

# Pressurisation & Automatic Dosing Unit – Fluid Category 5

## Dose & Fill Model – DF - Datasheet Page 1 of 4

### Description

Dose & Fill has been developed to combat the growing costs and problems associated with heating systems starved of inhibitor. Modern systems frequently have aluminium heat exchangers, steel panel radiators & thin copper tubing, requiring adequate levels of inhibitor to avoid perforations, blockages and to validate the manufacturers' warranties.

Traditionally a system is manually dosed via a dosing pot after the initial fill. However this is diluted every time the pressurisation unit adds plain water following normal minor losses or after partial draining for maintenance. Dose & Fill is a compact & wall mounted filling and automatic make-up unit for adding water to a sealed system.

The Dose & Fill incorporates the Arrow Valves "[Midi-Fill](#)" [Digital](#) pressurisation unit, whilst the lower half of the 1 m tall enclosure contains a 20 litre chemical container. In "Auto Dose" mode, the unit monitors the quantity of water added by the pressurisation unit and then the dosing pumps automatically inject inhibitor into the heating system according to concentration set via the LCD digital display. The correct concentration is therefore maintained.

Dose & Fill has been designed to comply with the Water Regulations, providing Fluid Category 5 backflow protection for filling and top-up of "non-house" heating or systems. **Filling loops with a Double Check Valve must no longer be used for "other than a house" primary circuits above 45 kW - see Water Regulations and WRAS interpretation.**

In addition to "Auto Dosing", the unit features an internal and external manual dosing facility. This generally avoids the need for a traditional dosing pot - a significant cost saving. The external dosing facility allows a newly filled system to be dosed from the manufacture's container stood on the floor adjacent to the Dose & Fill unit avoiding the need for an operative to lift and pour chemical into a potentially hot dosing pot.

The primary features are –

- Fluid Category 5 backflow prevention – initial fill & top-up
- Filling pump – with anti seize daily pulse feature
- Twin dosing pumps – with anti seize daily pulse feature
- High & low pressure cut-outs with boiler control output
- Comprehensive BMS controls
- Two digital displays, setting buttons and button lock
- Self test monitoring system alerting of pressurisation fault **before** heating system is shut down
- Electronic water meter with monthly excessive filling warning trigger (adjustable)
- Pressure transducer – accurate filling and small differential
- 20 litre internal chemical container with level monitoring

The unit is supplied fully assembled and tested. Inlet and outlet stainless steel braided hoses with Servicing Valves and push fit connections are provided to facilitate installation.

### Applications

Filling, topping up, initial & continued automatic dosing –

- Primary Heating Systems LTHW
- Under Floor Heating
- Refrigerating Equipment
- Cooling Circuits
- Industrial Processes

*Note - the maximum concentration level that can be set is 4% and therefore not suitable for chilled systems requiring a higher level. The dosing pumps are suitable for inhibitors only - e.g. Sentinel X100*



**Model shown - DF22 –**  
The left display controls the pressurisation unit, whilst the right controller and its buttons control the dosing unit

Lower section encloses a 20 litre chemical container & twin dosing pumps

Sizes - 15 or 22 mm. Supplied with flexible hoses incorporating Servicing Valves

### Boiler & BMS Controls Overview

Dose & Fill addresses the common weakness of pump seizure due to infrequent use by pulsing the pumps each day - *no water is admitted into the system*. A self test program ensures the pumps can generate pressure; otherwise the BMS fault relay activates and the specific fault is displayed on the LCD panel. This self monitoring system warns of faults **before** the system needs topping up and therefore helps avoid low pressure boiler shut down situations. These are invariably disruptive and costly – especially for schools.

BMS relay O3 is User Configurable, allowing groups of faults and warnings to be monitored or ignored. For example, the user may wish to monitor only a single parameter, such as excessive filling for the month. The state may be reversed from Healthy = contacts open to Healthy = contacts closed. Alternatively O3 relay may be configured as a pulsed water meter.

The pumps can be manually tested during maintenance and disabled during installation using the controls on the panel. The Auto Dose mode has the option "Dose Fault Stops", meaning the main pressurisation pump stops if the dosing unit runs out of chemical - useful for unattended filling. After the initial fill the unit is normally set to Auto Dosing "Healthy" where the pressurisation unit is independent of the dosing unit - i.e. continues to function if chemical container empty.

### Materials

|                     |                                |
|---------------------|--------------------------------|
| Cabinet             | Steel (powder coated RAL 7032) |
| Pump (wetted parts) | Brass (regenerative)           |
| Cistern             | Stainless steel 304            |
| Fittings            | Brass or stainless steel       |

### Arrow Valves Ltd

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### Water Regulations

Clause G24.2 (page 8.24) allows a temporary connecting pipe (quick fill loop) to be used for a **house heating system only** - since the Fluid Category is 3. For “other than a house” applications (e.g. output greater than 45 kW), the risk is Fluid Category 4 and a quick fill loop must not be used – **not even temporarily** (page 6.6, 4a). For systems less than 45 kW refer to datasheet “Autofill” – model AFCA. Above 45 kW the system could be filled through an RPZ valve or AB air gap and pump, the latter arrangement is incorporated into the Dose & Fill.

Dose & Fill does not require annual servicing and does not need to be notified to the local water company.

### Digital Controller (Pressurisation)

The unit is factory commissioned for systems up to 10 m head. For taller buildings, the cold-fill pressure can be increased using the buttons on the front panel. *Note - the buttons can be locked to prevent tampering.* The following adjustments are permitted –

- Cold fill
- High cut-out pressure
- Excessive monthly water consumption warning trigger  
*Note - the buttons can be locked to prevent tampering*

The controller ensures a workable program; since settings must be in range. E.g. the low cut-out pressure is automatically adjusted to 0.5 bar below cold fill. The high cut-out pressure cannot be set with less than 0.5 bar above the cold-fill value.

### Panel display messages include –

- System healthy
- Last filled date
- Water consumption – since zeroing
- Water consumption – since 1<sup>st</sup> of that month
- Low level fault
- Low system pressure fault
- High system pressure fault
- Pump fault
- Excessive monthly water usage warning

### Electronic Water Meter (Pressurisation)

The Dose & Fill incorporates a built-in electronic water meter, which determines the system volume; enabling the quantity of inhibitor to be added via a dosing pot if preferred. The meter also indicates any system leakage. The meter can be zeroed from the panel. An excessive monthly consumption warning feature is also provided, where a second meter reading illustrates the filling since the 1<sup>st</sup> of the month. If the filling exceeds the user defined trigger value, a visual warning is displayed on the panel and the warning relay closes. *Note – the boiler control is unaffected and the warning will automatically clear on the 1<sup>st</sup> of each month – if not cleared manually earlier.*

Where a pulsed water meter is required to monitor water consumption, the user configurable BMS relay can be used as a pulsed water meter (1 pulse / litre) – rather than BMS faults.

### Factory (Default) Settings –

|                         |  |
|-------------------------|--|
| Cold Fill               | Switch on 1.2 bar (falling)<br>Switch off 1.4 bar (rising) |
| Low cut-out (automatic) | 0.3 below cold fill = 0.9 bar (falling)                    |
| High cut-out            | 2.8 bar (rising)   |
| Electronic water meter  |  |
| monthly trigger point   | 50 Litres  |

### Adjustable Parameters (Pressurisation)

The following are adjustable via the buttons below the LCD display (*assuming buttons have not been locked*).

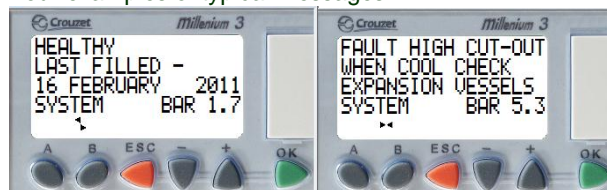
|              |   |
|--------------|---|
| Cold Fill    | Switch on 0.6 – 3.2 bar (falling)<br><b>(max. suggested head 30 m)</b><br>Switch off 0.8 – 3.4 bar (rising)   |
| High cut-out | 5.8 bar max (rising)<br>Must be at least 0.5 bar more than cold fill. <i>E.g. if left at 2.8 bar default, cold fill cannot be set above 2.3 bar</i> |

Electronic water meter  
monthly trigger point

10 – 1000 Litres

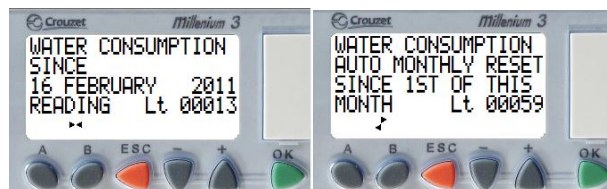
### Display (Pressurisation)

Four examples of typical messages –



Normal – alternates last fill / cold fill

Fault – Excessive pressure



Water consumption since zeroing

Consumption that month

*Note – in normal “Healthy” Auto Dose mode, the pressurisation unit will continue to operate normally even if there is a fault with the dosing unit (e.g. chemical container empty)*

### Specification - Mechanical

|                             |   |
|-----------------------------|---|
| Connection hoses (supplied) | 15 or 22 mm stainless braided metal push fit with serv. valve |
| Pressure Supply min.        | 1.0 bar dynamic   |
| Pressure Supply max.        | 10 bar  |
| Enclosure                   | Wall mounted with lockable door                               |
| Weight (wet)                | 50 kg   |
| Water Regulations           | <a href="#">1112062</a> (DF22)                                |
| Approval                    | <a href="#">1112063</a> (DF15)                                |

### Specification – Electrical

|                            |   |
|----------------------------|---|
| Volts/Phase/Frequency      | 230/1/50  |
| Supply                     | via 6 A MCB isolator (not supplied)<br>RCBO recommended |
| Motor type                 | Induction (brushless)                                   |
| Low level cut out          | Stops pump (BMS & warning lamp on door) – auto reset    |
| Max. current BMS relays    | 8 A resistive @ 230 V a.c.                              |
| Control circuit protection | 3 A fuse inside enclosure                               |
| Switch Enclosure           | IP65  |
| Cable Entries              | M20 hole  |
| Solenoid (22 mm only)      | 230 V 50 Hz IP65  |
| IP Rating EN60529          | IP65 (controls)   |
| Power Consumption          | 625 W (DF15), 635 W (DF22)                              |
| Full Load Current          | 2.7 A (DF15), 2.8 A (DF22)                              |

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# Dosing Unit

## Dose & Fill Model – DF - Datasheet Page 3 of 4

### Digital Controller (Dosing)

The following functions are available –

- Internal dose pot (manual dosing)
- External dose pot (manual dosing)
- Pump test / run
- Tare zeroing (allowing for alternative container weights)
- Concentration – range: 0.5 – 4%

### Dosing Modes

“Flash corrosion” occurs when oxygen rich raw water is admitted to a clean system, resulting in heavy corrosion and magnetite sludge within a few hours. To avoid this, it is recommended that the system is filled in “Auto Dosing” mode which will add the correct amount of inhibitor. This also avoids volume calculations and manual dosing. *Any system leaks should have been detected during the pre commission cleaning stage.*

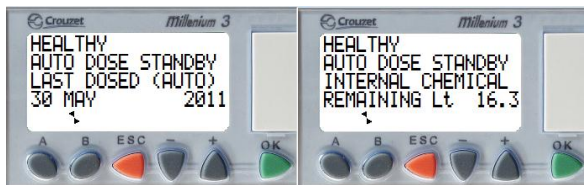
**AUTO DOSING** – The dosing pumps inject 0.5 litre of chemical after it detects that the appropriate quantity of water has been admitted. E.g. @ 1.0% concentration, every 50 Lt of water. The normal mode allows the pressurisation unit to function if dosing unit develops a fault - e.g. out of chemical. The “DOSE FAULT STOPS!” mode is selectable for commission allowing unattended filling and dosing. If chemical runs out, filling stops.

**EXTERNAL DOSING POT** – Place the 2 m long hose (supplied) into the manufacturer’s container and then set the required quantity via the LCD display & buttons. *Note - Since the Dose & Fill cannot weigh the container it uses a time-estimation and the user must supervise, monitoring the quantity injected and ensuring the pumps do not run dry.*

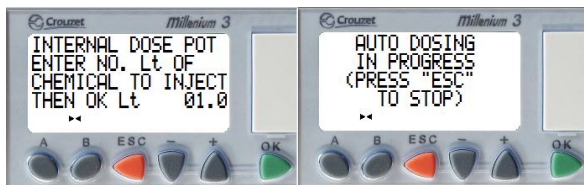
**INTERNAL DOSING POT** – Fill the 20 litre internal container and then set the required quantity via the LCD display & buttons. The 18 litre usable quantity @ 1.0% concentration will dose 1800 litres, generally equating to 150 kW. Refill the container as required. *This method is accurate (98%) and the pumps will stop once the unit detects less than 2 Lt of chemical remaining.*

### Display - Dosing

Four examples of typical messages –



Normal – alternates last dose / chemical remaining



Manual Dosing - “Internal Dosing Pot”

“Auto Dosing” in Progress message

### Boiler & BMS Controls

Four volt free SPST N.O. relays are provided in the control box for BMS monitoring. The operation is shown in the table below, where • = contacts closed. The installer has a choice of running one, two, three or four BMS monitoring signals back to the panel. Where just one pair of wires is available the installer can choose between - BMS for faults only (relay O2) or combined faults/warnings (relay O3) - see table below and drawing AM176\*.

*Note – factory wiring has the dosing warning and faults linked to the pressurisation controller. If required, the dosing unit links can be removed to provide volt free relays.*

*Note - power is required to power relays and run boiler.*

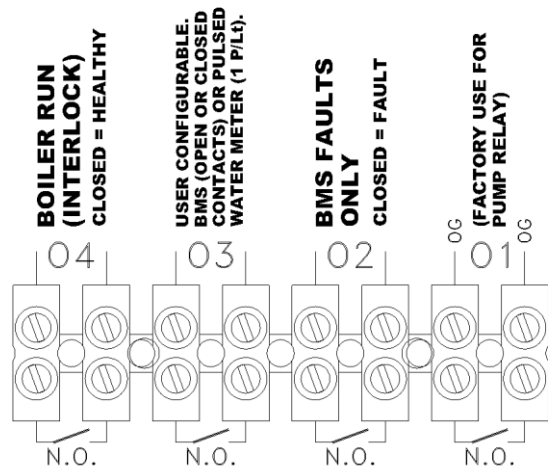
| CONDITION  | FAULTS ONLY | BMS USER CONFIGURABLE | BOILER RUN / INTER-LOCK |
|--|-------------|-----------------------|-------------------------|
| PRESSURISATION (RELAY NUMBER)                              | O2          | O3                    | O4                      |
| NO POWER (e.g. unit isolated or power cut)                 |             |                       | •                       |
| HEALTHY (no faults or warnings)                            |             |                       | •                       |
| FAULT – LOW LEVEL (internal tank water level)              | •           | • G1                  | •                       |
| FAULT – LOW CUT-OUT (low system cut-out pressure)          | •           | • G1                  |                         |
| FAULT – HIGH CUT-OUT (high system cut-out pressure)        | •           | • G1                  |                         |
| FAULT – PUMP SEIZED? TRANSDUCER FAULT? (inc. self test)    | •           | • G1                  | •                       |
| FAULT – FLOOD PROTECTION SYSTEM                            | •           | • G1                  | •                       |
| DOSE FAULT STOPS! mode                                     |             | • G2                  | •                       |
| FILLING DISABLED   |             | • G2                  | •                       |
| WARNING – EXCESSIVE FILLING THIS MONTH                     |             | • G3                  | •                       |
| PULSED WATER METER OUTPUT ENABLED INSTEAD OF BMS           |             | •••••                 | •                       |
| DOSE   |             |                       |                         |
| HEALTHY (no faults)  |             |                       | •                       |
| FAULT – LOW CHEMICAL LEVEL < 2 litres (dosing disabled)    | •           | • G5                  | •                       |
| FAULT – DOSE PUMP OVERHEAT                                 | •           | • G5                  | •                       |
| FAULT – NOT AUTO DOSING                                    | •           | • G5                  | •                       |
| WARNING – AUTO DOSING DISABLED                             |             | • G4                  | •                       |
| WARNING – DOSING DISABLED – PRESSURE ABOVE LIMIT           |             | • G4                  | •                       |
| WARNING – LOW CHEMICAL LEVEL < 4 litres (dosing operative) |             | • G4                  | •                       |

User configurable relay O3 notes –

G1, G2, G3, G4, G5 refer to groups, which can be ignored (disabled).

Factory default – as above – all faults and warnings enabled.

Pulsed water meter disabled.



CONTROL TERMINALS AM176\*

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## Dose & Fill – DF – Datasheet Page 4 of 4

### Model Selection Based On Boiler Size

The table below shows the filling rates for both the 15 & 22 mm models. The 22 mm version has a fast-filling solenoid in place of a float valve and a faster system filling rate.

| Model                            | DF15        | DF22         |
|----------------------------------|-------------|--------------|
| Filling rate Litres/hour         | 720 @ 1 bar | 1000 @ 1 bar |
| Suggested boiler size            | 46 – 200 kW | Above 200 kW |
| Typical volume assuming 12 Lt/kW | 332 - 2400  | 2400 +       |
| Chemical @ 1.0% Concentration    | 4 - 24      | 24 +         |

Note - systems requiring more than 40 litres of chemical may benefit from a 20 litre dosing pot. Also where non-inhibitor chemicals need to be added.

### Codes and Descriptions

| Size  | Code | Description                              |
|-------|------|--|
| 15 mm | DF15 | Dose & Fill Pressurisation & Dosing Unit |
| 22 mm | DF22 | Dose & Fill Pressurisation & Dosing Unit |

### Ancillaries

The sealed heating system requires a correctly sized expansion vessel and controls.

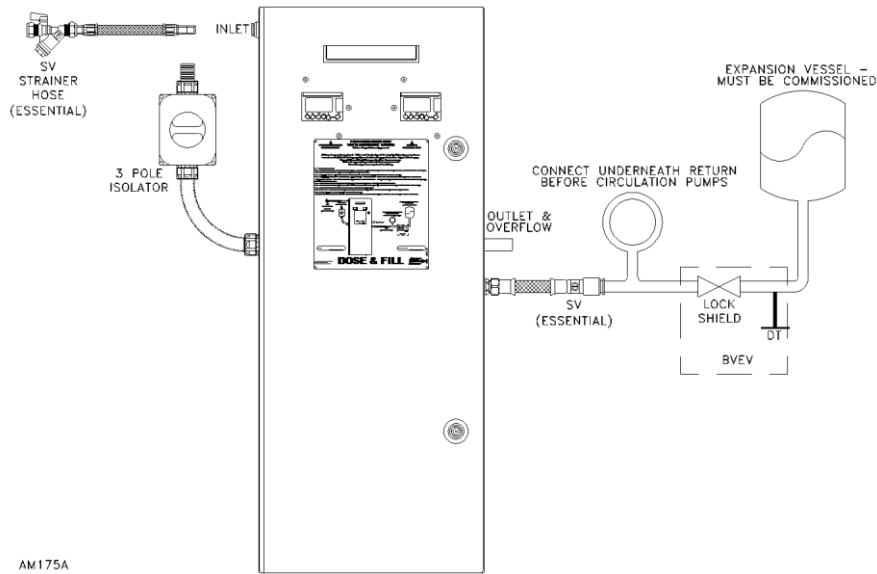
Available from Arrow Valves –

- Wall Mounting Bracket – MIDIBRA
- Stainless Steel Drip Tray – BTDT3
- Bespoke programming
- Expansion Vessels - [EVCP](#)
- Expansion Vessel Servicing Valve c/w Drain Tap – [BVEV](#)
- Dosing Pots - [DP](#)
- Dirt & Air Removers (Deaerators) – [ADR](#)

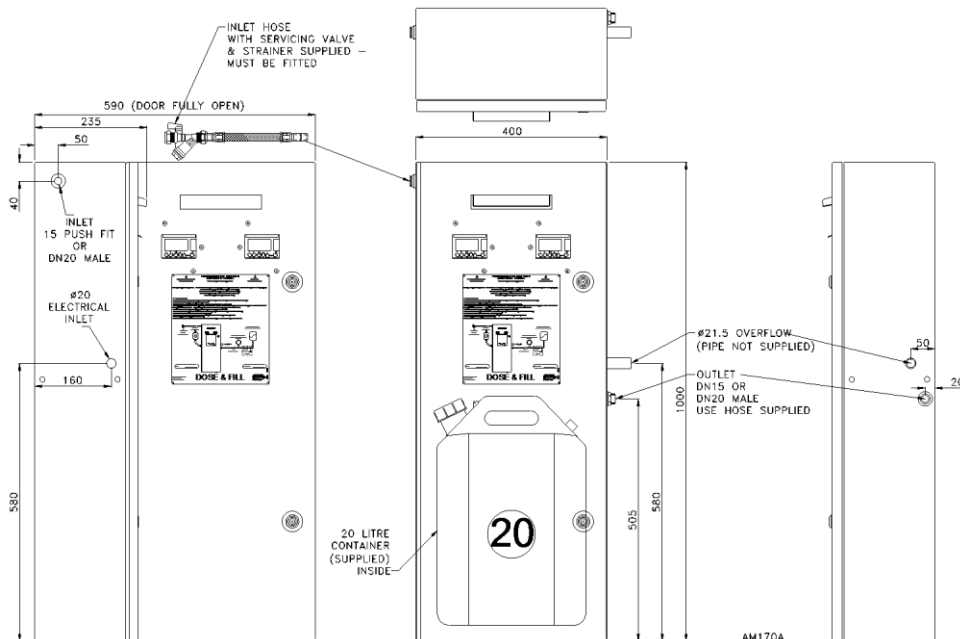


Model - EVCP

### Installation Schematic



### Dimensions



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