# Tool and equipment test for Honda

## Testing resistance spot welding equipment


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# 1 Summary

## *1.1 Summary of rolling test specimens*

| **Equipment manufacturer:** | **Civic rolling test specimens** | **CRV rolling test specimens** |
|---|---|---|
| Gys Gyspot Inverter 125 L | 120 points, OK | 120 points, OK |

## *1.2 Summary of micrographic test specimens*

| **Equipment manufacturer:** | **Front frame sidemember** | | **A-pillar** | | **B-pillar** | | **Rocker panel** | |
|---|---|---|---|---|---|---|---|---|
| | Civic | CRV | Civic | CRV | Civic | CRV | Civic | CRV |
| Gys Gyspot Inverter 125 L | 0 | 0 | + | + | 0 | 0 | - | 0 |

## *1.3 Summary of test results*

| **Equipment manufacturer:** | **Civic test passed** | **CRV test passed** | **Overall test** |
|---|---|---|---|
| Gys Gyspot Inverter 125 L | OK | OK | OK |

# 2 Testing resistance spot welding equipment

## *2.1 Assessment of the handling of the machine*

As it is not possible to assess all the characteristics of a mobile resistance spot welding machine with objectively measurable parameters, the tester or company carrying out the testing is given a list of questions. The list of questions serves as an aid to subjective assessment of the characteristics of the machine.

*Parameters*

1 Are the welding parameters set in the standard mode (main operating mode of the machine automatically selected after switching on) by means of data on the welding task (obvious criteria such as panel thickness for example)?
2 Can special conditions, e.g. "material coatings" (such as zinc coating), "multi-layer welds" (such as 3-panel joints) and "higher-strength steels" be set directly through the operating controls?
3 Can the current and time welding parameters be set directly?
4 Can welding parameters be stored as individual programmes and called up again?
5 Does the control system allow working with programmes/parameters? (Clear identification of the supplier of the parameters must be possible!)
6 Are directions on setting the electrode force provided directly on the machine or in the operating instructions?
7 What is the maximum electrode force?

*Welding*

1 Is welding prevented or aborted if the mains power is insufficient?
2 Is an automatic warning given by the machine if the mains power is insufficient?
3 Is the power sufficient for the welding tasks to be performed or are power reserves available?
4 Is it possible for the welding operation to be aborted during the preliminary compression phase?
5 Does the switch which triggers the welding process have a palpable on/off switching point?
6 Do the welding currents have a negative trend?
7 Did the assessment of the diameters of the spot welds produced during the welding tasks reveal a negative trend, i.e. decreasing spot weld diameters over a series of tests?
8 Does the machine control the welding current effectively?
9 Are data storage and data processing possible?
10 Does the machine store data on welding operations and evaluate it when necessary?

| | | |
|---|---|---|
| *Tool* | 1 | How would you assess the handling of the electrode holder as an essential tool? (Ability to reach welding locations and effort required or fatigue during welding; are effective aids provided to reduce the handling weight without significantly impairing working freedom?) - Test on 4 typical but not insignificant body parts on a vehicle selected by the testing company: |
| | 2 | Case 1: Welding in a back panel |
| | 3 | Case 2: Welding in a rear fender |
| | 4 | Case 3: Welding in the B-pillar and side members |
| | 5 | Case 4: Welding in a roof frame |
| | 6 | How much does the electrode holder weigh? |
| | 7 | Can external cables and/or hoses impede working with the electrode holder? |
| *Electrodes* | 1 | Are the electrodes guaranteed to be mounted securely in the holder so that they cannot twist? |
| | 2 | Can the electrode caps be changed? |
| | 3 | Do the electrode caps have (direct or indirect) water cooling? |
| | 4 | What range of electrode arms is available as standard? |

## *2.2 Honda Civic materials*

### 2.2.1 Honda welding task 1: A-pillar

*Panel dimensions:*

**Panel 1: Skin panel**
Material 1: Normal-strength steel
Thickness: 0.7 mm

**Panel 2: Reinforcement**
Material 2: High-strength steel
Thickness 2: 1.0 mm

**Panel 3: Inner panel**
Material 3: High-strength steel
Thickness 3: 1.25 mm

### 2.2.2 Honda welding task 2: B-pillar

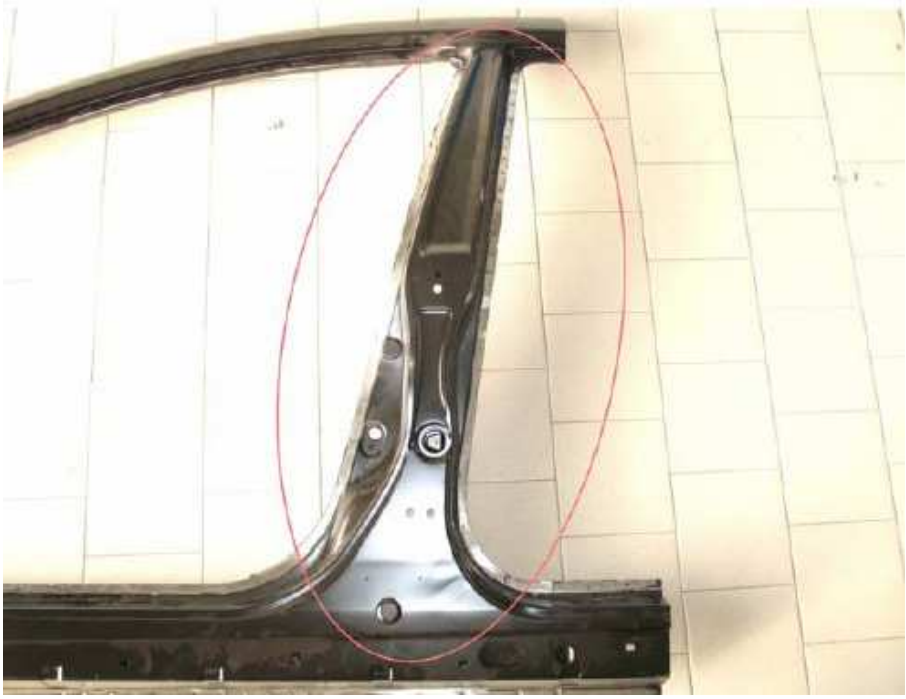
*Panel dimensions:*

**Panel 1: Skin panel**

| | |
|---|---|
| Material 1: | Normal-strength steel |
| Thickness: | 0.7 mm |

**Panel 2: Reinforcement**

| | |
|---|---|
| Material 2: | High-strength steel |
| Thickness 2: | 1.25 mm |



### 2.2.3 Honda welding task 3: rocker panel

*Panel dimensions:*

**Panel 1: Skin panel**

| | |
|---|---|
| Material 1: | Normal-strength steel |
| Thickness: | 0.7 mm |

**Panel 2: Reinforcement**

| | |
|---|---|
| Material 2: | High-strength steel |
| Thickness 2: | 1.5 mm |

### 2.2.4 Honda welding task 4: frame side member

*Panel dimensions*

**Panel 1: Skin panel**

| | |
|---|---|
| Material 1: | Normal-strength steel |
| Thickness: | 2.0 mm |

**Panel 2: Inner panel**

| | |
|---|---|
| Material 3: | High-strength steel |
| Thickness 3: | 2.0 mm |

## *2.3 Honda CRV materials*

### 2.3.1 Honda welding task 1: A-pillar

*Panel dimensions:*

**Panel 1: Skin panel**

| | |
|---|---|
| Material 1: | Normal-strength steel |
| Thickness: | 0.7 mm |

**Panel 2: Reinforcement**

| | |
|---|---|
| Material 2: | High-strength steel |
| Thickness 2: | 2.0 mm |

**Panel 3: Inner panel**

| | |
|---|---|
| Material 3: | High-strength steel |
| Thickness 3: | 1.25 mm |

### 2.3.2 Honda welding task 2: B-pillar

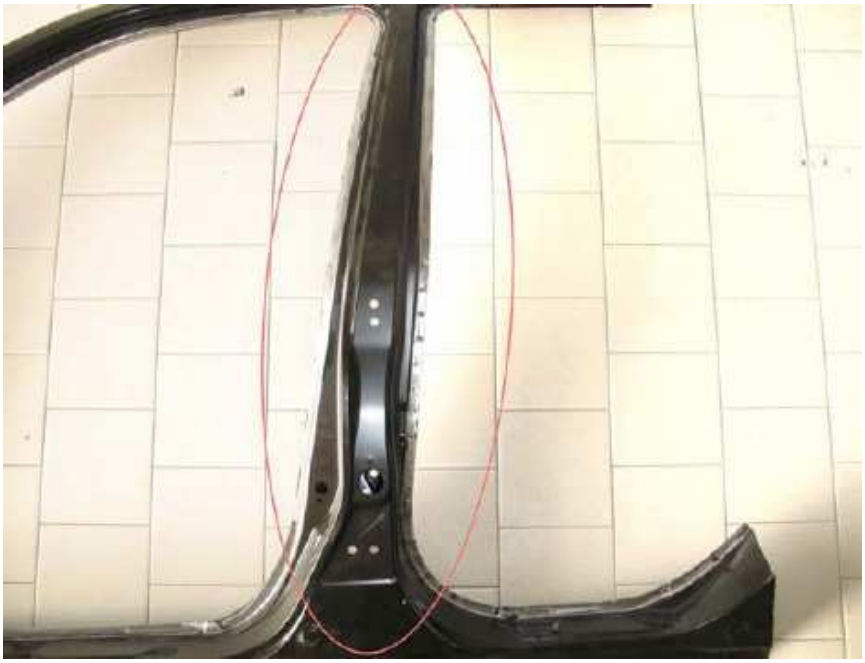
*Panel dimensions:*

**Panel 1: Skin panel**

| | |
|---|---|
| Material 1: | Normal-strength steel |
| Thickness: | 0.7 mm |

**Panel 2: Reinforcement**

| | |
|---|---|
| Material 2: | High-strength steel |
| Thickness 2: | 1.25 mm |



### 2.3.3 Honda Schweißaufgabe 3: Schweller

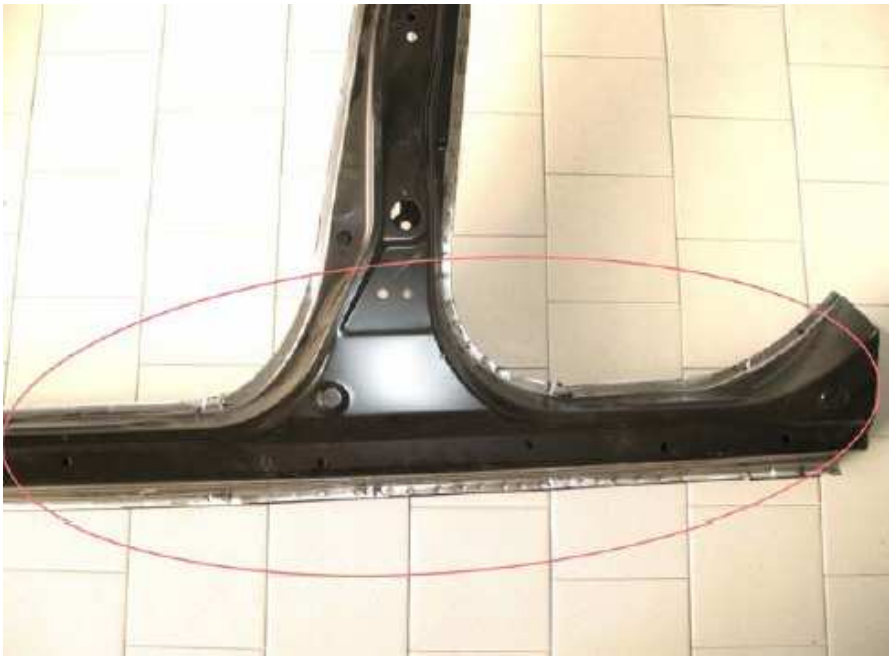
*Abmessungen der Bleche:*

**Blech 1: Außenblech**

| | |
|---|---|
| Werkstoff 1: | Normal-strength steel |
| Dicke: | 0.7 mm |

**Blech 2: Verstärkungsblech**

| | |
|---|---|
| Werkstoff 2: | High-strength steel |
| Dicke 2: | 1.0 mm |



### 2.3.4 Honda welding task 4: frame side member

*Panel dimensions:*

**Panel 1: Skin panel**

| | |
|---|---|
| Material 1: | Normal-strength steel |
| Thickness: | 2.0 mm |

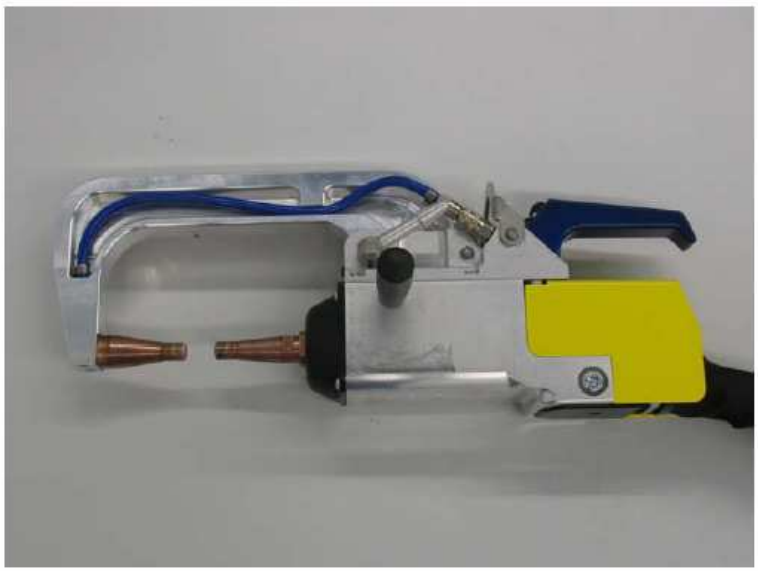
**Panel 2: Inner panel**

| | |
|---|---|
| Material 3: | High-strength steel |
| Thickness 3: | 2.2 mm |

## 3.6 Gys Gyspot Inverter 125 L

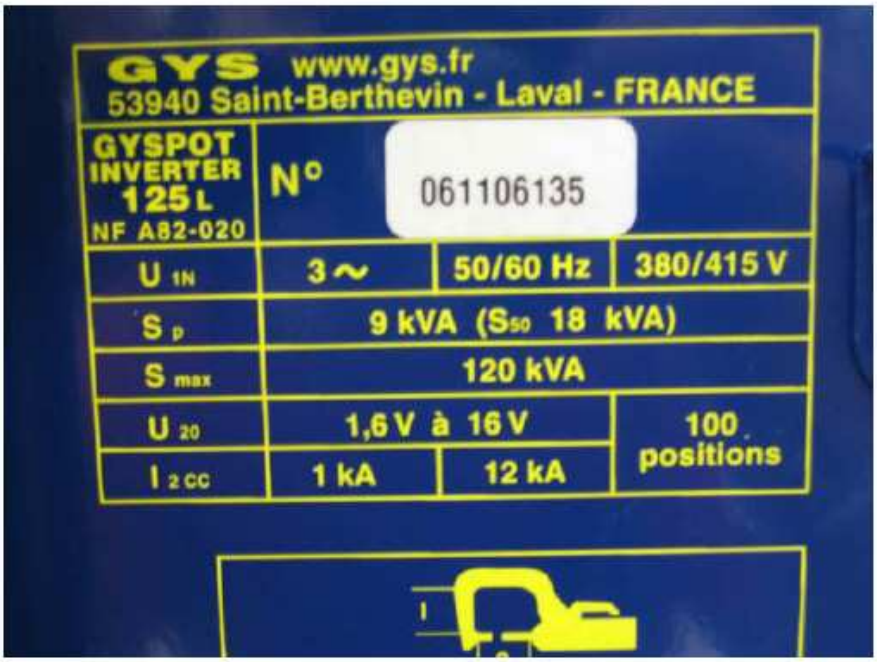
GYSPOT Inverter 125 L
Gys
welding machine

C-type electrode holder



*Operating controls and weld tester on the Gys welding machine*


*Type plate*



### 3.6.1 Technical characteristics of the welding machine

| List of technical characteristics | Art. Nr. 019201 |
|---|---|
| Data | Ident. Nr. 061106135 |
| Welding transformer/input frequency | 1000 Hz |
| Welding current | 12 KA |
| Max. welding power (rms) / 380 V | 120 KA |
| Mains power supply | |
| Thermal overload protection | Yes |
| Mains protection 380-415 V 210-230 V | 32 A / 50 A |
| Mains lead 8 m | Yes |
| Water cooling | Yes 30 litre |
| Dimensions (Height x Breadth x Depth) | 2050x800x650 mm |
| Weight | 140 kg |
| **Electrode holder** | |
| Electrode force 120 mm/8 bar | 550 daN |
| Electrode diameter | 13 mm |
| Welding cable diameter | 180 $mm^2$ |
| Welding cable length | 2,5 m |
| Weight | 5,6 kg |
| **Butt welding gun** | |
| Welding cable length | 3 m |
| Ground cable length | 2 m |
| Welding cable diameter | 150 $mm^2$ |
| Set of electrodes 120 mm | 100 mm |
| **Accessories** | |
| Trolley | Yes |
| Welding cable balancer | Yes |
| Panel beating hammer | Yes |
| Set comprising studs, carbon electrode contacts, extraction plates | Yes |
| **Water cooling unit** | |
| Mains supply voltage | Yes |
| Mains protection | Yes |
| Cooling unit with water recooling | Yes |
| Cooling liquid | 30 litre |
| Base cooling temperature | 25° |
| Welding cable water cooling | Yes |
| Electrode arm water cooling | Yes |
| Electrode cap water cooling | No |
| **Butt welder functions** | |
| Welding uncoated panels | Yes |
| Welding zinc-coated panels | Yes |
| Pulse welding | No |
| Air puller connection | No |
| Dent removal with welded plates | Yes |
| Welding on T-pins | Yes |
| Welding on fir tree pins | Yes |
| Welding on threaded nuts | Yes |
| Welding on threaded pins | Yes |
| Welding on wave wire | Yes |
| Panel shrinking using the carbon electrode | Yes |

### 3.6.2 Assessment of the handling of the machine

As it is not possible to assess all the characteristics of a mobile resistance spot welding machine with objectively measurable parameters, the tester or company carrying out the testing is given a list of questions. The list of questions serves as an aid to subjective assessment of the characteristics of the machine.

*Parameters*

1. Are the welding parameters set in the standard mode (main operating mode of the machine automatically selected after switching on) by means of data on the welding task (obvious criteria such as panel thickness for example)?
   - Yes
2. Can special conditions, e.g. "material coatings" (such as zinc coating), "multi-layer welds" (such as 3-panel joints) and "higher strength steels" be set directly through the operating controls?
   - Yes
3. Can the current and time welding parameters be set directly?
   - Only time welding
4. Can welding parameters be stored as individual programmes and called up again?
   - Yes
5. Does the control system allow working with programmes/parameters? (Clear identification of the supplier of the parameters must be possible!)
   - No
6. Are directions on setting the electrode force provided directly on the machine or in the operating instructions?
   - No
7. What is the maximum electrode force?
   - Over 350 daN

*Welding*

1. Is welding prevented or aborted if the mains power is insufficient?
   - In our test the equipment did not come to this point. This is not reached in normal workshop operations.
2. Is the power sufficient for the welding tasks to be performed or are power reserves available?
   - The power reserves are sufficient.
3. Does the switch which triggers the welding process have a palpable on/off switching point?
   - There is a palpable on / off switching point
4. Do the welding currents have a negative trend?
   - There is no detectable negative trend in the welding currents
5. Did the assessment of the diameters of the spot welds produced during the welding tasks reveal a negative trend, i.e. decreasing spot weld diameters over a series of tests?
   - The spot weld diameters were constant over the series of tests
6. Does the machine control the welding current effectively?
   - The welding current is controlled effectively
7. Are data storage and data processing possible?
   - Data storage is not possible
8. Does the machine store data on welding operations and evaluate it when necessary?
   - Welding data is not stored in the machine

*Tool*

1. How would you assess the handling of the electrode holder as an essential tool? (Ability to reach welding locations and effort required or fatigue during welding; are effective aids provided to reduce the handling weight without significantly impairing working freedom?) - Test on 4 typical but not insignificant body parts on a vehicle selected by the testing company:
   - The weight of the cables and electrode holder is reduced with a balancer
2. Case 1: Welding in a back panel
   - It is possible to weld in a back panel on the Honda CRV
3. Case 2: Welding in a rear fender
   - It is possible to weld in a rear fender on the Honda CRV
4. Case 3: Welding in the B-pillar and side members
   - It is possible to weld in the B-pillar and side members on the Honda CRV Max
5. Case 4: Welding in a roof frame
   - It is generally possible to weld in a roof frame on the Honda CRV although it may be necessary to modify the electrode holder
6. How much does the electrode holder weigh?
   - The weight of the electrode holder and cables is 13 kg
7. Can external cables and/or hoses impede working with the electrode holder?
   - The cables and the hoses do not get in the way when working

*Electrodes*

1. Are the electrodes guaranteed to be mounted securely in the holder so that they cannot twist?
   - Secure twist-free mounting is guaranteed
2. Can the electrode caps be changed?
   - The caps can be changed
3. Do the electrode caps have (direct or indirect) water cooling?
   - The electrode caps have indirect water cooling

*Current source*

- 400 V, 3-phase, 50 amp fuse

*Electrode holder*

- X-type electrode holder
- Handling of the electrode holder is made easier with the balancer supplied
- External cables and/or hoses cannot get in the way when working with the electrode holder.

### 3.6.3 Setting parameters

| Welding task | Vehicle | Material thickness | Setting parameter |
|---|---|---|---|
| | | | |
| A-pillar | Einstellung Civic | 0,7mm/ 1,0mm/ 1,25mm | 350daN/ 580ms/ 10000A |
| | Einstellung CRV | 0,7mm/ 2,0mm/ 1,25mm | 350daN/ 580ms/ 10000A |
| | | | |
| B-pillar | Einstellung Civic | 0,7mm/ 1,25mm | 300ms/ 8000A/ 280daN |
| | Einstellung CRV | 0,7mm/ 1,25mm | 300ms/ 8000A/ 280daN |
| | | | |
| Rocker panel | Einstellung Civic | 0,7mm/ 1,25mm | 300ms/ 8000A/ 280daN |
| | Einstellung CRV | 0,7mm/ 1,0mm | 300ms/ 8000A/ 200daN |
| | | | |
| Frame side member | Einstellung Civic | 2,0mm/ 2,0mm | 580ms/ 10000A/ 400daN |
| | Einstellung CRV | 2,0mm/ 2,2mm | 550ms/ 9500A/ 350daN |

### 3.6.4 Assessment of the welding tasks

This overview lists the main points for assessment of the welding tasks and describes the criteria.

| Scope | Main point | Assessment criteria |
|---|---|---|
| All welding tasks | Assessment of spot weld sizes | Spot weld ∅ > 4 x √ t 10 points each<br><br>A maximum of 240 points can be scored with 4 welding tasks each comprising 24 welds |
| All welding tasks | The welding parameters are not established in the documentation accompanying the machine or its operation or are in conflict with these. | No 0 points<br>Yes (is so) -25 points<br>Maximum deduction –100 points with non-compliance in all 4 welding tasks |
| All welding tasks | Machine interrupts working on the welding task<br>(safety cut-off) | For each 30 second break -5 points |
| All welding tasks | Machine interrupts working on the welding task<br>(fuse blows) | For each fuse -5 points |
| **Honda - Total possible points 240** | | |

### 3.6.5 Rolling test specimens

***Honda Civic***

*Welding task 1*
*3-panel joint*

*A-pillar*

| No. | Point 1 | Point 1 | Average | Point 2 | Point 2 | Average |
|---|---|---|---|---|---|---|
| | Normal-strength steel | | | High-strength steel | | |
| | 0,7 mm | 1,0 mm | **3,5 mm** | 1,0 mm | 1,25 mm | **4,0 mm** |
| 1 | 7,4 | 7,2 | **7,3** | 6,9 | 6,7 | **6,8** |
| 2 | 6,9 | 6,7 | **6,8** | 6,6 | 6,8 | **6,7** |
| 3 | Micrographic test specimen | | | | | |

*Welding task 2*
*2-panel joint*

*B-pillar*

| No. | Point 1 | Point 1 | Average |
|---|---|---|---|
| | Normal-strength steel | High-strength steel | |
| | 0,7 mm | 1,25 mm | **3,5 mm** |
| 1 | 5,8 | 6,2 | **6,0** |
| 2 | 6,2 | 6,8 | **6,5** |
| 3 | Micrographic test specimen | | |

*Welding task 3*
*2-panel joint*

*Rocker panel*

| No. | Point 1 | Point 1 | Average |
|---|---|---|---|
| | Normal-strength steel | High-strength steel | |
| | 0,7 mm | 1,25 mm | **3,5 mm** |
| 1 | 6,2 | 6,0 | **6,1** |
| 2 | 5,0 | 5,4 | **5,2** |
| 3 | Micrographic test specimen | | |

*Welding task 4*
*2-panel joint*

*Frame side member*

| No. | Point 1 | Point 1 | Average |
|---|---|---|---|
| | Normal-strength steel | High-strength steel | |
| | 2,0 mm | 2,0 mm | **6,0 mm** |
| 1 | 7,6 | 7,4 | **7,5** |
| 2 | 6,6 | 6,8 | **6,7** |
| 3 | Micrographic test specimen | | |

***Honda CRV***

*Schweißaufgabe 1*
*3-Blechverbindung*

*A-Säule*

| No. | Point 1 | Point 1 | Average | Point 2 | Point 2 | Average |
|---|---|---|---|---|---|---|
| | Normal-strength steel | | | High-strength steel | | |
| | 0,7 mm | 2,0 mm | **3,5 mm** | 2,0 mm | 1,25 mm | **4,5 mm** |
| 1 | 7,7 | 7,5 | **7,6** | 7,6 | 7,4 | **7,5** |
| 2 | 7,1 | 7,3 | **7,2** | 7,7 | 7,5 | **7,6** |
| 3 | Micrographic test specimen | | | | | |

*Schweißaufgabe 2*
*2-Blechverbindung*

*B-Säule*

| No. | Point 1 | Point 1 | Average |
|---|---|---|---|
| | Normal-strength steel | High-strength steel | |
| | 0,7 mm | 1,25 mm | **3,5 mm** |
| 1 | 5,6 | 5,2 | **5,4** |
| 2 | 5,0 | 4,8 | **4,9** |
| 3 | Micrographic test specimen | | |

*Schweißaufgabe 3*
*2-Blechverbindung*

*Schweller*

| No. | Point 1 | Point 1 | Average |
|---|---|---|---|
| | Normal-strength steel | High-strength steel | |
| | 0,7 mm | 1,25 mm | **3,5 mm** |
| 1 | 6,5 | 6,3 | **6,4** |
| 2 | 6,0 | 5,6 | **5,8** |
| 3 | Micrographic test specimen | | |

*Schweißaufgabe 4*
*2-Blechverbindung*

*Rahmenlängsträger*

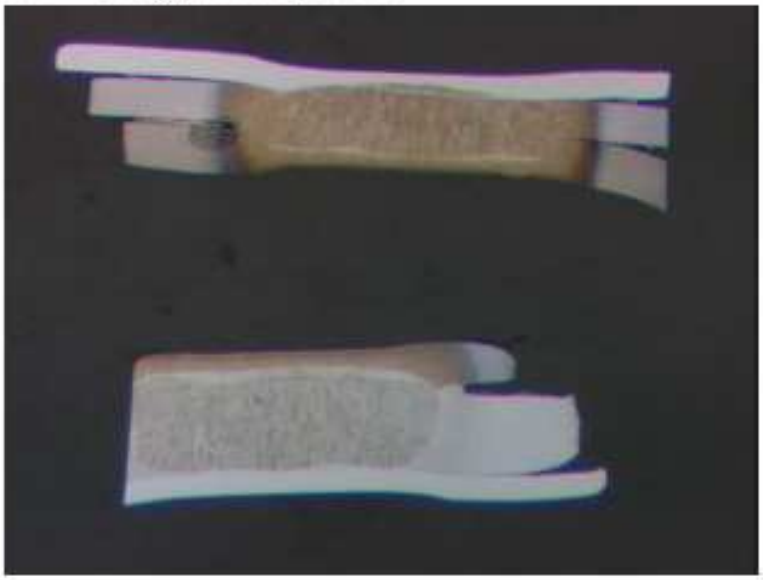
| No. | Point 1 | Point 1 | Average |
|---|---|---|---|
| | Normal-strength steel | High-strength steel | |
| | 2,0 mm | 2,0 mm | **6,0 mm** |
| 1 | 6,9 | 6,9 | **6,9** |
| 2 | 7,3 | 7,1 | **7,2** |
| 3 | Micrographic test specimen | | |

### 3.6.6 Micrographic test specimens

*Micrographic assessment*
*Welding task 1*
*A-pillar*

*Spot weld for Civic top, CRV bottom*

*Finding:*
*Cracks*

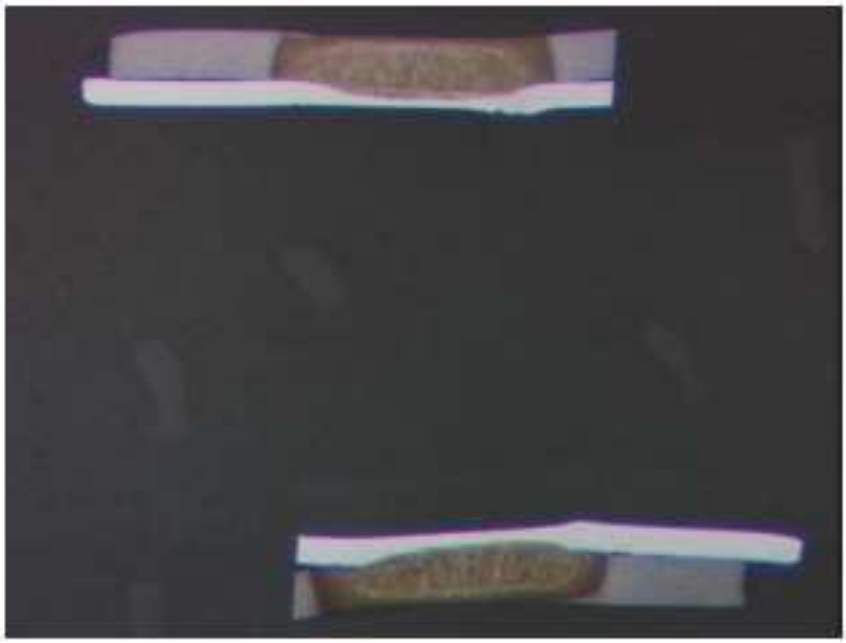


*Micrographic assessment*
*Welding task 2*
*B-pillar*

*Spot weld for Civic top, CRV bottom*

*Finding:*

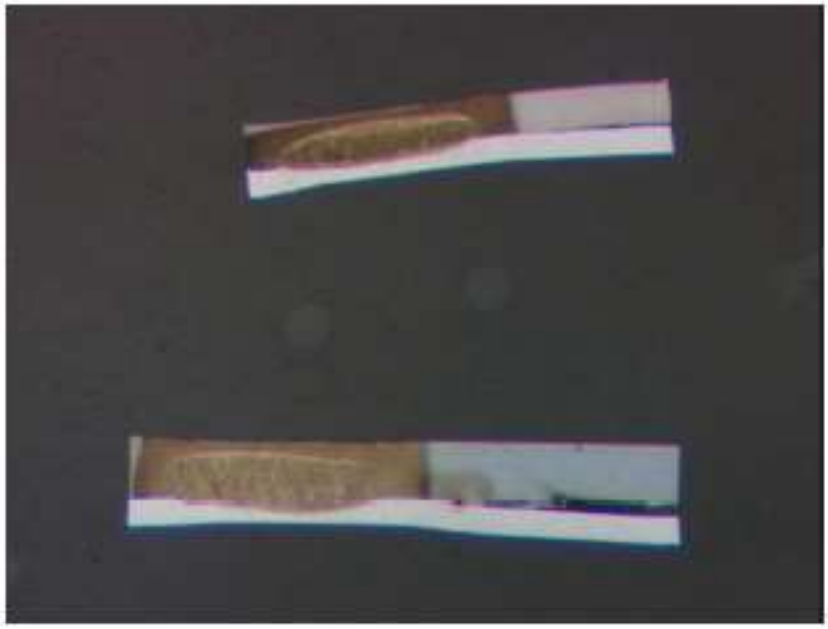
*fine cracks*



*Micrographic assessment*
*Welding task 3*
*Rocker panel*

*Spot weld for Civic top, CVR bottom*

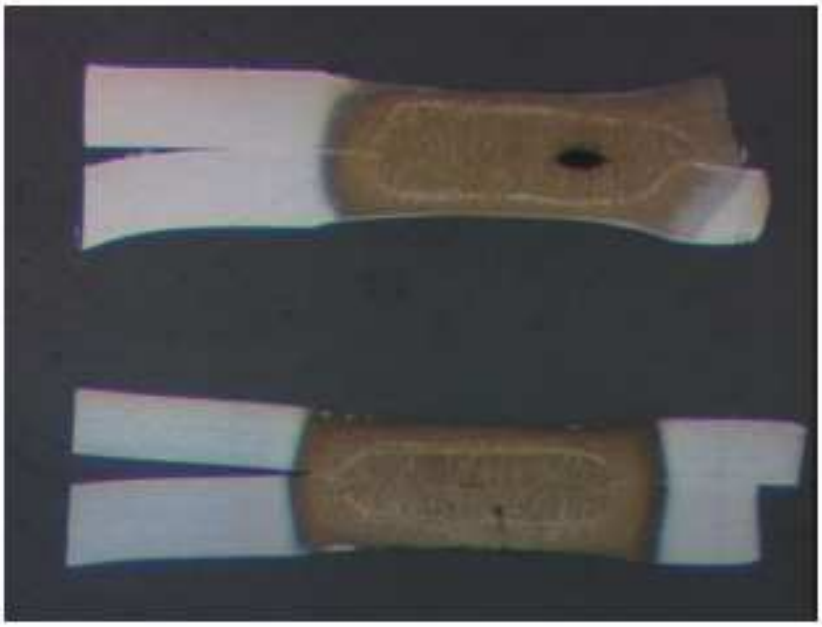
*Finding:*
*little blowhole, partly cracks*



*Micrographic assessment*
*Welding task 4*
*Frame side member*

*Spot weld for Civic top, CVR bottom*

*Finding:*
*Pores, blowhole, cracks*



#### 3.6.6.1 Assessment of the micrographic test specimens

The micrographic test specimens are being finally assessed by Honda, when any defects will be graded as being unacceptable or acceptable.
The grading basis is as follows:

| | |
|---|---|
| Micrographic test specimen OK: | + |
| Micrographic test specimen imperfect but acceptable: | 0 |
| Micrographic test specimen unacceptable: | - |

| | Civic | CRV |
|---|---|---|
| Welding task 1, A-pillar | 0 | 0 |
| Grading | | |
| Welding task 2, B-pillar | + | + |
| Grading | | |
| Welding task 3, rocker panel | 0 | 0 |
| Grading | | |
| Welding task 4, frame side member | - | 0 |
| Grading | | |

### 3.6.7 Overall assessment

OK