WELDING ROBOT
ARC MAN™
STRUCTURAL STEEL WELDING ROBOT SYSTEM
Welding robot systems for structural steel from Japan’s leading welding company “KOBELCO”

Kobe Steel, the only welding solutions company that develops all of its own original welding robots, welding power supplies and welding wires aims to be your No.1 partner for structural steel fabrication.

ASSURING
Through our in-depth understanding of the welding process, our aim is to make a system that fabricators can trust and use with confidence
- We provide robot systems that contribute to the quality and control of the production process
- We also support new processes and new standards

TRUSTWORTHY
We continually pursue the optimization of structural steel welding
- We aim for the best welding quality that meet certification standards and type approval for architectural structural steel
- We provide support for a wide range of structural steel welding technologies and production processes

EFFICIENT
Contributing to cost reduction through fast and high efficiency welding
- By raising the percentage of welding automation, we aim to increase the number of weld that can be robot-welded
- Our robot is adaptable to numerous applications thus increasing the rate of return on its investment

EASY
Our welding robot system is user friendly such that anyone can operate it from day one of its installation
- Our aim is to supply a robot system that requires minimum pre-operation setting up
- Minimal data input and simple operation lessen the work load of the operator
The advantages of REGARC™ welding and constant voltage welding combined to give high quality welding.

What is REGARC™?

- The REGARC™ process featuring our new power supply, REGARC™ AB500 achieves systematic and smooth droplet transfer for global transfer through our original current/voltage waveform controller (painted).

Wire for REGARC™

- Optimized to reduce slag volume and slag removal for carbon dioxide multi-pass welding.
- Superior conductivity, adherence resistivity and wire feedability made possible through REGARC™, unique waveform control.
- Compatible with conventional constant voltage welding 490MPa level (YGW111) REGARC™ MG-SOR(N) 550MPa level (YGW181) REGARC™ MG-SGR(N).

System characteristics

1. Reduces production time

- Low spatter means less frequent cleaning and because of reduction in spatter adhering to the work, the robot operation time and post-treatment time can be significantly reduced.
- Combined with the reduction in air cut time as a result of the new software, robot operation time reduction up to 20% can be expected for a column plate thickness of 72mm/0.87%, 400mm/5.17mm diameter (compared to our competitor). *1
- Time reductions may vary due to plate thickness or diameter. In addition, an automated contact chip changer is supplied as standard as chip changes are carried out automatically during operation resulting in increased continuous operability.

2. High quality welding

- Since the average current can be reduced as a result of the faster wire melting rate in the REGARC™ welding process, the maximum heat input can be minimized.
- In addition, by switching between REGARC™ welding and constant voltage welding for each weld pass or during welding, each part can be welded appropriately.

3. Environment friendly and energy saving welding

- Even whilst the wire melting rate is being increased, with our proprietary process, the average current can be lowered thereby reducing the energy consumption compared to conventional constant voltage welding (a 5% reduction in power consumption can be achieved for the same wire feed rate).
- Furthermore, by reducing the over-heat time for melting, the amount of fumes generated can be reduced.

- **High wire melting speed**

  - Comparison between generated fumes
    - (Amount of fumes according to wire weight for bead-on-plate)
  - High wire melting speed

  - About 10% increase in wire feed rate at the same current
  - About 25% decrease in current at the same wire feed rate

**REGARC™ Optimal plate thickness**

- HSS-Column welding
  - Plate thickness 9~40mm/0.35~1.57in
- Round pipe welding
  - Plate thickness 9~40mm/0.35~1.57in

**Regard™ 2-ARC welding robot system for steel core connection**

- Spatter on nozzle
  - Spatter comparison test

**System installed**

- Structural Steel Large Assembly “2-ARC” Welding Robot System

**Scope of application**

- Types of REGARC™ Welding Robot Systems
  - System
    - Compact Structural Steel Connection Welding Robot System
    - Structural Steel Connection Welding Robot System
    - Structural Steel Large Assembly Welding Robot System
    - Robotic Structural Steel Connection Welding Robot System
  - Robot type
    - Single-2-ARC
  - Wire weight
    - MAX 1000 kg / 2204lbs
    - MAX 1500 kg / 3306lbs
    - MAX 2000 kg / 4408lbs
  - Chip changer
    - Chip changer included

[1] *The conventional constant voltage mode can be used for applications other than the above.*
Structural Steel Large Assembly Welding Robot System

- Enhanced functionality and expandability

**Features**

1. **Feature to realize unobserved operation for extended periods**
   - Nozzle cleaner, nozzle auto changer, wire cutter, chip changer (available for ROREX only) come as standard
   - The arc start pre-check function and crator - arc start combination feature reduces arc start errors
   - The slow down start feature and wire stick removal feature control arc ON/OFF time stops
   - Slag automated removal equipment can be installed (option)

2. **Applicable to a wide variety of work, increased plant operation rate**
   - S-form column, SRC column (H-column), round pipe column, box column can all be handled
   - Applicable also to column body fabrication method (non-bracket fabrication method)
   - Applicable also to bracket welding (horizontal welding) for column through-box column, SR column (H-column)
   - Applicable also to core connector welding, connection welding

3. **High quality welding**
   - Bead appearance corresponding to JASS6 and heat control conditions, in-past temperature management, handling feature and robot model certification are also applicable
   - The automatic measurement of corner radius and corner gap means that even work with variations can be welded appropriately

4. **Simple operation**
   - Easy-to-understand input screen makes it easy to create data
   - The home automatic measurement feature allows the robot to automatically measure the column position

5. **Existing delivered systems can be upgraded to 2 arcs (robots)**
   - Adding a robot and slider to an existing column large assembly system can upgrade the system to a 2-ARC welding system

**Some variations of Structural Steel Large Assembly System**

- Example of column large assembly system connection process
- Example of column large assembly system beam process
- Example of cut-out base process
- Example of horizontal process

Welding points

- HSS-Column
- SRC column
- Round pipe column
- Variable diaphragm core
- Round pipe core
- H-column
- Beams
- Connection

Reference layout plan

2033mm / 68.78: Safety sensor
16800mm / 55.11: Occupied space

20332mm / 68.78: Safety sensor

Structural Steel Large Assembly “2-ARC” Welding Robot System

- Significant increase in productivity per unit area

Features

1. **Welding time halved**
   - Welding time is halved compared to Single ARC welding systems.
   - In addition to welding, wire cut, sensing function and slag removal is automatically executed by 2 robots at the same time.

2. **Welding different route gaps**
   - To weld different initial cross-sections within the same welding time, the welding amperage, arc voltage and welding speed are automatically calculated.

3. **Applicable also for columns with different plate thickness or diameter**
   - Different sizes (plate thickness, diameter) can be welded simultaneously with 2-ARC welding system.
   - *Same diameter, same plate thickness only possible with INNOARC.*

4. **Applicable to a variety of work with improved operational efficiency**

### Benefits of automated welding

For a 5-form column: 400mm (15.75in core) 225/0.87in, 6 joint, semi-automated arc generation rate of 36%

- Semi-automated welding (3 Weldon)
  - Conventional welding system (1 robot, 1 positioner)
  - 2-ARC system welding (2 robots, 1 positioner)

4 welders work overtime until 19:00hrs for 2 columns

3 welders work overtime until 19:00hrs for 2 columns

1 robot does the work of 3 welders

Add 1 positioner to produce 4 columns in 1 day!

### Applicable range

<table>
<thead>
<tr>
<th>System type</th>
<th>1OT-BDOMP2</th>
<th>1ST-1 DOMMP2</th>
<th>2DT-1 DOMMP2</th>
<th>5DT-1 DOMMP2</th>
</tr>
</thead>
<tbody>
<tr>
<td>HSS-Column diameter</td>
<td>210<del>600mm / 8.27</del>23.62in</td>
<td>250<del>1000mm / 9.84</del>39.37in</td>
<td>250<del>1000mm / 9.84</del>39.37in</td>
<td>250<del>1000mm / 9.84</del>39.37in</td>
</tr>
<tr>
<td>Pipe diameter</td>
<td>250<del>810mm / 9.84</del>12.20in</td>
<td>250<del>1000mm / 9.84</del>39.37in</td>
<td>250<del>1000mm / 9.84</del>39.37in</td>
<td>250<del>1000mm / 9.84</del>39.37in</td>
</tr>
<tr>
<td>Column maximum weight, welding applicable range</td>
<td>10x<del>130t / 45.36x</del>57.17t</td>
<td>15x<del>130t / 45.36x</del>57.17t</td>
<td>20x<del>130t / 45.36x</del>57.17t</td>
<td>30x<del>130t / 45.36x</del>57.17t</td>
</tr>
<tr>
<td>Joint number</td>
<td>Maximum 4-joint and base plate</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Applicable column plate thickness</td>
<td>9, 12, 16, 19, 22, 25, 32, 36, 40mm / Min 0.35in Max 1.57in</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pipe Round pipe SBC</td>
<td>9, 12, 16, 19, 22, 25, 32, 36, 40, 45, 50, 55, 60mm / Min 0.35in Max 2.36in</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Application to column plate thickness (option)</td>
<td>45, 50mm / 1.77, 1.97in</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gap range</td>
<td>4<del>10mm / 0.16</del>0.39in</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gap difference tolerance for 2 weld joints</td>
<td>Maximum 6mm / 0.24in (a single pass may apply depending on the configuration)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Combined joint</td>
<td>2-ARC welding combination selection is automatically set</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: 1) HSS-Column diameter, column maximum weight, welding range, etc. are all within the applicable range of the “column large assembly welding system” (see p6).

Note 2): See p3 for the appropriate plate thickness of columns and round pipes for INNOARC.

Columns with different plate thickness/diameter (image of mock-up)
Multi-work Structural Steel Connection Welding Robot System

● Multi-purpose and operational efficiency achieved
  ● Applicable to respective types of core, connection, inner diaphragm and SRC shaft.
  ● Due to continuous operation of differing types or multiple works, long operation times would be possible.

Features

1. Simple input of data for each type of work
   ● A simple interactive input screen not just for cores but also for all connections, inner diaphragms and SRC shafts.
   ● Work measurement and test inputs are lessened to reduce time and prevent input errors.

2. Continuous operation for various works
   ● Using the reserved operation function, numerous works of different types can be set at once, allowing for continuous operation.

Reference installation points for each type of connection and inner diaphragm and corresponding image

Welding points

HSS-Column core  SRC core  Round pipe core  Inner diaphragm

Connection  SRC Connection (core type)  SRC Connection  SRC shaft

Applicable range

● Core

<table>
<thead>
<tr>
<th>Type</th>
<th>Diameter (mm)</th>
<th>Applicable plate thickness (mm)</th>
<th>Applicable to thick plate (mm)</th>
<th>Length (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HSS-Column</td>
<td>250~400mm</td>
<td>9, 12, 16, 19, 22, 25, 30, 34,</td>
<td>45, 50, 65, 70, 80, 90, 100,</td>
<td>1570mm</td>
</tr>
<tr>
<td>SRC pipe</td>
<td>250~415mm</td>
<td>9, 12, 16, 19, 22, 25, 30, 34,</td>
<td>45, 50, 65, 70, 80, 90, 100,</td>
<td>1570mm</td>
</tr>
<tr>
<td>SRC shaft</td>
<td>90~250mm</td>
<td>9~13mm thick: 11, 16, 19, 22,</td>
<td>9~25mm, 1mm: 30, 40, 50, 60,</td>
<td>Over 1200mm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>25mm, 1mm: 80, 100, 120, 150,</td>
<td>80, 100, 120, 150, 180, 200,</td>
<td>/ 4720mm</td>
</tr>
</tbody>
</table>

Type L

● Connection

<table>
<thead>
<tr>
<th>Type</th>
<th>Diameter (mm)</th>
<th>Flange width (mm)</th>
<th>Flange thickness (mm)</th>
<th>Bears Structure (mm)</th>
<th>Connection size (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>S-Connection</td>
<td>250~1100mm</td>
<td>90~400mm</td>
<td>9~15mm</td>
<td>90~13mm thick: 11, 16, 19, 22, 25, 30, 34, 40, 50, 60, 80, 100, 120, 150, 180, 200,</td>
<td>9~25mm, 1mm: 30, 40, 50, 60, 80, 100, 120, 150, 180, 200,</td>
</tr>
<tr>
<td>SRC-connection</td>
<td>250~1100mm</td>
<td>90~400mm</td>
<td>9~15mm</td>
<td>90~13mm thick: 11, 16, 19, 22, 25, 30, 34, 40, 50, 60, 80, 100, 120, 150, 180, 200,</td>
<td>9~25mm, 1mm: 30, 40, 50, 60, 80, 100, 120, 150, 180, 200,</td>
</tr>
</tbody>
</table>

Type M

● Inner diaphragm

<table>
<thead>
<tr>
<th>Type</th>
<th>Column core diameter (mm)</th>
<th>Inner diaphragm width (mm)</th>
<th>Inner diaphragm length (mm)</th>
<th>Column core diameter (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>S-connection</td>
<td>200~1000mm</td>
<td>9~32mm thick: 11, 16, 19, 22, 25, 30, 34, 40, 50, 60, 80, 100, 120, 150, 180, 200,</td>
<td>9~25mm, 1mm: 30, 40, 50, 60, 80, 100, 120, 150, 180, 200,</td>
<td>Below 1000mm / 39.37in</td>
</tr>
<tr>
<td>SRC-connection</td>
<td>200~1000mm</td>
<td>9~32mm thick: 11, 16, 19, 22, 25, 30, 34, 40, 50, 60, 80, 100, 120, 150, 180, 200,</td>
<td>9~25mm, 1mm: 30, 40, 50, 60, 80, 100, 120, 150, 180, 200,</td>
<td>Below 1000mm / 39.37in</td>
</tr>
</tbody>
</table>

Type S

● SRC shaft

<table>
<thead>
<tr>
<th>Type</th>
<th>Flange width (mm)</th>
<th>Flange/web thickness (mm)</th>
<th>Shaft length (mm)</th>
<th>Flange gap separation (mm)</th>
<th>Flange aperture (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SRC shaft</td>
<td>100~300mm</td>
<td>9~15mm thick: 11, 16, 19, 22, 25, 30, 34, 40, 50, 60, 80, 100, 120, 150, 180, 200,</td>
<td>9~25mm, 1mm: 30, 40, 50, 60, 80, 100, 120, 150, 180, 200,</td>
<td>Below 1000mm / 39.37in</td>
<td></td>
</tr>
</tbody>
</table>

(Note 1) The flange aperture requires more than 140mm when using automatic removal equipment.
**Full-package Structural Steel Connection Welding Robot System**

- Connections are “fully” finished by “one set”
- With the addition of various positions, a variety of work can be handled

**Welding points**

- SRC Connection (core type)
- SRC Connection
- Inner diaphragm

**Features**

1. Connections are fully completed in one set
   - A crane is not required for work reversal
   - Diaphragm x beam flange (inside/outside) and beam web edge material welding is carried out continuously

2. Simple operation
   - The only inputs are diameter, flange thickness and leg length
   - Flange thickness and attachment point do not need to be entered

**Applicable range**

<table>
<thead>
<tr>
<th>Item</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connection height</td>
<td>300～800mm / 11.81～31.5in</td>
</tr>
<tr>
<td>Size</td>
<td>Below 2400mm / 94.48in</td>
</tr>
<tr>
<td>Diaphragm diameter</td>
<td>240～650mm / 9.45～25.59in</td>
</tr>
<tr>
<td>Beam flange width</td>
<td>100～400mm / 3.94～15.75in</td>
</tr>
<tr>
<td>Step dimension</td>
<td></td>
</tr>
<tr>
<td>Mass</td>
<td>Below 206 / 4409.6b</td>
</tr>
</tbody>
</table>

*SRC connections are also applicable.
*For ground installation, the applicable range increases. See the applicable range: connection table on P16.

**Application example**

- Outside flange welding
- Inside flange welding
- Web welding

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**Structural Beam Welding Robot System**

- Automation of beam welding is achieved

**Welding points**

- Beams

**Features**

1. Turn welding
   - The flange terminal and scallop interior are served and the positional accuracy of the angles are detected to ensure quality turn welding

2. Positioner for beams
   - In order to weld stiffener and flange, the beam is rotated by the positioner, and the robot approaches the beam from directly above to reduce residual welding.
   - Rotating the beam from front to back does not require a crane thus reducing time.

3. Alternate welding function
   - Stiffener welding is done alternately on the front and rear, reducing warping due to the thermal strain of welding.

4. Rotation correction function
   - If a part is attached at an angle, the deviation in rotation will be accounted for during welding
   - After detecting the terminal position of the component part by sensing, a welding program for the part is made to enable real-time corrections to be made during welding by arc tracking.

**Introduction merit**

<table>
<thead>
<tr>
<th>Beams</th>
<th>SP</th>
<th>PL</th>
<th>Operation time</th>
<th>Arc time (%)</th>
<th>Semi-automatic (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1200mm x 1000mm x 19mm x 12mm / 47.24in x 19.68in / 0.75in x 1.25in</td>
<td>16t / 64.16in</td>
<td>16t / 66.43in</td>
<td>04:14:24</td>
<td>03:05:24 (72.9%)</td>
<td>10:15:54 (10.9%)</td>
</tr>
<tr>
<td>1000mm x 800mm x 16mm x 28mm / 33.75in x 17.75in / 0.68in x 1.11in</td>
<td>14t / 65.31in</td>
<td>14t / 65.31in</td>
<td>03:07:54</td>
<td>01:58:54 (63.3%)</td>
<td>06:36:12 (10.8%)</td>
</tr>
<tr>
<td>800mm x 1000mm x 14mm x 26mm / 31.56in x 13.81in / 0.65in x 1.03in</td>
<td>12t / 64.71in</td>
<td>12t / 64.71in</td>
<td>02:35:30</td>
<td>01:26.30 (55.5%)</td>
<td>04:48:12 (10.0%)</td>
</tr>
</tbody>
</table>

*Operation time, arc time and semi-automatic are shown in units of time (HH MM SS)

**Applicable range**

<table>
<thead>
<tr>
<th>Beam web x stiffener</th>
<th>Holds beams up to 400〜4000mm/15.75〜31.5in and beam floor position of 1400mm/55.12in</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beam flange x stiffener</td>
<td>Includes turn welding (positioned used)</td>
</tr>
<tr>
<td>Beam web x reinforcement plate</td>
<td>Separation between beam flange from 58.9mm / 1.97in upwards</td>
</tr>
<tr>
<td>Beam web x reinforcement plate through hole</td>
<td>Through hole diameter 100〜600mm / 3.94〜24.32in</td>
</tr>
<tr>
<td>Beam web x reinforcement round type plate</td>
<td>Separation between beam flange from 350mm / 13.78in upwards</td>
</tr>
</tbody>
</table>
Structural Steel Connection Welding Robot System

Welding points
- HSS-Column core
- Deformed diaphragm core
- Round pipe core
- SRC core
- tapered core

Features
1. Realizing unobserved operation for extended periods
   - A maximum of 18 fixtures can be welded continuously
   - Nozzle cleaner, nozzle auto-changer, wire cutter, chip changer (FEGARC™ only) come as standard
   - The arc start pre-check function and crater-arc start combination feature reduce arc start errors
   - The slow-down start feature and wire stick removal feature control arc ON/OFF time stoppages
   - Automatic slag removal equipment can be installed (optional)
2. Applicable to a variety of work, improved operational efficiency
   - Optimal for round pipe, SRC or other types of core
3. High quality welding
   - bead appearance corresponding to JASS6, heating management conditions, applicable to in-pass temperature management and robot model certification
   - The automatic measurement of corner radius and corner gap means that work with variations can be welded appropriately
4. Simple operation
   - Easy-to-understand input screen makes it easy to create data
5. Existing delivered systems can be upgraded to a 2-ARC welding system
   - 2-ARC welding is possible by adding a robot and slider to an existing core connector welding system

Structural Steel Connection “2-ARC” Welding Robot System

Features
1. Welding time halved
   - Similar to the 2-ARC of the column large assembly system, the time of a conventional system can be halved.
   - Apart for welding, wire cut and sensing related work or slag removal is also executed by 2 robots simultaneously.
2. High efficiency and space saving
   - The welding time of the core can be significantly reduced with just the occupied space of a Single ARC system.
3. Welding different root gap
   - A welding current to weld different groove cross-sections within the same amount of welding time.
4. Applicable to different column plate thicknesses or diameters
   - Different sizes (plate thickness, diameter) can be welded simultaneously with 2-ARC welding system.
5. Core connection clamp with counter-strain feature
   - The connection jig for conventional clamp surface plate is improved and prevents diaphragm bevels breaking (patented)

Applicable range

<table>
<thead>
<tr>
<th>System type</th>
<th>2t specification</th>
<th>3t specification</th>
<th>4t specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>HSS-Column diameter</td>
<td>200<del>800mm / 7.87</del>31.5in</td>
<td>250<del>800mm / 9.84</del>31.5in</td>
<td>250<del>1000mm / 9.84</del>39.37in</td>
</tr>
<tr>
<td>Pipe diameter</td>
<td>200<del>613mm / 7.87</del>24.07in</td>
<td>250<del>613mm / 9.84</del>32.01in</td>
<td>250<del>1016mm / 9.84</del>40in</td>
</tr>
<tr>
<td>Length/connection points</td>
<td>300<del>3000mm / 11.81</del>118.11in / maximum of 9 (18points)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Applicable plate thickness</td>
<td>Column: 9,12,16,19,22,25,28,32,36,40mm / Min 0.5in Max 1.77in</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Round pipe: 9,12,16,19,22,25,28,32,36,40,45,50,55,60mm / Min 0.35in Max 2.36in</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>SRC: 9~32 in 1mm Pitched: 36,40,45,50,55,60mm / Min 0.35in Max 2.36in</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Column plate thickness handled (option): 45, 50mm / 1.77, 1.97in</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(Note 1) Core connection clamp (required as a separate option) (Note 2) Attachment jig for core attachments other that square diaphragms will be required additionally (Note 3) See p2 for the appropriate plate thickness of columns and round pipes.
Compact Structural Steel Connection Welding Robot System

- Small space, big effect!

**Welding points**

<table>
<thead>
<tr>
<th>HSS-Column core</th>
<th>Round pipe core</th>
<th>SRC core</th>
<th>Tape core</th>
<th>Connection</th>
<th>SRC Connection (core type)</th>
<th>SRC Connection</th>
</tr>
</thead>
</table>

**Features**

1. **Space saving and easy operation**
   - The equipment only occupies 1.8m x 3.0m / lift x 9.8ft.
   - The robot automatically measures the outer radius of 4 corners by the corner radius sensing function thus eliminating time for measurement and improves quality.
   - Easy-to-understand input screen makes it easy to create data.

2. **High quality welding**
   - High appearance corresponding to JASS6 and heat control conditions, in-pass temperature management, handling feature and robot model certification are also applicable.
   - The automatic measurement of corner radius and corner gap means that work with variations can be welded appropriately.

3. **Connection data can be input easily**
   - Since the input of detailed dimensions is not needed, production time including set-up time can be significantly reduced.
   - Burn through prevention function, surface step applicability function and round trip multi-pass welding function reduces time and effort during assembly and negates the need for repair welding after robot welding.

4. **Realizing unobserved operation for extended periods**
   - Nozzle cleaner, nozzle auto change and wire cutter come as standard.
   - Welding of core connection is also possible.
   - The arc start pre-check function and crater – arc start combination feature reduces arc start errors.
   - The slow-down start feature and wire stick removal feature control arc ON/OFF time stoppages.
   - 2 connections positioned to make continuous operation possible.

5. **Applicable to a variety of work, improving operational efficiency.**
   - Optional for round pipe, SRC or other types of core.
   - Connection flange welding can also be applied for step connections.

**Application example**

- **Core connection welding**
- **Round pipe core welding**
- **SRC core welding**

**Benefits of automating**

**Subject work**: 5-form column (400mm / 15.75in core, 16t / 0.75in)

<table>
<thead>
<tr>
<th>Semi-automated welding</th>
<th>2 pieces per day</th>
<th>Average fabrication time 3.5hrs per piece</th>
</tr>
</thead>
<tbody>
<tr>
<td>Core</td>
<td>1st piece</td>
<td>Lunchroom</td>
</tr>
<tr>
<td>500</td>
<td>400</td>
<td>1100</td>
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</table>

<table>
<thead>
<tr>
<th>Robot welding</th>
<th>6 pieces per day</th>
<th>Average fabrication time 1.7hrs per piece</th>
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<tr>
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<td>Lunchroom</td>
</tr>
<tr>
<td>500</td>
<td>400</td>
<td>1100</td>
</tr>
</tbody>
</table>

**Applicable core, connection shape/dimensions**

- **Core**
  - HSS-Column: 200–800mm / 7.87–31.5in
    - Plate thickness: 9, 12, 16, 19, 22, 25, 32, 36, 48mm / Min 0.55in, Max 1.37in
    - Plate thickness handling: 45, 50mm (option) / 172, 193in
  - Round pipe: 200–813mm / 7.87–32.0in
    - Plate thickness: 9, 12, 16, 19, 22, 25, 32, 36, 48mm / Min 0.55in, Max 2.36in
    - Plate thickness handling: 30, 40, 45, 50, 55, 60mm / Min 1.42in, Max 2.36in
  - Tape (option): 250–800mm / 9.84–31.5in
    - Plate thickness: 9, 12, 16, 19, 22, 25, 32, 36, 48mm / Min 0.55in, Max 2.36in
  - SRC form
    - Cross section dimensions: 250–700mm / 9.84–27.56in
    - Flange width: 100–400mm / 3.94–15.75in
    - Flange thickness: 9, 12, 16, 19, 22, 25, 32, 36, 48mm / Min 0.55in, Max 2.36in
    - Plate thickness handling: 30, 40, 45, 50, 55, 60mm / Min 1.42in, Max 2.36in

**Connection**

- 5-form connection: 240–700mm / 9.45–27.56in
  - Flange thickness: 9–32mm (fishmouth) 36, 40, 45, 50mm / Min 0.55in, Max 1.97in
  - Flange thickness 9–32mm (level) 36, 40, 45, 50mm / Min 0.55in, Max 1.97in
  - Beam structure: 310–1100mm / 12.2–43.3in
  - Connection size: 5/120mm / 19.72in

**Surface step handling function**

- Using the amount of surface step, the welding speed, current, etc. are automatically calculated and burn-through prevented.

**Surface step sensing and burn through prevention function**

- Detecting the amount of surface step using the welding speed, current, etc. are automatically calculated and burn-through prevented.

**Surface step detection**

- Using the amount of surface step, the welding speed, current, etc. are automatically calculated and burn-through prevented.
Structural Steel Navigation

Useful for checking production process and aiding planning and making quotes.

- Checking production progress: Management of robot welding progress and improving the process prior to welding.
- Displays robot operation progress. Production progress can be checked both on the shop floor as well as from the office through a network connection.
- Estimate calculation feature: Eliminates wastage and enables high precision process planning to be made.

Apart from tacit time, wire usage etc. can be calculated to enable high precision process planning and cut down production wastage.

Process report software (option)

Management of input can be executed for the entire welding line thus increasing reliability.
- The welding current, arc voltage and welding speed are fed back through the robot during welding and can be displayed real-time on the PC monitor.
- After welding, the heat input can be calculated based on the data stored in the PC and a report can be generated.

The obtained data is collected under the job name and a process report is made.

The process report function can be used in combination with welding power supply SIMARC® AB8500 and ARCMAN™ "VP."

Software quick-glance table

<table>
<thead>
<tr>
<th>Software name</th>
<th>Large assembly</th>
<th>Multi-assembly</th>
<th>Full package</th>
<th>Connections</th>
<th>Compact</th>
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</thead>
<tbody>
<tr>
<td>SIMARC® M5G Column welding</td>
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<tr>
<td>SIMARC® NBFW method</td>
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<td>Pipe welding</td>
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<td>1RC core welding</td>
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<tr>
<td>Inner diaphragm welding</td>
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<td>NBFW method</td>
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<tr>
<td>Beam welding</td>
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<td>Taper core welding (only for Single ARC)</td>
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<tr>
<td>Connecting welds welding</td>
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<td>1RC shaft welding</td>
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<tr>
<td>Column through column (horizontal) welding</td>
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<tr>
<td>Pipe ring welding</td>
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<tr>
<td>M5G Column welding plate (Feeler included) (50, 50mm)</td>
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<td>NBFW plate thickness increase (50, 50mm)</td>
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<td>Weld overlay adjustment function</td>
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<td>2-ARC weld function</td>
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<td>Arc start function</td>
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<tr>
<td>Process reporting software</td>
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<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>

Notes: ○ = Only compatible with welding power supply AB8500.
  ○ = Standard specification.
  ○ = Optional.

ARCMAN™ call function (option)

During unmanned operation, the robot’s finishing schedule, error messages and operation information can be sent to a designated email address.

BCP325T-NBFW method software (option)

To weld a cold press steel plate (BCP325T) with increased toughness, a laminating method known as NBFW (Non-Brittle Fracture Welding) shown below is necessary. In addition, with this method, the use of a YGW18 welding wire is necessary and the heat input for the U bead/U bead must be limited to 15 - 22/10 - 25kJ/cm²

Corner gap sensing function

The welding quality can be improved by measuring the gap of the corner parts which are variations from machining process.

Arc start pre-check function

Before welding, the robot automatically checks whether or not the arc can start or as to prevent arc start error.

Crater – arc start combined function

For circumference welding, the corrected information of the sensor position information for the terminal part arc is reflected in the position of the next pass to improve the appearance of the bead.

Wire stick release function

When the wire is stuck during the treatment of craters, the robot automatically re-archs to dislodge the wire thus facilitating the robots continuous operation.

Arc retry function

If the arc does not appear due to surface slag or impurities, the start position is changed and arc start initiation is repeated.

Slow down start function

Arc starting is improved by smoothly feeding the wire at arc start.

Scheduled operation function

Even if there are several wires, the data for the next wire can be input into the computer during welding to reduce the robot idle time after welding. In addition, when there are multiple positions, welding can be carried out on 2 workpieces with just 1 start operation.

Origin auto-measurement function

For column large assembly system, the column installation position is automatically measured thus reducing personnel measurement work.

Throat thickness height adjustment function

Throat thickness height target value can be slightly adjusted when necessary.
All work data can be easily viewed in diagram form while inputting

1. Column large assembly welding
   (Corresponding system: Large assembly 2-ARC/Single ARC)

2. Core welding
   (Corresponding system: Large assembly 2-ARC/Single ARC,
    Core connection 2-ARC/Single ARC, Full-package multi, Compact)

3. Connection welding
   (Corresponding system: column large assembly, Full-package multi, Compact)

4. Inner diaphragm welding
   (Corresponding system: Full-package multi)

5. SRC shaft welding
   (Corresponding system: Multi)

6. Beam welding
   (Corresponding system: Large assembly, Beam)

Peripheral equipment for continuous un-supervised operation

- Nozzle auto changer
  - By using 2 types of nozzle lengths, long and short, welding quality can be improved and weld defects due to wind can be prevented.

- Nozzle cleaner
  - Spatter on the nozzle is automatically cleaned preventing defects such as blow holes.

- Wire cutter
  - Improved sensing accuracy improves welding quality

- Chip changer
  - Chips are changed at the optimal timing to enable extended operation of REGARC™

- Slag automatic clearing equipment
  - The robot automatically removes slags which improves continuous operation as well as prevents failures.

- Core connector clamp
  - Since many cores can be welded continuously, continuous operation time is increased.

Certified robot type

Kobe Steel, Ltd.’s structural steel welding system for all equipment has obtained the Japanese Robot Association’s certification of Architectural steel welding robot and therefore officially approved for industrial use.

Robot specific solid wire FAMILIARC™ MG-R series

As an overall manufacturer of welding products, Kobe Steel, Ltd. develops and produces specific wires for robots.

With superior sensing ability compared to normal wire, slags reduction in contribute to superior re-arcing. This is the perfect solid wire for robots.

System configuration and specifications

<table>
<thead>
<tr>
<th>System configuration and specifications</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Welding equipment</td>
<td>SENSAR™ AB500</td>
</tr>
<tr>
<td>Welding mode</td>
<td>SENSAR™ CS500MK2</td>
</tr>
<tr>
<td>Utilization rate</td>
<td>Using 450A−100% water cooled torch</td>
</tr>
<tr>
<td></td>
<td>Using 500A~100% water cooled torch</td>
</tr>
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</table>

① Structural Steel Large Assembly “2-ARC” Welding Robot System

<table>
<thead>
<tr>
<th>System type</th>
<th>10 ton specifications</th>
<th>15 ton specifications</th>
<th>20 ton specifications</th>
<th>30 ton specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Robot</td>
<td>6-axes multi-joint welding robot</td>
<td>ARCMAN™ MP</td>
<td>ARCMAN™ MP</td>
<td>ARCMAN™ MP</td>
</tr>
<tr>
<td>Robot transfer equipment</td>
<td>Stroke: left-right 13.0m / 42.7m, front-back 1.1m / 3.8m</td>
<td>Please contact KOBELECO</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Stroke: left-right 13.0m / 42.7m, front-back 1.1m / 3.8m</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Stroke: left-right 13.0m / 42.7m, front-back 1.1m / 3.8m</td>
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<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Stroke: left-right 13.0m / 42.7m, front-back 1.1m / 3.8m</td>
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</tbody>
</table>

② Multi-work Structural Steel Connection Welding Robot System

<table>
<thead>
<tr>
<th>System type</th>
<th>Type S</th>
<th>Type M</th>
<th>Type L</th>
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<tbody>
<tr>
<td>Robot</td>
<td>6-axes multi-joint welding robot</td>
<td>ARCMAN™ MP</td>
<td>ARCMAN™ MP</td>
</tr>
<tr>
<td>Robot transfer equipment</td>
<td>Both grip 1 axis, possible load 2000kg / 6614lbs</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Left-right stroke 5.0m / 15.7m</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Left-right stroke 5.0m / 15.7m</td>
<td></td>
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<td>Left-right stroke 5.0m / 15.7m</td>
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<td></td>
<td>Left-right stroke 5.0m / 15.7m</td>
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</table>

③ Full-package Structural Steel Connection Welding Robot System

<table>
<thead>
<tr>
<th>System type</th>
<th>Reverse Positioner and floor plate type</th>
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<tbody>
<tr>
<td>Robot</td>
<td>6-axes multi-joint welding robot</td>
</tr>
<tr>
<td>Robot transfer equipment</td>
<td>Single grip 1 axis, possible load 2000kg / 4406lbs</td>
</tr>
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<td>Stroke: left-right 5.0m / 15.7m</td>
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<tr>
<td></td>
<td>Stroke: left-right 5.0m / 15.7m</td>
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<tr>
<td></td>
<td>Stroke: left-right 5.0m / 15.7m</td>
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<td>Stroke: left-right 5.0m / 15.7m</td>
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</tbody>
</table>

④ Structural Beam Welding Robot System

<table>
<thead>
<tr>
<th>Description</th>
<th>Beam specific system</th>
</tr>
</thead>
<tbody>
<tr>
<td>Robot</td>
<td>6-axes multi-joint welding robot</td>
</tr>
<tr>
<td>Positioner</td>
<td>Both grip 1 axis, possible load 2000kg / 6614lbs</td>
</tr>
<tr>
<td></td>
<td>Stroke: left-right 5.0m / 15.7m</td>
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<tr>
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⑤ Structural Steel Connection Welding Robot System

<table>
<thead>
<tr>
<th>Description</th>
<th>Beam specific system</th>
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<tbody>
<tr>
<td>Robot</td>
<td>6-axes multi-joint welding robot</td>
</tr>
<tr>
<td>Positioner</td>
<td>Both grip 1 axis, possible load 2000kg / 6614lbs</td>
</tr>
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</table>

⑥ Compact Structural Steel Connection Welding Robot System

<table>
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<tr>
<th>Description</th>
<th>Beam specific system</th>
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<tbody>
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<td>Robot</td>
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<tr>
<td>Positioner</td>
<td>Single grip 1 axis, possible load 2000kg / 4406lbs</td>
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<td></td>
<td>Stroke: left-right 5.0m / 15.7m</td>
</tr>
</tbody>
</table>

●Peripheral equipment, welding specifications (1) - (6) common

- Peripheral equipment: Nozzle cleaner, air cleaner, wire cutter (air drive type), nozzle auto-changer (with wire brush/cleaning feature), Computerized slag auto-removal equipment, chip changer (not space-saving type, SENSAR™, downsized series)

- Welding specifications:
  - Welding process: "Fusion welding", "Fusion welding", "Fusion welding", "Fusion welding", "Fusion welding", "Fusion welding"
  - Welding current: "100A", "100A", "100A", "100A", "100A", "100A"
  - Welding speed: "1.0m/min", "1.0m/min", "1.0m/min", "1.0m/min", "1.0m/min", "1.0m/min"

Note: The insulation method for the safety fence mentioned above is given in JS 397/77 (Machine safety - Safety distances for preventing upper limbs reaching dangerous areas.)

Note: Safety fence specifications: 1800mm/5500m or more from the floor level

KOBELECO Global Services Network