Nederlandse norm

NEN-EN-ISO 15614-1

(en)

Beschrijven en goedkeuren van lasmethoden voor metalen - Lasmethodebeproeving - Deel 1: Boog- en autogeenlassen van staal en booglassen van nikkel en nikkellegeringen (ISO 15614-1:2017,IDT)

Voorlichting over NEN-EN-ISO 15614-1: 2017

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Independent Welding Consultants Register

NEN LID VAN NORMCOMMISSIE

Voorlichting over NEN-EN-ISO 15614-1

Wie is Arjan Roza Lastechniek BV

- Gestart in 1998.
- Las technisch advies en inspecties.
- Normen en specificaties.
- Werkt nationaal en internationaal.

Mijn relatie met las normen:

Nederlands

- Voorzitter NEN committee 341008. (Alle lasnormen)
- Lid NEN committee *3510010201* (EN 1090)

Europese

- Lid CEN committee TC121 (Alle lasnormen) als NEN Expert

Internationaal

- Lid ISO committee TC44. (Alle lasnormen) als NEN Expert
  - Diverse sub commissies.
  - Taskgroup interpretaties

Mijn relatie met las standaards:

USA

- Delegate member main committee ASME IX.
  - Member of sub group committee Materials ASME IX
- Project leader European materials ASME IX.
  - Member peer group Cladding Cold/Hot wire cladding

Stichting

- Mede oprichter en bestuurslid IWCR opgericht in 2011.
  Independent Welding Consultant Register

Voorlichting over NEN-EN-ISO 15614-1: 2017

- Wanneer kun/moet je deze norm toepassen.

- Gedachte achter de nieuwe norm.
- Historie van ISO 15614-1
- Overzicht van belangrijke wijzigingen.
  - Let op, ik kan niet alles tot in detail behandelen.

Focus van deze presentatie.

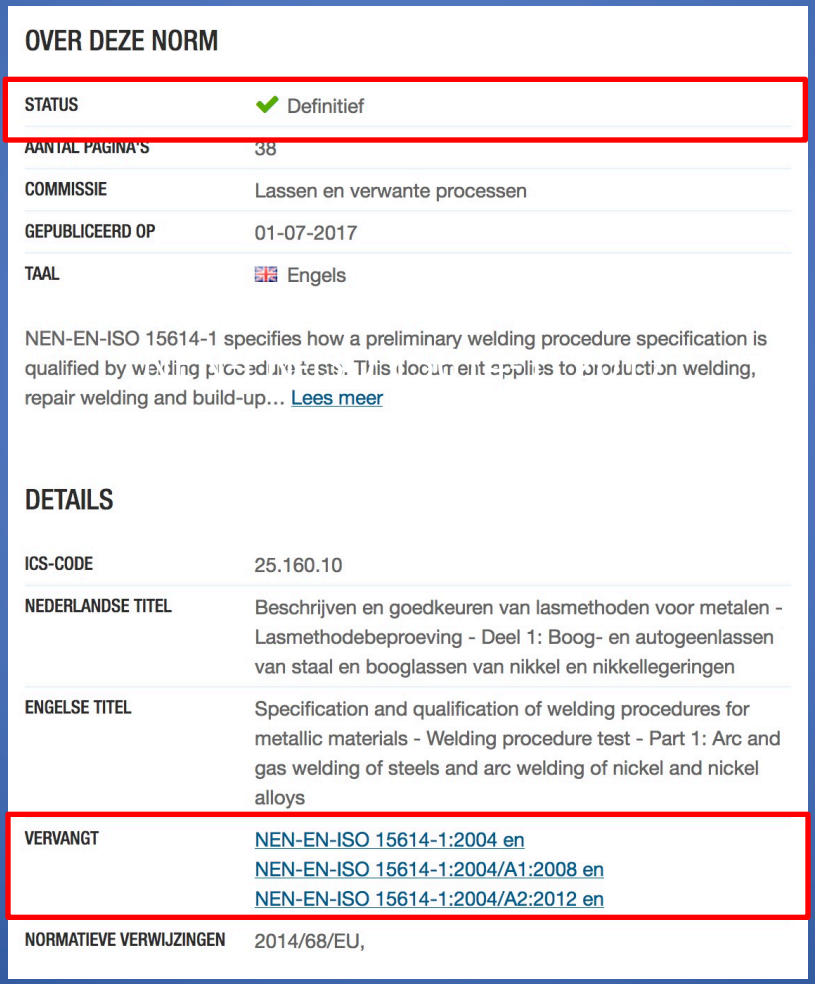
- De focus van deze presentatie zal liggen op de grootste verschillen tussen:

- Oude NEN-EN-ISO 15614-1 en de nieuwe NEN-EN-ISO 15614-1 level 2.

- Er zijn verschillende seminars in het land te volgen over dit onderwerp, ook het NIL geeft seminars over de gehele toepassing van deze nieuwe standaard.

NEN-EN-ISO 15614-1: 2017

Toepassen in Nederland vanaf 20-07-2017.



OVER DEZE NORM

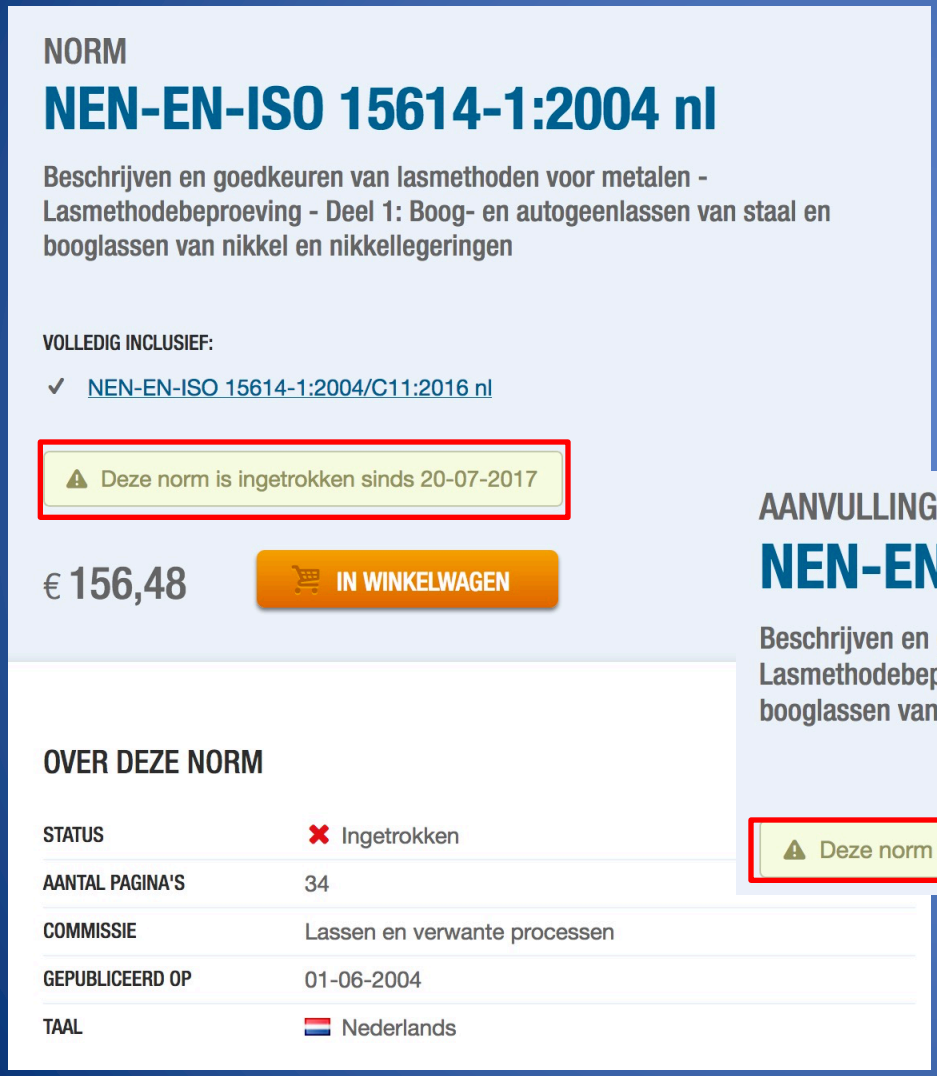
STATUS	✔ Definitief
AANTAL PAGINA'S	38
COMMISSIE	Lassen en verwante processen
GEPUBLICEERD OP	01-07-2017
TAAL	Engels

NEN-EN-ISO 15614-1 specifies how a preliminary welding procedure specification is qualified by welding procedure tests. This document applies to production welding, repair welding and build-up… Lees meer

DETAILS

ICS-CODE	25.160.10
NEDERLANDSE TITEL	Beschrijven en goedkeuren van lasmethoden voor metalen - Lasmethodebeproeving - Deel 1: Boog- en autogeenlassen van staal en booglassen van nikkel en nikkellegeringen
ENGELSE TITEL	Specification and qualification of welding procedures for metallic materials - Welding procedure test - Part 1: Arc and gas welding of steels and arc welding of nickel and nickel alloys
VERVANGT	NEN-EN-ISO 15614-1:2004 en NEN-EN-ISO 15614-1:2004/A1:2008 en NEN-EN-ISO 15614-1:2004/A2:2012 en
NORMATIEVE VERWIJZINGEN	2014/68/EU,

NEN-EN-ISO 15614-1: 2017



NORM

NEN-EN-ISO 15614-1:2004 nl

Beschrijven en goedkeuren van lasmethoden voor metalen - Lasmethodebeproeving - Deel 1: Boog- en autogeenlassen van staal en booglassen van nikkel en nikkellegeringen

VOLLEDIG INCLUSIEF:

✓ NEN-EN-ISO 15614-1:2004/C11:2016 nl

⚠ Deze norm is ingetrokken sinds 20-07-2017

€ 156,48 IN WINKELWAGEN

OVER DEZE NORM

STATUS	✖ Ingetrokken
AANTAL PAGINA'S	34
COMMISSIE	Lassen en verwante processen
GEPUBLICEERD OP	01-06-2004
TAAL	Nederlands

AANVULLING

NEN-EN-ISO 15614-1:2004/A2:2012 en

Beschrijven en goedkeuren van lasmethoden voor metalen - Lasmethodebeproeving - Deel 1: Boog- en autogeenlassen van staal en booglassen van nikkel en nikkellegeringen

⚠ Deze norm is ingetrokken sinds 20-07-2017

Gedachte achter de nieuwe norm.

- Meest gebruikte las standaards in de wereld.
  - ASME serie
  - AWS serie
  - ISO serie

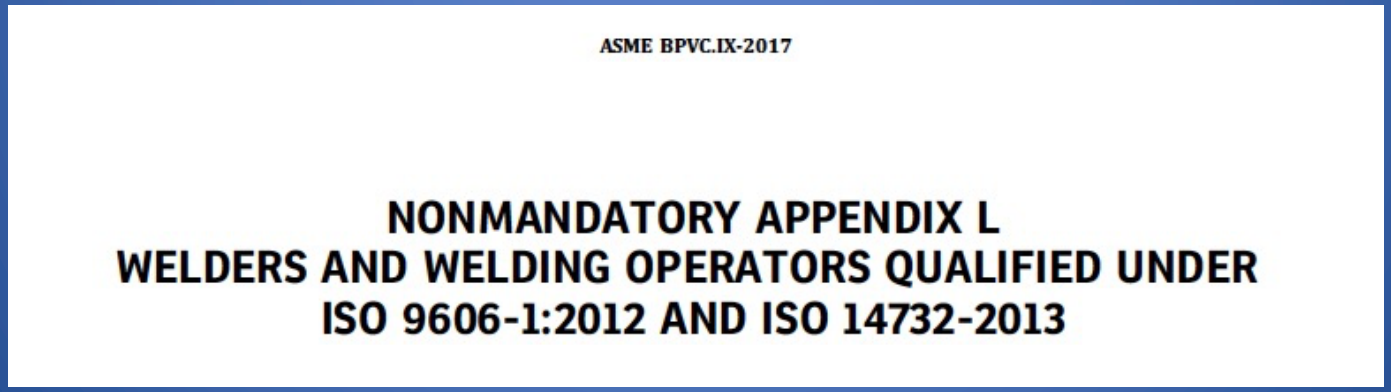
Het grotere doel is om 1 standaard te krijgen.

Dat is ten dele gelukt maar daar is wel Level 1 en 2 uit geboren omdat de verschillen toch te groot bleken.

Of op zijn minst acceptatie binnen die standaards.

Gedachte achter de nieuwe norm.

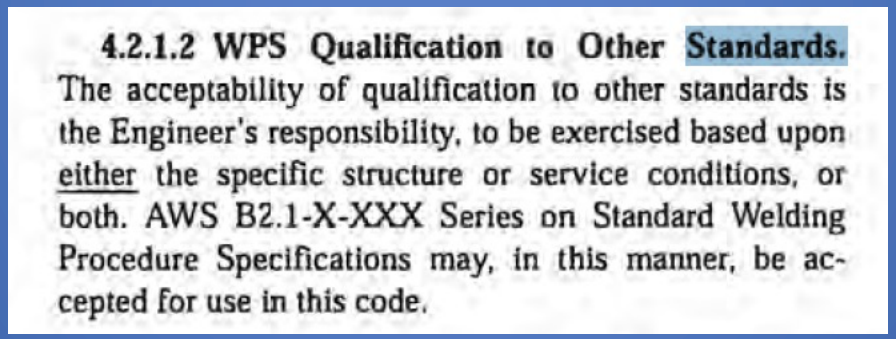
- Is dit al gelukt?
  - Ten dele.
    - ASME IX appendix L (Lassers kwalificaties)
    - Acceptatie ASME IX van ISO plate trekstaven.


ASME BPVC.IX-2017

NONMANDATORY APPENDIX L
WELDERS AND WELDING OPERATORS QUALIFIED UNDER
ISO 9606-1:2012 AND ISO 14732-2013

Gedachte achter de nieuwe norm.

- Is dit al gelukt?
  - Ten dele.
    - AWS D1.1.



4.2.1.2 WPS Qualification to Other Standards. The acceptability of qualification to other standards is the Engineer's responsibility, to be exercised based upon either the specific structure or service conditions, or both. AWS B2.1-X-XXX Series on Standard Welding Procedure Specifications may, in this manner, be accepted for use in this code.

Gedachte achter de nieuwe norm.

- Is dit al gelukt?
  - Ten dele.
    - ISO serie
      - NEE, helemaal geen escape voor acceptatie andere standaards.
      - Het begin is nu dan gemaakt met de ISO 15614-1: 2017.

Historie van EN 15614-1

- NEN-EN 288-3:1997 nl — EN standaard

- ISO 15614-1:2000 Ontw. En — ISO standaard
- NEN-EN-ISO 15614-1:2004/A1:2008 nl — NEN standaard
- NEN-EN-ISO 15614-1:2004/A2:2012 en
- NEN-EN-ISO 15614-1:2004/C11:2016 nl

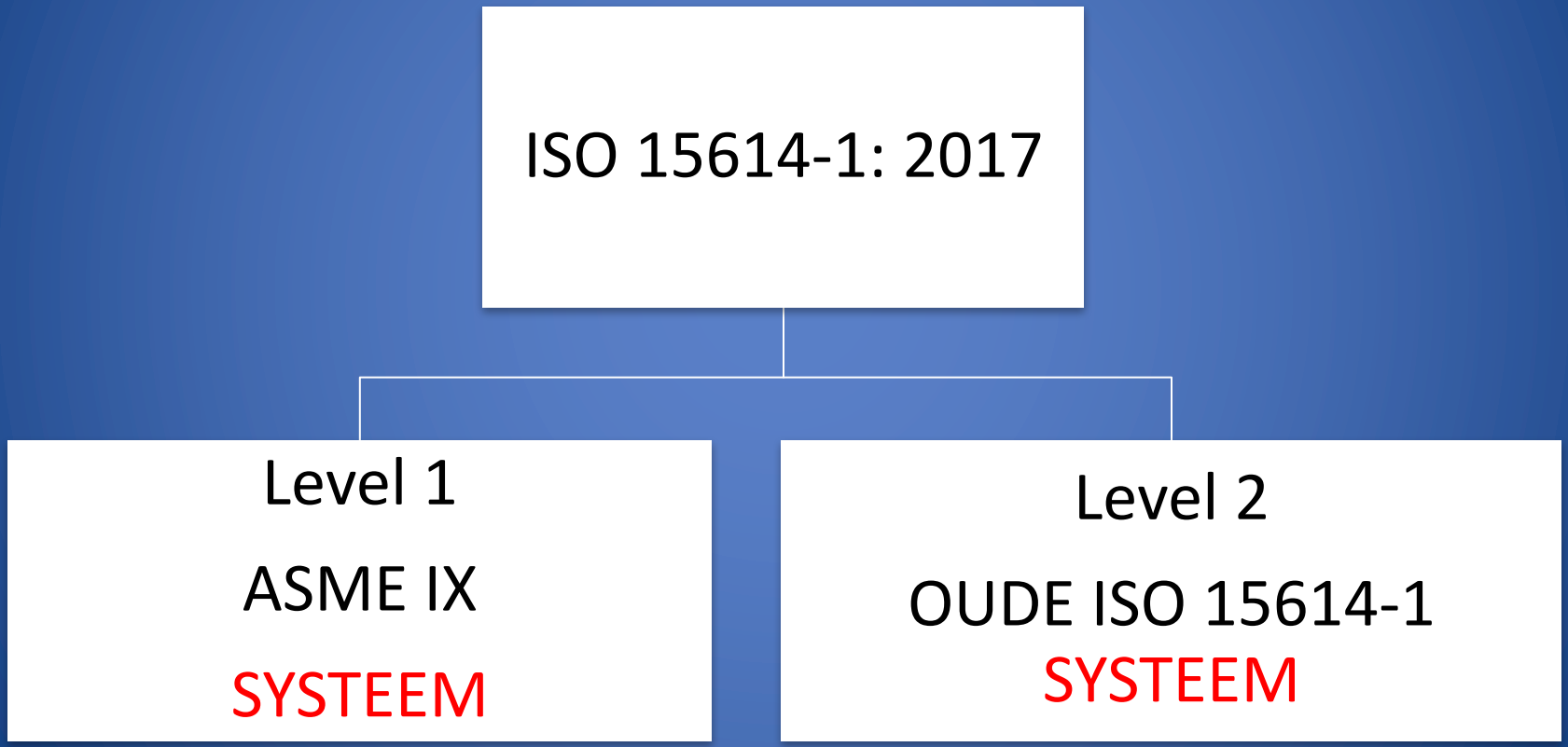
- ISO 15614-1:2017 en — ISO Standaard
- NEN-EN-ISO 15614-1:2017 en — EN Standaard

Inhouds opgave

Foreword
Introduction
1. Scope
2. Normative references
3. Terms and definitions
4. pWPS
5. Welding procedure test
6. Testpiece
7. Examination and testing
8. Range of qualification
9. WPQR

ANNEX A Filler material designation (Normative)
ANNEX B WPQR form (Informative)

Structuur


ISO 15614-1: 2017
Level 1
ASME IX
SYSTEEM
Level 2
OUDE ISO 15614-1
SYSTEEM

Lezen van deze standaard.

- Let op bij het lezen of Level 1 of Level 2 van toepassing is op de paragraaf.
- Soms staat Level 1 en Level 2 in kolommen en soms staat het boven de paragraaf.

8.4.7 Heat input (arc energy)

The heat input can be replaced by arc energy (J/mm). The arc energy shall be calculated in accordance with ISO/TR 18491. When using the calculation for the heat input, the k-factor according to ISO/TR 17671-1 shall be considered. The kind of calculation, either heat input or arc energy, shall be documented.

For level 1: When impact requirements apply, the upper limit of heat input qualified is the maximum heat input used when welding the test piece.	For level 2: When impact requirements apply, the upper limit of the heat input qualified is 25 % greater than used in welding the test piece. When hardness requirements apply, the lower limit of the heat input qualified is 25 % lower than that used in welding the test piece. If welding procedure test has been performed at both a high and a low heat input level, then all intermediate heat input levels are also qualified. It is not necessary to calculate every run.

For covered electrode, the heat input average shall be calculated for each used diameter in order to define the qualified heat input.

Foreword.

- Hierin staat een belangrijke opsomming van een aantal belangrijke achtergrond zaken die zeker gelezen moeten worden.

European foreword

This document (EN ISO 15614-1:2017) has been prepared by Technical Committee ISO/TC 44 "Welding and allied processes" in collaboration with Technical Committee CEN/TC 121 "Welding and allied processes" the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by December 2017 and conflicting national standards shall be withdrawn at the latest by December 2017.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN ISO 15614-1:2004.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

For relationship with EU Directive(s), see informative Annex ZA, B, which is an integral part of this document.

According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Endorsement notice

The text of ISO 15614-1:2017 has been approved by CEN as EN ISO 15614-1:2017 without any modification.

Introductie.

ISO 15614-1:2017(E)

Introduction

All new welding procedure tests are to be carried out in accordance with this document from the date of its issue. However, this document does not invalidate previous welding procedure tests made to former national standards or specifications or previous issues of this document.

Two levels of welding procedure tests are given in order to permit application to a wide range of welded fabrication. They are designated by levels 1 and 2.

Level 1 is based on requirements of ASME Section IX and level 2 is based on the previous issues of this document.

Introductie.

Two levels of welding procedure tests are given in order to permit application to a wide range of welded fabrication. They are designated by levels 1 and 2. In level 2, the extent of testing is greater and the ranges of qualification are more restrictive than in level 1.

Procedure tests carried out to level 2 automatically qualify for level 1 requirements, but not vice-versa.

When no level is specified in a contract or application standard, all the requirements of level 2 apply.

- Samengevat:
  - Dus twee levels in 1 standaard.
  - Level 2 dekt level 1 maar niet vice versa.
  - Is geen level gespecificeerd dan geldt level 2.

Level 1 kwalificaties.

- Gebaseerd op de ASME IX.
  - Deze standaard is onderdeel van de BPVC.
  - Daarin zitten product standaards voor:
    - Boilers
    - Vessels
    - Piping systemen
    - Etc.

Level 1 kwalificaties.

- De product standaards verwijzen naar:
  - ASME IX.
  - Hebben eigen eisen voor het lassen boven op ASME IX.
    - Zoals kerftaaiheids eisen.
    - Zoals hardheids eisen.
    - Afwijkende wanddikte ranges.

Level 1 kwalificaties.

- Dit noemen we service condities gestuurde kwalificaties.
- Deze regels kijken eerst naar de functie van het product en dan naar de extra eisen ten aanzien van de lasprocedure.
- Dus per product standaard kunnen er afwijkende of aanvullende eisen op de lasprocedure zijn.

Level 1 kwalificaties.

- Voor simpele constructies kan Level 1 dus voldoende zijn.

- Een waarschuwing is op zijn plaats, kijk eerst wat de toepassing van de het product is voor dat je beslist of Level 1 zonder aanvullende eisten wel voldoende is.

Level 1 kwalificaties.

- Het is voor ons wel nieuw, maar ik denk dat er zeker ook in Europa een markt is voor Level 1 WPQR's omdat deze voor heel veel simpele toepassingen prima geschikt zijn.

- De engineering bureaus en lastechnici moeten er alleen nog mee bekend moeten raken.

Level 2 kwalificaties.

- Level 2 kwalificaties kijken eigenlijk alleen naar het materiaal.
- De materiaal groep bepaald de test scope en range.
- Dure oplossing voor veel simpele constructies worden van S355 gemaakt omdat die het gemakkelijkste en het beste te krijgen is.
- Resultaat, voor hekwerken ook kerftaaiheids eisen en hardheids eisen, gevolg enorme begrenzing van de range dn dus duur.

Relatie met PED.

- Relatie met de PED, in Annex ZB wordt alleen nog level 2 genoemd om in overeenstemming te zijn met PED.

- NEN-EN-ISO 15614-1: 2017 is dus al gepubliceerd in ”The official Journal of the EU” en daarmee een geharmoniseerde standaard

Scope.

- Alle kwalificaties na 20-07-2017 moeten volgens de NEN-EN-ISO 15614-1: 2017 gemaakt worden.

- Maar wat te doen met oude kwalificaties.?

Scope.

- Optie 1 (Reeds bestaande kwalificaties)

- Bestaande kwalificaties gemaakt volgens eerdere edities van deze standaard blijven geldig.

- De range van de kwalificatie blijft het zelfde tenzij anders overeen gekomen in een contract of toepassingsnorm zoals EN 1090-2 of EN 13445.

Scope.

- Optie 2 (Omzetten bestaande kwalifcaties)

- Het is ook mogelijk een een “allignment sheet” te maken gebaseerd op de oude kwalificatie met gebruikt van de nieuwe ranges.

- TC44 moet alleen nog vast stellen dat de “technical content” van de oude kwalificaties gelijk is aan de nieuwe editie.

Scope.

- De norm is van toepassing op:
  - Productie lassen.
  - Reparatie lassen.
  - Build-up welding.
    (Oplassen tot de originele vereiste afmetingen)

- En de norm definieert de condities en de uitvoering van WPQR’s en de range van de WPQR’s.

Scope.

- Primaire doel van een WPQR is het aantonen dat het lasproces dat gebruikt wordt om aan de een constructie te lassen de vereiste mechanische eigenschappen heeft voor de bedoelde toepassing.

- Dus nadenken wat de vereiste mechanische eigenschappen voor de verbinding moeten zijn.
  - Corrosie eigenschappen
  - Kerftaaiheids eisen
  - Hardheids eisen (NACE)
- Denk hierbij zeker aan Level 1.

6. General

- Een essentieel verschil in Level 1 en Level 2.

6.2.5 Branch connection

For level 1: No specific test piece required.

For level 2: The test piece shall be prepared in accordance with Figure 4. The angle α is the minimum one used in production. This test piece applies to fully penetrated joints (set-on, set-in or set-through joint) and for fillet welds.

Oud

Welding and testing of the test pieces shall be witnessed by an examiner or an examining body.

Nieuw

The welding and the testing of the test piece shall be verified by the examiner or examining body.

7. Examination and Testing.

7 Examination and testing

7.1 Type and extent of testing

For level 1: Type and the extent of testing shall be in accordance with the requirements of Table 1.	For level 2: Type and the extent of testing shall be in accordance with the requirements of Table 2.
If impact testing, hardness testing or non-destructive testing (NDT) is required by an application standard or specification, they shall be carried out and assessed in accordance with the requirements of level 2, unless otherwise specified by the application standard or specification.	

7. Examination and Testing.

Table 1 — For level 1: Examination and testing of the test pieces

Test piece	Type of test	Extent of testing	Footnote
Butt joint with full penetration — Figure 1 and Figure 2	Visual testing Transverse tensile test Transverse bend test	100 % 2 specimens 4 specimens	a
Fillet welds — Figure 3	Visual testing Macroscopic examination	100 % 2 specimens	b

a For bend tests, see 7.4.2.

b Where mechanical properties are required by an application standard, it shall be tested accordingly. If an additional test piece is needed, the dimensions should be sufficient enough to allow testing of the mechanical properties. For this additional test piece, the welding parameter range, parent material group, filler metal and heat treatment are required to be the same.

7. Examination and Testing.

Table 2 — For level 2: Examination and testing of the test pieces

Test piece	Type of test	Extent of testing	Footnote
Butt joint with full penetration — Figure 1 and Figure 2	Visual testing	100 %	—
	Radiographic or ultrasonic testing	100 %	a
	Surface crack detection	100 %	b
	Transverse tensile test	2 specimens	—
	Transverse bend test	4 specimens	c
	Impact test	2 sets	d
	Hardness test	required	e
	Macroscopic examination	1 specimen	—
T- joint with full penetration — Figure 3 Branch connection with full penetration — Figure 4 f	Visual testing	100 %	
	Surface crack detection	100 %	b
	Ultrasonic or radiographic testing	100 %	a, g
	Hardness test	required	e
	Macroscopic examination	2 specimens	
Fillet weld — Figure 3 and Figure 4 f	Visual testing	100 %	
	Surface crack detection	100 %	b
	Hardness test	required	e
	Macroscopic examination	2 specimens	

7. Examination and Testing.

- De verschillen in testen level 1 ten opzichte van level 2
  - NDO mist
  - Macro mist voor BW
  - Hardheidsmetingen missen
  - Kerftaaiheids testen missen
- Level 1 heeft een veel kleinere test scope dan level 2

7. Examination and Testing.

Foot notes table 2

a Ultrasonic testing shall not be used for $t < 8$ mm and not for material groups 8, 10, 41 to 48.

b Accessible weld surfaces: penetrant testing or magnetic particle testing. For non-magnetic materials, penetrant testing.

c For bend tests, see 7.4.2.

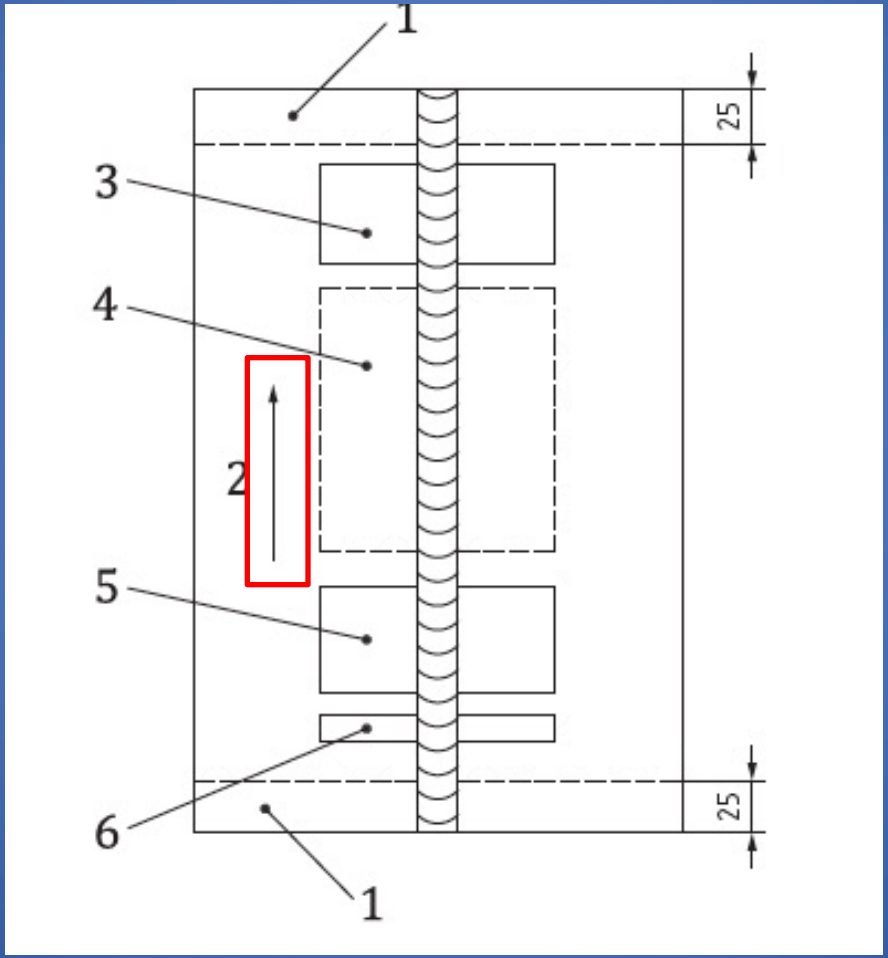
d One set in the weld metal and one set in the HAZ for materials ≥12 mm thick and having specified impact properties required by technical delivery conditions and/or if appropriate according to the service conditions. Application standards may require impact testing below 12 mm thick. The testing temperature shall be chosen by the manufacturer with regard to the application or application standards. For additional tests, see 7.4.4.

e Not required for parent metals: sub-group 1.1, groups 8 and 41 to 48 and dissimilar joints between these groups, except for dissimilar joints between sub-group 1.1 and group 8.

f Where mechanical properties are required by an application standard, it shall be tested accordingly. If an additional test piece is needed, the dimensions should be sufficient enough to allow testing of the mechanical properties. For this additional test piece, the welding parameter range, parent material group, filler metal and heat treatment are required to be the same.

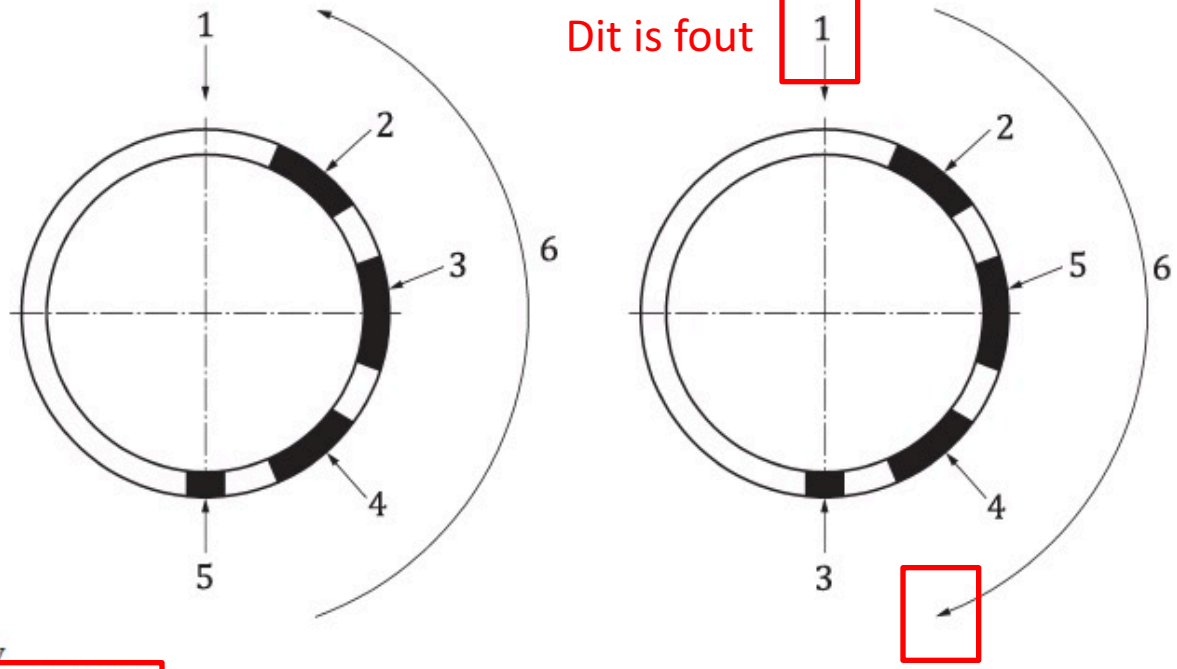
g For outside diameter ≤50 mm, no ultrasonic testing is required, but radiographic testing is required provided that the joint configuration will provide valid results. For outside diameter >50 mm and where it is not technically possible to carry out ultrasonic testing, a radiographic testing shall be carried out provided that the joint configuration will provide valid results.

7. Examination and Testing.



6. Macro/hardheid
Uitgenomen aan
koude zijde.

Dit is fout



Key

1 end of weld

2 area for:
- 1 tensile test specimen
- bend test specimens

3 area for:
- impact and additional test specimens if required

4 area for:
- 1 tensile test specimen
- bend test specimens

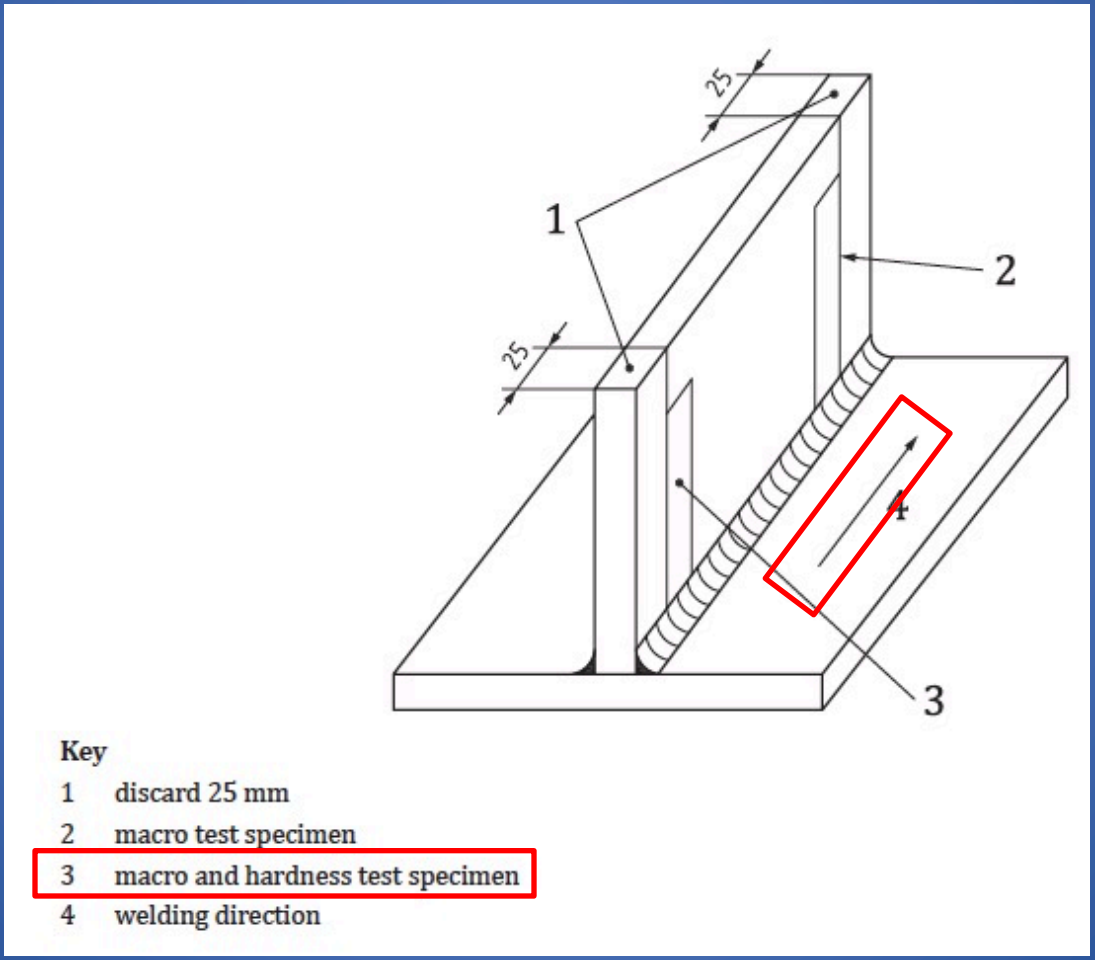
5 start of weld; area for:
- 1 macro test specimen
- 1 hardness test specimen (taken from the start of weld)

6 weld direction

NOTE Not to scale.

7. Examination and Testing.

6. Macro/hardheid Uitgenomen aan koude zijde.



7.3 Non-destructieve testing

7.3 Non-destructive testing

All non-destructive testing in accordance with 7.1 shall be carried out and accepted on the test pieces prior to cutting of the test specimens. The discard (see Figure 5 and Figure 7) shall not be considered for NDT. Any post-weld heat treatment (PWHT) that is specified shall be completed prior to non-destructive testing.

NDO dus alleen voor Level 2.
Of het moet een additionele eis zijn voor Level 1.
Het testen wordt aangestuurd uit table 1 en 2.

7.3 Non-destructieve testing

7.5 Acceptance levels

The acceptance levels for imperfections corresponding to level 1 and level 2 are given in Table 4.

NOTE The correlation between the quality levels of ISO 5817 and the acceptance levels of the different NDT techniques is given in ISO 17635.

Table 4 — Acceptance levels for imperfections

ISO 5817 Ref. no.	ISO 6520-1 Ref. no.	Designation	Level 1	Level 2 Quality level to ISO 5817
1.1	100	Crack	Not permitted	B (not permitted)
1.5	401	Lack of fusion (incomplete fusion)	Not permitted	B (not permitted)
1.6	4021	Incomplete root penetration	Not permitted	B (not permitted)
1.7	5011 5012	Continuous undercut Intermittent undercut	No specific requirements	C
1.9	502	Excess weld metal (butt weld)	No specific requirements	C
1.10	503	Excessive convexity (fillet weld)	No specific requirements	C
1.11	504	Excess penetration	No specific requirements	C
1.12	505	Incorrect weld toe	No specific requirements	C

[a] If required by the application standard or specified, micro crack sensitive materials may need specific examination.

7.3 Non-destructive testing

Table 4 *(continued)*

ISO 5817 Ref. no.	ISO 6520-1 Ref. no.	Designation	Level 1	Level 2 Quality level to ISO 5817
1.16	512	Excessive asymmetry of fillet weld (excessive unequal leg length)	$h \leq 3$ mm	B
1.21	5214	Excessive throat thickness	No specific requirements	C
—	—	All other imperfections[a]	No specific requirements	B

[a] If required by the application standard or specified, micro crack sensitive materials may need specific examination.

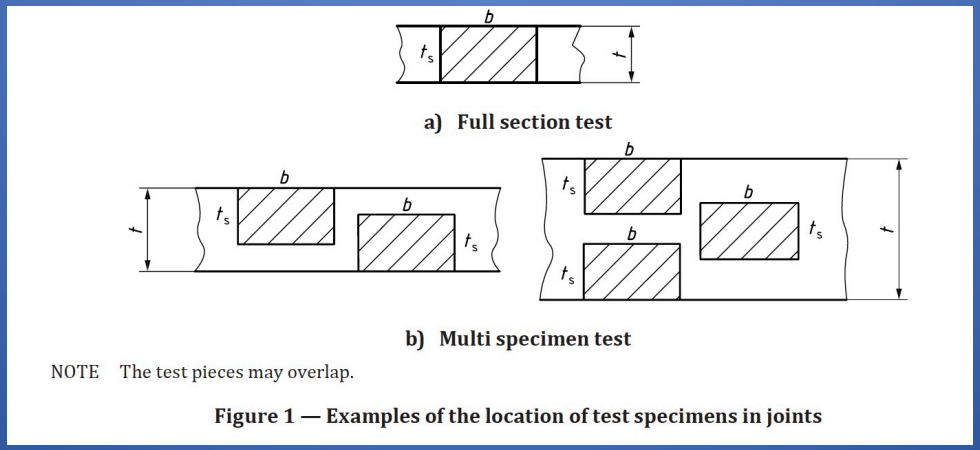
7.4 Destructive testing

- Tensile test.

7.4.1 Transverse tensile test

Specimens and testing for transverse tensile testing for butt joint shall be in accordance with ISO 4136. The test shall represent the whole thickness except as necessary to obtain parallel sides on the specimens. Tensile testing shall ensure all welding processes used and the associated essential variables are tested.

NOTE It is not essential to overlap the specimens as identified in ISO 4136.



NOTE The test pieces may overlap.

Figure 1 — Examples of the location of test specimens in joints

7.4 Destructive testing

- Bend test.

7.4.2 Bend test

Specimens and testing for bend testing for butt joints shall be in accordance with ISO 5173:2009.

Waar de formule gebleven uit de andere NEN-EN-ISO 15614-1????

ISO 5173:2009(E)

6.3 Diameter of former and roller

The diameter of the former or the inner roller shall be equal to 4 t_s for parent metal with elongation A W 20 %. For parent metal with elongation $A < 20$ %, the following formula shall be applied unless otherwise specified in the relevant application standard:

$$d = \frac{100 \times t_s}{A} - t_s$$

7.4 Destructive testing

- Macroscopic examination.

7.4.3 Macroscopic examination

The test specimen shall be prepared and etched in accordance with ISO 17639 on one side to clearly reveal the fusion line, the HAZ and the build-up of the runs.

The test specimen shall include unaffected parent metal and shall be recorded by at least one photograph of macro cross-section per procedure test.

The acceptance levels shall be in accordance with 7.5.

7.4 Destructive testing

- Macroscopic examination.

7.4.3 Macroscopic examination

The test specimen shall be prepared and etched in accordance with ISO 17639 on one side to clearly reveal the fusion line, the HAZ and the build-up of the runs.

The test specimen shall include unaffected parent metal and shall be recorded by at least one photograph of macro cross-section per procedure test.

The acceptance levels shall be in accordance with 7.5.

7.4 Destructive testing

- Impact testing.

7.4.4 Impact testing

Test specimens and testing for impact tests shall be in accordance with this document for location of specimens and temperature of testing, and with ISO 9016 for dimensions and testing. The striker radius of 2 mm according to ISO 148-1 shall be used, unless otherwise specified.

Waarom Striker 2mm?, ASTM gebruikt 8 mm striker en dat is ook standaard bij ASME IX de 2 mm is een compromis met ASME.

Where more than one welding process or type of covering and fluxes are qualified in a single test piece, additional impact test specimens shall be taken from the weld metal and HAZ that include each process and type of covering and fluxes.

Dit is ook nieuw, alle lasprocessen moeten getest zijn, dit betekend veel al ook root charpy's uitnemen. Hier is altijd discussie over geweest en is nu helder.

7.4 Destructive testing

- Hardness testing.

For double sided welds, one additional row of indentations shall be made through the root area. Examples of typical indentation patterns are given in ISO 9015-1.

Where more than one welding process is used, each welding process has to be tested by at least one row of indentation.

For each row of indentation at least three individual indentations shall be made in each of the following areas:

— the weld;

— both heat affected zones;

Let op bij meerdere processen alle processen meenemen in de hardheidsmetingen. Dit wijkt af van de vorige standaard.

7.4 Destructive testing

- Hardness testing.

The results from the hardness test shall meet the requirements given in Table 3. However, requirements for groups 6 (non-heat treated), 7, 10 and 11 and any dissimilar metal joints shall be specified prior to testing.

Table 3 — Permitted maximum hardness values (HV 10)

Steel groups ISO/TR 15608	Non-heat treated	Heat treated
1[a], 2[b]	380	320
3[b]	450	380
4, 5	380[c]	350[c]
6	—	350
9.1	350	300
9.2	450	350
9.3	450	350

a If hardness tests are required.

b For steels with min R_{eH} > 890 MPa, special values shall be specified.

c For certain materials, higher values may be accepted, if specified before the welding procedure test.

7.4 Destructive testing

- Re-testing.

7.6 Re-testing

If the test piece fails to comply with any of the requirements for NDT, one further test piece shall be welded and subjected to the same examination. If this additional test piece does not comply with the requirements, the welding procedure test has failed. Alternatively, an analysis may be performed to determine the main cause of the defect. If it is established that the main cause of failure is not procedure-related and due to insufficient welder's skill, no additional test piece is needed and a report of the evidence shall be added to the report.

If any test specimen required by Table 1 or Table 2 fails to meet the applicable acceptance criteria, the test piece shall be considered as failed. In the case of failure of the test piece, a new test piece with the same welding parameters may be welded. If all destructive tests provide acceptable test results and a macro section test failed, two additional test specimens for macro section test can be taken.

7.4 Destructive testing

- Re-testing.

In the case of failure of any destructive test specimen, except for macroscopic examination, two additional test specimens may be removed from the original test piece for each test specimen that failed if adequate material is available. The test specimens shall be taken as close as possible to the original specimen location.

Dit heeft te maken met de heat flow in het werkstuk en zeker bij wat grote zijn koude gedeelte aan de uiteinden en een warmer gedeelte in de midden.

Denk aan: Hardheden Kerftaaiheid

8. Range of qualification

8.3 Related to the parent material

8.3.1 Parent material grouping

8.3.1.1 General

In order to minimize the number of welding procedure tests, steels, nickel and nickel alloys are grouped according to ISO/TR 15608. Where materials are assigned to groups by ISO/TR 20172, ISO/TR 20173 or ISO/TR 20174, those assignments shall be used.

Separate welding procedure qualifications are required for each parent material or parent material combinations not covered by the grouping system according to ISO/TR 20172, ISO/TR 20173, ISO/TR 20174 or ISO/TR 15608.

Permanent backing material shall be considered as a parent metal within the approval (sub-)group.

8.3.1.2 Steels

The ranges of qualification are given in Table 5.

8.3.1.3 Nickel alloys

The ranges of qualification are given in Table 6.

Dus ook registeren op WPQR

8.3.1.4 Dissimilar joints between steels and nickel alloys

The ranges of qualification are given in Table 6.

8. Range of qualification

Table 5 — Range of qualification for steel groups and sub-groups[a,b,c]

Test piece material A	Test piece material B										
	1	2	3	4	5	6	7	8	9	10	11
1	1-1	—	—	—	—	—	—	—	—	—	—
2	1-1 2-1	1-1 2-1 2-2	—	—	—	—	—	—	—	—	—
3	1-1 2-1 3-1	1-1 2-1 2-2 3-1 3-2	1-1 2-1 2-2 3-1 3-2 3-3	—	—	—	—	—	—	—	—
4	4-1	4-1 4-2	4-1 4-2 4-3	4-1 4-2 4-3 4-4	—	—	—	—	—	—	—

Let op de voetnotes, en zeker voetnote [c]
Deze wijkt af van de oude norm voor Ferritische RVS en Duplex.

[a] Test piece materials in groups 1, 2, 3 and 11 qualify the equal or lower specified minimum yield strength steels (independent of the material thickness).

[b] Test piece materials in groups 4, 5, 6, 8 and 9 qualify steels in the same sub-group and any lower sub-group within the same group.

[c] Test piece materials in groups 7 and 10 qualify steels in the same sub-group.

8. Range of qualification

Table 5 *(continued)*

Test piece material A	Test piece material B										
	1	2	3	4	5	6	7	8	9	10	11
5	5-1	5-2	5-3	5-4	5-1 5-2 5-5	—	—	—	—	—	—
6	6-1	6-1 6-2	6-1 6-2 6-3	6-1 6-2 6-3 6-4	6-1 6-2 6-3 6-4 6-5	6-1 6-2 6-3 6-4 6-5 6-6	—	—	—	—	—
7	7-1	7-1 7-2	7-1 7-2 7-3	7-4	7-5	7-5 7-6	7-7	—	—	—	—
8	8-1	8-1 8-2	8-1 8-2 8-3	8-4	8-1 8-2 8-4 8-5 8-6	8-1 8-2 8-4 8-5 8-6	8-7	8-8	—	—	—

Kijk goed naar de combinaties
Die mogelijk zijn.

Niet in tabel= kwalificeren.

8. Range of qualification

Table 6 — Range of qualification for nickel alloy and nickel alloy/steel groups

Test piece material A	Test piece material B							
	41	42	43	44	45	46	47	48
41	41[c]-41	—	—	—	—	—	—	—
42	42[c]-41	42[c]-42	—	—	—	—	—	—
43	43[c]-41	43[c]-42	43[c]-43 45[c]-45 47[c]-47	—	—	—	—	—
44	44[c]-41	44[c]-42	44[c]-43	44[c]-44	—	—	—	—
45	45[c]-41	45[c]-42	45[c]-43	45[c]-44	45[c]-45 43[c]-43	—	—	—
46	46[c]-41	46[c]-42	46[c]-43	46[c]-44	46[c]-45	46[c]-46	—	—
47	47[c]-41	47[c]-42	47[c]-43	47[c]-44	47[c]-45	47[c]-46	47[c]-47 43[c]-43 45[c]-45	—
48	48[c]-41	48[c]-42	48[c]-43	48[c]-44	48[c]-45	48[c]-46	48[c]-47	48[c]-48

Kijk goed naar de combinaties
Die mogelijk zijn.

8. Range of qualification

Overgangen nikkel andere materialen

1	41[c]-1	42[c]-1	43[c]-1	44[c]-1	45[c]-1	46[c]-1	47[c]-1	48[c]-1
2	41[c]-2[a] 41[c]-1	42[c]-2[a] 42[c]-1	43[c]-2[a] 43[c]-1	44[c]-2[a] 44[c]-1	45[c]-2[a] 45[c]-1	46[c]-2[a] 46[c]-1	47[c]-2[a] 47[c]-1	48[c]-2[a] 48[c]-1
3	41[c]-3[a] 41[c]-2 41[c]-1	42[c]-3[a] 42[c]-2 42[c]-1	43[c]-3[a] 43[c]-2 43[c]-1	44[c]-3[a] 44[c]-2 44[c]-1	45[c]-3[a] 45[c]-2 45[c]-1	46[c]-3[a] 46[c]-2 46[c]-1	47[c]-3[a] 47[c]-2 47[c]-1	48[c]-3[a] 48[c]-2 48[c]-1
5	41[c]-5[b] 41[c]-6 41[c]-4 41[c]-2 41[c]-1	42[c]-5[b] 42[c]-6 42[c]-4 42[c]-2 42[c]-1	43[c]-5[b] 43[c]-6 43[c]-4 43[c]-2 43[c]-1	44[c]-5[b] 44[c]-6 44[c]-4 44[c]-2 44[c]-1	45[c]-5[b] 45[c]-6 45[c]-4 45[c]-2 45[c]-1	46[c]-5[b] 46[c]-6 46[c]-4 46[c]-2 46[c]-1	47[c]-5[b] 47[c]-6 47[c]-4 47[c]-2 47[c]-1	48[c]-5[b] 48[c]-6 48[c]-4 48[c]-2 48[c]-1
6	41[c]-6[b] 41[c]-4 41[c]-2 41[c]-1	42[c]-6[b] 42[c]-4 42[c]-2 42[c]-1	43[c]-6[b] 43[c]-4 43[c]-2 43[c]-1	44[c]-6[b] 44[c]-4 44[c]-2 44[c]-1	45[c]-6[b] 45[c]-4 45[c]-2 45[c]-1	46[c]-6[b] 46[c]-4 46[c]-2 46[c]-1	47[c]-6[b] 47[c]-4 47[c]-2 47[c]-1	48[c]-6[b] 48[c]-4 48[c]-2 48[c]-1
8	41[c]-8[b]	42[c]-8[b]	43[c]-8[b]	44[c]-8 [b]	45[c]-8 [b]	46[c]-8[b]	47[c]-8[b]	48[c]-8[b]
11	41[c]-11	42[c]-11	43[c]-11	44[c]-11	45[c]-11	46[c]-11	47[c]-11	48[c]-11

[a] Covers the equal or lower specified yield strength steels of the same group.

[b] Covers steels in the same sub-group and any lower sub-group within the same group.

[c] For groups 41 to 48, a procedure test carried out with a solid solution or precipitation hardening alloy in a group covers all solid solution or precipitation hardening alloys, respectively, in the same group.

8. Range of qualification

- Nieuw in dikte ranges
- (Basis materiaal en neergesmolten lasmetaal)

Voorbeeld hoe kwalificeer je 100 mm aan 15 mm, dat zo kunnen met:
50 mm aan 7,5 – 30 mm.

Deze combi is niet te maken in een ISO 15614-1 WPQR. (Denk aan gelijke dikten)

Both parts of the parent material to be welded shall be within the limits of thickness qualified, except that for dissimilar thickness parent materials there is no limit on the thickest part provided the qualification was performed on parent material of 30 mm or greater.

It is not intended that deposited metal thickness or base metal thickness or outside pipe diameters should be measured precisely, but rather the general philosophy behind the values given in Tables 7, 8 and 9 should be applied.

Table 7 — Range of qualification for butt welds material thickness and deposited metal thickness

Dimensions in millimetres

Thickness of test piece t	Range of qualification			
	Parent material thickness			Deposited weld metal thickness for each process s
	Level 1	Level 2		
		Single run	Multi-run	
$t \leq 3$		0,5 t to 2 t		max. 2 s
$3 < t \leq 12$	1,5 to 2 t	0,5 t (3 min) to 1,3 t	3 to 2 t[a]	max. 2 s[a]
$12 < t \leq 20$	5 to 2 t	0,5 t to 1,1 t	0,5 t to 2 t	max. 2 s
$20 < t \leq 40$	5 to 2 t	0,5 t to 1,1 t	0,5 t to 2 t	max. 2 s when $s < 20$ max. 2 t when $s \geq 20$
$40 < t \leq 100$	5 to 200	—	0,5 t to 2 t	max. 2 s when $s < 20$ max. 200 when $s \geq 20$
$100 < t \leq 150$	5 to 200	—	50 to 2 t	max. 2 s when $s < 20$ max. 300 when $s \geq 20$
$t > 150$	5 to 1,33 t	—	50 to 2 t	max. 2 s when $s < 20$ max. 1,33 t when $s \geq 20$

[a] For level 2: when impact requirements are specified but impact tests have not been performed, the maximum thickness of qualification is limited to 12 mm.

8. Range of qualification

Table 8 — For level 2: Range of qualification for material thickness and throat thickness of fillet welds

Dimensions in millimetres

Thickness of test piece t	Range of qualification		
	Material thickness[a]	Throat thickness	
		Single run	Multi-run
$t \leq 3$	0,7 t to 2 t	0,75 a to 1,5 a	No restriction
$3 < t < 30$	3 to 2 t		
$t \geq 30$	≥5		

Where a fillet weld is qualified by means of a butt weld test, the throat thickness range shall be based on the thickness of the deposited weld metal.

NOTE a is the nominal throat thickness as specified in pWPS for the test piece.

[a] In case of different material thicknesses, the range of qualification of both thicknesses of the test pieces shall be calculated separately.

Dit is een verbetering ten opzichte van de oude norm

8.3.3 Diameter of pipes and branch connections

For level 1: The diameter is not an essential variable. Any product form, i.e. plate, pipe, forging or casting, qualifies for all product forms.

For level 2: The qualification of a welding procedure test on diameter D shall include qualification for diameters in the following ranges given in Table 9.

A butt weld qualification for pipes covers butt welds in plates. Qualification given for plates also covers pipes when the outside diameter is >500 mm or when the outside diameter is >150 mm welded in the PC, in PF rotated position or in PA rotated position.

Table 9 — For level 2: Range of qualification for pipe and branch connection diameters

Dimensions in millimetres

Diameter of the test piece	Range of qualification
D	$\geq 0{,}5\ D$
NOTE 1 For hollow section other than circular (for example, elliptic), D is the dimension of the smaller side.	
NOTE 2 D is the outside diameter for the pipe of a butt weld or the outside diameter of the branch pipe for a branch connection (see Figure 4, outside diameter D_2).	

8.3.4 Angle of branch connection

For level 1: The angle of branch connection is not an essential variable.

For level 2: A welding procedure test shall be carried out on a branch connection with angle α (see Figure 4). A test piece made with a branch angle (α) between 60° and 90° in the procedure test qualifies the angle $60° \leq \alpha < 90°$. An angle $\alpha < 60°$ requires a separate test piece and qualifies angles from α up to 90°.

8. Range of qualification

- Algemeen voor alle lasprocessen. (Level 2)
  - Als er meerdere lasprocessen in een test coupon gebruikt zijn, dan moeten de testspecimen lasmetaal van lasprocessen bevatten.
  - Tegenlassen mag dan met 1 van de gebruikte processen.

8. Range of qualification

- Welding positions. (Level 1 en 2)
  - Verduidelijking dat er 2 platen gebruikt moeten worden om de hoogste en laagste heat input te demonstreren. (Behalve bij buizen)
  - Verduidelijking qua lasposities lage heat input PC en PE
  - Verduidelijking qua lasposities lage heat input PA en PF

8. Range of qualification

- Type of joints (Level 2)
  - Lassen gemaakt van twee zijden zonder het verwijderen van de grondlaag, kwalificeren lassen gemaakt aan twee zijden met verwijderen van de grondlaag. (Alleen niet met thermische processen zoals gutsen)
  - Build up lassen is gekwalificeerd door een buttweld.
  - Een buttering moet in een apart test stuk gekwalificeerd worden (Lassen een buffer op bv. P91 met inconel om eerst te kunnen gloeien, en dan een ander materiaal eraan te lassen wat niet gegloeid hoeft te worden)

8. RANGE OF QUALIFICATION

- FILLER MATERIAL. (Level 2)
- De handelsnaam van het las toevoegmateriaal is geen eis meer bij kwalificaties met een test temperatuur hoger of gelijk dan -20 °C. (Proces 111, 114, 12, 136, 132)
- Hiermee kunnen de staalconstructiebouwers gemakkelijker switchen naar een andere leverancier van toevoeg materialen.
- Wel moet het verplichte deel van de codering gelijk zijn. (Dus de rekgrens, impact en gas type.)

8. RANGE OF QUALIFICATION

- Heat input range. (Level 2)

- De heat input mag vervangen worden door Arc Energy. Bij Arc Energy geen K-factor meer nodig in de berekening. (optie, wel aangeven op de WPQR)

- Bij elektroden lassen heat input voor elke diameter bepalen.

- Voor hele kleine boogtijden zoals reparaties of kleine hechten is het verifiëren van de lasparameters (V en A) voldoende.

- Niet meer nodig om van alle snoeren de heat input te berekenen, dit is niet mogelijk als de hoogste heat en laagste heat input bepaald moet worden, geldt ook voor interpass temperatuur.

8. RANGE OF QUALIFICATION

- Preheating range. (Level 2)

- Het is geoorloofd om 50 °C naar beneden te gaan met de preheat temperatuur.

- Alleen als dit aangetoond kan worden met de ISO/TR 17671-2

- Het is geoorloofd om 50 °C naar boven te gaan met de interpass temperatuur, behalve voor groep 8, 10 , 41-48

- Het verhogen van de interpass temperatuur voor het lassen van de sluitlagen om de hardheden te verlagen is nu een essentiële variabele geworden en moet worden gerapporteerd en dus zal dan ook in de productie moeten gebeuren.

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8. RANGE OF QUALIFICATION

- Preheating range. (Level 2)

- Aanbevolen preheat temperaturen van leveranciers van materialen mogen worden gevolgd.

- Vergeet niet dat dit heel vaak commerciële temperaturen zijn die alleen maar onder test condities werken!

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8. Range of qualification

- Post weld Heat Treatment. (Level 1 en 2)

- Separate kwalificaties voor PWHT voor temperaturen bij de materialen 1,2,3,4,5,6,7,9,10 en 11.
  - Boven de upper transformation temperature. (Normalising)
  - Beneden de upper transformation temperatuur. (Stress relieving)
  - Boven de upper transformation temperatuur gevolgd door een andere warmte behandeling beneden de upper transformation temperatuur. (Normalizing or Q and T)
  - Tussen de lower- en de upper transformation temperatuur.

8. Range of qualification

- Proces variabelen proces 12 groep (121 tot 126)
- Elke variant van proces 12 (121 tot 126) apart kwalificeren.
- Elke wijziging in aantal draden apart kwalificeren.
- 10% in ratio van toevoegen van supplementair toevoeg materiaal aan de electrode.
- Toevoeging of weglaten van een hot or cold wire opnieuw kwalificeren.
- Merk en typenaam van de flux is een essentiële variabele.
- Bij hergebruik van slag (Crushed-slag), elke batch of mengverhouding met nieuwe flux verreis her-kwalificatie.

8. Range of qualification

- Proces variabelen proces groep 13

- Verduidelijking van de 20% regel van het beschermgas.

- The qualification is restricted to nominal composition of the shielding gas used in the procedure test. The designation of ISO 14175 may be used to specify the shielding gas composition, e.g. ISO 14175:2008-M21-ArC-18.

- A deviation of max. ±20 % (relative) of the nominal composition of the CO2 content is allowed.

- However, an intentional addition or deletion of maximum 0,1 % of any gas component does not require a new welding procedure test.

8. Range of qualification

- Proces variabelen proces groep 13

- ‘Relative deviation of ±20%’ betekend voor een gas mengsel met 80% Ar en 20% CO_2 een range van:

  - Minimum 16% CO_2, calculated as [20 - (20% of 20)]
  - Maximum 24% CO_2, calculated as [20 + (20% of 20)]

- Viel in verleden het gas met de 10% deze regel in een andere groep van de ISO 14175 dan moest je opnieuw kwalificeren.

- Dit is niet meer, de gas groepen zijn vervallen.

8.5.2.3 Transfer mode

8.5.2.3.1 General

For solid and metal cored wires, the qualification using short circuiting transfer qualifies only short circuiting transfer. Qualification using spray, pulse or globular transfer qualifies spray, pulse and globular transfer.

8.5.2.3.2 For level 2 — Welding with waveform control

When a power source with waveform control (see ISO/TR 18491) is used, the power source manufacturer and waveform control mode shall be recorded on the WPQR including all other pertinent information.

Change from one manufacturer to another manufacturer of the power source or a change in the waveform control mode requires a new qualification test.

8.5.2.3.3 For level 2 — Welding with pulsed mode (without waveform control)

When a power source with pulsed mode is used, the identification of the power source manufacturer shall be recorded on the WPQR including all pertinent information.

Change from one manufacturer to another manufacturer of the power source does not require a new qualification test.

8.5.2.3.4 For level 2 — Welding without pulsed mode and without waveform control

When the power source used to qualify a WPQR has been used without waveform control, an identification of the power source manufacturer is required.

Change from one manufacturer to another manufacturer of the power source does not require a new qualification test.

8. Range of qualification

- Proces variabelen proces groep 14

- Proces variabelen varianten van process 14.

- Introductie van de 10% regel voor het eventuele Helium component in het beschermgas.

- Verduidelijking hoe om te gaan met componenten die minder dan 0,1% bedragen van beschermgas zijn, dan geen her kwalificatie verplicht.

8. Range of qualification

- Verandering in range van de backing gassen.

- Een BW procedure gemaakt zonder backing gas kwalificeert lasprocedures met backing gas I, N1, N2, N3.

- Voor de groepen 1 tot 6 mogen de backing gassen I, N1, N2 en N3 worden uitgewisseld worden zonder her-kwalificatie.

- Voor de groepen 8 en 41 tot 48 een wissel tussen I, N, R vereist geen her kwalificatie.

- Voor de groepen 7 en 10 is her kwalificatie vereist bij een wissel van backing gas.

- Indien een lassen gemaakt worden op een materiaal support dikker dan 5 mm, dan is het weglaten van backing gas acceptabel.

9. WPQR

- In de eerdere NEN-EN-ISO 15614-1 was er geen verplichting tot een range van kwalificaties op het WPQR formulier.
- Op het WPQR formulier moet ook het Level vermeld worden.
- Nu is die verplichting er wel voor Level 2.

For level 2: A WPQR format shall be used to record details, range of qualification and level for the welding procedure and the test results, in order to facilitate uniform presentation and assessment of the data.

If required by an application standard or a specification, for example, the certificates of base metals and welding consumables shall be added to the WPQR.

An example of WPQR format is shown in Annex B.

9. WPQR

Annex B
(informative)

Welding procedure qualification record form (WPQR)

Welding procedure qualification — Test certificate

Manufacturer's WPQR no.:

Manufacturer:

Address:

Code/testing standard:

Level:

Date of welding:

Examiner or examining body:

Reference no.:

9. WPQR

Test piece **Range of qualification**

Product form:

Welding process(es):

	Welding processes used		
	No. 1	No. 2	No. 3
Process			
Deposited metal thick-ness (mm):			

Type of joint and weld:

Parent material group(s) and sub-group(s):

Parent material thickness (mm):

Throat thickness (mm):

Single layer/multi-run:

Outside pipe diameter (mm):

Filler material designation:

Filler material make:

Filler material size:

Designation of shielding gas/flux:

Designation of backing gas:

Type of welding current and polarity:

Transfer mode:

Heat input:

Welding positions:

Preheat temperature:

Interpass temperature:

Post-heating:

Post-weld heat-treatment:

Other information (see also 8.5):

We confirm that the statements in this record are correct and that the test pieces were prepared, welded, tested and have fulfilled the requirements in accordance with ISO 15614-1.

ANNEX A voor level 1.

Table A.1 — For level 1: Grouping of filler metals and electrodes for qualification (grouping of welding electrodes and rods for qualification)

Steels			
F-No.	**International Standard**	**A** **Classification by yield strength (or nom. comp.)**	**B** **Classification by tensile strength (or alloy type)**
1	ISO 2560	EXXxA13,EXXxA33,EXXxRR4,EXXx-RA54, EXXxB53	EXX20, EXX24,EXX27, EXX28
	ISO 3581	EXX XX Bx3, EXX XX Rx3	ESXXX(X)-25, ESXXX(X)-26
	ISO 2560	EXXxMo	EXX20–1M3, EXX27–1M3
2	ISO 2560	EXXxR12, EXXxR32, EXXxRA12	EXX12, EXX13, EXX14, EXX19
	ISO 2560	—	EXX13-XX
3	ISO 2560	EXXxC21, EXXxC11	EXX10, EXX11
	ISO 2560	EXXxMoC21, EXXxMoC11	EXX10-XX, EXX11-XX
4	ISO 2560	EXXxB22,EXXxB12,EXXxB32, EXXxB35	EXX15, EXX16, EXX18, EXX48
	ISO 14341	All classifications	All classifications
	ISO 636	All classifications	All classifications
	ISO 17632	All classifications	All classifications
	ISO 17633	All classifications	All classifications
	ISO 24598	All classifications	All classifications
	ISO 26304	All classifications	All classifications
	ISO 16834	All classifications	All classifications
	ISO 21952	All classifications	All classifications
	ISO 17634	All classifications	All classifications
	ISO 18276	All classifications	All classifications

Table A.2 — For level 1: Grouping of ferrous weld metal by chemical analysis (not applicable to nonferrous materials)

A-No.	Type of weld metal	Chemical composition, weight percent[a]					
		C	Cr	Mo	Ni	Mn	Si
1	Mild steel (non-alloy steel)	0,20	0,20	0,30	0,50	1,60	1,00
2	Carbon-molybdenum	0,15	0,50	0,40 to 0,65	0,50	1,60	1,00
3	Chrome (0,4 % to 2 %)-molybdenum	0,15	0,40 to 2,00	0,40 to 0,65	0,50	1,60	1,00
4	Chrome (2 % to 4 %)-molybdenum	0,15	2,00 to 4,00	0,40 to 1,50	0,50	1,60	2,00
5	Chrome (4 % to 10,5 %)-molybdenum	0,15	4,00 to 10,50	0,40 to 1,50	0,80	1,20	2,00
6	Chrome-martensitic	0,15	11,00 to 15,00	0,70	0,80	2,00	1,00
7	Chrome-ferritic	0,15	11,00 to 30,00	1,00	0,80	1,00	3,00
8	Chromium-nickel	0,15	14,50 to 30,00	4,00	7,50 to 15,00	2,50	1,00
9	Chromium-nickel	0,30	19,00 to 30,00	6,00	15,00 to 37,00	2,50	1,00
10	Nickel to 4 %	0,15	0,50	0,55	0,80 to 4,00	1,70	1,00
11	Manganese-molybdenum	0,17	0,50	0,25 to 0,75	0,85	1,25 to 2,25	1,00
12	Nickel-chrome-molybdenum	0,15	1,50	0,25 to 0,80	1,25 to 2,80	0,75 to 2,25	1,00

[a] Single values are maximum values.

NOTE Only listed elements are used to determine A-numbers.

NIL Seminars

- Het NIL gaat seminars verzorgen waarin deze nieuwe NEN-EN-ISO 15614-1 in zijn geheel besproken gaat worden. (Flyers zijn in de zaal)

- Dus Level 1 en Level 2 kwalificaties compleet met de geldigheidgebieden.

- Ik zal een opsomming van de wijzigen die besproken zijn aanleveren zodat de lasgroepen deze op de website kunnen zetten.

EINDE

- Nog vragen en opmerkingen?
- Dank voor uw aandacht.