



UNITED INITIATORS
driving your success



NOROX[®]

Thermoset-Americas

PRODUCT CODE

CHEMICAL STRUCTURE

ACTIVE OXYGEN CONTENT

PEROXIDE CONTENT

SAFETY INFORMATION
Recommended Storage Temperature
SADT

APPLICATION TEMPERATURE
Hand Lay-up/Spray-up
Casting/Winding

Polymer Concrete & Marble, Buttons
Gelcoats
Body Fillers

Chemical Anchors & Mine bolts
RTM, Vacuum Infusion
Coatings

Resin Transfer Molding (RTM)
Cured In Place Pipes (CIPP)
Engineered Stone

Continuous Lamination
Pultrusion
SMC, BMC, GMC, TMC

SPECIAL RESINS
Vinylesters
Acrylic Resins

KETONE PEROXIDES		%	%	°C	°C	Ambient												Elevated			High		
Methyl ethyl ketone peroxides - (CAS No 1338-23-4)																							
NOROX®MEKP-925H	High dimer, lowest H2O2 available, designed for VE resins & gelcoats, less foaming	8.9		140/60	86/30	●	●	●	●	●								●	●	●	●		
NOROX®MEKP-925	High dimer for VE & IsoUPR, higher peak exotherm, more thorough cure	8.9		140/60	86/30	●	●	●	●	●								●	●	●	●		
NOROX®MEKP-950	Medium gel time for low HAP gel coats	8.9		140/60	86/30	●	●	●	●	●								●	●	●	●		
NOROX®MEKP-9H	Longer gel time but same gel-to-cure time as MEKP-9; best for gel coat	8.9		140/60	86/30	●	●	●	●	●								●	●	●	●		
NOROX®MEKP-9	Medium gel time, general purpose use	8.9		140/60	86/30	●	●	●	●	●								●	●	●	●		
NOROX®MEKP-900	Fast gel time, general purpose lamination	8.9		140/60	86/30	●	●	●	NR	●							NR	●	NR	NR	NR		
NOROX®MEKP-30	Diluted MEKP-9, best used for when more volume is needed for metering equipment	5.5		140/60	86/30	NR ²	NR ²	NR ²	NR	NR ²							NR	NR ²	NR	NR	NR ²		
NOROX®MEKP-30 HD	Diluted MEKP-925, best used for more accurate metering in filled systems	5.5		140/60	86/30	NR ²	NR ²	NR ²	NR	NR ²							NR	NR ²	NR	NR	NR ²		
NOROX®KP 900 LE	MEKP-9/TBHP BLEND for exotherm control without sacrificing gel time	8.9		140/60	86/30	●	●	●	NR	●							●	●	NR	NR	NR		
NOROX®FS 100/9	Fastest gel time, medium cure; winter use	8.9		140/60	86/30	●	●	●	NR	NR							NR	●	NR	NR	NR		
NOROX®TLC-88	MEKP-925H blend with TBPB, faster cure, higher peak exotherm	8.8		140/60	86/30	●	●	●	NR	●							●	●	●	●	●		
Acetylacetone peroxides - (CAS No 37187-22-7)																							
NOROX®PD-40	Standard AAP	4.1		140/60	77/25	●	●	●	NR ¹	●							●	●	●	●	●		
NOROX®AZOX	Improved AAP for more consistent application	4.5		140/60	86/30	●	●	●	NR ¹	●							●	●	●	●	●		
NOROX®AMP-20	AAP/MEKP blend for faster cure in thinner laminates without large gel time change	7.9		140/60	77/25	●	●	●	NR ¹	●							●	●	●	●	●		
NOROX®AMP-50	AAP/MEKP blend for faster cure in thinner laminates	6.5		140/60	77/25	●	●	●	NR ¹	●							●	●	●	●	●		
NOROX®RTM-12	Long gel time, moderate cure and peak for VRTM	4.7		131/55	86/30	●	●	●	NR ¹	●							●	●	●	●	●		
NOROX®SHP-90	AAP/TBPB blend for more heat, faster cure	4.5		131/55	86/30	●	●	●	NR ¹	●							●	●	●	●	●		
NOROX®SHP-40	Diluted SHP-90	3.6		131/55	86/30	●	●	●		●							●	●	●	●	●		
NOROX®FC-100	AAP with improved cure performance	4.5		131/55	86/30	●	●	●	NR ¹	●							●	●	●	●	●		
NOROX®750E	AAP/CHP blend for fast cure, controlled exotherm	5.6		140/60	86/30	●	●	●	NR ¹	●							●	●	●	●	●		
NOROX®757E	Diluted 750 for more accurate metering	3.5		140/60	86/30	●	●	●		●							●	●	●	●	●		
NOROX®CHAP-21E	AAP/CHP blend for RTM moderate gel time, fast cure, controlled exotherm	7.0		140/60	86/30	●	●	●	NR ¹	●							●	●	●	●	●		
Ketone Peroxides Blend (CAS No 1338-23-4 & CAS No 12262-58-7)																							
NOROX®MEC-EX	Fast gel & cure as compared to MEKP; developed for low temperature gel & cure	8.9		140/60	86/30	●	●	●	NR	●							●	●	●	●	●		
NOROX®MEC	Cures well in thin film, not affected by temperature change as much as MEKP	8.9		140/60	86/30	●	●	●	●	●							●	●	●	●	●		

PRODUCT CODE	CHEMICAL STRUCTURE	ACTIVE OXYGEN CONTENT	PEROXIDE CONTENT	SAFETY INFORMATION		APPLICATION TEMPERATURE															
		%	%	Recommended Storage Temperature	SADT	Ambient				Elevated				High							
Methyl isobutyl ketone peroxides - (CAS No 37206-20-5)																					
NOROX®PULCAT CMB	Non-refrigerated kick off initiator, modified for low odor	8,9		140/60	86/30																
NOROX®PULCAT CWM	Blend with MEKP-925 for faster start in continuous panel production	8,9		>140/60	86/30																
tert Butyl Hydroperoxide - (CAS No 75-91-2)																					
NOROX®TBHP	70% aqueous solution; convenient source of free radicals when water is present	12.5	70	>176/80	86/30																
Dicumyl peroxides - (CAS No 80-43-3)																					
NOROX®DCP	An excellent source of free radical above 302°F/150°C for SMC/BMC use	5.9	99	>158/70	86/30																
HYDROPEROXIDES																					
Cumyl hydroperoxides - (CAS No 80-15-9)																					
NOROX®CHP	80-85%, low exotherm temperature for thicker laminates	8.5	80-85	>169/76	86/30				NR												
NOROX®CHP-90	High assay CHP, low exotherm for thicker parts	9.0	86-90	>169/76	86/30				NR												
NOROX®CHM-50	Promoted CHP for fast curing of some VE resins	4.5		140/60	86/30				NR												
NOROX®MCP	Lower exotherm temperature, longer gel & cure than MCP-21; for thicker laminates	8.8		140/60	86/30				NR												
NOROX®MCP-21	Lower exotherm temperature, longer gel & cure than MCP-75; for thicker laminates	8.9		140/60	86/30				NR												
NOROX®MCP-75	Lower exotherm temperature, long gel time, good final cure; for thicker laminates	8.9		140/60	86/30																
NOROX®HDP	High dimer version of MCP	8.9		140/60	86/30				NR												
NOROX®HDP-75	High dimer version of MCP-75	8.9		140/60	86/30																
NOROX®771	Faster gel time version of MCP-75	8.9		140/60	86/30																



DIALKYL PEROXIDES		%	%	°C	°C	Ambient				Elevated				High			
Methyl ethyl ketone peroxide (CAS No. 1338-23-4)																	
NOROX®305	Technically pure flake	4.0	99	122/50	86/30												
NOROX®DTBP	An excellent source of free radicals above 212°F (100°C)	10.8	99	167/75	81/27												
NOROX®DTAB	<i>t</i> -Amyl version of DTBP	8.7	96	194/90	81/27												
Dibenzoyl Peroxides - (CAS No. 94-360)																	
BENOX®L-40LV	40%, sprayable BPO dispersion	2.6	40	>122/50	32-77/10-25				NR								
BENOX®B-50	50% BPO paste in white color	3.3	50	>122/50	32-77/10-25				NR								
BENOX®B-55	55% BPO paste in a plasticizer	3.6	55	>122/50	32-77/10-25				NR								
BENOX®C-50	50 % BPO free flowing, non-caking powder with a phthalate ester plasticizer	3.3	50	>122/50	32-77/10-25				NR								
BENOX®A-75	75% BPO granules in water	5.0	75						NR								
BENOX®A-70	70% BPO granules in water	4.5	70						NR								
Peresters																	
tert-Butyl perbenzoate - (CAS No 4511-39-1)																	
NOROX®TBPB	Efficient perester, "kicker", helps reduce residual styrene	8.1	>98	140/60	50-77/10-25												
NOROX®P-20	Promoted TBPB for elevated temperature processes with cobalt; ETA sub for 410	6.6	80	140/60	50-77/10-25												
tert-Amyl perbenzoate - (CAS No 614-45-9)																	
NOROX®TAPB	High efficient perester, lowest residual styrene levels	7.6	98	149/65	50-77/10-25												
tert-Butyl peroxy-2-ethylhexyl carbonate - (CAS No 34443-12-4)																	
NOROX®400	High efficient, low TOC-emission	6.4	97	158/70	max 68/20												
tert-Amyl peroxy-2-ethylhexyl carbonate - (CAS No 70833-40-8)																	
NOROX®401	<i>t</i> -Amyl version, better cure, lower residual styrene	6.2	97	131/55	max 68/20												
tert-Butyl peroxy-2-ethylhexanoate - (CAS No 3006-82-4)																	
NOROX®410	Fast curing perester for reduced cycle times	7.3	99	95/35	max 50/10												
NOROX®410-50OMS	50% diluted in Odorless Mineral Spirits (OMS) for better metering	3.8	50	104/40	59/15												
tert-Amyl peroxy-2-ethylhexanoate - (CAS No 686-31-7)																	
NOROX®411	<i>t</i> -Amyl version for lower residual styrene, better cure	7.3	99	104/40	max 68/20												
NOROX®411-75OMS	25% dilution in Odorless Mineral Spirits (OMS) for better metering	5.2	75	95/35	50/10												
tert-Butyl peroxyperneodecanoate - (CAS No 26748-41-4)																	
NOROX®420-75OMS	75% solution in Odorless Mineral Spirits (OMS), fast starter, economical	4.9	75	68/20	23/-5												

6 * Available as red coloured system for improved homogenization during mixing. The colour disappears in the curing process. ** Available as red colored system for improved homogenization during the hole process. The colour remains in the final product.

● = Recommended application ● = Other possible application ● = Preferred for the application

PRODUCT CODE	CHEMICAL STRUCTURE		ACTIVE OXYGEN CONTENT	PEROXIDE CONTENT	SAFETY INFORMATION		APPLICATION TEMPERATURE															
					Recommended Storage Temperature	SADT	Ambient			Elevated			High			SPECIAL RESINS						
			%	%	°C	°C	Hand Lay-up/Spray-up	Casting/Winding	Polymer Concrete & Marble, Buttons	Gelcoats	Body Fillers	Chemical Anchors & Mine bolts	RTM, Vacuum Infusion	Coatings	Resin Transfer Molding (RTM)	Cured In Place Pipes (CIPP)	Engineered Stone	Continuous Laminating	Pultrusion	SMC, BMC, GMC, TMC	Vinylesters	Acrylic Resins
tert-Amyl peroxyperneodecanoate - (CAS No 26748-41-4)																						
NOROX®422-75-AL1	75% solution, diluted version, fast starter, economical		4.7	75	68/20	23/-5																
tert-Butyl peroxy-3,5,5-trimethylhexanoate - (CAS No 13122-18-4)																						
NOROX®425	Environment friendly, high efficient perester, drinking water application		6.9	99	140/60	max 68/20									●	●		●	●	●	●	●
NOROX®425 PR	Promoted Norox 425 for elevated temperature processes		6.3	90	131/55	max 68/20						●		●	●	●		●	●	●	●	●
PEROXYDICARBONATES																						
Di(4-tert.butylcyclohexyl)peroxydicarbonate - (CAS No 15520-11-3)																						
NOROX®600	Fast kick off peroxide for two-step curing		3.8	>96	113/45	max 68/20									●	●	●	●	●	●	●	●
NOROX®600-CL2	Class II-Fast kick off peroxide for two-step curing		3.5	89	104/40	max 68/20									●	●	●	●	●	●	●	●
Dimyrisyl peroxydicarbonate - (CAS No 53220-22-7)																						
NOROX®605	Technically pure flake, low kick off temperature, economical		3.0	97	95/35	max 68/20									●			●	●	●	●	●
TBIC	Most efficient styrene scavenger		6.8	75	140/60	81/27											●	●	●	●	●	●
bis(2-Ethylhexyl) peroxydicarbonate - (CAS No 53220-22-7)																						
NOROX®608-75-AL3	Fast kick off peroxide for two-step curing		3.5	75	41/5	max 5/-15													●	●	●	●
PERKETALS																						
1,1-Di(tert.butylperoxy)cyclohexane - (CAS No 3006-86-8)																						
NOROX®505-80-AL3	Hot curing initiator, long pot life, less affected by fillers and pigments		9.7	80	140/60	86/30															●	●
1,1-Di(tert.amylperoxy)cyclohexane - (CAS No 15667-10-4)																						
NOROX®510-80-AL3	Hot curing initiator, long pot life, less affected by fillers and pigments		8.8	80	131/55	86/30															●	●
1,1-Di(tert.butylperoxy)-3,3,5-trimethylcyclohexane - (CAS No 6371-36-8)																						
NOROX®500-90-AL3	Most efficient perketal, diluted version		5.3	90	158/70	86/30									●	●		●	●	●	●	●
NOROX®802-75-AL3	Most useful for pigmented systems above 212°F (100°C) for pultrusion, SMC/BMC		6.3	75	104/40	59/15									●			●				

Safety Information

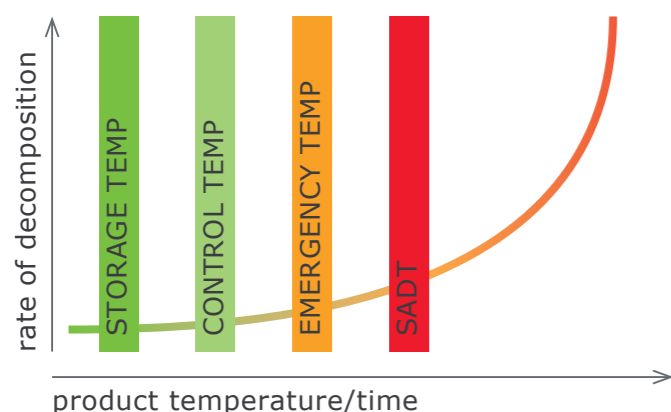
Half-life

Peroxide decomposition rates are commonly reported in terms of half-life time or when 50% of the peroxide has decomposed at a certain temperature. Recommended organic peroxide heat temperatures commonly reflect the half-life time at 10 hours, 1 hour and 1 minute. The higher the half-life temperature, the more stable the peroxide. Half-life temperatures can vary based on formulations and solvents.

Using the Arrhenius equation, acronyms related to half-life time include:

$$k_d = A \cdot e^{-EA/RT} \text{ and } t_{1/2} = \ln 2/k_d$$

k_d : Rate constant of the peroxide dissociation
 A: Arrhenius frequency factor
 E_A : Activation energy for the dissociation
 R: Ideal gas constant
 T: Temperature
 $t_{1/2}$: Half-life time



Controlling the temperature is the most important constant. If the temperature is maintained well below its self-accelerating decomposition temperature (SADT), most hazards are avoided when shipping, handling or storing. For storage over a longer period of time, follow the manufacturer's temperature recommendations.

Self-Accelerating Decomposition Temperature (SADT)

The SADT is the lowest constant temperature for self-accelerating decomposition when transporting packaged peroxides. At the SADT, when elevated heat temperatures from decomposition exceed the heat loss, over time, the peroxide's temperature increases and it decomposes faster or self-accelerates. The final decomposition may be uncontrollable.

Minimum/Maximum Recommended Storage Temperature

The maximum recommended storage temperature is lower than the control temperature for quality assurance purposes not safety. Keep in mind, some liquid or paste organic peroxides must not be stored below a certain minimum temperature as turbidity, phase separation, crystal deposits or solidification can occur.

Control Temperature (T_c)

The T_c is the maximum transportation temperature recommended for the product's estimated time of arrival. T_c is not required if the SADT exceeds 50°C (122°F). Generally, the T_c mirrors SADT canister guidelines.

$$T_c = \text{SADT minus } 20^\circ\text{C if SADT} < 20^\circ\text{C}$$

$$T_c = \text{SADT minus } 15^\circ\text{C if SADT} < 35^\circ\text{C}$$

$$T_c = \text{SADT minus } 10^\circ\text{C if SADT} < 50^\circ\text{C}$$

SADT transportation temperatures are based on recommendations by the UN Committee of Experts on the Transportation of Dangerous Goods.

Emergency Temperature (T_e)

The control temperature T_c is supplemented by an emergency temperature, T_e, which is higher than the T_c but still well below the SADT. The T_c may be exceeded if maintenance is necessary or until alternative cooling such as dry or wet ice is available. However, if the T_e is reached, emergency procedures must be implemented immediately – for instance, cooling down the organic peroxides.

Product Code	Chemical Name	Storage Temperature	EA [kJ/mol]	Half Life [°C]		
				10 h	1 h	1 min
DIPND	Di(2-neodecanoylperoxy-isopropyl)benzene	●	114	37	54	85
NOROX*210	Cumyl peroxyneodecanoate	●	115	38	55	90
TOPND	1,1,3,3-Tetramethylbutyl peroxyneodecanoate	●	117	40	57	92
NOROX*422-75	tert-Amyl peroxyneodecanoate	●	113	44	62	100
*)	Peroxydicarbonates	●	144	47	61	90
NOROX*420	tert. Butylperoxy-neodecanoate	●	121	47	64	100
TBPNH	tert-Butyl peroxyneohexanoate	●	116	51	69	107
TAPPI	tert-Amyl peroxy-pivalate	●	121	53	71	110
DCLBP	Di-2,4-dichlorobenzoyl peroxide	●	121	54	72	110
TBPPI	tert-Butyl peroxy-pivalate	●	121	56	74	110
INP	Di-3,5,5-trimethylhexanoyl peroxide	●	117	59	78	120
DP	Didecanoyl peroxide	●	126	62	80	120
NOROX*305	Dilauroyl peroxide	●	126	62	80	120
AIBN	2,2'-Azobis(isobutyronitrile)	●	130	62	80	120
NOROX*415	2,5-Dimethyl-2,5-di(2-ethylhexanoylperoxy) hexane	●	137	67	84	125
PMBP	Di-4-methylbenzoyl peroxide	●	125	70	89	130
BENOX*	Dibenzoyl peroxide	●	126	72	91	130
NOROX*411	tert-Amyl peroxy-2-ethylhexanoate	●	126	72	91	130
NOROX*410	tert-Butyl peroxy-2-ethylhexanoate	●	135	74	92	130
TBPIB	tert-Butyl peroxyisobutyrate	●	130	77	96	135
TBPM	tert-Butyl monoperoxy-maleate	●	116	82	104	150
NOROX*PULCAT	Methyl isobutyl ketone peroxide	●	125	90	110	155
NOROX*401	tert-Amylperoxy-(2-ethylhexyl)carbonate	●	151	95	113	150
NOROX*500-90	1,1-Di(tert-butylperoxy)-3,5,5-trimethyl-cyclohexane	●	143	95	114	155
NOROX*505-80	Di-2-ethylhexyl peroxydicarbonate	●	126	72	91	130
NOROX*510-80	Di-2-ethylhexyl peroxydicarbonate	●	135	87	106	152
NOROX*TBIC	tert-Butyl peroxyisopropyl carbonate	●	138	97	117	160
NOROX*425	tert-Butyl peroxy-3,5,5-trimethylhexanoate	●	147	100	119	160
DHPBC	2,5-Dimethyl-2,5-di(tert-butylperoxy)hexane	●	147	100	119	160
NOROX*400	tert-Butyl peroxy-2-ethylhexyl carbonate	●	128	100	122	175
TBPA	tert-Butyl peroxyacetate	●	149	102	121	160
TAPB	tert-Amyl peroxybenzoate	●	143	102	122	160
NOROX*TBPB	tert-Butyl peroxybenzoate	●	143	104	124	165
BU	2,2-Di(tert-butylperoxy)butane	●	143	104	124	165
NBV	n-Butyl-4,4-di(tert-butylperoxy)valerate	●	141	110	131	175
EBU	Ethyl-3,3-di(tert-butylperoxy)butyrate	●	144	114	135	180
DCUP	Dicumyl peroxide	●	152	116	136	175
BCUP	tert-Butyl cumyl peroxide	●	154	118	138	180
DTAP	Di(tert-amyl) peroxide	●	129	118	142	190
DIPP	Di[2-(tert-butylperoxy)-isopropyl]benzene	●	142	120	142	190
DHBP	2,5-Dimethyl-2,5-di(tert-butylperoxy)hexyne-3	●	142	120	142	190
DTBP	Di(tert-butyl) peroxide	●	152	125	146	190
DYBP	2,5-Dimethyl-2,5-di(tert-butylperoxy)hexyne-3	●	154	128	149	195
HMCN	3,3,6,6,9,9,-Hexamethyl-1,2,4,5-tetraoxa-cyclononane	●	146	135	158	205
NOROX*CHP	Cumyl hydroperoxide	●	133	140	166	223
TBHP	tert-Butyl hydroperoxide	●	149	173	200	260
CUROX*CC-DC	2,3-Dimethyl-2,3-diphenylbutane	●	195	210	234	285
*)	Peroxydicarbonates					
NOROX*608-75	Di(2-ethylhexyl)peroxydicarbonate	●	CHPC	Dicyclohexylperoxydicarbonate		
SBPC	Di(sec-butyl)peroxydicarbonate	●	NBPC	Di(n-butyl)peroxydicarbonate		
NOROX*600	Di(4-tert-butylcyclohexyl)peroxydicarbonate	●	NOROX*605	Dimyristylperoxydicarbonate		
CEPC	Dicetylperoxydicarbonate	●				

Colour code for storage temperature:

● = Deep refrigeration ● = Moderate refrigeration ● = Ambient temperature For precise values see specific product data sheets



UNITED INITIATORS

driving your success



Germany

United Initiators GmbH
Pullach
T: +49 89 74 422 237
cs-initiators.eu@united-in.com

France

United Initiators SAS
Chalon-sur-Saône
T: +33 (0)3 85 48 59 37
contact-chalon@united-in.com

Turkey

Hidrojen Peroksit A.S
Bandirma
T: +90 266 7210312
cs-initiators.tr@united-in.com

India

UI VR Private Limited
Ahmedabad
T: +91 9909724733
sales@vrpersulfates.com

USA

United Initiators Inc.
Elyria, OH

United Initiators Inc.
Helena, AR

United Initiators Inc.
Mobile, AL

United Initiators Inc.
Houston, TX

T: +1 800 231 2702
cs-initiators.nafta@united-in.com

Canada

United Initiators Canada Ltd.
Prince George, BC
T +1 250 561 4200
MLPRGCustomerService@united-in.com

China

Persulfates/Office
United Initiators (Shanghai) Co. Ltd.
Baoshan District Shanghai

Persulfates/Plants:
United Initiators Hefei Co. Ltd.
Hefei
T: +86 21 6117 2758

United Initiators (Huaibei) Co. Ltd.
Anhui
T: +86 561 7888 168
cs-initiators.cn@united-initiators.com

Organic Peroxides:
Shanghai United Initiators Trading
Co. Ltd.
Shanghai
T: +86 21 3429 3909
cs-initiators.cn@united-initiators.com

Australia

United Initiators Pty Ltd.
Banksmeadow
T: +61 2 9316 0046
cs-initiators.au@united-initiators.com

