Technical Contents

Hose selection conditions

One must consider a variety of conditions when determining which hose to use including meeting all the required functionality and the ability of the hose to last for an extended period of use. Please determine the specifications by comparing the use conditions with the following items as a basis for your hose selection

1 Maximum working pressure

Maximum working pressure refers to the set pressure of the hydraulic device (controlled with safety valves or other means). At a pressure level under the one indicated the hose can be used safely continuously over a long period of time.

2 Impulse pressure

There are cases where impulse pressure occurs that exceeds the controlled pressure due to variably load in general hydraulic devices. In terms of an impulse pressure wave, in general the one can consider the peak waveform (150% of maximum working pressure) and the trapezoidal waveform (133% of maximum working pressure).

3 Bend radius

Bending the hose reduces the ability to resist pressure so do not use with bends with radius higher than that indicated.

4 Temperature

Fluid has a small effect on the life of the hose. Please use within the fluid temperature range indicated in the catalog. Additionally, to use in locations with radiant heat or where the ambient temperature is high we ask that you enclose the hose in an insulator, but the effectiveness of insulators is limited.

5 Twisting

Take care that no significant twisting is applied in the routing of the hose, due to the ease with which flexible hoses twist. Using the hose while twisted may lower the usable life and can cause abnormal damage. When twisting during use cannot be prevented please use a rotary joint.

6 Flow speed

Select a hose specification that the maximum speed of fluid through the hose is held to 10m/ s. If the speed is too high it may cause heat or skiving (the peeling away of the inside layer of rubber).

7 External Pressure

If something heavy is dropped on the hose or an impact applied it can cause abnormal damage and shorter life. Please consider the hose protection to prevent external damage or wear caused by contact with other objects.

8 Fluid

The appropriate fluids differ depending on the hose series so please ensure the hose meets your requirements before selecting it.

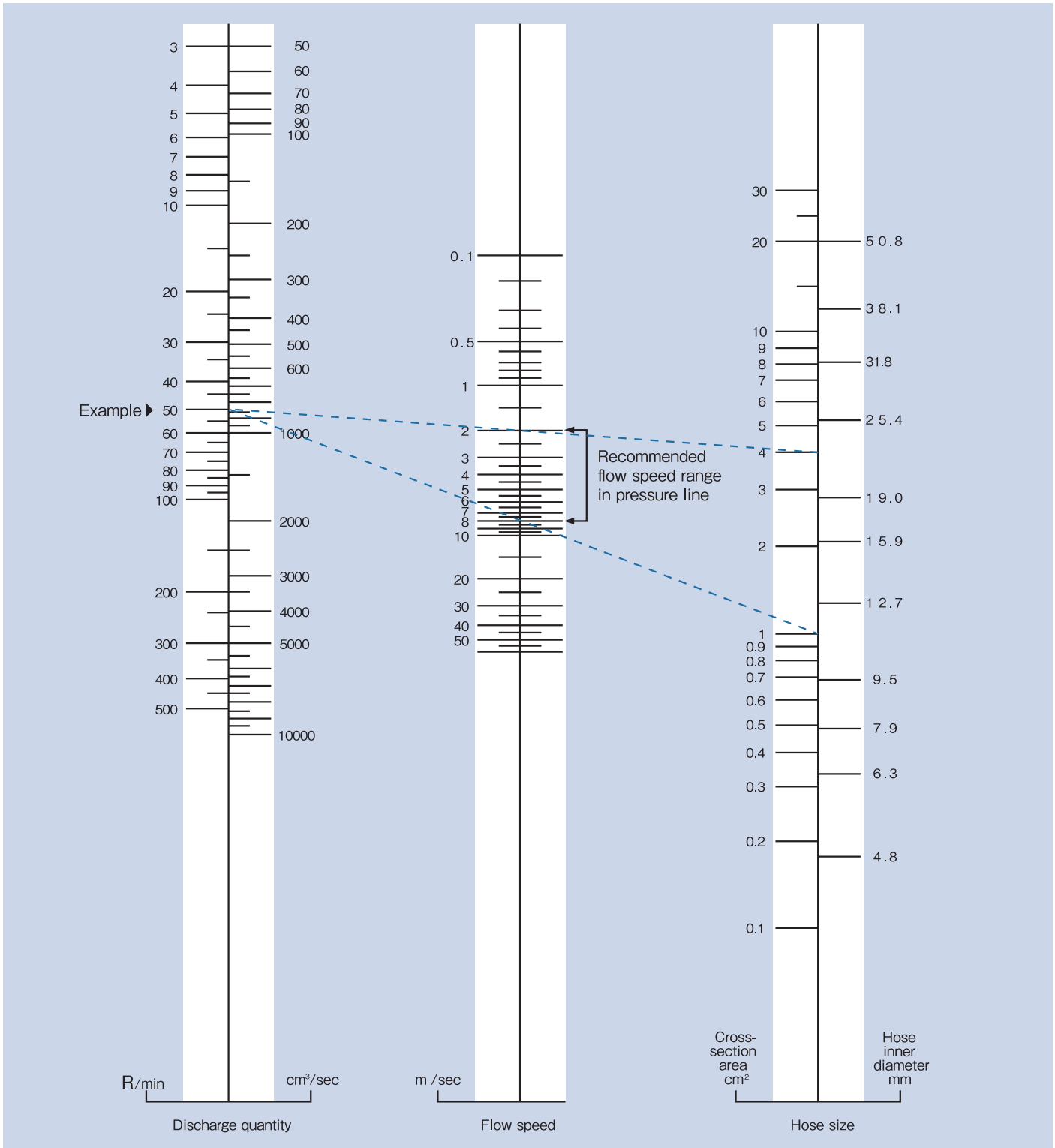
Discharge quantity, flow speed, and hose size

Use the following nomograph to select the appropriate hose size to use when able to determine the discharge quantity in the pressure line.

How to use the following graph

Example: Appropriate hose size when Discharge quantity = 50 liters/minute

When the discharge quantity is 50 liters/minute, we can discover the maximum and minimum flow speed on the center axis to get the recommended standard flow speed range. Extending the lines joining these points from the point on the first axis, the size closest to where they meet the hose size axis on the right is the appropriate size. (broken lines for reference.)
That is, the appropriate size is in the range from 12.7 to 19.0mm in diameter.



Discharge quantity and pressure loss

Pressure loss occurs due to friction resistance with the discharge quantity inside a pressure routing. The relationship between the discharge quantity and pressure loss in the high pressure hose is as follows.

Using the graph

Example: How much pressure is lose with a 2 meter lergth Hase, 12mm in diameter hose with fixtures on both ends and the flow volume is 20 liters/minute.

Horizontal access discharge quantity is 20 liters/minute and the hose size is 12mm in diameter intersects on the vertical access at 0.2MPa.

Pressure loss in hoses:

$0.2\text{MPa} \times \frac{2\text{m}}{10\text{m}} = 0.04\text{MPa}$

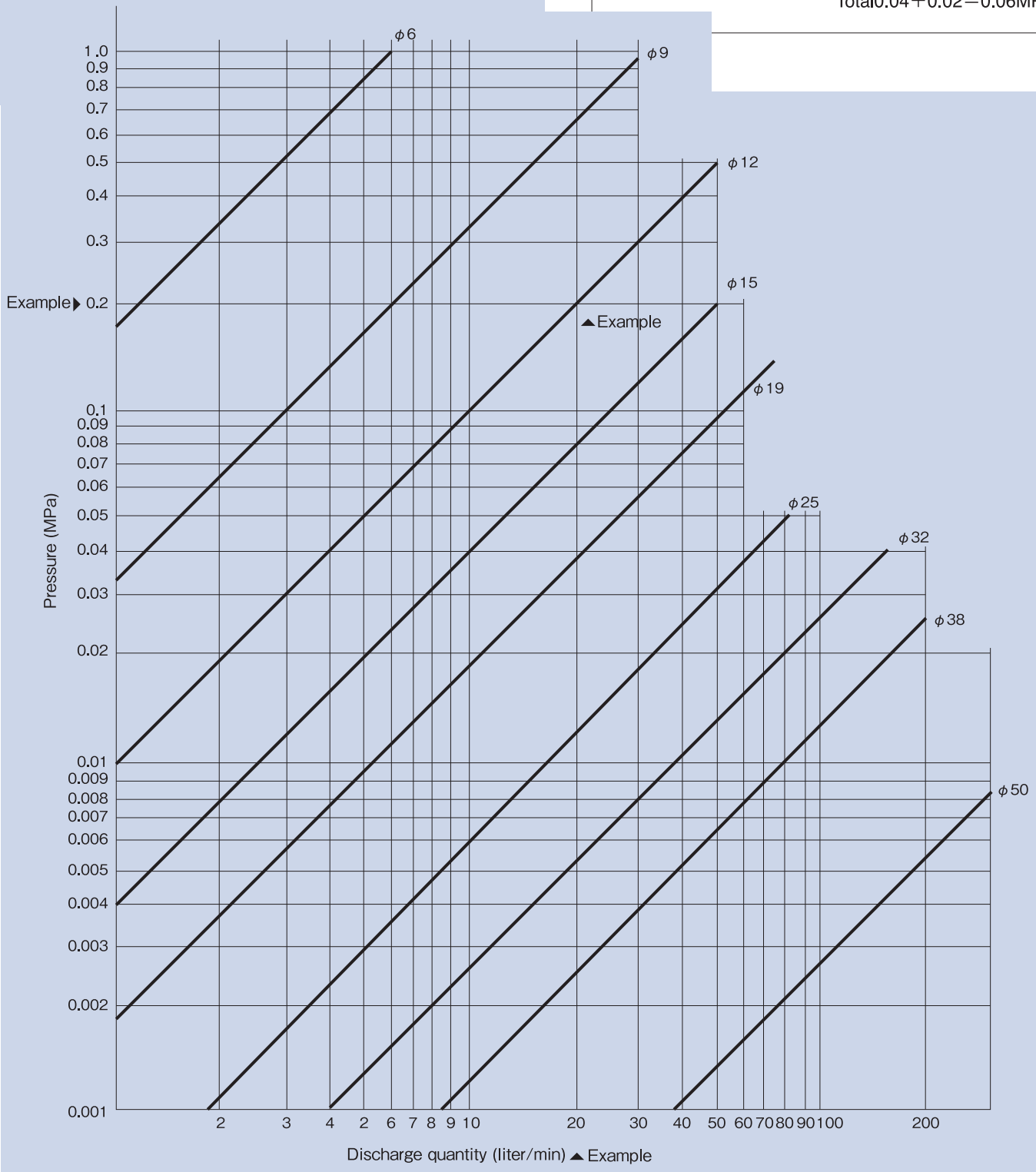
Pressure loss in the fixtures at both ends

$0.2\text{MPa} \times \frac{1}{20} \times 2\text{locations} = 0.02\text{MPa}$

Total 0.04 + 0.02 = 0.06MPa

Hose: 10m fluid – Hydraulic oil 46cst (33°C)

※Pressure loss in fixtures is close to $\frac{1}{20}$th of the hose value (per location)



Designing hose length / piping

1. Take care to prevent the hose from touching other parts due to excessive length when installing.
2. Consider the extension and contraction of the hose while pressurized to prevent additional tensile force on the hose.

Example1:When the hose is straight (Fig.1)

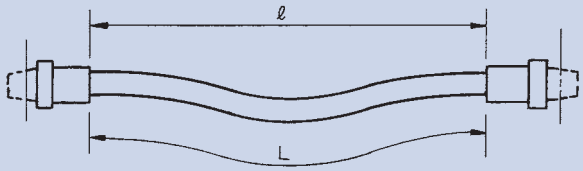
Hose free length　L≧ℓ(1+0.04)

Example2:U-shaped piping with both ends fixed (Fig.2)

L=2D+πR

Example3:U-shaped piping with one terminus moving by distance T (Fig.3)　L=2D+πR+T

Fig.1



Coefficient in straight hose area

Hose Size	6	9	12	15	19	25	32	38	50
D mm	40	50	60	65	75	90	110	120	140

Fig.2

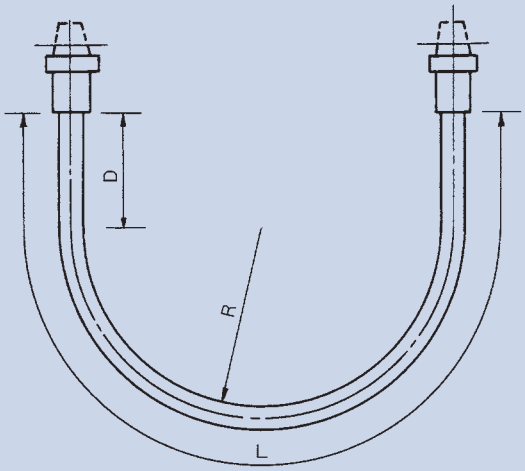
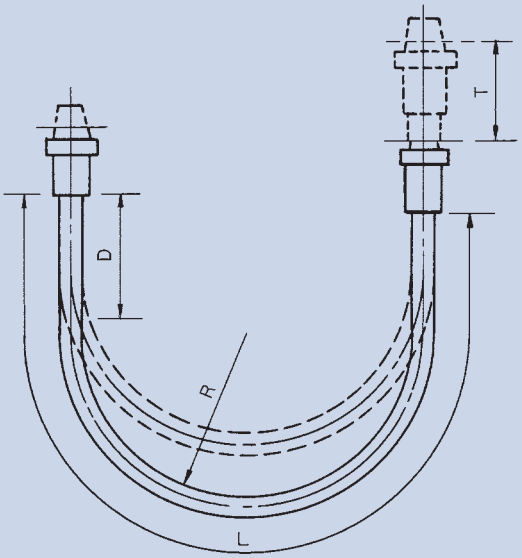
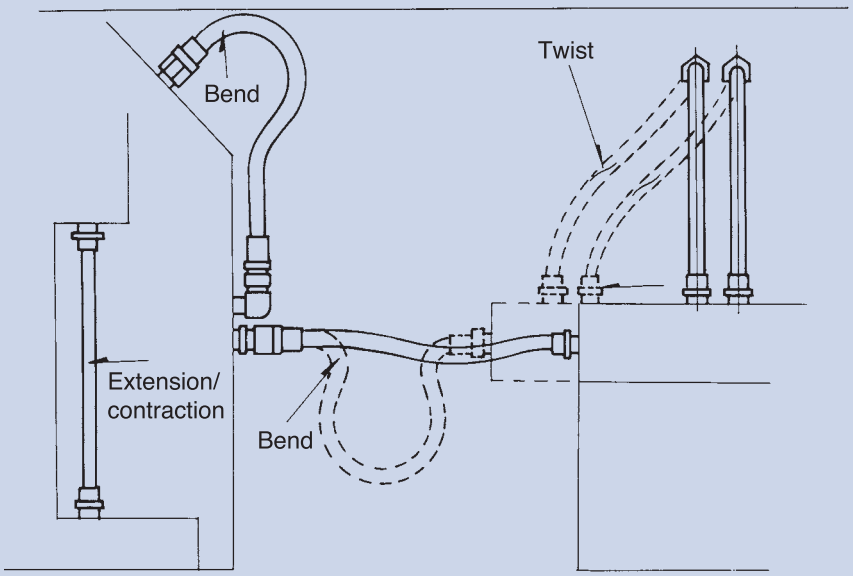


Fig.3



Piping examples (Bad examples)



Handling hoses

The functionality is greatly influenced by hose storage and hose installation methods. Please take care of the following items for proper use of the hose.

Storing the hoses and assembled hose

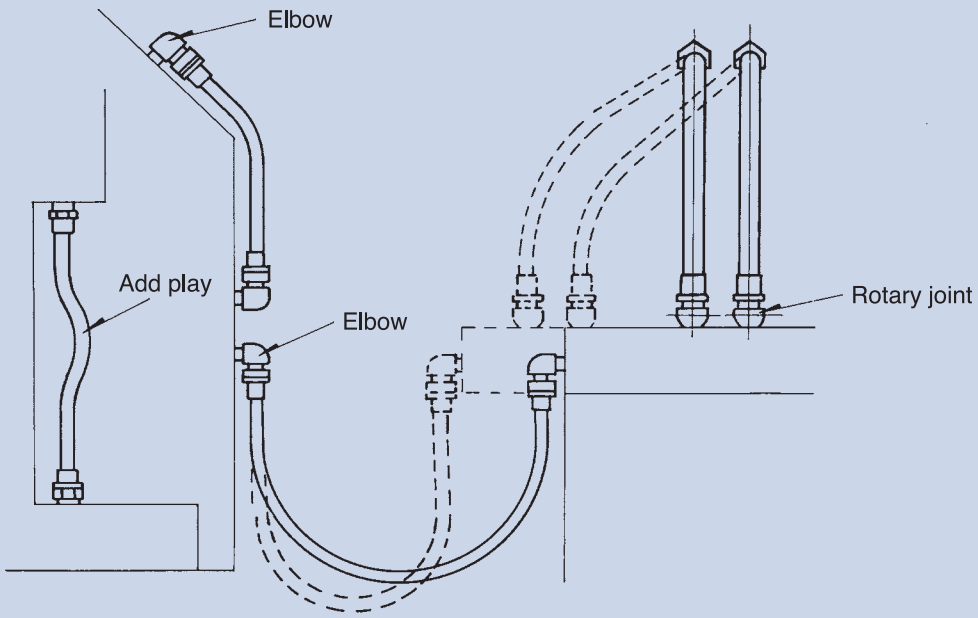
- Please select a cool, dark location to store the hoses that lacks humidity and direct sunlight.
- Please take care to prevent placed on top of the hoses. Take care to prevent entry of dust or grime into the hoses.
- Do not store the hoses for long periods of time. (Consider one year as a rough estimate.)
- Changes that take place as the hose ages may cause leaks. Use the hoses starting with the oldest ones in stock. Hoses after opening their caps, store on a flat surface avoiding bumpy places or grates.

Piping precautions

Hoses are made from raw (organic) material. Take particular care in routing the hoses.

- When internal pressure is applied the hose extends or contracts. Route the hose taking the amount of play into consideration. Under normal pressure the length of the hose stretches anywhere from +2% to -4%.
- Twisting the hose can result in decreased functionality. In cases where twisting can occur due to oscillating, rotating, and so on we recommend use of a rotary joint. Our hoses have a printed mark to use as a rough guide in preventing twisting.
- When bending to use near fixtures the hose while become damaged earlier than necessary. Modify the hose position or use the accompanying fixture (such as an elbow fitting).
- Contact with other objects may cause wear. Protect the hose by installing a support or guard wire. (spring wire)

Piping examples (good examples)



Fitting fastening torque

Union type nuts of hose fixtures will be damaged by unlimited fastening. Determine the fastening torque based on the working pressure conditions for safety. Refer to the chart on the right.

Hose sizeHose size		6	9	12	15	19	25	32	38	50
Thread Size	Pipe thread G(PF)	1/4	3/8	1/2	3/4	3/4	1	1 1/4	1 1/2	2
	Metric thread (MXP)	14×1.5	18×1.5	22×1.5	27×2	27×2	33×2	42×2	50×2	60×2
	Unified thread (UNF)	7/16-20	9/16-18	3/4-16	—	1 1/16-12	1 5/16-12	—	—	—
Maximum fastening torque N・m		25	34	64	132	132	196	225	255	316
Applicable pressure MPa		34.5					27.5	20.5	17.0	10.5

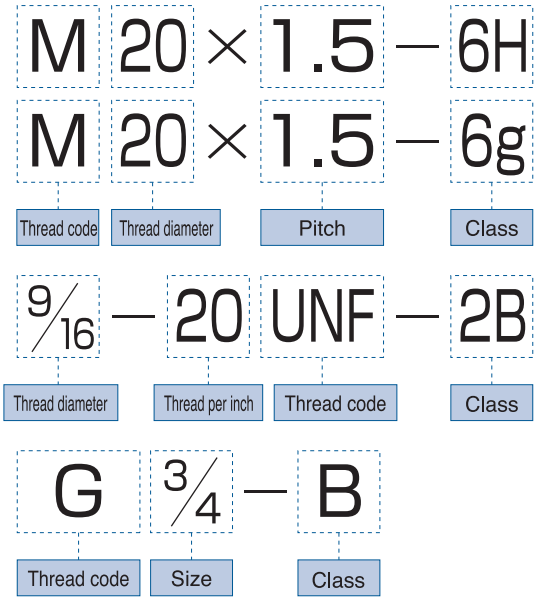
Note: The tightening torque values for pipe threads are based on JIS B8363.

Thread

Types

Thread code	Thread type	Related standard
M	Metric coarse thread	JIS B0205
M	Metric fine thread	JIS B0207
UNC	Unified coarse thread	JIS B0206
UNF	Unified fine thread	JIS B0208
G	Parallel pipe thread	JIS B0202
R	Taper pipe thread	JIS B0203
NPT	American Standard taper pipe threads for general use	ANSI B2・1
NPS	American Standard straight pipe threads	ANSI B2・1
NPTF	Dryseal American Standard taper pipe threads	ANSI B1・20・3
NPSM	American Standard straight pipe threads for free-fitting mechanical joints for fixtures	ANSI B2・1

Indication



Types

Threadtype	Female thread	Male thread	Unified Thread						Parallel pipe male thread	
Class	4H～6H	6～8g	3Aclass	3Bclass	2Aclass	2Bclass	1Aclass	1Bclass	Aclass	Bclass
Code	4H～6H	6～8g	3A	3B	2A	2B	1A	1B	A	B

Hose standard listing

Standard		JIS			ISO		
		JIS K6349-3	JIS K6379	JIS K6375	ISO 1436	ISO 3862	ISO 18752
		Wire reinforced rubber hose for hydraulic use	Fiber reinforced rubber hose for hydraulic use	Fiber reinforced resin hose for hydraulic use	Wire reinforced rubber hose and hose assembly for hydraulic use	←	Wire reinforced or fiber reinforced rubber hose and hose assembly for hydraulic use
Categorization method		Pressure standard(rubber)	Pressure standard(rubber)	Pressure standard(resin)	Composition standard (W/B)	Composition standard (W/S)	Pressure standard(rubber)
Types		9 types from 70 to 345	Types 1 to 4	Types 1 and 2	Types 1A, 2A, 2B, 1AT, 2AT, 2BT	Types 1 to 7	Class:9 types from 35 to 560 Types:AS,AC,BS, BC,CS,CC,DC
Operating temperature range		-40 to +100°C	←	←	←	←	AS,AC, BS,BC:-40 to +100°C CS,CC,DC:-40 to +120°C
Maximum working pressure (W.P)		7.0to 34.5MPa	1.0 to16.0MPa	6.9 to 34.5MPa	2.6 to 35.0 MPa	14.0 to 86.0 MPa	3.5 to 56 MPa
Pressure resistance test	Pressure resistance test	No abnormalities at double maximum working pressure	←	←	←	←	←
	Minimum bursting test	No abnormalities at four times maximum working pressure	←	←	←	←	←
	Length deformation ratio (%)at maximum working pressure	-4 to+2%	←	-3 to+3%	-4 to+2%	←	←
Impulse pressure test	Pressure	Maximum working pressure: (W.P) ×133%	Under diameter 25mm: (W.P) ×133% Over diameter 31.5mm: (W.P) × 100% (Excludes type1)	Type 1: (W.P) ×125% Type 2: (W.P) ×133%	Type 1 under diameter 25mm: (W.P) ×125% over diameter 31.5mm: (W.P) ×100% Type 2: (W.P) ×133%	Type 1,Type 2, 3 over diameter 12.5mm, Type 4 over diameter 19mm, Type 5,6: (W.P) ×133% Type 7: (W.P) ×120%	Maximum working pressure: (W.P) ×133% CS, CC class 350, 420, 560: (W.P) ×120%
	Waveform	Square	←	←	←	←	←
	Frequency	0.75 to1.25Hz	←	←	←	←	←
	Oil type	2 types of JIS K2213, ISO-VG46 conformance oil	←	←	←	←	←
	Test temperature	100°C	93°C	←	←	Type1 to 5:93°C Type6,7:121°C	AS, AC, BS, BC : 100°C CS, CC, DC : 120°C
	Mounting	Minimum bend radius U shape or L shape; Diameter more than 25mm is L shape	←	←	←	←	←
	Minimum impulse pressure repetitions	400,000 times	200,000 times	Type1: 150,000 Type2: 200,000 times	Type1: 150,000 Type2: 200,000 times	Type1: diameter 8 to 12.5mm: 200,000 times Diameter 16 to 51mm:300,000 times Type2 to 5: 400,000 times Type6,7: 500,000 times	AS, AC: 200,000times BS, BC: 500,000 times CS, CC: 500,000 times DC: 1,000,000 times
Low temperature flexibility test		After setting for 24 hours in -40°C, within 8 to 12 seconds, at the minimum bending radius (diameter 22mm or less is 180° and diameter 25mm or more, 90°) ensured nothing is abnormal when testing for pressure resistance and no cracks in the inner or outer surface layers					
Leak test		No standard	With pressure of 70% of the minimum bursting test pressure for 5 to 5.5 minutes, after releasing pressure, apply the same pressure for the same time again, no abnormality occurs.				

Hose, fitting material and usable fluid

The relationships between hose, fitting material and usable fluids can be seen in the table below. Please refer to the table when selecting a hose to use. Note that conditions change with differences in fluid temperature and concentration.

※Use air or gasses at under 1.0MPa.

Fluid type	Hose	Fitting		
	1	A	B	C
Asphalt	○	◎	◎	○
Acetaldehyde	×	—	—	—
Acetone	×	◎	◎	◎
Acetylene	△	◎	◎	○
Aniline	×	◎	◎	×
Ammonia gas (cold)	○	◎	◎	×
Ammonia gas (hot)	△	◎	×	×
Liquid ammonia	○	◎	◎	×
Sulfurous acid gas	△	○	○	△
Isooctane	◎	◎	◎	○
ASTM No. 1 oil	◎	◎	◎	○
ASTM No. 3 oil	△	◎	◎	○
Ethyl alcohol	◎	△	◎	◎
Hydrochloric acid (10% RT)	◎	×	×	△
Hydrochloric acid (36% RT)	△	×	×	△
LPG	◎	◎	◎	○
Olive oil	◎	◎	◎	◎
Hydrogen peroxide (5% RT)	×	×	◎	×
Hydrogen (30% RT)	×	×	◎	×
Seawater (RT)	◎	△	◎	△
Sodium hydroxide (10% RT)	◎	◎	◎	×
Sodium hydroxide (30% 60°C)	◎	◎	◎	×
Gasoline	×	◎	◎	◎
Formic acid (25% RT)	×	×	◎	△
Formic acid (50% RT)	×	×	◎	△
Cresol	×	—	—	—
Chloroform	×	×	◎	×
Grease	○	◎	◎	◎
Glycerin	◎	◎	◎	○
Kerosene (RT)	△	◎	◎	◎
Coke oven gas	△	◎	◎	△
Mineral oil (generic petroleum-based)	◎	◎	◎	◎
Acetic acid (10% RT)	△	×	◎	×
Acetic acid (100% RT)	×	×	◎	×
Ethyl Acetate	×	○	○	○
Oxygen	×	×	◎	◎
Cyclohexane	×	—	—	—
Carbon tetrachloride	×	△	○	○
Diethylene glycol	◎	◎	○	○
Sodium hypochlorite (5% RT)	△	×	○	×
Sodium hypochlorite (5% 60°C)	×	×	○	×
Heavy oil (B, C)	○	◎	◎	◎
Potassium bichromate(10%RT)	◎	◎	◎	◎

Hose, fitting material and usable fluid

	Usability
◎	No or almost no effect
○	Some effect occurs but sufficient for use depending on conditions
△	Relatively large effect
×	Do not use

	Hose series name
1	IB, SIB, HD, SHD

	Fitting material
A	Steel
B	Stainless steel
C	Brass

Fluid type	Hose	Fitting		
	1	A	B	C
Oxalic acid	○	△	○	△
Nitrous acid (10% RT)	×	×	◎	×
Nitrous acid (30% RT)	×	×	◎	×
Lubricant (Mineral oil)	◎	◎	◎	◎
Steam (only ST hoses)	×	◎	◎	◎
Stearic acid	○	△	○	△
Petroleum	○	◎	◎	◎
Tar	○	◎	◎	△
Carbonic acid	◎	×	○	×
Carbonated gas (under 1.0MPa)	△	◎	◎	◎
Nitrogen (under 1.0MPa)	△	◎	◎	◎
Natural gas (under 1.0MPa)	×	◎	◎	○
Trichloroethylene	×	△	◎	◎
Toluene	×	◎	◎	◎
Vegetable oil	◎	◎	◎	◎
Naphtha	○	◎	○	○
Castor oil	◎	◎	◎	◎
Vinegar	△	○	◎	○
Picric acid	○	△	○	×
Butane	○	◎	◎	◎
Freon 12	×	◎	◎	◎
Freon 22	×	◎	◎	◎
Phenol	×	×	◎	◎
Propane	◎	◎	◎	◎
Fuel oil	×	◎	◎	◎
Benzene	×	◎	◎	△
Boric acid	◎	×	◎	△
Formaldehyde (40% RT)	○	○	◎	○
Methyl alcohol	○	△	◎	◎
Methyl ethyl ketone	×	○	○	○
Monochlorobenzene	×	○	—	—
Lacquer	×	△	◎	◎
Lard	◎	◎	◎	◎
Sulfuric acid (10% RT)	○	×	○	×
Sulfuric acid (30% 60°C)	○	×	△	×
Hydrogen sulphide	○	△	○	△
Phosphoric acid (50% RT)	○	○	○	×
Phosphoric acid (30% 60°C)	○	×	○	×

Hoses and hose accessory JIS standards and compatible ISO standards

JIS standard			Compatible ISO standard	
Name	Hose	Hose assembly	Hose and hose assembly	Name
Wire reinforced rubber hose for hydraulic use	JIS K 6349	JIS B 8360	ISO 18752	Rubber hoses and hose assemblies-Wire-or textile reinforced single-pressure types for hydraulic applications Specification
Fittings and adapters for hydraulic hose assembly	—	JIS B 8360	—	—

National Shipping Association Certifications

Nippon Kaiji Kyokai (NK)	Japan
Maritime Bureau, Ministry of Land, Infrastructure,Transport and Tourism,Japan(JG)	Japan
American Bureau of Shipping （ABS）	America
Lloyd's Register （LR）	U.K.

※For details, please contact one of our sales locations.

Mine Safety and Health Administration MSHA United States Department of Labor

MSHA Approual

ACCEPTED HYDRAULIC HOSE

UNDER THE INTERIM FIRE CRITERIA