

**Rubber hoses and hose  
assemblies —  
Wire braid reinforced  
hydraulic type —  
Specification**

The European Standard EN 853 : 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 by Technical Committee PRI/66, Rubber and plastics tubing, hoses and hose assemblies, 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  
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 Ministry of Defence  
 RAPRA Technology Ltd.  
 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 853 : 1996 *Rubber hoses and hose assemblies — Wire braid reinforced hydraulic type — Specification*, published by the European Committee for Standardization (CEN).

It supersedes BS 3832 : 1991 which is withdrawn.

EN 853 : 1996 has been approved by CEN member bodies under the weighted voting procedures introduced in 1988 to coincide with the introduction of the '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 : 1997 <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>
ISO 1817 : 1985	BS 903 <i>Physical testing of rubber</i>
ISO 6743-4 : 1982	Part A16 : 1987 <i>Determination of the effect of liquids</i> BS 6413 <i>Lubricants, industrial oils and related products (class L)</i> Part 4 : 1983 <i>Classification for family H (Hydraulic systems)</i>
ISO 6803 : 1994	BS ISO 6803 : 1996 <i>Rubber and plastics hoses and hose assemblies — Hydraulic-pressure impulse test without flexing</i>

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### Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, the EN title page, pages 2 to 8, an inside back cover and a back cover.

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ICS 23.040.70

Descriptors: Rubber hoses, plastic tubes, hoses, armatures, hydraulic systems, hydraulic fluids, specifications, dimensions, dimensional tolerances, tests, marking

English version

## Rubber hoses and hose assemblies — Wire braid reinforced hydraulic type — Specification

Tuyaux et flexibles en caoutchouc — Type hydraulique avec armature de fils métalliques tressés — Spécification

Gummischläuche und-schlauchleitungen — Hydraulikschläuche mit Drahtgeflechteinlage — Spezifikation

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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 was prepared by Technical Committee CEN/TC 218, Rubber and plastics hoses and hose assemblies, the Secretariat of which is held by BSI.

This European Standard is based on ISO 1436.

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 April 1997, and conflicting standards shall be withdrawn at the latest by April 1997.

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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## 1 Scope

This European Standard specifies requirements for four types of wire braid reinforced hoses and hose assemblies of nominal bore from 5 to 51. They are suitable for use with:

- hydraulic fluids in accordance with ISO 6743-4 with the exception of HFD R, HFD S and HFD T at temperatures ranging from  $-40^{\circ}\text{C}$  to  $+100^{\circ}\text{C}$ ;
- water based fluids at temperatures ranging from  $-40^{\circ}\text{C}$  to  $+70^{\circ}\text{C}$ ;
- water at temperatures ranging from  $0^{\circ}\text{C}$  to  $+70^{\circ}\text{C}$

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 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.

EN 24671	<i>Rubber and plastics hose and hose assemblies — Methods of measurement of dimensions</i> (ISO 4671 : 1984)
EN 24672	<i>Rubber and plastics hoses — Sub-ambient temperature flexibility tests</i> (ISO 4672 : 1988)
EN 27326	<i>Rubber and plastics hoses — Assessment of ozone resistance under static conditions</i> (ISO 7326 : 1991)
EN 28033 : 1993	<i>Rubber and plastics hose — Determination of adhesion between components</i> (ISO 8033 : 1991)
EN ISO 1402	<i>Rubber and plastics hoses and hose assemblies — Hydrostatic testing</i> (ISO 1402 : 1994)
EN ISO 6945	<i>Rubber hoses — Determination of abrasion resistance of the outer cover</i> (ISO 6945 : 1991)

EN ISO 7233	<i>Rubber and plastics hoses and hose assemblies — Determination of suction resistance</i> (ISO 7233 : 1991)
ISO 1817	<i>Rubber, vulcanized — Determination of the effect of liquids</i>
ISO 6743-4	<i>Lubricants, industrial oils and related products (Class L) — Classification — Part 4: Family H (Hydraulic systems)</i>
ISO 6803	<i>Rubber or plastics hoses and hose assemblies — Hydraulic pressure impulse test without flexing</i>

## 3 Types of hoses

Four types of hoses are specified:

- type 1ST — hoses with a single braid of wire reinforcement;
- type 2ST — hoses with two braids of wire reinforcement;
- types 1SN and 2SN — types 1SN and 2SN shall be of the same reinforcement construction as types 1ST and 2ST, except that they shall have thinner covers designed to assemble with fittings that do not require removal of the cover or a portion of the cover.

## 4 Materials and construction

### 4.1 Hoses

Hoses shall consist of an oil and water resistant synthetic rubber lining, one or two layers of high tensile steel wire 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 in accordance with this European Standard.

## 5 Dimensions

### 5.1 Diameters and concentricity

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

Table 1. Diameters of hoses																
Dimensions in millimetres																
Nominal bore	All types		Type 1ST				Type 1SN			Type 2ST				Type 2SN		
	Internal diameter		Diameter over reinforcement		Outside diameter of hose		Outside diameter of hose	Cover thickness		Diameter over reinforcement		Outside diameter of hose		Outside diameter of hose	Cover thickness	
	min.	max.	min.	max.	min.	max.	max.	min.	max.	min.	max.	min.	max.	max.	min.	max.
5	4,6	5,4	9,0	10,0	11,9	13,5	12,5	0,8	1,5	10,6	11,6	15,1	16,7	14,1	0,8	1,5
6	6,2	7,0	10,6	11,6	15,1	16,7	14,1	0,8	1,5	12,1	13,3	16,7	18,3	15,7	0,8	1,5
8	7,7	8,5	12,1	13,3	16,7	18,3	15,7	0,8	1,5	13,7	14,9	18,3	19,9	17,3	0,8	1,5
10	9,3	10,1	14,5	15,7	19,0	20,6	18,1	0,8	1,5	16,1	17,3	20,6	22,2	19,7	0,8	1,5
12	12,3	13,5	17,5	19,1	22,2	23,8	21,4	0,8	1,5	19,0	20,6	23,8	25,4	23,0	0,8	1,5
16	15,5	16,7	20,6	22,2	25,4	27,0	24,5	0,8	1,5	22,2	23,8	27,0	28,6	26,2	0,8	1,5
19	18,6	19,8	24,6	26,2	29,4	31,0	28,5	0,8	1,5	26,2	27,8	31,0	32,6	30,1	0,8	1,5
25	25,0	26,4	32,5	34,1	37,1	39,1	36,6	0,8	1,5	34,1	35,7	38,5	40,9	38,9	1,0	2,0
31	31,4	33,0	39,3	41,7	44,4	47,6	44,8	1,0	2,0	43,3	45,7	49,2	52,4	49,5	1,0	2,0
38	37,7	39,3	45,6	48,0	50,8	54,0	52,1	1,5	2,5	49,6	52,0	55,6	58,8	55,9	1,3	2,5
51	50,4	52,0	58,7	61,7	65,1	68,3	65,5	1,5	2,5	62,3	64,7	68,2	71,4	68,6	1,3	2,5



When measured in accordance with EN 24671, the concentricity of the hoses shall comply with the values given in table 2.

<b>Table 2. Concentricity of hoses</b>			
Dimensions in millimetres			
Nominal bore	Maximum variation in wall thickness		
	Between internal diameter and outside diameter	Between internal diameter and reinforcement diameter	
		All types	Types 1ST and 1SN
Up to and including 6	0,8	0,4	0,4
Over 6 and including 19	1,0	0,6	0,7
Over 19	1,3	0,8	0,9

## 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 length of hose shall be less than 1 m.

### 5.2.2 Hose assemblies

The tolerances on the length of hose assemblies shall comply with table 3.

<b>Table 3. Tolerances of length of hose assemblies</b>			
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 %	

## 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 comply with the values given in table 4.

<b>Table 4. Maximum working pressure, proof pressure and burst pressure</b>						
<b>Nominal bore</b>	<b>Maximum working pressure</b>		<b>Proof pressure</b>		<b>Burst pressure</b>	
	bar <sup>1)</sup>		bar		bar	
	<b>Types 1ST and 1SN</b>	<b>Types 2ST and 2SN</b>	<b>Types 1ST and 1SN</b>	<b>Types 2ST and 2SN</b>	<b>Types 1ST and 1SN</b>	<b>Types 2ST and 2SN</b>
5	250	415	500	830	1000	1650
6	225	400	450	800	900	1600
8	215	350	430	700	850	1400
10	180	330	360	660	720	1320
12	160	275	320	550	640	1100
16	130	250	260	500	520	1000
19	105	215	210	430	420	850
25	88	165	175	325	350	650
31	63	125	125	250	250	500
38	50	90	100	180	200	360
51	40	80	80	160	160	320

<sup>1)</sup> 1 bar = 0,1 MPa

**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 %.

### 6.2 Minimum bend radius

When bent to the minimum bend radius given 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.

<b>Table 5. Minimum bend radius</b>	
Dimensions in millimetres	
Nominal bore	Minimum bend radius
5	90
6	100
8	115
10	130
12	180
16	200
19	240
25	300
31	420
38	500
51	630

### 6.3 Impulse test requirements

**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 1ST and 1SN hoses, when tested at impulse pressure equal to 125 % of the maximum working pressure for hoses of nominal bore 25 and smaller, and at 100 % of the maximum working pressure for nominal bore 31 and above, the hose shall withstand a minimum of 150 000 impulse cycles.

For type 2ST and 2SN hoses, when tested at impulse pressure equal to 133 % of the maximum working pressure, the hose shall withstand a minimum of 200 000 impulse cycles.

**6.3.3** There shall be no leakage or 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.

### 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 between lining and reinforcement, and between cover and reinforcement shall not be less than 2,5 kN/m.

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

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

<b>Table 6. Degree of vacuum</b>		
Nominal bore	Negative gauge pressure bar <sup>1)</sup> max.	
	Types 1ST and 1SN	Types 2ST and 2SN
5	-0,8	-0,95
6		
8		
10		
12		
16		
19	-0,6	-0,8
25		
31		
38		
51		

<sup>1)</sup> 1 bar = 0,1 MPa

### 6.8 Abrasion resistance

For hose types 1ST and 2ST, when tested in accordance with EN ISO 6945, with a vertical force of (50 ± 0,5) N, the loss of mass after 2 000 cycles shall not be greater than 1 g.

For hose types 1SN and 2SN, when tested in accordance with EN ISO 6945 with a vertical force of (25 ± 0,5) N, the loss of mass after 2 000 cycles shall not be greater than 0,5 g.

## 6.9 Fluid resistance

### 6.9.1 Test pieces

The fluid resistance tests shall be carried out on moulded sheets of lining and cover compound, 2 mm minimum thickness, of equivalent cure state to that of the 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 based 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 be not 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 a water for 168 h at a temperature of 70 °C shall show no shrinkage. The volume swelling shall be not 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  $\times 2$  magnification.

## 7 Designation

Hoses shall be designated as the following example.

Designation of a type 1ST hydraulic hose with wire braid reinforcement and a nominal bore of 10:

Hose EN 853 - 1ST 10

## 8 Marking

### 8.1 Hoses

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

- a) manufacturer's name or identification, e.g. XXX;
- b) the number of this European Standard 'EN 853';
- c) type, e.g. 2ST;
- d) nominal bore, e.g. 16;
- e) quarter and last two digits of year of manufacture, e.g. 4Q96.

EXAMPLE: XXX/EN 853/2ST/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 with at least the following information:

- a) manufacturer's name or identification, e.g. XXX;
- b) maximum working pressure, of the assemblies in bar, e.g. 250;
- c) last two digits of year and month of assembly, e.g. 9610.

EXAMPLE: XXX/250/9610.

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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