

**TT1100-FP Technical Specification for
the Fixed Pitch Tunnel Thruster
TT1100-FP 定螺距侧向推进器技术规格书**

船 名:

Ship name:

船 号:

Hull No.:

买 方:

Buyer :

供 方: 重庆海盛船舶设备进出口有限公司

**Seller : Chongqing Hi-Sea Marine Equipment Import &
Export Co.Ltd**

一、 **General/概述**

1. Class Notation/装置入级 : CCS
2. Install position 安装位置 : Bow 艏部

二、 **Subject Content /主题内容**

1. This specification specifies the technical requirements of designing, manufacturing, testing, checking and accepting for the tunnel thruster, and the supply scope is also specified in it./本技术规格书规定了侧推的设计, 制造, 试验, 验收的技术要求, 以及供货范围。
2. This specification is associated with the TT1100-FP tunnel thruster. It is basis of the thruster for the order and accepting, and it is an addition to the order contract, and it will take effect at the same time with contract. /本技术规格书适用于 TT1100-FP 侧推, 是订货和验收的依据, 作为合同的一部分与合同同时生效。

三、 **Standards & certificate/标准和证书**

1. CCS/中国船级社
2. The manufacturer supply CCS certificate and production certificate of conformity。

证书: 设备制造厂提供 CCS 证书及产品合格证书。

四、 **Consisting And Particulars/设备组成及主要参数**

- | | |
|-------------------------------------|--------------------------|
| 1. Tunnel thruster unit/侧推装置 | x1 set/vessel 套/船 |
| Type/型号 | TT1100-FP |
| Diameter of the propeller/螺旋桨直径 | φ1100mm |
| Inner diameter of tunnel/圆筒体内径 | φ1132mm |
| Wall thickness of tunnel/圆筒体壁厚 | 15mm |
| Tunnel standard length /圆筒体标准长度 | 1045mm |

Tunnel is standard length (shipyard provides the extra length part and the total length should not be exceeded 6 times of the propeller diameter).

圆筒体为标准长度 (接长部分由船厂提供, 总长度不大于桨叶直径的 6 倍)。

- | | |
|-----------------------------------|-------|
| Number of the propeller blade/桨叶数 | 4 |
| Input power/输入功率 | 250KW |

Nominal thrust/公称推力 About 40KN
 Propeller rotating speed/螺旋桨转速 566rpm

2. Main Motor/主电机: x1 set/vessel 套/船

Type /形式: Variable frequency/变频
 Motor rated voltage/电机额定电压: 440V, 60Hz, 3Φ
 Motor rated current/电机额定电流: ~410A
 Motor power/电机功率: 250KW
 Motor rotating speed /电机转速: ~1750rpm
 Installing method /安装方式: vertical/立式
 Working method /工作方式: S2-30Min
 Cooling method/冷却形式: Fan (Independent fan) /风冷 (独立风机)
 Isolation class/绝缘等级: Class F
 Protection class/防护等级: IP44
 Starting method/起动方式: Variable frequency/变频起动
 Starting current/起动电流: about 1.1 times rated current/约 1.1 倍额定电流
 Anti-condensation space heater/防冷凝电加热器: 220V/200W/1PH
 Accessory 附件: 2 sets of PTC thermister, 1 for working, 1 for spare
 2 套 (共装 6 只) PTC 热敏电阻各, 其中 1 套备用, 1 套工作

3. Converter Control Cubicle/变频启动柜 x1 set/vessel 套/船

Type of converter/变频器型号: VACON (伟肯)
 Power source/输入电压: 440V, 60Hz, 3Φ
 Efficiency/效率: 0.96~0.98
 Output frequency/输出频率: 0~60Hz
 Isolation class/绝缘等级: F
 Protection class/防护等级: IP44
 It has the function of variable frequency start, and it can ensure that starting current of motor is smaller than 1.1 times rated current./对侧推电机实现变频启动, 从而保证了侧推电机的启动电流不大于 1.1 倍额定电流。
 Converter Control Cubicle put in tunnel thruster cabin, content/侧推变频启动柜安置在侧推舱内包括下列与器件:

Switch/开关	LOCAL/REMOTE control change-over switch 本地/遥控转换开关
	Space heater switch/防冷凝加热器开关

Indicator and button 指示灯及按钮	Power lamp/电源指示灯
	Run lamp/运行指示灯
	Permit start lamp 允许启动指示灯
	Heavy load request push button 重载询问按钮
	FAULT RESET illuminated lamp 故障复位带灯按钮
	Emergency stop illuminated push lamp 紧急停车按钮
Instrument/仪表	Ammeter 电流表
	Voltmeter 电压表
	Hour meter 计时器

4. Gravity oil tank/重力油箱 **x1 set/vessel 套/船**

Type/形式 : Square mounting type , Including level switch (1) ,
Level gauge (1) ,Volume: 38L

The lubricants Model: L-CKC100 medium load industrial
gear oil

方形壁挂式, 包括浮子开关 (1), 油位计(1),容量: 38 升
润滑油型号: L-CKC100 中负荷工业齿轮油

5. Coupling/联轴器 **x1 set/vessel 套/船**

Type /型号: Flexible/弹性

6. Hand pump/手摇泵 **x1 set/vessel x1 台/套**

Type /型号: CS-20Y

7. Remote control system/遥控系统

A. Control position 控制位置

a) control panel/驾驶室控制面板: 1 unit/set (1 件/套)

B. Control、 alarming part adopts Siemens programmable controller.

控制、报警部分采用西门子可编程控制。

C. Remote control system consists of: central control cabinet, control panel,遥控系统的基本组成: 中央控制箱、驾驶室控制面板、

(1) control panel 驾控室控制面板 (Inserted type 嵌入式)

×1 unit/set 台/套

Control panel Joystick/驾控室控制面板操纵手柄	Follow up Joystick / 随动操纵手柄
Alarm indicating lamp on the control panel/驾控室控制面板报警指示灯	Power failure /主电源故障
	Emergency power function /应急电源故障
	Gravity oil level min /重力油位低
	Driving motor overload /电机高温
	Motor failure stop running /电机故障停车
	Following failure/随动故障
Indicating meters on control board/驾控室控制面板指示仪表	Revolution counter(with steering)/转速表 (带转向)
	Ammeter/电流表
Indicating lamp and button on the control panel/驾控室控制面板指示灯及按钮	Motor start(button with lamp)/电机启动 (带灯按钮)
	Motor stop(button)/电机停止 (按钮)
	Heavy load request(button with permitting start indicating lamp) 重载询问 (带灯按钮)
	Bridge control /主面板控制
	Failure reset(button with lamp)/故障复位(带灯按钮)
	Lamp test(button) /试灯 (按钮)
	Horn off(button)/消声 (按钮)
	Emergency stop button/紧急停车按钮 (带保护罩)
	VVVF power on(indicating lamp)/变频器通电 (指示灯)
	Spare control 备用控制

	Spare port 备用左舷
	Spare starboard 备用右舷
	Local Control ((indicating lamp)) /本地控制 (指示灯)
	Dimmer/调光
	Buzzer/蜂鸣器

(2)两翼控制面板或箱 (板为嵌入式,箱为壁挂式) 2 台/套 (选配)

2 wings control panel or box (panel is insert, box is wall-mounted)

2 pcs/set (optional selection)

wings control panel manipulate device/两翼控制面板操纵装置	Follow up joystick/随动操纵手柄
wings control panel indicating instrument/两翼控制面板指示仪表	Tachometer (with steering)/转速表 (带转向)
	Ammeter/电流表
Cab control panel indicate lights and buttons/ 驾控室控制面板指示灯及按钮	The broadside control (with light button)/舷侧控制(带灯按钮)
	frequency converter electrify/(indicator light)变频器通电 (指示灯)
	Dimming/调光
	Test lamp/试灯
	Emergency stop button (with protective cover)/紧急停车按钮 (带保护罩)
	Motor run (indicator light)电机运行 (指示灯)

(3)具有应急停车按钮，能在操纵面板上实行紧急停车。

With an emergency stop button, implement emergency stop on control panel.

五、 Interface /接口

1. Physical interface/物理接口 (Excluded from the supply /设备供应方供应)

The thruster with the tunnel and the other parts should be installed by the shipyard./带导管的侧推和其它部件由船厂安装:

- a) Tunnel and the vessel: welding /导管与船体的焊接;
- b) Suspended of driving motor and the tunnel thruster
驱动电机与侧推单元的安装;
- c) The pipeline connected of Gravity tank and the tunnel thruster, The pipes are supplied and welded by the yards. And the pipes must be clean according to relative rules.
重力油箱与侧推单元的管路连接, 输油管路的连接安装, 并需根据相关技术要求对管路进行清洗试压;
- d) Installation remote control system with the vessel
遥控系统与船上(驾控台)的安装;
- e) The external cable are supplied and installed by the yards.
所有外部连接电缆均由船厂提供并安装。
- f) VDR interface /VDR 接口
 - 1) Motor speed signal (4-20mA corresponding -100%~+100%)
电机转速信号(4-20mA 对应-100%~+100%)
 - 2) Motor ammeter signal (4-20mA corresponding 0~110%)
电机电流信号(4-20mA 对应 0~110%)
 - 3) Motor running signal (Passive normally open, operative closure)
电机运行信号(无源常开, 运行闭合);
- g) PMS interface /PMS 的接口
 - 1) Power request (passive open contact, opening when motor running, output from thruster)
重载询问(无源常开触点, 电机运行断开, 从侧推输出)
 - 2) Power available (passive open contact signal, opening when motor running, output from PMS)
允许起动(无源常开触点, 电机运行断开, 从电站管理系统输出)
 - 3) Thruster run (passive contact, operating close, output from thruster)
侧推运转(无源触点, 运行闭合, 从侧推输出)
 - 4) Passive contact signal for fan start and pump motor start from starter
提供一组侧推舱通风机与侧推电机同步启停无源触点信号

2. Function interface/功能接口(Supply by Shipyard/)

- a) Driving motor power: AC440V、60Hz、3Φ、250KW /
驱动电机电源: AC 440V、60Hz、3Φ、250KW
- b) AC 220V, 50Hz, 1Φ、500W (supply to Converter Control Cubicle)

/

交流 220V、50Hz、1Φ、 500W（外供至变频柜）

c) DC 24V、200W（supply to bridge room）/

直流 24V、200W（外供至驾驶台）

六、 Main function/主要功能

1. Tunnel thruster unit/推进器本体

The primary function of the fixed pitch tunnel thruster is product side thrust by motor –coupling-gear box. Fixed pitch tunnel thruster which is submitted this time is driven by frequency motor. Rotational direction and magnitude of propeller is controlled by changing input frequency and phase of driving motor. Corrosion prevention: There are same anode antisepticise zinc block for 3 years. To ensure sufficient protection we recommend to be add an anode mass of 1.5Kg per 1000mm length on the tunnel parts which has to be delivered by shipyard.

本装置的主要功能是将电机—联轴器—减速齿轮箱传递过来的动力通过定螺距螺旋桨装置产生（侧向）推力。定距桨侧向推进器是由变频电机来驱动，桨的旋转（推力）方向和推力大小是通过控制变频电机的频率及相位来实现。侧推本体自带防护锌块，这种保护是基于标准导管长度，周期为 3 年。为保证充分的防腐保护对于船厂加长部分的导管建议每米加 1.5kg 的锌块。

The basic functions of electrical control system include following 3 parts: Servo control of pitch fixed propeller, indicating rotational speed(with steering), and current indicating of tunnel thruster motor; Supply tunnel thruster device to realize on and off control in remote. Supply alarming indicating when tunnel thruster produces failure. 电控系统的基本功能主要包括以下三方面：侧推定距桨伺服控制及侧推螺旋桨的转速（带转向）、电流指示；为侧推装置提供的侧推变频电机遥控启停控制；为侧推装置系统故障提供报警指示。

2. Environmental conditions/环境条件

Thruster can be normal and reliable operation in the following circumstances:/侧推能在下列环境下正常可靠运行：

Relative Humidity/相对湿度: 60%±3%

Ambient temperature/环境温度: 0°C -- +45°C

Rolling/横摇: ±22.5°

Heeling/横倾: ±15°

Pitching/纵摇: ±7.5°

Trim/纵倾: ±5°

3. Electrical control system/电控系统

- A) Serve control of pitch fixed propeller: has the function of Control rotational direction and speed ,and ensure working current of tunnel thruster motor is smaller than rated current .Revolution counter indicates rotational speed and steering of driving motor, current meter indicates the current of driving motor. Revolution counter and current meter are set on control panel in bridge. 侧推定距桨伺服控制: 对侧推驱动电机实现旋转方向及旋转速度的控制,并确保侧推电机的工作电流不大于其额定电流。转速表(转向)指示侧推螺旋桨的转速及转向,电流表指示侧推电机的电流。转速表和电流表设置在驾驶室控制面板上。
- B) It has the function of variable frequency start, and it can ensure that starting current of motor is smaller than 1.1 times rated current. 对侧推电机实现变频启动,从而保证了侧推电机的启动电流不大于1.1倍额定电流。
- C) Frequency inverter is supplied for tunnel thruster and it has the function of local/remote starting. You can start/stop driving motor in the engine compartment or bridge. 为侧推装置提供的变频启动柜具有就地/遥控启动转换功能,可在机旁/驾驶室面板上进行侧推驱动电机的启/停控制。
- D) Emergency stop function is realized on the control board 具有应急停车按钮,能在操纵面板上实行紧急停车。

七、 Designing and manufacturing/设计和制造

1.主要零部件材料

Material of Main Parts

序号 No.	零件名称 Part Description	材料 Material
1	桨叶、桨毂 Blade, Hub	Cu3(镍铝青铜), 满足船级社规范 Nickel-aluminum bronze. Meet classification rules.
2	驱动轴、齿轮 Drive Shaft, Gear	优质合金钢, 齿面经硬化处理, 满足船级社规范 High class alloy steel. Tooth surface is hardened. Meet classification rules.
3	桨轴	优质合金钢锻造, 满足船级社规范

	Propeller Shaft	High class alloy steel. Meet classification rules.
4	齿轮箱 Gear Box	铸铁件，满足船级社规范 Cast iron. Meet classification rules.
5	圆筒体 Tunnel	B 级船板，满足船级社规范， Class B steel plate. Meet classification rules.
6	桨轴密封 Propeller Shaft Seal	丁腈橡胶 NBR
7	O 形圈 O Ring	丁腈橡胶 NBR

2. Quality of manufacturing/制造质量

- 1) The materials, type, specifications, Properties, requirements of technology, dimensional tolerance and fitting, shape and location tolerance and surface roughness of main parts of tunnel thruster is clearly specified on the drawing.

严格执行国家标准，装置主要零部件的材料型号、规格、性能、工艺要求、尺寸公差与配合、形位公差及表面粗糙度均在图纸上明确标注。

- 2) The property of material for key parts and important parts, manufacturing quality is recorded and filed by inspecting department of manufacturer. Manufacturer controls product quality strictly according ISO quality ensuring system.

对关键件、重要性的材料性能、制造质量由制造厂检验部门记录存档。生产单位按 ISO 质保体系严格控制产品质量。

3. Nameplate and painting/铭牌、油漆

Painting is according to the relative marine paint requirements., name of manufacturer, manufacturing No, type, main technical data, inspecting label of classification society is indicated on nameplate in Chinese and English.

油漆根据船用油漆要求涂装。铭牌上以中英标明生产日期、生产制造厂、生产编号、产品型号、主要技术参数、船检标识。

八、 Document of supplying/提交文档

1. Drawings for approval/认可资料:

Provide 3 sets of certificating drawings within 15 workdays after the contract is executed. /制造厂在合同生效后 15 个工作日内提供认可图纸

资料 3 套。

2. Documents with Delivered Product/随机完工资料:。

3 copies of final drawings should be sent to the buyer together with the equipments./ 制造厂在交付设备时提供随机资料每船共 3 套,随设备一起发给用户

The drawings shall be written in English and Chinese. /中英文资料

3. Detail of the drawings as following/资料清单

名 称 Name	认可资料 For Approval	工作资料 For Working	完工资料/船 Finish plan per vessel
布置总图 General arrangement drawing	√	√	√
筒体与电机尺寸图 Dimension of cylinder and motor drawing	√	√	√
格栅布置参考图 Gird bar layout	√	√	√
管路安装详 Tunnel installation requirements drawing	√	√	√
焊接与锌块布置图 Welding & zinc placement	√	√	√
重力油箱外形图 Gravity oil tank drawing	√	√	√
手摇泵外形图 Drawing of Hand-operated pump	√	√	√
侧推筒体与船体接口要 求 Requirements of cylinder and vessel interface	√	√	√
侧推用油要求 Oil use requirements			√
安装使用说明书 Installation maintenance and use instruction			√
备品备件与随机工具清 单			√

Spare part and Tool list			
电气系统图 Electric system drawing	√	√	√
电缆图（外部接线图） Cable drawing (external wiring diagram)	√	√	√
中央控制箱尺寸图 Central control box dimension drawing	√	√	√
中央控制箱接线图 Central control box wiring diagram	√	√	√
驾驶室面板尺寸图 Control panel dimension drawing	√	√	√
驾驶室面板接线图 Control panel wiring diagram	√	√	√
驱动电机启动柜外形图 Motor starter outline dimension drawing	√	√	√
电气系统说明书 Operation instruction for electrical system of TT			√

九、 Equipment list/设备清单

No	Name	Type 型号	Quantity 数量	重量 Weight	Remark
1	Thruster unit with tunnel 侧推装置	TT1100-FP	1 set		
2	Flexible Coupling /弹性联轴节		1 set		One half on the thruster and one half on the motor/ 一半装在驱动轴上，一半装在电机轴上
3	Support frame of motor/ 电机支架		1 set		装在侧推上 Together with

					thruster
4	Gravity oil tank/重力油箱		1 set		
5	Hand operated pump/手摇泵		1 set		
6	Driven motor/变频电机		1 set		
7	Starter of driven motor /变频电机启动柜		1 set		
8	Center unit/中央单元		1 set		
9	Control panel/控制面板		1set		
10	General spare parts/备件		1 set		
11	Wings control panel or box /两翼控制面板/箱		2 sets		Optional selection

注：以下所述内容不属本公司供货范围

Note: the items below are not included in the supply range.

序号 No.	名称 Description
1	除标准筒体长度以外的导流管接长筒体由船厂提供 Extended part of the tunnel is provided by the shipyard
2	格栅 Grids
3	各设备之间的配管及配管材料 Piping and piping material of equipments
4	外接管路的连接 External piping connection
5	外接电缆及连接及其保护支撑 External cable and connection and protective support
6	齿轮箱和重力油箱用油（L-CKC100） Industrial Oil for Gear box and Gravity Oil Tank

十、 试验及验收/ Testing

1. 10 days before supplying, notice the shipyard, ship owner, designing company to attend the test. Take rotation function test while the bench tests. The product is approval and certificated by CCS.

在供货前 10 天通知船厂、船东、设计所去供货方处按认可的台架试验大纲参加试验,台架试验时工厂对侧推装置进行旋转功能性试验。产品经 CCS 认可并签发证书。

十一、 油封和包装/ Oil seal and packing

1. Before packing and transportation, all the parts of the Thruster have to be operated according to the requirements. The period of oil sealing is available for 6 months consignment from the shipyard.

包装运输前，侧推装置各零部件涂装按要求执行，供货方保证产品从出厂之日起，油封、包装保证期为 6 个月。

2. All the oil hole had be covered by plug and plate, all the pipe port had be signed

所有油孔均由螺堵和盲板封住，所有接口均标有接口标示。

3. Accessory and spare parts should be oil sealed and packed in solid wooden box. The electric control system should be taken care of shake-proof, moisture-proof and marked with “careful placed” “damp-proof” etc.

零部件及备件油封后，包装并置于坚固的木箱内，电控装置各部件必须采取防潮措施，包装箱外表面应注明“小心轻放”“切勿倒置”和防潮标志。

4. Accessory and spare parts should be oil sealed and packed in the spare part box.

备件与专用工具油封后，包装并置于备件箱内。

5. There is a packing list according to the product in the packing box.

在包装箱内放置与实物相符的装箱单。

十二、 6.保修期及技术服务/ Guarantee repair

1. The supplier will guarantee the performance, design, manufacturing and material. Guarantee period of quality is 12 months after delivery. In this period if the product is damaged because of the cause of design and manufacturing, the supplier will repair the product free of charge.

供货方保证本技术规格书规定的性能、设计、制造和材质正确合格。所有零部件中如因制造和材质不良影响性能和使用，在交船 12 个月内供货方负责免费维修和更换零件。

2. After installed by the shipyard, the seller according to buyer's require, appoint personal to debug with the shipyard on ship. Service cost negotiate apart. /船厂安装后，承制方应按客户需求派人员上船配合船厂调试,服务费用另计。

3. Before service, shipyard should prepare the lube and amount the motor, according to the requirement. Generator and switch board system already can supply the power. The wires of bridge should already be connected.

在通知到现场服务时，船厂应做到润滑油已按要求的标号和容积准备好，电机已按要求安装好，发电机与配电盘系统已经可以供电，驾驶台厂家已经接好遥控系统所有线路。

十三、 其它/ Others

1. This specification is an addition to the order contract, and it will take effect at the same time with contract.

本技术规格书是购销合同的一部分，与购销合同同时生效。

2. The buyer can confer with the seller on the misunderstand affair.

未尽事宜，双方协商解决。

3. If there is dissidence, according to Chinese.

如有异议，以中文为准。