Elkem
A Bluestar Company

Silicones

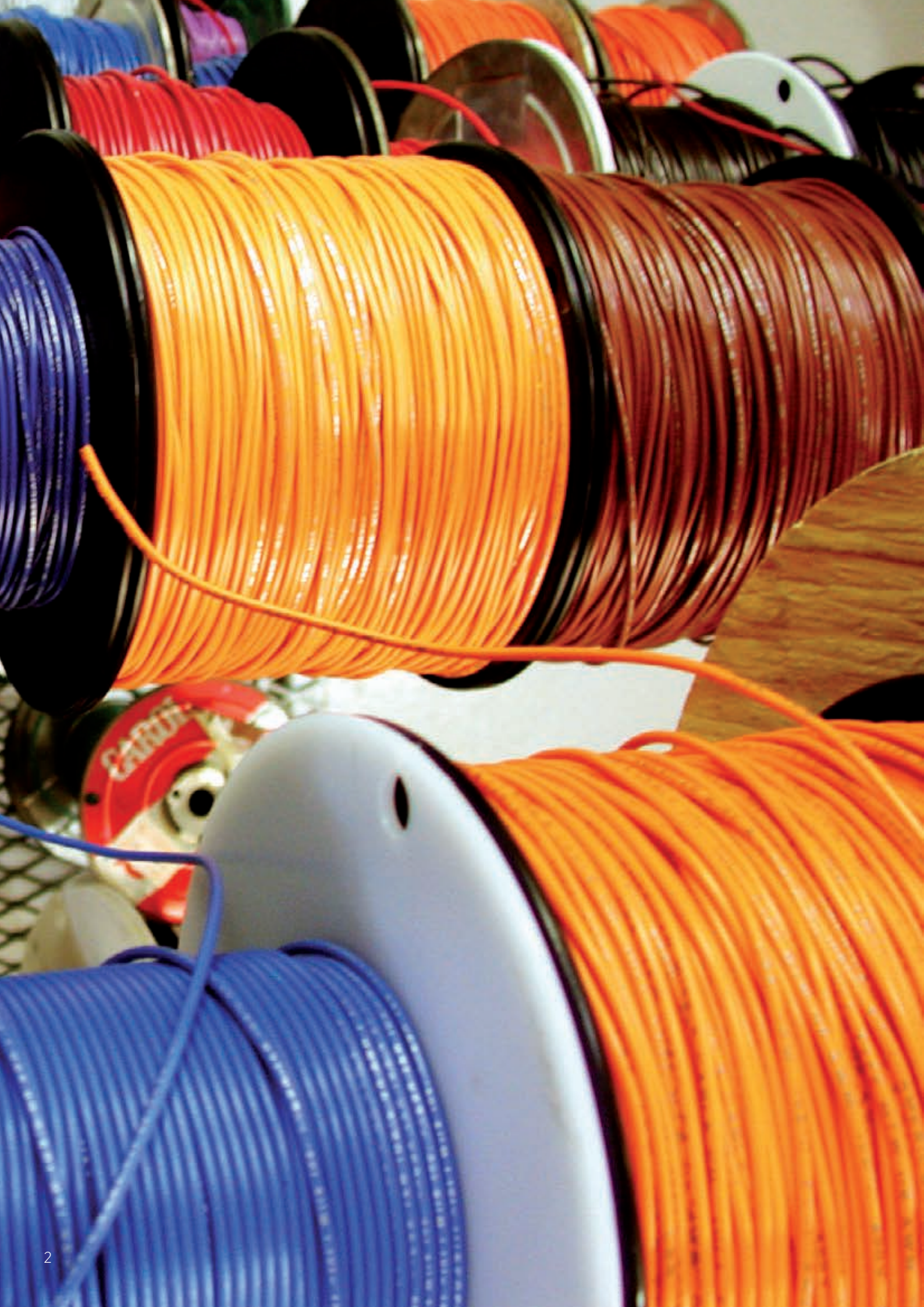
Delivering your potential

Mix&Fix
CENTER

Bluesil

Plug in your cables with Bluesil™ silicones

www.silicones.elkem.com



Bluesil™ Heat Cured Rubber

With increasing demand in energy, the role of cables is increasing, especially when talking about safety. Silicone insulated cables help to keep fire alarms, emergency exit lights and other life-saving electrical back-up systems operating during emergency situations by giving people more time to exit a building or a transportation system.

Standard and high thermal resistant cables

- Household appliances
- Medical & paramedical appliances
- Lighting
- Heating cables
- Nuclear power stations
- Heavy industries (foundries, glass factories, cement works).

Safety cables

- High rise buildings
- Highly populated and critical areas
- Hotels, offices, hospitals, schools
- Recreational buildings (cinema, theatres)
- Underground & tunnels.

High fire performance

- Railways industry
- Building
- Home Appliance
- Aerospace.

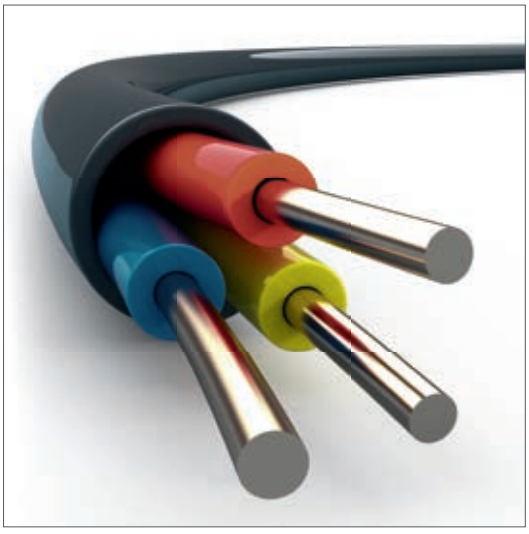
Automotive cables

- Battery cables
- Ignition cables
- Low voltage cables
- High voltage cables
- Copper and aluminium cables
- Flexible cables.

Transportation cables

- Shipbuilding
- Aerospace
- Railway stations & aiports
- Trucks
- Railway rollingstocks
- Building engines.

Bluesil™ Elastomers
for cables



Bluesil™ HCR elastomers for safe and durable insulation of your cables

Because they are so resistant to environmental stress, Bluesil™ HCR silicone elastomers maintain their insulation properties longer than other materials. They can extend the service life of electrical wires, cables circuits and systems and are better able to protect sensitive wires and circuits from heat, fire and flame than thermoplastics and organic elastomers.

Through custom compounding Bluesil™ HCR elastomers can meet many requirements:

- Fire resistant cables,
- Flame resistant cables
- Low smoke cables
- Low toxicity cables
- Low corrosive cables.

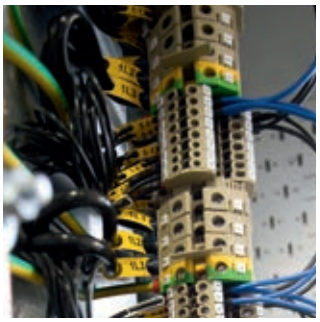
Bluesil™ Heat Cured Rubbers are basically made from reactive linear silicone gums and specific silica fillers. Bluesil™ HCR have outstanding properties, far superior to conventional organic elastomers:

- Photo-oxidative stability
- No residual reactive groups once cured
- Wide range of coloring.

Available as rubbery breads, Bluesil™ HCR are supplied in:

- Master batches (without incorporated catalyst)
- Ready to use compounds (via Elkem Silicones Mix & Fix Center®).

Safety cables & Transportation Cables



Conduct electricity

- Keep its integrity thanks to high flexibility
- Work with copper & aluminium

Insulate electrically

- Prevent short circuits, flashovers circuit failures and shutdowns

Protect

- Protect electrical wires and cables from a wide range of operating conditions: searing heat and cold, corrosion, moisture, oil, ozone and flame
- Improve overall cable integrity and cable safety

Help to improve safety

- Help safeguard the performance of electrical wires and cables used in conjunction with fire alarms and fire emergency back-up systems
- Reduce exposure to smoke and toxic and corrosive fumes caused by degrading wires in the event of fire

Improve your productivity & competitiveness

- Adapted packaging
- Customized formulation

Benefits of Bluesil™ HCR silicones

Good mechanical property

- Flexibility
- High temperature stability: - 50 °C up to 300 °C

With their chemical, mechanical and thermal properties, Bluesil™ HCR silicones elastomers are the best material for safety cables applications.

Dielectric properties

- Low dielectric loss factor leading to low electrical aging

Resistance to environment

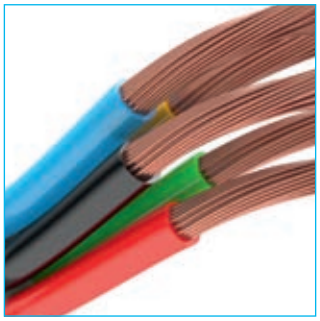
- Outstanding resistance to natural aging agents (spray, bad weather, UV radiation, ozone, salt fog, etc.) as well as to climatic and industrial pollution
- Water repellency: High long-term water repellency and outstanding ability to recover hydrophobic properties

Fire resistance

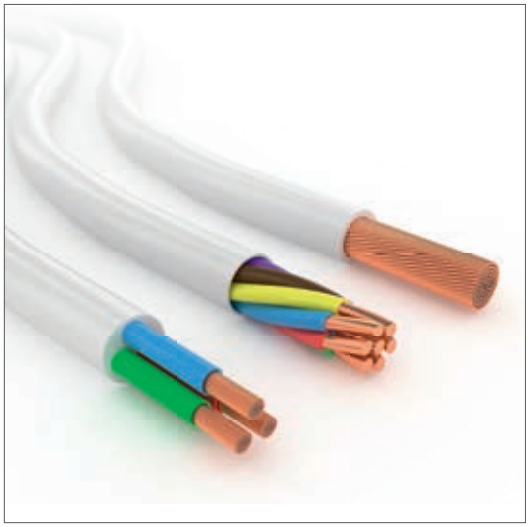
- Excellent fire resistance
- Low smoke, better visibility for fire fighters and rescue squads
- Non toxicity of residual gas
- Halogen free, not containing any toxic elements as bromine, iodine, chlorine, fluorine

Easy to manufacture

- Easy and cost-effective processing (high speed, high productivity)
- Suitable for steam cure, hot air vulcanizing, salt bath cure and radiation cure
- No loss of elasticity even at very high or low temperature allowing easy processing and installation



Bluesil™ Elastomers
for cables



Stay connected with us as a partner

With its complete range of services developed to make your life easier, Elkem Silicones is the right partner for all your electrical applications.

Tailor made developments

The challenge for electrical cables is to constantly innovate in order to offer new functions and answer to the evolving needs of your business. Tailor-made developments based on your specific requirements are our daily business. Let us innovate together!

A worldwide presence

Elkem Silicones has production and logistics sites all over the world. This global presence enables wide availabilities of Bluesil™ HCR products and technologies along with dedicated technical support. Dual sourcing is possible thanks to this Mix & Fix Center® network and ensures you a reliable global supply.

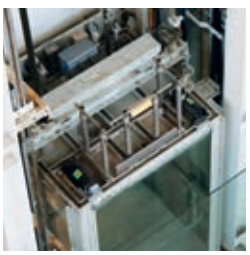
Dedicated technical support

Upon request, our electrical industry teams are at your service to support you for any specific applications and guidances:

- Technical training
- Solution development
- Regulation support,...

Regulatory assistance for the most demanding markets

With detailed knowledge of the evolution of standards and current regulations, our specialists are able to guide you in terms of legislation as well as giving you regulatory support for your most demanding applications.



Bluesil™ HCR
Standard range

				General purpose					
				MF 8140 U			MF 8150 U		
				Unfilled	Extended Ground quartz		Unfilled	Extended Ground quartz	
	Properties	Standards	Units	-	50 phr	75 phr	-	50 phr	100 phr
General characteristics	Appearance			Translucent	Off-white		Translucent	Off-white	
	Specific gravity	ISO 1826	(g/cm)	1.10	1.35	1.44	1.11	1.36	1.54
Vulcanization (moulded ASTM slabs)	Catalyst type			E			E		
	Catalyst content (%)			1.25			1.25		
	Vulcanization conditions			8 min - 115 °C			8 min - 115 °C		
	Post curing			No			No		
Mechanical properties	Hardness, shore A	ASTM D 2240		48	63	69	48	64	75
	Tensile strength	ISO R37	(MPa)	6.7	7.3	7.5	8.3	8.9	8.7
	Elongation at break	ISO R37	(%)	380	200	160	570	330	195
	Tear strength	ASTM D 624 A	(kN/m)	12	14	14	15	14	14
	Rebound resilience	ISO 4662	(%)	67	-	-	60	-	-
Mechanical properties after 10 days at 200 °C	Hardness, shore A	ASTM D 2240		45	63	70	48	61	73
	Tensile strength	ISO R37	(MPa)	5.5	8	7.8	6.3	7	7
	Elongation at break	ISO R37	(%)	320	180	130	450	250	170
Dielectric properties	Dielectric strength (on 1 mm thick slabs)	IEC 60243	(kV/mm)	26			28		
	Dielectric constant at 1 MHz	IEC 60250		2.7			2.7		
	Dissipation factor at 1 MHz	IEC 60250		4.5×10^{-3}			4.4×10^{-3}		
	Volume resistivity	IEC 60093	(Ohm.cm)	1.3×10^{15}			1.5×10^{15}		

Processing method

Silicone cables are obtained by extrusion process and can be vulcanized by different technologies.

- Hot air
- Salt melted bath
- Steam under pressure (6 to 20 bars)

The peroxide type is defined by the vulcanization process as recommended in the table below.

Catalyst	Elkem Silicones name	Vulcanising technique
2.4 dichlorobenzoyl peroxide	E	Hot air extrusion Melted salt bath extrusion
Dimethyl -2.5 bis (tertiobutylperoxy) -2.5 hexane	L	Extrusion in steam at 12 to 20 bars pressure
Dicumyl peroxide	D	Extrusion in steam at 6 to 12 bars pressure

General purpose						High properties			
MF 8160 U			MF 8170 U	MF 8270 U		MF 360 U		MF 370 U	
Unfilled	Extended Ground quartz								
-	50 phr	100 phr							
Transparent	Off-white		Transparent	Off-white		Transparent		Transparent	
1.15	1.42	1.53	1.16	1.32		1.16		1.18	
E			E	E	L	E	L	E	L
1.25			1.25	1.25	0.6	1.25	0.6	1.25	0.6
8 min - 115 °C			8 min - 115 °C	8 min - 115 °C	10 min - 170 °C	8 min - 115 °C	10 min - 170 °C	8 min - 115 °C	10 min - 170 °C
No			No	No	No	No	No	No	No
62	71	73	71	69	70	60	62	65	68
11.4	9.5	8.8	10.8	9.3	9.8	9.1	10	9.1	8.9
415	250	210	330	305	350	560	640	520	540
25	17	16	20	21	21	38	39	44	43
51	-	-	53	53	48	45	45	35	36
65	76	80	75	75	79	74	79	75	80
8.5	7.4	7.3	8.3	8.3	7.9	7.2	7.5	8.1	7.6
350	160	135	235	185	195	170	130	240	200
28			28	28	31	28	26	27	32
2.8			3.2	5.4	5.8	2.4	2.2	2.3	2.8
4×10^{-3}			4.8×10^{-3}	4.4×10^{-3}	4.2×10^{-3}	3.8×10^{-3}	2.6×10^{-3}	4.1×10^{-3}	3.7×10^{-3}
2×10^{15}			2.9×10^{15}	4.2×10^{15}	4.2×10^{15}	1.5×10^{15}	2.1×10^{15}	2.6×10^{15}	3.3×10^{15}

Additives

Process enhancing additives	
Additive	**Objective**
Additive AD 717	Incorporation of fillers Plasticity adjustment
Additive DA 22	No sticking to conductor

Performance enhancing additives	
Additive	**Objective**
Additive AD 916	Prevention of blooming in non-post cured parts vulcanised with 2.4 dichlorobenzoyl peroxide (acid acceptor)
Additive AD 720	Increased resistance to hot oils
Additive HFR 1	Improved fire resistance
Additive HAC 5	Improved ashes cohesion
Additive AD 744	Increased heat stability up to 250 °C
Additive AD 703	Increased heat stability up to 300 °C

Bluesil™ HCR
Speciality range

				Specialties			
				High thermal stability			
	Properties	**Standards**	**Units**	**MM 60 THT**		**MM 70 THT**	
General characteristics	Appearance			Creamy White		Creamy White	
	Specific gravity	ISO 1826	(g/cm)	1.16		1.19	
Vulcanization (moulded ASTM slabs)	Catalyst type			E	L	E	L
	Catalyst content (%)			1.25	0.6	1.25	0.6
	Vulcanization conditions			8 min - 115 °C	10 min - 170 °C	8 min - 115 °C	10 min - 170 °C
	Post curing			4 hours at 200 °C		4 hours at 200 °C	
Mechanical properties	Hardness, shore A	ASTM D 2240		56	56	64	64
	Tensile strength	ISO R37	(MPa)	9.4	9.4	9.5	9.5
	Elongation at break	ISO R37	(%)	460	505	410	530
	Tear strength	ASTM D 624 A	(kN/m)	19	20	20	25
	Rebound resilience	ISO 4662	(%)	50	44	43	34
Mechanical properties after 10 days at 200 °C	Hardness, shore A	ASTM D 2240		61	62	68	69
	Tensile strength	ISO R37	(MPa)	7.5	8.6	8.3	8.5
	Elongation at break	ISO R37	(%)	365	370	290	335
Mechanical properties after 3 days at 300 °C	Hardness, shore A	ASTM D 2240		68	70	76	78
	Tensile strength	ISO R37	(MPa)	5.6	5.5	5.7	5.2
	Elongation at break	ISO R37	(%)	210	220	175	155
Dielectric properties	Dielectric constant at 1 MHz	IEC 60250	-	-	-	-	-
	Dissipation factor at 1 MHz	IEC 60250	-	-	-	-	-
	Volume resistivity	IEC 60093	(Ohm.cm)	-	-	-	-
	Oxygen Index (LOI)	ASTM D 2863	(%)	-	-	-	-
Fire resistance	Vertical flame resistance	IEC 60695-1-10		-	-	-	-
	Fire protection on railway vehicule	EN 45545 part 2		-	-	-	-
				-	-	-	-
		NF 16 101		-	-	-	-
		BS 6853		-	-	-	-

(*) Bluesil™ MF 8465 U and Bluesil™ MF 8870 E are used in cable construction satisfaying fire resistance and ashes cohesion standards, such as IEC 32070 CR1, BS 6387C, W, Z, EN 50200...

Specialties			High ashes cohesion Specialties		
High fire resistance			High ashes cohesion		
FR 8750 U	**FR 8760 U**	**FR 8775 U**	**MF 8465 U (*)**		**FRC 8470 U (*)**
Creamy			Off-white		Off-white
1.24	1.43	1.28	1.23		1.29
E			E	L	E
1.25			1.25	0.6	1.25
8 min - 115 °C			8 min - 115 °C	10 min - 170 °C	8 min - 115 °C
4 hours at 200 °C			No	No	No
51	58	73	72	68	70
8.6	6.7	10.2	8.0	8.0	8.3
460	430	320	240	310	275
15	21	19	16	19	15
-	-	-	47	48	-
-			80	78	80
-			7.2	6.6	7.5
-			170	170	205
-			-		-
-			-		-
-			-		-
2.9	3.1	3.0	3.1	-	3.31
3.9×10^{-3}	3×10^{-3}	3×10^{-3}	5.1×10^{-3}	-	5.3×10^{-3}
$6.7 \times 10^{+15}$	$1.8 \times 10^{+15}$	$8.1 \times 10^{+15}$	$1.4 \times 10^{+14}$	-	$4.6 \times 10^{+15}$
-	-	37	28	-	-
V0 - 3 mm	V0 - 3 mm	V0 - 3 mm	-		-
R6 HL2	R6 HL3	R6 HL2	-		-
R1 HL2	R1 HL3	R1 HL2	-		-
-	-	Class I2 F0	-		-
-	-	Cat. A1	-		-

Bluesil™ HCR Standards

	Comparitive table of Testing Norms									
	International	**European**	**Hamonized**	**France**	**Germany**	**Italy**	**Spain**	**USA**	**UK**	**Belgium**
Non propagation of flame	IEC 60332-1	EN 50265-1	CENELEC HD 405 1	NF C 32-070 cat. C2	DIN VDE 0472-T804 (B)	CEI 20-35/162	UNE 20 432 (1)	UL 44	BS 4066-1	NBN C 30-004 F1
Non propagation of fire		EN 50265-2		NF C 32-070 cat. C1						
Test on layer / non propagation of fire bunched cables 800 °C	IEC 60332-3			NF C 32-072	DIN VDE 0472-T804 (C)	CEI 20-22-3	UNE 20 427 UNE 20 432 (3)	IEE383	BS 4066-3	NBN C 30-004 F2
Fire resistant: cable system					DIN 4102/ 12-E30, E90					NBN 713-020 R1h
Smoke opacity	IEC 61034	EN 50258	CENELEC HD 6061/2S1	NF C 32-073	DIN VDE 0472-T816	CEI 20-37-4		ASTM D 2843 ASTM E 662	BS 7622-93 BS 6401-83	
Toxicity	IEC 60754-1	EN 50267		NF X 70-100		CEI 20-37-4			BS 6425-1	
Nuisance				NF X 70-101		CEI 20-37-2				
Gaz analysis				NF C 20-454						
Corrosive halogen gaz	IEC 60754-2	EN 50267	CENELEC HD 60/2S1	NF C 20-453	DIN VDE 0472-T813	CEI 20-37-1 CEI 20-37-2	UNE 21 147 (1+2)		BS 6425-2	
Fire resistance: test on cables 650 - 750 - 800 - 850 °C	IEC 60331	EN 50200			DIN VDE 0472-T814	CEI 20-36	UNE 20 431		BS 6387 cat. A,B,Y,W	
900 - 950 °C				NF C 32-070 cat. CR1					BS 6387 cat. C,Z,S	NBN C 30-004 F3
Oxygen Index	ISO 4589			NF T 51-071				ASTM D 2863-77	BS 2782 141A78	
Ease of ignition (V0, V1, etc.)	DP 1210 TC61			NF T 51-072				UL 94 ASTM D635-77	BS 2782-508A	

Mix&Fix
CENTER

Our Mix & Fix Center® help you to develop your business

How to facilitate your operations through our Mix & Fix Center®?

Sharing your needs

At Elkem Silicones, your challenges are ours as well. To respond more closely to your needs, our Mix & Fix Center® are located in the heart of major rubber and elastomer converting regions. We come to see you where you are and listen to your requirements, so that we can understand clearly what you're aiming for and how we can work together to achieve your goals.

Enabling your solutions

Specialized in heat-curing silicone rubbers, our Mix & Fix Centers® develop products quickly and efficiently that are compatible with your production facilities and equipment. By operating locally, we develop solutions that meet your standards and contribute to achieving your Key Performance Indicators. To do that, we offer custom-designed and tailor-made compounds in the colors, packaging/format and curing systems of your choice, with the best additives in the market.

Succeeding together to build the future

We believe that providing you with the best products available in the market is just the start. At Elkem Silicones, we go one step further to help you to deliver your potential, by anticipating on market needs, training your teams, sharing product stewardship and knowledge to improve your products and process integration. As a committed partner, we make sure we grow together and that we share a common vision, based on innovation and entrepreneurship. This is why we offer you all the services you need to get the most out of our products.




Elkem
A Bluestar Company

Silicones

Delivering your potential

Elkem Silicones

Elkem Silicones is one of the world's leading fully integrated silicone manufacturers with applications and research laboratories, production sites and sales offices located around the globe.

At Elkem Silicones, we're more than just high quality silicone products and associated services. We are a team of professionals located around the globe ready to provide you with the service and performance you deserve with a personal touch.

From technical support to customized formulations and regulatory support, Elkem Silicones has the people in place when and where you need them, committed to help you deliver your potential. Because we care!

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