

# TMVA

## TMVA Guide

The control of hot water temperatures in domestic properties



Thermostatic Mixing Valve  
Manufacturers Association

This guide is intended to provide information that will lead to increased levels of both comfort and safety in the UK's 25 million homes. It has been prepared by Members of the Thermostatic Mixing Valve Manufacturers Association (TMVA) for use by building professionals and homeowners.

The document is intended to provide clear guidance relevant to all Domestic installations including Private Homes, Holiday Homes, Rented Accommodation, Hostels, Hotels and Guest Houses, but does not supersede any current standards or legislation.

**For guidance on non-domestic and specialist applications, such as in Health Care, Care Homes and those areas for use by people deemed to be at risk, please refer to the TMVA 'Recommended Code of Practice for Safe Water Temperatures'.**

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## 1.0 SCALDING IS A WHOLLY PREVENTABLE ACCIDENT

An adequate supply of hot water is vital in a modern home. Everyone knows the pleasure that can be taken from a relaxing hot bath or shower, and most of us understand that water can be uncomfortable if it is too hot. How many realise it can actually be dangerous - or that there are no National Regulations prescribing safe limits in homes?

**All scaldings are wholly avoidable by the installation and use of appropriate safety products.**

### Need for High Temperatures

Best practice dictates that hot water is generated and stored at temperatures of no less than 60°C in all domestic dwellings. This is primarily to prevent the proliferation of micro-organisms within the Domestic Hot Water system, but it also allows the use of more compact storage cylinders, which can help reduce energy costs.

However, hot water temperatures that kill bacteria such as legionella will cause scalding.



## 2.0 HOT WATER BURNS LIKE FIRE

Scalding occurs well below the boiling point of water. Temperatures above 45°C can cause serious injury very quickly. With water at 70°C, partial thickness injuries occur in well under 1 second, and full thickness burns in approximately 10 seconds.

At 60°C, similar injuries occur in approximately 7 seconds (partial), and 90 seconds (full thickness).

The DTI\* publication 'Burns and Scald Accidents in the Home', issued in June 1999, shows that 14% of domestic accidents occur in bathrooms. Of the 2,700 accidents recorded, 2,100 that occurred whilst bathing were listed as minor. Disturbingly though, some 600 accidents were classified as severe (more than 5 days in hospital), with 21 of them involving fatalities. Of these, 15 people were older than 65 years, 4 were aged between 18-64 and 2 were less than 4 years old.

Scald injuries tend to be severe and may cover large areas of the body. Treatment is usually long and painful. For children, skin grafts may be required at intervals until they stop growing, maybe 15 to 20 years later. The pain suffered by these children is severe and is stressful for both the children and their families.

Experience in other countries has shown that limiting hot water temperatures to a safe range for bathing and washing can reduce accidents involving hospitalisation by 50%.

By following the recommendations of this Guide, homeowners can identify where there is a risk of scalding through accidental contact with hot water in bathrooms, kitchens and in utility rooms. Controls can then be installed at each 'point of use' that will prevent them and their families being exposed to such dangers.

\*The Department of Trade and Industry, Consumer Safety Section.

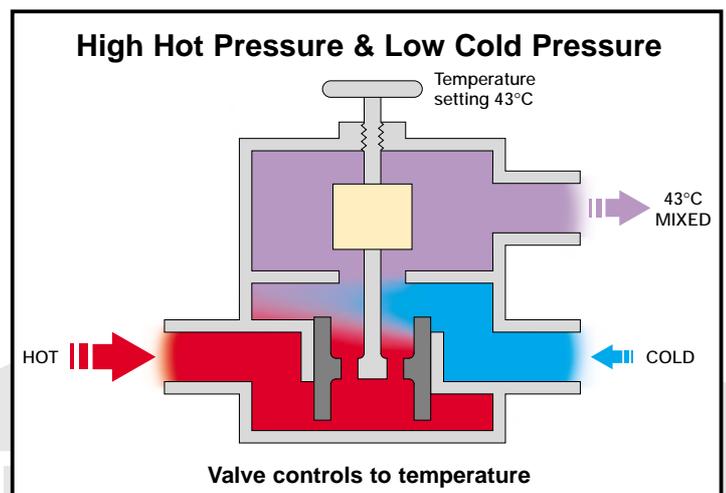
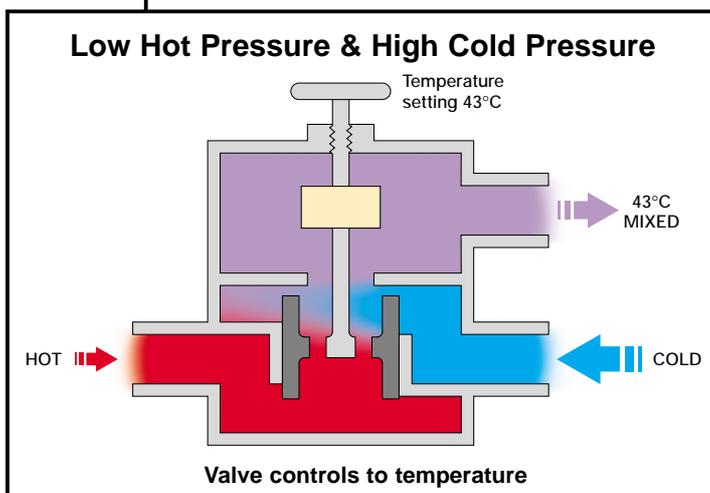
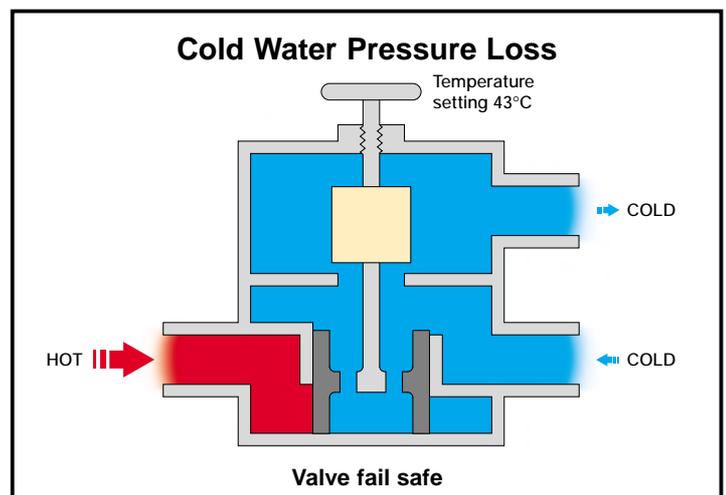
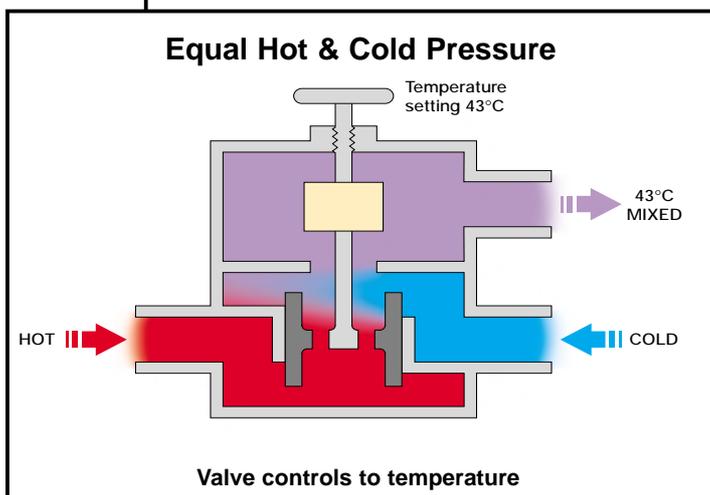


### 3.0 THERMOSTATIC MIXING VALVES; THE SAFE, SIMPLE SOLUTION.

A wide range of thermostatically controlled products is readily available to control the temperature of water accurately for showering, bathing and hand-washing applications. If installed and maintained correctly, these can significantly reduce the risk of scalding in the home.

The function of a thermostatic mixing valve is to mix the hot and cold water entering the valve to the temperature that has been pre-selected by the user. This is done automatically by a thermally sensitive mechanism within the valve that proportions the amount of hot and cold water entering so as to achieve the required blend. Thereafter, the mechanism automatically compensates for variations in supply pressures or temperatures so as to maintain a safe temperature. Moreover, in the event of cold water supply failure, the thermostatic mixing mechanism will automatically "shut down" the flow so as to prevent dangerously hot water being discharged.

#### Examples of the operation of valves under different water supply conditions



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## Comfort

Many of us will recall using a manual shower mixer where the flushing of a toilet or opening a tap elsewhere has caused a rapid change in shower temperature, and necessitated rapid evasive action for safety and comfort reasons.

Thermostatic mixing valves avoid such occurrences by controlling the temperature accurately at the point of use, thus providing the 'comfort factor' when bathing or washing. They enable homeowners to set precisely their preferred individual showering temperature and will compensate for variations in water temperature and pressures. Thermostatic Shower Valves are available in a range of styles, materials, colours and finishes to suit all UK applications.

Most people have stepped into a hot bath and been forced out quickly to avoid discomfort or injury. Thermostatic mixing valves avoid any discomfort when filling a bath, or washing at a basin or bidet.

## Safety

Preventing very hot water from contacting the skin protects those bathing or washing from the dangers of scalding. For use in domestic properties, care should be taken to select high performance Thermostatic Mixing Valves ideally conforming to BS 7942 suitable for care establishments. As a minimum all valves must at least conform to BS EN 1111 or BS EN 1287 as these will shut off the flow of hot water in the event of interruption of the cold supply.

This is of obvious benefit to those showering or hand washing. It is also particularly useful for those preparing to take a bath. Despite recommendations to the contrary, most bathers fill baths by turning on the hot tap first. They then regulate the bathing temperature by running in some cold water. This results in a period during which the bath contains dangerously hot water.

An adult may react quickly enough to avoid serious scalding, but a child, whose skin is more delicate, could suffer considerable injury. Older people whose sensitivity is reduced may not realise the danger until too late. Thermostatic control of the fill temperature of baths prevents such risks.

## Peace of Mind

With hot water temperatures controlled to safe levels at the 'point of use' by Thermostatic Mixing Valves, homeowners can secure peace of mind knowing that they and other members of their family are protected from the dangers of accidents through scalding.



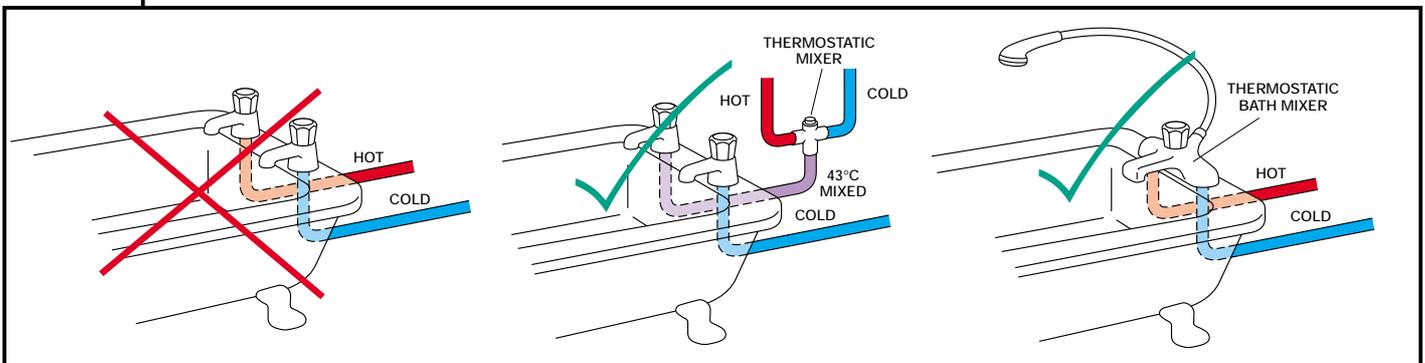
## 4.0 AREAS OF RISK

The following recommended temperatures are 'typical' but user preferences will vary. Thermostatic Mixing Valves usually allow adjustment whilst still providing protection from scalding.

### Baths

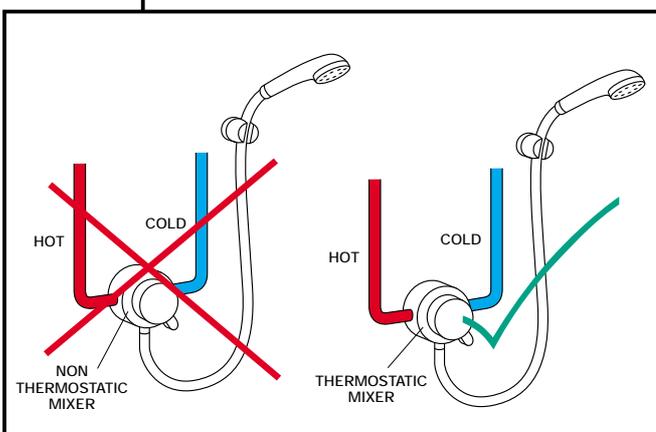
Baths are responsible for the highest number of reported fatal/serious scalding incidences. Safe water temperatures are essential. Most incidents relate to the young, elderly or infirm either getting into baths that are initially too hot, or in topping up with hot water.

Thermostatic Mixing Valves can be used to control hot water at a safe pre-selected maximum temperature of typically 43°C, which allows for temperature loss in metal baths. Temperature adjustment to suit user preferences is still possible, but Thermostatic Mixing Valves limit the top temperature to a safe level.



### Shower Controls

Showering with water that is too hot can cause scalding. Any sudden changes in temperature, whether hotter or colder, can also lead to injury through shock, slips and falls.



A Thermostatic Shower Valve offers individual users the ability to set their preferred showering temperature. It then responds to changes in water pressure or temperature to maintain the selected showering temperature. In the event of loss of either hot or cold water supply, the Thermostatic Shower Valve provides automatic shut down to reduce the risk of scalding.

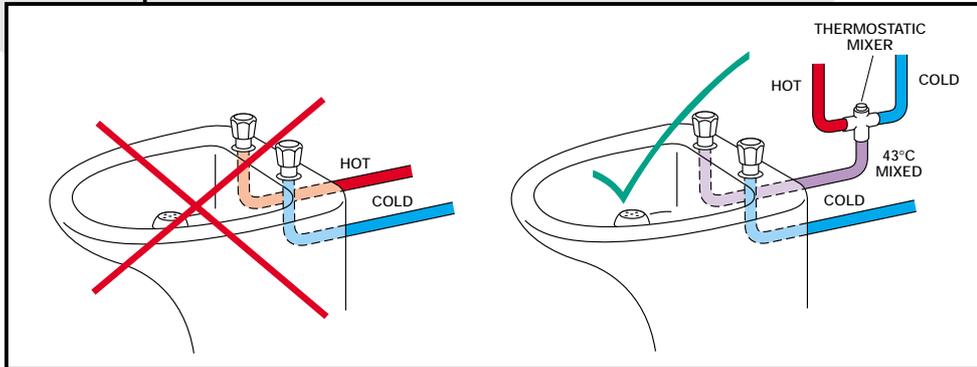
It is recommended that Thermostatic Shower Mixing Valves be limited to delivering water at safe temperatures of 40-43°C.



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## Bidet

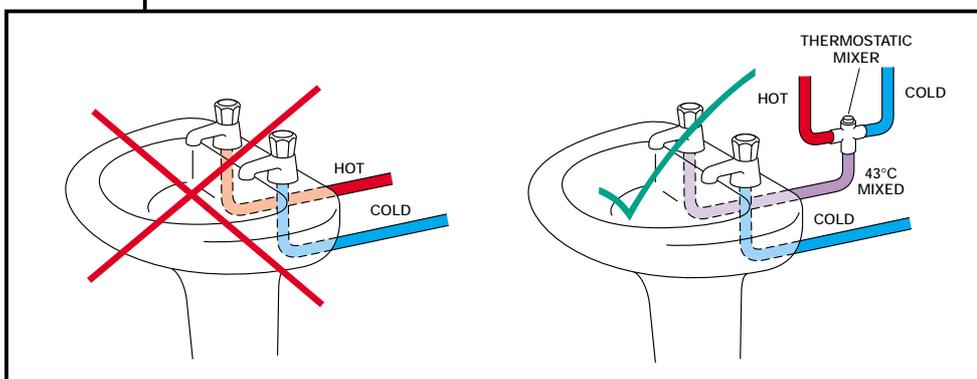
For water being directed at such sensitive areas of the body, a lower temperature setting is required. It is recommended that the bidet water temperature be controlled to 37°C maximum using a Thermostatic Mixing Valve.



## Basins

When hand washing, people may put their hands directly into running water without waiting for it to get hot. When the hot water reaches full discharge temperature, scalding can occur without warning. As with bathing, the young, elderly and infirm are most at risk, but scalding can occur to anyone.

It is recommended that an under-basin Thermostatic Mixing Valve be used to control the hot water at each outlet to a safe temperature, typically 40°C.



## Kitchen Sinks/Dishwashing

In the kitchen environment, practicality and safety from scalding come into direct conflict. Water needs to be at a temperature of between 46°C and 48°C to ensure thorough removal of grease, but at the risk of scalding. This application is not covered by any known published recommendations, so special care must be taken to avoid injury.



## 5.0 GOOD PRACTICE ADVICE

### Hot Water Generation, Storage and Distribution

Hot water should be maintained at 60° - 65°C to reduce microbiological contamination. Some systems deliver hot water at higher temperatures. In domestic applications, water temperature is controlled by the hot water cylinder thermostat or the 'Hot Water' control on a combination boiler.

Hot water temperatures of 60° - 65°C and above are too hot for domestic use. Such temperatures create a risk of scalding at every point of use as identified in the DTI report on burns and scalds (Ref URN98/757). Consideration should be given to reducing temperatures to safer levels with the use of suitable Thermostatic Mixing Valves.

Hot water storage and distribution systems should be installed and maintained in accordance with BS6700.

### Cold Water

Cold water storage (where appropriate) should be located to ensure that storage temperatures do not exceed 20°C. Cold water distribution temperatures may increase through the close proximity of hot water pipes to within the temperature range that encourages legionella growth. Cold water pipes should not be positioned above hot water pipes in horizontal runs or too close to hot water pipes when fixed vertically. Pipe runs should be kept to a minimum to limit the volume of system water that might attain ambient temperature.

### Cleanliness

All water distribution systems must be correctly flushed out before being put into use. Prior to flushing, all flow restrictions within the system must be removed to ensure that sufficient velocity is maintained to clean the pipework.



## 6.0 LEGISLATION STANDARDS AND REGULATIONS

### The Legal Position

In domestic premises, common law prevails. While legal action would be unusual in the domestic context, a householder who fails to ensure that family members and guests can have access to facilities that are safe according to general construction standards would be in breach of his duty of care under the law of negligence. The use of properly installed and maintained systems minimises the risk of both injury and any consequent legal concerns.

### Standards

BS EN1111 and BS EN 1287 (Replace BS1415 Pt 2 1986) cover single outlet applications. Manufacturers self certify valves as complying with these standards.

BS 7942, for single outlet applications, relates to thermostatic mixing valves for use in care establishments. It covers high-risk areas, such as health care and registered care home premises or other areas where people are deemed to be at risk. This Standard is accepted as best practice for thermostatic mixing valve performance, in all installations.

BS 6700: 1987 Specification covers the design, installation, testing and maintenance of services supplying water for domestic use within buildings and their curtilages. This will be replaced either in whole or part by EN806-2.

### Requirements of the Water Supply (Water Fittings) Regulations 1999

These replace the Water Byelaws and cover waste, misuse, contaminate and undue consumption of water. They do not cover fitness of purpose for areas outside these four criteria.

Materials in contact with water must not affect the taste, colour, or potability, or promote the growth of potentially harmful organisms.

Mixing valve design must ensure that crossflow cannot occur, that is contamination of the main supply with other water. Backflow prevention requirements must be satisfied. All BS 7942 valves will achieve this.

Water Regulations Advisory Service (WRAS) listing of a valve demonstrates that the valve complies with the requirements of UK Water Regulations.



## Current Legislation and Recommendation Documents

- BS EN1111 Sanitary tapware — thermostatic mixing valves PN10
- BS EN1287 Low pressure thermostatic mixing valves
- BS 7942 Thermostatic mixing valves for use in care establishments
- BS 6700: 1987 Specification for design, installation, testing and maintenance of services supplying water for domestic use within buildings and their cartridges. This will be replaced either in whole or in part by BS EN806-2.
- SI 1999 No. 1148 The Water Supply (Water Fittings) Regulations 1999
- SI 1999 No. 1506 The Water Supply (Water Fittings) (Amendments) Regulations 1999
- Water Bylaws 2000 (Scotland)
- Water regulations (Northern Ireland)
- DTI Report 'Burns and Scalds in the Home' (URN98/757)



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