INTERNATIONAL STANDARD

ISO 17165-1

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Hydraulic fluid power — Hose assemblies —

Part 1: Dimensions and requirements

Transmissions hydrauliques — Flexibles de raccordement —

Partie 1: Dimensions et exigences

Reference number
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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 17165-1 was prepared by Technical Committee ISO/TC 131, *Fluid power systems*, Subcommittee SC 4, *Connectors and similar products and components*.

ISO 17165 consists of the following parts, under the general title *Hydraulic fluid power — Hose assemblies*:

— *Part 1: Dimensions and requirements*

— *Part 2: Recommended practices for hydraulic hose assemblies*

Introduction

In hydraulic fluid power systems, power is transmitted and controlled through a liquid under pressure within an enclosed circuit.

Components may be connected through their ports by piping (both connectors and conductors). Hose assemblies make up the flexible part of piping.

Hydraulic fluid power — Hose assemblies —

Part 1:
Dimensions and requirements

1 Scope

This part of ISO 17165 specifies requirements for hose assemblies that are manufactured from hoses that conform to ISO 3949 and to all parts of ISO 1436, ISO 3862, ISO 4079 and ISO 11237 and hose fittings with elastomeric seals that conform to ISO 12151-1, ISO 12151-2, ISO 12151-3 and ISO 12151-6.

This part of ISO 17165 contains information of the most important criteria for the selection of preferred types of hoses and hose fittings with elastomeric sealing for use in hydraulic fluid power applications.

Recommendations for installation, storage, life cycle and the necessary inspections to ensure the full functionality of hose assemblies are given in ISO/TR 17165-2.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 1436-1, *Rubber hoses and hose assemblies — Wire-braid-reinforced hydraulic types — Specification — Part 1: Oil-based fluid applications*

ISO 1436-2, *Rubber hoses and hose assemblies — Wire-braid-reinforced hydraulic types — Specification — Part 2: Water-based fluid applications*

ISO 3862-1, *Rubber hoses and hose assemblies — Rubber-covered spiral-wire-reinforced hydraulic types — Specification — Part 1: Oil-based fluid applications*

ISO 3862-2, *Rubber hoses and hose assemblies — Rubber-covered spiral-wire-reinforced hydraulic types — Specification — Part 2: Water-based fluid applications*

ISO 3949, *Plastics hoses and hose assemblies — Textile-reinforced types for hydraulic applications — Specification*

ISO 4079-1, *Rubber hoses and hose assemblies — Textile-reinforced hydraulic types — Specification — Part 1: Oil-based fluid applications*

ISO 4079-2, *Rubber hoses and hose assemblies — Textile-reinforced hydraulic types — Specification — Part 2: Water-based fluid applications*

ISO 5598[1)], *Fluid power systems and components — Vocabulary*

ISO 6743-4, *Lubricants, industrial oils and related products (class L) — Classification — Part 4: Family H (Hydraulic systems)*

ISO 8330, *Rubber and plastics hoses and hose assemblies — Vocabulary*

ISO 8434-1:2007, *Metallic tube connections for fluid power and general use — Part 1: 24° cone connections*

ISO 11237-1, *Rubber hoses and hose assemblies — Wire-braid-reinforced compact types for hydraulic applications — Specification — Part 1: Oil-based fluid applications*

ISO 11237-2, *Rubber hoses and hose assemblies — Wire-braid-reinforced compact types for hydraulic applications — Specification — Part 2: Water-based fluid applications*

ISO 12151-1, *Connections for hydraulic fluid power and general use — Hose fittings — Part 1: Hose fittings with ISO 8434-3 O-ring face seal ends*

ISO 12151-2, *Connections for hydraulic fluid power and general use — Hose fittings — Part 2: Hose fittings with ISO 8434-1 and ISO 8434-4 24° cone connector ends with O-rings*

ISO 12151-3[2)], *Connections for hydraulic fluid power and general use — Hose fittings — Part 3: Hose fittings with ISO 6162-1 or ISO 6162-2 flange ends*

ISO 12151-6[3)], *Connections for hydraulic fluid power and general use — Hose fittings — Part 6: Hose fittings with ISO 8434-6 60° cone ends*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 5598 and ISO 8330 and the following apply.

3.1
manufacturing date of the hose assembly
date that a hose and hose fittings were assembled into a hose assembly

1) To be published. (Revision of ISO 5598:1985)

2) Under development. (Revision of ISO 12151-3:1999)

3) Under development.

4 Designation

4.1 The symbols used to designate the forms of hose fitting types covered in Clause 8 of this part of ISO 17165 are given in Table 1.

Table 1 — Symbols used to designate hose fitting types

Symbol	Specification	Corresponding hose fitting standard connection end type and shape designation
G	Male threaded hose fitting with O-ring face seal end conforming to ISO 8434-3	ISO 12151-1, S
F	Female swivel straight hose fitting with O-ring face seal end conforming to ISO 8434-3	ISO 12151-1, SWS
F45	Female swivel 45° elbow hose fitting with O-ring face seal end conforming to ISO 8434-3	ISO 12151-1, SWE45
F90S	Female swivel 90° elbow short hose fitting with O-ring face seal end conforming to ISO 8434-3	ISO 12151-1, SWES
F90M	Female swivel 90° elbow medium hose fitting with O-ring face seal end conforming to ISO 8434-3	ISO 12151-1, SWEM
F90L	Female swivel 90° elbow long hose fitting with O-ring face seal end conforming to ISO 8434-3	ISO 12151-1, SWEL
D	Male threaded hose fitting with 24° compression end conforming to ISO 8434-1, L series	ISO 12151-2, S, L series
E	Male threaded hose fitting with 24° compression end conforming to ISO 8434-1, S series	ISO 12151-2, S, S series
N, N45, N90	Female swivel hose fitting with 24° compression end with O-ring conforming to ISO 8434-1, L series	ISO 12151-2, SWS, SWE45, SWE, L series
P, P45, P90	Female swivel hose fitting with 24° compression end with O-ring conforming to ISO 8434-1, S series	ISO 12151-2, SWS, SWE45, SWE, S series
R, R45S, R45M, R90S, R90M	Hose fitting with flange head with O-ring and flange clamp conforming to ISO 6162-1, 3,5 MPa to 35 MPa (35 bar to 350 bar) series	ISO 12151-3, S, E45S, E45M, ES, EM, 3,5 MPa to 35 MPa (35 bar to 350 bar) series
S, S45S, S45M, S90S, S90M	Hose fitting with flange head with O-ring and flange clamp conforming to ISO 6162-2, 40 MPa (400 bar) series	ISO 12151-3, S, E45S, E45M, ES, EM, 40 MPa (400 bar) series
T	Male threaded hose fitting with 60° cone end conforming to ISO 8434-6	ISO 12151-6, S
U, U45, U90S, U90M, U90L	Female swivel hose fitting with 60° cone end with O-ring conforming to ISO 8434-6	ISO 12151-6, SWSA, SWE45A, SWESA, SWEMA, SWELA

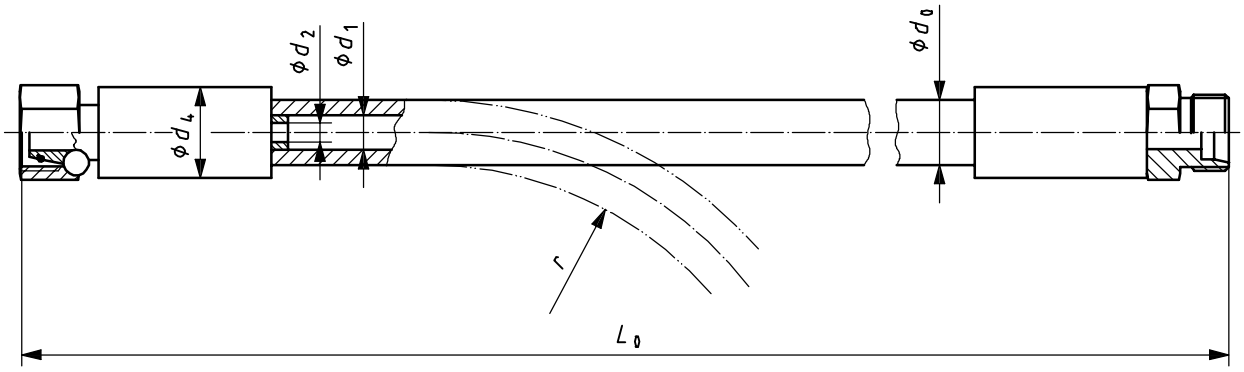
4.2 Unless otherwise agreed between manufacturer and user, crimped hose fittings shall be assumed.

4.3 It is not necessary that the hose assembly comply with the relevant figure; however, the relevant dimensions shall be followed (see Table C.1). See the following examples.

EXAMPLE 1

Hose fitting form P
(same as SWS, S series, conforming to ISO 12151-2)

Hose fitting form E
(same as S, S series, conforming to ISO 12151-2)



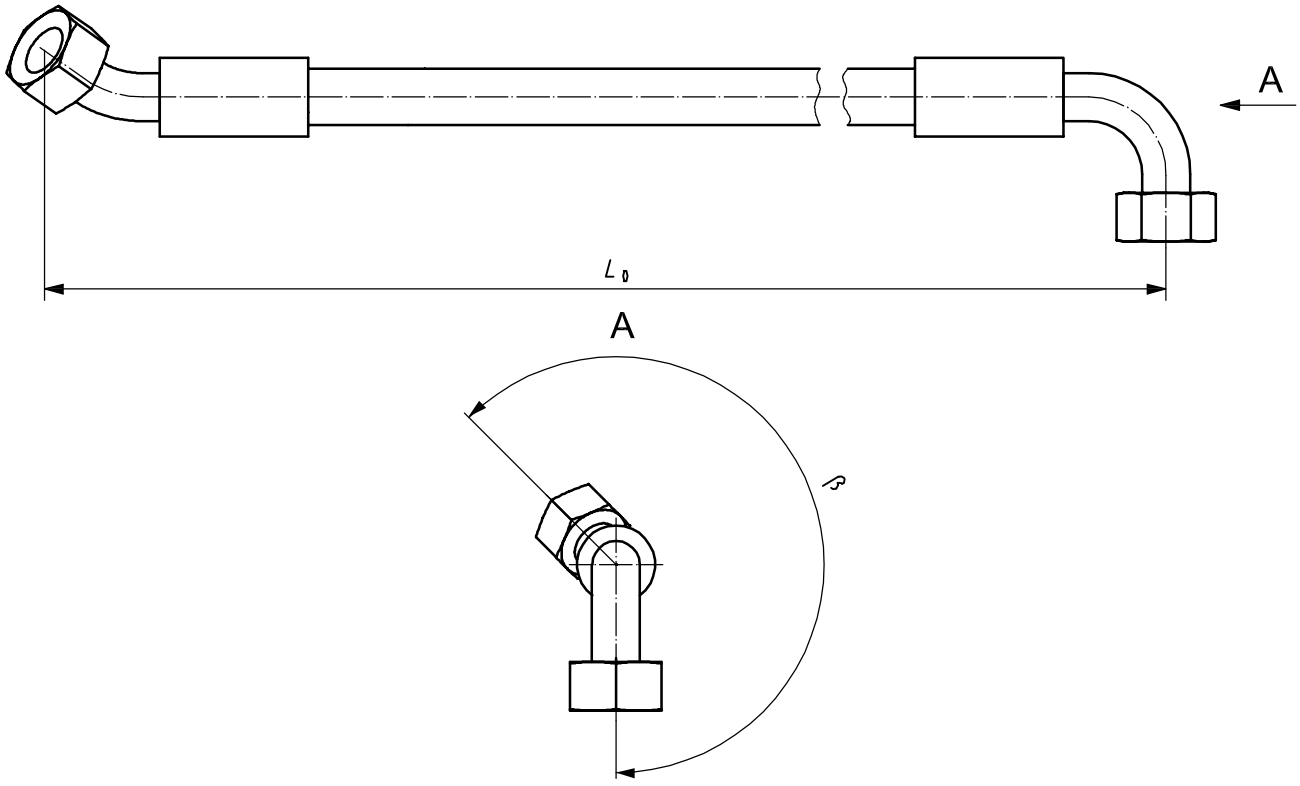
A hose assembly consisting of hose 2SN conforming to ISO 1436-1 with a nominal hose size of 19 mm (d_1) and hose fittings forms P and E with a length of $L_0 = 1\,000$ mm shall be designated as follows:

Hose assembly ISO 17165-1 – 2SN-19-PE-1000

EXAMPLE 2

Hose fitting form P45
(same as SWE45, S series, conforming to ISO 12151-2)

Hose fitting form P90
(same as SWE, S series, conforming to ISO 12151-2)



A hose assembly consisting of hose 2SN conforming to ISO 1436-1 with a nominal hose size of 19 mm (d_1) and hose fitting forms P45 and P90 with a length of $L_0 = 1\,500$ mm and a rotational angle of $\beta = 210°$ (measured anti-clockwise, starting from the hose fitting in the front) shall be designated as follows:

Hose assembly ISO 17165-1 – 2SN-19-P45P90-1500-210

5 Hose types, nominal inside diameters and maximum working pressures, and correspondence of hose sizes to tube sizes

5.1 Hose maximum working pressures and nominal inside diameters shall be selected from the latest edition of the relevant hose standard. A summary of maximum working pressures and nominal inside diameters for various types of hoses that conform to ISO 3949 and all parts of ISO 1436, ISO 3862, ISO 4079 and ISO 11237 is given for informative purposes in Table A.1.

5.2 A summary of dimensions of related steel tubes for use in combination with the hose types specified in 5.1 is given for informative purposes in Table B.1.

6 Dimensions of hose and hose fittings

Maximum hose outside diameters (d_{0max}), maximum hose fitting outside diameters (d_{4max}), minimum hose fitting inside diameters (d_{2min}) and minimum bend radii (r_{min}) of the hoses shall be selected from the relevant hose or hose fitting standard. A summary of these dimensions is given for informative purposes in Table C.1.

7 Overview of hose type, type of hydraulic fluid and temperature range

7.1 ISO 3949 specifies requirements for hose types R7 and R8. ISO 3949 is divided into two parts, depending on electrical conductivity requirements. They are suitable for use with

— petroleum- and synthetic-based hydraulic fluids at temperatures ranging from − 40 °C to + 100 °C;

— water-based hydraulic fluids at temperatures ranging from 0 °C to + 70 °C.

NOTE 1 Operating temperatures in excess of 100 °C can materially reduce the life of the hose.

NOTE 2 Requirements for hydraulic hoses for underground mining are specified in other International Standards.

7.2 ISO 1436, ISO 3862, ISO 4079 and ISO 11237 specify requirements for hose types 1TE, 2TE, 3TE, R3, R6, 1ST, R1A, 1SN, R1AT, 2ST, R2A, 2SN, R2AT, 1SC, 2SC, R16, 4SP, 4SH, R12, R13 and R15. Each International Standard is divided into two parts. They are suitable for use with

— all types of hydraulic fluids designated in accordance with ISO 6743-4 with the exception of HFDR at temperatures ranging from − 40 °C to + 100 °C and for types R12, R13 and R15 from − 40 °C to + 120 °C (see Part 1 of the relevant International Standard);

— water-based fluids at temperatures ranging from − 40 °C to + 70 °C (see Part 2 of the relevant International Standard);

— water at temperatures ranging from 0 °C to + 70 °C (see Part 2 of the relevant International Standard).

NOTE 1 The hoses specified in ISO 1436, ISO 3862, ISO 4079 and ISO 11237 are not suitable for use with castor-oil-based or ester-based fluids.

NOTE 2 It is preferable not to use the hoses and hose assemblies outside the pressure and temperature limits specified in this part of ISO 17165.

NOTE 3 Requirements for hydraulic hoses for underground mining are specified in other International Standards.

8 Summary of hose fitting end forms and key dimensions

Figures 1 through 15 show commonly used hose fitting end forms. Tables 2 through 5 repeat the most important interface dimensions from ISO 12151-1, ISO 12151-2, ISO 12151-3 and ISO 12151-6. The working pressures are shown with the hose fitting end form, along with the related tube outside diameters, related flange sizes and the mating end forms.

NOTE As far as is practicable, the dimension labels in Figures 1 through 15 correspond to the dimension labels in the relevant part of ISO 12151. However, because not all dimensions from the relevant part of ISO 12151 are included in these figures, some dimension labels, such as d_3, are not used.

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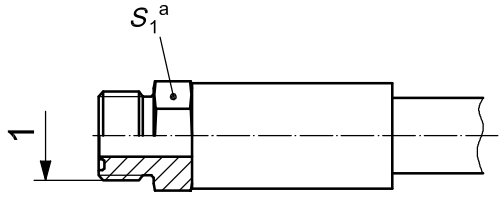
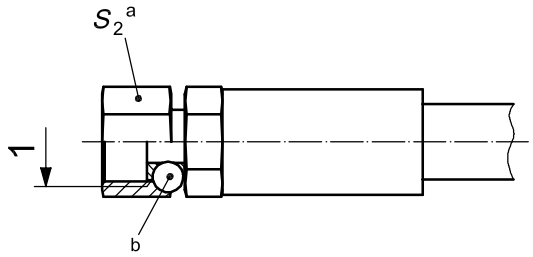


Key

1 thread

a Across the flats.

Figure 1 — Form G — Straight male threaded hose fitting (S) in accordance with ISO 12151-1



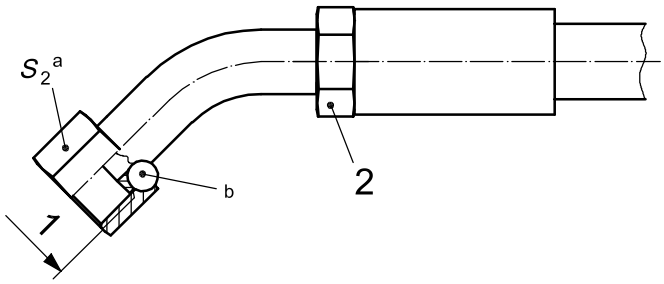
Key

1 thread

a Across the flats.

b Method of attachment of swivel nut as chosen by the manufacturer.

Figure 2 — Form F — Straight female swivel hose fitting (SWS) in accordance with ISO 12151-1



Key

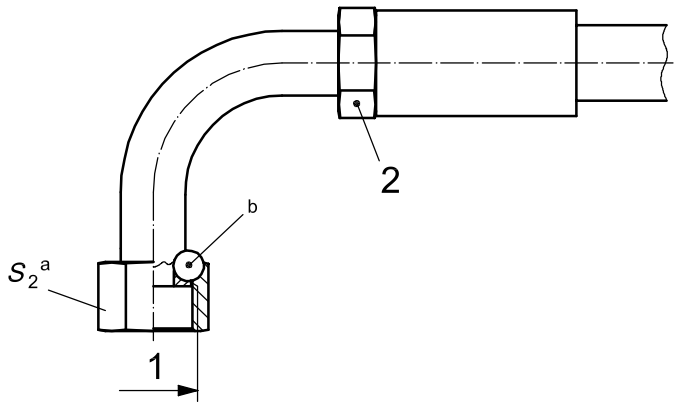
1 thread

2 hexagon and size optional

a Across the flats.

b Method of attachment of swivel nut as chosen by the manufacturer.

Figure 3 — Form F45 — 45° elbow female swivel hose fitting (SWE45) in accordance with ISO 12151-1



Key

1 thread

2 hexagon and size optional

a Across the flats.

b Method of attachment of swivel nut as chosen by the manufacturer.

Figure 4 — Form F90S, F90M, F90L — 90° elbow female swivel hose fitting (SWES, SWEM, SWEL) in accordance with ISO 12151-1

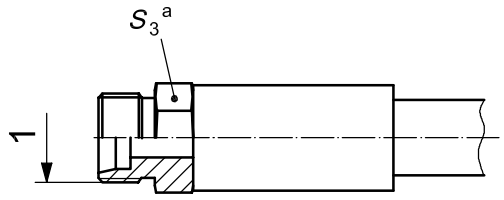
Table 2 — Forms and dimensions of threaded hose fittings in accordance with ISO 12151-1

Dimensions in millimetres

Form	Figure	Mating part form
G	1	F, F45, F90S, F90M, F90L
F	2	G
F45	3	G
F90S	4	G
F90M	4	G
F90L	4	G

	Nominal hose size, d_1								
	6,3	8	10	12,5	16	19	25	31,5	38
	Nominal tube outside diameter (nominal connection size)								
	6	8	10	12	16	20	25	30	38
Hose fitting size	6 × 6,3	6 × 8	10 × 10	12 × 12,5	16 × 16	20 × 19	25 × 25	30 × 31,5	38 × 38
Thread	9/16-18 UNF	9/16-18 UNF	11/16-18 UN	13/16-16 UN	1-14 UNS	1 3/16-12 UN	1 7/16-12 UN	1 11/16-12 UN	2-12 UN
S_1	17	17	19	22	27	32	41	46	55
S_2	17	17	22	24	30	36	41	50	60
Working pressure MPa (bar)	63,0 (630)			40,0 (400)			25,0 (250)		

9

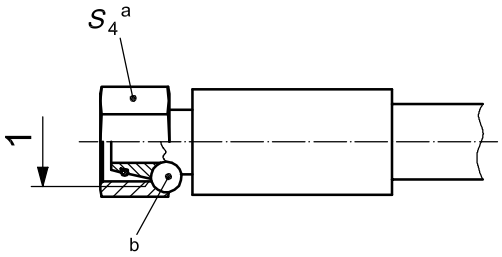


Key

1 thread

a Across the flats.

Figure 5 — Forms D and E — Straight male threaded hose fitting (S) in accordance with ISO 12151-2



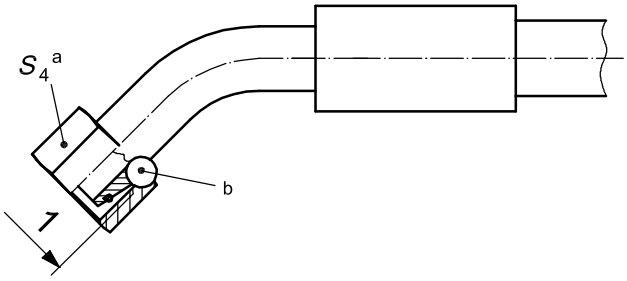
Key

1 thread

a Across the flats.

b Method of attachment of swivel nut as chosen by the manufacturer.

Figure 6 — Forms N and P — Straight female swivel hose fitting (SWS) in accordance with ISO 12151-2



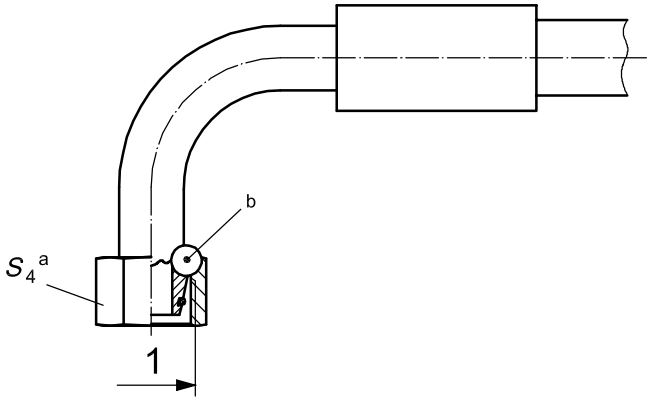
Key

1 thread

a Across the flats.

b Method of attachment of swivel nut as chosen by the manufacturer.

Figure 7 — Forms N45 and P45 — 45° elbow female swivel hose fitting (SWE45) in accordance with ISO 12151-2



Key

1 thread

a Across the flats.

b Method of attachment of swivel nut as chosen by the manufacturer.

Figure 8 — Forms N90 and P90 — 90° elbow female swivel hose fitting (SWE) in accordance with ISO 12151-2

Table 3 — Forms and dimensions of threaded hose fittings in accordance with ISO 12151-2

Dimensions in millimetres

Form	Figure	Mating part form
D	5	N, N45, N90 [a]
E	5	P, P45, P90 [b]
N	6	D
P	6	E
N45	7	D
P45	7	E
N90	8	D
P90	8	E

	Nominal hose size, d_1									
	5	6,3	8	10	12,5	16	19	25	31,5	38
	Nominal tube outside diameter (nominal connection size)									
L series	6	8	10	12	15	18	22	28	35	42
Hose fitting size	6 × 5	8 × 6,3	10 × 8	12 × 10	15 × 12,5	18 × 16	22 × 19	28 × 25	35 × 31,5	42 × 38
Thread	M12 × 1,5	M14 × 1,5	M16 × 1,5	M18 × 1,5	M22 × 1,5	M26 × 1,5	M30 × 2	M36 × 2	M45 × 2	M52 × 2
S_3	14	17	17	19	24	27	32	41	46	55
S_4	14	17	19	22	27	32	36	41	50	60
Working pressure PN1 MPa (bar)	25,0 (250)					16,0 (160)		10,0 (100)		
Working pressure PN2 MPa (bar) [c]	41,5 (415)	40 (400)	35 (350)	33 (330)	27,5 (275)	25 (250)	21,5 (215)	16,5 (165)	12,5 (125)	10 (100)
	Nominal tube outside diameter (nominal connection size)									
S series	8	10	12	12	16	20	25	30	38	—
Hose fitting size	8 × 5	10 × 6,3	12 × 8	12 × 10	16 × 12,5	20 × 16	25 × 19	30 × 25	38 × 31,5	—
Thread	M16 × 1,5	M18 × 1,5	M20 × 1,5	M20 × 1,5	M24 × 1,5	M30 × 2	M36 × 2	M42 × 2	M52 × 2	—
S_3	17	19	24	24	27	32	41	46	55	—
S_4	19	22	24	24	30	36	46	50	60	—
Working pressure MPa (bar)	63,0 (630)				40,0 (400)			25,0 (250)		

[a] At reduced pressures, a female swivel connector or tube with cutting ring in accordance with ISO 8434-1, and an L series swivel nut may be used.

[b] This form mates with a female swivel connector or tube with cutting ring in accordance with ISO 8434-1, and an S series swivel nut.

[c] **WARNING – These working pressures PN2 are only valid for the hose fittings specified in this part of ISO 17165, that is, forms N, N45, and N90 24° cone hose fittings with O-ring; these pressures are greater than the corresponding working pressures specified in ISO 8434-1 (cutting ring) and ISO 8434-4. The manufacturer shall use only components and elements that are approved for the maximum pressure in the system.**

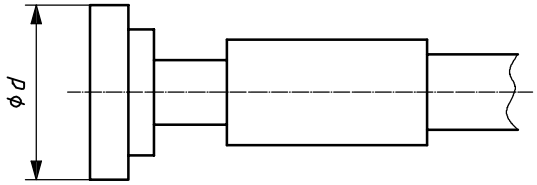


Figure 9 — Forms R and S — Straight hose fitting with flange head with O-ring groove in accordance with ISO 12151-3

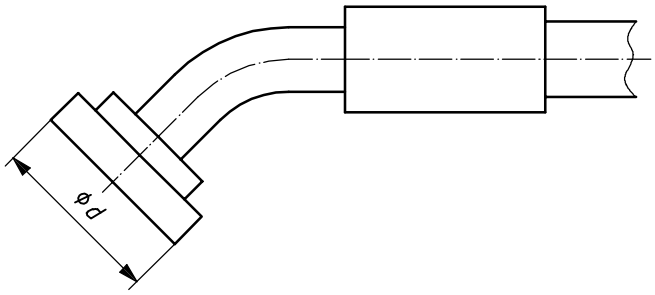


Figure 10 — Forms R45 and S45 — 45° elbow hose fitting with flange head with O-ring groove in accordance with ISO 12151-3

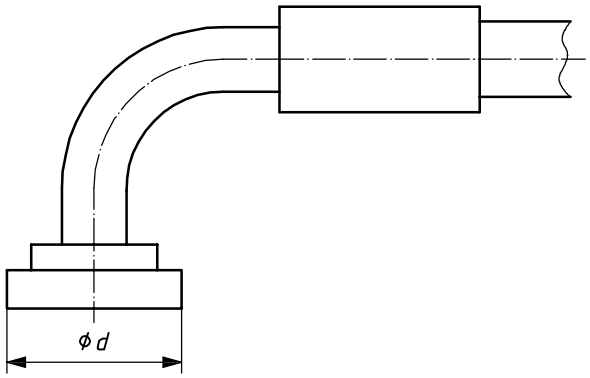


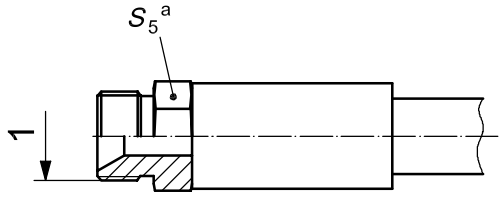
Figure 11 — Forms R90 and S90 — 90° elbow hose fitting with flange head with O-ring groove in accordance with ISO 12151-3

Table 4 — Forms and dimensions of hose fittings with flange ends in accordance with ISO 12151-3

Dimensions in millimetres

Form	Figure	Mating part form
R	9	Flange port ISO 6162-1 – 3,5 MPa to 35 MPa (35 bar to 350 bar) series
S	9	Flange port ISO 6162-2 – 40 MPa (400 bar) series
R45S	10	Flange port ISO 6162-1 – 3,5 MPa to 35 MPa (35 bar to 350 bar) series
R45M	10	Flange port ISO 6162-1 – 3,5 MPa to 35 MPa (35 bar to 350 bar) series
S45S	10	Flange port ISO 6162-2 – 40 MPa (400 bar) series
S45M	10	Flange port ISO 6162-2 – 40 MPa (400 bar) series
R90S	11	Flange port ISO 6162-1 – 3,5 MPa to 35 MPa (35 bar to 350 bar) series
R90M	11	Flange port ISO 6162-1 – 3,5 MPa to 35 MPa (35 bar to 350 bar) series
S90S	11	Flange port ISO 6162-2 – 40 MPa (400 bar) series
S90M	11	Flange port ISO 6162-2 – 40 MPa (400 bar) series

	Nominal hose size, d_1					
	12,5	19	25	31,5	38	51
	Nominal flange size					
3,5 MPa to 35 MPa (35 bar to 350 bar) series	13	19	25	32	38	51
Hose fitting size	13 × 12,5	19 × 19	25 × 25	32 × 31,5	38 × 38	51 × 51
d	30,2	38,1	44,45	50,8	60,35	71,4
Working pressure MPa (bar)	35,0 (350)			25,0 (250)	20,0 (200)	
	Nominal flange size					
40 MPa (400 bar) series	13	19	25	32	38	51
Hose fitting size	13 × 12,5	19 × 19	25 × 25	32 × 31,5	38 × 38	51 × 51
d	31,8	41,3	47,6	54	63,5	79,4
Working pressure MPa (bar)	40,0 (400)					

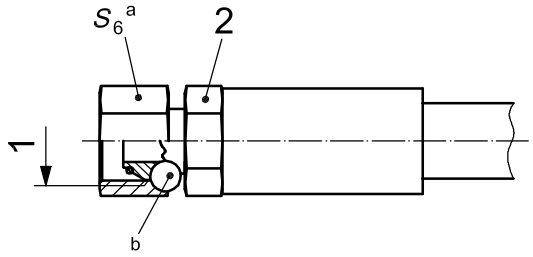


Key

1 thread

a Across the flats.

Figure 12 — Form T — Straight male threaded hose fitting (S) in accordance with ISO 12151-6



Key

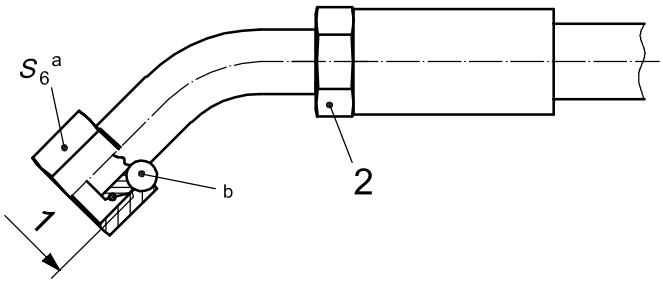
1 thread

2 hexagon and size optional

a Across the flats.

b Method of attachment of swivel nut as chosen by the manufacturer.

Figure 13 — Form U — Straight female swivel hose fitting (SWSA) in accordance with ISO 12151-6



Key

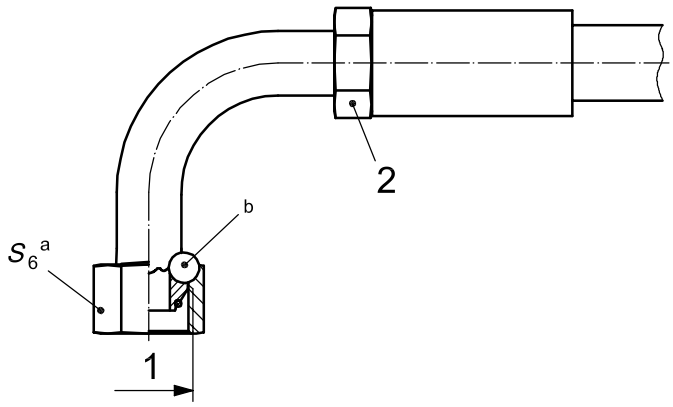
1 thread

2 hexagon and size optional

a Across the flats.

b Method of attachment of swivel nut as chosen by the manufacturer.

Figure 14 — Form U45 — 45° elbow female swivel hose fitting (SWE45A) in accordance with ISO 12151-6



Key

1 thread

2 hexagon and size optional

a Across the flats.

b Method of attachment of swivel nut as chosen by the manufacturer.

Figure 15 — Form U90 — 90° elbow female swivel hose fitting (SWEA) in accordance with ISO 12151-6

Table 5 — Forms and dimensions of threaded hose fittings in accordance with ISO 12151-6

Dimensions in millimetres

Form	Figure	Mating part form
T	12	U, U45, U90S, U90M, U90L
U	13	T
U45	14	T
U90S	15	T
U90M	15	T
U90L	15	T

	Nominal hose size, d_1									
	6,3	8	10	12,5	16	19	25	31,5	38	51
	Nominal tube outside diameter (nominal connection size)									
	8	10	10	12	16	20	25	32	38	50
Hose fitting size	8 × 6,3	10 × 8	10 × 10	12 × 12,5	16 × 16	20 × 19	25 × 25	32 × 31,5	38 × 38	50 × 51
Thread	G 1/4 A	G 3/8 A	G 3/8 A	G 1/2 A	G 5/8 A	G 3/4 A	G 1 A	G 1-1/4 A	G 1-1/2 A	G 2 A
S_5	19	22	22	27	30	32	41	50	55	70
S_6	19	22	22	27	30	32	41	50	55	70
Working pressure MPa (bar)	40,0 (400)			35,0 (350)		31,5 (315)	25,0 (250)	20,0 (200)	16,0 (160)	12,5 (125)

9 Requirements for manufacturing instructions for hose assemblies

The hose fitting manufacturer shall issue manufacturing instructions for the different hose assemblies to ensure their correct manufacture. These shall contain the following information:

— instructions about the hose to be used;

— instructions for cutting and preparing the hose;

— instructions for assembling the hose fitting to the hose;

— recommendations for the tools to be used;

— further measures to be taken during and after the assembly process to ensure proper manufacturing and leak prevention.

10 Tolerances on hose assembly length and rotational angle

10.1 The tolerances on the length of hose assemblies conforming to this part of ISO 17165 shall be in accordance with Table 6, unless otherwise agreed upon by the manufacturer and user.

Table 6 — Tolerances on hose assembly length

Dimensions in millimetres

Length of hose assembly [a]	Nominal hose size	
L_0	$\leqslant 25$	> 25
$\leqslant 630$	± 4	± 8
$> 630 \leqslant 1\,250$	± 8	± 13
$> 1\,250 \leqslant 2\,500$	± 13	± 15
$> 2\,500 \leqslant 8\,000$	$+ 1{,}5\ \%$ $- 0{,}5\ \%$	
$> 8\,000$	$+ 3\ \%$ $- 1\ \%$	

[a] Length of hose assembly measured in accordance with ISO 4671.

10.2 If two elbow hose fittings are being used on the same hose assembly, the rotational angle, β (see 4.3, Example 2), shall be stated. The tolerance on the rotational angle, β, shall be $\pm 5°$.

11 Pressure drop of hose assemblies

When calculating the pressure drop in a hose assembly, it shall be noted that the hose fittings have smaller inside diameters than the hoses.

Hose fittings may differ in length, inside diameter and form according to their design. To determine the actual pressure drop in a hose assembly, it shall be measured directly.

12 Requirements and tests

NOTE For safety requirements related to hose assemblies, see ISO 4413 and ISO/TR 17165-2.

12.1 Hose assemblies shall be manufactured with only those hoses and hose fittings whose functionality has been verified in accordance with all tests required in the relevant hose and hose fitting standards.

12.2 If the working pressures of the hose and hose fitting(s) that make up the hose assembly are different, the maximum working pressure of the hose assembly shall be the lower of the two.

13 Marking

The hose assembly shall be permanently marked and shall include the following information:

— manufacturer's name or identification (in the example below, XXX);

— maximum working pressure of the assembly, including the unit of pressure (for example, 25,0 MPa or, alternatively, 250 bar);

— last two digits of year and month of assembly, separated by an oblique (for example, 04/10 for 2004-10).

EXAMPLE 1: **XXX/25,0 MPa/04/10**

EXAMPLE 2: **XXX/250 bar/04/10**

14 Identification statement (reference to this part of ISO 17165)

It is strongly recommended to manufacturers who have chosen to conform to this part of ISO 17165 that the following statement be used in test reports, catalogues and sales literature:

“Hose assemblies conform to ISO 17165-1, *Hydraulic fluid power — Hose assemblies — Part 1: Dimensions and requirements*.”

Annex A
(informative)

Maximum working pressures of hoses

Table A.1 — Relationship among types of hoses that conform to ISO 3949 and to all parts of ISO 1436, ISO 3862, ISO 4079 and ISO 11237, hose inside diameter and maximum working pressure

Dimensions in millimetres

Hose type	Maximum working pressure associated with the following nominal hose sizes, d_1 MPa (bar)										
	5	6,3	8	10	12,5	16	19	25	31,5	38	51
1TE ISO 4079-1 ISO 4079-2 [a]	2,5 (25)	2,5 (25)	2,0 (20)	2,0 (20)	1,6 (16)	1,6 (16)	—	—	—	—	—
R6 ISO 4079-1 ISO 4079-2 [a]	3,5 (35)	3,0 (30)	3,0 (30)	3,0 (30)	3,0 (30)	2,6 (26)	2,2 (22)	—	—	—	—
2TE ISO 4079-1 ISO 4079-2 [a]	8,0 (80)	7,5 (75)	6,8 (68)	6,3 (63)	5,8 (58)	5,0 (50)	4,5 (45)	4,0 (40)	—	—	—
R3 ISO 4079-1 ISO 4079-2 [a]	10,5 (105)	8,8 (88)	8,2 [b] (82)	7,9 [b] (79)	7,0 (70)	6,1 (61)	5,2 (52)	3,9 (39)	2,6 (26)	—	—
3TE ISO 4079-1 ISO 4079-2 [a]	16,0 (160)	14,5 (145)	13,0 (130)	11,0 (110)	9,3 (93)	8,0 (80)	7,0 (70)	5,5 (55)	4,5 (45)	4,0 (40)	3,3 (33)
R7 ISO 3949 [c]	21,0 (210)	19,2 (192)	17,5 (175)	15,8 (158)	14,0 (140)	10,5 (105)	8,8 (88)	7,0 (70)	—	—	—
R1A, R1AT ISO 1436-1 ISO 1436-2 [d]	21,0 (210)	19,2 (192)	17,5 (175)	15,7 (157)	14,0 (140)	10,5 (105)	8,7 (87)	7,0 (70)	4,3 (43)	3,5 (35)	2,6 (26)
1ST, 1SN ISO 1436-1 ISO 1436-2 [e]	25,0 (250)	22,5 (225)	21,5 (215)	18,0 (180)	16,0 (160)	13,0 (130)	10,5 (105)	8,8 [f] (88)	6,3 [f] (63)	5,0 (50)	4,0 (40)
1SC ISO 11237-1 [g] ISO 11237-2 [h]	—	22,5 (225)	21,5 (215)	18,0 (180)	16,0 (160)	13,0 (130)	10,5 (105)	8,8 (88)	6,3 (63)	—	—
R8 ISO 3949 [c]	35,0 (350)	35,0 (350)	—	28,0 (280)	24,5 (245)	19,2 (192)	15,8 (158)	14,0 (140)	—	—	—
R16 ISO 11237-1 [g] ISO 11237-2 [i]	—	35,0 (350)	29,8 (298)	28,0 (280)	24,5 (245)	19,2 (192)	15,8 (158)	14,0 (140)	11,0 (110)	—	—
R2A, R2AT ISO 1436-1 ISO 1436-2 [d]	35,0 (350)	35,0 (350)	29,7 (297)	28,0 (280)	24,5 (245)	19,2 (192)	15,7 (157)	14,0 (140)	11,3 (113)	8,7 (87)	7,8 (78)

Table A.1 (*continued*)

Dimensions in millimetres

Hose type	Maximum working pressure associated with the following nominal hose sizes, d_1 MPa (bar)										
	5	6,3	8	10	12,5	16	19	25	31,5	38	51
2ST, 2SN ISO 1436-1 ISO 1436-2 [e]	41,5 (415)	40,0 (400)	35,0 (350)	33,0 (330)	27,5 (275)	25,0 (250)	21,5 (215)	16,5 (165)	12,5 (125)	9,0 (90)	8,0 (80)
2SC ISO 11237-1 [g] ISO 11237-2 [h]	—	40,0 (400)	35,0 (350)	33,0 (330)	27,5 (275)	25,0 (250)	21,5 (215)	16,5 (165)	12,5 (125)	—	—
4SP ISO 3862-1 ISO 3862-2 [j]	—	45,0 (450)	—	44,5 (445)	41,5 (415)	35,0 (350)	35,0 (350)	28,0 (280)	21,0 (210)	18,5 (185)	16,5 (165)
4SH ISO 3862-1 ISO 3862-2 [j]	—	—	—	—	—	—	42,0 (420)	38,0 (380)	32,5 (325)	29,0 (290)	25,0 (250)
R12 ISO 3862-1 ISO 3862-2 [j]	—	—	—	28,0 (280)	28,0 (280)	28,0 (280)	28,0 (280)	28,0 (280)	21,0 (210)	17,5 (175)	17,5 (175)
R13 ISO 3862-1 ISO 3862-2 [j]	—	—	—	—	—	—	35,0 (350)	35,0 (350)	35,0 (350)	35,0 (350)	35,0 (350)
R15 ISO 3862-1 ISO 3862-2 [j]	—	—	—	42,0 (420)	42,0 (420)	—	42,0 (420)	42,0 (420)	42,0 (420)	42,0 (420)	—

[a] Taken from ISO 4079-2.

[b] Pressure values for hose type R3, size 8: 8,4 (84), and for size 10: 7,8 (78), according to ISO 4079-2, differ from those published in ISO 4079-1.

[c] Taken from ISO 3949.

[d] Pressure values for hose types R1A/R1AT and R2A/R2AT are taken from ISO 1436-1. The values from ISO 1436-2 differ in all sizes from those of ISO 1436-1.

[e] Taken from ISO 1436-2.

[f] Pressure values for hose types 1ST and 1SN, size 25: 9,0 (90) and size 31,5: 6,5 (65) taken from ISO 1436-2, differ from those published in ISO 1436-1.

[g] Taken from ISO 11237-1.

[h] Taken from ISO 11237-2.

[i] The pressure values for hose type R16 from ISO 11237-2 differ in all sizes from those of ISO 11237-1. These values are not included in this part of ISO 17165.

[j] Taken from ISO 3862-2.

NOTE It is ISO/TC 131/SC 4's understanding that ISO/TC 45/SC 1, which developed the ISO hydraulic hose standards referenced in this part of ISO 17165, intends to harmonize the pressure ratings between the respective parts 1 and 2 of each hydraulic hose International Standard.

Annex B
(informative)

Dimensions of steel tubes to be used in combination with hose types listed in Table A.1

Table B.1 — Dimensions of steel tubes in accordance with ISO 10763, to be used in combination with the hose types of Table A.1 and hose fittings in accordance with ISO 12151-2

Dimensions in millimetres

Working pressure MPa (bar)	Series	Tube outside diameter and tube wall thickness associated with the following hose inside sizes									
		5	6,3	8	10	12,5	16	19	25	31,5	38
10,0 (100)	L	6 × 1	8 × 1	10 × 1	12 × 1	15 × 1,5	18 × 1,5	22 × 1,5	28 × 2	35 × 2,5	42 × 3
	S	8 × 1	10 × 1	12 × 1	14 × 1,5	16 × 1,5	20 × 1,5	25 × 2	30 × 2	38 × 3	—
16,0 (160)	L	6 × 1	8 × 1	10 × 1	12 × 1,5	15 × 1,5	18 × 1,5	22 × 2	28 × 2,5	35 × 3	42 × 6
	S	8 × 1	10 × 1	12 × 1	14 × 1,5	16 × 1,5	20 × 2	25 × 2,5	30 × 2,5	38 × 3,5	—
25,0 (250)	L	6 × 1	8 × 1	10 × 1,5	12 × 1,5	15 × 2	18 × 2,5	22 × 3	28 × 3,5	35 × 4	42 × 7
	S	8 × 1	10 × 1,5	12 × 2	14 × 2	16 × 2	20 × 2,5	25 × 3	30 × 4	38 × 5	—
31,5 (315)	S	8 × 1,5	10 × 1,5	12 × 2	14 × 2,5	16 × 2,5	20 × 3	25 × 4	30 × 5	38 × 6	—
40,0 (400)	S	8 × 2	10 × 2	12 × 2,5	14 × 3	16 × 3	20 × 4	25 × 5	30 × 6	38 × 7	—
60,0 (600)	S	8 × 2	10 × 2,5	12 × 3	12 × 3	16 × 4	—	—	—	—	—

NOTE Tube outside diameter of 14 mm is not included in ISO 10763.

Annex C
(informative)

Key dimensions of the hose types covered in ISO 17165-1

Table C.1 — Key dimensions of the hose types covered in ISO 17165-1
(see 4.3, Example 1, for explanation of dimensions)

Dimensions in millimetres

Hose type	Dimension	Nominal hose size d_1										
		5	6,3	8	10	12,5	16	19	25	31,5	38	51
	d_{2min} [a]	2,5	3	5	6	8	11	14	19	25	31	42
Type 1TE ISO 4079	d_{4max}	16	17	20	23	30	32	—	—	—	—	—
	d_{0max}	11,6	13,2	14,7	16,3	19,7	23,9	—	—	—	—	—
	r_{min}	35	45	65	75	90	115	—	—	—	—	—
Type R6 ISO 4079	d_{4max}	16	16	19	19	23	27,5	30	—	—	—	—
	d_{0max}	11,9	13,5	15,1	16,7	20,6	23,8	27,8	—	—	—	—
	r_{min}	50	65	80	80	100	125	150	—	—	—	—
Type 2TE ISO 4079	d_{4max}	21	22	25	29	32,5	35	40	50	—	—	—
	d_{0max}	12,6	14,2	15,7	17,3	20,7	24,9	28,0	35,9	—	—	—
	r_{min}	25	40	50	60	70	90	110	150	—	—	—
Type R3 ISO 4079	d_{4max}	18	18,5	20	23	26	30	34	42,5	51	—	—
	d_{0max}	13,5	15,1	18,3	19,8	24,6	27,8	32,5	39,3	46,0	—	—
	r_{min}	80	80	100	100	125	140	150	205	255	—	—
Type 3TE ISO 4079	d_{4max}	21	22	25	29	32,5	35	40	50	58	70	70
	d_{0max}	13,6	15,2	17,7	19,3	22,7	26,9	30,0	37,4	43,8	51,6	64,3
	r_{min}	40	45	55	70	85	105	130	150	190	240	300
Type R7 ISO 3949	d_{4max}	20	21	21	24,5	27,5	31	34	42	—	—	—
	d_{0max}	11,4	13,7	15,6	18,4	22,5	25,8	28,6	34,7	—	—	—
	r_{min}	90	100	115	125	180	205	240	300	—	—	—
Types 1ST and R1A ISO 1436	d_{4max}	22	23,5	27	29	32,5	39	41	50	62	70	88
	d_{0max}	13,5	16,7	18,3	20,6	23,8	27,0	31,0	39,3	47,6	54,0	68,3
	r_{min}	90	100	115	130	180	200	240	300	420	500	630
Type 1SN and R1AT ISO 1436	d_{4max}	22	23,5	27	29	32,5	39	41	50	62	70	88
	d_{0max}	12,5	14,1	15,7	18,1	21,5	24,7	28,6	36,6	44,8	52,1	65,9
	r_{min}	90	100	115	130	180	200	240	300	420	500	630
Type 1SC ISO 11237	d_{4max}	—	23,5	27	29	32,5	39	41	50	62	—	—
	d_{0max}	—	13,5	14,5	16,9	20,4	23,0	26,7	34,9	42,2	—	—
	r_{min}	—	75	85	90	130	150	180	230	250	—	—

Table C.1 (*continued*)

Dimensions in millimetres

Hose type	Dimension	Nominal hose size d_1										
		5	6,3	8	10	12,5	16	19	25	31,5	38	51
	d_{2min} [a]	2,5	3	5	6	8	11	14	19	25	31	42
Type R8 ISO 3949	d_{4max}	20	21	21	24,5	27,5	31	34	42	—	—	—
	d_{0max}	14,6	16,8	18,6	20,3	24,6	29,8	33,0	38,6	—	—	—
	r_{min}	90	100	115	125	180	205	240	300	—	—	—
Type R16 ISO 11237	d_{4max}	—	17,5	19	22	25	28	33	41,5	53	—	—
	d_{0max}	—	14,5	15,8	18,8	22,0	25,4	29,0	36,6	44,3	—	—
	r_{min}	—	55	57	65	90	100	120	150	210	—	—
Types 2ST and R2A ISO 1436	d_{4max}	22	23,5	27	29	32,5	39	41	50	62	70	88
	d_{0max}	16,7	18,3	19,9	22,2	25,4	28,6	32,6	40,9	52,4	58,8	71,4
	r_{min}	90	100	115	130	180	200	240	300	420	500	630
Types 2SN and R2AT ISO 1436	d_{4max}	22	23,5	27	29	32,5	39	41	50	62	70	88
	d_{0max}	14,1	15,7	17,3	19,7	23,1	26,3	30,2	38,9	49,6	56,0	68,6
	r_{min}	90	100	115	130	180	200	240	300	420	500	630
Type 2SC ISO 11237	d_{4max}	—	23,5	27	29	32,5	39	41	50	62	—	—
	d_{0max}	—	14,2	16,0	18,3	21,5	24,7	28,6	36,6	44,3	—	—
	r_{min}	—	75	85	90	130	170	200	250	280	—	—
Type 4SP ISO 3862	d_{4max}	—	23	—	30	35	39	45	56	73	84	92
	d_{0max}	—	18,7	—	22,2	25,4	29,0	33,0	40,9	52,4	58,8	71,4
	r_{min}	—	150	—	180	230	250	300	340	460	560	660
Type 4SH ISO 3862	d_{4max}	—	—	—	—	—	—	45	56	73	84	92
	d_{0max}	—	—	—	—	—	—	33,0	39,9	47,1	55,1	69,7
	r_{min}	—	—	—	—	—	—	280	340	460	560	700
Type R12 ISO 3862	d_{4max}	—	—	—	25	29	32	35,5	44	53	59	72
	d_{0max}	—	—	—	21,0	24,6	28,2	31,5	39,2	48,6	55,0	68,3
	r_{min}	—	—	—	130	180	200	240	300	420	500	630
Type R13 ISO 3862	d_{4max}	—	—	—	—	—	—	45	56	73	84	93
	d_{0max}	—	—	—	—	—	—	33,2	39,8	51,3	58,8	72,7
	r_{min}	—	—	—	—	—	—	240	300	420	500	630
Type R15 ISO 3862	d_{4max}	—	—	—	26	30	—	37	45	55,5	63	—
	d_{0max}	—	—	—	23,3	26,8	—	36,1	42,9	51,5	59,6	—
	r_{min}	—	—	—	150	200	—	265	330	445	530	—

[a] Minimum diameter at any point through the hose fitting prior assembly to the hose. The diameter after assembly shall not be less than 0,9 d_2.

Bibliography

[1] ISO 1746, *Rubber or plastics hoses and tubing — Bending tests*

[2] ISO 4080, *Rubber and plastics hoses and hose assemblies — Determination of permeability to gas*

[3] ISO 4413, *Hydraulic fluid power — General rules relating to systems*

[4] ISO 4671, *Rubber and plastics hoses and hose assemblies — Methods of measurement of the dimensions of hoses and the lengths of hose assemblies*

[5] ISO 4672, *Rubber and plastics hoses — Sub-ambient temperature flexibility tests*

[6] ISO 6162-1, *Hydraulic fluid power — Flange connectors with split or one-piece flange clamps and metric or inch screws — Part 1: Flange connectors for use at pressures of 3,5 MPa (35 bar) to 35 MPa (350 bar), DN 13 to DN 127*

[7] ISO 6162-2, *Hydraulic fluid power — Flange connectors with split or one-piece flange clamps and metric or inch screws — Part 2: Flange connectors for use at pressures of 35 MPa (350 bar) to 40 MPa (400 bar), DN 13 to DN 51*

[8] ISO 6801, *Rubber or plastics hoses — Determination of volumetric expansion*

[9] ISO 6802, *Rubber and plastics hose and hose assemblies with wire reinforcements — Hydraulic impulse test with flexing*

[10] ISO 6803, *Rubber or plastics hoses and hose assemblies — Hydraulic-pressure impulse test without flexing*

[11] ISO 6945, *Rubber hoses — Determination of abrasion resistance of the outer cover*

[12] ISO 7233, *Rubber and plastics hoses and hose assemblies — Determination of resistance to vacuum*

[13] ISO 7326, *Rubber and plastics hoses — Assessment of ozone resistance under static conditions*

[14] ISO 7662, *Rubber and plastics hoses — Determination of abrasion of lining*

[15] ISO 7751, *Rubber and plastics hoses and hose assemblies — Ratios of proof and burst pressure to design working pressure*

[16] ISO 8030, *Rubber and plastics hoses — Method of test for flammability*

[17] ISO 8031, *Rubber and plastics hoses and hose assemblies — Determination of electrical properties*

[18] ISO 8032, *Rubber and plastics hose assemblies — Flexing combined with hydraulic impulse test (half-omega test)*

[19] ISO 8033, *Rubber and plastics hoses — Determination of adhesion between components*

[20] ISO 8331, *Rubber and plastics hoses and hose assemblies — Guidelines for selection, storage, use and maintenance*

[21] ISO/TR 8354, *Rubber hoses and hose assemblies for underground mining — Textile-reinforced air and water type*

[22] ISO 8434-3, *Metallic tube connections for fluid power and general use — Part 3: O-ring face seal connectors*

[23] ISO 8434-6, *Metallic tube connections for fluid power and general use — Part 6: 60° cone connectors with or without O-ring*

[24] ISO 8580, *Rubber and plastics hoses — Determination of ultra-violet resistance under static conditions*

[25] ISO 10763, *Hydraulic fluid power — Plain-end, seamless and welded precision steel tubes — Dimensions and nominal working pressures*

[26] ISO 10960, *Rubber and plastics hoses — Assessment of ozone resistance under dynamic conditions*

[27] ISO 11758, *Rubber and plastics hoses — Exposure to a xenon arc lamp — Determination of changes in colour and appearance*

[28] ISO 12151-4, *Connections for hydraulic fluid power and general use — Hose fittings — Part 4: Hose fittings with ISO 6149 metric stud ends*

[29] ISO 12151-5, *Connections for hydraulic fluid power and general use — Hose fittings — Part 5: Hose fittings with ISO 8434-2 37° flared ends*

[30] ISO/TR 17165-2, *Hydraulic fluid power — Hose assemblies — Part 2: Recommended practices for hydraulic hose assemblies*

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