

Modular Cross Flow Filtration – FT18-MkII



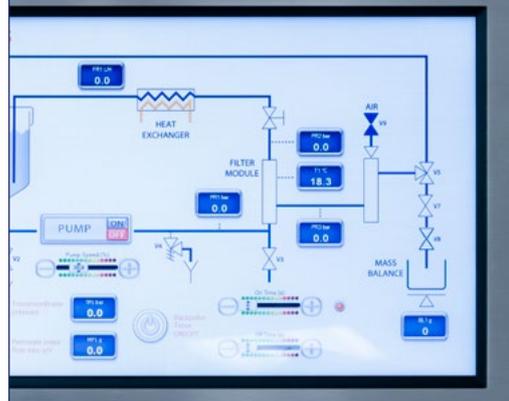
The Armfield FT18-MkII is a pilot-scale cross-flow filtration system designed to operate with a range of membrane module configurations.

It can operate with as little as 10 litres of material but still give data that is useful for process scale-up.

It can be used over the full range of cross-flow filtration applications from microfiltration through to reverse osmosis. It is the perfect tool to use, following on from flat sheet membrane trials with the FT17, for further process development and scale-up.



FT18-MkII-50-1 shown with Backpulsing/Backflushing options
FT18-5 Ceramic Filter Module fitted. Below touch screen (option)



Features / benefits

- ▶ Ability to assess the important cross-flow filtration module types on a single system
- ▶ Electronic instrumented option (-50) to allow the effect of process variables on filtration performance to be measured and logged
- ▶ Assessment of the effect of backpulsing on extending the time between CIP steps
- ▶ 10-litre minimum processing volume enables development with minimal product
- ▶ Simple cleaning and maintenance protocols
- ▶ Four membrane module options:
 - Ceramic (FT18-5)
 - Spiral wound (FT18-6)
 - Hollow fibre (FT18-7)
 - Tubular (FT18-8)
- ▶ Capable of microfiltration, ultrafiltration, nanofiltration and reverse osmosis operations
- ▶ Maximum filtration pressure of 40 bar
- ▶ Clean-in-place capability
- ▶ Backpulsing option (suitable for FT18-5 and FT18-7)
- ▶ Variable retentate flow rate in order to change filtration cross-flow velocity
- ▶ Retentate and permeate back pressure valves
- ▶ Pressure sensors on the retentate inlet and outlet of the filtration module and on the permeate line
- ▶ Mass balance option for permeate flow rate measurement
- ▶ All parameters can be data logged

Description

The system uses a high-pressure piston-recirculation pump to circulate product through the filter module of choice. The variable speed triple-piston design combined with high-pressure flexibles minimises pressure pulsation. The operator can use their own feed vessel or this can be specified (FT18-20 option). The speed of the recirculation pump can be adjusted to suit the particular filtration module and the product.

A level sensor mounted on the pump inlet protects the pump from running dry.

The retentate back-pressure valve enables pressures up to 40 bar to be achieved. Accidental system over-pressure is avoided by a downstream of the recirculation pump.

There is a permeate back-pressure valve so that accurate transmembrane pressures (TMP) can be set. Pressure sensors are sited on the retentate side on the inlet and outlet of the filter module, as well as on the permeate side. Any temperature gain in the retentate through recirculation at high pressure is removed using a 316 stainless steel shell and tube heat exchanger, which has corrugated tubes for improved heat transfer.

The transmembrane pressure can be finely controlled with independent back pressure valves. This reduces the fouling on the membrane when operating at higher pressures, extending the lifetime of the membrane.

Electronic Instrumentation FT18-MKII-50

- ▶ The basic system has analogue pressure sensors and variable pump speed operation. It is operated via the unit itself
- ▶ The FT18-50 option enables the system to be controlled by Armbus software on a PC. Pressure sensors are electronic and all sensor values are displayed and logged through the software. This option also includes a retentate flow-meter and an electronic mass balance so that filtration performance can be monitored and logged in real time.
- ▶ The FT18-60 option includes a touchscreen so that the unit can be operated without a PC.

Software

The armSOFT software displays the equipment flow diagram with readings displayed for all sensors. Cross-flow velocity, transmembrane pressure and flux are also displayed. There are also controls for feed pump stop/start and speed.

A data tab offers several options for processing and displaying the data from the equipment in the form of graphs and results tables.

Results are saved in a log that can be viewed and manipulated with the armSOFT Results Viewer or they can be exported in a generic spreadsheet format for further analysis.

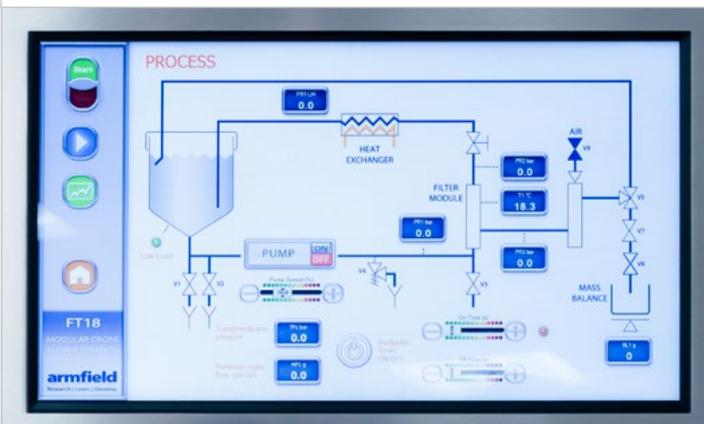
Vessel (FT18-20)

30-litre 316 stainless steel retentate vessel for recirculated product. Mass balance option for permeate flow rate measurement.



Backpulsing/Backflushing (FT18-MKII-50-1)

- ▶ This module enables filtration pressure to be reversed for a period of time during processing in order to reduce fouling and thus enable extended operation between cleaning cycles
- ▶ This module is compatible with the Ceramic (FT18-5) and Hollow Fibre (FT18-7) filter modules only*
- ▶ The backpulsing/backflushing options include that the FT18-MKII-50 electronic instrumentation package



Ceramic Filter Module (FT18-5)

Filter housing	316 stainless steel
Filter length	0.5m
No of channels	1
Channel internal diameter	7mm
Membrane area	0.011m ²
Available membranes	MF: 110-800nm UF: 3-10nm (2-20 kDa) NF: 200-600 Da



Spiral Wound Filter Module (FT18-6)

Filter housing	1812 (1.8" x 12") 316 stainless steel sanitary housing
Generic module for use with female elements from different membrane manufacturers	
Membrane area depends on element (max: 0.45m ²)	
The module can be used for MF, UF, NF and RO operations	
Max operating pressure	40 bar



Hollow Fibre Filter Module (FT18-7)

Membrane housing	Polysulfone
Filter length	0.46m
Fibre internal diameter	1.1mm
Max operating pressure	2.1-2.8 bar
Membrane area	0.09m ²
Available membranes	5-500 kDa



Tubular Filter Module (FT18-8)

Filter housing	316 stainless steel
Filter length	2 x 0.3m
Membrane area	0.024m ²
Max operating pressure	40 bar (recommended)
Available membranes	UF: 2-200 kDa NF: 60-75% CaCl ₂ rejection RO: 80-99 % NaCl rejection



Requirements

Scale



- ▶ Electrical supply:
FT18-MKII-C: 380-415V / 3ph / 50Hz / 10A
FT18-MKII-D: 208-220V / 3ph / 60Hz / 20A
- ▶ Water supply:
Mains water 10 l/min at 2 bar or equivalent flow recirculation chiller for lower temperatures
- ▶ Air supply:
6 bar with minimal air consumption
(Required for FT18-50-1 option only)



Technical specifications

Max flow rate	1400 l/hr
Max operating pressure	40 bar
Pressure sensors	0-60 bar
Mass balance range	0-6kg

Overall dimensions

Length	0.72m
Width	1.00m
Height	1.50m

Packed and crated shipping specifications

Volume	1.9m ³
Gross weight	300kg

Applications

- ▶ Dairy: Removal of micro-organisms from milk and cheese brines, milk protein standardisation and concentration, whey demineralisation, whey protein fractionation, defatting of whey proteins, and filtration
- ▶ Fermented foods: Clarification of wine, beer and vinegar, removal of alcohol from wine and beer, post-fermentation yeast recovery, wine lifting
- ▶ Fruit juices: Clarification and concentration
- ▶ Water: Water and waste water purification, desalination, water softening
- ▶ Pharma: Concentration and purification of macromolecules, sterile filtration, viral clearance, cell separation, water purification
- ▶ Edible oils: Degumming of vegetable oils

Associated equipment

- FT140X – Mixing Vessels
- FT63 – Laboratory Process Chiller

Related products

- ▶ FT17 - Crossflow Membrane Filtration System
- ▶ FT22 - Rising Film Evaporator
- ▶ FT32 - Drum Dryer
- ▶ FT80 - Spray Dryer

Ordering codes

- ▶ FT18-MKII
- ▶ FT18-MKII-50
- ▶ FT18-MKII-50-1

Note: These systems are supplied without modules or options. Please select one or more modules at time of placing your order.

Accessories

- ▶ FT18-5 Ceramic Filter Module (option)
- ▶ FT18-6 Spiral Wound Filter Module (option)
- ▶ FT18-7 Hollow Fibre Filter Module (option)
- ▶ FT18-8 Tubular Filter Module (option)
- ▶ FT18-20 Vessel (option)

Electrical Supply

The previous options are available in the following configurations:

- ▶ -C: 380-415V/3pH/50Hz/10A
- ▶ -D: 208-220V/3pH/60Hz/20A

Please note: *FT18MKII-50-1 compatible with FT18-5 and FT18-7 filter modules only.

The FT18-50 options must be defined at time of order as these cannot be retro-fitted by the end user.

Knowledge base

- > 28 years' expertise in research & development technology
- > 50 years' providing engaging engineering teaching equipment

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