

Series 5100 Low Pressure Reactors

Series Number:

5100

Type:
Glass or Metal
Bench Top

Vessel:
Fixed Head

Sizes, mL:
160 mL - 1.5 L

Maximum Operating Pressure, psi (bar):

Glass:
150 psi (10 bar)

Metal:
1000 psi (69 bar)

Maximum Operating Temperature, °C:
225



5111 Bench Top Reactor, 1000 mL, Fixed Head, Glass Jacketed Vessel.

The Parr series 5100 Low Pressure Reactors are offered in response to users requests for:

1. A system for running reactions similar to those that have been conducted for many years in the Parr shaker, but which offer stirring for better scalability, higher operating temperatures and pressures, and more extensive reactor controls and instrumentation.

2. Reactors for elevated pressures with glass vessels that permit direct observation of mixing action, color changes, or changes of state.

3. Reactors designed for convenient operation at moderate pressure and/or for corrosion resistance.

Convenient and Easy Sealing with O-rings and Split Ring Closures

Parr has developed a new O-ring and closure system to accommodate the requirements of this unique glass-to-metal seal and support, which is convenient to use. A face seal-type O-ring design is used with the proven and popular Parr split ring closure. For this application a special gasket groove was designed to retain the O-ring on the head of the reactor when it is opened. A full range of O-ring materials is available for chemical compatibility with reactants, products and solvents.

The split ring for the glass vessel is padded with high temperature plastic cushions so the glass vessel does not come in direct contact with the metal split ring. Six sealing screws are tightened only finger tight to develop the seal on the O-ring. The split ring snaps together with latches to provide a secure and positive closure.

The alternate metal cylinders use a different split ring designed to handle the higher working pressure of the metal vessels.

Positive Agitation by High Torque Magnetic Drives

These reactors are equipped with Parr magnetic drives to provide a trouble free internal stirrer. These drives have been designed and tested to routinely deliver 2000 hours of operation without service.

Internal Stirrers

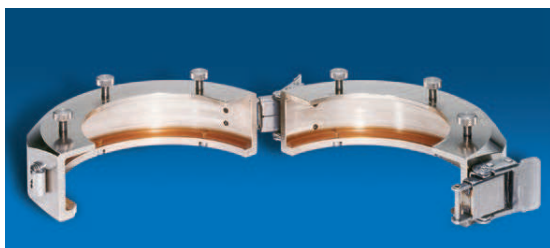
The standard internal stirrer for these vessels is a turbine type impeller. These impellers have been designed to provide good axial mixing to keep any solid particles up in suspension and to provide good gas distribution through the liquid phase.

A gas entrainment impeller is available as an alternate agitator for those users whose primary need is gas re-circulation from the head space of the reactor through the liquid phase.

Standard Reactor Fittings

The head of each glass reactor is equipped with:

- Pressure gage, 3-1/2 inch diameter, calibrated 0-200 psi and 0-14 bar
- Gas release valve
- Gas inlet valve
- Liquid sampling valve
- Internal thermocouple
- Internal cooling loop – standard 300 mL to 1.5 L
- Internal stirrer with magnetic drive
- Heads intended for use with glass cylinders are equipped with spring-loaded relief valves adjustable between 50-150 psi.
- All heads are equipped with a rupture disc rated for 1000 psi.
- Internal fittings are T316 Stainless Steel with PTFE coating.



Split Ring for Glass Reactors.



Split Ring for Metal Reactors.

Materials of Construction

These reactors are a combination of a glass reaction vessel with a metal head, internal stirrer, dip tube, thermowell, cooling loop, and external valves and fittings, or alternately an all metal system.

The standard material of construction for the head is Type 316 Stainless Steel with PTFE coated T316SS internals. As an alternative the head and internal wetted parts can be provided in any of the standard Parr materials of construction. See the 5100 Ordering Guide.

Size

Series 5100 Reactors can be easily converted between the 160, 300, 450, and 600 mL sizes by simply changing the cylinders and internal parts. In a similar manner, 1 L and 1.5 L are interchangeable. While the 160-600 mL stand cannot be converted to hold 1 and 1.5 L vessels, the larger stand can be converted to accommodate the 160-600 mL vessels. If you plan to convert at a later time, be sure to order the stand for the largest size you plan to use so the shield and supports will not have to be replaced.

Heating and Temperature Control

These reactors are available with either jacketed or non-jacketed glass cylinders allowing for heating by either a user supplied circulator or with a removable heating mantle respectively. While we would normally expect glass vessels to be equipped with circulating jackets to maintain their transparent feature, some users may not need to heat their reactions or may prefer to use removable heating mantles when they need to work at elevated temperatures. Although transparency is not an issue with metal vessels, users will generally want to select the same heating method for metal vessels as they use for glass vessels so they can utilize the same heating and control system for both.

Users who are using a circulating bath that has its own temperature control for use with these reactors will want to order the reactor without a heating mantle and may only need a

motor controller for stirring speed to complete the system. Most laboratory circulators should be adequate for these small vessels. Moveable electric heating mantles are available for vessels that do not have attached circulating jackets. These mantles are for use with 115 or 230 VAC.

4848 Controller

The Parr 4848 Controller provides PC communications to all of the functions housed in the controller. The 4848 Controller offers PID Control with auto tune, Ramp and Soak Programming, Separate Heating and Cooling Control Loops, Stirrer Motor Speed Control, Full or Half Power Heater Option, Lockout Relay and Reset for Over Temperature Protection, Expansion Modules for Tachometer, Pressure, and High Temperature Alarm. Users who wish to program their reactor to automatically step through a pre-set temperature profile will want to select the 4848 Controller with this feature. These controllers will control the electric heating mantle but not a user supplied circulator.

A2110E Motor Controller

For those who supply their own circulator for use with glass jacketed versions of the 5100, Parr offers The A2110E Motor Controller for setting and controlling the speed of the stirrer motor.

Stirrer Motors

Series 5100 Reactors are provided with a choice of three motors.

- The standard motor is a 1/8 hp variable speed motor.
- The standard stirring speed is from 0-1700 rpm. A dual pulley can be inverted to double the torque and halve the speed.
- An explosion proof motor (1/4 hp) is available. This motor is also variable speed and offers the same stirrer speed ranges as the standard motor.
- An air motor is available for users who prefer the added safety of motors that are not electrical and have available a variable compressed air source.

Series 5100 Low Pressure Reactors

5110 Conversion Sets: Glass to Metal or Metal to Glass

Series 5100 Reactors can be easily converted between glass and metal cylinders. The conversion sets include the cylinder, closure, gage and safety relief devices for the "converted to" system. Sets do not include heater.

Glass Under Pressure

In the seventy years Parr has been offering apparatus incorporating glass vessels and bottles to be used under pressure, we have learned the following important lessons.

1. Reactions at elevated pressures and temperatures can be conducted safely only if the user takes into consideration all of the potential hazards that may occur if the glass vessel should break under pressure.

2. Vessel design is important. Glass vessels must have rounded sections, proper annealing, cushioning supports, and provisions for dealing with differential thermal expansion as well as adequate thicknesses, careful construction, inspection and testing. All of the glass vessels used in these reactors are tested to a minimum of 225 psi (15 bar).

3. Careful maintenance is also critical to safe operation of glass vessels. Scratches on metal vessels which are highly ductile are cosmetic. Scratches on brittle glass vessels create enormous stress risers which can completely destroy the structural integrity of the vessel. Great care must be employed in handling and washing these vessels to maintain the strength designed into them and confirmed by their original hydrostatic testing.

4. Finally, operators must be trained to recognize the potential hazards and ensure that adequate safety provisions are in place and operational at all times.

Series 5100 Pressure Reactor System Specifications						
Shaded bar indicates specifications that change within series.						
Model Number	5101	5102	5103	5104	5111	5112
Sizes, mL	300	450	600	160	1000	1500
Maximum Pressure, Glass	150 psi (10 bar)					
Maximum Pressure, Metal	1000 psi (69 bar)					
Maximum Temperature						
with FKM O-ring	225 °C					
Vessel Style	Fixed Head					
Reactor Mounting	Bench Top					
Closure (Cap Screws)	Split-Rings (6)					
Valve Connections	1/8" Male NPT					
Magnetic Stirrer, Model No.	A1120HC9					
Maximum Torque	16 Inch-Pounds					
Impeller(s), 4-blade	1	2	2	1	2	2
Pressure Gage, Size	3.5 inches					
Range, Glass	0-200 psi (0-14 bar)					
Range, Metal	0-1000 psi (0-65 bar)					
Temperature Measurement	Fixed, Type J, Thermocouple					
Cooling Coil	Included		None		Included	
Style	Single Loop					
Heater Style	Mantle					
Heater Power Glass, Watts	510	590	780	400	400	550
Heater Power Metal, Watts	510	590	780	400	450	650
Stirrer Motor	1/8 hp Variable Speed					
Electrical Supply						
Volts, AC	115 or 230					
Maximum Load, amps, 115 / 230	8.5 / 5.2					
Vessel Dimensions						
Inside Diameter, inches	2.5			4		4
Inside Depth, inches	4.0	6.0	8.0	2.0	6.0	8.0
Weight of Cylinder, Glass, pounds	0.75	1.1	1.25	0.75	3	5
Weight of Cylinder, Metal, pounds	3	5	7	3	9	13
Reactor Dimensions						
Width, inches w/o Controller	17				21	
Depth, inches	24				26	
Height, inches	30				33	
Weight, pounds	60	63	66	60	109	113
Spare Parts Kit	5109M				5119M	
Other options available. See Ordering Guide, visit www.parrinst.com , or call for more information.						



Series 5100 Ordering Guide

The Order No. for the Base System is: **51___-G-SS-4B-115-VS.12-200**

A composite identification number to be used when ordering a 5100 Series Reactor can be developed by combining individual symbols from the separate sections below. For more information on how to use this ordering guide, please see page 27.

A Base Model

Model No.	Size
5101	300 mL
5102	450 mL
5103	600 mL
5104	160 mL (215 mL Glass Jacketed)
5111	1000 mL
5112	1500 mL

B Cylinder Type

-GJ	Glass Jacketed
-G	Glass
-MJ	Metal Jacketed
-M	Metal

C Materials of Construction*

-SS	T316 Stainless Steel
-HB	Alloy B-2
-HC	Alloy C-276
-TI	Titanium

* Other Alloys Available on Request

D Stirrer Options

-4B	4-Bladed Stirrer Impeller, 160-600 mL
-6B	6-Bladed Stirrer Impeller, 1000 & 1500 mL
-GE	Gas Entrainment Stirrer Impeller

E Electrical Supply

-115	115 VAC
-230	230 VAC

F Motor Option

-VS .12	Variable Speed, 1/8 hp
-VS .25	Variable Speed, 1/4 hp
-XP .25	Explosion Proof Variable Speed, 1/4 hp
-AM .25	Air Motor, 1/4 hp

G Pressure Gage

-200	200 psi / 14 bar
-100	100 psi / 7 bar
-1000	1000 psi / 70 bar (Metal Vessels Only)

H Heater

-MH	Mantle (Non-Jacketed Vessels Only)
-NH	No Heater

I Controller

-4848	PID Control, Ramp & Soak Programming, Motor Speed Control, and Data logging with Software
-A1925E4	Optional RS485 to USB Cable for 4848 Controller
-A2110E	Speed Controller
-NC	No Controller

J 4848 Expansion Modules

-TDM	Tachometer Display Module
-MCM	Tachometer w/Motor Control Module
-PDM	Pressure Display Module
-HTM	High Temperature Cut Off Module
-ETLM	External Temperature Limit Module
-MTM	Motor Torque Module

K 4848 Cooling Control: Solenoid Valve Module

-SVM1	115 VAC
-SVM2	230 VAC

L Certification

-ASME	ASME Certification (Metal Vessels Only)
-PED	PED Certification (Metal Vessels Only)
-CE	European Community Standard (for EMC Compliance)

M 5110 & 5120 Conversion Sets

Glass to Metal			
Catalog Number	Size mL	Converts From	Converts To
5110A	300	Glass Jacketed	Metal Jacketed
5110B	300	Glass	Metal
5110C	450	Glass Jacketed	Metal Jacketed
5110D	450	Glass	Metal
5110E	600	Glass Jacketed	Metal Jacketed
5110F	600	Glass	Metal
5110M	215	Glass Jacketed	Metal Jacketed
5110N	160	Glass	Metal
5120A	1000	Glass Jacketed	Metal Jacketed
5120B	1000	Glass	Metal
5120C	1500	Glass Jacketed	Metal Jacketed
5120D	1500	Glass	Metal

Metal to Glass			
Catalog Number	Size mL	Converts From	Converts To
5110G	300	Metal Jacketed	Glass Jacketed
5110H	300	Metal	Glass
5110I	450	Metal Jacketed	Glass Jacketed
5110J	450	Metal	Glass
5110K	600	Metal Jacketed	Glass Jacketed
5110L	600	Metal	Glass
5110P	215	Metal Jacketed	Glass Jacketed
5110Q	160	Metal	Glass
5120E	1000	Metal Jacketed	Glass Jacketed
5120F	1000	Metal	Glass
5120G	1500	Metal Jacketed	Glass Jacketed
5120H	1500	Metal	Glass

N Spare Parts Kit

-5109M	Spare Parts Kit for Models 5101, 5102, 5103, 5104
-5119M	Spare Parts Kit for Models 5111 and 5112