MEIDEN
Quality connecting the next

Cold Cathode X-ray Tube Using Carbon Nanostructures

Compact, lightweight, and low power consumption enable mobile non-destructive inspection applications

Made in Japan

RoHS compliant (10 substances)

Reliable vacuum technology from Meidensha

Cold Cathode X-ray

Cold cathode X-ray tubes generate X-rays when an electric field is applied to device.
There is no Cathode heater as used in conventional X-ray tubes, no warm-up/stabilization period is required and X-ray irradiation is possible instantaneously.

Full-scale [90 kV]

Compact and Lightweight

No need for a heating element means a slim and compact shape.
It is less than 50% the size of conventional products.

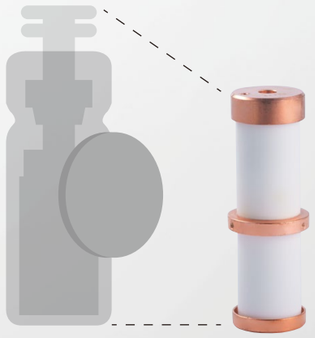
Instant Irradiation

X-rays are emitted instantly upon power application, there is no cathode heater warm-up/stabilization period.
Intermittent operation is possible because there is no standby time.

Volume and weight both reduced by **50% or more**

Low Power Consumption

Power consumption is reduced because the cathode does not need to be heated. X-rays can be output even using dry batteries.



Hot Cathode X-ray Tube

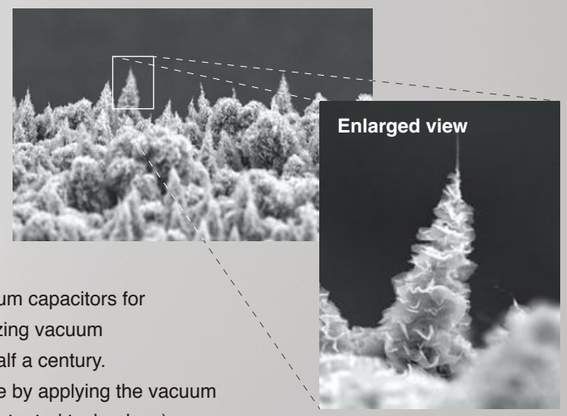
Cold Cathode X-ray Tube Using Carbon Nanostructures

Life Expectancy Prediction

The optimum timing for replacement can be predicted by capturing signs of life expectancy coming to an end from dose reduction.

Carbon Nanostructure Emitter

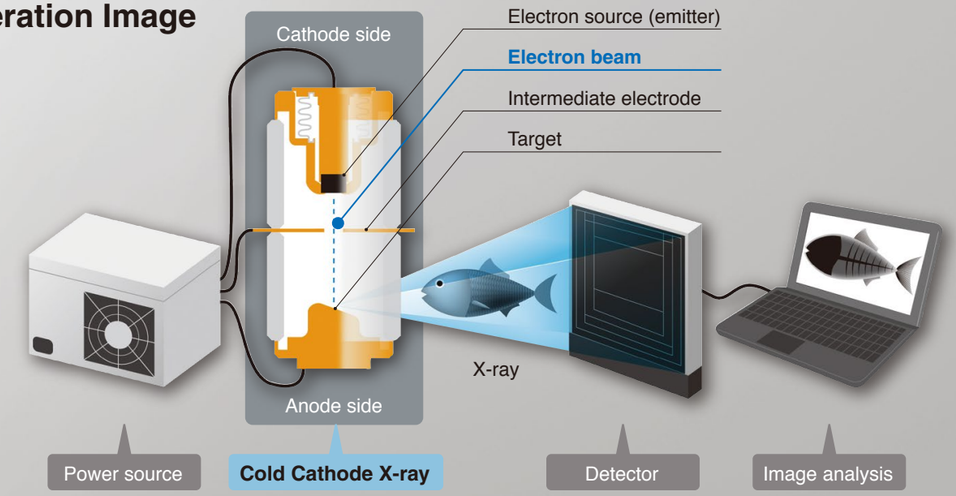
Carbon nanostructures (CNX) are used as the electron source (emitter).
CNXs have a pine tree-like structure and are characterized by the ease with which they emit electrons.



Reliable Vacuum Technology

Meidensha has been developing and manufacturing vacuum capacitors for semiconductor manufacturing equipment since 1994, utilizing vacuum technology and know-how accumulated over more than half a century.
Commercialization of this product has been made possible by applying the vacuum technology acquired through those efforts (Meidensha's patented technology).

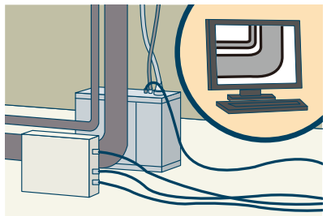
Operation Image



Main Applications

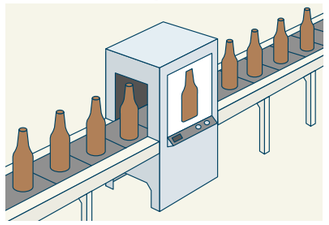
Utilizing the ability of X-rays to penetrate objects, it is possible to non-destructively check the internal structure of objects.
In addition to medical X-rays, the product is also expected to play an active role in a variety of industrial applications such as industrial goods and baggage inspection.

Infrastructure inspection

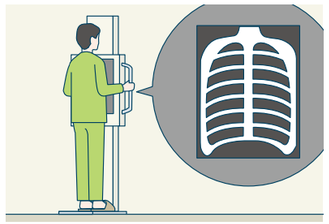


Security

Manufacturing

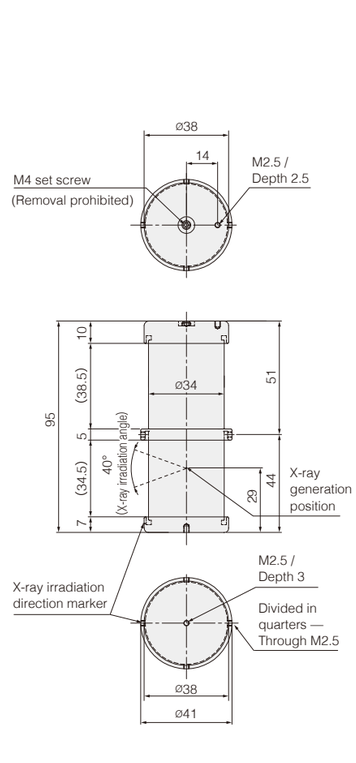


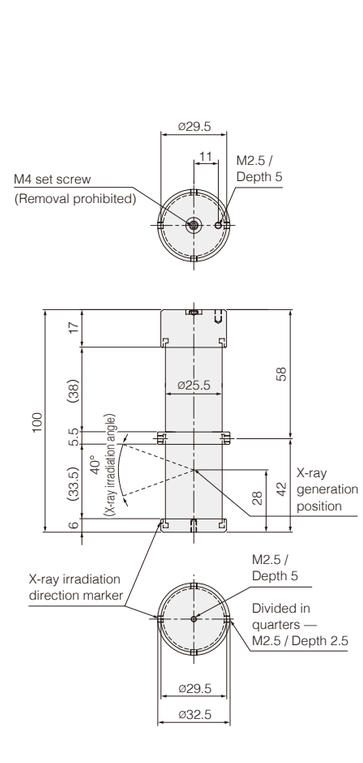
Medical

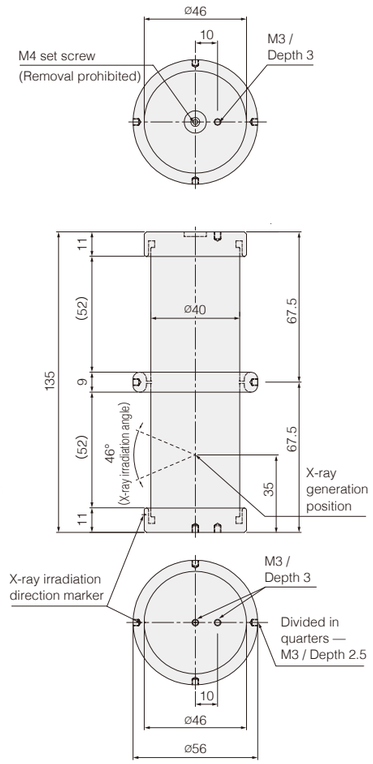


* This product uses technology of the National Institute of Advanced Industrial Science and Technology (AIST) and Life Technology Research Institute, Inc. Meidensha has entered into a patent licensing agreement with both institutes for the manufacture and sale of this product.

Specifications / External Drawing







Maximum tube voltage used 90 kV 120 kV 180 kV

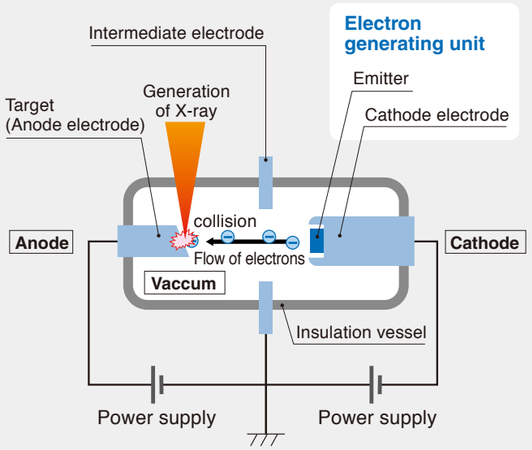
Specifications		S-EG91B34W	S-EG121B26W	S-EG181B40W
Maximum tube voltage		90 kV	120 kV	180 kV
Rated voltage between poles	Cathode-Intermediate electrode	−35~−45 kV	−40~−60 kV	−60~−90 kV
	Anode-Intermediate electrode	30~55 kV	40~60 kV	70~100 kV
Maximum tube current		1 mA	1 mA	1 mA
Focal spot size		0.4×1.0 mm	0.8×1.6 mm	1.0×2.6 mm
Weight		340 g	240 g	580 g
Outer diameter		Φ41 mm	Φ32.5 mm	Φ56 mm
Total length		95 mm	100 mm	135 mm
Target angle		20°	20°	23°
Target		Tungsten	Tungsten	Tungsten
Electron source (emitter)		Carbon nanostructure	Carbon nanostructure	Carbon nanostructure
Solid filtration		Alumina 3 mm	Alumina 3.3 mm	Alumina 4 mm
Ambient environment conditions	Operating environment	Insulated between poles	Insulated between poles	Insulated between poles
	Ambient temperature in use	10~60°C	10~60°C	10~60°C
	Pressure	70~140 kPa	70~140 kPa	70~140 kPa
Transport and storage conditions	Ambient temperature	10~60°C	10~60°C	10~60°C
	Relative temperature	0~85 % * No condensation	40~85 % * No condensation	40~85 % * No condensation
	Atmospheric pressure	50~106 kPa	50~106 kPa	50~106 kPa

* When using this product, external insulation and immersion in insulating oil or insulation molding is required.
* This product generates X-rays. When using this product, please take protective measures such as shielding it from the surrounding environment or keeping a sufficient distance from it.
* This product was developed for pulse irradiation. If CW irradiation is required, please consult a sales representative.

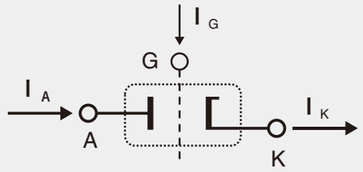
Control of Cold Cathode X-ray Tubes

The product is composed of an 2 stage power source.

The tube voltage and tube current are determined by the controller settings.



Schematic



Tube voltage:

$$V_0 = V_{A\text{-}G} - V_{K\text{-}G}$$

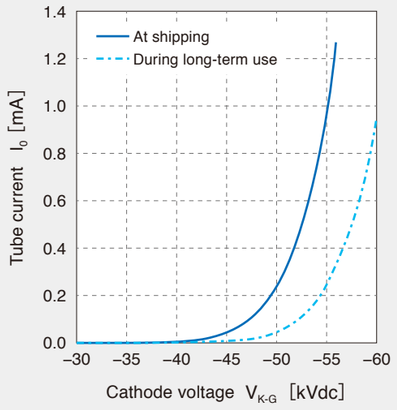
Tube current:

$$I_0 = I_A = I_K - I_G$$

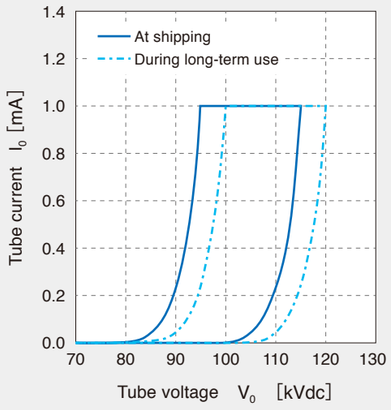
Shift of Current–Voltage Characteristic

The current–voltage control characteristic shifts to voltage dominance during the energization interval.
Required drive range is dynanmic during the interval.

S-EG121B26W
I-V curve at anode 60kVdc



S-EG121B26W
Available range



Life Expectancy Prediction

When a cold cathode X-ray tube is used for a long period of time, the CNX of the emitter surface layer wears away and the amount of electrons emitted decreases.
If used at a constant input voltage, the dose will gradually decrease, enabling estimation of the X-ray tube replacement timing by predicting its life expectancy based on the decrease in dose.

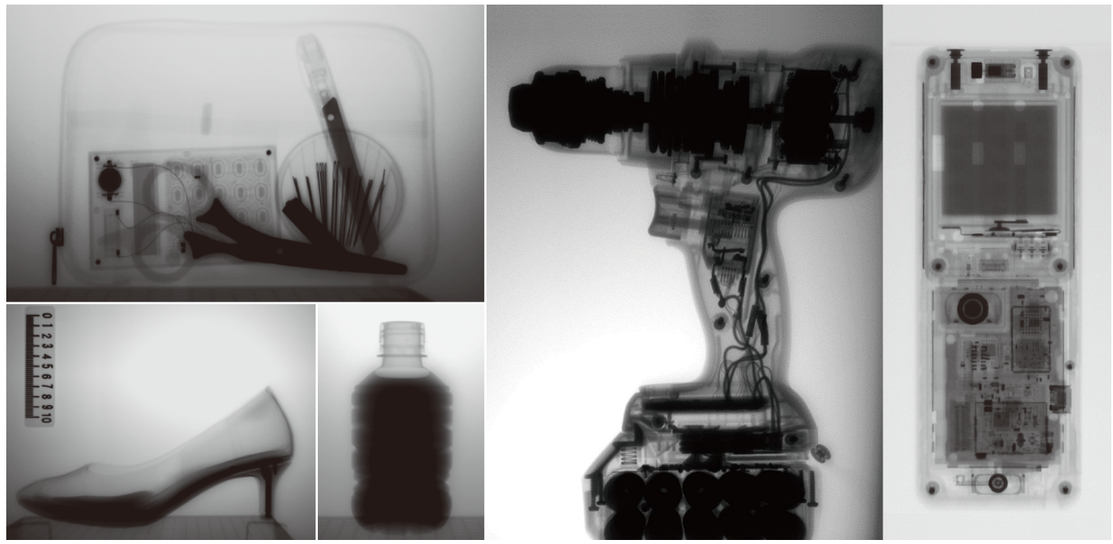
X-ray Source for Evaluation S-EG121BW

The X-ray source is a 120 kV tube (S-EG121B26W) includes a generator and console.
Drive voltages can be controlled from the console.
The control unit is included to simplify testing.

Maximum tube voltage	120 kV
Input tube voltage operating range	80~120 kV
Maximum tube current	1.0 mA
Irradiation angle	40°
Focal spot size	0.8×1.6 mm
Irradiation time	0.1~1 sec
Repetition frequency	0.1 Hz
Main unit weight	5.4 kg
Main unit dimensions	250×220×80 mm
Console weight	0.5 kg
Console	46×180×105 mm

* A separate power source and signal source are required when using this product.

X-ray Fluoroscopy Example



Customized Cold Cathode X-ray Tubes

Meidensha's cold cathode X-ray tubes are scheduled to be adaptable to customer specifications. Irradiation angle, and aperture specifications are customizable per application. Please contact us for more information.

E-mail：X-ray tube@mb.meidensha.co.jp

MEIDEN

MEIDENSHA CORPORATION

ThinkPark Tower, 2-1-1, Osaki, Shinagawa-ku, Tokyo, 141-6029 Japan

www.meidensha.com

Safety Precautions

Prior to using our products, please read through the relevant instruction manuals and related materials.

In the case of applications in facilities where fatal injuries are anticipated as a result of product failure, malfunction, and/or misoperation, or where the occurrence of serious losses is predicted, it is recommended to take adequate measures separately by installing, for example, proper safety devices.

Agents and distributors for our products

In regard to queries about these products, please contact the Industrial Component Business Unit specified below.

● Vacuum Device Sales Section Industrial Component Business Unit : ThinkPark Tower 2-1-1 Osaki, Shinagawa-ku, Tokyo 141-6029 Japan
Phone: +81-3-6420-7590

■ Due to our commitment to continually improving the function and performance of our products, specifications are subject to change without prior notice.

■ The nameplates for marking the product types and logos shown in this catalog may differ from the actual ones.

VEGETABLE OIL INK

BA92-3363 As of Oct., 2022

2022-10ME 0.5L