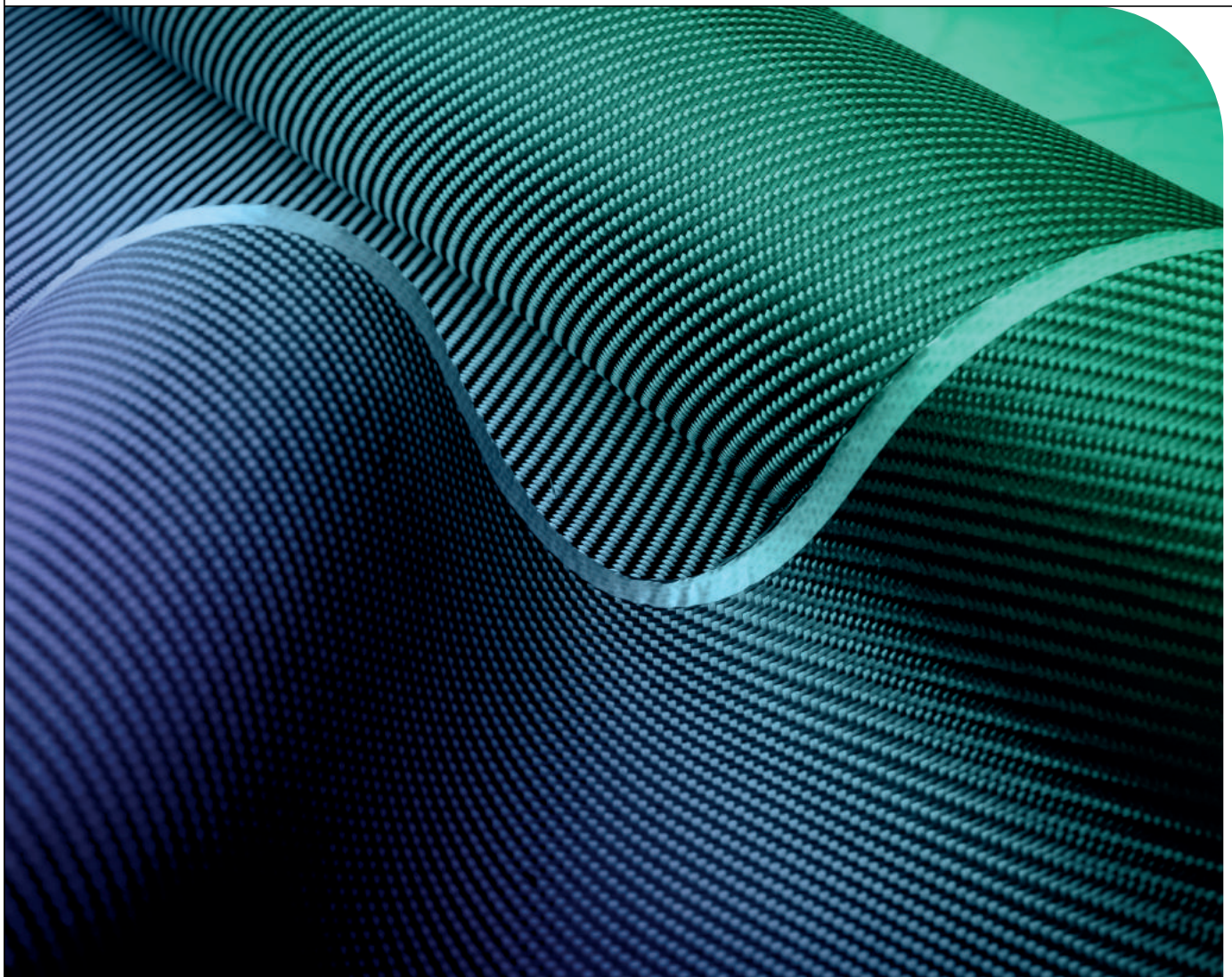


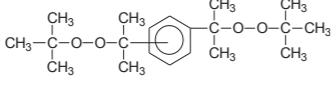
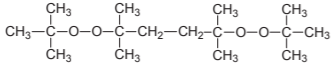
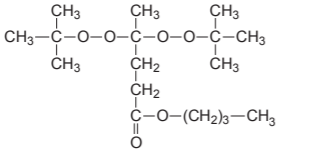
ARKEMA

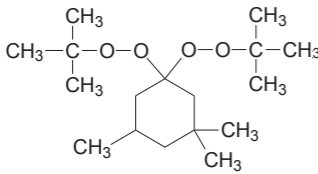
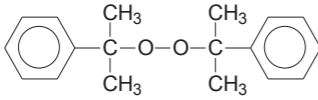
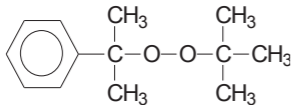
LUPEROX®

Organic Peroxides  
Polymer Crosslinking

EMEA



| Product Family and Description   | Chemical Formula   | Physical Form     | Assay %             | Carrier                               | Specific Benefits                          | Product Name                     | Typical Application ( ● - recommended   ○ - also possible ) |           |                              |                   |                    |          |                                       |   |  |
|--|--|-------------------|---------------------|---------------------------------------|--|----------------------------------|---|-----------|------------------------------|-------------------|--------------------|----------|---------------------------------------|---|--|
|  |  |                   |                     |                                       |  |                                  | Rubber cross-linking  | EVA foams | Medium & High voltage cables |                   | Low voltage cables | Silicone | PP recycling/<br>polymer modification |   |  |
|  |  |                   |                     |                                       |  |                                  |   |           | Insulator                    | Semi - conductors |                    |          |                                       |   |  |
| <b>LUPEROX® F</b><br>Multipurpose peroxide, highest crosslinking efficiency and best mechanical properties of the cured rubber.<br><br>Typical curing temperature: 170 - 200°C<br><br>Maximum compounding temperature: 135°C / 150°C for Scorch Protected grades | <br>1,3-1,4-bis(tert-butylperoxyisopropyl)benzene<br>CAS N° 25155-25-3<br>Molecular weight : 338.5 g<br>Melting point : 41°C<br>Active oxygen : 9.45% | Solid flakes      | ≥ 96                | -                                     | Fast melting                               | LUPEROX® F FLAKES                | ○   | ○         | ●                            | ●                 |                    |          |                                       |   |  |
|  |  | Powder            | 90                  | Silica                                | High assay free flowing                    | LUPEROX® F90P                    | ○   | ○         |                              |                   | ○                  | ●        |                                       |   |  |
|  |  |                   | 40                  | Calcium carbonate + Silica            | Versatility                                | LUPEROX® F40P                    | ●   | ●         |                              |                   | ●                  |          |                                       |   |  |
|  |  |                   | 40                  |                                       | Scorch protected                           | LUPEROX® F40P-SP2                | ●   | ●         |                              |                   | ●                  |          |                                       |   |  |
|  |  |                   | 48                  |                                       | Special grade: Curing in air               | LUPEROX® F-AIR-B2-80             | ●   |           |                              |                   | ●                  |          |                                       |   |  |
|  |  |                   | 40                  |                                       | Curing in air, high temperature resistance | LUPEROX® AIR XL3 PW              | ●   |           |                              |                   | ●                  |          |                                       |   |  |
|  |  |                   | 40                  | Surface treated kaolin + silica       | Low moisture                               | LUPEROX® F40KEP                  | ●   | ●         |                              |                   | ●                  |          |                                       |   |  |
|  |  | Granules          | 40                  | Calcium carbonate + Silica            | Versatility, low dust                      | LUPEROX® F40P                    | ●   | ●         |                              |                   | ●                  |          | ●                                     |   |  |
|  |  |                   | 40                  |                                       | Scorch protected                           | LUPEROX® F40-SP                  | ●   | ●         |                              |                   | ●                  |          | ○                                     |   |  |
|  |  |                   | 40                  |                                       | Scorch protected                           | LUPEROX® F40-SP2                 | ●   | ●         |                              |                   | ●                  |          | ○                                     |   |  |
|  |  |                   | 40                  | Surface treated kaolin                | Low moisture                               | LUPEROX® F40KE                   | ●   | ●         |                              | ○                 | ●                  |          | ●                                     |   |  |
|  |  |                   | Masterbatch pellets | 40                                    | EPM + Calcium carbonate + Silica           | Low fillers, low moisture        | LUPEROX® F40MG  | ○         | ○                            | ○                 | ●                  |          |                                       |   |  |
|  |  |                   |                     | 40                                    |  | Scorch protected                 | LUPEROX® F40M-SP  | ●         | ●                            |                   |                    | ●        |                                       | ● |  |
|  |  | 40                |                     | Versatility, no dust, fast dispersion |  | LUPEROX® F40MGF                  | ●   | ●         |                              |                   | ●                  |          | ●                                     |   |  |
|  |  | 40                |                     | Versatility, no dust, fast dispersion |  | LUPEROX® F40ED                   | ●   | ●         |                              |                   | ●                  |          | ●                                     |   |  |
|  |  | 20                |                     | For PP recycling                      |  | LUPEROX® F20ED                   |   |           |                              |                   |                    |          | ●                                     |   |  |
|  |  | 10                |                     | For PP recycling                      |  | LUPEROX® F10ED                   |   |           |                              |                   |                    |          | ●                                     |   |  |
|  |  | Masterbatch slabs | 40                  | EPM + EVA + Silica                    | For EVA compounds                          | LUPEROX® F40MGEVT                | ○   | ●         |                              |                   | ○                  |          |                                       |   |  |
|  |  |                   | 40                  | EPM + LDPE + Silica                   | For PP recycling                           | LUPEROX® F40MF                   | ○   | ○         | ○                            | ●                 |                    |          |                                       |   |  |
|  |  |                   | 40                  | EPM + Calcium carbonate + Silica      | Versatility, no dust, fast dispersion      | LUPEROX® F40EDF                  | ●   | ●         |                              | ○                 | ●                  |          | ●                                     |   |  |
| 40   | EPM + EVA + Silica   | For EVA compounds | LUPEROX® F40MFEVT   | ○                                     | ●  |                                  | ○   | ○         |                              |                   |                    |          |                                       |   |  |
| <b>LUPEROX® 101</b><br>Multipurpose peroxide, high crosslinking efficiency and good mechanical properties of the cured rubber.<br><br>Typical curing temperature: 175 - 205°C<br><br>Maximum compounding temperature: 140°C / 150°C for Scorch Protected grades  | <br>2,5-dimethyl-2,5-di(tert-butylperoxy)hexane<br>CAS N° 78-63-7<br>Molecular weight : 290.4 g<br>Melting point : 5°C<br>Active oxygen : 11.02%    | Liquid            | ≥94                 | -                                     | Injection in mixing equipment              | LUPEROX® 101                     | ●   |           | ○                            | ○                 |                    |          | ○                                     |   |  |
|  |  | Powder            | 45                  | Calcium carbonate + Silica            | Versatility                                | LUPEROX® 101XL45                 | ●   | ○         |                              |                   | ○                  |          |                                       |   |  |
|  |  |                   | 45                  |                                       | Scorch protected                           | LUPEROX® 101XL45-SP2             | ●   | ○         |                              |                   | ○                  |          |                                       |   |  |
|  |  |                   | 45                  |                                       | Specific for FKM                           | LUPEROX® HP101XLP                | ●   |           |                              |                   |                    |          |                                       |   |  |
|  |  |                   | 50                  | Silica                                | Acid resistance and transparency           | LUPEROX® 101XLS50                | ○   | ○         |                              |                   | ○                  | ●        |                                       |   |  |
|  |  | Granules          | 45                  | Calcium carbonate + Silica            | Versatility, low dust                      | LUPEROX® 101G45 N                | ●   | ○         |                              |                   | ○                  |          |                                       | ○ |  |
|  |  |                   | Beads               | 20                                    | PP   | For PP visbreaking and recycling | LUPEROX® 101PP20  |           |                              |                   |                    |          |                                       | ● |  |
|  |  | 10                |                     | LUPEROX® 101PP10                      |  |                                  |   |           |                              |                   |                    |          | ●                                     |   |  |
|  |  | 7.5               |                     | LUPEROX® 101PP7.5                     |  |                                  |   |           |                              |                   |                    |          |                                       | ● |  |
|  |  | Paste             | 75                  | Silicone polymer                      | For silicone crosslinking                  | LUPEROX® 101XL75 SIL PASTE       |   |           |                              |                   |                    |          | ●                                     |   |  |
| 45   | LUPEROX® 101XL45 SIL PASTE   |                   |                     |                                       |  |                                  |   |           |                              |                   |                    | ●        |                                       |   |  |
| <b>LUPEROX® 230</b><br>Fast curing peroxide, medium crosslinking efficiency.<br><br>Typical curing temp: 160 - 180°C<br><br>Maxi. compounding temp: 120°C / 130°C for SP grades  | <br>n-butyl-4,4-di(tert-butylperoxy)valerate<br>CAS N° 995-33-5<br>Molecular weight : 334.4 g<br>Active oxygen : 9.57%                              | Granules          | 40                  | Calcium carbonate + Silica            | Versatility, low dust                      | LUPEROX® 230G40 N                | ●   | ●         |                              |                   |                    | ○        |                                       |   |  |
|  |  | Powder            | 40                  | Calcium carbonate + Silica            | Versatility                                | LUPEROX® 230XL40                 | ●   | ●         |                              |                   |                    |          | ○                                     |   |  |
|  |  |                   | 40                  | Calcium carbonate + Silica            | Scorch protected                           | LUPEROX® 230XL40-SP              | ●   | ●         |                              |                   |                    |          | ●                                     |   |  |

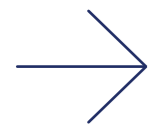
| Product Family and Description   | Chemical Formula   | Physical Form       | Assay %                        | Carrier                          | Specific Benefits  | Product Name        | Typical Application ( ● - recommended   ○ - also possible ) |           |                              |                 |                    |          |                                       |
|--|--|---------------------|--------------------------------|----------------------------------|--|---------------------|---|-----------|------------------------------|-----------------|--------------------|----------|---------------------------------------|
|  |  |                     |                                |                                  |  |                     | Rubber cross-linking  | EVA foams | Medium & High voltage cables |                 | Low voltage cables | Silicone | PP recycling/<br>polymer modification |
|  |  |                     |                                |                                  |  |                     |   |           | Insulator                    | Semi-conductors |                    |          |                                       |
| <b>LUPEROX® 231</b><br>Fastest curing peroxide, medium crosslinking efficiency.<br>Typical curing temperature: 150 - 170°C<br>Maximum compounding temperature: 100°C / 120°C for Scorch Protected grades   | <br>1,1-di(tert-butylperoxy)-3,3,5-trimethylcyclohexane<br>CAS N° 6731-36-8<br>Molecular weight : 302.4 g<br>Active oxygen : 10.58% | Granules            | 40                             | Calcium carbonate + Silica       | Versatility, low dust  | LUPEROX® 231G40 N   | ●   | ●         |                              |                 | ○                  |          |                                       |
|  |  | Powder              | 40                             |                                  | Versatility  | LUPEROX® 231XL40    | ●   | ●         |                              |                 | ○                  |          |                                       |
|  |  |                     | 40                             |                                  | Scorch protected   | LUPEROX® 231XL40-SP | ●   | ●         |                              |                 | ●                  |          |                                       |
|  |  | Masterbatch pellets | 40                             | EPM + Calcium carbonate + Silica | Versatility, no dust, fast dispersion                        | LUPEROX® 231MG40    | ●   | ○         |                              |                 | ○                  |          |                                       |
| <b>LUPEROX® DCP</b><br>Multipurpose peroxide, medium crosslinking efficiency and good mechanical properties of the cured rubber, releases a typical smell after curing. Restrictive HES classification (CMR cat. 1B, H360D)<br>Typical curing temperature: 160 - 190°C<br>Maximum compounding temperature: 130°C / 145°C for Scorch Protected grades | <br>Dicumyl peroxide<br>CAS N° 80-43-3<br>Molecular weight : 270.4 g<br>Melting point : 39°C<br>Active oxygen : 5.92%               | Solid crystals      | ≥ 99                           | -                                | Fast melting   | LUPEROX® DCP        |   |           | ●                            | ●               |                    | ○        |                                       |
|  |  | Powder              | 40                             | Calcium carbonate + Silica       | Versatility  | LUPEROX® DC40P      | ●   | ●         |                              | ○               | ●                  |          | ○                                     |
|  |  |                     | 40                             |                                  | Scorch protected   | LUPEROX® DC40P-SP2  | ●   | ●         |                              | ○               | ●                  |          | ○                                     |
|  |  |                     | 40                             | Surface treated kaolin           | Low moisture   | LUPEROX® DC40KEP    | ●   | ●         |                              | ○               | ●                  |          | ○                                     |
|  |  | Granules            | 40                             | Calcium carbonate + Silica       | Versatility, low dust  | LUPEROX® DC40       | ●   | ●         |                              | ○               | ●                  |          | ○                                     |
|  |  |                     | 40                             | Surface treated kaolin           | Low moisture   | LUPEROX® DC40KE     | ●   | ●         |                              | ○               | ●                  |          | ○                                     |
|  |  | Masterbatch pellets | 40                             | EPM + LDPE                       | Filler free  | LUPEROX® DC40MG     | ○   | ○         |                              | ●               |                    |          | ○                                     |
|  |  |                     | 40                             | EPM + Calcium carbonate + Silica | Versatility, no dust, fast dispersion                        | LUPEROX® DC40ED     | ●   | ●         |                              | ○               | ●                  |          | ○                                     |
|  |  |                     | 40                             |                                  | Versatility, no dust, fast dispersion                        | LUPEROX® DC40MGF    | ●   | ●         |                              | ○               | ●                  |          | ○                                     |
|  |  |                     | 40                             |                                  | Scorch protected   | LUPEROX® DC40M-SP2  | ●   | ●         |                              | ○               | ●                  |          | ○                                     |
|  |  |                     | 40                             | EPM + LPDE                       | Filler free, high LDPE content                               | LUPEROX® DC40MGPE   | ○   | ○         |                              | ●               |                    |          | ○                                     |
|  |  | 40                  | Filler free, filtered < 100 µm |                                  | LUPEROX® DC40MGA   | ○                   | ○   | ●         | ●                            |                 |                    | ○        |                                       |
|  |  | Masterbatch slabs   | 40                             | EPM                              | Filler free  | LUPEROX® DC40MF     | ○   | ○         |                              | ●               |                    |          |                                       |
| Paste  | 40   | Silicone polymer    | For silicone crosslinking      | LUPEROX® DC40 SIL PASTE          |  |                     |   |           |                              |                 | ●                  |          |                                       |
| <b>LUPEROX® 801</b><br>Specific peroxide for cables application, medium crosslinking efficiency. Liquid at room temperature. Releases a typical smell after crosslinking<br>Typical curing temperature: 170 - 200°C<br>Maximum compounding temperature: 135°C  | <br>Tert-butylcumylperoxide<br>CAS N° 3457-61-2<br>Molecular weight : 208.3 g<br>Melting point : 6°C<br>Active oxygen : 7.68%     | Liquid              | ≥ 95                           | -                                | For Direct Peroxide Injection in extruder or pellets soaking | LUPEROX® 801        |   |           | ●                            | ●               |                    |          |                                       |

# Physical Forms



- 1 Masterbatch slabs
- 2 Masterbatch pellets
- 3 Granules
- 4 Powder
- 5 Pure (crystals)

| MIXING TECHNOLOGIES                     | MASTERBATCHES |         | GRANULES | POWDERS | PURE GRADES<br>(liquid or molten) |
|---|---------------|---------|----------|---------|-----------------------------------|
|   | SLABS         | PELLETS |          |         |                                   |
| Internal mixer or continuous compounder | •••           | •••     | ••       | ••      |                                   |
| Open mill                               | •••           | ••      | •        |         |                                   |
| Blending with polymer pellets           |               | ••      | •        |         | •••                               |
| Continuous feed in extruder's hopper    |               | •••     | •        |         | ••                                |
| Direct peroxide injection in extruder   |               |         |          |         | •••                               |



## Suggested Dosage Rate in Polymers

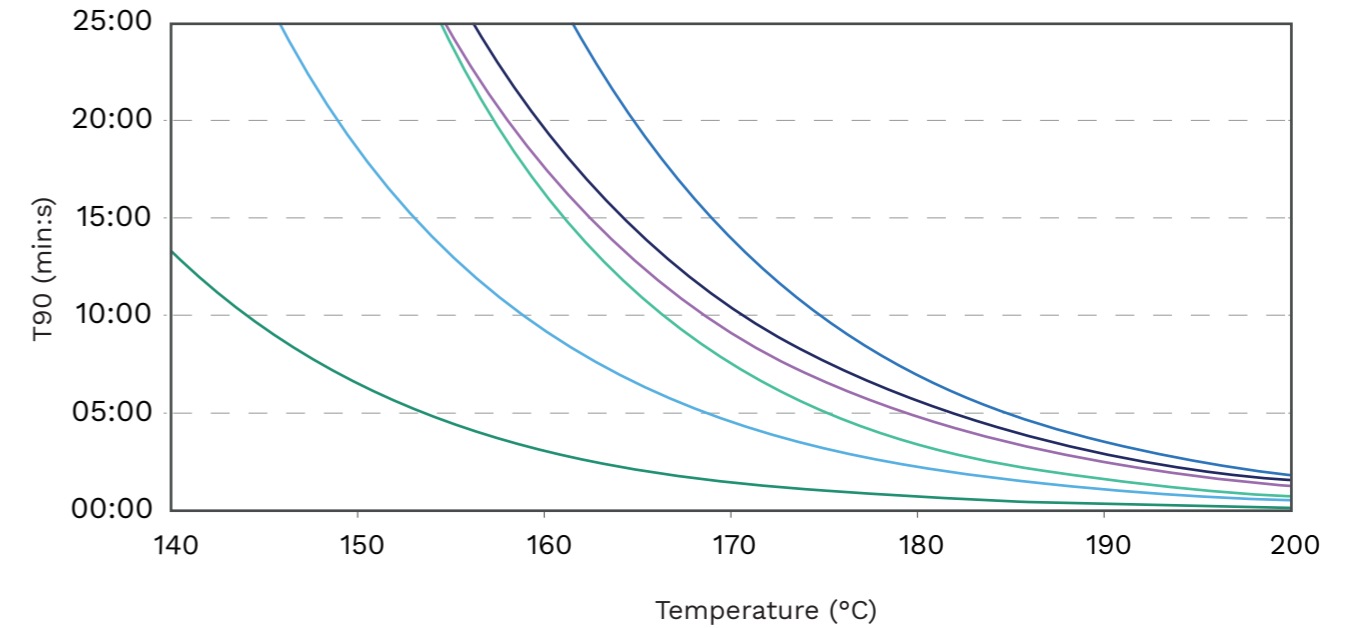
Example: Typically, 1.6 to 3.2 phr of Luperox® F is used in an EPM/EPDM compound. For formulated peroxide, this quantity has to be divided by the peroxide content. Therefore, 4 to 8 phr of Luperox® F40 is the typical range of quantity used for an EPM/EPDM compound. SP grades are used at same dosage rate as standard peroxides.

| PHR OF ACTIVE SUBSTANCE                            | LUPEROX® F | LUPEROX® 101 | LUPEROX® 230 | LUPEROX® 231 | LUPEROX® DCP | LUPEROX® 801 |
|--|------------|--------------|--------------|--------------|--------------|--------------|
| <b>LDPE</b><br>Low Density Polyethylene            | 1.2 - 1.8  | 1.4 - 2.0    |              |              | 1.5 - 2.5    | 1.2 - 2.0    |
| <b>HDPE</b><br>High Density Polyethylene           |            | 0.5 - 1.2    |              |              |              |              |
| <b>EVA</b><br>Ethyl-Vinyl Acetate                  | 0.8 - 1.6  | 1.2 - 2.0    | 1.4 - 2.6    | 1.2 - 2.3    | 1.2 - 2.0    | 1.0 - 1.6    |
| <b>EP(D)M</b><br>Ethylene-Propylene-(diene) rubber | 1.6 - 3.2  | 1.7 - 3.4    | 3.2 - 6.3    | 2.4 - 6.0    | 2.4 - 5.4    |              |
| <b>CM</b><br>Chlorinated polyethylene              | 1.5 - 2.4  | 2.5 - 4.0    | 3.3 - 6.0    | 3.0 - 5.5    | 2.4 - 3.8    |              |
| <b>VMQ</b><br>Silicone rubbers                     | 0.2 - 1.0  | 0.4 - 1.5    |              |              | 0.5 - 2.0    |              |
| <b>NBR</b><br>Butadiene acrylonitrile rubber       | 0.5 - 1.5  | 1.1 - 2.0    | 1.2 - 2.2    | 1.0 - 2.0    | 0.9 - 1.7    |              |
| <b>SBR</b><br>Styrene Butadiene Rubber             | 0.4 - 1.0  | 0.7 - 1.2    | 0.8 - 1.8    | 0.7 - 1.6    | 0.7 - 1.5    |              |

# Cure Time

Data generated using an Oscillating Disc Rheometer. This graph shows the cure time represented by T90, which is the time needed at a specific temperature to get 90% of the peroxide decomposed. This key feature of the peroxide is to be taken into account when selecting the proper peroxide.

T90 vs. temperature in an EPDM compound

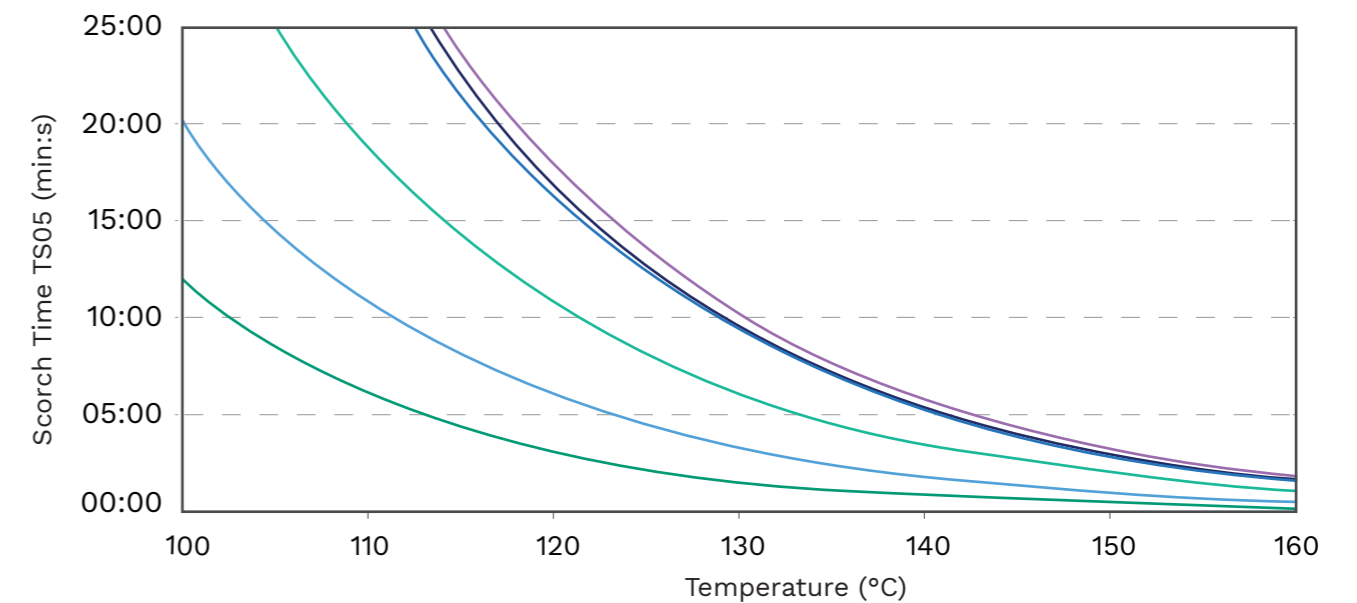


LUPEROX® F LUPEROX® 101 LUPEROX® 230 LUPEROX® 231 LUPEROX® DCP LUPEROX® 801

# Scorch Time

Data generated using a Mooney viscometer. TS05 is the scorch time at the processing temperature (usually at the polymer extrusion temperature). This value represents the time during which the vulcanizable compound can be safely processed before unwanted crosslinking or "scorch" takes place. TS05 is defined by the time needed at a specific temperature to obtain a 5 Mooney Unit increase in the viscosity as measured from the MV or minimum viscosity.

Mooney scorch TS05 vs. temperature in an EPDM compound



LUPEROX® F LUPEROX® 101 LUPEROX® 230 LUPEROX® 231 LUPEROX® DCP LUPEROX® 801



**Headquarters: Arkema France**

420 rue d'Estienne d'Orves  
92705 Colombes Cedex  
France  
T +33 (0)1 49 00 80 80

Luperox® is a registered trademark of Arkema.

DIRCOM – no. ref/09.2022 – Design: DRise International PVT. LTD.

**Disclaimer - Please consult Arkema's disclaimer regarding the use of Arkema's products on <https://www.arkema.com/global/en/products/product-safety/disclaimer/>**

Arkema France, a French société anonyme registered at the Trade and Companies Register of Nanterre under the number 319 632 790

**arkema.com**

**ARKEMA**