

Attachment 2 (reference: Question #1)

\_\_\_\_\_ **betacontrol** 

# **OPERATION MANUAL**

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## Remarks

The information contained in this manual is based on meticulous research and compilation. Nevertheless, we cannot accept any liability whatsoever for completeness or errors; we would, however, be grateful for your suggestions and proposals for improvement.

With the exception of intent or gross negligence, all claims for compensation shall be excluded.

We reserve the right to technical modifications which serve the improvement of the product without prior notification. It therefore cannot be assumed that subsequent product versions will feature the same properties as the previous versions.

Registered trademarks are the property of their manufacturers.

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**General License Document  
Amendment to Operations Manual**

But they have  
the old operations  
manual  
- verify that ~~it~~  
back is what  
they already have.  
if not then need  
to see that

Dear Customer:

A general licensee has been granted to you for the use of this device (gauge). Under this general license you must follow the requirements of the Nuclear Regulatory Commission's 10 CFR 31.5 or Agreement State's regulations equivalent to 10 CFR 31.5. We are furnishing you with a copy of the general license in 10 CFR 31.5. If you are in one of the Agreement State's listed below, this device is regulated by the Agreement State under requirements substantially the same as those in 10 CFR 31.5. We recommend contacting your Agreement State Office to obtain a copy of these regulations.

**Agreement State Contact List**

**Alabama**

Division of Radiation Control  
Department of Public Health  
434 Monroe Street  
Montgomery, AL 36130-1701

**California**

Environmental Health Division  
State Department of Health Services  
714/744 P Street  
Post Office Box 942732  
Sacramento, CA. 94234-7320

**Arizona**

Arizona Radiation Regulatory Agency  
4814 South 40th Street  
Phoenix, AZ 85040

**Colorado**

Radiation Control Division 20/82  
Department of Health  
4300 Cherry Creek Drive South  
Denver, CO 80220

**Arkansas**

Division of Radiation Control and  
Emergency Management  
Department of Health  
4815 West Markham Street, Slot 30  
Little Rock, AR 72205-3876

**Florida**

Office of Radiation Control  
Department of Health and Rehabilitative  
Services  
1317 Winewood Boulevard  
Tallahassee, FL 32399-0700

Georgia

Radioactive Materials Program  
Department of Natural Resources  
4244 International Parkway, Suite 114  
Atlanta, GA 30354

Illinois

Department of Nuclear Safety  
1035 Outer Park Drive  
Springfield, IL 62704

Iowa

Bureau of Environmental Health  
Iowa Department of Public Health  
Lucas State Office Building  
Des Moines, IA 50319

Kansas

X-ray & Radioactive Materials  
Control Section  
Department of Health & Environment  
Bureau of Environmental  
Health Service  
109 SW 9th Street  
Topeka, KS 66612

Kentucky

Radiation Control Branch  
Cabinet for Human Resources  
275 East Main Street  
Frankfort, KY 40621-1000

Louisiana

Radiation Protection Division  
Office of Air Quality and  
Radiation Protection  
7290 Bluebonnet Road  
Post Office Box 82135  
Baton Rouge, LA 70884-2135

Maryland

Radiological Health Program  
Office of Toxics, Environmental Science  
and Health (TESH)  
Department of the Environment  
2500 Broening Highway  
Baltimore, MD 21224

Mississippi

Division of Radiological Health  
State Department of Health  
3150 Lawson Street  
Post Office Box 1700  
Jackson, MS 39215-1700

Nebraska

Division of Radiological Health  
Department of Health  
301 Centennial Mall South  
Post Office Box 95007  
Lincoln, NE 68509

Nevada

Radiological Health Section  
Health Division  
Department of Human Resources  
505 East King Street  
Carson City, NV 89710

#### New Hampshire

Radiological Health Bureau  
Division of Public Health Services  
Health and Welfare Building  
6 Hazen Drive  
Concord, NJ 03301-6527

#### New Mexico

Bureau of Hazardous and  
Radioactive Materials  
Water and Waste Management Division  
Department of Environment  
Post Office Box 26110  
Santa Fe, NM 87502

#### New York

Bureau of Environmental  
Radiation Protection  
Department of Health  
2 University Place  
Albany, NY 12203

#### North Carolina

Division of Radiation Protection  
Department of Environment, Health  
and Natural Resources  
Post Office Box 27687  
Raleigh, NC 27611-7687

#### North Dakota

Division of Environmental Engineering  
Department of Health  
1200 Missouri Avenue, Room 304  
Post Office Box 5520  
Bismarck, ND 58502-5520

#### Oregon

Radiation Control Section  
State Health Division  
Department of Human Resources  
800 NE Oregon Street #21  
Portland, OR 97214-0450

#### Rhode Island

Division of Occupational and  
Radiological Health  
Department of Health  
203 Cannon Building  
3 Capital Hill  
Providence, RI 02908-5097

#### South Carolina

Bureau of Radiological Health  
Department of Health and  
Environmental Control  
2600 Bull Street  
Columbia, SC 29201

#### Tennessee

Division of Radiological Health  
L&C Annex, Third Floor  
401 Church Street  
Nashville, TN 37219-5404

#### Texas

Bureau of Radiation Control  
Department of Health  
1100 West 49th Street  
Austin, TX 78756-3189

Utah

Division of Radiation Control  
Department of Environmental Quality  
168 North 1950 West  
Post Office Box 144850  
Salt Lake City, UT 84114-4850

Washington

Division of Radiation Protection  
Department of Health, LE-13  
Airdustrial Center Building #5  
Post Office Box 47827  
Olympia, WA 98504-7827

The following is the general license as written in 10 CFR 31.5:

- (a) A general license is hereby issued to commercial and industrial firms and research, educational and medical institutions, individuals in the conduct of their business, and Federal, State or local government agencies to acquire, receive, possess, use or transfer, in accordance with the provision of paragraphs (b), (c) and (d) of this section, byproduct material contained in devices designed and manufactured for the purpose of detecting, measuring, gauging or controlling thickness, density, level, interface location, radiation, leakage, or qualitative or quantitative chemical composition, or for producing light or an ionized atmosphere.
- (b) The general license in paragraph (a) of this section applies only to byproduct material contained in devices which have been manufactured or initially transferred and labeled in accordance with the specification contained in a specific license issued pursuant to Part 32.51 of this chapter or in accordance with the specifications contained in a specific license issued by an Agreement State which authorizes distribution of the devices to persons generally licensed by the Agreement State.
- (c) Any person who acquires, receives, possesses, uses or transfers byproduct material in a device pursuant to the general license in paragraph (a) of this section:
  - (1) Shall assure that all labels affixed to the device at the time of receipt and bearing a statement that removal of the label is prohibited are maintained thereon and shall comply with all instructions and precautions provided by such labels;
  - (2) Shall assure that the device is tested for leakage of radioactive material and proper operation of the on-off mechanism and indicator, if any, at no longer than six-month intervals or at such other interval as are specified in the label; however
    - (i) Devices containing only Krypton need not be tested for leakage of radioactive material, and
    - (ii) Devices containing only Tritium or not more than 100 microcuries of other beta and/or gamma emitting material or 10 microcuries of alpha emitting material and devices held in storage in the original shipping container prior to initial installation need not be tested for any purpose.



- (3) Shall assure that the tests required by paragraph (c)(2) of this section and other testing, installation, servicing, and removal from installation involving the radioactive materials, its shielding or containment, are performed:
  - (i) In accordance with the instructions provided by the labels; or
  - (ii) By a person holding a specific license pursuant to Parts 30 and 32 of this chapter or from an Agreement State to perform such activities;
- (4) Shall maintain records showing compliance with the requirements of paragraphs (c)(2) and (c)(3) of this section. The records must show the results of tests. The records also must show the dates of performance of, and the names of persons performing, testing, installing, servicing, and removing from the installation radioactive material and its shielding containment. The licensee shall retain these records as follows:
  - (i) Each record of a test for leakage of radioactive material required by paragraph (c)(2) of this section must be retained for three years after the next required leak test is performed or until the sealed source is transferred or disposed.
  - (ii) Each record of a test of the on-off mechanism and indicator required by paragraph (c)(2) of this section must be retained for three years after the next required test of the on-off mechanism and indicator is performed or until the sealed source is transferred or disposed.
  - (iii) Each record that is required by paragraph (c)(3) of this section must be retained for three years from the date of the recorded event or until the device is transferred or disposed.
- (5) Upon the occurrence of failure of or damage to, or any indication of a possible failure of or damage to, the shielding of the radioactive material or the on-off mechanism or indicator, or upon the detection of 0.005 microcuries or more removable radioactive material, shall immediately suspend operation of the device until it has been repaired by the manufacturer or other person holding a specific license pursuant to Parts 30 and 32 of this chapter or from an Agreement State to repair such devices, or disposed of by transfer to a person authorized by a specific license to receive the byproduct material contained in the device and, within 30 days, furnish to the Administrator of the appropriate Nuclear Regulatory Commission, Regional Office listed in appendix D of Part 20 of this chapter, a report containing a brief description of the event and the



- remedial action taken;
- (6) Shall not abandon the device containing byproduct material;
  - (7) Shall not export the device containing byproduct material except in accordance with Part 110 of this chapter;
  - (8) Except as provided in paragraph (c)(9) of this section, shall transfer or dispose of the device containing byproduct material only by transfer to persons holding a specific license pursuant to parts 30 and 32 of this chapter or from an Agreement State to receive the device and within 30 days after transfer of a device to a specific licensee shall furnish to the Director of Nuclear Material Safety and Safeguards, U.S. Nuclear Regulatory Commission, Washington, DC 20555 a report containing identification of the device by manufacturer's name and model number and the name and address of the person receiving the device is transferred to the specific licensee in order to obtain a replacement device;
  - (9) Shall transfer the device to another general licensee only:
    - (i) Where the device remains in use at a particular location. In such case the transferor shall give the transferee a copy of this section and any safety documents identified in the label of the device and within 30 days of the transfer, report to the Director of Nuclear Material Safety and Safeguards, U.S. Nuclear Regulatory Commission, Washington, DC 20555, the manufacturer's name and model number of device transferred, the name and address of the transferee, and the name and/or position of an individual who may constitute a point of contact between the Commission and the transferee; or
    - (ii) When the device is held in storage in the original shipping container at its intended location of use prior to initial use by a general licensee.
  - (10) Shall comply with the provision of parts 20.2201 and 20.2202 of this chapter for reporting radiation incidents, theft or loss of licensed material, but shall be exempt from the other requirements of parts 19, 20, and 21 of this chapter.
- (d) The general license in paragraph (a) of this section does not authorize the manufacture or import of devices containing byproduct material.

The following procedures and information is provided to you to ensure the safe use of this device.

### Installation and Servicing

Initial installation of the source housing must be completed by Betacontrol. After initial installation the source housing must only be removed, installed or serviced by individuals specifically authorized by the NRC or an Agreement State to perform these services. This general license does not authorize installation or servicing of this device.

### Labelling

The labels affixed to the device at the time of installation must be maintained in a legible and visible manner.

### Leak Testing

The device must be leak tested on a six (6) month frequency as indicated by the general license (except for Krypton-85 devices)

Leak test kits can be obtained through Betacontrol

The following procedures should be followed when wiping the gauge housing:

1. De-energize the device, so the shutter closes and shields the source. The green light will indicate that the shutter is in the closed (off) position.
2. Using the wiping material supplied with the kit, wipe the external surface of the source holder where contamination would be expected (shutter window, weld seams, edge of bolted plates).
3. Place the wiping material in the appropriate container (being careful not to touch the wiping area to other objects because this would spread contamination, if present).
4. Provide the supplier with the requested information about the source.
5. Send the leak test kit to the supplier for analysis.
6. If results indicate 0.005 uCi or more contamination take device out of service and immediately contact one of Betacontrol's service representatives. Also, a report to the NRC and/or Agreement State Office will need to be filed, if the removable contamination exceeds these levels.

### Testing of On-Off Mechanism

The shutter (on-off mechanism) along with the indicators (lights) must be tested at a six (6) month frequency. The results of these tests must be recorded. When the red light is lit, this indicates the device is in the ON or exposed position. When the green light is lit the device is in the OFF or shielded position. You should record the functioning of the shutter, the lights, the date performed and the individual performing the tests. If a malfunction with the shutter or lights occur, contact one of Betacontrol's service representatives. The changing of a burned out light bulb can be performed by your personnel.

### Emergency Procedures

To ensure all employees at your facility are safe from any possible radiation hazard during an accident (fire, explosion, etc.) directly or indirectly involving this device the following procedures should be posted and followed:

If a malfunction, accident, or damage occur to a nuclear gauge take the following steps:

1. Cease work immediately.
2. If the gauge has been partially damaged or destroyed, keep people at least 20 feet away or rope off the area at 20 feet.
3. Notify the Radiation Safety Officer or supervisor, immediately after isolating the area.
4. Contact one of Betacontrol's service representatives for additional assistance.
5. In the case of a fire or explosion inform the fire department personnel of the presence of the nuclear gauge.
6. In the case of any accident or fire, do not use the gauge until any damage or damage to the gauge is assessed.
7. If required, notify the NRC and/or Agreement State.

This information has been provided to assist your facility in maintaining exposures "as low as is reasonably achievable" ALARA. If at anytime you have questions or concerns please contact one of our service representatives.



# 1. RADIATION PROTECTION

## 1.1 RADIATION SOURCE: Americium 241

Prior to commissioning a measurement system containing radioactive nuclides, careful attention must always be paid to the safety measures to avoid exposure of the operating personnel to any radiation hazard.

### 1.1.1 Gamma transmission measurement methods

Providing the safety regulations are observed, the use of isotopic measuring equipment generally presents no greater danger than the handling of electrical apparatus.

**betacontrol** basis-weight measurement systems satisfy the usual requirements of radiological protection legislation. The level of radiation to which operating personnel is exposed falls well below the permissible tolerance limits. The following information is intended to draw your attention to possible hazards and their avoidance.

Injury may result from external or internal irradiation.

Normal use of these systems is only associated with external irradiation, with a natural distance existing between radiation source and body. With **betacontrol** measurement systems, detectable physical injury from external irradiation will only occur as a result of negligent or consciously incorrect conduct.

Under German legislation, the following doses must not be exceeded for persons exposed to radiation at the workplace:

50 mSv/year for the overall body  
300 mSv/year for skin

The above levels are 10 times lower for the general public or persons not directly exposed to radiation at the workplace.

The area exposed to a dose of 7.5  $\mu$ Sv/h or over is known as the "control area". Any persons working in or frequently entering such areas must be monitored by a dosimeter and be at least 18 years of age. In addition, regular examinations by a physician from the health authorities are prescribed.

Pregnant women, nursing mothers and children must not enter this area. The limits of this control area must be clearly signalled and marked.

The signs indicating the radiation source as well as the position of the shutter must always be in perfect condition - for the safety of operating personnel as well as for the safety of all.

## 1.1 RADIATION SOURCE: Americium 241

### 1.1.1 Gamma transmission measurement methods

Internal irradiation occurs if radioactive material penetrates the human body. This is considerably more dangerous since

- the duration of irradiation cannot be controlled (it is necessary to wait until the material has vacated the body or has been transformed into a non-radioactive material),
- no space exists between source and body,
- no additional screening measures can be taken.

However, radioactive material can only escape from its capsule and enter the environment or penetrate the human body if the capsule is damaged and radioactive material is additionally spread by means of dispersive influences (extinguishing water, wiping motion).

### 1.1.2 Description of source and source holder

The source comprises a cylindrical housing constructed of brass or stainless steel accomodating the radioactive Americium 241 in a ceramic state. This housing is sealed by soldered joints.

The source is installed in the source holder in such a way that it is protected from external damage.

The holder is protected from dust and moisture.

**CAUTION!**      **The source is fragile!**

The weakest part of the holder is the radiation exit window, a plastic film with a thickness of 0.05 mm and aluminized on one side, which covers the collimator lens in the holder.

The source is located at a distance of 10 mm behind this cover film. When the unit is switched off or in the «Measuring off» mode, the source is screened by a lead shield.

The source is automatically screened in the event of power failure.



## 1.1 RADIATION SOURCE: Americium 241

### 1.1.3 Protective measures

The following points must be observed to protect personnel from exposure to excessive irradiation:

- Under no circumstances must any work be carried out directly on the source holder.
- The illuminated signal display indicates the «Source closed» and «Attention radiation» modes by means of a limit switch. This limit switch is fitted in such a way that the «Source closed» signal is only activated in the absolute end position, with intermediate positions being signalled as «Attention radiation».
- When the calibration process is activated, the radiation shutter is automatically controlled by the system's electronics. The signal display must be observed. Additional switching status information is provided by an illuminated indicator on the front panel of the central system at illuminated key «Measuring I».

Should the radiation shutter become damaged, the radiation exit port can also be closed by covering it with a 100 \* 100 mm plate of

lead            3 mm thick  
steel, brass 10 mm thick

- Do not look directly into the source of radiation.
- Persons working at the control area must wear a radiation dosimeter. The type of radiation dosimeter to be worn is prescribed by the supervisory authority (in general a film badge dosimeter). These film badges are evaluated each month by an official body, with the wearer being informed of the level of radiation to which he or she has been exposed.
- Never put your hands into the measurement gap.
- The dose-rate table shows the distribution of radiation around the sensor. The range within 25 µSv/h should always be avoided.

In normal operating conditions, however, direct exposure to radiation is not possible.

The geometric configuration of the sensor also contributes towards significantly reducing radiation. The amount of radiation actually occurring in the vicinity of the sensor is shown in the enclosed dose-rate table.

## 1.1 RADIATION SOURCE: Americium 241

### 1.1.3 Protective measures

Americium 241 is a gamma source. Gamma radiation is weakened to  $1/10$  of its intensity by

- 0.5 mm lead,
- 3 mm steel or brass,
- 30 mm aluminium or glass.

Double wall thickness weakens it to  $1/100$  of its original intensity.

When «source screened», the dose rate at any point on the surface of the measuring sensor is less than  $7 \mu\text{Sv/h}$ .

The alpha radiation from Americium 241 generates a low radiation of high-speed neutrons in the emitter source enclosure.

The equivalent dose rate is:

- $3.2 \mu\text{Sv/h}$  at a distance of 15 cm and
- $1 \mu\text{Sv/h}$  at a distance of 25 cm.

## 1.2 RADIATION DOSE RATES

Refer to drawing

700-100-219

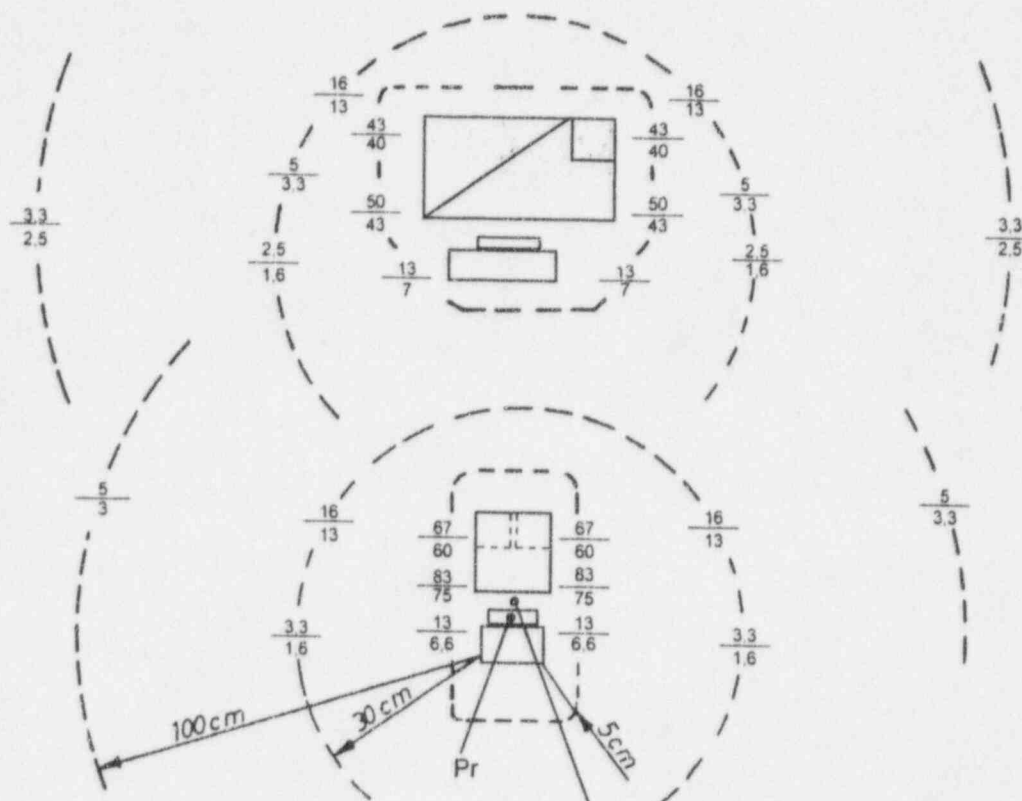
Bl. 64,

page 6

700-100-220

Bl. 64,

page 7



Pr:  
Strahlenquelle  
radiation source  
source de rayonnement

Meßspalt  
gap  
fente de mesure : 400 mm

Strahler  
source : Americium 241; 18,5 GBq

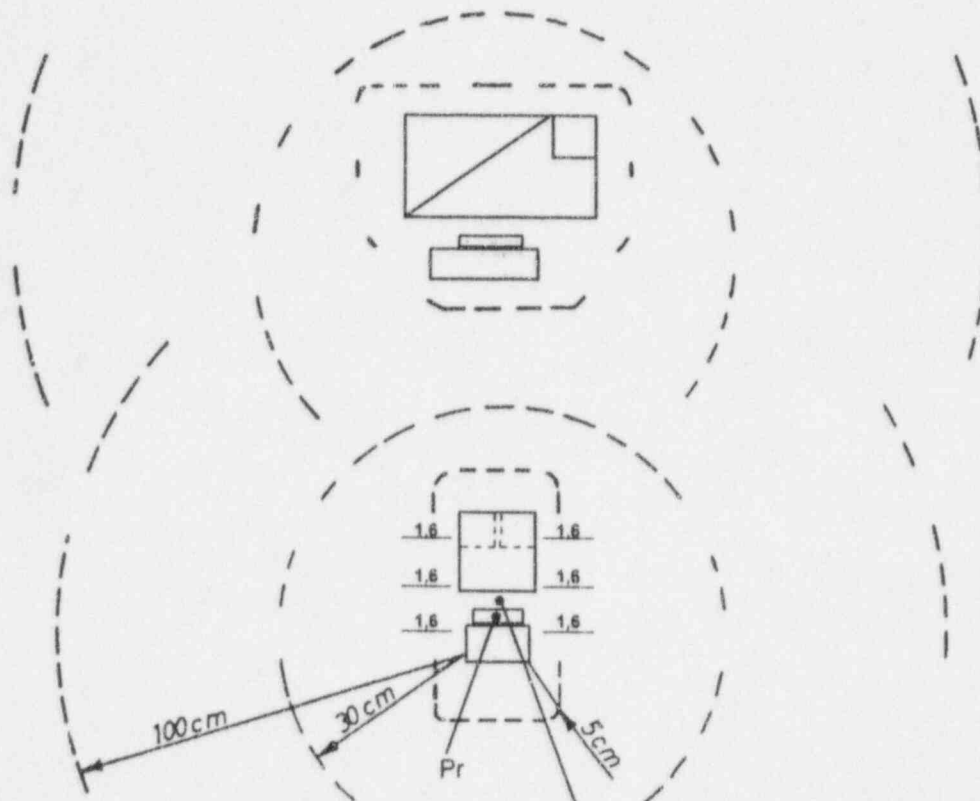
Strahlerfenster  
source window : offen  
fenêtre de la source : open  
ouverte

Meßgerät  
survey meter : Babyline 31  
appareil de mesure

Dosisleistung  
dose rate : (µSv/h) mit Absorber  
débit de dose : avec absorbeur : 7 mg/cm²  
300 mg/cm²

Typ / type: X 97

	Datum	Name	Das Urheberrecht an dieser Zeichnung gehört uns. Laut Gesetz ist Vervielfältigung oder Mitteilung an dritte Personen unzulässig und strafbar.	betacontrol gmbh meß- und regeltechnik, D-57258 Freudenberg
Gezeichnet	31.05.1995	Lerch		
Geprüft	31.05.1995	Kray		
Strahlenbelastung Radiation dose rates Valeurs d'irradiation				700-103-219 Bl. 64



**Pr:**  
Strahlenquelle  
radiation source  
source de rayonnement

Meßspalt  
gap  
fente de mesure : 400 mm

Strahler  
source : Americium 241; 18,5 GBq

Strahlerfenster  
source window : geschlossen  
fenêtre de la source : closed  
fermée

Meßgerät  
survey meter : Babyline 31  
appareil de mesure

Dosisleistung  
dose rate : (µSv/h) mit Absorber  
débit de dose : with absorber : 7 mg/cm²  
avec absorbeur : 300 mg/cm²

Typ / type: X 97

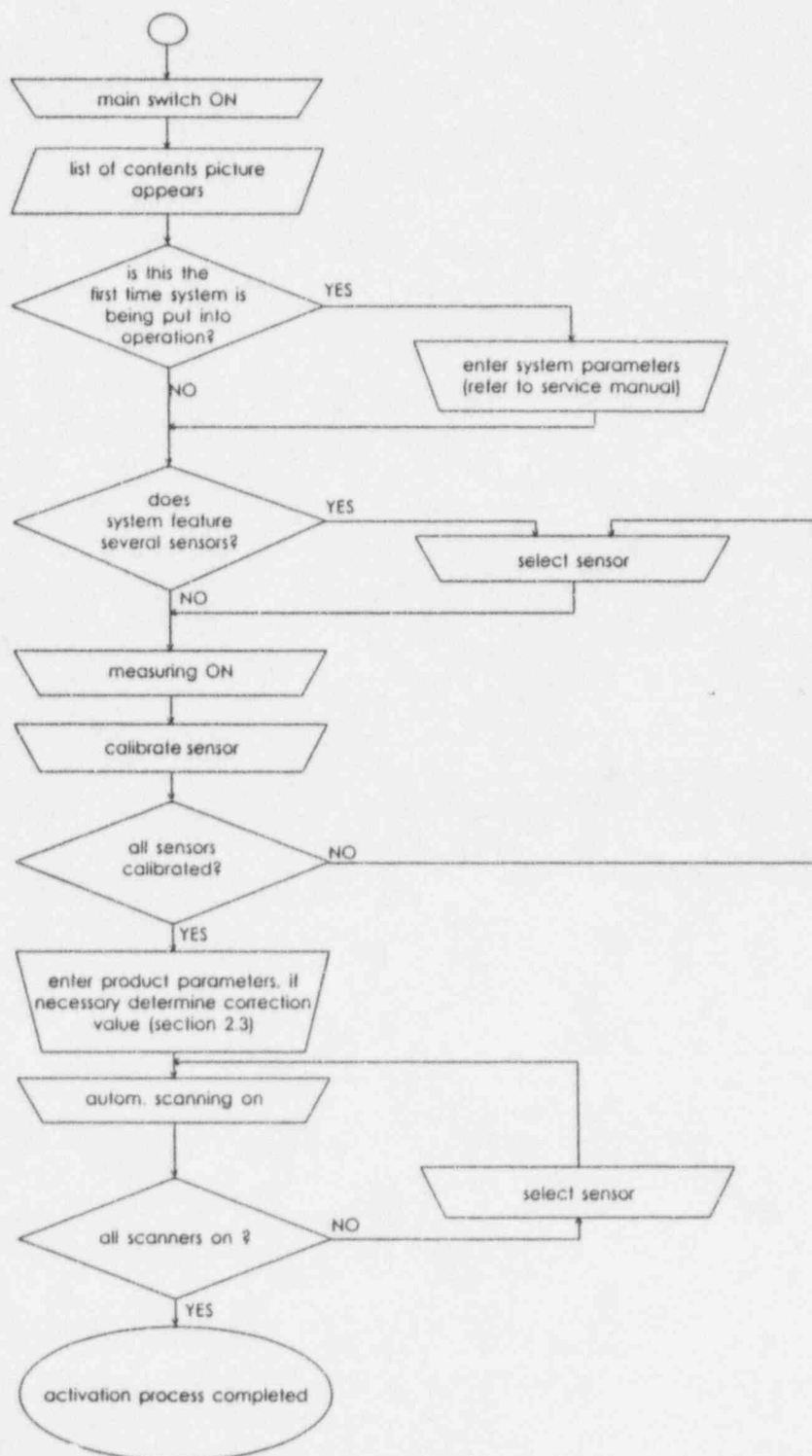
	Datum	Name	Das Urheberrecht an dieser Zeichnung gehört uns. Laut Gesetz ist Vervielfältigung oder Mitteilung an dritte Personen unzulässig und strafbar.	betacontrol gmbh meß- und regeltechnik, D-57258 Freudenberg
Gezeichnet	31.05.1995	Lerch		
Geprüft	31.05.1995	Kray		
Strahlenbelastung Radiation dose rates Valeurs d'irradiation				700-103-220 Bl. 64



Notes



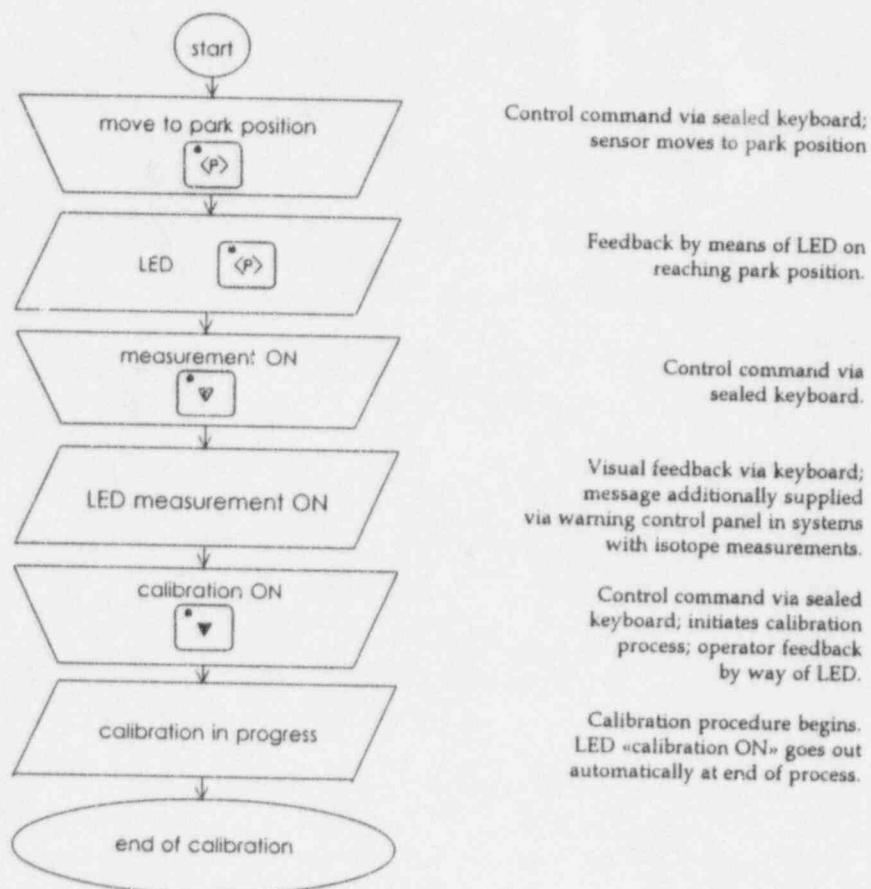
## 2.2 SWITCHING ON



## 2.2 CALIBRATION OF SENSORS

The measurement result / measurement signal is subject to fluctuation which may be attributed to temperature fluctuations, change in air pressure or also to the core disintegration process of the isotope measuring system. In order to keep these influences to a minimum, it is necessary to calibrate the measuring system at certain time intervals.

*The calibration process is performed as follows:*



Feedback by means of LED on  
reaching park position.

## 2.2 CALIBRATION OF SENSORS

### Calibration procedure:

#### a) In systems with isotope measuring method

The mean value of 100 measured values with the source closed and open is calculated and stored. Corresponding to the calculated values, the program now assigns the measured values to the characteristic curve of the sensor.

#### b) In systems with following types of sensors: ultrasonic, laser and infrared

A corresponding sample with known parameters such as thickness, moisture or weight ( $\text{g/m}^2$ ) is necessary for these sensors. In this case, the mean value is also formed on the basis of 100 measured values (measured with respect to the sample piece) and calculated according to the characteristic curve.

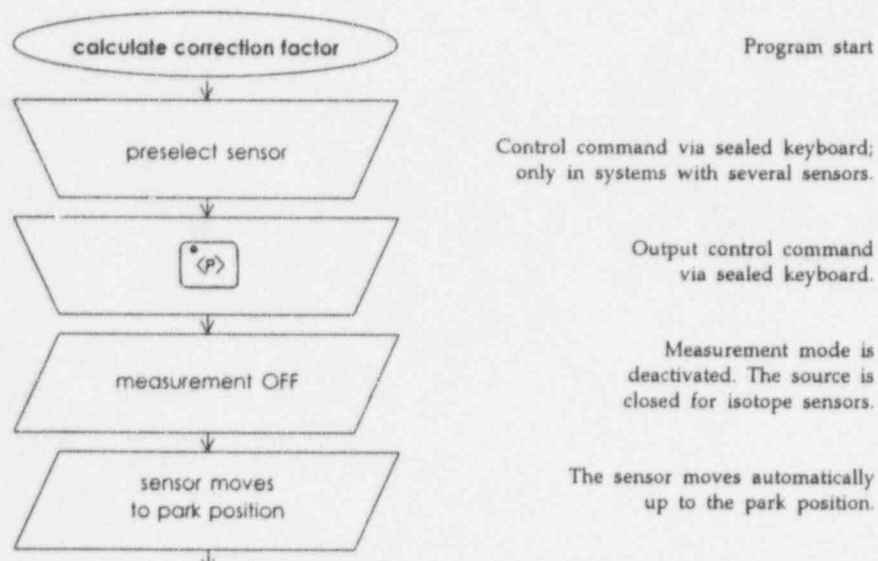
## 2.3 CALCULATING THE CORRECTION FACTOR

### (only isotope sensor)

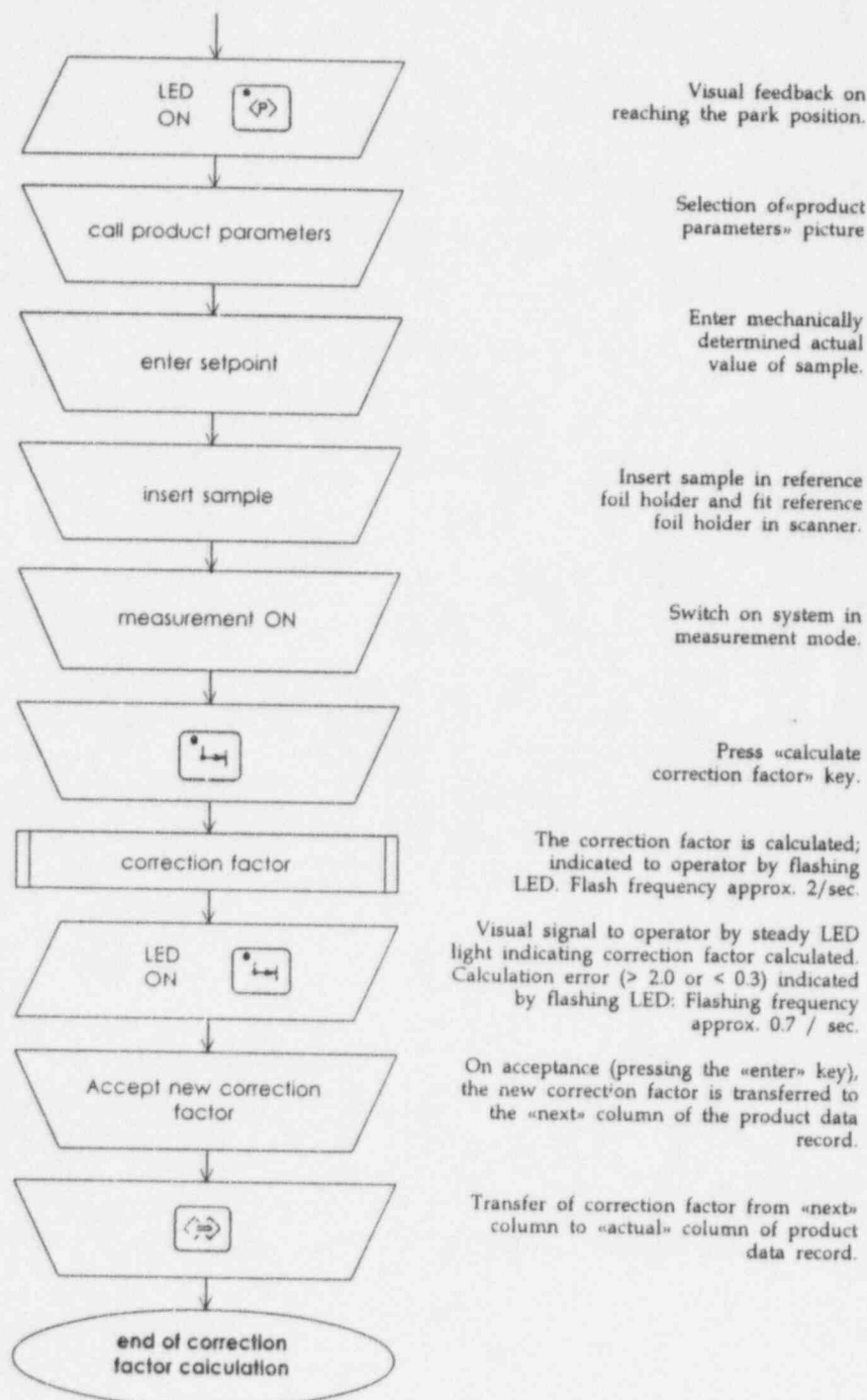
Due to different material compositions of the product to be measured (colour additives, metallic additives etc.), it is necessary to specify the measured result on the basis of a correction factor.

To determine the correction factor, a mechanically measured or weighed sample of the product with a known basis weight is inserted into the measurement gap.

The correction factor is determined as follows:



### 2.3 CALCULATING THE CORRECTION FACTOR (only isotope sensor)



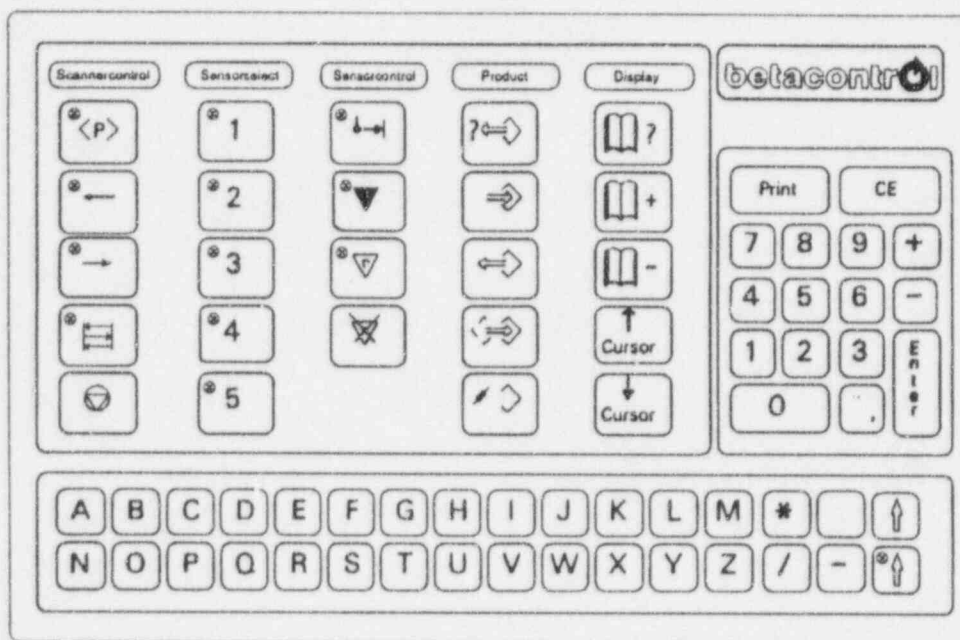


### 3. Control elements and their functions

#### 3.1 SEALED KEYBOARD

The sealed keyboard used in the thickness measurement and control system is divided up into three main groups:

1. **Function block** for operating the system
2. **Numeric block** with clear and hardcopy function
3. **Alpha block** for entering characters



Sealed keyboard

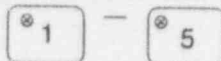
### 3.1.1 Function block

The function block contains all the keys necessary for controlling the system. It is divided up into 5 sections as follows.

- |                   |   |  |
|-------------------|---|--|
| 1. Sensorselect   | : | for selecting the sensors  |
| 2. Scannercontrol | : | all control functions of the scanner                               |
| 3. Sensorcontrol  | : | all control functions of the sensor                                |
| 4. Product        | : | all control functions for managing the product data.               |
| 5. Display        | : | all control functions for selecting pictures and moving the cursor |

#### 3.1.1.1 Sensorselect

This section of the keyboard is used for selecting one of 5 possible sensors. All commands from the «Scannercontrol» and «Sensorcontrol» sections only ever apply to the sensor selected. In each case, the sensor selected is indicated by a red LED in the



keys.

#### 3.1.1.2 Scannercontrol

This section of the keyboard is used for controlling the scanner of the sensor activated using «Sensorselect». LEDs in each of the keys show the operator which function has been activated in this section.



After pressing this key, the measuring sensor is moved to the park position and the measurement process is discontinued. In the case of measuring sensors containing radioactive source, the source is closed.



The measuring sensor travels to min. position.



The measuring sensor travels to max. position.



In automatic mode, the sensor travels to the starting position for measuring the boards. If a board then is recognized by the light barrier, the sensor scans the material exactly one time. The adaptation of the scanning speed is made by the entry of board width and length (see «product parameters» picture) and on the basis of the measured line speed.



Measuring sensor travel is discontinued.



3.1.1.3 Sensorcontrol

This section of the keyboard is used for controlling the measuring sensor selected using «Sensorselect». It contains all the functions required to control the measuring sensor. A LED shows the operator which function has been selected.



Activates calculation of the correction value (only radioactive measuring sensor!). In radioactive measuring sensors, this serves to compensate for the differing degree of radiation absorbed by various material types.



Calibrates the measurement process.



Starts the measurement process.



Stops the measurement process.

3.1.1.4 Product

The keys belonging to the «Product» section are used for managing product data in the measurement and control system.



After pressing this key, the product picture (a list of all available product data blocks) will be displayed on the monitor.



The product data block will be memorized under the specified product number. Press «Enter» to confirm this entry!



The product data block for the selected product number will be transferred from memory into the «Next» column.



The product data block will be transferred from the «Next» column to the «Actual» column.



Deletes the product data block for the specified product number in the «Next» data block. Press «Enter» to confirm this entry!

3.1.1.5 Display

This section of the keyboard is used for controlling the monitor while selecting pictures as well as for moving the cursor. All monitor pictures can be selected either by means of the «list of contents» picture or by entering the appropriate page number.



The «list of contents» picture, a listing of all available pictures, will be displayed on the monitor.



Jumps to the next picture page.



Jumps to the previous picture page.



Cursor moves up.

Special function:

Pressed in combination with



and



, the cursor

will move to the right.



Cursor moves down.

Special function:

Pressed in combination with



and



, the cursor


will move to the left.

The line in which the cursor is located is indicated by a change in colour.


#### Examples illustrating how to select pictures:

Picture can be selected by two different methods. This depends on whether the page number of the picture you require is known or not.

##### 1. Selecting a picture when page number is unknown:

After pressing the  key, use the cursor keys to select the monitor picture you require. The picture you wish to view will then appear on the monitor after pressing «Enter» to confirm.

##### 2. Selecting a picture when page number is known:

After pressing the  key, enter the page number (using keys «0» to «9»), press «Enter» and the picture you wish to view will appear on the monitor.

### 3.1.2 Numeric block

The numeric Block contains digits «0 - 9» as well as the following keys / functions:



Hardcopy of the monitor picture; command must be confirmed by pressing «Enter». If your system features a colour printer, you can print out either in b/w or in colour. To print out in b/w, press the «Print» key, enter a «1» and confirm, by pressing «Enter». For a colour printout, enter a «2». The b/w or colour setting need not be reselected for each printout. The setting remains intact until changed.



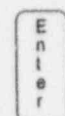
clears the character to the right of an entry.



sign, e.g. for center deviations.



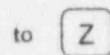
decimal point, for target values.



data transfer, command confirmation.

### 3.1.3 Alpha block

This block contains alphabetic and special characters. It is used for entering product and order numbers as well as the name of the system / shift leader in various report pictures, e.g. in the shift report.



alphabetic characters.



special characters and blanks.

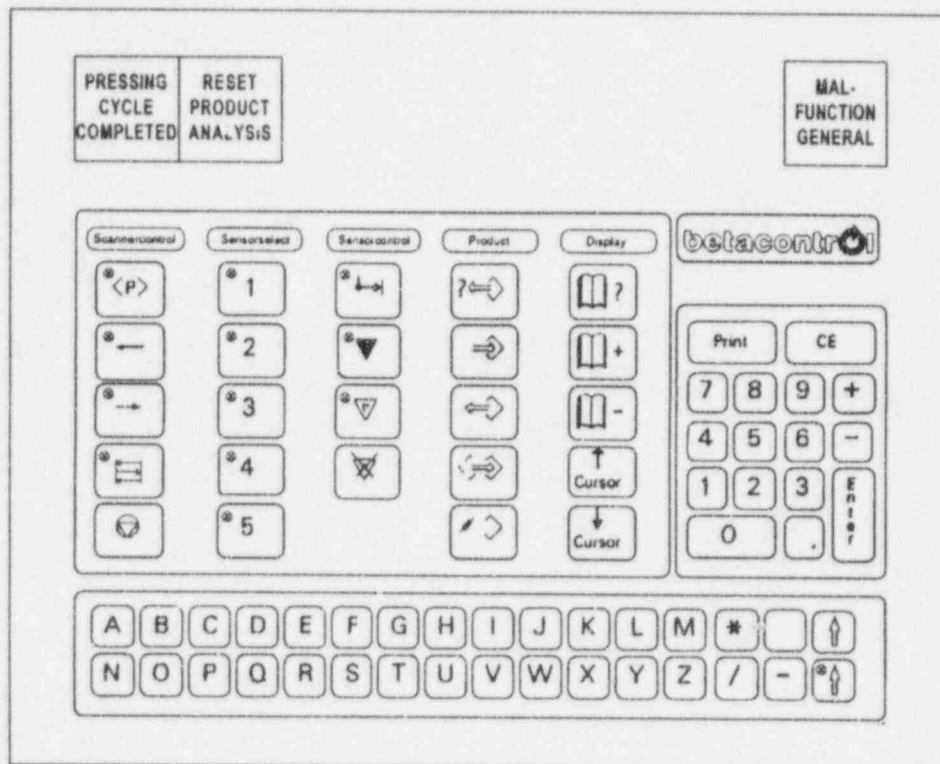


switches to upper-case letters; key must be pressed simultaneously with the alphabetic character.



switches to upper-case letters; when activated, function is indicated by LED and is only cancelled after pressing «Shift»

## 3.2 CUSTOMIZED KEYBOARD EXTENSION



Overview of the control panel of the measurement and control system



### 3.2 CUSTOMIZED KEYBOARD EXTENSION

The control panel of the measurement system is adapted to the various specific requirements of the customer by equipping the sealed keyboard with additional components, such as extra keys, indicator lamps.

Following keys / functions are available:

PRESSING  
CYCLE  
COMPLETED

After pressing this key, the pressing cycle number will be incremented and the board number will be reset.

RESET  
PRODUCT  
ANALYSIS

After pressing this key, the «product analysis» picture will be reset and restarted. This pictures can only be printed out using the hardcopy function.



## 3.2 CUSTOMIZED KEYBOARD EXTENSION

### Signal lamps



If this lamp lights up, the corresponding errors without interrupting in control (right column) are highlighted in red in the «error messages» picture.

After pressing the key, the «error messages» picture appears immediately.

### 3.3 MONITOR PICTURES

#### «list of contents» picture

bc p. 1	list of contents	tu 23.04.1996 16:00:40
	list of contents	
	basic adjustments	
	products	
	product parameters	
	measuring values	
	BW averages	
	BW product analysis	
	TH averages	
	TH product analysis	
	TH scanner error	
	error messages	
	system parameters	
	test pictures	

List of all available monitor pictures belonging to the measurement and control system. As already described in section 3.1.1.5, the various pictures may be selected using the «Display» function block.

### 3.3 MONITOR PICTURES

#### «basic adjustments» picture

bc p. 2	basic adjustments	tu 23.04.1996 16:01:44
operating hours :	total	
h:min:sec	25:40:05	
code basic adjustments		??????
time(hhmm)		0
date (ddmmyyyy)		0
pressing cycle		1

This picture contains an operating hours counter with three different ranges. It records the following times:

1. Total operating hours.
2. Hours of operating in the automatic mode; at least one control loop must be in the automatic mode.
3. Hours of operation in the manual mode.

This picture can also be used to select various parameters which are extensively independent of the product being manufactured, i. e. parameters remaining constant for different products.

In this measurement system, such parameters include:

- «code basic adjustments» : The code number must be entered in this line to make an update or entry in one line of basic adjustments. Correct entry is indicated by the selected input line changing from red to white.
- «time (hhmm)» : Entry of the time of day, expressed in hours and minutes.
- «date (ddmmyyyy)» : Entry of date, expressed in the form of day, month and year.
- «pressing cycle» : Entry of the start number of the pressing cycle.

### 3.3 MONITOR PICTURES

#### «products» picture

betacontrol	p. 3	products	mo 06.11.1995	14:18:35
0	1	2	3	4
5	6	7	8	9
10	11	12	13	14
15	16	17	18	19
20	21	22	23	24
25	26	27	28	29
30	31	32	33	34
35	36	37	38	39
40	41	42	43	44
45	46	47	48	49
50	51	52	53	54
55	56	57	58	59
60	61	62	63	64
65	66	67	68	69
70	71	72	73	74
75	76	77	78	79
80	81	82	83	84
85	86	87	88	89
90	91	92	93	94
95	96	97	98	99
100	101	102	103	104
105	106	107	108	109
110	111	112	113	114
115	116	117	118	119
120	121	122	123	124
125	126	127	128	129
130	131	132	133	134
135	136	137	138	139
140	141	142	143	144
145	146	147	148	149
150	151	152	153	154
155	156	157	158	159
160	161	162	163	164
165	166	167	168	169
170	171	172	173	174
175	176	177	178	179
180	181	182	183	184
185	186	187	188	189
190	191	192	193	194
195	196	197	198	199
200				

Listing of all available product numbers under which the relevant product parameters / data blocks have been filed in the data memory. On standard systems, the battery-buffered data memory has a storage capacity of approx. 200 product data blocks. Storage capacity is governed by the length of product data blocks (number of lines in a data block) and may therefore be less for comprehensive systems.



### 3.3 MONITOR PICTURES

#### «product parameters» picture

bc p. 4		product parameters		tu 23.04.1996 16:03:47	
		actual		next	
product parameters		memorized		memorized	
product#		existent		existent	
product number		ABCDEF		ABCDEF	
order number		18/0638		18/0638	
min. nominal edge		inch	75	75	
max. nominal edge		inch	75	75	
board width		inch	122	122	
board length		inch	315	315	
BW					
target		lbs/1000ft2	1068.3	1068.3	
plus tolerance		lbs/1000ft2	10	10	
minus tolerance		lbs/1000ft2	10	10	
correction factor			0.993	0.993	
TH					
target		mils	77	77	
plus tolerance		mils	4	4	
minus tolerance		mils	4	4	
correction value		mils	0	0	

This picture contains product parameters bearing relevance to the measurement process and, on request, also customer-specific product parameters and process variables. These may be filed under a freely selectable product number in the battery-buffered data memory and are therefore retrievable at any time.

The picture is divided up into clearly arranged columns.

1. «actual» column

Indicates the values for the data block currently selected.

2. «next» column

This column indicates the next data block. This data block may be entered / transferred using the keyboard or as an extension from a master system via an RS 232 interface.

All entries for product and order number must not exceed 15 alphanumeric characters, all other entries must not exceed a maximum of 15 numerical digits. Use the cursor keys to select the appropriate input line which will then be displayed in white. Press «Enter» to confirm all entries.

**Attention!** After terminating entries and before saving the product data block or transferring it from column «next» to column «actual», the product number must be reentered. For reasons of safety, this number is deleted when any change is made to the data block in order to avoid possible errors when the data block is memorized, e.g. overwriting a valid data block.



### 3.3 MONITOR PICTURES

#### «product parameters» picture

##### Input lines in the «product parameters» picture:

«product number»	:	Product number under which the displayed data package is to be memorized or has been memorized (max. 15 numerical digits).
«order number»	:	Order number under which the product is to be manufactured. This order number is independent of product and is therefore not memorized with the data package.
«min. nominal edge»	:	Entry of the useful board width, calculated from the scanner center towards min. (calibration position).
«max. nominal edge»	:	Entry of the useful board width, calculated from the scanner center towards max.
«board width»	:	Distance across which the sensor is to travel in automatic mode. The scanning path is allocated in equal parts to the left and right of the scanner center (center of board).
«board length»	:	Length of the boards to be measured.
«BW/TH target»	:	Target value of the material to be manufactured.
«BW/TH plus tolerance»	:	Permissible deviation of the actual value from the target value. An error message is given if tolerance is exceeded.
«BW/TH minus tolerance»	:	Permissible deviation of the actual value from the target value. An error message is given if tolerance is exceeded.
«BW correction factor»	:	Alignment of the measurement signal to the calibration characteristic curve as a result of different material composition after changing measurement product. The correction factor must be re-determined for each product being measured.
«TH correction value»	:	Alignment of the ultrasonic measurement signal to material thickness as a result of different material surfaces. The correction value must be re-determined for each product to be measured.

### 3.3 MONITOR PICTURES

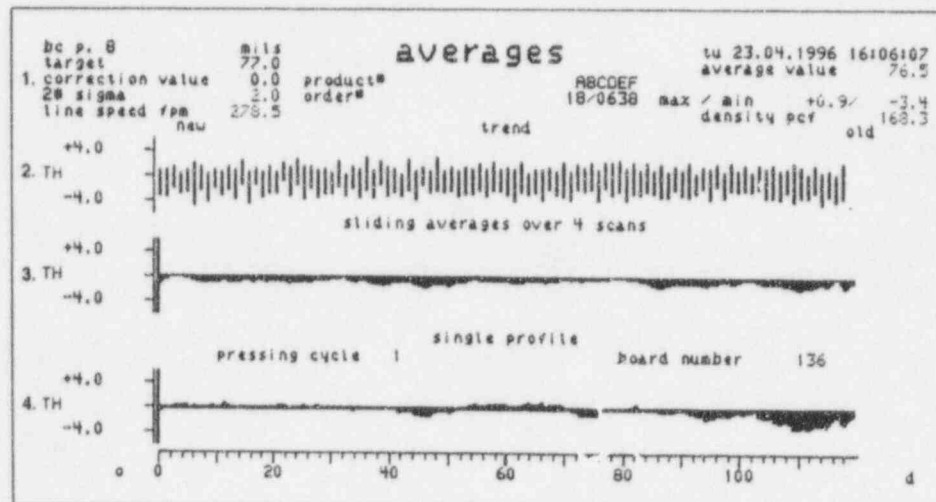
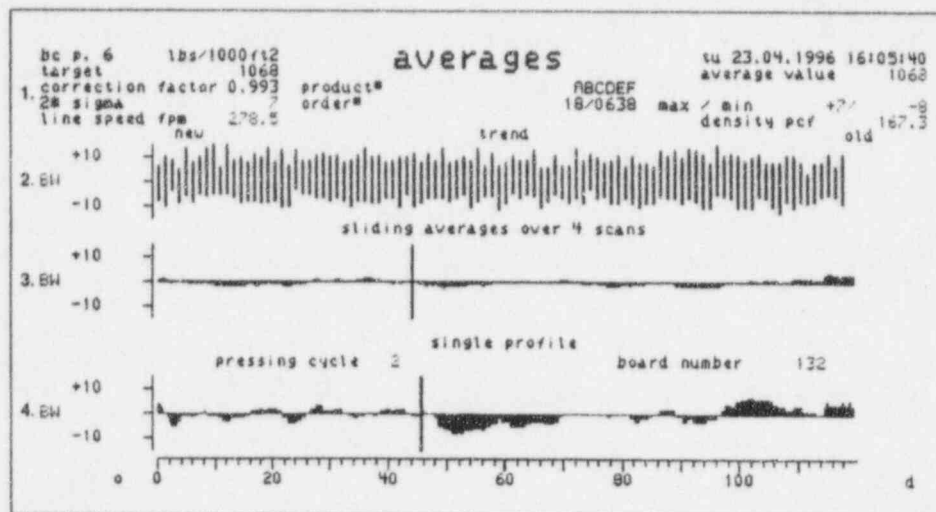
#### «measuring values» picture

bc p. 5		measuring values	tu 23.04.1996 16:03:58
BW	actual value	1073 lbs/1000ft2	
	deviation	+5 lbs/1000ft2	
	meas. position	87.9 inch	
TH	actual value	78.5 mils	
	deviation	+1.5 mils	

This monitor picture displays the current values for: actual values, deviation as well as the position of the sensor.

## 3.3 MONITOR PICTURES

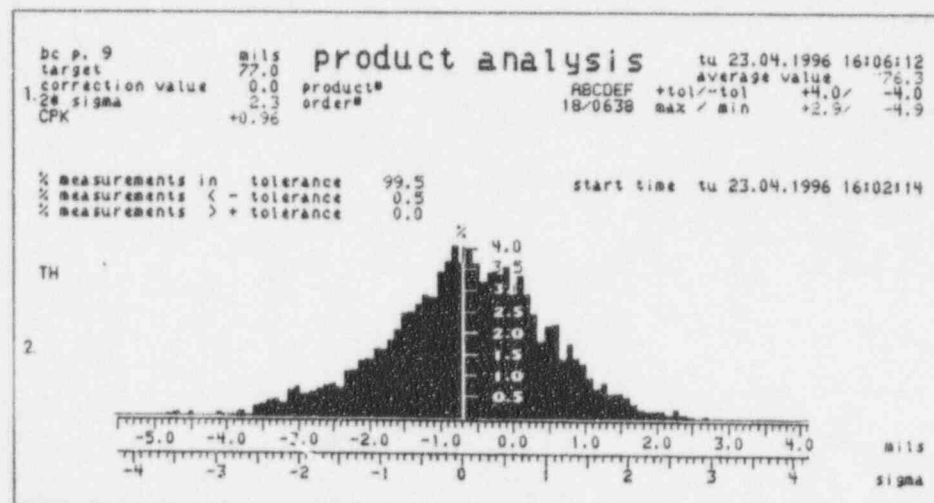
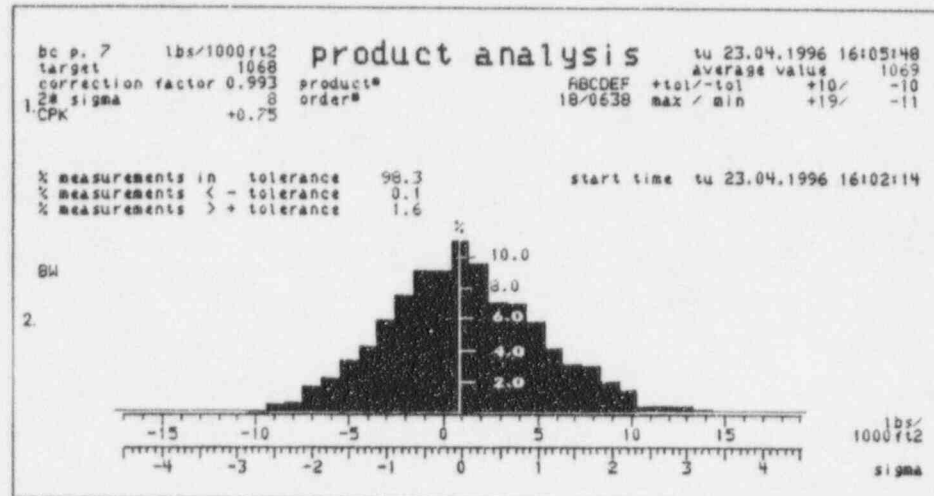
## «averages» picture



1. The header of this picture contains data from product parameters as well as various profile- and process-specific information.
2. Trend picture indicating max. / min. deviation and overall average for each profile measurement.  
This display is capable of handling a maximum of 400 scans. After completion of the last scan, the graph is shifted by one place to the right, the rightmost scan being deleted.
3. Averaged cross profile over X single profiles (X = a max. of 20).  
The number of single profiles selected is indicated above the graph.
4. Indication of current single profile.  
The actual pressing cycle and board number are indicated above the graph.

## 3.3 MONITOR PICTURES

## «product analysis» picture





### 3.3 MONITOR PICTURES

#### «product analysis» picture

1. The header of this picture contains data from product parameters as well as details on current production.
2. The values for entire production are graphically displayed on the basis of the Gaussian curve. Scaling is in mils or lbs/1000ft<sup>2</sup> and in sigma. This makes it possible to make a direct comparison between standard deviation and current production.

This picture is reset and restarted when order number (on picture «product parameters») is changed and upon receipt of the «reset product analysis» signal.

The CPK-value (process suitability index) in the header of this picture is calculated as follows:

$$CPK = \frac{Z_{KRIT}}{3}$$

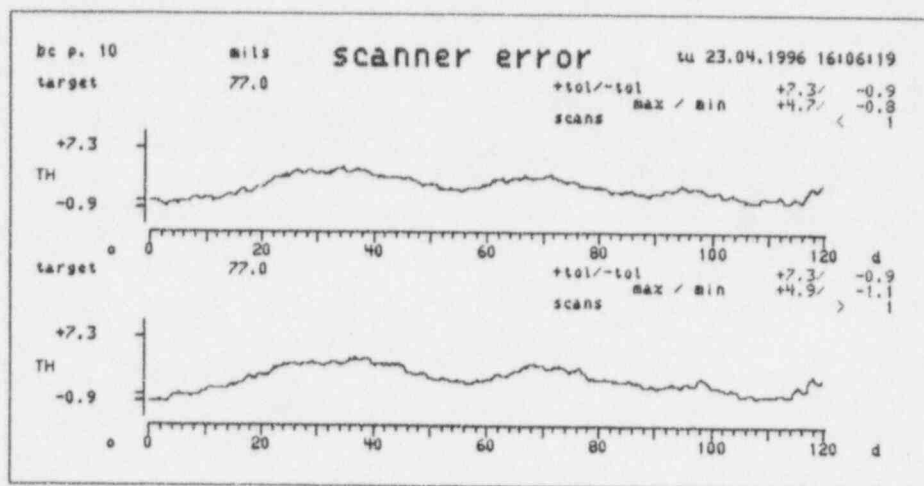
$$\text{mit } Z_{KRIT} = \min \left( \frac{(\text{tol}+) - mW}{\text{Sigma}}, \frac{mW - (\text{tol}-)}{\text{Sigma}} \right)$$

mW	=	average value of the deviation
tol+	=	upper tolerance limit from product parameters
tol-	=	lower tolerance limit from product parameters
sigma	=	standard deviation



## 3.3 MONITOR PICTURES

## «scanner error» picture



The scanner error compensation is necessary in order to compensate measuring errors caused by scanner faults. Before the scanner error compensation is released, the U-shaped sample supplied with the gauge must be placed on the lower ultrasonic sensor. The compensation of the scanner error is started by the line 638 in the picture «system parameters» (during the recording of the measured values only the sample for the scanner error compensation is allowed to be in the measuring gap). Then automatically the picture «scanner error» is indicated and recording of the measured values is started.

The scanner error compensation will have been successfully completed, if «ready» appears in the picture and the picture «scanner error» is printed by the connected printer.

Only after the scanner error compensation will have been completed, the standard measuring operation can be started again.

The scanner error compensation will be interrupted if the scanner control is interfered or the function «calibration» is selected. Then automatically all correction values are deleted.

### 3.3 MONITOR PICTURES

#### «error messages» picture

bc p. 11		error messages		tu 23.04.1996 16:06:50	
BH	measurement off	BH	sensor in park position		
BH	scanning off	BH	+ tolerance exceeded		
		TH	+ tolerance exceeded		

This picture displays various error messages. In the event of error, the relevant line will be displayed in red.

This picture is divided up into two columns:

#### *Display*

machine off

measurement off

scanning off

+ tolerance exceeded

- tolerance exceeded

sensor in park pos.

#### *Possible cause*

Production line standing still.

«Measuring off» activated;  
source shutter jammed;  
limit switch defective.

Automatic scanning mode off;  
friction clutch worn;  
no direction pulses from position  
encoder;  
limit switch defective;  
control parameters incorrectly set.

Upper tolerance limit incorrectly set;  
material too thick;

Lower tolerance limit incorrectly set;  
material too thin.

Calibration process activated;  
automatic calibration process  
activated.

