DIERS formetric 4D
Optical 4D Spine and Posture Analysis

- pioneering 4D scan technology
- radiation-free and contactless
- based on scientific research
DIERS formetric 4D - Optical 4D spine and posture analysis

Several leading European universities were involved in the development of the contactless static and dynamic measurement system, the **DIERS formetric 4D**.

With the unique “Spinometry” module, a three-dimensional reconstruction of a vertebral spine model based on the surface data obtained is possible.

The development of the 4D technology (3D + time component) has significantly improved the measurement quality and reproducibility of the **DIERS formetric system**. This module enables functional testing, and the averaging of test series – among other methods – which minimise postural variances.

Due to its proven scientific background and continual commitment to improvement, the formetric system has been established as the leading optical measurement method in clinical postural matters.

The measurement data gained with the **DIERS formetric 4D** can be linked to expert systems which automatically generate proposals for treatment.

**DIERS formetric**

- The correlation module “Spinometry” gives an automatic reconstruction of a 3D vertebral spine model.
- The system automatically detects specific anatomical landmarks. In most cases, manually placed markers are no longer necessary.
- 4D technology sets new standards and allows for functional testing.
- The AVERAGING method compensates for movement (body sway, respiration) and significantly increases reproducibility for outcomes management.
- The system is radiation-free and does not require patient body contact.
- Suited for evaluating therapeutic measures and outcomes management for success as well as for quality assurance and documentation in rehab.
- Certified in compliance with the Medical Devices Directory (European Medical Devices Act).
Clinical objective

The original clinical objective was to develop a radiation-free spine measurement method in order to reduce the X-ray burden in scoliosis patient monitoring.

Since the product launch in 1996, various new clinical challenges have led to permanent upgrades and improvement of the DIERS formetric method.

Besides the classical application in scoliosis patients, the technology is now also used in many other clinical application fields.

DIERS formetric 4D is based on the principle of optical stereographic measuring and was consequently focused on the human surface and depiction of the spine.

Compromises, due to the constraints of industrial scanners, could thus be avoided. Contrary to simple 3D measurement methods which only detect individual measurement points on the skin, the DIERS formetric 4D performs complete shape scanning (surface measurement) of the back. This makes it possible to record even extraordinarily small changes which occur in therapeutic measures.

To avoid movement effects, the scanning times for individual images need to be very short. Scanning times of one second or longer cause inaccuracy. For that reason, the scanning time is set to a maximum of 40 milliseconds in the formetric system.

Due to the short scanning time of the individual images, the method is able to generate scan sequences with individually selected time and image frequency.
**Measurement:**

The patient stands at a distance of about 2 metres (6.5 ft.) in front of the height-adjustable 4D scanning device. The complete procedure only takes a few seconds. The results of the protocols of the analysis are available immediately after the measurement.

**The following measurement modes are possible using the 4D technology:**

**Static 3D scan**

Individual image with a scanning time of 40 milliseconds.

**4D Averaging**

A user set Image series of for example, twelve images in six seconds, makes it possible to determine an average; this reduces postural variances and thus clearly improves preciseness, reproduceablity, and clinical significance.

**4D posture tests**

Postural tests in an upright position normally take between 30 and 60 seconds in order to observe and quantify a patient’s coordination and any muscular deficits.

Besides movement patterns, surface and shape changes of the reconstructed spine are precisely displayed for the selected measurement period.

Typical examples are the Romberg test (equilibrium test) and the Matthiass test.

**4D dynamic**

The detection of movements of the body is an important issue in clinical diagnostics and in biomechanics. Customary systems only measure by analysing marker points which have been attached to the patient’s skin.

Due to the DIERS formetric 4D surface measurement, with up to 10,000 three-dimensional measurement points, it is now possible to follow movements of the whole body and skeletal system (spine and pelvis) with a measurement frequency of up to 24 images per second. Typical applications are examinations using a stair stepper or treadmill.
Single measurement for spine and posture analysis

Example | Scoliosis with typical parameters
Method | Averaging / 6 Seconds / 12 images

Measurement of posture

Example | Matthiaß test
Method | 30 Seconds / 60 images

Functional study

Example | Analysis on stepper
Method | 5 seconds / 100 images
DIERS formetric 4D -
Optical 4D spine and posture analysis

Typical clinical indications

Diagnostic

• scoliosis
• scoliotic posture
• pelvic tilt
• pelvic rotation/torsion
• posture-related pain symptoms
• postural variances
• blocks (sacroiliac joint, thoracic spine, lumbar spine …)
• leg length discrepancies
• cranio mandibular dysfunctions (TMJ)
• defective leg positions, e.g. after TEP
• foot deformities and defective foot positions
• prescription of conventional insoles
• sensomotoric (proprioceptive) insole treatment
• functional analysis
• and many more

The bridge to therapy

• posture balance
• special insoles for posture correction
• body balance
• medically based exercise therapy together with DIERS myoline
• musculoskeletal problems
• muscular deficits (Matthiaß test, Flamingo test)
• neurological symptoms
• swaying
• falling (Romberg test)
• brace treatment
• follow-up and quality assurance
• blocks: cervical, thoracic, lumbar, pelvis
• arthrosis
• morbus Scheuermann
• osteoporosis
• morbus Bechterew

Application fields:

• orthopaedic clinics
• orthopaedic private institutes
• orthopaedic technicians
• rehabilitation centers
• medical centers
• physical therapists
• chirotherapy
• dentists
• orthodontists
• sports medicine
• chiropractors
• labour medicine
• fitness centers
• and many more

Options:

Basic components:

• stereo imager 800 with elevating column
• operator and computer console

Optional components:
The following optional components can be added to the DIERS formetric 4D:

3D simulation platform
Platform which can be electronically elevated, suited e. g. for the measurement of differences in leg lengths and the simulation of the effect on posture from these changes. The following can be adjusted –linear height changes, heel or forefoot raises, and medial or lateral wedges – are individually adjustable for each foot.

Cervical Spine Modul
For 3D measurement of the mobility of the cervical spine. All movement directions of the cervical spine – such as flexion, extension, lateral flexion and rotation – can be precisely determined.

Pedography
A foot pressure measurement system completes the analysis of the musculoskeletal system and provides important additional clinical information.
DICAM - the bridge between diagnosis and therapy

In the current market there are various measurement methods and tools used for biomechanical applications. This creates many problems for the clinician. When more than one method is used there is no uniform software structure, control philosophy or storage system for all of the collected data.

DICAM solves these problems.

DICAM unites the different measuring methods in just one software interface. The integrated remote maintenance makes quick software updates and online support in case of patient issues possible. DICAM may be plugged directly to existing software systems and thus reach any biomechanical devices without requiring new input of patient data.

DICAM is the bridge to therapy:

Bringing together different measurement methods and the expert knowledge we have been collecting for more than 10 years from research, clinics, and doctors, we are now able to offer concrete treatment proposals for patient care with DIERS theraline.

DIERS theraline – the bridge between diagnosis and therapy

Patient-specific treatment proposals

• using the measurement data from DIERS measurement procedures
• making use of clinical expert knowledge
• computer-supported creation of treatment proposals

Using the clinical measurement data for the creation of treatment proposals is consistent with the further enhancement of the DIERS philosophy. In various scientific programs – supported by the BMWi (German Federal Ministry for Economy) – the foundation for the treatment proposal has been established using the DIERS measuring technology.

Thus, there are now solutions which provide high-quality proposals for treatments besides sophisticated diagnostics.

Measuring a patient with DIERS formetric 4D can generate the following treatment proposals:

DIERS body balance
(in combination with DIERS myoline)

Patient-specific medically based exercise treatment
Based on the measurement data, a suggested patient-specific exercise schedule is created immediately. The user can modify the exercise schedule.

DIERS posture balance

Special posture-correcting insoles
Based on the measurement data and taking into account the individual patient’s medical history, a proposal for posture-correcting insoles (also known as sensomotoric or proprioceptive insoles) is created.

DIERS portfolio

- formetric 4D
- statico
- pedoline
- digiscan
- professional
- emg
- body balance
- posture balance
- foot balance

DIERS bodyline

DIERS pedoline

DIERS myoline

DIERS theraline
DIERS formetric 4D - Optical 4D spine and posture analysis

DIERS formetric 4D

Basic equipment:
- certified medical device
- computer system, TFT monitor, printer
- operator- and PC-console
- measurement frequency up to 10 images/sec.
- software DICAM basic
- internet remote service

Optional components:
- expansion module formetric 4D+ (24 images/sec.)
- software DICAM professional
- viewer license
- site license
- 3D simulation platform
- cervical spine module

The space requirement of the formetric system is approx 3.0 to 3.5 m (9-11.5 ft.) length and approx. 1.5 m (4 ft.) width.

Art. 303-46  DIERS statico 3D
3D technology for spine and posture analysis. The basic system with up to 10,000 measurement points allows a static measurement without a reconstruction of the spine and only for individual images.

Art. 303-50  DIERS formetric 4D
4D technology for dynamic spine and posture analysis: It allows all analyses of formetric systems with reconstruction of the spine. The system is able to perform scanning sequences with automatic averaging, measurement sequences of up to one minute for posture analyses and functional studies with up to 10 images per second (optional 24 images/sec.).