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TELEFAX MESSAGE

TO: Georgia Department of Natural Resources

ATT: Mr. Slocumb

FAX NO:

DATE:.

Feb 25, 1993

NUMBER OF PAGES:
(incl. this sheet)

x

CC.: x

x

FROM:

Jukka Perento

RE: Liscence application for Tapio Paper Variabilty Analyzer, State of Georgia

First let me thank You for all the help, information and patient You have had with us.

I have enclosed quite a few pages which should cover all the questions You made during our last few phone calls.

1. On the unpaid bills report you sent there was one 800.00 US inspection fee unpaid, is it still so or should we tkae care of it from here. Our "agent" there has got money for that, but..
2. The research liscence we got under name Makkonen Associates, can we use that with the /under name Tapio Technologies or do we have to reapply ? (We do not have a device in US right now). *(We do not need a research liscense, presently)*

Pages I have enclosed cover the following things in this order:

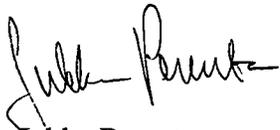
- Our acceptance of the stray radiation measurement for BW-2h54 (older model)
We have asked Atlan-Tech to give their report of the possible effects of the new BW-2h55 design to the above measurement. *a.k*
- The model of label which is attached to the analyzer (Rule 391-3-17-.02) there is also a text on transducer itself (see page manual page 9 after the label): there are both "CAUTION - Radio Active Material" and "Promethium 147 200 mCi" on transducer.
- The three manual pages mentioning the basis weight sensor are updated and enclosed
- The explanation of the new bw-2h55 design (compared to older bw-2h54) includes the following pages : General description of shutter mechanism, functional description of BW-2h55 and the schematic drawing of the transducer, 2 pages showing and explaining the shutter a little more , three sort of three dimensional layouts of the shutter and solenoids in different open or closed positions, and last a layout of the whole TAPIO device with BW sensor on it's place.

BR. Jukka Perento

Jukka Perento

***"Measurement of the Stray Radiation Profile for the TAPIO
Model BW-2h54 Basis Weight Sensor" by Atlan-Tech, Inc.***

We have read the above mentioned measurement report and hereby notify
our acceptance of the report.



Jukka Perento
Tapio Technologies Oy

**U.S NUCLEAR REGULATORY COMMISSION
Rule 391-3-17-.02(11)(d) label concerning the
BASIS WEIGHT SENSOR OF TAPIO ANALYZER**

INSTALLATION, OPERATION AND SERVICE

It is **STRICTLY FORBIDDEN** to open the Basis Weight Sensor. The sensor is installed and serviced only by authorized individuals with legal licenses.

The operation of the analyzer is allowed only for personnel having successfully fulfilled the operator's training given by an organization with legal authorization from behalf of the manufacturer. An official diary of each operation of the device (with other pertinent information) is to be kept by the operators.

The instructions to operate the Analyzer are described in the Operator's Manual with special reference to the basis weight sensor in chapters headed: Description, Basis Weight Sensor BW-2h55; Calibration, Basis Weight; And Radioactive radiation protection.

BETA- RADIATION SOURCE, TESTS ON ITS SAFE USE

The isotope used for β -radiation is a scaled and solid Promethium-147 (Pm-147) capsule manufactured by Amersham Int. plc. (Bucks HP79NA, U.K.) with nominal activity of 200 mCi (milli Curie). The measured activity on the Day: _____ of Month: _____, 19__ was: _____ mCi. The manufacture's certificate on the activity is included in the delivery documents of the analyzer.

The basis weight sensor is required to be tested for possible leaks and for the function of the on/off shutter mechanism once per every six months.

Periodically, each 4-7 years, the β -source has to be replaced with the new one. The old source has to be sent back to the manufacturer of the Analyzer.

The RECEIPT, POSSESION, USE, and TRANSFER of this device,

Model PVA-113 Serial No. _____, is subject to a general license or the equivalent, and the regulations of the U.S Nuclear Regulatory Commission or a state with which the Nuclear Regulatory Commission has entered into an agreement for the exercise of regulatory authority. This label shall be maintained on the device in a legible condition. Removal of this label is prohibited.

CAUTION - RADIO ACTIVE MATERIAL

(NAME OF MANUFACTURER OR DISTRIBUTOR)

Basis weight sensor BW-2h54

The function of the basis weight sensor is based on the absorption of beta radiation in paper. The sensor consists of a transmitter with a radiation source and of a detector on the other side of the web.

NOTE: The transmitter encapsulates a radioactive beta-source, Pm 147 (Promethium). The opening of the transmitter is automatically closed by a shutter, when the electricity is turned off. The desired opening is selected by computer control. **The mill has to have a person with legal authorization for handling and possession of radioactive material! It is strictly forbidden to open the sensor!**

Figure 9 illustrates the principle of the basis weight measurement and Figure 10 the appearance of the sensor.

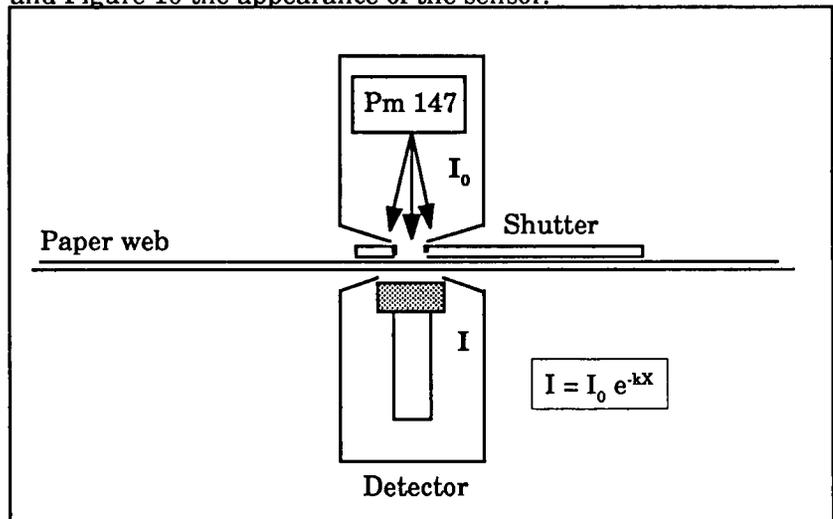


Fig. 9 Measurement principle of the basis weight.

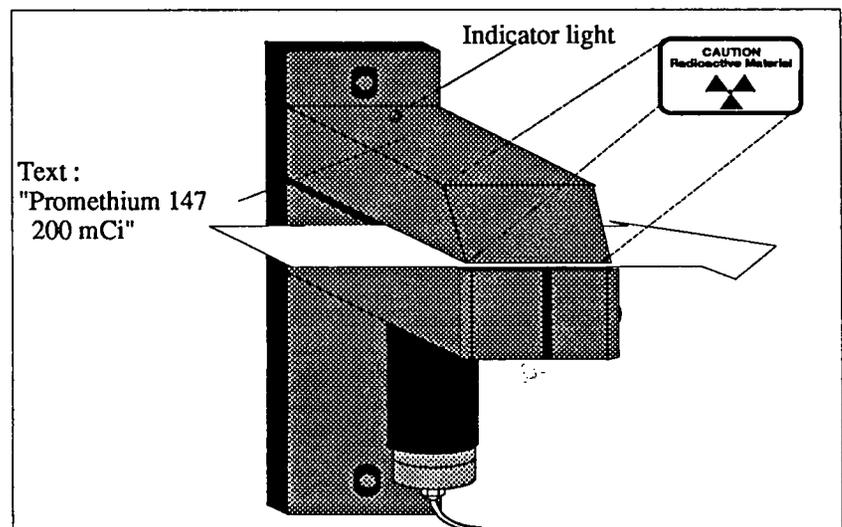


Fig. 10 Basis weight sensor BW-2h55

When there is no sample in the sensor the gloss value will be 0.

Since the gloss is different on top and bottom sides, be careful and place the sample the right side up (or down). Also avoid any rubbing of the sample, although it has to be placed and stretched by hand during the calibration.

Transmission

The zero-sample of the transmission sensor is obtained by placing a non-transparent sample, *e.g.* a caliper calibration sample to the sensor. The transmission signal is site-dependent and therefore the sample has to be supported tightly by the guiding rolls and moved along the web moving direction during the calibration.

The samples used for transmission calibration are preferably stored in a black plastic bag to prevent them from yellowing.

NOTE. The sensor is not allowed to be calibrated without a sample (100 % transmission cannot be used for calibration).

Basis weight

The basis weight is calibrated by the application of either pre-weighed paper or plastic sheets. The samples have to be moved like in the case of transmission.

For the different sizes of sensor apertures the calibration has to be done separately:

1. Choose the desired aperture by computer
2. When the program tells, insert into the sensor a steel strip of 0.5 mm in thickness (infinite basis weight).
3. Proceed with paper calibration samples.

Never calibrate without any sample . (=0 g/m² sample cannot be used for calibration).

F3 = Delete last value

Deletes the last value and updates the number of the calibration measurements. If the deletion is tried when the number is 0, a note appears "Nothing to delete".

The background-value of the logarithmic calibration (basis weight) cannot be deleted with **F3**, but with the key **F4**.

F4 = Delete all values

Deletes all the input values of the channel and gives the note "All values deleted". If the deletion is tried, when the number of the measurements is 0, a note appears "Nothing to delete".

RADIATION PROTECTION

TAPIO
User's Manual
Version 1.02e

General

The TAPIO-basis weight sensor contains a radioactive radiation source that emits β - (beta-) radiation. The radioactive material is a commercial product containing Promethium-147 (Pm-147) manufactured by Amersham Int. plc. (Bucks HP7 9NA, U.K.). The source is a sealed one and usually mailed by air. The aperture of the sensor is automatically closed by the shutter in case the electric current is turned off. The size of the aperture is selected through computer control.

• Maintenance

Any maintenance procedure that requires even partial disassembly of the sensor or opening of any of the covers is subject to prior approval of TAPIO Technologies, Inc. The maintenance has to be performed according to the procedures provided by TAPIO Technologies, Inc. or otherwise the warranty is dissolved. **The Basis Weight Sensor is not allowed to be opened under any circumstances.**

• Replacement and disposal of the radiation source

Since the half-life of the radiation source is 5.4 years it has to be replaced periodically. Only TAPIO® Technologies, Inc. or someone else assigned by TAPIO Technologies, Inc. possessing the proper licenses is entitled to replace the source. TAPIO® Technologies, Inc. will take care also for the disposal of the old source.

• License of approval of type-inspection

The basis weight sensor has been ~~type-inspected and granted the license a copy of which is enclosed.~~ *evaluated by the appropriate reg. agency and authorized to be distributed as a generally licensed device*

• Radiation profile

There is no measurable radiation being emitted from the device except at very close proximity to its surface, and only then at positions close to the location of the Pm147 source within the sensor housing. (Measurement of stray radiation profile by Atlan-Tech Inc.- Quote from the conclusion)

• Operating license of the employer and the person responsible

6(c)1 requirements

The institution operating the TAPIO-analyzer has to have a person possessing the proper LICENSE to safeguard the radioactive materials on that particular work place. He is responsible for the limitations regarding the operating personnel (age over 18 years, pregnancy etc.) and for the overall possession and handling of radioactive materials (cf. level control, on-line basis weight etc. licenses)!

• Additional reading

It is recommended to read additional instructions regarding safety procedures (fire, earthquake etc.) provided by the employer. In the following is the name of the mill person responsible for the above licenses and the confirmation signature of the company:

NAME AND PHONE NUMBER OF THE PERSON RESPONSIBLE:

Place: _____

Date: _____

Name of responsible person

Official employer signature

Telephone where to reach: _____

COMPUTER CONTROLLED SHUTTER MECHANISM OF TAPIO BW-2h 55 BASIS WEIGHT SENSOR

Following text describes how BW-2h55 transducer's closing and opening is mechanically working. The actual control is done through computer software. The shutter mechanism is manually unreachable, since it is build inside the BW-2h55. Also shutter can only be moved when both computer and analyzer are turned on and not only that it also requires knowledge of measurement software to know where to go and what to do before the control software permits the shutter to open.

There is an indicator light added to transducer, which is on if either the 5 or 15 mm opening is selected and open (10 mm opening from previous model has been deleted).

Enclosed please find a general description describing the new BW-2h55 transducer and a nondimensional schematic drawing. Please note the indicator light, which has been added, also note the two solenoids which are used in moving the shutter (torque and blocking solenoid). Aperture disk is connected to torque solenoid, which is the main device moving the disk (computer controlled as already mentioned). The functions of solenoids are explained in detail a little later in this letter.

Note that outside the transducer there is nothing with which the aperture disk could be moved instead the transducer is now closed with aluminum plate which is tightened with screws. (In old design there was the manual aperture selection dial) This here is a change compared to original BW-2h54 design.

The new design has required us to change the length of the body and holder of PMT assembly by 3 mm (about 0.12 in longer) otherwise that part is the same as it was.

After the general description and the general type drawing please find two pages explaining how the computer controlled shutter mechanism is working. Following that there are 3 drawings (BWOHJ-12-4M, BWOHJ-13-4M, BWOHJ-14-4M) showing sort of three dimensionally the different possible positions of the shutter and the controlling solenoids.

The last drawing is a layout of the whole product TAPIO ANALYZER where the location of Bw-2h55 is marked.

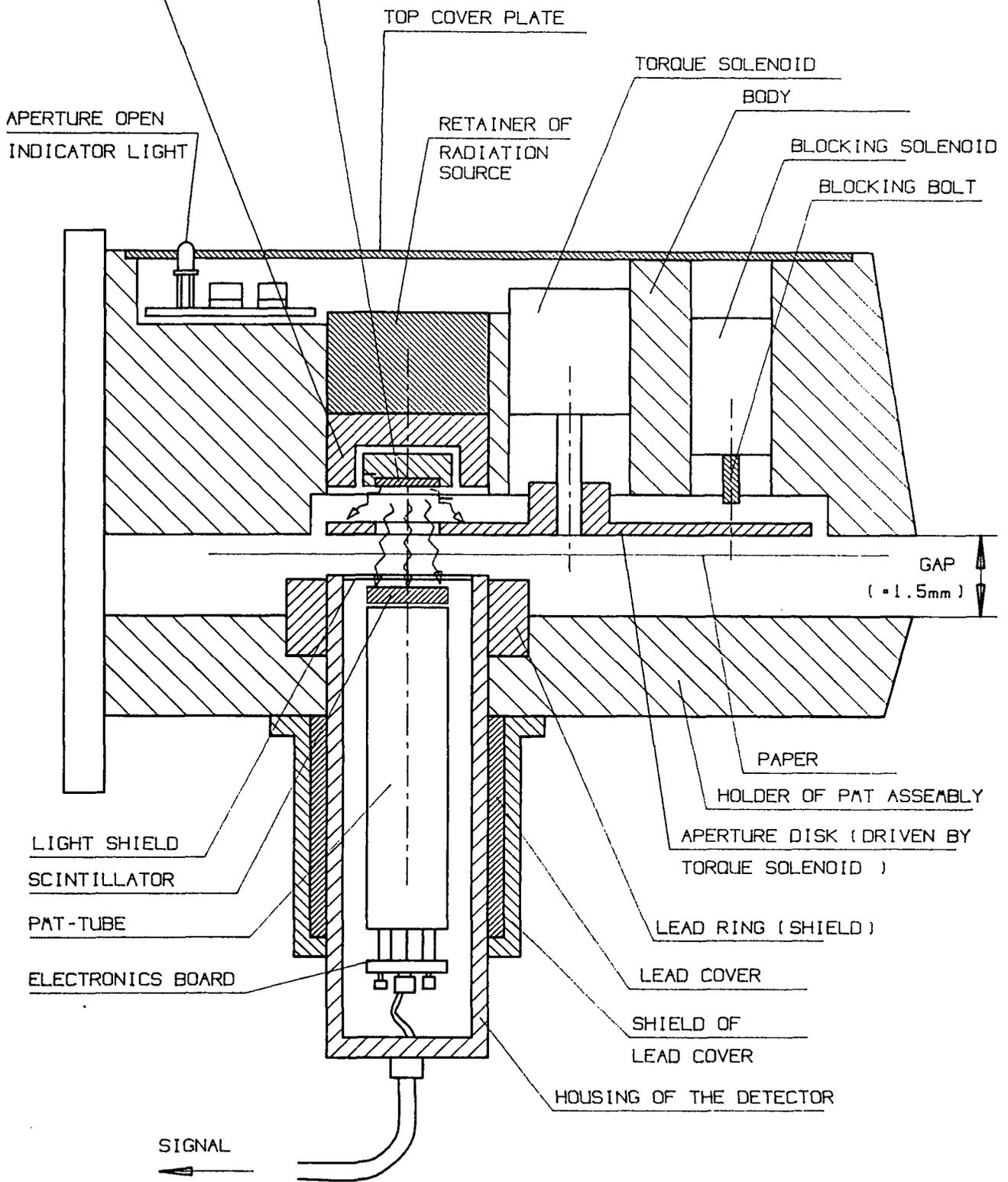
FUNCTIONAL DESCRIPTION OF BASIS WEIGHT SENSOR BW-2h55

The new Basis Weight Sensor BW-2h55 has been changed in comparison to the old type BW-2h54 so that the aperture selection is done completely by electric power, however the changes has been kept to a minimum. Hence the outer dimensions of the sensor are the same as in the old type except that the lengths of the Body and the Holder of PMT assembly have been increased by 3mm, and of course the Aperture selection disk of the old type has been omitted. The top of the Body is covered with a large Top cover plate tightened with screws, so manual interference in aperture selection is not possible. The measurement gap (for paper web) is the same as in the older model i.e. 1.5mm.

The Lead housing and the Radiation source retainer and the Radiation source as well as the whole detector assembly are the same as in the older sensor.

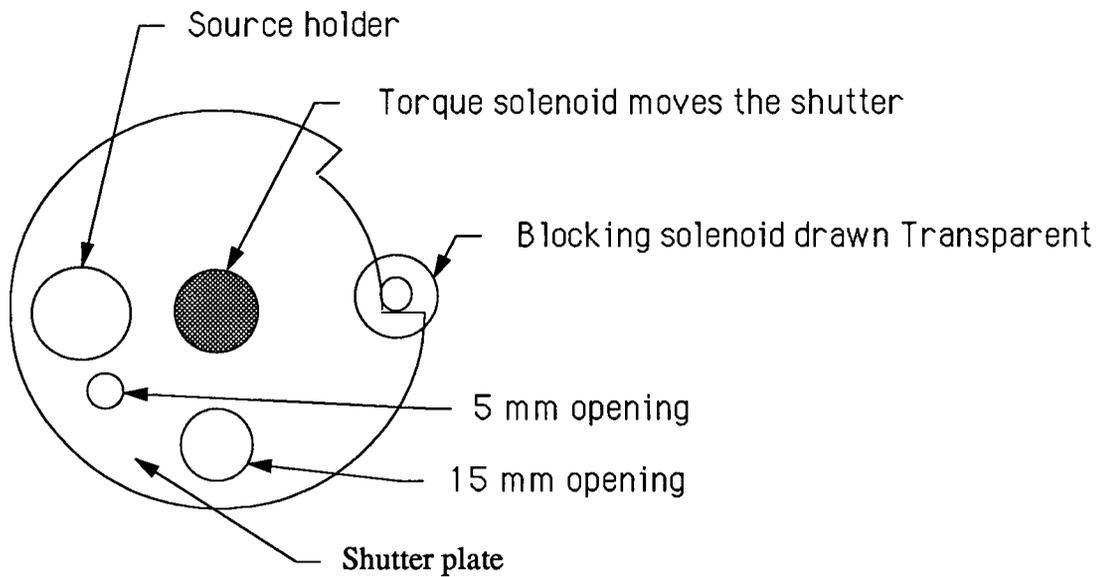
The new Basis Weight Sensor BW-2h55 has only two measurement apertures $\varnothing 5\text{mm}$ and $\varnothing 15\text{mm}$ on its aperture disk. A Torque solenoid is used to turn the Aperture disk. Whenever the electricity falls off or is turned off, an integrated spiral spring in the Torque solenoid returns the Aperture disk to OFF position; drawing BWOHJ-12-4M. When selecting $\varnothing 5\text{mm}$ aperture a Blocking solenoid (4/BWOHJ-13-4M) is used to stop the Aperture disk in correct position ;drawing BWOHJ-13-4M. When selecting $\varnothing 15\text{mm}$ aperture the Blocking solenoid is not activated and the Aperture disk turns to $\varnothing 15\text{mm}$ position; drawing BWOHJ-14-4M.

All the control signals to the solenoids come from the measurement computer through a multi-conductor cable and there is a small interface board with drivers for the solenoids inside the Body of the sensor. The power of the board comes from the Analyzer itself and the solenoids can be activated only when the power is on in the Analyzer and in the measurement computer.

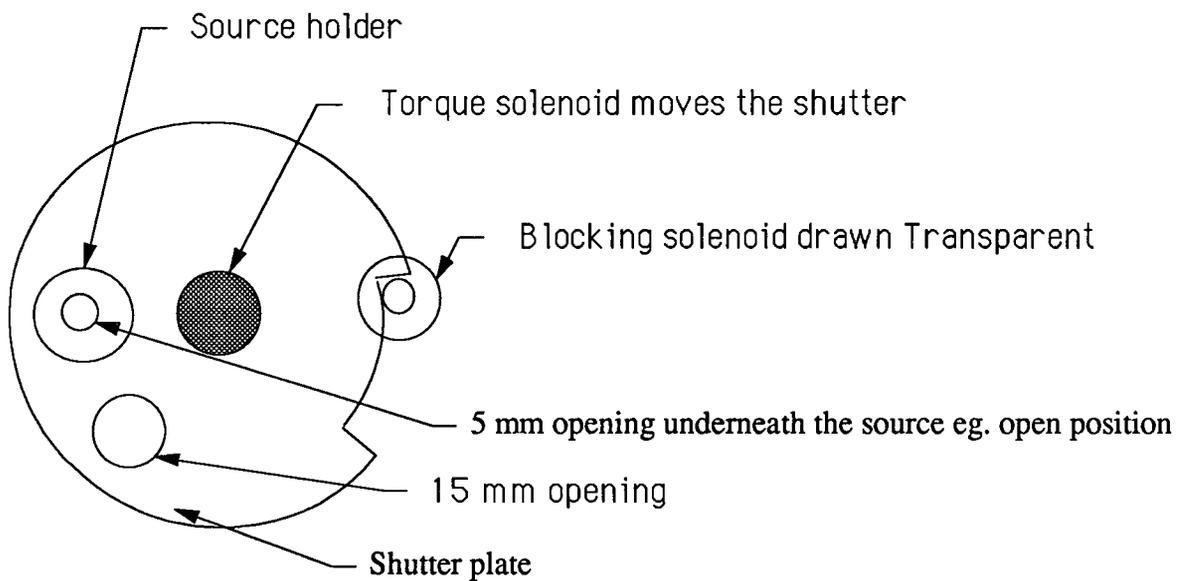


NOTE: (RED) ZIGZAG ARROWS INDICATE BETA-RADIATION COMING FROM THE ACTIVE LOWER FACE OF THE RADIATION SOURCE. IN THIS DRAWING MOST OF THE RADIATION GOES THROUGH THE APERTURE ($\varnothing 15\text{mm}$) AND PAPER TO THE DETECTOR. ALL THE GAPS ARE MUCH EXAGGERATED.

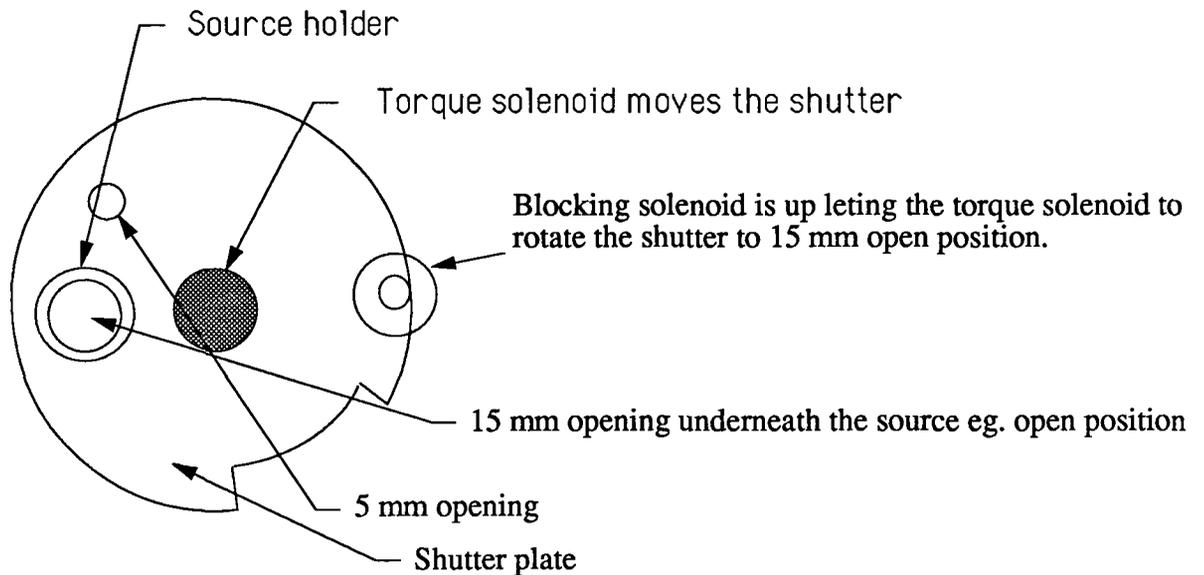
		Айна	Лектис АЛ	Райвтыг 27.1.-93
	Нийтийг	BW-2h55 SENSOR	Судыг	Лийтгүүг BW-2h55
TAPIO TECHNOLOGIES	FUNCTIONAL DESCRIPTION		№ BWOHJ-15-3A	
	(PARTS ARE NOT IN CORRECT PROPORTION TO EACH OTHER)			



Closed position underneath the source there is a solid shutter plate



When 5 mm opening is selected torque solenoid rotates the shutter disk until the blocking solenoid forces the movement to stop. This is done so that 5mm opening is underneath the source.



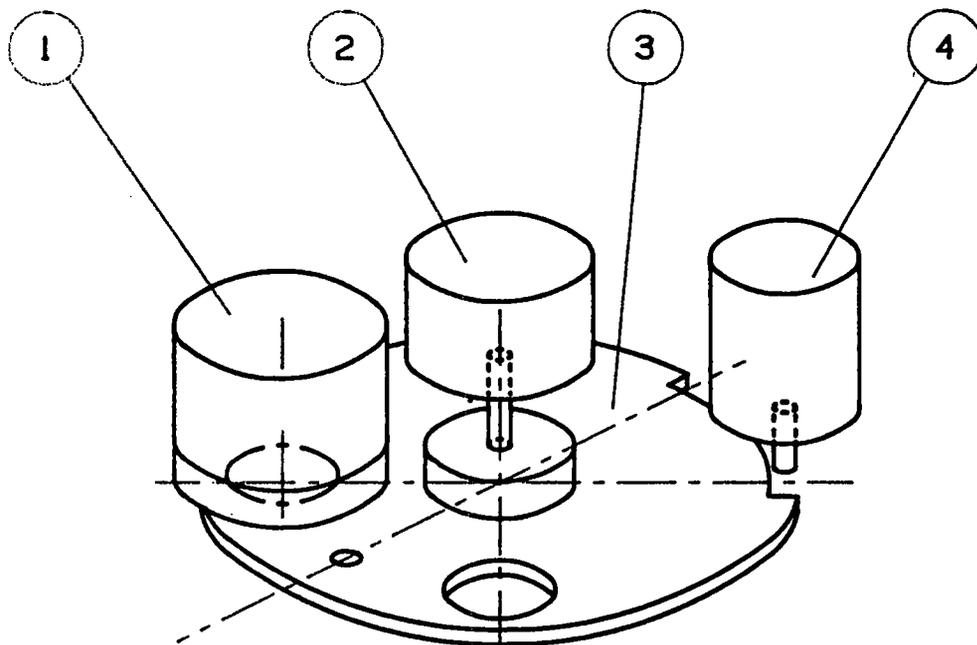
When 15 mm opening is selected torque solenoid rotates the shutter disk until the whole movement of solenoid has been used. At the same time the blocking solenoid is pulled off so that it lets the shutter to rotate to open 15 mm position.

When power is turned off either from computer or analyzer, the torque solenoid starts rotating the shutter to off position and blocking solenoid is pulled up so that the movement is allowed.

Summary: Torque solenoid has three possible positions

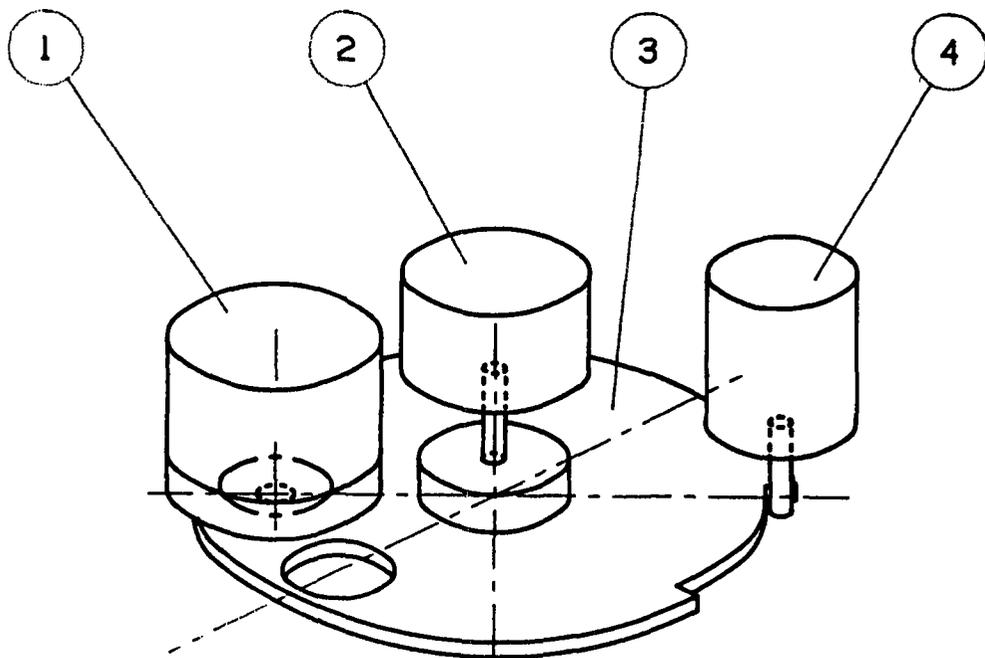
1. Closed - when power is off returns automatically by spring
2. Half open - 5 mm opening selected. Blocking solenoid is used to stop the movement to full open so that 5 mm can be selected. In case that power is lost from computer or analyzer, blocking solenoid releases automatically (spring powered as well as torque solenoid. This results to closed position automatically
3. (All) open - when 15 mm opening is selected blocking solenoid is not used and torque solenoid can move all the way open. This is the selected 15 mm opening.

Indicator light is on when either 5 or 15 mm position has been selected.



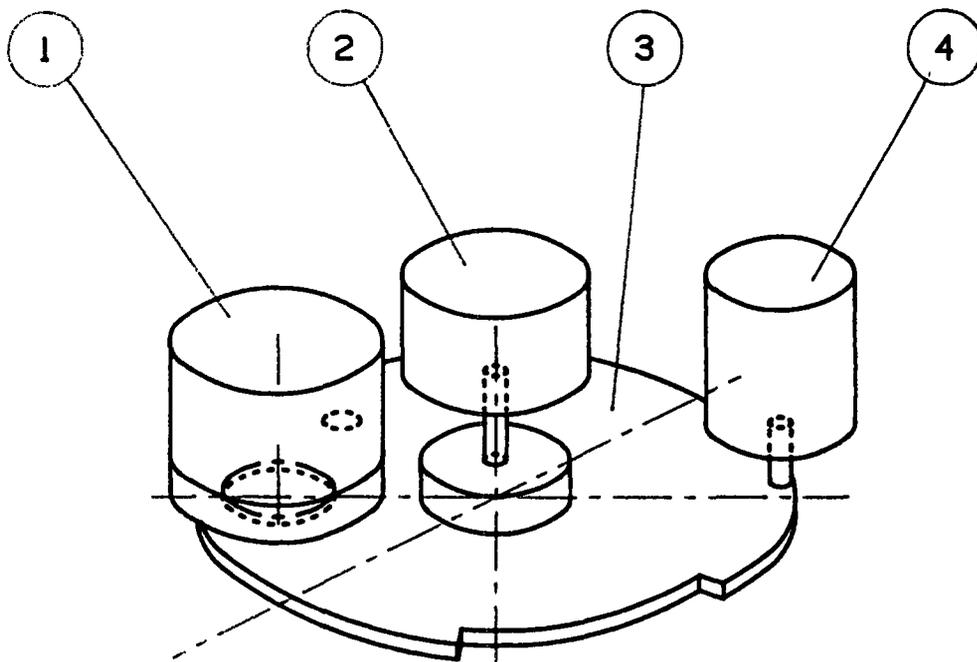
APERTURE DISK IN OFF POSITION

		Asmes	Location ACL	Revision 11.1.-93
	Part Name BV-2h55 SENSOR		Location BV-2h55	
TAPIO TECHNOLOGIES	APERTURE SELECTION MECHANISM		Part No BVOHJ-12-4M	



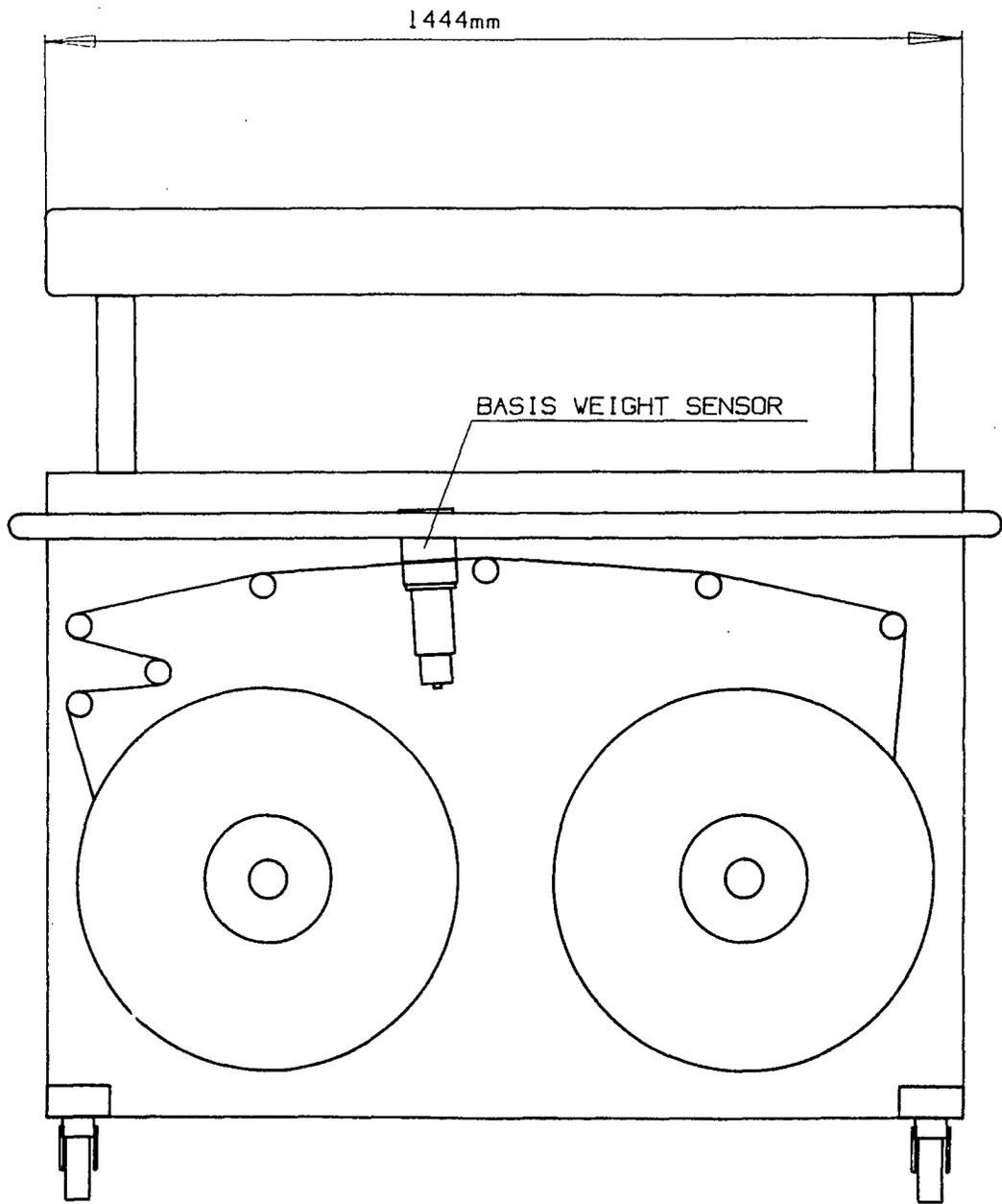
APERTURE DISK IN Ø5mm POSITION

		Atmos	Locking	Part No
			AOL	11.1.-83
	Name	BV-2h55 SENSOR	Sub	Locking
		APERTURE SELECTION		BV-2h55
TAPIO		MECHANISM		No
TECHNICAL DRAWING				BVOHJ-13-4M



APERTURE DISK IN Ø15mm POSITION

		Atves	Leakija ACL	Paivitus 11.1.-83
	Niaskya BV-2h55 SENSOR		Liiskuu BV-2h55	
TAPIO TECHNOLOGIES	APERTURE SELECTION MECHANISM		Nro BWOHJ-14-4M	



		Aines	Leetija MOL	Päiväys 27.1.1.
	Näytty	BW-2h55 SENSOR	Suhde	Lisäys
TAPIO TECHNOLOGIES		POSITION IN PVA ANALYZER		Nro BWOHJ-16-3M