

PMAC Autoclave with Rotating Cylinder Electrode (RCE)

Fluid flowing past a corroding surface often affects the way in which a metal corrodes in an environment. PMAC systems' Autoclave RCE apparatus is designed to measure the corrosion rate under a variety of shear, pressure, and temperature conditions with the ability of utilising a variety of standard rotating electrodes.

The Autoclave range comes in a range of volumes from 500cc to 10Lts all

- Quality Assured to BS EN ISO 9001:2000
- Designed in accordance with ASME VIII. Div 1 (NCS) and or PD5500 2000
- Pressure Equipment Directive 97/23/EC (PED)
- Pressure Systems Safety Regulations 2000 (PSSR)
- British Compressed Gases CP4 Rev 2 1998



Manufactured from solid 316/316L stainless steel with options for Hastelloy lined stainless steel vessel or if budget allows for a solid Hastelloy option.

Standard fittings to an autoclave would include the following but other configurations can be accommodated.

Internal:

- $\varnothing\frac{1}{4}$ " Thermowell - Located close to the vessel wall, fitted with 1mm diameter type K thermocouple.
- $\varnothing\frac{1}{4}$ " Sampling dip tube
- Rotating cylinder electrode

External:

- Port 1 Central tapping for connection to rotating cylinder electrode system
- Port 2 - $\frac{1}{4}$ " Gas inlet valve connected to vessel cover via $\frac{1}{4}$ "NPT male connector
- Port 3 - $\frac{1}{4}$ " Gas outlet valve connected to vessel cover via $\frac{1}{4}$ "NPT male connector
- Port 4 - $\varnothing\frac{1}{4}$ " Thermowell tube connected to vessel cover and close to internal wall via $\frac{1}{4}$ "NPT male connector
- Port 5 - $\varnothing\frac{1}{4}$ " sampling dip tube complete with quarter turn $\frac{1}{4}$ " isolation valve connected to vessel cover via $\frac{1}{4}$ "NPT male connector
- Port 6 - $\frac{1}{4}$ "NPT tapping for connection to customers own 'buffalo connax' fitting
- Port 7 and Port 8 $\frac{1}{4}$ " tappings for future cooling coil connected to vessel cover via $\frac{1}{4}$ "NPT male connectors. (supplied blanked-off)



PMAC Systems

Flow Assurance Specialists

Products and Services for Corrosion & Erosion Integrity and Monitoring

UK Office

PMAC House
Greenhole Park
Greenhole Place
Bridge of Don
Aberdeen UK
AB23 8EU

Phone: +44 (0)1224 703032

Fax: +44 (0)1224 821660

E-mail: sales@pmacsystems.com

Singapore Office

PMAC Asia Pacific Pte Ltd
#01-01, 19 Loyang Way
Changi Logistics Centre
Singapore
508724

Phone: +65 6214 9029

E-mail:

asia.pacific@pmacsystems.com

- Port 9 - 1/4" NPT Manifold fitted with: - Safety, pressure relief valve (PED compliant) conforming to the requirements of BS 6759-1/2 1984 set at 45barg c/w engraved brass identification disc. Supplied complete with individual calibration certificate
- Bursting disc body - c/w engraved brass identification disc. Fitted with, P.T.F.E. protected, nickel bursting disc to the requirements of B.S. 2915:1990. Manufacture set of three to 50barg (depending on options) one to be fitted into body, remainder individually identified and packed in a small plastic box. Supplied complete with individual calibration certificate
- Dual Scale Pressure Gauge with 63mm clock face Range and primary scale to 80barg. Supplied complete with individual calibration certificate to BS1780:1985
- Connection for Pressure transducer.

Safety feature:

Burst disc discharge hose, especially made high pressure burst disc hose complete with armour braided stainless sheathing, supplied 3m in length (longer available).

Mounting style: Fixed vessel – removable cover (or to suit).

Mounting Frame work.

The vessel and associated equipment is floor mountable to a static location or onto mobile purpose built, light gauge frame constructed in Stainless steel. The frame with integral top plate accommodates the fixed vessel body with lift-away cover complete with secondary manifold plate (located above vessel cover) for the burst disc body and other pressure related equipment. The frame is also fitted with a base plate to support the options of vessel jack and guided lifting equipment for heating manifold.



Counterbalanced Davit arm

If manual handling of the cover is not suitable for the size of vessel arrangement then a propose built counterbalanced davit arm can be provided. This arm, appropriately mounted onto the framework's tabletop, will rotate accordingly to and from an appropriately positioned parking bay. This so called parking bay is essentially a hole within the tabletop which allows the various internals to hang underneath the table top. The davit is particularly useful if more than one design of cover is in use with the autoclave. Alternatively a lifting / lowering jack, manufactured in accordance to BS5323 supplied complete with certification, can be supplied. This lightweight and robust manually operated (hydraulic); scissors type platform is suitable for moving the cover vertically from the body but does not allow it to be cleared away to the side for changing the id for an alternative design. The platform itself is modified to accommodate guide bars to ensure the vessel body accurately locates with the vessel cover.

Heating mantel

Via the lifting lowering jack, this allows easy and immediate connection / disconnection of the heating equipment with the autoclave. The mantel is essentially a band heater clamped with internal tie bars to the outside diameter of a very thin walled inner tube which is further encased with a wool insulated protective outer tube accommodating top and bottom flanges. The inner tubes' inside diameter is a snug fit and slides onto the vessels outside diameter. The inner tube being of low thermal mass quickly transfers the heat to the vessel. The heating equipment can be instantaneously removed from the autoclave to assist in the cooling operation.

PMAC Systems

**Flow Assurance
Specialists**

**Products and
Services for
Corrosion &
Erosion Integrity
and Monitoring**

UK Office

PMAC House
Greenhole Park
Greenhole Place
Bridge of Don
Aberdeen UK
AB23 8EU

Phone: +44 (0)1224 703032
Fax: +44 (0)1224 821660
E-mail: sales@pmacsystems.com

Singapore Office

PMAC Asia Pacific Pte Ltd
#01-01, 19 Loyang Way
Changi Logistics Centre
Singapore
508724

Phone: +65 6214 9029
E-mail:
asia.pacific@pmacsystems.com

RCE

A suitable stirrer drive motor is supplied for the RCE with a digital display of speed and an accumulator (rev. total).

Standard electrodes are 20mm dia and 10mm or 20mm long. They have an 'O' seal design to accurately specify the area exposed to the test fluid (717 sq mm for the 10 mm length electrode and 1345 sq mm for the 20 mm long. These figures are based on a smooth surface which is more predictable than a surface roughened by some mechanical process).

The samples are internally machined to achieve good electrical contact.

The grade of steel is normally a low carbon such as 080M40 (UK) = 1040 (U.S.A.) but within reason other commercially available grades can be used. The reference electrode – oil industry preference uses Hastelloy 276 although we offer option of Hastelloy C22 (we believe better).

Rotating Cage Coupon Test

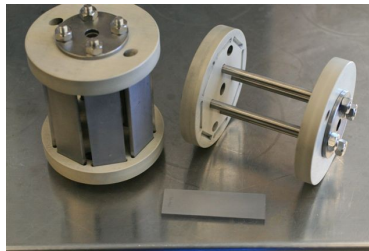
This ASTM G170 technique was developed to allow for a more detailed evaluation of the effectiveness of corrosion inhibitors under severe field conditions within a laboratory environment. The high shearing capability of the Cage is a valuable tool when used in cooperation with the Rotating Cylinder Electrode technique (RCE).

The cage is especially useful in evaluation of:

- flow effects on corrosion (a limitation of the RCE technique)
- inhibitor effectiveness under variable shearing conditions
- rapid screening of inhibitors

Optional Rotating Cage Apparatus

For vessels in excess of 2lt volume it is possible to have the rotating cage assembly fitted. The Rotating cage is an assembly attached to a rotator, whereby a number of corrosion coupons are mounted between two discs. The assembly may be then mounted into a low pressure vessel for rapid screening of corrosion inhibitors or into the HPHT Autoclave for a detailed evaluation.



PMAC Rotating Cage apparatus is a complete stand alone set-up, complete with a belt driven stirrer motor, cage for 6 x 2 1/8 " standard corrosion coupons. It has a standard glass cylinder vessel.

As there are numerous possible combinations for temperature range, pressure, material and test available using PMAC autoclaves and reactor vessels please contact us with your requirements.

PMAC Systems

**Flow Assurance
Specialists**

**Products and
Services for
Corrosion &
Erosion Integrity
and Monitoring**

UK Office

PMAC House
Greenhole Park
Greenhole Place
Bridge of Don
Aberdeen UK
AB23 8EU

Phone: +44 (0)1224 703032

Fax: +44 (0)1224 821660

E-mail: sales@pmacsystems.com

Singapore Office

PMAC Asia Pacific Pte Ltd
#01-01, 19 Loyang Way
Changi Logistics Centre
Singapore
508724

Phone: +65 6214 9029

E-mail:

asia.pacific@pmacsystems.com

