

**舱 盖 制 造 安 装 原 则 工 艺**  
**Guidance for manufacturing and installation of**  
**hatch cover**

**型式/Type :** **折叠式舱盖/Folding hatch cover**

**船厂/Shipyard :** **大洋/DAYANG**

**船 号/Hull no. :** **DY119/120**

**船级社/Class :** **NK**

**TTS 定单号/TTS Order :** **299**

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# 舱口盖制造指导说明书

## INSTRUCTION OF HATCH COVER MANUFACTURING

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1.0      **综述**  
**General**

1.0.1    **本制造指导说明书的目的**  
**Purpose of this guidance for manufacturing**

编制本手册是为了帮助达到我们及我们的客户所有高质量要求。关于本部分如果有任何疑问或问题请及时联系我们。您可以联系德瑞斯华海方面的质量检测员、采购员和项目负责人。

This manual has been made to help achieving all our and our Customer's high requirements. Should any questions or problems occur regarding this area one should not hesitate to contact us. Main contact parts in TTS side are our own Quality Surveyors, Purchaser and Production Support people.

本手册是为了给予舱口盖制造厂家帮助。它提供了一些重要的注解、指导和提示。

Purpose of this manual is to give assistant for hatch cover manufacturing. It gives some important notes, instructions and hints.

我们极力推荐制造厂有关人员（比如管理人员、质检人员、焊接者、生产人员及计划编制人员等）熟悉本手册。

It is strongly recommended that Manufacture's specialists (like management, QC, welding, production, scheduling etc.) get familiar to this document.

本说明书不影响合同或规格书中规定的责任，也不影响制造厂家本身的制造职责。

The guidance for manufacturing is a document that does not affect the responsibilities defined in the contract or specification nor the responsibility of the manufacturer for its own work.

所有的规则及标准，特别是本手册包含的用于下列各项的说明和指导，规则均完全相同或者规则相同但数值不同，此时应用要求较高的数值。

The rules and standards, especially herein enclosed instructions and directives, to be used in following order. I.e. where regulations are identical or of same kind but with different values the one with the higher valence is to be used.

1、关图纸中的公差或说明

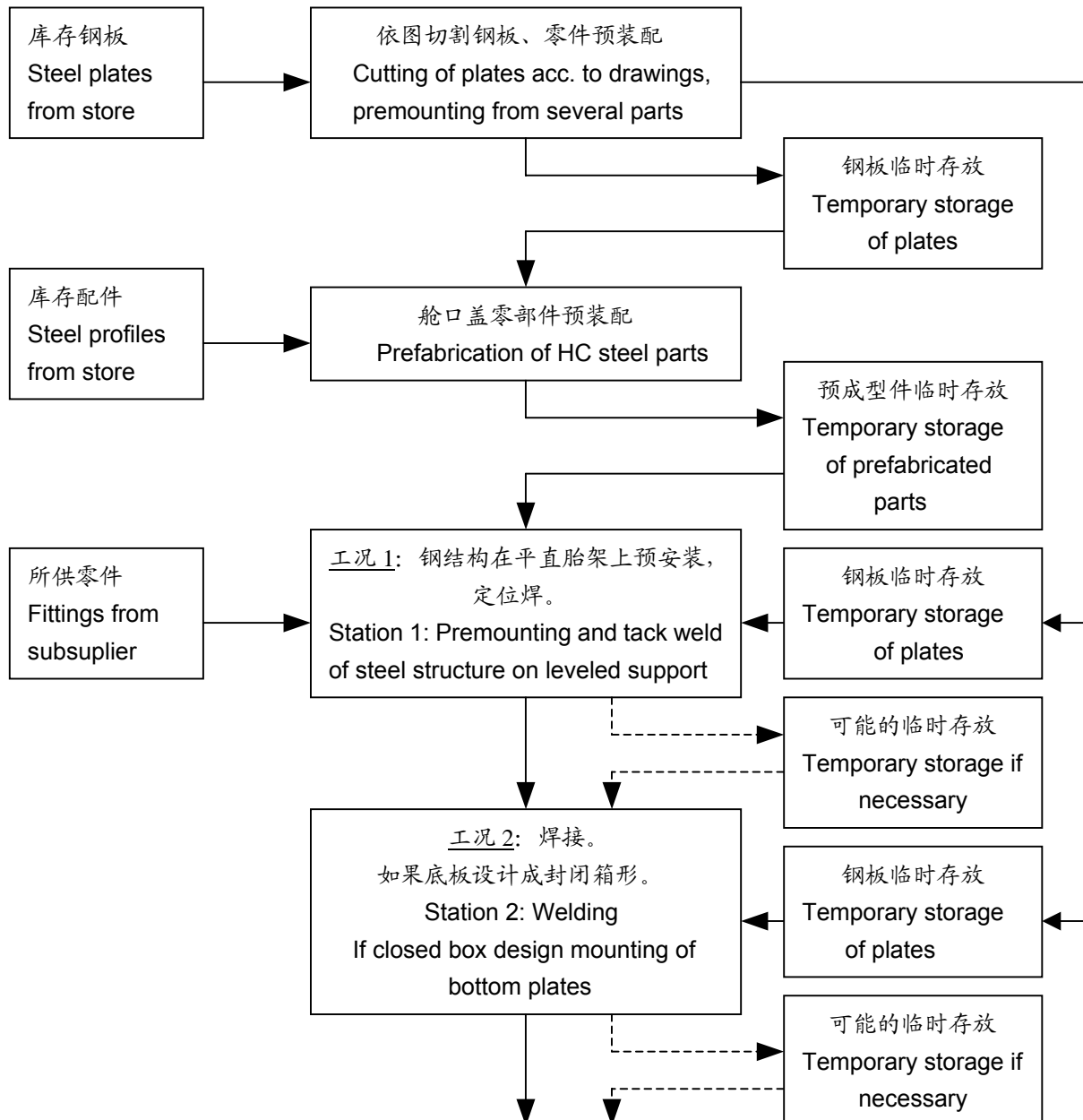
Tolerances or instructions given on the related drawings

2、德瑞斯华海标准说明文件

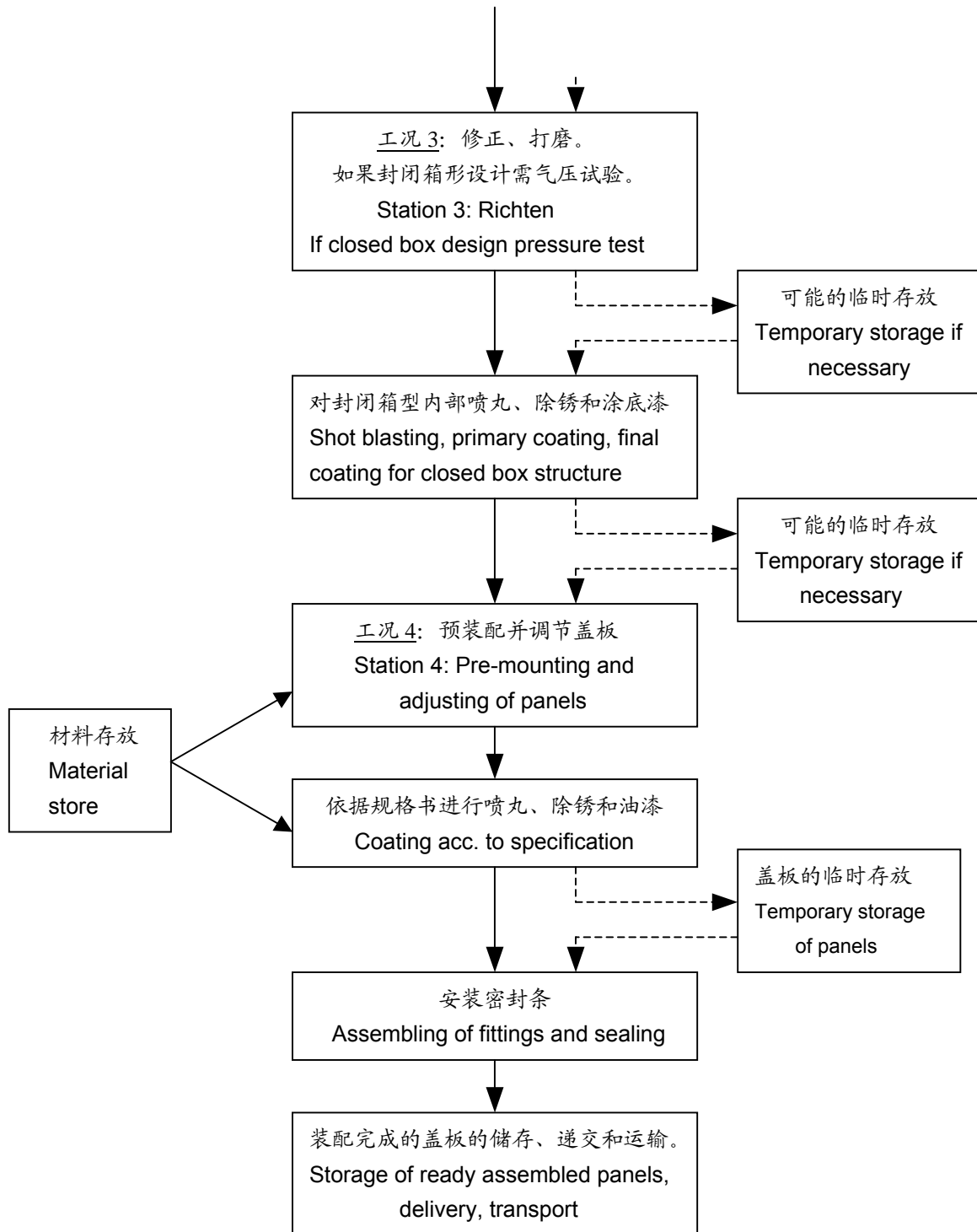
TTS HuaHai standard instruction documents

## 1.1.0 舱口盖制造流程

## Principles of Hatch Cover Manufacturing







**1.1.1 综述****General**

每个制造厂家都应该遵从他们所制订的质量准则和质量体系。其中包括所有必不可少的与舱口盖有关的操作的书面指导和施工程序。施工者质量体系的可靠性是涉及舱口盖最终质量的最重要的文件之一。

Every and each Manufacturer must follow their own written quality policy and quality system. This should also include written instructions and procedures of all essential hatch cover related operations. Reliability of manufacturer's quality system is one of the most important issues regarding the final quality of the hatch cover.

质量体系中最重要条文如下:

- 质量组织
- 检验规则
- 检验、测量、试验仪器设备
- 人员的资格要求
- 报告体系

The most important elements of a quality system are:

- ~ -Quality organization
- ~ -Inspection routines
- ~ -Inspection, measuring and test equipment
- ~ -Requirements for qualified personnel
- ~ -Reporting system
- ~

**1.1.2 船级社认可****Approval of classification society**

制造厂家应负责向合同规定的船级社提交车间认证。建议制造厂家在订购钢材及焊接耗材之前先与船级社取得联系,以免出现麻烦。船级社最为重视的是焊接。当焊接车间需要认可时,船级社检验人员会在生产开始之前对场地进行校验。以下是必须的检查项目:

The Manufacturer is responsible for getting the workshop approval from the Classification Society specified in the Contract. It is recommended to contact Classification Society prior ordering any steels or consumable to avoid difficulties. The most crucial item for the Classification Society's point of view is welding. When welding shop approval is required a Class surveyor will visit the site before any manufacturing starts. At least following items are to be checked:

- 焊工资格
- 采用的焊接方法,焊接材料的储藏

- 材料跟踪
- Qualification of welders
- Welding methods employed (including welding onto shop primer) Storage of welding consumable
- Material follow-up and traceability

在生产过程中船级社验船师会至少检查以下项目来确定船级社要求:

During the manufacturing Class surveyor will check that at least following items conforms Class's requirements

- 钢结构必须依据经审定的图纸、认可材料和焊接耗材（有证书）
- 焊接质量和尺寸
- 检验和试验报告，并附有制造厂家所做的无损探测结果报告。
- Steel structure must be according to approved drawings Approval of materials and consumables (certificates)
- Quality and size of the welds
- Inspection reports and tests carried out by the Manufacturer Additional NDT results

### 1.1.3 质量控制（QC） Quality control (QC)

制造厂家实行的质量控制必须依据合同的规定和船级社的标准。以下各方面须引起质检人员（QC）的特别注意：

Quality Control carried out by the Manufacturer must be conformed to all requirements set in the Contract and Classification Society's Rules. Following areas of production need a special attention from QC:

#### 1.1.3.1 钢结构 Steel structure

- \* 零件、部件、盖板的尺寸和公差。
- \* 收缩量。
- \* 每个部件的位置。
- \* 钢材施工质量。
- \* 焊接质量。
- \* dimensions/tolerances of parts, sub-assemblies and panel
- \* shrinkage rate
- \* locations of each parts

- \* steel work quality
- \* quality of welds

#### 1. 1. 3. 2 附件

##### Outfitting

- \* 材料依据规格书（当转包时尤为重要）。
- \* 附件位置。
- \* 热处理/表面粗糙度。
- \* 铰链、滚轮的同轴度。
- \* 焊接质量。
- \* 检测舱口围的基准线。
- \* 盖板接缝间调整对直。
- \* material according to specification (important in case of subcontracting)
- \* location of fittings
- \* heat treatment/surface roughness
- \* alignment of hinges, wheels
- \* quality of welds
- \* baseline of test coaming
- \* alignment of panels

#### 1. 1. 3. 3 试验

##### Testing

- \* 机械试验。
- \* 气压试验。
- \* 重心。
- \* mechanical testing
- \* pressure testing
- \* centre of gravity

#### 1. 1. 3. 4 表面处理

##### Surface treatment

- \* 喷丸表面足够的粗糙度和清洁度。
- \* 焊接变形矫正。
- \* 依据油漆商家要求采取合适的油漆流程（混合、模糊漆膜、条纹漆膜等）。
- \* 足够的干燥时间。
- \* adequate roughness/cleanness of the blasted surface

- \* welding correction
- \* proper painting procedure (mixing, mist coat, stripe coats etc.) according to makers requirements
- \* adequate curing times

#### 1.1.3.5 完工

##### **Finalising**

- \* 橡皮安装。
- \* rubber installation

#### 1.1.4 质量控制部门

##### **Quality organisation**

强烈建议每一制造厂家有自己的质量控制部门，此部门应与制造部门相互独立，直接受管理部门的领导。

It is strongly recommended that every fabricator has its own quality organization which is separated from production department. This quality organization should be directly under management control.

质检人员应遵循以下几个方面：

Following QC-personnel is required:

对于小规模的生产厂家（每年舱口盖产量最多 2000 吨）

- \* 1-2 名钢结构/表面处理技术人员。
- \* 拥有超声波/X 光片技术人员。

For the small scale fabrication (up to 2000 ton/year of hatch covers)

- \* 1-2 steel /surface treatment specialist
- \* availability of ultra sonic/X-ray specialist subcontractor

中等规模的生产厂家（每年舱口盖产量为 2000-5000 吨）

- \* 1-2 名钢结构技术人员。
- \* 表面处理技术人员。
- \* 拥有超声波/X 光片技术人员。

Medium scale fabrication (2000-5000 tons of hatch covers/year):

- \* 1-2 steel structure specialist
- \* surface treatment specialist
- \* availability of ultra sonic/X-ray specialist subcontractor

大规模的生产厂家（每年舱口盖产量多于 5000 吨）

- \* 1 名主管。
- \* 1 名焊接工程师/焊接技术人员。
- \* 2 名钢结构技术人员。
- \* 表面处理技术人员。
- \* 拥有超声波/X 光片技术人员。

Large scale fabrication (above 5000 tons of hatch covers/year):

- \* 1 chief
- \* 1 welding engineer/welding specialist
- \* 2 steel structure specialist
- \* surface treatment specialist
- \* availability of ultra sonic/X-ray specialist subcontractor

应该提起注意，除了以上各条的监督，设计/制造管理人员和职员应尽力实现其它的质量控制要求。例如，向德瑞斯华海公司提供报告。

It should be noted that additionally of this direct quality control personnel a lot of effort must be put by the design/production management and staff to fulfill all other QC-requirements for example reporting to TTS Ships Equipment.

质检人员必须是经过专业培训并胜任所负责工作的人员，他们也必须能够解释和判断检验结果。

The QC personnel must be trained and qualified to tasks they are in charge of. They must also be able to interpret and judge the results of inspection.

联系人员必须能够用英语与德瑞斯华海进行口头和书面形式的交流。

The contact person towards TTS Ships Equipment must be able to report in English both verbally and in written form.

以下是必须的质检器具：

Following QC-equipment is required:

- \* 焊接测量片（a/z-公制）。
- \* 喷丸样板。
- \* 接触式温度计。
- \* 腕式湿度计。
- \* 漆膜测厚计。
- \* 露点板。
- \* 水平仪和/或经纬仪。

- \* 卷尺、卤素灯、镜子等。
- \* 检查直线长度的不同长度的直尺。
- \* fillet weld measurement tools (a/z-meter)
- \* blasting example plates
- \* contact thermometer
- \* psychrometer of sling type
- \* paint film thickness gauge
- \* dew-point plates
- \* levelling equipment or/and theodolite
- \* measurement tapes, halogen lamps, mirrors etc.
- \* rulers of different length to check local straightness

所有这些量具必须是高质量并定期检测性能。每次使用时还应校准刻度及状态，并注意维护。所有这些操作是制造质量体系的一部分。

All these equipment must be of good quality. Follow-up of their capability of performance, calibration and condition as well as maintenance must be arranged. This operation should be part of the fabricators quality system.

#### 1.1.5 材料跟踪

##### **Material traceability**

总的来说所有用于制造舱口盖的材料应该毫无疑问的经过船级社认可，并提供工厂证书。材料的跟踪标记应妥善保管，也就是保存钢板上的钢厂编号标记、钢板炉号。这样便于每件材料的查寻。

Generally all the materials used for hatch cover fabrication must be approved by Classification Society in question. Mill certificates must be available when requested. Traceability of the material must be taken care by marking plate steel mill code/heat number of the plate to the nesting plan including part numbering. By this mean material for each single part can be traced.

#### 1.1.6 质量文件和记录

##### **Quality documents and quality records**

制造厂家必须良好运作，以便控制从客户定货到舱口盖交货整个过程的制造项目。同样，所有部门和职员的责任应该明确。

The manufacturer has to have well functioning processes in handling the manufacturing projects from customer order to the delivery of the hatch covers. Likewise the organization and the responsibilities of all employees have to be defined and clear.

质量文件是书面的说明和描述，指导工厂每天的日常操作并提供依据。这些质量文件分为几种，从质量手册（总则及指导书）到详细的施工说明（焊接程序、质量检测）。建议制造厂家编制主要操作的质量体系文件和主要工序的书面指导。

Quality documents are written instructions and descriptions telling how the company handles everyday routines and what the resources are. There are different levels of documentation starting from quality manual (general principles and guidelines) ending to detailed work instructions (welding procedures, quality inspection). It is recommended that the manufacturer has a documented quality system and written instructions of the main activities.

质量记录是与不同定单相关的独立文件。典型的质量记录包括材料证书，测量报告书（和其它质量检测报告）和钢结构及油漆证书，一般只有舱口盖的最重要的数据和质量需要监测。另外，制造厂家还须有一套系统来编制（比如：测量并将结果保存归档）、识别与保存所有舱盖制造工程中所需的质量记录。

Quality records are separate documents related to different orders. Typical quality records are material certificates, measurement protocols (and other quality check reports) and certificates for the steel structures and the coating system. Only the most important features or qualities of hatch cover are requested to be monitored. The manufacturer has to have a system to produce (e.g. make measurements and document the results), identify and save all the quality records required in a hatch cover manufacturing project.

#### **1.1.7 检验报告**

##### **Inspection reports**

出具检验报告的目的是确保产品达到技术要求，同时也为日后的对产品所发生的意见分歧提供了有力的证据。制造厂家完全有责任根据德瑞斯华海公司提出的要求编制检验报告。

Purpose of the inspection reports is to make sure that product will conform all technical requirements. Also reports allows later on to verify features in case of any discrepancies. It is completely on Manufacture's responsibility to produce these reports according at least to requirements set and send by TTS Ships Equipment.

##### **1.1.7.1 交货控制报告**

##### **Delivery control**

交货控制报告是在产品制造阶段一些具体的检验、试验和认可的汇总。

The delivery control report is the summary of all specified inspections, tests and



approvals that have to take place during the manufacturing stage.

在交货之前，制造厂家应检查产品以确保其符合所有要求并为运输做好准备。这些工作包括确保所有具体的检验和试验均已完成并做好了相应的纪录；记录中数据应表明产品没有不符合要求之处；确保零部件没有缺损；产品外观应令人满意等。

Before delivery manufacturer will check that the product conforms all requirements and is ready for the transportation. This includes making sure that all specified inspections and tests have been made and recorded accordingly, the records show no unsettled non-conformity, no components are missing, the product is visually satisfactory, etc.

#### **1.1.7.2 尺寸控制清单**

##### **Dimensional control sheets**

尺寸控制清单是最为重要的控制文件，它可以证明产品是否符合要求，该文件的编制原则在本指导说明书中做了描述。

Dimensional control sheets are the most important control document by which the conformity of the of the product is verified. The principle of these reports is presented in this Guidance.

#### **1.1.7.3 无损探伤报告**

##### **Records of non-destructive tests**

无损探伤测试（NDT）的基本要求由船级社来确定。

The basic requirements for non-destructive tests (NDT) are determined by the Classification Society.

## 2.1 施工图纸资料

### Workshop Documentation

### 2.1.1 综述

#### General

由德瑞斯华海公司提供的图纸资料是经审定的图纸。由于每个制造厂家都有自己的施工流程和习惯，德瑞斯华海公司不可能为每一个施工单位提供生产设计图纸。因此由德瑞斯华海提供的图纸需要由施工厂家自己进行生产设计，以便对施工人员将细节表达清楚。

The documentation provided by TTS is the approved drawings. Because every manufacturer has its own procedures and practices to work it is not possible to complete a copy of documentation for each workshop. Therefore the documentation TTS provides must be processed by the manufacturer themselves in order to make every detail clear for the workers.

### 2.1.2 德瑞斯华海公司供货范围

#### Scope of TTS delivery

每一个制造厂的生产范围都已在合同中明确，基本上是增加了尺寸的公差、零件号的准备、切割清单、以及套料等，其中套料一般由制造厂家完成。如果合同中达成协议，德瑞斯华海公司可以提供材料预估单、预套料图纸以及有详细施工信息的切割清单。

The scope of work each manufacturer has to do is as stated in the Contract. Basically it is to add allowances to dimensions, preparing part numbering, cutting lists, nesting etc. Nesting will be made always by the manufacturer. For the material reservation or ordering pre-nesting plan or cutting lists with detailed working information can be supplied by TTS if agreed upon in the contract.

一般情况下，每个制造厂家自己完成材料订货所需的切割清单和预套料图。考虑到德瑞斯华海公司仅提供送审图纸，以下各章给出了切割清单和预套料图的例子作为参考。Normal practice is that each manufacturer makes cutting lists and pre-nesting for material reservation/order by themselves. In following chapters an example of cutting lists and pre-nesting plan is presented as recommended to each manufacturer in case TTS delivers only approved drawings.

### 2.1.3 收缩量

#### Shrinkage

在制造过程中钢构件发生的收缩是由于气割、焊接或矫正过程中产生热量而发生的。在所有德瑞斯华海图纸中如无特别说明，均为净尺寸，故收缩余量应由制造厂家计算，通常在套料中或在套料之前考虑。为装配所划的尺寸也应该增加收缩余量。

Shrinkage of the steel members occurs during fabrication due to heat input of dimensions are shown unless otherwise stated. So any add of shrinkage must be done by the manufacturer. Normally the manufacturer adds shrinkage factors to parts in or before the nesting procedure. Shrinkage must be added also to the dimensions which are marked for assembly.

需要的收缩量取决于装配的准确性（缝隙越大收缩量越大）、应用的热量消耗（对母板加热越多收缩量越大，对厚板也要视预热情况）、材料厚度（材料越厚收缩越小）、焊接顺序（小焊缝施焊在先，则产生收缩较小）和结构设计。

The amount of the needed shrinkage depends on the accuracy of outfit (bigger gaps, bigger shrinkage), applied heat input (more heat to parent plates, more shrinkage (see also preheating of thick plates)), material thickness (thicker material less shrinkage) welding sequence (smaller welds first generates smaller shrinkage) and structure design.

**不采用不必要的厚焊缝**

**Never use thicker welds than necessary!**

选择产生热量较少的焊接方法（用 CO<sub>2</sub>-MAG 代替手工焊）和应用精确的自动切割机（用 CNC 代替手工切割），都可以使可能的变形降到最小。

Choosing less heat generating welding methods (CO<sub>2</sub> -MAG instead of manual stick electrodes) and using of high accuracy automatic cutting machines (CNC instead of manual cutting) enables to achieve minimum possible distortions.

正如前面所描述的，每个制造厂家应该根据其自身的施工流程来考虑收缩系数，其收缩值取决于制造厂家及其经验，测量、评估收缩量并记录结果非常重要。通过这些统计数据，可以使得理论收缩值与实际收缩值一致，同时还能在发生变化时（焊接方法、制造过程等）及时调整收缩值。

As described above each manufacturer has its own specific procedures and to choose its own shrinkage factors. Shrinkage values are depending on the manufacturer and based on own experiences and knowledge. It is very important to measure and evaluate shrinkage and record the results. By this statistical data it is possible to focus assumed shrinkage values to be equivalent with the real values. Following this helps to update shrinkage values if any changes take place (welding method, fabrication sequence, etc.).

收缩余量必须在以下制造阶段给予考虑:

- \* 切割零部件
- \* 顶板焊接
- \* 横梁、边板、端板和部件装配的焊接
- \* 部件装配时的矫正
- \* 顶板焊接扶强材
- \* 主结构上焊接主梁或次梁
- \* 主要结构的矫正

Shrinking allowances have to be taken into a consideration in the following fabrication steps:

- \* flame cutting of parts
- \* top plate welding
- \* welding of beams, side- and end plates and other sub-assemblies
- \* straightening of sub-assemblies
- \* welding of stiffeners onto the top plate
- \* welding of main beams and secondary beams to main structure
- \* straightening of the main structure

以下数据仅做示例:

Following is to be taken as an example only:

对于主要钢结构包括顶板的安装和焊接及主结构的焊接, 可以采用 0.6-1.2mm/m 的收缩量。焊接扶强材或横梁时产生的垂直收缩必须相对于结构平均分布(顶板的划线)。例如, 如果顶板的收缩补偿量总共为 15mm(垂直于扶强材)而扶强材数量为 10 个, 那么扶强材的分布距离应该是理论距离+15mm/10 块=理论距离+1.5mm。因为在最终装配之前部件装配要经过切割、焊接和矫正(在最终装配之前部件已经完成)所以附加收缩量(0.6-1.2mm/m)应考虑。由于部件装配在与主结构焊接时会再次收缩, 因此部件装配的总的收缩余量需要大约  $2 * (0.6 - 1.2 \text{ mm/m})$ 。

For the main steel structure including top plate assembly and welding as well as welding of the main structure 0.6 - 1.2 mm/m can be applied. Shrinkage occurring perpendicular to welding of stiffeners or beams must be distributed evenly over to structure (marking of top plate). For example if the shrinkage compensation of the top plate is totally 15 mm (perpendicular to stiffeners) and the number of the stiffeners is 10, plotted spacing of each and every stiffener must be the nominal spacing + 15 mm/10 pcs = nominal spacing + 1.5 mm. Because subassemblies are flame cut, welded and straightened before main assembly (subassemblies are completed before main assembly) an additional shrinkage factor (0.6 - 1.2 mm/m) for them must be added. Subassemblies are shrinking again in the main welding phase so totally subassemblies need  $\sim 2 * (0.6 - 1.2 \text{ mm/m})$  allowance for the shrinking.

收缩发生在焊接的两个方向上，即纵向和横向上，它们必须分开来考虑。对于高度小于 1000mm 的盖板和构件，高度方向收缩可以不考虑。

Shrinkage occurs in both directions of the welds, i.e. in longitudinal and transversal direction. These have to be evaluated separately. For the height of the panels and for the parts less than 1000 mm shrinkage is not to be taken into consideration.

#### **2.1.4 施工余量**

##### **Working allowances**

施工余量一般用于在制造前无法估计的可能收缩量和不确定的变形，其主要指在钢结构构件的理论尺寸上留出超过估计收缩余量值的多余材料。

Working allowances are normally used in case all possible shrinkage and some unexpected deformations during fabrication can not be estimated before manufacturing. Working allowance means to add to nominal dimension of the steel members some extra material exceeding the amount of the estimated shrinkage allowance.

当所有构件的焊接完成，盖板的尺寸检查完毕进行舱口盖总预装时，施工余量应切割掉，例如在顶板的外边缘上留 20-30mm 的余量。

Working allowance, for example, is used on the top plate, for example 20-30 mm around the outer edges. This allowances will be removed during outfitting when all main steel members has been welded and dimensional check of the panel is completed.

#### **2.1.5 套料**

##### **Nesting**

当切割清单完成之后，所有的零件应该显示在钢板上以便切割机进行切割成型，在开始之前，所有零件必须考虑收缩因素重新确定尺寸，许多套料程序中这一步是自动完成。另外，一些技术参数，比如板中几何图形的距离、切口因素、切割方向和速度必须根据制造厂家的经验和设备供应商的建议来确定。

After completion of cutting lists all parts must be placed to existing steel plates for with the shrinkage factor. In many nesting programs this can be done automatically. Technical parameters like plate/geometry distances, kerf-factor, cutting direction, cutting speed etc. must be determined according to manufacturers experience and equipment supplier recommendations.

在套料中零件号必须被定义。在套料图中零件一般从 1 开始依次编号。在套料图中每一个位置都有施工号码，它对应相应零件。

During nesting work part numbers must be defined. In nesting plan normally parts are numbered in ascending order starting from 1. In nesting plan each position has a workshop number, which identifies the part.

下列信息应包含在每个零件的标记中:

- \* 订货号 (根据制造厂家的编码系统); 明确指出订货情况。
- \* 零件规格型号 (板/横梁/扶强材)
- \* 指明下一工序号 (指明此零件在厂内何处装配)
- \* 零件识别编码

Following information should be included in the marking of separate parts:

- \* Order number (according manufacturer's numbering system); identifies which order is in question
- \* Part specification code (plate/beam/stiffener)
- \* Code for next procession area (place where this part will be assembled, address inside the factory)
- \* Part identification number

#### 3.1 钢结构; 装配和焊接 Steel structure; assembly and welding

##### 3.1.1 部件制造 Part manufacturing

部件制造是整个生产的第一个环节, 在舱口盖制造中大部分部件是切割而成的, 部分型钢和扁钢可以用锯切割成型, 在一些特殊情况下也可以采用剪板机。

Part manufacturing is the first step of the production process. In hatch cover manufacturing most parts are created by flame cutting. Some sections and flat bars can be cut by saws. In special cases plate shear can be used for the cutting.

部件制造的准确性和质量是高质量舱口盖的保证, 准确、良好的焊缝和清晰的标记可以确保后道工序达到预期要求, 强烈推荐采用 CNC 切割机。

Quality and accuracy of part fabrication are the base for high quality hatch covers. Accuracy, good welding chamfers and clear marking enable the rest of the production process to achieve set targets. CNC cutting machines are strongly recommended.

一般可以达到的准确性应根据零件尺寸来定。

Normal achievable accuracy for the parts is depending on the size of the part.

钢结构的建造要求请参阅德瑞斯华海文件 HQS. 01. 0000。

For requirements on fabricated steel structure please see TTS HuaHai document HQS.01.0000

##### 3.1.2 部件装配 Subassemblies

钢结构制造中采用部件装配的目的是提高劳动生产率、缩短建造周期以及更合理的利用劳动力和设备。部件装配有以下好处:

The purpose of using subassemblies in steel structure manufacturing is to achieve higher productivity, shorter throughput time and better usage of labor and manufacturing facilities. Following benefits can be listed because of subassembly manufacturing:

- \* 在车间更有效的展开生产 (可以有更多的工人参与到前期生产中; 尽可能缩短整个建造周期)
- \* 结构的尺寸可以更小, 便于各种翻身和移动操作; 这样可以产生更好的工况、提高劳

动生产率。

- \* 可以控制成型盖板的收缩
- \* 更好的利用现有的生产设备
- \* 增加了灵活性
- \* 通过生成较小的、完整的装配部件，建造过程可以更为简单并易于理解。
- \* spreading the work more effectively through the workshop (more worker are involved manufacturing in earlier state of production; possibilities to shorten total throughput time
- \* the physical size of structures to be handled is smaller that enables all kind of turning and moving operations; this result better working positions and higher productivity
- \* controlling of shrinkage in ready panel
- \* better usage of existing manufacturing facilities
- \* increasing of flexibility
- \* by creating smaller, complete sub-assemblies, process will be simplified and it is more understandable

在焊接中利用部件装配目的是使施工位置便于操作从而减少工时并且有效控制收缩。通过重复相同形式的装配部件，这些部件有相同的焊接顺序、焊接方法和其他变量，可以很容易为总体装配制造准确的装配部件。比如，在总体装配时变量就会减少，控制收缩也很容易。通常，在较舒适的位置进行焊接，速度要比在施工困难的位置要快，质量也好。

The target of using subassemblies in welding work is to reduce working hours by better position of work pieces and control shrinkage. By repeating same type of subassemblies with same welding sequence, welding method and other variables it is easy to achieve accurate subassemblies for the main assembly step. I.e. Variables are less during main assembly and control of shrinkage is more easy. Usually welding speed is higher and the quality is better when welding in normal position than in forced position.

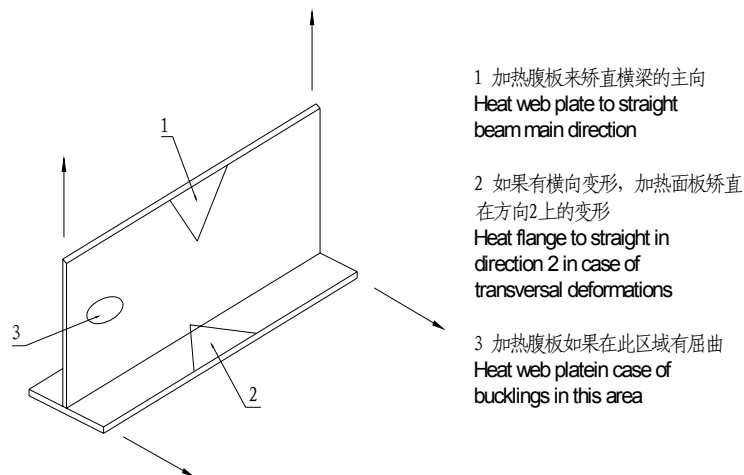
在焊接操作中，由于热量和结构产生的变形应该通过矫正使其恢复原状，否则在下一生产阶段将会产生较大困难。

During the welding work deformation occurs due to welding heat and structures are to be returned to their original shape by straightening. In next fabrication step it creates great difficulties unless subassemblies are not in correct shape and dimension.



下图显示了一个简单的矫正示例:

The picture shows a simplified example of straightening:



在将装配部件交到下一工序之前应做好标记以便识别。

Before delivering subassemblies to next step in the manufacturing process they must be clearly and visibly marked for easier identification.

如图纸中无特别说明, 公差采用德瑞斯华海公司标准。

If not otherwise stated in the drawings tolerances acc. to TTS Standards to be used.

### 3.1.3 整体装配及焊接 Assembly and welding

#### 3.1.3.1 综述 General

整体装配是一个制造阶段, 在此阶段所有的主要构件都要装配并焊接在顶板上。一般整体装配在顶板装配场地进行。

Main assembly is a manufacturing step where all major steel members shall be assembled and welded to the top plate. Normally main assembly is performed in the same place as top plate assembly.

按照以下状态选取装配和焊接顺序:

- 钢结构的设计
- 所应用的器材和设备
- 制造厂的经验

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Assembly and welding sequence to be chosen are depending on following conditions:

- Steel structure design
- Facilities and equipment available
- Manufacturer's experience and knowledge

根据顶板上的位置线首先安装扶强材，之后有两种方案可供选取：

Stiffeners are assembled on the top plate first according to marked lines on the top plate. After this two main alternatives can be chosen:

方案 1:

- \* 利用高效焊接设备焊接扶强材
- \* 装配主/次梁和侧/端板
- \* 依据认可的焊接顺序进行焊接

**Alternative 1:**

- \* welding of stiffeners with high efficiency welding equipment
- \* assembly of primary/secondary beams and side/end plates
- \* welding according to agreed welding sequence

方案 2:

- \* 装配主/次梁和侧/端板
- \* 依据认可的焊接顺序进行焊接包括对扶强材的焊接

**Alternative 2:**

- \* assembly of primary/secondary beams and side/end plates
- \* welding according to agreed welding sequence inclusive stiffeners

焊接顺序的选择应使得变形最小。一般来讲，焊接应从中间区域向两边延伸。如果遇到封闭结构（箱形梁、双壳板）在封闭此结构之前，控制变形尤为重要。如果产生了过大的变形结构封闭后将很难矫正。

Welding sequence should be chosen to minimize deformation. Normally welding should be started from middle area to outwards. In case of big closed structures (box beams, double skin) it is even more important to control deformation before closing the structure. In case there are excessive deformations it is very difficult to make corrective actions after structure is closed.

关于装配和焊接顺序的具体情况应由制造厂家焊接技术人员制定。

Regarding assembly and welding sequence project specific information to be established by manufactures welding expert.

### 3.1.3.2 封闭结构的保护

#### **Protection of closed structures**

在结构封闭之前应检查以下 3 个项目:

- \*所有的构件必须在箱形结构封闭前全部焊接完毕并核查(一旦封闭没有任何开口)
- \* 结构外形在允许范围内
- \* 封闭前塞进防腐药粉(如果指明)或用通气塞(依产品而定)

Before closing the structure check three items:

- \* All steel members are fully welded and checked before closing any boxes (no access anymore after closing)
- \* The shape of the structure are within the acceptable limits
- \* Insert corrosion inhibitor powder into the box before closing it (if specified) or use filling sockets (depending on product)

如果合同中指明封闭箱形结构必须用防腐剂保护内部,此防腐剂可以祛除内部氧气并防止腐蚀。防腐剂是不可燃的,即外部焊接没有危险。如无特别说明建议用量为 100 克/每立方米。

If specified in the fabrication contract closed boxes must be protected inside with corrosion inhibitor. This inhibitor removes existing oxygen inside and prevents corrosion. The inhibitor is not flammable i.e. welding outside of closed box is not dangerous. The recommended amount of the powder is 100 g/m<sup>3</sup> of protected space unless otherwise stated.

防腐剂类型在合同中指明。

Type of inhibitor to be used is specified in the contract.

焊接完毕将盖板送往喷丸房之前要核查箱形梁结构是气密的。在腔内充以 0.02 ~ 0.1bar (视结构形状而定)的压力并用肥皂水检查所有焊缝。空压试验应通过注气插座。

After welding and before sending the panel to shotblasting and priming verify that the box girder structure is airtight. Apply air pressure of abt. 0,15 bar inside the cavities and check all welding seams by soapy water. The air pressure is to be applied through the filling sockets.

### 3.1.3.3 焊接

#### **Welding**

焊接质量对舱口盖质量和安全影响最大,因此,对焊接应引起特别注意。焊接过程应被严格控制和监控。其中包括与焊接相关的施工人员、材料和操作。

Quality of the welds has greatest impact on the hatch cover quality and safety. Therefore a special attention must be paid on this matter and welding process has to be very strictly controlled and monitored. This concerns staff, material and working operations related to welding.

使变形最小、保证质量、降低费用的先决条件是:

- \* 合格焊接工人
- \* 可与母材相容的干燥焊接材料
- \* 合适的焊接方法和设备
- \* 正确的焊接顺序和不超过规定尺寸的焊缝
- \* 适宜的环境, 特别是对于 MAG-焊接
- \* 焊接件的正确支承/固定, 避免变形
- \* 良好的热量分布

Prerequisites for minimum deformation, adequate quality of weld and low cost are

- \* qualified welders
- \* dry welding consumables compatible with the substrate
- \* suitable welding method and machines
- \* correct welding sequence and **no oversized welds**
- \* proper environment, especially for MAG-welding
- \* correct supporting/fixing of the welded object, to avoid deformations
- \* good heat distribution

#### 焊接质量要求

#### Welding quality requirements

总的来说焊接质量必须满足船级社的要求。如无特别指明, 焊接必须符合 EN 25817 标准中的级别 “C”。本标准与 ISO5817: 1992 相同。然而一些高于级别 “C” 标准的船级社附加要求和油漆说明书要求也必须遵守。

Generally the quality of the welds must meet the requirements of the Classification Society concerned. If nothing else has been specified means that welding must fulfill requirements of EN 25817 standard, level "C". This standard is identical to international standard ISO5817: 1992. However some additional requirements like requirements from Classification Society and painting specification for example can exceed level "C" requirements.

#### 无损探伤 (NDT) 要求

#### Non-destructive testing (NDT) requirements

船级社要求按其程序进行无损探伤试验。如果德瑞斯华海公司要求对焊接进行无损探伤, 则在图纸中已经指明。标记的形式在图纸中说明。一般的试验程序是超声波 (US) 试验。对焊接可以接受的等级是 B 级。

Classification Society requires NDT for the hatch covers based on their own procedures. In case TTS requires NDT for the hatch cover welds it has been shown

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in the drawings. The form of the marking is explained in the drawings. Normal testing procedure is ultra sonic (US) testing. Acceptance level for these welds is B.

### 焊接过程要求

#### **Requirements for the welding process**

- \* 钢材明白无误的进行验证并经船级社认可。
- \* 焊接耗材明白无误的进行验证并经船级社认可适用于母材；另外它们应按供应商的建议储存和使用
- \* 生产过程中所有焊接过程应该经过试验并报告母材和焊接耗材的融合情况（程序认证记录/PQR）
- \* 焊工必须持有编制的焊工名册；此说明以认可的 PQR 为基础。
- \* 每一位焊工必须定期进行培训、取证，并能胜任所从事工作（焊工操作资格认证 / WPQ）；资格证书必须保留。
- \* Steel material must be classified and approved by Classification Society in question
- \* All welding consumables must be classified and approved for the parent material in question by Classification Society; also they must be stored and used according to manufactures recommendation
- \* All welding processes used in production must be tested and reported for required parent material/welding consumable-combination (Procedure Qualification Record / PQR)
- \* Welder must have a written instruction available; these instruction must be based on approved PQR
- \* Each welder must be trained and qualified for the work she/he has to do with set intervals (Welders Performance Qualification / WPQ); a record of these qualifications must be kept

#### **3.1.3.4 厚板的预热**

##### **Preheating of thick plates**

需要预热的焊接接头取决于以下三个条件：

- \* 母材钢板的化学成分（ $C_{EV}$ -值）
- \* 焊接接头的总厚度（对应于焊接冷却时间）
- \* 焊接方法（焊缝金属中的热量以及氢含量）

The need of preheating of weld joint depends on following three conditions:

- \* Chemical composition of parent steel plates (CEV-value)
- \* Combined thickness of welded joint (corresponding to weld cooling time)
- \* Welding method (heat input and hydrogen content in the weld metal)

如果要采取摄氏 150 度预热, 此决定应依据一定的钢材吸热量和焊接方法等。施工厂家的焊接技术人员应做此决定。如果存在其它因素如外部环境或用好的工艺等, 也许需要预热。如果焊接在摄氏零度以下进行, 钢板必须加热到摄氏 50 度来进行干燥, 此方法适用于所有厚度的钢板。这样做会使过量的氢在钢板表面降低。

If to perform +150°C preheating temperature is required. The decision is based on certain assumption of steel, welding methods etc. Decision is to be made by manufacturers welding expert. In case some other facts like environmental condition, good workmanship etc. may require preheating. If welding is performed in sub zero temperature steel plates must be dried by heating to +50°C. This is to be done for plates with all thickness. Doing this excessive hydrogen will be eliminated from the steel plate surfaces.

### 3.2 矫正

#### **Straightening**

#### 3.2.1 综述

##### **General**

由于焊接会产生不同的扭曲和变形, 所有需要矫正。在一些情况下有时技术规格书中要求带有拱形的盖板, 而这种形状焊接之后达不到要求。为了获得最好的结果, 在建造过程中必须将扭曲和变形降到最小。

The need for straightening of steel structures is caused by different welding distortions and deformations. In some cases also sometimes technical specification of the hatch cover requires convex shape of panel which cannot be achieved after completion of welding work. In order to achieve the best possible result deformations and distortions caused by the welding should be minimized during the fabrication process.

下列操作应该给予考虑:

Following activities should be taken into consideration:

- \* 采用装配部件, 以便在总装之前可以预先弯曲或矫正。
- \* 尽量使零件制造准确→使坡口根部缝隙最小→使不必要的焊接降到最少。
- \* 采用最好的装配施工以便使坡口根部缝隙最小→使不必要的焊接降到最少。
- \* 选择合适的装配和焊接顺序使变形尽可能小。
- \* 焊接过程中采用固定夹具和附属工具来保持结构稳定。
- \* 采用适当的焊接方法使其产生尽可能低的热量对母板造成影响。用 MAG-焊接 (实心或药心焊丝) 代替 MMAW (棒形焊条)。
- \* 不要采用超出设计尺寸的焊接。

- \* Using of subassemblies which can be pre-bent or straightened before assembling
- \* Best possible accuracy of the part fabrications => minimize root gaps => minimize unnecessary welding.
- \* Best possible assembly work in order to minimize root gaps => minimize unnecessary welding.
- \* Choosing the assembly and welding sequence that deformation is as low as possible.
- \* Using of fixed jigs and attachments to keep structure stable during welding work.
- \* Using welding methods which are producing as less as possible heat to the parent metal. Instead of using MMAW (stick electrode) using of MAG-welding (solid or flux cored wire).
- \* Not exceeding designed weld sizes

在大多数情况下，变形是不可避免的而矫正是必须的。矫正盖板的顺序是非常重要的。

In most cases some deformation are unavoidable and straightening is needed. Sequence to straighten hatch covers are very important.

一般下列顺序必须遵守：

- \* 矫正主结构梁（主梁）。
- \* 矫正次梁、腹板、橡皮槽等。
- \* 光顺扶强材和梁之间的顶板（消除过多的屈曲变形）。

Generally following sequence must be adhered:

- \* Straightening of main structural beams (primary beams)
- \* Straightening of secondary beams, webs, packing holders etc.
- \* Fairing of top plate (removing excessive buckling) between stiffeners and beams

当盖板在顶板向上的状态下进行矫正可望达到最好的结果。盖板在水平胎架上矫正时必须支承好。矫平点应尽量与操作的支承一致。在矫正施工中以下几条应该给予重视：

The best possible result can be achieved when panel is straightened in top plate up position. Panel must be supported during the straightening on levelled supports. The levelling points must follow operative supporting as far as possible. Following must be noted during the execution of the straightening:

- \* 一直加热直到钢板温度达到摄氏 700 度（伸缩模板接近零度），颜色呈深红或红色。
- \* 只有在下列条件下才允许用水冷却高强度板（ $R_{EH}=355N/mm^2$ ）：
  - ✧ 直到钢板温度降到摄氏 600 度以下（颜色为暗红色/颜色不再变化）时才可以用水直接喷射到钢板上。适用于高强度板和软钢。
  - ✧ 最大允许温度为摄氏 800 度。
- \* Heating is effective until the temperature of the steel has risen up to 700C°

(Elastic modulus is close to zero), color of the steel is dark red/red.

- \* Using of water to speed up cooling of high tensile steels ( $R_{eh}=355 \text{ N/mm}^2$ ) is allowed only with following conditions:
  - ✧ water shall not be sprayed directly to heated area until the temperature has been lowered  $600^\circ\text{C}$  (color of the steel plate very dark red/no change of color), this applies both high tensile steel and mild steel
  - ✧ maximum allowed temperature is  $800^\circ\text{C}$

如果发生任何的差异德瑞斯华海公司或船级社可以要求进行附加的机械试验，检查母材是否发生变化。

In case any discrepancies TTS HuaHai or Classification Society can require additional mechanical testing for the parent material in order to check that no changes have occurred.



### 3. 3 附件 **Outfitting**

#### 3. 3. 1 密封橡皮 **Sealing rubber**

密封橡皮应该按照德瑞斯华海说明在盖板做好油漆准备之后进行安装。

Sealing rubber is to be mounted to ready painted panels according to TTS HuaHai instructions.

#### 3. 3. 2 关于支承块和支承垫板的综述 **Generals about bearing pads / mating plates**

支承块传递舱口盖与船体结构之间垂向力和水平力, 所以其位置和公差都非常重要。

Bearing pads are transmitting vertical and horizontal forces between hatch cover and ship structure. Therefore position and tolerances for the pads are very important.

一般情况下, 支承块位于舱口围面板上, 而支承垫板位于船口盖四周。如果支承块安装于舱口盖上, 其公差请参考德瑞斯华海图纸和标准。

Normally bearing pads are located on the faceplate of the coaming and the mating plates are located on the four sides of hatch covers. In case mating plates are located on the hatch cover, tolerances for mating plates applies, see TTS HuaHai drawings and standard.

##### 3. 3. 2. 1 不同形式的支承块 **Different types of pads**

在开始安装之前重要的是检查建造水平度以保证支承块的最终定位符合德瑞斯华海标准的公差要求. 装配说明请参考图纸。

Before starting of installation, it is important to check the level of construction to ensure, that final alignment of the bearing pads fulfils tolerance requirement of TTS standard. Instructions for the assembly are to be taken from the drawings.

简单支承块的安装依据 HMP (水平基准面) 要求的尺寸。支承块两端的尺寸必须保证。如果高度方向需要调整, 可以利用薄垫片安装于支承块背面。支承块调整到正确位置之后可以进行最终紧固。

Simple pads to be installed acc. to required dimensions from the HMP. Measures must be taken at both ends of the pad. If height level needs adjusting, it can be done with a shim plate installed underneath of the pad. After adjusting the pads to correct

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dimensions final fastening can be started.

支承块座架的安装:

Installation of the bearing pad holder:

座架的安装应按 HMP (水平基准面) 要求的尺寸进行。如果对准需要调整, 可以利用厚度不大于 2.0mm 的垫片。

Holders are installed to required dimension from the HMP, and if alignment needs adjusting, it is acceptable to use shim plates of maximum 2.0 mm underneath the holder.

座架的实际安装方法如下:

The most practical way to install holders is as follows:

调整座架 (如果必要可用垫片) 到正确水平位置, 点焊座架, 再利用临时支承块检查座架, 如果需要再调整并焊接。

Adjust holders (with shim plates if necessary) to correct level, tack weld holders, recheck all holders with temporary pads, readjust if necessary and weld finally.

### 3.3.2.2 公差

#### **Tolerances**

在德瑞斯华海图纸和标准中给出了支承块的安装形式、位置及其公差。

In TTS drawings and standard tolerances for the position and locations of the pads are given.

下列公差应检测:

- \* 和橡皮槽底部相关联的支承块的垂向位置
- \* 每组支承块的定位角度 (两个方向)

Following measures are tolerated:

- \* vertical position of the pads in relation to bottom of packing holder
- \* angular position of each pad group (two directions)

**3.3.3 集装箱附件****Container fittings**

集装箱附件的安装应引起特别注意，如果集装箱跨越接缝（集装箱被两个相邻的盖板支承）则盖板定位之前集装箱底座脚不要安装，而应在盖板上作标记。这样做可以保证集装箱在船上的正确安装（在船上安装时有相同标记信息）。

Special attention should be paid on the container fitting installation. In case containers passing over a joint (container supported by two adjacent panels) sockets are not to be assembled before the panels positions are fixed and marked on the panels. By this it can be assured that container will fit also on board (same marking information is also available during installation onboard).

德瑞斯华海关于集装箱附件安装的标准如下：

- \* 4 个集装箱底座脚（1 个集装箱）的平面度公差
- \* 集装箱区域的平面度公差（8 个箱脚）
- \* 尺寸公差（长、宽、对角线）
- \* 对于 1 个箱底座的不平整度公差

In TTS standard tolerances for container fitting assembly are given.

- \* flatness tolerances for 4 Container sockets (one Container)
- \* flatness tolerance for Container field (8 fittings)
- \* dimensional tolerances for (length, width, diagonal)
- \* misalignment tolerance for single fittings

集装箱附件是在盖板最后安装的零部件，这是为了避免由于热量输入造成尺寸的变化（比如在矫正工作完成之后）

The container fittings should be the last parts welded to the panel in order to avoid changes in the dimensions due to heat input (i.e. after completion of straightening work).

集装箱附件的安装工作是在盖板上的全部集装箱划线后开始的，并且要检查附件是否布置在设计构件上。整个布置作少量调整是可以的，但注意偏移值不超过板厚的 1/2。安装中心线必须划得足够长，便于在切割和焊接之后检查。

The work with the container fittings starts with plotting the whole pattern of containers on the panel and checking whether the fittings lie on the designed members or not. Slight adjustments of the whole pattern are possible. Notify misalignment rule of 1/2 of thinner material thickness. Lines marking the centre of the fitting must be scribed long enough to facilitate checking of the fitting even after cutting and welding.

现在顶板上的集装箱底座脚可以进行安装和焊接了。如果是平置式箱脚则对应区域的顶板及加强需要开孔切割，在切割时必须保持良好的配合。

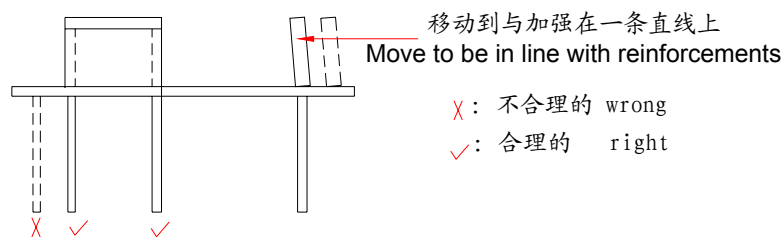
Container fittings on the top plate can now be installed and welded. If the fittings are flush with the top plate holes must be cut in the top plate and in the reinforcements as needed. When cutting, a good fit up must be maintained and necessary bevels fabricated.

如果绑扎眼板的理论尺寸和实际有一些偏差，应根据顶板下面加强安装。

If there are any inaccuracies between nominal dimensions of lashing eye compared to reality - installation should be made according to reinforcements under the top plate.

然而每一种情况应个别考虑，并需与德瑞斯华海人员讨论。

However each case has to be considered separately and discussed with TTS HuaHai personnel.



绑扎眼板的安装应按照顶板下面的加强板。

Assembly of lashing eyes according to reinforcement plate under the top plate.

如果集装箱底座区域不平整，比如顶板向下弯曲变形太严重，则不允许在箱座处下方安装任何类型的垫板。存在的变形应该被矫平。

In case the flatness of container socket field can not achieved i.e. top plate is buckled down too much it is not allowed to use any kind of doubling plates under the socket.

### 3.4 试验 Testing

#### 3.4.1 盖板起吊重心验证 Testing of lifting centre of gravity of the panel

先做起吊试验，测量盖板的倾斜角度，验证盖板的实际重量是否与设计图纸相吻合。起吊试验须用 4 根等长索具，起吊点应与设计图纸理论重心对称布置。

Testing the tilting angle of the panel by means of lifting test and verify if the weight of the panel is according with the drawings. The lifting testing is handled by means of a spreader with four spreader fittings which must be located symmetrically in relation to the gravity centre of the panel

对于倾斜角大于  $1.5^{\circ}$  盖板（或规格书限定的角度）再作盖板重心试验，确定实际重心位置。

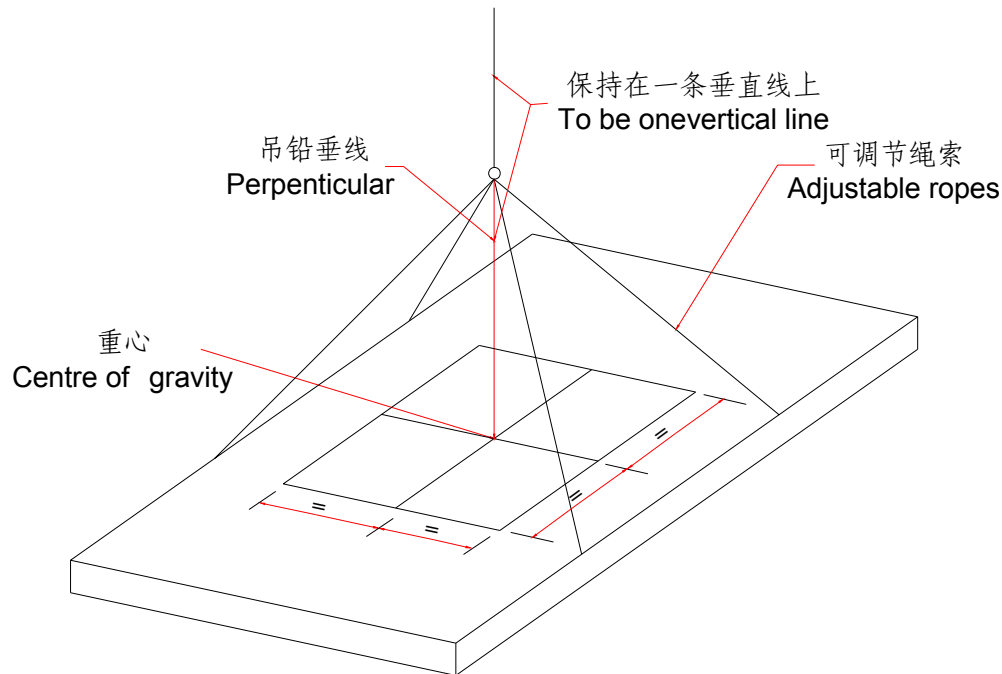
If the tilting angle be  $>1.5^{\circ}$  (or the angle defined in the specification), the gravity centre of the panel are requested to test for determining the practice location of the gravity centre of the panel

#### 3.4.2 盖板的重心测定（吊离式） Testing of centre of gravity of the panel (lift on/lift off)

盖板的重心测定，是在盖板起吊试验之后，重心验证超差基础上进行的

吊离式舱口盖由拥有四根吊索的吊具（20 英寸/40 英寸）操作。为了防止在起吊操作时盖板倾斜，吊索应相对于盖板的重心对称布置。理论计算的重心位置并不能和实际位置恰好吻合（归因于计算和制造误差等），因此重心位置必须通过如图所示起吊盖板来确定。

The lift on/lift off hatch covers are handled by means of a spreader (20' and/or 40') with four spreader fittings. In order to prevent the panels from tilting during the lifting operation, the spreader fittings must be located symmetrically in relation to the gravity centre of the panel. The theoretically calculated gravity centre does not always coincide with the actual one (due to the material and manufacturing tolerances, etc.). Therefore the gravity centre has to be evaluated by lifting the panel as shown in Picture 1.



从四个点起吊舱口盖。临时起吊眼板（如草图所示）、集装箱底座作为起吊点。

Lift the hatch cover by four lifting points. Temporary lifting eyes (as shown in the sketch), Container fittings etc. can be used as lifting points.

利用可以调节的钢丝绳悬起盖板以便使它保持在水平状态（比如倾斜角 $<1^\circ$ 度，亦即15mm/1m）。

Use adjustable wire ropes to suspend the panel so that it remains in horizontal position (i.e. the tilting angle must be  $<1^\circ$  corresponding 15 mm/1 m).

当含有几种特定盖板时，则要对每种形式的盖板中一块进行吊平。

When the order consists of several identical panels, only one of each type is to be leveled by lifting.

对称于重心焊接起吊索具作为最后附装的尺寸。

Weld the spreader fittings symmetrically to the centre of gravity as the last measure of the outfitting.

如果倾斜角大于限定的角度方向，请与德瑞斯华海公司联系，以找出原因并确定解决的方法。

Inform TTS HuaHai when tilting angle is bigger than the limit specified (any directions), so that find the causes and determine the resolvent.

### 3.5 表面处理 **Surface treatment**

#### 3.5.1 喷丸除锈 **Blast cleaning**

当所有焊接工作完成之后才可以对盖板进行喷丸除锈。一般应达到 Sa 2½等级。为了找出所有钢板表面和焊缝的缺陷，必须在喷丸和清洁之后对结构进行检查（参照德瑞斯华海标准）。

Blast cleaning of the panel has to be done after all welding work has been done. Normally blasting is required in Sa 2½ grade. After blasting and cleaning steel structure must be checked in order to find out all surface defects on the plate surface as well as welds (see [TTS standards](#)).

如果做了修正（打磨和/或焊接），修正的区域必须重新喷丸。

In case corrections are made (grinding and/or welding), corrected areas must be re-blasted.

如果油漆规格书要求用硅酸锌油漆，建议用钢砂作为喷丸材料，以保证清洁度和粗糙度达到要求。

In case painting specification requires zinc silicate painting steel grit is recommended as blasting material. By this mean required cleanness and roughness can be achieved.

#### 3.5.2 油漆 **Painting**

每一批定单都有自己的合同中指明的油漆规格书。油漆工作必须按照油漆规格书和油漆商提供的要求。

Each order has its own specification for painting as given in the contract. Painting work has to be done according to specification and requirements set in paint vendor's data sheets.

关于油漆最为重要的项目如下：

- \*合适的钢板表面状况
- \*漆膜厚度
- \*正确的搅拌和混合次数
- \*干燥时间
- \*条纹油漆

\*环境状况（温度、湿度）

The most important items regarding painting are:

- \* proper steel surface preparation
- \* film thickness
- \* right stirring and mixing times
- \* curing times
- \* stripe coating
- \* environmental conditions (temperature, humidity)



**尺寸定义****DIMENSIONAL DEFINITIONS****1. 综述****General**

下列讲述的是有关舱口盖的重要工艺标准，主要涉及到舱口盖的测量及公差。这些标准以德瑞斯华海标准的形式，作为舱口盖制造指导说明书的附录。

In following pages some of the most important measurement protocols are shown. These protocols indicates measures and defines tolerances which are the most essential in hatch cover operation. These protocols refers to the TTS HuaHai standards which are located as an appendix of this Guidance of Manufacturing.

制造者在尽可能满足这些标准的情况下编写自己的工艺文件。

Manufacturers are free to prepare their own protocols as far as requirements set in this Manual will be fulfilled.

需指出德瑞斯华海标准是总体标准，标准以指导附录形式设置。（例如德瑞斯华海标准“盖板的变形”）

Please be noted that TTS HuaHai requirements for the hatch covers includes also measures on which measurement protocols are not needed. Standards defining these requirements are however located as appendixes in the Manual (like TTS HuaHai standard "Deformation of panel").

另注：对于每一产品都有作为工作图纸一部分的公差图纸。

In addition, each individual order has its own tolerance drawing as part of the drawing set.

公差要求适用于所有由德瑞斯华海提供或设计的舱口盖。通用公差适用于所有工作图中没有单独公差要求的尺寸。

The tolerances apply to all equipment delivered or designed by TTS HuaHai. These general tolerances shall be applied to all dimensions that do not have an individual tolerance given in the working drawings.

测量橡皮密封的压缩量及支承块的接触时应特别注意舱口盖和船体结构（舱口围）的温度应保持一致，大约在20℃左右。考虑到温差的变化，测量一般在早上进行或尽可能使结构不受阳光直射影响以满足上述要求。

Taking measurements especially compression of rubber seals and contact of bearing pads should be done when hatch covers and ship structure (coamings) are at the same

temperature level of about 20°C. Consider the variety of temperatures those measurements normally to be taken early in the morning or so far as possible without any sun influence to the constructions to fit above given requirements.

如果产品不满足此项标准或其它相关公差规定而仍进行后续工作，则德瑞斯华海公司有权决定是否接受或拒绝该产品。

If the product does not fulfill the tolerances on this sheet and/or other documents referred to but still works blamelessly TTS HuaHai may decide whether to accept or to reject the product.

## 2. 基准面定义

### Definition of measure planes

基准面是结构的基本面，所有尺寸定义，测量及公差都以基准面为基础。（见图1-4）：

- 水平基准面（HMP）= 固定的水平面，位置定义于垂直方向
- 中心垂直基准面（CVMP）=固定的垂直面，位于平行于船体中心线垂直面。
- 横向垂直基准面（TVMP）= 固定的垂直面，垂直于船体中心线的垂直面

Measure planes are the base planes of the structure. All dimensioning, measurements and tolerances are based on these measure planes (see also pictures 1-4):

- Horizontal Measure Plane (HMP) = fixed horizontal plane, location defined in vertical direction
- Central Vertical Measure Plane (CVMP) = fixed vertical plane located perpendicularly to the joint of the panels
- Transversal Vertical Measure Plane (TVMP) = fixed vertical plane parallel with the joint of the panels

基准线用来表明基准面的位置。基准线在舱口盖制造过程中标记于舱口盖顶板。如果基准线超出顶板（例如接缝的中间），则在顶板上标记基准线的平行线

Measure lines are the lines indicating the position of the measure planes. Measure lines are marked on the top plate during manufacturing of hatch covers. In case measure lines are located out of the panel (for example in the middle of the joint), parallel reference lines are marked on the panel.

- 2.1 水平基准面（HMP）适用于一个舱口的所有盖板，每块盖板垂向支承面都定义水平基准面内。这些支承位于盖板角上橡皮槽的底部（端板和侧板交接处或侧板与强横梁交接处）。

Horizontal Measure Plane (HMP) is the horizontal plane which is common for all panels of one hatch opening. Each panel is vertically situated that the defined supports of the panel are in the Horizontal Measure Plane. These supports are located in the bottom of the packing holder in the panel corners (in the crossing of the end plate and the side plate or

in the crossing of the side plate and the joint beam web).

如果无橡皮槽，支承点位于盖板的四角，底部面板的端板和侧板交接处。

If no packing holder exists the support points are in the panel corners in the bottom of the face plate of the end/side plate.

- 2.2 中心垂直基准面（CVMP）为平行于船体中心线的垂直面。中心垂直基准面（CVMP）一般位于舱口中心线。中心垂直基准面（CVMP）在舱口盖顶板的两端以一排中心铰点来标记。

Central Vertical Measure Plane (CVMP) is the vertical plane which is parallel to ships centre line. The CVMP is normally situated in the middle of hatch opening. The line is marked onto the top plate at both ends of a panel by a row of punched points.

中心垂直基准面（CVMP）一般适用于整舱的所有盖板

The Central Vertical Measure Plane is common for all panels of one hatch opening.

- 2.3 横向垂直基准面（TVMP）为垂直于中心垂直基准面的垂直面，一般位于折叠式或侧移式舱口盖的接缝处的系统线（例如2+2盖板的分离接缝处）。如需要，TVMP可定义于任何接缝处或任何位置。实践中横向垂直基准面（TVMP）以两行间距为500mm的铰印标记于两块相邻的盖板的顶板。对于吊离式舱口盖横向垂直基准面（TVMP）位于盖板的对称线上，以冲铰印标记于顶板两端。

Transversal Vertical Measure Plane (TVMP) is the vertical plane which is perpendicular to Central Vertical Measure Plane and is situated on folding and rolling covers in the system line of a defined joint (e.g. split joint in 2 + 2 panels). If needed, TVMP can be defined to any joint or even any location. In practice the TVMP can be found in the middle of the point rows, which are punched onto the top plates of two adjacent panels. The distance between the rows is 500 mm. In lift on/lift off covers the TVMP is situated in the symmetry axis of a panel. The line is marked onto the top plate at both ends of a panel by a row of punched points.

### 3. 直线度和平面度定义

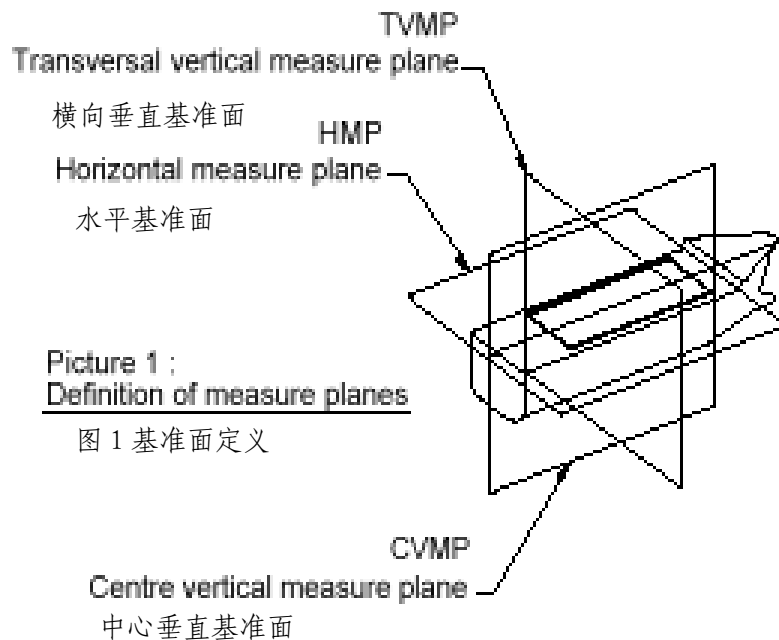
#### Definition of straightness and flatness

以下定义根据标准 ISO/R 1101, part 1, 此标准同样适用于德瑞斯华海的公差要求。

The definitions below comply with standard ISO/R 1101, part 1, which standard shall be applied when interpreting TTS tolerance requirements.

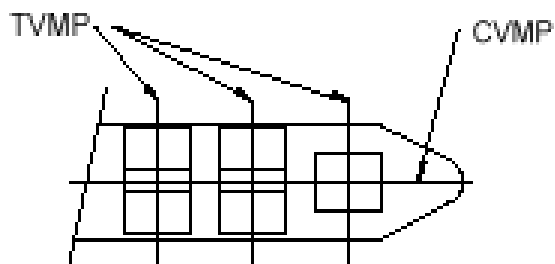
直线度

Straightness of a line



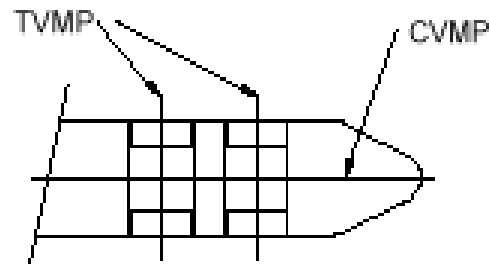
Picture 1 :  
Definition of measure planes

图 1 基准面定义



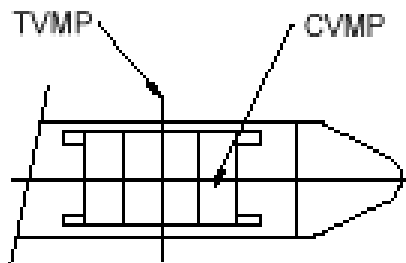
Picture 2 :  
Definition of measure planes  
lifton-lift off hatch covers

图 2 吊离式舱口盖定义



Picture 3:  
Definition of measure planes  
side rolling hatch covers

图 3 侧移式舱口盖基准面定义



Picture 4:  
Definition of measure planes  
MFC hatch covers

图 4 折叠式舱口盖基准面定义

直线度的公差由距离为 $t$ 的两个平行线定义(同一平面)

The tolerance zone is limited by two parallel straight lines with a distance  $t$  apart.  
(tolerance is specified in one plane)

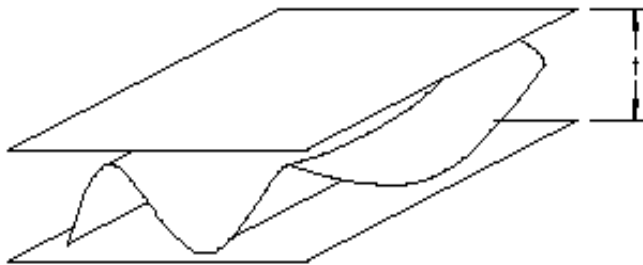


平面度

Flatness of a surface

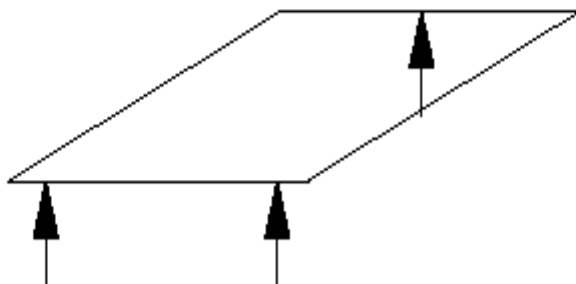
平面度的公差由两个平行面的间距 $t$ 定义

The tolerance zone is limited by two parallel planes with a distance  $t$  apart.



平面由三点定义

A plane is defined by three given points.



## 通用公差

**GENERAL TOLERANCES**

内容:

**Contents:**

1.技术规则	Technical regulations
2.通用公差	General tolerance
3.公差标准文件	Tolerance requirements standard files

**1. 技术规则****Technical regulation**

除了相关文件中另有说明，德瑞斯华海的标准引用下列的文件和标准。

The following documents and standards are applied to TTS HUA HAI standard unless otherwise stated on affected documents.

ISO2768-1 & 2	常规公差（主要机械装置） General tolerances (mainly mechanical fitting)
ISO 2768-1	线型和角度公差 Tolerances for linear and angular dimensions
ISO 2768-2	几何特征公差 Geometric tolerances for featuring
ISO 13920	常规焊接结构公差（主要钢结构装置） General tolerances for welded construction (mainly steel construction fitting)
Table 1 -----	线型公差 Tolerances for linear dimensions
Table 2 -----	角度公差 Tolerances for angular dimensions
Table 3 -----	直线度、平面度和平行度公差 Tolerances for straightness, flatness and parallelism

---

ISO 8062 常规铸件公差  
General tolerances for cast construction

Table 1 ----- 铸件公差等级-CT  
Casting tolerance grade-CT

ISO 3302-1&-2 常规橡皮产品公差  
General tolerances for rubber products

ISO 3302-1 产品公差-第 1 篇: 尺寸公差  
Tolerances for products-Part 1: Dimensional tolerances

浇铸公差 (表格 1)  
Tolerances for mouldings (table 1)

Table 2----- 无支撑挤出部分剖面公差  
Tolerances on cross-sectional dimensions of unsupported extrusions

Table 6----- 挤出部分切割尺度公差  
Tolerances on cut length of extrusions

ISO 3302-2 产品公差-第 2 篇: 几何公差  
Tolerances for products-Part 2: Geometrical tolerances

表面粗糙度标注方法按照 ISO 1302, 公差等级按照 SS-ISO 468 (Ra)

Method of indicating surface texture acc. to ISO 1302. Tolerance grade acc. to SS-ISO 468(Ra)

#### 图纸和文件

#### Drawings and documents

除了在相关文件中另有说明, 德瑞斯华海的文件引用下列的文件和标准。

The following documents and standards are applied to all TTS HUA HAI documentation unless otherwise stated on affected documents.

ISO 1101	形位公差	Tolerances of form and position
ISO 2553	焊缝在图纸上的符号表示法	Welding symbols on drawings
ISO 286-1&2	界限和适用	Limits and fits
IEC 617	电气符号	Electric symbols

ISO 1219

液压符号

Hydraulic symbols

**2. 通用公差****General tolerance**

下文所述公差适用于本公司设计或交货的设备。对那些未标明公差的尺寸，适用于通用公差表所列数据。

The tolerances mentioned below apply to equipment either delivered or designed by TTS HUAHAI. For measures where no tolerance is stated, the general tolerance table to be applied.

A、舱口盖机加工零件允许的尺寸偏差。

--- 机加工零件尺度的允许偏差，也包括装配在一起加工的零件的尺寸。例如，外部和内部尺寸，突肩尺寸，直径、宽度、高度、厚度、孔的中心距等。允许偏差见表 1。

--- 倒圆、倒角的允许偏差见表 2。

**Permissible deviations for dimensions of machined hatch cover parts.**

--- Length dimensions of machined parts, also including dimensions of assembled fittings which are machined together, as for example external and internal dimensions, shoulder dimensions, diameter, widths, heights, thickness, hole center pitches etc. Permissible deviations according to Table 1.

--- Radii and chamfers. Permissible deviations according to Table 2.

表 1: 舱口盖机加工零件，尺度 (mm)

Table 1 : Machined hatch cover parts, length dimensions (mm)

基本尺度 Basic dimensions		允许偏差 ± Permissible deviations
以上 Above	包括 Include	
0.5	6	0.1
6	30	0.2
30	120	0.3
120	315	0.5
315	1000	0.8
1000	2000	1.2
2000	4000	2
4000	8000	3
8000	12000	4
12000	16000	5
16000	20000	6



表 2: 舱口盖机加工零件, 倒角和切角 (mm)

Table 2 : Machined hatch cover parts ,radii and chamfer (mm)

基本尺寸 Basic dimensions		允许偏差± Permissible deviations
以上 Above	包括 Include	
0.5	3	0.2
3	6	0.5
6	30	1
30	120	2
120	315	4

B、 舱口盖焊接结构允许偏差。

--- 焊接结构件和结构完整件的尺度。允许偏差见表 3。

--- 由焊接装配而成的角钢。表 4 所列以度和分 ( $\Delta\alpha$ ) 为单位的允许偏差只有当角度在图纸上以度为指示单位时才适用。若角度只以线尺度指示, 则允许偏差应用表 4 中的 mm 和 m。偏差从角度边的最远一点测量。

Permissible deviations for dimensions of welded hatch cover constructions.

--- Length dimensions of welded structural parts and finished construction. Permissible deviations according to table 3.

--- Angles assembled by welding. The permissible deviations in degrees and minutes ( $\Delta\alpha$ ) in Table 4 do only apply when the angle is indicated in degrees on the drawing. If the angle is indicated only by the use of length dimensions, the permissible deviation apply in mm or m in Table 4 . The deviation is measured from the extreme point of the leg.

表 3: 舱口盖焊接结构件, 尺度 (mm)

Table 3: Welded hatch cover parts, length dimensions (mm)

Basic dimensions 基本尺度		Permissible deviations 允许偏差 ±
Above 以上	Include 包括	
---	30	1
30	315	2
315	1000	3
1000	2000	4
2000	4000	6
4000	8000	8
8000	12000	10
12000	16000	12
16000	20000	14
20000		16

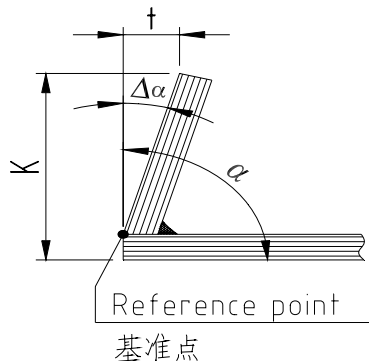
表 4: 舱口盖焊接结构件, 角度

Table 4: Welded hatch cover parts, Angles

1		2	3
成一定角度的边的基本尺寸 (mm) Basic dimension of the angled leg in mm		允许偏差 (分) Permissible deviation in minutes	确定允许偏差的系数 (mm) Factor for determination of the permissible deviation in mm
<div> <div> <div>K</div> <div>以上 Above 包括 Include</div> </div> </div>		<div>Δα</div>	<div>e</div>
---	315	±45	±13
315	1000	±30	±9
1000	---	±20	±6

允许偏差 (mm):  $t = (e \times k) / 1000$  解释如下:

Permissible deviation in mm:  $t = (e \times k) / 1000$  See explanation below.



$\alpha$  = Specified angle in degrees and minutes  
规定的角度(度,分)

$K$  = Length of the angled leg in mm  
构成角度的边的长度(mm)

$\Delta\alpha$  = Deviation in minutes  
偏差(分)

$t \leq \frac{e \times K}{1000} = \text{Deviation in mm}$   
偏差(mm)

### 3. 德瑞斯华海的公差标准文件

#### TTS HuaHai Tolerance Requirements Standard File

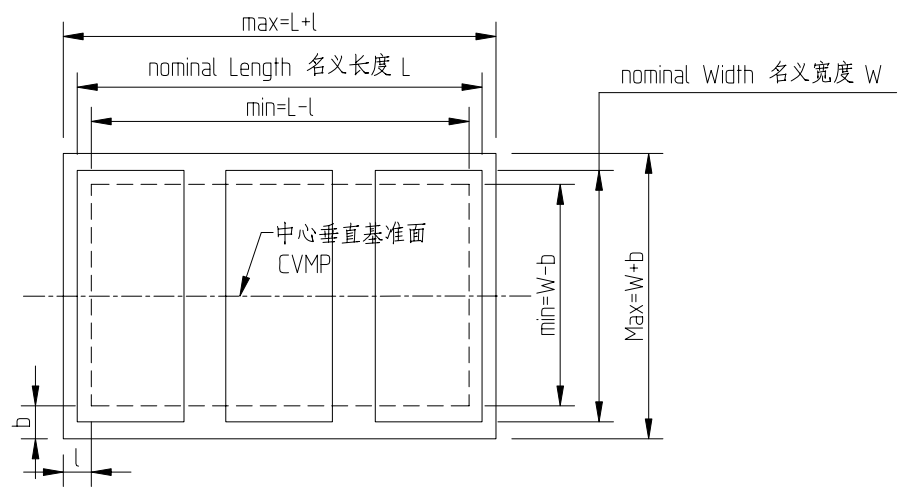
HQG.01.0000	通用公差 General Tolerance
HQG.02.0000	舱口盖总体尺度公差 Tolerance Requirements of Main Dimension
HQG.05.1000	舱口盖支承块公差 Tolerance Requirements of Resting Pads
HQG.05.2000	集装箱箱底座公差 Tolerance Requirements of Container Sockets
HQS. 01. 0000	钢结构制造质量要求 Quality Requirements on Fabricating of Steel Structure
HQG.02.0000	结构件的变形公差 Tolerance of Members' Deformations

舱口盖总体尺寸公差

TOLERANCES OF H.C MAIN DIMENSIONS

主尺寸 W和L均在侧板和端板的外侧测量。如果产品不满足此项标准或其它相关公差规定而仍进行后续工作，则TTS HuaHai公司有权决定是否接受或拒绝该产品。

Main dimensions W and L are to be measured to the outside of the side and end plates. If the product does not fulfill the tolerances on this sheet and/or other documents referred to but still works blamelessly TTS HuaHai may decide whether to accept or to reject the product.



L 与 W 名义值	1000	(2000)	(4000)	(8000)	(12000)	(16000)	(20000)	(24000)	
Nominal measure L or W	2000	4000	8000	12000	16000	20000	24000	28000	>28000
宽度 W 偏差值 b									
Deviation b for measure W	4	6	8	10	12	14	16	17	18
长度 L 偏差值 l									
Deviation l for measure L	4	5	6	7	8	9	10	10	10

舱口盖的主要尺寸（L，W）必须在公差范围之内。

The main dimensions of hatch cover (L, W) must stay within the tolerance zone.

对于单块盖板的舱口盖，长和宽的尺寸偏差允许以b作为评定值。

For a single panel hatch cover the allowed deviation for measures L and W is w.

## 舱口盖支承块公差

## TOLERANCE REQUIREMENTS OF RESTING PADS

每块舱口盖板至少有四块支承块（用来承受舱口盖向舱口围板传递垂直方向力）。支承块/支承垫板与橡皮槽的相对位置公差在下列的图中给出。

There are minimum 4 bearing pads per panel (transmitting vertical forces from cover to coaming). The position of the bearing pads / mating plates in relation to the packing holder is given in the drawing.

测量时，盖板须象实船一样作相应支承，测量前须验证支承的平面度。如果产品不满足此项标准或其它相关公差规定而仍进行后续工作，则德瑞斯华海公司有权决定是否接受或拒绝该产品。

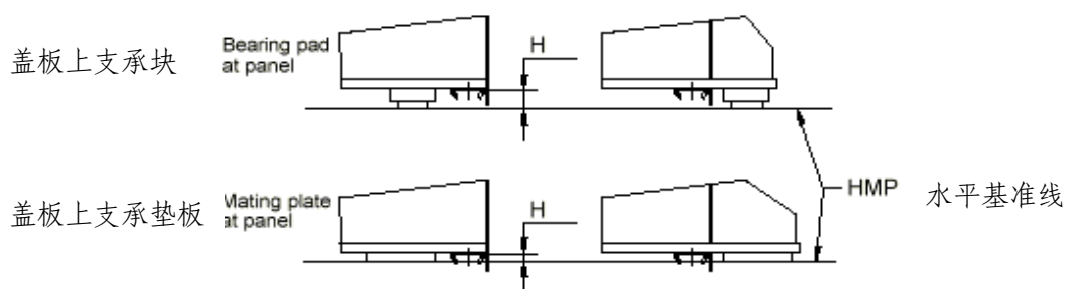
For the measurements, the panel must be supported as on board and the level of the supports must be checked prior the measurement. If the product does not fulfill the tolerances on this sheet and/or other documents referred to but still works blamelessly TTS HuaHai may decide whether to accept or to reject the product.

## 1 普通支承块

## General bearing pads

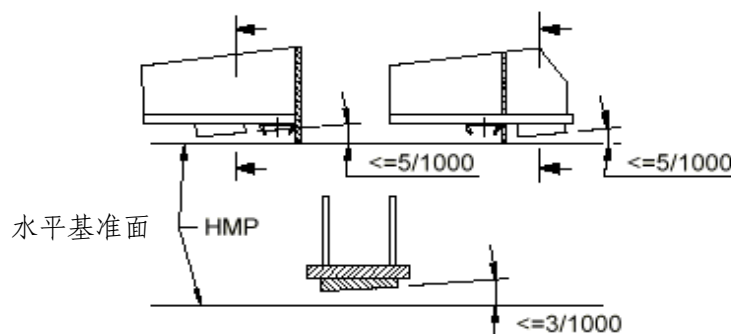
## 1.1 支承块/支承垫板的垂向位置。

Vertical location of bearing pads / mating plates



## 1.2 支承块和支承垫板的校准

Alignment of a bearing pad / mating plate

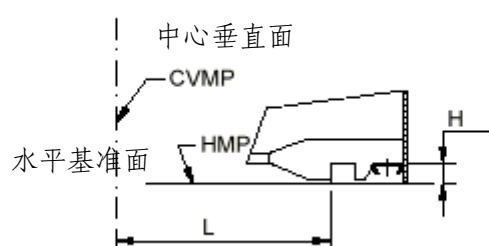


## 2. 组合支承块

## Integrated bearing pads

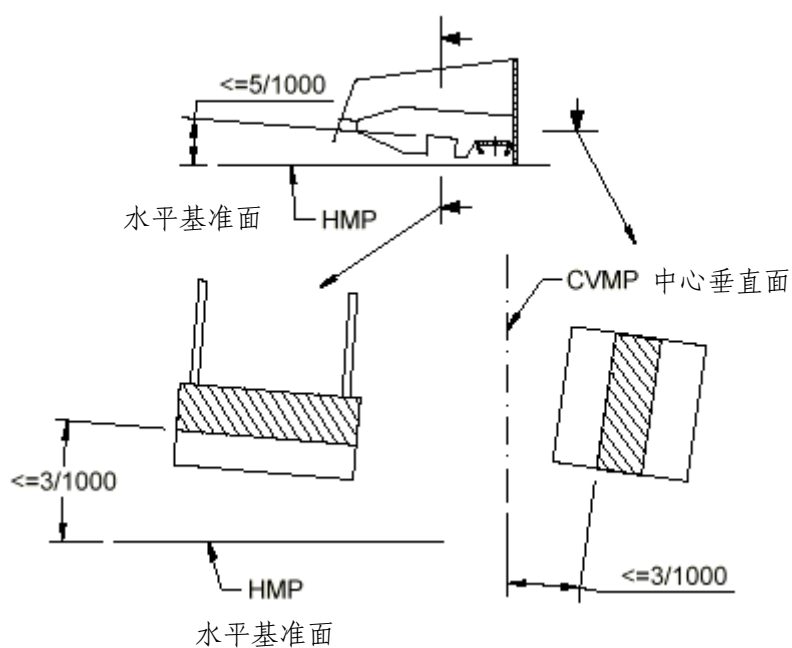
## 2.1 Fy 限位块与组合式支承块

Location of Fy stopper and integrated bearing pad



## 2.2 Fy 限位块与组合式支承块校准

Alignment of Fy stopper and integrated bearing pad



## 集装箱底座公差

## TOLERANCE REQUIREMENTS OF CONTAINER SOCKETS

测量时，盖板必须像在实船上一样作相应支承，测量前必须验证支承的平面度且盖板必须处于同一温度。

For the measurements, the panel must be supported as on board and the level of the supports must be checked prior to the measurements. The panel must be at uniform temperature.

如果产品不满足此项标准或其它相关公差规定而仍进行后续工作，则德瑞斯华海公司有权决定是否接受或拒绝该产品。

If the product does not fulfill the tolerances on this sheet and/or other documents referred to but still works blamelessly TTS HuaHai may decide whether to accept or to reject the product.

## 定义 Definitions

参考面 = 平行于水平基准面 (HMP)

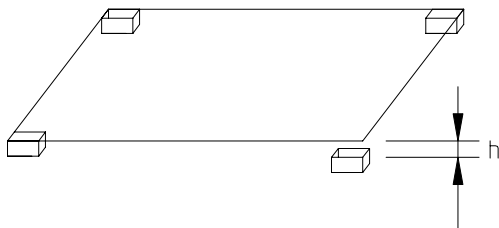
共同区域 = 每个集装箱4个支承点或前后两个20" 集装箱8个支承点

Reference plane = Surface parallel with the Horizontal Measure Plane (HMP)

Common zone = Foundations (4 pcs) for one container or foundations (8 pcs) for two containers.

集装箱底座垂向位置

Vertical location of container foundations and lifting sockets

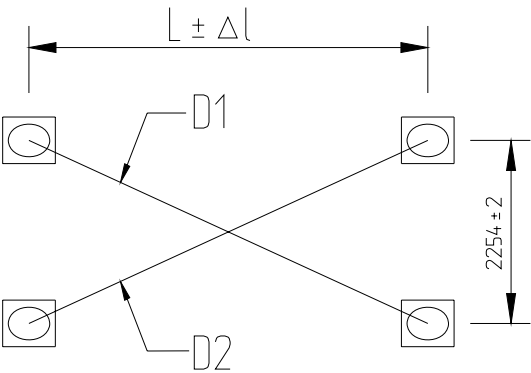
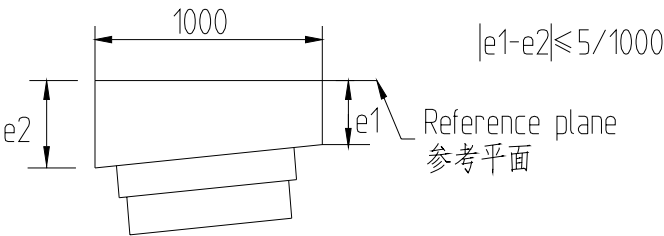


集装箱底座允许垂直偏差

Vertical tolerance of container foundations

底座 Sockets	h	位置 Location
4个支承点 (pcs)	$\pm 4$	在舱口盖制作中测量 at manufacturer side
	$\pm 5$	舱口盖放置在甲板上测量 when hatch covers on board
8个支承点 (pcs)	$\pm 6$	在舱口盖制作中测量 at manufacturer side
	$\pm 7$	舱口盖放置在甲板上测量 when hatch covers on board

Max allowed misalignment  
一个箱脚最大允许的偏差



长度和对角线长度  
Distances and rectangularity

集装箱尺寸 Container size	L	$\Delta l$	$ D1-D2 $
20'	5853	$\pm 2$	5
24 1/2'	7225	$\pm 3$	5
30'	8918	$\pm 3$	5
40'	11985	$\pm 4$	6
45'	13513	$\pm 4$	6
49'	14729	$\pm 4$	6



---

**钢结构制造质量要求****QUALITY REQUIREMENTS ON FABRICATED STEEL STRUCTURES****引言****Introduction**

本文件规定了德瑞斯华海公司对钢结构材料和制造装配工艺的质量要求。

This document specifies TTS HuaHai Ships equipment's quality requirements for materials and workmanship on fabricated steel structures.

本文件用于

The document is to be used

作为相关制造合同文件不可分割的一部分

- as an integral part of associated manufacturing contract documentation; and

作为德瑞斯华海检查人员在制造作业进行期间的检查指导性文件。

- as guidance for TTS HuaHai inspectors during fabrication work follow-up.

在签订制造合同之前，任何不符本文件规定的偏差均需经双方达成共识，并成为制造合同的一部分。

Any deviations from these requirements are to be agreed upon prior to the signing of the manufacturing contract and are to be documented in this contract.

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# TTS HUAHAI STANDARD

## 钢结构制造质量要求

QUALITY REQUIREMENT ON FABRICATED STEEL STRUCTURE

文件/File: HQS.01.0000  
版本/Rev: a  
页数/Page: 3/12  
日期/Date: 2006.08

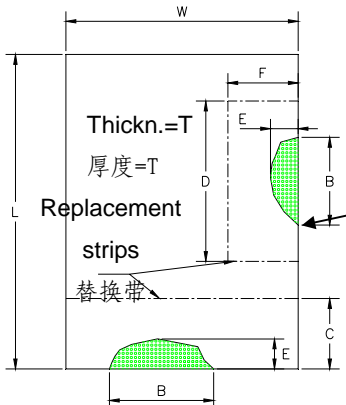
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### 1、材料 Material

注意!关于材料等级的要求及详细规定在各相应的施工图上注明。

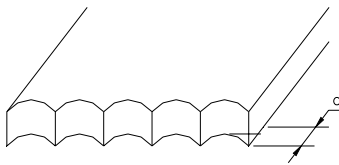
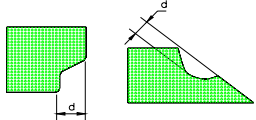
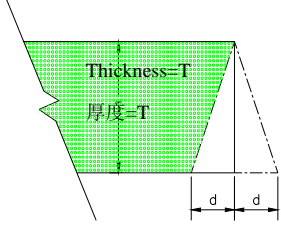
**Note! The requirements on material grade is specified on TTS HuaHai's fabrication drawings for the individual item of equipment.**

## 钢结构制造质量要求

项目 Item	说 明 Subject	要 求 Requirement(s)	意见或改正措施 Comment or corrective action
1.1	原材料的锈蚀等级 Rust grade of received material	锈蚀等级 A 和 B 可以接受 (见附件 1 锈蚀等级定义) Rust grades A and B are acceptable (see Appendix 1 to this document for rust grade definitions)	若材料收到时其锈蚀程度超过 B 级, 则应通知德瑞斯华海采购部 TTS HuaHai Purchasing Department to be notified if the material at receipt has a rust grade beyond grade B.
1.2	表面缺陷 Surface defects	所有钢材均需满足 EN10163 - 1.2.3 (1991) 的要求。对于钢板和扁钢适用于 E 级和 II 次级; 对于型钢适用于 D 级和 II 次级。 All steel materials shall fulfill the requirements of EN 10 63-1, 2 & 3:1991. For plates and wide flats Class E and Subclass 2 apply, and for sections Class D and Subclass 2 apply.	若材料收到时有不允许的表面缺陷, 则应通知德瑞斯华海采购部 TTS HuaHai Purchasing Department to be notified if the material at receipt has surface defects
1.3	材料端部或侧部内夹灰层 Internal laminations at end or side of material 	材料应无内部夹灰层。 Material to be free from internal laminations  侧部替换带内角隅必须磨圆 (最大为 100 或 $5 \times T$ ) Inner corners of replacement strips at sides to be well rounded (greatest of 100 or $5 \times T$ )	缺陷范围用超声波试验法进行探伤检测。若 $E \leq T/2$ 和 $B < 300$ , 则应磨掉、补焊、磨光。若 $E > T/2$ 或 $B > 300$ , 则切除缺陷部分并按照如下所示进行更换: $C \geq E+100$ ; 或 $D \geq B+2 \times 100$ 和 $F \geq E+100$ Extent of defect to be ascertained by ultrasonic testing. If $E \leq T/2$ and $B < 300$ , grind out, weld and grind smooth. If $E > T/2$ or $B > 300$ , cut out defective area and replace as indicated with $C \geq E + 100$ ; or $D \geq B+2 \times 100$ and $F \geq E+100$
1.4	材料内部夹灰层 Internal laminations clear of material edges	须保证材料没有内部夹灰层 Material to be free from internal laminations	通常这种夹灰层在切割时才会被发现, 可按 1.3 项方法处理。 This type of lamination is normally detected during cutting and is then to be dealt with as per item

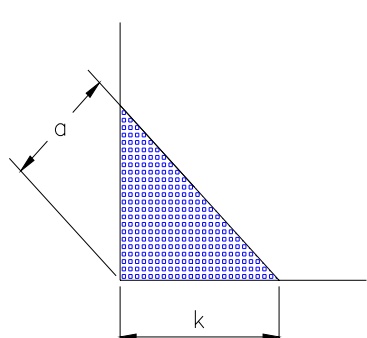
## 钢结构制造质量要求

## 2、准备 Preparation

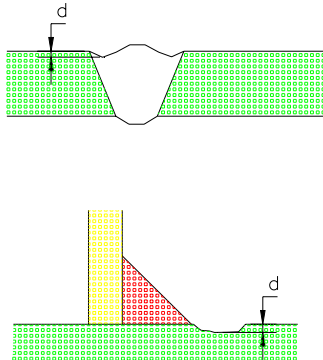
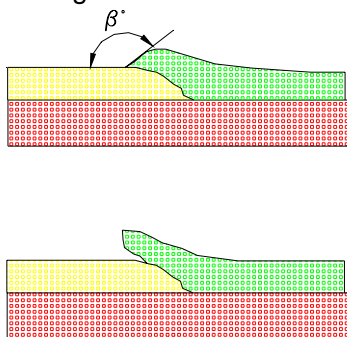
项目 Item	说 明 Subject	要 求 Requirement(s)	意见或改正措施 Comment or corrective action
2.1	气割切割边缘 Flame cut edges 	边缘要平直, 偏差 $d \leq 0.3\text{mm}$ . 没有烧伤或割渣 Edges to be even with deviation $d \leq 0.3\text{mm}$ No burns or slag	打磨处理到可接受为止, 烧伤处须打磨光滑, 割渣要去除对于自由边的要求见 2.4 Grind to accepted value Burns to be ground to even transition and slag to be removed. For free edge. See item 2.4
2.2	剪切机切割边缘 Shear cut edges	切口无毛刺 Cuts to be free from burr	除掉一切毛刺。对于自由边的要求见 2.4 Any burr to be removed. For free edges, see item 2.4
2.3	等离子切割机切割边缘 Plasma cut edges 	平面度偏差 $d$ 不大于材料厚度的 5% Out-of-flatness $d \leq 5\%$ of material thickness.	打磨处理到可接受为止 对于自由边的要求见 2.4 Grind to accepted value For free edges, see item 2.4.
2.4	自由边缘 Free edges	锐边不予接受 Sharp edges are not accepted	边缘应磨圆, 圆弧相当于 $R \approx 2\text{mm}$ (轧制钢边缘一般不需处理) Edges to be well rounded by grinding or rumbling to a roundness corresponding to $R=2\text{mm}$ (rolled edges are normally not required to be rounded).
2.5	切割后材料垂直度 Squareness of cut material 	切割后边缘必须方正, 最大偏差 $d$ 不大于 $0.03 \times T$ Cut edges to be square with max. deviation $d \leq 0.03 \times T$	

## 钢结构制造质量要求

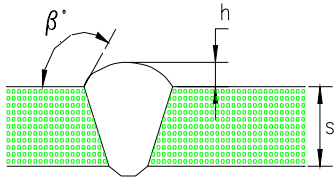
## 3、焊接 Welding

项目 Item	说 明 Subject	要 求 Requirement(s)	意见或改正措施 Comment or corrective action
3.1	装配 Assembling (Fit-UP)	焊接边缘应无锈蚀和其他异物、油脂、油漆（车间底漆除外） Edges to be welded to be free from rust and other foreign matter, and clean of grease or paint except shop primer.	
3.2	临时附着物的清除 Removal of temporary attachments	临时附着物应小心去除，不可损伤处理表面。切不可用强力进行清除。 Temporary attachments to be carefully removed without damaging the surface where it has been fitted. They must never be removed by force!	对任何表面损伤都应打磨光滑 Any surface damages to be ground smooth
3.3	暴露在外部的气孔 Pores in welds exposed to weather	气孔不能接受 No pores accepted	所有气孔都应补焊并打磨光滑 All pores to be welded and ground smooth
3.4	焊缝内部的气孔 Pores in welds not exposed	只有圆形（最大直径不超过1mm）、孤立（不成群）、间隔较远（至少50mm）的气孔可以接受。 Pores accepted if circular (max diameter 1 mm), isolated (not grouped) and well spaced (min. 50 mm). 对于对接焊，气孔的数目每米焊缝不可超过X只。X=接头中最薄构件的厚度 For butt welds. The number of pores must not exceed X per meter weld seam where X is the thickness of the thinnest member of the joint.	超过可接受标准的气孔均应补焊，并打磨光滑 Pores exceeding the acceptance criteria to be welded and ground smooth. 

## 钢结构制造质量要求

项目 Item	说 明 Subject	要 求 Requirement(s)	意见或改正措施 Comment or corrective action
3.5	砂眼 (针孔) Blowholes (Pinholes)	针孔不能接受 Pinholes are not accepted	补焊并磨光 To be welded and ground smooth
3.6	咬边 Undercuts 	焊接件与焊缝之间的过渡必须光滑。咬边 d 应不超过最薄构件厚度的 5%，但若为零星分散出现(小于 250mm / 1000 mm 坡口焊缝)，则可接受的最大咬边为 0.5mm Transition between weld seams and base material to be smooth Undercuts $d \leq 5\%$ of thickness of thinnest member but max. 0.5 mm are accepted provided sporadic occurrence (less than 250 mm for every 1000mm of ground welding).	若深度可接受，则将一切锐边磨光；若深度不可接受，则需补焊并磨光。 If depth is acceptable, grind smooth any sharp edges. If depth is unacceptable. Fill up by welding and grind smooth.
3.7	更换焊条处 Change of electrodes 	焊道之间过渡必须光滑 ( $\beta \geq 120^\circ$ ) Transition between weld beads to be smooth ( $\beta \geq 120^\circ$ )  焊瘤不可接受 Overlaps are not accepted	锐角过渡必须磨光顺，焊瘤必须补焊及磨光 Sharp transitions to be ground smooth. Overlaps to be welded and ground smooth.

## 钢结构制造质量要求

项目 Item	说 明 Subject	要 求 Requirement(s)	意见或改正措施 Comment or corrective action
3.8	焊缝不平 Uneven weld seams 	焊缝与母体金属之间的过渡必须光滑 $\beta \geq 120^\circ$ , $h \leq (0.1 \times S + 1) \text{mm}$ 或最大4mm Transition between weld seams and base material to be smooth. $\beta \geq 120^\circ$ $h \leq (0.1 \times S + 1) \text{mm}$ or max. 4mm	锐角过渡必须磨光 过渡处必须磨光修整 Sharp transitions to be ground smooth. Transition to be faired by grinding.
3.9	焊后清洁处理 Post-weld cleaning	没有飞溅、焊渣、焊剂、表面缺陷或引弧痕迹 No weld spatter, slag, flux, surface defects or striking marks.	作必要的刮铲。引弧痕迹须磨光 Scrape as necessary. Striking marks to be ground.



## 钢结构制造质量要求

## 4、焊后处理 Post-weld treatment

项目 Item	说 明 Subject	要 求 Requirement(s)	意见或改正措施 Comment or corrective action
4.1	用气体加热法矫正 straightening by heating with gas	应该用丙烷或氧/乙炔加热 材料温度不应超过 700oC(相当 于呈樱桃红色) Heating should be done by means of propane or oxy /acetylene gas. The temperature of the material should not exceed approximately 700oC (corr. to cherry red colour).	火焰不可直接喷射在材料表面 上(材料不可熔化)。均匀施加 热量使变形降低到规定的要求 There must not be any direct flame impingement on the surface of the material ( the material must not melt) The heat should be applied such that the deformation is reduced as required.
4.2	检查尺寸 Checking of dimensions	请参考相关的德瑞斯华海公差 图, 以及公差总则 Reference is made to pertinent TTS HuaHai tolerance drawings. And TTS HuaHai Standard Tolerance General	若超过规定的公差, 则在开始 任何修整作业之前应通知德瑞 斯华海采购部 TTS huaHai Purchasing Department to be notified when specified tolerances are exceeded (and prior to commencement of any rectification work .).

## 钢结构制造质量要求

## 5、表面处理 Surface Treatment

项目 Item	说 明 Subject	要 求 Requirement(s)	意见或改正措施 Comment or corrective action
5.1	涂有车间底漆的钢结构件 Structures fabricated from primed material	<p>受损害的表面应用喷丸处理清洁到 Sa 2½级, 并涂上厚约 40μm 的底漆 (若合同中无其他规定的话)。其余表面应用喷砂清扫法扫除焊接沉积物</p> <p>Damaged surfaces to be cleaned by blast-cleaning to Sa 2½, and touched-up with primer to approx. 40 μ (where nothing else is specified in contract). Remaining surfaces to be cleaned from welding fume deposits by sand sweeping.</p> <p>如果没有喷丸处理设备, 损伤表面可用钢丝刷进行处理, 并涂上厚约 40μm 的底漆。其余表面应用喷砂清扫法扫除焊接沉积物</p> <p>If no suitable blast-cleaning equipment is available. Damaged surfaces to be wire brushed to St 3. Or according to contract, and touched-up with primer to approx. 40μ. Remaining surfaces to be thoroughly cleaned from welding fume deposits.</p>	<p>见本文件附件 B 表面准备等级定义</p> <p>See Appendix B to this document for surface preparation grade definitions.</p> <p>注意: 双方在谈判制造合同时 应就清理方法取得协议</p> <p>Note! Cleaning method is to be agreed upon between the parties during the manufacturing contract negotiations.</p>
5.2	未涂车间底漆的钢结构件 Structures fabricated from non-primed material	<p>整个结构件应用喷丸处理清洁到 Sa 2½级, 并涂上厚约 40μm 的底漆 (如果合同中无特殊规定)</p> <p>The complete structure to be cleaned by blast-cleaning to Sa 2½ and primed to approx. 40μ. (where nothing else is specified in contract).</p>	<p>干膜厚度 (DFT) 验收标准:</p> <p>---最小 DFT=30μ</p> <p>---在不大于 20% 的表面上:</p> <p><math>30\mu \leq DFT \leq 40\mu</math></p> <p>Dry film thickness (DFT) acceptance criteria:</p> <p>Min. DFT= 30μ</p> <p><math>30\mu \leq DFT \leq 40\mu</math></p> <p>max. 20 % of the surface</p>

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**6. 附件 Appendixes****A、锈蚀等级定义****Rust Grade Definitions**

(摘自国际标准化组织 ISO8501-1: 1988=瑞典标准 SS 05 59 00, 1988, 第 3 版)  
(extracts from ISO 8501-1:1988= SS 05 59 00, issue 3, 1988)

锈蚀等级 A: 钢材表面大部分为紧粘着的氧化皮所复盖, 锈蚀比较少。

Rust grade A: Steel surface largely covered with adhering mill scale but little, if any, rust.

锈蚀等级 B: 钢材表面氧化皮开始剥落, 剥落处开始生锈

Rust grade B: Steel surface which has begun to rust and from which the mill scale has begun to flake.

**B、表面准备等级定义****Surface Preparation Grade Definitions**

(摘自国际标准化组织 ISO 8501-1: 1988 = 瑞典标准 SS 055900, 1988, 第 3 版)  
(extracts from ISO 8501-1:1988= SS 05 59 00, issue 3, 1988)

**注意:** 清洁前, 一切厚锈层必须铲除, 肉眼可见的油, 脂和污物也应清除。

**Note:** Prior to cleaning, any heavy layers of rust shall be removed by chipping. Visible oil, grease and dirt shall also be removed.

**1) 喷丸清理: Sa2½ 级**

**Blast-cleaning, grade Sa 2½;**

当不用放大镜观察时, 表面应无肉眼可见的油、脂和污物, 也没有氧化皮, 锈蚀、漆膜和其他异物。污染物残留下来的痕迹只是一些轻微的点状或条状污点而已。

When viewed without magnification, the surface shall be free from visible oil, grease and dirt and from mill scale, rust, paint coatings and foreign matter. Any remaining traces of contamination shall show only as slight stains in the form of spots or stripes.

**2) 手工和动力工具清洁, St 2 级**

**Hand and power tool cleaning, grade St 2.**

当不用放大镜观察时, 表面应无肉眼可见的渍, 脂和污物, 也没有粘附不牢的氧化皮、锈蚀、漆膜和异物。

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When viewed without magnification, the surface shall be free from visible oil, grease and dirt, and from poorly adhering mill scale, rust, paint coatings and foreign matter.

3) 手工和动力工具清洁, St 3 级

Hand and power tool cleaning, grade St 3:

要求与 St 2 级相似。但表面应处理得更彻底, 显示出母材的金属光泽。

As for St 2, but the surface shall be treated much more thoroughly to give a metallic sheen arising from the metallic substrate.

4) 手工和动力工具清洁包括刮擦、钢丝刷刷清、机械刷清和磨光。

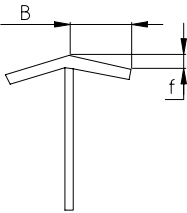
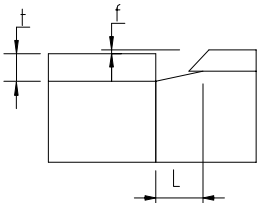
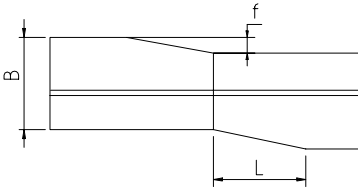
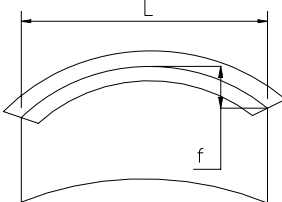
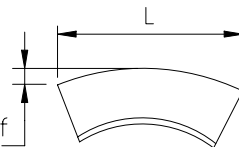
Hand and power tool cleaning includes scraping, wire brushing, machine brushing and grinding.

5) 注意: 清洁后, 表面上的松散尘埃和残屑应清除。

Note: After cleaning, the surface shall be cleaned from loose dust and debris.

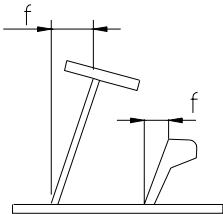
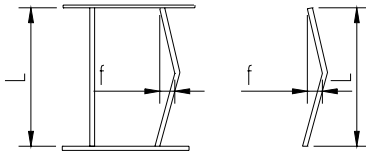
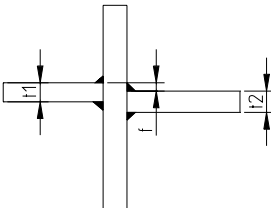
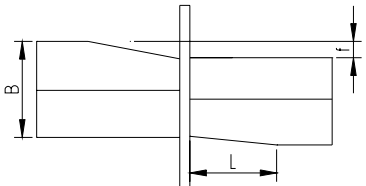
## 结构件的变形公差

## TOLERANCE OF MEMBER'S DISTORSIONS

面板变形 Distortion of flanges	$B < 315 \quad f = \pm 1.3 \times B / 100$ $315 < B < 1000 \quad f = \pm B / 100$	
不同腹板高度的面板 对接 Various web height Flange connection	$f \leq 0.15 \times t \quad f_{\max} = 3$ 如果超出公差，修正腹板，调整面板 $L \geq 50 \times f$ If exceeding tolerances release flange and adjust with $L \geq 50 \times f$	
面板宽度误差 Flange width error	$f \leq 0.04 \times B \quad f_{\max} = 6$ 如果超出公差，调节面板如下： If exceeding tolerances adjust with $0.04 \times B < f < 0.08 \times B \quad L_{\min} \geq 30f$ 如果 $f > 0.08 \times B$ ，调整面板 $L \geq 50 \times f$ If $f > 0.08 \times B$ release flange and adjust with $L_{\min} \geq 50 \times f$ 端角打磨平滑 Always grind smoothly!	
梁横向平直度 Transversal Straightness of a beam	$L \leq 1000 \quad f_{\max} = 5$ $1000 < L \leq 3500 \quad f_{\max} = 3 + 2 \times L / 1000$ $L > 3500 \quad f_{\max} = 10$	
梁纵向直线度 Longitudinal straightness of a beam	如果 $0 < f < L / 1000$ 即可认为板是平直 的, 否则需要采取特殊的测量 In case panel will be straight when ready $0 < f < L / 1000$ otherwise special measurements to be taken !	

## 结构件的变形公差

## TOLERANCE OF MEMBER'S DISTORSIONS

按已知角度允许 偏离一定角度 Permissible deviation from a given angle	详见标准 Detail tolerances see document HQQ.01.0000	
两点之间的直线度偏差 Straight line in Deviation from the relation to the length between two given points	$f=8$ $L \leq 1000$ $f=6+(2 \times L/1000)$ $1000 < L \leq 3500$ $f=13$ $L > 3500$	
十字架型腹板接头 Alignment of cruciform web plate joints	$f < 0.5t$ $t=t_1$ 和 $t_2$ 的较小的板厚 $f < 0,5 \times t$ $t = \text{thinner thickness}$ of $t_1$ or $t_2$	
十字型面板接头 cruciform flange Alignment of joints	$f \leq 0.04 \times B$ $f_{\max}=6$ 如果 $f > 6$ : 光滑打磨 $L_{\min} \geq 30f$ For $f > 6$ : $0.04 \times B < f < 0.08 \times B$ : grind smooth with $L_{\min} = 30 \times f$ 如果 $f > 0.08 \times B$ : 调整 $L_{\min} \geq 50 \times f$ release and adjust with $L_{\min} = 50 \times f$	

所有标注尺寸[mm]

All dimension [ mm ]

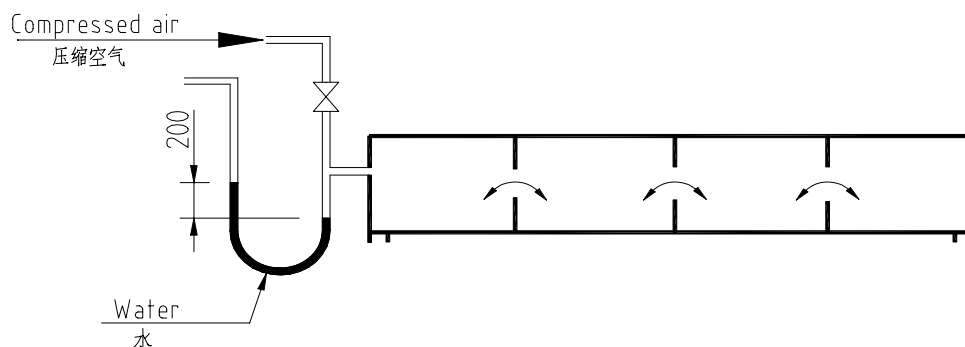
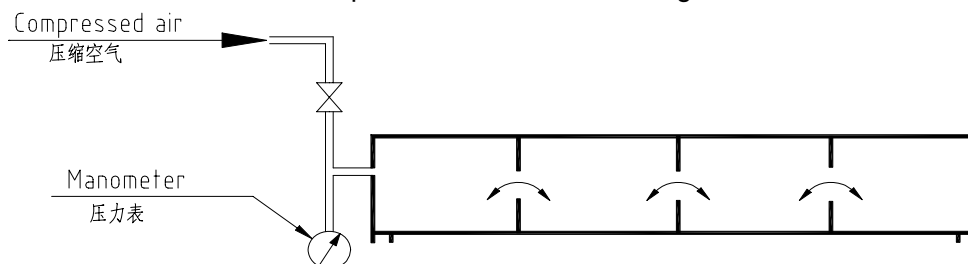
## 封闭式箱型结构压力试验 (0.02bar)

## PRESSURE TEST FOR BOX STRUCTURE (0.02 bar)

压力试验: 封闭式箱型结构不管里面有没有 V.P.I , 都应检查其密封性。

PRESSURE TEST: The boxes(i.e. close structure) shall be checked for hermetical sealing whether there is V.P.I.(Vapour Phase Inhibitor) supplied inside.

- 1) 试验压力取 0.02bar 或按下面简图取水柱高 200mm H<sub>2</sub>O. 通过增压来检查封闭结构的密封性。  
The pressure for test should be 0.02bar or a pressure of 200 mm/H<sub>2</sub>O according to the sketch below. It should be left pressurized to check the tightness of the box.



- 2) 试验时间: a. 大的箱形结构需整个晚上 (8 小时)  
b. 小的箱形结构需 2 小时。  
Test time: a. All night(8 hours) pressure for large boxes.  
b. Two(2) hours pressure for small boxes.
- 3) 肥皂水试验: 如果过了试验时间, 压力数值下降, 则恢复压力并用肥皂水检查焊缝。  
Soap test: If the pressure head has sunk after test time, restore the pressure and check the welding with soap water.
- 4) 试验后, 进气孔应封焊或用塞子塞住。  
After the test the inlet hole should be either welded or plugged.

**涂装预处理****PREPARATION FOR PAINTING****1. 引言****Introduction**

本标准提供了涂装前钢板表面的预处理方法和相关预处理等级。

This standard presents the method of preparation of steel surface before painting, and also the grade of preparation for respective treatments.

如果产品不满足以下有关规定而仍进行后续工作，则德瑞斯华海公司有权决定是否接受或拒绝该产品。

If the product does not fulfill the requirements below but still works perfectly, it is TTS HuaHai Ships Equipment exclusive right and responsibility to decide whether to accept or to reject the product.

**2. 表面预处理****Pre-protected surface**

以车间底漆作为临时保护。

Temporary protection with Shopprimer can be used.

a) 由钢厂提供预处理好的钢材。

Using pre-primed material delivered from steel manufacturer.

b) 制造厂对钢材进行预处理，并确保满足本标准的要求。底漆须经船级社认可。

The subcontractor treats the black steel material before starting manufacturing. Doing this the subcontractor has to fulfill the requirements mentioned in this standard.

前面所述须经船级社认可。

The primer has to be approved by the classification societies.

**硅酸锌的油漆附加规定****Extras for zinc silicate systems**

可采用低含量乙基硅酸锌底漆作为临时保护。参考以上 a), b)

Temporary protection with low content ethyl zinc silicate shopprimer can be used. a) and b) see above.



#### 3. 焊缝

##### Welded seams

清除焊渣。

Slag to be removed.

硅酸锌的油漆附加规定

##### Extras for zinc silicate systems

清除焊渣

Slag to be removed.

所有焊缝必须没有气孔并达到可以由油漆保护的状态。所有焊缝必须完整和连续，没有会引起油漆不连续的间隙和裂纹的存在。

All welds must be free of pinholes and in such a condition that they can be acceptably protected by paint. All welds must be complete and continuous without cracks and fissures causing coating discontinuity.

#### 4. 焊接飞溅

##### Weld spatter

去除松散的毛刺。

Loose spatter to be removed.

松散的毛刺意指用手动铲具而无需过分的外力可去除的飞溅物。

Loose spatter means spatter which can be removed with hand scraper without excessive force.

剩余的毛刺应处理光滑。

Remaining spatter to be well bevelled.

硅酸锌的油漆附加规定

##### Extras for zinc silicate systems

所有焊接飞溅要去除。

All weld spatters to be removed.

#### 5. 冲压和切割后的边缘处理

##### Edges after punching and cutting

轻微倒去棱角

割渣要去除。

加工面尖角要去除。

Light chamfering.

Slag to be removed.

Sharp peaks on sectional surface to be smoothed.

不允许新的锐角产生。

尖角可理解为不平整处即用裸手接触该处时感到尖锐。

New sharp edges must not arise.

Sharp edges are understood as irregularities that feel sharp or pointed when touched with the bare hand.

##### 硅酸锌的油漆附加规定

##### Extras for zinc silicate systems

边缘要磨圆角

建议所磨圆角半径约为 1-2mm。

Edges to be grounded.

recommended radius of the rounding is approximately 1-2 mm.

#### 6. 钢材表面缺陷

##### Defects in steel surface

当钢材表面缺陷如凹痕，剥落，起泡等的不连续深度超过 EN10163: 92 和 EN10129: 92 A 级或按船级社的要求可在打磨后填充焊，其它可打磨光滑。

Surface defects, such as pittings, flakes, blisters etc. to be filled with weld after grinding only, when the depths of discontinuities are exceeding the limits given in EN 10163:92 and EN 10029:92 class A, or if required by the Classification Society. Otherwise the grinding is carried out so that smooth passages are obtained.

气割处（例如割除某一起吊眼板）应修整打磨。

Burnt areas (i.e. when a lifting eye has been taken away) to be repaired and ground.

缺陷如若平滑可不予处理。

Smooth round defects not to be treated.

**7. 表面清理****Cleaning of surface**

## 去油脂

油脂和油污用适当的油脂分解溶剂去除，例如乳化石油溶剂。去油脂必须在喷砂或清洗喷砂之前进行。

## Degreasing.

Grease and oil to be removed by suitable grease dissolving medium, for example white spirit with emulsifier. Degreasing has to be made before blasting or sweep blasting.

## 其它清理

除油脂和油污之外的其它污染物如焊接产生的焊渍等必须清除。如果表面被清洗，在油漆之前必须晾干。

## Other type of cleaning.

Other impurities than grease or oil, for example weld smoke must be removed. If the surface is washed, it has to be dry before painting.

## 打扫

清扫、吸尘、压缩空气

## Dusting

Sweeping, vacuum cleaning, air blowing etc.

**8. 喷丸****Blasting****a) 钢材的喷丸**

喷丸至少达到 ISO8501 (瑞典标准 SS 05 59 00) SA 2½ 级。

**Blasting of black steel**

Blast to min ISO 8501 (Swedish Standard SS 05 59 00) SA 2½.

应使用砂，钢丸或类似磨料。

喷丸结束应除去剩余砂/钢丸和灰尘。

Sand, steel grit or similar abrasive should be used.

When blasting is completed, remove residual sand/grit and dust.

**b) 预处理表面的喷丸**

损坏的临时底漆和未用底漆处理的表面（或类似表面）必须仍按 8a 处理。

底漆面的修复：

**Blasting of pre-protected surface**

---

Damaged temporary primer and surfaces not treated with primer (or equivalent) has to be blasted according to item 8a.

底漆表面的清理:

如果车间底漆用作预处理, 在焊缝表面和底漆损坏处须进行清扫喷丸处理。清扫喷丸后还要表面除尘。

Reconditioning of primed surface:

If shop primer is used for preliminary protection, thorough sweep blasting of surface is required in connection with blasting of welds and damaged shop primer. After sweep blasting, the surface shall be dusted off.

硅酸锌的油漆附加规定

**Extras for zinc silicate systems**

c) 预处理表面的喷丸

损坏的临时底漆和未用低硅酸富锌底漆或类似漆处理的表面必须仍按 8a 处理。

Blasting of pre-protected surface. Damaged temporary primer and surfaces not treated with low rich zinc silicate (or equivalent) has to be blasted according to item 8a.

底漆面的修复:

如果含锌底漆或其它硅酸锌漆用作表面预处理, 为确保后续油漆附着力应在最后一道油漆之前, 要求进行喷丸处理。在喷丸处理之后, 去除积尘和锌盐。清扫喷丸后还要表面除尘。

Reconditioning of primed surface:

If zinc primer or other zinc silicate products are used for temporary protection, very thorough abrasive sweep blasting is required before final coating (with the zinc system) to remove accumulated dirt and zinc salt and to ensure adhesion. After sweep blasting, the surface shall be dusted off.

## 9. 油漆前的条件

### Conditions before painting

所有钢结构工作(包括焊接, 构件切割, 打磨)必须在表面处理之前结束。

All steel work (incl. welding, flame cutting, grinding) must be finished before the surface preparation starts.

制定油漆进程, 提交油漆说明书

Inform yourself of the painting process, given in the instructions of the paint manufacturer.

---

相关德瑞斯华海标准:

HFP. 02. 1000	硅酸锌涂料
HFP. 02. 2000	厚浆型涂料
HFP. 03. 0000	漆膜厚度测量

Related TTS HuaHai Standards:

HFP.02.1000	Zinc Silicate Coating
HFP.02.2000	Thick Film Coating
HFP.03.0000	Measurement of Film Coating Thickness

**硅酸锌涂料****ZINC SILICATE COATING****舱口盖硅酸锌漆涂装及其干膜厚度测量说明****Specification for coating and measuring the dry film thickness of zinc silicate coating on hatch covers (for manufacturer).**

硅酸锌产品的应用除了需要合格人员外，还需要有一定的工作经验。我们强烈建议在油漆之前咨询油漆商和有经验的专业人员。

Application of zinc silicate products requires, beside the qualification of the personnel, some experience. We recommend strongly consulting an application expert from the paint supplier before starting the coating work.

漆膜厚度不足会造成过早腐蚀。漆膜太厚会产生裂缝及锌的分解，相当于漆膜厚度不足。

Inferior layer thickness cause early corrosion, excessive layer thickness cause cracks, resulting in zinc decompose, leading again to inferior layer thickness.

油漆工具可以采用油漆刷（预涂/其后的油漆）和喷枪。

Application tool may be paintbrush (for pre-painting/subsequent painting) and spray gun.

**原则上禁止使用油漆滚刷****On principle, the use of a paint roller is prohibited**

油漆喷枪难以喷到的区域和焊缝必须用油漆刷进行预涂，之后，可以采用喷枪。

All areas that are difficult to reach with the spray gun as well as welding seams have to be pre-painted with the paintbrush. Right after this application with the spray gun takes place.

在油漆硬化前进行漆膜厚度控制。注意漆膜硬度，防止测厚仪不能穿透。（大约油漆后 4 小时）

The control of the dry thickness has to take place before the material has hardened. Pay attention to that the film has sufficient hardness, i.e. the measure probe shall not penetrate (abt. 4 h after application of the paint).

为达到规定的膜厚应根据油漆商提供的指导说明作必要的补漆。

Possible necessary subsequent layers for reaching the specified thickness have to be done according to the application instructions of the paint manufacturer.

为了控制油漆干膜厚度，将涂装区域根据标准 HFP. 03. 0000 的要求以面积 10 平方米进行划分，在每个划分区域内选择 5 个  $0.5 \times 0.5$  m 的测量区，每区测量三点，包括集装箱底座/绑扎件等配件等。

For control of the dry thickness, divide the component according to drawing MPROTO 1 into areas of 10 m<sup>2</sup>. In each of these areas choose 5 measure fields of 0,5 x 0,5 m. Take 3 measures per field. Include fittings like container foundations/lashing devices etc. according to their averaging.

利用测量工具做范例测量。

Carry out the measurements for example with the measuring device

**“POSITECTOR 2000” 或相当的型式**  
**Type "POSITECTOR 2000" or equivalent**

按测量标准 MPROTO 2 记录测量值。

Write down the measured values on the measure protocol MPROTO 2.

**理论油漆干膜厚度为 75 μm**  
**The nominal dry film thickness has to be 75 μm.**

油漆干膜厚度公差范围为 65-110 μm。

Single values shall be within the tolerance of 65 - 110 μm.

如若测量值超出上述规定的公差则应将它们定为超差值。这些超差值不应作标准记录，而需针对它们进行必要的修补工作。

Greater tolerances shall be localized by additional measurements to encircle it. These measurements shall not be noted on the measure protocol but used for the necessary restoring work.

对于超出厚度公差的漆膜，需用带灯的放大镜逐一检查裂缝并根据油漆商提供的指导说明进行必要的修补工作。

Excessive layer thickness shall be checked for cracks from case to case using a magnifying glass with lamp. Do necessary restoring work according to the instructions of the paint manufacturer.

采用浸泡了甲基-乙基-酮的抹布摩擦硅酸锌漆膜来检验其硬化程度，如果锌不溶解，则说明已经硬化。若硅酸锌漆膜完全硬化（硬化取决于干膜厚度、通风、温度、湿度），则需再涂一度漆（密封、完工涂装等作用）。

Apply a further layer (sealer, cover coating etc.) only after completely hardened zinc silicate (hardening depends on the dry film thickness, airing, temperature, humidity). Check the hardening by rubbing with a duster drenched with methyl-ethyl-keton. Is the zinc not dissolved, hardening is finished.

另外请参考油漆商提供的指导说明书。

Further, regard the respective paint manufacturer's instructions for use.



**厚浆型涂料****THICK FILM COATING**

舱口盖制造中油漆使用和厚浆型油漆干膜厚度测量指导说明

**Specification for coating and measuring the dry film thickness of thick film coating on hatch covers (for manufacturer).**

厚浆型油漆产品的使用除了需要合格人员外，还需有一定的生产经验。

Application of thick film paint products requires, beside the qualification of the personal, some experience.

油漆的混合以及油漆工具的使用应当依据油漆的指导说明。

Mixing of the paint as well as the use of the application tools according to the paint manufacturer's respective instructions for use.

喷枪难以喷到的区域和焊缝必须使用油漆刷进行预涂。之后，可以采用喷枪进行喷涂。

All areas that are difficult to reach with the spray gun as well as welding seams have to be pre-painted with the paintbrush. Right after this application with the spray gun takes place.

为了控制油漆干膜厚度，将涂装区域根据图MPROTO 1以面积10平方米进行划分，在每个划分区域内选择5个0.5x0.5m的测量区，每区测量三点，包括集装箱底座/绑扎件等配件等。

The control of the dry thickness has to take place before the material has hardened. Pay attention to that the film has sufficient hardness, i.e. the measure probe shall not penetrate. For control of the dry thickness, divide the component according to drawing MPROTO 1 into areas of 10 m<sup>2</sup>. In each of these areas choose 5 measure fields of 0,5 x 0,5 m. Take 3 measures per field. Include fittings like container foundations/lashing devices etc. according to their averaging.

对于盖板底部的油漆请特别注意构件阴影区域及横梁底部的油漆。

Coating the panel's bottom side see particularly to the "shady" sides of profiles and bottom booms.

利用测量工具做范例测量。

Carry out the measurements for example with the measuring device.

**“POSITECTOR 2000” 或相当的形式**

**Type "POSITECTOR 2000" or equivalent**

按测量标准 MPROTO 2 记录测量值。

Write down the measured values on the measure protocol MPROTO 2.

合同中指明的漆膜厚度为理论干膜厚度

**The film thickness specified in the contract is the dry film thickness.**

测量值不得低于理论干膜厚度的80%。最少80%的测量值必须达到理论值。在油漆供应商提供的指导说明书允许范围内的厚度超差是可以接受的。

20% of the readings may be max 20 % below the nominal dry film thickness. 80% of the readings have to reach nominal dry film thickness as a minimum. Excessive thickness is admissible within the limits given by the instructions for use of the respective paint manufacturer.

如若测量值超出规格书中规定的公差则应将它们定为超差值。这些超差值不应作标准记录，而需针对它们进行必要的修补工作。

If deviations from the specification are stated, they shall be localized by additional measurements to encircle it. These measurements shall not be noted on the measure protocol but used for the necessary restoring work.

另外请参考油漆商提供的指导说明书。

Further, regard the respective paint manufacturer's instructions for use.

漆膜厚度测量

MSASURING OF FILM COATING THICKNESS

漆膜厚度测量

MSASURING OF FILM COATING THICKNESS

油漆膜测量记录 MINUTES OF PAINT COAT MEASUREMENTS

测量值 MEASURED VALUES:

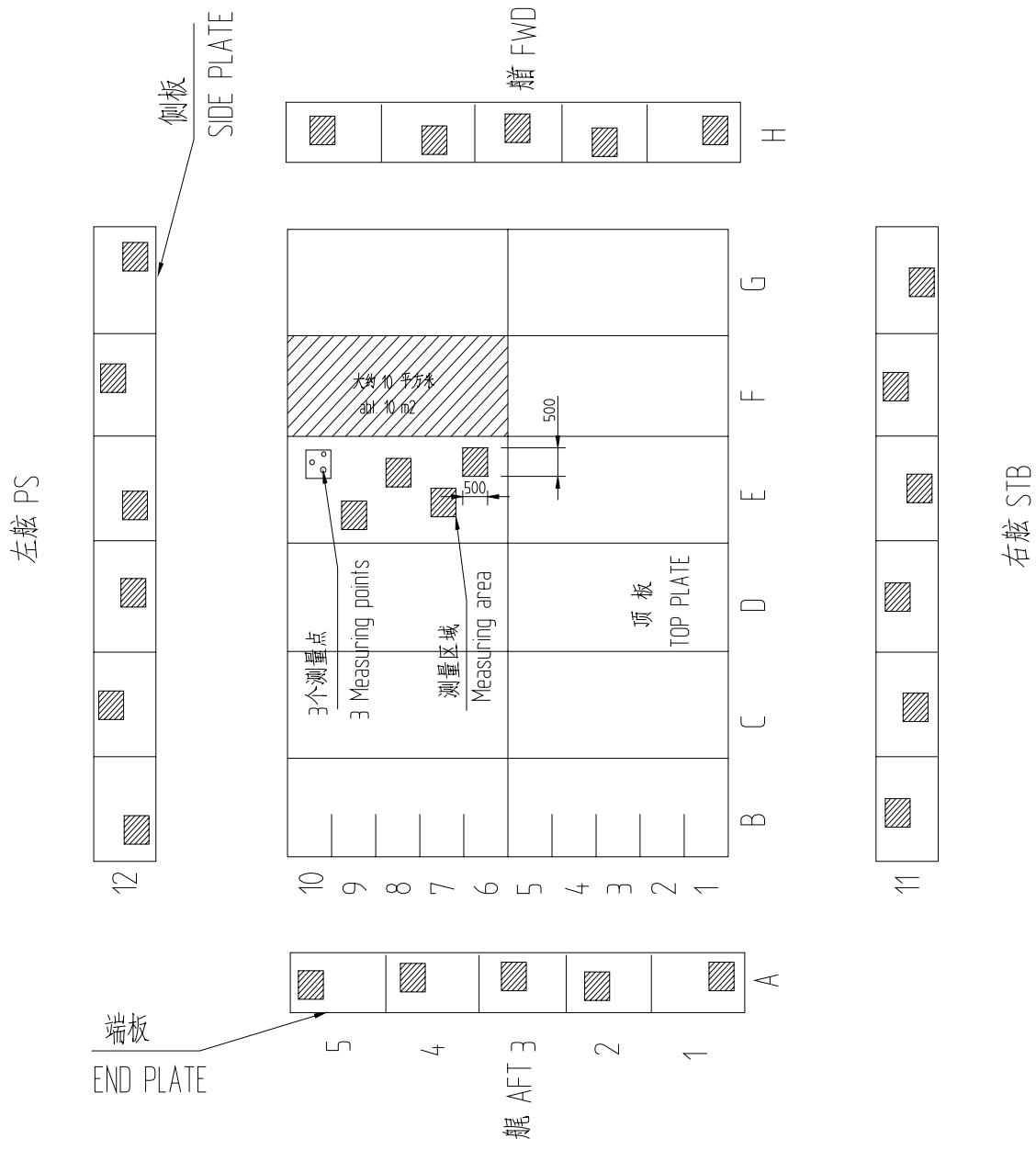
定单号: Order No:			盖板号: Panel No:			盖板上位置: 外部/内部 _ocation at panel: outside/inside area											
测量区域 Measuring Area			1			2			3			4			5		
			1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
A																	
B																	
C																	
D																	
E																	
F																	
G																	
H																	

测量区域 Measuring Area			6			7			8			9			10		
			1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
B																	
C																	
D																	
E																	
F																	
G																	

测量区域布置原则参阅第二页

Principal arrangement of measuring areas see page 2

日期: Date:	签字/盖章: Signature/stamp:
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油漆测量区域布置原则  
Paint coat measurements  
Principle arrangement of measuring area

密封条安装通用工艺

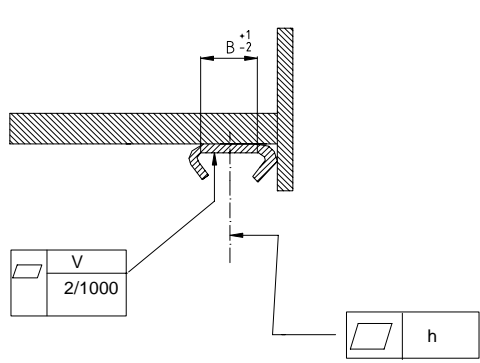
INSTALLATIONS OF PACKING, GENERAL REMARKS

测量时，盖板须与在实船上一样作相应支承，测量前须验证支承的平面度。如果产品不满足此标准或其它相关公差规定而仍进行后续工作，则德瑞斯华海公司有权决定是否接受或拒绝该产品。

For the measurements, the panel must be supported, as on board and the level of the supports must be checked prior to the measurement. If the product does not fulfill the tolerances on this sheet and/or other documents referred to but still works blamelessly TTS HuaHai may decide whether to accept or to reject the product.

1.1 橡皮槽平面度

Flatness of packing holder

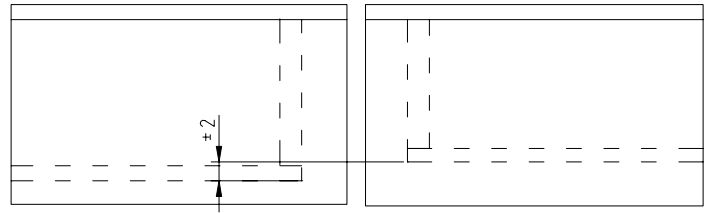


L	<5000	<8000	>8000
v	3	4	5
h	4	5	6

L-侧板，端板和接缝处橡皮长度  
L - LENGTH OF SIDE-, ENDPLATE, .  
v-垂向平直度  
v - VERTICAL FLATNESS  
h-水平平直度  
h - HORIZONTAL FLATNESS

1.2 相邻盖板橡皮槽许用高低公差

Allowed step for packing holders of adjacent panels



**2. 德瑞斯华海标准****TTS HuaHai Standards**

除了在此工艺说明涉及到的内容之外，以下标准也包括在内：

Apart from the instructions mentioned herein the following standards are also involved:

HFR. 02. 1000	单唇式密封橡皮安装说明 Installation Instruction of Single Lip Seal
HFR. 02. 2000	单孔密封橡皮安装说明 Installation Instruction of Hollow Seal
HFR. 02. 3000	矩形密封橡皮安装说明 Installation Instruction of Rectangle Seal
HFR. 02. 4000	泡沫密封橡皮安装说明 Installation Instruction of Foam Seal
HFR. 02. 5000	滑移式密封橡皮安装说明 Installation Instruction of Sliding Seal
HFR. 02. 6000	150×75 大滑移式密封橡皮安装说明 Installation Instruction of 150x70 Big Sliding Seal
HFR. 02. 7000	抽气封橡皮安装说明 Installation Instruction of Vacuum Seal

**3. 准备工作****Preparation work**

所有橡皮槽钢结构焊接节点焊接光顺，所有焊渣和飞溅必须清除。橡皮槽必须按照说明书要求正确喷丸和涂装。

All welded joints in rubber housing steelwork must be absolutely flush, all slag and spatter removed. The rubber housing to be blasted and painted according to specification.

除非另有规定橡皮槽应该按下列工序之一处理：

- 喷丸处理至 SA 2½，环氧锌底漆涂装，最小 50 微米。

- 喷丸处理至 SA 2½，硅酸锌底漆涂装，最小 75 微米。

Unless otherwise specified following preparation of the rubber housing should be in accordance to one of following procedures:

- blasting to Sa 2½, painting with zinc epoxy primer, min. 50 microns

- blasting to Sa 2½, painting with zinc silicate, min. 75 microns).

**重要:** 橡皮槽公差必须满足德瑞斯华海标准要求, 以确保橡皮密封件的正确安装。

**Important:** Housing tolerances must be within TTS requirements to ensure correct fit of rubber seal.

橡皮槽油漆完全硬化以后, 用干净的布把橡皮槽和与橡皮槽接触的橡皮密封件四周所有灰尘和其它污物清除干净。

After the housing paint is perfectly cured clean the housing and the sides of the rubber seal, which contact the housing, with a clean cloth to remove all dust and other impurities.

橡皮密封件上的油脂, 蜡, 白粉须用合适的溶剂如: 稀释剂, 苯, 或胶水溶剂清理干净。

Grease, wax. or chalk on the packing should be removed by cleaning with a suitable solvent like thinner, benzene or glues own solvent.

#### 4. 橡皮密封件的准备工作

##### Preparation of rubber

- \* 所有橡皮接头和直条橡皮均要切掉大约 20mm, 因为只有新的切削面才能避免存在可能使粘接剂失效的蜡或其他附加物。

Cut approx. 20 mm of all form pieces as well as of all straight lengths because only a recently cut cross section is free from waxes and other additives, which may destroy the subsequent gluing.

- \* 橡皮接头应保持干燥, 切割直条橡皮留有1%-2%的余量以确保接头处处于压缩接触。直条橡皮切削损耗要最小, 但最小使用长度为1000mm。

Fit form pieces dry and cut straight lengths with an additional allowance of 1 - 2 % to ensure compressed contact at butt joint. The straight lengths should be cut that minimum waste is created but no pieces shorter than 1000 mm are used.

- \* 橡皮剖面的切割尤其是端接头的切割质量要求光滑平直以确保接合面的涂胶均匀。

Cutting of rubber profiles; essential for the quality of the butt joint is to be done smoothly and square to ensure a uniform contact area when glued.

- \* 橡皮密封件的端部要用切割工具切割。

Ends of rubber seal to be cut by using a cutting tool.

- \* 最好的切割润滑剂是水。

The best cutting lubricant is water.

**警告:** 使用硅油会使粘接剂失效。

**WARNING:** The use of silicon oil will make the gluing impossible.

**注意:** 没有定位工具的手工切割是不允许的。

**Important:** Hand made cuttings without any guiding tool are not allowed.

接头对接处高低最大允许值

**Max allowed steps at butt joints**

- \* 密封对接面应齐平 (高低不得大于0.2mm)
- \* 其他对接面的高低不得大于0.5mm
- \* 凡对接面明显高低不平的台阶, 应作削斜消斜处理, 削斜长度与高度间隙比应大于30倍。
- \* Tightening surfaces should be even (steps \* 0.2 mm)
- \* All other surfaces steps \* 0,5 mm
- \* All bigger steps to be tapered by grinding; length of slope/step / 30

## 5. 推荐工具

### Recommended tools

切割工具

- a) 一只锯槽, 槽内切割工具为一把带锯条的钢锯, 钢条锋利且有完整的锯齿。
- b) 一只铡刀槽, 刀架铰接于槽边
- c) 一台专用剪裁型工具

Cutting tool

- a) A mitre box, where the cutting tool is a hack saw with a blade, which has been ground sharp, not removing the teeth completely.
- b) A mitre box, where the blade is hinged to the box.
- c) A special guillotine type cutting tool.

装配工具

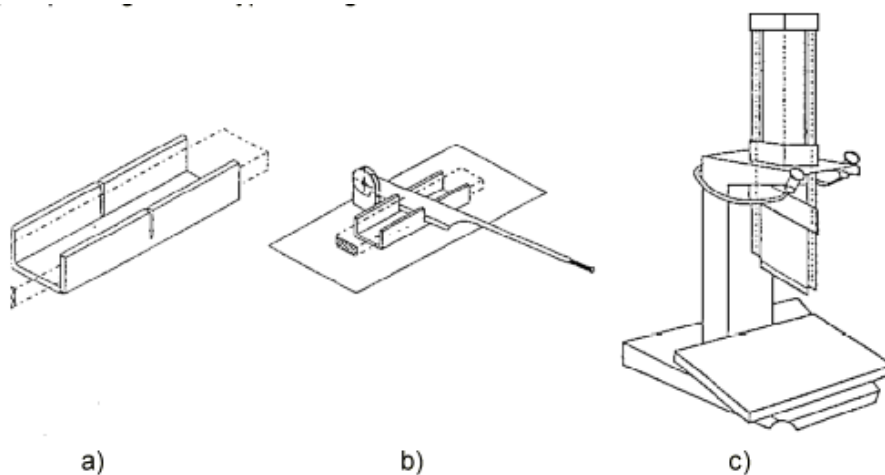
一把将橡皮密封件装入橡皮槽所需的大锤。能移动的, 安装型钢 (例如500mm长的角钢 L50×50×5) 之类的架空作业平台其操作由液压或机械的吊机完成。

A heavy sledge hammer is necessary for driving the rubber packing into the housing. For overhead working for the type sliding a mounting bar (e.g. L 50x50x5 - 500) operated by means of two hydraulic or mechanical screws, which are mounted on a movable table.

其它使用工具

Application tools





粘结剂使用的毛刷或带锯齿工具。

Adhesive to be applied by means of a brush or serrated tools.

#### 6. 工作位置

##### Working position

涂粘结剂的程序按盖板/密封槽的位置来定

盖板在头顶上是正常位置。

顶板在下方是倒过来的位置。

Gluing procedure is dependent on the position of the panel / seal retainer.

Overhead – panel in normal position

Upside down – panel laying on top plate.

#### 7. 工作温度

##### Working temperature

粘接剂使用推荐温度为+15°C到+20°C。常规而言，当橡皮密封涂粘结剂时的环境温度不得低于0°C。在这种情况下，粘结剂本身的温度应控制在+15°C到+30°C之间。如果温度在0°C到+15°C，那么就得加热粘结剂，以加速粘结剂的流动。（具体使用时必须遵循粘结剂制造厂产品说明书要求）。

Recommended temperature for application of the adhesive is +15°C to +20°C. As a rule the ambient temperature should not be below 0°C when gluing rubber packings. In that case, the temperature for the glue itself have to be within +15°C to +30°C. When the temperature is 0°C to + 15°C some sort of heating must be arranged to speed up the curing of the glue.

## 8. 橡皮接头

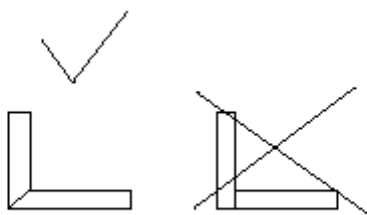
## Corner pieces on site

## 8.1 橡皮角接头的准备

## Preparing of corner pieces on site

德瑞斯华海标准采用成品橡皮接头。然而，有时橡皮接头不得不现场准备。为了满足风雨密性和强度要求，橡皮接头处必须按下图所示切割。

TTS HuaHai standard is to use ready made corner pieces. However, sometimes the corner piece has to be prepared on site. In order to achieve the weather tightness and the required strength, the joints must be cut as shown.

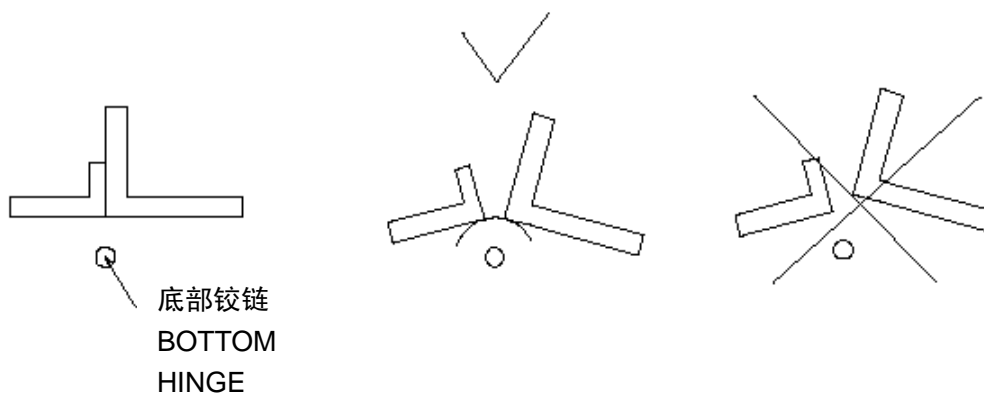


## 8.2 橡皮角接头的安装

## Mounting of corner pieces

橡皮角接头的装配工作要仔细实施以避免不必要的拉伸。

Mounting of the corner pieces should be carried out carefully avoiding all unnecessary stretching of the rubber pieces.



当在铰链接缝处（折叠式舱口盖）安装橡皮角接头和端头橡皮时，这些橡皮接头必须安装在一条直线上并且在进行折叠试验时无间隙产生。这在车间试验期间要做检查。

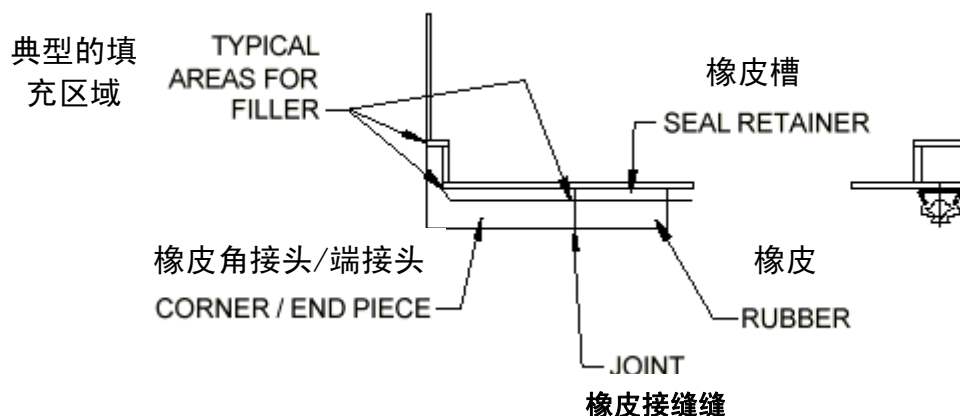
When fitting corner and end pieces at hinged joint (folding pair hatch covers) the pieces must be fitted that corner and end pieces are in line and no step occurs when a fold test is carried out. This is to be checked during workshop testing.

## 9. 粘合密封条

### Gluing of sealings

在密封条装入后粘结剂的外溢应迅速清除。橡皮安装工作的最后一步就是采用合适的橡皮填充物装填进所有的孔洞，以防止水进入密封系统。合适的填充物用补漏胶 PLOYURETHANE 或类似产品

When adhesive flows out after insertion of the sealing, it shall completely be removed. The last step of the rubber installation work, is to fill all holes and cavities with a suitable rubber compound in order to prevent the water ingress into the sealing system. Suitable fillers are Bostik C, Sikaflex 260 or equivalent.



## 10. 安全

### Safety

### 10.1 安全保障

#### Safety precautions

防火防爆：不要在暴露的火焰，火花或炽热的表面使用稀释剂和清洁剂。

Fire and explosion: Do NOT use thinners and cleaners in the presence of naked flames, sparks or hot surfaces.

清除附近引燃物品（包括指示灯）。火花或电器开关足以引起爆炸，马达或钢质工具也可引起易燃的溶剂挥发气体着火。防护措施还必须避免由接地装置如容器，管路，搅拌机和电机上所产生的静电。

Eliminate all sources of ignition in the neighbourhood including pilot lights. Sparks sufficient to cause an explosion and/or a fire by ignition of flammable solvent vapour can be caused by electrical switches, motors, steel tools etc. Precautions must also be taken to avoid the build-up of static electricity by earthing plant such as containers, pipes, mixers and applicators.

吸入：不要吸入稀释剂和清洁剂放出的挥发气体。尽可能采用排放挥发气体，适当的通风以及适当的工作安排以保持其低浓度。并检测挥发气体在工作区域的浓度。

Inhalation: Do NOT breathe the vapours from thinners and cleaners. It is essential to maintain as low a vapour concentration as possible by suitable ventilation and work arrangements, utilising vapour extraction as necessary. Ensure that solvent concentrations in the working area are monitored.

皮肤接触：佩带合适的防蚀手套并且小心保存，避免穿戴已被污染或损坏的手套。在存在飞溅危险之处所，操作人员必须穿戴防护裙或工作服以及面罩。

Skin contact: Wear suitable solvent-resistant gloves and take care when removing them, avoid the use of contaminated or torn gloves. Where danger from splashing exists operatives must wear a protective apron or overall and suitable face protection.

在表面皮肤上使用合适的皮肤药膏可增加必要的防护。不要用稀释剂和清洁剂来洗释皮肤，而应采用合适的皮肤清洁物品。

The application of a suitable barrier cream to the skin will give additional protection. DO NOT USE THINNERS AND CLEANERS FOR CLEANING THE SKIN - USE A SUITABLE SKIN CLEANER.

眼睛接触：无论在任何会有飞溅进入眼睛的危险地方，应该佩带合适的眼睛防护罩。

Eye contact: Wherever there is a risk of splashing into the eyes a suitable eye protection must be worn.

摄取：应避免摄取（有害）气体或液体。

Ingestion: Avoid ingestion.

## 10.2 应急措施

### Emergency action

火灾：采用CO<sub>2</sub>泡沫，干粉或BCF灭火器。**不要用水**

**Fire:** A fire extinguisher of the foam CO<sub>2</sub>, dry powder or BCF type should be used.  
DO NOT USE WATER.

有害吸入：把受害人抬到空气新鲜处并立刻寻求医疗救护。注意受害人的保暖和休息。  
如果呼吸停止，应及时进行人工呼吸。

**Inhalation:** Remove affected person(s) to fresh air and immediately seek medical assistance. Keep patient warm and at rest. If breathing stops give artificial respiration.

皮肤接触：用温的肥皂水清洗，干后然后施以合适的防护膏。

**Skin contact:** Wash with warm soapy water and, after drying, apply a suitable skin cream.

眼睛接触：先用大量水清洗，然后立刻采取医疗救治。

**Eye contact:** Wash with copious amounts of water and immediately seek medical assistance.

摄取：用水彻底漱口，然后寻求医疗建议。

**Ingestion:** Rinse the mouth thoroughly with water and immediately seek medical advice

### 10.3 溢出物

#### Spillages

溢出物应及时用沙，土或其它中性的不可燃的物品吸收（不可用锯屑）。然后这些浸渍的吸收物应放在贴有标签的容器里密封，并按废料处理方法仔细处置。

The spillage should immediately be soaked up with an inert absorbed such as sand, earth or any other inert non-combustible material (not sawdust). The impregnated absorbent should then be placed in adequately labelled containers, sealed and disposed of as detailed under "Disposal".

### 10.4 废料处理

#### Disposal

放置稀释剂或清洁剂的容器以及浸渍吸收物应作为特殊废料，小心处理。

Containers of thinners or cleaners or contaminated material should be disposed of as special waste. Care should be taken in the disposal of empty containers as normal waste.

## 矩形密封橡皮安装说明

## INSTALLATION INSTRUCTURE OF RECTANGLE SEAL

## 1. 安装前的准备

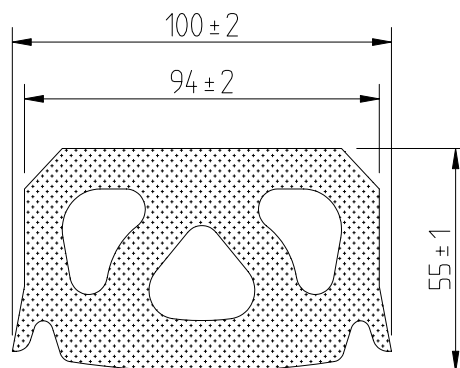
## Preparation before installation

## 1.1 橡皮槽

## Rubber seal retainer

- a) 内场安装完毕，提交验收后，对橡皮槽进行喷丸除锈，所有的焊缝须磨平打光，然后在橡皮槽内壁涂  $75\mu\text{m}$  无机锌底漆(zinc-silicate)。具体详细的油漆涂法须按油漆技术规格说明书进行。

Blast cleaning of the rubber seal retainer has to done when it has been checked and accepted after construction in the inside area. All of the welds have to be smoothed and flatted. Paint zinc-silicate in the inner surfaces of retainer with the layer thickness of  $75\mu\text{m}$ . Specifications of painting shall follow the instructions of the manufacturer for use of the paint.



- b) 最后一道油漆涂后 1.5 天，方可安装橡皮。安装前应清洗槽内 壁，彻底清除油脂和灰粉。

It is recommended to start fixing the rubber seal when it comes one day and a half after the last painting. Before installation, the inner surfaces shall be cleaned in order to release dirt and grease.

- c) 在橡皮槽的长度中央作个粉笔记号。

Mark the middle of the sealing with chalk.

## 1.2 橡皮

## Rubber sealing

- a) 将橡皮条展开成一直线，并保持直线状态至少放置 24 小时。

Unroll the rubber seal as a straight line and rest it in this condition at least for 24 hours.

- b) 橡皮条的尺寸须经过仔细检查，特别是其剖面高度。如果偏差超过容许公差，请立即通知德瑞斯华海。

The dimensions of the rubber seal must be checked carefully, especially for the height of

the seal profile. If the deviations exceed the allowable tolerances, TTS Huahai must be informed immediately.

- c) 将橡皮条精确切割成正确的角度，切割面应平整；直条橡皮切割时须放长些（约 5mm/m），这样插入后纵向稍受压缩可保证接缝处紧密配合。  
Cut the rubber seal precisely in correct angle while keep the cutting surface flat. Prepare the straight strips by cutting with overlength (about 5 mm per meter) so that the contact surfaces can fit each other tightly when the rubber seals are slightly compressed longitudinally after insertion.
- d) 橡皮条应保持干燥，没有污物和油脂，不可置于阳光下暴晒。  
The rubber seal should be kept dry and free of dirt and grease. Don't expose it to sunlight.
- e) 在涂胶水前将橡皮条的背部（即与橡皮槽的粘接面）用适当的工具弄粗糙，并用清洁的棉沙头抹拭干净。  
It is recommended to roughen the contact surfaces with proper tools and wipe them with clean cotton waste.
- f) 在橡皮条的长度中央作个粉笔记号。  
Mark the middle of the sealing with chalk.

### 1.3 将胶水彻底搅拌均匀

#### Mix the glue thoroughly

## 2、粘接与安装

### Adhesion and installation

### 2.1 橡皮条与橡皮条的粘接

#### Adhesion of rubber to rubber

- a) 用 LOCTITE 495 瞬干胶或由 TTS HuaHai 认可的同等粘结剂产品。使用时必须遵循制造厂的说明书要求。  
Use LOCTITE 495 or a substitute approved by TTS Huahai. Follow the instructions of the manufacturer for use of the adhesive.
- b) 将瞬干胶小心涂遍橡皮的粘接面，将接头压紧至少 10 秒，同时必须保证橡皮的压紧表面齐平（接头处橡皮压紧面的台阶差不可超过 0.2mm）。  
Paint the adhesion surfaces of rubber carefully, keep it pressed at least ten seconds and

## 矩形密封橡皮安装说明

## INSTALLATION INSTRUCTURE OF RECTANGLE SEAL

keep the contact surfaces on the same level (making the tolerance of two sealing connections less 0.2 mm).

## 2.2 橡皮条与橡皮槽的粘接

### Adhesion of the rubber seal and the retainer

- a) 用 JY-2 阻燃胶或由 TTS HuaHai 认可的同等粘结剂产品，使用时必须遵循制造厂的说明书要求。

Use JY-2 or a substitute approved by TTS Huahai. Follow the instructions of the manufacturer for use of the adhesive.

- b) 将胶水涂于橡皮槽内（见图 1），须干燥到胶的表面手摸上去不粘即可。

Paint the glue in the rubber seal retainer (as figure 1). The glue is ready for application when the surface still feels sticky but shows no threads by touching with a finger.

- c) 再将胶水涂于橡皮的背部（见图 2），当胶水还是湿的时候将橡皮嵌入橡皮槽。

Then paint the back of the straight seal strips with glue (as figure 2), before the glue has become dry, press the rubber seal into the retainer.

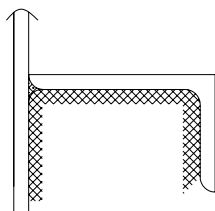


图 1 Fig.1

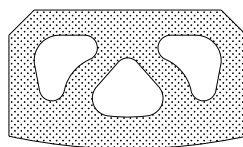


图 2 Fig.2

- d) 首先嵌入转角及端头的橡皮接头（若有必要，可用螺丝夹等适当的工具）。待胶水干了再嵌入直条橡皮。

First of all insert the corner pieces, using screw clamps if necessary. Insert the straight strips when the glue becomes dry.

- e) 安装直条橡皮时借助工具（重锤和木块）先将两端压入，然后再装中间部分（根据粉笔记号）。按图 3 顺序将橡皮均匀压入，以保证橡皮与橡皮槽之间不留空气，橡皮背部与橡皮槽粘合紧密以及橡皮条不拉伸。

Press both ends of straight strips in by hammers and blocks, then press in the left. In order to ensure there is no air between rubber seal and retainer so that they are adhesive tightly and the rubber seal doesn't stretch, work as the sequence shown in fig 3.



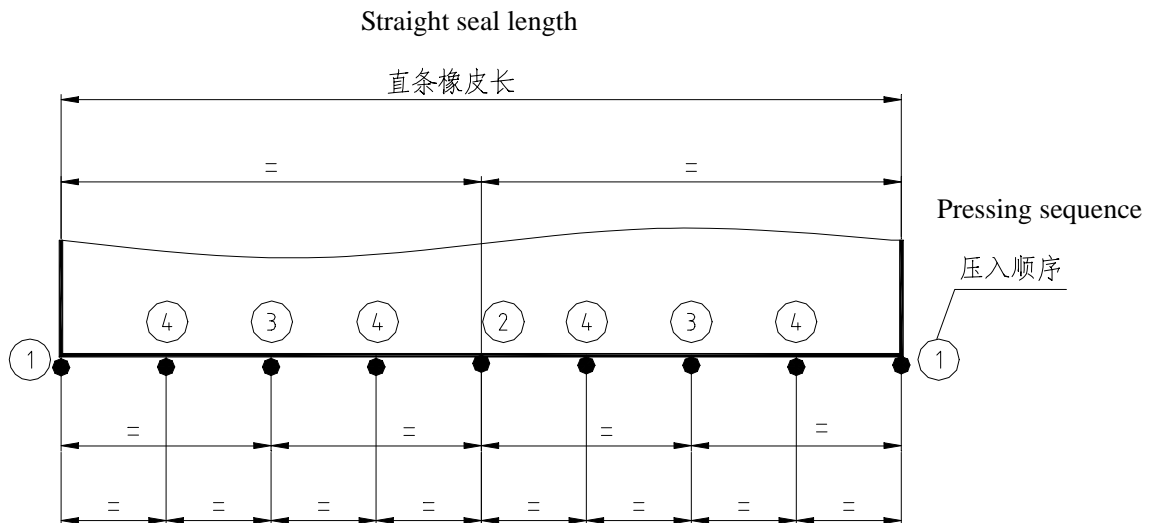


图 3 Fig.3

- 2.3 安装完毕后,所有的橡皮与橡皮槽粘接的边缘及橡皮之间接缝必须用 POLYURETHANE 补漏胶或由德瑞斯华海 认可的同等产品密封,在不平整之处必须磨光磨平。

After installation: All joining edges and gluing seams must be sealed with POLYURETHANE rubber cement or substitutes approved by TTS Huahai. Unevenness must be smoothed and planned by grinding.

注: 建议正式使用前先进行胶合试验, 因为环境温度、天气条件和施工方式都会影响胶水的干燥速度。

Notice: It is recommended that make a test before beginning to work as the drying of glue depends on the ambient temperature, the weather conditions and the construction styles.

**注意:**

**Caution:**

**粘结剂易燃烧!**

**The adhesive is highly inflammable!**

**必须采取必要的预防措施!**

**All necessary precautions must be taken!**