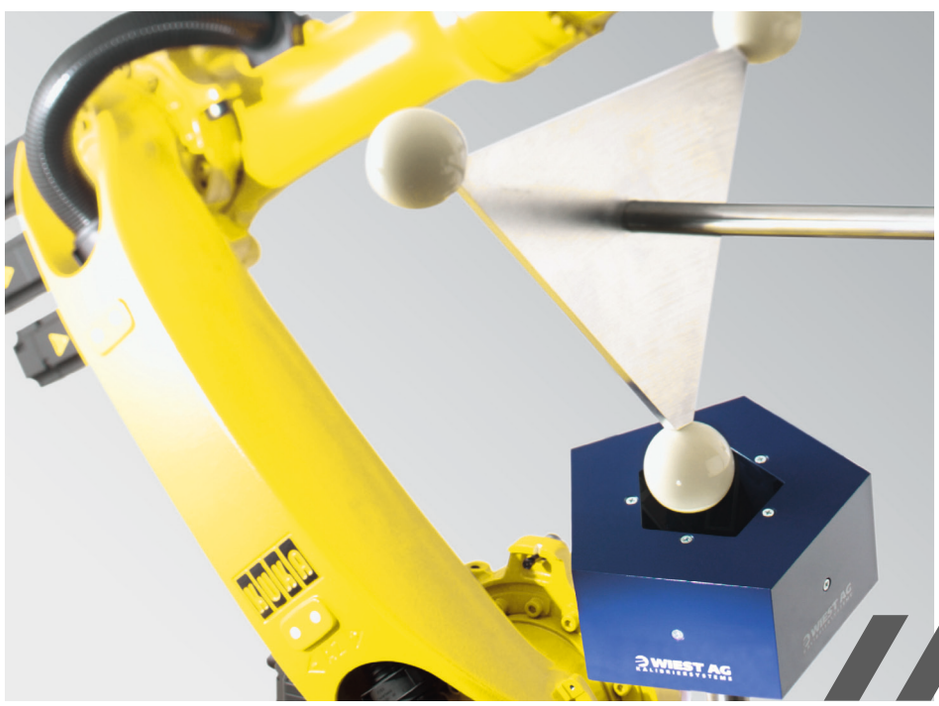
EN

WIEST AG
KALIBRIERSYSTEME

MEASURING AND CALIBRATING OF ROBOT PLANTS



PARTNER OF INDUSTRY – WIEST AG

Wiest AG is a strong partner of the automotive industry. It supplies customers operating in growth markets such as the medical technology and aviation sectors – its customer base even includes robot manufacturers.

OEM supplier for the automotive industry

Further clients

BMW
BENTELER
ZF
B BRAUN SHARING EXPERTISE
GAMBRO
DAIMLER
GRAMMER
BORGERS
BROETJE AUTOMATION
MTU Aero Engines
Ford
Johnson Controls
Matador
düspohl
YASKAWA
MAN
RAMPF discover the future
SUSPA
ABB
ThyssenKrupp
SKODA AUTO
LÄPPLE
TRUMPF
FFT
SAR
PERI
OLYMPUS
KLINGELNBERG
SMT Flexible Robotersysteme
PORSCHE
KUKA
MAGNA
mössner
MBB FERTIGUNGSTECHNIK

“THE VISION

OF USING SMART SENSORS

TO CARRY OUT ALL MEASURING TASKS

RELATING TO ROBOTS

HAS BECOME REALITY

–

BOTH FOR INITIAL SETUP

AND FOR MAINTENANCE.

–

OUR SENSORS

ARE THE CONNECTING LINK BETWEEN

THE MANUFACTURER AND THE USER

OF INDUSTRIAL ROBOTS.”

Dr.-Ing. Dipl. Math. Ulrich Wiest, CEO

THE HISTORY OF WIEST AG

2001 marked the beginning of Wiest AG's success story with the development of the LaserLAB – 2014 saw the launch of the latest product, GripLAB.

2001

Foundation of Wiest AG and development of **LaserLAB** by Dr. Ulrich Wiest

2004

Breakthrough with a solution to the maintenance difficulty (Daimler AG)

2006

Development and market launch of **RotoLAB** – participation in trade show Automatica

2007

Wiest now standard in the field of seam sealing at BMW, calibration of linear axes

2008

Device driver for Fanuc robots

2009

Device driver for Yaskawa DX100 controller

2010

Device driver for B&R controllers, resulting in becoming standard for Trumpf bending machine

2011

Standard in calibrating welding robots at Daimler AG

2012

Extension of measurement process of "auto-centering tool-tip", thus increasing accuracy further

2013

Development of **GripLAB**, measurement of additional axes for Kuka and ABB robots

2014

Introduction of **GripLAB** at Motek 2014

2001 ***2004*** ***2006*** ***2007*** ***2008*** ***2009*** ***2010*** ***2011*** ***2012*** ***2013*** ***2014***

With his experience and his profound know-how, Dr. Ulrich Wiest built up Wiest AG to an innovative company together with Dr. Johannes Neher as development director.

DR. ULRICH WIEST, CEO

In 2001, Dr. Ulrich Wiest began with the product development of 3D measuring systems and founded Wiest AG shortly thereafter. The development of the "absolutely accurate robot" and a measuring robot at Kuka Roboter GmbH in Augsburg as well as the integration of various measuring systems connected to these, the kinematic modelling of industry robots, or working with various coordinate measuring technologies – these are only some of the many tasks that Ulrich Wiest has taken care of during the course of his career. Ulrich Wiest studied mathematics with computer science as a secondary subject at the Technical University of Munich and worked there and at the Technical University of Augsburg as an academic assistant. He later took a doctorate degree at the University of Karlsruhe in the faculty of computer science.

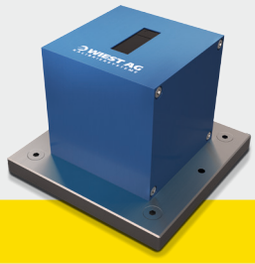
DR. JOHANNES NEHER, AUTHORIZED SIGNATORY

Studied mathematics and physics at the University of Augsburg from 2002 to 2007 and took a doctorate degree there in the field of numerical mathematics to become "Dr. rer. nat.". From 2011 to 2012, he worked as a scientific assistant under Professor Hoppe. During his time as a scientific assistant, he devoted himself to the Finite Element methods, the discretization of elliptical second-order boundary value problems and the error estimators pertaining to these. Dr. Neher has worked at Wiest AG since 2012 and has taken on increasing responsibilities within the company. He is familiar with all the relevant tasks in the business process. These range from customer acquisition to corporate and product presentations, drawing up quotations, contract negotiations with suppliers and customers, project planning, through to product integration at the customer's premises, training and documentation as well as after sales support.

WIEST AG
KALIBRIERSYSTEME

GRIPLAB

- Automatic checking and calibration of grippers in the production cell
- 6D measurement of the gripper or of the gripped component
- Increased process reliability during handling tasks by robots



from page 8

ROTOLAB

- Automatic checking and calibration of welding torches for line welding applications in the production cell
- 3D measurement of the welding wire
- Increased process reliability and a clear reduction in the maintenance costs as well as minimisation of wastage
- Measurement of other rotation-symmetric robot tools possible

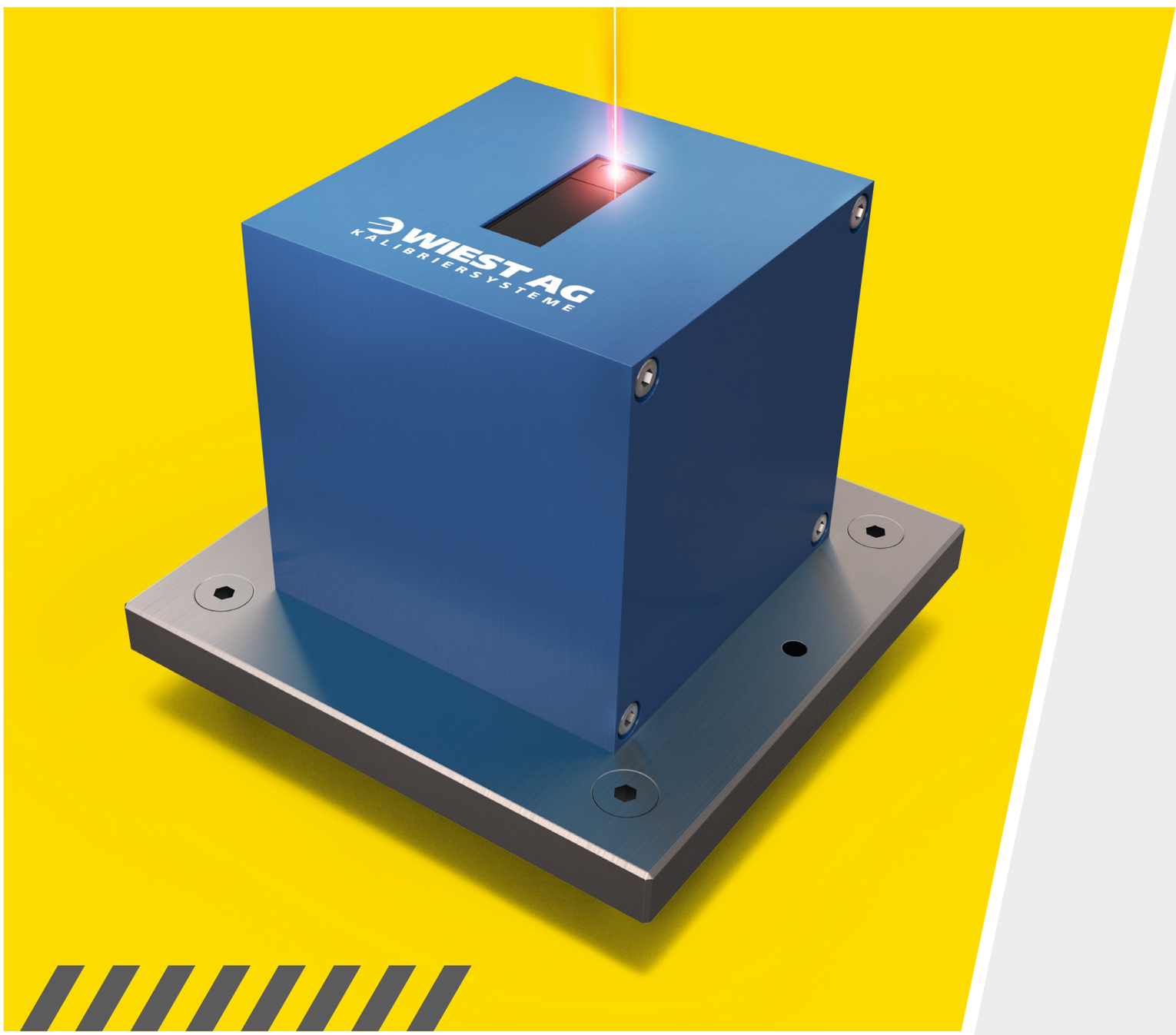
from page 12

LASERLAB

LaserLAB is an all-in-one solution for cell calibration and maintenance. Mobile use: one system for many robot cells.

- Very easy-to-use optical 3D measuring system
- Robust and with a proven track record in many industries
- Robot calibration right in the production cell
- Measurement of tools in 3D, 5D and 6D
- Measurement of jigs and stations in the working area of the robot
- Measurement of synchronous additional axes, positioners, rotary / tilting tables right through to the measurement of cooperating robots
- Continuous compensation and measurement of temperature drift on sensitive robot applications
- Minimisation of downtime and setup times
- Software drivers available for virtually all commonly used industrial robots

from page 16



WIEST AG
KALIBRIERSYSTEME

GRIPLAB

CHECKING AND CALIBRATING GRIPPERS WITH GRIPLAB

Your robot has had a collision and the component to be handled no longer lies correctly in the gripper? GripLAB from WIEST offers quick, automatic checking and calibration of the gripped component. Your robot is productive again in the shortest possible time.

The gripper position of your robot changes increasingly because the gripper shifts in the event of even a minimal collision. Over time, the next component cannot be gripped correctly and production comes to a standstill. Generally, in such cases you re-programme the robot positions, which is very time-consuming. With GripLAB you can carry out a quick and automatic check and correction of the gripper.

GripLAB is a 6D sensor for checking and calibrating grippers or gripped components during handling tasks.

The initial setup of GripLAB, following installation in the robot cell, can be completed in a few minutes.

The sensor measures either the gripper itself or the component to be handled. In the process, the entire error chain is measured from the flange to the component. If a defined limit value is exceeded during the check, calibration of the gripper is started automatically. If deviations in the tool data are small, the changes are transferred directly to the robot; in the case of major deviations, updating of the tool data must be confirmed manually by the user.

YOUR ADVANTAGE

- Automatic checking of the gripper or the component to be handled
- The entire error chain is measured, from the flange to the component
- Correction of the TCP (in 6 dimensions) in the robot controller
- Measurement check and calibration during ongoing operations
- Control of GripLAB by robot programmes.
  No need for installation of additional software on the robot controller
- Irrespective of robot manufacturer
- Precision laser measuring technology
- Test duration < 1 minute
- Calibration accuracy of gripper < 0.2 mm

TECHNICAL DATA

- 6D measurement
  (3D coordinates, 3D rotation angle)
- Calibration accuracy < 0.2 mm
- Data communication via Profinet, Profibus, Ethernet or RS232
- Control of GripLAB by robot programmes (included in delivery)
- Measuring distance:
  medium measuring distance 120 mm
  (+/- 60 mm measurement area)
- Dimensions: w 85 mm, d 85 mm, h 85 mm
- Installed in the work area of the robot

TYPICAL COMPONENTS

- Axle journals
- Engine casings
- Gears
- etc ...

COMPATIBILITY

- ABB
  S4C+ (RS232, Profibus)
  IRC5 (RS232, Profibus , Ethernet)
- KUKA
  KRC2 (RS232)
  KRC4 (EtherCAT, Profinet, Profibus)
- Fanuc (Profibus, Profinet)
- and other robot controllers with the corresponding interface (RS232, Profibus, Profinet, EtherCAT, Ethernet)

WORKFLOW INITIAL OPERATION

Mount GripLAB in the robot cell

↓

Install the robot program provided

↓

One-time calibration of the base for the GripLAB

↓

Define and teach 9 poses on the gripper or handled component
(3 poses for each spatial plane)

↓

Perform initial measurement (automatically by robot program)

→ Tool data for the gripper are determined and stored

time required: < 1 min. (depending on size)

↓

GRIPLAB IS READY

MEASURING TEST WORKFLOW

Test of the dimensional stability of the gripper

Deviation inside the limit value	Deviation outside the limit value

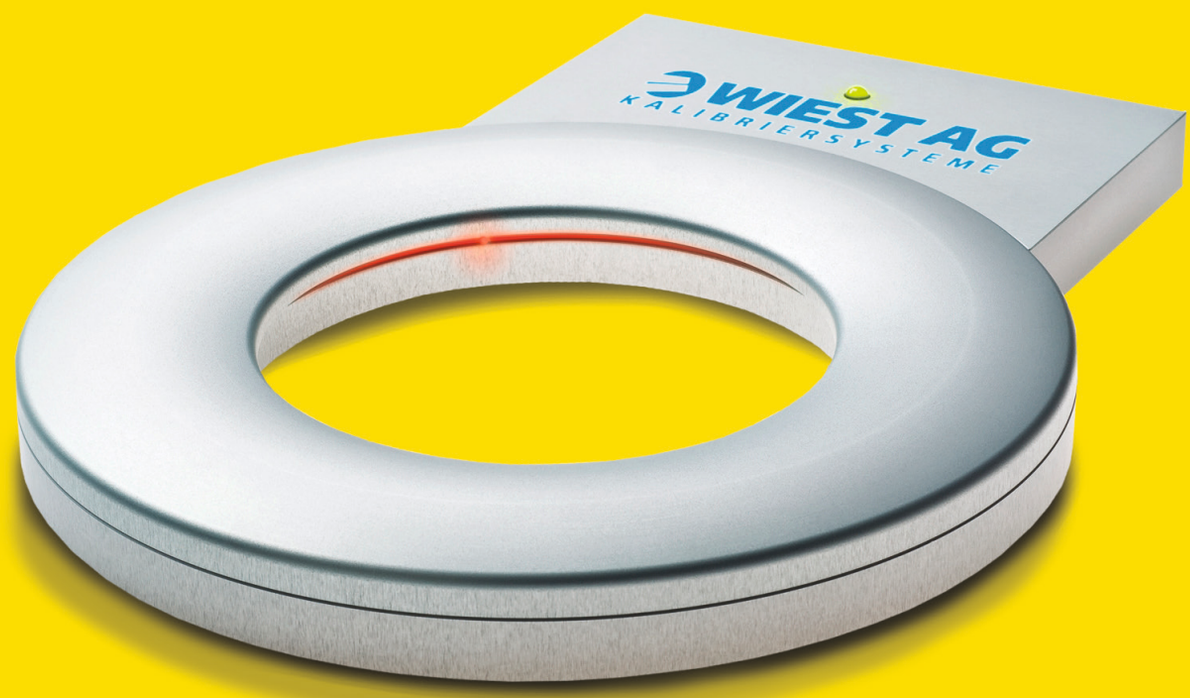
↓

Calibration of the gripper

Automatic correction of the tool data	Manual confirmation of the correction	Deviation outside the maximum limit
↓	↓	↓
		Stop

Quit the robot program


RS232
Ethernet
Feldbus
(EtherCAT, PROFINET)



WIEST AG
KALIBRIERSYSTEME

ROTOLAB

TESTING AND CALIBRATING ROBOT-GUIDED WELDING TORCHES WITH ROTOLAB

Does the welding line, your robot takes, deviate from the line it should take?
With the RotoLAB, Wiest AG offers a measuring system for quickly and automatically checking and calibrating rotation-symmetric robot tools.

The welding quality on your components is sub-standard. The reason once again is the welding torch. There was an unnoticed collision because it got caught on the component or on the wire cutter or the thermal conditions caused it to readjust. Usually, you reteach the welding program in such cases. Use RotoLAB for the automatic testing and correction of your welding torch.

RotoLAB is an optical 3D sensor for testing and calibrating rotation-symmetric robot tools such as welding torches, soldering tools, plasma cutters, plasma torches, nozzles for gluing or sealing, spot welding guns, bolt welding guns or tungsten torches.

Setup can be completed in just a few minutes without the current tool data in the robot controller having to be changed. This means RotoLAB can be retrofitted into plants that are already producing, without production programmes having to be modified.

Due to the short testing time of 4 seconds, a continuous survey of the dimensional stability of the tool is made possible. If, in the course of any testing the limit values are exceeded, calibration will start automatically. In the case of minor geometric variations of the tool, the corrections are effected automatically. In the case of more major variations, the robot stops automatically and the tool data have to be updated manually.

YOUR ADVANTAGE

- TCP tracking (in 3 dimensions) of the geometric change in robot tools
- Testing the concentricity of the contact tip to the gas nozzle
- Simple to operate
- Testing duration 4 sec. (without robot positioning times)
- Automatic correction of the tool data possible (no operator input necessary)
- Calibration time < 30 sec.
- Calibration accuracy of tool < 0.2 mm
- All approximately rotationally symmetric tools can be calibrated (diameter: 0.8 mm – 50 mm)

TECHNICAL DATA

- 3D measurement (2D coordinate measurement, 1D bisection procedure)
- Relative repeat accuracy < 0.03 mm
- Data communication via RS232, Profibus, Profinet, Ethernet
- Control of RotoLAB by robot programs (included in delivery)
- Measurement range: 75 mm inside the diameter
- Dimensions: b 190 mm, t 245 mm, h 23 mm
- Splash-proof casing
- Horizontal mounting

TYPICAL TOOLS

- Welding torches
- Soldering tools
- Plasma cutters / torches
- Nozzle for gluing or sealing
- Spot-welding gun
- Tungsten needle
- Bolt welding guns

COMPATIBILITY

- KUKA
  KRC2
  KRC4
- ABB
  S4C+
  IRC5
- Fanuc
  From RJ-3

WORKFLOW INITIAL OPERATION

Mount RotoLAB to the working cell

↓

Install the robot program provided

↓

Adjust the parameters (Tool no., limit values)

↓

Teach the starting point

↓

Initial operation (automatically effected by the robot program)

→ RotoLAB position is determined

→ Tool data are determined and stored

Time required: < 3 minutes

↓

ROTOLAB IS READY FOR OPERATION

MEASURING TEST WORKFLOW

Test of the dimensional stability of the torch

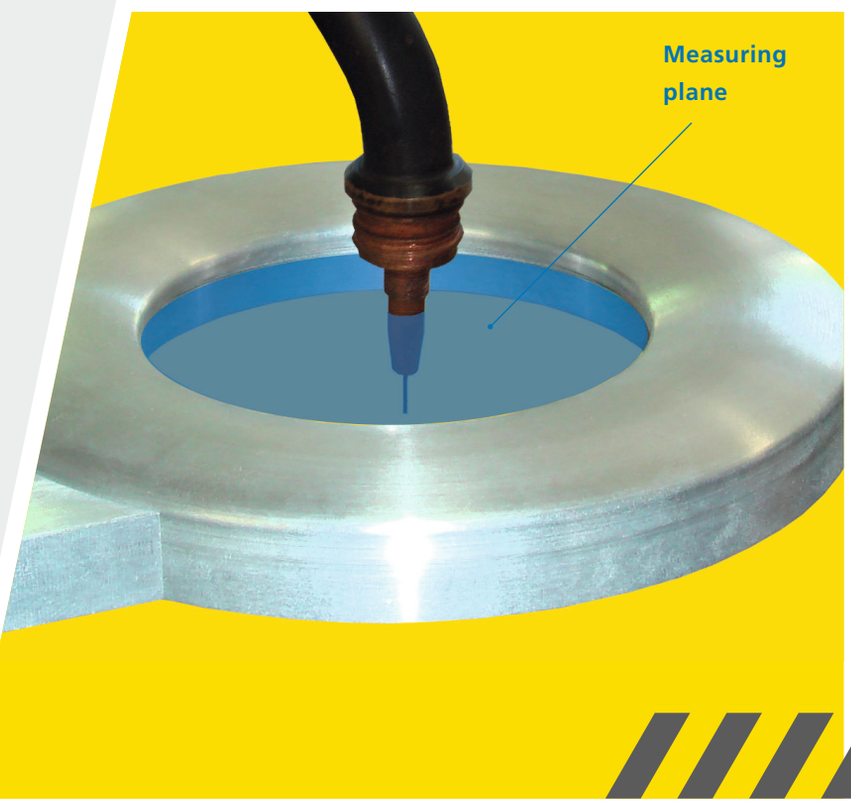
Deviation inside the limit value	Deviation outside the limit value

↓

Calibration of the torch

Automatic correction of the tool data	Manual confirmation of the correction	Deviation outside the maximum limit
↓	↓	↓
		Stop

Quit the robot program


Measuring
plane

WIEST AG
KALIBRIERSYSTEME

LASERLAB

LASERLAB – THE ONE FOR EVERYTHING!

Conventional solutions are too inflexible and complicated in application; manual reteaching takes time... The 5-angle sensor is handy, compact and extremely versatile! The "All-in-One-Solution" for robot systems works:

- highly accurate and non-contact
- versatile, mobile and flexible
- compatible with all popular robot types
- ... and easy to operate!

With LaserLAB, you have only one solitary measuring system, which carries out all measurement tasks in connection with robots directly in the production cell: Integrated into the robot control, all measuring procedures are automated – on request including error correction. This procedure is the ideal solution during commissioning, as well as for maintenance of the robot systems.
The advantage: Less downtime, more production.

The goal of the measurement is the improvement of the absolute positioning accuracy. You will get an accurate model of the robot axes according to the "Closed-Loop Calibration Method".

The goal of the measurement is the determination of the Tool Centre Point. You will get the real geometric dimensions of the tool; in 3, 5 as well as in 6 dimensions.

The goal is to determine the transformation from the work piece into the coordinate system of the robot. The software measures jigs, stations or external, stationary tools.

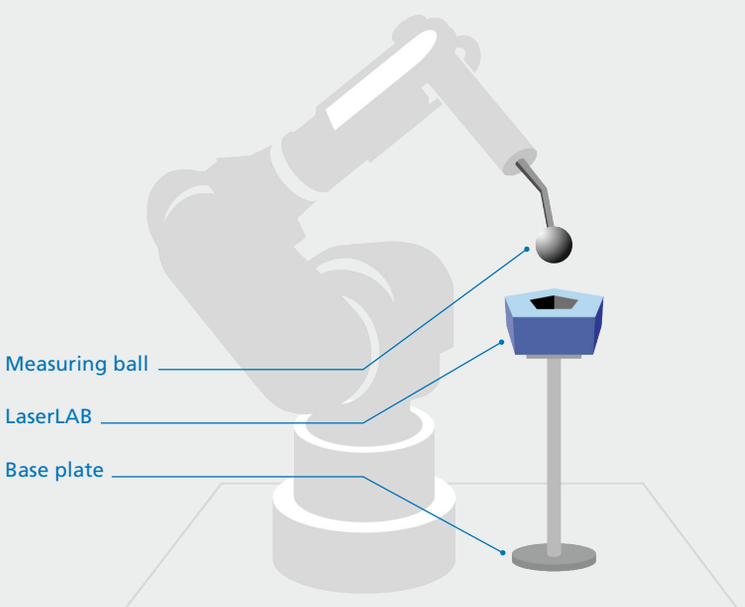
The goal is the measurement of one or several additional axes up to cooperating robots. You will get a common coordinate system, within which the kinematics moves.

With LaserLAB and temp:in you will be able to continuously measure the temperature drift and straightaway compensate it inside the robot – without having to stop production!

CALIBRATION AND MEASUREMENT WITH LASERLAB

You need to accurately measure the tool data, the pick-up and the placement positions of components to enable the setup of a new robot cell, or carry out robot calibration directly in the production cell? The LaserLAB from WIEST offers you a handy and compact measuring system as a solution for all measurements on the robot.

LaserLAB is a patented measuring procedure. It consists of a pentagonal blue measuring sensor with five laser triangulation sensors, measuring balls and suitable software each for one application area. LaserLAB does not remain stationary in one robot cell, but can be used flexibly in several cells. If a measuring ball is placed into the visibility area of the measuring system, the position of the ball centre will be calculated. Due to the direct correlation of the ball centre to the Tool Centre Point (TCP) of the robot, it is possible to measure the robot. As you get a solution for all measurements around the robot, you can save unnecessary costs. With the system from WIEST you will achieve a high accuracy in all measuring tasks and you will be able to carry out all measurements by yourself – and thus save valuable production time! Therefore, LaserLAB is not just another solution, but the permanent solution!



YOUR ADVANTAGE

- All measurements with one system
- Application for initial operation and maintenance
- Automated non-contact measurement
- Robot calibration directly inside the manufacturing cell
- Easy operation, applicable by yourself!
- No teach-in repetition!
- Reduction of downtimes to a minimum
- Compatible with most of the common robots
- Very robust, solid design
- Proven in industrial environment
- Mobile and flexible use
- Wireless communication with the LaserLAB and the robot is possible with a wireless adapter

HOW IT IS DONE

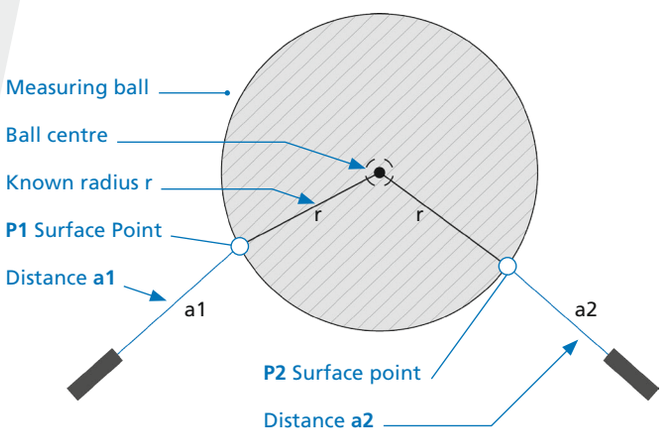
LaserLAB consists of two hardware components: The pentagonal sensor and one or more measuring balls, which can be used differently. Measuring tools of this kind, for example the measuring bone, beam or quadruple, help you with 3D, 5D or 6D measurement of special tools such as welding tongs, nozzles, milling cutters or grippers. Depending on the measuring or calibrating task, the LaserLAB operates with different software so that the robot tool, the base, the robot itself, the temperature drift or even cooperating industrial robots can be measured with only one device.

COMPATIBILITY

- ABB
- Comau
- Fanuc
- Kuka
- Mitsubishi
- Yaskawa
- Stäubli

WIEST AG
KALIBRIERSYSTEME

THE PROCEDURE IN DETAIL



SPECIFICATION

- Repetition accuracy or resolution < +/- 0.02mm
- Absolute accuracy < +/- 0.1mm (typically +/- 0.035 mm)
- Measuring range (x, y, z): 39.5 x 38.5 x 36.5 mm
- Temperature range: 0° – 55°C (no measurable temperature drift)

Several one-dimensional distance measurements to the measuring ball form a reliable basis for the non-contact measurement of coordinates. The five laser triangulation sensors of the LaserLAB are aligned in such a way that their rays from different directions meet in a common centre. The directions of the laser beams will be exactly determined by calibration factory-made. Surface points on the ball can be determined in three dimensions from the directions and the measured distance of the individual sensors. Due to this information, the position of the ball centre can be calculated. A first approximation for the TCP is obtained after four measurements. This can be transferred to the robot control by pushing a button. Further measurements will be obtained by just re-orientating the ball within LaserLAB. As a rule, 12 measurements are enough to achieve a sufficiently high accuracy.

TECHNICAL DETAILS

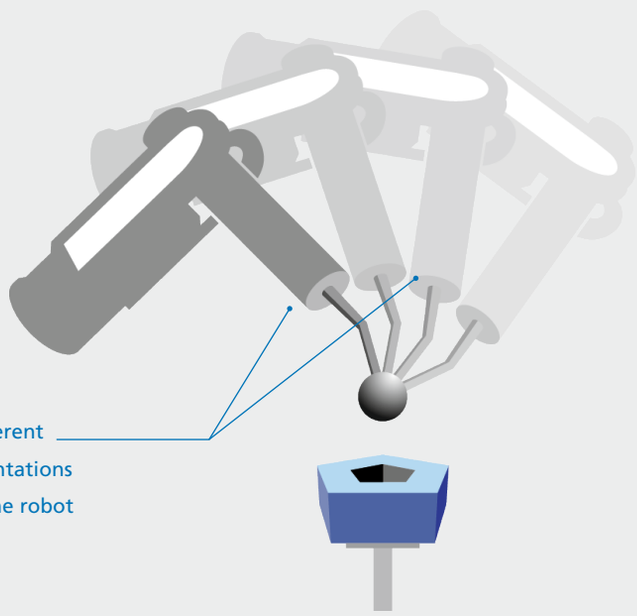
- 5 laser triangulation sensors, laser class 2
- Communication via RS232 or USB
- Adapter for Profinet, Profibus and EhterCat available
- Power consumption: 15 V / 300 m
- Dimensions: 195 x 195 x 95 mm
- Weight: 2.1 kg
- Wireless-adapter available

ROBOT MEASUREMENT WITH LOOP:IN

Do you want to improve the positioning accuracy of your robots? Do you need an Absolutely Accurate Robot for high-precision production processes? Would you like to clone robots or replace mechanical robot parts and continue to run your robot programmes with fitting accuracy?
Then you will benefit from LaserLAB with loop:in!

The goal of robot measurement is the improvement of the absolute positioning accuracy. The measurement with LaserLAB is carried out directly inside the robot cell. The software loop:in determines an exact model of the robot axes with the aid of the "Closed-Loop Calibration Method" and transfers the result to the control.

After a crash or after maintenance work a robot that is already measured can be reset to its original status by repeating the measurement. Due to this, teach-in repetition of the robot programmes will be completely dropped!



YOUR ADVANTAGE

- Original adjustment can always be reset
- Quick robot replacement
- Quick motor, gear unit or hand replacement
- Ideal prerequisite for successful offline programming
- Clear improvement of positioning accuracy
- Manufacture of the Absolutely Accurate Robot
- Cloning of robots
- TCP for re-orientation can be determined very accurately
- Easy integration into cells that are already producing, without manual re-teaching
- Time necessary < 15 min
- Reduction of downtimes to a minimum
- Plant availability will be clearly increased!

HOW IT IS DONE

Fix the LaserLAB to the base plate in the robot cell and the measuring ball to the robot tool. Now move the measuring ball to a teach-in starting position in the visibility area of the measuring system. After pushing the start button, loop:in takes over the control of the robot and drives along the measuring positions without collision. The new zero-positions of the robot axes will be calculated from the measured robot positions and can be transferred into the robot control by pushing a button.

KOMPATIBILITÄT

- ABB
- Comau
- Fanuc
- Kuka
- Mitsubishi
- Yaskawa
- Stäubli

WIEST AG
KALIBRIERSYSTEME

loop:in

SUCCESS BY ACCURACY – APPLICATIONS

IMPROVEMENT OF POSITIONING ACCURACY

Do you want to improve the positioning accuracy? Do you want to rotate exactly around a point or an axis? A robot calibration can be carried out at any time without special preconditions. For this purpose, the measuring system is placed at will into the working space of the robot. After the automatic calibration you will get the zero-positions of the axes 2 to 5. A measurement with LaserLAB and loop:in is the ideal precondition for successfully implementation of offline programming.

MAINTENANCE

With the first initial operation of the LaserLAB and loop:in the actual status of the real robot kinematics will be stored implicitly in the form of measured data. In case of a change of the robot mechanic due to a crash or replacement of components, like gear unit, motor or even the whole robot, the original kinematic will be restored again by repeating the measurement of the robot. Due to this, it will be guaranteed that the production programmes, for which a teach-in with the old kinematics had been carried out, can continue to run with fitting accuracy.

INTEGRATION INTO PRODUCING PLANTS

Has your plant been programmed wrongly or is the calibration not traceable anymore? Again, loop:in offers the ideal solution as the measurement will supply a correct and comprehensible calibration: Thanks to an additional software, the robot positions will be converted in such a way that at the start with the modified robot calibration the room points stay physically the same. Your advantage: From now on, your robot calibration is stored, regardless of what happens!

MANUFACTURE OF AN ABSOLUTELY ACCURATE ROBOT

Do you need a “true” absolute accuracy to, for example, duplicate robot programmes? For this, the location of LaserLAB with regard to the robot coordinate system as well as the position of the measuring ball with regard to the flange coordinate system must be known. This can be achieved by one measurement with a higher measuring system.

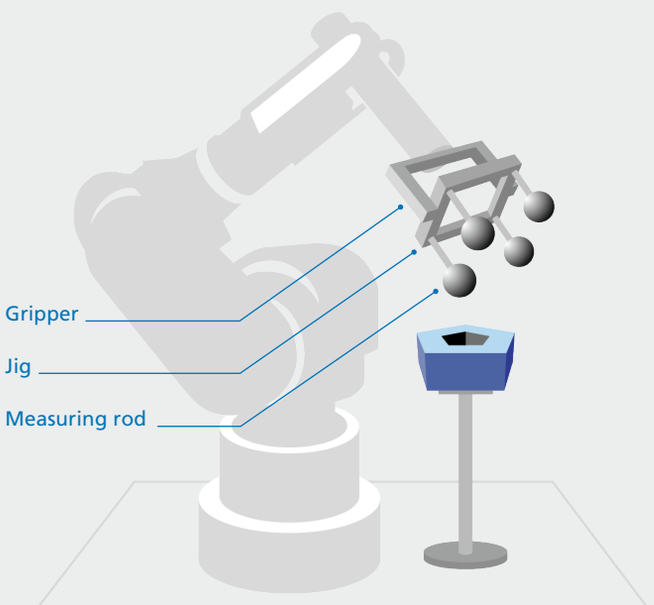
THE PROCEDURE IN DETAIL

Robot and measuring system form a closed-loop control. While the robot rotates around its constant TCP, the deviations of the measuring ball from its nominal position will be determined by measurement and corrected with the robot. The robot positions, at which the ball has reached the nominal position, are the input data for the kinematics calibration of the robot. As a result, a model of the robot axes will be received: The axes 2 to 5 can be calibrated without special preconditions. The axis 1 will be calibrated via the solid attachment to the base plate. The calibration of the 6th axis can be carried out by using a measuring tool. However, this will be achieved, as a rule, by measuring the Tool Centre Points (TCP) with the aid of the software tool:in.

TOOL MEASUREMENT WITH TOOL:IN

What do you do if your robot's welding gun no longer welds with precision accuracy, the gripper misses, or the work point of the robot wanders during re-orientation? The solution: Use LaserLAB with tool:in!

Whether during the initial operation of new robot programmes, maintenance work of robot tools or a crash – with LaserLAB and tool:in you will get the real geometrical dimensions of the robot tool with regard to the flange coordinate system, the so called Tool-Transformation. If tool measurement in 3 dimensions is sufficient, use the measuring ball or the measuring bone. However, if in addition you need the orientation of the tool then measurement with the measuring beam, measuring triangle or the measuring quadruple is advised. One thing is certain: No matter which measuring tool you decide on, you will always get exact results!



YOUR ADVANTAGE

- Measurement during initial operation and maintenance
- 3D and 6D measurements possible
- Measurement of movement direction
- Direct measurement of TCP
- Exact joining with robots possible
- Indirect gripper measurement
- Automated measurement
- Easy and safe operation
- Comprehensible due to measurement report
- No teach-in repetition in case of tool crash
- Measurement duration < 15 min
- Long downtimes will be avoided!
- Improvement of plant availability!

HOW IT IS DONE

Fix LaserLAB to the base plate in the robot cell and attach the measuring tool to the robot. Now run a teach-in measuring programme with the robot. The measuring ball(s) will be moved, one after the other, into the visibility area of the sensor and will be measured automatically. As soon as all balls have been measured, you can transfer the newly calculated tool data into the robot control by pushing a button.

KOMPATIBILITÄT

- ABB
- Comau
- Fanuc
- Kuka
- Mitsubishi
- Yaskawa
- Stäubli

SUCCESS BY VERSATILITY – APPLICATIONS

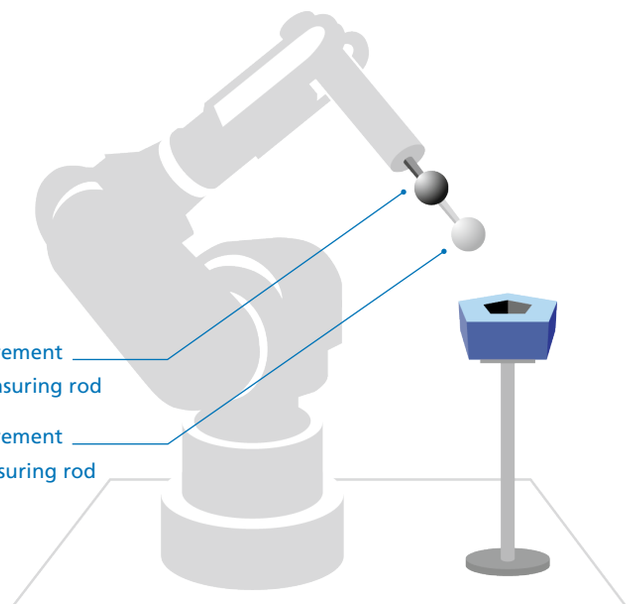
INITIAL OPERATION

Before your robot will be used for the first time, carry out a geometric tool measurement with tool:in. The advantage of this: Repeated manual teach-in of the off-line generated room points will not be necessary any more or only to a small extent. Even in case of complicated automation tasks with robots, like milling, joining or deburring, geometric measurement with tool:in has proved itself in practice.

MAINTENANCE

If a tool crash has occurred or a regular maintenance has to be carried out, LaserLAB helps you in combination with tool:in. It determines exactly the change of the tool. The upgraded tool data guarantee maintaining the room points by the robot. Whether you want to measure a welding torch, a laser beam, an adhesive nozzle or water jet nozzle: With LaserLAB and tool:in you can quickly measure by yourself and receive exact measuring data!

You want to mill, screw or join with robots?
The Solution: Use the "measuring beam"!



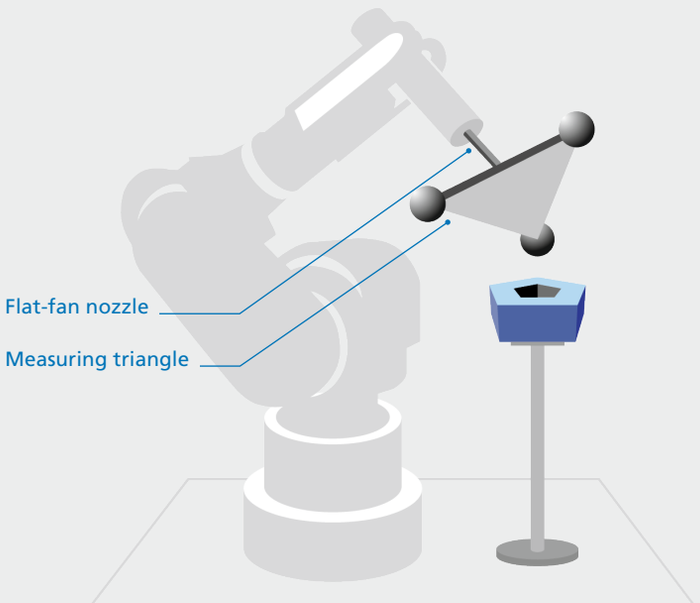
TCP MEASUREMENT (5D) WITH THE MEASURING BEAM

Tools, e.g. milling tools, screwdriver or water jet cutters have a defined movement direction. This will be measured exactly with the measuring triangle that has been assembled perpendicular to the movement direction.

The TCP can be moved user-defined along the movement direction by entering an offset value. With tool:in you will be able to manage several displacements along the movement direction and attribute each to one tool.

The procedure is ideal for use in joining processes, enabling the position and puncturing direction of drill holes to be determined.

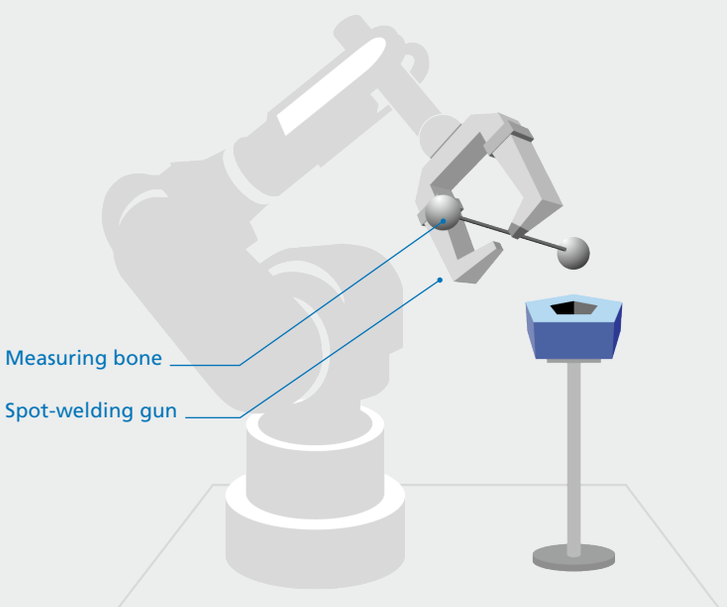
If the orientation of the jet's direction of movement (e.g. with flat-fan nozzles for seam sealing) is critical, then use the measuring triangle for a complete 6D measurement.



MEASUREMENT OF THE DIRECTION OF MOVEMENT (6D) WITH THE MEASURING TRIANGLE

The measuring triangle is installed perpendicular to the direction of movement.
The measuring balls on the equilateral triangle are measured one after the other. With the three measurements, the centre of gravity and the surface normal are calculated. The centre of gravity represents the TCP and the surface normal the direction of movement of the robot tool.

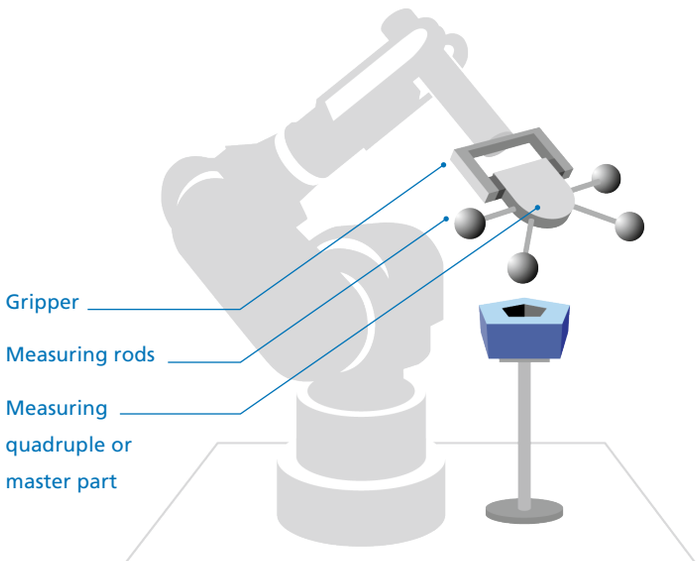
Your robot ought to weld exactly but misses the sheet metal? The solution: Use the "Bone"!

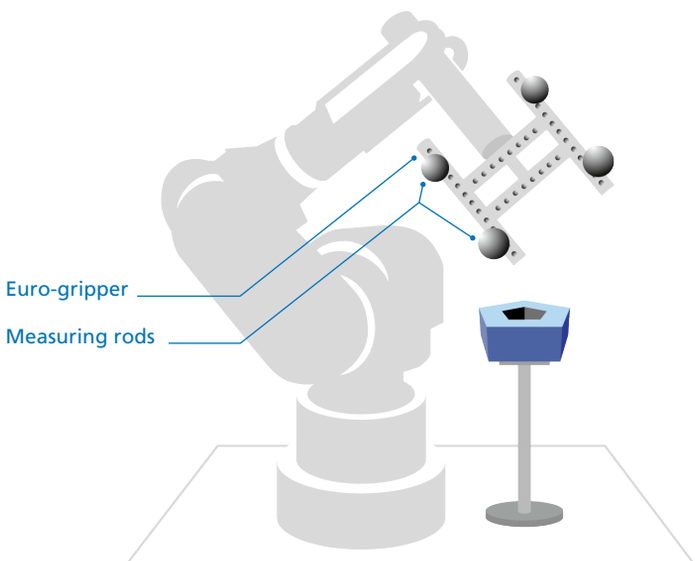


TCP-MEASUREMENT (3D) WITH THE MEASURING BONE

In narrow spot-welding electrode holders, the counter electrode prevents direct TCP-measurement as it presents a disturbing edge.
The solution is the rotation symmetrical measuring bone with two balls, which will be fitted to the electrode arm. tool:in now measures, one after the other, the two balls of the measuring bone. The TCP will be calculated from the centre of gravity of the two balls.

Has your gripper become de-adjusted? Can it not gripper the component anymore?
The solution: Use the “quadruple”.
Measure “indirectly” – that gives you directly a better result!





MEASUREMENT OF A GRIPPER (6D) WITH THE MEASURING QUADRUPLE

The LaserLAB works very tricky with tool:in, if you want to measure a gripper, e.g. after a mechanical change: Here, instead of the gripper, the gripped measuring quadruple is measured and this supplies the unknown transformation from the component to the flange coordinate system of the robot. This can be transmitted into the robot control so that the robot automatically moves to the correct working points.

Your advantage: You measure the gripped component and with this every inaccuracy of the gripper that can occur between the flange and the component! Teach-in repetition will be dropped completely!

Component jigs (e.g. Euro-grippers) attached to the robot flange can also be measured directly by means of four mounted measuring rods. A measuring quadruple is not necessary.

THE PROCEDURE IN DETAIL

A measuring quadruple is a rigid device with four measuring balls that can be gripped by a gripper. The measuring quadruple will be gripped likewise the component. The measuring balls of the quadruple will be measured successively. The measured ball coordinates are then the actual values of the ball positions. The numerical values of the nominal values of the ball positions will now be entered. They can be taken from different sources:

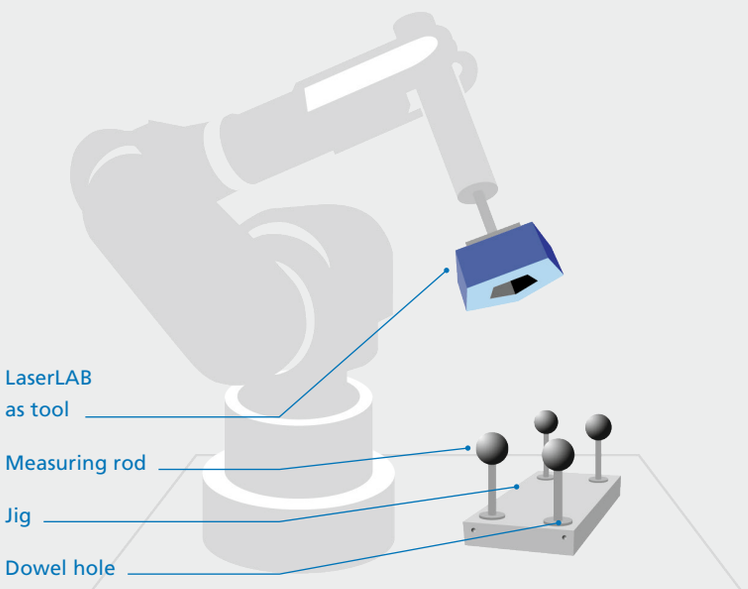
- Design data (absolute coordinates)
- Measurement by a superior measuring system, e.g. in the measuring room (absolute coordinates)
- Measurement with LaserLAB and robot (relative coordinates)

The required transformation into the flange coordinate system will be determined by correlating the measured actual values with the known nominal values.

BASE MEASUREMENT WITH BASE:IN

Does your robot grip into an empty space instead of picking up the component?
Do your robots not work exactly any more, even though everything should fit?
Then, most likely the base is incorrect... High time for LaserLAB and base:in!

The goal of measuring the robot base (base measurement) is determining the transformation from the work piece into the coordinate system of the robot. This is especially important for off-line programming, duplication of the robot programs, as well as relocating of robot plants. With base:in you can exactly measure the devices (stations), as well as external, stationary tools e.g. electrode holder and gluing jets.



YOUR ADVANTAGE

- Costly teach-in can be dropped
- Relocating of production plants can be carried out quicker
- Duplication of robot programs is possible
- Measuring tilted stations
- Measuring external, stationary tools
- Measuring linear axes
- Comprehensible due to measurement reports
- Non-contact and quick measurement
- Easy and safe to operate!
- Time required < 15 min
- Long downtimes will be avoided!

HOW IT IS DONE

Attach the measuring system LaserLAB to the robot hand and screw the measuring rods into the provided dowel holes in the device. Now measure the measuring balls by running a teach-in robot program or moving the robot manually. The searched transformation can be calculated on the basis of the measured values, which then can be transferred into the robot control by pushing a button.

Furthermore, you can measure stationary tools – such as glue nozzles or fixed milling cutters – and determine their movement direction by using the WIEST-measuring beam. The measuring sequence stays the same.

COMPATIBILITY

- ABB
- Comau
- Fanuc
- Kuka
- Mitsubishi
- Yaskawa
- Stäubli

base : in

SUCCESS BY FLEXIBILITY – APPLICATIONS

INITIAL OPERATION

The geometric base measurement of the robot before initial operation guarantees successful application of off-line generated production programs on real robot plants.

If you want to replace a robot, a new measurement also makes sense; especially, if the robot has not been dowelled at its working location and the same robot position cannot be guaranteed.

MAINTENANCE

If there is a crash with devices, displacements of it may occur; especially, if it has been manufactured as a lightweight construction. In such cases, the LaserLAB in combination with base:in has proved itself: Quick and automated measuring of the base transformation guarantees minimum downtimes compared with conventional methods!

DUPLICATION OF ROBOT PROGRAMMES

Do you have a manufacturing line with several identical robot plants? Then make full use of synergy effects with base:in!
For this purpose, the robot programs will be programmed on one plant and transported to the parallel robot plants. As the locations of the stations are lightly different in every plant, an exact base measurement for every single plant is necessary.

RELOCATING ROBOT PLANTS

Usually, the robot plants are at first installed, programmed and tested by the manufacturer in their own premises. Only after this, they will be transported to the end customer and finally installed. If you, as a manufacturer or operator of the plant, use LaserLAB and base:in, you can significantly speed up the initial operation, as automated measuring of the stations can be carried out. A manual teach-in repetition of room points – and therefore unnecessary waiting time to the initial operation – will be fully dropped!

THE PROCEDURE IN DETAIL

Together with the LaserLAB, the robot forms a contact-free coordinate measuring machine. The measuring rods in the robot coordinate system will be measured one after the other. The measured ball coordinates represent the actual ball positions. Now, the numerical values of the nominal values of the ball positions have to be entered.
They can be taken from different sources:

- Design data (absolute coordinates)
- Measurement by superior measuring system, e.g. in the measuring room (absolute coordinates)
- Measuring with LaserLAB and the robot (relative coordinates)

The required base transformation will be determined by correlating the measured actual values with the known nominal values.

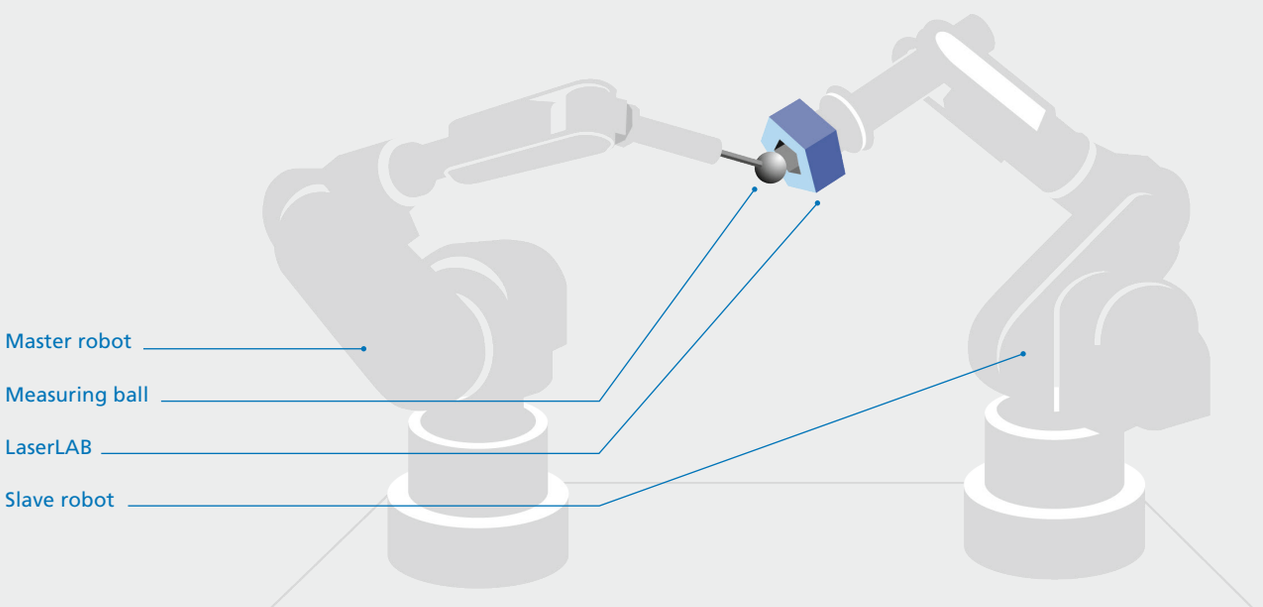
MEASUREMENT OF COOPERATING INDUSTRIAL ROBOTS WITH KIR:IN

Will your component be rotated and turned with additional axes during processing?
Or are you already using cooperating industrial robots?
Then, LaserLAB with kir:in will help you!

The goal of measuring additional axes in robot plants is improving the accuracy of the whole processing procedure. This is especially important, if e.g. work pieces will be processed in motion. The advantage of this new technology is high efficiency, as intermediate transportation steps can be completely dropped. From a simple rotary table to the cooperating robot: With LaserLAB and kir:in, you can exactly measure this production mode of the future!

YOUR ADVANTAGE

- Clear improvement of the accuracy
- Measurement of turn/ tilt tables and positioners
- Measurement of cooperating robots
- Standardised measurement
- Non-contact measurement
- Quick initial operation of plants
- Ideal prerequisite for successful offline programming



HOW IT IS DONE

By using LaserLAB and kir:in for measuring directly inside the robot cell, you will get a common coordinate system, inside which the kinematics are moving. The additional axes will be measured with the aid of the measuring system. For this, simply attach the LaserLAB to the additional axes and the measuring ball to the robot. If you want to measure cooperating robots LaserLAB will be attached to the slave robot and the measuring ball to the master robot.

COMPATIBILITY

- ABB
- Fanuc
- Kuka
- Yaskawa

WIEST AG
KALIBRIERSYSTEME

SUCCESS BY COOPERATION – APPLICATIONS

INITIAL OPERATION

Do you want to use cooperating robots? Do you want to prevent errors and collisions right from the beginning? Then measure with LaserLAB and kir:in already before the first initial operation: You will receive a common coordinate system of the kinematics – and this with very high accuracy.

MAINTENANCE

Has there been a crash of cooperating robots in your processing cell? The additional axes must be measured again because the synchronous editing process is not accurate enough? With LaserLAB and kir:in you are able to measure the common coordinate system of the kinematics quickly and exactly. In this way, your production programmes will operate smoothly again after a short period!

THE PROCEDURE IN DETAIL

LaserLAB and kir:in operate in a semi-automatic measuring procedure. For this, proceed as follows:

Move the measuring ball with the robot into the visibility area of LaserLAB and then operate the button “Control”. The robot with the measuring ball will be automatically moved to the origin of the measuring system. Subsequently, a measurement will be triggered. The control is only able to operate, if the ball has already been measured. Now move the additional axis/axes with the attached LaserLAB. Again, move the measuring ball into the visibility area of the measuring system and press the button “Control”. The robot with the measuring ball will again automatically be moved to the origin of the measuring system and a second measurement will be triggered.

Already after 4 measurements, you will receive a first calculation of the common coordinate system. In order to improve the accuracy, you may carry out further measurements. In this case, take into account that: The larger the distance is between the single measurements, the better the result will be. After the measurement you can transfer the common coordinate system into the robot control by pushing a button.

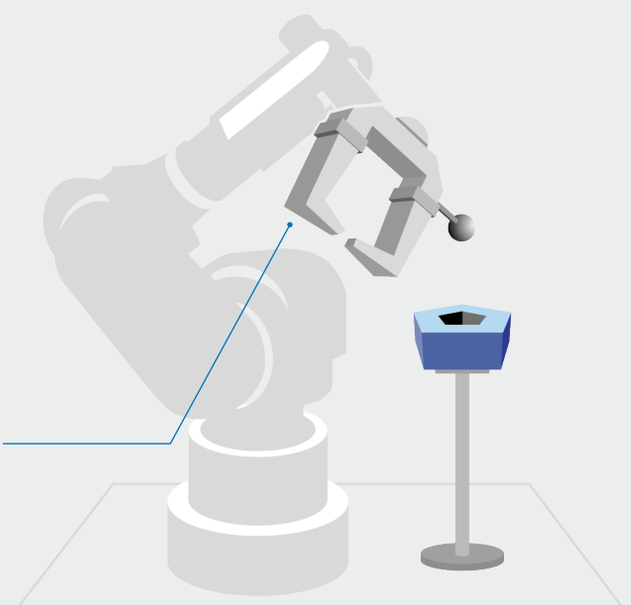
MEASUREMENT OF THE TEMPERATURE DRIFT WITH TEMP:IN

**Do you grind, hone and debur with the aid of industrial robots?
Do your processes need a high long-term stability, e.g. because measuring of quality characteristics is carried out with robot support?
Then, LaserLAB with temp:in will help you!**

If metal is heated, it expands and shrinks, if it is cooled. It is already sufficient, when a hall gate is opened during the manufacture or the robot arms warm up after a certain time. This can be fatal for high-accuracy applications as even smallest deviations lead here to faults. The consequences are that the specified tolerances cannot be reached and there will be high scrap quotas. Therefore, the goal of the measurement with LaserLAB and temp:in is the continuous compensation of modifications of the robot kinematics due to temperature changes. The modifications are compensated by continuous measurements without having to stop production.

YOUR ADVANTAGE

- Permanent drift compensation
- On-line compensation, directly in the robot control
- Quick measurement, due to this, no extension of cycle time
- Integrated temperature sensor
- Recording of the temperature changes
- No scrap due to temperature drift



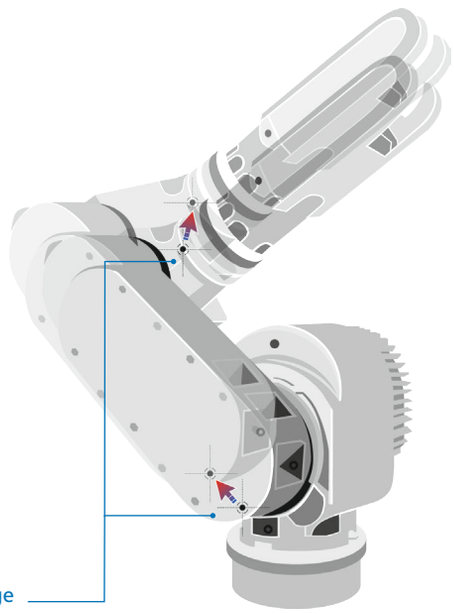
HOW IT IS DONE

LaserLAB and measuring ball will be rigidly fixed in the robot plant. temp:in is a permanent part of the application and will be called up cyclic. Your production will not be influenced by the measuring procedure, as it is carried out during the feed time of the components. The calculation of the robot parameters is carried out continuously after every measuring sequence. All kinematic modifications of the robot kinematics will be recorded by measuring, fed into the robot and compensated immediately.

KOMPATIBILITÄT

- ABB
- Fanuc
- Kuka
- Yaskawa

SUCCESS BY PROCESS STABILITY



The measuring system LaserLAB offers high process stability, as it has no measurable temperature drift in the temperature range from 0° to 55°C. Expansions in length of the measuring device holder will be calculated and compensated with the aid of the temperature sensor. Due to this, LaserLAB is the fixed point, which stays unchanged even if everything else starts “floating”.

THE PROCEDURE IN DETAIL

When installing LaserLAB and temp:in, initially the measurement positions will be set, within which a prefabricated robot programme will be checked for freedom from collision and will be adjusted in case it is required. After this, a basic calibration will be carried out. The measuring system, as well as the measuring ball will be measured into the plant during calibration.

As the last step of the initial operation, the so called “mastering” is carried out. Here, reference measurements will be carried out and permanently stored. Mastering serves to, implicitly, store the actual status of the robot kinematics in the form of measured values.

temp:in will be simply called-up by a function call-up with split parameter from the application. The split parameter determines the number of measurements per cycle. It will be set in such a way that the measuring cycle can take place during the feed time of the components. This guarantees that the cycle time will not be prolonged.

The system is now fully integrated into the production sequence. Changes in length that occur due to temperature changes will be measured automatically and the calculated kinematics parameter will be transferred automatically into the robot control. The inverse kinematics of the robot then makes sure that the room points will be maintained unchanged.

Do you have any questions? Do you search a customized solution?
Then contact us – we will be glad to help you personally!

WIEST AG
KALIBRIERSYSTEME
info@wiest-ag.de
www.wiest-ag.de