



Showa Denko
Chloroprene

Polychloroprene Rubber
"Manufacturing since 1963"

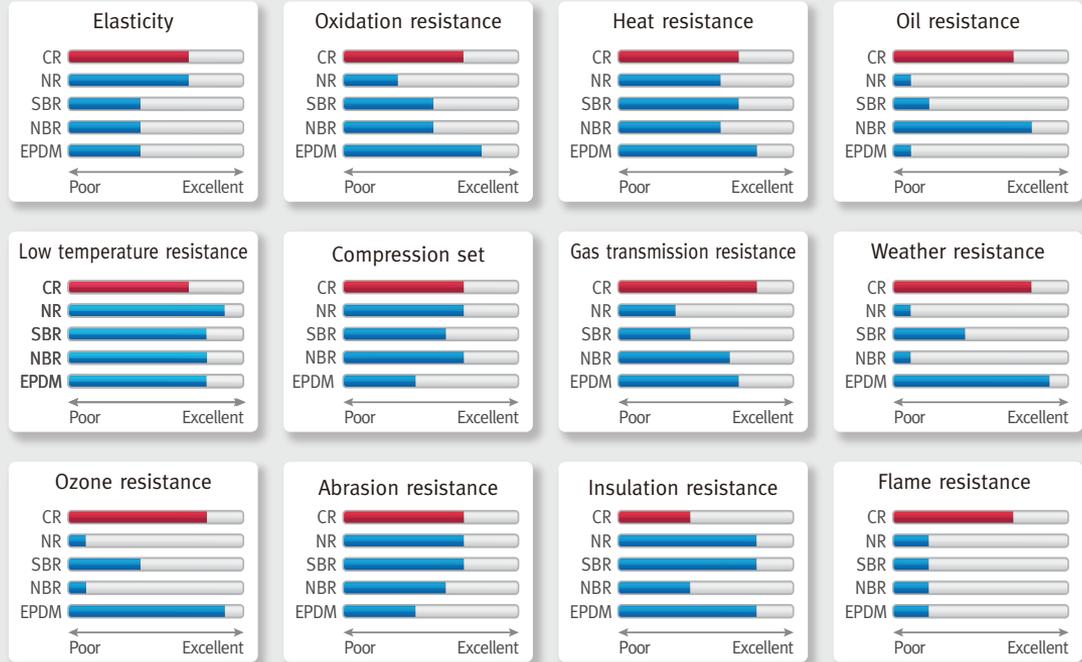
Polychloroprene Rubber

What is Showa Denko Chloroprene?

Showa Denko Chloroprene (CR) is a type of synthetic rubber used as an elastomer in the automotive (belts and hoses), construction (waterproofing and sealing), wire and cable, adhesives, and countless other industries. Showa Denko Chloroprene has been produced for over 50 years and continues to expand its application fields. The properties of Showa Denko Chloroprene is highlighted by the a wide range of resistances to sun, ozone, and weathering, many oils and chemicals, low and high temperatures, flame, and toughness against abrasion and general wear. The versatile properties have long been the key to Showa Denko Chloroprene's utility as a multi-purpose rubber. The product is available in over 40 grades, produced as either a dry chip or aqueous dispersion (Latex).



Well balanced elastomer CR



*These figures are only for reference purposes and therefore do not serve as specifications

Historical Overview

Location

Plant: Kawasaki, Japan



Footprints

1960: Established Showa Neoprene (Showa Denko 50% ,DuPont 50%)
1963: Started Neoprene production at Kawasaki with DuPont technology
2002: Terminated JV and started CR business as Showa Denko

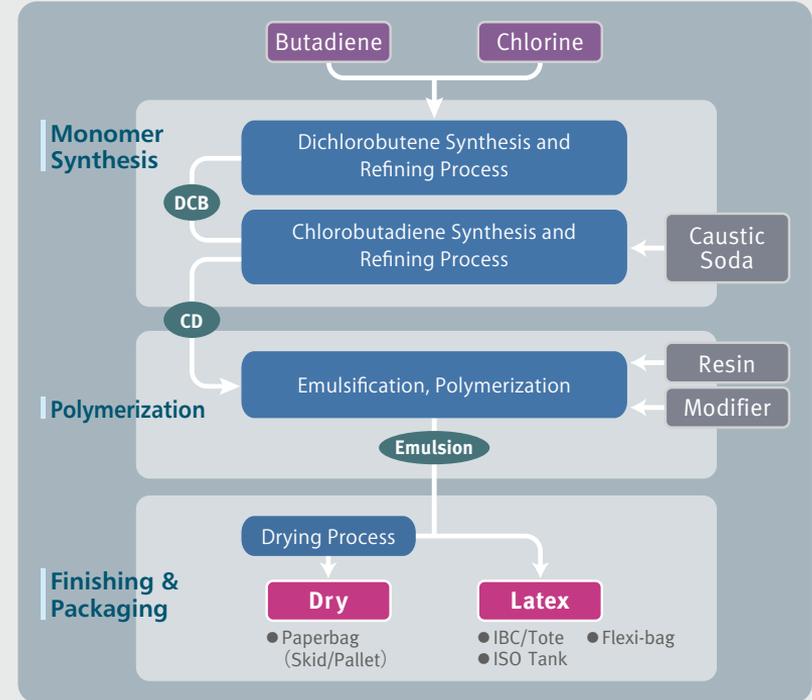
Process

1963: Started production with Acetylene process
1972: Converted to butadiene process, developed by DuPont, for safety concerns

Quality & Environment Management

ISO9001, ISO14001, OSHMS

Process (Butadiene)



DCB Dichlorobutene

CD Chlorobutadiene(or chloroprene) monomer

LATEX Aqueous Dispersion

Showa Denko Chloroprene latex grades are emulsions of polymerized chloroprene dispersed in water; containing emulsifying agents and stabilizers. The latex grades are viscous, off-white, liquids which range in solid content from 47% to 60%. Showa Denko chloroprene latex is available in over 15 different grades, each tailored to meet the requirements of specific end uses.

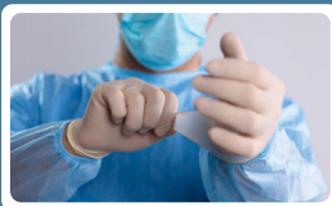
Water-based adhesives

Foam to foam, Shoe sole bonding, Contact adhesive, High pressure laminate, Metal bonding



Dipped goods

Surgical gloves, Industrial gloves, Medical breathing bags



Construction & Coating

Asphalt emulsion, Mortar modification, Water proof coating, Roofing



Others

Sealant, Mattress, Textile coating, Flame retardant foam



It is intended for use by persons having technical skill, at their own discretion and risk. Do not use in medical applications involving permanent implantation in the human body. For other medical applications, discuss with your Showa Denko customer service representative.

Showa Denko Chloroprene is available in a dry chip form. There are around 30 dry grades that cover a wide range of properties and performance to meet the requirements from automobile, adhesive, construction and general rubber industry fields.

Automotive

Transmission belt, Hose,
Engine mount



Industrial

Conveyor belt, Gasket, Boots seal,
O-ring, Wire and cable



Construction

Bearing pad, Joint,
Rubber sheet



Adhesive

Foam to foam, Carpet backing,
High pressure laminate



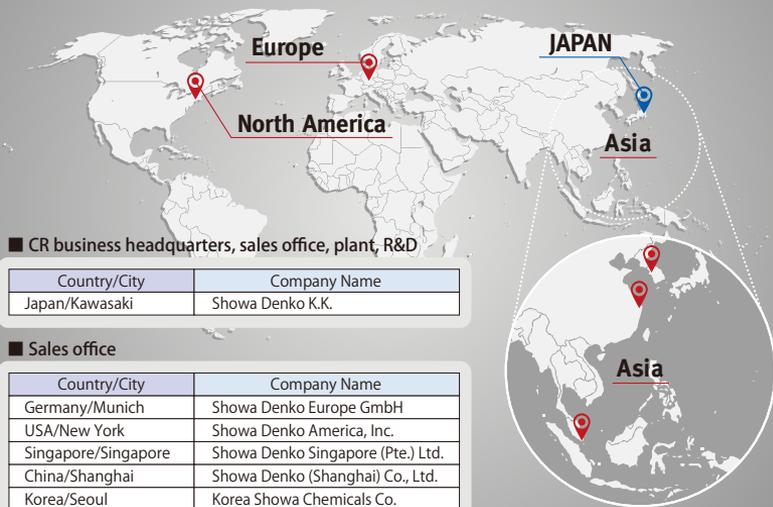
Others

Sponge, Escalator handrail,
Mattress



It is intended for use by persons having technical skill, at their own discretion and risk. Do not use in medical applications involving permanent implantation in the human body. For other medical applications, discuss with your Showa Denko customer service representative.

CR Business Global Network



Profile Showa Denko K.K.

Since its foundation in 1939, Showa Denko K.K. has been one of Japan's leading chemical manufacturers. For more than 70 years we have responded to the changing needs from various markets by continuously developing new chemicals and products in close cooperation with our customers.



Petrochemicals

Olefins (ethylene and propylene) and organic chemicals (vinyl acetate monomer, ethyl acetate and allyl alcohol)



Chemicals

Functional chemicals, basic chemicals, industrial gases, high-purity gases, Polychloroprene (CR), and chlorinated polyethylene (CPE).



Electronics

Hard disks (HDs), compound semiconductors (LED chips), and rare earth magnetic alloys



Inorganics

Graphite electrodes and ceramics (alumina and abrasives)



Aluminum

Rolled products specialty components, and beverage cans



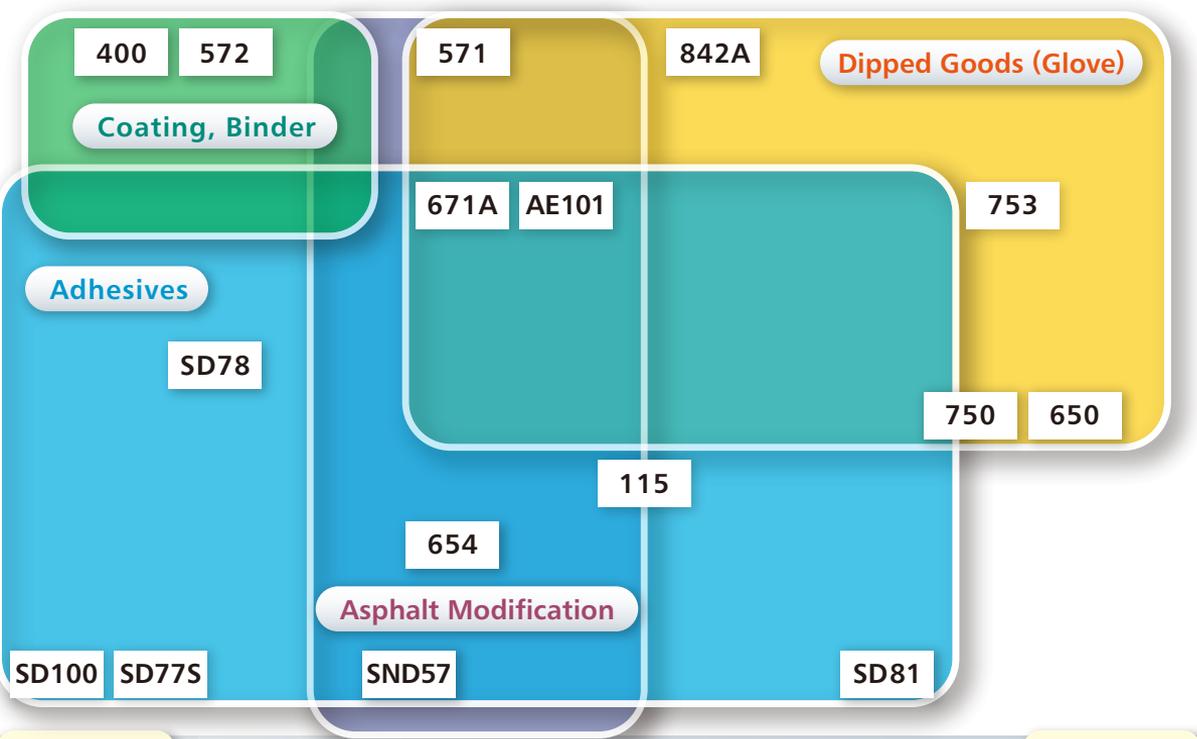
Others

Lithium-ion battery (LIB) materials, building products, and general trading

LATEX APPLICATION MAP BY CRYSTALLIZATION VS. GEL CONTENT

Cohesion ↑
Tensile strength ↑
Hardness ↑

High
Gel Content
Sol (Low)



Low temp. resist ↑
Dry tack ↑
Elongation ↑

Cohesion ↑
Tensile strength ↑
Hardness ↑

Fast ← Crystallization Rate → Slow

Low temp. resist ↑
Dry tack ↑
Elongation ↑

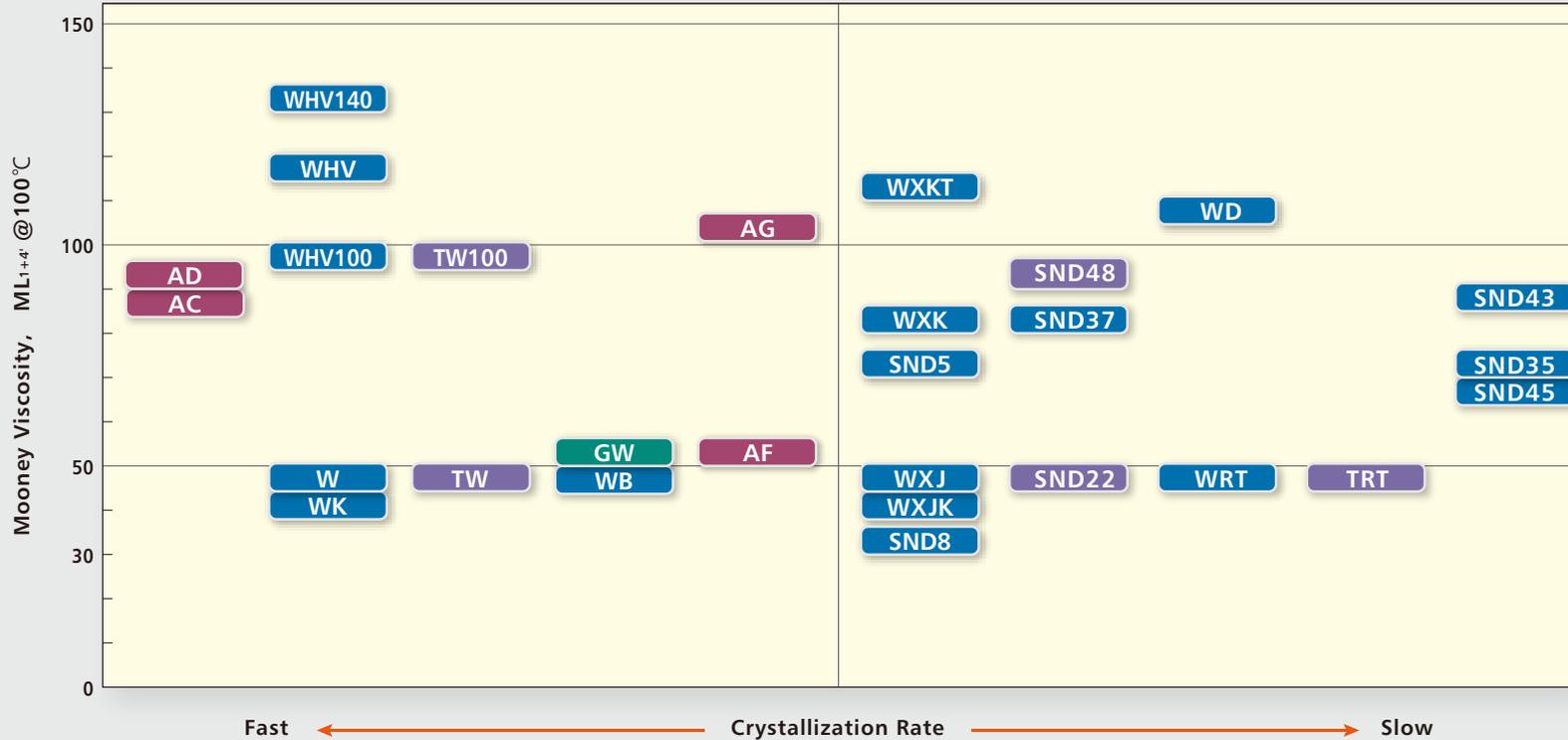
SHOWA DENKO CHLOROPRENE LIQUID DISPERSION PROPERTIES (Typical Values)

Grades	400	750	753	650	654	842A	671A	572	571	SND57	SD77S	SD100	SD78	AE101	115	SD81
Polarity	Anionic	Anionic	Anionic	Anionic	Anionic	Anionic	Anionic	Anionic	Anionic	Anionic	Anionic	Anionic	Anionic	Non ionic	Non ionic	Non ionic
Homo/Copolym.	Copolymer	Copolymer	Copolymer	Copolymer	Homopolymer	Homopolymer	Homopolymer	Homopolymer	Homopolymer	Homopolymer	Homopolymer	Homopolymer	Homopolymer	Homopolymer	Copolymer	Copolymer
Main Feature	Ozone and weather resistance	Excellent flexibility			Low modulus	Fast curing	Good wet strength	Fast crystallizing	General purpose	Good tackiness	Water based adhesives for foam bonding	Water based adhesives for foam bonding	Water based adhesives for high pressure laminate	Non-ionic	Non-ionic	Non-ionic
Solids Content, %	49	50	50	60	59	50	59	50	50	58	55	55	60.5	59	47.5	46.5
Primary Applications & Other Characteristics	<ul style="list-style-type: none"> * Bonded fibers * Coatings * Adhesives 	<ul style="list-style-type: none"> * Adhesives * Dipped goods * Non-woven fabric * Low modulus * Excellent elasticity 	<ul style="list-style-type: none"> * Adhesives * Dipped goods * Non-woven fabric * Low modulus * Accelerator free 	<ul style="list-style-type: none"> * Dipped goods * Adhesives * Foam * Sealant * High solid same polymer as 750 	<ul style="list-style-type: none"> * Dipped goods * Fabric impregnation (Binder) 	<ul style="list-style-type: none"> * Treated paper * Bonded fibers * Coatings * Carpet backing 	<ul style="list-style-type: none"> * Dipped goods * Adhesives * Bonded fibers * Treated paper * Mastics 	<ul style="list-style-type: none"> * Adhesives 	<ul style="list-style-type: none"> * Adhesives 	<ul style="list-style-type: none"> * Pressure sensitive adhesives * Primer 	<ul style="list-style-type: none"> * Good quick break with excellent stability 	<ul style="list-style-type: none"> * Adhesives * Excellent quick break with decent stability 	<ul style="list-style-type: none"> * Adhesives 	<ul style="list-style-type: none"> * Elasticized portland cement * Sealants * Coatings * Asphalt emulsion * Colloidal stability at low pH 	<ul style="list-style-type: none"> * Contact adhesives * Coating * Mastics * Sealant * Asphalt emulsion 	<ul style="list-style-type: none"> * Contact adhesives * Pressure sensitive adhesive
Physical Characteristics																
pH, 25°C ^{*1)}	11.5	12	12	12	12.5	12	12.5	11.5	11.5	12.5	12.5	12.5	12.3	12.5	7	7
Specific gravity, 25°C																
Latex	1.15	1.12	1.12	1.13	1.13	1.11	1.13	1.11	1.11	1.13	1.12	1.12	1.13	1.13	1.09	1.08
Polymer	1.41	1.23	1.23	1.23	1.23	1.23	1.23	1.23	1.23	1.23	1.23	1.23	1.23	1.23	1.24	1.23
Brookfield viscosity, mPa·s, 25°C (Spindle No. 1, 30rpm)	8	10	10	400 ^{*2)}	40	15	40	10	10	35	300	300	30	200	300 ^{*2)}	200 ^{*2)}
Surface tension, dyn/cm, 20°C	37	39	39	39	41	38	41	38	38	41	38	38	40	36	47	47
Softening point, °C (Creeping temp)	96	90	110	73	78	47	81	92	88	< 40	77	78	95	77	95	< 40
Polymer type	High gel	Med.gel	High gel	Med.gel	Low gel	High gel	Med-high gel	High gel	High gel	Sol	Sol	Sol	Med.gel	Med-high gel	Med.gel	Sol
Emulsifiers	Resinate	Resinate	Resinate	Resinate	Resinate	Resinate	Resinate	Resinate	Resinate	Resinate	Resinate	Resinate	Resinate	Resinate, Non-ionic	Polyvinyl alcohol	Polyvinyl alcohol
Wet gel properties																
Tensile strength	Very high	High	High	High	Medium	Medium	Very high	Medium	Medium	Low	Very high	Very high	Very high	High	High	Low
Elongation	High	High	High	High	High	Medium	High	Medium	Medium	Medium-high	High	High	High	High	Medium	Low
Cure rate	Slow	Medium	Medium-fast	Medium	Medium	Fast	Med.-fast	Fast	Fast	Slow	Slow	Slow	Med.-fast	Med.-fast	Medium	Slow
Cured Film Properties																
Modulus	Very high	Low	Low	Low	Low	Medium	High	High	High	Medium	High	High	High	High-medium	Medium	Low
Tensile strength	High	Medium	Medium	Medium	Medium	Med.-high	High	Medium	Medium	Medium	High	High	High	High-medium	Medium	Low
Crystallization rate	Extremely fast	Extremely slow	Extremely slow	Extremely slow	Medium-fast	Very slow	Medium-fast	Very fast	Slow	Medium	Extremely	Extremely	Medium-fast	Medium-fast	Slow	Very slow

Note: *1) : pH values decline slowly upon ageing. *2) : Spindle No.2

The information set forth herein is furnished free of charge and is based on technical data that Showa Denko K.K. believes to be reliable. It is intended for use by persons having technical skill, at their own discretion and risk. The handling precaution information contained herein is given with the understanding that those using it will satisfy themselves that their particular conditions of use present no health or safety hazards. Because conditions of product use and disposal are outside our control, we make no warranties, express or implied, and assume no liability in connection with any use of this information. As with any material, evaluation of any compound under end-use conditions prior to specification is essential. Nothing herein is to be taken as a license to operate or a recommendation to infringe on any patents. CAUTION: Do not use in medical applications involving permanent implantation in the human body. For other medical applications, discuss with your Showa Denko customer service representative. Showa Denko Chloroprene is a trademark of Showa Denko K.K. Copyright 2016 Showa Denko K.K. All Rights Reserved.

PLOT OF DRY GRADES CRYSTALLIZATION RATE VS. MOONEY VISCOSITY



SHOWA DENKO CHLOROPRENE DRY GRADE PROPERTIES (Typical Values)

GENERAL PURPOSE

Type	Grades	Mooney Viscosity [ML 1+4, 100°C]	Crystallization Rate	Other Characteristics
G Types (Sulfur-modified group)	GW	34-52	Slow	Sulfur modified G type with better heat and compression set resistance than GN
W Types (Basic group)	W	42-51	Medium	Standard grade for general purposes
	WHV	109-130	Medium	Higher viscosity version of W for high loading application and general adhesives
	WHV100	95-105	Medium	Lower viscosity version of WHV
W Types (Adhesive application)	WHV140	100-150*	Medium	For high viscosity adhesive
W Types (Crystallization resistant group)	WXJ	42-51	Very Slow	Good low temperature properties for general use
	SND5	67-76	Very Slow	Higher viscosity version of WXJ
	SND8	32-37	Very Slow	Lower viscosity version of WXJ
	WRT	42-51	Extremely slow	Excellent low temperature properties
W Types (Extrusion & calendering)	WB	42-51	Medium	Best extrusion and calendering properties
	W XK	73-89	Very Slow	Good low temperature properties with better extrudability
	W XKT	106-117	Very Slow	Higher viscosity version of WX-K for high loading use
	SND37	73-89	Very Slow	Better extrusion version of WX-K with improved mold release
W Types (Low mold fouling group)	WK	42-51	Medium	Better mold release version of W with good mill-and flow-ability
	W XJK	42-51	Very Slow	Improved mold release version of WXJ with good mill-ability
	SND35	63-73	Extremely slow	More excellent low temperature properties of WRT with improved mold release for injection molding goods
	SND43	78-88	Extremely slow	Higher viscosity version of SND-35 with less shrinkage
	SND45	60-73	Extremely slow	More excellent low temp. and improved brittleness temp. version of WRT with improved mold release for injection molding goods
T Types (Specific group for extrusion, calendering)	TW	42-51	Medium	Superior extrusion and calendering grade with good tensile properties
	TW100	85-102	Medium	Higher viscosity version of TW for high loading use
	SND22	42-51	Very slow	Good low temperature properties with better extrudability
	SND48	85-100	Very slow	Higher viscosity version of SND-22 with better calender-ability and extrusion-ability having collapse resistance
	TRT	42-51	Extremely slow	Excellent low temperature properties with better processability
A Types (Adhesive application)	AC	31-43*	Very fast	Adhesives and paints use with good breakdown properties
	AD	33-46*	Very fast	Adhesives and paints use with good solution viscosity stability
	AF	40-115**	Slow	Excellent hot bond strength, carboxylated
	AG	80-130	Medium-Slow	Excellent sprayability, thixotropic

Note * : Brookfield viscosity of 5% raw polymer solution in toluene at 25°C, [mPas] ** : Brookfield viscosity of 10% raw polymer solution in toluene/hexane (60/40 vol/vol) at 25°C, [mPas]

The information set forth herein is furnished free of charge and is based on technical data that Showa Denko K.K. believes to be reliable. It is intended for use by persons having technical skill, at their own discretion and risk. The handling precaution information contained herein is given with the understanding that those using it will satisfy themselves that their particular conditions of use present no health or safety hazards. Because conditions of product use and disposal are outside our control, we make no warranties, express or implied, and assume no liability in connection with any use of this information. As with any material, evaluation of any compound under end-use conditions prior to specification is essential. Nothing herein is to be taken as a license to operate or a recommendation to infringe on any patents. CAUTION: Do not use in medical applications involving permanent implantation in the human body. For other medical applications, discuss with your Showa Denko customer service representative. Showa Denko Chloroprene is a trademark of Showa Denko K.K. Copyright 2016 Showa Denko K.K. All Rights Reserved.



Showa Denko **Chloroprene**

Polychloroprene Rubber
"Manufacturing since 1963"

The information set forth herein is furnished free of charge and is based on technical data that Showa Denko K.K. believes to be reliable. It is intended for use by persons having technical skill, at their own discretion and risk. The handling precaution information contained herein is given with the understanding that those using it will satisfy themselves that their particular conditions of use present no health or safety hazards. Because conditions of product use and disposal are outside our control, we make no warranties, express or implied, and assume no liability in connection with any use of this information. As with any material, evaluation of any compound under end-use conditions prior to specification is essential. Nothing herein is to be taken as a license to operate or a recommendation to infringe on any patents.

CAUTION: Do not use in medical applications involving permanent implantation in the human body. For other medical applications, discuss with your Showa Denko customer service representative. Showa Denko Chloroprene is a trademark of Showa Denko K.K.

Copyright 2016 Showa Denko K.K. All Rights Reserved.