

Tangential Flow Filtration Membrane Cassette Holders

Choosing a Cassette Holder



Centramate Housing with 3-Gauge, 2-Valve Fitting Kit and Torque Wrench



Holder Fittings Kits

Complete fittings kits consisting of pressure gauges, valves, filtrate manifold, connectors, gaskets and clamps are available for most cassette holders. Ordering a complete fitting kit with the cassette holder simplifies installation into a system and avoids potential delays in starting your process due to missing parts.



Designed for optimum performance and product recovery Pall TFF cassette holders are available in a variety of sizes to meet every application requirement. This way applications that are developed on a small system using a **Centramate** or **Maximate** cassette can be easily scaled up, either by adding additional cassettes to the holder or by scaling into a larger cassette format and holder configuration with identical flow path like the **Centrasette/Centrastak** or **Maxisette** holders.

TFF cassette holders for the medium and large-scale production environment have a small footprint, yet still are capable of holding large areas of membrane. All stainless steel holders are engineered to precise specifications with a high standard internal and external surface finish and are available with either manual torque (MT) or auto torque (AT) compression systems for ease of use.

Operators must use calibrated torque wrenches (supplied with the holder) to effect required compression of cassettes and gaskets in a manual torque cassette holder. Auto-torque cassette holders automatically compensate for cassette compression and temperature reduction.

They also eliminate variability in technique between operators. Auto-torque cassette holders are recommended for process-scale validated processes.

Sanitary stainless steel holders may be sterilized by steam or autoclaving without cassettes installed.

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Choosing a Cassette Holder

The following table lists cassette holders with relative area capacities and working volumes. The **Minimate** TFF Capsule is also included to complete the range of lab scale products.

Product	Membrane Area	Working Volumes*	Starting	Final
Lab and Development Scale (Scale-up and Scale-down studies)				
Minimate TFF Capsule	0.005 m ²	0.05 ft ²	25 – 500 mL	25 mL
Centramate LV	0.01 – 0.02 m ²	0.1 – 0.2 ft ²	25 – 2,000 mL	10 mL
Centramate PE	0.01 – 0.37 m ²	1 – 4 ft ²	0.5 – 80 L	150 mL
Centramate	0.01 – 0.46 m ²	1 – 5 ft ²	0.5 – 100 L	150 mL
Maximate	0.19 – 1.11 m ²	2 – 12 ft ²	1 – 250 L	350 mL
Pilot Scale (Process Development)				
Centrasette LV	0.46 – 2.3 m ²	5 – 25 ft ²	2.5 – 500 L	400 mL
Centrasette P	0.46 – 2.3 m ²	5 – 25 ft ²	2.5 – 500 L	400 mL
Centrasette 5	0.46 – 4.6 m ²	5 – 50 ft ²	2.5 – 1,000 L	1,000 mL
Process Scale (Production)				
Centrastak 100	0.9 – 18.5 m ²	10 – 200 ft ²	10 – 4,000	4 L
Centrastak 200	1.85 – 37.2 m ²	20 – 400 ft ²	20 – 8,000	10 L
Centrastak 300	2.8 – 55.8 m ²	30 – 600 ft ²	30 – 12,000	15 L
Centrastak 400	3.7 – 74.0 m ²	40 – 800 ft ²	40 – 16,000	20 L
Maxisette 25	2.8 – 27.9 m ²	30 – 300 ft ²	30 – 6,000	15 L
Maxisette 50	5.6 – 55.8 m ²	60 – 600 ft ²	60 – 12,000	30 L
Maxisette 100	5.6 – 92.9 m ²	60 – 1,000 ft ²	60 – 20,000	40 L

⁽¹⁾ Fewer suspended screen cassettes will fit due to increased thickness. Some holders can fit more membrane area than can be operated at required cross flow rates due to high pressure drops. Do not use more than the recommended area in these holders. Manual (MT) and auto-torque (AT) version holders are available for Pilot and Process Scale applications.

⁽²⁾ Working Volumes are based on an average filtrate flux rate of about 50 LMH and process time of 5 hours. Starting Range covers minimum to maximum area installed for screen channel cassettes. Final process volume represents final concentration volume or minimum working volume for the system. Actual volumes depend on system hold-up volume and operating parameters. Piping (tubing) lengths and internal diameters significantly affect the final volume.

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Top to Bottom: Centramate LV Holder
Centramate PE Holder
Centramate Stainless Steel Holder
Centrasette LV Holder
Centrasette P Holder



Centramate LV Holder

The **Centramate** LV holder is fabricated from Stainless Steel (316L) with female luer fittings for use with 0.01 m² (0.1 ft²) and 0.02 m² (0.2 ft²) **Centramate** cassettes. The holder can accommodate up to 0.04 m² (0.4 ft²) of screen channel or 0.02 m² (0.2 ft²) of open channel **Centramate** cassettes at recommended cross flow rates. A range of luer fittings and valves are available as well as pressure gauges or transducers to set-up a complete TFF system.

Centramate PE Holder

The **Centramate** PE holder has a polyethylene manifold with ¼ in. NPT threaded ports sandwiched between 304 stainless steel outer plates for support. It will accommodate up to 4 screen channel (3 suspended screen channel) 0.09 m² (1 ft²) cassettes. The use of several spacers on the tie rods makes it easy to apply and tighten the nuts with minimal threading if only one cassette is installed. As additional cassettes are added, spacers can be removed. The **Centramate** PE holder is recommended for use in applications where metal contact must be avoided. A plastic, NPT threaded fitting kit, with either 2 or 3 pressure gauges is available.

Centramate Stainless Steel Holder

The **Centramate** stainless steel cassette holder (316L) comes with ½ in. sanitary flanges on feed and filtrate ports. The holder is supplied with surface and weld certification. Up to 5 screen channel (4 suspended screen channel) 0.09 m² (1 ft²) cassettes can be accommodated. Holder is supplied with both 1 in. and 2 in. spacers on the tie rods to simplify cassette installation and to apply the required torque. Spacers can be removed to

compensate for the height difference as additional cassettes are added to the holder. Sanitary fitting kits with either 2 or 3 pressure gauges are available.

Centrasette LV Holder

The **Centrasette** LV Holder is manufactured using highly polished 316L stainless steel. This holder has ¾ in. sanitary fractional fitting on the feed/retentate and permeate ports which minimizes the hold-up volume. It is ideal for use in systems that use **Centrasette** cassettes when total membrane area will be less than 2.5 m² (27 ft²) of screen channel cassettes or 1.5 m² (16 ft²) of suspended screen cassettes.

Centrasette P Holder

The **Centrasette** P Holder has a polypropylene center manifold and end plate, for use when product contact with metal is not desirable or prohibited by your application; for example when processing certain metal sensitive enzymes or oligonucleotides. The manifold and end plate are housed between stainless steel plates to supply the necessary rigidity when operating at higher pressures. Luer fittings on the ¾ in. sanitary polypropylene ports can be used for connection to plastic pressure transducers for monitoring pressures, again without metal contact. The low-cost plastic manifold and end plate can be replaced to avoid cleaning validation or dedicated to a specific application along with a set of cassettes to prevent any risk of cross-contamination. The **Centrasette** P holder like the **Centrasette** LV holder is intended for use with **Centrasette** cassettes when total membrane area will be less than 2.5 m² (27 ft²) of screen channel cassettes or 1.5 m² (16 ft²) of suspended screen cassettes.

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Centrasette 5 and Centrasette 5AT Holders

The **Centrasette 5** holder is intended for use in pilot and process scale applications with up to 5 m² (54 ft²) screen channel **Centrasette** or **Centrasette II** cassettes or 4 m² (43 ft²) of suspended screen cassettes. The feed/retentate channels have tapered bores engineered to maintain uniform cross flow and pressure drops across the membrane cassettes. Two permeate ports, one near the feed and the other near the retentate, are designed to reduce backpressure on the permeate side of the membrane. This is especially important when operating at high flux rates. Pressure on the permeate side effectively reduces transmembrane pressure and lowers filtrate flux rates. The highly polished 316L stainless steel unit has ports that mate up with 1 in. sanitary connectors. A calibrated torque wrench and socket is supplied with the holder, as it is with other manual torque holders.



Top : Centrasette Holder with Manual Torque
Bottom: Centrasette Holder with Auto Torque

Centrastak Holders

Processes developed at bench scale on **Centramate** and **Centrasette** cassettes can be scaled up to process volumes in excess of 10,000 L using a **Centrastak** system. The **Centrastak** range of cassette holders have been designed for optimal performance in large-scale production environment. The small footprint makes them ideal for use in process skids and manufacturing suites where space is at a premium. Each level in a **Centrastak** holder can hold up to 10 m² (107 ft²) of **Centrasette** cassettes on each side of a central manifold or effectively 20 m² [215 ft²] per level. A single center-manifold significantly reduces hold-up volumes.

Feed flow direction is from bottom to top allowing air to be easily expelled from the system. Four **Centrastak** holders are available:

- **Centrastak 100AT** – 20 m² (215 ft²) capacity
- **Centrastak 200AT** – 40 m² (430 ft²) capacity
- **Centrastak 300AT** – 60 m² (645 ft²) capacity
- **Centrastak 400AT** – 80 m² (861 ft²) capacity

All **Centrastak** holders are available in auto-torque format with a hydraulic system, including stainless steel pistons and pump, for maintaining optimal and uniform compression on the installed cassettes. A pressurized air supply is required to operate the hydraulic pump (60 psi minimum, 125 psi maximum). All wetted surfaces are electropolished, 316L stainless steel. Holder is supplied with surface and weld certification to support I/Q validation.



Top: Centrastak 200 AT
Bottom: Hydraulic Pump for AutoTorque Holders

Tangential Flow Filtration Membrane Cassette Holders



Maximate Holders

Maximate holders are designed for use with **Maximate** membrane cassettes. The 316L stainless steel holder has $\frac{3}{4}$ in. sanitary feed/retentate ports and $\frac{1}{2}$ in. permeate ports. Up to 6 screen channel cassettes (4 suspended screen channel cassettes), 0.19m^2 (2ft^2) will fit into the holder accommodating process fluid volumes from a few hundred milliliters up to over a hundred liters.

Maximate cassettes are chosen for scale-up studies when process-scale volumes will be processed using a **Maxisette** system that has the same feed/retentate channel path length.

Maxisette Holders

The **Maxisette** holder has been designed for optimal performance in a large-scale production environment. The longer path length of a **Maxisette** cassette compared with a **Centrasette** cassette allows a 40% reduction in cross flow rate (retentate flow rate), therefore requiring a smaller pump with a corresponding reduction in heating, energy costs and space requirements. The small footprint makes it ideal for use in process skids and manufacturing suites where space is at a premium. Feed flow direction is from bottom to top allowing air to be easily expelled from the system.

Port design in the **Maxisette** cassette results in a significant reduction in pressure drops and a more uniform pressure profile at operating cross flow rates compared to other cassette formats. This results in higher performance during production and more efficient cleaning. Processes developed at bench scale on **Maximate** cassettes can be efficiently scaled up to process volumes in excess of 10,000L.

Maxisette holders are available in auto-torque format with a hydraulic system, including six pistons and a pump, for maintaining optimal and uniform compression on the installed cassettes. A pressurized air supply is required to operate the hydraulic pump (60 psi [4.1 bar] minimum, 125 psi [8.6 bar] maximum). All wetted surfaces are electropolished, 316L stainless steel.

Maxisette holders are available in three different sizes:

- **Maxisette 25**: 28 m^2 (300 ft^2) capacity, screen channel
- **Maxisette 50**: 56 m^2 (600 ft^2) capacity, screen channel
- **Maxisette 100**: 89 m^2 (960 ft^2) capacity, screen channel

All **Maxisette** Holders are supplied with surface and weld certification.

Tangential Flow Filtration Membrane Cassette Holders

Technical Specifications

Centramate Cassette Holders

Cassette Holder	Centramate LV	Centramate PE	Centramate
Feed and Retentate Ports	Female luer SS	¼ in. NPT Fitting (female)	½ in. Sanitary, 9.6 mm (0.38 in.) bore
Filtrate Port	Female luer SS	¼ in. NPT Fitting (female)	½ in. Sanitary, 8.1 mm (0.32 in.) bore
Maximum Membrane Area			
Screen	0.04 m ² (0.4 ft ²)	0.37 m ² (4 ft ²)	0.46 m ² (5 ft ²)
Suspended Screen	0.02 m ² (0.2 ft ²)	0.28 m ² (3 ft ²)	0.37 m ² (4 ft ²)
Nominal Dimensions (Width x Length x Depth)	12 x 23 x 6.6 cm (4½ x 9 x 2½ in.)	9.4 x 24 x 19 cm (3¾ x 9½ x 7½ in.)	13 x 23 x 16 cm (5¼ x 9 x 6¼ in.)
Weight	4 kg (8.75 lbs)	8.6 kg (19 lbs)	6.4 kg (14 lbs)
Maximum Operating Temperature⁽²⁾	50 °C (121 °F)	80 °C (175 °F)	80 °C (175 °F) ⁽³⁾
Maximum Operating Pressure	5 bar (75 psi)	6 bar (90 psi)	6 bar (90 psi)

Centrasette Cassette Holders

Cassette Holder	Centrasette LV	Centrasette P	Centrasette 5,* 5AT*
Feed and Retentate Ports	¼ in. sanitary SS	¼ in. sanitary PP	1 in. sanitary SS
Filtrate Port	¼ in. sanitary SS	¼ in. sanitary PP	1 in. sanitary SS
Maximum Membrane Area⁽¹⁾			
Screen	2.0 m ² (22 ft ²)	2.0 m ² (22 ft ²)	5 m ² (54 ft ²)
Suspended Screen	1.5 m ² (16 ft ²)	1.5 m ² (16 ft ²)	4 m ² (43 ft ²)
Nominal Dimensions (Width x Length x Depth)	26 x 25 x 21 cm (10¼ x 10 x 8½ in.)	30 x 20 x 34 cm (12 x 8 x 13½ in.)	26 x 25 x 27 mm (10¼ x 10 x 10¼ in.)
Weight	28 kg (62 lbs)	25 kg (55 lbs)	30 kg (66 lbs)
Maximum Operating Temperature⁽²⁾	80 °C (175 °F) ⁽³⁾	50 °C (121 °F)	80 °C (175 °F) ⁽³⁾
Maximum Operating Pressure	6 bar (90 psi)	5 bar (75 psi)	6 bar (90 psi)

* Extended tie rods available to increase membrane capacity to 5 m² (54 ft²) for suspended screen channel cassettes.

Centrastak Cassette Holders

Cassette Holder	Centrastak 100	Centrastak 200	Centrastak 300	Centrastak 400
Feed and Retentate Ports	2 in. sanitary	2 in. sanitary	2 in. sanitary	2 in. sanitary
Filtrate Port	1 in. sanitary	1 in. sanitary	1 in. sanitary	1 in. sanitary
Maximum Membrane Area⁽¹⁾				
Screen	20 m ² (216 ft ²)	40 m ² (430 ft ²)	60 m ² (645 ft ²)	80 m ² (860 ft ²)
Suspended Screen	15 m ² (161 ft ²)	30 m ² (323 ft ²)	45 m ² (484 ft ²)	60 m ² (645 ft ²)
Nominal Dimensions (Width x Length x Height)	39 x 91 x 59 cm (15½ x 36 x 23¼ in.)	39 x 91 x 95 cm (15½ x 36 x 37½ in.)	39 x 91 x 107 cm (15½ x 36 x 42 in.)	39 x 91 x 120 cm (15½ x 36 x 47½ in.)
Weight	155 kg (340 lbs)	255 kg (560 lbs)	314 kg (690 lbs)	409 kg (900 lbs)
Maximum Operating Temperature^(2,3)	80 °C (175 °F)			
Maximum Operating Pressure	6 bar (90 psi)			

⁽¹⁾ Cassette blocks (2 m² [21.6 ft²] or 2.5 m² [26.9 ft²]) are recommended. If 0.5 m² [5.3 ft²] cassettes are used, stabilizer plates must be used between every 5 cassettes (fine/medium screen) or 3 cassettes (suspended screen).

⁽²⁾ Maximum operating temperature may be restricted by cassette operating temperature limit.

⁽³⁾ Holder may be steamed with compatible cassettes, or without cassettes at up to 142 °C (287.6 °F).

Tangential Flow Filtration Membrane Cassette Holders

Technical Specifications and Ordering information

Maximate and Maxisette Cassette Holders

Cassette Holder	Maximate	Maxisette 25	Maxisette 50	Maxisette 100
Feed and Retentate Ports	¾ in. sanitary	2 in. sanitary	2½ in. sanitary	2½ in. sanitary
Filtrate Ports	1½ in. sanitary	1½ in. sanitary	1½ in. sanitary	1½ in. sanitary
Maximum Membrane Area⁽¹⁾				
Fine/Medium Screen	1.1 m ² (12 ft ²)	28 m ² (300 ft ²)	56 m ² (600 ft ²)	89 m ² (960 ft ²)
Suspended Screen	0.74 m ² (8 ft ²)	28 m ² (300 ft ²)	56 m ² (600 ft ²)	56 m ² (600 ft ²)
Dimensions (Width x Length X Height)	16 x 44 x 22 cm (6¼ x 17½ x 8¾ in.)	47 x 105 x 57 cm (18½ x 41½ x 22½ in.)	47 x 105 x 97 cm (18½ x 41½ x 38 in.)	47 x 105 x 117 cm (18½ x 41½ x 46 in.)
Approximate Weight	13.3 kg (29.2 lbs)	455 kg (1000 lbs)	566 kg (1245 lbs)	566 kg (1245 lbs)
Maximum Operating Temperature^(2,3)	80 °C (176 °F)	80 °C (176 °F)	80 °C (176 °F)	80 °C (176 °F)
Maximum Operating Pressure	6 bar (87 psi)	6 bar (87 psi)	6 bar (87 psi)	6 bar (87 psi)

⁽¹⁾ Cassette blocks (2 m² [21.6 ft²] or 2.5 m² [26.9 ft²]) are recommended. If 0.5 m² [5.3 ft²] cassettes are used, stabilizer plates must be used between every 5 cassettes (fine/medium screen) or 3 cassettes (suspended screen).

⁽²⁾ Maximum operating temperature may be restricted by cassette operating temperature limit.

⁽³⁾ Holder may be steamed with compatible cassettes, or without cassettes at up to 142 °C (287.6 °F).

Materials of Construction for Wetted Parts

	Centramate PE	Centramate LV	Centramate/Maximate	Centrasette P	Centrasette/Maxisette
Plates	UHMW polyethylene	316L Stainless Steel	316L Stainless Steel	Polypropylene	316L Stainless Steel
Flow Distribution Manifold	UHMW polyethylene	316L Stainless Steel	316L Stainless Steel	Polypropylene	316L Stainless Steel
Other Components		EPDM O-ring on SS threaded Luer connector		EPDM sanitary gaskets	

Ordering Information

The following table lists individual cassette holders as well as holders sold in combination with fittings packages. Additional combinations and a variety of other accessories are available. For complete descriptions and additional offerings, contact your local Pall representative.

Description	Part Number
Centramate	
Centramate PE Holder, Including torque wrench and socket	FS002K10
Centramate PE Holder, Including fittings package with 3 pressure gauges	FS013K10
Centramate LV Holder, Including torque wrench and socket	FS003K10
Centramate SS Holder, Including torque wrench and socket	FS001K10
Centramate SS Holder, Including torque wrench, fittings package with 3 pressure gauges, 2 diaphragm valves	FS011K10
Centrasette 5 manual torque Including torque wrench and socket	FS001K05
Centrasette	
Centrasette P Holder Including torque wrench and socket	FS039K05
Centrasette LV Holder Including torque wrench and socket	FS044K05
Centrasette LV holder, Including torque wrench and socket, fittings package with 3 pressure gauges, 2 diaphragm valves	FS046K05
Centrasette 5 Including torque wrench and socket	FS001K05
Centrasette 5 holder, Including torque wrench and socket, fittings package with 3 pressure gauges, 2 diaphragm valves	FS014K05
Centrasette 5AT Holder	FS020K05
Centrasette 5AT holder, Including torque wrench and socket, fittings package with 3 pressure gauges, 2 diaphragm valves	FS022K05
Contrastak	
Contrastak 100 AT	FS050K05
Contrastak 200 AT	FS034K05
Contrastak 300 AT	FS036K05
Contrastak 400 AT	FS038K05
Maximate	
Maximate holder, including torque wrench and socket	FS001G01
Maximate fitting package, Including torque wrench and socket, fittings package with 3 pressure gauges and 2 diaphragm valves	FS003G01
Maxisette	
Maxisette 25 AT	FS009K50
Maxisette 50 AT	FS013K50
Maxisette 100 AT	FS016K50