Let us introduce ourselves

PTW-Freiburg is an internationally operating company, manufacturing and marketing specialized dosimetry and quality control equipment for the medical radiology market. Founded in 1922, the company is located in Freiburg on the western side of the famous Black Forest mountains in southwestern Germany.

Our History

In 1922, twenty-seven years after Roentgen discovered the X-rays, Professor Hammer from the Physics Institute of Freiburg University founded PTW to produce and market his development of an X-ray dosemeter based on the electrostatic relais, a revolutionary new electromechanical component for measuring very small electrical charges.

In 1927, Dr. Herbert Pychlau took over the company and developed it during four decades into an internationally recognized manufacturer of quality dosemeters for medical radiology.

PTW has developed and manufactured many generations of up-to-date products over the years, based on the newest technology. The company has grown continuously.

PTW Freiburg's production and office area covers a total of approx. 7000 m² today. PTW employs a staff of 230 all over the world. The company, which scores steady growth, is the recognized market leader in radiation medicine dosimetry today.

Our Operations

PTW-Freiburg designs, develops, manufactures and distributes high quality dosimetry and QC equipment mainly for use in the medical field, especially in radiation therapy, diagnostic radiology and nuclear medicine. The development and production of mechanical, electronic and software components are all done in house. We have a well-equipped and modern workshop with 9 CNC machines. Our products, especially the PTW ionization chambers, are well known throughout the world and are recognized for their workmanship and high level of quality. PTW-Freiburg is the market leader in its major product lines.

The PTW distribution is organized internationally. A number of exclusive PTW representations are established in many countries around the world. In 1995, the PTW New York Corporation was established to improve our service to customers in America and to distribute and service PTW products all over the American continent. In January 2002, PTW-France was established followed later on by PTW-Asia Pacific, PTW-Beijing, PTW-Latin America and PTW-UK.

PTW-Freiburg runs an accredited secondary standard dosimetry laboratory. We perform radiological calibrations for dosemeters used in radiation therapy, diagnostic radiology and health physics, which are directly traceable to the primary standard. Our calibration lab provides a complete range of radiological calibrations from low X-ray energies up to 60Co and from low to high dose rates.

We cooperate closely with official public agencies worldwide, and we participate actively in national and international work groups for the standardization of devices and procedures for dose measurement and quality control in medical radiology.

Our Company Philosophy

From the very beginning, PTW-Freiburg's products have been optimized for practicability, precision and quality. All dosemeters are thoroughly tested in radiation beams, and calibration certificates are attached to every dosemeter. Thanks to the constant improvement of our quality standards and internal procedures, our quality assurance system was certified in 1995 as compliant with the standards ISO 9001 and EN 46001. Our medical products are CE marked according to the European Medical Device Directive and they are FDA 510(k) approved (if applicable). The calibration laboratories are part of the quality management system of PTW-Freiburg.

We at PTW-Freiburg are proud to work with our customers as a competent and reliable partner. We provide you with products, support and service in line with good manufacturing practice, with the added touch of personal attention from our motivated staff. We constantly strive to improve the international presence and reputation of PTW-Freiburg.

We intend to continue our efforts in the future as we did in the past to develop the most useful, most reliable and highest quality products possible. Our commitment to maximum customer satisfaction will remain unchanged.

For more details please visit our website at www.ptw.de
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## Diagnostic Radiology: At A Glance

### At A Glance

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IEC 60580 (2003-09) Medical electrical equipment - Dose area product meters
IEC 60601 (1988-12) Medical electrical equipment
- 1 General requirements for safety
- 1 – 3 (1994-07) 3. Collateral standard: General requirements for radiation protection in diagnostic X-ray equipment
IEC 60731 (1997-09) Medical electrical equipment - Dosimeters with ionization chambers as used in radiotherapy
IEC 61223 (1993-02) Evaluation and routing testing in medical imaging departments
- 2 – 1 (1993-02) Constancy tests - Film processors
- 2 – 2 (1993-07) Constancy tests - Radiographic cassettes and film changers - Film-screen contact and relative sensitivity of the screen-cassette assembly
- 2 – 3 (1993-07) Constancy tests - Darkroom safelight conditions
- 2 – 5 (1994-03) Constancy tests - Image display devices
- 2 – 6 (1994-04) Constancy tests - X-ray equipment for computed tomography
- 2 – 7 (1999-09) Constancy tests - Equipment for intra-oral dental radiography excluding dental panoramic equipment
- 2 – 9 (1999-09) Constancy tests - Equipment for indirect radioscopy and indirect radiography
- 2 – 10 (1999-09) Constancy tests - X-ray equipment for mammography
- 2 – 11 (1999-09) Constancy tests - Equipment for general direct radiography
- 3 – 1 (1999-03) Acceptance tests - Imaging performance of X-ray equipment for radiographic and radioscopic systems
IEC 61674 (1997-10) Medical electrical equipment - Dosimeters with ionization chambers and/or semi-conductor detectors as used in X-ray diagnostic imaging
IEC 61676 (2002-09) Medical electrical equipment - Dosimetric instruments used for non-invasive measurement of X-ray tube voltage in diagnostic radiology

Please note: The products comply with the IEC regulations within their ranges of use.
Patient Dosimetry Equipment

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Patient Dosimetry

Patient exposure has to be determined, documented and evaluated according to international regulations. The DIAMENTOR® patient dosimetry systems are our solution for diagnostic radiology to fulfill these requirements. Its major features are:

- Helps to fulfill the European Directive 97/43/EURATOM on health protection in medical radiology and the proposed rules of the performance standard for diagnostic X-ray systems, published by the Food and Drug Administration FDA, USA, in the 21 CFR Part 1020 Federal Register
- Measures and protocols the dose area product (DAP) and/or dose during X-ray examinations, especially during high dose and high risk examinations such as:
  - Angiography, including DSA
  - Cardiology
  - Interventional radiology
  - Pediatrics
  - Fluoroscopy
- Informs the practitioner of the amount of radiation applied to the patient
- Mounts firmly to the X-ray unit without disturbing routine work
- Consists basically of a transparent ionization chamber and a display unit

Starting in May 2000, radiation protection procedures are mandatory in the countries of the European Community. The Food and Drug Administration FDA in the USA requires health physics procedures in medical radiology. Dose area product (DAP) meters and dosemeters, firmly installed to the X-ray unit, make it possible to determine the radiation loads to which patients are exposed during X-ray examinations. Patient exposures can differ in hospital routine practices. The exposures can be reduced by a measuring device informing the practitioner of the total amount of radiation applied to the patient. Especially the above-mentioned high dose and high-risk X-ray examinations require such a device.

The measuring quantity ‘dose area product’ is not dependent on the distance between focus and patient plane. The ionization chambers can be mounted at any distance between focus and patient plane without affecting the results. Using the optional DiaSoft software, detailed information about the patient exposure can be derived from the dose area product, such as organ doses and the effective dose. The DIAMENTOR patient dosimetry series provides a solution for every application and budget and helps to protect patients against the risk of radiation exposure in medical diagnostic radiology.

PTW-Freiburg has five decades experience in developing and manufacturing dose area product meters. The first DIAMENTOR patient dosemeter was introduced in 1959. Over the years, PTW has delivered many thousands of reliable units to satisfied customers, worldwide.
DIADEEM
Patient Dosemeter

Dosemeter for patient entrance dose and dose rate measurement during diagnostic X-ray examinations

Features
- Economic single channel patient dosemeter
- Complies with IEC 60601-1 and IEC 60601-2-43 within the ranges of use
- Complies with FDA 21CFR Part 1020
- Measures kerma and kerma rate at a reference distance
- Provides an interface to connect a label printer

DIADEEM is an economic and easy-to-handle device for measuring the entrance dose and the entrance dose rate during radiographic and fluoroscopic examinations. The basic unit consists of the measuring amplifier with a bright, easy-to-read LED display. It is fitted with a test, reset and print button, which make it possible to check the calibration, setup the device and print the measuring results via a connected label printer.

The transparent rectangular DIADEEM ionization chamber is mounted directly to the collimator of the X-ray tube by using appropriate adaptation rails.

The DIADEEM dosemeter is particularly suitable for retrofitting existing equipment and for use with mobile X-ray installations. It meets the requirements of international standards including the proposed rules of the performance standard for diagnostic X-ray systems, published by the Food and Drug Administration, USA.

Ordering Information
L981951 DIADEEM reference kerma meter
TA34057-1 DIADEEM chamber, transparent, connecting system A (adaptation rails required)

- Label Printer page 13

DIAMENTOR® M4-KDK
DAP/Dose Meter

Device for simultaneous measurements of DAP, dose and dose rate in radiography and fluoroscopy

Features in addition to the DIAMENTOR M4
- Displays the dose and the dose rate of the chamber plane besides the dose area product (DAP)
- Provides calculation of the effective dose and the organ doses by using the DiaSoft software

The dual channel DIAMENTOR M4-KDK features the innovative “Chamber-in-Chamber” transmission ion chamber. Using this design technology, the unit can measure dose, dose rate and dose area product easily and simultaneously during radiographic and fluoroscopic procedures. The KDK chamber, firmly fixed to the collimator by adaptation rails, is transparent for light and X-rays. The chamber structures are not shown on the X-ray images.

Ordering Information
T11017 DIAMENTOR M4-KDK display unit, 115/230 V, connecting system V
TV34044-1 DIAMENTOR chamber KDK, transparent (adaptation rails required)
T11025 DIAMENTOR M4-KDK display unit, 115/230 V, connecting system A
TA34044-1 DIAMENTOR chamber KDK, transparent (adaptation rails required)

- DIAMENTOR Chambers page 11
- DiaSoft Software page 12
- DIAMENTOR Printers page 13
**DIAMENTOR® M4 DAP Meter**

Multifunctional dual channel dose area product (DAP) meter for patient dosimetry in diagnostic radiology

**Features**
- Dual channel device for single plane and bi-plane fluoroscopic and radiographic X-ray units
- Complies with the international standard IEC 60580
- Displays the selectable DAP units µGym², cGycm², Gycm², Rcm² and the exposure time
- Displays DAP rate during fluoroscopy, switches automatically over to DAP after the examination

DIAMENTOR M4 is a state-of-the-art dose area product meter. The dual channel device measures the total diagnostic dose area product (DAP) during radiography and fluoroscopy according to international regulations. Its digital display shows simultaneously the readings from both channels. In addition, exposure time during fluoroscopy is measured without the need of any connection to an X-ray generator. The RS232 interface enables the user to transfer data to a RIS or PACS.

**Ordering Information**
T11006 DIAMENTOR M4 display unit, 115/230 V, connecting system V
TV34028-1 DIAMENTOR chamber, transparent (adaptation rails required)
T11024 DIAMENTOR M4 display unit, 115/230 V, connecting system A
TA34028-1 DIAMENTOR chamber, transparent (adaptation rails required)

**Option**
T11011 DIAMENTOR SD secondary display, backlit

**DIAMENTOR® C2 DAP Meter**

Dual channel dose area product (DAP) meter for patient dosimetry in diagnostic radiology

**Features**
- Dual channel device connects two ion chambers
- Complies with the international standard IEC 60580
- Built-in printer optionally available

The DIAMENTOR C2 is a microprocessor-controlled measuring system with two separate measuring channels, enabling simultaneous measurements with two chambers. The system can also be used at two separate X-ray rooms, if these are operated from one control desk. Each channel can be reset separately and the measured values of channel A and B can be printed alternatively. The measuring results of both channels can be shown simultaneously on the digital display. Two different DIAMENTOR C2 versions, with and without an internal printer, are available. The RS232 interfaces enable the user to transfer data to a RIS or PACS.

**Ordering Information**
T11038A DIAMENTOR C2 display unit
T11038AP DIAMENTOR C2 display unit with built-in printer
TA34028-1 DIAMENTOR chamber size B (adaptation rails required)

**Options**
S020011 DiaSoft without dose option
S020003 DiaSoft software with dose option
S020007 DiaSoft software upgrade to dose option

- DIAMENTOR Chambers page 11
- DiaSoft Software page 12
- DIAMENTOR Printers page 13
**DIAMENTOR® E2**

**Economy dose area product (DAP) meter for patient dosimetry in diagnostic radiology**

**Features**
- Single channel patient dosemeter
- Complies with international standard IEC 60580
- Particularly suitable for retrofitting existing equipment and for use with small X-ray equipment
- Provides an interface to connect a label printer or for easy connection to a RIS or PACS

DIAMENTOR E2 is an economic and easy-to-handle device for measuring the dose area product (DAP) during radiography and fluoroscopy according to international regulations. The RS232 interface enables the user to transfer data to a RIS or PACS.

**Ordering Information**
- T11033 DIAMENTOR E2 display unit
- TA34028-1 DIAMENTOR chamber, transparent
  (adaptation rails required)

**Options**
- L981997 Power supply 110 V ... 240 V
- L981249 Power limitation for DIAMENTOR E2
  - DIAMENTOR Chambers page 11
  - DIAMENTOR Label Printer page 13

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**DIAMENTOR® CX**

**Compact dosemeter for DAP and DAP rate measurement in patient dosimetry during diagnostic examinations**

**Features**
- All-in-one chamber and electronics housing
- Complies with IEC 60580
- Mounts directly on the collimator of the X-ray unit

By integrating the electronic parts into the flat size B chamber, the whole DIAMENTOR CX is made suitable for firm mounting on the collimator of radiography and fluoroscopy units using appropriate adaptation rails. The transparent chamber neither blocks the light field nor interferes with patient routine work. The DIAMENTOR CX includes a built-in small size display unit and two buttons to reset the display, to setup the device and to test proper functioning. An external power supply is included.

**Ordering Information**
- L981961 DIAMENTOR CX DAP meter incl. external power supply 110V ... 240V (adaptation rails required)
- L981967 DIAMENTOR CX DAP meter incl. power limitation (adaptation rails required)
- L981251 DIAMENTOR CX Set for AMX4+/AMX4

**Option**
- L981254 RS232 interface for DIAMENTOR CX
**DIAMENTOR® Set CI**

**DAP System**

*Dose area product measuring system with communication between single CAN components*

**Features**
- All-in-one chamber and electronics housing
- Flexible display positioning
- Easy connection to a RIS or PACS via an optional RS232 interface
- Internal test function for fast calibration and constancy checks

The well-priced DIAMENTOR Set CI includes a DIAMENTOR chamber size B with integrated measuring electronics, a power supply, extension cable and a separate display unit. By integrating the electronic parts in a chamber the whole device is made suitable for firm mounting on the collimator of radiographic and fluoroscopy units. For presenting the measuring results, a separate small-sized display can be connected and fixed arbitrary e.g. next to the control desk. An easy and uncomplicated RIS or PACS connection can be realized straightforward via an optional RS232 interface. Fast calibration and constancy checks can be performed by means of a built-in test function. For mobile X-ray installations a power limitation can be connected. Providing a digital resolution of 0.01 µGym² the DIAMENTOR Set CI is suitable for measurements in pediatric applications and fully complies with the requirements of IEC 60580.

**Ordering Information**
L981196 DIAMENTOR Set CI

**Options**
- L981255 CAN-RS232 interface
- L981250 Power limitation for CAN system

› DIAMENTOR Accessories page 12

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**DIAMENTOR® Set CM**

**DAP System**

*Compact dose area product system with communication between single CAN components*

**Features**
- Highly integrated single channel built-in DAP meter
- Flexible positioning of the small electronics
- Flexible display positioning
- Easy connection to a RIS or PACS via an optional RS232 module
- Internal test function for fast calibration and constancy checks

The well-priced DIAMENTOR Set CM includes a separate electronics, a DIAMENTOR chamber size B, a separate display unit as well as a power supply and extension cable. The miniature DAP meter electronics can be mounted arbitrary e.g. behind the housing of the X-ray installation. For presenting the measuring results, the separate small-sized display can be connected and fixed flexible e.g. next to the control desk. An easy and uncomplicated RIS or PACS connection can be realized straightforward via an optional RS232 interface. Fast calibration and constancy checks can be realized by means of a built-in test function. For mobile X-ray installations a power limitation can be connected. Providing a digital resolution of 0.01 µGym² the DIAMENTOR CM is suitable for measurements in pediatric applications and fully complies with the requirements of IEC 60580.

**Ordering Information**
L981197 DIAMENTOR Set CM
L981198 DIAMENTOR Set CM mobile for mobile X-ray units

**Options**
- L981255 CAN-RS232 interface
- L981250 Power limitation for CAN system

› DIAMENTOR Accessories page 12
DIAMENTOR® Built-in Solutions

Features
- Different built-in DIAMENTOR systems and dosemeters are available
- Multifunctional and dual channel devices for single plane and biplane X-ray units
- Systems with an internal RS232 interface for easy connection to a RIS or PACS
- Internal test function for fast calibration and constancy checks

Various built-in DIAMENTOR systems have been developed in cooperation with well known manufacturers of X-ray installations worldwide. Built-in solutions with one or two measuring channels, all-in-one chambers and electronic systems with or without an internal RS232 interface are available. For presenting the measured dose area product or dose results, the display of the control desk as well as secondary display units can be used. An easy and uncomplicated RIS or PACS connection can be realized straightforward via the internal RS232 interface. Apart from that, fast calibration and constancy checks can be performed by means of a built-in test function. The optimally coordinated DIAMENTOR built-in solutions enable convenient and fast installations and comply fully with the requirements of IEC 60580.

Ordering Information
Built-in DIAMENTOR solutions upon request. Please contact us!

DIAMENTOR Chambers page 11
DIAMENTOR Accessories page 12

DIAMENTOR® Chambers

Features
- Very simple measurement of patient exposures
- Do not interfere with routine work, as the chambers are transparent and mounted directly to the X-ray collimator
- The combined KDK chamber measures dose area product and dose simultaneously

The flat, transparent and rectangular DIAMENTOR chambers size B are suitable for firm mounting on the collimator of radiography and fluoroscopy units using appropriate adaptation rails. Moreover many different ionization chambers are available. The chambers are supplied with a firmly attached connecting cable of 1 m length. Using an extension cable of max. 40 m length, the chamber is connected to the DIAMENTOR display unit, which usually is located in the control room of the X-ray installation. The chambers show a very low filter absorption and beam hardening effect. The large chambers are designed for a maximum beam size of 141 mm x 141 mm.

Ordering Information
TV34028-1 Chamber for DIAMENTOR M4
TA34028-1 Chamber for DIAMENTOR C2, E2 and M4
TV34044-1 Combined DAP/dose chamber for DIAMENTOR M4-KDK
T57523/U10 Chamber adaptation rails ’S’, rail distance 177 mm
T57523/U30 Chamber adaptation rails ’P’, rail distance 170 mm
More chambers and adaptation rails upon request Please contact us!

DIAMENTOR M4-KDK page 7
DIAMENTOR M4 page 8
DIAMENTOR C2 page 8
DIAMENTOR E2 page 9
### DiaSoft Diagnostic Software

**MS Windows software for automatic recording and analysis of patient exposures in diagnostic radiology**

**Features**
- Calculates the effective dose and the organ doses from the dose area product (DAP)
- Determines the patient entrance dose with DIAMENTOR M4-KDK chamber measurements
- Presents results as a function of time graphically
- Provides a convenient Windows-based user interface

With the combination of DiaSoft and the DIAMENTOR C2, M4 or M4-KDK patient dose systems, a complete technical solution is provided for determining organ doses and effective dose. Organ doses and effective dose are calculated based on direct dose area product measurements. Patient entrance doses can be determined based on dose measurements using the DIAMENTOR M4-KDK chamber.

The DiaSoft software is also available in a version with a reduced range of functions. This budget DiaSoft version does not calculate organ and effective doses, but features a database for administrative and measuring data and presents the results graphically as a function of time.

**Ordering Information**
- S020003 DiaSoft diagnostic software incl. dose option
- S020011 DiaSoft diagnostic software without dose option
- S020007 DiaSoft software, upgrade to dose option
- DIAMENTOR M4-KDK page 7
- DIAMENTOR M4 page 8
- DIAMENTOR C2 page 8

### DIAMENTOR® Accessories

**Optional accessories for DIAMENTOR systems**

**DIAMENTOR universal mount**
- Easy and flexible adjustment of rail distances between 133 mm and 177 mm are possible
- Allows the correct arrangement of any filter and the chamber without influencing the measurement
- Optional rails for use of filters are available

**DIAMENTOR universal cone mount**
- Special DIAMENTOR mount for the usage of max. 3 kg heavy (max. 30 cm long) cones in 90° orientation
- Universal adjustment of rail distances between 133 mm and 177 mm are possible

**DIAMENTOR chamber adaptation rails**
- Various (distance) adaptation rails for different collimators are available
- Can be screwed easily to the ionization chamber
- Distance adaptation rails enable the use of fade out filters

**DIAMENTOR power limitation**
- Ideal for mobile installations
- Small and convenient solution for operation with 24 V
- For use with a DIAMENTOR CX, CI, CM, E2

**DIAMENTOR RS232 interface**
- For easy connection to a RIS or PACS
- For use with a DIAMENTOR CX, CI, CM

**DIAMENTOR RS232, extension & adapter cable**
- Different lengths are available

**Ordering Information**
- T34028.1.210 DIAMENTOR universal mount
- T34028.1.212 DIAMENTOR universal cone mount
- L981250 Power limitation for DIAMENTOR CX, CI, CM
- L981249 Power limitation for DIAMENTOR E2
- L981255 CAN-RS232 interface for DIAMENTOR CI/CM
- L981254 RS232 interface for DIAMENTOR CX
DIAMENTOR® Label Printer

Optional label printer for patient exposure recording, connects to DIADEM DIAMENTOR M4, M4-KDK and E2

Features
- Makes it possible to print the DIAMENTOR and DIADEM measuring results on self-adhesive thermo stickers, which can be attached to the patient documentation
- Prints the relevant data of both DIAMENTOR measuring channels
- Printing is automatically controlled by the dosimeter

The standard printer ports of the DIAMENTOR M4, M4-KDK, E2 and DIADEM make it possible to connect the external label printer for documentation. The printed measurement report on the label includes date, time, measuring results of the DIAMENTOR channels A, B, and the total of A+B as well as the duration of the exposures. The self-adhesive stickers are supplied in standard quantities of 750.

Ordering Information
L991056 Thermal label printer including power supply 100V...230V
T25002-3 Connection cable between printer and DIAMENTOR M4 and M4-KDK display units, 3 m length
T25022-3 Connection cable between printer and DIAMENTOR E2/DIADEM display unit, 3 m length
L502076 Roll of 750 self-adhesive stickers

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DIADEM page 7
DIAMENTOR M4 page 8
DIAMENTOR E2 page 9

DIAMENTOR® Printer DP8340

Optional matrix printer for patient exposure recording, connects to DIAMENTOR M4 and M4-KDK

Features
- Prints the DIAMENTOR measuring results on self-adhesive stickers, which can be attached to patient documentation
- Prints the relevant data of both DIAMENTOR measuring channels
- 9 needle matrix printing is automatically controlled by the DIAMENTOR

The matrix printer DP8340 can be connected to the serial printer ports of the DIAMENTOR models M4 and M4-KDK for the documentation of patient exposures during X-ray examination. The printed measurement report on the label includes date, time, measuring results of the DIAMENTOR channels A, B, and the total A+B as well as the duration of the exposures. The printing speed of the 9-needle matrix printer is two lines per second. The printing width is 84 mm. The documentation can be printed on standard paper or on self-adhesive stickers. A batch of stickers contains 1000 labels. An external power supply and a connection cable to the DIAMENTOR display unit are required to operate the printer.

Ordering Information
L991096 Label matrix printer DP8340 w/o power supply
L991132 External power supply 110V ... 250V for matrix printer DP8340 including power cord
T25002-3 Connection cable between printer and DIAMENTOR display unit, 3 m length

Option
L502035 Self-adhesive stickers for printer DP8340, batch of 1000 labels

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DIAMENTOR M4 page 8
Notes
Absolute Dosimetry

- Absolute Dosimetry Equipment

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Absolute Dosimetry

The dose output of X-ray tubes is one of the most important parameters for image quality and patient exposure to radiation in diagnostic radiology. The dose output has to be checked very carefully during acceptance tests after installation and regularly during routine quality control. PTW manufactures a variety of high precision dosemeters for this purpose, including the reference class dosemeter UNIDOS E, connecting ionization chambers and the multipurpose diagnostic dosemeters DIADOS and DIADOS E, connecting semiconductor probes and a special CT chamber. The detectors are calibrated exactly for their range of use. Depending on the application, our secondary standard dosimetry laboratories perform calibrations in a wide energy range from low energy X-rays up to $^{60}$Co and in a wide dose rate range. Calibration factors are given for measurements in the unfiltered beam or behind an absorber. A variety of patient equivalent absorbers for different purposes complete the range of dosimetry accessories.

The dosimetric test equipment from PTW is widely used by X-ray technicians working in companies manufacturing X-ray equipment and by public agencies monitoring technical standards, as well as by medical physicists and technicians in hospitals. The instruments are self-explanatory and consequently easy to use. Many satisfied customers worldwide could not imagine working without their reliable dosemeters from PTW.
**DIADOS Diagnostic Dosemeter**

Diagnostic acceptance test dosemeter for radiography, fluoroscopy, mammography, dental X-ray and CT

**Features**
- Measures dose, dose rate, dose per pulse, dose length product and irradiation time
- Ideal for measurements in the useful X-ray beam at the entrance and exit side of patient-equivalent phantoms
- Includes electrometer modes for current and charge measurements
- Complies with IEC 61674

DIADOS is an all-round acceptance test device for measuring dose values and exposure time of different X-ray equipment using various accessories. The measurements of radiographic, fluoroscopic, mammographic and dental X-ray equipment are based on solid state detectors. The CT measurement is based on a CT ion chamber connected to a separate high voltage supply. The calibration factors of the detectors are selectable for different X-ray filtration. The autostart feature for the dose, dose per pulse and exposure time measurement starts as soon as the DIADOS detects radiation. The measuring ranges in general feature wide dynamics. The DIADOS can be operated by mains power or by rechargeable batteries. An RS232 interface for computer control is included.

Data can be downloaded from the DIADOS unit by means of the DiaControl software.

**Ordering Information**
- T11003 DIADOS dosemeter, 115/230 V
- S030004 DiaControl software

- DIADOS Detectors page 18
- DIADOS Dental Dosimetry page 18
- CTDI Set for CT Dosimetry page 19

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**DIADOS E Diagnostic Dosemeter**

Diagnostic routine dosemeter for QC of radiographic, fluoroscopic, mammographic, dental and CT X-ray installations

**Features**
- Valuable small size dosemeter for acceptance tests and service of any X-ray equipment
- Measures dose, dose rate, dose per pulse, pulses, dose length product and irradiation time
- Includes electrometer modes for current and charge measurement
- Complies with IEC 61674

The DIADOS E is a small size dosemeter for acceptance tests and routine quality control of any type of diagnostic X-ray installation, which measures dose values and irradiation time. It utilizes semiconductor detectors except for CT measurement, which is based on a pencil ion chamber connected to a separate high voltage supply. The calibration factors of the detectors are selectable for different X-ray filtration. The auto-start feature for the dose and exposure time measurement starts as soon as the instrument detects radiation. The measuring ranges in general feature wide dynamics. The DIADOS E can be operated by the mains power supply or by rechargeable batteries. Data can be downloaded from the DIADOS E unit by means of the DiaControl expert software.

**Ordering Information**
- L981239 DIADOS E dosemeter
- S030006 DiaControl expert software

- DIADOS Detectors page 18
- DiaControl expert Software page 25
**DIADOS / DIADOS E Detectors**

**Semiconductor detectors for mammography of 25 kV to 45 kV and diagnostic X-rays of 40 kV to 150 kV**

**Features**
- Small size and lightweight precision X-ray detectors for acceptance tests and service quality checks
- Avoid air density corrections with a radioactive check device or measurement of air pressure and temperature
- Comply with IEC 61674

The sturdy detectors, supplied with TNC connectors, withstand tough handling. They do not need high voltage supply like ion chambers do. The detector cable length is 2 m. The detectors can measure the following quantities in conjunction with a DIADOS or DIADOS E:

- Transmission dose/dose rate behind a phantom
- Entrance dose/dose rate in the range 40 kV ... 150 kV with and without 25 mm additional Al absorber
- Dental dose in the range 40 kV ... 90 kV with and without 8.5 mm additional Al filtration
- Mammography dose in the range 25 kV ... 45 kV with and without 2 mm additional Al filtration
- Dose per pulse and number of pulses in cinemagraphy or pulsed fluoroscopy
- Exposure/irradiation time

**Ordering Information**
- T60004 DIADOS diagnostic detector
- T60005 DIADOS MAM detector

**Options**
- T20002 18 cm x 24 cm cassette adapter
- T26333 Cable holding device for cassette adapter
- DIADOS, DIADOS E page 17
- DIADOS Dental dosimetry page 18
- DiaControl expert Software page 25

**DIADOS / DIADOS E Dental Dosimetry**

**Optional DIADOS accessories for dental X-ray dosimetry**

**Features**
- Makes it possible to measure doses of dental, intraoral, remote and panoramic X-ray units
- Provides all DIADOS features by operating in conjunction with the DIADOS dosemeter
- Calibration factors for dental use are stored in the DIADOS data base

The different types of dental X-ray units require different setup for dose measurements. Transmission doses from intraoral units are determined behind a 6 mm Al absorber. Remote X-ray units require the dose measurement behind an absorber of 6 mm Al and 0.8 mm Cu. Alternative filters of 0.3 mm Cu and 8 mm PTFE can be used. Dose measurements of panoramic X-ray units with movable film cassette are made by means of a cassette adapter of 15 cm x 30 cm size to which the detector is mounted. The filter setting for this type of dose measurement is 6 mm Al + 0.8 mm Cu for film-screen systems and 1.8 mm Cu for digital systems. All filters required are included in the absorber set T42029. The filters are placed between focus and detector. Dental doses are measured using the DIADOS diagnostic detector connected to the DIADOS dosemeter. The calibration for dental use has to be ordered separately. All appropriate calibration factors are stored in the DIADOS data base.

**Ordering Information**
- T60004 DIADOS diagnostic detector
- E21232 Diagnostic dental detector calibration
- T42029 Absorber set for dental dose measurements
- T20003 Dental cassette adapter
- L981234 DIAset DENT
- L981376 Dental set for dose measurements
- DIADOS, DIADOS E page 17
- DIADOS Detectors page 18
CTDI Set
for CT Dosimetry

Accessories for determination of CTDI in computed tomography

Features
- Makes CTDI\textsuperscript{1} and CTDI\textsubscript{w}\textsuperscript{2} determination possible
- CT ion chamber, sensitive length 10 cm
- Body phantom, 32 cm Ø, and head phantom, 16 cm Ø, both acrylic cylinders of 15 cm height
- Combined head and body phantom is available

The CT probe is inserted for measurements into one of five holes of the head or body phantom, which represent the body part to be CT scanned. Holes not used are filled by acrylic dummy plugs, and a support keeps the phantom in its position on the CT couch. Etched crosshairs on the phantoms allow exact alignment. The CT chamber can be supplied by a BNT or TNC or PTW-M connector for operation in connection with a UNIDOS E dosemeter. Only the DIADOS and DIADOS E require an optional HV adapter. The measuring quantity is dose length product in Gy·m.

Ordering Information
- CT chamber, connecting system BNT, TNC or M: 30009
- T40016 CT body measuring phantom
- T40017 CT head measuring phantom
- T40027 CT head and body phantom

Options
- T16018 DIADOS CT adapter for chamber HV
- T40016.1.010 Carrying case for body phantom
- T40017.1.010 Carrying case for head phantom, DIADOS and CT chamber
- T40027.1.050 Carrying case for head and body phantom, DIADOS E and CT chamber

- UNIDOS E page 19
- DIADOS, DIADOS E page 17
- DiaControl expert Software page 25

UNIDOS\textsuperscript{®} E
Dosemeter

Highly sensitive and precise dosemeter for dosimetry in diagnostic radiology

Features
- Suitable for standard dosimetry in diagnostic radiology and radiation therapy
- Features high accuracy and excellent resolution (1 fA)
- Meets and exceeds the requirements for field-class dosemeters according to IEC 61674 and IEC 60731

The lightweight and compact UNIDOS E is ideally suited for acceptance tests and routine measurements in diagnostic radiology. It measures dose, dose rate, dose length product, charge and current. The displayed units are Gy, Gy/min, R, R/min, Gy·m, C and A. It can be used with a variety of ionization chambers and solid state detectors. A CT probe can be connected to measure the dose length product for dosimetry in computed tomography. Air density corrections of the sensitive chamber volume are made by keying-in the air pressure and temperature.

Ordering Information
- T10010 UNIDOS E (connecting system BNT), 115/230 V
- T10009 UNIDOS E (connecting system TNC), 115/230 V
- T10008 UNIDOS E (connecting system M), 115/230 V

Option
- UNITEST electric test device

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\textsuperscript{1} Computed Tomography Dosimetry Index; \textsuperscript{2} Weighted CTDI
Diagnostic Radiology: Absolute Dosimetry Equipment

SFD Chambers for Diagnostic X-Rays

**Shadow free ionization chambers**
6 cm³ and 75 cm³ for absolute dosimetry

**Features**
- Plane parallel chambers for the measurement and monitoring of radiation output in diagnostic radiology
- Shadow free design causes hardly no interference with automatic exposure control (AEC)
- Do not influence the X-ray image
- For measurements in front of and behind a phantom

The high precision SFD chamber suitable for mammography has a sensitive volume of 6 cm³. The energy response for mammography radiation qualities (25 ... 35) kV is better than \( \pm 2\% \), and better than \( \pm 3\% \) within the conventional range (50...150) kV.

The high precision SFD chamber for conventional radiology has a sensitive volume of 75 cm³. The energy response within the conventional range is better than \( \pm 2\% \) and better than \( \pm 3\% \) within the mammography range (25 ... 35) kV. Both flat SFD chambers are used for dose and dose rate measurements in front and behind a patient-equivalent phantom. Because of their shadow free construction and low attenuation both chambers give near to no interference with the phototimer, reduce effects with the AEC and cause almost no influence like shadows on the image. Furthermore HVL measurements can be performed conveniently using special chamber holders, which enable to use the SFD chamber easily in combination with the HVL measuring stand. Both chambers comply fully with IEC 61674. The cable length is 2.5 m each.

**Ordering Information**
*Flat chamber, connecting system BNT, TNC or M:*
34069-2,5 SFD mammo chamber 6 cm³
34060-2,5 SFD diagnostic chamber 75 cm³

**Options**
- T34069.1.050 Chamber holder for SFD chamber 34069-2.5
- T34060.1.050 Chamber holder for SFD chamber 34060-2.5
- T20011 Cassette adapter for SFD chamber 34060
- T20012 Cassette adapter for SFD chamber 34069

Flat Chamber for Diagnostic X-Rays

**Flat ionization chamber 30 cm³ for precise dose measurements in the useful X-ray beam**

**Features**
- Enables dose measurements of diagnostic X-ray qualities in air
- Can be used down to 35 keV radiation energy
- Comes with a holding stem for mounting in the radiation field

The 30 cm³ flat chamber is especially designed for X-ray dose measurements in air down to 35 keV radiation energy. The maximum polarizing voltage is 500 V. The area density of the entrance window is 90 mg/cm². The chamber can be supplied with a BNT or TNC or PTW-M connector. It can be operated in connection with a UNIDOS E dosemeter. A radioactive check device including check source and shielding is available to correct air density and carry out function tests. Using the appropriate holder, the check source can always be positioned and oriented at the same place on the chamber.

**Ordering Information**
*Flat chamber, connecting system BNT, TNC or M:*
233612 Flat chamber 30 cm³

**Option**
- T232371 Holder
- UNIDOS E page 19
HVL Measuring Stand

**Measuring stand for an ideal performance of half value layer (HVL) measurements**

**Features**
- Accommodates Al or a Cu filters
- Accommodates a radiation detector
- Suitable for HVL measurements at overcouch and undercouch tube installations

Measurements of the half value layer (HVL) are performed during acceptance tests to determine the beam quality of X-ray installations in diagnostic radiology as well as in diagnostic therapy. The HVL measuring stand enables the user to position a detector and a HVL filter easily. Convenient undercouch measurements as well as HVL measurements in computed tomography can be carried out by using the HVL measuring stand with its U-shaped tripod.

The set includes an universal detector holder enabling the user to fix different detectors to the stand. An optional carrying case to accommodate the HVL measuring stand and up to 13 HVL filters is available.

**Ordering Information**
T20008 HVL measuring stand

**Options**
T20008.1.020 Carrying case for HVL measuring stand and 13 filters
23261 30 cm³ Cylindrical chamber
30004 0.6 cm³ Farmer chamber graphite
30012 0.6 cm³ Farmer chamber Al
34069-2.5 SFD mammo chamber 6 cm³
34060-2.5 SFD diagnostic chamber 75 cm³

Chambers with BNT, TNC and PTW-M connector available

- Al and Cu Filter Sets page 21

Al and Cu Filter Sets

**Al and Cu filters for precise half value layer (HVL) measurements**

**Features**
- Include 99.99 % high purity Al and Cu material
- Comply with IEC 60601-1-3

The extremely high purity of the aluminium and copper filter material enables high precision measurements of the X-ray beam quality in diagnostic radiology and in diagnostic therapy. The useful filter size is 80 mm x 80 mm and the outer dimensions are 100 mm x 100 mm.

**Ordering Information**
L981957 99.99 % Al filter set RAD/FLU
(7 Al-layers; 1 x 0.1 mm; 2 x 0.2 mm; 1 x 0.5 mm; 1 x 1 mm and 2 x 2 mm thickness)
L981956 99.99 % Al filter set MAM
(4 Al-layers; 1 x 0.1 mm; 2 x 0.2 mm and 1 x 0.5 mm thickness)
T43026 99.5 % Al filter set RAD/FLU
(7 Al-layers; 1 x 0.1 mm; 2 x 0.2 mm; 1 x 0.5 mm; 1 x 1 mm and 2 x 2 mm thickness)
T43025 99.0 % Al filter set RAD/FLU/DENT
(11 Al-layers; 4 x 0.1 mm; 2 x 0.5 mm and 5 x 1 mm thickness)
T43024 99.45 % Al filter set MAM
(6 Al-layers, each 0.1 mm thickness)
T43009.1.910 99.9 % Cu filter set
(11 Cu-layers; 2 x 0.02 mm; 0.05 mm; 0.1 mm; 2 x 0.2 mm; 0.5 mm; 2 x 2 mm; 5 mm; 10 mm thickness)

Single Al and Cu filters are available

- HVL Measuring Stand page 21
Diagnostic Measuring Phantom

Patient phantom for transmission dose measurement behind a 25 mm Al absorber

Features
- Simulates ideally the absorption and scattered radiation from a patient body
- Can be used at bucky units and undercouch units
- Includes steel tape measure 2 m, ruler 30 cm, stop watch. Cassette adapter for radiation detector required

Ordering Information
L981401 Diagnostic Measuring phantom

Option
Cassette adapters 18 cm x 24 cm for detectors

Absorbers

Absorbers for X-ray transmission dose measurements

Features
- Two types are available
- 25 mm Al absorber\(^1\) 163 mm x 163 mm, mounted on the collimator of radiographic and fluoroscopic units
- Dental absorber for all types of dental units, includes 6 mm Al, 8 mm PTFE, 0.3 mm Cu, 3 x 0.5 mm Cu filters and self-adhesive tape

\(^1\) Contains 99.5 \% high purity aluminum

Ordering Information
T42011 Absorber for overcouch tubes
T42029 Absorber set for dental dose measurement

PROFI Test Phantoms

Patient phantoms for health physics measurements on X-ray installations

Features
- Simulate the scattered radiation from a patient body
- Two types are available (Flu/Rad and Mammo)

Both phantoms are used to measure the radiation level around X-ray installations by using a survey meter. PROFI-M enables to place 3 different absorber thicknesses to check automatic mammo exposure control.

Ordering Information
T42006 PROFI-K Phantom for conventional X-rays
T42009 PROFI-M Phantom for mammography

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## Quality Control Equipment

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The quality of X-ray images is influenced by a number of parameters. To maintain the consistent performance of X-ray installations, quality checks have to be conducted regularly. International regulations demand quality test procedures for all types of X-ray equipment. Regular quality controls ensure proper functioning of the medical X-ray devices, reduce patient exposure, avoid unnecessary double exposures and consequently even reduce the costs of X-ray departments. The various components of the imaging chain are ideally tested independently to identify malfunctions and eliminate those detected easily.

PTW offers a variety of diagnostic test tools for different X-ray equipment. The PTW product line includes non-invasive kVp meters and test objects for quality checks of radiographic, fluoroscopic, mammographic, dental, DSA and CT installations. Additionally, sensitometers and densitometers are available to check the quality of the film processing independently from X-ray units. The QC sets include the basic test instruments. Further test tools are available for checking the focal spot size, image resolution, screen-film contact and image quality of image display devices and film viewers.
### DIAset QC Kits for Diagnostic Radiology

Sets of measuring equipment for comprehensive non-invasive quality control of diagnostic X-ray installations

**Features**
- Various portable sets of QC meters for X-ray services
- Include small size and lightweight measuring devices for non-invasive quality control of any X-ray equipment
- Measure dose, dose rate, dose per pulse, dose length product, kVp, PPV and exposure time

The DIAset kits for quality control of X-ray installations in general include a DIA Dos E dosemeter with appropriate detector and any type of DIAVOLT non-invasive kV-meter. This combination of measuring instrumentation covers the complete range of measuring tasks in diagnostic quality control. For practical reasons, the dose parameters and the voltage parameters are measured by two separate and independent devices. There is a choice of different QC kits for different applications.

**Ordering Information**

- L981240 DIAset UNIVERSAL (fluoroscopy, radiography, dental radiography, CT, mammography)
- L981241 DIAset MULTI (fluoroscopy, radiography, dental radiography, CT)
- L981242 DIAset FLU/RAD (fluoroscopy, radiography)
- L981245 DIAset MAM (mammography)
- L981234 DIAset DENT

**Options**
- T20002 Cassette adapter 18 cm x 24 cm
- T26333 Cable holding device for cassette adapter T20002
- T20003 Dental panorama cassette adapter
- T42029 Absorber set for dental dose measurement

### DiaControl expert QC Software

Comprehensive QC software for automatic data evaluation in diagnostic radiology

**Features**
- Software for fast and precise measurement analysis for use with all DIAVOLT types and DIADOS E
- Offers device operation by remote control
- Automatically sorted data presentation
- Evaluates data according to defined limits
- Implements HVL calculation, statistic functions and report modification

With the combination of the MS Windows based DiaControl expert software and the components out of the DIAset systems - DIAVOLT and DIADOS E - a complete and powerful technical solution is provided for determination, evaluation and documentation of all relevant parameters in diagnostic radiology. The user-friendly DiaControl expert software acquires and evaluates the measured values by means of an automatically sorting function. Quality parameters such as the accuracy, reproducibility and linearity can be checked easily. The measuring results are presented both in table form and graphically, showing the deviations from defined limit values. HVL calculations and automatic exposure control (AEC) tests can be determined.

DiaControl expert presents the kV waveform graphically and provides statistical evaluation. Measured data can be stored or exported to Excel sheets and the analysis results can be added to a report for subsequent documentation. The report can be modified individually.

**Ordering Information**

- S030006 DiaControl expert software

### Additional Information
- DIAset page 25
- DIAVOLT QC Meters pages 26 to 27
- DIADOS E page 17
DIAVOLT UNIVERSAL
All-in-one QC Meter

Non-invasive X-ray meter for kVp, PPV, dose and exposure time measurements at X-ray installations

Features
- Compact universal meter for quality control of different X-ray installations
- Measures kVp, PPV, dose and exposure time in one shot according to IEC 61676
- Independent of orientation
- Very fast sampling frequency
- Convenient use for under couch tubes

The DIAVOLT UNIVERSAL is designed for measurements of kVp mean, kVp max, PPV, exposure time and dose of X-ray installations for CT, radiography, fluoroscopy, mammography and for dental applications. The key features of the small and light-weight all-in-one device provide easy handling because of automatic functions like auto start, auto stop and auto range. The display reading switches automatically when used for measurements on under couch tubes. The DIAVOLT UNIVERSAL has an analogue output which connects to an oscilloscope for displaying the voltage waveform. Furthermore because of the fast sampling frequency, precise measurements can be performed even on very demanding X-ray units with high substantial ripples. No test shots for determination of the right detector orientation are necessary and no external accessories are required for operation. Via the optional DiaControl expert software for automatic data evaluation, quality parameters like the accuracy, reproducibility and linearity can be checked fast and easily.

Ordering Information
L981810 DIAVOLT UNIVERSAL

Options
S030006 DiaControl expert software
T25020 RS232 interface cable, 10 m
T25018 Oscilloscope cable, 10 m
L22038 Bag for DIAVOLT

DIAVOLT MULTI
All-in-one QC Meter

Non-invasive X-ray meter for kVp, PPV, dose and exposure time measurements at X-ray installations

Features
- Compact multipurpose meter for quality control of X-ray installations except of mammography units
- Measures kVp, PPV, dose and exposure time in one shot according to IEC 61676
- Independent of orientation
- Very fast sampling frequency
- Convenient use for under couch tubes

The DIAVOLT MULTI is designed for measurements of kVp mean, kVp max, PPV, exposure time and dose of X-ray installations for CT, radiography, fluoroscopy and for dental applications. The key features of the small and light-weight all-in-one device provide easy handling because of automatic functions like auto start, auto stop and auto range. The display reading switches automatically when used for measurements on under couch tubes. The DIAVOLT MULTI has an analogue output which connects to an oscilloscope for displaying the voltage waveform. Furthermore because of the fast sampling frequency, precise measurements can be performed even on very demanding X-ray units with high substantial ripples. No test shots for determination of the right detector orientation are necessary and no external accessories are required for operation. Via the optional DiaControl expert software for automatic data evaluation, quality parameters like the accuracy, reproducibility and linearity can be checked fast and easily.

Ordering Information
L981811 DIAVOLT MULTI

Options
S030006 DiaControl expert software
T25020 RS232 interface cable, 10 m
T25018 Oscilloscope cable, 10 m
L22038 Bag for DIAVOLT
**DIAVOLT RAD/FLU**
All-in-one QC Meter

*Non-invasive X-ray meter for kV<sub>p</sub>, PPV, dose and exposure time measurements at X-ray installations*

**Features**
- Compact kV and dosemeter for quality control of radiographic and fluoroscopic X-ray installations
- Measures kV<sub>p</sub>, PPV, dose and exposure time in one shot according to IEC 61676
- Independent of orientation
- Very fast sampling frequency
- Convenient use for under couch tubes

The DIAVOLT RAD/FLU is designed for measurements of kV<sub>p<sub>mean</sub></sub>, kV<sub>p<sub>max</sub></sub>, PPV, exposure time and dose of X-ray installations for radiography and fluoroscopy. The key features of the small and light-weight all-in-one device provide easy handling because of automatic functions like auto start, auto stop and auto range. The display reading switches automatically when used for measurements on under couch tubes.

The DIAVOLT RAD/FLU has an analogue output which connects to an oscilloscope for displaying the voltage waveform. Furthermore because of the fast sampling frequency, precise measurements can be performed even on very demanding X-ray units with high substantial ripples. No test shots for determination of the right detector orientation are necessary and no external accessories are required for operation. Via the optional DiaControl expert software for automatic data evaluation, quality parameters like the accuracy, reproducibility and linearity can be checked fast and easily.

**Ordering Information**
L981812 DIAVOLT RAD/FLU

**Options**
- S030006 DiaControl expert software
- T25020 RS232 interface cable, 10 m
- T25018 Oscilloscope cable, 10 m
- L522038 Bag for DIAVOLT

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**DIAVOLT MAM**
All-in-one QC Meter

*Non-invasive X-ray meter for kV<sub>p</sub>, PPV, dose and exposure time measurements in mammography*

**Features**
- Compact non-invasive meter for quality control of mammographic X-ray installations
- Measures kV<sub>p</sub>, PPV, dose and exposure time in one shot according to IEC 61676
- Independent of orientation
- Very fast sampling frequency
- Convenient use for under couch tubes

The DIAVOLT MAM is designed for measurements of kV<sub>p<sub>mean</sub></sub>, kV<sub>p<sub>max</sub></sub>, PPV, exposure time and dose of X-ray installations in mammography. The key features of the small and light-weight all-in-one device provide easy handling because of automatic functions like auto start, auto stop and auto range. The display reading switches automatically when used for measurements on under couch tubes.

The DIAVOLT MAM has an analogue output which connects to an oscilloscope for displaying the voltage waveform. No test shots for determination of the right detector orientation are necessary and no external accessories are required for operation. Via the optional DiaControl expert software for automatic data evaluation, quality parameters like the accuracy, reproducibility and linearity can be checked fast and easily.

**Ordering Information**
L981813 DIAVOLT MAM

**Options**
- S030006 DiaControl expert software
- T25020 RS232 interface cable, 10 m
- T25018 Oscilloscope cable, 10 m
- L522038 Bag for DIAVOLT
CONNY® II  
QC Dosemeter

Dosemeter for constancy tests of X-ray installations for radiography, fluoroscopy and mammography

Features
- Represents a valuable small size dosemeter for routine QC
- Measures the entrance dose and dose rate in front of a phantom at 30 kV (Mammo) and 70/100 kV (conventional X-rays)
- Complies with IEC 61674 within the ranges of use
- Displays dose and dose rate in Gy and Gy/s (R and R/s optional) and time in s

The dose of X-ray beams is the most important parameter of consistent performance of X-ray equipment. Each constancy check should include a dose measurement. The CONNY II dosimeter is especially designed for this purpose. It is used in combination with the REX phantom for QC of radiography and fluoroscopy devices and with the NORMI and X-Check phantoms for QC. CONNY II is calibrated in air kerma. The battery operated device features auto start, auto shut-off and timer functions.

Ordering Information
T11007 CONNY II dosimeter

- REX page 30
- NORMI MAM page 34
- NORMI 13 page 33
- X-Check FLU page 29
- X-Check RAD page 29
- NORMI 4 FLUplus page 31

X-Check PRO  
X-Ray Test Object

Test object for acceptance tests of radiographic and fluoroscopic X-ray installations according to the IEC standard

Features
- Suitable for acceptance tests of radioscopic and radiographic X-ray installations
- Complies with IEC 61223-3-1
- Suitable for overcouch and undercouch tubes and wallstand units

The X-Check PRO test object is used for acceptance tests of fluoroscopic and radiographic X-ray equipment according to IEC 61223-3-1. It includes a structure plate with 10 mm grid and a number of field size lines, which are radiologically visible, a crosshair, a line group resolution test pattern and circles with different optical densities.

The X-Check PRO test object includes assembling parts as well as a 25 mm thick aluminum plate, a 50 mm thick acrylic plate and a 1.5 mm thick Cu plate for beam attenuation. The external plate dimensions are 250 mm x 250 mm, except the structure plate, which is 300 mm x 300 mm.

The entrance dose is measured with a DIADOS or DIADOS E dosimeter.

Ordering Information
L981323 X-Check PRO test object

- DIADOS, DIADOS E page 17
X-Check FLU
X-Ray Test Object

Test object for constancy tests of analogue fluoroscopic X-ray installations acc. IEC 61223-2-9

Features
- Modular package for constancy tests of analogue fluoroscopic X-ray installations
- Suitable for overcouch and undercouch tubes and C arms
- Simulates the patient with respect to attenuation and hardening of the radiation beam
- Includes all relevant test structures and absorbers
- All characteristics can be tested simultaneously

The X-Check FLU test object is used for constancy tests of fluoroscopic and indirect radiographic X-ray equipment according to IEC 61223-2-9. The X-Check FLU package includes a structure plate with a 10 mm grid, a gray-scale test, a low-contrast test and a resolution test pattern. Furthermore, the X-Check FLU package comprises assembling parts as well as a 30 mm thick acrylic plate and a 1.3 mm thick copper plate for beam attenuation. The external plate dimensions are 300 mm x 300 mm. The construction of the X-Check FLU allows to check all parameters in one shot. Instead of the acrylic absorber, an optional 25 mm thick aluminum absorber can be fixed to the collimator by using adaption rails. The entrance dose can be measured with a CONNY II dosemeter.

Ordering Information
L981319 X-Check FLU base package
L981321 X-Check RAD/FLU base package

Options
T42020.1.002 X-Check FLU structure plate
L981912 Absorber 25 mm Al for 177/170 mm rail distance
T11007 CONNY II dosemeter

X-Check RAD
X-Ray Test Object

Test object for constancy tests of analogue radiographic X-ray installations acc. IEC 61223-2-11

Features
- Modular package for constancy tests of analogue radiographic X-ray installations
- Suitable for overcouch and undercouch tubes and wallstand installations
- Simulates the patient with respect to attenuation and hardening of the radiation beam
- Includes all relevant test structures and absorbers
- All characteristics can be tested simultaneously

The X-Check RAD test object is used for constancy tests of general direct radiographic X-ray equipment according to IEC 61223-2-11. The X-Check RAD package comprises two structure plates including a resolution test pattern, structures for testing the field alignment, the perpendicular position and the optical density. The construction of the X-Check RAD allows to check all parameters in one shot. The field alignment is checked by X-ray absorbing markings. Furthermore, the X-Check RAD package includes assembling parts as well as a 30 mm acrylic and a 1.3 mm thick copper plate for beam attenuation. The plate dimensions are 300 mm x 300 mm. Instead of the acrylic absorber, an optional 25 mm thick aluminum absorber can be fixed to the collimator by using adaption rails. The X-Check RAD also features a cassette holder according to the IEC. The entrance dose can be measured with the CONNY II dosemeter.

Ordering Information
L981320 X-Check RAD base package
L981321 X-Check RAD/FLU base package

Options
L981912 Absorber 25 mm Al for 177/170 mm rail distance
T11007 CONNY II dosemeter

X-Check FLU page 29
CONNY II page 28
**REX**  
**X-Ray Test Phantom**

*Reference phantom for quality control of X-ray installations for fluoroscopy and radiography*

**Features**
- Suitable for constancy tests and acceptance tests of conventional X-ray equipment
- Complies with IEC 61223-3-1
- Suitable for overcouch and undercouch tubes and wallstand installations
- Suitable for health physics measurements by an optional scattering plate and a survey meter

The REX phantom enables fast and easy control of properties, adjustment and stability of X-ray components and imaging systems. The compact aluminum test object of 250 mm x 250 mm size and 25 mm Al thickness includes well-defined structures with respect to X-ray attenuation and image quality. Requires the CONNY II dosemeter for entrance dose measurements.

**Ordering Information**
L981030 REX phantom base package, incl. carrying case

**Options**
L981031 REX scattering plate for health physics measurements
L653003 Magnifying glass, 8x

- CONNY II page 28
- DensiX page 40

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**NORMI 3**  
**X-Ray Test Object**

*Test object for constancy tests of analogue radiographic X-ray installations*

**Features**
- Checks all relevant parameters of analogue radiographic X-ray installations during constancy tests
- Complies with DIN 6868-3
- Suitable for overcouch and undercouch tubes and wallstand installations
- All characteristics can be tested simultaneously

The NORMI 3 test object is used for constancy tests of general direct radiographic X-ray equipment according to DIN 6868-3. The NORMI 3 package comprises a structure plate with a copper step wedge, radio opaque edge marks, a 10 mm grid and a homogeneous field in the centre for optical density measurements. All relevant parameters can be checked in one shot. Furthermore, the NORMI 3 package includes assembling parts as well as a 30 mm thick acrylic and a 1.3 mm thick copper plate for beam attenuation. The external plate dimensions are 300 mm x 300 mm. Instead of the acrylic absorber, an optional 25 mm thick aluminum absorber can be fixed to the collimator by using adaptation rails. The entrance dose can be measured with a CONNY II dosemeter.

**Ordering Information**
L981304 NORMI 3 base package

**Options**
T20005 Bucky mounting device
L981306 NORMI 3/4 base package
L981091 NORMI 3/4 base package with CONNY II
L981912 Absorber for over couch tubes, 177/170 mm

- CONNY II page 28
NORMI 4 X-Ray Test Object

Features
- Checks all relevant parameters of analogue fluoroscopic X-ray installations during constancy tests in one shot
- Suitable for overcouch and undercouch tubes and wallstand installations
- Complies with DIN 6868-4: 1987

The NORMI 4 test object is used for constancy tests of fluoroscopic and indirect radiographic X-ray equipment according to DIN 6868-4: 1987. The NORMI 4 package includes a structure plate with a copper step wedge, radio opaque concentric rings, a 10 mm grid, a homogeneous field in the centre for testing the optical density or the gray value and a resolution test pattern. Furthermore, the NORMI 4 package includes assembling parts as well as a 30 mm thick acrylic plate and a 1.3 mm thick copper plate for beam attenuation. The external plate dimensions are 300 mm x 300 mm. Instead of the acrylic absorber, an optional 25 mm thick aluminum absorber can be fixed to the collimator by using adaptation rails. The entrance dose can be measured with a CONNY II dosemeter.

Ordering Information
L981305 NORMI 4 base package

Options
T20005 Bucky mounting device
L981306 NORMI 3/4 base package
L981091 NORMI 3/4 base package with CONNY II
L981912 Absorber for over couch tubes, 177/170 mm

CONNY II page 28

Test object for constancy tests of analogue fluoroscopic X-ray installations

NORMI 4 FLU\textsuperscript{plus} X-Ray Test Object

Features
- Checks all relevant parameters of analogue and digital fluoroscopic X-ray units
- Suitable for routine quality checks on over couch tubes, under couch tubes and C arms
- Includes an attenuation plate for patient simulation
- Complies with DIN 6868-4: 2007

The NORMI 4 FLU test object is used for constancy tests of analogue and digital X-ray installations for fluoroscopy acc. to DIN 6868-4. The NORMI 4 FLU packages include a structure plate with a copper step wedge for testing the dynamic range, a resolution test pattern, low contrast and detail test elements as well as a kV test area for the determination of the radiation quality. The NORMI 4 FLU structure plate allows to check all parameters in one shot. Different NORMI 4 FLU packages are available, either with the outer dimensions 200 mm x 200 mm x 18.5 mm or 300 mm x 300 mm x 18.5 mm (NORMI 4 FLU\textsuperscript{plus}) and either with a 30 mm thick PMMA and a 1 mm thick copper plate or with a 25 mm thick aluminum absorber for patient simulation. Furthermore, each NORMI 4 FLU package includes assembling parts which allow a convenient adjustment on over couch tubes, under couch tubes and C arms. The entrance dose can be measured with a CONNY II or DIADOS E dosemeter.

Ordering Information
L981301 NORMI 4 FLU\textsuperscript{plus} Set PMMA
L981302 NORMI 4 FLU\textsuperscript{plus} Set Al
L981307 NORMI 4 FLU Set PMMA
L981374 NORMI 4 FLU\textsuperscript{plus} Retrofit Set

CONNY II page 28
DIADOS E page 17
X-Check® DSA
Test Object

X-ray test object for quality control of DSA installations

Features
- Suitable for acceptance and constancy tests of DSA installations
- Complies with IEC 61223-3-3 and DIN 6868-4: 2007
- Simulates the contrast agent within vessels
- Includes pneumatic remote control of the movable slider, extension 8m

X-Check DSA is a test object for quality checks of DSA equipment (Digital Subtraction Angiography). The size of the acrylic phantom is 150 mm x 150 mm x 57 mm. X-Check DSA includes a 6 mm thick acrylic slider with manual remote-control and contains four Al strips for vessel simulation to check dynamic range and artifacts. Sensitivity checks are conducted by means of a copper step wedge with 7 steps in 0.2 mm increments. An additional copper step of 1.4 to 0.2 mm makes it possible to evaluate logarithmic errors.

Ordering Information
T42003 X-Check DSA test object, including case

Option
T42003.1.006 X-Check DSA frame 300 mm x 300 mm, incl. 4 supports for use with undercouch tubes

NORMI 4 FLUplus page 31
X-Check FLU page 29

X-Check Beam
X-Ray Test Object

Test object for testing the perpendicular position of the radiation beam

Features
- Small mechanical test object for easy operation
- Fast and convenient check of the alignment of the radiation beam axis in relation to the image receptor plane

The X-Check Beam test tool is used to check the perpendicular alignment of the radiation beam axis in relation to the image receptor plane. The cylindrical X-Check Beam consists of two thin parallel PMMA plates arranged to form an upper and a lower base. Two steel balls are attached to both plates and arranged so that the centres of both steel balls lie in the same line perpendicular to the plane of both bases.

When irradiated, the related position of both steel balls to each other indicates, if the X-ray beam axis is perpendicular to the image receptor plane or if there is a deviation from the required 90° angle.

Ordering Information
T40039 X-Check Beam
NORMI 58
X-Ray Test Object

Test object for quality control of digital X-ray installations

Features
- Checks the specific parameters of digital X-ray equipment
- Enables QA checks of digital radiographic X-ray installations
- Used in combination with an Al absorber

NORMI 58 is a test object to check the image quality of digital radiographic installations. The object structures make it possible to test the specification of the electronic signals, the dose indicator, the contrast resolution, the image homogeneity, the image geometry and scale, and possible artifacts. NORMI 58 requires a 25 mm Al absorber for realistic exposures.

Ordering Information
T42012 NORMI 58 test object

Options
T42012.1.020 NORMI 58 carrying case
L981914 Absorber 25 mm Al for undercouch and overcouch tubes, incl. 4 supports and NORMI 58 mounting parts
L981912 Absorber 25 mm Al for overcouch tubes with rail distance 177/170 mm
- DensiX page 40
- CD LUX Meter page 38

NORMI 13
X-Ray Test Object

Test object for quality control of digital X-ray installations

Features
- Checks the relevant parameters of digital X-ray equipment
- Suitable for acceptance tests and constancy tests
- Includes a resolution test pattern
- Requires an attenuation plate for patient simulation and a diagnostic dosemeter for entrance dose measurement

The NORMI 13 test object is designed for acceptance tests and constancy tests of X-ray equipment with a digital image intensifier. It includes a structure plate with radiological visible line marks for the light field adjustment and the test of the light field/radiation field congruency, a gray scale test, a low-contrast test, a line group resolution test pattern, an area for entrance dose measurement and homogeneous areas for homogeneity tests and signal normalization.

The structure plate is used in combination with a 30 mm thick acrylic attenuation plate or a 25 mm Al plate to simulate patient absorption. A 1.3 mm thick Cu plate is used in addition for tests at 100 kV. The external dimensions of the plates are 300 mm x 300 mm.

The entrance dose is measured with the CONNY II or the DIADOS E dosemeter.

Ordering Information
L981247 NORMI 13 Set
L981246 NORMI 13 Focus

Options
T42023.1.010 NORMI 13 carrying case
L981358 NORMI 13 test object
L981135 NORMI 13 acrylic absorber 30 mm PMMA
T20005 Bucky mounting device
- CONNY II page 28
- DIADOS E page 17
NORMI PAS Set 1054
Mammo Test Object

Test object for acceptance and constancy tests of digital mammographic X-ray installations

Features
- Checks all relevant parameters of digital mammographic X-ray installations
- ACR test element based on the Mammographic Accreditation Phantom of the American College of Radiology (ACR) included
- Optional test element for acceptance tests available
- Complies with DIN PAS 1054 in combination with IEC 61223-3-2

NORMI PAS Set 1054 is used to test specific values of digital mammographic X-ray installations. The modularly composed phantom includes a basic phantom, a structure plate, three PMMA absorbers and up to five different test elements for insertion into the structure plate:
- Test element PMMA for testing the average gray value
- Test element ACR with micro-calcifications and fibrils
- Test element HK for testing the high contrast
- Test element KRV for testing the signal-to-noise-ratio
- Optional test element AP for testing the low contrast.

The resolution test pattern embedded in the structure plate can be rotated by 45°, 60° and 90°. The basic phantom has an inclined step wedge with 14 ranges for testing the dynamic range. Two lines of five steel balls each are symmetrically placed in the structure plate and in the attenuation phantom. They show the limitations on the thoracic wall side. Various acrylic absorbers can be used for testing the automatic exposure control (AEC).

Ordering Information
L981248 NORMI PAS Set 1054

Options
T42028.1.020 Test element AP
T42028.1.018 Aluminum step
- CONNY II page 28
- DIADOS E page 17

NORMI MAM
Mammo Test Object

Test phantom for quality control of analog mammographic X-ray installations

Features
- Suitable for acceptance and constancy tests of analog mammographic X-ray units
- High-contrast test, low-contrast test and steel balls at thorax side
- Checks specific mammography parameters

NORMI MAM is an easy-to-use test phantom, which makes it possible to test specific values of mammographic X-ray systems. The values tested are the optical density of test films, the position and size of the useful radiation field, the contrast resolution, the presence of impurity spots. Two lines of five steel balls each are symmetrically placed in the structure plate and in the attenuation phantom. They show the image limitations at the thorax side on the radiograph. The acrylic plate of 20 mm thickness in combination with the standard 40 mm attenuation phantom can be used for operation tests of the automatic exposure control (AEC). Checks for artefacts are performed with the acrylic plate of 20 mm thickness. Moreover a resolution test pattern (8, 10, 13, 16 lp/mm) is included in the structure plate. An optional second 20 mm plate is used for bigger cassette formats such as 24 cm x 30 cm.

Ordering Information
T42024 NORMI MAM test object

Options
T26766/11 NORMI MAM acrylic plate (20 mm)
L653003 Magnifying glass, 8x
- CONNY II page 28
- DensIX page 40
- SensiX page 40
SIB Mammo Phantom

Test phantom for comprehensive quality control of mammographic X-ray installations

Features
- Contains a combination of medical details and physical tests for mammo quality checks
- Tests film processing using a sensitometer
- Enables the most important factors influencing image quality to be recorded objectively and numerically

The SIB phantom is a mammographic testing medium in accordance with international standards for acceptance and constancy tests. It is possible to test mean optical density, object contrast, resolution capacity, magnification factor, the position of the effective radiation field and film processing. Microcalcifications, tumor shadows and connective tissue can be simulated. An image quality number can be determined for each phantom exposure independently of the receptor system used.

Ordering Information
T42001 SIB mammographic phantom

Options
T42001.3.050 Dosimetry plate for DIADOS detector
S030003 SIB record keeping software for recording, evaluating and reporting SIB phantom data.
MS-DOS application
- SensiX page 40
- DensiX page 40

Mammo Stand Focal Spot Test

Test stand for measuring mammographic spatial resolution

Features
- Locates test patterns precisely 4 – 5 cm above grid cover or mag stand
- Provides attenuation appropriate for phototiming
- Two orthogonal slots for conventional mammography test patterns
- Two orthogonal slots for digital and digital stereo test patterns

The Mammo Focal Spot Test Stand is designed for easy assessment of mammographic spatial resolution measurements according to ACR, MQSA\(^1\) and AAPM TG-4, Report #60. The stand precisely positions the test patterns above the grid cover or mag stand and provides attenuation, which is appropriate for phototiming, while minimizing scatter effects. The test patterns may be inserted or removed by the user. The test pattern scale in line pairs per mm (lp/mm) is printed on the stand.

The spatial resolution range of the patterns for conventional mammography is (10.0 ... 20.0) lp/mm with increments of 1 lp/mm, and the resolution range of the pattern for digital mammography is (4.5 ... 9.5) lp/mm with increments of 0.5 lp/mm.

Ordering Information
T42013 Mammo Focal Spot Test Stand
L659092 Test pattern for conventional mammography
L659093 Test pattern for digital mammography
- Test Patterns page 39

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\(^1\) ACR, MQSA: American College of Radiology, Mammography Quality Control Manual
Mammography Compression Test Set

Set for testing the compression device of mammographic installations

Features
- Comprises an electrical compression scaling unit and a foam cuboid
- Complies with IEC 61223-3-2, DIN PAS 1054
- Large LC-Display

The compression device of mammographic installations has to be checked during acceptance tests. The set for testing the compression device comprises a foam cuboid with a specified density and a non-calibratable electrical device with a scale displaying the mechanical force of the mammography compression device (measuring range 0-300 N ± 5 N; displayed unit is kg). It measures the compression force for all selectable settings, including the maximum value. The measured values and the indicated values at the mammographic X-ray equipment shall agree within the specified tolerances and the maximum force specified shall not be exceeded.

Ordering Information
- L981143 Mammo compression test set
- L991235 Scale for testing the compression device
- L514044 Foam cuboid according to IEC 61223-3-2

PMMA Absorbers AEC Test Phantoms

Absorbers for testing the automatic exposure control (AEC) of X-ray installations in mammography

Features
- Easy quality checks of the automatic exposure control (AEC) of analog and digital mammographic X-ray installations
- Different sizes and thicknesses according to IEC and DIN are available

According to IEC and DIN the automatic exposure control (AEC) has to be checked during acceptance and constancy tests of analog and digital X-ray installations in mammography. For exposures under AEC, any variation in the net optical density or grey value has to be in the same direction and closely correlated for different PMMA thicknesses.

Ordering Information
- T40033 PMMA absorber 240 mm x 180 mm x 5 mm
- T40029 PMMA absorber 240 mm x 180 mm x 10 mm
- T40032 PMMA absorber 240 mm x 180 mm x 20 mm
- T40034 PMMA absorber 240 mm x 180 mm x 40 mm
- T40031 PMMA absorber 240 mm x 180 mm x 45 mm
- T40035 PMMA absorber 240 mm x 180 mm x 50 mm
- T40030 PMMA absorber 300 mm x 240 mm x 45 mm
- DensiX page 40
- CD LUX Meter page 38
Screen-Film Contact Test Tools

Meshes for checks of the contact between film and screen of X-ray film cassettes

Features
- Enable fast and easy quality checks of film cassettes
- Copper mesh embedded in plastic plate
- Two types are available:
  - Radiography test tool 36.5 cm x 43 cm with 8 wires per inch (~3 wires per cm), 0.7 mm thick
  - Mammography test tool 26 cm x 31 cm with 40 wires per inch (~16 wires per cm), 0.26 mm thick

Poor image quality of X-ray films can be caused by film-screen contact problems in the film cassette. These problems can be determined easily by laying the mesh over the cassette and exposing the film. Blurring or distortion of the screen image across the film indicates poor film-screen contact. The screen-film contact of the X-ray film cassettes should be checked frequently to ensure image quality.

Ordering Information
- L991077 Radiography screen-film contact test tool
- L991078 Mammography screen-film contact test tool

Centric Cross Image Ruler

Cross ruler to determine image locations on intensifier screens

Features
- Small mechanical test tool to check the correct centering of intensifier screens
- Enables easy adjustment at fluoroscopic installations
- Presents radiopaque scales on a fluoroscopic monitor

The centric cross is mounted on a base plate of 16 cm x 16 cm, made of Al. Two 20 cm rulers, starting from the center, can be adjusted as a cross and can be centered easily. The centric cross is fixed by means of suction cups.

Ordering Information
- T43010.1.001 Centric cross
Focal Spot Measuring Stand

**Stand for focal spot measurements by means of a star test pattern or slit camera**

**Features**
- Focal spot measurements according to IEC 60336 and NEMA XR5–1984
- Includes measuring stand with universal holder for ideal positioning of a star test pattern or slit camera

The focal spot measuring stand allows an easy adjustment and precise positioning of a slit camera or star test pattern for the determination of focal spot dimensions and of the modulation transfer function (MTF).

**Ordering Information**
- T20009 Focal Spot measuring stand
- Slit Camera page 38
- Test Patterns page 39

Slit Camera

**For focal spot measurements and determination of the modulation transfer function (MTF)**

**Features**
- For the determination of focal spot dimensions and of the modular transfer function (MTF)
- Easy, fast and precise measurements according to IEC 60336 and NEMA XR5–1984

The MTF is developed from the one-dimensional intensity distribution obtained from the slit images.

**Ordering Information**
- L659117 Slit camera, 10 µm
- L659138 Slit camera, 30 µm

CD LUX Meter Light Measurement

**Digital luminance and illuminance meter for quality control of viewing boxes and image display devices**

**Features**
- Measures the luminance and illuminance during quality checks of viewing boxes and image display devices
- Includes a spacing tool for correct distance adjustment of the detector
- Built-in laser pointer for precise measurements by indicating the measuring spot
- All relevant parameters acc. IEC and DIN can be measured in combination with a test picture

The quality of film viewing boxes and monitors in X-ray diagnostics has to be monitored regularly. Boxes and image display devices are tested easily by using the battery operated CD LUX Meter, which measures the luminance in cd/m². With the LUX detector measurements of the (room) illuminance in lux can be performed.

A spacing tool helps to place the detector at the right distance, while a built-in laser pointer allows correct positioning by indicating the measuring spot. The CD LUX Meter includes a USB interface.

The optional Mavo-Max is a self-contained small measuring device designed for the monitoring of the ambient light in the surrounding of image display devices for continuous operation. Two LEDs indicate directly if the ambient light is within the permissible light range.

**Ordering Information**
- L991263 CD LUX Meter Set for luminance and illuminance measurement
- L991260 CD LUX Meter for luminance measurement

**Options**
- L991261 LUX Detector
- L991262 Mavo-Max
- S030007 RadiCS software
  - NORMI 13 page 33
  - NORMI PAS 1054 page 34
  - NORMI 4 FLU page 31
Lead foil test patterns for X-ray resolution, focal spot size and MTF tests

Features

- Enable easy quality checks of X-ray imaging chains
- A multitude of different test patterns with various lead thicknesses are available
- Spatial frequencies are given in line pairs per mm (lp/mm)

- Rectangular, circular and high resolution line group tests with various spatial frequency ranges are available
- Focal spot measuring test patterns for easy determination of the size and shape of X-ray focus spots are available

Ordering Information

<table>
<thead>
<tr>
<th>Model</th>
<th>Resolution [lp/mm] (min. – max.)</th>
<th>Pb Thickness [mm]</th>
<th>Size [mm]</th>
<th>Remarks</th>
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<tr>
<td>L650005</td>
<td>0.6 / 0.7 / 0.9 / 1 / 1.2 / 1.4</td>
<td>0.05</td>
<td>50 x 50</td>
<td></td>
</tr>
<tr>
<td>L650006</td>
<td>0.6 / 0.7 / 0.9 / 1 / 1.2 / 1.4</td>
<td>0.05</td>
<td>50 x 50</td>
<td>2 orthogonal groups per step</td>
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<td>L650007</td>
<td>0.8 / 1.1 / 1.4 / 1.7 / 2.1 / 2.4 / 3.0 / 4.2 / 6.9</td>
<td>0.05</td>
<td>50 x 50</td>
<td></td>
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<tr>
<td>L650008</td>
<td>5 / 5.2 / 5.4 / 5.8 / 6 / 6.2 / 6.6 / 6.8 / 7</td>
<td>0.10</td>
<td>35 Ø</td>
<td></td>
</tr>
<tr>
<td>L650009</td>
<td>5 / 5.2 / 5.4 / 5.8 / 6 / 6.2 / 6.6 / 6.8 / 7</td>
<td>0.05</td>
<td>34 Ø</td>
<td></td>
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<tr>
<td>L650010</td>
<td>9 / 12 / 7 / 6 / 5 / 4 / 3 / 2.5 / 1.5 / 1 / 0.7 / 0.5</td>
<td>0.05</td>
<td>31 Ø</td>
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<table>
<thead>
<tr>
<th>Model</th>
<th>Resolution [lp/mm] (min. – max.)</th>
<th>Pb Thickness [mm]</th>
<th>Size [mm]</th>
<th>Remarks</th>
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</thead>
<tbody>
<tr>
<td>L650008</td>
<td>4.5 / 5 / 5.5 / 6.5 / 7 / 7.5 / 8 / 9 / 10 / 11 / 20</td>
<td>0.03</td>
<td>24 x 12</td>
<td>e.g. for digital mammography</td>
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<tr>
<td>L650011</td>
<td>3.55 / 4 / 4.5 / 5 / 5.5 / 6 / 7 / 8 / 9 / 10 / 11 / 12 / 13 / 14 / 16 / 20</td>
<td>0.03</td>
<td>95 x 50</td>
<td>e.g. for mammography</td>
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<tr>
<td>L650009</td>
<td>2 / 2.5 / 3 / 3.5 / 4 / 4.5 / 5 / 6 / 7 / 8 / 9 / 10 / 11 / 12 / 13 / 14 / 16 / 20</td>
<td>0.03</td>
<td>24 x 12</td>
<td>e.g. for mammography</td>
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<table>
<thead>
<tr>
<th>Model</th>
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<th>Size [mm]</th>
<th>Remarks</th>
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<tr>
<td>L650008</td>
<td>6 / 7 / 8 / 9 / 10 / 11 / 20</td>
<td>0.03</td>
<td>40 x 30</td>
<td></td>
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<tr>
<td>L650013</td>
<td>1.5 / 2.5 / 3 / 3.5 / 4 / 4.5 / 5 / 6 / 7 / 8 / 9 / 10 / 11 / 12 / 13 / 14 / 16 / 20</td>
<td>0.03</td>
<td>40 x 30</td>
<td>1 sector of 20 lp, angle 0.4°</td>
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<td>L650012</td>
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<td>0.05</td>
<td>150 x 50</td>
<td>1 sector of 5 lp, angle 0.4°</td>
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<th>Model</th>
<th>Resolution [lp/mm] (min. – max.)</th>
<th>Pb Thickness [mm]</th>
<th>Size [mm]</th>
<th>Remarks</th>
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<tbody>
<tr>
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<td>0.25 / 0.5 / 0.6 / 0.7</td>
<td>0.05</td>
<td>71 x 44</td>
<td>scale on additional sheet</td>
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<td>L650015</td>
<td>0.3 / 0.5 / 0.7 / 0.8 / 0.9 / 1.0 / 1.2 / 1.4 / 1.7 / 2.4 / 2.8 / 3.6 / 3.7 / 4.05 / 4.1 / 4.2</td>
<td>0.05</td>
<td>95 x 50</td>
<td>scale on additional sheet</td>
</tr>
<tr>
<td>L650016</td>
<td>0.25 / 0.3 / 0.33 / 0.36 / 0.4 / 0.44 / 0.48 / 0.52 / 0.57 / 0.63 / 0.69 / 0.76 / 0.83 / 0.91 / 1 / 1 / 1.1 / 1.3 / 1.45 / 1.6 / 1.75 / 1.9 / 2.1 / 2.3 / 2.5 / 2.75 / 3 / 3 / 3.3 / 3.6 / 4 / 4.4 / 6.8 / 8.2 / 10.1 / 10.7 / 12 / 12.6 / 14 / 16.2 / 18 / 20 / 22.5 / 24 / 26 / 28 / 30 / 32.5 / 35 / 37 / 40 / 42 / 44.2 / 46 / 48 / 50 / 52 / 54 / 56 / 58 / 60 / 62 / 64 / 66 / 68 / 70 / 72 / 74 / 76 / 78 / 80</td>
<td>0.05</td>
<td>62 x 44</td>
<td>scale on additional sheet</td>
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<table>
<thead>
<tr>
<th>Model</th>
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<th>Pb Thickness [mm]</th>
<th>Size [mm]</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>L650017</td>
<td>0.85 / 16</td>
<td>0.03</td>
<td>55 Ø</td>
<td>angle 1.5°</td>
</tr>
<tr>
<td>L650018</td>
<td>0.85 / 16</td>
<td>0.03</td>
<td>55 Ø</td>
<td>angle 2.0°</td>
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</table>

<table>
<thead>
<tr>
<th>Model</th>
<th>Resolution [lp/mm] (min. – max.)</th>
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<th>Size [mm]</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>L650041</td>
<td>1.27</td>
<td>0.03</td>
<td>55 Ø</td>
<td>angle 1.0°</td>
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<tr>
<td>L650042</td>
<td>0.63 / 20</td>
<td>0.03</td>
<td>55 Ø</td>
<td>angle 0.5°</td>
</tr>
<tr>
<td>L650043</td>
<td>0.64 / 20</td>
<td>0.03</td>
<td>55 Ø</td>
<td>angle 2.0°</td>
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</table>

<table>
<thead>
<tr>
<th>Model</th>
<th>Resolution [lp/mm] (min. – max.)</th>
<th>Pb Thickness [mm]</th>
<th>Size [mm]</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>L650044</td>
<td>0.2</td>
<td>0.05</td>
<td>50 x 50</td>
<td>absorbing</td>
</tr>
<tr>
<td>L650045</td>
<td>0.2</td>
<td>0.05</td>
<td>50 x 50</td>
<td>non-absorbing</td>
</tr>
</tbody>
</table>

This is just a selection. About 60 different patterns are available. More information upon request.
SensiX
Film Sensitometer

Sensitometer for exposing a 21-step wedge on X-ray films

Features
- Enables checks of film processing systems independent of X-ray equipment
- Enables light exposures of 21-step wedges on blue or green sensitive X-ray films
- Includes audible exposure control
- Fulfills international regulations
- A calibrated version is available

SensiX is a single-sided, dual color, light-emitting sensitometer for reproducible exposures of a 21-step wedge on X-ray films. SensiX is used in the dark room to check the consistent performance of film processing systems. Light emission can be selected for blue sensitive films (spectral maximum 460 nm) and green sensitive films (spectral maximum 510 nm). The audible exposure control indicates blue, green or no exposure. SensiX is battery operated.

Ordering Information
L981261 SensiX sensitometer, battery operated
L981262 SensiX Cal sensitometer, calibrated

- SensiX page 40
- SensiX auto page 41

DensiX
Film Densitometer

Film densitometer for measuring the optical density of X-ray films

Features
- Suitable for the evaluation of processed test films from sensitometer or X-ray exposure
- Enables manual single point measurement of optical densities in the range (0.00 ... 4.5) OD
- Enables menu-prompted calibration by the user
- A special version DensiX-LE for calculating light sensitivity LE and light contrast LK is available

DensiX is a manually operated film densitometer for measuring the optical density of processed X-ray films, exposed by a sensitometer (light exposure of a step wedge) or by X-ray equipment (X-ray exposure of a test object). It is suitable for constancy measurements on radiographic, mammographic and cine films. The length of the measuring arm is 20 cm, which makes it possible to measure the optical density even in the middle of 35 cm x 43 cm large size films. The special version DensiX-LE is used for acceptance test measurements.

Ordering Information
L981263 DensiX densitometer
L981264 DensiX-LE densitometer

Option
Rechargeable batteries

- DensiX auto page 41
- SensiX page 40
**DensiX auto**

**Auto Densitometer**

*Automatic film densitometer for measuring the optical density of X-ray films*

**Features**

- Combination device for automatic and manual density measurements of X-ray films in the range (0.0 ... 4.00) OD
- Suitable for constancy and acceptance tests
- Motor-driven, sensor-controlled transport of the test film, exposed by a SensiX sensitometer
- Evaluation of the measuring results according to ANSI and DIN to check the quality of film processing systems
- Single-point measurement by a separate measuring arm with 18 cm film access length
- Enables menu-prompted calibration using the enclosed calibration strip

The features of DensiX auto are similar to the DensiX densitometer. Additionally it is equipped with a device for automatic transport and evaluation of SensiX test films. Up to five measurement results can be stored in the unit. DensiX auto requires a power supply and can be connected to a computer. ConsiX software is available.

**Ordering Information**

L981265 DensiX auto Densitometer

**Options**

L178023 RS232 interface cable, 1.8 m, 9 pins

- ConsiX Software page 41

**ConsiX**

**Software**

*MS Windows software for computer controlled quality checks of X-ray film processing*

**Features**

- Controls the DensiX auto densitometer
- Evaluates the 21-step wedge densities according to ANSI and DIN
- Indicates when given tolerance limits are exceeded
- Enables storing any number of measuring results
- Enables keying-in optical density measuring results
- Documents the measuring results in relation to specific film processors as a function of date

The MS Windows software ConsiX is commonly used in combination with the automatic DensiX auto densitometer. ConsiX is designed for automatic optical density measurements of 21-step wedges, exposed by the SensiX sensitometer on a radiographic film. The film gradation curve is evaluated according to ANSI and DIN standards. ConsiX gives a warning if specific limits of density variation are exceeded. All data are stored as a function of date and can be printed.

**Ordering Information**

S030001 ConsiX Software

- DensiX auto page 41
- SensodensiX auto page 42
SensodensiX Combined Device

Combined 21-step sensitometer and manual densitometer for QC in diagnostic radiology

Features
- Combines a sensitometer and a manual densitometer in one compact unit
- Exposes a 21-step wedge on blue or green sensitive X-ray films
- Suitable for manual single point measurement of optical densities in the range (0.00 ... 4.5) OD

The SensodensiX device is a combination of a sensitometer and a manual densitometer for quality control of X-ray film processing and for checking test phantom films.

The single-sided, dual color, light-emitting sensitometer exposes a step wedge of 21 steps on X-ray films. The light emission can be selected for blue sensitive films (spectral maximum 460 nm) and green sensitive films (spectral maximum 510 nm). The wedge constant is 0.15 OD according to international standards.

The manually operated densitometer is designed for optical density single point measurements of processed X-ray films, exposed by a sensitometer or by X-ray equipment. The measuring accuracy and the repeatability are ± 0.01 OD each. The measuring aperture is 3 mm diameter. The length of the measuring arm is 20 cm, which makes it possible to measure the optical density even in the middle of large size films (35 cm x 43 cm).

Ordering Information
L981266 SensodensiX combined unit

SensodensiX auto Combined Device

Combined 21-step sensitometer, manual and automatic densitometers for QC in diagnostic radiology

Features
- Three in one - Combines a sensitometer, a manual and an automatic densitometer in one compact unit
- Exposes a 21-step wedge on blue or green sensitive X-ray films
- Suitable for manual single point measurement of optical densities in the range (0.00 ... 4.5) OD
- Includes an automatic densitometer with film feeder

The SensodensiX auto device is a combination of a sensitometer, a manual densitometer and an automatic densitometer for quality control of X-ray film processing and for checking phantom test films.

The single-sided, dual color, light-emitting sensitometer exposes a 21-step wedge on X-ray films. The light emission can be selected for blue sensitive films (spectral maximum 460 nm) and green sensitive films (spectral maximum 510 nm). A calibrated sensitometer version is available.

The manually operated densitometer is designed for optical density single-point measurements of processed X-ray films, exposed by a sensitometer or by X-ray equipment. The length of the measuring arm is 20 cm, which makes it possible to measure the optical density even in the middle of large size films (35 cm x 43 cm).

The automatic densitometer includes a mechanism for motor driven film transport and computer controlled measurement and evaluation of test films exposed by the 21-step sensitometer.

The device can be connected to a computer via an RS232 interface cable. ConsiX software is available.

Ordering Information
L981267 SensodensiX auto unit
L981268 SensodensiX auto Cal unit with calibrated sensitometer
L178023 RS232 interface cable, 1.8 m, 9 pins
- ConsiX Software page 41
Diagnostic QC Set ‘A’

Set of test devices for quality control of X-ray film processing

Features
- Enables complete, fast and accurate constancy tests of film processing
- Comprises all relevant test devices: a SensiX sensitometer, a DensiX densitometer and a model 175 thermometer
- Complies with international regulations
- Supplied with a carrying case

Consistent performance of film processing has to be checked daily to ensure proper processing and good image quality of X-ray films. To check the film developing process independently of X-ray equipment, the 21-step wedge SensiX sensitometer carries out test exposures. After the development by the processor to be checked, the DensiX densitometer evaluates the test film, measuring the optical densities at the step wedge. The model 175 thermometer checks the temperature of the developing liquid. For processing constancy tests, it suffices to compare the results by always using the same SensiX sensitometer. The optional set ‘A Cal’ includes a calibrated SensiX Cal sensitometer for calibrated light exposures to a test film.

Ordering Information
L981310 QC measuring set ‘A’

Option
L981317 QC measuring set ‘A Cal’ with calibrated SensiX Cal sensitometer

Diagnostic QC Set ‘B’

Set of test devices for quality control of film processing and of radiographic and fluoroscopic units

Features
- Enables complete, fast and accurate constancy tests of film processing and X-ray units
- Comprises all relevant test devices: a REX phantom, a CONNY II dosemeter, a SensiX sensitometer, a DensiX densitometer and a model 175 thermometer
- Complies with international regulations
- Supplied with a carrying case

In addition to the processing QC test tools of set ‘A’, the set ‘B’ includes the REX phantom and the CONNY II dosemeter for quality control of radiographic and fluoroscopic X-ray equipment. The REX phantom is suitable for checks of X-ray overcouch, undercouch and wall stand installations. The optional set ‘B Cal’ includes a calibrated SensiX Cal sensitometer.

Ordering Information
L981311 QC measuring set ‘B’

Options
L981315 QC measuring set ‘B Cal’ with calibrated SensiX Cal sensitometer
L981308 AFSSAPS kit for QC acc. French regulation

- SensiX page 40
- DensiX page 40
- REX page 30
- CONNY II page 28
Notes
## Accessories and Services

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</table>
Darkroom equipment

PTW has been manufacturing darkroom accessories for many years. Especially the low price FILMSCRIBOR has become a standard for easy and reliable film marking. It exposes any documentation to the X-ray film and develops it together with the radiological X-ray exposure of a patient.

The PTW safelights are widely used for secure illumination of darkrooms to avoid unintentional light exposure to X-ray films during film processing. Thousands of reliable darkroom safelights and film markers have been delivered during the past years to X-ray departments.

Pediatric filters

For radiation protection of children in pediatric radiology, additional X-ray filters should be used to reduce the patient exposure. Transparent plumbiferous acrylic filters in various sizes are available.

Surgical gloves

Lead loaded rubber gloves are available in various sizes to reduce radiation exposure, especially of surgeons in orthopedics and in interventional radiology.

Selection of Health Physics Products

A variety of pocket-sized and light-weight digital radiation monitors and mobile monitors are available. The X-ray leakage system checks the leakage radiation of diagnostic X-ray tubes. The PTW calibration laboratory offers comprehensive radiological calibration services.
FILMSCRIBOR®
X-Ray Film Marker

Film marker for exposing patient data on X-ray films prior to film processing

Features
- Based on a photoelectric system, it automatically exposes all essential patient data on film
- Works independently of cassette type
- Can be adapted for use in any X-ray department

The Filmscribor ensures automatic exposure of all essential patient data on a film together with the name of the hospital or X-ray department. This eliminates any errors resulting from manual subsequent film marking. The desired text is typed on a paper strip soon after the patient is registered for examination. This text will be photographed on a film before processing in the darkroom. The identification system using the filmscribor can be adapted for use in any X-ray department easily.

Ordering Information
T5345 FILMSCRIBOR film marker, 230 V

Options
T5344 FILMSCRIBOR with enlarged exposure window
Paper strips upon request

Safelights for Darkrooms

Bright illumination safelights for X-ray film processing darkrooms

Features
- Deliver high brightness for both indirect and direct illumination of the darkroom
- Provide continuous brightness adjustment, enabling film processing without danger of causing fog
- Include a bracket for wall or ceiling mounting

The yellow safelight is supplied with a 25 W krypton lamp in combination with a Schott filter glass. Only yellow light is emitted, fulfilling the requirements for blue sensitive X-ray films used with or without intensifying screens.
The red safelight is supplied with a 40 W krypton lamp and a homogenous Schott filter glass. This combination emits red light only to comply with the requirements for green sensitive X-ray films and other high sensitivity films, which must be handled with red light only.

Ordering Information
Darkroom safelight 230 V, yellow for blue sensitive X-ray films:
T50001.1.010 with bracket for wall or ceiling mounting
L379005 Spare lamp 25 W for yellow safelight

Darkroom safelight 230 V, red for green sensitive X-ray films:
T5418/U10 with bracket for wall or ceiling mounting
L379004 Spare lamp 40 W for red safelight
Pediatric Filters

*Transparent filters for reducing the patient entrance dose during pediatric X-ray examinations*

**Features**
- Slide into the rails of the X-ray collimators
- Two filter types with different beam hardening values at 70 kV are available:
  - 1.0 mm Al + 0.1 mm Cu (2.4 mm thickness)
  - 1.0 mm Al + 0.2 mm Cu (4.3 mm thickness)

The radiation risks for children are much higher than those for adults. Radiation protection procedures in pediatric radiology are mandatory. Additional X-ray filters should be used to reduce patient exposure. The plumbiferous acrylic filters are inserted into the collimator guide rails of radiographic and fluoroscopic X-ray installations. They are transparent and do not interfere with standard routine work. Of course, the filters can also be used to reduce the radiation load given to adults during X-ray procedures.

**Ordering Information**
Quite a number of different filters for X-ray collimators from various manufacturers such as GE Medical Systems, Siemens, Philips, Marconi (Picker) and Comet are available. Both filter types can also be manufactured according to user-defined dimensions. Details are available upon request.

---

Surgical Gloves for Radiation Protection

*Lead-loaded rubber gloves to attenuate X-rays and consequently protect surgeon’s hands during X-ray guided surgery*

**Features**
- Attenuate the radiation of low energy X-rays and gamma rays, and protect surgeons’ hands against radiation exposure
- Maintain sensitivity of touch
- Minimize the risk of allergic reaction

The radiation-attenuating gloves are only 0.3 mm (0.012 in) thick to permit greatest flexibility, dexterity and sensitivity of touch. The material is natural latex-free to minimize the risk of allergic reaction due to natural latex sensitivity. The gloves are lead-loaded to attenuate direct or scattered radiation and to protect hands when operating directly in low energy radiation fields. The radiation exposure of surgeons during X-ray guided surgeries can be reduced when using the surgical gloves especially in fluoroscopy and orthopedics. In addition, the gloves can be used in any other radiation department where surgeons place their hands into radiation fields, such as cardiology, general radiology, dental applications, nuclear medicine and other radioisotope laboratories. The gloves are carefully tested for pinholes and leaks, and they can be re-sterilized. The gloves are CE marked for the use in the territory of the European Union. Thicker gloves than the standard gloves and gloves with longer sleeves are also available upon request.

**Ordering Information**
- L991350 Pair of surgical gloves, size 6½
- L991351 Pair of surgical gloves, size 7
- L991352 Pair of surgical gloves, size 7½
- L991353 Pair of surgical gloves, size 8
- L991354 Pair of surgical gloves, size 8½
- L991355 Pair of surgical gloves, size 9
STEP
Survey Meter

Compact portable ion chamber dosimeter for dose and dose rate measurements of X and gamma radiation

Features
- Serves for protection level dosimetry in a wide energy range of 6 keV to 7.5 MeV of X-rays and gamma rays
- Shows very low energy and directional dependence
- Provides wide measuring ranges for radiation protection levels:
  - Dose: (2 ... 2000) µSv
  - Dose rate: 2 µSv/h ... 2 mSv/h
- Measures continuous and pulsed radiation

The approved STEP survey meter is used for protection level dosimetry in nuclear medicine laboratories and in the environment. Nuclear medicine therapy patients can be checked before release. The instrument is based on a 600 cm³ large volume ionization chamber, which provides high precision and a wide range of health physics measurements. The wall reinforcement cap can be removed for low energy measurements down to 6 keV. The unit is prepared for chamber volume air density corrections. The chamber can be separated from the display unit and located at a distance of 1.5 m by using the standard extension cable or up to 15 m by using the optional extension cable. The background-illuminated LCD display shows the measuring result in large characters and on a bar graph as well as the operating conditions. The STEP basic set comes with a battery operated display unit, a measuring probe including wall cap, a mountable handle and a carrying case.

Deliveries to non-EU destinations require an export license from the German Federal Office of Economics and Export Control (BAFA).

Ordering Information
L991160 STEP survey meter

Option
L178025 probe extension cable, 15 m

BLEEPER
Personal Monitor

Personal pocket-sized radiation monitor

Features
- Suitable for personal X and gamma radiation protection measurements
- Provides audible dose rate indication and generates one bleep per 15 minutes in a natural background
- Two types are available:
  - BLEEPER III, 45 keV ... 6 MeV, audible dose rate indication
  - BLEEPER Sv Sw, 45 keV ... 6 MeV, audible dose rate indication and display of accumulated dose (1 ... 999999) µSv on an LCD, reset function.

The BLEEPER is a simple robust pocket radiation monitor for safeguarding all personnel against the hazards of X and gamma radiation. The available dose rate indication gives immediate warning when entering a higher radiation level. The BLEEPER slips easily into a pocket and is held firmly by a strong clip. A quiet series of "clicks" from the loudspeaker indicates that the instrument is operating correctly. The BLEEPER is battery operated. Its typical operating lifetime using standard batteries is more than one year. A change in bleep length indicates that the batteries need replacing.

Ordering Information
L991005 BLEEPER III Personal Monitor
L991032 BLEEPER Sv Sw Personal Monitor
Electronic personal dosemeters for $H_p(10)$ and $H_p(0.07)$ readouts of gamma, beta and X-radiation

**Features**
- Highly sophisticated multi-functional personal radiation monitors based upon modern detector technology
- Measure the radiation quantities $H_p(10)$ and $H_p(0.07)$ according to ICRP
- Small size and light weight

The DMC 2000 personal dosemeters are modern digital monitors for personal radiation protection measurements. The nominal useful energy range for gamma radiation is 60 keV to 6 MeV (model S) and 20 keV to 6 MeV (models X and XB). The mean energy of beta particles may vary from 60 keV to 3.5 MeV (model XB). All dosemeters provide direct readout of dose equivalents $H_p(10)$ and $H_p(0.07)$ in addition $H_p(10)$ according to ICRP. All DMC 2000 dosemeters are battery operated and feature audible and visual alarms and history memories. The optional software DosiMass can be used to read out the memory and to configure the instruments. Several readers for this purpose are available. The dosemeter models S and X are PTB approved and can be delivered with an official German authority calibration. A radioactive check device is available upon request.

**Ordering Information**
- L991370 DMC 2000 S Electronic personal dosemeter 60 keV to 6 MeV (gamma and X-rays)
- L991371 DMC 2000 X Electronic personal dosemeter 20 keV to 6 MeV (gamma and X-rays)
- L991372 DMC 2000 XB Electronic personal dosemeter 20 keV to 6 MeV (gamma and X-rays) and 60 keV to 3.5 MeV (beta)
- S150005/S150006 DosiMass software in German/English (LDM reader required)

LDM Dosemeter Readers

**Features**
- Connect contactless to the personal dosemeters
- Available with RS232, USB, PCMCIA and LAN interface
- Work together with DosiMass software

The readers LDM 210, LDM 220, LDM 230 and LDM 2000 are especially designed to read-out the personal dosemeters of the DMC 2000 series. With the software DosiMass not only the memory can easily be read out but also the device can be configured. The wall-mounted reader LDM 2000 allows the convenient read-out just by passing by and it features a LAN interface. For standard applications small-sized readers which connect to an RS232, USB or PCMCIA interface are also available. All readers connect contactless to the dosemeters with a nominal range of up to 30 cm (LDM 2000 1.2 m w/o and 2.4 m with an optional external antenna). The readers can also be used for access control and therefore feature related indicator lamps. Depending on the desired application, additional software might be necessary.

**Ordering Information**
- L991374 LDM 210 RS232 dosemeter reader
- L991375 LDM 220 USB dosemeter reader
- L991376 LDM 230 PCMCIA dosemeter reader
- L991377 LDM 2000 LAN dosemeter reader
- S150005/S150006 DosiMass software in German/English
- DMC 2000 Personal Dosemeter  page 50
Multi-channel dosemeter for radiation leakage measurements of diagnostic X-ray installations

Features

- Measures dose and dose rate at 18 locations around diagnostic X-ray tubes simultaneously
- High sensitivity and excellent long-term stability
- Complies with IEC 60601-1-3
- Full software control via the RS232 interface

Manufacturers of diagnostic X-ray tubes must ensure that the leakage radiation emitted by the tube outside the useful beam does not exceed certain levels provided by law or by standards such as IEC 60601-1-3. The XLS X-ray leakage system is an effective device to fulfill these requirements. It consists of a specialized MULTIDOS multi-channel dosemeter and an 18 channel measuring extension to connect up to 18 XLS ionization chambers. The system measures dose and dose rate or charge and current of all 18 chambers simultaneously. The maximum and minimum measuring results are displayed together with the channel numbers. The integration time for dose and charge measurements can be selected between 1 second and 18 hours. A built-in high voltage supply for 400 V chamber polarizing voltage is included in the base unit. The measuring results of all chambers can be read via an RS232 interface. The chamber calibration factors are stored in the device and can be read and modified via the serial interface.

Ordering Information

T11037 MULTIDOS for X-ray leakage system, 115/230 V
T11036 MULTIDOS LS18, 18 channel extension unit
T10006.1.002 Signal cable MULTIDOS – LS18
T10006.1.003 High voltage cable MULTIDOS – LS18

Rectangular ionization chamber for radiation leakage measurements of diagnostic X-ray installations

Features

- Vented sensitive volume of 300 cm³
- Highly sensitive for detection of X-ray leakage radiation
- Up to 18 chambers can be arranged for radiation leakage detection around X-ray tubes

The rectangular plane parallel XLS ionization chamber is used for the XLS X-ray leakage system. Up to 18 chambers can be mechanically arranged on a semicircular arch of 1 m radius according to IEC. The X-ray tube is positioned on a rotatable table. While the table is continuously rotating, the XLS leakage system monitors the dose rate of all detectors and records the radiation levels of the entire hemisphere around the X-ray tube. The rotatable table and the chamber fixation parts are neither part of the XLS chambers nor the XLS X-ray leakage system.

The individual response and the long-term stability of the chambers can be checked by means of an appropriate adapter between a radioactive check source type T48010 or T8921/8922 and the chambers type TA34055-0.

Ordering Information

TA34055-0 XLS Ionization chamber
T26014-15 Chamber connection cable, 15 m length
T26014-30 Chamber connection cable, 30 m length

Option

T48011 Chamber adapter for radioactive check source

- XLS X-ray Leakage System page 51
PTW-Freiburg operates an accredited secondary standard dosimetry laboratory for radiological measuring quantities

- PTW-Freiburg is a member of the IAEA international SSDL network and the German Calibration Service DKD
- The calibrations are directly traceable to the primary standards of:
  - BIPM (Bureau International de Poids et Mesure, Paris)
  - PTB-Braunschweig (German Federal Institute of Physics and Metrology)
- Nine calibration facilities for various radiation qualities, measuring quantities and dose rate ranges are available (upgrade to 12 units in 2008)
- Regular external audits are performed by PTB

The calibration laboratory has been a most important part of PTW-Freiburg since its first days. The task to produce accurate dosimetric instrumentation implies the necessity to provide accurate calibration. PTW-Freiburg operates Germany’s first Secondary Standard Dosimetry Laboratory for radiation quantities accredited by the DKD German Calibration Service, under direct supervision of the National Laboratory. It operates as an ADCL (Accredited Dosimetry Calibration Laboratory) and it is also a member of the international SSDL network, organized by the International Atomic Energy Agency (IAEA). With nine calibration benches in continual use, the PTW calibration lab is one of the most active calibration labs for ionizing radiation in the world. The following radiation beam qualities can be calibrated:

- $^{60}$Co (1.3 MeV)
- $^{137}$Cs (662 keV)
- X-rays (70 .. 280) kV
- Soft X-rays (10 .. 70) kV

In addition, well-type chambers can be calibrated to measure brachytherapy sources. The PTW lab provides for dose and non-invasive kV calibrations in diagnostic imaging, nuclide radioactivity calibrations of isotope calibrators in nuclear medicine and calibrations of health physics dosimetry equipment.

A variety of ionizing radiation beam quality sets for different applications is available

**Radiation Therapy Dosemeters**
- X-rays 10, 15, 30, 50, 70 kV (TW qualities according to DIN 6817)
- X-rays 70, 100, 140, 200, 280 kV (TH qualities according to DIN 6817)
- $^{137}$Cs 662 keV
- $^{60}$Co 1.3 MeV

**Diagnostic Radiology Dosemeters**
- X-rays 50, 70, 90, 120, 150 kV Conventional (RQR and RQA qualities according to IEC 61267)
- X-rays 70, 90, 120, 150 kV CT (RQR and RQA qualities according to IEC 61267)
- X-rays 50, 70, 90 kV Dental
- X-rays 25, 28, 30, 35 kV Mammography (RQR-M and RQA-M qualities according to IEC 61267 plus anode/filter combinations Mo/Al, Mo/Rh, W/Al, W/Rh, W/Mo with and w/o 2 mm Al)

**Radiation Protection Dosemeters**
- X-rays 10, 20, 30, 40 kV (Narrow Spectrum Series (N) qualities acc ISO 4037-1)
- X-rays 60, 80, 100, 150, 200, 250 kV (Narrow Spectrum Series (N) qualities acc ISO 4037-1)
- $^{137}$Cs 662 keV
- $^{60}$Co 1.3 MeV

**Miscellaneous Calibrations**
- Source strength (cGym$^2$h$^{-1}$) of brachytherapy sources measured by well-type chambers
- Diagnostic X-ray generator high voltage of all types of X-ray equipment measured non-invasively by kV-meters: Different ranges from 20 to 150 kV
- Nuclide activity in nuclear medicine measured by isotope calibrators (only CURIEMENTOR instruments)
- Electrical measuring quantities charge (C) and current (A) measured by highly sensitive electrometers

**General Information**
According to the PTW definition, each such set of beam qualities represents one calibration point for a certain application and can be ordered with a single order number.
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The objective from the start was to be a trustworthy and competent partner for our customers throughout the world. This also includes maintaining quality standards and comprehensive service and support. We will continue to do everything possible in the future to manufacture high-quality dosimetry products, which users and patients can trust.

We know what responsibility means.