

NRF

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

FEATURES

- Ideal for a wide range of energy measurement - Gamma ray: 30keV to 6 MeV , Beta ray: 200 keV to 2.3 MeV and Neutron: 0.025 eV to 15 MeV
- Accordance with IEC 61526:2010, JIS Z4312:2004
- Compact and lightweight
- Long battery life -1 year in 8 hours use a day or 4 months more in continuous use

Electronic personal dosimeter

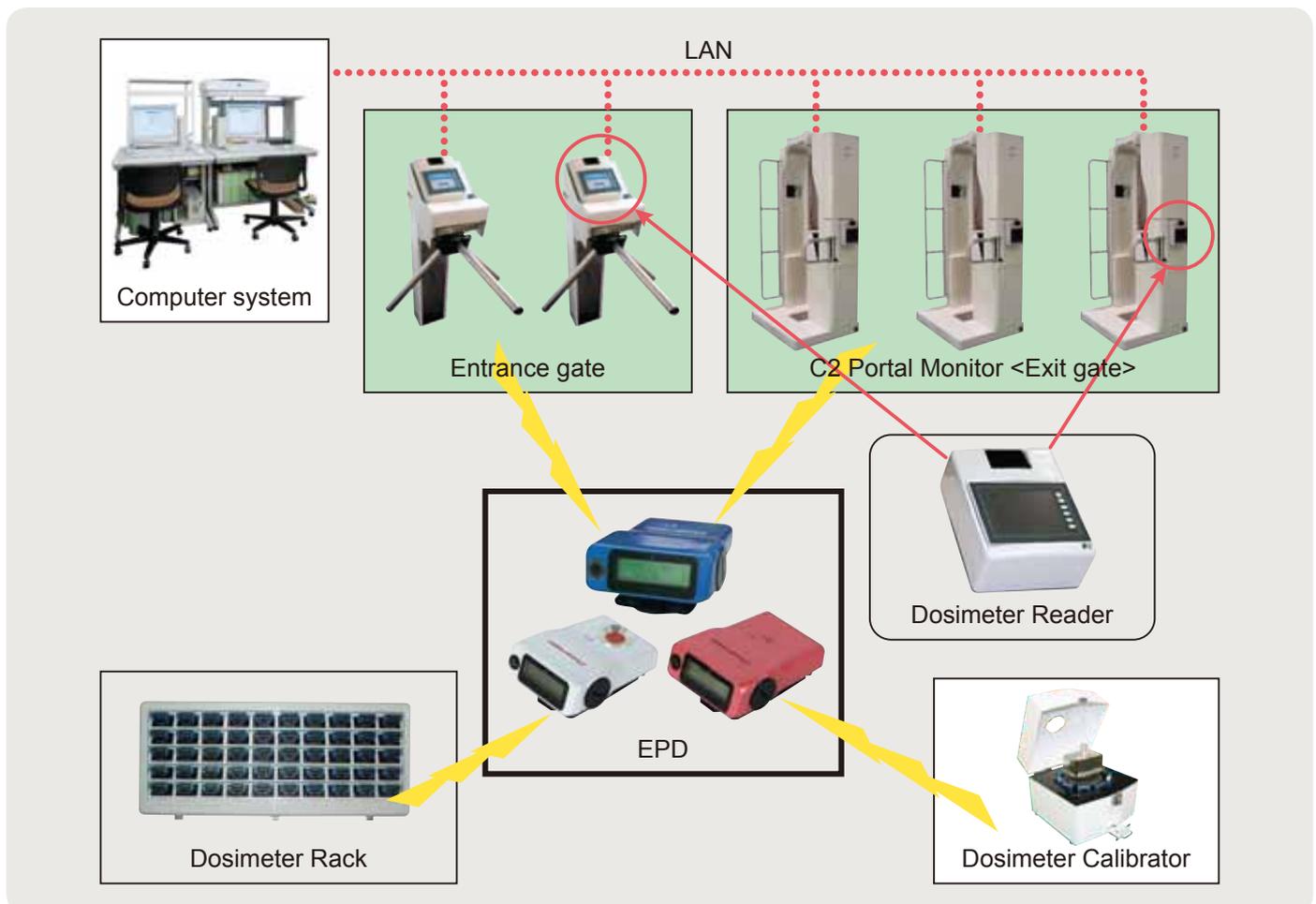


Personal dose management system

The NRF series Electronic Personal Dosimeter (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 Computer 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 dosimeters 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's continuing effort to provide you with the best possible products.



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 dosimeter 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 dosimeters are available.

Please see the pages 6 and 7.

Specifications

No.		NRF30	NRF31
1.	Radiation detected	Gamma(X)-ray	Gamma(X)-ray and Neutron
2.	Detector	Silicon semiconductor	
3.	Dose equivalent range	(Sv) 0 μ Sv to 999 μ Sv 1.000mSv to 999.9mSv 1.000Sv to 9.999Sv (rem) 0.0mrem to 999.9mrem 1.000rem to 999.9rem	
4.	Accuracy	$\pm 10\%$ (0.1mSv to 9.999Sv, ¹³⁷ Cs)	Gamma(X)-ray $\pm 10\%$ (0.1mSv to 9.999Sv, ¹³⁷ Cs) Neutron $\pm 15\%$ (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	$\pm 20\%$ (50keV to 6MeV, ¹³⁷ Cs)	Gamma(X)-ray $\pm 20\%$ (50keV to 6MeV, ¹³⁷ Cs) Neutron $\pm 50\%$ (250keV to 4.5MeV, ²⁵² Cf)
7.	Angular response	$\pm 20\%$ (Up to ± 60 degree, vertical and horizontal, ¹³⁷ Cs) $\pm 50\%$ (Up to ± 60 degree, vertical and horizontal, ²⁴¹ Am) $\pm 30\%$ (All around horizontal, ¹³⁷ Cs, free air)	Gamma(X)-ray $\pm 20\%$ (Up to ± 60 degree, vertical and horizontal, ¹³⁷ Cs) $\pm 50\%$ (Up to ± 60 degree, vertical and horizontal, ²⁴¹ Am) $\pm 30\%$ (All around horizontal, ¹³⁷ Cs, free air) Neutron $\pm 30\%$ (Up to ± 75 degree, vertical and horizontal, ²⁴¹ Am-Be)
8.	Linearity for wide range of dose rate	$\pm 10\%$ (0.1mSv/h to 9.999Sv/h, ¹³⁷ Cs)	Gamma(X)-ray $\pm 10\%$ (0.1mSv/h to 9.999Sv/h, ¹³⁷ Cs) Neutron $\pm 20\%$ (0.5mSv/h to 9.999Sv/h, ²⁵² Cf)
9.	Display	LCD (With backlight)	
10.	Alarm volume	85dB to 100dB (at a point 30cm away from the top of the buzzer)	
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	
15.	Battery life	1 year or more (when used for 8 hours a day) or 4 months or more (when used for continuous monitoring)	
16.	Size	60W x 78H x 27Dmm (excluding clip)	60W x 78H x 27Dmm (excluding clip)
17.	Mass	< 100g	< 100g

No.		NRF34	NRF40 (Magnesium alloy case)
1.	Radiation detected	Gamma(X)-ray, and Beta-ray	Gamma(X)-ray
2.	Detector	Silicon semiconductor	
3.	Dose equivalent range	(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.	Accuracy	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, ¹³⁷ Cs) ±50%(Up to ±60 degree, vertical and horizontal, ²⁴¹ Am) ±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, ¹³⁷ Cs)
9.	Display	LCD (With backlight)	
10.	Alarm volume	85dB to 100dB (at a point 30cm away from the top of the buzzer)	
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	1 year or more (when used for 8 hours a day) or 4 months or more (when used for continuous monitoring)	
16.	Size	60W x 78H x 27Dmm (excluding clip)	62W x 82H x 29Dmm (excluding clip)
17.	Mass	< 100g	< 115g

Accessory device

Dosimeter 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 : 8.4 or 5.7 inch color LCD
2. Communication : Ethernet (computer system)
Digital I/O (portal monitor, turnstile, etc.)
infrared (dosimeter)
3. Size : 200Wx250Hx105D or
250Wx285Hx115D mm
4. Mass : 2.8 or 4 kg approx.
5. Power supply : DC24V±10%
(DC power is supplied by the user)
6. Power requirement : 45W or less
7. Ambient temperature : 0 to 45 deg.
8. Ambient humidity : Less than 85%, Non-condensing

Dosimeter 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)x430mm(D)x350mm(H)
(excluding knob)
6. Mass : Approx. 95kg
7. Power supply : 100 to 240V AC 50/60Hz

Setting Device



EPD



IR Com-Port
Serial Adapter



PC (Supply by the User)

Type: NRZ

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 dosimeter 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.



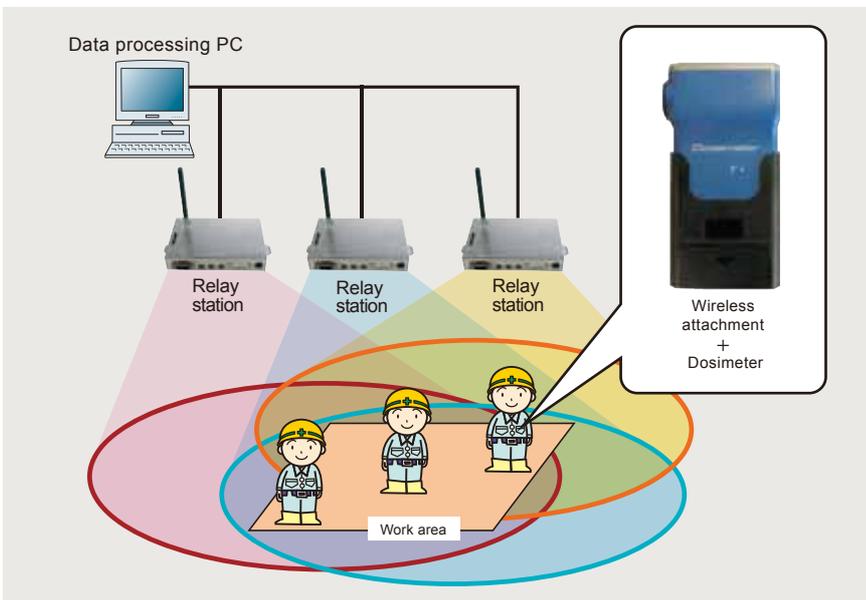
SPECIFICATIONS

Item	Contents
Wireless communication method	Complies with FCC PART15
Fundamental frequency	915MHz
Modulation method	F1D 2-value modulation
Field strength of fundamental	93.9dB μ V/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)

Two-Step C2 Portal Monitor

Type: NMA6



- *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 dosimeter reader NRM and performs exit process from a radiation controlled area (option)

SPECIFICATIONS

1. Radiation detected :Beta rays or Gamma rays (Alpha rays : Gas flow counter)
2. Detector :Gas flow counter or Plastic scintillator
3. Area measured :Head (top, front, back, sides), face, chest, abdomen, back, sides of the body, shoulders, upper and lower arms, legs (fronts, backs, sides), insteps, bottoms of the feet, palms and backs of the hands

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: NHP23

1. Radiation detected :Beta rays and alfa rays
2. Detector :Gas flow detector
3. Area measured :Hands (palms, backs of the hands), bottoms of the feet and clothing (optional)

Hand and Foot Surface Contamination Monitor



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

SPECIFICATIONS

1. Radiation detected :Beta rays
2. Detector :Silicon semiconductor
3. Area measured :Hands (palms, backs of the hands), bottoms of the feet and clothing (optional)

Type: NHP12

⚠ CAUTION

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

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