

MEMORANDUM

TO: All Interested Parties
FROM: Hugo Aguilar, Staff Liaison
DATE: December 18, 2015
SUBJECT: Proposed TIA (Log No. 003-15) to UNIFORM MECHANICAL CODE, Section 1206.1.

In accordance with the IAPMO Regulations Governing Committee Projects, the attached proposed Tentative Interim Amendment (TIA) to the 2015 edition of the UNIFORM MECHANICAL CODE is being submitted for public comment. The TIA (Log No. 003-15) is on UMC, Section 1206.1.

We invite all interested parties to review the proposed TIA and to respond by filling out the attached comment form. You may fax in the completed form to Codes Department, 909-472-4246. **The final closing date for receiving comment forms for this TIA is January 20, 2016.**

Thank you for your time and interest in the development of the Uniform Mechanical Code.

In accordance with the IAPMO [Regulations Governing Committee Projects](#) this, a proposed TIA which has been submitted for processing pursuant to 5-1 of the Regulations, will be automatically docketed as an appeal on the agenda of the IAPMO Standards Council. Any party may advocate their position before the Council. Please note that most Council meetings are held via teleconference.

Parties wishing to address the Council shall notify the Council Secretary no later than 48 hours prior to the Council meeting. Although not required, parties wishing to advocate a position are encouraged, to the extent practicable, to file written submissions in general conformance with sections 1-6.3 and 1-6.4 of the Regulations in advance of the meeting at which action will be considered.

When an automatically docketed appeal has not been pursued by any party, the Council will not consider the matter as an appeal.

This TIA will be on the Council agenda schedule – date to be determined.

FORM FOR TIA COMMENT ON IAPMO UPC/UMC COMMITTEE DOCUMENT

NOTE: All comments MUST be received by 5:00 PM PST on Wednesday, January 20, 2016.

For further information on the standards-making process, please contact
Codes and Standards Administration at 909-472-4110

For technical assistance, please call IAPMO at 909-472-4111 or
909-230-5535

FOR OFFICE USE ONLY

RESP # : _____

DATE REC'D: _____

Please Print or Type using Black Ink

Date: _____ Name: _____ Telephone #: _____

Company: _____

Street Address: _____ City: _____ State: _____ Zip: _____

Please Indicate Organization Represented (if any): _____

1. a) IAPMO Document Title: Uniform Mechanical Code Document Year: 2015

b) Section/Paragraph: Section 1206.1

c) Comment on TIA: Item # UMC 003-15

2. Comment Recommends (check one): New Text Revised Text Deleted Text

3. **Comment** (Include proposed new or revised wording, or identification of wording to be deleted):
[Note: Proposed text should be in legislative format: i.e., use underscore to denote wording to be inserted (inserted wording) and strike-through to denote wording to be deleted (~~deleted wording~~).
PLEASE TYPE OR PRINT LEGIBLY IN BLACK INK.]

4. **Statement of Problem and Substantiation for Comment:** [Note: State the problem that will be resolved by your recommendations; give the specific reason for your proposal including copies of tests, research papers, etc. If more than 200 words, it may be abstracted for publication.]

5. **This comment is original material.** [Note: Original material is considered to be the submitter's own idea based on or as a result of his/her own experience, thought, or research and, to the best of his/her knowledge, is not copied from another source.]

This comment is not original material, its source (if known) is as follows: _____

I hereby grant IAPMO all and full rights in copyright, in this proposal, and I understand that I acquire no rights in any publication of IAPMO in which this proposal appears in this or another similar or analogous form is used.

I do not now hold and I do not intend to hold any patent, the use of which would be required for compliance with this proposal.

Signature (**Required**): _____

Please use separate form for each comment.

INSTRUCTIONS FOR SUBMITTING COMMENTS
– PLEASE READ CAREFULLY –

1. Type or print in BLACK ink.
2. Indicate the title of the document and the document year. In addition, indicate the specific section or paragraph and the Item number shown in the Report on Proposals (ROP) that the comment applies to.
3. Check the appropriate box to indicate whether this comment recommends adding new text, revising proposed text, or deleting proposed text.
4. In the space identified as “Comment”, indicate the exact wording you recommend as new or to revise proposed text, or the text you recommend be deleted.
5. In the space title “Statement of Problem and Substantiation for Comment”, state the problem which will be resolved by your recommendation and give the specific reason for your comment. Include copies of test results, research papers, fire experience, or other materials that substantiate your recommendation. [See note below, item (f).]
6. Check the appropriate box to indicate whether or not this comment is original material, and if it is not, indicate the source of the material.
7. Sign the comment. (Required)

If supplementary material (photographs, diagrams, reports, etc.) is included, you may be required to submit sufficient copies for all members and alternates of the technical committee. The technical committee is authorized to abstract the “Statement of Problem and Substantiation for Comment” if it exceeds 200 words for publication in the Report on Comments.

NOTE: The IAPMO Regulations Governing Committee Projects in Paragraph 4.4 state: Each comment shall be submitted to the Council Secretary and shall include: (a) identification of the submitter and his or her affiliation (i.e., technical committee, organization, company), where appropriate; (b) identification of the document, edition of the document, and paragraph of the document to which the proposal is directed; (c) the proposed text of the proposal, including the wording to be added, revised (and how revised), or deleted; (d) a statement of the problem and substantiation for proposal; (e) the signature of the submitter; and, (f) two copies of any document(s) (other than an IAPMO document) being proposed as a reference standard or publication (see 3-3.7).

UNIFORM MECHANICAL CODE TIA FORM - 2015

Reference Code Section: 1206.1

Submitter Name: Alex Green
Company: Watts Water Technologies
Address: 815 Chestnut St, North Andover, MA 01845
Phone number: 978 689 6173

PROPOSED LANGUAGE FOR TIA:

Revise text as follows:

1206.0 Safety Devices.

1206.1 General. Hydronic systems containing pressurized fluids shall be protected against pressures ~~and temperatures~~ exceeding design limitations with a pressure ~~and temperature~~ relief valve. Each section of the system in which excessive pressures are capable of developing shall have a relief valve located so that a section is not capable of being isolated from a relief device. Pressure ~~and temperature~~ relief valves shall be installed in accordance with the terms of their listing and the manufacturer's installation instructions.

Technical Merit

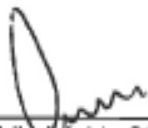
- No technical grounds for the additional temperature protection. Temperature safety relief valves are designed solely to prevent BLEVEs. Auxiliary pressure relief valves are used to control system pressure due to thermal expansion, such as those specified in IAPMO IGC-128.
- Onerous/impossible installation of T&P valves in hydronic systems. Temperature safety relief valves must be installed in the top 6" of the water heater tank. This ensures that the temperature probe is sensing the hottest water in the system, and thus cannot be installed downstream in a hydronic heating system. Reference "Location in Water Heater" on page 5 of the attached product guide.
- Temperature and pressure safety relief valves must be sized in accordance with the BTU input of the water heater, as required by ASME Section IV and/or ANSI Z21.22, referenced elsewhere in the UMC. There are no additional provisions for sizing the temperature relief valve for this section 1206.1 beyond which is already required.

Emergency Nature

- No manufacturer currently makes T&P relief valves for such low pressures, so it would be impossible to follow their installation instructions. This will cause significant confusion in the market as AHJ's try to enforce the new code.
- T&P relief valves mandate many discharge line requirements that are not feasible, and not required, for auxiliary pressure relief. The mandating of such requirements is unduly burdensome to the installer/end-user.

I hereby grant IAPMO all and full rights in copyright, in this proposal, and I understand that I acquire no rights in any publication of IAPMO in which this proposal appears in this or another similar or analogous form.

Submitter signature (required):



Date: 12/16/15.

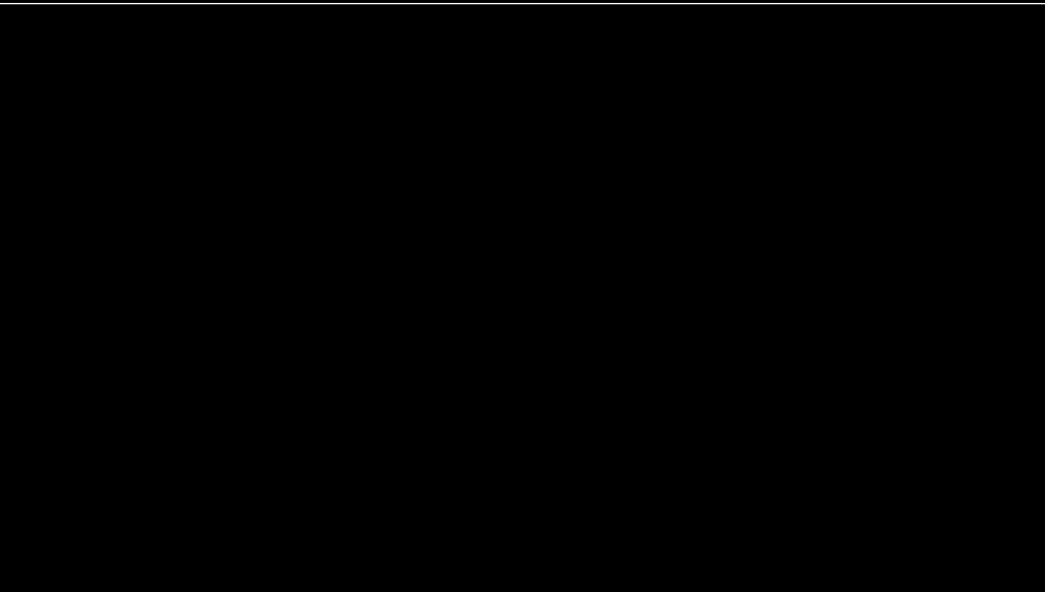
Mail to: Codes Department · IAPMO · 4755 E. Philadelphia Street · Ontario · CA · 91761-2816
FAX: 909-472-4246



⚠ DANGER



T&P and ASME Safety Relief Valves



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ASME Rated Pressure Relief Valves

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ASME Water Pressure Relief Valves

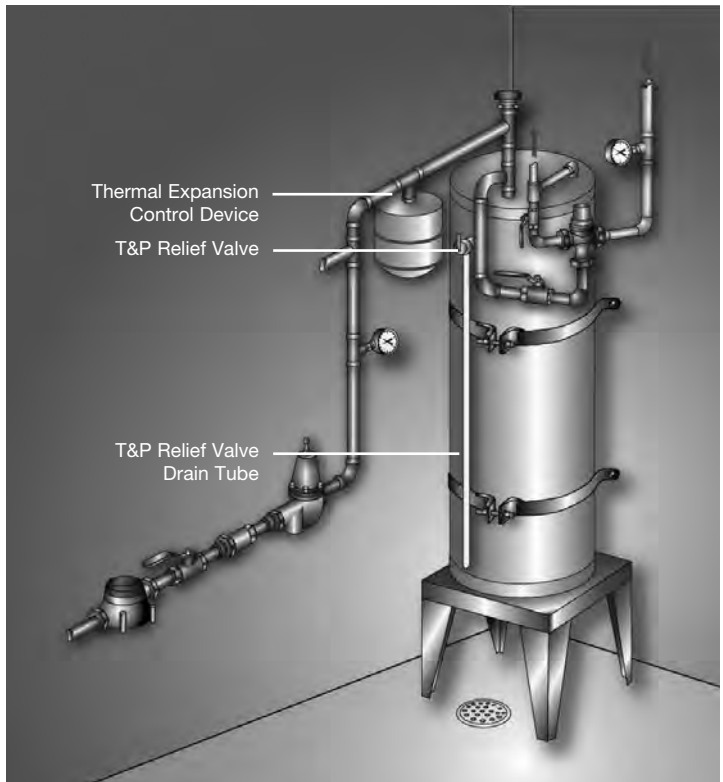
Series LF174A	16
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ASME Pressure Steam Rating

The ASME pressure steam rating should be considered with caution, because it represents the ability of the device to discharge steam pressure at the set pressure of the valve. For example, let's consider a 150psi set relief valve with an ASME pressure steam rating of 1,437,600 BTU per hour. Before this valve can deliver that rating, there must be generated within the tank over 150psi of steam pressure in order to actuate the valve. This is certainly an unsafe condition for a non-ASME-rated water heater tank. The tank could rupture and explode prior to reaching this ASME pressure rating. An ASME-rated tank is constructed to higher standards than a non-rated tank. It is important to understand which type of tank will be used in an application. For all non-ASME-rated tanks, the CSA temperature steam rating should always be used.

Pressure Relief Settings

Questions regarding relief valve settings frequently come up. For some years, 125psi was the standard setting. Today 150psi is considered the standard. The history of the 125psi setting stems from a water heater standard which formerly stated that the working pressure of the water heater tank would be designated at 42% of the test pressure. As most heaters were tested at 300psi, the working pressure figured out to 127psi. Thus, the 125psi valve became the standard setting. However, the water heater standard was changed to allow the working pressure to be 50% of the test pressure, resulting in the change to a pressure relief setting of 150psi. Under no circumstances should the relief valve setting of the valve exceed the working pressure of the tank, as this would violate all heater warranties and codes.

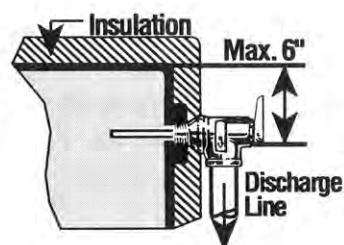


Typical Heater Installation

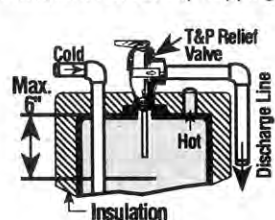
Location in Water Heater

Installation

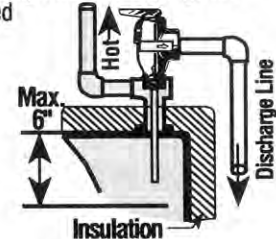
The installation of temperature and pressure relief valves is critical. They must be installed so that the temperature sensing element is immersed in the hottest water in the tank. The hottest water is located in the top six inches of the tank. Most water heaters are equipped with a special tapping for the T&P valve at the proper location in the tank. If, however, the valve were to be installed a distance away from the tank, a thermal lag condition would be created, which simply means that the valve thermostat cannot respond to the hottest water in the top of the heater. For example, a $\frac{3}{4}$ " valve which is installed four inches from the tank would actually be sensing cooler water, and by the time the temperature of the water at the point of the valve reached 210°F, the temperature at the top of the tank would be 244°F. Another example: If the valve was installed ten inches away, when it finally sensed 210°F water, the temperature at the top of the tank would be 272°F. So the basic rule is to install the valve so that the temperature sensing element is immersed in the water in the top six inches of the tank. This may require the installation of an extended temperature sensing element.



For Heaters with Direct Top Tapping



"Alternate" Only when the tappings are not provided



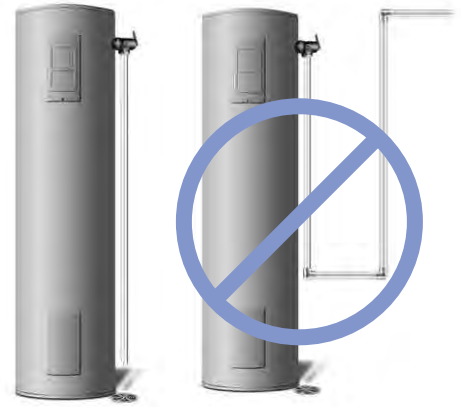
Use Standard or extra length extensions thermostat

Typical T&P Valve Installations

Drain Lines

A drain line must be connected to the discharge outlet of a T&P relief valve to avoid water damage and scalding injury. A drain line, the same size as the relief valve outlet, must be used in order to channel the discharge of hot water to a safe place of disposal. The drain line must pitch downward to allow for the complete drainage of both the valve and the line. The drain

line must never be trapped. Also, the drain line should not contain any shut-off valves, reducing couplings or restrictions. One must never plug or crimp or reduce the size of a drain line. **The T&P valve rating can only be achieved with a full sized discharge line.** The drain line should terminate above a floor drain or where any discharge will be clearly visible.



Watts Model 100DT drain lines are available for both T&P mount and side mount T&P valves.

Boiling Points of Water

Water is practically an incompressible solid, and unless it is superheated, it has no latent heat energy within itself to expand when released. However, water above 212°F is considered superheated water and does possess latent heat energy which, when exposed to atmospheric pressure, flashes into steam and creates

the energy which is the power behind an explosion. In an open vessel at atmospheric pressure, water will boil at 212°F. No matter how much heat is applied, there is no latent heat energy stored by the water. However, water in a closed system and under pressure has a much higher boiling point, which increases with pressure.

For example, where water supply pressure to the water heater is 90psi, the boiling point is not reached until 331.2°F. At only 50psi, water flashes into steam and boils at 297°F. This energy, if released by a water heater rupture, equals more than one pound of dynamite. Thus, it is essential to keep water temperature below 212°F.

Thermal Expansion

One of the more common questions regarding T&P relief valves is why they drip. In most cases, dripping is caused by thermal expansion. When water is heated in a closed plumbing system, it expands, causing an increase in pressure. This increase in system pressure over that regulated by the pressure reducing valve is called thermal expansion pressure. **The T&P valve is a safety device and is not intended for continuous operation to relieve thermal expansion. Continuous dripping can cause the build up of mineral deposits on the valve and may render it useless.**

A simple way to detect whether or not thermal expansion is the cause of a dripping relief valve is to open a fixture during the expansion period. Opening a fixture opens the system, and immediately the pressure will drop back to normal. A second method that is used to determine the maximum pressure of the system is to install a pressure test gauge with a telltale on a hose bibb connection. As the pressure increases, the gauge moves the telltale. By leaving the gauge on the system for 24 hours, the telltale will remain at the highest pressure registered on the system.

Watts model 276H300 or IWTC water pressure test gauges can do just that. They connect to any standard hose bibb for easy thermal expansion detection.



276H300



H32



Governor 80M2



BRV



530C

Thermal expansion problems can be solved by using a thermal expansion relief device on the system. Devices include auxiliary type relief valves which can be placed anywhere on the system and set approximately to 10psi below the water heater relief valve setting. They allow the auxiliary relief valve to take the brunt of thermal expansion relieving and to prevent unnecessary relieving cycles by the T&P relief valve.

Watts offers the model 530C, H32 and BRV. Watts also offers the Governor 80M2 combination toilet ballcock and thermal expansion relief valve. The Governor 80M2 discharges thermally expanded water into the toilet tank.

Another solution is to use an expansion tank. With this method, the expanded volume of water remains contained within the system, which is important where water conservation is a concern. Expansion tanks consist of an air chamber separated by a flexible diaphragm. When thermal expansion occurs, the excess water created is absorbed by the tank. When the tap is opened, the water is then forced by the tank back into the system. Watts offers several potable water expansion tanks including the models DET, PLT and DETA.



DET



PLT



DETA

T&P Relief Valve Reinspection

Temperature and pressure relief valves should be reinspected at least once every three years by a licensed plumbing contractor or authorized inspection agency to ensure that the product has not been affected by corrosive water condition and to ensure that the valve and discharge line have not been altered or tampered with illegally. Certain naturally occurring conditions may corrode the valve or its components over time, rendering the

valve inoperative. Such conditions are not detectable unless the valve and its components are physically removed and inspected. An unauthorized person must not attempt to conduct this inspection.



Mineral build-up can render T&P Valve inoperative.



Contact a plumbing contractor for a reinspection to assure continuing safety. Failure to reinspect as directed could result in unsafe temperature or pressure build-up that can result in serious injury or death and/or severe property damage.

Watts recommends using the following checklist when reinspecting T&P relief valves:

ITEM TO INSPECT	WHAT TO DO	PURPOSE
1. Test Lever	Manually lift lever	Following installation, the valve lever MUST be operated AT LEAST ONCE A YEAR to ensure that waterways are clear. Certain naturally occurring mineral deposits may adhere to the valve, blocking waterways, rendering it inoperative. When the lever is operated, hot water will discharge if the waterways are clear. PRECAUTIONS MUST BE TAKEN TO AVOID PERSONAL INJURY FROM CONTACT WITH HOT WATER AND TO AVOID PROPERTY DAMAGE.
2. Valve Location	Observe how valve is installed	Valve thermostat must be immersed in tank water and located in top 6" of tank to accurately sense temperature.
3. Discharge Line	Observe size and direction	Discharge line must always be installed to avoid water damage and scalding injury, when valve operates. Discharge line must be same size as valve outlet, be pitched down for free draining, and have no shut-off valve or obstructions throughout its entire length. Discharge line termination point should be visible to observe any discharge.
4. Nameplate	A. Observe Pressure Setting	Pressure Relief Setting cannot exceed working pressure of tank.
	B. Observe CSA rating	CSA Rating must be in excess of BTU input of heater.
	C. Observe Type number	To ensure that valve is temperature and pressure type rather than plain pressure relief.
	D. Observe Dating Code*	To determine age of valve, all devices have a 4 digit serial number dating code. The first two digits are the year and the last two digits are the week of the year the valve was manufactured (i.e. 1320 is 20th week of 2013.)
5. Complete Valve	Remove valve from tank	TEMPERATURE AND PRESSURE RELIEF VALVES should be inspected AT LEAST ONCE EVERY THREE YEARS , and replaced, if necessary, by a licensed plumbing contractor or qualified service technician, to ensure that the product has not been affected by corrosive water conditions and to ensure that the valve and discharge line have not been altered or tampered with illegally. Certain naturally occurring conditions may corrode the valve or its components over time, rendering the valve inoperative. Such conditions can only be detected if the valve and its components are physically removed and inspected. Do not attempt to conduct an inspection on your own. Contact your local licensed plumbing contractor for a reinspection to assure continuing safety.
6. Inspection Log	Log inspection data	To provide record of inspection date and results of inspection.
		*The date code may be located on the underside of the test lever or on the metal nametag.

Commercial T&P Relief Valves

Series LF40, LF140, LFN240, and LF340

LEAD FREE Automatic Re-seating T&P Relief Valves

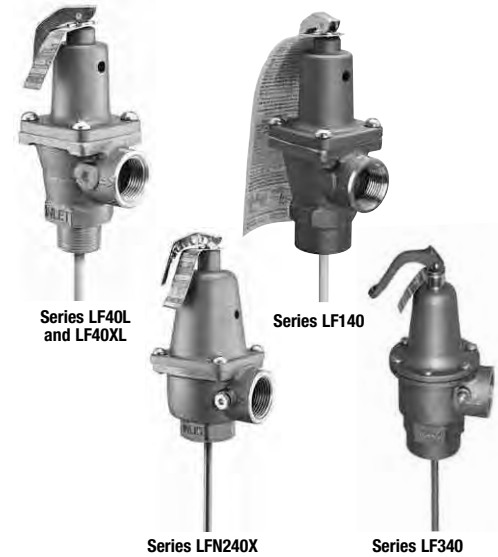
The combined 2-in-1 Temperature & Pressure Relief Valve provides the least expensive and proven means for protection against both excessive temperature and pressure emergency conditions.

Fully automatic temperature and pressure relief protection for domestic hot water supply tanks and heaters based on the latest ANSI Z21.22 Listing requirements for temperature discharge capacity. The LF40, LF140, LFN240, and LF340 feature Lead Free* construction to comply with Lead Free* installation requirements.

LF40XL with test lever and extension thermostat for installation in hot water outlet within the allowable distance from the top of the tank based on latest ANSI Z21.22. Sizes ¾" and 1" (20 – 25mm).

LF40L with test lever and short thermostat for installation directly in available tank tappings. Sizes ¾" and 1" (20 – 25mm).

Series LF140, LFN240 and LF340 have the same basic body construction and advanced design features as the Series LF40 except for discharge capacity and size of inlet and outlet connections. For complete specifications (including specifications for the Series LF40) see other side. Sizes 1", 1¼", 1½" and 2" (25, 32, 40 and 50mm).



Features

- Lead Free cast body
- Non-mechanical seat-to-disc alignment
- Tamper-resistant bonnet screws
- Series ¾" LF40 and LF140 feature a unique thermostat with a special thermo-bonded coating
- Series 1" LF140 are furnished with stainless steel thermostat tube
- Series LFN240 and LF340 are hot furnished with stainless steel thermostat tube

Standards

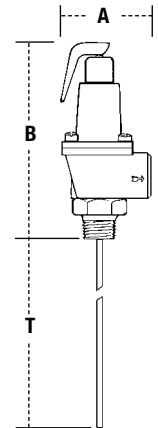


ASME Rated, ANSI Z21.22, Design certified and listed by CSA, National Board of B&PVI to Section IV of the ASME B&PV code and meet current FHA requirements and ANSI Z21.22 in addition to Military Spec. MIL-V-136-12D, Type I.

Pressure - Temperature

Temperature relief 210°F (99°C)
 Pressure range 75 – 150psi (5.2 – 10.3 bar)
 Standard setting 75, 100, 125 and 150psi (5.2, 6.9, 8.6 and 10.3 bar)

*The wetted surface of this product contacted by consumable water contains less than 0.25% of lead by weight.



MODEL	INLET X OUTLET (IN.)	THERMOSTAT LENGTH (IN.) (BELOW INLET THREAD)	DIMENSIONS (IN.)		WEIGHT LBS.	CSA TEMP. STEAM RATING BTU/HR	**ASME PRESSURE STEAM RATING BTU/HR			
			HEIGHT (LESS THERMOSTAT)	WIDTH			@75PSI SET PRES.	@100PSI SET PRES.	@125PSI SET PRES.	@150PSI SET PRES.
LF40L-3	¾ M x ¾ F	3	5½	2½	1¼	180,000	777,600	997,600	1,217,600	1,437,600
LF40XL-5	¾ M x ¾ F	5	5½	2½	1¼	205,000	777,600	997,600	1,217,600	1,437,600
LF40XL-8	¾ M x ¾ F	8	5½	2½	1¼	205,000	777,600	997,600	1,217,600	1,437,600
LF140S-3	¾ F x ¾ F	3	5½	2½	1¼	180,000	777,600	997,600	1,217,600	1,437,600
LF140X-5	¾ F x ¾ F	5	5½	2½	1¼	205,000	777,600	997,600	1,217,600	1,437,600
LF140X-8	¾ F x ¾ F	8	5½	2½	1¼	205,000	777,600	997,600	1,217,600	1,437,600
LF40L-2	1M x 1F	2	6¼	2¼	2¼	450,000	1,155,000	1,481,000	1,808,000	2,134,000
LF40XL-4	1M x 1F	4	6¼	2¼	2¼	500,000	1,155,000	1,481,000	1,808,000	2,134,000
LF40XL-7	1M x 1F	7	6¼	2¼	2¼	500,000	1,155,000	1,481,000	1,808,000	2,134,000
*LF140S-3	1F x 1F	3	5½	3	2¼	570,000	1,670,000	2,140,000	2,610,000	3,085,000
*LF140X-6	1F x 1F	6	5½	3	2¼	670,000	1,670,000	2,140,000	2,610,000	3,085,000
*LF140X-9	1F x 1F	9	5½	3	2¼	670,000	1,670,000	2,140,000	2,610,000	3,085,000
*LFN240X-6	1F x 1F	6	6½	3¾	2¼	730,000	2,195,000	2,817,000	3,438,000	4,059,000
*LFN240X-9	1F x 1F	9	6½	3¾	2¼	730,000	2,195,000	2,817,000	3,438,000	4,059,000
*LFN241X-5	1¼ M x 1F	5	6½	3¾	2¼	730,000	2,195,000	2,817,000	3,438,000	4,059,000
*LFN241X-8	1¼ M x 1F	8	6½	3¾	2¼	730,000	2,195,000	2,817,000	3,438,000	4,059,000
*LF340-3	1½ F x 1½ F	3	9¼	4½	7	1,150,000	3,450,000	4,426,000	5,403,000	6,379,000
*LF340X-8	1½ F x 1½ F	8	9¼	4½	8	1,150,000	3,450,000	4,426,000	5,403,000	6,379,000
*LF342-3	2 M x 1½ F	3	9¼	4½	7	1,150,000	3,450,000	4,426,000	5,403,000	6,379,000
*LF342X-8	2 M x 1½ F	8	9¼	4½	8	1,150,000	3,450,000	4,426,000	5,403,000	6,379,000

*Furnished with stainless steel thermostat tube. M = Male F = Female

**ASME capacities are steam pressure ratings and do not reflect the CSA temperature relieving capacity of the valves for selection purposes.

†LFLL40XL and LFLLL40XL valves with extended inlet shanks should be used for water heaters that have extra thick insulation, Ask for ES-LFLL/LLL40XL.

For additional information, reference literature ES-LF40_LFN240_LF340.

Series LFLL40 and LFLLL40

LEAD FREE Extended Inlet Shank Automatic Re-seating T&P Relief Valves

The combined 2-in-1 Temperature & Pressure relief valve provides the least expensive and proven means for protection against both excessive temperature and pressure emergency conditions.

Full automatic temperature and pressure relief protection for commercial hot water supply tanks and heaters based on the latest ANSI Z21.22 listing requirements for temperature discharge capacity.

LFLL40XL and LFLLL40XL with test lever and extended inlet shank for use with the new generation of water heaters with extra thick insulation. These valves eliminate the use of an extension nipple required with standard shank length models.

Watts self-closing combination T&P relief valves are design certified and listed by CSA and NB.

Features

- Lead Free* cast copper silicon alloy
- Non-mechanical seat-to-disc alignment
- Thermostat is accurate and proven. Exclusively designed and manufactured by Watts
- Tamper-resistant bonnet screws
- Unique thermostat with a special thermo-bonded coating

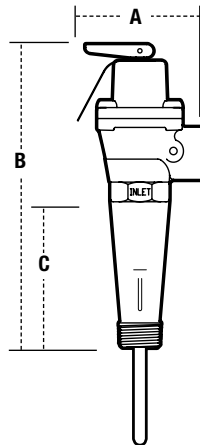
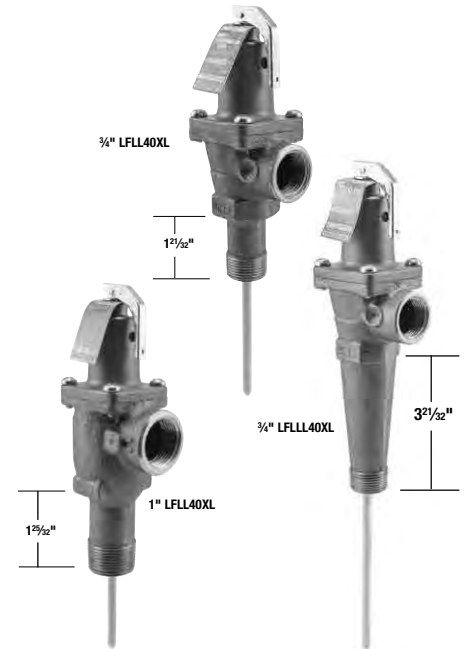
Standards



ASME rated, ANSI Z21.22. Design certified and listed by CSA. Meets current FHA and ANSI Z21.22 requirements in addition to Military Spec. MIL-V 136-12D, Type I.

Pressure - Temperature

Temperature relief 210°F (98.9°C). Pressure range 75-150psi (5.17-10.34 bar). Standard setting 75, 100, 125 or 150psi (5.17, 6.9, 8.61 and 10.34 bar).



*The wetted surface of this product contacted by consumable water contains less than 0.25% of lead by weight.

MODEL	INLET X OUTLET (IN.)	THERMOSTAT LENGTH (IN.) (BELOW INLET THREAD)	DIMENSIONS (IN.)		WEIGHT LBS.	CSA TEMP. STEAM RATING BTU/HR	**ASME PRESSURE STEAM RATING BTU/HR			
			HEIGHT (LESS THERMOSTAT)	WIDTH			@75PSI SET PRES.	@100PSI SET PRES.	@125PSI SET PRES.	@150PSI SET PRES.
LFLL40XL	3/4 M x 3/4 F	3 1/2	5 5/8	2 5/8	1 1/2	205,000	777,600	997,600	1,217,600	1,437,600
LFLLL40XL	3/4 M x 3/4 F	5	7 5/8	2 5/8	2	205,000	777,600	997,600	1,217,600	1,437,600
LFLL40XL	1M x 1F	3	6 1/2	2 3/4	2	500,000	1,155,000	1,481,000	1,808,000	2,134,000

M= Male F=Female

**ASME capacities are steam pressure ratings and do not reflect the CSA temperature relieving capacity of the valves for selection purposes.

Residential T&P Relief Valves

Series LF1L, LF1XL, LF10L and LF100XL

LEAD FREE Temperature and Pressure Relief Valves

A.S.M.E Rated**, CSA Listed. Self-closing T&P Relief Valves

for Water Heaters up to 105,000 BTU/Hr.

The combined 2 in 1 T&P relief valve provides the least expensive and proven means for protection against both excessive temperature and pressure emergency conditions.

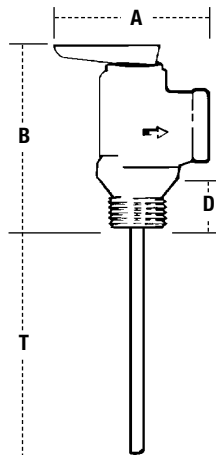
Provides fully automatic temperature and pressure relief protection for hot water storage tanks and heaters up to 105,000 BTU/HR. Series LF10L furnished with test lever and short thermostat for installation directly in tank tapping. Series LF100XL

furnished with test lever and extension thermostat for installation in the hot water outlet line or directly in the tank tapping. Temperature sensing element must be immersed in the water within the top 6" (152mm) of the tank. Male inlet and female outlet. Temperature relief 210°F (99°C). Standard settings 75, 100, 125, 150psi (5.3, 7.0, 8.8, 10.6 bar). The LF1L, LF1XL, LF10L, and LF100XL feature Lead Free* construction to comply with Lead Free* installation requirements.



Features

- Series LF1L, LF1XL Size ½" (15mm)
LF10L, LF100XL Size ¾" (20mm)
- A.S.M.E. Rated**, CSA Listed
- Features a unique thermostat with special thermo-bonded coating
- An all Lead Free* copper silicon alloy body
- Stainless steel spring
- Thermostat is accurate and proven. Exclusively designed and manufactured by Watts



*The wetted surface of this product contacted by consumable water contains less than 0.25% of lead by weight.

MODEL	SIZE (DN)		DIMENSIONS								WEIGHT		CSA Temp. Steam Rating BTU/hr.
	in.	mm	A		B		D		T		oz.	gm.	
LF1L2 M7	½	15	1¼	43	3½	89	⅞	22	2	50	10	284	15,000
LF1XL-4 M7	½	15	1¼	43	3½	89	⅞	22	4	100	12	340	15,000
LF1XL-8 M7	½	15	1¼	43	3½	89	⅞	22	8	203	16	454	15,000
LF10L-2 M7	¾	20	1¼	43	3½	89	1⅞	29	2	50	10	284	80,000
LF100XL-4 M7	¾	20	1¼	43	3½	89	1⅞	29	4	100	12	340	105,000
LF100XL-8 M7	¾	20	1¼	43	3½	89	1⅞	29	8	203	14	397	105,000

A = overall width of the valve. B = overall height of the valve, with lever closed, not including thermostat element length.

D = length of shank, from shoulder under outlet orifice overhang to inlet orifice edge.

T = length of thermostat element, measured from inlet orifice edge to end of thermostat.

* 150psi set pressure

Series LFSL100XL, LFL100XL, LFLL100XL and LFLLL100XL

LEAD FREE Extended Shank T&P Relief Valves

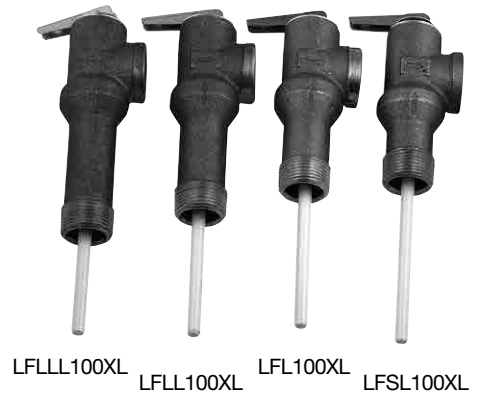
CSA Rated. Standard Models are self-closing T&P Relief Valves for Water Heaters up to 105,000 BTU/Hr.

Watts Series LFSL100XL, LFL100XL, LFLL100XL and LFLLL100XL have extended inlet shanks for use with the new generation of water heaters containing extra thick insulation. These valves eliminate the use of an extension nipple required with standard shank length models. They feature Lead Free* construction to comply with Lead Free* installation requirements.

The combined 2-in-1 Temperature & Pressure relief valve provides the least expensive and proven means for protection against both excessive temperature and pressure emergency conditions.

Watts Self-closing combination T&P relief valves are design certified, rated and listed by CSA to the requirements of ANSI Z21.22; and by the National Board to the requirements of ASME Section IV.

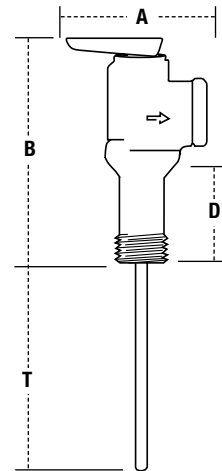
They provide fully automatic temperature and pressure relief protection for hot water storage tanks and heaters up to 105,000 BTU/Hr. The temperature sensing element must be immersed in the water within the top 6" (152mm) of the tank. Male inlet and female outlet. Temperature relief 210°F (99°C). Standard setting 75, 100, 125, 150psi (5.3, 7.0, 8.8, 10.6 bar).



Features

- Model LFSL100XL Extended inlet model for installations with thick insulation. Suitable for water heaters with up to 1¾" (44.5mm) of insulation
- Model LFL100XL Extended inlet model for installations with thick insulation. Suitable for water heaters with up to 2" (50.8mm) of insulation
- Model LFLL100XL Extra extended inlet model. Suitable for water heaters with up to 2½" (63.5mm) of insulation
- Model LFLLL100XL Extra extended inlet model. Suitable for water heaters with up to 3" (76mm) of insulation
- Thermostats with special protective coating
- All Lead Free* brass body
- Stainless steel spring
- Thermostat is accurate and proven. Exclusively designed and manufactured by Watts.

*The wetted surface of this product contacted by consumable water contains less than 0.25% of lead by weight.



NO.	SIZE		HEIGHT LESS THERMOSTAT		WIDTH		WEIGHT		C.S.A. TEMP STEAM RATING	MODEL
	in.	mm	in.	mm	in.	mm	lbs.	Kgs.		
LFSL100XL	¾	20	4	102	1⅞	48	.58	.26	105,000	Z5
LFL100XL	¾	20	4¼	108	1⅞	48	.61	.28	105,000	Z5
LFLL100XL	¾	20	4¾	127	1⅞	48	.65	.29	105,000	M7
LFLLL100XL	¾	20	5¼	133	1⅞	48	.68	.31	105,000	Z5

Relief/Shutoff Valves

Series 210-5

LEAD FREE Automatic Gas Shutoff Valves

Series LF210-5 automatic gas shutoff valves are positive-acting energy shutoff for the emergency temperature protection of gas water heaters. They are self-contained devices independent of all other operating controls. They provide protection against overheating water in the domestic hot water supply heating systems by automatically shutting off the gas supply to the heater in the event that the water temperature reaches 210°F (99°C). Series LF210-5 must be manually reset in order to resume heater service. This feature serves as a warning of malfunctioning of the normal operating controls. Manual resetting is easily done and does not require dismantling or replacing of any part of the valve. See "Reset Button" feature. The LF210-5 features Lead Free* construction to comply with Lead Free* installation requirements.

This gas shutoff differs from other contemporary design in that Watts engineers have embodied the time tested Watts auto-thermatic thermal actuator principle along with a snap-acting trip latch which closes the valve at a definite controlled temperature.

Models LFL210-5 M2, LFL210-5 M2 and LFL210-5 M2 feature extended shanks for use with the new generation of water heaters containing extra thick insulation.

Features

- **Seating** – Buna-N disc to metal seating assures positive seal for shutting off the gas to burner in the event of high water temperature conditions
- **Reset Button** – After operating from high temperature, the gas shutoff must be manually reset (opened). Pressing the reset button in as far as it will go and then releasing, opens the valve and allows gas to again flow to the burner
- **Trip Latch Assembly** – Snap acting latch releases the valve to closed at a definite controlled temperature. Stainless steel spring seats valve when trip latch releases valve to closed position

*The wetted surface of this product contacted by consumable water contains less than 0.25% of lead by weight.

- **Thermostat** – Operates trip latch in response to water temperature. Thermobulb, temperature sensitive portion, is at end of extension tube for accurate response to tank temperature conditions

Specifications

Standard setting: 210°F (99°C)
 Extension: Furnished with 5" thermostat extension only.



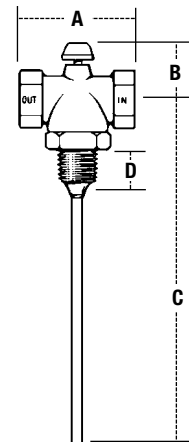
LF210-5 M2

LFL210-5 M2

LFL210-5 M2



LFL210-5 M2



MODEL	DIMENSIONS								WEIGHT	
	A		B		C		D		lbs	kgs.
	in.	mm	in.	mm	in.	mm	in.	mm		
LF210-5 M2	2½	64	1⅝	29	8	203	⅞	22	1.0	0.45
LFL210-5 M2	2½	64	1⅝	29	7¼	198	1⅞	48	1.0	0.45
LFL210-5 M2	2½	64	1⅝	29	8⅞	211	2⅜	60	1.0	0.45
LFL210-5 M2	2½	64	1⅝	29	8¼	224	2⅞	73	1.0	0.45

MODELS	CONNECTIONS				BTU/HR Ratings M.F.G. and L.P. Gas Air Mixtures	Mixed Gases
	Tank	Gas	Natural Gas	L.P. Gas		
LF210-5 M2, LFL210-5 M2, LFL210-5 M2, LFL210-5 M2	¾" male	½" female	150,000	243,000	77,400	125,750

For additional information, reference literature ES-LF210-5.

Series LF3L

LEAD FREE Poppet Type Pressure Relief Valves for Protection Against Excessive Pressure

Series 3L/LF3L are used for protection against excessive pressure on domestic storage tanks or tankless water heaters. Similar in construction to Watts Model 10L, the Models 3L/LF3L has no temperature relieving element. Models 3L/LF3L are ASME approved. The LF3L is constructed using Lead Free* cast copper silicon alloy and complies with Lead Free* installation requirements. These Pressure Relief Valves are popularly used in conjunction with the Models 210/LF210 gas shutoff valve on gas water heaters to shut of gas to heater if water heater temperature exceeds 210°F (99°C).



LF3L

Features

- Lead Free* cast copper silicon alloy bodies
- Furnished with test levers
- Relieves excessive pressure on storage tanks
- Relieves excessive pressure on tankless water heaters
- Model LF3L is ASME approved
- Compatible with Model LF210 gas shut-off valves Pressure range of 17-150psi (5.2-10.3 bar)

Materials

Body: Lead Free* cast copper silicon alloy
 Spring: Stainless steel
 Disc: Silicone
 Pressure range: 75—150psi (5.2—10.3 bar)
 Standard settings of 75psi, 100psi, 125psi, 150psi

*The wetted surface of this product contacted by consumable water contains less than 0.25% of lead by weight.

MODEL	SIZE		HEIGHT		WIDTH		WEIGHT		VERSION
	in	mm	in	mm	in	mm	lbs.	gms.	
LF3L	3/4	20	3 1/2	89	1 3/4	44	5/8	284	M7

Model LF3L 3/4" (20mm) size CSA and ASME

For additional information, reference literature ES-LF3L.

Model LF53L

LEAD FREE Pressure Relief Valve

Models 53L/LF53L are used for protection against excessive pressure on domestic storage tanks or tankless water heaters. Models 53L/LF53L has the basic design as Model 3L/LF3L except it is furnished in 1/2" size and does not comply with A.S.M.E. requirements. The LF53L is constructed using Lead Free* cast copper silicon alloy and complies with Lead Free* installation requirements. These Pressure Relief Valves are popularly used in conjunction with the Models 210/LF210 gas shutoff valve on gas water heaters to shut of gas to heater if water heater temperature exceeds 210°F (99°C).



LF53L

Features

- Lead Free* cast copper silicon alloy bodies
- Furnished with test levers
- Relieves excessive pressure on storage tanks
- Relieves excessive pressure on tankless water heaters
- Model LF53L is CSA certified and is furnished in 1/2" size
- Compatible with Model LF210 gas shut-off valves Pressure range of 17-150psi (5.2-10.3 bar)

Materials

Body: Lead Free* cast copper silicon alloy
 Spring: Stainless steel
 Disc: Silicone
 Pressure range: 75—150psi (5.2—10.3 bar)
 Standard settings of 75psi, 100psi, 125psi, 150psi

*The wetted surface of this product contacted by consumable water contains less than 0.25% of lead by weight.

MODEL	SIZE		HEIGHT		WIDTH		WEIGHT		VERSION
	in	mm	in	mm	in	mm	lbs.	gms.	
LF53L	1/2	15	3 1/2	89	1 7/8	48	1/2	227	M7

Model LF3L 3/4" (20mm) size CSA and ASME

For additional information, reference literature ES-LF53_LF530C.

Series 100DT

Drain Tubes for use on Side or Top Mounted T&P Safety Relief Valves

Series 100DT Drain Tubes are used to easily provide a safe discharge line from residential water heater temperature and pressure relief valves. No special tools, fittings or sealants are required to install these drain tubes, they are simply hand-tightened to the T&P valve discharge.

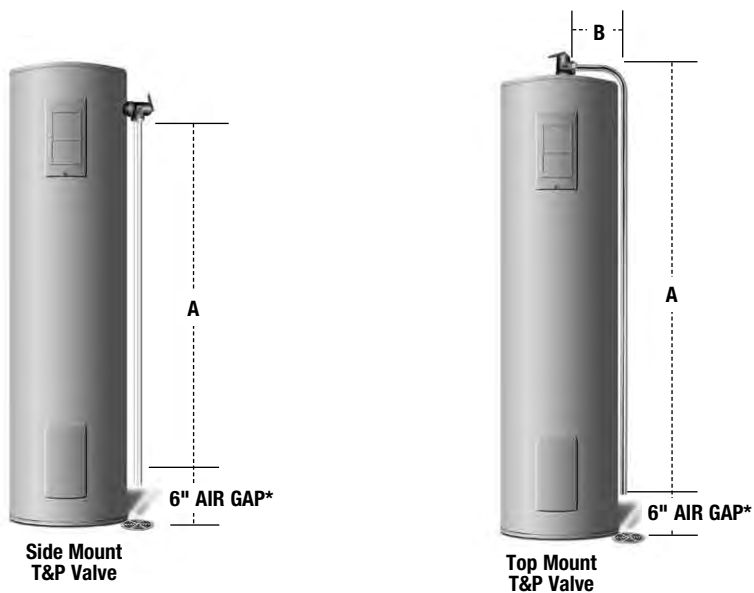
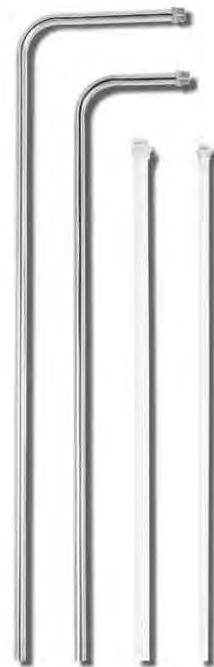
Features

- Models available for both side mounted T&P relief valves (100DT, 100DT-T2) and for top mounted T&P relief valves (100DT-A60, 100DT-A60-12)
- No special tools required to install, simply hand-tighten
- Can be used on gas, electric or oil fired water heaters
- CSA and IAPMO listed

Pressure – Temperature

Maximum Operating Temperature: 250°F (121°C)

Maximum Working Pressure: 15psi (103.35 kPa)



MODEL	CONNECTION SIZE (DN)		DIMENSIONS (APPROX.)			
	<i>in.</i>	<i>mm</i>	A Drop length		B Run	
	<i>in.</i>	<i>mm</i>	<i>in.</i>	<i>mm</i>	<i>in.</i>	<i>mm</i>
100DT	3/4	20	48	1219	—	—
100DT - 72	3/4	20	72	1829	—	—
100DT - A60	3/4	20	60	1524	8	203
100DT - A60 - 12	3/4	20	60	1524	12	305

General Information

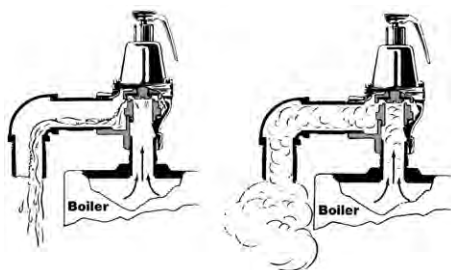
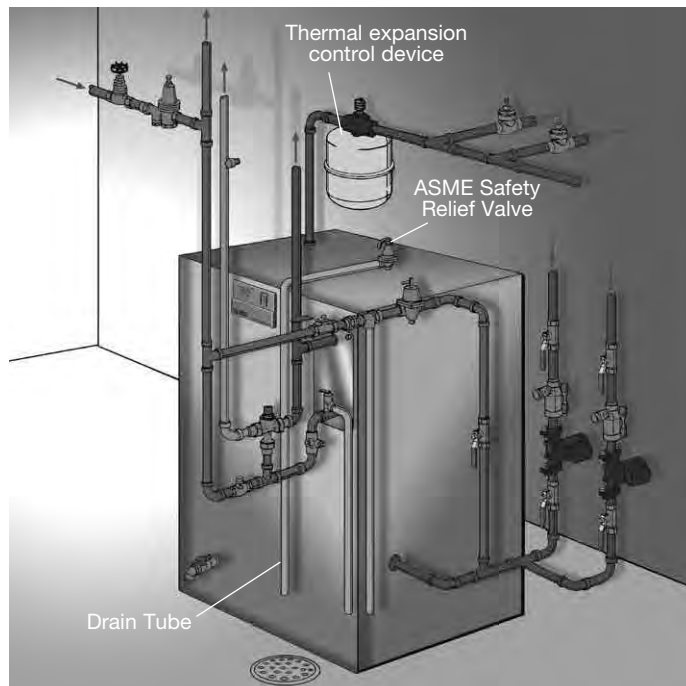
The Role of ASME Rated Pressure Relief Valves in Water Heating Systems

Hot water boiler systems are designed to operate safely at temperatures higher than the atmospheric boiling temperature of water, but at relatively low pressures. Watts ASME rated pressure relief valves protect against excessive pressure conditions only.

Watts offers one of the most advanced designs of ASME rated water pressure relief protection for hot water boilers. Watts valves feature high accuracy and a tight seal by utilizing non-metallic disc-to-metal seating. Watts ASME rated pressure relief valves meet all performance requirements of the ASME Low Pressure Heating Boiler Code. Watts valves also feature the first ever nonmechanically guided stick-resistant design.

Hot water boilers normally operate full of water. If steam forms, this is a sign of a malfunction with the firing controls. When this occurs the energy stored in the boiler should be reduced, lowering the heat content of the boiler as rapidly as possible. This is the function the ASME rated pressure relief valves perform.

It is important that a relief valve work in both water and steam conditions. When steam forms in a hot water boiler, it is a sign of an emergency temperature condition that must be relieved. Watts ASME rated pressure relief valves discharge excessive water pressure created by thermal expansion as well as steam conditions. These valves feature a built in steam rated pressure safety relief feature and exceptionally high BTU steam discharge capacity ratings.



How ASME Rated Valves Work

Watts ASME rated pressure relief valves act as both a water pressure relief valve as well as a steam safety relief valve.

As thermal expansion (see thermal expansion section on page 6 of this guide) conditions develop, pressures may be built up to the setting of the relief valve. In this case the relief valve will then discharge this expanded water, just as a water pressure relief valve would do.

Should operating controls fail, permitting runaway firing, the boiler water may reach steam-forming temperatures, creating a steam pressure condition. In this case the relief valve will then discharge steam at the rate or faster than the boiler can generate it, thus restoring system pressure to a safer level, just as a steam safety relief valve would do.

ASME Boiler and Pressure Vessel Code

The following is from the ASME Boiler and Pressure Vessel Code Section IV – Low Pressure Heating Boilers

“Each hot water heating boiler shall have at least one officially rated pressure relief valve set to relieve at or below the maximum allowable working pressure of the boiler.”

Installation

The installation of a safety relief valve is essential. These devices are designed for emergency safety relief and shall not be used as an operating control. Valves should not be used on coal or wood boilers having an uncontrolled BTU heat input.

Safety relief valves shall be connected to the top of the boiler with the valve in the vertical position, either directly to a topped or flanged opening in the boiler,

to a fitting connected to the boiler by a close nipple, to a Y base, to a valveless header, connecting water outlets on the same boiler, or to a valveless water pipe between adjacent boilers. To avoid water damage or scalding due to valve operation, a discharge line must be connected to valve outlet and run to a safe place of disposal. Discharge lines must be as short as possible and be the same size as the valve discharge connection throughout its entire length. Discharge line must pitch downward from the valve and terminate at least 6" (152mm) above the floor drain where any discharge will be clearly visible. The discharge line shall terminate plain, not threaded, with a material serviceable for temperatures of 375°F (191°C) or greater. No shutoff valve shall be installed between the relief valve and boiler, or in the discharge line.

If discharge occurs, call a plumber immediately. A licensed plumbing contractor must evaluate the system and determine the cause of discharge and correct the

cause immediately. Discharge may indicate that unsafe pressure conditions exist which require immediate attention by a licensed plumbing contractor.

⚠ WARNING

Following installation, the valve lever must be operated at least once a year by the boiler owner to ensure that waterways are clear. Certain naturally occurring mineral deposits may adhere to the valve, rendering it inoperative. When manually operating the lever, water will discharge and precautions must be taken to avoid contact with hot water and to avoid water damage. Before operating lever, check to see that a discharge line is connected to this valve directing the flow of hot water from the valve to a proper place of disposal otherwise personal injury may result. If no water flows, valve is inoperative. Call a licensed plumber immediately.

ASME Water Pressure Relief Valves

Series LF174A

LEAD FREE ASME Water Pressure Relief Valves For Pressure Protection of Hot Water Heating Boilers

S Series LF174A Lead Free* cast copper silicon alloy body safety relief valves for pressure protection only of all types of hot water heating boiler equipment. Pressure range 30 to 150psi (2 - 10 bar) with corresponding high ratings from 650,000 to 14,370,000 BTU/hr. Female inlet and outlet connections. Sizes ¾" - 2" (20 - 50mm). The LF174A features Lead Free* construction to comply with Lead Free* installation requirements.



Series LF174A

Features

- Seat located above drain; water can't be trapped and sediment can't foul seat.
- Non-mechanical seat-to-disc alignment will not stick or freeze.
- Water seal of high temperature resisting material isolates spring working parts from water during relief.

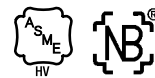
Materials

- Lead Free* brass
- Nonmetallic disc-to-metal seating

Pressure – Temperature

Pressure range: 30psi to 150psi (2 to 10 bar) with corresponding high BTU/hr ratings from 650,000 to 14,370,000 BTU/hr. Maximum Temperature: 250°F (121°C)

Standards



Tested and rated by the National Board of Boiler and Pressure Vessel Inspectors to the requirements of ASME. Meets Military Spec. MIL-V-18634B, Type I, Class 3A, Style A (Bronze Body).

Dimensions – Weights

SERIES LF174A									
Model	Size (Dn)		Model	Height		Length		Weight	
	in.	mm		in.	mm	in.	mm	lbs.	kg.
LF174A	¾ x ¾	20 x 20	M3	5½	130	2½	64	1.50	.7
LF174A	1 x 1	25 x 25	M1	5¾	146	3	76	3.13	1.4
LF174A	1¼ x 1¼	32 x 32	M1	8¾	213	4¾	121	6.25	2.8
LF174A	1½ x 1½	40 x 40	M	9	229	4¾	124	7.25	3.3
LF174A	2 x 2	50 x 50	M	11½	295	6¼	159	13.75	6.2

*The wetted surface of this product contacted by consumable water contains less than 0.25% of lead by weight.

Capacity*

BTU/hr Steam Pressure Discharge Capacities

As tested and rated by the National Board of Boiler and Pressure Vessel Inspectors

SERIES LF174A						
Set Pressure	¾" x ¾" 20 x 20mm	1" x 1" 25 x 25mm	1¼" x 1¼" 32 x 32mm	1½" x 1½" 40 x 40mm	2" x 2" 50 x 50mm	
psi	bar	Model M3	Model M1	Model M	Model M	
30	2.07	650,000	1,005,000	1,682,000	2,020,000	3,815,000
33	2.27	695,000	1,075,000	1,788,000	2,150,000	4,080,000
35	2.41	725,000	1,125,000	1,877,000	2,250,000	4,250,000
36	2.48	740,000	1,145,000	1,916,000	2,310,000	4,344,000
40	2.76	800,000	1,240,000	2,071,000	2,490,000	4,690,000
45	3.10	875,000	1,355,000	2,265,000	2,720,000	5,130,000
50	3.45	950,000	1,470,000	2,459,000	2,950,000	5,575,000
55	3.79	1,025,000	1,590,000	2,653,000	3,190,000	6,010,000
60	4.13	1,100,000	1,702,000	2,847,000	3,425,000	6,450,000
65	4.58	1,170,000	1,820,000	3,041,000	3,660,000	6,890,000
70	4.82	1,245,000	1,935,000	3,325,000	3,890,000	7,330,000
75	5.17	1,320,000	2,055,000	3,429,000	4,125,000	7,770,000
80	5.51	1,400,000	2,166,000	3,605,000	4,360,000	8,215,000
85	5.86	1,470,000	2,285,000	3,817,000	4,590,000	8,650,000
90	6.60	1,545,000	2,400,000	4,011,000	4,825,000	9,090,000
95	6.55	1,620,000	2,520,000	4,205,000	5,060,000	9,530,000
100	6.89	1,695,000	2,635,000	4,399,000	5,290,000	9,970,000
105	7.23	1,770,000	2,750,000	4,593,000	5,525,000	10,410,000
110	7.58	1,845,000	2,865,000	4,787,000	5,760,000	10,850,000
115	7.92	1,920,000	2,980,000	4,981,000	5,990,000	11,290,000
120	8.27	1,995,000	3,100,000	5,175,000	6,225,000	11,730,000
125	8.61	2,070,000	3,215,000	5,370,000	6,460,000	12,170,000
130	8.96	2,145,000	3,330,000	5,564,000	6,690,000	12,610,000
135	9.30	2,220,000	3,445,000	5,758,000	6,925,000	13,050,000
140	9.65	2,295,000	3,565,000	5,952,000	7,160,000	13,490,000
145	9.99	2,370,000	3,680,000	6,146,000	7,390,000	13,930,000
150	10.34	2,445,000	3,795,000	6,340,000	7,630,000	14,370,000

For additional information, reference literature ES-LF174A.

ASME Rated Pressure Relief Valves

Series 174A, 374A, 740

ASME Pressure Relief Valves

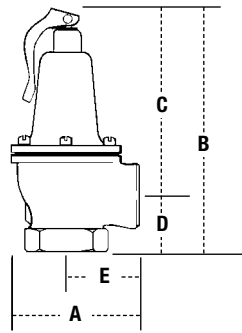
Series 174A bronze body Safety relief valves for pressure protection only for **hot water heating boiler equipment**. This series has a pressure range of 30 to 150psi (2.1 - 10.3 bar) with corresponding high ratings from 650,000 to 14,370,000 BTU/hr. The Series 174A features female inlet and outlet connections and is available in sizes ¾" to 2" (20 to 50mm).

Series 374A iron body pressure relief valves with forged bronze inlet have a 550,000 BTU/hr pressure rating and are available in size ¾" (20mm) only.

Series 740 iron body pressure relief valves feature expanded outlets for hot water space heating boilers. The Series 740 has a pressure range of 30 to 75psi (2.1 to 5.2 bar) with corresponding high ratings from 925,000 to 10,700,000 BTU/hr.

Features

- Seat located above drain so water can not be trapped and sediment can not foul seat
- Non-mechanical seat-to-disc alignment will not stick or freeze



174A



740



374A

MODEL	SIZE (DN)	DIMENSIONS (APPROX.)										WEIGHT		
		A mm	B in.	C mm	D in.	E mm	in.	mm	in.	mm	in.	mm	lbs.	kg.
374A														
374A	¾"	20	2½"	64	3⅝"	72	2⅝"	60	1¼"	32	1½"	38	1.1	0.5
740	Inlet x Outlet													
740	¾" x 1"	20-25	3"	76	5⅞"	149	4⅞"	111	1½"	38	1⅞"	48	1.9	.9
740	1" x 1¼"	25-32	3½"	89	7¼"	184	5⅝"	137	1⅞"	48	2½"	54	3.1	1.4
740	1¼" x 1½"	32-40	4⅝"	117	8¾"	222	6½"	165	2¼"	57	2⅝"	67	6.1	2.8
740	1½" x 2"	40-50	5¼"	133	9¼"	235	7"	178	2¼"	57	3"	76	7.5	3.4
740	2" x 2½"	50-65	6¾"	171	11⅝"	295	8¾"	222	2⅞"	73	3⅝"	98	16.5	7.5

Capacity*

BTU/hr Steam Pressure Discharge Capacities

As tested and rated by the National Board of Boiler and Pressure Vessel Inspectors

SERIES 374A		
Set	¾" x ¾"	
Pressure	20 x 20mm	
psi	bar	Model M3
30	2.07	550,000

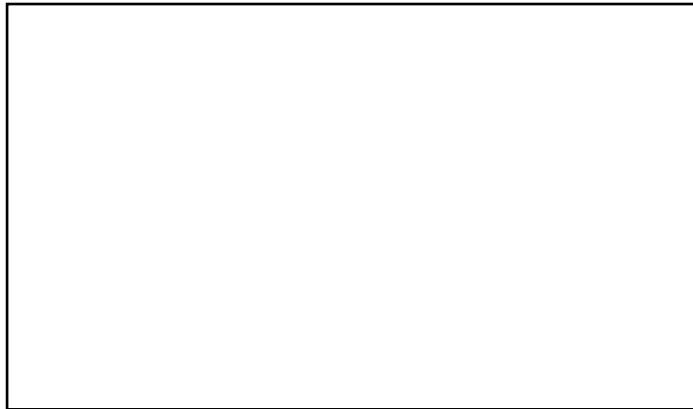
SERIES 740						
Set		¾" x 1"	1" x 1¼"	1¼" x 1½"	1½" x 2"	2" x 2½"
Pressure		20 x 20mm	25 x 25mm	32 x 32mm	40 x 40mm	50 x 50mm
psi	bar	Model M1	Model M	Model M	Model M	Model M
30	2.07	925,000	1,300,000	2,105,000	2,900,000	5,250,000
33	2.27	989,000	1,390,000	2,250,000	3,100,000	5,613,000
35	2.41	1,032,000	1,450,000	2,345,000	3,235,000	5,855,000
36	2.48	1,053,000	1,480,000	2,395,000	3,300,000	5,975,000
40	2.76	1,139,000	1,600,000	2,590,000	3,569,000	6,461,000
45	3.10	1,245,000	1,750,000	2,830,000	3,903,000	7,067,000
50	3.45	1,352,000	1,899,000	3,075,000	4,237,000	7,672,000
55	3.79	1,459,000	2,049,000	3,315,000	4,572,000	8,277,000
60	4.13	1,566,000	2,200,000	3,560,000	4,907,000	8,883,000
65	4.58	1,672,000	2,349,000	3,800,000	5,241,000	9,488,000
70	4.82	1,779,000	2,499,000	4,045,000	5,575,000	10,093,000
75	5.17	1,886,000	2,649,000	4,285,000	5,909,000	10,700,000

For additional information, reference literature ES-LF174A.

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