

AQUARIUS

*Operating Instructions
for the*

Type 70 Electrolytic Gas Soldering / Welding Unit

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1. Important General Remarks

You have made the right decision by purchasing **AQUARIUS** equipment. Our equipment can easily serve you for 20 years or more with **proper operation and regular maintenance**. We guarantee all new equipment for **36 months**. Please read these Operating Instructions carefully to ensure smooth operation of the equipment in your daily work. Nearly all alleged defects occurring within the warranty period can be traced to improper use. The unit should be shipped back to our factory for renewal of the seals about every 6 years, depending on how often it is used. We recommend that you save the original packaging for this purpose. **Please note that you should always make sure that the unit is empty of all fluids before shipping, and that the Generator and Booster caps are screwed down tightly for transport, because there can always be a residual amount of fluid in the tanks.** Always ship the hand-held torch and gas tube screw coupling along with the unit so that these can also be inspected.

2. Safety Instructions

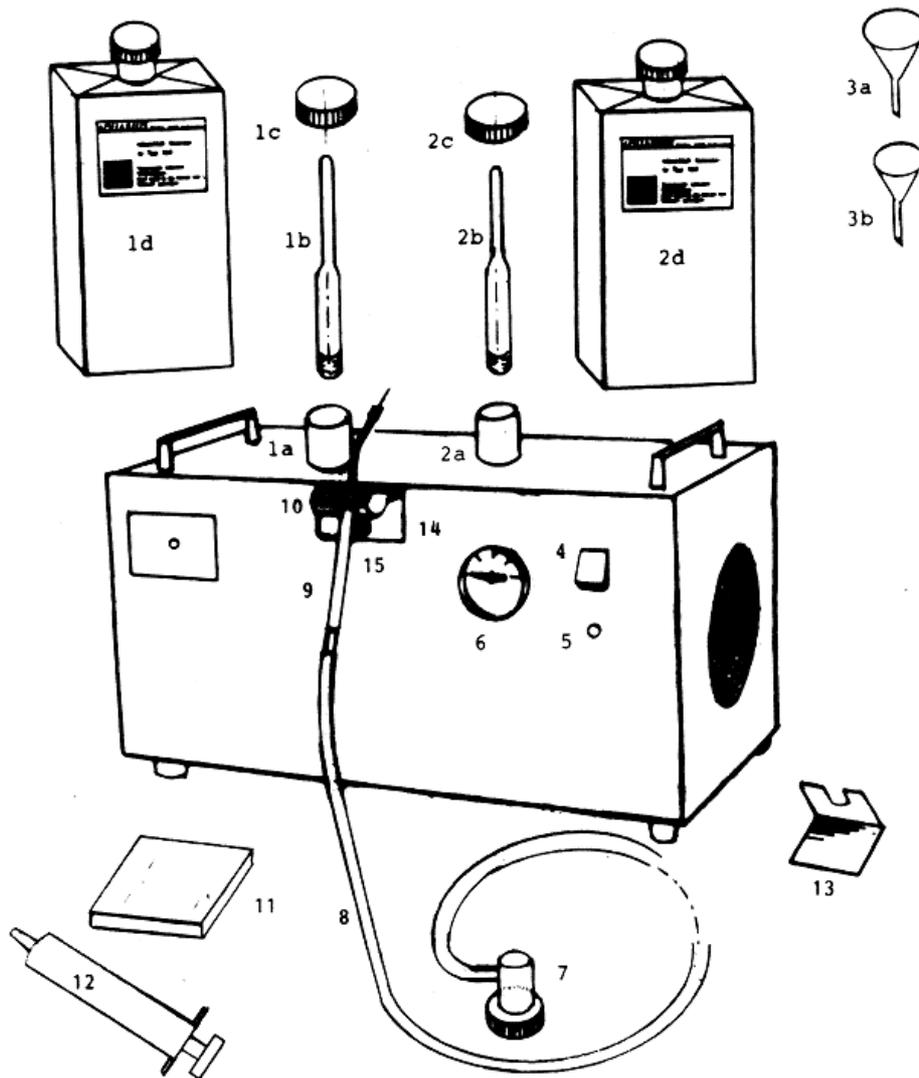
1. The electrolyte is a strongly corrosive fluid; the flux fluid is flammable and poisonous.
Electrolyte: R 35 Causes severe acid burns.
S 2 Must not fall into the hands of children.
Flux Fluid: R 11 Easily ignitable.
R 22/23 Poisonous when breathed or swallowed.
When filling, always wear protective gloves and safety goggles! Keep away from open flames!
Should electrolyte or flux fluid come into contact with the skin or clothes, rinse immediately with plenty of water!
Spent or old fluids should always be disposed of at appropriate local waste collecting points!
2. Never run the unit unattended.
3. Choose the location of the torch stand such that the flame cannot come into contact with surrounding objects.
4. Always extinguish the torch flame before opening the screw caps and gas tube screw coupling. Keep open flames away from the unit when these are open.
5. Always disconnect the power cord from the socket before removing the unit's cover.
6. It is forbidden to make unauthorized repairs to the unit.
For safety reasons, it is forbidden to remove, or drill holes in, the flashback arresters.
When making authorized repairs, always use original-manufacture replacement parts.
Repairs of the gas generator should only be made by our factory to ensure that the required inspections are performed.

3. Description of the Soldering Unit and Accessories

The AQUARIUS Type 70 is a self-contained, electrolytic gas soldering / welding unit with a gas output of 45 l/h. By splitting distilled water into hydrogen and oxygen, oxyhydrogen gas is produced, which burns in the torch flame to reach temperatures of up to 3200°C. Since temperatures this high are only needed when working with platinum, the flame temperature is reduced to 2400°C by mixing a flux fluid vapor (from the booster tank) into the gas. The flux also helps to reduce oxide buildup when soldering, which when combined with the finely adjustable flame, ensures ideal working conditions for all types of soldering applications. Once filled with electrolyte, which only needs to be renewed about every 8 to 12 months, the unit consumes only distilled water and flux fluid during regular operation. This unit is the result of years of development work and a proven safety concept. Some of the safety features include:

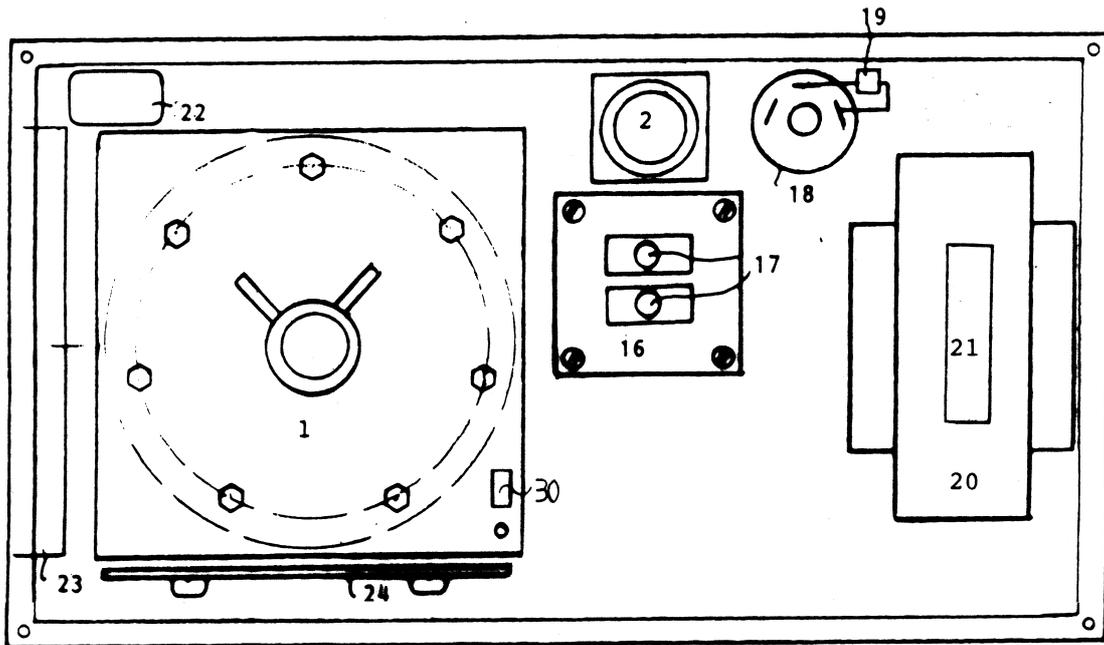
1. A flashback arrester in the hand-held torch unit.
2. A flashback arrester in the gas tube screw coupling.
3. A safety pressure limiter that interrupts both lines of the power supply to shut the unit down on failure of the pressure switch. The working pressure of the unit ranges from 0.18 to 0.20 bar. If the pressure switch fails, the safety pressure limiter switches the unit off when the pressure reaches 0.30 bar.
4. The unit produces only as much gas as consumed by the torch flame except for very small amounts that are still in the generator and tubing.
5. A thermostat switch shuts off gas production if the temperature of the gas generator gets too high.

AQUARIUS Soldering Units have a multi-cell generator allowing them to produce the same amount of gas as other soldering units at only one half of the power consumption. You are thus helping to protect the environment and saving energy costs at the same time!



Numbered Components:

- 1a) Filler opening of the electrolyte tank (= gas generator, **black**)
- 1b) Level indicator float for electrolyte tank
- 1c) Screw cap of the generator tank, **black**
- 1d) Electrolyte bottle
- 2a) Filler opening of the flux tank (= booster, **red**)
- 2b) Level indicator float for flux tank
- 2c) Screw cap of the booster tank, **red**
- 2d) Flux fluid bottle
- 3a) Large funnel to fill electrolyte fluid
- 3b) Small funnel to fill flux fluid
- 4) Power switch (On / Off)
- 5) LED to indicate gas production
- 6) Pressure gauge indicating gas pressure
- 7) Screw coupling for gas tube
- 8) Gas tube to hand-held torch
- 9) Hand-held torch
- 10) Torch flame adjustment valve
- 11) Assortment of different-sized torch nozzles
- 12) Syringe for cleaning and siphoning off liquids
- 13) Torch stand
- 14) Side-mount torch holder
- 15) Screw to fasten side-mount torch holder



Numbered Components:

- 1) Gas generator (electrolyte tank)
- 2) Booster (flux fluid tank)
- 16) Safety pressure limiter
- 17) Reset pushbuttons of the safety pressure limiter
- 18) Pressure switch
- 19) NTC resistor
- 20) Transformer
- 21) Dropping resistor
- 22) Mist collector
- 23) Cooling fan
- 24) Diode plate
- 30) Thermostat switch

4. Operating for the First Time

Caution: When filling, always wear protective gloves and safety goggles! Keep away from open flames!

1. Filling the Electrolyte (black filler opening):

Using the larger funnel (3a), pour the entire contents of the supplied bottle of electrolyte solution (1d) **slowly into the filler opening of the electrolyte tank (1a). Because there are several cells in the gas generator into which the fluid must flow, you should allow at least 3 minutes for this operation. Pour slowly to avoid overflowing!** When done, carefully insert the level indicator float for the electrolyte (1b) into the tank with the thicker end pointing down. The top of the float should be level with the top edge of the filler opening. Screw on and hand tighten the cap of the generator tank (1c). Note that the supplied electrolyte solution already contains enough distilled water, so do not add water.

2. Filling the Flux Fluid (red filler opening):

Using the smaller funnel (3b) and the 50 ml syringe (12), fill approximately 100 ml of flux fluid (2d) into the filler opening of the booster tank (2a). Carefully insert the booster level indicator float (2b) into the tank with the thicker end pointing down. The top of the float should be **approximately 2 to 3 cm below** the top edge of the filler opening. You do not need to put the screw cap on the tank, because the torch tube screw coupling will be screwed onto it in the next step.

3. Connecting the Hand-Held Torch:

Screw on and hand tighten the screw coupling of the torch gas tube (7) onto the filler opening of the booster tank (2a). Choose the appropriate size torch nozzle (11) according to the desired size of the flame, and put it on the end of the hand-held torch (9). Press the nozzle tightly onto the end of the torch and twist it slightly (about $\frac{1}{4}$ of a turn) to ensure a tight fit. Keep the torch valve (10) closed for the moment.

4. Testing the Unit for Gas Leaks:

Connect the power cord to a wall socket. Press the power switch (4) to turn the unit on. The LED (5) should light up to indicate that gas is being produced. The needle of the pressure gauge (6) moves up to 0.20 bar, at which point the pressure switch (18) inside the unit interrupts gas production, and the LED goes off. Watch the needle of the pressure gauge for approximately 1 minute to determine whether the pressure drops. If the pressure does drop, check and tighten the generator cap (1c), the screw coupling of the gas tube (7) and the torch valve (10).

5. Lighting the Torch:

Open the torch valve (10), but wait about 1 minute before lighting the torch to allow the air in the gas generator and tubing to escape, then light the torch. The flame should burn with a bright green color. When the pressure falls below 0.18 bar, the pressure switch switches on again to restart gas production, and the LED lights up. The torch valve must be adjusted appropriately according to the size of the nozzle. If the valve is open too far, the flame makes an audible hissing sound; if the valve is not open far enough, the flame can pull back into the nozzle, which glows and may begin to melt. When using smaller nozzles, gas production switches on and off at regular intervals between the pressures 0.18 and 0.20 bar. When using larger nozzles, it is normal that the pressure may sink below 0.10 bar and gas production never stops because all of the gas being produced is consumed by the flame. To save energy and fluids, the flame should only be burning during the actual soldering work. However, the torch valve can be closed and the power switch left on to keep the unit ready for immediate operation. Because the gas generator gets warm during gas production, it is advisable when you stop working after longer soldering operations to close the torch valve (10) to extinguish the flame (see next step), but to leave the unit switched on for a while to allow the cooling fan (23) to run.

6. Extinguishing the Torch Flame:

Quickly close the torch valve (10) to extinguish the flame. Never turn the power switch off to extinguish the flame because the slowly sinking gas pressure will pull the flame back into the nozzle, which can melt and burn.

5. Daily Operation

Before beginning work, you should check the fill levels of the generator and booster tanks. Depending on how often you use the unit, you may not necessarily have to do this every day. When it is in its ready state (power switch on, torch valve closed) the unit does not consume fluids. When gas is being produced, the approximate consumption rates are as follows:

Consumption of distilled water:	25 ml / hour
Consumption of flux fluid:	7 ml / hour

Note: Before opening the generator tank screw cap (1c) or the gas tube screw coupling (7), you must open the torch valve with power switched off to release the pressure. **Caution: Keep open flames away!**

1. Checking the Fill Level of the Generator Tank (black filler opening):

With the unit switched off, remove the screw cap (1c) of the generator tank, and check the depth of the level indicator float (1b). If the float is down too far, then use the large funnel (3a) to **slowly pour in distilled water** until the top of the float is level with the top edge of the filler opening (1a). Because there are several cells in the generator and it takes time for the water to flow into them, check the float again after about 1 minute and add more **distilled water** as needed. Screw on and hand tighten the screw cap.

Important: Never add more electrolyte solution after filling for the first time or renewing (see Step 1 in Section 6)! The electrolyte is not consumed, it just gets old or spent.

The electrolyte consists of potassium hydroxide dissolved in distilled water, and has a concentration that ensures an ideal electrical conductivity. During electrolysis (gas production), only the distilled water is consumed while the amount of potassium hydroxide in the generator stays the same. If you were to keep adding electrolyte, its concentration would increase, initially causing a loss in performance and later, a crystallization that would damage the generator.

2. Checking the Fill Level of the Booster Tank (red filler opening):

With the unit switched off, remove the screw coupling of the gas tube (7) from the filler opening of the booster tank (2a), or if the coupling is not connected, remove the screw cap. Switch the unit on for a short period until you hear gas escaping from the filler opening in order to allow flux fluid to be pumped from the runback reservoir back into the booster tank. (There is runback reservoir inside the unit between the gas generator and booster that prevents flux fluid from being sucked into the generator by the partial vacuum that is created when the warm generator cools down after being in operation. When the unit is switched on again, the gas pressure pumps the flux from the reservoir back into the booster tank, so that the fill level of the booster tank increases although no fluid was added.) Switch the unit off again. **Only after this has been done, can the true fill level of the booster tank be reliably determined by checking the booster float (2c).** The top of the float should be about **2 to 3 cm below** the top edge of the filler opening. Using the small funnel (3b), fill flux fluid (2d) as required until the float indicates that the tank is full. If you have put in too much fluid, you can use the syringe (12) to suck some of it back out. Replace the gas tube screw coupling (7) and screw it down hand tight, or if you are not going to use the unit, put the booster screw cap (2c) on and screw it down hand tight.

6. Maintenance

1. Renewing the Electrolyte:

Caution: When working with electrolyte , always wear protective gloves and safety goggles to prevent acid burns (see Section 2. Safety Instructions)!

The electrolyte should be renewed about every 8 to 12 months, depending on how often the unit is used. An indication that it is time to renew the electrolyte is when the gas yield starts to drop, i.e., the gas pressure is too low for large nozzles (the nozzle burns) or the flame is not hot enough. The generator should be emptied while it is still warm from being operated to allow the sediment that collects at the bottom to be removed. **Before changing the electrolyte, always remove the gas tube screw coupling (7) from the booster tank and screw on and hand tighten the booster tank screw cap (2c).** After removing the generator screw cap (1c) and the level indicator float (1b), tilt the unit toward the front side (power switch side) until the electrolyte starts to pour out in a steady stream, but not too far so that air can still get back in. The unit must be tilted toward the front (power switch side) so that electrolyte does not flow into the tubing inside the unit. As electrolyte pours out, continue tilting the unit slowly until it is upside down and completely empty. Before filling new electrolyte (see Section 4, Step 1), rinse the generator once or twice with distilled water. To do this, slowly pour in about ½ l of distilled water, shake the unit lightly, and then empty it by tilting it as described above. Make sure to dispose of the old electrolyte properly (it is a caustic substance).

2. Replacing Old or Contaminated Flux Fluid:

If the booster fill level is OK, but the flame is pale or reddish instead of bright green, or if electrolyte or distilled water has been filled into the booster tank by mistake, then the flux fluid must be replaced. Switch the unit on for a short period to allow fluid to be pumped from the runback reservoir back into the booster tank, then use the syringe (12) to suck the old fluid out of the booster tank. If the old fluid is contaminated, e.g., with electrolyte or distilled water, then rinse the empty tank with about 100 ml of flux fluid and then empty the tank again. Dispose of the old flux fluid properly. **Never rinse the booster tank with water, because the flux fluid saponifies (becomes soapy) when combined with water, which can stop up the gas lines.** Refill the booster tank with new flux fluid as described in Section 4, Step 2.

7. Troubleshooting Guide

1. The unit does not build up pressure.

- a) If the LED (5) lights up, than gas is leaking at one of the screw connections or out of the torch.
Solution: Check and tighten the generator tank screw cap (1c), the gas tube screw connection (7), and the torch adjusting valve (10).
- b) If the LED (5) does not light, then electric power for gas production has been interrupted. Several faults are possible:
1. A defect of the pressure switch (18) has caused the safety pressure limiter (16) to trigger.
Solution: Replace the defective pressure switch and push down both pushbuttons (17) on the safety pressure limiter.
 2. The dropping resistor (21) has burned through.
Solution: Replace the dropping resistor.
 3. The rectifier diodes on the diode plate (24) are defective.
Solution: Replace the diode plate.
 4. The thermostat switch (30) has triggered because the generator is too hot.
Solution: Check that the cooling fan is working! When the fan is running, gas production restarts automatically as soon as the generator cools to a temperature below 45°C.

2. The flame has normal color (**bright green**) but is not hot enough.

- a) The fill level in the generator tank is too low.
Solution: Refill the generator with **distilled water** as described in Section 5, Step 1.
- b) The electrolyte is contaminated or spent.
Solution: Renew the electrolyte as described in Section 6, Step 1.
- c) The gas line is blocked either inside the unit, or in the flashback arresters of the torch or the gas tube screw coupling.
Test: Remove the nozzle from the torch, open the torch valve all the way open, and switch the unit on. Normally, the LED should remain constantly lit to indicate that gas is being produced, and the pressure indicator should stay at 0 because all of the gas is being allowed to escape unhindered through the torch. However, if the pressure increases and the LED goes off after a short period, then the gas is being blocked somewhere. To find out where it is being blocked, start by pulling the torch out of the tubing. If the pressure drops, then the flashback arrester of the torch is blocked. If the pressure stays up, then the gas is blocked either in the flashback arrester of the gas tube screw coupling or inside the unit. Unscrew the gas tube coupling. If the pressure drops, then the flashback arrester of the gas tube screw coupling is blocked. If the pressure stays up, then the gas is blocked inside the unit.
Solution: The flashback arresters can be cleaned with highly diluted sulfuric acid (density of 1.02). Fill roughly 4 to 5 cm of the diluted sulfuric acid into a glass. With the plunger pushed in, connect the syringe to either the torch or the screw coupling, and dip the torch or coupling into the acid. Now pull the plunger out to draw acid up into the syringe while keeping the torch or coupling in the glass. Let the acid work for about 10 minutes. Occasionally move the plunger in and out a little to wash fresh acid into the flashback arrester. When done, thoroughly rinse the flashback arrester with distilled water, and dry it with compressed air.
If the gas is blocked inside the unit, call our customer service or send the unit to the factory for repair.

3. The flame is red or pale, and not hot enough.

- a) The fill level in the booster tank is too low.
Solution: Refill the booster with flux fluid as described in Section 5, Step 2.
- b) The flux fluid is contaminated or old.
Solution: Empty and clean the booster tank as described in Section 6, Step 2. Refill the booster tank with new flux fluid as described in Section 4, Step 2.

8. Technical Data

Gas yield	45 l/h
Largest nozzle size	20G
Number of torches working at same time	1 to 2 (2 with 22G and smaller nozzles and optional T-piece in gas tube)
Rated voltage	230 V, 50 Hz
Rated current	0.9 A
Rated power consumption	200 VA
Maximum operating pressure	0.20 bar
Number of cells in the gas generator	3
Distilled water consumption	25 ml/h
Flux fluid consumption	7 ml/h
Pressure regulation	pressure switch
Overpressure protection	safety pressure limiter
Overheating protection	thermostat switch
Number of flashback arresters	2
Direct current display	LED
Generator tank capacity	0.8 l of electrolyte
Booster tank capacity	0.1 l of flux fluid
Fill level indicator in generator tank	generator float
Fill level indicator in booster tank	booster float
Dimensions of the unit in cm	45 x 28 x 22
Weight when ready for operation	14 kg

Size Table for Torch Nozzles in mm:

Nozzle No.	Inside Diameter	Outside Diameter
20G	0.60	0.90
21G	0.50	0.80
22G	0.40	0.70
23G	0.35	0.60
24G	0.30	0.55
25G	0.25	0.50
26G	0.20	0.45

9. Schematic Diagram

A schematic diagram of the unit's circuitry is shown on the next page.

AQUARIUS Type 70 Soldering / Welding Unit
Schematic Diagram

