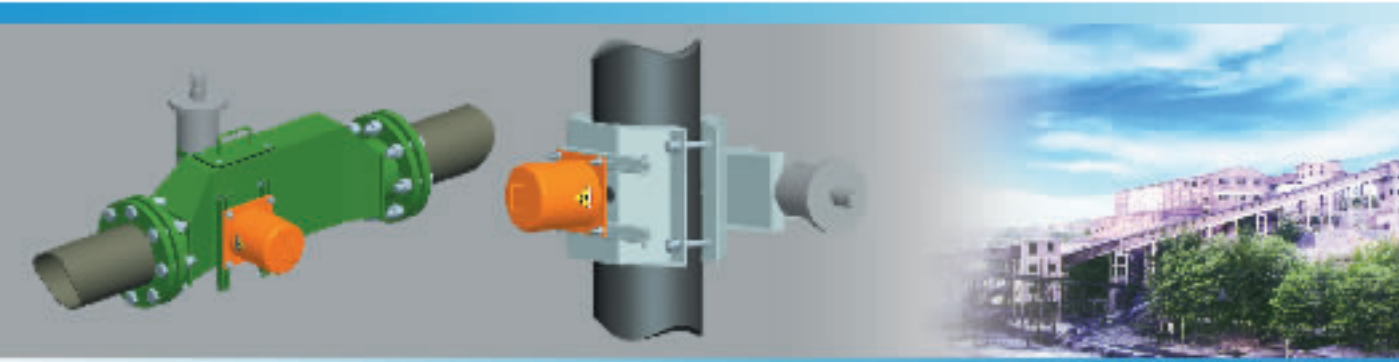


DF-5420

Online Concentration(Density)Meter



丹东东方测控技术股份有限公司
Dandong Dongfang Measurement & Control Technology Co., Ltd.

公司简介 Company Profile

Established in 1996, Dandong Dongfang Measurement & Control Co., Ltd. features the largest company specialized in mine automation in China with the highest market share. In addition, it is also the biggest inline industrial detection instrument manufacturer in Asia and one leading enterprise in National Digitalized Mine Program in China.

The company features a hi-tech company combining instrument and apparatus research and development, software development and system integration together, offering production informatization solutions and carrying out whole-process automation for industrial production processes in metallurgical, mine, building materials, paper-making, chemical, coal and other industries. It has acquired 48 patents, with the technologies covering GPS scheduling, CIS (geographic information system), neutron activation, X-ray fluorescence, nuclear magnetic resonance, ultrasound, infrared, micro-wave, radar, digitalized mine, ERP, MES, dust elimination and other fields.

For years, the company has persisted in independent innovation and successively produced 72 kinds of online detecting and analytical instruments and over 50 measurement and control systems in 12 categories at advanced level in the world, which have been widely used in more than 200 mine enterprises in the country. In the ore dressing automation engineering field, it holds over 90% of the market share.

As one state-level hi-tech enterprise, the enterprise witnesses that the leaders of municipal and provincial governments and the state have attached great importance and given energetic support to its development. Member of the Standing Committee of the Political Bureau of the Central Committee of the CPC and Premier of the State Council Li Keqiang and President of Chinese Academy of Sciences Bai Chunli, etc. have successively made inspection in the company and presented their valuable advice.

Product Overview

DF-5420 online concentration(density)meter is used for online detection and control of the density and concentration of various materials and liquids in industrial processes. The concentration, content as well as the matching ratio of two kinds of materials, etc. can be indirectly measured by density, such as detection and control of the concentration of crude ore, concentrate and tailings in ore dressing, detection and control of the density of floating liquid in coal washeries, determination of the concentration of various solutions and liquids as well as density and water content of oil products in oilfield and petrochemical processes, online detection of the concentration of acid, alkali and salt as well as the matching ratio of different ingredients in saltworks and various chemical plants, determination and control of paper pulp concentration in paper-making plants, determination of sand content in the water flows of rivers, etc.

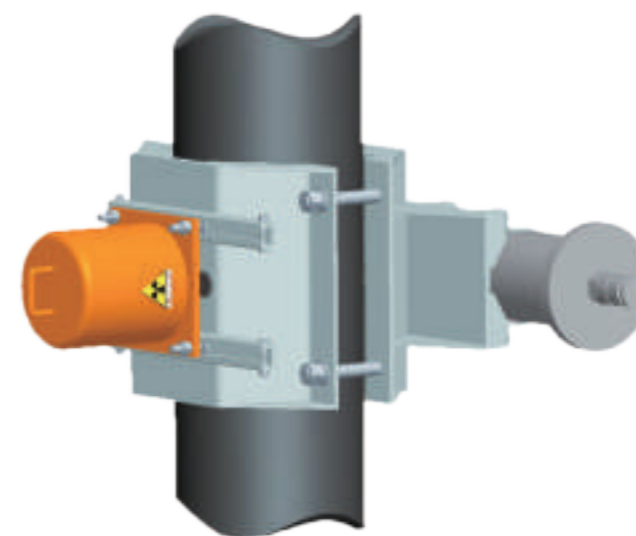


Fig. 1-1 DF-5420 online concentration (density) meter

Product Structure

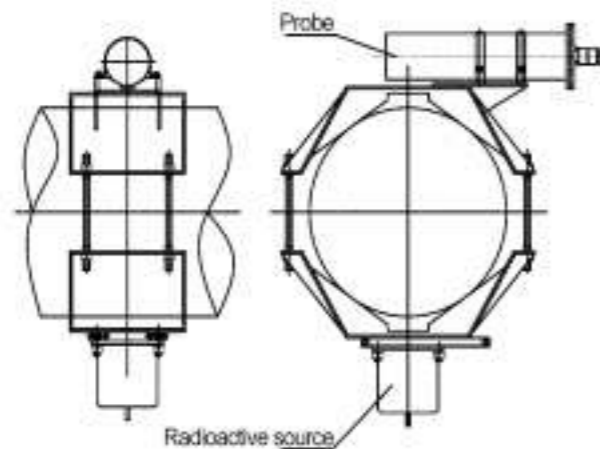
The basic composition of concentration meter includes measuring unit, ^{137}Cs detector, ^{137}Cs radioactive source and main unit.

1. Measuring unit

The measuring unit of concentration meter is determined depending on different measurement process conditions, which is divided into clamp device, variable diameter device, chute device and immersion device.

Clamp device

The clamp device is to directly clamp the detector and radioactive source outside the industrial pipeline with long bolt, as shown in the following figure:



Clamp type concentration meter

The device is suitable to be installed on the ore feeding pipelines.

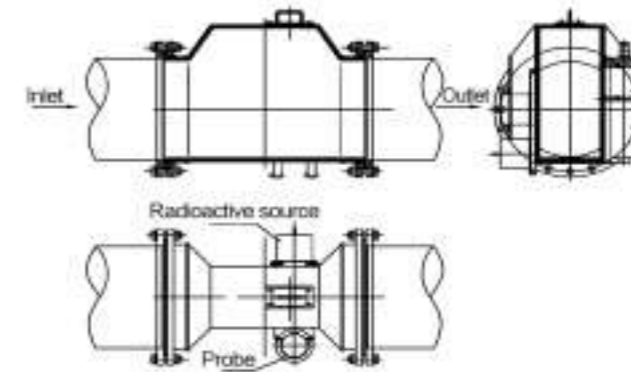
Advantages: It is not necessary to transform the pipelines at site, making installation convenient and fast.

Shortcomings: If this kind of concentration meter is installed on thick pipelines, radioactive sources with larger dose shall be chosen. It is not suitable for the pipelines with lower filling rate or greater liquid level fluctuation.

Variable diameter device

Variable diameter device is specific variable diameter device made according to the size of pipe

diameter. It is fixed on the pipeline by flange, and then detector and radioactive source are fixed thereon. It is used to elevate the liquid level, so that rays can pass through stable ore pulp streams and radiate the detector, as shown in the following figure:



Variable diameter concentration meter

This device is suitable to be installed on the pipelines with low ore pulp filling rate or great liquid level fluctuation.

Advantages: It makes up the shortcomings of clamp device, and can be installed on the pipelines with low ore pulp filling rate or great liquid level fluctuation. Radioactive source with small dose can be chosen.

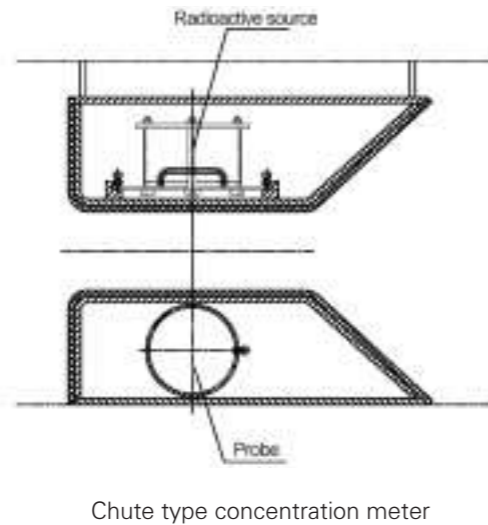
Shortcomings: The pipelines at site shall be altered, and electric welding will be used. The installation is relatively complicated.

Chute device

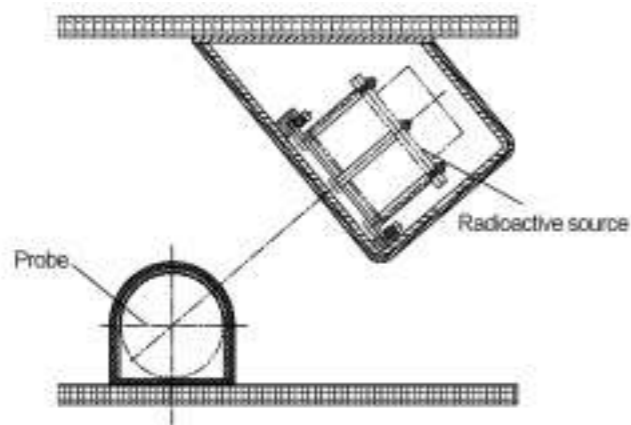
Chute device features one kind of fairly special device. There are chutes under the classifier in general. If there is no pipeline suitable for installing the concentration meter under the classifier, the concentration meter shall be installed in the chutes.

The chute device is divided into two categories, i. e. the one suitable for relatively wide chutes and the one suitable for narrow chute. This device is greatly influenced by radioactive source. Radioactive source with small dose can be used, but there are high requirements on the size of radioactive source. Generally, radioactive source with small size is chosen.

The wide chute device is shown as the following figure:



Narrow chute device is shown as the following figure:

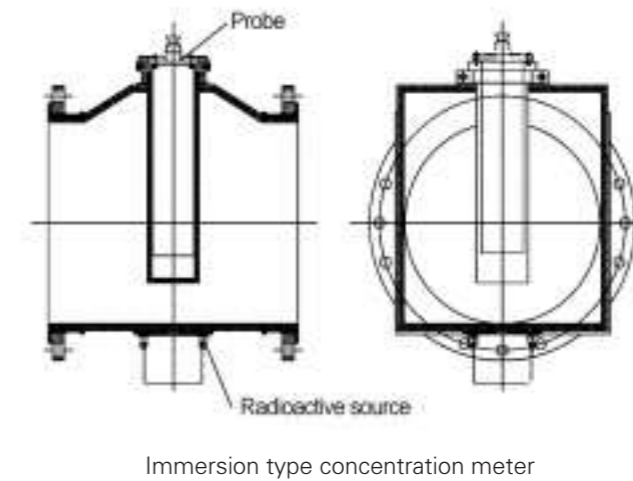


In case of narrow chute device, radioactive source can be placed outside the chute. Chute device can realize the installation of concentration meter under an environment other than pipeline, so that the users' demands can be met.

Immersion device

It is used for pipelines with large diameter (more than 500mm). If clamp device is installed, radioactive source with relatively large dose shall be chosen, and even radioactive source with larger dose (hereinafter referred to as Cs-137) cannot meet the measurement requirement; if

variable diameter device is chosen, the weight of device will be very big, making it not easy for installation and maintenance and bringing unstable factors to site pipelines. As a result, it is suggested installing immersion device, as shown in the following figure:



2. Signal detector

Main function: To receive the γ rays passing through the measurement pool, and then convert them into pulse signals and output to the upper computer. It is installed inside the measuring unit.



3. Radioactive source

Radioactive source is γ ray generation device, and by making use of γ rays generated by the radioactive source, online detection can be achieved.

The protection measures and radiation level of radioactive sources used by the company: as for dose, there is an essential distinction between radioactive sources for instrument use and those for medical use. The purpose of instrument is to detect whether there are rays. In particular, the probe with modern high sensitivity has greatly reduced the intensity of radioactive sources, and the radiation intensity of radioactive sources used has been almost reduced to natural background level.

The activity of radioactive sources used by the company is over one million times lower than that of radioactive sources for radiation processing and medical use.

As stipulated by the state, radioactive sources for instrument use shall be strictly sealed and safe.

Preparation of radioactive sources used for this instrument completely meets national standards.

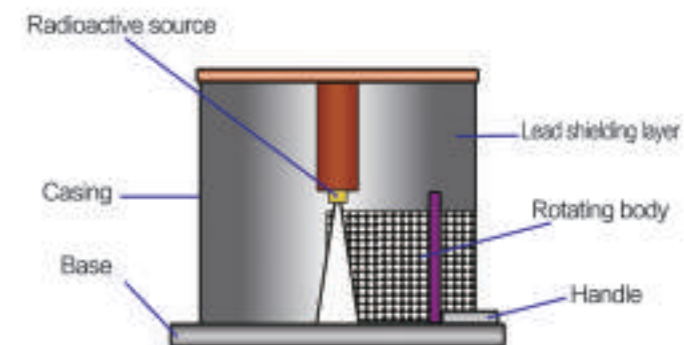
Its preparation process is as follows: the radioactive matter is firstly sintered into a ceramic core that doesn't leak water; the core is sealed by double-layer stainless steel casing through welding, so as to ensure that there is no leakage of any radioactive substance; thick enough lead is wrapped outside the casing to shield the rays, so as to reduce the radiation intensity to permissible level. An iron casing is set up outside the lead, so that no leakage of any radioactive substance occurs at any time. A rotating body with aligning hole is set up on the lead shield. The rays are constrained in a narrow range of the beam aperture and radiate the detector upon working. In case of inactivity or transportation, the beam aperture can be shut off by turning the rotating body. At the on-off position of the rotating body, there is an obvious mark and a lock as well, so as to ensure safety; there is a fully sealed iron container outside the lead shield and rotating body, so as to ensure that the rotating body and source core won't fall out of the shielding container.

The dose equivalent around all radioactive sources used is less than $2.5 \mu\text{ Sv/h}$. The total exposure dose of working personnel who stay here for 8 hours a day and for one consecutive year (per 300 days) is less than 5 mSv , which is lower than the permissible dose limit for public. Such dose equivalent is only equal to one tenth by X-ray examination once. As stipulated by the state, the place where the dose rate is less than $2.5 \mu\text{ Sv/h}$ shall be non-radioactive working place.

The radioactive source is ^{137}Cs , with an activity of 5 to 100 mci.

Straight aligning hole is adopted for the follower of radioactive source, so as to output parallel rays.

Lead or depleted uranium is adopted as the shielding material of moderate-energy radioactive source follower. It is unnecessary to use lead for the shielding container of low-energy radioactive source, and copper can be used as shielding material, which is enough to shield the low-energy rays at permissible level.



Basic structure of radioactive source

4. Main unit

The main unit part includes IPC, display, signal transmitter, counting board used for gathering signals and D/A board used for outputting signals. The role of the main unit is to gather the signals transmitted by the detector, display the concentration and density by software computation, and then deliver 4–20mA signals that are involved in control.

Working principle

The online concentration tester adopts advanced online ray testing technology and contactless measurement method, and is suitable for use in various process environments. It can attain continuous, real-time and online testing and long-term stable operation. It has reliable performance and high test accuracy.

The operation of series DF-5420 concentration meter is based on the principle of the absorption effect of matters on γ ray. Shielding containers for radioactive resources and ray detectors are directly mounted on both sides of industrial piping to be measured. The radioactive sources are housed in a lead container. There is a rotary aligning hole in the lead shield. γ rays penetrate liquid materials through the aligning hole and then are received by the detector. The signals are sent from the detector to the meter body via cables and then processed.

Technical Parameters

- Measuring range: 0~100% (for concentration)
- Pipe diameter (liquid layer thickness): $\Phi 80\sim 500\text{mm}$;
- Basic error: $\pm 0.1\%\sim 1\%$ of the measuring range (depending on site conditions and range)
- Long-term stability and repeatability of ray counting rate: 0.1%;

Product Features

- The contactless measurement method ensures that the detector is mounted outside industrial piping or equipment and therefore is not influenced by material viscosity, corrosion, high temperature, high pressure, wear and other extreme conditions. The meter can attain long-term, stable and reliable operation and has long service life.
- The measurement result is interfered by few factors. Any environmental factors, material flow velocity and temperature have no effect on density or concentration;
- The use of sensitive and efficient flash detector greatly reduces the intensity of radioactive sources required and ensures radiation safety of the meters.
- The innovative automatic peak stabilization technique can automatically compensate for meter drift caused by temperature variation or component aging, etc. and ensure extremely high stability.
- One IPC can be connected with 16 sets of concentration meters and standard signals of 4~20mA are sent out, thus making it easy for maintenance and management and saving costs.
- There are a lot of concentration meter measurement devices suitable for various site environments, thus greatly meeting the demands of clients.



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