Portable 5-axis robot for on-site welding of building steel frames

Outline

In the on-site welding of steel frame construction, securing welding workers has become increasingly challenging due to a shortage of welding operators and a decline in skilled welders resulting from an aging workforce. To address these issues and strive for "manpower saving" and "assurance of welding quality" through the automation of on-site welding, we have collaborated with "NIPPON STEEL ENGINEERING CO., LTD." to develop Portable 5-axis robot. This innovative solution is the world's first portable orthogonal-type 5-axis robot with image-sensing capabilities, previously showcased as a reference in the 2022 International Welding Show.
In this study, we present Portable 5-axis robot as a mass-produced model, featuring enhancements in rigidity and a revised body structure.

Features

1. Adoption of 5-axis control enabling automatic avoidance function of erection pieces and ensuring optimal bead formation.
2. Increased mechanical rigidity minimizing unstable movement of the torch tip.
3. Image sensing using a line laser and camera enabling high-precision, short-term measurement of groove shape.
4. Automatic calculation of the stacking method (welding conditions, aiming position, etc.) suitable for our welding materials (YM and SX) based on groove shape.
5. Maximum cable length of 100 m reducing transportation and setup labor for the robot.
6. Standard wireless operations with a tablet terminal and wired operations with a pendant box.

Mass-production portable 5-axis robot

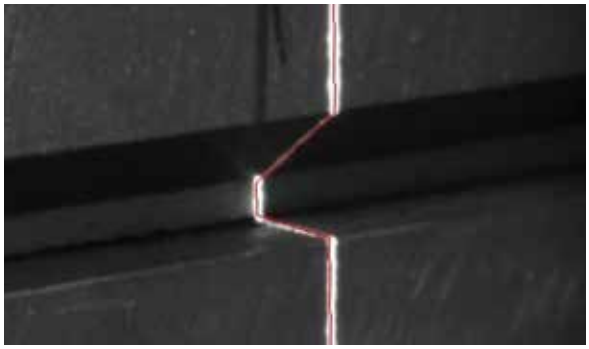
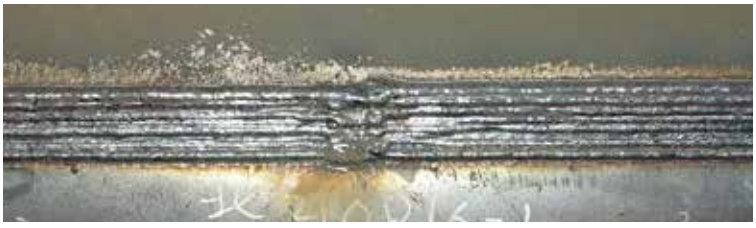


Image processing measurement by laser and camera

Bead appearance by optimal stacking method combined with SX-55 Φ1.2mm



Column welding straight section

Column welding corner

High efficiency vertical electroslag automatic welder with 2 electrodes

Outline

Our High efficiency vertical electrogas arc welding machine have been utilized as 1-pass vertical automatic welders in various applications such as stockpile tanks and ship hull plates. However, using electrogas arc welding requires additional measures to manage spatter, fumes, and provide wind protection against shielding gas during on-site welding operations. To address these challenges, we have developed and will showcase a new 2-electrode electroslag welder designed for extended lengths.
The 2-electrode electroslag welder utilizes the technology cultivated by our existing electroslag welders.

Features

1. The adoption of a 2-electrode welding method, along with an oscillating stroke set to 80 mm, enables automatic welding of extra-thick steel sheets.
2. The two-electrode welding method facilitates highly efficient automatic vertical welding.
3. Stable long vertical automatic welding is achieved by leveraging the features of our electrogas arc welding machine and electroslag welder.
4. Minimal spatter or fumes generation enhances the working environment, whereas the elimination of spatter removal work improves workability.
5. A graphic display panel and numerical input of specific welding conditions allow for reproducible automatic welding.
6. The integration of PLC for control equipment facilitates the collection of welding data.
7. The absence of shield gas (CO_2) enhances wind resistance and contributes to carbon neutrality.
8. We are developing welding materials specifically for Our Welding Machine to further enhance efficiency.

Control panel

YM-55HF φ1.6mm

Face side bead

Reverse side bead