FACT SHEET

CLASSIFICATION TEMPERATURE

Consistent use of pure raw materials...

...higher classification, low shrinkage, consistent quality

Superwool® Plus™
Insulating fibre

The consistent use of pure raw materials in all our factories worldwide has lead to the 4% shrinkage temperature rising from >1100°C (2012°F) Superwool® 607® to >1200°C (2192°F) Superwool® Plus™.

- For AES fibres the shrinkage is low at the maximum continuous use temperature
- European standard EN 1094-1 test methods are used for tensile strength, permanent linear change and temperature classification
- ASTM C-201 equipment used for thermal conductivity

Does Superwool® **Plus**™ blanket withstand high temperatures?

Permanent linear shrinkage

Shrinkage is generally to be avoided in designs using fibre products as it results in gap formation at joints, which can give a path for heat to penetrate deeper into the insulation structure. A low linear shrinkage is therefore highly desirable and AES fibres have a low shrinkage at the maximum continuous use temperature. With Superwool® **Plus**™ fibre, the consistent use of pure raw materials has lead to the 4% shrinkage temperature rising from >1100°C (2012°F) to >1200°C (2192°F).
For this reason, the classification temperature is now given as 1200°C in line with EN1094 norm.

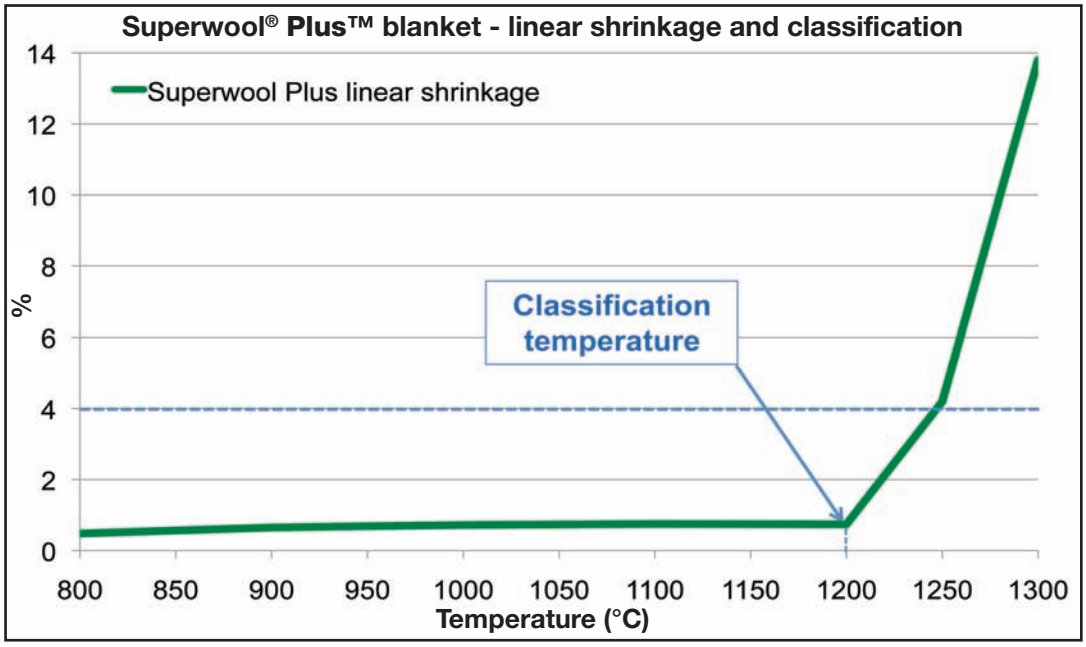
What is the difference between classification temperature and maximum continuous use temperature?

- **Classification temperature (EN1094-3)** is the temperature at which the product has a linear shrinkage not exceeding 4% (for blanket, paper, felt) or 2% (for vacuum formed shapes, board).

- **Maximum continuous use temperature** is the temperature in an oxidising atmosphere (no pollution) at which products show fibrous structure and very low linear and thickness shrinkages. Above that temperature, crystallisation can occur and the mechanical properties may be reduced.

	Superwool® 607®	Superwool® Plus™	Superwool® 607® HT®
Continuous use temperature	1000°C (1832°F)	1000°C (1832°F)	1150°C (2102°F)
Classification temperature	1100°C (2012°F)	1200°C (2192°F)	1300°C (2372°F)
Benefits	Original Superwool®, over 15 years market experience	New manufacturing process gives improved insulation and energy savings	Higher temperature allows additional applications

*The Classification temperature 1200°C (2192°F) does not imply that the product can be used continuously at this temperature. In practice, as for Superwool® 607®, the maximum continuous use temperature for Superwool® **Plus**™ is 1000°C (1832°F) (this applies only under oxidising atmosphere without presence of contaminants).*



What is melting point and why is it important?

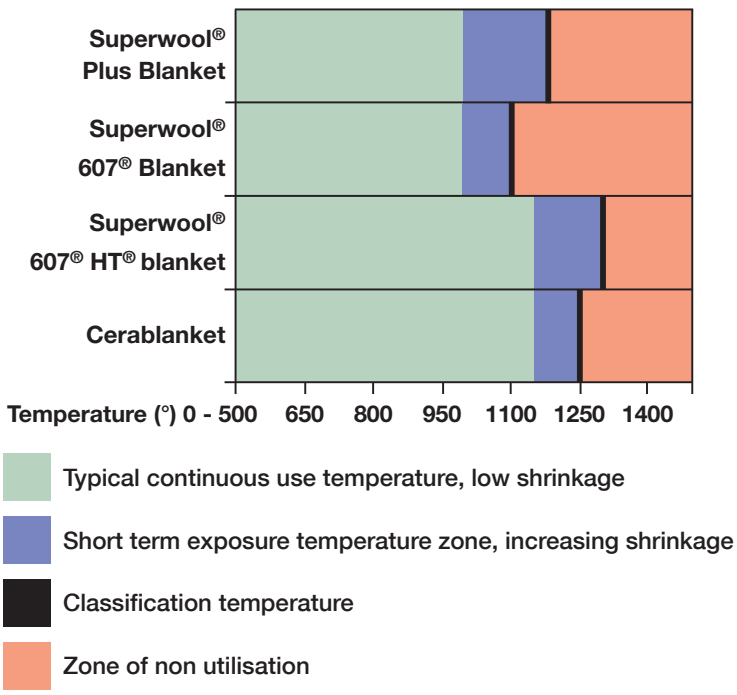
The melting point of Superwool® **Plus**™ blankets (or similar products) is defined as the temperature when the material exceeds 20% linear shrinkage. At this level of shrinkage the blanket will have lost virtually all of its thermal insulation properties and will become liquid with only a relatively small increase in temperature. It is therefore important to know the temperature of the melting point to ensure that the material is only installed into appropriate areas where the melting point will not be exceeded.

Testing methods (ASTM C-201 and EN 1094-1)

For test methods measuring the properties of high temperature insulation wools (HTIW), the European standard EN 1094-1 (2008) is used for the test methods where appropriate. Superwool® **Plus**™ data sheets refer to measurements such as tensile strength, permanent linear change and temperature classification. These characterisations are made according to the test methods given in this standard. However there are several test procedures for HTIW products which are currently in development and will not be included into the EN 1094-1 standard until they have been ratified.

Some tests, such as thermal conductivity and leachable chloride use the ASTM methods. In particular the thermal conductivity test uses the methods based on the ASTM C-201 equipment as it is believed that this gives the most accurate data for high temperature insulation. The thermal conductivity method given in the draft European Standard EN 1094-1 has been withdrawn as it was was inaccurate and so was not included in the current standard.

Typical use temperature range



Superwool® Plus™

Insulating fibre

Features	Benefits
An engineered solution (unique)	Takes insulation beyond normal performance
Patented technology	Proven chemical formulation
Exonerated from Carcinogen classification under Nota Q of European Directive 67/548	Restrictions on use do not apply. No special requirements for dust control, supply to the general public or waste disposal
Lower thermal conductivity	Improves insulation by 20%
Up to 30% more fibres	Efficient prevention of heat transfer and greater strength
Less shot	Cleaner workplace
High Fibre Index	Up to 20% reduction in thermal conductivity giving energy saving
Stronger with good handleability (no tearing)	**Ease of installation saving time and waste**
Improved handling	Operator satisfaction
Soft & smooth feel	Less mechanical skin irritation
Consistent use of pure raw materials	Higher classification temperature, low shrinkage and consistent quality
Lower density grade for the same result	Material weight savings up to 25%
Thinner lining for the same result	Create more working space within unit
Resistant to vibration	Allows long lifetime under vibration conditions where other products fail
An environmental solution	Potential savings on waste disposal
Worldwide production	Availability

Copyright and disclaimer information

Morgan Thermal Ceramics has made all reasonable efforts to ensure that all information provided through the technical manual is accurate at the time of inclusion. However, it is possible that there may be occasional errors or omissions for which Morgan Thermal Ceramics apologises.

Morgan Thermal Ceramics makes no representation or warranty, express or implied, as to the accuracy or completeness of the contents of this manual, and reserves the right to make such changes as it may wish at any time without notice.

Neither Morgan Thermal Ceramics nor any of its subsidiaries, associates, directors, officers, employees or agents shall have any liability to any person for any direct, special, indirect, or consequential damages, or any other damages of whatsoever kind or for any costs or expenses resulting from their use of the contents of this manual.

Any and all decisions (including but not limited to investment decisions) which may be based on information in this technical manual are entirely the responsibility of the reader. No information contained in this technical manual constitutes or shall be deemed to constitute an invitation or advice concerning any decision to invest or otherwise deal in shares or securities of Morgan or its subsidiaries or associates.

Links to third party's containing information on Morgan Thermal Ceramics and/or its subsidiaries and associates are provided for the reader's convenience only. Thermal Ceramics is not the publisher of such information and takes no responsibility of any kind for it. Information contained in this technical manual is for illustrative purposes only. Further information and advice on specific details of the products described should be obtained in from Morgan Thermal Ceramics directly.

For more information on our products, please refer to the Technical Datasheet Section and the MSDS Information Section on our website www.morganthermalceramics.com

The values given herein are TYPICAL AVERAGE VALUES obtained in accordance with accepted test methods and are subject to normal manufacturing variations. Actual use limit depends on application, construction, fibre thermal stability, anchoring system, etc. They are supplied as a technical service and are subject to change without notice. Therefore, the data contained herein should not be used for specification purposes. Check with your Morgan Thermal Ceramics office to obtain current information, or visit us online at www.morganthermalceramics.com

SUPERWOOL® is a patented technology for high temperature insulation wools which have been developed to have a low bio persistence (information upon request). This product may be covered by one or more of the following patents, or their foreign equivalents:

SUPERWOOL® PLUS™ products are covered by patent numbers:
US5714421, US5994247, US6180546, US7259118, and EP0621858.

SUPERWOOL® 607HT™ products are covered by patent numbers:
US5955389, US6180546, US7259118, US7470641, US7651965, US7875566, EP0710628, EP1544177, and EP1725503

A list of foreign patent numbers is available upon request to The Morgan Crucible Company plc.

For all enquiries please contact: marketing.tc@morganplc.com

www.morganthermalceramics.com