

V₂i

WELDO

AN OPTIMIZED SYSTEM FOR WELD MONITORING

The V₂i WELDO series can assess, in real time, the quality of the weld seam all along its length. It comprises the most advanced on-line systems based on non-contact sensors. The seam profile analysis is completed via powerful data handling, as well as a handy operator interface which allows, rapidly and reliably, various weld defects detection, such as broad or narrow seams, holes, misaligned strips, gaps, and seams.

WELDO systems are designed for different types of welding machines: overlapping resistance welders for thin strips, coil-joining welders for thick strips, and laser welders. For each type, the standard configuration includes one profile sensor (at the top) or two profile sensors (one at the top and one at the bottom). The bottom sensor is positioned below the weld seam to detect defects which can not be seen from the top.

Line operators can then accurately assess the quality of the weld and, based on this, decide to proceed or, in case a defect is detected, start again with a new weld.

In order for the operator to easily find the cause of any defect, an AI platform can also be supplied, which correlates the defect with operating welder parameters and additional sensor measurements. This option can be added at any time after the installation of the base WELDO system.

Using the WELDO system significantly improves line operations by avoiding weld breakages which, most of the time, may cause line stoppages with their associated high costs.

APPLICATIONS

- Annealing Line
- Pickling Line
- Galvanizing Line
- Galvanneal Line
- Aluminizing Line
- Tinning Line
- Electrolytic Line



WELDO VERSIONS

For coil-joining welders

WELDO 100 - T Quality of the Weld Profile, One Side

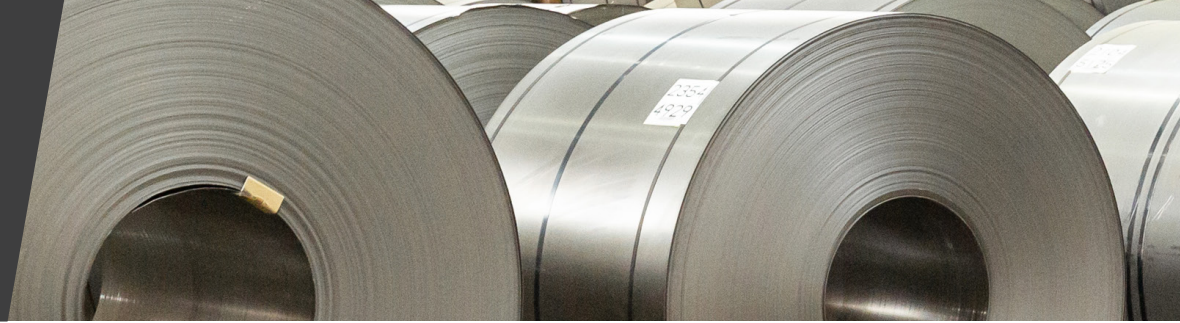
WELDO 100 - TB Quality of the Weld Profile, Two Sides

For resistance overlapping welders

WELDO 200 - T Quality of the Weld Profile, One Side

WELDO 200 - TB Quality of the Weld Profile, Two Sides

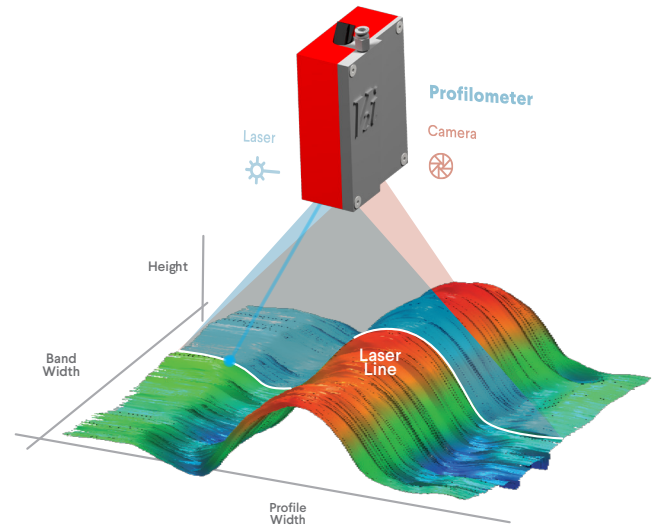
WELDO 200 - AI Optional AI Package (including Vibration, Tension, Pressure, Voltage, and Current measurements)



WELDO DESIGN

The WELDO system profile measurement is based on the triangulation principle: a laser beam is projected vertically onto the weld seam. A camera, which aims the seam beneath a suitable angle, records the deformation of the laser line at the surface, which is produced by the cross-shape of the seam. After the sensor has been calibrated, this relative profile is converted into absolute measurements, which allows the computation of the seam's physical properties. Special devices are included to eliminate the influence of ambient light or interferences with the welding process.

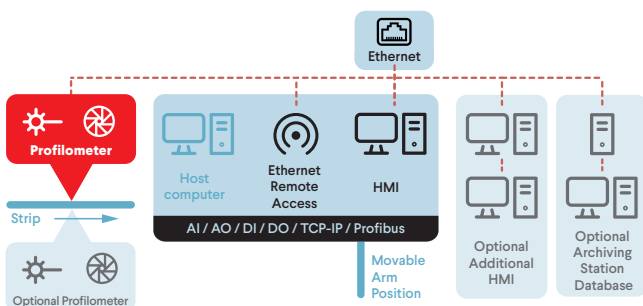
The laser and camera are embedded in the same robust housing and move together, in conjunction with the arm holding the welding device. By considering the displacement of the arm, the entire weld-seam profile can be drawn in 3D as a function of the seam length.



The WELDO system is based exclusively on well-established proprietary technologies, which have been developed and applied by V2i in its various control and optimization systems. At its heart is a powerful industrial off-the-shelf host computer, driven by a real-time, multi-user, multi-tasking operating system (Linux RT).

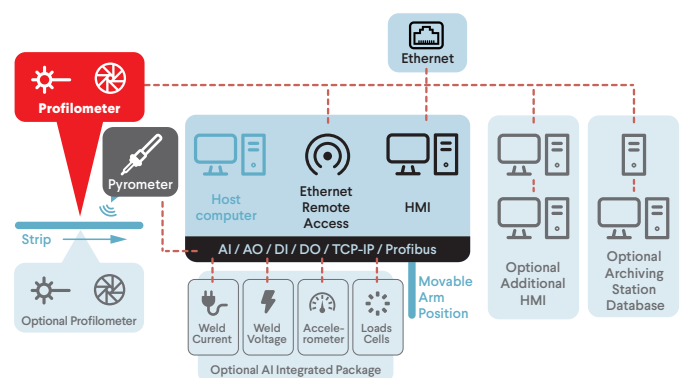
WELDO 100 CONFIGURATION

The **WELDO 100** has been designed for coil-joining welders. It is mainly based on one proprietary profilometer, which is aimed at the top or the bottom weld seam. This sensor is connected to the data-processing computer platform via an Ethernet link. An optional second profilometer allows for the inspection of both sides of the strip.



WELDO 200 CONFIGURATION

The **WELDO 200** has been designed for overlapping resistance welders. It is based on the WELDO 100 configuration (also with the two-sided option) and a smart weld-seam control package, including an IR pyrometer. Additional sensors (the "AI-Integrated Package"), which have a high acquisition rate, are used in conjunction with several mathematical algorithms, in order to quickly assist in the diagnosis of the causes of potential defective weld seams.





WELDO DATA PROCESSING

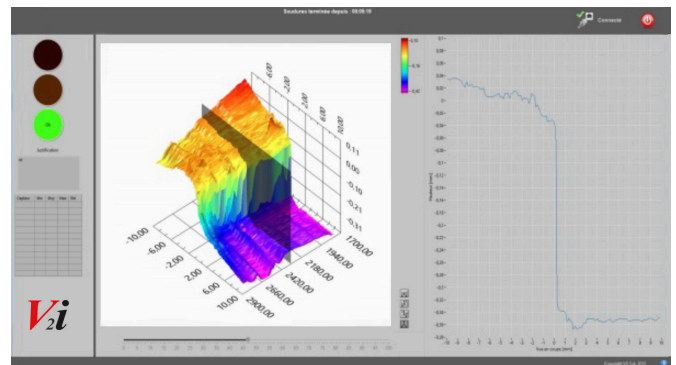
WELDO

The WELDO data-processing system provides all of the up-to-date features that customers expect from a modern gauge:

- All measuring data are processed by industrial computers, which are linked via an Ethernet network.
- Successive weld seam profiles are recorded in the system's database and entered into a selection of mathematical algorithms in order to reject undesirable profiles and to compute seam feature parameters that can be easily interpreted by the line operator.
- Weld-seam profiles can be stored in the system for months and played back on-line, to allow an in-depth examination of possible welding problems.
- The operator's HMI station displays seam-feature results in a graphic, easy-to-read form, such as 3D views, bar charts, and trends of the entire profile. Welding quality reports are displayed and can be automatically printed.
- Multiple HMI stations can be connected to the base system, with on-line and play-back features.
- An optional archive feature allows for the storage of years' worth of gauge data (measurements, calibration files, alarms, etc.) in an external server. This server can be accessed from HMI stations via the plant's Ethernet network.

The gauge's computers handle all communications with the mill:

- Analog inputs and outputs (all with galvanic isolators);
- Digital inputs and outputs (all with opto-isolators);
- Links to level 1/level 2 computers (via FTP protocol);
- Access to the maintenance menus via a dedicated monitor;
- Furthermore, a permanent Ethernet link provides the customer with remote assistance from V2i.



MAIN ADVANTAGES OF WELDO SYSTEM

- The **modular structure** allows the system to be easily adapted to the type of welding machine, by adding different sensors to the system.
- **On-line real time** seam profile and detection of defects. When a red light is displayed on the HMI screen, the operator still has the time needed to start a new weld.
- The **HMI** offers **multiple displays** of the weld seam (3D, plan view, selected transversal and longitudinal profiles).
- **Full characterization of the weld seam:**
 - incorrect seam dimensions (height, width, symmetry, etc.);
 - incorrect overlapping (overlapping resistance welders),
 - incorrect sheet gaps prior to welding and incorrect alignment (coil-joining welders).
- **Powerful tools for analyzing weld-seam failures** (data storage and play-back).



TECHNICAL SPECIFICATIONS

WELDO 100

WELDO 200

APPLICATION Coil-joining welders Overlapping resistance welders

WELD SEAM HEIGHT RANGE 0.08-0.5" – 2-12 mm 0.01-0.08" – 0.2-2 mm

PROFILOMETER

Height-measuring range 2.1-3.1" – 53-78 mm

Height-measuring resolution 7.874e-5" – 2 µm

Width-measuring range 0.9-1.1" – 23-29 mm

Width-measuring resolution 1,280 points/profile

Profile-update rate up to 200 profiles/sec.

Ambient temperature range 32 to 113°F – 0 to 45°C

PYROMETER

Temperature range: 200-1,500 °C

Response time: 1 ms

DATA PROCESSING

Multi-tasking, real-time operating system
Synchronous high-speed acquisition (up to 51,200 Hz)
Filtering
Coil-edge detection
Area of interest determination
Key process indicators (min, mean, max, slope, crest, etc.)
Limit determination based on steel properties
Raw data streaming
Processed data streaming

DEFECT DETECTION

Wrong gap size High/low voltage
Bad seam thickness High/low current
Gap/seam misalignment High/low temperature
Hole detection Low overlapping
Coil misalignment Low compensation
Foreign body detection
Coil misalignment

HMI DISPLAY

Windows 10, user configurable

AI-INTEGRATION PACKAGE (OPTIONAL)

Seam Temperature
Vibrations of the welder moving arm
Tension and Pressure of working cylinders
Welding Voltage and Current (resistance welders)

V2i IN A FEW WORDS...

V2i specializes in the design, manufacture, and servicing of industrial measurement systems, with regards to the need for structural dynamic analysis. It combines extensive industry experience with the latest technology. V2i products can be used in various applications where quality control is required to improve the reliability and increase the life span of industrial and structural equipment.

For additional information, please visit our website www.v2i.be

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