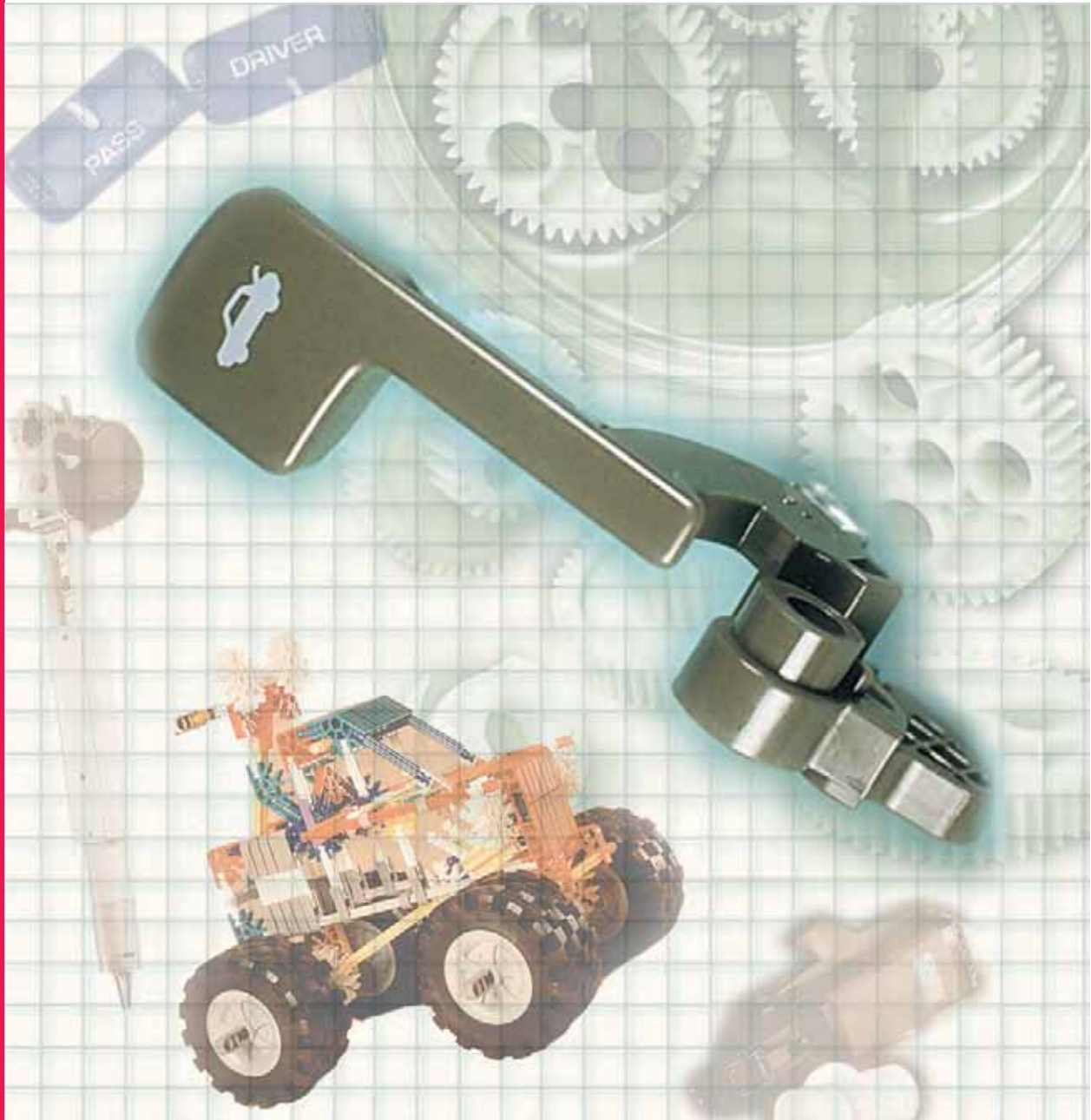


Celcon[®] acetal copolymer Short Term Properties Brochure

acetal copolymer

CE-4



Celcon[®] *acetal copolymer*

Celcon[®] acetal copolymer

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. Please refer to individual product data sheets on our web site for the most up-to-date data and information. 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 40 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 D6778	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, ASTM D4181 LP-392-A MIL-P-46137A(MR)	Superseded by ASTM D6778
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 our Medical Technology (MT) grades
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 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

MR90B Media resistant Standard flow grade for performance against intermittent bleach exposure. Refer to our website for additional grade offerings.

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, exceptional resistance to fuels, and is FDA compliant.

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

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

LW90-F2 PTFE modified M90 with good wear characteristics for 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 when wear against the same mating surface is important. 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 specifically formulated to meet automotive UV requirements (SAE J1885).

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. Colors available specifically formulated to meet automotive UV requirements (SAE J1885).

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. Colors available specifically formulated to meet automotive UV requirements (SAE J1885).

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 UV radiation resistance where outdoor weathering is required (black only). Formulated for automotive exterior applications (SAE J1960).

WR90Z M90 based material having the same weathering characteristics as WR25Z (black only). Formulated for automotive exterior applications (SAE J1960).

UV15HPZ M15HP based material having UV and color characteristics similar to UV25Z but with strength and stiffness of M15HP.

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.

CF801 General purpose electrostatic dissipative (ESD) grade.

CF802 Electrostatic dissipative (ESD) grade based on stainless steel fibers for fuel applications.

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

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	Unfilled						High Performance	Media Resistant
			M25	M50	M90	M140	M270	M450	M15HP	MR90B
<i>Physical</i>										
Density	1183	g/cm ³	1.41	1.41	1.41	1.41	1.41	1.41	1.40	1.41
Mold Shrinkage – Flow Direction	294-3,-4	%	2.2		2		1.7		2.3	2.2
Mold Shrinkage – Transverse Direction	294-3,-4	%	1.8		1.9		1.6		1.9	2.2
Melt Flow Rate	1133	gm/ 10 min	2.5	5	9	14	27	45	1.5	9
Melt Volume Rate MVR (1st value)	1133	ml/ 10 min	2.2	4.3	8	12	23	39	1.3	8
Water Absorption (23°C-sat)	62	%	0.65	0.65	0.65	0.65	0.65	0.65		
Moisture Absorption (23°C/50%/RH)	62	%	0.2	0.2	0.2	0.2	0.2	0.2		
<i>Mechanical</i>										
Tensile Modulus (1 mm/min)	527	MPa	2,460	2,500	2,760	2,800	2,820	2,890	2,800	2,750
Tensile Stress @ Yield (50 mm/min)	527	MPa	63	63	66	66	67	66	68	65
Tensile Stress @ Break (5 mm/min)	527	MPa								
Tensile Strain @ Break (5 mm/min)	11359-2	%								
Flexural Modulus	178	MPa	2,430	2,500	2,550	2,640	2,750	2,820	2,750	
Charpy Notched Impact Strength @ 23°C	179/1eA	kJ/m ²	9.1	8.7	6	6	5.2	4.4	10	5.8
Notched Impact Strength (Izod) @ 23°C	180/1A	kJ/m ²	8.3	7.5	5.7	5.7	5.4	4.7	8.9	
<i>Thermal</i>										
Melting Temperature	11357	°C	166	166	166	166	166	166	172	165
DTUL @ 1.8 MPa	75	°C	94	97	100	100	102	103	101	100
CLTE - Parallel	11359-2	10 ⁻⁴ /°C	1.2	1.2	1.2	1.2	1.1	1.1	1.1	
CLTE - Normal	11359-2	10 ⁻⁴ /°C	1.2	1.2	1.2	1.2	1.2	1.2	1.2	
<i>Electrical</i>										
Volume Resistivity	IEC 60093	ohm-cm	NR	NR	NR	NR	NR	NR	NR	NR
Surface Resistivity	IEC 60093	ohms	NR	NR	NR	NR	NR	NR	NR	NR

NR - Not recommended for ESD or conductive applications.

Refer to the individual product data sheets on our website for the most up-to-date product information.

Celcon® Acetal Copolymer –Typical Properties

Property	ISO Test Method	Units	Anti-Static	Electrically Conductive			Improved Impact		
				EC-90 Plus	CF801	CF802	TX90	TX90PLUS	M25HT
			AS270	EC-90 Plus	CF801	CF802	TX90	TX90PLUS	M25HT
Physical									
Density	1183	g/cm ³	1.41	1.37	1.38	1.47	1.38	1.37	1.35
Mold Shrinkage – Flow Direction	294-3,-4	%		1.9	2	1.7	1.8	1.5	
Mold Shrinkage – Transverse Direction	294-3,-4	%		1.7	1.9	1.6	1.6	1.4	
Melt Flow Rate	1133	gm/10 min	27	2.5			9.7	7	3.2
Melt Volume Rate MVR (1st value)	1133	ml/10 min	23	2.2			8.5	6	2.8
Water Absorption (23°C-sat)	62	%		2.8			0.65	0.65	
Moisture Absorption (23°C/50%/RH)	62	%		0.3			0.2	0.3	
Mechanical									
Tensile Modulus (1 mm/min)	527	MPa	2,700	1,880	2,450	3,100	2,150	1,700	1,290
Tensile Stress @ Yield (50 mm/min)	527	MPa	64	37	49	60	55	46	38
Tensile Stress @ Break (5 mm/min)	527	MPa							
Tensile Strain @ Break (5 mm/min)	527	%							
Flexural Modulus	178	MPa	2,700	1,660	2,400	3,000	1,970	1,560	1200
Charpy Notched Impact Strength @ 23°C	179/1eA	kJ/m ²		4.3	4.3	4.5	10.5	11	15.4
Notched Impact Strength (Izod) @ 23°C	180/1A	kJ/m ²	4.7	4.4	4.4	4.8	8.6	9.8	15.6
Thermal									
Melting Temperature	11357	°C	166	165	165	167	165	165	167
DTUL @ 1.8 MPa	75	°C	100	70	90	100	84	80	65
CLTE - Parallel	11359-2	10 ⁻⁴ /°C		1	1.1	1	1.2	1.2	
CLTE - Normal	11359-2	10 ⁻⁴ /°C		1.1	1.1	1.2	1.2	1.4	
Electrical									
Volume Resistivity	IEC 60093	ohm-cm	NR	<10 ⁴	<10 ⁴	<10 ⁴	NR	NR	NR
Surface Resistivity	IEC 60093	ohms	NR	<10 ⁴	<10 ⁴	<10 ⁴	NR	NR	NR

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
 - Improved media 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
 - Specialty colors available upon request

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 / bleach 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
 - Low gloss and other specialty appearance

Products Offered by Ticona

- Celanex® thermoplastic polyester (PBT)
- Celcon® and Hostaform® acetal copolymer (POM)
- Celstran® and Compel® long fiber reinforced thermoplastics (LFRT)
- Fortron® polyphenylene sulfide (PPS)
- GUR® ultra-high molecular weight polyethylene (UHMW-PE)
- Impet® thermoplastic polyester (PET)
- Riteflex® thermoplastic polyester elastomer (COPE)
- Vandar® thermoplastic polyester alloy (PBT)
- Vectra® liquid crystal polymer (LCP)

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Properties of molded parts can be influenced by a wide variety of factors including, but not limited to, material selection, additives, part design, processing conditions and environmental exposure. Any determination of the suitability of a particular material and part design for any use contemplated by the user is the sole responsibility of the user. The user must verify that the material, as subsequently processed, meets the requirements of the particular product or use. The user is encouraged to test prototypes or samples of the product under the harshest conditions to be encountered to determine the suitability of the materials.

Material data and values included in this publication are either based on testing of laboratory test specimens and represent data that fall within the normal range of properties for natural material or were extracted from various published sources.

All are believed to be representative. These values alone do not represent a sufficient basis for any part design and are not intended for use in establishing maximum, minimum, or ranges of values for specification purposes. Colorants or other additives may cause significant variations in data values.

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