

## Technical Appendix

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John Bindu  
X-LA  
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**Clause 1 Design Condition****1.1 Atmospheric condition: (design point):**

大气条件（设计点）：

Atmospheric pressure 大气压力	0.101MPaA
Atmospheric temperature 大气温度	32 deg C
Relative humidity 相对湿度	75%
Oxygen content 大气含氧量	20.95%O <sub>2</sub>
Average temperature 平均温度	32 deg C

**1.2 Material air:**

原料空气：

Mechanical impurity 机械杂质	≤30mg/m <sup>3</sup>
CO <sub>2</sub>	≤400×10 <sup>-6</sup>
C <sub>2</sub> H <sub>2</sub>	≤2×10 <sup>-6</sup>
CH <sub>4</sub>	≤10×10 <sup>-6</sup>
C <sub>n</sub> H <sub>m</sub>	≤5×10 <sup>-6</sup>

**1.3 Utility condition to be fulfilled by Purchaser:**

公用工程条件：

**1.3.1 Cooling water:**

冷却水：

Water-in temperature 进水温度	32 deg C
Water pressure at inlet of plant 进水压力	≥0.3MPa(G)
PH	7~8
Suspending component content 悬浮物含量	≤30mg/L
Total rigidity 总硬度	≤1.78mmol/L
Fouling factor 水垢系数	0.00017m <sup>2</sup> K/W


 A handwritten signature in black ink, appearing to read "John Binder".

## 1.3.2 Power supply condition:

电源条件:

High-voltage power

高压电源:

Low-voltage power:

低压电源:

Frequency:

频率:

11KV +/- 5%, AC, 3 phases, 3 wires,

Not grounding in the middle

415V / 230V +/- 5%, AC, 3 phases,

4 wires, grounding in the middle

50Hz +/- 0.5Hz

1.4 Instrument gas to be supplied by Purchaser (use at startup): ~150m<sup>3</sup>/h

用户供备用仪表空气（启动时用）：

**Clause 2 Major Technical Performance Data**
**2.1 Production value (at cold box outlet):**

产量与纯度（出冷箱）：

Product	Output Nm <sup>3</sup> /h	Purity (impurity)	Out of cold box pressure	Temperature
Liquid oxygen	2350	≥99.6%O <sub>2</sub>	~0.15MPa	~90 K
Liquid nitrogen	1750	≤2ppmO <sub>2</sub>	~0.3MPa	~81 K

Meter reading power consumption: liquid unit power consumption:  
 0.91KW·h/Nm<sup>3</sup>(LO+LN), not including utility and workshop&office electricity, not  
 including backup system; The grid power factor is ≥ 0.98

抄表能耗为：液体能耗：0.91KW·h/Nm<sup>3</sup> (LO+LN) ,不包括公用工程及厂房办公用电，不包括后  
 备系统。电网功率因素≥ 0.98

Remark:

2.1.1 The liquid phase capacity is converted from the gas phase capacity;

液体为折合气态后的指标

2.1.2 Output and purity are data at ex of cold box.

产量和纯度为出冷箱参数

2.1.3 Liquid pressure is after considering the elevation of products ex cold box

液体产品压力以冷箱地面 0 标高出测量;

 2.1.4 Nm<sup>3</sup>/h is measured under condition of 0 deg C, 760mmHg.

 Nm<sup>3</sup>/h 指在 0 ℃, 760mm Hg 状态下测量。

2.2 Startup time (from the startup of turbine until purity achieved) ~ 12hr  
 起动时间（从膨胀机起动到氧产品纯度达到）： ~12小时

2.3 Heating and defrosting time ~ 24h  
 装置加温解冻时间： ~24小时

2.4 Continuous operating period (between two defrosting time) 24 months  
 连续运行时间（两次大加温间隔期） 24个月

2.5 Installed capacity and shaft power:

装机功率和轴功率

Item	Equipment	Qty	Installed capacity (KW)	Shaft power (KW)	Remark
序号	设备	数量	装机容量	轴功率	备注

## Power consumption of ASU

## 空分设备用电

1	Self-cleaning air filter 自洁式空气过滤器		1	0.2	0.1	At intervals 间断运行
2	Centrifugal air compressor 离心式空气压缩机		1	1200	1090	Continuous 连续运行
3	Pre-cooling system 预冷系统	Low temperature water pump 低温水泵	2	5.5×2	4	1 standby 一用一备
4	Water chiller 冷水机组		1	37	31	
5	Electric heater in purifying system 纯化系统电加热器		1	192 (design power)	62 (in average)	At intervals 间断运行
6	Recycle air compressor 循环空压机		1	2500	2230	Continuous 连续运行
7	Oil pump of expansion turbine 透平膨胀机油泵		2	7.5×2	6	1 standby 一用一备
8	Electric heater of expansion turbine 透平膨胀机电加热器		1	5	0	Occasional 偶尔运行
9	Control system 控制系统		1	3	3	
Total 总计				~3963.2	~3426.1	

## Power consumption of backup system

## 后备系统用电

10	Cryogenic piston liquid oxygen pump 低温活塞式液氧泵	2	4×2	3	1 standby 一用一备
11	Centrifugal cryogenic liquid oxygen pump 离心式低温液氧泵	1	20HP	13	
12	Cryogenic cryogenic liquid nitrogen pump 离心式低温液氮泵	1	20HP	13	

Total 总计	38	29	
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**2.6 Cooling water flowrate: (XLA supply cooling water system 冷却水系统 XLA 提供)**  
**冷却水流量**

Item	Equipment	Qty	Water flowrate (T/h)	Remark
1	Centrifugal air compressor 离心式空气压缩机	1	~130	
2	Pre-cooling system 预冷系统	2	~0.5	Soft water 软化水
3	Water chiller 冷水机组	1	30	
4	Recycle air compressor 循环空压机	1	280	
5	Booster cooler 增压冷却器	1	~85	
Total 总计			~525.5	

**Clause 3      Equipment Supply from the Vendor**

**Description of scope of supply(Equipment model and technical data are subject to final design):卖方供货范围（设备型号及技术参数以最终设计为准）**

- The whole plant, including each component shall be supplied for site assembly. For each equipment, in addition to major components, scope of supply also includes measuring components, instruments, corresponding connector, connecting piece, root valve. The cold box will be supplied in 2 packages, consisting of heat exchanger box and fractionation column box. In addition, turbine cold boxes will be supplied loose. The cold boxes will be supplied without perlite insulation. All ladders and platforms will be supplied loose.

卖方供货范围按各系统和单机组整体供货为原则，以供现场组装。各系统和各机组的供货范围除主体设备和单机组外，还包括一次测量组件、仪表及相应的接头、联接件、根部阀。另外，膨胀机过渡冷箱将散装供货。所有冷箱不装珠光砂，所有梯子平台散装供货。

- All loose items will be supplied in 40ft & 20ft containers.(Note: loose means not assemble and can be convenience for loading to container, connection cold box and ladder could be supplied piece by piece)

所有散装货物均以40英尺或20英尺集装箱供货物。（注：散装意为不组装并能方便的装入集装箱的货物，即过渡冷箱和梯子可以一片一片供应）

- The design of this plant is based on the design condition specified in clause 1. All the technical data of each component mentioned hereof is based on current information only, and will be confirmed at the final design.

本设备的设计基于第一条款的设计条件，本附件提供的单机设备技术参数仅为目前参数，有待在最终设计阶段确定。

- Shaft power data indicated below for each equipment are for the design mode and will be subject to final design.

以下所有设备轴功率均为设计工况下该设备的轴功率，且以最终设计为准。

**3.1 Self-cleaning air filter :                          1 set**

自洁式空气过滤器 :

**3.1.1 Main technical data:**

主要技术参数:

Feed air capacity

500m<sup>3</sup>/min

处理空气量:

Resistance descending

150~650Pa

阻力降		
Filter material	Plant fiber	
过滤材质	植物纤维	
Filter granularity	$\geq 2\mu\text{m}$	efficiency 99.99%
过滤粒度	$\geq 1\mu\text{m}$	efficiency 99%
	$\geq 0.5\mu\text{m}$	efficiency 96%

## 3.1.2 Scope of supply:

供货范围:

- Steel structure depurating chamber & draught exit, pedestal: 1 set  
钢结构净化室和出风口、底座
- Self-cleaning system and control system (including PLC controller) 1 set  
自洁系统和控制系统（包括PLC控制器）
- Filter canister 1 set  
过滤筒

## 3.1.3 Manufacturer: Chinese make

制造商: 中国产

3.2 Centrifugal air compressor 1 set  
离心式空气压缩机 1套

## 3.2.1 Main technical data:

主要技术参数:

Atmosphere pressure	101Kpa(A)
Capacity adjustment scope	80%~105%
Suction pressure	0.099MPa(A)
Discharge pressure	0.45MPaG
Suction temperature	32deg C
Discharge temperature	42deg C
Discharge capacity	13200 Nm <sup>3</sup> /h(standard state, dry, air)
Shaft power	~1090KW
轴功率	

Data of equipped motor 配套电机参数	~1200KW / 11KV / 3 phrase / 50Hz
Cooling water flowrate 冷却水流量	~130T/h

## 3.2.2 Scope of supply

供货范围

➤ Main body of compressor 压缩机主机	1 unit
➤ Motor 电机	1 unit
➤ Inter-cooler 中间冷却器	2 units
➤ After-cooler 后冷却器	1 unit
➤ Oil supply system 供油系统	1 set
➤ Flowrate adjusting system 气量调节系统	1 set
➤ Check and bypass valve 止回阀，大气旁通阀	1 set
➤ Gas pipeline 气管路	1 set
➤ Water pipeline 水管路	1 set
➤ Instrument and electric control system 仪电控制系统	1 set
➤ Constant pressure or constant flowrate control 恒压控制或恒流控制，同时具备	
➤ Lubrication oil number and data 提供润滑油牌号及参数	

Note:

1.The capacity adjusting scope of IHI compressor flow rate adjusting system is confirmed to achieved at 80%~105%

注：IHI压缩机气量调节系统的气量调节范围确认能达到80%~105%

2.油冷却器的尺寸以外配套厂商为准；

2.The oil cooler tube size is subjected to equipped outsourcing manufacturer.

## 3.2.3 Manufacturer: IHI or other same brand

制造商：IHI或同等品牌

**3.3 Air pre-cooling system:****1 set**

空气预冷系统：

**3.3.1 Main technical data:**

主要技术参数：

Air capacity

13500Nm<sup>3</sup>/h

处理空气量：

Operating pressure

0.45MPaG

工作压力

Inlet temperature of pre-cooling air

≤42 deg C

预冷空气进口温度

Outlet temperature of pre-cooling air

~10 deg C

预冷空气出口温度：

Power of low temperature circulation water pump

5.5 KW

低温循环水泵功率

Makeup quantity of circulation refrigerated water

1T/h (tap water soft water )

循环冷冻水补充量

自来水或软化水

Power of water chiller

~37KW

冷水机组功率

Input power of water chiller

~31KW

冷水机输入功率

Cooling water flowrate of water chiller

~30T

冷水机组冷却水量

**3.3.2 Scope of supply:**

设备组成

➤ Direct contact Air cooler 1 unit

空冷塔

➤ Low temperature circulation water pump(Grundfos) 2 units(1 standby,5.5KW×2)

低温循环水泵（一用一备； 5.5KW×2） 2 台（格兰富水泵）

➤ Water filter 1 unit

水过滤器

➤ Water cooling tower 1 unit

水冷塔

➤ Valve 1 set

阀门

➤ Field measurement components &amp; instruments, corresponding connectors, root valve and accessories etc. 1 set

就地测量组件和仪表以及相应的接头、根部阀等附件 1 套

➤ Valves for system 1 set

系统用阀门

- Water chiller(Bitzer compressor)  
冷水机组(比泽尔压缩机)
- 1 unit (Hangzhou Jialian or Shanli)  
1 台 (杭州加联或山立)

### 3.3.3 Manufacturer: XLA

制造商: 苏州市兴鲁空分设备科技发展有限公司

### 3.4 Air purifying system :

1 set

分子筛纯化器:

#### 3.4.1 Main technical data:

主要技术参数:

Feed air capacity 处理空气量	13500Nm <sup>3</sup> /h
Adsorption pressure 吸附压力	~0.44MpaG
Adsorption temperature 吸附温度	~12 deg C
Adsorption period 吸附周期	6 hr 6小时
CO <sub>2</sub> content after adsorption 吸附后空气CO <sub>2</sub> 含量	≤1PPmCO <sub>2</sub>
Dew point after adsorption 吸附后空气露点	≤-70 deg C
Power of electric heater 电加热器功率	192KW

#### 3.4.2 Scope of supply:

供货范围

- Adsorption vessels  
吸附筒
- 2 units
- Electric heater (192KW)  
电加热器 (192KW)
- 1 unit
- Powder filter  
粉末过滤器
- 1unit
- Vent silencer  
放空消声器
- 1 unit
- Switch valve  
切换阀门
- 1 set
- Valve  
阀门
- 1 set

➤ Control system 控制系统	1 set
➤ Molecular sieve 13X-APG 13X-APG分子筛	sufficient
➤ Activate alumina 活性氧化铝	sufficient

### 3.4.3 Manufacturer: XLA

制造商: 苏州市兴鲁空分设备科技发展有限公司

<b>3.5 Recycle air compressor:</b> 离心式循环压缩机	<b>1 set</b> <b>1套</b>
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#### 3.5.1 Main technical data:

主要技术参数:

Type 型式	Centrifugal 离心式
Medium 介质	Dry air 干燥空气
Discharge capacity 排气量	29500Nm <sup>3</sup> /h
Suction temperature 吸气温度	30 deg C
Suction pressure 吸气压力	0.405MPaG
Discharge pressure 排气压力	~2.75MPaG
Discharge temperature 排气温度	≤40 deg C
Shaft power 轴功率	2230KW
Motor power 电机功率	2500KW
Cooling water flowrate 冷却水流量	~280T/h

#### 3.5.2 Scope of supply

供货范围

➤ Main body of compressor 压缩机主机	1 unit
➤ Inter-cooler 中间冷却器	2 units

➤ After-cooler	1 unit
后冷却器	
➤ Oil supply system	1 set
供油系统	
➤ Flowrate adjusting system	1 set
气量调节系统	
➤ Check and by-pass valve	1 set
止回阀, 大气旁通阀	
➤ Anti-surge device	1 set
防喘振装置	
➤ Expansion joint of inlet and outlet	1 set
进出口膨胀节	
➤ Gas pipeline	1 set
气管路	
➤ Water pipeline	1 set
水管路	
➤ Instrument and electric control system	1 set
仪电控制系统	
➤ Documents along with equipment	1 set
随机资料	
➤ Framework of steel structure	1 unit
钢结构机架	
➤ Constant pressure or constant flowrate control	
恒压控制或恒流控制	
➤ Lubrication oil number and data	
提供润滑油牌号及参数	

### 3.5.3 Manufacturer: IHI or other same brand

制造商: IHI 等同等品牌

## 3.6 (High temperature)Booster expansion turbine A: 1 set (高温膨胀机)增压透平膨胀机A:

### 3.6.1 Main technical data:

主要技术参数:

型式

Type

油轴承, 反动式可调喷嘴增压风机制动

Oil bearing, reaction type, nozzle  
adjustable and braked by boosting blower

Cooling water flowrate

45T/h

冷却水量

Pressure before expansion

27barA

膨胀前压力	
Pressure after expansion	5.16barA
膨胀后压力	

## 3.6.2 Scope of supply :

每套供货范围

➤ Booster expansion turbine	1 unit
增压透平膨胀机	
➤ Filter	1 unit
过滤器	
➤ Oil supply system (oil pump 7.5KW×2 )	1 set(shared by A&B)
供油系统（油泵7.5KW×2，一用一备）	(A、B公用)
➤ Electric heater	1 unit(5KW)
电加热器	
➤ Booster outlet cooler	1 unit(XLA)
增压机出口冷却器	1台（兴鲁空分配）
➤ Emergent cut-off valve and adjusting nozzle	1 set
紧急切断阀和可调节喷嘴	
➤ Lubrication oil number and data	
提供润滑油牌号及参数	

## 3.6.3 Manufacturer: ACD或CRYOSTAR

制造商:

3.7 (Low temperature turbine)Booster expansion turbine B: 1 set  
(低温膨胀机)增压透平膨胀机B:

## 3.7.1 Main technical data:

主要技术参数:

Type	油轴承, 反动式可调喷嘴增压风机制动
Type	Oil bearing, reaction type, nozzle adjustable and braked by boosting blower
Cooling water flowrate	40T/h
冷却水量	
Pressure before expansion	56barA
膨胀前压力	
Pressure after expansion	5.2barA
膨胀后压力	

## 3.7.2 Scope of supply :

每套供货范围

➤ Booster expansion turbine 透平膨胀机	1 unit
➤ Air filter 空气过滤器	1 unit
➤ Booster outlet cooler 增压机出口冷却器	1 unit(XLA) 1台(兴鲁空分配)
➤ Emergent cut-off valve and adjusting nozzle 紧急切断阀和可调节喷嘴	1 set
➤ Lubrication oil number and data 提供润滑油牌号及参数	

## 3.7.3 Manufacturer: ACD or CRYOSTAR

制造商:

## 3.8 Fractionation column: 1 set

分馏塔:

## 3.8.1 Scope of supply:

供货范围

➤ Main heat exchanger 主换热器	1 unit
Type	aluminum plate-fin type 铝制板翅式
➤ Lower column 下塔	1 unit
Type	Counter, sieve- tray column 对流筛板塔
➤ Evaporator-condenser 冷凝蒸发器	1 unit
Type	aluminum plate-fin type 铝制板翅式
➤ Upper column 上塔	1 unit
Type	Structured packing 规整填料塔
➤ Sub-cooler for LA 液空过冷器	1 unit
Type	aluminum plate-fin type 铝制板翅式
➤ Sub-cooler for LN	1 unit

液氮过冷器	
Type	aluminum plate-fin type
形式	铝制板翅式
➤ Cold box 冷箱	1 set
➤ Internal pipelines, valves, vessel supports inside of CB 冷箱内管道、阀门、容器支架	1 set
➤ External valves 冷箱外阀门	1 set
➤ Platform, ladder, handrail 平台、梯子、栏杆	1 set
➤ Perlite 珠光砂	to be supplied by PURCHASER 买方自备
➤ Remark: Manual valves on the cold box shall be set at the bottom of cold box for easy to operate. Middle-upper part of cold box can not set manual valves. But it can set automatic valve. 冷箱上手动阀门宜设置在冷箱底部，方便操作，冷箱中上部不可以设置手动阀，但是可以设置自动阀。	

### 3.8.2 Manufacturer: XLA

制造商：苏州市兴鲁空分设备科技发展有限公司

## 3.9 Cryogenic vacuum liquid oxygen storage tank: 2 sets

### 3.9.1 Main technical data:

主要技术参数：

➤ Type 型式	vertical 立式
➤ Effective volume 有效容积	100m <sup>3</sup>
➤ Working pressure 工作压力	0.2MPa
➤ Design temperature 设计温度	-196 deg C
➤ Thermal insulation 绝热形式	powder - vacuum insulation 真空粉末绝热
➤ Medium 充装介质	LOX 液氧

### 3.9.2 Scope of supply :

## 每套供货范围

- Adopt high quality Chinese make cryogenic valves, double safety valve and other necessary valves 1 set  
采用优质国产低温阀门、双安全阀及其他配套阀门
- Vacuum insulation valve 1 set  
真空隔离阀
- Vacuum gauge pipe 1 set  
真空规管
- Boosting control valve 1 set  
增压调压阀
- Liquid level indicator 1 set  
液位计
- Double cryogenic globe valve 1 set  
双低温截止阀
- Connector for liquid receiving from ASU 1 set  
低温贮槽增加空分接口

3.9.3 Manufacturer: Chinese make  
生产厂家: 国产

**3.10 Cryogenic vacuum liquid nitrogen storage tank:** 2 set  
低温真空液氮罐

## 3.10.1 Main technical data:

主要技术参数:

- Type vertical  
型式 立式
- Effective volume 150m<sup>3</sup>  
有效容积
- Working pressure 0.2MPa  
工作压力
- Design temperature -196 deg C  
设计温度
- Thermal insulation powder - vacuum insulation  
绝热形式 真空粉末绝热
- Medium LIN  
充装介质 液氮

## 3.10.2 Scope of supply :

每套供货范围

- Adopt high quality Chinese make cryogenic valves, double safety valve and other necessary valves 1 set  
采用优质国产低温阀门、双安全阀及其他配套阀门
- Vacuum insulation valve 1 set  
真空隔离阀
- Vacuum gauge pipe 1 set  
真空规管
- Boosting control valve 1 set  
增压调压阀
- Liquid level indicator 1 set  
液位计
- Double cryogenic globe valve 1 set  
双低温截止阀
- Connector for liquid receiving from ASU 1 set  
低温贮槽增加空分接口

Note: LIN product temperature is 81K, the saturated pressure is lower than 0.2Mpa, LIN storage tank working pressure is 0.2Mpa.

注：液氮产品温度为 81K，其饱和压力低于 0.2Mpa，液氮储罐的工作压力为 0.2Mpa

## 3.10.3 Manufacturer: Chinese make

生产厂家：国产

## 3.11 Piston liquid oxygen pump:

**2 sets(1 standby, Chinese make)**

活塞式液氧泵：

## 3.11.1 Main technical data:

主要技术参数：

- Medium LOX  
介质
- Type (operate discontinuously) horizontal, single cylinder, reciprocating piston, motor speed regulating  
形式（非连续运行） 卧式，单缸，电磁调速，活塞泵
- Flowrate 100~200L/h  
流量
- Discharge pressure 16MPa

出口压力	
➤ Suction pressure	0.02~0.2MPa
进口压力	
➤ Input power	415/3 phases/50Hz
输入电源	
➤ Motor rotate speed	125~1250 r.p.m.
电机转速	
➤ Power	4KW
功率	

### 3.11.2 Scope of supply for each set:

每套供货范围:

➤ Gear box	1 set
传动箱	
➤ Cryogenic cold end	1 set
低温冷端	
➤ Electric control panel	1 unit
电控箱	
➤ Metal hose	1 set
金属软管	
➤ 2.5KW electromagnetic speed regulating motor	1 unit
2.5KW电磁调速电机	
➤ Belt transmission system	1 set
皮带传动系统	

(All above components are mounted on a mutual pedestal)  
(以上部件均安装在一撬装式底座上)

### 3.11.3 Manufacturer: Chinese make

制造商: 中国制造

## 3.12 QQ-150/165 oxygen vaporizer: 1 unit

QQ-150/165氧气气化器

### 3.12.1 Main technical data:

➤ Vaporized capacity	150Nm <sup>3</sup> /h
气化量	
➤ Outlet pressure	~16MPa
出口压力	
➤ Inlet temperature	~-176 deg C
进口温度	

➤ Outlet temperature	~10degC(lower than ambient temp.)
出口温度	
➤ Medium	oxygen
气化介质	

## 3.12.2 Scope of supply for each set:

每套供货范围:

➤ Inlet cryogenic globe valve	1 set
进口低温截止阀	
➤ Outlet globe valve	1 set
出口截止阀	
➤ Check valve	1 set
止回阀	
➤ Safety valve	1 set
安全阀	
➤ Pressure gauge	1 set
压力表	
➤ Pipeline, support	1 set
管道, 支架	
➤ Evaporation fin	1 set
蒸发翅片	
➤ Mating flange	1 set
成对法兰	

注: 阀门仪表等散货供, 未安装在汽化器上;

Note: The valve and instrument, etc will be supplied in loose and does not be installed at vaporizer.

## 3.12.3 Manufacturer: Chinese make

制造商: 中国制造

## 3.13 Centrifugal cryogenic liquid pump(Tanker filling): 各 1 套(共 2 台)

离心式低温液体泵 (充装槽车) 1 set for each(total 2 units)

注: 各一套指总共两台泵, 一台泵用于液氧一台泵用于液氮;

**Note: 1 set for each means that there are 2 units of pump, 1 pump is for LOX and another pump is for LIN**

## 3.13.1 Main technical data:

主要技术参数:

➤ Medium	LOX/LIN
介质	液氧/液氮

➤ Design flow	16 m <sup>3</sup> /h(liquid state)(max. flow can reach 24m <sup>3</sup> /h)
设计流量	16m <sup>3</sup> /h (液态) (最大流量可达 24m <sup>3</sup> /h)
➤ Inlet pressure	0.15MPa (A)
进口压力	
➤ Design lift	60m
设计扬程	
➤ Impeller/volute	aluminum alloy/copper alloy
叶轮/蜗壳	铝合金/铜合金
➤ Seal type	CFS mechanical seal
密封形式	CFS 机械密封
➤ Rotate speed	2950r.p.m.
转速	
➤ Motor power	20HP
电机功率	
➤ Power supply	415V / 3 ph / 50HZ
电源	

### 3.13.2 Scope of supply for each set:

每套供货范围:

➤ Pump body	1 unit
泵体	
➤ Motor	1 unit
电机	
➤ Inlet strainer	1 unit
进口过滤器	
➤ Inlet bellows	1 pc
进口波纹管	
➤ Outlet bellows	1 pc
出口波纹管	

### 3.13.3 Manufacturer: Chinese make

制造商: 中国制造

### 3.14 Instrument control system: 1 set

仪表控制系统:

Since XLA establishment, Instrument & Electric Design department of XLA carried out the design independently, instrument selection, configuration, installation and commissioning in respect of DCS

or PLC + PC control systems of all the air separation plants supplied by XLA. Therefore, XLA has accumulated great experiences in work of control system design, especially in respect of design and configuration of DCS and PLC + PC systems. Regarding to the startup operation, analysis startup, interlock protection and etc, XLA has his original design, and also can always consider sufficiently the whole process of plant, as well as peripheral equipment, utility system and power supply on integrity basis, which leads to low hardware cost, easy operation, and was well-reputed by users.

苏州兴鲁空分设备科技发展有限公司自创建以来，技术部仪电设计室均是独立地完成了本公司生产的所有空分设备的 DCS 或 PC+PLC 等多种形式仪电控制系统的设计、选型、组态和安装调试工作。苏州兴鲁空分公司在仪控设计中特别是 DCS 和 PC+PLC 的设计组态工作中积累了大量的经验，在便于起动操作和分析起动、联锁工程等画面组态中具有独到的设计，又能真正站在总成套的立场上将整套空分设备，包括非主要设备厂家提供的机组、电源、公用工程测点等的有机地结合成一个整体，硬件成本低，操作使用方便，受到各用户的好评。

### 3.14.1 Description of instrument control system

#### 仪控系统描述

- The air separation plant would be controlled by DCS. The system is suggested to selects well-known SUPCON or Hollysys product at home and abroad. CUP, power supply, communication are redundant structure. This plant adopt center control , together with local instruments. There will be no monitor station at the plant, to reduce labor cost of operators. There will be simple and necessary display instrument and operating buttons on the local panels. Function of local instrument panel will be simplified as possible, and most of control will be realized by the centralized control room DCS.

本套空分设备采用 DCS 系统进行控制,系统推荐选用在国内外知名的中控 JX-300XP 系统或和利时产品，主控卡（CPU）、电源、通讯均为冗余结构。通过 DCS 系统结合就地仪表控制，就地不设岗，以减轻操作工劳动强度。就地放置机旁盘，机旁盘上设置必要的尽量简单的显示仪表及操作按钮，各设备设置必要的就地指示仪表，尽可能地简化机旁盘地作用,强化中控室 DCS 的控制作用。

- Monitor and control the process data of each unit and equipment for the whole air separation plant through DCS system. Complete safety interlock protection for above each unit.  
通过 DCS 系统来对整套空分设备的各个单元及机组进行工艺参数的监视和控制；并完成上述各单元、机组的安全联锁保护。
- The monitoring scope of DCS includes monitoring and signal alarming interlock of pre-cooling system; monitoring and signal alarming interlock of turbine system;monitoring and alarming etc. of air compressor;

DCS 系统的监控范围包括预冷系统的监控和信号报警联锁；纯化系统的监控和切换程序的顺序控

制；分馏塔系统的监控和信号报警联锁；膨胀机系统的监控和信号报警联锁；空气压缩机监视、报警等。

- For this control system, PC computer is selected from DELL make and with 2 units of 23' LCD screen. There is 10% redundant quantity for I/O point. It is also equipped UPS to take emergent measures under the conditions of unexpected shutdown of power. UPS is selected from American APC .

本控制系统中，PC 机选用 DELL 产品，配置 23 寸液晶显示器。I/O 点均留有～10%的备用余量，配备 UPS 不间断电源以便市电掉电时进行紧急操作，UPS 选用美国 APC 产品。

- The analyzer device is set to be the online analyzer and analysis valve panel (frame type) and the online data is transmitted into DCS system for alarm and display;  
分析仪设置成套供货的在线分析仪和分析阀盘（框架式），在线分析的工艺参数进入 DCS 系统显示和报警。
- The Protocol to connect System with external communication is Profibus-DP.  
系统与外部通讯协议为 Profibus 协议 DP 接口。

### 3.14.2 Design principle of instrument control system:

仪控系统设计原则：

- A.The instrumentation system could monitor and control the whole process of plant efficiently, to guarantee a stable performance, as well as an easy maintenance and operation;  
A. 仪控系统应能有效地监控成套空分设备生产过程，保证运行可靠，操作维护方便；
- B. This plant would be controlled chiefly by DCS, together with local instrument control. There will be no monitor station at the plant, to reduce labor cost of operators. The molecular sieve purifying system, turbine etc. will be equipped with side-by instrument panel. There will be simple and necessary display instrument and operating buttons on the local panels. Function of local instrument panel will be simplified as possible, and most of control will be realized by the centralized control room DCS;  
B. 采用 DCS 控制为主，结合就地仪表控制，就地不设岗，以减轻操作工的劳动强度。分子筛纯化器、膨胀机等设置机旁仪表盘。机旁盘上设置必要的尽量简单的显示仪表及操作按钮，各设备设置必要的就地指示仪表，尽可能地简化机旁盘地作用，强化中控室 DCS 的控制作用。
- C. Display, record, control of important process parameters, sequence control of purifying system, startup interlock and trip interlock of turbine and the whole plant, parameter sheet of production will all be realized by DCS system. Process parameters over-limit and system failure could be printed automatically(or manually). Parameters over-limit and system failure will be alarmed with sound and light by DCS;  
C. 主要的工艺参数的显示、记录、调节、纯化器的顺序控制、膨胀机及空分设备的起动联锁和事故

联锁保护，生产过程各主要工艺参数报表均由 DCS 系统完成，工艺参数越限及系统故障均可自动（或手工）打印，参数越限及系统故障时 DCS 系统声光报警。

- D.Instrument equipment in instrument control system of ASU is all powered by instrument control system, DCS computer system is powered by UPS.  
D.成套空分设备的仪控系统内的仪表设备均由仪控系统供电，DCS 计算机系统由不间断电源供给。
- The system is mature and is extensible.  
E.系统先进成熟可扩展。
- F.The system can supply the control and adjust window, alarm window, sheet window and so on.  
F.系统提供在流程画面上支持控制调节窗口、报警窗口和报表窗口等。
- G.Manufacturer guarantees the integrity of the instrument control system.  
G.厂家保证仪表控制系统的完整性。
- H.Each measuring instrument and transmitter is chosen from superior make in domestic, guaranteeing the integrity of the instrument control system.  
H.各监测仪表和变送器选用在国内有一定声誉中国产优质品牌，且保证仪表控制系统的完整性。
- I. Setting control room, control system in the control room is generally called central control system. Central control room adopts DCS to realize monitoring and collect signal, process signal and record data of the whole plant. The method of collecting signal is hard-wired type. Control command is sent by DCS system to each local instruments and local cabinets.  
I.设置控制室，控制室内的控制系统总称中央控制系统，中央控制系统采用 DCS 实现监控，对整套空分设备进行信号采集、信号处理、数据记录等功能，信号采集方式采用硬接线形式，控制命令由 DCS 系统发出，各就地仪表和就地柜接受 DCS 命令。
- J.DCS control panel is set inside the central control room, field panel, control valve and electric heater etc. are set on-site. Instrument inspection equipment includes: transmitter, thermal resistance, flowmeter etc.. To achieve following function:  
J.DCS 控制机柜设置在中央控制室内，就地设置各就地机旁柜、调节阀、加热器等。仪表检测设备包括：变送器、热电阻、流量计等。实现如下功能：
  - Data collection(analog value, digital value and state value etc.)  
数据采集（模拟量、数字量、状态量等）
  - Data recording(DCS control station collects operating data of equipment and DCS operator station by communication, monitoring software of operator station records and saves data.)  
数据记录（DCS 控制站采集设备的运行数据，通过通信将数据发送到 DCS 操作员站，操作员站对数据进行记录和保存）
  - Adjusting and control(provide linkage, interlock and control, and adjust according to data set by operation in operation station. Switch of operation mode is selected by operator.)

- 调节与控制（提供设备运行的联动、联锁和控制，操作员在操作站设置的参数进行调节；运行模式的切换由操作员选择实施）
- Alarm(Monitoring software of PC gives sound-light alarm.)  
报警（PC 监控软件发出声光报警）

### 3.14.3 Selection principle of instrument (to be confirmed by final instrumentation design): 仪表选型原则（按最终仪表设计时确认）

A.	DCS system (SUPCON JX-300XP or Beijing Hollysys)	1 set
	中控室 DCS 系统一套（中控 JX-300XP 系统或和利时产品）	
Equipped with following components:		
➤ Operator station		1 unit
操作站		
➤ Engineer station(double as operator station)		1 unit
工程师站（兼做操作员站）		
➤ 23"LCD		2 units
23” 液晶显示器		
➤ Printer		1 unit
打印机		
➤ Communication cable		Length will be decided as per the layout of central control room 按中控室布置确定长度
通讯电缆		
➤ Control station		2 units(power and controller redundant)
控制站		2 台（电源及控制器冗余）

(including power supply, controller, I/O module etc. I/O point there is 10% redundancy)

(内含电源、控制器、I/O 模块等, 其中 I/O 点预留 10%余量)

- UPS,30 Mins in support (APC)                          1 set  
UPS不间断供电装置采用APC产品， 30分钟后备

### 3.14.4 Primary instrument and secondary instrument

一次和二次仪表

- Temperature instrument: PT100 thermal resistance outside of cold box; double probe - PT100 thermal resistance inside cold box(Tiankang or Chuanyi) ;  
铂热电阻： 冷箱外部温度测量元件为 Pt100 铂热电阻，冷箱内部为 Pt100 双支铂热电阻（天康或川仪）
- Local temperature display: Bimetallic thermometer (Tiankang or Chuanyi);  
就地温度计： 双金属温度计（天康或川仪）

- Capacitance pressure transmitter, intelligent type with Hart protocol (SAIC 3151 product or Chuanyi PDS product);  
电容式压力变送器,带有Hart 协议的智能形式 (上自仪3151产品 或川仪PDS产品)
- Capacitance pressure differential transmitters,intelligent type with Hart protocol (SAIC 3151 product or Chuanyi PDS product);  
电容式差压变送器,带有Hart 协议的智能形式 (上自仪3151产品 或川仪PDS产品)
- Gas flow measured by flow orifice and pressure differential transmitter. The calculation result of flow orifice will be uploaded.  
气体流量由流量孔和差压变送器测量, 流量孔的计算结果将会上传
- Rotate speed meter for turbine;  
透平膨胀机智能转速表
- Local pressure display: spring manometer(oil-free);Bimetallic thermometer will be used to measure local temperature.  
就地压力显示: 弹簧管压力表 (无油型) , 双金属温度计将会用于就地温度测量;
- Pneumatic butterfly valve for purifier (Shanghai electricity)  
纯化器气动蝶阀(上海电气)
- Valve positioner:(YAMATAKE);  
阀门定位器 (山武)
- Ambient temperature control valve: with hand wheel, equipped with filter pressure reducing valve and positioner solenoid valve(KOSO)  
常温调节阀,调整控制阀带有手轮, 根据阀门功能配置过滤减压阀和定位器电磁阀 (工装)
- Cryogenic control valve: KOSO;  
低温调节阀 (工装)
- Solenoid valve 3/2 way and 5/2 way: SMC or ASCO;  
两位三通、两位五通电磁阀 (采用日本SMC或ASCO公司产品)

### 3.14.5 分析仪表柜

- All analyzers are required to provide standard 4~20mA analog signal for DCS; measured values of all analyzers will be shown, recorded and alarmed in DCS system. The online analyzers and sample gas treatment system shall be installed in analysis cabinet, analyzers, sample gas treatment system and analysis cabinets will be supplied by seller in package. The span of analyzers will be subject to final design.  
所有分析仪均要求提供标准 4~20mA 模拟信号至 DCS; 所有分析仪的测量值将在 DCS 系统中显示记录并报警。提供的在线分析仪及样气处理系统安装在分析仪柜内, 分析仪、样气处理系统和分析仪柜由卖方成套供货, 分析仪量程选择以最终设计选择为准。
- Analysis pre-treatment system adopts package supply of analysis cabinet, analysis pre-treatment system installed in the analysis cabinet. Analysis pre-treatment system (switch valve, pressure

reducing valve and screwed connector adopt Hamlet and Swagelok products, others adopt Chinese make products).

分析预处理系统（采用分析柜整体供货，预处理系统安装与分析柜内，分析预处理系统（切换阀、减压阀、螺纹接头采用 Hamlet 和 Swagelok 产品，其它采用国产品牌）。

- Calibration gas required in the process of commissioning of ASU will be supplied by buyer.  
空分设备调试过程中所需标准气由买方提供。

### Analyzer

分析仪配置如下：

Item 序号	Tag No. 位号	Description 描述	Range 范围	Qty. 数量	Model 型号	Remarks 备注
1	AIA-	CO <sub>2</sub> after molecular sieve(Chinese make) 分子筛出口 CO <sub>2</sub> 分析（国产品牌）	0~10ppmCO <sub>2</sub>	1	旭艾/北分 Chang-Ai/BAI F-Maihak	CI-PC21/Q GS08
2	AIA-	Product oxygen analysis(imported make) 产品氧分析（进口品牌）	95~100%O <sub>2</sub>	1	西门子 Siemens	OXYMAT61
3	AIA-	Oxygen content analysis in product nitrogen(Chinese make) 产品氮气中氧含量分析（国产品牌）	0~10ppmO <sub>2</sub>	1	旭艾/西安泰戈/特瑞尔/久兴隆 Chang-Ai/Xi'an Tiger/ Turrell/ Long xinglong	CI-PC16/DF Y-IIC
4	AIA-	Trace water analysis(Chinese make) 微量水分分析（国产品牌）	20- -80 deg C	1	旭艾/西安泰戈/特瑞尔/久兴隆 Chang-Ai/Xi'an Tiger/ Turrell/ Long xinglong	CI-PC36/TG -1510

Note: Measuring range of analyzer shall be subject to final selection.

说明：分析仪测量范围以最终选型为准

Note: During the usage, if customer need spare sensor of Chinese make analyzers, we could help to purchase in China and send to India.

### 3.15 Electric control system:

1 set

电气控制系统

#### 3.15.1 Design condition

设计条件

Incoming line voltage of user

用户进线电压

- 11KV±5%/AC/3 phase/3 wires, not grounding in the middle  
11KV±5%交流三相三线制，中心点不接地
- 415V/230V±5%/AC/3 phase/4 wires, grounding in the middle  
415V/230V±5%交流三相四线制，中心点直接接地
- Frequency: 50Hz±0.5 Hz  
频率：50Hz ±0.5 Hz
- Incoming type: single incoming line  
进线方式：单线进线

#### Utilization voltage of equipment

设备用电电压：

- 11KV±5%/AC/3 phase/3 wires, not grounding in the middle  
11KV±5%交流三相三线制，中心点不接地
- 415V/230V±5%/AC/3 phase/4 wires, grounding in the middle  
415V/230V±5%交流三相四线制，中心点直接接地
- Frequency: 50Hz±0.5 Hz  
频率：50Hz ±0.5 Hz

#### 3.15.2 Design principle

设计原则

- HV and LV power supply of the plant are single way supplying power.  
本空分装置高、低压电源设单路供电。
- High and low voltage distribution system includes high voltage system, low voltage system and soft startup system. The operation of electric equipment of ASU will be completed on-site.  
高低压配电系统包含高压系统、低压系统、软启系统组成。空分装置用电设备的操作在用电设备的机旁完成。
- To ensure the advancement and reliability of low voltage electric control system, main elements choose products of Schneider, ABB or equivalent brand to achieve reliable operation of the whole ASU.  
保证低电压电控系统的先进性和可靠性，主要元器件选用施耐德、ABB 或同等厂家产品，满足成套设备的可靠运行。
- Compressor adopts reactance resistance startup to reduce impact to power grid.  
压缩机选用电抗式，从而减少其起动时对电网的冲击。
- The design of high and low voltage system and soft startup system is as per Chinese standard and regulation.  
高低压及软起系统设计按照中国标准和规范。

- Use on-site operation, main equipment can be emergent stopped in the main control room.  
采用现场操作，重要设备可在主控室急停。
- Local control cabinet of low voltage motor has starting&stopping switch and signal light on it.  
低压电机在机旁操作箱，操作箱上设开停机开关、信号灯等。
- Microcomputer comprehensive protection device is set in the high voltage system switch cabinet with different protective methods for different electric equipment such as: current fast tripping, overload, low voltage and one-phase grounding etc. function.
- 高压系统开关柜内设微机综合保护装置，不同的用电设备，具有不同的保护形式：如电流速断、过负荷、低电压、单相接地等功能。

### 3.15.3 Selection of equipment

设备的选型

Selection of high voltage switch cabinet

高压开关柜的选型

- Choose KYN28 cabinet , as the equipment of control and distribution of high voltage system, ABB products are selected as main elements in the switch cabinet, Microcomputer comprehensive protection device adopts ABB products too.

选用 KYN28 柜体，开关柜作为高压系统的控制和配电的设备，柜内主要元器件选用 ABB 产品，微机综合保护装置采用 ABB 产品。

Soft startup device

软启动装置

- Soft startup device adopts Chinese make reactance startup type, the startup operating cabinet chooses KYN28, which features small impact on power grid, stable performance and convenient operation.
- 软启装置选用国产电抗式，启动运行柜柜体选 Y 用 KYN28 柜体，对电网冲击小，性能稳定，操作方便。

Selection of low voltage switch cabinet

低压开关的选型

- Cabinet chooses GGD type, main elements adopts Schneider, ABB or equivalent brand products.

柜体形式选用 GGD 形式，主要元器件选用施耐德、ABB 或同等厂家产品。

高压开关柜

High voltage switch cabinet

- 选用 KYN28 柜体，开关柜及 PT 柜作为高压系统的控制和配电的设备，柜内主要元器件选用 ABB 产品，微机综合保护装置采用 ABB 产品。柜内器件主要包含真空断路器，微机保护装置，电流

互感器（CT），电压互感器（PT），接地开关，隔离开关，高压接触器，高压熔断器，高压带电显示器，绝缘件及指示灯等。配套厂家：顺德开关，常熟通用，襄阳大力等。

- Choose KYN28 cabinet body. Switch cabinet and PT cabinet, as the equipment of control and distribution of high voltage system. ABB products are selected as main elements in the switch cabinet. Microcomputer comprehensive protection device adopts ABB products too. The components mainly includes: vacuum breaker, microcomputer comprehensive protection device, current transformer(CT), voltage transformer(PT), earthing switch, dis-connecting switch, HV contactor, HV fuse, HV charged display, insulating part and indication light etc. Equipped manufacturer: Guangdong Shunkai Electric, Changshu General Electric, Xiangyang Big Power etc.

#### 低压开关柜

##### Low voltage switch cabinet

- 柜体形式选用 GGD 形式，主要元器件选用施耐德、ABB 或同等厂家产品。低压开关柜主要由低压进线柜及低压出线柜组成。主要器件包括。框架断路器、隔离开关，塑壳断路器，铜排，电压互感器，按钮，指示灯等。配套厂家：顺德开关，常熟通用，襄阳大力等。
- Cabinet body chooses GGD type, main elements adopts Schneider, ABB or equivalent brand products. Low voltage switch cabinet main comprises LV incoming line cabinet and LV out coming line cabinet. Main components includes: frame circuit breaker, dis-connecting switch, moulded case circuit breaker, copper bar, voltage transformer, button, indication light etc. Equipped manufacturer: Guangdong Shunkai Electric, Changshu General Electric, Xiangyang Big Power etc.
  
- 选用 KYN28 柜体，柜内元件组成主要有：传动装置、电极板、水箱、传动电机、接触器、继电器、空气开关、行程开关、温控仪、指示灯、按钮、铜排等。配套厂家：襄阳大力。
- Adopt KYN28 cabinet body. The components mainly includes: transmission device, battery lead plate, water tank, driving motor, contactor, relay, air switch, limit switch, temperature controller, indication light, button, cooper bar. Equipped manufacturer: Xiangyang Big Power.

#### 就地机旁柜

##### Field panel

- 就地机旁柜主要有：设备厂家自带的如：压缩机机旁柜（压缩机带），冷水机机旁柜（冷水机带）以及我公司提供的如：预冷系统柜，纯化器电控柜，膨胀机控制柜，后备系统液体泵柜等。低压柜内元器件选用西门子或施耐德等大品牌优质产品；柜内设备布置合理、流畅、元器件间距适中。元器件主要有：断路器，接触器，热继电器，按钮，指示灯，电流互感器，电流表、电压表等。
- Field panel mainly: panels supplied by manufacturer: Field panel for centrifugal

compressor(supplied by compressor manufacturer), Field panel for water chiller(supplied by cold refrigerator manufacturer); Field supplied by XLA: Field panel for pre-cooling system water pump and purifier, Field panel for fractionation column and turbine, Field panel for liquid pump of backup system.

- The elements inside of panel shall be Siemens or Schneider etc. big brand. The components inside of panel are rational and proper distance. The components mainly includes: breaker, contactor, relay, button, indication light, current transformer(CT), ampere meter, voltmeter etc.

合同签定两月后提供最终设计，具体配置以最终设计为准。

2 months after signing the contract, the final design will be provided. The specific configuration is subject to final design.

### 3.15.4 scope of supply

#### 供货范围

➤ Incoming line cabinet	1 unit
进线柜	1 台
➤ PT cabinet	1 unit
PT 柜	1 台
➤ 压缩机软启动装置	
Soft startup operation cabinet of centrifugal air compressor	1 unit
离心式空气压缩机软启动运行柜	1 台
Soft startup device of centrifugal air compressor	1 unit
离心式空气压缩机软启动装置	1 台
Soft startup operation cabinet of recycle air compressor	1 unit
循环空气压缩机软启动运行柜	1 台
Soft startup device of centrifugal recycle air compressor	1 unit
循环气压缩机软启动装置	1 台
➤ Low voltage system(GGD type)	
低压系统 (GGD 形式)	
➤ Low voltage cabinet	1 set
低压柜	1 套
➤ Lead-acid maintenance-free DC screen	1 set
铅酸免维护直流屏	1 套

### 3.15.5 Field panel

#### 就地操作机旁柜

Design principle: The panel is chosen from domestic or imported superior product. The type, dimension and color shall be uniform. The elements inside of panel shall be Siemens or Schneider etc. Big brand. The components inside of panel are rational and proper distance.(The quantity is subject to final design)

设计原则：柜体选用国内或进口优质产品，型式及尺寸、颜色力求统一；柜内元器件选用西门子或施耐德等大品牌优质产品；柜内设备布置合理、流畅、元器件间距适中。（数量以最终设计为准）

- Field panel for centrifugal compressor (supplied by compressor manufacturer) 2 units  
离心压缩机机旁控制柜（压缩机厂配）
- Field panel for water chiller(supplied by cold refrigerator manufacturer) 1 unit  
冷水机组机旁柜（冷冻机厂家配）
- Field panel for pre-cooling system water pump and purifier (XLA supply) 1 unit  
预冷系统水泵及纯化器机旁控制柜（XLA提供）
- Field panel for purifier (XLA supply) 1 unit  
纯化器机旁控制柜（XLA提供）
- Field panel for fractionation column and turbine (XLA supply) 1 unit  
分馏塔、膨胀机机旁柜（XLA提供）
- Field panel for liquid pump of backup system (XLA supply) 2units  
后备系统液体泵柜（XLA提供） 2台

### 3.16 两年备件清单

#### 3.16.1 For self-cleaning air filter:

自洁式过滤器

Item 项目	Description 描述	Qty 数量	Remark
1	Filter canister 过滤器筒	2 pcs	
2	Solenoid valve 电磁阀	1 pc	

#### 3.16.2 For centrifugal air compressor:

离心式空压机：

Item 项目	Description 描述	Qty 数量	Remark
1	Oil filter core 油过滤器芯	2 pcs	
2	Oil and mist filter core 油雾过滤器芯	1 pc	

3	Gasket of air and oil cooler 空气和油冷却器垫片	1 set	
4	O型密封圈 O ring	1 set	

## 3.16.3 Spare parts for water chiller:

冷水机组备件:

Item	Description	Qty	Remark
1	Core of dry filter 干燥过滤器芯	2 pcs	
2	Pressure gauge(refrigerant high pressure) 压力表(冷媒高压)	2 pcs	
3	Pressure gauge((refrigerant low pressure) 压力表(冷媒低压)	2 pcs	
4	Thermostatic expansion valve 热力膨胀阀	1 unit	

## 3.16.4 Spare parts for Water pre-cooling system:

预冷系统备件:

Item	Description	Qty	Remark
1	Magnetic reversible level meter for WNCT and DCAC 空、水冷塔用磁翻板液位计	1 pcs	

## 3.16.5 For air purifying system:

纯化系统

Item 项目	Description 描述	Qty 数量	Remark
1	Electric heating bar 电加热管	2 pcs	
2	Bursting disc 爆破膜	5 pcs	

## 3.16.6 For centrifugal recycle compressor:

离心式循环压缩机

Item	Description	Qty	Remark

1	Vibration sensor 振动探头	2 pcs	
2	Temperature sensor 温度传感器	2 pcs	
3	Pressure transmitter 压力变送器	2 pcs	
4	Oil & mist filter core 油雾过滤器滤芯	2 pcs	
5	Oil filter core 油过滤器滤芯	2 pcs	
6	O ring O型密封圈	1 set	

## 3.16.7 For fractionation column:

分馏塔

Item 项目	Description 描述	Qty 数量	Remark
1	Pressure globe valve DN4 压力截止阀 DN4	2 pcs	
2	Manometer globe valve DN4 压力表截止阀 DN4	2 pcs	
3	仪表阀 Instrument valve	2 pcs	

## 3.16.8 Instrument control system

仪控系统

Item 项目	Description 描述	Qty 数量	Remark
1	Pressure transmitter 压力变送器	3	
2	Pressure differential transmitter 差压变送器	3	
3	Solenoid valve 2/3 way 二位三通电磁阀	2	
4	Solenoid valve 2/5 way 二位五通电磁阀	3	

5	Mid-relay 中间继电器	5	
6	Direct connector of pressure transmitter 变送器直通接头	4	
7	Direct connector of pressure differential transmitter 差压变送器直通接头	3 pcs	
8	Diaphragm of pneumatic valves 气动阀膜片	1 set	2 pcs for each valve 每个阀门两片
9	Valve positioner 阀门定位器	2	
10	Pressure gauge 压力表	6	
11	PT thermal resistance 铂热电阻		2 sets for each type 每种类型两个
12	Actuator 执行机构	1	
13	Remote Sensor of magnetic plate level indicator 磁翻板液位计远程传感器	3pcs	

## 3.16.9 Booster expansion turbine A

增压透平膨胀机A

Item 项目	Description 描述	Qty 数量	Remark
1	Speed Probe 转速探头	1	
2	Vibration Probe 振动探头	1	
<b>Lube Oil System</b> 润滑油系统			
3	Lube Oil Filter Elements 润滑油过滤器滤芯*	1	
4	Oil Cooler Header Gaskets 油冷却器端盖垫圈	1	
5	Oil Reservoir Access Port Gaskets 油箱检修口垫圈	1	

6	Oil Mist Eliminator Elements 油雾分离器滤芯	1	
<b>System</b> 系统			
7	Seal Gas Filter Element 密封气过滤器滤芯	1	
8	Vibration Transmitters 振动变送器	1	

## 3.16.10 Booster expansion turbine B

增压透平膨胀机B

Item 项目	Description 描述	Qty 数量	Remark
1	Speed Probe 转速探头	1	
2	Vibration Probe 振动探头	1	
<b>System</b> 系统			
7	Seal Gas Filter Element 密封气过滤器滤芯	1	
8	Vibration Transmitters 振动变送器	1	

## 3.16.11 液氧充装泵

## 3.16.11 LOX filling pump

Item 项目	Description 描述	Qty 数量	Remark
1	Mecahnical seal 机械密封	1 pcs	

**Clause 4            Engineering Work in Scope of the Vendor 卖方工程范围**

Vendor's scope of supply shall refer to Clause 3 of this contract. In addition to above, the Vendor shall take charge of following jobs as well:

卖方的供货范围如本合同第三条款所示。除了上述以外，卖方还应该负责以下工作：

**4.1 Site engineering design, including following items only:**

现场工程设计，仅包括以下方面：

- Site layout design for all equipment supplied by the Seller;  
卖方供的所有设备的现场布置；
- Site interconnection pipeline routing design, including pipe section details, supports location and platform location (cryogenic liquid pipeline routing included);  
现场连接管道走向设计，包括管段详情，支架和平台位置（包括低温液体管道布置）；
- Site cable tray layout design, including instrument tube route, instrument cable route;  
现场桥架走向设计，包含仪表管及仪表电缆；
- Site power cable layout design inside the workshop;  
厂房内动力电缆走向设计；

**4.2 Material supply of above design, including following items only:**

按上述设计的材料的供应，仅包括下列项目：

- Interconnection pipeline as per above design (including all fitting), including the cryogenic vacuum-jacketed liquid pipeline connecting cold box and Buyer's storage tanks (storage tanks quantity is limited within 2);  
按上述设计的所有连接管道（包括紧固件），包括连接冷箱和买方的低温真空液体管道（液体罐数量限制在 2 个以内）；
- Instrument cables and installation accessories;  
仪表电缆和安装附件；
- Installation instrument tubes (copper) and installation accessories;  
安装仪表管（铜管）和安装附件；
- Cable trays for instrument cable and instrument tubes;  
仪表电缆和仪表管用的桥架；

**4.3 Technical documents:**

技术文件：

**4.3.1 Site engineering design documents:**

现场工程图纸和文件：

- The Seller shall furnish technical drawings and documents pertaining to civil load requirement,

and electric load requirement within 3 months from the Advance Payment date, to enable the Buyer's to do his civil engineering and electrical engineering of the jobsite.

卖方应在收到定金之日起 3 个月内提供关于土地承载要求、布置及电气负荷要求的图纸及文件，以便买方在现场做土建工程及电气工程。

- The Seller shall furnish equipment layout, and foundation layout and drawing, primary P&ID, equipment G.A drawings and documents within 3 months from the Advance Payment date, to enable the Purchaser's to do his site piping engineering works.

卖方应在收到定金之日起 3 个月内提供设备布置图、基础布置图，初步流程图，设备组装图等文件，以便买方开展其范围内的现场工程工作。

#### **4.3.2 Other technical documents:**

其他技术文件：

- Other drawings will be furnished before the plant arrival in India. Total drawings and documents shall consists of process flow diagram, assembly drawing, wiring diagram and other necessary drawings, as well as test certificate as per Chinese standard and normal engineering practice. 其他资料将在设备到达印度之前提供。所有的图纸和文件将包括流程图，组装图，接线图等其他必要图纸，以及按中国标准和常规工程习惯供应的设备检测报告。

#### **4.3.3 Purchaser's comments and incompliance:**

买方的评论和不符：

- Notice of any comments or request of changes on the technical documents furnished by VENDOR shall be made by the PURCHASER in writing within 14 days of receipt of such documents. Beyond 14 days, PURCHASER can still notice its comments, but shall not request any changes.

如买方对卖方提供的所有设计资料有任何评论或要求更改，则须在收到这些文件后 14 天内书面通知。如超过 14 天，买方仍然可以评论，但不能再要求更改。

- Should the PURCHASER change VENDOR's design or fail to comply with the design pertaining to civil load requirement, electric load requirement, layout, interconnecting piping and etc without approval of VENDOR, PURCHASER shall, as its sole liability and at its own cost, bear the consequence and do all the additional work arisen.

如果买方在没有卖方同意的情况下改变了或没能符合卖方关于土建负荷要求、电气负荷要求、布置、配管等的设计，则买方须自费并自行承担责任来处理后果并实施额外的工作。

#### **4.4 Jobsite Instruction:**

现场监督指导：

- On Purchaser's request, the Vendor shall dispatch well-organized engineer group to the Purchaser's jobsite for instruction of installation, and commissioning for all equipment supplied by the Vendor, which shall consist of 7~8 engineers approximately (including process engineer, instrument engineer,

commissioning engineer and etc. Translator is not included) who will come successively. Engineer depute schedule shall be finalized by both parties after discussion as per site condition and project progress.

收到买方邀请后，卖方要派遣具有良好组织的工程师团队到买方现场指导卖方供应的设备的安装，调试。该团队约由 7~8 个人组成（包括工艺工程师，仪表工程师，调试工程师，不包括翻译）相继到达现场。工程师派人计划应由双方根据现场条件和工程进度讨论后共同确定。

- The Vendor shall also offer training of operations of air separation plant to the Purchaser at jobsite in both theory and practice during stay in India;  
卖方要在指导期间提供空分设备理论和实践两方面的操作培训；
- Such Instruction by Vendor shall not relieve the Purchaser from any its obligation of civil work construction and installation and etc. to be in compliance with technical requirement of the plant and design document provided by Vendor  
卖方的指导监督不解除买方对于土建施工和安装工作要符合设备技术要求和卖方提供的设计资料的义务：

#### 4.5 Note:

注：

Any further equipment or service, which is not included in Clause 3 and clause 4, and which the Purchaser requires the Vendor to supply, shall be otherwise negotiated by both parties.

任何买方需要卖方提供的但第 3 条款和第 4 条款所未包括的设备及服务，须由双方另议。

**Clause 5            Engineering Work in Scope of the Purchaser 买方的工程范围**

Except for items specified in technical Clause 3 and Clause 4 in this contract, the Purchaser shall supply all other necessary equipment which is compulsory for the operation of the air separation plant, and shall take charge of all necessary jobs for this project, mainly including but not limited to following items:

除技术附件第 3 条及第 4 条规定内容外,买方应负责的所有其他必须的设备和工作, 主要包括但不限于如下:

**5.1 Site engineering to be carried out by the Purchaser:**

买方工程范围:

- Engineering design, material supply and construction for workshop, foundation, water & cable trench, fire-fighting, lightning conducting, grounding and other items which are not covered by Vendor's scope;  
现场工程设计, 供货和施工, 包括厂房、基础、水电管沟、消防、防雷、接地、以及其他卖方未包括的内容;
- Engineering design for cooling water system; Include pipeline outside the workshop.  
冷却水系统工程设计, 包括厂房外管道
- Supports and platform design and supply;  
按卖方设计做支架和平台设计及供货;
- To install the plant under the Instruction of engineers from the Vendor, including cold boxes connection, accessories assembly, gas pipeline connection, water system connection, power system connection, instrument system installation and etc as per process requirement of the plant; and supply all the material (including gas pipeline, liquid pipeline, water pipeline, power cables, instrument cables, instrument tubes and etc.), installation assisting material, consumption material involved.  
在卖方工程师指导下按工艺要求安装设备, 包括冷箱拼接, 附件组装, 气体管道连接, 水管道连接, 电系统连接, 仪表系统安装等, 并提供安装材料(液体管道, 水管道等), 安装辅材, 安装耗材等。
- To paint the plant and pipeline, and to do makeup painting to equipment where necessary; to do thermal insulation(including perlite) as per process requirement; Supply of material involved;  
设备和管道的喷漆, 并对设备做必要的补漆, 按工艺需要做保温(包括珠光砂); 及所涉及的所有材料的供货;
- To do pressure test, and cold test run under the Instruction of engineers from the Vendor and provide the required gas;  
在卖方工程师指导下做压力试验和裸冷试验, 并提供所需气体;

- To take charge of procedures for getting approval from local government for the project starting, project progress, project acceptance, pressure vessels and etc, as well as any cost incurred.  
对于项目开工，项目进展，项目验收，压力容器等，买方负责向当地政府和有关部门报批手续，以及负责产生的费用；
- Other engineering jobs, which is required as per actual condition but not covered by Vendor's scope.  
其他实际需要的但不在卖方供应范围内的工程内容

## 6.2 Supply of equipment which is compulsory for operation of the air separation plant but not covered by scope of the Vendor, including but not limited to the following:

提供空分设备运行所必须的、但不属于卖方供货范围内的设备。主要包括但不限于以下：

- Product distribution system from the product valves of each flow of product (boarder of each party shall be referred to attached P&ID), including but not limited to liquid storage tanks, liquid transfer pumps, road tankers and etc. Purchaser shall furnish relative data of storage tanks to Vendor for confirmation and approval;  
自产品放出阀之后的产品输配系统（双方界区划分参考流程图），包括但不限于液体罐，液体泵，槽车等： 买方应将液体罐相关参数提供给卖方确认并批准。
- To supply lubrication oil and other material, calibrate gas required for commissioning and running of the plant;  
提供设备调试和运行用润滑油及其他物料，标气等；
- To supply necessary office facility in centralized control room, except for the items specified in 3.18.  
提供除附件 3.18 规定项目外的中控室内的必要办公设施；
- Equipment and material which is otherwise defined as Purchaser's scope in this contract  
本合同中另外规定的需要买方提供的设备
- Other equipment and material, which is required as per actual condition but not covered by Vendor's scope.  
其他实际需要的但不在卖方供应范围内的设备和材料。



**Clause 6      Guaranteed Performance of plant性能保证****6.1 Basic condition:**

基础条件:

- 6.1.1 This "guaranteed performance" is based on "Clause 1 - Design Condition" and "Clause 2 - Main technical performance data". The record of this test will be the basis of acceptance for Purchaser and Vendor.

本性能指标是建立在“技术附件一-基础设计条件”和“技术附件二-主要技术参数”基础上的。检测报告将作为买卖双方接受设备的依据。

- 6.1.2 Should the site condition differ from the design data specified in clause 1, the Vendor and the Purchaser shall agree on the performance of the plant.

如现场条件与第一条款中规定的条件不符，则双方应同意设备性能并验收。

**6.2 Measurement method:**

测量方法:

- 6.2.1 Gas flowrate: measured with orifice-plate flow meter ex cold box, compensated with temperature and pressure;

气体流量: 孔板流量计测量出冷箱参数，并用压力温度参数修正；

- 6.2.2 Liquid output: measured as per the reading of liquid level indicator in the tank, and after taking due correction for evaporation losses in pipeline and tank. The check of liquid product must be executed on the condition that the storage tank should fill in full at least one time and continuously inlet liquid time arriving at 15 days;

液体产量: 根据液位计读数测量，并用管道和贮槽的汽化损失进行修正；液体产量考核须在储罐注满至少一次，且连续进液 15 天之后方可进行考核。

- 6.2.3 Purity: measured with gas analyzers, calibrated with correct zero and span gas. Certificate of analysis of zero and span gas must be shown to Vendor;

纯度: 分析仪测量，并用 0 和适当范围的标准气校准。0 和适当范围的标准气分析证明须出示给卖方；

- 6.2.4 Pressure: measured with pressure gauge / transmitter;

压力: 压力表或变送器测量；

- 6.2.5 Temperature: measured with PT 100 thermal resistance and digital thermometer;

温度: 铂热电阻和数字温度计测量；

6.2.6 Meters and gauges used above shall be checked and approved by both parties.

以上选用的计器表和测量表由双方校正和确认。

### 6.3 Performance guarantee:

性能保证:

6.3.1 It is guaranteed that the plant shall perform as the design data specified in clause 2.1.

保证合同设备的性能满足技术附件 2.1 所规定的设计参数。

Item	Finish time	29 <sup>th</sup> 6 , 2018	10 <sup>th</sup> 7 , 2018	10 <sup>th</sup> 8 , 2018	10 <sup>th</sup> 9 , 2018	10 <sup>th</sup> 10 , 2018	10 <sup>th</sup> 11 , 2018	10 <sup>th</sup> 12 , 2018	10 <sup>th</sup> 1 , 2019	10 <sup>th</sup> 2 , 2019	10 <sup>th</sup> 3 , 2019	10 <sup>th</sup> 4 , 2019	10 <sup>th</sup> 5 , 2019	10 <sup>th</sup> 6 , 2019	10 <sup>th</sup> 7 , 2019	10 <sup>th</sup> 8 , 2019	10 <sup>th</sup> 9 , 2019
合同签订 Signing contract																	
准备采购工作 Prepare for purchasing issue																	
收到定金合同正式生效 Contract effective after receiving the downpayment																	
设备平面设计以及工程图纸 Plant Layout Design and Civil Drawings																	
材料采购 Material purchasing																	
自洁式空气过滤器 Self-cleaning air filter																	
空压机 Air compressor																	
预冷系统 Pre-cooling system																	
纯化系统 Purifying system																	



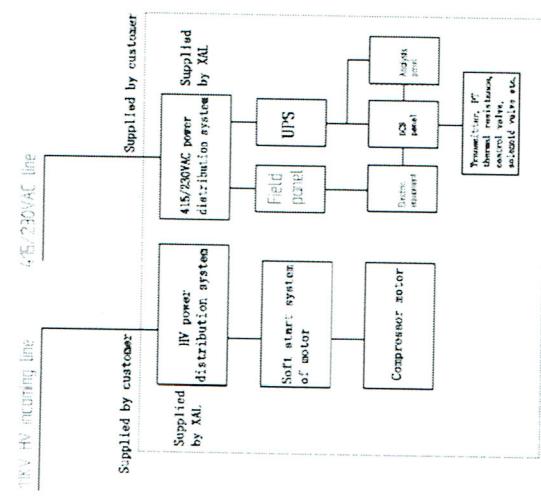
循环空气压缩机 Recycle air compressor											
进口膨胀机 Turbine (Imported)											
Item	29 <sup>th</sup> 6 , 2018	10 <sup>th</sup> 7 , 2018	10 <sup>th</sup> 8 , 2018	10 <sup>th</sup> 9 , 2018	10 <sup>th</sup> 10 , 2018	10 <sup>th</sup> 11 , 2018	10 <sup>th</sup> 12 , 2018	10 <sup>th</sup> 1 , 2019	10 <sup>th</sup> 2 , 2019	10 <sup>th</sup> 3 , 2019	10 <sup>th</sup> 4 , 2019
Finish time											
分馏塔的制造 Manufacture of fractionation column											
仪表控制系统 Instrument&control system											
电控系统 Electric control system											
LOX/LIN/LAr 储罐 Storage tank for LOX/LIN/LAr											
LOX/LAr 槽车充装泵 Tanker filling pump for LOX/LIN/LAr											
LOX/LAr 充瓶泵 Cylinder filling pump for LOX/LAr											

工程安装材料 Installation material of engineering																				
Item	29 <sup>th</sup> 6 , 2018	10 <sup>th</sup> 7 , 2018	10 <sup>th</sup> 8 , 2018	10 <sup>th</sup> 9 2018	10 <sup>th</sup> 10 , 2018	10 <sup>th</sup> 11 , 2018	10 <sup>th</sup> 12 , 2018	10 <sup>th</sup> 1 , 2019	10 <sup>th</sup> 2 , 2019	10 <sup>th</sup> 3 , 2019	10 <sup>th</sup> 4 , 2019	10 <sup>th</sup> 5 , 2019	10 <sup>th</sup> 6 , 2019	10 <sup>th</sup> 7 , 2019	10 <sup>th</sup> 8 , 2019	10 <sup>th</sup> 9 , 2019				
第一批设备运输 First shipment																				
第一批人员派遣 Engineer for first lot goods																				
第二批设备运输 Second shipment																				
第二批人员派遣 Engineer for second lot goods																				
指导 Instruction																				
调试 Commissioning																				

注：上述时间安装仅为初步计划，最终以实际情况为准。The same installation are just the preliminary schedule and finally be subjected to final design.

## Annex 2 Supply Scope Block Diagram for Electric and Instrument Control System

**Supply Scope Block Diagram for  
Electric and Instrument Control System**



1. The customer will connect the HV&LV cable to the incoming cabinet upper termination of high&low voltage board supplied by XIA.
2. HV power distribution system, HV soft start system, HV instrument control system, field panels of supplied equipments, DCS instrument control system (including primary instrument, computer, printer, UPS etc.), instrument cable, power cable, gas source pipe, hose pipe, cable tray etc. And installation accessories between analysis system and supplied equipment in the dashed box are supplied by XIA.

Mark No.	Part No.	Signature	Date	Drawing mark	Weight	Scale
Design	Standard					1:1
Checked						
Process	Approved			Total Figs	Specs	

A handwritten signature in black ink, appearing to read "John Bindra".

## Annex 3 Document to be Provided during Engineering

### 工程期间提供的资料

No.	Item Description	BD	BE	DE	Customer's action
		60days	90days	150 days	
	<b>Basic and Detailed Engineering</b> 基础和详细的工程				
1	- Design Basis 设计基础				
	- Process flow diagram 工艺流程图	Y			
	- P&I diagram for all systems 所有系统的 P&ID	Y			
	- General layout plan 总布置图			Y	General layout drawing 平面布置总图
	- Performance parameters and design basis for plant and facilities 设备、设施的性能参数和设计基础		Y		
	- Detailed specification for all bought-out equipment and systems 所有设备及系统的详细参数		Y		
	- Detailed plot plan showing location of all equipment and facilities with dimensions 详细的配置图标示出所有设备、设施的位置和尺寸			Y	
	- Layout drawings and cross section of all facilities 所有装置的布置图和横截面图			Y	
	- Route layout for piping and cabling 管道和电缆的布线图			180days	
	- Arrangement of supports 支架的安排			180days	
	- Arrangement of stairs, ladders, platforms within battery limits (if any) 界区内梯子平台的安排（如果有的话）			180 days	
	- Civil scope drawings with dimensions load data, requirement of pockets for anchor bolts and other data required for design of facilities to be provided by the Purchaser 卖方提供带有尺寸数据、地脚螺栓要求和其他设施设计所需数据的土建图			Y	
	- Layout of foundations, cable and pipe trenches with dimensions 基础、电缆和管沟的布置图（带有尺寸）			Y	
	- Equipment GA and cross-section drawings with dimensions 带有尺寸的设备总装和截面图			Y	
	- Details of interconnections at battery limits 界区的详细互连			Y	

	- Detailed list and specification for all consumables & utilities 所有消耗品和公共设施的详细清单和规格		Y	
	- Any other documents and details as required for providing interface and as agreed. 照约定的其他文件和详细信息		Y	
	- Safety valve documentation 安全阀文件	Y		
	- Packing lists 装箱单		收到预付款后 8 个月 8 months after receiving down payment	
	- Dynamic load data related to Compressor 空压机动力载荷数据	Y		
	- Details for anchor bolts 地脚螺栓详情	Y		
	- HAZID/HAZOP Study 危险源辨识/危险与可操作型研究	Y		
	- Project management and execution plan 项目管理和执行计划	Y		
	- Project quality plan 项目质量计划	Y		
	- Time schedule for project 项目进度	Y		
	- S Curve S 曲线	Y		
	- Progress report during engineering/manufacturing /fabrication, shipping, erection and construction, start up and commissioning. It should be reported biweekly (also should be shown in s-curve form) 在设计, 生产, 制造, 装运, 就位, 开机调试期间的进度报告。两周报告一次(以 S 曲线的形式体现)	Y		
	- Project risk identification and mitigation 项目风险识别和减轻	Y		
	- HSE Plan 应急救援预案	Y		
	- Design Basis 设计基础	Y		
2	<b>Instrumentation 仪表</b>			
	- P&I diagrams P&I 图	Y		
	- Control schematic diagrams 控制原理图		Y	
	- List of measurements 测量清单		Y	
	- Instrument list 仪表清单		Y	
	- Panel GA drawings 仪表盘总图		Y	
	- Specification and data sheets 规格和数据表		Y	
	- Analyser specifications 分析仪规格		Y	



	- Requirement for control room and analyser room with Heat Load 控制室要求和带热负荷分析室要求	Y			
	- Specification for other accessories 其他附件规格			Y	
	- I/O list 输入/输出清单		Y		
	- Terminal strip diagram 接线图			Y	
	- PC operator system instructions 电脑操作系统说明			收到预付款后 8 个月 8 months after receiving down payment	
3	<b>Electrical 电气</b>				
	- List of drives / loads for HT & LT power supply 高&低压电源的电机/负荷清单	Y			
	- Single line diagram for panels 柜子的单线图		Y		
	- Control schematics 控制原理图		Y		
	- Panel GA drawing with make & specification of all components 柜子总图, 带所有部件的品牌及规格			Y	
	- Specification & sizing of cables 电缆的规格机组尺寸			Y	
	- Cable layout 电缆布置图				
	- Control section/MCC section part list 控制部分/MCC 部分部件清单			Y	
	- Any other documents listed under Technical Specification Chapters 技术说明章节中列明的其他资料			收到预付款后 8 个月 8 months after receiving down payment	
4	<b>Final Documentation 最终文件</b>				
	- Operation and maintenance manuals for all equipment and system. 所有设备和系统的操作维护手册			收到预付款后 8 个月 8 months after receiving down payment	
	- Test and inspection certificates for all major equipment and all pressure vessels. 主要设备和所有压力容器的测试和检验证明			收到预付款后 8 个	

			月 8 months after receiving down payment	
	- Erection manual for units within scope of supply 在供货范围内的设备就位手册		Y	
	- As built Drawings for vessels 容器的竣工图		收到预付款后 8 个月 8 months after receiving down payment	
	- Certificate of conformity incl. final assessment report for vessels 合格证，包括容器的最终评估报告		收到预付款后 8 个月 8 months after receiving down payment	
	- Data sheet, Operating manual, Motor manual ,Performance curves, Cross-sectional drawing with parts list, Outline dimensional drawing for pumps & compressors 数据表，操作手册，电机手册，性能曲线，带部件清单的剖面图 泵和压缩机的外形尺寸图纸		收到预付款后 8 个月 8 months after receiving down payment	
	- Pipe classification list, 管道分类表		Y	不提供应力分析 Stress analysis is not provided.
	- Training Manual 培训手册		收到预付款后 8 个月 8 months after receiving down payment	

Number of drawings or specifications required to furnish the above listed information resp. data will be given 3-sets in hard copies.

要求提供的图纸及说明书的数量将提供三份纸质版。

Documentation will be supplied in English language. All documents shall be also supplied in soft copy - Drawings in PDF format and documents in MS Office format. Language shall be in English.

资料将提供英文版，所有资料将提供电子版，图纸格式为 PDF，语言为英文。

The above information, data, drawings or specifications in the form will be supplied in specified schedule.

以上表格中的信息，数据，图纸或说明书将在指定的时间里提供。

Documentation will include information necessary with regard to construction, erection, operation and maintenance of the plant.

文件将包含关于设备建造，就位，操作和保养的必要信息。

Documentation will also include basic information for obtaining the required building and operation permits by BUYER from the authorities.

资料将还包含基本信息，以便买方从当局获得所需的建筑及操作许可证。

Documents subject to BUYER's approval shall be approved by BUYER's authorized person and returned to SELLER within 10 working days.

需要买方批准的资料应该由买方授权人员审核并且在 10 个工作日内发回给卖方。

## Annex 4 Division List of Equipment and Facilities 设备和设施分区表

LIQUID AIR SEPERATION PLANT KDONAr-2350Y/1750Y		U= USER 用户, S=XLA, C=CIVIL CONSTRUCTION TEAM 土建队, E=ERECTION TEAM 安装队 (U & C & E=USER) 土建队、安装队属于用户负责范围内										Supply 供货	Vendor 供应商	Remark 备注
		SERVICES												
ITEM NO			Qty. 数量	Basic Data 基本数 据	Basic Eng. 基本工 程	Detail Design 详细设 计	Erection 就位	Com. 调试	Instruction 指导		Erect. 就位	Com. 调试		
1.	CIVIL WORKS 土建 XLA will supply basic civil data within 45 days after signing the contract. (XLA 将会在合同签订之日起 45 天之内提供土建的基本数据)												The general foundation drawing will include the filling structure, pre-cooling system, purifier, system, cold box, control system. 总的土建图将包括填充结构, 预冷系统, 纯化系统, 冷箱, 控制系统。	
1.1	Compressor House 压缩机室		S	C	C	C	C	C	C	C	C			
1.2	Steel Structure/Working Platform for Compressor House 钢结构/压缩机室工作平台		S	C	C	C	C	C	C	C	C	If required 若需要		

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		Qty. 数量	Basic Data 基本数 据	Basic Eng. 基本工 程	Detail Design 详细设 计	Erection 就位	Com. 调试	Instruction 指导		Erect. 就位	Com. 调试		
ITEM NO													
1.3	Control Building 控制室		S	C	C	C	C	C	C	C	C		
1.4	Foundation for Main Equipments & Storage System 主设备和存储系统基础		S	C	C	C	C	C+S	C	C			
1.5	Cable Canals 电缆槽		S	C	C	C	C	C+S	C+S	C			
1.6	Concrete Works in the plant 设备混凝土		S	C	C	C	C	C	C	C			
1.7	Anchor bolts 地脚螺栓		S	C	C	C	C	C	C	S		部分提前预埋地脚螺栓需用户提供 Part pre-embedded anchor bolts shall be supplied by customer	
1.8	Overhead Crane for Maintenance 维护用桥式吊车	1	S	C	C	C	C	C	C	C		S: 提供设备最大吊装重量及高度 S: to supply the max lifting weight and height	

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		Qty. 数量	SERVICES							Erect. 就位	Com. 调试			
ITEM NO			Basic Data 基本数 据	Basic Eng. 基本 工程	Detail Design 详细设 计	Erection 就位	Com. 调试	Instruction 指导						
1.9	Leveling and Compaction of Construction & Erection Field 建设土地的平整、压实	C	C	C	C	C	C	C	C					
1.10	Construction of Road Within Battery Limit of ASP 界区内道路建设	S	C	C	C	C	C	C	C			S: 可以提供平面布置简图 S: can supply brief layout drawing		
1.11	Construction of Road Surrounding Battery Limit of ASP 界区周围道路建设	C	U	U	U	U	U	U	U					
1.12	Temporary Warehouse for Construction and Erection 建设安装临时仓库	U	C	C	C	C	C	C	C			临时仓库用户自己规划 Temporary warehouse shall be planned by user		
1.13	Temporary Office and Housing for Construction & Erection 建设、安装临时办公室	S	C	C	C	C	C	C	C			S: 可以提供布置简图 S: can supply brief layout drawing		
1.14	Analyzer room 分析室	S	C	C	C	C	C	C	C			S: 可以提供布置简图		



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		SERVICES											
ITEM NO		Qty. 数量	Basic Data 基本数 据	Basic Eng. 基本工 程	Detail Design 详细设 计	Erection 就位	Com. 调试	Instruction 指导		Erect. 就位	Com. 调试		
													S: can supply brief layout drawing
1.15	Diesel generator room 柴油发电机室	U	C	C	U	U	U	U	U	U	U		If required 若需要
1.16	Lockers building 衣帽间	S	C	C	C	C	C	C	C	C	C		S: 可以提供布置简图 S: can supply brief layout drawing
1.17	Gatehouse building 门卫室	S	C	C	C	C	C	C	C	C	C		S: 可以提供布置简图 S: can supply brief layout drawing
1.18	Truck filling station 槽车充装站	S	C	C	C	C	C	C	C	C	C		S: 可以提供布置简图 S: can supply brief layout drawing
2.	INSTALLATION and COMMISIONING MATERIAL 安装调试材料												



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		Qty. 数量	SERVICES							Erect. 就位	Com. 调试			
ITEM NO			Basic Data 基本数 据	Basic Eng. 基本工 程	Detail Design 详细设 计	Erection 就位	Com. 调试	Instruction 指导						
2.1	Tools and equipments 工具和设备		S	E	E	E	E	E	E	E	E		S: 提供主要工具设备清单及参数 S: To supply main tools equipment list and parameter.	
2.2	Mobile Lift Crane 机动吊车		S	E	E	E	E	U	U	U			S: 可以提供设备吊装用尺寸及重量 S: can supply size and weight for plant lifting	
2.3	Agent material, First fill lubricating oil 润滑油		S	S	S	E	E	U	U	U			润滑油用户(买方)提供 lubricate oil shall be supplied by user(buyer)	
2.4	Welding machine, welding rod, soldering flux etc. 焊机, 焊条, 焊剂等		S	E	E	E	E	U	U	E				
2.5	Special tools for cold box 冷箱 特殊工具		S	S	S	E	E	U	S	S				
2.6	Tools, devices and auxiliaries used in pressure test		S	E	E	E	E	U	U	E				

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		SERVICES												
ITEM NO		Qty. 数量	Basic Data 基本数据	Basic Eng. 基本工程	Detail Design 详细设计	Erection 就位	Com. 调试	Instruction 指导	Erect. 就位	Com. 调试				
	压力测试用工具, 装置和附件													
2.7	Valve, flange, bolts and nuts in the battery limit 界区内阀门, 法兰, 螺栓, 螺母	S	S	S	E	E	S	S	S			Installation material 安装材料		
2.8	Carbon steel pipeline for the air separation plant 空分设备碳钢管道 (碳钢管道将会和第一批货物一起发货) Carbon steel pipeline will deliver together with first lot of shipment.	S	S	S	E	E	S	S	S			循环水系统碳钢材除外 Except for carbon steel material for recycle water system Installation material 安装材料		
2.9	The stainless steel pipeline for the air separation plant 空分设备不锈钢管道	S	S	S	E	E	S	S	S			提供属于 XLA 界区内的 Supplied within XLA B/L Installation material 安装材料		
2.10	The copper pipeline for the air separation plant (if required). 空分设备铜管 (若需要)	S	S	S	E	E	S	S	S			提供属于 XLA 界区内的 Supplied within		

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		SERVICES											
ITEM NO		Qty. 数量	Basic Data 基本数 据	Basic Eng. 基本工 程	Detail Design 详细设 计	Erection 就位	Com. 调试	Instruction 指导		Erect. 就位	Com. 调试		
													XLA B/L
													Installation material
2.11	Pipeline rack 管道架	S	S	S	E	E	S	S	S				提供属于 XLA 界区内的 Supplied within XLA B/L
2.12	The aluminum pipeline in the cold box 冷箱内铝管	S	S	S	S	S	S	S	S				
2.13	The aluminum welding rod for the cold box installation 冷箱安装用铝焊条	S	S	S	S	S	S	S	S				
2.14	The installation of the aluminum equipment in the cold box 冷箱内铝制设备安装	S	S	S	S	S	S+U	S+U	S+U				XLA 负责场内安装, 客户负责现场安装 XLA do cold box factory installation, customer do jobsite installation



U= USER 用户, S=XLA, C=CIVIL CONSTRUCTION TEAM 土建队, E=ERECTION TEAM 安装队  
(U & C & E=USER)  
土建队、安装队属于用户负责范围内

ITEM NO		SERVICES								Supply 供货	Vendor 供应商	Remark 备注
		Qty. 数量	Basic Data 基本数据	Basic Eng. 基本工程	Detail Design 详细设计	Erection 就位	Com. 调试	Instruction 指导				
3.	<b>MAIN EQUIPMENTS</b> 主要设备											
3.1	Inlet Air Filter, Filter Body 进气过滤器, 过滤器主体	1	S	S	S	E	S	S	S	S		
3.2	Main Air Compressor 主空压机	1	S	S	S	E	S	S	S	S		
3.3	Recycling compressor 循环压缩机	1	S	S	S	E	S	S	S	S		
3.4	Air pre-cooling system 空气预冷系统	1	S	S	S	E	S	S	S	S		
3.6	Molecular Sieve Adsorbers (vessels, filling material, valves, regeneration heater) 分子筛吸附剂(容器, 填充材料, 阀门和再生加热器)	1	S	S	S	E	S	S	S	S		
3.7	Expansion Turbine(lubrication system, duct, cooler and booster)透平膨胀机(润滑油系 统, 导管, 冷却器和增压机)	1	S	S	S	E	S	S	S	S		



LIQUID AIR SEPERATION PLANT KDONAr-2350Y/1750Y		U= USER 用户, S=XLA, C=CIVIL CONSTRUCTION TEAM 土建队, E=ERECTION TEAM 安装队 (U & C & E=USER) 土建队、安装队属于用户负责范围内										Supplier 供货	Vendor 供应商	Remark 备注
		Qty. 数量	SERVICES							Erection 就位	Com. 调试			
ITEM NO				Basic Data 基本数 据	Basic Eng. 基本工 程	Detail Design 详细设 计				Erect. 就位	Com. 调试			
3.7A	Booster after cooler 增压器后冷	2	S	S	S	E	S	S	S	S	S			
3.8	Cold Box shell 冷箱外壳	1	S	S	S	E	S	S	S	S	S			已安装在冷箱内 installed inside cold box
3.9	Main Heat Exchanger 主换热器	1	S	S	S	S	S	S	S	S	S			已安装在冷箱内 installed inside cold box
3.10	LOW COLUMN 下塔	1	S	S	S	S	S	S	S	S	S			已安装在冷箱内 installed inside cold box
3.11	UPPER COLUMN 上塔	1	S	S	S	S	S	S	S	S	S			已安装在冷箱内 installed inside cold box
3.12	Main Condenser/Evaporator 主冷凝器/蒸发器	1	S	S	S	S	S	S	S	S	S			已安装在冷箱内 installed inside cold box
3.13	Sub cooler 过冷器	1	S	S	S	S	S	S	S	S	S			已安装在冷箱内 installed inside cold box



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ITEM NO		Qty. 数量	SERVICES						Supply 供货	Vendor 供应商	Remark 备注
			Basic Data 基本数 据	Basic Eng. 基 本 工 程	Detail Design 详细设 计	Erection 就位	Com. 调试	Instruction 指导			
4.	AUTOMATION & INSTRUMANTION 自动化和仪控										
4.1	DCS configuration DCS 配置	1	S	S	S	E	E+S	S	S	S	
4.2	UPS	1	S	S	S	E	E+S	S	S	S	
4.3	Cabinet (included electrical equipment) 柜子(包括电力设备)	1	S	S	S	E	E+S	S	S	S	
4.4	23" LCD Display 23 寸显示屏	2	S	S	S	E	S+E	S	S	S	
4.5	Color ink A3 Printer A3 打印机	1	S	S	S	E	S+E	S	S	S	
4.6	Operation station 操作站	1	S	S	S	E	S+E	S	S	S	
4.7	Engineering Station 工程师站	1	S	S	S	E	S+E	S	S	S	
4.8	Instrumentation and Control cables 仪控电缆	1	S	S	S	E	S+E	S	S	S	

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		SERVICES							Qty. 数量				
ITEM NO		Basic Data 基本数 据	Basic Eng. 基本工 程	Detail Design 详细设 计	Erection 就位	Com. 调试	Instruction 指导			Erect. 就位	Com. 调试		
4.9	Network cables and Network devices 网络电缆和装置	1	U	U	U	C	U	C	U	U			
4.10	DCS Editing software DCS 编辑软件	1	S	S	S	-	S	-	-	S			
4.11	Earthing System above ground 上接地系统	1	S	U	U	C	U	C	U	U			
4.11a	Earthing System under ground 下接地系统	1	S	U	U	C	U	C	U	U			
4.12	All Gas Analyzers 所有气体分析仪	1	S	S	S	E	S+E	S	S	S			
4.13	All Calibration Tubes & Cylinders for Gas Analyzers Zero & Span Calibration (所有气体分析仪用校准管和钢瓶和量程校准气)	1	S	U	U	E	U	C	U	U			
4.14	Pressure Transmitter 压力传感器	1	S	S	S	E	S+E	S	S	S			
4.15	Diff. Pressure Transmitters 差压传感器	1	S	S	S	E	S+E	S	S	S			
4.16	RTD ( PT 100 )	1	S	S	S	E	S+E	S	S	S			

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		Qty. 数量	SERVICES							Erect. 就位	Com. 调试			
ITEM NO			Basic Data 基本数 据	Basic Eng. 基本工 程	Detail Design 详细设 计	Erection 就位	Com. 调试	Instruction 指导		Erect. 就位	Com. 调试			
4.17	Standard Orifice Plate 标准孔板	1	S	S	S	E	S+E	S	S	S				
4.18	Switches (Level, flow, pressure, proximity etc.) 开关 (液位, 流量, 压力等)	1	S	S	S	E	S+E	S	S	S				
4.19	2/3 way Solenoid Valve 2 位 3 通电磁阀	1	S	S	S	E	S+E	S	S	S				
4.20	2/5 way Solenoid Valve 2 位 5 通电磁阀	1	S	S	S	E	S+E	S	S	S				
4.21	Cutting Valves 切断阀	1	S	S	S	E	S+E	S	S	S				
4.22	All Fitting Materials 所有配对材料	1	S	S	S	E	S+E	S	S	S				
4.23	Local Pressure Manometer 本地压力计	1	S	S	S	E	S+E	S	S	S				
4.24	Local Bi-Metal Thermometer 本地双金属温度计	1	S	S	S	E	S+E	S	S	S				
4.25	Pressure Manometer which included electric contacts 压力计包括电接触	-	-	-	-	-	-	-	-	-				

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		Qty. 数量	SERVICES							Erect. 就位	Com. 调试			
ITEM NO			Basic Data 基本数 据	Basic Eng. 基本 工程	Detail Design 详细设 计	Erection 就位	Com. 调试	Instruction 指导		Erect. 就位	Com. 调试			
4.26	Bi-Metal Thermometer which included electric contacts 双金属温度计包括电接触	-	-	-	-	-	-	-	-	-	-			
4.27	Control Valves (In the battery limit) 控制阀 (界区内)	1	S	S	S	E	S+E	S	S	S	S			
4.28	Butterfly Valves (In the battery limit) 蝶阀 (界区内)	1	S	S	S	E	S+E	S	S	S	S			
4.29	Anti-Surge Valves ( for Air Comp./ Exp. Turbine ) 防喘振阀 (压缩机和膨胀机用)	1	S	S	S	E	S+E	S	S	S	S			
4.30	Operation Desk for others 其他设备操作台	1	S	S	E	E	S+E	E	E	E	U			
4.31	Operation Desk for DCS DCS 操作台	1	S	U	U	C	U	C	U	U	U			
4.32	Operation Chairs 操作椅	1	S	U	U	C	U	C	U	U	U			
4.33	The manual analyzers in the gas analysis room. 气体分析室手动分析仪	1	S	U	U	C	U	C	U	U	U	If required 如需要		
4.34	The air conditioner for the instrument control and electric	1	S	U	U	C	U	C	U	U	U			

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		Qty. 数量	Basic Data 基本数据	Basic Eng. 基本工程	Detail Design 详细设计	Erection 就位	Com. 调试	Instruction 指导				
	control room. 仪电控室空调											
5.	ELECTRIC CONTROL SYSTEM 电控系统											
5.1	33KV/11KV Transformer 变压器	1	S	U	U	U	U	U	U			POWER SUB-STATION 变电所
5.2	11KV/0.415KV Transformer 变压器	1	S	U	U	C	U	C	U			
5.3	MV-Switchgear 中压开关装置		S	S	S	E	E+S	U	S	S		
5.4	LV-Switchgear 低压开关装置		S	S	S	E	E+S	U	S	S		
5.5	MV Cable (in battery limit) 中压电缆 (界区内)		S	S	S	E	E+S	U	S	S		
5.6	MV Cable (From substation to incomer) 中压电缆 (从变电所到进线)		S	U	U	C	U	C	U	U		



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ITEM NO		Qty. 数量	SERVICES							Supply 供货	Vendor 供应商	Remark 备注
			Basic Data 基本数 据	Basic Eng. 基本工 程	Detail Design 详细设 计	Erection 就位	Com. 调试	Instruction 指导				
5.7	LV Cable (in battery limit) 低压电缆 (界区内)	S	S	S	E	E+S	S	S	S			
5.8	LV Cable from 6.6/0.4KV transformer to LV incomer 低压电缆从 6.6/0.4KV 转换到低压进线	S	U	U	C	U	C	U	U			
5.9	Emergency power Cable from USER to LV incomer 应急电源 从用户到低压进线的电缆	S	U	U	C	U	C	U	U			If required
5.10	DC Power Supply and Battery Units DC 电源和电池设备	S	S	S	E	E+S	S	S	S			
5.11	Grounding System ( Grounding for neutral line) (under ground) 接地系统 (接中性线) (地下)	S	U	C	C	C	C	C	C			
5.12	Grounding System ( Grounding for neutral line) (above ground) Grounding System ( Grounding for neutral line) (under ground) 接地系统 (接中性线) (地上)	S	S	C	C	C	C	C	U			

**LIQUID AIR SEPERATION PLANT**  
**KDONAr-2350Y/1750Y**

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ITEM NO		Qty. 数量	SERVICES							Supply 供货	Vendor 供应商	Remark 备注
			Basic Data 基本数据	Basic Eng. 基本工程	Detail Design 详细设计	Erection 就位	Com. 调试	Instruction 指导				
5.13	Grounding System ( Protection)(under ground) 接地系统 (防护) (地下)	S	S	C	C	C	C	C	C			
5.15	Power Factor Compensation 功率因素补偿	S	U	U	C	U	C	U	U			
5.16	Plant lighting 设备照明	S	U	U	C	U	C	U	U			
5.17	Field lighting 场地照明	S	U	U	C	U	C	U	U			
5.18	Lightning System (under ground) 照明系统 (地下)	U	U	U	C	U	C	U	U			
5.19	Lightning System (above ground) 照明系统 (地上)	U	U	U	C	U	C	U	U		FOR PROCESS	
5.20	Electrical & Instrumentation Cable Trays 仪电电缆桥架	S	S	S	E	E+S	S	S	S			
5.21	Electrical & Instrumentation Cable conduits 仪电电缆沟	S	S	C	C	C+S	S	S	S			

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LIQUID AIR SEPERATION PLANT KDONAr-2350Y/1750Y		SERVICES								Supply 供货	Vendor 供应商	Remark 备注
		Qty. 数量	Basic Data 基本数 据	Basic Eng. 基本工 程	Detail Design 详细设 计	Erection 就位	Com. 调试	Instruction 指导				
ITEM NO								Erect. 就位	Com. 调试			
5.22	Local Control Box and JB 就地控制柜		S	S	S	E	E+S	S	S	S		
6.	CCTV SYSTEM(if required) 闭路电视系统(如需要)											
6.1	IR Security Cameras 安全摄像头		U	C	C	C	C	C	C			
6.2	Special CCTV cables 特殊闭路电视电缆		U	C	C	C	C	C	C			
6.3	Special CCTV system accessories 特殊闭路电视系统附件		U	C	C	C	C	C	C			
6.4	CCTV Monitor CCTV 监视器		U	C	C	C	C	C	C			
6.5	Embedded Condit 预埋管道		U	C	C	C	C	C	C			

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ITEM NO		SERVICES								Supply 供货	Vendor 供应商	Remark 备注
		Qty. 数量	Basic Data 基本数据	Basic Eng. 基本工程	Detail Design 详细设计	Erection 就位	Com. 调试	Instruction 指导				
7.	GAS COMPRESSION AND BACK UP SYSTEM 气体压缩和后备系统											
7.1	LOX tank 液氧罐	2	S	S	S	E	S	S	S			
7.2	LOX transfer pump for tanker filling 液氧转注泵(充槽车)	1	S	S	S	E	S	S	S			
7.3	Liquid Nitrogen Tank 液氮罐	2	S	S	S	E	S	S	S			
7.4	LIN transfer pump for tanker filling 液氮转注泵(充槽车)	1	S	S	S	E	S	S	S			
7.5	GOX balloon 氧气气囊	1	U	U	U	E	U	U	U			For industrial GOX
7.7	GOX cylinder filling manifold 氧气充装排	1	U	U	U	E	U	U	U			For industrial GOX
7.8	LOX pump for cylinder filling 液氧充瓶泵	1	S	S	S	E	S	S	S			For medical GOX 用于医用气氧
7.9	HP LOX vaporizer 高压液氧汽化器	1	S	S	S	E	S	S	S			For medical GOX 用于医用气氧
7.10	GOX cylinder filling manifold 氧气充装排	1	U	U	U	E	U	U	U			For medical GOX 用于医用气氧

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LIQUID AIR SEPERATION PLANT KDONAr-2350Y/1750Y		SERVICES								Supply 供货	Vendor 供应商	Remark 备注			
		Qty. 数量	Basic Data 基本数 据	Basic Eng. 基本工 程	Detail Design 详细设 计	Erection 就位	Com. 调试	Instruction 指导							
								Erect. 就位	Com. 调试						
7.11	GAN compressor 氮气压缩机	1	U	U	U	E	U	U	U	U					
7.12	GAN cylinder filling manifold 氮气充装排	1	U	U	U	E	U	U	U	U					
8.	COOLING WATER SYSTEM ( Required make up water) 冷却水系统 (需要的补充水)														
8.1	Make up water system 补充水系统	1	U	U	U	E	U	U	U	U					
8.2	Cooling water pump 冷却水泵	1+1	U	U	U	E	U	U	U	U					
8.3	Cooling water tower 冷却水塔	2+1	U	U	U	E	U	U	U	U					
8.4	Cooling water pool 冷却水池	1	U	U	C	C	C	C	C						
8.5	Water treatment system 水处理系统	1	U	U	U	E	U	U	U	U					
8.6	Water pipeline and valve 水管路和阀门	1	U	U	U	E	U	U	U	U		Installation material			



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								Erect. 就位	Com. 调试			
9.	Fire fighting system 消防系统											XLA will provide 5 fighting piping points
9.1	Fire fighting pipeline system 消防管道系统	U	C	C	C	C	C	C	C			
9.2	Fire Hydrant 消防栓	U	C	C	C	C	C	C	C			
9.3	Fire fighting water pumps 消防水泵	U	C	C	C	C	C	C	C			
9.4	Automatic Spraying System 自动喷洒系统	U	C	C	C	C	C	C	C			XLA will suggest where shall be placed the extinguisher
9.5	Removable Extinguisher 可移动灭火器	U	C	C	C	C	C	C	C			
10.	Drinking water system 饮用水系统	S	C	C	C	C	C	C	C			

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		Qty. 数量	SERVICES										
ITEM NO			Basic Data 基本数 据	Basic Eng. 基本工 程	Detail Design 详细设 计	Erection 就位	Com. 调试	Instruction 指导		Erect. 就位	Com. 调试		
10.1	Sanitary sewage piping 下水管道	S	C	C	C	C	C	C	C	C	C		
10.2	Storm water drainage 雨水下水道	S	C	C	C	C	C	C	C	C	C		
10.3	Industrial sewage drainage 工业水下水道	S	C	C	C	C	C	C	C	C	C		
14.	SPARE PARTS for two year 两年备件	S	S	S	U	S	S	S	S				
15.	OTHER EXPENSES 其他花费												
15.1	Perlite for Cold Box 冷箱珠光砂	U	U	U	E	U	U	U	U				XLA will provide the paint code
15.2	Finish Paint on Site 现场面漆	U	U	U	E	U	U	U	U				

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ITEM NO		Qty. 数量	SERVICES							Supply 供货	Vendor 供应商	Remark 备注
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								Erect. 就位	Com. 调试			
15.3	Pickling & Flushing 酸洗和冲洗	U	U	U	E	U	U	U	U	U		
15.4	Non-Destructive inspection 无损检测	U	U	U	E	U	U	U	U	U		
15.5	Training 培训	S								S		
15.6	Additional Geotechnical survey (if required) 地质调查 (如需要)	U	U	C	C	C	C	C	C	C		
15.7	Fencing & gates 棚栏和门	U	U	C	C	C	C	C	C	C		
15.8	Hotel and Living Costs 、住宿和生活花费	U								U		
15.9	Travel to and from INDIA 来往印度花费	S								U		



## Annex 5 Vendor List 供应商列表

Item No. 序号	Field 部机	DESCRIPTION 名称	COMPANY 公司	Remarks1 备注 1	Remarks 2 备注 2	Performance warranty 性能保证
1	Air filter 空气过滤器		WUXI	√		
2	Air Compressor 空压机	Air Compressor 空压机	ATLAS			
			IHI	√	IHI or same brand 寿力或同等品牌	
		Air Compressor motor 空压机电机	ABB	√		
			SIEMENS			
			TECO			
3	Recycling compressor 循环空压机	Recycling air compressor 循环空压机	ATLAS			
			IHI	√	IHI or same brand 寿力或同等品牌	
		Compressor motor 压缩机电机	ABB	√		
			SIEMENS			
			TECO			
4	Pre-cooling unit 预冷机组	Pre-cooling unit 预冷机 组	SHANLI	√		
			JIANGLIAN			
		Compressor 压缩机	BITZER	√		

Item No. 序号	Field 部机	DESCRIPTION 名称	COMPANY 公司	Remarks 1 备注 1	Remarks 2 备注 2	Performance warranty 性能保证
5	Purification system 纯化系统	Electric heater 电加热器	XLA			
		Silencer 消音器	XLA			
		Switch valve 切换阀	上海电气			
		Molecular Sieves 分子筛	UOP SHANGHAI			
			Or equal brand 或同等			
		Activated Alumina 活性氧化铝	JIANGYAN			
			WENZHOU			
6	Booster 膨胀机 Turbo-expander	Booster Turbo-expander 透平膨胀机	CRYOSTAR	根据交货进度选择  To select as per delivery schedule		
			ACD			
		Oil Supply Device 供油装置	CRYOSTAR	根据交货进度选择  To select as per delivery schedule		
			ACD			
7	Cold Box System	Main Heat Exchanger 主换热器	Chinese make			



Item No. 序号	Field 部机	DESCRIPTION 名称	COMPANY 公司	Remarks1 备注 1	Remarks 2 备注 2	Performance warranty 性能保证
8	冷箱系统	Upper Column 上塔	XLA			
		Condenser/Evaporator 冷凝器/蒸发器	Chinese make			
		Lower Column 下塔	XLA			
		LIN/LA Sub-cooler 液空液氮过冷器	Chinese make			
		Liquid Evaporator 液体蒸发器	Chinese make			
		Cold box shell 冷箱外壳	XLA			
		Structural Packing 规整填料	TIANDA 天大			
8	Oxygen system 氧系统	LOX Storage Tank 液氧储罐	CHINESE MAKE			
		LOX Pump for tanker filling 储罐充装液氧泵	CHINESE MAKE			
		LOX pump for cylinder filling 液氧充瓶泵	CHINESE MAKE			

Item No. 序号	Field 部机	DESCRIPTION 名称	COMPANY 公司	Remarks1 备注 1	Remarks 2 备注 2	Performance warranty 性能保证
		HP LOX vaporizer 高压液氧汽化器	CHINESE MAKE			
9	<b>Nitrogen system</b> 氮系统	LIN Storage Tank 液氮储罐	CHINESE MAKE			
		LIN Pump for tanker filing 储槽充装液氮泵	CHINESE MAKE			

## ANNEX 6 Plant protection and delivery proposal 设备包装、运输保护方案

### 8.1. Plant package 设备的包装

#### 8.1.1 Regular requirement 常规要求

- Packed product must gone through product quality inspection qualification, the document equipped with plant is complete and the paint film is completely dry.

包装的产品须经产品检验合格，随机文件齐全，漆膜完全干燥。

- Product package must have enough strengthens, to ensure it can bear with loading and unloading.  
产品包装应具有足够强度，保证产品能经受装卸。
- Plant delivery adopts with lorry, platform car; It should take good bundle between plants, and between plant and car in order to avoid plant spilling due to bumps during loading.

设备装运使用卡车、平板车，装载时设备与设备，设备与车辆之间应妥善捆扎，以防颠簸而发生设备散落。

- Takes care of protecting plant during loading and delivery, especially for bulk equipment, which should avoid directly contact with other equipment and car.

装载运输过程中应注意保护设备，特别是一些裸运设备，应避免与其它设备或车辆直接接触。

### 8.2. Limitation and mark on package 包装的限制及标记

- The equipment of a same system should be packaged together, and different units of equipment shall not be packaged together.

应将同一系统的设备包装在一起，不同单元的设备不能混包。

- Gravity point and lifting mark: For big size equipment, making gravity point and mark at the out of package.  
重心点及吊运标志：大件设备，在外包装上标记重心点及起吊位置及标记。
- It should compile delivery list before delivery. On the list, it should clearly marked project name, equipment No, equipment quantity and weight etc for the convenience of consignee checking.  
设备发运前必须编制发运清单，清单上必须明确项目名称、设备号、设备数量及重量等，以便收货单位核查。
- Wooden case: At the outer side of case, it should mark with wooden case No and packing list.
- 木箱：箱子的外侧标记箱号、装箱清单等。
- Naked equipment: Mark with marks.  
Naked equipment: 裸运设备：贴上唛头。

### 8.3. Delivery of equipment 设备的运输

#### 8.3.1 Attentions on delivery 运输注意事项

- For the goods ready to delivery, it should be stacked with flat, dry, no-water place to avoid rusting.  
待运物件堆放需平整稳妥垫实搁置干燥、无积水处，防止锈蚀。
- The plant will stored in different areas in accordance with system and installation sequence.  
设备按系统、安装顺序分区存放。
- Before loading, it should put sleeper to make it flat to prevent naked equipment directly crack with iron case and avoid the broken plant and painting.

装车前，在车厢内放置枕木垫平，垫牢固，以防止裸运设备直接与车铁箱碰撞，避免损坏设备外表与油漆。

- When loading, there must have special person to supervise it, check the case No and packing no, and handle good on the transfer and its relative procedures.

装车时，必须有专人监管，清点上车的箱号及打包件号，并办好移交或交接手续。

- The plant must be in accordance with safety delivery requirement and the jobsite installation progress and quality.

设备制作必须符合运输安全要求和现场安装进度、质量要求。

## ANNEX 7 Quality guarantee and service commitment 服务承诺与质量保证

### 5.1 Service commitment 服务承诺

We takes the principle of “quality is the first, buyer is the first, service is the first, putting full attention on serving buyer”, taking serious attitude to providing a better after sales service and helps the buyer owning a good quality.

贯彻“质量第一、买方第一、服务第一、全心全意为买方服务”的方针，认真做好售后服务工作，帮助买方用好、维修保养好提供的产品。

After sales service is the extended of product quality, in order to provide a better after sales service, we takes the follow steps:

售后服务是产品质量的延伸，为切实做好售后服务工作，本企业采取的措施是：

- The buyer will arrange a person in charge who is professional in technology and has more responsibility, the one who has the experience of commissioning similarly plant, taking charge of installation Instruction, commissioning and technology Instruction, apart from it, the seller will redispach another instrument control personnel and a commissioning personnel to support Instruction and commissioning. Which in accordance with relative commissioning technology document.

卖方将从派遣的技术服务人员中指定一名曾调试过相似类型设备的技术熟练、称职的负责人为现场总代表，负责在买方现场进行安装、调试、技术指导及另派一名仪控人员和一名调试人员对该仪电控设备进行技术指导、调试。按提供的有关调试技术文件。

- Ask customer's feedback regularly, and takes serious attitude on the buyer;s letter and visit, to make customer satisfy with it.  
定期回访，主动服务，认真处理买方函电及采访，做到使买方满意。
- Help to purchase spare parts timely, in particular, when the buyer shut off the plant and ask for help for some accident, XLA will takes the "Three principle" as the rules, which is priorly provide the inventory spares, if the inventory does not have, XLA will borrow the spares to products, if the same two principle both not apply for, then XLA will prior to arrange the producing department to do firstly arrangement and organize produce" The spares will be deemed as Special need level lacking goods, make sure to provide it.  
及时供应备品备件、尤其是买方停机，向求援事故备件，将采取“三优原则”给予优先解决，以满足买方的生产要求。“三优原则”具体为：备件库中已有的“优先提供”；备件库中没有，则从产品中“优先移用”；若无条件满足上述“二优”，则由生产制造部“优先安排、组织生产”，视同特急商品缺件，确保提供。  
Within the warranty period, once receive the inform letter feedback jobsite issues from the buyer, XLA will provide settling suggestion within 8 hour timely; For the jobsite technology and maintain service, after receiving the letter informing from the buyer, XLA will arrange personnel come to jobsite timely and settle this issue timely with buyer; If it is belong to seller's responsibility, the seller will repair or change it for free, otherwise, it should be responsible by buyer.  
保证期内，接到买方反映质量问题的通知，及时提出处理意见。现场技术及维修服务在收到买方书面通知，及时达现场处理，及时与买方共同协商解决问题。如属卖方责任，卖方应自费修改或更换，反之则由买方承担。
- If it is beyond warranty period, XLA has the obligation to providing spare parts with cost on a long terms.

在保修期外，有义务为买方长期提供有偿设备的备品备件。

- If it is beyond warranty period, XLA has the obligation to provide the plant maintenance and inspection with cost.

在保修期外，有义务为买方长期提供有偿设备维护和检修。

- Providing long terms service support for buyer.

为买方长期提供技术支持。

- After the contract is executing and the plant has delivery to buyer for operation, seller should response immediately once buyer has quereis on the product, technolofy and quality issue.

在执行合同及产品交付买方使用后，卖方应及时负责地答复买方对产品、技术、质量问题的咨询。

## 5.2 Arrangement on service personnel 服务人员安排

服务人员 <b>Service personnel</b>	时间 <b>Period</b>
工艺工程师人 Craft engineer requires 1 person	总时间~45 (间断) Total time ~45 days(Interrupt)
仪控工程师人 Instrument control engineer requires 1 person	总时间~45 天 (间断) Total time ~45 days(Interrupt)
调试工程师人 Commissioning engineer requires 1 ~2 persons	总时间~45 天 Total time~45days

说明：上述时间根据现场情况具体调整。

Instruction: The same time will be finally decided by the actual jobsite situation.

### 5.3 Quality guarantee 质量保证

- According to quality guarantee manual, ISO 9001 and relative standard and requirement and enterprise requirement on ASU plant, to control the whole on design, purchasing manufacturing and quality inspection and be tested by the quality management department; All of the pressurized pressure vessel is inspected all the process by XLA and by the preventative of Suzhou pressure vessel special inspection company.

根据苏州市兴鲁空分设备科技发展有限公司的《质量保证手册》、ISO9001 以及空分设备的相关标准要求和企业标准的要求，对设计、采购制造和质量检验进行全过程的控制，并由质量管理部试验。所有压力容器制造全过程受本厂检验及苏州压力容器特检院驻公司代表监检。

- The contract will be executed as per Chinese standard, current standard and relative technology scode.

合同设备按现行的中国国家、行业标准、现行标准及技术规范执行。

- Plant guarantee period: Within 1 year from the date of signing the commissioning report or within 16 months from the date of delivery date stipulated as per contract. Whichever is earlier. During the installation, commissioning and warranty period, if the plant is broken because of plant quality issue, the seller will takes charge of maintaining or change it for free.

质保期：从调试报告之日起一年，或从合同规定交货期之日起 16 个月，以先到为准。在安装、调试和质保期内，凡因设备的质量问题所造成的部件损坏由卖方负责免费修理或更换。