

**INSTRUCTION MANUAL**  
**GAS PURGE COMPRESSOR**  
**MODEL HS-55DO**

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**I HYDROLOGICAL SERVICES STANDARD WARRANTY TERMS**

WARRANTY, DISCLAIMER AND LIMITATION OF LIABILITY:

We warrant this product to be free from defects in material and workmanship for a period of three years from the date of shipment hereof or its total rated life, whichever first occurs. During the warranty period, we will repair or replace this product if it is returned to us with shipping charges prepaid and we determine it to be defective. This warranty shall not apply if this product has been subjected to misuse, negligence, accidents, or misapplied, or modified or repaired by unauthorised persons, or improperly installed, and we shall not be liable to any person for personal injury or property damage caused by such a product.

All other warranties, express and implied, including warranties of MERCHANTABILITY and FITNESS FOR A PARTICULAR PURPOSE, are disclaimed. All other remedies and liabilities, including incidental, consequential, and special damages, losses, and expenses, are excluded.

Note: It is Hydrological Services' policy to support all of our products. If design or workmanship problems arise after this statutory warranty period we request that you contact us.

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**HYDROLOGICAL SERVICES**

**HS-55DB GAS PURGE COMPRESSOR**

**II GENERAL**

The HS-55DO has been designed to replace conventional nitrogen gas bottle supply bubble units/gas purge systems for water level measurement.

The design of the unit centres around the tried and proven Hydrological Services' Model HS23DO Dry Bubble Unit with Differential Regulator (BU07). The HS-55DO incorporates a maintenance free Air Drying System that utilises a "Self Purging" Membrane Filter Dryer and Auto Drain Moisture Traps to ensure a moisture free system. The effectiveness of the HS-55DO Filter Dryer is such that the unit also removes up to 20% of oxygen from the air it dries, thus helping to reduce aquatic growth at the river end. The unit is maintenance free for up to 5 years.

**HS-55DO MODEL**

**(i) DUAL ORIFICE FEATURE**

The Model HS-55DO comes with a dual orifice application. It consists of 2 orifices located at different heights from the river bed. Under normal condition the bottom orifice is active and the top orifice is inactive. The dual orifice application become beneficial in a situation where severe siltation appears and causes the blockage of the bottom orifice at which instance the valve of the bottom orifice(1) is closed and the valve of the inactive (top) orifice (2) is opened to keep the bubbler system operating.

**(ii) MANUAL PURGE - MODEL HS-55DO**

The HS-55DO incorporates one rotary valve for manual purging of the system. Continuous purging occurs when the valve is opened. This is similar to Gas Bubbler Unit (Model HS23DO) functions.

**Voltage Regulator Protection**

If the compressor pump operates continuously for a long period of time or if the system voltage drops to 11V due to power supply failure, the voltage protection system will be activated. At 11V the compressor shuts down until the battery is recharged to 12V at which time the system will commence normal operation. This feature protects the system from continuous operation.

### III UNPACKING YOUR HS-55DO

The carton should include:

- Model HS-55DO
- This Instruction Manual
- Any Accessories you have ordered

Please verify you have received these items. It is recommended that you visually inspect the HS-55DO to verify all components and connections are secure. For more details about HS-55DO Purge System (see page 8 and 9 figure 1).

### IV. TESTING YOUR SYSTEM

Before installing the HS-55DO, you may wish to test the system prior to going to the field. Testing the HS-55DO will familiarize you with the compressor in an environment where it is easy to work.

**The HS-55DO is designed to be mounted in a vertical position. The water /oil separator will not function properly if the unit is in a horizontal position.** Once the HS-55DO is positioned, connect the power leads to an appropriate 12VDC power supply. Turn on power switch to start the compressor pumping. The pump will take approximately 4 minutes to fill the air tank to maximum pressure of 85 p.s.i, (600 Kpa) and will then automatically switch off. Connect to one of the outlet ports a short piece of river line tubing and secure the end into a container of water. Check the bubble rate setting as required (factory setting is equivalent to 80 bubbles per minute). If the bubble rate requires adjustment, (see page 16 for instructions).

Please note, if the HS-55DO is not purchased with a WL1000D dry pressure transducer fitted, then the transducer used must be fitted or the sensor valves closed prior to the test operation commencing.

There are two pressure gauges fitted to the HS-55DO. The unit attached to the pressure regulator (figure 1, N<sup>o</sup> 37) indicates the set feed pressure (factory set at 400 Kpa) this pressure should be retained at this setting, however, if adjustment is required, turn the supply regulator knob to achieve the required setting. The second pressure gauge (figure 1, N<sup>o</sup>8) is located on the side of the HS-55DO, indicates the air tank pressure.

**V SPECIFICATION**

Power:	12V d.c. (38 amp hour battery minimum).
Maximum Current:	17 Amps
Average Current Draw:	Approx. 14 mA (Based on 60 bubbles/min)
Compressor:	Precision Piston
Receiver Capacity: (Air Tank)	13.5 litres (3.5 U.S. Gallons)
Normal Operating Pressure Range:	60 p.s.i, (400 kpa) to 85 p.s.i, (600 kpa)
Duty Cycle:	Typically 10 hours per year at 60 bubbles/minute
Maximum Head:	30 metres (100 ft) using 200 metres (656 ft) of river line. <b>Note:</b> Water head increases for shorter river lines [i.e. 45 metres (150 ft) of water head with 100 metres (330 ft) of river line].
Maximum Length: (River Line)	200 Metres (Using 3/8" O.D.x1/8" I.D Tubing)
Maximum Purge Pressure:	85 p.s.i, (600 kpa)
Minimum Purge Pressure:	60 p.s.i, (400 kpa)
Differential Pressure:	3 p.s.i, (20 kpa) to 5 p.s.i, (35 kpa)
Purging:	Manual - lever valve operation continuous
Bubble Rate:	User selectable from 40 to 120 bubbles/minute. Bubble rate is set 40 bubble/min for GCO1 application (See page 15 for adjustment details).
Air Dryer:	5 year maintenance free "Self Purging"Hydrophobic filter
Environment:	-30 deg C to 60 deg C (-40 deg C to 60 deg C optional)
Pressure Connections:	Outlet 3/8" dia tube, instrument 1/4 BSP Adaptor fittings available for most transducers
Mass:	Approx. 30 lbs, (13 kg)
Dimensions:	24" H x 12" W x 15" D (610 mm x 305 mm x 380 mm)
Packed Dimensions:	32" H x 16" W x 19" D (810 mm x 410 mm x 480 mm)
Mass:	Approx. 70.55 lbs, (32 kg)

**OPTIONAL ACCESSORIES:**

(i) Pressure Transducer (Model W.L 2100 Dry).

Accuracy:	+/- 0.05% B.S.L
Operating Temp:	-20 deg C to +60 deg C (-4 °F to +140 °F)
Combined non linearity, Hysteresis and Repeatability:	+/- 0.05% of full scale
Long term stability:	+/- 0.03% full scale per annum
Compensated temp. Range:	-20 deg C to +60 deg C (-4 °F to +140 °F)

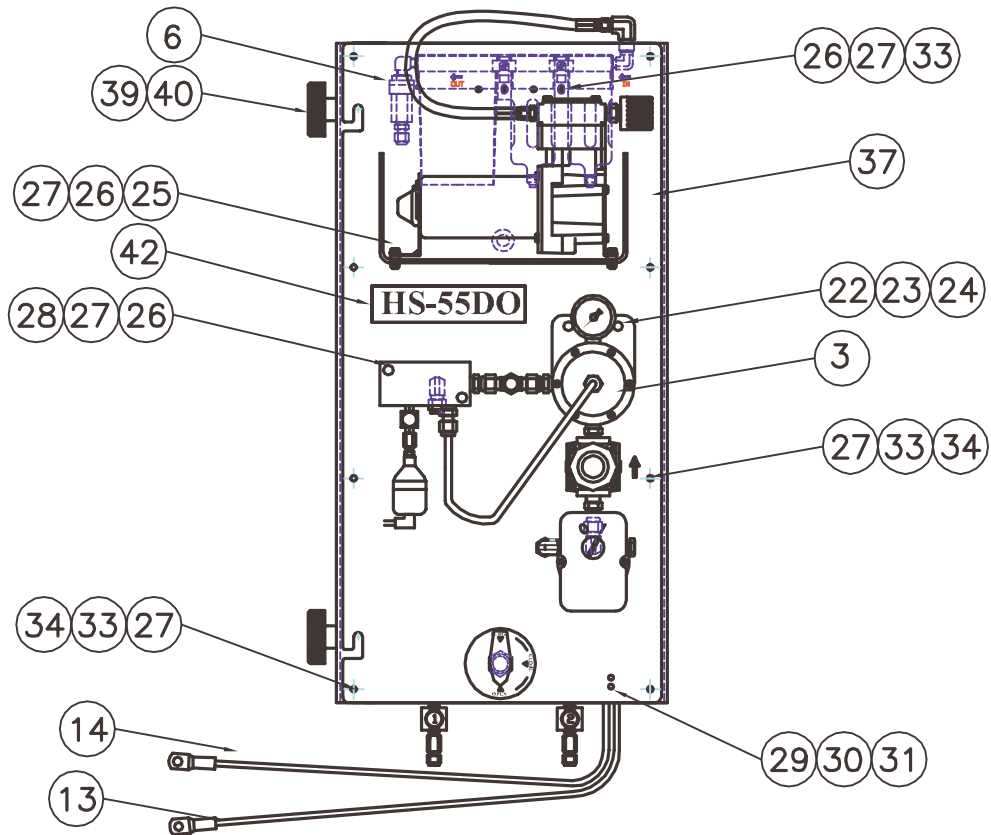
(iii) RRDL3-AN Data Logger Refer Bulletin 28

(iv) Pressure Line 1/8" I.D. x 3/8" O.D. heavy wall black polyethylene.  
SC078-01 - 300M (1000 Ft) Roll  
SC078-06 - 100M (328 Ft) Roll

(v) Orifice Fitting 1) Copper swivel fitting to mount on 2" G.W.I. pipe (BU07)  
2) Gas Chamber Orifice (GCO)

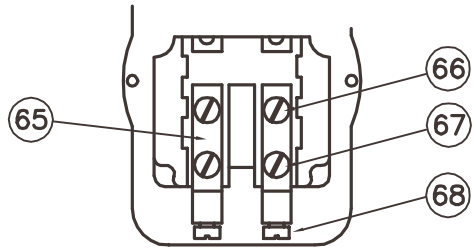
(vi) Mounting Bench mounting bracket available





42	HS-55DO HORIZONTAL LABEL	1	GPC45-04	
41				
40	KNOB	2	SC023-109	
39	1/4 UNC NUTSERTS (FOR KNOB)	2	SC008-57	
38				
37				
36				
35				
34	M5 NUTSERTS (FOR MOUNTING PANEL)	8	SC008-30A	
33	M5X16MM PHIL PAN HD SCREW	8	SC022-46	
32	M5X8MM PHIL PAN HD SCREW	4	SC022-45	
31	CABLE CLAMP	2	SC006-12	
30	6-32 UNC HEX NUT	2	SC008-06	
29	6-32X3/8 PAN HD PHIL SCREW	2	SC022-08	
28	SOC HD CAP SCREW M5X50 SS304	2	SC045-13	
27	FLAT WASHER M5 SS304	15	SC004-10	
26	HEX NYLOK NUT M5 SS304	4	SC008-20	
25	HEX SETSCREW M5x10 SS304	2	SC017-29	
24	HEX SET SCREW M8X25 SS304	2	SC017-31	
23	FLAT WASHER M8 SS304	2	SC004-16	
22	HEX NYLOK NUT M8 SS304	2	SC008-13	
ITEM	DESCRIPTION	QTY	PART NO.	REMARK

FIGURE 1 COMPRESSOR LAYOUT MODEL HS-55DO



VIEW OF PRESSURE SWITCH  
WITH COVER REMOVED

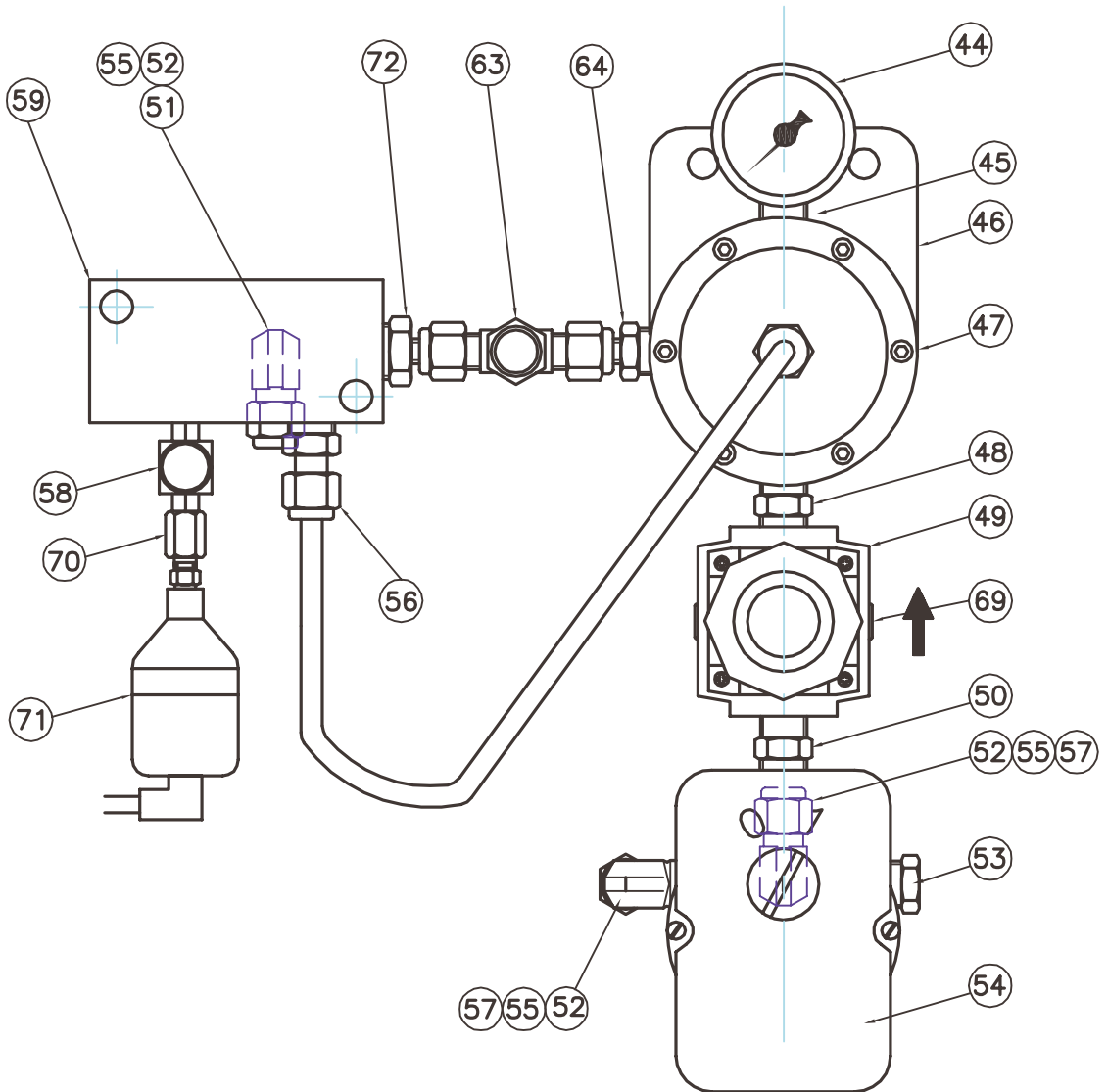


FIGURE 2 REGULATOR ASSEMBLY GPC03

72	ADAPTOR TUBE 1/4" TUBEx 1/4" MALE NPT	1	SC027-30	
71	DRY PRESSURE TRANSDUCER	1	WL1000D	OPTIONAL
70	ADAPTOR 1/4 NPT FEMALE X 1/4 BSP MALE	1	WL1000-06	OPTIONAL
69	TAPER PLUG 1/8 BSP STAINLESS STEEL	2	GPC03-04	
68	CHEESE HD SCREW M4x6 SS304	2	SC016-13	
67	CHEESE HD SCREW M4x16 SS304	2	SC016-14	
66	CHEESE HD SCREW M4x8 SS304	2	SC016-15	
65	CONTACT	2	GPC03-03	
64	ADAPTOR TUBE 1/4" TUBEx 1/8" MALE NPT	1	SC027-16	
63	METERING NUPRO VALVE	1	SC027-06	
62				
61				
60				
59	MANIFOLD - MANUAL PURGE	1	GPC03-01	
58	WHITEY STOP VALVE	1	SC027-01	
57	MALE COMPRESSION ELBOW BRASS 1/4BSPx1/4TUBE	2	SC025-34	
56	MALE CONNECTOR BRASS 1/4NPTx1/4TUBE	1	SC025-42	
55	PRESSURE TUBE 1/4"x2.0 M LONG	1	SC078-03	
54	PRESSURE SWITCH	1	SC023-108	
53	HEX PLUG BRASS 1/4BSP	1	SC025-07	
52	FERRULE SET 1/4	4	SC025-13	
51	MALE COMPRESSION ELBOW BRASS 1/4NPTx1/4 TUBE	1	SC025-08	
50	HEX NIPPLE BRASS 1/4BSP	1	SC023-100	
49	PRESSURE REGULATOR	1	SC123-110	
48	HEX NIPPLE BRASS 1/4NPTx1/4BSP	1	SC025-14	
47	ASSEMBLY DIFFERENTIAL REGULATOR	1	GPC08	
46	MOUNTING PLATE	1	GPC03-02	
45	PRESSURE GAUGE FITTING	1	GPC03-06	
44	PRESSURE GAUGE 40# BACK ENTRY 1/8BSP 1-1000kPa	1	SC109-02	
ITEM	DESCRIPTION	QTY	PART NO.	REMARK

FIGURE 2 REGULATOR ASSEMBLY GPC03

ITEM	DESCRIPTION	QTY	PART NO.	REMARK
73	COMPRESSOR	1	SC023-105	
74	HEX NIPPLE 1/8 NPT X 9/16 JIC	1	SC025-36	
75	M5 M100K NUT	3	SC008-20	
76	HEX HD SCREW M5X16.0	3	SC017-32	
77	WASHER	3	GPC05-03	
78	RING TERMINAL	2	SC044-28	
79	CABLE RED X 60 LG.	1	SC032-15	
80	CABLE BLACK X 60 LG.	1	SC032-16	
81	HEATSHRINK RED 5# X 50 LG.	1	SC033-27	
82	HEATSHRINK BLACK 5# X 50 LG.	1	SC033-24	
83	HEATSHRINK BLACK 5# X 50 LG.	1	SC201-14	
84	UCSAB 1563-10 10 MICRON	1	SC123-08	

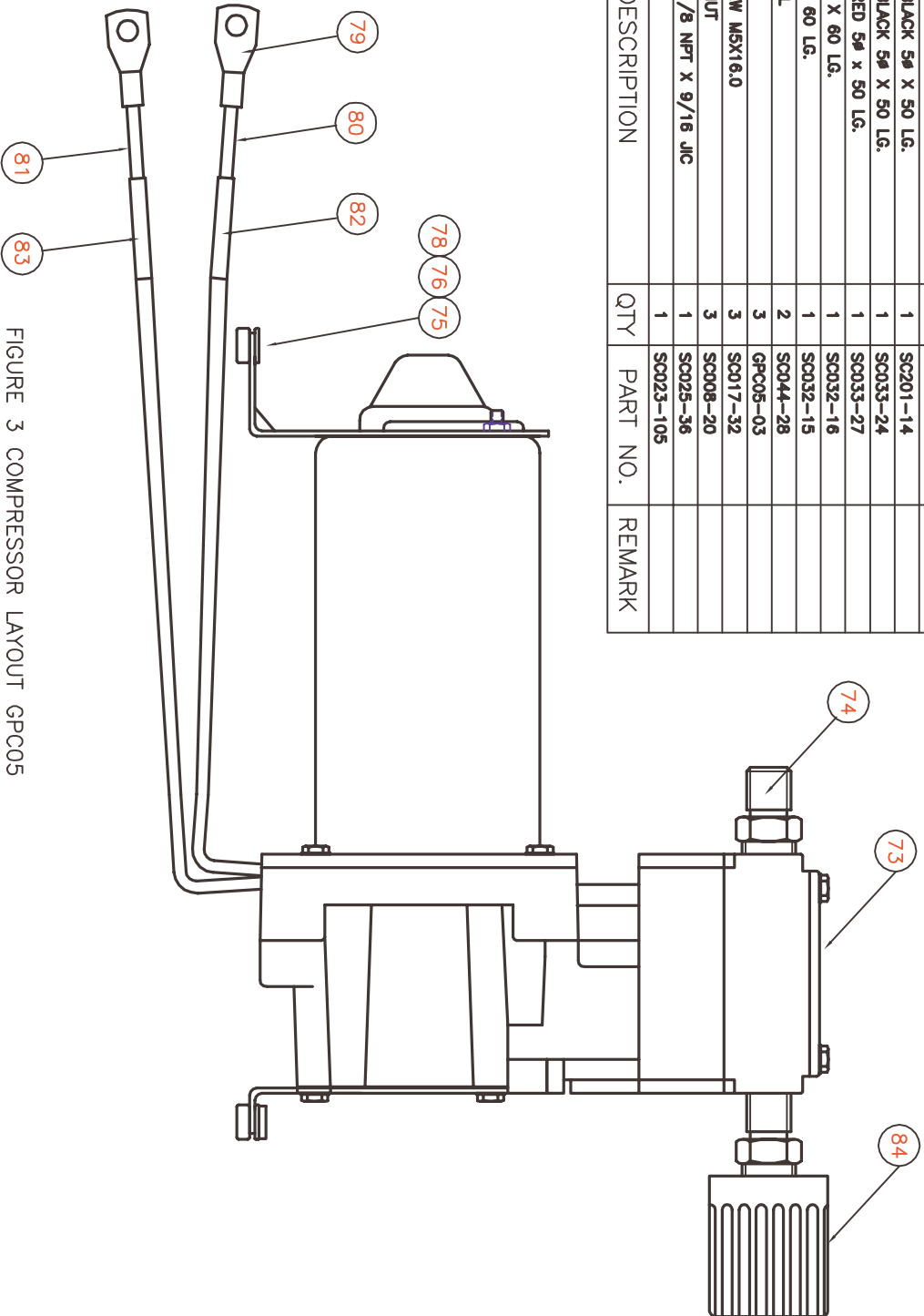
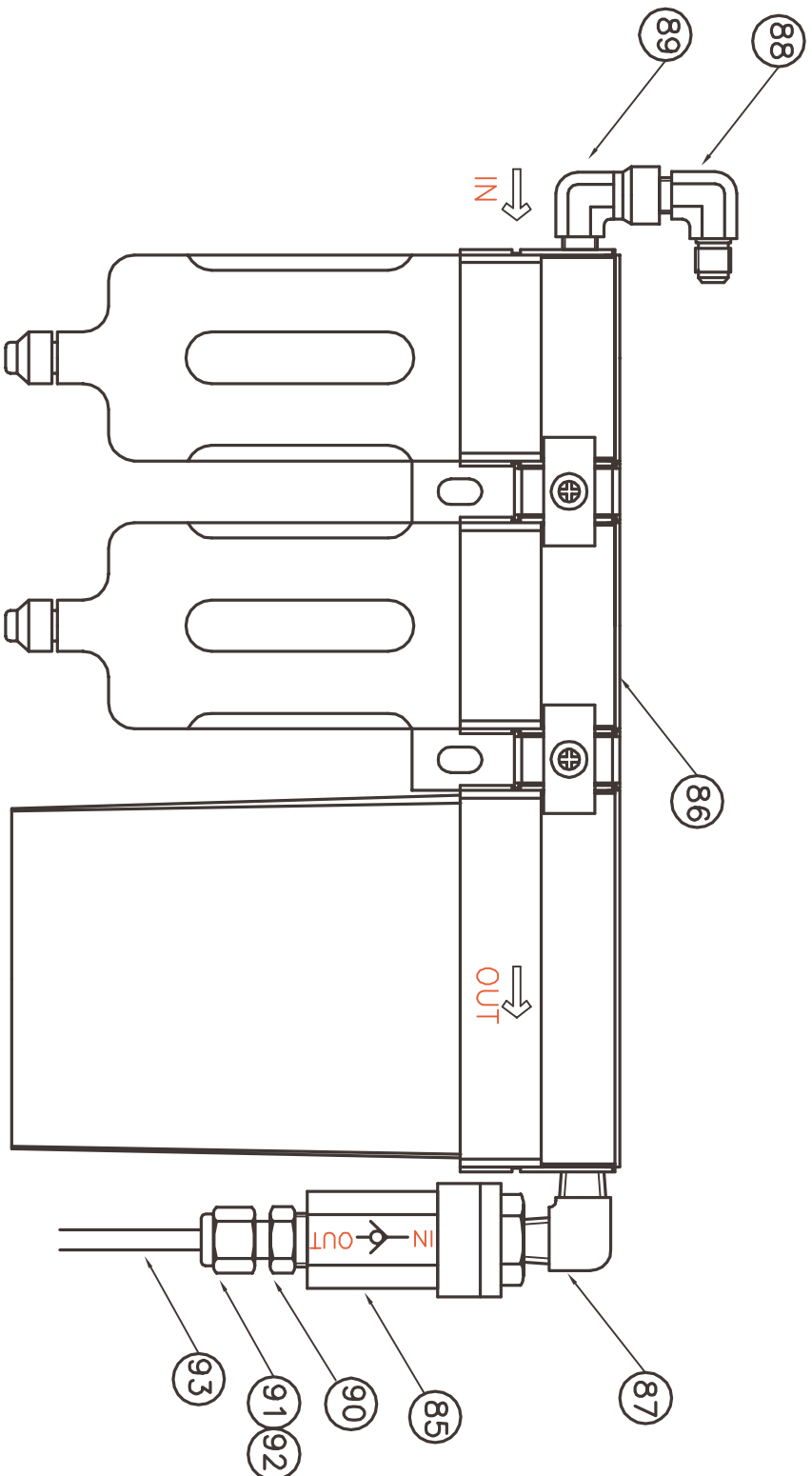
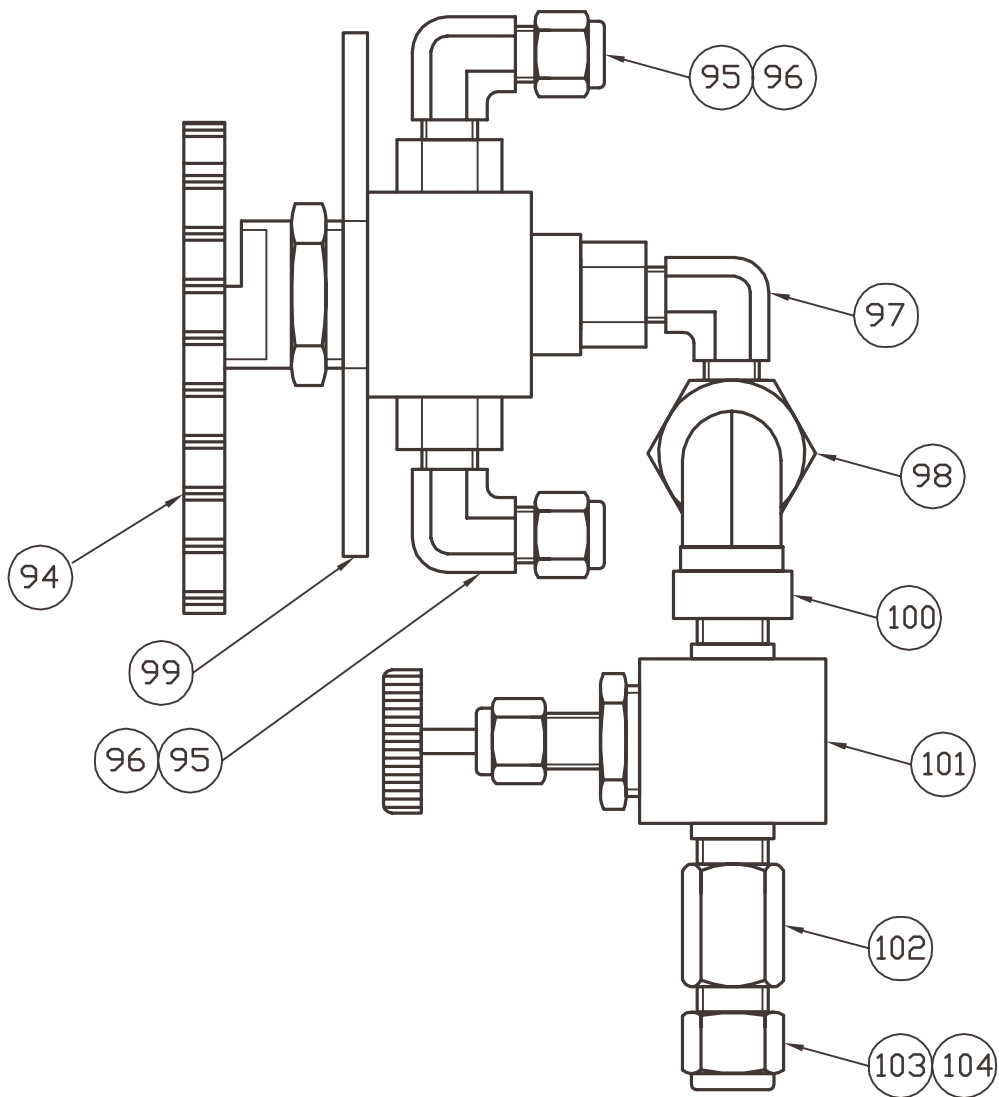


FIGURE 3 COMPRESSOR LAYOUT GPC05



93	PRESSURE TUBE 1/4	1	SC078-03	
92	1/4 TUBE NUT BRASS	1	HSF01-02	
91	FERRULE SET 1/4	1	SC025-13	
90	CONNECTOR MALE BSP X 1/4 TUBE	1	SC025-05	
89	MALE FEMALE STREET ELBOW BRASS 1/4NPT	1	SC025-39	
88	MALE ELBOW 1/4 NPTX9/16 JIC	1	SC025-37	
87	MALE COMP ELBOW 1/4 NPT X 1/4 NPT MALE	1	SC025-54	USE LOCTITE
86	IDGSM-02D-S MEMBRANE AIR DRYER	1	SC123-07	
85	NON RETURN VALVE AK2000 SMC	1	SC027-31	
ITEM	DESCRIPTION	QTY	PART NO.	REMARK

FIGURE 4 DRYER-OIL SEPARATOR ASSEMBLY GPC07



104	3/8" TUBE NUT	2	HSF01-01	
103	3/8" FERRULE SET	2	GPC09-01	
102	3/8" TUBE TO 1/4" NPT FEMALE	2	HSF02-02	
101	STOP VALVE	2	SC027-01	
100	MALE FEMALE STREET ELBOW 1/4" NPT	2	SC025-39	
99	PURGE VALVE INSTRUCTION PLATE	1	GPC09-01	
98	"T" PIECE DUAL ORIFICE	1	GPC14-01	
97	MALE COMPRESSION ELBOW BRASS 1/4NPTx1/4NPT	1	SC025-54	
96	FERRULE SET 1/4	2	SC025-13	
95	MALE COMPRESSION ELBOW BRASS 1/4 NPTx 1/4 TUBE	2	SC025-08	
94	3 WAY SWITCHING VALVE	1	SC027-33	
ITEM	DESCRIPTION	QTY	PART NO.	REMARK

FIGURE 5 DUAL ORIFICE PURGE VALVE ASSEMBLY GPC14

## VI. INSTALLATION

### (i) Installing the Model HS-55DO

For proper installation of the HS-55DO, you will need:

- The HS-55DO
- This Instruction Manual
- Installation Kit (provided)

Installation for your HS-55DO may vary according to your application.

Figure 2 illustrates the physical input/output connections on your HS-55DO. This drawing will help in determining where you should make your connections for power, ground, communications, outlet to orifice and pressure to your sensor

### (ii) Field Installation

- (i) **The HS-55DO must be wall mounted in a vertical position, with the compressor at the top.** A mounting bracket can be provided for bench mounting (see drilling template page 16).
- (ii) Connect your pressure sensor directly to the sensor valve or connect a pressure line between the valve and your pressure measurement device. If your measurement device has non-compatible connections, you will need to request adaptor fittings to suit. The manifold sensor valve for the transducer is  $\frac{1}{4}$  NPT
- (iii) The HS-55DO requires only one power source to power the compressor. This supply is typically a 12V, 38 amp hour minimum, long life re-chargeable battery with solar or mains charger.

### (iv) Connecting a Pressure Sensor

The pressure sensor can be fitted directly to the sensor valve or connected using pressure fittings and connecting tube.

Figure 3 shows typical installations of a complete pressure measurement system.

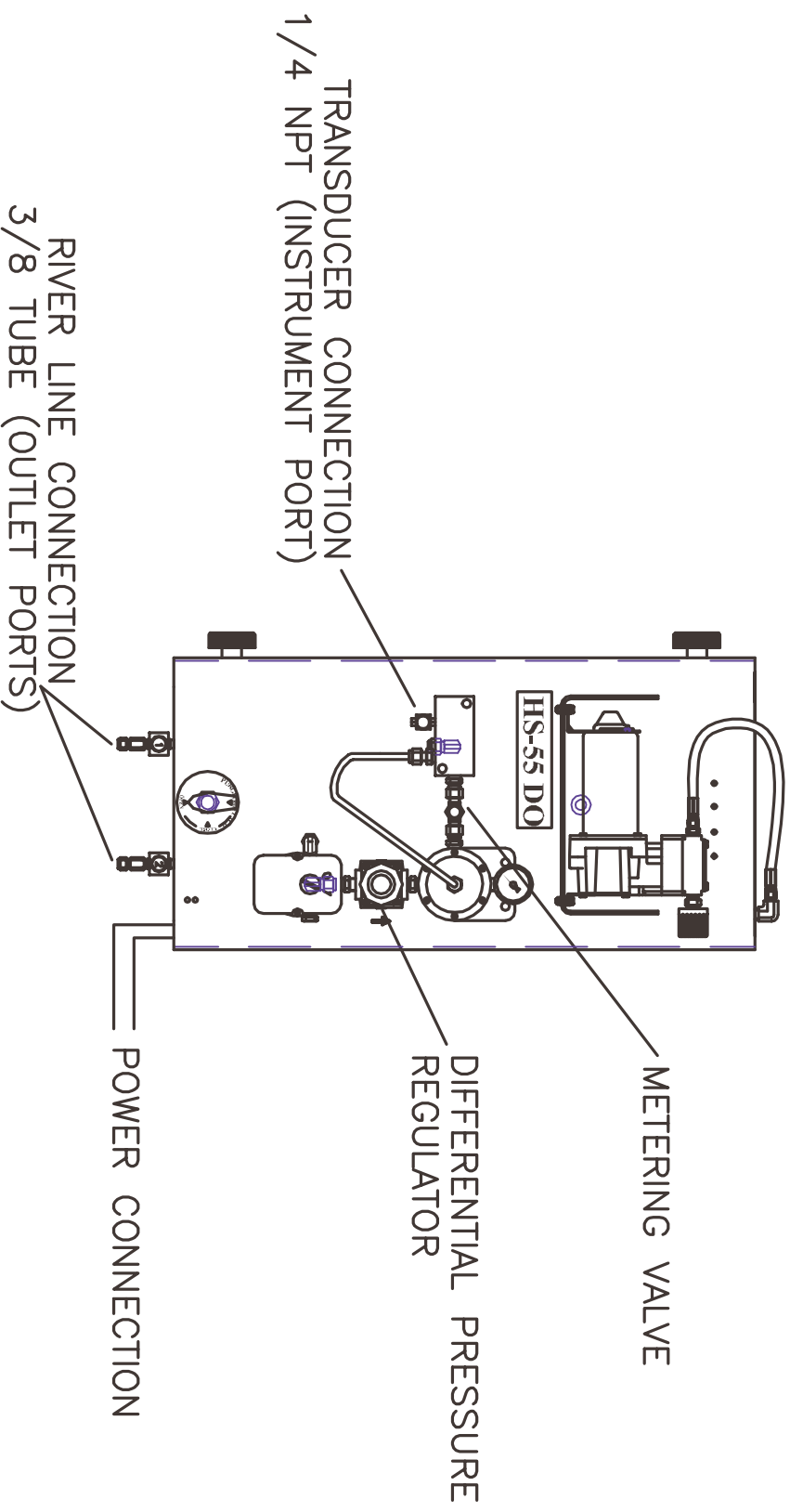


Figure 6 CONNECTIONS AND ADJUSTMENTS

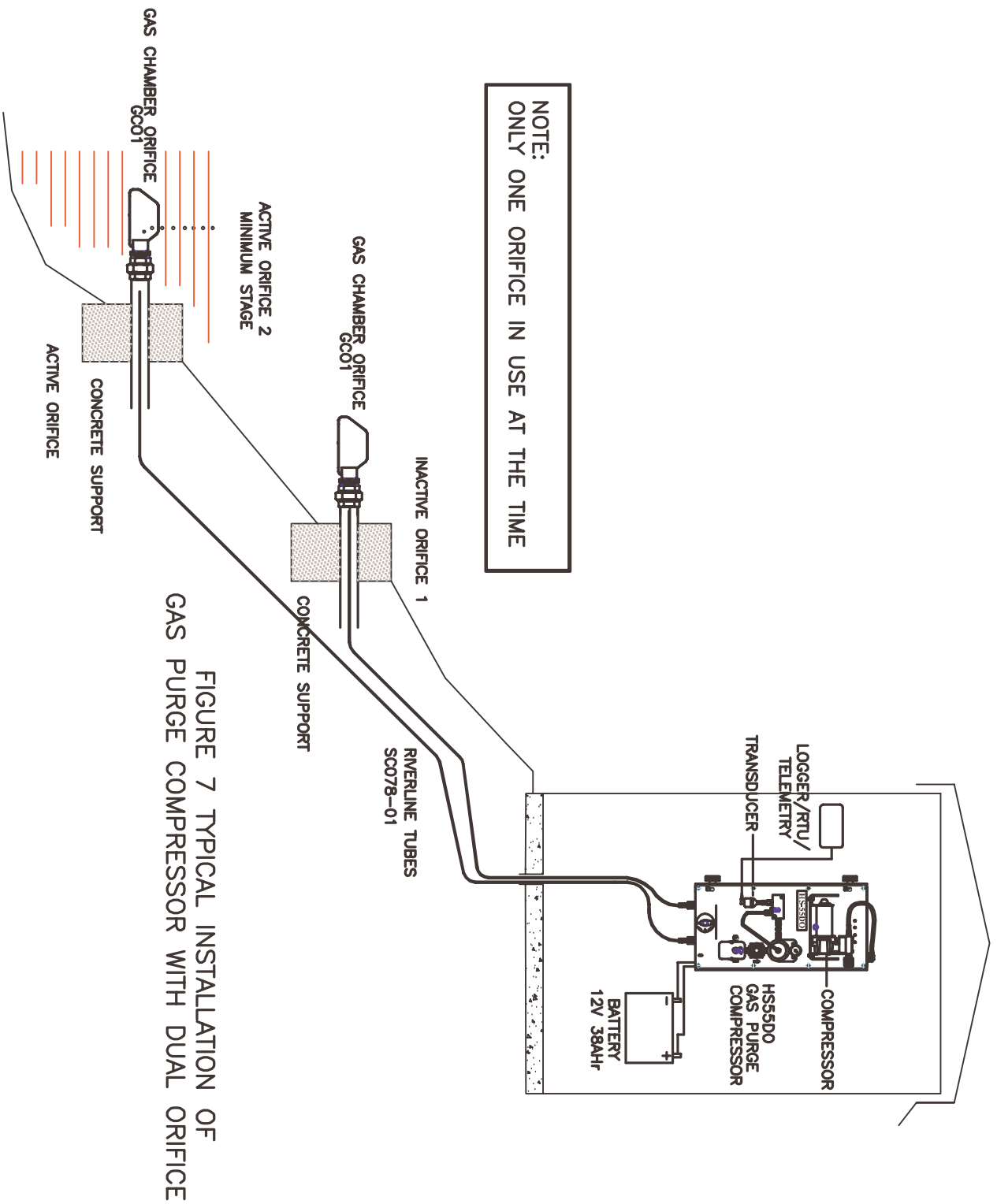


FIGURE 7 TYPICAL INSTALLATION OF GAS PURGE COMPRESSOR WITH DUAL ORIFICE

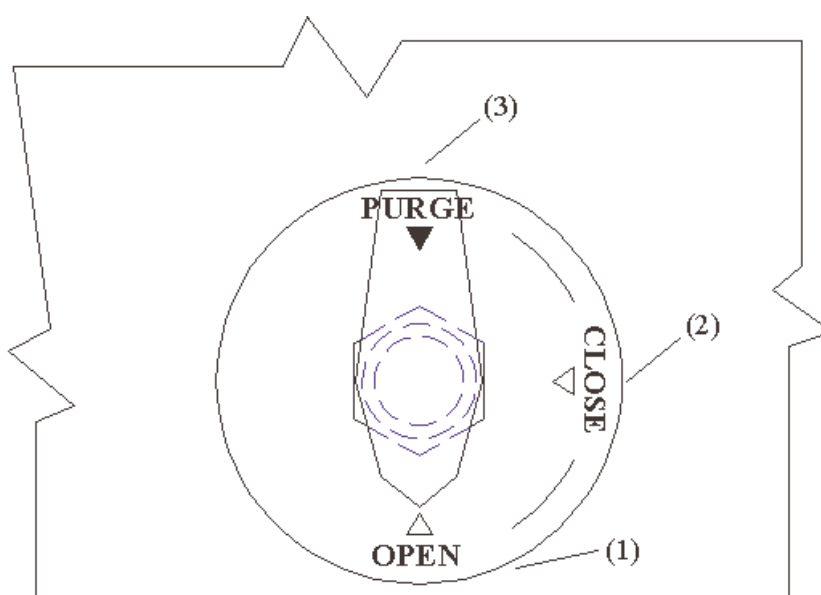
## VII. OPERATION

### (i) Normal Pumping Operation

During normal operation, When the tank pressure drops to about 60 p.s.i (400 Kpa), the pressure switch powers up the compressor recharging the receiver to 85 p.s.i (600 Kpa). This should take about 2 minutes.

### (ii) Manual Purge

This feature allows the operator to purge the system during routine service visits.



### **WARNING: PLEASE READ THE FOLLOWING INSTRUCTIONS PRIOR TO OPERATION**

1. The above diagram indicates the river orifice line is open for normal bubbler operation.
  2. Close position indicates the river line is closed to the bubbler system.
  3. Purge position permits the river line to be purged at full tank pressure for a short duration.
- Note:** Ensure transducer valve is closed prior to purge operation.
5. Allow pressure to stabilise after purging for approximately 10 minutes prior to opening transducer valve.

During the purge operation, the active orifice (1) or (2) should produce vigorous bubbling with the tank pressure falling to approximately 400Kpa (60 p.s.i.) after about 30 seconds. At this point the compressor will be activated to recharge the air receiver. If further purging is required, the compressor should be allowed to refill the tank to maximum pressure 600 kpa (85 p.s.i).

At the completion of the purge sequence, the compressor will resume the normal bubble operation.

## VIII MAINTENANCE

The HS-55DO is almost maintenance-free. You will need to ensure that your power supply is sufficient for the equipment that you have installed. (See Specification Page HS-55DO 100-06). As the compressor's duty cycle is a few minutes every 24 hours, it will last for many years. The voltage sensor prevents the HS-55DO from running continuously for long periods of time. This will protect the pump and many other components of the HS-55DO in case of a system leaks or other malfunctions.

All fittings must be secure. At 80 bubbles/minutes, even a tiny leak will allow the entire gas flow to escape.

## IX. BUBBLE RATE ADJUSTMENT

The chart below has been prepared to show the relationship between the bubble rate at the test orifice and the equivalent rates that would be observed on a sight glass bubble unit.

Once the desired bubble rate has been achieved tighten the screw to lock the nupro valve.

Bubble rate at Test Orifice	Equivalent Sight Glass Rate
10 (GCO1 only)	40
15	60
21	80
27	100
35	120

**Note:** Bubble rates detailed above are only an approximate guide for the purpose of conserving gas and have no influence on the performance of the transducer.

**Example:** To adjust the HS-55DO to the equivalent of 80 bubbles per minutes, the nupro valve should be rotated anticlockwise if the bubble rate is below this amount, or clockwise if bubble rate is above 80 per minute. There should be 21 bubbles per minute emerging from the test orifice.

## X. FAULT FINDING

### (i) HS-55DO Not Powering Up

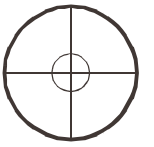
- (a) Check battery voltage
- (b) Check all connections including POWER and GROUND. Both the compressor and control power sources must be connected.

### (ii) Intermittent Operation

- Check your power and ground connection. Moisture over time, will oxidize and corrode connectors and pins;
- Verify your power supply or battery voltage.

## XI. DRILLING TEMPLATE

(See page 22).



# TOP

## DRILL TEMPLATE FOR HS55

230.00

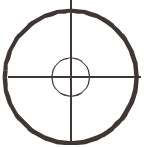
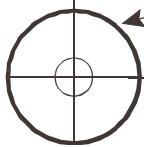
OFFER UP THE TEMPLATE AND SPOT DRILL THE FOUR HOLES ON THE  
SELECTED THE POSITION OF THE HS55 GAS PURGE COMPRESSOR.

CENTRERS SHOWN ARE TO SUIT 8 MM DIA. FASTENERS .

IT WOULD BE ADVISABLE TO CHECK THE DIMENSIONS BEFORE  
DRILLING.

170.00

M8 HOLE  
(5"/16 IMP)



XII Appendix A

**GC01 (GAS CHAMBER ORIFICE)**

**INSTALLATION OF POLYTHENE TUBING AND GAS CHAMBER ORIFICE GC01**

**A. General Description**

The G.C.O.1 permits the use of extremely low bubble rates with increased accuracy and near total reduction of lag between actual level rise and orifice pressure. The polythene tubing - SC078-01 can be supplied in 100 or 300 metre rolls. It is an extremely durable material that has been used successfully in this application world wide for many years. The tubing is flexible, easy to handle and can be cut with a knife.

The copper construction of the GCO1 deters aquatic growth while the plastic insulating bush prevents contact between the copper chamber and steel pipe.

Bubble rates as low as 40 bubbles per minutes (bpm) can be used on fast rising water levels, thereby reducing gas consumption by as much as 60%.

The GC01 chamber orifice is constructed of copper and welded to a 2" copper connection . The connection mates with a 2" plastic insulating bush and is taped for a 1/4" National pipe thread (NPT) copper Swagelok a fitting which allows adaptability to the existing standard USGS orifice configuration. The bottom of the chamber include a removable copper screen for cleaning purposes.

**B. Performance:**

The following table summaries the results of comparative tests on the H.S demonstration rig with water level rising at 9 meters/hr.

<i>Float Operated Encoder (Level in mm)</i>	<i>Standard Orifice 100 Bubble/Min</i>		<i>Gas Chamber Orifice 10 Bubbles/Min</i>	
	<i>Reading</i>	<i>Lag</i>	<i>Reading</i>	<i>Lag</i>
0	0	--	0	--
810	578	232	810	0
1700	1200	500	1700	0
2400	1540	860	2398	2
3600	2294	1306	3588	12

At 3 meters/hr rate of rise the standard orifice still lagged significantly whereas the gas chamber orifice exhibited no appreciable error.

### **C. Orifice Fittings**

The site and reference level for the GCO1 should be resolved before installation proceeds. The length of tubing from the (HS23A or HS23DB) to the orifice should not exceed 150 metres. A suggested method for installation of the GCO1 is shown in (fig1,page 100-03)

The site of the orifice should be positioned in quiet water out of the mainstream to provide protection. The area should be free of silting and aquatic growth.

The mounting for the GCO1 should consist of a section of 50 nominal bore galvanised pipe threaded at one end and secured at the appropriate reference level.

The securing of the Gas Chamber Orifice (GCO1) mounting should be such that it can withstand the forces applied by the flowing stream and associated floating debris.

The immersion of the GCO1 in the water should be at level equal or higher to that of CTF point ( see fig 1, page 100-03)

### **D. Preparation of Orifice Tubing**

Do not open the carton or remove the strapping. To prepare the roll of tubing for use, cut a 300 mm diameter hole in the centre of the cardboard carton, retrieve the end of the tubing from the middle of the coil, then cut the strapping retaining the coil. This method will reduce the possibility of tangling the tubing. Prevent the ingress of dirt etc. from entering the tubing, by taping up the ends. At no time should the open end of the tubing be permitted to contact the soil.

### **E. Orifice Tubing**

It is recommended that a trench be dug (minimum 600 deep) between the equipment shelter and the proposed positions of the orifice. The trenches should not have any low points in their length, they should have a continuous fall to the river.

Pull the free end of the coiled tubing to the orifice position laying the tubing in the trench as you go. Remove the protective tape from the end of the tubing, and push the tubing through the 50 nominal bore pipe mounting. Insert the tubing into the tube fitting on the rear of the GCO1 orifice fitting, ensuring that both ferrules are in place. Tighten the fitting nut first and then place the GCO1 assembly onto the mounting pipe and tighten the barrel union. (See fig 2, page 100-04).

Cut the tube at the coil end (tape both ends), ensuring that there is sufficient length to make the joint at the (HS23A, HS23DB) within the shelter. Check the lay of the tubing in the trench to ensure that it is free of coils and kinks. Under no circumstances should the tube form hollows where moisture can be trapped within the tube. Lay the tubing into position in the equipment shelter as required. Remove the protective tape from the end of river line tube. Insert the end of the tube into the appropriate river line fitting on the (HS23A, HS23DB) and tighten both fittings.

Finally, Open the valve to the orifice.

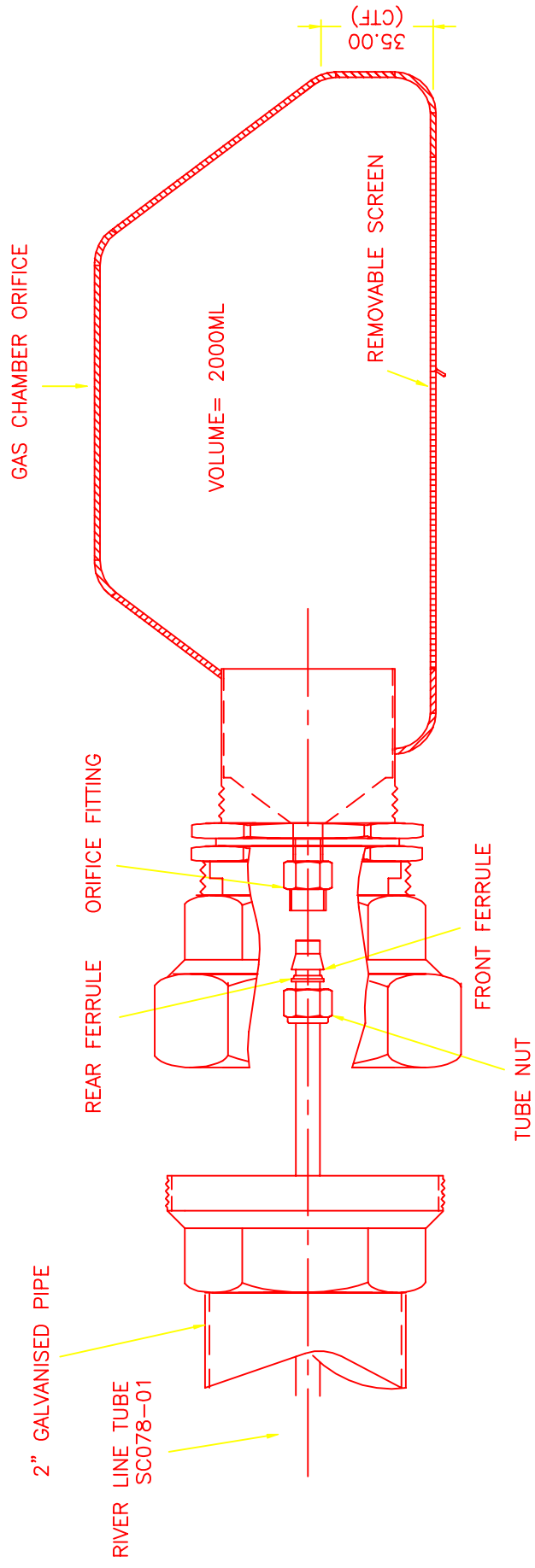


FIG.5 GAS CHAMBER ORIFICE INSTALLATION

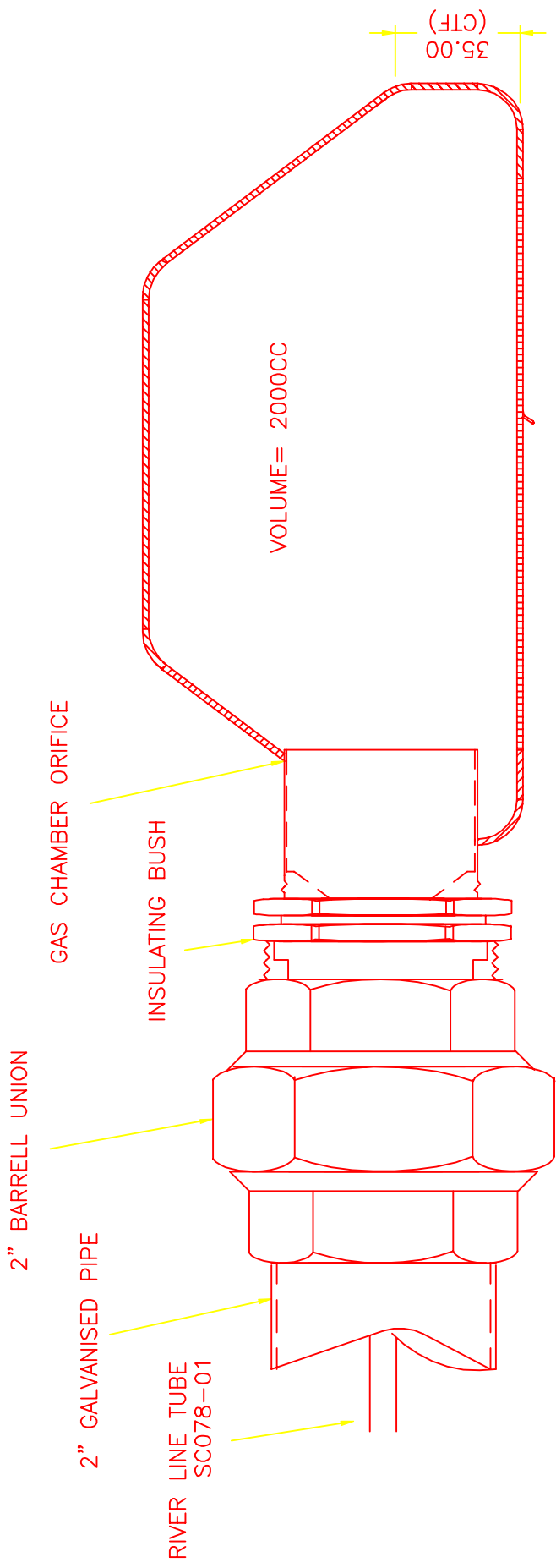


FIG.6 GAS CHAMBER ORIFICE INSTALLATION ONTO 2" PIPE