

BEYOND EXPECTATION & BEYOND LIMITATION



# PRODUCT GUIDE



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## MESSAGE FROM CEO

Dear valuable customers,

First of all, I would like to express my deepest gratitude to our valuable customers in the world who have constantly supported Kukdo Chemical Co, Ltd. to become the global leader of Epoxy industry. Since Kukdo set foot in the world of epoxy for the first time in Seoul, Korea 40 years ago, we have overcome a lot of challenges successfully, thanks to the full support from our customers.

Kukdo currently operates 3 factories in Korea and 1 in China where we produce over 480,000mt of epoxy resins and hardeners yearly. We also set up a logistics center in the heart of Europe where we are able to provide the most efficient and prompt delivery service. It is a huge benefit to our valuable customers that they are able to avoid the risk of time lag and reduce the burden of inventory. We are working hard to finalize our global supply networks in a few years to provide the same excellent service to our customers who are outside of our current network.

Furthermore, Kukdo continuously focuses on our well-organized quality control and environmental management system based on ISO-9000 and 14001 for our customer's confidence. We also increasingly put our efforts toward developing innovative products for our valuable customers who are engaged in a variety of applications including electric & electronic products, automobiles, wet & powder coatings, composites, adhesives and insulation. We are strongly confident that our continuous efforts on R&D benefit our valuable customers enormously, which eventually increase our customer's value.

As Kukdo's core value is "For customer value", we try to provide our valuable customers with a total solution; supplying trend-leading products, innovative materials, cost-efficient packaged delivery service, technology and market information in cooperation with our valuable customers. Our core value will be firmly alive in our daily life in Kukdo.

All members of Kukdo always appreciate the full support from our valuable customers and promise that we will continuously try our best for our customer's success.

Faithfully yours,



Si Chang Lee, President

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## KUKDO HISTORY

### 1970~80's History

- Feb. 1972 Establishment of KUKDO CHEMICAL Industry CO., LTD.
- Jan. 1973 Completion of Seoul factory for Epoxy resin & Hardener (1st factory in Korea)
- Oct. 1983 Establishment of R&D Center.

### 1990's History

- Apr. 1994 Completion of Iksan factory for Epoxy resin & Hardener (2nd factory in Korea)
- Mar. 1996 Establishment of KUKDO Fine Chemical in Sihwa(3rd factory in Korea)
- Apr. 1999 Change Company Name to KUKDO CHEMICAL CO., LTD.

### 2000's History

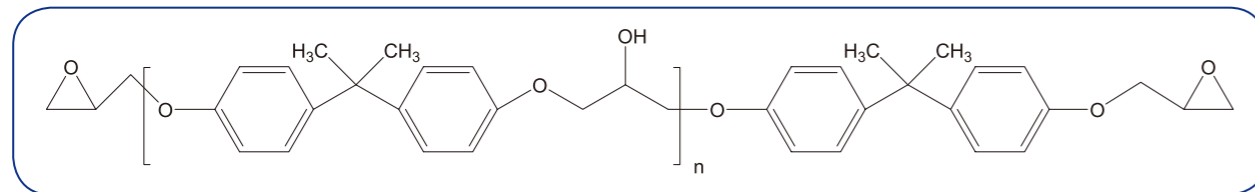
- Apr. 2002 Establishment of KUKDO CHEMICAL (KunShan) CO., LTD. in China
- Nov. 2003 Completion of KunShan factory for Epoxy resin and Polyol in China
- Jul. 2004 Completion of Busan factory for Epoxy resin and System Polyol in Busan
- Mar. 2008 Acquisition of HAJIN CHEM TECH
- Nov. 2008 Completion of 40KT of Liquid Epoxy resin in Iksan
- Dec. 2008 Awarded 200 Million Dollar Export Tower Prize (45th Trade Anniversary)
- Nov. 2010 Awarded 2010 Global Excellent Management by JMAC
- Apr. 2011 Obtained Customs approved registered exporter Certificate by Customs
- Sep. 2011 Obtained AEO(Authorized Economic Operator) Certificate by Customs
- Dec. 2011 Awarded 300 Million Dollar Export Tower Prize (48th Trade Anniversary)
- Dec. 2011 Awarded Korean World-class Product Award 2011 by Knowledge Economy
- Feb. 2013 Establishment of NICHIDO CHEMICAL CO., LTD.

**GLOBAL  
SALES  
NETWORKS**



## BISPHENOL-A TYPE EPOXY RESIN

### 1. Standard Liquid Type



#### 1) Low Viscosity Type

Grade	EEW (g/eq)	Viscosity (cps@25°C)	Hy-Cl (wt. %)	Specific Gravity* <sup>1</sup> (20°C)	Color (G,max.)	Characteristics/Use
YD-113	175-190	500-700	0.2max.	1.14	1	CGE modified type
YD-114	190-210	500-700	0.05max.	1.14	0.7	C <sub>12</sub> -C <sub>14</sub> modified type
YD-114E	190-210	700-1,200	0.05max.	1.14	0.7	C <sub>12</sub> -C <sub>14</sub> modified type
YD-114F	185-205	450-750	0.1max.	1.14	1	C <sub>12</sub> -C <sub>14</sub> modified type
YD-114EF	180-200	700-1,200	0.1max.	1.14	1	C <sub>12</sub> -C <sub>14</sub> modified type
YD-115J	175-195	150-500	0.6-0.9	1.14	0.7	BGE modified type, Low viscosity type
YD-115	180-194	700-1,100	0.1max.	1.14	1	BGE modified type
YD-115G	180-190	700-1,100	0.2-0.3	1.15	1	Non-crystal type
YD-115E	185-205	1,100-2,800	0.05max.	1.14	0.7	C <sub>12</sub> -C <sub>14</sub> modified type
YD-115CA	195-215	800-1,600	1.75-1.95	1.15	1	BGE modified type, Non-crystal type

\*<sup>1</sup> Reference data

#### 2) Medium Viscosity Type

Grade	EEW (g/eq)	Viscosity (cps@25°C)	Hy-Cl (wt. %)	Specific Gravity* <sup>1</sup> (20°C)	Color (G,max.)	Characteristics/Use
YD-127	180-190	8,000-11,000	0.05max.	1.17	0.5	Standard type
YD-128	184-190	11,500-13,500	0.05max.	1.17	0.5	Standard type
YD-128M	184-196	12,000-14,000	0.06-0.07	1.17	0.5	Stable reaction type
YD-128H	187-205	12,000-18,000	0.6-1.0	1.17	0.5	Stable reaction type
YD-128S	205-225	19,000-24,000	1.85-2.20	1.17	1	Non-crystal type
YD-128SH	190-205	16,000-20,000	0.5-1.5	1.15	1	Non-crystal type

\*<sup>1</sup> Reference data

### 3) High Viscosity Type

Grade	EEW (g/eq)	Solution Viscosity (25°C)	Hy-Cl (wt. %)	Specific Gravity* <sup>2</sup> (20°C)	Color (G,max.)	Characteristics/Use
YD-134	230-270	P-U* <sup>1</sup>	0.1max.	1.18	1	Semisolid, High adhesion
YD-136	290-335	A-C* <sup>3</sup>	0.1max.	1.18	1	High adhesion

\*<sup>1</sup> Gardner Holdt Method, Butyl Carbitol NV 70% Solution \*<sup>2</sup> Reference data \*<sup>3</sup> Gardner Holdt Method, Butyl Carbitol NV 40% Solution

### 2. Standard Solid Type

Grade	EEW (g/eq)	Solution Viscosity* <sup>1</sup> (25°C)	Softening Point* <sup>2</sup> (°C)	Specific Gravity* <sup>3</sup> (20°C)	Color (G,max.)	Characteristics/Use
YD-011* <sup>4</sup>	450-500	D-F	60-70	1.16-1.20	1	General, Laminate
YD-011S	455-495	D-F	60-70	1.16-1.20	0.5	General
YD-011H	530-570	F-J	70-80	1.16-1.20	0.3	General
YD-012	600-700	G-J	75-85	1.16-1.20	0.5	General
YD-012H	640-670	G-K	75-85	1.16-1.20	0.5	General
YD-013K	780-840	M-O	88-95	1.16-1.20	0.5	General, Non-blocking
YD-014ER	800-950	P-S	88-102	1.16-1.20	1	High purity, Ester coating
YD-014* <sup>4</sup>	900-1,000	Q-U	91-102	1.16-1.20	0.5	General
YD-017* <sup>4</sup>	1,750-1,950	Y-Z <sub>1</sub>	115-125	1.16-1.20	0.5	Can coating
YD-017R	1,750-2,100	Y-Z <sub>1</sub>	117-127	1.16-1.20	1	High purity, Ester coating
YD-017H	2,100-2,400	Z <sub>1</sub> -Z <sub>6</sub>	120-135	1.16-1.20	0.5	High purity, Can coating
YD-019* <sup>4</sup>	2,500-3,100	Z <sub>3</sub> -Z <sub>5</sub>	125-140	1.16-1.20	0.5	Can coating, PCM
YD-019K	2,400-3,800	Z <sub>3</sub> -Z <sub>7</sub>	120-150	1.16-1.20	0.7	Can coating, PCM
YD-020	4,000-6,000	Z <sub>4</sub> -Z <sub>6</sub>	140-155	1.16-1.20	1	High purity, Can coating

\*<sup>1</sup> Gardner Holdt Method, Butyl Carbitol NV 40% Solution \*<sup>2</sup> Ball & Ring Method \*<sup>3</sup> Reference data \*<sup>4</sup> Approved by F. D. A

Head Office



Iksan Factory

### 3. Solution of Solvent Epoxy Resin

Grade	EEW (g/eq)	Viscosity (cps@25°C)	Non-Volatile Content (wt. %)	Color (G,max.)	Characteristics/Use
YD-011MS65S	450-500	400-800	65±1	0.5	n-Butanol/Xylene/MIBK
YD-011BC70	450-500	-	70±1	0.5	Butyl Cellosolve
YD-011X70	450-500	2,500-4,000	70±1	0.5	Xylene
YD-011AM70	450-500	K-P* <sup>1</sup>	70±1	0.7	Acetone/Methyl Cellosolve
YD-011X75	450-500	Z <sub>3</sub> -Z <sub>6</sub> * <sup>1</sup>	75±1	1	Xylene
YD-011T75	450-500	Z-Z <sub>5</sub> * <sup>1</sup>	75±1	0.5	Toluene
YD-011BC75	450-500	Z <sub>3</sub> -Z <sub>6</sub> * <sup>1</sup>	75±1	0.5	Butyl Cellosolve
YD-011EC75	450-500	Z <sub>1</sub> -Z <sub>6</sub> * <sup>1</sup>	75±1	0.5	Ethyl Cellosolve
YD-011M75	450-500	-	75±1	0.5	MIBK
YD-011MX75	460-485	Z <sub>1</sub> -Z <sub>3</sub> * <sup>1</sup>	75±1	0.5	MIBK/Xylene
YD-011A80	450-500	X-Z <sub>4</sub> * <sup>1</sup>	80±1	0.5	Acetone
YD-012A80	600-700	Z <sub>3</sub> -Z <sub>6</sub> * <sup>1</sup>	80±1	0.5	Acetone
YD-014AM70	900-1,000	Y-Z <sub>3</sub> * <sup>1</sup>	70±1	1	Acetone/Methyl Cellosolve
YD-014M75	900-1,000	30,000-50,000	75±1	0.5	MIBK
YD-017KT55	1,750-2,100	Z-Z <sub>4</sub> * <sup>1</sup>	55±1	1	MIBK/Toluene
YD-128MX75	184-190	-	75±1	0.5	Xylene/Methanol
YD-128X80	184-190	100-200	80±1	1	Xylene
YD-128X90	184-190	T-Y* <sup>1</sup>	90±1	0.5	Xylene
YD-134X80	230-270	S-X	80±1	1	Xylene
YD-134X90	230-270	10,000-20,000	90±1	1	Xylene
YD-136X80	290-335	Z-Z <sub>4</sub> * <sup>1</sup>	80±1	1	Xylene
KD-211EX75	455-485	Z <sub>3</sub> -Z <sub>7</sub> * <sup>1</sup>	75±1	0.5	Xylene
KD-211GX75	500-550	Z <sub>3</sub> -Z <sub>7</sub> * <sup>1</sup>	75±1	0.7	Xylene

\*<sup>1</sup> Gardner Holdt Method

### 4. Powder Coating Epoxy Resin

#### 1) General Grade

Grade	EEW (g/eq)	Melt Viscosity* <sup>1</sup> (cps@150°C)	Softening Point* <sup>2</sup> (°C)	Color (G,max.)	Characteristics/Use
KD-211E	455-485	300-700	65-75	0.3	General
KD-211G	500-550	500-1,500	70-80	0.7	General
KD-242K	590-640	1,000-2,000	80-90	1	General
KD-242GHF	625-675	1,500-3,500	83-93	0.7	Good flow, High gloss
KD-242C	640-700	1,500-3,500	84-90	0.7	General
KD-242G	650-725	2,000-3,500	85-95	0.7	General
KD-243C	715-835	3,000-8,000	88-98	0.7	General, Hybrid
KD-213	730-840	3,500-7,000	88-98	0.4	General, Hybrid
KD-213K	780-850	4,500-8,000	92-102	0.5	General, Hybrid
KD-214C	875-975	2,000-4,000* <sup>3</sup>	95-105	0.5	PCM, Hybrid, General

\*<sup>1</sup> I.C.I. Viscometer \*<sup>2</sup> Ball & Ring Method \*<sup>3</sup> Melt Viscosity at 175°C

#### 2) Low Viscosity, High Flow Grade

Grade	EEW (g/eq)	Melt Viscosity* <sup>1</sup> (cps@150°C)	Softening Point* <sup>2</sup> (°C)	Color (G,max.)	Characteristics/Use
YD-012	600-700	800-1,600	75-85	0.5	General, Hybrid
YD-012H	640-670	1,200-1,700	75-85	0.5	General, Hybrid
YD-053	700-750	1,000-3,000	85-92	0.5	General, Hybrid
YD-013K	780-840	1,500-4,000	88-95	0.5	General, Hybrid
YD-013K55	800-900	2,000-5,000	90-100	0.5	General, Hybrid
YD-014	900-1,000	3,000-7,000	91-102	0.5	General, Hybrid

\*<sup>1</sup> I.C.I. Viscometer \*<sup>2</sup> Ball & Ring Method

#### 3) High Molecular Weight Grade

Grade	EEW (g/eq)	Melt Viscosity* <sup>1</sup> (cps@175°C)	Softening Point* <sup>2</sup> (°C)	Color (G,max.)	Characteristics/Use
KD-214L	1,050-1,150	4,000-8,000	100-110	1	Pipe coating
KD-214M	1,150-1,300	5,000-10,000	107-117	0.4	Pipe coating
KD-216	1,400-1,600	1,400-1,570* <sup>3</sup>	-	0.5	General
YD-017	1,750-1,950	Y-Z <sub>1</sub> * <sup>4</sup>	115-125	0.5	General
YD-017H	2,100-2,400	Z <sub>1</sub> -Z <sub>6</sub> * <sup>4</sup>	120-135	0.5	General
YD-019	2,500-3,100	Z <sub>3</sub> -Z <sub>5</sub> * <sup>4</sup>	125-140	0.5	General
YD-020	4,000-6,000	Z <sub>4</sub> -Z <sub>6</sub> * <sup>4</sup>	140-155	1	Can coating, PCM

\*<sup>1</sup> I.C.I. Viscometer \*<sup>2</sup> Ball & Ring Method \*<sup>3</sup> Brookfield Viscometer at 25°C, Butyl Carbitol NV 40% Solution\*<sup>4</sup> Gardner Holdt Method, Butyl Carbitol NV 40% Solution

#### 4) Special Grade

Grade	EEW (g/eq)	Melt Viscosity* <sup>1</sup> (cps@150°C)	Softening Point* <sup>2</sup> (°C)	Color (G,max.)	Characteristics/Use
KD-211D	500-575	1,000-3,500	82-92	0.7	Novolac modified type
KD-211H	510-550	2,500-3,500	90-98	0.7	Novolac modified type
KD-213C	750-850	3,000-8,000* <sup>3</sup>	105-118	0.7	Novolac modified type
KD-213H	750-850	23,000-38,000	110-120* <sup>4</sup>	0.7	Novolac modified type
KD-242S	600-700	500-2,000	77-87	0.7	Good flow
KD-242H	660-720	2,200-2,800	85-95	0.5	Good flow
KD-292	660-720	1,000-4,000	85-95	0.4	Good flow
KD-293	710-760	1,000-3,000	85-95	0.7	Good flow
KD-294	1,000-1,100	S-V* <sup>5</sup>	100-110	0.4	Good flow

\*<sup>1</sup> I.C.I. Viscometer \*<sup>2</sup> Ball & Ring Method \*<sup>3</sup> Melt Viscosity at 175°C \*<sup>4</sup> Mettler Method\*<sup>5</sup> Gardner Holdt Method, Butyl Carbitol NV 40% Solution

#### 5) Half-capped Epoxy Resin

Grade	EEW (g/eq)	Ph-OH E.W (g/eq)	Softening Point* <sup>1</sup> (°C)	Color (G,max.)	Characteristics/Use
KD-3013	700-1,500	700-2,500	90-100	1	Self-curing epoxy resin
KD-4014	1,000-2,000	1,000-3,000	100-110	1	Self-curing epoxy resin

\*<sup>1</sup> Ball & Ring Method

## COMPARATIVE PROPERTY DATA

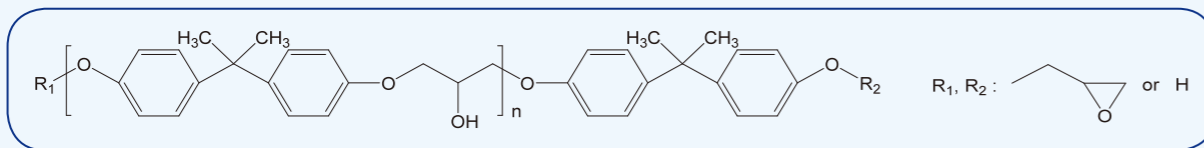
KUKDO

## KD-3013 &amp; KD-4014

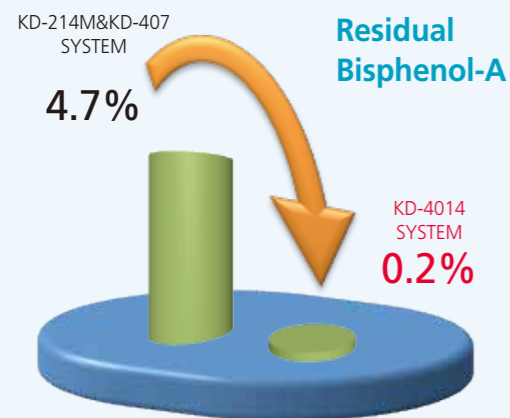
## Self Curable Bisphenol-A type Half-Capped Epoxy Resins

KD-3013 and KD-4014 Epoxy Resins are bisphenol-A type half-capped epoxy resin, and designed for applications of high performance powder coating, especially FBE(Fusion Bonded Epoxy coating). The most advantage of these products is that residual bisphenol-A content is the less than one percent by weight. Also, these products have excellent performance of block resistance, chemical resistance and mechanical properties.

## Chemical Structure



## Residual Bisphenol-A Content



## Difference between KD-4014 system &amp; KD-214M, KD-407 system

ITEMS	I	II	Remarks
KD-4014	400	-	Residual BPA : about 0.2 wt%
KD-214M	-	334.5	Residual BPA : about 4.7 wt%
KD-407	-	65.5	
Benzoin	2.9	2.9	-
2-MI	2	2	-
BaSO <sub>4</sub>	66	66	-
TiO <sub>2</sub> R902	200	200	-
Testing Items	I	II	Remarks
Thickness (μm)	530	520	-
Gloss	105.5	105.2	-
Impact Resistance	Pass	Pass	1000g×50Cm

\*Curing condition : Preheating at 230°C × 30 min → spray coating  
→ post curing at 210°C × 3 min

## Formulation

Items	I	II	Remarks
KD-3013	540	-	-
KD-4014	-	560	-
Benzoin	4	4	-
MFP-VP	6	6	Flow agent
2MI	2.5	2.5	-
TiO <sub>2</sub> R902	240	240	-

## Test Results

Testing Items	I	II	Remarks
Gloss	104.6	105	60°
Cross-cutting	100/100	100/100	-
Impact Resistance	Pass	Pass	1000g×50Cm

\*Curing condition : Preheating at 130°C × 20 min



KD-3013 and KD-4014 are designed for application of high performance powder coating, especially FBE(Fusion Bonded Epoxy coating).

## 6) High Tg Grade

Grade	EEW (g/eq)	Melt Viscosity* <sup>1</sup> (cps@150°C)	Softening Point** <sup>2</sup> (°C)	Characteristics/Use
KD-2011	400-500	2,000-4,000	90-100	High Tg, FBE Powder coating
KD-2012H	550-650	3,000-8,000	95-105	High Tg, FBE Powder coating

\*<sup>1</sup> I.C.I Viscometer \*<sup>2</sup> Ball & Ring Method

## 7) Master Batch Grade

Grade	EEW (g/eq)	Melt Viscosity* <sup>1</sup> (cps@150°C)	Softening Point** <sup>2</sup> (°C)	Color (G,max.)	Characteristics/Use
YD-012F15	730-830	1,000-3,000	77-87	Milky White	High flow
YD-014DLM	830-870	3,000-7,000	93-97	Milky White	High flow
YD-0153F	820-930	4,000-9,000	92-102	Milky White	High flow
KD-213F2	760-840	3,050-7,950	92-98	Milky White	High flow
KD-214CR	900-950	5,000-10,000	95-105	Milky White	High flow
KD-242GB	670-770	2,000-4,000	-	Milky White	High flow
KD-242GR	760-875	3,000-7,000	85-95	Milky White	High flow
KD-264	830-940	4,000-8,000	88-98	Milky White	Dimer acid modified type, High flow
KD-292U	660-720	1,000-4,000	85-95	Milky White	High flow
KD-293U	700-780	1,000-4,000	85-95	Milky White	High flow
KD-293X	675-725	2,000-3,000	83-98	0.7	High flow

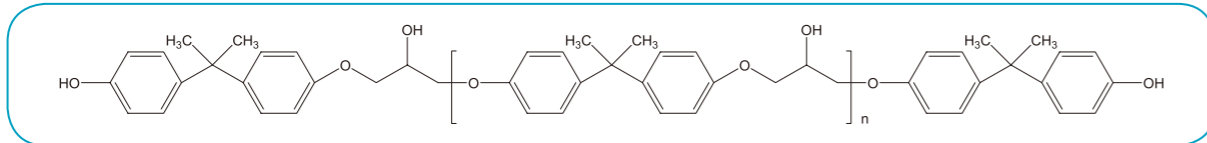
\*<sup>1</sup> I.C.I Viscometer \*<sup>2</sup> Ball & Ring Method

## 8) Rubber Modified Epoxy Resin

Grade	EEW (g/eq)	Melt Viscosity* <sup>1</sup> (cps@150°C)	Softening Point** <sup>2</sup> (°C)	Color (G,max.)	Characteristics/Use
KR-101	700-800	2,000-10,000	-	3	CTBN modified epoxy resin
KR-102	1,100-1,300	3,000-15,000* <sup>3</sup>	-	5	CTBN modified epoxy resin
KR-104L	1,100-1,300	3,000-15,000* <sup>3</sup>	95-105	5	CTBN modified epoxy resin
KR-692	675-775	1,000-7,000	82-98	Milky white	Acrylic rubber modified epoxy resin
KR-693	800-900	3,000-13,000	90-105	Milky white	Acrylic rubber modified epoxy resin
KSR-900	600-700	3,000-5,000	82-97	2	Excellent adhesion epoxy resin
KSR-1000	1,100-1,300	1,000-5,000* <sup>3</sup>	-	Milky white	Silicone modified epoxy resin

\*<sup>1</sup> I. C. I Viscometer \*<sup>2</sup> Ball & Ring Method \*<sup>3</sup> I.C.I Viscometer at 175°C

## 9) Phenol Excess Type Curing Agent



Grade	Ph-OH E.W (g/eq)	Softening Point* <sup>1</sup> (°C)	Gel time* <sup>2</sup> (sec)	Color (G,max.)	Characteristics/Use
KD-401	230-260	73-85	85-150	Milky White	High adhesion
KD-404	240-260	73-85	40-80	1	Fast cure
KD-404J	230-260	73-85	30-70	1	Fast cure
KD-405	240-260	73-85	100-160	1	High adhesion
KD-407	220-250	73-85	-	1	Non-catalyst
KD-410	230-260	73-85	40-80	Milky White	Fast cure
KD-410J	230-260	73-85	30-70	Milky White	Fast cure
KD-420	230-260	73-85	25-50	Milky White	Fast cure
KD-426	360-440	90-100	25-55* <sup>3</sup>	Milky White	Fast cure, High flexibility
KD-438	500-580	90-110	-	1	Non-catalyst, High flexibility
KD-448	660-760	95-120	-	1	Non-catalyst, High flexibility
KD-448J	660-760	95-120	30-60* <sup>4</sup>	1	Fast cure
KD-448H	660-760	95-120	20-50* <sup>4</sup>	1	Fast cure
KDF-407	200-260	500-2,500* <sup>5</sup>	-	2	Non-catalyst, BPF type
KDF-438	450-550	500-4,000* <sup>6</sup>	-	-	Non-catalyst, BPF type
KDF-448	600-700	2,000-7,000* <sup>6</sup>	-	2	Non-catalyst, BPF type
KD-407A	250-280	73-85	-	yellow to brown* <sup>8</sup>	Improved adhesion in hot & wet environments
KD-410A	260-290	73-85	30-70* <sup>7</sup>	Milky yellow to brown* <sup>8</sup>	Improved adhesion in hot & wet environments

\*<sup>1</sup> Ball & Ring Method \*<sup>2</sup> 43phr on KD-211D, at 180°C \*<sup>3</sup> 73phr on KD-211D, at 180°C \*<sup>4</sup> 130phr on KD-211D, at 180°C  
 \*<sup>5</sup> Melt Viscosity : I.C.I Viscometer at 125°C \*<sup>6</sup> Melt Viscosity : I.C.I Viscometer at 150°C \*<sup>7</sup> 51phr on KD-211D, at 180°C (Reference data)  
 \*<sup>8</sup> Reference data

## 5. Low BPA Type

Grade	EEW (g/eq)	Melt Viscosity* <sup>1</sup> (cps@150°C)	Softening Point* <sup>4</sup> (°C)	Color (G,max.)	BPA Content (ppm,max.)
KD-6512	600-700	1,000-3,000	80-90	1	2
KD-6514	900-1,000	1,500-4,000 * <sup>2</sup>	95-105	1	2
KD-6516	1,500-1,750	X-Z <sub>1</sub> * <sup>3</sup>	115-130	1	2
KD-6517	1,750-2,100	Z-Z <sub>3</sub> * <sup>3</sup>	120-135	1	2
KD-6518	2,100-2,400	Z <sub>1</sub> -Z <sub>4</sub> * <sup>3</sup>	120-135	1	2
KD-6519	2,400-2,900	Z <sub>3</sub> -Z <sub>6</sub> * <sup>3</sup>	130-145	1	2
KD-6520	2,900-3,800	Z <sub>4</sub> -Z <sub>7</sub> * <sup>3</sup>	135-155	1	2

\*<sup>1</sup> I.C.I Viscometer \*<sup>2</sup> Melt Viscosity : I.C.I Viscometer at 175°C \*<sup>3</sup> Gardner Holdt Method, Butyl Carbitol NV 40% Solution \*<sup>4</sup> Ball & Ring Method

## 6. n=0 free, BPA free Type

Grade	EEW (g/eq)	Melt Viscosity* <sup>1</sup> (cps@150°C)	Softening Point* <sup>3</sup> (°C)	Color (G,max.)	BPA Content (ppm,max.)	BADGE Content (ppm,max.)
KD-452	490-570* <sup>4</sup>	2,000-4,000	96-106	2	400	-
KD-6812	600-700	800-1,800	80-90	1	1	500
KD-6814* <sup>5</sup>	850-950	4,000-8,000	90-105	2	1	400
KD-6817	1,750-2,000	1,600-4,500* <sup>2</sup>	115-130	2	1	100
KD-6819	2,500-2,900	5,000-15,000* <sup>2</sup>	130-150	2	1	100

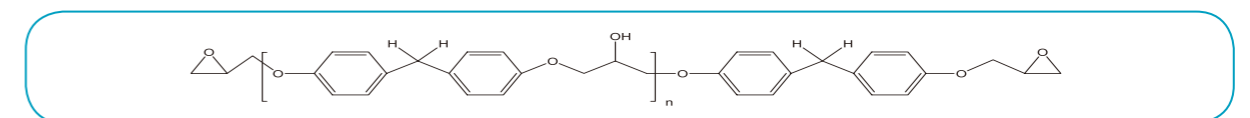
\*<sup>1</sup> I. C. I Viscometer \*<sup>2</sup> Brookfield Viscometer at 25°C, Butyl Carbitol NV 40% Solution \*<sup>3</sup> Ball & Ring Method \*<sup>4</sup> Ph-OH E.W. \*<sup>5</sup> Approved by F.D.A

## 7. High Purity-Low Chlorine Epoxy Resin

Grade	EEW (g/eq)	Hy-Cl (ppm)	Total-Cl* <sup>1</sup> (ppm)	Viscosity (cps@25°C)	Purity* <sup>4</sup> (n=0,%)	Characteristics/Use
YD-128K	184-196	<250	<1000	11,000-14,000	-	Low T-Cl, Low Hy-Cl, Low Phenol-OH, BPA type
YDF-170K	160-180	<250	<1200	2,000-5,000	-	Low T-Cl, Low Hy-Cl, Low Phenol-OH, BPF type
YDPN-638K	170-190	<250	<1200	20,000-50,000 * <sup>2</sup> G-J * <sup>3</sup>	-	Low T-Cl, Low Hy-Cl, Low Phenol-OH, Phenol novolac type
KDS-8128	170-175	<200	<700	4,000-5,000	>98	High purity, Low Cl, BPA type
KDS-8128P	170-175	<100	<200	2,000-5,000	>98	Ultra high purity, Ultra low Cl, BPA type
KDS-8170	155-160	<200	<700	1,000-2,000	>98	High purity, Low Cl, BPF type
KDS-8170P	155-160	<100	<300	1,000-2,000	>98	Ultra high purity, Ultra low Cl, BPF type
KDS-8161	160-170	<200	<700	2,000-3,000	>98	High purity, Low Cl, Non crystalline
KDS-8165	155-165	<200	<700	1,000-2,000	-	High purity, Low Cl, Non crystalline
KDS-8631	165-180	<100	<1,800	19,000-24,000	-	High purity, Low Cl, Phenol novolac type
KDS-8805	90-110	-	-	100-1,000	>95	High purity, Low viscosity, Aminophenol type

\*<sup>1</sup> Total-Cl : Potentiometric titration \*<sup>2</sup> Brookfield Viscometer at 52°C (Reference data) \*<sup>3</sup> Gardner Holdt Method, Butyl Carbitol NV 60% Solution  
 \*<sup>4</sup> GPC Data

## BISPHENOL-F TYPE EPOXY RESIN



## 1. General Type

Grade	EEW (g/eq)	Viscosity (cps@25°C)	Softening Point* <sup>1</sup> (°C)	Color (G,max.)	Characteristics/Use
YDF-161	170-180	5,000-7,000	-	1	Bisphenol A/F type
YDF-161H	175-185	6,000-8,000	-	1	Bisphenol A/F type
YDF-162	175-185	7,000-10,000	-	1	Bisphenol A/F type
YDF-165	160-180	700-1,100	-	3	Low viscosity
YDF-170	160-180	2,000-5,000	-	1	Standard BPF type
YDF-175	160-180	2,000-5,000	-	1	Less-crystal type
YDF-2001	450-500	B-D* <sup>2</sup>	50-60	1	Low viscosity, Flexible type
YDF-2004	900-1,000	K-N* <sup>2</sup>	-	1	High flow, Flexible type

\*<sup>1</sup> Ball & Ring Method \*<sup>2</sup> Gardner Holdt Method, Butyl Carbitol NV 40% Solution

## 2. Low Viscosity Type

Grade	EEW (g/eq)	Viscosity (cps@25°C)	Color (G,max.)	Characteristics/Use
YDF-1020	160-180	2,000-3,000	1	Low viscosity

## 3. Solid Type

Grade	EEW (g/eq)	Softening Point* <sup>1</sup> (°C)	Color (G,max.)	Characteristics/Use
KD-9001	450-500	50-60	1	Low viscosity, Flexible type
KD-9002	600-700	70-80	1	Low Temp. curing, Low viscosity
KD-9003	750-850	80-90	1	Low Temp. curing, Low viscosity
KD-9004	900-1,000	85-95	1	High flow, Flexible type
KD-9005	1,000-1,200	90-100	1	High flow, Flexible type
KD-9006	1,400-1,600	95-105	1	High flow, Flexible type
KD-9007	1,750-1,950	100-110	1	Can coating, Manufactured with high purity BPF
KD-9009	2,300-2,900	107-122	1	Can coating, Manufactured with high purity BPF

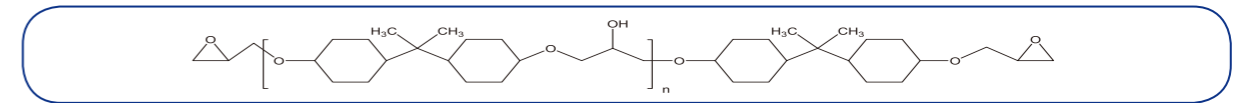
\*<sup>1</sup> Ball & Ring Method

## BROMINATED EPOXY RESIN

Grade	EEW (g/eq)	Softening Point* <sup>1</sup> (°C)	Br. Content (wt.%)	Volatile Content (wt%)	Characteristics/Use
YDB-228	210-240	10,000-20,000* <sup>2</sup>	16-18	-	Liquid flame retardant
YDB-400	380-420	64-74	46-50	-	Flame retardant, Artificial marble
YDB-400H	430-460	70-80	48-51	-	Flame retardant
YDB-400T60	390-410	9-11* <sup>3</sup>	46-50	39-41	Toluene solution type, Flame retardant for laminate
YDB-400T70	390-410	30-50* <sup>3</sup>	46-50	29-31	Toluene solution type, Flame retardant for laminate
YDB-400TE70	390-410	-	48-50	29-31	Toluene / MEK solution type, Flame retardant for laminate
YDB-406	620-680	98-109	50-52	-	Flame retardant for ENPLA
YDB-408	690-750	102-112	50-52	-	Flame retardant for ENPLA
YDB-410P	900-1,000	120-130	50-52	-	Flame retardant for ENPLA
YDB-423A80	420-460	1,500-2,500* <sup>3</sup>	19-21	19-21	Flame retardant for laminate
YDB-424A80	442-458	1,500-2,400* <sup>3</sup>	19.5-20.5	19.5-20.5	Flame retardant for laminate
YDB-500A80	475-520	-	19-22	19.5-20.5	Narrow molecular distribution type for laminate
KB-560	800-1,500* <sup>4</sup>	95-105	58-60	-	End capped type for ENPLA
KB-562P	1,700-2,300* <sup>4</sup>	113-120	57-59	-	End capped type for ENPLA
KB-563H	3,000-4,000* <sup>4</sup>	135-145	54-57	-	End capped type for ENPLA
KDB-430A80	425-440	1,700-2,500* <sup>3</sup>	19-21	19-21	Standard resin for FR-4 laminate
KDB-621A80	440-460	800-1,600* <sup>3</sup>	19.5-20.5	19.5-20.5	UV-Blocking resin for FR-4 laminate
KDB-652A80	385-405	800-2,000* <sup>3</sup>	17.5-18.5	19.5-20.5	Middle Tg resin for laminate

\*<sup>1</sup> Ball & Ring Method \*<sup>2</sup> Brookfield Viscometer at 40°C \*<sup>3</sup> Brookfield Viscometer at 25°C \*<sup>4</sup> Mw (Reference data)

## HYDROGENATED BPA TYPE EPOXY RESIN



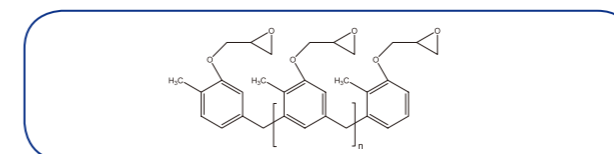
Grade	EEW (g/eq)	Viscosity (cps@25°C)	Softening Point* <sup>1</sup> (°C)	Color (G,max.)	Characteristics/Use
ST-3000	220-240	2,500-4,000	-	2	Good compatibility with acrylic and polyester resin
ST-4000D	600-750	-	85-100	3	Good exterior durability, Powder coating
ST-4100D	1,000-1,200	-	100-115	3	Good exterior durability, Powder coating
ST-5080	550-650	-	78-88	1	Good exterior durability, Powder coating
ST-5100	900-1,100	-	95-105	1	Good exterior durability, Powder coating

\*<sup>1</sup> Ball & Ring Method

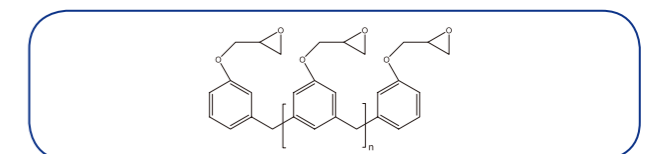
## NON-HALOGEN FLAME RETARDANT EPOXY RESIN

Grade	EEW (g/eq)	Viscosity (cps@25°C)	Volatile Content (wt.%)	Characteristics/Use
KDP-550MC65	555-585	2,200-2,800	34-36	High adhesive for laminate
KDP-555MC80	250-280	15,000-20,000	19-21	High Tg for laminate

## NOVOLAC EPOXY RESIN



[o-Cresol Novolac]



[Phenol Novolac]

### 1. o-Cresol Novolac Type

Grade	EEW (g/eq)	Softening Point* <sup>1</sup> (°C)	Hy-Cl (ppm,max.)	Color (G,max.)	Characteristics/Use
YDCN-500-1P	190-210	50-54	350	2	EMC, Laminate, Coating
YDCN-500-4P	200-212	60-63	350	2	EMC, Laminate, Coating
YDCN-500-5P	200-212	63-66	350	2	EMC, Laminate, Coating
YDCN-500-7P	200-212	66-70	350	2	EMC, Laminate, Coating
YDCN-500-8P	200-212	68-72	350	2	EMC, Laminate, Coating
YDCN-500-10P	200-212	70-74	350	2	EMC, Laminate, Coating
YDCN-500-80P	190-220	75-85	350	2	EMC, Laminate, Coating
YDCN-500-90P	190-220	85-95	350	2	EMC, Laminate, Coating
YDCN-500-90PA75	200-230	-	75±1* <sup>2</sup>	1	Acetone solution type
YDCN-500-80PBC60	190-220	-	60±1* <sup>2</sup>	8	Butyl carbitol solution type
YDCN-500-80PCA60	190-220	-	60±1* <sup>2</sup>	8	Cellosolve acetate solution type

\*<sup>1</sup> Ball & Ring Method \*<sup>2</sup> Non-Volatile Content(wt.%)



## 2. Phenol Novolac Type

Grade	EEW (g/eq)	Viscosity (cps)	Color (G,max.)	Characteristics/Use
YDPN-631	165-185	A-D* <sup>1</sup>	3	High heat resistance, Molding, Low viscosity
YDPN-636	170-180	2,000-8,000* <sup>5</sup>	3	High heat resistance, Low viscosity
YDPN-638	170-190	H-K* <sup>1</sup>	3	High heat resistance, Molding
YDPN-641	170-190	800-1,100* <sup>2</sup>	3	High heat resistance
YDPN-644	195-235	32,000-52,000* <sup>3</sup>	3	High Performance
YDPN-638A80	170-190	80±1* <sup>4</sup>	3	Acetone solution type
YDPN-638X80	170-190	80±1* <sup>4</sup>	3	Xylene solution type

\*<sup>1</sup> Gardner Holdt Method, Butyl Carbitol NV 60% Solution \*<sup>2</sup> I.C.I Viscometer at 150°C \*<sup>3</sup> Brookfield Viscometer at 60°C  
\*<sup>4</sup> Non-Volatile Content(wt.%) \*<sup>5</sup> Brookfield Viscometer at 52°C

## 3. Low Viscosity Phenol Novolac Type

Grade	EEW (g/eq)	Solution Viscosity* <sup>1</sup> (25°C)	Color (G,max.)	Characteristics/Use
KDPN-1020	165-185	D-G	3	High heat resistance, Low viscosity

\*<sup>1</sup> Gardner Holdt Method, Butyl Carbitol NV 60% Solution

## 4. BPA-Novolac Type

Grade	EEW (g/eq)	Softening Point* <sup>1</sup> (°C)	Color (G,max.)	Characteristics/Use
KBPN-110	190-230	60-70	3	High heat resistance, High performance
KBPN-115	200-230	70-80	3	High heat resistance, High performance
KBPN-120	200-230	80-90	3	High heat resistance, High performance
KBPN-110EK80	196-210	3000max* <sup>2</sup>	3	High heat resistance for laminate

\*<sup>1</sup> Ball & Ring Method \*<sup>2</sup> Brookfield Viscometer at 25°C

## 5. DCPD Type

Grade	EEW (g/eq)	Softening Point* <sup>1</sup> (°C)	Characteristics/Use
KDCP-130	240-260	65-75	Low melt viscosity, Low moisture absorption, EMC, PCB, etc.
KDCP-150	270-290	75-85	Low melt viscosity, Low moisture absorption, EMC, PCB, etc.
KDCP-130EK80	245-255	79-81* <sup>2</sup>	Low melt viscosity, Low moisture absorption, EMC, PCB, etc.

\*<sup>1</sup> Ball & Ring Method \*<sup>2</sup> Non-Volatile Content(wt%)

## 6. Xylok Type

Grade	EEW (g/eq)	Softening Point* <sup>1</sup> (°C)	Characteristics/Use
KDXN-1055	225-255	50-60	Flame retardance, Low moisture absorption, Electronic application

\*<sup>1</sup> Ball & Ring Method

## 7. Multi-functional Novolac Type

Grade	EEW (g/eq)	Softening Point* <sup>1</sup> (°C)	Characteristics/Use
KDMN-1065	162-176	65-75	High heat resistance, EMC, PCB, etc

\*<sup>1</sup> Ball & Ring Method

## MULTI-FUNCTIONAL EPOXY RESIN

Grade	EEW (g/eq)	Softening Point* <sup>1</sup> (°C)	Hy-Cl (wt, %)	Color (G,max.)	Characteristics/Use
KD-1011	270-300	50-58	0.2 max	2	Low temp. curing coating, High heat resistance
KD-1012	300-360	65-80	0.2 max	2	Low temp. curing coating, High heat resistance
KD-1014	320-370	75-90	0.2 max	1	Low temp. curing coating, High heat resistance
KD-1024	340-400	85-95	0.2 max	3	Low temp. curing coating, High heat resistance

\*<sup>1</sup> Ball & Ring Method

## FLEXIBLE EPOXY RESIN

### 1. Dimer Acid Modified Epoxy Resin

Grade	EEW (g/eq)	Viscosity (cps@25°C)	Color (G,max.)	Characteristics/Use
YD-171	390-470	400-900	12	Dimer acid modified epoxy resin
YD-172	600-700	Semisolid	6	Dimer acid modified epoxy resin
YD-172X75	600-700	X-Z* <sup>1</sup>	6	Xylene solution type
YD-173	600-700	Semisolid	6	Dimer acid modified epoxy resin
KD-176A	280-380	5,000-15,000* <sup>2</sup>	-	Dimer acid modified epoxy resin

\*<sup>1</sup> Gardner Holdt Method \*<sup>2</sup> Brookfield Viscometer at 50°C

### 2. Rubber Modified Epoxy Resin

Grade	EEW (g/eq)	Viscosity (cps@25°C)	Color (G,max.)	Characteristics/Use
KR-170	200-235	30,000-60,000	8	CTBN modified epoxy resin
KR-202C	350-400	600-1,000	9	NBR modified epoxy resin. Mixed solvent
KR-207	175-205	2,000-3,000	10	CTBN modified epoxy resin
KR-208	270-330	8,000-12,000	5	NBR modified epoxy resin
KR-309	280-320	25,000-40,000	11	NBR modified epoxy resin
KR-415	375-425	50,000-100,000* <sup>1</sup>	10	NBR modified epoxy resin
KR-450	400-500	Semisolid	12	CTBN modified epoxy resin
KR-818	370-430	Semisolid	8	CTBN modified epoxy resin
KR-909	350-400	15,000-40,000	11	NBR modified epoxy resin
KR-627	190-210	10,000-30,000	Milky white	Acrylic rubber modified epoxy resin
KR-628	220-240	40,000-60,000	Milky white	Acrylic rubber modified epoxy resin

\*<sup>1</sup> Brookfield Viscometer at 50°C

### 3. Urethane Modified Epoxy Resin

Grade	EEW (g/eq)	Viscosity (cps@25°C)	Color (G,max.)	Characteristics/Use
UME-305	230-270	5,000-12,000	3	High flexibility, Molding
UME-330	265-280	10,000-40,000* <sup>1</sup>	5	Elasticity, Molding

\*<sup>1</sup> Brookfield Viscometer at 40°C

### UV CURING TYPE EPOXY RESIN

Grade	Acid Value (mgKOH/g)	Solution Viscosity* <sup>1</sup> (25°C)	Volatile Content (wt.%)	Color (G,max.)	Characteristics/Use
KDU-651	3max.	Semisolid	-	1	NV 100%
KDU-651TP75	1max.	Z <sub>3</sub> -Z <sub>5</sub>	25±1	1	TPGDA
KDU-653	3max.	Semisolid	-	5	NV 100%

\*<sup>1</sup> Gardner Holdt Method

### LOW TEMPERATURE CURING TYPE EPOXY RESIN

Grade	EEW (g/eq)	Solution Viscosity* <sup>1</sup> (25°C)	Non-Volatile Content (wt.%)	Color (G,max.)	Characteristics/Use
KDN-253	300-340	W-Z	70±1	1	Low temp. curing coating, Adhesive
KDN-255	450-500	S-W	60±1	1	Low temp. curing coating, Adhesive

\*<sup>1</sup> Gardner Holdt Method, Butyl Carbitol NV 40% solution

### PHENOXY RESIN

Grade	Solution Viscosity (25°C)	Non-Volatile Content (wt.%)	Color (G,max.)	Characteristics/Use
YP-50	Z <sub>1</sub> -Z <sub>5</sub> * <sup>1</sup>	100	3	Magnetic tape, Polymer blend
YP-50EK35	W-Z <sub>2</sub>	35±1.5	-	Paint, Can coating
YP-55	50,000-60,000* <sup>2</sup>	84* <sup>3</sup>	-	BPA type
YP-70	50,000-60,000* <sup>2</sup>	74* <sup>3</sup>	-	BPA/BPF type

\*<sup>1</sup> Gardner Holdt Method, MEK NV 40% solution \*<sup>2</sup> Mw(Reference data) \*<sup>3</sup> Tg(°C), DSC(Reference data)

### EPOXY RESIN FOR P.C.M.

Grade	Mw	Viscosity (cps@25°C)	Non-Volatile Content (wt.%)	Characteristics/Use
KU-400T40	20,000-30,000	3,000-4,800	40±1	Mixed solvent, Coil coating
KU-420K40	15,000-30,000* <sup>3</sup>	X-Z* <sup>1</sup>	40.5±1	Mixed solvent, Coil coating
KU-450B40	5,000-15,000* <sup>3</sup>	T-Y* <sup>1</sup>	40±2	Mixed solvent, Coil coating
YD-017CW50	2,000-2,200* <sup>2</sup>	700-1,300	51±1	Mixed solvent, Coil coating
YD-017KC50	2,000-2,200* <sup>2</sup>	T-Z* <sup>1</sup>	50±1	Mixed solvent, Coil coating

\*<sup>1</sup> Gardner Holdt Method \*<sup>2</sup> EEW(g/eq) \*<sup>3</sup> Reference data

### EPOXY MODIFIED POLYOL (ISOCYANATE CURING TYPE)

Grade	OH Value (mgKOH/g)	Solution Viscosity (25°C)	Non-Volatile Content (wt.%)	Characteristics/Use
YU-300	100-130	Z-Z <sub>4</sub>	60±1	Tar-urethane coating, MIBK/Toluene=1/1

### FILAMENT WINDING, LAMINATING EPOXY RESIN

Grade	EEW (g/eq)	Viscosity (cps@25°C)	Color (G,max.)	Characteristics/Use
KBR-1722	190-200	3,000-7,000	2	F/W, Laminate
KBR-1726	187-197	4,500-6,500	1	F/W, Paint
KBR-1728	175-190	6,500-9,500	1	F/W, Non-crystal type
KBR-1729	170-190	3,000-7,000	1	F/W, Laminate
KBR-1753	190-205	800-1,000	1	F/W, Laminate, Paint

### MOLDING EPOXY RESIN

Grade	EEW (g/eq)	Viscosity (cps@25°C)	Color (G,max.)	Characteristics/Use
YC-195	360-400	500-700* <sup>1</sup>	1	Large scale electrical molding, Hardener YC-195H
YC-195B	370-420	380-550* <sup>1</sup>	1	Large scale electrical molding, Hardener YC-195H
YC-230	185-200	10,000-15,000	1	Electrical parts, Hardener YC-230H
KC-305	183-192	9,500-13,000	0.5	Large scale electrical casting, Transformer, Hardener KC-305H
KC-335	188-196	8,500-15,000	-	Electrical casting, Molding, Hardener KC-335H

\*<sup>1</sup> Brookfield Viscometer at 120°C

## SPECIAL TYPE EPOXY RESIN

### 1. High Solid Epoxy Resin

Grade	EEW(g/eq)	Viscosity(cps@25°C)	Characteristics/Use
KD-174X90	230-270	1,000-3,000	High solid epoxy resin
KD-175LX90	240-300	2,000-8,000	High solid epoxy resin
KD-175X90	240-275	2,000-4,000	High solid epoxy resin
KD-176EX80	290-330	1,000-2,000	High solid epoxy resin
KD-176X80	290-330	1,000-2,000	High solid epoxy resin

## COMPARATIVE PROPERTY DATA

### High Solid Type Epoxy Resin

EPOKUKDO KD-17X series is a high solid epoxy resin which is derived from Bisphenol-A, Epichlorohydrin and special modification to improve mechanical properties such as adhesion, impact resistance and flexibility. It is recommended for low VOCs coating system needed flexibility and corrosion protection.

### Features of High Solid Type Epoxy Resin

- Low solution viscosity
- Improved compatibility with polyamide and hydrocarbon resins
- Better flexibility than standard resin

- Longer pot life than standard resin
- Improved salt fog and water resistance than standard resin

### Suggested uses

- Marine and Protective Coatings
- Industrial Maintenance
- Epoxy Top Coat Applications
- Railcar Coatings



### Formulation

	EEW(g/eq)	G-5022X70* <sup>1</sup>	GX-475B70* <sup>2</sup>	KMH-101X80* <sup>3</sup>
AHEW (g/eq)	-	250	190	163
YD-134X90	278	90 phr	68 phr	59 phr
KD-174X90	272	92 phr	70 phr	60 phr
KD-175LX90	282.5	89 phr	67 phr	58 phr
KD-175X90	282.5	89 phr	67 phr	58 phr

\* Curing Condition : Room Temperature x 14 days  
 \* Plate : Cold Rolled Steel (0.7T)  
 \* EEW : Epoxy Equivalent Weight (solution base)  
 \* AHEW : Active Hydroxyl Equivalent Weight (solution base)  
 \*<sup>1</sup> : Polyamide Hardener  
 \*<sup>2</sup> : Polyamide Adduct Type Hardener  
 \*<sup>3</sup> : Phenalkamine Hardener

### Test Results

Classification	G-5022X70			GX-475B70			KMH-101X80		
	A* <sup>1</sup>	B* <sup>2</sup>	C* <sup>3</sup>	A* <sup>1</sup>	B* <sup>2</sup>	C* <sup>3</sup>	A* <sup>1</sup>	B* <sup>2</sup>	C* <sup>3</sup>
YD-134X90	100 / 100	50/50F* <sup>4</sup>	8.7	64 / 100	50F/40F	7.6	5 / 100	30F/10F	8.2
KD-174X90	100 / 100	50/50	9.1	100 / 100	50F/50F	7.7	12 / 100	30F/20F	8.9
KD-175LX90	100 / 100	50/50	9.0	100 / 100	40F/40F	7.9	48 / 100	50F/30F	8.8
KD-175X90	100 / 100	50/50	9.0	100 / 100	50F/50F	7.8	63 / 100	50F/40F	8.9

\*<sup>1</sup> A : Adhesion test (cross-hatch) \*<sup>2</sup> B : Dupont test (Impact Test, D/R), condition : 1/2 inch x high(cm) x 1,000 g \*<sup>3</sup> C : Erichsen Test (mm) \*<sup>4</sup> F : Failed

### 2. High Performance Adhesion Epoxy Resin

Grade	EEW(g/eq)	Viscosity (cps@25°C)	Characteristics/Use
KSR-176X90	240-270	2,000-5,000	Excellent adhesion for non-ferrous metal and glass
KSR-177	190-220	9,000-15,000	Excellent adhesion for non-ferrous metal and glass
KSR-276	450-500	50-60 * <sup>1</sup>	Excellent adhesion for non-ferrous metal and glass
KSR-276M70	450-500	500-2,500	Excellent adhesion for non-ferrous metal and glass
KSR-276EK70	450-500	100-600	Excellent adhesion for non-ferrous metal and glass
KSR-277EK70	450-500	500-2,500	Excellent adhesion for non-ferrous metal and glass

\*<sup>1</sup> Softening Point(°C) : Ball & Ring Method

## COMPARATIVE PROPERTY DATA

### High Performance Adhesion Epoxy Resin

EPOKUKDO KSR series is a High Performance Epoxy Resin, which provides excellent adhesion to wide range of substrates such as glass and nonferrous metals. It shows excellent wettability, leveling and high gloss as well. KSR Series follows the trends of lightweight using light materials.

### Features

1. Excellent adhesion to nonferrous metals
2. Good wettability and leveling on nonferrous metals
3. Good compatibility with polyamide and hydrocarbon resins
4. High gloss type

### Applicable Substrates

- Aluminum
- Titanium
- Stainless steel
- Copper
- Steel
- Glass
- Magnesium
- Bronze
- Nickel
- Nickel Chrome plating
- Tin
- Nonferrous alloy

### Adhesion Measurement

Substrate		KSR-276M70	YD-011X70	KSR-177	YD-128
Cross Hatch (% Retained)	Glass	100	30	100	20
	Aluminum	100	40	100	37
	Steel	-	-	100	100
	Stainless steel	100	15	-	-
	Tin	100	18	-	-
	Copper	100	12	-	-

\* Test Method : ASTM D 3359B

\* Mixing ratio : KSR-276M70/G-640=16phr, YD-011X70 / G-640=16phr

\* Curing condition : 3days at RT x 80°C for 1hr

\* Curing agent : Kukdo Domide G-640

\* Film thickness : 20μm

\* Substrate condition : No sanding treatment

\* Mixing ratio : KSR-177/G-640=100/53,

YD-128 / G-640=100/59

\* Curing condition : 80°C for 2hr

Unit: kg/cm<sup>2</sup>

Item	KSR-177	YD-128
Shear adhesion strength	80.8	34.1

\* Substrate condition : No sanding treatment on Aluminum

\* Mixing ratio : KSR-177/G-640=100/53

YD-128 / G-640=100/59

\* Curing condition : 80°C for 2hr

### 3. BPA-PO Epoxy Resin

Grade	EEW(g/eq)	Viscosity (cps@25°C)	Characteristics/Use
KDSF-180	300-350	3,000-6,000	High adhesive, Low viscosity

### 4. Modified Weatherable Epoxy Resin

Grade	EEW(g/eq)	Viscosity (cps@25°C)	Characteristics/Use
KT-3100X70	360-400	200-400	Advanced weather resistance
KT-3200X70	450-500	300-1,300	Advanced weather resistance

### TRI-FUNCTIONAL EPOXY RESIN

Grade	EEW(g/eq)	Viscosity (cps@25°C)	Hy-Cl (wt.%)	Specific Gravity* <sup>1</sup> (20°C)	Color (G,max.)	Characteristics/Use
YH-300	135-150	100-300	0.1max	1.14	1	TMPTGE type
YH-325	175-190	4,000-6,000	0.1max	1.16	1	High adhesion

\*<sup>1</sup> Reference data

### TETRA-FUNCTIONAL EPOXY RESIN

Grade	EEW(g/eq)	Viscosity (cps@25°C)	Volatile Content (wt.%)	Hy-Cl (ppm)	Characteristics/Use
KDT-4400	210-240	80-90* <sup>1</sup>	-	3,000max.	High heat resistance, UV-Blocking
KDT-4400A70	210-240	100-200	29-31	1,400-1,600	High heat resistance, UV-Blocking Acetone solution type
KDT-4400M70	210-240	150-350	29-31	1,400-1,600	High heat resistance, UV-Blocking MEK solution type

\*<sup>1</sup> Softening Point (°C) : Ball & Ring Method

### WATERBORNE EPOXY RESIN

Grade	EEW(g/eq)	Viscosity (cps@25°C)	Non-Volatile Content(wt.%)	Characteristics/Use
KEM-128M	200-220	7,000-15,000	100	YD-128 based self-emulsifiable epoxy resin
KEM-128R	195-215	2,000-8,000	100	YD-128 based self-emulsifiable epoxy resin
KEM-128-70	190-210* <sup>1</sup>	1,000-10,000	70±2	Liquid based epoxy emulsion resin Waterborne paint, Adhesive, Cement mortar, Sizing
KEM-134-60	260-300* <sup>1</sup>	500-7,000	60±2	Semisolid based epoxy emulsion resin Waterborne paint, Adhesive, Cement mortar, Sizing
KEM-101-50	450-550* <sup>1</sup>	1,000-10,000	47±2	Solid based epoxy emulsion resin Waterborne paint, Adhesive, Cement mortar, Sizing
KEM-012F-50	700-1,000* <sup>1</sup>	200-1,000	50±2	Solid based epoxy emulsion resin Waterborne paint, Sizing
KEM-474F-55	1,100-1,500* <sup>1</sup>	500-5,000	55±2	Solid based epoxy emulsion resin Waterborne paint, Sizing
KEM-638-60	190-210* <sup>1</sup>	500-5,000	60±2	Phenol novolac based emulsion resin Waterborne paint, Sizing

\*<sup>1</sup> Basis of solid content

### REACTIVE DILUENT

Grade	EEW(g/eq)	Viscosity (cps@25°C)	Color (G,max.)	Characteristics/Use
PG-202	135-165	15-30	1	NPGDGE type
PP-101	220-240	10-20	5	SBPMGE type
PG-207	310-330	55-75	60* <sup>1</sup>	PPGDGE type
PG-207P	300-330	40-100	0.2	PPGDGE type
Neokukdo-E	240-265	5-20	2	Coating, Carboxylic acid glycidyl ester
LGE	275-300	5-20	30* <sup>1</sup>	Aliphatic glycidyl ether
BGE	145-155	1-5	30* <sup>1</sup>	Butyl glycidyl ether
1,6HDGE	135-165	10-30	50* <sup>1</sup>	1,6 Hexanediol diglycidyl ether
1,4BDGE	120-140	15-30	50* <sup>1</sup>	1,4 Butanediol diglycidyl ether

\*<sup>1</sup> APHA Color

## SUMMARY OF HARDENER PRODUCT GROUP

PRODUCT GROUP	PRODUCT PROPERTIES	PRODUCT TYPE
POLYAMIDES	Ambient cure, low toxicity, good flexibility and toughness, high viscosity, long pot-life and good water resistance. Polyamide-Adducts provide good compatibility and faster dry under severe conditions than standard polyamides.	G-series
AMIDOAMINES	Low viscosity. Exhibit very good adhesion, particularly to concrete. Modified Amidoamine can offer faster cure speed, lower viscosity and good chemical resistance.	G-A series
ALIPHATIC AMINES	Wide range of products has a different properties. High reactivity and fast cure at room or low temperature. Relatively moisture sensitivity. Good chemical resistance, particularly to solvents. For heat-cure applications, very good chemical resistance and electrical and mechanical properties.	KH-5 series
CYCLOALIPHATIC AMINES	Good film properties such as excellent gloss. Resistance to amine blush and water-spotting. For heat-cure applications, good elevated-temperature performance and very good chemical resistance.	KH-8 series
AROMATIC AMINES	For heat-cure applications, low viscosity. Lower exothermic and higher heat resistance. Very good chemical resistance and electrical properties.	TH-series
PHENALKAMINES	Good cure at low temperature condition. Good chemical resistance and anti-corrosive. High-solid and solvent free system are available for marine coating.	KMH-series
WATERBORNE CURING AGENTS	Water is a diluent, instead of solvents in waterborne-epoxy system. This system with Zero-VOC may not affect on environmental conditions.	KH-7 series
ACCELERATOR & CATALYST	This includes tertiary amines, imidazoles substituted urea (e.g., thiourea.). Tertiary amines and imidazoles are excellent accelerators for other curing agents such as dicyandiamide and anhydrides.	KH-30

## POLYAMIDE & AMIDOAMINE TYPE

Grade	TAV* <sup>1</sup> (mgKOH/g)	Viscosity (cps@25°C)	Color (Gardner)	A.H.E.W. (g/eq)	Description
G-700	90-100	Semi-Solid	12max.	450-500	High M.W Type Coatings, Adhesives
G-5022	200-240	50,000-70,000* <sup>2</sup>	12max.	165-185	Standard high-viscosity polyamide Flexibility, Long pot-life and good properties with solid epoxy resin
G-0930	280-320	8,000-12,000* <sup>2</sup>	12max.	120-140	Standard medium-viscosity polyamide 1:1 volume ratio with standard liquid epoxy resin
G-640	370-400* <sup>3</sup>	8,000-12,000	12max.	100-120	Standard high-imidazoline content polyamide High solid coatings, Adhesives, Sealer and putties
G-0430	270-330	4,500-8,500	16max.	100-120	Medium-viscosity polyamide Adhesive, Civil works Competitive price
G-0331	280-340	2,500-4,500	12max.	100-120	Medium-viscosity polyamide Adhesives, Civil works
G-650	370-400* <sup>3</sup>	2,000-4,000	10max.	100	Medium-viscosity polyamide High solid coatings, Adhesives, Sealer and putties
G-0240	370-430	1,500-3,000	12max.	60-80	Standard type polyamide for adhesives, Coatings
G-A0533	310-350	500-1,000	14max.	95-115	Grouts, Mortar and floorings, Low-viscosity adhesives
G-A0432	320-380	200-600	10max.	70-80	High-imidazoline content amidoamine Grouts, Mortar and adhesives
G-A0635	325-375* <sup>3</sup>	500-850	10max.	93	Grouts, Mortar and adhesives Good chemical resistance
G-5022X70	140-170	T-W* <sup>4</sup>	9max.	235-265* <sup>5</sup>	DOMIDE G-5022X70 is a 70% solid solution of DOMIDE G-5022 cut in xylene Solventborne primer coating Long pot-life

\*<sup>1</sup> TAV : Total Amine Value(0.1N-HCl Method) \*<sup>2</sup> Viscosity : cps at 40°C \*<sup>3</sup> TAV : Total Amine Value(0.1N-HClO<sub>4</sub> Method)  
\*<sup>4</sup> Viscosity : Gardner Holdt Method \*<sup>5</sup> A.H.E.W. : Solution base

## POLYAMIDE ADDUCT TYPE

Grade	TAV* <sup>1</sup> (mgKOH/g)	Viscosity (cps@25°C)	NV* <sup>2</sup> (wt.%)	Solvents	A.H.E.W.* <sup>5</sup> (g/eq)	Description
GX-328B75	230-260* <sup>3</sup>	4,000-8,000	74-76	n-Butanol	160-180	Polyamide adduct High solid, Anti-corrosive coatings for marine & industrial use
GX-328K	210-250	1,500-4,500	75-77	Xylene	110-130	Polyamide adduct High solid, Anti-corrosive coatings for marine & industrial use
GX-422	110-150	Z-Z <sub>3</sub> * <sup>4</sup>	59-61	Xylene/ iso-Butanol	350-390	Polyamide adduct Solventborne coatings Fast dry
GX-430	170-220* <sup>3</sup>	2,000-6,000	73-77	n-Butanol	180-190	Polyamide adduct High solid, Anti-corrosive coatings for marine & industrial use
GX-450TI60	120-140	800-1,500	58.5-61.5	Toluene/ iso-propanol	316	Polyamide adduct Coal tar Epoxy curing agent
GX-450XB70	145-165* <sup>3</sup>	4,500-8,500	68.5-71.5	Xylene/ n-Butanol	330	Polyamide adduct Fast dry and fast cure Anti-corrosive coatings for marine & industrial use
GX-455X75	120-160	3,000-7,000	73-77	Xylene	260-280	Polyamide adduct High solid, Anti-corrosive coatings for marine & industrial use
GX-460	230-270* <sup>3</sup>	3,000-6,000	88-92	Ethanol	190	Polyamidoamine adduct High solid, Anti-corrosive coatings for marine & industrial use
GX-475B70	135-175	1,500-3,500	68.5-71.5	n-Butanol	190	Polyamide adduct Fast dry and fast cure Anti-corrosive coatings for marine & industrial use
GX-483	180-219* <sup>3</sup>	2,700-6,400	100	-	133	Polyamidoamine adduct High solid coatings for marine & industrial use
GX-533	260-320	800-2,000	100	-	100	Polyamidoamine adduct
GX-540	250-290* <sup>3</sup>	1,200-2,500	100	-	115	Polyamidoamine adduct High solid coatings for marine & industrial use

\*<sup>1</sup> TAV : Total Amine Value(0.1N-HCl Method) \*<sup>2</sup> N.V : Non-Volatile Content(wt.%) \*<sup>3</sup> TAV : Total Amine Value(0.1N-HClO<sub>2</sub> Method)  
\*<sup>4</sup> Viscosity : Gardner Holdt Method \*<sup>5</sup> A.H.E.W. : Solution base

## ALIPHATIC AMINE MODIFIED TYPE

Grade	TAV* <sup>1</sup> (mgKOH/g)	Viscosity (cps@25°C)	Color (Gardner)	A.H.E.W. (g/eq)	Description
KH-240	280-360	2,000-4,000	15max.	80-90	Adhesives, Sealants and putties Concrete repair
KH-252	420-500	50-800	12max.	75	Fast cure Accelerator for other curing agent
KH-406	600-660	300-900	5 max.	47	Good chemical resistance and mechanical properties
KH-417	420-480	500-3,000	8 max.	75	Fast cure Accelerator for other curing agent
KH-500	450-500	500-4,000	7max.	70	Mannich product Curable at low temperature and damp conditions
KH-500F	450-500	500-4,000	7max.	70	Mannich product curable at low temperature and damp conditions Reduced free amine and phenol comparing with KH-500
KH-505	300-370	500-2,500	10max.	90-105	Curable under damp condition
KH-506	340-400	500-2,000	9max.	70	Fast curing under cold and damp conditions Good water-spot resistance
KH-530N	450-500	20-50	6max.	90-100	Laminating, Floorings, Grouts
KH-531N	290-350	30-150	3max.	80-90	Self-leveling, Floorings, Grouts, Mortar
KH-550N	360-420	100-200	8max.	90-100	Fast cure Accelerator for other curing agent
KH-602	670-730	50-250	5max.	47	Good flexibility and mechanical properties Resin mortar, Grouts
KH-620	550-610	2,000-5,000	6max.	38	Fast cure Good resistance to alcohol, solvents, acids

\*<sup>1</sup> TAV : Total Amine Value(0.1N-HCl Method)

## CYCLOALIPHATIC AMINE MODIFIED TYPE

Grade	TAV* <sup>1</sup> (mgKOH/g)	Viscosity (cps@25°C)	Color (Gardner)	A.H.E.W. (g/eq)	Description
KH-808	310-370	200-500	7 max.	75	Self-leveling floorings High-solid coatings
KH-809	345-385	400-900	5 max.	95	Self-leveling floorings High-solid coatings
KH-811	370-430	2,000-6,000	3max.	65	Good chemical resistance Floorings, high gloss coatings
KH-812	290-350	30-150	3max.	85	Low viscosity High solid, Solvent-free floorings
KH-813	300-350	80-200	8max.	85-90	Low viscosity Solvent-free and high solid coatings Tank linings
KH-814	300-360	30-100	3max.	95	Low viscosity Good color retention, High gloss Solvent-free and high solid coatings
KH-815N	245-305	100-1,000	3max.	105-110	Resin mortar Solvent-free and high solid coatings
KH-816	220-320	300-500	3max.	110	Good color retention, High gloss Solvent-free and high solid coatings
KH-818B	250-320	100-300	3max.	110	Low viscosity Good color retention, High gloss Solvent-free and high solid coatings
KH-819	340-390	50-150	5max.	85	Low viscosity Solvent-free and high solid coatings
KH-820	235-275* <sup>2</sup>	350-700	10max.	110	Excellent chemical resistance High solid, Solvent free floorings
KH-825N	270-300	80-350	5max.	95-100	Low viscosity, High gloss Resin mortar, Floorings
KH-831	330-400	400-1,000	3max.	85	Self-leveling floorings Solvent-free and high solid coatings
KH-835	305-335	20-40	2max.	78	Self-leveling floorings Low viscosity Good color retention, High gloss
KH-836	340-380	250-450	5max.	78	Self-leveling floorings Low temperature cure
KH-852	350-450	200-500	7max.	75	Self-leveling floorings Solvent-free and high solid coatings
KH-891	290-350* <sup>2</sup>	7,000-13,000	3max.	179	Adhesives, Sealer and putties Fast cure
KH-892	420-460* <sup>2</sup>	500-2,000	3max.	120	Floorings, Resin mortar Fast cure

\*<sup>1</sup> TAV : Total Amine Value(0.1N-HCl Method) \*<sup>2</sup> TAV : Total Amine Value(0.1N-HClO<sub>4</sub> Method)

## AROMATIC AMINE MODIFIED TYPE

Grade	Viscosity (cps@25°C)	Appearance	A.H.E.W. (g/eq)	Description
TH-430	4,000-8,000	Dark brown liquid	110	Good chemical resistance
TH-431	3,200-6,300	Dark brown liquid	110	Good chemical resistance
TH-432	300-1,000	Dark brown liquid	110	Good chemical resistance
TH-437	600-2,000	Dark brown liquid	75	Good chemical resistance
TH-438	14,000-23,000	Dark brown liquid	110	Good chemical resistance
TH-451	14,000-23,000	Dark brown liquid	110	Good chemical resistance
TH-452N	1,500-2,500	Dark brown liquid	110	Good chemical resistance

## PHENALKAMINE TYPE

Grade	TAV* <sup>1</sup> (mgKOH/g)	Viscosity (cps@25°C)	Non-Volatile Content (wt%)	Solvent	A.H.E.W* <sup>2</sup> (g/eq)	Description
KMH-100	490-550	1,000-4,000	100	-	81	Phenalkamine type Low viscosity Coatings for marine & industrial use
KMH-101	300-335	20,000-45,000	100	-	130	Phenalkamine type Coatings for marine & industrial use
KMH-101X90	250-290	2,500-4,500	88-92	Xylene	144	Phenalkamine solution type Coatings for marine & industrial use
KMH-121X80	170-210	4,000-8,000	78-82	Xylene	225	Phenalkamine modified type High solid anti-corrosive coatings for marine & industrial use High flexibility
KMH-151XB70	170-210	1,000-3,000	68-72	Xylene/ n-Butanol	170	Phenalkamine modified type Coatings for marine & industrial use
KMH-153XB80	220-265	1,000-4,000	78-82	Xylene/ n-Butanol	164	Phenalkamine modified type High solid anti-corrosive coatings for marine & industrial use
KMH-154XB70	160-210	1,000-3,000	68-72	Xylene/ n-Butanol	169	Phenalkamine modified type Coatings for marine & industrial use
KMH-350X80	155-175	2,500-5,000	78-82	Xylene	180	Phenalkamine modified type High solid anti-corrosive coatings for marine & industrial use
KMH-553XI80	170-190	1,000-4,000	68-72	Xylene/ IPA	255	Phenalkamine modified type Coatings for marine & industrial use
KMH-591X70	145-175	1,000-3,000	68-72	Xylene	250	Phenalkamine & Polyamide modified type
KMH-310	260-300	500-1,000	100	-	100	Phenalkamine free solvent type Low viscosity Coatings for marine & industrial use

\*<sup>1</sup> TAV : Total Amine Value (0.1N-HClO<sub>4</sub> Method) \*<sup>2</sup> A.H.E.W : Solution base

## COMPARISON OF CURED PROPERTIES OF PHENALKAMINES FOR EPOXY APPLICATIONS

Grade	KMH-100	KMH-101	KMH-121X80	KMH-151XB70	KMH-153XB80	KMH-154XB70	KMH-350X80	KMH-591X70	KMH-310
Low Temperature Cure	△	△	○	◎	○	◎	○	△	△
Price competition	◎	◎	△	◎	◎	◎	x	○	x
Appearance	x	x	◎	x	x	x	○	△	○
Chemical Resistance	△	△	△	○	○	○	△	○	△
Flexibility	x	x	◎	△	△	△	◎	○	△
Adhesion	x	x	◎	△	△	△	◎	○	△
High solid	○	○	○	△	○	△	○	△	◎
Compatibility with Liquid epoxy	x	x	◎	△	△	△	◎	△	◎
Workability	x	x	○	◎	◎	◎	○	◎	x

Epoxy resin: YD-128(Standard liquid epoxy resin) ◎: Very good, ○: Good, △: Normal, x: Bad



SIHWA Factory



BUSAN Factory



CHINA Factory

## WATERBORNE CURING AGENT

Grade	TAV* <sup>1</sup> (mgKOH/g)	Viscosity (cps@25°C)	A.H.E.W. (g/eq)	Description
KH-700	190-250	3,000-10,000	145-185	Polyamine base Waterborne coatings and primers
KH-701	350-420	14,000-22,000	60-70	Polyamide base Primer/sealer for concrete Adhesives for wood and steel Waterborne coatings and primers
KH-720	200-250	30-150	280-320	Polyamine base. Emulsion type Waterborne coatings and primers
KH-721	190-240	10,000-20,000	140-160	Polyamine base Waterborne coatings and primers
KH-723	260-300	20,000-40,000	130	Polyamide base Waterborne coatings and primers
KH-748	190-250	5,000-15,000	160-180	Polyamine base Waterborne coatings and primers

\*<sup>1</sup> TAV : Total Amine Value (0.1N-HCl Method)

## AMINE &amp; ANHYDRIDE HARDENER

Grade		A.H.E.W. (g/eq)	H.D.T (°C)	Description
Aliphatic Amines	DETA	19-23	90-120	Civil works, Construction
	TETA	23-27	90-120	
Tertiary Amines	KH-30	10-20	90	Accelerator for anhydride, polyamide and other amines
	BDMA	10-20	100	
Araliphatic Amine	MXDA	32-36	130-150	Heat and chemical resistance
Cycloaliphatic Amine	IPDA	40-46	100-120	Good weatherability Civil works, Construction
Aromatic Amine	DDM	50-55	140	Heat and chemical resistance
Anhydrides	Me-THPA	165-175	130	Electrical fields, Laminating, Filament winding, FRP
	MNA	170-180	135	
Jeffamine	D-230	56-60	60	Coating, Molding
	D-400	98-102	50	
	A-399	10-30	60	Accelerator for Jeffamine