

Ticona

Celcon[®] acetal copolymer Short Term Properties Brochure

acetal copolymer

CE-4



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Introduction

This Short Term Property Guide for Celcon[®] acetal copolymer is intended to provide a collection of the physical, mechanical and thermal properties as measured primarily by short term ISO test protocols. In addition, agency approvals / specifications, grade characteristics, and a list of typical applications are provided to familiarize you with the product line and its uses. Celcon acetal copolymer is an engineering thermoplastic material used in a wide spectrum of applications because of its many desirable properties. Celcon acetal copolymer is the market leader among acetals because of its superior processing characteristics, long term service characteristics and its 30 year history of outstanding performance in many demanding applications. Part designers and molders choose Celcon acetal copolymer over other materials because it offers the following advantages:

Advantages over metal

- Chemical / corrosion resistance
- Design flexibility
- Opportunities for parts consolidation
- Lower finished part cost
- Inherent lubricity
- Color matching possible
- High strength-to-weight ratio

Advantages over other thermoplastics

- Inherent lubricity / low coefficient of friction
- High fatigue strength / good creep resistance
- Good toughness / impact resistance
- Hard surface with good appearance
- High strength and stiffness
- Excellent dimensional stability
- Excellent chemical resistance

Advantages over acetal homopolymers

- Easier to process / wider processing window
- Superior long-term performance (creep resistance, fatigue endurance, strength retention)
- Less gassing and odor
- Heavy metal free colors, i.e. cadmium and lead (safer for workers / environment)
- Better maintenance of color under ultraviolet light exposure
- Faster molding cycles
- Less mold deposit

Specifications and regulatory approvals

Many grades comply with the following:

Agency	Scope of regulation / specification
ASTM D4181	General Material Specification
Food and Drug Administration (FDA)	Food contact applications which conform to 21CFR 177.2470.
National Sanitation Foundation (NSF)	Potable water contact items and food machinery components NSF Standards 14, 51, 61
Underwriters Laboratory (UL)	UL ratings for flammability, electrical and thermal use properties
ASTM-17-2133 LP-392-A MIL-P-46137A(MR)	Superseded by ASTM D4181
Dairy and Food Industries Supply Association (DFISA)	3A Sanitary Standards
United States Department of Agriculture (USDA)	Approved for use with direct contact with meat and poultry products
United States Pharmacopoeia (USP)	Class VI compliant for Celcon M90 [™] natural, Celcon M270 [™] natural
Plumbing Code Bodies	
International Association of Plumbing and Mechanical Officials (IAPMO)	
Building Officials Conference of America (BOCA)	Plumbing fixtures and specific applications covered in the various codes
Southern Standard Building Code	
Canadian Standards Association (CSA)	Plumbing fixtures, fittings and potable water contact items

Grade Characteristics

M25 High melt strength for extrusion, high molecular weight for maximum toughness in injection molding.

M50 Intermediate grade between M25 and M90 offering improved toughness and elongation vs. M90 and improved flow vs. M25.

M90™ General purpose injection molding grade acetal copolymer.

M140 Offers improved flow characteristics vs. M90.

M270™ Low melt viscosity for fast cycling, thin walled injection molding.

M450 Lowest melt viscosity for fast cycling in injection molding parts having long flow paths and thin walls.

M15HP Offers high strength and stiffness combined with significantly improved impact properties along with toughness and superior fatigue properties

GB25 25% glass bead filled grade for low shrinkage and warp resistance in large, flat and thin walled parts.

GC25A 25% glass-coupled acetal for maximum strength and stiffness.

GC25T 25% glass fiber coupled acetal copolymer grade with higher strength than the standard Celcon GC25A does and is FDA approved.

GC25TF 25% fiber coupled acetal copolymer based on Celcon M450 for higher flow in thin walled and small parts with exceptionally resistant to fuel especially oxygenated fuels.

LW270AS Low wear grade with anti-static properties.

LW90 Low wear grade for high speed, low load service against metals.

LW90-F2 PTFE modified M90 with good wear characteristics for use in applications that cannot tolerate silicone additives.

LW90-S2 2% silicone modified M90 for wear resistance against glass, metal or plastic.

LWGC-S2 2% silicone modified GC25A used to provide stiff parts requiring good wear resistance.

M90AW Low wear grade designed for gears and other low wear applications, especially where reducing noise and wear in low load-high velocity applications.

M90SW Low wear grade designed for gears and other low wear applications against the same mating surface is important. This grade may be preferred in high load - low velocity applications.

MC90 Mineral coupled M90 material for producing flat and dimensionally stable parts (normal flow).

MC90-HM Highly mineral coupled M90 material for producing very flat and dimensionally stable parts (normal flow).

MC270 Mineral coupled M270 material for producing flat and dimensionally stable parts (higher flow).

MC270-HM Highly mineral coupled M270 material for producing very flat and dimensionally stable thin parts (higher flow).

UV25Z M25 based material stabilized for use where ultraviolet radiation exposure is a problem. Available in custom matched colors only.

M25UV UV stabilized version of M25 for color and property retention in artificial and indirect sunlight exposure. Available in natural color only.

UV90Z M90 based material having UV and color characteristics similar to UV25Z.

M90UV UV stabilized version of M90 for color and property retention in artificial and indirect sunlight exposure. Available in natural color only.

UV270Z M270 based material having UV and color characteristics similar to UV25Z.

M270UV UV stabilized version of M270 for color and property retention in artificial and indirect sunlight exposure. Available in natural color only.

WR25Z M25 based material stabilized for maximum U.V. radiation resistance where outdoor weathering is required (black only).

WR90Z M90 based material having the same weathering characteristics as WR25 (black only).

LM25 2.5 melt flow acetal copolymer that is capable of being permanently marked by a laser.

LM90 9.0 melt flow rate acetal copolymer that is capable of being permanently marked by a laser.

LM90Z UV stable, 9.0 melt flow acetal copolymer which is capable of being permanently marked by a laser.

AS270 M270 based material formulated to reduce static build-up on molded parts.

AS450 M450 based material formulated to reduce static build-up on molded parts.

EC-90PLUS Semi-conductive grade of acetal copolymer for applications requiring rapid dissipation of static build-up.

EF10 10% carbon fiber reinforced acetal for strength, stiffness and electrical conductivity.

TX90 M90 based material tailored to provide moderate improvement in impact strength and flexibility.

TX90PLUS M90 based material modified to provide significant improvement in impact strength and flexibility.

Celcon® Acetal Copolymer –Typical Properties

Property	ISO Test Method	Units	Anti-Static	Electrically Conductive		Improved Impact	
			AS450	EC-90 Plus	EF10	TX90	TX90PLUS
<i>Physical</i>							
Density	1183	g/cm ³	1.40	1.37	1.42	1.38	1.37
Mold Shrinkage – Flow Direction	294-3,-4	%					
Mold Shrinkage – Transverse Direction	294-3,-4	%					
Melt Flow Rate	1133	gm/ 10 min	45.0	5.0			
Melt Volume Rate MVR (1st value)	1133	ml/ 10 min	38.6	4		8.5	6
Water Absorption (23°C-sat)	62	%		28		0.65	0.65
Moisture Absorption (23°C/50%/RH)	62	%		0.25		0.2	0.25
<i>Mechanical</i>							
Tensile Modulus (1 mm/min)	527	MPa	2,800	1,810	8,760	2,150	1,700
Tensile Stress @ Yield (50 mm/min)	527	MPa	67	37		55	46
Tensile Stress @ Break (5 mm/min)	527	MPa			67		
Tensile Strain @ Break (5 mm/min)	527	%			67		
Tensile Creep Modulus @ 1 hr.	899	MPa		1,300		1,800	1,300
Tensile Creep Modulus @ 1,000 hr	899	MPa		1,300		1,800	1,300
Flexural Modulus	178	MPa	2,800	1,660	8,180	2,050	1,560
Charpy Notched Impact Strength @ 23°C	179/1eA	kJ/m ²	4.0	4.4	4.2	8.6	11
Notched Impact Strength (Izod) @ 23°C	180/1A	kJ/m ²	5.0	4.4	4.7	8.1	19.8
<i>Thermal</i>							
Melting Temperature	3146	°C	167	165	165	165	165
DTUL @ 1.8 MPa	75	°C	100	70	154	84	80
<i>Electrical</i>							
Volume Resistivity	IEC 60093	ohm-cm		600			
Surface Resistivity	IEC 60093	ohms		1,000			

Typical Areas of Application

Applications

Benefits

Industrial / Material Handling

- Gears
- Bearings
- Conveyor links
- Cams
- Bushings
- Valve bodies
- Hose connectors
- Pistons
- Wear stops
- Pulleys, casters, rollers

- Low wear / inherent self-lubricity
- Low coefficient of friction
- Fatigue resistance
- Abrasion resistance
- Dimensional stability
- Withstands repeated short-term steam sterilization
- FDA, USDA, NSF approvals
- Chemical resistance

Appliances

- Food processor blades
- Dishwasher soap dispensers, spray nozzles and rollers
- Functional gears in washers and dryers
- Kettles
- Mixer bowls
- Washing machine / dryer parts

- Stain resistance
- High gloss surface appearance
- FDA approval for food containers
- Detergent resistance
- Dimensional stability over a wide range of temperatures

Fluid Handling / Agricultural and Irrigation

- Faucets
- Shower heads
- Stop valves
- Ball cocks
- Pop-up irrigation sprinkler
- Water meter housing / gear
- Pump housings and internal components

- NSF, FDA approval
- Corrosion / chemical resistance
- Resistance to scale build-up
- Creep resistance
- Thread strength / torque retention
- Outdoor weathering performance
- Fatigue resistance

Consumer / Home Electronics

- Zippers
- Cosmetic applicators / containers
- Aerosol valves
- Pens
- Audio / video tape reels
- Phone housing, keys and parts

- Low coefficient of friction
- Low wear / inherent lubricity
- Dimensional stability
- Toughness
- Fatigue resistance
- High strength-to-weight ratio

Automotive

- Door handles / locks
- Seat belt buckles
- Fuel / fuel sending systems
- Gas tank caps
- Windshield wiper components
- Window hardware
- Control cables

- Ultraviolet light resistance
- Color matching
- Fuel / chemical resistance
- Long term dimensional stability
- Creep resistance

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NOTICE TO USERS: To the best of our knowledge, the information contained in this publication is accurate; however, we do not assume any liability whatsoever for the accuracy and completeness of such information.

Any values shown are based on testing of laboratory test specimens and represent data that fall within the standard range of properties for natural material. Colorants or other additives may cause significant variations in data values.

Any determination of the suitability of this material for any use contemplated by the users and the manner of such use is the sole responsibility of the users, who must assure themselves that the material as subsequently processed meets the needs of their particular product or use.

It is the sole responsibility of the users to investigate whether any existing patents are infringed by the use of the materials mentioned in this publication.

Please consult the nearest Ticona Sales Office, or call the numbers listed below for additional technical information. Call Customer Services for the appropriate Material Safety Data Sheets (MSDS) before attempting to process these products.

Celcon® and Hostaform® acetal copolymers are not intended for use in medical or dental implants.

Products offered by Ticona

Celcon® and Hostaform® *acetal copolymer (POM)*

GUR® *ultra-high molecular weight polyethylene (UHMW-PE)*

Celanex® *thermoplastic polyester*

Impet® *thermoplastic polyester*

Vandar® *thermoplastic polyester alloy*

Riteflex® *thermoplastic polyester elastomer*

Vectra® *liquid crystal polymer (LCP)*

Vectran™ *liquid crystal polymer (LCP)*

Celstran® *long fiber reinforced thermoplastic (LFRT)*

Fortron® *polyphenylene sulfide (PPS)*

Celanese® *nylon 6/6 (PA 6/6)*

Topas® *cyclic olefin copolymer (COC)*

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