

技术协议编号: TA-A-503-M13

No.T.A: TA-A-503-M13

技术协议书  
TECHNICAL AGREEMENT

船号: XSI503A/B/C/D 船名: 113600DWT LNG DF OIL Tanker

Hull No. Ship name:

日期: 2024-8-20 船级: ABS 挂旗: Liberia or Singapore or Malta

Date Class: Flag:

地点: \_\_\_\_\_

Place

项目: Plate Heat Exchanger

Subject:

型号: see attachment

Model:

品牌: SONDEX 制造厂/制造国: Denmark&China

Brand: Manufacture/Country

代理商: FOR WIN EQUIPMENT & ENGINEERING CO., LIMITED

Agency:

数量: 4 (套/船)

Quantity: (set/ship)

参加人员: 买 方: \_\_\_\_\_

Attendee Buyer

卖 方: \_\_\_\_\_

Seller

卖方:

Seller

买方:

Buyer

FOR WIN EQUIPMENT & ENGINEERING CO., LIMITED

Xiamen Shipbuilding Industry Co., Ltd.

签字:

Signature:

王友安

签字 Signature:

会签 Countersign:

审核 1st Approved By:

审定 2nd Approved By:

## 1、概述 General

a) 本协议用中文和英文书写的内容，若有矛盾，须以英文为准。

For the items of this agreement written in Chinese and English language, If any contradiction is found between the Chinese and English, the English shall prevail.

b) 设备及材料应符合合同签订时，ABS 船级社的最新规范要求。

Equipment and material shall be according to the latest standards of ABS classification society at the time when the contract is executed.

c) 待合同生效之后，本协议才能生效。

This agreement shall become effective on the date when the contract has been duly executed.

d) 图纸的迟交和罚款

Delayed delivery of drawings and penalty

除人力不可抗拒事故者外，卖方应按照本协议第 3 项向买方及时完整地寄送图纸和技术资料，资料应采用快递方式发往如下地址：福建省 厦门市 海沧区 排头 厦门船舶重工股份有限公司设计部，邮政编码 361026， 收件人：张建志。

Except for force majeure cases, the SELLER should send these full set drawings and technical materials to BUYER according to item 3 in this agreement. The drawings should be delivered to: Paitou, Haicang, Xiamen, China, Design Department. Xiamen Shipbuilding Industry Co., Ltd. Mr.Zhang Jianzhi Post Code 361026,by post express.

一旦延期交付这些图纸(以邮戳为准)，卖方应付给买方每一星期按货物总值的 1.5%的迟交罚款。此项罚款总额不超过全部货物总值的 5.5%，由买方付款时进行扣除，买方将开出罚款通知单。

In case of delayed delivering of these drawings, as per postmark, the SELLER shall pay to the BUYER for every week of delay a penalty amounting to 1.5% of the total value of the goods. The total amount of penalty shall not however exceed 5.5% of the total value of the goods and is to be deducted by the BUYER directly at the time of payment. The Buyer will send the notice of penalty.

卖方的认可图应保证满足本技术协议的要求及买方的安装设计要求，否则予以退回，由此引起的推迟应按上面条款视为延期交付图纸。

Approval drawings submitted by the SELLER shall meet this technical agreement and installation design requirements of BUYER and otherwise shall be rejected. Consequential delay shall be calculated in accordance with above-stated provisions.

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e) 制造厂提供的工作图必须保证与认可图及买方确认后的退审意见一致，同时，需保证向买方提供与工作图相一致的设备，若生产过程中需有任何的改动，应及时联系买方并征得买方同意，并书面作出修改标记及说明寄给买方;任何由于未经买方同意的单方修改所造成的买方损失必须由卖方承担。

The manufacturer shall guarantee that the working drawing shall be conformed to both approval drawing and buyer's approval comments. At same time, shall guarantee that the equipments, which are delivered to the buyer, shall be conformed to the working drawings (only updated according to buyer's approval comments of approval drawings). In case any change is occur during the process of manufacture, the manufacture shall immediately contact and obtain consent from the buyer and mark of modifications or explanations in written and mail to buyer.any cost caused by seller's self-modification which is not agreed by buyer should be paid by seller.

f)所提供的设备及零配件均必须是商务合同生效后生产的符合合同及本技术协议的产品。

Equipment and parts provided are to be produced after the contract become effective and in compliance with the requirement of the contract and this technical agreement.

g)卖方的认可图、工作图应将买卖双方商定的任何修改除在封面说明外，必须在图面上作明显的标记以区别于不改的部分。

All modifications agreed by the buyer and the seller are to be noted on front cover of approval and working drawings from the seller and marked clearly in the relevant drawings.

h) 卖方必须对我们的退审意见在三个工作日内作出回复，有困难的话也必须在期限内说明。

Seller should give reply to our approval comments or give explanation for failure of it within three working days.

i) 完工图必须与所提供的设备是一致的，并且必须使用白图打印，封面、封底均采用加厚硬质纸张，采用胶装方式，装订成书册形式，以便于长期的保存。

The final drawing is to coincide with the provided equipment. For long-term conservation , the drawings should be printed with high quality white papers, and bound up into one volume by glue binding with thick hard papers covers .

j) 每个设备均应在显眼的地方装有铭牌，上面有设备的名称、规格型号、制造厂名等有关设备本身的特性。

Each set of equipment is to be fitted with a nameplate in notable place with equipment name, model No. and the manufactory's name, etc.

k) 设备出厂前必须做好保养工作，其保养必须能确保有至少一年及以上的有效期。首次设备运行所需要的防冻液和防腐剂由厂家提供。

Maintenance is to be done by the maker before delivery of equipment and it shall ensure at least one year and above of period of validity. The antifreeze and corrosion inhibitor will be provided by maker while the equipment is running firstly.

l) 设备出厂前，卖方应关闭所有船级社的意见（包括证书上的）。所有需要买家处理的船级社意见，卖方应在收到船级社文件后3个工作日内通知买家。

Seller should close all the comments(including the comment in the certificate)from class before delivery of the equipment. All the class comment which need to be closed by Buyer should be informed to Buyer by Seller within 3 working day after receiving from class.

m) 在本协议中，若厂家提供的设备技术协议中的技术要求与买方的技术协议要求有矛盾时，应以买方技术协议要求中的描述为准，但有技术偏离表（附件一）且已经双方签字确认，以签字版技术偏离表为准。

If any discrepancy is found between the buyer's technical requirements and the seller's technical requirements in this agreement, the buyer's technical requirements shall prevail. However, if there is a technical deviation table (Annex 1 )and it has been signed and confirmed by both parties, the signed technical deviation table shall prevail.

n) 本协议包括技术协议附件或附录，若出现厂家、合作商、供应商、制造商等词语，其均指卖方。

In this agreement, including its annex or appendix etc, if there are the terms such as 'maker', 'vendor', 'supplier' and so on, they all mean the 'Seller'.

o) 售后服务：见商务合同

Commissioning: please see the commercial contract.

## 2、技术要求 technical specifications

### 2.1 基本技术要求

#### Basic technical specifications

a) 环境温度： 0 °C ~ 45 °C

Temperature of environment. 0 °C ~ 45 °C

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b) 满足规范和规则、法定要求： 所有适用本船的① ABS 船级社规范要求；② IMO 有关要求；③ 挂旗国法定要求；④ 其他有关主管当局要求；

All rules and specifications and statutory requirements which shall be applicable to the Vessel should be complied with ① ABS Classification rules requirements, ② Requirements related to IMO, ③ Flag the legal requirements, ④ Other relevant competent authorities requirements.

c) 要求的证书： 船级社、挂旗国、国际海事组织或主管当局所要求证书，且对于本船没有任何限制或批注意见，包括但不限于 ABS Product Certificate, Mfr Cert, Asbestos free Certificate accepted by Class, MED Cert

Certificates required : All certificates requested by classification, Flag authority and Regulatory bodies which shall be applicable to the Vessel, should to be provided, the certificates to be without any restriction or remark, Including but not limited to ABS Product Certificate, Mfr Cert, Asbestos free Certificate accepted by Class, MED Cert

d) 计量单位： 【 √ 】 ISO 【 】 其它：

Measuring unit: 【 √ 】 ISO 【 】 other :

e) 提供配对法兰/配对接头： 【 】 是 【 √ 】 否 适用标准： 【 √ 】 ISO 【 】 其它：

Supply counter flanges/counter-union: 【 】 Yes 【 √ 】 No Applicable standard: 【 √ 】 ISO 【 】 other :

f) 铭牌： 【 √ 】 用英文 【 】 用中文 材质： 【 】 铜 【 √ 】 不锈钢 【 】 PVC (所有铭牌和标志，除用于外部甲板、潮湿空间、机械空间等的安全标牌和标志外，均应采用最小厚度为 2mm 的雕刻不锈钢板，并在雕刻处涂上黑色油漆。所有固定螺钉均为不锈钢材质。)

Nameplate: 【 √ 】 In English 【 】 in Chinese Material: 【 】 Copper 【 √ 】 SUS 【 】 PVC (All nameplates and signs, except safety placards and signs used on external deck, wet spaces, in machinery spaces, etc to be of engraved stainless-steel plate with minimum thickness 2mm, and with black painting in the engravings. All retaining screws to be of stainless steel.)

g) 面漆颜色： 见下文要求(认可图确认)

Color of finish painting: See Next Requirement(To be approved in Approval Drawing)

h) 电源： Main: AC 440 V, 60 Hz, 3 Φ Control: AC 220 V, 60 Hz, 1 Φ

Power source: Main: AC 440 V, 60 Hz, 3 Φ, Control: AC 220 V, 60 Hz, 1 Φ

i) 电机绝缘等级： B 或 F

Motor insulation class: B or F

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j) 电机防护等级: IP 56(露天)/IP44(机械处所)

Motor protection class: IP56(expose to weather); IP44 (in machinery space)

k) 电机带电缆填料函:  带  不带

Motor with cable gland:  With  Without

l) 电机带接地螺柱: 带

Motor with earth bolt WITH

m) 电机带空间加热器:  带  不带

Motor with space heater:  With  Without

n) 电机起动方式:  直接启动 (<110kw)  Y/△启动  降压启动

Motor starting method:  Direct starting (<110kw)  Y/△ starting  Reduced voltage starting

o) 电机满足 IEC 要求:  是  否

Motor in compliance with IEC requirement:  Yes  No

p) 提供 IHM 清单:  是  否,

Supply IHM list:  Yes  No,

若是, 所交货的物资要满足《2009 年 香港国际安全与环境无害化拆船公约》要求, 并满足 GREEN PASSPORT 的要求, 并提供 MD 表和 SDoC 表。

If need , The supplies of delivery should meet the <Hong Kong International Convention for the safe and environmentally sound recycling of ships, 2009 > requirements, also meet the notation "green passport" and the seller should provide MD table and SDoC table.

对不需要提供 IHM 清单的产品, 在设备技术协议和订货清单文件中要求禁止使用石棉及含有机锡化合物包括三丁基锡 (TBT)、三苯基锡 (TPT) 和氧化三丁基锡 (TBTO) 的物资, 并要求厂家提供无前述物资的声明文件

If no need, no materials containing asbestos and organo tin compounds include tributyltin (TBT), triphenyltin (TPT) and Tributyl Tin Oxide (TBTO) to be used in the technical requirements and Ordering list file, and the maker should provide declaration without the aforementioned materials.

q) 提供有害物质检测报告:  是  否,

Supply IHM testing report:  Yes  No

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### 3 供图范围 Scope Of Drawings To Be Supplied

厂家应根据需要提供认可图、工作图、退审图(如果船级社要求)和完工图;

Maker should provide approval drawing, working drawing, approved drawing (if class requires) and final drawing.

认可图指的是: 厂家与船厂签订技术协议及采购合同后, 由厂家根据技术协议要求设计提供给船厂审查的图纸, 认可图一般应包括设备供货清单, 设备材料, 设备参数, 安装说明, 外形尺寸及接口坐标尺寸, 系统图和单线图。

Approval drawing: after shipyard signed the contract with maker, maker provides the drawing to shipyard for approval as required in the technical agreement. Approval drawing generally should include the supply scope, material specification, parameter, installation manual, outline drawing, piping system drawing and single line drawing.

工作图指的是: 厂家根据船厂的认可意见(包括船东意见)修改认可图后, 提供给船厂的图纸, 工作图中除包含认可图纸中的内容外, 一般还应增加操作说明书等。

Working drawing: after the maker updated the drawing according to the approval comment, and provide to shipyard for working during ship building. Normally , working drawing also includes operation manual comparing the approval drawing.

退审图指的是: 根据船级社要求, 厂家把修改后的设备认可图送船级社审查后, 由船级社认可并随附船级社审查意见的设备资料。

Approved drawing: after maker updated the drawing according to the approval comment, maker submit the drawing to class for approval.

完工图指的是: 厂家的设备完工后, 根据交货时的实际设备提供给船厂的图纸, 完工图除包含工作图纸中的内容外, 一般还应增加工厂试验数据, 维修手册和维护保养说明等。

Final drawing: after maker produced the equipment, maker provide the drawing to shipyard for operation according to the actual equipment. Normally, the final drawing also should include shoptest data, maintenance manual comparing the working drawing.

a) 设备资料的份数: Drawing number

设备资料状态 State of equipment information	纸质版 hardcopy		电子版 electronic copy (In one PDF file)
	首制船 The First vessel	后续船 The Following vessels	
认可图 Appr.Draw.	3	0	√

工作图 Work draw.	4	2	√
退审图 approved draw.	0	0	√
完工图 Final draw.	5	4	√

b) 供图时间 Drawings Delivery Schedule

除非合同另有约定供图起计日外，自买方发出本设备中标函之日起后 14 天（自然日）内，卖方应向买方提交认可图。

The SELLER shall deliver the approval drawings to the BUYER within 14 nature days after the date when the Buyer send the letter of winning the bid to the Seller, unless the contract has specified starting date for delivering the approval drawings .

c) 图纸供图 Supply of Drawings:

卖方应按照约定的供图计划，向买方提供图纸。

每批次供图的图纸数量应不低于约定供图之日前所有图纸总数量的 98%，且供图应包含所有主要图纸，才视为按时供图，否则视为延期交付图纸。

The SELLER should provide the drawings to BUYER according to drawing schedule if fitted

Compare with the schedule, the ratio of drawings which have been supplied should not less than 98%. Otherwise, it can be judged as delay delivery of drawing

d) 在收到认可图后，买方应及时对认可图提出退审意见，若在 45 天内，买方不提供退审意见，这意味着买方对认可图没意见。

After receiving the approval drawings, buyer will return the comments of the approval drawings in time. If buyer did not return the comments within 45 days, that means Buyer has no comments for the approval drawing.

e) 卖方在收到买方提出的最终退审意见后，10 天内卖方应提交工作图给买方。

Seller should submit the working drawings to Buyer within 10 days after receiving the Buyer's final comments for the approval drawings.

f) 完工图应随设备一起提供买方。

Final drawings should be sending to BUYER together with equipments.

g) 上述图纸应使用： 【√】英文 【√】中文

The drawings shall be in : 【√】English 【√】Chinese

(The drawings shall be in both English and Chinese as far as possible)

4、图纸的内容如下： Detail of the drawings as following

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序号 No.	图纸名称 Name of drawing	认可图 Appr.Draw.	工作图 Work draw.	完工图 Final draw.	备注 Remarks
1	结构使用及维修说明书 Description instruction & maintenance manuals			√	
2	外型图(包括传感器布置, 配对接头) Outline diagram(including sensor Arrangement, counter flanger/union)	√	√	√	Dwg, WRL97, S AT4.0 or Solidwo rd
3	管系图 Piping diagram	√	√	√	Dwg
4	控制系统图 Control system diagram	√	√	√	
5	电气原理及接线图 Electric wiring & connection Diagram	√	√	√	
6	运行参数表 Operation data sheet	√	√	√	
7	附件清单 Accessory list	√	√	√	
8	备件及工具清单 Spare list & tool list	√	√	√	
9	试验程序方法 Test procedure & method	√	√	√	
10	安装说明书 installation manual	√	√	√	
11	安装图 Installation diagram	√	√	√	
12	与外部管路和电缆联接的法兰座标图 Coordinate diagram of connection flanges and cable for external piping	√	√	√	Dwg
13	带公章的无石棉声明 Declaration of asbestos free with official stamp or authorized signature	√	√	√	

说明 Note:

- 1) 认可图、工作图、完工图均应装订成册，并有封面及目录。

Approval, working and final drawings are respectively to be bound up into one volume with covers and contents.

- 2) 认可图中包括其可选项，超出技术协议供货范围的部分，厂家应免费提供  
Scope of supply mentioned in the approval drawing including optional items, but not required in technical agreement, the maker shall provide free of charge.

5 技术要求及供货范围(包括附件, 超规范的备件、工具及船厂中试验时使用的易损件)。Technical specification & Scope of supply (including accessories, spare parts and tools beyond regulations and consumables used for tests at shipyard).

#### 5.1 船厂轮机要求 Machinery Part Requirement

5.1.1 设备带的压力传感器 (PT)、压力开关 (PS) 需提供三通测试阀。Pressure transmitter and pressure of equipment switch should be with three-way test cock, level switch should have test pole.

5.1.2 设备带的压力表需提供压力表考克阀及压力表根阀。Pressure gauge of equipment should

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be with connecting cock and root valve.

5.1.3 压力表、压力真空表、真空表必须按国际标准或船用标准，应该是注液防震型，压力表的铜管在靠近压力表处做缓冲圈。Pressure, compound and vacuum gauges to be manufactured in accordance with the International Standard or equivalent for marine use and to be glycerine filled type. and the copper pipe of pressure gauge should have buffer near the pressure gauge.

5.1.4 所有表是黑字(红的是真空表)、白表面、字母英文、单位米制单位 All gauges to have black figures (red figures for vacuum), white scale plate, letter in English and units in metric system

5.1.5 设备带的压力表和温度计工作区域用绿色标记，报警区域用红色标记。The working area of pressure gauge and temperature gauge of equipment should be marked by green color, and the alarm area should be marked by red color.

5.1.6 法兰要满足 ISO 标准。The flange should be in accordance with ISO standard.

5.1.7 温度计和温度传感器需带可拆式保护套。毛细管也要带保护套。Temperature gauge and temperature transmitter should be with removable protect pocket. Capillarity should be covered with protection

5.1.8 由于实际到货设备没有按照经船厂确认后的认可图生产，造成船厂在设计和施工的延期和修改所产生的费用由卖方承担。If the production can not fulfill the approved drawing, and herefrom causes the delay and modification of the shipyard's design and construction, maker shall be responsible for the extra expense.

5.1.9 所有表盘式测量仪器（如压力表，表盘式温度计等）的量程应保为工作压力的 1.5~2 倍。The max scale of all measurement instruments (e.g. manometer, dial type thermometer, etc), to be 1.5-2.0 times of working pressure /temperature.

5.1.10 厂家应按照船级社要求和厂家标准提供备件和工具,并应该在认可图，工作图和完工图的工具清单或备件清单体现。另外，也应提供供船厂调试用的工具和备件（如密封圈、滤器的一次性滤芯等）并在认可图中单独说明。Maker should supply spare part and tool according to class requirement and maker's standard, the spare part and tool should be listed in maker's drawing. Maker also need to provide the spare part and tool for yards commissioning usage, the said commissioning spare part and tool to be indicated in approval drawing only.

5.1.11 交货前，厂家应关闭所有船级社的意见（包括证书上的）。所有需要船厂处理得船级社意见，厂家应在收到意见后3个工作日内通知船厂。makers should close all the comments (including the comment in the certificate) from class before delivery of the equipment. All the

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comment, which need to be closed by shipyard, from class to be informed to shipyard by maker, after maker received from class.

5.1.12 设备或模块的所有部件需有足够的加强以免装船后振动 To avoid abnormal vibration after installation, all components should be supported enough if necessary.

5.1.13 设备上的阀附件（如过滤器和压力传感器）要带铭牌。设备或模块中管路接口要有铭牌。 All valve and accessories (e.g. filter and pressure sensor) to be with name plate. All piping connections to be with name plate.

5.1.14 认可图，工作图和完工图应标明重量重心 Weight and the center of gravity to be mentioned in the approval drawing, working drawing and final drawing.

5.1.15 认可图中超出技术协议部分包括可选项目，厂家应免费提供。 Exceed scope (means not required in technical agreement but included in approval drawing), maker to be provided freely.

5.1.16 控制空气的压力为4-8 bar, 蒸汽压力为4-8 bar, 工作淡水压力4-8 bar, 冷却水压力2-5bar, 冷却水温度25~36摄氏度。 On vessel, Available control pressure air to be 4-8 bar, Available steam pressure to be 4-8 bar, Available working fresh water pressure to be 4-8 bar, Available cooling fresh water pressure to be 2-5 bar, Available cooling fresh water low temperature to be 25~36 deg C

5.1.17 根据厂家要求，管接口若需要配软管，则厂家应提供软管（型式认可）。 According to maker requirement, If the piping connection need to be flexible type, maker should supply the flexible hose(type approved by Class).

5.1.18 过热的部件应包隔热绝缘，包绝缘后，机舱温度40度时绝缘表面温度不超过60度。 All the overheated (over 60°C) component of should be well insulated. The outer face temperature after insulation should be not exceeded by 60°C, when the engine room temperature is 40°C.

5.1.19 如果协议中的商务条款（比如服务条款）和商务合同有矛盾，应以商务合同为准。 If any discrepancy is found between technical agreement and business contract regarding to the business item (e.g. commissioning), the business contract shall prevail.

## 5.2 船厂电气要求 Electrical Apparatus Requirement

### 5.2.1 电源接线端子颜色要求 Power Terminal Color:

交流电源 R(U): 黑; S(V): 棕; T(W): 灰 AC power: R(U): Black; S(V): Brown; T(W): grey;

直流电源 P: 棕; N: 蓝 DC power: P: Brown; N: Blue

### 5.2.2 电机马达 Electrical motor

a) 电机马达功率在0.5kW及以上要配带欠压保护的马达起动机。 All motors with a power

rating in excess of 0.5 kW to be provided with under-voltage cut-out protection as included in motor starters.

b) 一般使用三相鼠笼式电机。In general, triple-phase squirrel cage motors to be installed.

c) 一般所有电机马达的绝缘等级为 B 或者 F，除非特殊工作的马达的绝缘等级根据厂家要求。In general, class "B" or "F" insulation to be adopted, except for special service motors which insulation to be in accordance with the maker's standard.

d) 电源接线盒内和马达壳体上要提供接地柱（片）。Earth Bolt (bar) to be provided in the power cable junction box and outside of the shell for the electrical motor.

e) 马达接线处要提供金属铭牌用于指示相位和转向。All motors terminal should be provided by metal name plates indicating phase and turning.

### 5.2.3 起动器、控制箱、分电箱 The starter, the control panel, and the distribution panel.

a) 起动器基本上要提供欠压脱扣、带单相保护脱扣和温度补偿的三相热继电器、负载开关、起停按钮、绿色运行指示灯和电源指示灯。Starters shall basically be provided with no voltage release, triple-phase thermal relay with differential tripping (single-phase protection) and temperature compensation, load switch, start/stop buttons, green running lamp and with source lamp.

b) 当起动器布置于马上视线外应在对应附近配置就地起停按钮（除机舱风机外），停止按钮需带自锁功能（除消防泵外）。Starters located out of sight of motors to have local start/stop push button switches near respective motors, except the E/R fan. And the stop push button to be supplied with lock. (except fire pump).

c) 起动器和控制箱要提供 230VAC 二次电源的控制变压器。Control voltage transformers with 230 VAC secondary voltage to be provided in starter cabinets or control panel.

d) 功率大于（或等于）10KW 和双套设备，机舱风机，泵舱风机，油渣泵舱底泵等的马达起动器和控制箱上要提供电流表和计时器。The starter and control panel should provide ampere meter and running hour meter if the date power of the motors is no less 10KW and and for duplicated equipment, E/R ventilation fans, pump room fans, Sludge pump, and bilge pump shall be provided with an ammeter and running hour meters..

e) 安装在水气容易凝结区域的起动器内要安装空间加热器。Space heaters to be provided in starter cabinets installed in areas where condensation is likely to be expected.

f) 马达起动器和控制箱上要提供就地过载指示灯，过载设定值要在认可图中标记，过

载报警和运行信号要输出到监测报警系统。All the starter and control panel for motors should provide local overload indication lamp. Overload setting data should be indicated in approval drawing. And overload alarm and running signal should be output to AMS.

g) 所有起动机、控制箱、分电箱的面板上应由电源指示灯。All the starter, control panel and distribution panel should provide “Power ON” type lamp on front of panel.

h) 指示灯要用 LED 型式。Pilot lamps to be of LED type.

i) 起动机、控制箱、分电箱的里面和外面都要提供接地柱（片）。Earth Bolt (bar) to be provided inside and outside of the starter, the control panel and the distribution panel.

j) 起动机和控制箱内提供接线排给船厂电缆接线，包括所有的电力电缆和信号电缆；分电箱内可以直接接到开关上。Cable terminal to be arranged for shipyard’s cable connection work, including all power cable and signal cable. In the distribution panel, the power cable can be connected in the MCCB or MCB.

k) 起动机和控制箱内的电力电缆和信号电缆敷设路径应分开，包含预留给船厂的电缆路径。The power and signal cable way to be separated in starter cabinets and control panel, including the pre-arranged cable way for shipyard cable.

l) 所有由厂家散供的电气控制箱应在认可图中标明重量信息。All electric control cabinets for loose supply by maker should be indicated the weight data in approval drawing.

m) 起动机、控制箱、分电箱门后应有相应的过塑接线图。The wiring diagram shall be plastic packaged and fitted on the back of starter cabinet, control panel and distribution box door.

n) 起动机、控制箱、分电箱安装于防滴式金属箱内。Starters which are not contained in the group starter boards, control panel and distribution box shall be mounted in the drip-proof metal cabinet.

#### 5.2.4 成套设备 Complete Set of machine

a) 如果船厂有电缆需要敷设在设备单元上，电缆支承件应由厂家提供，具体布置和要求在认可图阶段确认。If Shipyard’s cables need to lay on the machine(or unit), cable way supports to be supplied by seller, detail arrangement and proposal to be confirmed on approval stage.

b) 如果设备单元上有多个电气部件，由厂家在单元上提供通用接线盒汇总所有电气部件的电缆，船厂电缆仅拉放到通用接线盒。If the machine unit with multi- electrical components, general junction box to be arranged on the unit by seller, which have collected all the electrical components cables(supplied by seller) .It’s easy for shipyard multi-core cable arrangement.

c) 原则上设备单元应包含电控系统, 所有的电气部件应由厂家提供, 同时在图纸中清晰标明。电气部件是组装在单元上或是散供应在图纸中清晰标明。The electrical control system for machine (or unit) should be included generally. All relative electrical components should be supplied by seller, and all electrical components to be enumerated in drawing. The electrical component to be combination installed on the unit or loose supply should be clearly remarked in the drawing.

d) 电气部件安装在设备单元上的位置要在图纸中清晰标明。The electrical components installation position on the machine (or unit) should be remarked in the drawing.

e) 成套设备(单元)的报警点要满足船级社和建造规格书的要求, 否则应由厂家免费提供。所有报警点及其设定值在认可图阶段确认。All alarm points arrangement for the complete set of machine (or unit) should be provided to meet class and building specification requirement. Otherwise seller should provide for free. And all alarm points (including in the set point) should be confirmed in approval stage.

#### 5.2.5 电气设备防护等级 The protection of electrical equipment enclosure

a) 电气设备防护等级在 IP23 及以上应带电缆填料函或同等的配置, 电缆填料函应为金属材质。The electrical equipment is IP23 or above should be with cable glands or equal components, the cable gland should be metal type.

b) 电缆填料函应安装在控制箱底部的可拆除底板上, 底板与控制箱用螺栓固定。The cable glands should be installed on the special plate which can be taken out and fixed with screw bolts on the bottom of the cabinets.

c) 露天区域电气部件(控制箱、马达、遥控按钮、控制开关、插座等)的防等级至少为 IP56, 带铭牌标记。The IP degree of electrical equipment (including the control panel, electrical motor, remote control box, control switch, dimmer, socket etc) which is located in open deck, should be at least IP56 and with name plate remark.

#### 5.2.6 报警传感器 Alarm sensor

a) 如船东要求, 在工厂试验时要按照压力和温度传感器的等级实际测试或提交测厂家试报告并得到船东认可。所有非散供的传感器应由厂家提供铭牌, 铭牌的具体描述应在认可图中提供给船厂认可。All pressure and temperature sensors must be actually tested with class in shop test stage or submitted maker test report to owner for approval, if owner requires. All sensors in unit (not loosen supply) is to be supplied with maker's nameplates, the description of nameplate to be in

drawing and submitted to yard for approval.

b) PT100 温度传感器应为 3 线制。The PT100 sensor should be 3 wires.

c) 由厂家提供的传感器电缆长度在认可图阶段确认。The cable length of sensor cable which is supplied by maker should be confirmed in approval stage.

#### 5.2.7 其他要求 Miscellaneous

a) 所有安装在驾驶室外的设备应带调光功能。All the equipments installed in the wheel house should have dimmer function.

b) 非特殊情况不允许电缆自电气部件（接线盒、控制箱、配电板等）的顶部进线。The cable entrance cannot be arranged on the top surface of the electrical components (like junction box; control cabinet; switchboard etc.) except for special condition.

c) 应保证绝缘值在认可情况下  $10M\Omega$  或以上。The insulation resistance for all devices should be  $10M\Omega$  or above in any condition.

d) 包括传感器在内的所有电气信号不能接地。All the electrical signal can't be earthed, including the signal from sensors.

e) 由厂家提供的配套电缆长度在认可图阶段确认 The length of cable which is supplied by maker should be confirmed in approval drawing.

f) 认可图中要包括防爆证书和本安隔离栅电气参数。Ex certification and I.S. Barrier parameter should be included in approval drawing.

g) 所有的控制箱和接线盒由厂家提供铭牌, 铭牌的具体描述应在认可图中提供给船厂认可。All control cabinet, panel, board and junction boxes of equipment to be with maker's nameplates, the description of nameplate to be in drawing and submitted to yard for approval.

h) 除插座等简单设备外, 所有安装在驾驶室外的设备应提供电磁兼容证书或报告。为满足桥楼功能要求而安装在驾驶室外的设备也应提供电磁兼容证书或报告。All the equipments installed in the wheel house should be with EMC certificate or report, except the simple equipments e.g. socket etc. The equipments outside wheel house as supplement of bridge function requirement should be with EMC certificate or report too.

i) 图纸中应包含通讯协议清单。The communication protocol should be supplied in the approval/working/final drawing.

### 5.3 TECHNICAL SPECIFICATION

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### 5.3.1 General Description of the Vessel

The vessel to be designed and built as a single screw, slow speed dual fuel(LNG/oil)engine driven tanker for world-wide service transporting crude oil and product oil(listed in MARPOL 73/78 Annex I except asphalt solution, clarified and Road Oil) in cargo tanks and slop tanks.)

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LNG dual fuel system to be provided for M.E., A.E. and boilers.

### 5.3.2 Main Propulsion Power and Speed

Type	MAN 6G60ME-GI-C10.5-HPSCR
No. of set	1 set
SMCR	10,700 kW x 76.2 rpm
NCR (83%SMCR)	8,885 kW x 71.6 rpm

The contract speed to be not less than 14.5 knots at NCR power output of main engine with 15% SM (sea margin) at design draft at condition of clean bottom in deep sea and calm water(no wind, no wave, no current).

The speed to be abt. 14.1 knots(for reference only) at NCR power output of main engine with 15% SM (sea margin) at scantling draft at condition of clean bottom in deep sea and calm water(no wind, no wave, no current).

To achieve the target speed, combination of FAN DUCT (one type of pre-swirl ducts) and propeller fan cap to be applied.

### 5.3.3 Fuel Oil Consumption, EEDI

#### Fuel oil mode

Fuel oil consumption of main engine to be about 33.56 tons/day at NCR(Tier II) and about 33.73 tons/day at NCR(Tier III)excluding +/- 6 % manufacturer's tolerance based on L.C.V. of 42700 kJ/kg and ISO standard reference conditions.

#### Fuel gas mode

Gas consumption of main engine to be about 28.06 tons/day at NCR(Tier II) and about 28.2 tons/day at NCR(Tier III)excluding +/- 6 % manufacturer's tolerance based on L.C.V. of 50000 kJ/kg and ISO standard reference conditions.

The pilot oil consumption at gas mode to be 0.7t/d at NCR(Tier II & III) excluding +/- 50 % manufacturer's tolerance based on L.C.V. of 42700 kJ/kg and ISO standard reference conditions.

The M/E fuel oil/gas consumption at Tier II mode to be confirmed as per maker's shop test.

The attained EEDI of the vessel meets the requirement of phase 3.

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### 5.3.4 CLASS, RULES, REGULATIONS AND CERTIFICATES

The Vessel, including its hull, machinery, equipment and outfitting, shall be constructed in accordance with the Rules and Regulations of the Class and under survey of the Class and shall be distinguished in register by symbol of:

ABS ✕A1, (E), Oil Carrier, CSR, AB-CM, CPS-B,ESP, SPMA, UWILD,✕AMS

+ACCU,BWT,TCM, VEC-L, IHM, POT, GFS(DFD), EGC-SCR(M),NOx-Tier III, RW, LSC

The vessel flies the convenient flag (Liberia or Singapore or Malta).

Rules and Regulations:

The following Rules and Regulations to be applied.

- (1) Rules and Regulations of Authority Government.
- (2) IACS Common Structure Rules for Bulk Carriers and Oil Tankers(HCSR)
- (3) International Convention for the Safety of Life at Sea, and Protocol of 1988 (SOLAS 74/88) including all latest amendments and V19
- (4) International Convention for the Prevention of Pollution from Ships 1973, including Protocol 1978 (MARPOL 73/78) and with protocol 1978 and all amendments, including Annex I, IV, V & VI.
- (5) Convention on the International Regulations for Preventing Collisions at sea, (London 1972) including latest amendments
- (6) International Convention on Load Lines (1966) with the Protocol of 1988 including all latest amendments.
- (7) International Conversion on Tonnage Measurement of ships, 1969, and the latest amendments.
- (8) International Convention on the Harmful Anti-Fouling on Ships – AFS
- (9) The International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004
- (10) Hong Kong International Convention For The Safe And Environmentally Sound Recycling of Ships, 2009(IHM list only)
- (11) International Tele-communication Union Radio Regulations, 2008.
- (12) International Code for the Security of Ships and port facilities – ISPS code.
- (13) IMO Resolution MSC.137(76) - Standards for Ship Maneuverability.
- (14) IMO Publication No.978 Performance Standards for Navigational Equipment(1988)
- (15) ISO 6954 – 2000 Guideline for Vibration in Merchant Ships
- (16) Rules and Regulations governing navigation of Suez Canal, including tonnage measurement.
- (17) Rules and Regulation governing navigation of the Panama Canal (No. N-1- 2024) including tonnage measurement, Panama chock, mooring arrangement, visibility, etc.. (The ballast draft of this vessel without ballast water in cargo tanks is less than the data of Panama requirement. The permission to be received from authority by buyer for transiting at less than the minimum required draft upon its first visit under ballast condition. Seller will provide the Appendices 3 in accordance with IMO Resolution A.601 (15) if necessary)
- (18) U.S. Coast Guard Regulations for Foreign Flag Vessels operating in the Navigable

Waters of the U.S. (oil/chemical tanker), including requirement for OPA 1990.

USCG 46 CFR 39 – Vapour Control System

USCG 46 CFR 162 - Ballast Water Shipboard Testing

USCG 33 CFR 151 - Subpart D - Ballast Water Management for Control of Nonindigenous Species in Waters of the United States.

USCG 33 CFR 155 – Oil Pollution Regulations of Vessels

USCG 33 CFR 159 – Maritime Sanitation Devices.

USCG 33 CFR 164 – Navigation Safety Regulations.

- (19) MLC, 2006, standard A3.1 excluding swimming pool
- (20) IMO PSPC (Performance Standard for Protective Coating of dedicated seawater ballast tanks – MSC.215(82))
- (21) MEPC.245(66) 2014 Guidelines on the method of calculation of the Attained Energy Efficiency Design Index (EEDI) for new ships as amended by IMO Res. MEPC.263 (68), and later amendments
- (22) IMO Res. 337(91), Adoption of the Code on Noise Levels on Board Ships
- (23) International Electro technical Commission (IEC) Publication 92
- (24) OCIMF, Recommendations for Oil and Chemical Tanker Manifolds Associated Equipment, 1<sup>st</sup> Edition 2017.
- (25) OCIMF, Ship to Ship Transfer Guide (for fixed mooring fitting only)
- (26) OCIMF, Recommendations for Equipment Employed in the bow mooring of Conventional Tankers at Single Point Moorings, 2007 (for fixed mooring fitting only)
- (27) OCIMF, Mooring Equipment Guidelines, 2018. (for fixed mooring fitting only, except load sensors on brake drums and the clause of  $D/d > 15$ )
- (28) OCIMF ISGOTT 5th edition 2006 (items regarding shipyard installation only)
- (29) ExxonMobil “Marine Environmental, Safety and Quality Assurance Criteria for Seagoing Industry Vessel in ExxonMobil Affiliate Service”, 2017. (must and strongly prefer items to be applied according to the attached list. Documents involving in management and assessment, maintain procedure, books, publication, test, portable fittings/instruments, material and consumable etc. in excess of this specification to be provided by Buyer).
- (30) Marine Traffic Safety Law of Japan for Foreign Flag Vessel Entering Japanese Ports, red and green light only
- (31) ICS Guide to Helicopter/Ship Operations (day operation winch only, design based on ‘D’ value of 12.0m)
- (32) EC Directive 2005/33/EC, as regards the sulphur content of marine fuels.
- (33) 2008 IS Code (Part A)
- (34) International Code of Safety for Ships using gases or other low-flashpoint fuels (IGF Code) (if applicable, adopted by IMO resolution MSC.391(95) on 11 June 2015)
- (35) MEPC.1/CIRC.676 and MEPC.1/Circ.760, but not include the regeneration of fuel oil from oil residue (sludge) and evaporation sludge function.
- (36) MSC.1-Circ.1387-Revised Guidelines For The Approval Of Fixed Water- Based Local Application Fire-Fighting Systems For Use in Category A Machinery Spaces

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- (37) BWM.2/Circ.62 Guidance on contingency measures under the BWM convention
- (38) MEPC.127(53) & MEPC.306(73) – Guidelines for ballast water management and development of ballast water management plans (G4)
- (39) IMO Res. MSC.1/Circ.1279 Corrosion Protection of Permanent Means of Access Arrangements.
- (40) IMO Res. MSC.1/Circ.1321 Guidelines for measures to prevent fires in engine rooms and cargo pump rooms.
- (41) IMO Res. MSC/Circ. 1331 Guidelines for Construction, Installation Maintenance & Inspection of Means of Embarkation and disembarkation.
- (42) IMO Res. MSC.1/Circ.1675 Interim guidelines on safe operation of onshore power supply (OPS) service in port for ships engaged on international voyages.
- (43) IMO Res. MEPC.269(68), 2015 Guidelines for the Development of the Inventory of Hazardous Materials.
- (44) IMO Resolution A.601(15) regarding the Provision & Display of Manoeuvring Information on board ships.
- (45) IMO Res.A.962(23) IMO Guidelines on Ship Recycling as amended by IMO Res. A.980(24).
- (46) USCG Vessel General Permit for discharge incidental to the normal operation of vessels (VGP-2013), including;
  - VGP – US ballast water requirement
  - VGP – US sediment management
  - VGP – EPA EAL requirement (or using air sealing system)
- (47) MSC.532(107)- Amendments to SOLAS Chapter II-1 lifting appliances and anchor handling winches (Only for items apply for oil tanker)

Certificates:

The following certificates or provisional certificates are to be furnished to the Buyer at the delivery of the vessel.

However, if formal certificates cannot be obtained at the ship's delivery, the Builder shall furnish provisional certificate(s) to the Buyer which substitutes for the formal certificate(s).

The following to be issued by the Classification Society or Flag Administration/related authorities. The exactly name of the certificate should be according the class society standard.

- (1) Classification certificate of hull and machinery
- (2) International load line certificate
- (3) International Tonnage Certificate

- (4) International Sewage Prevention Pollution Certificate
- (5) International Oil Pollution Prevention Certificate (IOPP)
- (6) International Air Pollution Prevention Certificate (IAPP)
- (7) Certificate for MLC 2006 or Crew Accommodation Certificate
- (8) Suez Canal tonnage certificate
- (9) Harmonized Cargo ship safety construction certificate
- (10) EIAPP Certificate for Main Engine and Auxiliary Engines
- (11) Antifouling System Certificate
- (12) International Energy Efficiency Certificate
- (13) Certificates for Loading Computer System.
- (14) Cargo Gear Book for Engine Room, Hose Handling and Provision Cranes.
- (15) Deadweight Certificate(to be delivered by builder)
- (16) EIAPP NOx Tier III technical files approved for all diesel engines.
- (17) Sanitary Inspection Certificate(to be issued by local authorities and arranged by builder)
- (18) Statement of Compliance of vessel's Sewage System with the USCG Rule & Regulations from Class.
- (19) Statement of Fact for the Low Sulphur fuel oil system
- (20) Statement of Compliance for garbage pollution prevention (MARPOL annex v)
- (21) Confirmation of Compliance to SEEMP Part II(provided by buyer)
- (22) Statement of compliance for IHM (if non - EU flag) as per EU 2009/16/EC & The Hong Kong International Convention for the Safe and Environmentally Sound Recycling of Ships, 2009 (the Ship Recycling Convention or the Hong Kong Convention)
- (23) International Ballast Water Management Certificate
- (24) Type Approval Certificate of Sewage Treatment Plant
- (25) Certificate for Lifeboat and Life Saving Equipment (Registry Government)
- (26) Certificate for Navigation Lights and Special Signal lights (Registry Government)
- (27) Certificate for Voyage Data Recorder (Class)
- (28) Certificate for GMDSS radio equipment (Class)
- (29) Certificate for L.R.I.T (Class)
- (30) Statement of Fact for California Code of Regulations, title 13, section 2299.2 "Fuel Sulphur and other operational requirements for ocean - going vessels within California waters and 24 nautical miles of the California baseline" (Class)
- (31) Statement of Fact for 2013 US EPA Vessel General Permit (VGP) (Class)

The initial survey referred to COW of Annex I of the MARPOL is to be carried out by and between the Buyer and the Authority after the delivery of the Vessel.

The following is to be provided by Builder/ subcontractor or Buyer, and to be approved by Classification Society or the Flag Authority if necessary.

- (1) Builder's Certificate(to be issued by builder)
- (2) De-ratting Exemption Certificate(arranged by builder and issued by authority)
- (3) Mooring Winch break test Certificate. (to be issued by builder)
- (4) Life rafts servicing Certificate
- (5) Portable fire-fighting extinguisher Certificate
- (6) Liquid foam Certificate
- (7) Test Certificates for anchors & Anchor Chains / Fittings.

- (8) Certificate of Navigation Light & Special Signal Light.
- (9) License to establish Radio Station.
- (10) Plans and Procedures for recovery of persons from the water (to be provided by buyer based on the data and plans supplied by the builder)
- (11) MGO changeover procedure (to be provided by builder)
- (12) Waste Oil Incinerator Type approval Certificate
- (13) Oily Water Separator Type approval certificate
- (14) Oil Content meter Type approval Certificate & Calibration Certificate
- (15) Sewage Treatment Plant Type approval certificate
- (16) ODME Type approval Certificate
- (17) Portable Oil Water Interface detector type approval certificate
- (18) Hydrocarbon Gas High concentration alarm type approval certificate
- (19) Level gauges Type approval certificate
- (20) Portable fire extinguishers type approval certificate
- (21) Oil Mist Detector Type approval Certificate
- (22) Self Contained Breathing Apparatus Test Certificate
- (23) Ballast Water Treatment system type approval certificate
- (24) Cargo tank level sensor type approval certificate
- (25) Adjustment Certificate for Magnetic Compass (issued by the Builder under commissioning to a certified service provider)
- (26) Test Certificate of windlass, anchor, anchor chain and mooring ropes
- (27) Mooring winch test Certificate (Builder)
- (28) Manufacturer's Certificates for all lifting devices (including chain blocks, slings, lifting beams etc.)

The following is to be issued by the Authorized Department.

- (1) All calibration /sounding tables for cargo oil tanks
- (2) Certificate of drinking water (to be arranged by builder, issued by local authority)

The following is to be provided by Maker/builder:

- (1) Incinerator calibration test Certificate
- (2) ODME Calibration test Certificate.
- (3) Adjustment Certificate for magnetic compass.

All equipment(except owner supply equipments) certificates required by the Classification and/or Authority to be supplied to the Buyer. However, if above mentioned formal certificates cannot be obtained at the ship's delivery, the Builder to furnish provisional certificates to the Buyer, which substitute the formal certificate. But the formal Certificate to be submitted to the Buyer before the expiry of the provisional Certificate by builder.

All LSA and FFA equipment certificate(s) shall have at least seven (7) months of validity at the time of delivery.

### 5.3.5 Standard

Materials and equipment shall be in accordance with the ISO, JIS, DIN, GB, CB, CBM, YB or equivalent standard, unless otherwise specifically described in the Specifications.

Stainless steel without grade notation in the Specifications shall mean SUS304 or Maker's standard.  
Standards

Materials & equipment shall be of ISO, JIS, DIN, GB, CB, CBM, YB or equivalent standard. Units of measure

SI units to be adopted for design and construction of hull, machinery, equipment, etc. in general.

All measuring units such as power, pressure gauge, thermometer, volume gauge, tank scales, etc. to be in accordance with SI system.

Types, sizes and materials of fittings, equipment and machinery to be in accordance with ISO or equivalent, the standard of IEC or equivalent, and/or the Builder's standard and/or Manufacturer's standard.

The SI unit to be applied throughout the vessel. However, some conventional units are also to substitute the corresponding SI units or metric units as common customs in shipbuilding and shipping.

### **5.3.6 Vibration and Noise**

The special attention shall be paid in the design and construction to limit the vibration and noise levels within the criteria of ISO 6954:2000 and IMO Resolution MSC.337(91).

The vibration level in living quarters of the vessel to be measured by local calibrated vibration equipment by the Builder when the vessel is running straight ahead steadily at NCR of main engine on calm and deep open sea trial condition.

Noise level to be measured by the Builder at the suitable point in the machinery space, engine control room, wheelhouse, private cabin, galley, pantry when the vessel is running ahead steadily at NCR output of main engine in the sea trial.

In case of excessive noise corrective action to be taken prior delivery of vessel.

### **5.3.7 Inventory and spare parts**

Spare parts and tools to be furnished in accordance with the class society requirement and maker's standard.

### **5.3.8 INSPECTIONS, TESTS**

#### Shop tests

Shop tests for main engine, auxiliary machinery, deck machinery, etc. to be performed in accordance with the Rule requirements and/or the standard of the makers.

The buyer shall be informed of the shop test schedule at least fourteen(14) days for foreign maker(outside China) and seven(7) days for domestic maker in advance of the expected date of the shop tests and the buyer's attendance shall be confirmed to the Builder.

### **5.3.9 Other requirements**

All the plans, booklets, nameplates and all the documents required for the implementation of this Specification to be in English. Only metric units and international standards to be used for the construction and building of the Vessel.

All valves and other components to be marked according to the SFI standard (the classification standard used in this specification) and Owner's request (Marking manual).

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All parts in equipment and in piping systems, which are electrically connected and exposed to sea water, sea water atmosphere or any other corrosive media, are to be made of equivalent materials according to the galvanic series for the actual media. If equivalent material cannot be used, the parts to be galvanize isolated.

Facilities for lifting components weighing over 50kg, or where otherwise required, to be provided.

### 5.3.10 Maintenance system, instruction material

One data-based maintenance system to be installed where the Owner will buy the software and PC's. Builder will install all necessary cables etc and the Owner will do the installation on the PC's.

Maintenance program from all suppliers to be handed over to the Owner preferable in excel sheet as soon as equipment confirmed and between builder and maker, but latest three months prior to delivery. This information shall be grouped in accordance with SFI code for easy implementing in the ship maintenance system.

From all suppliers of equipment to the Vessel the Builder shall hand over three copies of operating manuals (two onboard and one for the office), instruction books etc to the Owner. Builder to collect excel lists of spares and job descriptions etc. from Suppliers and hand over to Owner for implementation The Builder shall present a list of the above-mentioned material to the Owner for approval.

Three months before delivery of the Vessel the Builder to prepare a book/file concerning information about all the equipment onboard the Vessel, and it shall contain:

- Name of the equipment and the main particulars with type, size, capacity, serial number etc.
- Makers/suppliers name, address, telephone number, telefax number, e-mail address, web site, etc.

### 5.3.11 Electrical equipment Requirement From the Specification

#### Electric System

Main distribution system shall be AC three-phase three-wire insulated system.

In general, voltage, frequency and phase for electric equipment to be as follows:

Item	Voltage	Frequency	Phase
Generator	450 V AC	60 Hz	3
Power motor	440 V AC	60 Hz	3
Galley and domestic equipment (large)	440 V AC	60 Hz	3
Galley and domestic equipment (small)	220 V AC	60 Hz	3 or 1
Lighting fixtures	220 V AC	60 Hz	1
Nautical instruments	220 V AC 24 V DC	60 Hz	1
Radio communication, interior communication and alarm equipment	220 V AC 24 V DC	60 Hz	1
Automation device	220 V AC 24 V DC	60 Hz	1

All systems will be insulated against hull throughout the vessel except for ground detecting circuits,

secondary circuits of potential and current transformers to be grounded at switchboard or control panel.

In general, the voltage for portable equipment such as portable lamp, portable control box for turning gear motor and traveling crane and so on to be lower than AC 50V by the two (2) windings type transformer which the secondary winding not to be earthed.

Name plate

The name plate will be made of PVC or acrylic resin indoor and stainless steel SUS304 outdoor.

The engraved letter on the name plates and caution plates will be in English. White background with black letter for general use, red background with white letter for caution use.

**Color scheme of electric equipment**

1) Color of electrical equipment

Metal surfaces of enclosure of the electrical equipment will be painted with the following colors or according to the Buyer' s specified.

- |   |                          |
|---|--------------------------|
| Generators, motors and transformers:  | Munsell code 7.5 BG 7/2  |
| Switchboards, distribution boards and starter panels, control console etc.: | Munsell code 7.5 BG 7/2  |
| Wheelhouse control console, radio console                                   | Munsell code 7.5 BG 7/2  |
| Interior communication, navigation and radio Equipment:                     | Manufacturer' s standard |
| General alarm and other emergency operating equipment:                      | Munsell code 5R4/13      |
| Others:   | Manufacturer' s standard |

Interior metal surfaces of electrical equipment may be painted with maker's standard colors.

Resin made surface of electrical equipment to be of maker's standard colors.

Bus bars and connections of major power equipment shall be marked with tapes, paints, letters or equivalent and shall be arranged as follows:

(A) A.C. system

Source	Load side	Colour	Arrangement		
Phase R	Phase U	Black	Left	Top	Front
Phase S	Phase V	Brown	to	to	to
Phase T	Phase W	Grey	Right	Bottom	Back

(B) DC. system

Pole	Colour	Arrangement		
Positive (+)	Brown	Left	Top	Front
		to	to	to
Negative (-)	Blue	Right	Bottom	Back

2) Color of indicating light

Standard color of indicating lamps:

- |                 |        |
|-----------------|--------|
| Power           | White  |
| Running         | Green  |
| Stand-by        | Yellow |
| Alarm           | Red    |
| Space heater ON | Orange |

3) Color of push button

The color of push button shall be as follows:

- |       |       |
|-------|-------|
| Start | Green |
| Stop  | Red   |





4) Color of alarms and indicators

The color of the visual indicators and calls should meet the IMO resolution” CODE ON ALERTS AND INDICATORS”

**5.3.12 Equipment Requirement From the Specification**

**Coolers**

The central F.W. coolers, M/E jacket cooling F.W. cooler and M/E L.O. cooler are of plate type.

The coolers for main engine to be designed on the basis of heat dissipation of SMCR.

M/E Jacket cooling F.W. Cooler

No. of set : One (1)

Type : plate type (stainless steel)

Heat dissipation : abt. 1520 kW

Jacket F.W. flow : 90 m<sup>3</sup>/h

Jacket F.W. inlet temp. : 85 °C

L.T. cooling F.W. flow : abt.105 m<sup>3</sup>/h

Central F.W. cooler

No. of set : Two (2)

Type : plate type (titanium)

Heat dissipation : 60% total capacity each (abt6600KW)

L.T. cooling F.W. flow : abt. 320 m<sup>3</sup>/h

L.T. cooling outlet temp. : 36°C

Cooling S.W. flow : abt. 400 m<sup>3</sup>/h

**In-line sea water strainer for central cooler shall be provided.**

**Back flushing connection for sea water inlet / outlet shall be provided.**

**Boss with isolating valve shall be provided.**

**Central coolers to be provided with glass tube thermometers and liquid filled pressure gauges on the inlet and outlet of both FW and SW**

**The cleanliness factor is 85% for plate type cooler**

M/E lubricating oil cooler No. of set : One (1)

Type : plate type

Heat dissipation : abt. 920kW

Lub. O. Flow : abt. 340 m<sup>3</sup>/h

L.T. cooling F.W. flow : abt. 105m<sup>3</sup>/h

L.T. outlet temp : 45°C

**Plate Type Cooler**

General

The heat exchanging surface to consist of number of corrugated plates clamped together in a frame and sealed at edges by rubber gaskets.

The plates form a closed system of parallel two media between which heat is exchanged flow through alternate inter plate spaces.

The accessories to be in accordance with maker's standard. If the cooler to be cooled by S.W., the cooler to have built in filters in sea water side.

The built in filters to be attached with the cooler.

Material

Frame	Mild steel
Plate	Titanium plate for sea water handling Stainless plate for fresh water
Gasket	Nitrile rubber

**Painting**

The color of finished coat for external surface shall be in accordance with the following table:

L.O. and F.W. coolers      Light blue green (munsell notation: 7.5 BG 7/2)

备注 REMARK:

1) 以上为技术协议的船厂部分，后续部分为厂家部分。如果船厂部分和厂家部分描述有矛盾时，应以船厂部分中描述为准。

Note: All above contents of this technical agreement are the requirements of shipyard. If any discrepancy is found between above contents and the later contents provided by the Seller, the above contents shall prevail. And the Buyer shall take the later contents of this technical requirement provided by the Seller as ineffective.

2) 保密：本技术协议及项目任何资料包含 Mawei 信息可能是专有的，机密的，只给指定人员。若无 Mawei 明确书面同意，任何披露，复制，分发或使用是被禁止的。

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**Annex 1 技术偏离表 Annex 1 technical deviation table**

厂商:

技术协议编号:

Manufacturer:

TA No.:

序号 No.	名称 Name	买方技术协议要求的 条目 No. of buyer's technical agreement requirements	买方技术协 议要求 Buyer's technical agreement	厂家技术方 案内容 Manufacturer's technical	偏离 Deviation	说明 Explain	结论 Conclusion

			requirements	scheme			
1							

Danfoss HEXSelector 1.3.43

#176-240731195601

Customer		Date	7/31/2024
Project	Central F.W. cooler	Engineer	
HEX Type	S65-IS10-207-TMTL38	Contact Person	
Units Connected	2 (Parallel)	E-mail	

Calculated Parameters	Unit	Hot Side	Cold Side
Flow Type			CounterCurrent
Heat Load	kW		6600.00
Inlet Temperature	°C	53.9	32.0
Outlet Temperature	°C	36.0	46.5
Mass Flow Rate	kg/s	88.09	113.36
Volumetric Flow Rate	m³/h	320.00	400.00
Total Pressure Drop	kPa	33.08	50.03
Pressure Drop in Port	kPa	4.32	6.74
Surface Margin	%		15.00
LMTD	K		5.5
Port Velocity	m/s	2.80	3.50
Shear Stress	Pa	32.67	49.17

Properties of Fluid	Unit	Hot Side	Cold Side
Fluid		Water	Sea Water
Liquid Viscosity	mPa·s	0.58	0.66
Liquid Density	kg/m³	990.3298	1020.2000
Liquid Heat Capacity	J/kg·K	4177.4495	4020.0000
Liquid Thermal Conductivity	W/m·K	0.6353	0.6300

Specifications	Unit	Hot Side	Cold Side
HEX Type			S65-IS10-207-TMTL38
Number of Plates			207
Grouping			1x103 + 0x0 / 1x103 + 0x0
Plate Thickness	mm		0.50
Plate Material / Ratio			Ti
Effective Area	m²		144.12
Gasket Material			NBRH (SonderLock) -15/150 °C
Frame	Type		IS, painted frame
	Length	mm	1557
	Maximum Number of Plates		232
Volume	l	175.1	175.1
Weight, empty/operating	kg		1581 / 1933
Paint Category			Category C2L
Paint Color			munsell notation:7.5 GB 7.2
Connection	Inlet	F1: DN 200 Flange St.37 PN10	F3: DN 200 studded end connection with rubber lined PN10 HT
	Outlet	F4: DN 200 Flange St.37 PN10	F2: DN 200 studded end connection with rubber lined PN10 HT
Certification/Approval Type			ABS
Minimum Design Temperature	°C		0.0
Maximum Design Temperature	°C		80
Maximum Differential Pressure	kPa		600.0
Maximum Test Pressure	kPa		900
Maximum Design Pressure	kPa	600.0	600.0

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Danfoss HEXSelector 1.3.43

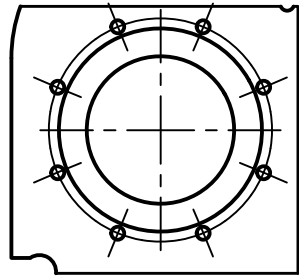
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<i>Customer</i>		<i>Date</i>	7/31/2024
<i>Project</i>	Central F.W. cooler	<i>Engineer</i>	
<i>HEX Type</i>	S65-IS10-207-TMTL38	<i>Contact Person</i>	
<i>Units Connected</i>	2 (Parallel)	<i>E-mail</i>	

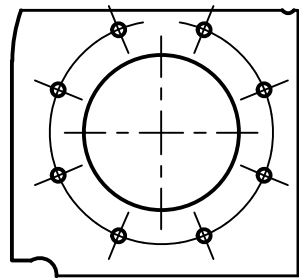
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Category	Product Code	Pcs.	Delivery Concept	Component	
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Accessory		2		Inter Filter	



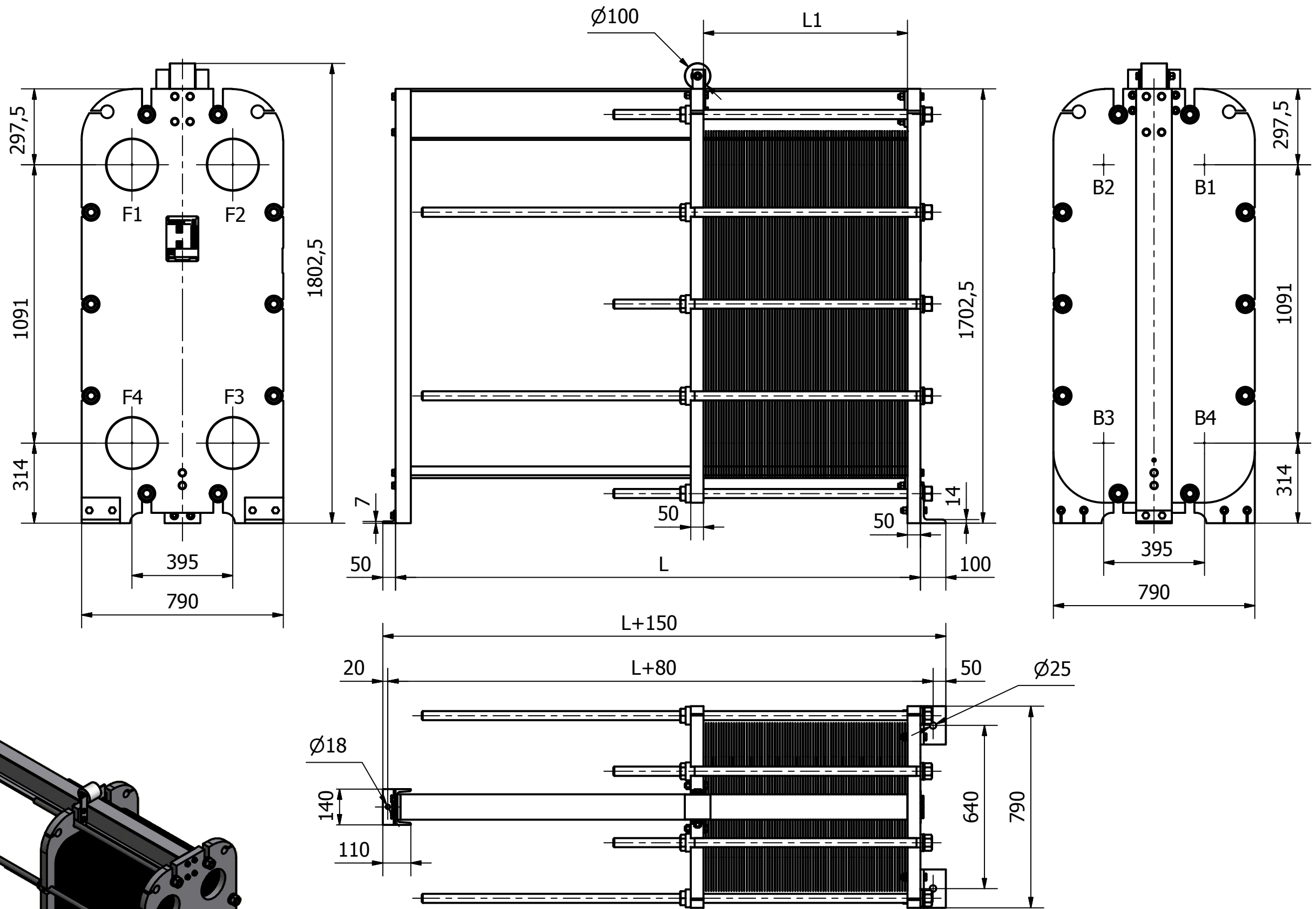
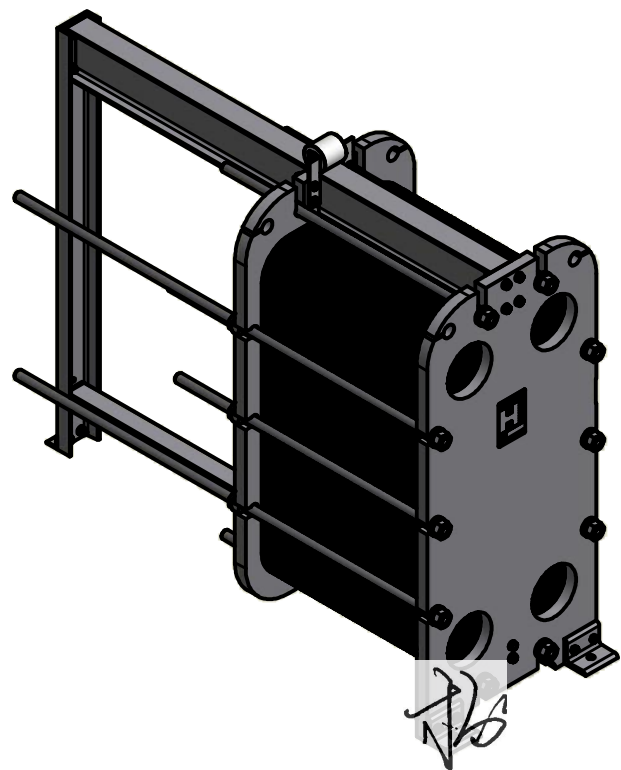
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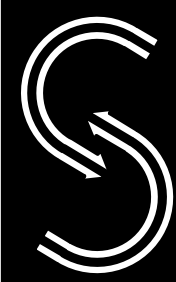
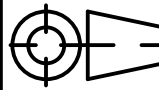


F1-F4 AND B1-B4  
DN200 DIN2632  
8" ANSI CLASS 150  
CLADED OR  
RUBBERLINED



F1-F4  
DN200 DIN2632  
8" ANSI CLASS 150  
UNCLADED



	Dimensions without tolerance	Designed by	Date	Approved by	Date	Rev. no.	Revision Text		
	ISO 2768-m	LGK	05-07-2012	FLEB	19-04-2017	01	Added Hang On and changed thickness of follower to 50mm		
ISO projection			<b>SONDEX</b>		Description: S65 S65A IS PN10 DN200 DIM DRAW (H.O) LENGTH 600-4000 MM FEA				
						Rev. date	Rev. by	Drawing no.	Sheet
						08-11-2016	LGK	S65-S65AISPN10DN200L600-4000-FEA	1 / 1

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Danfoss HEXSelector 1.3.44

#176-240802175847

Customer		Date	8/2/2024
Project	M/E Lubricating oil cooler	Engineer	
HEX Type	S65-IS10-418-TMTL70	Contact Person	
Units Connected	1 (Parallel)	E-mail	

Calculated Parameters	Unit	Hot Side	Cold Side
Flow Type			CounterCurrent
Heat Load	kW		920.00
Inlet Temperature	°C	50.3	36.0
Outlet Temperature	°C	45.0	43.6
Mass Flow Rate	kg/s	88.09	28.96
Volumetric Flow Rate	m³/h	360.00	105.00
Total Pressure Drop	kPa	49.59	1.69
Pressure Drop in Port	kPa	5.46	0.46
Surface Margin	%		15.00
LMTD	K		7.8
Port Velocity	m/s	3.15	0.92
Shear Stress	Pa	57.89	1.66

Properties of Fluid	Unit	Hot Side	Cold Side
Fluid		SAE30	Water
Liquid Viscosity	mPa·s	58.63	0.66
Liquid Density	kg/m³	880.7280	993.1966
Liquid Heat Capacity	J/kg·K	1960.3069	4175.3084
Liquid Thermal Conductivity	W/m·K	0.1270	0.6261

Specifications	Unit	Hot Side	Cold Side
HEX Type			S65-IS10-418-TMTL70
Number of Plates			418
Grouping			1x209 + 0x0 / 1x208 + 0x0
Plate Thickness	mm		0.40
Plate Material / Ratio			AISI304
Effective Area	m²		292.45
Gasket Material			NBRH (SonderLock) -15/150 °C
Frame	Type		IS, painted frame
	Length	mm	2557
	Maximum Number of Plates		421
Volume	l	355.3	353.6
Weight, empty/operating	kg		2486 / 3150
Paint Category			Category C2L
Paint Color			munsell notation:7.5 GB 7.2
Connection	Inlet	F1: DN 200 Flange St.37 PN10	F3: DN 200 Flange St.37 PN10
	Outlet	F4: DN 200 Flange St.37 PN10	F2: DN 200 Flange St.37 PN10
Certification/Approval Type			ABS
Minimum Design Temperature	°C		0.0
Maximum Design Temperature	°C		80.0
Maximum Differential Pressure	kPa		600.0
Maximum Test Pressure	kPa		900
Maximum Design Pressure	kPa	600.0	600.0

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Danfoss HEXSelector 1.3.44

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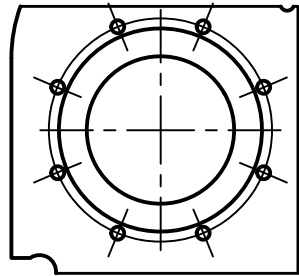
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<i>Project</i>	M/E Lubricating oil cooler	<i>Engineer</i>	
<i>HEX Type</i>	S65-IS10-418-TMTL70	<i>Contact Person</i>	
<i>Units Connected</i>	1 (Parallel)	<i>E-mail</i>	

Items				
Category	Product Code	Pcs.	Delivery Concept	Component
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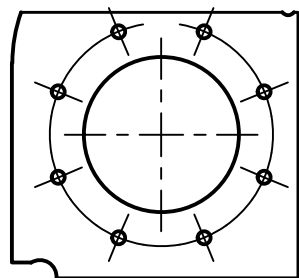
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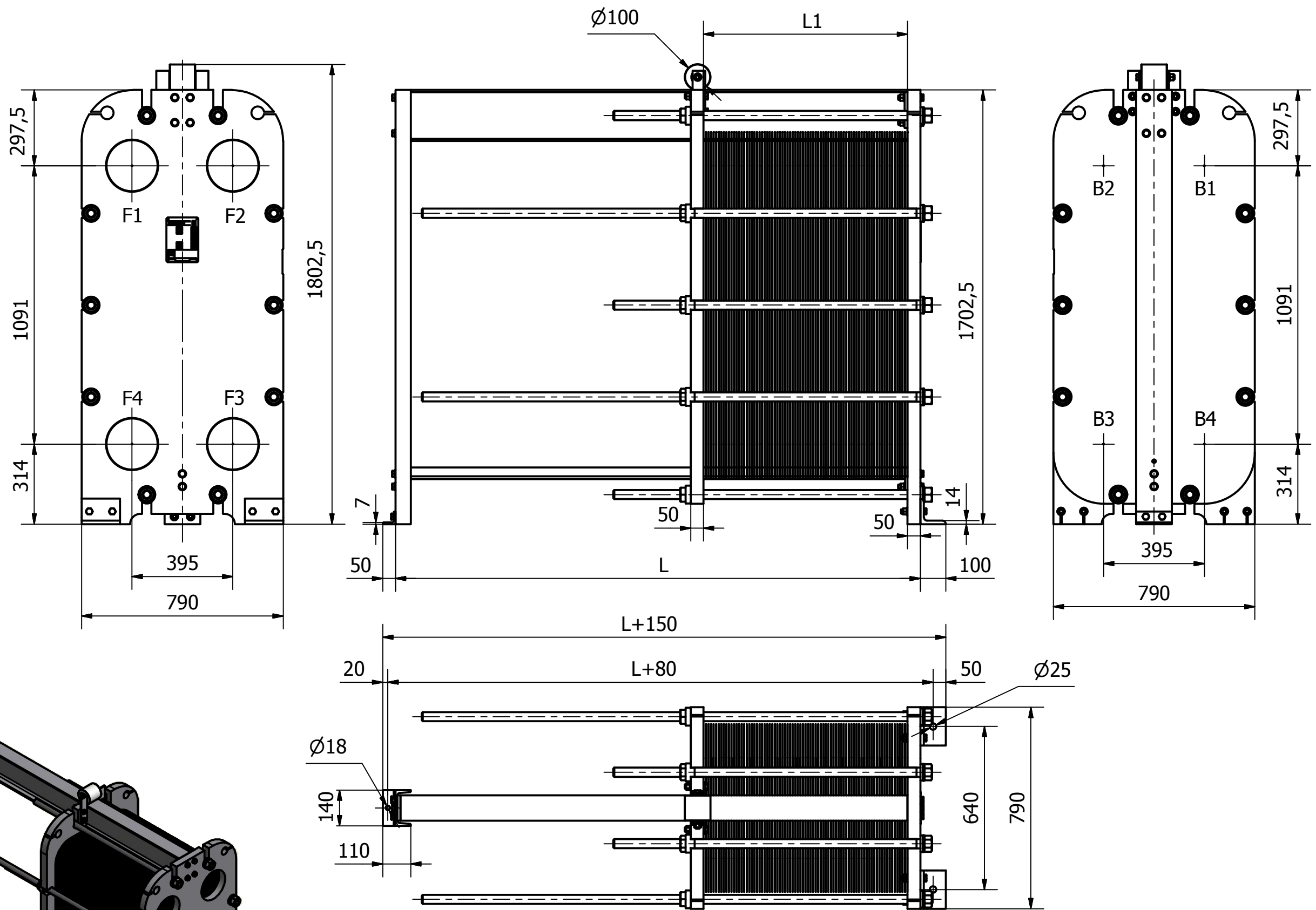
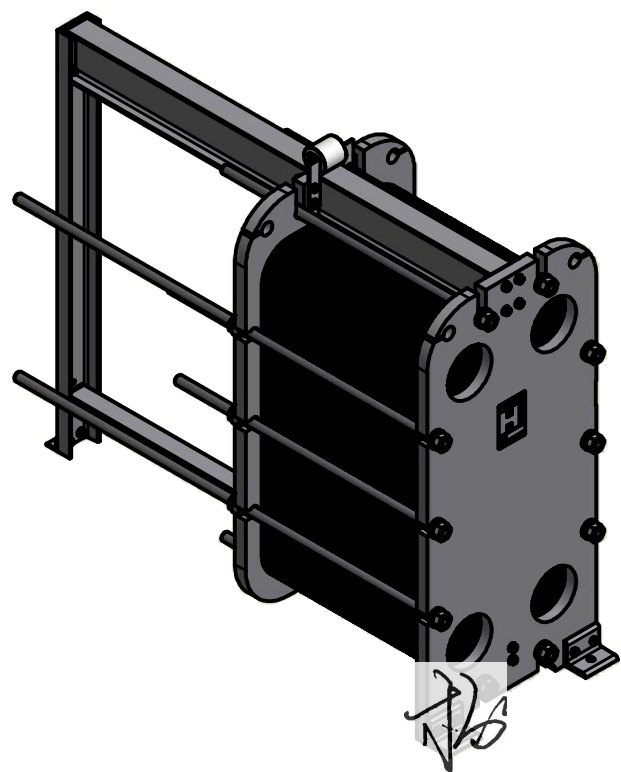


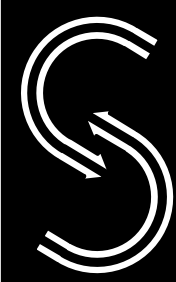
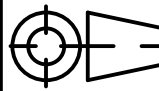


F1-F4 AND B1-B4  
DN200 DIN2632  
8" ANSI CLASS 150  
CLADED OR  
RUBBERLINED



F1-F4  
DN200 DIN2632  
8" ANSI CLASS 150  
UNCLADED



	Dimensions without tolerance	Designed by	Date	Approved by	Date	Rev. no.	Revision Text		
	ISO 2768-m	LGK	05-07-2012	FLEB	19-04-2017	01	Added Hang On and changed thickness of follower to 50mm		
ISO projection			<b>SONDEX</b>		Description: S65 S65A IS PN10 DN200 DIM DRAW (H.O) LENGTH 600-4000 MM FEA				
				<b>Jernet 9</b> <b>DK-6000 Kolding</b>		Rev. date	Rev. by	Drawing no.	Sheet
						08-11-2016	LGK	S65-S65AISP10DN200L600-4000-FEA	1 / 1

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Danfoss HEXSelector 1.3.43

#176-240731203029

Customer		Date	7/31/2024
Project	M/E Jacket cooling F.W. cooler	Engineer	
HEX Type	S22-IG10-36-TKTM29	Contact Person	
Units Connected	1 (Parallel)	E-mail	

Calculated Parameters	Unit	Hot Side	Cold Side
Flow Type			CounterCurrent
Heat Load	kW		1520.00
Inlet Temperature	°C	85.0	43.6
Outlet Temperature	°C	70.1	56.2
Mass Flow Rate	kg/s	24.36	28.84
Volumetric Flow Rate	m³/h	90.00	105.00
Total Pressure Drop	kPa	36.38	44.57
Pressure Drop in Port	kPa	5.57	7.59
Surface Margin	%		17.62
LMTD	K		27.6
Port Velocity	m/s	3.18	3.71
Shear Stress	Pa	100.65	121.30

Properties of Fluid	Unit	Hot Side	Cold Side
Fluid		Water	Water
Liquid Viscosity	mPa·s	0.36	0.56
Liquid Density	kg/m³	973.4956	989.3080
Liquid Heat Capacity	J/kg·K	4194.4978	4179.6939
Liquid Thermal Conductivity	W/m·K	0.6657	0.6381

Specifications	Unit	Hot Side	Cold Side
HEX Type			S22-IG10-36-TKTM29
Number of Plates			36
Grouping			1x17 + 0x0 / 1x18 + 0x0
Plate Thickness	mm		0.40
Plate Material / Ratio			AISI304
Effective Area	m²		9.18
Gasket Material			NBRH (SonderLock) -15/150 °C
Frame	Type		IG, painted frame
	Length	mm	539
	Maximum Number of Plates		42
Volume	l	12.8	13.5
Weight, empty/operating	kg		291 / 317
Paint Category			Category C2L
Paint Color			munsell notation:7.5 GB 7.2
Connection	Inlet	F1: DN 100 Flange St.37 PN10	F3: DN 100 Flange St.37 PN10
	Outlet	F4: DN 100 Flange St.37 PN10	F2: DN 100 Flange St.37 PN10
Certification/Approval Type			ABS
Minimum Design Temperature	°C		0.0
Maximum Design Temperature	°C		98
Maximum Differential Pressure	kPa		600.0
Maximum Test Pressure	kPa		900
Maximum Design Pressure	kPa	600.0	600.0

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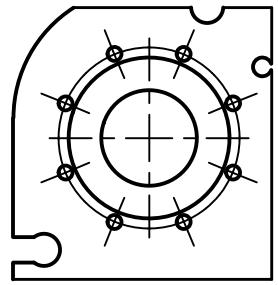
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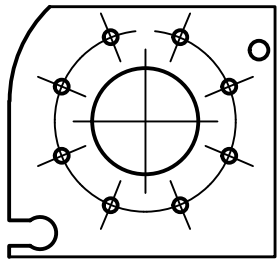
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<i>Project</i>	M/E Jacket cooling F.W. cooler	<i>Engineer</i>	
<i>HEX Type</i>	S22-IG10-36-TKTM29	<i>Contact Person</i>	
<i>Units Connected</i>	1 (Parallel)	<i>E-mail</i>	

Items					
Category	Product Code	Pcs.	Delivery Concept	Component	
HEX		1		S22-IG10-36-TKTM29	

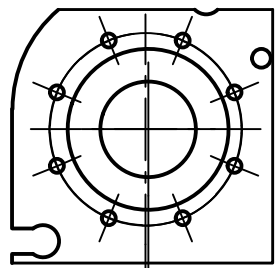




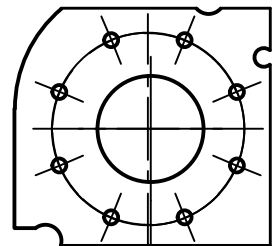
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FLANGED DN100  
DIN2632-2633  
CLADED OR  
RUBBERLINED



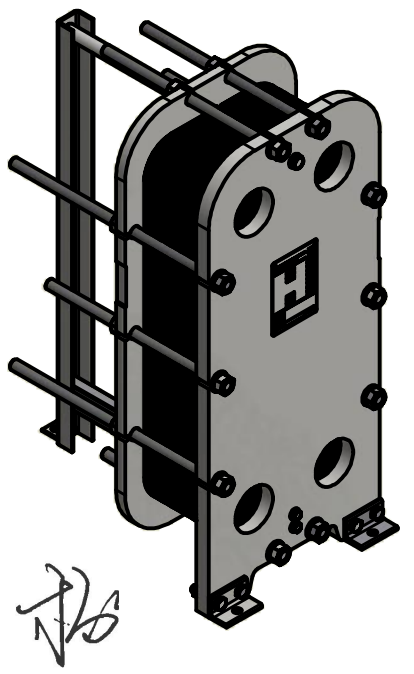
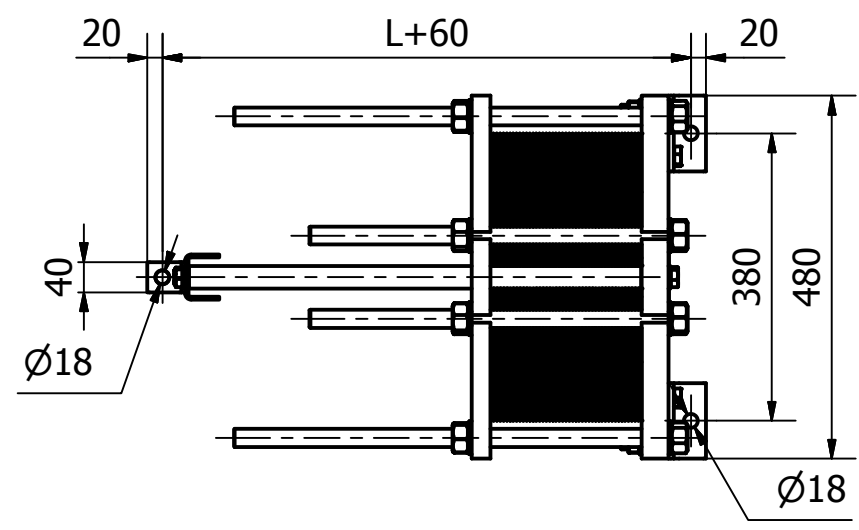
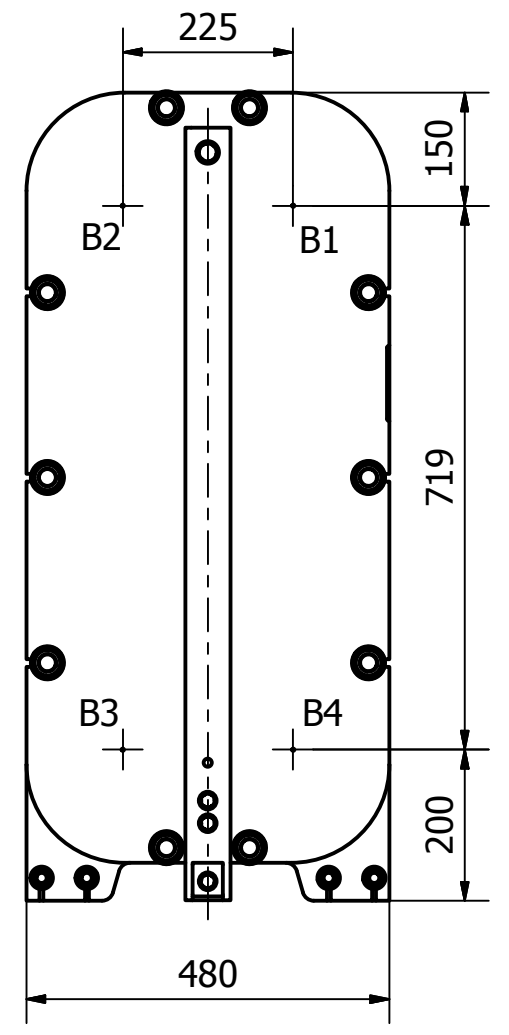
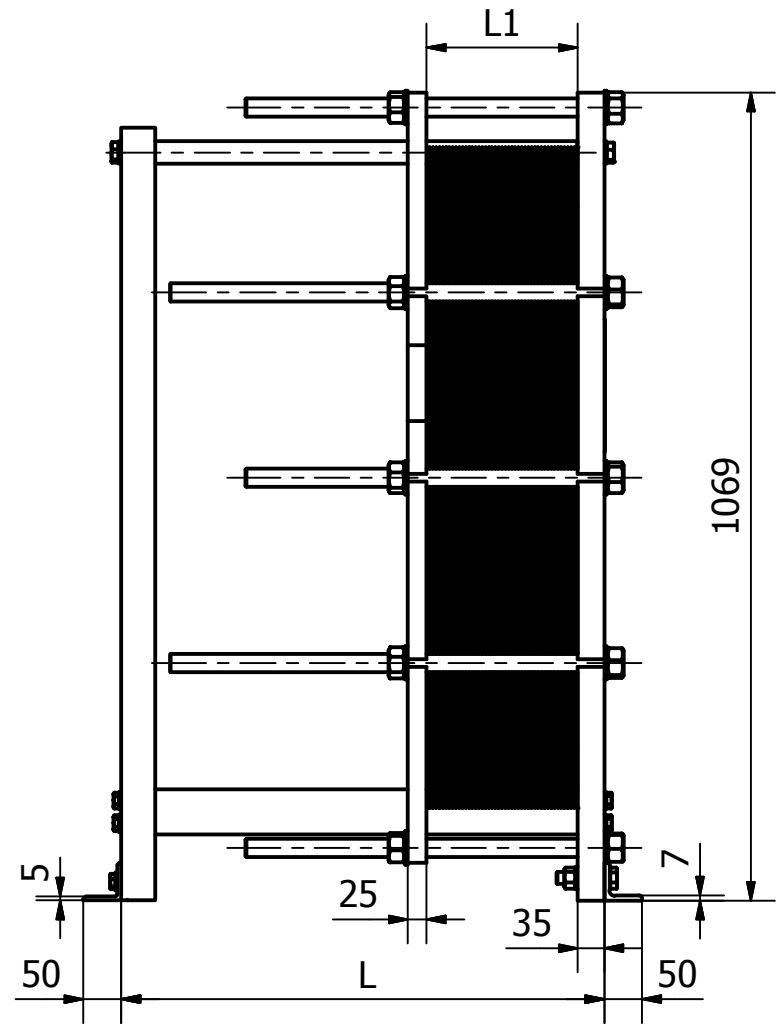
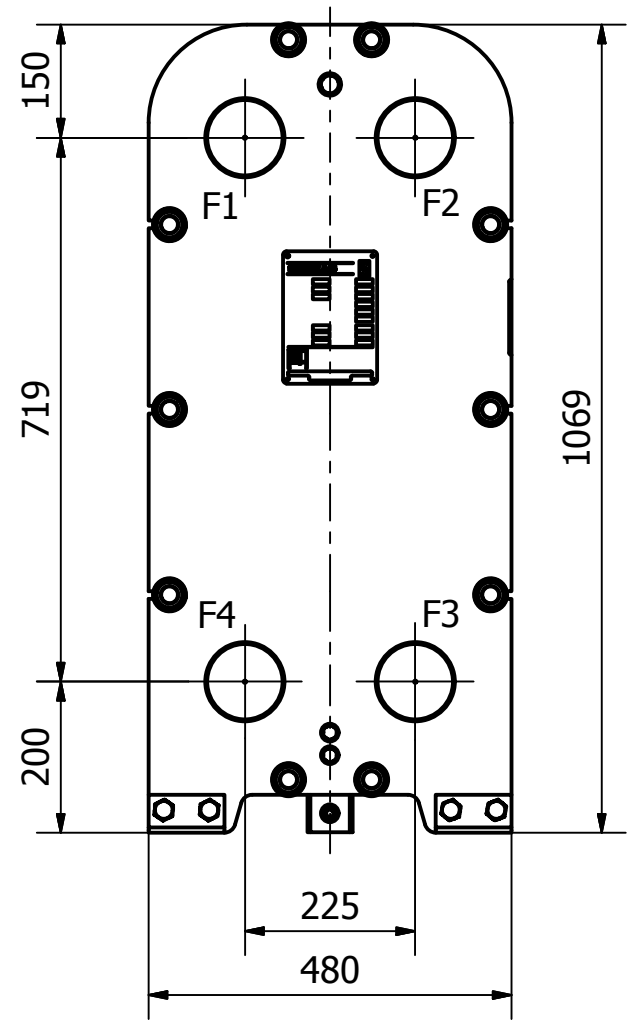
F1-F4  
FLANGE DN100  
DIN2632-2633  
UNCLADED



F1-F4  
FLANGE 4"  
ANSI CL150  
CLADED OR  
RUBBERLINED  
DCD 2,5 MM


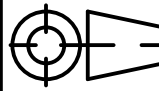


F1-F4  
FLANGE 4"  
ANSI CL150  
UNCLADED  
DCD 2,5 MM



*Handwritten signature*

*Handwritten symbol*

	Dimensions without tolerance	Designed by LGK	Date 26-03-2009	Approved by AGSO	Date 11-10-2018	Rev. no. 05	Revision Text HEAD WAS 30 MM, STAYBOLTS MOVED
	ISO 2768-m	ISO projektion				Description: S21a/S22 IG PN10 DN100 DIM. DRAWING LENGTH 400-1000 MM FEA	
Jernet 9 DK-6000 Kolding		Rev. date 05-10-2018	Rev. by AGSO	Drawing no. S21a-S22IGPN10DN100L400-1000-FEA	Sheet 1 / 1		

**Supply scope: 113600DWT LNG DF OIL TANKER At Xiamen Shipbuilding Industry Co., Ltd**

Hull No.: XSI502A/B/C/D

**Central F.W. cooler**

2 sets Sondex Plate Heat Exchanger type S65-IS10 with 207pcs plates in Titanium 0.5mm & NBR gasket.

**M/E Lubricating oil cooler**

1 sets Sondex Plate Heat Exchanger type S65-IS10 with 400pcs plates in AISI304 0.4mm & NBR gasket.

**M/E Jacket cooling F.W. cooler**

1 set Sondex Plate Heat Exchanger type S22-IG10 with 36pcs Plates in AISI304 0.4mm & NBR Gasket.

Each cooler will be equipped with the following accessories:

4pcs thermometers.

4pcs pressure gauges, glycerine filled needle instrument.

2pcs air venting valves mounted on top connections. **with short pipe**

2pcs drain valves mounted on the lower connections. **with short pipe**

All above parts are fitted on intermediate rings resistant to the respective fluids.

1 set In-line strainer for easy cleaning mounted on the moveable cover of Sea water Cooler.

Counter flange shall be supplied by maker.

**protection for the screw should be provided**

ABS certificates

**Tools:**

spanner

