

## MIC 227

### Test support for determination of hardness progression

The MIC 227 support is intended for recording the hardness progression / profile using hardness testers belonging to the MICRODUR family.

A typical application for this support is the hardness test on heat affected zones along a weld. The hardness is affected by the composition of the base metal and the weld metal, the metallurgical effects of the welding process, cold working of the metal, heat treatment and many other factors.

Experience has dictated that limitations be placed on the hardness of the base metal, heat-affected zone (HAZ), weld interface and weld metal.

If too hard, they will not have sufficient ductility for the service conditions, their corrosion resistance may be impaired or some other factor may dictate this limitation.

When a HAZ that may be 3mm wide and contains several metallurgically differing zones is tested, the size of the indentation is of major importance. A small indenter, as used in our MICRODUR probes, allows to detect the hardened zone or the soft or tempered zone, while a 5 mm ball, for example, just represents an average hardness value.

The combination of the MIC 10 and the MIC 227 support has been successfully tested for hardness testing on HAZ. Find enclosed the instructions for hardness testing on HAZ of pipelines issued by the German safety standards authority:

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## Instructions for Hardness Testing on pipelines made of fine grain construction steel

### 1. General

These instructions should ensure that the exact hardness values/hardness peaks are determined in the Heat Affected Zone (coarse grain zone).

### 2. Equipment used

The following equipment is used:

- Right angle grinder with roughing disk
- Manual grinder with fan grinders having different grain sizes
- Hardness Tester MIC 10 from Krautkrämer and special test stand

### 3. Preparatory work

#### 3.1 Grinding with the right angle grinder

- Grinding of a strip approx. 30 mm wide

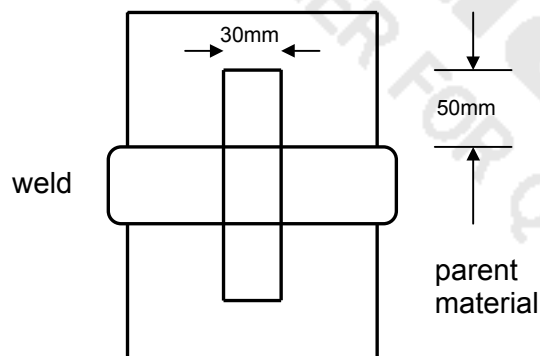


Fig. 1

- All areas of the weld must be prepared (Fig. 1)
- At least 50 mm of parent material must be prepared on each side of the weld
- The complete test position must be level and parallel to the tube surface
- Only apply slight pressure to the right angle grinder

#### NOTE:

Colouring of the material caused by overheating produces testing errors.  
If necessary, rework the test area.

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### 3.2 Using the manual grinder

- Fan grinders are used with the following grain sizes: 60, 120/150, 320, 400 or finer
- Grain size 60 is firstly used finishing with the finest grain size
- Each grinding process is made transverse to the previous one

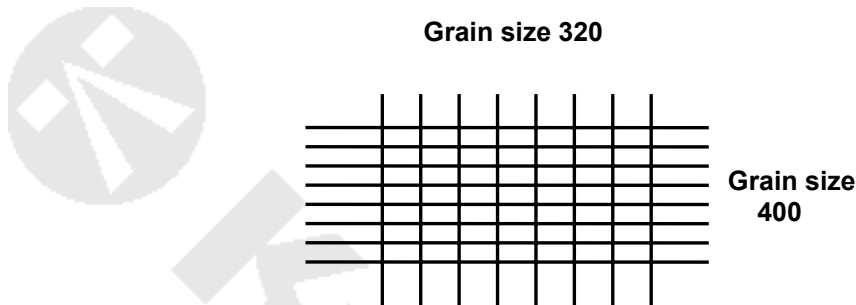


Fig. 2

- Each grinding process is finished when all marks of the previous one have been ground out
- Only apply slight pressure to the machine when grinding

#### **NOTE:**

Erroneous test results will be obtained if the surface of the test object is deformed

### 3.3 Etching of the prepared test area

**The relevant safety regulations concerning the use of acids must be observed.**

- Application of acid: 96 ccm 95% Ethanol (denatured)  
4 ccm 65% HNO<sub>3</sub>

### 3.4 Etching the test area

- A wad of cotton wool is impregnated with the ready made acid
- The impregnated cotton wool is then lightly dabbed onto the test surface
- Care should be taken to see that the complete test area is covered with acid
- Etching is successful when the individual weld components can be clearly distinguished from each other
- Unclean etchings cause phantom structural formations
- Rinse off the area with Ethanol and dry off using a dryer

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## 4. Hardness testing

- The hardness tester must be used according to the manufacturer's instructions
- The hardness tester is to be calibrated on the material at least once every day
- Both weld interfaces are to be tested
- A device is to be used enabling movement in the X and Y axes
- The indents in the X axis must be 2.5 times the indent diagonals (approx. 0.1 – 0.2 mm) from each other
- The indents in the Y axis should be not more than 0.2 mm from each other
- A set of hardness values should be obtained as shown in Fig. 3

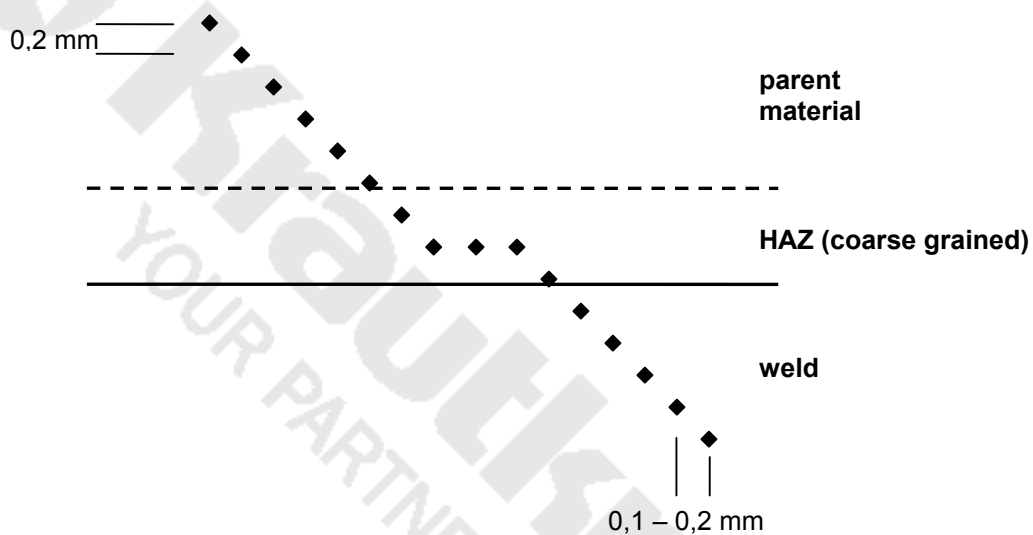


Fig. 3

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