ROBOT-GUIDANCE

Robot Vision Systems

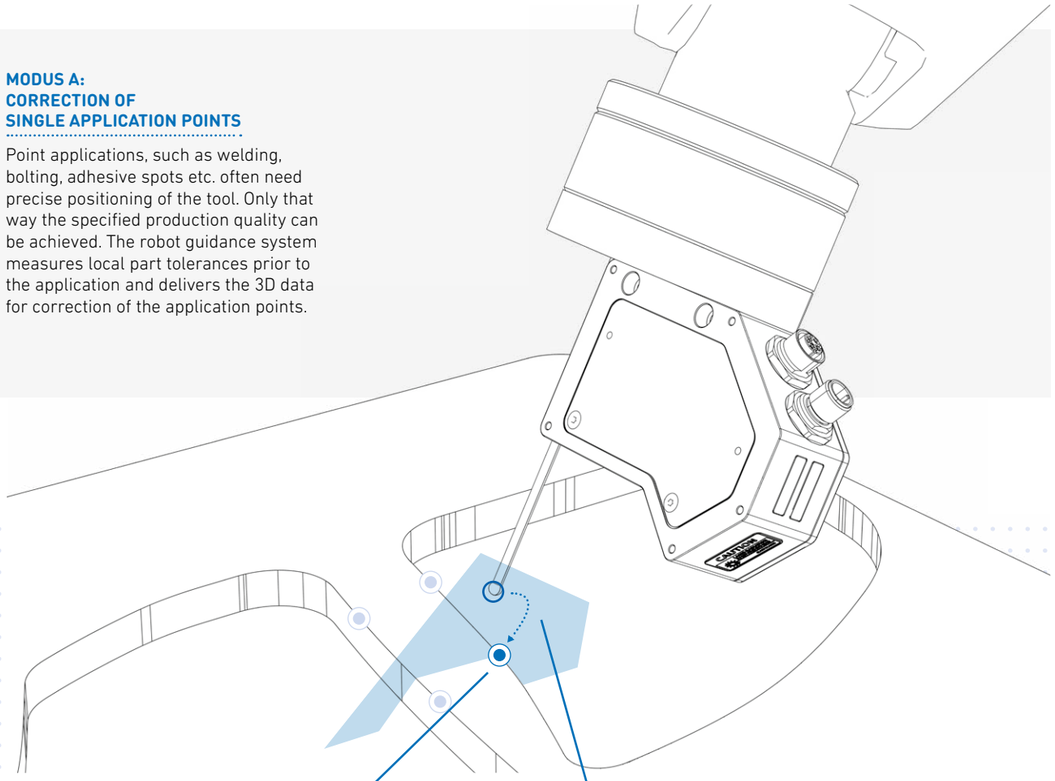
Simple by Design

EN

The ROBOT GUIDANCE SYSTEM can be operated in different modi. You can guide your tool independently per characteristic or adjust the complete position of the part. You will find the explanation for both modi on the following pages.

MODUS A: CORRECTION OF SINGLE APPLICATION POINTS

Point applications, such as welding, bolting, adhesive spots etc. often need precise positioning of the tool. Only that way the specified production quality can be achieved. The robot guidance system measures local part tolerances prior to the application and delivers the 3D data for correction of the application points.



1. MEASURING OF A "CORRECTION VECTOR" FOR EVERY APPLICATION POINT

Through the measurement with VISIONSCANNER2 deviations of the appliation points are acquired. The specification of the ideal application points through calibration or CAD data enables the system to determine the "correction vectors".

2. USAGE OF THE CORRECTION VECTOR FOR EACH POSITION OF THE APPLICATION

The determined correction vectors can be used as TCP- or FRAME-corrections.

MODUS A OFFERS TWO PROCESS SEQUENCES:

- measuring, measuring,..., applying, applying,...
- measuring, applying, measuring, applying,...

ROBOT-GUIDANCE

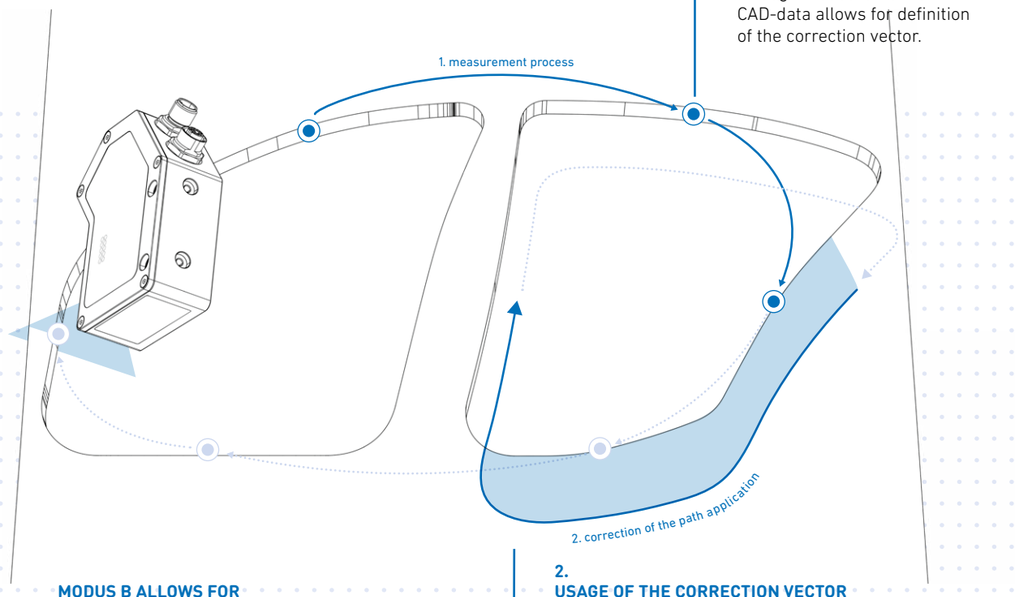
THE PRINCIPLE ◦ ROBOTGUIDANCE ◦ AI

MODUS B: CORRECTION OF THE COMPLETE APPLICATION PROGRAM

Path and handling application such as adhesive applications, welding or assembly processes need a precise positioning of path or part. Thus, the mandatory production quality can be achieved. The ROBOTGUIDANCE System measures the part at several features and delivers a 6D correction vector for the complete part.

1. MEASURING OF THE CORRECTION VECTOR FOR THE COMPLETE PART

Global deviations in part position are detected through measuring of several features of the part. The default ideal part position through measurement or CAD-data allows for definition of the correction vector.

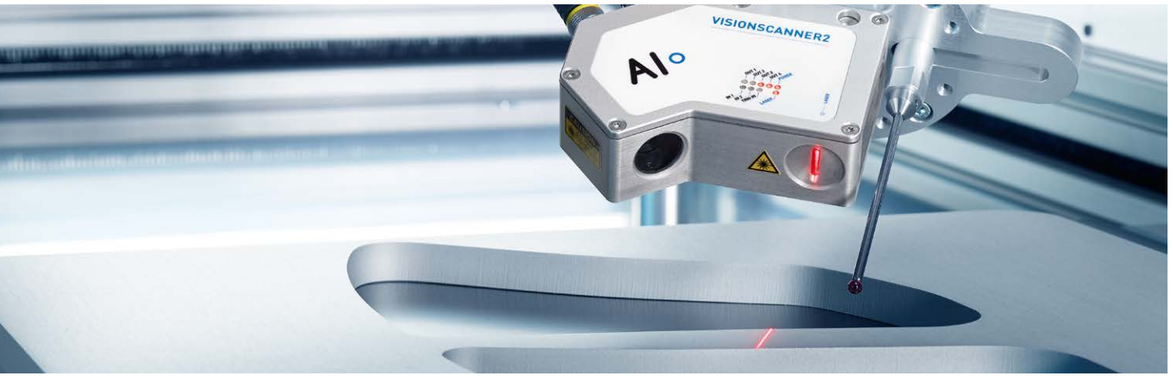


MODUS B ALLOWS FOR TWO PROCESS SEQUENCES AS WELL:

Measuring of all relevant positions
- after each other with one sensor
- at the same time with multiple sensors

2. USAGE OF THE CORRECTION VECTOR FOR THE GLOBAL PART POSITION

The determined correction vector is used as FRAME correction data. Thereby the global application program is being shifted.



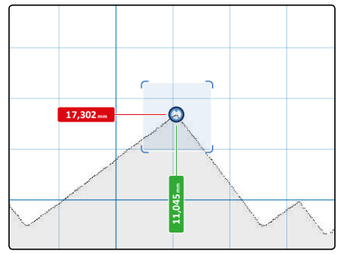
Positioning of your robot through AI◦ ROBOTGUIDANCE. We determine the pertaining correction for your robot to compensate tolerances in the part or system and guide your robot to the desired location.

- 3D local correction with one measurement. (2 translations, 1 rotation)
- 6D correction for the global part position through a combination of minimum 3 measurements. (3 translations, 3 rotations)
- Depending on the situation, sensors can be integrated into the production line in a stationary set up or can be attached to a robot.
- Delivery of a technology package for robot communication.
- Fast integration into the robot program through simple "Inline-Form-Commands".
- Short measuring time of 200 ms (example: 5 measuring points; 1.5 s time for robot moves: 5 × (0.2 s + 1.5 s) = 8.5 s additional process time)
- High accuracy: 0.2 mm (assumption: 0.1 mm robot and 0.1 measurement inaccuracy. Multiple measurement points do not decrease accuracy)
- Low maintenance: Sensors are easy to exchange. (please see "commissioning and maintenance")

AI◦ VISIONSCANNER2 is being delivered with multiple measuring tools. Thereby it solves most of your measuring tasks already.

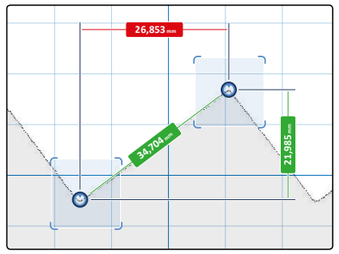
POSITION

E.g. increase the positioning accuracy of your production process.



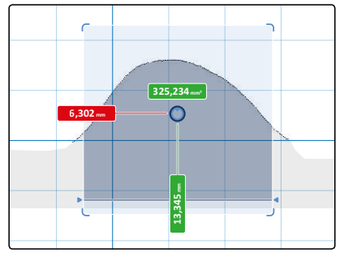
RELATION TWO POINTS

100 % checks of important dimensions of your product.



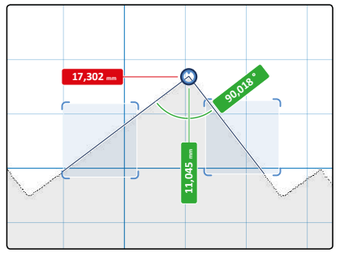
AREA

E.g. regulation of adhesive load during application.



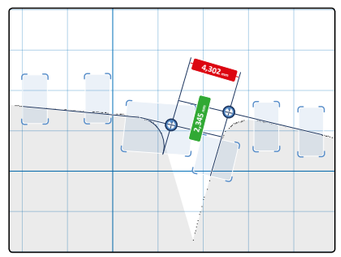
ANGLE

Secure e.g. the quality of your bending process.



GAP

Track e.g. the accuracy of assembling automotive closures into a car body.



YOUR TASK

We develop customized solutions for your needs.

CONFIGURE; VISUALIZE & CONTROL TASKS ◦ ROBOTGUIDANCE ◦ AI

Put your measuring, control or robot guidance task in effect within shortest time. Therefore a fully integrated, graphical user interface is at your disposal. Programming skills are not required. Keep the system under control and use data from a previous period for analysis.

LIVE VIEW

Configure your measuring tasks online based on live data.

DATABASE OF DEFECT CHARACTERISTICS

Control and optimize your measuring tasks offline based on saved measuring data.

GRAPHICAL PARAMETER SETTING

Fast and precise system configuration through intuitive graphical setting of parameters.

MEASURING AND CONTROL DATA

The graphical visualization offers a simple overview over measuring and control data.

DIFFICULT OBJECT PROPERTIES & ENVIRONMENTAL CONDITIONS ◦ VISIONSCANNER2 ◦ AI

AI◦ VISIONSCANNER2 uses multiple mechanisms to ensure a robust profile reading. Thereby it is perfectly applicable also to difficult measuring tasks in todays production environments.

1. BANDPASS FILTER

Reduction of system errors incidence of extraneous light.

2. ROBUST EXTRACTION OF LASER LINE

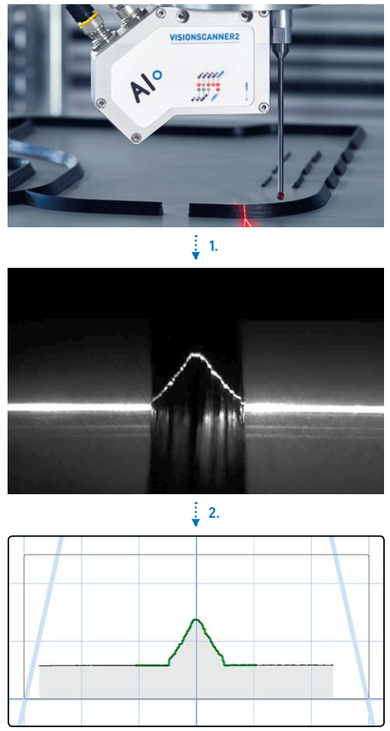
Automatic resolution of ambiguity by reflection or scattered light. Extraction of the laser line simultaneously between light and dark lines.

3. PREPROCESSING OF PROFILES

Morphological filter for elimination of flaw.

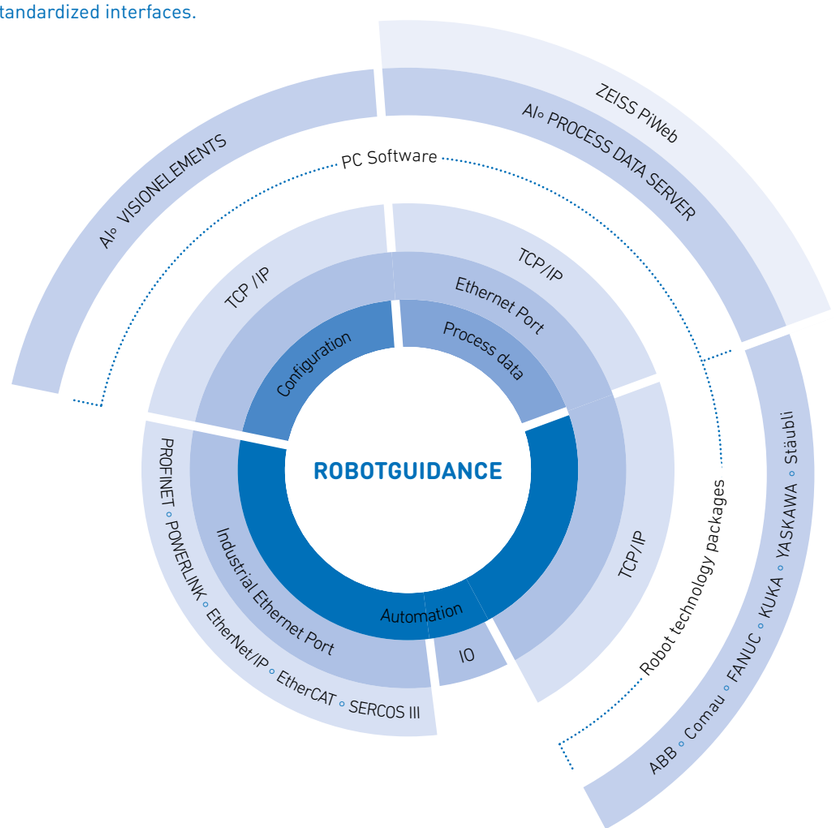
4. DYNAMIC ADJUSTMENT OF LIGHT EXPOSURE

Verification of line intensity in a defined area of the measuring location. Adjustment to optimal illumination also for scanning processes.



THE INTERFACES ◦ ROBOTGUIDANCE ◦ AI

The strength of AI◦ VISIONSCANNER2 is its ability for integration. We offer multiple industrially standardized interfaces.



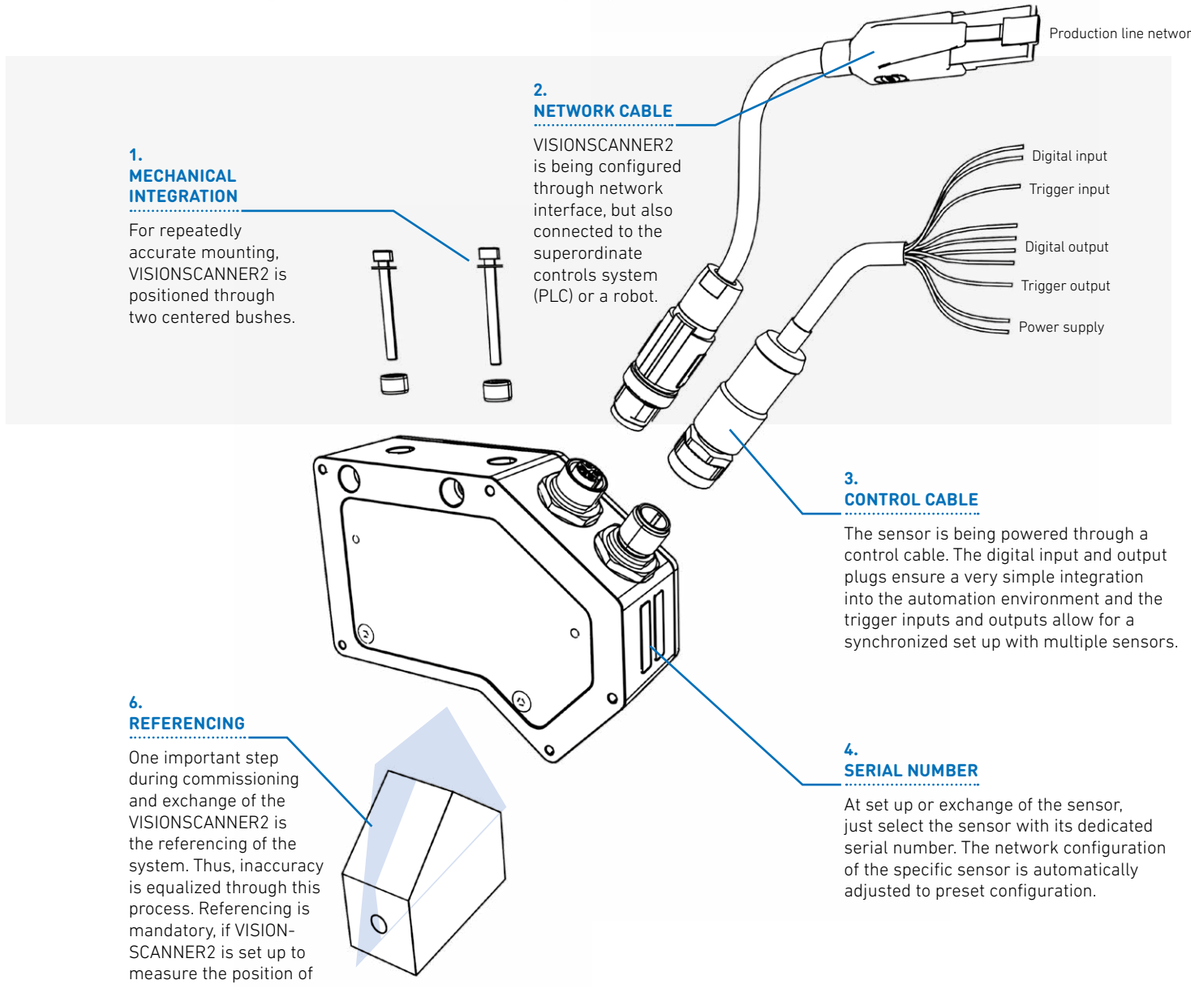
••••• Software products or software options which need to be installed on a robot or PC.

AUTOMATION INTERFACE TCP/IP ◦ INTERFACE

Robot Manufacturer	Supported Controllers	Mandatory Options
KUKA	KRC2, KRC4, VKRC2, VKRC4	KUKA.Ethernet KRL XML
Stäubli	S7	–
FANUC	RJ3iB, R30iA, R30iB	SKMG Socket Messaging, R648 User Socket Messaging
ABB	IRC5	PC-Interface Option 616-1
YASKAWA	DX200	MotoPlus
Comau	C5G	PDL2 Read/Write on TCP/IP

COMMISSIONING & MAINTENANCE ◦ ROBOTGUIDANCE ◦ AI

Within only few steps AI◦ VISIONSCANNER2 is fully integrated into the automation environment. Next to simple mechanical and electrical setting, the development has been carried out specifically in regards to network configuration and creation of measuring programs.



1. MECHANICAL INTEGRATION

For repeatedly accurate mounting, VISIONSCANNER2 is positioned through two centered bushes.

2. NETWORK CABLE

VISIONSCANNER2 is being configured through network interface, but also connected to the superordinate controls system (PLC) or a robot.

3. CONTROL CABLE

The sensor is being powered through a control cable. The digital input and output plugs ensure a very simple integration into the automation environment and the trigger inputs and outputs allow for a synchronized set up with multiple sensors.

4. SERIAL NUMBER

At set up or exchange of the sensor, just select the sensor with its dedicated serial number. The network configuration of the specific sensor is automatically adjusted to preset configuration.

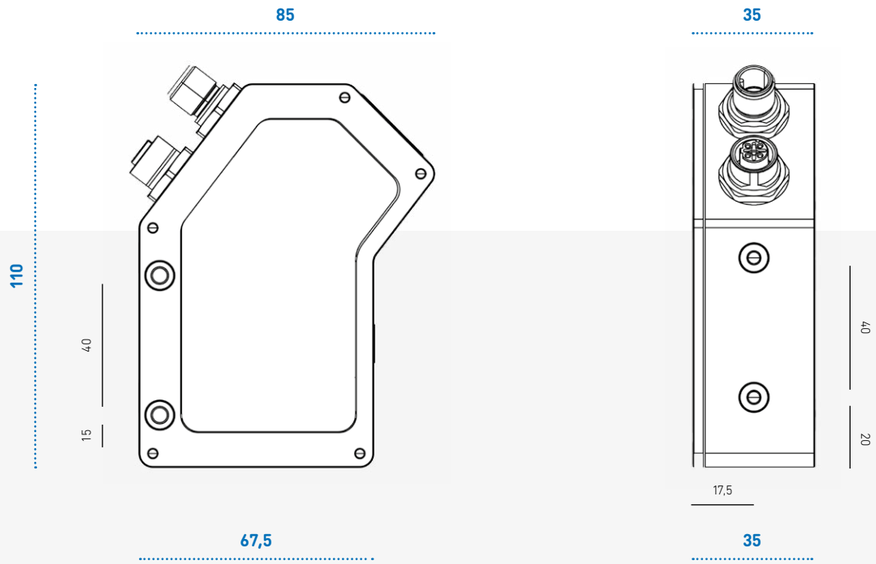
5. CONFIGURATION

After mechanical and electrical commissioning of the automation environment, measurement tasks can be created. The integrated automation interface can be configured. Now, measuring tasks can be triggered by the superordinate system and measuring and control data can be drawn. Extended feature is the process data interface, which allows for control of the measuring process and specifically the quality of the product being measured.

6. REFERENCING

One important step during commissioning and exchange of the VISIONSCANNER2 is the referencing of the system. Thus, inaccuracy is equalized through this process. Referencing is mandatory, if VISION-SCANNER2 is set up to measure the position of an object or if multiple sensors are used for one coherent measuring system.

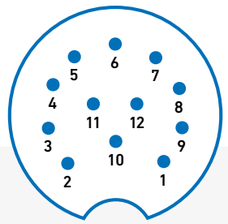
TECHNICAL DATA ◦ ROBOTGUIDANCE ◦ AI



Sensor Technology	CMOS Sensor
Reading speed	up to 500 Hz
Measuring accuracy	± 0,2 % of measuring field, depending on feature and surface property
Laser	Laser Class 1 at 660 nm
Lifetime laser	40.000 h (independent from cycle of operation)
Interface	Fast Ethernet 10/100 Mbit, Half-/Fullduplex, Auto negotiation
Power supply	24 V DC, max. 400 mA

Size	110 x 85 x 35 mm
Weight	ca. 400 g
Protection class	IP 64
Housing	Aluminium, eloxated
Environmental conditions for warehousing	–20 up to 60 °C, humidity max. 90 %
Environmental conditions during operation	0 up to 55 °C, humidity max. 80 %
Registrations	CE, UL

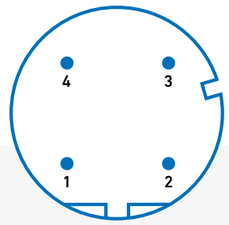
CONNECTIONS ◦ TECHNISCHE DATEN



Pin-No.	Signal	Comment
1	OUT 2	Digital output 2
2	TRIG IN	Trigger input
3	OUT 1	Digital output 1
4	OUT 3	Digital output 3
5	IN 2	Digital input 2
6	OUT 4	Digital output 4
7	GND, 0 V	Ground, 0 V power supply

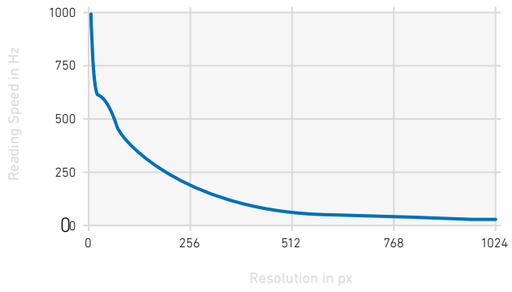
For 4 and 8 pin control cable different pin may apply

8	IN 1	Digital input 1
9	+ 24 V DC	Power supply
10	TRIG OUT	Trigger output
11	+ 24 V DC	Power supply
12	+ 24 V DC	Power supply
shield		Pin 7 = ground connected



Pin-No.	Signal	Comment
1	Tx +	Output data Ethernet +
2	Rx +	Input data Ethernet +
3	Tx –	Output data Ethernet –
4	Rx –	Input data Ethernet –

READING SPEAD ◦ TECHNISCHE DATEN



Resolution in px	Reading Speed in Hz
1280 × 64	588
1280 × 128	336
1280 × 256	181
1280 × 512	93
1280 × 768	63
1280 × 1024	50

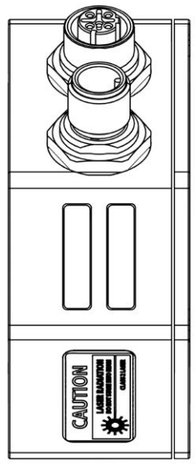
VS2-RFFAA-PPPWWW-SSE

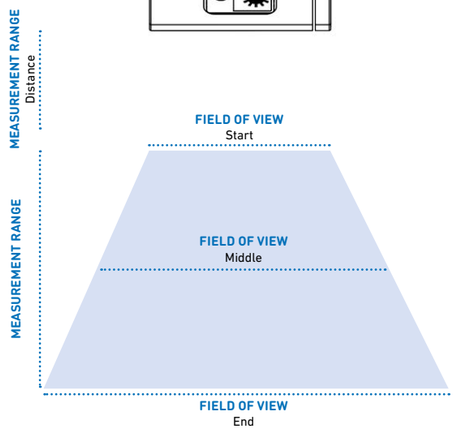
CAMERA | LASER | INTERFACE

CAMERA		Code	Value
R	Resolution	L	752 × 480 px
		H	1280 × 1024 px
		U	2592 × 1944 px
F	Focal Distance	06	6 mm
		08	8 mm
		12	12 mm
		16	16 mm
A	Angle of Triangulation	30	30°
		37	37,5°
		45	45°

LASER		Code	Value
P	Power	100	100 mW
W	Wavelength	660	660 nm

INTERFACE		Code	Value
S	Control Cable	04	4-pin
		08	8-pin
		12	12-pin
E	Ethernet Cable	F	Fast Ethernet
		I	Industrial Ethernet





Camera	L0637	H0637	H1237	H1637	U1645
MEASUREMENT RANGE Distance mm	45	25	50	60	48
MEASUREMENT RANGE mm	100	250	75	50	28
FIELD OF VIEW Start mm	60	80	40	30	23
FIELD OF VIEW Middle mm	90	190	58	38	30
FIELD OF VIEW End mm	120	300	75	45	0
MEASUREMENT RANGE Resolution mm / px	0,1	0,15	0,05	0,03	0,01
FIELD OF VIEW Resolution mm / px	0,2	0,25	0,08	0,05	0,014

COMMUNICATIVE

Interface to robot or PLC through
Industrial Ethernet, TCP/IP or IO

ROBUST

Automatic adjustment of illumination
and reflexion compensation of the
laser line for extreme conditions

SMART

No PC needed during operation

SIMPLE

Graphic configuration
without programming skills

ALLROUNDER

Detection, measuring, verification
and control on one device

FUNCTIONAL

User and change management,
configuration and fault analysis using
PC software VISIONELEMENTS.

POWERFUL

Laser triangulation is possible
on almost any surface

SMALL BUT IMPRESSIVE

Suitable for industrial use, compact design

AUTOMATION INTERFACE

We know the challenges manufacturing companies have to handle complex production systems to enhance their own competitiveness. Our products offer the highest level of comfort and only need little specialist knowledge by using comfortable interfaces for various robots and control systems.

ADAPTIVE IMAGING

AI◦ stands out through optimal integration capability as well as highest user friendliness, specifically in regards to the requirements of todays complex production scenarios. The components can be integrated without special programming skills.

ARTIFICIAL INTELLIGENCE

Thanks to many years of experience in dealing with industrial robots in the automotive industry, we understand the requirements for quality and process optimization in production environments for various products. Therefore, we deliver sensors and pertaining intelligence in an integrated machine vision solution.

ALL INCLUSIVE

We offer various possibilities for our customers, from components to integrated solutions. AI◦ not only offers high value products, but also services and support for parameter setting and start up, training as well as software programming for your special requirements.

AI◦ STANDS FOR NEXT LEVEL IMAGING AND ROBOT VISION SYSTEMS OF ENGROTEC-SOLUTIONS GMBH.

EngRoTec-Solutions GmbH

Zum Wolfsgraben 5
36088 Hünfeld

+49 (0) 6652 ◦ 79 39 48-0
info@ai-engrotec.de
www.ai-engrotec.de