

生产设备

Production equipment

石墨电极采用优质的煅后焦为原料、按照先进的石墨电极生产工艺,经粉碎、筛分、配料、混捏、压型、焙烧、浸渍、石墨化、机加工等工序精制而成。

Graphite electrode adopts forged coking materials of high quality in accord with sophisticated graphite electrode process through milling, screening, batching, mixing, extruding, baking, impregnating, graphitizing and machining.



35MN挤压机 (35MN extruding press)



焙烧 (Bake)



浸渍 (Impregnation)



内热串接石墨化
(Internal heat series graphite)

产品展示

Product display



普通功率石墨电极理化指标及允许电流负荷一览表

Technical properties of R P graphite electrode

1. 理化指标 Physical and chemical index

项目 Item		单位 unit	公称直径Nominal Diameter(mm)		
			行业标准YB/T4090-2015 Industry Standard		典型值 Typical Values
			250-300	350-600	300-600
电阻率 Electric Resistivity	电极 Electrode	$\mu\Omega \cdot m$	≤ 9.0	≤ 9.0	7.4-8.8
	接头 Nipple		≤ 8.5	≤ 8.5	4.4-5.5
抗折强度 Bending Strength	电极 Electrode	Mpa	≥ 7.8	≥ 6.4	≥ 8.0
	接头 Nipple		≥ 13.0	≥ 13.0	≥ 15.0
弹性模量 Elastic Modulus	电极 Electrode	Gpa	≤ 9.3	≤ 9.3	≤ 9.0
	接头 Nipple		≤ 14.0	≤ 14.0	≤ 13.0
体积密度 Bulk Density	电极 Electrode	g/cm^3	≥ 1.52	≥ 1.52	1.55-1.60
	接头 Nipple		≥ 1.68	≥ 1.68	1.70-1.76
灰分 Ash	电极 Electrode	%	≤ 0.5	≤ 0.5	≤ 0.3
	接头 Nipple		≤ 0.5	≤ 0.5	≤ 0.3
热膨胀系数 CET(100-600)°C	电极 Electrode	$10^{-6}/^{\circ}C$	≤ 2.9	≤ 2.9	2.0-2.6
	接头 Nipple		≤ 2.8	≤ 2.8	1.5-1.8

2. 允许电流负荷 Recommended current carrying capacity

公称直径 Nominal Diameter		行业标准YB/T4090-2015 Industry Standard		典型值 Typical Values	
		允许电流负 Current Carrying Capacity	电流密度 Current Density	粗炼炉 Electrical Arc Furnace	
				允许电流负 Current Carrying Capacity	电流密度 Current Density
in	mm	A	A/cm ²	A	A/cm ²
12	300	10000-13000	14-18	11000-15000	15-21
14	350	13500-18000	14-18	15000-20000	15-20
16	400	18000-23500	14-18	19000-26000	15-20
18	450	22000-27000	13-17	23000-31000	14-19
20	500	25000-32000	13-16	28000-36000	14-18
22	550	30000-40000	12-16	32000-42000	13-17
24	600	38000-47000	13-16	40000-49000	14-17

高功率石墨电极理化指标及允许电流负荷一览表

Technical properties of H P graphite electrode

1. 理化指标 Physical and chemical index

项目 Item		单位 unit	公称直径Nominal Diameter(mm)			
			行业标准YB/T4090-2015 Industry Standard		典型值 Typical Values	
			200-400	450-600	300-400	450-600
电阻率 Electric Resistivity	电极 Electrode	$\mu\Omega \cdot m$	≤ 7	≤ 7.5	5.0-6.6	5.4-6.8
	接头 Nipple		≤ 6.5	≤ 6.5	4.0-5.0	4.0-5.0
抗折强度 Bending Strength	电极 Electrode	Mpa	≥ 10.5	≥ 9.8	≥ 11.0	≥ 11.0
	接头 Nipple		≥ 14.0	≥ 14.0	≥ 16.0	≥ 16.0
弹性模量 Elastic Modulus	电极 Electrode	Gpa	≤ 12.0	≤ 12.0	≤ 11.0	≤ 11.0
	接头 Nipple		≤ 16.0	≤ 16.0	≤ 15.0	≤ 15.0
体积密度 Bulk Density	电极 Electrode	g/cm^3	≥ 1.60	≥ 1.60	1.63-1.70	1.63-1.70
	接头 Nipple		≥ 1.70	≥ 1.70	1.73-1.80	1.73-1.80
灰分 Ash	电极 Electrode	%	≤ 0.3	≤ 0.3	≤ 0.3	≤ 0.3
	接头 Nipple		≤ 0.3	≤ 0.3	≤ 0.3	≤ 0.3
热膨胀系数 CET(100-600)°C	电极 Electrode	$10^{-6}/^{\circ}C$	≤ 2.4	≤ 2.4	1.8-2.2	1.8-2.2
	接头 Nipple		≤ 2.2	≤ 2.2	1.5-1.8	1.5-1.8

2. 允许电流负荷 Recommended current carrying capacity

公称直径 Nominal Diameter		行业标准YB/T4090-2015 Industry Standard		典型值 Typical Values			
		允许电流负荷 Current Carrying Capacity	电流密度 Current Density	粗炼炉 Electrical Arc Furnace		精炼炉 Ladle Refining Furnace	
				允许电流负荷 Current Carrying Capacity	电流密度 Current Density	允许电流负荷 Current Carrying Capacity	电流密度 Current Density
in	mm	A	A/cm ²	A	A/cm ²	A	A/cm ²
12	300	13000-17400	17-24	13000-17500	18-25	15000-21000	21-29
14	350	17400-24000	17-24	17500-24500	18-25	20000-28000	21-29
16	400	21000-31000	16-24	21500-32000	17-25	24000-35000	19-28
18	450	25000-40000	15-24	26000-40500	16-25	29000-45000	18-28
20	500	30000-48000	15-24	32000-50000	16-25	34000-54000	17-27
22	550	35000-55000	14-22	37000-57000	15-23	40000-62000	16-25
24	600	38000-58000	15-23	40000-67000	15-23	44000-67000	16-24

准超大功率石墨电极理化指标及允许电流负荷一览表

Technical properties of SHP graphite electrode

1. 理化指标 Physical and chemical index

项目 Item		单位 unit	公称直径Nominal Diameter(mm)	
			内控标准 Inner Controlled std	典型值 Typical Values
			300-600	300-600
电阻率 Electric Resistivity	电极 Electrode	$\mu\Omega \cdot m$	≤ 6.5	5.0-6.4
	接头 Nipple		≤ 5.5	3.8-4.8
抗折强度 Bending Strength	电极 Electrode	Mpa	≥ 10.0	≥ 10.0
	接头 Nipple		≥ 16.0	≥ 17.0
弹性模量 Elastic Modulus	电极 Electrode	Gpa	≤ 14.0	≤ 13.0
	接头 Nipple		≤ 18.0	≤ 17.0
体积密度 Bulk Density	电极 Electrode	g/cm^3	≥ 1.64	1.65-1.72
	接头 Nipple		≥ 1.74	1.75-1.82
灰分 Ash	电极 Electrode	%	≤ 0.3	≤ 0.3
	接头 Nipple			
热膨胀系数 CET(100-600) $^{\circ}C$	电极 Electrode	$10^{-6}/^{\circ}C$	≤ 1.8	1.50-1.80
	接头 Nipple		≤ 1.6	1.30-1.50

2. 允许电流负荷 Recommended current carrying capacity

公称直径 Nominal Diameter		典型值 Typical Values			
		粗炼炉 Electrical Arc Furnace		精炼炉 Ladle Refining Furnace	
		允许电流负荷 Current Carrying Capacity	电流密度 Current Density	允许电流负荷 Current Carrying Capacity	电流密度 Current Density
in	mm	A	A/cm ²	A	A/cm ²
12	300	14000-20000	19-28	16000-23000	22-32
14	350	18000-26000	18-27	20500-30000	21-31
16	400	23000-33000	18-26	26000-37000	20-29
18	450	27000-42000	17-26	31000-47000	19-29
20	500	34000-52000	17-26	36000-56000	18-28
22	550	40000-60000	16-24	42000-64000	17-26
24	600	42000-63000	17-26	43000-65000	17-26

超功率石墨电极理化指标及允许电流负荷一览表

Technical properties of UHP graphite electrode

1. 理化指标 Physical and chemical index

项目 Item		单位 unit	公称直径Nominal Diameter(mm)			
			行业标准YB/T4090-2015 Industry Standard		典型值 Typical Values	
			300-400	450-600	350-400	450-600
电阻率 Electric Resistivity	电极 Electrode	$\mu\Omega \cdot m$	≤ 6.2	≤ 6.5	4.6-6.0	4.8-6.2
	接头 Nipple		≤ 5.5	≤ 5.5	3.5-4.5	3.5-4.5
抗折强度 Bending Strength	电极 Electrode	Mpa	≥ 10.5	≥ 10.0	≥ 11.0	≥ 11.0
	接头 Nipple		≥ 16.0	≥ 16.0	≥ 18.0	≥ 18.0
弹性模量 Elastic Modulus	电极 Electrode	Gpa	≤ 14.0	≤ 14.0	≤ 13.0	≤ 13.0
	接头 Nipple		≤ 18.0	≤ 18.0	≤ 17.0	≤ 17.0
体积密度 Bulk Density	电极 Electrode	g/cm^3	≥ 1.65	≥ 1.64	1.66-1.72	1.65-1.72
	接头 Nipple		≥ 1.72	≥ 1.70	1.75-1.82	1.75-1.82
灰分 Ash	电极 Electrode	%	≤ 0.3	≤ 0.3	≤ 0.3	≤ 0.3
	接头 Nipple		≤ 0.3	≤ 0.3	≤ 0.3	≤ 0.3
热膨胀系数 CET(100-600)°C	电极 Electrode	$10^{-6}/^{\circ}C$	≤ 1.5	≤ 1.5	1.20-1.40	1.20-1.40
	接头 Nipple		≤ 1.4	≤ 1.4	1.10-1.30	1.10-1.30

2. 允许电流负荷 Recommended current carrying capacity

公称直径 Nominal Diameter		行业标准YB/T4090-2015 Industry Standard		典型值 Typical Values			
		允许电流负荷 Current Carrying Capacity	电流密度 Current Density	粗炼炉 Electrical Arc Furnace		电流密度 Current Density	
				允许电流负荷 Current Carrying Capacity	电流密度 Current Density	允许电流负荷 Current Carrying Capacity	电流密度 Current Density
in	mm	A	A/cm ²	A	A/cm ²	A	A/cm ²
14	350	20000-30000	20-30	22000-31000	23-32	24000-33000	25-34
16	400	25000-40000	19-30	28000-41000	22-32	31000-44000	24-34
18	450	32000-45000	19-27	33000-46000	20-28	36000-49000	22-30
20	500	38000-55000	18-27	38000-56000	19-28	42000-60000	21-30
22	550	42000-62000	17-25	45000-65000	18-26	50000-70000	20-28
24	600	49000-75000	17-26	49000-72000	18-26	50000-75000	20-28

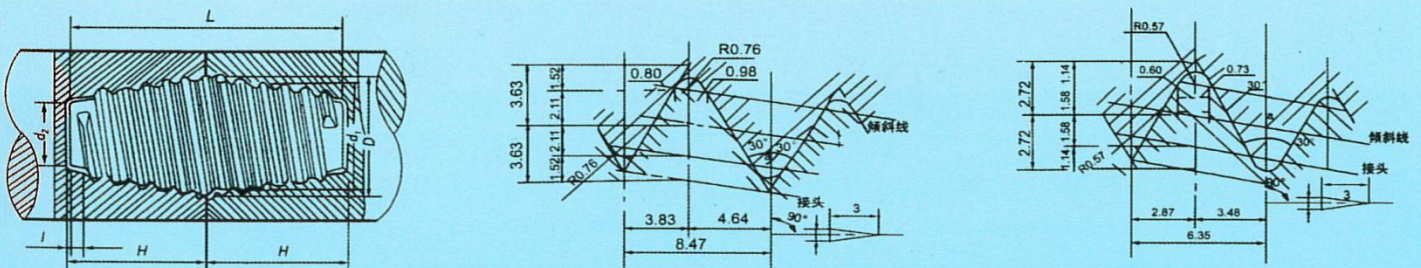
电极直径及长度表 (mm) Tolerances of electrode diameters and lengths (mm)

公称直径 Nominal Diameter	实际直径 Actual Diameter			长度 Length
	最大 max	最小 min	黑皮部分最小 Black surface min	
250	256	251	248	1600/1800
300	307	302	299	1600/1800
350	357	352	349	1600/1800
400	409	403	400	1600/1800/2000/2200
450	460	454	451	1600/1800/2000/2200
500	511	505	502	1800/2000/2200/2400
550	562	556	553	1800/2000/2200/2400
600	613	607	604	2000/2200/2400

电极接头及接头孔尺寸表 (mm) Sizes of taper-thread nipples and sockets (mm)

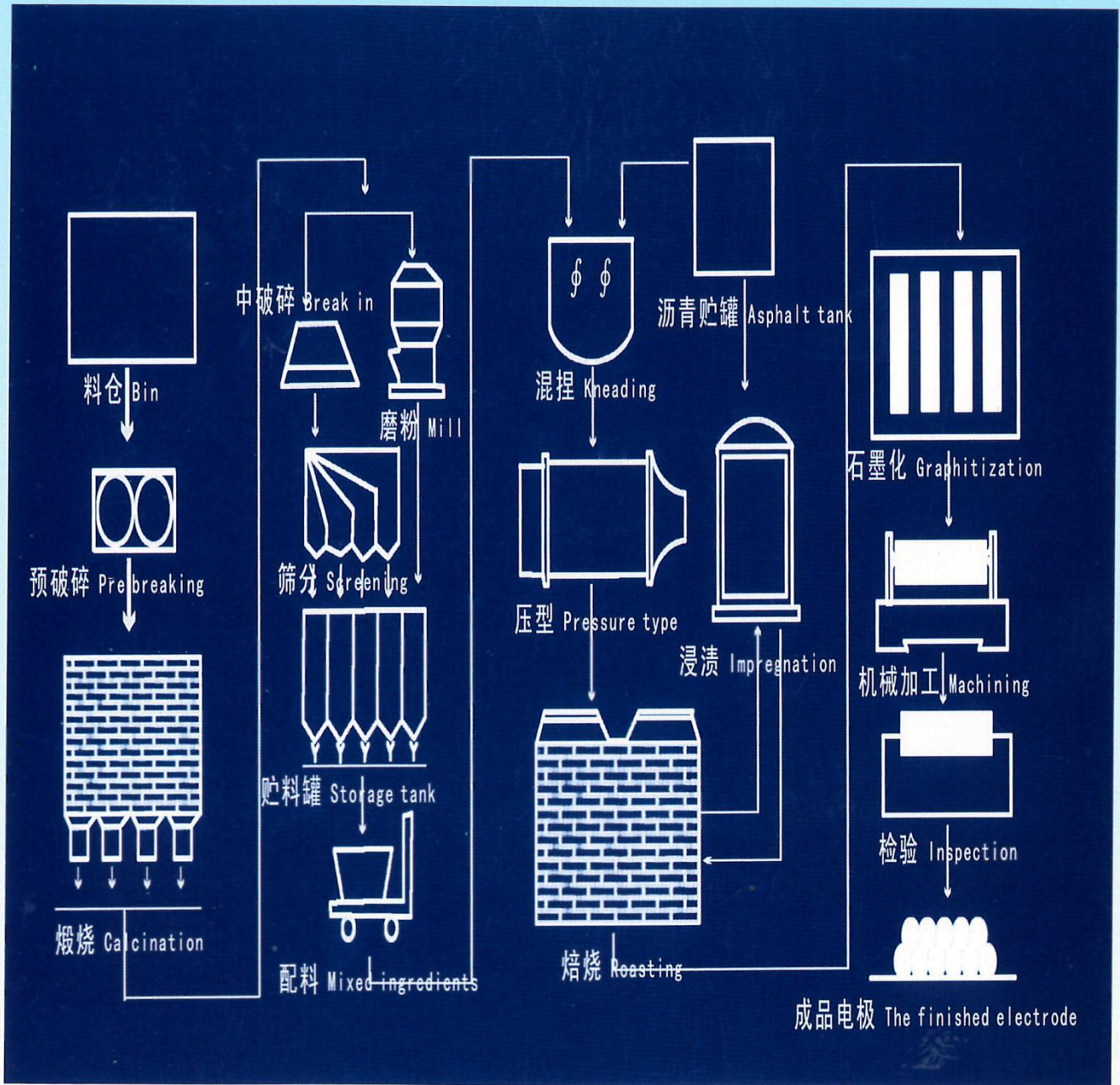
公称直径 Nominal Diameter	接头 Nipple				接头孔 Socket		螺距 Thread pitch
	D	L	d ₂	l	d ₁	H	
250	155.57	220.00	103.80		147.14	116.00	8.47
300	177.16	270.90	116.90		168.73	141.50	
350	215.90	304.80	150.00		207.47	158.40	
400	215.90	304.80	150.00		207.47	158.40	
400	241.30	338.70	169.80	0	232.87	175.30	
450	241.30	338.70	169.80	< 10	232.87	175.30	
450	273.05	355.60	198.70	-5	264.62	183.80	
500	273.05	355.60	198.70	-5	264.62	183.80	
500/550	298.45	372.60	221.30		290.02	192.02	
250	152.40	190.50	108.00		146.08	101.30	
300	177.80	215.90	129.20		171.48	114.00	
350	203.20	254.00	148.20		196.88	133.00	
400	222.25	304.80	158.80		215.93	158.40	
400	222.25	355.60	150.00	0	215.93	183.80	
450	241.30	304.80	177.90	< 7	234.98	158.40	
450	241.30	355.60	169.42	-5	234.98	183.80	
500	269.88	355.60	198.00	-5	263.56	183.80	
500	269.88	457.20	181.08		263.56	234.60	
550	298.45	355.60	226.58		292.13	183.80	
550	298.45	457.20	209.65		292.13	234.60	
600	317.50	335.60	245.63		311.18	183.80	
600	317.50	457.20	228.70		311.18	234.60	

电极接头的形状、尺寸如下图 Chart of taper-thread nipple:



生产工艺

Production process



产品使用说明 Product instructions



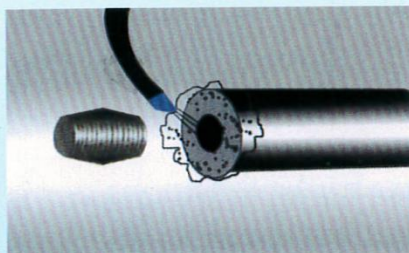
1、石墨电极吊装应使用专用工具，严禁使用撬棍，搬运时要防止撞击碰损。
1、Use special hoist tools to hoist graphite electrode. It is strictly forbidden to pry electrode ends up with crowbar. It must be handled with great care during transport to avoid being struck.



2、石墨电极禁止雨、雪、水浸淋，应保持干燥。
2、Graphite electrode must be kept away from being moistened or wetted by rain, snow and water, and must be kept dry.



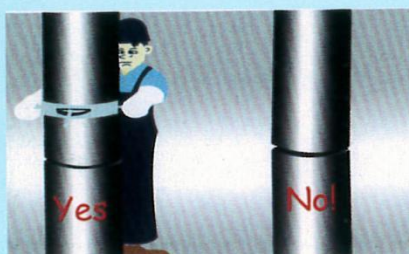
3、石墨电极连接前要认真检查电极接头孔是否完好，接头螺纹是否损伤，接头栓是否丢失。
3、Carefully checking before making connection. Make sure that the socket and nipple thread is not damaged, nipple pitch plug is in.



4、接头和接头孔内的灰尘、杂物，须用压缩空气吹干净，严禁使用其他物品清理。
4、Blow the nipple and socket threads with compressed air



5、使用前应在干燥炉内烘干，炉温 $\le 150^{\circ}\text{C}$ ，干燥时间不少于30小时。
5、It must be dried in the furnace before use. The drying temperature in the furnace should be less than 150°C . The drying period should be more than 30 hours.



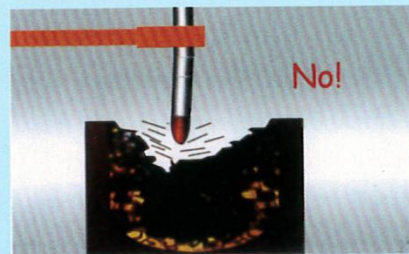
6、电极对接要紧密，应使用专用力矩扳手，防止用力过大或过小，绝对不允许倾斜。

6、Graphite electrode must be connected and contacted closely and straightly. Use moment spanner for connecting electrode with suitable force. Must not decline.



7、电极卡头要夹紧，不得松动且接触良好，不应产生电弧。

7、The holding device must hold the electrode tightly good contact and no arc.



8、为避免电极折断，炉内小块料应放置在上部，不得装入绝缘料块，电极的工作电流，要与说明书的电极允许电流相适应。

8、To avoid the electrode breakage, put the large materials in lower part and small materials in the upper part. Insulating materials should not be put into the furnace. The working current of electrode must be conformity with the allowable current of electrode in the instructions.

电极在冶炼中出现各种问题的分析指导

Guide To Analysis Of Electrode problems

影响因素 Factors	电极折断 Body Breakage	接头折断 Nipple Breakage	电极柱松动 Loosening	端部吊块 Tip spalling	线极损失 Bolt Loss	氧化 Oxidation	电极消耗 Consumption
废钢中的不导电物 Nonconductor in Charge	◆	◆					
废钢块太大 Heavy Scrap in Charge	◆	◆					
变压器容量太大 Transformer Capacity too large	◆	◆		◆	◆	◆	◆
三相不平衡 Phase Imbalance	◆	◆		◆	◆		◆
相旋转 Phase Rotation		◆	◆				
振动过大 Excessive Vibration	◆	◆	◆				
夹持器压力太高或太低 Clamper pressure too High or too Low	◆		◆				
炉盖电极孔与电极不同心 Roof Electrode socket disalignment with electrode	◆	◆					
炉盖上电极喷水冷却 Water Sprayed on Electrodes above Roof							△
废钢预热 Scrap Preheating							△
二次电压太高 Secondary Voltage too High	◆	◆		◆	◆		◆
二次电流太高 Secondary Current too High	◆	◆		◆	◆	◆	◆
功率因数太低 Power Factor too Low	◆	◆		◆	◆		◆
油消耗太高 Oil Consumption too High				◆	◆	◆	◆
氧消耗过高 Oxygen Consumption too High				◆	◆	◆	◆
出钢到出钢时间太长 long time gap from tapping to tapping						◆	◆
电极浸入钢水中 Electrode Dipping					◆		◆
连接部位不清洁 Dirty Joint		◆	◆				
提升塞和扭紧工具未得到好的保养 poorly Maintained Lift Plug and Tightening Tool		◆	◆			◆	
电极连接不紧 Insufficient Joint Tightening		◆	◆			◆	

注：△ 表示该项有益于电极行为。 ◆ 表示该项不利于电极行为。

Note: △ Indicates increased performance. ◆ Indicates decreased performance.