Technical Data Sheet

AS1810 (ESP411)
1 Part neutral thixotropic adhesive sealant

Introduction

AS1810 is a non-corrosive, 1-part, room temperature vulcanising (RTV) silicone rubber.
It is one of a new family of products called acetone cure sealants that are solvent free.
It exhibits excellent primerless adhesion to many substrates.
The product is cured rapidly in contact with atmospheric moisture to a tough rubber.
It does not corrode copper or its alloys and exhibits excellent primerless adhesion when fully cured.
ACC employed MERL (Materials Engineering Research Laboratories) to carry out extensive testing using Liquid F diesel (ISO1817) and RME diesel (DIN EN 14214) a full copy of the report is available on request.

Key Features

- **Non-Corrosive**
- **Excellent Adhesion**
- **Improved fuel resistance**
- **Cure through to 3 mm in 24 hours**

How to Use

AS1810 is ready for use. If supplied in cartridges it can be applied using either manual or pneumatic dispensers.
It can also be applied from bulk containers using conventional drum dispensing equipment.

Application and Cure

All surfaces to which the sealant is to be applied should be clean, dry and free from grease, dirt, and loose material.
Priming of surfaces is not normally required.
If using as an adhesive, it should be applied to one clean surface and the other clean surface brought into contact with it within 15 to 20 seconds.
For optimum bond strength the thickness of the sealant joint is 1 to 2mm.
Joints should be left undisturbed for at least 24 hours, but preferably longer to effect sufficient depth of cure. Full cure requires 7 days.

Health and Safety - Material Safety Data Sheets available on request.

Packages - 75 ml and 310 ml cartridges. Arrangements can be made to supply in bulk containers.

Storage and Shelf Life – Expected to be **12** months in cartridges and 9 months in bulk, unopened containers.

Property	Test Method	Value
Uncured Product		
Colour:		**Black**
Appearance:		**Paste**
Tack Free Time:		**4 minutes ***
3mm Cure Through:		**<24 hours ***
Extrusion Rate:		**169g / minute**
Viscosity		**mPas**

* measured at 23+/-2°C and 65% relative humidity.

Cured Elastomer		
(after 7 days cure at 23+/-2°C and 65% relative humidity)		
Tensile Strength:	BS903 Part A2	**1.81 MPa**
Elongation at Break:	BS903 Part A2	**353 %**
Youngs Modulus:		
Modulus at 100% Strain:	BS903 Part A2	**0.80 MPa**
Tear Strength:	BS903 Part A3	**6.00 kN/m**
Hardness:	ASTM D 2240-95	**35° Shore A**
Specific Gravity:	BS 903 Part A1	**1.05**
Linear Shrinkage:		**0.40%**
Thermal Conductivity:		**0.19W/mK**
Coefficient of Thermal Expansion:		
Volumetric		**884 ppm / °C**
Linear		**295 ppm / °C**
Min. Service Temperature:		**-50°C**
Max. Service Temperature:	AFS 1540B	**220 °C**

Electrical Properties

Volume Resistivity:	ASTM D-257	**6.38E+14Ω.cm**
Surface Resistivity:	ASTM D-257	**3.3E+12Ω**
Dielectric Strength:	ASTM D-149	**>20kV/mm**
Dielectric Constant at 1MHz:	ASTM D-150	**2.97**
Dissipation Factor at 1MHz:	ASTM D-150	**2.5E-3**

Adhesion Testing

Overlap Shear Strength:	ASTM D 1002	kg/cm^2
Copper		**4.87**
Aluminium		**6.94**
Stainless Steel 304		
Polycarbonate		

Customers are advised to carry out their own tests on clean, degreased substrates to ensure satisfactory adhesion is achieved

Stress cracking can appear on some grades of polycarbonate. Customers are advised to carry out initial testing to ensure product compatibility.

All values are typical and should not be accepted as a specification.

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Technical Application Report

AS1810 Diesel Resistant Silicone RTV

Application Challenges

Modern diesel engines require gaskets to seal a variety of components including fuel systems and control units. RTV silicones have bean used with in and around the engine for many years, being chosen for their flexibility and ability to with stand high temperatures. For use within a diesel engine the gasket material must be able to withstand the temperatures generated from the engine but most importantly, must be able to withstand the continual contact with diesel fuel.

In general silicone RTV sealants are prone to attack from mineral oils. To overcome this problem silicone RTV's can be formulated using fluorosilicone polymers, however the dramatic increase in costs usually prohibits their commercial use.

ACC have taken one of their patented acetone cure RTV silicone sealants and carried out extensive testing to prove their suitability for applications involving contact with both conventional and bio-diesel fuels.

AS1810

Technical Data*

Cure type:	Acetone
Colour:	Black
Tack free:	4 min
SG:	1.05
Extrusion rate:	169 g/m
Temp range:	-50°C to +220°C
Hardness (Duro):	35 shore A
Tensile:	1.81 MPa
Elongation:	353%
Tear:	6.00 kN/m

*for full product data refer to technical data sheet

Additional testing would be required to establish the fuel resistance of the Acetone cure silicone. In addition to testing with standard grade diesel, tests would be carried out using RME (Rapeseed Methyl Ester) Bio-grade diesel.

Testing

As a supplier to the aerospace industry for well over 25 years ACC silicones are well qualified to carry out an extensive rage of material testing within their own facilities. In addition to the standard tests carried out under their own stringent quality control and development procedures, ACC commissioned a specialist outside testing house.

ACC employed MERL (Materials Engineering Research Laboratories) to carry out the following tests using Liquid F diesel (ISO1817) and RME diesel (DIN EN 14214).

MEARL Additional Testing:

Fuel immersion testing to establish effect on:
Hardness, SG, Elongation, Tensile, Tear, Modulus, Compression Set, Heat Capacity.

Exposure Conditions
72 hours @ 23ºC
72 hours @ 100ºC
504 hours @ 100ºC
1008 hours @ 100ºC

Testing regime

Property	Standard	No of Samples
Micro IRDH hardness	Din 53519-2	17 off
Shore A hardness	DIN 54505	17 off
Tensile strength	DIN 53504	17 x 5 off
Tear strength	DIN 35307B	17 x 5 off
Density	DIN 53479A	17 off
Compression set 22hrs @ 150ºC	VDA 675216B	2 off
DMA analysis -45ºC to +60ºC in 1ºC steps		1 off
DSC cold orientation value	TR DBL5555 Part II section 4.3 also ISO 4663	1 off

Conclusions of testing

1. **Liquid F Diesel ISO1817 reduces the physical strength of AS1810 by a greater degree in comparison to Winter Bio-diesel RME (Rapeseed Methyl Ester) DIN EN 14214.**

2. The modulus/hardness of the AS1810 drops very rapidly after 3 days of exposure to Liquid F diesel at 100°C and slowly decreases in hardness over the next 928 hours. The elongation remains relatively constant after an initial drop after 3 days exposure. The density initially drops after 3 days exposure at 100°C then remains constant over the next 928 hours. This indicates that the AS1810 has become saturated with the Liquid F diesel and can't physically absorb any more. The liquid F diesel is trapped in the AS1810 and is very difficult to remove, even after drying at 100°C for 22 hours. **The AS1810 though weak in physical strength, (tensile and trouser tear) and low in hardness, still has sufficient strength and elastic properties to remain useful as a sealant in a low stress environment when immersed in Liquid F diesel for 1000 hours at 100°C.**

3. The modulus/hardness of the AS1810 drops very rapidly after 3 days of exposure to Winter Bio-diesel at 100° and slowly decreases in hardness over the next 928 hours. The drop in properties is not as great as those seen with Liquid F diesel. The elongation remains relatively constant over the 100 hour test period at 100°C. The density initially drops after 3 days exposure at 100°C then remains constant over the next 928 hours. This indicates that the AS1810 has become saturated with the Winter Bio-diesel and can't physically absorb any more. The Winter Bio-diesel is trapped in the AS1810 and is very difficult to remove even after drying at 100°C for 22 hours. **The AS1810, though weak in physical strength and low on hardness, still has sufficient strength and elastic properties to remain useful as a sealant in a low stress environment when immersed in Winter Bio-diesel for 1000 hours at 100°C**

4. Compression set results indicate the ability of the AS1810 to return to its original shape and size after a compression force gas been applied for a given time period. In this case AS1810 gave a value of 74.4% after 22 hours compression at 150°C. When left for a further 30 minutes the AS1810 does improve to 60% compression set. The lower the % compression set the better the ability of the material to recover from stress compression. **These values indicate that the AS1810 can be compressed beyond its point of recovery. There is a slow improvement but AS1810 is not expected to return to the original size and shape.**

5. DMA (Dynamic Mechanical Analysis) is the change in modulus of a material over a temperature range. Modulus is the ability of a material to stretch with applied force, the lower the modulus value, the softer/more elastic the material. The modulus of AS1810 shows a small increase with a decrease in temperature but then achieves a stable value (see Table Fig 7). **The DMA results show that the AS1810 shows very little change in elastic properties over the temperature range of -45°C to 60°C.**

6. DSC (Differential Scanning Calorimetry) analysis determines the specific heat capacity of the AS1810. This is the amount of energy/heat required to raise the temperature of 1 gram of AS1810 by 1°C (1 Kelvin). AS1810 has a specific heat capacity of 1.57 joules/gram.Kelvin (J/g.K). The lower the specific heat capacity the less energy/heat is required to raise the temperature of the material. Some comparisons are given below:

Material	Specific Heat Capacity (j/g.K)
AS1810	1.57
Iron	0.46
Aluminium	0.90
Polypropylene	1.93
Nitrile rubber	1.99

This shows that AS1810 requires a substantial amount of energy to raise the temperature by 1°C in comparison to metallic materials like aluminium and iron, so would take a longer period of time to reach a maximum operating temperature and also, take a longer period of time to lose this heat (thermal insulator).

A full copy of the MERL testing results can be made available from ACC silicones

Summary

Extensive testing proved AS1810 suitable for use with conventional and Bio-diesel when used as a gasket material in conjunction with mechanical fixings.