

中国一重 CFHI	订货技术条件 PURCHASE SPECIFICATION	标准号	STANDARD NO	20250508-101
		版本号	REVISION NO	0
		页码	PAGES	13

## 加氢反应器用不锈钢焊带和焊剂

### 订货技术条件

### PURCHASE SPECIFICATION

### OF STAINLESS STEEL WELDING STRIP AND FLUX

### 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焊带和焊剂订货及验收的技术要求。

This specification prescribes requirements for the purchase and acceptance of stainless steel welding strips and fluxes 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-5.9/SFA-5.9M，最新版；类别号为改良型 EQ309L 和 EQ347L

ASME B&PVC, Sec. II Part C SFA-5.9/SFA-5.9M, latest Edition; Classification shall be as follows: modified EQ309L 和 EQ347L

ASME 锅炉及压力容器规范，第 II 卷 C 篇 SFA-5.39/SFA-5.39M，最新版

ASME B&PVC, Sec. II Part C SFA-5.39/SFA-5.39M, latest Edition

ASME 锅炉及压力容器规范，第 IX 卷，最新版

ASME B&PVC, Sec. IX, latest Edition

除符合上述规范要求外，还应符合本订货技术条件的规定。

Except for applicable code above, the requirement of this specification also shall be met by the manufacturer.

## 3 技术要求 Technical Requirements

EQ309L（改良型）和 EQ347L（改良型）焊带和焊剂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。每批焊材的生产量尽量满足一次订货的要求。

The welding strip and flux of EQ309L (Modify) and EQ347L (Modify) 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 heat production shall meet the ordering required as possible.

## 4 试验要求 Test Requirements

供方需对每批焊带和焊剂进行如下检测项目的检验：

Supplier shall test each heat of stainless steel welding strips and fluxes

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required as follows:

#### 4.1 焊带化学成分分析

Chemical Analysis of Welding Strips

#### 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 堆焊金属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-5.9/SFA-5.9M（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-5.9/SFA-5.9M (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 Conditions

#### 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 C12 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 C12 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.

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### 5.3 焊接顺序 Welding Procedure

堆焊层焊接 2 层。第一层采用 EQ309L (改良型) 类别焊带, 第二层采用 EQ347L (改良型) 类别焊带堆焊。

It needs to perform welding of two layers overlay cladding. Welding strip of classification EQ309L (Modify) is used to perform the first layer and that of classification EQ347L (Modify) is used to perform the second layer.

### 5.4 焊接位置 Welding Position

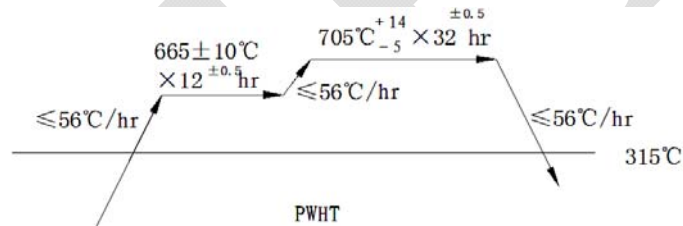
堆焊金属的焊接位置为平焊位。

Welding position for weld overlay cladding is flat.

### 5.5 焊后热处理 Post Weld Heat Treatment

试件焊后热处理按  $665 \pm 10^\circ\text{C} \times 12^{\pm 0.5} \text{hrs} + 705^{+14}_{-5} \text{C} \times 32^{\pm 0.5} \text{hrs}$  的热处理工艺执行。

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



## 6 化学成份分析 Chemical Analysis

### 6.1 焊带化学成分 Chemical Composition of Welding Strip.

焊带化学成分见表 1.

The chemical composition of welding strip shall be as shown in table 1.

表 1 焊带化学成分 (wt%)

Table 1 Chemical Composition of welding strip (wt%)

	C	Si	Mn	P	S	Ni	Cr	Nb+Ta	Mo	Cu	N	Cr/Ni
EQ309L (Modify)	≤ 0.025	0.20~ 0.60	1.75~ 2.25	≤ 0.025	≤ 0.020	10.00~ 11.50	20.75~ 22.75	-	≤ 0.20	≤ 0.20	≤ 0.04	≥ 1.8
EQ347L (Modify)	≤ 0.025	0.20~ 0.60	1.50~ 2.00	≤ 0.025	≤ 0.020	9.50~ 11.00	19.00~ 21.00	0.50~ 0.80	≤ 0.20	≤ 0.20	≤ 0.04	≥ 1.8

### 6.2 堆焊层熔敷金属化学成分

Chemical Composition of Weld Deposit Metal of Overlay Cladding

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熔敷金属化学成分应从第二层堆焊层表面以下 2.75~3.25mm 深处的金属取样分析,需满足表 2 的要求。

Weld deposit metal chemical composition determined under 2.5mm to 3.0mm from the surface of 2nd 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: EQ309L (Modify)	≤	≤	1.00	≤	≤	9.00	18.00	8×C	≤	≤	≤	≥1.7
2nd layer: EQ347L (Modify)	0.03	0.90	~ 2.50	0.030	0.020	~ 11.00	~ 21.00	~ 1.00	0.20	0.20	0.05	

### 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  
Table 3 Ferrite content Measuring Method

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

### 8 第二层堆焊金属晶间腐蚀倾向试验

Intergranular Corrosion Tendency Test for 2nd layer Overlay

不锈钢堆焊层焊后经  $665 \pm 10^\circ\text{C} \times 12^{\pm 0.5} \text{hrs} + 705^{+14}_{-5} \text{C} \times 32^{\pm 0.5} \text{hrs}$  的热处理后,第二层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  $3 \times 20 \times 80 \text{mm}$ ,按 ASTM A262-15E 法检验后无裂纹或裂缝出现为合格。

两层以上堆焊时,堆焊金属晶间腐蚀倾向试验也应符合上述要求。

The intergranular corrosion tendency test of 2nd overlay shall be examined after heat treatment at  $665 \pm 10^\circ\text{C} \times 12^{\pm 0.5} \text{hrs} + 705^{+14}_{-5} \text{C} \times 32^{\pm 0.5} \text{hrs}$  hrs. The specimens of which dimension is  $3 \times 20 \times 80 \text{mm}$  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 A262-15E examination method.

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Above-mentioned intergranular corrosion requirements shall also be met when welding more than two layers.

## 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 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（焊后）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,

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at least 5 points. The hardness values are for reference.

## 11 焊带制造质量 Manufacture Quality of Welding Strip

(1) 焊带的规格尺寸如表5所示。

Dimensions of welding strip are showed in table 5.

焊带应缠绕成盘交货。每盘焊带由同一炉号的一根组成,不允许有接头。

Welding strip shall be furnished in continuous and wound in coils. The strip of one coil shall be the same heat No. without any joint.

表 5 焊带规格  
Table 5 Welding Strip Size

宽度 Width (mm)	厚度 Thickness (mm)	内径 Inner Dia (mm)	重量 Weight (Kg)
19±0.5	0.4±0.04	305±5	40±5
37.5±0.5			50±5
50±0.5			50±5
75±0.5			100±10

(2) 金属箱内标准焊剂的净重为 $20_0^{+1.0}$  kg。

Standard net weight of fluxes in metal container shall be  $20_0^{+1.0}$  kg.

(3) 焊带表面质量 Surface Quality of welding Strips

焊带要求在冷轧状态交货,其软硬适合于焊接时自动送进,不影响焊接正常进行和焊接质量为合格。

Welding strips shall be furnished with cold rolled condition. Hardness of welding strips shall be suitable for automatic welding and it shall be acceptable when welding strips can be maintained smooth feeding during weld and show no effect to the properties of welded metal.

不锈钢带冷轧后,表面必须进行精整,达到表面清洁、光亮和平滑、无油脂、无结疤、无重皮。

After cold rolled process, welding strip surface shall be clean, glossy, flat and smooth and shall not have grease, scratches and laps.

边缘经过清理,无毛刺和裂纹,表面粗糙度等级为 $Ra=0.32$ 以上。

The both edges of welding strip shall be free from burrs and cracks by cleaning.

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Roughness grade shall be not less than Ra=0.32um.

(4) 焊带缠绕和焊带不直度 Winding procedure for the coil and straightness of welding strips

焊带缠绕成盘时应避免焊带盘边缘出现参差不齐，不平度高度不应超过焊带宽度的0.6%。测量焊带任意部位，在一米长度内其不平度和焊带不直度不能超过表6所规定的公差范围。

Welding strips shall be wound into coil so as to avoid producing uneven edge of coil, and the height of uneven edge shall not exceed 0.6% on width of welding strips. The camber of welding strip shall not exceed from a straight line by tolerance as specified in table 6 on each width of welding strip as measured on 1m length.

表 6 焊带不直度允许公差

Table 6 Allowance Tolerance of Welding Strips straightness

Strip width (mm)	8~<20	20~<50	50~<125	≥125
Tolerance (mm)	2	1.5	1	0.5

12 焊带的包装和标记 Packaging and Marking of Welding Strips

(1) 焊带须进行紧凑层状缠绕，带间严密贴合成盘状。

Welding strips shall be wound into coil in tight layers.

(2) 焊带的两端头要固定牢固，并加标记。

The both ends of welding strips for each coil shall be secured and identified.

每个包装件的外部都应清楚地标出下列内容：

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

(a) 商品名称 Trade designation

(b) 规格尺寸和净重 Size and net weight

(c) 炉号 Heat number

(d) 批号 Coil number

(e) 生产日期 Production date

(f) 制造商名称 Manufacturer's name

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(g) 警示标签 Warning label.

(3) 焊带表面不准涂油或其它有害的防护涂层。

The surface of welding strips shall not be covered with oil or other harmful protective agents.

(4) 带盘箍紧带不许锈蚀。

The steel belt to be fasten the coil shall not be rusted.

(5) 带盘外面应使用具有一定韧性且防潮的包装,防止在运输和储存过程中受到损坏和污染。

The coil shall be wrapped with tough and moisture-proof material for prevention of damage and dirt during transportation and preservation.

(6) 带盘外应缠绕牛皮纸,牛皮纸两端应使用塑料带固定。

Each coil shall be spirally wrapped with kraft paper and the end of paper shall be fixed with vinyl tape.

(7) 包装后,每盘焊带的内、外均应放置标签,标签包含以下内容:

After packaging two labels shall be stuck on inside and outside of each coil with the following information.

(a) 制造商名称和商品名称 Manufacturer's name and trade designation

(b) 规格尺寸和净重 Size and net weight

(c) 炉号 Heat number

(d) 批号 Coil number

(e) 生产日期 Production date

(f) 警示标签 Warning label

(8) 所有焊带盘应放置在最大载重1000kg的木质货盘上,按照出口或如包装程序进行包装,防止在常规运输和储存过程中受到损坏。

All coils shall be put on a wooden pallet with maximum packaging weight 1,000kg and packed by exporting packaging procedure to prevent damage during shipment and storage under normal condition.

13 焊剂的包装和标记 Marking and Packaging of Fluxes

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(1) 焊剂应包装在合适的罐状容器中防止在常规运输过程和储存过程中受到损坏。

Fluxes shall be packaged into a suitable can to ensure against injury during shipment or storage under normal conditions.

(2) 每个包装的外部应明确标示以下内容：

The outside of each package shall be legibly marked with the follow information.

- (a) 制造商名称和商品名称 Manufacturer's name and trade designation
- (b) 净重 Net weight
- (c) 批号 Lot number
- (d) 生产日期 Production date
- (e) 推荐烘干条件 Recommendation for baking condition
- (f) 警示标签 Warning label

#### 14 材料合格证书 Certified Material Test Report

供方所提供的每一批次焊带和焊剂，都必须提供材料合格证书，其内容包括下述项目。

Each heat of welding strip and flux 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) 焊接条件和烘干条件 Weld and Baking Conditions
- (11) 热处理状态 Heat Treatment Condition
- (12) ASME SFA-5.9/SFA-5.9M要求的试验结果 Test Results required in ASME SFA-5.9/SFA-5.9M

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(13) ASME SFA-5.39/SFA-5.39M 要求的试验结果 Test Results required in ASME SFA-5.39/SFA-5.39M

(14) 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

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

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

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

(18) 硬度试验结果 Results of Hardness Test

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

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