BRITISH STANDARD

BS EN
856 : 1997

Rubber hoses and hose assemblies —

Rubber-covered spiral wire reinforced hydraulic type —

Specification

The European Standard EN 856 : 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, 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
London Fire and Civil Defence Authority
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

This British Standard, having been prepared under the direction of the Sector Board for Materials and Chemicals, was published under the authority of the Standards Board and comes into effect on
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The following BSI references relate to the work on this standard:
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Contents

National foreword

This British Standard has been prepared by Technical Committee PRI/66 and is the English language version of EN 856 : 1996 *Rubber hoses and hose assemblies — Rubber-covered spiral wire reinforced hydraulic type — Specification*, published by the European Committee for Standardization (CEN).

It supersedes BS 4586 : 1992 which is withdrawn.

EN 856 : 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 *Rubber and plastics hose and hose assemblies. Methods of measurement of dimensions*
EN 24672 : 1993	BS EN 24672 : 1993 *Rubber and plastics hoses. Sub-ambient temperature flexibility tests*
EN 27326 : 1993	BS EN 27326 : 1993 *Rubber and plastics hoses. Assessment of ozone resistance under static conditions*
EN 28033 : 1993	BS EN 28033 : 1993 *Rubber and plastics hose. Determination of adhesion between components*
EN ISO 1402 : 1996	BS EN ISO 1402 : 1997 *Rubber and plastics hoses and hose assemblies — Hydrostatic testing*
EN ISO 6945 : 1996	BS EN ISO 6945 : 1996 *Rubber hoses — Determination of abrasion resistance of its outer cover*
ISO 1817 : 1985	BS 903 *Physical testing of rubber* Part A16 : 1987 *Determination of the effect of liquids*
ISO 6743-4 : 1982	BS 6413 *Lubricants, industrial oils and related products (class L)* Part 4 : 1983 *Classification for family H (hydraulic systems)*
ISO 6803 : 1994	BS ISO 6803 : 1996 *Rubber and plastics hoses and hose assemblies — Hydraulic–pressure impulse test without flexing*

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, the EN title page, pages 2 to 8, an inside back cover and a back cover.

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 856

October 1996

ICS 23.040.70

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

English version

Rubber hoses and hose assemblies — Rubber-covered spiral wire reinforced hydraulic type — Specification

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

Gummischläuche und -schlauchleitungen — Hydraulikschläuche mit Drahtspiraleinlage — 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 3862.

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.

Contents

1 Scope

This European Standard specifies requirements for four types of rubber covered spiral wire reinforced hydraulic hoses and hose assemblies of nominal bore from 6 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 °C to +100 °C for types 4SP and 4SH and −40 °C to +120 °C for types R12 and R13;

– water based fluids at temperatures ranging from −40 °C to +70 °C.

– water fluids 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 nor 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	*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 hose — 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

Four types of hose are specified:

– type 4SP — a 4-steel wire spiral medium pressure hose;

– type 4SH — a 4-steel wire spiral extra high pressure hose;

– type R12 — a 4-steel wire spiral heavy duty high temperature hose — medium pressure rating;

– type R13 — a multiple steel wire spiral heavy duty high temperature hose — high pressure rating.

4 Materials and construction

4.1 Hoses

Hoses shall consist of an oil and water resistant synthetic rubber lining, spiral plies of steel wire wrapped in alternating directions, and an oil and weather resistant synthetic rubber cover. Each spiral wire ply shall be separated by an insulating layer of synthetic rubber.

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 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.

When measured in accordance with EN 24671, the diameter over reinforcement and outside diameter of the hoses shall comply with the values given in table 2.

Table 1. Diameters of hoses

Dimensions in millimetres

Nominal bore	Internal diameter							
	Type 4SP		Type 4SH		Type R12		Type R13	
	min.	max.	min.	max.	min.	max.	min.	max.
6	6,2	7,0	—	—	—	—	—	—
10	9,3	10,1	—	—	9,3	10,1	—	—
12	12,3	13,5	—	—	12,3	13,5	—	—
16	15,5	16,7	—	—	15,5	16,7	—	—
19	18,6	19,8	18,6	19,8	18,6	19,8	18,6	19,8
25	25,0	26,4	25,0	26,4	25,0	26,4	25,0	26,4
31	31,4	33,0	31,4	33,0	31,4	33,0	31,4	33,0
38	37,7	39,3	37,7	39,3	37,7	39,3	37,7	39,3
51	50,4	52,0	50,4	52,0	50,4	52,0	50,4	52,0

Table 2. Diameter over reinforcement and outside diameter

Dimensions in millimetres

Nominal bore	Type 4SP				Type 4SH				Type R12				Type R13			
	Diameter over reinforcement		Outside diameter of hose		Diameter over reinforcement		Outside diameter of hose		Diameter over reinforcement		Outside diameter of hose		Diameter over reinforcement		Outside diameter of hose	
	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.
6	14,1	15,3	17,1	18,7	—	—	—	—	—	—	—	—	—	—	—	—
10	16,9	18,1	20,6	22,2	—	—	—	—	16,6	17,8	19,5	21,0	—	—	—	—
12	19,4	21,0	23,8	25,4	—	—	—	—	19,9	21,5	23,0	24,6	—	—	—	—
16	23,0	24,6	27,4	29,0	—	—	—	—	23,8	25,4	26,6	28,8	—	—	—	—
19	27,4	29,0	31,4	33,0	27,6	29,2	31,4	33,0	26,9	28,4	29,9	31,5	28,2	29,8	31,0	33,2
25	34,5	36,1	38,5	40,9	34,4	36,0	37,5	39,9	34,1	35,7	36,8	39,2	34,9	36,4	37,6	39,8
31	45,0	47,0	49,2	52,4	40,9	42,9	43,9	47,1	42,7	45,1	45,4	48,6	45,6	48,0	48,3	51,3
38	51,4	53,4	55,6	58,8	47,8	49,8	51,9	55,1	49,2	51,6	51,9	55,0	53,1	55,5	55,8	58,8
51	64,3	66,3	68,2	71,4	62,2	64,2	66,5	69,7	62,5	64,8	65,1	68,3	66,9	69,3	69,5	72,7

When measured in accordance with EN 24671, the concentricity of the hoses shall comply with the values given in table 3.

Table 3. Concentricity of hoses

Dimensions in millimetres

Nominal bore	Maximum variation in wall thickness	
	Between internal diameter and outside diameter	Between internal diameter and reinforcement diameter
6	0,8	0,5
Over 6 and including 19	1,0	0,7
Over 19	1,3	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 hose length shall be less than 1 m.

5.2.2 *Hose assemblies*

The tolerances on the length of hose assemblies shall comply with the values given in table 4.

Table 4. Tolerances of length of hose assemblies

Dimensions in millimetres

Hose assembly length	**Nominal bore**	
	Up to and including 25	**Over 25**
Up to and including 630	+7 −3	+12 −4
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 5.

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 % for types 4SP and 4SH and ±2 % for types R12 and R13.

Table 5. Maximum working pressure, proof pressure and burst pressure

Nominal bore	**Maximum working pressure** bar[1)]				**Proof pressure** bar				**Burst pressure** bar			
	Type				**Type**				**Type**			
	4SP	**4SH**	**R12**	**R13**	**4SP**	**4SH**	**R12**	**R13**	**4SP**	**4SH**	**R12**	**R13**
6	450	—	—	—	900	—	—	—	1800	—	—	—
10	445	—	276	—	890	—	552	—	1780	—	1104	—
12	415	—	276	—	830	—	552	—	1660	—	1104	—
16	350	—	276	—	700	—	552	—	1400	—	1104	—
19	350	420	276	345	700	840	552	690	1400	1680	1104	1380
25	280	380	276	345	560	760	552	690	1120	1520	1104	1380
31	210	325	207	345	420	650	414	690	840	1300	828	1380
38	185	290	172	345	370	580	344	690	740	1160	688	1380
51	165	250	172	345	330	500	344	690	660	1000	688	1380

[1)] 1 bar = 0,1 MPa

6.2 Minimum bend radius

When bent to the minimum bend radius given in table 6 measured on the inside of the bend, the hose shall be capable of performing at maximum working pressure.

Table 6. Minimum bend radius

Dimensions in millimetres

Nominal bore	Minimum bend radius			
	Type 4SP	Type 4SH	Type R12	Type R13
6	150	—	—	—
10	180	—	130	—
12	230	—	180	—
16	250	—	200	—
19	300	280	240	240
25	340	340	300	300
31	460	460	420	420
38	560	560	500	500
51	660	700	630	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 for types 4SP and 4SH and 120 °C for types R12 and R13.

6.3.2 For types 4SP and 4SH hose, when tested at impulse pressure equal to 133 % of the maximum working pressure, the hose shall withstand a minimum of 400 000 impulse cycles.

For type R12 hose, tested at impulse pressure equal to 133 % of the maximum working pressure, the hose shall withstand a minimum of 500 000 impulse cycles.

For type R13 hose, tested at impulse pressure equal to 120 % of the maximum working pressure, the hose shall withstand a minimum of 500 000 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 Abrasion resistance

When tested in accordance with EN ISO 6945, with a vertical force of (50 ± 0,5) N, the loss of mass after 2000 cycles shall not be greater than 1 g.

6.8 Fluid resistance

6.8.1 *Test pieces*

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

6.8.2 *Oil resistance*

When tested in accordance with ISO 1817, the lining of types 4SP and 4SH immersed in oil No.3 for 168 h at a temperature of 100 °C shall show no shrinkage nor volume swelling greater than 60 %.

When tested in accordance with ISO 1817, the cover of types 4SP and 4SH immersed in oil No.3 for 168 h at a temperature of 70 °C shall show no shrinkage nor volume swelling greater than 100 %.

When tested in accordance with ISO 1817, the lining and cover of hose types R12 and R13, immersed in oil No.3 for 70 h at a temperature of 120 °C, shall show no shrinkage nor volume swelling greater than 100 % for the lining 125 % for the cover.

6.8.3 *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 the lining nor 100 % for the cover.

6.8.4 *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 the lining nor 100 % for the cover.

6.9 Ozone resistance

When tested in accordance with method 1 or 2 of EN 27326, depending on 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 4SP hydraulic hose with spiral wire reinforcement and a nominal bore of 10:

Hose EN 856 – 4SP 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 sign 'EN 856';

c) type, e.g. 4SP;

d) nominal bore, e.g. 16;

e) quarter and last two digits of year of manufacture, e.g. 4Q96.

EXAMPLE: XXX/EN 856/4SP/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. 350

c) the last two digits of year and month of assembly, e.g. 9610.

EXAMPLE: XXX/350/9610

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

List of references

See national foreword.

BSI — British Standards Institution

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