加氢反应器用不锈钢药芯焊丝

订货技术条件

PURCHASE SPECIFICATION

OF STAINLESS STEEL FLUX-CORED WIRE

FOR HYDROGENANT REACTOR

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1 范围 Scope

本文件规定了用于加氢反应器不锈钢药芯焊丝订货及验收的技术要求。

This specification prescribes requirements for the purchase and acceptance of stainless steel flux-corded wire for hydrogenation reactor.

2 参考规范 Applicable Code

ASME 锅炉及压力容器规范，第Ⅱ卷 C 篇 SFA-5.01/SFA-5.01M，最新版。

ASME B&PVC, Sec.Ⅱ Part C SFA-5.01/SFA-5.01M，latest Edition。

ASME 锅炉及压力容器规范，第Ⅱ卷 C 篇 SFA-5.22/SFA-5.22M，最新版；类别号为 E309LT0-1 和 E347T0-1.

ASME B&PVC, Sec.Ⅱ Part C SFA-5.22/SFA-5.22M, latest Edition; Classification shall be as follows: E309LT0-1 and E347T0-1

ASME 锅炉及压力容器规范，第Ⅸ卷，最新版

ASME B&PVC, Sec.Ⅸ, latest Edition

3 技术要求 Technical Requirements

E309LT0-1 和 E347T0-1 药芯焊丝的制造可采用任何能使产品符合规范和本技术条件要求的方法进行，每批焊丝的生产量尽量满足一次订货的要求。

The flux-cored wire of E309LT0-1 and E347T0-1 classification can be manufactured with any method of which products meet the requirements of applied code and this specification. To the best of manufacturer’s ability, the quantity of each batch production shall meet the ordering required as possible.

4 试验要求 Test Requirements

供方需对每批不锈钢药芯焊丝进行如下试验：

Supplier shall test each batch of stainless steel flux-cored wire required as follows:

4.1 未经稀释熔敷金属化学成分分析

Chemical Analysis of Undiluted Weld Metal

4.2 堆焊层熔敷金属化学成分分析

Chemical Analysis of Weld Deposit Metal for Overlay Cladding

4.3 堆焊层熔敷金属铁素体含量测定

Measuring Ferrite Content of Weld Deposit Metal for Overlay Cladding.

4.4 堆焊层熔敷金属晶间腐蚀倾向试验

Intergranular Corrosion Tendency Test of Weld Deposit Metal for Overlay Cladding.

4.5 弯曲试验 Bend Test

4.6 维氏硬度试验 Vickers Hardness Test

上述检验，供方在产品出厂前，应按照 ASME SFA-5.22/SFA-5.22M（最新版）执行，其结果必须满足本技术条件的要求，并提供试验报告。

The supplier shall perform above mentioned tests with ASME SFA-5.22/SFA-5.22M (latest Edition) before products leave the factory, and all test results shall meet the requirements in this specification and supply the test reports.

5 焊接条件 Welding Condition

5.1 焊接试验用母材 Base Metal for Welding Test

焊接试验用母材优先选用符合 ASME 规范第 II 卷 A 篇相关标准要求的 SA-387 Gr.22 Cl2 或 SA-542 Type D 板材，允许使用其他碳钢或低合金钢母材用于堆焊试验。

For the base material of welding tests, SA-387 Gr.22 Cl2 or SA-542 Type D plates specified in ASME Sec. Ⅱ, Part A are preferred. Other carbon steel or low alloy steel base materials may be used.

5.2 试件规格和形式 Weld Coupon Dimension and Shape

试件规格和形式不受限制，应满足检验项目的需要。

The weld coupon dimension and shape are not mandatory and shall meet requirements of examination items.

5.3 焊接顺序 Welding Procedure

堆焊层焊接 2 层。第一层采用 E309LT0-1 类别药芯焊丝堆焊，第二层及后续层采用 E347T0-1 类别药芯焊丝堆焊。

It needs to perform welding of two layers overlay cladding. Flux-cored wire of classification E309LT0-1 is used to perform the first layer and that of

classification E347T0-1 is used to perform the second layer and subsequent layers.

5.4 焊接位置 Welding Position

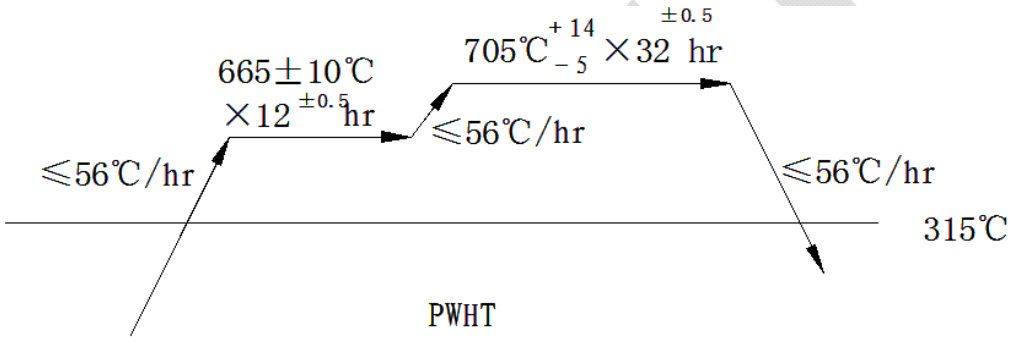
堆焊金属的焊接位置为平焊位和横焊位。

Welding position for weld overlay cladding is flat and horizontal.

5.5 焊后热处理 Post Weld Heat Treatment

试件焊后热处理按 665±10℃×12$^{\pm0.5}$hrs+705$^{+14}_{-5}$℃×32$^{\pm0.5}$hrs.的热处理工艺执行。

Post weld heat treatment of weld coupon shall be done with the following conditions.



6 化学成分分析 Chemical Analysis

6.1 未经稀释熔敷金属化学成分 Chemical Composition of Undiluted Weld Metal.

未经稀释熔敷金属化学成分应满足表 1 要求。

The chemical composition of undiluted weld metal shall be as show in table 1.

表 1 未经稀释熔敷金属化学成分(wt%)

Table 1 Chemical Composition of undiluted weld metal (wt%)

	C	Si	Mn	P	S	Ni	Cr	Nb+Ta	Mo	Cu	N	Cr/Ni
E309LT0-1	≤ 0.04	≤ 1.00	0.50～ 2.50	≤ 0.030	≤ 0.020	12.00～ 14.00	22.00～ 25.00	-	≤ 0.20	≤ 0.20	≤ 0.06	≥1.8
E347T0-1	≤ 0.03	≤ 1.00	1.00～ 2.50	≤ 0.030	≤ 0.020	9.00～ 11.00	18.00～ 21.00	8×C～ 1.00	≤ 0.20	≤ 0.20	≤ 0.06	≥1.8

6.2 堆焊层熔敷金属化学成分

Chemical Composition of Weld Deposit Metal for Overlay Cladding

距堆焊层表面 2.75 毫米至 3.25 毫米范围内的化学成分应如表 2 所示。

Chemical composition determined under 2.75mm to 3.25mm from the surface of overlay cladding shall be as show in table 2.

表 2 堆焊层熔敷金属化学成分（wt%）

Table 2 Chemical Composition of overlay cladding (wt%)

Combination	C	Si	Mn	P	S	Ni	Cr	Nb+Ta	Mo	Cu	N	Cr/Ni
1st layer: E309LT0-1 2nd layer & subsequent: E347T0-1	≤ 0.04	≤ 1.00	1.00 ～ 2.50	≤ 0.030	≤ 0.020	9.00 ～ 11.00	18.00 ～ 21.00	8×C ～ 1.00	≤ 0.20	≤ 0.20	≤ 0.06	≥ 1.8

7 铁素体含量 Ferrite Content

距堆焊层表面 2.75 毫米至 3.25 毫米处的熔敷金属中的铁素体含量应如表 3 所示。

Ferrite content of weld deposit metal under 2.75mm to 3.25mm from the surface of overlay cladding shall be as shown in table 3.

表 3 铁素体含量

Table3 Ferrite content Measuring Method

Measuring Method / T.P Conditions	WRC-1992 Diagram (FN)
As-Welded	3～8

8 第二层及后续堆焊层晶间腐蚀倾向试验 Intergranular Corrosion Tendency Test for 2nd and Subsequent layers Overlay Cladding

经焊后热处理后，第二层及后续堆焊层进行抗晶间腐蚀能力检验。试样取自表面至 3mm 处，试样尺寸为 3mm×20mm×80mm，按 ASTM A262 E 法检验后无裂纹出现为合格。

The intergranular corrosion tendency test of 2nd and Subsequent layer overlay shall be examined after PWHT. The specimens of which dimension is 3mm×20mm×80mm shall be taken from the metal at 3mm depth from the surface of overlay ,and no crack occurred shall be accepted on the specimen according to ASTM A262 Practice E.

9 弯曲试验 Bend Test

不锈钢堆焊层经上述制度的热处理后，应进行弯曲检验，试样为堆焊层和母材的复合金属，试验方法按照 ASME 规范第Ⅸ卷执行，试验结果应满足表 4 的要求。

The bend test shall be examined after the heat treatment above-mentioned, and the specimen includes base metal and overlays. The test results shall meet the requirements in table 4 in accordance with ASME Sec.Ⅸ.

表 4 弯曲试验

Table 4 Bend Test

试验温度 Test Temp.	类型 Type	尺寸（mm） Dimension	数量 Quantity	弯曲条件 Bend Condition
室温 Room Temp.	（a）纵向弯曲 Longitudinal Side Bend	10×30×200(d)	2	(c)D=40mm 180°
	（b）横向弯曲 Transverse Side Bend	10×30×200(d)	2	(c)D=40mm 180°
	（a)纵向弯曲 Longitudinal Side Bend	3×13×160(d)	2	(c)D=12mm 180°
	（b）横向弯曲 Transverse Side Bend	3×13×160(d)	2	(c)D=12mm 180°

注 Note：a. 纵向侧弯试样长度方向平行于堆焊方向

The length direction of longitudinal side bend specimen shall be parallel to welding direction.

b. 横向侧弯试样长度方向垂直于堆焊方向

The length direction of transverse side bend specimen shall be perpendicular to welding direction.

c. D—弯辊直径 Bending Plunger Diameter。

d. 试样长度可根据试验设备进行调整。

The length of the sample can be adjusted according to the test equipment.

10 维氏硬度试验 Vickers Hardness Test

347 堆焊层（焊态）表面进行 HV 硬度测定，至少 5 点，硬度值供参考。

HV hardness test shall be conducted on the 347 overlayer（as welded） surface, at least 5 points. The hardness values are for reference.

11 焊丝制造质量 Manufacture Quality of the Flux-cored Wire

（1）焊丝的规格尺寸如表5所示。每盘焊丝由同一炉号的一根组成，不允许有焊接接头。

Dimensions of the flux-cored wire are showed in table 5. Each spool of wire shall be from a single lot of material and shall be continuous, no welded joint is permitted.

表5 焊丝规格

Table5 Welding Wire Size

焊丝直径 Wire Diameter（mm）	盘径 Spool Diameter（mm）	盘重 Each Spool Weight（Kg）
Φ1.2±0.02	ASME SFA5.02/SFA5.02M S300	$20^{+0.3}_{-0}$
Φ1.6±0.02		$20^{+0.3}_{-0}$

（2）光洁度和均匀度 Finish and Uniformity

焊丝应有光滑的表面，没有毛刺、凹陷、刮伤、氧化皮或对焊接性能、焊接设备操作或熔敷金属性能起到不利影响的其它外来物质。芯部组成物应沿焊丝的整个长度分布足够均匀，使得焊接操作或焊缝金属的性能不受有害影响。

The surface of welding wire shall be finished smoothly, and free from slivers, depressions, scratches, scales and other foreign matter that would adversely affect the welding properties and the operation of the welding equipment. Composition in the core shall distribute enough uniformity along the length of the welding wire so as not to adversely affect performance properties of the weld metal.

（3）弹射度 Cast

对于连续长度的填充金属，缠绕在标准的 300mm 盘上焊丝的弹射度应当给焊丝造成一定的曲率，即将 1.2～2.4 米长的一段焊丝从焊丝盘上切下并放置在一个平面上时，其形成的弯曲半径不小于 380mm，又不大于 1300mm。

For the fill in metal which is continuum and winding on 300mm spool, its cast shall make a stated curvature to the welding wire. For example when cut a specimen of 1.2～2.4 meter length wire from the coil and lay unrestrained on a flat surface will form a curve which is not less than 380mm nor more than 1300mm in radius.

（4）螺旋度 Helix

对于连续长度的填充金属，缠绕在 300mm 盘上焊丝的螺旋度，应当是将测定了弹射度的同一根焊丝放置在一个平面上，所测得相邻两圈之间的垂直间隔不大于 50mm。

For the helix of the filler metal which is the continuum and winding on 300mm spool, the specimen shall be the same with the cast measuring and put it on the same flat surface, the vertical distance is no more than 50mm between the adjacent circles。

（5）缠绕要求 Winding Requirements

焊丝的缠绕要避免扭折、弯曲或影响送丝的骤弯、能够无限层绕，保证焊丝在焊接设备上能连续均匀的进给。焊丝的外端应作标记，并牢固地固定。

Welding wire shall be wound so that kinks, waves, sharp bends, or wedging are

not encountered, leaving the wire free to unwind without restriction. To ensure the wire will feed in an uninterrupted manner in automatic and semiautomatic equipment. The outside end of the welding wire shall be identified and secured to avoid unwinding.

（6）每批焊丝应抽取10%，但至少2盘进行形状、尺寸、表面质量检查，其检验结果应符合本技术条件的规定。

More than 10 percent of welding wire but not less than 2 spools in one batch shall be withdrawn to check the shape, size and appearance quality according to the requirements as specified in this specification.

12 包装Package

（1）盘装焊丝的焊丝盘，其材料及结构型式应当在正常搬运或使用时，能保证防止焊丝盘本身和填充金属不发生损坏或变形。骨架采用钢结构。

The welding wire spools shall be steel structure to prevent damage and distortion of the spools and the welding wire during normal handling and usage.

（2）焊丝盘应足够地清洁及干燥，以便保持填充金属洁净。焊丝盘外表要用蜡纸包裹，在海上运输时应加以密封，防止受潮或腐蚀。

The welding wire spools shall be cleaned and dried enough to maintain the cleanliness of the welding wire. The outside of welding wire spools shall be wrapped with wax paper. It shall be sealed over sea transportation to protect against moisture and corrosion.

13 标识 Marking of Packages

每个单位包装件的外表都应清晰地标出下述内容：

The following information shall be legibly marked on the outside of each unit package:

（1）制造厂名称 Manufacturer's name

（2）商品名称 Trade designation

（3）ASME规范号和AWS类别号 ASME specification number and AWS classification number

（4）规格和净重 Size and net weight

（5）批号、检验号或炉号 Lot, control, or heat number

（6）生产日期 Production date

14 材料合格证书 CERTIFIED MATERIAL TEST REPORT

供方所提供的每一批次焊丝，都必须提供材料合格证书，其内容包括下述项目。

Each batch of welding wire supplied by the seller must offer the certificate material test report including the following contents:

（1）商品名称 Trade Designation

（2）ASME规范号和AWS类别号 ASME specification number and AWS classification number

（3）规格和净重 Size and net weight

（4）批号、检验号或炉号 Lot, control, or heat number

（5）生产日期 Production date.

（6）用户名称 Customer's name

（7）制造厂名称 Manufacturer's name

（8）用户规范号和版本号 Customer's Spec.No. and Rev.No.

（9）试验采用的基材名称 Material Designation of Base Metal for Acceptance Test

（10）焊接条件 Weld Conditions

（11）热处理状态 Heat Treatment Condition

（12）ASME SFA-5.22/SFA-5.22M 要求的试验结果 Test Results required in ASME SFA-5.22/SFA-5.22M

（13）未稀释焊接金属和堆焊金属化学成分

Chemical composition of undiluted weld metal and overlay metal

（14）堆焊金属弯曲试验结果 Results of bend test of overlay metal

（15）堆焊金属铁素体含量 Ferrite content of overlay metal

（16）第二层堆焊金属腐蚀试验结果 Results of corrosion test of 2nd layer overlay metal

（17）硬度试验结果 Results of Hardness Test

（18）用户订单号 Customer's purchase order number

（19）QA责任人的证明声明和签字 Certification Statement and Signature by QA.