

Fujikin

Manual / Pneumatic / Electric

CRYO Series

Cryogenic Valves

Certified High-Pressure Gas Product
SUS316/SUS316L



ULH-525CY
CRYO N₂ -196

ULH-61C
CRYO He -268

M3R-115C
CRYO H₂ -253

Patents registered or pending.

フジキン
Fujikin Incorporated

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&



*The Height of
Excellence*

High Reliability, Durability, Precision
Cryogenic Valves

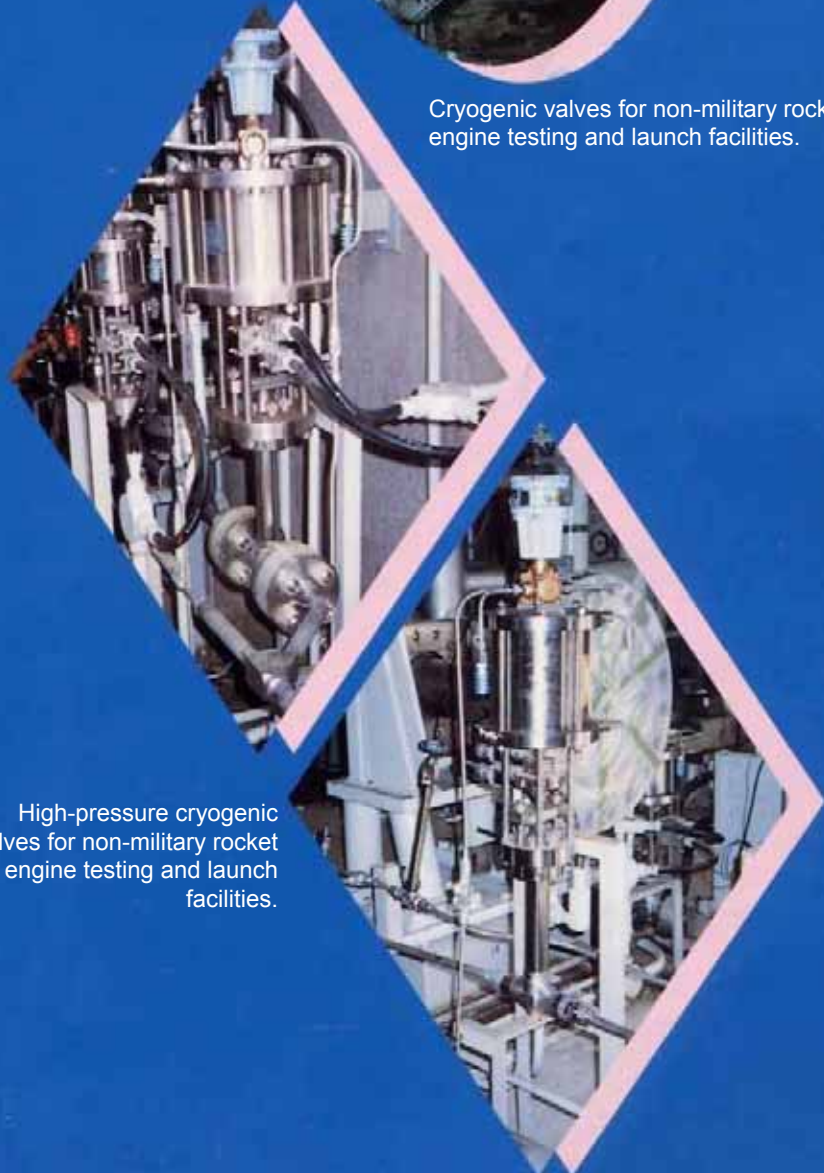
A leader in high-purity flow-control systems, Fujikin plays a key role in 21st century science and technology. Always state of the art, Fujikin manufactures valves and fittings used in such fields as rocketry, semiconductors, nuclear plants, maglev transport, and biotechnology. With the Cryogenic Valves, Fujikin has concentrated its technical and design capabilities to produce equipment of innovative precision and quality. These products make significant contributions to the cryogenic industry, bringing new levels of performance, reliability, quality and safety.



Cryogenic valves for large-bore superconducting magnet facilities



Cryogenic valves for non-military rocket engine testing and launch facilities.







High-pressure cryogenic valves for non-military rocket engine testing and launch facilities.

Stainless Steel Cryogenic Valves

Product overview and reference pages

Cryogenic needle valves


CRYO N₂ -196°C

Name	Configuration	Nominal dia.	Orifice dia. (Ømm)	Max. Cv	Mass (kg)	Part Number	Page
Threaded Extended Stem Needle Valve ●ULH – 125CY		Rc 1/8"	6	0.38	1.37	ULH-125CYC-A	8
		Rc 1/4"	6	0.52	1.35	ULH-125CYC-B	
		Rc 3/8"	6	0.64	1.35	ULH-125CYC	
		Rc 1/2"	8	1.1	1.4	ULH-125CYD	
		Rc 3/4"	10	1.9	2.3	ULH-125CYE	
		Rc 1"	12	2.8	3.2	ULH-125CYF	
Threaded Extended Stem Needle Valve ●ULH – 125CY		Rc 1/8"	6	0.52	1.37	ULH-325CYC-A	8
		Rc 1/4"	6	0.67	1.35	ULH-325CYC-B	
		Rc 3/8"	6	0.78	1.35	ULH-325CYC	
		Rc1/2	8	1.47	1.4	ULH-325CYD	
		Rc 3/4"	10	2.47	2.3	ULH-325CYE	
		Rc 1"	12	3.56	3.2	ULH-325CYF	
Socket weld Extended Stem Needle Valve ●ULH – 525CY		1/8"	6	0.52	1.42	ULH-525CYC-A	9
		1/4"	6	0.52	1.4	ULH-525CYC-B	
		3/8"	6	0.64	1.4	ULH-525CYC	
		1/2"	8	1.1	1.5	ULH-525CYD	
		3/4"	10	1.9	2.4	ULH-525CYE	
		1"	12	2.8	3.4	ULH-525CYF	
Socket weld Extended Stem Needle Valve ●ULH – 625CY		1/8"	6	0.52	1.42	ULH-625CYC-A	9
		1/4"	6	0.67	1.4	ULH-625CYC-B	
		3/8"	6	0.78	1.4	ULH-625CYC	
		1/2"	8	1.47	1.5	ULH-625CYD	
		3/4"	10	2.47	2.4	ULH-625CYE	
		1"	12	3.56	3.4	ULH-625CYF	

Stainless Steel Cryogenic Valves




Cryogenic needle valves (for custom orders)

CRYO N₂ -196°C

Name	Configuration	Size	Orifice dia. (Ømm)	Max. Cv	Part Number	Page
Threaded Extended Stem Needle Valve ● ULH-125CGY		MS33649-4	8	0.5	ULH-125CGYD-4	12
		MS33649-6	8	1.0	ULH-125CGYD-6	
		MS33649-8	12	1.9	ULH-125CGYD-8	
		MS33649-12	12	2.4	ULH-125CGYD-12	
		MS33649-16	12	2.4	ULH-125CGYD-16	

Cryogenic flanged valves (for custom orders)




CRYO N₂ -196°C

Name	Configuration	Nominal dia.	Orifice Dia. (mm)	Max. Cv	Part Number	Page
JIS RF Flange Needle Valve JIS 10K, 20K ● UH-225CY		3/8"	8	1.1	ULH-225CYD-J**R-C	14
		1/2"	8	1.1	ULH-225CYD-J**R-D	
		3/4"	10	1.9	ULH-225CYE-J**R-E	
		1"	12	2.8	ULH-225CYF-J**R-F	
ANSI RF Flange Needle Valve ANSI 150, 300 ● UH-225CY		1/2"	8	1.1	ULH-225CYD-A*R-D	15
		3/4"	10	1.9	ULH-225CYE-A*R-E	
		1"	12	2.8	ULH-225CYF-A*R-F	
ANSI RJ Flange Needle Valve ANSI 900, 1500 ● UH-225CY		1/2"	8	1.1	ULH-225CYD-A*J-D	16
		3/4"	10	1.9	ULH-225CYE-A*J-E	
		1"	12	2.8	ULH-225CYF-A*J-F	

Stainless Steel Cryogenic Valves



Cryogenic valves for LN₂ and LH₂ (for custom orders)

CRYO He  **-268°C**

Name	Configuration	Nominal dia.	Orifice dia (mm)	Max. Cv	Part Number	Page
Butt Weld Full Port Disk Valve ●UL-51CGJY		1"	25	12	UL-51CGJYF	18
		1 1/2"	40	30	UL-51CGJYH	
		2"	50	48	UL-51CGJYI	
		3"	75	98	UL-51CGJYK	
Socket Weld Stop Valve ●ULH-61C		6 mm	4	0.37	ULH-61C-6	20
		10 mm	6	0.83	ULH-61C-10	
Socket Weld Pneumatic Valve ●APR-ULH-61C		6 mm	4	0.37	APR-ULH-61C-6	20
		10 mm	6	0.83	APR-ULH-61C-10	

Cryogenic check valves for LN₂ and LH₂




CRYO H₂  **-253°C**

Name	Configuration	Connecting Thread	Orifice dia.	Max. Cv	Mass (kg)	Part Number	Page
Threaded Lift Type Check Valve ●UC-125		Rc1/8"	8	0.78	0.2	UC-125A	22
		Rc1/4"	8	0.78	0.2	UC-125B	
		Rc3/8"	12	1.4	0.7	UC-125C	
		Rc1/2"	12	2.7	0.7	UC-125D	
		Rc3/4"	15	3.9	1.2	UC-125E	
		Rc 1"	15	4.3	1.2	UC-125F	
Socket Weld Lift Type Check Valve ●UC-525		1/8"	8	0.78	0.2	UC-525A	22
		1/4"	8	0.78	0.2	UC-525B	
		3/8"	12	1.4	0.7	UC-525C	
		1/2"	12	2.7	0.7	UC-525D	
		3/4"	15	3.9	1.2	UC-525E	
		1"	15	4.3	1.2	UC-525F	

Stainless Steel Cryogenic Valves

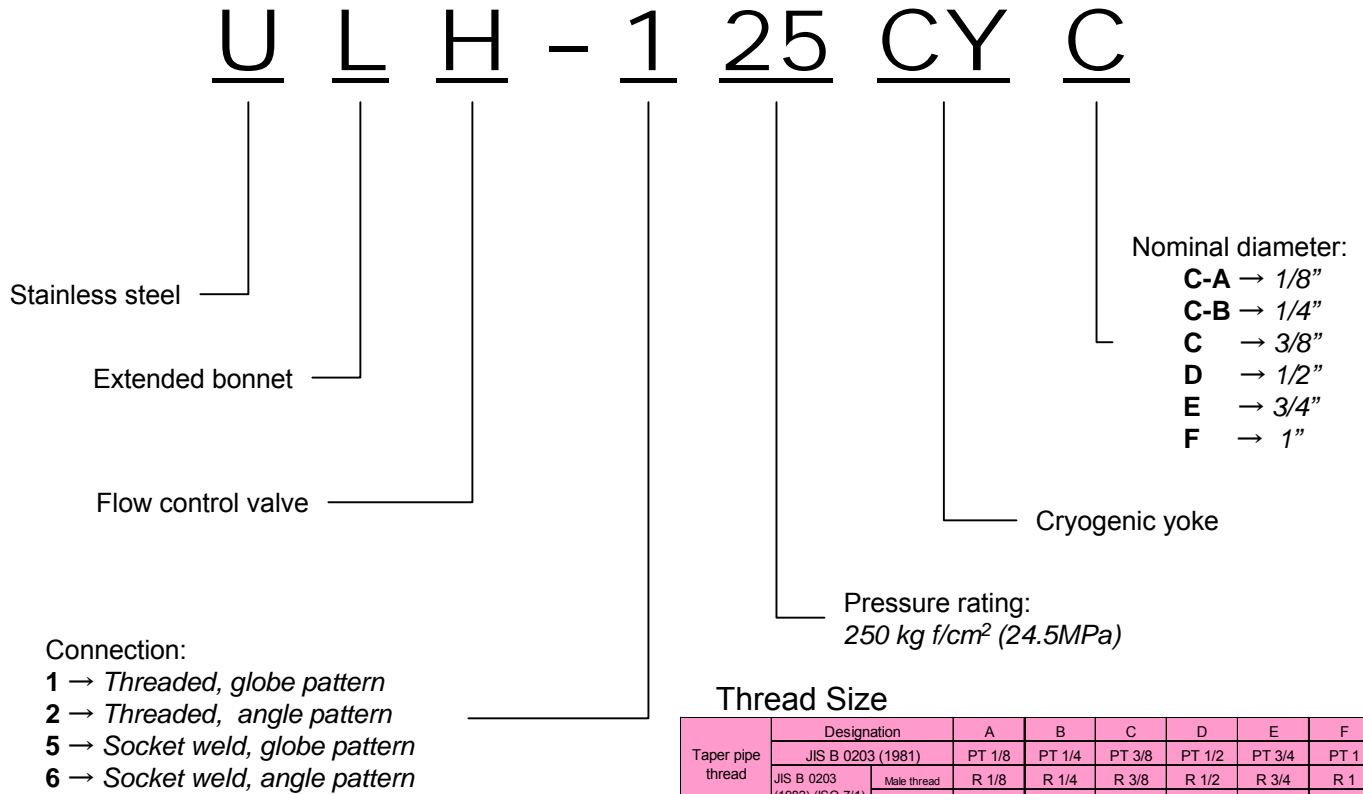
CRYO H₂ -253°C

Cryogenic automatic control valves

Name	Configuration	Nominal dia.	Max. Cv	Page
Pneumatic Mini Control Valve Needle Valve ● MINUCON		1/4" - 1/2"	below 0.5	23
		1/4"	0.5 ~ 0.7	
		3/8"	0.5 ~ 1.0	
		1/2"	0.5 ~ 3.0	
		3/4"	0.7 ~ 5.0	
		1"	0.7 ~ 5.0	
Solenoid Control Valve Needle Valve ● SR100		1/4" - 1/2"	below 0.5	26
		1/4"	0.5 ~ 0.7	
		3/8"	0.5 ~ 1.0	
		1/2"	0.5 ~ 3.0	
		3/4"	0.7 ~ 5.0	
		1"	0.7 ~ 5.0	
Stepper Motor Control Valve Needle Valve ● AR2000		1/4" - 1/2"	below 0.5	29
		1/4"	0.5 ~ 0.7	
		3/8"	0.5 ~ 1.0	
		1/2"	0.5 ~ 3.0	
		3/4"	0.7 ~ 5.0	
		1"	0.7 ~ 5.0	

Cryogenic Needle Valves

Part Number Designation



Thread Size

Taper pipe thread	Designation		A	B	C	D	E	F
	JIS B 0203 (1981)	JIS B 0203 (1981)		PT 1/8	PT 1/4	PT 3/8	PT 1/2	PT 3/4
JIS B 0203 (1982) (ISO 7/1)	Male thread		R 1/8	R 1/4	R 3/8	R 1/2	R 3/4	R 1
	Female thread		Rc 1/8	Rc 1/4	Rc 3/8	Rc 1/2	Rc 3/4	Rc 1

Thread designation complies with JIS B0203 (1982) (ISO7/1). Sizes as per JIS B0203 (1981) are shown for reference.

Features

1. Extended bonnet allows a minimum fluid temperature of -196 (liquid nitrogen) without freezing the gland or compromising valve performance.
2. Needle design enhances ease of flow adjustment.
3. Combination of gland packing and actuation mechanism reduces handle torque and enhances sealing performance.
4. Easy-to-operate handwheel with large drainage holes; its standard color is metallic blue.
5. Body designed so that it may be secured with U-bolts.
6. High pressure certification assures safe operation.

Applications

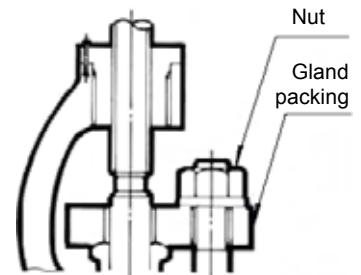
LPG, LNG, liquid nitrogen, and oxygen lines lines, cold evaporators, LNG carriers, superconductivity machinery, petrochemical plants, natural gas processing plants, power plants, steel mills, shipyards, and cryogenic lines in other facilities.

Guidelines for Adjusting Gland Packing

Because the gland may loosen during shipment, the hexagon nut at the gland should be tightened before the valve is pressurized. Tighten the nut to the value shown in the table to the right. To prevent uneven packing compression, tighten both sides of the nut evenly.

Tightening Torque

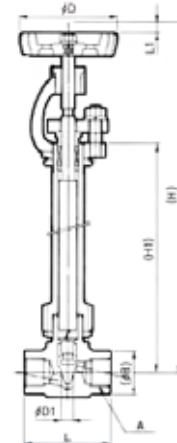
Pipe Size	Torque (kg f · cm)
1/8" - 1/2"	10
3/4"	15
1"	25



CRYO N₂ **-196°C**

Threaded (Rc)

ULH-125CY



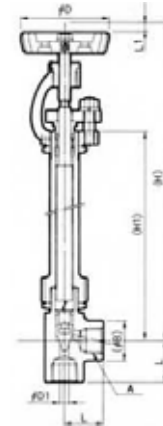
Dimensions

Units: mm

Connecting thread A	Orifice dia. (D1)	Face-to-face dimension L	H1	Height H	Lift L1	Handle dia. D	B	Max Cv value	Mass (kg)	Part number
Rc1/8"	6	55	217	303	4.5	68	26	0.38	1.37	ULH-125CYC-A
Rc1/4"	6	55	217	303	4.5	68	26	0.52	1.35	ULH-125CYC-B
Rc3/8"	6	55	217	303	4.5	68	26	0.64	1.35	ULH-125CYC
Rc1/2"	8	60	220	306	7.5	68	32	1.1	1.4	ULH-125CYD
Rc3/4"	10	70	240	340	10	78	38	1.9	2.3	ULH-125CYE
Rc 1"	12	85	255	368	12	88	46	2.8	3.2	ULH-125CYF

Threaded (Rc)

ULH-325CY



Dimensions

Units: mm

Connecting thread A	Orifice dia. (D1)	Face-to-face dimensions L	H1	Height H	Lift L1	Handle dia. D	B	Max Cv	Mass (kg)	Part Number
Rc 1/8"	6	27.5	217	303	4.5	68	26	0.52	1.37	ULH-325CYC-A
Rc 1/4"	6	27.5	217	303	4.5	68	26	0.67	1.35	ULH-325CYC-B
Rc 3/8"	6	27.5	217	303	4.5	68	26	0.78	1.35	ULH-325CYC
Rc 1/2"	8	30	220	306	7.5	68	32	1.47	1.4	ULH-325CYD
Rc 3/4"	10	35	240	340	10	78	38	2.47	2.3	ULH-325CYE
Rc 1"	12	42.5	255	368	12	88	46	3.56	3.2	ULH-325CYF

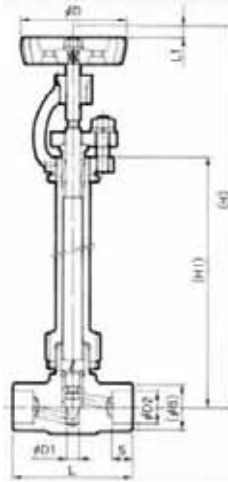
Materials and dimensions are subject to change without notice.

Products must be selected with regard to the compatibility of the system in which they will be used.

Fujikin shall bear no liability for products damaged by misuse, system failure, or accidents.

Socket Weld

ULH-525CY



Welding precautions:

- (1) During welding, **keep the valve partially open**, and cover it with a wet towel to protect it from the heat.
- (2) After welding one side, wait at least 10 minutes for the valve to cool to room temperature before welding the other side.

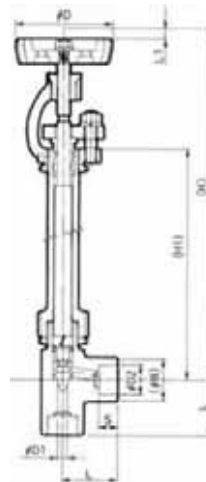
Dimensions

Units: mm

Nominal dia.	Orifice dia. (D1)	Face-to-face dimensions L	Pipe Connection		H1	Height H	Lift L1	Handle dia. D	B	Max Cv	Mass (kg)	Part Number
			D2	S								
1/8"	6	60	11	10	217	303	4.5	68	21.3	0.52	1.42	ULH-525CYC-A
1/4"	6	60	14.3	10	217	303	4.5	68	21.3	0.52	1.4	ULH-525CYC-B
3/8"	6	65	17.8	13	217	303	4.5	68	25.3	0.64	1.4	ULH-525CYC
1/2"	8	75	22.2	13	220	306	7.5	68	31	1.1	1.5	ULH-525CYD
3/4"	10	85	27.7	16	240	340	10	78	37	1.9	2.4	ULH-525CYE
1"	12	100	34.5	16	255	368	12	88	45.5	2.8	3.4	ULH-525CYF

Socket Weld

ULH-625CY



Welding precautions:

- (1) During welding, **keep the valve partially open**, and cover it with a wet towel to protect it from the heat.
- (2) After welding one side, wait at least 10 minutes for the valve to cool to room temperature before welding the other side.

Dimensions

Units: mm

Nominal dia.	Orifice dia. (D1)	Face-to-face dimensions L	Pipe Connection		H1	Height H	Lift L1	Handle dia. D	B	Max Cv	Mass (kg)	Part Number
			D2	S								
1/8"	6	30	11	10	217	303	4.5	68	21.3	0.52	1.42	ULH-625CYC-A
1/4"	6	30	14.3	10	217	303	4.5	68	21.3	0.67	1.4	ULH-625CYC-B
3/8"	6	32.5	17.8	13	217	303	4.5	68	25.3	0.78	1.4	ULH-625CYC
1/2"	8	37.5	22.2	13	220	306	7.5	68	31	1.47	1.5	ULH-625CYD
3/4"	10	42.5	27.7	16	240	340	10	78	37	2.47	2.4	ULH-625CYE
1"	12	50	34.5	16	255	368	12	88	45.5	3.56	3.4	ULH-625CYF

Materials and dimensions are subject to change without notice.

Products must be selected with regard to the compatibility of the system in which they will be used.

Fujikin shall bear no liability for products damaged by misuse, system failure, or accidents.

● Materials

Part	Material
Body	SUS 316
Bonnet	SUS 316
Stem	SUS 316
Disk	SUS 316L (Stelliting)
Gland packing	PTFE+PCTFE
Handle	ADC 12

● Specifications

Max. Operating Pressure	Fluid Temperature Range
24.5 MPa	-196°C to +150°C

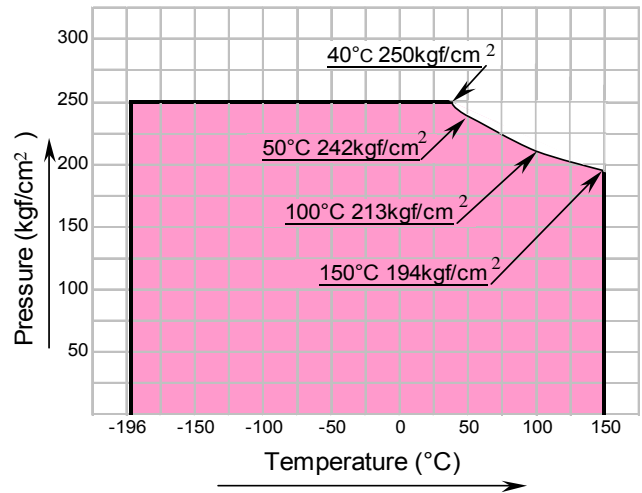
● Precautions

- (1) This valve was not designed to be throttled at an almost-closed position. Using it in such a manner may result in damage to the disk and/or seat. Notify Fujikin in advance if you are planning to throttle this valve with the handle less than a 1/2 turn from the fully closed position.
- (2) Do not use this valve with ammonia, acetylene or similar gases as bronze gaskets are used for sealing.
- (3) As the extended bonnet design is meant to prevent the transfer of cold to the gland, do not expose the actuator to freezing temperatures.

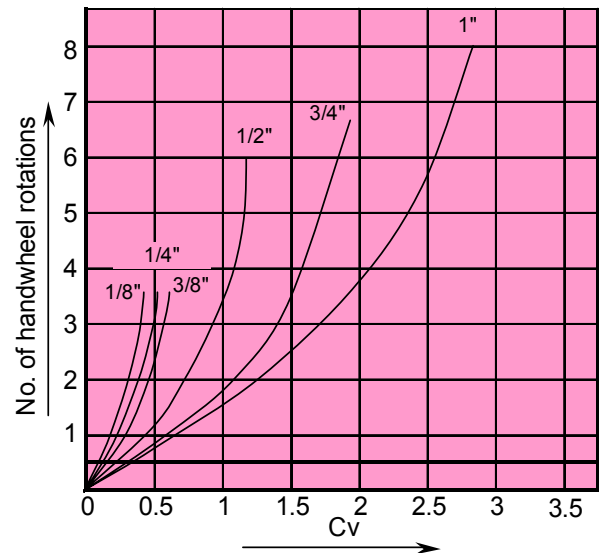
● Welding Precautions

- (1) During welding, **keep the valve partially open**, and cover it with a wet towel to protect it from the heat.
- (2) After welding one side, wait at least 10 minutes for the valve to cool to room temperature before welding the other side.

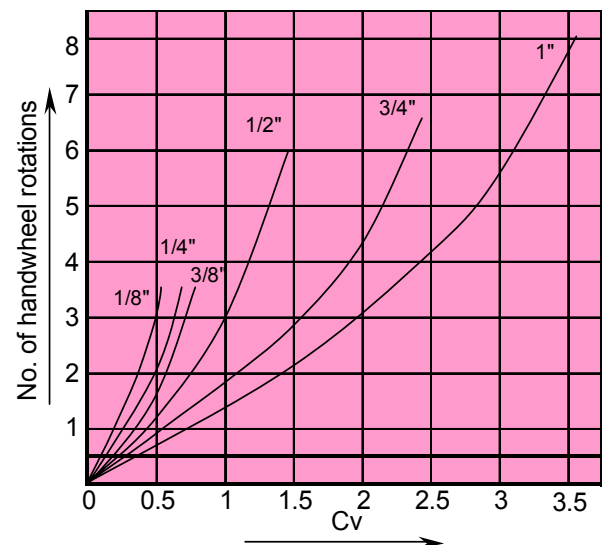
● Pressure-Temperature Curve



● Cv Curves (Globe Pattern)



● Cv Curves (Angle Pattern)



Materials and dimensions are subject to change without notice.

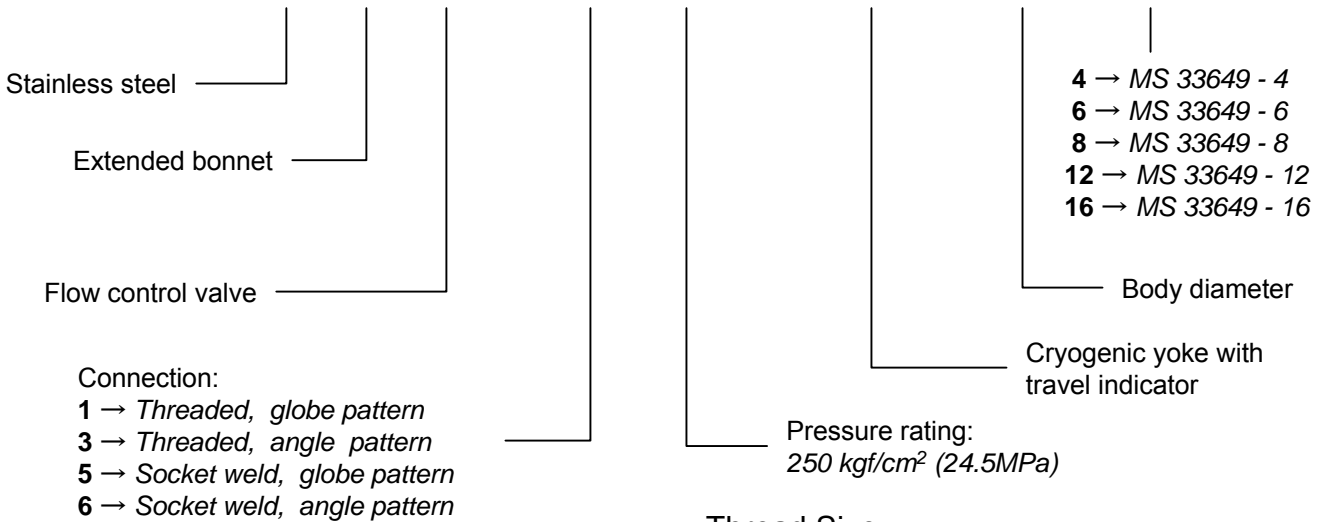
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Cryogenic Needle Valves with Travel Indicator

Part Number Designation (for custom orders)

U L H - 1 2 5 C G Y D - 4



Thread Size

Taper pipe thread	Designation		A	B	C	D	E	F
	JIS B 0203 (1981)		PT 1/8	PT 1/4	PT 3/8	PT 1/2	PT 3/4	PT 1
	JIS B 0203 (1982) (ISO 7/1)	Male thread	R 1/8	R 1/4	R 3/8	R 1/2	R 3/4	R 1
		Female thread	Rc 1/8	Rc 1/4	Rc 3/8	Rc 1/2	Rc 3/4	Rc 1

Thread designation complies with JIS B0203 (1982) (ISO7/1). Sizes as per JIS B0203 (1981) are shown for reference.

Due to the relatively small demand for this valve type, it has been removed from Fujikin's standard product line. It is available as a custom order only.

Features

1. Extended bonnet allows a minimum fluid temperature of -196°C (liquid nitrogen) without freezing the gland or compromising valve performance.
2. Needle design enhances ease of flow adjustment.
3. Combination of gland packing, O-rings, and actuation mechanism reduces handle torque and enhances sealing performance.
4. Standard end connection: MS thread (US AS3350/3354). Rc thread, and socket weld end connections available as options.
5. Easy-to-operate handwheel with large drainage holes; its standard color is metallic blue.
6. Body designed so that it may be secured with U-bolts.
7. High pressure certification assures safe operation.

Applications

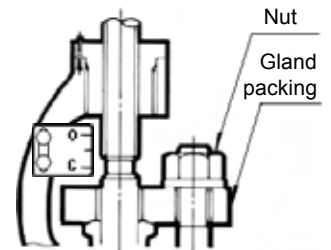
Non-military rocket launch and testing facilities; liquid hydrogen, liquid nitrogen, and liquid oxygen production; cryogenic lines in other facilities.

Guidelines for Adjusting Gland Packing

Because the gland may loosen during shipment, the hexagon nut at the gland should be tightened before the valve is pressurized. Tighten the nut to the value shown in the table to the right. To prevent uneven packing compression, tighten both sides of the nut evenly.

Tightening Torque

Pipe Size	Torque (kg f · cm)
1/8" -1/2"	10
3/4"	15
1"	25



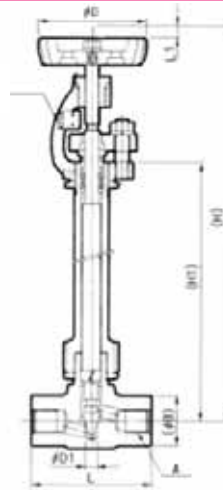
CRYO N₂
-196°C

Threaded (MS)

ULH-125CGYD



Travel indicator



Dimensions

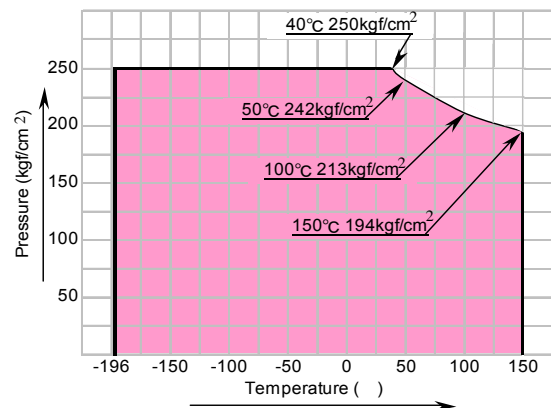
Units: mm

Nominal dia.	Orifice dia. (D1)	Face-to-face dimension L	Connecting thread A	H1	Height H	Lift L1	Handle dia. D	B	Max Cv value	Mas (kg)	Part number
1/4"	8	70	0.4375-20UNJF-3B(MS33649-4)	220	306	7.5	68	32	0.6	1.8	ULH-125CGYD-4
3/8"	8	75	0.5625-18UNJF-3B(MS33649-6)	220	306	7.5	68	32	1.1	1.6	ULH-125CGYD-6
1/2"	12	100	0.7500-16UNJF-3B(MS33649-8)	255	368	12	88	46	1.9	3.2	ULH-125CGYF-8
3/4"	12	100	1.0625-12UNJF-3B(MS33649-12)	255	368	12	88	46	2.8	3.3	ULH-125CGYF-12
1"	12	100	1.3125-12UNJF-3B(MS33649-16)	255	368	12	88	46	2.8	3.4	ULH-125CGYF-16

Materials

Part	Material
Body	SUS 316
Bonnet	SUS 316
Stem	SUS 316
Disk	SUS 316L (Stelliting)
Gland packing	PTFE+PCTFE
O-Ring	FKM
Handle	ADC 12

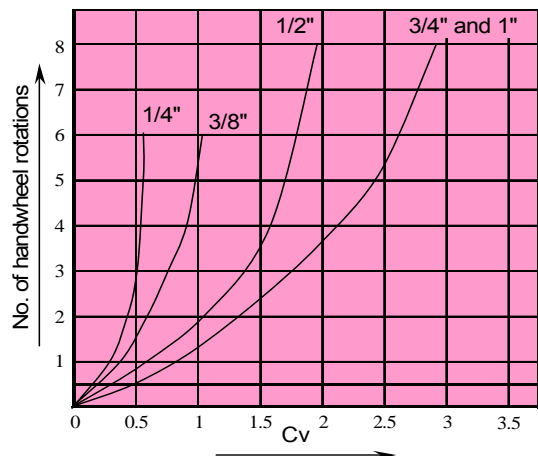
Pressure-Temperature Curve



Specifications

Max. Operating Pressure	Fluid Temperature Range
24.5 MPa	-196°C to +150°C

Cv Curves



Precautions

- (1) This valve was not designed to be throttled at an almost-closed position. Using it in such a manner may result in damage to the disk and/or seat. Notify Fujikin in advance if you are planning to throttle this valve with the handle less than a 1/2 turn from the fully closed position.
- (2) Do not use this valve with ammonia, acetylene or similar gases as bronze gaskets are used for sealing.
- (3) As the extended bonnet design is meant to prevent the transfer of cold to the gland, do not expose the actuator to freezing temperatures.

Materials and dimensions are subject to change without notice.

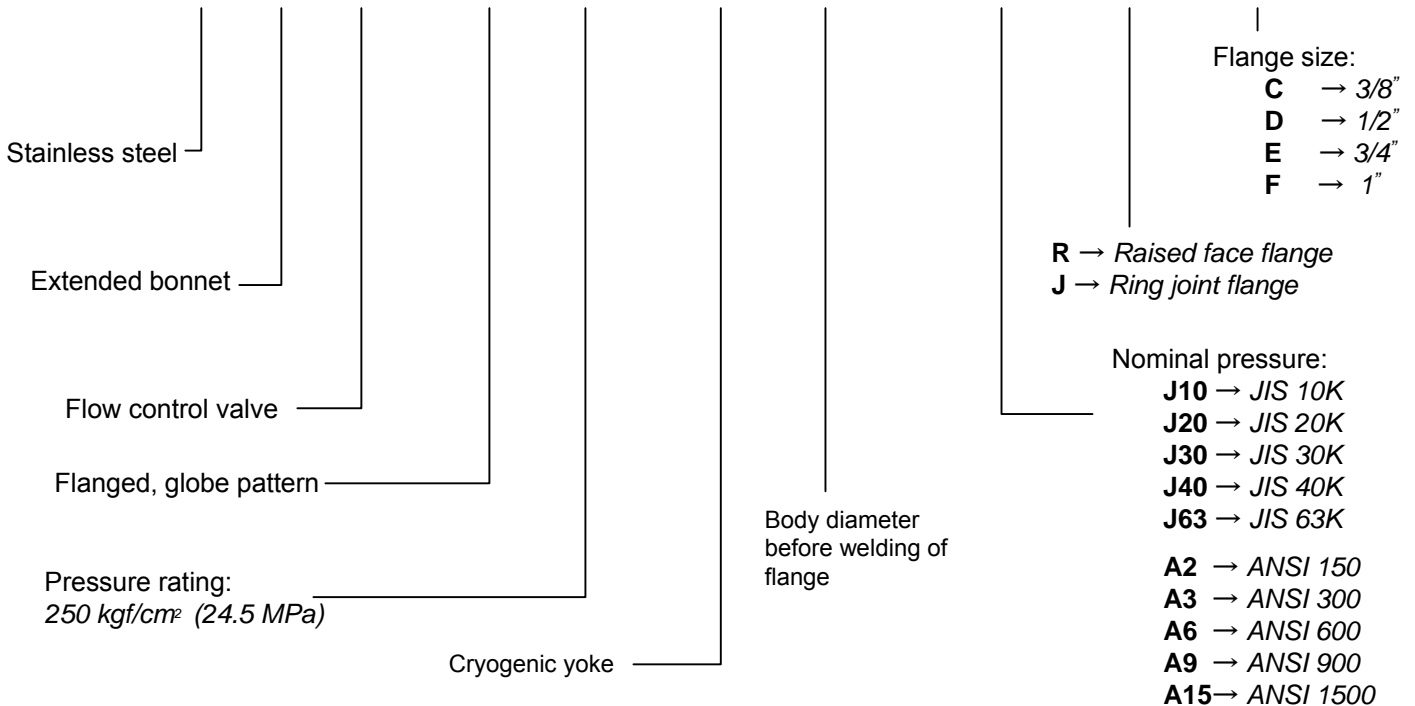
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Flanged Cryogenic Needle Valves

Part Number Designation (for custom orders)

U L H - 2 2 5 C Y D - J 1 0 R - C



Due to the relatively small demand for this valve type, it has been removed from Fujikin's standard product line. It is available as a custom order only.

Features

1. Extended bonnet allows a minimum fluid temperature of -196°C (liquid nitrogen) without freezing the gland or compromising valve performance.
2. Needle design enhances ease of flow adjustment.
3. Combination of gland packing and actuation mechanism reduces handle torque and enhances sealing performance.
4. Easy-to-operate handwheel with large drainage holes; its standard color is metallic blue.
5. Body designed so that it may be secured with U-bolts.
6. High pressure certification assures safe operation.

Applications

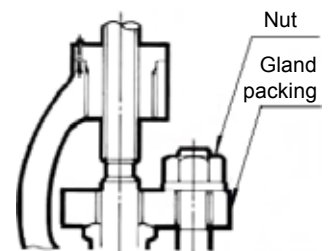
LPG, LNG, liquid nitrogen, and oxygen lines, cold evaporators, LNG carriers, superconductivity machinery, petrochemical plants, natural gas processing plants, power plants, steel mills, shipyards, and cryogenic lines in other facilities.

Guidelines for Adjusting Gland Packing

Because the gland may loosen during shipment, the hexagon nut at the gland should be tightened before the valve is pressurized. Tighten the nut to the value shown in the table to the right. To prevent uneven packing compression, tighten both sides of the nut evenly.

Tightening Torque

Pipe Size	Torque (kg f · cm)
1/8" - 1/2"	10
3/4"	15
1"	25



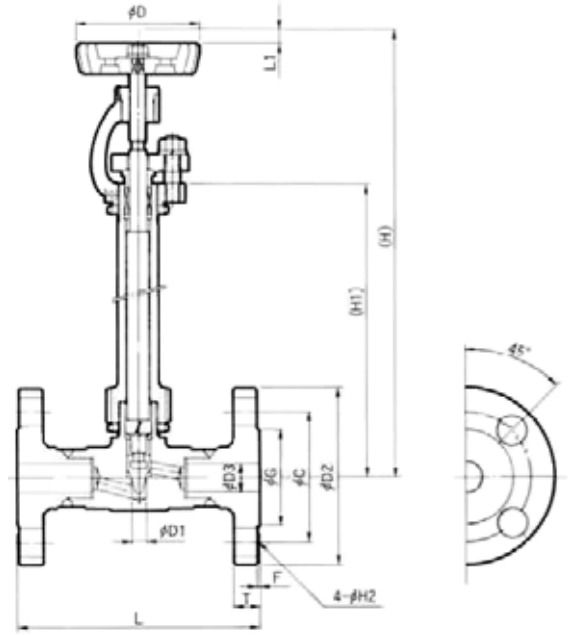
CRYO N₂
-196°C

JIS RF Flanged Cryogenic Needle Valve

CRYO N₂ -196°C

RF Flange Connection JIS 10K, 20K

ULH-225CYD-J*
RF



JIS 10K Dimensions

Units: mm

Nominal dia.	Orifice dia. D1	Bore D3	Face-to-face dimension L	Flange						H1	Height H	Lift L1	Handle dia. D	Max Cv	Mas s (kg)	Part number
				D2	T	C	G	H2	F							
3/8	8	10	126	90	12	65	46	15	1	220	306	7.5	68	1.1	2.7	ULH-225CYD-J10R-C
1/2	8	15	126	95	12	70	51	15	1	220	306	7.5	68	1.1	2.8	ULH-225CYD-J10R-D
3/4	10	20	141	100	14	75	56	15	1	240	340	10	78	1.9	4.1	ULH-225CYE-J10R-E
1	12	25	156	125	14	90	67	19	1	255	368	12	88	2.8	5.9	ULH-225CYF-J10R-F

JIS 20K Dimensions

Units: mm

Nominal dia.	Orifice dia. D1	Bore D3	Face-to-face dimension L	Flange						H1	Height H	Lift L1	Handle dia. D	Max Cv value	Mas s (kg)	Part number
				D2	T	C	G	H2	F							
3/8	8	10	130	90	14	65	46	15	1	220	306	7.5	68	1.1	2.9	ULH-225CYD-J20R-C
1/2	8	15	130	95	14	70	51	15	1	220	306	7.5	68	1.1	3.0	ULH-225CYD-J20R-D
3/4	10	20	145	100	16	75	56	15	1	240	340	10	78	1.9	4.3	ULH-225CYE-J20R-E
1	12	25	160	125	16	90	67	19	1	255	368	12	88	2.8	6.4	ULH-225CYF-J20R-F

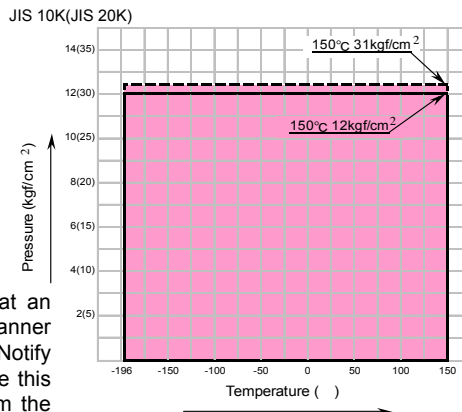
Materials

Part	Material
Body	SUS 316
Bonnet	SUS 316
Stem	SUS 316
Disk	SUS 316L (Stellite)
Gland packing	PTFE+PCTFE
Handle	ADC 12

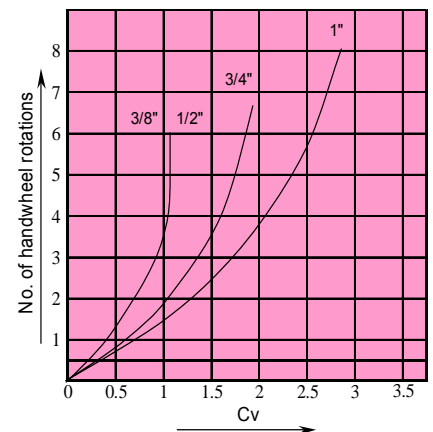
Precautions

- (1) This valve was not designed to be throttled at an almost-closed position. Using it in such a manner may result in damage to the disk and/or seat. Notify Fujikin in advance if you are planning to throttle this valve with the handle less than a 1/2 turn from the fully closed position.
- (2) Do not use this valve with ammonia, acetylene or similar gases as bronze gaskets are used for sealing.
- (3) As the extended bonnet design is meant to prevent the transfer of cold to the gland, do not expose the actuator to freezing temperatures.

Pressure-Temperature Curve



Cv Curves



Materials and dimensions are subject to change without notice.

Products must be selected with regard to the compatibility of the system in which they will be used.

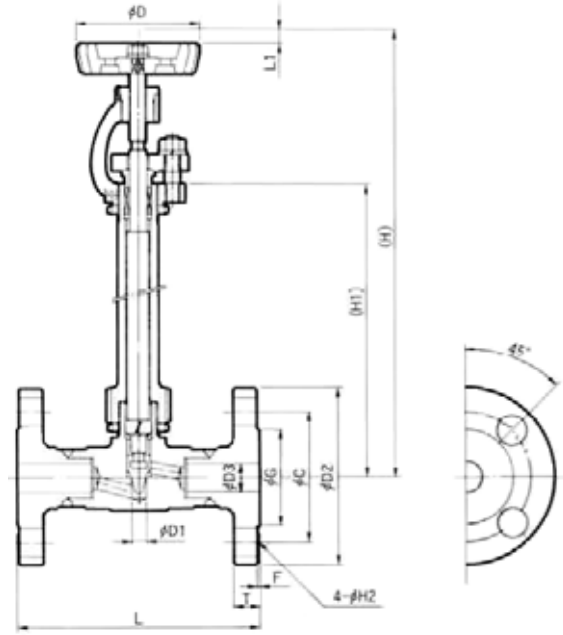
Fujikin shall bear no liability for products damaged by misuse, system failure, or accidents.

ANSI RF Flanged Cryogenic Needle Valves

CRYO N₂ -196°C

RF Flange Connection: ANSI 150, 300

ULH-225CYD-A*
RF



ANSI 150 Dimensions

Units: mm

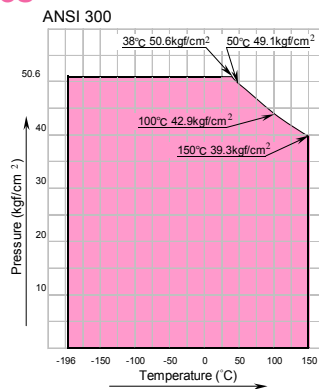
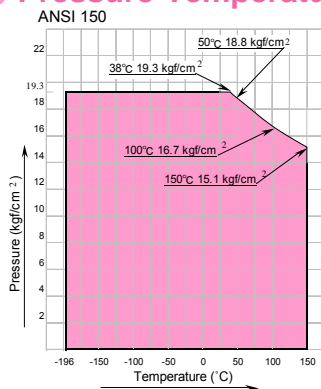
Nominal dia.	Orifice dia. D1	Bore D3	Face-to-face dimension L	Flange						H1	Height H	Lift L1	Handle dia. D	Max Cv value	Mas s (kg)	Part number
				D2	T	C	G	H2	F							
1/2	8	15	125	88.9	11.2	60.5	35.1	16	1.6	220	306	7.5	68	1.1	2.5	ULH-225CYD-A2R-D
3/4	10	20	139	98.6	12.7	69.9	43	16	1.6	240	340	10	78	1.9	3.8	ULH-225CYE-A2R-E
1	12	25	157	108	14.3	79.3	50.8	16	1.6	255	368	12	88	2.8	5.4	ULH-225CYF-A2R-F

ANSI 300 Dimensions

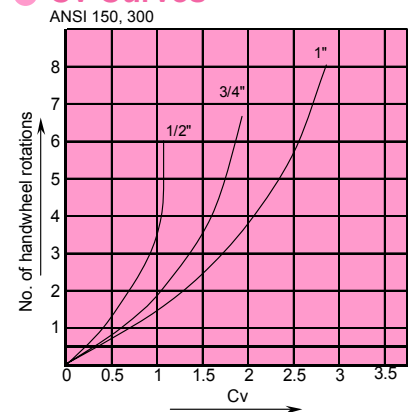
Units: mm

Nominal dia.	Orifice dia. D1	Bore D3	Face-to-face dimension L	Flange						H1	Height H	Lift L1	Handle dia. D	Max Cv value	Mas s (kg)	Part number
				D2	T	C	G	H2	F							
1/2	8	15	131	95.3	14.3	66.6	35.1	16	1.6	220	306	7.5	68	1.1	2.9	ULH-225CYD-A3R-D
3/4	10	20	147	117	15.8	82.6	43	19.5	1.6	240	340	10	78	1.9	4.7	ULH-225CYE-A3R-E
1	12	25	163	124	17.6	88.9	50.8	19.5	1.6	255	368	12	88	2.8	6.5	ULH-225CYF-A3R-F

Pressure-Temperature Curves



Cv Curves



Materials

Part	Material
Body	SUS 316
Bonnet	SUS 316
Stem	SUS 316
Disk	SUS 316L (Stellite)
Gland packing	PTFE+PCTFE
Handle	ADC 12

Precautions

- (1) This valve was not designed to be throttled at an almost-closed position. Using it in such a manner may result in damage to the disk and/or seat. Notify Fujikin in advance if you are planning to throttle this valve with the handle less than a 1/2 turn from the fully closed position.
- (2) Do not use this valve with ammonia, acetylene or similar gases as bronze gaskets are used for sealing.
- (3) As the extended bonnet design is meant to prevent the transfer of cold to the gland, do not expose the actuator to freezing temperatures.

Materials and dimensions are subject to change without notice.

Products must be selected with regard to the compatibility of the system in which they will be used.

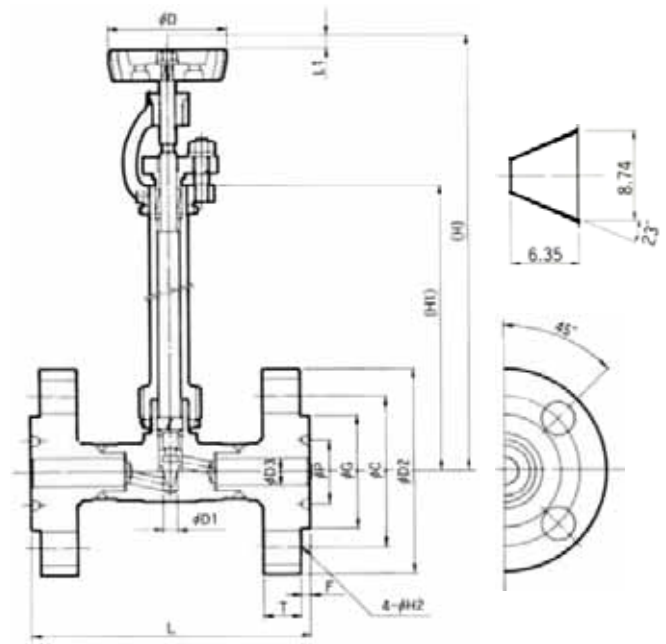
Fujikin shall bear no liability for products damaged by misuse, system failure, or accidents.

ANSI RJ Flanged Cryogenic Needle Valves

CRYO N₂ -196°C

RJ Flange Connection ANSI 900, 1500

ULH-225CYD-A*
RJ



Dimensions: ANSI 900

Units: mm

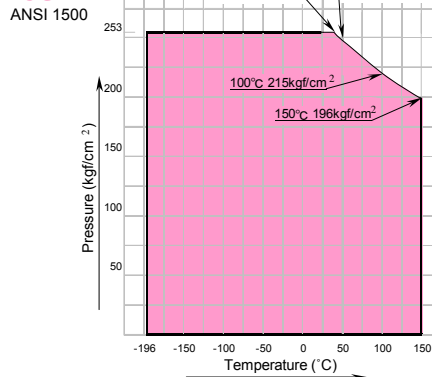
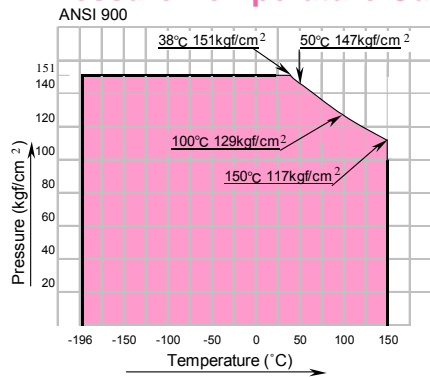
Nominal dia.	Orifice dia. D1	Bore D3	Face-to-face dimension L	Flange								H1	Height H	Lift L1	Handle dia. D	Max Cv	Mas s (kg)	Part Number
				D2	T	C	P	G	H2	F								
1/2"	8	15	160	121	22.4	82.6	39.7	60.5	22.5	6.35	220	306	7.5	68	1.1	5.2	ULH-225CYD-A9R-D	
3/4"	10	20	180	130	25.4	88.9	44.5	66.6	22.5	6.35	240	340	10	78	1.9	7.4	ULH-225CYE-A9R-E	
1"	12	25	205	149	28.5	102	50.8	71.4	25.5	6.35	255	368	12	88	2.8	11	ULH-225CYF-A9R-F	

Dimensions: ANSI 1500

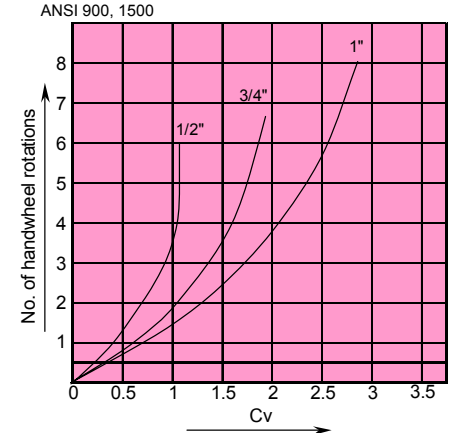
Units: mm

Nominal dia.	Orifice dia. D1	Bore D3	Face-to-face dimension L	Flange								H1	Height H	Lift L1	Handle dia. D	Max Cv	Mas s (kg)	Part Number
				D2	T	C	P	G	H2	F								
1/2"	8	15	160	121	22.4	82.6	39.7	60.5	22.5	6.35	220	306	7.5	68	1.1	5.2	ULH-225CYD-A15R-D	
3/4"	10	20	180	130	25.4	88.9	44.5	66.6	22.5	6.35	240	340	10	78	1.9	7.4	ULH-225CYE-A15R-E	
1"	12	25	205	149	28.5	102	50.8	71.4	25.5	6.35	255	368	12	88	2.8	11	ULH-225CYF-A15R-F	

Pressure-Temperature Curves



Cv Curves



Materials

Part	Material
Body	SUS 316
Bonnet	SUS 316
Stem	SUS 316
Disk	SUS 316L (Stellite)
Gland packing	PTFE+PCTFE
Handle	ADC 12

Precautions

- (1) This valve was not designed to be throttled at an almost-closed position. Using it in such a manner may result in damage to the disk and/or seat. Notify Fujikin in advance if you are planning to throttle this valve with the handle less than a 1/2 turn from the fully closed position.
- (2) Do not use this valve with ammonia, acetylene or similar gases as bronze gaskets are used for sealing.
- (3) As the extended bonnet design is meant to prevent the transfer of cold to the gland, do not expose the actuator to freezing temperatures.

Materials and dimensions are subject to change without notice.

Products must be selected with regard to the compatibility of the system in which they will be used.

Fujikin shall bear no liability for products damaged by misuse, system failure, or accidents.

Full Port Cryogenic Needle Valves

Part Number Designation (for custom orders)

U L - 5 1 C J Y F

Size:

- D → 1/2"
- E → 3/4"
- F → 1"
- G → 1 1/4"
- H → 1 1/2"
- I → 2"
- J → 2 1/2"
- K → 3"

Accessories:

- G → Travel indicator scale
- J → Vacuum jacketing
- Y → Yoke

Stainless steel

Extended Bonnet

Connection:

- 1 → Threaded, globe pattern
- 2 → Flanged, globe pattern
- 5 → Welded, globe pattern

Pressure rating:

- 1 → 10kgf/cm²(0.98MPa)
- 2 → 20kgf/cm²(1.96MPa)
- 5 → 50kgf/cm²(4.9MPa)

Cryogenic

Thread Size

Taper pipe thread	Designation							
	JIS B 0203 (1981)		A	B	C	D	E	F
	JIS B 0203 (1982) (ISO 7/1)	Male thread	R 1/8	R 1/4	R 3/8	R 1/2	R 3/4	R 1
		Female thread	Rc 1/8	Rc 1/4	Rc 3/8	Rc 1/2	Rc 3/4	Rc 1

Thread designation complies with JIS B0203 (1982) (ISO7/1). Sizes as per JIS B0203 (1981) are shown for reference.

Due to the relatively small demand for this valve type, it has been removed from Fujikin's standard product line. It is available as a custom order only.

Features

- The SUS 316L body, extended bonnet design, and hollow stem permit minimal thermal conductivity between the fluid and actuator. Total heat transfer is less than 2-3 W. Thermal conductivity can be reduced by lengthening the bonnet.
- Welded cryogenic vacuum jacketing is available.
- PCTFE valve disk offers excellent sealing performance, even with full port valves.
- Chevron V-ring packing and O-rings ensure high reliability.
- High pressure certification assures safe operation.

Applications

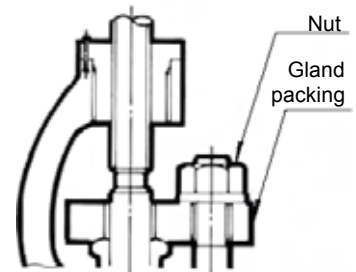
LPG and LNG gas lines, cold evaporators, LNG carriers, superconductivity machinery, petrochemical plants, natural gas processing plants, power plants, steel mills, shipyards, cryogenic lines in other facilities.

Guidelines for Adjusting Gland Packing

Because the gland may loosen during shipment, the hexagon nut at the gland should be tightened before the valve is pressurized. Tighten the nut to the value shown in the table to the right. To prevent uneven packing compression, tighten both sides of the nut evenly.

Tightening Torque

Pipe Size	Torque (kg f · cm)
1/8" - 1/2"	10
3/4"	15
1"	25



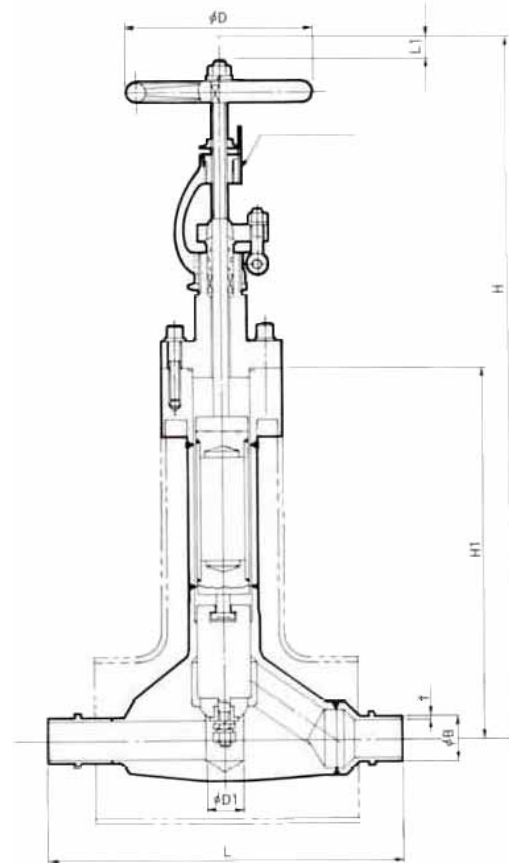
Specifications

Material	Max. Operating Pressure	Fluid Temperature Range
SUS316L	0.98 MPa	-253°C to +80°C

CRYO H₂
-253°C

Butt Weld

UL-51CGJY



Dimensions

Units: mm

Nominal dia.	Orifice dia. D1	Face-to-face dimensions L	Pipe Connection (butt weld)		H1	Height H	Lift L1	Handle dia. D	Max. Cv	Mass (kg)	Part Number
			B	t							
1"	25	300	34	2.8	300	608	25	125	12	17	UL-51CGJYF
1 1/2"	40	380	48.6	2.8	400	700	30	180	30	30	UL-51CGJYH
2"	50	440	60.5	2.8	500	900	40	250	48	90	UL-51CGJYI
3"	75	550	89.1	3.0	550	1100	50	355	98	110	UL-51CGJYK

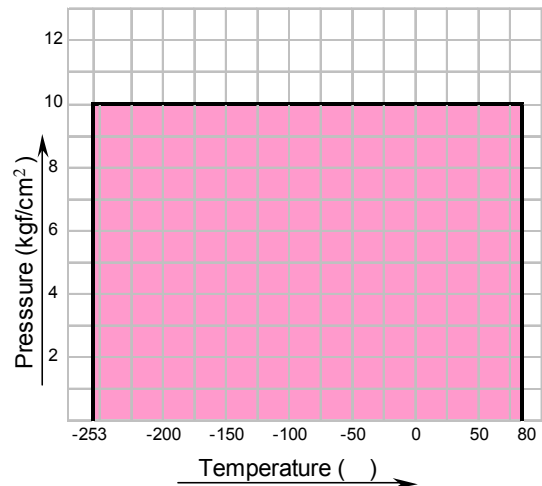
Material

Part	Material
Body	SUS 316L
Bonnet	SUS 316L
Stem	SUS 316L
Disk	SUS 316L
Disk packing	PCTFE
Handle	FC20

Welding precautions:

- (1) During welding, **keep the valve partially open**, and cover it with a wet towel to protect it from the heat.
- (2) After welding one side, wait at least 10 minutes for the valve to cool to room temperature before welding the other side.

Pressure-Temperature Curve



Materials and dimensions are subject to change without notice.

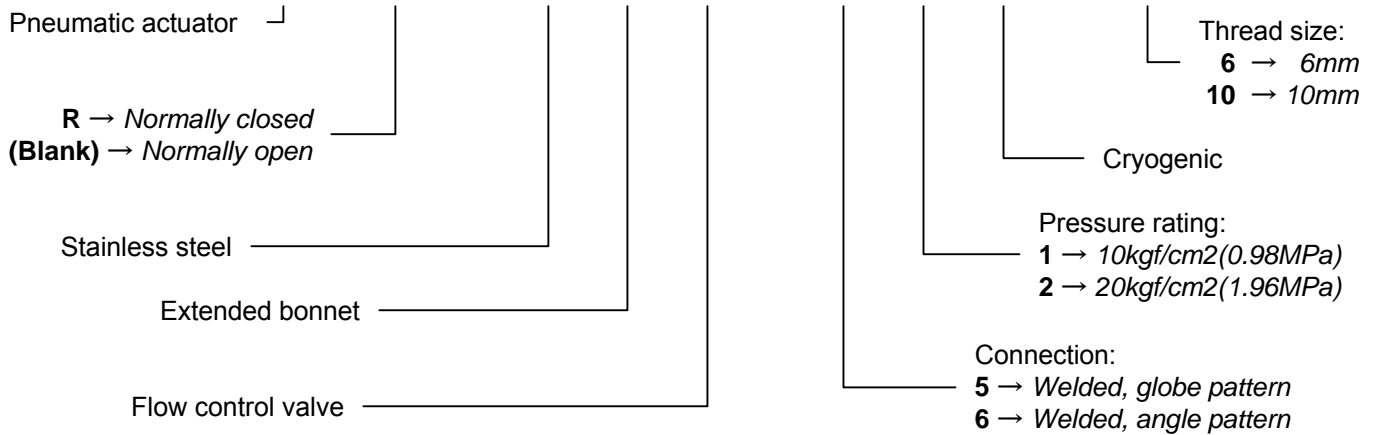
Products must be selected with regard to the compatibility of the system in which they will be used.

Fujikin shall bear no liability for products damaged by misuse, system failure, or accidents.

Cryogenic Needle Valves for Liquid Helium

Part Number Designation (for custom orders)

APR - ULH - 6 1 C - 10



Due to the relatively small demand for this valve type, it has been removed from Fujikin's standard product line. It is available as a custom order only.

Features

1. The SUS 316L body, extended bonnet design, and hollow stem permit minimal thermal conductivity between the fluid and actuator. Total heat transfer is less than 1 W. Thermal conductivity can be reduced by lengthening the bonnet.
2. Bonnet flange (JIS B 2290, nominal diameter: 40 mm) allows installation inside vacuum insulated equipment and cold boxes.
3. Bellows sealing models available.
4. Fujikin also manufactures low flow control valves (Joule-Thomson expansion valves).
5. High pressure certification assures safe operation.

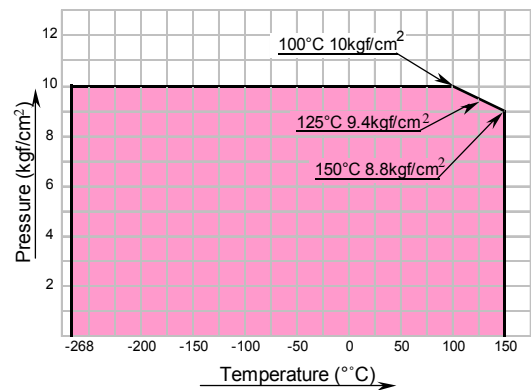
Applications

Liquid helium equipment (e.g., cryostat, MRI) and cryogenic lines in other facilities.

Specifications

Material	Max. Operating Pressure	Fluid Temperature Range
SUS316L	0.98 MPa	-268°C to +150°C

● Pressure-Temperature Curve



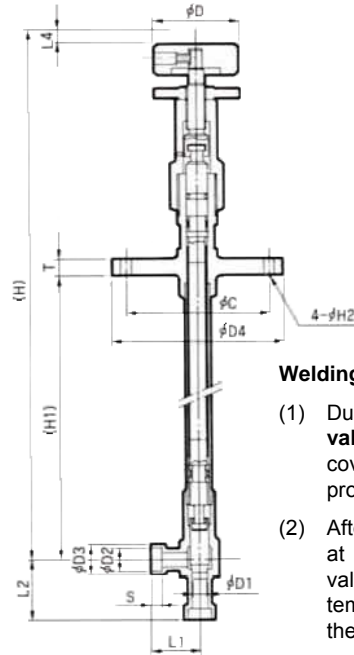
● Materials

Part	Material
Body	SUS 316L
Stem	SUS 316L
Disk	SUS 316L
Bonnet	SUS 316L
Handle	A 5052
Actuator	A 5052

CRYO He
-268°C

Socket Weld

ULH-61C



Welding precautions:

- (1) During welding, **keep the valve partially open**, and cover it with a wet towel to protect it from the heat.
- (2) After welding one side, wait at least 10 minutes for the valve to cool to room temperature before welding the other side.

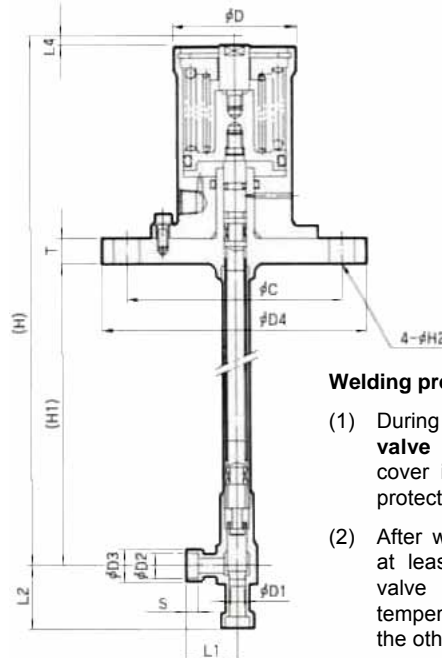
Dimensions

Units: mm

Nominal dia.	Orifice dia. D1	Connection			Body		Flange				H1	Height H	Lift L4	Handle dia. D	Max Cv	Mass (kg)	Part number
		D2	D3	S	L1	L2	C	D4	T	H2							
6	4	6.1	9	5	20	25	85	105	10	10	400	605	4	35	0.37	1.2	ULH-61C-6
10	6	10.1	13	5	20	25	85	105	10	10	400	605	4	35	0.83	1.3	ULH-61C-10

Socket Weld (pneumatic)

APR-ULH-61C



Welding precautions:

- (1) During welding, **keep the valve partially open**, and cover it with a wet towel to protect it from the heat.
- (2) After welding one side, wait at least 10 minutes for the valve to cool to room temperature before welding the other side.

Dimensions

Units: mm

Nominal dia.	Orifice dia. D1	Connection			Body		Flange				H1	Height H	Lift L4	Actuator dia. D	Max. Cv	Mass (kg)	Part Number
		D2	D3	S	L1	L2	C	D4	T	H2							
6"	4	6.1	9	5	20	25	85	105	10	10	400	490	4	48	0.37	1.8	APR-ULH-61C-6
10"	6	10.1	13	5	20	25	85	105	10	10	400	490	4	48	0.83	1.9	APR-ULH-61C-10

Materials and dimensions are subject to change without notice.

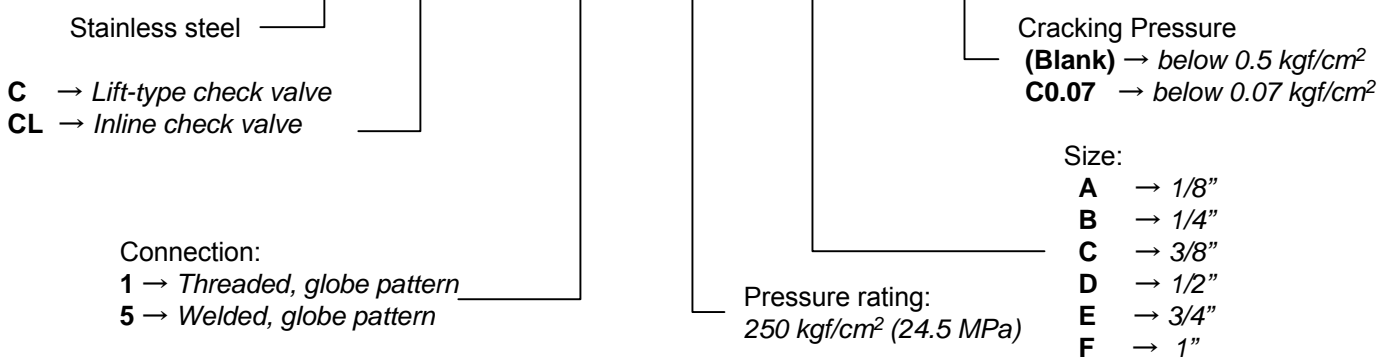
Products must be selected with regard to the compatibility of the system in which they will be used.

Fujikin shall bear no liability for products damaged by misuse, system failure, or accidents.

Cryogenic Check Valves

Part Number Designation

U C - 1 25 C - C0.07



Thread Size

Taper pipe thread	Designation		A	B	C	D	E	F	
	JIS B 0203 (1981)		PT 1/8	PT 1/4	PT 3/8	PT 1/2	PT 3/4	PT 1	
	JIS B 0203 (1982) (ISO 7/1)	Male thread	R 1/8	R 1/4	R 3/8	R 1/2	R 3/4	R 1	
	Female thread	Rc 1/8	Rc 1/4	Rc 3/8	Rc 1/2	Rc 3/4	Rc 1		

Thread designation complies with JIS B0203 (1982) (ISO7/1).
Sizes as per JIS B0203 (1981) are shown for reference.

Features

1. Compact body and simple construction allows minimum temperature of -253°C (Liquid nitrogen)
2. Offers excellent sealing even at the low temperature
3. Soft seal design is available as an option.
4. High pressure certification assures safe operation.

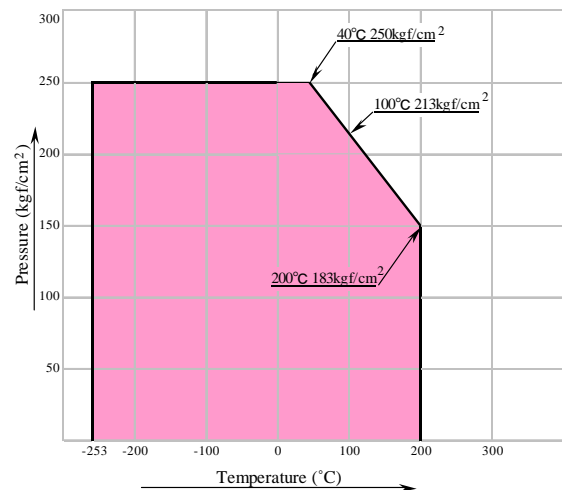
Applications

LPG and LNG gas lines, cold evaporators, LNG carriers, superconductivity machinery, petrochemical plants, natural gas processing plants, power plants, steel mills, shipyards, and cryogenic lines in other facilities.

Specifications

Material	Max. operating pressure	Fluid Temperature Range
SUS316	24.5MPa	-253°C to $+200^{\circ}\text{C}$

● Pressure-Temperature Curve



● Materials

Part	Material
Body	SUS 316L
Disk	SUS 316L (Stellite)
Bonnet	SUS 316L
Gasket	A 5052

● Precautions

Do not use this valve with ammonia, acetylene or similar gases as bronze gaskets are used for sealing.

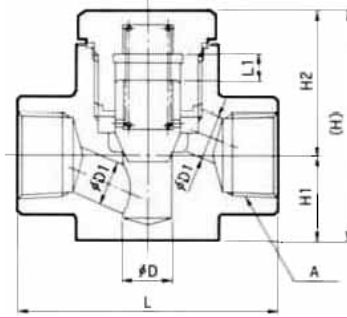


Check Valve

CRYO H₂ -253°C

Threaded (Rc)

UC-125



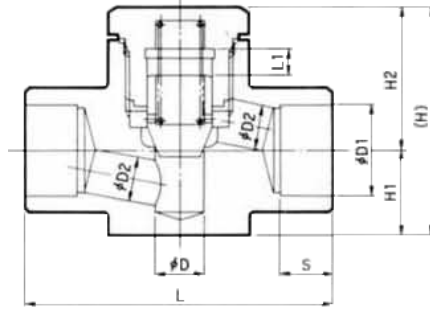
Dimensions

Units: mm

Nominal dia.	Orifice dia. D1	Face-to-face dimensions L	D1	H1	H2	Lift L1	Height H	Max. Cv	Mass (kg)	Part Number
Rc1/8"	8	50	5	13	33.5	6.5	46.5	0.78	0.2	UC-125A
Rc1/4"	8	50	6	13	33.5	6.5	46.5	0.78	0.2	UC-125B
Rc3/8"	12	65	8	18	44.5	8.5	62.5	1.4	0.7	UC-125C
Rc1/2"	12	70	12	18	44.5	8.5	62.5	2.7	0.7	UC-125D
Rc3/4"	15	80	14	25	45.5	8.5	70.5	3.9	1.2	UC-125E
Rc 1"	15	90	15	25	45.5	8.5	70.5	4.3	1.2	UC-125F

Socket Weld

UC-525



Dimensions

Units: mm

Nominal dia.	Orifice dia. D	Face-to-face dimensions L	Pipe connection		D2	H1	H2	Lift L1	Height H	Max. Cv	Mass (kg)	Part Number
			D1	S								
1/8"	8	60	11.0	10	5	13	33.5	6.5	46.5	0.78	0.2	UC-525A
1/4"	8	60	14.3	10	6	13	33.5	6.5	46.5	0.78	0.2	UC-525B
3/8"	12	80	17.8	13	8	18	44.5	8.5	62.5	1.4	0.7	UC-525C
1/2"	12	85	22.2	13	12	18	44.5	8.5	62.5	2.7	0.7	UC-525D
3/4"	15	95	27.7	16	14	25	45.5	8.5	70.5	3.9	1.2	UC-525E
1"	15	105	34.5	16	15	25	45.5	8.5	70.5	4.3	1.2	UC-525F

Specifications

Cracking Pressure	Flow Range	Back Pressure
below 0.5 kgf/cm ²	above 40 m ³ /h	above 125 kgf/cm ²
Precaution		
Please notify Fujikin in advance when planning to use these valves. (Caution: the minimal back pressure is 50kgf/cm ²).		

Materials and dimensions are subject to change without notice.

Products must be selected with regard to the compatibility of the system in which they will be used.

Fujikin shall bear no liability for products damaged by misuse, system failure, or accidents.

Cryogenic Pneumatic Mini Control Valve

MINUCON

Actuator

Body

Disk and seat

E M3 D 2-115 CD-E 07 R2-V

Actuator:
M3 → Pneumatic
UN → Manual

Positioner:
(blank) → None
P → P/P positioner
E → E/P positioner
 (ExdIIBT6X)
E1 → Explosion-proof E/P
 positioner (ExdIIB+H2T6X)

Actuator mode:
D → Direct (Normally Open)
R → Reverse (Normally Close)

Actuator operating pressure:
(blank) → ON-OFF: 100kPa;
 Control: 20-100/140kPa
2 → ON-OFF: 200kPa; Control: 240kPa
4 → 400kPa

Connection:
1(3) → Threaded, globe pattern (angle)
2(4) → Flanged, globe pattern (angle)
5(6) → Socket weld, globe pattern (angle)
7(8) → Union fitting, globe pattern (angle)
9(0) → Tube fitting, globe pattern (angle)

Rangeability:
R1 → 10:1
R2 → 20:1
 ...
R10 → 100:1

Cv value:
 (See table on next page)

Valve characteristics:
O → ON-OFF
L → Linear
E → EQ%

Size:
B → ¼" (8A)
C → 3/8" (10A)
D → ½" (15A)
E → ¾" (20A)
F → 1" (25A)

Cryogenic

Pressure rate:
15, 30, 50 → 14.7MPa, 29.4 MPa, 49MPa
J1, J2, J3, J4, J6 → JIS 10K, 20K, 30K, 40K, 60K
A2, A3, A6, A9, A15 → ANSI 150, 300, 600, 900, 1500
JP2, JP3, JP6, JP9, JP15 → JPI 150, 300, 600, 900, 1500

* - Accessories:
AS → Regulator
L* → Limit switch
V* → Solenoid valve
******* → Other options

Features

1. Extended bonnet allows a minimum fluid temperature of -253°C.
2. Stellite SUS 316 disc and seat allows long-term use without necessary adjustments to the valve.
3. Because the valve seat is screwed into the body, it is easy to replace.
4. Design can be modified for liquid helium.
5. High pressure certification assures safe operation.

Applications

LPG, LNG, liquid nitrogen, and oxygen lines; other cryogenic gas lines in cold evaporators, LNG carriers, superconductivity machinery, petrochemical plants, natural gas processing plants, power plants, steel mills, and shipyards.

CRYO H₂ **-253°C**

Materials

Part	Material
Body	SUS 316
Disk(Needle)	SUS 316L (Stellite)
Seat	SUS 316L (Stellite)
Bonnet	SUS 316
Packing	PTFE
Actuator diaphragm	NBR
Yoke	ADC12
Actuator body	ADC12

Specifications

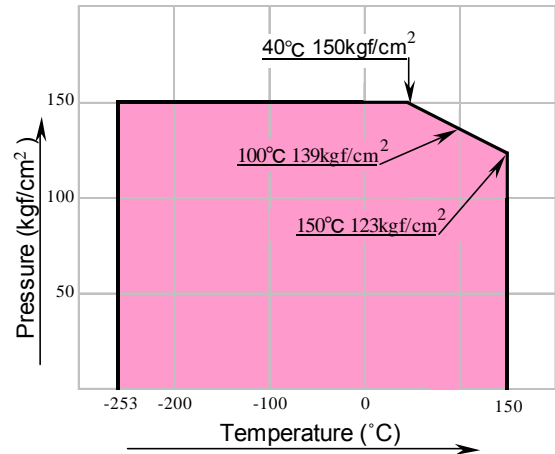
Max. operating pressure	Fluid Temperature Range
14.7, 29.4, 49MPa	-253°C to +150°C

Cv, Rangeability Table

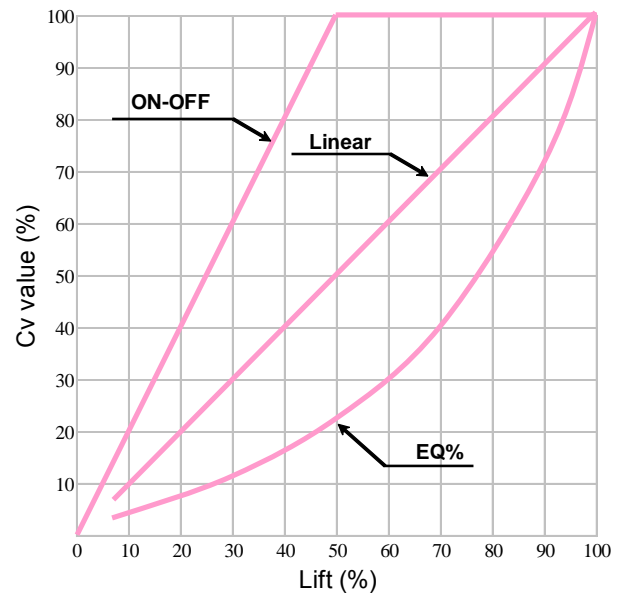
Valve characteristic		Linear and EQ%										
Rangeability		ON-OFF	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10
Code	Cv		10:1	20:1	30:1	40:1	50:1	60:1	70:1	80:1	90:1	100:1
01	5											
02	3											
03	2											
04	1.5											
05	1											
06	0.7											
07	0.5											
08	0.35											
09	0.25											
10	0.15											
11	0.1											
12	0.07											
13	0.05											
14	0.035											
15	0.025											
16	0.015											
17	0.01											
18	0.007											
19	0.005											
20	0.0035											
21	0.0025											
22	0.0015											
23	0.001											
24	0.0007											
25	0.0005											
26	0.00035											
27	0.00025											
28	0.00015											
29	0.0001											
30	0.00007											
31	0.00005											
32	0.000035											
33	0.000025											
34	0.000015											
35	0.00001											
36	0.000007											
37	0.000005											
38	0.0000035											
39	0.0000025											
40	0.0000015											

Cv and ability selection
 for Code

Pressure-Temperature Curve



Cv Curves



Calculation of Cv

Media	$P_2 > \frac{P_1}{2}$	$P_2 \leq \frac{P_1}{2}$
Liquid	$C_v = 0.366 \cdot Q_L \sqrt{\frac{G_L}{P_1 - P_2}}$	Same equation as on left
Gas	$C_v = \frac{Q_g}{4140} \sqrt{\frac{G_g(273+t)}{(P_1 - P_2)P_2}}$	$C_v = \frac{Q_g}{2070 \cdot P_1} \sqrt{G_g(273+t)}$

- Cv – Flow rate
- Q_L – Liquid value (m³/h)
- Q_g – Gas value (m³/h)
- P₁ – Upstream pressure (MPa abs.)
- P₂ – Downstream pressure (MPa abs.)
- t – Temperature (°C)
- G_L – Specific gravity of liquid
- G_g – Specific gravity of gas

Materials and dimensions are subject to change without notice.

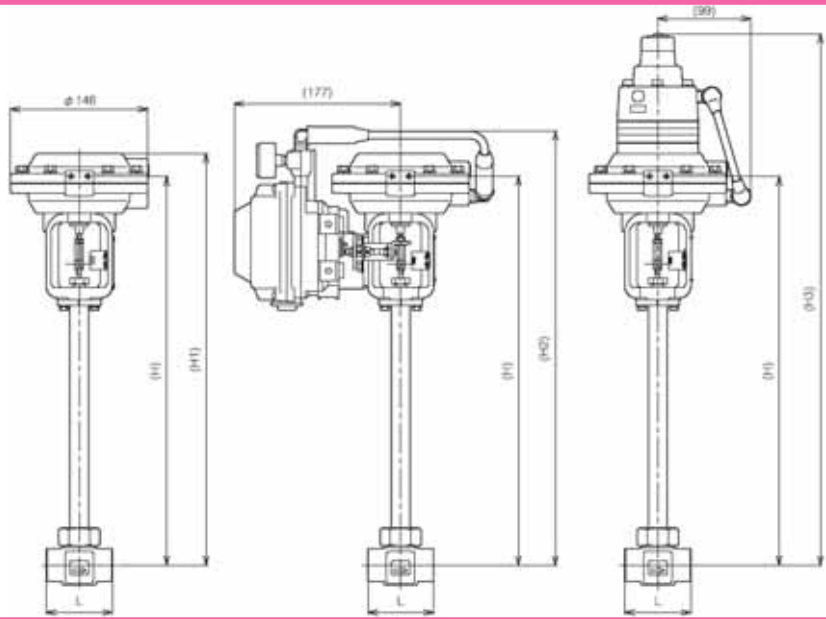
Products must be selected with regard to the compatibility of the system in which they will be used.

Fujikin shall bear no liability for products damaged by misuse, system failure, or accidents.

Pneumatic Mini Control Valve: MINUCON

CRYO H₂ -253°C

Threaded (Rc)

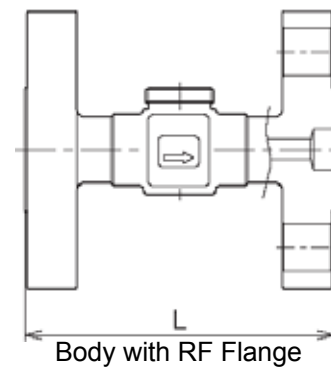
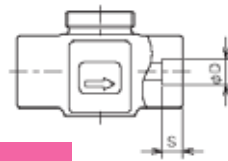


Valve characteristics					No positioner			E/P positioner			P/P positioner		
Pressure rate	Connection	Cv	Dimensions (mm)		Code		(mm)	Code		(mm)	Code		(mm)
			H	L	Norm. Open	Norm. Close	H1	Norm. Open	Norm. Close	H2	Norm. Open	Norm. Close	H3
14.7MPa	Rc 1/4 - 1/2	< 0.5	414	70	M3D-115C*	M3R-115C*	439	EM3D-115C*	EM3R-115C*	463	PM3D-115C*	PM3R-115C*	568
	Rc 1/4 - 1	> 0.7	419	100			443			467			572
29.4MPa	Rc 1/4 - 1/2	< 0.5	417	80	M3D-130C*	M3R-130C*	442	EM3D-130C*	EM3R-130C*	466	PM3D-130C*	PM3R-130C*	571
	Rc 1/4 - 1	> 0.7	419	100			443			467			572
49MPa	Rc 1/4 - 1/2	< 0.5	414	100	M3D-150C*	M3R-150C*	439	EM3D-150C*	EM3R-150C*	463	PM3D-150C*	PM3R-150C*	568
14.7MPa	SW 1/4 - 1/2	< 0.5	414	80	M3D-515C*	M3R-515C*	439	EM3D-515C*	EM3R-515C*	463	PM3D-515C*	PM3R-515C*	568
	SW 1/4 - 1	> 0.7	419	110			443			467			572
29.4MPa	SW 1/4 - 1/2	< 0.5	417	90	M3D-530C*	M3R-530C*	442	EM3D-530C*	EM3R-530C*	466	PM3D-530C*	PM3R-530C*	571
	SW 1/4 - 1	> 0.7	419	110			443			467			572
49MPa	SW 1/4 - 1/2	< 0.5	419	110	M3D-550C*	M3R-550C*	439	EM3D-550C*	EM3R-550C*	463	PM3D-550C*	PM3R-550C*	568

Socket Weld

Dimensions Units: mm

Nominal dia.	D	S
1/4"	14.3	10
3/8"	17.8	13
1/2"	22.2	
3/4"	27.7	16
1"	34.5	



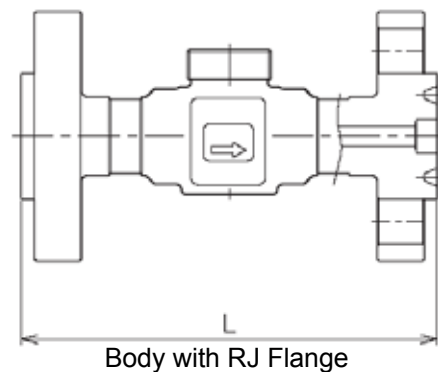
Flanged

Dimensions: JIS Units: mm

Cv	Class	Flange RF			
		Dimensions (L)			
		10A	15A	20A	25A
below 0.5	10K, 20K, 30K, 40K, 63K	150			
more 0.7	10K, 20K	150			
	30K	150	180		
	40K, 63K	150	180		

Dimensions: ANSI-JPI Units: mm

Cv	Class	Flange RF			Flange RJ		
		Dimensions (L)			Dimensions (L)		
		15A	20A	25A	15A	20A	25A
below 0.5	150, 300, 600	150			150		
	900, 1500	200			200		
more 0.7	150	150			150		
	300	150			180		
	600	180			180		
	900, 1500	200			200		



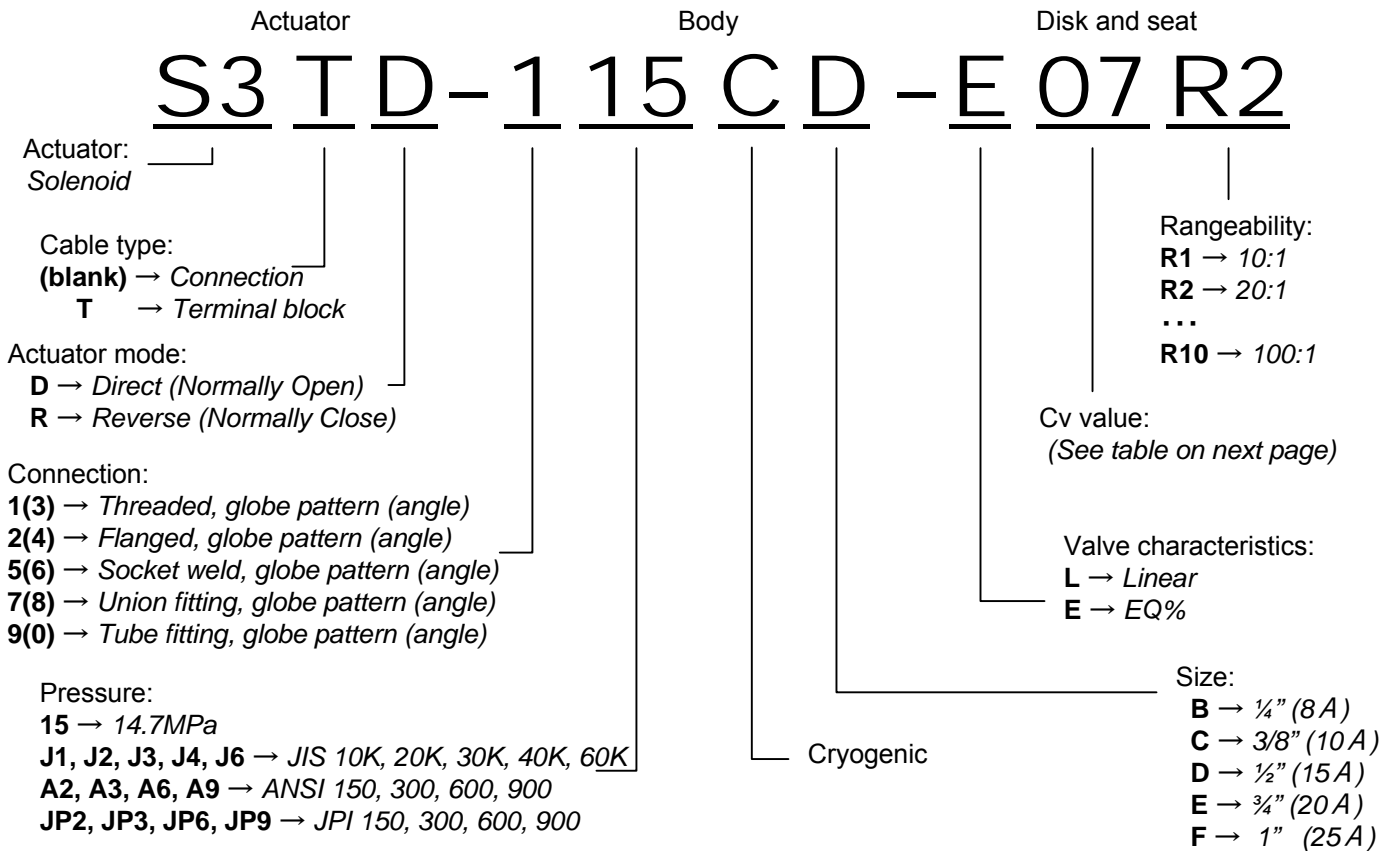
Materials and dimensions are subject to change without notice.

Products must be selected with regard to the compatibility of the system in which they will be used.

Fujikin shall bear no liability for products damaged by misuse, system failure, or accidents.

Cryogenic Solenoid Control Valve

SR100



Features

1. Extended bonnet allows a minimum fluid temperature of -253°C .
2. Electric solenoid actuator allows a response time of less than 0.6 seconds (0.8 seconds in the case of normally-open valves).
3. Choice of control signals: 4-20 mA or 1-5 V.
4. High resolution: Fujikin drive unit maintains continuous control of the current to the actuator.
5. Feed-back mechanism: Precise linear sensor (over 2 million cycles) for stroke detection assures superior repeatability and minimized hysteresis.
6. Stellite SUS 316 disc and seat allows long-term use without necessary adjustments to the valve.
7. Because the valve seat is screwed into the body, it is easy to replace.
8. Design can be modified for liquid helium.
9. High pressure certification assures safe operation.

Applications

LPG, LNG, liquid nitrogen, and oxygen lines; other cryogenic gas lines in cold evaporators, LNG carriers, superconductivity machinery, petrochemical plants, natural gas processing plants, power plants, steel mills, and shipyards.



Solenoid Control Valve: SR100

CRYO H₂ -253°C

Materials

Part	Material
Body	SUS 316
Disk (Needle)	SUS 316L (Stellite)
Seat	SUS 316L (Stellite)
Bonnet	SUS 316
Packing	C-PTFE, PFA
Yoke	AC2A
Actuator base	A5052
Actuator cover	AC2A

Specifications

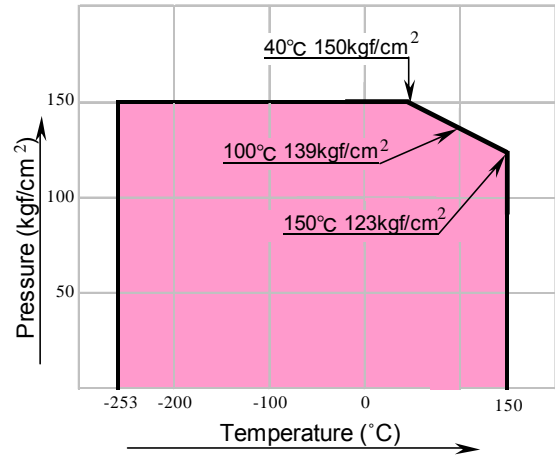
Max. operating pressure	Fluid Temperature Range
14.7, 29.4, 49MPa	-253°C to +150°C

Cv, Rangeability Table

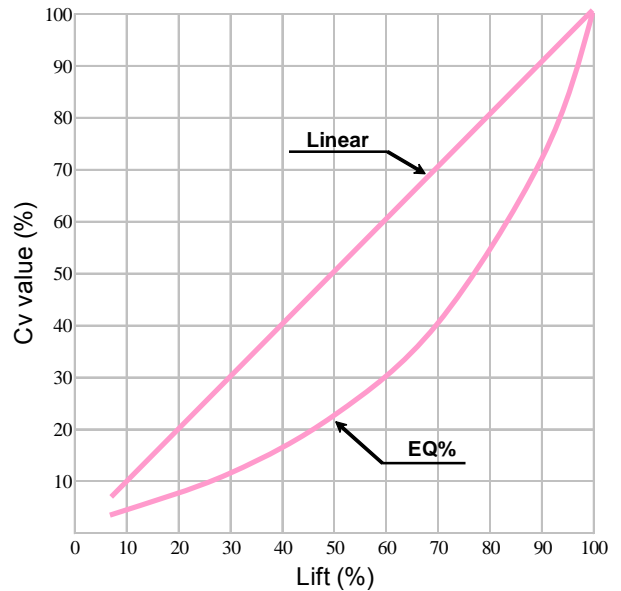
Valve characteristic		Linear and EQ%									
Rangeability		R1	R2	R3	R4	R5	R6	R7	R8	R9	R10
Code	Cv	10:1	20:1	30:1	40:1	50:1	60:1	70:1	80:1	90:1	100:1
01	5										
02	3										
03	2										
04	1.5										
05	1										
06	0.7										
07	0.5										
08	0.35										
09	0.25										
10	0.15										
11	0.1										
12	0.07										
13	0.05										
14	0.035										
15	0.025										
16	0.015										
17	0.01										
18	0.007										
19	0.005										
20	0.0035										
21	0.0025										
22	0.0015										
23	0.001										
24	0.0007										
25	0.0005										
26	0.00035										
27	0.00025										
28	0.00015										
29	0.0001										
30	0.00007										
31	0.00005										
32	0.000035										
33	0.000025										
34	0.000015										
35	0.00001										
36	0.000007										
37	0.000005										
38	0.0000035										
39	0.0000025										
40	0.0000015										

Cv and ability selection
 for Code

Pressure-Temperature Curve



Cv Curves



Calculation of Cv

Media	$P_2 > \frac{P_1}{2}$	$P_2 \leq \frac{P_1}{2}$
Liquid	$C_v = 0.366 \cdot Q_L \sqrt{\frac{G_L}{P_1 - P_2}}$	Same equation as on left
Gas	$C_v = \frac{Q_g}{4140} \sqrt{\frac{G_g(273+t)}{(P_1 - P_2)P_2}}$	$C_v = \frac{Q_g}{2070 \cdot P_1} \sqrt{G_g(273+t)}$

- Cv – Flow rate
- Q_L – Liquid value (m³/h)
- Q_g – Gas value (m³/h)
- P₁ – Upstream pressure (MPa abs.)
- P₂ – Downstream pressure (MPa abs.)
- t – Temperature (°C)
- G_L – Specific gravity of liquid
- G_g – Specific gravity of gas

Materials and dimensions are subject to change without notice.

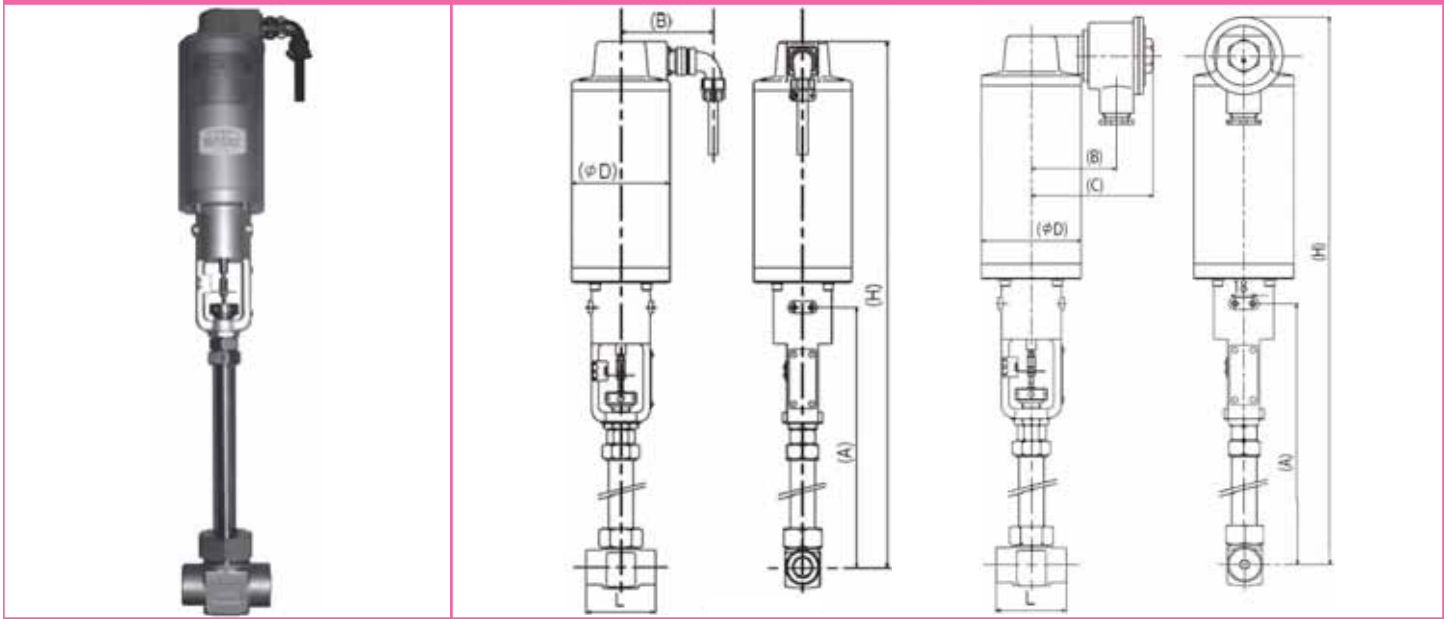
Products must be selected with regard to the compatibility of the system in which they will be used.

Fujikin shall bear no liability for products damaged by misuse, system failure, or accidents.

Solenoid Control Valve: SR100

CRYO H₂ -253°C

Threaded (Rc)

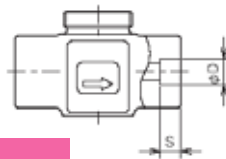


Actuator	Connection	Cv	Code		Dimensions (mm)					Code		Dimensions (mm)					
			Norm. Open	Norm. Close	L	H	A	B	D	Norm. Open	Norm. Close	L	H	A	B	C	D
S3	Rc 1/4 - 1/2	< 0.5	S3D-115C*	S3R-115C*	70	676	376	107	127	S3TD-115C*	S3TR-115C*	70	695	376	99	135	127
	Rc 1/4 - 1	> 0.7			100	715	415					100	734	415			
	SW 1/4 - 1/2	< 0.5	S3D-515C*	S3R-515C*	80	676	376			S3TD-515C*	S3TR-515C*	80	695	376			
	SW 1/4 - 1	> 0.7			110	715	415					110	734	415			

Socket Weld

Dimensions Units: mm

Nominal dia.	D	S
1/4"	14.3	10
3/8"	17.8	13
1/2"	22.2	
3/4"	27.7	16
1"	34.5	



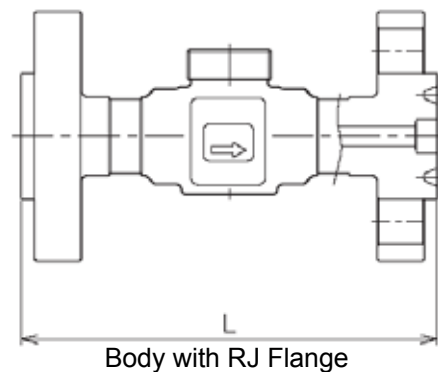
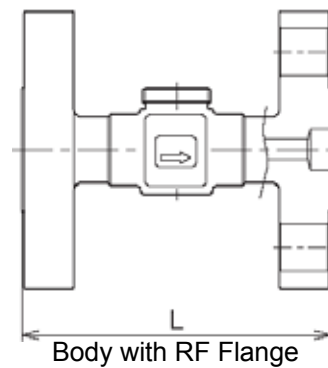
Flanged

Dimensions: JIS Units: mm

Cv	Class	Flange RF			
		Dimensions (L)			
		10A	15A	20A	25A
below 0.5	10K, 20K, 30K, 40K, 63K	150			
more 0.7	10K, 20K	150			
	30K	150	180		
	40K, 63K	150	180		

Dimensions: ANSI-JPI Units: mm

Cv	Class	Flange RF			Flange RJ		
		Dimensions (L)			Dimensions (L)		
		15A	20A	25A	15A	20A	25A
below 0.5	150, 300, 600	150			150		
	900, 1500	200			200		
more 0.7	150	150			150		
	300	150			180		
	600	180			180		
	900, 1500	200			200		



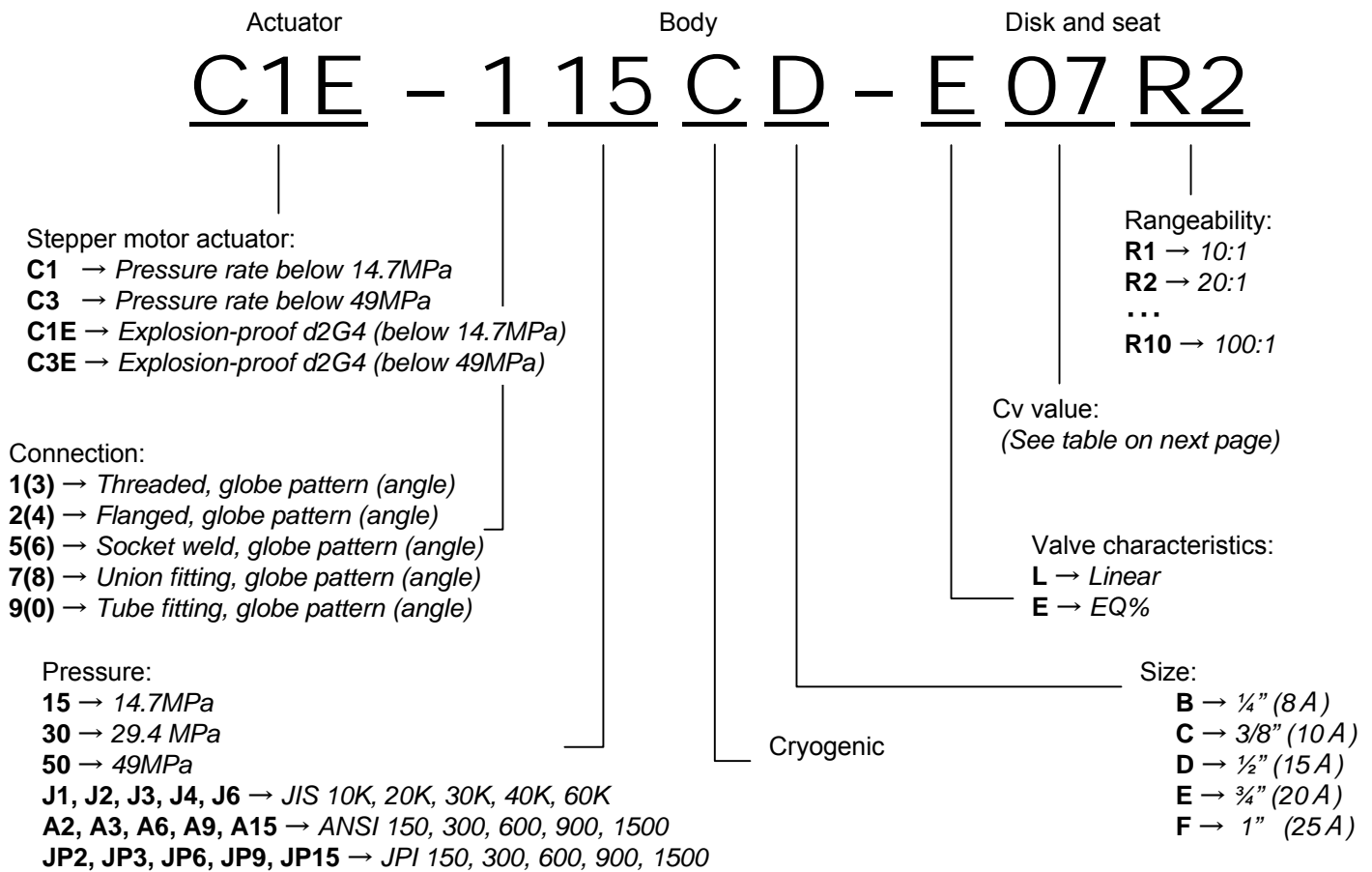
Materials and dimensions are subject to change without notice.

Products must be selected with regard to the compatibility of the system in which they will be used.

Fujikin shall bear no liability for products damaged by misuse, system failure, or accidents.

Cryogenic Stepper Motor Control Valve

AR2000



Features

1. Extended bonnet allows a minimum fluid temperature of -253°C.
2. Explosion-proof protection d2G4 also available.
3. Less than 0.1% hysteresis: AR2000 electronic valves use a high precision stepper motor for precise stroke position.
4. Choice of control signal: 4-20 mA or 1-5 V.
5. High resolution: Fujikin drive unit maintains continuous control of the current to the actuator.
6. Stellite SUS 316 disc and seat allows long-term use without necessary adjustments to the valve.
7. Because the valve seat is screwed into the body, it is easy to replace.
8. Design can be modified for liquid helium.
9. High pressure certification assures safe operation.

Applications

LPG, LNG, liquid nitrogen, and oxygen lines; other cryogenic gas lines in cold evaporators, LNG carriers, superconductivity machinery, petrochemical plants, natural gas processing plants, power plants, steel mills, and shipyards.



Materials

Part	Material
Body	SUS 316
Disk (Needle)	SUS 316L (Stellite)
Seat	SUS 316L (Stellite)
Bonnet	SUS 316
Packing	C-PTFE, PFA
Yoke	AC2A
Solenoid	-
Solenoid cover	AC2A

Specifications

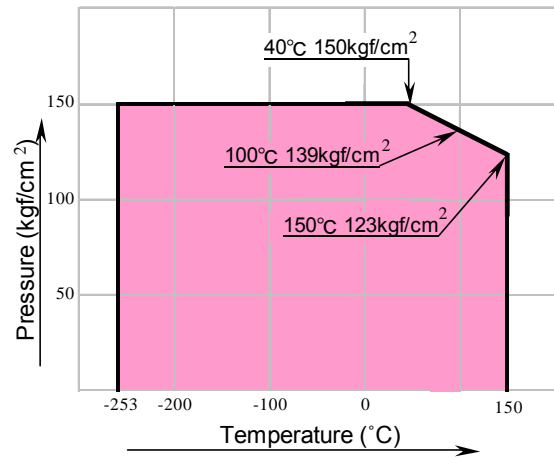
Max. operating pressure	Fluid Temperature Range
14.7MPa	-253°C to +150°C

Cv, Rangeability table

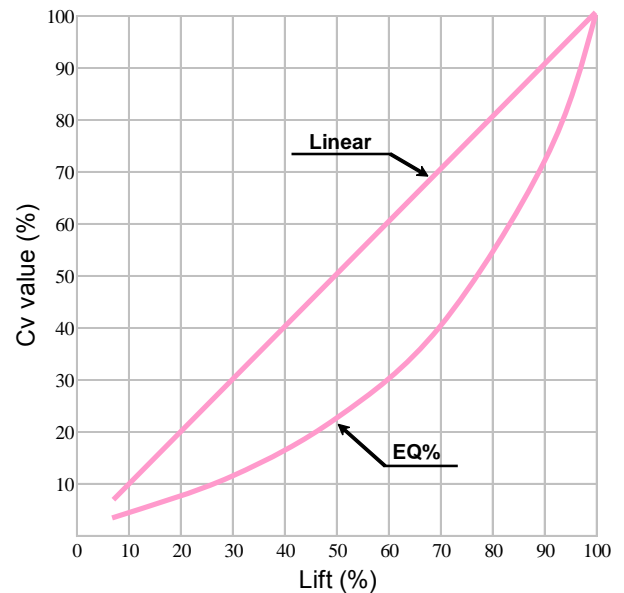
Valve characteristic		Linear and EQ%									
Rangeability		R1	R2	R3	R4	R5	R6	R7	R8	R9	R10
Code	Cv	10:1	20:1	30:1	40:1	50:1	60:1	70:1	80:1	90:1	100:1
01	5										
02	3										
03	2										
04	1.5										
05	1										
06	0.7										
07	0.5										
08	0.35										
09	0.25										
10	0.15										
11	0.1										
12	0.07										
13	0.05										
14	0.035										
15	0.025										
16	0.015										
17	0.01										
18	0.007										
19	0.005										
20	0.0035										
21	0.0025										
22	0.0015										
23	0.001										
24	0.0007										
25	0.0005										
26	0.00035										
27	0.00025										
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29	0.0001										
30	0.00007										
31	0.00005										
32	0.000035										
33	0.000025										
34	0.000015										
35	0.00001										
36	0.000007										
37	0.000005										
38	0.0000035										
39	0.0000025										
40	0.0000015										

Cv and ability selection
 for Code

Pressure-Temperature Curve



Cv Curves



Calculation of Cv

Media	$P_2 > \frac{P_1}{2}$	$P_2 \leq \frac{P_1}{2}$
Liquid	$C_v = 0.366 \cdot Q_L \sqrt{\frac{G_L}{P_1 - P_2}}$	Same equation as on left
Gas	$C_v = \frac{Q_g}{4140} \sqrt{\frac{G_g(273+t)}{(P_1 - P_2)P_2}}$	$C_v = \frac{Q_g}{2070 \cdot P_1} \sqrt{G_g(273+t)}$

- Cv – Flow rate
- Q_L – Liquid value (m³/h)
- Q_g – Gas value (m³/h)
- P₁ – Upstream pressure (MPa abs.)
- P₂ – Downstream pressure (MPa abs.)
- t – Temperature (°C)
- G_L – Specific gravity of liquid
- G_g – Specific gravity of gas

Materials and dimensions are subject to change without notice.

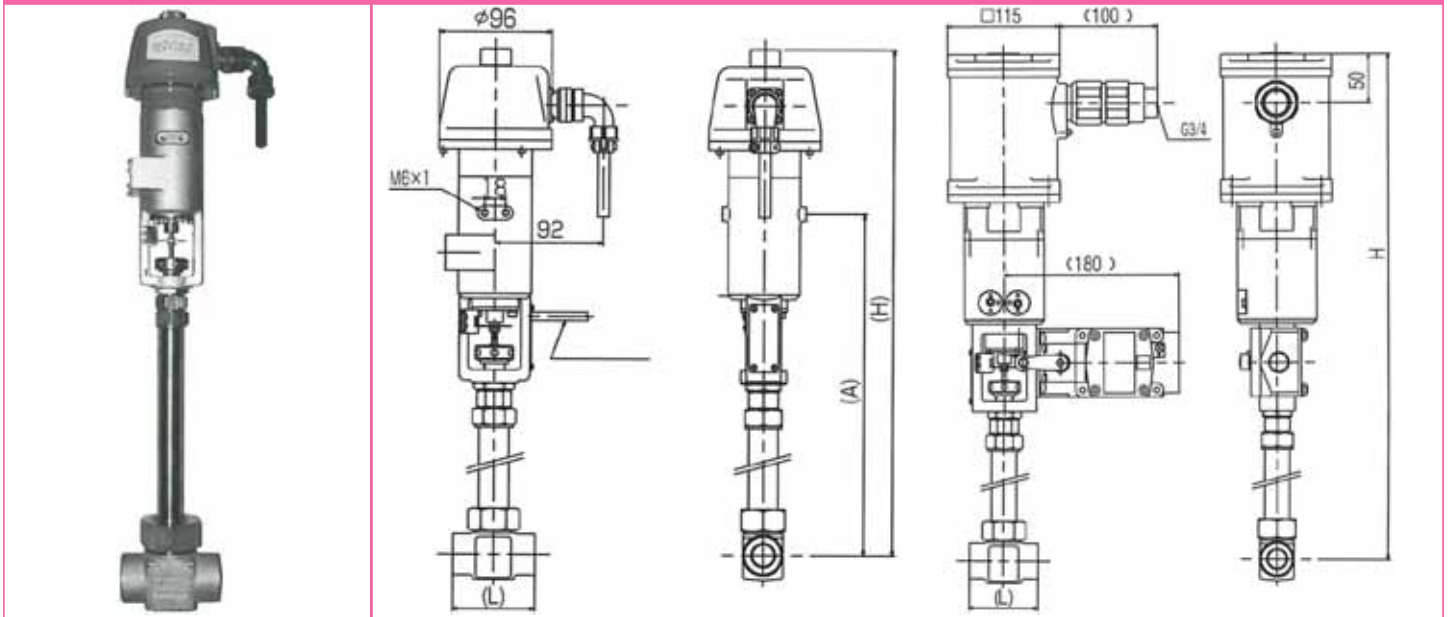
Products must be selected with regard to the compatibility of the system in which they will be used.

Fujikin shall bear no liability for products damaged by misuse, system failure, or accidents.

Stepper Motor Control Valve: AR2000

CRYO H₂ -253°C

Threaded (Rc)

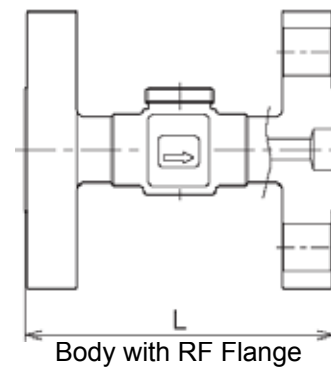
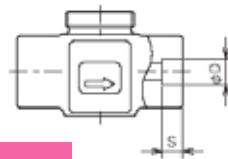


Actuator	Pressure rate	Connection	Cv	Code	Dimensions (mm)			Code (Explosion-proof)	Dimension(mm)	
					L	H	A		L	H
C1 (C1E)	14.7MPa	Rc 1/4 - 1/2	< 0.5	C1-115C*	70	545	405	C1E-115C*	70	625
		Rc 1/4 - 1	> 0.7		100	583	443		100	663
		SW 1/4 - 1/2	< 0.5	C1-515C*	80	545	405	C1E-515C*	80	625
		SW 1/4 - 1	> 0.7		110	583	443		110	663
C3 (C3E)	14.7MPa	Rc 1/4 - 1/2	< 0.5	C3-115C*	70	568	405	C3E-115C*	70	670
		Rc 1/4 - 1	> 0.7		100	606	443		100	709
		SW 1/4 - 1/2	< 0.5	C3-515C*	80	568	405	C3E-515C*	80	670
		SW 1/4 - 1	> 0.7		110	606	443		110	709

Socket weld

Dimensions Units: mm

Nominal dia.	D	S
1/4"	14.3	10
3/8"	17.8	13
1/2"	22.2	
3/4"	27.7	
1"	34.5	16



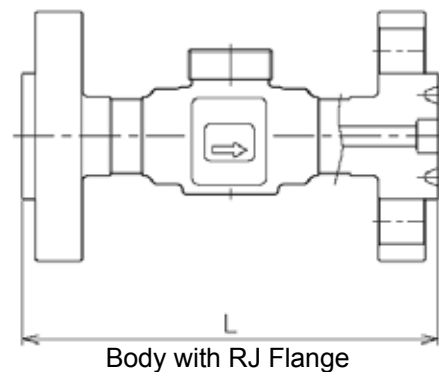
Flanged

Dimensions: JIS Units: mm

Cv	Class	Flange RF			
		Dimensions (L)			
		10A	15A	20A	25A
below 0.5	10K, 20K, 30K, 40K, 63K	150			
above 0.7	10K, 20K	150			
	30K	150	180		
	40K, 63K	150	180		

Dimensions: ANSI-JPI Units: mm

Cv	Class	Flange RF			Flange RJ		
		Dimensions (L)			Dimensions (L)		
		15A	20A	25A	15A	20A	25A
below 0.5	150, 300, 600	150			150		
	900, 1500	200			200		
above 0.7	150	150			150		
	300	150			180		
	600	180			180		
	900, 1500	200			200		



Materials and dimensions are subject to change without notice.

Products must be selected with regard to the compatibility of the system in which they will be used.


Fujikin shall bear no liability for products damaged by misuse, system failure, or accidents.

MUNUCON DATA SHEET FOR INQUIRY

CUSTOMER		QUANTITY	
END-USER		DELIVERY	
APPLICATIONS		TAG No.	
CODE			

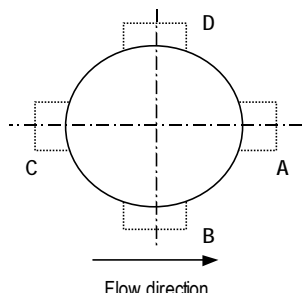
VALVE SPECIFICATIONS	DESIGN PRESSURE [MPa G]			ACTUATOR COMPONENT SPECIFICATIONS	ACTUATOR MODE	<input type="checkbox"/> Direct (Normally Open) <input type="checkbox"/> Reverse (N. Close)		
	DESIGN TEMPERATURE [°C]				POSITIONER	<input checked="" type="checkbox"/> P/P <input type="checkbox"/> E/P <input type="checkbox"/> None		
	MAX. PRESS AT SHUT-OFF [MPa G]				Electric/Air Signal	4~20mA / 20~100kPa		
	CONNECTION	TYPE	<input type="checkbox"/> Threaded		<input type="checkbox"/> Socket weld	Air Supply	140 ~ 400	[kPa]
			<input type="checkbox"/> Flange		<input type="checkbox"/> Other	ACTUATOR OPERATING PRESSURE		[kPa]
	SIZE/CLASS	()			SIGNAL PART CONNECTION	<input type="checkbox"/> Fujikin Standard (PT 1/4B) <input type="checkbox"/> Other ()		
	PATTERN	<input type="checkbox"/> Globe <input type="checkbox"/> Angle			E/P POSITIONER DIRECTION (No.1 Fujikin Standard)			
	BODY MATERIAL	<input type="checkbox"/> SUS316 or SUSF316 (Fujikin Standard) <input type="checkbox"/> Other ()			<input type="checkbox"/> No.1 <input type="checkbox"/> No.2 <input type="checkbox"/> No.3 <input type="checkbox"/> No.4			
	DISK/NEEDLE SEAT MATERIAL	<input type="checkbox"/> SUS316+Stellited (Fujikin Standard) <input type="checkbox"/> Other ()			ATUATOR			<input type="checkbox"/> Cobalt blue: Mansell No.10B4/10 (Standard) <input type="checkbox"/> Other ()
	BONNET TYPE	<input type="checkbox"/> Fujikin Standard <input type="checkbox"/> Extension (CRYO) <input type="checkbox"/> Finned for High Temp. <input type="checkbox"/> Other ()			YOKE			<input type="checkbox"/> Silver (Fujikin Standard) <input type="checkbox"/> Other ()
	GLAND PACKING	<input type="checkbox"/> Fujikin Standard (PTFE) <input type="checkbox"/> O-Ring <input type="checkbox"/> Bellows <input type="checkbox"/> Other ()			OPTIONAL ACCESSORIES	REMARKS		
	VALVE CHARACTERISTICS	<input type="checkbox"/> Linear <input type="checkbox"/> EQ% <input type="checkbox"/> ON-OFF <input type="checkbox"/> Other ()				REGULATOR	<input type="checkbox"/> Yes <input type="checkbox"/> No	
	Cv	<input type="text"/>	<input checked="" type="checkbox"/> Fujikin select			SOLENOID VALVE (EXPLOSION-PROOF)	<input type="checkbox"/> Yes <input type="checkbox"/> No () <input type="checkbox"/> AC100V <input type="checkbox"/> DC24V	
	RANGEABILITY	<input type="text"/> : 1	<input checked="" type="checkbox"/> Fujikin select			LIMIT SWITCH (EXPLOSION-PROOF)	<input type="checkbox"/> Yes <input type="checkbox"/> No () <input type="checkbox"/> Open side <input type="checkbox"/> Both <input type="checkbox"/> Close side	
	METI CERTIFICATION	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO				OTHER		
CLEAN RATE	<input type="checkbox"/> Fujikin Standard <input type="checkbox"/> Cleaned <input type="checkbox"/> Other ()		SEAT / ALLOWABLE LEAKAGE RATE	Fujikin Standard	<input type="checkbox"/> Control valve below Cv×10 ⁻⁴ <input type="checkbox"/> ON-OFF valve below 5Cv×10 ⁻⁷			
			Other					

FLUID SPECIFICATIONS	MEDIA	<input type="text"/>	<input type="checkbox"/> GAS <input type="checkbox"/> LIQ <input type="checkbox"/> STEAM	REMARKS	
		MAX	NOR		MIN
	FLOW (m ³ /h)				
	UPSTREAM PRESSURE [MPa G]				
	DOWNSTREAM PRESSURE [MPa G]				
	DIFERENTIAL PRESSURE [MPa]				
	OPERATING TEMP. [°C]				
	SPECIFIC GRAVITY [H2O=1, AIR=1]				
VISCOSITY [c.St, c.p]					
NOTES					
1. 1. If you do not specify the fluid media, the performance of the valves cannot be guaranteed.					
2. 2. If you do not specify the fluid media, please specify the valve materials you require. Otherwise, we will recommend our standard materials.					
3. 3. Fujikin is not liable for any losses, damage, or equipment failures resulting from clogs caused by the use of media containing solids.					


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SR100 DATA SHEET FOR INQUIRY

CUSTOMER		QUANTITY	
END-USER		DELIVERY	
APPLICATIONS		TAG No.	
CODE			

VALVE SPECIFICATIONS	DESIGN PRESSURE [MPa G]			ACTUATOR COMPONENT SPECIFICATIONS	ACTUATOR MODE	<input type="checkbox"/> Direct (Normally Open) <input type="checkbox"/> Reverse (N. Close)	
	DESIGN TEMPERATURE [°C]				EXPLOSION-PROOF	NOT REQUIRED	
	MAX. PRESS. AT SHUT-OFF [MPa G]				INPUT SIGNAL	<input type="checkbox"/> 4 ~ 20mA <input type="checkbox"/> Other ()	
	CONNECTION	TYPE	<input type="checkbox"/> Threaded <input type="checkbox"/> Socket weld			POWER SUPPLY	<input type="checkbox"/> AC100V 50/60 Hz <input type="checkbox"/> DC24V <input type="checkbox"/> Other ()
			<input type="checkbox"/> Flange <input type="checkbox"/> Other		()		
	SIZE/CLASS				CABLE CONNECTION	<input type="checkbox"/> Connector <input type="checkbox"/> Terminal block	
	PATTERN		<input type="checkbox"/> Globe <input type="checkbox"/> Angle <input type="checkbox"/> Manifold		CABLE CONNECTION DIRECTION (Fujikin Standard A)	<input type="checkbox"/> Direction: A <input type="checkbox"/> Direction: B <input type="checkbox"/> Direction: C <input type="checkbox"/> Direction: D	
	BODY MATERIAL		<input type="checkbox"/> SUS316 or SUSF316 (Fujikin Standard) <input type="checkbox"/> Other ()				
	DISK/NEEDLE SEAT MATERIAL		<input type="checkbox"/> SUS316 + Stellite (Fujikin Standard) <input type="checkbox"/> Other ()				
	BONNET TYPE		<input type="checkbox"/> Fujikin Standard <input type="checkbox"/> Extension (CRYO) <input type="checkbox"/> Finned for High Temp. <input type="checkbox"/> Other ()				
	GLAND PACKING		<input type="checkbox"/> Fujikin Standard (PTFE) <input type="checkbox"/> O-Ring <input type="checkbox"/> Other ()				
	VALVE CHARACTERISTICS		<input type="checkbox"/> Linear <input type="checkbox"/> EQ% <input type="checkbox"/> ON-OFF <input type="checkbox"/> Other ()				
	Cv		<input type="text" value=""/> <input type="checkbox"/> Fujikin select		ACCESSORIES	ACTUATOR	<input type="checkbox"/> Cobalt blue: Mansell No.10B4/10 (Standard) <input type="checkbox"/> Other ()
	RANGEABILITY		<input type="text" value=""/> : 1 <input type="checkbox"/> Fujikin select			YOKE	<input type="checkbox"/> Silver (Fujikin Standard) <input type="checkbox"/> Other ()
	METI CERTIFICATION		<input type="checkbox"/> YES <input type="checkbox"/> NO		SWITCH ADAPTER (DC24V, 60W)	<input type="checkbox"/> YES <input type="checkbox"/> NO	
CLEAN RATE		<input type="checkbox"/> Fujikin Standard <input type="checkbox"/> Cleaned <input type="checkbox"/> Other ()	CONNECTION CABLE	<input type="checkbox"/> YES m <input type="checkbox"/> NO			
			SEAT / ALLOWABLE LEAKAGE RATE	Fujikin Standard: below Cv×10 ⁻⁴ Other:			

FLUID SPECIFICATIONS	MEDIA	<input type="text" value=""/>	<input type="checkbox"/> GAS <input type="checkbox"/> LIQ <input type="checkbox"/> STEAM	REMARKS	
		MAX	NOR		MIN
	FLOW (m ³ /h)				
	UPSTREAM PRESSURE [MPa G]				
	DOWNSTREAM PRESSURE [MPa G]				
	DIFERENTIAL PRESSURE [MPa]				
	OPERATING TEMP. [°C]				
	SPECIFIC GRAVITY [H2O=1 , AIR=1]				
	VISCOSITY [c.St, c.p]				
				NOTES 1. 1. If you do not specify the fluid media, the performance of the valves cannot be guaranteed. 2. 2. If you do not specify the fluid media, please specify the valve materials you require. Otherwise, we will recommend our standard materials. 3. 3. Fujikin is not liable for any losses, damage, or equipment failures resulting from clogs caused by the use of media containing solids.	


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AR2000 DATA SHEET FOR INQUIRY

CUSTOMER		QUANTITY	
END-USER		DELIVERY	
APPLICATIONS		TAG No.	
CODE			

VALVE SPECIFICATIONS	DESIGN PRESSURE [MPa G]				ACTUATOR COMPONENT SPECIFICATIONS	ACTUATOR MODE	NOT REQUIRED		
	DESIGN TEMPERATURE [°C]					EXPLOSION-PROOF	<input checked="" type="checkbox"/> YES (d2G4)	<input checked="" type="checkbox"/> NO	
	MAX. PRESS AT SHUT-OFF [MPa G]					INPUT SIGNAL	<input checked="" type="checkbox"/> 4 ~ 20 mA		
	CONNECTION	TYPE	<input checked="" type="checkbox"/> Threaded <input checked="" type="checkbox"/> Socket weld			POWER SUPPLY	<input checked="" type="checkbox"/> DC24V		
			<input checked="" type="checkbox"/> Flange <input checked="" type="checkbox"/> Other				<input checked="" type="checkbox"/> Other ()		
	SIZE/CLASS					CABLE CONNECTION	Connector(Standard); Terminal block(Explosion-Proof)		
	PATTERN		<input checked="" type="checkbox"/> Globe <input checked="" type="checkbox"/> Angle <input checked="" type="checkbox"/> Manifold			CABLE CONNECTION DIRECTION (Fujikin Standard A)			
	BODY MATERIAL		<input checked="" type="checkbox"/> SUS316 or SUSF316 (Fujikin Standard)			<input checked="" type="checkbox"/> Direction: A			
	DISK/NEEDLE SEAT MATERIAL		<input checked="" type="checkbox"/> SUS316 + Stellite (Fujikin Standard)			<input checked="" type="checkbox"/> Direction: B			
	BONNET TYPE		<input checked="" type="checkbox"/> Fujikin Standard			<input checked="" type="checkbox"/> Direction: C			
			<input checked="" type="checkbox"/> Extension (CRYO) <input checked="" type="checkbox"/> Finned for High Temp.			<input checked="" type="checkbox"/> Direction: D			
			<input checked="" type="checkbox"/> Other ()			COLOR			
	GLAND PACKING		<input checked="" type="checkbox"/> Fujikin Standard (PTFE)			ACTUATOR	<input checked="" type="checkbox"/> Cobalt blue: Mansell No.10B4/10(Standard)		
			<input checked="" type="checkbox"/> O-Ring			YOKE	<input checked="" type="checkbox"/> Silver (Fujikin Standard)		
			<input checked="" type="checkbox"/> Bellows			<input checked="" type="checkbox"/> Other ()			
		<input checked="" type="checkbox"/> Other ()							
VALVE CHARACTERISTICS		<input checked="" type="checkbox"/> Linear <input checked="" type="checkbox"/> EQ% <input checked="" type="checkbox"/> ON-OFF		ACCESSORIES					
		<input checked="" type="checkbox"/> Other ()		SWITCH ADAPTER (DC24V, 60W)		<input checked="" type="checkbox"/> YES			
Cv		<input type="text"/> <input checked="" type="checkbox"/> Fujikin select		CONNECTION CABLE		<input checked="" type="checkbox"/> YES m			
						<input checked="" type="checkbox"/> NO			
RANGEABILITY		<input type="text"/> : 1 <input checked="" type="checkbox"/> Fujikin select							
METI CERTIFICATION		<input checked="" type="checkbox"/> YES <input checked="" type="checkbox"/> NO		SEAT / ALLOWABLE LEAKAGE RATE (Cv value compare)		Fujikin Standard	below Cv×10 ⁻⁴		
CLEAN RATE		<input checked="" type="checkbox"/> Fujikin Standard <input checked="" type="checkbox"/> Cleaned				Other			
		<input checked="" type="checkbox"/> Other ()							

FLUID SPECIFICATIONS	MEDIA		<input type="text"/> <input checked="" type="checkbox"/> GAS <input checked="" type="checkbox"/> LIQ		REMARKS			
			<input checked="" type="checkbox"/> STEAM					
			MAX	NOR		MIN		
	FLOW (m ³ /h)							
	UPSTREAM PRESSURE [MPa G]							
	DOWNSTREAM PRESSURE [MPa G]							
	DIFERENTIAL PRESSURE [MPa]						NOTES	
	OPERATING TEMP. [°C]						1. 1. If you do not specify the fluid media, the performance of the valves cannot be guaranteed.	
	SPECIFIC GRAVITY [H2O=1, AIR=1]						2. 2. If you do not specify the fluid media, please specify the valve materials you require. Otherwise, we will recommend our standard materials.	
	VISCOSITY [c.St, c.p]						3. 3. Fujikin is not liable for any losses, damage, or equipment failures resulting from clogs caused by the use of media containing solids.	

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Plant ISO 9001 certified



Osaka Plant

Plant ISO 14001 certified



Tsukuba Plant

IMPORTANT NOTICE:

The product data in this catalogue was obtained under specific test conditions that may vary substantially from actual site conditions and / or customer needs.

Purchasers or other end users of Fujikin products should rely solely on their system design engineer(s) when selecting Fujikin products for a particular system, and when determining the suitability of any system in which a Fujikin product is to be installed.

Fujikin shall bear no liability regarding product selection criteria or decisions, nor shall Fujikin be liable (including direct, special or consequential damages including, but not limited to, lost profits or income) in regard to any product which has been damaged by misuse, improper handling or accident, or as a result of service or modification by anyone other than an authorized employee or agent of Fujikin, or being subjected to use under conditions, or combinations of conditions, that are not compatible with that particular Fujikin product.