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Parr Instrument Company

Stirred Reactors and Pressure Vessels

Bulletin 4500 | Volume 14

Designing and Building Quality Pressure Apparatus for Over 100 Years

Start









Chapter Two

This pdf is just one chapter from our Catalog 4500. Please refer to all eight chapters to make the proper equipment choice for your needs.

14

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Chapter 2
Stirred Reactor Systems

Inside this chapter you will find:

REACTOR SELECTION GUIDE

4520 BENCH TOP, 1000 & 2000 mL

4520 HP BENCH TOP, 970 & 1900 mL

4530 MOVEABLE CART OR FLOOR STAND, 1000 & 2000 mL

4530 HP MOVEABLE CART OR FLOOR STAND, 970 & 1900 mL

4540 BENCH TOP, FLOOR STAND, OR CART, HIGH PRESSURE, 600 & 1200 mL

4550 GENERAL PURPOSE, CART OR FLOOR STAND, 1 & 2 GALLON (3.75 & 7.99 L)

4555 GENERAL PURPOSE, FLOOR STAND, 2.6 & 5 GALLON (10 & 18.75 L)

4560 MINI, BENCH TOP, 100-600 mL

4560 HT MINI, BENCH TOP, 300-600 mL

4570 HP/HT, BENCH TOP, CART, OR FLOOR STAND, 250-1800 mL

4580 HP/HT, CART OR FLOOR STAND, 1 & 1.5 GALLON (3.75 & 5.5 L)

4590 MICRO, BENCH TOP, 25-100 mL

4590 HP MICRO, BENCH TOP, 25-100 mL

4590 HP/HT MICRO, BENCH TOP, 25-100 mL

5100 LOW PRESSURE GLASS & METAL, 160-1500 mL

5500 COMPACT HIGH PRESSURE REACTORS, 25-600 mL

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It is possible to convert most of these reactors from one size to another within the same series. This is done by substituting a longer or shorter cylinder with corresponding internal fittings including the stirrer shaft, thermowell or thermocouple, dip tube and cooling coil (if installed). In some cases, the heater will also need to be changed. The Parr Technical Service department will be happy to provide a list of the appropriate conversion parts for any contemplated conversion.

The selection process starts with establishing the Four Basic Specifications discussed below. Having set these requirements, the user can then identify a suitable series group from the Guide to Parr Stirred Reactors. The user should then review the standard fittings. Finally, a list of Secondary Specifications should determine some of the finer details of the system.

1 Establish 4 Basic Specifications

1. Maximum Operating Pressure

Parr offers a number of operating pressures. Vessels 600mL and under in volume are typically rated for 3000 psi, and vessels 1L or larger are typically rated for 1900 psi. We also offer 5000 psi versions of these sizes for those who need this combination of smaller size and higher pressure. Some pressure limits can be increased with custom designs. However, higher pressure vessels generally require thicker walls, which can make temperature control more difficult, and larger volume, high pressure vessels are heavier and more difficult to handle. We also have a line of 5100 Series Glass Reactors which can handle pressures up to 150 psi with a glass cylinder or up to 1000 psi with a metal cylinder.

2. Maximum Operating Temperature

Traditionally, the choices here have been up to 350 °C for vessels with PTFE gaskets and up to 500 °C for flexible graphite (previously metal gaskets). Parr added the option of a self-sealing O-ring closure for general purpose vessels over a full range of volumes. These quick closing designs are limited to 225 °C, although this can be raised to 300 °C with special O-ring materials.

3. Vessel Size

Parr stirred reactors are offered in many sizes ranging from 25mL to 18.75 liters (5-gallon). It should be noted that these volumes refer to the free space in the vessel, and for safe operation the maximum liquid charge held in the vessel should not exceed two-thirds of the available free space in sealed batch operations. Generally, several vessel volumes are offered within most series, and reactor sizes can be reconfigured with conversion parts.

4. Material of Construction

Parr reactors are normally made of Type 316 Stainless Steel, but they can be made of other alloys as well.

The list of available construction materials includes:

Type 316/316L Stainless Steel
Alloy 286
Alloy 20
Alloy 230
Alloy 400
Alloy 600
Alloy 625
Alloy B-2/B-3
Alloy C-276
Nickel 200
Titanium Grades 2, 3, 4, & 7
Zirconium 702 & 705

Other materials may be available upon request. The majority of organic reactions can be handled in a standard T316 Stainless Steel vessel, but other corrosion resistant alloys are available to provide vessels suitable for use with a wide range of corrosive acids, bases, salts and gases. Special alloy construction can be provided for both the internal parts of the vessel and the external valves and fittings. However, there are considerable cost savings if the user can accept standard external parts made of stainless steel instead of a special alloy.

There is more detailed information on special materials in the "Materials of Construction" section of Chapter 1 on pages 10-12 of this catalog.

Moveable and Fixed Head Designs



A moveable head is best for when you need to remove the entire reactor in one piece after running your operation.



A fixed head allows you to remove the cylinder and leave the head and all of its attachments mounted to the stand.

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2 Select Appropriate Series

Series No.	Reactor Type	Nominal Size	Maximum Pressure psi (bar)	Maximum Temperature °C
4520	Mid-Size, Bench Top	1000 and 2000 mL	1900 (131)	225-350
4520 HP	Mid-Size, Bench Top, High Pressure	970 and 1900 mL	2900 (200)	350
4530	Mid-Size, Moveable Cart or Floor Stand	1000 and 2000 mL	1900 (131)	225-350
4530 HP	Mid-Size, Moveable Cart or Floor Stand, High Pressure	970 and 1900 mL	2900 (200)	350
4540	Mid-Size, Bench Top, Floor Stand, or Cart, High Pressure	600 and 1200 mL	5000 (345)	350
4550	General Purpose, Cart or Floor Stand	1 and 2 gallon (3.75 and 7.99 L)	1900 (131)	225-350
4555	General Purpose, Floor Stand	5 and 2.6 gallon (18.75 and 10 L)	1900 (131)	225-350
4560	Mini, Bench Top	100-600 mL	3000 (200)	225-350
4560 HT	Mini, Bench Top, High Temperature	300-600 mL	2000 (138)	500
4571-4572 4577-4578	High Pressure/High Temperature, Cart or Floor Stand	1000 and 1800 mL	5000 (345)	500
4575A-4576A 4575B-4576B	High Pressure/High Temperature, Bench Top	250 and 500 mL	5000 (345)	500
4581-4584	High Press./High Temp., Cart or Floor Stand	1 and 1.5 gallon (3.75 L and 5.5 L)	3000 (200)	500
4590	Micro, Bench Top	25-100 mL	3000 (200)	225-350
4590 HP	Micro, Bench Top, High Pressure	25-100 mL	5000 (345)	350
4590 HP/HT	Micro, Bench Top, High Pressure, High Temperature (Fixed Head Only)	25-100 mL	5000 (345)	500
5100	Low Pressure Glass or Metal Reactors	160 mL-1.5 L	150 (10.3) Glass	225
			1000 (69) Metal	225-300
5500	Mini or Micro, Bench Top, Compact Stand	25-600 mL	3000 (200)	225-350

Size

25 mL **18.75 L**

Parr Instrument Company offers laboratory reactors and pressure vessels in sizes from 25 mL to 18.75 L. Generally it is best to select a size that will allow for 1/3 free space. This allows for some liquid expansion during the heating phase of a reaction.

Pressures (psi)

1900 **3000** **5000**

Maximum Allowable Working Pressures (MAWP) are determined by adherence to the ASME pressure vessel design criteria. There are three ranges; up to 1900 psi, up to 5000 psi, and in most cases reactors in the 25 mL to 600 mL range can be rated to 3000 psi. Parr Instrument Company recommends research be restricted to 90% of any vessels MAWP rating. A vessel's pressure capacity is directly tied to the temperature the vessel will be operating.

Temperatures

225 °C **500 °C**

Operating Temperatures have traditionally been up to 350 °C using a flat PTFE gasket. Flexible graphite gaskets have now extended the range to 500 °C. New quick opening designs have been added to the Parr product line that use O-rings for the seal and normally limit the temperature to 225 °C (Viton®) or 300 °C (Kalrez®).

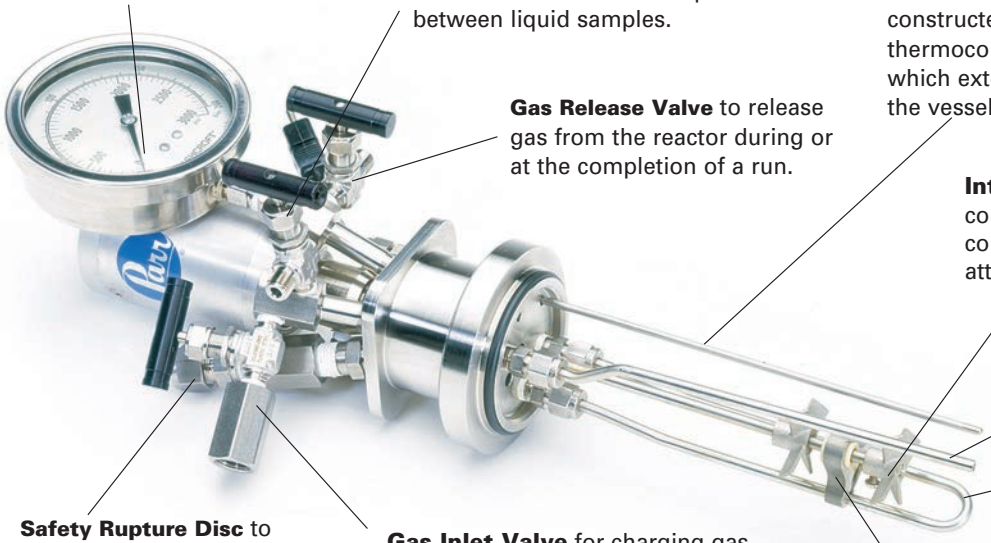
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3 Confirm Standard Fittings

Pressure Gage, analog type, which shows the pressure within the vessel at all times.

Liquid Sampling Valve for withdrawing liquid samples through the dip tube shared with the gas inlet valve. Incoming gas can be used to clear the dip tube between liquid samples.

Thermocouple or Thermowell for measuring the temperature within the vessel. In small reactors, a thermocouple encased in a metal sheath extends directly into the vessel. In larger reactors, and in vessels constructed of special alloys, the control thermocouple is inserted into a thermowell which extends to a point near the bottom of the vessel.



Gas Release Valve to release gas from the reactor during or at the completion of a run.

Internal Stirring System consists of a motor drive magnetically coupled to an internal stirrer shaft with attached turbine-type impeller(s).

Dip Tube

Cooling Coil

Safety Rupture Disc to protect the vessel and the operator from dangerous pressures beyond the rated limit for the vessel.

Gas Inlet Valve for charging gas into the reactor. This valve and the liquid sampling valve are connected to a dip tube which extends to the bottom of the vessel.

Guide or Foot Bearing with a PTFE bushing to support and stabilize lower stirrer shaft. *(Not required with footless magnetic drive)*

4 Specify Detailed Options

There are a number of options to be considered and selections to be made in order to complete the specifications for a reactor. You will need to choose from the following:

1. Sealing Style

Parr reactors may be provided with a flat gasket seal or an O-ring seal. Most commonly, a flat PTFE gasket is used. These are generally good for temperatures up to 350 °C. A graphite seal for temperatures up to 500 °C is used for high temperature systems.

O-ring seals allow for a convenient, boltless closure, but the material must be checked carefully against the intended process as there are many solvents and gases which attack O-rings.

2. Mounting Style

Parr reactors may be provided with a moveable vessel mounting or fixed head mounting.

In the moveable vessel style the complete vessel assembly (only the head in the one gallon or larger) is removed from the heater for charging, product recovery, and vessel cleaning.

In the fixed head style the head remains in the mounting and the reactor heater then cylinder drop away to open the vessel. This is useful for users who wish to leave inlet and feed lines, discharge and vent lines, condensers, and similar head connections undisturbed between runs. The head is easily removable if desired by sliding the head out of its slot on the stand.

3. Support Stand

Parr stirred reactors are most commonly mounted on a bench top stand for sizes of 2 liter or smaller. Vessels 1 liter or larger may be mounted on either moveable carts or fixed floor stands. Care should be taken to check stand dimensions with the available space at the user's facility.

4. Stirrer Type

Parr reactors have a magnetic drive equipped for most low viscosity fluids and light slurries. Drives with higher coupling torque and more powerful motors are available for higher viscosity applications.

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Also, many reactors require a lower support bracket to stabilize the stirring shaft. In applications with abrasive particles or heavy mixing, a "footless" magnetic drive with a larger diameter shaft may be provided.

5. Cooling Coil

An internal cooling coil can be installed in all reactors (except the Micro sizes) to remove the heat of a reaction and/or to cool the vessel at the end of a run. In some reactors a cooling coil is furnished as a standard fitting. In others, a coil can be added as an option in either serpentine style or alternately in a spiral style for selected models. For the micro sizes, with their limited dimensions, a cold finger may be added as an option

6. Gage and Rupture Disc Ranges

The pressure gage range must be selected to provide the resolution desired, while having a range high enough to handle the maximum pressure the reactor will undergo. One would be tempted to simply get a gage with the largest range possible, but this can reduce the resolution to unacceptable levels. One good rule of thumb for good resolution is to operate with the gage at half of its maximum range.

The rupture disc is most commonly matched to the Maximum Allowable Working Pressure of the vessel, ensuring the disc will burst before reaching a pressure beyond the MAWP range. Care must be taken not to take the vessel above 90% of its burst pressure under normal operation. This will help protect the disc from the effects of repeated pressure cycles.

7. Controller Options

Parr controllers are typically set up to control temperature, but may also be set up with digital pressure displays, stirring speed, secondary temperature, and other displays and controls.

These may be set up with data logging via PC as well. For more information on these options, see the Controller Section of this catalog.

8. Certification

ASME, CE, CHINA, and Parr Certifications are available for users who require these recognized quality assurance certifications.

9. Custom Options

A wide range of custom options such as special openings in the head or cylinder, high viscosity stirrers, windows, special valves, heaters or jackets, explosion proof wiring, and volume modifications are available.

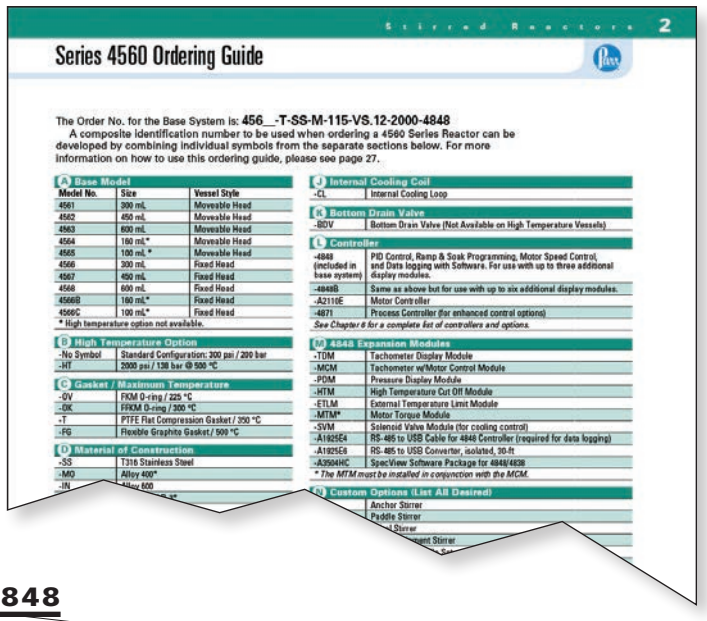
Various accessories, such as glass or PTFE liners, condensers, catalyst holders, and alternate stirrers are available to further adapt these reactors to the individual user's applications.

Detailed information for these and other options are in Optional Fittings, Chapter 7, starting on page 107 of this catalog.

How to use the Ordering Guide:

The last page of each Reactor Series in this chapter is an Ordering Guide. A composite identification/order number can be generated by combining the individual symbols from the separate sections. Omit symbol if not desired for system.

In the following example: Using the Ordering Guide from the Series 4560 Stirred Reactors for our sample order, we have chosen to order a 600 mL fixed head reactor, FKM O-ring, the vessel manufactured out of T316 Stainless Steel, a general purpose magnetic drive also made of T316SS, 115V power supply, 1/4 hp explosion-proof motor, 3000 psi pressure gage, no bottom drain valve, and a 4848 controller.



Series 4560 Ordering Guide

The Order No. for the Base System is: **456__-T-SS-M-115-VS.12-2000-4848**

A composite identification number to be used when ordering a 4560 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	Vessel Style
4561	300 mL	Moveable Head
4562	450 mL	Moveable Head
4563	600 mL	Moveable Head
4564	160 mL*	Moveable Head
4565	100 mL *	Moveable Head
4566	300 mL	Fixed Head
4567	450 mL	Fixed Head
4568	600 mL	Fixed Head
4566B	160 mL*	Fixed Head
4566C	100 mL*	Fixed Head

* High temperature option not available.

B High Temperature Option

-No Symbol	Standard Configuration: 300 psi / 200 bar
-HT	2000 psi / 138 bar @ 500 °C

C Gasket / Maximum Temperature

-OV	FKM O-ring / 225 °C
-OK	FFKM O-ring / 300 °C
-T	PTFE Flat Compression Gasket / 350 °C
-FG	Flexible Graphite Gasket / 500 °C

D Material of Construction

-SS	T316 Stainless Steel
-MQ	Alloy 400*
-IN	Alloy 600

J Internal Cooling Coil

-CL	Internal Cooling Loop

K Bottom Drain Valve

-BDV	Bottom Drain Valve (Not Available on High Temperature Vessels)

L Controller

-4848 (included in base system)	PID Control, Ramp & Soak Programming, Motor Speed Control, and Data logging with Software. For use with up to three additional display modules.
-4848B	Same as above but for use with up to six additional display modules.
-A2110E	Motor Controller
-4871	Process Controller (for enhanced control options)

See Chapter 6 for a complete list of controllers and options.

M 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
-SVM	Solenoid Valve Module (for cooling control)
-A1925E4	RS-485 to USB Cable for 4848 Controller (required for data logging)
-A1925E6	RS-485 to USB Converter, isolated, 30-ft
-A3504HC	SpecView Software Package for 4848/4838

* The MTM must be installed in conjunction with the MCM.

N Custom Options (List All Desired)

Anchor Stirrer
Paddle Stirrer
Stirrer

No. 4568-OV-SS-M-115-XP.25-3000-4848

A. Model	C. Gasket	D. Material	E. Stirrer	F. Drive MOC	G. Voltage	H. Motor	I. Gage	L. Controller
No. 4568	-OV	-SS	-M	-No Symbol (same as vessel)	-115	-XP.25	-3000	-4848

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Series 4520 1 & 2 Liter General Purpose Reactor Systems

Series Number:
4520

Type:
General Purpose

Stand:
Bench Top

Vessel Mounting:
Moveable or Fixed Head

Vessel Sizes, mL:
1000-2000
970-1900 HP

Standard Pressure MAWP Rating, psi (bar):
1900 (131)

Standard Maximum Operating Temp., °C:
225 w/ FKM O-ring
300 w/ FFKM O-ring
350 w/ PTFE Flat Gasket

High Pressure (HP) MAWP Rating, psi (bar):
2900 (200)

Maximum Operating Temperature, °C, at High Pressure (HP):
350 @ 2900 psi



Model 4523 Fixed Head Reactor open to show Internal Fittings, and a 4848 Controller shown with optional Expansion Modules.

These are the largest of the Parr Reactors that can be handled on a bench top.

These reactors are available with an FKM O-ring seal for operating temperatures to 225 °C, and FFKM O-ring for temperatures to 300 °C, or with a flat, PTFE gasket for operating temperatures up to 350 °C maximum.

An optional HP (High Pressure) flat gasket version has been added for maximum allowable working pressure of 2900 psi (200 bar) at 350 °C. Both fixed head and moveable vessel designs are available. An optional pneumatic lift is available for the heavier 2 liter cylinder and heater. It should be noted, however, that the 2 liter, fixed head model is tall and may not be convenient to operate on a standard height bench top. We recommend using a floor stand. (See Series 4530)

With their larger diameter, these mid-size reactors have sufficient space for special modifications, such as: an internal cooling coil, bottom drain valve (not on 2 liter bench top), ball valve for a solids charging port, catalyst addition devices, condensers, electrical feedthroughs and more. Details are provided in the Chapter 6 of this catalog, starting on page 93.

The standard magnetic stirrer drive on these 4520 Models works well for reaction mixtures with viscosities up to 25,000 centipoise. For heavier stirring loads, these reactors can be equipped with larger magnetic drives, more powerful motors, and drive trains capable of delivering additional stirring torque.

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Series 4520 Pressure Reactor System Specifications				
Shaded bar indicates specifications that change within series.				
Model Number	**4523**	**4524**	**4525**	**4526**
Approximate Sizes, mL	1000	2000	1000	2000
Approximate Sizes for HP Models, mL	970	1900	970	1900
Maximum Pressure (MAWP)	1900 psi (131 bar)			
HP Maximum Pressure (MAWP)	2900 psi (200 bar)			
Maximum Temperature				
with FKM O-ring	225 °C			
with FFKM O-ring	300 °C			
with PTFE Flat Gasket	350 °C			
Vessel Style	Fixed Head		Moveable	
Reactor Mounting	Bench Top			
Closure	Split-Ring (6 Compression Bolts for Flat Gasket, no Compression Bolts for O-ring)			
High Pressure Closure	Split-Ring (12 Compression Bolts for Flat Gasket, no Compression Bolts for O-ring)			
Valve Connections	1/8" Male NPT			
Magnetic Stirrer, Model No.	A1120HC6			
Maximum Torque	16 Inch-Pounds			
Impeller(s), 6 blades	2 (2.28" dia., 2.00" dia. HP)			
Pressure Gage, Size	4.5 inches			
Range	0-3000 psi (200 bar)			
Temperature Measurement	Thermowell			
Cooling Coil (Optional)	Serpentine			
Bottom Drain Valve (Optional)	3/8" NPT (1900psi/350 °C) 1000 mL	NA	1/4" NPT (2900psi/350 °C) 970 mL	NA
Heater Style	Calrod			
Heater Power, Watts	1000	1500	1000	1500
Stirrer Motor	1/8 hp variable speed			
Electrical Supply				
Volts, AC	115 or 230			
Maximum Load, amps, 115 / 230	12 / 9			
Cylinder Dimensions				
Inside Diameter, inches	4.00			
High Pressure Inside Diameter, inches	3.75			
Inside Depth, inches	5.4	10.5	5.4	10.5
Weight of Cylinder, pounds	28	32	32	36
Reactor Dimensions				
Width, inches w/o Controller	17			
Depth, inches	24			
Height, inches	38*	48	38*	48
Weight, pounds	105	120	100	115
Spare Parts Kit	4509M			
* Stand height is 48-inches with Bottom Drain Valve option.				
Other options available. See Ordering Guide, visit www.parrinst.com, or call for more information.				

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Series 4520 1 & 2 Liter General Purpose Reactor Systems

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Model 4525 Reactor, 1000 mL, Moveable Vessel, and a 4848 Controller shown with optional Expansion Modules.



Model 4523 Bench Top Reactor, 1000 mL, Fixed Head Style.



4526 Moveable Vessel, 2000 mL

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Series 4520 Ordering Guide

The Order No. for the Base System is: **452__-T-SS-M-115-VS.12-2000-4848**

A composite identification number to be used when ordering a 4520 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	Vessel Style
4523	1000 mL	Fixed
4524	2000 mL	Fixed
4525	1000 mL	Moveable
4526	2000 mL	Moveable

High Pressure sizes are 970 mL & 1900 mL

B High Pressure Option

-No Symbol	Standard Configuration (1900 psi / 131 bar)
-HP	2900 psi (200 bar)

C Gasket / Maximum Temperature

-OV	FKM O-ring / 225 °C
-OK	FFKM O-ring / 300 °C
-T	PTFE Flat Compression Gasket / 350 °C

D Vessel Material of Construction

-SS	T316 Stainless Steel
-MO	Alloy 400
-IN	Alloy 600
-HB	Alloy B-2/B-3
-HC	Alloy C-276
-CS	Alloy 20
-TI2	Titanium Grade 2
-TI4	Titanium Grade 4
-ZR702	Zirconium Grade 702
-ZR705	Zirconium Grade 705

See page 11 for complete list of available alloys.

E Magnetic Stirrer Drive

-M	General Purpose, 16 in-lb
-HD	Heavy Duty, 60 in-lb
-FMD1	Footless, General Purpose, 16 in-lb
-FMD2	Footless, Heavy Duty, 60 in-lb

F Mag. Drive Material of Construction

-MOC Symbol	Indicate Material of Construction

G Electrical Supply

-115	115 VAC
-230	230 VAC

H Motor Option

-VS .12	Variable Speed, 1/8 hp
-VS .25	Variable Speed, 1/4 hp
-VS .50*	Variable Speed, 1/2 hp
-XP .25	Explosion Proof, Variable Speed, 1/4 hp
-XP .50*	Explosion Proof, Variable Speed, 1/2 hp
-AM .25	Air Motor, 1/4 hp
-AM .50	Air Motor, 1/2 hp

** 230V Systems Only*

I Pressure Gage

-3000	3000 psi / 200 bar
-2000	2000 psi / 137 bar
-1000	1000 psi / 70 bar
-600	600 psi / 40 bar
-200	200 psi / 14 bar
-100	100 psi / 7 bar

J Internal Cooling Coil

-SC	Serpentine Coil

K Bottom Drain Valve

-BDV	Bottom Drain Valve, 3/8" NPT for standard systems, 1/4" NPT for HP systems

L Controller

-4848 (included in base system)	PID Control, Ramp & Soak Programming, Motor Speed Control, and Data logging with Software. For use with up to three additional display modules.
-4848B	Same as above but for use with up to six additional display modules.
-A2110E	Motor Controller
-4871	Process Controller (for enhanced control options)

See Chapter 6 for a complete list of controllers and options.

M 4848 Controller Options

-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
-SVM	Solenoid Valve Module (for cooling control)
-A1925E4	RS-485 to USB Cable for 4848 Controller (required for data logging)
-A1925E6	RS-485 to USB Converter, isolated, 30-ft
-A3504HC	SpecView Software Package for 4848/4838

** The MTM must be installed in conjunction with the MCM.*

N Custom Options (List All Desired)

-AS	Anchor Stirrer
-PS	Paddle Stirrer
-SA	Spiral Stirrer
-GE	Gas Entrainment Stirrer
-BF	Removable Baffle Set
-SB	Static Catalyst Basket
-DB	Dynamic Catalyst Basket
-CAD	Internal Catalyst Addition Device
-XCAD	External Catalyst Addition Device
-SCP	Solids Charging Port (Ball Valve)
-RC	Reflux Condenser
-RTC	Reflux/Take-Off Condenser
-WJ	Welded Jacket
-ABH	Aluminum Block Heater with Cooling Channels

See Chapter 7 for a complete list of optional accessories.

O Certifications

-ASME	ASME Certification
-PED	PED Certification
-CH	China Certification
-P	Parr Certification

P Spare Parts Kit

-4509M	Spare Parts Kit for 4520 Series

Please note that all options and combinations are not compatible with all models.

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Series 4530 1 & 2 L General Purpose Reactor Systems

Series Number:
4530

Type:
General Purpose

Stand:
Floor Stand or Cart

Vessel Mounting:
Moveable or Fixed Head

Vessel Sizes, mL:
1000-2000
970-1900 HP

Standard Pressure MAWP Rating, psi (bar):
1900 (131)

Standard Maximum Operating Temp., °C:
225 w/ FKM O-ring
300 w/ FFKM O-ring
350 w/ PTFE Flat Gasket

High Pressure (HP) MAWP Rating, psi (bar):
2900 (200)

Maximum Operating Temperature, °C, at High Pressure (HP):
350 @ 2900 psi

This series of reactors will appeal to users who have any of the following needs:

• **Reactors Configured for Polymer Studies.** The reactors in this series are mounted on a sturdy floor stand which will accommodate larger stirrer drive motors and stronger power trains that are generally not available for the bench top models. With these options it is possible to provide the high torque and low stirring speeds required for work with polymers and other mixtures with viscosity of 1 million centipoise and more. These mountings are also better suited for the installation of a drain valve in the cylinder bottom for convenient removal of the reaction mixture while it is still hot.

• **Reactors Requiring Extensive Modifications.** Floor stand mountings provide a good base for reactor modifications and for the addition of accessories, such as: condensers, packed columns, special motors, special heaters, jacketed vessels, automatic valves or regulators, and many other fittings. Both fixed head and moveable vessel designs are available. An optional pneumatic lift is available for fixed head models

• **Reactors that Need to be Moved.** These reactors are designed for use in an area where a bench top is not available. Users who wish to move the reactor to storage when not in use, will appreciate the movable cart design of the Series 4531 and 4532.

These reactors are available with an FKM O-ring seal for operating temperatures to 225 °C, and FFKM O-ring for temperatures to 300 °C, or with a flat, PTFE gasket for operating temperatures up to 350 °C maximum.

• **HP versions.** These reactors are now available in an HP (High Pressure) version up to 2900 psi (200 bar) at 350 °C.



4534 Floor Stand Reactor, 2000 mL, Fixed Head, with Spiral Cooling Coil and Liquid Charging Pipette, in the open position, and a 4848 Controller with optional Expansion Modules.

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Series 4530 Pressure Reactor System Specifications						
Shaded bar indicates specifications that change within series.						
Model Number	**4531**	**4532**	**4533**	**4534**	**4535**	**4536**
Sizes, mL	1000	2000	1000	2000	1000	2000
Sizes for HP Models, mL	970	1900	970	1900	970	1900
Maximum Pressure (MAWP)	1900 psi (131 bar)					
HP Maximum Pressure (MAWP)	2900 psi (200 bar)					
Maximum Temperature						
with FKM O-ring	225 °C					
with FFKM O-ring	300 °C					
with PTFE Flat Gasket	350 °C					
Vessel Style	Moveable		Fixed Head		Moveable	
Reactor Mounting	Cart		Floor Stand		Floor Stand	
Closure	Split-Ring (6 Compression Bolts for Flat Gasket, no Compression Bolts for O-ring)					
High Pressure Closure	Split-Ring (12 Compression Bolts for Flat Gasket, no Compression Bolts for O-ring)					
Valve Connections	1/8" Male NPT					
Magnetic Stirrer, Model No.	A1120HC					
Maximum Torque	16 Inch-Pounds					
Impeller(s), 6-Blade	2 (2.28" dia., 2.00" dia. HP)					
Pressure Gage, Size	4.5 inches					
Range	0-2000 psi (137 bar)					
Temperature Measurement	Thermowell					
Cooling Coil (Optional)	Serpentine					
Bottom Drain Valve (Optional)	3/8" NPT (1900psi/350 °C) 1000/2000 mL			1/4" NPT (2900psi/350 °C) 970/1900 mL		
Heater Style	Calrod					
Heater Power, Watts	1000	1500	1000	1500	1000	1500
Stirrer Motor	1/4 hp Variable Speed					
Lift Mechanism	NA		Pneumatic Lift		NA	
Electrical Supply						
Volts, AC	115 or 230					
Maximum Load, amps, 115 / 230	12 / 9					
Cylinder Dimensions						
Inside Diameter, inches	4.0					
High Pressure Inside Diameter, inches	3.75					
Inside Depth, inches	5.4	10.5	5.4	10.5	5.4	10.5
Weight of Cylinder, pounds	28	32	32	36	28	32
Reactor Dimensions						
Width, inches w/o Controller	35		21		21	
Depth, inches	18		28		28	
Height, inches	50		63		63	
Weight, pounds	200	215	225	240	225	240
Spare Parts Kit	4539M (General Purpose) or 4539MA (Heavy Duty)					
Other options available. See Ordering Guide, visit www.parrinst.com, or call for more information.						

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Series 4530 1 & 2 L General Purpose Reactor Systems

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4532 Floor Stand Reactor, 2000 mL, Moveable Vessel on Cart, and a 4848 Temperature Controller with optional Expansion Modules.



2000 mL Stirred Moveable Vessel



4533 Reactor, 1000 mL Vessel with Gear Drive, Dual Condenser and Spiral Stirrer.

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Series 4530 Ordering Guide

The Order No. for the Base System is: **453__-T-SS-M-115-VS.25-2000-4848**

A composite identification number to be used when ordering a 4530 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	Vessel Style
4531	1000 mL	Moveable Head, Moveable Cart
4532	2000 mL	Moveable Head, Moveable Cart
4533	1000 mL	Fixed Head, Stationary Floor Stand
4534	2000 mL	Fixed Head, Stationary Floor Stand
4535	1000 mL	Moveable Head, Stationary Floor Stand
4536	2000 mL	Moveable Head, Stationary Floor Stand

B High Pressure Option

-No Symbol	Standard Configuration (1900 psi / 131 bar)
-HP	2900 psi (200 bar)

C Gasket / Maximum Temperature

-OV	FKM O-ring / 225 °C
-OK	FFKM O-ring / 300 °C
-T	PTFE Compression Gasket / 350 °C

D Material of Construction

-SS	T316 Stainless Steel
-MO	Alloy 400
-IN	Alloy 600
-HB	Alloy B-2 / B-3
-HC	Alloy C-276
-CS	Alloy 20
-TI2	Titanium Grade 2
-TI4	Titanium Grade 4
-ZR702	Zirconium Grade 702
-ZR705	Zirconium Grade 705

See page 11 for complete list of available alloys.

E Magnetic Stirrer Drive

-M	General Purpose, 16 in-lb
-HD	Heavy Duty, 60 in-lb
-FMD1	Footless, General Purpose, 16 in-lb
-FMD2	Footless, Heavy Duty, 60 in-lb
-FMD3	Footless, Extra Heavy Duty, 120 in-lb

F Mag. Drive Material of Construction

-MOC Symbol	Indicate Material of Construction

G Electrical Supply

-115	115 VAC
-230	230 VAC

H Motor Option

-VS .12	Variable Speed, 1/8 hp
-VS .25	Variable Speed, 1/4 hp
-VS .50	Variable Speed, 1/2 hp (230V Only)
-XP .25	Explosion Proof, Variable Speed, 1/4 hp
-XP .50	Explosion Proof, Var. Speed, 1/2 hp (230V Only)
-AM .25	Air Motor, 1/4 hp
-AM .50	Air Motor, 1/2 hp
-GDD	Geared Direct Drive (Fixed Head Only)

I Geared Direct Drive Ratio*

-3D	3:1, 0-600 rpm
-5D	5:1, 0-360 rpm
-10D	10:1, 0-180 rpm

** For -GDD Motor Option Only.*

J Pressure Gage

-3000	3000 psi / 200 bar
-2000	2000 psi / 137 bar
-1000	1000 psi / 70 bar
-600	600 psi / 40 bar
-200	200 psi / 14 bar
-100	100 psi / 7 bar

K Internal Cooling Coil

-SC	Serpentine Coil

L Bottom Drain Valve

-BDV	Bottom Drain Valve, 3/8" NPT for standard systems, 1/4" NPT for HP systems

M Controller

-4848 (included in base system)	PID Control, Ramp & Soak Programming, Motor Speed Control, and Data logging with Software. For use with up to three additional display modules.
-4848B	Same as above but for use with up to six additional display modules.
-A2110E	Motor Controller
-4871	Process Controller (for enhanced control options)

See Chapter 6 for a complete list of controllers and options.

N 4848 Controller Options

-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
-SVM	Solenoid Valve Module (for cooling control)
-A1925E4	RS-485 to USB Cable for 4848 Controller (required for data logging)
-A1925E6	RS-485 to USB Converter, isolated, 30-ft
-A3504HC	SpecView Software Package for 4848/4838

** The MTM must be installed in conjunction with the MCM.*

O Custom Options (List All Desired)

-AS	Anchor Stirrer
-PS	Paddle Stirrer
-SA	Spiral Stirrer
-GE	Gas Entrainment Stirrer
-BF	Removable Baffle Set
-SB	Static Catalyst Basket
-DB	Dynamic Catalyst Basket
-CAD	Internal Catalyst Addition Device
-XCAD	External Catalyst Addition Device
-SCP	Solids Charging Port (Ball Valve)
-RC	Reflux Condenser
-RTC	Reflux/Take-Off Condenser
-WJ	Welded Jacket
-ABH	Aluminum Block Heater with Cooling Channels
-PL	Pneumatic Lift

See Chapter 7 for a complete list of optional accessories.

P Certifications

-ASME	ASME Certification
-PED	PED Certification
-CH	China Certification
-P	Parr Certification

Q Spare Parts Kit

-4539M	General Purpose Spare Parts Kit for 4530 Series
-4539MA	Heavy Duty Spare Parts Kit for 4530 Series

Please note that all options and combinations are not compatible with all models.

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Series 4540 600–1200 mL High Pressure Reactor Systems

Series Number:
4540

Type:
High Pressure

Stand:
Bench Top, Floor Stand, or Cart

Vessel Mounting:
Moveable or Fixed Head

Vessel Sizes, mL:
600 and 1200

High Pressure MAWP Rating, psi (bar):
5000 (345)

Standard Maximum Operating Temp., °C:
350 w/ PTFE Flat Gasket

This series of stirred reactors has been designed for users who need higher operating pressures than the 2000 to 3000 psi offered by the General Purpose Reactors, but do not require the high operating temperatures provided by the Series 4570 High Pressure, High Temperature Reactors. These reactors offer working pressures to 5000 psi (345 bar) at temperatures to 350 °C.

These vessels have been designed with outside dimensions comparable to the Series 4520 and 4530 Reactors so that they can use the same support system, stirrer drive and heater as these popular general purpose models. This provides not only an attractively priced high pressure/moderate temperature system, but also reactors that can be interchanged with the 1 and 2 liter sizes. The thicker walls required for higher operating pressures reduce the volumes of these reactors to 600 and 1200 mL.

These reactors can be used in either the bench top or floor stand mountings. While the 1200 mL reactor is offered as a fixed head bench top model, it is too tall and too heavy to be handled comfortably on a standard height bench top. It is recommended that the floor stand support option should be selected unless the user has an adjustable bench top which will accommodate the overall height of the 1200 mL systems.



Model 4544 High Pressure Reactor, 600 mL, Moveable Style Vessel, with heater lowered, and a 4848 Controller shown with optional Expansion Modules.

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Series 4540 Pressure Reactor System Specifications						
Shaded bar indicates specifications that change within series.						
Model No. - Moveable Vessel	**4544**	**—**	**4544A**	**—**	**4544C**	**4546C**
Model No. - Fixed Head	**4545**	**4547***	**4545A**	**4547A***		
Approximate Sizes, mL	600	1200	600	1200	600	1200
Maximum Pressure (MAWP)	5000 psi (345 bar)					
Maximum Temperature						
with PTFE Flat Gasket	350 °C					
Vessel Details						
Reactor Mounting	Bench Top		Floor Stand		Moveable Cart	
Closure	Split-Ring (8 Compression Bolts for Flat Gasket, no Compression Bolts for O-ring)					
Valve Connections	1/4" Male NPT					
Magnetic Stirrer, Model No.	A1120HC6					
Maximum Torque	16 Inch-Pounds					
Impeller(s), 6-Blade	2 (1.75" dia.)					
Pressure Gage, Size	4.5 inches					
Range	5,000 psi (345 bar)					
Temperature Measurement	Thermowell					
Cooling Coil (Optional)	Serpentine or Loop					
Bottom Drain Valve (Optional)	1" NPS (Floor Stand Supports Only)					
Heater Style	Calrod					
Heater Power, Watts	1000	1500	1000	1500	1000	1500
Stirrer Motor, hp	1/8	1/8	1/8	1/8	1/4	1/4
Electrical Supply						
Volts, AC	115 or 230					
Maximum Load, amps, 115 / 230	12 / 9					
Cylinder Dimensions						
Inside Diameter, inches	3.25					
Inside Depth, inches	4.7	9.8	4.7	9.8	4.7	9.8
Weight of Cylinder, pounds	51	57	51	57	51	57
Reactor Dimensions						
Width, inches	17		21		35	
Depth, inches	24		28		18	
Height, inches	38	48	63		50	
Weight, pounds	125	135	175	185	175	185
Spare Parts Kit	4549MA		4549MB		4549MB	
Other options available. See Ordering Guide, visit www.parrinst.com, or call for more information.						
* Fixed head style only.						

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Series 4540 600-1200 mL High Pressure Reactor Systems

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Model 4546C Reactor, 1200 mL, Moveable Head Style, on a Moveable Cart, and a 4848 Reactor Controller shown with optional Expansion Modules.



1200 mL Fixed Head, and 600 mL Moveable Reaction Vessels.

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Series 4540 Ordering Guide

The Order No. for the Base System is: **454__-T-SS-M-115-VS.12-2000-4848**

A composite identification number to be used when ordering a 4540 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	Vessel Style
4544	600 mL	Moveable Head, Bench Top
4544A	600 mL	Moveable Head, Floor Stand
4544C	600 mL	Moveable Head, Moveable Cart
4545	600 mL	Fixed Head, Bench Top
4545A	600 mL	Fixed Head, Stationary Floor Stand
4546	1200 mL	Moveable Head, Bench Top
4546A	1200 mL	Moveable Head, Stationary Floor Stand
4546C	1200 mL	Moveable Head, Moveable Cart
4547	1200 mL	Fixed Head, Bench Top
4547A	1200 mL	Fixed Head, Stationary Floor Stand

B Gasket / Maximum Temperature

-T	PTFE Compression Gasket / 350 °C

C Materials of Construction

-SS	T316 Stainless Steel
-MO	Alloy 400
-IN	Alloy 600
-HB	Alloy B-2 / B-3
-HC	Alloy C-276
-CS	Alloy 20
-TI2	Titanium Grade 2*
-TI4	Titanium Grade 4*
-NI	Nickel 200*
-ZR702	Zirconium Grade 702*
-ZR705	Zirconium Grade 705*

See page 11 for complete list of available alloys.

**Maximum Pressure and/or Temperature are limited.*

D Magnetic Stirrer Drive

-M	General Purpose, 16 in-lb
-FMD1	Footless, General Purpose, 16 in.-lb,

E Mag. Drive Material of Construction

-MOC Symbol	Indicates Material of Construction

F Electrical Supply

-115	115 VAC
-230	230 VAC

G 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

H Pressure Gage

-10000	10000 psi / 690 bar
-7500	7500 psi / 517 bar
-5000	5000 psi / 345 bar
-3000	3000 psi / 200 bar

I Internal Cooling Coil

-SC	Serpentine Coil

J Bottom Drain Valve

-BDV	Bottom Drain Valve, 1" NPS

K Controller

-4848 (included in base system)	PID Control, Ramp & Soak Programming, Motor Speed Control, and Data logging with Software. For use with up to three additional display modules.
-4848B	Same as above but for use with up to six additional display modules.
-A2110E	Motor Controller
-4871	Process Controller (for enhanced control options)

See Chapter 6 for a complete list of controllers and options.

L 4848 Controller Options

-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
-SVM	Solenoid Valve Module (for cooling control)
-A1925E4	RS-485 to USB Cable for 4848 Controller (required for data logging)
-A1925E6	RS-485 to USB Converter, isolated, 30-ft
-A3504HC	SpecView Software Package for 4848/4838

** The MTM must be installed in conjunction with the MCM.*

M Custom Options (List All Desired)

-AS	Anchor Stirrer
-PS	Paddle Stirrer
-GE	Gas Entrainment Stirrer
-SP	Spiral Stirrer
-BF	Removeable Baffle Set
-CAD	Internal Catalyst Addition Device
-XCAD	External Catalyst Addition Device
-SCP	Solids Charging Port (Ball Valve)
-RC	Reflux Condenser
-RTC	Reflux/Take-Off Condenser
-WJ	Welded Jacket
-ABH	Aluminum Block Heater w/ Cooling Channels

See Chapter 7 for a complete list of optional accessories.

N Certifications

-ASME	ASME Certification
-PED	PED Certification
-CH	China Certification
-P	Parr Certification

O Spare Parts Kit

-4549MA	Spare Parts Kit for 4544-4547
-4549MB	Spare Parts Kit for 4544A-4547A, 4544C, 4546C

Please note that all options and combinations are not compatible with all models.

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Series 4550 1 & 2 Gallon Reactor Systems

Series Number:
4550

Type:
General Purpose

Stand:
Floor Stand or Cart

Vessel Mounting:
Moveable or Fixed Head

Vessel Sizes, Gallons (Liters):
1 (3.75) and 2 (7.99)

Standard Pressure MAWP Rating, psi (bar):
1900 (131)

Standard Maximum Operating Temp., °C:
225 w/ FKM O-ring
300 w/ FFKM O-ring
350 w/ PTFE Flat Gasket

These 4550 Reactors extend the size range of the 4530 Series to 1 and 2 gallon (3.75 and 7.99 liter) sizes, providing excellent facilities for pilot plant studies.

These reactors are available with an FKM O-ring seal for operating temperatures to 225 °C, and FFKM O-ring for temperatures to 300 °C, or with a flat, PTFE gasket for operating temperatures up to 350 °C maximum.

Both fixed head and moveable head designs are available. The moveable head, Model 4551 and 4552, cart reactors are designed so that they can be opened or closed conveniently without removing the cylinder from the heater and without auxiliary handling equipment. The split-ring cover clamp sections can be moved into place from the sides, and the cap screws can be tightened with the vessel in place in its heater. The fixed head versions, Model 4553 and 4554, allow the head (and the connections made to it) to remain in place while the cylinder and heater are lowered with the aid of the included pneumatic lift system.

The 1 gallon size is usually recommended for high viscosity polymer studies. An optional bottom drain valve may be added for convenient product recovery. As with the smaller floor stand models, these larger, self- contained systems can be equipped with a variety of attachments, such as: condensers, solids charging port, bottom drain, special motors, special heaters, jacketed vessels and automatic valves and regulators. Because of the higher wattage heaters for these reactors, all models in the 4550 Series require a 230 volt power supply.



Model 4554 Reactor Fixed Head, Two Gallon Vessel, Pneumatic Lift, Hinged Split Rings, opened to show Internal Fittings and Serpentine Cooling Coil, with 4848 Reactor Controller shown with optional Expansion Modules.

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Series 4550 Pressure Reactor System Specifications				
Shaded bar indicates specifications that change within series.				
Model Number	**4551**	**4552**	**4553**	**4554**
Approximate Sizes, Gallon (Liter)	1 (3.75)	2 (7.99)	1 (3.75)	2 (7.99)
Maximum Pressure (MAWP)	1900 psi (131 bar)			
Maximum Temperature				
with FKM O-ring	225 °C			
with FFKM O-ring	300 °C			
with PTFE Flat Gasket	350 °C			
Vessel Style	Moveable		Fixed Head	
Reactor Mounting	Cart		Floor Stand	
Closure	Split-Ring (10 Compression Bolts for Flat Gasket, no Compression Bolts for O-ring)			
Valve Connections	1/4" NPT Male			
Magnetic Stirrer, Model No.	A1180HC			
Maximum Torque	60 Inch-Pounds			
Impeller(s), 6-Blades	2 (3.85" dia.)			
Pressure Gage, Size	4.5 inches			
Range	0-2000 psi (140 bar)			
Temperature Measurement	Thermowell			
Cooling Coil (Optional)	Serpentine			
Bottom Drain Valve (Optional)	3/8" NPT			
Heater Style	Calrod			
Heater Power, Watts	2250	2700	2250	2700
Stirrer Motor	1/2 hp variable speed			
Lift Mechanism	NA		Pneumatic Lift	
Electrical Supply				
Volts, AC	230			
Maximum Load, amps	13	15	13	15
Cylinder Dimensions				
Inside Diameter, inches	6.0			
Inside Depth, inches	8.6	17.2	8.6	17.2
Weight of Cylinder, pounds	95	120	115	140
Reactor Dimensions				
Width, inches w/o Controller	35		20	
Depth, inches	18		31	
Height, inches	50		75	
Weight, pounds	265	295	315	345
Spare Parts Kit	4559M			
Other options available. See Ordering Guide, visit www.parrinst.com, or call for more information.				

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The innovative Parr Hinged Split-Rings on the 4553 and 4554 add to a safe vessel removal routine. Simply loosen the compression bolts, unlatch the split-ring closures, and pivot the split-rings out of the way.





4551 Moveable Cart Stand Reactor, 1 Gallon, with Bottom Drain Valve, and a 4848 Temperature Controller shown with optional Expansion Modules.

4553 Floor Stand Reactor with Gear Drive, Hinged Split Rings, and heater attached.

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Series 4550 Ordering Guide

The Order No. for the Base System is: **455__-T-SS-HD-230-VS.50-2000-4848**

A composite identification number to be used when ordering a 4550 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	Vessel Style
4551	1 Gallon	Moveable Head, Moveable Cart
4552	2 Gallon	Moveable Head, Moveable Cart
4553	1 Gallon	Fixed Head, Stationary Floor Stand
4554	2 Gallon	Fixed Head, Stationary Floor Stand

B Gasket / Maximum Temperature

-OV	FKM O-ring / 225 °C
-OK	FFKM O-ring / 300 °C
-T	PTFE Compression Gasket / 350 °C

C Materials of Construction

-SS	T316 Stainless Steel
-MO	Alloy 400
-IN	Alloy 600
-HB	Alloy B-2 / B-3
-HC	Alloy C-276
-CS	Alloy 20
-TI2	Titanium Grade 2
-TI4	Titanium Grade 4
-ZR702	Zirconium Grade 702
-ZR705	Zirconium Grade 705

See page 11 for complete list of available alloys.

D Magnetic Stirrer Drive

-HD	Heavy Duty, 60 in-lb
-XHD	Extra Heavy Duty, 120 in-lb
-FMD2	Footless, Heavy Duty, 60 in-lb
-FMD3	Footless, Extra Heavy Duty, 120 in-lb

E Mag. Drive Material of Construction

-MOC Symbol	Indicate Material of Construction

F Electrical Supply

-230	230 VAC

G Motor Option

-VS .50	Variable Speed, 1/2 hp
-XP .50	Explosion Proof Variable Speed, 1/2 hp
-AM .50	Air Motor, 1/2 hp
-VS .75	Variable Speed, 3/4 hp
-GDD	Geared Direct Drive (Fixed Head Units Only)

H Geared Direct Drive Ratio*

-3D	3:1, 0-600 rpm
-5D	5:1, 0-360 rpm
-10D	10:1, 0-180 rpm

** For Geared Direct Drive Motor Option Only.*

I Pressure Gage

-2000	2000 psi / 137 bar
-1000	1000 psi / 70 bar
-600	600 psi / 40 bar
-200	200 psi / 14 bar
-100	100 psi / 7 bar

J Internal Cooling Coil

-SC	Serpentine Coil

K Bottom Drain Valve

-BDV	Bottom Drain Valve 3/8" NPT

L Controller

-4848 (included in base system)	PID Control, Ramp & Soak Programming, Motor Speed Control, and Data logging with Software. For use with up to three additional display modules.
-4848B	Same as above but for use with up to six additional display modules.
-A2110E	Motor Controller
-4871	Process Controller (for enhanced control options)

See Chapter 6 for a complete list of controllers and options.

M 4848 Controller Options

-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
-SVM	Solenoid Valve Module (for cooling control)
-A1925E4	RS-485 to USB Cable for 4848 Controller (required for data logging)
-A1925E6	RS-485 to USB Converter, isolated, 30-ft
-A3504HC	SpecView Software Package for 4848/4838

** The MTM must be installed in conjunction with the MCM.*

N Custom Options (List All Desired)

-AS	Anchor Stirrer
-PS	Paddle Stirrer
-SA	Spiral Stirrer
-GE	Gas Entrainment Stirrer
-BF	Removeable Baffle Set
-CAD	Internal Catalyst Addition Device
-XCAD	External Catalyst Addition Device
-SCP	Solids Charging Port (Ball Valve)
-RC	Reflux Condenser
-RTC	Reflux/Take-Off Condenser
-WJ	Welded Jacket
-ABH	Aluminum Block Heater w/ Cooling Channels

See Chapter 7 for a complete list of optional accessories.

O Certifications

-ASME	ASME Certification
-PED	PED Certification
-CH	China Cerification
-P	Parr Certification

P Spare Parts Kit

-4559M	Spare Parts Kit for 4550 Series

Please note that all options and combinations are not compatible with all models.

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Series 4555 2.6 & 5 Gallon Reactor Systems

Series Number:
4555

Type:
General Purpose

Stand:
Floor Stand

Vessel Mounting:
Moveable or Fixed Head

Vessel Sizes, Gallons (Liters):
2.6 (10) and 5 (18.75)

Standard Pressure MAWP Rating, psi (bar):
1900 (131)

Maximum Operating Temperature, °C:
225 w/ FKM O-ring
300 w/ FFKM O-ring
350 w/ PTFE Flat Gasket

The Model 4555 and 4557 Reactors with their 5 gallon (18.75 L) capacity are the largest stirred reactors offered by Parr. The 4556 and 4558 Models are similar units with a 10 liter (2.6 gal) volume which falls between the larger 5 gallon design and the smaller 1 and 2 gallon models in the 4550 Series. Vessel styles are offered in a moveable head or fixed head design.

These reactors are available with an FKM O-ring seal for operating temperatures to 225 °C, and FFKM O-ring for temperatures to 300 °C, or with a flat, PTFE gasket for operating temperatures up to 350 °C maximum.

In the moveable head design, the vessel is held in a support system which minimizes the physical effort required to handle these heavy components. The hoist is attached to a support column which provides a convenient means for lifting the head and cylinder out of the stand. These components may be transferred to the holding position on the right side of the stand. Vessels equipped with a bottom drain valve will probably remain in the heater most of the time, but can be lifted out when necessary.

The fixed head support stand features hinged split-rings that swing to either side allowing the head to remain fixed to the stand while a pneumatic lift allows the cylinder to be raised and lowered. When lowered, the cylinder can be slid forward for cleaning and servicing.

These reactors are generally used for pilot plant or for custom chemical production purposes, usually with a variety of attachments added to the basic units. Various heaters, larger motors, heavier stirrer drives and remote controls appropriate to the size of these reactors have been designed and are available. ***Modified versions of these units are available with higher working pressures and temperatures.***



4557 Floor Stand Reactor, Flexible Mantle Heater, with Split Rings and Pneumatic Lift. Below: Hinged Split Rings open revealing Serpentine Cooling Coil, with Heater and Vessel lowered via Pneumatic Lift.



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Series 4555 Pressure Reactor System Specifications				
Shaded bar indicates specifications that change within series.				
Model Number	**4555**	**4556**	**4557**	**4558**
Sizes, Gallon (Liter)	5 (18.75)	2.6 (10)	5 (18.75)	2.6 (10)
Maximum Pressure (MAWP)	1900 psi (131 bar)			
Maximum Temperature				
with FKM O-ring	225 °C			
with FFKM O-ring	300 °C			
with PTFE Flat Gasket	350 °C			
Vessel Style	Moveable Head		Fixed Head	
Reactor Mounting	Table Floor Stand		Floor Stand	
Closure	Split-Ring (12 Compression Bolts for Flat Gasket, no Compression Bolts for O-ring)			
Valve Connections	3/8" NPT Male			
Magnetic Stirrer, Model No.	A1750HC			
Maximum Torque	60 Inch-Pounds			
Impeller(s), 6-Blades	2 (5.25" dia.)	2 (3.85" dia.)	2 (5.25" dia.)	2 (3.85" dia.)
Pressure Gage, Size	4.5 inches			
Range	0-2000 psi (140 bar)			
Temperature Measurement	Thermowell			
Cooling Coil	Serpentine			
Bottom Drain Valve (Optional)	1.0" NPT			
Heater Style	Ceramic, 3-Zone		Band Heater, 3-Zone	
Heater Power, Watts	4500	4250	5500	3300
Stirrer Motor	3/4 hp variable speed			
Electrical Supply				
Volts, AC	230-1P or 400-415V 3-Phase "Y"			
Maximum Load	1P-30 amps or 3P-15 amps/leg			
Cylinder Dimensions				
Inside Diameter, inches	9.5	7.75	9.5	7.75
Inside Depth, inches	16.25	12.2	16.25	12.2
Weight of Cylinder, pounds	375	250	375	250
Reactor Dimensions				
Width, inches w/o Controller	63		31	
Depth, inches	25		43	
Height, inches	91		95	87
Weight, pounds	1000	900	1000	900
Spare Parts Kit	4559PCM		4559PDM	
Other options available. See Ordering Guide, visit www.parrinst.com, or call for more information.				

Because of considerable power requirements for a unit this size, 3-phase power is typical. Single phase 230 VAC is also possible, but requires a power source capable of supplying over 40 amps, well beyond the limits of most laboratory power supplies.

Users are advised to have a qualified electrician install a suitable 3-phase "Y" power supply. Parr Technical Support will be happy to assist with electrical specifications.

Systems with lower electrical requirements such as jacketed systems or lower wattage mantle heaters may be able to use single phase effectively.

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4556 Table Floor Stand Reactor, 10 Liter Moveable Vessel, Electric Hoist, and a 4848 Controller shown with optional Expansion Modules.



10 Liter Stirred Vessel removed from heater.



Model 4556 Reactor, 10 Liter Vessel, with head removed.

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Series 4555 Ordering Guide

The Order No. for the Base System is: **455__-T-SS-HD-230-VS.75-2000-SC-C3-4848-ASME**

A composite identification number to be used when ordering a 4555 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	Vessel Style
4555	5 Gallon	Moveable Head
4556	10 Liter	Moveable Head
4557	5 Gallon	Fixed Head
4558	10 Liter	Fixed Head

B Gasket / Maximum Temperature

-OV	FKM O-ring / 225 °C
-OK	FFKM O-ring / 300 °C
-T	PTFE Compression Gasket / 350 °C

C Materials of Construction

-SS	T316 Stainless Steel
-MO	Alloy 400
-IN	Alloy 600
-HB	Alloy B-2 / B-3
-HC	Alloy C-276
-CS	Alloy 20
-TI2	Titanium Grade 2
-TI4	Titanium Grade 4
-ZR702	Zirconium Grade 702
-ZR705	Zirconium Grade 705

See page 11 for complete list of available alloys.

D Magnetic Stirrer Drive

-HD	Heavy Duty, 60 in-lb
-XHD	Extra Heavy Duty, 120 in-lb
-FMD2	Footless Magnetic Drive, 60 in-lb
-FMD3	Footless Magnetic Drive, 120 in-lb

E Mag. Drive Material of Construction

-MOC Symbol	Indicate Material of Construction

F Electrical Supply

-230	230 VAC, Single Phase
-400	400-415V 3-Phase "Y"

G Motor Option

-VS .75	Variable Speed, 3/4 hp
-XP .75	Explosion Proof Variable Speed, 3/4 hp
-AM .100	Air Motor, 1 hp
-GDD	Geared Direct Drive (Fixed Head Only)

H Geared Direct Drive Ratio*

-3D	3:1, 0-600 rpm
-5D	5:1, 0-360 rpm
-10D	10:1, 0-180 rpm

* for -GDD Motor Option Only

I Pressure Gage

-2000	2000 psi / 137 bar
-1000	1000 psi / 70 bar
-600	600 psi / 40 bar
-200	200 psi / 14 bar
-100	100 psi / 7 bar

J Internal Cooling Coil

-SC	Serpentine Coil

K Bottom Drain Valve

-BDV	Bottom Drain Valve, 1" NPT

L Heater Options

-C3	Ceramic, 3-Zone (4555/4556)
-B3	Band Heaters, 3-Zone
-WJ	Welded Jacket
-MH	Flexible Mantle Heater, 1-zone, 2500 W, 200 °C Max.

M Head Lift Mechanism (Table Floor Stand only)

-EH	Electric Hoist (115 VAC)

N Controller

-4848 (included in base system)	PID Control, Ramp & Soak Programming, Motor Speed Control, and Data logging with Software. For use with up to three additional display modules.
-4848B	Same as above but for use with up to six additional display modules.
-A2110E	Motor Controller
-4871	Process Controller (for enhanced control options)

See Chapter 6 for a complete list of controllers and options.

O 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
-SVM	Solenoid Valve Module (for cooling control)
-A1925E4	RS-485 to USB Cable for 4848 Controller (required for data logging)
-A1925E6	RS-485 to USB Converter, isolated, 30-ft
-A3504HC	SpecView Software Package for 4848/4838

** The MTM must be installed in conjunction with the MCM.*

P Custom Options (List All Desired)

-AS	Anchor Stirrer
-PS	Paddle Stirrer
-SA	Spiral Stirrer
-GE	Gas Entrainment Stirrer
-BF	Removeable Baffle Set
-XCAD	External Catalyst Addition Device
-SCP	Solids Charging Port (Ball Valve)
-RC	Reflux Condenser
-RTC	Reflux/Take-Off Condenser
-WJ	Welded Jacket
-ABH	Aluminum Block Heater

See Chapter 7 for a complete list of optional accessories.

Q Certifications

-ASME	ASME Certification
-PED	PED Certification
-CH	China Certification
-P	Parr Certification

R Spare Parts Kit

-4559PCM	Spare Parts Kit for 4555 and 4557
-4559PDM	Spare Parts Kit for 4556 and 4558

Please note that all options and combinations are not compatible with all models.

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Series 4560 Mini Reactor Systems

Series Number:
4560

Type:
Mini

Stand:
Bench Top

Vessel Mounting:
Moveable or Fixed Head

Sizes, mL:
100 - 600

Standard Temperature MAWP Rating, psi (bar):
3000 (200)

High Temperature (HT) MAWP Rating psi (bar):
2000 (138)

Standard Maximum Operating Temp., °C:
225 w/ FKM O-ring
300 w/ FFKM O-ring
350 w/ PTFE Flat Gasket

High Temperature (HT) Maximum Operating Temperature, °C:
500 w/ FG Flat Gasket

These are the most popular of all Parr Stirred Reactors. Although they are called "Mini" reactors, they offer a range of sizes large enough to work with significant sample sizes, yet small enough to be handled with ease by all operators.

They are made in both fixed head and moveable vessel styles and are available with an FKM O-ring seal for operating temperatures to 225 °C, and FFKM O-ring for temperatures to 300 °C, or with a flat, PTFE gasket for operating temperatures up to 350 °C maximum.

Choosing the high temperature option (HT) boosts the maximum temperature to 500 °C, but de-rates the MAWP to 2000 psi (138 bar). Standard Mini reactors can be converted to high temperature reactors (500 °C max temperature and 2000 psi MAWP) by changing the head assembly (contains cone connections, high temperature valves, and graphoil gasket) replacing the heater with a ceramic fiber heater and replacing the split ring. Contact Parr Instrument Company for details.

Although internal and external space is limited in these small vessels, gas entrainment impellers, catalyst baskets, condensers and other options are available. All reactors in this series can also be easily converted from one size to another by simply substituting a longer or shorter cylinder with the corresponding internal fittings and heaters.

The support system for these Mini Reactors is designed specifically to provide stability at stirring speeds up to 1700 rpm, in a compact mounting small enough to fit into a laboratory hood. The support system can also be adapted to accept any of the smaller vessels from the 4590 Micro Reactor Series.



4566 Mini Reactor, 300 mL, Fixed Head, Quick-release Split Ring, and a 4848 Controller shown with optional Expansion Modules.



4566 with Aluminum Block Heater, Bottom Drain Valve, and a 4848 Controller shown with optional Expansion Modules.

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Series 4560 Pressure Reactor System Specifications										
Shaded bar indicates specifications that change within series.										
Model Number	**4561**	**4562**	**4563**	**4564**	**4565**	**4566**	**4567**	**4568**	**4566B**	**4566C**
Sizes, mL	300	450	600	160	100	300	450	600	160	100
Maximum Pressure (MAWP)	3000 psi (200 bar)									
HT Max. Pressure (MAWP)	2000 psi (138 bar)									
Maximum Temperature										
with FKM O-ring	225 °C									
with FFKM O-ring	300 °C									
with PTFE Flat Gasket	350 °C									
with FG Flat Gasket (HT)	500 °C			NA		500 °C			NA	
Vessel Style	Moveable					Fixed Head				
Reactor Mounting	Bench Top									
Closure	Split-Ring (6 Compression Bolts for Flat Gasket, no Compression Bolts for O-ring)									
Valve Connections	1/8" NPT Male									
Magnetic Stirrer, Model No.	A1120HC6									
Maximum Torque	16 Inch-Pounds									
Impeller(s), 4-Blade, 1.38" dia.	1	1	2	1	1	1	1	2	1	1
Pressure Gage, Size	3.5 inches									
Range, Standard Temp.	0-3000 psi (200 bar)									
Range, High Temperature	0-2000 psi (137 bar)									
Temperature Measurement	Fixed Thermocouple (Thermowell for special alloys)									
Cooling Coil	Included			Not Included		Included			Not Included	
Style	Single Loop (Optional Serpentine Style)									
Bottom Drain Valve	1/4" NPT (Not available on HT Models.)									
Heater Style	Mantle			Clamp-on		Mantle			Clamp-on	
Heater Power, Watts	510	590	780	500		510	590	780	500	
Heater Style w/ HT Option	Ceramic Fiber			N/A		Ceramic Fiber			N/A	
Heater Power, Watts	800	800	1100	—		800	800	1100	—	
Stirrer Motor	1/8 hp variable speed									
Electrical Supply										
Volts, AC	115 or 230									
Maximum Load, amps, 115 / 230	10 / 5 (14 / 7 High Temperature)									
Cylinder Dimensions										
Inside Diameter, inches	2.5	2.5	2.5	2.5	2	2.5	2.5	2.5	2.5	2
Inside Depth, inches	4	6	8	2	2	4	6	8	2	2
Weight of Cylinder, pounds	10	13	16	8	9	12	15	18	8	9
Reactor Dimensions										
Width, inches w/o Controller	12									
Depth, inches	18									
Height, inches*	28	32	36	28	28	28	32	36	28	28
Weight, pounds w/ Controller	60	63	66	60	60	62	65	68	60	60
Spare Parts Kit	4569M									
* Height increases 4-inches with the Bottom Drain Valve option.										
Other options available. See Ordering Guide, visit www.parrinst.com, or call for more information.										

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Model 4563 Mini Reactor, 600 mL, Moveable Vessel, PTFE Flat Gasket Seal, with vessel disassembled, and a 4848 Controller shown with optional Expansion Modules.



4560 Reactor Vessels from left to right, 300 mL, 100 mL, 450 mL, 160 mL, and 600 mL.

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Series 4560 Ordering Guide

The Order No. for the Base System is: **456__-T-SS-M-115-VS.12-2000-4848**

A composite identification number to be used when ordering a 4560 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	Vessel Style
4561	300 mL	Moveable Head
4562	450 mL	Moveable Head
4563	600 mL	Moveable Head
4564	160 mL*	Moveable Head
4565	100 mL *	Moveable Head
4566	300 mL	Fixed Head
4567	450 mL	Fixed Head
4568	600 mL	Fixed Head
4566B	160 mL*	Fixed Head
4566C	100 mL*	Fixed Head

* High temperature option not available.

B High Temperature Option

-No Symbol	Standard Configuration: 3000 psi / 200 bar
-HT	2000 psi / 138 bar @ 500 °C

C Gasket / Maximum Temperature

-OV	FKM O-ring / 225 °C
-OK	FFKM O-ring / 300 °C
-T	PTFE Flat Compression Gasket / 350 °C
-FG	Flexible Graphite Gasket / 500 °C

D Material of Construction

-SS	T316 Stainless Steel
-MO	Alloy 400*
-IN	Alloy 600
-HB	Alloy B-2 / B-3*
-HC	Alloy C-276
-CS	Alloy 20*
-TI2	Titanium Grade 2*
-TI4	Titanium Grade 4*
-ZR702	Zirconium Grade 702*
-ZR705	Zirconium Grade 705*

See page 11 for complete list of available alloys.

* Not available for HT option

E Magnetic Stirrer Drive

-M	General Purpose, 16 in-lb
-FMD1	Footless, 16 in-lb

F Stirrer Drive Material of Construction

-MOC Symbol	Indicate Material of Construction

G Electrical Supply

-115	115 VAC
-230	230 VAC

H 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

I Pressure Gage

-3000	3000 psi / 200 bar	-600	600 psi / 14 bar
-2000	2000 psi / 137 bar	-200	200 psi / 40 bar
-1000	1000 psi / 70 bar	-100	100 psi / 7 bar

J Internal Cooling Coil

-CL	Internal Cooling Loop

K Bottom Drain Valve

-BDV	Bottom Drain Valve (Not Available on High Temperature Vessels)

L Controller

-4848 (included in base system)	PID Control, Ramp & Soak Programming, Motor Speed Control, and Data logging with Software. For use with up to three additional display modules.
-4848B	Same as above but for use with up to six additional display modules.
-A2110E	Motor Controller
-4871	Process Controller (for enhanced control options)

See Chapter 6 for a complete list of controllers and options.

M 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
-SVM	Solenoid Valve Module (for cooling control)
-A1925E4	RS-485 to USB Cable for 4848 Controller (required for data logging)
-A1925E6	RS-485 to USB Converter, isolated, 30-ft
-A3504HC	SpecView Software Package for 4848/4838

** The MTM must be installed in conjunction with the MCM.*

N Custom Options (List All Desired)

-AS	Anchor Stirrer
-PS	Paddle Stirrer
-SA	Spiral Stirrer
-GE	Gas Entrainment Stirrer
-BF	Removeable Baffle Set
-SB	Static Catalyst Basket
-CAD	Internal Catalyst Addition Device
-XCAD	External Catalyst Addition Device
-SCP	Solids Charging Port (Ball Valve)
-RC	Reflux Condenser
-RTC	Reflux/Take-Off Condenser
-WJ	Welded Jacket
-ABH	Aluminum Block Heater w/ Cooling Channels

See Chapter 7 for a complete list of optional accessories.

O Certifications

-ASME	ASME Certification
-PED	PED Certification
-CH	China Certification
-P	Parr Certification

P Spare Parts Kit

-4569M	Spare Parts Kit for 4560 Series
-4569HT	Spare Parts Kit for 4560HT Series

Please note that all options and combinations are not compatible with all models.

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Series 4570/80 High Temperature/High Pressure Reactor Systems

Series Number:
4570/80

Type:
High Temperature High Pressure

Stand:
Bench Top, Floor Stand or Cart

Vessel Mounting:
Moveable or Fixed Head

Vessel Sizes, mL:
250-5500

Standard Pressure MAWP Rating, psi (bar):
3000 (200) 4580
5000 (345) 4570

Maximum Operating Temperature, °C:
500 w/ FG Flat Gasket

Parr offers a number of different reactors in the 4570 and 4580 Series in a variety of sizes and with different mountings for operating pressures to 5000 psi (345 bar) and temperatures to 500 °C.

4571 - 4572 Reactors
These are 1000 and 1800 mL moveable head reactors mounted in movable carts.

4577 - 4578 Reactors
These are 1000 and 1800 mL fixed head reactors mounted on a floor stand with pneumatic lift.

4575 - 4576A Reactors
These are 500 and 250 mL bench top reactors with 5000 psi (345 bar) and 500 °C ratings. They are available as either moveable or fixed head vessels.

4581 - 4582 Reactors
These 1 gallon (3.75 L) and 1.5 gallon (5.5 L) reactors are designed for 3000 psi (200 bar) maximum pressure with a 500 °C maximum working temperature and mounted on movable carts.

4583 - 4584 Reactors
These are 1 gallon (3.75 L) and 1.5 gallon (5.5 L) fixed head reactors mounted on floor stands with pneumatic lift.

All of these reactors have been designed with suitable valves, fittings and modifications to the vessel itself to operate at the higher temperature and pressure ratings.

Flat, flexible graphite (FG) gaskets are used for temperatures in the higher range to 500 °C. These can be replaced with PTFE gaskets for procedures in which the temperature will not exceed 350 °C.



Model 4577 High Temperature/High Pressure Reactor, Floor Stand, Fixed Head 1000 mL with Heater and Pneumatic Lift.



The Series 4570/80 High Temperature/High Pressure Reactors come in three configurations, from left to right: Bench Top (250 & 500 mL Only), Floor Stand, and Cart.

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Series 4570/80 Pressure Reactor System Specifications						
Shaded bar indicates specifications that change within series.						
Model No. – Moveable Vessel	**4571**	**4572**	**4581**	**4582**	**4575B**	**4576B**
Model No. – Fixed Head	**4577**	**4578**	**4583**	**4584**	**4575A**	**4576A**
Reactor Mounting	Cart / Floor Stand		Cart / Floor Stand		Bench Top	
Sizes, mL	1000	1800	3750	5500	500	250
Maximum Pressure, MAWP	5000 psi (345 bar)		3000 psi (200 bar)		5000 psi (345 bar)	
Maximum Temperature						
with FG Flat Gasket	500 °C					
Vessel Details						
Closure (Compression Bolts)	Split-Ring (12 Compression Bolts for Flat Gasket, no Compression Bolts for O-ring)		Split-Ring (16 Compression Bolts for Flat Gasket, no Compression Bolts for O-ring)		Split-Ring (8 Compression Bolts for Flat Gasket, no Compression Bolts for O-ring)	
Valve Connections	1/4" NPT Female					
Magnetic Stirrer, Model No.	A1120HC		A1180HC		A1120HC	
Maximum Torque	16 Inch-Pounds		60 Inch-Pounds		16 Inch-Pounds	
Impeller(s), 6-Blade (4-blade)	2 (2" dia.)		2 (3.5" dia.)		2 (.81/1.38" dia.)	
Pressure Gage, Size	4.5 inches					
Range	0-5000 psi (345 bar)					
Temperature Measurement	Thermowell					
Cooling Coil	Included					
Style	Serpentine		Serpentine		Single Loop	
Bottom Drain Valve	1" NPS (Floor stand supports only)					
Heater Style	Ceramic: Fixed Head, Calrod: Removeable				Ceramic	
Heater Power, Watts	2800		2800		1400 at 115 Volts	
Stirrer Motor, Variable Speed	1/4 hp		1/2 hp		1/8 hp	
Electrical Supply						
Volts, AC	230		230		115 or 230	
Maximum Load, amps, 115 / 230	15	15	15		15 / 9	
Cylinder Dimensions						
Inside Diameter, inches	3.75		5.5		2.5	
Inside Depth, inches	6.2	10.5	9.7	15	6.6	3.2
Weight of Moveable Vessel, pounds	70	85	100	130	35	29
Weight of Fixed Vessel, pounds	85	100	120	160	37	31
Reactor Dimensions						
Moveable Width x Depth x Height, in.	Cart: 35 x 18 x 50		Cart: 35 x 18 x 50		Bench Top: 17 x 24 x 42	
Fixed Width x Depth x Height, in.	Floor Stand: 20 x 31 x 75		Floor Stand: 20 x 31 x 75			
Moveable Weight w/Controller, pounds	245	265	325	355	125	120
Fixed Weight w/Controller, pounds	265	285	345	375	127	122
Spare Parts Kit	4579B		4589B		4579D	
Other options available. See Ordering Guide, visit www.parrinst.com, or call for more information.						

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Series 4570/80 High Temperature/High Pressure Reactor Systems

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Model 4581 High Temperature/High Pressure Reactor, with One Gallon Moveable Vessel, and a 4848 Reactor Controller with optional Expansion Modules.



Model 4576A HT/HP Reactor, Fixed Head Bench Top, with 250 mL Vessel.



Model 4575B High Pressure/High Temperature 500 mL Moveable Vessel Assembly.

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Series 4570/80 Ordering Guide

The Order No. for the Base System is: **457__ or 458__-FG-M or HD-SS-115 or 230-VS.__-5000-4848**

A composite identification number to be used when ordering a 4570 or 4580 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	Size	Vessel Style
4571	1000 mL	Moveable Head, Moveable Cart
4572	1800 mL	Moveable Head, Moveable Cart
4575B	500 mL	Moveable Head, Bench Top
4576B	250 mL	Moveable Head, Bench Top
4575A	500 mL	Fixed Head, Bench Top
4576A	250 mL	Fixed Head, Bench Top
4577	1000 mL	Fixed Head, Stationary Floor Stand
4578	1800 mL	Fixed Head, Stationary Floor Stand
4581	1.0 Gallon	Moveable Head, Moveable Cart
4582	1.5 Gallon	Moveable Head, Moveable Cart
4583	1.0 Gallon	Fixed Head, Stationary Floor Stand
4584	1.5 Gallon	Fixed Head, Stationary Floor Stand

B Gasket / Maximum Temperature

-FG	Flexible Graphite Gasket, 500 °C
-T	PTFE Compression Gasket, 350 °C

C Materials of Construction

-SS	T316 Stainless Steel
-MO	Alloy 400*
-IN	Alloy 600
-HB	Alloy B-2 / B-3*
-HC	Alloy C-276
-CS	Alloy 20*
-TI2	Titanium Grade 2*
-TI4	Titanium Grade 4*
-ZR702	Zirconium Grade 702*
-ZR705	Zirconium Grade 705*

See page 11 for complete list of available alloys.

*Maximum temperature and/or pressure limited.

D Magnetic Stirrer Drive

-M	General Purpose, 16 in-lb
-FMD	Footless, General Purpose, 16 in-lb

E Magnetic Stirrer Drive for 4571-4584 Only

-M	General Purpose , 16 in-lb
-HD	Heavy Duty, 60 in-lb
-XHD	Extra Heavy Duty, 120 in-lb
-FMD1	Footless, 16 in-lb.
-FMD2	Footless, Heavy Duty, 60 in-lb
-FMD3	Footless, Extra Heavy Duty, 120 in-lb

F Mag. Drive Material of Construction

-MOC Symbol	Indicate Material of Construction

G Electrical Supply

-115	115 VAC (4575-4576 Only)
-230	230 VAC

H Motor Option

-VS .12	Variable Speed, 1/8 hp (4575-4576 Only)
-VS .25	Variable Speed, 1/4 hp
-VS .50*	Variable Speed, 1/2 hp
-XP .25	Explosion Proof Variable Speed, 1/4 hp
-XP .50*	Explosion Proof Variable Speed, 1/2 hp
-AM .25	Air Motor, 1/4 hp (4575-4576 Only)
-AM .50*	Air Motor, 1/2 hp
-GDD	Geared Direct Drive (Fixed Head Unit Only)

* For use with -HD Magnetic Stirrer Drive. Only available on 230V systems.

I Pressure Gage

-2000	2000 psi / 137 bar
-3000	3000 psi / 200 bar
-5000	5000 psi / 345 bar

J Bottom Drain Valve

-BDV	Bottom Drain Valve (Not available on 250 mL or Bench Top Systems.)

K Controller

-4848 (included in base system)	PID Control, Ramp & Soak Programming, Motor Speed Control, and Data logging with Software. For use with up to three additional display modules.
-4848B	Same as above but for use with up to six additional display modules.
-A2110E	Motor Controller
-4871	Process Controller (for enhanced control options)

See Chapter 6 for a complete list of controllers and options.

L 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
-SVM	Solenoid Valve Module (for cooling control)
-A1925E4	RS-485 to USB Cable for 4848 Controller (required for data logging)
-A1925E6	RS-485 to USB Converter, isolated, 30-ft
-A3504HC	SpecView Software Package for 4848/4838

** The MTM must be installed in conjunction with the MCM.*

M Custom Options (List All Desired)

-AS	Anchor Stirrer
-PS	Paddle Stirrer
-SA	Spiral Stirrer
-GE	Gas Entrainment Stirrer
-BF	Removeable Baffle Set
-SB	Static Catalyst Basket
-DB	Dynamic Catalyst Basket
-CAD	Internal Catalyst Addition Device
-XCAD	External Catalyst Addition Device
-SCP	Solids Charging Port (Ball Valve)
-RC	Reflux Condenser
-RTC	Reflux/Take-Off Condenser
-WJ	Welded Jacket

See Chapter 7 for a complete list of optional accessories.

N Certifications

-ASME	ASME Certification
-PED	PED Certification
-CH	China Certification
-P	Parr Certification

O Spare Parts Kit

-4579B	Spare Parts Kit for 4571, 4572, 4577, 4578
-4579D	Spare Parts Kit for 4575A, 4576A, 4575B, 4576B
-4589D	Spare Parts Kit for 4581, 4582, 4583, 4584

Please note that all options and combinations are not compatible with all models.

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Series 4590 Micro Reactor Systems

Series Number:
4590

Type:
Micro

Stand:
Bench Top

Vessel Mounting:
Moveable or Fixed Head

Sizes, mL:
25, 50, 100

Standard Pressure MAWP Rating, psi (bar):
3000 (200)

High Pressure (HP) MAWP Rating, psi (bar):
5000 (345)

Standard Maximum Operating Temp., °C:
225 w/ FKM O-ring
300 w/ FFKM O-ring
350 w/ PTFE Flat Gasket

High Temperature (HT) / High Pressure (HP) Maximum Operating Temperature, °C:
500 w/ FG Flat Gasket (Fixed Head Only)

These are the smallest of all Parr Stirred Reactors. They will be a good choice for chemists working with very expensive materials or materials only available in small amounts. They will also appeal to users who wish to minimize the risks associated with hazardous materials or reactions by restricting the reactants or products to a minimum. Use of the Series 4590 Reactors also helps minimize the quantities of waste products which may require special disposal procedures. The 4590 systems are now available in high pressure (5000 psi) or high pressure/high temperature (500 °C) versions.

These micro reactors have been designed to provide as many of the features of the larger vessels as possible in the limited space available. All of the standard head fittings are provided, with optional cooling now available with aluminum block heaters with cooling capability, welded jackets or Cold Fingers.

These systems are offered in both fixed head and moveable head vessel styles with choices of a self sealing FKM O-ring for temperatures up to 225 °C or with FFKM O-ring for temperatures to 300 °C or with a flat PTFE gasket for temperatures to 350 °C, or with an FG Flexible Graphite gasket for temperatures to 500 °C with the HP/HT option (for fixed head versions only). A split ring closure is standard.

All three volumes use the same ceramic fiber heater.



4598 Micro Reactor, Fixed Head, 100 mL HP/HT Vessel

These micro reactors can be easily converted from one size to another by simply substituting a larger or smaller cylinder and the corresponding internal fittings. The support system can also be readily adapted to accept any of the vessels from the 4560 Mini Reactor Series. The opportunity to modify these small reactors is restricted because of the limited head space available.

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Series 4590 Pressure Reactor System Specifications						
Shaded bar indicates specifications that change within series.						
Model Number	**4591**	**4592**	**4593**	**4596**	**4597**	**4598**
Sizes, mL	25	50	100	25	50	100
Maximum Pressure (MAWP)	3000 psi (200 bar)					
HP, HP/HT Max. Pressure (MAWP)	5000 psi (345 bar)					
Maximum Temperature						
with FKM O-ring	225 °C					
with FFKM O-ring	300 °C					
with PTFE Flat Gasket	350 °C					
with FG Flexible Graphite, Flat Gasket (HP/HT)	500 °C					
Vessel Style	Moveable			Fixed Head		
Reactor Mounting	Bench Top					
Closure	Split-Ring (6 Cap Screws)					
Valve Connections	1/8" NPT Male, 1/4" NPT Male for HP, 1/4" NPT Female for HP/HT					
Magnetic Stirrer, Model No.	A1120HC6					
Maximum Torque	16 Inch-Pounds					
Impeller, 4-Blade	1 (.81" dia.)					
Pressure Gage, Size	3.5 inches					
Range	0-3000 psi (200 bar), 0-5000 psi (345 bar) HP, HP/HT					
Temperature Measurement	Fixed Thermocouple (Thermowell for special alloys)					
Cold Finger	Optional					
Bottom Drain Valve	N / A					
Heater Style	Ceramic Fiber Heater					
Heater Power, Watts	700					
Stirrer Motor	1/8 hp Variable Speed					
Electrical Supply						
Volts, AC	115 or 230					
Maximum Load, amps, 115 / 230	7 / 4			7 / 4		
Maximum Load, amps, HP/HT, 115 / 230	NA			7 / 4		
Cylinder Dimensions						
Inside Diameter, inches	1.0	1.3	1.3	1.0	1.3	1.3
Inside Depth, inches	2.0	2.3	4.6	2.0	2.3	4.6
Weight of Cylinder, pounds	7	7	8	7	7	8
Reactor Dimensions						
Width, inches w/o Controller	12					
Depth, inches	18					
Height, inches*	27		35	27		35
Weight, pounds	55	55	56	56	56	57
Spare Parts Kit	4599M					
* Add 8" to height for Aluminum Block Heater.						
Other options available. See Ordering Guide, visit www.parrinst.com, or call for more information.						

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Model 4598 Reactor, 100 mL Fixed Head Vessel, with PTFE Compression Gasket, and Split Ring Closure, Mantle Heater, shown with a 4848 Reactor Controller with optional Expansion Modules.



Model 4593 100 ml stirred vessel.



Model 4597 100 ml HP/HT stirred vessel.

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Series 4590 Ordering Guide

The Order No. for the Base System is: **459__-T-SS-M-115-VS.12-3000-4848**

A composite identification number to be used when ordering a 4590 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	Size	Vessel Style
4591	25 mL	Moveable Head
4592	50 mL	Moveable Head
4593	100 mL	Moveable Head
4596	25 mL	Fixed Head
4597	50 mL	Fixed Head
4598	100 mL	Fixed Head

B Temperature / Pressure Options

-No Symbol	3000 psi (345 bar) @ 350 °C
-HP	5000 psi (345 bar) @ 350 °C
-HP/HT*	5000 psi (345 bar) @ 500 °C

* Fixed Head Only

C Gasket / Maximum Temperature

-OV	FKM O-ring / 225 °C
-OK	FFKM O-ring / 300 °C
-T	PTFE Flat Gasket / 350 °C
-FG	Flexible Graphite / 500 °C (HP/HT option only)

D Material of Construction

-SS	T316 Stainless Steel
-MO	Alloy 400*
-IN	Alloy 600
-HB	Alloy B-2/B-3*
-HC	Alloy C-276
-CS	Alloy 20*
-TI2	Titanium Grade 2*
-TI4	Titanium Grade 4*
-ZR702	Zirconium Grade 702*
-ZR705	Zirconium Grade 705*

See page 11 for complete list of available alloys.

* Maximum temperature and/or pressure limited.

E Stirrer Drive

-M	General Purpose Magnetic

F Mag. Drive Material of Construction

-MOC Symbol	Indicate Material of Construction

G Electrical Supply

-115	115 VAC
-230	230 VAC

H 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
-XP .25X	ATEX Explosion Proof Variable Speed (.18 KW, 0-1300 rpm)
-AM .25	Air Motor, 1/4 hp

I Pressure Gage

-5000	5000 psi / 345 bar
-3000	3000 psi / 200 bar
-2000	2000 psi / 137 bar
-1000	1000 psi / 70 bar
-600	600 psi / 40 bar
-200	200 psi / 14 bar
-100	100 psi / 7 bar

J Controller

-4848 (included in base system)	PID Control, Ramp & Soak Programming, Motor Speed Control, and Data logging with Software. For use with up to three additional display modules.
-4848B	Same as above but for use with up to six additional display modules.
-A2110E	Motor Controller
-4871	Process Controller (for enhanced control options)

See Chapter 6 for a complete list of controllers and options.

K 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
-SVM	Solenoid Valve Module (for cooling control)
-A1925E4	RS-485 to USB Cable for 4848 Controller (required for data logging)
-A1925E6	RS-485 to USB Converter, isolated, 30-ft
-A3504HC	SpecView Software Package for 4848/4838

** The MTM must be installed in conjunction with the MCM.*

L Custom Options (List All Desired)

-GE	Gas Entrainment Stirrer
-BF	Removeable Baffle Set
-XCAD	External Catalyst Addition Device
-SCP	Solids Charging Port (Ball Valve)
-RC	Reflux Condenser
-RTC	Reflux/Take-Off Condenser
-WJ	Welded Jacket
-ABH	Aluminum Block Heater with Cooling Channels

See Chapter 7 for a complete list of optional accessories.

M Certifications

-ASME	ASME Certification
-PED	PED Certification
-CH	China Certification
-P	Parr Certification

N Spare Parts Kit

-4599	Spare Parts Kit for 4590 Series
-4599HPHT	Spare Parts Kit for 4590HPHT Series

Please note that all options and combinations are not compatible with all models.

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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 (Glass)
300 (Metal)



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

The Parr series 5100 Low Pressure Reactors offer:

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. 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 an 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 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.

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 optional PTFE coating.

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-

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Split Ring for Glass Reactors.



Split Ring for Metal Reactors.

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 or metal 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.

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.

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

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Series 5100 Low Pressure Reactors

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					
with FFKM O-ring, Glass Vessel	225 °C					
with FFKM O-ring, Metal Vessel	300 °C					
Vessel Style	Fixed Head					
Reactor Mounting	Bench Top					
Closure	Glass Vessels: 6 Thumb Screws, Metal Vessels: Split-Rings (6 Compression Bolts)					
Valve Connections	1/8" Male NPT					
Magnetic Stirrer, Model No.	A1120HC9					
Maximum Torque	16 Inch-Pounds					
Impeller(s)	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	9 / 5					
Cylinder 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.						

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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	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

-GL	Glass Jacketed
-G	Glass
-MJ	Metal Jacketed
-M	Metal

C Gasket

-OV	FKM O-ring
-OK	FFKM O-ring

D Materials of Construction

-SS	T316 Stainless Steel
-MO	Alloy 400
-IN	Alloy 600
-HB	Alloy B-2 / B-3
-HC	Alloy C-276
-CS	Alloy 20
-TI2	Titanium Grade 2
-TI4	Titanium Grade 4
-ZR702	Zirconium Grade 702
-ZR705	Zirconium Grade 705

See page 11 for complete list of available alloys.

E Magnetic Stirrer Drive

-M	General Purpose, 16 in-lb
-FMD1	Footless, General Purpose, 16 in-lb

F Mag. Drive Material of Construction

-MOC Symbol	Indicate Material of Construction

G Electrical Supply

-115	115 VAC
-230	230 VAC

H 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

I Pressure Gage

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

J Heater

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

K Controller

-4848	PID Control, Ramp & Soak Programming, Motor Speed Control, and Data logging with Software. For use with up to three additional display modules
-4848B	Same as 4848 but with up to six additional modules
-A2110E	Motor Controller
-4871	Process Controller (for enhanced control options)

See Chapter 6 for a complete list of controllers and options.

L 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
-SVM	Solenoid Valve Module (for cooling control)
-A1925E4	RS-485 to USB Cable for 4848 Controller (required for data logging)
-A1925E6	RS-485 to USB Converter, isolated, 30-ft
-A3504HC	SpecView Software Package for 4848/4838

** The MTM must be installed in conjunction with the MCM.*

M Custom Options (List All Desired)

-PS	Paddle Stirrer, 300 mL and Larger
-GE	Gas Entrainment Stirrer
-4B	4-Bladed Stirrer Impeller, 160-600 mL
-6B	6-Bladed Stirrer Impeller, 1000-1500 mL
-XCAD	External Catalyst Addition Device
-SCP	Solids Charging Port (Ball Valve)
-RC	Reflux Condenser
-RTC	Reflux/Take-Off Condenser

See Chapter 7 for a complete list of optional accessories.

N Certifications

-ASME	ASME Certification
-PED	PED Certification
-CH	China Certification
-P	Parr Certification

O Spare Parts Kit

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

Please note that all options and combinations are not compatible with all models.

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Series 5500 High Pressure Compact Laboratory Reactors

Series Number:
5500

Type:
High Pressure Compact

Stand:
Bench Top

Vessel Mounting:
Moveable

Sizes, mL:
25-600

Standard Pressure MAWP, psi (bar):
3000 (200)

Maximum Operating Temperature, °C:
225 w/ FKM O-ring
300 w/ FFKM O-ring
350 w/ PTFE Flat Gasket



Parr Series 5500 HPCL Reactor and a 4848 Reactor Controller shown with optional Expansion Modules.

Familiar Parr Designs

All of the safety, convenience and reliability features which have been the hallmark of Parr pressure reaction equipment for more than 50 years have been incorporated into a new line of high pressure, compact laboratory reactors. (HPCL Reactors.)

The Series 5500 HPCL Reactors are based upon our popular micro and mini, Series 4590 & 4560 Reactors. There are several differences between these new reactors and their original counterparts. Primarily, these are:

1. A smaller, more compact magnetic drive is installed.
2. A smaller, more compact variable speed stirrer motor.
3. The larger support stand, overarm and motor have been eliminated.
4. An Aluminum Block Heater also serves as the support stand.

As a result of these changes, we are now able to offer these new reactors to users who do not require the wide variety of options and expandability provided by our Series 4500 Reactors at a significantly lower cost. These new designs will be welcomed by not only investigators with limited space or budgets, but also by investigators building multiple reactor installations for combinatorial chemistry or high throughput investigations.

The reaction vessels used in these new HPCL reactors are identical to the ones furnished in the Series 4590 Micro and Series 4560 Mini Reactors. HPCL Reactors use the popular Parr split ring closure. These vessels are rated for a maximum working pressure of 3000 psi. The maximum operating temperature is dependent upon the seal selected, PTFE gasket for up to 350 °C; with FKM O-ring to 225 °C or FFKM O-ring to 300 °C.

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Series 5500 Pressure Reactor System Specifications								
Shaded bar indicates specifications that change within series.								
Model Number	**5511**	**5512**	**5513**	**5521**	**5522**	**5523**	**5524**	**5525**
Sizes, mL	25	50	100	300	450	600	160	100
Maximum Pressure	3000 psi (200 bar)							
Maximum Temperature								
with FKM O-ring	225 °C							
with FFKM O-ring	300 °C							
with PTFE Flat Gasket	350 °C							
Vessel Style	Moveable							
Reactor Mounting	Compact Bench Top							
Closure	Split Ring (6 Cap Screws for Flat Gasket) (0 Cap Screws for Quick Close)							
Valve Connections	1/8" Male NPT							
Maximum Torque, Inch-Pounds	2.5 (0.28 Nm)							
Impeller(s), 4-blade	1 (0.81" dia.)			1 (0.81" dia.)		2 (1.38" dia.)	1 (0.81" dia.)	
Pressure Gage, Size	3.5 inches							
Range	0-3000 psi (200 bar)							
Temperature Measurement	Fixed Thermocouple							
Cooling Coil	NA			Standard Single Loop			NA	
Optional Cooling Coil	Coldfinger			NA			Spiral	
Bottom Drain Valve	NA							
Heater Style	Aluminum Block (External Cooling Optional)							
Heater Power, Watts	700		1000	700	1000		700	
Stirrer Motor, Variable Speed	1/17 hp							
Electrical Supply								
Volts, AC	115 or 230							
Maximum Load, amps, 115 / 230	8 / 4		10 / 5	8 / 4	10 / 5		8 / 4	
Cylinder Dimensions								
Inside Diameter, inches	1	1.3	1.3	2.5	2.5	2.5	2.5	2
Inside Depth, inches	2	2.25	4.5	4	6	8	2	2
Weight of Cylinder, pounds	12	12	12	13	15	17	12	12
Reactor Dimensions								
Width, inches w/o Controller	8.3							
Depth, inches	9.5							
Height, inches	23	23	25	23	25	27	23	23
Weight, pounds	25	25	25	26	28	30	25	25
Spare Parts Kit	5529SPK							
Other options available. See Ordering Guide, visit www.parrinst.com, or call for more information.								

Heater / Reactor Support

A heater also serves as the vessel support for the HPCL Reactors. This is an aluminum block style heater for excellent thermal uniformity. The cartridge heaters used in this heating block are easily replaced if required. A stainless steel heat shield is provided around the heating block. This style of heater/reactor support provides a very small footprint, ideal for limited bench space.

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Series 5500 Ordering Guide

The Order No. for the Base System is: **55___-T-SS-115-VS-M-3000-4848**

A composite identification number to be used when ordering a 5500 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	Cylinder, I.D.
5511	25 mL	1.0-inch
5512	50 mL	1.3-inch
5513	100 mL	1.3-inch
5521	300 mL	2.5-inch
5522	450 mL	2.5-inch
5523	600 mL	2.5-inch
5524	160 mL	2.5-inch
5525	100 mL	2.0-inch

B Gasket / Maximum Temperature

-OV	FKM O-ring 225 °C
-OK	FFKM O-ring 300 °C
-T	PTFE Compression Gasket, 350 °C

C Materials of Construction (MOC)

-SS	T316 Stainless Steel
-MO	Alloy 400
-IN	Alloy 600
-HB	Alloy B-2 / B3
-HC	Alloy C-276
-CS	Alloy 20
-TI2	Titanium Grade 2
-TI4	Titanium Grade 4
-ZR702	Zirconium Grade 702
-ZR705	Zirconium Grade 705

See page 11 for complete list of available alloys.

D Electrical Supply

-115	115 VAC
-230	230 VAC

E Motor

-VS	1/17 HP Variable Speed

F Magnetic Stirrer Drive

-M	General Purpose Magnetic

G Mag. Drive Materials of Construction

-MOC Symbol	Indicate Material of Construction

H Pressure Gage

-3000	3000 psi / 200 bar
-2000	2000 psi / 137 bar
-1000	1000 psi / 70 bar
-600	600 psi / 40 bar
-200	200 psi / 14 bar
-100	100 psi / 7 bar

I Controller

-4848 (included in base system)	PID Control, Ramp & Soak Programming, Motor Speed Control, and Data logging with Software. For use with up to three additional display modules.
-4848B	Same as above but for use with up to six additional display modules.
-A2110E	Motor Controller
-4871	Process Controller (for enhanced control options)

See Chapter 6 for a complete list of controllers and options.

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
-SVM	Solenoid Valve Module (for cooling control)
-A1925E4	RS-485 to USB Cable for 4848 Controller (required for data logging)
-A1925E6	RS-485 to USB Converter, isolated, 30-ft
-A3504HC	SpecView Software Package for 4848/4838

** The MTM must be installed in conjunction with the MCM.*

K Custom Options (List All Desired)

-GE	Gas Entrainment Stirrer
-BF	Removeable Baffle Set
-CAD	Internal Catalyst Addition Device
-XCAD	External Catalyst Addition Device
-SCP	Solids Charging Port (Ball Valve)
-RC	Reflux Condenser
-RTC	Reflux/Take-Off Condenser

See Chapter 7 for a complete list of optional accessories.

L Certifications

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

M Spare Parts Kit

-5529SPK	Spare Parts Kit for 5500 Series

Please note that all options and combinations are not compatible with all models.

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