



# Instruction Manual

## Steam Desuperheating System **RGDS**

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## Introduction

Thank you for purchasing the TLV steam desuperheating system RGDS.

This system has been thoroughly inspected before being shipped from the factory. When the product 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 installing and using the system properly by following the installation and operating procedure.

After the completing the installation work, our technical personnel will explain the commissioning and operation of this system. Please keep this manual, commissioning report, specification and all documents related to this system for further reference.

There are some cases on which this manual does not include instructions concerning individual special specifications but instead refers to other manuals.









For further details please contact your closest TLV office.

This instruction manual is intended for use with the system 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

	<b>Indicates a DANGER, WARNING or CAUTION item.</b>
	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
	<p><b>In the event of any abnormality, stop the system and utilities supply (steam, water, air and electricity). Investigate the cause of the abnormality and take countermeasures.</b>          Forbid the supply of utilities to the system until the countermeasures have been implemented.</p>
	<p><b>Install properly and DO NOT use this system outside the recommended operating pressure, temperature and other specification ranges.</b>          Improper use may result in such hazards as damage to the system or malfunctions that may lead to serious accidents. Local regulations may restrict the use of this system to below the conditions quoted.</p>
	<p><b>Use hoisting equipment for heavy objects (weighing approximately 20 kg (44 lb) or more).</b>          Failure to do so may result in back strain or other injury if the object should fall.</p>
	<p><b>Take measures to prevent people from coming into direct contact with system outlets.</b>          Failure to do so may result in burns or other injury from the discharge of fluids.</p>

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 <b>CAUTION</b>	<p><b>When disassembling or removing the system, wait until the internal pressure equals atmospheric pressure and the surface of the system has cooled to room temperature.</b> Disassembling or removing the system when it is hot or under pressure may lead to discharge of fluids, causing burns, other injuries or damage.</p>
	<p><b>Be sure to use only the recommended components when repairing the system, and NEVER attempt to modify the system in any way.</b> Failure to observe these precautions may result in damage to the system and burns or other injury due to malfunction or the discharge of fluids.</p>
	<p><b>Do not use excessive force when connecting threaded pipes to the system.</b> Over-tightening may cause breakage leading to fluid discharge, which may cause burns or other injury.</p>
	<p><b>Use only under conditions in which no water hammer will occur.</b> The impact of water hammer may damage the system, leading to fluid discharge, which may cause burns or other injury.</p>
	<p><b>Make sure the power supply is OFF before carrying out work on the wiring or inspections involving disassembly.</b> If such work is carried out with the power on, there is a danger that components may malfunction or electric shock may occur, leading to injury or other accidents.</p>
	<p><b>Make sure that installation work requiring a special license is carried out by qualified personnel.</b> Improper work may cause falls, dropped items, overheating and electrical leaks, leading to injury, burns, fires, damage and other accidents.</p>
	<p><b>When using this system, NEVER stand close to, or leave tools anywhere near moving parts, such as the shaft.</b> Contact with moving parts or objects becoming caught in moving parts could lead to injury, damage or other accidents.</p>
	<p><b>This system is composed of steam devices and piping.</b> Insulate the system properly to prevent burns and heat loss.</p>
	<p><b>After all piping work has been performed according to the system flow diagram, check that all connections are tightened, all gaskets have been installed and for unsecure installations.</b> Improper piping work may lead to discharge of fluids, causing burns, other injuries or damage.</p>
	<p><b>Do NOT touch terminals when power is on.</b> This may lead to system breakages, erroneous operation, electrical shock or fires.</p>

## System Control



Use only under conditions in which no water hammer will occur. The impact of water hammer may damage the system, leading to fluid discharge, which may cause burns or other injury.

The TLV desuperheating system consists of three main parts,

- Pressure reducing section, used to regulate steam pressure to the desired setting value by a pressure control loop, as a result the steam pressure stabilizes, which leads to a stable steam temperature.
- Desuperheating section, consists of temperature control valves and injector with nozzles, used to inject the cooling water in to the steam flow in order to reduce the temperature of the steam. Feed control valves actuated through a temperature control loop regulate the water volume injected for temperature reduction.
- Water mixing and separation section, consist of static mixer and condensate separator, in order to desuperheat (reduce the temperature) from the steam with the cooling water, by passing the flow through (2) static mixers connected in series and later on through a cyclone separator to remove the excess water that could exist.

## System Features

The following are some features of the desuperheating system (RGDS) from TLV.

- Stable and steady steam pressure supply
- The spray nozzle used for water injection has a very fine tip in order to ensure the spray absorbs the most heat in a shorter distance. Furthermore the heat absorption effect is improved by forcibly mixing the flow with a static mixer.
- In the unlikely event that any excess water is injected, it is forcibly removed by condensate separators, so this excessive water will not flow into the downstream of the system. As a result, the prevention of water hammer and stable heating are achieved.

## System Specifications



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

Item		Property	RGDS (Standard Specification)		Ex-proof Specification
Pressure Reducing Section	Steam Control Valve	Model	CV10 <sup>1)</sup> (Non Ex-proof)		CV10 <sup>1)</sup> (Exd II BT5)
		Size/Connection	Depends on specifications		
	Pressure Sensor (With Siphon)	Model	MBS33M <sup>1)</sup> (Non Ex-proof)		KD43 <sup>1)</sup> (Exd II BT4)
		Size/Connection	R 3/8	R 1/2	
Desuperheating Section	Temperature Control Valve	Model	CV10 <sup>1)</sup> (Non Ex-proof)		CV10 <sup>1)</sup> (Exd II BT5)
		Size/Connection	Depends on specifications		
	Temperature Sensor	Model	TR1-35S <sup>1)</sup>		R1G <sup>1)</sup> (d2G4)
		Connection	R 3/8	R 1/2	
	Strainer	Model	Y3 <sup>1)</sup>		
		Size/Connection	Depends on specifications		
Check Valve	Model	CKF3M <sup>1)</sup>			
	Connection	Flangeless (wafer) type Size depends on specifications			
Water Mixing and Separation Section	Water Injector, Static Mixer	Size/Connection	50 – 200 mm (2 – 8 in): JIS 10K, 20K, 30K, ASME/JPI Class 150, 300		
		Condensate Separator	Model	DC3	
	Steam Trap	Model	JS-X series, JH series		
		Size/Connection	Depends on specifications		
Pump Section <sup>2)</sup>	Pump	Model	CRN <sup>1)</sup> (Non Ex-proof)		CRN <sup>1)</sup> (eG3, d2G4)
		Size/Connection	Depends on specifications		
Control Panel	Power rating	200 V			
	Installation Location	Indoor	Outdoor		Special order
	Installation Type	Wall-mounted	Stand-alone		
Pressure Range	0 to 1.6 MPaG (0 to 250 psig)				
Minimum Set Temperature	5 °C (10 °F) above saturated steam temperature (Size 200 mm (8 in): 10 °C (20 °F) above saturated steam temp.)				
Steam Supply Temp. Stability	Within ±1 °C (1.8 °F) <sup>3)</sup>				
Steam Velocity	5 to 50 m/s (20 to 160 ft/s)				
Steam Discharge	200 to 30,000 kg/h (450 to 66,000 lb/h)				

<sup>1)</sup> Standard products when the components are supplied by TLV. The model type may differ depends on the installation environment.

<sup>2)</sup> This device is required when the pressure of the desuperheating water supplied to the system is insufficient.

<sup>3)</sup> This value depends on the status of the process as well as the PID setting and is only to be used as a reference.

For details regarding components, refer to the individual specification data sheets (SDS).

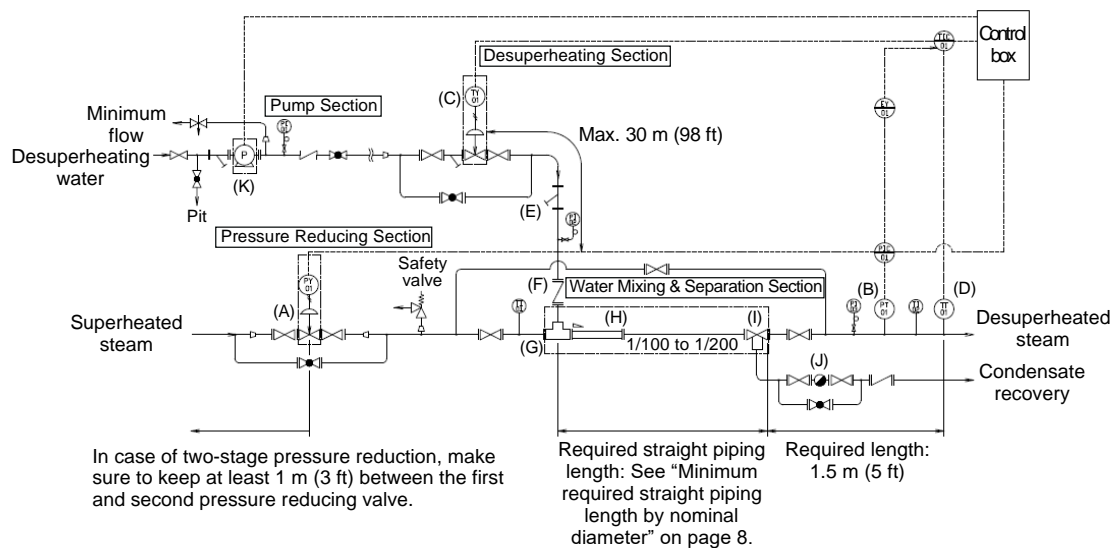
## System Description



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

The TLV standard desuperheating system (RGDS) consist of three sections: Pressure reducing section, desuperheating section and water mixing and separation section.

Note: a pump section is required when the desuperheating water pressure is insufficient.



Section	Component	Description
Pressure reducing section	A Pressure control valve	<b>The pressure control valve reduces the steam pressure as required.</b>
	B Pressure sensor	
Desuperheating section	C Temperature control valve	<b>The temperature control valve reduces the steam temperature as required.</b>
	D Temperature sensor	
	E Strainer	
	F Check valve	
Water mixing and separation section	G Water injector	<b>Injects water and mixes it with steam for desuperheating. Discharges excess desuperheating water via the separator.</b>
	H Static mixer	
	I Condensate separator	
	J Steam trap	

- The strainer prevents clogging of the water injector's internal nozzle by dirt, rust and scale.
- The check valve reduces the risk of water hammer due to steam flowing into the desuperheating water line.
- The steam trap discharges condensate from the separator and excess desuperheating water.

## Installation



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



Use hoisting equipment for heavy objects (weighing approximately 20 kg (44 lb) or more). Failure to do so may result in back strain or other injury if the object should fall.



Take measures to prevent people from coming into direct contact with product outlets. Failure to do so may result in burns or other injury from the discharge of fluids.



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



Make sure that installation work requiring a special license is carried out by qualified personnel. Improper work may cause falls, dropped items, overheating and electrical leaks, leading to injury, burns, fires, damage and other accidents.



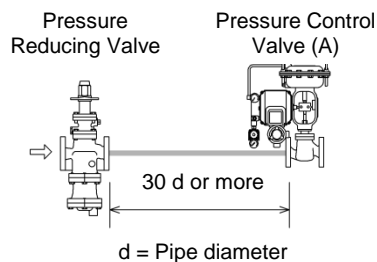
After all piping work has been performed according to the system flow diagram, check that all connections are tightened, all gaskets have been installed and for unsecure installations. Improper piping work may lead to discharge of fluids, causing burns, other injuries or damage.



This system is composed of steam devices and piping. Insulate the system properly to prevent burns and heat loss.

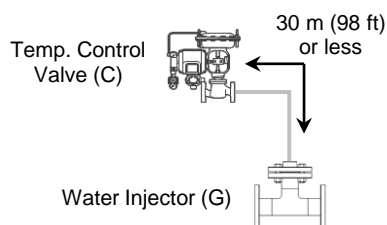
## Pressure Reducing Section

Ensure the distance between the pressure reducing valve and the pressure control valve (A) is 30 d or more when reducing supply steam on the primary side of the control valve (A).

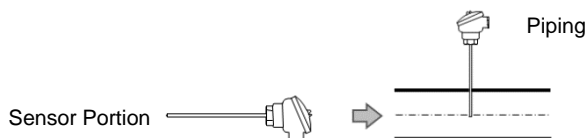


## Desuperheating Section

1. The piping distance from the temperature control valve (C) outlet to the injector (G) nozzle should be as short as possible in order to reduce pressure losses.



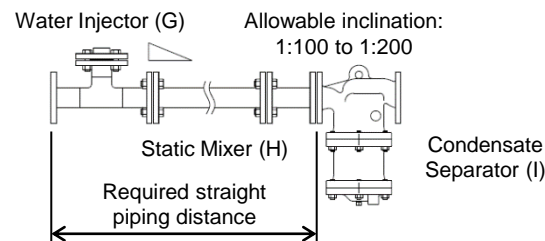
2. Install the temperature sensors (D) so that the sensor portion is inserted into the piping.





## Water Mixing and Separation Section

1. Make sure the piping between the injector (G) and the temperature sensors (D) is straight and horizontal. Do not install other devices such as check valves and strainers that could cause a pressure drop.
2. Ensure the piping between the injector (G) and the condensate separator (I) is at a slight decline (between 1:100 and 1:200) and is of the required straight piping distance.

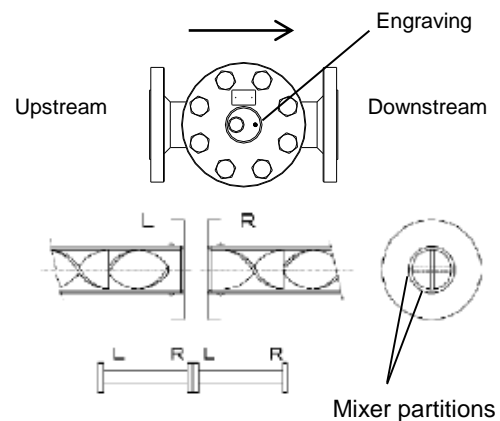


Minimum required straight piping length by nominal diameter

Pipe size/DN	mm (in)	50 (2)	65 (2½)	80 (3)	100 (4)	125 (5)	150 (6)	200 (8)
Length	m (ft)	4.5 (15)			5.5 (9)	6.5 (22)	7.5 (25)	10 (33)

3. The injector (G) and static mixer (H) each have an installation direction. Installation in the wrong direction will prevent the equipment from functioning as a desuperheater.

- a) There is a circular engraving on top of the injector body (G) (see right). Make sure this engraving is on the downstream side of the injector when installing the desuperheating water piping.



- b) The static mixer (H) is shipped as two separate pipe-shaped products. Each static mixer has a flow direction indicated on the flange (L = Left, R = Right). Make sure the second mixer starts with the same direction as the first mixer, i.e. "LR-LR" and "RL-RL". Note: "L" and "R" do not denote upstream and downstream.

In addition, make sure the static mixer flange faces meet so that the internal mixer partitions meet at right angles to each other at the flange face.

There is no restriction on the direction the mixer partitions face in the end of the flanges on the upstream and downstream sides.

4. Ensure the steam trap (J) on the condensate outlet of the injector (I) is installed in a location where inspections and maintenance can be performed.

**Other**

Carefully consider the following items if installing a pump.

1. Install piping supports on the suction side and discharge side of the pump (K) and make sure there is no load on the pump body.
2. Install flexible tubing on both the suction side and discharge side of the pump (K), to prevent vibrations from the pump from transmitting through the piping. Make sure to use vibration absorbing type flexible tubing for use with pumps.
3. Install a strainer to prevent foreign matter from entering the suction side of the pump (K).
4. Set a minimum flow line for the pump (K) and make sure not to operate the pump under shut-off conditions.

## Pre-commissioning Verification



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After all piping work has been performed according to the system flow diagram, check that all connections are tightened, all gaskets have been installed and for unsecure installations. Improper piping work may lead to discharge of fluids, causing burns, other injuries or damage.

### Checking the System

#### 1. Preparation

##### 1.1 Items to prepare

- System equipment list
- Flow diagram
- Product specifications
- Control box diagrams, terminal connection diagrams, sequence diagrams
- Applicable equipment documents (drawings, specifications etc.)
- Instruction manuals for each products

##### 1.2 Items to verify

Verify whether commissioning can be performed.

- Installation progress (verify whether piping and wiring installation is complete)
- Utilities (verify whether steam, water and electricity are supplied)
- Personnel from user's side to witness the commissioning (ensure at least one person is present)
- Process for maintenance work in the event of a problem, or preparations for such work
- Preparations for the load (steam venting) for steam control adjustment

Note: Commissioning should be conducted with TLV personnel present.

## Normal Operation and Shutdown Procedures

### Operating Procedures: Pressure Reducing Section

#### 2. Pressure reducing section

##### 2.1 Preparation

1. Supply electricity and air to the system.
2. Turn on the power for the control box.
3. Check whether the pressure sensor values are normal.
4. Check whether the valves before and after the system are open.

##### 2.2 Verification for manual operation

1. Open the pressure control valve manually to 10%.\*  
(Verify that steam has started to flow.)
2. Wait 5 minutes for the hot air in the steam piping to be discharged.
3. Slowly open the pressure control valve (at a rate of approximately 10% per 2 minutes), until the indicated pressure is approximately 0.2 MPaG less than the target value.

\* If superheated steam cannot be supplied to the steam-using equipment side, perform the operating procedures for the desuperheating section in parallel with the operating procedures for the pressure reducing section.

##### 2.3 Verification for automatic operation

1. Verify that the pressure has reached approximately 0.2 MPaG less than the target value and switch to automatic operation.
2. Verify that the steam pressure is stable at the target value.

### Operating Procedures: Desuperheating Section

#### 3. Pressure reducing section

##### 3.1 Preparation

1. Supply electricity, air and water to the system.
2. Turn on the power for the control box.\*
3. Check whether the temperature sensor values are normal.
4. If a pump is installed, start operating the pump.
5. Check whether the valves before and after the system are open.

##### 3.2 Verification for manual operation

1. Open the temperature control valve manually to 10%.\*  
(Verify that steam has started to flow.)
2. Slowly open the temperature control valve (at a rate of approximately 10% per 2 minutes), until the indicated temperature is approximately 10 °C less than the target value.

##### 3.2 Verification for automatic operation

1. Verify that the temperature has reached approximately 10 °C less than the target value and switch to automatic operation.
2. Verify that the steam temperature is stable at the target value.

Check visually that the amount of condensate discharged by the separator is normal.

\* Unnecessary if sharing the same control box as the pressure reducing section.

**Shutdown Procedures: Pressure Reducing Section**

1. Slowly close the pressure reducing valve (approximately 10% per 2 minutes).
2. Verify that the pressure reducing valve is fully closed, and then close the manual valve on the primary side of the pressure reducing valve.
3. Turn off the power for the control box.\*

\* Unnecessary if sharing the same control box as the pressure reducing section.

**Shutdown Procedures: Desuperheating Section**

1. Verify that the pressure reducing section has stopped. If a pump is installed, stop the pump.
2. Close the temperature control valve fully.
3. Verify that the temperature control valve is fully closed, and then close the manual valve on the primary side of the temperature reducing valve.
4. Stop the electricity supply for the control box and close the valves for the air supply to the control valve instruments.

## Maintenance and Inspection



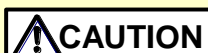
When disassembling or removing the system, wait until the internal pressure equals atmospheric pressure and the surface of the system has cooled to room temperature. Disassembling or removing the system when it is hot or under pressure may lead to discharge of fluids, causing burns, other injuries or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



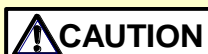
Be sure to use only the recommended components when repairing the system, and NEVER attempt to modify the product in any way. Failure to observe these precautions may result in damage to the system or burns or other injury due to malfunction or the discharge of fluids.



Make sure the power supply is OFF before carrying out work on the wiring or inspections involving disassembly. If such work is carried out with the power on, there is a danger that components may malfunction or electric shock may occur, leading to injury or other accidents.



Make sure that installation work requiring a special license is carried out by qualified personnel. Improper work may cause falls, dropped items, overheating and electrical leaks, leading to injury, burns, fires, damage and other accidents.



When using this system, NEVER stand close to, or leave tools anywhere near moving parts, such as the shaft. Contact with moving parts or objects becoming caught in moving parts could lead to injury, damage or other accidents.

Periodically inspect and check the following items as preventive maintenance.

For details regarding maintenance considerations, refer to the individual instruction manual for each component.

### Maintenance Checklist

To promote trouble-free operation of the system, inspections and maintenance of the following items should be carried out periodically.

#### Injector pump

Daily inspection	<input type="checkbox"/> Leakage from pump mechanical seal <input type="checkbox"/> Abnormal sounds from the pump or motor <input type="checkbox"/> Values indicated by the pressure/temp. gauges
Monthly inspection, maintenance point	<input type="checkbox"/> Pump suction pressure changes <input type="checkbox"/> Cracks in the tank and piping or water leakage <input type="checkbox"/> When there is a risk of freezing or the system will not be used for a long time, water must be blown from the tank and pump interior

#### Valves

Daily inspection	<input type="checkbox"/> Leakage from the valve body <input type="checkbox"/> Control valve air pressure and valve aperture
Annual inspection	<input type="checkbox"/> Disassemble and clean the control valves

#### Other accessories

Daily inspection	<input type="checkbox"/> Values indicated by the pressure/temp. gauges
Monthly inspection, maintenance point	<input type="checkbox"/> Disassemble and clean Y strainers, blow strainers with condensate blow valves <input type="checkbox"/> Steam trap and condensate separator operation <input type="checkbox"/> Spray nozzle is not blocked

## Replacement Timing for Consumables

Refer to the following table as a guide for the timing to replace consumable parts.

Part		Replacement Timing
Pump	Mechanical seal	When liquid leakage is observed or after 8000 hours operation
	Shaft, bearings	Every 2 to 3 years
Gaskets		When liquid leakage is observed or when disassembling

Refer to individual instruction manuals for other maintenance and inspection procedures.

## Troubleshooting



**WARNING**

In the event of any abnormality, stop the system and utilities supply (steam, water, air and electricity). Investigate the cause of the abnormality and take countermeasures. Prevent the supply of utilities to the system until the countermeasures have been implemented.



**CAUTION**

Use hoisting equipment for heavy objects (weighing approximately 20 kg (44 lb) or more). Failure to do so may result in back strain or other injury if the object should fall.



**CAUTION**

Take measures to prevent people from coming into direct contact with product outlets. Failure to do so may result in burns or other injury from the discharge of fluids.



**CAUTION**

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



**CAUTION**

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



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**CAUTION**

When using this system, NEVER stand close to, or leave tools anywhere near moving parts, such as the shaft. Contact with moving parts or objects becoming caught in moving parts could lead to injury, damage or other accidents.



**CAUTION**

Do NOT touch terminals when power is on. This may lead to system breakages, erroneous operation, electrical shock or fires.

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

Item	Cause	Diagnostic	Remedy
The pump does not start	A current is not applied to the pump	The power is not turned on	Turn on the power
		The wiring is disconnected or not connected	Connect the wiring
		The power is cut off	Apply current to the pump
	The non-fuse breaker is operating	There is a short in the sequence	Fix the control system then reset the non-fuse breaker
The pump cannot be activated	A thermal relay has tripped or the wiring is disconnected	Disassemble and clean the pump If the motor is broken, replace the motor Reset the thermal relay	

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Item	Cause	Diagnostic	Remedy
The pump suction pressure gauge indicates the actual suction pressure	The pump is running empty	Water is not flowing into the pump	Open the pump inlet valve and discharge air
	The pump is running backwards	The operating direction is incorrect	Correct the wiring
	The number of rotations is too low	Measure the number of rotations with a tachometer	Correct the frequency
	The lifting height is lower	See the instruction manual for the pump	Replace with a new pump
	Foreign matter is clogging the pump	Check if there is foreign matter in the pump inlet	Clean the pump
	The pressure gauge on the pump outlet is broken	The pressure gauges on the pump inlet and outlet show the same pressure at shutdown	Replace with a new pressure gauge
Steam or desuperheating water are not supplied	The steam inlet valve is still closed	The inlet valve is closed	Open the inlet valve
	The steam pressure control valve (CV) is still closed; the steam pressure control valve does not move at all	Check the wiring to the control valve; check the controller wire connections; check the input signal wiring for incorrect connections	Check the electrical wiring diagram and correct the wiring
		Check that a signal of 4 – 20 mA is being received by the CV at the connection terminals	Adjust the controller or positioner or replace with a new controller or positioner
		Check the secondary pressure of the steam pressure control valve; if the electrical wiring and signal are normal, then the steam pressure control valve is malfunctioning	Disassemble, inspect or replace the steam pressure control valve
		Check if air is being supplied to the steam pressure control valve (CV) positioner	Supply air to the positioner
Does not reach desired steam pressure	The PID set values are incorrect	Check the PID set values	Correct the PID set values
	The pressure sensor is malfunctioning	Check the pressure value reading from the sensor and compare with the pressure gauge, if the electrical wiring and signal are normal, then the pressure sensor is malfunctioning	Replace with a new pressure sensor
	Component(s) inside the pressure control valve positioner are broken	Check for abnormal sounds from the positioner	Replace with a new positioner (Investigate whether the valve aperture changes frequently or the ambient temperature is too high)

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Item	Cause	Diagnostic	Remedy
Does not reach desired steam pressure	There is a problem with the input current of the pressure control valve	Check that a signal of 4 – 20 mA is being received from the pressure sensor at the connection terminals	Adjust the controller or replace with a new controller
	Supply steam pressure is too low	Check whether there is a correct steam pressure	Supply steam at the correct pressure
Temperature does not go down	Operation at a temperature outside the operating specifications	Check the specifications	Operate within the range of the operating specifications
	There is insufficient desuperheating water	The Y-strainer installed on the desuperheating water line is blocked	Clean the Y-strainer
		The lifting height of the pump has decreased	If the pump lifting height has decreased, replace with a new pump
		Check the aperture of the temperature control valve (Check whether the value on the controller and the valve aperture match)	Correct the air pressure supplied to the positioner Repair any air leakages between the temperature control valve actuator and positioner
	The PID set values are incorrect	Check the PID set values	Correct the PID set values
	The temperature sensor is malfunctioning	Check the temperature value reading from the sensor and compare with the temperature gauge, if the electrical wiring and signal are normal, then the temperature sensor is malfunctioning	Replace with a new temperature sensor
Temperature is below the set value	The temperature sensor is malfunctioning	Check the temperature value reading from the sensor and compare with the temperature gauge, if the electrical wiring and signal are normal, then the temperature sensor is malfunctioning	Replace with a new temperature sensor
	The condensate separator is blocked	Condensate is not being discharged, the surface temperature of the separator is cold	Perform maintenance on the separator or replace with a new separator
	The temperature sensor is installed wrong	The probe section of the temperature sensor is not in the center of the piping (The sensor is measuring the temperature of the condensate on the bottom of the piping)	Correct the installed length of the temperature sensor

Continued on the next page

<b>Item</b>	<b>Cause</b>	<b>Diagnostic</b>	<b>Remedy</b>
Does not reach desired steam temperature	The PID set values are incorrect	Check the PID set values	Correct the PID set values
	The temperature sensor is malfunctioning	Check the temperature value reading from the sensor and compare with the temperature gauge, if the electrical wiring and signal are normal, then the temperature sensor is malfunctioning	Replace with a new temperature sensor
	Component(s) inside the pressure control valve positioner are broken	Check for abnormal sounds from the positioner	Replace with a new positioner (Investigate whether the valve aperture changes frequently or the ambient temperature is too high)
	There is a problem with the input current of the temperature control valve	Check that a signal of 4 – 20 mA is being received by the CV at the connection terminals	Adjust the controller or replace with a new controller
	Desuperheating water pressure is too low	Check whether there is a correct steam pressure	Supply steam at the correct pressure

## TLV EXPRESS LIMITED WARRANTY

Subject to the limitations set forth below, TLV CO., LTD., a Japanese corporation (“**TLV**”), warrants that products which are sold by it, TLV International Inc. (“**TII**”) or one of its group companies excluding TLV Corporation (a corporation of the United States of America), (hereinafter the “**Products**”) are designed and manufactured by TLV, conform to the specifications published by TLV for the corresponding part numbers (the “**Specifications**”) and are free from defective workmanship and materials. The party from whom the Products were purchased shall be known hereinafter as the “**Seller**”. With regard to products or components manufactured by unrelated third parties (the “**Components**”), TLV provides no warranty other than the warranty from the third party manufacturer(s), if any.

### Exceptions to Warranty

This warranty does not cover defects or failures caused by:

1. improper shipping, installation, use, handling, etc., by persons other than TLV, TII or TLV group company personnel, or service representatives authorized by TLV; or
2. dirt, scale or rust, etc.; or
3. improper disassembly and reassembly, or inadequate inspection and maintenance by persons other than TLV or TLV group company personnel, or service representatives authorized by TLV; or
4. disasters or forces of nature or Acts of God; or
5. abuse, abnormal use, accidents or any other cause beyond the control of TLV, TII or TLV group companies; or
6. improper storage, maintenance or repair; or
7. operation of the Products not in accordance with instructions issued with the Products or with accepted industry practices; or
8. use for a purpose or in a manner for which the Products were not intended; or
9. use of the Products in a manner inconsistent with the Specifications; or
10. use of the Products with Hazardous Fluids (fluids other than steam, air, water, nitrogen, carbon dioxide and inert gases (helium, neon, argon, krypton, xenon and radon)); or
11. failure to follow the instructions contained in the TLV Instruction Manual for the Product.

### Duration of Warranty

This warranty is effective for a period of one (1) year after delivery of Products to the first end user. Notwithstanding the foregoing, asserting a claim under this warranty must be brought within three (3) years after the date of delivery to the initial buyer if not sold initially to the first end user.

ANY IMPLIED WARRANTIES NOT NEGATED HEREBY WHICH MAY ARISE BY OPERATION OF LAW, INCLUDING THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE AND ANY EXPRESS WARRANTIES NOT NEGATED HEREBY, ARE GIVEN SOLELY TO THE INITIAL BUYER AND ARE LIMITED IN DURATION TO ONE (1) YEAR FROM THE DATE OF SHIPMENT BY THE SELLER.

### Exclusive Remedy

THE EXCLUSIVE REMEDY UNDER THIS WARRANTY, UNDER ANY EXPRESS WARRANTY OR UNDER ANY IMPLIED WARRANTIES NOT NEGATED HEREBY (INCLUDING THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE), IS **REPLACEMENT**; PROVIDED: (a) THE CLAIMED DEFECT IS

REPORTED TO THE SELLER IN WRITING WITHIN THE WARRANTY PERIOD, INCLUDING A DETAILED WRITTEN DESCRIPTION OF THE CLAIMED DEFECT AND HOW AND WHEN THE CLAIMED DEFECTIVE PRODUCT WAS USED; AND (b) THE CLAIMED DEFECTIVE PRODUCT AND A COPY OF THE PURCHASE INVOICE IS RETURNED TO THE SELLER, FREIGHT AND TRANSPORTATION COSTS PREPAID, UNDER A RETURN MATERIAL AUTHORIZATION AND TRACKING NUMBER ISSUED BY THE SELLER. ALL LABOR COSTS, SHIPPING COSTS, AND TRANSPORTATION COSTS ASSOCIATED WITH THE RETURN OR REPLACEMENT OF THE CLAIMED DEFECTIVE PRODUCT ARE SOLELY THE RESPONSIBILITY OF BUYER OR THE FIRST END USER. THE SELLER RESERVES THE RIGHT TO INSPECT ON THE FIRST END USER'S SITE ANY PRODUCTS CLAIMED TO BE DEFECTIVE BEFORE ISSUING A RETURN MATERIAL AUTHORIZATION. SHOULD SUCH INSPECTION REVEAL, IN THE SELLER'S REASONABLE DISCRETION, THAT THE CLAIMED DEFECT IS NOT COVERED BY THIS WARRANTY, THE PARTY ASSERTING THIS WARRANTY SHALL PAY THE SELLER FOR THE TIME AND EXPENSES RELATED TO SUCH ON-SITE INSPECTION.

#### **Exclusion of Consequential and Incidental Damages**

IT IS SPECIFICALLY ACKNOWLEDGED THAT THIS WARRANTY, ANY OTHER EXPRESS WARRANTY NOT NEGATED HEREBY, AND ANY IMPLIED WARRANTY NOT NEGATED HEREBY, INCLUDING THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, DO NOT COVER, AND NEITHER TLV, TII NOR ITS TLV GROUP COMPANIES WILL IN ANY EVENT BE LIABLE FOR, INCIDENTAL OR CONSEQUENTIAL DAMAGES, INCLUDING, BUT NOT LIMITED TO LOST PROFITS, THE COST OF DISASSEMBLY AND SHIPMENT OF THE DEFECTIVE PRODUCT, INJURY TO OTHER PROPERTY, DAMAGE TO BUYER'S OR THE FIRST END USER'S PRODUCT, DAMAGE TO BUYER'S OR THE FIRST END USER'S PROCESSES, LOSS OF USE, OR OTHER COMMERCIAL LOSSES. WHERE, DUE TO OPERATION OF LAW, CONSEQUENTIAL AND INCIDENTAL DAMAGES UNDER THIS WARRANTY, UNDER ANY OTHER EXPRESS WARRANTY NOT NEGATED HEREBY OR UNDER ANY IMPLIED WARRANTY NOT NEGATED HEREBY (INCLUDING THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE) CANNOT BE EXCLUDED, SUCH DAMAGES ARE EXPRESSLY LIMITED IN AMOUNT TO THE PURCHASE PRICE OF THE DEFECTIVE PRODUCT. THIS EXCLUSION OF CONSEQUENTIAL AND INCIDENTAL DAMAGES, AND THE PROVISION OF THIS WARRANTY LIMITING REMEDIES HEREUNDER TO REPLACEMENT, ARE INDEPENDENT PROVISIONS, AND ANY DETERMINATION THAT THE LIMITATION OF REMEDIES FAILS OF ITS ESSENTIAL PURPOSE OR ANY OTHER DETERMINATION THAT EITHER OF THE ABOVE REMEDIES IS UNENFORCEABLE, SHALL NOT BE CONSTRUED TO MAKE THE OTHER PROVISIONS UNENFORCEABLE.

#### **Exclusion of Other Warranties**

THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, AND ALL OTHER WARRANTIES, INCLUDING BUT NOT LIMITED TO THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, ARE EXPRESSLY DISCLAIMED.

#### **Severability**

Any provision of this warranty which is invalid, prohibited or unenforceable in any jurisdiction shall, as to such jurisdiction, be ineffective to the extent of such invalidity, prohibition or unenforceability without invalidating the remaining provisions hereof, and any such invalidity, prohibition or unenforceability in any such jurisdiction shall not invalidate or render unenforceable such provision in any other jurisdiction.

## Service

For Service or Technical Assistance: Contact your TLV representative or your regional TLV office.

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