

Stirred Reactors

Laboratory



Parker Autoclave Engineers has been associated with excellence in pressurized reaction equipment for over 50 years. Parker Autoclave is noted not only for its history of safety and dependability, but also as an innovator in designs. The magnetically coupled agitator drive, MagneDrive®, was originally conceived and designed by Parker Autoclave Engineers along with a series of innovative pressure vessel styles. We have taken advantage of this vast experience to establish an advanced line of stirred autoclaves for the research laboratory.

The laboratory stirred reactor line adds a high degree of configuration flexibility to the established Parker Autoclave Engineers' high quality designs. The modular configuration of the product line allows one to customize the autoclave to specific needs using an extensive array of options.

Configuration starts with selection of vessel type based upon factors such as pressure and temperature requirements, volume, stand style and seal compatibility. Next, agitation is specified including torque requirements, impeller configuration, and motor type.

Finally, select internal components, valving, and instrumentation to meet your research needs.



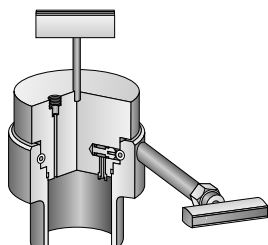
ENGINEERING YOUR SUCCESS.

Pressure Vessel:

CLOSURE STYLE / VOLUME / MATERIAL / SEALS

Parker Autoclave Engineers' offers three basic vessel closure styles. Select the style that meets your requirements for ease of opening and closing, seal compatibility, as well as pressure and temperature performance.

ZipperClave®



The ZipperClave® offers the quickest opening autoclave available. No bolts to torque, nor clamps or rings. Inserting a single spring section closes the vessel. The ZipperClave® uses an elastomeric O-ring for its pressure seal.

MAWP:

2,200 psi @ 450 °F
(151 bar @ 232 °C)

Volumes:

500 ml
1,000 ml
2,000 ml
4,000 ml

Seal Materials (Temp):

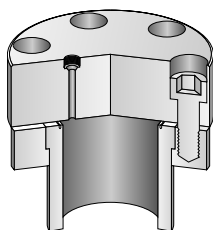
Nitrile (250 °F / 121 °C)
Ethylene-Propylene (300 °F / 149 °C)
PTFE (400 °F / 204 °C)
Fluorocarbon (450°F / 232°C)
Silicone (400 °F / 204 °C)
Perfluoroelastomer (500 °F / 260 °C)

Vessel Materials:

ANSI 316 Stainless Steel
Hastelloy® C-276

Notes: MAWP based upon Fluorocarbon seals, temperature and pressure ratings will vary depending upon seal material selected. See Bulletin "PV-ZIP" for details of vessel performance. ASME Code Stamp not available for the Zipper Closure. Alternative materials are available, please consult factory.

EZE-Seal



The EZE-Seal provides the ability to operate at high temperature and moderate pressure. The "loose flange" allows for easy interchange of vessel bodies. The seal design requires low bolting torque. The EZE-Seal may be equipped with either metal or elastomeric pressure seal.

MAWP:

3,300 psi @ 850 °F
(227 bar @ 454 °C)

Volumes:

100 ml
300 ml
500 ml
1,000 ml
2,000 ml
4,000 ml

Seal Materials (Temp):

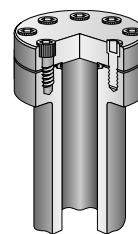
Metal Double Delta (850 °F / 454 °C)
Nitrile (250°F / 121°C)
Ethylene-Propylene (300 °F / 149 °C)
PTFE (400 °F / 204 °C)
Fluorocarbon (450 °F / 232 °C)
Silicone (400 °F / 204 °C)
Perfluoroelastomer (500 °F / 260 °C)

Vessel Materials:

ANSI 316 Stainless Steel
Hastelloy® C-276

Notes: MAWP based upon metal seals, temperature and pressure ratings will vary depending upon seal material selected. See Bulletin "PV-EZE" for details of vessel performance. Alternative materials are available, please consult factory.

Bolted Closure



The Bolted Closure [BC] and High Temperature Bolted Closure [HTBC] offer a high pressure capacity at moderate and high temperatures. The Bolted Closure uses multiple gasket materials and the High Temperature Bolted Closure utilizes the Gasche metal gasket for its pressure seal.

MAWP:

5,500 psi @ 650 °F [BC]
(379 bar @ 343 °C)

5,000 psi @ 950 °F [HTBC]
(345 bar @ 510 °C)

Volumes:

100 ml, 300 ml, 500 ml
1,000 ml, 2,000 ml
4,000 ml, 8,000 ml

Seal Materials (Temp):

Bolted Closure
Metal Gasket (650 °F / 343 °C)
Nitrile (250 °F / 121 °C)
Ethylene-Propylene (300 °F / 149 °C)
PTFE (400 °F / 204 °C)
Fluorocarbon (450 °F / 232 °C)
Silicone (400 °F / 204 °C)
Perfluoroelastomer (500 °F / 260 °C)
High Temp. Bolted Closure
Metal Gasket (950 °F / 510 °C)

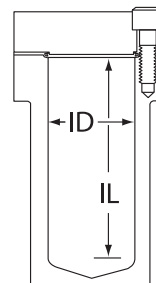
Vessel Materials:

ANSI 316 Stainless Steel
Hastelloy® C-276

Notes: MAWP based upon metal seals, temperature and pressure ratings will vary depending upon seal material selected. See Bulletin "PV-BC" for details of vessel performance. Alternative materials are available, please consult factory.

WORKING DIMENSIONS/CONVERSION KITS:

Regardless of the closure style selection, the autoclave internal working dimensions are consistent for the various volumes. Conversion kits allow the interchange of vessel bodies and internals within reactors of common inside diameter and closure style.



Interchangeable vessel sizes are:

- 100 & 300 ml
- 500 & 1,000 ml
- 2,000 & 4,000 ml.

	100 ml	300 ml	500 ml	1,000 ml	2,000 ml	4,000 ml
Inside Diameter	1.81" (46 mm)	1.81" (46 mm)	3.0" (76 mm)	3.0" (76 mm)	5.0" (127 mm)	5.0" (127 mm)
Inside Length	2.75" (70 mm)	6.69" (170 mm)	4.59" (116 mm)	8.71" (221 mm)	6.06" (153 mm)	12.31" (312 mm)

FLUSH VALVE

Parker Autoclave Engineers' laboratory reactors may be equipped with our bottom flush valve. The Parker Autoclave Engineers' flush valve permits easy removal of vessel contents through it's 1/2" NPT exit port. The closed valve provides a smooth vessel interior, free of dead zones.



Note: A flush valve is only available on reactors 500 ml and larger. Due to space constraints, autoclaves with flush valves must be mounted in a floor type stand.

CODES AND APPROVALS

All Parker Autoclave Engineers' pressure components are designed to ASME design criterion. Where required, ASME stamping may be applied. For our European users, the Laboratory Stirred Autoclave line may be provided with a CE Declaration of Incorporation for Machinery, Low Voltage, and EMC Directives. Complete PED Approval for pressure vessels is also available. For Canadian users, CRN is available.



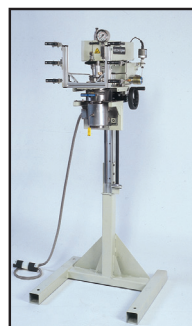
Note: Not all options are capable of carrying the CE Mark. Also, ZipperClave® closures are not capable of carrying an ASME stamp.

STANDS

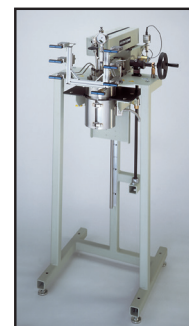
The laboratory series of reactors may be mounted in open stands which allow easy access to connections and components. There are four stands available for the laboratory stirred reactors; two benchtop models as well as light and heavy-duty floor stands.



Tall and Short
Bench Top Stand



Light-duty
Floor Stand



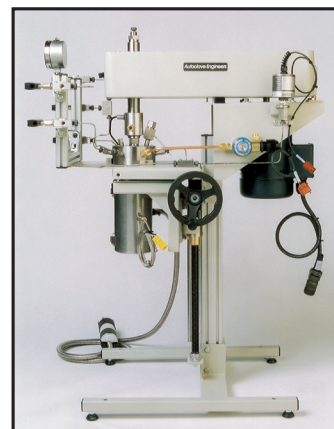
Heavy-duty
Floor Stand

STAND CONFIGURATION AND OVERALL DIMENSION:

STYLE	Stand Configuration			Overall Dimensions		
	100 & 300 ML	500 & 1000 ml	2000 & 4000 ml	Wide	Deep	Tall
Short Bench Top	X			20.5" (521 mm)	26.2" (665 mm)	34.8" (884 mm)
Tall Bench Top		X		20.5" (521 mm)	26.2" (665 mm)	39.4" (1001 mm)
Light-Duty Floor		X		25.0" (635 mm)	26.5" (673 mm)	61.8" (1570 mm)
Heavy-Duty Floor			X	28.4" (721 mm)	30.8" (782 mm)	61.6" (1565 mm)

LIFT MECHANISM

All laboratory reactor stands are designed such that the top cover of the reactor is held in the stand and the vessel body drops away when opened. The body lift mechanism provides a mechanical assist for raising and lowering the body. The lift mechanism is recommended for all applications where frequent opening and closing of the reactor is required.



Agitation:

MAGNEDRIVE®

All Parker Autoclave Engineers' laboratory reactors feature the MagneDrive® magnetically actuated packless impeller system. Rare earth magnets provide high torque mixing effectiveness. Because the MagneDrive® is a sealed system there is no packing to wear causing leakage, contamination and costly downtime. Mixing speeds up to 3,300 RPM are possible to meet your specific requirements.

The laboratory stirred reactor series is available with the MAG075 series belt driven MagneDrive® or the iMAG075 inline unit. The MAG075 series is an enhanced design which provides improved bearing life and ability to increase to unit's torque capacity with the substitution of a high torque stator module. This takes the static mixing torque from 7 in-lb (0.79 n-m) to 16 in-lbs (1.8 n-m).

The iMAG075 inline unit is an enhanced design which provides improved bearing life and the space saving feature of a direct inline motor, which eliminates belts, reduces sizes, and creates nearly silent operation. The iMAG075 has a static mixing torque of 7 in-lbs. (791 N-mm).



BEARING MATERIAL

Standard bearing material is Purebon® 658RCH¹. Optional polymeric bearings are available.

Note: Polymeric bearings are not acceptable for all conditions, consult the factory for an evaluation of your application.

SPEED SENSOR

The rotational speed of the MagneDrive® is monitored by a solid state magnetically sensitive pickup. The pickup is a simple device, using the pick-up in an explosive environment requires intrinsic safety barriers.

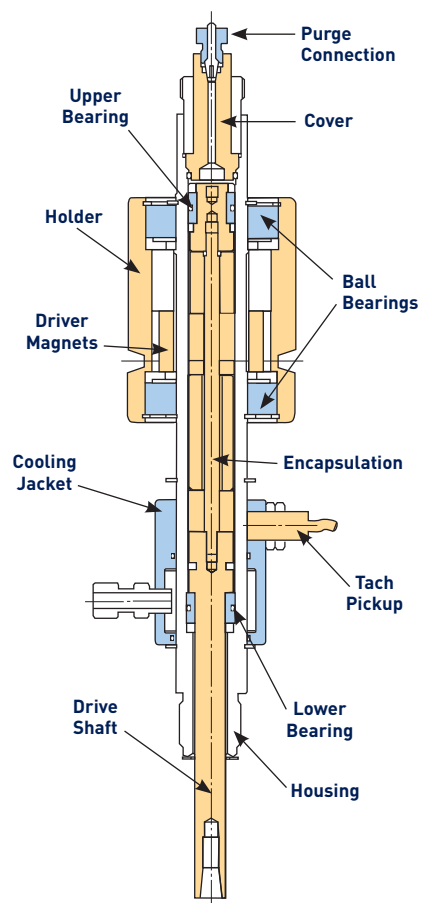
Note: Intrinsic Safety barriers are available as instrumentation accessories.

MOTOR

On the Mag075 a variable speed motor that is connected using a drive belt powers the MagneDrive®. The belt drive includes a hinged guard for operator safety. There are several options for these agitation motors. The 1/2 HP DC electric motor options include general purpose or explosion-proof (Class I, Group C & D, Division 1) and 90 or 180 volt armatures. DC motors require electronic drives for adjustment of motor speed. The 1/2 HP AC electric motor has the CE mark for explosion proof service. It is a 230-400 VAC, 50Hz, inverter duty motor.

The iMAG075 has a direct coupled (in line) motor. There are two DC electric motor options, 1/8 and 1/3 HP. These are general purpose motors which require electronic drives for adjustment of motor speed. Both Magnedrives, belt driven and inline, have two air motor options. The manual speed adjust package includes: air motor, air regulator, air filter, and lubricator. The electronic speed adjust package includes: air motor, air filter, lubricator, and electro-pneumatic flow control valve. This package allows the motor speed to be adjusted via a 4-20 mA signal from control instrumentation.

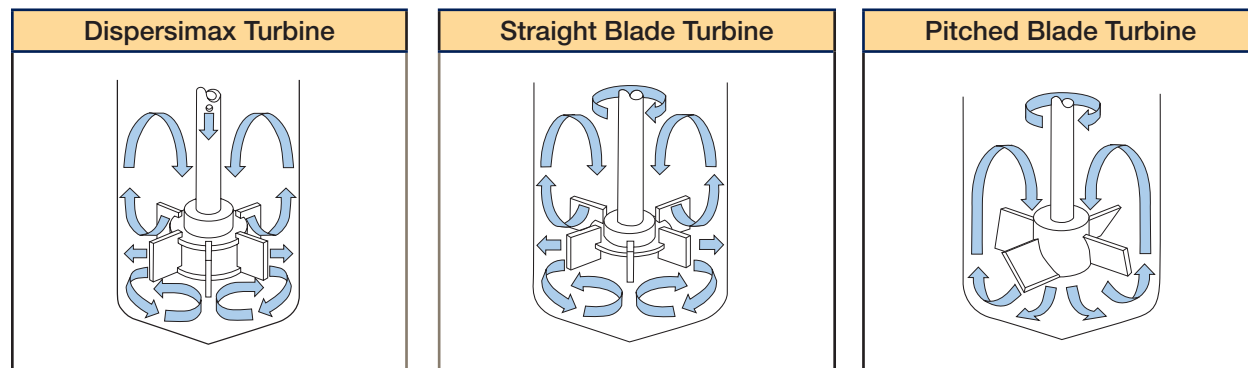
Note: The 1/2 HP AC electric motor is the only option that has a CE Mark for explosion-proof service.



MAG075 SERIES

IMPELLER

There are several basic impeller styles offered in the laboratory stirred reactor line. The Dispersimax turbine-type impeller is well suited for gas/liquid reactions. It provides radial flow, while it draws gas down a hollow shaft and disperses it through the impeller for effective high speed stirring. The straight blade turbine (a.k.a. Rushton Turbine) is suited for gas/liquid applications requiring fairly high shear at high speeds. The axial flow or pitched blade turbine impeller is especially suited for high speed liquid/solid applications where tank baffles are impractical. The pitch angle is 45° and may be specified as either upward or downward flow.



The straight blade and axial flow impellers are provided with solid agitator shafts. Removable baffle bars are included for all impeller styles.

Impeller Diameters		
100 - 300 ml: .88" (22.4 mm)	500 - 1000 ml: 1.25" (31.8 mm)	2000 - 4000 ml: 2.0" (50.8 mm)

Internal Accessories:

There are several internal accessories to pick from when configuring your stirred autoclave. Further, each accessory has the possibility of different variations. Many include manual valves which are conveniently located at the front of the unit.

LIQUID SAMPLE

The liquid sample tube allows the user to remove liquid from the lower portion of the autoclave. The sample is withdrawn through a top cover connection. The liquid sample accessory may be plugged at the top cover, or include a manual valve. A filter option is also available.

BLOW PIPE

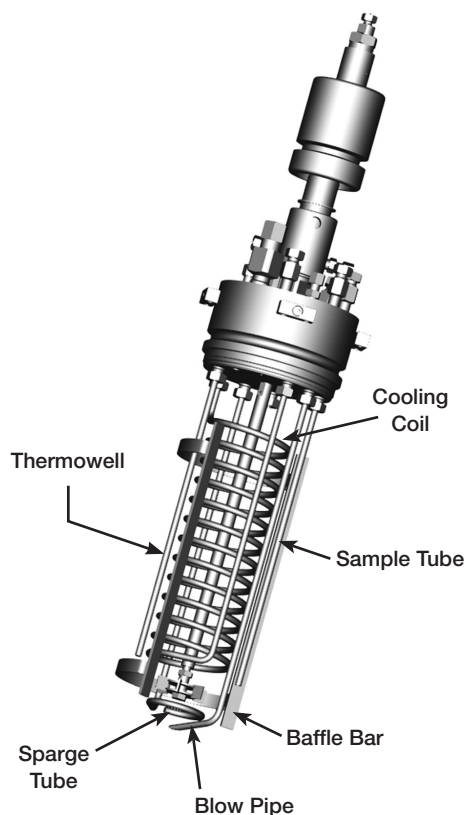
The blow pipe allows the user to empty the liquid contents of the autoclave via a tube formed to meet the lowest portion of the vessel. Gas pressure is used to force the contents through the tube and out via a top cover connection. This may also be used to move solids from the vessel bottom. The blow pipe accessory may be plugged at the top cover, or include a manual valve.

SPARGE TUBE

The sparge tube provides a means of injecting gas into the reactor below the liquid level. The gas is injected through a top cover connection. The sparge tube accessory may be plugged at the top cover, or include a manual valve.

COOLING COIL

The cooling coil provides a means of cooling the reactor contents by circulating media through an internal coil. The coolant inlet and outlet connections are located on the top cover. The cooling coil accessory may be provided: plugged at the top cover, with a manual inlet valve or a solenoid valve (available in 120 VAC, or 240 VAC).



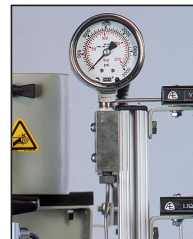
External Accessories:

VENT VALVE

The vent valve is a manual device which permits the user to exhaust headspace gases.

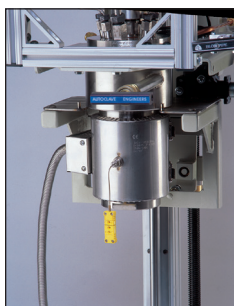
PRESSURE GAUGE/TRANSDUCER

Laboratory autoclaves may be equipped with a 2-1/2" (63.5 mm), dual scale (psig / bar) dial pressure gage or a combination of pressure gage and electronic pressure transducer. These pressure measurement accessories are available in the following ranges; 0-600 psig (0-41 bar), 0-1,000 psig (0-69 bar), 0-2,000 psig (0-138 bar), 0-3,000 psig (0-207 bar), 0-5,000 psig (0-345 bar), and 0-7,500 psig (0-517 bar). If a pressure measurement accessory is selected that has a lower pressure rating than the autoclave to which it is being attached, the overpressure device (rupture disk) will automatically be selected for protection of the pressure measurement device. The pressure transducer is a 2 wire type, with a 4-20 mA signal output. An intrinsically safe transducer is available.



HEATING / COOLING

There are numerous external heating (and cooling) options from which to choose. Single zone electrical furnaces may be 120 or 240VAC. Removable heating/cooling jackets are available for applications where a heat transfer system is used to control reactor temperature. A purged heater option is also available for XP applications.



A process thermocouple/thermowell and a furnace thermocouple are supplied when the heating option is chosen.

PROCESS THERMOCOUPLE/THERMOWELL

The thermowell provides a means of measuring process temperature using a thermocouple, which is inserted through the top cover. A thermowell, inclusive of a Type "K" thermocouple is included.

FURNACE THERMOCOUPLE

It is recommended that any electric furnace employ an overtemperature device which monitors the skin (outside diameter) temperature of the autoclave. This is a safety device which prevents overheating due to shorted power controls. Type "K" thermocouples are used.

GAS INLET

Each autoclave is provided with a gas inlet port in the top cover. The autoclave can be supplied with one or two (manifolded) valves which are connected to the gas inlet port. If no valves are selected the gas inlet port will be plugged.

CHARGING

One charging port is provided in each reactor top cover. This port is intended for charging of catalyst or like materials. The charging valve may be included. The charging valve is a “ball” type with a 1/4” diameter orifice. It is connected to 3/8” OD -1/4” ID stainless steel or Hastelloy C tube and is manually operated.

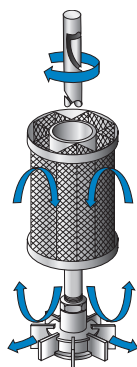


Other Accessories:

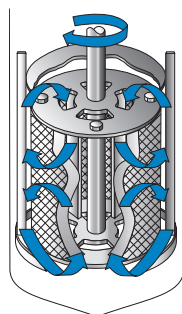
Parker Autoclave Engineers offers additional ancillary components which may be needed to put your stirred autoclave to work. Our multiple series controllers provide precise control and measurement of temperature, agitator speed, and pressure. Gas and liquid feed controls, product handling, data acquisition, and process automation are among the additional features we can offer. Our capabilities include complete, integrated systems, custom designed to your requirements.



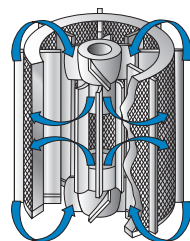
Parker Autoclave Engineers has been a pioneer, along with its partners in industry and academia, in the development of catalytic internals for its reactors. These specialized internals are also available for your new stirred autoclave.



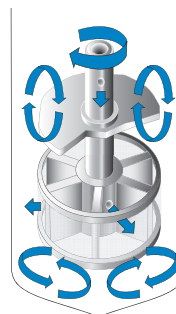
Harshaw
Catalyst Basket



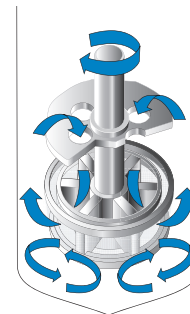
Mahoney-Robinson
Spinning
Catalyst Basket



Robinson-Mahoney
Stationary
Catalyst Basket



Dispersimax™
GLS
Catalyst Basket



GGS
Catalyst Basket

MODIFICATIONS AND CUSTOM DESIGNS

Parker Autoclave Engineers' standard stirred reactor products satisfy most researchers needs. However, your process may require specialized equipment. Parker Autoclave Engineers has a long history of success in custom design that fulfills the customers need. We will work with the customer to quote specific equipment requirements. Contact your local sales representative for assistance in completing Parker Autoclave Engineers' "Pressure Vessel and Stirred Reactor Applications Data Sheet."

Supporting Information:

Stirred Reactor Packages		
ZipperClaves®		
500 and 1,000 ml	Bulletin SR-ZC-500/1L	
2,000 and 4,000 ml	Bulletin SR-ZC-2/4L	
Ordering Guide	Bulletin SR-ZC-OG	
EZE-Seals		
100 and 300 ml	Bulletin SR-EZ-100/300	
500 and 1,000 ml	Bulletin SR-EZ-500/1L	
2,000 and 4,000 ml	Bulletin SR-EZ-2/4L	
Ordering Guide	Bulletin SR-EZ-OG	
Bolted Closure		
	Standard	Hi-Temp
100 and 300 ml	Bulletin SR-BC-100/300	Bulletin SR-HTBC-100/300
500 and 1,000 ml	Bulletin SR-BC-500/1000	Bulletin SR-HTBC-500/1000
2,000 and 4,000 ml	Bulletin SR-BC-2/4L	
Ordering Guide	Bulletin SR-BC-OG	
Pressure Vessels		
Zipper Closure	Bulletin PV-ZIP	
EZE-Seal	Bulletin PV-EZE	
Bolted Closure	Bulletin PV-BC	
MagneDrive®		
MAG075	Bulletin AGT-MAG075	
iMAG075	Bulletin AGT-MAG075 Inline	
Control Instrumentation		
Sentinel	Bulletin Sentinel	
URC	Bulletin IN-URC	

Product information can be downloaded after registering your name on the Parker Autoclave Engineers website. A good starting point is www.autoclaveengineers.com to reach the main page of Parker Autoclave Engineers reactor products.

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NOTE: Parker Autoclave Engineers reserves the right to substitute an equivalent material for trademarked material. Parker Autoclave Engineers purchases substitute materials based on specification conformance, typically a widely accepted specification created by an industry standards organization.

Notes:

Notes:

WARNING

FAILURE, IMPROPER SELECTION OR IMPROPER USE OF THE PRODUCTS AND/OR SYSTEMS DESCRIBED HEREIN OR RELATED ITEMS CAN CAUSE DEATH, PERSONAL INJURY AND PROPERTY DAMAGE.

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Caution! Do not mix or interchange component parts or tubing with those of other manufacturers. Doing so is unsafe and will void warranty.

Caution! Parker Autoclave Engineers Valves, Fittings, and Tools are not designed to interface with common commercial instrument tubing and are designed to only connect with tubing manufactured to Parker Autoclave Engineers AES specifications. Failure to do so is unsafe and will void warranty.

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