



Expect Service

Radiation Products Design Inc

INSTRUCTIONS

RPD INFORMATION

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RPD IS AN AUTHORIZED DISTRIBUTOR

Item Number	Description
300-630-BNC-M	PTW 23344 - 0.2cc Big Soft X-Ray Chamber

Disclaimer

CE-Marking

- * *CE-marking according to MDD-Directive for class IIb products*
The product bears the CE-mark "CE-0124" in accordance with the Council Directive 93/42/EEC about Medical Devices and fulfills the essential requirements of Annex 1 of this directive.
The product is a class IIb device (MDD).

General Information

- * The instruction manual is an integral part of the device. It should always be kept near the device. Observance of the manual is a prerequisite for proper device performance and correct operation.
- * Operator safety, specified measuring accuracy and interference-free operation can be guaranteed only if original devices and parts are used. Furthermore only the accessories listed in this manual are approved by PTW-Freiburg and may be used in conjunction with the device, or else accessories whose use has been expressly permitted by PTW-Freiburg. Safe operation and proper device performance are not guaranteed if accessories or consumables from other manufacturers are used.
- * PTW-Freiburg cannot be held liable for damages resulting from the use of accessories or consumables from other manufacturers.
- * The warranty period is 1 (one) year and begins on the day of delivery.
It is unaffected by repairs covered by the warranty regulations.
- * Devices on which moisture has developed as a result of temperature changes may not be switched on unless completely dry.
- * PTW- Freiburg considers itself responsible for safety, reliability and performance of the device only, if assembly, extension, readjustment, modification or repair is carried out by PTW-Freiburg or by persons authorized by PTW-Freiburg, and if the device is used in compliance with the technical documentation.
- * This technical documentation is in conformity with the device specifications and all applicable safety standards valid at printing date.

All rights are reserved for devices, circuits, techniques and names appearing in the manual.

- * No part of the technical documentation may be reproduced without written permission from PTW-Freiburg.

Electromagnetic immunity

- * The product fully complies with the electromagnetic immunity requirements of standard EN 60601-1-2 'Electromagnetic Compatibility - Medical Electrical Equipment'.

Safety Instructions

- * Dispose the packaging material according the applicable waste disposal regulations and keep it out of children's reach.
- * The product is a medical device. Only person with sufficient knowledge and skill may use the device.
- * Before using the device, the operator must ascertain that it is in correct working order and operating condition.
- * The operator must be trained in the use of the device.
- * Set up the device so that the operator has a clear and unobstructed view of the control panel.
- * The electronic components must be recycled according to local regulations.
- * The cost for an eventual return at the end of the product life time is to be borne by the customer.
- * The product is not suitable for operation in areas of risk where an **explosion hazard** may occur. Explosion hazards may be caused by the use of combustible anaesthetics, skin-cleansing agents and disinfectants. Furthermore the device is of restricted suitability for application in **oxygen-enriched atmospheres**. The atmosphere is considered to be oxygen-enriched when more than 25% of oxygen or nitrous oxide is added to the ambient air.

Use of peripheral devices

- * Peripheral devices (PC, printer) may only be connected if the devices meet the requirements of IEC 950.
- * Devices may be connected to other devices or to parts of systems only if it has been ascertained that this connection does not impair the safety of the patient, the operator or the environment. If the device specifications do not contain information as to connecting the device to other equipment, you must consult the manufacturer of the other equipment or an expert about the effects of the connection on the patient, the operator or the environment. Always observe standards UL 2601-1/IEC 601-1 (EN 60601-1) and IEC 601-1-1 (EN 60601-1-1).

Exclusion of operation in the patient environment

- * Neither the product nor any peripheral device may be operated within the patient environment (greater than 1.50 m from Patient Examination Area).

Exclusion of operation as controlling instrument

The device is only for use to measure the dose within radiation field. The product must not be used to control radiodiagnostic equipments or radiotherapy units.

Safety Instruction to avoid electrical hazard

- * Before putting the device into operation, visually inspect all connection cables for signs of damage. Damaged cables and connectors must be replaced immediately.
- * Never touch the patient and open connectors of the device at the same time.

NOTE



This symbol means:

Separate collection for electrical and electronic equipment!



This symbol stands for:
Please observe the manual !

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1 Application and Functional Description

The ionization chambers type 23342, type 23344 and type 34013 are parallel plate chambers for use with therapy dosimeters according to IEC 60731 for the measurement of photon radiation of low energies. They are used for absolute dosimetry, i.e. for the measurement of dose or dose rate in radiation therapy or with calibration laboratories.

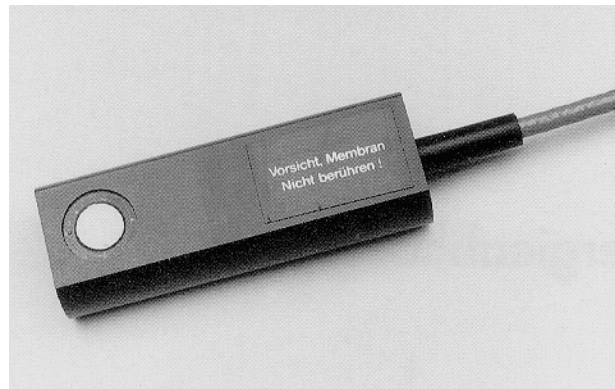


Figure 1: *Ionization chamber type 23342*

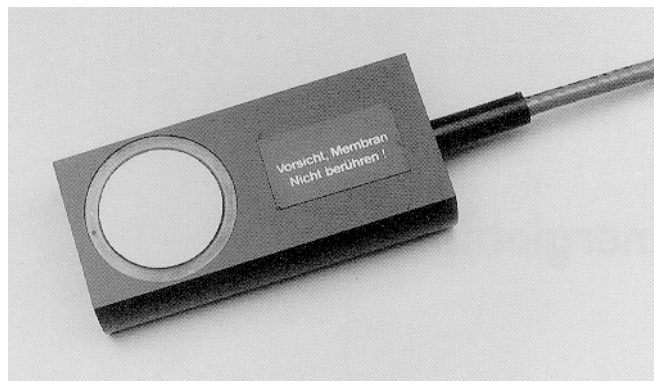


Figure 2: *Ionization chamber type 23344*



Figure 3: *Ionization chamber type 34013*

2 Usage

2.1 General hints

The soft X-ray chambers are designed for use with PTW dosimeters within the nominal ranges given in section 4, Technical Data. The use in combination with other electrometers or within other nominal useful ranges is in the user's responsibility. Special care has to be taken when combining different connector systems. High voltage must be connected including an active current limiting device ($I_{\max} < 0,5 \text{ mA}$).

Usage in water is not intended and will lead to damage of the chamber and the electrometer and dangerous short circuits.

When using the chamber, the entrance foil must point towards the beam. When using with check source, the entrance foil must point towards the check source.

Attention: Do not touch entrance foil!

The chambers are vented. Measuring values must be corrected for air density.

The chambers must be kept away from compounds like grease, oil or solvents. They may be cleaned with a dry or slightly moist cloth.

Connection cables for the total length of up to 100 m can be used between the chambers and appropriate electrometers.

The exact calibration factor and supplementary data are included in the calibration certificate. The recommended re-calibration interval is 2 years. The chambers should be re-calibrated at a dose rate typical for the application.

The nominal life expectancy of the chambers (presuming normal use) is 10 years.

2.2 Special hints for the usage of soft X-ray chambers

The energy dependence of the soft X-ray chambers is optimized for the measurement of either air-kerma free in air or absorbed dose to water in a PMMA phantom; the chamber may be used for the measurement of the other (non-optimized) quantity but then the energy dependence may not be within the limit of $\pm 2\%$.

The exact figures for the energy dependence can be seen in the calibration certificate, which is written for the optimized quantity.

2.3 Special hints for the usage of the ionization chamber type 23342

The ionization chamber type 23342 is type-tested by the German National Laboratory (PTB).

2.4 Special hints for the usage of the ionization chamber type 34013

The extremely small design of this chamber allows for measurements in small fields and with extreme dose gradients. Due to the small size of the measuring volume, the user must watch for the stem effect. The factory calibration is done with reference to a field of 30 mm diameter.

3 Measuring ranges using PTW-dosemeters

The ionization chambers type 23343, type 23344 and type 34013 can be used together with the therapy dosimeter PTW-UNIDOS. Usage with this electrometer results in the measuring ranges listed below:

Measuring range with PTW-UNIDOS:

Measuring range/ chamber	34013	23342	23344
Dose: LOW	12 mGy - 1200 mGy	3 mGy - 300 mGy	300 µGy - 30 mGy
Dose: HIGH	600 mGy - 120 Gy	150 mGy - 30 Gy	15 mGy - 3 Gy
Dose rate: LOW	80 mGy/min - 60 Gy/min	20 mGy/min - 15 Gy/min	2 mGy/min - 1,5 Gy/min
Dose rate: MEDIUM	4 Gy/min - 3700 Gy/min	1 Gy/min - 840 Gy/min	0,1 Gy/min - 84 Gy/min
Dose rate: HIGH	400 Gy/min - 370000 Gy/min ¹	100 Gy/min - 84000 Gy/min ²	10 Gy/min - 8400 Gy/min ³

The resolution of the digital display is at least 0.5 % of the measuring ranges given.

¹The upper limit of the measuring range for a saturation of 99.5 % is 60.000 Gy/min

²The upper limit of the measuring range for a saturation of 99.5 % is 10.500 Gy/min

³The upper limit of the measuring range for a saturation of 99.5 % is 3.600 Gy/min

4 Technical data

Ionization chamber type:	34013	23342	23344
Radiation quality:	Photons (7,5 ... 100) kV		
Measuring quantities:	Air kerma and air kerma rate / absorbed dose-to-water and absorbed dose rate to water		
Measuring volume:	0,0053 cm ³	0,02 cm ³	0,2 cm ³
Chamber dimensions:	refer to figures 6,10,14		
Guard ring:	yes	yes	yes
Chamber voltage:	max. 400 V	max. 300 V	max. 500 V
Response:	2·10 ⁻¹⁰ C/Gy	1·10 ⁻⁹ C/Gy	1·10 ⁻⁸ C/Gy
Leakage current:	± 4·10 ⁻¹⁵ A		
Cable leakage:	≤ 10 ⁻¹² A/s Gy ⁻¹ cm ⁻¹		
Direction dependence:	< ± 5 % at ≤ ± 10° (also see figures 9,13)		
Energy dependence:	see figure 5	see figure 8	see figure 12
Nominal useful range:	(15 ... 50) kV	(7,5 - 70) kV	(7,5 - 70) kV
Wall material:	Polyethylene		
Entrance foil thickness:	0,03 mm		
Area density:	2,5 mg/cm ²		
Electrode material:	Graphite	0,1 mm Al on graphite	0,1 mm Al on graphite
Ion collection time¹:	0,01 ms	0,03 ms	0,05 ms
Polarity effect:	≤ 0,5 %		
Max. dose rate at continuous radiation²:	990 Gy/s	175 Gy/s	35 Gy/s
Max. dose/radiation pulse:	4 mGy	1,8 mGy	0,8 mGy
Nominal ambient conditions:			
Temperature:	(10 ... 40) °C		
Air humidity:	(10 ... 80) %, max. 20 g/m ³		
Air pressure:	(700 ... 1060) hPa		
Transient periods:			
Pressure equilibrium:	≤ 10 s		
Temperature equilibrium:	(2 ... 3) min/K		
Reference point:	Center of entrance foil inside		
Connecting systems:	PTW M-System, BNT or TNC triax-connector, BNC + banana-connector		

¹At 300 V chamber voltage

²At 300 V (34013 400 V) chamber voltage for a minimum of 99,5 % saturation



Figure 4: *Ionization chamber type 34013*

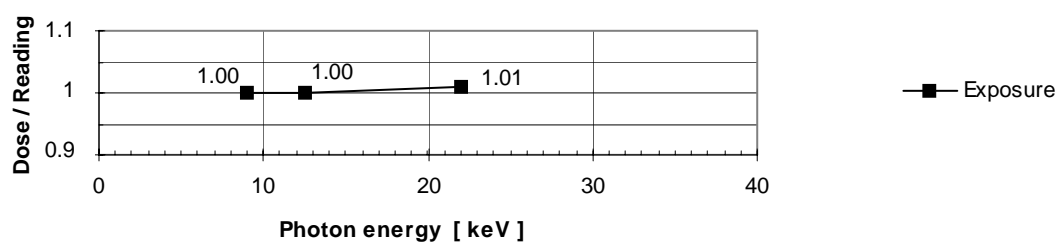


Figure 5: *Energy dependence of chamber type 34013
(typical values; for exact values see calibration certificate)*

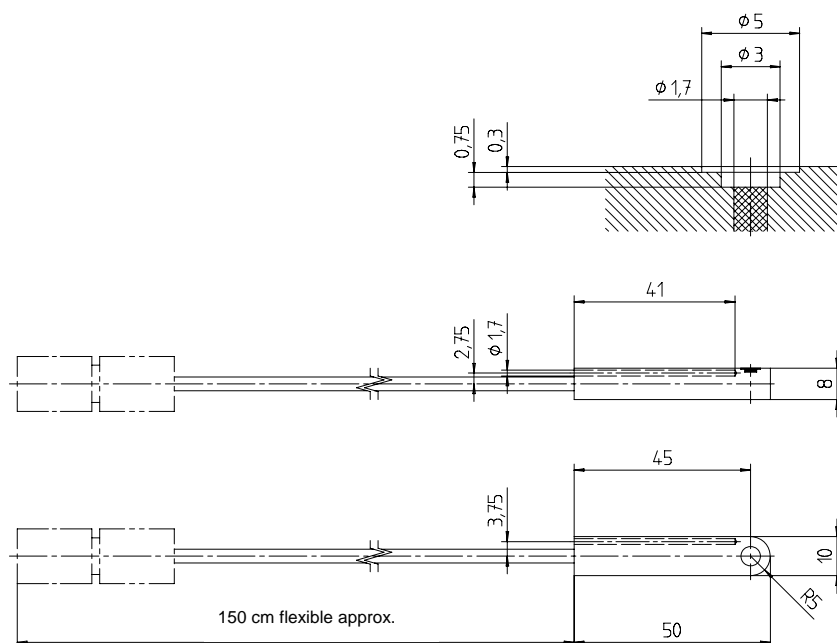


Figure 6: *Design of chamber type 34013*



Figure 7: *Ionization chamber type 23342*

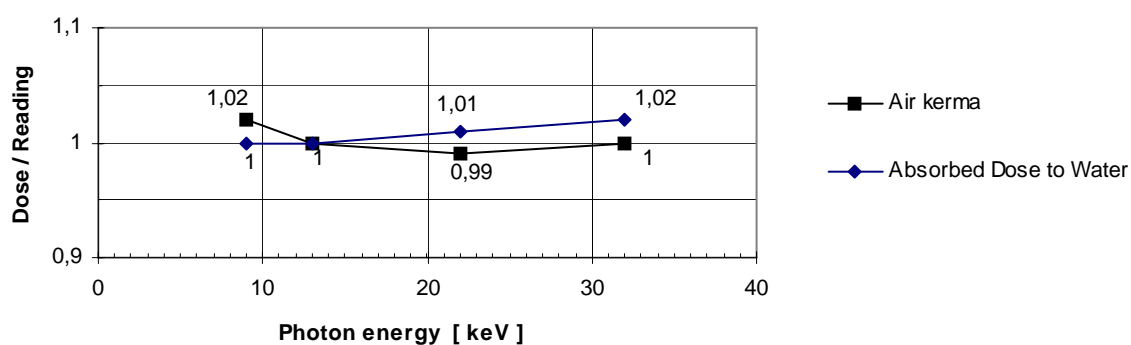
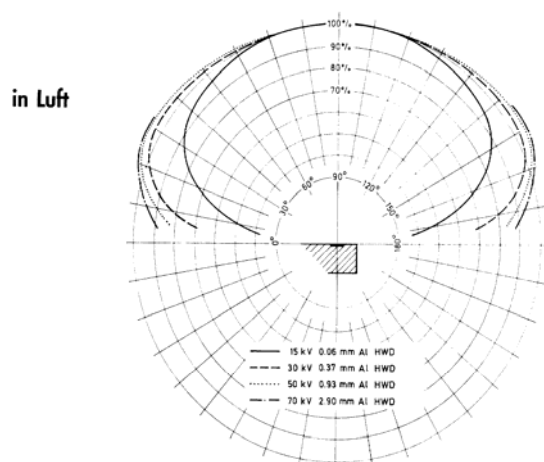


Figure 8: *Energy dependence of chamber type 23342
(typical values; for exact values see calibration certificate)*



Reading / Dose [%]

	6°	24°	36°	54°	66°	90°	114°	126°	144°	156°	174°
15 kV	33.4	79.6	91.5	96.5	98.7	100.0	98.7	96.5	91.5	79.6	33.4
30 kV	68.7	100.7	102.8	101.6	100.6	100.0	100.6	101.6	102.8	100.7	68.7
50 kV	82.7	103.7	104.2	102.5	101.1	100.0	101.1	102.5	104.2	103.7	82.7
70 kV	88.5	104.4	104.5	102.5	101.1	100.0	101.1	102.5	104.5	104.4	88.5

Figure 9: *Directional dependence of chamber type 23342*

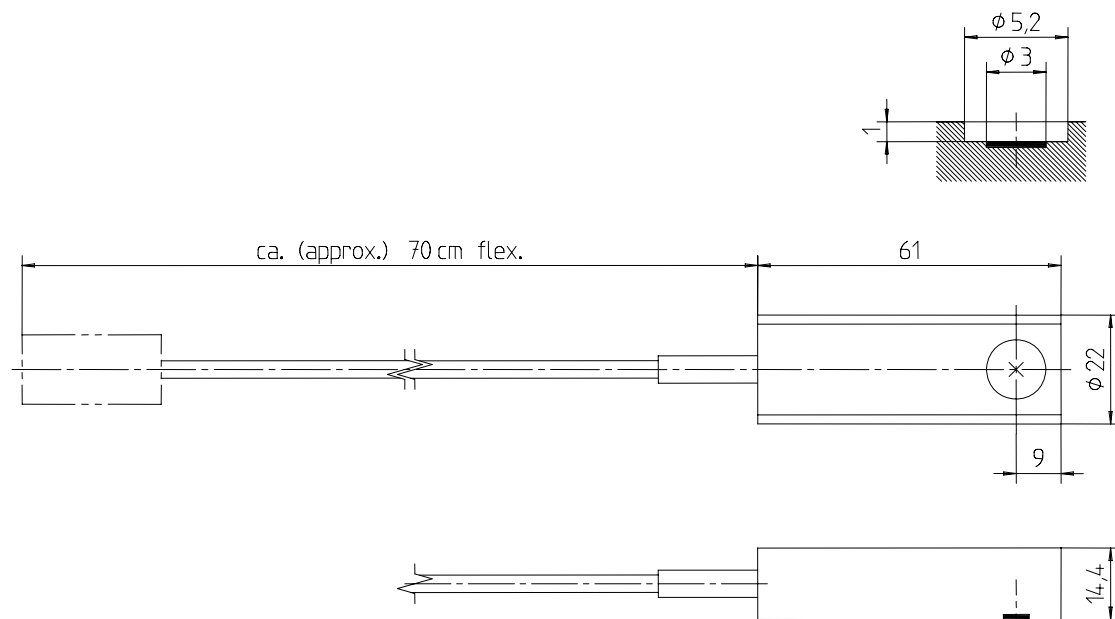


Figure 10: *construction of chamber type 23342*

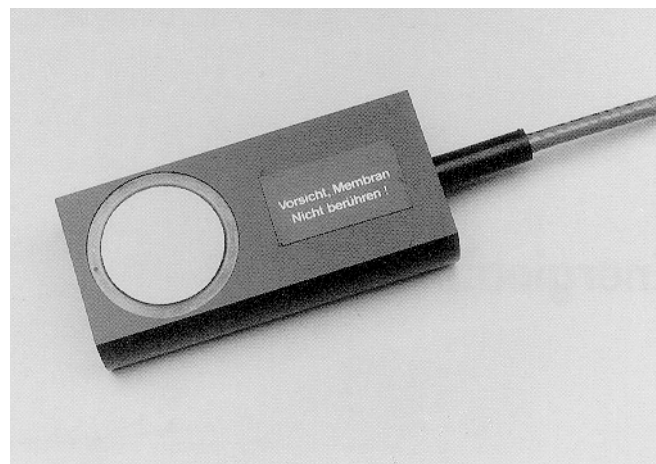


Figure 11: *Ionization chamber type 23344*

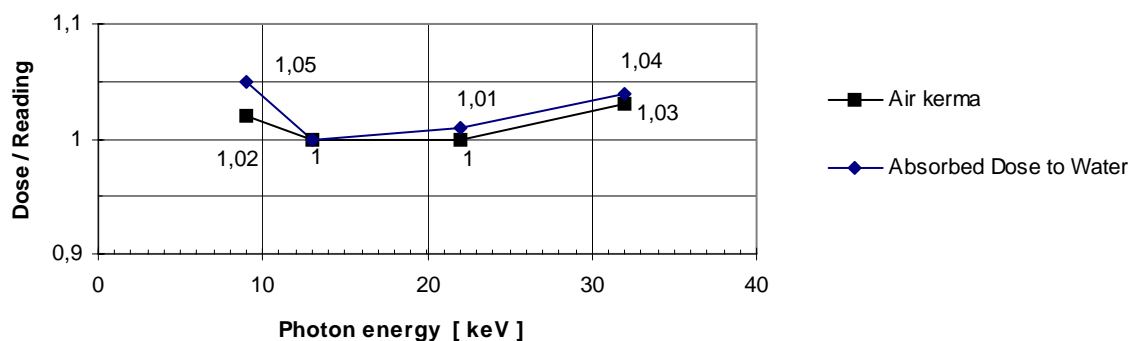


Figure 12: *Energy dependence of chamber type 23344
(typical values; for exact values see calibration certificate)*

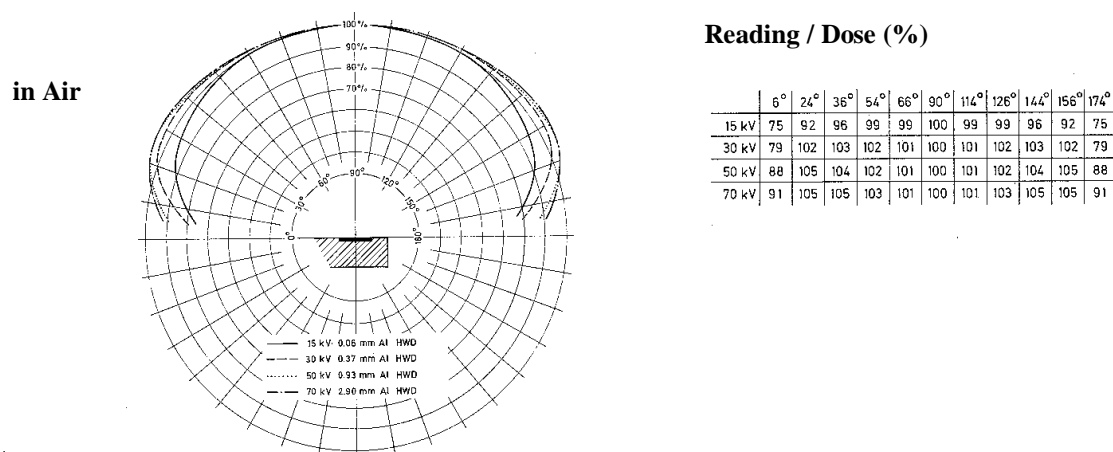


Figure 13: *Directional dependence of chamber type 23344*

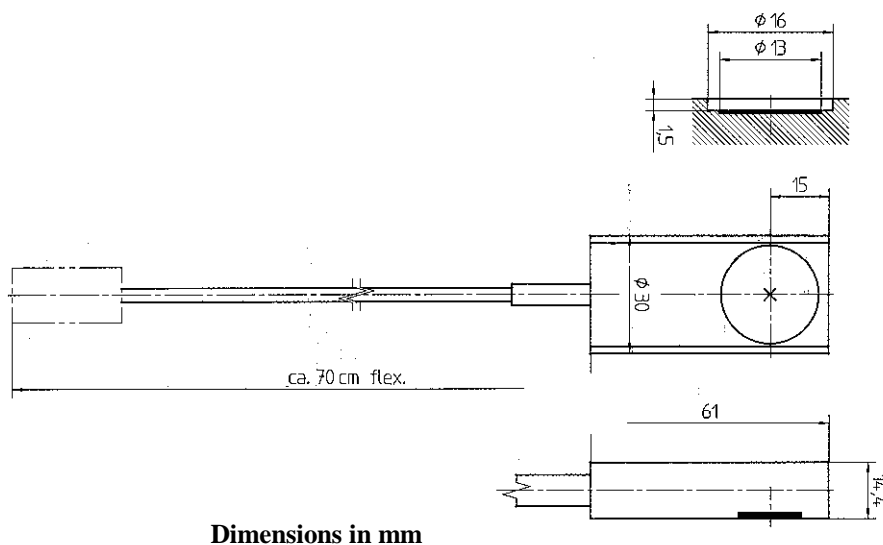


Figure 14: *Construction of chamber type 23344*