



GRAPHITE ELECTRODE

For Arc Furnaces



Our vision

To be a recognized global leader in the Graphite Electrode industry

Our values

Ethically and socially responsible

Celebrate diversity and care for the wellbeing of all stakeholders

Contributing to sustainable electric steelmaking

Our mission statement

To provide our customers everywhere in the world the best Electrode solutions: Through producing High performance Graphite Electrode through a Resilient supply chain, with competitive pricing, unequaled value added service and flexible tailor made financial solutions.

Our process

ALTech branded Graphite Electrode are produced in three fully integrated ISO9001-certified plants in China, for a combined capacity of 80,000 MT/year

One of these plants have been manufacturing electrode since 1964

ALTech's engineers and technicians supervise the manufacturing process in China, ensuring traceability and quality control

ALTech buys raw materials including needle coke from the best suppliers in the world
ALTech's expert team of PhDs and Engineers across Switzerland, Austria, Germany and France designs and implements our in-house mix recipe



Electrode Dimensions*							
Electrode Diameter (mm)			Electrode Length (mm)				Grade
Nominal	Min	Max	Nominal	Min	Max	Allowance short length 15 %	
						Minimum short length	
250	251	256	1500	1400	1600	1225	RP/HP/UHP
			1800	1700	1900	1525	RP/HP/UHP
300	302	307	1800	1700	1900	1525	RP/HP/UHP
			2100	1975	2225	1825	RP/HP/UHP
350	352	358	1800	1700	1900	1525	RP/HP/UHP
			2100	1975	2225	1825	RP/HP/UHP
400	403	409	1800	1700	1900	1525	RP/HP/UHP
			2100	1975	2225	1825	RP/HP/UHP
450	454	460	1800	1700	1900	1525	RP/HP/UHP
			2100	1975	2225	1825	RP/HP/UHP
			2400	2275	2525	2125	RP/HP/UHP
500	505	511	1800	1700	1900	1525	HP/UHP
			2100	1975	2225	1825	HP/UHP
			2400	2275	2525	2125	HP/UHP
			2700	2550	2900	2400	HP/UHP
550	556	562	2100	1975	2225	1825	HP/UHP
			2400	2275	2525	2125	HP/UHP
			2700	2550	2900	2400	HP/UHP
600	607	613	2100	1975	2225	1825	HP/UHP
			2400	2275	2525	2125	HP/UHP
			2700	2550	2900	2400	HP/UHP
650	659	663	2400	2275	2525	2125	UHP
			2700	2550	2900	2400	UHP
700	710	714	2400	2275	2525	2125	UHP
			2700	2550	2900	2400	UHP
750	761	765	2700	2550	2900	2400	UHP

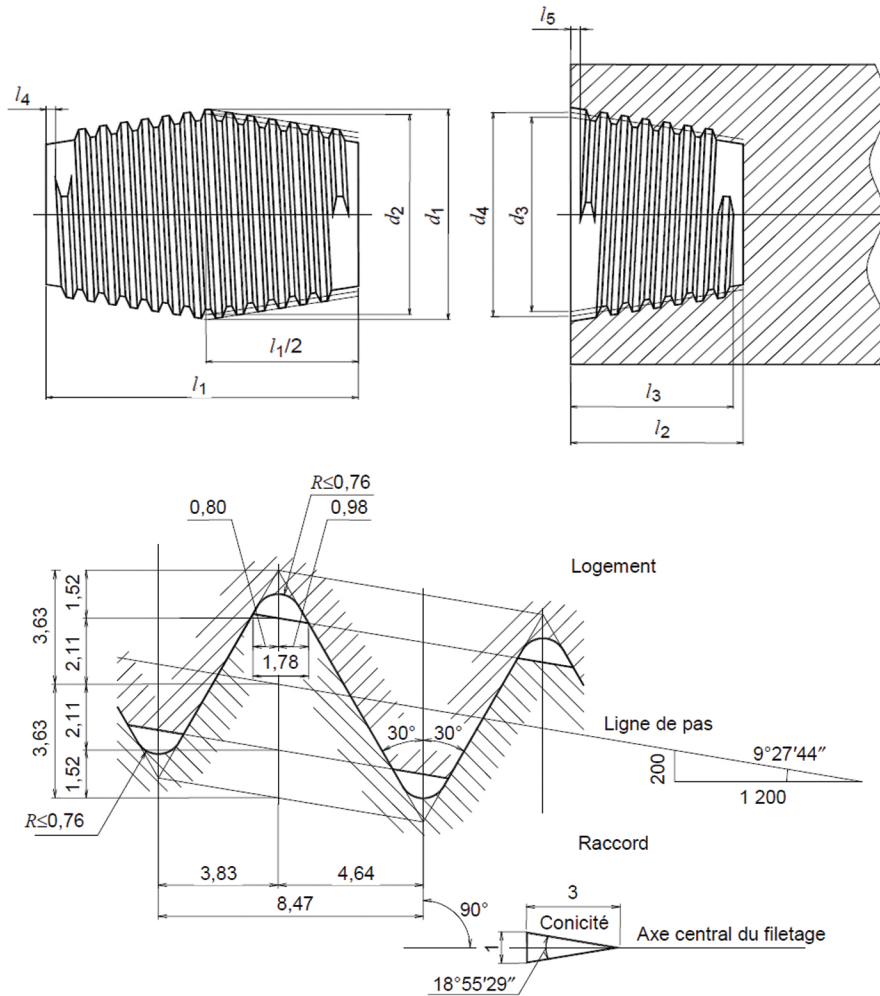
*Different tolerances could be supplied under special request

Typical Properties for Electrode						
Property	Nominal Diameter	350mm to 450mm (14" to 18")			500mm to 750mm (20" to 30")	
	Grade	RP	HP	UHP	HP	UHP
Bulk Density	g/cm ³	1.55 to 1.65	1.60 to 1.70	1.65 to 1.75	1.60 to 1.70	1.65 to 1.74
Total Porosity	%	23-29	20-26	20-26	20-26	20-26
Flexural Strength	MPa	5.0 to 12.0	6.0 to 13.0	7.0 to 13.0	6.0 to 13.0	8.0 to 13.0
Specific Resistance	μΩm	6.0 to 8.0	5.5 to 6.5	4.5 to 6.0	5.5 to 6.5	4.0 to 5.5
Thermal Conductivity	W/(mk)	120-220	160-210	210-250	210-280	250-280
Coefficient of Thermal Expansion (R.T. to 400°C)	x10 ⁻⁶ /°C	0.5 to 1.5	0.5 to 1.4	0.2 to 1.4	0.5 to 1.4	0.1 to 0.6
Elastic Modulus	GPa	≤ 9.3	≤ 9.3	≤ 14	≤ 14	≤ 14
Ash	%	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1



4 TPI Pins			
Electrode Diameter	Pin IEC designation	Diameter (d1)	Length (l1)
250	152T4N	152.40	190.50
300	177T4N	177.80	215.90
350	203T4N	203.20	254.00
	203T4L	203.20	304.80
400	222T4N	222.25	304.80
	222T4L	222.25	355.60
450	241T4N	241.30	304.80
	241T4L	241.30	355.60
500	269T4N	269.88	355.60
	269T4L	269.88	457.20
550	298T4N	298.45	355.60
	298T4L	298.45	457.20
600	317T4N	317.50	355.60
	317T4L	317.50	457.20
650	355T4N	355.60	457.20
	355T4L	355.60	558.80
700	374T4N	374.65	457.20
	374T4L	374.65	558.80
750	406T4N	406.40	609.60
	406T4L	406.40	685.80
3 TPI Pins			
Electrode Diameter	Pin IEC designation	Diameter (d1)	Length (l1)
250	155T3N	155.57	220.00
300	177T3N	177.16	270.90
350	215T3N	215.90	304.80
	215T3L	215.90	355.60
400	215T3N	215.90	304.80
	215T3L	215.90	355.60
450	241T3N	241.30	338.70
	241T3L	241.30	355.60
500	273T3N	273.05	355.60
	273T3L	273.05	457.20
550	298T3L	298.45	457.20

Typical Properties for Pins		
Bulk Density	g/cm ³	1.73 - 1.86
Total Porosity	%	13 - 20
Tensile Strength	MPa	12.4 - 20
Flexural Strength	MPa	20 - 23
Specific Resistance	μΩm	3.4 - 4.5
Thermal Conductivity	W/(mK)	300
Coefficient of Thermal Expansion (R.T. to 400°C)	x10 ⁻⁶ /°C	0 - 0.3
Elastic Modulus	GPa	20 - 22
Ash	%	< 0.1



Main Properties

Flexural Strength

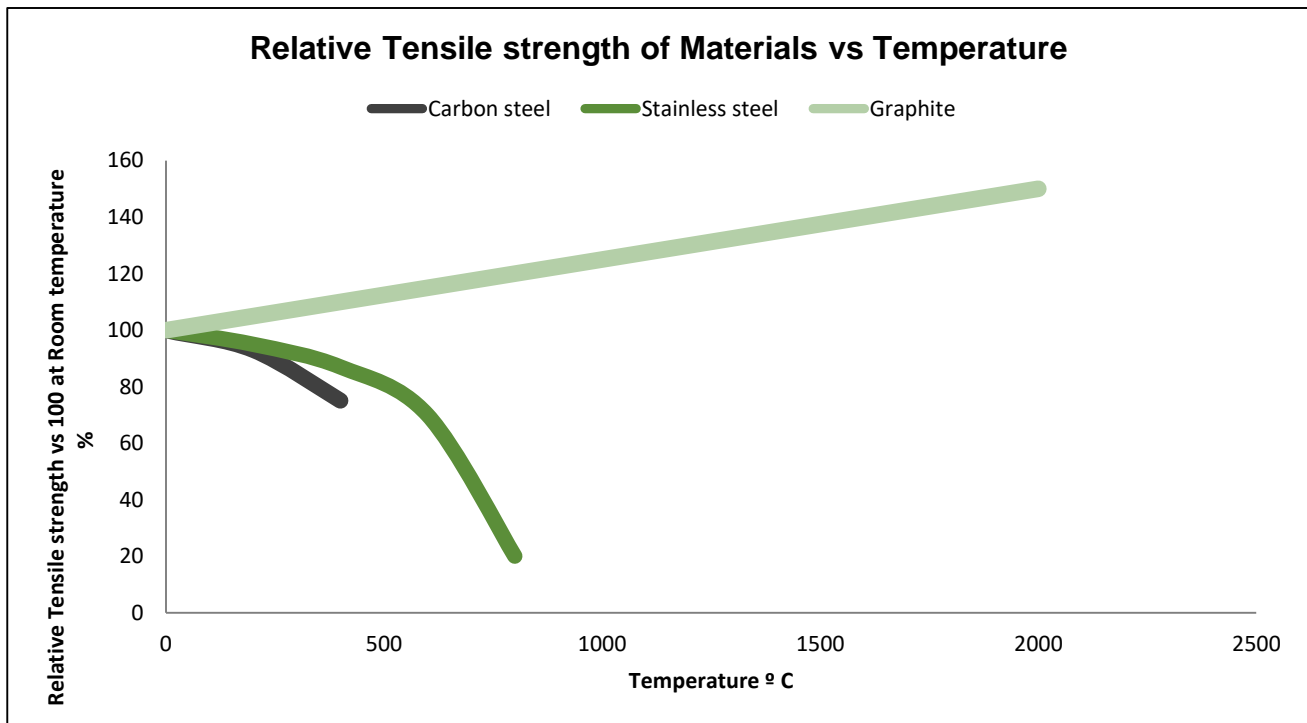
The maximum stress which the material will withstand before rupture in bending (also called Bending Strength or Modulus of Rupture).

Higher flexural strength in electrode will generally result in lower electrode breakage frequency.

Tensile Strength

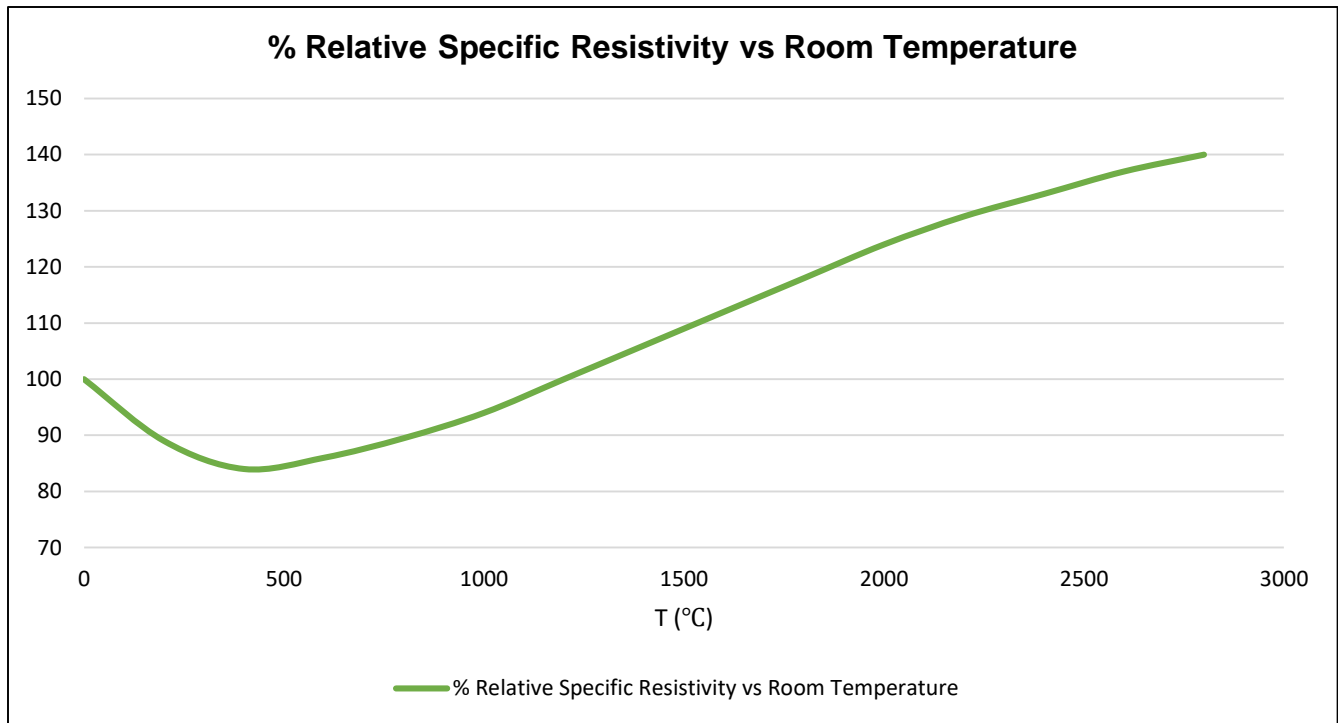
A measurement of pure tensile force per unit area required to cause rupture by pulling apart. Higher tensile strength in pins will generally result in lower pin breakage frequency.

Graphite's strength characteristics increase significantly with temperature.



Specific Resistance

The electrical resistance of a unit length of graphite. One of the graphite's useful properties is that electrical resistance does not increase strongly with temperature. Up to 1400 °C, the electrical resistance is lower than it was at room temperature.



Bulk Density

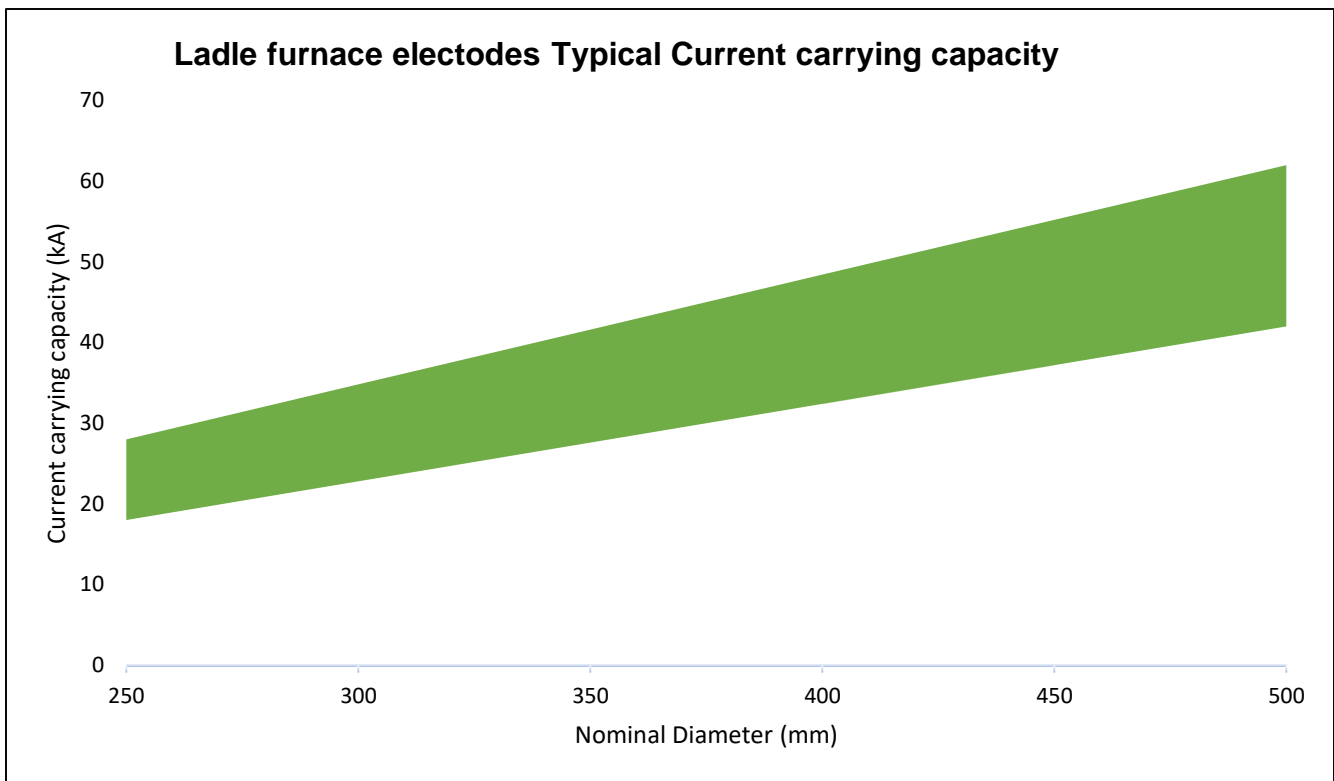
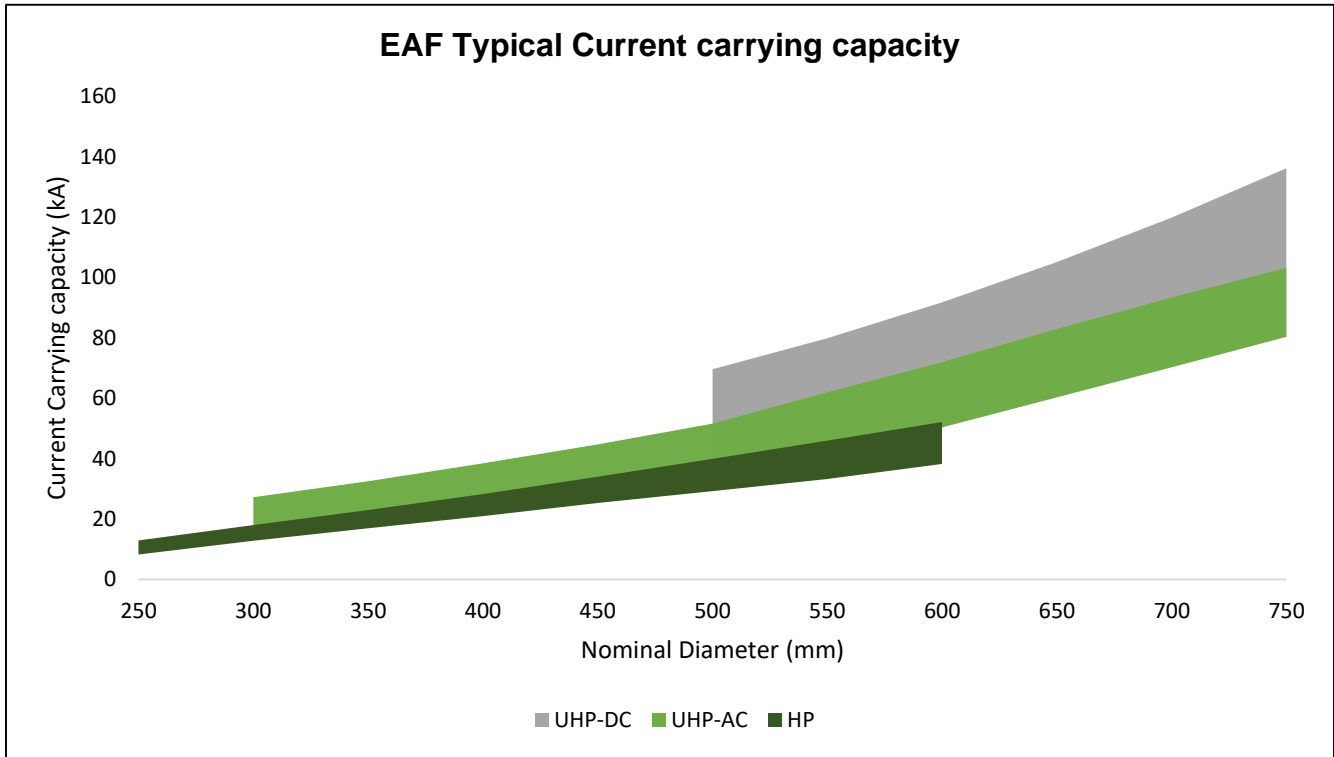
A measurement of weight per unit volume. A higher bulk density will generally be reflected in improved mechanical properties.

Ash Content

Graphite Electrode typically have less than 0.1% impurities, and do not contain elements harmful to steel making.

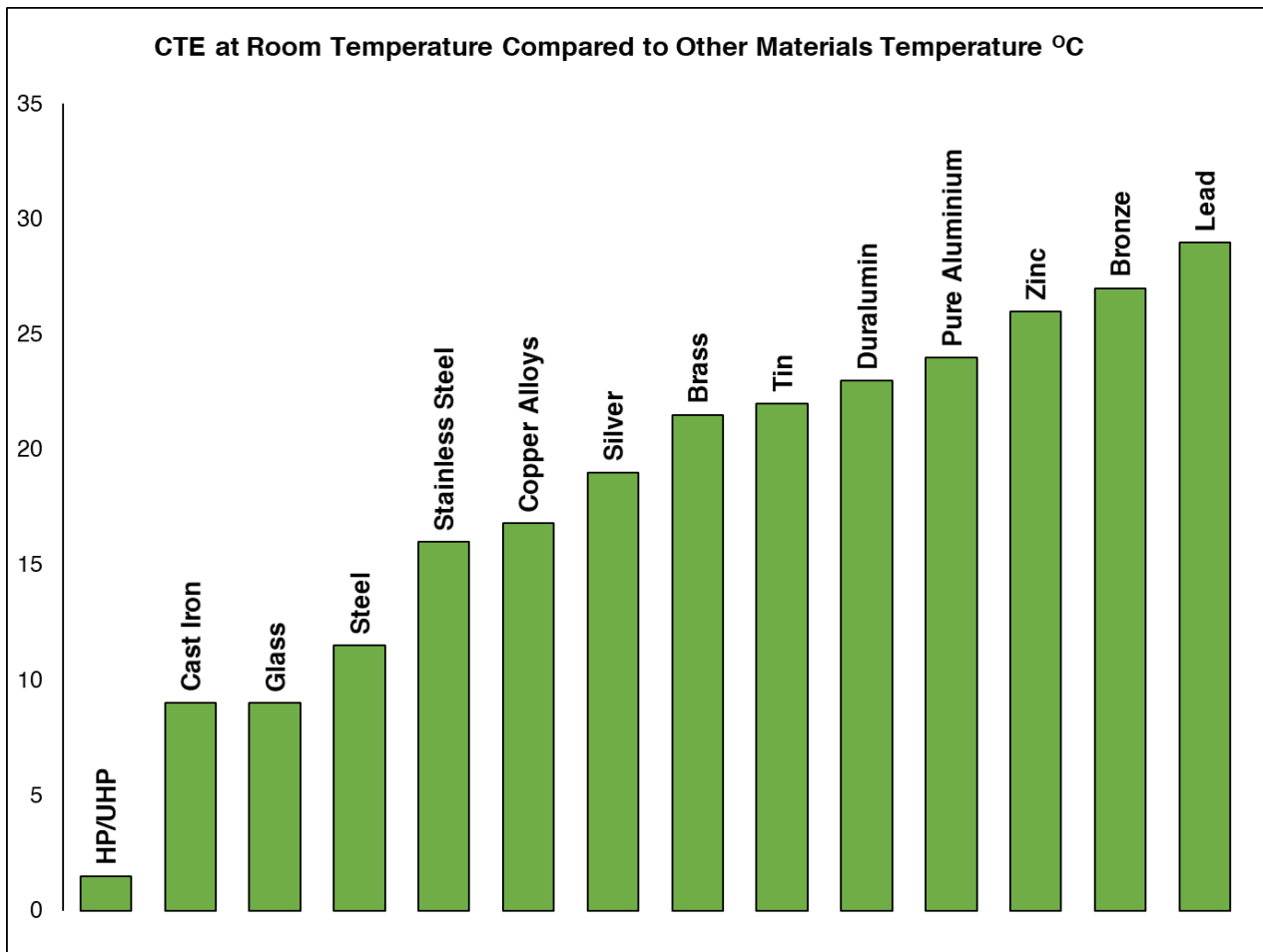
Testing Methods

Property	Method
Bulk Density	ASTM C-559
Flexural Strength	ASTM C-651
Tensile Strength	ASTM C-749
Specific Resistance	ASTM C-611
Ash	ASTM C-561
Coefficient of Thermal Expansion (R. T. to 400°C)	ASTM E-228
Elastic Modulus	ASTM C-747
Porosity	ASTM C-1039



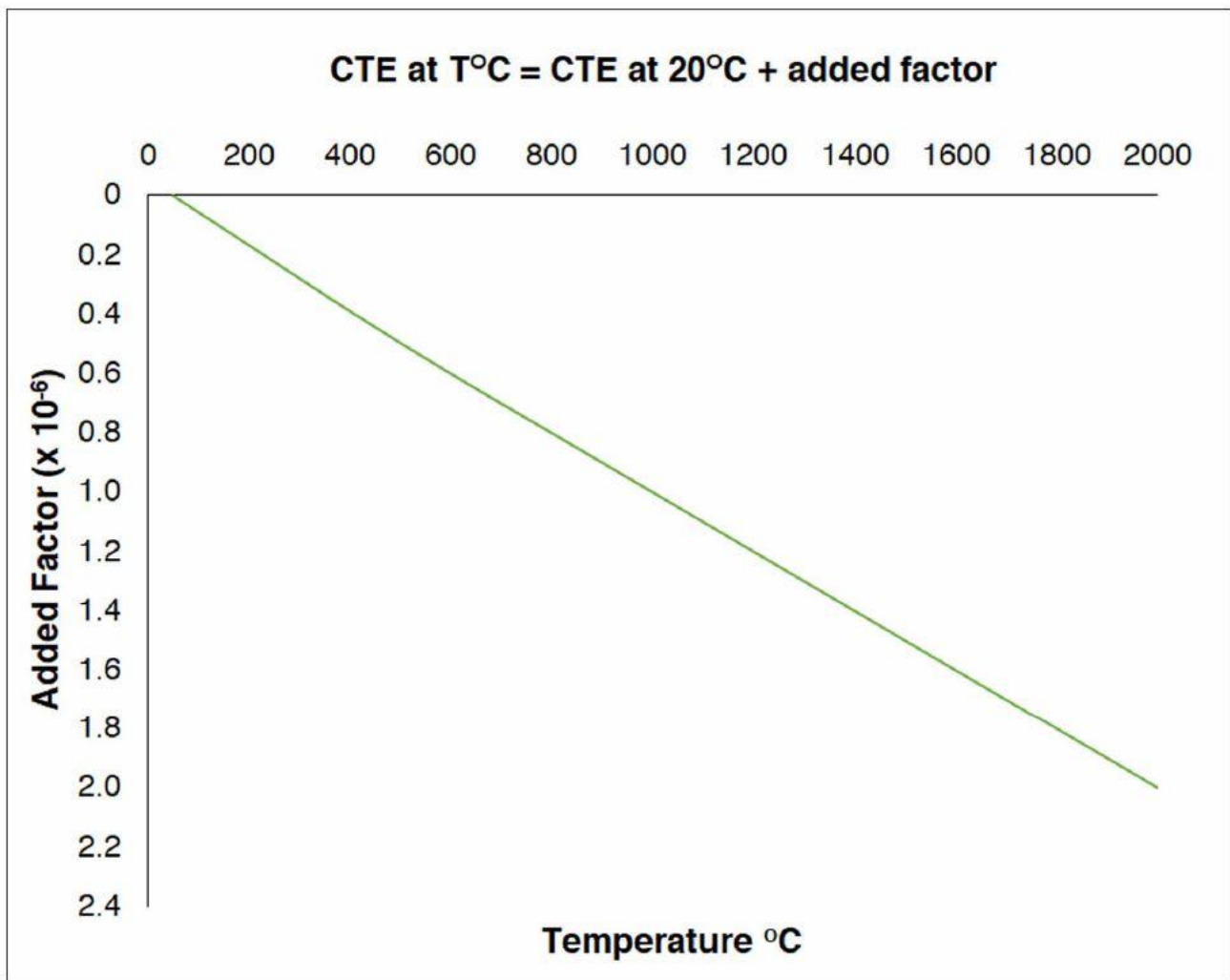
Coefficient of Thermal Expansion (CTE)

A measurement of the increase in length per unit length per degree rise in temperature. Lower CTE will give better resistance to thermal shock. Also, CTE compatibility between the graphite electrode and the connecting pin is important for satisfactory performance of the electrode joint



Change in Graphite CTE with Temperature

The change in CTE with temperature is about the same for all graphite at high temperature. The mean linear CTE between room temperature and any final temperature can be obtained from the following formula.





Property	Typical Torque
mm	Nm
250	550
300	650
350	900
400	1120
450	1500
500	2000
550	3000
600	4000
650	5000
700	6000
750	7500

The following operating considerations must be addressed before selecting the electrode size and grade for a particular application.

- Production / Productivity Goals
- Furnace Design
- Steel Type and Grade
- Charge Material

- Charging Practice
- Power Level
- Current Level
- Slag Practice
- Burner / Oxygen Practice

- Water Spray Rings
- Fume Control System
- Graphite Electrode Consumption Goal



ALTech has an excellent expertise in designing, selecting, measuring the performance of your Graphite Electrode.

Our Graphite Electrode solution provides added value service that monitors and analyses the electrical steel making process and the arc furnace electrical parameters in order to reduce your conversion costs and improve your steel output.



ALTech Group have a global footprint



altech@altechgroup.net
www.altechgroup.net

