

# Cast Iron Valves

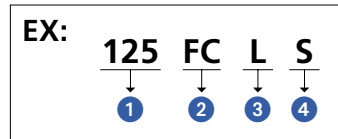
JIS 5K/10K, Class 100/125



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## Product Coding



- 1 Valve class
  - 100 ..... Class 100
  - 125 ..... Class 125
  - 5 ..... JIS 5K
  - 10 ..... JIS 10K

- 2 Symbol of shell material
  - FC ..... Cast Iron
- 3 Type of valve
  - L ..... Gate valve
  - WI & HI... Gate valve with indicator
  - J ..... Globe valve
  - O ..... Check valve
  - TB ..... Full port ball valve
  - TR ..... Reduced port ball valve

- 4 Trim material
  - None ..... Bronze trim
  - U ..... Type 304 stainless steel
  - S ..... Type 403 stainless steel

NOTE	<b>B.B.</b> ..... Bolted bonnet	<b>I.S.</b> ..... Inside screw
	<b>O.S.&amp;Y</b> ... Outside screw & yoke	<b>N.R.S.</b> ..... Non-rising stem

## STANDARD PRODUCTION RANGE

Valve type	Class	Fig.	Size	mm.	40	50	60	80	100	125	150	200	250	300	350	400	450	500	600
				in.	1 1/2	2	2 1/2	3	4	5	6	8	10	12	14	16	18	20	24
Gate valves	JIS 5K	5FCM				●	●	●	●	●	●	●	●						
	JIS 10K	10FCL		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
		10FCLS		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
		10FCLU		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
		10FCWI		●	●	●	●	●	●	●	●	●	●	●	●				
	Class 10K	10FCHI		●	●	●	●	●	●	●	●	●	●	●	●				
	Class 125	125FCL			●	●	●	●	●	●	●	●	●	●	●	●			
		125FCLS			●	●	●	●	●	●	●	●	●	●	●	●			
		125FCWI			●	●	●	●	●	●	●	●	●	●	●				
		125FCHI		●	●	●	●	●	●	●	●	●	●						
Globe valves	JIS 10K	10FCJ		●	●	●	●	●	●	●	●	●							
		10FCJS		●	●	●	●	●	●	●	●	●	●	●					
		10FCJU		●	●	●	●	●	●	●	●	●	●	●					
	Class 125	125FCJ			●	●	●	●	●	●	●	●							
		125FCJS			●	●	●	●	●	●	●	●							
Swing check valves	JIS 10K	10FCO		●	●	●	●	●	●	●	●	●	●	●					
		10FCOS		●	●	●	●	●	●	●	●	●	●	●	●				
		10FCOU		●	●	●	●	●	●	●	●	●	●	●	●				
	Class 125	125FCO			●	●	●	●	●	●	●	●	●	●	●				
		125FCOS			●	●	●	●	●	●	●	●	●	●	●				
	JIS 10K	10FW			●	●	●	●	●	●	●	●	●	●	●	●	●		
Strainers	Class 10K	10FCY*		●	●	●	●	●	●	●	●	●	●	●	●				
	Class 125	125FCY			●	●	●	●	●	●	●	●	●	●	●				

Size 3/8" to 14"

Valve type	Class	Fig.	Size	mm.	40	50	60	80	100	125	150	200	250	300	350	400	450	500	600
				in.	1 1/2	2	2 1/2	3	4	5	6	8	10	12	14	16	18	20	24
Ball valves	JIS 10K	10FCT *1		●	●	●	●												
		10FCTB *2		●	●	●	●	●	●	●	●	●	●						
		10FCTR								●	●	●	●						
		10FCTB2L		●	●	●	●	●											
		10FCTR2L									●	●	●						
	Class 125	125FCTB			●	●	●	●			●	●							
		125FCTR									●	●	●						

\*1 Size 3/8 to 3 \*2 Size 1/2 to 10

This catalog uses **MPa**, a SI unit, for indication of pressures. For readers' convenience, however, **psi** and **kgf/cm<sup>2</sup>** are also used for **ASME** and **JIS** related products respectively.

The products introduced in this catalog are all covered by the ISO 9001 Certification awarded KITZ Corporation in 1989, the earliest in the valve industry.

**Basic Design Specifications** (Details in each page)

Class	JIS5K/10K	Class 100/125
Pressure-temperature rating	Refer to the table below	
Face to face dimension	JIS B2031	ASME B16.10
End flange dimension		ASME B16.1
Wall thickness		KITZ Std.

**Material Specifications for Grey Iron Casting**

Mechanical Properties	JIS materials		
	FC200	FC250	FC300
Tensile strength (N/mm <sup>2</sup> ) min.	200	250	300
Brinell hardness (HB) max.	235	248	269
ASTM A126 Class B	Tensile strength (min)		31ksi
Transverse test requirement	Face at center, min.		3,300 lb
	Deflection at center, min.		0.12in

**ASME Valves Pressure-Temperature Ratings**

Maximum Allowable Non-Shock Pressure

Service temperature		Class 125				
		Size 2" to 12"		Size 14" to 24"		
°F	°C	Psi.	MPa	Psi.	MPa	
-20 to 150	-29 to 66	200	1.37	150	1.03	
200	93	190	1.30	135	0.93	
225	107	180	1.24	130	0.89	
250	121	175	1.20	125	0.86	
275	135	170	1.17	120	0.82	
300	149	165	1.13	110	0.75	
325	163	155	1.06	105	0.72	
350	177	150	1.03	100	0.69	
375	191	145	1.00			
400	204	140	0.96			
425	218	130	0.89			
450	232	125	0.86			
Saturated steam		125	0.86	100	0.69	
Test Pressure	Hydro-static	Shell	350	2.41	265	1.83
		Seat	220	1.51	165	1.13
	Air	Seat	80	0.59	80	0.59

**Remarks:**

- (1) All pressures are given in pounds per square inch gage (PSIG).
- (2) Pressure-temperature ratings extracted from MSS SP-70, 71, 85 apply to iron flanged end valves designed for primary working pressures in Class 125.

**JIS Valves Pressure-Temperature Ratings MPa**

Service temperature °C (°F)	5K	10K	10K		
	All Sizes	Sizes 2" to 12"	Sizes 14" to 24"	FC300 all sizes	
120°(248) non-shock water	0.69	1.37	0.98	0.98	
120°(248) oil, water, air	0.49	0.98	0.86	0.86	
Saturated steam	0.20	0.69/*0.20	0.69	0.69	
Test Pressure	Hydro-static	Shell	1.03	2.06	1.86
		Seat	0.76	1.51	1.08
	Air	Seat	0.59	0.59	0.59

\*Inside screw gate valves only.

**Simplified Material Indication** (as referred to in each page)

- Bronze trim** : Iron body with bronze trim
- 13 Cr. trim** : Iron body with 13 Cr. trim
- 18-8 trim** : Iron body with 18 Cr.-8 Ni trim

**Certification by JIS Mark**

Industrial Standardization Law of Japan provides an effective measure to promote introduction of high level quality assurance system of manufacture and processing. Wherever KITZ valves are identified with JIS Mark, it is officially certified that such valves are produced under strict quality assurance procedures and practices to satisfy the designated quality level stably and constantly.

**Valve Position Indicators**



A valve position indicator is provided on gate valves with inside screw design as illustrated here. Opening or closing valves does not move the vertical position of the hand-wheel. Instead, the position indicator visually indicates three valve operating positions-fully opened, fully closed or half opened.

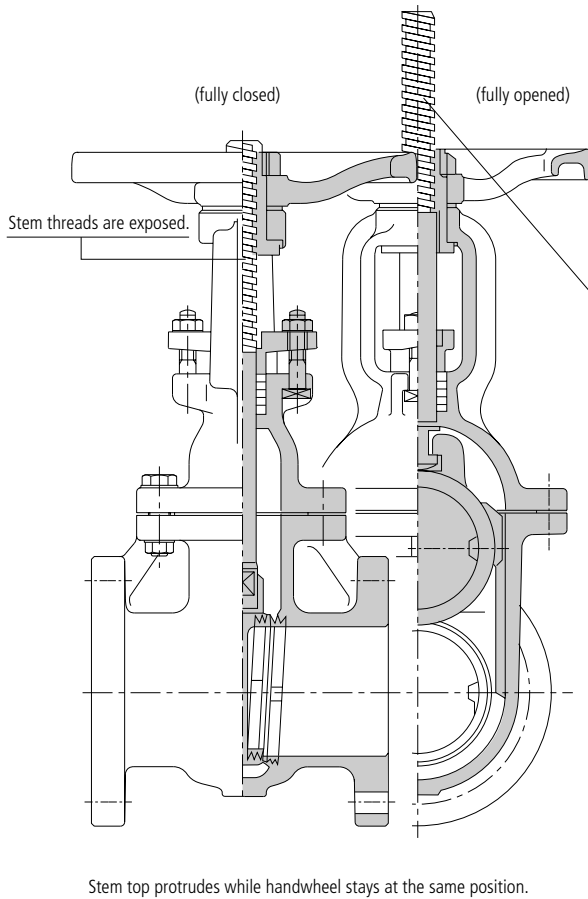
**Trim Materials**

KITZ cast iron valves are provided with either one of the three trim materials tabled below for versatility of service applications. Color coding is made on a spoke of the handwheel of gate or globe valves and on the cover of swing check valves.

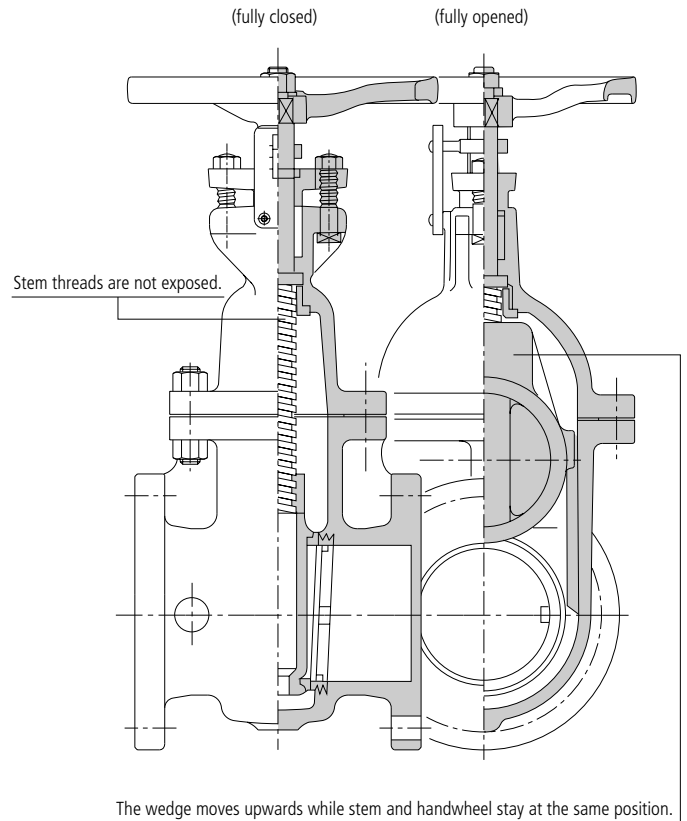
Trim material	Color coding	Suffix of Fig.
■ Bronze seats / Brass stem	None	—
■ 13 Cr. seats / stem	Yellow	S
■ 18-8 seats / stem	Red	U

## Outside Screw (O.S.) Valves and Inside Screw (I.S.) Valves

### Outside Screw Gate Valve



### Inside Screw Gate Valve



### Outside Screw Gate Valves

Stem threads are exposed to the air, and valve opening operation moves the stem upwards while the handwheel stays at the same position. Valve operating position can be visually known by observing stem travel KITZ Fig. FCM, FCL, FCLS and FCLU are designed this way.

### Outside Screw Globe Valves

The stem and handwheel move upwards or downwards at the same time, following valve opening or closing operation. All KITZ globe valves are provided with this design.

### Inside Screw Gate Valves

Stem threads are not exposed to the air and valve opening operation does not make movement of the stem or handwheel so that valve operating position is not visible. A position indicator is provided for this reason.

Inside screw gate valves are generally designed shorter than outside screw gate valves and the stem and handwheel stay always at the same position. For this feature, inside screw gate valves are widely employed for underground installation or service in narrow areas with limited room. KITZ Fig. FCW and FCHI are designed this way.

### Asbestos-free Packings and Gaskets

KITZ has led the industry in employing asbestos-free sealers for all cast iron valves, meeting the requirement of pollution-free valve materials. PTFE impregnated glass fiber gland packings and compressed glass and aramid fiber gaskets are the standard sealers for KITZ cast iron valves.

# JIS 5K

# IRON GATE VALVE

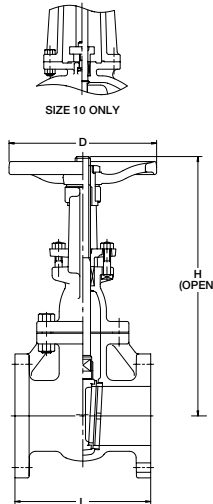
Bolted bonnet, outside screw & yoke, rising stem.

120°C Non-shock water 0.69 MPa (7kgf/cm<sup>2</sup>), 120°C Water, oil, air 0.49 MPa (5kgf/cm<sup>2</sup>)  
 120°C Gas 0.20 MPa (2kgf/cm<sup>2</sup>), Saturated steam 0.20 MPa (2kgf/cm<sup>2</sup>)

Designed to JIS B2031

Fig. 5FCM

- Bronze trim



### Materials

Parts	Material	JIS Spec.
Body	Cast Iron	FC200
Bonnet	Cast Iron	FC200
Stem	Forged Brass	C3771BD
Disc	Cast Iron	FC200
Disc seat ring	Bronze	CAC406
Body seat ring	Bronze	CAC406
Gland	Ductile Iron	FCD-S
Gland packing	Asbestos-free	
Gasket	Asbestos-free	
Gland bolt/nut	Carbon Steel	SS400
Bonnet bolt/nut	Carbon Steel	SS400
Yoke sleeve	Bronze	CAC406
Hand wheel	Cast Iron	FC250

### Design Specifications

Items	
Shall wall thickness and general valve design*	JIS B2031
Face-to-face dimensions End-to-end dimensions	JIS B2031
End flange dimensions Gasket contact facing	JIS B2239 10K

### Dimensions

Valve Size	inch	2	2½	3	4	5	6	8	10	mm
	mm	50	65	80	100	125	150	200	250	
L Face-to-face		160	170	180	200	220	240	260	300	
H Height (OPEN)		328	382	436	532	627	726	919	1134	
D Handwheel Diameter		160	170	170	225	225	250	280	350	

# JIS 10K

# IRON GATE VALVE

Bolted bonnet, outside screw & yoke, rising stem.

120°C Non-shock water 1.37 MPa (14kgf/cm<sup>2</sup>), 120°C Water, oil, air 0.98 MPa (10kgf/cm<sup>2</sup>)  
 120°C Gas 0.20 MPa (2kgf/cm<sup>2</sup>), Saturated steam 0.69 MPa (7kgf/cm<sup>2</sup>) (Refer to Page 2 for size 14" to 24")

Designed to JIS B2031

Fig. 10FCL

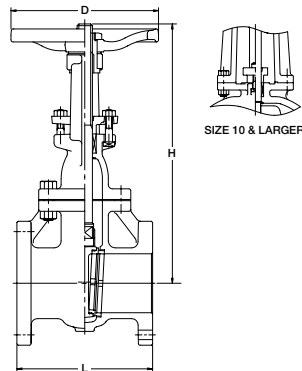
- Bronze trim

Fig. 10FCLS

- Stainless steel trim (13 Cr.)

Fig. 10FCLU

- Stainless steel trim (18-8)



### Materials

Parts	Material	JIS Spec.		
		10FCL	10FCLS	10FCLU
Body	Cast Iron	FC200		
Bonnet	Cast Iron	FC200		
Stem	Brass/Stainless Steel	C3771BD	SUS403	SUS304
Disc	Cast Iron	FC200		
Disc seat ring	Brass/Stainless Steel	CAC406	SUS403	SUS304
Body seat ring	Bronze	CAC406	SUS403	SUS304
Gland	1½ to 14	Ductile Iron		
	16 to 24	Stainless Steel		
		FCD-S		
Gland packing	Asbestos-free			
Gasket	Asbestos-free			
Gland bolt/nut	Carbon Steel	SS400		
Bonnet bolt/nut	Carbon Steel	SS400		
Yoke sleeve	Bronze	CAC406		
Hand wheel	1½ to 8	Cast Iron		
	10 to 24	Ductile Iron		
		FCD400		

### Design Specifications

Items	
Shall wall thickness and general valve design*	JIS B2031
Face-to-face dimensions End-to-end dimensions	JIS B2031
End flange dimensions Gasket contact facing	JIS B2239 10K

\*Nominal size 11/4, 14 and larger shall not be in accordance with JIS B2031

### Dimensions

Valve Size	inch	1½*	2	2½	3	4	5	6	8	10	12	14*	16*	18*	20*	24*	mm
	mm	40	50	65	80	100	125	150	200	250	300	350	400	450	500	600	
L Face-to-face		165	180	190	200	230	250	270	290	330	350	381	406	432	457	508	
H Height (OPEN)		306	343	389	462	547	648	759	956	1168	1363	1560	1795	1995	2230	2640	
D Handwheel Diameter		160	170	170	200	250	280	300	350	400	450	500	600	600	680	760	

\*JIS Mark is not applicable

**JIS 10K**

**IRON GATE VALVE**

Bolted bonnet, inside screw with indicator, non-rising stem.

120°C Non-shock water 1.37 MPa (14kgf/cm<sup>2</sup>), 120°C Water, oil, air 0.98 MPa (10kgf/cm<sup>2</sup>)  
120°C Gas 0.20 MPa (2kgf/cm<sup>2</sup>), Saturated steam 0.20 MPa (2kgf/cm<sup>2</sup>)

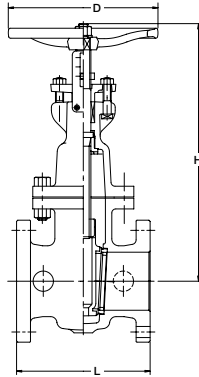
Designed to JIS B2031

Fig. 10FCWI

- Bronze trim



SIZE 8 & LARGER



**Materials**

Parts	Material	JIS Spec.
Body	Cast Iron	FC200
Bonnet	Cast Iron	FC200
Stem	Forged Brass	C3771BD
Disc	Cast Iron	FC200
Disc seat ring	Bronze	CAC406
Body seat ring	Bronze	CAC406
Gland	Ductile Iron	FCD-S
Gland packing	Asbestos-free	
Gasket	Asbestos-free	
Gland bolt/nut	Carbon Steel	SS400
Bonnet bolt/nut	Carbon Steel	SS400
Bonnet bushing	Bronze	CAC406
Hand wheel	1 1/2 to 8	Cast Iron
	10 to 12	Ductile Iron

**Design Specifications**

Items	
Shall wall thickness and general valve design*	JIS B2031
Face-to-face dimensions End-to-end dimensions	JIS B2031
End flange dimensions Gasket contact facing	JIS B2239 10K

\*Nominal size 1 1/4, shall not be in accordance with JIS B2031

**Dimensions**

Valve Size	inch	1 1/2	2	2 1/2	3	4	5	6	8	10	12
	mm	40*	50	65	80	100	125	150	200	250	300
L Face-to-face		165	180	190	200	230	250	270	290	330	350
H Height		285	313	344	401	444	517	577	693	814	925
D Handwheel Diameter		160	180	180	200	250	280	300	350	400	450

\*No JIS Mark

**JIS 10K**

**IRON GATE VALVE**

Bolted bonnet, inside screw with indicator, non-rising

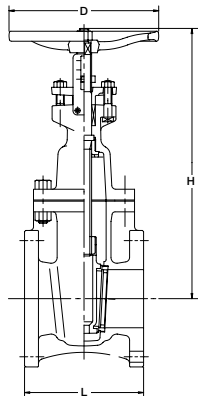
120°C Non-shock water 0.98 MPa (10kgf/cm<sup>2</sup>), 120°C Water, oil, air 0.86 MPa (8.8kgf/cm<sup>2</sup>)  
Saturated steam 0.69 MPa (7kgf/cm<sup>2</sup>)

Fig. 10FCHI

- Bronze trim



SIZE 8 & LARGER



**Materials**

Parts	Material	JIS Spec.
Body	Cast Iron	FC300
Bonnet	Cast Iron	FC300
Stem	Forged Brass	C3771BE
Disc	1 1/2	Bronze
	2 to 12	Cast Iron
Disc seat ring	Bronze	CAC406
Body seat ring	Bronze	CAC406
Gland	Ductile Iron	FCD-S
Gland packing	Asbestos-free	
Gasket	Asbestos-free	
Gland bolt/nut	Carbon Steel	SS400
Bonnet bolt/nut	Carbon Steel	SS400
Bonnet bushing	Bronze	CAC406
Hand wheel	Cast Iron	FC250

**Design Specifications**

Items	
Shall wall thickness and general valve design*	KITZ Standard
Face-to-face dimensions End-to-end dimensions	BS 3464
End flange dimensions Gasket contact facing	JIS B2239 10K

\*Nominal size 1 1/4, shall not be in accordance with JIS B2031

**Dimensions**

Valve Size	inch	1 1/2	2	2 1/2	3	4	5	6	8	10	12
	mm	40	50	65	80	100	125	150	200	250	300
L Face-to-face		140	146	159	165	171	190	210	241	273	305
H Height		210	250	285	350	400	460	515	635	760	870
D Handwheel Diameter		140	140	160	160	180	225	225	300	350	350



# Class 125 IRON GATE VALVE

Bolted bonnet, outside screw & yoke, rising stem.

200psi. Water, oil, gas 65°C  
125psi. Saturated steam

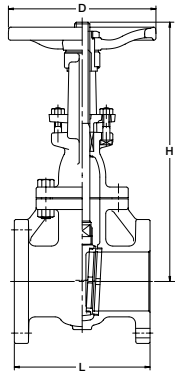
Fig. 125FCL

- Bronze trim



Fig. 125FCLS

- Stainless steel trim (13 Cr.)



### Materials

Parts	Material	ASTM Spec.	
		125FCL	125FCL
Body	Cast Iron	A126 CL. B	
Bonnet	Cast Iron	A126 CL. B	
Stem	Brass/Stainless Steel	B124 C37700	A276 Type403
Disc	Cast Iron	A126 CL. B	
Disc seat ring	Bronze/Stainless Steel	B62	A182 Gr.F6a
Body seat ring	Bronze	B62	A182 Gr.F6a
Gland	Ductile Iron		
Gland packing	Asbestos-free		
Gasket	Asbestos-free		
Gland bolt/nut	Carbon Steel		
Bonnet bolt/nut	Carbon Steel		
Yoke sleeve	Bronze	B62	
Hand wheel	Cast Iron	A126 CL. B	
	2 to 10 12 & 14	Ductile Iron	

### Design Specifications

Items		
Shall wall thickness and general valve design		KITZ Standard
Face-to-face dimensions	End-to-end dimensions	ASME B16.10 Class 125
End flange dimensions	Gasket contact facing	ASME B16.1 Class 125

### Dimensions

Valve Size	inch	2	2½	3	4	5	6	8	10	12	14	mm
L Face-to-face	mm	178	190	203	229	254	267	292	330	356	381	
H Height (OPEN)		328	382	436	532	627	726	919	1134	1363	1560	
D Handwheel Diameter		160	170	170	225	225	250	280	350	450	500	

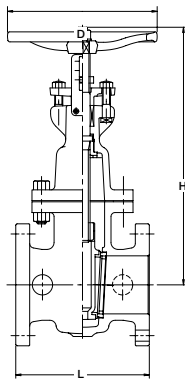
# Class 125 IRON GATE VALVE

Bolted bonnet, inside screw with indicator, non-rising stem.

200psi. Water, oil, gas 65°C  
125psi. Saturated steam

Fig. 125FCWI

- Bronze trim



### Materials

Parts	Material	JIS Spec.
Body	Cast Iron	A126 CL. B
Bonnet	Cast Iron	A126 CL. C
Stem	Forged Brass	B124 C37700
Disc	Cast Iron	A126 CL. C
Disc seat ring	Bronze	B62
Gland	Ductile Iron	
Gland packing	Asbestos-free	
Hand wheel	Cast Iron	A126 CL. C
Gasket	Asbestos-free	
Gland bolt/nut	Carbon Steel	
Bonnet bolt/nut	Carbon Steel	
Body seat ring	Bronze	B62
Bonnet bushing	Bronze	B62

### Design Specifications

Items		
Shall wall thickness and general valve design		KITZ Standard
Face-to-face dimensions	End-to-end dimensions	ASME B16.10 Class 125
End flange dimensions	Gasket contact facing	ASME B16.1 Class 125

### Dimensions

Valve Size	inch	2	2½	3	4	5	6	8	10	12	mm
L Face-to-face	mm	178	190	203	229	254	267	292	330	356	
H Height		250	285	350	400	465	515	630	760	870	
D Handwheel Diameter		140	160	160	180	225	225	300	350	350	



# Class 125 IRON GATE VALVE

Bolted bonnet, inside screw & yoke, non-rising stem.

200psi. Water, oil, gas 65°C  
125psi. Saturated steam

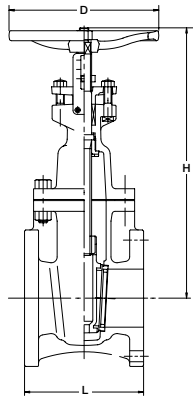
Designed to JIS B2031

Fig. 125FCHI

- Bronze trim



SIZE 8 ONLY



### Materials

Parts	Material	JIS Spec.
Body	Cast Iron	A126 CL. C
Bonnet	Cast Iron	A126 CL. C
Stem	Forged Brass	B124 C37700
Disc	1 1/2	Bronze B62
	2 & larger	Cast Iron A126 CL. C
Disc seat ring	Bronze	B62
Body seat ring	Bronze	B62
Gland	Ductile Iron	
Gland packing	Asbestos-free	
Gasket	Asbestos-free	
Gland bolt/nut	Carbon Steel	
Bonnet bolt/nut	Carbon Steel	
Bonnet bushing	Bronze	B62
Hand wheel	Cast Iron	A126 CL. B

### Design Specifications

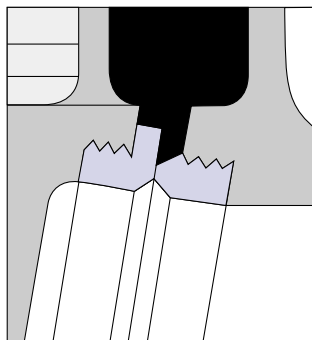
Items	
Shall wall thickness and general valve design	KITZ Standard
Face-to-face dimensions End-to-end dimensions	KITZ Standard
End flange dimensions Gasket contact facing	ASME B16.1Class 125

### Dimensions

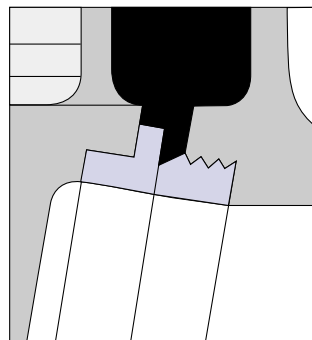
Valve Size	inch	1 1/2	2	2 1/2	3	4	5	6	8	mm
	mm	40	50	65	80	100	125	150	200	
L Face-to-face		140	146	159	165	171	190	210	241	
H Height		210	250	285	350	400	465	575	630	
D Handwheel Diameter		140	140	160	160	180	225	225	300	

## Mounting of Seat Rings

In case of KITZ cast iron gate valves, seat rings are mounted on the valve disc seat ring either by means of threading or press-fitting. For example, 10K outside screw gate valves are provided with threaded seat rings which are ideal for saturated steam service. Or, 10K inside screw gate valves are provided with mechanically press-fit seat rings by means of patented special process to suit them also for saturated steam service. All KITZ cast iron globe and check valves are provided with threaded seat rings.



Threaded seat ring



Press-fit seat ring

# JIS 10K

# IRON GLOVE VALVE

Bolted bonnet, outside screw & yoke, rising stem.

120°C Non-shock water 1.37MPa (14kgf/cm<sup>2</sup>), 120°C Water, oil, air 0.98MPa (10kgf/cm<sup>2</sup>)  
 120°C Gas 0.20MPa (2kgf/cm<sup>2</sup>), Saturated steam 0.69MPa (7kgf/cm<sup>2</sup>)

Designed to JIS B2031

Fig. 10FCJ

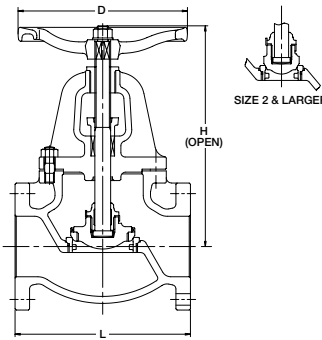
- Bronze trim

Fig. 10FCJS

- Stainless steel trim (13 Cr.)

Fig. 10FCJU

- Stainless steel trim (18-8)



### Materials

Parts	Material	JIS Spec.		
		10FCJ	10FCJS	10FCJU
Body	Cast Iron		FC200	
Bonnet	Cast Iron		FC200	
Stem	Brass/Stainless Steel	C3771BD	SUS403	SUS304
Disc	1 1/4 & 2	Bronze/Stainless Steel	CAC406	SUS403
	2 1/2 & larger	Cast Iron		FC200
Disc seat ring	Brass/Stainless Steel	CAC406	SUS403	SUS304
Body seat ring	Bronze	CAC406	SUS403	SUS304
Gland	1 1/2 to 14	Ductile Iron		FCD-5
Gland packing		Asbestos-free		
Gasket		Asbestos-free		
Gland bolt/nut	Carbon Steel		SS400	
Bonnet bolt/nut	Carbon Steel		SS400	
Yoke bushing	Bronze		CAC406	
Hand wheel	1 1/2 to 6	Cast Iron		FC250
	8 only	Ductile Iron		FCD400
	10 only	Cast Iron		FC200

### Design Specifications

Items		
Shall wall thickness and general valve design		JIS B2031
Face-to-face dimensions	End-to-end dimensions	JIS B2031
End flange dimensions	Gasket contact facing	JIS B2239 10K

### Dimensions

Valve Size	inch	1 1/2	2	2 1/2	3	4	5	6	8	mm
L Face-to-face	mm	40	50	65	80	100	125	150	200	
H Height (OPEN)		190	200	220	240	290	360	410	500	
D Handwheel Diameter		260	277	307	353	404	454	533	642	
		160	180	180	225	280	300	350	450	

# CLASS 125

# IRON GLOBE VALVE

Bolted bonnet, outside screw & yoke, rising stem.

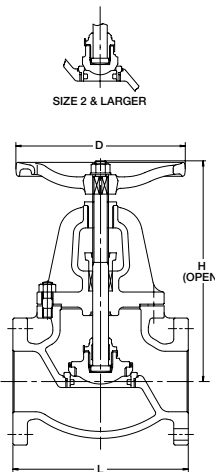
200psi. Water, oil, gas 65°C  
 125psi. Saturated steam

Fig. 125FCJ

- Bronze trim

Fig. 125FCJS

- Stainless steel trim (13 Cr.)



### Materials

Parts	Material	ASTM Spec.	
		125FCJ	125FCJS
Body	Cast Iron		A126 CL. B
Bonnet	Cast Iron		A126 CL. B
Stem	Brass/Stainless Steel	B124 C37700	A276 type403
Disc	2 only	Bronze/Stainless Steel	B62 A276 type403
	2 1/2 & larger	Cast Iron	A126 CL. B
Disc seat ring	Brass/Stainless Steel	B62	A276 type403
Body seat ring	Bronze	B62	A276 type403
Gland	1 1/2 to 14	Ductile Iron	
Gland packing		Asbestos-free	
Gasket		Asbestos-free	
Gland bolt/nut		Carbon Steel	
Bonnet bolt/nut		Carbon Steel	
Yoke bushing	Bronze		B62
Hand wheel	2 only	Cast Iron	
	2 1/2 & larger	Ductile Iron	

### Design Specifications

Items		
Shall wall thickness and general valve design		KITZ Standard
Face-to-face dimensions	End-to-end dimensions	ASME B16.10 Class 125
End flange dimensions	Gasket contact facing	ASME B16.1 Class 125

### Dimensions

Valve Size	inch	2	2 1/2	3	4	5	6	8	mm
L Face-to-face	mm	50	65	80	100	125	150	200	
H Height (OPEN)		203	216	241	292	330	356	495	
D Handwheel Diameter		277	307	353	404	454	533	642	
		180	180	225	280	300	350	450	

# JIS 10K

# IRON SWING CHECK VALVE

Bolted cover, swing type disc.

120°C Non-shock water 1.37MPa (14kgf/cm<sup>2</sup>), 120°C Water, oil, air 0.98MPa (10kgf/cm<sup>2</sup>)  
Saturated steam 0.69MPa (7kgf/cm<sup>2</sup>), 120°C Gas 0.69MPa (7kgf/cm<sup>2</sup>)

Designed to JIS B2031

**Fig. 10FCO**

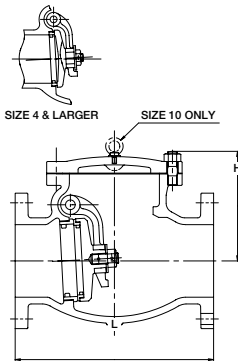
- Bronze trim

**Fig. 10FCOS**

- Stainless steel trim (13 Cr.)

**Fig. 10FCOU**

- Stainless steel trim (18-8)



### Materials

Parts	Material	JIS Spec.		
		10FCO	10FCOS	10FCOU
Body	Cast Iron		FC200	
Cover	Cast Iron		FC200	
Hinge pin	Brass/Stainless Steel	C3771BD	SUS403	SUS304
Disc	11/4 & 4	Brass/Stainless Steel	CAC406	SUS403
	5 & lager	Cast Iron		FC200
Disc seat ring	Brass/Stainless Steel	CAC406	SUS403	SUS304
Body seat ring	Bronze	CAC406	SUS403	SUS304
Arm	Stainless Steel		SCS13A	
Gasket		Asbestos-free		
Cover bolt/nut	Carbon Steel		SS400	

### Design Specifications

Items		
Shall wall thickness and general valve design*		JIS B2031
Face-to-face dimensions	End-to-end dimensions	JIS B2031
End flange dimensions	Gasket contact facing	JIS B2239 10K

\* Nominal size 11/4, 10 and lager shall not be in accordance with JIS B2031

### Dimensions

Valve Size	inch	1 1/2*	2	2 1/2	3	4	5	6	8	10*	12*	14*	mm
L Face-to-face	mm	40	50	65	80	100	125	150	200	250	300	350	
H Height		106	111	121	145	165	207	225	268	315	356	381	

Only 12" & 14" for 10FCOS & 10FCOU. \*No JIS Mark

# CLASS 125

# IRON SWING CHECK VALVE

Bolted cover, swing type disc.

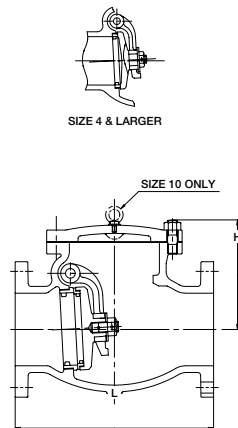
200psi. Water, oil, gas 65°C  
125psi. Saturated steam

**Fig. 125FCO**

- Bronze trim

**Fig. 125FCOS**

- Stainless steel trim (13 Cr.)



### Materials

Parts	Material	ASTM Spec.	
		125FCO	125FCOS
Body	Cast Iron		A126 CL. B
Cover	Cast Iron		A126 CL. B
Hinge pin	Brass/Stainless Steel	B124 C37700	A276 Type403
Disc	2 to 4	Brass/Stainless Steel	B62
	5 & lager	Cast Iron	A182 Gr.F6a
			A126 CL. B
Disc seat ring	Brass/Stainless Steel	B62	A182 Gr.F6a
Body seat ring	Brass/Stainless Steel	B62	A182 Gr.F6a
Arm	Stainless Steel		A315 Gr.CF8
Gasket		Asbestos-free	
Cover bolt/nut		Carbon Steel	

### Design Specifications

Items		
Shall wall thickness and general valve design		KITZ Standard
Face-to-face dimensions	End-to-end dimensions	ASME B16.10 Class 125
End flange dimensions	Gasket contact facing	ASME B16.1 Class 125

### Dimensions

Valve Size	inch	2	2 1/2	3	4	5	6	8	10	mm
L Face-to-face	mm	50	65	80	100	125	150	200	250	
H Height (OPEN)		111	121	145	165	207	225	268	315	

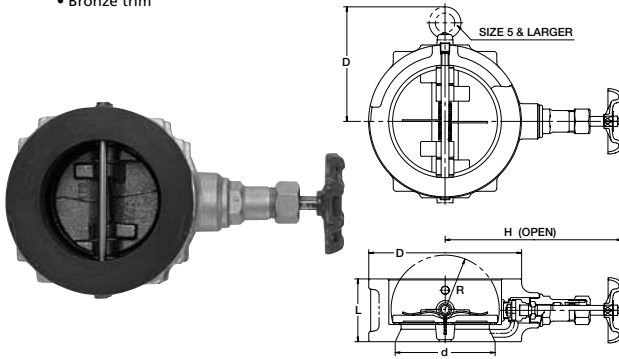
10K

IRON WAFER TYPE CHECK VALVE

80°C Non-shock water 1.37MPa (14kgf/cm<sup>2</sup>)  
80°C Water, oil, air 0.98MPa (10kgf/cm<sup>2</sup>)

Fig. 10FW

• Bronze trim



Materials

Parts	Material	JIS Spec.
Body	Cast Iron	FC200+NBR
Pin	Stainless Steel	SUS304
Stem	Stainless Steel Bronze	SUS420J2
Disc	Bronze	CAC406
Plug	Carbon Steel	SWCH10R

Bypass Valve

Parts	Material	JIS Spec.
Bonnet	Ductile Iron	FCD450-15
Stem	Stainless Steel	SUS420J2
Disc	Reinforced PTFE	
Body seat ring	Stainless Steel	SUS403
Gland packing	Asbestos-free	
Gasket	Copper	C1100P

Design Specifications

Items	
Shall wall thickness and general valve design	JIS B2031
Face-to-face dimensions End-to-end dimensions	KITZ Standard
End flange dimensions Gasket contact facing	Wafer Type (JIS 10K)

Dimensions

Valve Size	inch	2	2½	3	4	5	6	8	10	12	14	16	18	mm
	mm	50	65	80	100	125	150	200	250	300	350	400	450	
L		54	54	57	64	70	76	95	108	144	184	191	203	
H Height (OPEN)		167	173	179	192	205	246	271	297	323	342	370	396	
F		—	—	—	—	135	150	177	216	240	284	314	352	
D		101	121	131	156	187	217	267	330	375	420	483	538	
d		51	64	77	102	127	153	204	254	305	356	407	458	
R		31	37	43	55	66	78	104	129	155	176	201	225	

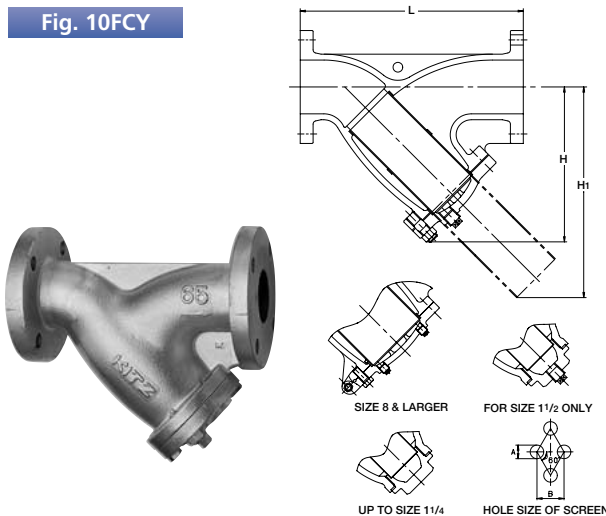
10K

IRON Y-PATTERN STRAINER

Bolted cover, Y-pattern body, Punched stainless steel plate screen.

120°C Non-shock water 1.37MPa (14kgf/cm<sup>2</sup>), 120°C Water, oil, air 0.98MPa (10kgf/cm<sup>2</sup>)  
120°C Gas 0.20MPa (kgf/cm<sup>2</sup>), Saturated steam 0.69MPa (7kgf/cm<sup>2</sup>)

Fig. 10FCY



Materials

Parts	Material	JIS Spec.
Body	Cast Iron	FC200
Cap	3/8 to 1 1/2	Brass C3771BE
Cover	2 & larger	Cast Iron FC200
Screen		Stainless Steel SUS304
Gasket		Asbestos-free
Cover bolt/nut	Carbon Steel	S5400
Plug	1 1/2 to 6	Stainless Steel SUS304

Screen dimensions

Valve Size	A	P
3/8 to 2	1.4ø	2.4mm
2 1/2 to 5	1.5ø	2.5mm
6 & 8	3.0ø	5.0mm
10 & 14	5.0ø	7.0mm

Design Specifications

Items	
Shall wall thickness and general valve design	KITZ Standard
Face-to-face dimensions End-to-end dimensions	KITZ Standard
End flange dimensions Gasket contact facing	JIS B2239 10K

Strainer dimensions

Valve Size	inch	3/8	1/2	3/4	1	1¼	1½	2	2½	3	4	5	6	8	10	12	14	mm
	mm	10	15	20	25	32	40	50	65	80	100	125	150	200	250	300	350	
L Face-to-face		115	125	140	150	170	190	230	305	360	415	465	515	580	680	800	950	
H Height		46	57	63	77	90	100	127	208	237	280	325	370	462	536	625	741	
H1		64	82	91	114	134	146	173	289	335	388	446	497	589	694	818	993	

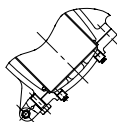
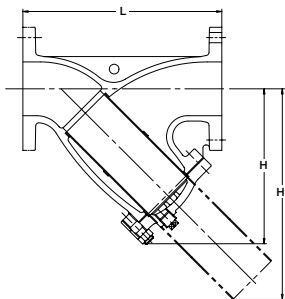
# CLASS 125 IRON Y-PATTERN STRAINER

Bolted cover, Y-pattern body, Punched stainless steel plate screen.

200 psi. Non-shock water 120°C  
150 psi. Water, oil, air 120°C

Fig. 125FCY

- Bronze trim



SIZE 8 & OVER

HOLE SIZE OF SCREEN

### Materials

Parts	Material	ASTM Spec.
Body	Cast Iron	A126 CL.B
Cover	Cast Iron	A126 CL.B
Screen	Stainless Steel	A167 Type304
Gasket	Asbestos-free	
Cover bolt/nut	Carbon Steel	A307 Gr.B
Plug	1 1/2 to 6	Stainless Steel A276 Type304

### Screen dimensions

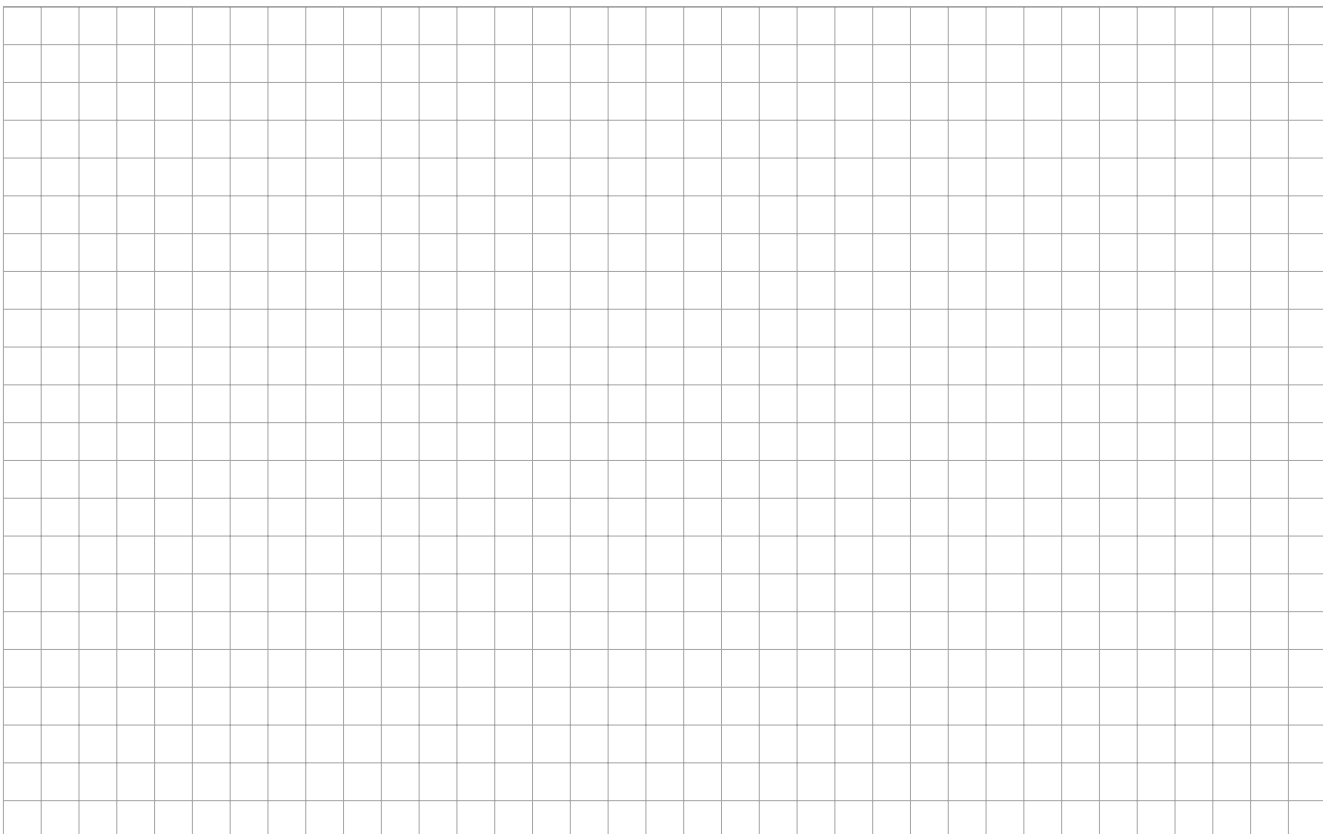
Valve Size	A	P
2 only	1.4ø	2.4mm
2 1/2 to 5	1.5ø	2.5mm
6 & 8	3.0ø	5.0mm
10 & 12	5.0ø	7.0mm

### Design Specifications

Items	
Shall wall thickness and general valve design	KITZ Standard
Face-to-face dimensions End-to-end dimensions	KITZ Standard
End flange dimensions Gasket contact facing	ASME B16.1 Class125

### Dimensions

Valve Size	mm		mm									
	inch		2	2 1/2	3	4	5	6	8	10	12	14
L Face-to-face			50	65	80	100	125	150	200	250	300	350
H Height			168	212	242	284	325	370	440	515	600	740
H1			208	289	335	388	446	497	589	694	818	993

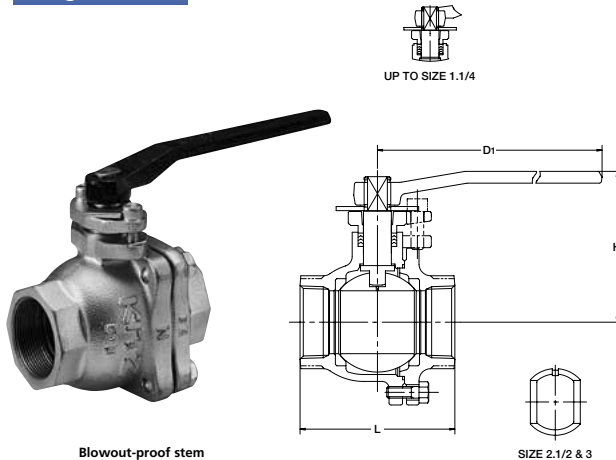


# JIS 10K

## IRON THREADED BALL VALVE (Full Port)

120°C Non-shock water 1.37MPa (14kgf/cm<sup>2</sup>), 120°C Water, oil, gas 0.98MPa (10kgf/cm<sup>2</sup>)  
Saturated steam 0.69MPa (7kgf/cm<sup>2</sup>)

Fig. 10FCT



### Materials

Parts	Material	JIS Spec.
Body	Cast Iron	FC200
Body cap	Cast Iron	FC200
Stem	Stainless Steel	SUS403
Ball	Stainless Steel	SCS13A or SUS304 or SUS304TP
Grand packing		PTFE
Gasket		PTFE
Ball Seat		PTFE
Cap bolt	Carbon Steel	SS400
Handle	Ductile Iron	FCD400

### Design Specifications

Items		
Shall wall thickness and general valve design		KITZ Standard
Face-to-face dimensions End-to-end dimensions		KITZ Standard
End flange dimensions Gasket contact facing		JIS B0203

### Dimensions

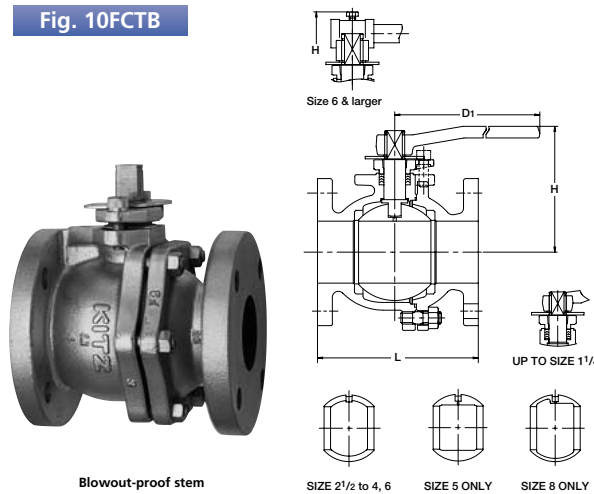
Valve Size	inch	3/8	1/2	1/2	1	1 1/4	1 1/2	2	2 1/2	3	mm
L Face-to-face	mm	10	15	20	25	32	40	50	65	80	
H Height		71	102	105	125	130	115	120	155	165	
D Handle		130	130	130	160	160	230	230	400	400	

# JIS 10K

## IRON BALL VALVE (Full Port)

120°C Non-shock water 1.37MPa (14kgf/cm<sup>2</sup>), 120°C Water, oil, gas 0.98MPa (10kgf/cm<sup>2</sup>)  
Saturated steam 0.69MPa (7kgf/cm<sup>2</sup>)

Fig. 10FCTB



### Materials

Parts	Material	JIS Spec.
Body	Cast Iron	FC200
Body cap	Cast Iron	FC200
Stem	Stainless Steel	SUS403
Ball	Stainless Steel	SCS13A or SUS304 or SUS304TP
Grand packing		PTFE
Gasket		PTFE
Ball Seat		PTFE
Cap bolt	Carbon Steel	SS400
Handle	Ductile Iron	FCD400

### Design Specifications

Items		
Shall wall thickness and general valve design		KITZ Standard
Face-to-face dimensions End-to-end dimensions		KITZ Standard
End flange dimensions Gasket contact facing		JIS B2239 10K

### Dimensions

Valve Size	inch	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2	3	4	5	6	8	10	mm
L Face-to-face	mm	15	20	25	32	40	50	65	80	100	125	150	200	250*	
H Height		102	105	124	130	115	120	155	165	200	220	295	355	477	
D Handle		130	130	160	160	230	230	400	400	460	460	1000	1500	-	

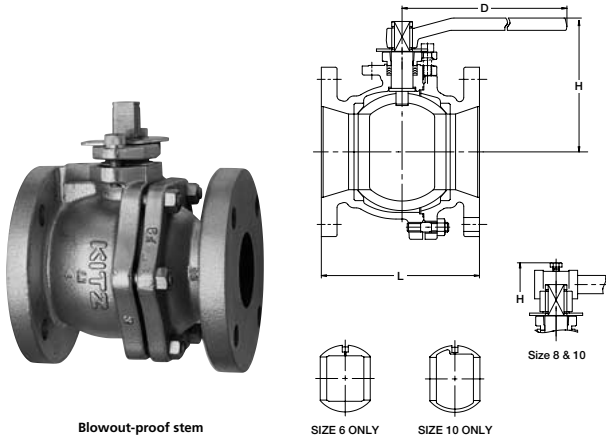
\*Note: Gear Operated. Contact KITZ or KITZ distributors for details.

# JIS 10K

# IRON BALL VALVE (Reduced Port)

120°C Non-shock water 1.37MPa (14kgf/cm<sup>2</sup>), 120°C Water, oil, gas 0.98MPa (10kgf/cm<sup>2</sup>)  
Saturated steam 0.69MPa (7kgf/cm<sup>2</sup>)

Fig. 10FCTR



### Materials

Parts	Material	JIS Spec.
Body	Cast Iron	FC200
Bonnet	Cast Iron	FC200
Stem	Forged Brass	C3771BD
Disc	Cast Iron	FC200
Disc seat ring	Bronze	CAC406
Body seat ring	Bronze	CAC406
Gland	Ductile Iron	FCD-5
Gland packing	Asbestos-free	
Gasket	Asbestos-free	
Gland bolt/nut	Carbon Steel	SS400
Bonnet bolt/nut	Carbon Steel	SS400
Bonnet bushing	Bronze	CAC406
Hand wheel	1 1/2 to 8	Cast Iron
	10 to 12	Ductile Iron

### Design Specifications

Items		
Shall wall thickness and general valve design*		KITZ Standard
Face-to-face dimensions	End-to-end dimensions	JIS B2002
End flange dimensions	Gasket contact facing	JIS B2239 10K

\*Nominal size 1 1/4, shall not be in accordance with JIS B2031

### Dimensions

Valve Size	inch	5	6	8	10	mm
	mm	125	150	200	250	
L Face-to-face		250	270	290	330	
H Height		200	220	295	355	
D Handle		460	460	1000	1500	

\*No JIS Mark

# JIS 10K

# IRON GATE VALVE (Full or Reduced Port)

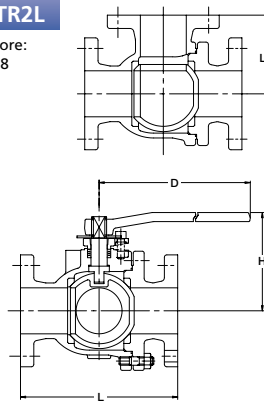
120°C Non-shock water 1.37MPa (14kgf/cm<sup>2</sup>), 120°C Water, oil, gas 0.98MPa (10kgf/cm<sup>2</sup>)  
Saturated steam 0.69MPa (7kgf/cm<sup>2</sup>)

Fig. 10FCTB2L

• Full Bore:  
Size 1 1/2 to 4

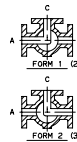
Fig. 10FCTR2L

• Reduced Bore:  
Size 5 to 8



### Materials

Parts	Material	JIS Spec.
Body	Cast Iron	FC200
Body cap	Cast Iron	FC200
Stem	Stainless Steel	SUS403
Ball	Stainless Steel	SCS13
Grand packing	PTFE	
Gasket	PTFE	
Ball Seat	PTFE	
Cap bolt/nut	Carbon Steel	SS400
Handle	Ductile Iron	FCD400



### Note:

- Flow is between Ports "A" and "C" in Form 1. Flow is between Ports "B" and "C" in Form 2. Flow paths in Form 1 and Form 2 can be changed each other.
- When the fluid pressure P2 in the closed path is higher than P1 in the open path, a little fluid leakage may occur to P1 through the ball seat of the closed path.

### Design Specifications

Items		
Shall wall thickness and general valve design		JIS B2031
Face-to-face dimensions	End-to-end dimensions	KITZ Standard
End flange dimensions	Gasket contact facing	JIS B2239 10K

### Dimensions

Valve Size	inch	1 1/2	2	2 1/2	3	4	5	6	8	mm
	mm	40	50	65	80	100	125	150	200	
L Face-to-face		210	220	250	260	330	370	430	540	
L1		105	110	125	130	165	185	215	270	
H Height		115	123	155	163	205	205	225	295	
D Handle		230	230	400	400	460	460	460	1000	



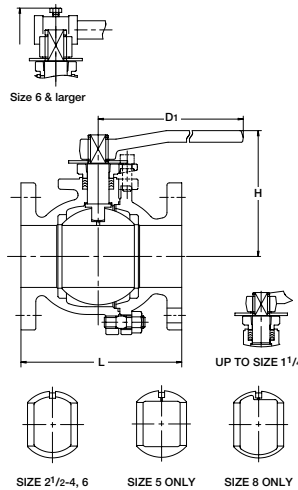
## CLASS 125 IRON BALL VALVE (Full Port)

120°C Non-shock water 1.37MPa (14kgf/cm<sup>2</sup>), 120°C Water, oil, gas 0.98MPa (10kgf/cm<sup>2</sup>)  
Saturated steam 0.69MPa (7kgf/cm<sup>2</sup>)

Fig. 125FCTB



Blowout-proof stem



### Materials

Parts	Material	JIS Spec.
Body	Cast Iron	A126 CL. B
Body cap	Cast Iron	A126 CL. B
Stem	Stainless Steel	A276 Type403
Ball	Stainless Steel	A276 Type 304 or A312 Gr.TP304 or A351 Gr.CF8
Grand packing	PTFE	
Gasket	PTFE	
Ball Seat	PTFE	
Cap bolt	Carbon Steel	
Handle	Ductile Iron	

### Design Specifications

Items	
Shall wall thickness and general valve design	KITZ Standard
Face-to-face dimensions End-to-end dimensions	ASME B16.10 Class150
End flange dimensions Gasket contact facing	ASME B16.1 Class125

### Dimensions

Valve Size	inch	2	2 1/2	3	4	6	8	mm
	mm	50	65	80	100	150	200	
L Face-to-face		178	190	203	229	394	457	
H Height		120	155	165	200	295	355	
D Handle		230	400	400	460	1000	1500	

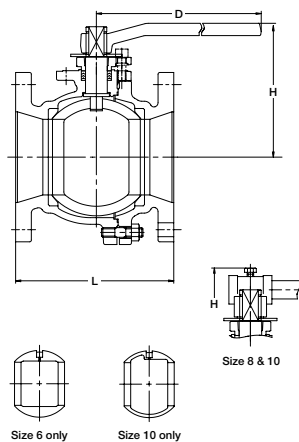
## CLASS 125 IRON BALL VALVE (Reduced Port)

120°C Non-shock water 1.37MPa (14kgf/cm<sup>2</sup>), 120°C Water, oil, gas 0.98MPa (10kgf/cm<sup>2</sup>)  
Saturated steam 0.69MPa (7kgf/cm<sup>2</sup>)

Fig. 125FCTR



Blowout-proof stem



### Materials

Parts	Material	JIS Spec.
Body	Cast Iron	A126 CL. B
Body cap	Cast Iron	A126 CL. B
Stem	Stainless Steel	A276 Type403
Ball	Stainless Steel	A312 Gr.TP304 or A351 Gr.CF8
Grand packing	PTFE	
Gasket	PTFE	
Ball Seat	PTFE	
Cap bolt	Carbon Steel	
Handle	Ductile Iron	

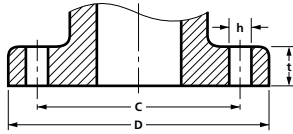
### Design Specifications

Items	
Shall wall thickness and general valve design	KITZ Standard
Face-to-face dimensions End-to-end dimensions	ASME B16.10 Class150
End flange dimensions Gasket contact facing	ASME B16.1 Class125

### Dimensions

Valve Size	inch	6	8	10	mm
	mm	150	200	250	
L Face-to-face		267	292	330	
H Height		220	295	355	
D Handle		460	1000	1500	

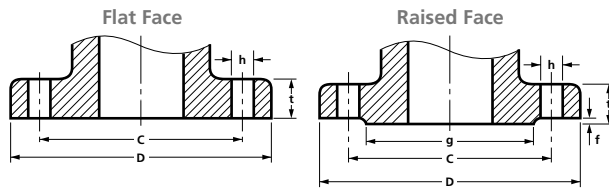
## PIPE FLANGE DIMENSIONS



## Class 125 ASME B16.1 - 1989

Nominal Size		D		C		t		h (Bolt Holes)		D	
in.	mm.	in.	mm.	in.	mm.	in.	mm.	in.	mm.	Number	Diam.
1	25	4.25	108	3.12	79.5	0.44	11.2	0.62	16	4	1/2
1 1/4	32	4.62	117	3.50	89.0	0.50	12.7	0.62	16	4	1/2
1 1/2	40	5.00	127	3.88	98.5	0.56	14.3	0.62	16	4	1/2
2	50	6.00	152	4.75	120.5	0.62	15.9	0.75	19	4	5/8
2 1/2	65	7.00	178	5.50	139.5	0.69	17.5	0.75	19	4	5/8
3	80	7.50	190	6.00	152.5	0.75	19.1	0.75	19	4	5/8
4	100	9.00	229	7.50	190.5	0.94	23.9	0.75	19	8	5/8
5	125	10.00	254	8.50	216.0	0.94	23.9	0.88	22	8	3/4
6	150	11.00	279	9.50	241.5	1.00	25.4	0.88	22	8	3/4
8	200	13.50	343	11.75	298.5	1.12	28.6	0.88	22	8	3/4
10	250	16.00	406	14.25	362.0	1.19	30.2	1.00	25	12	7/8
12	300	19.00	483	17.00	432.0	1.25	31.8	1.00	25	12	7/8
14	350	21.00	533	18.75	476.5	1.38	35.0	1.12	29	12	1
16	400	23.50	597	21.25	539.5	1.44	36.6	1.12	29	16	1
18	450	25.00	635	22.75	578.0	1.56	39.7	1.25	32	16	1 1/8
20	500	27.50	699	25.00	635.0	1.69	42.9	1.25	32	20	1 1/8
24	600	32.00	813	29.50	749.5	1.88	47.8	1.38	35	20	1 1/4

PIPE FLANGE DIMENSIONS



JIS 5K Cast iron pipe flange dimensions JIS B2239 - 1996

Unit: mm

Valve size		D	C	g	t		h	f	Bolt	
in.	mm.				Other than Cast iron	Cast iron			Number	Diam.
1 1/2	40	120	95	75	12	16	15	2	4	M12
2	50	130	105	85	14	16	15	2	4	M12
2 1/2	65	155	130	110	14	18	15	2	4	M12
3	80	180	145	121	14	18	19	2	4	M16
4	100	200	165	141	16	20	19	2	8	M16
5	125	235	200	176	16	20	19	2	8	M16
6	150	265	230	206	18	22	19	2	8	M16
8	200	320	280	252	20	24	23	2	8	M20
10	250	385	345	317	22	26	23	2	12	M20
12	300	430	390	360	22	28	23	3	12	M20
14	350	480	435	403	24	30	25	3	12	M22

JIS 10K Cast iron pipe flange dimensions JIS B2239 - 1996

Unit: mm

Valve size		D	C	g	t		h	f	Bolt	
in.	mm.				Other than Cast iron	Cast iron			Number	Diam.
3/8	10	90	65	46	12	14	15	1	4	M12
1/2	15	95	70	51	12	16	15	1	4	M12
3/4	20	100	75	56	14	18	15	1	4	M12
1	25	125	90	67	14	18	19	1	4	M16
1 1/4	32	135	100	76	16	20	19	2	4	M16
1 1/2	40	140	105	81	16	20	19	2	4	M16
2	50	155	120	96	16	20	19	2	4	M16
2 1/2	65	175	140	116	18	22	19	2	4	M16
3	80	185	150	126	18	22	19	2	8	M16
4	100	210	175	151	18	24	19	2	8	M16
5	125	250	210	182	20	24	23	2	8	M20
6	150	280	240	212	22	26	23	2	8	M20
8	200	330	290	262	22	26	23	2	12	M20
10	250	400	355	324	24	30	25	2	12	M22
12	300	445	400	368	24	32	25	3	16	M22
14	350	490	445	413	26	34	25	3	16	M22
16	400	560	510	475	28	36	27	3	16	M24
18	450	620	565	530	30	38	27	3	20	M24
20	500	675	620	585	30	40	27	3	20	M24
24	600	795	730	690	32	44	33	3	24	M30

## TEMPERATURE-PRESSURE TABLE FOR SATURATED-VAPOUT

Temperature			Pressure (abs.)			Pressure (G)		
Temperature °C	Pressure (abs.) MPa (kgf/cm <sup>2</sup> )	Pressure (G) MPa (kgf/cm <sup>2</sup> )	Pressure (abs.) MPa (kgf/cm <sup>2</sup> )	Pressure (G) MPa (kgf/cm <sup>2</sup> )	Saturation Temperature °C	Pressure (G) MPa (kgf/cm <sup>2</sup> )	Pressure (abs.) MPa (kgf/cm <sup>2</sup> )	Saturation Temperature °C
70	0.03(0.32)	-0.07(-0.71)	0.09(1)	-0.01(-0.03)	99.1	0(0)	0.10(1.03)	100.0
80	0.05(0.48)	-0.05(-0.55)	0.19(2)	0.09(0.97)	119.6	0.09(1)	0.19(2.03)	120.1
90	0.07(0.71)	-0.03(-0.32)	0.29(3)	0.19(1.97)	132.9	0.19(2)	0.29(3.03)	133.2
100	0.10(1.03)	0(0)	0.39(4)	0.29(2.97)	142.9	0.29(3)	0.39(4.03)	143.2
110	0.14(1.46)	0.04(0.43)	0.49(5)	0.39(3.97)	151.1	0.39(4)	0.49(5.03)	151.3
120	0.19(2.02)	0.09(0.99)	0.58(6)	0.48(4.97)	158.1	0.49(5)	0.59(6.03)	158.3
130	0.26(2.75)	0.16(1.72)	0.68(7)	0.58(5.97)	164.2	0.58(6)	0.68(7.03)	164.3
140	0.36(3.68)	0.26(2.65)	0.78(8)	0.68(6.97)	169.6	0.68(7)	0.78(8.03)	169.8
150	0.47(4.85)	0.37(3.82)	0.88(9)	0.78(7.97)	174.5	0.78(8)	0.88(9.03)	174.7
160	0.61(6.30)	0.51(5.27)	0.98(10)	0.88(8.97)	179.0	0.88(9)	0.98(10.03)	179.3
170	0.79(8.08)	0.69(7.05)	1.17(12)	1.07(10.97)	187.1	0.98(10)	1.08(11.03)	183.2
180	1.00(10.22)	0.90(9.19)	1.37(14)	1.27(12.97)	194.1	1.17(12)	1.27(13.03)	190.0
190	1.25(12.80)	1.15(11.77)	1.56(16)	1.46(14.97)	200.4	1.37(14)	1.47(15.03)	197.4
200	1.55(15.86)	1.45(14.83)	1.76(18)	1.66(16.97)	206.2	1.56(16)	1.66(17.03)	203.4
210	1.90(19.46)	1.80(18.43)	1.96(20)	1.86(18.97)	211.4	1.78(18)	1.88(19.03)	208.9
220	2.32(23.66)	2.21(22.63)	2.45(25)	2.35(23.97)	222.9	1.96(20)	2.06(21.03)	213.8
230	2.79(28.53)	2.69(27.50)	2.94(30)	2.84(28.97)	232.8	2.45(25)	2.55(26.03)	223.8
240	3.34(34.14)	3.24(33.11)	3.43(35)	3.33(33.97)	241.4	2.94(30)	3.04(31.03)	234.5
250	3.97(40.56)	3.87(39.53)	3.92(40)	3.82(38.97)	249.2	3.92(40)	4.02(41.03)	250.6
260	4.66(47.87)	4.56(46.84)	4.90(50)	4.80(48.97)	262.7	4.90(50)	5.00(51.03)	263.9
270	5.50(56.14)	5.40(55.11)	5.88(60)	5.78(58.97)	274.3	5.88(60)	5.98(61.03)	275.3
280	6.41(65.46)	6.31(64.43)	6.86(70)	6.76(68.97)	284.5	6.86(70)	6.96(71.03)	285.4
290	7.44(75.92)	7.34(74.89)	7.84(80)	7.74(78.97)	293.6	7.84(80)	7.94(81.03)	294.5
300	8.59(87.61)	8.49(86.58)	8.82(90)	8.72(88.97)	301.9	8.82(90)	8.92(91.03)	302.7
310	9.87(100.7)	9.77(99.67)	9.80(100)	9.70(98.97)	309.5	9.80(100)	9.90(101.0)	310.9
320	11.28(115.1)	11.18(114.1)	11.76(120)	11.66(119.0)	323.1	11.76(120)	11.86(121.0)	323.8
330	12.86(131.2)	12.76(130.2)	13.72(140)	13.62(139.0)	335.1	13.72(140)	13.82(141.0)	335.6
340	14.61(149.0)	14.51(147.9)	15.69(160)	15.59(159.0)	345.7	15.69(160)	15.79(161.0)	346.2
350	16.47(168.6)	16.37(167.6)	17.65(180)	17.55(179.0)	355.4	17.65(180)	17.75(181.0)	355.8
360	18.77(191.4)	18.67(190.4)	19.61(200)	19.51(199.0)	364.1	19.61(200)	19.71(201.0)	364.5
370	21.15(215.7)	21.05(214.7)	21.57(220)	21.47(219.0)	372.0	21.57(220)	21.67(221.0)	372.5

 **CAUTION**

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