



PRODUCT GUIDE

epoxy resins | reactive diluents | curing agents



energising possibilities
stimulating growth



first manufacturing site, Atul, India

Profile

Atul Ltd (Atul) is an integrated chemical company belonging to the Lalbhai Group, serving about 6,000 customers in 92 countries across the world. The Company manufactures about 900 products and 450 formulations, and owns over 114 retail brands. It has established subsidiary companies in the Brazil, China, the UAE, the UK and the USA to serve its customers and thus enhance the breadth and depth of its business.

Atul was founded on September 05, 1947 – within a month after India gained independence – by Kasturbhai Lalbhai, an institution builder par excellence and a legendary Indian of his times. The Company was a manifestation of his dream to generate large-scale employment, create wealth in rural India and make the country self-sufficient in its requirements of chemicals.

The Company has its production facilities in Ankleshwar, Atul and Panoli in Gujarat, Ambarnath and Tarapur in Maharashtra, Jodhpur in Rajasthan, India and Somerset, in the UK. The first manufacturing site of the Company in Atul, Gujarat is spread over 1,250 acres and is amongst the largest and greenest chemical complexes of its kind in the world. The Company has its registered office in Ahmedabad and head office at Atul, both in Gujarat, India. The shares of Atul Ltd are listed both on National Stock Exchange and Bombay Stock Exchange.

Purpose

We are committed to significantly enhancing value for our Stakeholders by:

- fostering a spirit of continuous learning and innovation
- adopting developments in science and technology
- providing high quality products and services, thus becoming the most preferred partner
- having people who practice Values and exemplify a high standard of behaviour
- seeking sustained, dynamic growth and securing long-term success
- taking responsible care of the surrounding environment
- improving the quality of life of the communities we operate in

Polymers Performance Materials

Epoxy resins, reactive diluents and curing agents are manufactured and marketed under the trade name 'Lapox®' by the Polymers Performance Materials Business of Atul. The manufacturing of epoxy systems began in 1960 in Cibatul Ltd, a joint venture between the erstwhile Ciba-Geigy, Switzerland and Atul. Following the split of Ciba-Geigy into two different companies, Cibatul was merged into Atul in 1999.

The state-of-the-art manufacturing facility for these products is located at the first manufacturing site of the Company in Atul. In addition to its leadership position within India, Atul also sells its Polymers products to discerning customers outside the country. The Polymers Business has been awarded ISO 9001:2008 and ISO 14001 certification.

Lapox® is a registered trademark of Atul Ltd.

Product range

Resins

Bisphenol-A and Bisphenol-F based resins
Cycloaliphatic resins
Epoxy phenol novolac resins
Multifunctional resins
Benzoxazine resins
Bismaleimide resins
Modified and formulated resins
Brominated resins
Dimer acid based resins
Alkyl phenolic resins

Curing agents

Aliphatic amines and their adducts
Aromatic amines and their adducts
Cycloaliphatic amines and their adducts
Phenalkamines
Polyamides and Polyamidoamines

Reactive diluents

Aliphatic and Aromatic (mono, di and trifunctional)
Cycloaliphatic (difunctional)

Accelerators and catalysts

Flexibilisers

Industries served

Adhesives
Aerospace and Defence
Automotive
Composites

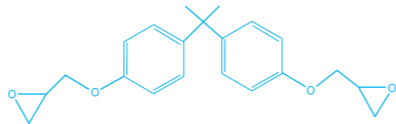
Construction
Electrical and Electronics
Food and Beverage packaging
Marine

Paint and Coatings
Sport and Leisure
Transport
Wind Energy

RESINS

BISPHENOL-A BASED LIQUID EPOXY RESINS

Atul offers unmodified liquid epoxy resins in various viscosities. Liquid epoxy resins are recommended for advancement reactions and various formulations. Formulated resins prepared from these resins are used for multiple applications including adhesives, coatings, construction, electrical and composites.



Diglycidyl ether of Bisphenol-A (DGEBA)

Lapox®	Colour	EEW	Viscosity ¹ @ 25°C	Recommendations
	APHA	g/eq	mPa · s	
AR-101	Max 100	184 - 191	11,000 - 15,000	A standard viscosity, liquid epoxy resin for multiple applications. ED version also available for low ionic impurities. CAS # 1675-54-3 ³ 25068-38-6
ARL-141	Max 150	213 - 233	20,000 - 26,000	A high viscosity unmodified resin recommended to obtain high reactivity in coatings and adhesive formulations.
B-7	Max 100 ²	225 - 280	450 - 800 ²	A semi-solid resin for adhesives and prepregs.
B-9	Max 100	180 - 187	8,000 - 11,000	A low viscosity, unmodified liquid epoxy resin for multiple applications. ED version also available for low ionic impurities. CAS # 1675-54-3 ³ 25068-38-6
B-11	Max 100	184 - 191	11,000 - 15,000	A standard viscosity, unmodified liquid epoxy resin for multiple applications. ED version also available for low ionic impurities. CAS # 1675-54-3 ³ 25068-38-6
B-770	Max 100 ²	280 - 300	500 - 1,500 ²	A semi-solid resin for high solids coatings and adhesives.

¹Brookfield viscosity
²70% solution in butyl carbitol
³CAS # of Europe as per REACH
 *Method: Colour - ASTM D1209; EEW - ASTM D1652; Viscosity - ASTM D2196

RESINS

BISPHENOL-A BASED MODIFIED LIQUID RESINS

Atul offers various modified resins for different applications including adhesives, coatings, composites and flooring.

Lapox®	Colour	EEW	Viscosity ¹ @ 25°C	Recommendations
	APHA	g/eq	mPa · s	
ARB-22 (XR-118)	Max 100	192 - 204	800 - 1,200	A liquid epoxy resin modified with glycidyl ether of C ₁₂ - C ₁₄ alcohol recommended for primers, mortars and floor top coatings.
ARB-26	Milky white liquid	192 - 205	450 - 750	A liquid epoxy resin modified with glycidyl ether of C ₁₂ - C ₁₄ alcohol recommended for self-leveling flooring and coatings with high gloss.
ARB-28	Max 100	182 - 200	1,500 - 2,000	A liquid epoxy resin modified with glycidyl ether of C ₁₂ - C ₁₄ alcohol recommended for primers, mortars and floor top coatings.
ARB-30	Max 100	182 - 200	4,500 - 5,500	
ARB-32	Max 100	195 - 215	500 - 700	A liquid epoxy resin modified with glycidyl ether of C ₁₂ - C ₁₄ alcohol recommended for primers, mortars and floor top coatings, crack-filling and high solids coatings.
ARB-33	Max 150	180 - 195	500 - 700	A liquid epoxy resin modified with glycidyl ether of o-Cresol recommended for primers, mortars, grouts, maintenance coatings and castings.
ARB-43	Max 100	180 - 193	7,500 - 9,000	A liquid epoxy resin modified with glycidyl ether of pTBP recommended for coatings, flooring and grouting.
ARB-44	Max 100	189 - 204	1,400 - 2,600	A reactive diluent modified liquid epoxy resin recommended for battery case and terminal sealing applications.
ARB-47	Max 100	180 - 195	400 - 700	A liquid epoxy resin modified with glycidyl ether of o-Cresol recommended for primer, crack filling and flooring applications.
ARC-43	Max 100	220 - 255	300 - 600	A low viscosity, medium reactive system with good resistance to moisture. High filler loading is possible.
ARC-44	Max 100	218 - 226	2,000 - 2,500	A modified epoxy resin recommended for clear casting application. The product offers improved UV resistance.
ARL-135	Max 100	169 - 185	1,700 - 2,500	A modified epoxy resin recommended for FRP components and concrete structure strengthening.
ARL-135 LV	Max 100	169 - 185	1,000 - 1,500	A modified epoxy resin recommended for fast impregnation of reinforcement and concrete structure strengthening.
ARL-136	Max 100	175 - 189	2,500 - 4,500	A modified epoxy resin recommended for pultrusion, filament winding and coating applications.
ARL-143	–	195 - 205	1,500 - 2,500	A low viscosity epoxy filler modified resin to achieve fire retardant properties for wet lamination.
ARPN-52 (L-552)	Max 2 ² (Gardner)	146 - 150	1,000 - 1,500	A modified resin with high functionality recommended for FRP composites to be used in static and dynamic conditions at ambient and elevated temperatures.
B-41 (ARB-20)	Max 100	179 - 192	900 - 1,100	A liquid epoxy resin modified with glycidyl ether of n-butanol recommended for high solids coatings, chemical resistant tank linings and floor coatings.
B-42 (ARB-19)	Max 200	182 - 200	5,000 - 6,500	A liquid epoxy resin modified with glycidyl ether of pTBP recommended for adhesives, tank linings and tank linings.
B-47 (ARB-18)	Max 100	177 - 187	450 - 650	A liquid epoxy resin modified with glycidyl ether of phenol recommended for high gloss, heavy duty flooring, solvent free coatings, grouts, mortars and crack filling applications.

¹Brookfield viscosity
²ASTM D1544
 *Method: Colour - ASTM D1209; EEW - ASTM D1652; Viscosity - ASTM D2196

RESINS

BISPHENOL-A BASED SOLID RESINS

Atul offers Bisphenol-A based modified and unmodified resins from Type 1 to Type 9. Solid resins are recommended for can and coil coatings, functional coatings, powder coatings, protective coatings, rebars and wire enamels.

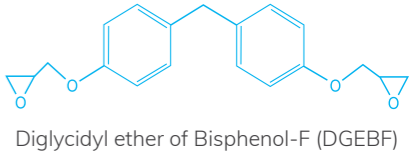
Lapox®	EEW	Viscosity ¹ @ 25°C	Softening point	Recommendations
	g/eq	mPa · s	°C	
ARP-12	653 - 704	375 - 475	80 - 90	A Type 2 medium molecular weight epoxy resin recommended for powder coating formulations to enhance flow.
ARP-13 HT	769 - 847	6,000 - 8,000 @ 150°C	Tg = Min 55	A Type 2 modified epoxy resin recommended for powder coating formulations with high glass transition temperature.
ARP-13 LV	714 - 752	500 - 600	95 - 101	A Type 2 medium molecular weight epoxy resin recommended for hybrid powder coatings.
ARP-14 HF	781 - 855	480 - 580	85 - 90	A Type 4 modified epoxy resin to achieve better flow properties in powder coating formulations.
P-3 (ARP-11)	450 - 465	160 - 190	65 - 75	A Type 1 epoxy resin recommended for solvent based protective coatings, zinc based primers and stoving enamels.
P-4 (ARP-14)	833 - 893	550 - 700	90 - 102	A Type 4 epoxy resin recommended for esterification with fatty acids for enamels and exterior coatings of cans and tubes, also suitable for functional powder coatings.
P-5 (ARP-17)	1,695 - 1,887	1,800 - 2,600	110 - 120	A Type 7 epoxy resin suitable for cross linking with amino and phenolic resins as stoving lacquers for internal coatings of cans and tubes.
P-6 (ARP-19)	2,381 - 2,941	5,000 - 10,000	125 - 140	A Type 9 high molecular weight epoxy resin recommended for tubes, can and coil coatings.
P-10 (ARP-14 E)	847 - 926	430 - 550	90 - 100	A Type 4 epoxy resin recommended for esterification of water based systems for anodic electrodepositions.
P-62 (ARP-13)	741 - 800	600 - 700	95 - 101	A standard Type 3 epoxy resin for powder coating formulations.
P-122 (ARP-14 A)	862 - 935	620 - 900	100 - 110	A Type 4 epoxy resin recommended for functional powder coatings.

¹Brookfield viscosity of 40% solution in butyl carbitol
 *Method: EEW - ASTM D1652; Viscosity - ASTM D2196; Softening point - ASTM E28

RESINS

BISPHENOL-F AND BISPHENOL-A/F BLENDS

Bisphenol-F based resins are known for low viscosity, better chemical resistance and a low crystallisation tendency in cold conditions. Atul offers Bisphenol-F based pure and Bisphenol-A/F blend resins in varying viscosities for several applications.



Lapox®	Colour	EEW	Viscosity ¹ @ 25°C	Recommendations
	APHA	g/eq	mPa · s	
ARF-11 (XR-40)	Max 200	159 - 175	2,000 - 5,000	A standard Bis-F based epoxy resin recommended for coating applications, composites, construction and electrical casting. CAS # 9003-36-5 ³ 42423-25-6
ARF-12	Max 200	164 - 172	2,000 - 3,300	A low viscosity Bis-F based epoxy resin recommended for coating applications, composites, construction and electrical casting. CAS # 9003-36-5 ³ 42423-25-6
ARF-13	Max 200	164 - 172	3,300 - 4,100	A medium viscosity Bis-F based epoxy resin recommended for coating applications, composites, construction and electrical casting. CAS # 9003-36-5 ³ 42423-25-6
ARF-14	Max 200	159 - 172	5,000 - 7,000	A high viscosity Bis-F based epoxy resin recommended for coating applications, composites, construction and electrical casting. CAS # 9003-36-5 ³ 42423-25-6
ARF-15	Max 100	156 - 167	1,200 - 1,600	A distilled and pure Bis-F based epoxy resin for specific applications. CAS # 9003-36-5 ³ 42423-25-6
ARFM-12 (XR-123)	Max 2 ² (Gardner)	172 - 180	6,500 - 8,500	A medium viscosity Bis-A/F blend recommended for coatings, composites, construction applications and floor coatings.
ARFM-13 (XR-60)	Max 2 ² (Gardner)	174 - 182	4,500 - 6,500	A low viscosity Bis-A/F blend recommended for coatings, composites, construction applications and floor coatings.
ARFM-14 (XR-106)	Max 2 ² (Gardner)	185 - 196	860 - 960	A reactive diluent modified Bis-A/F blend recommended for high solids coatings, construction and floor coatings.

¹Brookfield viscosity
²ASTM D1544
³CAS # of Europe as per REACH
 *Method: Colour D1209; EEW - ASTM D1652; Viscosity - ASTM D2196

BROMINATED RESINS

Halogenated epoxy resins are used to impart flame retardancy along with superior mechanical and electrical properties in casting or laminate products. They are used to manufacture PCBs, copper clad laminates and instrument transformers.

Lapox®	Colour	EEW	Viscosity ¹ @ 25°C	Bromine content	Recommendations
	Gardner	g/eq	mPa · s	%	
L-68	Max 4	450 - 500 ²	2,200 – 3,000	19 - 23	A solvent cut brominated epoxy resin recommended for the manufacture of B-stage prepregs and FR-4 laminates.
L-247	–	250 - 280	700 – 1,100 @ 70°C	21 - 26	A solvent free brominated epoxy resin. The product provides good dielectric properties up to 130°C and UL-94 V0 performance.
L-249	–	319 - 410	–	44 - 48	A solvent free brominated epoxy resin. The product is recommended to produce FR products such as vinyl ester and electronic components.

¹Brookfield viscosity
²100% solid
 *Method: Colour - ASTM D1544; EEW - ASTM D1652; Viscosity - ASTM D2196

RESINS

SOLVENT CUT RESINS

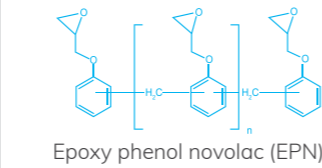
Atul offers solid resin solutions in various solvents. Major applications include FRP composites, industrial maintenance coatings, marine coatings, protective coatings, stoving enamels and varnishes.

Lapox®	EEW	Viscosity ¹ @ 25°C	Non-volatile content ²	Recommendations
	g/eq	mPa · s	%	
ARL-148	–	50 - 350	50 - 55	A low viscosity epoxy resin recommended for polyester film coatings along with melamine formaldehyde curing agent (AH-343).
ARL-154	–	50 - 350	50 - 55	A low viscosity epoxy resin recommended for polyester film coatings to achieve high gloss and adhesion.
B-7 X 80	294 - 323	600 - 850	79 - 81 (150°C/1h)	A solvent cut epoxy resin recommended for high solids coatings to achieve excellent adhesion, gloss and flexibility.
P-101	606 - 702	9,000 - 13,000	74 - 76 (105°C/2h)	A Type 1 epoxy resin solution in xylene recommended for paint and coatings.
P-101 HV	606 - 741	14,000 - 20,000	74 - 76 (105°C/2h)	
XR-128	12,500	2,000 - 5,000	49 - 51 (160°C/2h)	A high molecular weight epoxy resin solution recommended for primers and enamels. The product improves flexibility in coating formulations.
ARP-24 X 80	300 - 336	3,500 - 7,000	79 - 81	A Type 1 epoxy resin solution in xylene recommended for high solids coatings and paints.

¹Brookfield viscosity
²120°C/2h
 *Method: EEW - ASTM D1652; Viscosity - ASTM D2196; Non-volatile content - Atul

EPOXY PHENOL NOVOLAC RESINS

Epoxy phenol novolac (EPN) resins are available in varying functionalities and are recommended to achieve higher chemical and thermal resistance in various applications including adhesives, coatings, composites, electrical and flooring.



Lapox®	Colour	EEW	Viscosity ¹ @ 25°C	Non-volatile content ²	Recommendations
	APHA	g/eq	mPa · s	%	
ARPN-25	Max 250	172 - 179	1,100 - 1,700 @ 52°C	–	A low viscosity EPN resin with average 2.5 functionality recommended for composites, electrical and coating applications.
ARPN-36 (L-238)	Max 250	175 - 182	20,000 - 50,000 @ 52°C	–	A standard semi-solid EPN resin having average 3.6 functionality recommended for composites, electrical, chemical resistant coatings and flooring.
ARPN-36 M 80	Max 2 ³ (Gardner)	215 - 231	150 - 350	79 - 81	A solution of EPN resin ARPN-36 in MEK recommended for chemical resistant coatings, electrical and composite applications.
ARPN-36 X 80	Max 2 ³ (Gardner)	215 - 231	800 - 1,500	79 - 81 (150°C/1h)	A solution of EPN resin ARPN-36 in xylene recommended for chemical resistant coatings, electrical and composite applications.
ARPN-53 (XR-55)	Max 4 ³ (Gardner)	167 - 179	35,000 - 55,000	–	A modified EPN resin with average 2.2 functionality recommended for composites, electrical and coating applications.
ARPN-54	Max 3 ³ (Gardner)	167 - 182	25,000 - 35,000	–	

¹Brookfield viscosity
²105°C/2h
³ASTM D1544
 *Method: Colour - ASTM D1209; EEW - ASTM D1652; Viscosity - ASTM D2196

RESINS

CYCLOALIPHATIC RESINS

Cycloaliphatic resins offer UV resistance if cured with cycloaliphatic curing agents. They are recommended for outdoor coatings, electrical castings and flooring.



Lapox®	Colour	EEW	Viscosity ¹ @ 25°C	Recommendations
	APHA	g/eq	mPa · s	
ARCH-11 (XR-34)	Max 100	159 - 182	500 - 1,100	A cycloaliphatic epoxy resin based on HHPA recommended for electrical component castings, potting and outdoor coatings. CAS # 1395383-69-3 ² 5493-45-8
ARCH-12	Max 100	180 - 200	350 - 750	A modified cycloaliphatic epoxy resin based on HHPA with low viscosity which offers good thermal shock resistance in electrical cast components.
ARCH-13	Max 100	220 - 240	2,000 - 4,000	A cycloaliphatic epoxy resin based on hydrogenated Bis-A. The product is recommended for outdoor coatings, flooring, electrical castings and composite parts with high toughness. CAS # 30583-72-3
ARCH-13 LV	Max 100	210 - 230	1,300 - 2,500	A high purity cycloaliphatic epoxy resin based on hydrogenated Bis-A. The product is recommended for outdoor coatings, flooring, electrical castings and composite parts with high toughness. CAS # 30583-72-3
ARCH-18	Max 100	130 - 143	250 - 450	A low viscosity cycloaliphatic epoxy resin recommended for electrical component castings, potting and outdoor coatings. CAS # 2386-87-0

¹Brookfield viscosity
²CAS # of Europe as per REACH
 *Method: Colour - ASTM D1209; EEW - ASTM D1652; Viscosity - ASTM D2196

ALKYL PHENOLIC RESINS

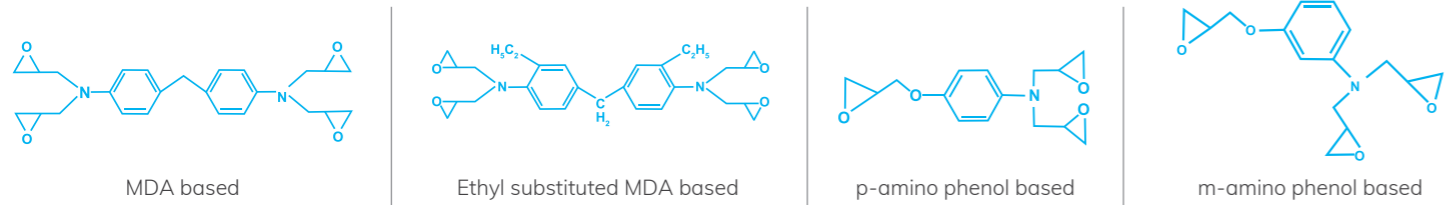
Lapox®	Appearance	Colour	Methylol content	Softening point	Recommendations
	–	Gardner	%	°C	
APR-101	Pale yellow lumps	Max 4 ²	8 - 12	65 - 80	A pTBP phenolic resin offers variable open time in rubber based adhesive formulations.
APR-102	Pale yellow lumps	Max 6 ²	14 - 17	90 - 100	
APR-103	Dark violet lumps	–	12 - 16	85 - 105	
APR-104	Pale yellow lumps	Max 7	8 - 12	70 - 90	An alkyl phenolic resin suitable for high temperature resistant adhesive formulations.

¹Brookfield viscosity
²60% solution in toluene
 *Method: Colour - ASTM D1544; Methylol content - ISO 354-3:1986; Softening point - ISO 1205:1978

RESINS - SPECIALTY

GLYCIDYL AMINE BASED MULTIFUNCTIONAL RESINS

Atul offers various specialty resins with different functionalities and thermal stabilities. Specialty resins provide high Tg (glass transition temperature) along with mechanical and thermal resistance, and are extensively used for electrical and electronic, FRP composites, high performance structural adhesives and prepregs.

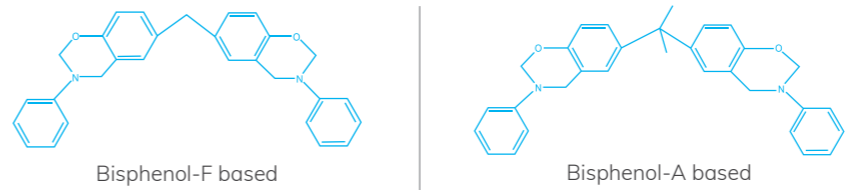


Lapox®	Colour	EEW	Viscosity ¹ @ 25°C	HyCl	Recommendations
	Gardner	g/eq	mPa · s	%	
ARTF-13	Max 12	117 - 134	7,000 - 11,000 ² @ 50°C	Max 0.10	Medium viscosity variants of tetrafunctional resin based on MDA for aerospace and high performance composites. CAS # 28768-32-3
ARTF-14	Max 12	117 - 134	10,000 - 12,000 ² @ 50°C	Max 0.10	
ARTF-15	Max 12	117 - 134	11,000 - 13,000 ² @ 50°C	Max 0.10	
ARTF-16	Max 12	117 - 134	13,000 - 15,000 ² @ 50°C	Max 0.10	
ARTF-17	Max 12	117 - 134	17,000 - 19,000 ² @ 50°C	Max 0.10	A high viscosity, tetrafunctional resin based on MDA for aerospace and high performance composites. CAS # 28768-32-3
ARTF-18	Max 12	117 - 134	7,000 - 19,000 ² @ 50°C	Max 0.10	A general purpose tetrafunctional resin based on MDA for aerospace and high performance composites. CAS # 28768-32-3
ARTF-23 (XR-23)	Max 12	111 - 117	3,000 - 6,000 @ 50°C	Max 0.10	A low viscosity, tetrafunctional resin based on MDA for aerospace and high performance composites. CAS # 28768-32-3
ARTF-33 (XR-93)	Max 7	118 - 133	7,000 - 12,000	Max 0.10	A tetrafunctional resin based on ethyl substituted MDA for aerospace and high performance applications. The product offers very low viscosity and reactivity. CAS # 130728-76-6
ARTF-35	–	105 - 115	2,000 - 5,000	Max 0.30	A trifunctional unmodified resin based on p-amino phenol for aerospace and high performance applications. CAS # 5026-74-4
ARTF-36	–	95 - 106	550 - 850	Max 0.20	A distilled trifunctional unmodified resin based on p-amino phenol for aerospace and high performance applications. CAS # 5026-74-4
ARTF-37	–	102 - 110	7,000 - 13,000	Max 0.30	A trifunctional unmodified resin based on m-amino phenol for aerospace and high performance applications. CAS # 71604-74-5
ARTF-38	–	94 - 102	1,500 - 4,800	Max 0.20	A distilled trifunctional unmodified resin based on m-amino phenol for aerospace and high performance applications. CAS # 71604-74-5
ARTF-32	Max 18	118 - 135	2,000 - 4,000 @ 50°C	Max 0.10	A low viscosity, tetrafunctional resin based on substituted MDA for aerospace and high performance composites. CAS # 142675-09-0
ARTF-39	Max 10	125 - 143	2,500 - 4,000 @ 50°C	Max 0.10	A modified low viscosity, multifunctional resin for aerospace and high performance composites.

¹Brookfield viscosity
²Viscosity by CAP 2000 (ASTM D4287)
 *Method: Colour - ASTM D1544; EEW - ASTM D1652; Viscosity - ASTM D2196; HyCl - ASTM D1726

RESINS - SPECIALTY

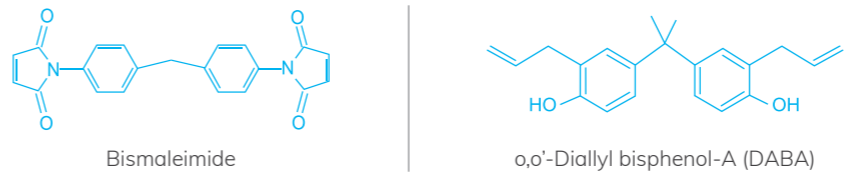
BENZOXAZINE RESINS



Lapox®	Appearance	Softening point	Viscosity ¹ @ 25°C	Gel time @ 220°C	Recommendations
	–	°C	mPa · s	secs	
ARBZ-10	Yellowish solid	60 - 80	1,000 - 7,000 ² @ 100°C	200 - 450	A Bis-F based benzoxazine resin for high performance composites, electrical and electronics. The product offers excellent resistance to moisture, has low shrinkage and provides flame retardancy. CAS # 137836-80-7
ARBZ-10 A 75	Yellowish liquid	74% - 76% (solid content)	100 - 400	380 - 420	A Bis-F based benzoxazine resin ARBZ-10 solution in acetone with 75% solids. The product offers excellent resistance to moisture, has low shrinkage and provides flame retardancy.
ARBZ-11	Yellowish solid	60 - 80	50 - 500 ² @ 125°C	250 - 550	A Bis-A based benzoxazine resin for high performance composites, electrical and electronics. The product offers excellent resistance to moisture and low shrinkage. CAS # 154505-70-1

¹Brookfield viscosity
²Viscosity by CAP 2000 (ASTM D4287)
 *Method: Softening point - Atul; Viscosity - ASTM D2196; Gel time - DIN 16945

BISMALEIMIDE RESINS

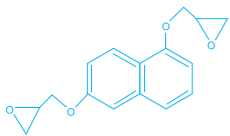


Lapox®	Appearance	Melting point	Viscosity ¹ @ 25°C	Purity	Recommendations
	–	°C	mPa · s	%	
ARBMI-11	Fine yellow powder	155 - 158	–	Min 95	A bismaleimide resin for composites, electrical and electronic applications. The product offers excellent thermal stability. CAS # 13676-54-5
ARD-63	Yellow to amber liquid	–	13,000 - 25,000	Min 85	A co-reactant (DABA) to use along with ARBMI-11. The product offers excellent processability and achieves high mechanical properties. CAS # 1745-89-7

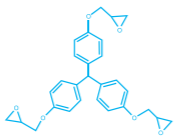
¹Brookfield viscosity
 *Method: Melting point - ASTM D2073; Viscosity - ASTM D2196

RESINS - SPECIALTY

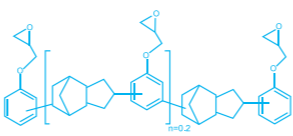
OTHER SPECIALTY RESINS



Naphthalene based



Triphenol methane based



Dicyclopentadiene based

Lapox®	Colour	EEW	Viscosity ¹ @ 25°C	HyCl	Recommendations
	Gardner	g/eq	mPa · s	%	
ARC-28	Max 50 ² (APHA)	168 - 175	4,000 - 5,500	Max 0.03	A distilled and pure Bis-A based epoxy resin for aerospace, high performance composites and impregnation of electrical machines.
ARN-16	Max 16	133 - 154	1,000 - 2,500 @ 50°C	Max 0.20	A bifunctional resin based on naphthalene for aerospace, structural adhesives and high performance composite components. CAS # 27610-48-6
ARTF-34	Max 13	150 - 170	30 - 55 ³ @ 150°C	Max 0.05	A trifunctional resin based on triphenol methane for aerospace, high performance composites, electrical and electronic applications. CAS # 66072-38-6
ARTF-50	Max 16	225 - 240	1,000 - 1,500 ³ @ 85°C	Max 0.05	A multifunctional resin based on Dicyclopentadiene (DCPD) for aerospace, composites, electrical and electronic applications. CAS # 119345-05-0

¹Brookfield viscosity
²ASTM D1209
³Viscosity by CAP 2000 (ASTM D4287)
 *Method: Colour - ASTM D1544; EEW - ASTM D1652; Viscosity - ASTM D2196; HyCl - ASTM D1726

DIMER ACID BASED AND MODIFIED RESINS

Lapox®	Colour	EEW	Viscosity ¹ @ 25°C	Recommendations
	Gardner	g/eq	mPa · s	
ARES-101	Max 8	385 - 472	300 - 800	A diglycidyl ester of dimer acid recommended to modify liquid epoxy resin to improve toughness and flexibility.
ARES-102	Max 12	286 - 400	20,000 - 30,000	A dimer acid modified liquid epoxy resin that provides adhesion, toughness and flexibility. The product is recommended for coatings, adhesives, composite and laminating applications.

¹Brookfield viscosity
 *Method: Colour - ASTM D1544; EEW - ASTM D1652; Viscosity - ASTM D2196

ACCELERATORS AND CATALYSTS

Accelerators and catalysts are normally used along with curing agents for faster production. They alter the properties of cured products and thus their selection should be done carefully to suit the process and desired properties.

Lapox®	Appearance	Colour	Viscosity ¹ @ 25°C	Amine value	Recommendations
	–	Gardner	mPa · s	mg KOH/g	
AC-13 (K-13)	Clear liquid	Max 2	Max 10	–	A liquid triamine accelerator recommended to accelerate anhydrides, polyamides and amines for composites, electrical and coating applications.
AC-14 (K-65)	Clear yellow brown liquid	Max 6	150 - 300	580 - 635	A liquid tertiary amine accelerator recommended to accelerate anhydrides, polyamides and amines for composites, electrical and coating applications.
AC-18	Clear yellow liquid	Max 9	Max 50	–	A low viscosity heterocyclic amine based accelerator. It can be used for filament winding and pultrusion.
AC-19	Clear liquid	Max 1	10 - 30	–	A low reactive liquid triamine accelerator recommended to accelerate anhydrides, polyamides and amines for composites, electrical and coating applications.
AC-20	Brown liquid or solid	–	Max 100	36 - 42 (melting point in °C)	An accelerator recommended to accelerate anhydrides, polyamides and amines for composites, electrical and coating applications.
K-86 (AC-15)	White crystalline powder	–	–	Min 75 (melting point in °C)	A solid polyamine complex recommended to accelerate aromatic amines.
K-112	Clear brown liquid	–	1,000 - 1,800	–	A modified viscous tertiary amine accelerator recommended to accelerate anhydrides, polyamides and amines for composites, electrical and coating applications.

¹Brookfield viscosity
 *Method: Colour - ASTM D1544; Viscosity - ASTM D2196; Amine value - ASTM D2073

FLEXIBILISERS

Electrical castings are prone to crack during thermal cycling due to brittleness. Incorporation of a flexibiliser increases toughness and reduces viscosity. The amount of flexibiliser is to be optimised, as a higher amount reduces glass transition temperature drastically.

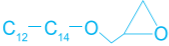

Lapox®	Appearance	Colour	Viscosity ¹ @ 25°C	Refractive index	Recommendations
	–	APHA	mPa · s	–	
ADP-11 (K-14)	Clear liquid	Max 100	60 - 90	1.445 - 1.446	A low viscosity flexibiliser for producing casting with good electrical and mechanical properties.
ADP-12	Clear liquid	Max 100	350 - 450	1.450 - 1.451	A moderate viscosity flexibiliser to imparts resilience to casting with minimal Tg drop.
ADP-14	Clear colourless to pale yellow liquid	–	500 - 700	1.470 - 1.473	An internal release additive for epoxy systems that helps in smooth release of components.
ADP-15	Clear liquid	Max 100	80 - 105	–	A solvent free, low viscosity flexibiliser for indoor applications
ADP-16	Clear liquid	Max 100	150 - 300	–	A medium viscosity flexibiliser offers superior toughneing and better crack resistance.

¹Brookfield viscosity
 *Method: Colour - ASTM D1544; Viscosity - ASTM D2196

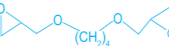
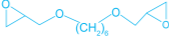
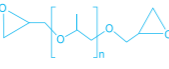

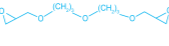
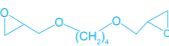
REACTIVE DILUENTS

Reactive diluents are used to reduce the viscosity of epoxy resins and to achieve the desired combination of properties. Atul offers a wide range of reactive diluents, including aromatic and aliphatic diluents that provide various functionalities.


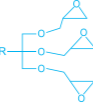
ALIPHATIC - MONOFUNCTIONAL

Lapox®	Colour	EEW	Viscosity ¹ @ 25°C	HyCl	Structure	Recommendations
	APHA	g/eq	mPa · s	%		
ARD-13 (XR-80)	Max 100	270 - 298	4 - 12	Max 0.10		A reactive diluent based on C ₁₂ -C ₁₄ alcohol. The product provides excellent wetting and flexibility. It is recommended for epoxy flooring and coating applications. CAS # 68609-97-2
ARD-14 (XR-83)	Max 100	137 - 161	Max 2	Max 0.10		A reactive diluent based on n-butanol. The product offers highest viscosity cutting power due to extremely low viscosity. CAS # 2426-08-6

ALIPHATIC - DIFUNCTIONAL

Lapox®	Colour	EEW	Viscosity ¹ @ 25°C	HyCl	Structure	Recommendations
	APHA	g/eq	mPa · s	%		
ARD-51 (K-77)	Max 100	128 - 143	10 - 22	Max 0.15		A reactive diluent based on 1,4-butanediol, recommended to modify resins used for construction and composite applications. CAS # 2425-79-8
ARD-52 (XR-86)	Max 100	147 - 161	15 - 30	Max 0.15		A reactive diluent based on 1,6-hexanediol, recommended to modify resins used for construction, coating and composite applications. CAS # 16096-31-4
ARD-54 (XR-19)	Max 100	313 - 345	40 - 90	Max 0.15		A reactive diluent based on polypropylene glycol that imparts higher flexibility to epoxy resins. CAS # 26142-30-3
ARD-56 (XR-87)	Max 100	125 - 145	12 - 18	Max 0.15		A reactive diluent based on neopentyl glycol, recommended for coatings, construction and composite formulations. CAS # 17557-23-2
ARD-59	Max 100	161 - 192	20 - 50	Max 0.20		A reactive diluent based on dipropylene glycol, recommended for composite and construction formulations. CAS # 162303-54-0
ARD-60	Max 100	111 - 125	15 - 22	Max 0.15		A high purity reactive diluent based on 1,4-butanediol, recommended to modify resins used for composite applications. CAS # 2425-79-8

ALIPHATIC - TRIFUNCTIONAL

Lapox®	Colour	EEW	Viscosity ¹ @ 25°C	HyCl	Structure	Recommendations
	APHA	g/eq	mPa · s	%		
ARD-55 (XR-85)	Max 100	125 - 143	100 - 200	Max 0.15		A reactive diluent based on trimethylol propane, recommended for construction, composite and coating formulations. CAS # 701-135-4 ³ 30499-70-8
ARD-65	Max 6 ² (Gardner)	500 - 649	250 - 500	–		A reactive diluent based on castor oil, recommended for concrete patching, floor coatings and thermal shock resistant potting. CAS # 74398-71-3
ARD-65 LC	Max 3 ² (Gardner)	500 - 649	250 - 500	–		A low colour reactive diluent based on castor oil, recommended for concrete patching, floor coatings and thermal shock resistant potting.

¹Brookfield viscosity

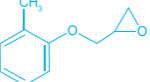
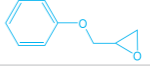
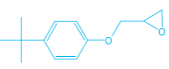

²ASTM D1544

³EC # in REACH

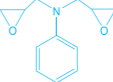
*Method: Colour - ASTM D1209; EEW - ASTM D1652; Viscosity - ASTM D2196; HyCl - ASTM D1726

REACTIVE DILUENTS

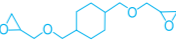
AROMATIC - MONOFUNCTIONAL

Lapox®	Colour	EEW	Viscosity ¹ @ 25°C	HyCl	Structure	Recommendations
	APHA	g/eq	mPa · s	%		
ARD-10 (K-100)	Max 100	167 - 189	6 - 8	Max 0.20		A reactive diluent based on o-Cresol. Offers high gloss and mechanical strength, recommended for flooring and electrical formulations. CAS # 2210-79-9
ARD-11 (K-103)	Max 100	159 - 170	6 - 8	Max 0.20		A reactive diluent based on phenol, recommended for flooring and electrical formulations. CAS # 122-60-1
ARD-12 (XR-59)	Max 100	222 - 244	20 - 35	Max 0.20		A reactive diluent based on p-tertiary butyl phenol, recommended for crystallisation and chemical resistance. CAS # 3101-60-8
ARD-15 (K-513)	Max 13 ² (Gardner)	417 - 556	40 - 70	Max 1.00		A reactive diluent based on cardanol, recommended to modify resins used for coatings, adhesives, construction and electrical applications. CAS # 68413-24-1
ARD-58	Max 10 ² (Gardner)	385 - 455	20 - 50	Max 1.00		A high purity reactive diluent based on cardanol, recommended to modify resins used for coatings, adhesives, construction and electrical applications. CAS # 68413-24-1

AROMATIC - DIFUNCTIONAL

Lapox®	Colour	EEW	Viscosity ¹ @ 25°C	HyCl	Structure	Recommendations
	APHA	g/eq	mPa · s	%		
ARD-57 (XR-104)	Max 16 ² (Gardner)	105 - 123	100 - 200	–		A reactive diluent based on aniline, recommended for high performance composite formulations. CAS # 09-06-2095

CYCLOALIPHATIC - DIFUNCTIONAL

Lapox®	Colour	EEW	Viscosity ¹ @ 25°C	HyCl	Structure	Recommendations
	APHA	g/eq	mPa · s	%		
ARD-66	Max 100	154 - 167	50 - 100	Max 0.10		A cycloaliphatic reactive diluent based on 1,4-cyclohexane dimethanol. The product offers good electrical insulation, UV and weather resistance. CAS # 14228-73-0

¹Brookfield viscosity

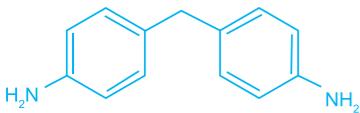
²ASTM D1544

*Method: Colour - ASTM D1209; EEW - ASTM D1652; Viscosity - ASTM D2196; HyCl - ASTM D1726

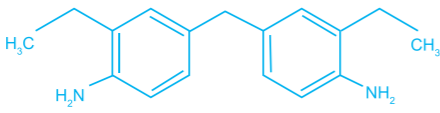
CURING AGENTS

AROMATIC AMINE CURING AGENTS

These are available in liquid and solid forms and are modified to cure epoxy resins at ambient conditions as well. Higher thermal stability and chemical resistance along with excellent mechanical properties are specific advantages of these curing agents. Atul offers a wide range of aromatic amine curing agents for various applications.



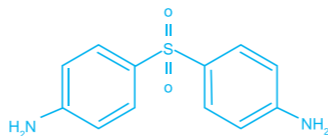
DDM based



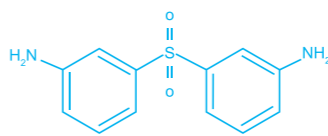
Ethyl substiuted DDM based

Lapox®	Appearance	Colour	Viscosity ¹ @ 25°C	Amine value	AHEW	Mixing ratio ²	Recommendations
	–	Gardner	mPa · s	mg KOH/g	g/eq	pbw	
AH-657	Viscous brownish liquid	Max 16	25,000 - 35,000	555 - 625	48.0	25	A modified aromatic amine curing agent with low viscosity to achieve higher glass transition temperature.
AH-667	Viscous brownish liquid	Max 15	1,400 - 2,000 @ 60°C	–	51.0	28	A semi-solid aromatic amine curing agent based on DDM recommended for composite applications.
AH-685	Dark brown liquid	Max 12	1,000 - 2,000	300 - 400	95.0	50	A low viscosity modified aromatic amine recommended for battery cases and terminal sealing applications. It provides fast curing at room temperature with high chemical resistance.
K-5	White to tan pastilles	–	–	–	49.5	26	A pure aromatic amine curing agent- 4,4'-Diaminodiphenyl methane recommended to cure epoxy resins at elevated temperatures.
K-41	Brown liquid	Max 13	3,800 - 5,800	4.7 - 5.1 (eq/kg)	114.0	60	A low viscosity aromatic amine curing agent to be used along with curing agent K-42 for high chemical resistant industrial flooring, coatings and chemical resistant tank linings.
K-42	Dark brown liquid	Max 16	15,000 - 21,000	4.4 - 4.8 (eq/kg)	114.0	60	An aromatic amine curing agent with high reactivity to be used along with curing agent K-41.
K-49	Brown liquid	Max 13	700 - 900	4.7 - 5.0 (eq/kg)	114.0	60	A low viscosity aromatic amine curing agent with moderate reactivity recommended to achieve high chemical resistance in flooring, coatings and tank linings.
K-92	Brown liquid	Max 13	5,000 - 7,500	4.4 - 5.1 (eq/kg)	114.0	60	An ambient curing modified aromatic amine curing agent recommended for high chemical resistant coatings, tank linings and flooring.
AH-664	Dark brown liquid	Max 12	3,500 - 6,500	430 - 470	65.0	34	A liquid aromatic amine with high viscosity and low reactivity recommended to use along with an accelerator for composite applications.
K-450	Dark brown liquid (solidifies upon storage)	–	250 - 400 @ 40°C	430 - 450	65.0	34	A liquid aromatic amine curing agent with very low reactivity recommended to use along with an accelerator for composite applications.

CURING AGENTS



4,4'-DDS



3,3'-DDS

Lapox®	Appearance	Colour	Viscosity ¹ @ 25°C	Amine value	AHEW	Mixing ratio ²	Recommendations
	–	Gardner	mPa · s	mg KOH/g	g/eq	pbw	
ASH-10	Crystalline powder	White to off-white	176 - 185 (melting point in °C)	99% (purity)	–	35	An aromatic amine curing agent (4,4'-DDS) suitable to manufacture prepregs for advanced composites, printed circuit boards (PCB), powder coating and electronic moulding compounds (EMC). CAS # 80-08-0
ASH-10 FF	Crystalline powder	White to off-white	176 - 185 (melting point in °C)	99% (purity)	–	35	An aromatic amine curing agent (sulfone) - free flowing version of ASH-10 suitable to manufacture prepregs for advanced composites, PCB, powder coating and EMC. CAS # 80-08-0
ASH-10 MIC	Micronised powder	White to off-white	176 - 180 (melting point in °C)	99% (purity)	–	35	An aromatic amine curing agent (sulfone) - micronised version of ASH-10 for uniform dispersion in solvent free resins. The product is suitable to manufacture prepregs for advanced composites. CAS # 80-08-0
ASH-11	Crystalline powder	White to brownish	167 - 175 (melting point in °C)	99% (purity)	–	35	An aromatic amine curing agent (3,3'-DDS) which is more reactive than ASH-10. The product is suitable for fast curing and higher productivity. CAS # 599-61-1
ASH-11 MIC	Micronised powder	Off-white to yellowish brown	167 - 175 (melting point in °C)	99% (purity)	–	35	An aromatic amine curing agent (sulfone) - micronised version of ASH-11 suitable for fast curing and higher productivity. CAS # 599-61-1
AH-681	Dark brown liquid	Max 18	2,000 - 3,000	760 - 790	47.5	25	A modified aromatic amine curing agent recommended for high chemical resistant composite applications.
AH-682	Yellowish brown liquid	Max 8	50 - 150	–	46.0	24	A modified aromatic amine recommended for composites and laminating applicatons.
K-5200 (AH-618)	Yellow to brown liquid	Max 15	100 - 300	628 - 634	–	24	A hot curing aromatic amine curing agent recommended for achieving a long pot life and high glass transition temperature.

¹Brookfield viscosity

²With liquid epoxy resin of EEW:190

*Method: Colour - ASTM D1544; Viscosity - ASTM D2196; Amine value - ISO 9702

CURING AGENTS

ALIPHATIC AMINES AND THEIR ADDUCTS

Aliphatic amines are low in viscosity and are preferred curing agents at ambient conditions for general applications. They offer excellent combinations of properties and are used in adhesives, coatings, composites and construction applications. Atul offers several grades of aliphatic amine curing agents with varying viscosities, reactivity and performance properties after optimum curing.



Aliphatic polyamine

Lapox®	Colour	Viscosity ¹ @ 25°C	Amine value	Pot life ² @ 25°C	AHEW	Mixing ratio ³	Recommendations
	Gardner	mPa · s	mg KOH/g	minutes	g/eq	pbw	
AH-313	Max 4	30 - 70	1,290 - 1,370	30 - 40	27.0	12	An unmodified aliphatic polyamine recommended for adhesives, castings, coatings and composite applications.
AH-315	Max 1	5 - 15	–	7 - 9 hr	61.0	32	An unmodified polyether amine recommended for adhesives, composites, coatings and casting applications.
AH-332 to AH-338	Max 4	10 - 150	–	10 min - 10 hr		32	A comprehensive range of 7 aliphatic amine curing agents with varying pot life and viscosity recommended for composites, adhesives, construction and coating applications.
AH-341	Max 2	30 - 100	290 - 320	110 - 140	76.0	40	A modified aliphatic polyamine curing agent recommended for high solids coatings with a long pot life.
AH-342	Yellow brown	19,000 - 31,000	500 - 640	15 - 25 ⁴	152.0	80	A modified polyamine adduct with high reactivity recommended for adhesives and sealants.
AH-348	Max 1	5 - 10	680 - 720	40 - 50	39.5	21	An unmodified aliphatic polyamine curing agent recommended for mortar mastics and coatings.
AH-350	Max 8	500 - 1,000	650 - 750	3 - 4 ⁵	76.0	40	A modified polyamine adduct with high reactivity recommended for adhesives and sealants.
AH-351	Max 4	500 - 1,000	575 - 625	35 - 45	48.0	25	A light coloured modified polyamine curing agent recommended to use along with resin ARPN-54 to achieve 98% sulphuric acid resistance.
AH-354	Max 8	60,000 - 1,00,000	340 - 375	5 - 10 ⁶	190	100	A high viscosity aliphatic amine curing agent with extremely fast reactivity recommended as a co-curing agent for slow curing agents. The product can be used for making very fast setting adhesives and putties.
AH-370	Max 5	4,500 - 7,500	600 - 700	5 - 10	95.0	50	A modified polyamine with fast reactivity recommended for adhesives, solvent-free and high solids coatings.

CURING AGENTS

Lapox®	Colour	Viscosity ¹ @ 25°C	Amine value	Pot life ² @ 25°C	AHEW	Mixing ratio ³	Recommendations
	Gardner	mPa · s	mg KOH/g	minutes	g/eq	pbw	
AH-371	Max 5	100 - 400	900 - 1,000	10 - 15	34.2	18	A low viscosity modified polyamine recommended for mortar, mastics and crack filling applications.
AH-372	Max 3	350 - 550	600 - 700	20 - 30	47.5	25	A modified polyamine recommended for moratr, mastica and crack filling application.
AH-373	Max 5	350 - 550	500 - 600	30 - 40	47.5	25	A modified polyamine recommended for adhesive, moratrs, mastics and crack filling applications.
K-6 (AH-312)	Max 3	–	–	30 - 40	19.0	10 - 12	An unmodified aliphatic polyamine recommended for adhesives, castings, coatings, construction and composite applications.
K-7 (AH-311)	Max 1	5 - 10	1,600 - 1,650	15 - 30	21.0	8	An unmodified aliphatic polyamine recommended for adhesives, castings, coatings and composite applications.
K-48	Max 4	150 - 300	17.0 - 17.8 (eq/kg)	20 - 30	34.0	18	A modified polyamine curing agent with low vapour pressure and high reactivity recommended for adhesives, composites, castings and coating applications.
K-54 (AH-356)	Max 2	2,900 - 3,600	398 - 415	15 - 30	67.0	35	A modified polyamine adduct recommended for high solids coatings, mortars and adhesives.
K-105	Black	3,000 - 6,000	–	20 - 25	190.0	100	A coal tar modified polyamine adduct recommended for construction and high build coatings with resin ARB-28.
K-306	Clear liquid	850 - 1,200	–	–	–	100 (with resin ARL-148)	A butylated melamine formaldehyde curing agent recommended for backing enamel with resin ARL-148 for polyester film coatings.
XH-61 (AH-321)	Max 2	1,500 - 2,000	165 - 210	4 - 6 hr	195.0	30 (with resin P-101)	A modified polyamine adduct solution in xylene and butanol recommended for clear coatings.

¹Brookfield viscosity

²100 g mix mass in plastic cup with liquid epoxy resin of EEW:190

³With liquid epoxy resin of EEW:190

⁴With liquid epoxy resin of EEW:190 of 25 g mix mass at 27°C

⁵With liquid epoxy resin of EEW:190 of 14 g mix mass at 27°C

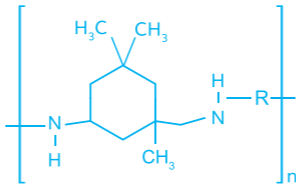
⁶With liquid epoxy resin of EEW:190 of 20 g mix mass at 27°C

*Method: Colour - ASTM D1544; Viscosity - ASTM D2196; Amine value - ISO 9702; Pot life - ASTM D2471

CURING AGENTS

CYCLOALIPHATIC AMINE CURING AGENTS AND THEIR ADDUCTS

Cycloaliphatic amine curing agents offer low colour and viscosity. They are widely used in adhesives, coatings, composites and self-leveling flooring.



Cycloaliphatic polyamine

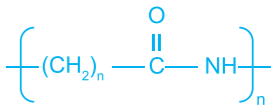
Lapox®	Colour	Viscosity ¹ @ 25°C	Amine value	Pot life ² @ 25°C	AHEW	Mixing ratio ³	Recommendations
	Gardner	mPa · s	mg KOH/g	minutes	g/eq	pbw	
AH-411	Max 1	10 - 20	–	90 - 120	–	23	An unmodified low viscosity cycloaliphatic amine curing agent for coatings, composite applications and flooring.
AH-412 (K-552)	Max 4	50 - 150	–	110 - 160 ⁴	–	38	A low viscosity cycloaliphatic amine curing agent for composite applications. The product offers excellent mechanical properties in static and dynamic working conditions.
AH-416	Max 1	400 - 800	250 - 300	30 - 45	114.0	60	A moderate viscosity, modified cycloaliphatic amine curing agent recommended for coatings and self-leveling flooring with high gloss.
AH-420 (K-964)	Max 3	40 - 60	320 - 340	25 - 40	91.0	48	A very low viscosity cycloaliphatic amine curing agent with moderate pot life for protective coatings and flooring with better chemical resistance.
AH-422	Max 50 ⁵ (APHA)	100 - 200	–	200 - 250	60.0	32	A unmodified cycloaliphatic amine suitable for solvent free coatings, composite and adhesive applications.
AH-424	Max 2	20 - 50	330 - 360	25 - 35	86.0	45	A low viscosity, modified cycloaliphatic amine curing agent to facilitate higher filler loading recommended for self-leveling flooring and coatings.
AH-428	Max 1	50 - 150	340 - 390	30 - 40	86.0	45	A low viscosity cycloaliphatic amine curing agent with fast reactivity recommended for coatings, self-leveling flooring with high gloss and colour stability.
AH-439	Max 100 ⁵ (APHA)	–	Min 98 (purity by GC)	15 - 30	43.7	23	A unmodified cycloaliphatic amine suitable for adhesives, protective coatings and mortars. It offers fast reactivity at room temperature.
AH-440	Max 2	150 - 300	335 - 375	25 - 40	75.0	40	A low viscosity, accelerated cycloaliphatic amine curing agent suitable for solvent-free coatings and flooring.
AH-442	Max 30 ⁵ (APHA)	80 - 90	515 - 525	–	52.5	28	A liquid unmodified cycloaliphatic amine recommended for structural composite applications having high chemical resistance and good resistance to UV light.
K-302	Max 2	300 - 600	260 - 310	40 - 50	95.0	50	A transparent, modified cycloaliphatic amine curing agent suitable for self-leveling flooring, solvent-free coating and clear casting applications.

¹Brookfield viscosity
²100 g mix mass in plastic cup with liquid epoxy resin of EEW:190
³With liquid epoxy resin of EEW:190
⁴100 g mix mass in plastic cup with ARPN-52 (L-552) resin
⁵ASTM D1209
 *Method: Colour - ASTM D1544; Viscosity - ASTM D2196; Amine value - ISO 9702; Pot life - ASTM D2471

CURING AGENTS

POLYAMIDE CURING AGENTS

A polyamide curing agent is a reaction product of dimer acid and polyamine. These curing agents can be blended with epoxy resins in a variety of mixing ratios. Good chemical resistance, film forming character, high gloss and excellent adhesion make them suitable for coating and adhesive applications. Atul offers various curing agents under this category with varying viscosities and reactivity.



Polyamide

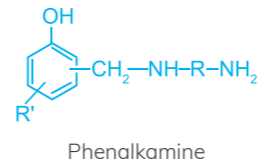
Lapox®	Colour	Viscosity ¹ @ 25°C	Amine value	Pot life ² @ 25°C	AHEW	Mixing ratio ³	Recommendations
	Gardner	mPa · s	mg KOH/g	minutes	g/eq	pbw	
AH-711	Max 9	50,000 - 75,000 @ 40°C	210 - 230	–	190 - 238	100 - 125	A high viscosity polyamide curing agent recommended for adhesives, sealants and anti-corrosive coatings.
AH-712	Max 9	45,000 - 60,000	290 - 320	110 - 130	105 - 124	55 - 65	A high viscosity polyamide curing agent recommended for protective coatings, adhesives, flooring, marine coatings and industrial paints.
AH-713 (K-46)	Max 9	12,000 - 18,000	350 - 400	60 - 80	95	50	A moderate viscosity polyamide curing agent recommended for high solids coatings, primers, grouts, mortars, adhesives, marine and industrial paints.
AH-714	Max 8	500 - 1,000	425 - 450	120 - 130	95	50	A low viscosity polyamide curing agent recommended for grouts, crack injection, primers, protective coatings, tile gap filling, mortars and adhesives.
AH-716 (K-29)	Max 10	2,500 - 5,500	202 - 225	80 - 100	190	100	A low viscosity modified polyamide curing agent recommended for high solids coatings, primers and floor coatings.
AH-725	Max 8	7,000 - 11,000	400 - 450	40 - 50	95	50	A moderate viscosity polyamide curing agent recommended for adhesives, mortars and protective coating applications. The product provides faster reactivity and early development of mechanical properties.
AH-727	Max 12	1,000 - 2,000	280 - 320	45 - 65	114	60	A modified polyamide curing agent suitable for curing under wet damp conditions. The product provides excellent adhesion to metal and concrete surfaces.
AH-747	Max 12	1,000 - 2,000	250 - 290	55 - 65	114	60	A modified polyamidoamide curing agent suitable for curing under wet damp conditions. The product provides excellent adhesion to metal and concrete surfaces. It is recommended as a primer for flooring and coating applications.

¹Brookfield viscosity
²100 g mix mass in plastic cup with liquid epoxy resin of EEW:190
³With liquid epoxy resin of EEW:190
 *Method: Colour - ASTM D1544; Viscosity - ASTM D2196; Amine value - ISO 9702; Pot life - ASTM D2471

CURING AGENTS

PHENALKAMINE CURING AGENTS

A phenalkamine is a reaction product of cardanol and polyamine. They cure epoxy resins at low temperatures, even in moist conditions. They are preferred for protective and marine coatings in cold conditions.



Lapox®	Colour	Viscosity ¹ @ 25°C	Amine value	Pot life ² @ 25°C	AHEW	Thin film set time (8 mils)	Mixing ratio ³	Recommendations
	Gardner	mPa · s	mg KOH/g	minutes	g/eq	hours	pbw	
AH-543 (XH-80)	Max 15	2,000 - 5,000	300 - 350	50 - 65	125	4 - 5	67	A light coloured and low viscosity phenalkamine curing agent useful for heavy duty anti-corrosive coatings for marine applications.

¹Brookfield viscosity

²100 g mix mass in plastic cup with liquid epoxy resin of EEW:190

³With liquid epoxy resin of EEW:190

*Method: Colour - ASTM D1544; Viscosity - ASTM D2196; Amine value - ISO 9702; Pot life - ASTM D2471

ANNEXURE

Calculating the mixing ratio of epoxy resin with curing agent:

To calculate Amine Hydrogen Equivalent Weight (AHEW), use the following equation:

$$\text{AHEW} = \frac{\text{Molecular weight of amine}}{\text{Number of active hydrogen atoms}}$$

To calculate the stoichiometric ratio of curing agent with resin, use the following equation:

$$\text{PHR of amine} = \frac{\text{AHEW} \times 100}{\text{Epoxy Equivalent Weight}}$$

To calculate Epoxy Equivalent Weight (EEW) of the mixture that contains reactive and non-reactive additives, diluents and fillers, use the following equation:

$$\text{EEW of the mixture} = \frac{\text{Total weight}}{\frac{\text{Weight of component A}}{\text{EEW of component A}} + \frac{\text{Weight of component B}}{\text{EEW of component B}} + \frac{\text{Weight of component C}}{\text{EEW of component C}}}$$

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