

# Technical Specification

## AWL Continuous Carousel Filter CCF20 Evaluator

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## Overview

### **System:**

The AWL Continuous Carousel Filter “CCF” has been designed for the research and development of continuous filtration processes. 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 the following main components; slurry buffer tank, solvent wash tank (x1), solvent wash pump, Wash-in-Place “WIP” tank, WIP solvent pump, carousel filter, filtrate receiver (x1), solids receiver bottle, and a PLC / touch screen control system. The filter carousel consists of five 20 mm diameter, 30 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 DN20 CCF Evaluator is a lab-scale continuously operating filter. It is capable of automatic filtering, washing, deliquoring and discharge of filtered solids. Integrated 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 system
- Auto WIP dosing system
- Adjustable filtration and wash parameters
- Auto WIP, triggered by pressure differential
- End of day automated cleaning routine

### **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:

- Automatic Mode: Continuous filtration and washing, operating simultaneously, including automatic solid-liquid separation, dosing of wash solvents and auto WIP
- 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 WIP 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. Transfer volumes and intervals can be specified by the end user.

## Process Vessels:

6 process vessels are provided with the system:

- 1 Litre capacity jacketed, agitated slurry buffer vessel
- 50ml capacity jacketed slurry dosing vessel
- 1 Litre capacity wash vessel complete with peristaltic pump
- 1 Litre capacity WIP vessel complete with peristaltic pump
- 1 Litre capacity filtrate/WIP receiver vessel
- 1 Litre capacity solids receiver vessel

Vessels are manufactured from borosilicate 3.3 glass.

## Control System:

The control system consists of a pre-programmed PLC system, 5" 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.

## Support Structure:

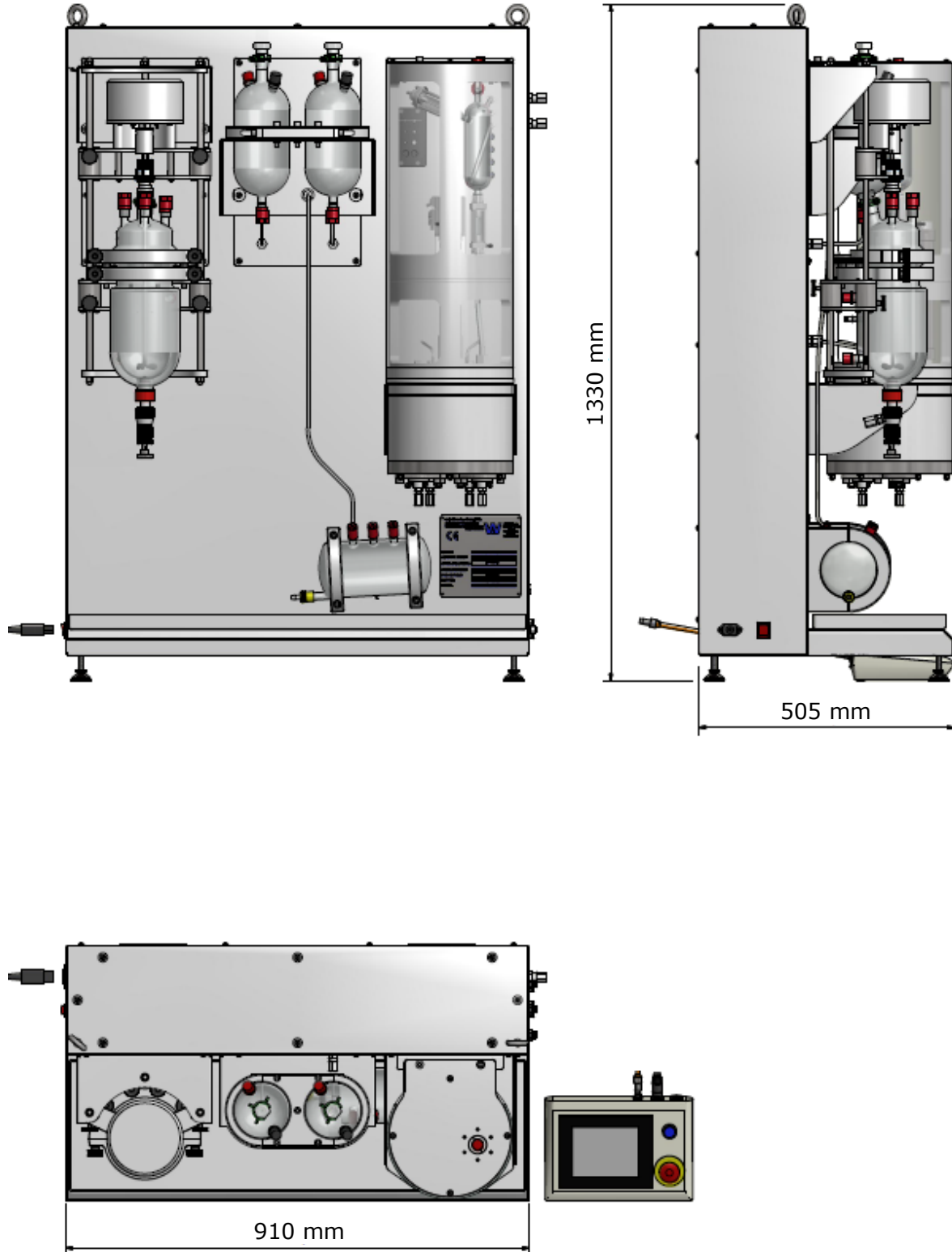
The Carousel Filter and process vessels are mounted on a self-supporting framework comprised of a powder coated steel structure mounted on four independently adjustable feet.

## Overall Weight / Dimensions:

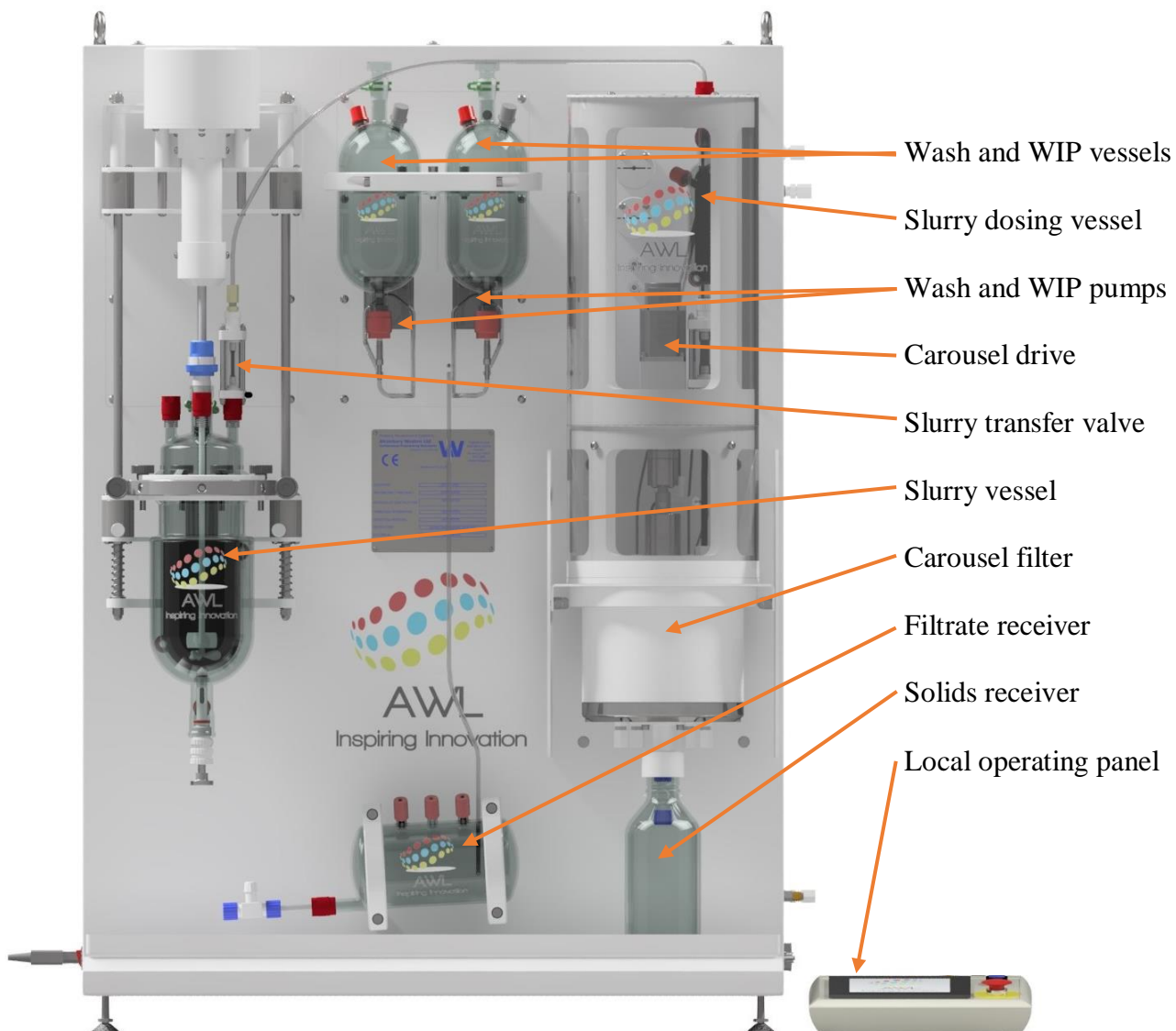
Weight: 65 kg (complete system)  
Dimensions: 910mm Wide x 505mm Deep x 1330mm High

The above dimensions are the footprint of the filter unit.  
Minimum of 1000 mm x 550 mm advised to allow for connections of services.

## General Arrangement CCF20 Evaluator



## System Configuration



**Typical configuration of a CCF20 Evaluator**

## Process Section - Operating Parameters & Design Criteria:

### Filter:

Temperature Range:	0 °C to +100 °C
Design Pressure:	-1.0 bar to +50 mbar
Material of construction:	Wetted parts - Polypropylene, 316L, FEP, PTFE
Filter plates standard:	Sintered mesh 20 micron, 5 layer, 316L (other sizes and materials are available on request)

### Process Vessels:

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 - PEEK, FFKM, PTFE, Silicone
Pipe work:	FEP, PTFE
Fittings:	PFA, PTFE, Polypropylene, 316L

### Typical flow rates:

Typical Slurry flow rate:	From 1.5 to 3.0 L/hr Slurry (Chemistry dependent)
Typical Solid throughput:	From 0.3 to 0.6 kg/hr Solids (Chemistry dependent) (Based on 20% Solid Loading)

### Service Requirements:

Electrical Specifications:	1 phase, N and Bonded Earth, 230 Volts, 50 Hz, 5 Amp supply (local geographical variations, e.g. 110V 60Hz are available)
Compressed Air Specifications:	4-6 bar compressed air at 1 L/min
Vacuum Specifications:	>700 mbar vacuum at 20 L/min with solvent compatible pump & liquid trap
Nitrogen Specifications (optional):	typically 20 L/min (for deliquoring and blanketing)

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 of the AWL Carousel Filter range are designed and built to meet the following standards, others are available on request:

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 valving to control nitrogen blanketing.
- Second wash solvent system: Allows the user to utilise two different wash solvents helping with material attributes and performance. Second wash system includes a second wash solvent vessel, pump and valves.
- Materials of construction: Various available, particularly wetted parts.
- Dosing of slurry via tube-in-tube temperature-controlled transfer line. Available as 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.
- DCS control via OPC server.

**For further information:**  
**please contact:** [enquiries@a-w-l.co.uk](mailto:enquiries@a-w-l.co.uk) **or visit:** [www.a-w-l.co.uk](http://www.a-w-l.co.uk)