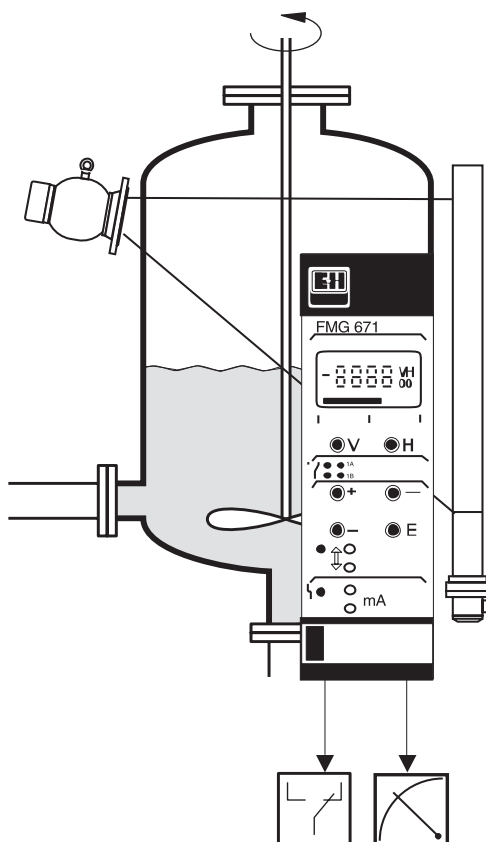


gammasilometer **FMG 671 (P)** **Level Measurement**

Installation and Operating Instructions



Short Instructions for Use

Matrix position

Measured value

Bar chart

Matrix selection

Relay status
red: de-energised
green: energised

Parameter entry

Commulog
sockets

Alarm LED lit:
fault

Test sockets for
4...20 mA output

FMG 671

- 00000VH

0000000

0

50

100

V

H

L1

1A

1B

+

→

-

E

↕

↕

+

mA

-

V

H

V + H

→

→ + +

+

-

E

Selects vertical matrix position

Selects horizontal matrix position

Select position V0H0

Select next digit

Move decimal point

Increases value of digit

Decreases value of digit

Registers entry

For operating elements see Chapter 3

For operating matrix see Chapter 8

L00-FMG671x-07-00-00-en-001

Quick configuration for Cs137 source and DG 57 mounted with PMT at bottom*

Function	Matrix	Action
Check detector no. on label	V7H1	• Cs
Reset transmitter	V9H5	• Enter 671: see above for key functions Press »E« to register entry
Calibrate	V3H0 V3H4 V0H1 V0H2 V3H9	• Enter 4 to select standard calibration with background calibration Press »E« to register entry • Enter calibration date: year (1 = 2001), week (01...53) weekday (1=Monday etc.) • Press »E« to register entry • With vessel empty (wait 100s) Press »E« to register entry • With vessel full (wait 100s) Press »E« to register entry • With radiation off and vessel full (wait 100s) Press »E« to register entry
Analogue output (default values) Relays (default values)	...	• 4 mA = 0%, 20 mA = 100% level • Relay 1 is set automatically to minimum fail-safe mode Switch-off point 10%, switch-on point 90% • Relay 2 to maximum fail-safe mode Switch-off point 90%, switch-on point 10%

*Measuring system must have been in operation (source switched on or off) for at least 6 hours before calibration

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Revision Index

Software	Issue	Changes
1.x	11.94	Original
2.x	06.95	Cascade operation, Chapter 5, corresponding revisions in Chapters 1...4 and 6. EMV requirements for CE mark Technical data moved to Section 1.5
3.x	02.96	Gammagraphy, Chapter 6, corresponding revisions in Chapters 1...5 and 7 Chapters renumbered As far as uploading and downloading from a computer is concerned, Software Version 3.x is not compatible with earlier versions.

Notes on Safety

Approved usage

The Gammasilometer FMG 671 is a transmitter for continuous level measurement in industrial environments which can be used with a variety of radioactive sources (in source containers) and detectors. It has been designed to operate safely in accordance with current technical and safety standards. It must be installed by qualified personnel according to the instructions in this manual and local radiation protection regulations.

The manufacturer accepts no responsibility for any damage arising from incorrect use, installation or operation of the equipment. Changes or modifications to the equipment not expressly approved in the operating manual or by the bodies responsible for compliance may void the user's authority to operate the equipment.

Radioactive sources

Radioactive isotopes are used as sources for level detection by gamma radiation.

In practically all countries, the handling and operation of radioactive sources is governed by strict regulations which are enforced by a national radiation protection board. Authorisation, which usually includes a requirement for personnel specially trained in radiation protection, must be obtained from this board before the equipment enters the factory.

The source container must be switched off at all times during installation and maintenance of the measuring system as well as when maintenance work is required within the tank being measured.

If you are in any doubt as to the regulations in your country, call your E+H sales office or representative - they will be glad to help you further!

Endress+Hauser radiometric systems are designed, manufactured and shipped with special regard to German and International radiation safety regulations. Original radiometric systems are normally delivered equipped with double-encapsulated sources of ^{137}Cs or exceptionally ^{60}Co , both complying with DIN 24426/ISO 2919 classification 66646. This is acknowledged as the highest safety classification for industrial source containments.

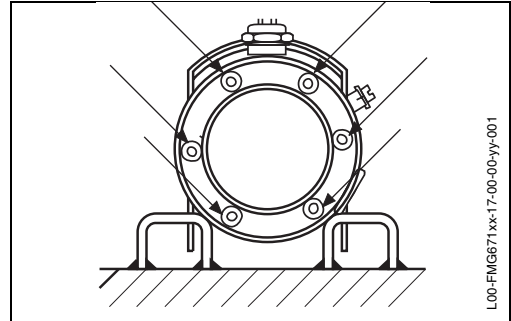
Certificates

The transmitter and ancillary equipment are available with certificates of conformity for use in hazardous locations. The table below indicates the combinations available and conditions for installation. Full details can be taken from the certificates. Please note that where quoted technical data differs from that in Section 1.5, that in the certificate applies.

Certificate	Instruments	Notes
PTB 99 ATEX 2089	Gammasilometer FMG 671	ATEX II(2)GD / [EEx ib] IIC, s. Safety instructions XA 055F-C
PTB Nr. Ex-94.C.1019 ATEX 1104	DG 57-A... DG 57-H... DG 57-M...	ATEX II 2 G/EEEx d ib IIC T6 ATEX II 2 G/EEEx d IIC T6 ATEX II 2 G/EEEx de IIC T6 s. Safety instructions XA 057F-A
DMT 01 ATEX E 093	DG 57-D...	ATEX II 2 D IP65 T 60 °C s. Safety instructions XA 112F-A
PTB Report 6.62-1972/1 (^{60}Co) PTB Report 6.22-1991 (^{137}Cs)	QG 020	Report on local dosage measurement on source container
PTB Report 6.62-1972/2 (^{60}Co) PTB Report 6.22-1993 (^{137}Cs)	QG 100	
PTB Report 6.32-2005 (^{60}Co)	QG 2000	

**Warning!**

Do not unscrew the Allen screws which hold the protective steel tube and detector head together. Removing these screws will destroy the explosion protection of the detector electronics!

**Safety conventions**

In order to highlight safety-relevant or alternate operational procedures in the manual, the following conventions have been used, each indicated by a corresponding icon in the margin.

**Note!**

A note highlights actions or procedures which, if not performed correctly, may indirectly affect operation or may lead to an instrument response which is not planned.

**Caution!**

Caution indicates actions or procedures which, if not performed correctly, may lead to personal injury or incorrect functioning of the instrument.

**Warning!**

A warning indicates actions or procedures which, if not performed correctly, will lead to personal injury, a safety hazard or destruction of the instrument.

1 Introduction

Operating Manual

The operating manual must have been read and understood before the equipment is installed. The operating instructions are structured as follows:

- Chapter 1: Introduction;
contains general information including application, measurement principle, functional description and technical data.
- Chapter 2: Installation;
contains instructions on the installation of the radioactive source, DG 57 detector, Gammasilometer FMG card, hardware configuration and connection diagrams.
- Chapter 3: Controls;
describes operation with the front panel keys, Commulog VU 260 Z and ZA 67... gateways.
- Chapter 4: Calibration and Operation;
tells you how to commission and operate the Gammasilometer for level measurement and set the analogue outputs and relays
- Chapter 5: Cascade Mode;
describes the cascade mode which allows measurement with two DG 57 detectors,
- Chapter 6: Gammagraphy;
describes the gammagraphy detection mode
- Chapter 7: Trouble-Shooting;
contains a description of the self-checking system with error messages, the simulation feature as well as instructions for configuration on replacement of the transmitter, source or detector.
- Index: lists key words to help you find information quickly.

Short instructions

The front cover contains short instructions for the standard set-up, level measurement, using the Gammasilometer FMG 671, DG 57 and Cs 137 source.

Further documentation

In addition to this manual, the following publications provide information on configuration of the Gammasilometer FMG 671:

Publication	Instrument
TI 264F	Source Container QG 020/100, Standard design
TI 194F	Source Container QG 020/100, Chemical, European and Swedish designs
TI 346F, BA 223F	Source Container QG 2000
TI 180F	Scintillation Detectors DG 57
TI 213F	Gamma sources
BA 028F	Commulog VU 260 Z handheld terminal
BA 054F	ZA 672 Modbus Gateway
BA 073F	ZA 673 Profibus Gateway
BA 085F	ZA 674 FIP Gateway

The installation of the radioactive source and detector is described in the documentation accompanying these articles as well as briefly in Chapter 2.



Note!

When installing detectors in explosion hazardous areas the instructions included in the accompanying certification must also be observed.

1.1 Application

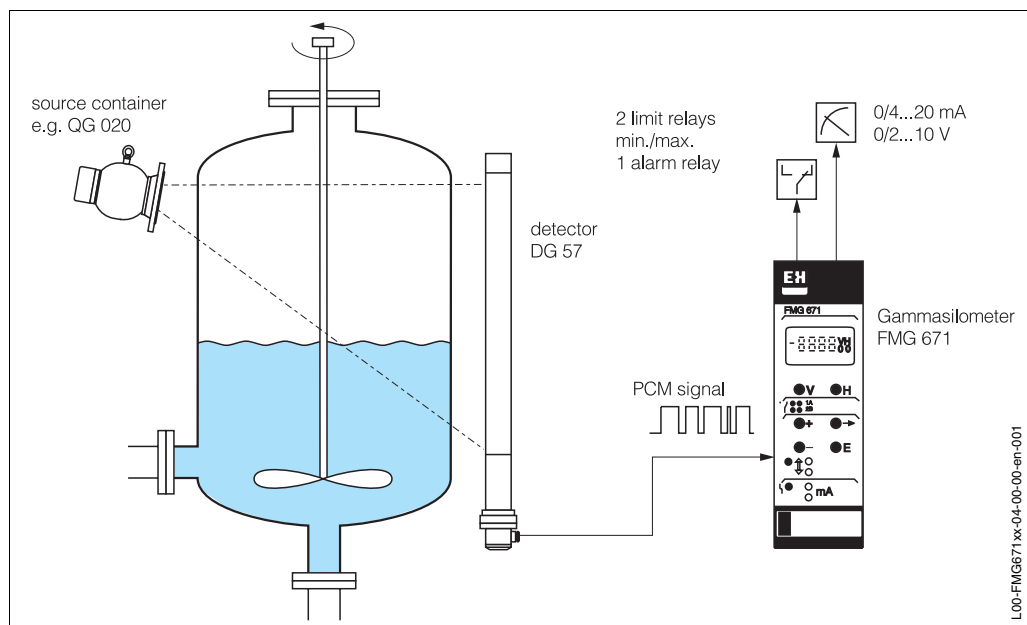


Fig. 1.1 Standard application showing Gammasilometer FMG 671, source and detector

The Gammasilometer FMG 671 is designed as a non-contact, level measurement transmitter for containers (mixers, reactors, hoppers, silos, tanks) e.g. with inflammable, poisonous and aggressive bulk material and liquids. It is also suitable for applications in the food processing industry.

Gammasilometer transmitters may also be used for applications in explosion hazardous areas, e.g. in acid tanks, boilers, cement silos etc., and possess intrinsically-safe sensor circuits conforming to [EEx ib] IIC / ATEX II (2) G. A list of certified combinations is to be found in »Notes on Safety« preceding this chapter.

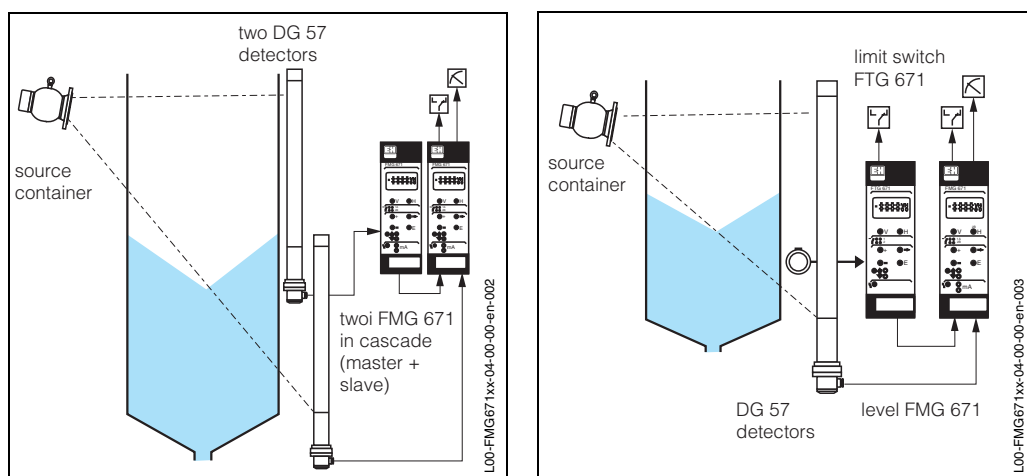


Fig. 1.2 left: Measurement with two detectors: both detectors are controlled by a Gammasilometer FMG 671 P transmitter (Chapter 5)

right: Measurement with automatic calibration correction. The external limit switch is e.g. a Gammapiot FTG 671 with a DG 57/100 detector or DG 17/27 GM-tube

1.2 Measuring system

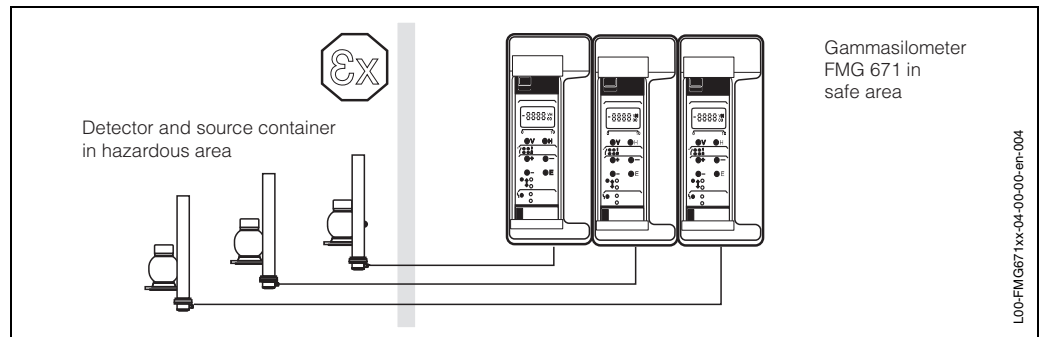


Fig. 1.3 Gammasilometer FMG 671 row mounted in Monorack II housing

A working system for level measurement comprises:

- Gammasilometer FMG 671 transmitter,
- QG 020, QG 100 or QG 2000 source container with ^{60}Co or ^{137}Cs gamma source
- DG 57 scintillation detector.

The Gammasilometer may operate as a stand-alone or system unit. In addition to the display on the front panel, the transmitter has two level proportional 0/4...20 mA and 0/2...10V analogue outputs as well as two limit relays which can be used to operate follow-up instrumentation. An alarm relay monitors the correct functioning of the measurement point and trips on fault condition.

If controlled remotely with other Commutec transmitters within a process control system, the Gammasilometer is addressed via the Rackbus. In this case, communication is controlled by a ZA 67... Gateway which converts Rackbus data into the appropriate network protocol. The Gammasilometer can be remotely configured, its measured data and status scanned and its settings up- and downloaded through the Gateway.

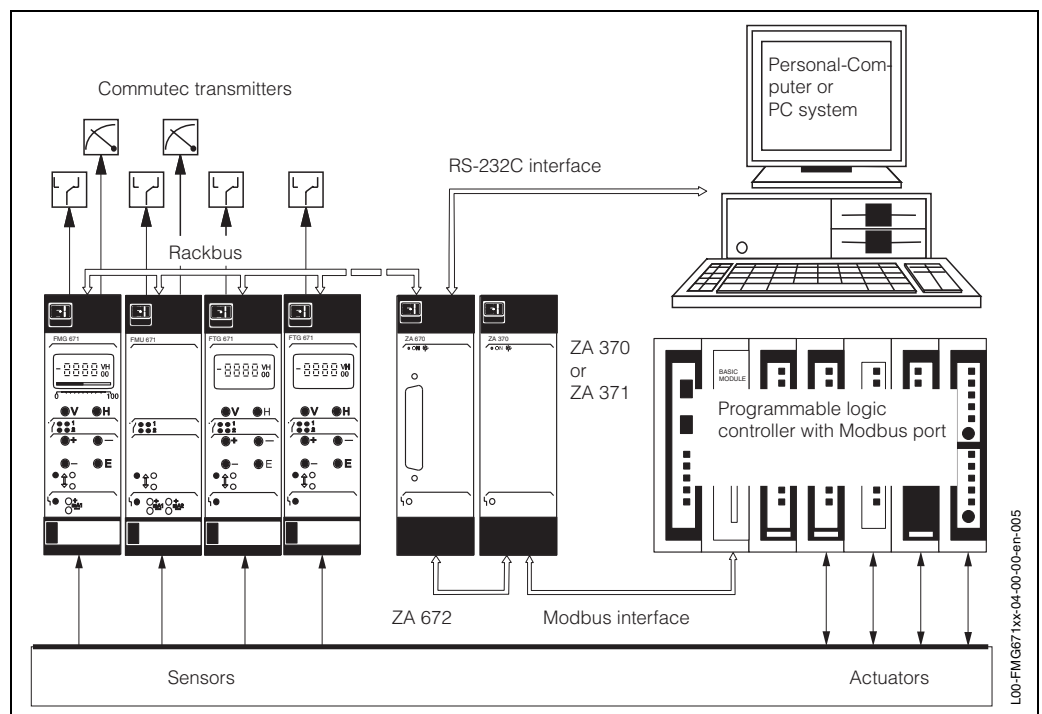


Fig. 1.4 The Gammasilometer FMG 671 can be used as part of a process control system. Here it is shown with other Commutec transmitters and the ZA 672 Modbus Gateway

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