



Instruction Manual

Disc Type Check Valve
CK3M / CK3T / CK3R / CK3T-M
CKF3M / CKF3R
CK3MG
CKF3MG / CKF3RG

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Introduction

Thank you for purchasing the TLV disc type check valve.

This product has been thoroughly inspected before being shipped from the factory. When the check valve is delivered, before doing anything else, check the specifications and external appearance to make sure nothing is out of the ordinary. Also be sure to read this manual carefully before use and follow the instructions to be sure of using the product properly.

Due to its compact design, the disc type check valve can easily be installed in places where space is limited, and can be installed in either horizontal or vertical pipelines. It can be used even with an extremely low pressure differential.








If detailed instructions for special order specifications or options not contained in this manual are required, please contact TLV for full details.

This instruction manual is intended for use with the models listed on the front cover. It is necessary not only for installation but for subsequent maintenance, disassembly/reassembly and troubleshooting. Please keep it in a safe place for future reference.

Safety Considerations

- Read this section carefully before use and be sure to follow the instructions.
- Installation, inspection, maintenance, repairs, disassembly, adjustment and valve opening/closing should be carried out only by trained maintenance personnel.
- The precautions listed in this manual are designed to ensure safety and prevent equipment damage and personal injury. For situations that may occur as a result of erroneous handling, three different types of cautionary items are used to indicate the degree of urgency and the scale of potential damage and danger: DANGER, WARNING and CAUTION.
- The three types of cautionary items above are very important for safety: be sure to observe all of them as they relate to installation, use, maintenance, and repair. Furthermore, TLV accepts no responsibility for any accidents or damage occurring as a result of failure to observe these precautions.

Symbols

	Indicates a DANGER, WARNING or CAUTION item.
	Indicates an urgent situation which poses a threat of death or serious injury
	Indicates that there is a potential threat of death or serious injury
	Indicates that there is a possibility of injury or equipment / product damage
	DO NOT use for toxic, flammable or otherwise hazardous fluids. Use only for fluids listed in the specification table. This product is for intended use only. Improper use may result in such hazards as damage to the product or malfunctions that may lead to serious accidents.
	Install properly and DO NOT use this product outside the recommended operating pressure, temperature and other specification ranges. Improper use may result in such hazards as damage to the product or malfunctions that may lead to serious accidents. Local regulations may restrict the use of this product to below the conditions quoted. When disassembling or removing the product, wait until the internal pressure equals atmospheric pressure and the surface of the product has cooled to room temperature. Disassembling or removing the product when it is hot or under pressure may lead to discharge of fluids, causing burns, other injuries or damage. Be sure to use only the recommended components when repairing the product, and NEVER attempt to modify the product in any way. Failure to observe these precautions may result in damage to the product and burns or other injury due to malfunction or the discharge of fluids.
	Do not use excessive force when connecting threaded pipes to the product. Over-tightening may cause breakage leading to fluid discharge, which may cause burns or other injury. Use only under conditions in which no freeze-up will occur. Freezing may damage the product, leading to fluid discharge, which may cause burns or other injury.

Specifications



DO NOT use for toxic, flammable or otherwise hazardous fluids. Use only for fluids listed in the specification table. This product is for intended use only. Improper use may result in such hazards as damage to the product or malfunctions that may lead to serious accidents.



Install properly and DO NOT use this product outside the recommended operating pressure, temperature and other specification ranges. Improper use may result in such hazards as damage to the product or malfunctions which may lead to serious accidents. Local regulations may restrict the use of this product to below the conditions quoted.



Use only under conditions in which no freeze-up will occur. Freezing may damage the product, leading to fluid discharge, which may cause burns or other injury.

	Model	Size mm (in)	Body Material	Sealing Material	ΔP^{*1} MPa (psi)	Applicable Fluids	PMO ^{*1} MPaG (psig)	TMO ^{*1} °C (°F)	PMA ^{*2} MPaG (psig)	TMA ^{*2} °C (°F)
Screwed	CK3M	15 – 25 ($\frac{1}{2}$ – 1)	Brass	Metal ^{*3}	0.002 (0.3)	Steam	1.0 (150)	220 (428)	1.0 (150)	220 (428)
		32 – 50 ($\frac{1}{4}$ – 2)	Bronze				2.1 (300)		2.1 (300)	
		15 – 50 ($\frac{1}{2}$ – 2)	Stainless Steel				1.0 (150)		1.0 (150)	
	CK3T	15 – 25 ($\frac{1}{2}$ – 1)	Brass	PTFE ^{*3}		Steam, Water	1.0 (150)	185 (365)	1.0 (150)	
		32 – 50 ($\frac{1}{4}$ – 2)	Bronze				1.6 (230)		2.1 (300)	
		15 – 50 ($\frac{1}{2}$ – 2)	Stainless Steel				1.0 (150)		1.0 (150)	
	CK3R	15 – 25 ($\frac{1}{2}$ – 1)	Brass	NBR ^{*4}		Air, Water	1.0 (150)	90 (194)	1.0 (150)	
		32 – 50 ($\frac{1}{4}$ – 2)	Bronze				1.6 (230)		2.1 (300)	
		15 – 50 ($\frac{1}{2}$ – 2)	Stainless Steel				1.0 (150)		1.0 (150)	
	CK3T-M	15 ($\frac{1}{2}$)	Brass	PTFE ^{*3}		0.007 (1)	Steam, Water	1.0 (150)	185 (365)	
20,25 ($\frac{3}{4}$, 1)		0.005 (0.75)								
CK3MG	25,40,50,80 (1, $\frac{1}{2}$, 2, 3)	Stainless Steel	Metal ^{*3}	0.001 (0.15)	Steam, Water	2.1 (300)	220 (428)	3.2 (450)		
Flangeless (Wafer)	CKF3M	15 – 40 ($\frac{1}{2}$ – $\frac{1}{2}$)	Stainless Steel	Metal ^{*3}	0.002 (0.3)	Steam, Water	3.0 (425)	350 (662)	3.0 (425)	350 (662)
	CKF3R	15 – 40 ($\frac{1}{2}$ – $\frac{1}{2}$)	Stainless Steel	FPM ^{*4}		Air, Water	1.6 (230)	150 (302)		
	CKF3MG	50 – 100 (2 – 4)	Stainless Steel	Metal ^{*3}	0.001 (0.15)	Steam, Water	3.0 (425)	350 (662)		
	CKF3RG	50 (2)	Stainless Steel	FPM ^{*4}		Air, Water	1.6 (230)	150 (302)		

(1 MPa = 10.197 kg/cm²)

*1 ΔP = Minimum Opening Differential Pressure; PMO = Maximum Operating Pressure; TMO = Maximum Operating Temperature

NOTE: - PMO, TMO may vary according to the options selected. Check nameplate, drawing, etc.

- When the valve has remained closed for a long period of time, the valve and the valve seat may stick, increasing the necessary minimum opening differential pressure. Make sure to open the valve properly before the installation.

In addition, the minimum opening differential pressure varies depending on the direction of flow due to the influence of the weight of the valve disc. See the table on the next page.

*2 Maximum Allowable Pressure (PMA) and Maximum Allowable Temperature (TMA) are PRESSURE SHELL DESIGN CONDITIONS, **NOT** OPERATING CONDITIONS

*3 PTFE = Fluorine Resin

Perfect sealing cannot be guaranteed for metal or PTFE sealing surfaces.

*4 NBR = Nitrile Rubber; FPM = Fluorine Rubber

For rubber sealing surfaces, a closing differential pressure of more than 0.05 MPa (7 psi) will be required for perfect sealing. (However, degradation of, or debris on, the rubber sealing surface may prevent perfect sealing.)

Minimum Opening Differential Pressure by Direction of Fluid Flow

Model		Flow Direction		Horizontal			Vertical : Upward			Vertical : Downward		
		MPa	[kPa]	(psi)	MPa	[kPa]	(psi)	MPa	[kPa]	(psi)		
CK3M/CK3T/CK3R		0.002	[2]	(0.3)	0.0015	[1.5]	(0.22)	0.0025	[2.5]	(0.40)		
CK3T-M	Size	15 (1/2)	0.007	[7]	(1)	0.0065	[6.5]	(0.94)	0.0075	[7.5]	(1.10)	
	mm (in)	20, 25 (3/4, 1)	0.005	[5]	(0.75)	0.0045	[4.5]	(0.65)	0.0055	[5.5]	(0.80)	
CK3MG		0.001	[1]	(0.15)	0.0005	[0.5]	(0.07)	0.0015	[1.5]	(0.22)		
CKF3M/CKF3R		0.002	[2]	(0.3)	0.0016	[1.6]	(0.23)	0.0024	[2.4]	(0.35)		
CKF3MG/CKF3RG		0.001	[1]	(0.15)	0.0005	[0.5]	(0.07)	0.0015	[1.5]	(0.22)		

Cv Values

Model	Size	mm (in)	15	20	25	32	40	50	65	80	100
			(1/2)	(3/4)	(1)	(1 1/4)	(1 1/2)	(2)	(2 1/2)	(3)	(4)
CK3M/ CK3T/ CK3R	Cv (US)		3.7	6.6	10	15	21	29	—		
	Cv (UK)		3.1	5.5	8.3	13	17	24	—		
	Kvs (DIN)		3.2	5.7	8.6	13	18	25	—		
CK3T-M	Cv (US)		3.7	6.6	10	—					
	Cv (UK)		3.1	5.5	8.3	—					
	Kvs (DIN)		3.2	5.7	8.6	—					
CK3MG	Cv (US)		—		25	—	55	91	—	180	—
	Cv (UK)		—		21	—	46	76	—	150	—
	Kvs (DIN)		—		21	—	47	78	—	154	—
CKF3M/ CKF3R	Cv (US)		4.6	8.8	16	20	29	—			
	Cv (UK)		3.8	7.3	13	17	24	—			
	Kvs (DIN)		3.9	7.5	14	17	25	—			
CKF3MG	Cv (US)		—					54	100	140	240
	Cv (UK)		—					45	83	117	200
	Kvs (DIN)		—					46	85	120	206
CKF3RG	Cv (US)		—					54	—		
	Cv (UK)		—					45	—		
	Kvs (DIN)		—					46	—		

Connectable Flange Standards

(This applies to the flangeless connections; CKF3M, CKF3R, CKF3MG and CKF3RG)

Size	JIS	ASME / JPI	PN (EN/DIN)	BS TABLE
15 (1/2)	5,10,16,20,30K	Class 150,300	PN 6,10,16,25,40	A,D,E,F,H,J
20 (3/4)				
25 (1)				
32 (1 1/4)				
40 (1 1/2)				
50 (2)				
65 (2 1/2)	10,16,20,30K	Class 125,150,250,300	PN 10,16,25,40	F,H,J
80 (3)				
100 (4)				

Options

Model	ΔP Minimum Opening Differential Pressure
CK3M/CK3T/CK3R	MPa
	(psi)
CKF3M/CKF3R	MPa
	(psi)

*Except nominal size of 40 mm (1 1/2 in) for ΔP 0.01 MPa (1.5 psi).

Model	Rubber Sealing Material
CK3R	Fluorine Rubber (FPM) — TMO 150 °C (302 °F)

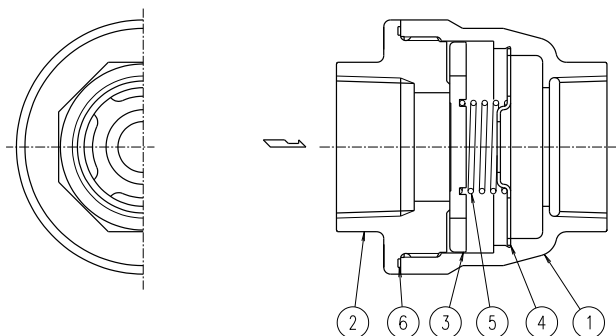
Special use	As a vacuum breaker*
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*CK3R, CKF3R and CKF3RG (with rubber sealing) should not be used.

Due to the nature of the rubber, there is a possibility of the disc sticking to the metal valve seat, compromising product performance at the very low differential pressures under which vacuum breakers operate.

Configuration

CK3M/CK3T/CK3R/CK3T-M



No.	Name	M*	R*
1	Body		
2	Inlet Union		
3	Valve Disc		✓
4	Spring Holder		
5	Coil Spring		✓
6	Union Gasket	✓	✓

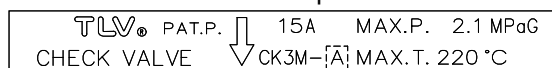
*Replacement parts are available only in the following kits:
 M = Maintenance Kit
 R = Repair Kit

NOTE: - When requesting a Repair Kit, please specify the minimum opening differential pressure.

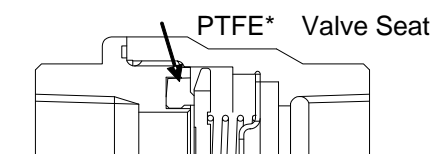
- For nominal sizes 15 – 25 mm (1/2 – 1 in), confirm that an identification code of "A" or later is present on the nameplate as shown in the figure below when requesting replacement parts. Both Maintenance Kit and Repair Kit will be available for products with such a code. If no such code is shown on the nameplate, please contact TLV.

- For nominal sizes 32 – 50 mm (1 1/4 – 2 in), both Maintenance Kit and Repair Kit are available regardless of identification code.

Location of identification code on nameplate



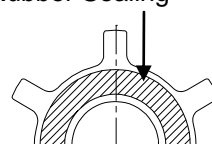
Identification Code



* PTFE = Fluorine Resin

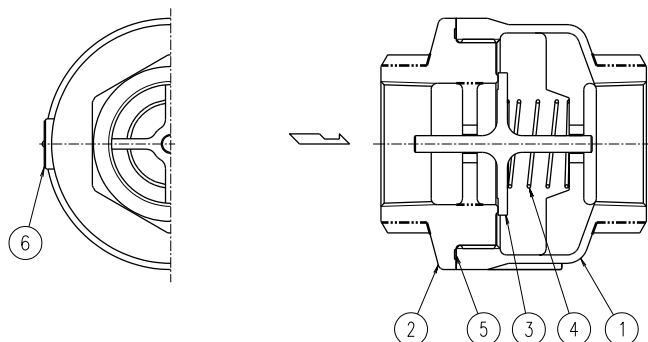
The CK3T, CK3T-M inlet union has a PTFE valve seat insert.

Rubber Sealing



CK3R valve disc is inlaid with rubber.

CK3MG

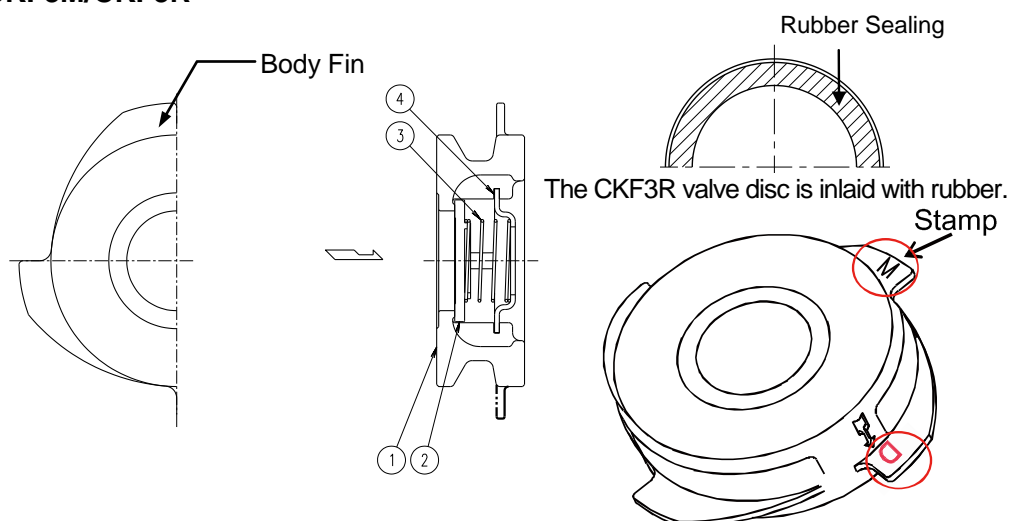


No.	Name	M*	R*
1	Body		
2	Inlet Union		
3	Valve Disc		✓
4	Coil Spring		✓
5	Union Gasket	✓	✓
6	Nameplate		

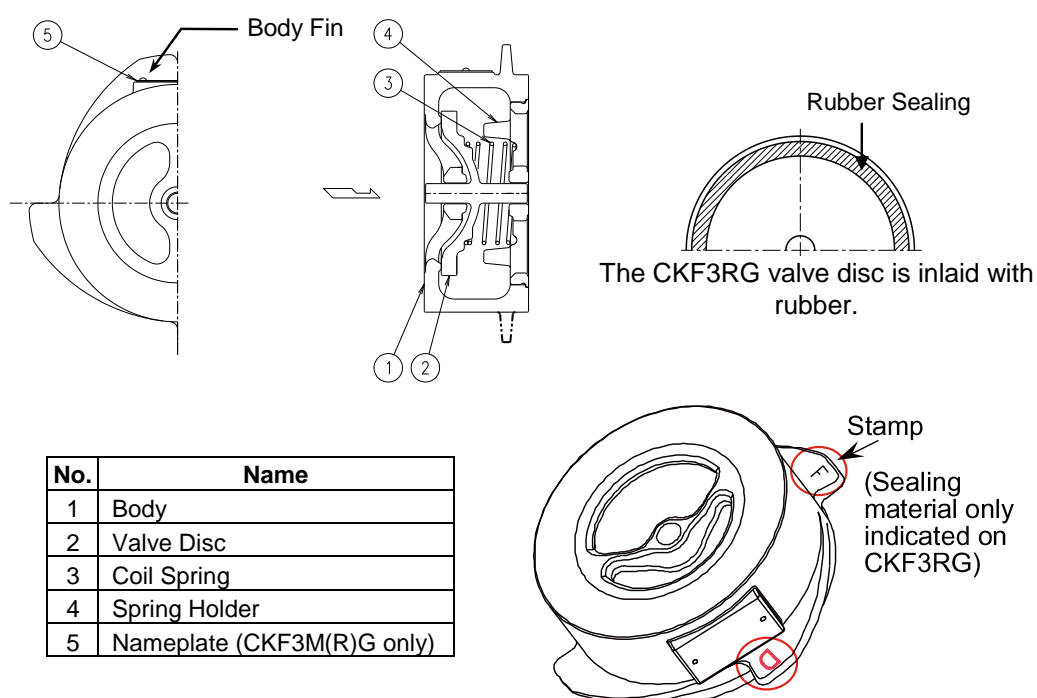
*Replacement parts are available only in the following kits:
 M = Maintenance Kit
 R = Repair Kit

NOTE: When requesting a Repair Kit, please specify the minimum opening differential pressure.

CKF3M/CKF3R



CKF3MG/CKF3RG



No.	Name
1	Body
2	Valve Disc
3	Coil Spring
4	Spring Holder
5	Nameplate (CKF3M(R)G only)

Replacement parts are not available for CKF3 series (flangeless) check valves, as special equipment is required for assembly/disassembly.

Sealing material and flange face finish can be identified by a stamp on the body fin. The flange face finish is stamped for DIN serration only, with the "D" mark.

Mark	Model	Sealing Material	Mark	Flange Face Finish
M	CKF3M CKF3MG	Metal	—	- Surface roughness: 3.2 – 6.3 μmRa (125 – 250 AARH) Serration - ASME B16.5 Serration
F	CKF3R CKF3RG	Fluorine Rubber (FPM) (Standard)	D	DIN Serration
N		Nitrile Rubber (NBR)*		
E		Ethylene Propylene Rubber (EPDM)*		

*Optional or special order materials

Installation



WARNING

DO NOT use for toxic, flammable or otherwise hazardous fluids. Use only for fluids listed in the specification table. This product is for intended use only. Improper use may result in such hazards as damage to the product or malfunctions that may lead to serious accidents.



CAUTION

Install properly and DO NOT use this product outside the recommended operating pressure, temperature and other specification ranges. Improper use may result in such hazards as damage to the product or malfunctions which may lead to serious accidents. Local regulations may restrict the use of this product to below the conditions quoted.



CAUTION

Do not use excessive force when connecting threaded pipes to the product. Over-tightening may cause breakage leading to fluid discharge, which may cause burns or other injury.

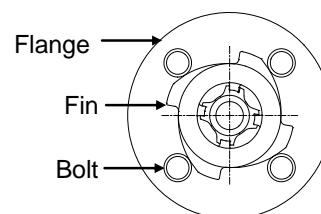
Installation, inspection, maintenance, repairs, disassembly, adjustment and valve opening/closing should be carried out only by trained maintenance personnel.

1. Avoid installation directly after equipment that may cause sudden changes in pressure or flow including water hammer and pulsation. (For example: high flow ON-OFF valves or pumps that start and stop frequently) Strong shocks to internal parts may result in damage to the spring or premature wear on the disc valve and seating surfaces.
2. Temperature:

Maximum Operating Temperature	Model				
	350 °C (662 °F)	CKF3M CKF3MG ↓	CK3M CK3MG ↓	CK3T CK3T-M ↓	CKF3R CKF3RG ↓
220 °C (428 °F)					
185 °C (365 °F)					
150 °C (302 °F)					
90 °C (194 °F)					

- NOTE: 1. Choose the model that meets operating temperature requirements
2. The CK3R optional FPM sealing model can be used to 150 °C (302 °F)

3. Before installation, be sure to remove all protective seals.
4. Before installing the product, blow out the inlet piping to remove any piping scraps, dirt and oil. Close the inlet valve after blowdown.
5. Before installing the product, open the valve to make sure that the valve and the valve seat do not stick to each other.
6. Install the product so the arrow on the body is pointing in the direction of flow.
7. There are no restrictions on the direction of installation, however vertical piping installation is recommended. To center the valve, install the CKF3M(R) and the CKF3M(R)G with the bolts touching the fins (see the figure shown above).
8. When installing a screwed type, secure the inlet and outlet piping of the product using supports, etc. to ensure that it does not place stress on the inlet union or the body of the product.
9. Open the inlet valve, and perform the necessary checks to make sure that the product functions properly.



If there is a problem, determine the cause using the "Troubleshooting" section in this manual.

Maintenance



Be sure to use only the recommended components when repairing the product, and NEVER attempt to modify the product in any way. Failure to observe these precautions may result in damage to the product or burns or other injury due to malfunction or the discharge of fluids.

Operational Check

A visual inspection of the following items should be done on a daily basis to determine whether the product is operating properly or has failed. Periodically (at least biannually) the operation should also be checked using diagnostic equipment, such as a stethoscope.

If the product should fail, it may cause damage to piping and equipment, resulting in faulty or low quality products.

Normal : Where inlet pressure is higher than outlet pressure (equal to or greater than the minimum opening differential pressure), flow, in the proper direction, can be verified.

If outlet pressure becomes higher than inlet pressure, flow ceases.

Leakage : There is flow even when outlet pressure becomes higher than inlet pressure.

Parts Inspection

When parts have been removed, or during periodic inspections, use the following table to inspect the parts and replace any that are found to be defective.

Procedure	
Gaskets:	Check for warping or damage
Valve Disc:	Check for scratches
Inlet Union Sealing Surfaces:	Check for scratches
Coil Spring:	Check for scratches or wear
(After cleaning inside the body)	
Spring Holder:	Check for scratches or wear

Disassembly/Reassembly

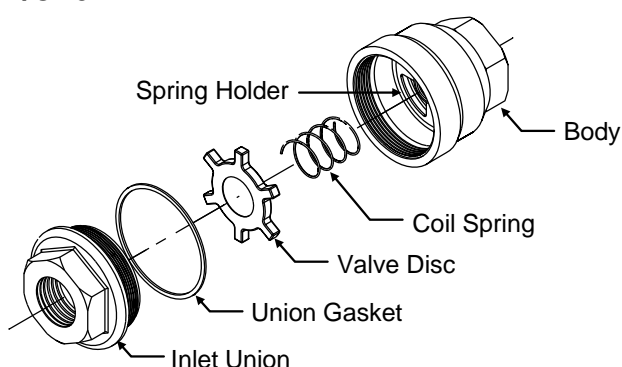


When disassembling or removing the product, wait until the internal pressure equals atmospheric pressure and the surface of the product has cooled to room temperature. Disassembling or removing the product when it is hot or under pressure may lead to discharge of fluids, causing burns, other injuries or damage.

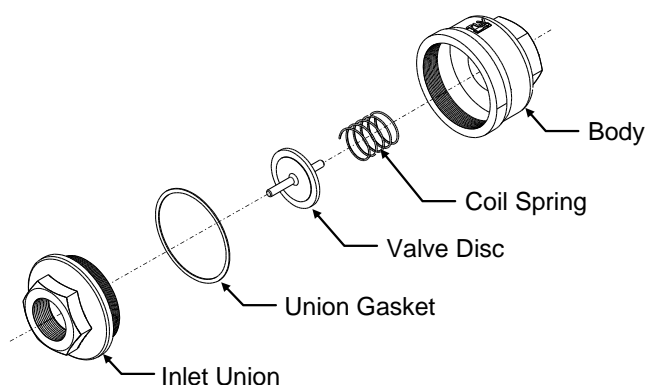
Use the following procedures to remove components. Use the same procedures in reverse to reassemble. (Installation, inspection, maintenance, repairs, disassembly, adjustment and valve opening/closing should be carried out only by trained maintenance personnel.)

Disassembly/Reassembly of Check Valve

CK3M/CK3T/CK3R/CK3T-M



CK3MG



Part	During Disassembly	During Reassembly
Inlet Union	Remove with a wrench	Coat threads with anti-seize and tighten to the proper torque
Union Gasket	Remove the union gasket	Replace with a new gasket if warped or damaged; make sure the gasket does not get pinched when tightening the inlet union
Valve Disc	Remove the valve disc	Insert, making sure the polished surface is facing the inlet union
Coil Spring	Remove the coil spring	CK3M/CK3T/CK3R/CK3T-M: Insert into housing CK3MG: Place the coil spring on the disc stem
Spring Holder (not CK3MG)	This part is inserted tightly in the body, and is not meant to be removed	—

CKF3M/CKF3R/CKF3MG/CKF3RG

Assembly/disassembly are not possible for these models as special equipment is required. Accordingly, replacement parts are not available for these models.

Table of Tightening Torques

Inlet Union

Model	CK3M/CK3T/CK3R/CK3T-M				CK3MG					
	Size		Torque		Distance Across Flats		Torque		Distance Across Flats	
	mm	(in)	N·m	(lbf·ft)	mm	(in)	N·m	(lbf·ft)	mm	(in)
15		(1/2)	100	(73)	27	(1 ¹ / ₁₆)	—		—	
20		(3/4)	150	(110)	32	(1 ¹ / ₄)	—		—	
25		(1)	180	(130)	41	(1 ⁵ / ₈)	180	(130)	41	(1 ⁵ / ₈)
32		(1 ¹ / ₄)	250	(185)	50	(1 ³¹ / ₃₂)	—		—	
40		(1 ¹ / ₂)	300	(220)	55	(2 ⁵ / ₃₂)	600	(440)	60	(2 ³ / ₈)
50		(2)	400	(290)	70	(2 ³ / ₄)	800	(590)	75	(2 ¹⁵ / ₁₆)
80		(3)	—		—	100			(3 ¹⁵ / ₁₆)	

(1 N·m ≈ 10 kg·cm)

NOTE: If drawings or other special documentation were supplied for the product, any torque given there takes precedence over values shown here.

Troubleshooting



When disassembling or removing the product, wait until the internal pressure equals atmospheric pressure and the surface of the product has cooled to room temperature. Disassembling or removing the product when it is hot or under pressure may lead to discharge of fluids, causing burns, other injuries or damage.

When the product fails to operate properly, use the following table to locate the cause and remedy.

Problem	Cause	Remedy	
		Screwed	Flangeless
The sound of flow can be heard when the outlet pressure is higher than inlet pressure	Dirt or damage on sealing surfaces or build-up inside the body	Clean parts	
	The valve disc is catching due to wear, dirt, rust, etc.	Replace with a new check valve	
	The coil spring is dislodged or broken	Replace with a new coil spring	Replace with a new check valve
	The spring holder is dislodged or broken	Replace with a new check valve	
Leakage to the outside of the check valve	The union gasket is warped or damaged	Replace with a new gasket	—
	Incorrect inlet union tightening torque	Tighten to the proper torque	—
	The check valve is subject to stress from the piping (weight, torsion, etc.)	Correct the piping	—
Flow is poor	The valve disc is catching due to wear, dirt, rust, etc.	Clean parts	
	Incorrect operating pressure	Adjust by increasing the pressure or replace with a check valve that has a larger Cv value	
The valve does not open at the specified differential pressure	Sticking of the valve and the valve seat due to rust, pipe sealing agent, etc.	Clean parts	
		If the valve disc is inlaid with rubber, it may be the case that the rubber is sticking to the metal. Contact TLV for details.	

NOTE: When replacing parts with new, use the parts list for reference and replace with parts from the Maintenance Kit, Repair Kit, etc. (Please note that replacement parts are only available in pre-packaged kits.)

Product Warranty

1. Warranty Period
One year following product delivery.
2. Warranty Coverage
TLV CO., LTD. warrants this product to the original purchaser to be free from defective materials and workmanship. Under this warranty, the product will be repaired or replaced at our option, without charge for parts or labor.
3. This product warranty will not apply to cosmetic defects, nor to any product whose exterior has been damaged or defaced; nor does it apply in the following cases:
 - 1) Malfunctions due to improper installation, use, handling, etc., by other than TLV CO., LTD. authorized service representatives.
 - 2) Malfunctions due to dirt, scale, rust, etc.
 - 3) Malfunctions due to improper disassembly and reassembly, or inadequate inspection and maintenance by other than TLV CO., LTD. authorized service representatives.
 - 4) Malfunctions due to disasters or forces of nature.
 - 5) Accidents or malfunctions due to any other cause beyond the control of TLV CO., LTD.
4. Under no circumstances will TLV CO., LTD. be liable for consequential economic loss damage or consequential damage to property.

* * * * *

For Service or Technical Assistance:

Contact your TLV representative or your regional TLV office.

Manufacturer

TLV CO., LTD.

881 Nagasuna, Noguchi
Kakogawa, Hyogo 675-8511, JAPAN
Tel: 81-(0)79-427-1800