Compression

Compression Stress Relaxometer

The Wallace Compression Stress Relaxometer (WAC11) allows the operator to easily measure the Compression Stress Relaxation (CSR) characteristics of elastomers and rubber products (e.g. seals, O-rings) as required by the relevant standards.

CSR is a measure of the ability of an elastomer to seal efficiently when held in compression over time and in varying environmental conditions between two rigid faces. The stress at the interface between the elastomer and the rigid faces is important for efficient sealing and is a function of the modulus of the elastomer and the strain applied.

CSR is used by industries including aerospace, automotive and construction to understand the characteristics of elastomeric seals. Seals are used in numerous applications e.g. O-rings in pipe joints or seals in aero and automotive engines. For safety, warranty and product liability reasons, it is essential that these components, whilst under compression, operate without failure for many years.

Features

- **Accurate, repeatable and reproducible measurement**
- **Software allows the brakeforce data from a number of individual jigs to be collected and stored**
- **Discontinuous method, only one instrument for any number of jigs**
- **This WAC11 is backwards compatible with jigs used on previous models**
- **Compression force from 0N to a capacity of 2.2kN (500 lbf)**
- **Units of measurements mN, daN, N, kN, gf, kgf, ozf, lbf**
- **Alternative Load Cell range available**

Accessories

- Wallace supplies a range of both Shawbury-Wallace test jigs (with fixed or adjustable heights/compression percentages) as well as Wykeham Farrance test jigs.

Principle of Operation

The principle of the WAC11 is based on the electrical contact being made between the load cell and the head of the jig. The contact is only broken when the force applied to the Relaxometer marginally exceeds the counterforce exerted by the test sample. The Relaxometer features a ballscrew-driven motorised test frame and load cell designed to apply and measure the required force. At the start of the test cycle the measuring head moves quickly to the jig. At a pre-set position, the measuring head reduces the speed to allow the load cell to more accurately read the force. When the applied force just exceeds the counterforce, the results are displayed graphically and can be saved to a designated folder.

Test Procedure

The test sample is compressed by a known amount in a Wallace Test Jig. The resulting force, at the interface between the sample and the jig, is measured using the WAC11 Compression Stress Relaxometer. The WAC11 is easy to use with a simple onscreen operator interface, allowing the test to be initiated quickly and simply. The force is measured at periodic intervals defined by the relevant standards, and the results are displayed on the computer and stored.

Compression Stress Relaxometer

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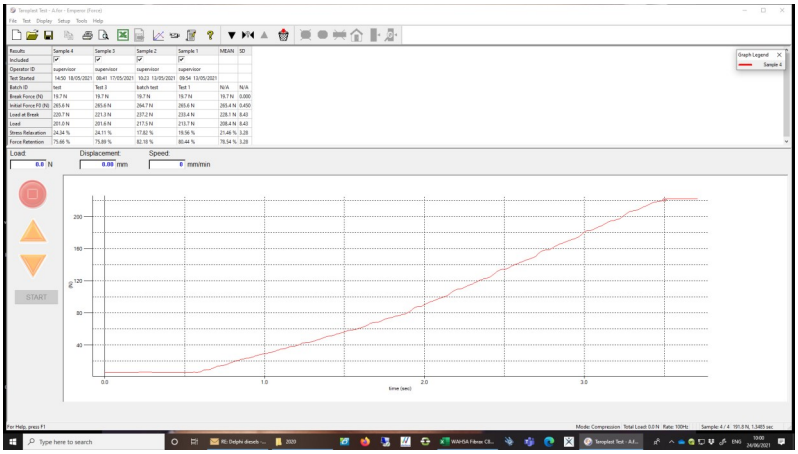
Software

The software allows the brakeforce data from a number of individual jigs to be collected and stored.

- **Windows based, easy-to-use software with almost limitless freedom to design and customise compression tests to suit your needs.**



Specifications

Compression Stress Relaxometer	
Part Number	WAC11
Dimensions	941mm (h) x 290mm (w) x 414mm (d)
Weight	22kg
Max. Power Requirements	250W
Voltage	230VAC 50Hz or 110VAC 60Hz
Available Load Cell Ranges	2 to 50,000 N 0.2 to 55,000 kgf 0.45 to 11,000 lbf
Load Cell Accuracy	±0.1% of full scale 2 to 2.5kN ±0.2% of full scale 5kN to 50kN
Load Cell Resolution	1:6,500
Speed Range	1-1000mm/min
Digital Display of Load/Position/Speed	Yes
Operating Temperature	10°C to 35°C
Humidity Range	Normal industry and laboratory conditions
Output of Test Results to PC/Printer/ Datalogger	Via USB/networks ports RS232 via USB converter in ASCII format

Standards

BS ISO 3384-1 Method B, BS ISO 3384-2 Method B, ASTM D6147 Method B

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Compression

Compression Stress Relaxometer - Jigs

Wallace offers a range of jigs to accompany the WAC11 Compression Stress Relaxometer. The main models we offer in line with the applicable standards are:

- **Shawbury-Wallace Stress Relaxation Jig**

  This fixture is used for the discontinuous method and is based on the electrical contact being made between the load cell and the head of the jig. The contact is only broken when the force applied to the Relaxometer marginally exceeds the counterforce exerted by the test sample.

- **Wykeham Farrance Stress Relaxation Jig**

  This fixture is used for the discontinuous method and works by applying a slight increase in the compression of the test specimen.

Shawbury-Wallace Stress Relaxation Jig

This jig comes both as fixed height jigs and adjustable jigs. Fixed height jigs are generally used when the same test is often repeated (e.g. same sample thickness and compression ratio), whilst the adjustable jigs are used where the applicable size or compression ratio varies.

The fixed height jig (C11/1) is supplied with one fixed spacer, it's height being determined by the sample size and the required percentage compression. There are a number of standard fixed height spacers available to suit different sample heights and percentage compressions. Refer to Annexure A for the range of C11/1 fixed height jigs. Bespoke spacers can be made for specific applications.

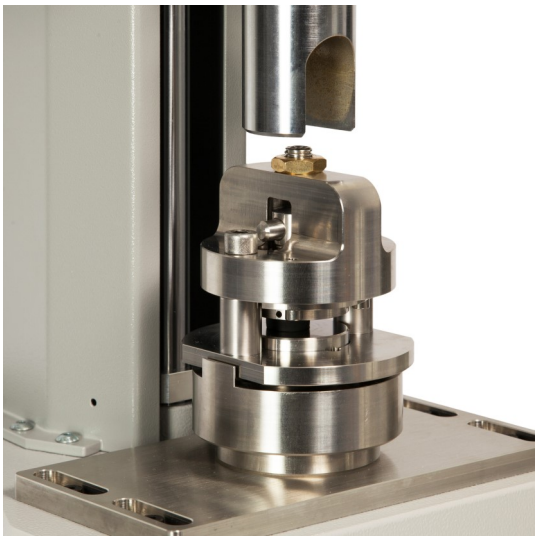
The adjustable height jig (C11/6) is supplied with one adjustable spacer. This allows the required compression ratio to be achieved on samples of varying heights. The distance between the upper and lower platen faces can be adjusted in the range of 0.0mm to 12.0mm.

An O-ring adaptor (C11/7) is available, suitable for both the C11/1 and C11/6 jigs and can accommodate O-rings of up to 41mm diameter. It simply locates over the bottom plate of the jig and a small hole drilled through the adaptor allows air to vent to atmosphere, preventing a pressure differential across the seal.

The Wallace jig assemblies are made from stainless steel as standard, but can be manufactured in other materials for specific applications.

Features

- **Full range of jigs for standard and bespoke applications**
- **Bespoke jigs on request**
- **Seamlessly integrates with existing and previous models of WAC11 Compression Stress Relaxometer**
- **Suitable for testing O-rings**



Accessories

- O-ring Adaptor
- Standard rotary cutters
- Spacer - see table on page 3

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Wykeham Farrance Stress Relaxation Jig

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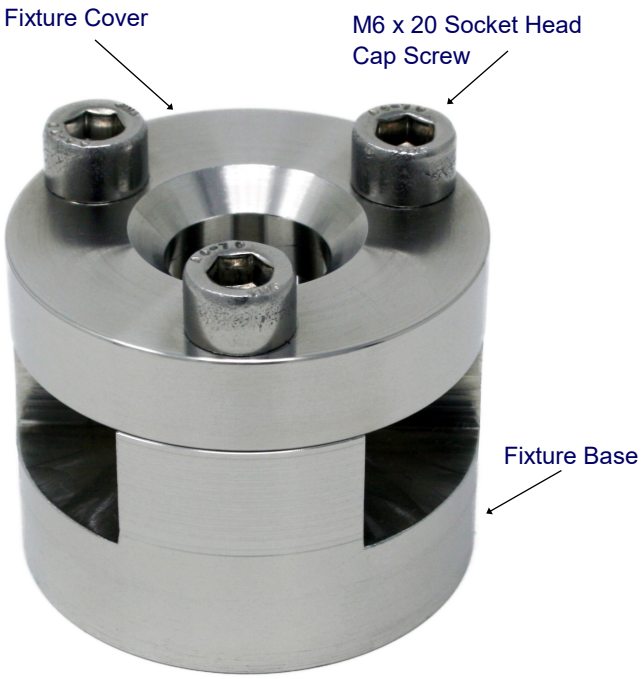
Wallace offers a range of jigs to accompany the WAC11 Compression Stress Relaxometer. This jig is the Wykeham Farrance style jig. It is a fixed height jig and will provide a known compression percentage using precision ground spacers.

The fixed height jig (WAC11-190) is supplied with a pair of fixed spacers. The spacers are sized to give 25% compression to a standard 6.3mm thick sample. Spacers are available to give 15% compression to a standard 6.3mm thick sample. Bespoke spacers can be made for specific applications. Refer to Annexure B for specifications.

The Wykeham jig assemblies are made from stainless steel as standard, but can be manufactured in other materials for specific applications.

Features

- **Full range of jigs for standard and bespoke applications**
- **Bespoke jigs on request**
- **Seamlessly integrates with existing and previous models of WAC11 Compression Stress Relaxometer**
- **Temperature sensor hole in base for 1.6mm probe**



Accessories

- Custom spacer thickness
- WAC11 location adaptor
- Sample positioning gauge
- Standard rotary cutters

Principle of Operation

The jigs compress the sample by a known percentage and maintains the compression throughout the entire test process. With the jig fitted to the WAC11, the counterforce can be measured at the prescribed time intervals easily. The jigs can then be stored in the required condition, until the next test time, without compromising the known compression percentage.

Annexure A

Shawbury-Wallace Stress Relaxation Jigs

Specifications

Shawbury-Wallace Stress Relaxation Jigs	
Part Number	WAC11/1 and WAC11/6
Dimensions (mm)	120 (h) x 100 (Ø)
Weight	1.8kg
Operating Temperature	-40°C to +250°C

Range of Spacers for Fixed Height Jigs			
Part Number	**Sample Height (mm)**	**% Compression**	**Spacer Height (mm)**
WAC11/1-1-1A	12.50	20%	26.00 ± 0.05
WAC11/1-1-1B	6.30	20%	30.96 ± 0.05
WAC11/1-1-1C	12.70	20%	25.84 ± 0.05
WAC11/1-1-1D	6.35	20%	30.92 ± 0.05
WAC11/1-1-1E	12.50	25%	26.63 ± 0.05
WAC11/1-1-1F	6.30	25%	31.28 ± 0.05
WAC11/1-1-1G	12.50	15%	25.38 ± 0.05
WAC11/1-1-1H	6.30	15%	30.65 ± 0.05
WAC11/1-1-1J	13.00	25%	26.25 ± 0.05
WAC11/1-1-1K	13.00	35%	27.55 ± 0.05
WAC11/1-1-1L	1.00	10%	35.10 ± 0.05
WAC11/1-1-1M	3.50	25%	33.38 ± 0.05
WAC11/1-1-1N	6.30	40%	32.22 ± 0.05
WAC11/1-1-1P	2.00	25%	34.50 ± 0.05
WAC11/1-1-1Q	7.00	10%	29.70 ± 0.05
WAC11/1-1-1R	12.70	25%	26.47 ± 0.05
WAC11/1-1-1S	6.00	25%	31.50 ± 0.05
WAC11/1-1-1AA	6.30	30%	31.59 ± 0.05
WAC11/1-1-1AB	6.30	50%	32.85 ± 0.05
WAC11/1-1-1AC	6.25	40%	32.25 ± 0.05
WAC11/1-1-1AE	10.00	15%	27.50 ± 0.01
WAC11/1-1-1AF	10.00	20%	28.00 ± 0.01
WAC11/1-1-1AG	10.00	25%	28.50 ± 0.01
WAC11/1-1-1AH	12.50	15%	25.38 ± 0.01
WAC11/1-1-1AJ	12.50	20%	26.00 ± 0.01
WAC11/1-1-1AK	12.50	25%	26.63 ± 0.01
WAC11/1-1-1AL	2.65	25%	34.01 ± 0.05
WAC11/1-1-1AN	10.00	30%	29.00 ± 0.01

Note: Bespoke spacers are available upon request.

Standards

BS ISO 3384-1 Method B, BS ISO 3384-2 Method B, ASTM D6147 Method B

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Annexure B

Wykeham Farrance Stress Relaxation Jig

Specifications

Wykeham Farrance Stress Relaxation Jig	
Part Number	WAC11-190
Dimensions (mm)	35 (h) x 44.5 (Ø)
Weight	1.2 kg
Operating Temperature	-40°C to +250°C

Range of Spacers (2 off required)			
Part Number	**Sample Height (mm)**	**% Compression**	**Spacer Height (mm)**
WAC11-199-001	6.30	25%	3.9875 ± 0.025
WAC11-199-002	6.30	15%	3.6725 ± 0.025
WAC11-199-003	6.25	25%	4.0063 ± 0.025
WAC11-199-004	6.35	25%	3.9688 ± 0.025
WAC11-199-005	6.40	25%	3.9500 ± 0.025
WAC11-199-006	6.45	25%	3.9313 ± 0.025

Parts and Accessories of Jig	
Part Number	**Description**
WAC11-193	Push Rod to fit WAC11 instrument
WAC11-194	WAC11-190 fixture locator for WAC11 instrument
WAC11-195S	Sample locating tool - set of three
WAC11-199-001	Compression Spacer 25% compression for 6.3mm sample
WAC11-199-002	Compression Spacer 15% compression for 6.3mm sample

Note: Bespoke spacers are available upon request.

Standards

BS ISO 3384-1 Method B, BS ISO 3384-2 Method B, ASTM D6147 Method B