

QIROX Sensor systems

Top quality with each weld seam

CLOOS

Weld your way.

www.cloos.de

Content

| | |
|---------------------------|---------|
| Overview | Page 4 |
| Tactile gas nozzle sensor | Page 6 |
| Arc sensor | Page 8 |
| Laser offline sensor | Page 10 |
| Laser online sensor | Page 12 |
| Technical Data | Page 14 |
| Applications | Page 16 |

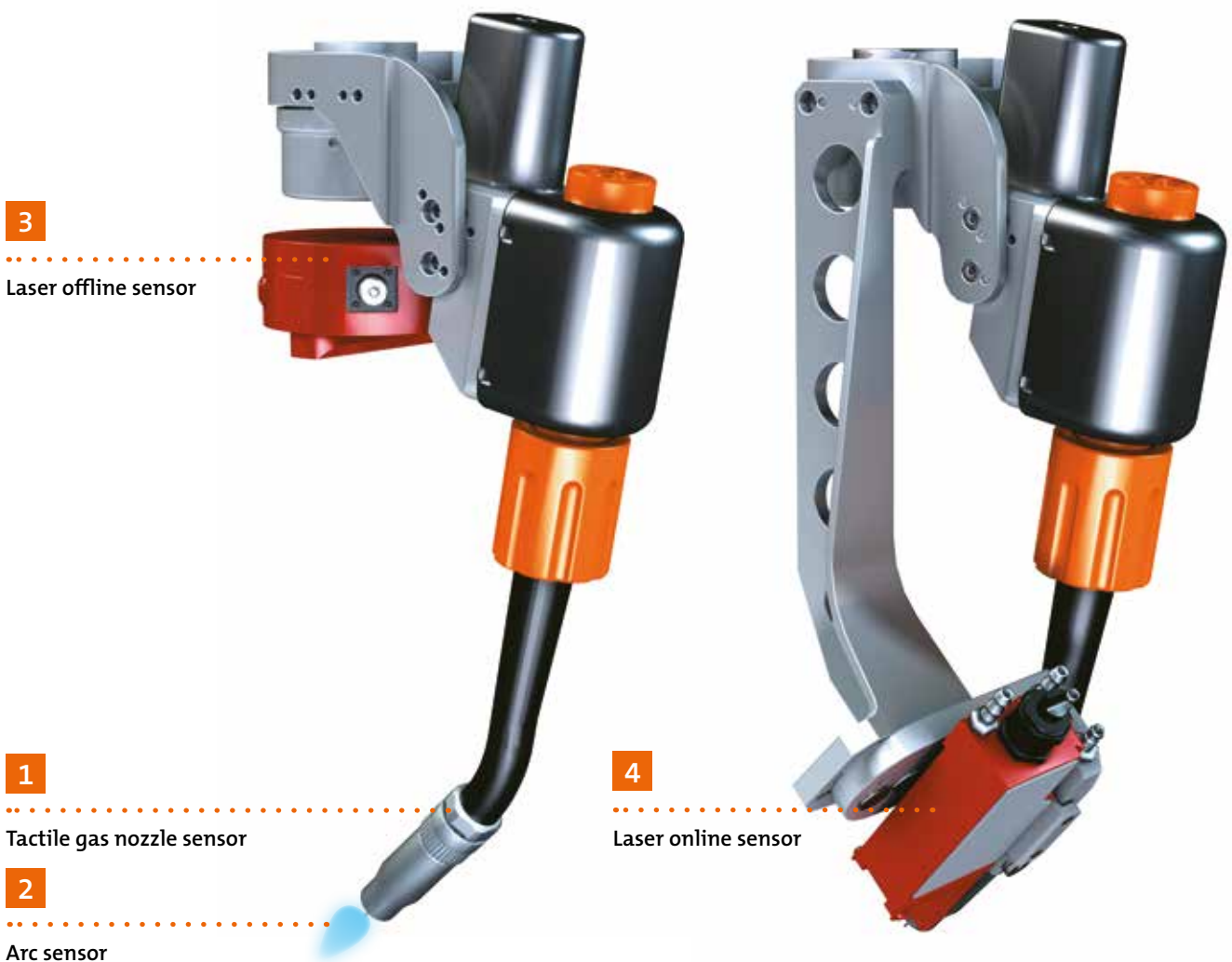




Sensitivity to perfect welding processes

With our QIROX® system solution for automated welding and cutting we can integrate state-of-the-art welding technology into your welding production. The main task of our sensor systems is to ensure quality control through precise welding procedures. The flexibility of your systems increases due to the control and compensation of tolerances between the programmed paths and the real workpieces. Four CLOOS sensors

which have been proven in the field are available for the most varied materials and applications; these sensors are able to further improve automated welding due to their intelligent control and guidance. The optimised work flow minimises rework so that you are able to produce more efficiently and with excellent quality.



Plus factors for increased productivity

- Four proven sensor systems for the most varied materials, weld forms and applications
- Perfectly matched to the CLOOS system solution QIROX®
- Considerably improved weld quality
- Less manual work – minimum rework
- Opening up of new application possibilities using CLOOS sensor systems

The right sensor always available

With intensive consultation we can develop complete solutions to meet your requirements. To generate maximum efficiency and effectiveness by automating the welding processes, all components are individually matched to the relevant production conditions and requirements. This applies in particular to the field of sensor technology, where we have developed four products with different capacity ranges: tactile gas nozzle sensor, arc sensor, laser offline sensor and the laser online sensor. These sensors have different tasks depending on the production requirements. The tactile gas nozzle sensor and the laser offline sensor can also be combined with the arc sensor.



Tactile gas nozzle sensor

Using an electro-mechanical detecting principle the CLOOS tactile gas nozzle sensor can determine the start and/or end of the weld seam – any deviations due to material tolerances are corrected.



Arc sensor

During welding the CLOOS arc sensor measures whether the torch position is actually following the programmed path. If any deviations occur due to heat distortion for example, the robot tracks the real contour. Tolerances have to be directly aligned.



Laser offline sensor

The system detects the start and/or the end of the weld seam offline before welding and collects measurement data. Using this data the program is adjusted to the actual measured condition.



Laser online sensor

This high-tech sensor offers maximum flexibility. The section to be welded is measured online during welding – the position of the tooling, e.g. the welding torch or the laser beam, and the various process parameters are continuously adjusted to achieve an optimum welding result.

Tactile gas nozzle sensor

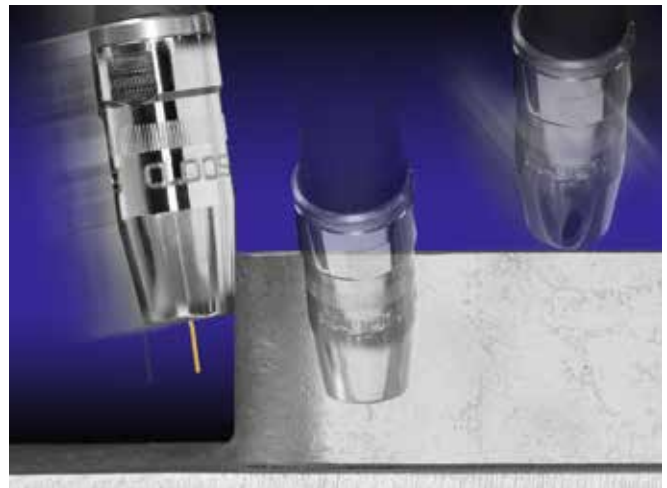
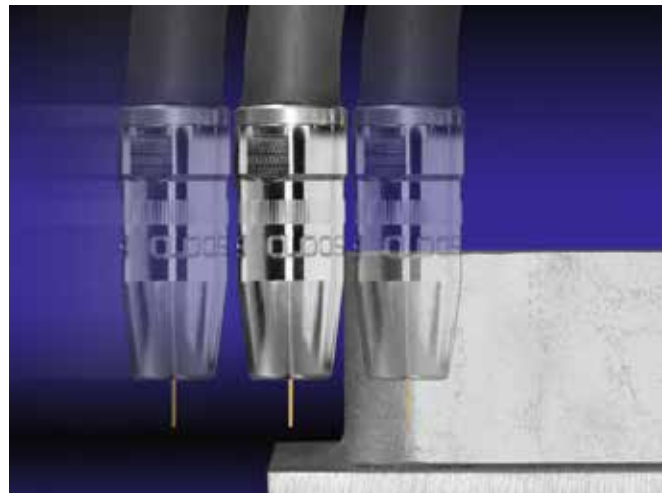
Start and/or end point exactly located

The start point and the workpiece joint contour play a special role in automated robot welding. Although the positions are defined by the relevant program which controls the robot, in practice deviations occur due to inaccurate settings or material tolerances. To enable these deviations to be quickly and accurately compensated for, the CLOOS tactile gas nozzle sensor checks the start and/or end positions – and corrects the programmed welding path correspondingly. The tactile gas nozzle sensor can be combined with the arc sensor.



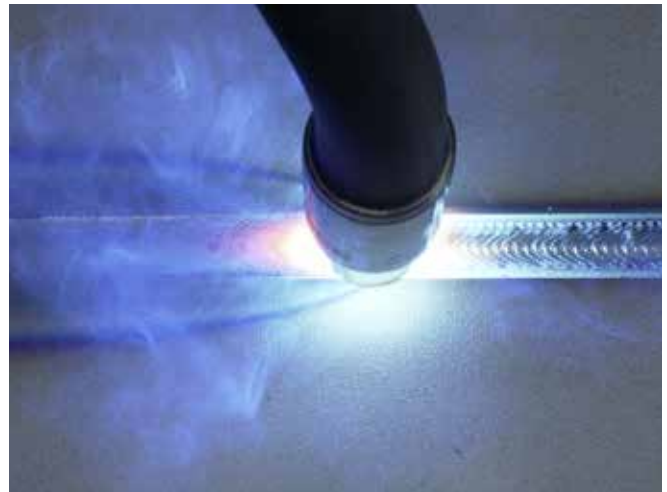
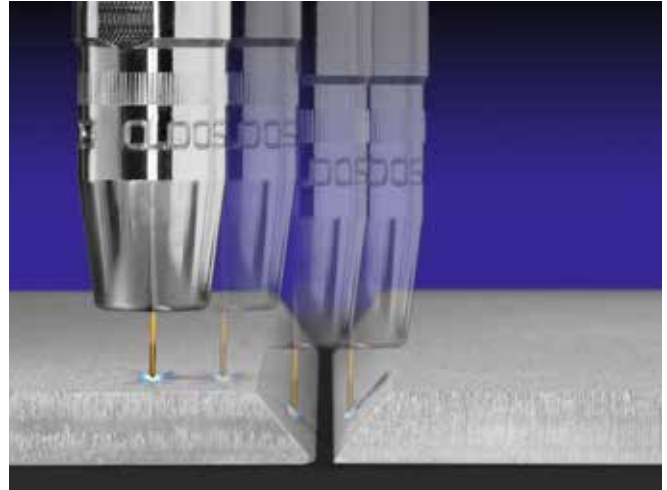
Electro-mechanical detecting principle

The CLOOS tactile sensor uses the torch gas nozzle or a separate tracer pin to determine start and/or end position. The robot moves the torch along the programmed seam tracking section. If the gas nozzle or a tracer pin touches the workpiece, a current flows, the robot stops and the position is stored. In order to define the X, Y and Z coordinates exactly, the workpiece is approached from three directions.



Measuring the seam volume

If both positions are defined, the linear run of the weld seam is determined automatically. In the case of a V seam the tactile CLOOS gas nozzle sensor also measures the seam volume according to the same principle. After saving the information in the user program, the robot fills the seam along the optimised path. The main advantage is a perfect welding result as a basis for a reliable quality.



Tasks

- Detection of the start and/ or end position
- Definition of the workpiece position
- Determination of the linear welding path
- Measurement of the seam volume in the case of V seams

Detectors

- Gas nozzle
- Free wire end
- Additionally mounted tracer pin

Materials

- All materials with electroconductive surface

Advantages and benefit

- Process independently
- No interference from attached parts (except when using a tracer pin)
- Direct integration into the user program

Arc sensor

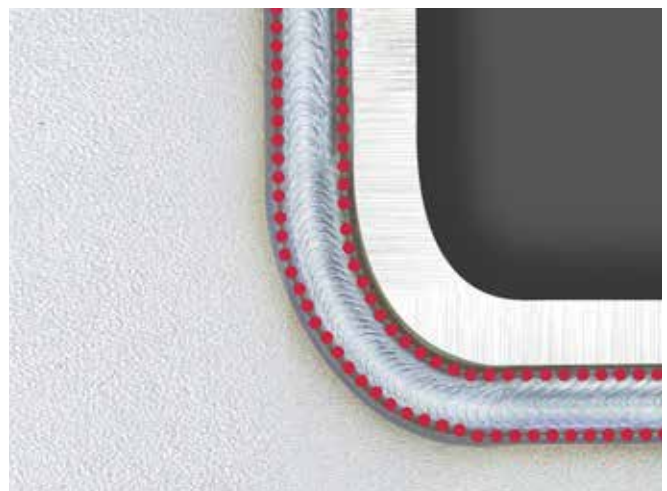
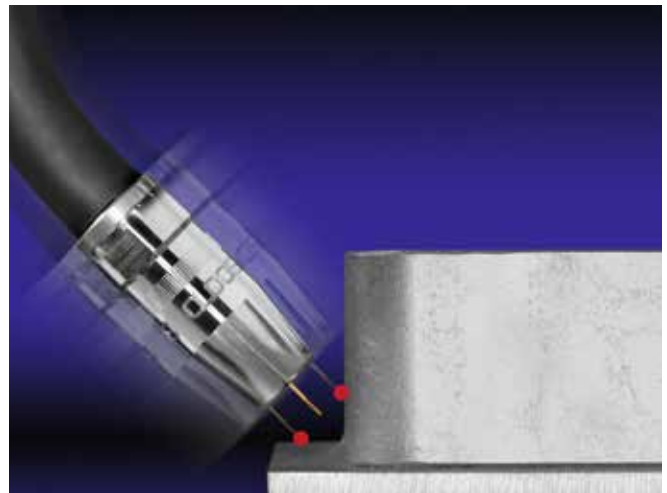
Correction signals from the arc

The CLOOS arc sensor uses the arc to simultaneously weld and measure the joint position on the workpiece. The welding torch oscillates along the joint scanning the edges of the weld seam preparation. If the measured values, which are obtained electronically from weld current and voltage, are not the same on both sides, the weld seam position deviates from the programmed path. The computer-based robot controller adjusts the welding head position so that the seam is placed exactly in the centre of the joint. In addition, this procedure corrects the distance of the welding torch to the workpiece.



Welding and Measuring

As the arc sensor enables measurement and welding to be carried out simultaneously, the loss in time is minimal. At the same time workpiece distortions – for example due to heat expansion – are directly compensated for. In this way the CLOOS arc sensor combines productivity with optimum quality. No additional intrusive parts are necessary.



Saving the measured values

After the robot has welded the root seam, the correction data determined is saved and used for welding the cover runs ensuring that the build-up of these runs is continuously optimised. The final result is further improved when combined with the CLOOS gas nozzle sensor, which determines the start of the weld seam.

Tasks

- Correction of the torch position during welding for compensation of material tolerances
- Distance correction during TIG welding and plasma cutting

Arc operating modes

- Control Weld
- Speed Weld
- Rapid Weld
- Tandem Weld

Weld seam geometries

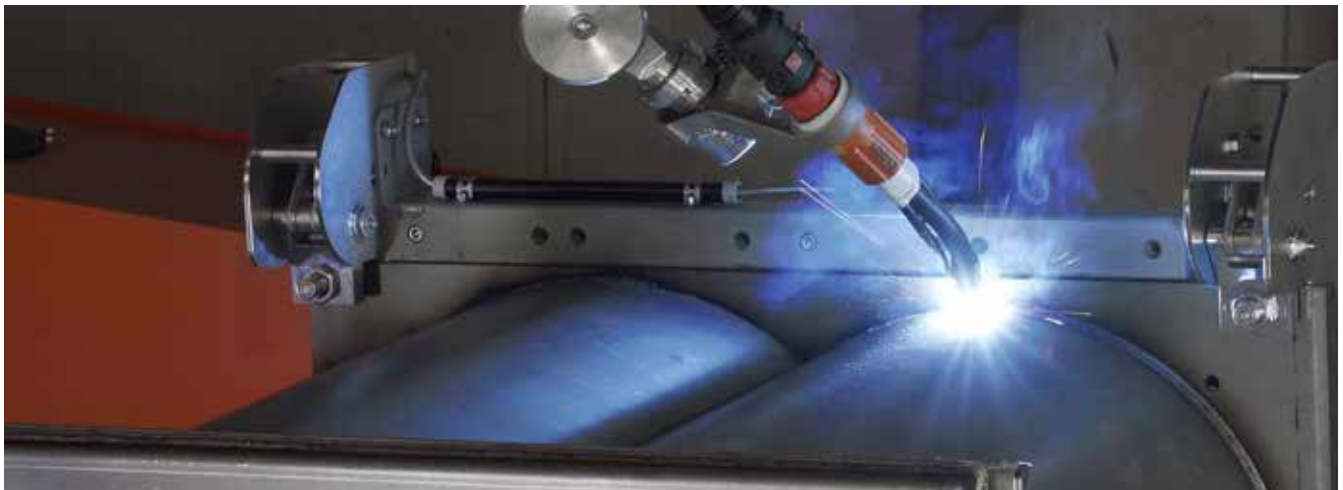
- Fillet weld
- V weld
- Y weld

Materials

- Steels
- Chrome nickel steels

Advantages and benefit

- Nearly no loss in time
- No interference from attached parts
- Direct connection to the robot controller
- Adaptation of the correcting sensitivity
- Memory function – data storage for welding



Laser offline sensor

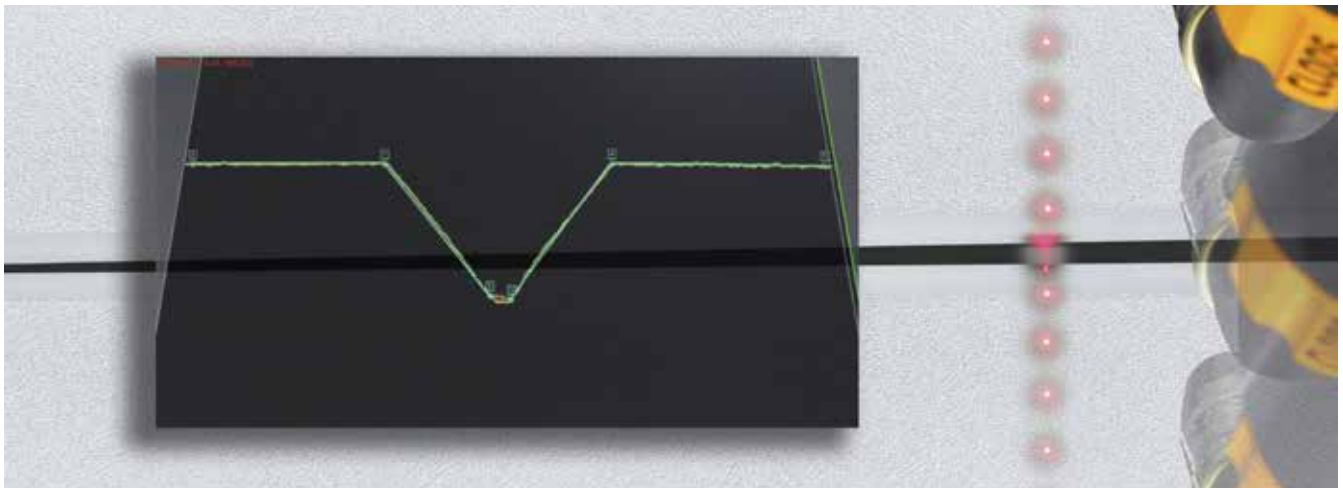
Optically measured welding path

The laser offline sensor tracks the programmed path offline before starting the welding process. The sensor sends a light beam onto the material surface, receives the reflection and obtains every measurement information on the actual seam position and seam geometry. This procedure can be used for materials made of high-alloy steel and aluminium as well as for unalloyed steel and galvanised steel. The laser offline sensor can be combined with the arc sensor without any problems.



Short detection distance, low cycle times

In order to achieve very short detection distances, the sensor is located in the hand flange of the robot. The torch position for the tracking movement is nearly identical to the later welding position and compared to conventional sensors, which require additional robot movements, considerably lower cycle times can be achieved.

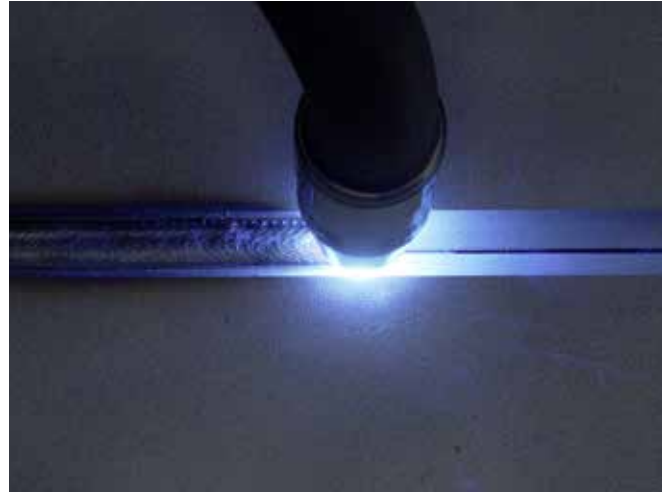


Contactless measurement

As a non contact optical measuring system, the CLOOS laser offline sensor is largely independent of the material. The scanning process is quick and due to its high resolution and insensitivity to reflection can provide reliable details and data on positions as well as geometrical information on the different weld types.

Programming adaptation

During scanning the laser sensor detects the position of the seam start and end, as well as the position of tubes and bolts; it measures gap widths, detects workpiece edges and recognises seam geometries. Following this measuring process the data which was sent to the robot controller is compared with the programmed values. Deviations are corrected in the program and the robot starts the welding process which has been matched to the actual workpiece situation.



Monitoring Integrated video camera

- Programming aid where access is difficult
- Observation of the torch during welding

Option

Tasks

- Search for seam start and seam end
- Recognition of workpiece edges and seam geometries
- Determination of position of tubes and bolts
- Measurement of gap widths
- Seam preparation check

Weld types

- Lap joint
- Joint with air gap
- V weld
- Circular arc (concave, convex)
- Corners and cutouts
- Fillet weld
- HV weld
- Multi overlap weld
- Multilayer filling weld
- Tube and bolt joints
- Special seam types

Materials

- Structural steels
- Galvanised/electrolytic galvanised steels
- Organically coated plate
- Aluminium
- Chrome nickel steels

Advantages and benefit

- Process independently
- Short search intervals due to optimum sensor position
- Insensitive due to non contact measuring procedure
- Memory function – data storage for cover layer welding
- Maximum flexibility: can be used for nearly every material; scanning width adjustable
- Programming and analysis via the QIROX® robot controller teach pendant
- High workpiece accessibility due to compact design

Laser online sensor

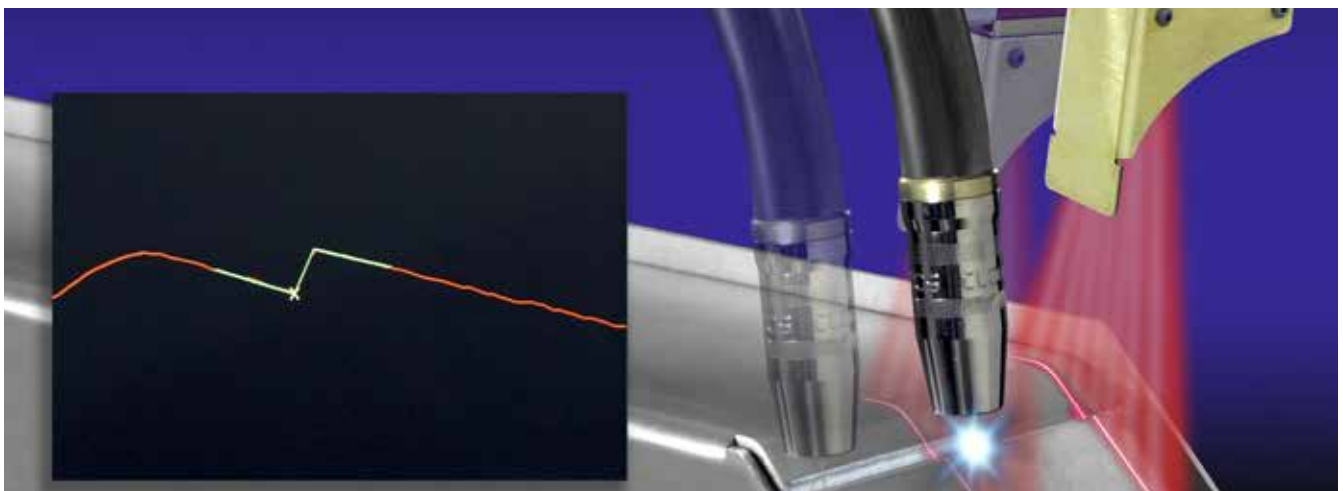
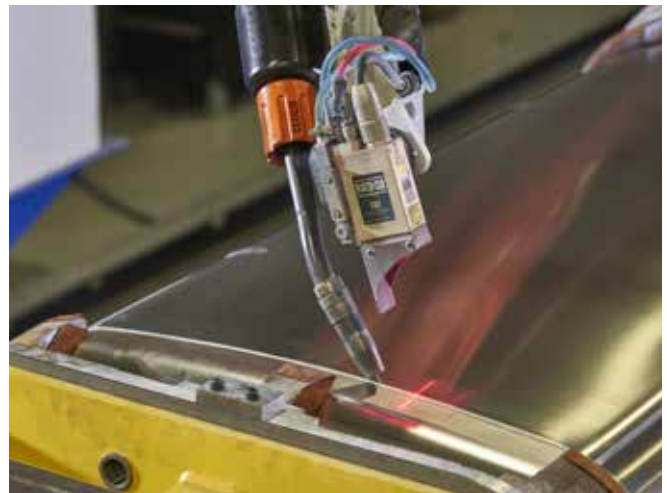
Maximum sensor capacity

The laser online sensor first moves to the programmed start position. The tracking section is then measured online during welding. The laser head which is mounted parallel to the processing point sends a laser beam onto the workpiece surface, receives the reflected beams and transfers the measured results to the robot controller. Here the data is evaluated in order to compensate for material tolerances and heat distortion. Based on the new values the system changes the position of the welding torch and adjusts the process parameter. The on-line sensor carries out corrections immediately, thus ensuring optimum welding results.



New application possibilities

The operation of the CLOOS laser sensor opens up completely new application areas for automated welding without affecting the cycle times, and due to the wide application range offers maximum flexibility. The system to a large extent does not depend on the material – even where workpieces are coated or contaminated– and the scanning width and resolution can be adjusted to the most varied requirements.



Consistent quality

If the tolerance deviations indicated by measurements during welding are too high, the system interrupts the production run. This integrated quality control inhibits faulty welds, thus avoiding extensive rework.

Tasks

- Search seam start
- Correction of tooling position
- Adaptation of process parameters during welding
- Control of the edge offset in the case of butt welds

Weld types

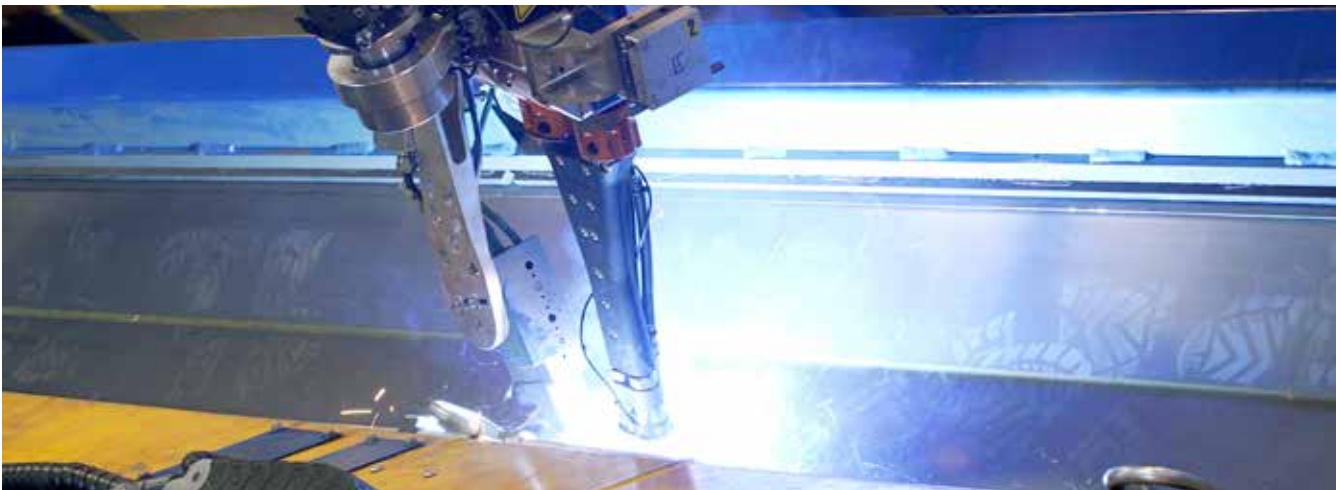
- Lap joint
- Multi overlap weld
- Butt joint
- Butt joint with air gap
- Fillet weld
- V weld, HV weld
- Corner weld
- Flange weld
- Special seam types

Materials

- Nearly all materials
- Even coated and contaminated workpieces

Advantages and benefit

- Process independently
- Online compensation of workpiece tolerances
- Insensitive due to non contact measuring procedure
- Wide application range: largely irrespective of the material
- For the most varied weld types
- Direct connection to the robot controller
- Integrated quality control with interruption in the case of tolerance deviations



Sensors

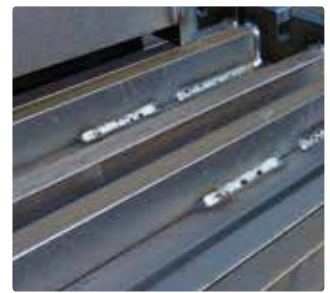
| | Tactile gas nozzle sensor | Arc sensor | Laser distance sensor | Adaptive laser sensor |
|------------------------------|--|---|---|--|
| Tasks | <ul style="list-style-type: none"> ■ Detection of the start and/or end position ■ Definition of the work-piece position ■ Determination of the linear welding path ■ Measurement of the seam volume in the case of V seams | <ul style="list-style-type: none"> ■ Torch guidance during MAG welding for compensation of material tolerances ■ Height correction during ■ TIG welding and plasma cutting | <ul style="list-style-type: none"> ■ Search for seam start and seam end ■ Recognition of work-piece edges and seam geometries ■ Determination of position of tubes and bolts ■ Measurement of gap widths ■ Seam preparation check | <ul style="list-style-type: none"> ■ Search seam start ■ Correction of tooling position and process parameters during welding ■ Offline measurement is also possible ■ Control of the edge offset in the case of butt welds |
| Detectable geometries | <ul style="list-style-type: none"> ■ all | <ul style="list-style-type: none"> ■ Fillet weld ■ V weld ■ Y weld | <ul style="list-style-type: none"> ■ Lap joint ■ Joint with air gap ■ V weld ■ Circular arc (concave, convex) ■ Corner weld and cutouts ■ Fillet weld ■ HV weld ■ Multi overlap weld ■ Multilayer weld ■ Tube and bolt joints ■ Special seam types | <ul style="list-style-type: none"> ■ Lap joint ■ Multi overlap weld ■ Butt weld ■ Joint with air gap ■ Fillet weld ■ V weld, HV weld ■ Corner weld ■ Flange weld ■ Special seam types |
| Materials | <ul style="list-style-type: none"> ■ All materials with electroconductive surface | <ul style="list-style-type: none"> ■ Structural steel ■ Chrome nickel steel | <ul style="list-style-type: none"> ■ Structural steel ■ Galvanised/electrolytic galvanised steel ■ Organically coated plate Aluminium ■ Chrome nickel steel | <ul style="list-style-type: none"> ■ Nearly all materials - even coated and contaminated workpieces |

| | Tactile gas nozzle sensor | | Arc sensor | Laser distance sensor | Adaptive laser sensor | |
|--------------------------------|---------------------------|------------------------|------------------|-----------------------|-----------------------|--------------------|
| | | Fastsense | | | | CST FLEX D |
| Mains connection | 400 V AC / 0,2 A | 400 V AC / 0,2 A | 24 V DC / 1 A | 24 V DC / 1,5 A | 24 V DC / 1,5 A | 24 V DC / 1,5 A |
| Dimensions (L x W x H) | 380 x 210 x 300 mm | 380 x 210 x 300 mm | – | Ø 100 X 43 mm | 33 x 58 x 158,9 mm | 33 x 58 x 170,4 mm |
| Weight | 1200 g | 1200 g | – | 600 g | 475 g | 540 g |
| Measuring voltage | 60 V 700 V | 60 V 700 V | – | – | – | – |
| Weld current range | – | – | 50 - 500 A | – | – | – |
| Min. side height | – | – | 5 mm | 1 mm | 1 mm | 0,5 mm |
| Min. gap width | – | – | – | 1 mm | 1 mm | 0,5 mm |
| Tracking speed | ca. 30 cm / min | ca. 200 - 250 cm / min | – | ca. 300 cm / min | – | – |
| Max. working speed | – | – | ca. 200 cm / min | – | ca. 400 cm / min | ca. 400 cm / min |
| Min. measuring distance | – | – | – | 310 mm | 5,5 mm | 26,6 mm |
| Measuring range | – | – | – | 0 - 170 mm | 140 mm | 16 mm |
| Beam diameter / width | – | – | – | 150 - 220 µm | 27 - 76 mm | 12,5 - 15 mm |
| Resolution horizontal Ø | – | – | – | 50 µm | 50 µm | 15 µm |
| Resolution vertical Ø | – | – | – | 100 µm | 90 µm | 25 µm |
| Laser capacity | – | – | – | 45 mW | 130 mW | 130 mW |
| Spectral range | – | – | – | 660 nm | 660 nm | 660 nm |
| Laserschutzklasse | – | – | – | 3R | 3B | 3B |
| Laser protection class | – | – | – | 6,5 m | 1,5 m | 2,5 m |
| Response time | – | – | – | – | 60 ms | 60 ms |
| Working temperature | – | – | – | 0 - 50° C | 5 - 40° C | 5 - 40° C |

– not relevant

Applications

Robot system for welding supports for building constructions



Tactile gas nozzle sensor



Goldbeck GmbH

- Component: Column Prop
- Industry: Metal construction
- Process: Rapid Weld

In the two-station robot system a QRC350 welds different steel supports for systematised building construction. These supports are used for offices, car parking and production halls as well as for municipal buildings such as hospitals, schools and sports halls. The MAG pulsed arc ensures optimum weld seam quality at high weld speed. The welding robot is mounted on an approx. 20 m floor-mounted linear track and has a rotating positioner with counter bearing which is used to always position the supports perfectly for welding.

Flexible robot system for efficiency and quality



Arc sensor



MBH Maschinenbau & Blechteile

- Component: Chassis
- Industry: Agricultural technology
- Process: Speed Weld

As a competent system supplier for chassis and frame construction, laser cutting, sheet machining and stainless steel processing, MBH Maschinenbau & Blechtechnik GmbH relies on the latest production technologies, quality and productivity from CLOOS. A highlight is the new robot system which allows to weld complex components with different sizes and variants. The system

controls two independent, programmable welding robots, which can weld simultaneously on a single component in single station mode, but in two station mode can also process different, smaller components completely independently. The turn/tilt positioner always positions the complex workpiece perfectly for welding. Thus positions which are difficult to access can be reached and an optimum weld quality is achieved. The torch changing system facilitates the use of single wire and tandem processes with a single robot. The entire welding process is designed in such a way that welding times and ancillary activities are of the same duration. This is how MBH achieves an optimum degree of utilisation of the system and efficient use of personnel which makes production quick and attractively priced.

Applications

Faun counts on the Tandem welding process



Arc sensor



Faun Umwelttechnik

- Component: Trash Container
- Industry: Commercial vehicles
- Process: Tandem Weld

Faun as the most successful manufacturer of waste disposal vehicles in Europe offers customised solutions for the most different waste types. The company uses the Cloos Tandem Process for welding the rear loader housing of the Variopress container with a built-in compaction press. A major advantage of this welding process is a high deposition rate which results in a high welding speed. The low heat input considerably reduces the component distortion. The floor-mounted linear

track is equipped with a vertical and horizontal carriage and a C frame which guarantees an optimum accessibility to the workpiece, particularly when welding bigger workpieces. The workpiece positioner with turning/swivelling movement is designed to position the complex workpiece perfectly for welding. This combination enables the robot to deeply enter into the workpiece and to weld the seams inside.

Perfection...



Control Weld

Reliable MIG/MAG welding process for thin and thick materials



Speed Weld

Stable MIG/MAG pulsed arc for numerous applications



Vari Weld

MIG/MAG pulsed arc for optimum welding results even under demanding conditions



Rapid Weld

High-capacity MIG/MAG spray arc for efficient welding



Cold Weld

Heat-reduced MIG/MAG AC pulsed arc for optimum results when welding sensitive materials



Tandem Weld

Combination of two synchronised MIG/MAG arcs for double capacity



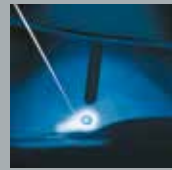
Narrow Gap Weld

MIG/MAG process with narrow gap technology for efficient thick plate welding



TIG welding

Reliable process for clean and precise welding



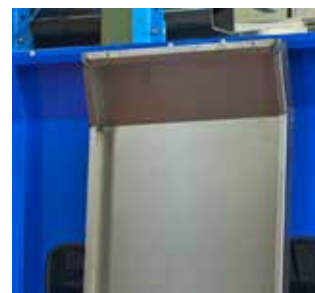
Laser Hybrid Weld

Combination of laser welding and MIG/MAG arc for maximum efficiency and quality

...due to diversity

Applications

VariWeld reduces reworks to a minimum at Matyssek



Laser offline sensor



Matyssek Metalltechnik

- Component: Protective Housing
- Industry: Metal construction
- Process: Vari Weld

The system consists of two stations and a 7-axis robot, model QRC-E 350. The robot is fixed to a floor-mounted linear track and can travel back and forth flexibly between the two stations. The reach of the robot means that it can be easily guided around corners or into niches. The turn/tilt positioner always positions the complex workpiece perfectly for welding. The big component - here a cover plate – is welded with the Vari Weld process. The Vari Weld process is characterised by a very low-spatter pulsed arc so that extensive rework is reduced to a minimum. Due to the low temperature the base material remains metallurgically unaffected and the corrosion protection is maintained.

The way..



Advisory Service

With this comprehensive “pre-service”, we take care of your project from the beginning and transfer our integrated process expertise to your component. Thus we ensure you a decisive lead in technology.



Planning

We elaborate a solution which perfectly meets your individual requirements. We work hand-in-hand with our customers to guarantee you on-schedule project processing.



Design

From the cell to the fully-automated production line - due to the modular design of our product series we develop customised solutions which meet all your production requirements.



Production

Our production workshops are the core of our company. Welding machine and robot technology is our strength - including our core competence: the arc.



Commissioning

Our specialists carry out the installation step by step in your production hall and test your system for faultless functionality. In this way, we guarantee a smooth installation and a rapid start of production.



Training

We train your employees and service technicians in programming, operation and maintenance in our modern training centre.



Service

Our competence team advises you on any extensions, modifications and retrofits of your existing robot and welding systems. We offer complete service packages for inspection, calibration and maintenance.

.. to your success.

Applications

CLOOS - Innovative welding and handling technology at Viessmann



Laser online sensor



Viessmann Werke Berlin GmbH

- **Component:** Boiler
- **Industry:** Heating technology
- **Process:** Rapid Weld

The Viessmann Group relies on innovative production technologies worldwide. At its Berlin site, a new robot system from CLOOS not only carries out welding, it also handles the boilers. — the positioner grips and clamps the boiler automatically to bring the workpiece into the optimum position for welding, loading and unloading. When one side has been fully welded, the positioner ro-

tates the boiler automatically to weld the other side. The new system can flexibly process a range of boiler types. Since the boilers are automatically rotated directly in the system and the component tolerances are automatically compensated for during the welding process, the set-up and cycle times — and thus also the production costs — are also reduced considerably.

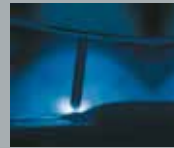
With CLOOS you weld and cut...



... all types of metal!



... all material thicknesses from
0.5 to 300 mm!



... with innovative processes!



... manually or automated, just as
you need it!



... efficiently and individually!



... and profit from many additional
services!



... in all industries!



... all over the world!



... to your utter satisfaction!



... and benefit from more than
100 years of welding experience!

... everything from one single source!

Worldwide!



Carl Cloos Schweißtechnik GmbH
Carl-Cloos-Strasse 1
35708 Haiger
GERMANY

Telefon +49 (0)2773 85-0
Telefax +49 (0)2773 85-275
E-Mail info@cloos.de
www.cloos.de

CLOOS

Weld your way.