

# NANO FORCE S

NANO ENGINEERED CONDUCTIVE POLYMERS  
(TPU / PP)

# NANO FORCE S

**NANO-TECH'S** HIGHLY CONDUCTIVE THERMOPLASTIC POLYMERS (NANO FORCE S TPU AND PP) ARE NANO-ENGINEERED FOR SUPERIOR CONDUCTIVITY, WHILE RETAINING OPTIMAL MECHANICAL PROPERTIES

# KEY FEATURES

**NANO-TECH** DEVELOPED TWO DIFFERENT TYPES OF POLYMERS

**NANO FORCE S TPU** IS A CONDUCTIVE MASTERBATCH BASED ON THERMOPLASTIC POLYURETHANE POLYMER (POLYESTER BASED) LOADED WITH CARBON NANO TUBES.

## KEY FEATURES:

- GOOD ELECTRICAL CONDUCTIVITY AT LOW LOADING
- GOOD TRACTION AND IMPACT RESISTANCE AT LOW TEMP
- BETTER ABRASION RESISTANCE
- SUITABLE FOR INJECTION MOLDING AND EXTRUSION
- IDEAL FOR ANTISTATIC AND CONDUCTIVE PARTS

**NANO FORCE S PP** IS A CONDUCTIVE MASTERBATCH BASED ON THERMOPLASTIC POLYPROPYLENE POLYMER LOADED WITH CARBON NANO TUBES.

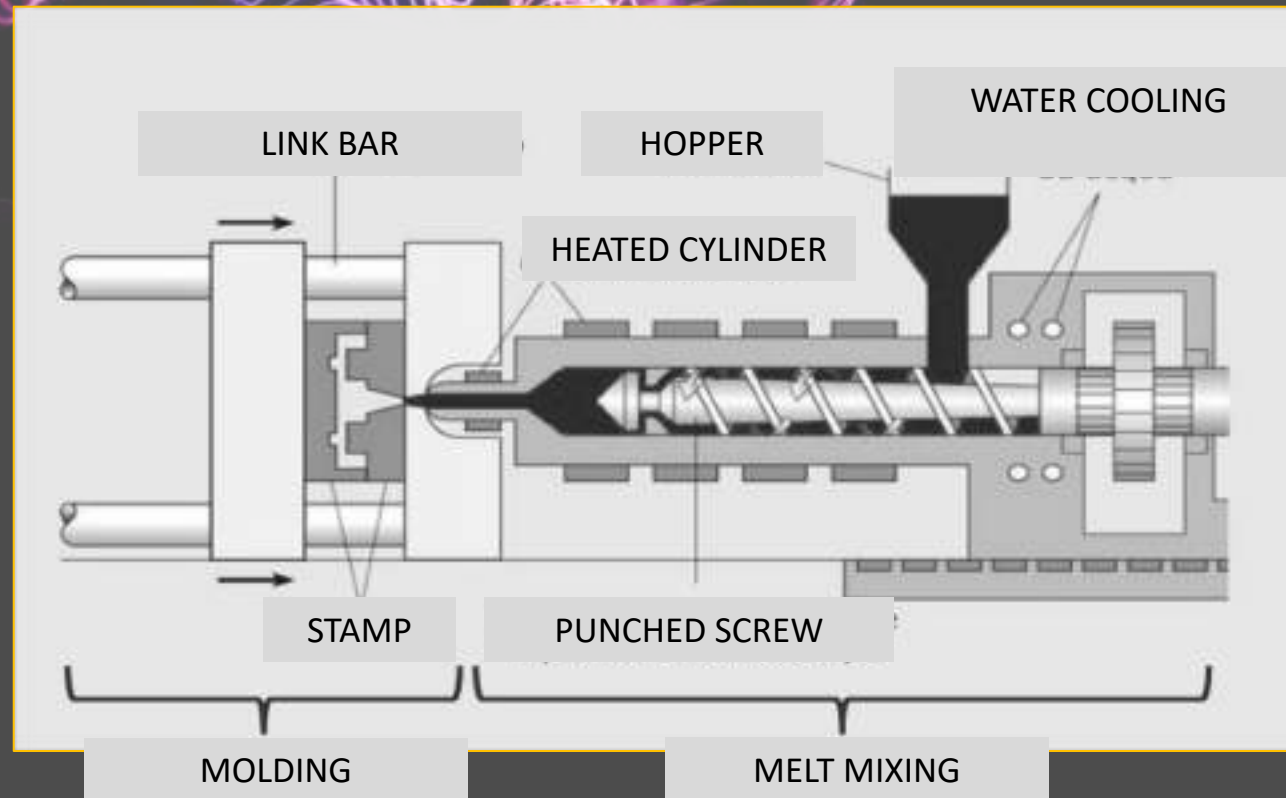
## KEY FEATURES:

- GOOD ELECTRICAL CONDUCTIVITY AT LOW LOADING
- LONG TERM STABILITY WITH TEMPERATURE
- GOOD RESISTANCE TO HYDROLYSIS
- LOW OIL/MICROBIOLOGICAL CONTAMINATION
- IDEAL FOR ANTISTATIC AND CONDUCTIVE PARTS

# PROCESS

BOTH **NANO FORCE S TPU** AND **PP** ARE IDEAL FOR INJECTION MOLDING AND EXTRUSION PROCESSES, ALLOWING APPLICATIONS ONCE RESTRICTED TO METALS.

HIGHLY RECOMMENDED TO DILUTE THE MASTERBATCHES USING A TWIN-SCREW EXTRUDER AT SPECIFIC EXTRUDING TEMPERATURES (190°C FOR TPU AND 230°C FOR PP)



# PHYSICAL PROPERTIES

## NANO FORCE S TPU

Physical properties	Value	Unit	Test Standard
Melt Flow Index(MFI) [190°C/2.16Kg]	0.3-0.5	dg/min	ISO1133
Hardness	87	Shore A	ISO 4649
Melting Point	180	°C	DSC (onset)
Color	Black	-	-

## NANO FORCE S PP

Physical properties	Value	Unit	Test Standard
Melt Flow Index(MFI) [230°C/2.16Kg]	2.5-3.5	dg/min	ISO1133
Melting Point	160-165	°C	DSC (onset)
Color	Black	-	-

# MECHANICAL PROPERTIES

## NANO FORCE S TPU

Mechanical Properties	Test Standard	Unit	Masterbatch (MB)
Tensile Modulus	ISO 527-2	MPa	41,9
Tensile Strength	ISO 527-2	Mpa	11,65
Elongation at break	ISO 527-2	%	605
Elongation at yield	ISO 527-2	%	602
Tensile Impact Strength	ISO 8256 @ Tamb	kJ/m <sup>2</sup>	473

## NANO FORCE S PP

Mechanical Properties	Test Standard	Unit	Masterbatch (MB)
Tensile Modulus	UNI EN ISO 527/2	MPa	1741
Tensile Strength	UNI EN ISO 527/2	MPa	27,85
Elongation at break	UNI EN ISO 527/2	%	3,3
Elongation at yield	UNI EN ISO 527/2	%	3,19
Heat Deflection Test	ISO 75	°C	108
Impact Strength, notched Charpy	ISO 179 @ Tamb	kJ/m <sup>2</sup>	3,6
Impact Strength, unnotched Charpy	ISO 179 @ Tamb	kJ/m <sup>2</sup>	15,5

# ELECTRICAL PROPERTIES

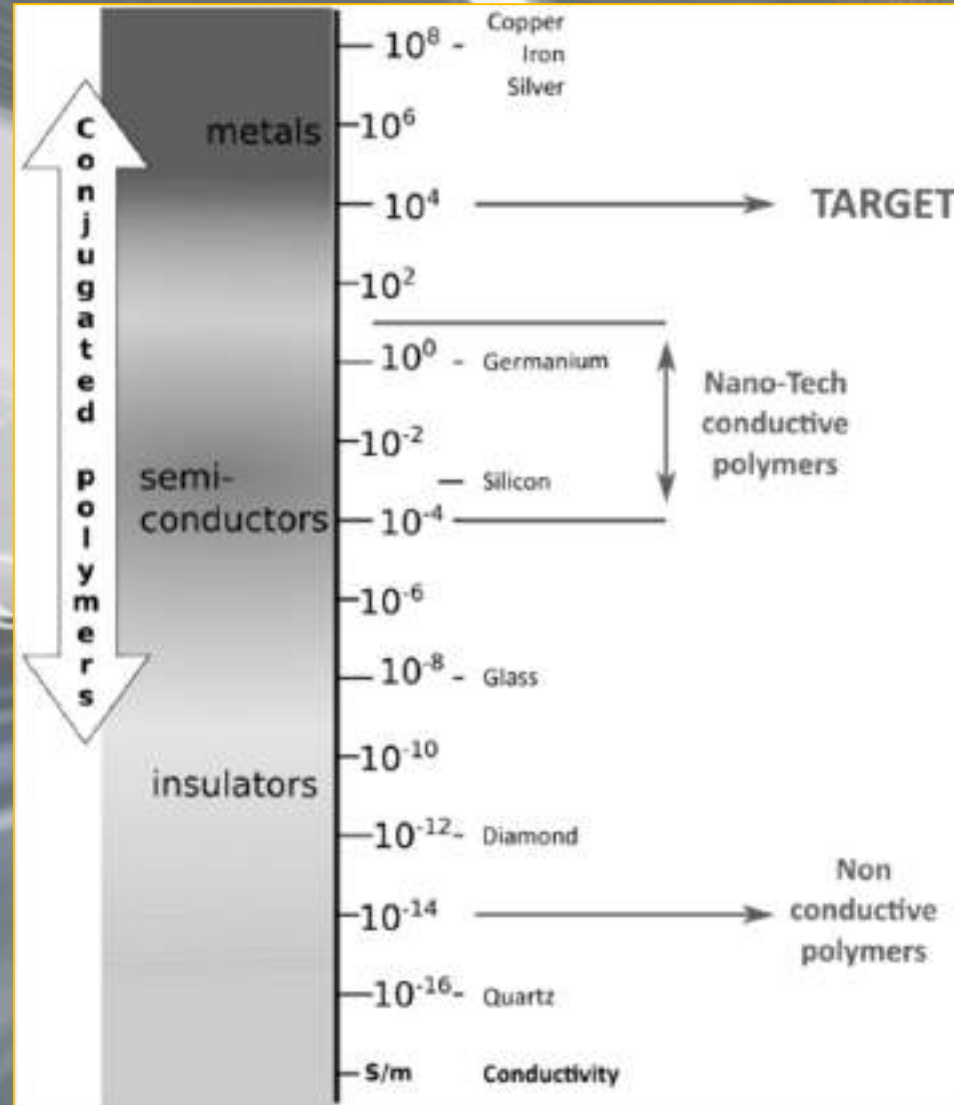
## NANO FORCE S TPU

Electrical Properties	Test Standard	Unit	Masterbatch (MB)	Dilution 1:3	Dilution 1:5	Dilution 1:10
Surface Resistivity	ASTM D257:2007	$\Omega/\text{sq}$	$2.9 \cdot 10^6$	$4 \cdot 10^6$	$6.9 \cdot 10^6$	$7.4 \cdot 10^6$
Volume Resistivity	ASTM D257:2007	$\Omega \cdot \text{cm}$	$6.1 \cdot 10^6$	$9 \cdot 10^6$	$1.28 \cdot 10^7$	$1.22 \cdot 10^8$
Electrical Conductivity	ASTM D257:2007	S/m	$1.64 \cdot 10^{-5}$	$1.11 \cdot 10^{-5}$	$7.81 \cdot 10^{-6}$	$8.2 \cdot 10^{-7}$

## NANO FORCE S PP


Electrical Properties	Test Standard	Unit	Masterbatch (MB)	Dilution 1:1	Dilution 1:3	Dilution 1:5	Dilution 1:10
Surface Resistivity	ASTM D257:2007	$\Omega/\text{sq}$	$5.9 \cdot 10^5$	$1.70 \cdot 10^6$	$5.0 \cdot 10^7$	$3.7 \cdot 10^9$	$1.89 \cdot 10^{12}$
Volume Resistivity	ASTM D257:2007	$\Omega \cdot \text{cm}$	$8 \cdot 10^6$	$1.35 \cdot 10^7$	$1.45 \cdot 10^7$	$7.7 \cdot 10^{10}$	$2.6 \cdot 10^{12}$
Electrical Conductivity	ASTM D257:2007	S/m	$1.25 \cdot 10^{-5}$	$7.41 \cdot 10^{-6}$	$6.9 \cdot 10^{-6}$	$1.3 \cdot 10^{-9}$	$3.85 \cdot 10^{-11}$

# CONDUCTIVE COMPARABLES





# APPLICATIONS



FARADAY CAGE



CAPACITATOR



3D PRINTING



ANTISTATIC FILM



SDENSOR



ELECTROMAGNETIC SHIELD