

**Installation, Operation and
Maintenance Instructions
For
Automated
Airpel Self Cleaning Filters
Type S1,S2,S3,S4**



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ISO 9001
2000



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FOREWORD

This manual has been prepared for users of Airpel self cleaning filters. The working principles are fully described and attention is drawn to the care necessary to maintain the filter in first class condition.

In view of constant efforts to improve both design and methods of manufacture, the filter and equipment specifications given and the illustrations shown are not binding. The right to change them at any time without notice is reserved.

It is essential that the user satisfies himself of the suitability of the equipment for the intended application and that any additional requirements, such as earthing, have taken account of during installation.

As Airpel have no control over the use or operating conditions we cannot be held responsible for any damage caused to/by the filter, or any subsequent costs incurred.

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PREFACE

MODE OF OPERATION

The Airpel range of self cleaning blade type filters has been specifically designed to prevent disruption to flow during the cleaning process.

The element, is cleaned by rotating it against a pair of stationary scraper blades. The blades remove the debris from the surface of the element. This debris may then be removed from the filter body through the drain located in the base of the unit.

The cleaning and draining process can be manual or automated. Automation is achieved by the addition of a number of optional power devices that are controlled via a programmed control panel which has manual push button override.

FILTER VARIANTS

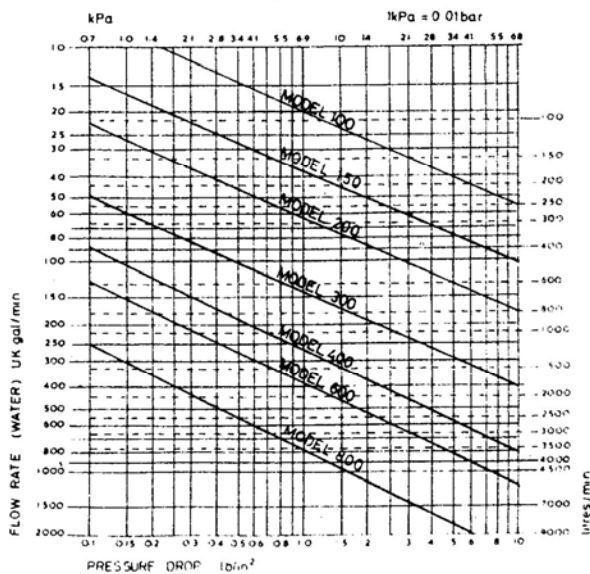
There are two basic designs of self-cleaning filter; standard units for working pressures up to 13.8 bar g (200psi) where the head is fixed in the pipeline and the inlet and outlet are in-line and higher pressure units up to 40 bar g (580psi) where the body is fixed in the pipeline and the inlet and outlet are either in-line or are 90° to each other (see sectional assembly drawings).

Additionally, fabricated self-cleaning filters are available to special order. These comprise of the head/element/scraper blade of the higher pressure filter mounted in a sheet metal fabricated body.

All the filters are available with either manual cleaning features or with automated cleaning devices for on-site wiring, or fully loomed prior to delivery.

The airborne noise emission from all Airpel filters is less than 70 dB(A).

PERFORMANCE DATA



The chart is for water flowing through a filter without an element. Use the following correction factors for the chosen filtration rating and for liquids of higher viscosity.

CORRECTION FACTORS

EITHER - Multiply the pressure drop for water shown in the chart by the following correction factors to obtain the actual pressure drop.

(Water has a viscosity of 1 centistoke at 20°C)

OR - Divide the acceptable pressure drop by the necessary correction factor in the tables below and then use the chart to determine filter flow and size.

VISCOSITY		FILTRATION RATING				
REDWOOD NO.1	CENTISTOKES	1000 micron	500 micron	200 micron	100 micron	50 micron
28	1	1.0	1.1	1.1	1.2	1.45
200	50	1.4	1.8	2.1	2.3	2.5
950	230	1.7	2.5	3.0	3.35	3.75
1500	370	1.8	3.0	3.4	3.8	4.3
3500	860	2.6	3.7	4.2	5.0	6.0

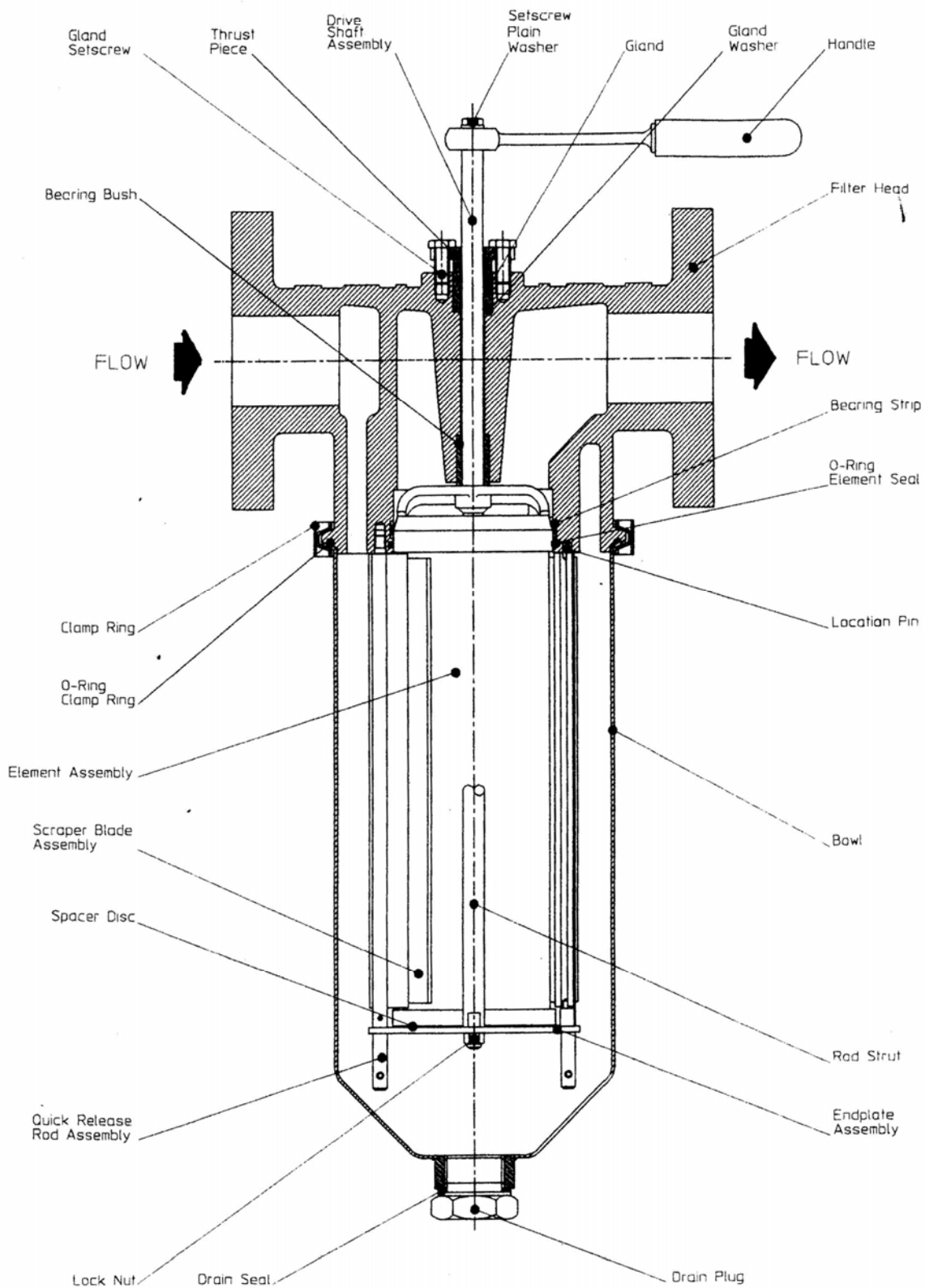
GOOD ENGINEERING PRACTICE

The following notes are for good engineering practice as applied to Airpel filters. The list is not exhaustive, but is intended as an aide memoir. International, national and local codes of practice, environmental regulations and Health and Safety directives must be adhered to and take precedence over any stated or implied practices in this document. Installation and maintenance should be undertaken by a competent person.

- All warning and caution notes should be rigorously observed.
- Before and after installation protect the filter and associated equipment from mechanical or environmental damage.
- Support heavy loads-lift the filter by the main body, not by any protuberance. Do not apply loads to the bowl of the standard pressure filter.
- Confirm there is sufficient access for maintenance operations including the removal of the complete filter assembly from the pipeline.
- Scraper blades are sharp – take suitable precautions to prevent cuts and similar injuries.
- Before working on any pressurised unit, reduce the pressure to a safe level and stop the flow if necessary.
- Take appropriate precautions to protect the operator or during normal operations and during maintenance operations when filtering hazardous or operating the filter at temperature extremes.
- Before working on any electrical equipment, isolate the electrical supply.
- Ensure that all cables are of sufficient gauge to prevent overheating/power drops and that the wiring/conduits satisfy the necessary codes of practice. Ensure all earth connections are good.
- Confirm the wiring of components with the wiring diagrams supplied with each component in case detail product changes have occurred since the publication of this document.

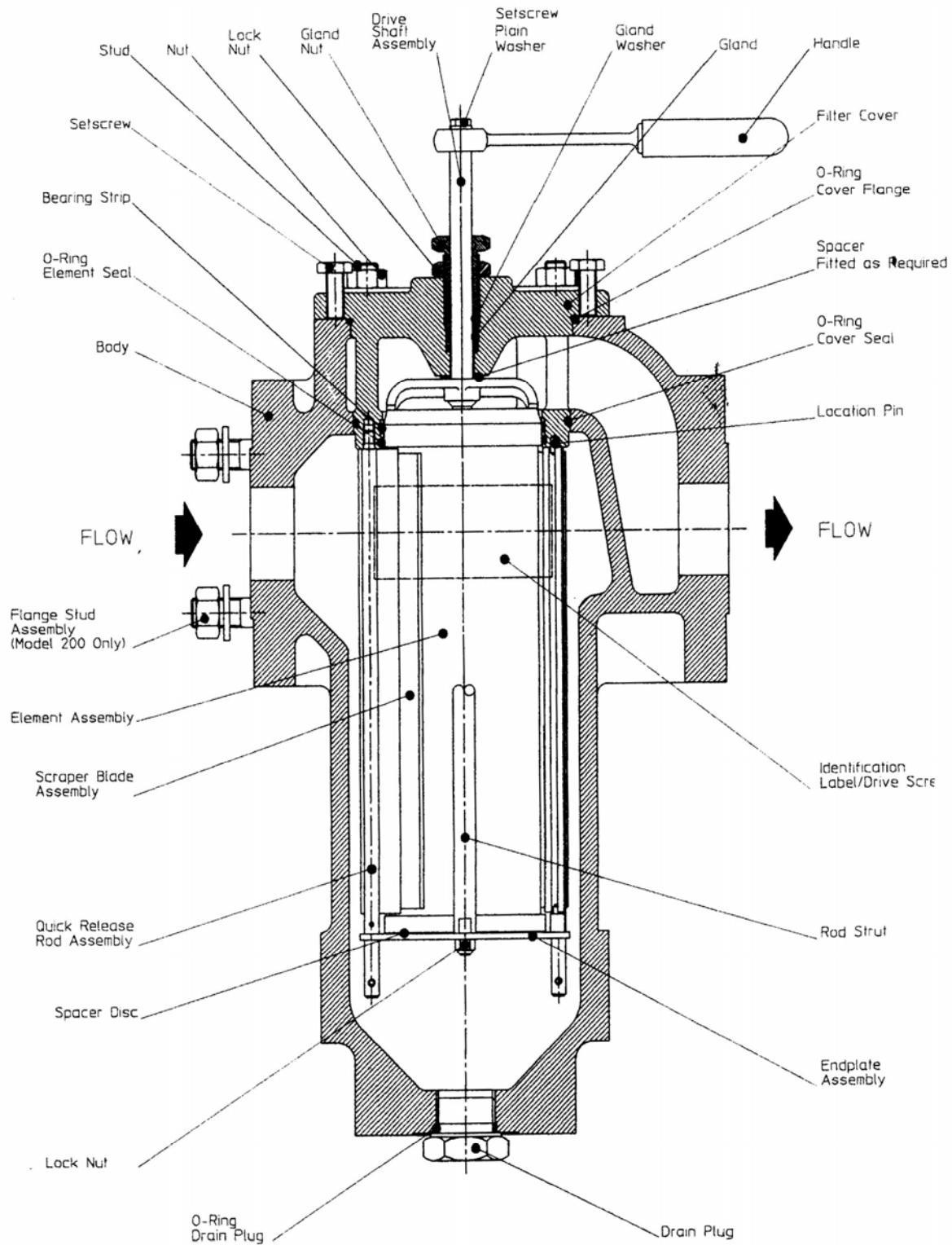
STANDARD PRESSURE UNIT

MAX. WORKING PRESSURE 13.8 bar (200psi)



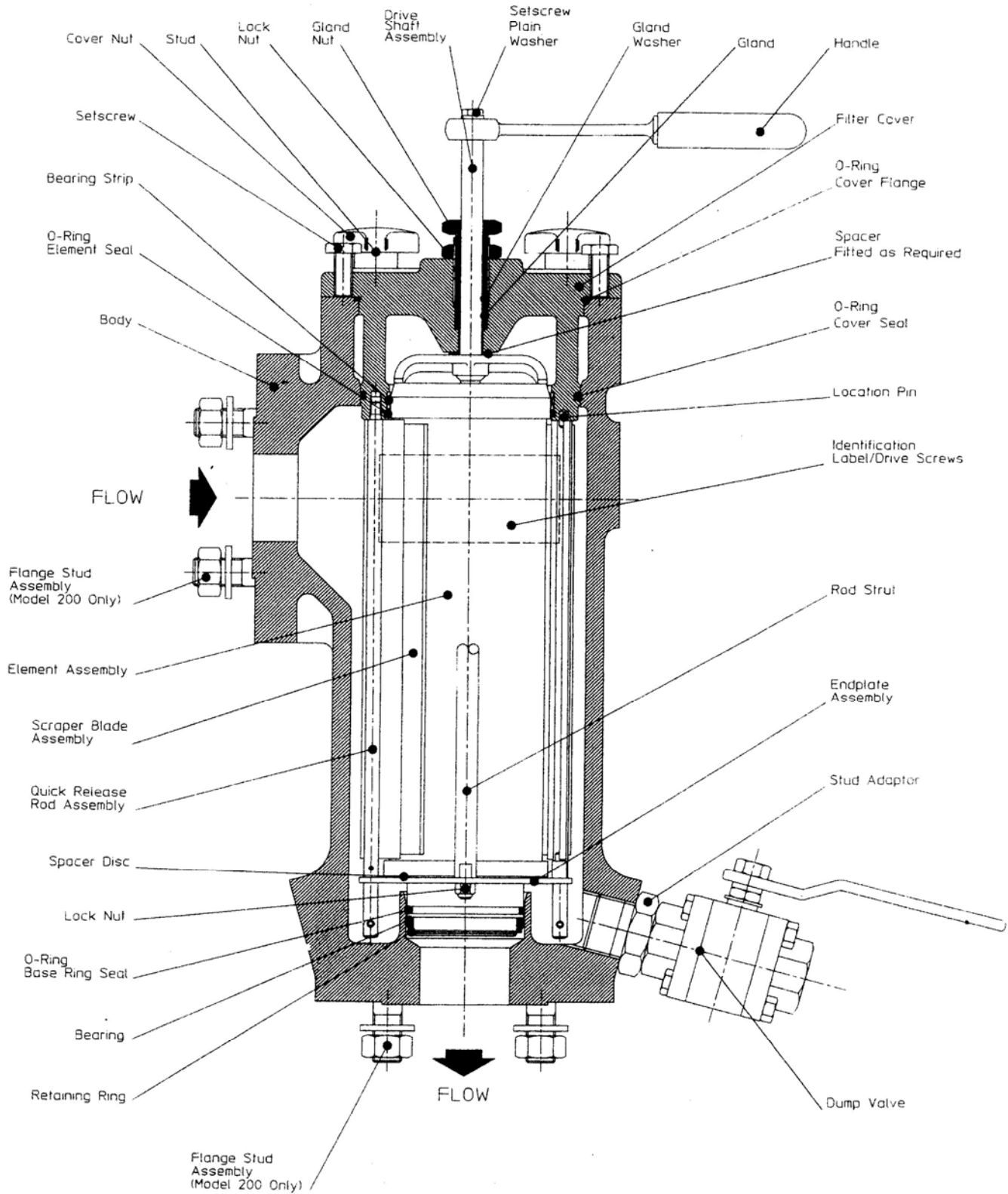
HIGHER PRESSURE UNIT

MAXIMUM WORKING : 40 bar (580 psi) Stainless steel and carbon steel filters
: 20 bar (290 psi) Cast Iron Filters



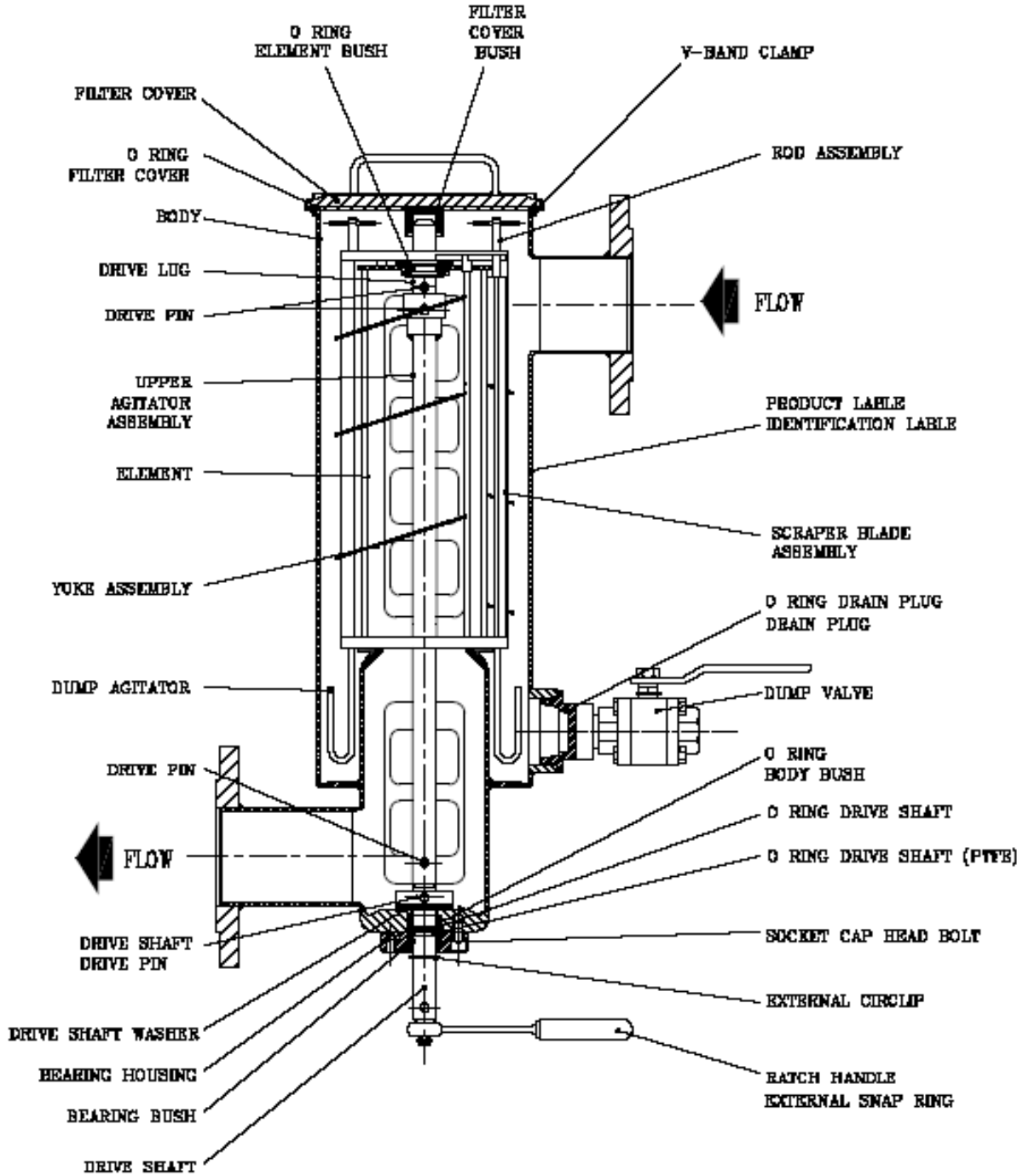
VERTICAL EXIT (SV) FILTER

MAXIMUM WORKING PRESSURE : 40 bar (580 psi) Stainless steel and carbon steel filters
: 20 bar (290 psi) Cast Iron Filters



ROTOR (S4) FILTER

MAXIMUM WORKING PRESSURE : 13.8 bar (200psi) STAINLESS STEEL AND CARBON STEEL FILTERS



INSTALLATION AND OPERATION

1.1 INSTALLATION

a) Filter Assembly

Installation and maintenance should be undertaken by a competent person. National and local codes of practice, Environmental Regulations and Health and Safety Directives must be adhered to and take precedence over any stated or implied practices in this document. All Airpel filters are hydrostatically pressure tested prior to delivery.

Fit the filter assembly into the pipeline ensuring:

There is no undue stress on the unit – support filters appropriately.

The unit is installed using suitable flange bolting materials and gaskets.

The flow direction is correct.

The unit is vertical with the cover at the top and that the cleaning element is fitted.

The unit is protected by suitable safety devices (pressure relief valves, earthing straps etc.) as appropriate within the system that it is installed.

There is enough space available for maintenance operations (suitable lifting devices may be required to undertake maintenance operations).

The process fluid is compatible with the materials of construction.

The filter is being operated within its pressure/temperature limits and flange limitations.

The filter is clean, including (if appropriate) the removal of corrosion preventative liquids applied during manufacture.

All attachments are secure.

A suitable electrical supply is provided to power the unit ensuring that a local isolation facility is provided.

Suitable provision is made for the safe handling and disposal of waste product.

Fit isolation valves before and after the filter to simplify maintenance operations.

NOTE that the model 200 flanged high pressure filter has studs screwed into the flanges. Adjacent pipework should be arranged to allow removal of this size filter. All other flanged filters have standard through bolt flanges.

Fill the filter and check for leaks. If the liquid is hazardous, suitable protective clothing and safe handling procedures should be used to prevent harm to operators, the environment, or property. Check that the materials of constructions are compatible with fluid being handled.

b) Hazardous Fluids & Pressures

- The filters, when despatched from Airpel, do not contain substances specifically hazardous to health, but may have a thin coating of oil based corrosion preventative on all internal surfaces.
- If the fluid to be filtered is in any way hazardous, the operator and the environment should be suitably protected. Care should be exercised if the fluid at atmospheric conditions is above its boiling point or explosive or vapours may be released upon opening the filter for maintenance.

- Relieve the pressure in the filter before opening the filter cover.
- Do not make any adjustments whilst the filter is pressurised.
- If a filter is to be stored or transported, ensure that the filter is clean, suitably protected (including corrosion protection if appropriate) and does not contain substances that could be hazardous to health.

c) Electrical Control

Filters supplied with Airpel Automatic control systems will be supplied with all components factory wired into the control panel. The power supply and any external alarm outputs should be wired as in section 3

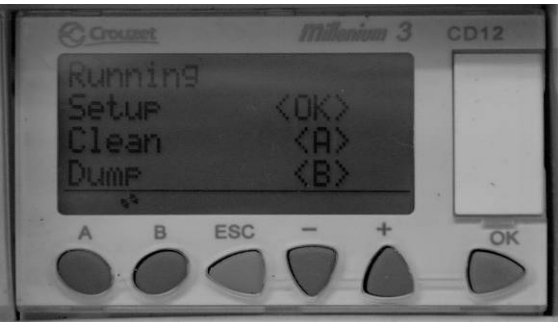
Where the filter is supplied with motor, dump valve and differential pressure switch mounted but not wired, components should be wired to the user control system per the interconnecting diagrams noted in section 3

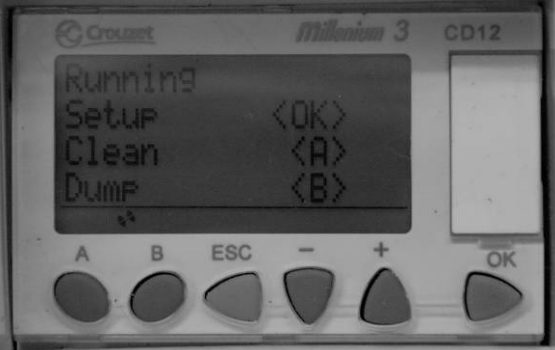
All electrical wiring should be carried out by a suitably qualified and competent electrician, care should be taken to ensure:

- the electrical supply is the correct rating for the cleaning motor/dump valve/control panel and the voltage selection switch is correctly positioned.
- that suitable cable is used and is correctly routed, supported and terminated.
- that all cable entry/exit points are suitably sealed to prevent debris/water ingress. (All supplied equipment is rated to IP 65 in accordance with EN60529/IEC 529).
- that satisfactory earth connections have been made.
- an electrical isolator and main fuse have been provided in the power supply line
- adjacent electrical cables/equipment do not create electromagnetic disturbances sufficient to affect the performance of the control system.

It is suggested that during commissioning the following checks are made once supply wiring is complete.

Airpel Automated System Control Panel

ACTION	RESULT
Switch on electrical power to the unit	'POWER ON' LED illuminated Running Message Displayed
Press 'Button A' 	'ELEMENT CLEANING' will commence and motor operates for a time defined by default factory settings (see section 3.4 for programme setting). Confirm that rotation of the motor is clockwise when viewed from the top.

<p>Press 'Button B'</p> 	<p>'DUMP VALVE OPERATION' starts to operate, when valve is fully open and Timer T3 has timed-out. Valve will remain open for a period defined by Timer T4. When T4 times-out the valve will start to close</p>
<p>Pressurise the filter assembly.</p>	<p>Confirm no leaks.</p>

1.2 OPERATION

a) General

All fully assembled units are subject to a hydrostatic pressure/leak test and any automated control systems are set to factory default values and total operation checked at Airpel prior to delivery.

Once installed units may require small adjustments. These adjustments are usually limited to tightening the drive shaft gland packing as it 'beds in' and adjusting the control system timers to settings to suit the particular application.

b) Pressure/Temperature Ratings

The filter should be used within the flange drilling pressure/temperature limits and the filter body limits. If in doubt Pressure and temperature limits are available on the Airpel web site www.airpel-filtration.co.uk Alternatively Airpel can advise as necessary.

Cast Iron filters should be used with extreme caution below 0°C and above 100°C. Carbon Steel should be used with caution below 0°C (unless low temperature steel has been specifically ordered). All filters, and in particular Cast Iron filters, should be protected from excessive thermal, hydraulic and mechanical shock loading.

c) 'O' Ring Seal Temperature Limits

Viton:	-20°C to +200°C.	PTFE encapsulated Viton:	-20°C to +200°C.
Nitrile:	-30°C to +120°C.	Ethylene Propylene (EPDM)	-50°C to +150°C.

The above values are guidelines based upon absolute compatibility with the fluid and are not binding due to unaccountable factors that may be detrimental to the performance of the 'O' seals.

† See Airpel specifications Doc-23 Chemical Compatibility and Pressure/Temperature Limits which are available on the Airpel web site: www.airpel-filtration.co.uk. Alternatively Airpel will offer advice as necessary.

Note: As Airpel has no control over the use or operating conditions to which the filter is applied we cannot be held responsible for any damage to/by the filter, or any subsequent costs incurred. It is essential that the user satisfies themselves of the suitability of the equipment for the intended application.

d) European Pressure Equipment Directive (97/23/EC)

All Plenty Cast Self Cleaning Filters comply with the above Directive.

Cast Iron Filters are restricted to the SEP category only.

e) Airpel Automatic Control System Outline Description.

The Airpel Automatic control system is designed to allow both manual and fully automatic operation of the filter. A programmable logic control interface allows the user to set control timing parameters for the time between cleaning operations, the time of cleaning operations, the frequency at which the dump valve is opened to drain off filtered debris, and the time which the dump valve remains open during the cleaning process. The system also includes the ability to override programme settings to initiate manual cleaning or dump valve opening.

g) Automated Operation Overview:

Activation of the cleaning cycle is either via the time period set on the PLC controller or via activation of the differential pressure switch if the differential pressure across the filter exceeds pre set limits before the PLC has reached the Automatic clean cycle activation time. Initial activation of the cleaning cycle starts the rotation scraper mechanism. The rotating scraper will operate for the time period set by the user on the PLC control, unless the cleaning cycle has been initiated by activation of the High High differential pressure switch being tripped. In the latter case the rotating scrapers will continue to operate until the differential pressure across the basket is reduced to the desired levels.

Opening of the dump valve and the time period for which the valve remains open is controlled by the user set frequency and time period functions on the PLC controller. Frequency is defined as the number of cleaning cycles (the number of times rotation of scraper is energised) before valve opening is activated. A separate settable time function determines the length of time that the dump valve remains open.

The automated functions can be overridden and manual operation effected by pressing control function buttons on the PLC controller.

Operating fault conditions are also indicated by the digital output on the PLC controller

Details of programmer setting procedures, function ranges and fault codes are provided in section 3

When the filter assembly is in standby condition, '**POWER ON**' LEDs should be illuminated.

CAUTION

- When manually draining the unit via the drain plug ensure that the pressure in the filter has been reduced to a safe level.
- When manually draining the unit, via the drain valve, operate the valve slowly to prevent introducing a shock into the system. Ensure the system can withstand the loss of flow and pressure when the valve is open.
- Excessive scraper blade or element wear may occur if the unit is operated at differential pressures in excess of 1 bar (15psi).
- The element could be damaged if operated at a differential pressure in excess of 2 bar (30psi). Reinforced elements are available if differential pressure peaks above 2 bar are anticipated.
- If the filtered fluid is hazardous to health or at a temperature extreme, appropriate precautions should be taken.

1.0 MAINTENANCE INSTRUCTIONS

It is incumbent on the end user to establish the frequency of maintenance dependent on the particular filter duty. Airpel recommend 'on condition' servicing of its products and for most applications would suggest daily checks for leakage and weekly examinations of the scraper blade/element for wear. Regular checks should also be made for mechanical damage to covers, cables, conduits or any item that may lead to consequential premature component failure or present an operator hazard. More arduous operating conditions will require more regular checks.

Leaks should be cured as soon as they are identified. All joints in Airpel products are sealed by elastomeric 'O' rings and if undamaged and correctly fitted give long term reliable service. Care should be taken to ensure undue loads are not applied to the drain fittings, or the bowl of standard pressure filters as this may unseat the bowl seal.

The drive shaft gland should be tightened only sufficiently to prevent leakage. Overtightening will cause excessive operating torque requirements and may result in premature wear.

The filter fittings should not be adjusted/dismantled whilst the unit is pressurised.

2.1 TO DISMANTLE

Stop the fluid flow, relieve the pressure and, isolate and lock off the electricity supply.

Standard Pressure Model

Drain the bowl and release the V-band clamp while supporting the bowl; detach and remove the bowl. (If the unit is fitted with an automated dump valve, do not stress the cable).

High Pressure and Vertical Exit Models

If applicable, disconnect the motor connections at the terminal box or remove the motor assembly by removing four setscrews in the base of the motor mounting. If removing the motor assembly, do not stress the cable when lifting clear.

Remove the four cover retaining nuts. Release the cover with the jacking screws, lift out the cover and element assembly. Do not support the assembly on the element or scraper blades.

S4 Rotor Blade

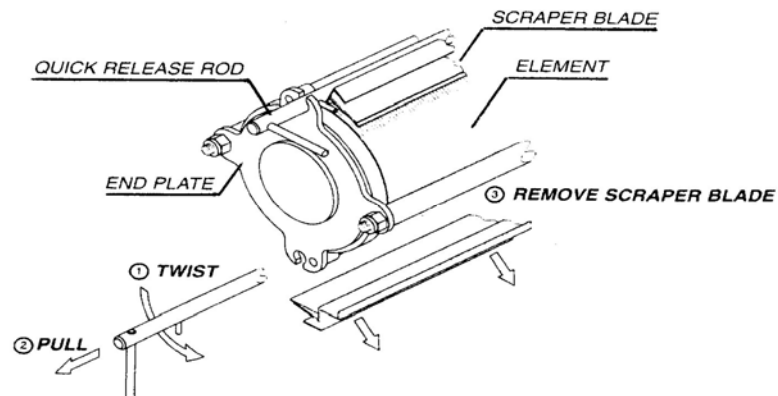
Remove the V-band clamp and cover and lift out the element/rotorblade assembly. Rotate the quick release rods so that the locking pins align with the slots in the end plate. Pull the rods axially to remove them and lift out the scraper blades. With both blades removed the element can be extracted from the rotor assembly.

All Models – to remove the scraper blades:

Rotate the quick release scraper blade rod until the locking pin aligns with the slot in the end plate and then pull the rod axially to remove it. Lift out the scraper blade and check for wear and that they are effective along their length. Replace as necessary.

NOTE

- (i) To remove the head end scraper blades on model 400, 600 and 800 filters, remove four nuts on the rod struts and remove the end plate before lifting out the scraper blades.
- (ii) Scraper blades should be replaced well before wear of the blade support is likely. Failure to do so will result in poor cleaning efficiency and may result in rapid element wear.



To remove the element:

Remove the lock nuts on the rod struts and withdraw the end plate assembly and spacer disc. Lift out the element and check for wear and damage. Replace as necessary.

To remove the drive shaft/gland assembly:

Remove the handle or motor and coupling as appropriate. Remove the gland thrust piece (standard pressure units) or gland nut (high pressure units). Remove the drive shaft and press out the gland packing and gland washer.

NOTE: Ensure that the spacer (if fitted) on the drive shaft is retained as a matched pair for subsequent reassembly.

2.2 TO REASSEMBLE

Prior to reassembly, all components should be examined for wear and condition. In particular check:

- the scraper blade and element for wear
- blade location pins are secure
- the pins in the quick release rod are secure

It is good practise to replace all elastomeric 'O' rings. However, if they are not being replaced they should be examined for condition.

NOTE: Ensure replacement 'O' rings are the correct material (i.e. Nitrile, Viton, etc) for the particular application.

Ensure all components are clean.

To refit the drive shaft/gland assembly:

Insert the gland washer and gland packing into the gland cavity. (Insert a second gland washer on 'top' of the packing for high pressure units). Fit the drive shaft ensuring that the mating spacer is fitted (if required - see 'To refit the element'). Fit the gland nut or thrust piece as appropriate and compress the packing. To ensure that there is sufficient subsequent gland adjustment, remove the gland nut and top gland washer or thrust piece and insert another 'ring' of gland packing. Refit the gland nut and gland washer or thrust piece as appropriate and tighten.

CAUTION: Overtightening the gland will result in excessive turning torque's and may result in premature wear. Only tighten sufficiently to prevent leakage.

To refit the element:

Align the slot in the element top ring with the drive shaft assembly and push the element through the seal into engagement with the drive shaft. Fit the PTFE spacer disc and end plate assembly to the element and secure using the two rods and lock nuts. Ensure the element rotates freely and that the axial movement of the element is between 0.1mm and 1.5mm. Adjust the axial freedom of the element by selecting suitable spacers on the drive shaft.

To refit the blade:

Position one blade such that both ends are on the location pins as shown (see section 2.1). Insert the quick release rod through the end plate and with the locking pin aligned with the slot in the end plate locate the pointed end of the quick release rod in the hole in the head casting. Push the rod home and rotate to lock. Fit the diametrically opposite blade in the same fashion.

Important: Ensure that both blades are evenly in contact with the element along their whole length. Use a 0.05mm feeler gauge lightly along the length of the blade to ensure there are no gaps between the blade and the element.

NOTE: To refit the head end scraper blades of a model 400, 600 or 800 filter use the supplied fitting tool to ease the blade over the locating pin. Keep the fitting tool close to the location pin and do not overbend the blade.

Final Assembly

a) Standard Pressure Model

Rotate the quick release rod handle until it nominally tangential to the element. Ensure the 'O' ring is in position and fit the bowl and V-clamp ring. Hand tighten the V-clamp ring bolt (10 Nm nominal). Refit the motor if applicable.

Ensure the drain plug is correctly fitted or that the drain valve is closed as appropriate. Reconnect the power supply if applicable.

The unit is now ready for use.

Check for leaks when pressurised.

b) High Pressure Model

Rotate the quick release rod handle until it is nominally tangential to the element. Unscrew the jacking screws until they are underflush with the flange of the filter cover. Refit the filter cover, ensuring that the seals are correctly located and secure with the four cover retaining nuts. Refit/reconnect the motor if applicable. Ensure the drain valve is closed as appropriate. Reconnect the power supply if applicable.

NOTE: Position the rod handle on vertical exit models so that it does not foul on the base 'O' seal housing.

The unit is now ready for use.

Check for leaks when pressurised.

c) S4 Rotor Blade

Check all items for wear and damage and replace as necessary.

Insert the element in the rotor assembly, then the scraper blades. Put in the rods axially, check that the blades are in good contact with the element. Rotate the quick release rods so that the locking pins align with the slots in the end plate. Put in the element/rotorblade assembly and finally put on the cover and the V-band clamp.

2.3 AUTOMATED UNITS

There are no routine maintenance requirements for any of the automation components (motor, dump valve, differential pressure switch) other than ensuring they are undamaged and all cables are secure and correctly sealed at the exit/entry points. After 500 cleaning cycles it is recommended maintenance / inspection of the filter is carried out as noted above.

2.4 DE-COMMISSIONING, STORAGE & TRANSPORT

The following steps are recommended when de-commissioning a filter assembly:

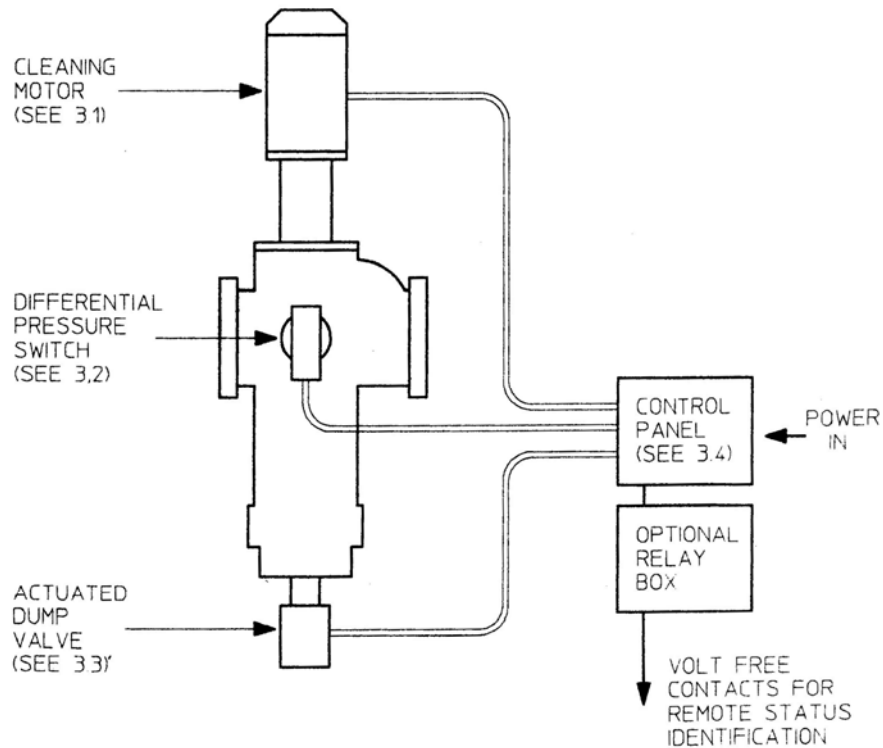
- Isolate the electrical supply where appropriate.
- Stop the fluid flow, relieve the pressure and drain.
- Clean and dry the unit and apply corrosion inhibitor where necessary.
- Protect from mechanical damage and debris ingress.

Store the filter in a clean, dry environment ensuring that debris cannot enter the filter body or contaminate the element. Protect from corrosion as appropriate.

If a used filter is to be stored, transported or returned to Airpel, ensure that the filter is clean, suitably protected (including corrosion protection if appropriate) and does not contain substances that could be hazardous to health.

The filters, when shipped from Airpel, do not contain substances specifically hazardous to health. However, the filters may have a thin coating of oil based corrosion preventative on all internal surfaces.

3.0 AUTOMATED FILTER COMPONENTS



Where filters are supplied with the Airpel fully automated control system, all connections between motor, differential pressure switch and dump valve will be made at the factory. The only external connections required are the provision of suitable power supply, and connections to volt free contacts for warning signal if required. If the Filter is provided without automatic the control system, then all components should be connected to the users control interface in accordance with the interface diagrams provided below.

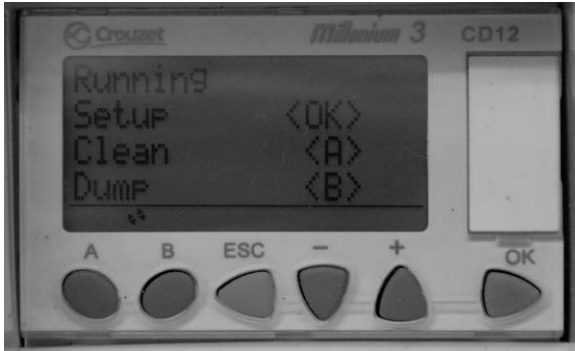
3.1) Programmable Controller Set Up and Operation

The Airpel Automatic control system is designed to allow both manual and fully automatic operation of the filter. A programmable logic control interface allows the user to set control timing parameters for the time between cleaning operations, the time of cleaning operations, the frequency at which the dump valve is opened to drain off filtered debris, and the time which the dump valve remains open during the cleaning process. The system also includes the ability to override programme settings to initiate manual cleaning or dump valve opening.

The interface provides operating status and fault condition indication.

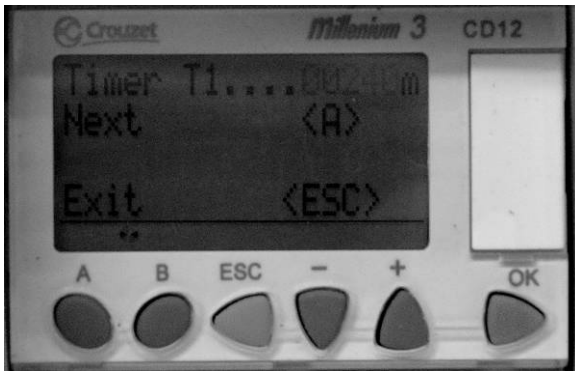
Controller Set Up

Set Up Entry Screen



Access to the controller can be gained by lifting the protective front cover, the following screen should be visible

Set Time Between Cleaning Cycles (T1)

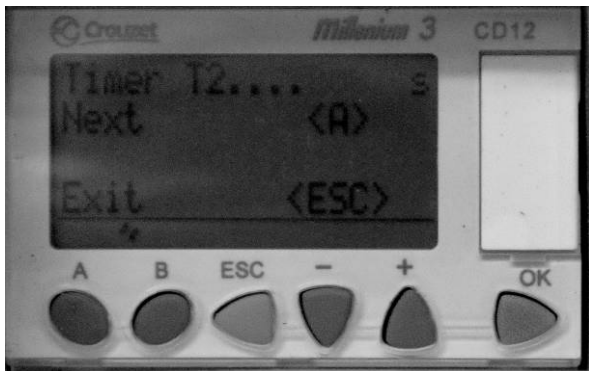


Set Time between Cleaning Cycles T1 (Range 1 – 240 minutes)

Select **<A>** and then press **<OK>**

Adjust Timer T1 up or down using **<+>** / **<->** keys press **<OK>** to save

Set Motor Run Time (T2)

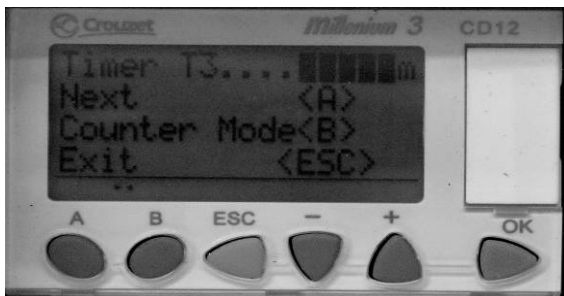


Set Motor Run Time T2 (Range 1-60 seconds)

Select **<A>** to cycle to Timer T2 and then press **<OK>**

Adjust Timer T2 using **<+>** / **<->** keys press **<OK>** to save

Set Dump Valve Opening Cycle (T3/C1)



Set Period between Dump valve opening Cycle T3 /C1

Select **<A>** to cycle to Timer 3 and then press **<OK>**

Select **<A>** to enter cycle time in minutes

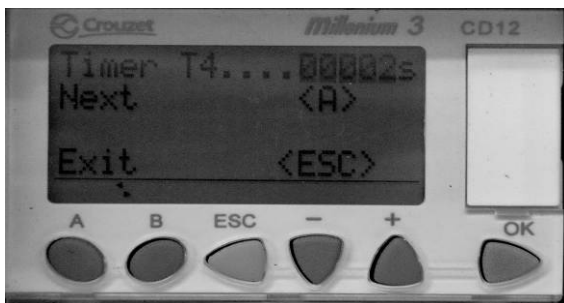
Or

Select **** to set cycle count in counter mode C1.

Cycle count C1 is the number of cleaning cycles (T1) between dump valve opening cycle

Adjust timer or counter using **<+>** / **<->** press **<OK>** to save

Set Valve Opening Time (T4)

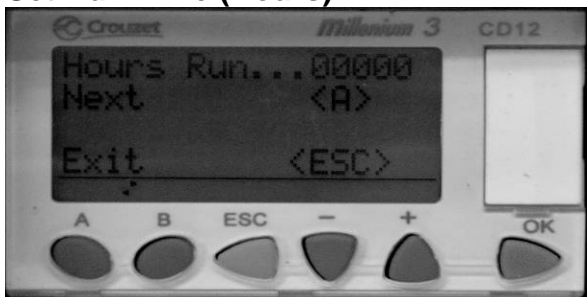


To set the time which the dump valve is open for (T4)

Select **<A>** to cycle to Timer T4 and then press **<OK>**

Adjust Timer T4 using **<+>** / **<->** keys press **<OK>** to save

Set Run Time (Hours)



Set Run Time (Hours) Records number of hours the scraper has been operating.

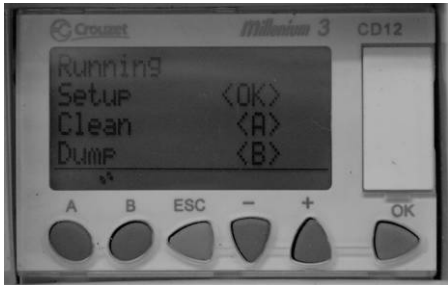


Select **<A>** to cycle to Hour Run Adjust hrs run time using **<+>** / **<->** as required and then press **<OK>**

3.2) Controller Setting Range and Defaults

TIMER NUMBER AND FUNCTION	RANGE	INITIAL NOMINAL SETTING
T1 Cleaning motor cycle timer	1-1440 min	240 min
T2 Cleaning motor running duration timer	1- 60 sec	20 sec
T3-C1 Time for dump valve to move from closed to open position or vice versa	T3 1 - to 1440 min C1 1 – 100 Cycles	C 10 sec for ¾” BSP valve C 15 sec for 1½” BSP valve
T4 Time the dump valve is fully open	1 – 60 sec	20 sec

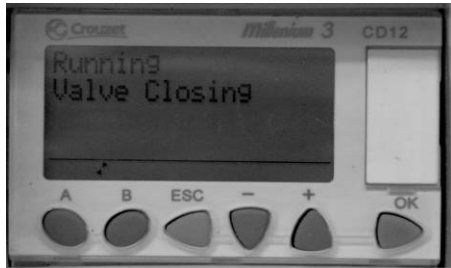
3.3) Operating Status Indication Normal Operation

The controller displays the following operating status conditions during normal operation

	<p>RUNNING: Displayed when system is powered up and running with no faults</p>
	<p>MOTOR RUNNING: Displayed when cleaning scrapers are running</p>
	<p>VALVE OPENING: Displayed when dump valve is opening</p>







VALVE OPEN: Displayed when dump valve is open



VALVE CLOSING: Displayed when dump valve is closing

3.4) Fault Messages

The following fault condition messages are displayed

Fault Message	Description	Remedy / Cause
<p>Valve Close</p> 	<p>Dump valve failed to Close</p>	<p>Press <A> to clear fault From main menu press to cycle valve if necessary</p>
<p>Valve Open</p> 	<p>Dump valve failed to Open in the time set in T3</p>	<p>Press <A> to clear fault From main menu press to cycle valve if necessary</p> <p>Ensure Time T3 is greater than the physical time taken for valve to open.</p>
<p>Motor Trip</p> 	<p>Motor Overload Q1 tripped</p>	<p>Reset Q1</p>
<p>DP High</p> 	<p>High differential pressure across Filter</p>	<p>Filter may be clogged or worn.</p>

3.5) Programme Operating Sequence Airpel Automated Systems

When powered up the control panel will enter a standby state with the 'POWER ON' is illuminated. The cleaning motor or dump valve will operate when one of their respective start stimuli is present. The cleaning motor start stimuli are:

- (i) The Clean push button is pressed (Button A)
- (ii) Differential pressure switch DP1 (or DP2) operates.
- (iii) Delay timer T1 times-out.

The length of time that the motor runs is controlled by timer T2 (timer T1 resets when the motor starts to run regardless of the start stimuli). "MOTOR RUNNING" is displayed whilst the motor is running. Dump valve stimuli are:

- (i) The "Dump" push button is pressed.
- (ii) Delay timer T3 or count C1 times-out

The length of time the dump valve takes to move from the closed to open (or open to closed) position is a function of valve size (see section 3.3) and timer T3 should be set to a time longer than the valve movement time. "VALVE OPENING" is displayed when the valve stimuli is received and "VALVE OPEN" is illuminated when the valve is fully open. The length of time the valve remains fully open is controlled by timer T4. The "VALVE OPEN" message is extinguished as the valve starts to close and the message "VALVE CLOSING" is displayed until the valve is fully closed.

Motor run time is recorded by the system. This indicates the cumulative time the motor has been running and maybe used as an aid to determining filter service intervals.

3.6) REMOTE INDICATION AND OPERATION

Certain operations/functions may be initiated / monitored remotely providing an additional control module is fitted at time of manufacture. Dependants upon the date of manufacture, modular plug in upgrades are available to provide the facility to control and monitor filter operation remotely.

Dump Valve:

The dump valve operation may be initiated remotely by wiring a 'normally open' switch to the 'valve act' terminals on the termination strip. (Close switch to operate the dump valve).

Shut Down:

The control unit (and thus the automatic control of the filter assembly) may be turned 'off' from a remote position by breaking a 'normally closed' switch wired to the 'external timer' terminals on the termination strip.

NOTE:

A wire shorting link should remain across the external timer terminals if the external timer function is not used.

3.7) Remote Status Indication:

Certain operations may be monitored remotely providing an additional control module is fitted at time of manufacture. Dependants upon the date of manufacture, modular plug in upgrades are available to provide the facility to monitor filter operation remotely.

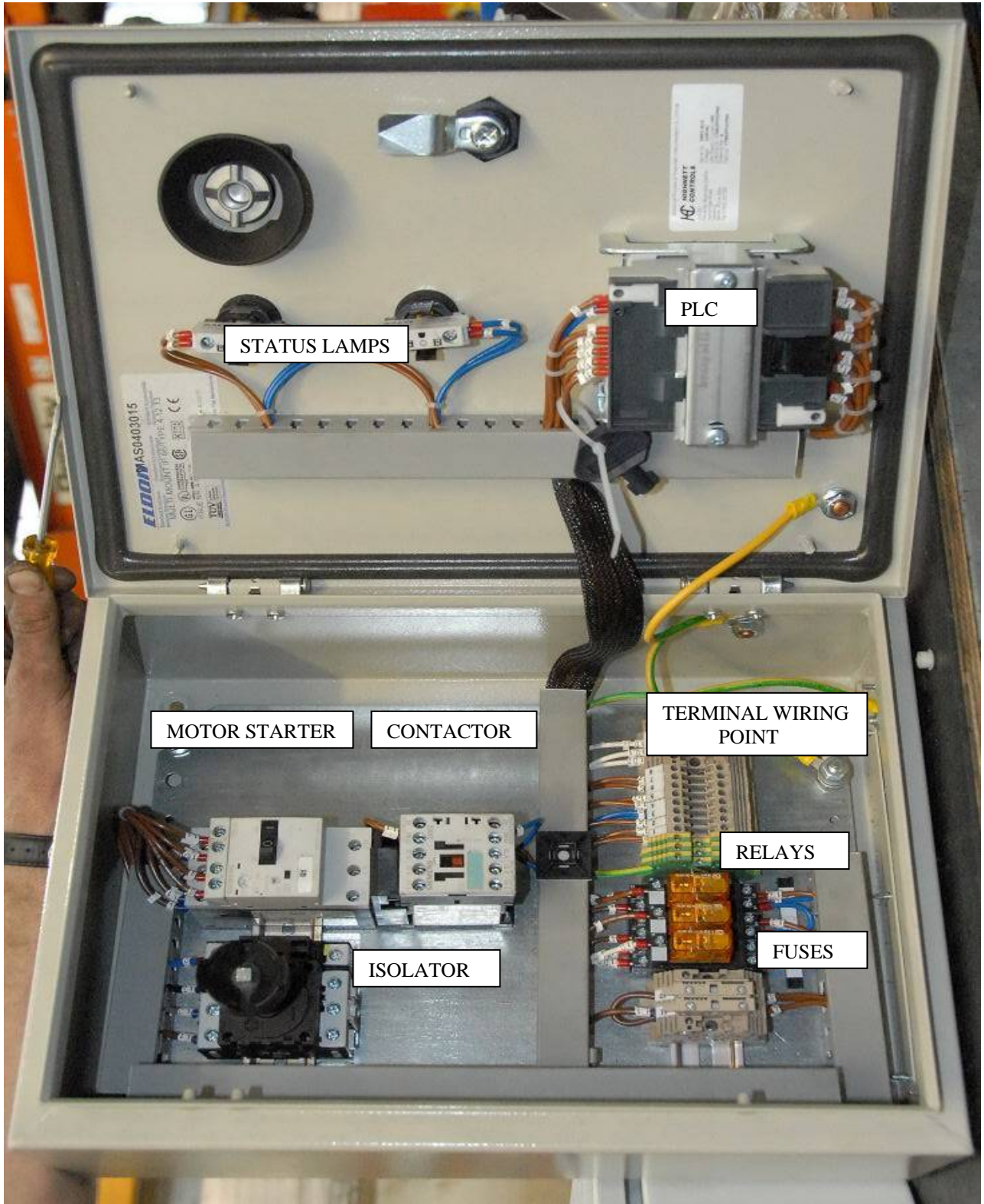
The following outputs are provided this module:

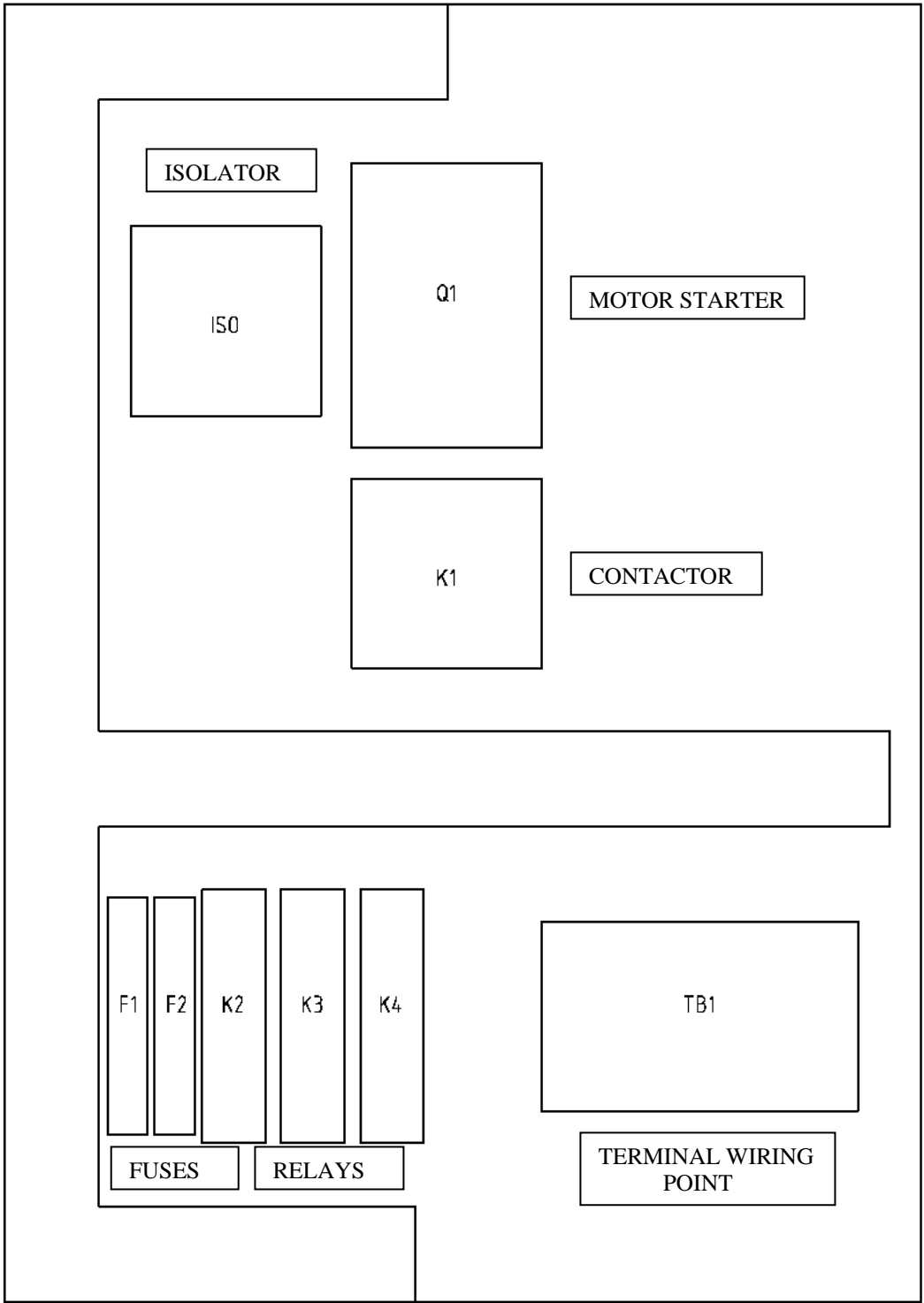
- (i) Element cleaning (i.e. motor running).
- (ii) Element failed
- (iii) High differential pressure (DP2 switch operated).
- (iv) Dump valve operating.
- (v) Dump valve open
- (vi) Dump valve failed to open
- (vii) Dump valve failed to close

Relay number 8 is not normally used.

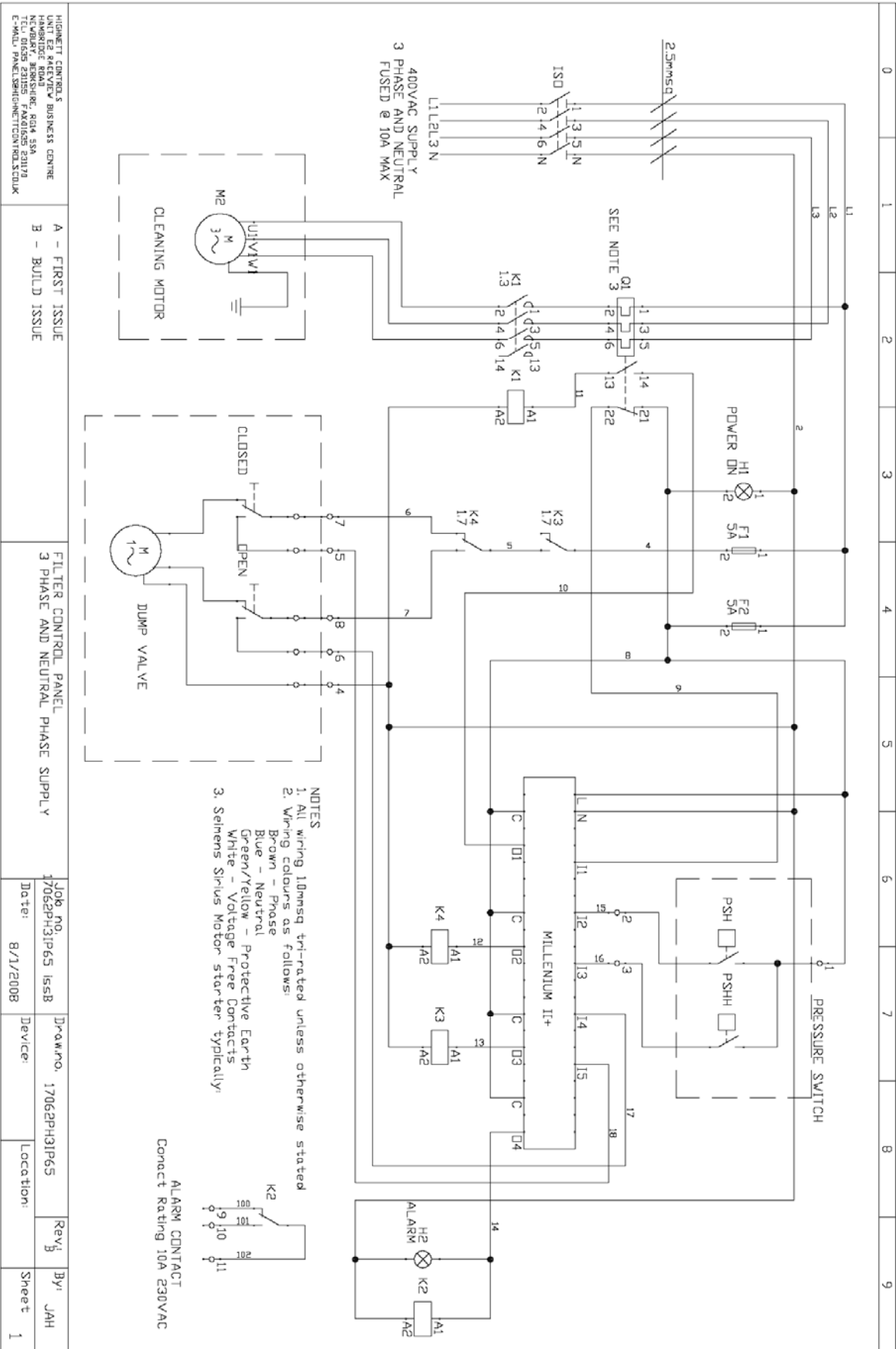
The remote panel will also need a mains power supply.

3.8 CONTROL PANEL

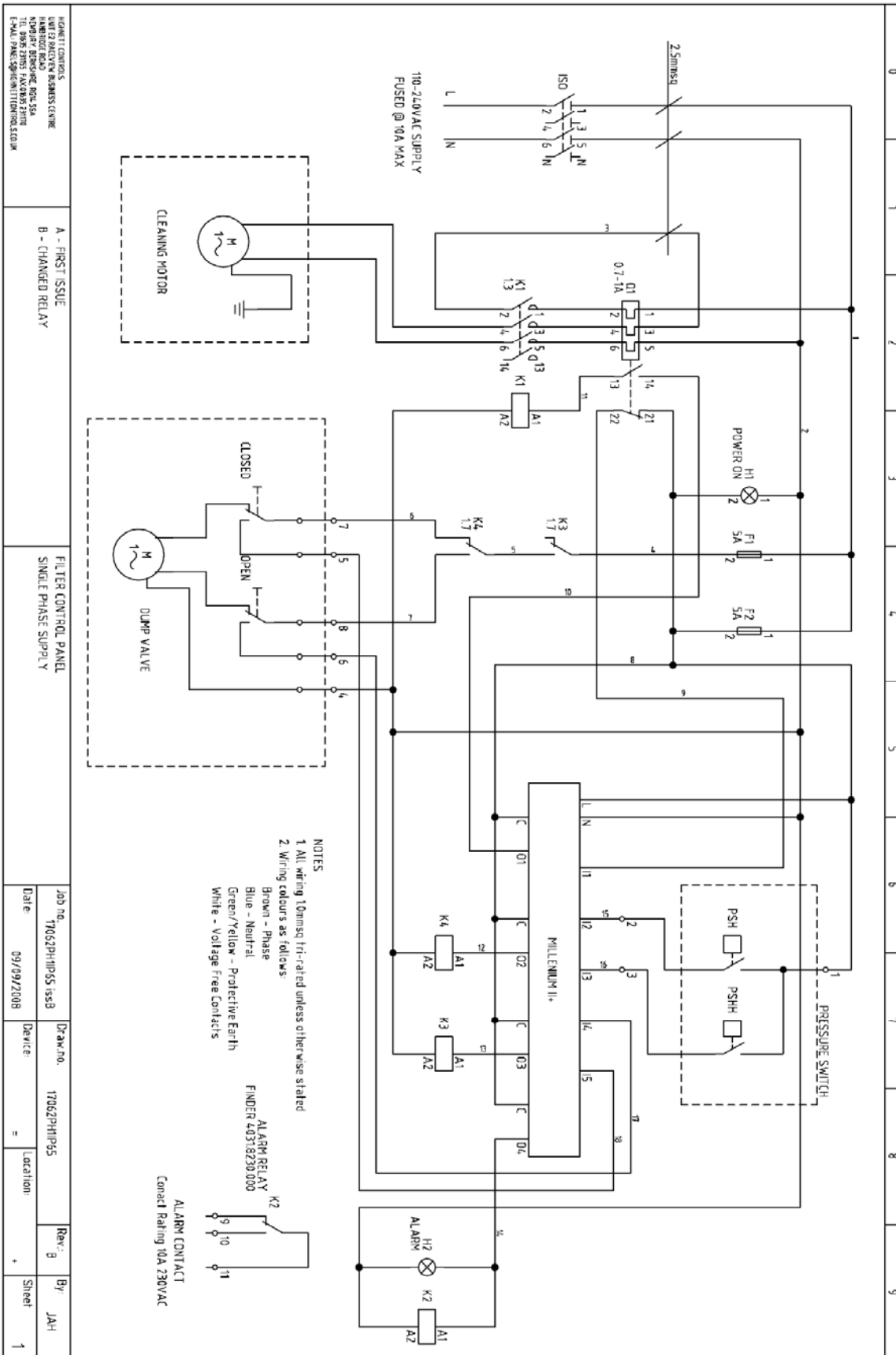




3 PHASE WIRING



1 PHASE WIRING



4.0) Control System Hardware Components

4.1) CLEANING MOTOR

The cleaning motor is either a 3 phase AC or a single phase AC device (customer specified) attached to a helical gear speed reduction box. Motor details are shown on an motor nameplate plate.

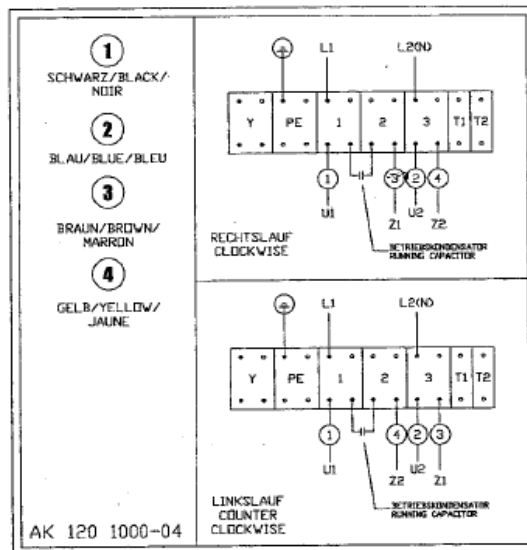
The motor/gearbox assembly is environmentally protected to IP65 in accordance with EN 60529/IEC 529 (i.e. proofed against ingress of dust and water from low pressure jets).

No routine maintenance is required, other than keeping the motor clean.

Typical Standard Motor Performance:

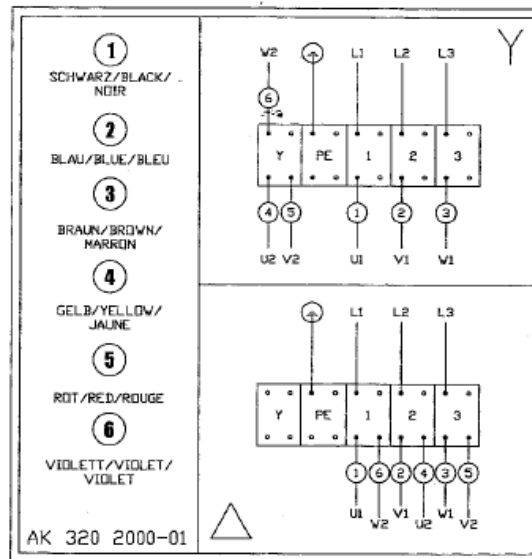
Filter Size	125 - 300		400 -600	
	240 v 1 phase	415v 3 phase	240v 1 phase	415v 3 phase
Rated Current	.458A	.255A	1.26A	.66A
Peak current (starting)	1.4A	0.74A	0.74A	2A
Power Factor	0.64	0.64	0.64	0.7
Output Power	0.075KW	0.075KW	0.18KW	0.37KW
Output Speed	17rpm	17rpm	17.5rpm	17.5rpm
Output Torque	30Nm	30Nm	98Nm	200Nm

MOTOR TERMINAL WIRING DIAGRAMS CAUTION



MOTOR TERMINAL WIRING DIAGRAM

1 PHASE 115 V & 230V



MOTOR TERMINAL WIRING DIAGRAM 3 PHASE 415 V

- 1) Check wiring diagram provided with the motor in case product improvements/ changes have been made. (Motor rotation is clockwise when viewed from above.
- 2) Ensure suitable cable is used to wire the motor to the control panel.
- 3) Suitable sealing arrangements should be provided at the motor terminal box if the environmental protection rating is to be maintained.
- 4) Electronically isolate the motor before commencing any work on the item.

4.2) DIFFERENTIAL PRESSURE SWITCH

The differential pressure switch operates by means of a diaphragm deflection operating two micro switches.

The two micro switches have individual adjustments to give two independent circuits opening or closing at two pressures. The micro switches are housed in a waterproof/dustproof enclosure. (IP65 rating in accordance with EN 60529/IEC 529).

The two micro switches are preset at 0.34 bar (5psi) and 0.7 bar (10psi), but either can be set between 0.07 and 1.0 bar by simple adjustment. Complete scale of adjustment is 2 ½ complete turns. (see diagram of pressure switch internals). The switch does not provide two pole operation as the micro switches are not mechanically interlinked.

Micro switch rating:

- 5 amps at 240 volts AC
- 2 amps at 440 volts AC
- 1 amp up to 30 volts DC

The differential pressure switch does not require maintenance.

CAUTION:

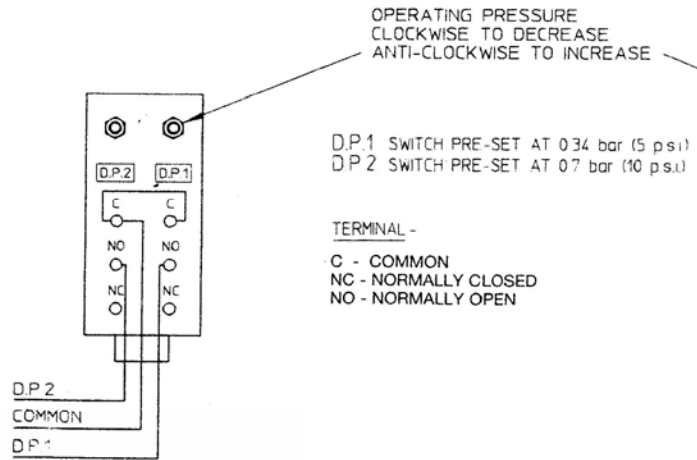
Suitable sealing arrangements should be provided at the termination box to prevent water ingress.

DP2 switch should always operate at a higher pressure than DP1 switch.

Poor soldering of wires to the DP switch terminals is often a source of system failure.

Ensure that wire terminators are sound and that the terminals are not overheated during soldering causing insulation breakdown within the switch.

INTERNAL DIAGRAM OF PRESSURE SWITCH



4.3) DUMP VALVE

The automated dump valve is a reinforced PTFE seat ball valve operated by an electric motor/speed reduction gearbox actuator. The 'valve open' and 'valve closed' positions are controlled by a pair of single pole double throw limit switches that are factory set. 240V AC and 110 AC actuators are available. Wiring connections are inside the actuator cover. All automated control valves are waterproof and dustproof to IP65 rating in accordance with EN 60529/IEC 529. (NEMA 4).

The gears and bearings are permanently lubricated and maintenance free.

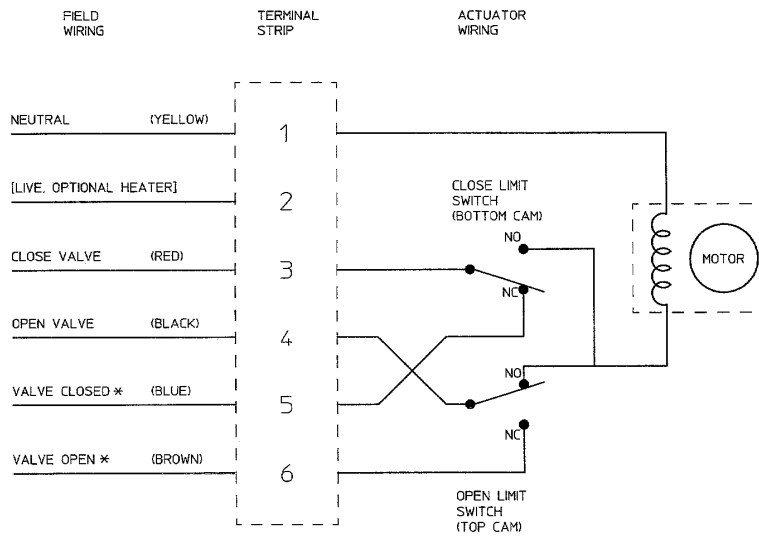
Standard Actuated performance:

Filter Size	150-200		300-600	
Valve Size	¾" BSP/NPT FULL BORE		1½" BSP/NPT FULL BORE	
Actuator Torque	17 Nm		34 Nm	
Operating Time (90°)	6 seconds		10 seconds	
	115 V	240 V	115 V	240 V
Small Current	1.3 A	0.65 A	1.8 A	0.9 A

Valve open/valve closed adjustments

The valve open and valve closed positions are factory set. In the unlikely event that they need readjusting, the following procedure should be followed:

- 1) Electrically isolate the valve before commencing any work on the item.
- 2) Remove the cover and position the valve in either the open or closed position (whichever needs adjusting).
- 3) Release the set screw in the open cam or the closed cam depending on the position of the valve (see 2 above)
- 4) Rotate the cam until the associated micro switch operates (as indicated by a slight 'click' or as indicated on a meter). Tighten the set screws.
- 5) Repeat procedures 2 to 4 for the other valve position if necessary. Refit the cover ensuring a good seal is achieved. Operate the actuator several times to confirm correct positioning.



* NOT REQUIRED FOR SERIES B CONTROL PANEL WIRING

CAUTION:

- 1) Check the wiring diagram supplied with the actuator in case product improvement/changes have been made.
- 2) Ensure suitable cable is used to wire the actuator to the control panel.
- 3) Suitable sealing arrangements should be provided at the actuator wire entry point if the environmental protection rating is to be maintained.
- 4) Electrically isolate the actuator before commencing any work on the item.

5.0) FAULT FINDING

Faults should be cured as soon as they are identified to prevent consequential damage. Airpel filters are robust and extremely reliable products and are all checked for correct function prior to delivery. Faults on automated filters can often be traced to incorrect wiring and for this reason it is recommended that all wiring is checked for correct termination/routing and that the voltage/polarity of the power supply is correct for the motor/valve/control panel combination. Confirm also that the control panel voltage selector switch is correctly positioned.

CAUTION:

- Depressurised the filter before working in the item
- Isolate the power supply before working on electrical equipment.

Symptom	Cause	Cure
1. Fluid Leakage	a) Seal Failure b) Debris across seal face.	a) Replace seal (ensure seal material/ fluid compatibility). b) Clean and reassemble
2. Leakage from drive shaft	Wear/settling of gland packing	a) Tighten gland b) If no further adjustment, replace packing (and shaft, if worn). See section 2.1 and 2.2
3. Leakage from bowl/head joint standard pressure units only	Bowl dislodged (possibly caused by excessive external loading)	Reset bowl. (Ensure dump valve pipework and manual operating loadings, including accidental impacts loads are low) Check 'O' ring is in position.
4. Non-symmetrical wear on scraper blades or element	a) Incorrect assembly b) Bent or damaged blade/element	a) Replace ensuring correct assembly (see section 2.2) b) Replace

Symptom	Cause	Cure
5. Cleaning motor runs continuously very frequently	<p>a) DP switch incorrectly wired (applicable to first start-up only)</p> <p>b) DP too high</p> <p>c) Element not cleaning properly</p> <p>(i) Drive shaft failed</p> <p>(ii) Incorrect element/blade assembly</p>	<p>a) Connect wires to normally open terminals (see section 3.2)</p> <p>b) (i) Reset DP1 switch, but ensure DP1 setting is less than 1.0 bar (15 psi) and less than DP2</p> <p>(ii) Reduce flow rate/viscosity/dirt content</p> <p>(iii) Select larger filter</p> <p>d)</p> <p>(i) Replace</p> <p>(ii) Reassemble (see section 2.2)</p> <p>(1) Add pre-filter</p> <p>(2) Operate dump valve more frequently</p>
6. Control panel LEDs extinguished	<p>a) Power supply interrupted</p> <p>b)"Power in" fuse blown</p>	<p>a) Reinstate power supply</p> <p>b) Replace (identify reason for cause and rectify)</p>
7. Dump valve motor operates, but no flow from valve	<p>a) Motor to valve drive failed</p> <p>b) End of travel switches/cams slipped</p> <p>c) Valve blocked</p> <p>d) System operating at or below atmospheric pressure</p>	<p>a) Replace drive linkage</p> <p>b) Readjust (see section 3.3)</p> <p>c) Clean</p> <p>d) Consult Airpel</p>
9. 'MOTOR TRIP' Fault Message Displayed	<p>a) Control panel overload tripped/motor fuse blown/circuit breaker tripped (3 phase motors only)</p>	<p>a) Reset/replace (Identify reason for cause and rectify)</p>
	<p>b) Wiring to motor (single phase) or to contactor (3-phase) open circuit</p>	<p>b) Replace wiring</p>
10. DP HIGH Fault Message Displayed	<p>a) If this occurs on installation/first power-up examine DP switch wiring</p> <p>b) During operation excessive DP has occurred</p> <p>c) Wiring open circuit to DP1 terminals</p>	<p>a) Connect wires to normally open (NO) terminals (see wiring diagram section 3.2 and 3.4)</p> <p>b) Ensure satisfactory cleaning has occurred. (Clean and flush via push buttons or strip and clean if necessary)</p> <p>c) Replace wiring</p>
11. 'VALVE OPEN VALVE CLOSE' Message Displayed	<p>a) Timer T4 set too low</p> <p>b) Valve/Motor seized</p>	<p>a) Increase T3 (see section 3.4). T3 time should be greater than valve operating time (90^o) given in section 3.3</p> <p>b) Release or replace problem item</p>

Symptom	Cause	Cure
12. Dump valve cycles repeatedly	c) Wiring 'open circuit' d) End of travel switch failed e) Incorrect wiring at actuator	c) Replace wiring d) Replace e) Connect wiring in accordance with wiring diagram supplied with actuator
13. Cleaning motor fails to rotate	a) 'VALVE ACT' terminals shorted to each other b) Timer T3 set too low	a) Ensure terminals are 'open circuit' b) Readjust to an acceptable time period (see section 3.4)
	a) Seizure b) 'POWER ON' LED extinguished c) 'FILTER Running message' extinguished d) For 3-phase motors - wiring open circuit between contractor and motor	a) Inspect motor bearings, drive shaft/gland and element blade for source of seizure and release b) Reinststate power supply c) See 8 above d) Replace wiring

6.0) RECOMMENDED SPARES

The following spares listing is for guidance only. The end user should judge the required spares holding based on anticipated/historical duty cycle/wear out frequency and the consequences of filter wear/failure.

a) Typical spares list for 6 months operation:

- | | |
|----------------------|-------|
| 1. Element | 1 off |
| 2. Scraper Blade | 2 off |
| 3. Seal Kit | 1 off |
| 4. Drive Shaft assy | 1 off |
| 5. Thrust piece | 1 off |
| 6. End plate nut | 2 off |
| 7. Rod-strut | 2 off |
| 8. Quick release rod | 2 off |

For multiple filter installations (where the filters are the same size and type) only the number off of items 1,2 and 3 need be multiplied by the number of filters in use. The remaining items can be multiplied by a smaller factor.

7) PNEUMATIC CONTROL SYSTEM

Airpel self cleaning filters can be powered and controlled pneumatically. There are no electrical components in the pneumatic control system and therefore Airpel pneumatically controlled self cleaning filters can be used in explosion hazard environments. The two major control options are:

a) Cleaning motor only: This option consists of a pneumatic vane motor coupled to a speed reduction gearbox. The cleaning motor is usually run continuously when processing fluid. (This is often achieved by using a common gas supply for the cleaning motor and for a pneumatically driven pump.)

b) Pneumatic Automation: Full automation of the self cleaning filter is achieved using the following hardware:

Control Panel - incorporating all pneumatic logic

Pneumatic Cleaning Motor - as described in (a) above

Pneumatic Differential Pressure Trip - on all pneumatic device

Pneumatic Dump Valve - a pneumatic piston/spring return actuated ball valve

When the filter is in 'stand-by' mode there is no gas consumption. As the differential pressure reaches the set value of the differential pressure trip, the trip initiates the operation of the cleaning motor and then the operation of the dump valve. The duration that the motor runs and the dump valve remains open can be individually adjusted by two independent timers located in the control panel. (Timer range = 0.1 to 30 seconds) There are two manual over-ride buttons on the control panel to initiate operation of the cleaning motor or dump valve, and two visual indicators that show the operational status of the system. (One indicator shows 'Control Panel Pressurised' the other shows 'Cleaning Cycle Initiated')

General

The major components of the pneumatically automated self cleaning filter are:

- Cleaning motor – a vane motor and gear box arrangement
- Dump Valve – a piston actuated / spring return ball valve
- Differential pressure trip – a diaphragm operated air valve
- Control panel - logic panel incorporating manual overrides

A cleaning cycle consists of the operation of the cleaning motor and the subsequent operating of the dump valve. The time the cleaning motor runs, and the time the dump valve remains 'open' are controlled by two independent timers that are located inside the control panel. A cleaning cycle is initiated by the differential pressure trip (which is factory set at a differential pressure of 0.35 bar / 5 lbin²) Manual override of the cleaning motor and dump valve can be achieved by pressing the appropriate button on the front of the control panel.

Two visual indicators are provided on the control panel – one indicating the panel is pressurised; the other showing that the cleaning motor or/and dump valve are operating.

All connections to the control panel are ¼ inch BSP. The connection to a fully piped system is ¼" BSP although it is recommended that the air supply pipe to the connection point is 8mm (5/16") to keep flow pressure losses to a minimum.

The automation system does not contain electrical components or electrical signals.

Gas Supply

The gas supply should be connected to the control panel as shown in the attached diagram (and marked on the control panel) The gas supply should be dry (suggest Dew point less than 0° C) and filtered to 1 micron or better to ensure reliable operation. Ideally the gas should be oil lubricated to 0.5 ppm. The regulated gas pressure should be between 5 and 8 bar (75 and 120 lbin²) The gas flow rate will peak at 20 standard litres per second (45 Std ft³/min) There is no gas usage when the filter system is on 'standby'.

Quality of Gas Supply

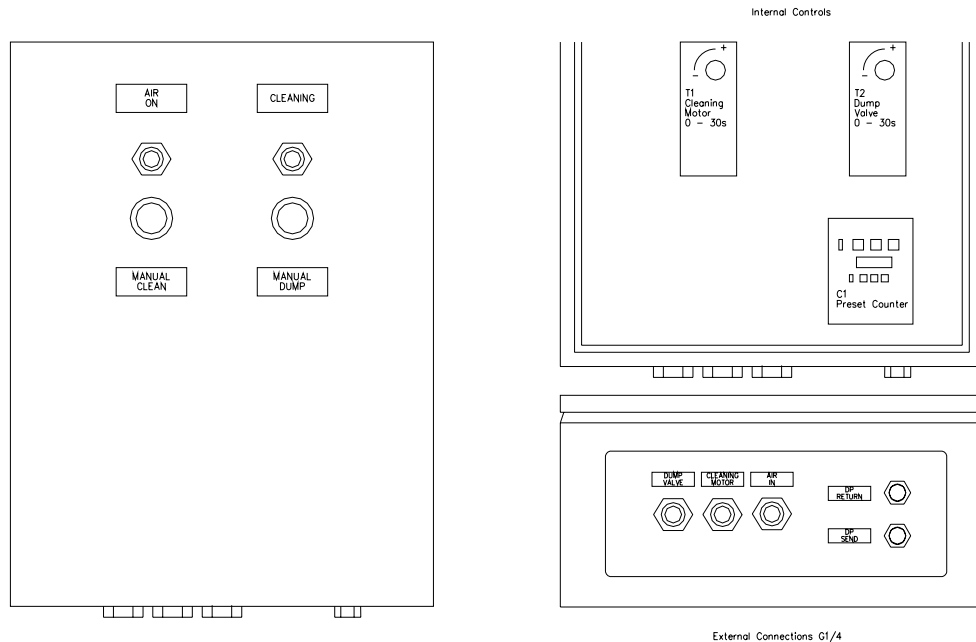
Gas pressure:	5 to 8 bar gauge
Gas consumption:	Stand-by mode: Nil Cleaning mode: 40 standard litres/second (80 scfm) Note: 8mm (5/16") bore supply hose recommended
Dew point:	Less than 0° C
Gas filtration level:	1 micron nominal

System Adjustments

- a) Control Panel Timers: The timers for the duration of operation of the cleaning motor and the dump valve are located inside the control panel. (see diagram) Rotating the timer knob clockwise will increase the time interval.

NOTE: Fluctuations in air supply pressure may affect timer operation. Rotating the knob clockwise will increase the time interval up to a maximum of 30 seconds

- b) Differential Pressure Trip: The trip is pre-set at 0.35 bar (5lb/in²). This valve can be adjusted by removing the top cover and turning the adjusting nut (Clockwise rotation will lower the set point differential pressure; anticlockwise will raise the pressure) A ¼ turn of the nut will give approximately 0.1 bar (1.5 lb/in²) adjustment. It is recommended that any changes to the set pressure are done with the trip removed from the filter, pressurised with air and compared with an accurate pressure gauge.



PNEUMATIC CONTROL UNIT

System Logic:

Filter Cleaning (Motor) Operation:

Motor will operate with differential Pressure factory set @ 0.7 bar.

Motor timer has a range of 0 – 30 seconds – Set according to amount of debris
Recommended 15 seconds.

i.e.: When DP reaches 0.7 the motor will run for 15 seconds and will stop.

Dump valve Operation:

The Dump Valve operates with the Counter:

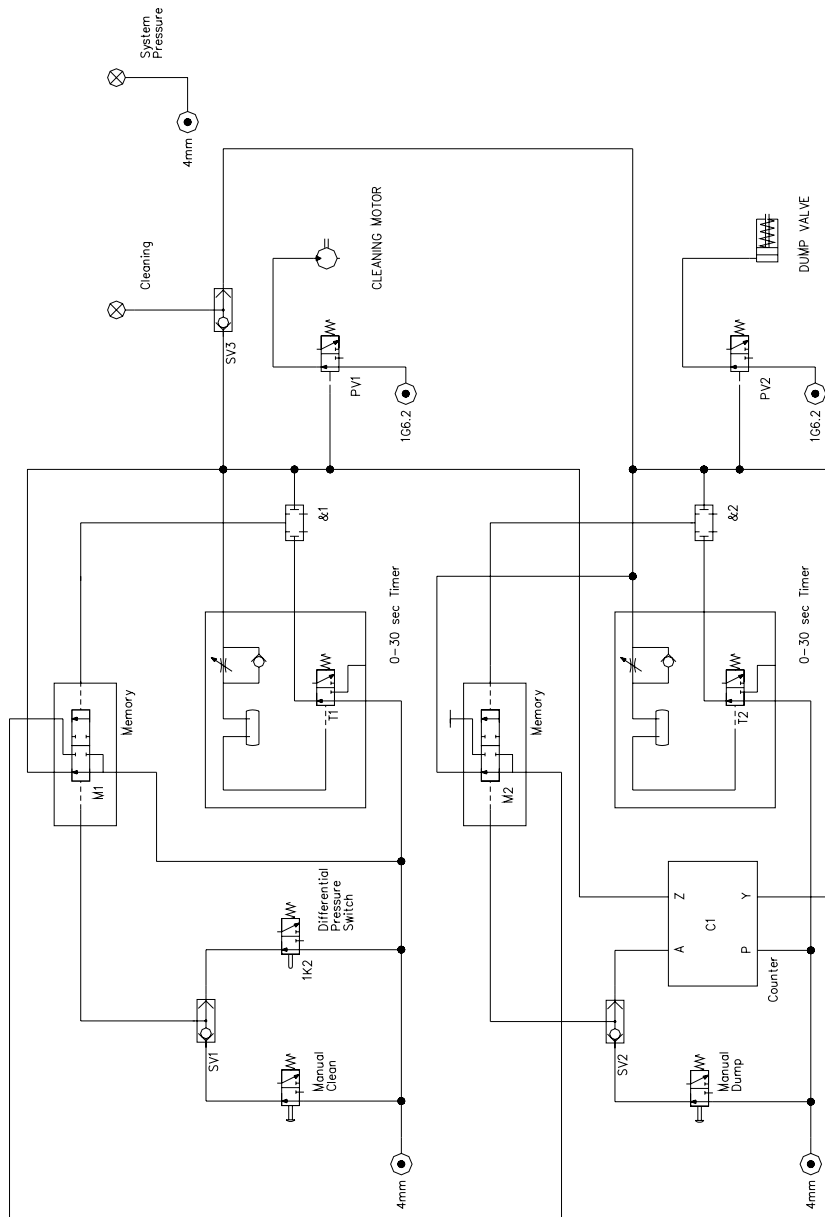
Set the counter according to amount of debris – The Dump Valve will operate after the number of times that the motor operates.

i.e.: Fluid with heavy load of debris – The dump valve should operate after 3 element cleaning cycles (Motor operates 3 times – The Dump Valve will operate)

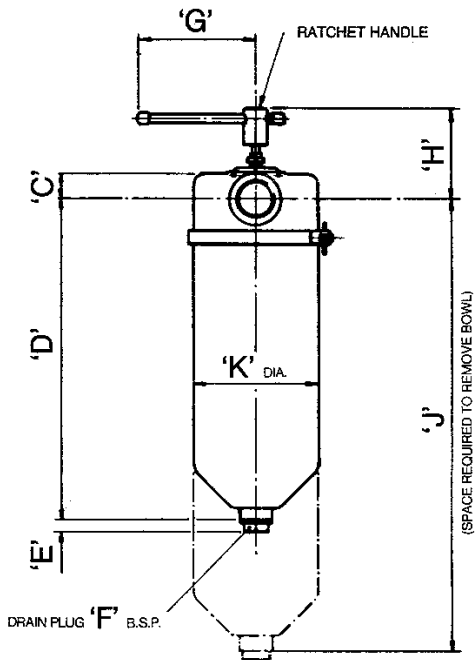
Dump Valve Timer has a range from 0 to 30 seconds - Set according to amount of debris.

i.e.: Fluid with heavy load of debris – The dump valve should remain open for 5 seconds.
If fluid has a small amount of debris – The Dump Valve should be open for 1 second.

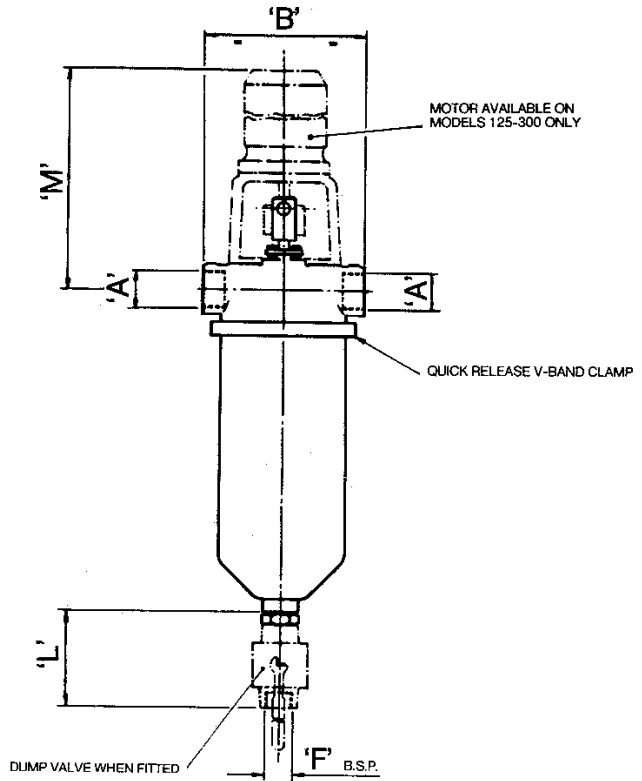
The front panel push buttons for Cleaning Motor and Dump Valve manually override the system logic and can be used for test and manually operate the system.



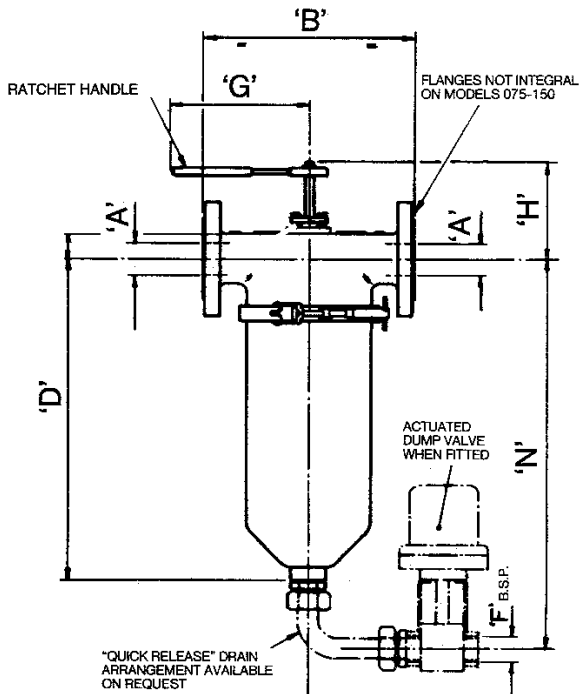
DIMENSION DRAWINGS STANDARD PRESSURE FILTERS



MODEL 075-100.
ONLY AVAILABLE IN MANUAL VERSION.



MODEL 125-200.
SCREWED CONNECTIONS.
AUTOMATED OR MANUAL VERSION.
(MOTORISED ILLUSTRATED)

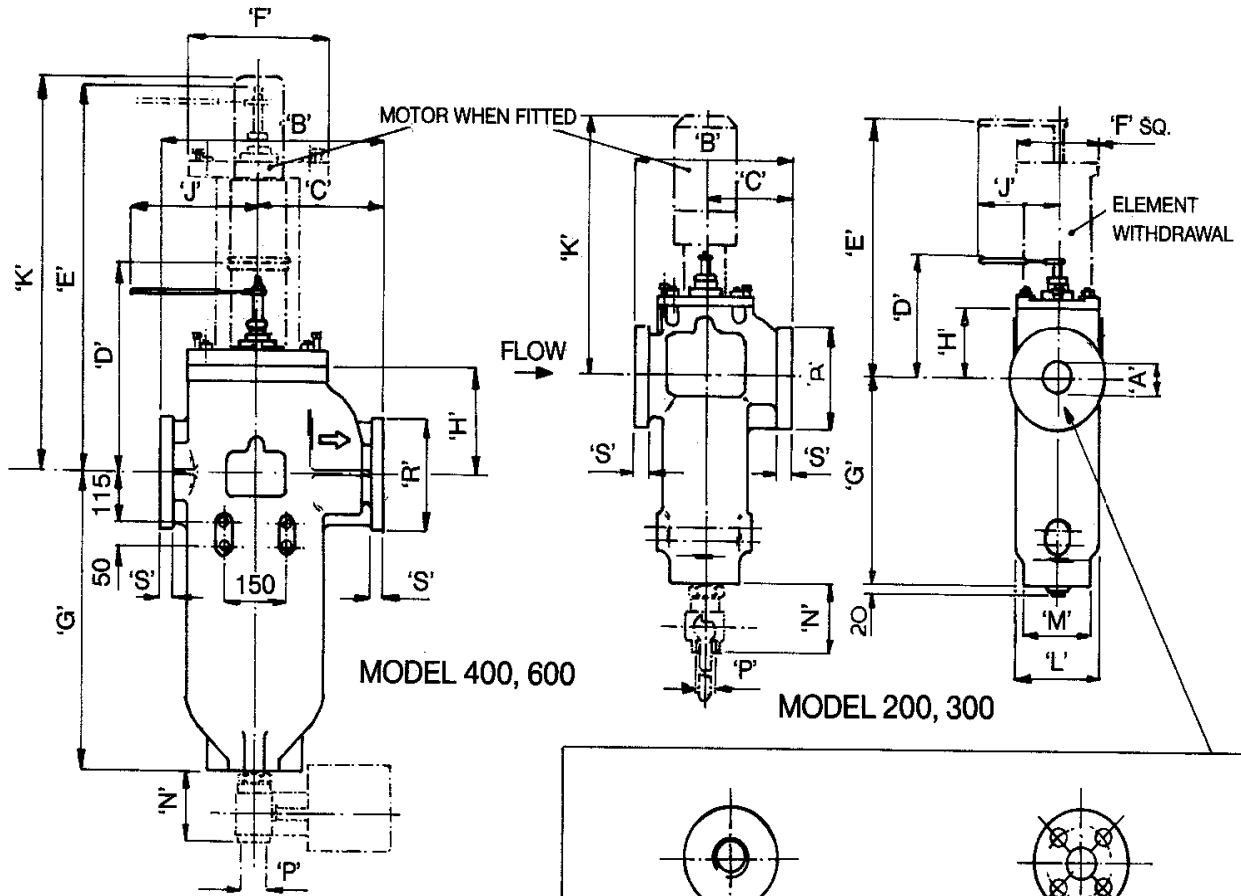


MODEL 125-300.
FLANGED CONNECTIONS. AUTOMATED OR MANUAL VERSION.
(MANUAL ILLUSTRATED)

SCREWED FILTERS - STANDARD RANGE														
MODEL	'A' PIPE SIZE	'B'	'C'	'D'	'E'	'F'	'G'	'H'	'J'	'K'	'L'	'M'	'N'	Wt. (KG)
075	3/4" BSP	150	24	266	13	1/2" BSP	65	105	450	114	-	-	-	5.4
100	1" BSP	150	24	266	13	1/2" BSP	65	105	450	114	-	-	-	5.4
125	1 1/4" BSP	208	32	404	15	1" BSP	120 (MAX)	105	600	155	110	440	490	11.2
150	1 1/2" BSP	208	32	404	15	1" BSP	120 (MAX)	105	600	155	110	440	490	11.2
200	2" BSP	220	40	457	15	1" BSP	140	133	650	155	110	447	540	15.2

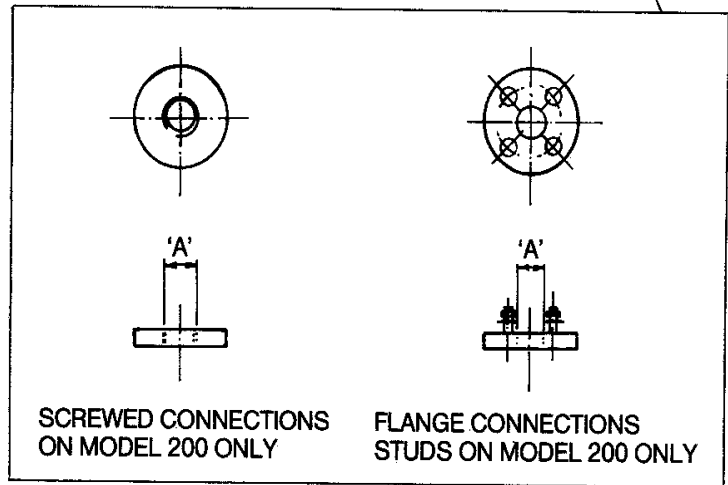
FLANGED FILTERS - STANDARD RANGE														
MODEL	'A' PIPE SIZE	'B'	'C'	'D'	'E'	'F'	'G'	'H'	'J'	'K'	'L'	'M'	'N'	Wt. (KG)
075	3/4" (20)	210	24	266	13	1/2" BSP	65	105	450	114	-	-	-	8
100	1" (25)	210	24	266	13	1/2" BSP	65	105	450	114	-	-	-	8.5
125	1 1/4" (32)	270	32	404	15	1" BSP	120 (MAX)	105	600	155	110	440	490	16.5
150	1 1/2" (40)	270	32	404	15	1" BSP	120 (MAX)	105	600	155	110	440	490	17.5
200	2" (50)	270	40	457	15	1" BSP	140	133	650	155	110	447	540	25.0
300	3" (80)	300	56	575	20	2" BSP	140	148	875	190	142	461	710	41.0

DIMENSION DRAWINGS HIGHER PRESSURE FILTERS



MODEL 400, 600

MODEL 200, 300



SCREWED CONNECTIONS
ON MODEL 200 ONLY

FLANGE CONNECTIONS
STUDS ON MODEL 200 ONLY

HIGHER PRESSURE RANGE

MODEL	'A' SIZE	'B'	'C'	'D'	'E'	'F'	'G'	'H'	'J'	'K'	'L'	'M'	'N'	'P'	'R'	'S'	Wt. HAND OF (KG)	Wt. WITH MOTOR (KG)
200	32 mm* 1 1/4 in	270	150	198	413	150	325	115	140	540	150	124	110	1" BSP	165		36	44
	40 mm* 1 1/2 in																	
	50 mm 2 in																	
300	80 mm 3 in	360	210	230	690	180	430	140	140	575	180	124	142	2" BSP	210	22	55	63
400	100 mm 4 in	550	315	435	1115	340	665	235	406	940	332	-	150	2" BSP	254	30	ON REQ.	ON REQ.
600	150 mm 6 in	550	315	435	1550	340	1165	235	406	940	332	-	150	2" BSP	318	35	ON REQ.	ON REQ.

* 32 mm/ 40 mm size units offered in screwed version only.

Larger sizes on request.