Fe *e-Front runners*

NRF

Electronic personal dosemeter

The system continuously monitors personal dose when personnel are in controlled areas.

FEATURES

- Ideal for a wide range of energy measurement - Gamma ray: 50keV to 6 MeV , Beta ray: 500 keV to 2.2 MeV and Neutron: 0.025 eV to 15 MeV
- Generally in accordance with most aspects of IEC 61526:2005, JIS Z 4312:2004Self-diagnosis function
- Compact and lightweight
- Long battery life -1 year in 8 hours use a day or 4 months more in continuous use

Fuji Electric Systems Co., Ltd.

Personal dose management system

The NRF series Electronic Personal Dosemeter (EPD) is a suitable for detecting and monitoring radiation in the restricted areas of nuclear power stations and other nuclear facilities. An audible alarm activates if the dose or dose rate exceeds a preset value.

- **The dose value detected by the EPD is sent to a CoÜuter system through a Reader, to allow you to effectively manage personnel safety.**
- **Dose, dose rate and operating-time alarm values can be preset with setting device.**
- **The EPD can be easily calibrated with Calibrator.**

The technically advanced dosemeters of the NRF series and their accessories can be combined to effectively protect your personnel from dangerous levels of radiation under a wide range of conditions. They are another example of Fuji Electric Systems's continuing effort to provide you with the best possible products.

LAN

Computer system

Entrance gate

Portal Monitor <Exit gate>

EPD Reader

EPD

Dosemeter Rack

Calibrator
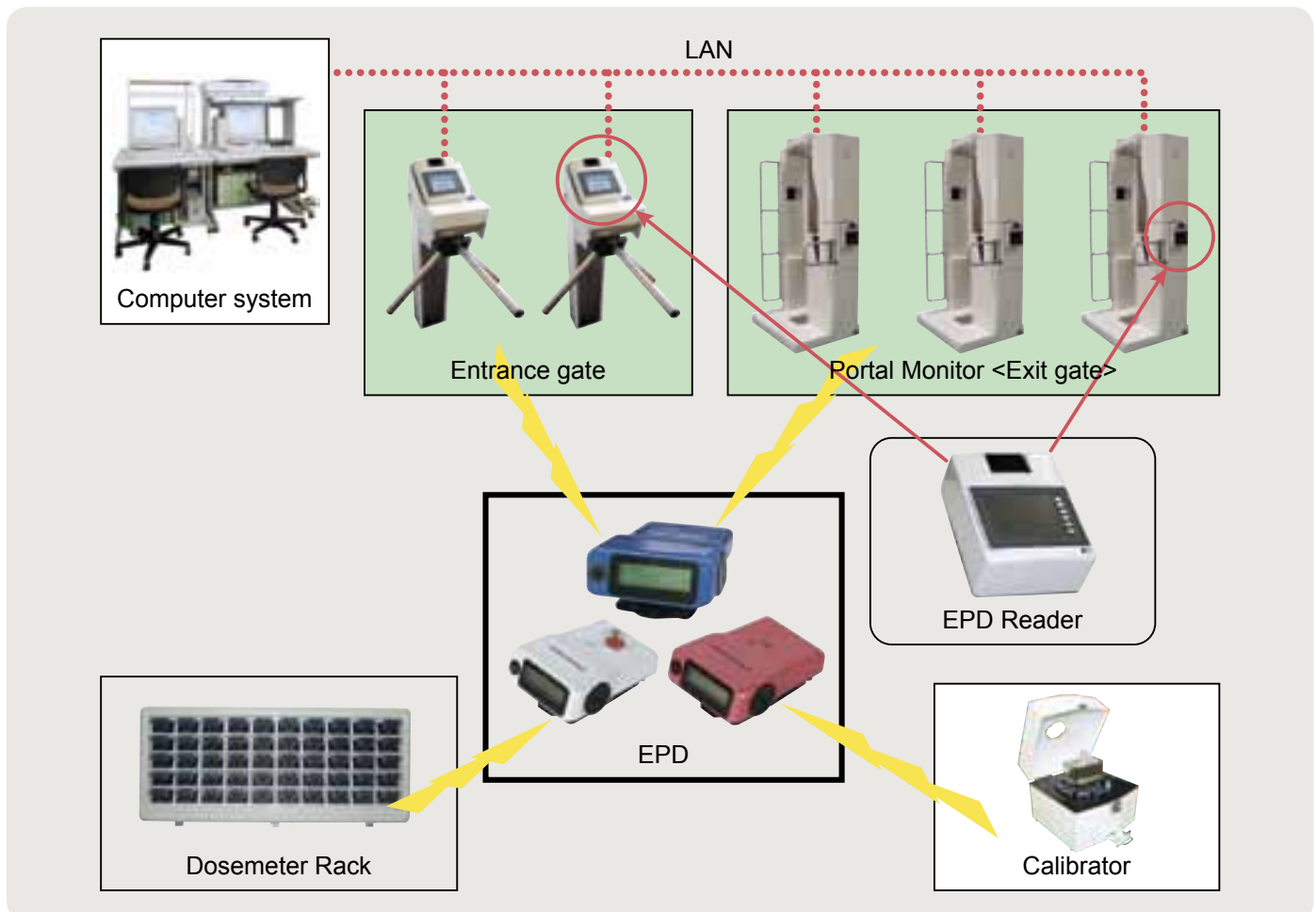
NRF series line-up

NRF30

Gamma (X)

NRF31

Gamma (X) and neutron

NRF34

Gamma (X) and beta

NRF40

Gamma (X) , Magnesium alloy case

General of the personal dosemeter series
- NRF30 measures gamma ray (blue)
- NRF31 measures gamma ray, thermal and fast neutron (red)
- NRF34 measures gamma and beta ray (white)
- NRF40 is greatly a heavy-duty model of NRF30 (silver)

    - Drop on surface   : 2.0m onto steel floor
    - Waterproof   : 20sec/30cm depth in water
    - Electromagnetic interference : 100V/m at 100kHz to 500MHz

Please refer to the specifications on the next page.

Also other devices and optional accessories for the dosemeters are available.
    Please see the pages 6 and 7.

Specifications

No.		NRF30	NRF31
1.	Radiation detected	Gamma(X)-ray(Hp(10))	Gamma(X)-ray(Hp(10)) and Neutron(Hp(10))
2.	Detector	Silicon semiconductor	
3.	Ranges for dose equivalent	(Sv) 1μSv to 999μSv 1.000mSv to 999.9mSv 1.000Sv to 9.999Sv (rem) 0.1mrem to 999.9mrem 1.000rem to 999.9rem	
4.	Relative error of indication	±10%(0.1mSv to 9.999Sv,^{137}Cs)	Gamma(X)-ray ±10%(0.1mSv to 9.999Sv,^{137}Cs) Neutron ±15%(0.5mSv to 9.999Sv,^{252}Cf)
5.	Energy range	30keV to 6MeV	Gamma(X)-ray 30keV to 6MeV Neutron 0.025eV to 15MeV
6.	Energy response	±20%(50keV to 6MeV, ^{137}Cs)	Gamma(X)-ray ±20%(50keV to 6MeV, ^{137}Cs) Neutron ±50% (250keV to 4.5MeV,^{252}Cf)
7.	Angular response	±20% (Up to ±60 degree, vertical and horizontal, ^{137}Cs) ±50% (Up to ±60 degree, vertical and horizontal, ^{241}Am) ±30% (All around horizontal, ^{137}Cs, free air)	Gamma(X)-ray ±20%(Up to ±60 degree, vertical and horizontal,^{137}Cs) ±50%(Up to ±60 degree, vertical and horizontal, ^{241}Am) ±30%(All around horizontal, ^{137}Cs, free air) Neutron ±30%(Up to ±75 degree, vertical and horizontal,^{241}Am-Be)
8.	Linearity for wide range of dose rate	±10%(0.1mSv/h to 9.999Sv/h,^{137}Cs)	Gamma(X)-ray ±10%(0.1mSv/h to 9.999Sv/h,^{137}Cs) Neutron ±20%(0.5mSv/h to 9.999Sv/h,^{252}Cf)
9.	Display	LCD (With backlight)	
10.	Alarm volume	85dB to 100dB	
11.	Communication method	Infrared communication	
12.	Ambient temperature	- 20°C to+50°C	
13.	Ambient humidity	35% to 95% Non condensing	
14.	Power supply	"CR123A" battery[1]	
15.	Battery life	For 1 year or more (8hours use per a day, without alarm and backlight) or For 4 months or more (Continuous use)	
16.	Size	60W x 78H x 27Dmm (excluding clip)	60W x 78H x 27Dmm (excluding clip)
17.	Mass	100g approx	110g approx

No.		NRF34	NRF40 (Magnesium alloy case)
1.	Radiation detected	Gamma(X)-ray(Hp(10)), and Beta-ray(Hp(0.07))	Gamma(X)-ray(Hp(10))
2.	Detector	Silicon semiconductor	
3.	Ranges for dose equivalent	(Sv) 0 µSv to 999 µSv 1.000mSv to 999.9mSv 1.000Sv to 9.999Sv (rem) 0.0mrem to 999.9mrem 1.000rem to 999.9rem	
4.	Relative error of indication	Gamma(X)-ray ±10%(0.1mSv to 9.999Sv,^{137}Cs) Beta-ray ±15%(0.1mSv to 9.999Sv,^{90}Sr/^{90}Y)	±10%(0.1mSv to 9.999Sv,^{137}Cs)
5.	Energy range	Gamma(X)-ray 30keV to 6MeV Beta-ray 200keV to 2.3MeV	30keV to 6MeV
6.	Energy response	Gamma(X)-ray ±20%(50keV to 6MeV, ^{137}Cs) Beta-ray ±30%(500keV to 2.2MeV, ^{90}Sr/^{90}Y)	±20%(50keV to 6MeV, ^{137}Cs)
7.	Angular response	Gamma(X)-ray ±20%(Up to ±60 degree, vertical and horizontal, 137Cs) ±50%(Up to ±60 degree, vertical and horizontal, 241Am) ±30%(All around horizontal, ^{137}Cs, free air) Beta-ray ±30%(Up to ±60 degree,vertical and horizontal, ^{90}Sr/^{90}Y)	±20% (Up to ±60 degree, vertical and horizontal,^{137}Cs) ±50% (Up to ±60 degree, vertical and horizontal,^{241}Am) ±30% (All around horizontal,^{137}Cs, free air)
8.	Linearity for wide range of dose rate	Gamma(X)-ray ±10%(0.1mSv/h to 9.999Sv/h,^{137}Cs) Beta-ray ±20%(0.1mSv/h to 9.999Sv/h,^{90}Sr/^{90}Y)	±10% (0.1mSv/h to 9.999Sv/h,137Cs)
9.	Display	LCD (With backlight)	
10.	Alarm volume	85dB to 100dB	
11.	Communication method	Infrared communication	
12.	Ambient temperature	- 20°C to + 50°C	
13.	Ambient humidity	35% to 95% Non-condensing	40% to 95% Non-condensing
14.	Power supply	"CR123A" battery x 1	
15.	Battery life	More than 1 year(8hours use per a day, without alarm and backlight) or For 4 months or more (Continuous use)	
16.	Size	60W x 78H x 27Dmm(excluding clip)	62W x 82H x 33D mm (excluding clip)
17.	Mass	100g approx	110g approx

# Accessory device

Dosemeter reader

Type: NMR

PURPOSE
Reader reads EPD data, and writes the data from Computer system into EPD. Reader also sends the data to Computer system and receives the command from Computer system.

SPECIFICATIONS
1. Display : 5.7 inch color LCD
2. Communication : Infrared
3. Size : 200W×105H×250D mm
4. Mass : 2.8kg approx
5. Power supply : DC24V±10%
   (DC power is supplied by the user)
6. Power requirement : Up to 45W
7. Ambient temperature : 0 to 45 deg.
8. Ambient humidity : Less than 85%, Non-condensing

Dosemeter calibrator
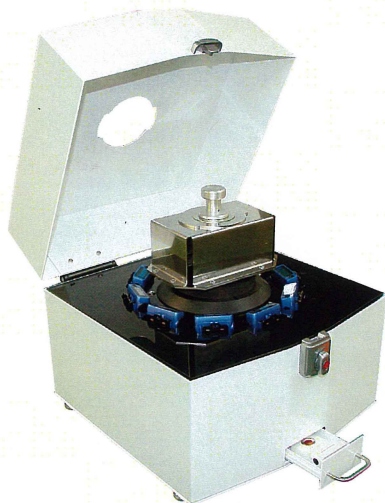
Type: NRK

PURPOSE
This calibrator for gamma-ray and beta-ray calibrates EPD easily and effectively. Calibration factor is calculated and updated automatically.
The calibration reports are available to be printed out.

SPECIFICATIONS
1. Gamma source : ^{137}Cs, 370 MBq
2. Beta source : ^{90}Sr-^{90}Y, 74 MBq
3. Number of EPD (gamma) : 10 units
4. Number of EPD (beta) : 1 unit
5. Size : 430mm(W)×430mm(D)×350mm(H)
   (excluding knob)
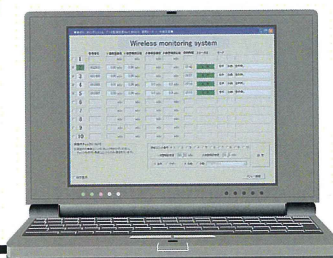6. Mass : 90kg
7. Power supply : 100 to 240V AC 50/60Hz

Setting Device

EPD

IR Com-Port
Serial Adapter

PC (Supply by the User)

Type: NRZ

PURPOSE
The Setting Device communicates the data with EPD using IR. The Setting Device reads the setting value/accumulated dose and writes the setting value into EPD.

Wireless data transmission device

Type: NRA

PURPOSE

・The dosemeter is inserted into the wireless attachment and they communicate each other via infrared function.
・The wireless attachment has a connection port for earphones or bone-conduction earphone.
・A wireless attachment requires 4 cells of AAA battery, which has battery life over 15 hours of continuous use.

SPECIFICATIONS

Item	Contents
Wireless communication method	Complies with FFC PART15
Fundamental frequency	915MHz
Modulation method	F1D 2-value modulation
Field strength of fundamental	93.9dBµV/m (Distance of 3 meters)
Transmission rate	19200 bps

FCC IDENTIFIER: WY5NRA30201, WY5NRA50201

Feature

・Receivable number of data :50 units per 1relay station
・Monitoring area :100m
・We achieved 99.85% success rate with the operation test of 2 relay stations and 25 wireless attachments.
・Communication interval :Once every 20 sec
・Transmission frequency from data processing unit:Once every 60 sec
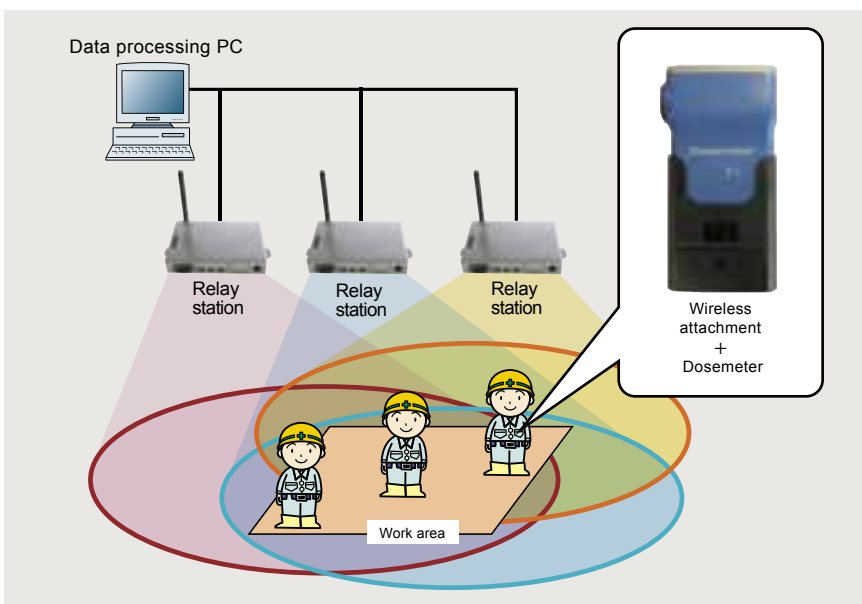
Example display screen of data processing unit

Portal monitors

*No need of gas supply device and routine maintenance required by employing our detectors
*Compliance code: IEC61098(2003)

Whole Body Surface Contamination Monitor   Type: NMA

*Measurement contains 2 sets as Anterior and Posterior body surfaces.
*Measure the natural counting rate over 10 minutes under the maximum reference background and calculate the minimum detectable surface emission rate.
*Monitors top of heads - the height of overhead detector can be adjusted. (automatic adjuster is option.)
*Communicates with dosemeter reader NRM and performs exit process from a radiation controlled area (option)

SPECIFICATIONS
1. Radiation detected   :Beta rays
2. Detector   :Plastic scintillator
3. Area measured   :17 channels
                         (Top and back of head, face, chest, stomach,
                         front and back of legs, back, sides of upper and lower body,
                         soles, palms and backs)

Alpha/Beta Hand and Foot Surface Contamination Monitor

*Great reduction of cross talk by employing highly precise Alfa/Beta discrimination system
*Highly accurate measurements- unsusceptible to interference of other radiation
 (ex. Neutron, gamma rays)

SPECIFICATIONS   Type: NHP
1. Radiation detected :Beta rays and alfa rays
2. Detector   :Plastic scintillator (for beta rays),
               ZnS(Ag) scintillator (for alfa rays)
3. Area measured :Soles, palms and backs
                  of both hands
4. Crosstalk :Less than 1 %
              (Alfa rays mix rate for beta rays)
              Less than 0.1 %
              (Beta rays mix rate alfa rays)

Hand and Foot Surface Contamination Monitor

*Reduction in size and weight by employing semiconductor detectors and FRP body
*The body can be folded

                              Type: NHP

SPECIFICATIONS
1. Radiation detected :Beta rays
2. Detector   :Silicon semiconductor
3. Area measured
               :Hands (palms·backs), feet, clothes

⚠ **CAUTION**
*Read the instruction manual provided before using this product, to make sure you operate it safely.

Fuji Electric Systems Co., Ltd.

Headquarters
Sales Group, International Sales Div. II
Gate City Ohsaki, East Tower, 11-2, Osaki 1-chome, Shinagawa-ku, Tokyo 141-0032, Japan
Phone: +81-3-5435-7275, FAX: +81-3-5435-7437

http://www.fesys.co.jp