

## **“Welding S304H and HR3C with R1”**

In welding, austenitic and nickel-based materials – such as S30H and HR3C – tend, as a rule, to form hot cracks in the micro-structure range. These micro-cracks develop straight after welding and may be the starting point for larger cracks under boiler operations. Cracks result in component failure and, as a consequence, in major repair steps.

The welding parameters are primarily responsible here. In particular, heat input – calculated from amperage, voltage and welding speed – impacts on micro-crack formation. The greater the heat input (welding parameters), the greater is the risk of hot crack susceptibility.

Thus the processor must find ways of lowering the heat input. Especially under TIG-type welding operations, welding parameters are needed which bring about proper material fusing. Given a 5 to 10 millimeter wall thickness, a 100 amperage (A) is needed to obtain reliable welding results. In accordance with the VdTÜV specification, the weld filler metals to be used must be welded with the I1 inert gas (99.9% argon).

Meeraner Dampfkesselbau GmbH's innovation lies in exchanging the inert gas deployed. Instead of I1 (99.9% argon) an R1 mixed gas (95% argon, 5% hydrogen) is used in welding. The inert gas hydrogen proportion results in a lowering of the weld metal surface stress. This, in turn, brings about an approx. 50% reduction in the welding parameters. Only 50A is required in place of the originally needed 100A.

Separate welding procedure tests have involved R1 gas welding which a TÜV specialist has examined and confirmed. The associated reduced heat input lessens the risk of hot crack formation. An appropriate welder instructional course under the modified welding conditions is to be carried out.

Another effect is one of a marked reduction of tarnishing both in and next to the weld. Time-consuming finishing work – such as brushing or possibly acid cleaning – is minimized or possibly dispensed with. However as a requirement exists in many customer specifications for only VdTÜV tested weld filler metals to be used, Meeraner Dampfkesselbau GmbH has obtained special authorization to process the S304H and HR3C materials with the R1 welding gas.

**Statement by Technical Inspection Authority (TÜV):**

## **Stellungnahme**

**zur**

**Anwendung des Schweißverfahrens 145-(WSG) zur Verbindung des Werkstoffs X10CrNiCuNb18-9-3  
(1.4907) artgleich unter Verwendung des Schweißzusatzwerkstoffs**

**Bezeichnung: EN 12072-W Z 18 16 Mn Cu N Nb**

**sowie des Schutzgases mit der Bezeichnung: DIN EN ISO 14175 –R1/R1**

**im Mitsubishi Hitachi Power Systems Europe (MHPSE) Projekt Wilhelmshaven durch die Firma  
Meeraner Dampfkesselbau GmbH**

Als im oben genannten Projekt beauftragte benannte Stelle gemäß Druckgeräterichtlinie erfolgt  
nachfolgende Stellungnahme:

Der Verwendung des oben genannten Schweißverfahrens einschließlich des genannten  
Schweißzusatzes sowie des ebenfalls genannten Schutzgases wird aufgrund der vom TÜV Süd mit  
Datum 8.10.2015 bescheinigten erfolgreichen Qualifizierung von Schweißverfahren

Zertifikat-/Auftrags-Nr.: 0036-IS-DD1-CHE-15-10-353284-284-ds

im Rahmen der im Zertifikat aufgeführten Grenzen und Festlegungen zugestimmt.

Köln, 7. Januar 2016

  
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## Application in practice





