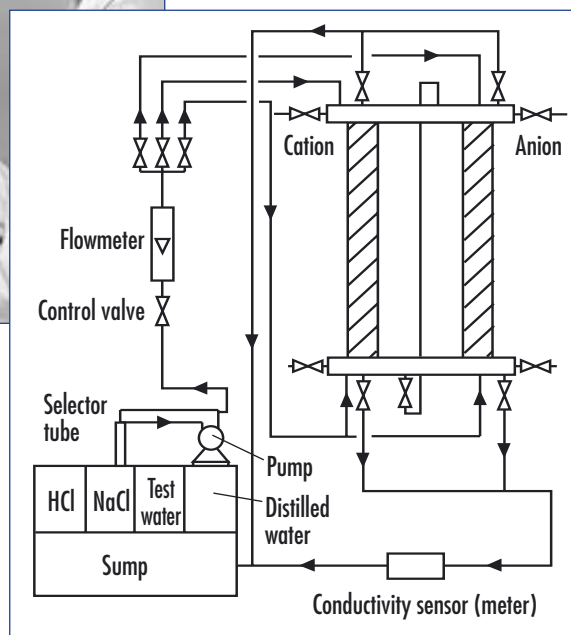




# armfield

## ION EXCHANGE UNIT

**W9**  
issue 4



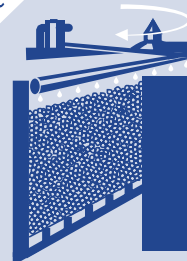
Schematic diagram of valve arrangement

*A low cost, bench-mounted unit designed to demonstrate the use of ion-exchange resins for either continuous water softening or demineralisation. The equipment is designed to emulate the industrial operation of such units, including monitoring 'break-through' and regeneration cycles.*

### DEMONSTRATION CAPABILITIES

- *The exchange capacities of different resin materials*
- *Water softening using a cationic resin (fig. 1)*
- *Regeneration efficiency of a softening system*
- *Demineralisation using two-bed exchange*
- *Regeneration efficiency of a cationic and anionic resin*

Water Treatment Processes



## DESCRIPTION

Two vertical transparent tubes mounted on a backboard contain the cation and anion resins. A manifold arrangement at the inlet and outlet to the tubes allows the flow configuration to be changed to simulate the cycles involved in the operation of a deioniser. Union couplings permit the tubes to be removed from the manifolds and interchanged for softening/demineralisation experiments.

Regenerant and test or wash solutions contained in separate sumps are selected by a traversing tube and delivered to the apparatus by pump through a control valve and flow meter. Effluent may be fed to a sump tank and treated water collected in bottles for tests on hardness, conductivity or dissolved solids. A conductivity meter connected to the outlet of the second ion exchange bed gives a continuous indication of the progress of demineralisation. The apparatus is supplied with typical commercial cation and anion resins. Other ion exchange materials may be used so that their characteristics, exchange capacity etc, may be measured and compared.

### Water softening theory

The usual ion exchange material employed in water softening is a sulphonated styrene-based resin, supplied in the sodium form. This has a strong affinity for calcium and magnesium ions and will also remove ferrous ions after the almost complete removal of calcium and magnesium.

Softening may be carried out as a batch process by stirring a suspension of resin in the water until equilibrium or an acceptable level of hardness is reached. It is more convenient to operate as a continuous flow process, passing the water slowly downwards through a column of resin beads. The exchange reaction takes place rapidly enough for the upper layers of the bed to approach exhaustion before the lower layers are able to exchange ions.

Thus there is a zone of active exchange which moves down the column until the resin at all depths becomes exhausted. The position at an intermediate stage is illustrated (fig 1). When the zone of active exchange reaches the bottom of the column the emerging water begins to show an increasing hardness. This is the breakthrough point when it becomes necessary to regenerate the resin with a strong sodium chloride solution.

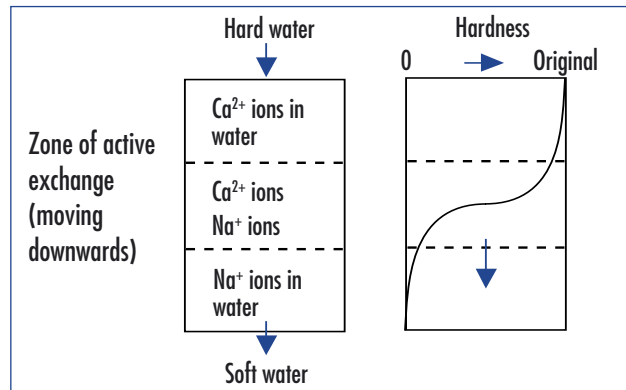


Fig1: Water softening using a cationic resin

## TECHNICAL DETAILS

Pump:	Self priming diaphragm type
Flowmeter range:	10-80ml/min
Sump tank capacity:	20 litres
Anion exchange resin:	0.75 litre
Cation exchange resin:	1litre
Chemicals required (not supplied):	Sodium chloride Hydrochloric acid Sodium hydroxide

## ORDERING SPECIFICATION

- Self-contained apparatus either for single bed water softening or double bed system for demineralisation.
- Two vertical transparent tubes house the resins.
- A manifold at inlet/outlet allows flow configuration changes.
- Equipment includes pump, valves, conductivity meter and sumps for regenerant and test or wash solutions.
- Typical commercial cation and anion resins are supplied.

## RECOMMENDED EQUIPMENT

Cartridge type water deioniser	Beaker cell
Replacement cartridges	

## SERVICES REQUIRED

Electrical supply:	W9-A: 220-240V/1ph/50Hz
	W9-B: 120V/1ph/60Hz
Water supply:	initial fill and drain

## OVERALL DIMENSIONS

Height:	0.9m
Width:	1.1m
Depth:	0.45m

## SHIPPING SPECIFICATION

Volume:	1.1m <sup>3</sup>
Gross weight:	120kg

Specifications may change without notice  
5k/1105/BCP

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