1 2Wet overview

2Wet ("ToWet") is an automated fluid dosing device, gas stream humidifier and pure steam generator all in one device[1]. With the 2Flow software it is easy to program dispense rates, ramps and setpoints as function of time, in various units. When working with gases, the software also calculates partial pressures and volumetric units for all constituents (and RH% in case of H_2O, at any given conditions)

The device doses H_2O or other low viscosity fluid directly into process or experiment, or into evaporator system to generate steam or vapor, or to mix with a stream of gas. The device's main purpose is to humidify a steam of gas, and with its' companion device 2Mix, forms a gas mixing and humidification system. These devices are modular and are controlled from one software.

2Wet device consist of a power source, the fluid pump-2Wet device itself, the gas evaporator line (heated and insulated gas line), and the 2Wet software.

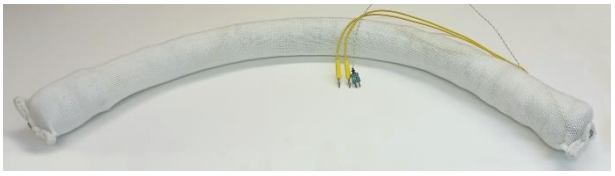
1.1 Components

1.1.1 Device

Front side of the 2Wet device has inputs for a gas and a fluid. Syringe pump's valve and syringe, power switch and the PID controller to regulate the power of the evaporator. The fluid pump on the 2Wet has its front side exposed, so the user may inspect and change the 2-way valve, and the syringe when necessary. Syringe pumps come in various volumes. These parts are mechanical repeaters, and as such considered consumables that will eventually wear out. Easy access to inspect and replace is essential, as high throughput and high pressures increase their wear.

The back side also has outputs for the gas and the fluid. Thermocouple connector and power connectors in- and out for the evaporator line, for connectivity two USB ports, for daisy-chaining multiple devices and the controlling computer, and finally the main power in.

1.1.2 Evaporator / gas carrier line



The fluid evaporator/gas carrier line is 1.2 meters long corrugated (flexible) stainless steel tube, with built-in safe low-voltage heating and insulation. It connects directly to the back of the device leaving the other end to connect to user processes or to further transfer line. The device has manual on/off switch. By default, the temperature is limited to 150°C, but much higher temperatures can be achieved with custom versions.

1.1.3 Power source

The power source is by default ~12 Amp, 24 VDC transformer, much like a beefy laptop charger. Heating power is ~280W, enough for ~5 L of pure steam per minute in atmospheric pressure.

When higher steam throughput, and/or steam against elevated pressures are required, the system can be built for higher current requirements. The power supply will be DIN rail mounted, or in extreme cases modular server PSUs requiring their own racks.

1.1.4 2Flow software

The software is meant for Windows PC (computer not included), and can control any number of 2Wet or 2Mix devices, or standalone mass flow controllers.

The user enters desired flow profile for any connected device(s) with freely selectable flows, ramps, steps, delays for gases in 2Mix, and for fluids in 2Mix. If these flows are combined, the software calculates flows in user defined units, in grams, and the resulting partial pressures for each constituent.

[1] 2Wet used alone, without 2Mix, can dose fluid; Dispense volume as function of time; ramps, steps, varying dispense amounts. If the dispensed fluid is evaporated with the included evaporator, the device can act as standalone vapor/steam generator. When used with 2Mix and the outputs are combined, the system becomes gas humidifier. This is the main purpose and function, but there is nothing preventing use for the two above functions.

2 Specifications and options

2.1 Available device configurations/options

Device type	Default 2Wet	High pressure & corrosive option
Materials in contact with fluid / gas	Copper, brass, PTFE, Borosilicate glass	Stainless steel, Borosilicate glass, PFA, CTFE, ETFE & UHMW-PE
Maximum pressure	5 barA	7 barA

2.2 Fluids

Any low viscosity fluid that is chemically compatible can be used; the software has typical fluids but also allows entering any custom compound.

2.3 Pressures

The pressure rating is somewhat ambiguous. The syringe pump manufacturer has various and conflicting information. Here we use the most conservative numbers found.

When using against elevated pressures, consider the eventual failure of the syringe pump components; the syringe seals, and the syringe pump valve. Assume the high pressure from the experiment to backflow and leak out, and design the experiment safety accordingly. Alarms, fume hoods, SOPs etc.

The device is likely fine to be used against pressures above these limits, but will have shorter lifetime, less accuracy and no warranty. Any gas trapped in the syringe, when operating against high pressures, will expand during the time syringe is connected to fluid reservoir, and cause inaccuracy or in the worst case prevent any new fluid from being drawn in. See maintenance section on how to remove gas bubbles.

It is also possible to have fluid reservoir at the same or similar pressure as the experiment, but the details are currently beyond the scope of this manual.

Likewise, it is possible to flush, protect or bubble the fluid reservoir with an inert gas in order to remove dissolved oxygen should it be a problem. This also is beyond the scope of the manual.

The device is designed so that replacing the valve and the syringe is easy and can be done by the end user.

2.3.1 Standard 2Wet device

In the default configuration the device is rated to work against pressures of 5 barA.

2.3.2 High pressure & corrosive option

Changing several components and component materials it is possible to achieve setup where the device is rated for 7 barA pressure. This option is also built with improved corrosion resistance.

2.4 Dispense and flows

2.4.1 Low flows

With the smallest syringe (12.5 µL) the device has dispense resolution of 0.5 nL, and can dispense full syringe volume in 192 000 steps. The device can pause for any number of milliseconds between each movement, so there is no fixed minimum dispense speed or limit. The device can easily achieve ppm levels of evaporated fluid.

A version of the pump exists that can dispense even slower (with constant speed, not with pauses). Take contact if adapting this to the system is of interest. For example for steady ppb evaporations, of nL fluid dosing.

2.4.2 High flows

At maximum speed the device can perform 25 dispense and refill cycles per minute. The largest syringe size for the standard device is 12.5 mL, and for the high pressure option 250 µL.

2.4.3 Syringe

The device has user-changeable syringe on the front panel. Syringe size is selected and confirmed in the software.

Syringe volume µl	Resolution nL	Max dispense[2] mL/min	Max steam volume[3] L/min	Max power needed[2] W
12.5[4]	0.5	0.31	0.6	16
25	1	0.63	1.2	31
50	2	1.25	2.4	63
100	4	2.50	4.8	125
125	5	3.13	6	156
250	10	6.25	12	313[5]
500[6]	21	12.50	24	625[4]
1000[5]	42	25.00	48	1.25 k[4]
1250[5]	52	31.25	60	1.56 k[4]
2500[5]	104	62.50	120	3.13 k[4]
5000[5]	208	125.00	240	6.25 k[4]
12500[5]	521	312.50	601	15.63 k[4]

2.4.4 Accuracy

Device accuracy is rated as ±1% of syringe volume at full dispense

2.4.5 Precision

Device precision ±0.1% of any dispensed volume.

2.4.6 Power options

The dispense must be matched with enough power to avaporate the fluid (at the intended pressure). Both the evaporator temperature and heating power can be customized according intended use, roughly into these three groups:

Comments	Voltage	Power supply	Amps	Power, W	Surcharge
Default	24 VDC	“Big laptop charger”	< 12	250	-
Relatively easy	24 VDC	DIN rail DC power supply	12 – 40	250 – 960	~2k€
Custom design	24 VDC	Single or parallel, modular DC power supplies (1.5 KW)	> 40	> 1 KW	>5k€

Evaporator temperature is limited in the standard version to 150°C. It is possible to build the device for significantly higher temperatures, if needed, (for additional cost and increased power demand).

2.5 Interfaces

Fluid input: Swagelok compression bulkhead 1/16” with 30 cm input line of 1/16” tubing
Gas stream input: Swagelok compression fitting bulkhead 1/8”
Heated gas line outlet: Swagelok compression fitting for 1/4” stainless steel tubing
Mains power input: 100-240 VAC 50/60 Hz, 4.5 A. Socket for any C13 plug, typically includes CEE 7/7 plug.

[2] When ran at maximum speed
[3] When evaporating H2O at 1 bar pressure
[4] Default syringe
[5] Requires custom power option
[6] Not suitable for high pressure or corrosive option

Internal:	24 VDC, 12 A
Software:	Requires Windows system (computer not included).

2.6 Materials compatibility

2.6.1 Bulkheads and unions

Gas and fluid bulkheads are brass. Corrosive option has stainless steel.

2.6.2 Tubing gas

Copper. Corrosive option has stainless steel.

2.6.3 Tubing fluid

PTFE (polytetrafluoroethylene) is the generic name for the class of materials such as Teflon. It offers superior chemical resistance but is limited in pressure and temperature capabilities. Because it's so easy to handle, it is often used in low pressure situations where stainless steel might cause adsorption. PTFE tubing is relatively porous, and compounds of low molecular weight can diffuse through the tubing wall.

- PTFE fluid delivery line melting point 326°C
- Suitable for Aqua Regia, Alcohols, Biological Fluids, Hydrofluoric Acid, Esters, Fragrances, Fuming Sulfuric Acid, Ketones, Food, Chlorosulfuric Acid, Highly Halogenated, Organics, Printing Inks & Dyes, Boiling Sodium, Hydroxide Solution, Aromatic Solvents, Low Level Radioactive, Substances, Chlorine Gas, Amines, Oxidizers, Hydrogen Peroxide, Industrial Oils, Acid Chlorides, Nitric Acid

2.6.4 Syringe

Borosilicate glass barrel, PTFE or PFA insert, stainless steel or aluminum rod with PTFE coating, PTFE or UHMW-PE plunger tip.

2.6.5 Valve

CTFE, PTFE, ETFE, or ceramic.

3 Unpacking

A delivery of 2Wet consists of the following:

- 2Wet device
- Optional: Gas line adapter 1/4” to 1/8”
- Fluid input line 1/16”, 30 cm
- USB A-B cable
- PID controller manual
- (Optional) Device power cable(s)

- Heated gas line (may be shipped separately)

- Power supply 24 VDC (may be shipped separately)
- (Optional) Mains power cable

Software and manual supplied electronically.

4 Safety

4.1 Alarms

When used with any dangerous fluid, or in conjunction with any dangerous gas, the whole system should be in a fume hood with appropriate alarm systems installed according to local rules and regulations.

The seals in the syringe are consumables and will not last forever.

For risk assessment, consider failure a certainty. Loose connections, worn out syringe seals, physical impact to crack the syringe or cut the (relatively weak) fluid line. Over pressure event, component fatigue, user error. Asses the release of flammable or toxic gas or fluid. Plan accordingly.

5 Use and maintenance

5.1 Fluid input

The syringe pump pulls fluid through the front panel fluid input line. The mixer is supplied 1/16” with PTFE fluid input line of roughly 30 cm. Connect this and submerge the open end to your fluid reservoir. The syringe pump has two cycles, one is “retract” and takes few seconds. During this step the syringe pump valve connects the syringe to the fluid input, and the retracting pulls the fluid into the syringe. The other step is “dispense”, happens much slower, and during this step the syringe pump device valve connects the syringe to the fluid output line, which delivered the fluid to the heated gas line/evaporator where the boiling fluid mixes with the gas.

The syringe pump is able to push the fluid against the backpressure of the experiment.

5.2 Fluid reservoir

Fluid reservoir is not suppled with the mixer. Use appropriate container and place it close to the 2Wet device. Submerge and secure the fluid input line so that 2Wet can pull fluid. Perform fluid line priming until the new fluid is verified to exist from the back side fluid delivery line. Ensure no air is trapped in the syringe.

5.3 Setup (to add fluid to a gas)

Connect the front panel input gas line the gas or gas mixture that is to be humidified. Connect the front panel fluid input line to

5.4 Flushing and priming

The fluid delivery system only works as intended when it is primed with the fluid of choice. In case fluid different from earlier use is needed, in case the syringe was replaced, in case the fluid delivery system is full of air, or in case gas bubbles have been trapped in the syringe, the system needs to be flushed and primed.

Follow the relevant following sub-chapters to achieve flushing and priming.

5.5 Removing the syringe

The device is designed so that replacing the valve and the syringe is easy and can be done by the end user.

Apply this only in case a syringe is worn, damaged, a different volume syringe is needed, or there is gas bubbles trapped in the syringe.

In order to remove the syringe, select the appropriate device in the software and click “change syringe”. This will bring the syringe to the expended position where it is possible to remove the syringe by unfastening the bottom locking screw, then rotating the syringe until it comes loose.

5.6 Adding a syringe

First take a note of the new syringe volume in µl, write it down. The software will need to know, and reading the value off the syringe later may be difficult.

For best accuracy, the new syringe should be submerged into the intended liquid of use, or at least some liquid, and the plunger manually moved back and forth, removed even, until there are no trapped gas between the syringe tube and the plunger. In such state, insert the syringe into the pump and screw it on tight, then tighten the bottom locking screw. Try to expel as little of the fluid in the syringe while fastening it.

Once done, click “OK” in the software, proceed to the following chapter.

5.7 Replacing the valve

First remove the syringe as described. After this the valve itself can be removed by undoing the two screws with appropriate size Allen key, and adding the new valve the same way.

New valves and syringes can be bought from us.

5.8 Priming

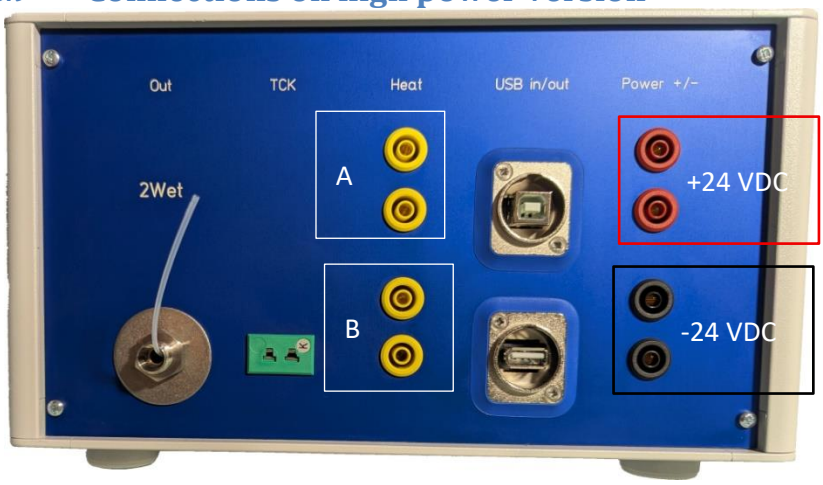
Purpose of “priming” is to remove gas or previous different liquid from the fluid delivery system. Disconnect the heated gas line so the fluid delivery line back-side of the device is free and observable. Submerge the fluid input line

to fluid of choice and in the software select the appropriate 2Wet device, and click “Prime pump”. Depending on the syringe volume many loops of clicking the aforementioned button, and waiting until it is done, may be required. For example, with 25 µL syringe, it takes 35 loops to fully flush the syringe pump and tubing volume.

Once the volume is primed, attach the heated gas line back on.

In case of stubborn gas bubbles, remove the whole syringe, and manually operate it underwater until all bubbles are removed. Then, still underwater, prime the syringe. Install it back to the pump, and perform full priming with fluid of choice.

5.9 Connections on high power version



The high-power version uses two parallel banana connectors for each function to spread the current.

The heated gas line has two short power wires and two long power wires. Keep the short wires as one group and connect to pair A, and the long wires as another group connected to pair B.

Likewise, the main power positive (red) and negative (black) both have two connectors for high currents.

It is important to keep track of the polarity of the supplied voltage (positive to red, negative to black) as wrong polarity will break the device. There is no mechanical safeguard to prevent wrong polarity, only the color coding.

EC Declaration of Conformity

Monday the 29 of September 2025

Manufacturer:	NORECS AS
Address:	Engervannsveien 39, NO-1337 Sandvika, Norway

We declare that the products:

Model:	2Mix, 2Wet, HumiStat
Description:	Mass flow controller -based gas mixing system for scientific measurements.

Are in conformity as follows:

- The equipment includes an external mains power adapter supplying 24 V DC. This adapter is CE marked and complies with EMC Directive 2014/30/EU and LVD 2014/35/EU. A separate declaration of conformity for the adapter is available on request and is included in this documentation.

- The product(s) operates at 24 V DC, below the 50 V threshold defined in LVD 2014/35/EU, and therefore does not require CE marking related to LVD.

- The equipment is designed and manufactured according to Sound Engineering Practice (SEP) in accordance with Article 4(3) of Directive 2014/68/EU (PED). Due to the small internal volume and low pressure, CE marking under PED is not applicable.

- PED 2014/68/EU reference: For pressure equipment where the product of maximum allowable pressure (PS, in bar) and internal volume (V, in litres) ≤ 50 bar·L, the equipment shall be designed and manufactured according to SEP (Article 4(3)), and CE marking is not required.

- Device is used in research laboratories with all appropriate gas alarm-, shutoff- and ventilation systems.

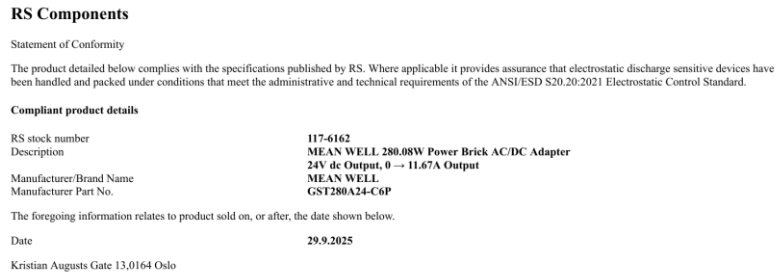
- This declaration is issued under the sole responsibility of the manufacturer.

MEAN WELL 280W AC-DC High Reliability Industrial Adaptor GST280A series

■ Features
- Global certificates
- Universal AC input / Full range
- 3 pole AC inlet IEC320-C14,Class I power unit
- Built-in active PFC function
- No load power consumption<0.5W
- Energy efficiency Level VI
- Comply with EISA 2007/DoE,NRCan,AU/NZ MEPS,EU ErP
- Protections: Short circuit / Overload / Over voltage / Over temperature
- Fanless design with -30~+70℃ working temperature
- Fully enclosed plastic case
- LED indicator for power on
- 3 years warranty

■ Applications
- Consumer electronic devices
- Telecommunication devices
- Office facilities
- Industrial equipments

■ GTIN CODE
MW Search: https://www.meanwell.com/serviceGTIN.aspx



RS Components

Statement of Conformity

The product detailed below complies with the specifications published by RS. Where applicable it provides assurance that electrostatic discharge sensitive devices have been handled and packed under conditions that meet the administrative and technical requirements of the ANSI/ESD S20.20:2021 Electrostatic Control Standard.

Compliant product details

RS stock number	**117-6162**
Description	**MEAN WELL 280.08W Power Brick AC/DC Adapter 24V dc Output, 0 → 11.67A Output**
Manufacturer/Brand Name	**MEAN WELL**
Manufacturer Part No.	**GST280A24-C6P**

The foregoing information relates to product sold on, or after, the date shown below.

Date **29.9.2025**

Kristian Augusts Gate 13,0164 Oslo