



TUBALL™

MATRIX

601

# TECHNICAL DATA SHEET

## MASTERBATCH FOR SILICONE APPLICATIONS

### GENERAL INFORMATION

TUBALL™ MATRIX is a line of concentrates based on TUBALL™ graphene nanotubes (GNT) produced by OCSiAl. TUBALL™ MATRIX concentrates are available in several matrixes, are easy to handle, and can be processed using standard equipment. Depending on the TUBALL™ MATRIX percentage in the final compound and the processing conditions and other system components, the volume resistivity can be adjusted within the range  $10^1$ – $10^8$   $\Omega$ ·cm.

TUBALL™ is a unique GNT additive that provides electrical conductivity at low dosages not achievable with any standard conductive additive. These low dosages enable the electrical resistivity of the material to be reduced with minimal impact on the host matrix, including retaining and even improving mechanical properties, minimally increasing the density, and limiting any influence on the rheological properties and color.

TUBALL™ MATRIX 601 is a concentrate specifically designed to provide superior electrical conductivity to silicone compounds (LSR – liquid silicone rubber, RTV – room temperature vulcanised rubber) while retaining mechanical properties and minimally impacting the host matrix.

### BENEFITS

- TUBALL™ GNT, carried by TUBALL™ MATRIX, enable ultra-low dosage of conductive filler starting from just 0.03 wt.% for anti-static, static dissipative and conductive applications
- Allow production of conductive parts that retain bright colors
- Ensure permanent and uniform electrical conductivity without “hot spots”
- Maintain rheology of the uncured compound
- Standard processing and mixing equipment
- Minimal influence on mechanical properties including softness

### TYPICAL PROPERTIES

PROPERTY	TEST METHOD	VALUE
Concentrate carrier	–	Polydimethylsiloxane
Color and appearance	–	Black paste
Density at 25°C	DIN 51757	Approx. 1.04 g/cm <sup>3</sup>

## TYPICAL DOSAGE LEVEL

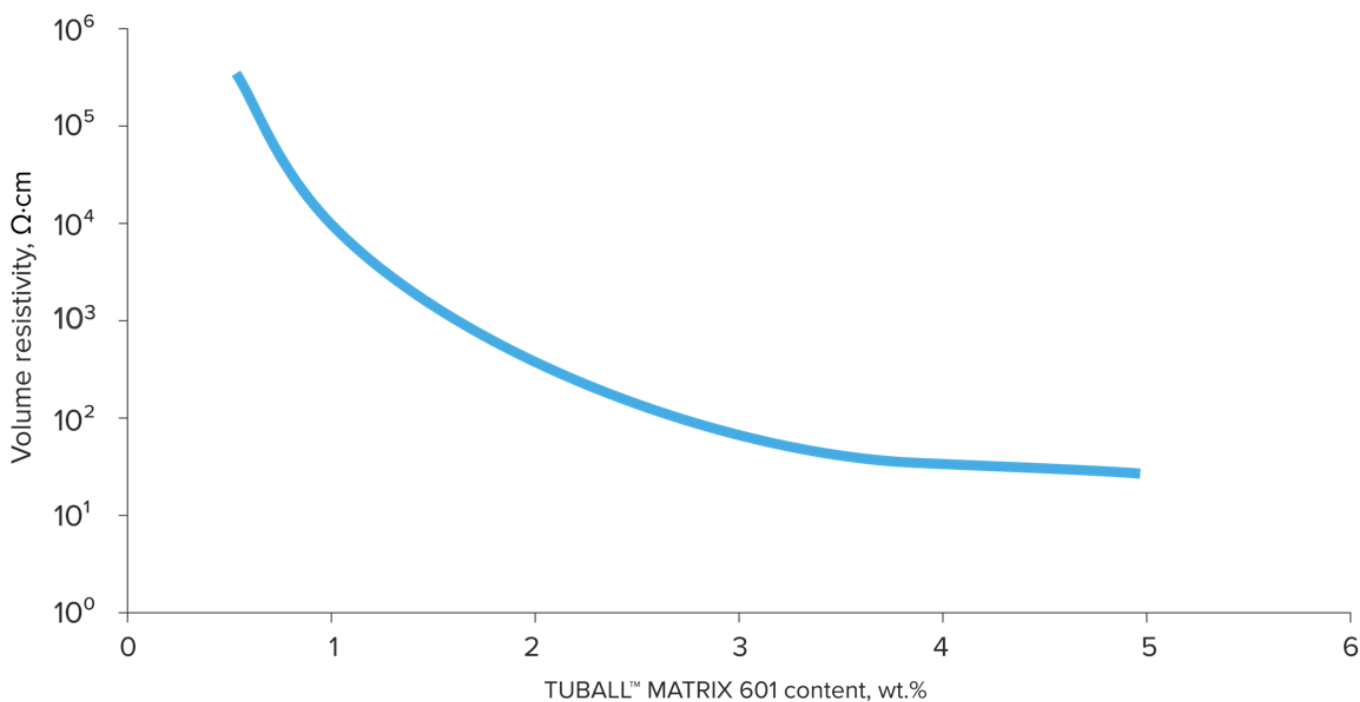
The concentration of TUBALL™ MATRIX 601 that is required in the final compound should be determined according to the desired level of conductivity, as shown in Figure 1.

The loading required to obtain a specific conductivity can vary by type of silicone, by the final formulation and by the type of application/molding process.

It is also important to note that the required dosage level of TUBALL™ MATRIX refers to the whole system. For example, if the system consists of 50% part A and 50% part B, and the required level of volume resistivity is  $10^4 \Omega \cdot \text{cm}$ , the required TUBALL™ MATRIX concentration should be 1 wt.% for the whole system (Figure 1).

For more information refer to the Processing Guidelines.

**Figure 1.** Volume resistivity of RTV with TUBALL™ MATRIX 601 is in the range  $10^1$ – $10^5 \Omega \cdot \text{cm}^*$



\* Tested in two-component RTV (basic viscosity 5 000 mPa.s), dilution in part A. Measurements conducted according to ASTM D991 standard.

## METHOD OF ADDITION

To enable the development of a well-distributed network of percolating TUBALL™ nanotubes in the silicone matrix, a compounding step of the concentrate is essential.

TUBALL™ MATRIX 601 can be diluted into compounds through the use of standard silicone compounding equipment. Other approaches for masterbatch dilution may be used provided that their mixing efficiency is sufficient. More information about the key parameters for masterbatch dilution and compound processing can be found in the “Processing Guidelines for TUBALL™ MATRIX 601/602 for Liquid Silicones”.

## PACKAGING

Plastic cans (0.2, 0.5, 1, 5, 10 kg).

OCSiAl provides TUBALL™ MATRIX 601 test samples in plastic cans (50, 100 or 200 g concentrate).

## STORAGE AND TRANSPORTATION

The product is stable in its unopened original packaging when stored under normal temperature conditions. The recommended storage life is up to 24 months when stored as directed.

## SAFETY

To ensure safe handling, the appropriate safety regulations should be observed. OCSiAl recommends that every user should be able to apply the safe handling procedures necessary for the user's applications before any handling or manufacturing takes place. A Safety Data Sheet outlining the hazards and handling methods for TUBALL™ MATRIX is available.

## WARRANTIES AND DISCLAIMER

The Products correspond to the chemical composition indicated in the Technical Data Sheet and the Safety Data Sheet supplied with the Product. The information contained in this document (Information) is based on trials carried out by OCSiAl and may contain inaccuracies or errors that could cause injury, loss or damage.

OCSiAl gives no further warranty and makes no further representation regarding the Products and/or the accuracy of Information and/or suggestions for any particular use of the Products or Information, or that suggested use will not infringe any patent. The Products and Information are supplied on an "as is" basis. These express provisions are in place for all warranties, representations, conditions, terms, undertakings and obligations implied by statute, common law, custom, trade usage, course of dealing or otherwise (including implied undertakings of satisfactory quality, conformity with description, fitness for purpose and reasonable skill and care), all of which are hereby excluded to the maximum extent permitted by applicable law.

## CONTACT INFORMATION

ASIA		EUROPE		NORTH & SOUTH AMERICA
<b>KOREA</b> 11F, 254-8 Gongdeok-dong, Mapo-gu, Seoul 04212, Korea +82 32 260 0407 <a href="mailto:asiapacific@ocsial.com">asiapacific@ocsial.com</a>	<b>CHINA</b> Room 1509, Pengrunda Commercial Plaza, No. 3368 Houhaibin Road, Nanshan District, Shenzhen, Guangdong, China +86 755 867 00059  Ground floor, Unit 4, Building 7, No.160, Basheng Road, Pudong district, Shanghai, China +86 135 9012 5295  <a href="mailto:china@ocsial.com">china@ocsial.com</a>	<b>JAPAN</b> Tokyo, Japan 070-1421-0331 <a href="mailto:japan@ocsial.com">japan@ocsial.com</a>  <b>INDIA</b> Vimal intertrade PVT Ltd, Shivam centrium, Sahar road, Koldongri, Andheri East, Mumbai, 400 069, India + 91 22 6288 4200 <a href="mailto:india@ocsial.com">india@ocsial.com</a>	<b>LUXEMBOURG</b> 1 Rue de la Poudrerie, L-3364, Leudelange, Grand-Duché de Luxembourg +352 27990373 <a href="mailto:europe@ocsial.com">europe@ocsial.com</a>  <b>SERBIA</b> Balkanska 21, Belgrade, Serbia +381 692083170 <a href="mailto:balkan@ocsial.com">balkan@ocsial.com</a>	<b>USA</b> 950 Taylor Station Road, Suite #W, Gahanna, OH 43230, USA +1 415 906 5271 <a href="mailto:usa@ocsial.com">usa@ocsial.com</a>