

3M™ Products for Wind Energy



Your ideas. Our technologies.

From design and manufacturing through day-to-day operations, 3M offers you a wide array of innovative technology solutions – designed to improve reliability, enhance performance and reduce your costs.

www.3M.com/wind

3M



Collaborate with 3M

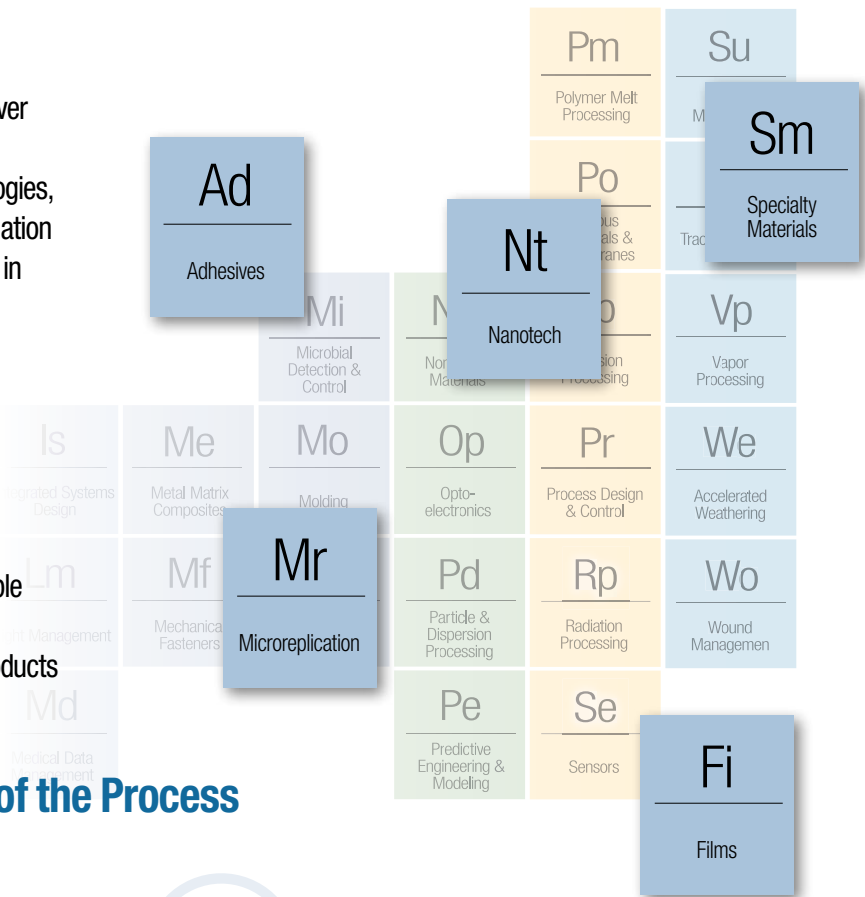
3M's vast product portfolio is derived from core technologies, ranging from advanced materials to nanotechnology and microreplication. There are many ways these technologies can be combined to meet the emerging needs of the wind industry.

3M innovation is fundamentally about solving problems. We invite you to present your challenges to our experts – so we can work together to design the solutions you need and build more performance and profit into your products. No matter what your need, we invite you to put 3M technology to work for you!

3M is a diversified global technology company, with over 100 years of product development and manufacturing expertise. Our portfolio of some 45 advanced technologies, represented by the 3M Table of Elements, is the foundation for thousands of unique and innovative products used in virtually every industry.

These technologies are being used to build the next generation of wind energy systems – with products designed to enhance reliability, improve performance and provide protection against weathering and harsh environments.

3M brings you the advantage of an experienced, reliable partner – with the resources and expertise to develop applications, provide technical support and supply products anywhere in the world.



Proven Solutions for Every Step of the Process

Operations & Maintenance

- 3M™ Wind Protection Tapes
- 3M™ Wind Fillers

- 3M™ Acrylic Foam Tape
- 3M™ Clean Sanding System

Manufacturing & Design

- 3M™ Wind Blade Protection Coating W4600
- 3M™ Wind Protection Tapes
- 3M™ Wind Blade Bonding Adhesive W1101
- 3M™ Wind Structural Adhesives
- 3M™ Wind Threadlockers

- 3M™ Dry Layup Adhesive
- 3M™ Wind Sealants
- 3M™ Acrylic Foam Tape
- 3M™ Diamond Cutoff Wheels
- 3M™ Clean Sanding System

Installation

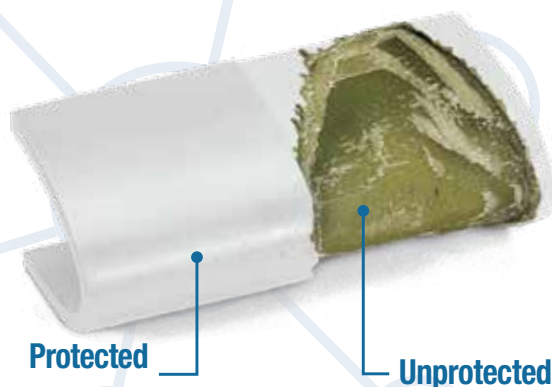
- 3M™ Cold Shrink Splices
- 3M™ Cold Shrink Terminations
- 3M™ and Scotch® Premium Electrical Tapes
- 3M™ Cable Grounding Kits

- 3M™ Wire Management and Marking Supplies
- Scotch® Detectable Buried Barricade Tapes
- 3M™ Locators and Markers

Safety

- 3M™ Safety-Walk™ Materials
- 3M™ Filtering Facepiece Respirators
- 3M™ Half and Full Facepiece Respirators
- 3M™ Powered and Supplied Air Respirators
- 3M™ Hearing Protection
- 3M™ Eye Protection
- 3M™ Head and Face Protection
- 3M™ Peltor™ Communications
- 3M™ Fall Protection
- 3M™ Speedglas™ Auto-Darkening Filters and Helmets
- 3M™ Sorbents

On the Leading Edge of Innovation



Sample tested in rainfall of one inch per hour at 500 mpg at the University of Dayton Research Institute Rain Erosion Test Facility.

Rotating up to 250 mph, wind blades are faced with erosion caused by rain, hail, salt spray and other debris. As a result, many blades will suffer pitting, gouging and delamination that can affect aerodynamic efficiency and even impact the integrity of the entire blade. Poor blade performance can also reduce annual energy production, and repair downtime is costly.

3M™ Wind Erosion Solutions offer an array of products to both repair and prevent damage caused by minor impacts and erosion. These advanced 3M materials are designed to enhance reliability, improve performance and extend the life of your valuable equipment.

3M™ Wind Blade Protection Coating W4600 and Accessories

3M™ Wind Blade Protection Coating W4600 is designed to help protect the leading edges of wind blades from damage caused by sand and rain erosion and minor impact. 3M Wind Blade Protection Coating W4600 is a two component polyurethane coating that provides excellent erosion protection in a single layer. The coating is designed for application in OEM facilities and can be easily applied via brush or casting.



Supplies

3M Wind Blade Protection Coating W4600
Part A & B, 250 mL Duo-Pack Cartridge, Part A, 18L Drum, Part B, 18 L Drum

3M™ Wind Blade Protection Coating Brush

3M™ Wind Blade Protection Coating Manual Applicator – 250 mL – 1.5:1

3M™ Wind Blade Protection Coating Pneumatic Applicator – 250 mL – 1.5:1

3M™ Wind Blade Protection Coating Mixing Nozzle

3M™ Accessories: 3M™ Abrasives, 3M™ Random Orbital Sander, 3M™ Masking Tape

Other Supplies: Thickness gauge, dropcloth for floor, gloves, knife

3M™ Wind Protection Tapes

3M™ Wind Protection Tapes shield leading edges and surfaces from pitting, wear and water ingress. Constructed from tough, abrasion-resistant polyurethane elastomers, 3M Wind Protection Tapes resist puncture, tearing, erosion and weathering. They are UV stable, solvent-free and conform to complex shapes to best protect your valuable equipment. They require no special application tools and are easily applied either in the factory or in the field via rope or platform access.

3M Wind Protection Tapes are based on the same dependable technology used to protect helicopter blades and aircraft radomes for over 40 years. Applied to the leading edge of wind turbine blades, these high-performance polyurethane tapes have a proven ability to maintain turbine efficiency, reduce downtime and maintenance, and extend the useful life of blades – even in the harshest environments.



Product Number	Color	Opacity	Thickness mils (mm)	Liner	Tensile Strength @ Break lb/in (N/100 mm)	Elongation @ Break (%)
W8607	Colorless	Transparent	14 (0.36)	Poly	80 (1400)	500
W8609	Colorless	Transparent	14 (0.36)	Poly	70 (1228)	500
W8620	White	Opaque	14 (0.36)	Paper	80 (1400)	500
W8640	Gray	Opaque	14 (0.36)	Poly	87 (1542)	500

3M™ Wind Protection Tape Accessories

Technologies designed to ensure optimal results and improve production – while simplifying and speeding up installation and repair operations.

Product Number	Name	Size	Qty/Case	Additional Information
W2600	3M™ Wind Protection Tape Edge Sealer W2600	50 cc	1	A clear, non-yellowing, durable two-part urethane sealer system used to help smooth and protect the edges of 3M™ Wind Protection Tape. Provides excellent resistance to environmental exposure.
W9900	3M™ Wind Tape and Residue Remover (TARR) W9900	16 oz.	6	Removes 3M™ Wind Protection Tapes, tape residue and neoprene without damaging composite or metal surfaces.
		1 gal.	4	
W9910	3M™ Wind Tape Adhesion Promoter W9910	7 × 7 in. wipe	5	Designed to enhance initial adhesion of 3M™ Wind Protection Tapes in demanding situations.
		1 pint	12	
50004	3M™ Scotch-Weld™ EPX™ Plus II Applicator 50004	50 mL	10	Handheld 50 mL applicator used to apply 3M™ Wind Protection Tape Edge Sealer W2600. Provides fast and easy manual dispensing.
9176	3M™ Scotch-Weld™ EPX™ Square Gold Mixing Nozzle	50 mL	72	Mixing nozzle used with 50 mL 3M™ Scotch-Weld™ EPX™ Plus II Applicator 50004.
23651	Scotch-Brite™ High Performance Cleaning Cloth 23651, Yellow	32 cm × 36 cm	50	Provides ultra cleaning power because of its knitted, interwoven design of water- and oil-absorbing microfibers that lift and trap liquids, grease, dust and dirt particles.
471	3M™ Vinyl Tape 471, Red	1 in. × 36 yd.	36	Used for marking and guiding when applying 3M™ Wind Protection Tapes. Vinyl backing with rubber adhesive. Ideal for masking curved or irregular surfaces.
–	3M™ Protective Tape Application Solution	1 qt.	1	Pre-mixed, water-based application solution to accurately combine the materials in the preferred ratios for the desired cleaning, ease of application and performance of 3M™ Wind Protection Tape.
PA1	3M™ Hand Applicator PA1-B Blue	N/A	25	Reusable squeegee-type applicator – flexible and durable.



3M™ Wind Protection Tapes are constructed from an exceptionally tough, abrasion and puncture-resistant polyurethane elastomer that stands up to sand, rain, hail and wind-borne debris.

3M™ Wind Epoxy and Polyurethane Fillers

3M offers a complete line of fillers, abrasives and accessories to repair minor damage on wind blade surfaces. 3M™ Wind Fillers are flexible, tough two-part epoxy and polyurethane fillers used to finish and smooth wind blade surfaces and leading edges during manufacture, and to repair minor damage on the wind blade surface quickly and reliably during maintenance operations. Multiple chemistries and performance times meet a variety of application needs, while innovative 3M™ Duo-Pak Cartridges and Applicators ensure accurate mixing, reduce waste and eliminate messy and time-consuming hand mix operations. This allows for the flexibility to finish and repair blades at the manufacturing facility or during operations and maintenance repairs either on the ground or up tower.

Product Number	Chemistry	Work Time	Sand Time	Color
W3120	Epoxy	10 min.	30 min.	Blue
W3610	Polyurethane	8-10 min.	30 min.	Dark Gray



3M™ Wind Filler Accessories

Product Number	Product Name	Size	Quantity/Case
08117	MixPac® Manual Applicator Gun	200 mL	1
–	3M™ Scotch-Weld™ EPX™ Pneumatic Applicator Gun	200 mL	1
–	3M™ Scotch-Weld™ Square Gold Mixing Nozzle	177 mm	36
344	Dynatron® Yellow Spreader	3 in. x 4 in.	144
354	Dynatron® Yellow Spreader	3 in. x 5 in.	144
363	Dynatron® Yellow Spreader	3 in. x 6 in.	36



3M™ Clean Sanding System

For dry-sanding composites, metal, coatings or almost any other substrate, nothing reduces dust more completely and efficiently than 3M™ Clean Sanding technology. Featuring a carefully-matched system of abrasives, random orbital tools, and accessories, these easy-to-use products work together to improve productivity – while delivering faster, more consistent finishing results.

The patented, precise multi-hole patterns of 3M Clean Sanding Discs and Sheets can evacuate dust better than 5 or 6-hole products – for improved faceside performance and dramatically longer disc life.



3M™ Wind Sealants

3M offers a complete line of polyurethane and hybrid sealants. These products are ideal for sealing, component attachment, and an unlimited variety of fabrication and repair applications, including blades and nacelle covers. Engineered to provide outstanding sealing and bonding performance, their unique one-part polyurethane formulations are also easy to use.

Product Number	Product Name	Skin Time	Rate of Cure per 24 hours	Shore A Hardness	Elongation @ Break (%)
W2640	3M™ Polyurethane Sealant W2640	60 min.	3 mm	40	>600%
W2650	3M™ Polyurethane Sealant W2650	50 min.	4 mm	45	>600%
W2660	3M™ Polyurethane Sealant W2660	50 min.	4 mm	55	>600%
W2340	3M™ Hybrid Sealant W2340	40-60 min.	>3 mm	>30	>300%
W2360	3M™ Hybrid Adhesive Sealant W2360	10-30 min.	>3 mm	55	>100%



3M™ Wind Sealant Accessories

Product Number	Power Source	310 ml Cartridges	600 ml Sausage Packs
310M	Manual	•	
400M	Manual	•	
600M	Manual	•	•
600A	Pneumatic		•
34A	Pneumatic	•	
643B	Battery-Operated	•	•

3M™ Acrylic Foam Tapes

3M™ Acrylic Foam Tapes can be used for a variety of surface bonding applications. The technology behind 3M Acrylic Foam Tapes has been used around the world since 1980 to replace liquid adhesives and mechanical fasteners in permanent bonding and sealing applications.

Product	Thickness		Density (lb/ft ³)	Color
	mil	mm		
4155	62	1.55	37	Black
4110	45	1.10	37	
4080	32	0.80	37	
4063	25	0.63	37	
2304	120	3.00	45	White
2204	79	2.00	45	
2155	62	1.55	52	Dark Gray
2110	45	1.10	52	
2063	25	0.63	52	



Enhancing Productivity at Every Turn

3M is a world leader in advanced adhesives, used by industries ranging from electronics and aerospace to woodworking and composites manufacturing. We offer thousands of structural and non-structural strength products in a wide range of formulations, cure times and dispensing systems.

For wind components manufacturing, 3M offers a line of innovative adhesive solutions – optimized to meet the unique needs of this dynamic industry for strength, durability, environmental resistance and efficiency.

3M™ Wind Blade Bonding Adhesive W1101

A tough, crack-resistant structural epoxy used for bonding composite wind blades. Enables faster throughput, resulting in more blades per mold.

W1101 is a two-part paste adhesive that combines outstanding shear and peel strength with excellent impact resistance and durability. It also provides faster cure speed, reduced exotherm and longer pot life than conventional epoxy wind blade adhesives, saving up to 6 hours in mold time per blade. Certified by Germanischer Lloyd (GL) as a duromeric adhesive.

Product Number	Color	Chemistry	Elasticity	Shear Strength (MPa)	Viscosity	Pot Life (hr)	Size (L)
W1101	Gray	Epoxy	Rigid	26-39	Non-Sag	2	200



Because of its high strength and durability, 3M™ Wind Blade Bonding Adhesive W1101 helps reduce labor costs for in-factory repairs. It also reduces turbine downtime by requiring fewer repairs on-site.

3M™ Wind Structural Adhesives

A family of load-bearing, two-part epoxy and acrylic adhesives used for bonding composite wind blades, and for other general purpose applications. Adhesives cure at room temperature and are available in various formulations to provide the combination of bond strength, flexibility and other properties that meet your application needs.

Product Number	Color	Chemistry	Elasticity	Shear Strength (MPa)	Viscosity (cP)	Work Life	Set Time	Size* (mL)	Quantity/Case
W1110	Gray	Epoxy	Flexible	15-18	55,000	20 min.	2.5 hr.	50 (400)	12 (6)
W1115	Off-White	Epoxy	Rigid	25-28	30,000	20 min.	2.5 hr.	50 (400)	12 (6)
W1120	Black	Epoxy	Rigid	15-22	Non-Sag	45 min.	4 hr.	50 (400)	12 (6)
W1125	Black	Epoxy	Rigid	17-25	600,000	1.5 hr.	8 hr.	50 (400)	12 (6)
W1210	Off-White	Acrylic	Rigid	18-21	Non-Sag	10 min.	20 min.	50 (400)	12 (6)

* Also available in bulk packaging.



Accessories for 3M™ Wind Structural Adhesives

Product	Quantity/Case
3M™ Scotch-Weld™ EPX™ Plus II Manual Applicator (small cartridges)	10
3M™ Scotch-Weld™ EPX™ Pneumatic Applicator (large cartridges)	1
3M™ Scotch-Weld™ EPX™ Square Gold Mixing Nozzle (small cartridges)	72
3M™ Scotch-Weld™ EPX™ Square Gold Mixing Nozzle (large cartridges)	36



3M™ Wind Structural Adhesives offer solutions for a wide range of applications. The Duo-Pak cartridge provides a controlled flow and is easy to use.

3M™ Wind Threadlockers

One-component anaerobic adhesives that cure and seal threaded assemblies in a wide range of applications to prevent loosening and leakage.

Product Number	Color	Strength	Viscosity (cP)	Set Time (min)	Size (mL)	Property
W1235	Blue	Medium	3,000	<20	50 (250)	Oil Tolerant
W1240	Red	High	10,000	<20	50 (250)	High Temperature Resistant
W1245	Red	High	1,200	<20	50 (250)	Oil Tolerant



3M™ Wind Threadlockers provide excellent vibration, corrosion, and shock resistance. Threadlocker W1235 produces a bond that can be removed with hand tools; Threadlockers W1240 and W1245 produce a permanent bond.

3M™ Dry Layup Adhesive

This sprayable, high tack and fast-drying adhesive is a synthetic elastomer-based formulation for bonding/holding glass fabrics and roving, other reinforcements and other materials (i.e. flow media) in place during the infusion process. Its particle spray pattern and red color provide a visual check of spray level for more consistent application.

Product Number	Color	Size	Application Method
09091	Red	16 oz. Aerosol	Aerosol Can
09092	Red	5 Gallon	3M™ PPS™ Paint Preparation System with 3M Spray Gun
09093	Red	55 Gallon	3M™ PPS™ Paint Preparation System with 3M Spray Gun
09094	Red	30 lbs. Cylinder	3M™ Scotch-Weld™ Cylinder Adhesive Applicator



3M™ Dry Layup Adhesive is designed to reduce the amount of time required for dry layup of fiberglass. Ideal for robotic application. It also helps reduce wrinkles, which can be a major source of failures.

Accessories for 3M™ Dry Layup Adhesive

Product	Qty/Case
3M™ PPS™ Paint Preparation System with 3M Spray Gun*	1
Pressure Pot System with 3M Spray Gun*	1
Bulk Pumping System with 3M Spray Gun*	1
3M™ Scotch-Weld™ Cylinder Adhesive Applicator	1
3M™ Scotch-Weld™ Cylinder Adhesive 6 Foot Hose	1
3M™ Scotch-Weld™ Cylinder Adhesive 12 Foot Hose	1
3M™ Scotch-Weld™ Cylinder Adhesive 25 Foot Hose	1
3M™ Scotch-Weld™ Cylinder Adhesive 50 Foot Hose	1
3M™ Scotch-Weld™ Cylinder Adhesive 250050 Spray Tip	1
3M™ Scotch-Weld™ Cylinder Adhesive 4001 Spray Tip	1
3M™ Scotch-Weld™ Cylinder Adhesive 650050 Spray Tip	1
3M™ Scotch-Weld™ Cylinder Adhesive 6501 Spray Tip	1
3M™ Scotch-Weld™ Cylinder Adhesive 9501 Spray Tip	1

*3M™ Spray Gun Options

Spray Gun	Air Cap	Fluid Nozzle in. (mm)	Inlet Air (psi)
Series 12S	7 or 9	0.05 or 0.06 (1.3 or 1.5)	25
Series 19C	805 or 807	0.04 or 0.05 (1.1 or 1.5)	25



Installation and Safety

Installation

3M offers a number of innovative electrical products for key components of the wind industry. From your underground networks to nacelle assembly, 3M electrical products are designed to facilitate installation and maximize efficiency.

- 3M™ Cold Shrink Splices and Terminations
- 3M™ and Scotch® Premium Electrical Tapes
- 3M™ Cable Grounding Kits
- 3M™ Wire Management and Marking Supplies



Scotch® Detectable Buried Barricade Tapes, Locators and Markers

Scotch® Detectable Buried Barricade Tapes 400 Series are designed for accurately locating and helping prevent damage to valuable underground installations. The tapes have an aluminum backing which helps make underground assets easier to find when using a nonferrous locator. Available in versions for electrical cables as well as for fiber optic lines.

The full line of 3M™ Locators and Markers helps you quickly and accurately identify underground assets. From finding the exact path and estimated depth of underground utilities, to locating buried passive markers, to reading and writing information directly to the new RFID markers, 3M offers the precision tools needed to manage your assets. And now, certain 3M™ Dynatel™ Locators interface with select GPS/GIS field mapping instruments.

3M™ Cold Shrink Splices

Cold shrink technology – invented by 3M – provides easy installation, effective insulation and creates a dynamic, compressive seal that has proven reliable for over 40 years of field use. 3M™ Splice Kits for wind farm applications are tested on aluminum and copper conductors to meet stringent IEEE Standards. 3M offers a wide range of splice kits for low voltage (up to 1000V), medium voltage (up to 35kV) and high voltage (up to 69kV) applications.



Safety

3M™ Personal Protection Equipment

3M gives you more ways to help improve worker safety and reduce lost time injuries, with a broad range of personal protection equipment engineered for comfort, convenience and functionality. This includes disposable, reusable and air-powered respirators appropriate for contaminants commonly encountered in the manufacture of polymer composites. 3M also offers a wide range of industry-leading products for eye, hearing and head protection, as well as devices for monitoring exposure to organic vapors.

- 3M™ Filtering Facepiece Respirators
- 3M™ Half and Full Facepiece Respirators
- 3M™ Powered and Supplied Air Respirators
- 3M™ Hearing Protection
- 3M™ Eye Protection
- 3M™ Head and Face Protection
- 3M™ Peltor™ Communications
- 3M™ Fall Protection
- 3M™ Speedglas™ Auto-Darkening Filters and Helmets
- 3M™ Sorbents



3M™ Safety-Walk™ Slip-Resistant Materials

A variety of 3M technologies used to help protect against costly slips and falls; prevent ice, snow and mud buildup; and reduce worker fatigue. 3M Safety-Walk materials are available in treads, tapes and matting, as well as a variety of pre-cut, easy-to-apply shapes, sizes, colors and grades for virtually any surface.



3M Renewable Energy Division: Unmatched Capabilities

3M's commitment to the renewable energy industry includes a global organization of research and development, sales, marketing, manufacturing, and technical service – all dedicated to developing reliable materials that reduce costs and improve performance.

Expertise

Founded in 1902, 3M has extensive experience developing durable materials for outdoor applications in transportation, commercial graphics and optics. This includes world-class facilities for simulated and real-time weathering exposure and testing.

Innovation

At 3M, the innovation is never-ending. Whether the free-flow of ideas and solutions is occurring among our people, our technologies, our industries or the geographies where we operate, the human and technological connections within 3M enable infinite combinations and applications of expertise as ideas multiply and solutions expand.



● Laboratories ● Manufacturing ● Sales and Marketing

Laboratories	Manufacturing	Sales and Marketing
USA	USA	USA
Japan	Poland	Singapore
Germany	Germany	Canada
South Korea	South Korea	China
Singapore	Singapore	South Korea
China	Japan	Germany
	Taiwan	Denmark
	China	Taiwan
		Spain
		UK
		France
		Italy
		Brazil
		Malaysia
		Singapore

For more information on our wind energy product line, contact 3M Renewable Energy at 800-755-2654 or visit us at www.3M.com/wind.

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