205M

Parr Instrument Company

1108 Series Oxygen Combustion Vessels

Operating Instruction Manual

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PREFACE

Scope

These instructions cover the procedures to be followed when using a Parr Series 1108 Oxygen Combustion Vessel to determine calorific values of solid or liquid combustible material in a Parr calorimeter, or when using an 1108 vessel in a 1901 Oxygen Vessel Apparatus to prepare solid or liquid samples for chemical analysis. The user should study these instructions carefully in order to obtain a complete understanding of the capabilities and limitations of an 1108 Series Oxygen Combustion Vessel, and to be well aware of the precautions to be observed in its operation. Calorimeter operations and the operation of various oxygen combustion vessel accessories are described in separate instruction manuals listed in the Related Instructions section, copies of which are available upon request.

Related Instructions

No.	Description
201M	Limited Warranty
207M	Analytical Methods for Oxygen Bombs
230M	Safety Precautions to be observed when operating Pressure Reaction Equipment
483M	Introduction to Bomb Calorimetry

Note About Nomenclature: *Historically, burning a sample enclosed in a high pressure oxygen environment is known as Oxygen Bomb Calorimetry and the vessel containing the sample is known as an Oxygen Bomb. The terms bomb and vessel are used interchangeably.*

1108 Vessel Models Guide

Model	Identifying Parts	Description
1108	394A12 Head / 101A Cylinder	Vessel with O-ring head seal and single use fuse wire (Current 1108 Vessel)
1108*	394A Head / 101A Cylinder	Vessel with quad ring head seal and single use fuse wire (1108 manufactured prior to August 1990)
1108P	394A18 Head / 101A Cylinder	Vessel with O-ring head seal and semi-permanent fuse wire
1108B	394A12 Head / 101A4 Cylinder	Vessel with O-ring head seal and single use fuse wire and 103A6 Heavy Duty Screw Cap
1108BP	394A18 Head / 101A4 Cylinder	Vessel with O-ring head seal and semi-permanent fuse wire and 103A6 Heavy Duty Screw Cap
1108R	394A19 Head / 101A Cylinder	Vessel with quad ring head seal and semi-permanent fuse wire
1108V	394A21 Head / 101A Cylinder	Vessel with quad ring head seal and fittings for vacuum applications (Current 1108V Vessel)
1108V*	394A12 Head / 101A Cylinder	Vessel with O-ring head seal and fittings for vacuum applications (1108V manufactured prior to November 2019)

* *Indicates a change in the vessel design.*

Note: *The suffix of "CL" added to the model number/Identifying Parts listed in the table above indicates that the vessel is chlorine-resistant and constructed of Alloy G-30 for burning samples containing halogen compounds. See "Special Alloy Construction" and "A Chlorine-Resistant Vessel" sections for more information about the vessel material of construction.*

OPERATING THE VESSEL

Precautions

Combustion with oxygen in a sealed vessel is a very effective and reliable method for releasing all heat energy obtainable from a sample and for preparing hydrocarbon compounds and carbonaceous materials for analysis, but there are certain precautions which must always be observed when using this equipment. In particular:

- Do not overcharge the combustion vessel with too much sample or with a sample which might react with explosive violence.
- Do not overcharge the combustion vessel with too much oxygen. The initial charging pressure should not exceed 4.0 MPa (40 atm or 590 psig).
- Do not ignite the sample in the combustion vessel alone on an open bench without providing a protective cooling medium. The combustion vessel should be completely submerged in water during firing.
- Do not ignite the sample if gas bubbles are released from any point on the combustion vessel when it is submerged in water.
- Do not ignite a volatile sample without using one of the sealed sample holders described on page 10.
- Stand away from the combustion vessel during the ignition of the sample and do not handle the vessel for at least 6 minutes after firing.
- Keep the combustion vessel in good condition at all times. Any parts that show signs of weakness or deterioration must be replaced promptly.
- Read the maintenance and safety instructions beginning on page 13 before starting to use the combustion vessel, and urge all operating personnel to re-read these instructions often.
- Some older screw caps and cylinders were manufactured as a matched set and stamped accordingly. We recommend that you maintain the match of these older cylinders and screw caps for your safety. Currently produced cylinders and screw caps can be used interchangeably without limitations.

Special Alloy Construction

The standard 1108 Series Oxygen Combustion Vessel is made of a special columbium-stabilized stainless steel selected for it's excellent resistance to the mixed nitric and sulfuric acids generated in a combustion. It is a superior alloy which will withstand the conditions generated in almost all fuel testing applications, yet neither it nor any other stainless steel will resist the corrosive atmospheres produced when burning samples containing halogen compounds. For these applications, Parr offers a chlorine-resistant vessel described below. It should be noted that all instructions for the 1108 Series apply equally to the 1108CL as well.

A Chlorine-Resistant Vessel

The chlorine-resistant vessel (indicated by the suffix of "CL" in the part number) is the same as the standard 1108 series, but with a head and cylinder made of an alloy with superior corrosion resistance to the free chlorine and halogen acids released when burning chlorinated samples. Users who analyze waste materials and combustible solvents are urged to select the chlorine-resistant vessel instead of the standard 1108 series for its longer service life under extreme corrosive conditions. Combustion Vessel maintenance is also improved. In most cases, 1108CL returned to the factory for scheduled maintenance can be restored to optimum finish by repolishing instead of having to rebore the cylinder to remove pits.

1108B Oxygen Combustion Vessel

The 1108B and 1108BP Combustion Vessels are identical to the 1108 and 1108P models except for the screw cap and cylinder. The 1108B and 1108BCL have a heavy duty screw cap allowing for higher energy release per sample. The cylinder has been adapted to comply with Indian Standard IS 1350.

Other Special Purpose Combustion Vessels

Although the 1108 Series Combustion Vessels will handle a broad range of test samples, Parr also offers other special purpose combustion vessels, including: a high pressure vessel for explosives (1104 series), an oversize combustion vessel for large samples and a semi-micro combustion vessel for small samples (1109 series). Separate operating instructions are issued for these special oxygen combustion vessels.

Allowable Sample Size

To stay within safe limits, the combustion vessel should never be charged with a sample which will release more than 33.5 kJ (8000 cal) in the 1108, 1108P, 1108R, and 1108V, or 41.8 kJ (10000 cal) in the 1108B and 1108BP when burned in oxygen, and the initial oxygen pressure should never exceed 4.0 MPa (40 atm or 590 psig). This generally limits the mass of the combustible charge (sample plus benzoic acid, gelatin, firing oil or any combustion aid) to less than 1.1 g. When starting tests with new or unfamiliar materials it is always best to use sample mass of 0.7 g or less, with the possibility of increasing the amount if preliminary tests indicate no abnormal behavior. To avoid damage to the combustion vessel and possible injury to the operator, it should be a standing rule in each laboratory that the combustion vessel must never be charged with more than 1.5 g of combustible material mass.

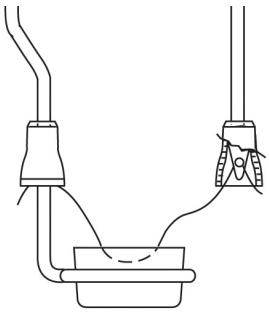
Attaching the Fuse

A38A Head Support & Stand

The 1108 Series has two types of fuse styles. The first is a one-use style fuse that is attached between electrodes and ignites the sample with direct contact. The second style uses a semi-permanent fuse wire installed between two electrodes. Cotton ignition thread is then used as an auxiliary fuse to ignite the sample.

The A38A Head Support and Stand is used to hold the head assembly while the user attaches the fuse wire or cotton ignition thread and prepares the sample.

1108, 1108B, 1108V Oxygen Combustion Vessels



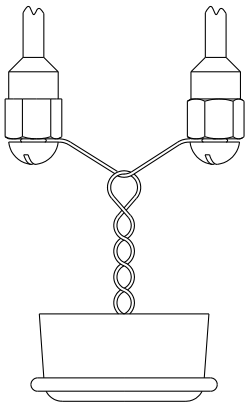
45C_ Series Fuse Wire fastened between two electrodes

Set the combustion vessel's head assembly on an A38A support stand and fasten a 10 cm (4 in) length of fuse wire between the two electrodes. Parr 45C10 nickel alloy wire, which is used for most tests, is furnished on cards from which uniform 10 cm (4 in) lengths can be cut without further measurement. Alternatively, 45C3 (36 AWG) or 45C2 (26 AWG) platinum wire are offered for certain special procedures. Follow the procedure for 1108P/BP/R vessels described below when using the 45C2 wire with a cotton thread in 1108/B/V vessels.

Quick-grip electrodes now installed in all new 1108 Oxygen Combustion Vessels eliminate most of the threading and twisting formerly required when binding the wire to plain electrodes. To attach the fuse to quick-grip electrodes, insert the ends of the wire into the eyelet at the end of each stem and push the cap downward to pinch the wire into place. No further threading or twisting is required. The procedure for binding the fuse to the 4A and 5A plain electrodes in the old 1108 with the 394A Head is illustrated in the instruction manual furnished with the original equipment. For convenience, it is recommended that the user purchase and install new 4A10 and 5A10 quick-grip electrodes as replacements for the 4A and 5A styles in older equipment.

Place the fuel capsule with its weighed sample in the electrode loop and bend the wire downward toward the surface of the charge as shown above. It is not necessary to submerge the wire in a powdered sample. In fact, better combustions will usually be obtained if the loop of the fuse is set slightly above the surface. When using pelleted samples, bend the wire so that the loop bears against the top of the pellet firmly enough to keep it from sliding against the side of the capsule. It is also good practice to tilt the capsule slightly to one side so that the flame emerging from it will not impinge directly on the tip of the straight electrode.

1108P, 1108BP, and 1108R Oxygen Combustion Vessels



Cotton Ignition Thread looped over the Semi-Permanent Fuse Wire

A single piece of the 845DD2 cotton ignition thread is used as an auxiliary fuse to ignite the sample, 10 cm (4 in) is the recommended length for the cotton thread. The thread is looped over the 840DD2 Semi-Permanent Fuse Wire, doubled on itself, twisted or tied to form a single strand and fed into the sample cup to lay on the sample.

When the current flows through the heating wire, the thread will ignite, drop into the sample cup and ignite the sample.

Liquids in the Combustion Vessel

Most combustion procedures call for a small amount of liquid to be placed in the bottom of the combustion vessel as a sequestering agent and absorbent. If the amount and type of liquid are not otherwise specified, add 1 mL of distilled or deionized water from a pipet.

Closing the Combustion Vessel

Care must be taken not to disturb the sample when moving the combustion vessel's head assembly from the support stand to the vessel cylinder.

The 1108 (394A12 Head) and 1108P have a 230A O-ring which is secured by a groove in the head. Check this O-ring to be sure that it is in good condition and moisten it with a bit of water so that it will slide freely into the cylinder, then slide the head into the cylinder and push it down as far as it will go. For easy insertion, push the head straight down without twisting and leave the gas release valve open during this operation.

The 1108R, 1108V and old style 1108 (with 394A Head), have a removable 104A2 contact ring and 410A quad ring. Place the 410A quad ring into the sealing surface (optionally moisten it with a bit of water), and then place the 104A2 contact ring above the 410A quad ring. Slide the head assembly into the cylinder and push down as far as it will go.

Set the screw cap on the cylinder and turn it down firmly by hand to a solid stop. When properly closed, no threads on the cylinder should be exposed. If the screw cap tends to bind to the cylinder at this point, indicating that it might be difficult to open the combustion vessel after it has been fired, turn the screw cap back slightly – but only a few degrees – enough to release the binding, since the bottom thread must remain fully engaged. It is not necessary to use a wrench or spanner on the screw cap. Hand tightening should be sufficient to secure a tight seal.

Filling the Combustion Vessel with the 1825

1108, 1108B/BP, 1108P, & 1108R

1825 Oxygen Filling Connection

The instructions below describe a manual system using the 1825 Oxygen Filling Connection furnished with other Parr apparatus.

Oxygen for the combustion vessel can be drawn from a standard commercial oxygen tank. Unscrew the protective cap from the tank and inspect the threads on the valve outlet to be sure they are clean and in good condition. Place the ball end of the connection into the outlet socket and draw up the union nut tightly with a wrench, keeping the output gage (0 atm - 60 atm) in an upright position.

The pressure connection to the combustion vessel is made with a slip connector on the oxygen hose which slides over the gas inlet fitting on the vessel head. Slide the connector onto the inlet valve body and push it down as far as it will go. If it does not slide easily, a drop of water spread around the inlet valve will lubricate the sealing rings. Older 1108 Oxygen Combustion Vessels (with 394A Head) manufactured before August 1990 use a threaded connector with a knurled coupling which must be turned finger tight.

Close the outlet valve on the vessel head; then open or "crack" the oxygen tank valve not more than one-quarter turn. Open the filling connection control valve slowly and watch the gage as the combustion vessel pressure rises to the desired filling pressure, usually 3 MPa (30 atm or 440 psig), but never more than 4.0 MPa (40 atm or 590 psig); then close the control valve. Release the residual pressure in the filling hose by pushing downward on the lever attached to the relief valve. The gage should now return to zero. The combustion vessel inlet check valve will close automatically when the oxygen supply is shut off, leaving the combustion vessel filled to the highest pressure indicated on the output gage (0 atm - 60 atm). If the pressure drops slowly and a large amount of gas escapes when the pressure relief valve is opened, the check valve in the vessel head is not operating properly. This trouble will have to be corrected before the combustion vessel can be used. If too much oxygen should accidentally be introduced into the combustion vessel, **DO NOT** proceed with the combustion. Detach the filling connection; exhaust the combustion vessel; remove the head and reweigh the sample before repeating the filling operation.

Evacuating & Filling the Combustion Vessel with the 1824

1108V Adapted for Vacuum Applications

The 1108V differs from a standard 1108 oxygen combustion vessel in that the self-sealing check valve has been replaced by a manual valve and the self-sealing O-ring has been replaced by a quad ring compression seal. This provides a way of sealing the vessel with a vacuum or low pressure, in addition to high pressure.

The instructions below describe a manual system using the 1824 Oxygen Filling Connection furnished with other Parr apparatus.

Evacuating the Vessel to Create a Vacuum

Attach the A233A2 Snap Coupling Assembly to the vacuum pump. Slide the snap coupling assembly over the gas inlet fitting on the vessel head. Close the outlet valve on the vessel head and open the 344A2 Valve Needle.

Follow the instruction for the vacuum pump until the desired pressure is obtained.

Close the 344A2 Valve Needle and remove any pressure or vacuum from the snap coupling assembly. Remove the A233A2 Snap Coupling Assembly.

Filling the Vessel with Gas

While the main use of an 1108V is to test self-oxidizing samples in a vacuum it can also easily be used for positive pressure applications. For testing samples in an inert atmosphere generally 0.5 MPa (5 atm or 75 psi) of nitrogen or argon is sufficient.

The instructions below describe a general procedure on how to fill the 1108V with positive pressure based on the 1824 Oxygen Filling Connection. Other filling methods may vary.

Gas for the vessel can be drawn from commercial tanks. Unscrew the protective cap from the tank and inspect the threads on the valve outlet to be sure they are clean and in good condition. Place the end of the filling connection into the tank outlet and draw up the connection tightly with a wrench.

The pressure connection to the vessel is made with the A233A2 Snap Coupling Assembly attached to the filling tubing which slides over the gas inlet fitting on the vessel head. Slide the snap coupling assembly onto the inlet valve and push it down as far as it will go. If it does not slide easily, a drop of water spread around the inlet valve will lubricate the sealing rings.

Close the outlet valve on the vessel head. Using a 5/16" open end wrench, open the 344A2 Valve Needle. Make sure that the filling connection control valve is closed. Then open or 'crack' the gas tank valve not more than one quarter turn. Open the filling connection control valve slowly and watch the gage as the vessel pressure rises to the desired filling pressure (never more than 4.0 MPa [40 atm or 590 psig]); then close the control valve. Close the 344A2 Valve Needle. Release the residual pressure in the filling hose by pushing downward on the lever attached to the relief valve. The gage should now return to zero. If the pressure drops slowly and a large amount of gas escapes when the pressure relief valve is opened the 344A2 Valve Needle in the head is not closed properly.

If too much pressure is accidently introduced into the vessel, **DO NOT** proceed with the combustion. Detach the filling connection; exhaust the vessel; remove the head and reweigh the sample before repeating the filling operation.

Igniting the Sample

2901 Ignition Unit

The electric current for firing the combustion vessel should be drawn from a Parr 2901EB (115V, 50/60 Hz) or 2901EE (230V, 50/60 Hz) Ignition Unit connected to a grounded electrical outlet. Connect one of the lead wires from the combustion vessel to the "10 cm" terminal on the ignition unit and the second wire to the middle or "common" terminal.

When using the combustion vessel in a calorimeter, insert the 421A lifting handle into the two holes in the side of the screw cap and lower the combustion vessel partially into the calorimeter water bucket. Press the banana plugs on the two ignition wires firmly into the terminal sockets on the vessel head before the head is completely immersed in the water. After connecting the wires, lower the vessel into the bucket with its feet spanning the circular boss in the bottom of the bucket. Remove the lifting handle and shake off any drops of water back into the bucket. Be careful not to remove any water from the bucket with the fingers.

When using the combustion vessel alone for analytical purposes it should be connected to the ignition unit as described above and held submerged in an A387A or similar water bath during firing.

In all operations, check the combustion vessel for leaks before firing. If any gas leakage is indicated, no matter how slight, **DO NOT IGNITE THE SAMPLE**. Instead remove it from the water bath; release the pressure and eliminate the leak before proceeding with combustion test. If no leakage is indicated, then stand back and press the firing button on the ignition unit to fire the charge.

> ***CAUTION!*** *Do not have the head, hands or any parts of the body directly over the combustion vessel during the firing period and do not go near the vessel for at least 20 s after the firing.*

Firing the Charge in the 1108, 1108B, & 1108V

Fire the charge by pressing the firing button on the ignition unit, keeping the circuit closed for about 5 s. The indicator light will come on when the button is depressed and will remain on while current flows through the fuse. When the fuse burns off and breaks the circuit, the light will go out. Normally this takes about 0.5 s, but it is good practice to keep the push

Igniting the Sample (Continued)

switch closed for about 5 s regardless of the light. If the light continues to glow while the button is depressed, there is either a short circuit in the firing system or the fuse was not properly arranged.

If a 45C2 (26 AWG) platinum wire is used to fire the charge, hold the firing button down for only 1 s - 2 s which should be sufficient to ignite the auxiliary fuse. A longer period may melt the wire. If the wire melts, use the "7 cm" terminal on the ignition unit to obtain a lower firing voltage; or add a 10 W, 1 Ω resistor to the "10 cm" firing circuit to lower the voltage.

Firing the Charge in the 1108P, 1108BP, and 1108R

Fire the charge by pressing the firing button on the ignition unit, keeping the circuit closed for about 2 s. The indicator light will come on when the button is depressed and will remain on while the button is depressed.

Troubleshooting the Ignition Unit

If the indicator light does not come on when the firing button is pressed there is either a fault in the 2901 unit or an open circuit in the system. Check for voltage between the "10 cm" and "common" terminals of the 2901 unit. Approximately 23 VAC should be measured. If there is no voltage present, check the fuse inside the 2901 unit. An open circuit can usually be located with an ohmmeter. Flex the lead wires during any continuity check as the wires may be broken and making only intermittent contact. If the red indicator light glows during ignition but the combustion vessel fuse does not burn, check the system for a voltage leak to ground, most likely in the insulated electrode on the vessel head. Check the electrode using the high impedance scale on an ohmmeter and replace the electrode insulator and seal if leakage is indicated.

Recovering the Combustion Products

Let the combustion vessel stand in the calorimeter or water bath for at least 3 min, then lift it out of the water and wipe with a clean towel. Open the valve knob slightly to release all residual gas pressure before attempting to remove the screw cap. Gas release should proceed slowly over a period of not less than 1 min to avoid entrainment losses. After all pressure has been released, unscrew the cap; lift the head out of the cylinder and place it on the support stand. Do not twist the head during removal. Pull it straight out to avoid sticking. Examine the interior of the combustion vessel for soot or other evidence of incomplete combustion. If such is found the test will have to be discarded. Wash all interior surfaces of the vessel and the combustion capsule with a jet of distilled water and collect the washings. If any precipitate or residue is present, remove it with a rubber policeman. Do not filter the washings as this might remove valuable constituents. Titrate the washings and measure the unburned fuse wire as required for calorific tests, then analyze the washings for sulfur and other elements, if required.

CAUTION! Do NOT have any part of the body in the exhaust path of the combustion vessel.

An Optional Recovery Procedure

If desired, a luer fitting, 518A, can be attached to the combustion vessel to provide a means for washing the vessel and recovering the combustion products with a syringe without opening the combustion vessel and removing the vessel head. To use this procedure, remove the standard A420A valve needle and replace it with an A420A2 needle to which a syringe, 244C, can be attached.

To recover the combustion products via a luer fitting, let the combustion vessel stand in a cooling bath for at least 3 min after firing to allow for complete condensation of all residual vapor. Then remove the combustion vessel from the water and attach only the barrel of a 244C syringe to the luer fitting. Open the valve and release the pressure at a slow rate, using at least a full minute to bring the combustion vessel pressure back to atmospheric. The attached syringe barrel will help to retain any condensate spray that might be carried out of the valve during the exhaust period.

Add 30 mL of distilled water to the attached syringe barrel and use the syringe plunger to force the water into the combustion vessel, then close the valve while holding the plunger down. This will develop sufficient pressure within the vessel to seat the inlet check valve and provide enough positive pressure to help remove the washings. Agitate and rotate the vessel in a horizontal position to wet all inner surfaces, then turn the vessel upside down over a 600 mL beaker and open the valve to discharge the washings into the beaker. Tilt the vessel slightly toward the valve to get as much of the water out as possible. Repeat this back-flushing procedure two additional times, collecting a total of 90 mL to 100 mL of washings, then open the combustion vessel and recover any liquid that may remain in the cylinder. The 3 complete back flush and rinse cycles should recover better than 99 % of the combustion products.

SAMPLES & SAMPLE HOLDERS

Particle Size and Moisture Content

Solid samples burn best in an oxygen combustion vessel when reduced to 250 µm (60 mesh), or smaller, and compressed into a pellet with a Parr Pellet Press. Particle size is important because it influences the reaction rate. Large particles may not burn completely and small particles are easily swept out of the capsule by turbulent gases during the rapid combustion. Compression into a pellet is recommended since a pellet burns less vigorously than a loose sample, resulting in fewer incomplete combustions.

Materials such as coal burn well in the as-received or air-dry condition, but **do not burn bone-dry samples.** A certain amount of moisture is desirable in order to control the burning rate. Very dry samples may burn so rapidly that a flame might reach the seals or the soft valve seat in the vessel's head, igniting these parts and possibly causing a serious burn-out through the head. Moisture contents up to 20 % mass fraction can be tolerated in many cases, but the optimum moisture is best determined by trial combustions. If moisture is to be added, drop water directly into a loose sample or onto a pellet after the sample has been weighed; then let the sample stand for a while to obtain uniform distribution.

Combustion Aids

Some samples may be difficult to ignite, or they may burn so slowly that the particles become chilled below the ignition point before complete combustion is obtained. In such cases benzoic acid, white oil or any other combustible material of known purity can be mixed with the sample. Ethylene glycol, butyl alcohol or decalin may also be used for this purpose. It must be remembered, however, that a combustion aid adds to the total energy released in the combustion vessel and the amount of sample may have to be reduced to compensate for the added charge. If benzoic acid is added as a combustion aid, it must be added in a pellet form, 0.2 g pellets. Never combust benzoic acid in powder form.

Sample Pellets

2810 Series Pellet Press

One of the most useful techniques for handling powdered samples is to compress the material into a tablet or pellet before it is weighed. Pellets are easier to handle than loose samples and they burn slower in the combustion vessel, thereby reducing the chances for incomplete combustion. The Parr pellet press offers a convenient means for preparing samples in this manner. Pellets produced in this press are ejected into a stainless steel receiver from which they can be lifted and handled easily with a pair of forceps. Most pellets for use in the 1108 Oxygen Combustion Vessel are made in a 0.5" (12.7 mm) diameter size, but smaller diameters can be produced in the same press using interchangeable punch and die sets. Complete pellet making instructions are furnished with each press.

Combustion Capsules

43AS Combustion Capsules

Non-volatile samples to be tested in Parr Oxygen Combustion Vessels are weighed and burned in shallow capsules measuring approximately 1" (25 mm) dia. and 7/16" (11 mm) deep. These are available in stainless steel, fused silica and platinum alloyed with a 3.5 % rhodium. Stainless steel capsules are suitable for all tests except those in which a non-metallic (fused silica) holder is desired or where the superior corrosion resistance of a Pt-Rh cup is required. Fused silica capsules should be used for samples containing dispersed metals which can ignite a stainless steel capsule and cause serious damage to the oxygen combustion vessel.

Combustion Capsules (Continued)

Stainless steel capsules will soon acquire a dull grey finish after repeated use in a combustion vessel due to the formation of a hard, protective oxide film. This dull finish not only protects the capsule but it also promotes combustion and makes it easier to burn the last traces of the sample. It is recommended, therefore, that capsules be heated in a muffle furnace at 500 °C for 24 hr to develop this protective coating uniformly on all surfaces. This treatment should be performed after a capsule has been polished with an abrasive to remove any ash or other surface deposits. Heating in a muffle is also a good way to destroy any trace of carbon or combustible matter which might remain in the capsule from a previous test. After heating, place the capsules in a clean container and handle them only with forceps when they are removed to be weighed on an analytical balance.

Capsules should be monitored for wear. Do not use the capsule if the wall or base thickness is less than 0.025" (0.7 mm)

Foodstuffs and Cellulosic Materials

Fibrous and fluffy materials such as vegetable fibers may have to be packed into the combustion capsule and moistened to slow the burning rate, but foodstuffs and cellulosic samples generally burn with little difficulty. Partial drying may be necessary if the moisture content is too high to obtain ignition. But if the sample is heat sensitive and cannot be dried, a water soluble combustion aid such as ethylene glycol can be added to promote ignition.

Coarse Samples

In most cases it may be necessary to burn coarse samples without size reduction since grinding or drying may introduce unwanted changes. There is no objection to this if the coarse sample will ignite and burn completely. Whole wheat grains and coarse charcoal chunks are typical of materials which will burn satisfactorily without grinding and with no additives or special procedure.

Corrosive Samples

Although the Parr Oxygen Combustion Vessel is made of corrosion resistant alloys, repeated use with high sulfur samples or with samples containing over 20 mg of chlorine may corrode the metal surfaces and produce a dull film on the inner walls of the combustion vessel. Materials containing appreciable amounts of caustic; such as dried black liquor from a pulp mill, may also damage the vessel, with the caustic attacking the alloy capsule and causing the metal capsule and the vessel's electrodes to ignite and burn. These corrosive attacks on the combustion vessel can be reduced by using smaller samples and by increasing the amount of liquid placed in the bottom of the vessel. If a corrosive film develops on the vessel's surfaces it should be removed by proper polishing before it grows to a point where deep pitting occurs.

Liquid Samples

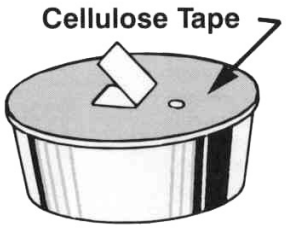
Non-volatile samples are treated in the same manner as solid materials. Oils and other liquids which are not volatile at room temperature can be weighed directly into open combustion capsules. The loop of the fuse should be positioned just slightly above the surface of the sample. Some operators place one end of a short piece of fine cotton thread over the fuse loop, with the other end touching the liquid. In any case, the wire itself should not be submerged in the liquid.

Gelatin Capsules

Volatile liquid samples to be burned in an oxygen combustion vessel can be handled conveniently in Parr 3601 Gelatin Capsules. These 0.9 mL capsules consist of two cups which telescope together with a friction fit adequate to retain most liquids. Corrections must be made for the heat of combustion of gelatin (approximately 19.3 kJ/g or 4600 cal/g) if the capsules are used for calorimetry, and for the sulfur content in the gelatin (approximate sulfur mass fraction 0.35 %) if used for sulfur determinations. Blank tests must be run to determine the exact amounts. Gelatin capsules should always be stored in sealed bottles and handled with due regard for their hygroscopic nature.

The blank tests should be repeated at frequent intervals since values determined on a mass basis will change if there are variations in the moisture content of the gelatin.

Tape-Sealed Sample Holders



43A6 Combustion Capsule with Adhesive Tape Seal

Volatile samples can be handled in a standard 43AS combustion capsule with a flat top rim, or in a 43A6 platinum capsule with a spun rim by covering the top of the capsule with a disc of adhesive plastic tape. To seal a capsule; stretch a piece of tape across the top and press it firmly against the rim with a flat blade, then trim the excess with a sharp knife. The seal obtained in this manner will be adequate to retain most volatile samples. The tape used for this purpose should be free of chlorine and as low in sulfur

as possible. Borden "Mystic Tape" No. M-169-C, or 3M Transparent Tape No. 610 are recommended for this purpose. Equivalent tape can be obtained from Parr under Part No. 517A. The mass of the tape disc must be determined separately and a correction applied for any elements in the tape which might interfere with the determination. This can be done by running a blank test with the tape alone using a sample weighing about 1 g. Tape should always be stored in a sealed container to minimize changes in its moisture content.

Use the following procedure when filling and handling any of these tape-sealed sample holders:

1. Weigh the empty cup or capsule.
2. Cover the top with tape, trim with a knife and press the trimmed edge firmly against the metal rim.
3. Cut and attach a small flag to the disc; see illustration of the 43A6.
4. Puncture the tape at a point below the flag.
5. Re-weigh the empty cup with its tape cover.
6. Add the sample with a hypodermic syringe.
7. Close the opening with the flag.
8. Re-weigh the filled cup.
9. Set the cup in the loop electrode and arrange the fuse wire so that it touches the center of the tape disc.
10. Just before closing the combustion vessel, prick the disc with a sharp needle to make a small opening which is needed to prevent collapse of the disc when pressure is applied.
11. Fill the combustion vessel with oxygen to the usual charging pressure, but add oxygen slowly so that the tape will not collapse into the cup.
12. Ignite the sample and complete the test in the usual manner.

Low volatile samples with a high water content, such as urine or blood, can be burned in an open capsule by absorbing the liquid on filter paper pulp or by adding a combustion aid, such as ethylene glycol or by freeze drying the sample.

Heavy Oils

Oils and other liquids which are not volatile at room temperature can be weighed directly into open combustion capsules. The loop of the fuse should be positioned just slightly above the surface of the sample. Some operators place one end of a short piece of fine cotton thread over the fuse loop, with the other end touching the liquid. In any case, the fuse wire itself should not be submerged in the liquid.

Several precautions must be observed when testing heavy oils because of the intense heat which they develop. If the wall of the metal combustion capsule is thin, or if some of the sample happens to have been spread on the thin rim of the capsule, it is possible that the metal may become heated to the point where it will ignite. This condition is serious because of the excessive heat liberated when metal burns in oxygen. Also, the molten metal oxides may damage the interior of the oxygen combustion vessel. In extreme cases the vessel's electrodes may also ignite and burn with similar results. For these reasons, be sure that any capsule holding a heavy oil is in good condition and not worn thin from prior usage. Also, bend the straight electrode so that it does not project over the cup where it will receive the full flame from the sample. It is always desirable to tilt the capsule slightly in the loop holder so as to direct the flame away from both electrodes. Some operators prefer to use a 10 mL to 13 mL platinum crucible for holding heavy oil samples because the added depth in a crucible promotes slower combustion and a milder flame.

Explosives and High Energy Fuels

Special precautions must be observed when testing materials which release large volumes of gas upon ignition, or which detonate with explosive force. Although most slow-burning gun powders and rocket propellants can be tested in the conventional 1108 Oxygen Combustion Vessel, the user must understand that this combustion vessel is not designed to withstand the shock pressures produced by primers and high explosives. It is much safer to test these materials in a Parr 1104 High Pressure Oxygen Combustion Vessel.

OPERATING SUGGESTIONS

Poor Combustion

The difference in combustion characteristics of the wide variety of materials which may be burned in an oxygen vessel make it difficult to give specific directions which will assure complete combustions for all samples. However, two fundamental conditions may be stated. First, some part of the sample must be heated to its ignition temperature to start the combustion and, in burning, it must liberate sufficient heat to support its own combustion regardless of the chilling effect of the adjacent metal parts. Second, the combustion must produce sufficient turbulence within the vessel to bring oxygen into the fuel cup for burning the last traces of the sample.

An incomplete combustion in an oxygen combustion vessel is nearly always due to one or more of the following causes:

1. Excessively rapid admission of gas to the vessel during charging, causing part of the sample to be blown out of the cup.

2. Loose or powdery condition of the sample which will permit unburned particles to be ejected during a violent combustion.

3. The use of a sample containing coarse particles which will not burn readily. Coal particles which are too large to pass a 250 µm (60 mesh) screen may not burn completely.

4. The use of a sample pellet which has been made too hard or too soft. Either condition sometimes causes spalling and the ejection of unburned fragments.

5. The use of an ignition current too low to ignite the charge, or too high, causing the fuse to break before combustion is under way.

6. Insertion of the fuse wire loop below the surface of a loose sample. Best results are obtained by barely touching the surface or by having the wire slightly above the sample.

7. The use of insufficient oxygen to burn the charge, or conversely, the use of a very high initial gas pressure which may retard the development of sufficient gas turbulence within the vessel.

8. Insufficient space between the combustion cup and the bottom of the vessel. The bottom of the cup should always be at least one-half inch above the bottom of the vessel, or above the liquid level in the vessel, to prevent thermal quenching.

9. Excessive moisture or non-combustible material in the sample amounts to approximately 20 % or more of the charge it may be difficult to obtain complete combustion. This condition can be remedied by adding a small amount of benzoic acid or other combustion aid.

Oxygen Charging Pressure

Operators sometimes disagree as to the most desirable oxygen charging pressure. As a rule, it is best to use the lowest gas pressure that will give complete combustion. Lower pressures permit higher gas temperatures and greater turbulence, both of which help to secure better combustion. The range of charging pressures for Parr Oxygen Combustion Vessels usually falls between 2.5 MPa and 3.5 MPa (25 atm to 35 atm, or 365 psig to 515 psig), and it should never exceed 4.0 MPa (40 atm or 590 psig).

MAINTENANCE & SAFETY

Oxygen Combustion Vessel Maintenance

Under normal usage Parr oxygen combustion vessels will give long service if handled with reasonable care. However, the user must remember that these combustion vessels are continually subjected to high temperatures and pressures which apply heavy stresses to the sealing mechanism. The mechanical condition of the combustion vessel must therefore be watched carefully and any parts that show signs of weakness or deterioration should be replaced before they fail. Otherwise, a serious accident may occur.

DO NOT IGNITE THE SAMPLE in the oxygen combustion vessel if gas bubbles are observed anywhere indicating a possible gas leak. Disassemble the combustion vessel and install new seals immediately. The parts which require closest attention and most frequent replacement are: the head seal (230A O-ring or 410A Quad Ring), all the 238A sealing rings, the 415A O-ring and the 20VB PCTFE valve seat in the needle valve.

A Parr 475A Service Clamp offers a convenient means for clamping the vessel's head firmly in a vise without damaging the head when replacing any of the vessel's head parts.

1108, 1108B, 1108P, and 1108B: When replacing the 230A O-Ring head seal, stretch the new O-ring and let it snap into place on the head to be sure that it moves freely in its groove and is not twisted.

1108R & 1108V: When replacing the 410A Quad Ring head seal, remove the 104A2 contact ring and position the new 410A flat upon the head.

The 20VB valve seat in the needle valve deteriorates with use, not only in the needle area but on the underside of the seat as well. Leakage and a possible serious burn-out can result from a worn or damaged seat if it is not replaced promptly. As a basic rule, the 20VB valve seat and the two 238A O-rings on the valve needle should be replaced after every 500 firings or every six months, whichever occurs first. If the combustion vessel is used for samples containing chlorine, these parts should be replaced after every 250 firings.

To replace the valve seat, unscrew the 397A compression nut; remove the valve stem and the old seat, and disassemble all of the parts. Drop a new 20VB valve seat into the body and push it down into place. Insert two 238A O-rings into the 378A packing cup and place the 378A packing cup into the 396A O-ring side up. Drop a 7VBCM Monel washer on top of the O-ring visible in the packing cup. Insert the 397A compression nut into the 396A outlet valve body and tighten to 108 in-lbs (12.2 Nm or 9 ft-lbs) of torque. Insert the A420A valve needle assembly and tighten the valve needle into the 397A.

CAUTION! The 397A Compression Nut must be tightened to 108 in-lbs (12.2 Nm or 9 ft-lbs) to seal properly

A Parr 3581HC Torque Wrench and 4056HC 5/8" Socket offers a convenient means of achieving the correct torque on the 397A Compression Nut.

Keep the 397A compression nut on the valve needle tightened firmly at all times. Frequent tightening is important. This nut, if slightly loose, may allow a leak to develop during the rapid pressure rise upon ignition. This type of leak may not be detectable before firing; but if it develops, the hot gases can ignite the 20VB valve seat and burn through the head.

Do not use extreme force when closing the needle valve. A moderate but firm turn on the valve knob should be sufficient to stop all gas flow. Excessive needle pressure will deform and possibly close the gas passage. If this happens, unscrew the valve body and replace the 20VB valve seat. Accumulated salt deposits may also clog the gas passage, making it difficult to release pressure at the end of a run. To avoid this, clean the passage through the valve needle and deflector nut with a small drill.

The 238A sealing ring in the insulated electrode should be replaced with the same frequency as the 20VB valve seat. Also, keep the 411A terminal nut tight at all times. As the 238A sealing ring ages and hardens it becomes a partial electrical conductor, permitting misfires and producing unwanted heating effects. Periodic replacement will eliminate this potential problem.

Vessel Maintenance (Continued)

The threads on the screw cap should be checked routinely for any burns or other deformity. After long use, the threads on the screw cap may become worn to the point where they will no longer provide a safe closure for the combustion vessel, and the screw cap will have to be replaced. The following procedure can be used to check the extent to which the threads have become worn:

1. Assemble the combustion vessel with the head in the cylinder and count the number of turns required to bring the screw cap down firmly against the head.
2. Then open the combustion vessel; remove the head and replace the screw cap, but turn it down to only one-half of the turns previously counted. This will usually be about four turns.
3. With the screw cap in this position, use a dial gage to measure the vertical deflection when lifting the screw cap upward. If this measurement exceeds 0.030", the screw cap is unsafe and should be discarded.
4. The cylinder can then be returned to the factory for inspection. If the threads on the cylinder are in good condition, a new screw cap can be purchased and used with the cylinder.

Never under any circumstances use oil on the O-rings which seals the vessel head or on any of the valves or fittings which handle compressed oxygen. This precaution applies to all of the oxygen combustion vessel's parts to the oxygen filling connection as well.

Although Parr oxygen combustion vessels are made from alloys which will withstand most corrosive gases, these combustion vessels will not resist chlorine, fluorine or bromine in the presence of moisture. If samples yielding appreciable amounts of these elements are burned in a Parr vessel, the interior surfaces may become etched or corroded. In such cases the combustion vessel should be emptied and washed as quickly as possible after each combustion.

If the interior of the combustion vessel should become etched as mentioned above, the resistance of the metal to further attack can be improved by restoring the surface to its original highly polished condition. Vessels needing repolishing or other repair work can be returned to the factory. A periodic overhaul and test at the factory will help to keep any Parr oxygen combustion vessel in first-class condition.

See pages 16 - 17 for the Maintenance Checklists.

Combustion Vessel Repairs and Proof Tests

The 20VB valve seat, 230A O-ring or 410A Quad Ring, 415A, and the four 238A O-rings should be replaced after every 500 firings, or every six months, whichever occurs first. If the combustion vessel is used for samples containing chlorine, these repairs should be made after every 250 firings. Parr oxygen combustion vessels can be returned at any time for repair and testing.

A factory test is recommended after any of the following conditions:

- Every 5000 firings or 3 years, whichever occurs first
- The vessel was fired with an excessive charge
- The ignition of any internal components
- The vessel was machined by any source other than the factory
- Damaged by corrosive vapors that might have exceeded 80 % of the corrosion allowance
- Any changes in the threads on the vessel cylinder and/or screw cap.

When returning an oxygen combustion vessel to the factory, ship it to:

Parr Instrument Company
Attn: Repair Department
211- 53rd Street
Moline, Illinois 61265

A purchase order covering the repair work should be included with the shipment or mailed to the same address as no repairs will be started without specific instructions. Be sure to **include a return shipping address and the name and telephone number of the individual to be contacted** if questions arise concerning excessive repair costs or other problems. Individual repair parts can be ordered from any Parr dealer or direct from the factory.

1108, 1108B, 1108P, 1108BP Maintenance Checklist

Refer to pages 13-14 & 18-21 of the 1108 Operating Instruction Manual for assembly instructions and parts diagram.

50 to 100 Test Maintenance (1108P & 1108BP Only)

	Date	Date	Date	Date
Replace 840DD2 Heating Wire				
Clean electrodes				

500 Test Maintenance

Replace the following:				
	Date	Date	Date	Date
230A				
415A				
238A (4)				
143AC				
20VB				

Examine and replace if worn or cracked.				
143AC				
401A				
96AC				

Permission is granted to copy this page to keep track of maintenance intervals.

1108R & 1108V Maintenance Checklist

Refer to pages 13-14 & 22-25 of the 1108 Operating Instruction Manual for assembly instructions and parts diagram.

50 to 100 Test Maintenance (1108R Only)

	Date	Date	Date	Date
Replace 840DD2 Heating Wire				
Clean electrodes				

500 Test Maintenance

Replace the following:				
	Date	Date	Date	Date
410A				
415A				
238A (4)				
143AC				
20VB				

Examine and replace if worn or cracked.				
143AC				
401A				
96AC				

Permission is granted to copy this page to keep track of maintenance intervals.

PARTS LISTS & DRAWINGS

1108 & 1108B Parts Diagram Key

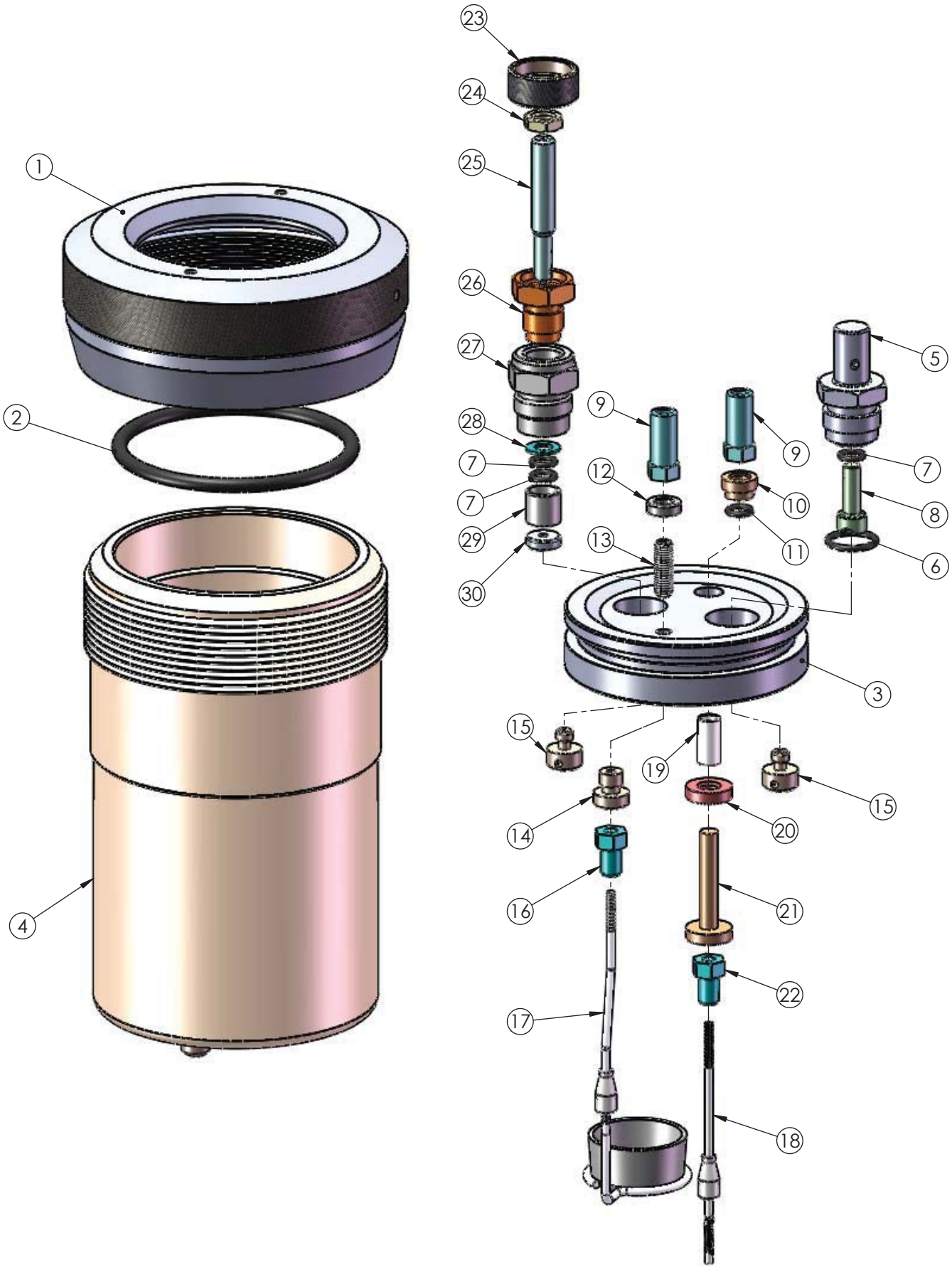
KEY	PART NO.	DESCRIPTION
1	103A	SCREW CAP (1108/1108CL)
	103A6	SCREW CAP, HEAVY DUTY (1108B/1108BCL)
2	230A	O-RING 2-3/8 ID BUNA-N
3	394A12	HEAD, BARE (1108/1108B)
	394A12CL	HEAD FOR CHLORINE SERVICE (1108CL/1108BCL)
4†	A101A	CYLINDER (1108)
	A101A4	CYLINDER (1108B)
	A101ACL	CYLINDER FOR CHLORINE SERVICE (1108BCL)
	A101A4CL	CYLINDER FOR CHLORINE SERVICE (1108B)
5	395A2	INLET VALVE BODY
6	415A	O-RING 7/16 ID BUNA-N
7	238A	O-RING 3/16 ID BUNA-N
8	403A	CHECK VALVE
9	411A	TERMINAL NUT
10	143AC	INSULATOR DELRIN
11	238A	O-RING 3/16 ID BUNA-N
12	388A	SPACER
13	SC1932SC10	SOCKET HEAD SET SCREW
14	278A3	ADAPTER BUSHING
15	404A2	DEFLECTOR NUT
16	406A	LOCK NUT
17	5A10	LOOP ELECTRODE WITH SLEEVE
18	4A10	STRAIGHT ELECTRODE WITH SLEEVE
19	401A	SLEEVE INSULATOR
20	96AC	ELECTRODE INSULATOR
21	402A	ELECTRODE CORE
22	406A	LOCK NUT
	A420A	VALVE NEEDLE W/ KNOB (NO. 23, 24, 25)
23	407A	VALVE KNOB
24	398A	LOCK NUT
25	400A	VALVE NEEDLE
26	397A	COMPRESSION NUT
27	396A	OUTLET VALVE BODY
28	7VBCM	WASHER MONEL
29	378A	PACKING CUP
30	20VB	VALVE SEAT KEL-F

† *Sold as complete assembly, see Complete Assemblies table*

Complete Assemblies

PART NO.	DESCRIPTION
AA101A	CYLINDER WITH 103A SCREW CAP (1108)
AA101A4	CYLINDER WITH 103A6 SCREW CAP (1108B)
AA101ACL	CYLINDER FOR CHLORINE SERVICE WITH 103A SCREW CAP (1108CL)
AA101A4CL	CYLINDER FOR CHLORINE SERVICE WITH 103A6 SCREW CAP (1108BCL)
A416A3	HEAD ASSEMBLY (1108/1108B)
A416A3CL	HEAD ASSEMBLY FOR CHLORINE SERVICE (1108CL/1108BCL)

1108 & 1108B Parts Diagram



1108P & 1108BP Parts Diagram Key

KEY	PART NO.	DESCRIPTION
1	103A	SCREW CAP (1108P/1108PCL)
	103A6	HEAVY DUTY SCREW CAP (1108BP/1108BPCL)
2	230A	O-RING 2-3/8 ID BUNA-N
3	394A18	HEAD, BARE (1108P/1108BP)
	394A18CL	HEAD, BARE FOR CHLORINE SERVICE 1108PCL/1108BPCL)
4†	101A	CYLINDER (1108P)
	101ACL	CYLINDER FOR CHLORINE SERVICE (1108PCL)
	101A4	CYLINDER (1108BP)
	101A4CL	CYLINDER FOR CHLORINE SERVICE (1108BPCL)
5	395A2	INLET VALVE BODY
6	415A	O-RING 7/16 ID BUNA-N
7	238A	O-RING 3/16 ID BUNA-N
8	403A	CHECK VALVE
9	411A	TERMINAL NUT
10	143AC	INSULATOR, DELRIN
12	388A	SPACER
13	SC1932SC10	SOCKET HEAD SET SCREW
14	655DD	ELECTRODE SPACER
15	404A2	DEFLECTOR NUT (1108P/1108BP)
	404A2CH	DEFLECTOR NUT (1108PCL/1108BPCL)
16	1095DD	ELECTRODE (1108P/1108BP)
	1095DDCH	ELECTRODE (1108PCL/1108BPCL)
17	1095DD2	ELECTRODE, INSULATED (1108P/1108BP)
	1095DD2CH	ELECTRODE, INSULATED (1108PCL/1108BPCL)
19	401A	SLEEVE INSULATOR
20	96AC	ELECTRODE INSULATOR
	A420A	VALVE NEEDLE WITH KNOB (NOS. 23, 24, 25)
23	407A	VALVE KNOB
24	398A	LOCK NUT
25	400A	VALVE NEEDLE
26	397A	COMPRESSION NUT
27	396A	OUTLET VALVE BODY
28	7VBCM	WASHER MONEL
29	378A	PACKING CUP
30	20VB	VALVE SEAT PCTFE
31	PA1332PP04	6-32 X 1/4 RHMS
32	840DD2	60" IGNITION WIRE (2.0" PER USE)
33	1095DD3	ELECTRODE W/ SETSCREW (1108P/1108BP)
	1095DD3CH	ELECTRODE W/ SETSCREW (1108PCL/1108BPCL)
34	PC1332SC02	6-32 SHSS (ELECTRODE)
35	906DD2	CAPSULE HOLDER
36	43A_SERIES	CAPSULE (NOT INCLUDED)

† *Sold as complete assembly, see Complete Assemblies table*

Complete Assemblies

PART NO.	DESCRIPTION
AA101A	CYLINDER WITH 103A SCREW CAP (1108P)
AA101A4	CYLINDER WITH 103A6 SCREW CAP (1108BP)
AA101ACL	CYLINDER FOR CHLORINE SERVICE WITH 103A SCREW CAP (1108PCL)
AA101A4CL	CYLINDER FOR CHLORINE SERVICE WITH 103A6 SCREW CAP (1108BPCL)
A416A5	HEAD ASSEMBLY (1108P/1108BP)
A416A5CL	HEAD ASSEMBLY FOR CHLORINE SERVICE (1108PCL/1108BPCL)

1108P & 1108BP Parts Diagram

1108R Parts Diagram Key

KEY	PART NO.	DESCRIPTION
1	103A	SCREW CAP
2	410A	QUAD-RING BUNA-N
3	394A19	HEAD, BARE (1108R)
	394A19CL	HEAD, BARE FOR CHLORINE SERVICE (1108RCL)
4†	101A	CYLINDER (1108R)
	101ACL	CYLINDER FOR CHLORINE SERVICE (1108RCL)
5	395A2	INLET VALVE BODY
6	415A	O-RING 7/16 ID BUNA-N
7	238A	O-RING 3/16 ID BUNA-N
8	403A	CHECK VALVE
9	411A	TERMINAL NUT
10	143AC	INSULATOR, DELRIN
11	906DD2	CAPSULE HOLDER
12	388A	SPACER
13	SC1932SC10	SOCKET HEAD SET SCREW
14	655DD	ELECTRODE SPACER (1108R)
	655DDCH	ELECTRODE SPACER (1108RCL)
15	404A2	DEFLECTOR NUT (1108R)
	404A2CH	DEFLECTOR NUT (1108RCL)
16	1095DD	ELECTRODE (1108R)
	1095DDCH	ELECTRODE (1108RCL)
17	1095DD2	ELECTRODE, INSULATED (1108R)
	1095DD2CH	ELECTRODE, INSULATED (1108RCL)
19	401A	SLEEVE INSULATOR
20	96AC	ELECTRODE INSULATOR
	A420A	VALVE NEEDLE W/ KNOB (NOS. 23, 24, 25)
23	407A	VALVE KNOB
24	398A	LOCK NUT
25	400A	VALVE NEEDLE
26	397A	COMPRESSION NUT
27	396A	OUTLET VALVE BODY
28	7VBCM	WASHER MONEL
29	378A	PACKING CUP
30	20VB	VALVE SEAT PCTFE
31	PA1332PP04	6-32 X 1/4 RHMS
32	840DD2	60" IGNITION WIRE (2.0" PER USE)
33	1095DD3	ELECTRODE W/ SETSCREW (1108R)
	1095DD3CH	ELECTRODE W/ SETSCREW (1108RCL)
34	PC1332SC02	6-32 SHSS (ELECTRODE)
35	906DD2	CAPSULE HOLDER
36	43A_ (SERIES)	CAPSULE (NOT INCLUDED)
37	104A2	CONTACT RING

† *Sold as complete assembly, see Complete Assemblies table*

Complete Assemblies

PART NO.	COMPLETE ASSEMBLIES
AA101A	CYLINDER WITH 103A SCREW CAP (1108R)
AA101ACL	CYLINDER FOR CHLORINE SERVICE W/ 103A SCREW CAP (1108RCL)
A416A6	HEAD ASSEMBLY (1108R)
A416A6CL	HEAD ASSEMBLY FOR CHLORINE SERVICE (1108RCL)

1108R Parts Diagram

1108V Parts Diagram Key

KEY	PART NO.	DESCRIPTION
1	103A	SCREW CAP
2	410A	SEALING RING, NBR (QUAD RING)
3	394A21	HEAD, QUAD RING SEAL
	394A21CL	HEAD, QUAD RING SEAL
4†	A101A	CYLINDER (1108V)
	A101ACL	CYLINDER FOR CHLORINE SERVICE (1108V)
5	A344A2	VALVE NEEDLE ASSEMBLY
5A	SC1332SC02	SHSS, 6-32 X 1/8 18-8 SS
5B	463A	PLUG, NEEDLE PTFE
5C	344A2	VALVE NEEDLE
8	378A	PACKING CUP
9	411A	NUT, 10-32 TERMINAL
10	143AC	INSULATOR, DELRIN
11	238A	O-RING, NBR 3/16 ID X 1/16 CS
12	388A	SPACER, WHITE DELRIN
13	SC1932SC10	SHSS, 10-32 X 5/8 18-8 SS
14	278A3	BUSHING, REDUCER
15	404A2	NUT, DEFLECTOR
16	406A	NUT, 3-48 LOCK
17	5A10	ELECTRODE, LOOP W/SLEEVE
18	4A10	ELECTRODE, STRAIGHT W/SLEEVE
19	401A	INSULATOR
20	96AC	ELECTRODE INSULATOR
21	402A	CORE, ELECTRODE, 3-48 THD
22	406A	NUT, 3-48 LOCK
25	A420A	NEEDLE VALVE W/KNOB
25A	407A	KNOB, VALVE (A420A)
25B	398A	NUT, 1/4-28 LOCK
25C	400A	VALVE, NEEDLE (A420A)
26	397A	NUT, COMPRESSION
27	396A	VALVE BODY, OUTLET
28	7VBCM	WASHER, MONEL
29	20VB	VALVE SEAT, PCTFE MATERIAL
30	104A2	CONTACT RING
	43A_ SERIES	CAPSULE (NOT INCLUDED, SHOWN)

† *Sold as complete assembly, see Complete Assemblies table*

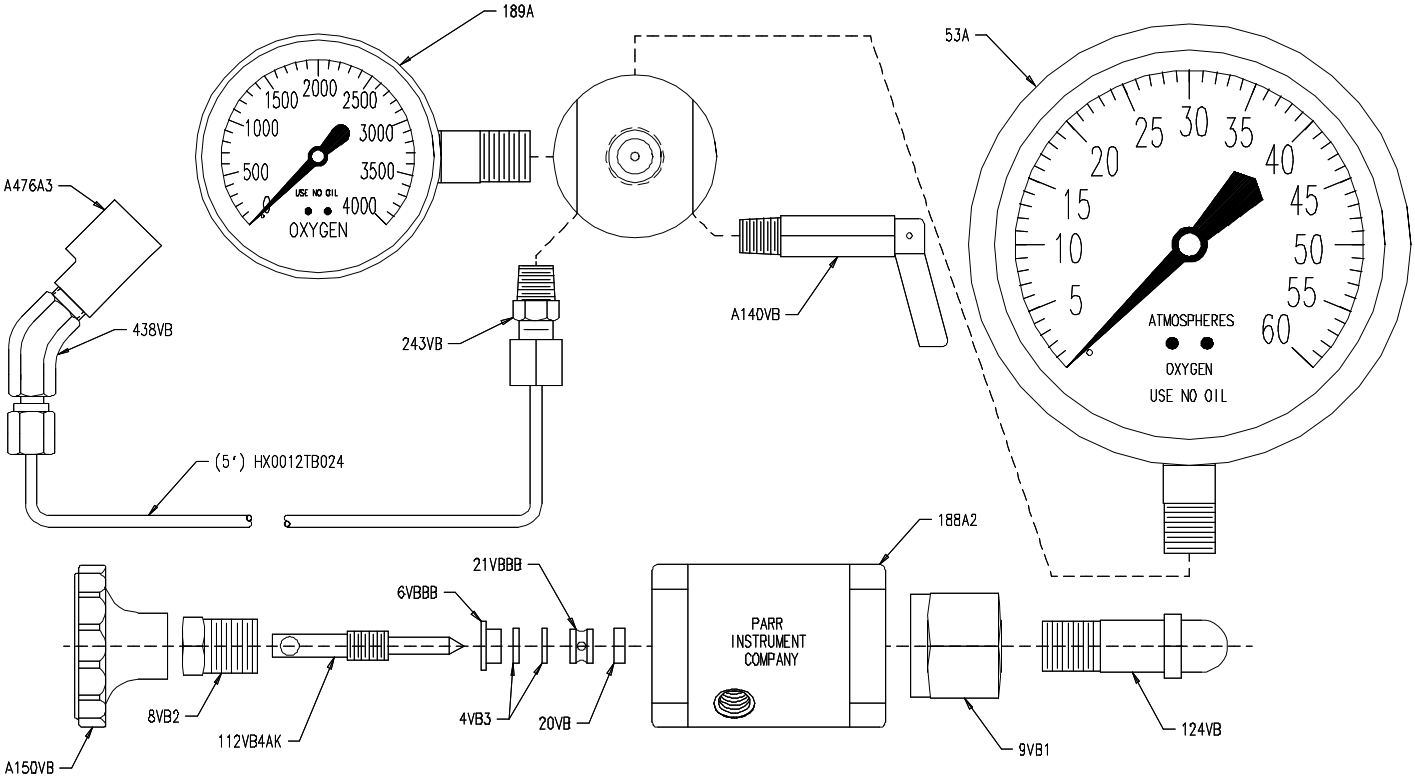
Complete Assemblies

PART NO.	DESCRIPTION
AA101A	CYLINDER WITH 103A SCREW CAP
AA101ACL	CYLINDER FOR CHLORINE SERVICE WITH 103A SCREW CAP
A416A4V	HEAD ASSEMBLY (VACUUM)
A416A4VCL	HEAD ASSEMBLY FOR CHLORINE SERVICE (VACUUM)

1108V Parts Diagram

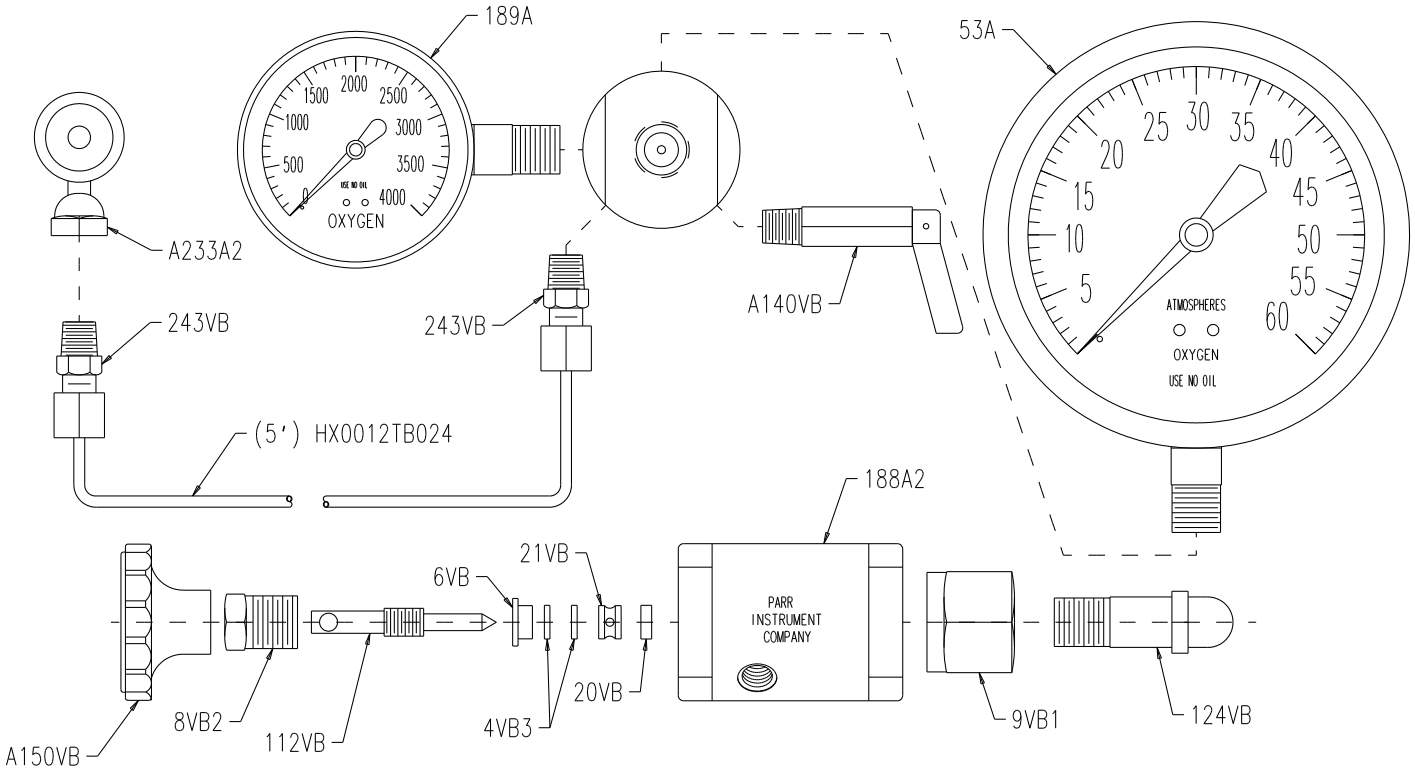
1825 Oxygen Filling Connection Drawing

For use with 1108, 1108P, and 1108R

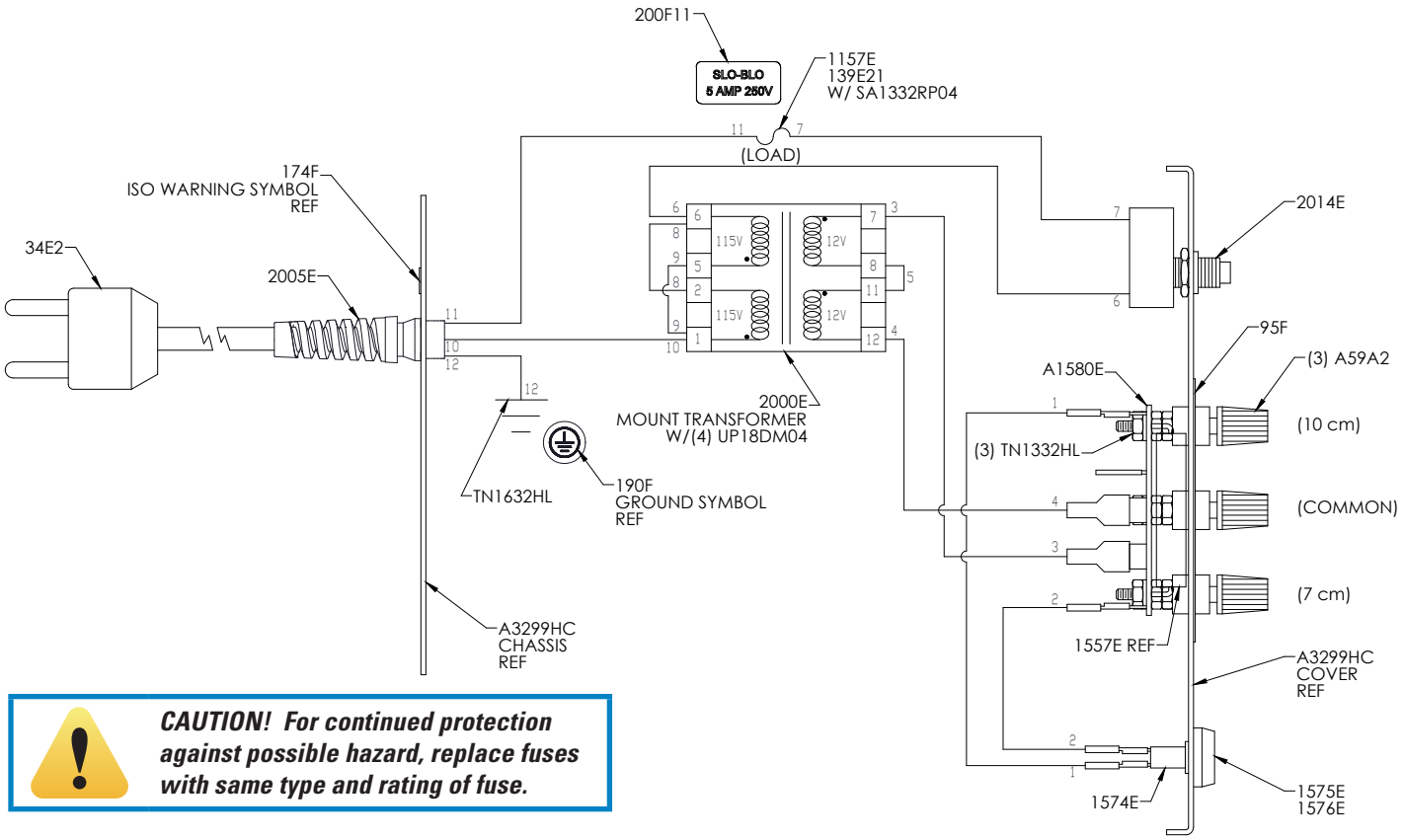


1824 Oxygen Filling Connection Drawing

For use with 1108V



2901 Ignition Unit Drawing



CAUTION! For continued protection against possible hazard, replace fuses with same type and rating of fuse.

1825 & 1824 Common Parts List

Part No.	Description
4VB3	Packing gasket
6VBBB	Packing cover, brass
8VB2	Packing nut
9VB1	Union nut, brass, CGA540
20VB	Valve seat, PCTFE
21VBBB	Lantern ring, brass
53A	Oxygen gage, 3-1/2", 0 - 60 atm
112VB4AK	Valve needle
124VB	Union nipple, brass, CGA540
A140VB	Toggle relief valve
A150VB	Valve knob
188A2	Filling connection body, bare
243VBAD	Tube connector, male, T316
HX0012TB024	Pressure tubing, 1/8" OD, Nylon, 5-ft

1825 Parts List

Part No.	Description
A19A13	Fill connection assembly, includes: 438VB, 243VBAD, A476A3, & HX0012TB024 (5 ft)
438VB	Elbow connector, 45°, male
A476A3	Slip connector with O-rings
394HCJE	O-ring for A476A3 slip connector (2 required)

1824 Parts List

Part No.	Description
A19A6	Fill connection assembly, includes: A233A2, (2) 243VBAD, & HX0012TB024 (5 ft)
A233A2	Snap coupling assembly
357HC	O-ring for A223A2 (2 required)

2901 Ignition Unit Parts List

Part No.	Description
A1673E2	Kit Electric Parts for 2901EB/EE
1203EEE	Cord 10A/220V Cont Europe Plug
1202EEE	Cord 13A/220V BS Plug
2000E	Transformer, 120/240 VAC 24V
XB0010	1/8ID Shrink Tubing Black
34E2	Cord w/ 115VAC Plug 18-3SJT
A3299HC	Box Assembly, Ignition Unit 115V
A3299HC2	Box Assembly, Ignition Unit 230V
2005E	Strain Relief Pigtail Black
2005E2	Strain Relief Pigtail Black, for 230V
139E21	Fuse 3AG Slo-Blo 250V 5.0 Amp (115 volt units)
139E8	Fuse 3AG Slo-Blo 250V 2.5 Amp (230 volt units)
1157E	Fuse Holder, 3AG x 1/4 Tab
SA1332RP04	6-32 x 1/4 RHMS Phillips 18-8

Parr Instrument Company

211 53rd Street
Moline, Illinois 61265-1770 USA
Phone: 1-309-762-7716 or 1-800-872-7720
Fax: 1-309-762-9453
E-mail: parr@parrinst.com
http://www.parrinst.com