



Bubbler monitoring case

INSTALLATION & OPERATIONS MANUAL



AIRWELL GROUP PTY LTD
DESIGNED AND MANUFACTURED IN AUSTRALIA

A.B.N. 46 009 323 871

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1 INTRODUCTION

The purpose of the BTMC01 bubbler monitoring case is to monitor the water level inside a bore or sump, with the use of a pre-installed bubbler tube.

2 HOW THE BUBBLER TUBE WORKS

A bubbler tube is a useful means of measuring Bottom Hole Pressure in a bore or well, without actually having to install a pressure measurement transducer into the bore itself.

Submersible type pressure transducers are both expensive and delicate. It is also easy to block the very fine barometric pressure compensation tube that is inside the submersible cable with condensation, and when this occurs the accuracy is affected.

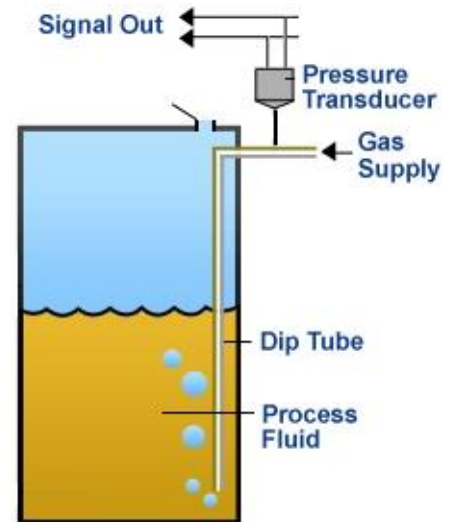
By using the bubbler tube principal, it is possible to measure the bottom hole pressure while being able to mount the expensive pressure transducer safely at the surface.

How does it work

If the bubbler tube can be kept empty of water, measuring the pressure inside this bubbler tube at the surface is the same as measuring the fluid pressure at the bottom of the bore.

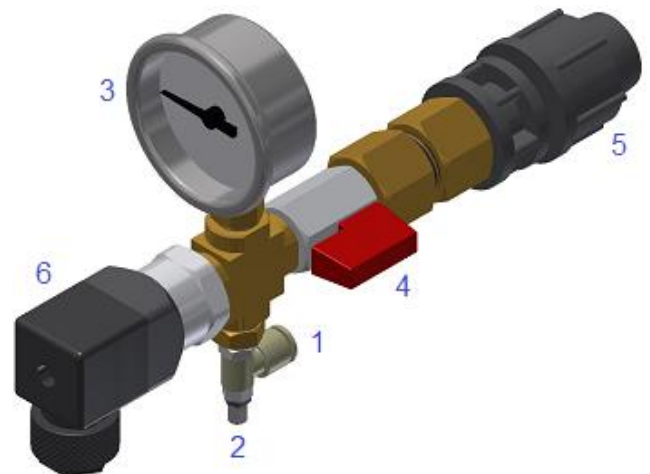
It is called a bubbler tube because if you continue to pressurise the bubbler tube at the surface with just enough gas, so as to be sure that some bubbles of gas are escaping the bottom of the tube, you can be sure that the surface pressure is the same as the pressure at the bottom of the tube.

Note: Do not adjust the pressure regulator in the bubbler tube box above the rating of the pressure transducers. This will usually be 160kPa.



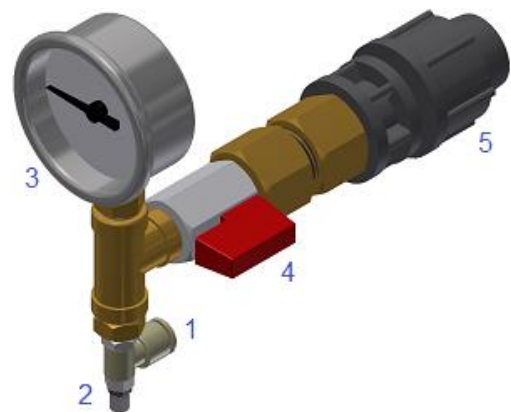
Typical bubbler tube assembly (Telemetry units):

1. Low pressure compressed air inlet.
2. High accuracy flow control valve.
3. Pressure gauge.
4. Ball valve.
5. Bubbler tube connection point.
6. Pressure transducer.



Typical bubbler tube assembly (Non - Telemetry units):

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2. High accuracy flow control valve.
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5. Bubbler tube connection point.



Pros of bubbler tubes

If properly set up, a bubbler tube can be just as accurate as, and more reliable than a pressure transducer installed down the well.

The tube used for the bubbler is very robust and very cheap.

The bubbler tube takes up less room in the bore casing.

Importantly, a bubbler tube is not affected by electrical interference from the electric motor cables, especially when a VSD is used.

Bubbler Tubes can be used at great depth.

Cons of bubbler tubes

You need a supply of compressed air or gas at a pressure greater than the depth that the end of the bubbler tube is submersed.

A Bubbler tube requires some setting up by someone that understands how it works.

Bubbler tubes may become inaccurate if the water level is rising in the bore fast. (See further explanation).

Stable water level condition

If the water level is something like stable in the bore, you only need a very small amount of air or gas to be sure of bubbling out the bottom of the tube and therefore being accurate. In this scenario, the amount of compressed air required is very little indeed and would see a small compressor with say a 50-litre tank, only have to start up to recharge the receiver tank every few hours or even only a few times per day.

Falling water level condition

If the water level is in fact falling in the well you do not in fact have to be adding any extra compressed gas at all to the system for it to maintain complete accuracy, as the gas inside the bubbler tube will be expanding under the decreasing pressure condition and therefore bubbling out the bottom of the tube anyway. In falling water level situations, the readings will always be accurate and the reading will instantly respond to the real bottom hole pressure condition.

Rising water level condition

The above helps to explain what happens when the water level rises in the bore casing.

In rising water level situations, we risk the data recorded at the surface lagging behind the real bottom hole pressure condition. It is really only a condition that can occur immediately after turning a pump off and in the early periods of recovery. It will appear on the water level recovery graph as a flat line in an otherwise curved line.

Unfortunately, hydro geologists often rely heavily on this bore recovery data to gain accurate information about the permeability nature of the formation. The shape of this recovery curve is therefore important for these high technology pump tests.

Why does this happen

As the water rises in the bore casing, the bottom hole pressure increases and has the effect of compressing the gas up inside the bubbler tube. This means that unless the gas pressure inside the bubbler tube is increased fast enough from the surface, water will be pushed up into the bottom of the bubbler tube. As mentioned above, unless the bubbler tube can be maintained completely empty of liquid, the system will not be accurate. You must be adding enough compressed gas to the top of the bubbler tube so as to be keeping up with the increase in pressure at the bottom, so as to ensure that bubbles are always being discharged from the bottom of the tube.

So why not just turn the needle valve that is regulating the gas flow into the top of the bubbler tube right up high so that you know that bubbles will always be pushed out the bottom, even if the water level is rising fast in the bore casing. The answer is friction loss of the gas going down the bubbler tube.

If the amount of gas that you are using is very small then essentially no gas friction is created and therefore the gas pressure measured at the top is the same as the gas pressure or water pressure at the bottom of the bubbler tube.

If the gas flow is turned up too high you will be measuring the bottom hole pressure plus a small amount of gas friction that will look like bottom hole pressure. The amount of gas friction is not great but when highly accurate measurement is required, and long lengths of bubbler tube are needed it can become a factor.

It is easy to check out how much friction is generated. It is best to do this in real life conditions.

- Install the pump and bubbler tube into a real-life situation that you want to measure bottom hole pressure.
- Turn up the needle valve so that the bubbler tube line is charged up quickly.
- Once the pressure stops rising, (this indicates that the bubbles must be coming out the bottom of the tube), turn the needle valve right off.
- Wait a moment for the pressure reading to stabilise and then record this pressure.
- Just crack the needle valve say ¼ turn and record another reading.
- Turn the needle valve up say to 1 full turn open and repeat the reading.
- Turn the needle valve to a selection of other settings so as to be able to get a full picture of how much the reading increase with each new setting.

Any amount of pressure higher than the pressure reading that you took with the needle valve turned off is friction. You will now know that when installed with that length of bubbler line to that depth of submergence you will experience that amount of friction with that valve setting.

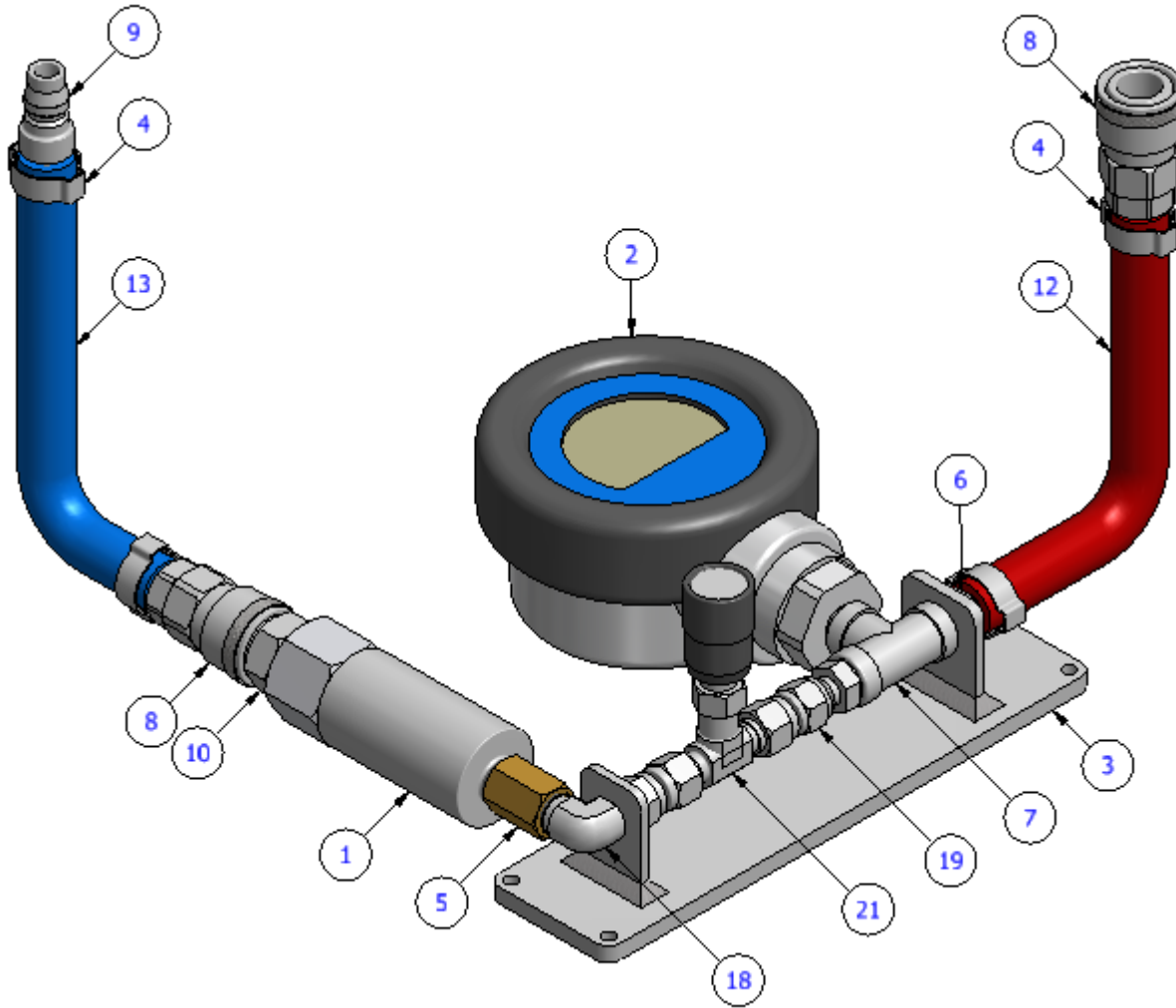
With this knowledge, you can decide how important the accuracy is and therefore how open to set the needle valve. If you want you can even apply a friction offset to your results.

If it is a tight formation the recovery of the bore when you turn the pump off is not likely to be very fast anyway, there is probably no need to have the needle valve turned up much at all, probably only say ½ to 1 turn.

The larger the diameter of the bubbler tube the more compressed gas is required to keep up with rising water levels. Therefore ¼" OD nylon tube seems to be a good size to use.

In situations like rubbish tips where the bubbler tubes may become blocked and where you definitely do not care about rapidly rising water levels, 16mm poly is much preferred.

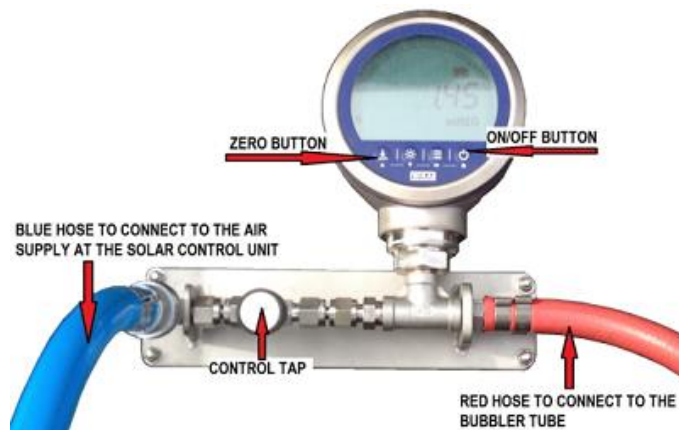
3 THE COMPONENTS



PARTS LIST			
ITEM	QTY	PART No	DESCRIPTION
1	1	A010	AIR FILTER ASSY - S/S
2	1	E419B	DIGITAL PRESSURE GAUGE (WIKA CPG1500)
3	1	FA0117	BASE PLATE - WELD ASSY
4	4	H013C	O CLIP (S/S) - 18mm HOSE
5	1	H206	SOCKET (BRASS) 1/4"BSP
6	1	H217S	TAILPIECE (SS) 3/8"HOSE x 1/4"BSP
7	1	H261S	TEE 1/4" F (SS)
8	2	H280	NITTO SOCKET - 3/8" HOSE
9	1	H280A	NITTO ADAPTOR PLUG MALE 3/8" HOSE
10	1	H285	NITTO ADAPTOR - 1/2" MALE
11	1	H395[001]	HOSE - RED 290PSI 10mm ID (L=2000mm)
12	1	H396[003]	HOSE - BLUE 290PSI 10mm ID (L=2000mm)
13	1	H782	ELBOW 1/4" x 1/4" ML BSP
14	1	H795	END CON - 1/4" x 1/4" MBSP
15	1	H994	METERING VALVE - 1/4" TUBE

4 CONNECTION AND OPERATION

- Make sure needle valve is turned off.
- Turn on digital gauge.
- Connect blue hose to air supply.
- Connect red hose to bubbler tube down the well.
- Open needle valve all the way to allow air into bubbler tube.
- When the gauge has stopped climbing turn the needle valve right down so only a small amount of air is passing through. (Trick is to close and then slightly open).
- Take the reading from the digital gauge. It should be reading in mH₂O (metres of water).
- Disconnect hoses and fully open needle valve to drain air from the box.
- Turn off gauge and pack away. (Gauge will automatically turn off after 30 minutes to conserve battery power).

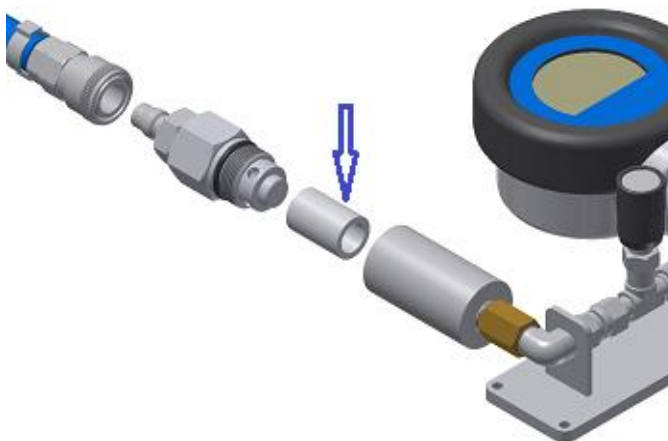


Compressed air

- Never point compressed air at yourself or others.
- Before releasing a fitting make sure it is not under pressure.
- Safety glasses should be worn at all times.
- Use hearing protection whenever allowing compressed air to escape.

5 REGULAR CHECKS AND MAINTENANCE

Depending on the quality of the supplied compressed air, clean the air filter element (H006) indicated with the blue arrow.



Airwell Group Pty Ltd

WARRANTY

Airwell Group Pty Ltd is committed to providing our customers with hardware whose manufacture, selection of materials and inbuilt quality exceeds our customers product expectations. The Airwell system is designed to provide long-term, sustainable service in a wide variety of applications.

Airwell Group Pty Ltd warranty terms and conditions are not intended to restrict your rights or guarantees afforded to you under the Australian Consumer Laws.

Provided the system has been installed in accordance with the instructions incorporated in the 'Installation and Operations' manual, and periodically maintained, the following warranty is applicable:

1. Equipment manufactured by Airwell Group Pty Ltd is warranted to be free from manufacturing and material defects for **5 years** from date of purchase from Airwell Group or one of its recognised distributors.
2. Should a problem arise, **any defective parts are to be returned to the point of purchase at the expense of the owner**, for examination.
3. Replacement parts will be issued under warranty, provided the equipment has not been;
 - i. repaired or altered by anyone other than an Airwell technician, or;
 - ii. the equipment was improperly installed, abused, misused, neglected or accidentally damaged.
4. All repaired or replaced items covered under warranty will be returned to the owner at the owner's expense.
5. Return of the faulty parts for analysis also enables us to continually improve the Airwell product. Please ensure that the returned items are suitably packaged. **Transit damage is not warrantable.**
6. All third-party equipment is supplied in good faith, however, Airwell does not provide warranty on any third-party goods supplied. If required, Airwell will assist our clients with warranty claims on third party goods with the original equipment manufacturer/s. The final decision and responsibility of the warranty claim is reserved by the original equipment manufacturer/s.

Damage due to corrosion:

Airwell Group uses new first grade 316L stainless steel as a standard minimum specification in the manufacture of down hole pumping equipment. (Wire rope 304).

Every effort is made to maximise corrosion tolerance on all down hole equipment, however due to the unpredictable corrosive nature of ground water, Airwell Group Pty Ltd will not provide a warranty on corrosion.

The exception where a warranty would apply would be if the corrosion is caused by a piece of substandard or incorrect grade material being included in a pump unit. (If more than one section of material in a pump has corroded it is assumable that it is a general corrosion problem and not a particular piece of material).

It is the responsibility of the customer to advise Airwell Group staff if the pump is to be installed in areas whereby the system may be subjected to damage caused by chemicals, or the area is deemed 'Hazardous', whereby the environment is potentially explosive.

Airwell Group Pty Ltd shall not be liable for incidental or consequential damages, including any damage to equipment or the environment caused by the failure of the Airwell system.

Please return the warranty registration card either by fax or post to your point of purchase at your earliest convenience. Alternatively, you can email the warranty registration card to sales@airwellgroup.com.au

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7 WARRANTY REGISTRATION CARD



WARRANTY REGISTRATION CARD

PLEASE POST OR FAX TO:
AIRWELL GROUP PTY. LTD.
30 Harris Road,
Malaga
Western Australia 6090

Please note: Warranty is conditional upon correct installation and operation of the product as per the Installation and Operations Manual provided with the unit and the warranty disclosure contained within the Installation and Operations Manual.

Pump serial number: -

Controller serial number: -

Company name: -

Address: -

Phone number: - (.....)..... Fax number: - (.....).....

Contact name: -

Equipment purchased from: -

Commissioned by: - Date: -/...../.....

ARE YOU HAPPY WITH THE PRODUCT?

We appreciate your comments regarding our products and service and welcome any suggestions that may help to improve them.

Was there any transport damage? Yes No

Were you happy with the quality and presentation of the equipment? Yes No

Were you happy with the sales and service personnel? Yes No

Comments:

