Wallace & Tiernan® Instruction Manual S10k™ Gas Feed System

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Important Notice

Evoqua Water Technologies Instruction Manuals are the safety documents for their products. The information provided therein is in accordance with the best practices known at the time of issue and, if fully implemented, should enable the user to operate the plant in the safest possible manner. It is therefore most important that instructions be read and understood prior to the installation, operation or maintenance of the plant.

Notes

Where necessary, special instructions are provided and are quoted under the following headings:

WARNING: A warning is given in instances where failure to observe the instruction could result in injury to personnel.

CAUTION: Cautions are given where failure to observe the instruction may result in equipment damage, or pollution to an allied system.

NOTE: Notes are provided to give additional emphasis to particular points of detail.

The following recommendations are made to ensure safe and efficient operation:-

1 Only suitably qualified personnel should install, operate and maintain the equipment.

2 Only Evoqua Water Technologies manufactured or approved parts should be used.

3 The equipment should not be used for any purpose other than that for which it was supplied.

4 If equipment being supplied is being put into storage or not being commissioned immediately, or if the plant is being de-commissioned, Evoqua Water Technologies urge that they be contacted for detailed advice.

In an effort to make progressive improvements to products, changes in design may be incorporated from time to time, which may not be reflected immediately in the instruction manual. If in doubt, contact Evoqua Water Technologies quoting the equipment serial number; serial numbers are essential for effective communication and proper equipment identification.

The equipment described in this manual may be used with substances that themselves may be hazardous to personnel safety. It is essential that persons employed in the vacinity of such substances be aware of the appropriate safety practices and the location of suitable safety equipment. Provision of safety cards and codes of practice concerning hazardous substance should be made by the supplier of the substance.

Warranty

The equipment supplied is guaranteed against mechanical defect notified to the Seller within a period of 1 year from the date of delivery. For such guarantee to be valid the purchaser must notify the seller in writing immediately such defect becomes apparent. If the Seller so requires, the Purchaser shall return the defective equipment (at the Purchaser's expense) to the Seller. The Seller undertakes that it will, at its own option and its own expense, and by way of full discharge of its guarantee obligation hereunder, either repair, or supply a replacement for the defective equipment, or refund any purchase monies paid to it in respect of any such defective equipment, or portion thereof. If title to the defective equipment is at the time of such replacement or refund vested in the Purchaser, then title shall thereupon vest in the Seller. Replacement material situated outside the U.K. will be supplied F.O.B. U.K. Port. The guarantee given in this clause shall not be operative and enforceable if the equipment is not operated strictly in accordance with the sellers instruction, or in the respect of any defect arising from accident, deliberate act, misuse, neglect or from a breach from the terms of the following clause, or in respect of any defect arising through damage incurred while being transported after delivery of the equipment, or if the equipment has been altered or modified in any way by any person other than the seller, or in respect of any other cause whatsoever which lies beyond the Sellers control.

The Purchaser must comply with all user instructions and safety recommendations issued by the Seller, and must install, commission and maintain the equipment in accordance with good engineering practice, and under the supervision of suitably qualified personnel, and the Seller shall not be liable to the Purchaser for any loss suffered as a result of the Purchaser's breach of the terms of this clause.

Subject to this guarantee all conditions, warranties and representations, whether expressed or implied (by statute or otherwise) relating to the equipment, are hereby excluded in so far as they can be excluded without such exclusion being void or unenforceable at law.

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INTRODUCTION

The Wallace and Tiernan Type S10k Gas Feed System described in this manual, is designed to feed a precisely metered volume of chlorine, sulphur dioxide, carbon dioxide or ammonia gas; to mix the gas with water and deliver the resultant solution to a point-of-application. The S10k is designed for manual or automatic control.

These instructions include a description of the S10k with installation, operating and maintenance procedures, backed up by illustrated part lists, and should enable the user to obtain maximum service from the equipment. Minor changes may be made to the equipment that are not immediately reflected in the manual. If such a change appears to have been made to your equipment, contact Wallace & Tiernan for information.

Our guarantee is conditional upon the equipment being treated in accordance with the contents of this manual and its supplements. We invite particular attention to it and urge that its contents be thoroughly understood and rigidly followed.

EVOQUA WATER TECHNOLOGY

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HAZARDOUS CHEMICALS

All operators of this equipment should be aware of the problems associated with handling hazardous chemicals. Reference should be made to the literature available from the suppliers of these chemicals, particular attention being paid to the requirements regarding protective clothing and emergency procedures.

MAINS VOLTAGES

Mains voltages can kill. Before carrying out maintenance or repair, persons concerned must ensure that the equipment is isolated from the electrical supply and make tests to verify that the isolation is complete.

If the supply cannot be isolated, functional testing, maintenance and repair is to be undertaken only by persons fully aware of the danger and who have taken adequate precautions.

NOTES ON PROTECTIVE EQUIPMENT AND CLOTHING

The following warning is general in nature due to the variety of hazardous chemicals the equipment is capable of handling.

WARNING: When dealing with hazardous material it is the responsibility of the equipment user to obtain and follow all safety precautions recommended by the material manufacturer.

It is good general practice to make use of the following types of protective clothing when handling any hazardous liquid. It is recommended that such protective equipment be used by all persons servicing this equipment and its associated piping, tubing , valves and accessories.

1	Goggles, flexible fitting, hooded ventilation (per BS EN 2092)	
2	Face shield (BS EN 2092)	
3	Chemical apron (BS EN 7184)	
4	Chemical gloves (BS EN 7184)	
5	Self contained, positive pressure breathing apparatus (BS 4667)	

NOTE 1: BS EN 7028 "practice for occupational.....eye and face protection" recommends goggles (see 1 above) as the "preferred protection" when handling chemicals which present a hazard from splash, acid burns or fumes; for severe exposure, a face shield (see 2 above) over the goggles is recommended.

NOTE 2: An eye flushing fountain and a deluge type shower may also be recommended.

GENERIC INSTALLATION GUIDELINES

For Maintaining EMC integrity of Equipment supplied by Wallace and Tiernan

The Guidelines below are general in nature. They do not guarantee compliance with legislation. The Installers/Assemblers/End Users of equipment supplied by Wallace & Tiernan should satisfy themselves as to the procedures required to ensure compliance. We recommend that Installers/Assemblers/End Users are familiar with the EMCD (Electromagnetic Compatibility Directive 89/336/EEC), the LVD (Low Voltage Directive 73/23/EEC) and the MSD (Machinery Safety Directive 86/392/EEC). The Guidelines below should not be taken as definitive and independent advice should be sought if in doubt.

The EMC Directive is applicable to "systems" it should be noted that some systems could be configured from apparatus supplied from different manufacturers. The onus is on the assembler of the system to meet the requirements of the directives.

The equipment you have been supplied with by Wallace & Tiernan has been tested for compliance with the EMC Directive (Electromagnetic Compatibility Directive 89/336/EEC) and appropriately marked. It is important that the equipment is installed in a manner that will maintain the integrity of that EMC requirement, thus ensuring that complete system being installed/commissioned will comply.

For this Purposes a "system" may be defined as a combination of electrical apparatus. The term apparatus can be defined as *Consisting of a product with an intrinsic function intended for the end user* and *is supplied or intended for supply or taken into service or intended to be taken into service as a single unit.*

Generic Guidelines

Having unpacked the equipment check all parts for obvious damage, If damage is apparent contact Wallace & Tiernan immediately. If the system is not to be installed or commissioned immediately check the instruction manual for any special storage instructions.

The intended mounting of all equipment should be carefully planned in advance. The cable lengths should be accurately calculated so as to avoid unnecessary cable jointing.

Some of the equipment may have been supplied with special signal cables. Under no circumstances should any of these special cables be

shortened or the connectors modified, changed or removed. If the cables supplied are too long then reference should be made to the relevant instruction manual or typical installation drawings (If supplied) to check any recommendations made as to methods of excess cable storage. If the cables are too short contact Wallace & Tiernan for supply of correct cables (This would normally be advised at order time).

Any screened sensor cables should be run separately from all other cables and the screen should be earthed at the Control/Analyser equipment. Often this will be shown on the drawings.

All other cables should be run in ridged or flexible metal conduit or steel wire armoured cable securely bonded to earth.

Low Voltage signal cables such as those to relays should be routed separately to power cables.

All cable entries to metallic coated plastic or metal enclosures should be via metal glands secured inside the enclosure with unpainted metal retaining nuts and washers. In the case where plastic glands are supplied the signal cables should be passed through the gland and the screen should be connected and securely bonded as indicated on the drawing.

So as not to introduce conducted interference into some analysers and controllers consideration should be given to the possible filtering of the relay signal cables. This is very much dependant on usage. The type of switching that the relay is being asked to perform should be considered. In general if the relay signal is being fed to, and being processed by, another piece of Wallace & Tiernan equipment then external filtering will not be required.

In some instances you may find it necessary to supply connections into the Wallace & Tiernan equipment where glands are not provided. If this is required by your system configuration or the equipment supplied then care should be taken not to damage any RFI coating/screening applied to the inside of the enclosure. In order to minimise damage we would recommend that holes are drilled and not punched. This would also apply to existing gland “Knockouts”.

You are now advised to read the instruction manuals of the equipment supplied to find any additional information that may be relevant to the installation.

1 GENERAL DESCRIPTION

The Type S10k Gas Feed System is a vacuum operated system designed to feed chlorine, sulphur dioxide, carbon dioxide or ammonia gas into a flow of water at feed rates up to 10 kg/hour equivalent chlorine.

The system comprises three main items interconnected by the injector vacuum (i.e. suction) pipeline:-

1 A remote mounted aspirator type injector, used to produce the vacuum required to pull the gas from the cylinder, mix it with water and deliver it to the point-of-application.

2 A vacuum demand valve designed to fit directly to a gas cylinder, for full vacuum operation, or to the gas header pipe work for remote vacuum operation. This valve ensures that gas can only feed when there is a demand for it (i.e. when injector vacuum is present).

3 A flowmeter unit which can be mounted directly onto the vacuum demand valve or remote from the demand valve. The flowmeter unit is fitted with a tube calibrated to show the amount of gas the vacuum is pulling and an adjustable V-notch plug unit to control the amount of gas pulled.

WARNING: Where the flowmeter is coupled directly to the vacuum demand valve, the vacuum demand valve MUST have a built in pressure relief valve.

Operation of the gas feed system is controlled by starting and stopping the flow of water through the vacuum producing injector. The gas feeder can be used with either a standard injector or an anti-syphon injector.

The standard S10k gas feeder is manually (Fig.1A) controlled but the system can be supplied for automatic control by utilising an electric plug positioner (Fig.1B). This allows the gas feed rate to be controlled by means of either a flow proportional signal or a measured residual signal.

1.1 Principle of Operation

When operating water flows through the S10k's injector a vacuum (suction) develops throughout the vacuum pipe work and pulls against the underside of the diaphragm in the vacuum demand valve. The diaphragm is pulled against the valves two stems which move away from their seats and allow gas to be pulled into the vacuum pipe work. The volume of gas, which depends upon the position of the V-notch plug and is indicated

at the flowmeter tube, is pulled through the vacuum pipe work and into the injector. Here it mixes with the operating water and passes into the solution distribution system.

If, during operations, a leak develops in the vacuum pipeline, air is pulled into the pipeline preventing gas from escaping into the atmosphere.

1.2 Injectors (Figs.6 to 9)

Standard Injectors

The standard injector used with the S10k gas feeder is a fixed throat unit and is available in two ranges; the 25mm Type U.96273 injector for gas capacities up to 10 kg/hour and the 19mm Type U.96275 injector for gas capacities up to 5 kg/hour. The injectors are fitted with check valves to prevent a back flow of water into the gas feeder if the injector is subject to positive back pressure when it is shut down or if the solution discharge line becomes blocked.

Anti-syphon Injectors

Anti-syphon versions of both the 19mm and the 25mm injectors are available and are basically as described above but are fitted with a second, spring loaded, diaphragm assembly to provide a positive shut-off against negative back pressure at the injector.

Both the standard and anti-syphon injectors are mounted remotely from the demand valve.

1.3 Vacuum Demand Valve

The standard vacuum demand valve is supplied for use with chlorine, sulphur dioxide or carbon dioxide gas. An optional valve designed for use with ammonia gas is also available.

WARNING: THE STANDARD VACUUM DEMAND VALVE MUST NOT BE USED FOR AMMONIA SERVICE NOR THE AMMONIA VALVE FOR CHLORINE OR SULPHUR DIOXIDE SERVICE. Severe personal injury or damage to plant can occur if a vacuum demand valve is used with a gas for which it is not designed.

The function of the vacuum demand valve is to ensure that gas can only flow from the storage cylinder into the vacuum line when the vacuum created by the injector is present throughout the pipe work.

The vacuum demand valve is supplied in four main assemblies all of which have double seat check valves; the standard unit for single cylinder operation and fitted with a universal yoke; the standard unit for single cylinder use but fitted with a Chlorine Institute yoke; the switchover (duty and stand-by) unit (2 required) fitted with a universal yoke; the switchover unit fitted with the Chlorine Institute yoke.

Automatic switchover capability is provided (when ordered) by two vacuum demand valves fitted with mechanical detents machined into the operating lever. One valve feeds gas until its cylinder is depleted (down to approximately 1 bar). The resulting rise in vacuum to a higher than normal level provides sufficient force to unlatch the operating lever in the second unit which then takes over the gas supply function.

The vacuum demand valve consists of:-

1 A front cover

2 A front housing

3 A back housing

4 A cylinder connection - a yoke type (with optional heater)

NOTE: Optional alarm switches can be supplied (Fig. 10 and 11).

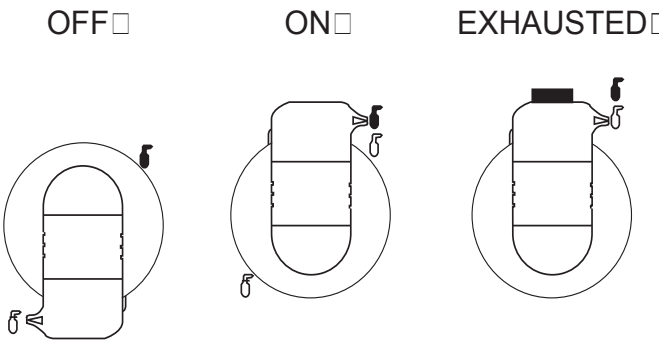
1.3.1 Front cover

The Front Cover houses the control mechanism and the front face is provided with symbols (3 on the standard cover and 4 on the switchboard), which indicate the operating condition of the unit as follows:-

Non - switchboard arrangement

OFF: (valve closed): indicated by an empty cylinder outline with a bar across its outlet pipeline to show that gas is prevented from flowing.

ON: (valve open): indicated by a shaded-in cylinder outline with the bar removed to allow gas to flow through the supply pipeline.

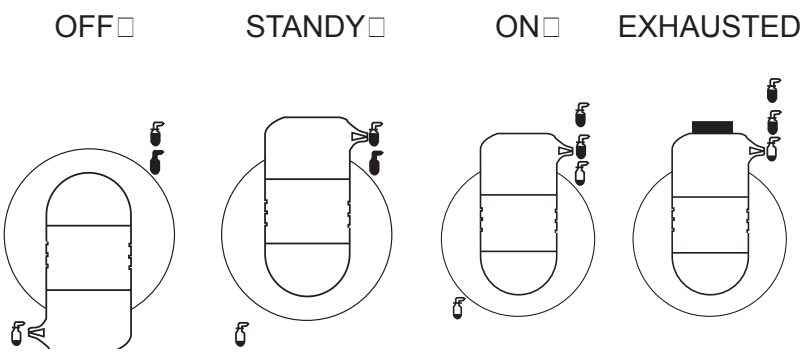


SUPPLY EXHAUSTED: (valve open but cylinder empty): indicated by an empty cylinder outline with bar removed but no flow of gas in the supply pipeline. In this position the red OUT OF GAS warning indicator, located immediately above the top of the knob, is also uncovered.

Switchover arrangement

OFF: (valve closed): indicated by an empty cylinder outline with a bar across its outlet pipeline to show that gas is prevented from flowing.

STAND-BY: (supply available but valve still closed): indicated by a shaded-in cylinder outline with a bar across its neck and no gas in the supply pipeline. The cylinder is full but the valve remains closed until the gas pressure in the duty cylinder falls to approximately 1 bar. At this point the increase in vacuum at the stand-by valve causes its mechanical detent to unlatch and the vacuum pulls the valve open.



ON: (valve open): indicated by a shaded-in cylinder outline without the bar and showing gas flowing through the supply pipeline.

SUPPLY EXHAUSTED: (valve open but cylinder empty): indicated by an empty cylinder outline with bar removed but no flow of gas in the supply pipeline. In this position the red OUT OF GAS warning indicator, located above the knob, is also uncovered.

1.3.2 Front housing

The front housing, contains the diaphragm assembly and the control mechanism. Fixed in the centre of the diaphragm is the operating shaft which connects at its top end, via the operating lever, to the control knob. As the control knob is moved to the required setting so the operating shaft positions the diaphragm for the corresponding operation. The operating shaft is provided with a coarse thread which, when the control knob is manually turned clockwise or anticlockwise will move the diaphragm between the locked and the unlocked position.

1.3.3 Back housing

The Back Housing of the vacuum demand valve is fitted with two check valves, the first is housed in a nipple which is screwed into the housing of the second check valve. When the operating vacuum is present the diaphragm is pulled against the secondary stem forcing it against the guide which in turn presses against the first stem forcing it away from its seat and allowing gas to enter the vacuum pipe work. If the operating vacuum is lost for any reason, the diaphragm will retract allowing both valve stems, under spring pressure, to re-seat and shut-off the gas supply.

The housing also contains (if fitted) the pressure relief valve which connects to atmosphere via the vent port.

1.3.4 Yoke assembly (Fig.4 and 5)

The vacuum demand valve is supplied with either a 'Universal' yoke or a 'Chlorine Institute' yoke, as appropriate, to mount the valve directly to a gas cylinder or a wall mounted header valve.

1.3.5 Heater (optional)

An optional, heater unit is available for installations where re-liquefaction of the gas within the valve is a problem due to low external temperatures.

This unit comprises a small, bolt on capsule which attaches to the check valve housing of the vacuum demand valve. The thermostatically controlled heater is designed to operate on any single phase supply of 115 volts or over, up to a maximum of 230 volts.

1.3.6 Pressure relief

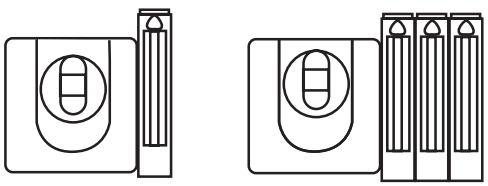
WARNING: When the flowmeter is fitted directly to the vacuum demand valve, the demand valve MUST have a pressure relief valve.

The pressure relief valve fits into a recess in the back housing of the regulating valve. The relief valve comprises a spring, plunger and diaphragm. The face of the diaphragm is spring loaded against two openings, one opening connects into the main chamber of the valve and the other connects to the vent line. Should either of the check valve stems fail to seat when the operating vacuum is shut off, gas will pass into the main chamber of the valve where its pressure acts against the underside of relief valve diaphragm. The relief valve diaphragm is forced against its spring until it unseats at which point gas is allowed to pass to atmosphere via the vent line.

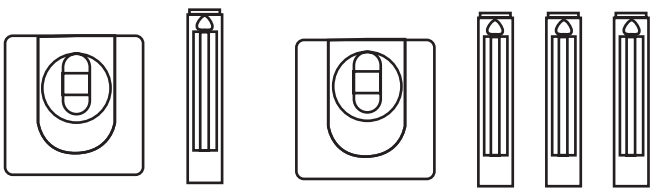
1.4 Flowmeter Assembly (Fig.2A/B)

The flowmeter assembly is fitted with a graduated glass tube and a control knob. The tubes inner surface is tapered towards the bottom and contains a free moving float. The gas forces the float up the tube until it can flow round it thus indicating gas flow by the position of the float in relation to the graduations. The control knob screws a variable orifice V-notch plug in or out to adjust the volume of gas passing through the assembly.

The flowmeter assembly can be connected to the vacuum demand valve, with a maximum of three flowmeter assemblies per valve:-



OR - remote mounted from the valve (a maximum of three units per valve):-



OR - in any combination of coupled or remote (i.e. two coupled and one remote unit or one coupled and two remote units etc.).

NOTE: Each flowmeter assembly MUST have its own injector.

Manual Control (Fig.2A/B):

Control of the gas feed-rate is achieved by turning the control knob (3) in the anticlockwise direction to increase the flow-rate or the clockwise direction to decrease the flow-rate.

Stop/Start Control:

Stop/start control is achieved by installing a solenoid operated water shut off valve in the injector water supply pipeline or utilising a water booster pump to supply operating water to the injector. The gas flow rate is adjusted manually as described above but the injector is operated by switching the solenoid valve or booster pump on/off.

Automatic Control (Fig.3):

Automatic control is achieved by adding a motor driven, V-notch plug into the vacuum pipeline. The plug positioner motor and its associated printed circuit card are housed in a separate enclosure and fitted, with the flowmeter, to a wall mounted back-plate. The circuit card is wired to an electronic controller (PCU or SCU) which is used to switch the reversing motor on/off in the appropriate direction to achieve the correct dosing requirement.

Three forms of automatic control are commonly used:-

FLOW CONTROL - where the gas feed-rate is adjusted by the plug positioner motor, switched on in response to a flow proportional signal (such as that provided by a W&T Signal Conditioning Unit (SCU)).

RESIDUAL CONTROL - where the gas feed-rate is adjusted by the plug positioner motor, switched on in response to a measured residual signal (such as that provided by a W&T Process Control Unit (PCU)).

FLOW AND RESIDUAL CONTROL (compound loop) - where the gas feed-rate is adjusted by a combination of the two signals described above (such as that provided by a W&T Process Control Unit)

The electric plug positioner can be disengaged by pulling out the actuator knob on the front of positioner housing. The knob is then used manually to adjust the dosing rate (e.g. in case of failure on the automatic control). To return the unit to automatic control push the actuator knob back in and turn slightly to ensure the drive fully engages.

1.5 Alarm Switches (Optional)

Optional alarm switches are available for use with the vacuum demand valve. These take two forms; a single function alarm switch mounted inside the valve and a dual function alarm switch which is mounted external to the demand valve.

1.5.1 Single function alarm switch (Fig.10)

The optional single function alarm switch is located within the valve adjacent to, and operated by, the vacuum indicator mechanism. If the vacuum indicator goes to the red OUT OF GAS position, then the switches volt free contact will make to initiate a LOSS OF VACUUM alarm condition.

The volt free contact can be used for an external alarm or to control the operation of an associated item of equipment if the injector vacuum fails.

1.5.2 Dual function alarm switch (Fig.11)

The optional dual function alarm switch is mounted on a wall adjacent to the flowmeter (or a back plate if used with an automatic gas feeder) and connected to the flowmeter via a ptfe tube. It detects the level of vacuum being pulled through the V-notch plug and if this level increases above – 60 inches H_2O the switches volt free 'GAS FAILURE' contact will make. If the level of vacuum falls below – 8 inches H2O then the volt free 'VACUUM FAILURE' contact will make.

1.6 Technical Data

Accuracy of dosage :		± 4% of indicated flow-rate
Capacities :		0.54 to 225 kg per day (chlorine)
Feed range :		
	Manual control:	20 to 1
	Auto control:	10 to 1
Injector operating water supply :		max. 20 bar at 38° C max. 10 bar at 55° C
Minimum operating vacuum at the gas control unit :		540 negative mbar
Ambient temperature :		2° to 55°C
Airborne noise emission :		No greater than 70dB(A)

Positioner:-

Mains supply :	230v, 50 Hz, 19 mA 115v 60 Hz, 46 mA
Time 0-100% :	80 sec (50 Hz), 66 sec (60 Hz)
Potentiometer :	1 kOhm ± 10%

Flowmeter capacities : 0.50 - 10 kg/h (equivalent Cl_2)

2 INSTALLATION

WARNING: To avoid possible severe personal injury or damage to plant this equipment should be installed, operated and serviced only by trained qualified personnel who are thoroughly familiar with the entire contents of this instruction book.

Piping for the chlorine (or sulphur dioxide) gas supply, where the gas is under pressure, should conform to Chlorine Institute (or Compressed Gas Association) recommendations. Plastic tubing and pipe are not recommended and should not be used.

When threaded joints are used, take extreme care to obtain clean, sharp threads. Make the joint using 'Loctite 275'.

2.1 Unpacking the Equipment

When the equipment and accessory items are unpacked, check all items against the packing list to ensure that no parts are discarded with the packing material. Whenever possible, unpack the equipment at the installation site. Items such as spare parts not required at the time of installation should be set aside where they will be available when needed.

NOTE: Do not discard or remove this instruction book when the installation is completed. The operator will need it.

2.2 Location Requirements

CAUTION: Before any attempt is made to place the equipment into operation, the operator should be familiar with the characteristics of the hazardous gases that will be metered.

The general physical requirements for installing a S10k gas feed system are shown on the typical installation drawings. Locate each item so that the necessary gas and power supplies may be connected. Ready access to the equipment for operation, routine maintenance and service is required.

Locate the injector so that the water supply, solution delivery line to the point-of-application, and vacuum lines may be connected and that access for service is convenient. A floor drain in the injector area is desirable.

A site for the gas feed system must be provided that will satisfy the following conditions:-

1 Exclude unauthorised persons from the installation.

2 Furnish storage space for the in-use and reserve gas cylinders, and protect them from falling over; from the weather; from direct sunlight or extremes of temperatures - not colder than 2° C (35°F) or warmer than 55° C (130°F).

3 Provide a vertical surface for mounting the auxiliary flowmeter assembly(s), unless mounted on the vacuum demand valve.

4 Make sure there is access to the injector(s).

5 Provide space, support and electric power for a booster pump and alarm system if required.

6 Allow adequate working space for routine servicing.

2.3 Manual Control (Fig.2A/B)

WARNING: The flowmeter/plug assembly is designed to operate under vacuum only. To avoid possible severe personal injury or equipment damage, DO NOT connect it to a source of gas under pressure.

When the S10k gas feed system is supplied for manual operation the flowmeter may be connected directly to the vacuum demand valve. Alternatively, the flowmeter is may be mounted remote from the demand valve, on a vertical surface (such as a wall or a column) at the height convenient for reading by the operator. This will be typically five feet from the floor to the bottom of the flowmeter assembly.

NOTE: If the flowmeter assembly is bolted to an uneven wall, shims must be added to prevent the flowmeter assembly from twisting when the bolts are tightened.

CAUTION: The axis of the flowmeter assembly must be vertical when mounted. Use a spirit level to check this.

2.4 Automatic Control (Fig.3)

The automatic gas feeder unit is designed to be mounted on a vertical surface (such as a wall or column) at the height suitable for convenient reading of the flowmeter by the operator.

NOTE: If the automatic gas feeder unit is bolted to an uneven wall, shims must be added to prevent the panel from twisting when the four bolts are tightened.

CAUTION: The flowmeter must be vertical in its mounting position. Use a plumb line or spirit level to check this.

Locate the flowmeter assembly to keep interconnecting pipelines between demand valve, flowmeter and injector as short as practicable.

2.5 Flowmeter (Fig.2A/B)

NOTE: For protection in shipment, the flowmeter and associated parts were removed after the flowmeter assembly was factory tested. These parts are separately packaged and should be assembled and installed as indicated.

Install the flowmeter as follows:-

1 Insert an open ended spanner or similar tool into the slot in the bottom of the flowmeter jackscrew (Fig. 2 (10). Unscrew it counter-clockwise from the bottom. Remove it.

2 Insert one gasket in the top of the flowmeter frame.

3 Insert lower stop and float and top stop into the flowmeter tube.

4 Carefully raise the flowmeter tube with its parts into the frame.

5 Insert the O-ring on top of the flowmeter jackscrew. (Be sure to grease the O-ring using Halocarbon grease).

6 Engage the flowmeter jackscrew in its threaded opening and tighten by hand.

7 Tighten the flowmeter jackscrew gently with a spanner until a firm seal is achieved.

CAUTION: Do not over tighten as this may break the flowmeter tube.

2.6 Installing the Vacuum Demand Valve (see Fig.13 for vac. line conns)

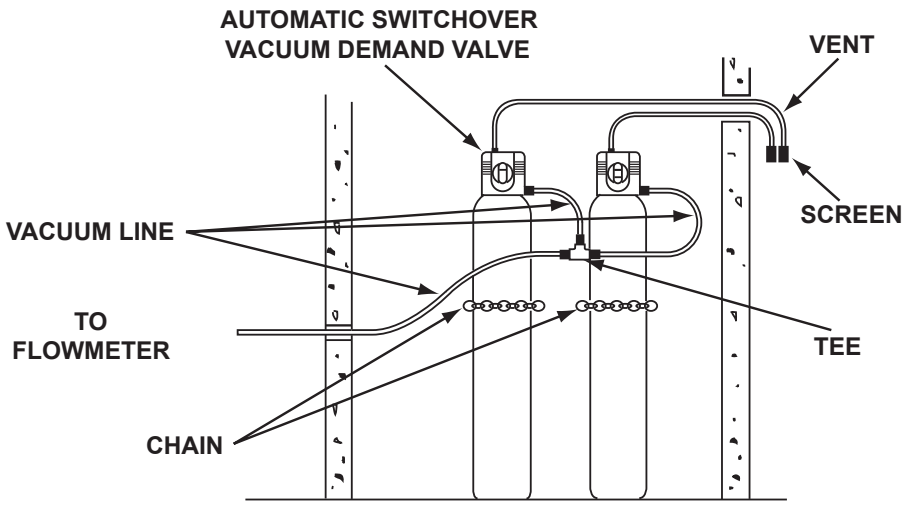
WARNING: When the vacuum demand valve is used with carbon dioxide, pressure valves, reducing valves, pressure relief valves and all related pipework and fittings between the gas supply and the vacuum demand valve, must be obtained from the gas supplier; they must be installed in accordance with his recommendations. (Drawings and text in this book are not applicable to carbon dioxide systems). Gas supply pressure must be reduced to between 1.4 and 15 bar g to prevent over-pressurization of the vacuum demand valve. A pressure relief device, set at a maximum of 15.8 bar g should be installed between the pressure reducing valve and the vacuum demand valve.

WARNING: The chlorine demand valve MUST NOT be used for ammonia NOR the ammonia valve for chlorine or sulphur dioxide. Severe personal injury or damage to plant can occur if a vacuum demand valve is used with a gas for which it is not designed.

Refer to Section 2.10 for information about vacuum pipelines between valve, flowmeter assembly and injector.

2.6.1 Cylinder mounted vacuum demand valve

WARNING: To avoid possible severe personal injury or equipment damage, if a flowmeter is mounted on a vacuum demand valve, the demand valve must be fitted with a pressure relief valve.



CYLINDER SWITCHOVER

When mounted on a gas supply cylinder, the vacuum demand valve is connected to the cylinder valve by a yoke. The cylinder must be in the upright position with the cylinder valve on top as shown on the sketch shown above.

WARNING: To avoid gas leakage and severe personal injury or equipment damage, always use a new lead gasket when installing a vacuum demand valve and each time a supply cylinder is changed.

CAUTION: When a vacuum demand valve is connected to a gas manifold, the manifold pipework must run at a level below that of the demand valve in order to prevent any reliquifying gas from settling in the valve. If necessary install a drip leg or similar trap.

If the installation comprises a single demand valve, when its associated cylinder is depleted, a full cylinder is put in place and the unit is

reconnected. If the installation comprises two switchover units as shown in the following sketch, the duty valve will feed gas until its cylinder is depleted (at approximately 1 bar). At this time the vacuum is higher than normal and will activate the mechanical detent in the second valve to bring the full stand-by cylinder into service. The depleted cylinder is then replaced with a full one and its valve set in the stand-by mode. When the second cylinder is exhausted the switchover process is repeated.

2.6.2 Gas vent line

As a matter of policy Wallace & Tiernan recommend that wherever practical the safety vent line should be run to a gas tight room, preferably containing an automatic shut off system. The vent lines should be terminated in an absorbing carbon filter (UXA93889) (U93882 replacement carbon). The contents of the carbon absorber should be replaced , as a matter of routine maintenance, every 6 months during normal operation and immediately after a major venting incident.

If it is not possible to vent into the room then the following recommendations are made:

WARNING: The vent lines should be terminated in a designated safe area. Do not terminate the safety vent line in areas frequented by personnel - external work areas, footpaths etc., or adjacent to windows or ventilation system intakes. The line must be run on a continuous down gradient, without low traps, to a point outside the building, and not exceed 10 metres in length. Where traps are unavoidable or a down gradient is not possible, provision for condensate removal (i.e. drip leg) must be installed at all low points.

The vent line should be supported over its entire length. The free end must be turned down to prevent the ingress of moisture and dust and a wire screen placed over the end to prevent the entry of insects and the possible blockage of the line. It is recommended that a suitable warning notice be affixed adjacent to the vent outlet, e.g. '**WARNING - CHLORINE FUMES'**

2.7 Installing the Injector

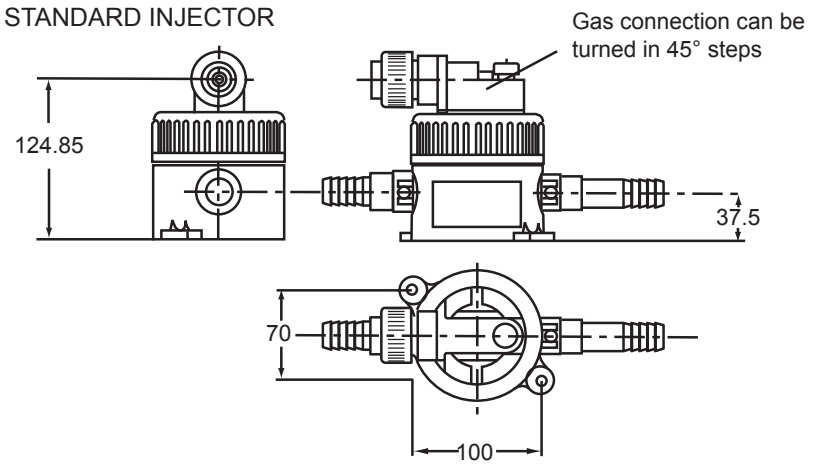
NOTE: When installing the injector avoid any downward discharge because air or gas bubbles may accumulate and become trapped in the tailway, interfering with its hydraulic operation. The distance between the centre of the injector and the first downstream bend or component should be at least 1.0m for the injector to operate at maximum efficiency. This is known as the 'recovery length'.

The injector diaphragm check valve will provide the greatest security against leakage if the injector is installed so that it is self draining. This can be accomplished by observing the steps in the following Sections.

2.7.1 U.96275 injector

CAUTION: For proper dispersal of solution, the end of the tailway (beige) must extend into the main, but not more than a third of the diameter of the main.

1 Install the injector tailway (beige colour with letter designation) directly into a 19mm NPT main which is 210mm or larger in size.



2 If the main is smaller than 210mm, install the tailway in a tee, in a run or corner of the main.

NOTE: Do not cut off any portion of the tailway. To do so would interrupt flow in the pressure recovery zone and prevent normal performance.

3 Where the injector is to be some distance away from the point-of-application, use adapters to connect to pipe or corporation cock type main connections, check valves, etc. See Fig.1A. Refer to NOTE in Section 2.7 re 'recovery length'.

4 Where the injector is not installed directly into the application main, wall mounting of the injector may be required. To install the injector on a suitable wall, secure the bracket to the wall at the desired location, using the bracket holes as the drilling template.

5 The injector nozzle (black colour with number size designation) is designed to accept 19mm polyethylene tubing or 19mm threaded pipe connection. For pipe thread connection, cut off the serrated section of the nozzle and bevel the internal/external corners. Ensure that the interior of the nozzle is free from burrs or chips before installing it in the injector.

NOTE: The polyethylene tubing is suitable for pressures up to 5 bar. Pressure in excess of 5 bar requires rigid pipe. The throat and the tailway are sealed to the injector body by means of O-rings. Hand tightening is sufficient. Do not use a wrench or attempt to tighten beyond that point where the shoulder on the fitting touches the body of the injector. If the injector is not oriented as desired when fully installed over the tailway, use a suitable tool to turn the tailway with respect to the main (or next fitting in the assembly) until the orientation is correct.

6 Install connection to the water supply or to a booster pump, if required. The water supply valve can be a manual valve or a solenoid valve. A water supply strainer is recommended. The water supply must be reasonably clean. If the injector is to be operated using clarified effluent, such as in sewage treatment plant, use larger sizes of throat and tailway, to minimise the likelihood of a blockage.

If difficulty is experienced in obtaining the specified capacity at the time of installation, check the injector operating water pressure and back pressure to see that they conform to the values specified on the order.

2.7.2 25mm injector

NOTE: Do not cut off any portion of the tailway. To do so would interrupt flow in the pressure-recovery zone and prevent normal performance. Refer to NOTE in Section 2.7 re 'recovery length'.

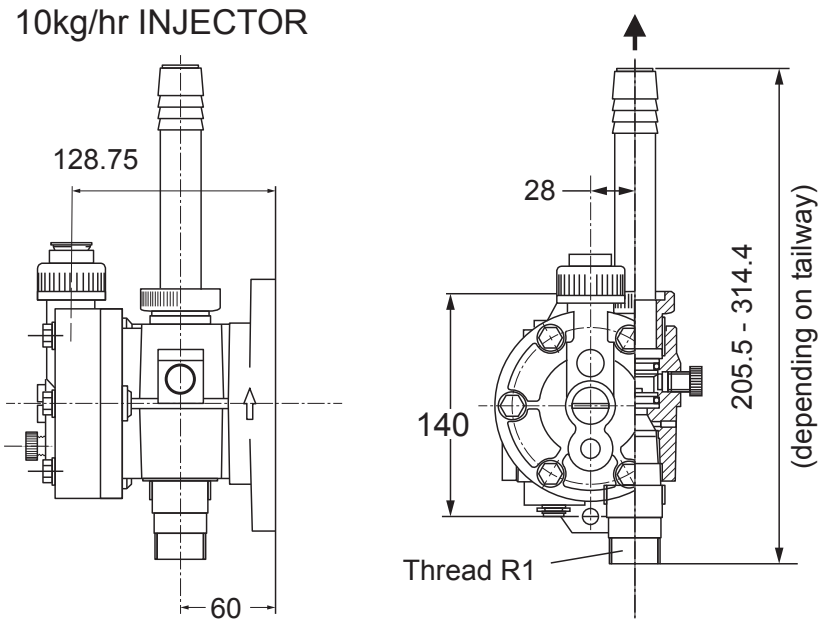
1 Where the injector is some distance away from the point-of-application, use adapters to connect to pipe or corporation cock type main connections, check valves, etc.

2 Install the injector on a suitable wall, secure the bracket to the wall at the desired location, using the bracket holes as the drilling template.

3 The injector water inlet is designed to accept 25mm threaded pipe.

NOTE: The nozzle and the tailway are sealed to the injector body by O-rings. Hand tightening of the retaining nut is sufficient.

4 Install connection to water supply or to a booster pump, if required. The water supply valve can be a manual valve or a solenoid valve. A water supply strainer is recommended. The water supply must be reasonably clean. If the injector is to be operated using clarified effluent, such as in sewage treatment plant, use a larger size of nozzle and tailway to minimise the likelihood of a blockage.



2.7.3 Injector water supply

The injector requires a supply of reasonably clean water otherwise it should be equipped with a suitable water line strainer. The pressure and quantity of water required depends on the operating conditions (back pressure and gas feed rate).

NOTE: For intermittent start-stop operation, it is recommended that at the least, a metre length of flexible polythene or rigid PVC pipe is fitted to the injector discharge connection. This should reduce corrosion of metal pipe and components (valves, pump impellers, etc.) caused by diffusion of solution during shutdown periods.

2.7.4 Injector discharge

WARNING: It is recommended that all solution delivery lines be fitted with a suitable valve and drain pipe to enable any pressure build up to be safely released prior to maintenance work commencing.

Rigid PVC pipe or W&T solution hose is required between the injector discharge and the point-of-application. The size depends on the size of the throat and tailway used in the injector. Solution hose may be connected directly to the injector tailway. If rigid PVC pipe is used, a piece of straight pipe at least 1.0m long should be coupled to the end of the injector tailway before any elbows, tees or Saunders valves are used. This will prevent any flow disturbances that could affect the hydraulic performance of tailway connections.

2.7.5 Injector vacuum (see Fig.12 for vacuum line connections)

The injector vacuum pipeline must be sized to ensure that the minimum vacuum of 540 negative mbar is available at the flowmeter assembly.

2.7.6 Drain

A floor drain is not essential, but is desirable to facilitate injector service.

2.8 Point-of-Application

1 Main connection. If the solution is to be applied in a main, a suitable pipe tapping is required in the main to accommodate the solution tube, corporation cock or diffuser.

2 Open well connection. If the solution is to be applied where there is no back pressure, the line from the injector must be supported so that the open end is submerged to minimum depth of 150mm, is located in a non stagnant area, and best promotes a rapid and thorough mixing of the solution into the water.

2.9 Electrical Connections (Fig.17)

WARNING: Mains voltages can kill. To avoid personal injury by electrical shock only authorized and qualified electrical personnel may carry out work on electrical parts of the system. Before uncovering electrical wiring, isolate the mains supply to the unit.

The automatic S10k gas feeder is fitted with an electric plug positioner for use with the Wallace & Tiernan Signal Conditioning Unit (flow proportional control) or the Process Control Unit (residual or compound loop control).

Mains supply

The plug positioner will require either a 120v ± 10% (200mA) or a 230v ± 10% (100mA), 50/60 Hz, single phase supply. The supply is fed, via its printed circuit card, to the reversing motor and is switched on/off by the remote mounted electronic controller.

The increase/decrease connections are made to the following terminals:-

INCREASE	-	L1 MAX
DECREASE	-	L1 MIN
EARTH	-	L2 N

Refer to the wiring diagram 30-E-7662 (see Fig.17).

To gain access to the plug positioner remove the control knob (use a 2mm Allen key), lift the lateral brackets and pull the cover away.

Make sure that the gear case of the positioner is safely connected to the earth stud.

In order to isolate the positioner from the mains supply during service or repair, install a 2 pole switch between the electronic controller and the positioner not far from the positioner.

Movement direction:	ZU/DEC	connecting rod moves out from plug housing, flow decreases
	AUF/INC	connecting rod moves into plug housing, flow increases

2.10 Vacuum Pipelines

With the flowmeter(s), injector(s) and demand valve(s) in place, the installation is completed by interconnecting the units with vacuum pipelines. Support long pipeline runs with tube clips or brackets.

CAUTION: Polyethylene pipes become brittle under the influence of chlorine and they should not be installed in narrow, badly vented protection pipes or in the ground which can hasten the process.

2.10.1 Vacuum line from cylinder mounted demand valve to flowmeter

NOTE: The vacuum line extending from the demand valve to the flowmeter must not exceed the distance for the standard tubing and pipe sizes given. If necessary any size tubing or pipe can be installed which will not give more than 127 mm of water differential between flowmeter assembly and vacuum demand valve at maximum feed rate. Note that the equivalent length of the fittings must be added to the tubing length to obtain the equivalent tubing length. (See Section 2.10).

The following table shows, in metres, the maximum pipe run allowed between cylinder and flowmeter for a given **chlorine/sulphur dioxide** feedrate.

Flowrate:	60-200g	400g	600-1000g	1.5-2.0kg	3.0kg	4.0-5.0kg	6.0kg	8.0kg	10kg
Flexible plastic tube 3/8" x 1/2" od (RP.68-4484) (m):	>300	>300	100	25	10	6	-	-	-
Flexible plastic tube 1/2" x 5/8" od (RP.68-4502) (m):	>300	>300	>300	130	110	38	18	11	7
Rigid pvc tube (DN 15) (m):	>300	>300	>300	>300	250	110	50	31	21
Rigid pvc tube (DN 20) (m):	>300	>300	>300	>300	>300	>300	162	96	64

2.10.2 Vacuum line from flowmeter to injector

The following table shows, in metres, the maximum pipe run allowed between **flowmeter** and injector for a given **chlorine/sulphur dioxide** gas feedrate.

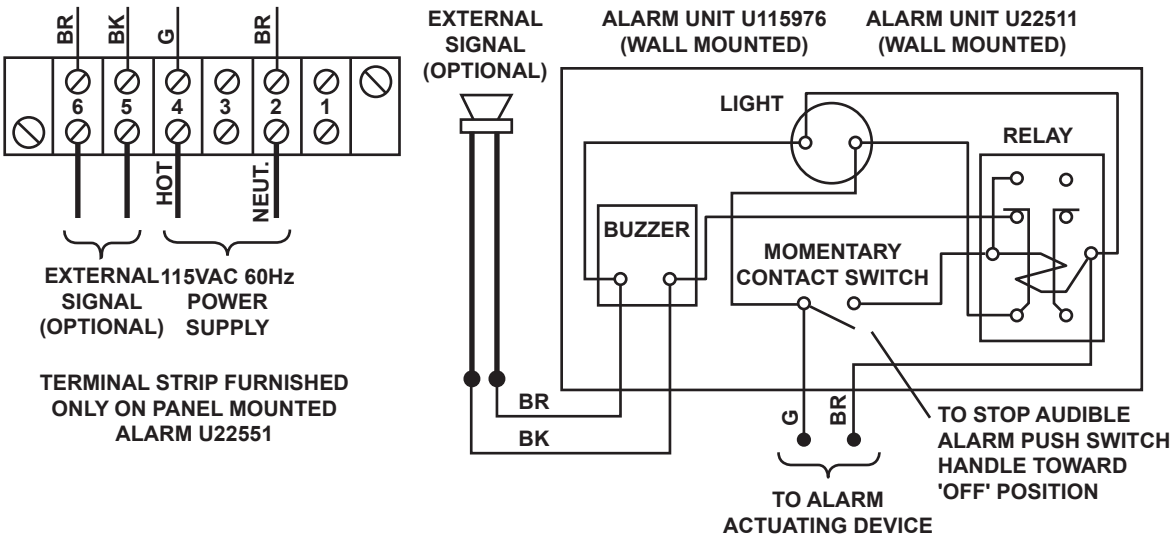
Flowrate: g/h	200	400	1000	2000	3000	4000	6000	88000	10000
Flexible plastic tube 3/8" x 1/2" (RP.68-4484):	>300	>300	200	50	20	12	-	-	-
Rigid pvc tube (DN 15):	>300	>300	>300	>300	300	200	100	-	-

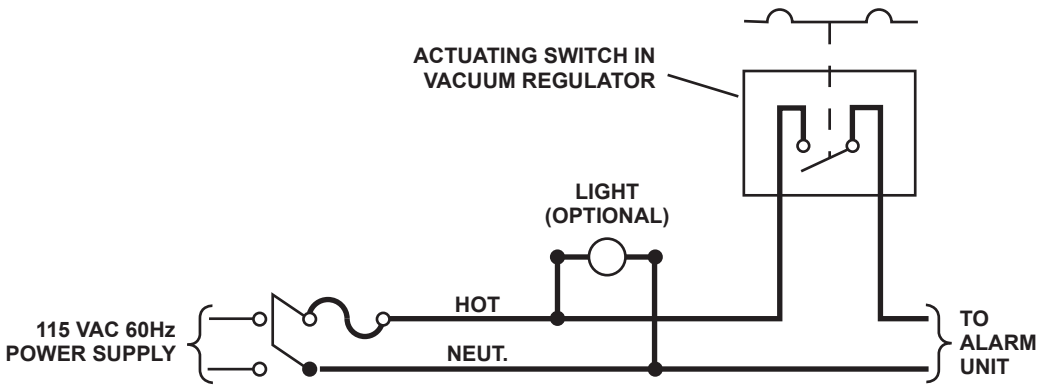
2.11 Single and Dual Function Alarm Switches (Fig.10 and 11)

The single function alarm switch is fitted inside the demand valve and provided with flying leads to enable its volt free alarm contacts to be connected to the associated alarm system.

Supplied as a loose item the dual function alarm switch is mounted on a wall close to the flowmeter and connected to it by a length of 6 mm id vacuum tubing. The centres of the units four locating holes are 80 mm in the horizontal plane and 70 mm in the vertical.

The remote alarm system is wired to the alarm switch by removing the alarm switch cover to gain access to the terminals and connecting the leads as indicated within the unit.





NOTE: —— Wiring by W&T

Field wiring (not W&T) must conform to local electrical codes

3 OPERATION

3.1 Preparation for Initial Operation

When all the connections in Section 2 have been made, the following pre-start checks must be carried out before the plant is placed in service.

3.1.1 Physical check

1 Ensure the gas supply lines from the cylinders are securely connected and that all valves in the system are closed.

2 Check that the water inlet line from the source of supply to the injector is securely connected.

3 Ensure the safety vent line is securely connected to the vacuum demand valve and that it terminates correctly outside the building.

4 Ensure the injector vacuum line is correctly fitted to the flowmeter assembly gas outlet and to the injector.

5 Check the solution line from the injector to the point-of-application. If the point-of-application is into a main through a corporation cock, the cock must be opened and the tube pushed in as far as possible and secured on the bayonet fitting.

6 Check the installation of any accessories fitted. Ensure the check valve is fitted correctly (the arrow indicates the direction of flow); ensure a drain line is fitted to the anti-siphon valve, terminating above a suitable drain.

3.1.2 Injector vacuum and leak check

1 Keep the valves on the chlorine cylinders closed. Open the valves in the water supply line to the injector and at the point-of-application. Check for leaks.

2 Check that the float rests on the bottom stop of the flowmeter. Any movement of the float indicates an ingress of air on one of the following locations:

- through the pressure relief valve
- through the 'O' ring on the bottom of the flowmeter
- through cracks in the flowmeter
- through the 'O' rings at the pipe connections
- through any incorrectly cemented joints or slack unions in the pipework.

3.1.3 Testing for gas leaks

WARNING: In the procedures described in the following paragraphs, chlorine gas is introduced into the system and all pressure joints are tested for leaks. It is recommended breathing apparatus are worn during the procedure!

NOTE: Testing for chlorine or sulphur dioxide gas leaks is accomplished by using a puffer bottle (W&T Part No.U86151), containing a 10% ammonia solution, to introduce ammonia fumes to the area under test. Any escaping gas will combine with the ammonia to form dense white clouds of ammonium chloride.

WARNING: Before commencing this procedure, ensure that the injector associated with the gas feed system is operational, i.e. that the injector is operating correctly and can be started immediately a gas leak is detected. On automatically controlled units select the manual mode of operation. If a leak of gas is detected, close the storage cylinder or header valves and start-up the injector immediately. Open all other valves in the gas supply line, including the vacuum demand valve, to evacuate any gas from the system. Rectify the leak and restart the procedure.

1 Activate the gas warning device.

2 Make sure the vacuum demand valve is set in the 'OFF' position and that all shut-off valves in the gas supply system are in the closed position.

3 Ensure that the auxiliary cylinder valve (if one is used) is closed and then crack open the main cylinder valve. Carry out leaks tests around the valve assembly as detailed in the NOTE shown above. If no leaks are detected, open the main cylinder valve one full turn.

4 Open the auxiliary cylinder valve (if one is used) and then close it again and carry out the leak test detailed in the NOTE shown above, to the next valve in the system. If there are no leaks, fully open the auxiliary cylinder valve.

5 Continue until each valve up to the vacuum demand valve is tested.

3.2 Operating Procedures

3.2.1 Preparation for initial operation

WARNING: Hazardous gas is present in this equipment during normal operation. To avoid possible severe personal injury or damage to the equipment, read this instruction book before connecting this equipment to a supply of gas. Operation and maintenance of this equipment must be restricted to trained, qualified personnel who are completely familiar with these instructions.

When all the above checks are satisfactorily concluded carry out the following checks of the gas feeder.

1 If the point-of-application is in a main through a corporation cock or valve, the cock or valve must be open. Push in the solution tube, if fitted, until the end extends into the main, approximately a 1/3 to a 1/2 of the diameter of the main. In the case of large mains, the tube may be pushed in as far as it will go.

2 With the gas supply turned OFF at the cylinder valve and the vacuum demand valve set to 'STAND-BY' or 'ON', open all the valves in the injector water supply line. The vacuum created should cause the red OUT-OF-GAS indicator to show. If sufficient vacuum cannot be obtained consult the Section on servicing and trouble shooting.

3 If proper injector operation is indicated, test the chlorine supply pipeline for leaks. Start at the source of gas supply and open valves in sequence. Test each valve and connection for leaks as the valve is opened near the point under test. A gas leak will produce a white vapour because of the reaction between chlorine and ammonia. If a leak is detected, shut off the gas supply immediately and allow the gas to be exhausted from the system. (See Section 3.2.4 Shutdown for Extended Periods). Correct the leak before further testing or operation is attempted.

3.2.2 Start-up

NOTE: The following procedures assume that all preparatory steps and leak tests have been completed satisfactorily.

1 Set the vacuum demand valve to 'ON'. Turn on the water supply to the injector and open the V-notch plug part-way. If there are two valves (automatic switchover system) select one cylinder as the 'duty' supply and set its demand valve to 'ON'. This should create a vacuum which will uncover the red OUT OF GAS indicator on the front of the vacuum demand valve.

2 Turn on the gas at the supply cylinder. This should cause the red OUT OF GAS indicator to disappear.

WARNING: To avoid possible severe personal injury or equipment damage, do not open the gas supply container valve more than one turn approximately. This will permit maximum discharge and also can be turned off quickly in the event of a gas leak.

3 If there are two vacuum demand valves, open the gas cylinder valve on the stand-by cylinder approximately one turn and set the control knob of the valve to the Stand-by position.

3.2.3 Shutdown for short periods

1 Turn off the water supply to the injector.

3.2.4 Shutdown for extended periods (e.g. servicing and repair)

WARNING: In the following procedure, which must be carried out before servicing any gas feeder system, a gas line is disconnected with a possible release of gas. It is recommended breathing apparatus are worn.

1 Isolate the vacuum demand valve from its gas supply (i.e. shut the main cylinder valve for a cylinder mounted valve or the appropriate header valve for multiple demand valve arrangements). Wait until the OUT-OF-GAS indicator shows all red and the float rests on the bottom stop of the flowmeter.

2 Slacken the connection between the vacuum demand valve and its gas isolating valve. Air is now drawn through the valve and into the system to purge any remaining gas.

3 After at least three minutes re-tighten the connection, turn the vacuum demand valve to OFF and turn off the water supply to the injector.

4 Release any pressure that may have built up in the solution delivery line (refer to WARNING in Section 2.7.4). If need be protect against frost by draining the water supply and solution delivery pipelines.

3.3 Intermittent Start/Stop Operation

Intermittent start/stop of the gas feed system is achieved with a solenoid operated water shut-off valve. The valve is installed in the injector water supply line and used to control the disinfection process. If appropriate the valve can be connected to operate in conjunction with a booster pump or similar item of equipment.

3.4 Electric Plug Positioner

Refer to Sections 4.6 and 4.7 in this manual for detailed instructions on making adjustments to the electric plug positioner.

3.4.1 Zero position of v-notch plug for auto control

To zero the V-notch plug for automatic control adjust the electronic controller until it outputs a zero flow signal and then carry out the following steps:-

1 Shut down the system, evacuate all gas from the vacuum pipework and release any pressure in the discharge line (see Section 3.2.4).

2 Pull out the knob on the plug positioner (Fig.3 (18)), disengage the drive and then turn the control knob manually to lower the actuator shaft as far as possible.

3 Disconnect the clamp nut (13).

4 Unscrew the V-notch plug (2).

With the V-notch plug and plug stem in the extension chamber and the orifice seated, move the plug stem in or out until the scratch line on the bottom of the plug is level with the bottom of the orifice as viewed through the holes in the extension chamber. Draw a pencil line around the plug stem, level with the bottom of the seal clamping screw. This line may be used as a zero reference when the parts are assembled in the plug housing and the linkage is adjusted to match the zero of the electric actuator.

3.5 Changing Gas Cylinders

WARNING: To avoid possible severe personal injury or equipment damage, prior to changing cylinders the person must be completely familiar with this manual and the local plant operating and emergency procedures. Gas cylinders must be secured in such a manner (e.g. chain) as to prevent their being knocked over.

When a cylinder is depleted, as shown by the red OUT OF GAS indicator on the front of the vacuum demand valve or by a weigh scale showing depletion of contents, place a full cylinder ready for service. If the gas feeder is operating, the injector need not be shut off. If the system has two vacuum demand valves for automatic switchover, the in-use unit need not be shut off. Proceed as follows:-

1 Bring a full cylinder to the point of use.

2 Close the main supply valve on the depleted cylinder.

3 Turn the vacuum demand valve control knob all the way to the OFF position.

CAUTION: When any connection is broken even for a short time, immediately plug the resultant openings with a rubber stopper or equivalent to prevent the entrance of moisture.

4 Disconnect the empty cylinder from the supply line. If the vacuum demand valve is mounted directly on the cylinder, loosen the yoke screw and remove the vacuum demand valve from the depleted cylinder. Rest the valve on any support surface or hang from a hook through the yoke.

CAUTION: Do not permit the demand valve to hang by its tubing as this practice may loosen or damage the tubing at the connectors.

5 Release the chain and move the depleted cylinder aside.

6 Move the full cylinder into place, secure with chain and check the cylinder valve packing nut has not worked loose.

7 Remove the old gasket from the supply line connection or demand valve inlet nipple and discard it. Replace it with a new lead gasket.

NOTE: Every three months, during a cylinder change, replace the mesh screen (Figs. 4 &5 (10)) and filter (9) fitted into the spring retainer (6) of the cylinder yoke nipple (3).

CAUTION: The mesh screen (10) must be inserted into the spring retainer (6) before the PTFE filter (9). If these items are placed in the wrong order the filter may be pulled into the valve by the vacuum.

WARNING: The PTFE filter (9) must always be fitted. Failure to fit the filter will result in the valve blocking and the subsequent venting of gas.

8 Position the demand valve on the cylinder valve and tighten the yoke screw securely.

9 Check for leaks as detailed in Section 3.1.3.

10 Check the gasket joint and packing nut for leaks.

WARNING: To avoid possible severe personal injury or equipment damage, do not tolerate leaks. Leaks always get progressively worse and must be corrected promptly.

11 Open cylinder by turning its valve handle approximately one turn.

12 After correcting leaks, turn demand valve knob fully to 'ON'.

13 Move empty cylinder to the storage area after replacing its cap and hood and tearing the tag (designating an empty cylinder).

3.6 Electronic Controller

Instructions for the electronic controller (PCU or SCU) can be found in a separate instruction book supplied with the controller.

3.7 Multiple Points - of - Application

If there are several flowmeter units in the system, these may be started and stopped at will, independent of each other as long as the gas supply is turned on. The operation of the injector associated with each flowmeter assembly determines whether or not it will feed gas.

4 MAINTENANCE

4.1 General

This section contains information on maintaining the S10k Demand Valve in good working order. It describes dismantling, servicing, reassembling the valve and includes illustrated views and spare parts lists.

WARNING: Hazardous gas is present in this equipment during normal operation. To avoid possible severe personal injury or damage to the equipment, read this instruction book before reconnecting this equipment to a supply of gas. Before any maintenance work is started the shutdown procedure detailed at Section 3.2.4 must be carried out.

4.1.1 Checking for gas leaks

WARNING: To avoid possible severe personal injury or equipment damage, no leaks should be tolerated. They always get progressively worse and must be promptly corrected. It is good practice to have an approved positive pressure breathing set available when making leak checks.

Check daily for signs of leaks - refer to the gas leak procedure detailed in Section 3.1.3. Eliminate any leak before proceeding. Green or reddish deposits on metal parts are an indication of a gas leak. There should be no evidence of a gas odour around the equipment except when a joint is temporarily opened.

4.1.2 Checking for water leaks

Check all connections daily - for signs of water leaks. Do not tolerate a water leak. Repair all water leaks as soon as they are discovered.

4.1.3 Moisture

CAUTION: When any connection is broken even for a short time, the resultant opening should immediately be plugged with a rubber stopper or equivalent in order to prevent the entrance of moisture. Moisture must be excluded from any part of the equipment which is normally exposed to dry gas only. While dry gas is non-corrosive, moist gas on the other hand is extremely corrosive to common metals such as brass or steel.

4.1.4 Plastic parts

When assembling plastic parts, use Teflon tape or Halocarbon grease on threads to prevent parts locking together. In general do not use tools to make up plastic connections. Make this type of connection by hand.

4.1.5 Gaskets and O-rings

A supply of gaskets and O-rings should be kept on hand so that all gasketed joints can be maintained in proper condition. Regular replacement of gaskets will minimise operating difficulties and is recommended. The preventative maintenance kit includes a set of gaskets. When replacing an O-ring be sure to grease it using Halocarbon grease.

WARNING: To avoid possible severe personal injury or equipment damage, never reuse gaskets. Always replace with a new gasket of the proper size and material as identified on the equipment drawing.

4.1.6 Cleaning the parts

If the flowmeter tube, float or V-notch plug becomes contaminated with impurities sometimes found in gases, it should be removed and cleaned.

WARNING: All cleaning should be carried out in an open area or in a well ventilated room.

1 Most of the residue which accumulates can usually be removed with warm water and a detergent.

2 If further cleaning is necessary, metal, glass and ceramic parts may be washed in a suitable solvent. Plastic and hard rubber parts should be cleaned only with warm water and a detergent, followed by methylated spirits (if necessary).

WARNING: Carbon tetrachloride is a satisfactory cleaning agent, but its use is not recommended due to possible toxic effects of exposure to its fumes. Do not use wood alcohol, ether, petrol or petroleum distillates.

3 All traces of solvent and moisture must be removed from parts which come in contact with the gas before being returned to service. Do not use heat on plastic or hard rubber parts.

4.1.7 Tools

When working with screws, bolts, nuts and other hardware, use the correct size tool to avoid damage. This precaution will make it easier to remove the components when necessary.

4.1.8 Injector performance

Good injector performance is necessary for proper gas feeder operation. The gas feeder is tested to ensure that it will deliver the required amount of gas when used at the correct hydraulic conditions. If the injector performance is poor check the following:-

1 **Dirty Water Strainer** - Fit a strainer in the water line prior to the injector to prevent foreign matter from blocking the injector throat ports. If material is allowed to build up on the strainer surface, the resultant pressure drop across the strainer will reduce the injector operating water pressure. If the drop is excessive, the injector will not be able to pull the required gas flow. Regular periodic inspection and cleaning of the strainer will minimise the possibility.

2 **Installation of Throat and Tailway** - The throat and tailway must be assembled as shown on the parts drawing. If faulty injector action is suspected, inspect the gaskets and replace them if necessary.

3 **Blocking of the Injector Ports** - The injector will not operate satisfactorily unless all its ports are clear. The quality of the injector water supply is easily checked by visual inspection after the throat has been removed. If the water supply contains appreciable quantities of manganese or iron, these may deposit in the throat or tailway over a long period and eventually interfere with the injector action. Such deposits are readily recognisable by their black or reddish colour. They may be removed by immersing the throat in a dilute (10%) solution of hydrochloric acid (known commercially as muriatic acid).

WARNING: To avoid possible severe personal injury or equipment damage, when working with hydrochloric acid observe all safety precautions recommended by the manufacturer/supplier.

4.2 Maintenance Intervals

The following maintenance/service operations, at the intervals stated, are considered the minimum necessary for optimum efficiency of the S10k gas feed system. However, the frequencies and recommendations given may need adjusting and/or amending to accord with local operating conditions (gas feed rate, amount of gas fed, the source of chlorine and operating water quality) which can vary significantly from site to site.

4.2.1 Daily

Check the complete system for signs of gas and water leaks.

4.2.2 Weekly

Remove and clean solution injection tubes.

4.2.3 Monthly

Check the flexible connections in the gas supply system for signs of deterioration and renew as necessary. Deterioration exists if a salmon pink colour develops on the end fittings (de-zincification owing to a minute leak), if dents or kinks are present or if the tubing squeaks when handled (a sure sign of internal stress corrosion).

4.2.4 Three monthly (performance checks)

To ensure that all elements of your system are functioning normally, check the following at approximately three monthly intervals. These checks are easily performed and require no tools.

1 With the gas cylinder valve open, the vacuum demand valve turned on and the injector operating, vary the feed of the flowmeter assembly through its full range. The gas should feed steadily and hold any rate set from the maximum flowmeter setting, down to 1/20th of the maximum setting. The flowmeter float should not stick or behave erratically at any point.

2 With the injector still operating, turn off the gas supply at the cylinder valve. In a few moments the red indicator should appear on the front cover of the vacuum demand valve. After initially rising, the flowmeter float will sink until it finally rests on the bottom stop. Decrease the feed rate if necessary to prevent the float from bouncing violently and damaging the glass tube. Failure of the float to settle down indicates an air leak upstream of the flowmeter.

3 When the indicator is red and the flowmeter float has settled on the bottom stop turn off the injector operating water. A rapid decrease in vacuum indicates an air leak somewhere in the system.

4 If the system is equipped with automatic switchover vacuum demand valves, operate the gas feeder with only one valve turned on. Set the second valve to stand-by and then close the gas cylinder valve of the first valve. The vacuum level should momentarily increase and then decrease and the knob on the second valve should be seen to snap down about 3/8 inch as it assumes the feeding function. Repeat the procedure to ensure the other valve also works automatically. If either valve does not switch on automatically it is an indication that its detent mechanism needs servicing and the unit should be returned to Wallace and Tiernan (see section 4.4).

5 Close the gas supply cylinder valve(s). Shut down the injector and let normal back pressure remain. Remove the tubing from the connection at the injector. No water should drip from the end of the disconnected tubing. Leave the tubing disconnected for approximately 10 minutes. Note if any water appears at the outer end of the connection fitting on the injector. Appearance of water is an indication that the injector back check valve should be serviced.

6 With the injector shut off and the gas supply cylinder valve closed, turn the vacuum demand valve off. Remove the vacuum tubing from the valves outlet. Crack the gas cylinder open about 1/8th of a turn and use the ammonia puffer bottle near the outlet of the unit to verify that the valve seats shut off tightly (no white vapours). Close the gas cylinder valve. A slight trace of vapour at the moment of disconnection may be ignored but any continuing vapour formation is an indication of gas passing the valve seat. If this is observed return the valve to Wallace and Tiernan (see Section 4.4).

Recommended Cleaning Intervals:-

Flowmeter and V-notch	-When deposits are seen inside the plug, tube or the float sticks in one place
Injector throat and tailway	-Every six months
Vacuum demand valve	-Refer to Section 4.4

NOTE: The actual frequency of cleaning will depend on calendar time, the feed rate and amount of gas fed, the care exercised in cylinder changing, the source of gas, and on the quality of the operating water.

The above maintenance schedule provides recommended cleaning intervals. However, the operators own experience is the best guide to preventative maintenance and these may result in significant variations from the recommended schedule.

4.2.5 Six-monthly

Clean the flowmeter, V-notch plug assembly and the injector throat and tailway in accordance with the procedures in Section 4.3. Observation of the flowmeter tube will indicate if the tube and also therefore, the V-notch plug, need cleaning more frequently.

4.2.6 Yearly

If the pressure side of gas pipework includes flexible connections your attention is directed to the Chlorine Institute's recommendation that:-

Flexible metal tubing connections used to connect supply cylinders to piping systems "Should be replaced whenever there is a sign of deterioration but, in any event, at intervals no less than annually".

Similar recommendations apply for other gases.

This recommendation recognises the potential for mechanical damage to these connections in normal use as well as the possibility of reduced mechanical strength resulting from the corrosive effects of damp air entering the tubing when cylinders are changed. Either of these conditions can be difficult to detect and carries the potential for breakage and resultant chlorine (or other gas) leakage. A timely replacement programme can minimise this potential.

Deterioration exists if a salmon pink colour develops on the end fittings (de-zincification due to a minute leak), if dents or kinks are present (which weaken the tubing) or if the tubing "squeaks" when it is handled (a sure sign of internal stress corrosion).

NOTE: Attached a label to each flexible indicating the date flitted, a record of inspections made and date it should be removed from service.

1 Dismantle the gas feed system (NOT the demand valve — see Section 4.4), clean all pipelines and the components in accordance with the foregoing Section 4.1 and the Service Notes at Section 4.3. On completion of the overhaul, carry out the Preparation for Initial Operation at Section 3.1.

2 Thoroughly check and inspect all solution delivery pipework.

4.2.7 Preventive maintenance

NOTE: If the gas feeder is used seasonally (long term shutdown) then the preventative maintenance procedure should be performed prior to start-up. This kit is supplied with the appropriate instructions.

Preventive Maintenance Kits

EQUIPMENT	TIME INTERVAL	KIT No.
Flowmeter 4 kg/h (3" Flowmeter)	At one-year intervals.	AAA1349 / W3T291490
Flowmeter 10 kg/h (5" Flowmeter)	ditto	AAA1343 / W3T291489
Vacuum Demand Valve	ditto	AAA1160 / W3T291488
Injector U.96275 (19mm)	At one-year intervals.	APQ4389 / W3T291971
Injector U.96273 (25mm)	ditto	AJE4406 / W3T291950
A/S Inj. U.96276 (19mm)	ditto	APQ4389 / W3T291971
A/S Inj. U.96274 (25mm)	ditto	AJE.4406 / W3T291950
Plastic Tubing, Corp. Cock and Solution Tube.	At one-year intervals.	Refer to parts list

4.3 Service Notes

WARNING: Except when detecting leaks or making calibration adjustments, to avoid possible severe personal injury or equipment damage, the system MUST be shutdown as detailed in Section 3.2.4 before breaking any connections.

4.3.1 Cleaning the flowmeter

If a milky white, powdery white, green slimy or brown oily deposit is visible inside the flowmeter tube or if the float has particles clinging to it or tends to stick to the tube wall at lower feedrates, clean the flowmeter. Do not drop the glass tube or float. Have a clean cup (such as a coffee cup or small beaker) and a pair of tweezers at hand before starting. Proceed as described in the following steps.

1 Shut down the gas feed system, evacuate all gas and release any pressure in the discharge line (see Section 3.2.4).

2 Insert the curved edge of an open wrench or similar into the slot in the flowmeter jackscrew and remove the jackscrew by turning it in a counter clockwise direction. Carefully remove the flowmeter tube from its housing. Take care not to lose the end stops, the float and the gaskets.

3 Place the end stops and float into the cup mentioned above.

4 Many gas contaminants are soluble in water and can be flushed out under running warm water (45 to 50° C). Submerge the tube for about 30 seconds; hold the tube (half full with water) capping the ends and shake vigorously endways for a few seconds. Discharge the water and repeat until clean. Use a common pipe cleaner to scrub the interior. A detergent will promote cleaning action.

WARNING: Do not use hydocarbons or alcohol because residual solvent may react with gas. Solvents can produce serious physiological effects unless used in strictest compliance with the solvent manufacturer's safety recommendations.

5 Drain and let dry. Do not use a pipe cleaner for drying because the lint from it will stick to the tube interior. Place the tube at a angle between a horizontal and vertical surface (as between a shelf and a wall) with both ends open so that air can flow through. Do not blow through the tube as moisture from the breath will condense on the tube walls.

6 To clean the float, pour about an inch of warm to hot water (55 to 65° C) into the cup containing the float. Grasp the float with tweezers and shake it from side to side for a few seconds while keeping it submerged. Release the float. Repeat the action several times so that all surfaces are washed. Hold the float with the tweezers, discard the wash water and repeat the above. A few drops of detergent will improve the process. Do not hold the float with your fingers.

7 Allow the float to dry on a clean surface and then, with tweezers place it in a clean dry cup.

NOTE: Do not attempt to dry the float with a piece of rag or with paper towel as electrostatic forces will make lint and other particles stick to the float.

8 Clean the float stops with water as necessary. These may be handled with the fingers. Dry thoroughly before re-assembly.

9 When the tube, float and float stops are clean and dry, reassemble the flowmeter as described in Section 2.5.

4.3.2 Cleaning the V-notch plug (Figs.2/3)

The same contaminants seen in the flowmeter are in the gas stream flowing through the V-notch orifice and may also be deposited at this point. At the same time the flowmeter is cleaned, also clean the V-notch plug. If at any time during operations the float movement is not proportional to V-notch plug adjustment (a sudden marked rise or drop for a small amount of plug adjustment), the V-notch plug needs cleaning.

1 Shut down the gas feed system, evacuate all gas and release any pressure in the discharge line (see Section 3.2.4).

2 On manually controlled flowmeters completely remove the control knob with V-notch plug assembly (Fig.2A/B (3)) from the flowmeter housing.

3 Using running water or a cup full of water and a small, stiff brush (such as a tooth brush) scrub out the V-notch groove and the shank of the plug. Do not use a knife, scraper or file to clean out the groove. Dissolving action and scrubbing are all that are required.

4 Dry the plug with a clean cloth or paper towel and refit to unit.

5 On automatic units remove seal clamping screw (Fig.3 (23)) and extension chamber (9). Clean and inspect orifice (26) and O-rings (25) and renew if necessary.

WARNING: Do not use hydrocarbons or alcohol because residual solvent may react with gas. Solvents can produce serious physiological effects unless used in strictest compliance with the solvent manufacturer's safety recommendations.

6 Wipe a thin film of Halocarbon grease on the threads of the V-notch extension chamber assembly. Refit it to the flowmeter assembly, reconnect the positioner and resume operation.

4.3.3 Cleaning the injector throat and tailway

Water containing carbonates, manganese or iron will frequently leave a deposit in injector tailways. As this deposit increases in thickness it can become scaly or rough and adversely affect pressure recovery or increase back pressure so that the injector fails to develop adequate operating vacuum. If the upstream strainer becomes corroded or perforated and passes a small pebble or other material, such particles can partially obstruct the throat and prevent adequate flow. Water containing suspended silt or sand particles can erode the opening in the throat. As the opening becomes larger, the velocity developed is reduced and the vacuum decreases.

Deposits may be removed by immersing the throat in dilute (10%) hydrochloric acid, known commercially as muriatic acid.

WARNING: To avoid possible severe personal injury or equipment damage when using hydrochloric acid, observe all safety precautions recommended by the acid manufacturer/supplier.

The injector should develop a dynamic vacuum of at least 540 negative mbar at the maximum flowmeter indicated feedrate. Lower gas feed rates tend to be higher for the same hydraulic conditions. With the gas supply shut off the static vacuum should be 840 to 940 negative mbar.

If the gas feeder fails to operate, inadequate vacuum is the most common reason and the injector is the first place to check. Proceed as described in Troubleshooting (Section 4.8).

4.3.4 Cleaning the 19mm injector check valve (Fig.8)

NOTE: When removing O-rings, use a needle to pull them out. Do not damage the tightening surfaces. Apply Halocarbon grease to the new O-rings and to the threads.

1 Shut down the gas feed system, evacuate all gas from the system, and release any pressure in the discharge line (see Section 3.2.4).

2 Disconnect the operating water and solution lines.

3 Disconnect the vacuum tube and as far as possible remove the water and solution lines to allow access to the injector throat (black with number) and tailway (white with letter).

4 Unscrew the throat and tailway.

5 Renew the O-rings.

6 Unscrew the inlet screw (3). Remove the valve stem (7). Renew the O-ring (5) and spring (6).

NOTE: Renew the valve stem (7) every two years.

7 Unscrew the union nut (21), if necessary use a strap wrench.

8 Remove the upper body (9).

9 Renew the ball headed valve stem (10). Take particular care not damage the ball head.

10 Remove the diaphragm assembly (19).

11 Unscrew the clamping nut (18) from the valve seat (12). Renew the diaphragm (19), O-rings (11 and 13) and spring (14).

NOTE: Renew the valve seat (12) every two years. Reassemble the valve seat and clamping nut, and tighten slightly with tongs.

12 Renew O-ring (13).

13 Place the spring (14) on the clamping nut (18) and together with the diaphragm assembly (19) insert into the body.

14 Refit the upper body (9) and the union nut (21). Lightly tighten.

15 Turn the upper body until the gas inlet faces the desired direction, ensure the two parts engage correctly and tighten the union nut.

16 Reassemble the valve stem (7), spring (6) and O-ring (5). Place the O-ring (4) against the body (9) and refit the inlet screw (3).

17 Take note of the flow direction and screw the throat (black with number) and tailway (white with letter) into the injector.

18 Reconnect the operating and solution water lines.

19 Renew the O-ring in the gas inlet connection.

20 Reconnect the vacuum line to the injector.

21 Check for tightness and function.

4.3.5 Cleaning the 19mm anti-syphon injector (Fig.9)

NOTE: When removing O-rings, use a needle to pull them out. Do not damage the tightening surfaces. Apply Halocarbon grease to the new O-rings and to the threads.

1 Shut down the gas feed system, evacuate all gas and release any pressure in the discharge line (see Section 3.2.4).

2 Drain the operating and solution water lines.

3 Follow the directions in Section 4.3.4 for steps 3 to 12.

4 Unscrew the lower union nut (5), if necessary use a strap wrench.

5 Remove the bottom cover (13) and spring (9).

6 Pull out the diaphragm assembly with guide pins (2). If necessary, press equally on both pins from the opposite side.

7 Renew the O-rings (15).

8 Unscrew the lower clamping nut (11) from the disk (3).

9 Renew the diaphragm (7) and O-ring (6).

10 Reassemble the diaphragms (7) with the O-ring (12), disk (3) and clamping nut (11).

NOTE: Renew the pins (2), every 5 years or when worn out or stiff. Remove the screws (14). Insert the new washers (4). Do not grease the washers, but apply some Loctite 242 to the threads. Tighten the screws, then loosen 3/4 turn.

11 Renew the O-ring (6) between the bottom cover (13) and body.

12 Put the diaphragm assembly (7) with the disk and pins into the body.

13 Refit the spring (9) and bottom cover (13). Screw on the lower union nut (5).

14 Place the spring (Fig.8 (14)) on the clamping nut (18) and place together with the diaphragm assembly (19) into the body (9).

15 Refit the upper body (9) and the union nut (21). Tighten slightly.

16 Turn the gas inlet to the desired direction, ensure the two parts engage correctly and then tighten the union nut.

17 Refit the check valve stem, the spring and O-ring. Place the O-ring against the body and refit the inlet screw.

18 Take note of the flow direction and screw the throat (black with number) and tailway (white with letter) into the injector.

19 Reconnect the operating and solution water lines.

20 Replace the O-ring in the gas inlet.

21 Connect the vacuum line to the injector.

22 Check for tightness and function.

4.3.6 Cleaning the 25mm standard injector and upper section of the 25mm anti-syphon injector (Figs.6 and 7)

NOTE: When removing O-rings, use a needle to pull them out. Do not damage the tightening surfaces. Apply Halocarbon grease to the new O-rings and to the threads.

1 Shut down the gas feed system, evacuate all gas and release any pressure in the discharge line (see Section 3.2.4).

2 Drain the operating and solution water lines.

3 Remove the vacuum tube from the injector. Remove the operating and solution water lines, as far as necessary, to remove the tailway from the injector.

4 Unscrew the tailway (marked with a letter).

5 Renew both O-rings and tighten again.

6 Loosen the six bolts (Fig. 6 (12)). Remove the upper body (18) and put aside, with the bolts still in the holes.

7 Remove the diaphragm (19) with clamping nut (24), valve seat (17), O-rings (16 & 21) and the spring (22).

8 Unscrew the clamping nut from the valve seat.

9 Renew the diaphragm, spring and the O-rings (16 and 21).

NOTE: Renew the valve seat (17), every two years. Renew the clamping nut (24), every 5 years.

10 Assemble together the diaphragm, valve seat, clamping nut and spring.

11 Renew the O-ring (20).

12 Refit the ball headed valve stem (14) and O-ring (13). Take care not to damage the ball head.

13 Place the diaphragm assembly and spring over the bolts of the upper body and press down into the lower body (23). Turn the gas inlet to face the desired direction and line up the bolt holes.

14 Insert the bolts and tighten equally.

15 Unscrew the plug (5). Renew the O-ring (6).

16 Take out the valve stem (11). Renew the O-ring (7) and the spring (10).

NOTE: Renew the stem (11), every 2 years.

17 Unscrew the plug (29) and Renew O-ring (28).

18 Press out and renew the valve seat (9) and its O-ring (8). Press in the new seat and O-ring until it reaches the stop, using a round rod or plastic tube (16 mm) with a flat, square front. Take note that the seating is on the side of plug (29).

19 Place the valve stem into the plug and refit the plug. Check the stem moves freely.

20 Screw in the plug (29) with its O-ring (28).

21 Renew the O-ring in the gas inlet.

22 Screw in the tailway and connect the operating water pipeline.

23 Connect the vacuum pipeline.

24 Check for tightness and function.

4.3.7 Cleaning the lower section of the 25mm anti-syphon injector (Fig.7)

NOTE: When removing O-rings, use a needle to pull them out. Do not damage the tightening surfaces. Apply Halocarbon grease to the new O-rings and to the threads.

1 Shut down the gas feed system, evacuate all gas and release any pressure in the discharge line (see Section 3.2.4). Follow steps 3 to 14 in Section 4.3.6 if the upper section of the injector is also to be cleaned.

2 Drain the operating and solution water lines.

3 Unscrew the clamping nut (11) with the parts connected.

4 Remove the valve stem (2) and renew its O-ring.

NOTE: Every 2 years, renew the valve stem (2).

5 Remove the securing clip (13).

6 Remove the clamping nut (11) and spring (12).

7 Remove the clamping disc (15) and renew the O-ring (7).

8 Renew the diaphragm assembly (4). Reassemble with clamping screw and spring, and secure with clip.

9 Screw in the tailway and connect to the operation water tubing.

10 Connect the vacuum line to the injector.

11 Check for tightness and function.

4.4 Servicing the Vacuum Demand Valve

4.4.1 Shutdown for servicing

WARNING: In the following procedure, which must be carried out before servicing any gas feeder system, a gas line is disconnected with a possible release of gas. It is recommended that self contained breathing apparatus are worn.

1 Isolate the vacuum demand valve from its gas supply (i.e. shut the main cylinder valve for a cylinder mounted regulator or the appropriate header valve for multiple demand valve arrangements). Wait until the OUT-OF-GAS indicator shows all red and the float rests on the bottom stop of the flowmeter.

2 Slacken the connection between the vacuum demand valve and its gas isolating valve. Air is now drawn through the valve and into the system to purge any remaining gas.

3 After at least three minutes re-tighten the connection, set the demand valve to OFF and turn off the water supply to the injector.

4 Release any pressure build up in the solution delivery line (refer to WARNING in Section 2.7.4 of the main instruction manual). If need be protect against frost by draining the water supply and solution delivery pipelines.

4.4.2 Disconnecting the Vent Line

WARNING: Any vertical section of the vent tube may contain chlorine gas/condensate.

1 Pinch the vent tube at its lowest point and then disconnect it from the demand valve.

2 Remove and plug the open end. If necessary clear the vent tube by passing dry air through it, or allow the tube to drain/vent into room under controlled conditions.

4.4.3 Removing the Vacuum Demand Valve

1 Loosen the union nut and disconnect the vacuum tubing from the demand valve outlet. Plug the tube with a rubber stopper to prevent the entrance of air and moisture while the valve is being cleaned.

2 Loosen the yoke screw and remove the entire vacuum demand valve to a location where the work is to be done. Cap the gas supply container valve outlet while they are not in use.

3 Remove inlet nipple (Fig.4 (3) Fig. 5(3))

4 Remove filter (9), screen (10), retainer (6), stem spring (5), and valve stem (4). Remove stop spring (Fig.14 (17)), spring (19), and stem (16) from pressure check housing (18).

5 Grip the inlet nipple and seat assembly with suitable tongs and hold it under hot running water (approx. 54° - 65°C (130-150° F)) to soften and flush away deposits. If running hot water is not available pour hot water, as from a kettle, in the same manner. Detergent may help loosen stubborn deposits.

CAUTION: Do not scrape or damage the hole in the Teflon seat as this could destroy the seat shape and stem seating surface.

6 Remove all traces of detergent and moisture from the parts before returning them to service. Do not use heat on plastic parts.

7 Clean the valve stems, springs, screen, retainer, and guide using hot water (an old tooth brush is a useful scrubbing tool on these parts). Do not use a knife or scraper on the conical part of the valve stem. Use paper towels or a clean rag to wipe and dry the parts.

8 Thoroughly dry all parts of the valve before re-assembly. Warming parts its the most effective means of drying them.

CAUTION: The mesh screen (10) must be inserted into the spring retainer (6) before the PTFE filter (9). If these items are placed in the wrong order the filter may be pulled into the valve by the vacuum.

NOTE: Always use a new screen and filter after servicing the valve.

9 Install stems with cones toward the Teflon seats. Install the spring. Insert the retainer, screen and guide. Lubricate the O-ring (1) and refit inlet nipple.

10 Apply a few drops of oil where the yoke screw enters the clamp and a dab of grease on the yoke screw thread to facilitate clamping.

11 Return the assembled vacuum demand valve to the gas supply container valve on which it is to be used. Install a new filter and lead gasket on the inlet nipple and tighten the yoke screw securely.

12 Remove any temporary plugs and refit the gas vacuum line and the vent line to their respective connections.

13 Turn the knob to OFF and test for gas leak checks before returning the unit to operations.

4.4.4 Preventive Maintenance

Maintenance of this equipment must be restricted to trained, qualified personnel who are completely familiar with these instructions.

General precautions simplify maintenance and help to prevent equipment failure. These precautions are easy to accomplish and will minimise repairs by providing good operating conditions.

NOTE: If the gas feeder is used seasonally (long term shutdown) then the cleaning procedure should be performed prior to start-up.

Recommended Cleaning Interval for S10k Demand Valve:-

Operating experience is generally the best guide to when preventative maintenance operations should be carried out. The actual frequency will depend on calendar time, the feed rate and amount of gas fed, the care exercised in cylinder changing, the source of gas, and the quality of the operating water. In general Evoqua Water Technologies recommend the following:-

Where the S10k is in continuous operation it should be serviced annually.

Where operation of the S10k is on a start/stop basis and is mounted on a cylinder it should be serviced every 6 months.

Wallace & Tiernan recognise that servicing of the S10k is not, generally speaking, within the responsibility of the plant operator. To cover this we offer two options:-

1 Where customers prefer to carry out their own maintenance - training of personnel to a level whereby Evoqua Water Technologies will provide certification of their ability.

2 Where customers prefer to use manufactures personnel - a Evoqua Water Technologies Service Engineer can carry out the service.

4.5 Testing Gas Pressure Relief Valve

Shut down the gas feed and evacuate all gas from the system as described in Section 3.2.4 of this manual.

1 Remove both the vent line tubing, from the pressure relief valve connection and the vacuum suction tubing from the demand valve outlet connection.

2 Connect a suitable length of tubing from the VENT half union to a container of water.

3 Connect a suitable length of tube to the vacuum demand valve outlet. Using a tee piece attach a squeeze bulb and a manometer to the tube.

4 Apply pressure with the squeeze bulb and note the manometer reading when bubbles start to appear in the water container. This pressure should be between 10 and 20 inches of water.

4.6 Adjusting the Automatic Plug Positioner

The electric plug positioner is tested and adjusted in the factory before despatch and should be ready to operate when installation and external wiring are complete. However, before starting the system after a major service it is recommended that the following procedure is adopted.

WARNING: Mains voltage can kill! It is essential that the utmost care is taken when work is carried out on an open chassis where mains voltages are present. It is recommended that mains supplies are switched off whenever possible.

Preparation

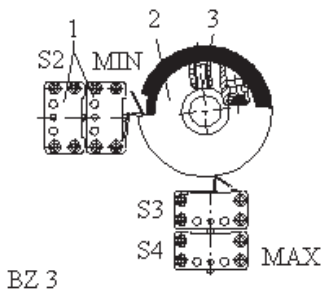
1 Switch off the mains supply to the positioner and to the limit switches and check to ensure that electrical isolation is complete.

2 Disengage the positioner drive by pulling out the actuator knob.

3 Remove the knob (use a 2 mm Allan key), unfasten the screws holding the cover, lift the side clips and remove the cover. Replace the knob or turn the knob shaft with a screw driver.

4 Remove the Allan key from inside of the cover for further use.

Adjusting the MINIMUM limit switch



BZ 3

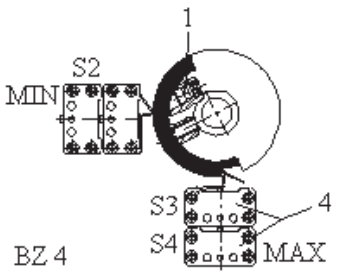
1 Move the connecting rod fully down and then 2 mm back.

2 Loosen the set screw (3) of the cam wheel (2).

3 Turn the yellow cam wheel until both MIN-limit switches (1) are switching.

4 Press the cam wheel to the stop and tighten the setscrew without turning the cam wheel.

Adjusting the MAXIMUM limit switch



BZ 4

1 Move the connecting rod fully up and then 2 mm back.

2 Turn the black cam wheel by turning the set screw (3) so far that both MAX switches (4) are switching. DO NOT LOOSEN or turn the whole cam wheel.

3 Check by moving the connecting rod.

4.7 Adjusting the feedback potentiometer

Adjustment is necessary, when a new board is mounted in the positioner or the motor gear unit has been removed or changed.

1 Open the cover (see **Preparation** at the start of Section 4).

2 Disconnect terminals 13, 14, 15 (see wiring diagram Fig.17).

3 Move the connecting rod fully outside to the stop.

4 Connect an ohmmeter to the terminals 13 and 14 on the board.

5 Loosen the great output tooth wheel on the shaft below the cam wheel.

6 Turn the tooth wheel until the ohmmeter displays between 10 and 30 ohm.

7 Lock the tooth wheel without turning it.

8 Move the connecting rod fully inside to the stop.

9 Ohmmeter must display resistance smaller than the total resistance of 1k ohm ± 10%.

10 Check both adjustments by moving the connecting rod.

11 Remove the ohmmeter and reconnect terminals 13,14 and 15.

12 Remove the control knob, if mounted and replace the cover without damaging the shaft sealing.

13 Move the connecting rod fully out.

14 Refit the control knob and turn it so that the arrow points to the minimum setting and fix in position.

15 Re-engage automatic drive ensuring tooth wheels mesh.

16 Switch on and check for function.

4.8 Troubleshooting (with a manometer and vacuum gauge)

WARNING: To avoid possible severe personal injury or equipment damage, shut off the gas supply at the gas cylinder valve and shutdown the system as detailed in Section 3.2.4.

The following troubleshooting table is provided for determining and correcting most of the systems common troubles (Steps 1 to 4 show basic procedure).

1 Measure the vacuum over the gas feed range. (Low, half and full).

2 Compare the measured figure with those given in the rest of the Section. If the figures are correct, leave that component alone and check the next element.

3 Make additional checks (if necessary) to pin-point the problem.

4 If repair work is needed, refer to the detailed instructions elsewhere in this manual for dismantling and replacement information.

4.8.1 Gas will not feed at all or will not reach full capacity (gas supply is normal)

CAUSE	REMEDY
Insufficient injector vacuum (measured at plugged port of injector using vac. gauge or manometer - if not available remove vac. line and place wetted thumb over vacuum inlet, vacuum should pull thumb firmly down and raise a bump on thumb).	Check inj. water supply pressure and back pressure. Check for deposits in throat and line strainer. Check discharge line for kink, part closed valves. Check recovery area.

4.8.2 Gas controls normally at high feed rates but not at low feed rates

CAUSE	REMEDY
Demand valve not throttling properly (vacuum measured at demand valve outlet by connecting a tee and single leg manometer, should be 13 to 40 inches of water)	Return vacuum demand valve to Evoqua Water Technologies

4.8.3 Float does not fall to bottom stop with gas off but injector still operating

CAUSE	REMEDY
Air leak upstream of flowmeter (float spinning or free floating in tube)	Check vacuum line between valve and flowmeter. If line is secure then return vacuum demand valve to Evoqua Water Technologies.

4.8.4 Float moves erratically with small changes to V-notch position

CAUSE	REMEDY
V-notch plug is dirty (a tooth brush and warm water is usually effective)	Remove the plug assembly and clean plug groove  **CAUTION:** Do not scrape or scratch the groove with sharp tool

4.8.5 No vacuum at gas inlet to injector (although supply/discharge pressures normal, throat/tailway clean, delivery line clear and 'O' ring good

CAUSE	REMEDY
Injector check valve not opening or diaphragms damaged	Replace parts as necessary or dismantle injector and examine diaphragms

4.8.6 V-notch hard to move, when forcibly moved an air leak is detected

CAUSE	REMEDY
Build up of gas contaminant residue on V-notch plug shaft is binding in the seal.	Remove entire V-notch assembly and soak in warm water for two minutes then clean seal
The shaft has been forced past the seal or the orifice forcing it open	Replace damaged seal and orifice. Lightly lubricate 'O' ring or seal with (Halocarbon), reassemble. Tighten seal clamp (if applicable) to give smooth sliding grip on plug

4.8.7 Gas feeder operates normally but gas usage does not agree with indicated feed rate

CAUSE	REMEDY
Air leak upstream of flowmeter	Check vacuum line between valve and flowmeter. If line is secure then return vacuum demand valve to Evoqua Water Technologies.

ILLUSTRATIONS

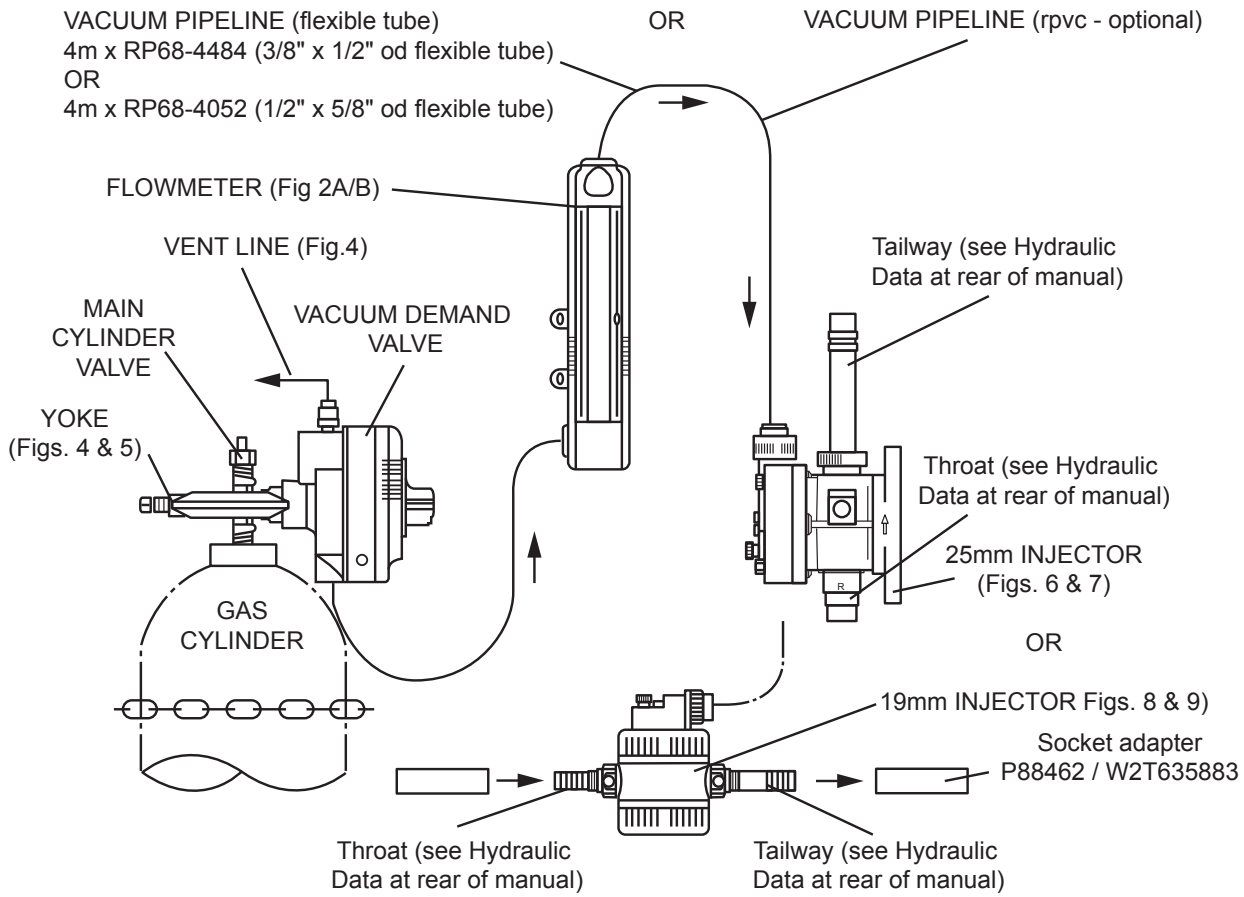


FIG.1A TYPICAL LAYOUT (REMOTE MOUNTED FLOWMETER)

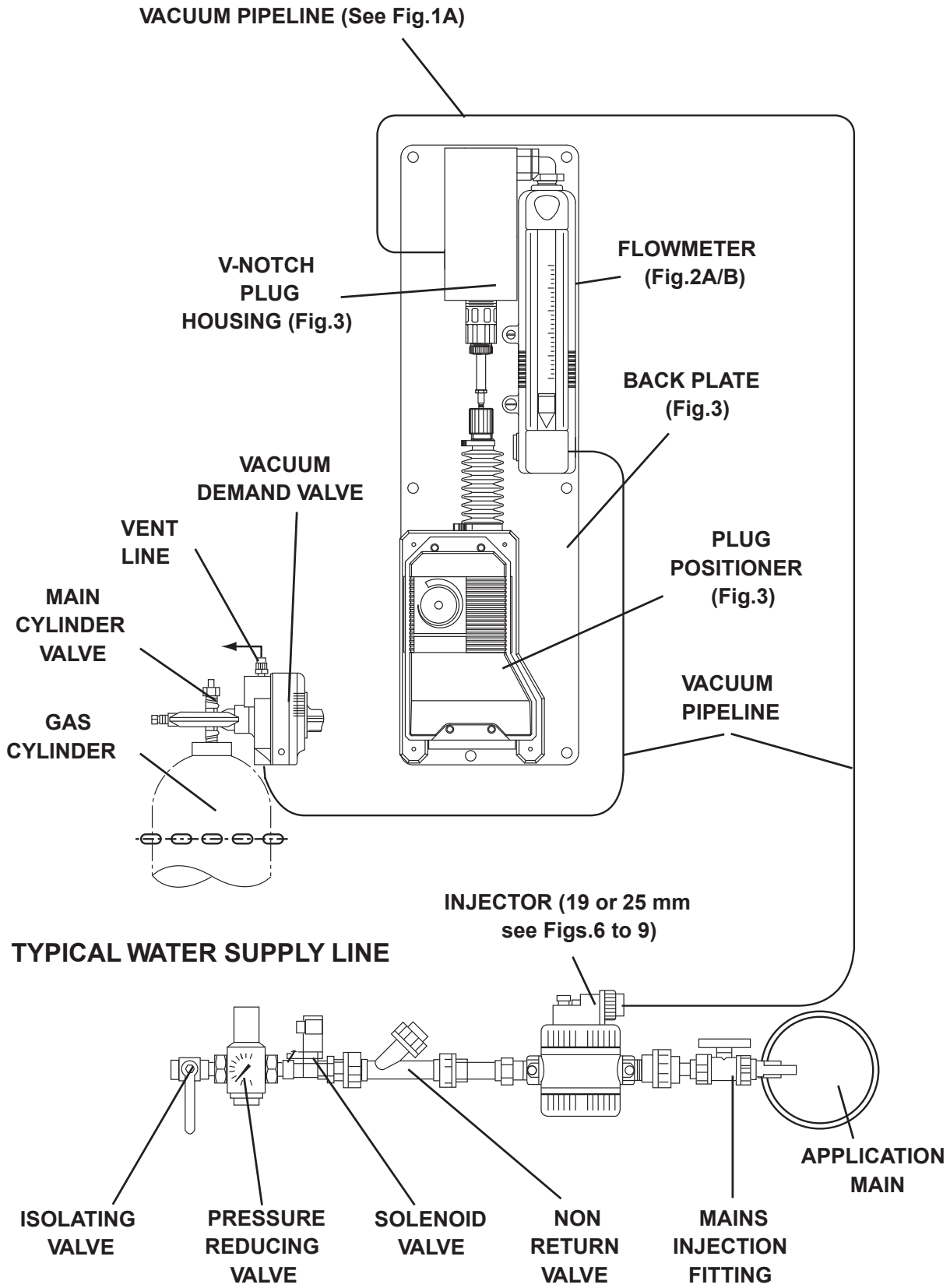


FIG.1B TYPICAL LAYOUT (AUTOMATIC CONTROL UNIT)

KEY	PART No.		QTY	DESCRIPTION
	OLD	NEW		
-	ANM4122	W3T98099	1	Flowmeter, 75mm
1	PXH.26482	W2T376757	1	'O' ring
2	P.59143	W2T11821	1	Orifice
3	AAA9672	—	1	Control knob
4	APM4489	W2T11504	1	Housing
5	P.44123	W2T16152	2	'O' ring
6	ANI4501	W2T11500	1	Plug, 1/2" NPT
7	AUK3460	—	2	Screw
8	-	-	{Refer to Fig 12	
9	-	-	{for different	
10	-	-	{connections	
11	AMK5536	W2T367071	1	'O' ring
12	PXH.39648	W2T14270	2	'O' ring
13	ARQ4515	W2T11512	1	Jack screw
14	See table	-	1	Flowmeter
15	NP.1437	W2T11924	1	Float stop

IMPORTANT: When ordering spare parts quote machine serial number with the full description and part number.

75mm (3") scale Flowmeters for Chlorine and Sulphur Dioxide		
Capacity	**Part No. (old)**	**Part No. (new)**
24 g/h	AAA4222	W2T633114
60	AAA4225	W2T633115
200	AAA4228	W2T633116
400	AAA4231	W2T633117
600	AAA4234	W2T633118
1000	AAA4237	W2T633120
1.5 kg/h	AAA4240	W2T633121
2	AAA4243	W2T633122
3	AAA4246	W2T633123
4	AAA4249	W2T633124
5	AAB5128	W2T633798

75mm (3") scale Flowmeters for Ammonia		
Capacity	**Part No. (old)**	**Part No. (new)**
0.6 - 12 g/h	AAA4252	—
1.5 - 30	AAA4255	—
5 - 100	AAA4258	—
10 - 200	AAA4264	—
15 - 300	AAA4267	—
25 - 500	AAA4270	—
37 - 740	AAA4273	—
50 - 1000	AAA4276	—
0.075 - 1.5 kg/h	AAA4279	—
0.1 - 2	AAA4282	—

75mm (3") scale Flowmeters for Carbon Dioxide		
Capacity	**Part No. (old)**	**Part No. (new)**
20 g/h	AAA4285	—
48	AAA4288	—
160	AAA4291	—
320	AAA4294	—
480	AAA4297	—
800	AAA4300	—
1.2 kg/h	AAA4303	—
1.6	AAA4306	—
2.4	AAA4309	—
3.2	AAA4312	—

FIG.2A FLOWMETER ASSEMBLY (75mm)

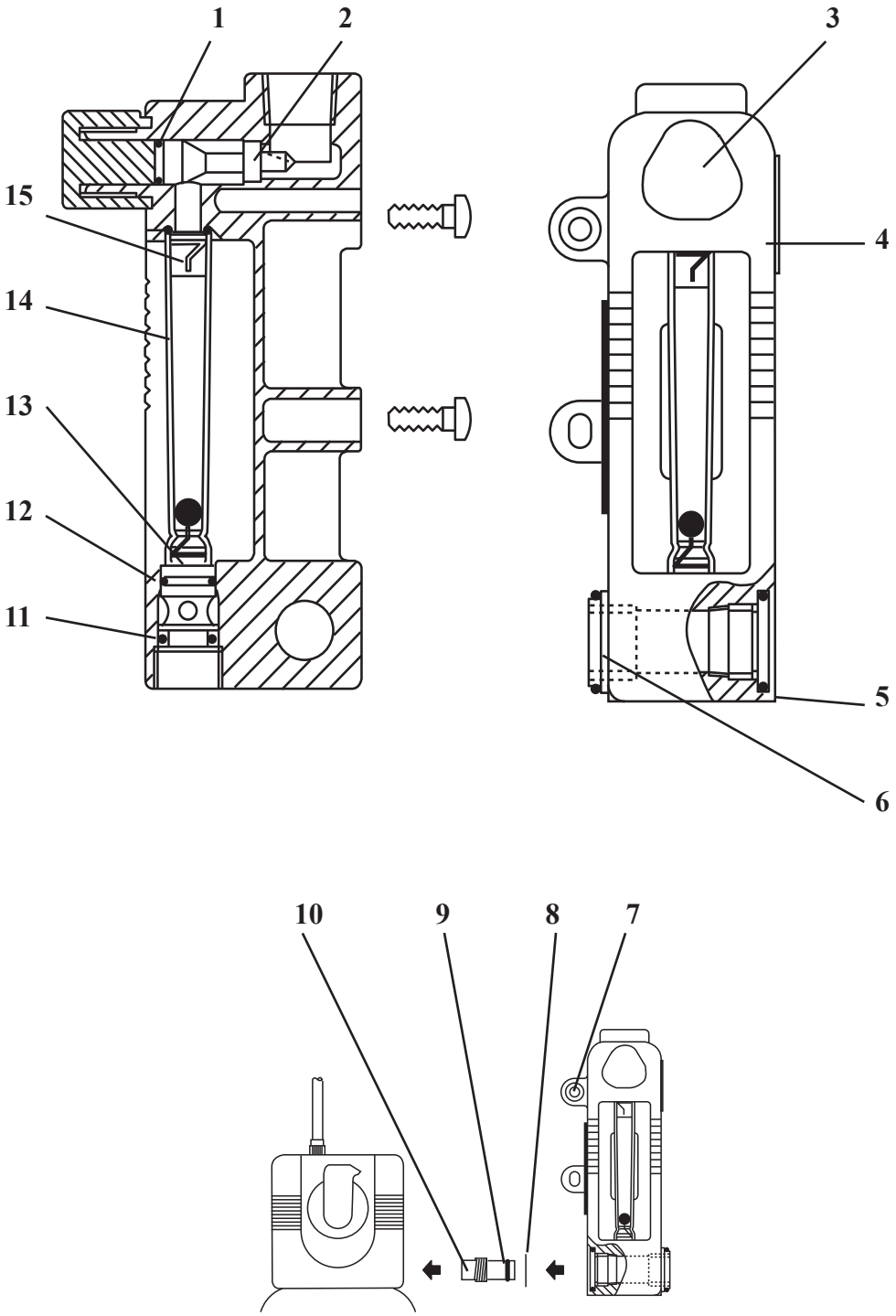


FIG.2A FLOWMETER ASSEMBLY (75mm)

KEY	PART No.		QTY	DESCRIPTION
	OLD	NEW		
-	ANM4127	W2T634587	1	Flowmeter, 125mm
1	PXH.26482	W2T376757	1	'O' ring
2	P.59143	W2T11821	1	Seal
3	AAA9672	—	1	Control knob
4	AOK4485	W2T11502	1	Housing
5	P.44123	W2T16152	2	'O' ring
6	ANI4501	W2T11500	1	Plug, 1/2" npt
7	AUK3460		2	Screw
8	-	-		{Refer to Fig 12
9	-	-		{for different
10	-	-		{connections
11	PXH.40040	W2T376759	1	'O' ring
12	P.44121	W2T16151	2	'O' ring
13	AOK4510	W2T11503	1	Jack screw
14	See table	-	1	Flowmeter

NOTE: The vacuum line supplied as standard is ½" OD flexible tube with the appropriate connection parts. Other sizes are optional and only supplied when specified at the order stage.

IMPORTANT: When ordering spare parts quote machine serial number with the full description and part number.

125mm (5") scale Flowmeters for Chlorine and Sulphur Dioxide		
Capacity	Part No. (old)	Part No. (new)
60 g/h	AAA.4105	W2T633089
200	AAA.4108	W2T633091
400	AAA.4111	W2T633092
600	AAA.4114	W2T633093
1000	AAA.4117	W2T633094
1.5 kg/h	AAA.4120	W2T633095
2	AAA.4123	W2T633096
3	AAA.4126	W2T633098
4	AAA.4129	W2T633099
5	AAA.4132	W2T633101
6	AAA.4135	W2T633102
8	AAA.4138	W2T633103
10	AAA.4141	W2T633104
12	AAB3600	W2T633708
15	AAB1401	W2T633576

125mm (5") scale Flowmeters for Carbon Dioxide		
Capacity	Part No. (old)	Part No. (new)
48 g/h	AAA.4183	—
160	AAA.4186	—
320	AAA.4189	—
480	AAA.4192	—
800	AAA.4195	—
1.2 kg/h	AAA.4198	—
1.6	AAA.4201	—
3.2	AAA.4204	—
4	AAA.4207	—
4.8	AAA.4210	—
6.4	AAA.4213	—
8	AAA.4219	—

125mm (5") scale Flowmeters for Ammonia					
Capacity	Part No. (old)	Part No. (new)	Capacity	Part No. (old)	Part No. (new)
15 - 30 g/h	AAA4144	W2T633105	0.075 - 1.5 kg/h	AAA4165	W2T633111
5 - 100	AAA4147	—	0.1 - 2	AAA4168	W2T633112
10 - 200	AAA4150	W2T633106	0.125 - 2.5	AAA4171	-
15 - 300	AAA4153	W2T633107	0.15 - 3	AAA4174	-
25 - 500	AAA4156	W2T633108	0.2 - 2	AAA4177	-
37 - 740	AAA4159	W2T633109	0.25 - 5	AAA4180	-
50 - 1000	AAA4162	W2T633110			

FIG.2B FLOWMETER ASSEMBLY (125mm)

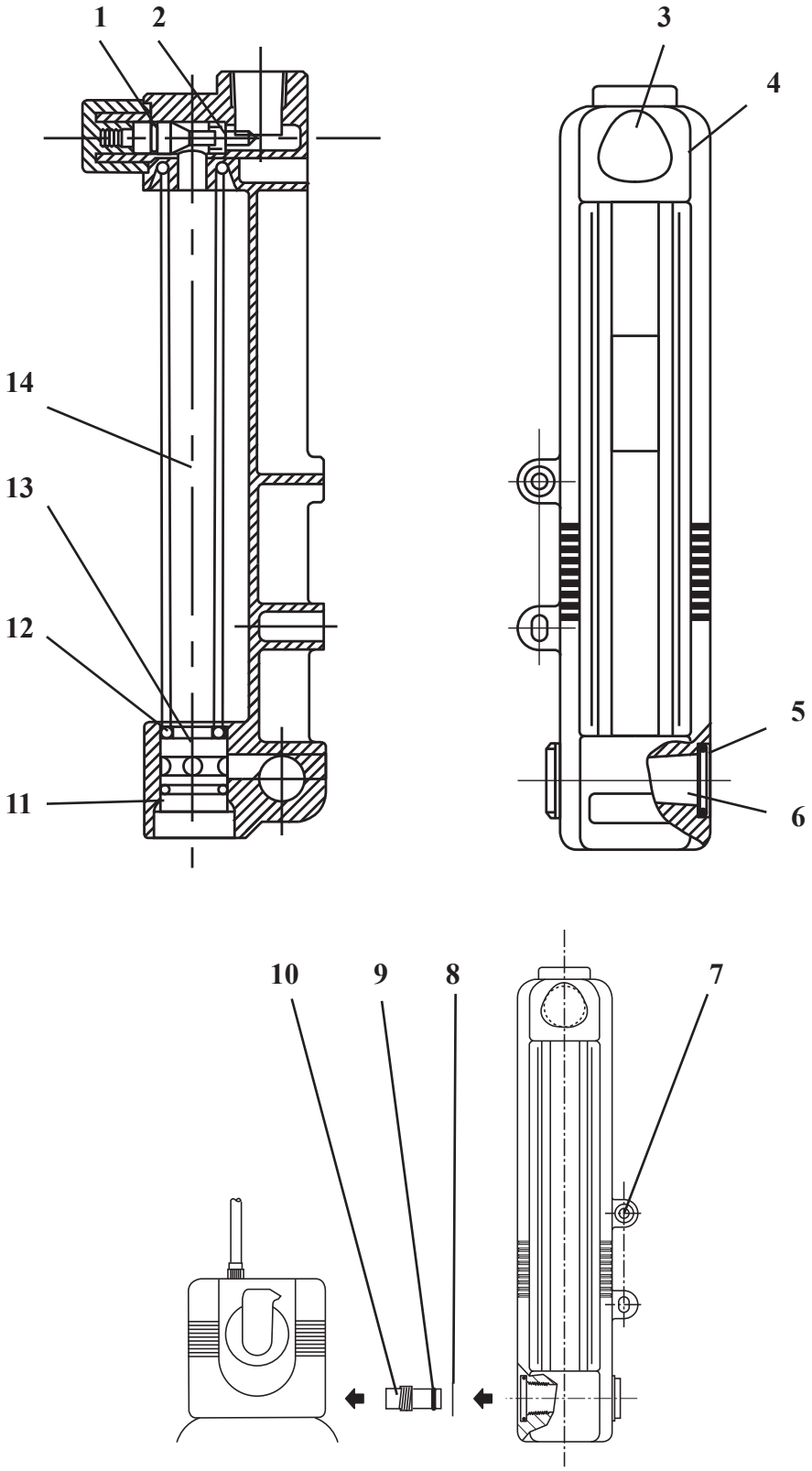
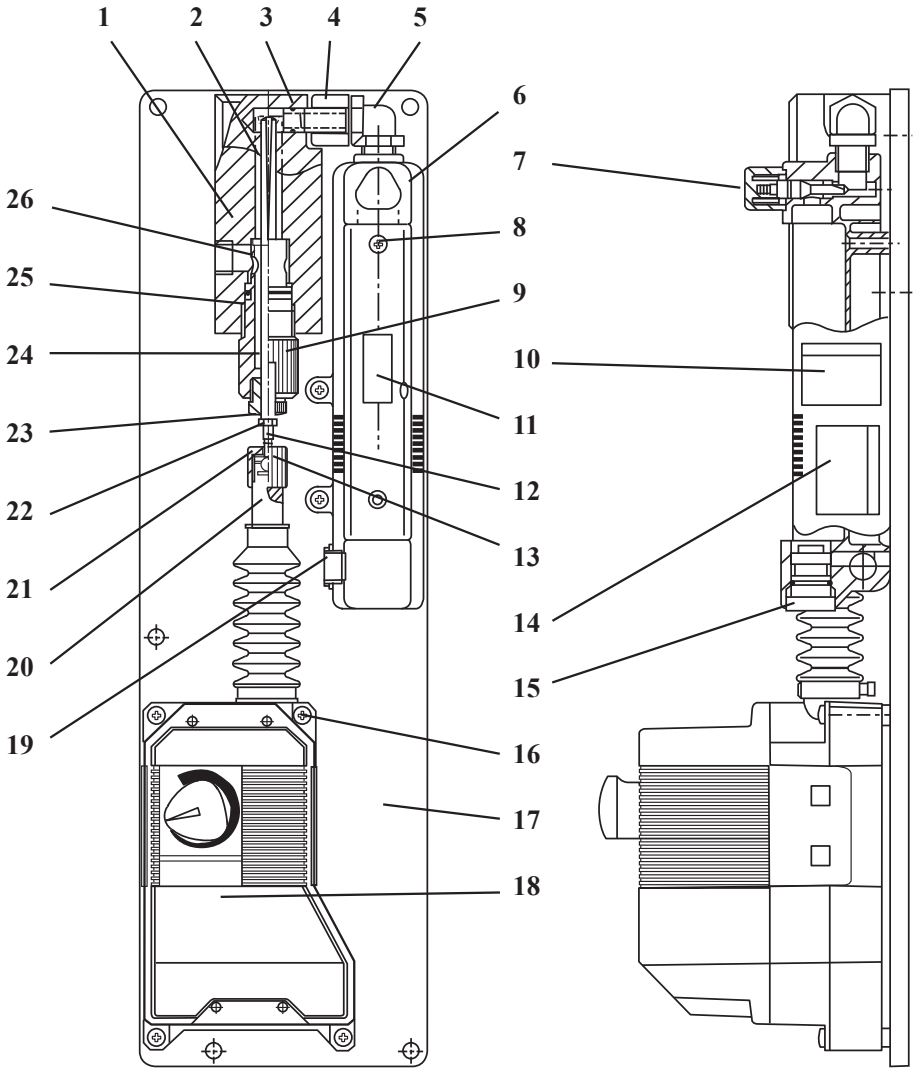


FIG.2B FLOWMETER ASSEMBLY 125mm

KEY	PART No.		QTY	DESCRIPTION
	OLD	NEW		
-	AAA1085	W3T291485	1	S10k Gas Feeder, Auto
1	AMK5115	W2T11161	1	V-notch chamber
2	Variable		1	V-notch plug (see Table below)
3	PXH.39648	W2T14270	1	'O' ring
4	AMK4267	W2T11166	1	Connector tube
5	U.24110	W3T292337	1	Elbow
6	AOK4485	W2T11502	1	Flowmeter housing (5")
	AUK3460	—	2	Screw
7	AAA9672	—	1	Knob
	PXH.26482	W2T376757	1	'O' ring
8	AAA9060	W2T10003	1	Screw
9	P.48157	—	1	Extension chamber
10	AHS4646	W2T11124	1	Warning label
11	AFM4743	—	1	Caution label
12	P.97027	W3T163456	1	Ball and screw
13	P.97026	W3T171121	1	Clamp nut
14	L.80171	W2T635273	1	Warning label
15	AOK4510	W2T11503	1	Jack screw
16	AAA2568	W2T11018	4	Screw
17	AKG4013	W2T11212	1	Back plate
18	UXB.96285	W3T173205	1	Plug positioner, 115V
	UXC.96285	—	1	Plug positioner, 230V
	UXA.96289	W3T173189	1	Motor/gearbox, 230V
	UXB.96289	—	1	Motor/gearbox, 115V
	P.97068	—	4	Screw, M4
	P.97070	W3T172904	1	Control knob
19	P.52090	W2T15128	1	Pipe plug
20	U.96288	—	1	Rack
	P.97090	—	1	Bellows
	P.97091	—	1	Hose clamp, small
	P.97092	—	1	Hose clamp, large
21	P.97028	—	1	Washer
22	P.16542	—	1	Nut
	P.16556	W2T635488 1		Washer
23	P.37663	—	1	Screw, V-notch seal
	P.34530	W2T635517	1	Seal, PTFE
	P.16556	W2T635488	1	Washer
24	P.40139	W2T635560	1	Plug stem
25	P.44045	W3T168909	1	'O' ring
26	P.37657	W2T635542	1	Orifice

FIG.3 AUTOMATIC GAS FEEDER



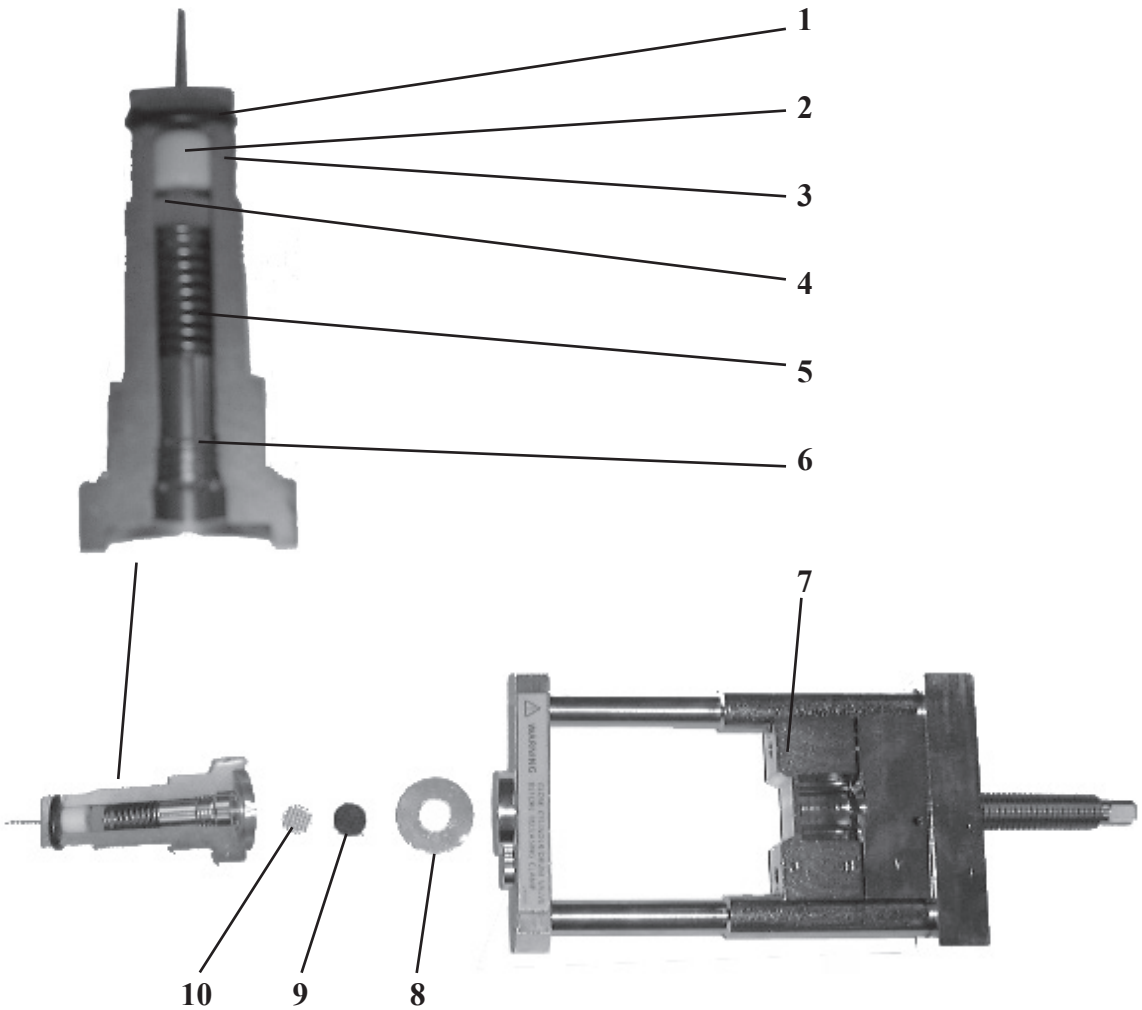
IMPORTANT: When ordering spare parts quote machine serial number with the full description and part number.

TABLE of V -NOTCH PLUGS								
Range (Cl2/ SO2)	V-notch plug		Range (NH3)	V-notch plug		Range (CO2)	V-notch plug	
	Old Part No.	New Part No.		Old Part No.	New Part No.		Old Part No.	New Part No.
1.4 to 24 g/h	ALI3595	W3T99902	0.6 to 12 g/h	ALI3595	W3T99902	1 to 20 g/h	ALI.3595	W3T99902
3 to 60 g/h	ALI3595	W3T99902	1.5 to 30 g/h	ALI3595	W3T99902	2.4 to 48 g/h	ALI.3595	W3T99902
10 to 200 g/h	ALI3595	W3T99902	5 to 100 g/h	ALI3595	W3T99902	8 to 160 g/h	ALI.3595	W3T99902
20 to 400 g/h	AKG3601	W3T166748	10 to 200 g/h	AKG3601	W3T166748	16 to 320 g/h	AKG.3601	W3T166748
30 to 600 g/h	PXA.39598	W3T159692	15 to 300 g/h	PXA39598	W3T159692	24 to 480 g/h	PXA.39598	W3T159692
50 to 1000 g/h	APS3605	W3T166782	25 to 500 g/h	APS3605	W3T166782	40 to 800 g/h	APS.3605	W3T166782
0.075 to 1.5 kg/h	PXC39598	W3T167327	37 to 740 g/h	PXC.39598	W3T167327	0.06 to 1.2 kg/h	PXC.39598	W3T167327
0.1 to 2 kg/h	AJE3801	W3T166740	50 to 1000 g/h	AJE3801	W3T166740			
0.15 to 3 kg/h	PXD.39598	W3T163533	0.075 to 1.5 kg/h	PXD.39598	W3T163533			
0.2 to 4 kg/h	PXE.39598	W3T163544	0.1 to 2 kg/h	PXE.39598	W3T163544			
0.25 to 5 kg/h	PXF.39598	W3T163561	0.125 to 2.2 kg/h	PXF.39598	W3T163561			
0.3 to 6 kg/h	APQ3806	W3T98106	0.15 to 3 kg/h	APQ3806	W3T98106			
0.4 to 8 kg/h	PXG.39598	W2T612734	0.2 to 4 kg/h	PXG.39598	—			
0.5 to 10 kg/h	PXH.39598	W3T163580	0.25 to 5 kg/h	PXH.39598B	—			

FIG.3 AUTOMATIC GAS FEEDER

KEY	PART No.		QTY	DESCRIPTION
	OLD	NEW		
1	AKG5549	W2T367045	1	O ring
2	AAB1736	W2T10156	1	Seat
3	AAB2291	W2T10012	1	Nipple
	AAA6225	W2T633350	1	Nipple (Ammonia only)
4	ANM5366	W2T367090	1	Valve Stem
5	APQ4110	W2T11229	1	Stem Spring
6	AAB2294	W2T10010	1	Retainer
	AAA6831	W2T633398	1	Retainer (Ammonia only)
7	AAA6780	W2T633395	1	Universal yoke assy.
	AAB2058	W3T291627	1	Yoke Assembly (Ammonia Only)
	AAA6861	—	1	Universal follower head
8	P.60134	W2T12212	1	Lead washer
9	AAA7109	W3T167914	1	Filter
10	AAA7106	W3T167913	1	Screen

IMPORTANT: When ordering spares quote unit serial number with full description and part number.

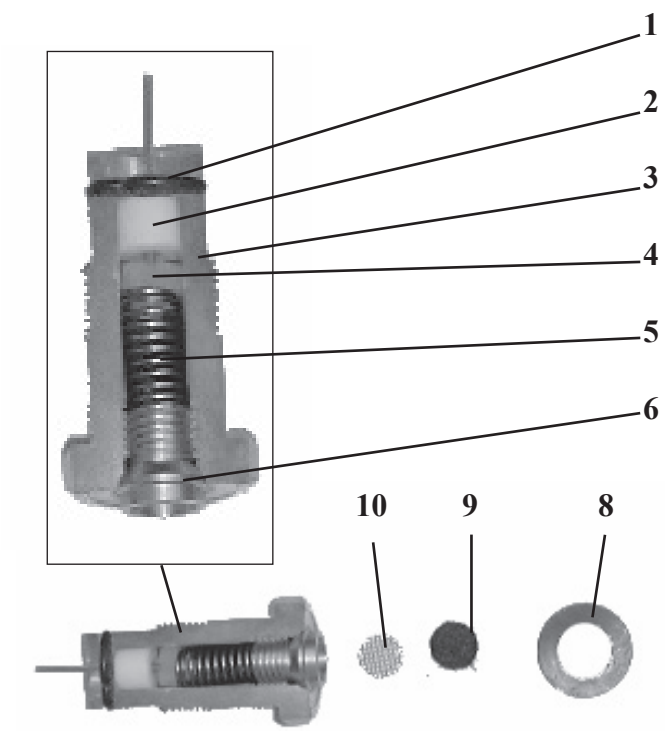


Note: This assembly has been sectioned for ease of identification of parts.

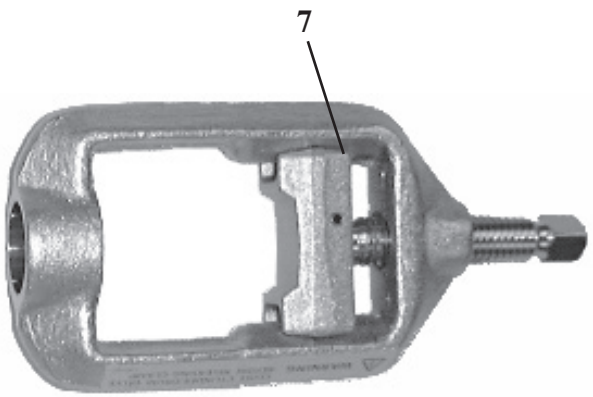
FIG.4 UNIVERSAL YOKE ASSEMBLY

KEY	PART No.		QTY	DESCRIPTION
	OLD	NEW		
1	AKG5549	W2T367045	1	O - ring
2	AAB1736	W2T10156	1	Seat
3	AKG5346	W2T11238	1	Nipple
4	ANM5366	W2T367090	1	Stem
5	APQ4110	W2T11229	1	Spring
6	AIC5355	W2T11202	1	Retainer
7	U23016	W3T292335	1	Chlorine Institute yoke assy.
8	P16191	W2T635486	1	Lead washer
9	AAA7109	W3T167914	1	Filter (1.57 thk PTFE)
10	AAA7106	W3T167913	1	Screen (1.27 x 1.27 monel wire mesh)
	AAA6831	W2T633398	1	Retainer (Ammonia only)
-	AAA4699	W3T162239	1	Heater (optional) continuously variable from 115V to 230V
-	AAA3492	—	1	Backnut tool
	AAA3486	—	1	Body
-	AAA3489	—	1	Handle

IMPORTANT: When ordering spares quote unit serial number with full description and part number.



Note: This assembly has been sectioned for ease of identification of parts.



CAUTION: The mesh screen (10) must be inserted into the spring retainer (6) before the PTFE filter (9). If these items are placed in the wrong order the filter may be pulled into the valve by the vacuum.

FIG.5 CHLORINE INSTITUTE YOKE ASSEMBLY

KEY	PART No.		QTY	DESCRIPTION
	OLD	NEW		
1	P.31295	W3T168893	1	Plug
2	P.37747	W3T161296	1	Plug
3	P.100363	—	1	Union nut
4	P.100355	—	1	Union end
	P.100457	W3T172724	1	O-ring
	P.100371	W3T172719	1	O-ring (NH3)
5	P.97050	W3T159666	1	Plug
6	P.97044	W3T172899	1	O-ring
	AAA5549	W3T160358	1	O-ring (NH3)
7	P.95279	W3T161434	1	O-ring
	PXC95968	W3T172997	1	O-ring (NH3)
8	P.97041	W3T161480	1	O-ring
	AAA5537	W3T160357	1	O-ring (NH3)
9	P.97040	W3T159661	1	Seat
10	P.48655	W2T376099	1	Spring
11	P.97032	W3T159656	1	Valve stem
12	P.97047	W3T172901	6	Screw
	P.97046	W3T172900	6	Washer
13	P.91485	W3T172882	1	O-ring
	P.100370	W3T172718	1	O-ring (NH3)
14	P.97048	W3T159664	1	Valve stem
15	P.31295	W3T168893	1	Plug
16	P.97342	W3T172921	1	O-ring
	P.97343	W2T507579	1	O-ring (NH3)
17	AAD2584	W3T170187	1	Valve seat
18	P.96971	W3T171119	1	Upper body
19	P.97062	W3T172902	1	Diaphragm
20	P.50524	W2T15514	1	O-ring
	AAA5582	W3T160359	1	O-ring (NH3)
21	P.91485	W3T172882	1	O-ring
	P.100370	W3T172718	1	O-ring (NH3)
22	ANM4147	W2T11157	1	Spring
23	P.97042	W3T171124	1	Lower body
24	P.97045	W3T159663	1	Clamping nut
25	P.85337	W2T635741	1	O-ring
26	P.85338	W2T635742	1	O-ring
27	P.38273B	—	1	Clamping nut
28	P.100448	W3T168867	1	O-ring
	AAA5555	W3T164205	1	O-ring (NH3)
29	P97049	W3T159665	1	Guide plug
30	P.83967	W2T635707	1	Inlet nipple

NOTE 1: For throat/tailway Part Nos. refer to Hydraulic Data which is found towards the rear of this manual.

IMPORTANT: When ordering spare parts quote machine serial number with the full description and part number.

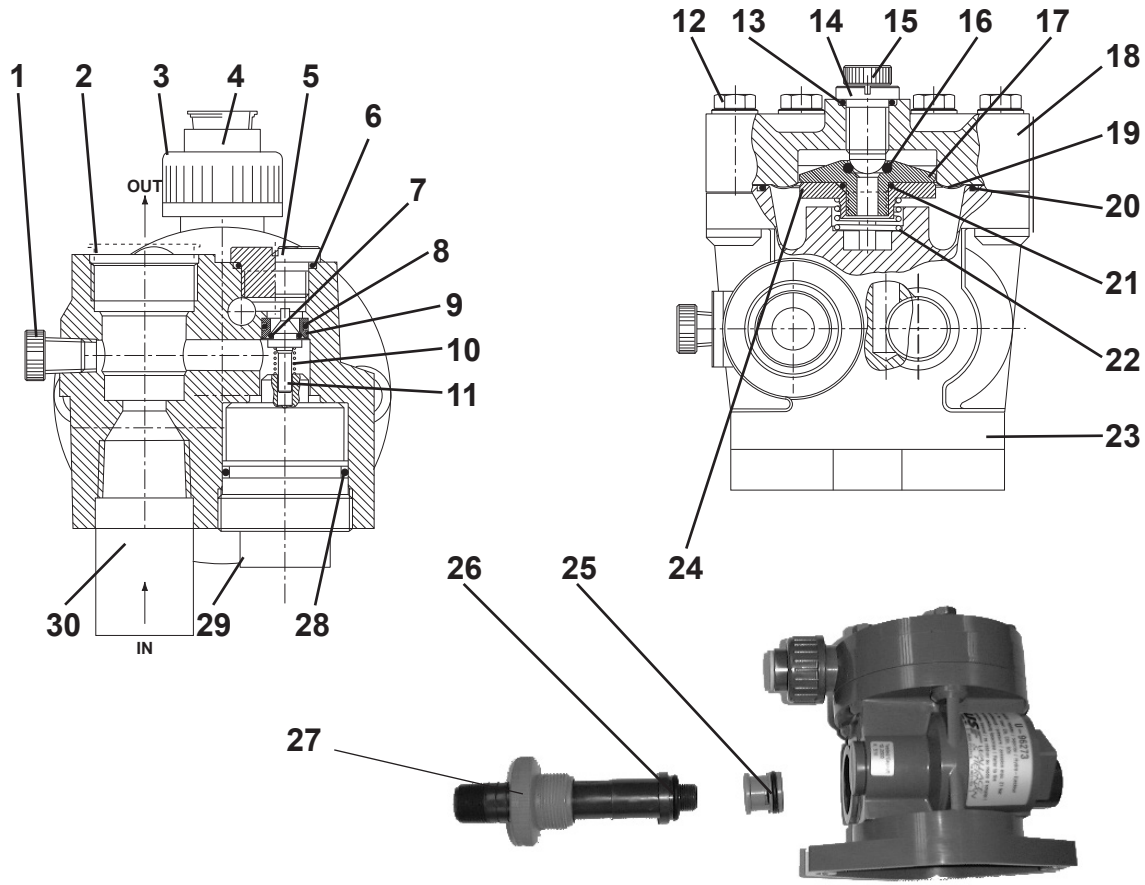


FIG.6 U.96273 - STANDARD 25mm INJECTOR

KEY	PART No.		QTY	DESCRIPTION
	OLD	NEW		
1	P.97050	W3T159666	1	Plug
	P.97044	W3T172889	1	O-ring
	AAA5549	W3T160358	1	O-ring (NH3)
2	P.97032	W3T159656	1	Valve stem
	P.95279	W3T161434	1	O-ring
	PXC95968	W3T172997	1	O-ring (NH3)
3	P.97054	—	1	Guide bushing
4	P.97061	W3T159674	2	Diaphragm
	AAA5788	—	2	Diaphragm (NH3)
5	P.97053	—	1	Collet
6	P.97052	—	1	Spacer
7	P.100448	W3T168867	1	O-ring
	AAA5555	W3T164205	1	O-ring (NH3)
8	P.85337	W2T635741	1	O-ring
9	P.85338	W2T635742	1	O-ring
10	P.96970	—	1	Body
	P.95408	—	1	Name plate
11	P.97051	W3T159667	1	Clamping nut
12	P.97064	W3T172903	1	Spring
13	PXG.95967	W3T173063	1	Securing clip
14	P.97056	W3T159672	1	Diaphragm holder
15	P.97055	W3T159671	1	Clamping disc
16	P.83967	W2T635707	1	Barrel Nipple

NOTE 1: For throat/tailway Part Nos. refer to Hydraulic Data which is found towards the rear of this manual.

NOTE 2: The parts that form the top section of the injector are identical to the standard injector at Fig.4

IMPORTANT: When ordering spare parts quote machine serial number with the full description and part number.

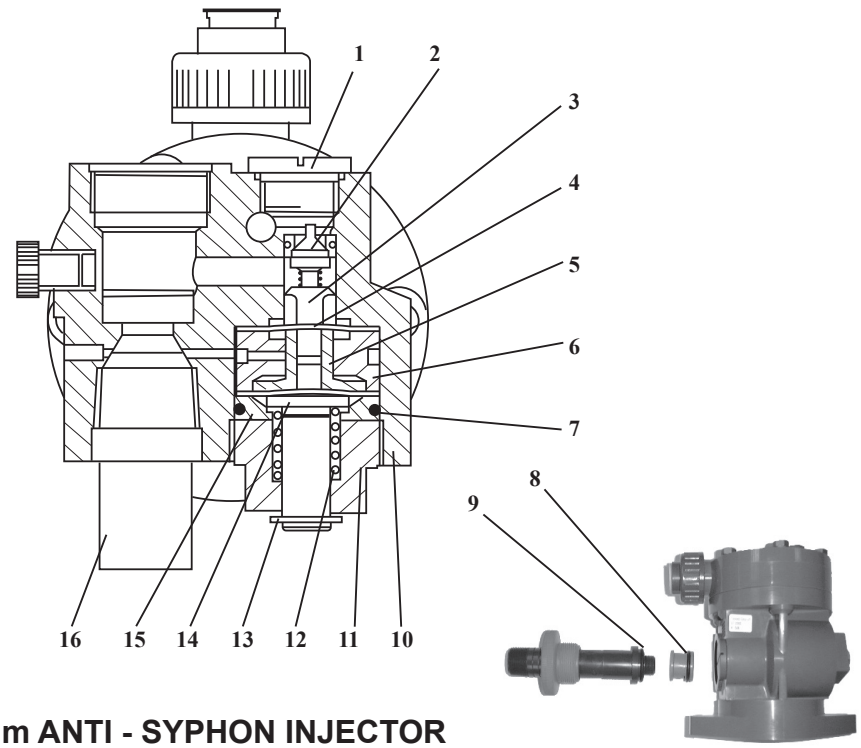


FIG.7 U.96274 - 25mm ANTI - SYPHON INJECTOR

KEY	PART No.		QTY	DESCRIPTION
	OLD	NEW		
1	P.34374	W2T12043	1	Plug
2	P.100363	—	1	Union nut
	P.100355	—	1	Union end
	P.100457	W3T172724	1	O-ring
	P100371	W3T172724	1	O-ring
3	P.97031	W3T159655	1	Inlet screw
4	P.100440	W3T168861	1	O-ring
	AAA5546	W3T164203	1	O-ring (NH3)
5	P.95279	W3T161434	1	O-ring
	PXC95968	W3T172997	1	O-ring (NH3)
6	P.48655	W2T376099	1	Spring
7	P.97032	W3T159656	1	Valve stem
8	P.31295	W3T168893	1	Plug
9	P.96973	W3T171120	1	Upper Body
10	P.97034	W3T159657	1	Valve stem
11	P.97342	W3T172921	1	O-ring
	P97343	W2T507579	1	O-ring
12	AAB.1489	—	1	Valve seat
13	PXA.26345	W2T17826	1	O-ring
	P100369	W3T168853	1	O-ring (NH3)
14	P.48976	W2T11964	1	Spring
15	APQ.3604	W2T634623	2	O-ring
16	P.95408	—	1	Name plate
17	P.96972	W3T159654	1	Lower Body
18	AAB.1495	—	1	Clamping nut
19	AAA.4325*	W3T171695	1	Upper diaphragm, Viton
	P.97063*	W3T161483	1	Lower d iaphragm, ptfe
	AAA5785*	W3T164208	1	Diaphragm (NH3)
20	P.94729	W3T168988	1	O-ring
	AAA5543	W3T164202	1	O-ring (NH3)
21	P.91805	—	1	Union nut

* Ptfe diaphragm is placed nearest injector water.

NOTE 1: For throat/tailway Part Nos. refer to Hydraulic Data which is found towards the rear of this manual.

IMPORTANT: When ordering spares quote machine serial number with the full description and part number.

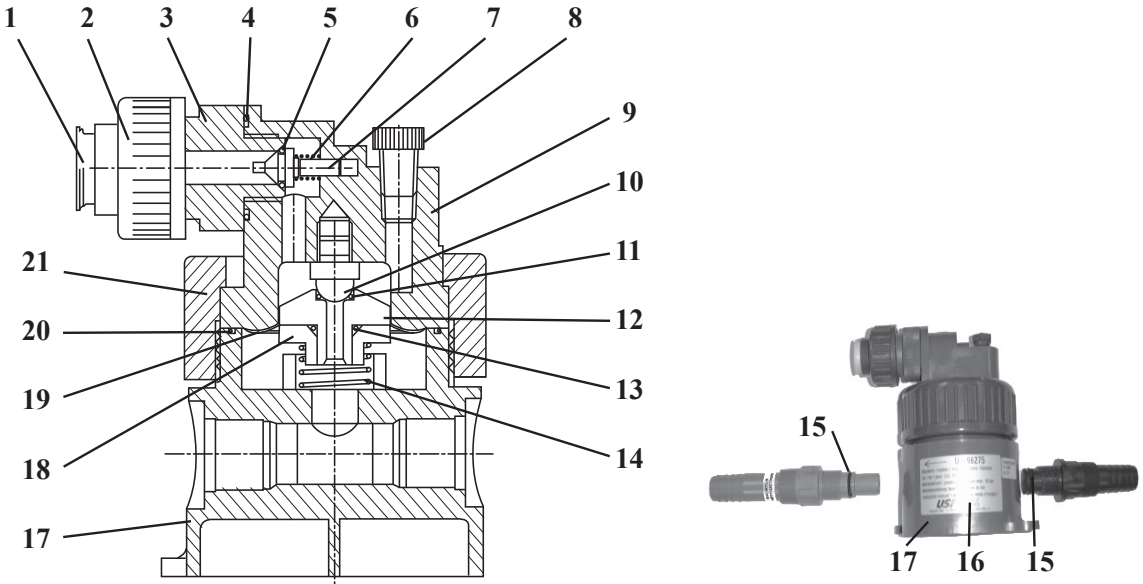


FIG.8 U.96275 - 19mm INJECTOR

KEY	PART No.		QTY	DESCRIPTION
	OLD	NEW		
1	P.97058	—	1	Body
	P.95408	—	1	Name plate
2	P.97035	—	2	Guide pin
3	P.97037	—	1	Disk
4	P.100440	W3T168861	2	Washer
5	P.91805	—	1	Union nut
6	P.94729	W3T168988	1	O-ring
7	P.97063	W3T161483	1	Diaphragm
8	APQ.3604	W2T634623	2	O-ring
9	P.97065	—	1	Spring
10	P.87812	W2T635808	1	O-ring
11	P.97033	—	1	Clamping nut
12	PXA.26345	W2T17826	1	O-ring
13	P.97036	—	1	Bottom cover
14	P.33847	—	2	Screw
15	PXA.25900	W2T407903	2	O-ring

NOTE 1: For throat/tailway Part Nos. refer to Hydraulic Data which is found towards the rear of this manual.

NOTE 2:The parts that form the top section of the injector are identical to the standard injector at Fig.6

IMPORTANT: When ordering spare parts quote machine serial number with the full description and part number.

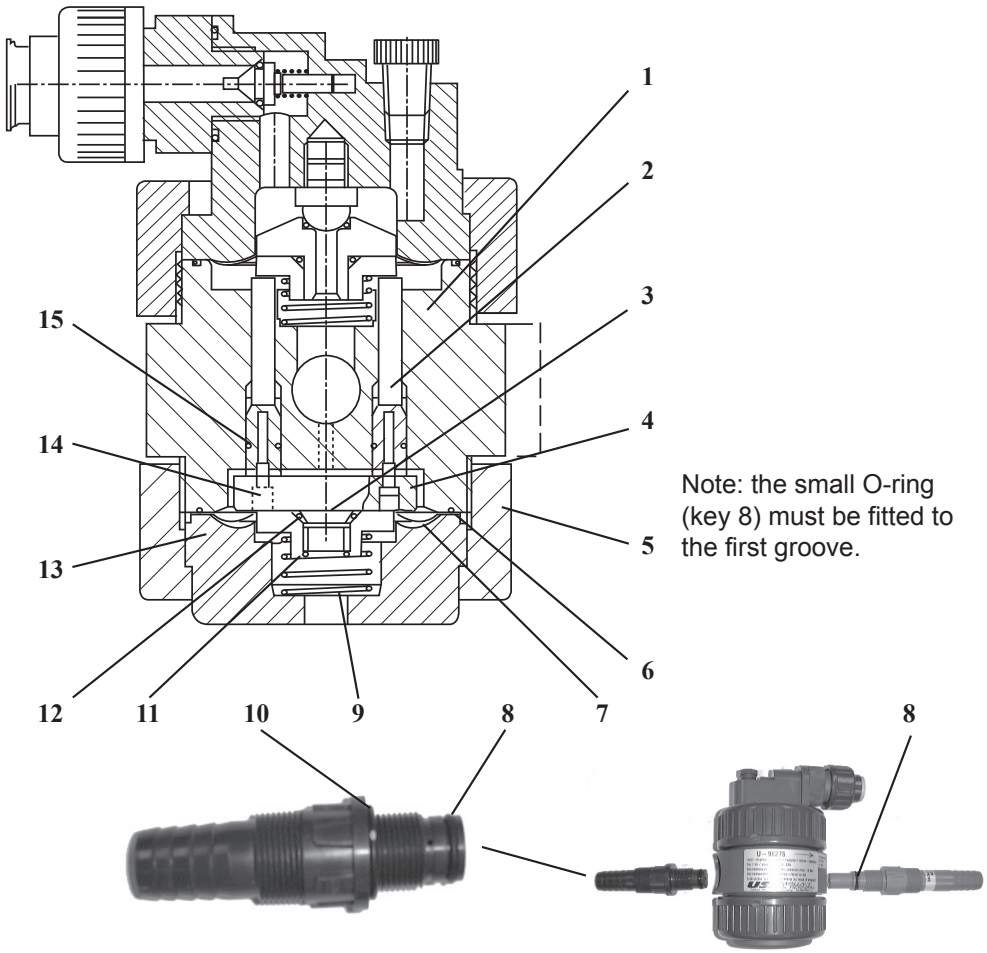


FIG.9 U.96276 - 19mm ANTI - SYPHON INJECTOR

THE INTERNAL VACUUM ALARM SWITCH IS NOT A USER SERVICABLE ITEM — THIS ILLUSTRATION IS PROVIDED TO SHOW THE BASIC OPERATION OF THE SWITCH

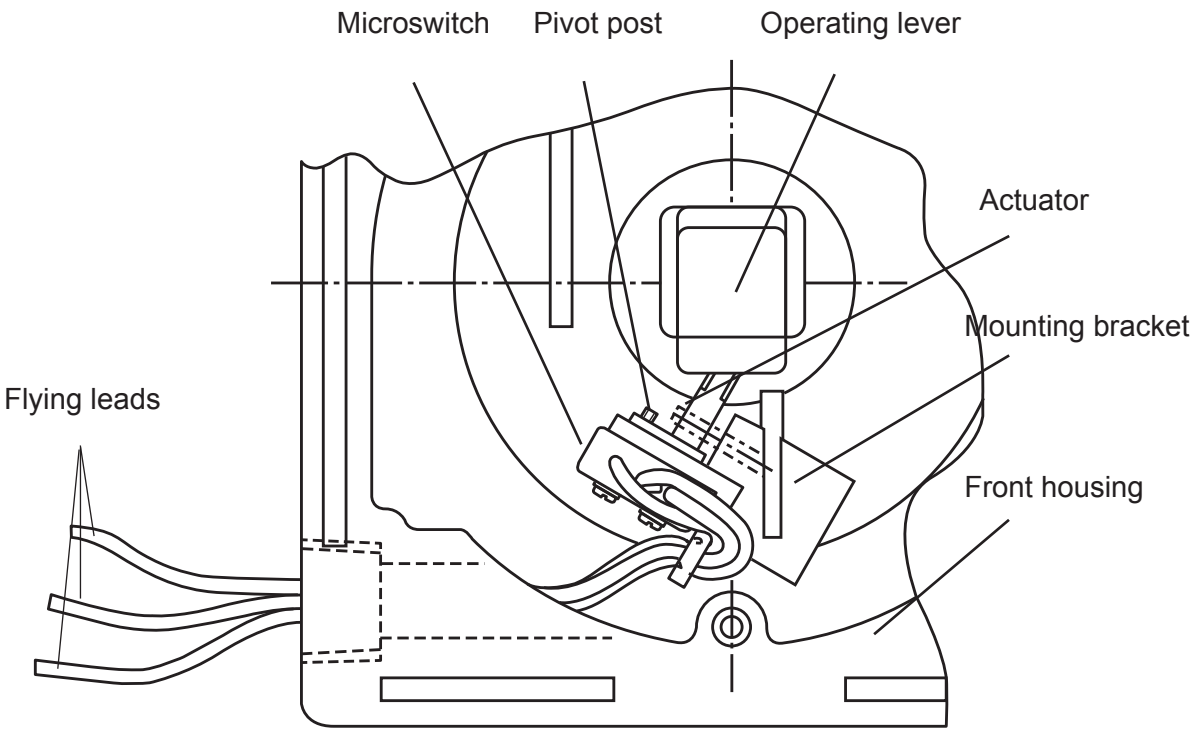


FIG.10 INTERNAL ALARM SWITCH

KEY	PART No.		QTY	DESCRIPTION
	OLD	NEW		
1	AAA2931	—	1	Connector, 1/2" NPT x 1/2" NPT
2	PXA96974	W3T169101	1	Tube adaptor, 1/4" NPT to 6 mm dia. PTFE tube
3	AAA2928	—	1	Socket adaptor, 1/2" NPT x 1/2" plain
4	AAA2502	W2T10203	1	Union nut
	AAA3479	W2T10192	1	'O' ring
5	AAA3453	—	1	Connector, 1/2” NPT x 1/4” NPT
6	RP9024426	W2T506980	-	Tube, 6mm dia.
7	PXA96974	W3T169101	2	Tube adaptor, 1/4” NPT to 6 mm dia. PTFE
8	ACG5035	—	1	Vacuum switch, remote mounting unit

IMPORTANT: When ordering parts quote machine serial number with the full description and part number.

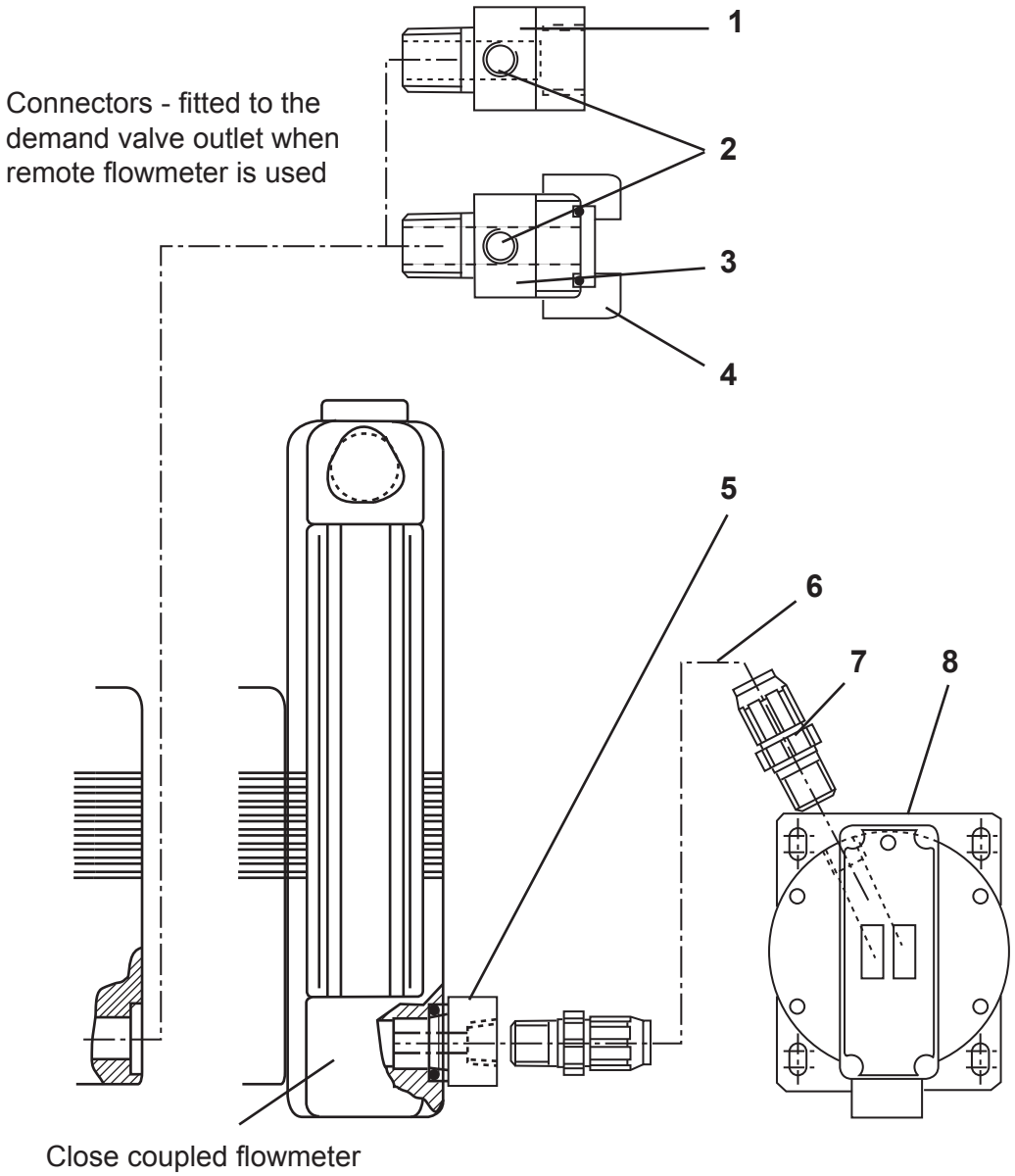
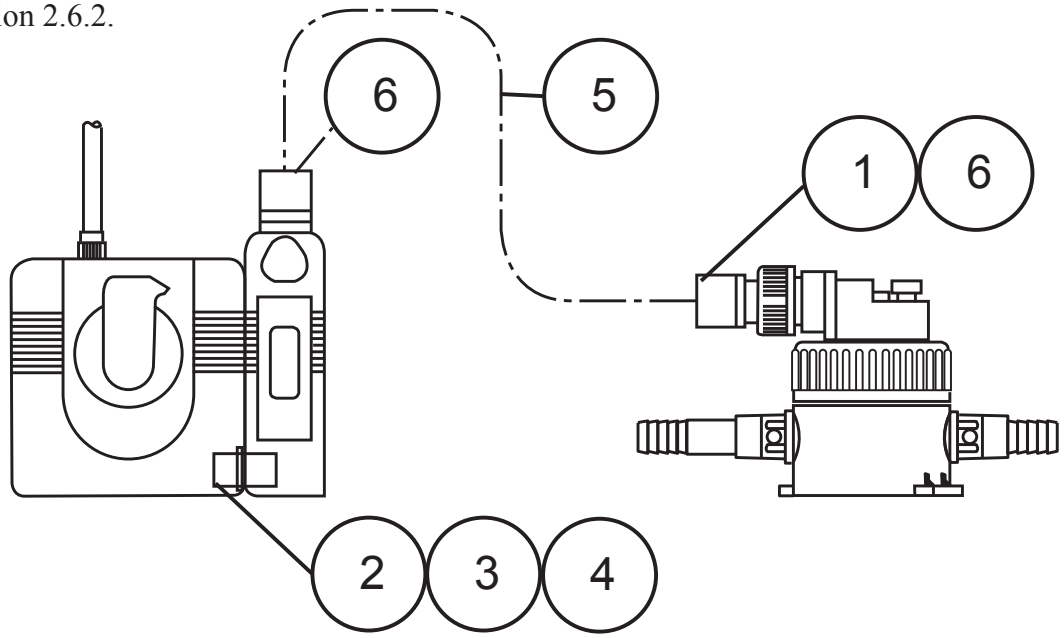


FIG.11 REMOTE MOUNTED ALARM SWITCH

RP684464 Vent hose 6m
not included in kit

The vent line should
be run as detailed
in section 2.6.2.



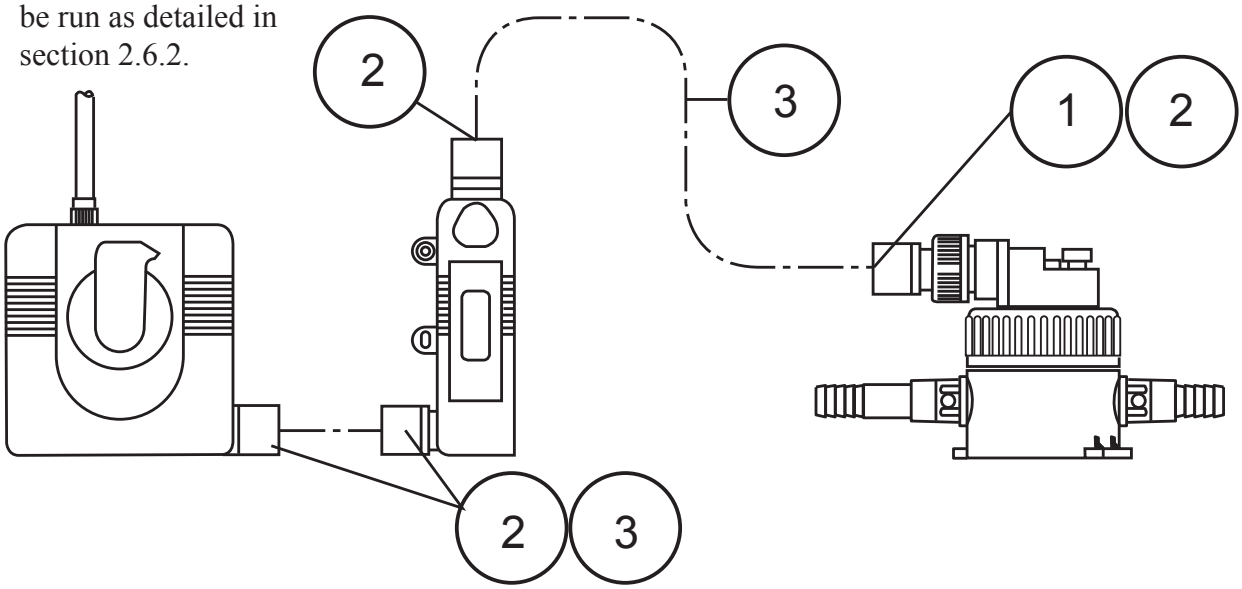
S10k Gas Control Unit with
direct mounted flowmeter and
flexible hose to injector

			Parts Kit AAA7419 - up to 4kg/hr		Parts Kit AAB5130 - 4kg/hr and above	
No	**Description**	**QTY**	**Old Part No.**	**New Part No.**	**Old Part No.**	**New Part No.**
1	Union end ½" NPT	1	AAA3267	W2T633002	AAA3267	W2T633002
2	Connector	1	AAA3491	W2T11003	AAA3491	W2T11003
3	O-ring	1	PXH26345	W2T12039	PXH23645	W2T12039
4	O-ring	1	P44123	W2T16152	P44123	W2T16152
5	Hose	5m/6m	RP684484	W2T636355	RP684502	W2T505677
6	Connector	2	U27486	W3T292344	U24102	W3T292336

FIG.12 VACUUM LINE CONNECTIONS (Drg.XAC1026 Sht 1 of 6)

RP684464 Vent hose
6m not included in kit

The vent line should be run as detailed in section 2.6.2.



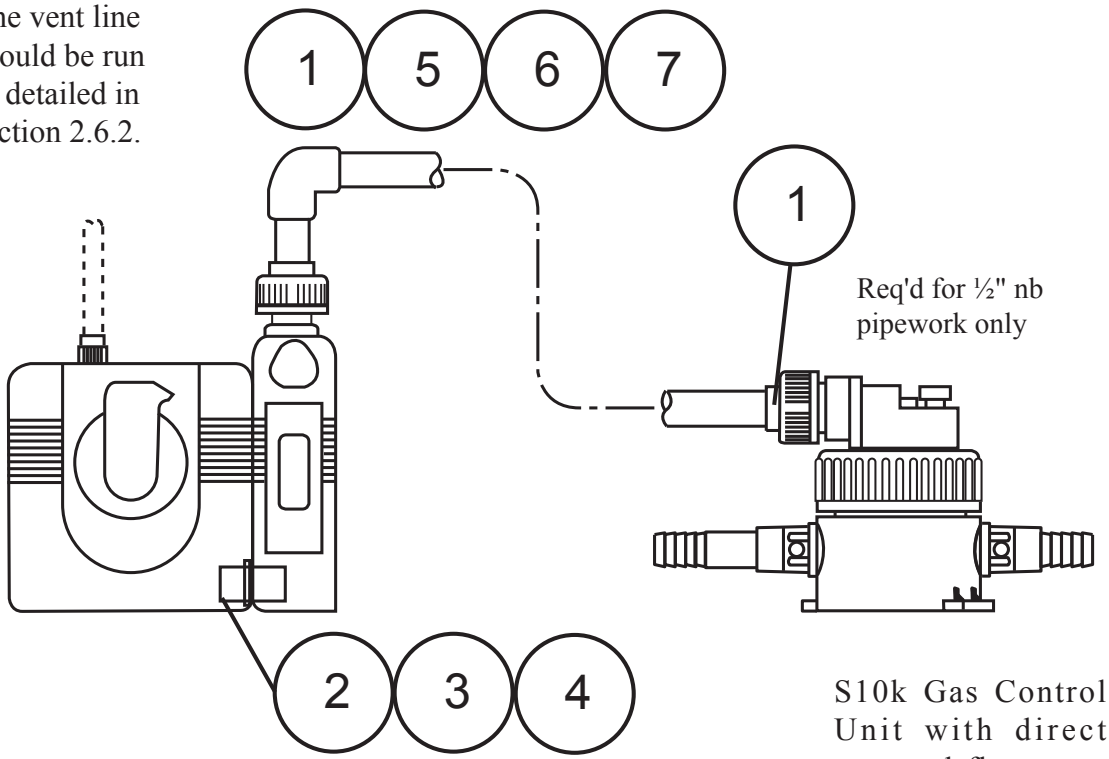
S10k Gas Control Unit with remote mounted flowmeter and flexible hose to injector

			Parts Kit AAA7422 - up to 4kg/hr		Parts Kit AAB5136 - 4kg/hr and above	
No	**Description**	**QTY**	**Old Part No.**	**New Part No.**	**Old Part No.**	**New Part No.**
1	Union end ½" NPT	1	AAA3267	W2T633002	AAA3267	W2T633002
2	Connector	2	U27486	W3T292344	U24102	W3T292336
3	Hose	10m/11m	RP684484	W2T636355	RP684502	W2T505677

FIG.12 VACUUM LINE CONNECTIONS (Drg.XAC1026 Sht 2 of 6)

RP684464 vent hose 6m not included in kit

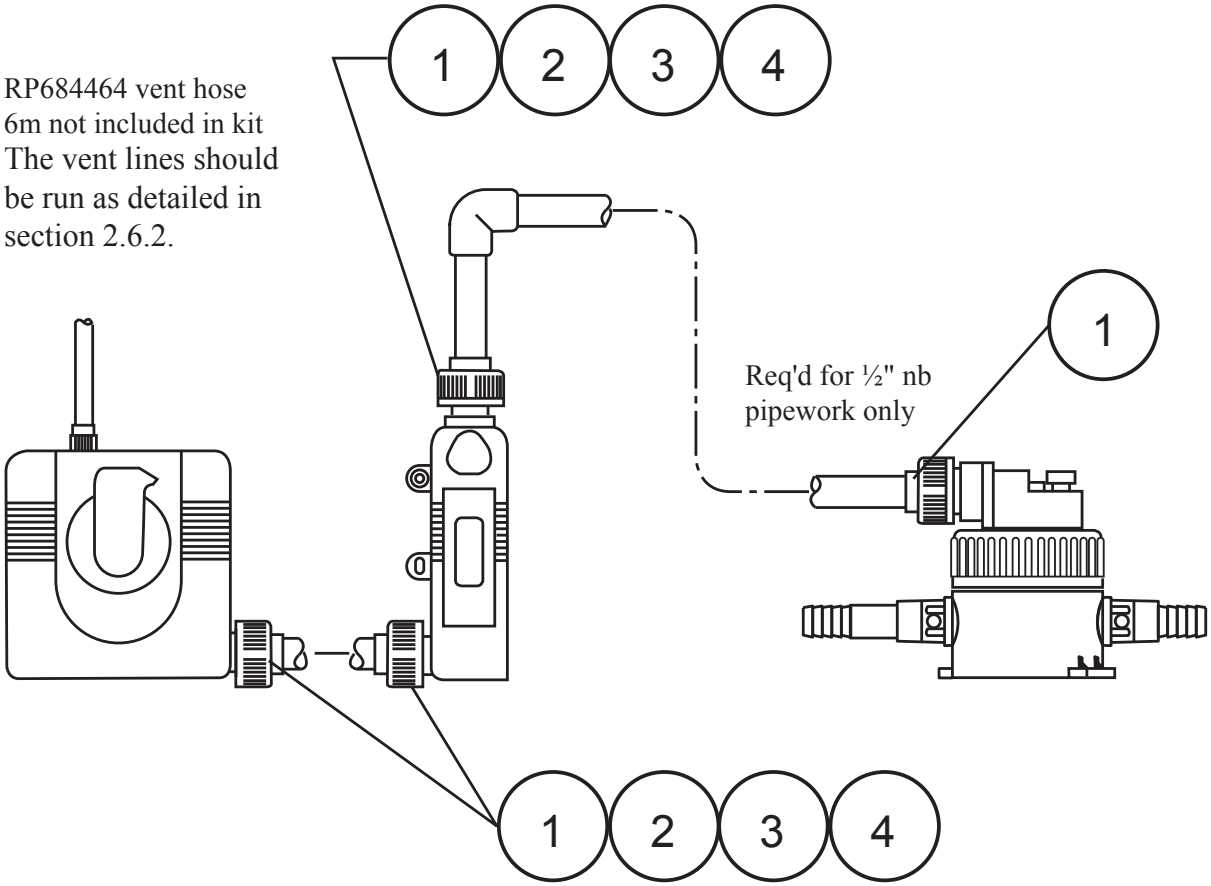
The vent line should be run as detailed in section 2.6.2.



S10k Gas Control Unit with direct mounted flowmeter and rigid pipework to the injector

			Parts kit AAA7428 — Arrangement E (½" plain)		Parts kit AAA7431 — Arrangement F (20mm plain)	
No	Description	QTY	Old Part No.	New Part No.	Old Part No.	New Part No.
1	Union end —½" plain	1	AAA2523	W2T633002	—	—
OR						
1	Union end — 20mm	1	—	—	AAA2553	W2T632923
Items 2 to 7 are common to both ½" and 20mm pipework						
2	Connector	1	AAA3491	W2T11003	U24102	W3T292336
3	O-ring	1	PXH26345	W2T12039	RP684502	W2T505677
4	O-ring	1	P44123	W2T16152	P44123	W2T16152
5	O-ring	1	AAA3479	W2T10192	AAA3479	W2T10192
6	Union nut	1	AAA2502	W2T10203	AAA2502	W2T10203
7	Connector	1	AAA2925	W3T162234	AAA2925	W3T162234

FIG.12 VACUUM LINE CONNECTIONS (Drg.XAC1026 Sht 3 of 6)

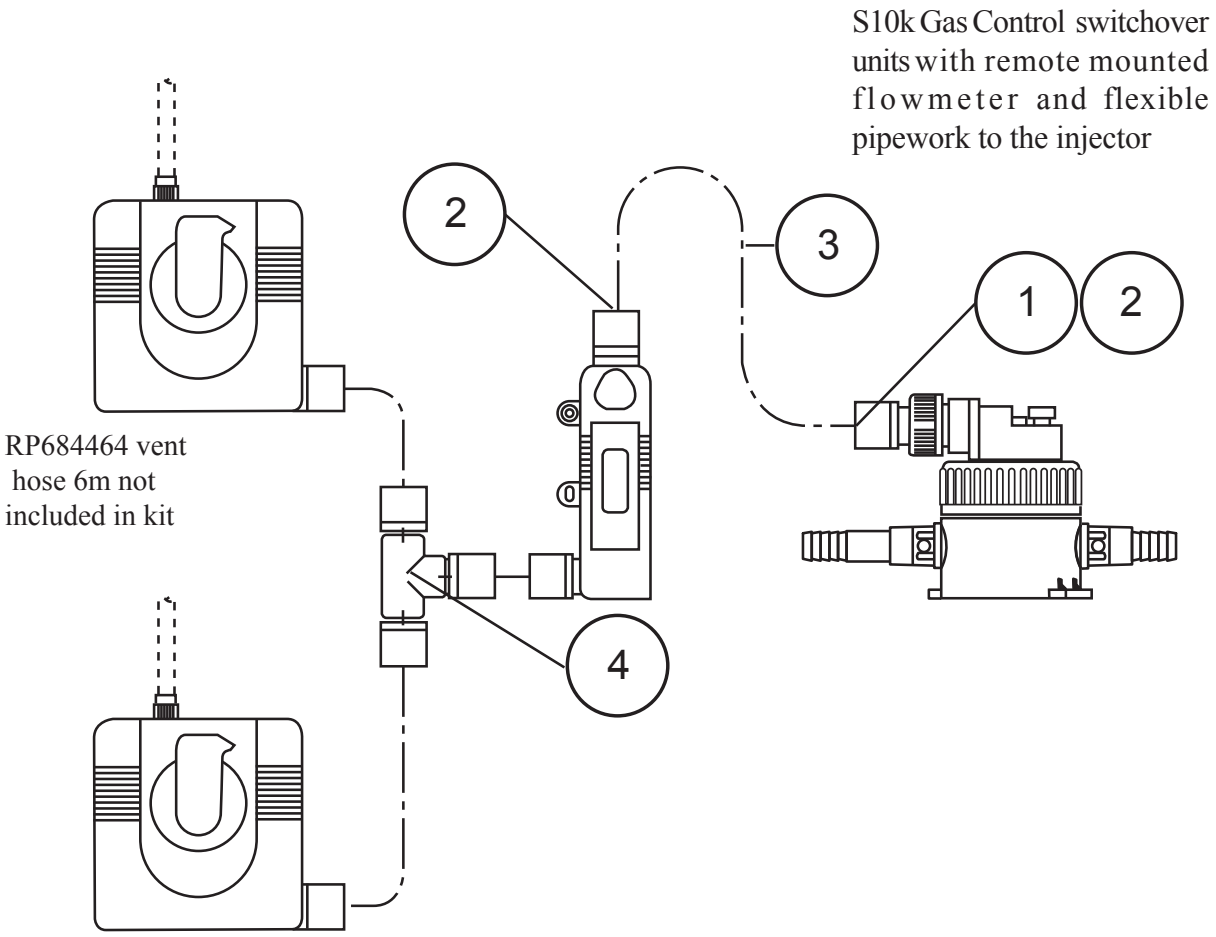


S10k Gas Control Unit with remote mounted flowmeter and rigid pipework to the injector

Parts kit AAA7434 — Arrangement G				
No	**Part No. (old)**	**Part No. (new)**	**Description**	**QTY**
1	AAA2523	W2T10205	Union end ½" plain	4
2	AAA3479	W2T10192	O-ring	3
3	AAA2502	W2T10203	Union nut	3
4	AAA2925	W3T162234	Connector	3

Parts kit AAA7437 — Arrangement H				
No	**Part No. (old)**	**Part No. (new)**	**Description**	**QTY**
1	AAA2553	W2T632923	Union end 20mm plain	3
2	AAA3479	W2T10192	O-ring	3
3	AAA2502	W2T10203	Union nut	3
4	AAA2925	W3T162234	Connector	3

FIG.12 VACUUM LINE CONNECTIONS (Drg.XAC1026 Sht 4 of 6)

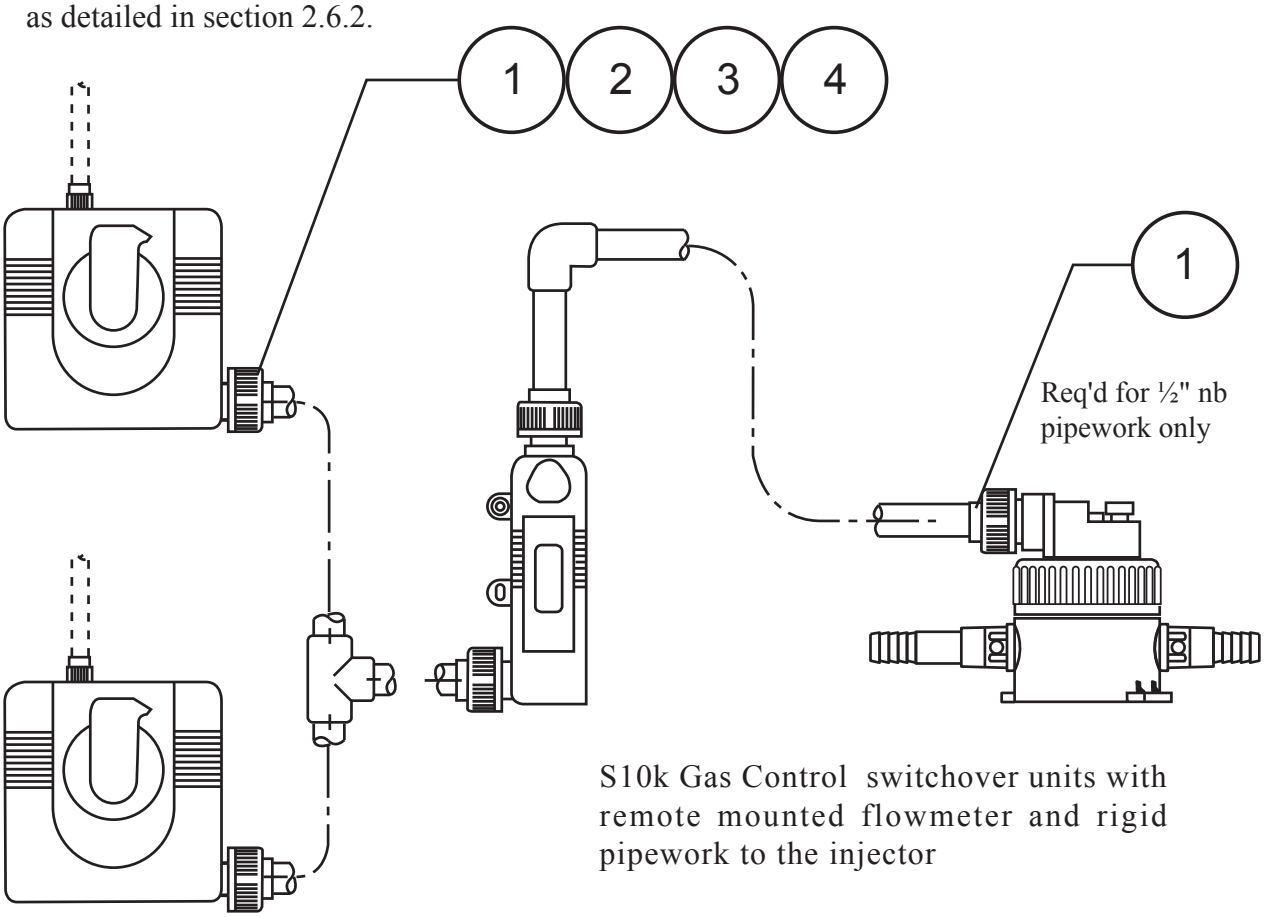


			Parts Kit AAA7425 - up to 4kg/hr		Parts Kit AAB5133 - 4kg/hr and above	
No	Description	QTY	Old Part No.	New Part No.	Old Part No.	New Part No.
1	Union end ½" NPT	1	AAA3267	W2T633002	AAA3267	W2T633002
2	Connector	1	U27486	W3T292344	U24102	W3T292336
3	Hose	16m/18m	RP684484	W2T636355	RP684502	W2T505677
4	Tee	2	P82942	W2T635691	P82942	W2T635691

FIG.12 VACUUM LINE CONNECTIONS (Drg.XAC1026 Sht 5 of 6)

RP684464 vent hose
6m not included in kit

The vent line should be run as detailed in section 2.6.2.



S10k Gas Control switchover units with remote mounted flowmeter and rigid pipework to the injector

Parts kit AAA7440— Arrangement J				
No	**Part No. (old)**	**Part No. (new)**	**Description**	**QTY**
1	AAA2523	W2T10205	Union end ½" plain	5
2	AAA3479	W2T10192	O-ring	4
3	AAA2502	W2T10203	Union nut	4
4	AAA2925	W3T162234	Connector	4

Parts kit AAA7443 — Arrangement K				
No	**Part No. (old)**	**Part No. (new)**	**Description**	**QTY**
1	AAA2553	W2T632923	Union end 20mm plain	4
2	AAA3479	W2T10192	O-ring	4
3	AAA2502	W2T10203	Union nut	4
4	AAA2925	W3T162234	Connector	4

FIG.12 VACUUM LINE CONNECTIONS (Drg.XAC1026 Sht 6 of 6)

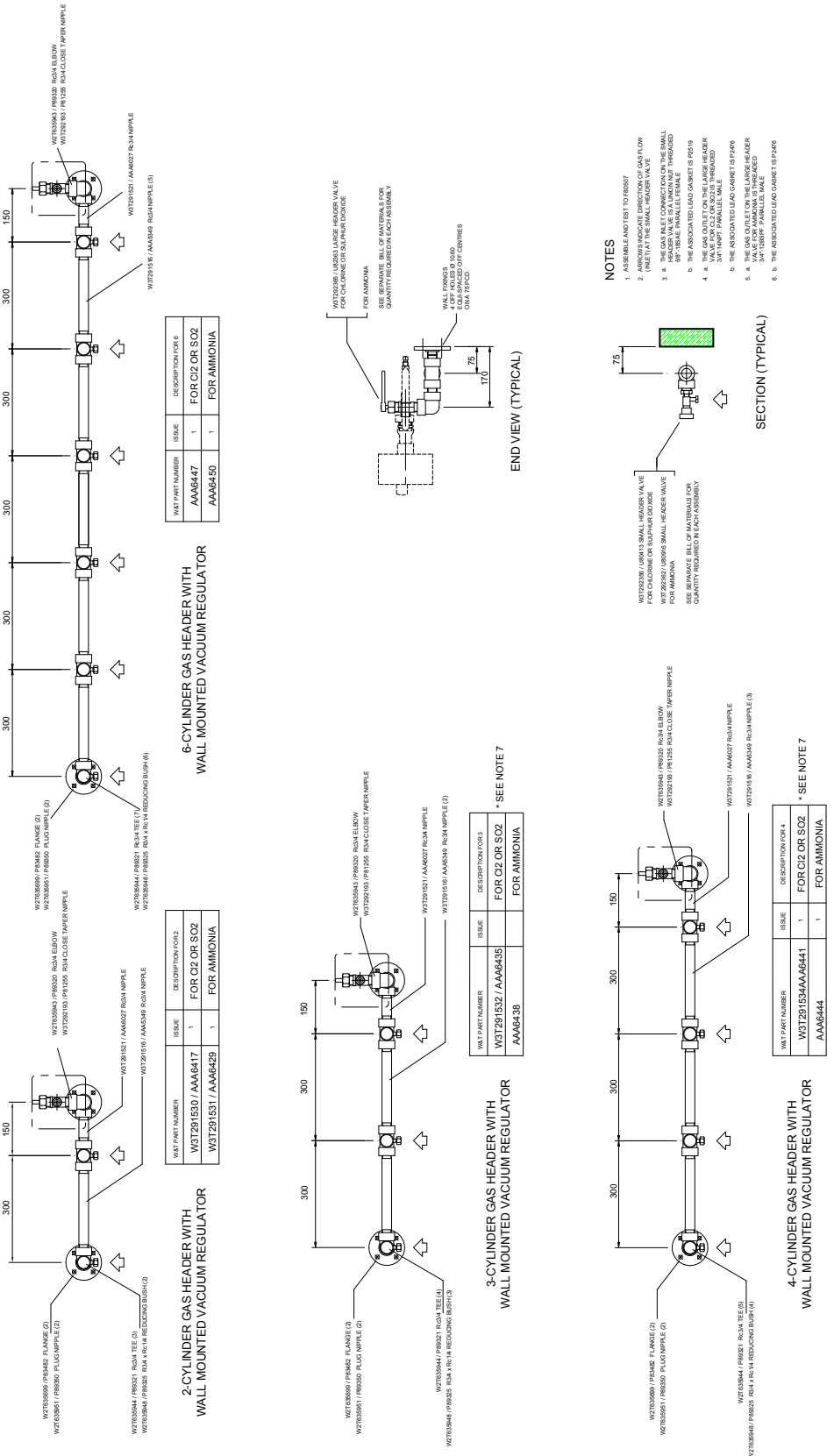


FIG.13 GAS HEADERS (WAC1622)

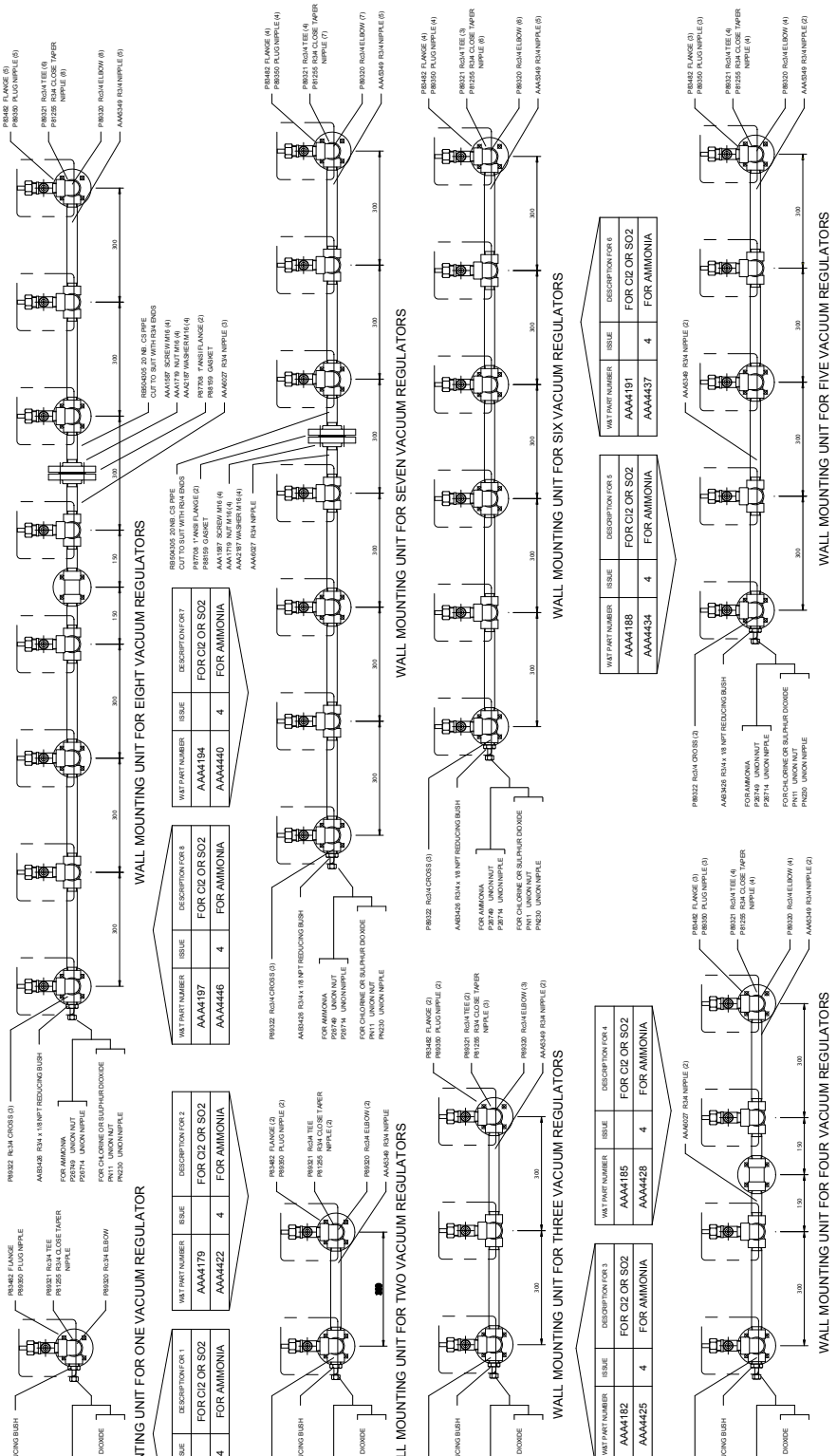


FIG.13 GAS HEADERS (WAC1415)

KEY	PART No. OLD	PART No. NEW	QTY	DESCRIPTION
-	AAB3656	W3T291649	1	Vacuum demand valve, (Universal yoke)
-	AAB3647	W3T291647	1	Vacuum demand valve, (Chlorine Inst. yoke)
1	AKG5438	W2T11240	1	Front cover
2	ARQ4529	W2T11513	1	Knob
3	AAB1251	W2T9974	1	Pin dowel
4	AAB2699	W2T9973	1	Operating lever pawl
5	AMK5341	W2T11210	1	Operating lever
6	P41078	W2T376033	1	Spring
7	AAA9033	W2T633505	1	Plug
8	AAA1616	W2T11006	1	Hypalon diaphragm
9	APQ5464	W2T11455	1	Operating diaphragm
10	AAA9027	W2T10001	6	Screw pan hd M6x20
11	ASS4538	W2T11507	1	Nut, backing plate
12	AAB3089	W2T9964	1	Operating shaft
	APQ5390	W2T11227	1	Operating shaft (Ammonia Only)
13	APQ5558	W2T367120	2	"O" ring
14	AAB1733	W2T10155	1	Seat
15	AMK5655	W2T11347	2	"O" ring
16	AIC5321	W2T367016	1	Stem
17	AAA7094	W2T10335	1	Stop, spring
18	AAB3092	W2T9965	1	Housing
	AAB3095	W2T9966	1	Housing (Ammonia only)
19	AKG4105	W2T11199	1	Spring
20	AAB2690	W2T9970	1	Nut, housing retainer
21	ALI5542	W2T367059	1	"O" ring
22	AOO5571	W2T11245	1	Spring-circular leaf
23	APQ4366	W2T11061	1	Retainer
24	P51401	W2T15248	1	"O" ring
25	AAB2693	W2T9971	1	Housing, back
26	AMK5553	W2T11346	1	"O" ring
27	AOK4480	W2T11501	1	Housing, front
28	P39233	—	2	Union
29	PXB39234	W3T169111	2	Nut
30	AAB3143	W2T9957	1	Diaphragm
31	P41079	W2T18114	1	Spring cup
32	AIA4045	W2T11216	1	Spring
33	APM4519	W2T11505	1	Plug

Note- Maintenance Kit AAA1160

-	APQ5464	W2T11455	1	Diaphragm, Halar
-	AAA 1616	W2T11006	1	Diaphragm, Hypalon
-	U27546	W2T13678	1	Grease, Halocarbon 15ml
-	AAB3143	W2T9957	1	Diaphragm
-	AIA4045	W2T11216	1	Spring-plunger safety valve
-	AMK5553	W2T11345	1	'O' ring
-	P51401	W2T15248	1	'O' ring
-	ALI5542	W2T367059	1	'O' ring
-	AMK5655	W2T11347	2	'O' ring
-	AKG5549	W2T367045	1	'O' ring
-	AAA7106	W3T167913	1	Screen
-	AAA7109	W3T167914	1	Screen support
-	APQ5558	W2T367120	2	'O' ring

IMPORTANT: When ordering spare parts quote machine serial number together with full description and part number.

Optional Extras

-	P5822	W3T292185	1	End wrench
-	P60134	W2T12212	10	Lead gasket
-	U29305	W2T11749	1	Insect screen
-	RP684464	W2T16217	1	$^{3}/_{8}$" Vent hose

FIG.14 VACUUM DEMAND VALVE (STANDARD)

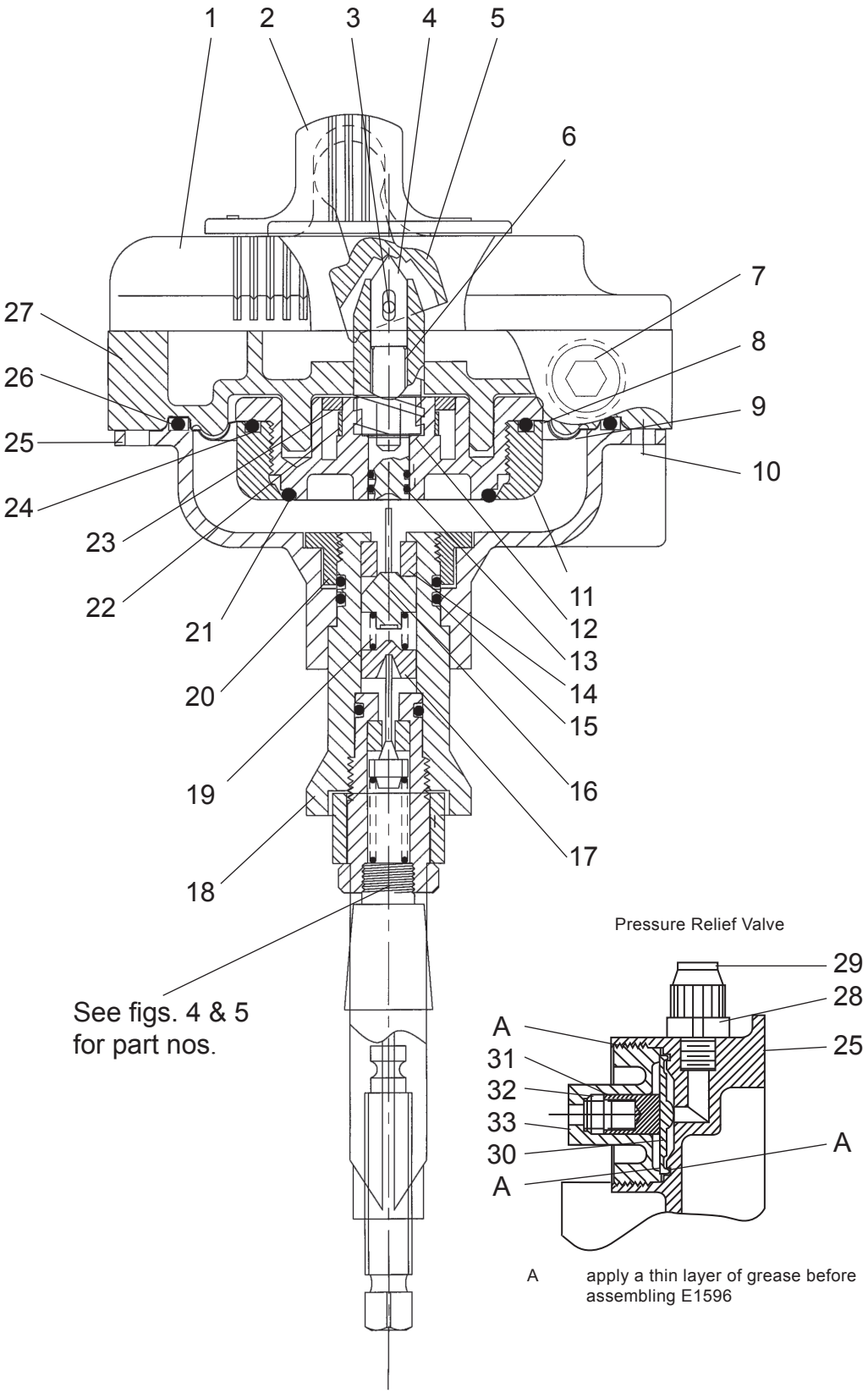


FIG.14 VACUUM DEMAND VALVE (STANDARD)

KEY	PART No.		QTY	DESCRIPTION
	OLD	NEW		
-	AAB3653	W3T291648	1	Vacuum demand valve, (Universal yoke)
-	AAB3671	W3T291651	1	Vacuum demand valve, (Chlorine Inst. yoke)
1	AMG4473	W2T11506	1	Front cover
2	ARQ4529	W2T11513	1	Knob
3	AAB1251	W2T9974	1	Pin dowel
4	AAB2699	W2T9973	1	Operating lever pawl
5	ALE4534	W2T11511	1	Operating lever
6	P41078	W2T11511	1	Spring
7	AAA9033	W2T633505	1	Plug
8	AAA1616	W2T11006	1	Hypalon diaphragm
9	APQ5464	W2T11455	1	Operating diaphragm
10	AAA9027	W2T11455	6	Screw pan hd M6x20
11	ASS4538	W2T11507	1	Nut, backing plate
12	AAB3089	W2T9964	1	Operating shaft
	APQ5390	W2T11227	1	Operating shaft (ammonia only)
13	APQ5558	W2T367120	2	"O" ring
14	AAB1733	W2T10155	1	Seat
15	AMK5655	W2T11347	2	"O" ring
16	AIC5321	W2T367016	1	Stem
17	AAA7094	W2T10335	1	Stop, spring
18	AAB3092	W2T9965	1	Housing
	AAB3095	W2T9966	1	Housing (Ammonia Only)
19	AKG4105	W2T11199	1	Spring
20	AAB2690	W2T9970	1	Nut
21	ALI5542	W2T367059	1	"O" ring
22	AOO5571	W2T11245	1	Spring-circular leaf
23	APQ4366	W2T11061	1	Retainer
24	P51401	W2T15248	1	"O" ring
25	AAB2693	W2T9971	1	Housing, back
26	AMK5553	W2T11346	1	"O" ring
27	AOK4480	W2T11501	1	Housing, front

Note- Maintenance Kit AAA1160

-	APQ5464	W2T11455	1	Diaphragm, Halar
-	AAA1616	W2T11006	1	Diaphragm, Hypalon
-	U27546	W2T13678	1	Grease, Halocarbon 15ml
-	AAB3143	W2T9957	1	Diaphragm
-	AIA4045	W2T11216	1	Spring-plunger safety valve
-	AMK5553	W2T11346	1	'O' ring
-	P51401	W2T15248	1	'O' ring
-	ALI5542	W2T367059	1	'O' ring
-	AMK5655	W2T11347	2	'O' ring
-	AKG5549	W2T367045	1	'O' ring
-	AAA7106	W3T167913	1	Screen
-	AAA7109	W3T167914	1	Screen support
-	APQ5558	W2T367120	2	'O' ring

IMPORTANT: When ordering spare parts quote machine serial number together with full description and part number.

FIG.15 VACUUM DEMAND VALVE (SWITCHOVER)

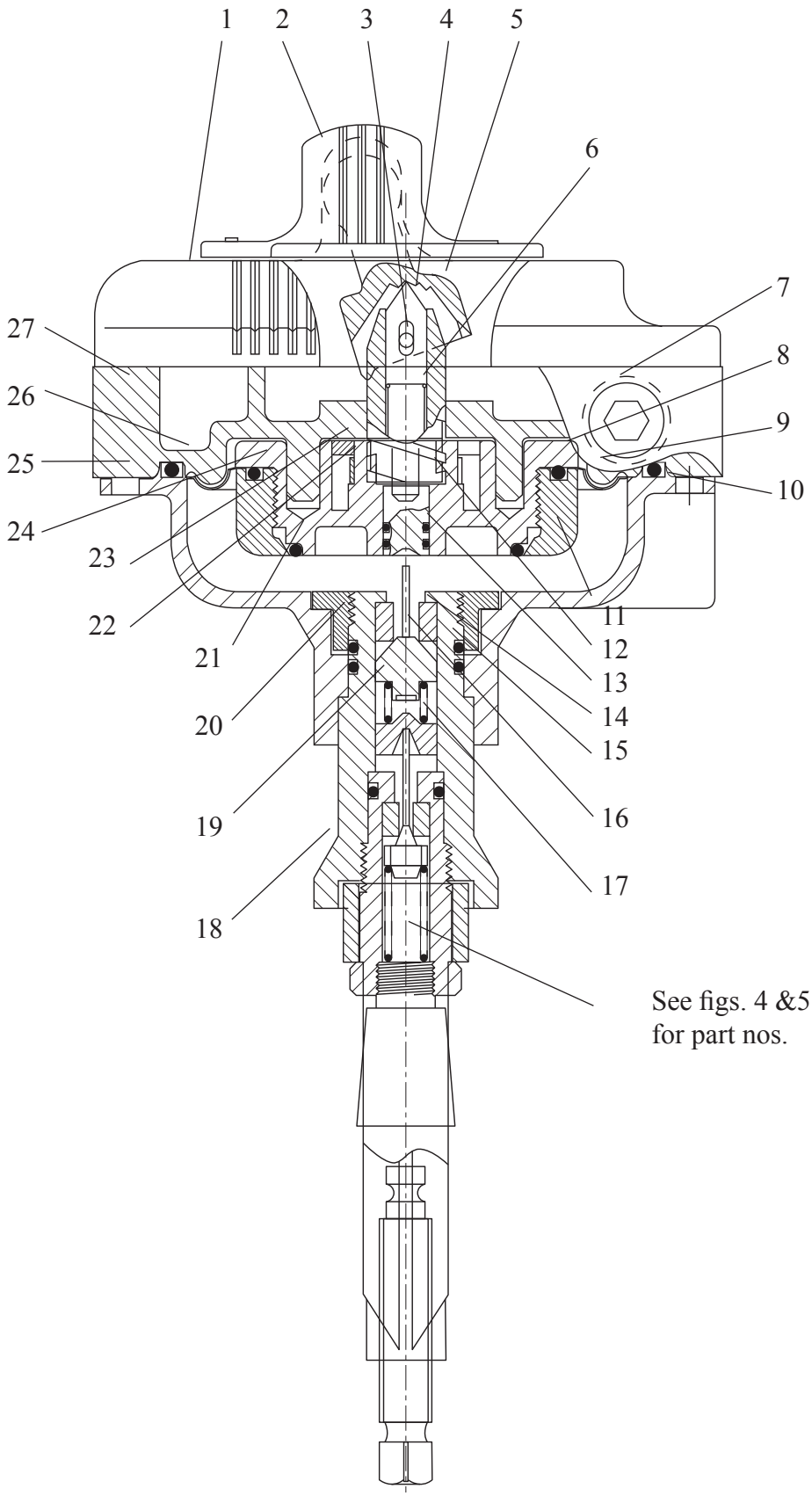


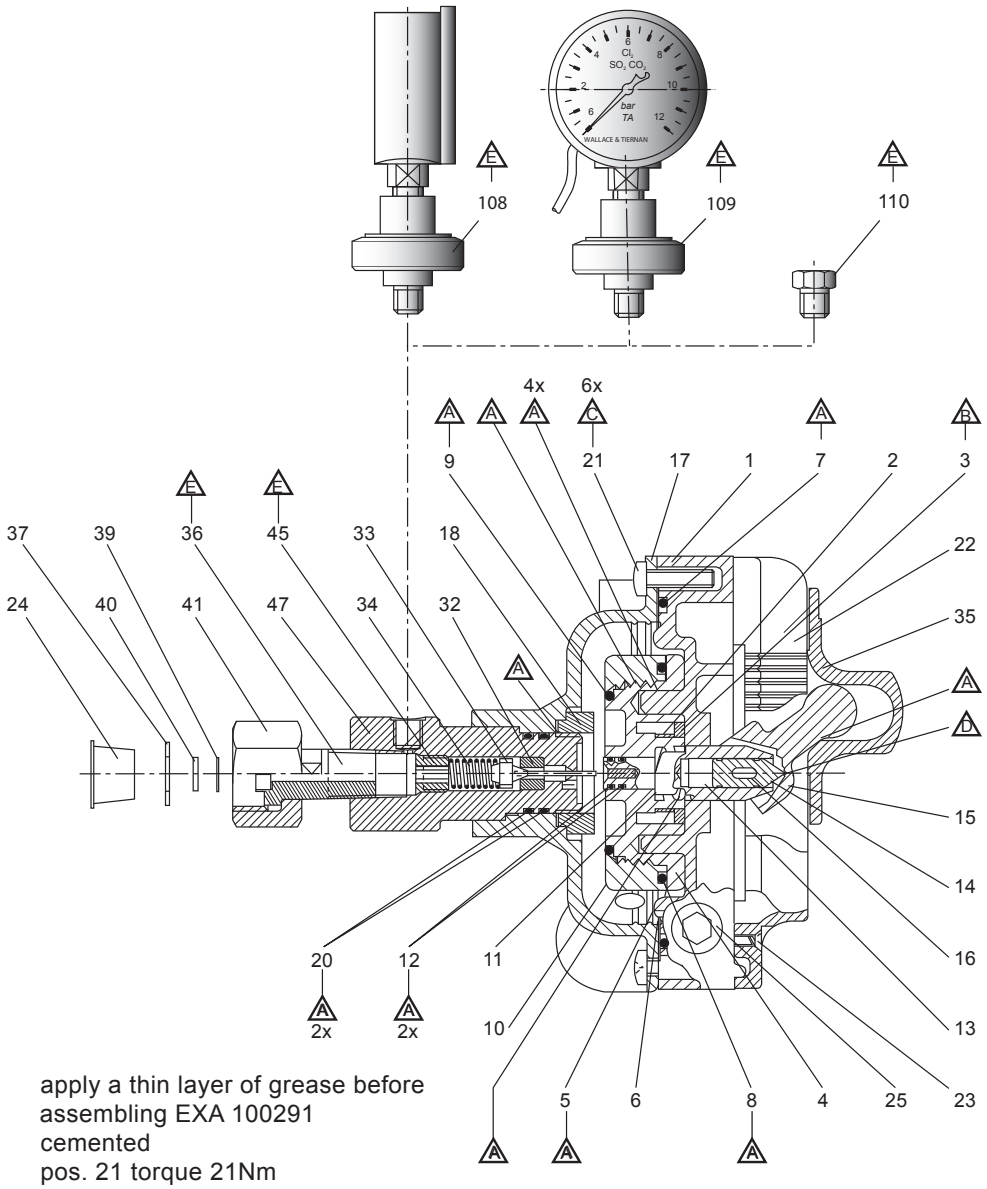
FIG.15 VACUUM DEMAND VALVE (SWITCHOVER)

Key	Part No		QTY	Description
	OLD	NEW		
1	AOK4480	W2T11501	1	front housing standard
2+3+4	AOO5571	W2T11245	1	plate
+	APQ4366	W2T11061		
+	AQO4543	W2T11508		
5	APQ5464	W2T11455	1	diaphragm (2-a)
6	AAA1616	W2T11006	1	diaphragm transparent(gas side) (2-a)
7	AMK5553	W2T11346	1	o-ring (1-a)
8	P51401	W2T15248	1	o-ring (1-a)
9	ALI5542	W2T367059	1	o-ring (1-a)
10	ASS4538	W2T11507	1	nut
11	AAB3089	W2T9964	1	shaft
12	APQ5558	W2T367120	2	o-ring (1-a)
13	P41078	W2T376033	1	spring
14	AAB2699	W2T9973	1	pawl
15	AMK5341 ①	W2T11210	1	lever
	ALE4534 ②	W2T11511	1	lever
16	AAB1251	W2T9974	1	pin
17	AAB2693	W2T9971	1	housing, back
18	AAB2690	W2T9970	1	nut
20	AMK5655	W2T11347	2	o-ring (1-a)
21	AAA9027	W2T10001	6	screw (2-a)
22	AKG5438 ①	W2T11240	1	housing, front
	AMG4473②	W2T11506	1	housing, front
23	AAA9030	W2T10002	1	screw (front part) (1-a)
24	P34374	W2T12043	1	plug (for transport)
25	AAA9033	W2T633505	1	plug
26	P39233	—	2	union
27	PXB39234	W3T169111	2	nut
28	AAB3143	W2T9957	1	diaphragm (2-a)
29	P41079	W2T18114	1	spring cup
30	AIA4045	W2T11216	1	spring (2-a)
31	APM4519	W2T11505	1	plug
32	AAB1736	W2T10156	1	seat (2-a)
33	ANM5366	W2T367090	1	stem (2-a)
34	APQ4110	W2T11229	1	spring (2-a)
35	ARQ4529	W2T11513	1	knob
36	AAB9328 ④	W3T169942	1	nipple (26 x 3 mm nut)
	AAB5268	W2T633807	1	nipple (G5/8 nut)
	AAB5294	—	1	nipple (G½ nut)
37	P94000 ④	W3T161419	1	gasket (26 x 3 mm nut)
	AAB5262	W2T633806	1	gasket (G5/8 nut)
	M2476	W2T635289	1	gasket (G½ nut)
38	P94821	W3T171038	1	reduction
39	AAB6057	W2T633852	1	filter holder (1-a)
40	AAB6060	W3T291692	1	filter (replace at every time the cylinder is changed) (1-a)
41	P91733 ③	W3T163338	1	nut (26 x 3 mm nut)
	AAB5259	W2T633805	1	nut (G5/8 nut)
	AAB5697	—	1	nut (G½ nut)
	U93704 ④	—	1	clamp
42	AAA5833	W3T164210	1	warning label
43	AAA5836	W3T164211	1	warning label
45	AAB9325	W3T169940	1	retainer
47	AAB9322	W3T169939	1	valve housing
62	AAA7704	—	1	label
108	U17805G	W2T614441	1	pressure gauge (option)

Key	Part No		QTY	Description
	OLD	NEW		
109	UXA96581	W3T169366	1	contact pressure gauge (optional)
110	PN288	W2T636095	1	plug
111	U94329	—	1	elbow (option)
112	U27486	W3T292344	1	union
113	U24102	W3T292336	1	union
Heater (optional, not shown):				
	AAA5101	—	1	heater element
	AAA5104	W2T506383	1	thermostat
	UXA96338	—	1	cable with plug

① for standard regulator (not switch-over)
② for switch-over regulator
③ for Cl2 or SO2 cylinder to DIN 477
④ for french Cl2 cylinder
⑦ without pressure gauge
⑧ for connecting to a CO2 tube
(1-a) replace every year
(included in spare parts kits 1 and 2 year)
(2-a) replace every second year
(included in spare parts kit 2 years)

FIG.16 VACUUM DEMAND VALVE (running nut)



A, D apply a thin layer of grease before assembling EXA 100291
B cemented
C. pos. 21 torque 21Nm
E tighten with Teflon tape

Pressure Relief Valve

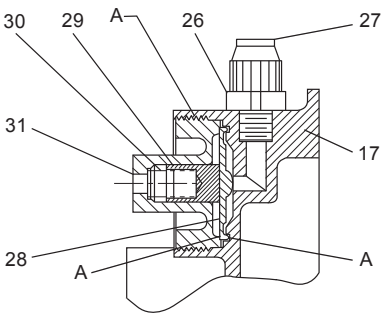


FIG.16 VACUUM DEMAND VALVE (running nut)

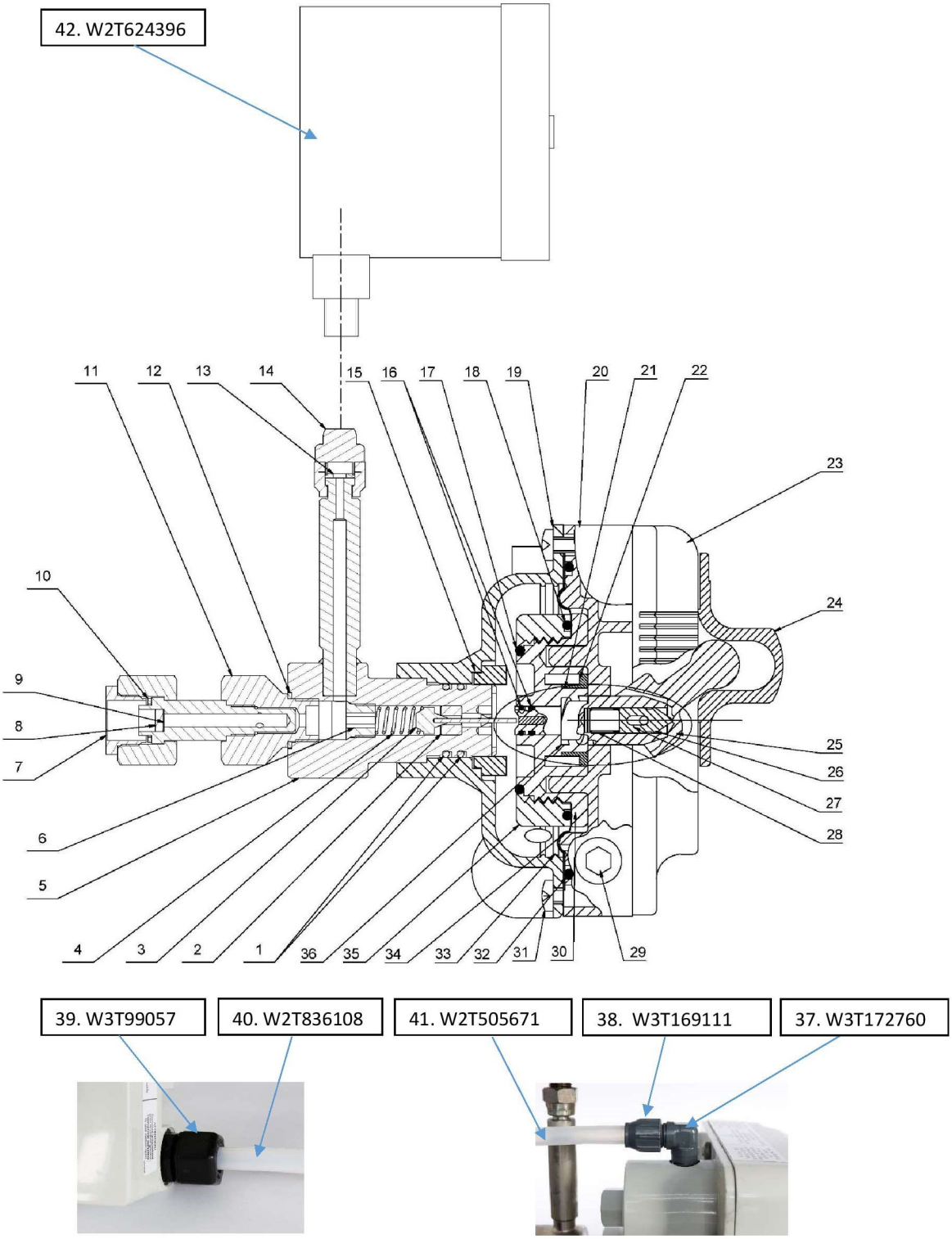


FIG. 17 S10k DIRECT MOUNT CHLORINE VACUUM REGULATOR (No. 6 CONNECTION)

S10k Direct Mount Chlorine Vacuum Regulator (No. 6 Connection)

Key	Part no.	Description	Qty.
1	W2T11347	O-ring 23.47 mm ID x 2.62 mm dia section	2
2	W2T10156	S10k Vacuum regulator seat dia 1/2	1
3	W2T367090	S10k Vacuum regulator stem assembly	1
4	W2T11229	S10k Vacuum regulator compression spring	1
5	W3T373664	S10k Valve body & gauge stem assembly weldment	1
6	W3T169940	S10k Vacuum regulator retainer	1
7	W2T635712	5/8” Redcap plug	1
8	W2T383713	Dia 8.6 mm x 3.1 Thick filter - felt	1
9	W2T832841	Dia 8.6 mm Filter gauze	1
10	W2T624448	Gasket 14.0 ID x 18.2 OD x 1.5 thick (No. 6)	1
11	W3T373236	S10k Direct mount vacuum regulator adaptor No. 6	1
12	W2T636873	Spacer washer 21.5 OD x 16.7 ID x 1.5 thick	1
13	W2T624520	Gasket 5.0 ID x 11.4 OD x 1.5 thick	1
14	W2T635709	Protective redcap plug	1
15	W2T9970	Nut housing retainer	1
16	W2T367120	O-ring (011)	2
17	W2T367059	O-ring (226)	2
18	W2T15248	O-ring (232)	1
19	W2T9971	Back housing	1
20	W2T11501	Front housing	1
21	W2T11245	Spring, circular	1
22	W2T11061	Retainer	1
23	W2T11240	Cover, front	1
24	W2T11513	Knob operating lever	1
25	W2T11210	Operating lever	1
26	W2T9973	Operating level pawl	1
27	W2T9974	Pivot pin	1
28	W2T376033	Spring pawl	1
29	W2T633505	Plug black, 1/2 NPT pipe	1
30	W3T108083	Diaphragm backing plate	1
31	W2T10001	Front/back housing assembly screw	6
32	W2T11346	O-ring (246)	1
33	W2T11455	Operating diaphragm	1
34	W2T11006	Backing diaphragm	1
35	W2T11507	Backing plate nut	1
36	W2T9964	Operating shaft	1
37	W3T172760	1/4 NPT x 3/8” OD Tube adaptor collect elbow	1
38	W3T169111	1/2-20 UNF x 3/8” OD Tube collect adaptor unit	1
39	W3T99057	1/2 NPT x 1/2” Tube connector	1
40	W2T836108	Gas discharge line ID 9.5 x 1.6 mm/ 3/8” x 1/2”, PE	3
41	W2T505671	Vent line ID 6.35 x 1.6 mm / 1/4” x 3/8”, PE	3
42	W2T624396	Contact pressure gauge 0 to 16 bar, Cl2, NG 100	1

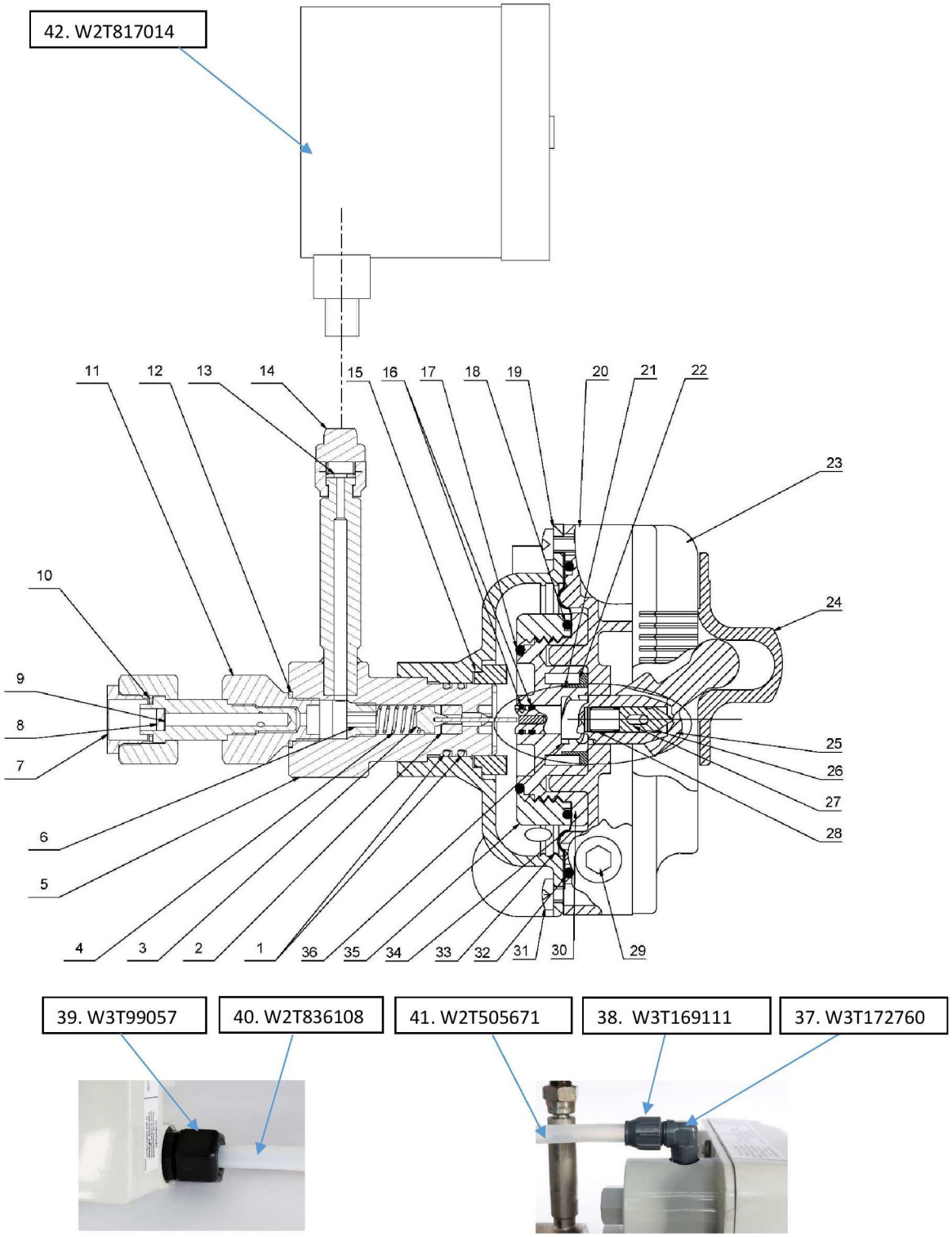


FIG. 18 S10k DIRECT MOUNT SULPHUR DIOXIDE VACUUM REGULATOR (No. 10 CONNECTION)

S10k Direct Mount Sulphur Dioxide Vacuum Regulator (No. 10 Connection)

Key	Part no.	Description	Qty.
1	W2T11347	O-ring 23.47 mm ID x 2.62 mm dia section	2
2	W2T10156	S10k Vacuum regulator seat dia 1/2	1
3	W2T367090	S10k Vacuum regulator stem assembly	1
4	W2T11229	S10k Vacuum regulator compression spring	1
5	W3T373664	S10k Valve body & gauge stem assembly weldment	1
6	W3T169940	S10k Vacuum regulator retainer	1
7	W2T635712	5/8” Redcap plug	1
8	W2T383713	Dia 8.6 mm x 3.1 Thick filter - felt	1
9	W2T832841	Dia 8.6 mm Filter gauze	1
10	W2T624454	Gasket 13.0 ID x 17.0 OD x 1.5 thick (No. 10)	1
11	W3T373240	S10k Direct mount vacuum regulator adaptor No. 10	1
12	W2T636873	Spacer washer 21.5 OD x 16.7 ID x 1.5 thick	1
13	W2T624520	Gasket 5.0 ID x 11.4 OD x 1.5 thick	1
14	W2T635709	Protective redcap plug	1
15	W2T9970	Nut housing retainer	1
16	W2T367120	O-ring (011)	2
17	W2T367059	O-ring (226)	2
18	W2T15248	O-ring (232)	1
19	W2T9971	Back housing	1
20	W2T11501	Front housing	1
21	W2T11245	Spring, circular	1
22	W2T11061	Retainer	1
23	W2T11240	Cover, front	1
24	W2T11513	Knob operating lever	1
25	W2T11210	Operating lever	1
26	W2T9973	Operating level pawl	1
27	W2T9974	Pivot pin	1
28	W2T376033	Spring pawl	1
29	W2T633505	Plug black, 1/2 NPT pipe	1
30	W3T108083	Diaphragm backing plate	1
31	W2T10001	Front/back housing assembly screw	6
32	W2T11346	O-ring (246)	1
33	W2T11455	Operating diaphragm	1
34	W2T11006	Backing diaphragm	1
35	W2T11507	Backing plate nut	1
36	W2T9964	Operating shaft	1
37	W3T172760	1/4 NPT x 3/8” OD Tube adaptor collect elbow	1
38	W3T169111	1/2-20 UNF x 3/8” OD Tube collect adaptor unit	1
39	W3T99057	1/2 NPT x 1/2” Tube connector	1
40	W2T836108	Gas discharge line ID 9.5 x 1.6 mm/ 3/8” x 1/2”, PE	3
41	W2T505671	Vent line ID 6.35 x 1.6 mm / 1/4” x 3/8”, PE	3
42	W2T817014	Contact pressure gauge 0 to 6 bar, SO2, NG 100	1

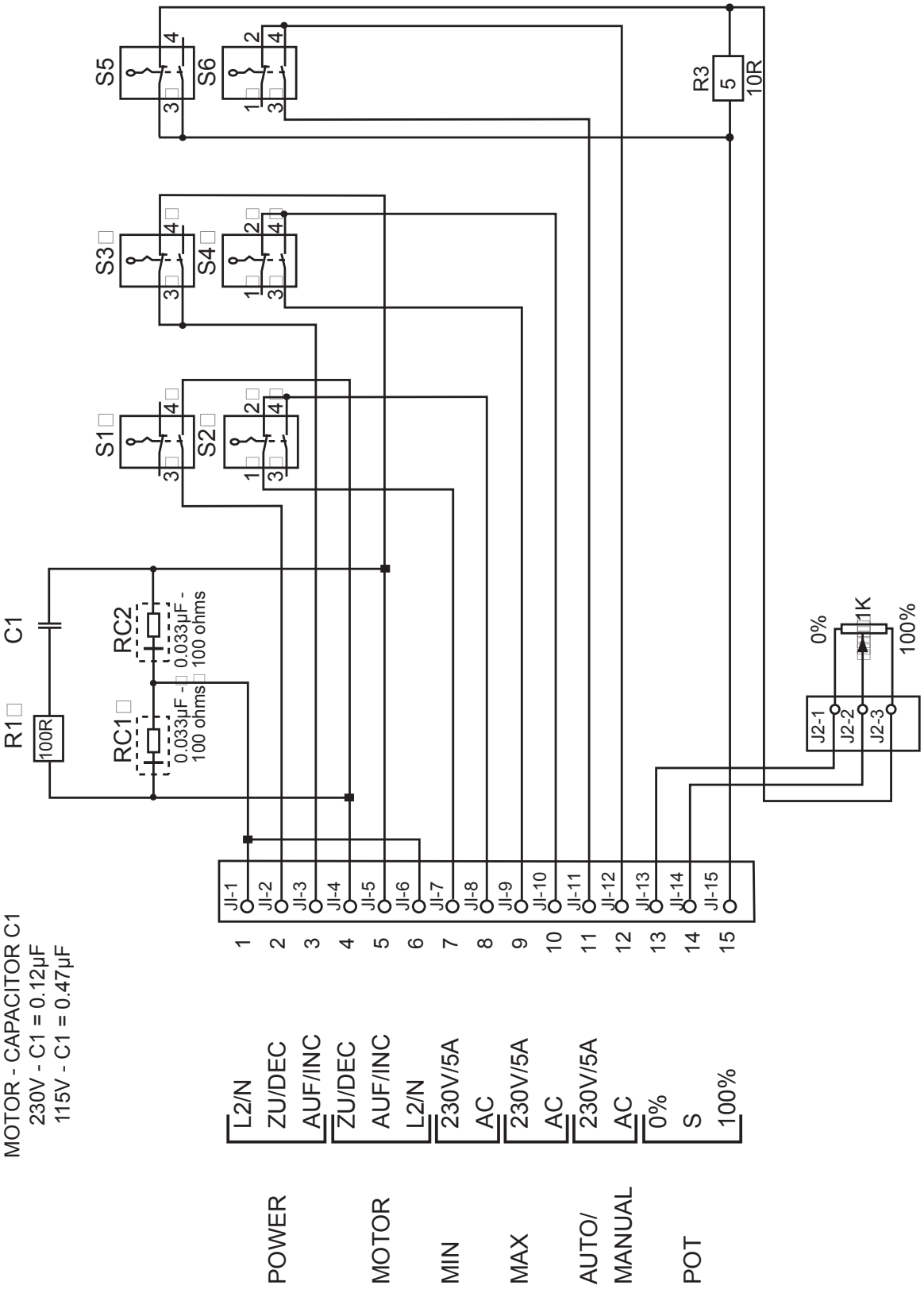


FIG.17 EXTERNAL CONNECTION DIAGRAM (Drg.30-E-7662)

Injector Operating Requirements

The following pages have been included to assist in the determination of the water pressure and flow required to operate the gas feeders under various conditions. The hydraulic data for the ¾" injector is applicable to systems with a capacity of up to 4 kg/h, whilst the hydraulic data for the 1" injector applies to systems with a capacity of up to 10 kg/h.

Before commencing work with these charts, it is necessary to have some idea of the hydraulic conditions on site. Once the 'back pressure' (essentially the mains pressure at the point of chlorine injection plus an allowance for friction losses) is known, the selection can be made.

As an example, assume a gas feeder, with a chlorine capacity of 4 kg/h, using a ¾" (19 mm) injector, to operate against a mains pressure of 1 bar. Search for the data block associated with the ¾" injector for the next highest back pressure above the actual. In our example this will be 1.4 bar. Within that block follow the line across relevant to the 4 kg/h capacity.

You will see that the column headed '140' is 7.1/G, in the column headed '193' is 6.1/J and in the column headed '242' is 5.4/J. This means that fitting the injector with a 140G venturi (throat and tailway) combination will require 7.1 bar operating pressure, 193J combination will require 6.1 bar and 242J will require 5.4 bar. These are minimum pressure requirements at the injector inlet for satisfactory operation against the total back pressure calculated at the injector outlet.

Now refer to the graph at the end to establish the minimum operating flow for each combination. Read vertically up from the operating pressure figure for a given venturi (throat and tailway) combination to the point of intersection with the appropriate diagonal line. From the point of intersection, read horizontally to the left to establish the water flow. For example, using the 140G combination, requiring 7.1 bar operating pressure, the appropriate minimum water flow is approximately 1.4 m^3/h. You will note that the venturi combinations requiring a smaller differential pressure (in this example 193J and 242J) have a higher flow requirement.

NOTE: As with the pressure requirements, these are the minimum flow requirements.

Should it be necessary to select a booster pump to operate the injector, it is strongly recommended that an allowance be made for the friction loss between the booster pump outlet and the injector inlet, plus the booster pump suction pipework should be carefully considered to ensure that the booster pump suction pressure is achievable under flow conditions.

HYDRAULIC DATA FOR ¾"-INJECTOR

Part No.

Throat Part No.		No.
OLD	NEW	
PXE48961	W2T9768	99
PXG48961	W2T376755	140
PXJ48961	W2T16045	193
PXK48961	W2T15702	242

Tailpiece Part No.		Code
OLD	NEW	
PXD48962	W2T636231	D
PXE48962	W2T13677	E
PXF48962	W2T16048	F
PXG48962	W2T15986	G
PXH48962	W2T15709	H
PXJ48962	W2T16046	J

Chlorine	Back Pressure	Injector Throat and Tailpiece													
g/h	bar	99	*			140	*			193	*	242	*		
200	0	1.6	D			1.0	F								
400	"	2.4	D			1.2	F			0.9	G				
600	"	3.3	D			1.4	F			1.0	J				
1000	"	3.6	D			1.6	F			1.3	J				
1500	"	4.5	D			2.5	F			1.8	J	1.4	J		
2000	"	5.3	F			3.4	F			2.4	J	1.9	J		
3000	"					4.2	G			4.7	J	2.6	J		
4000	"					5.8	G					3.9	J		

Chlorine	Back Pressure	Injector Throat and Tailpiece													
g/h	bar	99	*			140	*			193	*	242	*		
200	0.2	1.7	D			1.2	F								
400	"	2.6	D			1.4	F								
600	"	3.3	D			1.6	F								
1000	"	3.8	D			1.8	F			1.5	J				
1500	"	4.8	D			2.7	F			2.0	J	1.6	J		
2000	"	7.1	E			3.6	G			2.5	J	2.1	J		
3000	"					4.1	G			3.5	J	2.9	J		
4000	"					5.8	G					4.1	J		
5000	"					7.1	G					6.5	J		

Chlorine	Back Pressure	Injector Throat and Tailpiece													
g/h	bar	99	*			140	*			193	*	242	*		
200	0.4	2.0	D			1.3	F								
400	"	3.1	D			1.6	F								
600	"	3.6	D			1.8	F								
1000	"	4.0	D			2.1	F			1.9	J				
1500	"	5.6	D			3.2	F			2.3	J	1.9	J		
2000	"					3.6	G			2.7	J	2.2	J		
3000	"					4.3	G			3.8	J	3.2	J		
4000	"					5.8	G			7.7	J	4.3	J		
5000	"					7.5	G					7.5	J		

Chlorine	Back Pressure	Injector Throat and Tailpiece													
g/h	bar	99	*			140	*			193	*	242	*		
200	0.7	2.5	D			1.7	F								
400	"	3.3	D			2.1	F								
600	"	4.1	D			2.3	F								
1000	"	4.8	D			2.6	F			2.4	J				
1500	"	6.0	D			3.8	F			2.6	J	2.2	J		
2000	"					4.0	G			3.0	J	2.6	J		
3000	"					4.9	G			4.8	J	3.4	J		
4000	"					6.4	G			8.6	J	4.7	J		
5000	"					8.2	G					8.2	J		

Chlorine	Back Pressure	Injector Throat and Tailpiece													
g/h	bar	99	*			140	*			193	*	242	*		
200	1.4	3.3	D			2.7	F								
400	"	4.0	D			3.2	F								
600	"	5.1	D			3.4	F								
1000	"	6.6	D			3.6	F			3.0	G				
1500	"	8.3	D			4.5	F			3.9	G	2.7	J		
2000	"	10.5	D			5.4	G			4.3	G	3.3	J		
3000	"					5.8	G			5.2	H	4.3	J		
4000	"					7.1	G			6.1	J	5.4	J		
5000	"					9.3	G					9.3	J		

Chlorine	Back Pressure	Injector Throat and Tailpiece													
g/h	bar	99	*			140	*			193	*	242	*		
200	2.8	5.6	D			5.3	F								
400	"	5.8	D			5.4	F								
600	"	7.4	D			5.7	F								
1000	"	8.5	D			6.1	F			4.5	G				
1500	"	11.0	D			6.8	F			6.4	G				
2000	"	12.4	D			7.6	F			6.8	G				
3000	"					8.5	F			7.0	H	6.3	H		
4000	"					10.5	G			8.6	H	8.7	J		
5000	"					11.9	G					12.5	J		

Chlorine	Back Pressure	Injector Throat and Tailpiece													
g/h	bar	99	*			140	*			193	*	242	*		
200	4.2	8.1	D			7.6	F								
400	"	8.2	D			7.9	F								
600	"	8.9	D			8.2	F								
1000	"	10.4	D			8.5	F			6.4	G				
1500	"	13.0	D			9.1	F			8.3	G				
2000	"	13.5	D			9.8	F			9.9	G				
3000	"					10.7	F			10.2	G	8.2	H		
4000	"					13.2	F			10.6	H	9.1	J		
5000	"											13.0	J		

Chlorine	Back Pressure	Injector Throat and Tailpiece													
g/h	bar	99	*			140	*			193	*	242	*		
200	5.6	10.5	D			10.4	F								
400	"	10.5	D			10.5	F								
600	"	10.8	D			10.8	F								
1000	"	11.7	D			11.3	F			8.6	G				
1500	"					11.6	F			9.8	G				
2000	"					12.0	F			11.5	G				
3000	"					13.2	F			12.5	G				
4000	"					14.9	F			13.8	G	11.5	H		
5000	"					17.0	F			17.7	G	14.5	J		

Chlorine	Back Pressure	Injector Throat and Tailpiece													
g/h	bar	99	*			140	*			193	*	242	*		
200	7.0	13.4	D			12.5	F								
400	"	13.4	D			12.7	F								
600	"	13.7	D			13.0	F								
1000	"	14.3	D			13.2	F			10.0	G				
1500	"					13.8	F			12.3	G				
2000	"					14.5	F			13.8	G				
3000	"					15.6	F			13.9	G				
4000	"					17.5	F			14.7	G	14.5	H		
5000	"					20.0	F			19.2	G	17.4	J		

Chlorine	Back Pressure	Injector Throat and Tailpiece													
g/h	bar	99	*			140	*			193	*	242	*		
200	8.4"	15.7	D			15.2	F								
400	"	15.8	D			15.3	F								
600	"	15.9	D			15.7	F								
1000	"	17.3	D			15.9	F			11.9	G				
1500	"					16.6	F			13.6	G				
2000	"					17.2	F			15.9	G				
3000	"					18.6	F			16.5	G				
4000	"					19.5	F			17.8	G				
5000	"									21.5	G				

Chlorine	Back Pressure	Injector Throat and Tailpiece													
g/h	bar	99	*			140	*			193	*	242	*		
200	9.8	18.5	D			17.2	F								
400	"	18.6	D			17.6	F								
600	"	18.9	D			17.8	F								
1000	"	19.7	D			17.9	F			13.2	G				
1500	"					18.7	F			15.7	G				
2000	"					20.2	F			17.9	G				
3000	"									18.6	G				
4000	"									19.5	G				
5000	"														

Chlorine	Back Pressure	Injector Throat and Tailpiece													
g/h	bar	99	*			140	*			193	*	242	*		
200	11.2	21.0	D			19.4	F								
400	"	21.0	D			19.8	F								
600	"	20.1	F												
1000	"	20.4	F			15.6	G								
1500	"					20.8	F			17.4	G				
2000	"									19.6	G				
3000	"									20.5	G				
4000	"									21.0	G				
5000	"														

HYDRAULIC DATA FOR 1”-INJECTOR

Part No.		Throat No.	Tailpiece		Code	Tailpiece		Code
OLD	NEW		OLD	NEW		OLD	NEW	
PXE50094	W2T15729	99	PXC50093	W2T15731	C	PXK50093	W2T15723	K
PXF50094	W2T15729	120	PXD50093	W2T15719	D	PXL50093	W2T15725	L
PXG50094	W2T15727	140	PXE50093	W2T15728	E			
PXH50094	W2T15722	165	PXF50093	W2T15717	F			
PXJ50094	W2T15716	193	PXG50093	W2T15726	G			
PXK50094	W2T15724	242	PXH50093	W2T15721	H			
PXL50094	W2T15736	312	PXJ50093	W2T15715	J			

Chlorine	Back Pressure	Injector Throat and Tailpiece													
g/h	bar	99	*	120	*	140	*	165		193	*	242	*	312	*
200	0	1.1	D	1.0	D	1.0	F								
400	"	1.5	D	1.1	E	1.1	F								
600	"	1.6	D	1.4	E	1.1	G	1.2	F						
1000	"	2.3	E	1.7	F	1.3	G	1.3	F	1.2	H	1.0	H		
1500	"	3.2	E	2.3	F	1.8	G	1.5	H	1.5	H	1.2	J	0.9	L
2000	"			2.7	F	1.9	G	1.7	H	1.6	J	1.4	J	1.0	L
3000	"					3.2	G	2.1	H	1.7	J	2.5	J	1.2	L
4000	"							3.4	H	2.5	J	2.7	K	1.4	L
5000	"									3.1	J	2.8	K	1.4	L
6000	"									4.5	J	3.4	K	1.8	L
8000	"											4.8	K	2.7	L
10000												11.0	K	3.7	L

Chlorine	Back Pressure	Injector Throat and Tailpiece													
g/h	bar	99	*	120	*	140	*	165		193	*	242	*	312	*
200	0.2	1.6	D	1.2	D	1.2	F								
400	"	1.8	D	1.3	E	1.3	F								
600	"	1.9	D	1.6	E	1.5	G	1.3	F						
1000	"	2.4	E	1.8	F	1.7	G	1.4	F	1.3	H	1.2	H		
1500	"	3.4	E	2.5	F	1.8	G	1.7	G	1.4	H	1.3	J	0.9	K
2000	"			3.0	F	2.3	G	1.9	H	1.7	J	1.7	J	1.0	K
3000	"					3.4	G	2.6	H	2.2	J	2.8	J	1.1	L
4000	"							3.5	H	2.6	J	3.8	K	1.2	L
5000	"									3.2	J	4.0	K	1.4	L
6000	"									4.6	J	4.5	K	1.9	L
8000	"											5.6	K	2.7	L
10000														3.9	L

Chlorine	Back Pressure	Injector Throat and Tailpiece													
g/h	bar	99	*	120	*	140	*	165		193	*	242	*	312	*
200	0.4	1.	D	1.5	D	1.5	F								
400	"	2.2	D	1.8	E	1.6	F								
600	"	2.3	D	2.3	E	1.8	G	1.7	F						
1000	"	3.0	E	2.5	F	2.1	G	1.8	F	1.6	H	1.5	H		
1500	"	4.1	E	2.9	F	2.2	G	2.3	H	1.8	H	1.9	J	1.2	K
2000	"			3.3	F	2.9	G	2.4	H	2.4	J	2.4	J	1.2	K
3000	"			5.8	F	3.5	G	3.0	H	2.6	J	3.2	J	1.3	L
4000	"							3.6	H	3.1	J	4.1	K	1.4	L
5000	"							4.5		3.9	J	4.3	K	1.8	L
6000	"									4.7	J	4.8	K	2.3	L
8000	"									6.4	J	5.9	K	2.5	L
10000										7.2	J			4.2	L

Chlorine	Back Pressure	Injector Throat and Tailpiece													
g/h	bar	99	*	120	*	140	*	165		193	*	242	*	312	*
200	0.7	2.1	D												
400	"	2.8	D	2.5	E	2.1	E								
600	"	2.9	D	2.9	E	2.4	E	2.1	F						
1000	"	3.8	E	3.1	F	2.8	F	2.4	F	2.2	H	1.8	H		
1500	"	4.2	E	3.5	F	2.9	F	2.8	G	2.2	H	1.9	J	1.7	K
2000	"	5.0	E	4.3	F	3.5	F	2.9	H	2.6	J	2.4	J	1.7	K
3000	"			6.7	F	4.5	G	3.9	H	3.2	J	3.5	J	1.7	L
4000	"					6.2	G	4.1	H	3.6	J	4.3	K	1.7	L
5000	"							5.1	H	4.2	J	4.5	K	2.0	L
6000	"							6.3	H	5.2	J	5.1	K	2.5	L
8000	"									7.5	J	6.8	K	2.9	L
10000										8.4	J			4.7	L

Chlorine	Back Pressure	Injector Throat and Tailpiece													
g/h	bar	99	*	120	*	140	*	165		193	*	242	*	312	*
200	1.4	3.2	C												
400	"	3.9	D	3.4	E	3.2	E								
600	"	4.2	D	4.0	E	3.6	E	3.2	F						
1000	"	5.3	D	4.5	F	3.8	F	3.4	F	3.2	H	3.4	H		
1500	"	5.6	E	4.9	F	3.9	F	3.7	G	3.5	G	3.4	J		
2000	"	6.7	E	5.5	F	4.6	F	3.9	G	4.4	J	3.6	J	2.8	K
3000	"					5.4	G	5.0	G	4.7	J	4.2	J	3.0	K
4000	"					7.2	G	5.4	H	5.0	J	5.1	K	3.3	K
5000	"							6.6	H	5.8	J	5.2	K	3.4	K
6000	"									6.9	J	6.2	K	3.8	K
8000	"									8.4	J	7.8	K	4.4	L
10000										9.3	J			6.7	L

Chlorine	Back Pressure	Injector Throat and Tailpiece													
g/h	bar	99	*	120	*	140	*	165		193	*	242	*	312	*
200	2.8	5.4	C												
400	"	6.3	C	5.9	D	5.5	E								
600	"	6.4	D	6.3	E	5.6	E	5.3	F						
1000	"	7.2	D	6.6	E	6.2	E	5.6	F						
1500	"	7.8	D	7.2	E	6.7	F	6.0	F	5.6	G	5.3	H		
2000	"	8.7	E	7.8	E	7.3	F	6.7	F	5.9	G	5.7	H		
3000	"			9.5	F	8.0	F	7.1	G	6.7	H	6.4	H	5.2	K
4000	"			10.5	F	9.5	G	7.9	G	7.3	H	7.0	K	5.2	K
5000	"					11.2	G	8.9	G	7.9	H	7.1	J	5.3	K
6000	"							9.8	H	8.6	J	7.5	K	5.8	K
8000	"									10.4	J	9.4	K	6.5	K
10000										11.8	J			9.8	L

Chlorine	Back Pressure	Injector Throat and Tailpiece													
g/h	bar	99	*	120	*	140	*	165		193	*	242	*	312	*
200	4.2	7.7	C			7.2	E								
400	"	8.5	C	7.9	D	7.6	E								
600	"	8.7	D	7.9	D	7.7	E								
1000	"	9.2	D	8.9	E	8.1	E	7.7	F	3.2	H	7.6	H		
1500	"	9.8	D	9.4	E	9.2	F	8.0	F	7.6	G	7.8	H		
2000	"	11.4	D	9.9	E	9.6	F	8.5	F	7.8	G	8.0	H		
3000	"	13.1	E	13.0	E	10.3	F	9.6	G	9.4	G	8.4	H	7.4	K
4000	"			13.5	F	11.1	F	10.1	G	9.2	H	9.4	J	7.4	K
5000	"			15.1	F	12.8	G	10.7	G	9.7	H	9.7	J	7.6	K
6000	"							12.2	G	10.5	H	10.3	J	7.6	K
8000	"									12.6	J	11.6	J	8.2	K
10000										13.8	J			10.1	K

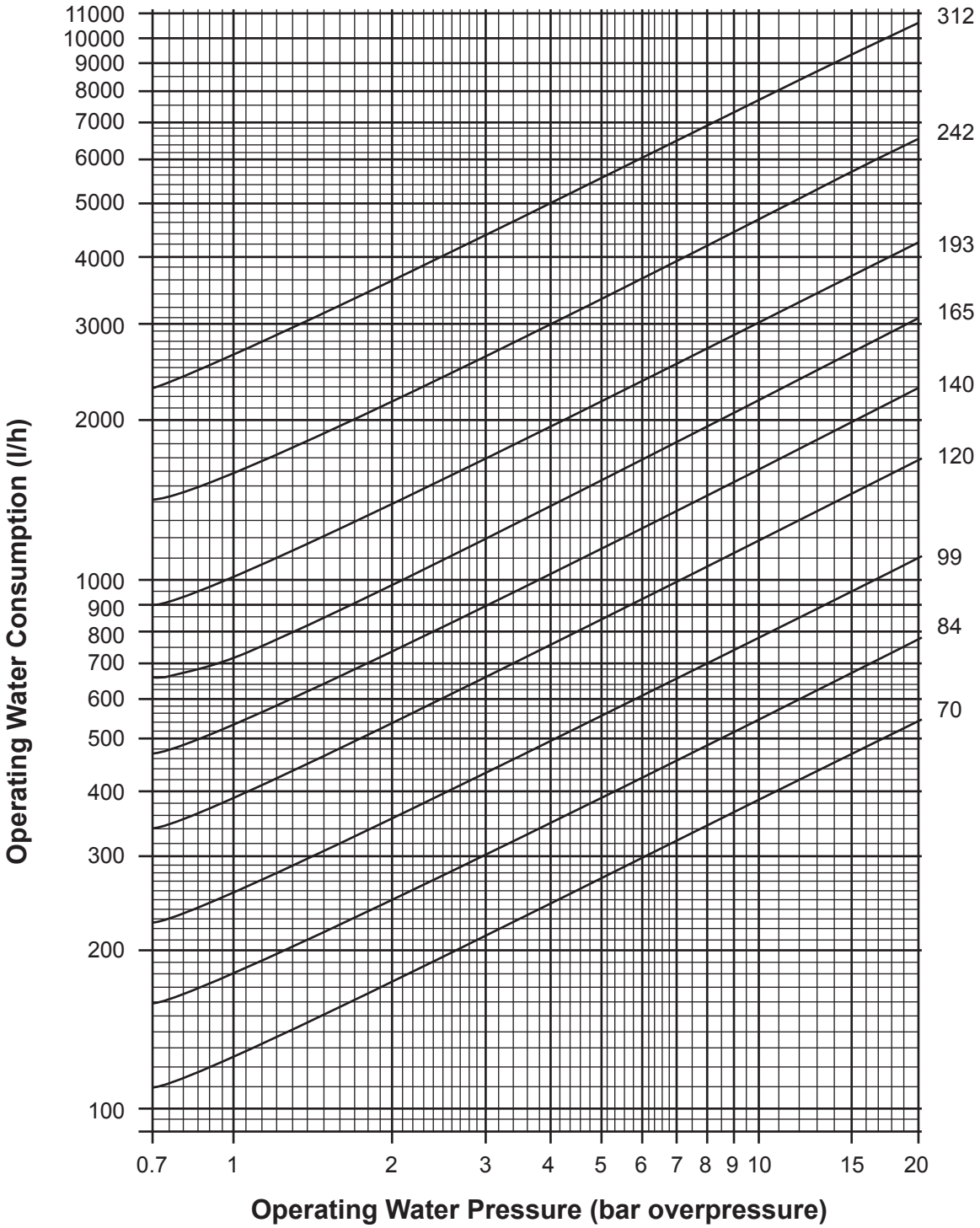
Chlorine	Back Pressure	Injector Throat and Tailpiece													
g/h	bar	99	*	120	*	140	*	165		193	*	242	*	312	*
200	5.6	9.4	C												
400	"	10.3	C	10.0	D	10.1	E								
600	"	10.9	C	10.3	D	10.3	E	9.9	F						
1000	"	11.6	D	10.9	D	10.5	E	9.9	F	9.5	G				
1500	"	12.4	D	11.7	E	11.1	E	10.0	F	9.6	G	10.3	H		
2000	"	13.6	D	12.1	E	11.8	F	10.2	F	9.8	G	10.4	H		
3000	"	15.8	E	13.7	E	12.2	F	11.5	F	10.5	G	10.9	H		
4000	"			16.3	F	12.7	F	12.2	G	11.3	G	11.5	H	9.4	K
5000	"					14.8	F	12.9	G	11.8	H	11.7	H	9.7	K
6000	"							14.8	G	12.4	H	12.2	J	9.9	K
8000	"									14.5	H	12.9	J	10.4	K
10000										15.6	J			11.7	K

Chlorine	Back Pressure	Injector Throat and Tailpiece													
g/h	bar	99	*	120	*	140	*	165		193	*	242	*	312	*
200	7.7	11.7	C												
400	"	12.1	C	13.0	D	11.7	E								
600	"	12.9	C	13.3	D	12.3	E								
1000	"	14.3	D	13.4	D	12.7	E	12.3	F	11.4	G	12.3	H		
1500	"	14.9	D	14.1	E	13.1	E	12.4	F	11.6	G	12.5	H		
2000	"	15.8	D	14.6	E	13.9	E	12.8	F	11.7	G	13.1	H	11.0	K
3000	"	18.9	E	16.1	E	14.9	F	13.7	F	12.1	G	13.9	H	11.5	K
4000	"			19.5	F	15.3	F	15.2	G	12.9	G	14.3	H	11.5	K
5000	"			20.6	F	16.5	F			14.0	H	14.5	H	11.5	K
6000	"									14.9	H	14.8	J	11.5	K
8000	"									16.3	H	15.4	J	12.0	K
10000	"											16.5	J	14.0	K

Chlorine	Back Pressure	Injector Throat and Tailpiece													
g/h	bar	99	*	120	*	140	*	165		193	*	242	*	312	*
200	8.4	13.9	C												
400	"	14.1	C	14.7	D										
600	"	14.8	C	14.8	D	14.4	E								
1000	"	16.7	D	14.9	D	14.5	E	14.6	F	13.8	G	14.0	H		
1500	"	17.3	D	16.2	E	14.6	E	14.7	F	13.8	G	14.3	H		
2000	"	18.6	D	16.9	E	15.5	E	14.8	F	13.9	G	14.6	H		
3000	"					17.4	F	16.2	F	14.1	G	14.9	H		
4000	"					17.8	F	17.4	F	14.9	G	15.3	H	14.0	K
5000	"							17.7	G	15.7	G	15.7	H	14.1	K
6000	"									16.8	G	16.1	J	14.1	K
8000	"									17.9	H			14.5	K
10000	"													15.8	K

Chlorine	Back Pressure	Injector Throat and Tailpiece													
g/h	bar	99	*	120	*	140	*	165		193	*	242	*	312	*
200	9.8	15.9	C												
400	"	16.0	C												
600	"	17.2	C	17.2	D	16.4	E	16.7	F						
1000	"	19.0	D	17.8	D	16.6	E	16.8	F	15.5	G				
1500	"	19.4	D	18.6	E	16.9	E	17.1	F	15.6	G				
2000	"			19.2	E	18.7	E	17.3	F	15.9	G				
3000	"					19.9	F	17.9	F	16.4	G	17.9	H		
4000	"							19.3	F	16.6	G	18.7	H	17.0	K
5000	"									17.5	G	19.0	H	17.1	K
6000	"									19.4	G	19.4	J	17.3	K
8000	"													17.9	K
10000	"													18.5	K

Chlorine	Back Pressure	Injector Throat and Tailpiece													
g/h	bar	99	*	120	*	140	*	165		193	*	242	*	312	*
200	11.2	17.9	C												
400	"	18.2	C	18.4	D	19.2	E								
600	"	18.9	C	18.8	D	19.8	E	19.8	F						
1000	"			19.5	D	21.0	E	19.9	F	18.2	G	19.6	H		
1500	"							20.0	F	18.2	G	20.1	H		
2000	"							20.1	F	18.4	G	20.6	H		
3000	"							20.3	F	18.6	G			20.0	K
4000	"							19.3	F	18.7	G			20.2	K
5000	"									21.0	G			20.5	K
6000	"													21.0	K
8000	"														
10000	"														


Operating Water Consumption (l/h)
11000
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
900
800
700
600
500
400
300
200
100
312
242
193
165
140
120
99
84
70
0.7
1
2
3
4
5
6
7
8
9
10
15
20
Operating Water Pressure (bar overpressure)

ACTIVATED CARBON FILTER

The activated carbon filter absorbs small amounts of chlorine gas from the vacuum regulator vent.

The activated carbon filter should be mounted vertically with the bottom of the unit approx. 200mm above floor level.

As soon as the activated carbon is saturated, chlorine gas is discharged from the underside of the filter housing. Chlorine gas odour is then detectable and the gas detector (option) installed in the room is triggered. In this case, and regularly once a year, replace the activated carbon filter (refer to the instructions on the plate on the filter housing, the servicing instructions and spare parts).

Replacing the Activated Carbon Filter

WARNING: Contaminated activated carbon reacts with water forming an acid. Never immerse it in water or pour water over it, but neutralize it first (as described below). Wear a gas mask and protective clothing (rubber apron and rubber gloves).

The activated carbon needs to be replaced as soon as it smells of chlorine (or sulphur dioxide) or is lumpy.

1 To replace the activated carbon, unscrew and carefully open the activated carbon filter.

2 If there is no smell of gas, stir the activated carbon powder and porcelain rings to check for lumps. If the activated carbon is still OK, close the filter housing again and re-tighten.

Activated carbon contaminated with chlorine

1 Take the activated carbon filter out into the open air.

2 Dissolve 300 g of sodium thiosulphate (part No. U-94054) in approx. 8 l of water.

3 Unscrew the upper cap.

4 Carefully pour the contaminated activated carbon into the sodium thiosulphate solution.

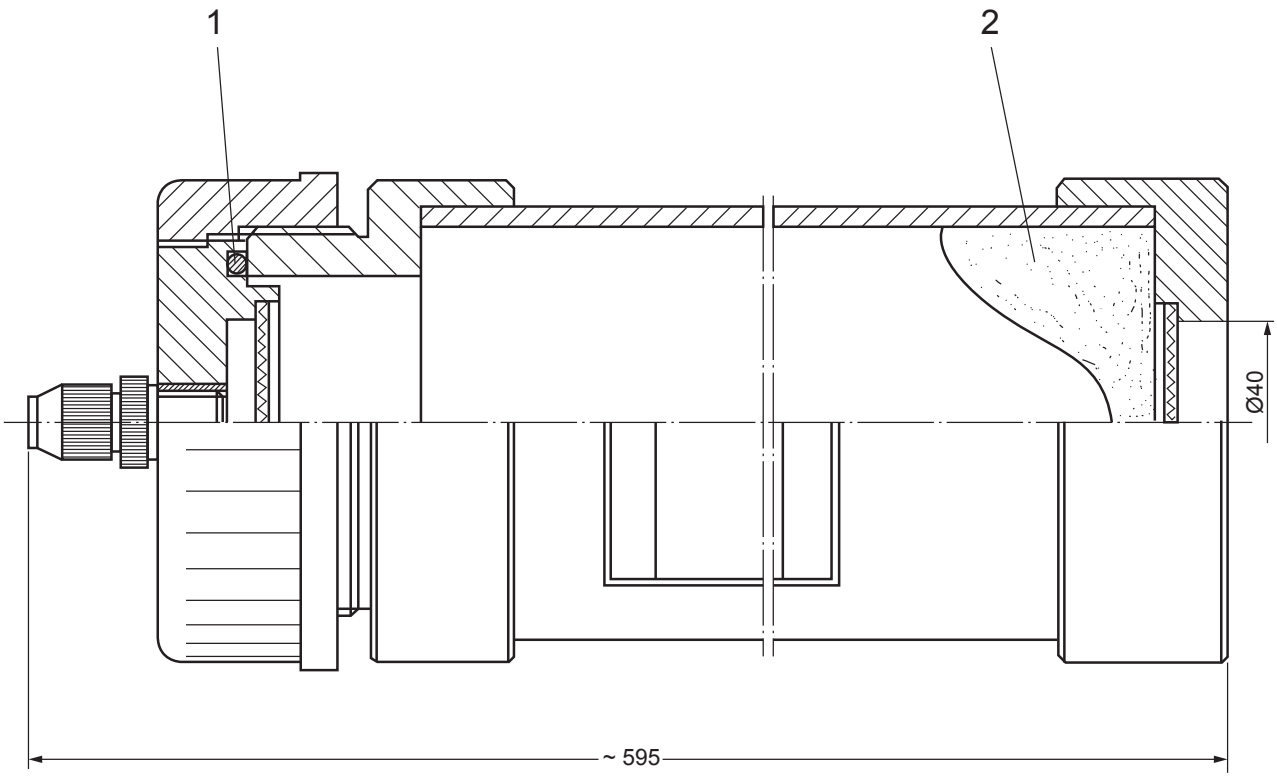
5 Dilute with several litres of water and dispose of down the drain.

6 Dispose of the ceramic rings and the activated carbon (e.g. as commercial waste).

7 Fill the filter housing with fresh activated carbon and ceramic rings (part No. U-93882) and screw on.

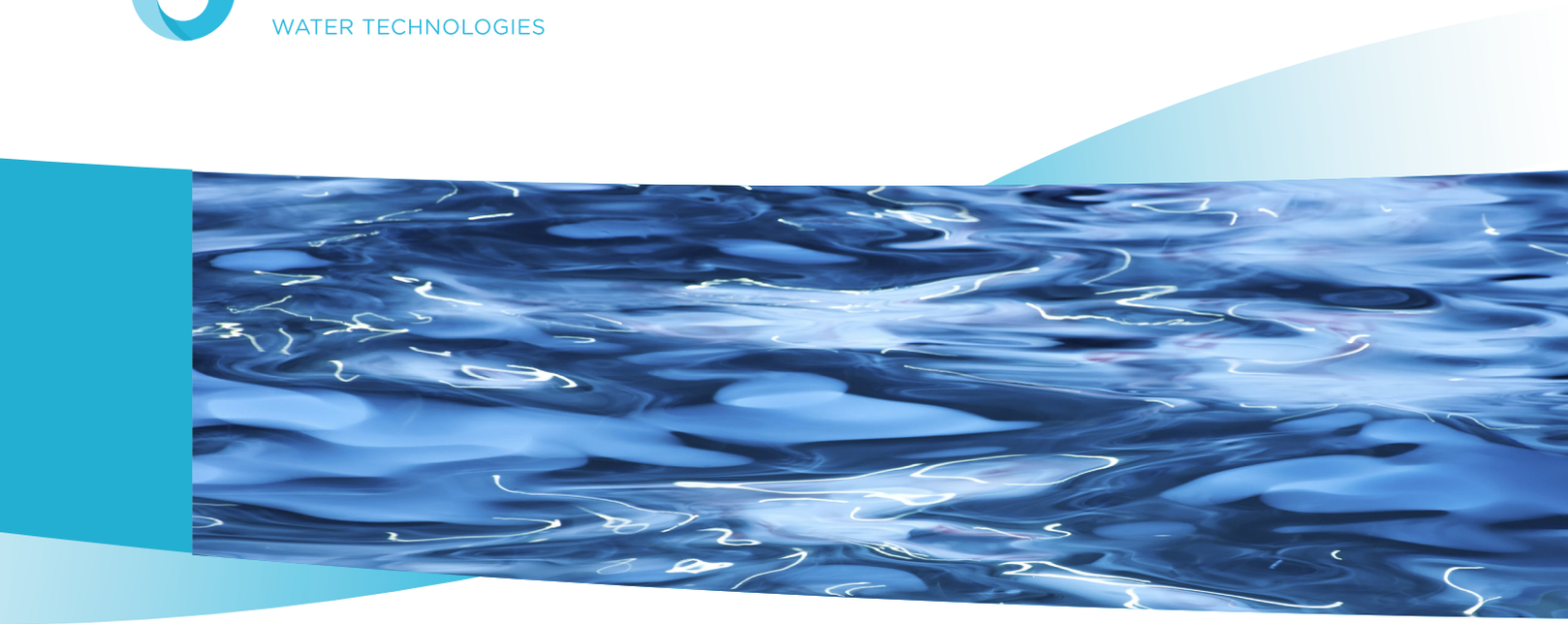
Activated carbon contaminated with SO2

Repeat the procedure as described above, except use sodium hydroxide (obtained locally) to neutralise the activated carbon.



Item	Part No.		Description	Qty
	OLD	NEW		
1	P-100376		O-ring d59.69x5.33/EPDM	1
2	U-93882	W3T161729	Activated carbon mixture 2,500ml	1
*)	U-94054	W3T163644	Sodium thiosulphite	300 g

*) Needed to neutralise activated carbon contaminated with chlorine.



Evoqua Water Technologies Aftermarket Support and Service

INTRODUCTION

Every day, millions of people and thousands of companies rely on Evoqua Water Technologies to help them meet their needs for clean water.

As the leading global provider of chemical dosing, metering, disinfection, chlorination, filtration, deionisation and electrochlorination products, Evoqua Water Technologies provide systems and process technology for water treatment in the municipal, industrial and the leisure industries.

AFTERMARKET SUPPORT AND SERVICE

Meeting our customers needs is our highest priority. In addition to supplying the products you need, we also offer a full range of aftermarket support and service options. Our dedicated team of highly skilled engineers are committed to providing a first class service to our customers.

Getting the correct level of aftermarket support and service can ensure that your plant runs as efficiently as possible by preventing breakdowns and minimising plant downtime.

Our modular flexible approach ensures that our aftermarket support and service offering can be tailored to meet your exact requirements, our offering includes:-

- Technical Assistance
- 24 Hour Telephone Support
- Breakdown Cover
- Maintenance Contracts
- Planned & Preventative Maintenance Programs
- Call-Out Service
- Supply of Spare Parts and Critical Spares
- System Refurbishments & Upgrades

CO-ORDINATION

Evoqua Water Technologies dedicated Customer Service Department is co-ordinated from our Derby office.

Tel: - 0845 450 2882

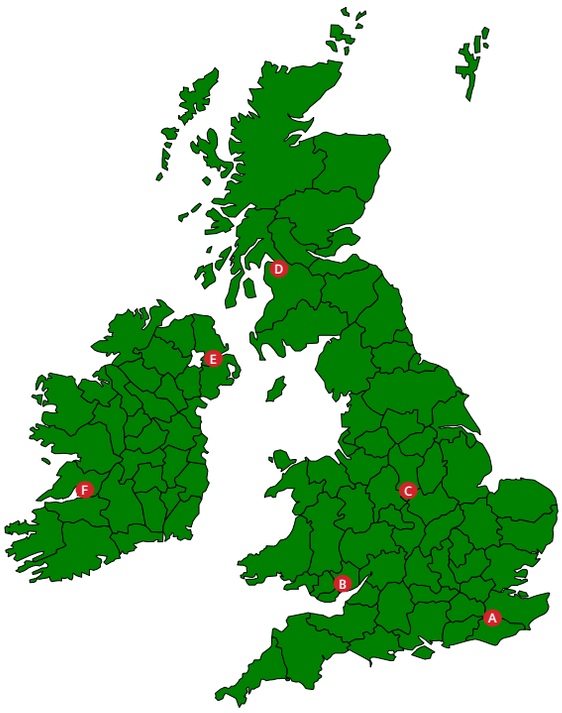
customerservice.uk@evoqua.com

COMMISSIONING

Following installation, our team of commissioning engineers are responsible for the safe handover of the equipment from ourselves to the new owner guaranteeing its operability in terms of performance, reliability and safety.

All our commissioning engineers undergo a comprehensive training programme on our products and the latest industry and health and safety standards.

In our team we have commissioning engineers who are trained to work in all industry sectors both on shore and offshore.



FULL COVERAGE UK & IRELAND

Over the years we have been able to grow our aftermarket support and service operation considerably. To ensure our customers get the very best support and shortest response times our engineers and support staff are strategically located across the country, to give us the very best coverage of the whole of the UK & Ireland.

A - Sevenoaks, Kent
B - Caldicot, Gwent
C - Little Eaton, Derbyshire
D - Kirkintilloch, East Dunbartonshire
E- Belfast, Northern Ireland
F - Limerick, Ireland

Did you know?

Evoqua Water Technologies has over 200 current service and maintenance contracts in mainland UK & Ireland and carry out over 2000 site vists per year

Did you know?

Our skilled engineers carry work in all industries including; life sciences, food & beverage and leisure

TRAINING

Evoqua Water Technologies understands the importance of training to our customers; receiving the correct training can ensure that you get the optimum performance out of our equipment and your plant.

Our team of qualified trainers can put together bespoke training solutions tailored to suit your needs. This could either be classroom based, or hands-on operator training, conducted onsite or at one of our locations around the country.

We have also found training creates stronger links with our customers and it gives us a better opportunity to understand each others requirements.

CONTACT

Evoqua Water Technologies have service centres all over the world. Please see the contacts table below to find a centre closest to you.

Country	Email	Telephone
Australia	info.au@evoqua.com	+61 (0) 3 8720 6597
Canada	canadainfo@evoqua.com	+1 905 944 2800
Germany	wtger@evoqua.com	+49 8221 9040
Singapore	infosg@evoqua.com	+65 6830 7100
USA	wtus@evoqua.com	+1 856 507 9000
UK	info.uk@evoqua.com	+44 0845 450 2882

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