Technical description and operating instructions

Survey meter

OD-02
OD-02 Hx

STEP Sensortechnik und Elektronik Pockau GmbH
Siedlungstrasse 5-7
D-09509 Pockau

Table of contents

1. OD-02 Product characteristics / scope of services

The OD-02 is an easy-to-handle survey meter for measuring the directional dose / dose rate equivalent $H'(0{,}07;\Omega); \dot{H}'(0{,}07;\Omega)$ and the ambient dose / dose rate equivalent $H^*(10); \dot{H}^*(10)$ of mixed radiation fields (X-rays, gamma and beta radiation).

Optional OD-02 Hx:
The OD-02 is an easy-to-handle survey meter for measuring the photon- equivalent dose / - dose rate Hx ; $\dot{H}x$ of mixed radiation fields (X-rays, gamma and qualitatively beta radiation).

Product characteristics:

- Compact device consisting of display and control unit, probe, device support and a 0.7-m-connecting cable
- Radiation detector: air-opened ionisation chamber
- Display range:
  Dose rate: 0 .. 2000 mSv/h, 0 .. 2000 µSv/h
  Dose: 0 .. 2000 µSv
- Measurement range: 3 decades for dose, 6 decades for dose rate measurement
- Auto ranging fine measurement ranges
- OD-02: Measurement of ambient and directional dose of pulsed radiation fields
- OD-02 Hx: Measurement of photon equivalent dose of pulsed radiation fields
- Measurement of photon radiation above 6 keV
- Measurement of hard X-rays and gamma radiation as well as bremsstrahlung of up to 15 MeV (> 15 MeV using an additional acrylic plastic shielding)
- OD-02: Measurement of beta radiation from 60 keV to 2 MeV
- Probe disposable up to 100 m from display and control unit
- Easy-to-read back-lighted LCD graphic display
- Battery powered, transportable and stationary applicable device

Scope of delivery:

- OD-02 display and control unit
- *Optional OD-02 Hx display and control unit*
- OD-02 probe with detachable wall reinforcement cap
- *OD-02 Hx probe with detachable wall reinforcement cap*
- Device carrier
- 0.7-m-probe cable
- 4 x batteries LR06
- Equipment case
- Technical description, operating instructions and calibration certificate

Optional equipment:

- USB cable and software for measurement evaluation via PC
- Power supply (DC 6 V) with power lead
- Variable probe extension cable up to 100 m upon customer request
- Acrylic plastic shielding for energy values E_γ > 15 MeV
- Wall holder for stationary application

2. Safety instructions

Sensitive parts such as the soft radiation chamber must be protected against mechanical influences. Damages to the soft radiation chamber can cause contact voltages of up to 400 V while switched on!

- The device may be opened by the manufacturer only. Infringing behaviour will lead to invalidation of any warranty claims!
- The survey meter must always be stored in dry rooms!
- If the survey meter is not used for a period of more than one month, the batteries must be taken out of the device!
- The manufacturer does not assume any warranty for damages caused by leaking or incorrectly inserted batteries and the use of wrong battery types!
- The device must be transported with fitted acrylic plastic shielding in the equipment case!
- It is not permitted to use solvents or solvent containing cleaners!
- Prior to connecting and disconnecting plug connectors, the survey meter must always be switched off!
- Statutory provisions for regular re-tests of mobile equipment must be observed for the optional power supply according to BGV A3!

3. Components

The basic equipment of the OD-02 / OD-02 Hx includes:

- Device carrier (**1**)
- Connecting cable 0.7 m (**2**)
- Probe with detachable probe cable (**3**)
- Display and control unit (**4**)
- Wall reinforcement cap (**5**)

Fig. 1) *OD-02 Standard components (scope of services)*

The following equipment is optionally available:

- USB cable with software CD (**6**)
- Wall power supply (**7**)
- Acrylic plastic shielding (**8**)
- Extension cable up to 100 m (**9**)
- Wall holders for probe and display unit (**10**)

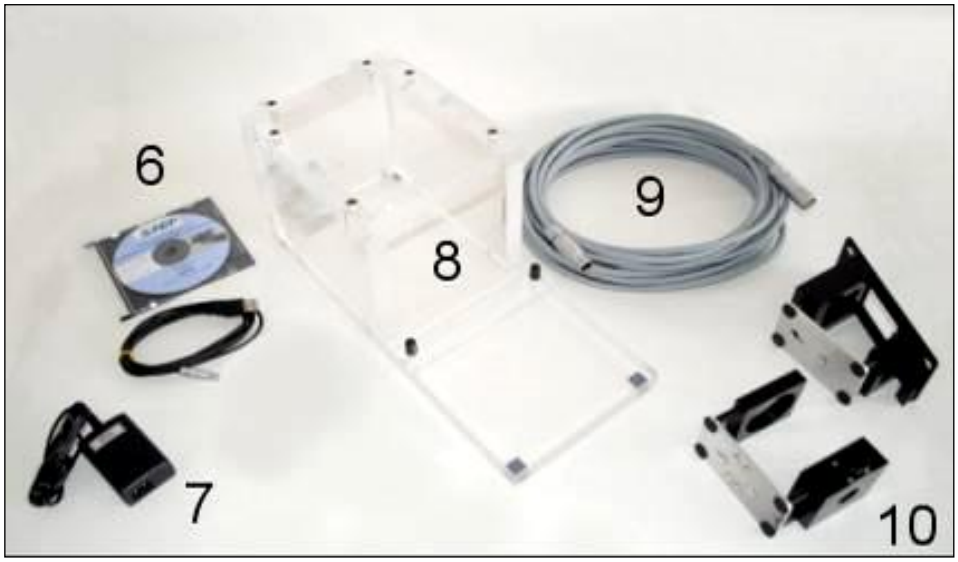


Fig. 2) *OD-02 optional equipment*

3.1. Control elements

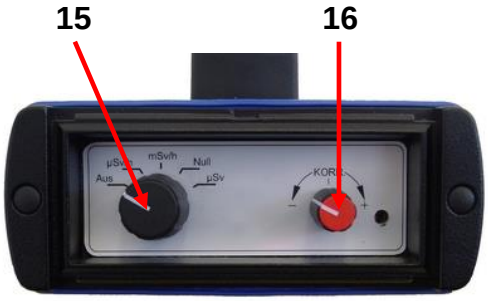
11 LCD display

12 “Light / Reset dose / Reset Max dose rate“-button

13 T-button „History Table / switch dose, max dose rate“

14 Battery compartment

Fig. 3) *Control elements front and rear side*



15 On/off and meter switch
16 Zero adjuster

17 Connection for external power supply (optional)
18 USB connection
19 Switch for internal and external power supply (optional)
20 Safety fuse (optional)
21 Probe connection

Fig. 4) *Control elements and connections device front side*

3.1.1. Meter switch (15)

The meter switch serves for switching the device on and off, the selection of one of the measurement range decades (µSv/h, mSv/h and µSv) as well as for call of the function “adjustment of the electrical zero”. The functions are described in detail in the chapters 4 and 5.

3.1.2. Zero adjuster (16)

The zero adjuster permits electrical zero balancing of the OD-02 (see chapt. 4.1) in cases where the electrical zero lies beyond the pre-adjusted range.

3.1.3. “Light / Reset Dose / Reset Max Dose rate” button (12)

The display backlight is switched on by briefly pressing the “Light“/Reset Dose/Reset Max Dose rate” button and switched off by pressing this button once again. The backlight is automatically switched off after 2 min.

Caution: The lighting places load on the batteries and should therefore not be switched on unnecessarily.

When switching on the device, the backlight is automatically switched on.

In the dose rate measurement mode, the maximum value of the dose rate is additionally displayed or (in depends of the mode) a dose calculated from the dose rate as well as the progressing time is additionally indicated. These values can be reset by pressing the button 12 “Light / Reset Dose / Reset Max Dose Rate” and holding it for a while. In doing so, the indicated dose and time value is reset to zero and the maximum dose rate value will deleted.

3.1.4. T-button “History-Table / switch dose, max dose rate” (13)

In the measuring ranges µSv/h and mSv/h, this button permits the indication of a “measuring value history” table in the lower section of the LC display. By pressing the T-button, the average values of the dose rate, averaged over a period of 1 min., the cumulated dose and the related time mark are indicated in table form (see fig. 5).

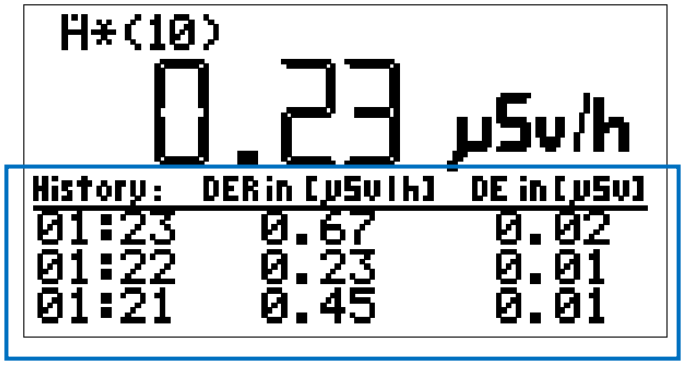


Fig. 5) *Display of the measuring value history table.*

It is possible to display an overall amount of 15 measuring values in the table. If more than 15 measuring values are reached, the prior data is automatically overwritten. Pressing the T-button once again allows the processing of the saved measuring values. When all saved measuring values are processed, the indication “End of Table” (see fig. 6) appears in the upper section of the LC display.

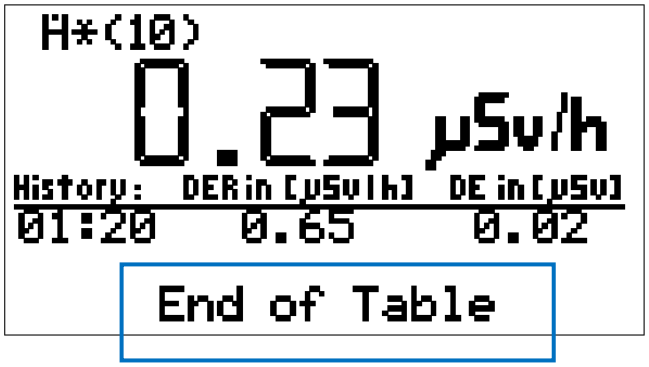


Fig. 6) *Display “End of Table”.*

Switching back to the initial measuring range display can be realised by pressing the T-button once again.
The switch between “dose” and “max. dose rate” can be realized by pressing the button 13 “History Table / switch dose, max dose rate” and holding it for a while (about 4 sec., see fig. 7 and 8).

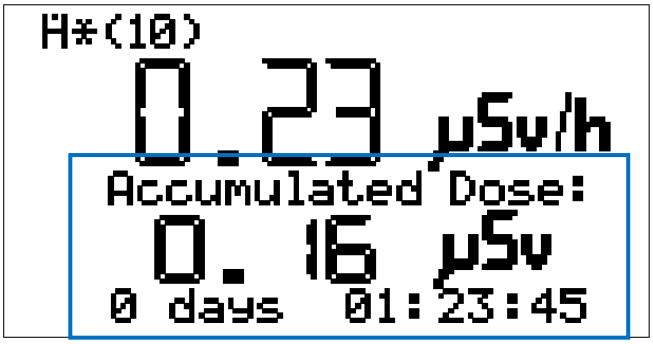


Fig. 7) *Mode “dose rate“: Display “Accumulated Dose”.*

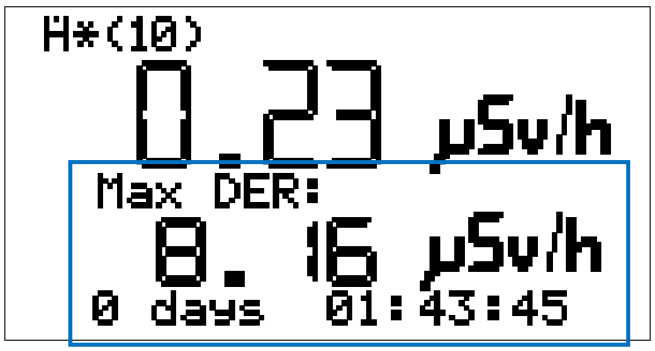


Fig. 8) *Mode “dose rate“: Display “Max dose rate”.*

3.1.5. External power supply (option)

The OD-02 can be operated by means of an internal (batteries) as well as by means of an external DC voltage supply (4 .. 6.2 V). Therefore, the switch for internal and external power supply (19) must be set to the respective operating mode (“PS” for power supply mode and “Batt.” for battery mode). In battery mode, the device is operated by means of 4 batteries or rechargeable batteries type LR06 (AA), supplying a maximum operating voltage of 6.2V. In power supply mode, the device, which is protected by means of a safety fuse, can be operated using DC voltage (19) from 4 to 6.2 V only.

3.1.6. USB interface

The survey meter is equipped with a USB interface for reading out the measuring values. For its use, special software as well as a corresponding connecting cable is optionally available.

4. Measuring principle

According ICRU Directive applies for dosimetry of beta radiation (within an energy range of equal or less than 2 MeV as well as of low energy photon radiation ≤ 15 keV) the measurement unit directional dose equivalent $H'(0{,}07)$ and the directional dose rate equivalent $\dot{H}'(0{,}07)$.

For X-ray and gamma radiation exceeding this energy values, the ambient dose equivalent $H*(10)$ and the ambient dose rate equivalent $\dot{H}*(10)$ represent the essential measuring values. The separate detection of the dose equivalents H*(10) and H'(0.07;Ω) with the OD-02 is carried out by means of measurements with or without wall reinforcement cap (5):

Measuring probe without wall reinforcement cap	Measuring value = $\dot{H}'(0{,}07)$ / $H'(0{,}07)$
Measuring probe with wall reinforcement cap	Measuring value = $\dot{H}*(10)$ / $H*(10)$

The respective dose equivalent is indicated in the upper section of the display (see fig.9).

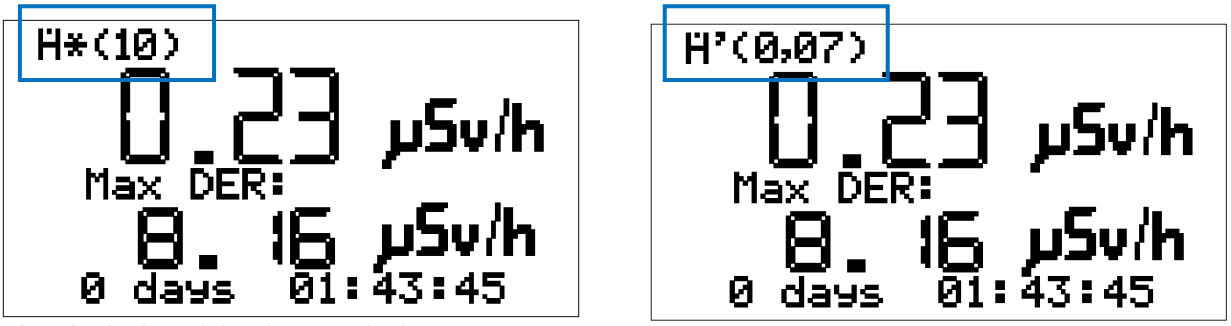


Fig. 9) *Display of the dose equivalents*

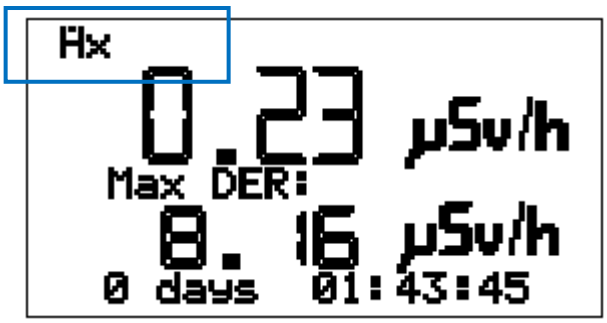
Beta radiation of up to 2 MeV (Sr/Y-90) is sufficiently shielded by the fitted wall reinforcement cap, so that in such cases the measuring variables are $H*(10)$ / $\dot{H}*(10)$.

Optional OD-02 Hx:
In countries, which <u>have not introduced</u> metrics according ICRU- Directive, the considered measurement unit of photon equivalent dose / - dose rate is: Hx ; $\dot{H}$x

The large energy range of dosimeter required the use of wall reinforcement cap in dependence of radiation type and energy:

Radiation	Energy	Wall reinforcement cap	comment
X-Ray and Gamma	6 – 100 keV	No	
X-Ray and Gamma	20 keV – 15 MeV	Yes	
X-Ray and Gamma	> 15 MeV	Yes with additional moderator cap	Radiation direction: lateral / 90° to probe
Beta radiation	≥ 160 keV	No	Only qualitatively

The measured unit of OD-02 Hx is shown in first line of display:



The factor of the applied ionisation chamber of OD-02 / OD-02 Hx amounts to approx. 4.2 fA/µSv·h^{-1}. The current generated by the ionisation chamber is transformed into processable voltage by means of the probe electronics. For that purpose, a transimpedance amplifier converts the current via a switchable feedback network into a proportional voltage signal. This voltage signal is scanned in steps of 80 ms in both dose rate modes.

Short dose rate pulses (pulse duration < 500 ms) are therefore not detected or detected incorrectly. Therefore, we recommend using the measuring mode “Dose” for measurements in pulsed radiation fields.

In the measuring mode “Dose”, the ionisation current created in the ionisation chamber by means of the radiation field is used for charging a capacitor, what makes it possible to measure also short dose rate pulses in the measurement mode “Dose”.

In order to transmit the amplified signal without signal losses to the display unit via an appropriate cable of variable length, an output driver was integrated. At the same time, the driver amplifies the signal in such a way that it is optimally adjusted to the display system. The survey meter is equipped with an automatic switch for fine measurement range decades.

4.1. Electrical zero adjustment

An electrical zero adjustment of the measurement device must be carried out prior to every measurement since the sensitive electronic system depends on the ambient temperature, the inherent noise and other influencing factors.
When switching on the device by actuating the meter switch (15), the device automatically requests a zero adjustment (see fig. 10).

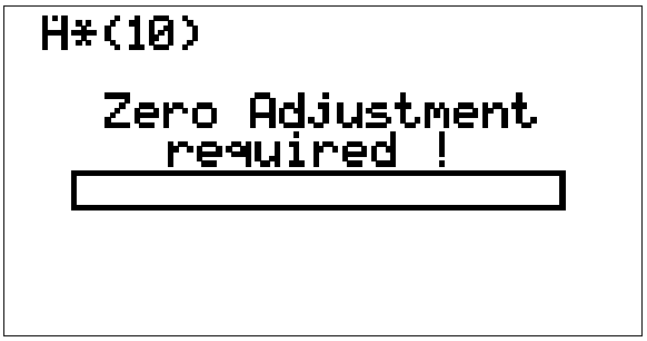


Fig. 10) *Zero adjustment request*

For that purpose, the meter switch is set to the position “ZERO”. The device automatically performs a zero adjustment (see fig. 9).

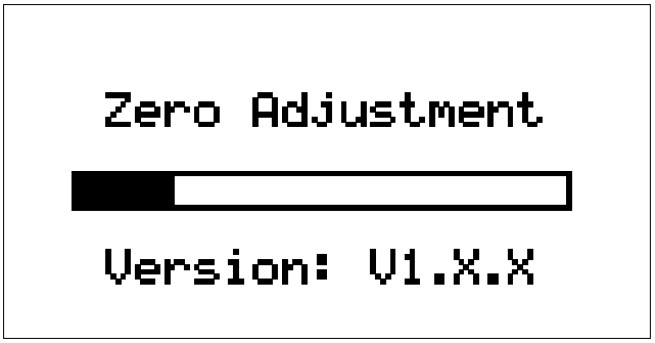


Fig. 11) *Zero adjustment*

After a few seconds, the zero adjustment is completed. If the automatic adjustment ranges from -5 to +5, the following message appears on the display:

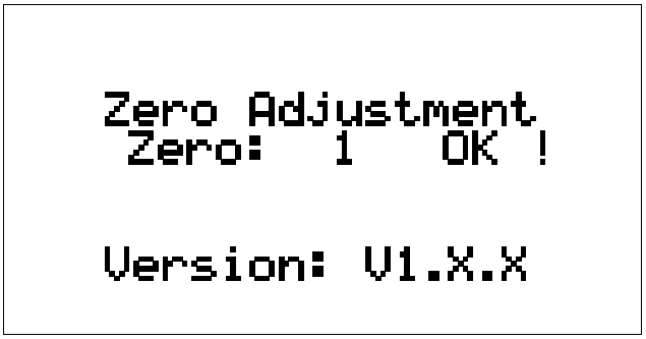


Fig. 12) *Zero adjustment O.K.*

In doing so, the value 1 in the example shown above corresponds to a value 0.01 in the respective measuring range. If the automatic adjustment lies beyond this range, the following message appears on the display:

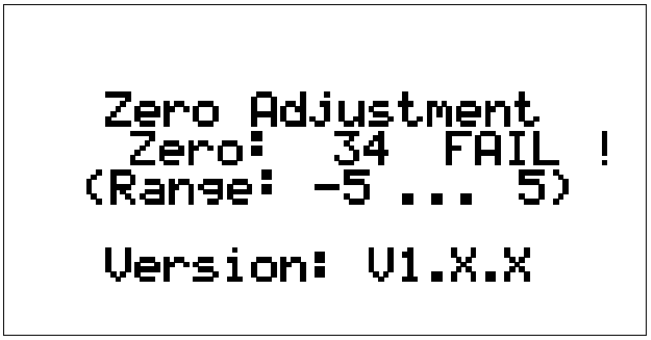


Fig. 13) *Zero adjustment beyond the specified range*

In this case, the indicated value must preferably be adjusted to 0 by means of the electrical zero adjuster (16)

- After having adjusted the electrical zero, the zero adjuster (16) must not be actuated any longer.
- Measurements in the different measurement ranges necessarily require a zero adjustment.
- We recommend preferably adjusting the indicated value to 0 also in case of a positive automatic zero adjustment.

4.2. Calculated air pressure correction

The changes of air pressure and temperature cause air pressure changes in the ionisation chamber, resulting into faulty measuring values.
For compliance with the indicated error tolerances, all measuring values M must be related to reference conditions (20 °C, 101.3 kPa).

This possibility for correction considers the influence of air pressure changes on the measuring result. For that purpose, it is important to know the air pressure and the temperature at the measuring location in order to determine the correction factor. The correction factor f is indicated in the nomogram in the appendix or can be calculated using the following the formula:

$$f = \frac{101{,}3}{p/kPa} \cdot \frac{273 + \vartheta/°C}{293} = \frac{760}{p/Torr} \cdot \frac{273 + \vartheta/°C}{293}$$

p - Air pressure in kPa / torr
ϑ - Temperature in °C.

The corrected measuring value M_0 results from:

$$M_0 = M \cdot f$$

M - Indicated measuring value
f - Correction factor

5. Measurement preparation and performance

Prior to the first measurement the device must be commissioned as follows:

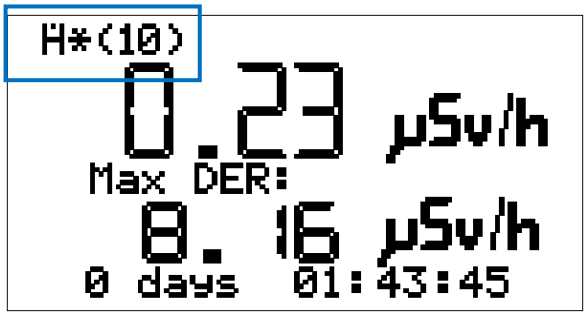
1. Insertion of the batteries in the battery compartment (14) at the rear side of the display unit. For opening the battery compartment, a recess is provided at the lower part of the cover. Care must be taken to ensure that the batteries are inserted with the correct polarity as indicated on the bottom of the battery compartment.

2. The measuring probe is connected with the display unit via the plug connector. Therefore, the meter switch (15) must be in the position OFF.

	The measuring device must exclusively be switched on if the measuring probe is connected.

5.1. Preselection of the measuring variables

The measuring variables ambient dose $H^*(10)$ and ambient dose rate equivalent $\dot{H}^*(10)$ are measured <u>with</u> wall reinforcement cap (delivery status) and indicated in the upper section of the display:



After the removal of a wall reinforcement cap, care must be taken that the marks on the wall reinforcement cap coincide with the marks on the soft radiation chamber at fitting (fig. 14).

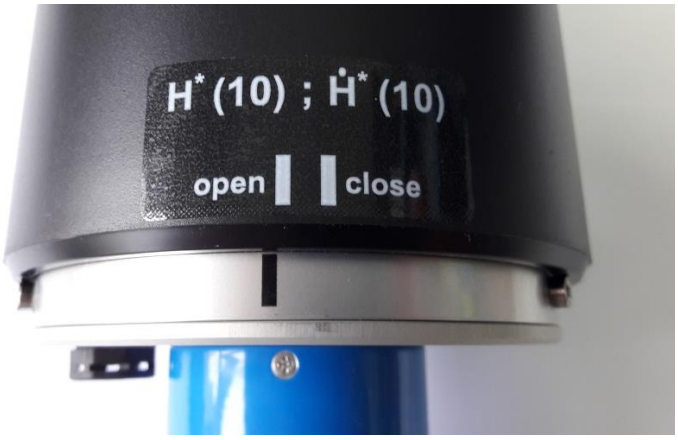
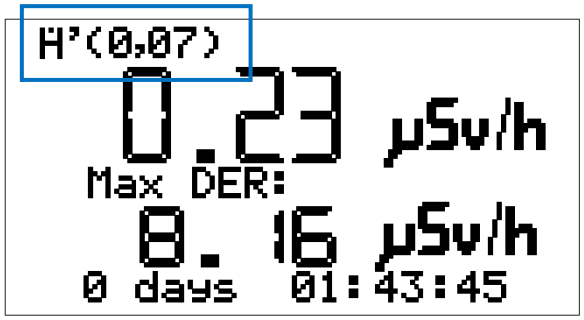


Fig. 14) *Interlock of the wall reinforcement cap*

If the wall reinforcement cap (5) is removed, the indicated measuring value at dose equivalent measurement corresponds to $H'(0{,}07)$ and to $\dot{H}'(0{,}07)$ at dose rate equivalent measurement. Both measurement units are indicated on the display:

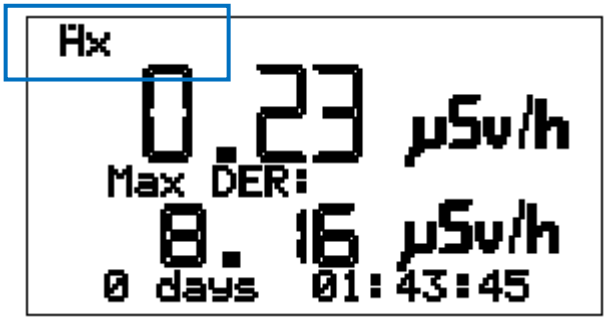


Optional OD-02 Hx:
In countries which have <u>not</u> introduced metrics regarding ICRU- Directive, the measurement unit is the photon dose equivalent / - dose rate: H_x ; $\dot{H}_x$

The large energy range of dosimeter required the use of wall reinforcement cap in dependence of radiation type and energy:

Radiation	Energy	Wall reinforcement cap	comment
X-Ray and Gamma	6 – 100 keV	No	
X-Ray and Gamma	20 keV – 15 MeV	Yes	
X-Ray and Gamma	> 15 MeV	Yes with additional moderator cap	Radiation direction: lateral / 90° to probe
Beta radiation	≥ 160 keV	No	Only qualitatively

The measured unit of OD-02 Hx is shown in first line of display:



	**Caution!** The entry windows of the soft radiation chamber are sensitive to mechanical stresses! After measurement completion, the acrylic plastic shielding must be refitted on the probe and the device must be switched off.
	**Note:** Measurements in electromagnetic fields, e.g. next to mobile phones, etc. must be avoided because these may influence the measuring results.

5.2. Dose rate equivalent measurement

Prior to performance of dose rate equivalent measurements, the meter switch (15) must be adjusted to the switch position “ZERO” and the electrical zero adjustment must be carried out when the measuring device is switched on. In case of deviations, the indicated value must preferably be adjusted to 0 by means of the electrical zero adjuster (16) (see 4.1.).

For dose rate equivalent measurements, the meter switch (15) must be adjusted to the position “µSv/h” or “mSv/h” after the electrical zero adjustment has been carried out. In doing so, the device switches to the run-in mode (see fig. 15).

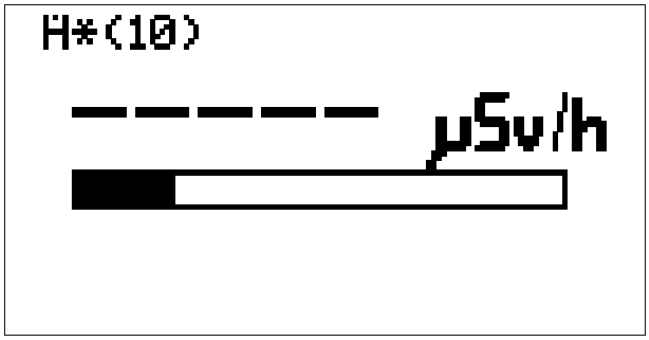


Fig. 15) *Display in run-in mode for the measuring mode µSv/h.*

The “run-in” of the device takes 2 min. The progress is shown in the bargraph. After the run-in, the actual value of the dose rate equivalent is indicated and the measurement can be started (see fig. 16).

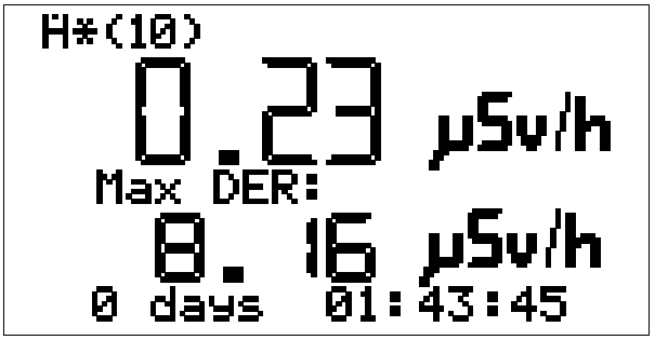


Fig. 16) *Display in the measurement mode µSv/h.*

In the dose rate equivalent measuring mode, the maximum dose rate value and the progressing time are additionally indicated in the lower area of the display. The maximum dose rate value refers to the indicated time. The maximum dose rate value, the indicated cumulated dose can be reset by pressing the button 12 “Light / Reset dose / Reset Max Dose rate” and holding it for a while. In doing so, the maximum dose rate value, the indicated dose and time value is reset to zero.

	- For an exact dose determination as well as for measurements in pulsed radiation fields, the measuring range “Dose” should be selected! - The function “Reset dose” of the button 12 is only active in the measuring mode “Dose rate”.

5.3. Dose measurement

In the dose rate equivalent measuring mode, the dose calculated from the dose rate and the progressing time are additionally indicated in the lower area of the display. The indicated cumulated dose can be reset by pressing the button 12 “Light / Reset dose” and holding it for a while. In doing so, the indicated dose and time value is reset to zero.

For an exact dose determination as well as for measurements in pulsed radiation fields, the measuring range “Dose” should be selected.

For that purpose, the following must be carried out:

For dose measurements, the meter switch (15) must be adjusted to the switch position „ZERO“ and the electrical zero adjustment must be carried out when the measuring device is switched on. In case of deviations, the indicated value must preferably adjusted to 0 by means of the electrical zero adjuster (16) (see 4.1).

For dose measurements, the meter switch (15) must directly be switched to the measuring range “µSv” after the adjustment of the electrical zero has been carried out. The dose measurement starts when the switching process is completed. The following message appears on the display:

Fig. 17) *Display in the dose measuring mode µSv.*

For resetting the displayed dose value, the operating position “Zero” must be selected by means of the meter switch 15. The electrical zero adjustment must be carried out again. Subsequently, it is possible to switch back to the operating position “Dose” by means of the meter switch 15. The dose and the time value counting is now started from zero again.

5.4. Display of the excess of the measurement range

At excess of the limits (2000) of the measurement range decades “µSv/h“, “µSv“ and “mSv/h“, the excess of measurement range is indicated on the display by means of the value **> 1999** using the corresponding measuring unit (see fig. 18 a). In the measuring mode “dose”, the display of the dose value **> 1999 µSv** (see fig. 18 b) is kept also without radiation field and must be reset for a new measurement according to point 5.3.

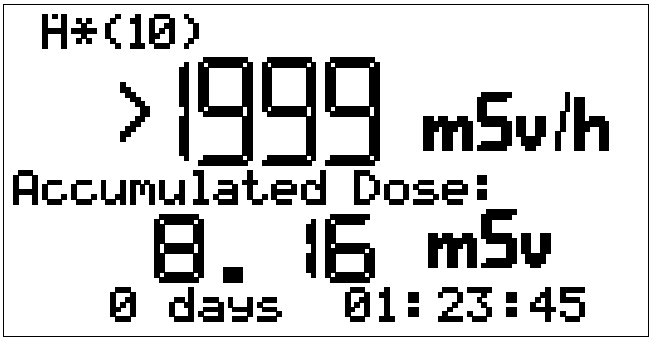


Fig. 18 a) *Display overflow of measurement range in mode "Dose rate".*

Fig. 18 b) *Display overflow of measurement range in mode „Dose".*

5.5. Special remarks for measurement performance

- The calibration of the survey meter OD-02 is carried out at 1.25 MeV (Co-60) (homogeneous radiation field). The point of reference (chamber centre of gravity) is marked on the detector by means of a line.
- Beta radiation with a maximum energy value of 2 MeV (Sr-90/Y-90) is sufficiently shielded by means of the fitted wall reinforcement cap. Therefore, only the measuring variable $H*(10)$ is detected. In case of beta radiation with higher energy values, a measurement uncertainty of at least 20 % must be assumed at the determination of $\dot{H}*(10)$.
- If required, the correction of the air density influence on the response of the air-opened ionisation chamber can be carried out by means of calculation based on the nomogram in the appendix
- After the radiation with high dose rate equivalents, a resetting time of up to 2 minutes in the measurement mode "dose rate" must be observed.
- Impacts and mechanical stresses on the measuring probe (e.g. at fitting the wall reinforcement cap) may influence the measuring values to be displayed.

Optional für OD-02 Hx:

- The calibration of the survey meter OD-02 Hx is carried out at 1.25 MeV (Co-60) (homogeneous radiation field). The point of reference (chamber centre of gravity) is marked on the detector by means of a line.
- Beta radiation with a maximum energy value of 2 MeV (Sr-90/Y-90) is sufficiently shielded by means of the fitted wall reinforcement cap. You can measure Beta radiation only qualitatively > 160 keV (see 4. or 5.1)

- If required, the correction of the air density influence on the response of the air-opened ionisation chamber can be carried out by means of calculation based on the nomogram in the appendix
- After the radiation with high dose rate equivalents, a resetting time of up to 2 minutes in the measurement mode “dose rate” must be observed.
- Impacts and mechanical stresses on the measuring probe (e.g. at fitting the wall reinforcement cap) may influence the measuring values to be displayed.

5.6. Note on battery lifetime

- Note that the total current consumption of the measuring device is 3 times higher at switched on background lighting. The battery lifetime indicated in the specifications refers to a switched off display lighting.
- The flashing battery symbol on the LCD display (see fig. 19) indicates that the batteries are discharged and must be replaced. In such case, measuring values detected under such conditions must be refused.

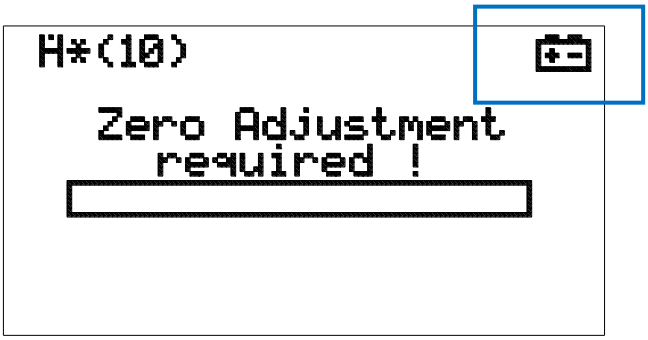


Fig. 19) *Display: battery voltage is too low*

- When replacing the batteries, it must be ensured that the batteries are inserted with the correct polarity. After having replaced the batteries, it is recommended to ensure the correct insertion via the display by switching on the device.
- A long-term period with inserted batteries must be avoided as the contact material may be affected by electrolyte leakage.

5.7. Use of the device carrier

For mobile use, it is possible to connect the measuring probe (3) to the display unit (4) via the device carrier (1) (delivery status). In doing so, the survey meter can be compactly operated (delivery status see fig. 20).

Fig. 20) *Display unit and probe engaged on the device carrier.*

Therefore, the four fastening bolts (see fig. 21) on the lower side of the display unit (4) must be engaged in arrow direction in the recesses on the device carrier (1). Prior to locking the display unit on the device carrier, the display unit (4) and the measuring probe (3) must be separated from each other. It must be ensured that the device is switched off.

Fig. 21) *Engagement principle display unit / device carrier*

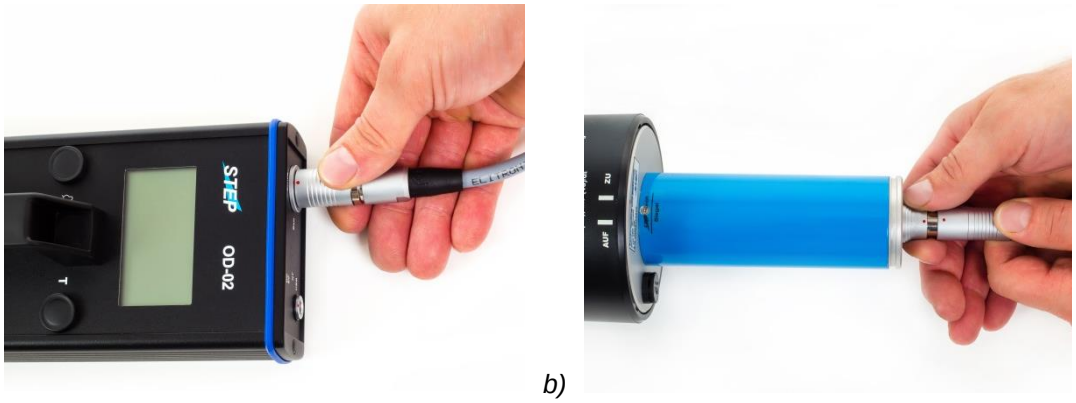
The probe must be fixed in the device carrier according to fig. 20 and secured by means of the locking screw. Subsequently, the probe and the display unit can be reconnected with each other via the probe cable.

In order to disconnect the display unit and the measuring probe from the device, the steps must be carried out in reverse order. When removing the display unit, the interlock (see fig. 22) must be moved downwards.

Fig. 22) *Unlocking of the display unit at the device carrier.*

The disconnection of the plug connection between probe cable and display unit is carried out by holding the ribbed connector part with the thumb and the index finger and pulling for separation from the bushing (see fig. 23a).

The disconnection of the plug connection between probe cable and measuring probe is carried out by moving the connector at the probe backwards (at the ribbed part) during disconnection (see fig. 23b).
During connection or disconnection, the plugs must not be turned out of position.



a) *b)*

Fig. 23) *Disconnection of the plug connectors measuring probe cable.*

⚠	Measuring probe and display unit must be separated at disconnected state only! When separating, do not turn the connector out of position.

6. Storage, handling and transport instructions

- Prior to long-time storage and transport, the batteries must be taken off and stored at the place provided in the case.
- Condensation actuation on the device must be avoided.
- Storage in chemically aggressive and polystyrene dissolving vapours is not admissible.
- Transport and delivery must be carried out in the manufacturer provided transport case only.
- Transport must be carried out with fitted wall reinforcement cap.

	The manufacturer does not assume any warranty for damages caused by leaking, incorrectly inserted batteries and the use of wrong battery types!

7. Cleaning of the device

If in the exceptional case cleaning should be necessary, this must be carried out by means of a damp cloth.

A cleaning of the ionisation chamber made of foam polystyrene is impossible. For measurements in danger of measuring probe contamination, the ionisation chamber must therefore be equipped with a protective coating (e. g. PE bag).

	Polystyrene solving agents, such as fuel, benzol or acetone containing substances, must not be used.

8. Service

Inspections and recalibrations shall be performed by the manufacturer only.

STEP Sensortechnik und Elektronik Pockau GmbH
Siedlungsstraße 5-7
D-09509 Pockau-Lengefeld
Phone: 037367 / 9791
Fax: 037367/77730
Email: info@step-sensor.de

The manufacturer recommends performing inspections and recalibrations at an interval of 2 years.

Important note:

	A destruction or removal of the ionisation chamber can cause contact voltages of up to 400 V while switched on.

Technical data

Measure unit:

OD-02	Ambient dose equivalent $H^*(10)$ Ambient dose rate equivalent $\dot{H}^*(10)$ Directional dose equivalent $H'(0{,}07;\Omega)$ Directional dose rate equivalent $\dot{H}'(0{,}07;\Omega)$
OD-02 Hx	Photon equivalent dose Hx Photon equivalent dose rate $\dot{H}x$

Measure range:

Dose	1 coarse measurement range: 3 fine measurement ranges*: (final values)	µSv 20 / 200 / 2000
Dose rate	2 coarse measurement ranges: 3 fine measurement ranges*: (final values)	µSv/h and mSv/h 20 / 200 / 2000

**auto ranging fine measurement ranges*

Energy range:

Photons OD-02

- *Without wall-reinforcement cap*	> 1 keV … <15 keV for measure unit $H'(0{,}07;\Omega)$ and $\dot{H}'(0{,}07;\Omega)$
- *With wall-reinforcement cap*	15 keV ... 15 MeV for measure unit $H^*(10)$ and $\dot{H}^*(10)$
- *With acrylic plastic shielding*	> 15 MeV

Photons OD-02 Hx

- *Without wall-reinforcement cap*	6 keV … 100 keV
- *With wall-reinforcement cap*	100 keV ... 15 MeV
- *With acrylic plastic shielding*	> 15 MeV

Beta radiation *OD-02* *OD-02 Hx*	60 keV … 2 MeV qualitatively 160 keV … 2 MeV
Angle of incidence (referred to probe longitudinal axis)	-90° .. + 90° (Photons) -45° .. + 45° (Betas, without wall reinforcement cap)
Measurement uncertainty:	≤ 15 % (fine measurement range 20) < 10 % (fine measurement ranges 200 and 2000)
Linearity	± 5 %
Saturation deficit	- 5 % @ 2000 mSv/h

Radiation detector

OD-02

Type	Air-opened ionisation chamber
Volume	600 cm^3
Mass per area of chamber	35 $mg \cdot cm^2$
Entry window	3.3 $mg \cdot cm^{-2}$ (PET foil metallised on one side)
Wall reinforcement cap	550 mg/cm^{-2} , detachable
Preferred direction	Axial
Point of reference	marked on detector
Chamber voltage	+ 400 V (mSv/h, µSv) + 40 V (µSv/h)

OD-02 Hx

Type	Air-opened ionisation chamber
Volume	600 cm^3
Mass per area of chamber	35 $mg \cdot cm^2$
Entry window	Not available
Wall reinforcement cap	550 mg/cm^{-2} , detachable,
Preferred direction;	Axial
Point of reference	marked on detector
Chamber voltager	+ 400 V (mSv/h, µSv) + 40 V (µSv/h)

Warm-up time 2 minutes

Power supply

Batteries	4 batteries or rechargeable batteries type LR06 (AA)
Current consumption	approx. 80 mA @ 5 V
Battery lifetime	approx. 35 h
Check battery voltage	Capacity and Battery symbol on display
External DC voltage supply (optional)	4 .. 6,5 V DC voltage (delay safety fuse: 400 mA 250 V)

Dimensions

Measurement probe	diameter 112 mm, length 260 mm
Display unit	250 mm x 108 mm x 42 mm (L x W x H)
Cable length	0.7 m (standard)

Weight

Measurement probe	600 g
Display unit	900 g (incl. batteries)

Display screen LCG graphic display with backlight
resolution 128 x 64 dpi

Operating conditions

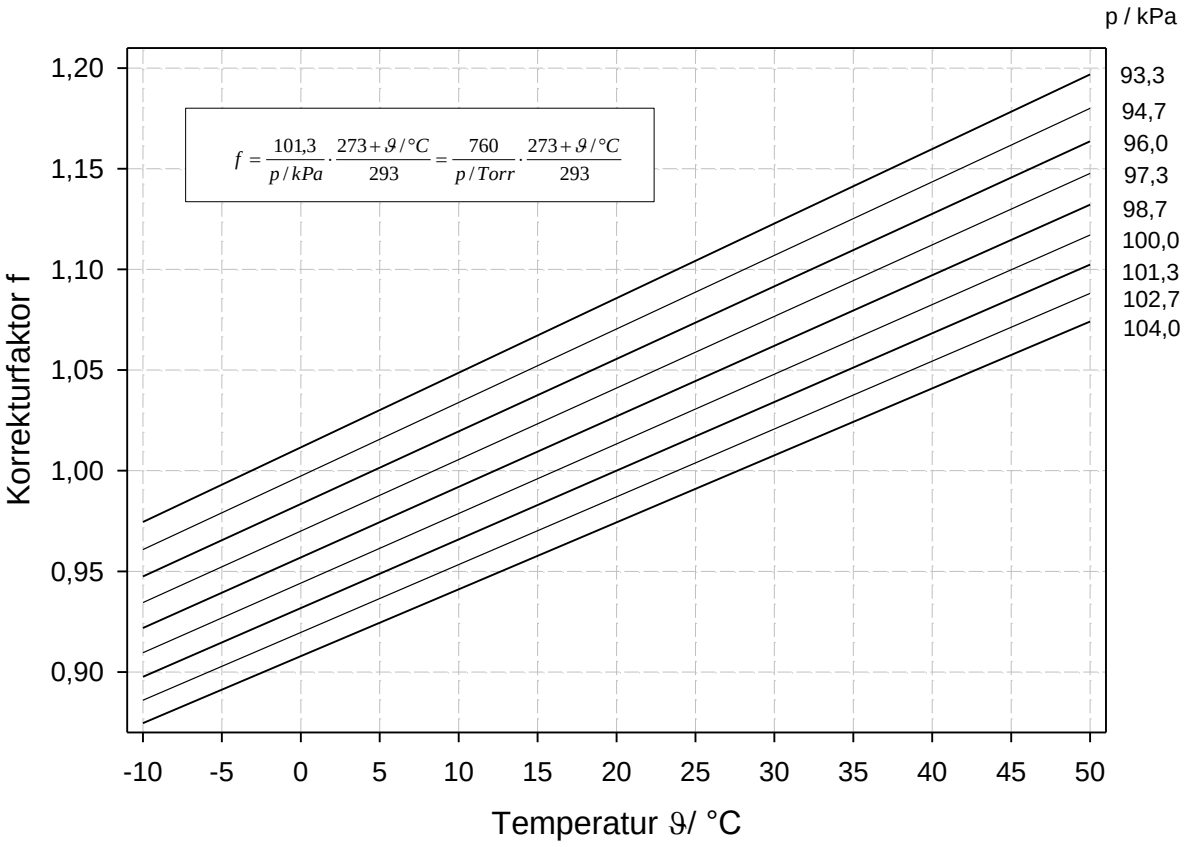
Operating temperature range	- 10 ... + 45 °C (for operation)
Storage and transport temperature range	- 20 ... + 55 °C (for storage and transport)
Air pressure	80 ... 110 kPa
Relative air humidity	max. 80 %

EMC test According to EN 61000

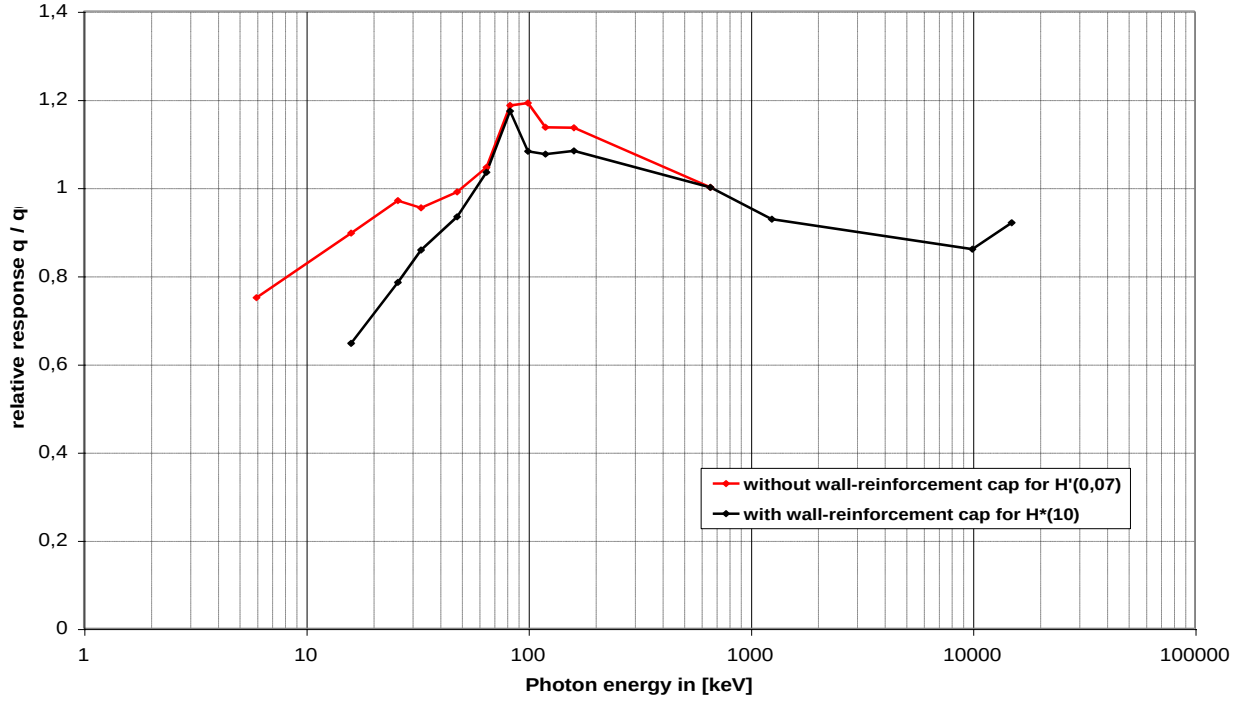
The manufacturer reserves the right to any modification of the specifications in terms of technical progress.

Appendix

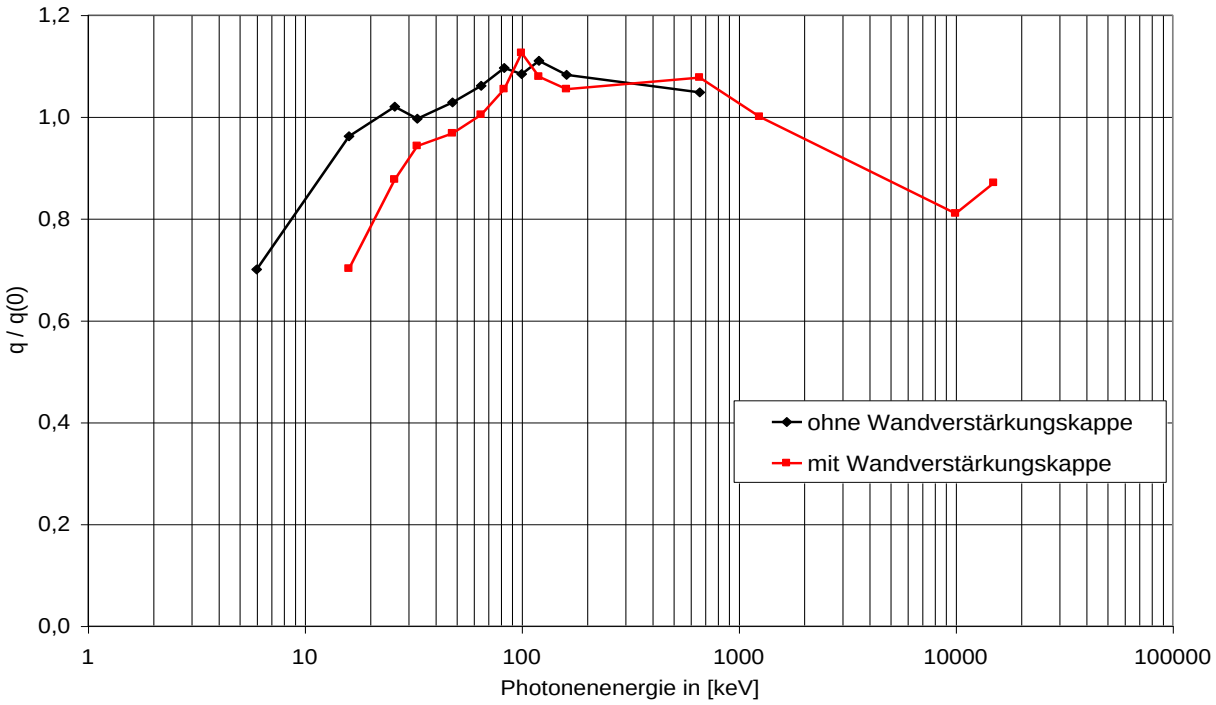
Nomogram (air pressure and temperature compensation)



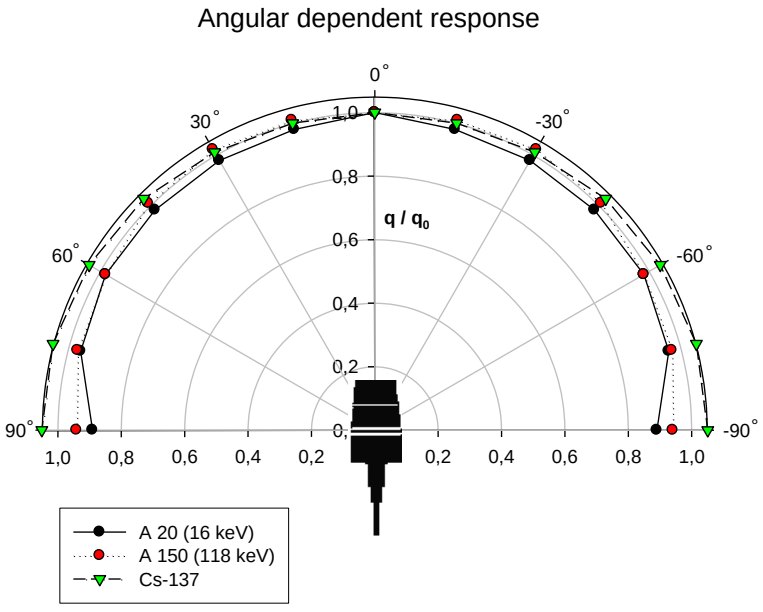
Energy dependent response OD-02:



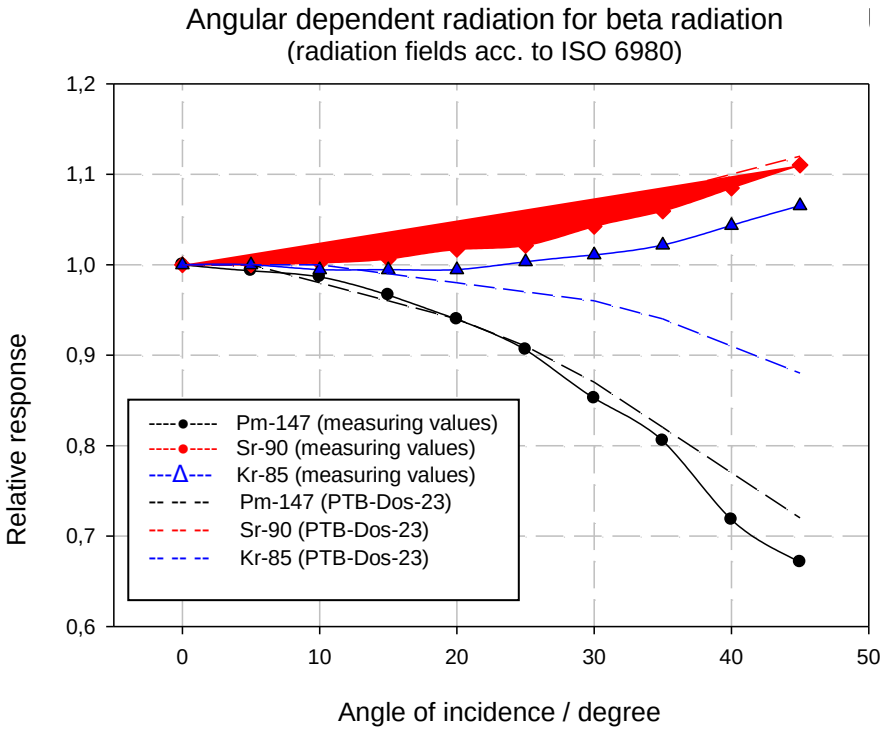
Energy dependent response OD-02 Hx



Angular dependent response for photon radiation



Angular dependent response for beta radiation



Relative response for various beta energies (characteristic values)

Radiation	Isotope	Energy in keV	Relative response	Direction of incidence
Beta	Sr-90/Y-90	800	0.70	axial
Beta	Kr-85	240	0.30	axial
Beta	Pm-147	60	0.20	axial

Operation sheet OD-02 / OD-02 Hx

Type: ☐ **OD-02** ☐ **OD-02 Hx**

Serial number: _____

External power supply : available ☐ not available ☐

Internal software version: _____

Final inspection date: _____

Delivery date: _____

Notes: _____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Name / Signature

CE declaration of conformity

Hereby we confirm that the following product:

OD-02 / OD-02 Hx

corresponds to the fundamental protection requirements as determined in the directive of the Council for approximation of the laws of the Member States relating to electro-magnetic compatibility (89/336/EWG).

This declaration is valid for all specimens which are produced.

For product evaluation in regard to electromagnetic compatibility, paragraphs of the following standard were used as a basis:

EN 61000

This declaration is transmitted on behalf of the manufacturer

STEP Sensortechnik und Elektronik Pockau GmbH
Siedlungsstraße 5-7
D-09509 Pockau-Lengefeld

by

Dr. Werner Schüler,
Managing director

Pockau, 20-12-2011

Legally valid signature