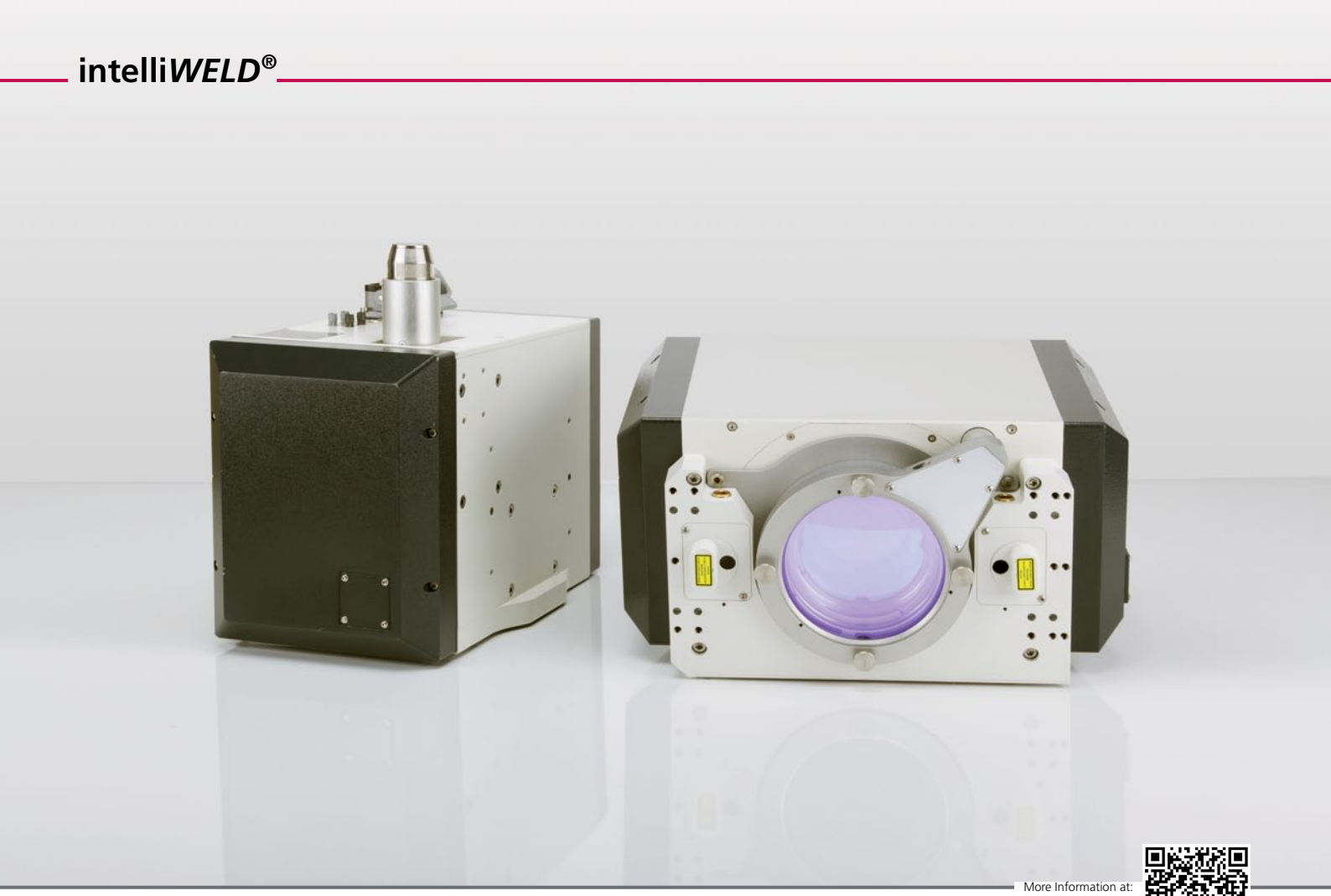


More Information at:

smart welding

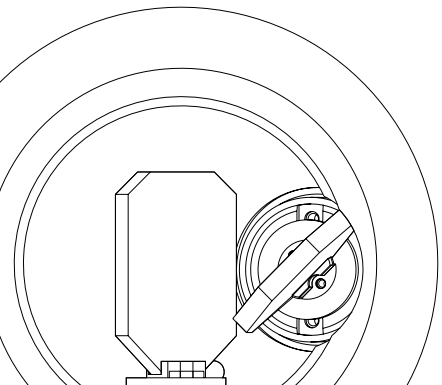
Designed for robot-assisted welding applications, this **3D-scan system** is capable of swiftly positioning the laser beam along 3D contours. While a robot guides the scan system along a part's contour, the intelli*WELD*® quickly and accurately moves and fine-positions the laser spot. Complex robotic motions and fast robotic repositioning are thereby avoided, thus reducing positioning times between spot welds to a few milliseconds. The result is a substantially enhanced utilization of the laser source.

Despite its 30 mm aperture, the intelli*WELD*® occupies a remarkably small volume, making it easily mountable on welding robots, even in difficult-to-access locations. Its optics are optimized for fiber-coupled disk or fiber lasers with powers up to 8 kW.

The intelli*WELD*® is based on SCANLAB's fully digital i*DRIVE*® technology, offering an integrated approach to laser and process safety. The technology allows real-time monitoring of all important scan head status parameters. A software-independent interlock signal indicates abnormal operational states.

Typical Applications:

- Robot-assisted welding ("remote welding")
- 3D applications
- Processing-on-the-fly



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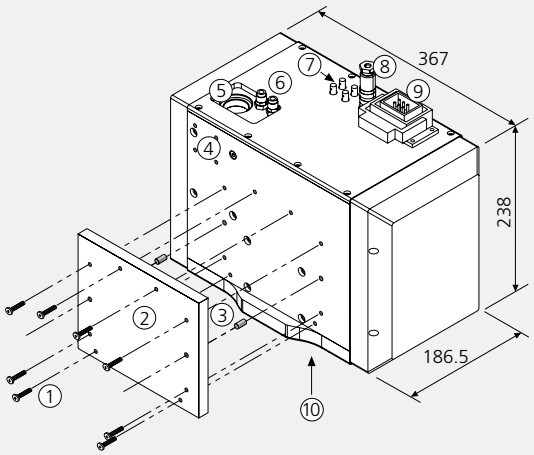


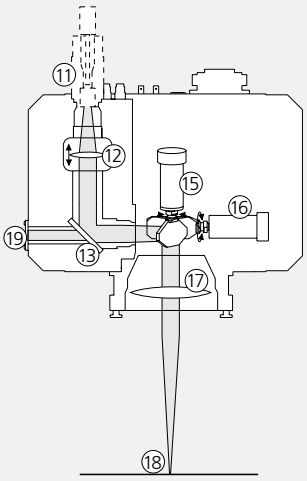
Legend

1 Mounting screws *
2 Flange (robot adapter plate) *
3 Alignment pins *
4 Attachment provision for strain relief (fiber)
5 Attachment provision for fiber adapter
6 Connector for cooling water
7 Data interface
8 Interlock
9 Power in
10 Bore holes for attaching an objective holder and a crossjet

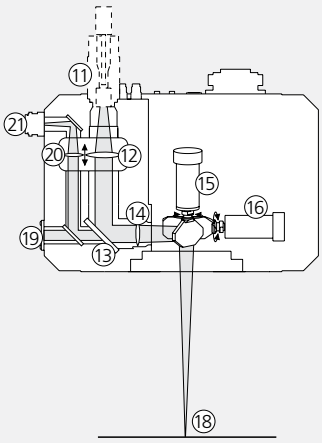
* not included

all dimensions in mm

Pre-Objective Scanning



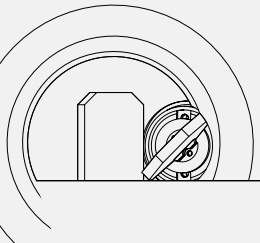
Post-Objective Scanning



Legend

11 Fiber adapter
12 Variable collimator
13 Dichroic mirror
14 Focusing optics
15 Galvanometer scanner 1
16 Galvanometer scanner 2
17 Objective
18 Working plane
19 Attachment provision for process monitoring
20 Variable camera tracking optics **
21 Camera connection **

** only for intelli*WELD* 30 FC V



Principle of Operation

The laser beam is fiber-delivered to the scan system's water-cooled collimator and then directed to the scan system's moving deflection mirrors. With pre-objective scanning design, focusing of the beam onto the working plane is achieved via a scan objective at the system's beam exit. With post-objective scanning design, focusing is achieved via an integrated focusing optic in front of the deflection mirrors (see figures left).

The variable collimator's optic is dynamically driven along the optical axis via the lin*AXIS*® linear axis, thereby altering the collimated laser beam's divergence as well as the overall system's focal length.

The scan system is equipped with a sealed housing. Two protective windows serve to protect the scan objective or the beam exit.

intelli*WELD*® 30 FC as well as intelli*WELD*® 30 FC V are available with an objective or a prefocusing optic.

Process Monitoring

All intelli*WELD*® scan systems have connections for process monitoring. Light or radiation emanating from the workpiece and returning via the deflection mirrors is decoupled from the optical path for potential analysis via additional process monitoring equipment.

Furthermore, the intelli*WELD*® 30 FC V (the V means vision) is equipped with a second camera port with variable camera-tracking optics. This enables process monitoring with continuously readjusted camera focus in the complete operating volume.

Control

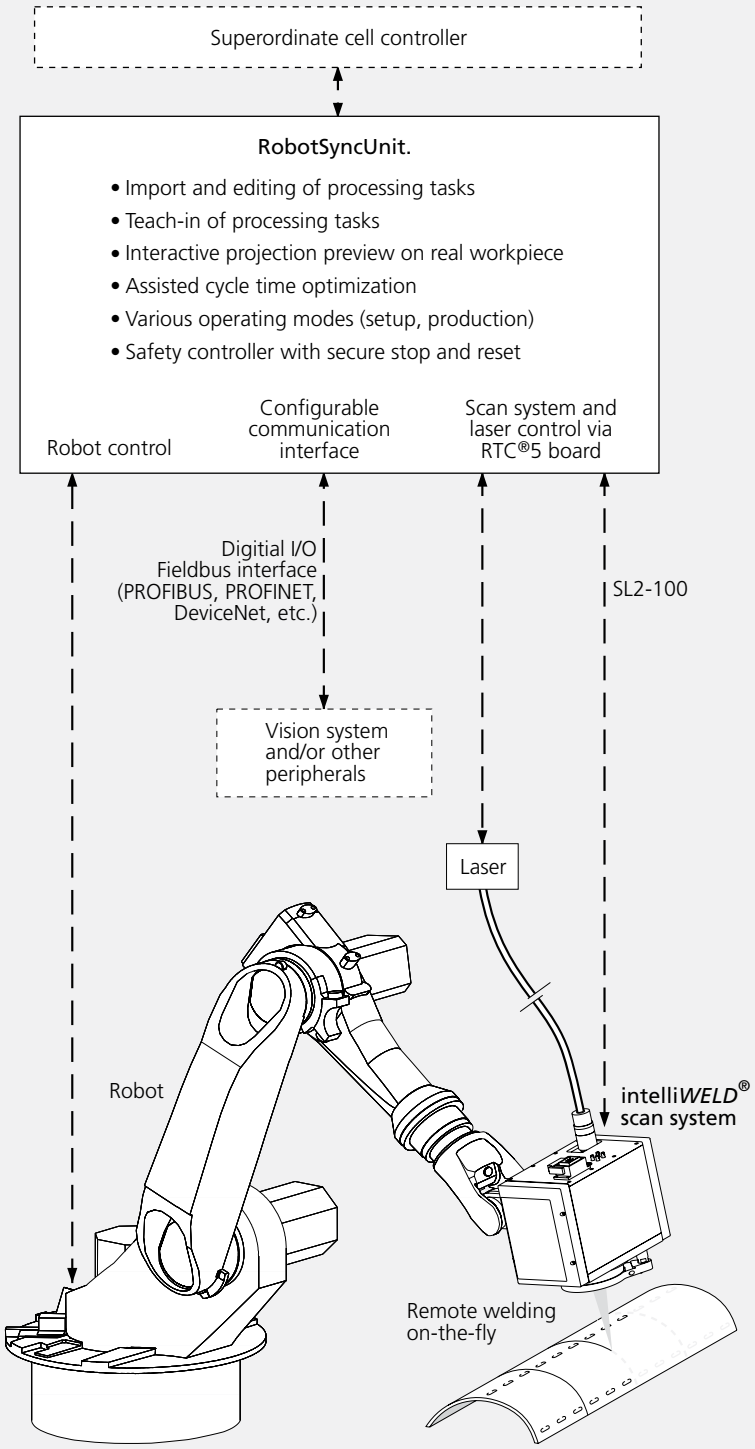
The intelli*WELD*® 30 FC incorporates SCANLAB's fully digital i*DRIVE*® technology, offering an integrated approach to laser and process safety. It allows real-time monitoring of all important scan head and double protective window status parameters. This facilitates detection of process miss-queues and enables advanced remote-diagnostics. A software-independent interlock signal, indicating abnormal operational states, can be used to switch the system to a predefined state or trigger an automatic emergency stop.

Options

- A **Teach-in Module** simplifies the set-up of laser scan systems for welding jobs. It is permanently installed at the intelli*WELD*® scan system´s beam exit side. Two laser diodes project (via deflection mirrors) a large crosshair and a small 45°-offset crosshair onto the workpiece and thereby visualize the position of the working laser beam´s focus. Both crosshairs exactly intersect at the working volume´s center (x = y = z = 0). This enables a simple and quick optical control during a Teach-in process, whether the scan system of the robot is positioned correctly above a defined welding position.
- The **RobotSyncUnit** is a central operating/control unit for laser welding systems (laser, intelli*WELD*® and robot). Simple and intuitive system usage brings efficiency to programming of welding tasks (see also image right).

  For further information on the RobotSyncUnit, visit the website of Blackbird Robotics:

  http://www.blackbird-robotics.de/products_remote_en.htm



Specifications (all angles are in optical degrees)

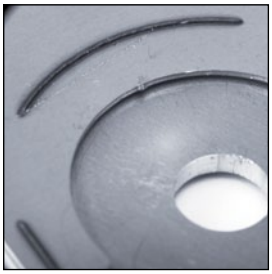
Wavelength	1030 nm - 1085 nm [1]
Maximum laser power (with specified cooling)	8000 W
Characteristics of the collimator	
Focal length	110 mm
Limiting numerical aperture	typ. 0.125 [2]
Fiber adapter	QBH,Q5/LLK-B,QD/LLK-D (other types on request)
Step response time (with step tuning) (settling to 1/1000 of full scale)	
1% of full scale	1.2 ms
10% of full scale	3.5 ms
100% of full scale	11 ms
Typical speeds (with vector tuning)	
Processing Speed	4 rad/s
Positioning Speed	50 rad/s
Dynamic performance	
Tracking error	0.6 ms
Repeatability (RMS)	< 2 µrad
Long-term drift over 8 h (after warm-up)	< 0.6 mrad
Optical performance	
Typical scan angle	±0.35 rad
Gain error	< 5 mrad
Nonlinearity	< 3.5 mrad
Power requirements	±(15+1.5) V DC, max. 8 A each
Input and output signals	SL2-100 or optical data transfer (XY2-100-O)
Weight	21 - 37 kg
Operating temperature	25 °C ± 10 °C
Typical water requirements	3 l/min at 20°C and Δp < 0.1 bar, p < 4 bar

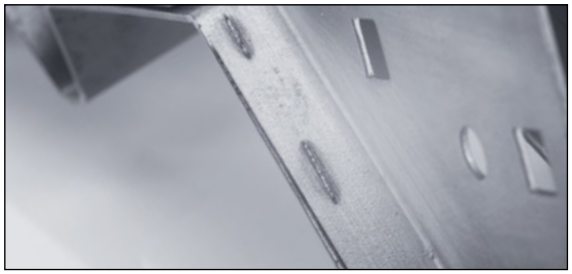
[1] mirror coatings for 1030 nm, 1055 - 1085 nm and 1070 - 1085 nm are currently available

[2] adapters for smaller numerical apertures are available

Typical Optical Configurations

	Pre-Objective scanning		Post-Objective scanning
Focal length of focusing optics	330 mm	460 mm	660 mm
Free operating distance	382 mm	488 mm	472 mm
Image volume size (cuboid-shaped)	(185 x 185 x 80) mm^3	(220 x 220 x 140) mm^3	(370 x 370 x 200) mm^3
Image field size (elliptical)	(240 x 200) mm^2	(385 x 270) mm^2	approx. (450 x 450) mm^2
Focus range in z direction	±40 mm	±70 mm	up to ±100 mm
Focus diameter	600 µm (with 200 µm fiber)	630 µm (with 150 µm fiber)	600 µm (with 100 µm fiber)
Fiber diameter	150 µm or 200 µm	100 µm, 150 µm or 200 µm	50 µm or 100 µm
Image scale	1:3	1:4	1:6





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