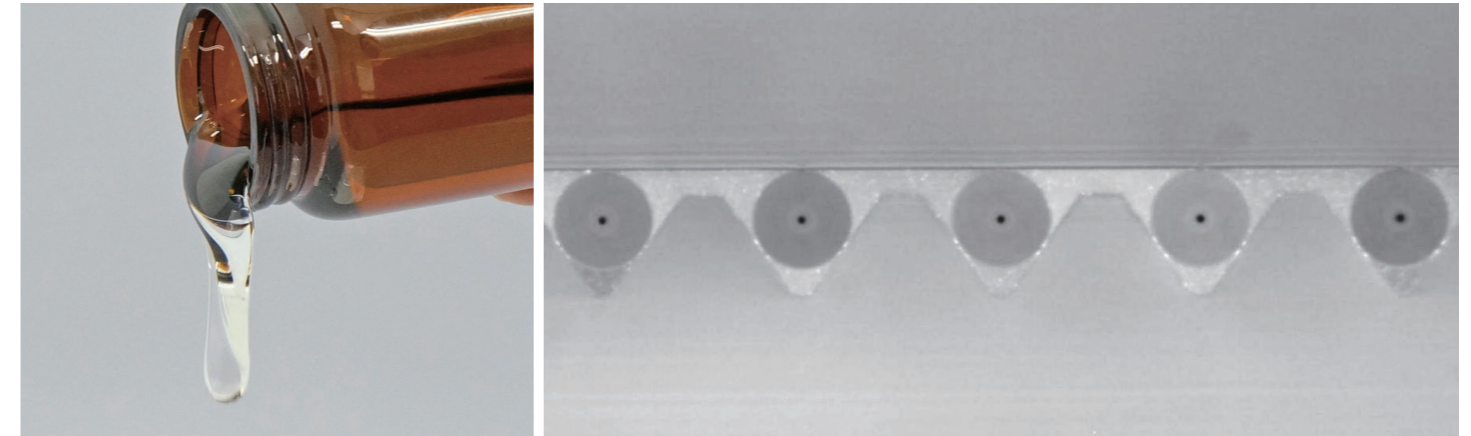
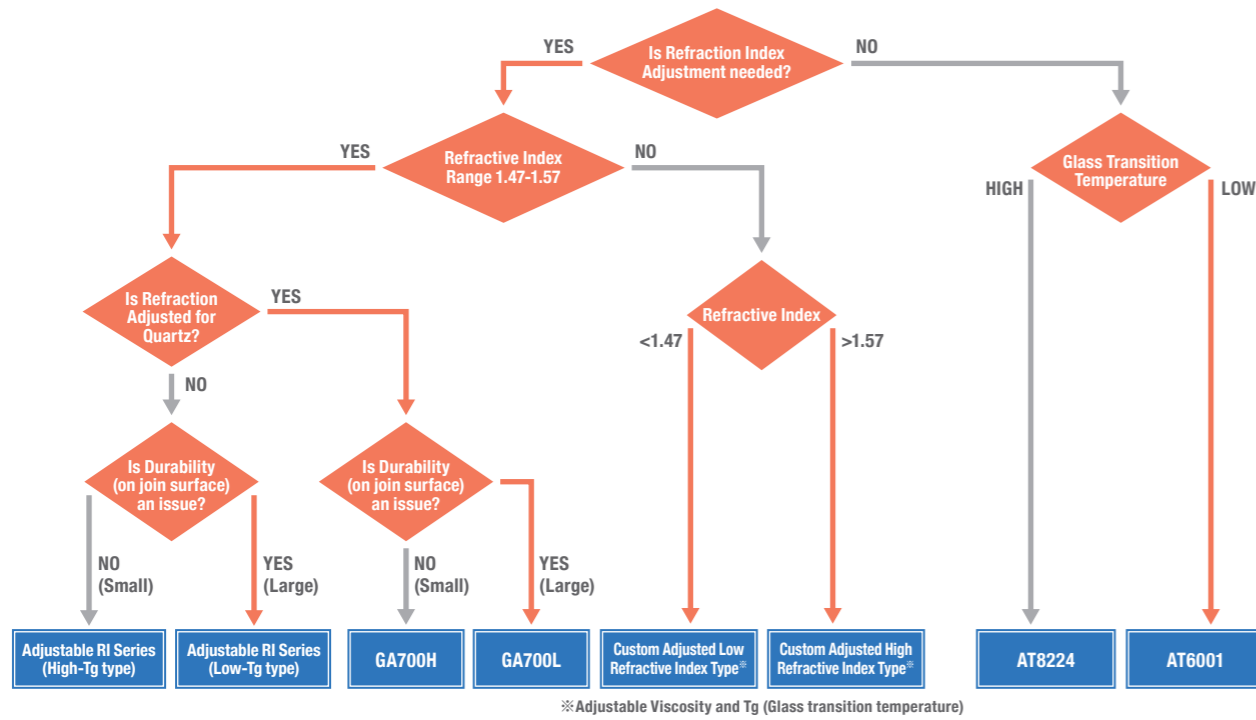


● Flow Chart: Selecting Optical Waveguide Adhesives Based On Application Usage



NTT-AT Optical Adhesives Lineup

▶▶▶ Adhesives / Resins and Sealants for Optical Component Assembly

● Measurement Item and Method of Measurement used for this Catalog

Measurement Item	Method of Measurement	Measurement Item	Method of Measurement
UV curing condition	Light source: Metal halide lamp (Center wavelength 365 nm) Heat-treating: Conditions as described in the Instruction manual	Optical transmittance	UV Spectrophotometer (Sample thickness 1mm)
Refractive index	Abbe refractometer (at 25°C)	Hardness (Shore d, a)	Hardness meter
Viscosity	E-type viscometer (at 25°C)	Thermal expansion coefficient	TMA (Thermomechanical analysis)
Glass transition temperature	Maximum peak temperature of viscoelastic spectrum tan δ	Shrinkage during curing	Calculated from the difference in density before and after curing
		Water vapor transmission rate	Transmittance measuring instrument (Sample thickness 0.5mm)
		Pot life	Time for confirmation of fluid flow to ø3mm SUS tube

Feel free to contact us if you have any questions about adhesives, requirements of custom adhesives, and measurement and testing services for adhesives.

■ Measurement and Testing Services for Adhesives

The Optical characteristics	Refractive index, Optical transmittance, Absorbance	The Thermal characteristics	Thermal expansion coefficient, Thermogravimetric analysis
The Electrical characteristics	Permittivity, Resistivity	The Material characteristics	Viscosity, Density, Shrinkage during curing etc.
The Mechanical characteristics	Bond Strength, Viscoelasticity etc.	Various environmental tests	Longevity tests, Durability tests

■ Custom Adhesives, Measurement and Testing Services for Adhesives

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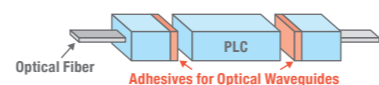


The adhesive technology used in optical communications is one of the key technologies we offer. Ask us anything you need to know Adhesives for optical component assembly.

- Adjust the Viscosity
- Adjust the Refractive Index

Consultation available for customization of each type. Feel free to contact us if you have any questions.

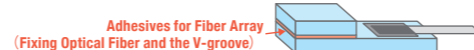
### Adhesives for Optical Waveguides



Model [Main ingredient]	Curing conditions (UV)		Refractive index (after hardening) @589nm	Viscosity (mPa · s)	Tg (°C)	Optical transmittance (%) @1.3µm	Bond strength (kgf/cm <sup>2</sup> )	Special features
	Irradiation level <sup>※1</sup>	Time (min)						
Adjustable RI Series (High-Tg type) [Epoxy]	30	10	1.458 - 1.567	250 - 2000	140 - 150	89 - 90	120 - 180	Refractive index can be adjusted in accordance with the customer's specification, High-Tg
Adjustable RI Series (Low-Tg type) [Epoxy]	10	10	1.458 - 1.567	200 - 560	40 - 50	86 - 90	>200	Refractive index can be adjusted in accordance with the customer's specification, Low-Tg
GA700H (High-Tg type) [Epoxy]	30	10	1.46	280	145	91	>247	Refractive index adjusted to match silica glass (at 1.55µm), High-Tg
GA700L (Low-Tg type) [Epoxy]	10	5	1.46	250	46	94	>154	Refractive index adjusted to match silica glass (at 1.55µm), Low-Tg
AT6001 [Acrylate]	10	5	1.51	470	0	91	99	Complies with Telecordia Standards (High Temperature/High Humidity), High Elasticity
AT8224 [Acrylate]	10	5	1.51	145	115	89	>209	Complies with Telecordia Standards (High Temperature/High Humidity), High-Tg

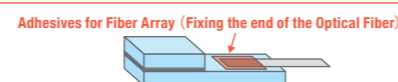
Tg: Glass transition temperature

### Adhesives for Fiber Array (Fixing Optical Fiber and the V-groove)



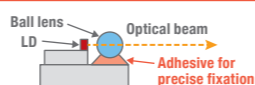
Model [Main ingredient]	Curing conditions (UV)		Refractive index (after hardening) @589nm	Viscosity (mPa · s)	Tg (°C)	Hardness (Shore D)	Bond strength (kgf/cm <sup>2</sup> )	Special features
	Irradiation level <sup>※1</sup>	Time (min)						
AT3925M [Epoxy]	100	10	1.52	200	219	88	>99	Mechanical polishing is available, Ultra-Hard, Heat-Resistant Adhesive
AT9390 [Epoxy]	30	10	1.49	600	131	81	>194	Mechanical polishing is available, Good Transparency
AT9968 [Epoxy]	100	10	1.51	70	181	85	>143	Mechanical polishing is available, Low Viscosity
AT3727E [Epoxy]	10	10	1.57	400	107	83	>147	Mechanical polishing is available, Humidity-Resistant, High-Tg
AT3728E [Epoxy]	10	10	1.57	400	55	20	>232	Mechanical polishing is available, Humidity-Resistant, Low-Tg

### Adhesives for Fiber Array (Fixing the end of the Optical Fiber)



Model [Main ingredient]	Curing conditions (UV)		Viscosity (mPa · s)	Tg (°C)	Hardness (Shore D)	Bond strength (kgf/cm <sup>2</sup> )	Special features
	Irradiation level <sup>※1</sup>	Time(min)					
AT9575M [Epoxy]	100	10	paste	42	35	>221	High Durability, Nonfluxional
AT8105 [Acrylate]	10	5	paste	103	78	>226	

### Adhesive for Precise Fixation



Model [Main ingredient]	Curing conditions (UV)		Shrinkage during curing (%)	Viscosity (mPa · s)	Tg (°C)	Thermal expansion coefficient (10 <sup>-6</sup> /°C)	Bond strength (kgf/cm <sup>2</sup> )	Special features
	Irradiation level <sup>※1</sup>	Time(min)						
AT3862P [Epoxy]	100	2	0.5	180,000	195	2	>210	Low Shrinkage Rate
AT3916P [Epoxy]	100	2	0.9	36,000	233	2	>220	Low Viscosity

### High RI Resins

Model [Main ingredient]	Curing conditions (UV)		Refractive index (after hardening) @589nm	Viscosity (mPa · s)	Tg (°C)	Hardness (Shore D)	Bond strength (kgf/cm <sup>2</sup> )
	Irradiation level <sup>※1</sup>	Time (min)					
# 18165 [Acrylate]	10	5	1.68	9	113	67	>48
# 18109 [Acrylate]	10	10	1.66	360	150	79	>107
# 6205 [Acrylate]	100	5	1.72	20	68	70	35
E3754 [Epoxy]	100	5	1.60	1,200	73	76	>280
#7200 [Epoxy]	100	10	1.63	11,000	63	83	55

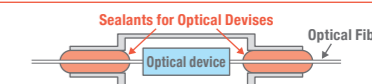
### Low RI Resins

Model [Main ingredient]	Curing conditions (UV)		Refractive index (after hardening) @589nm	Viscosity (mPa · s)	Tg (°C)	Hardness (Shore D)	Bond strength (kgf/cm <sup>2</sup> )
	Irradiation level <sup>※1</sup>	Time (min)					
# 18204 [Acrylate]	10	1	1.38	7	18	20	27
# 18114 [Acrylate]	10	5	1.40	25	94	72	26
E3810 [Epoxy]	10	10	1.44	100	103	78	>61

### Epoxy Resins for Fabricating Optical Waveguide

Model	Refractive index (after hardening) @830nm	Viscosity (mPa · s)	Tg (°C)	Δn (@830nm)
Core	1.53 ± 0.005	2,200	222	1.3%
Cladding	1.51 ± 0.005	2,900	200	

### Sealants for Optical Devices



Model	Curing conditions	Pot life (min)	Water vapor transmission Rate <sup>※2</sup>	Hardness (Shore D)	Bond strength <sup>※3</sup> (kgf/cm <sup>2</sup> )	Ratio of mixing (Weight A/B)	Main component	Conditions before hardening	Special features
OS5958	RT 24hr or 80°C 1hr	120	1.6×10 <sup>-8</sup> [85°C 85%]	47	131	10 : 3	A: Epoxy Resin B: Amine Hardener	A: White paste B: Yellow transparent fluid	High Moisture Proof Long Pot Life
OS5962		120	0.7×10 <sup>-8</sup> [85°C 85%]	66	146	21 : 3		A: White paste B: Yellow transparent fluid	High Moisture Proof, High Viscosity, Long Pot Life
OS5980	80°C 1hr	120	3×10 <sup>-7</sup> [85°C 85%]	20	24	1 : 2	A/B: Butylene Resin	A: Transparent paste B: Black paste	High Flexibility
OS-48	RT 24hr or 100°C 1hr	180	1×10 <sup>-8</sup>	66 (Shore A)	11	1 : 1		A: White paste B: Black paste	Long Pot Life

※1: [mW/cm<sup>2</sup>] ※2: [CC · cm/cmHg · cm<sup>2</sup> · s]@75°C 90% ※3: Shear adhesion strength of SUS / SUS (All other cases are glass / glass)

• Data in this catalog is the measured values, not guaranteed values.

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