



NICO LEVEL METERS

UFM20 - Ultrasonic Level Meter



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LEVEL MEASUREMENT · PRODUCT CATALOG

UFM20

Ultrasonic Level Meter

A complete family of non-contact ultrasonic level meters for water, wastewater, process tanks and open channels – six variants from the compact integrated type to the advanced multifunction unit, with QTULR-S / L / H sensors.

6 VARIANTS
ONE SERIES

UFM20-CP

UFM20-TW

UFM20-TH

UFM20-FW

UFM20-RM

UFM20-MF

QTULR-S/L/H

0...40 m

Operating Principle of Ultrasonic Level Measurement

An ultrasonic level meter measures level **without contact**: the sensor emits an ultrasonic pulse toward the surface, the sound reflects off the liquid surface, and the round-trip travel time is measured.

Fundamental relationship

Distance to surface = (speed of sound × round-trip time) ÷ 2 | and level = tank height - distance. Because the speed of sound changes with temperature (≈331 m/s at 0 °C, rising ≈0.6 m/s per °C), the device performs automatic **temperature compensation** using a temperature sensor.

The three UFM20 sensor types

Sensor	Use	Range codes
SEN-S	Short range (Small)	S05 / S08 (0...5 to 0...8 m)
SEN-L	Long range (Large)	L15 / L20 / L25 (up to 0...25 m)
SEN-H	Heated, for cold climates (electric heating)	H30 / H40 (0...40 m)

Advantages of the Ultrasonic Technology

- ✓ **Non-contact** measurement — no wear, no corrosion, no moving parts.
- ✓ Suitable for corrosive, sticky and dirty media (the sensor never contacts the medium).
- ✓ Simple installation and commissioning; very low maintenance.
- ✓ Independent of density, conductivity and dielectric constant of the medium.

Limitations & Where Not to Use

- Sensitive to **heavy vapour, foam and dense dust**, which disturb the acoustic signal.
- Temperature-dependent (the speed of sound varies with temperature) — temperature compensation is required.
- **Does not work in vacuum** (sound needs a transmitting medium).
- A dead zone exists near the sensor; the level must never enter it.
- Highly turbulent or steeply angled surfaces can weaken the returning echo.

Where NOT to use

- Tanks with permanent heavy vapour/foam or under vacuum → use radar instead.
- Powder silos with very heavy dust loading.
- Mounting the sensor inside the dead zone or directly facing an obstacle/agitator.

Key Concepts for Selection & Installation

Concept	Explanation
Dead zone	A blind zone near the sensor that cannot be measured; the sensor must sit above the maximum level by at least this distance.
Beam angle	The acoustic beam is conical (≈5–8°) and must not strike the wall, a ladder or obstacles.
Temperature compensation	Temperature changes the speed of sound; compensation is essential for accuracy.

Concept	Explanation
Independence from medium	Independent of density, conductivity and dielectric constant; it depends only on sound transmission through the headspace.

The UFM20 Variant Family

All six UFM20 variants share one common technology (ultrasonic) and differ mainly in their **wiring, power, output and feature level**. The table below is your quick reference:

Model	Type	Power	Output
UFM20-CP	Compact Integrated Type	2-wire loop or 24 V DC	4–20 mA / HART (optional LCD)
UFM20-TW	Two-Wire (Loop-Powered) Type	2-wire loop (4–20 mA)	4–20 mA (+ HART optional)
UFM20-TH	Three-Wire Type	24 V DC (three-wire)	4–20 mA + 1 relay
UFM20-FW	Four-Wire Type	24 V DC or 90...264 V AC	4–20 mA + HART + multiple relays
UFM20-RM	Remote (Separated) Version	24 V DC or 90...264 V AC	4–20 mA + HART + relays
UFM20-MF	Multifunction Type	24 V DC or 90...264 V AC	4–20 mA + HART + RS-485 Modbus + multiple relays

Quick Selection – Which Variant?

Model	When to choose this variant
UFM20-CP	Sensor and transmitter combined in one compact body – the simplest, fastest installation for small to medium tanks.
UFM20-TW	Loop-powered, lowest power consumption – simple, economical and compatible with intrinsically safe loops.
UFM20-TH	Three-wire with a separate supply – more power for longer range and one alarm relay.
UFM20-FW	Four-wire with fully separate power and signal – long range, multiple relays and heated-sensor support.
UFM20-RM	Sensor separated from the transmitter by cable – for hot ambients at the sensor, difficult access or panel-mounted electronics.
UFM20-MF	The flagship of the series – multiple outputs (mA/HART/Modbus), multiple relays, volume linearisation, open-channel flow and pump control.

Selection rule

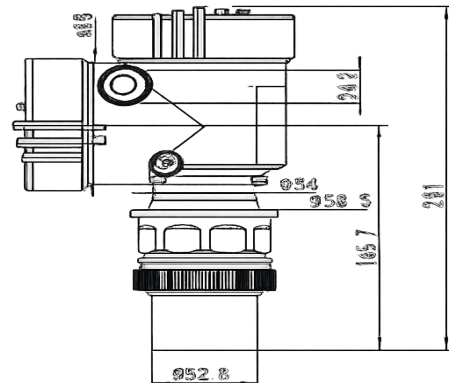
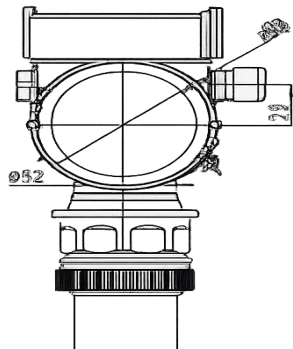
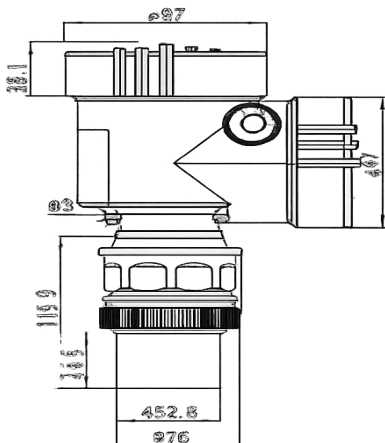
First fix the **range and ambient temperature** at the sensor (sensor type S/L/H), then choose the variant by **output type, number of relays and supply**: only a simple mA signal → TW; one alarm → TH; long range / multiple relays → FW; hot ambient or hard access → RM; volume / open-channel flow / multi-pump → MF; simple integrated install → CP.

UFM20-CP

Integrated sensor + transmitter

Compact Integrated Type

Sensor and transmitter combined in one compact body – the simplest, fastest installation for small to medium tanks.



1 · Application Overview

The UFM20-CP combines the ultrasonic sensor and the transmitter electronics in a single integrated body. This reduces installation to a single step and makes it the most economical and fastest choice for small to medium tanks, sumps and general applications where the mounting point is easily accessible.

2 · Operating Principle

This variant is based on the ultrasonic time-of-flight principle (described in full in the Foundations chapter). What distinguishes this variant is not the measuring principle but its **wiring, power and output**: In 2-wire mode, power and signal share a single pair (loop). In 24 V DC mode the supply is separate and the output is 4–20 mA. A relay output requires the powered (non-loop) version.

3 · Technical Specifications

Technical Specifications	
Measuring principle	Ultrasonic time-of-flight
Accuracy	±0.25% of range · 1 mm resolution
Measuring range	sensor-dependent, up to 0...15 m
Beam angle	≈5–8°
Operating frequency	≈40–50 kHz
Sensor temperature	–20...+60 °C (heated QTULR-H for cold climates)
Power supply	2-wire loop or 24 V DC
Output	4–20 mA / HART (optional LCD)
Relays	1 optional
Process connection	G1½ / G2 thread or flange
Ingress protection	IP66 / IP67
Enclosure	PC/ABS or aluminium
Ex protection	ATEX optional

4 · Recommended Applications

Small/medium water & wastewater tanks

Pump sumps

Process storage tanks

Utilities & HVAC

5 · Limitations & Where Not to Use

Variant-specific limitations

- Electronics are exposed to the temperature at the sensor location (for hot ambients → use the Remote version)

Ultrasonic-technology limitations

- Sensitive to **heavy vapour, foam and dense dust**, which disturb the acoustic signal.
- Temperature-dependent (the speed of sound varies with temperature) – temperature compensation is required.
- **Does not work in vacuum** (sound needs a transmitting medium).
- A dead zone exists near the sensor; the level must never enter it.
- Highly turbulent or steeply angled surfaces can weaken the returning echo.

Where NOT to use

- Tanks with permanent heavy vapour/foam or under vacuum → use radar instead.
- Powder silos with very heavy dust loading.
- Mounting the sensor inside the dead zone or directly facing an obstacle/agitator.

6 · Advantages

- ✓ Single-step, compact installation
- ✓ Minimal cabling and installation cost

- ✓ **Non-contact** measurement — no wear, no corrosion, no moving parts.
- ✓ Suitable for corrosive, sticky and dirty media (the sensor never contacts the medium).
- ✓ Simple installation and commissioning; very low maintenance.
- ✓ Independent of density, conductivity and dielectric constant of the medium.

7 · Model Selection Guide

Choose when a simple integrated installation is the priority, the measuring distance is short to medium, and the ambient temperature at the mounting point is within the sensor limits.

8 · Questions the Sales Engineer Should Ask

1. What is the maximum distance to the surface and the tank height?
2. What is the ambient temperature at the sensor location?
3. Is a 4–20 mA output enough, or are HART / a relay also required?
4. Is the installation in a hazardous area?

9 · Quick Selection Summary

Criterion	This variant
Choose when	Choose when a simple integrated installation is the priority, the measuring distance is short to medium, and the ambient temperature at the mounting point is within the sensor limits.
Range	sensor-dependent, up to 0...15 m
Output	4–20 mA / HART (optional LCD)
Power	2-wire loop or 24 V DC
Relays	1 optional

10 · Ordering Code

Code structure: **UFM20-[VAR]-[SR]-[OUT]-[PWR]-[OPT]** — five fields defining the model, sensor/range, output, power and options.

Example order code: **UFM20-CP-L15-HT-24-DS**

[VAR] Model		[SR] Sensor / Range		[OUT] Output	
CP	Compact integrated	S05	SEN-S · 0...5 m	MA	4–20 mA
TW	Two-wire	S08	SEN-S · 0...8 m	HT	4–20 mA + HART
TH	Three-wire	L15	SEN-L · 0...15 m	MB	RS-485 Modbus
FW	Four-wire	L20	SEN-L · 0...20 m	RL	with relay(s)
RM	Remote	L25	SEN-L · 0...25 m		
MF	Multifunction	H30	SEN-H heated · 0...30 m		
		H40	SEN-H heated · 0...40 m		

[PWR] Power		[OPT] Options	
LP	2-wire loop	XX	Standard
24	24 V DC	EX	ATEX Ex
AC	90...264 V AC	DS	LCD display
		SH	Sun shield
		BR	Mounting bracket

11 · Ordering Code – Field Explanation

- VAR** – model / variant (CP / TW / TH / FW / RM / MF).
- SR** – sensor type and range (S / L / H + maximum range in metres).
- OUT** – output type (4–20 mA, HART, Modbus, relay).
- PWR** – power supply (2-wire loop, 24 V DC or 220 V AC).
- OPT** – options (ATEX, display, sun shield, bracket).

12 · Accessories & Options

Accessory / option	Code	Function
Mounting bracket	BR	Roof or cantilever-arm mounting of the sensor
Stilling / guide pipe	SP	Reduces the effect of turbulence and foam
Sun shield	SH	Temperature stability for outdoor installation
Local LCD display	DS	Local indication of level and status
Traceable calibration certificate	CC	Calibration traceable per ISO/IEC 17025
ATEX Ex version	EX	For hazardous (flammable) areas

13 · Installation Notes

- Mount the sensor vertically and perpendicular to the liquid surface.
- Mount at least the dead-zone distance above the maximum process level.
- Avoid mounting above the inlet flow, an agitator, a ladder or close to the wall (false echoes).
- Use a stilling / guide pipe where turbulence or foam is present.
- Keep adequate clearance from the wall so the acoustic beam ($\approx 5\text{--}8^\circ$) does not strike it.
- Use a sun shield in direct sunlight to keep the sensor temperature stable.

14 · Wiring / Output Options

In 2-wire mode, power and signal share a single pair (loop). In 24 V DC mode the supply is separate and the output is 4–20 mA. A relay output requires the powered (non-loop) version.

Connection	Terminal	Note
2-wire (loop)	+ / - loop	power + signal on one pair
24 V DC	power + mA out	with optional relay

15 · Maintenance & Troubleshooting

Symptom	Likely cause	Action
No-echo / lost-echo message	Dust or foam on surface, out of range, obstacles	Clean the sensor face, verify range and mounting angle, enable echo filtering
Erratic or unstable reading	False echo from obstacle/wall, surface turbulence	Relocate the mounting point, add a stilling pipe, adjust the echo window
Constant error at high level	Level entering the dead zone	Raise the sensor mounting point
Drift with temperature	Missing temperature compensation or condensation on sensor	Check the temperature sensor; use the heated QTULR-H version
4–20 mA output zero / fault	Wiring or power-supply fault	Check connections, supply voltage and loop load

UFM20-TW

Loop-powered 2-wire

Two-Wire (Loop-Powered) Type

Loop-powered, lowest power consumption — simple, economical and compatible with intrinsically safe loops.



1 · Application Overview

The UFM20-TW is a loop-powered two-wire level meter that carries both power and the 4–20 mA signal on a single pair of wires. It has the lowest power consumption and the least cabling, making it ideal for simple, direct connection to a PLC/DCS and for intrinsically safe (IS) loops.

2 · Operating Principle

This variant is based on the ultrasonic time-of-flight principle (described in full in the Foundations chapter). What distinguishes this variant is not the measuring principle but its **wiring, power and output**: Power and signal both share the 4–20 mA loop. The loop supply voltage and maximum load resistance must be observed; HART communication requires a minimum load of $\approx 250 \Omega$.

3 · Technical Specifications

Technical Specifications	
Measuring principle	Ultrasonic time-of-flight
Accuracy	±0.25% of range · 1 mm resolution
Measuring range	sensor-dependent, up to ~10...15 m
Beam angle	≈5–8°
Operating frequency	≈40–50 kHz
Sensor temperature	–20...+60 °C (heated QTULR-H for cold climates)
Power supply	2-wire loop (4–20 mA)
Output	4–20 mA (+ HART optional)
Relays	none
Process connection	G1½ / G2 thread or flange
Ingress protection	IP66 / IP67
Enclosure	PC/ABS or aluminium
Ex protection	ATEX optional

4 · Recommended Applications

Simple level signal to a PLC

Networks with limited cabling

Intrinsically safe (IS) loops

Water & chemical tanks

5 · Limitations & Where Not to Use

Variant-specific limitations

- Limited loop power → no relay and usually no heated sensor
- Shorter range than the powered versions

Ultrasonic-technology limitations

- Sensitive to **heavy vapour, foam and dense dust**, which disturb the acoustic signal.
- Temperature-dependent (the speed of sound varies with temperature) – temperature compensation is required.
- **Does not work in vacuum** (sound needs a transmitting medium).
- A dead zone exists near the sensor; the level must never enter it.
- Highly turbulent or steeply angled surfaces can weaken the returning echo.

Where NOT to use

- Tanks with permanent heavy vapour/foam or under vacuum → use radar instead.
- Powder silos with very heavy dust loading.
- Mounting the sensor inside the dead zone or directly facing an obstacle/agitator.

6 · Advantages

- ✓ Lowest power consumption and cabling
- ✓ Compatible with intrinsically safe loops
- ✓ **Non-contact** measurement — no wear, no corrosion, no moving parts.
- ✓ Suitable for corrosive, sticky and dirty media (the sensor never contacts the medium).
- ✓ Simple installation and commissioning; very low maintenance.
- ✓ Independent of density, conductivity and dielectric constant of the medium.

7 · Model Selection Guide

Choose when only a single continuous 4–20 mA output is required, cabling must be minimal, and compatibility with an intrinsically safe loop matters.

8 · Questions the Sales Engineer Should Ask

1. Is a 4–20 mA output enough, or are a relay / digital output also required?
2. What is the loop supply voltage and load resistance?
3. Is an intrinsically safe loop required?
4. What are the range and the ambient temperature?

9 · Quick Selection Summary

Criterion	This variant
Choose when	Choose when only a single continuous 4–20 mA output is required, cabling must be minimal, and compatibility with an intrinsically safe loop matters.
Range	sensor-dependent, up to ~10...15 m
Output	4–20 mA (+ HART optional)
Power	2-wire loop (4–20 mA)
Relays	none

10 · Ordering Code

Code structure: **UFM20**-[VAR]-[SR]-[OUT]-[PWR]-[OPT] — five fields defining the model, sensor/range, output, power and options.

Example order code: **UFM20-TW-S08-HT-LP-EX**

[VAR] Model		[SR] Sensor / Range		[OUT] Output	
CP	Compact integrated	S05	SEN-S · 0...5 m	MA	4–20 mA
TW	Two-wire	S08	SEN-S · 0...8 m	HT	4–20 mA + HART
TH	Three-wire	L15	SEN-L · 0...15 m	MB	RS-485 Modbus
FW	Four-wire	L20	SEN-L · 0...20 m	RL	with relay(s)
RM	Remote	L25	SEN-L · 0...25 m		
MF	Multifunction	H30	SEN-H heated · 0...30 m		
		H40	SEN-H heated · 0...40 m		

[PWR] Power		[OPT] Options	
LP	2-wire loop	XX	Standard
24	24 V DC	EX	ATEX Ex
AC	90...264 V AC	DS	LCD display
		SH	Sun shield
		BR	Mounting bracket

11 · Ordering Code – Field Explanation

- VAR** – model / variant (CP / TW / TH / FW / RM / MF).
- SR** – sensor type and range (S / L / H + maximum range in metres).
- OUT** – output type (4–20 mA, HART, Modbus, relay).
- PWR** – power supply (2-wire loop, 24 V DC or 220 V AC).
- OPT** – options (ATEX, display, sun shield, bracket).

12 · Accessories & Options

Accessory / option	Code	Function
Mounting bracket	BR	Roof or cantilever-arm mounting of the sensor
Stilling / guide pipe	SP	Reduces the effect of turbulence and foam
Sun shield	SH	Temperature stability for outdoor installation
Local LCD display	DS	Local indication of level and status
Traceable calibration certificate	CC	Calibration traceable per ISO/IEC 17025
ATEX Ex version	EX	For hazardous (flammable) areas

13 · Installation Notes

- Mount the sensor vertically and perpendicular to the liquid surface.
- Mount at least the dead-zone distance above the maximum process level.
- Avoid mounting above the inlet flow, an agitator, a ladder or close to the wall (false echoes).
- Use a stilling / guide pipe where turbulence or foam is present.
- Keep adequate clearance from the wall so the acoustic beam ($\approx 5\text{--}8^\circ$) does not strike it.
- Use a sun shield in direct sunlight to keep the sensor temperature stable.

14 · Wiring / Output Options

Power and signal both share the 4–20 mA loop. The loop supply voltage and maximum load resistance must be observed; HART communication requires a minimum load of $\approx 250 \Omega$.

Connection	Terminal	Note
4–20 mA loop	+ / -	power and signal shared
HART (optional)	on the loop	needs $\geq 250 \Omega$ load

15 · Maintenance & Troubleshooting

Symptom	Likely cause	Action
No-echo / lost-echo message	Dust or foam on surface, out of range, obstacles	Clean the sensor face, verify range and mounting angle, enable echo filtering
Erratic or unstable reading	False echo from obstacle/wall, surface turbulence	Relocate the mounting point, add a stilling pipe, adjust the echo window
Constant error at high level	Level entering the dead zone	Raise the sensor mounting point
Drift with temperature	Missing temperature compensation or condensation on sensor	Check the temperature sensor; use the heated QTULR-H version
4–20 mA output zero / fault	Wiring or power-supply fault	Check connections, supply voltage and loop load

UFM20-TH

Three-wire, separate supply

Three-Wire Type

Three-wire with a separate supply — more power for longer range and one alarm relay.



1 · Application Overview

The UFM20-TH uses a three-wire arrangement (separate power with a shared ground) that provides more power than the two-wire version. This extra power enables a longer range, a more stable response and the addition of one alarm relay.

2 · Operating Principle

This variant is based on the ultrasonic time-of-flight principle (described in full in the Foundations chapter). What distinguishes this variant is not the measuring principle but its **wiring, power and output**: The 24 V DC supply is separate from the signal; a 4–20 mA output and one relay contact (for a level alarm) are available.

3 · Technical Specifications

Technical Specifications	
Measuring principle	Ultrasonic time-of-flight
Accuracy	±0.25% of range · 1 mm resolution
Measuring range	sensor-dependent, up to ~20 m
Beam angle	≈5–8°
Operating frequency	≈40–50 kHz
Sensor temperature	–20...+60 °C (heated QTULR-H for cold climates)
Power supply	24 V DC (three-wire)
Output	4–20 mA + 1 relay
Relays	1 (SPDT)
Process connection	G1½ / G2 thread or flange
Ingress protection	IP66 / IP67
Enclosure	PC/ABS or aluminium
Ex protection	ATEX optional

4 · Recommended Applications

Level with one alarm point

Medium-to-tall tanks

Simple single-relay pump control

General process

5 · Limitations & Where Not to Use

Variant-specific limitations

- More cabling than the two-wire version
- Single relay only

Ultrasonic-technology limitations

- Sensitive to **heavy vapour, foam and dense dust**, which disturb the acoustic signal.
- Temperature-dependent (the speed of sound varies with temperature) – temperature compensation is required.
- **Does not work in vacuum** (sound needs a transmitting medium).
- A dead zone exists near the sensor; the level must never enter it.
- Highly turbulent or steeply angled surfaces can weaken the returning echo.

Where NOT to use

- Tanks with permanent heavy vapour/foam or under vacuum → use radar instead.
- Powder silos with very heavy dust loading.
- Mounting the sensor inside the dead zone or directly facing an obstacle/agitator.

6 · Advantages

- ✓ More power → better range and stability
- ✓ One alarm relay available
- ✓ **Non-contact** measurement – no wear, no corrosion, no moving parts.
- ✓ Suitable for corrosive, sticky and dirty media (the sensor never contacts the medium).
- ✓ Simple installation and commissioning; very low maintenance.
- ✓ Independent of density, conductivity and dielectric constant of the medium.

7 · Model Selection Guide

Choose when a medium-to-long range, one level-alarm relay, or more power than a loop can supply is needed.

8 · Questions the Sales Engineer Should Ask

1. How many alarm points are required (one or more)?
2. What are the range and the tank height?
3. Is a 24 V DC supply available?
4. Is a heated sensor needed for a cold climate?

9 · Quick Selection Summary

Criterion	This variant
Choose when	Choose when a medium-to-long range, one level-alarm relay, or more power than a loop can supply is needed.
Range	sensor-dependent, up to ~20 m
Output	4–20 mA + 1 relay
Power	24 V DC (three-wire)
Relays	1 (SPDT)

10 · Ordering Code

Code structure: **UFM20-[VAR]-[SR]-[OUT]-[PWR]-[OPT]** — five fields defining the model, sensor/range, output, power and options.

Example order code: **UFM20-TH-L20-RL-24-DS**

[VAR] Model	[SR] Sensor / Range	[OUT] Output
CP Compact integrated	S05 SEN-S · 0...5 m	MA 4–20 mA
TW Two-wire	S08 SEN-S · 0...8 m	HT 4–20 mA + HART
TH Three-wire	L15 SEN-L · 0...15 m	MB RS-485 Modbus
FW Four-wire	L20 SEN-L · 0...20 m	RL with relay(s)
RM Remote	L25 SEN-L · 0...25 m	
MF Multifunction	H30 SEN-H heated · 0...30 m	
	H40 SEN-H heated · 0...40 m	

[PWR] Power	[OPT] Options
LP 2-wire loop	XX Standard
24 24 V DC	EX ATEX Ex
AC 90...264 V AC	DS LCD display
	SH Sun shield
	BR Mounting bracket

11 · Ordering Code — Field Explanation

- VAR** — model / variant (CP / TW / TH / FW / RM / MF).
- SR** — sensor type and range (S / L / H + maximum range in metres).
- OUT** — output type (4–20 mA, HART, Modbus, relay).
- PWR** — power supply (2-wire loop, 24 V DC or 220 V AC).
- OPT** — options (ATEX, display, sun shield, bracket).

12 · Accessories & Options

Accessory / option	Code	Function
Mounting bracket	BR	Roof or cantilever-arm mounting of the sensor
Stilling / guide pipe	SP	Reduces the effect of turbulence and foam
Sun shield	SH	Temperature stability for outdoor installation
Local LCD display	DS	Local indication of level and status
Traceable calibration certificate	CC	Calibration traceable per ISO/IEC 17025
ATEX Ex version	EX	For hazardous (flammable) areas

13 · Installation Notes

1. Mount the sensor vertically and perpendicular to the liquid surface.
2. Mount at least the dead-zone distance above the maximum process level.
3. Avoid mounting above the inlet flow, an agitator, a ladder or close to the wall (false echoes).
4. Use a stilling / guide pipe where turbulence or foam is present.
5. Keep adequate clearance from the wall so the acoustic beam ($\approx 5-8^\circ$) does not strike it.
6. Use a sun shield in direct sunlight to keep the sensor temperature stable.

14 · Wiring / Output Options

The 24 V DC supply is separate from the signal; a 4–20 mA output and one relay contact (for a level alarm) are available.

Connection	Terminal	Note
Power	+24 V / GND	separate supply
Signal	mA out	4–20 mA
Relay	SPDT contact	level alarm

15 · Maintenance & Troubleshooting

Symptom	Likely cause	Action
No-echo / lost-echo message	Dust or foam on surface, out of range, obstacles	Clean the sensor face, verify range and mounting angle, enable echo filtering
Erratic or unstable reading	False echo from obstacle/wall, surface turbulence	Relocate the mounting point, add a stilling pipe, adjust the echo window
Constant error at high level	Level entering the dead zone	Raise the sensor mounting point
Drift with temperature	Missing temperature compensation or condensation on sensor	Check the temperature sensor; use the heated QTULR-H version
4–20 mA output zero / fault	Wiring or power-supply fault	Check connections, supply voltage and loop load

UFM20-FW

Four-wire, fully separate power & signal

Four-Wire Type

Four-wire with fully separate power and signal — long range, multiple relays and heated-sensor support.



1 · Application Overview

The UFM20-FW uses a four-wire arrangement with fully separate power and signal, giving the most power and flexibility among the standard versions. It supports long range (up to 40 m with the heated QTULR-H sensor), multiple relays and a full local display.

2 · Operating Principle

This variant is based on the ultrasonic time-of-flight principle (described in full in the Foundations chapter). What distinguishes this variant is not the measuring principle but its **wiring, power and output**: Power (DC or AC) and signal are fully separate; a 4–20 mA / HART output plus several adjustable relays for alarm and pump control are available. There is sufficient power to heat the QTULR-H sensor.

3 · Technical Specifications

Technical Specifications	
Measuring principle	Ultrasonic time-of-flight
Accuracy	±0.25% of range · 1 mm resolution
Measuring range	sensor-dependent, up to 0...40 m (with QTULR-H)
Beam angle	≈5–8°
Operating frequency	≈40–50 kHz
Sensor temperature	–20...+60 °C (heated QTULR-H for cold climates)
Power supply	24 V DC or 90...264 V AC
Output	4–20 mA + HART + multiple relays
Relays	up to 2–3
Process connection	G1½ / G2 thread or flange
Ingress protection	IP66 / IP67
Enclosure	PC/ABS or aluminium
Ex protection	ATEX optional

4 · Recommended Applications

Tall tanks and silos

Multi-relay pump control

Cold-climate sites (heated sensor)

Heavy industrial process

5 · Limitations & Where Not to Use

Variant-specific limitations

- More cabling and installation cost
- Requires a separate power supply

Ultrasonic-technology limitations

- Sensitive to **heavy vapour, foam and dense dust**, which disturb the acoustic signal.
- Temperature-dependent (the speed of sound varies with temperature) – temperature compensation is required.
- **Does not work in vacuum** (sound needs a transmitting medium).
- A dead zone exists near the sensor; the level must never enter it.
- Highly turbulent or steeply angled surfaces can weaken the returning echo.

Where NOT to use

- Tanks with permanent heavy vapour/foam or under vacuum → use radar instead.
- Powder silos with very heavy dust loading.
- Mounting the sensor inside the dead zone or directly facing an obstacle/agitator.

6 · Advantages

- ✓ Most power → long range and heated-sensor support
- ✓ Multiple relays for control and alarm
- ✓ **Non-contact** measurement — no wear, no corrosion, no moving parts.
- ✓ Suitable for corrosive, sticky and dirty media (the sensor never contacts the medium).
- ✓ Simple installation and commissioning; very low maintenance.
- ✓ Independent of density, conductivity and dielectric constant of the medium.

7 · Model Selection Guide

Choose when a long range, multiple control/alarm relays, a heated sensor for a cold climate, or AC power is required.

8 · Questions the Sales Engineer Should Ask

1. What is the maximum range (up to 40 m)?
2. How many relays, and for what logic (alarm / pump)?
3. Is the supply DC or AC?
4. Is it a cold climate (heated QTULR-H sensor)?

9 · Quick Selection Summary

Criterion	This variant
Choose when	Choose when a long range, multiple control/alarm relays, a heated sensor for a cold climate, or AC power is required.
Range	sensor-dependent, up to 0...40 m (with QTULR-H)
Output	4–20 mA + HART + multiple relays
Power	24 V DC or 90...264 V AC
Relays	up to 2–3

10 · Ordering Code

Code structure: **UFM20**-[VAR]-[SR]-[OUT]-[PWR]-[OPT] — five fields defining the model, sensor/range, output, power and options.

Example order code: **UFM20-FW-H40-RL-AC-DS**

[VAR] Model		[SR] Sensor / Range		[OUT] Output	
CP	Compact integrated	S05	SEN-S · 0...5 m	MA	4–20 mA
TW	Two-wire	S08	SEN-S · 0...8 m	HT	4–20 mA + HART
TH	Three-wire	L15	SEN-L · 0...15 m	MB	RS-485 Modbus
FW	Four-wire	L20	SEN-L · 0...20 m	RL	with relay(s)
RM	Remote	L25	SEN-L · 0...25 m		
MF	Multifunction	H30	SEN-H heated · 0...30 m		
		H40	SEN-H heated · 0...40 m		

[PWR] Power		[OPT] Options	
LP	2-wire loop	XX	Standard
24	24 V DC	EX	ATEX Ex
AC	90...264 V AC	DS	LCD display
		SH	Sun shield
		BR	Mounting bracket

11 · Ordering Code – Field Explanation

- VAR** – model / variant (CP / TW / TH / FW / RM / MF).
- SR** – sensor type and range (S / L / H + maximum range in metres).
- OUT** – output type (4–20 mA, HART, Modbus, relay).
- PWR** – power supply (2-wire loop, 24 V DC or 220 V AC).
- OPT** – options (ATEX, display, sun shield, bracket).

12 · Accessories & Options

Accessory / option	Code	Function
Mounting bracket	BR	Roof or cantilever-arm mounting of the sensor
Stilling / guide pipe	SP	Reduces the effect of turbulence and foam
Sun shield	SH	Temperature stability for outdoor installation
Local LCD display	DS	Local indication of level and status
Traceable calibration certificate	CC	Calibration traceable per ISO/IEC 17025
ATEX Ex version	EX	For hazardous (flammable) areas

13 · Installation Notes

- Mount the sensor vertically and perpendicular to the liquid surface.
- Mount at least the dead-zone distance above the maximum process level.
- Avoid mounting above the inlet flow, an agitator, a ladder or close to the wall (false echoes).
- Use a stilling / guide pipe where turbulence or foam is present.
- Keep adequate clearance from the wall so the acoustic beam ($\approx 5\text{--}8^\circ$) does not strike it.
- Use a sun shield in direct sunlight to keep the sensor temperature stable.

14 · Wiring / Output Options

Power (DC or AC) and signal are fully separate; a 4–20 mA / HART output plus several adjustable relays for alarm and pump control are available. There is sufficient power to heat the QTULR-H sensor.

Connection	Terminal	Note
Power	AC/DC separate	24 V DC or 220 V AC
Signal	4–20 mA / HART	separate from power
Relays	2–3 × SPDT	alarm / pump control

15 · Maintenance & Troubleshooting

Symptom	Likely cause	Action
No-echo / lost-echo message	Dust or foam on surface, out of range, obstacles	Clean the sensor face, verify range and mounting angle, enable echo filtering
Erratic or unstable reading	False echo from obstacle/wall, surface turbulence	Relocate the mounting point, add a stilling pipe, adjust the echo window
Constant error at high level	Level entering the dead zone	Raise the sensor mounting point
Drift with temperature	Missing temperature compensation or condensation on sensor	Check the temperature sensor; use the heated QTULR-H version
4–20 mA output zero / fault	Wiring or power-supply fault	Check connections, supply voltage and loop load

UFM20-RM

Sensor separated from transmitter

Remote (Separated) Version

Sensor separated from the transmitter by cable — for hot ambients at the sensor, difficult access or panel-mounted electronics.



1 · Application Overview

In the UFM20-RM the ultrasonic sensor is separated from the transmitter/electronics unit and connected to it by a cable. This separation suits situations where the environment near the sensor is hot, where reading access is difficult, or where the electronics must be installed in a control panel or a cooler location.

2 · Operating Principle

This variant is based on the ultrasonic time-of-flight principle (described in full in the Foundations chapter). What distinguishes this variant is not the measuring principle but its **wiring, power and output**: The sensor connects to the transmitter unit by a dedicated cable (within the maximum allowed length); all outputs and relays are taken from the transmitter unit. Observe the maximum sensor-cable length.

3 · Technical Specifications

Technical Specifications	
Measuring principle	Ultrasonic time-of-flight
Accuracy	±0.25% of range · 1 mm resolution
Measuring range	sensor-dependent, up to 0...40 m
Beam angle	≈5–8°
Operating frequency	≈40–50 kHz
Sensor temperature	–20...+60 °C (heated QTULR-H for cold climates)
Power supply	24 V DC or 90...264 V AC
Output	4–20 mA + HART + relays
Relays	up to 2–3
Process connection	G1½ / G2 thread or flange
Ingress protection	IP66 / IP67
Enclosure	PC/ABS or aluminium
Ex protection	ATEX optional

4 · Recommended Applications

Hot ambient near the sensor

Electronics in a control panel

Inaccessible mounting points

Harsh processes

5 · Limitations & Where Not to Use

Variant-specific limitations

- Requires a dedicated sensor cable within the maximum allowed length
- Two-part installation (sensor + transmitter)

Ultrasonic-technology limitations

- Sensitive to **heavy vapour, foam and dense dust**, which disturb the acoustic signal.
- Temperature-dependent (the speed of sound varies with temperature) – temperature compensation is required.
- **Does not work in vacuum** (sound needs a transmitting medium).
- A dead zone exists near the sensor; the level must never enter it.
- Highly turbulent or steeply angled surfaces can weaken the returning echo.

Where NOT to use

- Tanks with permanent heavy vapour/foam or under vacuum → use radar instead.
- Powder silos with very heavy dust loading.
- Mounting the sensor inside the dead zone or directly facing an obstacle/agitator.

6 · Advantages

- ✓ Electronics kept away from heat and vibration at the sensor
- ✓ Better display and access location
- ✓ **Non-contact** measurement — no wear, no corrosion, no moving parts.
- ✓ Suitable for corrosive, sticky and dirty media (the sensor never contacts the medium).
- ✓ Simple installation and commissioning; very low maintenance.
- ✓ Independent of density, conductivity and dielectric constant of the medium.

7 · Model Selection Guide

Choose when the ambient near the sensor is hot, the sensor location is hard to reach, or the electronics must be mounted in a panel / safe area.

8 · Questions the Sales Engineer Should Ask

1. What is the distance from the sensor to the transmitter (cable length)?
2. What is the ambient temperature near the sensor?
3. Where will the electronics be mounted (panel / field)?
4. What output and how many relays are required?

9 · Quick Selection Summary

Criterion	This variant
Choose when	Choose when the ambient near the sensor is hot, the sensor location is hard to reach, or the electronics must be mounted in a panel / safe area.
Range	sensor-dependent, up to 0...40 m
Output	4–20 mA + HART + relays
Power	24 V DC or 90...264 V AC
Relays	up to 2–3

10 · Ordering Code

Code structure: **UFM20**-[VAR]-[SR]-[OUT]-[PWR]-[OPT] — five fields defining the model, sensor/range, output, power and options.

Example order code: **UFM20-RM-H30-RL-AC-EX**

[VAR] Model		[SR] Sensor / Range		[OUT] Output	
CP	Compact integrated	S05	SEN-S · 0...5 m	MA	4–20 mA
TW	Two-wire	S08	SEN-S · 0...8 m	HT	4–20 mA + HART
TH	Three-wire	L15	SEN-L · 0...15 m	MB	RS-485 Modbus
FW	Four-wire	L20	SEN-L · 0...20 m	RL	with relay(s)
RM	Remote	L25	SEN-L · 0...25 m		
MF	Multifunction	H30	SEN-H heated · 0...30 m		
		H40	SEN-H heated · 0...40 m		

[PWR] Power		[OPT] Options	
LP	2-wire loop	XX	Standard
24	24 V DC	EX	ATEX Ex
AC	90...264 V AC	DS	LCD display
		SH	Sun shield
		BR	Mounting bracket

11 · Ordering Code – Field Explanation

- VAR** – model / variant (CP / TW / TH / FW / RM / MF).
- SR** – sensor type and range (S / L / H + maximum range in metres).
- OUT** – output type (4–20 mA, HART, Modbus, relay).
- PWR** – power supply (2-wire loop, 24 V DC or 220 V AC).
- OPT** – options (ATEX, display, sun shield, bracket).

12 · Accessories & Options

Accessory / option	Code	Function
Mounting bracket	BR	Roof or cantilever-arm mounting of the sensor
Stilling / guide pipe	SP	Reduces the effect of turbulence and foam
Sun shield	SH	Temperature stability for outdoor installation
Local LCD display	DS	Local indication of level and status
Traceable calibration certificate	CC	Calibration traceable per ISO/IEC 17025
ATEX Ex version	EX	For hazardous (flammable) areas

13 · Installation Notes

- Mount the sensor vertically and perpendicular to the liquid surface.
- Mount at least the dead-zone distance above the maximum process level.
- Avoid mounting above the inlet flow, an agitator, a ladder or close to the wall (false echoes).
- Use a stilling / guide pipe where turbulence or foam is present.
- Keep adequate clearance from the wall so the acoustic beam ($\approx 5\text{--}8^\circ$) does not strike it.
- Use a sun shield in direct sunlight to keep the sensor temperature stable.

14 · Wiring / Output Options

The sensor connects to the transmitter unit by a dedicated cable (within the maximum allowed length); all outputs and relays are taken from the transmitter unit. Observe the maximum sensor-cable length.

Connection	Terminal	Note
Sensor cable	sensor ↔ transmitter	within max. length
Power	AC/DC	at the transmitter unit
Signal / relays	4–20 mA / HART + relay	at the transmitter unit

15 · Maintenance & Troubleshooting

Symptom	Likely cause	Action
No-echo / lost-echo message	Dust or foam on surface, out of range, obstacles	Clean the sensor face, verify range and mounting angle, enable echo filtering
Erratic or unstable reading	False echo from obstacle/wall, surface turbulence	Relocate the mounting point, add a stilling pipe, adjust the echo window
Constant error at high level	Level entering the dead zone	Raise the sensor mounting point
Drift with temperature	Missing temperature compensation or condensation on sensor	Check the temperature sensor; use the heated QTULR-H version
4–20 mA output zero / fault	Wiring or power-supply fault	Check connections, supply voltage and loop load

UFM20-MF

Multifunction · multi-output

Multifunction Type FLAGSHIP

The flagship of the series — multiple outputs (mA/HART/Modbus), multiple relays, volume linearisation, open-channel flow and pump control.



1 · Application Overview

The UFM20-MF is the complete, multifunction version of the series. In addition to level measurement it supports tank-volume linearisation, open-channel flow calculation, a totaliser and multi-pump control, and it provides multiple outputs (4–20 mA, HART, RS-485 Modbus) and several relays.

2 · Operating Principle

This variant is based on the ultrasonic time-of-flight principle (described in full in the Foundations chapter). What distinguishes this variant is not the measuring principle but its **wiring, power and output**: Simultaneous outputs: 4–20 mA / HART for level, RS-485 Modbus to SCADA, and several relays for pump control and alarms. Separate DC or AC supply.

3 · Technical Specifications

Technical Specifications	
Measuring principle	Ultrasonic time-of-flight
Accuracy	±0.25% of range · 1 mm resolution
Measuring range	sensor-dependent, up to 0...40 m
Beam angle	≈5–8°
Operating frequency	≈40–50 kHz
Sensor temperature	–20...+60 °C (heated QTULR-H for cold climates)
Power supply	24 V DC or 90...264 V AC
Output	4–20 mA + HART + RS-485 Modbus + multiple relays
Relays	up to 4–6
Process connection	G1½ / G2 thread or flange
Ingress protection	IP66 / IP67
Enclosure	PC/ABS or aluminium
Ex protection	ATEX optional

4 · Recommended Applications

Pump-station multi-pump control

Open-channel flow and weir measurement

Tank-volume linearisation

SCADA via Modbus

5 · Limitations & Where Not to Use

Variant-specific limitations

- More complex configuration; requires initial setup
- Higher cost than the simpler versions

Ultrasonic-technology limitations

- Sensitive to **heavy vapour, foam and dense dust**, which disturb the acoustic signal.
- Temperature-dependent (the speed of sound varies with temperature) – temperature compensation is required.
- **Does not work in vacuum** (sound needs a transmitting medium).
- A dead zone exists near the sensor; the level must never enter it.
- Highly turbulent or steeply angled surfaces can weaken the returning echo.

Where NOT to use

- Tanks with permanent heavy vapour/foam or under vacuum → use radar instead.
- Powder silos with very heavy dust loading.
- Mounting the sensor inside the dead zone or directly facing an obstacle/agitator.

6 · Advantages

- ✓ Multifunction: level + volume + open-channel flow + pump control
- ✓ Multiple outputs and relays plus RS-485 Modbus
- ✓ **Non-contact** measurement — no wear, no corrosion, no moving parts.
- ✓ Suitable for corrosive, sticky and dirty media (the sensor never contacts the medium).
- ✓ Simple installation and commissioning; very low maintenance.
- ✓ Independent of density, conductivity and dielectric constant of the medium.

7 · Model Selection Guide

Choose when, beyond level, you also need volume / open-channel flow, multi-pump control, Modbus communication, or many relays.

8 · Questions the Sales Engineer Should Ask

1. Do you need level only, or volume / open-channel flow as well?
2. How many pumps must be controlled, and how many relays?
3. Is Modbus / SCADA communication required?
4. Is the supply DC or AC, and what is the site climate?

9 · Quick Selection Summary

Criterion	This variant
Choose when	Choose when, beyond level, you also need volume / open-channel flow, multi-pump control, Modbus communication, or many relays.
Range	sensor-dependent, up to 0...40 m
Output	4–20 mA + HART + RS-485 Modbus + multiple relays
Power	24 V DC or 90...264 V AC
Relays	up to 4–6

10 · Ordering Code

Code structure: **UFM20-[VAR]-[SR]-[OUT]-[PWR]-[OPT]** — five fields defining the model, sensor/range, output, power and options.

Example order code: **UFM20-MF-H40-MB-AC-DS**

[VAR] Model		[SR] Sensor / Range		[OUT] Output	
CP	Compact integrated	S05	SEN-S · 0...5 m	MA	4–20 mA
TW	Two-wire	S08	SEN-S · 0...8 m	HT	4–20 mA + HART
TH	Three-wire	L15	SEN-L · 0...15 m	MB	RS-485 Modbus
FW	Four-wire	L20	SEN-L · 0...20 m	RL	with relay(s)
RM	Remote	L25	SEN-L · 0...25 m		
MF	Multifunction	H30	SEN-H heated · 0...30 m		
		H40	SEN-H heated · 0...40 m		

[PWR] Power		[OPT] Options	
LP	2-wire loop	XX	Standard
24	24 V DC	EX	ATEX Ex
AC	90...264 V AC	DS	LCD display
		SH	Sun shield
		BR	Mounting bracket

11 · Ordering Code – Field Explanation

- VAR** – model / variant (CP / TW / TH / FW / RM / MF).
- SR** – sensor type and range (S / L / H + maximum range in metres).
- OUT** – output type (4–20 mA, HART, Modbus, relay).
- PWR** – power supply (2-wire loop, 24 V DC or 220 V AC).
- OPT** – options (ATEX, display, sun shield, bracket).

12 · Accessories & Options

Accessory / option	Code	Function
Mounting bracket	BR	Roof or cantilever-arm mounting of the sensor
Stilling / guide pipe	SP	Reduces the effect of turbulence and foam
Sun shield	SH	Temperature stability for outdoor installation
Local LCD display	DS	Local indication of level and status
Traceable calibration certificate	CC	Calibration traceable per ISO/IEC 17025
ATEX Ex version	EX	For hazardous (flammable) areas

13 · Installation Notes

- Mount the sensor vertically and perpendicular to the liquid surface.
- Mount at least the dead-zone distance above the maximum process level.
- Avoid mounting above the inlet flow, an agitator, a ladder or close to the wall (false echoes).
- Use a stilling / guide pipe where turbulence or foam is present.
- Keep adequate clearance from the wall so the acoustic beam ($\approx 5\text{--}8^\circ$) does not strike it.
- Use a sun shield in direct sunlight to keep the sensor temperature stable.

14 · Wiring / Output Options

Simultaneous outputs: 4–20 mA / HART for level, RS-485 Modbus to SCADA, and several relays for pump control and alarms. Separate DC or AC supply.

Connection	Terminal	Note
Power	AC/DC	24 V DC or 220 V AC
Analogue out	4–20 mA / HART	level / volume / flow
Digital	RS-485 Modbus	to SCADA
Relays	4–6 × SPDT	multi-pump control / alarm

15 · Maintenance & Troubleshooting

Symptom	Likely cause	Action
No-echo / lost-echo message	Dust or foam on surface, out of range, obstacles	Clean the sensor face, verify range and mounting angle, enable echo filtering
Erratic or unstable reading	False echo from obstacle/wall, surface turbulence	Relocate the mounting point, add a stilling pipe, adjust the echo window
Constant error at high level	Level entering the dead zone	Raise the sensor mounting point
Drift with temperature	Missing temperature compensation or condensation on sensor	Check the temperature sensor; use the heated QTULR-H version
4–20 mA output zero / fault	Wiring or power-supply fault	Check connections, supply voltage and loop load

UFM20 – Ultrasonic Level Meter Variants

UFM20-CP

Compact Integrated Type

UFM20-TW

Two-Wire (Loop-Powered) Type

UFM20-TH

Three-Wire Type

UFM20-FW

Four-Wire Type

UFM20-RM

Remote (Separated) Version

UFM20-MF

Multifunction Type





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