

- **Qualificação de soldadores e operadores de máquinas automáticas de soldadura:**
 - A qualificação de soldadores e operadores de máquinas automáticas de soldadura constitui uma fase fundamental do controlo antes da soldadura.
 - É indispensável comprovar a aptidão dos soldadores de forma a obter uma soldadura sem defeitos e com a qualidade exigida.
 - Essa comprovação é feita através de ensaios de qualificação, os quais constam na realização de soldaduras de amostragem, com o mesmo tipo de materiais base, de adição e métodos operatórios semelhantes aos utilizados na soldadura de produção. A seguir realizam-se exames e ensaios necessários à avaliação da qualidade da soldadura e competência do soldador.
 - Existem várias normas que regulamentam os exames:
 - ASME IX
 - API
 - NP EN 287-1 – soldadura por de aços (antiga)
 - EN ISO 9606-1 – soldadura por fusão de aços
 - Disposições gerais das normas:
 - Um soldador qualificado para soldar com eléctrodos básicos, fica também qualificado para soldar com outros tipos de eléctrodos revestidos (básico, rutilo);

- Se tiver qualificado para soldar na horizontal, vertical e ao tecto, fica qualificado para soldar em todas as posições.
- A qualificação em soldadura topo a topo em junta topo a topo, qualifica também a soldadura topo em qualquer tipo de junta, nas mesmas posições, mas não inversamente.
- Ensaios usados para avaliar a qualificação das provas:
- Ensaios não destrutivos:
 - Exame visual;
 - Exame por radiografia, ultra sons, etc.
- Ensaios destrutivos:
 - Ensaios de dobragem (de face, de raiz ou lateral);
 - Macrografia;
 - Ensaios de fractura
 - Por vezes: ensaios de tracção e de resiliência.
- Ensaio de dobragem (geralmente a 180°):
 - Detectar falta de fusão;
 - Ductilidade da junta.

- Exame visual e macrografia (o exame visual também é feito em cada passe):

- **Avalia:**

- **dimensão e perfil da soldadura;**

- **uniformidade de aspecto;**

- **grau de bordos queimados;**

- **outros defeitos superficiais;**

- **penetração na raiz.**

- Radiografia: detecta defeitos internos

- **Repetição de provas (segundo a norma europeia):**

- **Se o soldador não for aprovado, poderá submeter-se a nova prova depois de decorrido um mês após a saída dos resultados.**


- **Entre vários ensaios realizados, se apenas um não apresentar resultados satisfatórios, o soldador pode repetir a prova referente a esse ensaio.**

- **Durante a soldadura não são admitidas reparações.**

- **Registo (certificado) e validade da qualificação do soldador**
 - **Os ensaios de qualificação e respectivos resultados são registados, para cada soldador, num certificado próprio emitido pela entidade inspectora.**
 - **O prazo de validade do certificado de qualificação é normalmente dois anos, se o soldador não deixar de soldar por um período superior a seis meses.**
 - **Em trabalhos de grande responsabilidade os períodos de validade são inferiores: três a seis meses.**

PCM 9

Alfredo Pimenta


Instituto de soldadura e qualidade

Certificado de Qualificação

WELDING PERFORMANCE QUALIFICATION
SOLDADOR/OPERADOR DE SOLDADURA
WELDER/WELDING OPERATOR

CERTIF. N.º 89/20482 CÓDIGO ASME IX 1986 E ADENDAS
CODE

A — IDENTIFICAÇÃO (IDENTIFICATION)

Empresa SEPSA - SOC. CONSTR. ELECTROMECANICAS, SA (CENFIM-NÚCLEO MATOSINHOS)
Company
Soldador/Op. de Soldadura ALFREDO MONTEIRO PIMENTA - Nº 132 (YY)
Welder/Welding Operator
Data de nascimento 03/02/21 B.I.N.º 742296 Arq. Ident. LISBOA
Birth Date Ident. Card N.º Ident. Office

B — PROCESSO DE SOLDADURA (WELDING PROCESS) SMW

C — MATERIAL DE BASE (BASE METAL)

Designação SAISI 316L Esp. 10 mm ø --- mm
Specification Thickness
Designação --- Esp. --- mm ø --- mm
Specification Thickness

D — MATERIAL DE ADIÇÃO (FILLER METAL)

Tipo (Type)	Designação (Specification)	Desig. Comercial (Trade Mark)	ø mm
ER-RÚTILO/BÁSICO	AWS ER 316L-16 (A 5.4)	INOX BWL	2,5
---	---	---	---
---	---	---	---

E — TIPO DE JUNTA (TYPE OF JOINT) TOPO A TOPO (CHANFRO EM V)

F — POSIÇÃO DE EXECUÇÃO (POSITION) 2G + 3G (ASCENDENTE)

G — VARIÁVEIS NA EXECUÇÃO (WELDING VARIABLES) (TEM PASSE DE CONFIRMAÇÃO)

Passes Passes	Corrente/Polar. Current/Polarity	Gás de protecção Shielding gas	Gás de purga Backing gas	Modo de transf. Mode of metal transfer	-----
TODOS	DC (+)	---	---	---	-----
---	---	---	---	---	-----
---	---	---	---	---	-----



Pré-aquecimento --- °C Tratamento térmico ☐ Pós aquecimento --- °C
Pre-heating Heat treatment Post-heating


H — CONTROLE DE EXECUÇÃO (CONTROL)

Exame visual (Visual Examination) ☒ Ensaio de tracção (Tensile Test) ☐
Exame radiográfico (Radiogr. Exam) ☒ Dobragens (Guided-Bend Test) ☐
Macro/Micrografia (Macro/Micrography) ☐ Resiliências (Roughness Test) ☐
Fractura (Fracture Test) ☐

I — RESULTADO (RESULT)

O Soldador/Operador de Soldadura foi qualificado pelo Instituto de Soldadura e Qualidade em conformidade
The Welder/Welding Operator has been qualified by Instituto de Soldadura e Qualidade in accordance
com o código mencionado, em 89.11.02 Anexo --- Págs. ---
with the above mentioned code on the

O Inspector:  48 O Responsável: 
Inspector Responsible



Welder's qualification test certificate ACCORDING TO EN ISO 9606-1:2013

Designation examples of this Standard

ISO 9606-1 141 T BW FM4 S s3.6 D60 PH ss nb

INTERNATIONAL STANDARD

welding process

product type

type of weld

filler material grouping

filler material

dimension of test piece

welding position

weld details

welding processes

according to EN ISO 5852

- 111 manual metal arc welding
- 114 self-shielded flux-cored arc welding
- 121 submerged arc welding with solid wire electrode (quartz flux-cored)
- 123 submerged arc welding with flux-cored electrode (quartz flux-cored)
- 131 MIG welding with solid wire electrode
- 135 MIG welding with solid wire electrode
- 136 MIG welding with flux-cored electrode
- 137 MIG welding with flux-cored electrode
- 138 MIG welding with solid wire electrode (air-cored)
- 142 submerged TIG welding
- 143 TIG welding with solid core filler material (air-cored)
- 144 TIG welding using reducing gas and solid filler material (air-cored)
- 15 plasma arc welding
- 310 electrolytic welding

types of weld

BW butt weld
FW fillet weld



welding positions

according to EN ISO 5847

- PA flat position
- PB horizontal vertical position
- PC horizontal position
- PD horizontal overhead position
- PE overhead position
- PF vertical up position
- PG vertical down position
- PH inclined position welding upwards
- PI inclined position welding downwards
- PJ pipe position for welding upwards
- PK pipe position for welding downwards

weld details

- BW butt weld
- BB single side beveling
- BBB material backing
- BBB welding with no material backing
- BBB gas backing
- BBB flux backing
- BBB welding from both sides
- BBB consumable insert
- FW fillet weld
- BB single layer
- BB multi layer
- BBB vapour-phase welding
- BBB air-cored welding
- BBB light-metal welding

product types

T tube
P pipe



filler material

shielded electrode

- Group A
- A1 acid covering
- A2 basic covering or electrode core - basic
- A3 cathodic covering
- A4 cathodic covering of electrode core - cathodic flux-coring slag
- A5 cathodic covering
- A6 cathodic covering
- A7 cathodic covering
- A8 cathodic covering
- A9 cathodic covering
- A10 cathodic covering
- A11 cathodic covering
- A12 cathodic covering
- A13 cathodic covering
- A14 cathodic covering
- A15 cathodic covering
- A16 cathodic covering
- A17 cathodic covering
- A18 cathodic covering
- A19 cathodic covering
- A20 cathodic covering
- A21 cathodic covering
- A22 cathodic covering
- A23 cathodic covering
- A24 cathodic covering
- A25 cathodic covering
- A26 cathodic covering
- A27 cathodic covering
- A28 cathodic covering
- A29 cathodic covering
- A30 cathodic covering
- A31 cathodic covering
- A32 cathodic covering
- A33 cathodic covering
- A34 cathodic covering
- A35 cathodic covering
- A36 cathodic covering
- A37 cathodic covering
- A38 cathodic covering
- A39 cathodic covering
- A40 cathodic covering
- A41 cathodic covering
- A42 cathodic covering
- A43 cathodic covering
- A44 cathodic covering
- A45 cathodic covering
- A46 cathodic covering
- A47 cathodic covering
- A48 cathodic covering
- A49 cathodic covering
- A50 cathodic covering
- A51 cathodic covering
- A52 cathodic covering
- A53 cathodic covering
- A54 cathodic covering
- A55 cathodic covering
- A56 cathodic covering
- A57 cathodic covering
- A58 cathodic covering
- A59 cathodic covering
- A60 cathodic covering
- A61 cathodic covering
- A62 cathodic covering
- A63 cathodic covering
- A64 cathodic covering
- A65 cathodic covering
- A66 cathodic covering
- A67 cathodic covering
- A68 cathodic covering
- A69 cathodic covering
- A70 cathodic covering
- A71 cathodic covering
- A72 cathodic covering
- A73 cathodic covering
- A74 cathodic covering
- A75 cathodic covering
- A76 cathodic covering
- A77 cathodic covering
- A78 cathodic covering
- A79 cathodic covering
- A80 cathodic covering
- A81 cathodic covering
- A82 cathodic covering
- A83 cathodic covering
- A84 cathodic covering
- A85 cathodic covering
- A86 cathodic covering
- A87 cathodic covering
- A88 cathodic covering
- A89 cathodic covering
- A90 cathodic covering
- A91 cathodic covering
- A92 cathodic covering
- A93 cathodic covering
- A94 cathodic covering
- A95 cathodic covering
- A96 cathodic covering
- A97 cathodic covering
- A98 cathodic covering
- A99 cathodic covering
- A100 cathodic covering

Group B

- B1 cathodic covering
- B2 cathodic covering
- B3 cathodic covering
- B4 cathodic covering
- B5 cathodic covering
- B6 cathodic covering
- B7 cathodic covering
- B8 cathodic covering
- B9 cathodic covering
- B10 cathodic covering
- B11 cathodic covering
- B12 cathodic covering
- B13 cathodic covering
- B14 cathodic covering
- B15 cathodic covering
- B16 cathodic covering
- B17 cathodic covering
- B18 cathodic covering
- B19 cathodic covering
- B20 cathodic covering
- B21 cathodic covering
- B22 cathodic covering
- B23 cathodic covering
- B24 cathodic covering
- B25 cathodic covering
- B26 cathodic covering
- B27 cathodic covering
- B28 cathodic covering
- B29 cathodic covering
- B30 cathodic covering
- B31 cathodic covering
- B32 cathodic covering
- B33 cathodic covering
- B34 cathodic covering
- B35 cathodic covering
- B36 cathodic covering
- B37 cathodic covering
- B38 cathodic covering
- B39 cathodic covering
- B40 cathodic covering
- B41 cathodic covering
- B42 cathodic covering
- B43 cathodic covering
- B44 cathodic covering
- B45 cathodic covering
- B46 cathodic covering
- B47 cathodic covering
- B48 cathodic covering
- B49 cathodic covering
- B50 cathodic covering
- B51 cathodic covering
- B52 cathodic covering
- B53 cathodic covering
- B54 cathodic covering
- B55 cathodic covering
- B56 cathodic covering
- B57 cathodic covering
- B58 cathodic covering
- B59 cathodic covering
- B60 cathodic covering
- B61 cathodic covering
- B62 cathodic covering
- B63 cathodic covering
- B64 cathodic covering
- B65 cathodic covering
- B66 cathodic covering
- B67 cathodic covering
- B68 cathodic covering
- B69 cathodic covering
- B70 cathodic covering
- B71 cathodic covering
- B72 cathodic covering
- B73 cathodic covering
- B74 cathodic covering
- B75 cathodic covering
- B76 cathodic covering
- B77 cathodic covering
- B78 cathodic covering
- B79 cathodic covering
- B80 cathodic covering
- B81 cathodic covering
- B82 cathodic covering
- B83 cathodic covering
- B84 cathodic covering
- B85 cathodic covering
- B86 cathodic covering
- B87 cathodic covering
- B88 cathodic covering
- B89 cathodic covering
- B90 cathodic covering
- B91 cathodic covering
- B92 cathodic covering
- B93 cathodic covering
- B94 cathodic covering
- B95 cathodic covering
- B96 cathodic covering
- B97 cathodic covering
- B98 cathodic covering
- B99 cathodic covering
- B100 cathodic covering

Group C

- C1 cathodic covering
- C2 cathodic covering
- C3 cathodic covering
- C4 cathodic covering
- C5 cathodic covering
- C6 cathodic covering
- C7 cathodic covering
- C8 cathodic covering
- C9 cathodic covering
- C10 cathodic covering
- C11 cathodic covering
- C12 cathodic covering
- C13 cathodic covering
- C14 cathodic covering
- C15 cathodic covering
- C16 cathodic covering
- C17 cathodic covering
- C18 cathodic covering
- C19 cathodic covering
- C20 cathodic covering
- C21 cathodic covering
- C22 cathodic covering
- C23 cathodic covering
- C24 cathodic covering
- C25 cathodic covering
- C26 cathodic covering
- C27 cathodic covering
- C28 cathodic covering
- C29 cathodic covering
- C30 cathodic covering
- C31 cathodic covering
- C32 cathodic covering
- C33 cathodic covering
- C34 cathodic covering
- C35 cathodic covering
- C36 cathodic covering
- C37 cathodic covering
- C38 cathodic covering
- C39 cathodic covering
- C40 cathodic covering
- C41 cathodic covering
- C42 cathodic covering
- C43 cathodic covering
- C44 cathodic covering
- C45 cathodic covering
- C46 cathodic covering
- C47 cathodic covering
- C48 cathodic covering
- C49 cathodic covering
- C50 cathodic covering
- C51 cathodic covering
- C52 cathodic covering
- C53 cathodic covering
- C54 cathodic covering
- C55 cathodic covering
- C56 cathodic covering
- C57 cathodic covering
- C58 cathodic covering
- C59 cathodic covering
- C60 cathodic covering
- C61 cathodic covering
- C62 cathodic covering
- C63 cathodic covering
- C64 cathodic covering
- C65 cathodic covering
- C66 cathodic covering
- C67 cathodic covering
- C68 cathodic covering
- C69 cathodic covering
- C70 cathodic covering
- C71 cathodic covering
- C72 cathodic covering
- C73 cathodic covering
- C74 cathodic covering
- C75 cathodic covering
- C76 cathodic covering
- C77 cathodic covering
- C78 cathodic covering
- C79 cathodic covering
- C80 cathodic covering
- C81 cathodic covering
- C82 cathodic covering
- C83 cathodic covering
- C84 cathodic covering
- C85 cathodic covering
- C86 cathodic covering
- C87 cathodic covering
- C88 cathodic covering
- C89 cathodic covering
- C90 cathodic covering
- C91 cathodic covering
- C92 cathodic covering
- C93 cathodic covering
- C94 cathodic covering
- C95 cathodic covering
- C96 cathodic covering
- C97 cathodic covering
- C98 cathodic covering
- C99 cathodic covering
- C100 cathodic covering

see other

- 1 cathodic covering
- 2 cathodic covering
- 3 cathodic covering
- 4 cathodic covering
- 5 cathodic covering
- 6 cathodic covering
- 7 cathodic covering
- 8 cathodic covering
- 9 cathodic covering
- 10 cathodic covering
- 11 cathodic covering
- 12 cathodic covering
- 13 cathodic covering
- 14 cathodic covering
- 15 cathodic covering
- 16 cathodic covering
- 17 cathodic covering
- 18 cathodic covering
- 19 cathodic covering
- 20 cathodic covering
- 21 cathodic covering
- 22 cathodic covering
- 23 cathodic covering
- 24 cathodic covering
- 25 cathodic covering
- 26 cathodic covering
- 27 cathodic covering
- 28 cathodic covering
- 29 cathodic covering
- 30 cathodic covering
- 31 cathodic covering
- 32 cathodic covering
- 33 cathodic covering
- 34 cathodic covering
- 35 cathodic covering
- 36 cathodic covering
- 37 cathodic covering
- 38 cathodic covering
- 39 cathodic covering
- 40 cathodic covering
- 41 cathodic covering
- 42 cathodic covering
- 43 cathodic covering
- 44 cathodic covering
- 45 cathodic covering
- 46 cathodic covering
- 47 cathodic covering
- 48 cathodic covering
- 49 cathodic covering
- 50 cathodic covering
- 51 cathodic covering
- 52 cathodic covering
- 53 cathodic covering
- 54 cathodic covering
- 55 cathodic covering
- 56 cathodic covering
- 57 cathodic covering
- 58 cathodic covering
- 59 cathodic covering
- 60 cathodic covering
- 61 cathodic covering
- 62 cathodic covering
- 63 cathodic covering
- 64 cathodic covering
- 65 cathodic covering
- 66 cathodic covering
- 67 cathodic covering
- 68 cathodic covering
- 69 cathodic covering
- 70 cathodic covering
- 71 cathodic covering
- 72 cathodic covering
- 73 cathodic covering
- 74 cathodic covering
- 75 cathodic covering
- 76 cathodic covering
- 77 cathodic covering
- 78 cathodic covering
- 79 cathodic covering
- 80 cathodic covering
- 81 cathodic covering
- 82 cathodic covering
- 83 cathodic covering
- 84 cathodic covering
- 85 cathodic covering
- 86 cathodic covering
- 87 cathodic covering
- 88 cathodic covering
- 89 cathodic covering
- 90 cathodic covering
- 91 cathodic covering
- 92 cathodic covering
- 93 cathodic covering
- 94 cathodic covering
- 95 cathodic covering
- 96 cathodic covering
- 97 cathodic covering
- 98 cathodic covering
- 99 cathodic covering
- 100 cathodic covering

filler material grouping

Group	Filler material for welding of	Examples of applicable standards
FM1	Non-alloy and low-alloy steels	ISO 2566, ISO 14041, ISO 585, ISO 14731, ISO 17833
FM2	High-strength steels	ISO 18275, ISO 16804, ISO 20004, ISO 18276
FM3	Deep-reducing steels $C \leq 0.25\%$	ISO 2566, ISO 21962, ISO 24386, ISO 17834
FM4	Deep-reducing steels $0.25\% < C \leq 0.42\%$	ISO 2566, ISO 21962, ISO 24386, ISO 17834
FM5	Aluminum and heat-treating steels	ISO 22891, ISO 15331, ISO 17833
FM6	Aluminum and nickel alloys	ISO 14733, ISO 18252

dimensions of test piece

- A thickness
- B width
- C outside diameter



www.dvs-ev.de/DVS-Pruefstellen

Notified bodies for the welder's qualification test are regulated by European directives, regulations or standards which apply to approved certification personnel or to accreditation according to DIN EN ISO / IEC 17024 for the holding of the welder's qualification test.

