About MIYAWAKI

Over 85 years Experience, Technology and Quality

The company MIYAWAKI has over 85 years history as one of the leading Japanese manufacturers of equipment for steam and condensate lines.

MIYAWAKI has a long experience as the leading supplier of steam traps for oil refineries and chemical plants in Japan. Besides of steam traps the company offers a wide range of pressure reducing valves for steam and other media, steam-water-mixing valves, separators, strainer, sight glasses and other ancillary equipment.

MIYAWAKI offers sophisticated hardware and software solutions for managing the steam trap population in a plant.

As the world leader of the production of bimetallic temperature control steam traps, the most effective steam traps for steam tracing and steam main lines in the sense of energy conservation, MIYAWAKI contributes substantially to the reduction of CO_2 emissions and to the development of a healthy environment.

Our mission

Kensuke Miyawaki, President, member of the executive board of MIYAWAKI Inc.

"MIYAWAKI's mission is to promote the ideas of energy saving and environmental protection, to fulfil the deliveries of its products with a high rate of reliability and to provide a high level of technical support for our products.

Reducing the consumption of energy in the form of steam is an extremely important goal of each modern industrial enterprise. Steam Traps are able to play an important role in this process, because by improving the management of the steam and condensate system and by regular professional steam trap surveys, up to 40% of the steam losses can be reduced which are not caused by the manufacturing process.

We have every confidence that the high quality of MIYAWAKI products will enable our customers to save energy and to meet their production goals."

Our history

MIYAWAKI opened its doors in 1933 and began designing steam traps for industrial use. In 1949, after extensive experiments and tests, MIYAWAKI developed an entirely new type of steam trap, with a "Duplex"-type valve, a double-ported valve operating by the pressure differential to increase the condensate capacity.

In the following years, the design was further refined and sales soared to the point where by 1953 the company MIYAWAKI Steam Trap Manufacturing Co., Ltd. was able to incorporate. Along with the development and sales of products other than steam traps, the name changed to MIYAWAKI Inc. in April 1986.

To emphasize the growing international activities of MIYAWAKI Inc., in June 1991 the subsidiary company MIYAWAKI GmbH was established in Germany. Later a joint venture in Russia had been opened. In April 2018, the subsidiary company MIYAWAKI WEST Co. , Ltd was established in China. During the last decade the network of sales representatives around the world was enlarged considerably.

Quality, Performance and Challenges to energy saving

Since 1933, MIYAWAKI has committed itself to a policy of **uncompromising quality, performance and challenges to energy conservation**.

Research and development has a high priority at MIYAWAKI. To meet industry´s demands and to ensure quality, MIYAWAKI invests heavily in the best personnel, facilities, manufacturing techniques and quality control systems available today.

This policy of **„Technology First"** has resulted in major advances in steam trap design and operation.

As a result of the certification MIYAWAKI can assure all our customers of its continuing policy of high quality standards and of the fact that all products are manufactured in accordance with international regulations and technical requirements.

ISO 9001


Certificate

Standard: ISO 9001:2015

Certificate Holder: MIYAWAKI INC
Head Office / Plant
2-1-30, Tagawakita, Yodogawa-ku, Osaka-shi
Osaka, 532-0021, Japan

Scope: Design / Development, Manufacturing and Servicing (Maintenances, Checks and Repairs) of Products for Pressure Vessels such as Steam Traps, Air Traps, Pressure Reducing Valves, Hot Water Supply Systems and Condensate Recovery Systems, and Steam Trap Tracking Systems and Piping Accessories

Proof has been furnished by means of an audit that the requirements of ISO 9001:2015 are met.

Validity: The certificate is valid from 2018-06-27 until 2021-06-26.
First certification 1993

2018-04-26

TÜVRheinland® Precisely Right.

ISO 14001


Certificate

Standard: ISO 14001:2015

Certificate Holder: MIYAWAKI INC
Head Office / Plant
2-1-30, Tagawakita, Yodogawa-ku, Osaka-shi
Osaka, 532-0021, Japan

Scope: Design / Development, Manufacturing and Servicing (Maintenances, Checks and Repairs) of Products for Pressure Vessels such as Steam Traps, Air Traps, Pressure Reducing Valves, Hot Water Supply Systems and Condensate Recovery Systems, and Steam Trap Tracking Systems and Piping Accessories

Proof has been furnished by means of an audit that the requirements of ISO 14001:2015 are met.

Validity: The certificate is valid from 2019-03-08 until 2022-03-03.
First certification 2001

2019-02-14

TÜVRheinland® Precisely Right.

European Directive 2014/68/EU


Certificate

Module A2
according to Directive 2014/68/EU

Name and address of the manufacturer: MIYAWAKI INC.
2-1-30 Tagawakita, Yodogawa-ku
Osaka 532-0021, JAPAN

CE 0035

Description of pressure equipment: Steam, Gas, Air Trap and other pressure accessories in category I and II

During the periodical monitoring, compliance with the directive has been demonstrated.
The next monitoring will be performed in December 2020.

Yokohama, December 27, 2019

TÜVRheinland® Precisely Right.

AD 2000-W0


Certificate

Material Manufacturer Approval
according to
AD 2000-Merkblatt W0

Name and Address of the manufacturer: MIYAWAKI INC.
2-1-30 Tagawakita, Yodogawa-ku
Osaka 532-0021 JAPAN

The material manufacturer has been inspected and approved acc. to AD 2000-Merkblatt W0.
All pertinent requirements are met.
Among others, the material manufacturer
- has facilities permitting manufacturing and inspection in conformity with the technical state of the art,
- operates a quality system which guarantees that manufacturing and inspection of the products stated in the scope are in conformity with the applicable technical codes and regulations,
- employs qualified supervisory and inspection personnel

Scope of Approval: see Annex

Manufacturing Plant: MIYAWAKI INC.
2-1-30 Tagawakita, Yodogawa-ku
Osaka 532-0021 JAPAN

Valid until: December 31, 2020

Yokohama, December 15, 2017 on behalf Dipl.-Ing. Hajl

TÜVRheinland® Precisely Right.

Certificate of Conformity Russia


ТАМОЖЕННЫЙ СОЮЗ

EAC

СЕРТИФИКАТ СООТВЕТСТВИЯ

№ ТС RU C-JP.АЯ45.В.00885

Серия RU № 0573082

ОРГАН ПО СЕРТИФИКАЦИИ

ЗАЯВИТЕЛЬ

ИЗГОТОВИТЕЛЬ

ПРОДУКЦИЯ

КОД ТН ВЭД ТС

СООТВЕТСТВУЕТ ТРЕБОВАНИЯМ

СЕРТИФИКАТ ВЫДАН НА ОСНОВАНИИ

ДОПОЛНИТЕЛЬНАЯ ИНФОРМАЦИЯ

Pressure Equipment Directive 2014/68/EU of the European Parliament and of the Council


Certificate

Module A2

according to Directive 2014/68/EU

CE 0035

TÜVRheinland®

In the course of the harmonization of the laws of the EU Member States concerning pressure equipment, the Pressure Equipment Directive 97/23/EC (PED) had been adopted in May 1997. The Directive came into effect on 30 May 2002. Considering the experience and changes during the implementation of the Directive 97/23/EC, the European Union published on June 27, 2014 the new Pressure Equipment Directive 2014/68/EU. The new Directive entered into force on July 19, 2016.
According to the PED all manufacturers of pressure equipment covered by the PED, are under the obligation to subject each item of equipment to one of the conformity assessment procedures described in the PED. The conformity assesment procedures to be applied to an item of pressure equipment with a view to affixing the CE marking shall be determined by the category, in which the equipment is classified. In this connection it is necessary to take into consideration the statement of the PED, that pressure equipment which is subject to Article 4, Section 3 of the PED "…shall be designed and manufactured in accordance with the sound engineering practice of a Member State in order to ensure safe use. … Such equipment … shall not bear the CE marking referred to in Article 18" of the PED.
In cooperation with TÜV Rheinland Industrie Service GmbH MIYAWAKI Inc., Osaka, Japan examined all products with respect to the PED and certified its production process in accordance with Modul A2 of the PED (internal manufacturing checks with monitoring of the final assessment).

As a result of this certification process MIYAWAKI Inc. draws the following conclusions:

1. The following MIYAWAKI products are classified according to Article 4, Section 3 of the PED which does not allow to bear the CE marking:

Steam Traps: TB1N, TBC2, TBC2B, TB7N, TB9N, TB51, TB52, TBH71, TBH72, TBH81, TBH82, W, DC1, DC2, DV1, DL1, DX1, DF1, S31N, SC31, SC, SF, SV, SL, SU2N, SU2H, SD1, S55N, S55H, S61N, S62N, ER105, ER110, ER116, ES5, ESU5, ES8N, ES10, ES12N, ESH8N, G11N, G12N, G3N-10R (to DN65), G3N-16R (to DN50), G2, GC1, GC20, G20N

Steam Pressure Reducing Valves: RE1, RE2, RE3, REC1, RE10N

Steam-Water-Mixing Valve: MX1N

All above MIYAWAKI products are designed and manufactured in accordance with the sound engineering practice as requested by the PED.

2. Steam traps not included into point 1 belong to category I or category II according to Annex II & III of the PED. They will bear the CE marking and the conformity with the PED will be confirmed by issuing a declaration of conformity.

CE

As a result of the certification by TÜV Rheinland Industrie Service GmbH MIYAWAKI can assure all our customers of its continuing policy of high quality standards and of the fact, that all products are manufactured in accordance with the regulations and technical requirements of the EU.

		First Choice	Second Choice
Steam Mains	< 1,6 MPa	**TB9N**	**GC1, D, S, ES**
	< 2,1 MPa	**TB7N**	**GC1, S**
	< 6,4 MPa	**TB51, TB52**	**S61N, S62N, ESH**
	< 20,0 MPa	**TBH71, 72, 81, 82**	
Process Equipment	Heater	**G, ES, ER**	**S**
	Heat Exchanger	**G**	**ES, ER**
	Vaporizer	**G**	**ES, S**
	Distiller	**D**	**ES, S**
	Sterilizer	**D**	**ES, G, S**
	Cylinder Dryer	**ES, ER**	
	Band Dryer	**G**	**ES, ER, D**
	Multi-Platen Presses	**G**	**ES, D, S**
	Vulcanizer	**D**	**S, ES**
	Tyre Presses	**D**	**S, ES**
	Autoclaves	**D**	**G, ES**
Laundry Equipment	Dryer	**G**	**ES, D, S**
	Tumbler	**ES, ER**	**D, S**
	Presses	**D**	**S, ES**
	Steam Mannequins	**D**	**ES, S**
	Steam Iron	**SL3**	**SD1**
	Steam Mangles	**D, G**	**ES, S**
Food Processing Equipment	Process Boiling Pans	**G**	**ES, D**
	Hot Tables	**D, G**	**ES**
	Jacketed Boiling Pans	**D**	**G, ES, S**
	Tilting Pans	**ES**	**D**
	Brewing Pans	**G**	**ES, D**
	Evaporator	**G**	**ES, ER**
	Retorts	**G**	**ES, ER**
Heating & Air Conditioning	Steam Radiator	**W**	**D**
	Unit Heaters	**G**	**ES**
	Convectors	**W**	**D, ES**
	Radiant Panels	**W**	**D, ES**
	Air Heater	**D**	**ES, G**
	Air Humidifiers	**ES, G**	**D, S**
	Heating Coils	**D, ES**	**G, S**
	Air Conditioning Units	**ES, G**	**D**
	Calorifiers	**G, ES**	**D**
Tracing	Steam Tracer Lines	**TB**	**D**
	Tank Heating	**TB**	**D, ES, S**
	Copper Tracing (Instrument Tracing)	**TB1N**	**DC1**

Disclaimer: This Guide is offered as a recommendation guide only and is not intended to replace the selection by a qualified person.

Temperature Control Steam Traps

SERIES TB

Temperature Control Steam Traps are bimetallic steam traps which do not follow the steam saturation curve. The discharge temperature can be adjusted manually, what allows to adopt these steam traps to a wide range of applications, where optional undercooling is possible and where sensible heat savings and flash steam reduction are desirable.
These steam traps are perfectly fitted for reducing the steam consumption at steam main and steam tracing lines thus guaranteeing a high degree of energy savings.

Models	**TB7N & TB9N**	with forged steel body for low and medium pressure applications
	TBU4, TBU4B	with stainless steel body for low pressure tracing
	TB1N	with steel body for low pressure applications
	TB51/52	with forged steel body for high pressure applications
	TBH71/72/81/82	with cast steel body for high pressure applications

Features

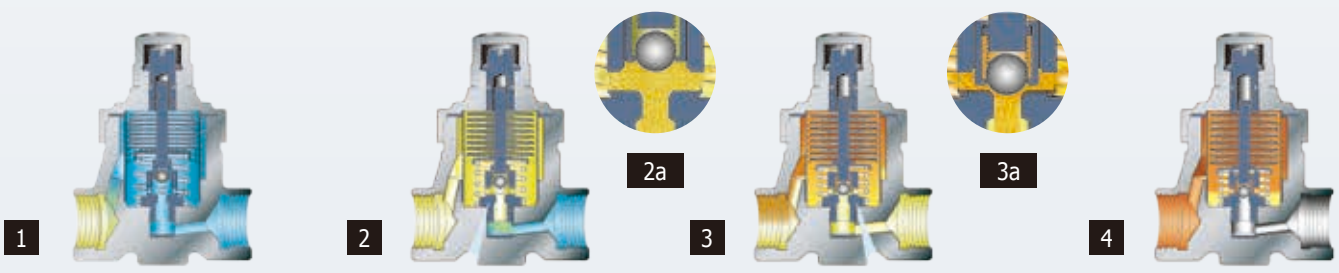
- All traps are equipped with the patented valve mechanism SCCV®-System (see pages 88 – 89).
- The SCCV®-System ensures a superior closing performance in the center of the port, greatly reduced wear of the internal parts and extended lifetime of the trap.
- Highly efficient in energy conservation – eliminates virtually 100% of steam loss.
- Continuous discharge of the condensate according to the adjusted temperature – not influenced by inlet pressure changes.
- Inline repairable – easy and quick replacement of the bimetal unit and the seat.
- Readjustment possible while the trap is in operation (for low pressure applications).
- All traps equipped with integral strainer.
- Can be installed both horizontally and vertically.

Suitable for:

TB7N	Steam main lines and tracing lines
TB9N	Steam main lines, tracing and small heat exchanger applications with specific condensate undercooling
TBU4, TB1N	Steam tracing lines
TB51/52	High pressure steam main lines
TBH71/72/81/82	High pressure steam main lines

Operating principle

cold condensate hot condensate



1) On start-up, the bimetal discs are all flat and the valve shaft is up with the valve fully open. Virtually all cold condensate and air are discharged.

2) As the temperature of the condensate increases, the bimetal discs begin to curve gradually and force the valve shaft and the valve holder to move down.

2a) Most of the condensate is still discharged quickly, since the valve and the holes in the fixed guide on the valve seat are still fully open.

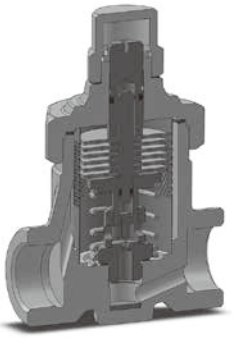
3) When condensate with higher temperature (near to set temperature) flows in, the bimetal discs are curved even more and at the same time the valve shaft moves down and the valve holder closes the holes in the guide partially.

3a) The amount of condensate being discharged is reduced quickly. This prolongs the time that the hot condensate stays near the bimetal discs and the heat of the condensate is transferred to the bimetals much more effectively.

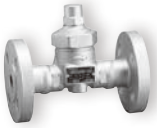
4) In case of very low condensate flow, the holes in the guide are closed completely by the valve holder and the valve will close precisely in the center of the seat. Normally, the trap is filled with hot condensate and the operation will rest in the state shown in figure 3. Condensate will be discharged continuously at a stable temperature (very close to the set temperature).

SERIES TB Bimetal Temperature Control Trap

TB7N



Screwed & Socket Weld



Flanged Connection

with Ball Valve

with Blow Valve

with Scale Removal

Available options **TB7N**

- with ball valve (TB7BN-C)
- with blow valve (TB7BN-R)
- with scale removal (TB7N-SR)

Special version **TB7N-P**

with maximum operating pressure
2,7 MPa / 392 psig

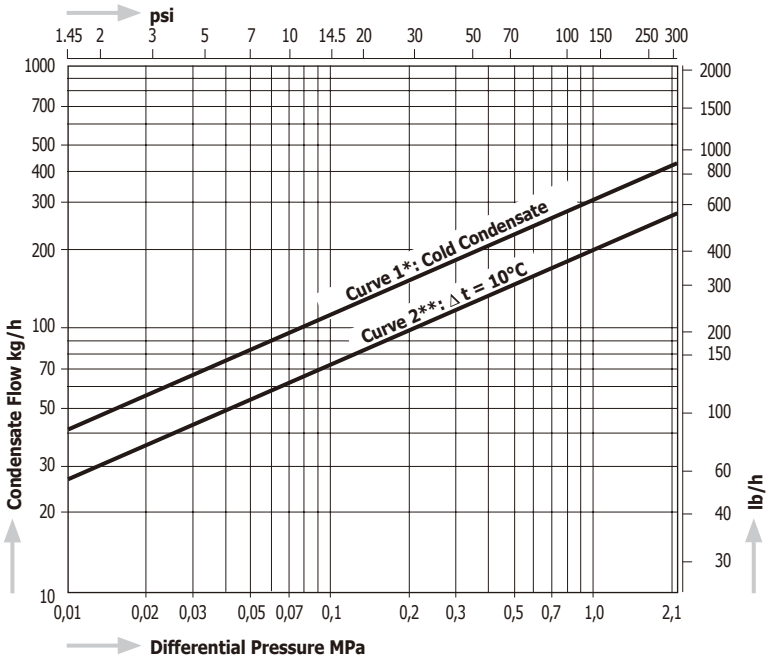
Special face-to-face dimensions available.

* **Curve 1** shows the trap's maximum capacity when discharging cold condensate.

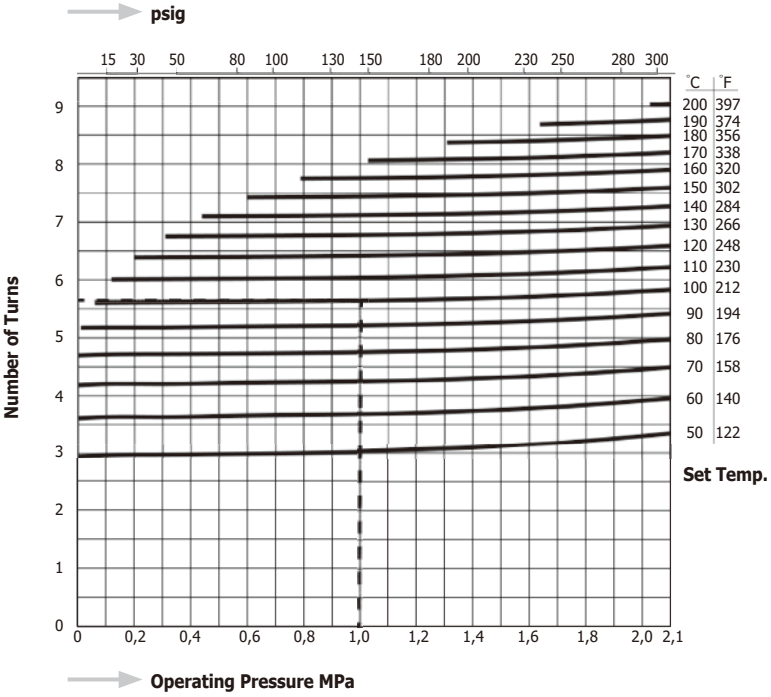
** **Curve 2** shows the trap's maximum capacity when discharging hot condensate at a temperature of 10°C (18°F) below the adjusted temperature of the trap.

Standard factory setting*:
100°C at 1,0 MPa (212°F at 145 psig)
* Settings may differ in various regions.
For more information please contact us.

Capacity Chart **TB7N**

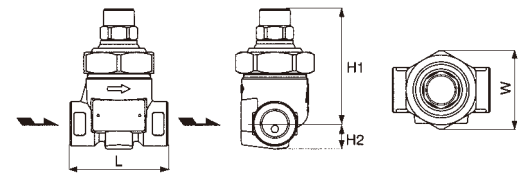


Temperature Stroke Chart **TB7N**

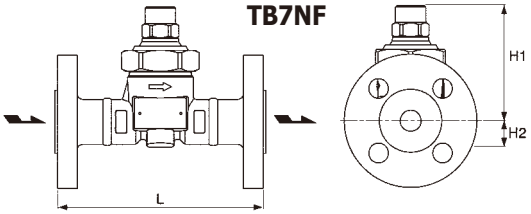


Max. allowable pressure (PMA) = 4,0 MPa (580 psig)
Max. allowable temperature (TMA) = 400°C (752°F)

Dimensions **TB7N / TB7NW**



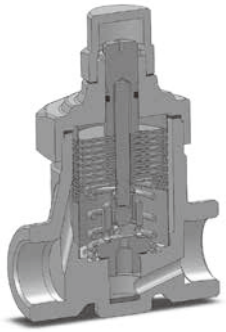
TB7NF



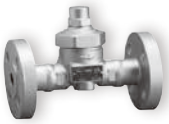
Model	Connections	Size	Max. Operating Pressure		Max. Operating Temperature		Adjustable Range		Dimensions (mm)				Dimensions (in)				Body Material	Weight	
			MPa	psig	°C	°F	°C	°F	L	H_1	H_2	W	L	H_1	H_2	W		kg	lb
TB7N	Screwed Rc, NPT	½¨	2,1	305	350	662	50 – 200	122 – 392	70	82	18	56	2.75	3.2	0.7	2.2	Forged Steel A105	0,9	2.0
		¾¨							80		19		3.1		0.75			1,0	2.2
		1¨									23				0.9			1,1	2.4
TB7NW	Socket Weld JIS, ASME, DIN	½¨	2,1	305	350	662	50 – 200	122 – 392	70	82	18	56	2.75	3.2	0.7	2.2		0,9	2.0
		¾¨							80		19		3.1		0.75			1,0	2.2
		1¨									23				0.9			1,1	2.4
TB7NF	Flanged JIS, ASME	½¨	2,1	305	350	662	50 – 200	122 – 392	145	82	18	56	5.7	3.2	0.7	2.2		2,0-2,6 *1	4.4-5.7 *1
		¾¨									19				0.75			2,5-3,4 *1	5.5-7.5 *1
		1¨									23				0.9			3,2-4,2 *1	7.0-9.3 *1
	Flanged DIN PN40	DN15							150	82	18	56	5.9	3.2	0.7	2.2		2,6	5.7
		DN20																3,4	7.5
		DN25							160				6.3					4,0	8.8

***1 Depending on size and flange standard the weight of the traps differs. Please, look at our technical drawings.**

TB9N



Screwed & Socket Weld



Flanged Connection

with Ball Valve

with Blow Valve

with Scale Removal

Available options **TB9N**

- with a ball valve (TB9BN-C)
- with a blow valve (TB9BN-R)
- with scale removal (TB9N-SR)

Special face-to-face dimensions available.

* **Curve 1** shows the trap's maximum capacity when discharging cold condensate.

** **Curve 2** shows the trap's maximum capacity when discharging hot condensate at a temperature of 10°C (18°F) below the adjusted temperature of the trap.

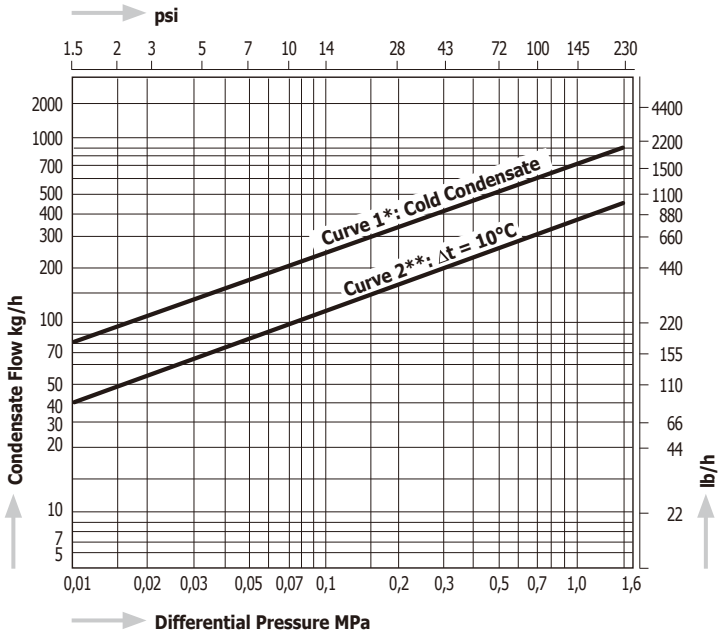
The dashed line shows the standard factory setting:

100°C at 0,5 MPa (212°F at 73 psig)

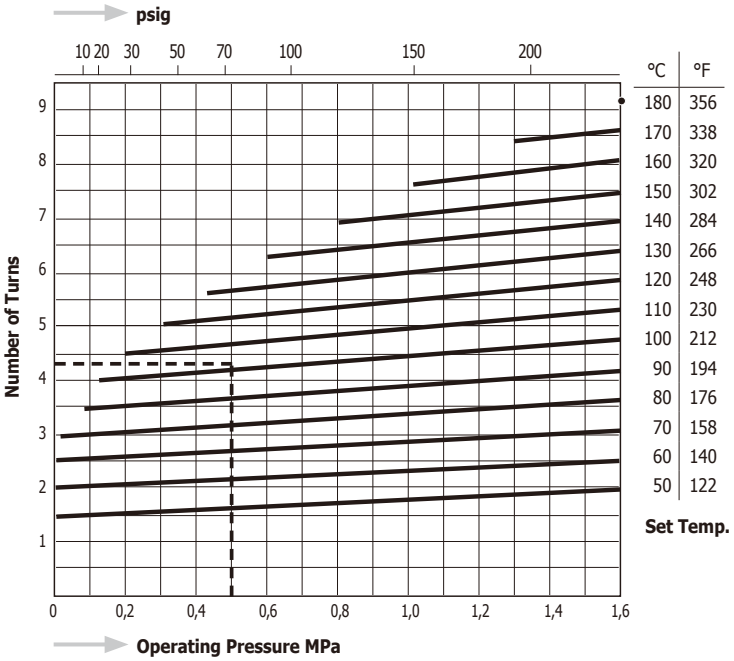
Max. allowable pressure (PMA):
4,0 MPa (580 psig)

Max. allowable temperature (TMA):
400°C (752°F)

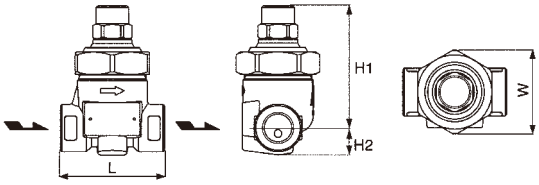
Capacity Chart **TB9N**



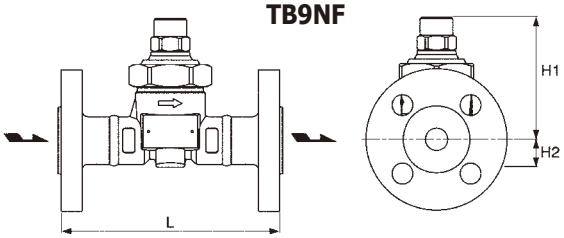
Temperature Stroke Chart **TB9N**



Dimensions **TB9N / TB9NW**



TB9NF

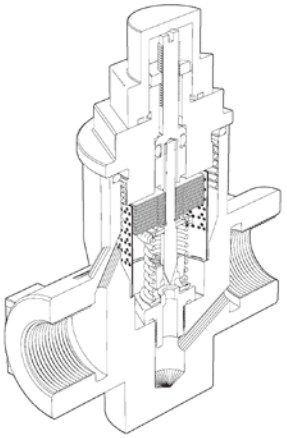


Model	Connections	Size	Max. Operating Pressure		Max. Operating Temperature		Adjustable Range		Dimensions (mm)				Dimensions (in)				Body Material	Weight	
			MPa	psig	°C	°F	°C	°F	L	H_1	H_2	W	L	H_1	H_2	W		kg	lb
TB9N	Screwed Rc, NPT	½¨	1,6	230	350	662	50 – 180	122 – 356	70	82	18	56	2.75	3.2	0.7	2.2	Forged Steel A105	0,9	2.0
		¾¨							80		19		3.1		0.75			1,0	2.2
		1¨									23				0.9			1,1	2.4
TB9NW	Socket Weld JIS, ASME, DIN	½¨	1,6	230	350	662	50 – 180	122 – 356	70	82	18	56	2.75	3.2	0.7	2.2		0,9	2.0
		¾¨							80		19		3.1		0.75			1,0	2.2
		1¨									23				0.9			1,1	2.4
TB9NF	Flanged JIS, ASME	½¨	1,6	230	350	662	50 – 180	122 – 356	145	82	18	56	5.7	3.2	0.7	2.2		2,0-2,5 *1	4.4-5.5 *1
		¾¨									19				0.75			2,5-3,4 *1	5.5-7.5 *1
		1¨									23				0.9			3,2-4,2 *1	7.0-9.3 *1
	Flanged DIN PN40	DN15							150	82	18	56	5.9	3.2	0.7	2.2		2,6	5.7
		DN20																3,4	7.5
		DN25							160				6.3					4,0	8.8

***1 Depending on size and flange standard the weight of the traps differs. Please, look at our technical drawings.**

SERIES TB **Bimetal Temperature Control Trap – Super Trace**

TBU4, TBU4B



Screwed

with Scale Removal

with Ball Valve

Available options **TBU4**

with a ball valve (TBU4B-C)
with scale removal (TBU4-SR)

Special version **TBU4-10**

Operating pressure range:

0,5 – 1 MPa (73 – 145 psig)

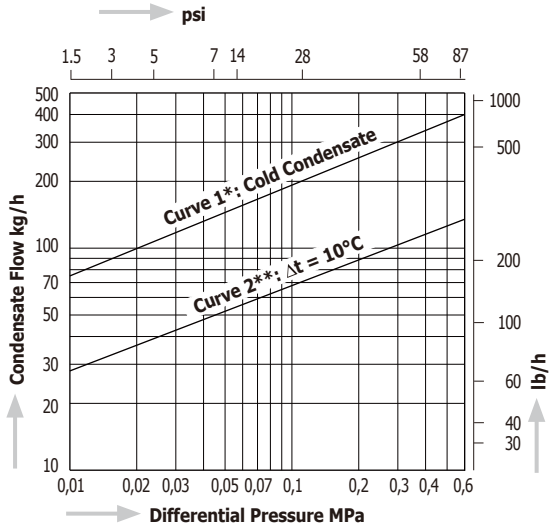
* **Curve 1** shows the trap's maximum capacity when discharging cold condensate.

** **Curve 2** shows the trap's maximum capacity when discharging hot condensate at a temperature of 10°C (18°F) (TBU4) / 5°C (9°F) (TB1N) below the adjusted temperature of the trap.

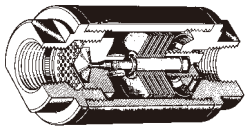
Standard factory setting:
70°C at 0,5 MPa; 158°F at 73 psig

The dashed line
shows the standard factory setting.

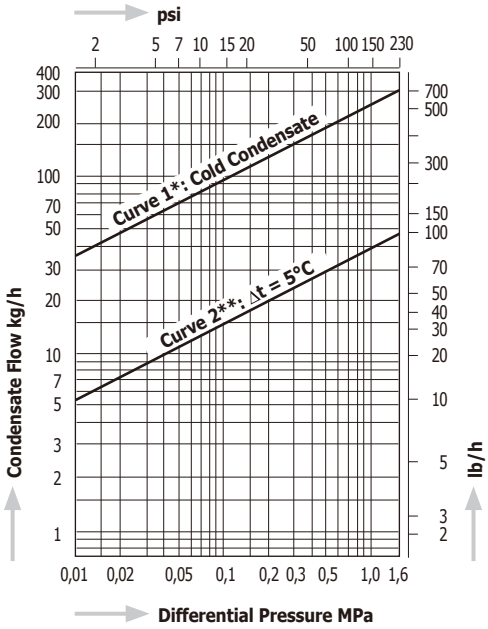
Capacity Chart **TBU4/TBU4B-6**



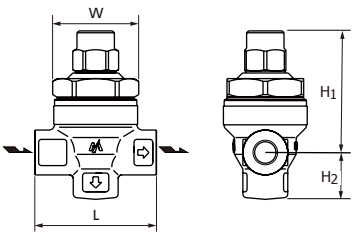
TB1N



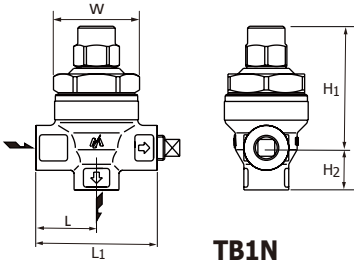
Capacity Chart **TB1N**



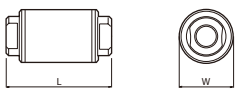
Dimensions **TBU4-6**



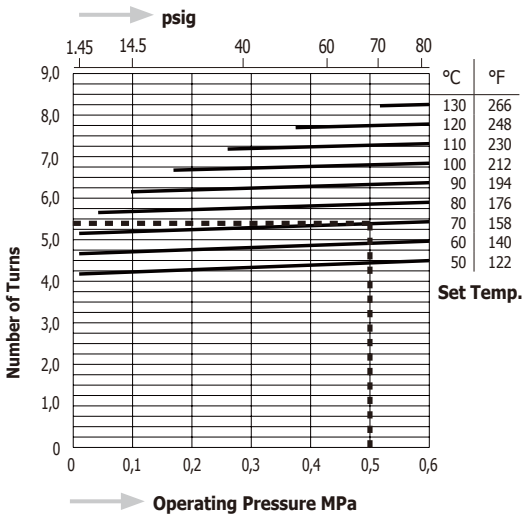
TBU4B-6



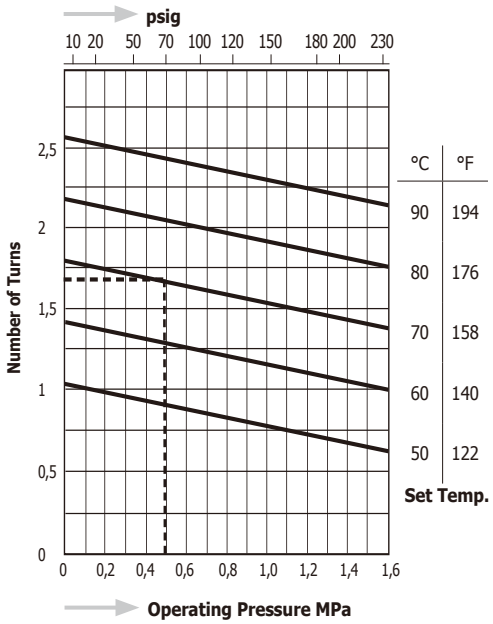
TB1N



Temperature Stroke Chart **TBU4/TBU4B-6**

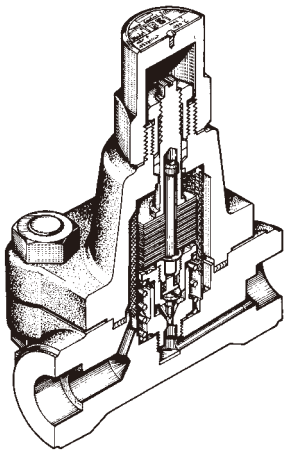


Temperature Stroke Chart **TB1N**



Model	Connections	Size	Max. Operating Pressure		Max. Operating Temperature		Adjustable Range		Dimensions (mm)					Dimensions (in)					Body Material	Weight	
			MPa	psig	°C	°F	°C	°F	L	L_1	H_1	H_2	W	L	L_1	H_1	H_2	W		kg	lb
TBU4-6	Screwed Rc, NPT	¼", ⅜"	0,6	87	220	428	50 – 130	122 – 266	65	–	65	25	46	2.6	–	2.6	1.0	1.8	Stainless Steel SCS F304	0,58	1.28
TBU4B-6									32,5	65		22,5		1.3	2.6		0.9				
TB1N	Screwed Rc, NPT	¼", ⅜"	1,6	230	350	662	50 – 90	122 – 194	70	–	–	–	38	2.8	–	–	–	1.5	Carbon Steel S25C	0,35	0.77

TB51, TB52



Screwed & Socket Weld **Flanged**

Special face-to-face dimensions available.

* **Curve 1** shows the trap's maximum capacity when discharging cold condensate.

** **Curve 2** shows the trap's maximum capacity when discharging hot condensate at a temperature of 10°C (18°F) below the adjusted temperature of the trap.

Standard factory setting:

TB51-45, TB52-45:

180°C at 2,1 MPa; 356°F at 305 psig

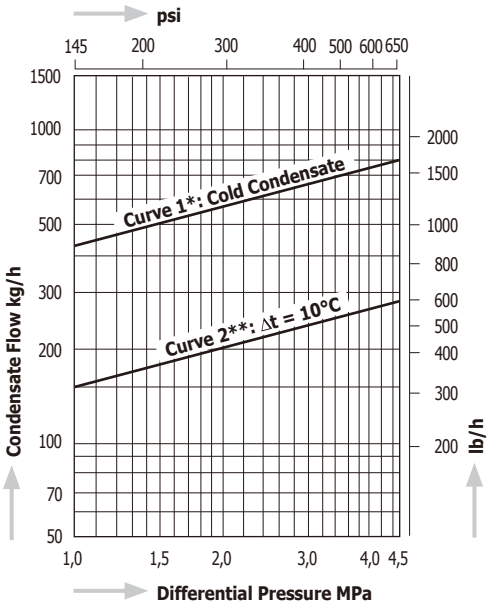
TB51-65, TB52-65:

220°C at 4,4 MPa; 428°F at 638 psig

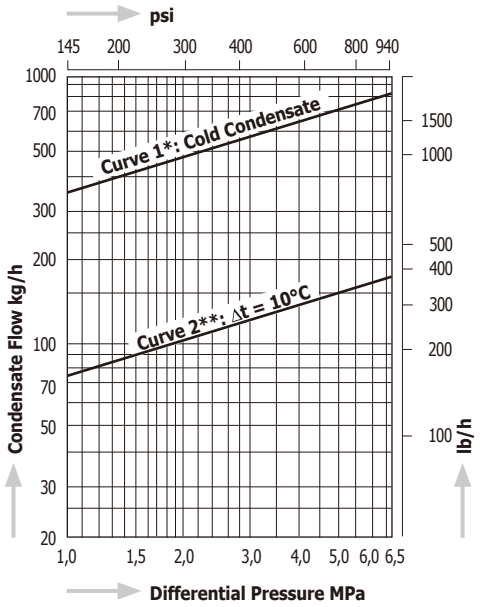
The dashed line

shows the standard factory setting.

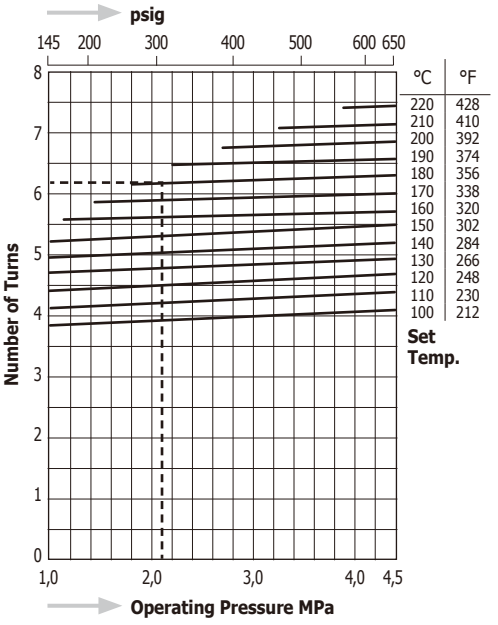
Capacity Chart TB51/52-45



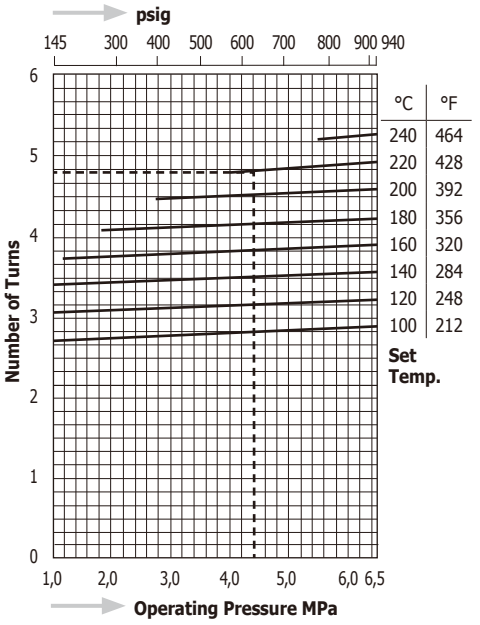
Capacity Chart TB51/52-65



Temperature Stroke Chart TB51/52-45



Temperature Stroke Chart TB51/52-65



Dimensions TB51, TB52 TB51F, TB52F

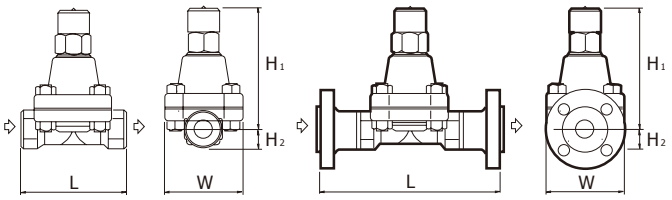


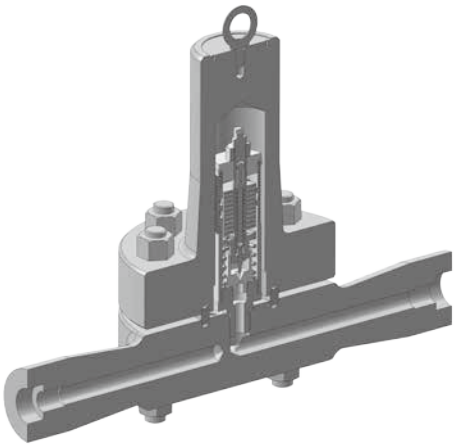
Table 1: Face-to-face dimensions / weights

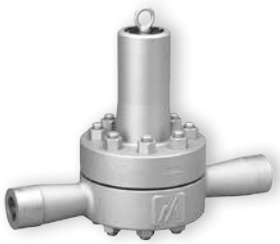
Model	Size (in)	ASME 600 lb				DIN PN63 / PN100				JIS 63 K / ASME 900 lb			
		mm	in	kg	lb	mm	in	kg	lb	mm	in	kg	lb
TB51F TB52F	½¨	200	7.9	7,3	16.1	210	8.3	9,4	20.7	220	8.7	9,6	21.2
	¾¨	210	8.3	8,5	18.7	230	9.1	11,4	25.1	230	9.1	11,1	24.5
	1¨	240	9.4	9,6	21.2	230	9.1	12,5	27.6	240	9.4	12,1	26.7

Model		Connections	Size	Max. Operating Pressure		Max. Operating Temperature		Adjustable Range		Dimensions (mm)				Dimensions (in)				Body Material	Weight	
				MPa	psig	°C	°F	°C	°F	L	H_1	H_2	W	L	H_1	H_2	W		kg	lb
TB51 (TB52)	45	Screwed Rc, NPT	½¨ – 1¨	4,5	653	425 (475)	800 (887)	100 – 220	212 – 428	130	155	25	100	5.1	6.1	1.0	3.9	Forged Steel A105 TB52: A182 F22	5,7	12.6
	65			6,5	943			100 – 240	212 – 464											
TB51 (TB52)W	45	Socket Weld JIS, ASME, DIN	½¨ – 1¨	4,5	653	425 (475)	800 (887)	100 – 220	212 – 428	130	155	25	100	5.1	6.1	1.0	3.9		5,7	12.6
	65			6,5	943			100 – 240	212 – 464											
TB51 (TB52)F	45	Flanged JIS, ASME, DIN	½¨ – 1¨	4,5	653	425 (475)	800 (887)	100 – 220	212 – 428	Table 1	155	25	100	Table 1	6.1	1.0	3.9		Table 1	Table 1
	65			6,5	943			100 – 240	212 – 464											

SERIES TB **Bimetal Temperature Control Trap – High Pressure**

TBH71, TBH72
TBH81, TBH82





TBH72, TBH81, TBH82
Socket Weld

TBH71
Flanged

Standard factory settings

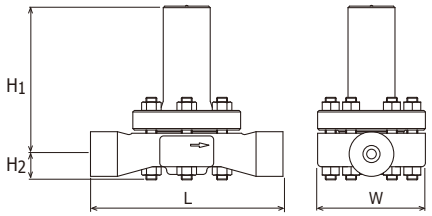
Model	MPa	psig	Model	MPa	psig
TBH71-80	6,5 (210°C)	942 (410°F)	**TBH72-80**	6,5 (210°C)	942 (410°F)
TBH71-105	8,0 (230°C)	1160 (446°F)	**TBH72-105**	8,0 (230°C)	1160 (446°F)
TBH81-150	10,5 (250°C)	1522 (482°F)	**TBH82-150**	10,5 (250°C)	1522 (482°F)
TBH81-200	15,0 (270°C)	2175 (518°F)	**TBH82-200**	15,0 (270°C)	2175 (518°F)

Pressure shell design conditions

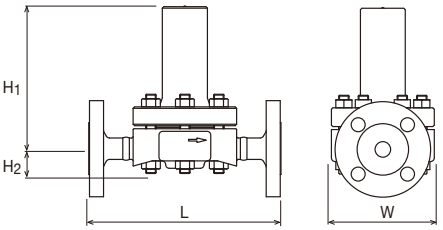
Model	PMA		TMA	
	MPa	psig	°C	°F
TBH71-80	11,8 (425°C)	1711 (800°F)	593 (1,3MPa)	1100 (188 psig)
TBH71-105				
TBH72-80	25,0 (492°C)	3625 (918°F)	593 (3,7MPa)	1100 (536 psig)
TBH72-105				
TBH81-150	25,0 (492°C)	3625 (918°F)	593 (3,7MPa)	1100 (536 psig)
TBH81-200				
TBH82-150	25,0 (520°C)	3625 (968°F)	593 (5,9MPa)	1100 (856 psig)
TBH82-200	25,0 (538°C)	3625 (1000°F)	593 (7,3MPa)	1100 (1059 psig)

Dimensions

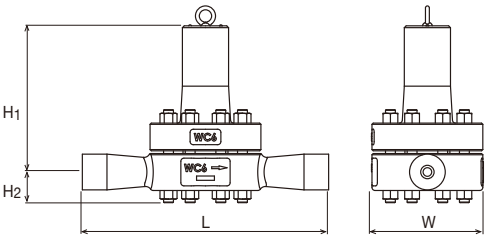
TBH71- ...W
Socket Weld



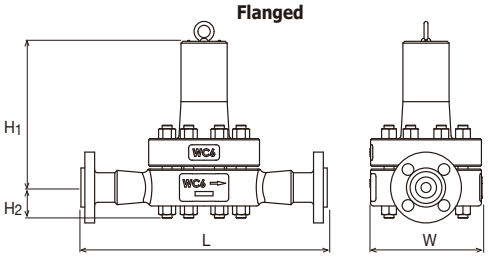
TBH71- ...F
Flanged



TBH72- ...W, TBH81- ...W, TBH82- ...W
Socket Weld



TBH72- ...F, TBH81- ...F, TBH82- ...F
Flanged



Model	Connections	Size	Max. Operating Pressure		Max. Operating Temperature		Adjustable Range		Dimensions (mm)				Dimensions (in)				Body Material	Weight	
			MPa	psig	°C	°F	°C	°F	L	H_1	H_2	W	L	H_1	H_2	W		kg	lb
TBH71-80W	Socket Weld JIS, ASME, DIN	½¨ – 1¨	8,0	1160	470	878	100 – 260	212 – 500	250	195	33	140	9.8	7.7	1.3	5.5	Cast Steel A217WC6	13	28.6
TBH71-105W			10,5	1522			100 – 280	212 – 536										13	28.6
TBH81-150W			15,0	2175			100 – 300	212 – 572	400	268	50	180	15.7	10.6	2.0	7.1		29	63.8
TBH81-200W			20,0	2900			100 – 320	212 – 608										29	63.8
TBH71-80F	Flanged JIS, ASME, DIN	½¨ – 1¨	8,0	1160	470	878	100 – 260	212 – 500	260	195	33	140	10.2	7.7	1.3	5.5	Cast Steel A217WC6	19*	41.8*
TBH71-105F			10,5	1522			100 – 280	212 – 536										19*	41.8*
TBH81-150F			15,0	2175			100 – 300	212 – 572	400	268	50	180	15.7	10.6	2.0	7.1		38*	83.6*
TBH81-200F			20,0	2900			100 – 320	212 – 608										38*	83.6*

Model	Connections	Size	Max. Operating Pressure		Max. Operating Temperature		Adjustable Range		Dimensions (mm)				Dimensions (in)				Body Material	Weight	
			MPa	psig	°C	°F	°C	°F	L	H_1	H_2	W	L	H_1	H_2	W		kg	lb
TBH72-80W	Socket Weld JIS, ASME, DIN	½¨ – 1¨	8,0	1160	550	1022	100 – 260	212 – 500	400	268	50	180	15.7	10.6	2.0	7.1	A217WC6	29	63.8
TBH72-105W			10,5	1522			100 – 280	212 – 536										29	63.8
TBH82-150W			15,0	2175			100 – 300	212 – 572		282	62	190		11.1	2.4	7.5	A217WC9	37	81.4
TBH82-200W			20,0	2900			100 – 320	212 – 608	465	310	75	235	18.3	12.2	3.0	9.3		68	149.6
TBH72-80F	Flanged JIS, ASME, DIN	½¨ – 1¨	8,0	1160	550	1022	100 – 260	212 – 500	400	268	50	180	15.7	10.6	2.0	7.1	A217WC6	35*	77.0*
TBH72-105F			10,5	1522			100 – 280	212 – 536										38*	83.6*
TBH82-150F			15,0	2175			100 – 300	212 – 572		282	62	190		11.1	2.4	7.5	A217WC9	46*	101.2*
TBH82-200F			20,0	2900			100 – 320	212 – 608	465	310	75	235	18.3	12.2	3.0	9.3		76*	167.2*

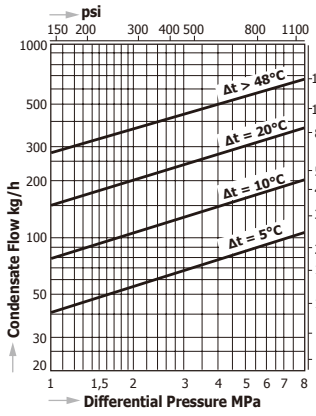
*** The weight refers to 1¨ flanged type. Depending on the size and flange standard the weights may differ.**

Forged Steel (A182F91) as body material for TBH72 and TBH82 is available as special design. For more details, please contact MIYAWAKI Inc. or an authorized representative.

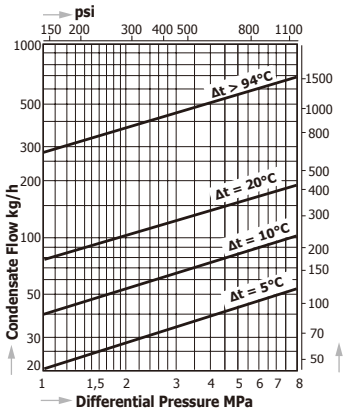
Bimetal Temperature Control Trap – High Pressure SERIES TB

Capacity Charts

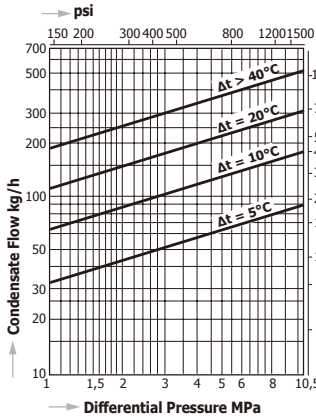
TBH71 - 80



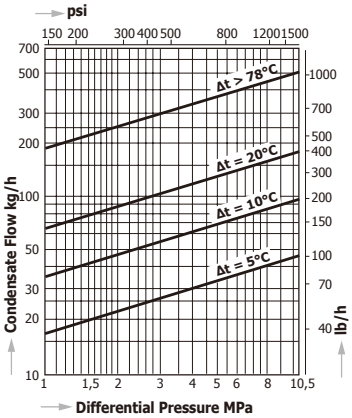
TBH72 - 80



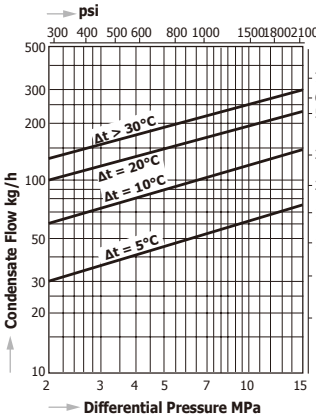
TBH71 - 105



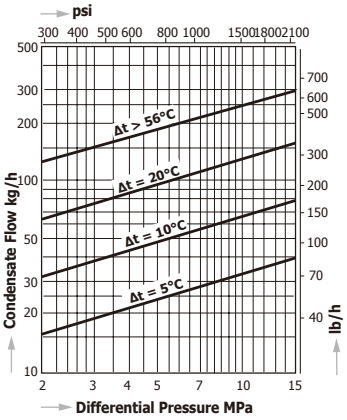
TBH72 - 105



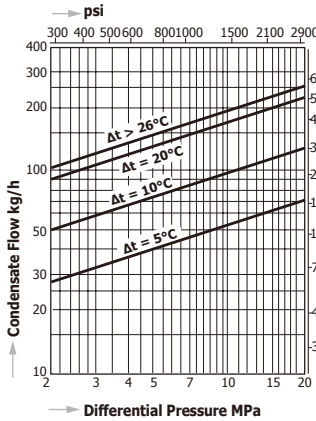
TBH81 - 150



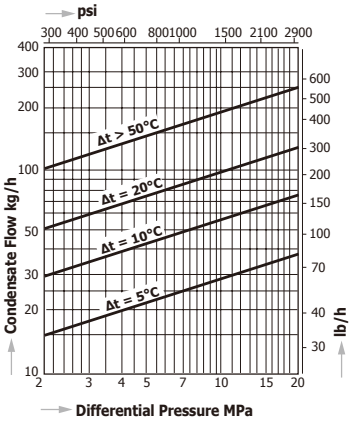
TBH82 - 150



TBH81 - 200

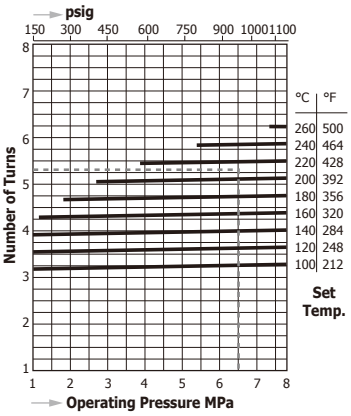


TBH82 - 200

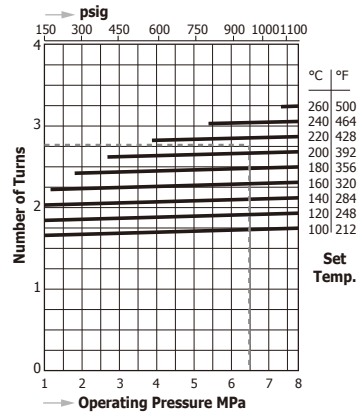


Temperature Stroke Charts

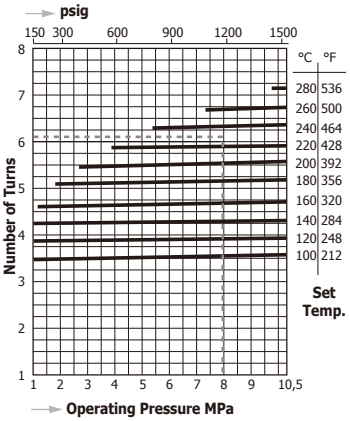
TBH71 - 80



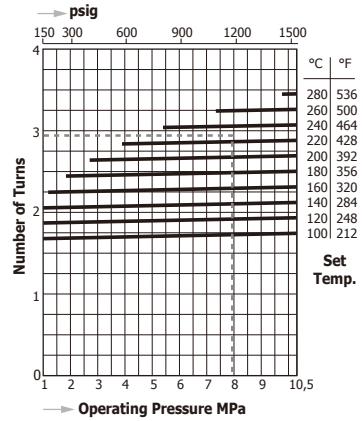
TBH72 - 80



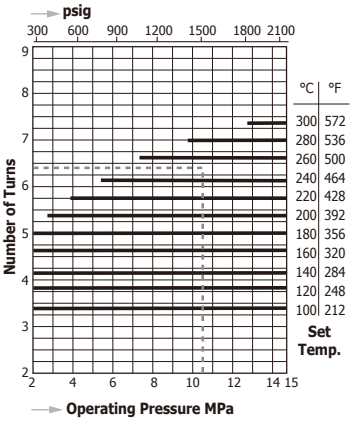
TBH71 - 105



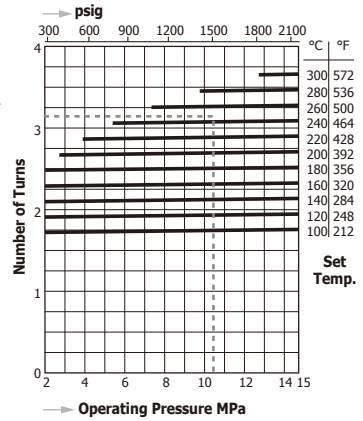
TBH72 - 105



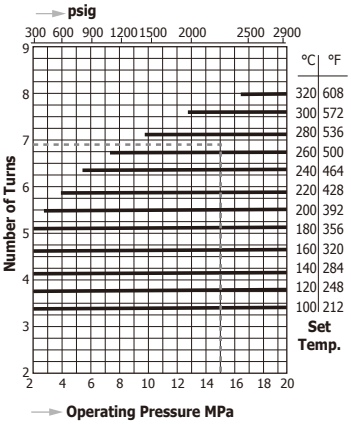
TBH81 - 150



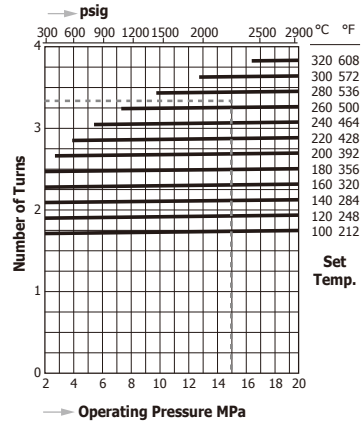
TBH82 - 150



TBH81 - 200



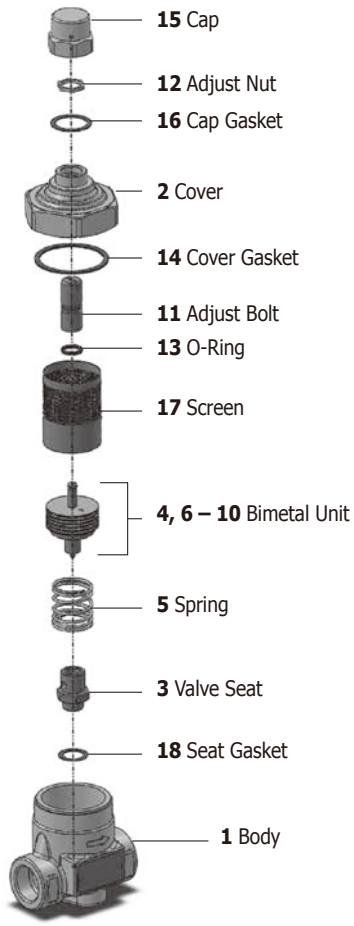
TBH82 - 200



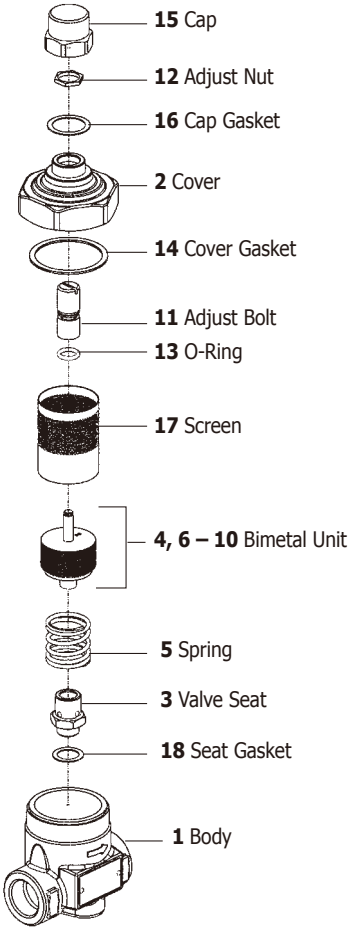
The dashed line shows the standard factory setting.

SERIES TB Spare Parts

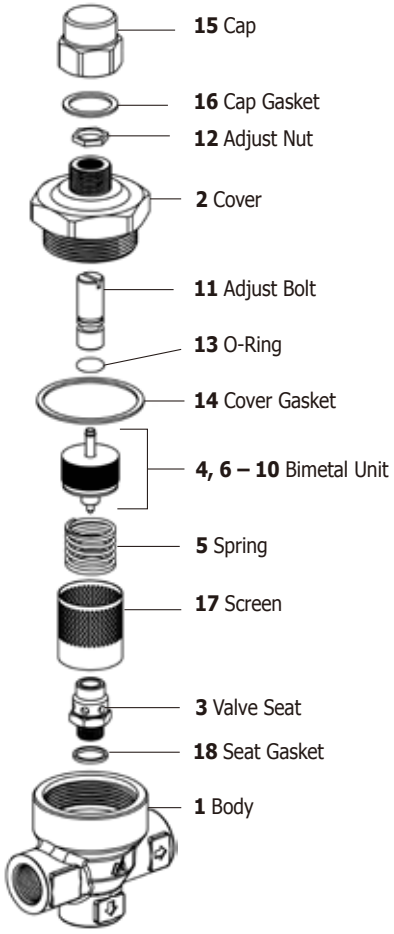
TB7N



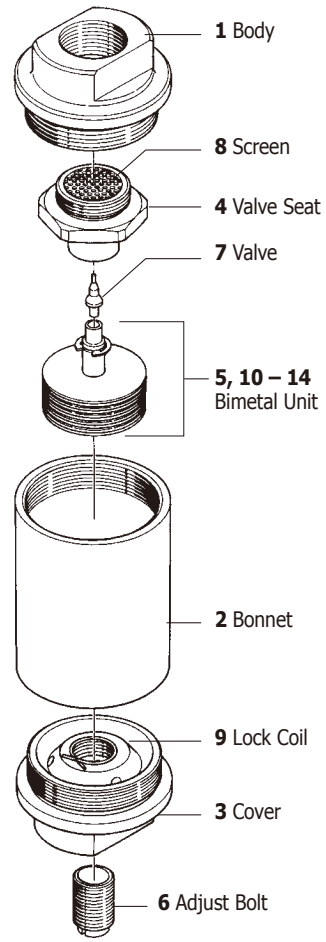
TB9N



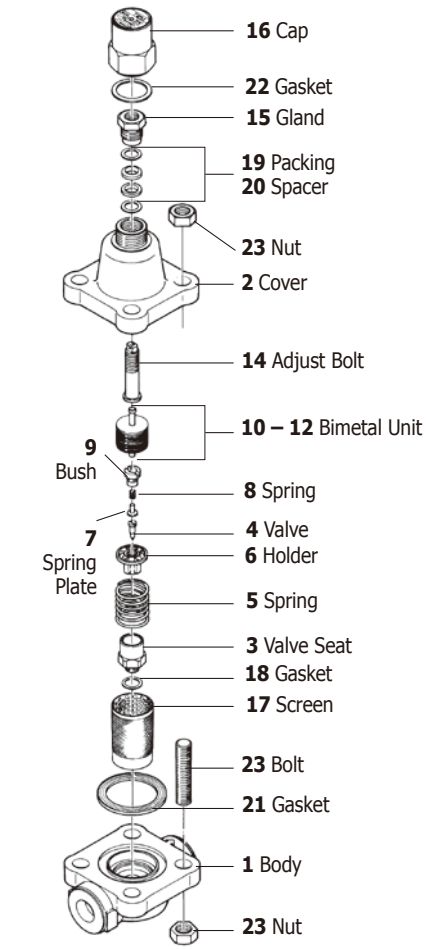
TBU4, TBU4B



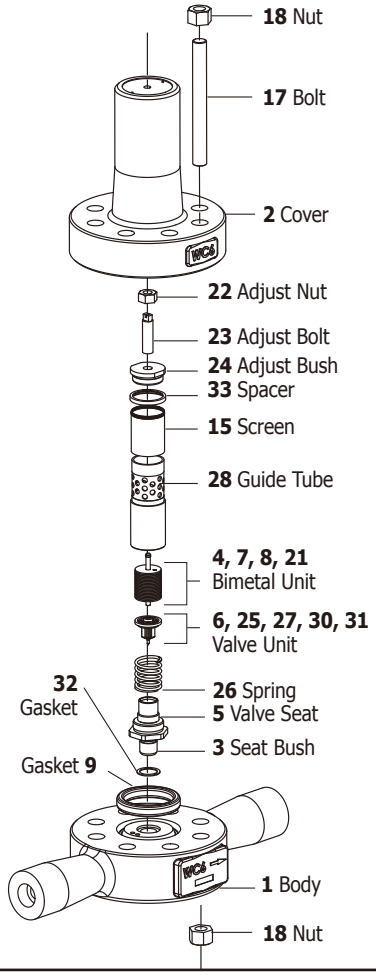
TB1N



TB51, TB52



TBH71, TBH72, TBH81, TBH82



Balanced Pressure Thermostatic Steam Traps

SERIES D

Balanced Pressure Thermostatic Steam Traps are equipped with a capsule element, which controls the discharge of condensate depending on the temperature. The capsule contains a special liquid, whose saturation temperature at a given pressure is always lower than that of the water. It ensures a very accurate functioning of the steam trap and is self-adjusting.

The discharge characteristic follows the saturation curve independent from pressure changes and the condensate load.

Series D MIYAWAKI steam traps can be delivered with 3 different capsule types:

Types H & C discharge hot condensate at approximately 5°C (9°F) below saturation temperature
Type L discharges hot condensate at approximately 15°C (27°F) below saturation temperature

Models

DC1, DC2,
DV1, DL1, DX1 with stainless steel body and internals
DF1 with forged steel body and stainless steel internals

Features

- Excellent air venting characteristics at start-up and during operation
- The operation will not be influenced by back pressure
- At time of non-operation self-draining
- No steam loss throughout its operating range
- All traps equipped with integral strainers
- Can be installed both horizontally and vertically
- Easy in-line inspection and maintenance
- Lightweight, compact design

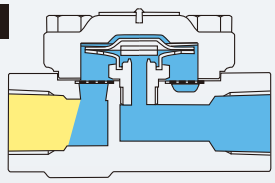
Suitable for

light to medium condensate loads: steam tracing, steam main drips, small heat exchangers, unit heaters, steam heating coils and many other applications in the petrochemical, chemical, textile, food, pharmaceutical and other industries.

Operating principle

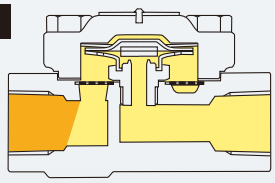
cold condensate hot condensate steam

1



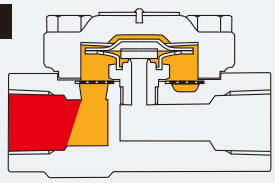
Upon start-up in the presence of cold condensate, the capsule element is contracted and the valve plate has moved away from the seat. The wide open valve discharges condensate and air rapidly.

2



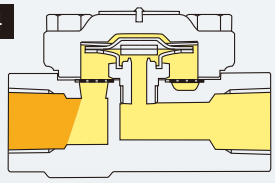
As the temperature inside the trap increases, the capsule element will start to expand, moving the valve plate toward the seat.

3



Just before the condensate reaches saturation temperature, the valve plate will close the seat completely. Steam can not enter the trap, ensuring zero steam loss.

4

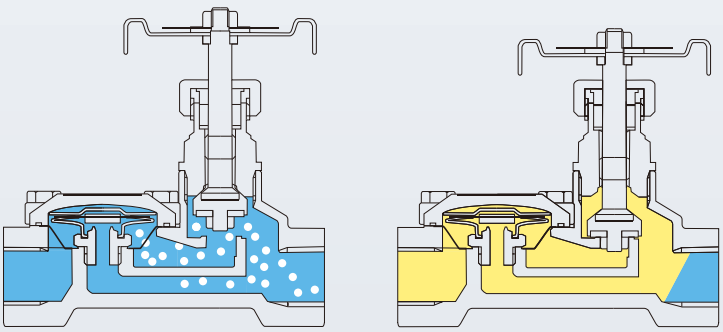


As the temperature inside the trap decreases, the capsule element moves away from the seat and the condensate will be discharged. During normal operation steps 3 and 4 will repeat continuously.

Operating principle of **DV1** when using the bypass valve

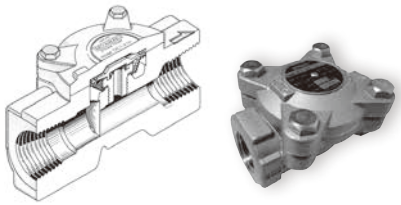
When the handle is turned in the direction indicated by the BLOW arrow on the nameplate (counterclockwise), the bypass valve will open, a bypass circuit will be formed inside the trap, and a large volume of air and condensate can be discharged quickly. Scale that has accumulated in the screen can also be blown out.

When the bypass valve is closed, the type DV1 will operate as a normal steam trap (see above operating principle).

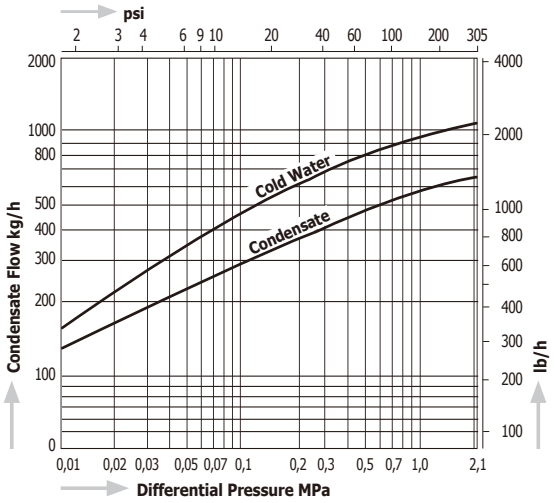


SERIES D Balanced Pressure Thermostatic Steam Trap

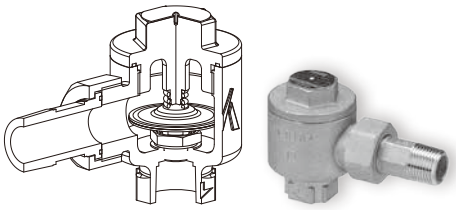
DC1



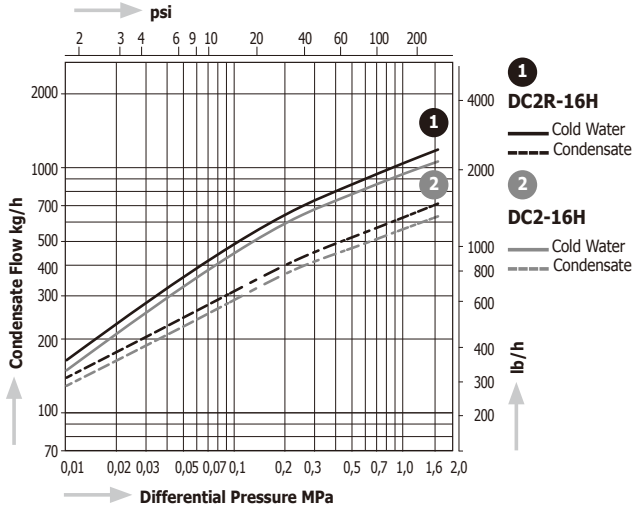
Capacity Chart DC1



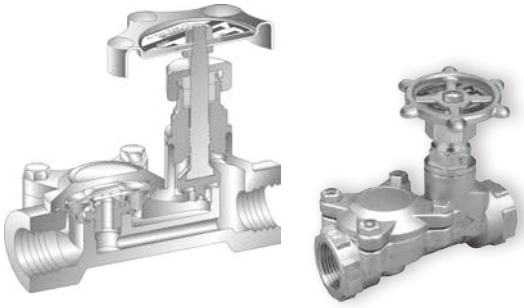
DC2



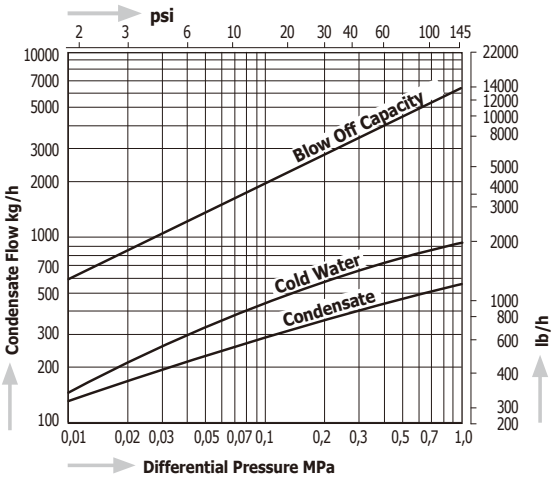
Capacity Chart DC2



DV1 with Bypass Valve

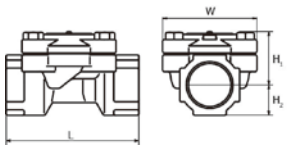


Capacity Chart DV1

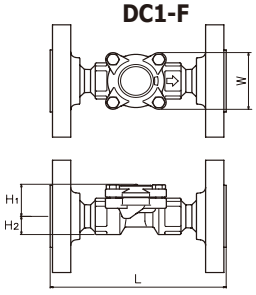


Dimensions

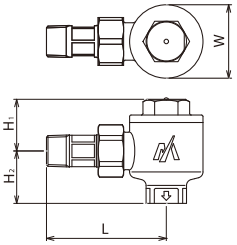
DC1



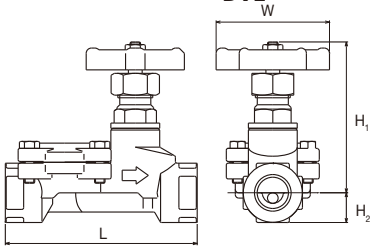
DC1-F



DC2



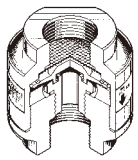
DV1



Model	Connections	Size	Max. Operating Pressure		Max. Operating Temperature		Dimensions (mm)				Dimensions (in)				Body Material	Weight	
			MPa	psig	°C	°F	L	H_1	H_2	W	L	H_1	H_2	W		kg	lb
DC1-21H **DC1-21L**	Screwed Rc, NPT	¼¨, ⅜¨	2,1	305	220	428	65	29	11	53	2.6	1.1	0.4	2.1	Stainless Steel SCS13A	0,4	0.9
		½¨, ¾¨					75	31	17		3.0	1.2	0.7			0,5	1.1
		1¨					80	34	21		3.1	1.3	0.8			0,5	1.1
DC1-21HF **DC1-21LF**	Flanged JIS, ASME, DIN	½¨					150	31	17	53	5.9	1.2	0.7	2.1		1,3	2.9
		¾¨														2,2	4.9
		1¨					160	34	21		6.3	1.3	0.8			3,1	6.8
DC2R-16H **DC2-16H**	Inlet: R Outlet: Rc, NPT	½¨	1,6	230	220	428	80	35	35	49	3.1	1.4	1.4	1.9		0,7	1.5
DV1-10	Screwed Rc, NPT	½¨, ¾¨	1,0	145	185	365	110	88	17	65	4.3	3.5	0.7	2.6		0,9	1.9

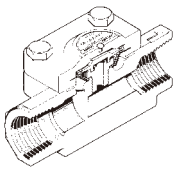
DC2R-16H – Type with bypass orifice to prevent residue of condensate in steam traps.

DL1



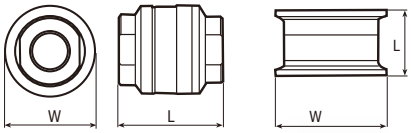
DX1

DF1

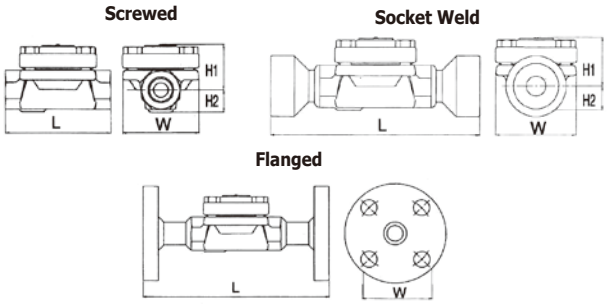


Dimensions

DL1 **DX1**

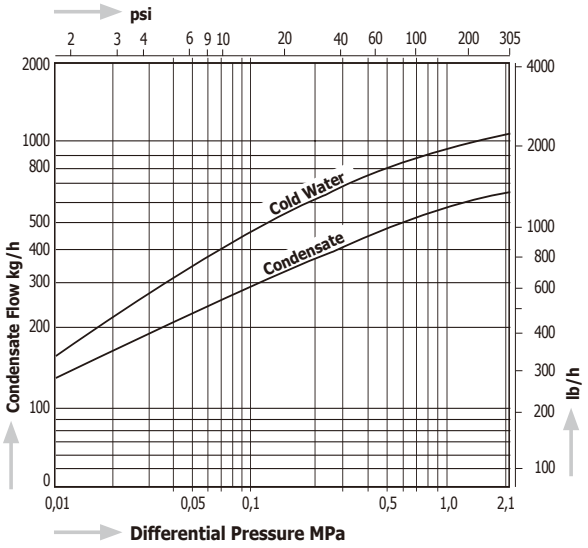


DF1

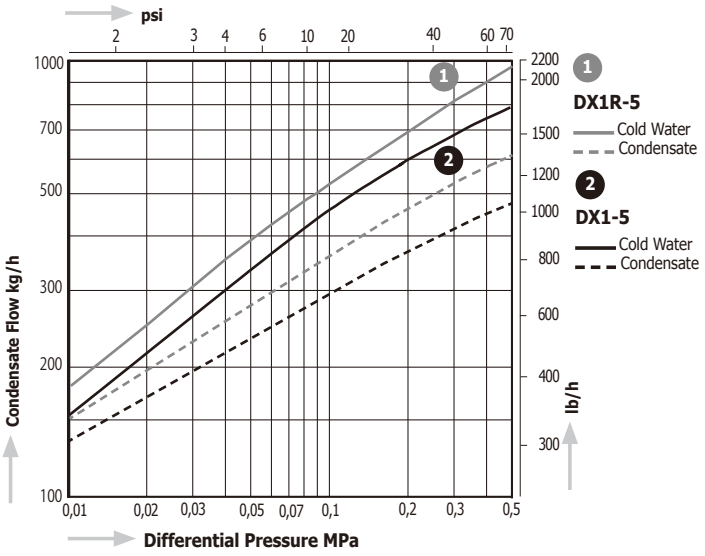


Special face-to-face dimensions available.

Capacity Chart **DL1, DF1**



Capacity Chart **DX1**

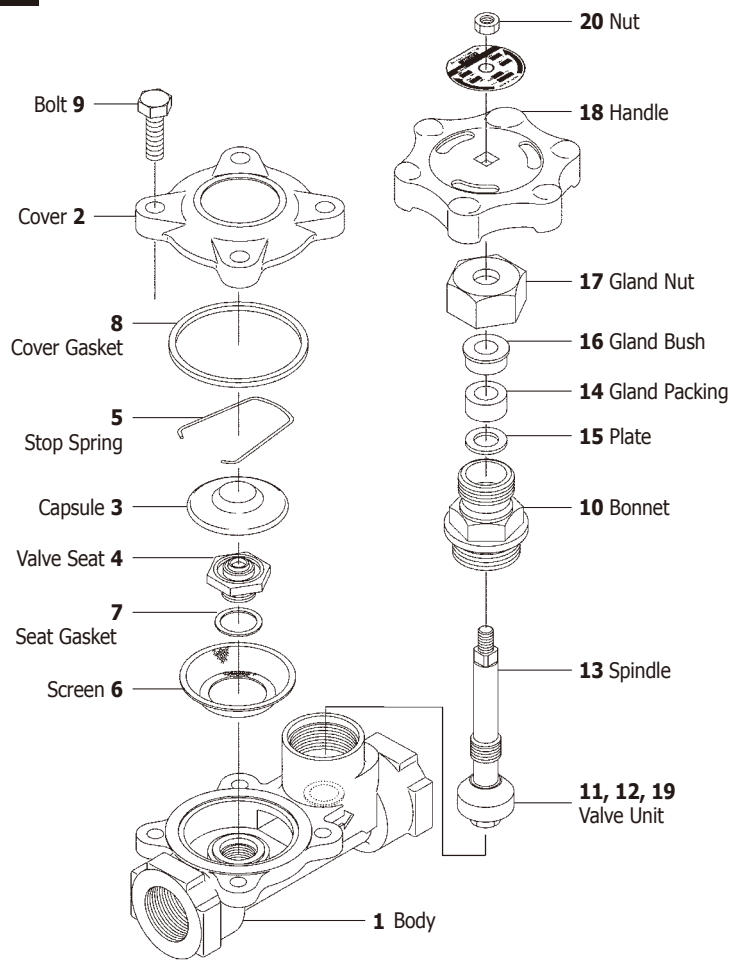


Model	Connections	Size	Max. Operating Pressure		Max. Operating Temperature		Dimensions (mm)				Dimensions (in)				Body Material	Weight	
			MPa	psig	°C	°F	L	H_1	H_2	W	L	H_1	H_2	W		kg	lb
DL1-21H **DL1-21L**	Screwed Rc, NPT	¼ ¨ 3/8¨ ½ ¨ ¾ ¨ 1 ¨	2,1	305	220	428	60			48	2.4			1.9	Stainless Steel SCS13	0,7	1.5
DL1-10C	Screwed Rc, NPT	¼ ¨ 3/8¨ ½ ¨ ¾ ¨ 1 ¨	1,0	145	220	428	60			48	2.4			1.9		0,7	1.5
DX1-5 **DX1R-5**	Tri-Clamp	38 mm	0,5	72.5	160	320	30			51	1.2			2.0	Stainless Steel SUS316	0,2	0.44
DF1-21H **DF1-21L**	Screwed Rc, NPT	½ ¨	2,1	305	235	455	85	36	18	62	3.4	1.4	0.7	2.4	Forged Steel A105	1,0	2.2
		¾ ¨					100	40	23		3.9	1.6	0.9			1,3	2.9
		1 ¨															
DF1-21HW **DF1-21LW**	Socket Weld JIS, ASME, DIN	½ ¨ ¾ ¨ 1 ¨					160	36	18	62	6.3	1.4	0.7	2.4		1,4	3.1
DF1-21HF **DF1-21LF**	Flanged JIS, ASME 150, 300 lb	½ ¨					175	36	18	62	6.9	1.4	0.7	2.4		2,1	4.6
		¾ ¨					195	40	23		7.7	1.6	0.9			3,3	7.3
		1 ¨					215				8.5					4,0	8.8
	Flanged DIN PN40	DN15					150	36	18	62	5.9	1.4	0.7	2.4	Forged Steel A105	2,3	5.0
		DN20														3,6	7.9
		DN25					160				6.3					4,3	9.5

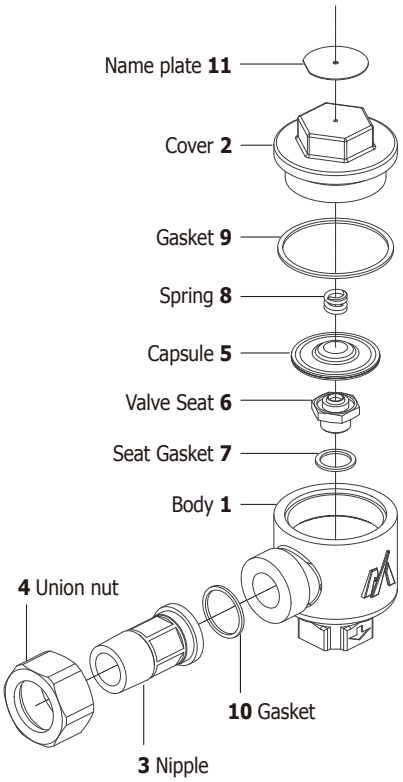
DX1R-5 – Type with bypass orifice to prevent residue of condensate in steam traps.

SERIES D Spare Parts

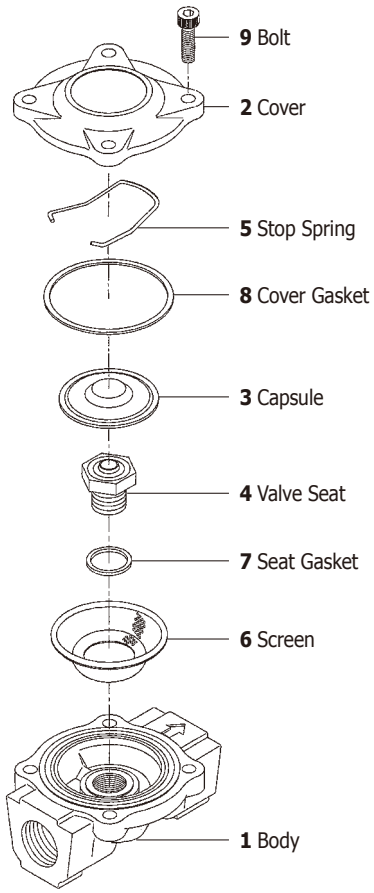
DV1



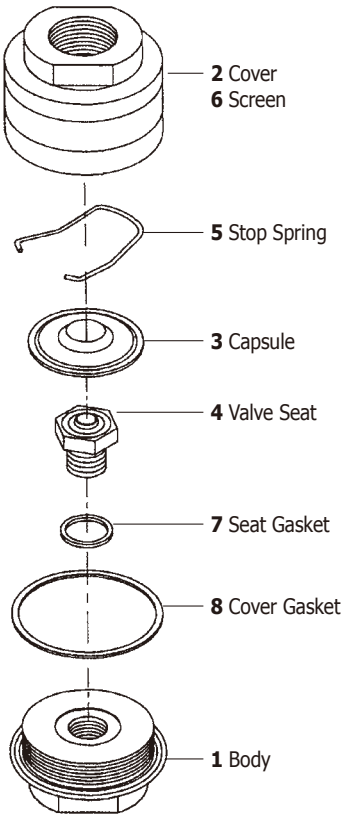
DC2



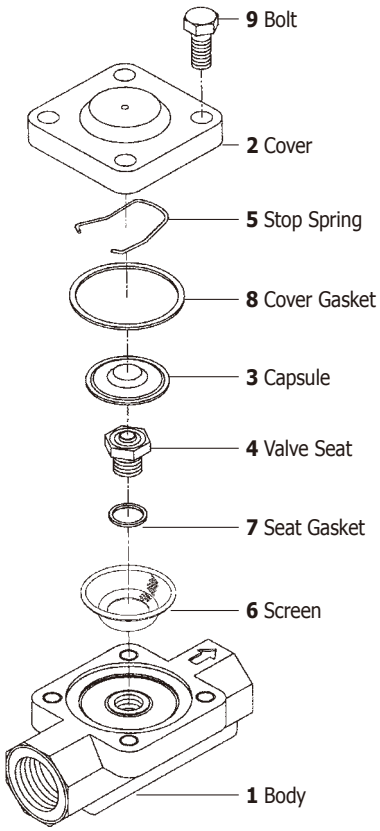
DC1



DL1

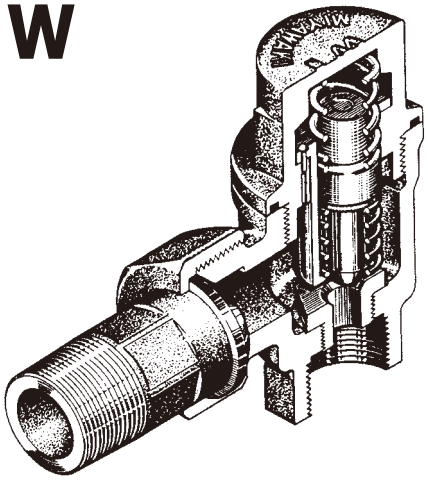


DF1



SERIES W Thermostatic Radiator Trap

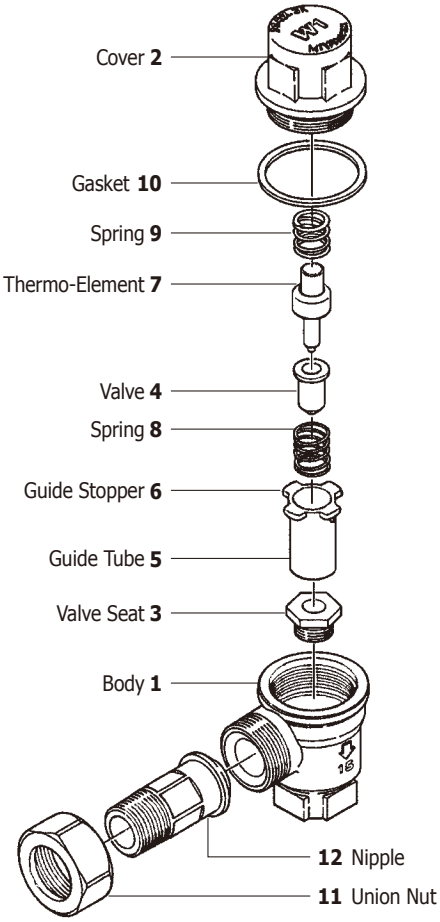
W



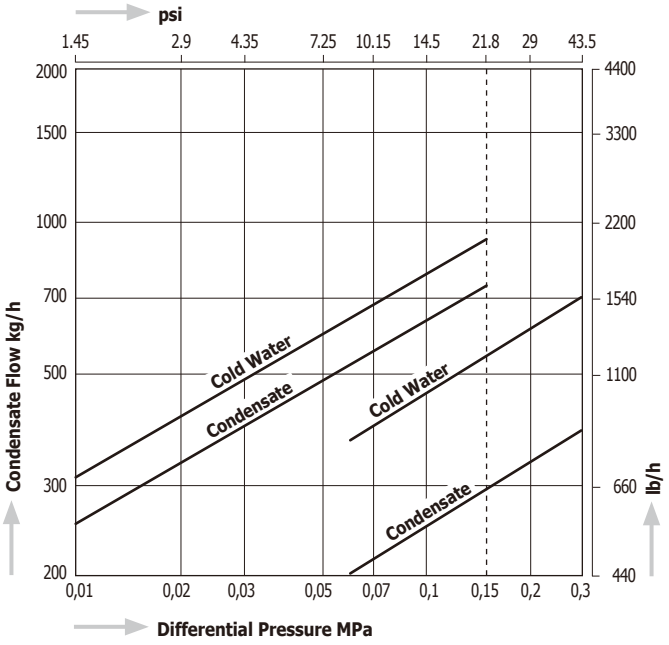
W1

W2

W1, W2, W3



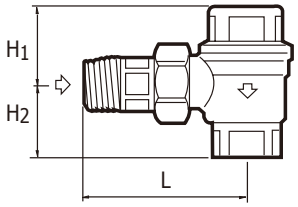
Capacity Chart W1, W2, W3



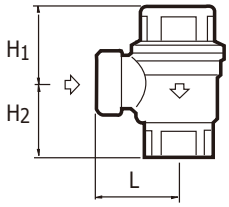
The opening temperature of the valve is preset
- at about 97°C (207° F) for W1-1,5, W2-1,5 and W3-1,5
- at about 115°C (239° F) for W1-3, W2-3 and W3-3

Dimensions

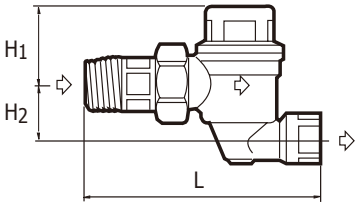
W1



W2



W3



Model	Connections	Size	Max. Operating Pressure		Max. Operating Temperature		Dimensions (mm)			Dimensions (in)			Body Material	Weight	
			MPa	psig	°C	°F	L	H_1	H_2	L	H_1	H_2		kg	lb
W1-1,5	Screwed Rc, NPT	½¨	0,15	21.8	150	302	80		35	3.1		1.4	Brass C3771	0,5	1.1
		¾¨					87		41	3.4		1.6		0,6	1.3
W1-3		½¨	0,3	43.5			80		35	3.1		1.4		0,5	1.1
		¾¨					87		41	3.4		1.6		0,6	1.3
W2-1,5	Screwed Rc, NPT	½¨	0,15	21.8	150	302	35	42	35	1.4	1.7	1.4	Brass C3771	0,4	0.9
		¾¨							41			1.6		0,5	1.1
W2-3		½¨	0,3	43.5					35			1.4		0,4	0.9
		¾¨							41			1.6		0,5	1.1
W3-1,5	Screwed Rc, NPT	½¨	0,15	21.8	150	302	123		28	4.8		1.1	Brass C3771	0,6	1.3
		¾¨					135		34	5.3		1.4		0,7	1.5
W3-3		½¨	0,3	43.5			123		28	4.8		1.1		0,6	1.3
		¾¨					135		34	5.3		1.4		0,7	1.5

Steam Trap Survey Assistant

Dr. Trap® Jr.

PM15

It is the ideal partner for steam trap inspections.

PM15 is capable to work with most of the steam traps of the main manufacturers.

Certified according to the European EMC Directive (2014/30/EU)

Ultrasonic Checker PM11 | **Temperature Probe** | **SurveyPro Light PM150 V2.0**

Features PM15

The Steam Trap Ultrasonic Checker PM11 has been designed to assess the operating condition of steam traps during operation by measuring the vibration and the temperature of the surface.

- The system consists of the Ultrasonic Checker PM11, a Temperature Probe and the SurveyPro Light PM 150 Software version 2.0.
- Measures vibration and temperature at the same time
- The temperature probe can measure temperatures between 0°C and 250°C
- Estimates and displays the saturation pressure by measuring the temperature.
- Useful for testing not only steam traps, but also valves
- One key operation for all functions
- Long battery life – 40 hours or more of continuous use
- Shuts off automatically if the device is not in use for 5 minutes
- Includes a stop watch for monitoring periodic characteristics of vibrations
- Compact, lightweight and easy to carry

Software SurveyPro Light PM150 V2.0

Software for analyzing the data which had been measured by using the steam trap checker PM11 and for determining the condition of the steam trap.

- Standard and Special versions available
- Both versions allow the estimation of CO_2 emissions which correspond to leaking steam traps.
- Compatible with Windows 7, Windows 8/8.1 and Windows 10 – 32 and 64 bit versions.
- Full data compatibility. Data generated by the previous version can be integrated into the new software*
- The version 2.0 comes with an updated list of steam trap models of the main steam trap manufacturers.
- The updated software allows a better classification of steam traps to various groups and areas inside a plant with the possibility for more detailed analysis of selected groups or areas.

* For more details please contact MIYAWAKI Inc. or an authorized representative

Working Flow

1 Tagging of Steam Traps

Put a tag on or text to each trap in your factory, so that it can be easily identified any time.

2 Survey List set-up

Run the Survey Pro Light software and fill in the basic information of the steam traps. Information such as survey list name, tag number, area, manufacturer, inlet pressure or size are filled in at this moment.

3 Traps inspection

Diagnose each trap on site using the checker PM11. Write down the vibration data measured for each trap.

4 Filling out of Survey List

Run again the Survey Pro Light software and enter the measured vibration data into the survey list for each trap. Once the vibration value of a trap has been entered, the operating condition of the trap will be displayed immediately. The list will also display the steam loss of each trap (if detected) and the related financial losses.

5 Analysis

After entering all test results of the survey, the software can show an analysis for each trap type and manufacturer, an analysis of steam losses and related financial losses for each manufacturer and trap type, an analysis of CO_2 emission, or an analysis for kind of application (process, tracing, etc.), with the possibility of showing the results by areas or groups.

6 Trend Analysis

Comparisons can be made by Manufacturer, by the installed types, by the pressure classification and by applications. In each case:

- the failure rate
- the steam loss
- and money loss tendencies

will be shown.

Technical Specification

Probes	**Vibration**	Piezo-electric-ceramic acceleration sensor (10 kHz – 40 kHz)	**Displays**	Illuminated liquid crystal display (LCD)
	Temperature	Thermistor Range: 0 – 250°C / 32 – 482°F	**Housing**	Heat-resistant plastic (ABS), simple waterproof design
Weight		230 g (incl. batteries)		
Power supply		2 x 1.5V AA alkaline batteries (40 hours or more) 2 x 1.2V AA NiMH (32 hours or more)	**Ambient working temperature**	0 – 40°C (32 – 104°F)

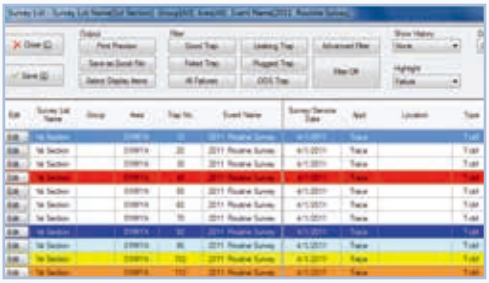
Steam Trap Survey Assistant

Dr. Trap® Jr.

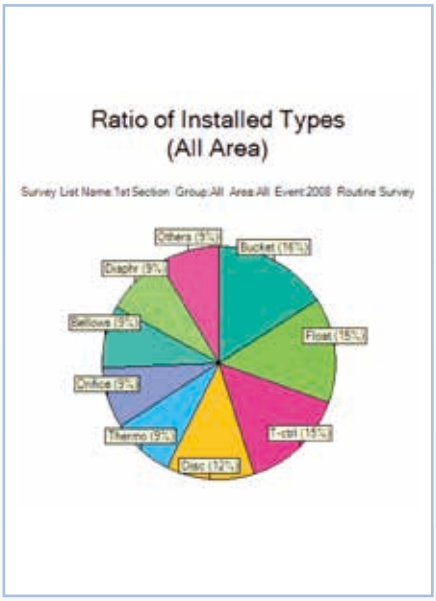
SurveyPro Light PM150 V2.0

Main Functions – Standard Version

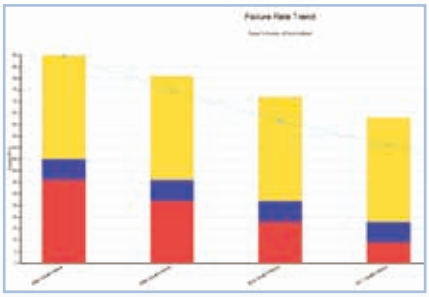
Survey List

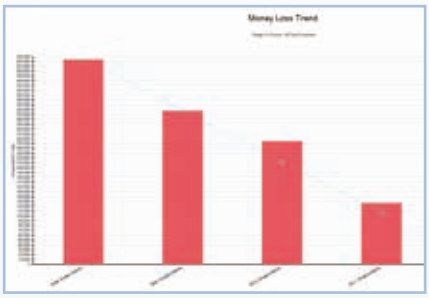


Analysis



Trend Analysis

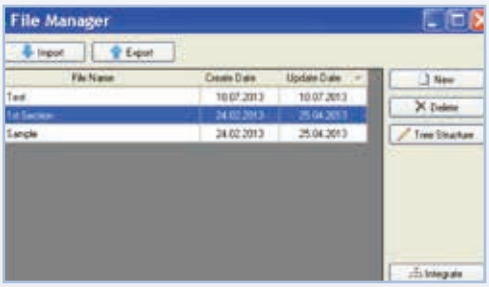




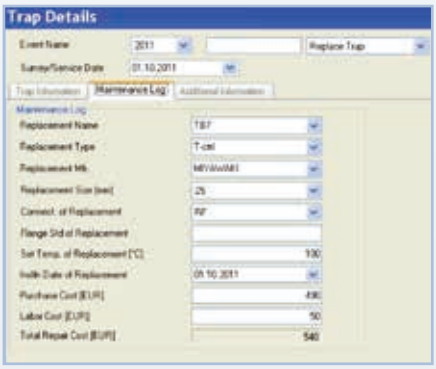
Additional Functions – Special Version

The Special Version includes the functions of the Standard Version plus the following ones:

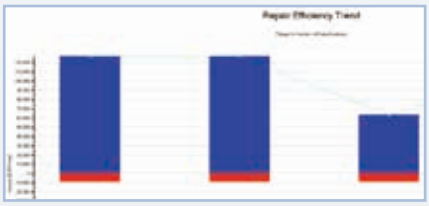
Integration of multiple survey files into a single one



Repair Cost Management



Repair Efficiency

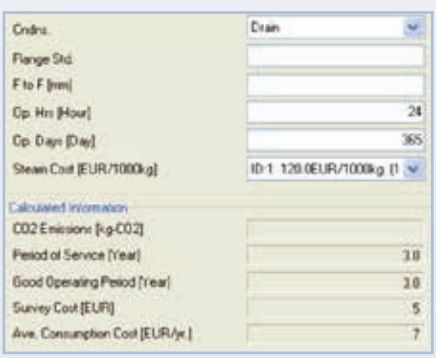


Management of other kind of failures

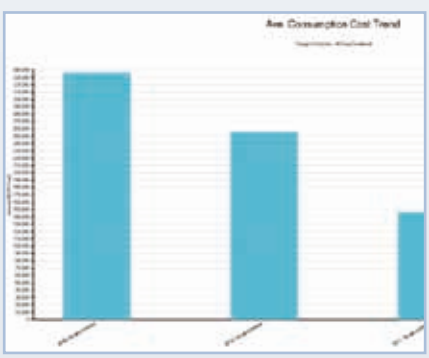
- Failure of inlet valve
- Failure of outlet valve
- Failure of other than valves

User and Ranking Summaries

Service Period



Average Consumption Cost



Steam Trap Management System

Dr. Trap®

PM500

Steam Trap Management System PM500

Checker (PM520)

It detects the vibration and temperature in steam traps at the same time.
The survey accuracy has been improved from the previous model (PM321) by MIYAWAKI's sensor technology.

Trap Survey App (PM510)

The App will be installed on a tablet computer, which must be prepared by the customer.
It displays and stores survey results transferred from the checker using Bluetooth connection.

Software SurveyPro 4.0 (PM530)

The software will be installed on a personal computer. It aggregates and analyzes steam trap data from the Trap Survey App, identifying faulty steam traps, providing steam loss and financial loss data and includes many other possibilities to manage the steam traps easily.
It provides detailed charts and graphs.

Checker (PM520)

* Tablet to be prepared by customer
* For Windows® only

Trap Survey App (PM510)

* Standard and Special versions available

Software SurveyPro 4.0 (PM530)

Features of PM500

- **High-speed survey**
  The special design of the vibration sensor integrating a contact-type thermocouple sensor guarantees a high survey speed.
  Each steam trap will be surveyed within 2 seconds at the shortest, and 10 seconds at the maximum.
- **Improved survey accuracy**
  The holding mechanism of the probe tip ensures a pressing force, which reduces the discrepancy of survey results substantially.
- **Simple operation**
  The checker is ergonomic shaped to handle and operate with one hand. The survey will start automatically by simply pressing down the probe on the trap with minimum force. It is possible to proceed with the survey uninterruptedly without using the tablet.
- **Improved durability**
  Dust and water protection : IP34 (Conforming to IEC 60529)
  Drop test (Conforming to IEC 60068-2-31)
- **Estimation of CO_2 emissions**
  The software can estimate CO_2 emissions based on steam trap leakage amounts.
- **Full data compatibility**
  After converting survey data generated by the previous version (V3.1), the data can be integrated into the new software without any problems.

Technical Specifications

Hardware	Weight		Sensor		Ambient working temperature		Max. surface temperature		Power supply *not included in package	Continuous operating (approximately)	Working survey time	Bluetooth	
	g	lb	Vibration	Temperature	°C	°F	°C	°F		Hours	Seconds	Interface	Communication distance
Checker PM520	220 excl. battery	0.49	Piezo-electro-ceramic sensor	Type K thermocouple	-5 to +50	23 to 122	400	752	2 x 1.2V AA size NiMH	8 (discharged capacity: 1900mAh)	10 (2 minimum)	Ver. 2.1 + EDR SPP	Approx. 5 m

Accessory: 1 x Soft case
Display: Transmission type TFT color liquid crystal

Software	Medium	Environment					
		Operating System	CPU	Memory (RAM)	Hard disk	Display resolution (pixel)	Others
Trap Survey App PM510*	CD-ROM	Windows 7, Windows 8/8.1, Windows 10 (32 or 64 bit)	1.6GHz or more	4GB or more	20GB or more free space (excl. Data area)	1280 x 800 or more	Bluetooth: Ver.2.1 + EDR SPP Microsoft NET Framework 4.5 Microsoft SQL Server Compact 3.5 SP2
SurveyPro PM530 V4.0			1GHz or more	1GB (64bit: 2GB) or more		1024 x 768 or more	Microsoft NET Framework 4.5 Microsoft SQL Server Compact 3.5 SP2 USB Port, CD Drive

*** PM510 is to be installed on a tablet. The above specifications of PM510 are hardware requirement for the tablet.**

Steam Trap Management System

Dr. Trap®

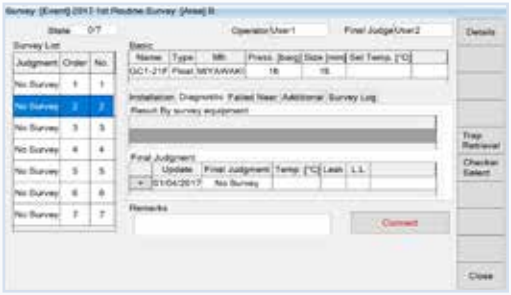
Trap Survey App PM510

The App displays and stores the survey results from the checker.
It includes a lot of new and additional functions such as viewing and editing a survey map or a camera function.
It can contribute to create a paperless environment.
The available functions depend on the version of SurveyPro 4.0, standard or special.

Main Functions

Survey screen

The touch-screen tablet makes it easy to browse and edit a survey list.
A lot of detailed information is available on the survey screen and can be edited there. The survey log information will be also displayed on the screen.



Survey map

A survey map can be displayed and edited on the tablet computer.
The map can be associated with each steam trap on the survey list.
Then, the order of the steam trap survey can be set.

Camera function

The camera function allows to take images and record videos on the Camera screen. It is possible to edit and save the images for each steam trap. The images and videos will be displayed on the detailed screen of each steam trap.

PM510 Function correspondence table

Several functions of PM510 are unavailable depending on the version of PM530.
[○] : Available, [-]: Unavailable

	PM530	
PM510 Function	**Standard**	**Special**
List Import/Export	○	○
List Retrieval	○	○
Edit Area	○	○
Survey	○	○
Survey map	-	○
Whole map	-	○
Edit Drawing	-	○
Camera	-	○

SurveyPro 4.0 PM530

The software was updated from SurveyPro V3.1. It offers to analyse survey data, view trends, and manage survey files.
Same as V3.1, it displays various summary sheets and graphs depending on the purpose, and export them to Excel and image files.
It helps to create survey reports. Standard and Special versions are available.

Upgraded Functions

Single Sheet

Each survey list can be displayed as a Single Sheet. Then, it can be exported to Excel as well. It is possible to browse and edit survey list detail information on the sheet at once.

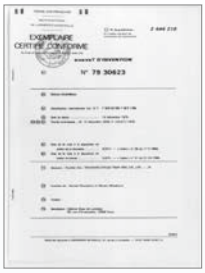
Data Summary Sheet

Different from the previous version, SurveyPro V3.1, the data summary sheets will be displayed as one sheet. Consequently, it is easier to use various analysis functions to create summary sheets such as by Manufacturer and by Type.
The summaries of all data can be displayed in graphical form same as V3.1.

MIYAWAKI-Technology

SCCV®-System

The MIYAWAKI SCCV®-System:
worldwide patented

MIYAWAKI´s internationally patented Self Closing and Centering Valve SCCV®-System has proven its high reliability and effectiveness during more than two decades. Many thousands of steam traps equipped with the SCCV®-System have proven enormous advantages for our customers:

1. A substantially longer service life compared with other steam traps
2. No partial or one-sided precipitate wear of valve and seat
3. Greatly reduced wear of all internal parts due to the reduction of the closing forces required to maintain a seal
4. No steam loss for all Temperature Control Traps

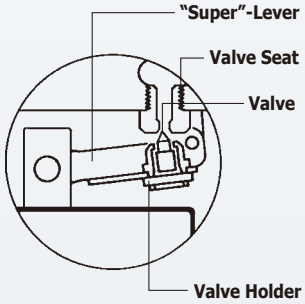
The MIYAWAKI SCCV®-System:
variable adjusted to various types

Intensive research and development activities over many years have enabled MIYAWAKI to incorporate the SCCV®-System in various types of steam traps. Thus it became possible to adopt the SCCV®-System to a wide pressure range and to utilize the SCCV®-System not only for Bimetal Steam Traps, but also for Inverted Bucket and Float Type Steam Traps.

Inverted Bucket Steam Traps

Series ES

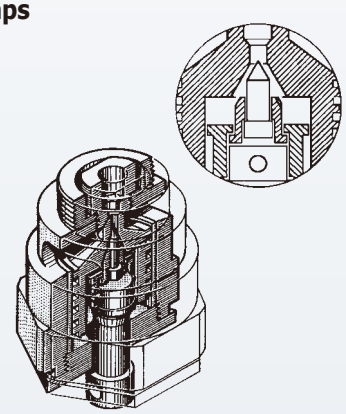
The Valve Holder is fixed to a specially developed "Super-Lever". The Valve is "free floating" inside the Valve Holder. Thus the control space inside the Valve Holder decreases the force toward the seat caused by the movement of the bucket. The Valve will close softly and exactly in the center of the seat.



Inverted Bucket Steam Traps

Series ER

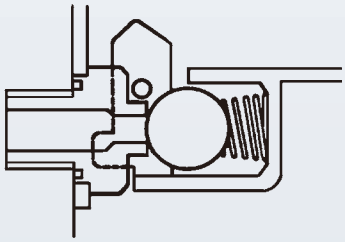
The SCCV®-System is part of a "Double Valve Unit", which is operating on the basis of the pressure difference inside the unit. The trap is thus characterized by extended lifetime of the valve assembly and a greater condensate discharge per body size when compared to conventional inverted bucket steam traps.



Ball Float Steam Trap

G11N, G12N

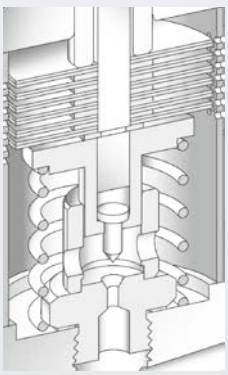
The Valve (Ball) lies inside a Valve Holder, which is directly connected through a lever with the float. By installing a spring inside the Valve Holder the movements of the float and the forces caused by it will not be directly transferred to the Valve. This will increase the service life of the sealing surfaces.



Temperature Control Steam Trap

TB7N

The Bimetal Unit including the valve are guided inside the body. A spring reduces the force caused by the deflection of the bimetals which move the valve toward the seat. The guiding of the valve within the seat and the lift of the valve is designed in such a way that the valve will close very smoothly in the center of the seat.



MIYAWAKI-Technology

SCCV®-System

Basic Principle

Regulating

The design of the Valve and Seat and the Valve lift (distance between the closed and open position of the valve) are calculated and designed in such a way that the valve closes its seat at the time that the condensate reaches the steam trap adjusted temperature.

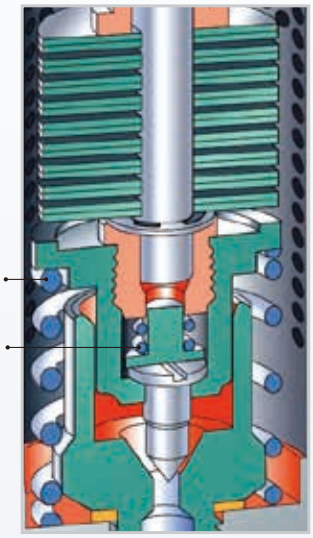
Centering and Soft Closing

The valve is "free floating" inside the valve holder. The valve moves to the center caused by the pressure and the flow of condensate. The tip of the valve is drawn down to the center axis of the valve seat.
A spring and a stop ring inside the control chamber absorb and soften the movement of the valve (caused by the temperature and pressure of the steam system) towards its seat.
The centering and soft closing characteristics prevents premature or uneven wearing of the valve and its seat, extending the lifetime of the steam trap.

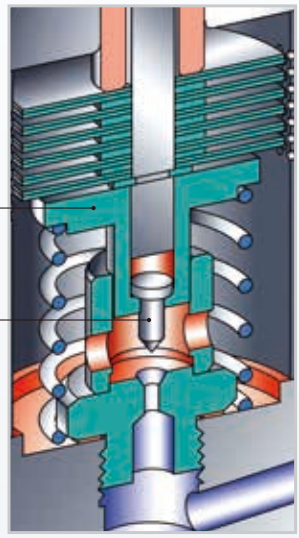
No Steam Loss

The valve closes exactly in the center of the seat at the adjusted temperature, slightly below the saturation temperature assuring Zero steam loss.

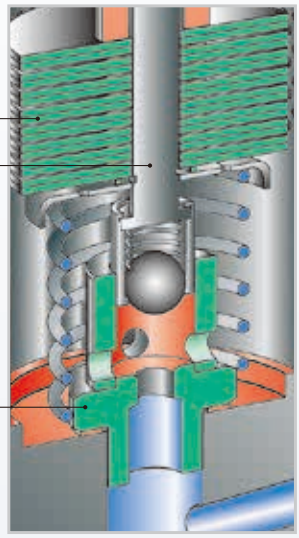
TB51



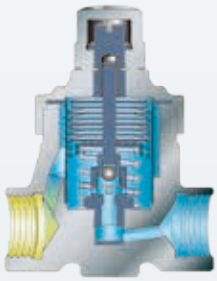
TB7N



TB9N

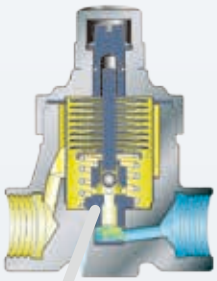


1



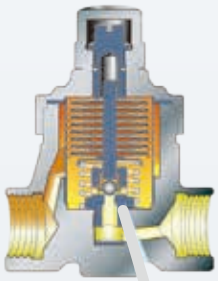
On start-up, the bimetal discs are all flat and the valve shaft is up with the valve fully open. Virtually all cold condensate and air are discharged.

2



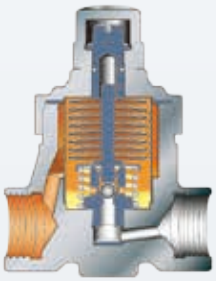
As the temperature of the condensate increases, the bimetal discs begin to curve gradually and force the valve shaft and the valve holder to move down.

3



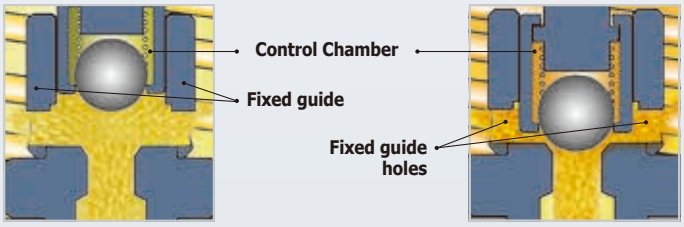
When condensate with higher temperature (near to set temperature) flows in, the bimetal discs are curved even more and, at the same time, the valve shaft moves down and the valve holder closes the holes in the guide partially.

4



In case of very low condensate flow, the holes in the guide are closed completely by the valve holder and the valve will close precisely in the center of the seat. Normally, the trap is filled with hot condensate and the operation will rest in the state shown in figure 3. Condensate will be discharged continuously.

Most of the condensate is still discharged quickly, since the valve and the holes in the fixed guide on the valve seat are still fully open.



The amount of condensate being discharged is reduced quickly. This prolongs the time that the hot condensate stays near the bimetal discs and the heat of the condensate is transferred to the bimetals much more effectively.

Material Standards and Temperature

Material Standards

Following you find a list of materials mainly used by MIYAWAKI for its Steam Traps, according to Japanese Standards and the most closely corresponding numbers of American (ASTM), European (EN) and German (DIN) Standards.

1. Iron Castings

JIS	ASTM	EN	DIN
FC200	A48 – class 30	EN-GJL-200	GG-20 (0.6020)
FC250	A48 – class 35	EN-GJL-250 (EN-JL 1040)	GG-25 (0.6025)
FCD450	A536 65-45-12	EN-GJS-450-10 (EN-JS1040)	GGG40.3 (0.7043)

2. Steel Casting and Forgings

JIS	ASTM	EN	DIN
SCPH 2	A216WCB	GP240GH (1.0619)	GS-C25
SCPH 21	A217WC6	G17CrMo5-5 (1.7357)	GS17CrMo55 (1.7357)
SCPH32	A217WC9	GS12CrMo9-10 (1.7380)	10CrMo9-10 (1.7380)
SFVC2A	A105	P250GH (1.0460)	C22.8 (1.0460)
SFVAF22B	A182F22	10CrMo9-10 (1.7380)	10CrMo9-10 (1.7380)

3. Stainless and Heat Resisting Steels

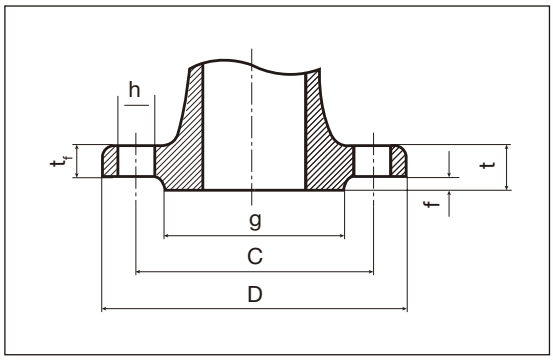
JIS	ASTM	EN	DIN
SCS13A	A351CF8	GX5CrNi19-10 (1.4308)	G-X6CrNi189 (1.4308)
SCS14	A351CF8M	GX5CrNiMo19-11-2 (1.4408)	G-X6CrNiMo1810 (1.4408)
SUS303	A582S30300	X8CrNiS18-9 (1.4305)	X10CrNiS189 (1.4305)
SUS304	A276S30400	X5CrNi18-10 (1.4301)	X5CrNi1810 (1.4301)
SUS403	A276S40300	X6Cr13 (1.4000)	X6Cr13 (1.4000)
SUS420J2	–	X30Cr13 (1.4028)	X30Cr13 (1.4028)

4. Alloys

JIS	ASTM	EN	DIN
C3771	C37700 (B 124-89)	CuZn39Pb2 (CW612N)	CuZn39Pb2

Diameters and Drilling of Flanges

(see Page 91)



Conversion Factors

$$T°C = \frac{5}{9}(T°F - 32) \quad T°F = 1{,}8\,T°C + 32$$

°C	°F / °C	°F	°C	°F / °C	°F
10,0	50	122	127	260	500
12,8	55	131	132	270	518
15,6	60	140	138	280	536
18,3	65	149	143	290	554
21,1	70	158	149	300	572
23,9	75	167	154	310	590
26,7	80	176	160	320	608
29,2	85	185	166	330	626
32,2	90	194	171	340	644
35,0	95	203	177	350	662
37,8	100	212	182	360	680
40,6	105	221	188	370	698
43	110	230	193	380	716
46	115	239	199	390	734
49	120	248	204	400	752
52	125	257	210	410	770
54	130	266	216	420	788
57	135	275	221	430	806
60	140	284	227	440	824
63	145	293	232	450	842
66	150	302	238	460	860
68	155	311	243	470	878
71	160	320	249	480	896
74	165	329	254	490	914
77	170	338	260	500	932
79	175	347	266	510	950
82	180	356	271	520	968
85	185	365	277	530	986
88	190	374	282	540	1004
91	195	383	288	550	1022
93	200	392	293	560	1040
99	210	410	299	570	1058
104	220	428	304	580	1076
110	230	446	310	590	1094
116	240	464	316	600	1112
121	250	482			

American Standard ASME B 16.5-2009

Size (in)	Dimensions	class 150		class 300		class 600		class 900		class 1500	
		in	mm	in	mm	in	mm	in	mm	in	mm
1/2 "	D	3.5	90	3.75	95	3.75	95	4.75	120	4.75	120
	tf	0.38	9,6	0.5	12,7	0.56	14,3	0.88	22,3	0.88	22,3
	f	0.06	2	0.06	2	0.25	7	0.25	7	0.25	7
	g	1.38	34,9	1.38	34,9	1.38	34,9	1.38	34,9	1.38	34,9
	C	2.38	60,3	2.62	66,7	2.62	66,7	3.25	82,6	3.25	82,6
	n x h	4 x 5/8	4 x 15,9	4 x 5/8	4 x 15,9	4 x 5/8	4 x 15,9	4 x 7/8	4 x 22,2	4 x 7/8	4 x 22,2
3/4 "	D	3.88	100	4.62	115	4.62	115	5.12	130	5.12	130
	t	0.44	11,2	0.56	14,3	0.62	15,9	1	25,4	1	25,4
	f	0.06	2	0.06	2	0.25	7	0.25	7	0.25	7
	g	1.69	42,9	1.69	42,9	1.69	42,9	1.69	42,9	1.69	42,9
	C	2.75	69,9	3.25	82,6	3.25	82,6	3.5	88,9	3.5	88,9
	n x h	4 x 5/8	4 x 15,9	4 x 3/4	4 x 19,0	4 x 3/4	4 x 19,0	4 x 7/8	4 x 22,2	4 x 7/8	4 x 22,2
1 "	D	4.25	110	4.88	125	4.88	125	5.88	150	5.88	150
	t	0.5	12,7	0.62	15,9	0.69	17,5	1.12	28,6	1.12	28,6
	f	0.06	2	0.06	2	0.25	7	0.25	7	0.25	7
	g	2	50,8	2	50,8	2	50,8	2	50,8	2	50,8
	C	3.12	79,4	3.5	88,9	3.5	88,9	4	101,6	4	101,6
	n x h	4 x 5/8	4 x 15,9	4 x 3/4	4 x 19,0	4 x 3/4	4 x 19,0	4 x 1	4 x 25,4	4 x 1	4 x 25,4
1 1/4 "	D	4.62	115	5.25	135	5.25	135	6.25	160	6.25	160
	t	0.56	14,3	0.69	17,5	0.81	20,7	1.12	28,6	1.12	28,6
	f	0.06	2	0.06	2	0.25	7	0.25	7	0.25	7
	g	2.5	63,5	2.5	63,5	2.5	63,5	2.5	63,5	2.5	63,5
	C	3.5	88,9	3.88	98,4	3.88	98,4	4.38	111,1	4.38	111,1
	n x h	4 x 5/8	4 x 15,9	4 x 3/4	4 x 19,0	4 x 3/4	4 x 19,0	4 x 1	4 x 25,4	4 x 1	4 x 25,4
1 1/2 "	D	5	125	6.12	155	6.12	155	7	180	7	180
	t	0.62	15,9	0.75	19,1	0.88	22,3	1.25	31,8	1.25	31,8
	f	0.06	2	0.06	2	0.25	7	0.25	7	0.25	7
	g	2.88	73	2.88	73	2.88	73	2.88	73	2.88	73
	C	3.88	98,4	4.5	114,3	4.5	114,3	4.88	123,8	4.88	123,8
	n x h	4 x 5/8	4 x 15,9	4 x 7/8	4 x 22,2	4 x 7/8	4 x 22,2	4 x 1 1/8	4 x 28,6	4 x 1 1/8	4 x 28,6
2 "	D	6	150	6.5	165	6.5	165	8.5	215	8.5	215
	t	0.69	17,5	0.81	20,7	1	25,4	1.5	38,1	1.5	38,1
	f	0.06	2	0.06	2	0.25	7	0.25	7	0.25	7
	g	3.62	92,1	3.62	92,1	3.62	92,1	3.62	92,1	3.62	92,1
	C	4.75	120,7	5	127	5	127	6.5	165,1	6.5	165,1
	n x h	4 x 3/4	4 x 19,0	8 x 3/4	8 x 19,0	8 x 3/4	8 x 19,0	8 x 1	8 x 25,4	8 x 1	8 x 25,4

Japanese Standard: JIS B 2210 – 1984

Size (in)	Dimensions	Dimensions at Pressure Rating (mm)					
		10 K	16 K	20 K	30 K	40 K	63 K
1/2 "	D	95	95	95	115	115	120
	t	12	12	14	18	20	23
	f	1	1	1	1	1	1
	g	51	51	51	55	55	55
	C	70	70	70	80	80	80
	n x h	4 x 15	4 x 15	4 x 15	4 x 19	4 x 19	4 x 19
3/4 "	D	100	100	100	120	120	135
	t	14	14	16	18	20	25
	f	1	1	1	1	1	1
	g	56	56	56	60	60	60
	C	75	75	75	85	85	95
	n x h	4 x 15	4 x 15	4 x 15	4 x 19	4 x 19	4 x 23
1 "	D	125	125	125	130	130	140
	t	14	14	16	20	22	27
	f	1	1	1	1	1	1
	g	67	67	67	70	70	70
	C	90	90	90	95	95	100
	n x h	4 x 19	4 x 19	4 x 19	4 x 19	4 x 19	4 x 23
1 1/4 "	D	135	135	135	140	140	150
	t	16	16	18	22	24	30
	f	2	2	2	2	2	2
	g	76	76	76	80	80	80
	C	100	100	100	105	105	110
	n x h	4 x 19	4 x 19	4 x 19	4 x 19	4 x 19	4 x 23
1 1/2 "	D	140	140	140	160	160	175
	t	16	16	18	22	24	32
	f	2	2	2	2	2	2
	g	81	81	81	90	90	90
	C	105	105	105	120	120	130
	n x h	4 x 19	4 x 19	4 x 19	4 x 23	4 x 23	4 x 25
2 "	D	155	155	155	165	165	185
	t	16	16	18	22	26	34
	f	2	2	2	2	2	2
	g	96	96	96	105	105	105
	C	120	120	120	130	130	145
	n x h	4 x 19	8 x 19	8 x 19	8 x 19	8 x 19	8 x 23

European Standard EN 1092-1

Size (in)	Dimensions	PN 10	PN 16	PN 25	PN 40	PN 63	PN 100
		mm	mm	mm	mm	mm	mm
DN15	D	95	95	95	95	105	105
	t	16	16	16	16	20	20
	f	2	2	2	2	2	2
	g	45	45	45	45	45	45
	C	65	65	65	65	75	75
	n x h	4 x 14	4 x 14	4 x 14	4 x 14	4 x 14	4 x 14
DN20	D	105	105	105	105	130	130
	t	18	18	18	18	22	22
	f	2	2	2	2	2	2
	g	58	58	58	58	58	58
	C	75	75	75	75	90	90
	n x h	4 x 14	4 x 14	4 x 14	4 x 14	4 x 18	4 x 18
DN25	D	115	115	115	115	140	140
	t	18	18	18	18	24	24
	f	2	2	2	2	2	2
	g	68	68	68	68	68	68
	C	85	85	85	85	100	100
	n x h	4 x 14	4 x 14	4 x 14	4 x 14	4 x 18	4 x 18
DN32	D	140	140	140	140	155	155
	t	18	18	18	18	24	24
	f	2	2	2	2	2	2
	g	78	78	78	78	78	78
	C	100	100	100	100	110	110
	n x h	4 x 18	4 x 18	4 x 18	4 x 18	4 x 22	4 x 22
DN40	D	150	150	150	150	170	170
	t	18	18	18	18	26	26
	f	3	3	3	3	3	3
	g	88	88	88	88	88	88
	C	110	110	110	110	125	125
	n x h	4 x 18	4 x 18	4 x 18	4 x 18	4 x 22	4 x 22
DN50	D	165	165	165	165	180	195
	t	18	18	20	20	26	28
	f	3	3	3	3	3	3
	g	102	102	102	102	102	102
	C	125	125	125	125	135	145
	n x h	4 x 18	4 x 18	4 x 18	4 x 18	4 x 22	4 x 26

Pressure

Conversion Table from psi to bar

psi	bar	psi	bar	psi	bar	psi	bar	psi	bar	psi	bar
1	0,07	105	7,24	310	21,37	510	35,17	820	56,55	1250	86,19
1,5	0,1	108,8	7,5	319,0	22,0	514,8	35,5	826,5	57,0	1276	88,0
5	0,34	110	7,58	320	22,06	520	35,86	840	57,93	1300	89,66
7,3	0,5	116,0	8,0	326,3	22,5	522,0	36,0	855,5	59,0	1305	90,0
10	0,69	120	8,27	330	22,75	530	36,55	860	59,31	1350	93,08
14,5	1,0	123,3	8,5	333,5	23,0	536,5	37,0	870,0	60,0	1378	95,0
15	1,03	130	8,96	340	23,44	540	37,24	880	60,69	1400	96,55
18,9	1,3	130,5	9,0	348,0	24,00	543,8	37,5	899,0	62,0	1407	97,0
20	1,38	140	9,65	350	24,13	550	37,92	900	62,06	1450	100,00
21,8	1,5	145,0	10,00	355,3	24,5	551,0	38,0	913,5	63,0	1479	102,0
25	1,72	150	10,34	360	24,82	560	38,62	920	63,45	1500	103,45
29,0	2,0	159,5	11,0	362,5	25,0	565,5	39,0	928,0	64,0	1523	105,0
30	2,07	160	11,03	370	25,51	570	39,31	940	64,83	1550	106,87
33,4	2,3	166,8	11,5	377,0	26,00	572,8	39,5	942,5	65,0	1595	110,0
35	2,41	170	11,72	380	26,20	580	40,00	960	66,21	1600	110,32
36,3	2,5	174,0	12,0	384,3	26,5	587,3	40,5	971,5	67,0	1624	112,0
40	2,76	180	22,41	390	26,89	590	40,69	980	67,59	1650	113,77
43,5	3,0	188,5	13,0	391,5	27,0	594,5	41,0	986,0	68,0	1668	115,0
45	3,10	190	13,10	400	27,85	600	41,37	1000	68,95	1700	117,22
47,9	3,3	195,8	13,5	406,0	28,0	609,0	42,0	1015	70,0	1711	118,0
50	3,45	200	13,79	410	28,27	620	42,76	1020	70,34	1750	120,66
50,8	3,5	203,0	14,0	413,3	28,5	623,5	43,0	1029	71,0	1784	123,0
55	3,79	210	14,48	420	28,96	640	44,14	1040	71,72	1800	124,11
58,0	4,0	217,5	15,0	420,5	29,0	652,5	45,0	1044	72,0	1813	125,0
60	4,14	220	15,17	430	29,65	660	45,52	1060	73,10	1850	127,56
62,4	4,3	224,8	15,5	435,0	30,0	667,0	46,0	1073	74,0	1885	130,0
65	4,48	230	15,86	440	30,34	680	46,90	1080	74,48	1900	131,01
65,3	4,5	232,0	16,0	449,5	31,0	696,0	48,0	1088	75,0	1929	133,0
70	4,83	240	16,55	450	31,03	700	48,27	1100	75,86	1950	134,45
72,5	5,0	246,5	17,0	456,8	31,5	710,5	49,0	1117	77,0	1958	135,0
75	5,17	250	17,24	460	31,72	720	49,66	1120	77,24	2000	137,90
79,8	5,5	253,8	17,5	464,0	32,0	725,0	50,0	1131	78,0	2030	140,0
80	5,52	260	17,93	470	32,41	740	51,03	1140	78,62	2050	141,35
82,7	5,7	261,0	18,0	478,5	33,0	754,0	52,0	1146	79,0	2074	143,0
85	5,86	270	18,62	480	33,10	760	52,41	1160	80,00	2100	144,80
87,0	6,0	275,5	19,0	485,8	33,5	768,5	53,0	1175	81,0	2103	145,0
90	6,21	280	19,31	490	33,79	780	53,79	1180	81,38	2150	148,24
94,3	6,5	282,8	19,5	493,0	34,0	797,5	55,0	1189	82,0	2175	150,0
95	6,55	290	20,00	500	34,48	800	55,16	1200	82,76	2200	151,69
97,2	6,7	297,3	20,5	507,5	35,0	812	56,0	1233	85,0	2320	160,0
100	6,9	300	20,69								
101,5	7,0	304,5	21,0								

Conversion Factors

Units of measurement								
Pa	KPa	MPa	bar	kg/cm^2	atm	mm H_20	mm Hg (Torr)	lbf/in^2 (psi)
1	0,001	1×10^{-6}	1×10^{-5}	$1{,}01972 \times 10^{-5}$	$9{,}86923 \times 10^{-6}$	0,101972	$7{,}50062 \times 10^{-3}$	$1{,}450377 \times 10^{-4}$
1000	1	0,001	0,01	0,0101972	$9{,}86923 \times 10^{-3}$	101,972	7,50062	0,1450377
1×10^6	1000	1	10	10,1972	9,86923	$1{,}01972 \times 10^5$	7500,62	145,0377
1×10^5	100	0,1	1	1,01972	0,986923	$1{,}01972 \times 10^4$	750,062	14,50377
$9{,}80665 \times 10^4$	98,0665	0,0980665	0,980665	1	0,967841	10000	735,559	14,22334
$1{,}01325 \times 10^5$	101,325	0,101325	1,01325	1,03323	1	10332,3	760,000	14,69595
9,80665	$9{,}80665 \times 10^{-3}$	$9{,}80665 \times 10^{-6}$	$9{,}80665 \times 10^{-5}$	0,0001	$9{,}67841 \times 10^{-5}$	1	0,0735559	0,001422334
133,322	0,133322	$1{,}33222 \times 10^{-4}$	0,00133322	0,00135951	0,00131579	13,5951	1	0,01933678
6894,76	6,89476	0,00689476	0,0689476	0,0703070	0,0680460	703,070	51,7149	1

Properties of Saturated Steam

Absolute Pressure	Saturation Temperature	Steam Volume	Steam Density	Sensible Heat	Total Steam Heat	Latent Heat
p MPa	ts °C	v˝ m^3/kg	ϱ˝ kg/m^3	h΄ kJ/kg	h˝ kJ/kg	r = h˝ - h΄ kJ/kg
0,1	99,63	1,6940	0,5904	417,51	2.675,4	2.257,9
0,15	111,37	1,1590	0,8628	467,13	2.693,4	2.226,3
0,2	120,23	0,8854	1,1290	504,70	2.706,3	2.201,6
0,25	127,43	0,7184	1,3920	535,34	2.716,4	2.181,1
0,3	133,54	0,6056	1,6510	561,43	2.724,7	2.163,3
0,35	138,87	0,5240	1,9080	584,27	2.731,6	2.147,3
0,4	143,62	0,4622	2,1630	604,67	2.737,6	2.132,9
0,45	147,92	0,4138	2,4170	623,16	2.742,9	2.119,7
0,5	151,84	0,3747	2,6690	640,12	2.747,5	2.107,4
0,55	155,46	0,3426	2,9200	655,78	2.751,7	2.095,9
0,6	158,84	0,3155	3,1700	670,42	2.755,5	2.085,1
0,65	161,99	0,2925	3,4190	684,12	2.758,8	2.074,7
0,7	164,96	0,2727	3,6670	697,06	2.762,0	2.064,9
0,75	167,75	0,2554	3,9150	709,29	2.764,8	2.055,5
0,8	170,41	0,2403	4,1620	720,94	2.767,5	2.046,6
0,85	172,94	0,2268	4,4090	732,02	2.769,9	2.037,9
0,9	175,36	0,2148	4,6550	742,64	2.772,1	2.029,5
0,95	177,66	0,2040	4,9010	752,81	2.774,2	2.021,4
1,0	179,88	0,1930	5,1470	762,61	2.776,2	2.013,6
1,1	184,07	0,1747	5,6370	781,13	2.779,7	1.998,6
1,2	187,96	0,1632	6,1270	798,43	2.782,7	1.984,3
1,3	191,61	0,1511	6,6170	814,70	2.785,4	1.970,7
1,4	195,04	0,1407	7,1060	830,08	2.787,8	1.957,7
1,5	198,29	0,1317	7,5960	844,67	2.789,9	1.945,2
1,6	201,37	0,1237	8,0850	858,56	2.791,7	1.933,1
1,7	204,31	0,1166	8,5750	871,84	2.793,4	1.921,6
1,8	207,11	0,1103	9,0650	884,58	2.794,8	1.910,2
1,9	209,80	0,1047	9,5550	896,81	2.796,1	1.899,3
2,0	212,37	0,0996	10,0500	908,59	2.797,2	1.888,6
2,2	217,24	0,0907	11,0300	930,95	2.799,1	1.868,2
2,4	221,78	0,0832	12,0200	951,93	2.800,4	1.848,5
2,6	226,04	0,0769	13,0100	971,72	2.801,4	1.829,7
2,8	230,05	0,0714	14,0100	990,48	2.802,0	1.811,5
3,0	233,84	0,0666	15,0100	1.008,40	2.802,3	1.793,9
3,2	237,45	0,0624	16,0200	1.025,40	2.802,3	1.776,9
3,4	240,88	0,0587	17,0300	1.041,80	2.802,1	1.760,3
3,6	244,16	0,0554	18,0500	1.057,60	2.801,7	1.744,1
3,8	247,31	0,0524	19,0700	1.072,70	2.801,1	1.728,4
4,0	250,33	0,0498	20,1000	1.087,40	2.800,3	1.712,9
5,0	263,91	0,0394	25,3600	1.154,50	2.794,2	1.639,7
6,0	275,55	0,0324	30,8300	1.213,70	2.785,0	1.571,3
7,0	285,79	0,0274	36,5300	1.267,40	2.773,5	1.506,1
8,0	294,97	0,0235	42,5100	1.317,10	2.759,9	1.442,8
9,0	303,31	0,0205	46,7900	1.363,70	2.744,6	1.380,9
10,0	310,96	0,0180	55,4300	1.408,00	2.727,7	1.319,7
11,0	318,05	0,0160	62,4800	1.450,60	2.709,3	1.258,7
12,0	324,65	0,0143	70,0100	1.491,80	2.689,2	1.197,4
13,0	330,83	0,0128	78,1400	1.532,00	2.667,0	1.135,0
14,0	336,64	0,0115	86,9900	1.571,60	2.642,4	1.070,8
15,0	342,13	0,0103	86,7100	1.611,00	2.615,0	1.004,0
16,0	347,33	0,0093	107,4000	1.650,50	2.584,9	934,4
17,0	352,26	0,0084	119,5000	1.691,70	2.551,6	859,9
18,0	356,96	0,0075	133,4000	1.734,80	2.513,9	779,1
19,0	361,43	0,0067	149,8000	1.778,70	2.470,6	691,9
20,0	365,70	0,0059	170,2000	1.826,50	2.418,4	591,9
22,0	373,69	0,0037	268,3000	2.011,10	2.195,6	184,5
22,12	374,15	0,0032	315,5000	2.107,40	2.107,4	0,0

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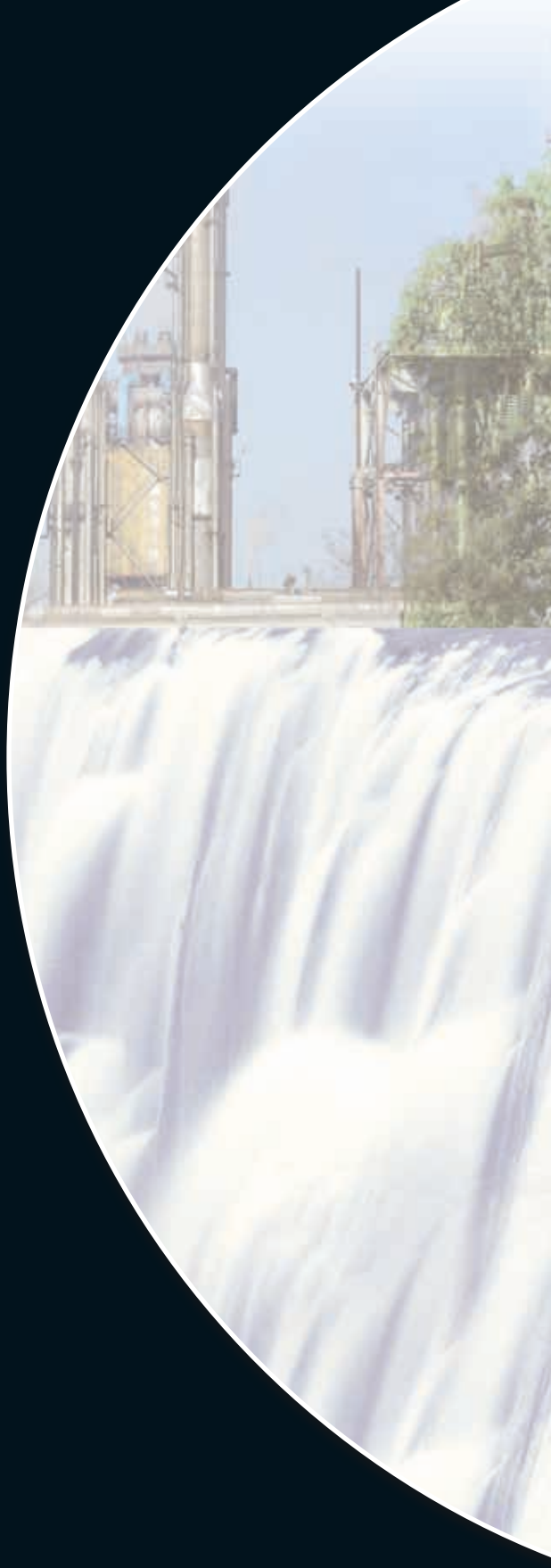

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