

DOC1111

Pressure washer user manual

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1. SAFETY

“**WARNING**” refers to situations that could result in **personal injury**.




“**CAUTION**” refers to situations that could result in **equipment damage**.

Failure to follow the requirements below may lead to dangerous situations.


1.1. General safety

 WARNING	The pressure washer operates at 100 bar; only power on when the device is properly installed
 WARNING	The V-Tuf pressure washer unit weighs ~45 kg; handle with care and follow site lifting procedures
 CAUTION	Only lift the pressure washer unit by the steel frame
 CAUTION	Do not operate outside the range of environmental or analyte conditions

1.2. Electrical safety

 WARNING	The electrical cable must be earthed and should include a 13A fuse with a means of isolating both live and neutral; obey local electrical safety codes
 WARNING	An emergency stop switch or device is recommended
 CAUTION	Residual current protection or ground fault interrupter devices are recommended

2. INSTALLATION

 CAUTION	The pressure washer will introduce water at 100 bar into the process line. Relief valves in the process line may be needed to accommodate this
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The pressure washer unit is comprised of several components as shown in section 3.1. The main parts being the washer unit; the nozzle and wand; and the connecting hose.

When locating the washer unit, it is important to consider proximity to the IRmadillo as well as the other factors that will affect the possible locations it can be installed.

The unit has restraints on the environment it can be installed into, see section 4.2 and the installation location must comply with these. If there is a risk of exposure to harsher

environments that may damage the materials of the unit then additional protection, such as a cover, may be required, consult with Keit if you feel this applies to you at support@keit.co.uk.

The inlet water supply is connected using 3/4" Chicago fittings and the unit comes with a 10m high pressure hose as standard and so must be installed in close proximity to the IRmadillo. Longer lengths of pressure hose may be used though these will reduce the pressure at the IRmadillo. See section 4.1. The pressure washer includes a rotameter flow meter which may be optionally installed to provide a visual indication of when the pump is running and when it is idle.

The unit may be positioned either on the floor or wall mounted. A wall mounting kit (WMB001) is required for this and may be purchased from V-TUF directly.

2.1. Powering the pressure washer

	<p>Note</p>	<p>See section 1 for safety information prior to attempting installation</p>
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The Pressure washer is supplied with a 4 meter blunt cut cable to be wired into your electrical supply. The pressure washer is rated for single phase as per Table 1 and should be connected with a permanent earth (grounding) connection.

A suitable switch or circuit breaker should be installed as per IEC 60947-1 and IEC 60947-3. The switch must be located withing easy reach of the unit and must be marked as the disconnection device for the equipment. This must not interrupt the earth connection.

The pressure washer is designed to operate over the following specifications:

Table 1 - Pressure washer power specification

Parameter	Value	Unit
AC input voltage	230	V
Supply fluctuations (% of nominal value)	+10 to -15	%
AC input frequency	50-60	Hz
Power consumption	2.2	KW
Overvoltage category	Category II	

The electrical components of the device consist of a timer and a pump. The circuit diagram for the timer is shown in section 0 with input being the connection to your supply and output being the connection to the pump.

2.2. Spool piece installations

These instructions assume a suitable spool piece has been manufactured and installed into a pipeline that is empty.

A label image of the components is available in section 3.1.7.



CAUTION

Correct alignment of the wand with the probe diamond window is critical for washer performance

1. Check the alignment of the probe and wand ports, ensuring the wand's central axis is aligned with the probe's.
2. Fit 2x O-rings (supplied) into the grooves in the wand orifice.
3. Insert the probe and follow standard cradle install procedure as per DOC0987.
4. Loosely fit the collet and collet nut into place on the wand.
5. Carefully insert the wand assembly until it makes contact with the probe.
6. Retract the wand assembly by 20 mm and tighten the collet nut using the provided collet nut wrench. This may be subsequently altered according to process requirements.
7. Clamp the collar halves onto the wand as close to the pipe orifice as possible and tighten the four bolts to 6.1 nm.
8. Attach a chain between the spool piece pipe and the collar halves.
9. Connect water supply hose to the pressure washer unit (optionally using supplied ¼" NPT threaded flow indicator) and check for leaks. Do not open flow to pressure washer yet.
10. Connect the pressure washing unit power cable but do not energize the circuit yet. Ensure pressure washer rocker switch is in the off (0) position.
11. Connect the high-pressure hose to the pressure washer unit and ensure any water released from the hose will reach a drain safely.
12. Turn on water supply and check/correct any leaks observed when using inlet supply pressure. A small amount of flow from the end of the hose is expected. Turn off water supply once completed.
13. Turn off the water supply and attach the pressure hose to the wand via the quick connect.
14. Turn on water supply once more.
15. **When electrical power is first provided to the pressure washer, it will immediately run for 10 seconds and turn off for 30 minutes.** These timings are then repeated.
16. Turn on electrical power at the pump rocker switch by setting to position (I) and then energise the pump circuit.

2.3. Flow cell installations



CAUTION

The weight of the flow cell and pressure washer tubing must be supported either by the process piping, or by other means to protect the probe from bending

A labelled diagram of the flow cell is available in section 3.1.7 for component reference.

1. Inspect all components for signs of shipping damage.
2. Using the collet nut spanner, loosen the collet nut and retract the wand as far as possible, then retighten the collet nut until the wand is restrained and cannot rotate.
3. Inspect the flow cell and ensure the components below are all present and the collet nut is tight. If this has become loose in shipping, please tighten this using the supplied collet nut spanner.
4. Connect water supply hose to the pressure washer unit (optionally using supplied ¼" NPT threaded flow indicator) and check for leaks. Do not open flow to pressure washer yet.
5. Connect the pressure washing unit power cable but do not energize the circuit yet. Ensure pressure washer rocker switch is in the off (0) position.
6. Connect the high-pressure hose to the pressure washer unit and ensure any water released from the hose will reach a drain safely.
7. Turn on water supply and check/correct any leaks observed when using inlet supply pressure. A small amount of flow from the end of the hose is expected. Turn off water supply once completed.
8. Turn off the water supply and attach the pressure hose to the wand via the quick connect.
9. Turn on water supply once more.
10. Attach the pressure washer flow cell assembly to the probe using the C-pieces, and tightening the sanitary clip until resistance is initially felt, followed by a further half turn. NOTE: that fitting should NOT be done up tightly and doing so can deform the probe.
11. Connect the ¾" NPT ports on the flow cell to the process pipework.
12. **When electrical power is first provided to the pressure washer, it will immediately run for 10 seconds and turn off for 30 minutes.** These timings are then repeated.
13. Turn on electrical power at the pump rocker switch by setting to position (I) and then energise the pump circuit.

3. USING THE DEVICE

3.1. Components

The pressure washer consists of several parts which are described here.

3.1.1. Pressure washer unit

The pressure washer unit is provided by V-TUF. This includes an electric motor and the pressure generating pump. There is a rocker power switch (A) for the pump motor located under the motor cover on the pump side. This component weighs approximately 45 kg and has dimensions 730 x 500 x 300 mm (29 x 20 x 12 inches). The pressure is adjusted at the factory using (B), Do not change this without discussion with Keit. The water outlet (C) is a quick connect with a connector supplied on the hose. The water intake (D) is connected using a 3/4" Chicago fitting (not shown in the photographs below).

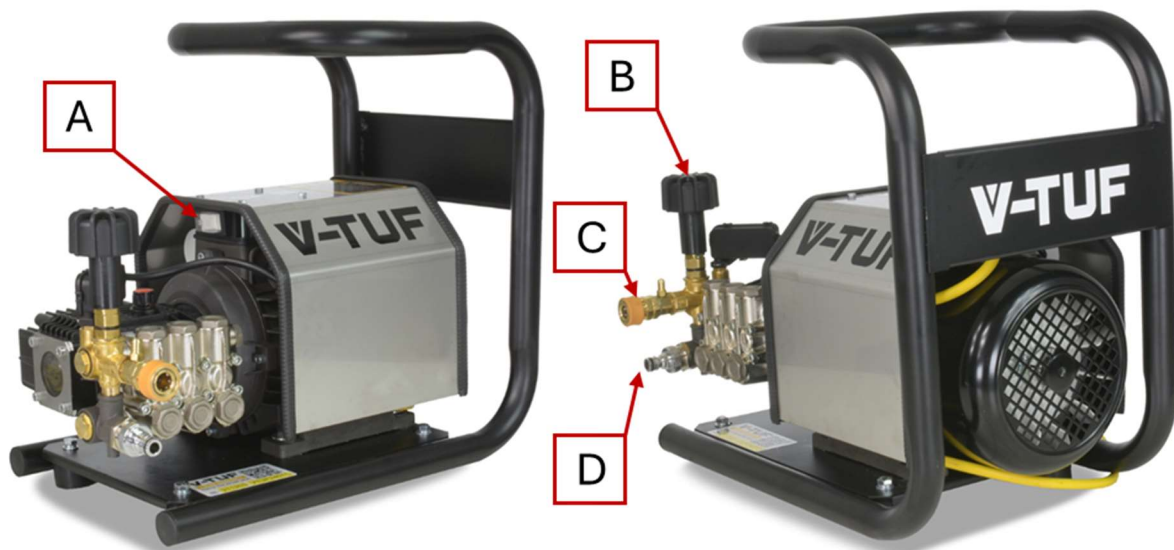


Figure 1 - Pressure washer unit

3.1.2. Timer box

The timer box is mounted above the motor cover. This box also houses the manual cycle button inside the door, which may be used to fire the pressure washer on demand (see below). It comprises 3 timer relays, 2 contactors, 1 button, housed in a polystyrene, polyurethane and polyamide case, with 2 nylon cable glands.



Figure 2 - Timer box

3.1.3. Hose

The pressure washer is supplied with a 10 metre (33 feet) high-pressure hose to connect the pressure washer unit to the wand assembly.



Figure 3 - High-pressure hose

3.1.4. Wand assembly

The wand assembly varies slightly depending on whether a flow cell or spool piece installation method is used, however both installations share the same functional components.

The assembly contains a number of parts which may be tightened or have PTFE tape replaced to limit any leaks that develop. Note that there is a non-return valve with an arrow that *must point towards the wand* (i.e. allowing flow from the pump towards the flow cell):

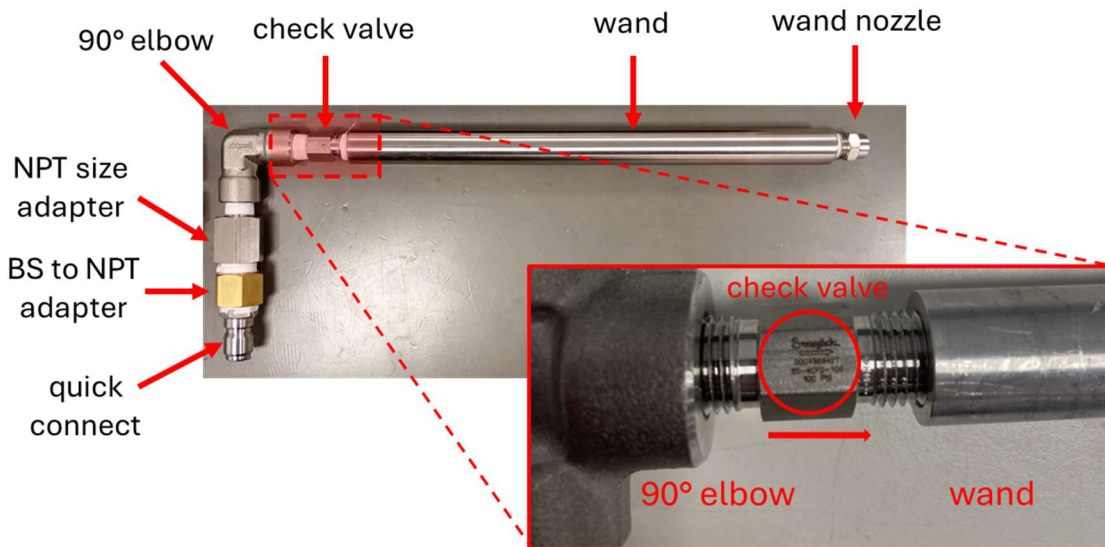


Figure 4 - Wand assembly

3.1.5. Nozzle

The nozzle is a replaceable part that screws into the end of the wand assembly. Water flow will cause wear over time, reducing washer efficiency. These are ¼" NPT 0° size 05 nozzles, made from 316 stainless steel.



Figure 5 - Nozzle

3.1.6. Rotameter

This is an optional installation component which may be used to visually verify when the descaler is operating.



Figure 6 - Rotameter

3.1.7. Flow cell

The flow cell is made up of several components. The flow cell body (H) is held on the instrument probe by the sanitary tri-clamp (A) and (G). (B) and (D) are O-rings that need to be maintained as per section 6.2. (C) is the pressure washer nozzle. By adjusting the collet (E) compression using the collet nut (I), the probe wand (F) can be adjusted to be closer or further from the ATR window of the spectrometer. The circlip (J) prevents the nozzle from being pushed too close to the probe window.

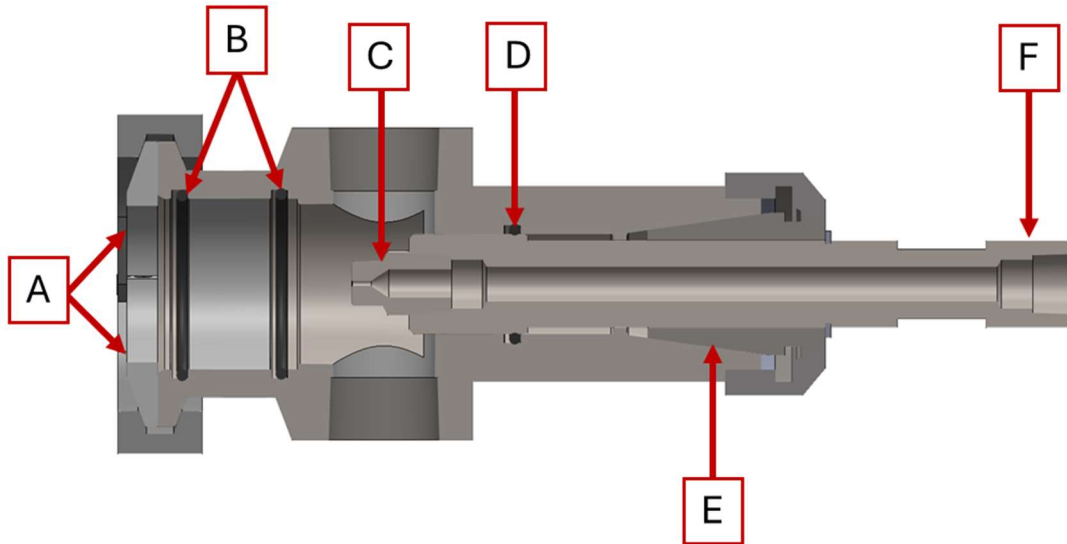


Figure 7 - Cross section of flow cell

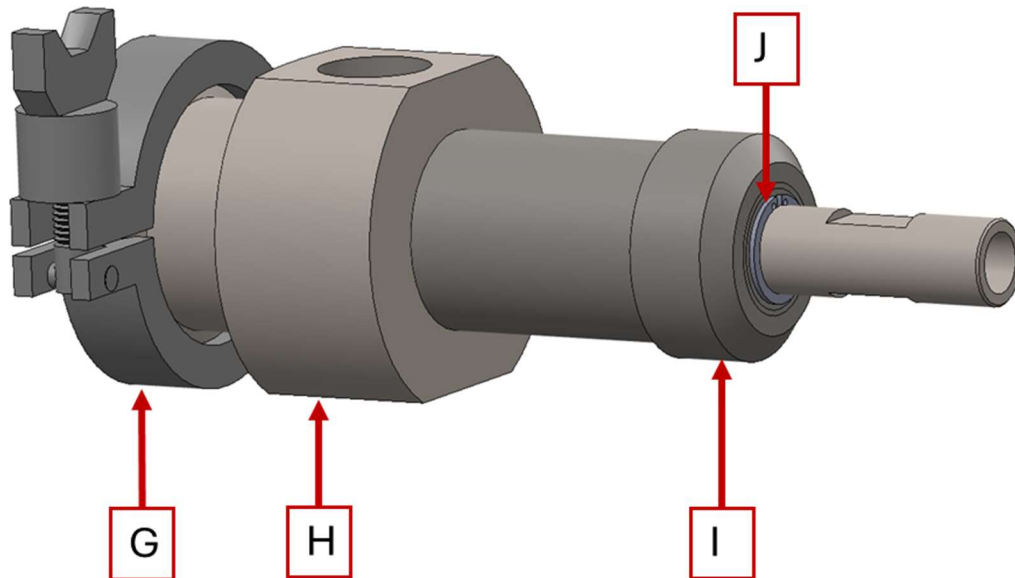


Figure 8 - Flow cell assembly

3.1.8. Spool piece

Spool pieces allow installation of the pressure washer into pipework without the need for a flow cell. This is performed by a similar method to the flow cell. The IRmadillo (A) is installed by into the custom spool piece (B) opposing the wand (C). The wand is sealed with 2x O-rings positioned at (D). The Wand is held at a set distance by the collet and collet nut (E). There is also a physical restraint bolted to the wand which comes with a chain mounting point to restrain movement further (F).

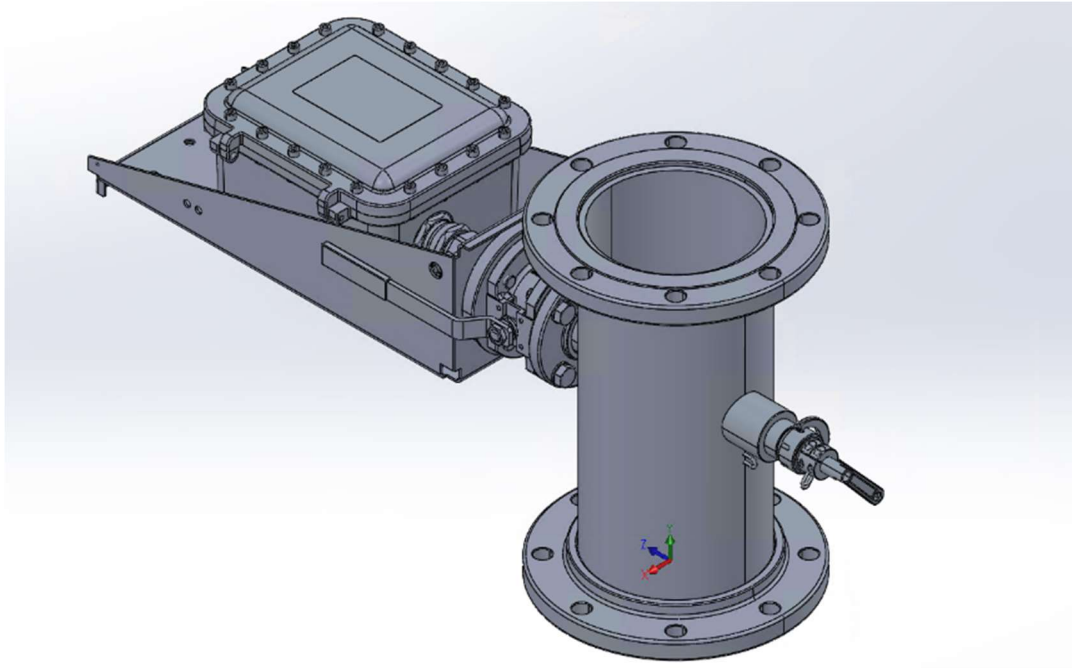


Figure 9 - Isometric projection of spool piece installation

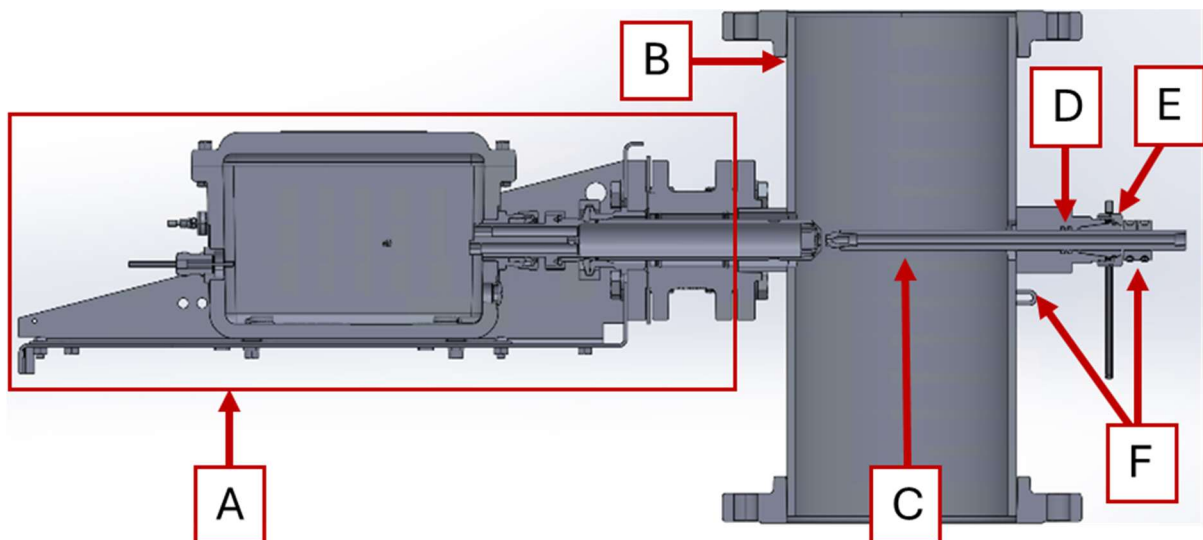


Figure 10 - Cross section of spool piece installation

3.2. Setting the timer

The pressure washer cleaner uses timer relays to coordinate the firing of the water jet. These timers allow for control of the delay between firings 'Timer A' and the duration of the firing 'Timer B & C'. These are set from the factory to fire for 10 seconds at a 30-minute interval as per Table 2.



 CAUTION	Adjusting any settings on Timers A, B or C could cause permanent damage to the spectrometer and will invalidate the warranty of the spectrometer and pressure washer cleaner unless explicitly authorised by Keit.
 CAUTION	Dial (3) should never be adjusted and if adjusted will invalidate the warranty of the spectrometer and pressure washer cleaner.

Table 2 - Factory default settings for timer circuits

Timer	(1) Order of magnitude	(2) Percentage	(3) Function
A	1h	25%	D
B	10s	100%	F
C	10s	100%	F

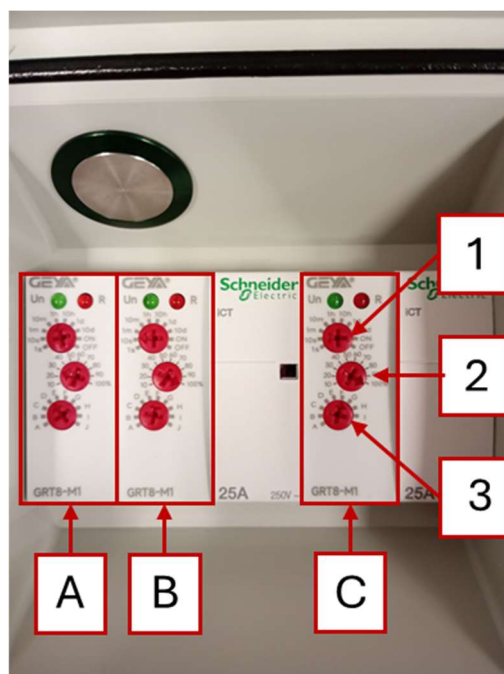


Figure 11 - Timer circuit controls

If adjustments have been authorised by Keit then the timing can be adjusted by rotating the order of magnitude and percentage dials. 'Timer A' is responsible for the duration between


each automatic use of the descaler. 'Timers B & C' are responsible for the duration of each water jet. B & C must be set to the same values on both timers.

3.3. Manually firing the washer before taking samples

During IRmadillo calibration, it is essential that the pressure washer is not firing during sample collection and that the flow cell is clean. Prior to taking a process sample, a manual wash cycle should be triggered, by briefly pressing the silver manual cycle button above the relay timers, shown in Figure 11. This will cause the pressure washer to become active for the preset firing time period after which the preset interval period is restarted. **Please wait a further 4 minutes before taking the sample** to allow the system to return to normal and collect a 'before sample' spectrum. Automated firing will then continue as before. This provides a 30-minute (unless altered) window when the pressure washer won't activate.



4. TECHNICAL SPECIFICATIONS

The pressure washer is designed to be appropriate for similar ambient conditions as the IRmadillo but it is limited as per the specification below.

 CAUTION	Do not operate the pressure washer outside the range of environmental or analyte conditions.
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4.1. Water Specification

The high-pressure washer will self-prime and can draw water from water tanks and natural water sources. It is IMPORTANT that the water is clean, and the inlet filter is clear and fitted to the system. Water should contain no particles greater than 20 microns, such as fine sands, to limit wear to the pump.

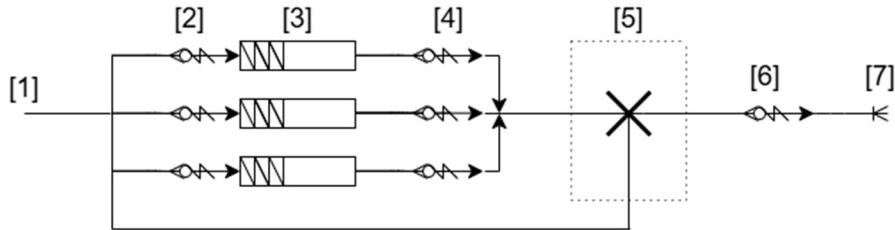
 CAUTION	Large contaminants in the water supply risks damage to check valves which could result in process chemistry flowing back into the device.
 CAUTION	Adjusting the unloader valve beyond its maximum 100 bar pressure setting will invalidate the IRmadillo and pressure washer's warranty.

The input water should also comply with the following specifications:

Parameter	Specified limits
Input water temperature	1 °C to 65 °C (33.8 °F to 149 °F)
Inlet fluid maximum pressure	6 bar (87 psi)
Flow rate	12 Litres/min (3.2 gpm)
Outlet pressure	7-100 bar (101-1450 psi)

4.1.1. Water flow diagram

The pump passes water to the process as per the diagram below:



- [1] Water inlet: The device is able to draw water via its normal function. It does not require a water tank.
- [2] Water inlet check valve
- [3] Pump plungers
- [4] Water outlet check valve
- [5] Pressure regulating valve: outlet pressure of the device can be adjusted manually up to 100 Bar.
- [6] Spray nozzle check valve
 - Process to pressure washer unit: 250 bar
 - Pressure washer unit to process cracking pressure: 7 bar
- [7] Spray nozzle

4.2. Environmental conditions

The operating conditions of the pressure washer areas specified below

Parameter	Specified limits
Operating temperature range	1 °C to 40 °C (23 °F to 104 °F)
Operating conditions	Pump and timer box: indoor / sheltered IP55. Pressure washer process fixture: indoor and outdoor
Process wetted materials	316L SS (default) FFKM O-rings
Non-wetted materials	Polystyrene, polyamide, polycarbonate, powder coated steel

4.3. Circuit diagrams

The power specifications for the pressure washer are mentioned in section 2.1. The circuit diagram for the timer box fitted to the top of the pressure washer is wired according to Figure 12.

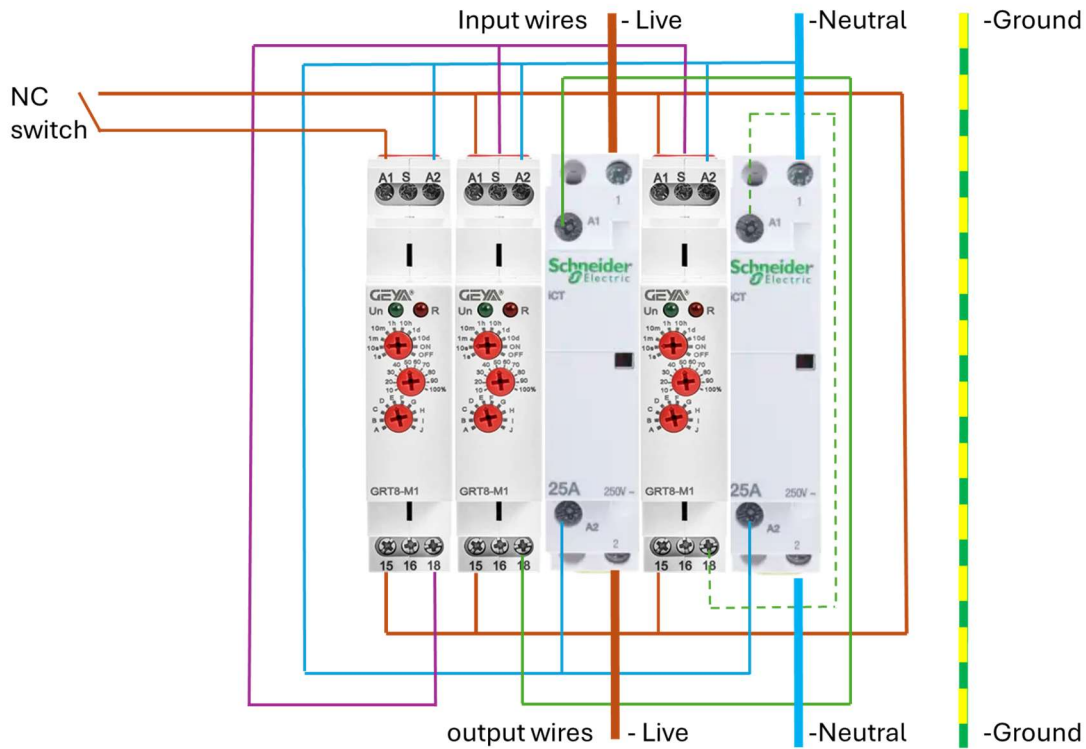


Figure 12 - Wiring diagram for the descaler timer box

4.4. Storage

If the machine is not going to be used for an extended period of time, empty the water circuits and isolate the power supply. Cover the machine and store it in a place protected from atmospheric extremes.

5. WARRANTY DETAILS

The Pressure Washer comes with a 1 year warranty covering parts and labour, and is subject to the terms and conditions in the purchase agreement.

6. MAINTENANCE

6.1. Oil

Oil in the pump should be replaced annually. We recommend V-TUF Pressure Lube PL500.

6.2. O-rings

O-rings in flow-cell and spool piece installs should be inspected regularly for visual signs of degradation. O-rings should be replaced as required and otherwise replaced annually.

6.3. Nozzles

Nozzles will wear over time and the resulting jet will become less effective at removing scale. We recommend annual replacement of the nozzle, but this should be monitored as process chemistry may accelerate wear, meaning more frequent changes are needed.

6.4. List of parts (O-rings, pump, timers)

The serviceable parts are as follows:

Part list	Part No.
O-ring BS118 FFKM	90032
O-ring BS128 FFKM	30037
O-ring BS210 FFKM	90045
Stainless Steel 316 replaceable nozzles - 1/4" NPT Male 0 degree size 05	90031
V-TUF 240C portable and wall mountable industrial pressure washer 240V	VTUF240C
Timer box	ASM1601
Check valve (Swagelok) 7 bar cracking pressure	SS-4CP2-100

7. TROUBLESHOOTING

If you encounter any issues either during installation or during use of the pressure washer please contact Keit (support@keit.co.uk).

Below are some examples of issues that may be experienced with potential solutions to the problem.

Issue	Cause	Potential Solution
IRmadillo model reports scaling	Pressure washer is not operating correctly.	Check power and water supply. Manually trigger a wash cycle. Contact Keit for further guidance.
Pump stops working and no lights are visible on the timer	The power supply fuse may have blown or the power supply to the pump has been interrupted.	Check the power supply to the pump and reset/replace any breaker or fuse.
The timer is flashing but the pump stops activating	Thermal cutout may have triggered and stopped power supply to the pump motor. OR This may be caused by a solenoid failure in the timer box.	Leave to cool and manually flip the rocker switch back. If this occurs many times then contact Keit for further guidance. OR To prevent a fail-on state, the timer uses separate contactors for live and neutral connectors. They may be tested using the manual cycle button. If one relay fails, both should be replaced by a suitably qualified electrician.
Leaks between joints	Joint seals have degraded.	De-energise, remove existing seals, replace leaking seals and reassemble. Re-energise and test.
Excess water enters process	The check valve may be leaking.	Replace with a new part.
Pressure washer operates but cleaning is insufficient	Distance from wand to probe or cleaning frequency may need change. Wear on the nozzle is reducing jet accuracy.	Consult Keit for guidance.