

# Operation and Maintenance

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**SafeWat Trace heating installations**  
for Hot Water Service (HWS) temperature maintenance.

Includes commissioning  
Website QR code on last page

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## About the trace heating system

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Generally, water in a pipe will eventually cool to ambient temperature if it is not flowing - even if it is covered with insulation. To prevent adverse cooling in single pipe Hot Water Service (HWS) distribution, the piping is fitted with *SafeWat* trace heating cable that has heat output sufficient to counter the natural heat loss from the pipe and its insulation.

*SafeWat* trace heating is usually applied to most of the HWS piping, to within one pipe-metre of the hot water source and to within one pipe-metre of each blending valve / TMV / unblended Point of Use (POU) tap.

However the actual extent of the trace heating varies among HWS systems. A *JB420B* power connection box facilitates 240V power connection to the *SafeWat* system. To accommodate pipe branches, *JB4-MF* maintenance-free junction boxes may be fitted along the pipe route in inaccessible locations.

*SafeWat* trace heating cable is self-regulating and does not require a thermostat or other controller in order to maintain pipe temperature. When energised, the *SafeWat* is safe for careful manual handling and will only be warm to the touch.

The serial numbered Test and Completion certificate from *Traceheaters Limited* confirms that each *SafeWat* system was safe to power up on the date of the certificate. It also provides pertinent information for the power supply designer.

A trace heating system's performance is dependent upon its pipe insulation's performance.

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## About the Hot Water Service system

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If water delivery is from a water storage heater or calorifier, water should be stored at a temperature of 60°C.

The whole piping system - including valves, unions and large piping joints - must be insulated to minimise heat loss, regardless of whether the piping is metallic or plastic.

TMVs should be as close to their POU as possible. When a POU is opened, 50°C hot water should be observed at the TMV or POU tap within 60 seconds (55°C in healthcare premises).

If the HWS piping insulation is subjected to outside ambient temperatures, the trace heating may maintain lower than expected pipe temperatures.

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## Items you may need

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References	Permit to work - if applicable Trace heating Test and Completion certificate Applicable drawings Trace heating performance specification or requirements Commissioning documentation - if applicable Previous test documentation - if applicable
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PPE	To suit site requirements Gloves
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Hand tools	4mm flat head VDE screwdriver Ph2 VDE screwdriver Trimming knife Long nose VDE pliers Side cutters
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Materials	Suitable fixing tape or cable ties Self-adhesive foil tape
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Equipment	Items required by the Permit to work Electric current measuring instrument (ammeter) Voltage measuring instrument Insulation resistance measuring instrument, minimum 500V output
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## Commissioning

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Commissioning tasks comprise:

- switching on the power to each trace heating system.
  - all the tasks described in the *Testing and Inspection* section below.
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Power supply system	<p>Check and record that each trace heating system is protected by a type C or D breaker and RCD.</p> <p>Check and record that each trace heating system's power supply is rated and installed:</p> <ul style="list-style-type: none"><li>• with regard to the trace heating Test and Completion certificate.</li><li>• in accordance with applicable local electrical installation regulations.</li></ul>
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Power supply local isolator	<p>Check and record that each trace heating system's local power supply isolator is unfused. If the local isolator contains a fuse, the isolator should be changed to an unfused type. If the isolator is changed, the wiring between the isolator and the <i>JB420B</i> power connection box may need to be upgraded.</p>
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## Testing and Inspection

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Tests and inspections (Ts&Is) of each *SafeWat* system should be performed regularly by a competent person, at sufficiently frequent intervals, so as to afford little chance for the system to become impaired or dangerous between times. The recommendations below are not exhaustive and applicable local electrical installation regulations prevail.

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Visual	<p>Check and record that every <i>SafeWat</i> cable connecting to each accessible <i>JB420B</i> junction box does not have a damaged jacket - the cable's outer insulation. The braid beneath the jacket should not be visible. If the damage extends into the inner insulation beneath the braid, consider isolating power to the trace heating system until the damage is repaired.</p> <hr/> <p>Check and record that each <i>JB420B</i> junction box is sound.</p> <hr/> <p>Check and record that caution labels are affixed to the pipe insulation - to warn others that electric trace heating is fitted beneath the insulation. Placement should be no more than 6 metres apart.</p> <hr/> <p>Inspect all visible pipe insulation for damage and continuity. If and where it is damaged, check the <i>SafeWat</i> cable beneath for damage by carefully removing a section of the damaged pipe insulation. If the <i>SafeWat</i> cable is not damaged immediately renew or repair the damaged pipe insulation afterwards.</p>
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Heater inner insulation testing	<p>Switch the trace heating system's local isolator to 'OFF'. Lock off if appropriate.</p> <hr/> <p>Remove the lid of the trace heating system's <i>JB420B</i> power connection box. Set the insulation resistance tester to 500V output and select the 200M<math>\Omega</math> range. Perform an insulation resistance test between any conductor terminal and the metal earth bar. The measurement should be greater than 200M<math>\Omega</math>, however measurements of 5M<math>\Omega</math> and greater achieve a 'pass'. Before each test, touch the two test lead probes together to make the tester measure zero resistance and thus confirm that the test leads are connected to the test instrument correctly. Discharge the <i>SafeWat</i> cable(s) after each test.</p> <hr/> <p>If the insulation resistance test indicates a fault, determine if the fault is in the trace heating system. Remove the <i>SafeWat</i> cable's earth braid from its terminal bar and re-perform the test between any conductor terminal and the un-terminated earth braid. If the test does not indicate a fault, the trace heating system has passed the test. If the test indicates a fault and there is more than one heater radial connected to the <i>JB420B</i>, separate the earth braids and re-perform the test between any conductor terminal and each earth braid to determine which radial contains the fault.</p> <hr/> <p>Record the 'pass' measurement if applicable, replace any removed earth braid and replace the lid if no further tests are to be performed.</p>
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## Testing and Inspection (cont'd)

Power supply confirmation	<p>Switch the trace heating system's local isolator to 'ON'.</p> <p>Check and record that after about one minute from switch-on, all SafeWat cables emanating from all <i>JB420B</i> junction boxes are warm to the touch.</p> <p>Check and record that current flow is greater than 0.75 Amps after about one minute. Usually, this test can only be carried out on live power supply conductors within an exposed enclosure such as a distribution board, local isolator or trace heating power connection box; competency and a permit to work may be required to perform this test.</p> <p>Check and record that all <i>SafeWat</i> cables connecting to all <i>JB420B</i> junction boxes are warm to the touch after about one minute from switch on.</p> <p>If possible / practicable, check the ends of all <i>SafeWat</i> radials for heat. Carefully remove the pipe insulation and detach the last 500mm - approximately - of <i>SafeWat</i> from the pipe so that its intrinsic temperature is not influenced by the pipe temperature. Re-instate the ends and the pipe insulation afterwards.</p>
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## Operation

The trace heating system will maintain pipe temperatures between 50°C and 60°C when the hot water is not flowing. The actual temperature is mostly influenced by the diameter of the pipe, the performance of the pipe insulation and the ambient temperature. When the hot water is flowing, the trace heating has a negligible effect, because for all intents and purposes, the pipe temperature is affected by the hot water source and the HWS system's efficiency.

No flow	The heat output from the trace heating cable is sufficient to counter the heat loss from the pipe through the pipe insulation when the water is not flowing, thus it will prevent it from cooling unduly; it maintains a proper temperature.
Flow	The trace heating will not increase the heat of the water to a noticeable higher temperature when the water is flowing.
If there are no specific site requirements for HWS delivery performance	50°C hot water must be observed at the POU or blending / TMV valve within 60 seconds from opening it - sink tap, shower head etc.
If there are specific requirements for HWS delivery performance	Operation should be in accordance with the requirements.

## Problem Solving

Symptoms	Causes - possible and probable	Suggested Remedies
No Hot Water	HWS system is not producing and / or delivering hot water.	-
Takes longer than 60 seconds for Hot Water to appear at an outlet or blending / TMV valve	HWS system is not producing and / or delivering hot water.	-
	Trace heating is not producing heat.	Check power supply to the <i>JB420B</i> power connection box.
	Pipe insulation is inadequate.	Ensure all piping and fittings have adequate covering of pipe insulation. Ensure that there are no gaps in the insulation through which heat could escape.
	Part of the HWS piping is subject to ambient temperature below 18°C.	Consult Traceheaters Limited for a choice of solutions. 01483 825193
13 Amp fuse in local isolator blows when trace heating is switched on	Incorrect local isolator type.	Change isolator to a suitable unfused type.

## Problem Solving cont'd

Symptoms	Causes - possible and probable	Suggested Remedies
Power supply main breaker trips after a few seconds delay when trace heating system is switched on	Incorrect breaker.	Check breaker rating is suitable for the power supply wiring and trace heating load. Correct breaker should be a type C or D.
	Intelligent breaker has not been commissioned.	Possible change of wiring configuration in the local isolator. Commission intelligent breaker then re-commission trace heating system.
RCD and / or power supply main breaker trips instantaneously when trace heating system is switched on	Damage to the <i>SafeWat</i> cable.	Perform the test prescribed in 'Heater Inner Insulation Testing' in 'Testing and Inspection' above. If the trace heating system fails the test and there is more than one <i>SafeWat</i> cable terminated at the <i>JB420B</i> , systematically prove each radial of <i>SafeWat</i> until the damaged radial is identified. 'Walk' the HWS route to check for obvious signs of damage to pipe insulation and exposed <i>SafeWat</i> cable. Contact Traceheaters Limited to arrange for the repair. 01483 825193
	Short circuit in the power supply wiring.	Perform the test prescribed in 'Heater Inner Insulation Testing' in 'Testing and Inspection' above. If the trace heating passes the test the problem is within with the power supply.
RCD trips when trace heating system is switched on	Intelligent RCD has not been commissioned.	Possible change of wiring configuration in the local isolator. Commission intelligent RCD then re-commission trace heating system.
Lower-than-expected insulation resistance test measurement	Gradual moisture ingress and / or damage to the trace heating.	Compare the measurement with that from the last inspection. If the insulation resistance has reduced since, but the new measurement is above 5M $\Omega$ , the system is safe to use. However it should be further inspected soonest to ensure that the resistance will not reduced to any value below 5M $\Omega$ . If the insulation resistance is below 5M $\Omega$ the fault must be rectified.

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**Problem Solving cont'd**

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Symptoms	Causes - possible and probable	Suggested Remedies
No insulation resistance when tested	Power supply is interfering with the measurement.	If the insulation resistance test indicates zero resistance or earth fault, either un-terminate the power supply conductors and earth wire or un-terminate the <i>SafeWat</i> conductors and earth braid. Re-perform the test. If necessary, lock off the power supply before removing the conductors.
<i>SafeWat</i> cable is damaged	Accident. Rodent activity.	Contact Traceheaters Limited to arrange for the repair. 01483 825193

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