07

Laser welding monitoring system

An intelligent real-time monitoring and quality evaluation system

Model   **WELW-2000**   **Laser welding**

Main Features

- System to manage welding quality and process on a real-time basis by measuring the strength of reflected plasma and infrared rays generated during laser welding
- Determining NG/GOOD of welding joints and producing NG signals (buzzer, flashing light, interlock, etc.) on a real-time basis.
- Automatic storing of measured data and providing of various analysis tools
- Securing component reliability by conducting a real-time lot inspection of laser welded joints
- Analyzing reasons for welding defects and preparing countermeasures
- Responding to various laser sources such as ND-YAG, Fiber, CO2 laser, etc.

Main Purposes

- Quality control of TWB laser welding in the automobile body manufacturing process
- Management of welding process for electric car batteries
- Real-time management of other various laser welding process

Applications

- Automobile, electronics, electronic units, aircraft parts, etc.

Benefits

- Real-time monitoring (detecting) of the quality of welded joints
- Securing product quality and reliability
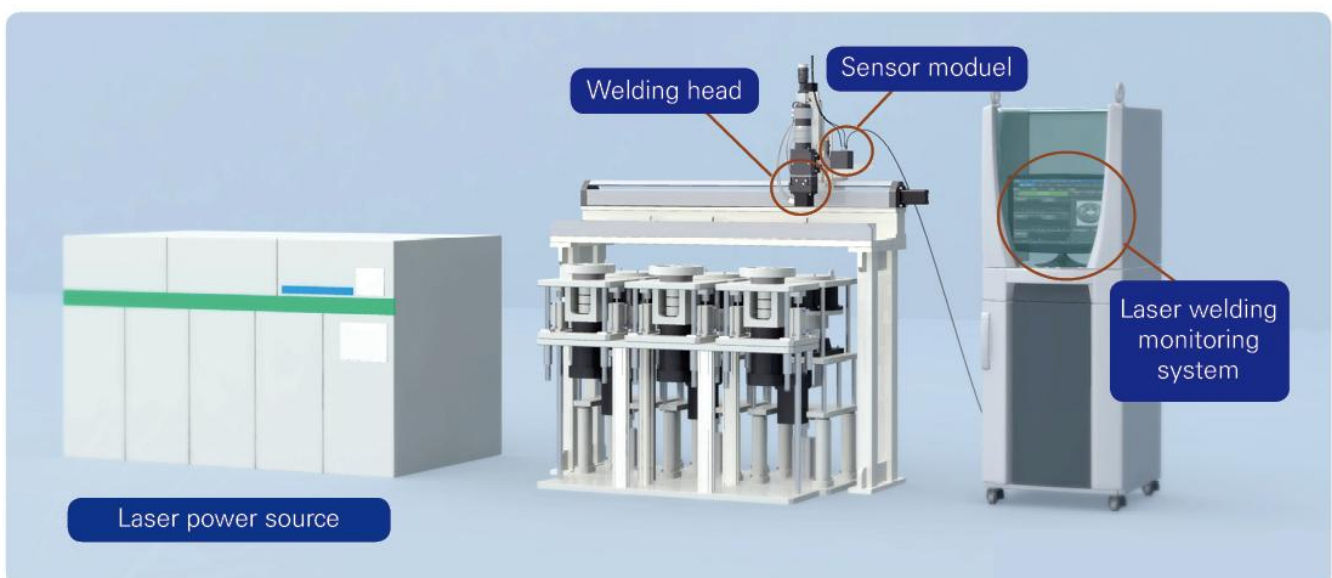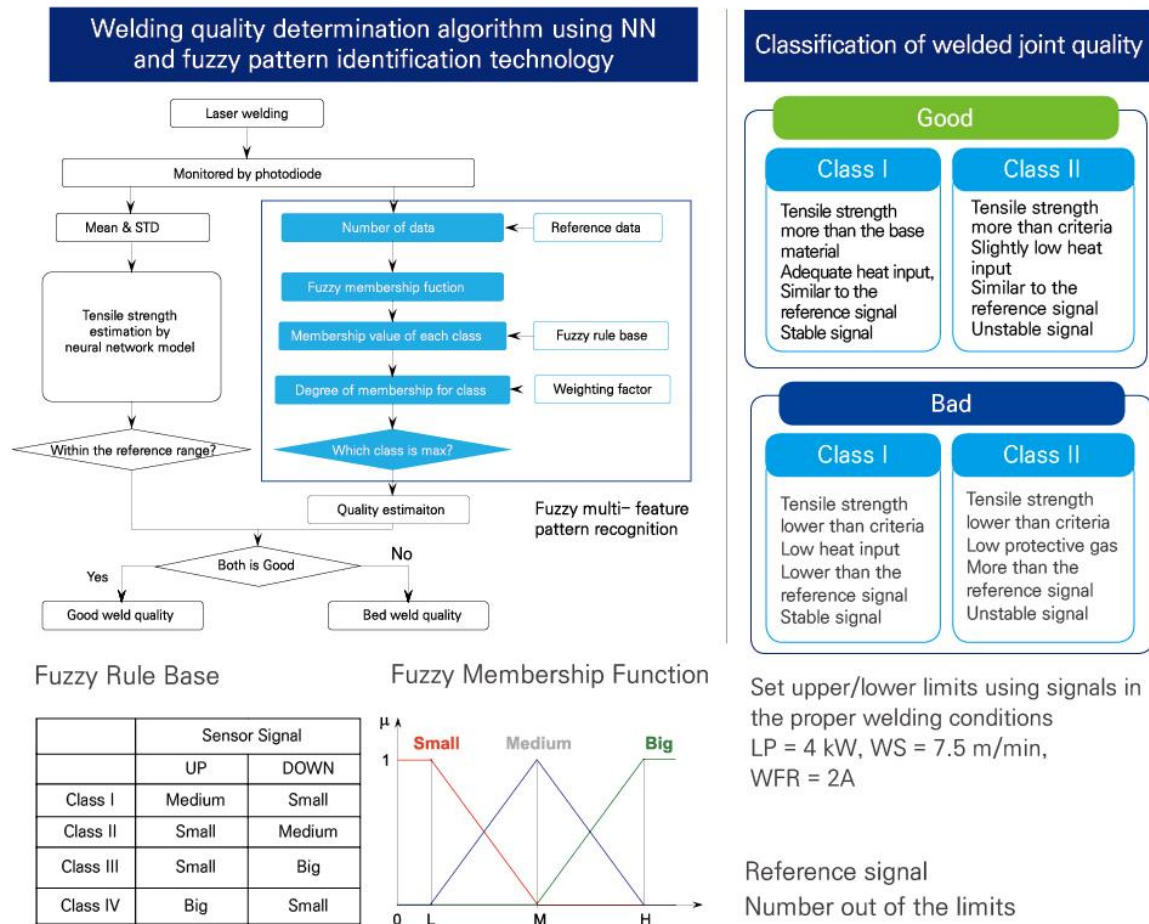- Automation and productivity maximization

Main Clients

SAMSUNG SDI   SAMSUNG   KWANG MYUNG Industry Co., LTD

and more

Basic Configuration of Laser Welding Monitoring System

Welding head

Sensor moduel

Laser welding monitoring system

Laser power source

Welding quality determination algorithm (artificial intelligence algorithm)

Welding quality determination algorithm using NN and fuzzy pattern identification technology

Laser welding
↓
Monitored by photodiode
↓
Mean & STD
↓
Tensile strength estimation by neural network model
↓
Within the reference range?

Number of data ← Reference data
↓
Fuzzy membership fuction
↓
Membership value of each class ← Fuzzy rule base
↓
Degree of membership for class ← Weighting factor
↓
Which class is max?
↓
Quality estimaiton

Fuzzy multi- feature pattern recognition

Both is Good → Yes / No
Yes → Good weld quality
No → Bed weld quality

Classification of welded joint quality

Good

Class I	Class II
Tensile strength more than the base material Adequate heat input, Similar to the reference signal Stable signal	Tensile strength more than criteria Slightly low heat input Similar to the reference signal Unstable signal

Bad

Class I	Class II
Tensile strength lower than criteria Low heat input Lower than the reference signal Stable signal	Tensile strength lower than criteria Low protective gas More than the reference signal Unstable signal

Fuzzy Rule Base

	Sensor Signal	
	UP	DOWN
Class I	Medium	Small
Class II	Small	Medium
Class III	Small	Big
Class IV	Big	Small

Fuzzy Membership Function

Set upper/lower limits using signals in the proper welding conditions
LP = 4 kW, WS = 7.5 m/min, WFR = 2A

Reference signal
Number out of the limits

S/W screens

Main screen(OK)

Main screen(NG)

Data search screen

Setup screen

Application case

Real-time welding quality control and inspection solution

Real-time welding monitoring system

01. Welding quality monitoring system (ARC/SPOT/TIG)
02. Intelligent welding monitoring system
    (NUT & BOLT Projection welding)
03. Welding calibration master equipment (ARC/SPOT/DUO)
04. MICRO SPOT welding monitoring system
05. High speed thermal imaging welding monitoring system
06. Ultrasonic welding monitoring system
07. Laser welding monitoring system

Welding process measurement and equipment

08. Welding force measuring gauge (FORCE)
09. Current and force gauge (HANDY)
10. Advanced current and force gauge (HANDY PRO)
11. Measuring analyzing equipment for WPS/PQR (WPS)
12. Welding waveform analysis management equipment (MULTI)

Inspection and integrated monitoring S/W

13. Integrated management and control system (MIS)
14. Inspection record computerized management system for
    the Initial, middle, and final products (IM)

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