FS022
C & C
EDITION

Bostik
smart adhesives

KNOWLEDGE

EDUCATION

BETTER RESULTS THROUGH KNOWLEDGE

OUR MISSION

SUPPORTED BY

FEICA Test Methods for PU Foam

FACTSHEET

Bostik_FactSheets-FS022_GBU_C&C_Sealing & Bonding_072020

GLOBAL LEADER IN ADHESIVE TECHNOLOGIES

Bostik is one of the largest adhesive and sealant Bostik is one of the largest adhesive and sealant companies. Worldwide, we employ some 6,000 people in 50 countries across five continents. Our customers come from diverse markets, most notably the industrial manufacturing, construction and consumer sectors.

SMART INNOVATIONS

Our smart identity is underpinned by innovation. We pursue innovation vigorously, applying the latest technological advances to developing 'smart' adhesives. Our archives are laden with examples of Bostik technologies that have disrupted markets - from potato starch-based wallpaper paste to elastic attachment adhesive for diapers.

Today, our commitment to innovation is as strong as ever. We innovate with our customers through a global R&D network, comprising three international Smart Technology Centres and 8 regional centres. And we differentiate our business through this investment.

FEICA test methods for PU Foam

GENERAL INFORMATION

FEICA's OCF manufacturers drive improvement in the sector OCF manufacturers represented in FEICA have their own Technical Working Group within FEICA, creating a strong voice for the industry in Europe and driving forward continuous improvement within the sector. All the members are committed to delivering high-quality products and accurate and reliable information in the most transparent way. To underline this commitment they have signed a Declaration of Intent, which sets out their shared values and principles of cooperation.

Bostik is a member of FEICA as one of the leading manufacturers of sealants, adhesives and of course polyurethane foams. All the FEICA members are committed to delivering high-quality products and accurate and reliable information in the most transparent way. To underline this commitment they have signed a Declaration of Intent, which sets out their shared values and principles of cooperation. The Declaration lists nine key pledges, as illustrated.

FEICA OCF TEST METHODS

- TM 1002 :2014 Joint Yield of an OCF canister
- TM 1003 :2013 Foam Yield of an OCF canister foam
- TM 1004 :2013 Dimensional Stability of an OCF canister foam
- TM 1005 :2013 Cutting Time of an OCF canister foam
- TM 1006 :2013 Sagging Behaviour of an OCF canister foam
- TM 1007 :2013 Volume by Water Displacement
- TM 1008 :2013 Brittleness of an OCF canister foam
- TM 1009 :2013 Curing Pressure of an OCF canister foam
- TM 1011 :2013 Compression Strength of an OCF canister foam
- TM 1012 :2013 Shear Strength of an OCF canister foam
- TM 1013 :2015 Movement Capabilities
- TM 1014 :2013 Tack Free Time of an OCF canister foam
- TM 1015 :2015 Open Time
- TM 1018 : 2015 Tensile Strength
- TM 1019 :2014 Free Foamed Density
- TM 1020:2017 Determination of the long term Thermal Conductivity of an OCF Canister Foam.

TM 1002:2014

Determination of the density of foam in a joint to calculate the Joint Yield of an OCF Canister Foam.

This test method describes how to determine the apparent density of an OCF sprayed in a joint and how to calculate from this the theoretical foam volume (yield) in running meters of the whole can. The liquid foam is sprayed into a joint with fixed dimensions. The weight and dimensions of the cured foam gives the foam density. By measuring the amount sprayed we can calculate the theoretical foam yield. The yield of an OCF canister is often important to customers buying the product. Information on labels concerning yield are often derived from laboratory tests that were completed under ideal circumstances, i.e. to obtain the highest possible yield. The purpose of this test procedure is to determine a realistic, achievable foam yield of a PU-foam canister when it is used in joints. The value should be reported in metres for a joint with specific width and height. Since numerous joint dimensions can be calculated, the specific width (a) and height (b) of the joint in mm, has to be mentioned together with the result.

TM 1003: 2013

Determination of the Foam Yield of an OCF Canister Foam.

This test method describes how to determine the total foam volume for the whole OCF canister. The full canister is emptied into a box with defined dimensions. The foam volume (yield) is determined by water displacement of the cured foam. The yield of canister PU-foam is often an important issue for customers buying the product. Information on labels concerning yield are often derived from laboratory tests that were completed under ideal circumstances, i.e. to deliver the highest possible yield. This test method was developed to be reproducible for measuring the free foamed volumetric yield.

TM 1004:2013
Determination of the Dimensional Stability of an OCF Canister Foam.
This test method describes how to determine the dimensional stability (shrinkage or expansion) of cured foam under extreme and typical conditions. The foam is dispensed in the gap between two boards. After full curing, the dimensional stability of the foam is determined by measurement of the distance between the panels over several days and weeks. Typically OCFs tend to shrink within the first few days after curing due to gas release from the closed cells. The vanishing propellant leaves an under-pressure in the cells resulting in a shrinking of cell size, therefore the whole foam shrinks. This effect is usually compensated over several days by the slower permeation of air. Shrinking foam can affect the sealing of joints by separation from the surfaces or deformation of the joints. The degree of shrinkage depends not only on the OCF formulation, but also on the environmental conditions like humidity.

TM 1005:2013
Determination of the Cutting Time of an OCF Canister Foam.
This test method describes how to determine the hardening time of a liquid OCF (froth) until it can be cut. The liquid foam is dispensed in defined strings on a horizontal surface. After a certain time for curing, the string is cut. The cutting time is reached when the cut surface is not sticky anymore, the knife remains clean without pre-polymer residues and the cells are not squeezed. The cutting time is the time after which the foam is still not entirely hardened (not to confuse with "load time"), but the time after which the foam is not liquid anymore and can be processed. The cutting time is linked to the curing time, which could be understood as another expression for the same property. The measured value depends strongly on the dispensed string diameter as well as the humidity, temperature and the processing and tools. The cutting time gives an indication about the water transport inside the foam body, therefore about the foam quality. Basically the shorter the cutting time the better, as the foam structure suffers from long curing.

TM 1006:2013
Determination of the Sagging Behaviour of an OCF Canister Foam.
This test method describes how to evaluate the sagging behaviour and determine the biggest joint possible before a liquid OCF (froth) slips off. The foam is sprayed into vertical joints of different dimensions. The joints are enlarged until the foam slips off. One of the most important physical properties of an OCF is the ability to set itself in a cavity and thus fill up joints. This property is dependent upon the temperature of both the canister, the environment and the dimensions of the joints, particularly vertical joints. The typical factors for sagging are low temperatures and wide joints. This method has two objectives:

- To judge the sagging behaviour of an OCF at given conditions: canister and ambient temperature and the joint width.
- To define the maximum joint width for the usability of the OCF at given temperatures where the foam does not slide down.

TM 1007:2013
Determination of the Volume by Water Displacement.
This test method describes how to determine the real volume of cured foam, respecting eventual cavities inside the foam structure. A test sample, preferably prepared according to TM 1003, is cut in several pieces and immersed underwater. The displaced quantity of water or the lifting power shows the foam volume. The yield of the foam can be determined in various ways; as joint yield or as free foamed yield. In a curing process the foam is changing its dimensions and the final shape of the cured foam is irregular, thus the problems with determination of the foam's volume may appear. Purpose of this procedure is to describe the water displacement test method to measuring the irregular shaped foam's yield.

TM 1008:2013
Determination of the Brittleness of an OCF Canister Foam.
This test method describes how to determine the degree of brittleness of cured foam at a given temperature. The brittleness is measured on a cylindrically shaped string of hardened foam after a certain time by pressing the foam by finger at preferably low ambient temperatures. The degree of brittleness is given in marks from creaking, breaking of the surface up to pulverizing the foam. Polyurethane based OCF have the tendency to become brittle during the curing phase, mainly at cold temperatures. This property usually disappears irretrievably at warming. Though the foam becomes flexible at higher temperatures, the brittleness may remain permanent in cold conditions and affect the applicability of the foam. The lower the brittle point, the better the foam quality.

TM 1009:2013
Determination of the Curing Pressure of a OCF Canister Foam.
This method describes how to determine the generation of pressure during the curing process of an OCF. The liquid foam (froth) is dispensed into the gap between two parallel plates, which are connected to a pressure measuring device. The pressure build up is measured during the whole curing process until the maximum level is reached. The hardening of polyurethane based OCFs comes along with volume growth and pressure build-up of the dispensed froth. This pressure is intended to assure adhesion to the substrates; however it might deform joints when too high. Basically the pressure can be absorbed by the temporary installation of clamps or spacers. In cases where this is not possible it is important to take OCF with low curing pressure.

TM 1010:2016
Determination of the post expansion of an OCF Canister Foam.
This method describes how to measure the expansion of a freshly dispensed liquid foam (froth) during the curing phase. The foam is dispensed into a linear joint up to a defined level. The foam expands during the curing phase to its final volume. The post expansion is the volume increase expressed as a percentage of the original dispensed froth. The evaporation of propellants and, in case the of polyurethanes, the generation of CO2, expands the froth to a larger volume. This expansion can cause waste of foam and other unwanted effects, which are hard to anticipate. By calculating the post expansion factor, the consumer can estimate the necessary filling degree of the froth to avoid overexpansion.

TM 1011:2015
Determination of the Compression Strength of An OCF Canister Foam.
This test method describes how to determine the compressive strength of a cured foam. It gives an indication of the foams resistance against area distributed pressure. The maximum endurable stress is determined. The test specimen is prepared by foaming between two wooden plates. After the full curing the specimen is compressed by a tensile testing machine to at least 10% of its initial thickness. The compressive strength is obtained at 10 % compression. One of the main application areas of OCF is the thermal insulation and sound damping in connection joints. The foam in those joints has to absorb the movement of the construction elements caused by temperature change, wind load etc. and therefore has to provide a certain strength and flexibility to withstand repetitive compression-tensile cycles. The strength can be measured by applying a compression force to a piece of the foam. The result is proportional to the extent of compression. A typical value is compression by 10%.

TM 1012:2013
Determination of the Shear Strength of an OCF Canister Foam.
This method displays the behaviour of a foam system towards shear forces. It shows the strength and the bonding power of the foam as the sandwich element between wooden plates. The test is conducted according to EN 12090. The foam is dispensed in the gap between two boards. After full curing, the boards are moved in opposite but parallel directions to each other (sheared) while the applied force is measured. The shear strength is an important property of the foam, needed to evaluate its fixing power, particularly for the fixation of doorframes. It is useful to calculate the necessary area of fixation (for given door wing weight) or vice versa. This test also indicates the breaking point of the fixation, which can be either within the foam (cohesion failure) or between foam and the bonded surface (adhesion failure).

TM 1013:2017
Determination of the Movement Capability of an OCF Canister Foam.
This test method describes how to determine the movement capability of cured foam. The result gives an indication of the degree of flexibility of the cured foam. At least two identical test specimens are prepared by foaming between two wooden plates. After fully curing, one of the specimens is alternately compressed and stretched for a total of 1000 cycles (by a tensile testing machine). Additionally the compressed/stretched sample is evaluated visually. After that, both specimens – the tested one and the control – are stretched until the samples fracture. Tensile force and elongation at fracture can be measured and compared. One of the main application areas of OCF is thermal insulation and sound damping in connecting joints. Those joints have to absorb the movement of the construction elements caused by temperature change, wind load, etc., and have to provide certain flexibility to ensure a long service life. The elongation is measured by stretching a piece of foam. 36 Bostik Polyurethane Foams – FEICA Test Methods Bostik Polyurethane Foams – FEICA Test Methods 37.

TM 1014:2013
Determination of the Tack Free Time of an OCF Canister Foam.
This test method describes how to determine the tack free time of a liquid OCF. The liquid foam is dispensed in a string on a horizontal surface. After a certain time for curing, the surface of the string is touched with a small rod or tube. The tack free time is reached when the surface doesn't stick anymore. In general the tack free time is the time that adhesion on the surface has stopped. The tack free time is subjected to temperature and humidity conditions. It is usually prolonged by lower temperature or / and lower humidity.

TM 1018:2015
Determination of the Tensile Strength of an OCF Canister Foam This test method describes how to determine the maximum stress a cured foam can withstand while being stretched before breaking. The result gives an indication of the elasticity of the cured foam. All test specimens are prepared by foaming between two wooden plates. After one way, two additional wooden plates are adhered as a tearing device. After fully curing, the specimen is stretched by a tensile testing machine, gradually increasing the distance at a set speed until the sample fractures. The tensile strength is the maximum force withstood by the specimen. The tensile strength is an important property of a foam. It is used to evaluate its fixing power, particularly for the fixation of doorframes. It allows the calculation of the necessary area of fixation for a given door wing weight and vice versa. This test also indicates the breaking point of the fixation, which can be either within the foam (cohesion failure) or between the foam and the bonded surface (adhesion failure).

TM 1019:2014

Determination of the Free Foamed Density of an OCF Canister Foam.

This test method describes how to determine the density of a cured OCF for identification purposes only. In general, density is a property used for product identification purposes. It is also an indication of the yield and strength of the product. Normally, the lower the density the higher the yield and the lower the strength. To measure the joint yield of a foam canister one should determine the density and yield in running metres according to FEICA TM 1002:2014. The liquid foam is dispensed in a string on a horizontal surface. After 24 hours for curing, the density of the cured product is measured using a balance and a measuring cylinder.

TM 1020:2017

Determination of the long term Thermal Conductivity of an OCF Canister Foam.

This method describes how to determine the long term thermal conductivity of a cured OCF foam, dispensed from a pressurised can, with a sample subjected to accelerated ageing procedure. The test specimen is prepared by foaming into a mould made of two wooden plates an d spacers. After curing, the two sides of the mould are open and the foam sample removed. The sample is then cut into the desired dimensions, depending on the measuring device to be used of e.g. 300 x 300 mm or 200 x 200 mm. The test is carried out on the basis of EN 12667 with a mean temperature of 10°C. One of the most important characteristics of polyurethane foam is its very good thermal insulation. When OCF foam is used as sealing and insulation of windows and external doors; low insulation value is of great importance.