

# When the level matters

Continuous level control and point level detection



## Overview

# Always the right technology for you

GF Piping Systems offers a wide range of technologies to measure levels in tanks either continuously or to detect point level thresholds. Due to the high diversity of process liquids and types of vessels, different methods are required to keep control of fluids – not only in piping systems but also in tank applications.

### + Comprehensive

Complete offering of proven technologies and materials to cover individual requirements of each tank application. GF offers all components to design filling control systems from water to chemical tanks.

### + Easy

Integration is easily done thanks to universal interfaces. Simple commissioning onsite via display or PC configuration tool. One partner to cover all your requirements in tank level measurement.

### + Economical

Long lifetime assured. Industrial standard electronics, non-contact technologies embedded in high performance materials such as PP, PVDF, PTFE, PPS or stainless steel ensure long term reliable tank control.

## GF has the variety – you have the choice

#### Guided radar level transmitter

⊕ Type 2291

#### Radar level transmitter

Type 2298 ⊕

#### Conductive multipoint switch

⊕ Type 2281

#### Ultrasonic level transmitter

Type 2260 / 2270 ⊕

#### Ultrasonic gap switch

⊕ Type 2284

#### Hydrostatic level sensor

Type 2250 ⊕

#### Float switch

⊕ Type 2285

#### Vibration fork

Type 2280 ⊕

#### Ultrasonic gap switch

⊕ Type 2284

#### Vibration fork

Type 2280 ⊕





## Continuous level control

For continuous tank level detection, GF offers a variety of measurement technologies. Depending on application requirements and characteristics of the process liquid, either a non-contact or contact device can be utilized. GF level sensors provide accurate level information through analog or digital signals to ensure easy interfacing with programmable logic controllers (PLC).

### Main applications

- Inventory management
- Batching and dosing processes

### Special application feature

- Open channel flow measurement (Type 2260, 2270 & 2298)



## Point level detection

To maintain full control over the liquid level in tanks, point level switches can be used for a physical detection of critical filling levels. These instruments provide additional safety and control. They are often installed together with a continuous level sensor as a back-up system. They can also be used to directly control filling and emptying process.

### Main applications

- Overfill protection
- High and low level alarms
- Pump control
- Dry-run protection for pumps

### Special application feature

- Leakage detection in double containment piping systems or double-wall tanks



Continuous level control

# Radar technology

## The direct line if things get rough

### Guided radar level transmitter type 2291

In vessels containing heavily agitated liquids or dense foam layers, the contacting guided radar is the even more reliable choice.

### + Features

- Reliable in agitated liquids and heavy chemical fumes
- Great performance with low dielectric liquids and foams
- Large LCD display
- High-performance coatings available to protect contacting probes from liquid
- Ideal for compact tanks

### + Specifications

<b>Measured values</b>	Level, distance; calculated dimensions: volume, mass
<b>Accuracy</b>	+/- 5 mm (0.2 inch), +/- 0.05 % of probe length
<b>Measuring range</b>	0.3 m - 6 m (11.8 inch - 236.2 inch) (process liquid) extended ranges available upon request
<b>EX approvals</b>	ATEX, IECEx
<b>Sensing field</b>	ø 600 mm (23.6 inch)
<b>Process isolation</b>	FEP, PFA, PP coated



### + Details

#### Wetted part

##### Cable

- Stainless steel
- Optional: FEP coated

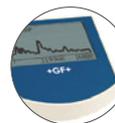


##### Optional: rod

- Stainless steel
- Optional: PFA or PP coated



#### Display



- Dot matrix LCD plug-in display
- Menu text based configuration
- Graphical illustration of reflection curve

#### Housing PBT plastic housing IP67

#### Outputs 2 wire 4-20 mA / HART



The radar principle is the most advanced measuring technology to measure tank levels even in challenging conditions such as in chemical fumes, pressurized tanks or light foams. Electromagnetic waves emitted by an antenna travel through the tank unaffected by fumes, changes of pressure, density, viscosity or temperature. In addition to this, radar beams have the ability to penetrate slightly conductive foams. Radar is widely unaffected by process conditions.



## Stay in touch

### Non contacting radar level transmitter type 2298 – 80 GHz

Non-contacting radar is favored due to its safety and long-term reliability.

### + Features

- Most advanced non contact technology (E-Band)
- LCD plug in display
- Precise results within +/-2 mm (+/- 0.1 inch)
- Selected process parameterizations
- Easy volume calculation thanks to pre-defined tank shapes
- Customizable 99 point linearization

### + Specifications

<b>Measured values</b>	Distance; Calculated Values: Level, Volume, Mass, Flow, Open channel flow
<b>Measuring range</b>	0.07m – 30m* (depending on dielectric constant $\epsilon_r$ of the process liquid) Minimum dielectric contact of process media $\epsilon_r$ 1.9
<b>Resolution</b>	0.1 mm (0.04 inch)
<b>Power supply voltage</b>	20 V ... 36 V DC, 24 V DC nominal
<b>Antenna diameter</b>	1" (25.4 mm)*; 1 1/2" (38.1 mm)
<b>Antenna material</b>	PP / PVDF / PTFE* / stainless steel*

\*on request



<b>Process connection</b>	1 1/2" BSP, 1 1/2" NPT" thread, 1"
<b>Accuracy</b>	+/- 2 mm (+/- 0.1 inch)
<b>Frequency</b>	80 GHz (W-Band)
<b>Communication certifications</b>	R&TTE, FCC
<b>Output</b>	2 wire 4 - 20 mA / HART® communication protocol
<b>Approvals</b>	  

### + Details

#### Wetted part PP (Polypropylene)

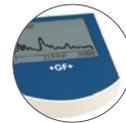
Further wetted part options:  
PVDF, PTFE, Stainless Steel



Also available in a blind version

#### Display

- 64x128 dot matrix LCD plug in display
- Comprehensive, text based configuration menu
- Graphical illustration of reflection bar graph to ease onsite setup



#### Housing

PBT plastic housing IP67 / NEMA 4x

#### Outputs

2 wire 4-20 mA / HART communication protocol



Continuous level control

# Ultrasonic technology

## Fundamental level control

### Non-contacting ultrasonic level transmitter type 2260 / 2270

The robust proven is the right choice in numerous tank applications. Easy installation, reliable operation.

#### + Features

- Non-contact
- Large LCD display (2260)
- Precise results +/- 3 mm (0.12 inch)
- Selected process parameterizations
- Easy volume calculation due to pre-defined tank shapes
- Customizable linearization curve to measure volumes of tanks with exceptional geometries

#### + Specifications

<b>Measured values</b>	Distance, level, volume, mass, open channel flow rate
<b>Accuracy</b>	+/- 0.2 % of measured distance + 0.05 % of range
<b>Measuring range</b>	0.2 – 15 m, special units up to 24 m on request
<b>Resolution</b>	2 mm (0.08 inch)
<b>Power supply voltage</b>	12...36 V DC
<b>EX approvals</b>	ATEX



#### + Details

##### Display version

Type 2260

##### Display plug in

##### Housing

PBT plastic housing IP67 / NEMA 4x

##### Compact beam angle

Only 5 - 6 degree

##### Wetted materials

PP or PVDF

##### Rugged blind version

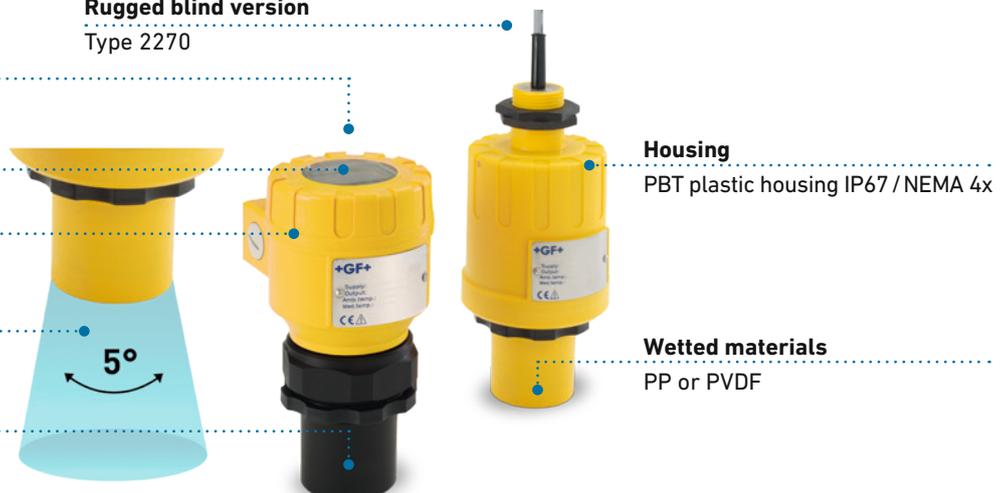
Type 2270

##### Housing

PBT plastic housing IP67 / NEMA 4x

##### Wetted materials

PP or PVDF





This principle is based on the velocity of ultrasonic sound. Top-mounted, the sensor head emits a ultrasonic time taken impulse. The transit time of this burst is either reduced or extended and is proportional to the tank level. Since the speed of sound in air is fixed, an accurate calculation of the tank level can be made.

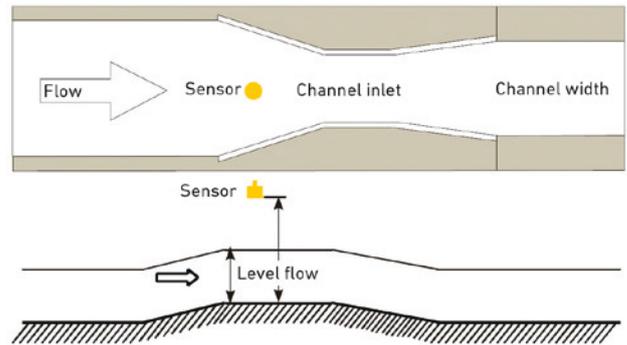
- Most economical non-contacting solution to detect tank levels
- No re-calibration required
- Additional feature: Flow measurement in open channels

## + Open channel flow

GF ultrasonic level sensors are also widely used to derive flow rates from the level measurement in open channels. The level of the media as it passes through an open channel is proportional to the flowrate. Knowing the channels dimensions allows a precise calculation of the flow.

Special feature exclusively available for ultrasonic sensors type 2260 & 2270:

- 13 different standard pre-defined channels such as parshall flume, thomson weirs, palmer-bowlus or rectangular weirs
- 2 internal flow totalizers
- Programmable pulse volumetric relay to indicate flow rate to a PLC system



Continuous level control

# Hydrostatic technology

## High-end hydrostatic level sensor

**Submersible hydrostatic level sensor type 2250 and side-mount type 2450**

Unaffected by foam layers, agitation or chemical fumes.

Superior chemical compatibility.

### + Features

- High performance materials PVDF, ceramic & FKM
- Current or digital interfaces
- Submersible or side mount
- Flush ceramic diaphragm
- Highly sensitive sensor detects small changes of level
- Enhanced circuitry to eliminate sensor drift

### + Specifications

<b>Measures values</b>	Level, pressure
<b>Measuring range</b>	0-7 m, 0-35 m (0-23 ft, 0-115 ft)
<b>Accuracy</b>	+/- 1 % FS
<b>Power supply voltage</b>	12... 24 V DC
<b>Approvals</b>	CE, FCC

### + Details

#### Type 2450 side-mount

With type 9950

SmartPro transmitter



#### Diaphragm

Chemically resistant ceramic

#### Outputs

4-20mA / HART communication protocol



#### Sensor body

One-piece injection molded PVDF



#### 2550 submersible level sensor

With PVC-U union end allowing easy customizing of a submersible conduit



Mounted through the tank wall or submersed from the top of the tank, a hydrostatic sensor measures the weight of a fluid column. The change and therefore the pressure at the sensor is proportional to the change in the tank level. A capillary tube in the cable ensures that changes of the atmospheric pressure can be compensated.



- Hydrostatic level = height x specific gravity
- Robust level technology
- Easy to use
- Can handle a wide range of liquids in vented tanks
- Detects slightest changes in level accurately

## + Unaffected by harsh conditions

The 2250 hydrostatic level sensor is the solution for difficult applications where the process environment is extremely harsh, as for example in the electroplating industry. The surface treatment of the final product takes place in various immersion baths holding different chemical solutions. The levels of the holding tanks need to be maintained very accurately, for this reason the tanks may be covered to prevent evaporation and the electrolyte level is maintained using the 2250 sensor. The key advantage of the 2250 hydrostatic level sensor over the non-contacting level sensors is the non-conductive one-piece injection molded PVDF body which does not interfere with the plating process.

### Benefits

- Great chemical resistance in the corrosive process solution due to one-piece injection molded PVDF body and ceramic diaphragm
- Non-conductive sensor assembly does not interfere with the plating process
- Easy submersible application
- Accurate level of solution in the closed tank displayed on 9950 multi-parameter transmitter



# Technology

## Get peace of mind – redundant safety for your tank application

GF offers a carefully selected range of point level switches. Different process conditions require dedicated working principles and wetted materials of excellent quality. Point level switches ensure a safe control of industrial tanks.

### + Benefits

- **Reliable operation**  
Choose the most suitable working principle for your application
- **Long lifetime**  
Select from a variety of materials to ensure long-term reliability even in corrosive environments
- **Excellent cost-benefit ratio**  
A range of solutions from simple float switches to more advanced technologies allows you to choose the right product for your application

### + Product overview

#### 2280 Swing forks



Principle: Contact to liquids dampens the vibrating fork which activates the alarm contact

#### Advantages

- Proven method
- PFA coating available
- No moving parts, maintenance free
- Easy wiring. Open collector or current output
- ATEX certified



Specifications	
Sensor material	Stainless steel 1.4571
Output	3-wire PNP / NPN, 2-wire AC, relay
Connection	Cable, DIN plug, terminal box
Approvals	CE, ATEX, WHG
Process connection	1" BSP, 1" NPT

Point level sensors have to be robust and reliable to act quickly in the case of an emergency. These sensors build a redundant back-up system to complement the continuous level sensor installed. If the continuous control system fails, the point level switch is able to prevent overfilling of a tank or protect pumps from running dry.



## 2281 conductive multipoint switch



Measures conductive process liquids. At desired levels the media acts as transmission media for a low-voltage. This way a relay provides point level feedback.

### Advantages

- Easy onsite installation and length adjustment
- One sensor providing up to 4 point levels
- Economical solution
- PE coating available
- Allows complete filling and emptying control of a tank

Specifications	
Sensor material	Stainless steel PP
Output	External relay
Connection	Cable, terminal box
Approvals	CE
Process connection	1 ½" BSP, 1 ½" NPT

## 2282 guided float switch



The switch is mounted on the side of the vessel. A hinged plastic float with a magnet floats up and down through the liquid level. The encapsulated reed contact is operated by the magnet.

### Advantages

- Full plastic PP or PVDF
- Compact design
- Optimized for small vessels
- High or low level activation

Specifications	
Sensor material	PP, PVDF
Output	Reed contact
Connection	Cable
Approvals	CE
Process connection	½" BSP, ½" NPT

## 2284 ultrasonic gap switch



The process liquid fills the gap which allows an ultrasonic pulse to pass between both fork arms. This activates the switch.

### Advantages

- Full plastic PPS housing
- Reliable even in high viscosities

Specifications	
Sensor material	PPS
Output	Relay
Connection	Cable, terminal box
Approvals	CE
Process connection	¾" NP T, 1" BSP, 1" NPT

## 2285 float switch



The type 2285 floats on top of the fluid being measured due to its relative density being less than that of water. The level switch is triggered when the internal contact reaches the +/- 45 from horizontal switching angle.

### Advantages

- Double chambered PP body
- Lead free microswitch for use in drinking water

Specifications	
Sensor material	PP
Output	Microswitch
Connection	Neoprene cable
Approvals	CE

Modularity

# Bring it all together

## Centralized tank control with the 9950 SmartPro transmitter

The modularity of the 9950 SmartPro not only allows it to display current tank levels but also to control a pump or a valve in emergency to prevent over or under filling conditions.

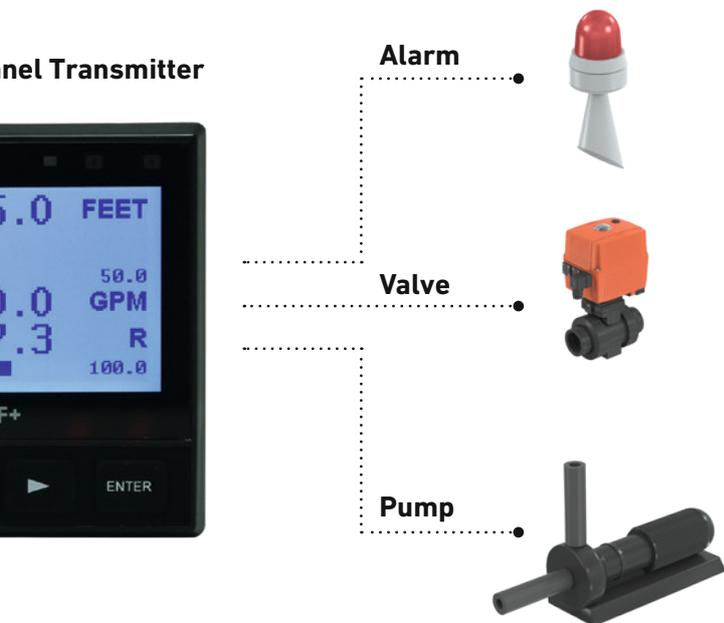


## + Multiple interfaces – tank logic control made easy

The 9950 Smart Pro offers up to six input channels which will accept all GF and third party measurement sensors. The optional input/ output module (3-9950.393-3) is especially convenient to design a tank control loop. It offers 2 mechanical relays and 4 binary inputs – perfect fit for one or two continuous sensors and up to four point level switches giving you a total of six process inputs or, the second standard input can be used to connect any other sensor such as a flowmeter or an analytical sensor.

## + Continuous level control

Choose any GF level sensor to connect to the 9950 standard inputs via an iGo Signal Converter (3-8058-3). The clear visibility of the display informs operators about the current tank level and alarm status at a glance. Individually combine the continuous measurement with a mechanical relay, for example, to indicate a high alarm through a visual feedback or to open / close a valve. The 9950 SmartPro also forwards the measurement to a PLC as a 4-20mA current signal pre-scaled on the transmitter either to tank level or volume.



## + Emergency shut-down / automatic refill

Connect any type of point level switch to the optional I/O module 9950.393-3 up to four binary inputs. The advanced Boolean logic allows a logical link between the status of the switches to the triggering of the mechanical relays. The 9950 when equipped with an optional relay module can also be utilized to signal a pump to turn off in case of HI, or HI-HI alarm avoiding overfilling the tank, and in case of a LO, or LO-LO alarm to protect the pump from running dry.

## + Get more from your tank

The 9950 offers two inputs. The second input can be used to directly measure incoming or effluent flow. Or connect analytical sensors to measure e.g. pH, conductivity or salinity of the process liquids as quality indicators.

## + Technical features

The 9950 includes advanced features such as derived functions, advanced multiple relay modes, as well as calendar and time-based relay functions. Derived functions allow for the control of a relay or current loop with the sum, delta (difference), or ratio of two measurements, for example, delta pressure or delta temperature. The 9950 has a state-of-the-art microprocessor, dot matrix display, ¼ DIN size, NEMA 4X front face, dual power 12 to 24 VDC, or 100 to 240 VAC, calendar and clock function.

## + Specifications

### Outputs

- 2x 4...20 mA loops

### Relay options

- 4 mechanical relays (3-9950.393-1)
- 2 mechanical & 2 solid state relays (3-9950.393-2)
- 2 mechanical relays & 4 binary inputs (3-9950.393-3)

# Product overview



## Continuous level control

Application considerations		Continuous level			
		Ultrasonic 2270 / 2260	Hydrostatic 2250	Radar unguided 2298	Radar guided 2291
Measured values	Level	+	+	+	+
	Volume	+	+	+	+
	Mass (calculated)	0	+	0	0
	Open channel	+	–	0	–
Process media	Changing density	+	0	+	+
	Changing dielectric	+	+	0	0
	Change in temperature and pressure	0	0	+	+
	Condensing vapors	0	+	+	+
	Bubbles	0	+	0	0
	Foam	–	+	0	0
	Coating liquids	+	0	+	0
	Crystallizing liquids	+	0	+	0
	Sludge & slurries	+	0	+	0
Tank considerations	Top down mount	+	+	+	+
	Bottom / side mount	–	+	–	–
	Mount close to object / wall	0	+	0	0
	High turbulence	–	+	0	+
	Angled surface	–	+	0	+
	High empty & fill rates	+	+	+	+
	Obstructions	0	+	0	0
	Agitation	0	+	0	0
	Non-metallic vessel	+	+	+	0
	Center mount	0	+	0	+
	Small tanks < 1.5 m	+	+	0	+

- + unconditionally applicable
- 0 conditionally applicable
- not applicable



## Point level detection

Application		Point level detection				
		Vibration forks 2280	Ultrasonic gap switch 2284	Conductive multipoint 2281	Guided float 2282	Float switch 2285
Process media	Changing density	+	+	+	o	o
	Changing dielectric	+	+	o	+	+
	Pressure & temperature changes	+	+	+	+	+
	Condensing vapors	+	+	o	+	+
	Bubbles	+	o	+	+	+
	Foam	-	o	o	o	o
	Coating liquids	o	+	-	-	+
	Crystallizing liquids	o	+	-	-	+
	Sludge & slurries	o	o	-	-	+
	Max. temperature	130 ° C 266 ° F	70 ° C 158 ° F	80 ° C 176 ° F	100 ° C 212 ° F	50 ° C 122 ° F
	Sludge & slurries	o	o	-	-	+
Approval	Intrinsically safe (ATEX)	+	-	-	-	-

- + unconditionally applicable
- o conditionally applicable
- not applicable

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