Automation und Messtechnik GmbH

automess

Case 6605.22

Protective cap

End window for beta radiation

Probe head with two GM counters

Telescope

with carrying strap (included)

TELETECTOR 6112 M/H CE
S/N 103857 H*(10)

µSv/h
0.06

approved by PTB (government authority)

Handle also serving as the battery compartment (four C cells)

➤ **Safety by distance: Telescope may be extended continuously up to a total length of approx. 4 m**

➤ **Measuring quantity J_S (6112M) or H*(10) (6112M/H)**

➤ **Wide dose rate range from 0.01 µSv/h to 10 Sv/h with automatic range selection and automatic switching among the two counting tubes**

➤ **Simultaneously measures current, average, and maximum value of dose rate, as well as dose**

➤ **One freely programmable alarm thresholds for both dose and dose rate, particularly intense warning tone and acoustic single pulse detection**

➤ **Illuminated fully graphic LC display**

➤ **Stores up to 450 measurements, serial transfer of the recorded measurements to a PC**

TELETECTOR® 6112M (/H)

Microprocessor controlled dose rate meter with telescope for measuring photon radiation (gamma and X-radiation) and for detecting beta radiation

TELETECTOR® is our trademark
(German registration number 303 55 581)

APPLICATION

The Teletector 6112M is a portable battery operated dose rate meter to measure photon radiation (gamma and X-radiation), and to detect beta radiation. Two GM counting tubes serve as detectors. The stainless steel telescope can be continuously extended up to approximately four metres; its end carries the two tubes. The tubes are placed along the axis one behind the other; a groove marks the centre of each tube. The low range tube (end window tube ZP1400) can also detect beta radiation. Together with the high range tube (ZP1300) the Teletector covers a dose rate range from 0.01 µSv/h to 10 Sv/h, where it automatically switches between the two tubes.

The Teletector 6112M simultaneously measures dose rate, dose, dose rate mean value, standard deviation of mean value, and dose rate maximum value. A fully graphic liquid crystal display (LCD) with switchable illumination (LED back-light) shows all the information. Four keys allow to select functions from a menu, where the display always describes the current function of all keys. Menu options are represented in plain language. The user may select one of the three pre-programmed languages (German, English, French) or even a fourth individually programmable language. Besides the current function the display always shows some important parameters in a status line: battery condition, detector in use (low or high range), date, time, and whether alarm thresholds have been exceeded.

The loudspeaker provides single pulse detection and goes on when some alarm goes on. In case of contamination, the speaker may easily be replaced without having to open the instrument.

A non-volatile memory stores all settings when switching the Teletector off or when replacing the batteries. The real time clock keeps date and time with the help of a rechargeable back-up battery. A 16-bit microprocessor controls all the functions.

The Teletector 6112M has three operation modes the user can select:

- 6112M mode: This mode offers the widest scope of functions.

- 6150AD mode: This mode makes operation very similar to operating a 6150AD5/6. Only the 6150AD5/6 functions will be available.

- Fire brigade mode: In this mode the Teletector only indicates dose rate, other functions are not available. The dose rate alarm threshold is fixed at 25 µSv/h. This mode is particularly intended for use by fire brigades.

MODELS 6112M and 6112M/H

The two models 6112M and 6112M/H differ in the measuring quantity they are designed for. The Teletector 6112M measures any of these three quantities: Photon Dose Equivalent Hx (Sv units), Js (Exposure Dose, R), and Air Kerma Ka (Absorbed Dose, Gy). Those three quantities are very close related to each other, because they can be converted to each other by simple conversion factors independent of photon energy:

$$Js\ [R] = 114\ R/Gy \bullet Ka\ [Gy]$$
$$Hx\ [Sv] = 0.01\ Sv/R \bullet Js\ [R]$$
$$Hx\ [Sv] = 1.14\ Sv/Gy \bullet Ka\ [Gy]$$

Because this conversion is independent of energy, the 6112M can allow the user to select one of the three units R, Gy, and Sv. Hx was the legal quantity in Germany from 1986 to 2001; however, the quantity Hx was hardly accepted internationally.

The 6112M/H is designed for Ambient Dose Equivalent H*(10), which is also measured in Sv units. The 6112M/H does no longer allow to switch the unit from Sv to R or Gy because this conversion is now energy dependent.

Operation and function do not depend on the measuring quantity. Therefore, from now on we shall distinguish between both models only if there are differences, for example when specifying energy dependence. Unless stated otherwise, all specifications apply to both models.

FUNCTIONS

- **Dose Rate**
  This function indicates the current dose rate; it is the instrument's ground state. Dose rate is represented in both digital and analogue form (bar-graph covering two logarithmic decades). The automatic change of range is emphasised by a short sound and two arrows to the left and the right of the digits. The arrows will point upwards, if a higher range was selected, and will point downwards, if a lower range was selected. This shall draw the user's attention to the fact that a new range was selected.

- **Dose Rate History**
  This function graphically represents dose rate history, where »history« means the progress of dose rate in the past. After having been switched on, the Teletector averages dose rate at one-minute intervals (independent of current dose rate indication) and stores those one-minute averages in a circular buffer. The circular buffer will overflow after 48 hours, then the most recent value will replace the oldest one. Therefore you may review dose rate history for up to the last 48 hours. Graphic dose rate history indication always comprises two decades that are automatically scaled according to the highest dose rate in the currently visible time window.

- **Dose**
  This function displays the dose that has been accumulated since the instrument was switched on or since the dose was reset to zero. It also indicates date and time when dose accumulation started, and the duration of dose accumulation. If the dose alarm threshold is active, the instrument will not display the duration of dose accumulation, but the time that will elapse until the dose gets to the threshold. Also, a bar-graph acting as a gauge indicates the dose value in relation to the threshold (0%-100%). Dose is always accumulated in the background, even if this function is not currently selected. The dose may be reset to zero after the Teletector has asked for confirmation.

- **Statistics**
  This function displays statistical information that has been collected since the instrument was switched on or since the statistics were reset to zero:
  - dose rate mean value,
  - standard deviation of mean value,
  - dose rate maximum value,
  - starting time and duration of measurement.
  The mean value allows to measure low dose rates (<1µSv/h) quite accurately, where the standard deviation tells you the statistical accuracy. Note that statistics are always collected in the background, that is even if this function is not currently selected. The statistics may be cleared after the Teletector has asked for confirmation.

- **Logbook**
  This function allows to view the logbook. The logbook may enable you to review exceptional events having occurred during previous uses of the instrument. When switching itself off, the Teletector stores the following data in his logbook:
  - starting time (date & time when switched on),
  - duration of use,
  - dose rate mean value for that use,
  - dose rate maximum value for that use,
  - dose accumulated during that use.

  These values are independent values; they will not be affected when deleting dose or statistics. You may only view previous uses, not the current one, because the current one has not yet ended.

- **Battery Condition**
  This function displays battery voltage digitally and residual battery capacity as a percentage gauge. If voltage drops below 4 volts, the Teletector issues battery warning in all functions, consisting of a short sound and the function line alternating between its normal text and the text »BATTERY CONDITION«. In this case you should replace the batteries as soon as possible.

- **Recording Measurements**
  The Teletector can store up to 450 measurements. One measurement is not just a shot of the current dose rate, but it is an averaged value of dose rate, where the user can control the averaging time. This permits improved statistical accuracy of the stored measurements especially at low dose rates.

  As a factory default, the individual measurements or »places« are named by their numbers 1 through 450. Recording is even more comfortable with a PC and the WINCOM-M software (optional accessory). Then you may give the places real names and divide them into 16 measuring schedules of your own, which makes selecting a place much easier. Once the user has selected a schedule, only places of that schedule are available for storage..

  While recording measurements, dose rate warning and dose warning are disabled.

- **Dose Rate Alarm Threshold**
  The dose rate alarm threshold is freely programmable. If dose rate reaches or exceeds the threshold, the Teletector automatically switches to dose rate indication and issues a rapidly intermittent sound as an acoustic warning. The alarm tone can be turned off by pressing a key. As soon as dose rate drops below the threshold, the alarm will automatically go out. If a new alarm appears, both visual and acoustic alarm will go on again. In case dose rate alarm and dose alarm occur simultaneously, dose rate alarm has priority.

- **Dose Alarm Threshold**
  The dose alarm threshold is freely programmable. If dose reaches or exceeds the threshold, the Teletector automatically switches to dose indication and issues a slowly intermittent sound as an acoustic warning. The alarm tone can be turned off by pressing a key. Once you have acknowledged the dose alarm, there will be no further dose alarm.

- **Settings**
  The following parameters can bet set:
  - date and time
  - language (German, English, French, or language programmed with the help of a PC)
  - unit Sv / R / Gy (6112M model only; the 6112M/H is forced to Sv units)

  - illumination mode:
    - on/off through pressing a particular key
    - 10 seconds on after pressing any key
    - always on
  - time constant: the time constant always floats with dose rate. You may select the time constant to float within one of these three ranges: 16s to 2s, 8s to 2s, or 4s to 2s.

- **Detector Check**
  This function allows to check the two GM tubes with the help of a check source. Dose warning and dose rate warning are disabled while using this function.

- **Connector with Interface and Earphone Output**
  This connector provides both a serial interface for communicating with a PC and an earphone output:
  Serial Interface
  The serial RS232 interface is bi-directional. The Teletector outputs dose rate through this interface at one-second intervals, which is the same cycle as for calculating dose rate. Moreover, this interface serves to load your customised measuring places into the Teletector and read the recordings later.
  To connect the Teletector to a PC, the connecting cable 865.1.3 is available as an optional accessory.
  Earphone Output
  The earphone 865.1.4 (optional accessory) also plugs into this connector. Acoustic signals transmitted to the earphone are the same as for the built-in speaker. However, the earphone is always on, even if the speaker was switched off through the speaker key.

OPTIONAL ACCESSORIES

The removable carrying strap is always included. Furthermore, these optional accessories are available:

Earphone 865.1.4

The earphone (dynamic, 500 ohms) with ear clip plugs into the Teletector's connector. Cable length is 1.5 m.

Connecting Cable 865.1.3

This cable connects the Teletector to the serial RS232 interface of a PC. The connector at the PC's end is a female 9 pin D-sub that plugs into a PC's standard COM port. The other end plugs into the Teletector's connector. Cable length is 3 m.

WINCOM-M Software

This software runs on a standard PC with a RS232 interface (COM1 - COM4). Its primary purpose is customising the Teletector (creating schedules and names of the places to be recorded, readout of stored measurements, creating your own language the Teletector shall use).

Source Holder 761.14

The source holder 761.14 used with a check source 6706 (333 kBq Cs-137) or equivalent allows a reproducible radiological check of either counting tube.

Probe cover 6112B-142

The probe cover made of colourless plastic foil protects the extended telescope against contamination and also against dirt and humidity, e.g. in case of outdoor use.

Aluminium Case 6605.22

This case (see photo on the front page) is recommended for safe transport and storage.

TECHNICAL DATA

	Teletector 6112M (/H)
Low range detector (energy compensated)	beta gamma end window tube ZP1400 or equivalent, effective length 40 mm, sensitivity approx. 5800 pulses per µSv
High range detector (energy compensated)	gamma tube ZP1300 or equivalent, effective length 8 mm, sensitivity approx. 100 pulses per µSv
Detector selection	automatically with hysteresis: > 10 mSv/h: goes to high range < 7 mSv/h: returns to low range manual selection of detector for radiological check provided
Measuring quantity	6112M: Js (R), Hx (Sv), Ka (Gy) 6112M/H: H*(10) (Sv)
Dose rate range	analogue: ZP1400: 0.1 µSv/h to 10 mSv/h ZP1300: 7 mSv/h to 10 Sv/h digital: 0.01 µSv/h to 10 Sv/h
Instrumental background	< 20 nSv/h (low range tube)
Linearity of dose rate measurement	±8% (calibration with Cs-137)
Dose range	10 nSv to 10 Sv (beyond 10 Sv up to 100 Sv flashing)
Alarm thresholds	adjustable threshold for both dose and dose rate
Energy range and angular range for photon radiation	6112M: 65 keV to 1.3 MeV (response within ±30% referred to Cs-137) ±45° (response within ±20% referred to response in preferential direction of 0° at the same energy)
	6112M/H: 45 keV to 1.3 MeV and ±45° (at any energy and direction within these ranges, response is within ±40% referred to response at Cs-137 at 0°)

preferential direction 0°

centre of high range tube (ZP1300)   centre of low range tube (ZP1400)

Detection of beta radiation	through end window tube ZP1400 behind the face of the tube housing (see photo on the front page). The protective cap must be removed. The beta rejection factor of the protective cap is in the order of 100.
Beta window	tube window: 2 - 3 mg/cm² protective foil: 6 mg/cm² sensitive area: approx. 60 mm²
Relative response to beta dose rate H'(0.07, 0°)	without protective cap: Pm-147 (E ~ 60 keV): 3.5% Kr-85 (E ~ 240 keV): 4.4% Sr-90/Y-90 (E ~ 800 keV): 22%
Display	fully graphic LCD (128 x 128 pixels) transflective, LED back-light

	Teletector 6112M (/H)
Range selection	automatically
Dose rate warning	acoustically and visually
Overload	dose rates above the full range (10 Sv/h) are indicated as over-range up to dose rates of 100 Sv/h; after overload the Teletector is still functioning
Detection of single pulses	acoustically, speaker may be replaced for decontamination
Speaker loudness level	> 90 dB(A) in a 30 cm distance
Climatic conditions	temperature range: -20°C to +60°C humidity range: 0 to 95% within the specified temperature range; change of response ±6%
Storage temperature	-40°C to +85°C
Atmospheric pressure	nominal range: 60 to 130 kPa (600 to 1300 mbar)
Geotropism	none (no change of response as a result of gravitational effects)
Teletector housing	aluminium die-cast
Telescope	stainless steel
Protection class	IP 67 according to DIN 40050 *if telescope completely retracted and protective cap applied*
Supply voltage range and power supply	4.0 to 7.0 Volt four C cells (LR14, AM2)
Battery life	approximately 100 hours with alkaline batteries (without illumination and speaker)
Dimensions	length: 970 mm (telescope retracted) 4170 mm (telescope extended) width 130 mm max. height approx. 90 mm
Weight	2.7 kg (without batteries) 3.0 kg (including batteries)
CE compatible according to	EN 50 082-2:1995, EN 55 011:1998, ENV 50 140:1993, EN 61 000-4-2:1995

Energy Response
Normalised to Indication at Cs-137 (662 keV)

- low range 6112M
- low range 6112M/H
- high range 6112M
- high range 6112M/H
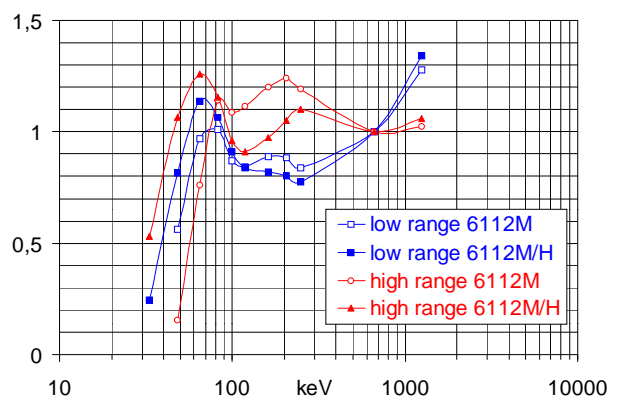
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