

A dramatic industrial scene featuring a large, dark, metallic structure, possibly a mold or part of a furnace, with a bright orange and yellow glow emanating from within. Numerous bright, curved sparks or molten droplets are captured in mid-air, creating a dynamic, starburst effect against the dark background. The overall color palette is dominated by warm, fiery tones of orange, yellow, and red, contrasting with the dark, industrial elements.

# **GRAFTech** *International*

**HIGH QUALITY GRAPHITE ELECTRODE PRODUCTS**



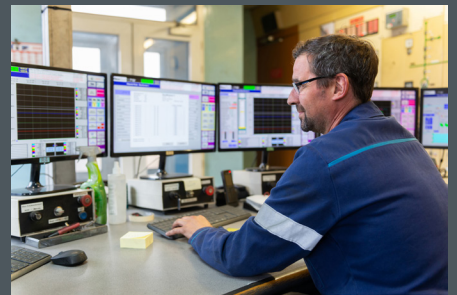


**GrafTech International** is a leading manufacturer of high-quality graphite electrode products essential to the production of electric arc furnace (“EAF”) steel and other ferrous and non-ferrous metals. The Company has a competitive portfolio of low-cost, ultra-high power graphite electrode manufacturing facilities, including three of the highest capacity facilities in the world. We are the only large-scale graphite electrode producer that is substantially vertically integrated into petroleum needle coke, our key raw material for graphite electrode manufacturing. This unique position provides us with competitive advantages in product quality and cost.

## MAXIMIZING STEEL PRODUCTIVITY THROUGH TECHNOLOGY AND SERVICE LEADERSHIP

Founded in 1886, we have over 135 years of experience in the research and development (“R&D”) of graphite and carbon based solutions, and our intellectual property portfolio is extensive. We currently have graphite electrode manufacturing facilities in Calais, France, Pamplona, Spain, Monterrey, Mexico and St. Marys, Pennsylvania. Our customers include major steel producers and other ferrous and non ferrous metal producers in Europe, the Middle East and Africa, the Americas and Asia Pacific, which sell their products into the automotive, construction, appliance, machinery, equipment and transportation industries.

Our vision is to provide highly engineered graphite electrode services, solutions and products to EAF operators. Based on the high quality of our graphite electrodes, reliability of our petroleum needle coke supply and our excellent customer service, we believe that we are viewed as a preferred supplier by the global EAF steel producer market.





## GRAFTECH SERVICE AND SOLUTIONS

We consider sustained customer satisfaction as a key measure of product and service performance. GrafTech International's stringent quality system focuses on the customer's needs and satisfaction.

- Substantial vertical integration into petroleum needle coke provides a secure source of raw material supply and associated quality, along with a sustainable competitive advantage.
- Four manufacturing facilities in different continents provide a global footprint and a reliable graphite electrode supply in each region.
- Statistical process control used in our manufacturing process and over 130 years of experience in the graphite industry lead to the production of superior and reliable quality electrodes.
- Customer Technical Service multi-disciplinary engineers with extensive know-how in the steel and electrode industry provide consultative services and solutions in furnace operations and efficiency.
- Global experienced sales team located around the world provides continuous support and advice to customer specific needs in over 65 countries.
- With the support of ArchiTech® Furnace Productivity System, our engineers can follow key furnace operations data and help customers improve EAF operations.







### UCAR® Grade AGX™ Graphite Electrodes

A premium grade that we recommend for AC high-power, ultra-high-power and DC furnaces operating under severe electrical or mechanical conditions.



GrafTech Commercial Grade	Attributes	Units	Typical Physical Properties range <sup>1</sup>				GrafTech Testing Methods <sup>2</sup>
			Electrode diameter 250-400 mm 10" - 16"	Electrode diameter 450-600 mm 18" - 24"	Electrode diameter 650-750 mm 26" - 30"	Connecting Pin All sizes	
AGX™	Bulk density	g/cc	1.66 - 1.77	1.66 - 1.76	1.67 - 1.75	1.75 - 1.84	Full Piece
	Specific resistance	μΩ.m	4.4 - 5.8	4.3 - 5.4	4.1 - 5.1	3.4 - 4.4	Full Piece
	Flexural strength	MPa	9.0 - 13.5	8.0 - 12.0	8.5 - 12.5	19.0 - 32.0	4 points bending
	Coefficient of thermal expansion	10 <sup>-6</sup> / °C	0.2 - 0.7	0.1 - 0.6	0.1 - 0.5	0.0 - 0.3	PATE <sup>3</sup> RT to 100°C

1: Displayed property values are typical ranges per GrafTech testing methods and constitute neither a guarantee or specification for individual electrode properties, nor any form of warranty, express or implied.

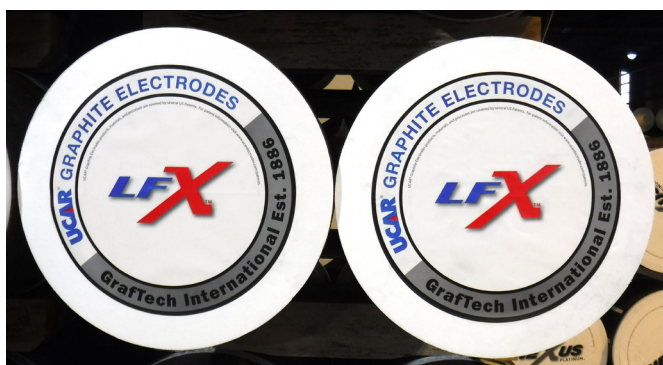
2: GrafTech testing methods have been specifically developed for graphite electrode characterization. Properties are measured in the axial direction.

3: PATE is a GrafTech invention for accurately measuring the coefficient of thermal expansion.



### UCAR® Grade LFX™ Graphite Electrodes

Ladle furnaces have different operating parameters than melting furnaces. We recommend this premium grade for ladle furnaces and other low-power melting applications.



## CHOOSING THE RIGHT ELECTRODE

Our technical experts can help you select the right UCAR® graphite electrode by assessing the specifics of your operating environment.

- Burner and oxygen usage
- Conversion costs
- Electrode consumption goals
- Electrode strength and oxidation
- Fume control system
- Furnace design
- Power level and power input program
- Productivity goal
- Refractory consumption goal
- Scrap types/charging practice
- Slag practice
- Steel type and grade
- Tap-to-tap time
- Water spray rings

GRAPHITE ELECTRODE SELECTION GUIDE (Metric)

Select Electrode Diameter			Electrode Length Options				Pin Options			
	Min	Max		Min	Max	Typical Weight of PRE-CET™ Electrode	IEC Designation	Diameter	Length	Threads per 25.4 mm
mm	mm	mm	mm	mm	mm	kg		mm	mm	
750	762	765	2700	2680	2900	2250	406T4L <sup>1</sup>	406.40	685.80	4
							406T4N	406.40	609.60	4
700	711	714	2700	2680	2900*	1940	374T4L	374.65	558.80	4
			2400	2325	2525	1700	374T4N	374.65	457.20	4
650	660	663	2700	2680	2900*	1650	355T4L	355.60	558.80	4
			2400	2325	2525	1450	355T4N	355.60	457.20	4
600	610	613	2700	2680	2900*	1410	317T4EL <sup>1</sup>	317.50	558.80	4
			2400	2325	2525	1250	317T4L	317.50	457.20	4
			2100	2045	2225	1080	317T4N	317.50	355.60	4
550	559	562	2700	2680	2900*	1180	298T4L	298.45	457.20	4
			2400	2325	2525	1050	298T3L	298.45	457.20	3
			2100	2045	2225	910	298T4N	298.45	355.60	4
500	508	511	2400	2325	2525	870	273T3L	273.05	457.20	3
			2100	2045	2225	760	273T3N	273.05	355.60	3
			1800	1745	1905	690	269T4L	269.88	457.20	4
							269T4N	269.88	355.60	4
450	457	460	2400 2100 1800	2325 2045 1745	2525 2225 1905	700 620 530	273T3L	273.05	457.20	3
							269T4L	269.88	457.20	4
							241T4N	241.30	304.80	4
							241T4L	241.30	355.60	4
							241T3L	241.30	355.60	3
							241T3N	241.30	338.70	3
400	406	409	2400 2100 1800	2325 2045 1745	2525 2225 1905	550 480 420	241T3L	241.30	355.60	3
							241T3N	241.30	338.70	3
							222T4L	222.25	355.60	4
							222T4N	222.25	304.80	4
							215T3N	215.90	304.80	3
350	352	358	2100 1800	2045 1745	2225 1905	370 310	215T3N	215.90	304.80	3
							203T4L	203.20	304.80	4
							203T4N	203.20	254.00	4
							177T3N	177.16	270.90	3
300	303	307	1800	1745	1905	230	177T4N	177.80	215.90	4
							177T3N	177.16	270.90	3
							155T3N	155.57	220.00	3
250	251	256	1800	1745	1905	160	155T3N	155.57	220.00	3
			1500	1490	1650	140	152T4N	152.40	190.50	4

\* Longer maximum length available to many 2700 mm customers  
<sup>1</sup> GrafTech also machines 406T4L and 317T4EL pins which are not part of the IEC60239

GRAPHITE ELECTRODE SELECTION GUIDE (English)

Select Electrode Diameter			Electrode Length Options				Pin Options			
	Min	Max		Min	Max	Typical Weight of PRE-CET™ Electrode	IEC Designation	Diameter	Length	Threads per inch
In	In	In	In	In	In	lbs		In	In	
30	30.00	30.12	110	105.51	114.17*	4950	406T4L <sup>1</sup>	16.00	27.00	4
							406T4N	16.00	24.00	4
28	27.99	28.11	110	105.51	114.17*	4268	374T4L	14.00	22.00	4
			96	91.54	99.41	3740	374T4N	14.00	18.00	4
26	25.98	26.10	110	105.51	114.17*	3630	355T4L	14.00	22.00	4
			96	91.50	99.40	3190	355T4N	14.00	18.00	4
24	24.02	24.13	110	105.51	114.17*	3102	317T4EL <sup>1</sup>	12.50	22.00	4
			96	91.54	99.41	2750	317T4L	12.50	18.00	4
			84	80.51	87.60	2376	317T4N	12.50	14.00	4
22	22.01	22.13	110	105.51	114.17*	2596	298T4L	11.75	18.00	4
			96	91.54	99.41	2310	298T3L	11.75	18.00	3
			84	80.51	87.60	2002	298T4N	11.75	14.00	4
20	20.00	20.12	96	91.54	99.41	1914	273T3L	10.75	18.00	3
			84	80.51	87.60	1672	273T3N	10.75	14.00	3
			72	68.70	75.00	1518	269T4L	10.63	18.00	4
							269T4N	10.63	14.00	4
18	17.99	18.11	96 84 72	91.54 80.51 68.70	99.41 87.60 75.00	1540 1364 1166	273T3L	10.75	18.00	3
							269T4L	10.63	18.00	4
							241T4N	9.50	12.00	4
							241T4L	9.50	14.00	4
							241T3L	9.50	14.00	3
							241T3N	9.50	13.33	3
16	15.98	16.10	96	91.54	99.41	1210	241T3L	9.50	14.00	3
			84	80.51	87.60	1056	241T3N	9.50	13.33	3
			72	68.70	75.00	924	222T4L	8.75	14.00	4
							222T4N	8.75	12.00	4
14	13.86	14.09	84 72	80.51 68.70	87.60 75.00	814 682	215T3N	8.50	12.00	3
							203T4L	8.00	12.00	4
							203T4N	8.00	10.00	4
							177T3N	6.97	10.67	3
12	11.93	12.09	72	68.70	75.00	506	177T4N	7.00	8.50	4
							177T3N	6.97	10.67	3
							155T3N	6.12	8.66	3
10	9.88	10.08	72	68.70	75.00	352	155T3N	6.12	8.66	3
			60	58.66	64.96	308	152T4N	6.00	7.50	4

\* Longer maximum length available to many 110 inch customers  
<sup>1</sup> GrafTech also machines 406T4L and 317T4EL pins which are not part of the IEC60239

# GRAFTech International

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