PRODUCTS & SERVICES

PRECISION MEETS **PERFORMANCE**

Measuring services
Measuring systems
Artefacts and reference standards
Measuring adapters

aimess

METROLOGY GUIDE

aimess

Image: Wirtschaftsinitiative für Mitteldeutschland / Arved von zur Mühlen

PRECISION
AS A RECIPE FOR SUCCESS

When a vocation develops from passion, undreamed of forces are unleashed: The force that brings new product ideas to life. The force that yields added value in the field of industrial metrology. And the force to develop smart solutions for complex measuring tasks; solutions that deviate from the norm.

As an industrial measurement services provider whose practical know-how is applied to the development of innovative measuring equipment, Aimess has created a niche for itself in the market of portable metrology solutions.

Innovation management plays a key role in our business because new market products, progressive measuring concepts and refined product developments constitute about 40 percent of sales turnover. Aimess' flagship is its patented 3D infrared scanner, R3Dscan, which has thus far profited from some 30,000 hours development time.

The numerous awards which we have received for it up until now, including the 2013 IQ Innovation Prize and the 2013 Bestform Award, stand as proof of the outstanding work performed by the entire Aimess Team. Because the path-finding new developments would not have been possible without our competent employees, who are always ready to go that extra mile in helping our customers with their individual projects while remaining pragmatic and focussed on the essential. Uncomplicated management structures, a high level of creative freedom and an open communications culture form the basis upon which metrological problems are converted to trendsetting results.

Focussed on customer benefits

The more unconventional the idea, the more important is a structured project approach. Whether it is a question of precisely digitising an entire aircraft or the series measurement of light weight construction components, thanks to the perfect symbiosis of service orientation and development know-how, Aimess engineer-designed full spectrum solutions fulfil any customer requirements with élan.

Whether in automotive engineering, the aerospace industry, marine engineering or mechanical engineering and plant construction, well-known companies from across the world rely on Aimess' competence. Because we think outside the box. Because we have high-performance optical and tactile measurement systems available, that bring prototype development to a new level. And because we offer every customer the best possible advice. Turning precision into a recipe for success, both for you and us.

Yours sincerely,

David Nabs

Hendrik Richter

HENDRIK RICHTER AND DAVID NABS

MANAGING DIRECTORS AND FOUNDERS OF AIMESS SERVICES GMBH AND ITS SUBSIDIARY AIMESS PRODUCTS GMBH.

TURNKEY **SERVICE PROVISION** IS OUR SPECIALITY.

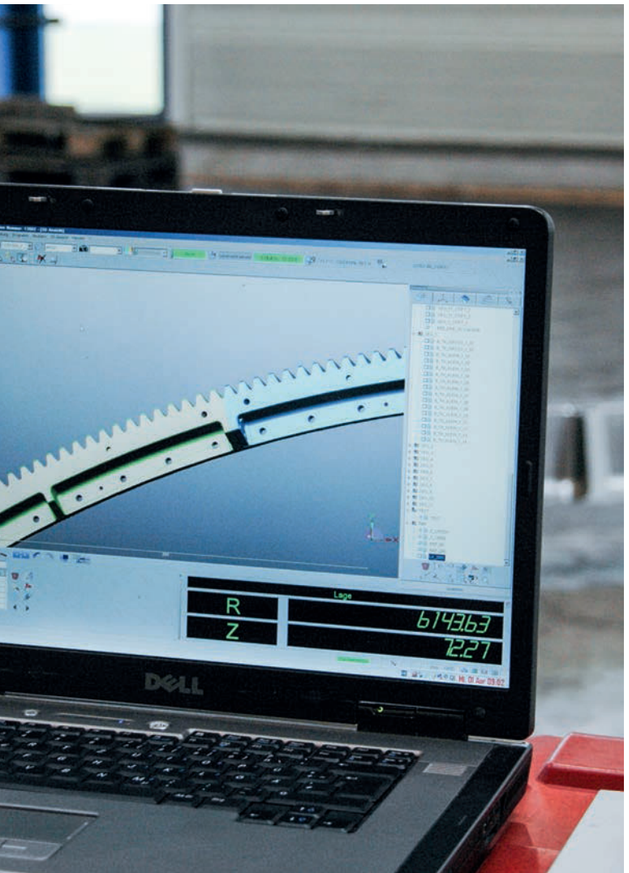
AS AN INDEPENDENT SERVICE PROVIDER IN THE FIELD OF HIGH-END INDUSTRIAL METROLOGY AIMESS SERVICES WORKS FOR CUSTOMERS FROM ACROSS THE GLOBE. ALWAYS FLEXIBLE. ALWAYS RELIABLE. AND ALWAYS LEADING THE PACK.

MEASURING SERVICES

FROM PROTOTYPING THROUGH TO SERIES PRODUCTION

From prototype digitisation through to the layout of sites and series production inspection, Aimess Services will provide you with just the metrology support that you need. On-site and using a wide range of measuring technologies. Our engineers don‘t only have an extensive technical knowledge about optical and tactile measuring systems, they are also experts when it comes to the different requirements of individual industries. Numbered amongst the long-term customers of Aimess Services are well-known vehicle manufacturers, the aerospace industry, shipbuilders, the steel industry, mechanical engineering and plant construction, their suppliers and the renewable energy sector.

Amongst our strengths is the ability to accept technical challenges and implement them based on high quality and innovative ideas.



Motivation

It is primarily the strong innovative force, which differentiates us from others. An example: In cooperation with well-known German industrial companies Aimess Services has developed a measuring process which makes it possible to measure castings so that the existence of defects can be excluded in the foundry before final machining. This new procedure saves time and results in a significant reduction in rejects. The overall production process is made more reliable, output quality is increased.

Measuring technologies

Dependent on the measuring task, we use a range of measuring instruments, including laser interferometry systems, absolute distance measuring systems, laser based profile measuring systems, angle measuring systems, laser trackers, multi-ply articulated arms, scanners with T-probe/TScan/T-Mac, stationary coordinate measuring instruments and multiple combined 3D systems.

Measuring technology consultancy

Seen from the point of view of a measurement services provider, we provide you with manufacturer-independent, comprehensive advice based on our years of practical experience. As a measurement services provider, we know how best to approach measuring tasks. And of course we don‘t shy away from complicated tasks. We have the know-how to resolve specific measuring tasks and are versed in the development of turnkey measuring systems.

Services provided

- Process consultancy
- Measurement uncertainty consideration
- Measuring concept creation
- Benchmarking
- Testing of measuring systems
- Employee qualification

Process consultancy: Based on practical experience for practical implementation

We support you in all phases of the measuring process, amongst other things safeguarding the process stability and process compatibility of all measuring resources while helping to create tight control loops and transparent structures.

Advice on coordinate measuring technology

Our specialists will quickly provide you with proactive and competent advice on all aspects of coordinate measuring technology, e.g. benchmarking, measuring systems tests, planning of individual measuring concepts and employee qualification.

MEASURING SERVICES

FROM PROTOTYPING THROUGH TO SERIES PRODUCTION

Reverse engineering

Aimess Services produces highly accurate scans of your components, from coin-sized samples through to man-sized castings and up to complete aircraft. To do so, we exclusively use the latest scanning systems that can measure even the most complex geometries clearly and in a contact-free manner.

Thanks to our new infrared scanner R3Dscan we are even able to digitise transparent, dark or reflecting surfaces without spraying or using stick-on markers. In contrast to tactile measuring processes, where the object surface must be sensed point by point, several million points are measured simultaneously with scanning devices. In this way CAD data can be easily generated, e.g. from old parts or prototype parts.

Services provided

- Digitisation of parts or complete products/tools
- Parametrised traceability
- Creation of CAD models
- Design/actual comparison

Contract metrology

Aimess performs contract measuring work for companies without 3D measuring systems or companies that temporarily do not have sufficient in-house workpiece measuring capacity.

Whether it is to check the dimensional accuracy of first samples or random inspection of series parts, our engineers always select the most appropriate technology for the measuring task and upon completion of the measuring produce a comprehensive report.

Services provided

- First sampling
- Series measurements
- Programming
- Digitisation
- Shape, surface and outline measurement
- Surface traceability

Inspection & calibration

Whether calibration of the production facilities or inspection of the finished workpieces, the aim is always adherence to the perfect geometry.

As an experienced measurement services provider, Aimess covers all the calibration and inspection tasks that arise in the industrial environment. With our large range of 3D measuring systems we are fully able to take measurements in-situ, even under rough production conditions. This avoids the time-consuming transport of individual components to stationary coordinate measuring machines or even more remote measuring rooms.

Aimess experts always follow the requirements and wishes of the customer without compromise when performing geometrical measurements.

Which means we always find the best solution – and that includes your measurement task.

Inspection, basic calibration and certification of production facilities

- Device and tool measuring
- Robot cell calibration/robot measuring
- Compensation measurements/determination of machine deviations
- Periodic testing, equipment checks
- Adjustment of printing machines
- Measuring and alignment of particle accelerator systems
- Measuring of rotary kilns

Component inspection

- Sheet metal part measuring
- Layout of castings
- Component deformation measurements
- Sheet metal part approval as part of quality assurance

Repeatability and accuracy studies

- Fixing of sheets or plates in devices
- Rotary table checks
- Robot positioning accuracy
- Machining capability study

WE SEE,
WHAT YOU DON‘T SEE.

PURE PRECISION IS NOT ENOUGH. OUR MEASURING SYSTEMS ARE FIRST AND FOREMOST INTELLIGENT. BECAUSE THEY SEE WHAT OTHERS CAN‘T. IN THIS WAY AIMESS‘ PRODUCTS CREATE REAL ADDED VALUE FOR YOU AND YOUR COMPANY.

MEASURING SYSTEMS

3D-INFRARED SCANNER R3DSCAN

Aimess has developed a unique measuring method with which transparent, dark and reflective objects can be scanned without surface treatment. R3Dscan, a novel fringe projection system using infrared light, obviates any need for pre-treatment of the measure-

No spraying, no stick-on markers for transparent, dark or reflective objects.

ment object. In contrast to the white-light scanners that are normally used for the measurement of 3D surface data, R3Dscan from Aimess does not analyse the reflection, rather it analyses the energy that is absorbed and converted into heat by the measured object. The heat is in turn recorded by the system using an infrared detector.

Since the surface properties are practically irrelevant for the Aimess patented process, the infrared scanner enables precise scanning of transparent, dark or reflective surfaces, without any necessity for prior spraying of the measured object.

Thanks to R3Dscan, it is not just spraying that is now unnecessary, there is also no need for the time-consuming application of markers. Thanks to highly precise positioning, different views of a measurement object can be combined into a complete data set.

System configuration

The R3Dscan is a complete system combining both hardware and software and comprising infrared projector, infrared detector, control and analysis unit plus analysis software developed by Aimess. To achieve the maximum possible projector radiation intensity, the system makes use of a special CO_2 laser that generates an invisible infrared beam.

This type of laser is widely used in material processing (e.g. cutting, engraving). No safety measures are necessary for operation of the device because the complete system is classified laser class 2M.

Operation free from temperature and ambient light influences

In addition, the system has been demonstrated to be insensitive to ambient light. Not only that, the temperature of the workpiece or the environment is irrelevant to measurement accuracy with the R3Dscan delivering highly accurate measurements under all light and temperature conditions.

Application areas

As spraying is no longer a requirement, the infrared scanner offers many new opportunities for fast manufacturing quality control. Thus for example, the system can be used directly in the production line, with object inspection integrated in the production cycle. And of course, the R3Dscan is ideal when objects must be digitally scanned and 100% cleaning after spraying is a requirement but cannot be guaranteed. Moreover components made from transparent laminates such as carbon fibre reinforced plastics and GRP as well as varnished or painted glass workpieces can also be scanned without surface treatment.

Manufacturer
Aimess Services GmbH

Resolution
640 x 512 or 1.280 x 1.024 pixels

Field of view
90 x 70 mm to 250 x 250 mm, larger upon request. Bigger scans can be created by registration of multiple different patches.

Image acquisition frequency
300 Hz, 3D evaluation corresponds to 1/15 FPS

Exposure time
0.5 s (per individual shot)

Sampling rate
0.3 MPOINTS/15 s (or megapixel camera 1.2 MPOINTS/15 s)

Accuracy
1/5,000 of the diagonal of the measurement area in accordance with VDI 2634

Ambient conditions
No sensitivity to ambient light. The temperature must be constant for a partial cycle (approx. 1 sec.)

Type of laser
CO_2

Laser class
2M

CAD data comparison
IGES, STEP or according to customer requirements

Total system weight
ca. 30 kg

Power supply
100–240 volt AC

WE MAKE IT ACCURATE,
VERY ACCURATE!

ADMIT IT: ARTEFACTS SEEM UNREMARKABLE, BUT THE FIRST IMPRESSION IS MISLEADING. OUR INTELLIGENT CFRP BARS, SPECIALLY DEVELOPED FOR HIGHLY PRECISE TRACEABILITY AND MONITORING OF MEASURING SYSTEMS, ARE THE RESULT OF MANY YEARS' RESEARCH & DEVELOPMENT.

ARTEFACTS AND REFERENCE STANDARDS
FOR STATIONARY AND MOBILE MEASURING SYSTEMS

Standards and artefacts form the backbone of the measuring chain from the product through to the national standard which safeguards the implementation of the SI system of units. The function of the artefacts and standards can be subdivided into two areas:

Artefacts suitable for flexible and mobile deployment reduce the costs of initial and periodic calibration.

Traceability and monitoring. Whether for traceability or periodic monitoring, the artefacts used must ideally not only be easy to use, but also be flexibly deployable for a range of different measuring systems. Based on these requirements Aimess has developed a universal and QM-suitable artefact concept that covers the widest possible range of applications.

Traceability

Traceability must ensure that all values determined anywhere in the world using measuring instruments are using the same benchmark. This requirement is described in quality management standards such as the ISO 9000 series of standards or ISO TS 16949. According to this, the standard is used to transfer the unit of measurement from the higher level (i.e. more accurate) measuring agency to the next level. In this respect, the properties of the standard, e.g. contour accuracy, stability and surface characteristics, must fulfil the requirements of the calibrating agency in respect of measurement uncertainty.

Typically measured quantities are represented with maximum accuracy in national metrological institutes (in Germany this is the Physikalisch-Technische Bundesanstalt or PTB). The measured quantity is transferred to a calibration laboratory or a calibration service provider by means of a suitably high quality standard. The latter then uses this standard to calibrate the measuring instrument at the manufacturer. In doing so, internationally recognised calibration rules, e.g. of the DKD, the DAkkS are used or the guideline VDI/VDE 2618 is implemented. In this way the unified system of units is “transferred down” to the workbench.

Monitoring

The second application area for artefacts and standards is for the surveillance of measuring instruments because even if a measuring system has been calibrated prior to its supply, its performance has to be checked on a regular base. This requirement is, amongst others, governed by the standards and guidelines DIN EN ISO 10360, VDI/VDE 2617 and VDI/VDE 2634.

Artefacts suitable for this application should allow for a quick testing of measuring instruments.

The flexible artefact concept from Aimess

All of Aimess‘ artefacts and standards fulfil the requirements made of them in respect of calibration (traceability) and for the monitoring of measuring instruments. As all Aimess artefacts are based on the same component, the Tetronom single bar, the user can quickly assemble their artefacts to match their requirements. In some cases, e.g. for the monitoring of optical 3D scanners, one single bar suffices for performance of the measurement.

Alternatively, it is possible to assemble the artefact from a number of single bars, for example as a tetrahedron, an octahedron or a ball bar. The conversion can be implemented in-situ with the measuring instrument under test.

The set-up only lasts a few minutes, because the targets, which are located on both ends of the single bar, are held in place using magnets. Bothersome screwing or involved fastening is thus no longer necessary.

Targets for all measuring instrument types

To cover an as large as possible application spectrum, targets are available for a wide range of measuring instrument types: Stainless steel balls for tactilely operating CMMs, matt stainless steel balls for laser scanners, special ceramics for optical systems, photogrammetric targets, etc.

Use of a mobile artefact for the example of the CMM

In general, stationary CMMs are checked at fixed intervals. To do so, measuring comparison standards (interferometers) as well as mechanical comparison standards (ball plate, ball rod) are used. These methods are worthwhile and deliver reliable information about the accuracy of the checked CMMs.

However, they are very time consuming; a duration of up to three days for an interferometric test, is not uncommon. The consequence: Very long checking intervals are then necessary, which in some cases involves intervals between tests extending to several years.

In these cases, additional testing at shorter intervals is required, especially if the CMM is subject to temperature variations. The Tetronom tetrahedron-shaped artefact is ideal for this situation because it is quickly set-up. The assembly of the six single bars and four balls is quickly performed, so that even a daily test does not take more than five minutes. Measuring with the Tetronom permits determination of the six most important CMM measurement error parameters (three measuring scale and three perpendicularity deviations).

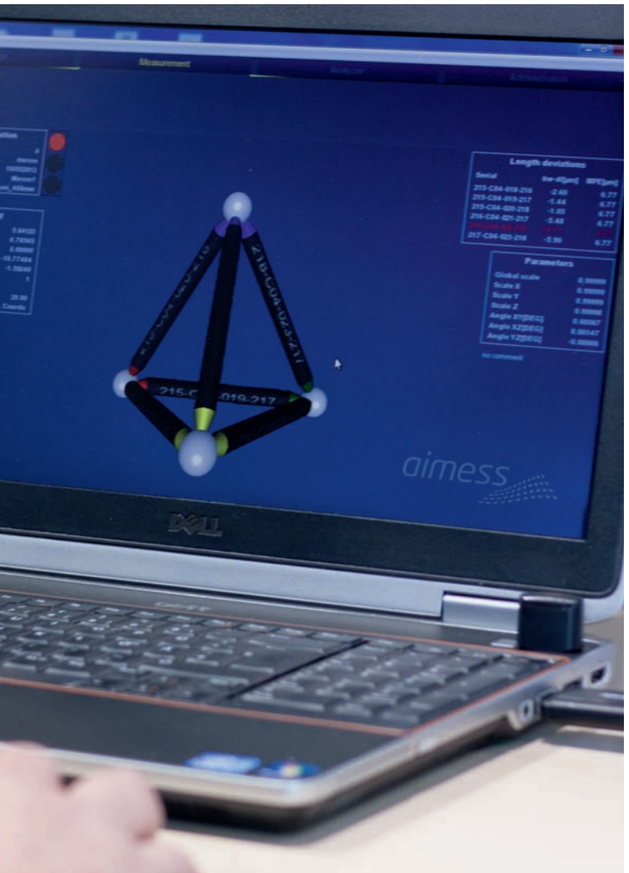
ARTEFACTS AND REFERENCE STANDARDS

FOR STATIONARY AND MOBILE MEASURING SYSTEMS

Measuring sequence of a Tetronom measurement

The assembly of the six single bars and four balls into a stable form-locking 3D artefact is performed within seconds.

The bars, balls and the 3-2-1 support are colour coded so that assembly is further simplified. When using the 3-2-1 support, care must be taken to ensure that the groove of the V docking station (YELLOW mounting) is oriented towards the RED mounting for unhindered assembly. The colours green, yellow and red of the docking stations indicate the respective degrees of freedom.



Measurement can start immediately; there is, for example, no requirement for the Tetronom to adapt to the ambient temperature. Initially, the probing system's deviation is determined by the ball that is located at the top of the Tetronom. For this purpose, 25 measuring points are recorded over the ball surface and then analysed by the Tetronom Analyzer. If the probing system is functioning correctly, the measuring scale and perpendicularity parameters are determined.

For this purpose, all four balls are measured sequentially using at least five points (one point on the pole, four points distributed one the ball's equator) and the balls' mid-points are calculated. To evaluate the CMM's deviation from perpendicularity correctly, it is important that the coordinates of the balls mid-points be known positions in the machine coordinate system.

Afterwards, the coordinates of the balls' mid-points will be read into the Tetronom Analyzer software and the CMM parameters determined and output as a report.

The entire process including set-up and dismantling can be performed in less than 30 minutes and provides the operator with comprehensive information about the essential parameters and the accuracy of their CMMs.

Tetronom single bar

The basis of all artefact configurations is provided by a single bar made of carbon fibre reinforced plastic (CFRP), each bar having two target mounts. Interchangeable targets are attached with magnets to these mounts which allow tactile as well as optical measurements. The targets are characterised by very high manufacturing accuracy.

Thanks to its construction, the Tetronom single bar is very light, yet very robust. The target mounts are patented, self-compensating heads which ensure the bar remains constant in length despite temperature fluctuations.

Each Tetronom single bar is supplied with a calibration certificate, on which the exact lengths and measurement uncertainties of the single bar are specified. This fulfils the requirement for traceability back to the national length standard and the Tetronom single bar can be used as a reference standard.

Available lengths
From 100 mm to 3,000 mm side length in 100 mm steps, special lengths upon request

Supported technologies
Coordinate measuring machines (CMM)
Theodolite measuring systems
Precision tachymeter
Measuring arms
Laser trackers
Laser radars
Scanning systems
Tactile online photogrammetry
Optical online photogrammetry
Offline photogrammetry
Machine tools
Robots

Targets
Stainless steel balls for tactile CMMs
Matt stainless steel balls for scanning systems
Ceramic balls for white light scanners, tactile CMMs and laser scanners
Targets for photogrammetric systems

Target sizes
38.1 mm and 50 mm
larger upon request

Calibration
DAkkS or manufacturer's calibration

ARTEFACTS AND REFERENCE STANDARDS

FOR STATIONARY AND MOBILE MEASURING SYSTEMS

Tetronom

The Tetronom, which comprises six individual bars, is a 3D artefact with a tetrahedral shape. Due to its 3D design, the Tetronom enables very efficient testing of 3D measuring machines and machine tools. With just one set-up, probing deviations as well as measuring scale and perpendicularity conditions can be checked. Furthermore, it allows direct comparison of different measuring systems.

Areas of application

The Tetronom is most appropriate for rapid and reliable periodic testing as well as measurement system analysis and testing in respect of temperature behaviour. Due to its shape and the materials used, the Tetronom fulfils all the requirements for artefacts according to the VDI/VDE guidelines 2617 and 2634, and the standard DIN EN ISO 10360.

Targets

You can find details about targets and accessories from page 26.

Available lengths
From 100 mm to 3,000 mm side length in 100 mm steps, special lengths upon request

Supported technologies
Coordinate measuring machines (CMM)
Theodolite measuring systems
Precision tachymeter
Measuring arms
Laser trackers
Laser radars
Scanning systems
Tactile online photogrammetry
Optical online photogrammetry
Offline photogrammetry
Machine tools
Robots

Targets
Stainless steel balls for tactile CMMs
Matt stainless steel balls for laser scanners
Ceramic balls for white light scanners, tactile CMMs and laser scanners
Targets for photogrammetric systems

Target sizes
38.1 mm and 50 mm
larger upon request

Calibration
DAkkS or manufacturer‘s calibration

Scope of delivery
Six single bars, transport case, calibration certificate with exact lengths and measurement uncertainties of the single bars,

Optional: Tetronom Analyzer analysis software for quick target/actual comparison of the measurements

Oktonom

The Oktonom, which comprises twelve individual bars, is a 3D artefact with an octahedral shape. With just one set-up, probing deviations as well as measuring scale and perpendicularity conditions can be checked. In comparison with the Tetronom, the validity of this artefact in respect of the Z-component is increased because rather than only one ball being measured three balls separated in space are now measured.

Areas of application

The Oktonom is most appropriate for rapid and reliable periodic testing as well as measurement system analysis and testing in respect of temperature behaviour. Due to its shape and the materials used, the Oktonom fulfils all the requirements for artefacts according to the VDI/VDE guidelines 2617 and 2634, and the standard DIN EN ISO 10360.

Targets

You can find details about targets and accessories from page 26.

Available lengths
From 100 mm to 3,000 mm side length in 100 mm steps, special lengths upon request

Supported technologies
Coordinate measuring machines (CMM)
Theodolite measuring systems
Precision tachymeter
Measuring arms
Laser trackers
Laser radars
Scanning systems
Tactile online photogrammetry
Optical online photogrammetry
Offline photogrammetry
Machine tools
Robots

Targets
Stainless steel balls for tactile CMMs
Matt stainless steel balls for laser scanners
Ceramic balls for white light scanners, tactile CMMs and laser scanners
Targets for photogrammetric systems

Target sizes
38.1 mm and 50 mm
larger upon request

Calibration
DAkkS or manufacturer‘s calibration

Scope of delivery
Twelve single bars, transport case, calibration certificate with exact lengths and measurement uncertainties of the single bars,

Optional: Tetronom Analyzer analysis software for quick target/actual comparison of the measurements

ARTEFACTS AND REFERENCE STANDARDS

FOR STATIONARY AND MOBILE MEASURING SYSTEMS

Tetronom ball bar

The Tetronom ball bar consists of a supporting body, one or more CFRP tripods and any number of ball bar elements (Tetronom single bars). The supporting body made of CFRP is the basic structure where docking sta-

tions for the targets can be arranged in any order. The Tetronom single bars are also attached with magnets to the docking stations in a stress-free manner. Consequently, changes in length caused by system stresses are excluded.

Mounting of the Tetronom ball bar is implemented using steady, height-adjustable tripods so that all spatial alignments can be achieved. Displacement of the artefact within the measuring volume can be effected within a couple of minutes.

Areas of application

The Tetronom ball bar complies with the requirements of the VDI/VDE guideline 2617, 2634 and DIN EN ISO 10360. Large CMMs can be approved and inspected with this artefact. The Tetronom ball bar can also be used for mobile measuring devices such as portable measuring arms or laser trackers.

Available lengths of the base body
500 mm to 15,000 mm

Bar length (ball distance)
100 mm to 3,000 mm

Applicable vertical height
500 mm to 3,750 mm (length dependent)

Supported technologies
Coordinate measuring machines (CMM)
Theodolite measuring systems
Precision tachymeter
Measuring arms
Laser trackers
Laser radars
Scanning systems
Tactile online photogrammetry
Optical online photogrammetry
Offline photogrammetry
Machine tools
Robots

Targets
Stainless steel balls for tactile CMMs,
Matt stainless steel balls for laser scanners
Ceramic balls for white light scanners, tactile CMMs and laser scanners
Targets for photogrammetric systems

Weight
Approx. 3.5 kg/m including base bodies and spacer bars with a bar length of 400 mm

Length of components
1,300 mm standard module / 300 mm to 3,000 mm add-on module

Length for transport
for a ball bar of 7,500 mm incl. accessories
the dimensions of the carry case are
1,560 mm x 500 mm x 225 mm

Calibration
DAkkS or manufacturer‘s calibration

Tetronom Analyzer

Different parameters can be deduced from measurements with the Tetronom single bar, the Tetronom, Oktonom or the Tetronom ball bar.

Aimess developed the Tetronom Analyzer software for quick target/actual comparison of these parameters. For the first time Tetronom Analyzer offers a visual 3D portrayal of artefacts, thus enormously simplifying the allocation of individual measurement points and operation of the software. Additionally, the software HMI has been completely revised and embedded in a modern design, making it much more user-friendly.

The software is suitable for all companies that monitor their mobile or stationary 3D measuring instruments using artefacts. Moreover, the customer base includes measurement service providers, calibration laboratories and the manufacturers of CMMs.

You can purchase Tetronom Analyzer from Aimess either as a stand-alone product or together with a number of artefacts.

The software is protected by a hardware dongle and is supplied with a user manual.

Scope of operation

- Management of multiple measuring instruments
- Management of multiple artefact configurations (Tetronom single bar, ball bar, Oktonom etc.)
- Saving of all measured and calculated data in a database with multi-user access
- Graphic and alphanumeric representation of the results (e.g. trend analysis, measurement uncertainty diagram) according to standards and guidelines (DIN EN ISO 10360 and VDI/VDE 2617/2634)
- Visual 3D portrayal of artefacts, thus enormously simplifying the allocation of individual measurement points and operation of the software.
- Quick evaluation of the test measurement (red/green statement)
- Simple interpretation of the results (traffic light function)
- Integral user help (Tetronom wizard) for set-up, measurement and analysis
- Calculation of deviation parameters
- Preparation of analysis reports

ARTEFACTS AND REFERENCE STANDARDS

FOR STATIONARY AND MOBILE MEASURING SYSTEMS

Targets

Target is the general term for different types of balls that can be mounted on the ends of the Tetronom single bars. There are different targets for different measuring instruments. The following targets are available for Aimess artefacts:

Retro-target

Target with white or retro-reflective target markers for measurements using photogrammetric systems.

Stainless steel balls

Stainless steel balls are suitable for tactile measuring systems. Our stainless steel balls are corrosion resistant. The ball‘s mid-point is determined by a ball measurement.

Matt stainless steel balls

Matt stainless steel balls are suitable for the same applications as ceramic balls and are suitable for laser projection systems and laser line scanning systems.

Ceramic balls

Ceramic balls for measurements with optical, area scanning systems on the basis of white light fringe projection or laser scanners, as well as for tactile systems. Compared to ceramic balls made from aluminium oxide, our special ceramic has the advantage that it can be directly measured without extra pre- or post-treatment under widely varying light conditions. The superiority of the special ceramic balls in comparison with conventional ceramic balls is proven by their use in the benchmarks of numerous measuring instrument manufacturers and their customers. The surface is diffusely scattering and complies with the guideline VDI/ VDE 2634. The sphericity precision is < 2 µm.

Laser tracker reflectors

It is also possible to use laser tracker reflectors instead of balls, so that the ball mid-point can be directly measured.

Available sizes
The standard diameter of the targets is either 38.1 mm (1.5“) or 50 mm (1.96“). Smaller and larger diameters are also available as an option.

Product	Product no.
Retro-target, Ø 38.1 mm	200 160 0038
Stainless steel ball, Ø 38.1 mm	200 130 0038
Stainless steel ball, Ø 50.0 mm	200 130 0050
Matt stainless steel ball, Ø 38.1 mm	200 140 1038
Matt stainless steel ball, Ø 50.0 mm	200 140 1050
Ceramic ball, Ø 38.1 mm	200 120 0038
Ceramic ball, Ø 50.0 mm	200 120 0050
Ceramic ball, 1x hole, Ø 38.1 mm	200 121 0038
Ceramic ball, 1x hole, Ø 50.0 mm	200 121 0050
Ceramic ball, 2x hole, Ø 38.1 mm	200 122 0038
Ceramic ball, 2x hole, Ø 50.0 mm	200 122 0050
Ceramic ball, 3x hole, Ø 38.1 mm	200 123 0038
Ceramic ball, 3x hole, Ø 50.0 mm	200 123 0050
Ceramic ball, 4x hole, Ø 38.1 mm	200 124 0038
Ceramic ball, 4x hole, Ø 50.0 mm	200 124 0050

3-2-1 support

The Tetronom / Oktonom is mounted on a universal 3-2-1 support which is designed for various applications and is consistent with the three-point bearing principle. It can be used on a CMM in a climatic chamber as well as in factories under production conditions. In this way, a Tetronom or Oktonom can be supported free from stresses or strains.

The supporting system consists of three single modules: fixed bearing, prism bearing and flat bearing. Each module comes with a fastening plate with a screw-on flange. Three magnets are inserted into the bottom of the fastening plate where three steel balls (diameter 12.7 mm) can be mounted making it possible for the support to be set up even on uneven surfaces.

Extensions are available which allows for different set-up heights.

Material
Stainless steel

Properties
Demountable, with colour coding for repeatable set-ups of the Tetronom or Oktonom; delivery in a transport case

Standard length extension
200 mm and 500 mm

Product	Product no.
Fixed bearing	300 100 0000
Prism bearing	200 110 0000
Flat bearing	200 120 0000
Solenoid	200 130 0000
Extension 200 mm	300 140 0200
Extension 500 mm	300 140 0500

3-2-1 support with solenoids

To ensure an especially stable construction on metal substrates, we recommend the use of solenoid magnets with a screw-on flange, which can be screwed under the respective mount.

ARTEFACTS AND REFERENCE STANDARDS

FOR STATIONARY AND MOBILE MEASURING SYSTEMS

Type B reference ball

The type B reference ball is used for referencing of tactile and optical measuring systems.

The balls are manufactured from our special ceramic. This has been optimised for the particular properties

of a scanner with white light fringe projection and, moreover, through its use in numerous benchmarks of instrument manufacturers and customers has proven its superiority in comparison with other ceramic balls (e.g. made from aluminium oxide). Alongside the excellent “optical” properties of the special ceramic, the balls also have very high sphericity precision (< 2 µm).

We will be happy to furnish you with samples of our special ceramic balls for you to try out.

Ball diameter
25 mm, optionally available in other diameters

Supported technologies
Coordinate measuring machines (CMM)
Scanning systems

Ball material
Special ceramic, optionally available in other materials

Ball holder material
Steel 1.4301

Ball holder length to ball mid-point
100 mm

Miscellaneous
Can be screwed in place using a threaded bolt/pin

Calibration
DAkkS or manufacturer‘s calibration

Areas of application

The type B reference ball is primarily used to check probing deviations and determine the measurement uncertainty in accordance with VDI/VDE 2617 and 2634 as well as DIN EN ISO 10360.

Flatness standard

The flatness standard is used to check errors of flatness indicated in optical measurements with area scanning systems in accordance with guideline VDI/VDE 2634.

It can be manufactured at different levels of accuracy and in various sizes and is manufactured from the same material as the Aimess ceramic balls. Compared to ceramic balls made from aluminium oxide (Al2O3), this special ceramic has the advantage that it can be directly measured without extra pre- or post-treatment under widely varying light conditions.

The surface is diffusely scattering and complies with the guideline VDI/VDE 2634.

Scope of delivery
Every flatness standard is supplied with a DAkkS calibration certificate. This fulfils the requirement for traceability back to the national standard.

Product	Product no.
Flatness standard - 50 x 50 x 12 mm	120 100 0050
Flatness standard - 100 x 150 x 12 mm	120 100 0150

Special sizes upon request.

SMALL PARTS,
BIG EFFECT.

IT IS ONLY THROUGH THE USE OF SUITABLE MEASURING ADAPTERS THAT THE POTENTIAL OF MOBILE 3D MEASURING SYSTEMS IS FULFILLED. GUARANTEED.

MEASURING ADAPTERS
FOR MOBILE 3D MEASURING SYSTEMS

Measuring adapters are part of the standard equipment of a flexibly deployable 3D measuring system. They are needed to accelerate, simplify or even just enable the measurements of geometric features. In addition, measuring adapters help to minimise measurement uncertainties and consequently to achieve very high measurement accuracies.

Aimess helps to reduce measurement uncertainties to a minimum through maximum accuracy.

Reference points and edge adapters

Aimess has specialized in the manufacture of nests, which are used as reference points within the scope of stationary and/or temporary measurements.

The permanently marked reference points must be quickly and flexibly useable and ensure permanent reproducibility of the measurement results.

By contrast temporary reference points, as required for connecting measurements or repositioning, must be small, light and flexible. Aimess will supply you with measuring adapters for every purpose, in different diameters and magnetised if required.

Also in the range: Edge adapters, used to measure component edges, and a pre-configured laser tracker kit comprising all standard adapters required for laser tracking measurements.

Minimum order quantity

As all Aimess measuring adapters are classed as custom-made products, the minimum order value is €200.

Pin nest for 1.5 inch reflector

The 1.5 inch pin nest is an adapter for determining the mid-point of holes on devices or similar. A special feature of the reflector is that it is held on the 3-point support of the pin nest by magnets, which greatly simplifies handling during measuring. The pin diameters vary between 6 mm and 22 mm, with h6 manufacturing accuracy as standard. The mid-point of the reflector is determined with an offset relative to the support. As manufactured, offset and concentricity have a tolerance ≤ 0.02 mm of the nominal dimension.

As standard, the pin nest is labelled with the offset value. Labelling with a sequential serial number is available as an option.

Material
Stainless steel

Pin diameter
From 6 mm to 22 mm
Other pin diameters on request

Special feature
Self-retaining reflector support

Concentricity
≤ 0,02 mm

Offset
25 mm

Optional
Offset 25,4 mm
Calibration
Labelling with a sequential serial number

Product	Product no.
Pin Nest with 6 mm pin	700 210 0638
Pin Nest with 8 mm pin	700 210 0838
Pin Nest with 10 mm pin	700 210 1038
Pin Nest with 12 mm pin	700 210 1238

MEASURING ADAPTERS

FOR MOBILE 3D MEASURING SYSTEMS

Pin nest for 0.5 inch reflector

The 0.5 inch pin nest is an adapter for determining the mid-point of holes on devices or similar. The reflector is held by magnets, which ensures it is held securely giv-

ing very high reproducibility of the measurement point.

The pin diameters vary between 6 mm and 12 mm, with h6 manufacturing accuracy as standard. The mid-point of the reflector is determined with an offset relative to the support. As manufactured, offset and concentricity have a tolerance ≤ 0.02 mm of the nominal dimension.

As standard, the pin nest is labelled with the offset value. Labelling with a sequential serial number is available as an option.

Material
Stainless steel

Pin diameter
From 6 mm to 12 mm

Special feature
Self-retaining reflector support

Concentricity
≤ 0,02 mm

Offset
10 mm

Optional
Offset 12.7 mm or 15 mm
Calibration
Labelling with a sequential serial number

Product	Product no.
Pin Nest with 6 mm pin	700 210 0612
Pin Nest with 8 mm pin	700 210 0812
Pin Nest with 10 mm pin	700 210 1012
Pin Nest with 12 mm pin	700 210 1212

Pin nest for 0.5 inch reflector, self-retaining

In contrast to a standard pin nest, a self-retaining pin nest has three magnets built into the lower contact surface. This improves mounting on metal surfaces, e.g. of devices or if used on construction sites. Additionally, the magnets prevent the pin nest from slipping

out of holes when mounted overhead. In the standard version, the pin diameters range from 6 mm to 12 mm with h6 manufacturing accuracy.

The mid-point of the reflector is determined with an offset relative to the support. As manufactured, offset and concentricity have a tolerance ≤ 0.02 mm of the nominal dimension. The reflector is held by a magnet, ensuring secure mounting and very high reproducibility of the measurement point.

As standard, the pin nest is labelled with the offset value. Labelling with a sequential serial number is available as an option.

Material
Stainless steel

Pin diameter
From 6 mm to 12 mm
Other pin diameters on request

Special feature
Magnetic pin nest with self-retaining reflector support

Concentricity
≤ 0,02 mm

Offset
10 mm

Optional
Offset 12.7 mm or 15 mm
Calibration
Labelling with a sequential serial number

Produkt	Art.-Nr.
Pin Nest with 6 mm pin	700 200 0612
Pin Nest with 8 mm pin	700 200 0812
Pin Nest with 10 mm pin	700 200 1012
Pin Nest with 12 mm pin	700 200 1212

MEASURING ADAPTERS

FOR MOBILE 3D MEASURING SYSTEMS

Edge adapter for 0.5 inch and 1.5 inch reflectors

The edge adapter is used to measure part edges. The mid-point of the reflector is determined relative to the support. As manufactured, offset and concentricity have a tolerance ≤ 0.02 mm of the nominal dimension.

The reflector is held on a 3-point support by magnets, ensuring secure mounting and very high reproducibility of the measurement point.

It is also possible to directly determine the intersection of two edges if these are at 90° angles to each other. For this purpose, the original edge is divided again (¼ edge).

The edge adapter is labelled with the offset value as standard. Labelling with a sequential serial number is available as an option.

The edge adapter is calibrated prior to delivery. The calibration certificate is supplied.

Material
Stainless steel

Special feature
Self-retaining reflector support

Concentricity
≤ 0,02 mm

Offset
25 mm

Optional
Offset 25.4 mm
Labelling with a sequential serial number
Available with a ¼ edge

Product	Product no.
Edge adapter for 0.5 inch reflector	700 220 0012
Edge adapter for 1.5 inch reflector	700 220 0038

Drift nest for 1.5 inch reflector

The 1.5 inch drift nest, also known as nest without shank (pin), provides a temporary, magnetic adapter for 1.5 inch reflectors or other targets of size 1.5 inch

(steel balls, retro-reflective targets or theodolite targets). The back of this adapter is flat so that it is usable in almost any location and on almost any surface.

Although the 1.5 inch drift nest holds the reflector in a 3-point support using a defined magnetic force, it is not itself magnetic. By using an adhesive, e.g. a hot glue gun, it is easy to attach the adapter to steel surfaces, walls or concrete floors. Once a job is complete, the nests can be removed free from any residue and re-used at another point.

For permanent target points, e.g. for a reference mesh that is to last for several months measuring, the 1.5 inch drift nest can be attached in any desired position using two screws.

Each nest can be labelled with a sequential serial number so that the nests can be better allocated.

Material
Aluminium

Colour
Red or blue anodized

Version
Fastening by gluing or screwing

Special feature
Self-retaining reflector support

Size
42 x 10 mm

Optional
Labelling with a sequential serial number

Product	Product no.
Drift nest for 1.5 inch reflector (fastening by gluing)	700 100 0038
Drift nest for 1.5 inch reflector with cut-out for deep views	700 102 0038
Drift nest for 1.5 inch reflector with 2 holes (fastening by screwing)	700 103 0038

MEASURING ADAPTERS

FOR MOBILE 3D MEASURING SYSTEMS

Drift nest for 0.5 inch reflector

The 0.5 inch drift nest, also known as nest without shank (pin), provides a temporary, magnetic adapter

for 0.5 inch reflectors. The back of this adapter is flat so that it is usable in almost any location and on almost any surface.

Although the 0.5 inch drift nest holds the reflector using a defined magnetic force, it is not itself magnetic. By using an adhesive, e.g. a hot glue gun, it is easy to attach the adapter to steel surfaces, walls or concrete floors. Once a job is complete, the nests can be removed free from any residue and reused at another point.

Each nest can be labelled with a sequential serial number so that the nests can be better allocated.

Material
Aluminium

Colour
Red or blue anodized

Version
Fastening by gluing

Special feature
Self-retaining reflector support

Size
13 mm x 8 mm

Optional
Labelling with a sequential serial number

Product	Product no.
Drift nest for 0.5 inch reflector	700 100 0012

Laser tracker kit

With the laser tracker kit you are well equipped for any measuring task, regardless of whether it is a case of

hidden points, edges or holes with diameters from 6 mm to 22 mm, temporary measuring points or indirect area scanning measurements.

The laser tracking kit is available as a standard version, however it can also be custom-assembled according to specific customer requirements.

Contents
04 x 0.5 inch pin nest (pin diameter 6, 8, 10, 12 mm)
10 x 1.5 inch drift nest
05 x 0.5 inch drift nest
01 x 1.5 inch edge adapter
01 x point dip stick
01 x stainless steel ball
01 x reflector mount
01 x panel for measuring of indirect points
01 x circlip pliers
01 x case

Product	Product no.
Laser tracker kit, basic	700 500 0003

MEASURING ADAPTERS

FOR MOBILE 3D MEASURING SYSTEMS

Wall point nest for 1.5 inch reflector

The wall point nest was developed for marking fixed points on a range of objects and on wall surfaces. It is ideal for producing permanent and/or temporary refer-

ence points. The wall point nest is equipped with a 1.5 inch reflector mount, ensuring secure mounting and very high reproducibility of the measurement point.
The wall point nest is available in two versions:

Version 1

The first version has a through hole so that the nest can be mounted with a stainless steel screw in a corrosion resistant steel dowel.

Version 2

The second version has a threaded hole (M6) which is screwed directly onto a threaded bolt.

Material
Aluminium

Colour
Red, blue or black anodized

Version
With through hole or M6 threaded hole

Special feature
Self-retaining reflector support

Product	Product no.
Wall point nest for 1.5 inch reflector with though hole (version 1)	700 310 0038
Wall point nest for 1.5 inch reflector with M6 threaded hole (version 2)	700 311 0038

Fixed point nest for 1.5 inch reflector

The fixed point is permanently anchored to the floor for final marking. For this purpose, the fixed-point nest is inserted in an existing hole where it is then grouted.

To ensure a permanent and solid marking, the grouting compound needs to be chosen according to the expected load.

To achieve a flush finish with the top edge of the floor, the fixed point nest can be adjusted in the floor using three screws. For permanent protection of the 1.5 inch mount, a lid is screwed on when it is not in use that tightly seals the entire fixed point nest to protect it against dirt and liquids.

To permit easy cleaning (removal of iron filings, dust, oil), the magnet is fixed in the 1.5 inch mount using a Seeger-V-ring so that removal and fitting are performed in seconds.

Material
Steel cylinder from corrosion-resistant material
Protective steel lid with rubber seal

External dimensions
Diameter 60 mm
Height with lid, without adjustment screws 54 mm

Installation dimensions
Hole depth min. 60 mm
Hole diameter when grouting with concrete min. 80 mm, with epoxy resin min. 70 mm, with cement min. 70 mm

Product	Product no.
Fixed point nest for 1.5 inch reflector	700 301 0038

Image: Guido Werner

AWARDED KNOW-HOW

BestForm Award

The Bestform Award 2013 recognises outstanding product ideas that are incorporated in a particularly appealing design. In 2013 Aimess Services, together with its project partner “factor m - office for design and construction” (Magdeburg/Germany), won second place.

European Business Awards

Aimess Services, nominated for the “UKTI Award for Innovation”, was chosen by the presenters of the European Business Awards as “National Champion” in 2013.

Grand Prize for medium-sized companies

In the 2013 Grand Prize competition for medium sized companies, presided over by the Oskar-Patzelt-Stiftung, there were 4,035 nominees including banks and local authorities, with AimessServices amongst them. Ultimately, the metrology experts were amongst the top-eight companies in the state of Sachsen-Anhalt.

IQ Innovation Prize

Aimess Services was awarded the 2013 IQ Innovation Prize Magdeburg for its 3D scanner, the R3Dscan.

TOP 100

In 2012 Aimess Services was amongst the 100 most innovative medium sized companies in Germany.


PRISMO

NOTES

FOR KEEN NOTE-TAKERS

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