Technical Data Sheet

DOWSIL™ SE 960 Sealant

Neutral (alcohol type), one-part silicone sealant
JIS A 5758 G-F-25HM (SR-1-9030) specified sealant

Features & Benefits

- Ideal for expansion, connection, perimeter and other joint movement
- Expansion/compression movement capability: M1 = 20%, M2 = 30%
- Shearing movement capability: M1 = 30%, M2 = 60%
- Excellent durability and weatherability compared with organic sealants such as urethane sealants and modified silicone sealants
- Excellent adhesion properties across a wide range of substrates such as various metals, glass, tiles, plastics, and porcelain
- Less odor than oxime type
- Resists surface cracking caused by movement after curing
- Ease of use; one-part composition eliminates mixing

Composition

- One-part
- Neutral cure (alcohol type)
- RTV sealant

Applications

- DOWSIL™ SE 960 Sealant is a high durability and high weatherability type sealant for use in general glazing and weather sealing in curtain wall, building facades, and infrastructure.

Typical Properties

Specification Writers: These values are not intended for use in preparing specifications.

Test[1]	Property	Unit	Result
JIS A 1439	Tack free	min	10
JIS K 6249	Density		1.47
JIS K 6249	Hardness (JIS type A)		34
JIS K 6249	Adhesion strength in shear	N/cm^2	192
JIS A 1439	50% modulus	N/mm^2	0.45
JIS A 1439	Maximum tensile strength	N/mm^2	1.8
JIS A 1439	Maximum elongation	%	480
JIS A 1439	CF%	%	100

1. JIS: Japanese Industrial Standard.

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Typical Properties (Cont.)

Test	Property	Unit	Result
	JIS A 5758 G25HM 9030 (SR-1)		
JIS A 1439	Slump (5°C and 50°C, length and breadth)	mm	0
JIS A 1439	Elastic recovery	%	97
JIS A 1439	Change in volume	%	2.8
JIS A 1439	100% modulus at 23°C	N/mm^2	0.8
JIS A 1439	Adhesion properties at maintained extension		Pass
JIS A 1439	Adhesion properties at variable temperatures		Pass
JIS A 1439	Adhesion properties after immersion in water		Pass
JIS A 1439	9030 durability		Pass

Description

DOWSIL™ SE 960 Sealant is a one-part, neutral-cure (alcohol type), architectural and infrastructure grade sealant. It easily extrudes in any weather and cures quickly at room temperature.

This cold-applied, non-sagging silicone material cures to silicone rubber upon exposure to atmospheric moisture.

The cured sealant is durable and flexible enough to accommodate M1: 30%, M2: 60% shear movement of original joint dimension when installed in a properly designed weather seal joint.

Evaluation Result of JIS A 5758-1

Properties	Condition	Unit	Evaluation Result	Specification
Slump (length)	5 ± 2°C	mm	0	3 or less
	50 ± 2°C	mm	0	3 or less
Slump (breadth)	5 ± 2°C	mm	0	3 or less
	50 ± 2°C	mm	0	3 or less
Elastic recovery	23 ± 2°C	%	97	70 or more
Resistance to compression	23 ± 2°C	N/mm^2	0.5	
Change in volume		%	4	10 or less

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Evaluation Result of JIS A 5758-2

Properties	Condition	Unit	Evaluation Result		Specification
			Substrate	Data[1]	
100% modulus	23 ± 2°C	N/mm^2	Glass	0.7	Exceed 0.4
		N/mm^2	Aluminum	0.7	
	-20 ± 2°C	N/mm^2	Glass	0.7	Exceed 0.6
		N/mm^2	Aluminum	0.7	
Adhesion properties at maintained extension	23 ± 2°C		Glass	NP	No failure
			Aluminum	NP	
	-20 ± 2°C		Glass	NP	No failure
			Aluminum	NP	
Adhesion properties after exposure heat, water and artificial light through glass	23 ± 2°C		Glass	NP	No failure
Adhesion properties at variable temperature	23 ± 2°C		Aluminum	NP	No failure
Adhesion properties after immersion in water	23 ± 2°C		Glass	NP	No failure
			Aluminum	NP	No failure

1. NP: No Particular

Evaluation Result of Tensile Adhesion

Substrate	Primer	Condition	Modulus	Max.		Failure Mode		
			M50	Tmax	Emax	CF	tCF	AF
			N/mm^2	N/mm^2	%	%	%	%
GL	Non	After initial curing	0.52	1.71	460	100	0	0
		Water immersion x 7 days	0.52	1.75	491	100	0	0
		50°C hot water immersion x 7 days	0.50	1.54	338	100	0	0
		90°C heating x 14 days	0.43	1.68	475	100	0	0
		WOM x 1,300 h	0.54	1.63	327	100	0	0
	DOWSIL™ Primer-D3(RF)	After initial curing	0.54	1.45	344	100	0	0
		Water immersion x 7 days	0.56	1.64	424	100	0	0
		50°C hot water immersion x 7 days	0.50	1.52	345	100	0	0
		90°C heating x 14 days	0.44	1.74	497	100	0	0
		WOM x 1,300 h	0.52	1.85	390	100	0	0

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Evaluation Result of Tensile Adhesion (Cont.)

Substrate	Primer	Condition	Modulus	Max.		Failure Mode		
			M50	Tmax	Emax	CF	tCF	AF
			N/mm²	N/mm²	%	%	%	%
AL	Non	After initial curing	0.52	1.79	484	100	0	0
		Water immersion x 7 days	0.52	1.71	450	100	0	0
		50°C hot water immersion x 7 days	0.50	1.65	357	100	0	0
		90°C heating x 14 days	0.41	1.66	474	100	0	0
	DOWSIL™ Primer-D3(RF)	After initial curing	0.51	1.77	480	100	0	0
		Water immersion x 7 days	0.52	1.72	440	100	0	0
		50°C hot water immersion x 7 days	0.49	1.63	400	100	0	0
		90°C heating x 14 days	0.42	1.74	497	100	0	0

[Test piece] JIS A 1439 H type
[Tensile speed: 50 mm/minute]
[Fracture mode] CF: Cohesion failure, tCF: Thin layer cohesion failure, AF: Adhesion failure
[Condition]
Initial: 23 ± 2°C /50 ± 5% RH × 14 days + 30 ± 2°C × 14 days
After water immersion: Initial + 23 ± 2°C water immersion × 7 days
After 50°C hot water immersion: Initial + 50 ± 2°C hot water immersion × 7 days + 23 ± 2°C × 1 day
After 90°C heating: Initial + 90 ± 2°C × 14 days

Available Deformation Ratio

DOWSIL™ SE 960 Sealant and DOWSIL™ SH 780 Sealant

Product Name	Expansion/Compression		Shear Side	
	M1[1]	M2[2]	M1	M2
	%	%	%	%
DOWSIL™ SE 960 Sealant	20	30	30	60
DOWSIL™ SH 780 Sealant	(10)	(15)	(20)	(30)

(): Glazing
1. M1: Thermal movement
2. M2: Window load/Earth quick movement

Joint Design

The joint design must conform to “JASS8 (Construction standard of Architect Institute of Japan)” and “Technological indicator concerning watertight design and construction of the outside wall joint.”

EX.) The calculation result of the joint width by the heat movement and the displacement between layers were compared to DOWSIL™ SH 780 Sealant (JIS durability classification 9030G).

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Joint Design (Cont.)

The Calculation of the Minimum Joint Width

The minimum joint width is calculated by below formula:

$$\text{Minimum Joint Width (mm)} = \frac{\text{Movement (mm)}}{\text{Design Shear Deformation Ratio (\%)}} \times 100$$

The Efficiency to the Design Joint Width for Thermal Movement

The result of calculation the minimum joint width was 15 mm when use DOWSIL™ SH 780 Sealant. However, it can be designed 10 mm when use DOWSIL™ SE 960 Sealant.

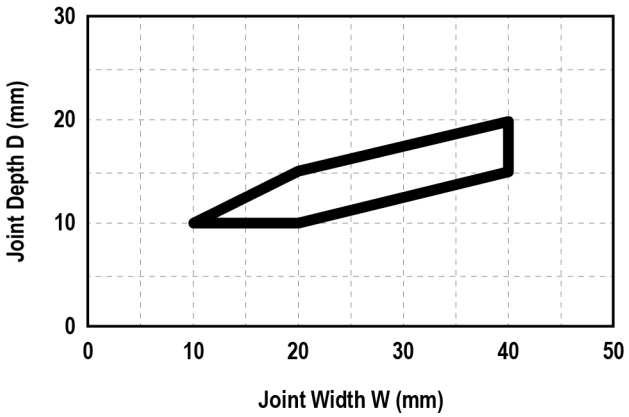
Properties	Unit	DOWSIL™ SE 960 Sealant	DOWSIL™ SH 780 Sealant
Thermal movement	mm	3.0	3.0
Design shear deformation ratio	%	30	20
Minimum joint width	mm	10	15

The Efficiency to the Design Joint Width for the Relative Story Displacement

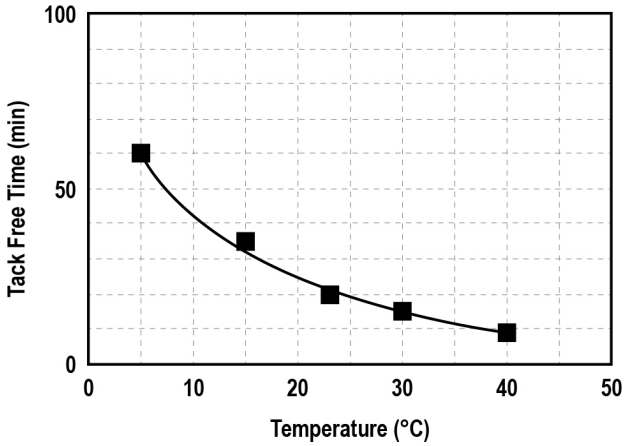
The result of calculation the minimum joint width was 17 mm when use DOWSIL™ SH 780 Sealant. However, it can be designed 9 mm when use DOWSIL™ SE 960 Sealant.

Properties	Unit	DOWSIL™ SE 960 Sealant	DOWSIL™ SH 780 Sealant
Relative story displacement	mm	5.0	3.0
Design shear deformation ratio	%	60	30
Minimum joint width	mm	9	17

Setting of Joint Depth - General Joint

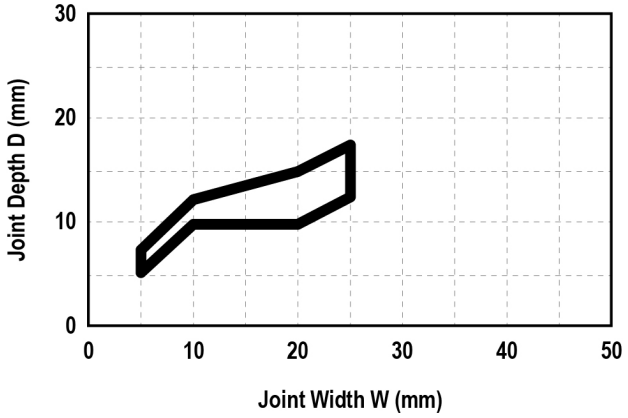


Surface Cure Rate

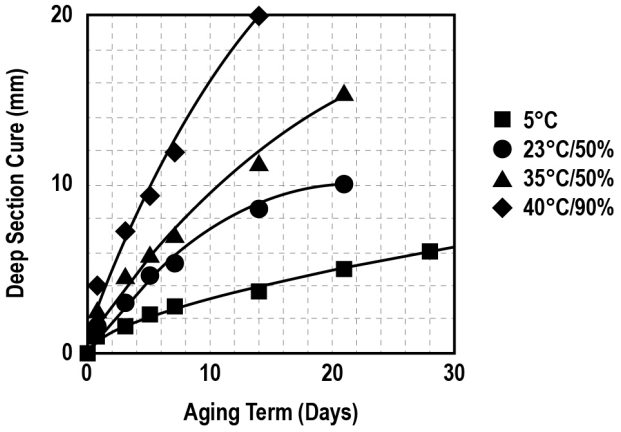


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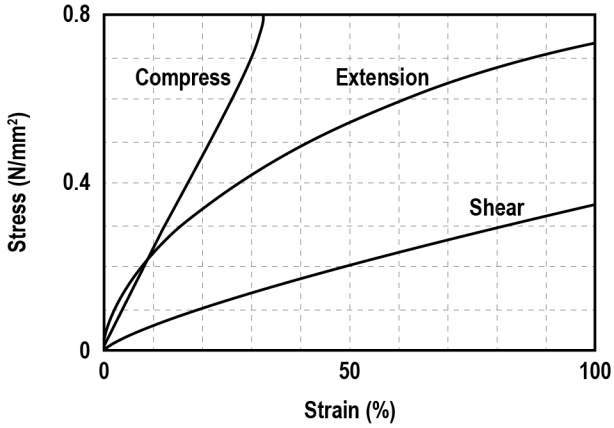
Setting of Joint Depth - Glazing Joint



Deep Section Cure



Stress Strain Curve



Fatigue Test

The result of +/-30% expansion and compression fatigue test.

	Modulus		Max.		Mode of Failure		
Repeat Count	50%	100%	Strength	Elongation	CF	tCF	AF
	N/mm²	N/mm²	N/mm²	%	%	%	%
Initial	0.53	0.74	1.65	450	100	0	0
After 10,000 times	0.49	0.74	1.69	436	100	0	0
After 20,000 times	0.48	0.74	1.67	416	100	0	0
After 50,000 times	0.49	0.76	1.58	393	100	0	0

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Weatherability

WOM Exposure Time (hrs)	Modulus		Max.		Mode of Failure		
	50%	100%	Strength	Elongation	CF	tCF	AF
	N/mm²	N/mm²	N/mm²	%	%	%	%
0	0.42	0.76	1.51	419	90	10	0
500	0.44	0.88	1.60	420	100	0	0
1000	0.41	0.80	1.70	446	90	10	0
2000	0.42	0.80	1.56	388	100	0	0
3000	0.43	0.82	1.68	427	100	0	0

General Adhesion Properties (Non-Primer)

Test method: JASS8 Simple adhesion test
Aging condition:
Initial: 25°C 50% RH×7 days
Hot-water: Initial + 50°C hot water immersion×7 days

Substrate		Mode of Failure	
		Initial	After Hot Water Immersion
Glass	Float Glass	CF 100%	CF 100%
	Heat Reflecting Glass	CF 100%	CF 100%
	Super Heat Reflecting Glass	CF 100%	CF 100%
	Heat Absorbing Glass	CF 100%	CF 100%
	Porcelain-clad	CF 100%	CF 100%
	Ceramic Tile	CF 100%	CF 100%
Metal	Anodized Aluminum	CF 100%	CF 100%
	Electrolytic Colorized Aluminum	CF 100%	CF 100%
	SPCC-SB (Machining)	CF 100%	CF 100%
	SUS	CF 100%	CF 100%
	Copper	CF 100%	CF 100%
	Hot Dip Zincing	CF 100%	CF 100%
Coatings	Acryl Coating	CF 100%	CF 100%
	Melmaine Coating	CF 100%	CF 100%
	PVC Coating	CF 100%	CF 100%
Plastic	PET	CF 100%	CF 100%
	Epoxy Glass	CF 100%	CF 100%
	ABS	CF 100%	CF 100%
	Poly Stylene	CF 100%	CF 100%
Plastic	Acryl	CF 100%	CF 100%
	Poly Carbonate	CF 100%	CF 100%
	Rigid PVC	CF 100%	CF 100%

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General Adhesion Properties (Non-Primer) (Cont.)

Notes:

- Adhesion properties might be different according to the manufacturer and the kind.
- The adhesion test is recommended before apply sealant.
- The use of the primer is recommended for to improve adhesion properties and durability.
- There is a possibility that the sealant changes in quality by the contact of EPDM and CR with the sealant.

Approvals/ Specifications

- JIS A 5758 G25HM 9030 (SR-1)
- JSIA F☆☆☆☆
- JWWA K161-2017 (Dissolution test)
- The Ministry of Health, Labor and Welfare Ministerial Notification No. 45

Colors

DOWSIL™ SE 960 Sealant is available in 6 colors: black, gray, light-gray 2, white, ivory, and umber.

How to Use

Please consult the “Sealant Hand book”, “JASS8 Waterproofing work” and “Technological indicator concerning watertight design and construction of the outside wall joint”.

Primer

Please use a primer on glass, metal, and porous material to achieve the highest quality of adhesion. In addition, to confirm adhesion properties, please conduct a test on the substrate in use. Typical primers used are as follows. Please refer to the primer data sheet for details of the primer. Please contact a sales engineer for specific advice.

- Glass, metal, varnished metal: DOWSIL™ Primer-D3(RF)
- Concrete: DOWSIL™ Primer-B

Handling Precautions

- The surface of the substrate should be clean and dry.
- Protect uncured sealant from rain.
- Prevent extreme joint movement until the sealant if fully cured.
- When using the sealant on an outside wall joint, staining may occur.
- When using an air gun to apply, pressure should be controlled below 0.3 Mpa.
- Changes in quality may be observed if the sealant comes in contact with EPDM or CR.
- Contact may cause the uncured oxime sealant to discolor.
- Bubbling and cracking may occur if the sealant is applied to a substrate during the summer when surface temperatures may be extreme (particularly with dark color substrates).
- Internal cracking and discoloration may occur when the construction joint is too deep. When considering joint depth (D) and width (W), please refer to the profile coefficient D/W ≦ 1.0. It is important to allow the sealant a sufficient number of days to fully cure. Please use the interconnected cell sponge as a back-up material for suitable curing.
- The sealant is not suitable for use in areas with continuous exposure to temperatures above 120°C.

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Usable Life and Storage

When stored at 5–25°C, DOWSIL™ SE 960 Sealant has a shelf life of 12 months from the date of manufacture. Refer to product packaging for “Use by Date.”

Packaging Information

DOWSIL™ SE 960 Sealant is supplied in 330 ml disposable plastic cartridge.

Limitations

This product is neither tested nor represented as suitable for medical or pharmaceutical uses.

Health and Environmental Information

- Do not allow the sealant to come into contact with flames.
- Allow proper ventilation when applying sealant.
- The primer is flammable, do not allow contact with flames.
- In case of skin contact, please wash with soap and water.
- In case of eye contact, immediately flush with water.

To support customers in their product safety needs, Dow has an extensive Product Stewardship organization and a team of product safety and regulatory compliance specialists available in each area.

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Disposal Considerations

Dispose in accordance with all local, state (provincial) and federal regulations. Empty containers may contain hazardous residues. This material and its container must be disposed in a safe and legal manner.

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