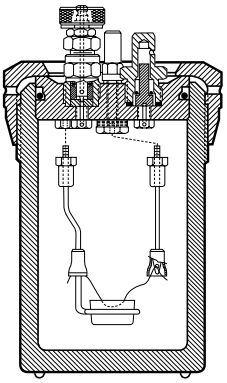
Parr Oxygen Combustion Bomb



For Reliable Combustion Procedures

Combustion with oxygen in a sealed Parr bomb has been accepted for many years as a standard method for converting solid and liquid combustible samples into soluble forms for chemical analysis. It is a reliable method whose effectiveness stems from its ability to treat samples quickly and conveniently within a closed system without losing any of the sample or its combustion products. All hydrocarbons are oxidized to carbon dioxide and water by the reaction, and all sulfur compounds are converted to soluble forms and absorbed in a small amount of water placed in the bomb. Organic chlorine compounds are converted to HCl or chlorides. Any mineral constituents remain as ash, but other inorganic elements such as arsenic, boron and all of the halogens are recovered with the bomb washings. The entire procedure is simple and straightforward, with its superiority over other sample preparation methods derived primarily from it's: **speed, safety and significant sample size.** Samples large enough to be statistically significant can be treated in these bombs with complete sample recovery.

Many applications. The reliability of the oxygen bomb method has led to its acceptance as the basic procedure for determining sulfur, halogens, and other elements in a broad range of combustible materials, particularly:

Sulfur in coal, coke and refuse derived fuels.

Sulfur in petroleum products.

Chlorine in petroleum and other combustible samples.

Other halogens and elements such as: arsenic, mercury, phosphorus and boron can also be determined by oxygen bomb methods. Heavy metals present as trace elements in combustible samples can be determined by adding a quartz liner described on page 13. A full discussion of oxygen bomb methods, including a listing of standard ASTM, ANSI, API, IP test procedures and an extensive bibliography is provided in Parr Manual 207M. Copies are available on request at no charge.

The 1108 Oxygen Bomb

This is the standard, 342 mL, general purpose bomb which is widely used in Parr oxygen bomb calorimeters and combustion apparatus. It will safely burn samples (usually weighing about one gram) which liberate up to a maximum of 8000 calories per charge using oxygen-charging pressures up to 40 atm. All designs used in the 1108 bomb have been developed specifically to give the user a reliable bomb that is easy to handle, easy to maintain and safe for its intended use. Separate valves are provided for charging the bomb with oxygen and for releasing gases at the end of a test. Oxygen is admitted through a check valve. Gases are released through a needle valve. Deflector nuts on the inlet and outlet passages divert the incoming gas and protect the valves from the combustion flame. Both valves can be replaced. The firing circuit is completed through a grounded electrode which also supports the combustion capsule. An insulated electrode with ceramic flame protection carries the firing current to the fuse wire.

The standard 1108 bomb is made of a special columbium-stabilized stainless steel selected for its excellent resistance to the mixed nitric and sulfuric acids produced in a bomb combustion. This is a superior alloy which is suitable for most combustion tests, yet neither it nor any other stainless steel will resist the corrosive atmosphere produced when burning samples containing halogen compounds. For these applications Parr offers the 1108CL bomb described below.

A Chlorine-Resistant Bomb

Parr now offers a new 1108CL bomb which is the same as the 1108 model, 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 intend to test waste materials and combustible solvents are urged to select the 1108CL bomb instead of the 1108 for its longer service life under extreme corrosive conditions. Bomb maintenance is also improved. In most cases 1108CL bombs returned to the factory for scheduled maintenance can be restored to optimum finish simply by repolishing instead of having to rebore the cylinder to remove pits. The 1108CL bomb may be purchased separately or it can be substituted for the standard 1108 bomb in any Parr calorimeter or combustion apparatus.

An oxygen filling system and other accessories for the 1108 bombs can be ordered from listings on page 15, or a bomb complete with all necessary accessories can be obtained by ordering the 1901 oxygen bomb apparatus described on page 13.

ORDERING INFORMATION

1108	Oxygen combustion bomb 342 mL, Carp. 20Cb-3 stainless steel
1108CL	Oxygen combustion bomb, 342 mL, for chlorine service.

Oxygen Bomb Apparatus

Complete Systems for Bomb Combustion Procedures

This is the convenient way to purchase an oxygen bomb with a full set of operating accessories. Although any of the components of this apparatus may be purchased separately, by purchasing a complete apparatus the user can be sure that he will have all of the equipment needed for bomb combustion operations. The 1901 Apparatus with an 1108 bomb will handle most procedures. It consists of:

1	1108	Oxygen combustion bomb
1	A387A	Water bath
1	1825	Oxygen filling connection
1	2901	Ignition unit
2	A468E	Ignition cords
1	A38A	Bomb head support stand
1	421A	Bomb lifter
6	43AS	Combustion capsules
3	45C10	Cards of 10-cm fuse wire
1	3601	Bottle of 100 gelatin capsules
1	set	Extra gaskets and sealing rings
1	—	Instruction manual

Similar oxygen bomb apparatus with accessories listed above can be furnished with an 1108CL bomb or with an 1108 bomb

with platinum electrodes and a quartz liner. Spare parts kits are available also.

ORDERING INFORMATION

Oxygen bomb apparatus with 1108 bomb.

1901EB	115v 50/60 Hz
1901EE	230v 50/60 Hz

Oxygen bomb apparatus with 1108CL bomb.

1901CLEB	115v 50/60 Hz
1901CLEE	230v 50/60 Hz

Oxygen bomb apparatus with 1108 bomb and quartz liner.

1911EB	115v 50/60 Hz
1911EE	230v 50/60 Hz

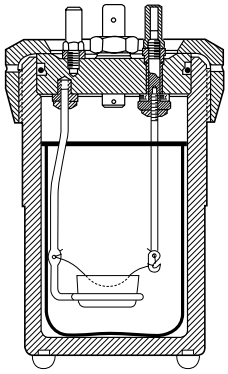
A Quartz Liner for the 1108 Oxygen Bomb

For Determining Trace Elements in Combustible Samples

Trace elements in coal, oil and other combustible samples are readily determined by AA or ICP spectroscopy following combustion in an oxygen bomb. However, trace amounts of heavy metals leached from the bomb walls and electrodes during combustion can cause problems. This can be avoided by using a platinum-lined bomb, but a platinum lining is expensive. As an alternate, Parr offers a quartz liner for the 1108 bomb which does not provide the full protection of platinum, but is, nevertheless, an effective substitute. In this arrangement the burning sample comes in contact with only the quartz liner and platinum electrodes. Reprints of papers describing the successful use of an 1108 bomb with quartz liner for trace analysis by AA spectroscopy are available from Parr.

The Quartz Liner

The quartz liner for the 1108 bomb consists of a quartz cup, 61 mm dia. x 86 mm deep, with a flat quartz cover. Holes are provided in the cover for inserting platinum electrodes which support a fused silica sample cup and a short platinum fuse wire. All of the parts needed for adding this liner are provided in the 1912 Quartz Liner Conversion Set, consisting of:



1	513A	Quartz liner
1	514A	Quartz liner
1	4AFB	Platinum electrode
1	5AFB	Platinum electrode
2	68AC	Lock nut, T303SS
1	45C3	Platinum fuse wire, 300 cm
4	43A3	Fused silica combustion capsules

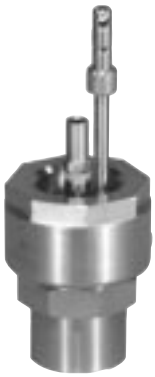
Users who do not have an 1108 bomb should order the 1911 oxygen bomb apparatus listed above which provides a bomb complete with a quartz liner and all accessories.

ORDERING INFORMATION

1912 Conversion set for adding a quartz liner to an 1108 oxygen bomb.

Special Oxygen Bombs


1105


1107


1106


1104


1121

Parr offers a number of special purpose oxygen bombs, some of which are described briefly below. Users interested in any of these or other special-purpose bombs are urged to contact Parr for additional details.

No. 1105 Vacuum-tight Bomb. This 340 mL oxygen bomb has the same capacity as the 1108 general purpose bomb, but it is designed for applications which require the bomb to be evacuated before or after firing. It has a one-piece head with inlet and outlet valve bodies machined as integral parts of the head to eliminate threaded joints at these locations. An 1824 oxygen filling connection with snap coupling is required.

No. 1106 Inverted Bomb. This bomb is the same as No. 1105, but designed to operate in an inverted position with all fittings at the bottom of the chamber so that hot gases strike only the smooth surfaces of the inverted cylinder. This arrangement is advantageous when testing rocket propellants and materials which burn with an unusually hot flame.

No. 1105C and 1106C Platinum-lined Bombs. These 1105C and 1106C bombs are fitted with a platinum liner for complete protection against highly corrosive combustion products. All inner surfaces are covered with platinum and inner fittings are made of a platinum – 10% iridium alloy. Once installed, the liner remains firmly in place. Platinum fuel capsules and fuse wire are required.

No. 1107 Semimicro Bomb. This 22 mL bomb is the smallest Parr combustion bomb. It will accommodate samples ranging from 25 to 200 milligrams liberating up to 1200 calories. Samples can also be burned in inert atmospheres when testing heat powders, pyrotechnic mixtures and slow-burning thermite types with self-contained oxidizers. It requires a wrench and socket for holding the bomb and an 1824 filling connection.

No. 1104 High-Strength Bomb. This is a 240 mL, extra-heavy oxygen bomb for combustion tests with gun powder, explosives and other samples which burn with extreme violence. It will handle samples liberating up to 12,000 calories using oxygen charging pressures up to 45 atm. Extra strength is built into all parts of the bomb. A removable combustion cage can be installed to baffle the combustion forces when treating fast-burning high-energy samples.

No. 1121 Large-Capacity Bomb. This is an 1850 mL oxygen bomb developed for users who want to analyze slow-burning cellulosic materials using larger samples than can be treated in the 1108 bomb. It will accommodate samples weighing up to 10 grams using oxygen charging pressures up to 20 atm., but these limits vary and must be checked experimentally for each sample. The bomb will hold vacuum, making it particularly useful for determining trace amounts of tritium, carbon-14 or heavy metals in vegetable matter.

No. 1122 Large-Capacity Bomb. Same as 1121 except for the smaller capacity of 920 mL.

ORDERING INFORMATION

1104	High pressure oxygen bomb, 240 mL, with capsule support cage and one 217A combustion capsule and 5A3 loop electrode.
1104B	High pressure oxygen bomb, 240 mL, with 5A3 loop electrode. (No combustion cage and no capsule).
1105	Oxygen combustion bomb, 340 mL, Carp. 20Cb-3 stainless steel.
1105C	Oxygen combustion bomb, 340 mL, platinum lined.
1106	Oxygen combustion bomb, 340 mL, inverted, Carp. 20Cb-3 SS.
1106C	Oxygen combustion bomb, 340 mL, inverted, platinum lined.
1107	Semimicro oxygen bomb, 22 mL.
1121	Oxygen bomb, 1850 mL, T316SS with two valves and 0-3000 psi pressure gage.
1122	Oxygen bomb, 920 mL, T316SS with two valves and 0-3000 psi pressure gage.

Oxygen Bomb Accessories

Oxygen Filling Connections

These connections provide all of the valves, gages, and couplings needed for charging Parr oxygen bombs from a commercial oxygen tank under manual control. They are made in three styles which are identical except for the coupling on the bomb filling hose. All units fit a standard 1A oxygen tank having a CGA 540 outlet with a right-handed thread. Two pressure gages are provided. The larger gage graduated from 0 to 55 atmospheres shows the pressure to which the bomb has been charged, while the smaller gage shows the available pressure in the supply tank. Gas flow to the bomb is controlled by a needle valve in the gage block. There is an automatic relief valve to prevent over-charging during the filling operation.

1823	Oxygen Filling Connection with flat gasket coupling for use with 1104 bombs.
1824	Oxygen Filling Connection with snap coupling for use with 1105, 1106, and 1107 bombs.
1825	Oxygen Filling Connection with O-ring coupling for use with 1108 and 1121 bombs.

Combustion Capsules

The 43A fuel capsules listed below are used in all 1105, 1106 and 1108 oxygen bombs. Other capsules in the list are for special purpose bombs as indicated.

43AS	Combustion Capsule, stainless steel
43A3	Combustion Capsule, fused silica
43A5	Combustion Capsule, platinum - 3% rhodium
43A6	Combustion Capsule, platinum – 3% rhodium w/ flanged rim
169AC	Combustion Capsule, platinum, for 1107 bomb
208AC	Combustion Capsule, Inconel, for 1107 bomb
217A	Heavy Combustion Capsule for 1104 bomb
446A	Combustion Cup, stainless, for 1121/1122 bomb

Autocharger

The 1841 Autocharger provides an electronic control system with a tank pressure regulator for filling an oxygen bomb rapidly and conveniently without operator attention. Operations with the Autocharger are completely automatic. The operator simply pushes a button to start the filling sequence. Filling then proceeds automatically to a pre-set pressure. Dual safety provisions are built into the system to prevent an overcharge. Bulletin 1841 provides additional details.

1841	Autocharger, bomb filling system, 115v 50/60 Hz or 230 v 50/60 Hz

Ignition Unit

These units provide the proper electric current for firing a Parr oxygen or sodium peroxide bomb from a 115 or 230 volt line. Each carries a push switch, pilot light and output binding posts for connections to 7 or 10 cm bomb fuses. Connecting cords must be ordered separately.

2901EB	Ignition unit, 115v 50/60 Hz
2901EE	Ignition unit, 230v 50/60 Hz
A468E	Ignition Cord, 3-ft., single cord with spade terminal one end, banana plug other end. Use with 1108 or 1121 bombs. Two required.

Fuse Wire

Parr 45C10 fuse wire is a 34 B&S gage, nickel-chromium resistance wire wound on a 10 cm card for ease in cutting a fuse to length. Platinum wire is sold by length as shown.

45C2	Fuse Wire, platinum, 26 ga, priced per foot
45C3	Fuse Wire, platinum, 36 ga, 300 cm coil
45C10	Fuse Wire, Ni-alloy, 10-cm card, 500 pieces per card, for oxygen bombs (1500/package)

The PARR Warranty

Parr Instrument Company (Parr) sample preparation vessels, and associated products are designed and manufactured only for use by or under the direct supervision of trained professionals in accordance with specifications and instructions for use supplied with the products. For that reason, Parr sells only to professional users or distributors to such users. Parr produces precision equipment and associated products which are **not intended for general commercial use**.

Exclusive Warranty

To the extent allowed by law, the express and limited warranties herein are the sole warranties. **Any implied warranties are expressly excluded**, including but not limited to implied warranties of merchantability or fitness for a particular purpose.

Express Warranties

Subject to the above Conditions, Parr expressly warrants that its products:

Are as described in the applicable Parr sales literature, or as specified in Parr shipping documents.

Will function as described in corresponding Parr sales bulletins, or for specifically engineered assemblies, as stated in the sales proposal and purchase agreement.

Will remain free from defects in materials and workmanship for one year from date of delivery of the product to the original purchaser/user. **Note** that there is no guarantee of a service life of one year after delivery.

Limitations On The Parr Warranty

As to the original purchaser/user and to the distributors to such users, Parr limits its liability for claims other than personal injury as follows:

Replacement or repair. With respect to express warranties herein, Parr's only obligation is to replace or repair any parts, assemblies or products not conforming to the warranties provided herein.

Disclaimer of consequential damages. In no event shall Parr be liable for consequential commercial damages, including but not limited to: damages for loss of use, damages for lost profits, and damages for resulting harm to property other than the Parr product and its component parts.

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