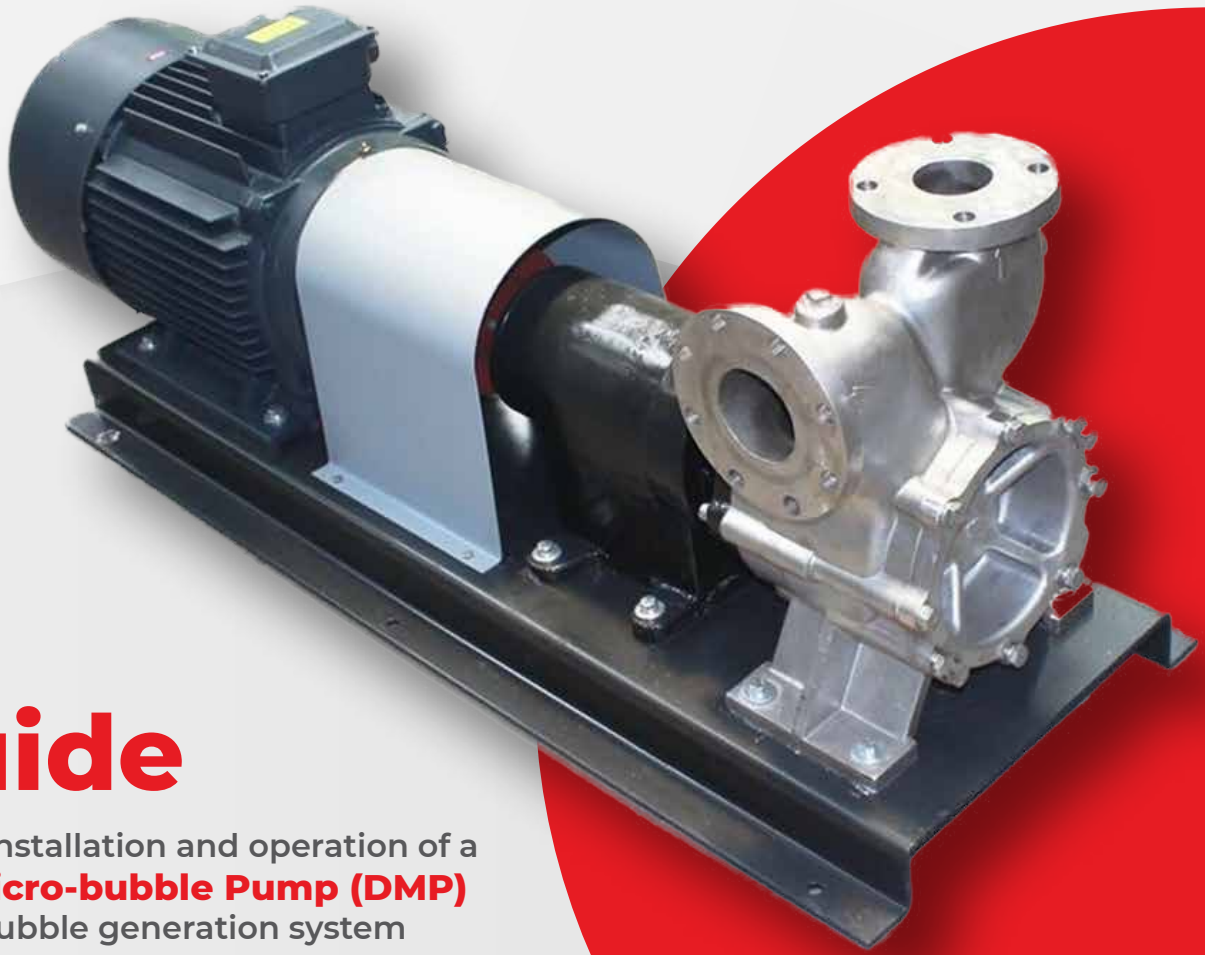
DAF PUMP



Guide

for the installation and operation of a
DAF Micro-bubble Pump (DMP)
micro-bubble generation system

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Description

The DMP micro-bubble generation pump dissolves gas, such as air, ozone, nitrogen, carbon dioxide etc, into water or other liquids, under pressure. This pump obviates the use of a conventional saturator & nozzles in dissolved air flotation (DAF) and replaces inefficient gas introduction devices, such as ejectors and static mixers, in gas dissolution in liquids.

Features

- ✓ Produces ultra-fine bubbles for higher efficiency (20 µm-30 µm diameter)
- ✓ No nozzles or large saturator required in DAF applications
- ✓ The effective dissolution of air or ozone in water is >80% - which is higher than what a conventional system can achieve
- ✓ Made of 304 stainless steel
- ✓ Proven quality and running experience
- ✓ Can operate continuously up to 120°C fluid temperature and 40°C environment temperature
- ✓ The DMP system is much less costly than similar micro-bubble systems

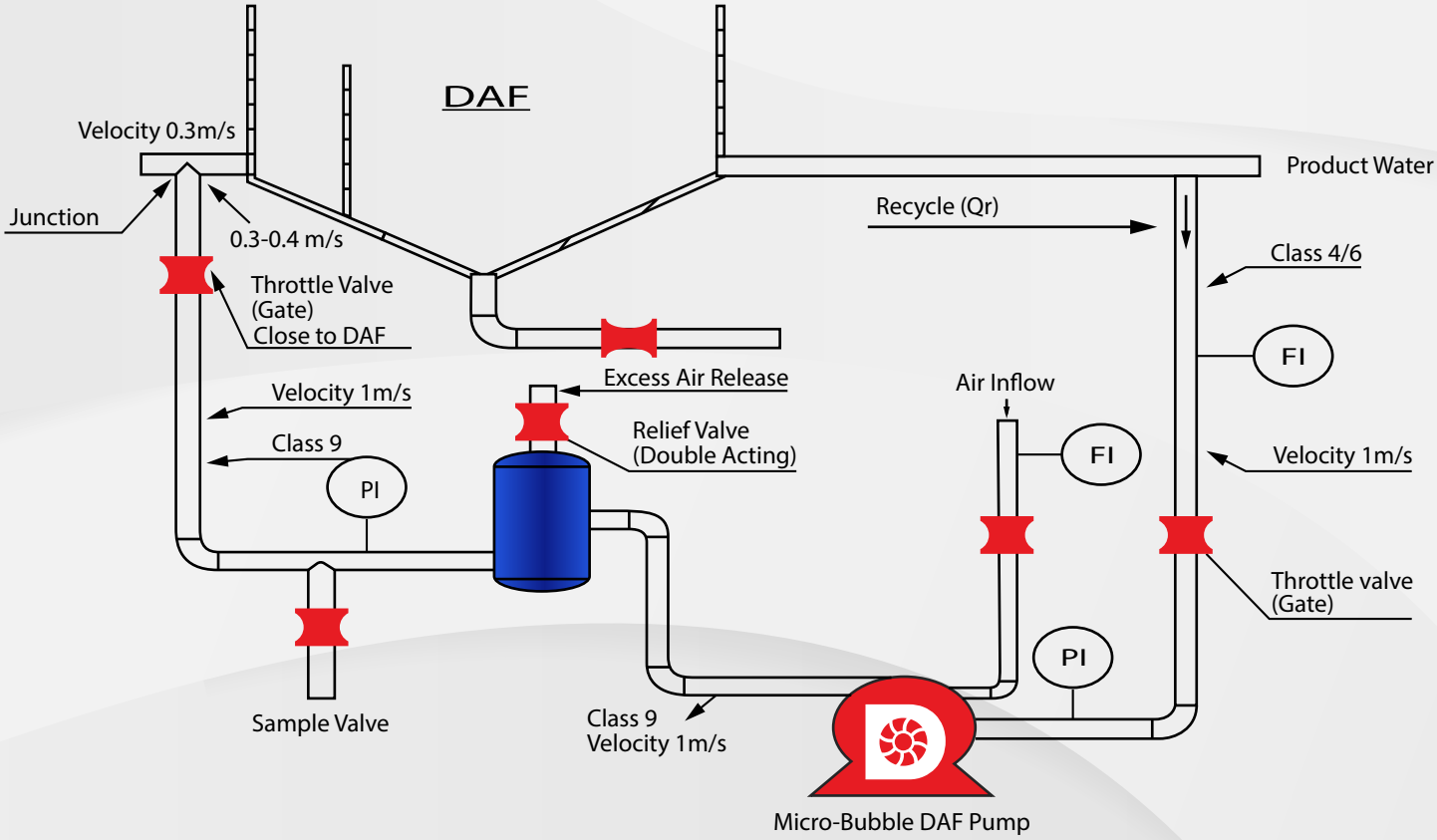
Models available, normally including motor & baseplate, as well as a set of essential spares :

Pump	DMP-2	DMP-3	DMP-6	DMP-8	DMP-12	DMP-17
Design delivery head (bar)	4	4	5	5	5	5
Flow rate (m^3/h)	2	3	6	8.6	12	17
Power (kW)	1.1	1.1	4	4	7.5	7.5
Voltage (V)	380	380	380	380	380	380
Speed (rpm)	2900	3480	2900	3480	2900	3480
Hz	50	60	50	60	50	60

Notes:

- These models are also available as a pump-only option (i.e., without an electrical motor). They are further available with explosion-proof or 550V motors
- Larger models are available on request
- Assistance can be provided with installation of the system, as well as the design of a full DAF plant
- Essential spares include the pump seal and a set of o-rings

Figure 1: DAFPump Installation Diagram



Notes:

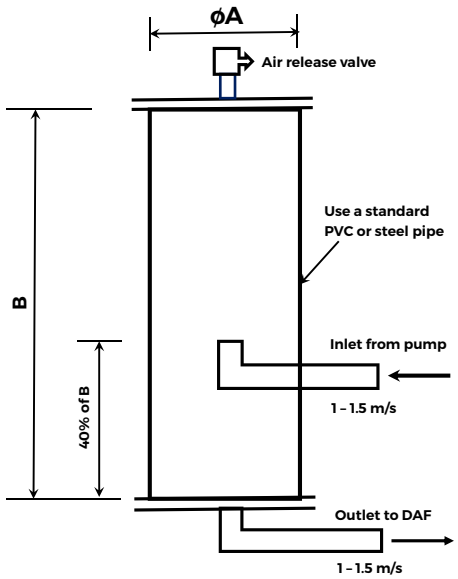
- The throttle valve down-stream of the pump should be <2m from the DAF entry'
- Where the aerated recycle enters the flocculated feed pipe (a T-junction), it is important to match the two velocities as close as possible not to break up any flocs in the mixing process. After the T-junction, allow approx. 500mm for mixing time (at <0.4 m/s) before entering the DAF.
- It is advisable to lift the inlet opening of the 10mm air suction pipe into the DMP pump to a level higher than the water level in the DAF, in order to prevent water outflow when stopping or starting. Use a simple rotameter to measure air flow.
- A throttle valve can also be used in place of an air release valve on the air release vessel. If using a throttle valve, feed the water/air mixture from the air release vessel back to the top of the DAF contact zone, via a 10-12 mm plastic pipe.
- Use good quality gate valves for the two throttle valves For the DMP-2 and DMP-3, a needle valve can also be used - for the pressure side.
- The excess air release vessel can simply be a pipe, with the required volume, with the inlet pipe entering approx. half-way up and the exit at the bottom. (See sketch on p4).
- DAF Pumps are not made to pump untreated effluent and can only handle low levels of suspended solids. The use of an automated pressure control is strongly recommended
- DAF-Pump is made to handle DAF product water with LOW TSS. Good DAF system control with failure interlocks is critical to protect the DAF-Pump components against failure.

Pump parameters & installation requirements for the DMP micro-bubble pump system

Parameter	DMP-2	DMP-3	DMP-6	DMP-8	OGP-12	DMP-17
Pump flow rate – Qr (m^3/h)	2	3	6	8	12	17
Delivery head (bar)	4	4	5	5	5	5
Water inlet connection size (mm)	25	32	40	40	50	50
Water outlet connection size (mm)	20	25	32	50	50	50
Motor power rating (kW)	1.1	1.5	3	4	5.5	7.5
Motor speed (rpm)	2900	3480	2900	3480	2900	3480
Air inflow required (l/min)	2.0	4.0	6.5	11.0	16.0	23.0
Air inflow (rotameter, range) – Qa (l/min at STP)	0-5	0-10	0-10	0-20	0-20	0-50
Pump inlet pressure gauge approx. range (kPa)	-50 - +50	-50 - +50	-50 - +50	-50 - +50	-50 - +50	-50 - +50
Pump outlet pressure gauge range (bar)	0 - 10	0 - 10	0 - 10	0 - 10	0 - 10	0 - 10

Excess Air Release Vessel

(simplified, using standard Class 9/12/16 pipe)



Parameter	DMP-2/3	DMP-6/8	DMP-12	DMP-17
Outer diameter OD-A (mm)	315	355	355	355
Height-B (mm)	400	800	800	1000
Capacity, at least (litres)	22	60	60	80

Please note:

A simple needle valve can be used instead of the double-acting air release valve. The air pipe can be 10-12mm diameter and should be taken to a height above the DAF water level to prevent over-flow of liquid when the pump is off

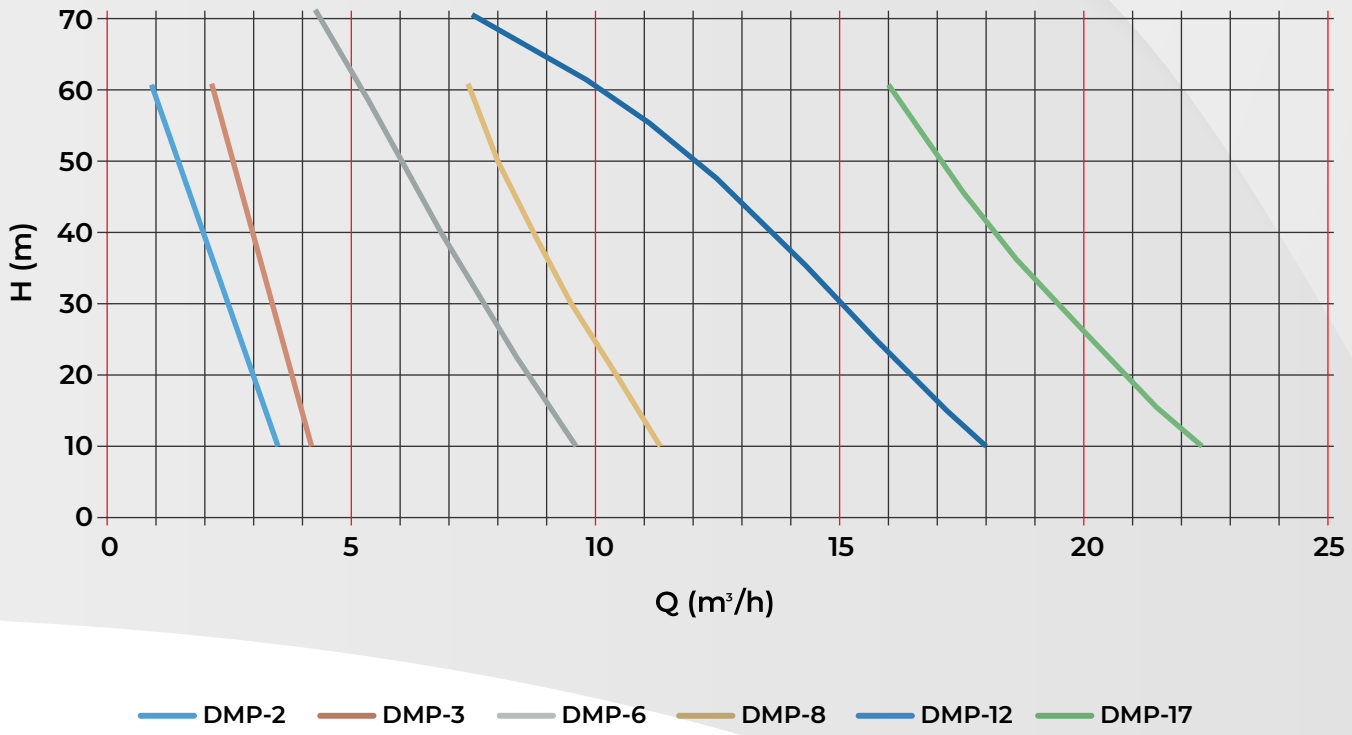
PUMP CURVES FOR THE DMP MICRO-BUBBLE PUMP RANGE

Although the micro-bubble pumps are designed to operate under continuous cavitation conditions, they are run as normal pumps – along the pump performance curves shown below. These curves have-been compiled under full aeration conditions.

The DMP-2 and DMP-3 pumps had been designed to operate at 4 bars. However, they can be operated up to 5 bars continuously (but then at the lower flow as shown in the pump performance curves). Please note that the amount of air dissolved in the water is approximately the same for both the lower pressure/higher flow and the higher pressure/lower flow cases.

Similarly, the DMP-6, DMP-8, DMP-12 and DMP-17 pumps have been designed to operate at 5 bars. How-ever, they can be operated up to 6 bars continuously (but then at the lower flow as shown in the pump performance curves).

DAF Micro-bubble Pump Performance Curve



Commissioning instructions

(Please refer to Figure 1: DAFPump Installation Diagram)

- Ensure that the DAF is filled with water/effluent and that adequate relatively clear water or effluent is available for suction from the DAF product line or tank.
- Prime the DMP with water or effluent. It is better to start on a clean water/effluent, if possible.
- Fully open the throttle valve on the suction side of the OGP pump and fully open the throttle valve on the pump discharge line (close to the contact zone of the DAF). Do not run the pump with any of the valves fully closed.
- Close off the air line inflow into the micro-bubble pump
- Start the pump.
- Slowly tighten the throttle valve on the pump discharge line until the discharge pressure falls within the desired range of around 4 bar on the pump discharge line pressure gauge (or, 5 bar in the case of the DMP-6, 8, 12 & 17). See pump curves for flow vs pressure. Do not let the pressure go below approximately 3.8 bars, in order to prevent the formation of course bubbles.
- Adjust the throttle valve on the suction line of the pump to ensure that the pressure reading on the pressure gauge on the water suction line of the pump indicates a negative suction pressure in the range of approximately -0.2 bar to -0.3 bar.
- Slowly open the valve on the air line into the micro-bubble pump until fully open.
- Fine- adjust the abovementioned throttle valve on the water suction line of the pump to ensure that the operating air flow readings on the air flow meter (rotameter) for the various DMP pump sizes are approximately as follows:
  25-DMP-2: 2.7 l/min
  40-DMP-6: 8.0 l/min
  50-DMP-12: 16.0 l/min

  (NB. Do not throttle the air line going through the rotameter into the pump. Throttle the valve on the suction side of the pump to obtain the correct air flow into the pump).
- Adjust the needle valve in the excess air tank's excess air release line (if not using an air release valve). Just open enough to release course bubbles (and some water) all the time, without causing the down-stream pressure to drop.