

Technical Specification

Pilot/Production Scale Continuous Carousel Filter AWL CCF50

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Doc: CCF50TS V1.0

Overview:

System:

The AWL Continuous Carousel Filter “CCF” has been designed to produce filtered and washed products in a continuous manner. The core technology is based on well-established Nutsche filtration, processing thin cakes in a fully automated system. The carousel is a series of hollow cylinders moved around a central axis to fixed processing stations. The CCF is supplied complete with all valves, pumps and vessels to allow for fully continuous operation, the user merely needs to connect to their vacuum and compressed air supplies.

The standard supply consists of a support structure with the following main components; slurry buffer tank, solvent wash tank (x2), wash solvent pumps (x2), Wash-in-Place “WIP” tank, WIP pump, carousel filter, filtrate receiver (x1), solids discharge chute terminated with a tri-clamp outlet flange, and a PLC / touch screen control system. The filter carousel consists of five 50 mm diameter, 400 ml capacity filtration chambers. The carousel and filter base have been designed to be easily removed for thorough manual cleaning if required.

This system is designed for use in a safe area and is not suitable for an ATEX environment.

Carousel Filtration:

The DN50 CCF is a pilot/production scale continuously operating filter. It is capable of automatic filtering, washing, deliquoring and discharge of filtered solids. Integrated wash-in-place (WIP) is included. Solid-liquid separation is by means of vacuum over a sintered multilayer filter plate. Industrial standard multilayer filter plate material is available in various micron ratings, from 2 to 40 microns. The system operates by applying vacuum to all filtration chambers simultaneously, deliquoring the cake in each port. Filtration and washing control are based on calibrated pump times and vacuum times.

Functionality:

The following functions are included in the supply:

- Auto transfer function from external reactor/crystalliser
- Auto wash solvent dosing systems (x2) and Auto WIP dosing system
- Adjustable filtration and wash parameters
- Filtrate receiver with auto-drain feature
- Auto data population, recall and presentation
- Auto WIP sequence, triggered by pressure differential
- End-of-Day automated cleaning routine
- Easily removable filter base and carousel for further manual cleaning if necessary

Process Sequence:

First, the slurry is transferred from the jacketed, agitated buffer vessel into a charge vessel via vacuum transfer. The slurry volume is then dispensed into the first port of the carousel. The carousel rotation is controlled by a servo motor which indexes the carousel ports to fixed processing stations. The process sequence for each port position is as follows:

- Port Position 1: Solid-liquid separation
- Port Position 2: Solvent Wash
- Port Position 3: Solvent Wash (optional)
- Port Position 4: Final Deliquor
- Port Position 5: Cake Discharge

Modes of Operation:

- Production Mode: Maximum throughput operation including automatic solid-liquid separation and dosing of wash solvents.
- Manual Mode: All valves, pumps and operations can be controlled manually via the touch screen control panel
- End-of-Day WIP: The filter internals can be cleaned by an automated wash-in-place sequence which sprays the carousel filter using the WIP pump system. The filter system is flooded and drained to remove residual material.

Interfacing with upstream processing:

The filtration system is designed to accept slurry from a batch or continuous source. It can operate as a stand-alone unit or interface directly with a reactor or crystalliser. Vacuum valves are provided to allow auto-transfer in from an upstream process.

Process Vessels:

6 process vessels are provided with the system.

- 2 Litre capacity jacketed, agitated slurry buffer vessel
- 450 ml capacity jacketed slurry dosing vessel
- 2 Litre capacity Wash Vessel (x2) complete with peristaltic pump
- 2 Litre capacity WIP Vessel complete with peristaltic pump
- 3.5 Litre capacity Filtrate/WIP Receiver vessel

Vessels are manufactured from borosilicate 3.3 glass.

The 3.5 L capacity receiver vessels act as a buffer for the filtrate and wash waste from the system. The auto drain sequence is managed by the onboard control system. It is the end user's responsibility to connect the receiver outlets to the appropriate waste/collection stream.

PLC / Control System:

The control system consists of a pre-programmed PLC system, 9" touch screen, safety circuits and power isolator. Controls are enclosed within the framework of the Carousel Filter and the HMI touch screen is housed in a separate Local Operating Panel. DCS remote access / control is available.

Support Structure:

The CCF and ancillary process vessels are mounted on a self-supporting 304 stainless steel mobile framework and mounted on four castors. Utility connections (compressed air, vacuum, nitrogen(optional), electrical supply) are provided to the side of the structure.

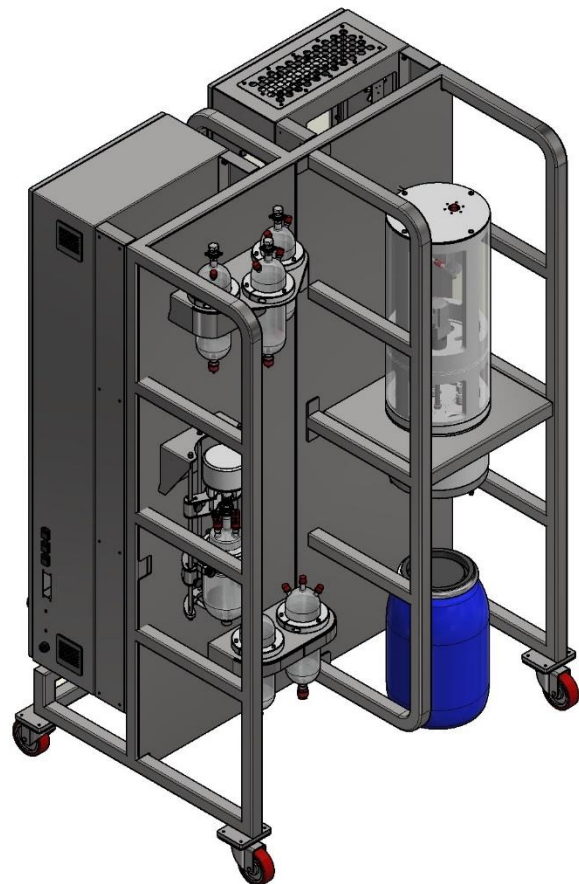
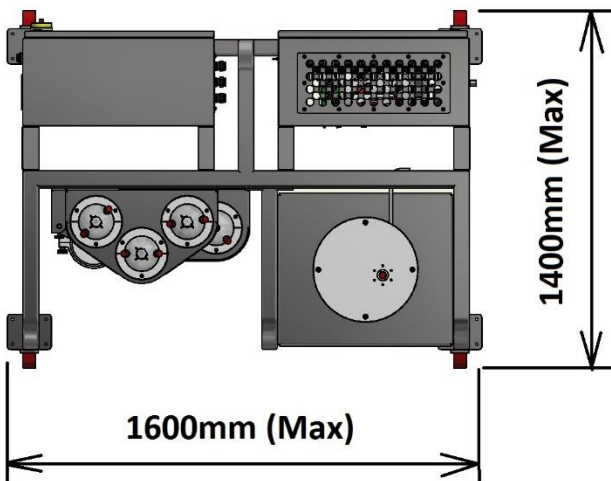
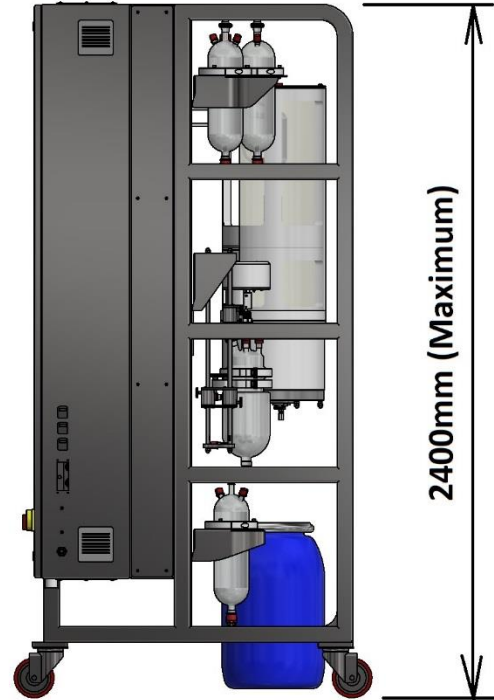
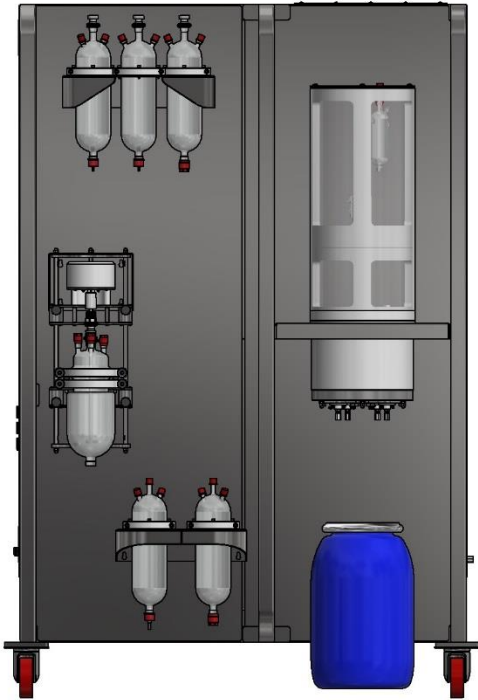
Overall Dimensions / Weight:

Approximate Weight: 750 kg (complete system)
Dimensions: 1600mm Wide x 1400mm Deep x 2400 mm High

The above dimensions are the footprint of the filter unit.

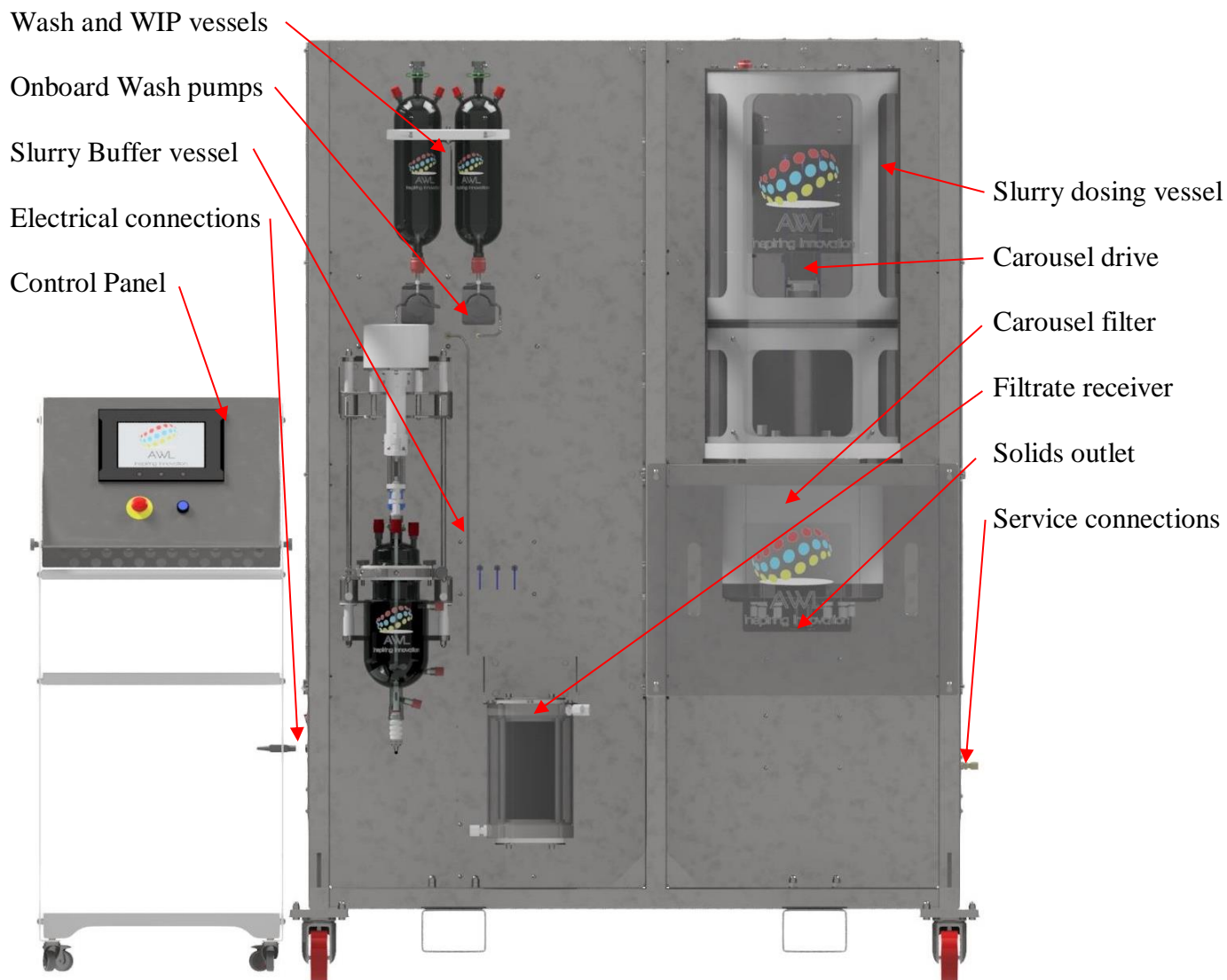
Minimum of 1700 mm x 1500 mm advised to allow for connection of services.

General arrangement of the CCF50



(Blue solids collection vessel is for information only)

System Configuration



Typical configuration of a CCF50

Process Section - Operating Parameters & Design Criteria:

Filter:

Design Principle:	Sound Engineering Practice
Temperature Range:	0°C to +100°C
Design Pressure:	-1.0 Bar to +50 mBar
Material of Construction:	Wetted parts - 316L, PTFE, Polypropylene, PEEK, FEP
Filter plates (standard)	Sintered Mesh 20 micron, 5 layer, 316L (other filter plates available on request)

Process Vessels:

Design Principle:	Sound Engineering Practice
Temperature Range:	0°C to +100°C
Design Pressure:	-1.0 Bar to +50 mBar
Material of Construction:	Borosilicate 3.3 Glass

Process Valves and Pipe work:

Process Valves:	Wetted parts - PTFE / PEEK, FFKM, 316L, silicone
Pipe work:	FEP, PTFE
Fittings:	PFA, PTFE, Polypropylene, 316L

Typical flow rates:

Typical Slurry flow rate	From 15 l/hr to 30 l/hr Slurry (Chemistry dependent)
Typical Solids throughput	From 3 to 6 kg/hr Solids (Chemistry dependent) (Based on 20% Solid Loading)

Service Requirements:

Electrical Specifications:	1 phase, N and Bonded Earth, 230 Volts, 50 Hz, 16 Amps (local geographical variations to be discussed)
Compressed Air specifications:	4-6 bar compressed air @ 10 l/min
Vacuum Specifications:	A vacuum supplies capable of >900 mbar vacuum and >40 l/min flow rate and a solvent compatible pump and liquid trap
Nitrogen Specifications (optional):	typically 120 l/min (for deliquoring with N ₂ blanket)

All Utility connections are provided on the side of the structure.

NOTES: - All pressures in this document are stated as bar gauge
- Flow rates are chemistry dependent
- Carousel is not actively cooled; filtration, washing, de-liquoring take place at ambient temperatures
- Alternative wetted parts can be made available to suit user chemistry

Documentation Pack:

Each filter is supplied with two sets of documents (one hard and one electronic) consisting of the following:

- Operation and Maintenance manual
- Engineering Drawings / Parts Lists
- Electrical Schematics
- OEM manuals for non-proprietary equipment
- Declaration of Conformity
- Safety documentation

Standards and Directives:

As a minimum all CCF50 Carousel Filters are built to meet the following standards:

2014/35/EU:	Low Voltage Directive
2014/30/EU:	Electromagnetic Compatibility Directive
EN 13849-1 : 2015	Safety of Machinery – Safety related parts of control systems
EN ISO 12100 : 2010	General principles for design. Risk assessment & Risk Reduction
EN 61000-6-4 : 2007	Generic Immunity Standard – Industrial Environment
EN 61000-6-6 : 2003	Generic Emission Standard – Industrial Environment

Options:

The following options can be added to the unit if specified at time of order:

- Nitrogen Blanket System: Includes low pressure regulator and valves to control nitrogen blanketing.
- Materials of construction: Various available, particularly wetted parts
- Dosing of slurry via tube-in-tube temperature-controlled transfer line. Available as a stand-alone product.
- Dosing of wash solvent via a liquid/liquid heat exchange ensuring that wash solvents are cool on arrival at the carousel filter.
- ATEX version of the CCF50 is available.
- DCS control via OPC server
 - Provision is made for remote control and access to the relevant process information via a communication module. Our standard communication is achieved by using an OPC Server (KEPServer). All process related signals, readings and data are accessible. Remote access to functions is limited to those deemed safe to operate without the presence of an operator at the filter operating panel.

For further information

please contact: enquiries@a-w-l.co.uk ***or visit:*** www.a-w-l.co.uk