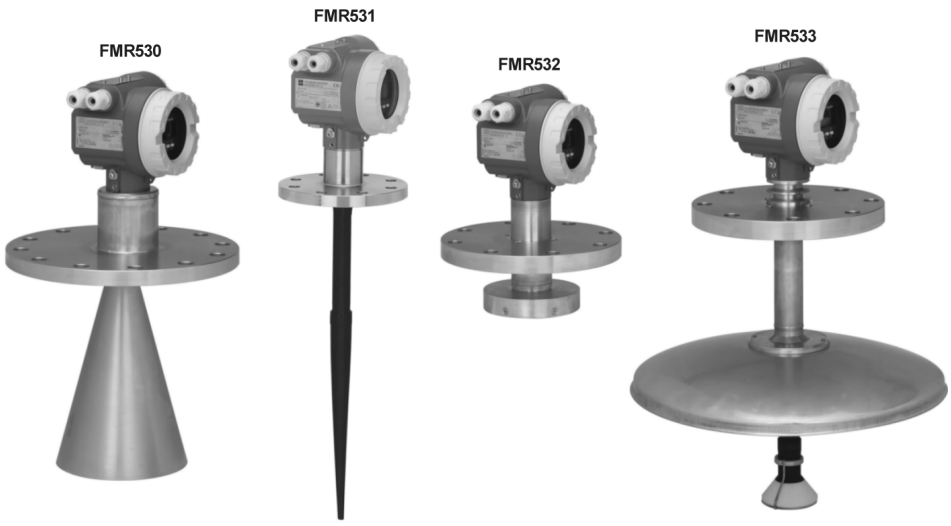
Füllstand Druck Durchfluss Temperatur Flüssigkeits-analyse Registrierung Systeme Komponenten Services Solutions

Technical Information

Micropilot S FMR530/531/532/533

Level-Radar

Smart Transmitter for continuous and non-contact precision level measurement. For custody transfer and inventory control applications with NMi- and PTB-approvals.



Application

The Micropilot S is used for highly accurate level measurement in storage tanks and can be applied in custody transfer applications. It meets the relevant requirements according to OIML R85 and API 3.1B.

- The FMR533 with parabolic antenna is excellently suited for free space applications up to 40 m (131 ft).
- The FMR532 with planar antenna is specifically suited for stilling well applications with ranges up to 38 m (124 ft).
- The FMR531 with rod antenna is used for highly accurate measurements of very aggressive products and in narrow nozzles.
- The FMR530 with horn antenna is suitable for free space applications that disallow the use of a parabolic antenna due to tank/nozzle geometry.

Your benefits

- 0.5 mm accuracy (2σ value)
- National approvals (NMi, PTB) for custody transfer.
- Applicable as stand-alone system or tied into tank gauging systems via the Tank Side Monitor NRF590.
- Easy on-site operation via menu-driven alphanumeric display.
- Easy commissioning, documentation and diagnostics via operating software (ToF Tool).
- Application-specific antenna selection. Planar antenna versions allow direct installation on tapered stilling wells.
- Cost-effective and simple installation via 4-wire cable with HART and 24 V DC intrinsically safe power supply.
- Gas-tight process connection (second line of defense) standard for any antenna version.
- Inventory Control Version with reduced accuracy (3 mm) available for all instrument types.

TI344F/00/en

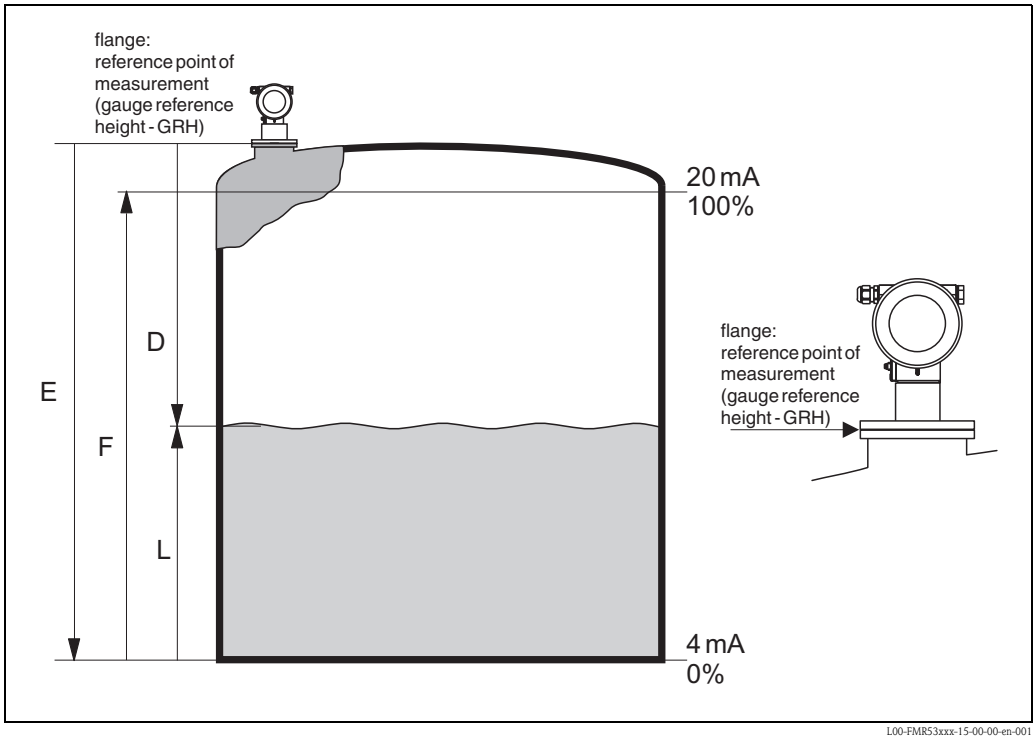
Endress+Hauser

People for Process Automation

Function and system design

Measuring principle

The Micropilot is a "downward-looking" measuring system, operating based on the time-of-flight method. It measures the distance from the reference point (process connection) to the product surface. Radar impulses are emitted by an antenna, reflected off the product surface and received again by the radar system.



Input

The reflected radar impulses are received by the antenna and transmitted into the electronics. A microprocessor evaluates the signal and identifies the level echo caused by the reflection of the radar impulse at the product surface. The unambiguous signal identification is accomplished by the PulseMaster® software, based on many years of experience with time-of-flight technology.
The mm-accuracy of the Micropilot S could be achieved with the patented algorithms of the PhaseMaster® software.
The distance D to the product surface is proportional to the time of flight t of the impulse:

$D = c \cdot t/2$,
with c being the speed of light.

Based on the known empty distance E, the level L is calculated:

$L = E - D$

Refer to the above figure for the reference point for "E".

The Micropilot is equipped with functions to suppress interference echoes. The user can activate these functions. They ensure that interference echoes (i.e. from edges and weld seams) are not interpreted as level echo.

Ordering information

Micropilot S FMR530

This overview does not mark options which are mutually exclusive.

10	Approval:		Basic weight
	A	Non-hazardous area	7.1 kg
	1	ATEX II 1/2G EEx ia IIC T6	
	6	ATEX II 1/2G EEx ia IIC T6, WHG	
	G	ATEX II 3G EEx nA II T6	
	S	FM IS Cl.I Div.1 Gr. A-D	
	U	CSA IS Cl.I Div.1 Gr. A-D	
	K	TIIS Ex ia IIC T3	
	L	TIIS Ex ia IIC T6	
	Y	Special version	

20	Antenna; Seal:		Additional weight
	M	80mm/3"; FKM, non-conductive media	0.5 kg
	P	80mm/3"; Kalrez, non-conductive media	0.5 kg
	R	80mm/3"; PTFE, conductive media	0.5 kg
	I	100mm/4", FKM, non-conductive media	1.3 kg
	K	100mm/4", Kalrez, non-conductive media	1.3 kg
	L	100mm/4", PTFE, conductive media	1.3 kg
	A	150mm/6", FKM, non-conductive media	0.3 kg
	C	150mm/6", Kalrez, non-conductive media	0.3 kg
	D	150mm/6", PTFE, conductive media	0.3 kg
	U	200mm/8", FKM, non-conductive media	0.2 kg
	W	200mm/8", Kalrez, non-conductive media	0.2 kg
	X	200mm/8", PTFE, conductive media	0.2 kg
	E	250mm/10", FKM, non-conductive media	0.9 kg
	G	250mm/10", Kalrez, non-conductive media	0.9 kg
	H	250mm/10", PTFE, conductive media	0.9 kg
	Y	Special version	

30	Process connection:		Mehrgewicht
		— EN-Flanges —	
	CMJ	DN80 PN10/16 B1, 316L flange EN1092-1 (DIN2527 C)	4.8 kg
	CNJ	DN80 PN25/40 B1, 316L flange EN1092-1 (DIN2527 C)	5.9 kg
	CQJ	DN100 PN10/16 B1, 316L flange EN1092-1 (DIN2527 C)	5.8 kg
	CRJ	DN100 PN25/40 B1, 316L flange EN1092-1 (DIN2527 C)	7.6 kg
	CWJ	DN150 PN10/16 B1, 316L flange EN1092-1 (DIN2527 C)	10.6 kg
	CXJ	DN200 PN16 B1, 316L flange EN1092-1 (DIN2527 C)	16.5 kg
	C6J	DN250 PN16 B1, 316L flange EN1092-1 (DIN2527 C)	25.6 kg
		— ANSI-Flanges —	
	ALJ	3" 150lbs RF, 316/316L flange ANSI B16.5	5.0 kg
	AMJ	3" 300lbs RF, 316/316L flange ANSI B16.5	6.8 kg
	APJ	4" 150lbs RF, 316/316L flange ANSI B16.5	7.0 kg
	AQJ	4" 300lbs RF, 316/316L flange ANSI B16.5	11.5 kg
	AVJ	6" 150lbs RF, 316/316L flange ANSI B16.5	11.3 kg
	A3J	8" 150lbs RF, 316/316L flange ANSI B16.5	19.6 kg
	A5J	10" 150lbs RF, 316/316L flange ANSI B16.5	28.8 kg
		— JIS-Flanges —	
	KA2	10K 80A RF, 316Ti flange JIS B2238	3.7 kg
	KD2	10K 200A RF, 316Ti flange JIS B2238	13.8 kg
	KH2	10K 100A RF, 316Ti flange JIS B2238	4.5 kg
	KV2	10K 150A RF, 316Ti flange JIS B2238	9.9 kg
	K52	10K 250A RF, 316Ti flange JIS B2238	22.5 kg
	Y	Special version	

40	Output; Operation:	
	A	4-20mA HART; 4-line display, envelope curve display on site
	Y	Special version

50	Housing:	
	C	T12 Alu, coated IP65 NEMA4X, separate conn. compartment
	Y	Special version

FMR530-						Product designation (Part 1)

FMR530 continued

60		**Cable entry:**
	2	Gland M20
	3	Thread G1/2
	4	Thread NPT1/2
	Y	Special version

70		**Weight + measure approval:**
	A	NMi + PTB (<1mm) type approval
	F	NMi witnessed initial verificat. (<1mm) type approval
	G	PTB witnessed initial verificat. (<1mm) type approval
	R	Not selected; Inventory control version (3mm)
	Y	Special version

80		**Additional option:**
	A	Basic version
	S	GL/ABS marine certificate
	Y	Special version

FMR530-	Complete product designation

Micropilot S FMR531

This overview does not mark options which are mutually exclusive.

10	Approval:		Basic weight
	A	Non-hazardous area	7.1 kg
	1	ATEX II 1/2G EEx ia IIC T6	
	6	ATEX II 1/2G EEx ia IIC T6, WHG	
	G	ATEX II 3G EEx nA II T6	
	S	FM IS Cl.I Div.1 Gr. A-D	
	U	CSA IS Cl.I Div.1 Gr. A-D	
	K	TIIS Ex ia IIC T3	
	L	TIIS Ex ia IIC T6	
	Y	Special version	

20	Antenna; Inactive length:		Additional weight
	H	PTFE antistatic 390mm/15", fully insul.; nozzle height max 100mm/4"	
	J	PTFE antistatic 540mm/21", fully insul.; nozzle height max 250mm/10"	0.4 kg
	E	PTFE 390mm/15", fully insulated; nozzle height max 100mm/4"	
	F	PTFE 540mm/21", fully insulated; nozzle height max 250mm/10"	0.4 kg
	Y	Special version	

30	Process connection:		Additional weight
		— Clamp-connections —	
	TEJ	Tri-Clamp ISO2852 DN40-51 (2"), 316L	
	TLJ	Tri-Clamp ISO2852 DN70-76.1 (3"), 316L	0.4 kg
		— EN-Flanges —	
	CFJ	DN50 PN10/16 B1, 316L flange EN1092-1 (DIN2527 C)	2.9 kg
	CFK	DN50 PN10/16, PTFE >316L flange EN1092-1 (DIN2527)	3.0 kg
	CMJ	DN80 PN10/16 B1, 316L flange EN1092-1 (DIN2527 C)	4.8 kg
	CNJ	DN80 PN25/40 B1, 316L flange EN1092-1 (DIN2527 C)	5.9 kg
	CMK	DN80 PN10/16, PTFE >316L flange EN1092-1 (DIN2527)	4.9 kg
	CQJ	DN100 PN10/16 B1, 316L flange EN1092-1 (DIN2527 C)	5.8 kg
	CQK	DN100 PN10/16, PTFE >316L flange EN1092-1 (DIN2527)	5.9 kg
	CWJ	DN150 PN10/16 B1, 316L flange EN1092-1 (DIN2527 C)	10.6 kg
	CWK	DN150 PN10/16, PTFE >316L flange EN1092-1 (DIN2527)	10.8 kg
		— ANSI-Flanges —	
	AEJ	2" 150lbs RF, 316/316L flange ANSI B16.5	2.4 kg
	AEK	2" 150lbs, PTFE >316/316L flange ANSI B16.5	2.5 kg
	ALJ	3" 150lbs RF, 316/316L flange ANSI B16.5	5.0 kg
	AMJ	3" 300lbs RF, 316/316L flange ANSI B16.5	6.8 kg
	ALK	3" 150lbs, PTFE >316/316L flange ANSI B16.5	5.1 kg
	APJ	4" 150lbs RF, 316/316L flange ANSI B16.5	7.0 kg
	AQJ	4" 300lbs RF, 316/316L flange ANSI B16.5	11.5 kg
	APK	4" 150lbs, PTFE >316/316L flange ANSI B16.5	7.1 kg
	AVJ	6" 150lbs RF, 316/316L flange ANSI B16.5	11.3 kg
	AVK	6" 150lbs, PTFE >316/316L flange ANSI B16.5	11.5 kg
		— JIS-Flanges —	
	KEJ	10K 50 RF, 316L flange JIS B2238	2.1 kg
	KEK	10K 50, PTFE >316L flange JIS B2238	2.2 kg
	KLJ	10K 80 RF, 316L flange JIS B2238	3.4 kg
	KLK	10K 80, PTFE >316L flange JIS B2238	3.5 kg
	KPJ	10K 100 RF, 316L flange JIS B2238	4.5 kg
	KPK	10K 100, PTFE >316L flange JIS B2238	
	KVJ	10K 150 RF, 316L flange JIS B2238	9.9 kg
	KVK	10K 150, PTFE >316L flange JIS B2238	10.1 kg
	Y	Special version	

40	Output; Operation:	
	A	4-20mA HART; 4-line display VU331, envelope curve display on site
	Y	Special version

50	Housing:	
	C	T12 Alu, coated. IP65 NEMA4X, separate conn. compartment
	Y	Special version

FMR531-						Product designation (Part 1)

FMR531 continued

60		**Cable entry:**
	2	Gland M20
	3	Thread G1/2
	4	Thread NPT1/2
	Y	Special version

70		**Weight + measure approval:**
	A	NMi + PTB (<1mm) type approval
	F	NMi witnessed initial verificat. (<1mm) type approval
	G	PTB witnessed initial verificat. (<1mm) type approval
	R	Not selected; Inventory control version (3mm)
	Y	Special version

80		**Additional option:**
	A	Basic version
	S	GL/ABS marine certificate
	Y	Special version

FMR531-	Complete product designation

Micropilot S FMR532

This overview does not mark options which are mutually exclusive.

10	Approval:		Basic weight
	A	Non-hazardous area	6.5 kg
	1	ATEX II 1/2G EEx ia IIC T6 - XA Note safety instruction (Elektrostatische Aufladung)!	
	6	ATEX II 1/2G EEx ia IIC T6, WHG - XA Sicherheitshinweise beachten (electrostatic charging)!	
	G	ATEX II 3G EEx nA II T6	
	S	FM IS Cl.I Div.1 Gr. A-D	
	U	CSA IS Cl.I Div.1 Gr. A-D	
	K	TIIS Ex ia IIC T3	
	L	TIIS Ex ia IIC T6	
	Y	Special version	

20	Antenna:		Additional weight
	A	150mm/6", FKM, Planar	
	B	150mm/6", HNBR, Planar	
	U	200mm/8", FKM, Planar	
	V	200mm/8", HNBR, Planar	1.1 kg
	E	250mm/10", FKM, Planar	
	F	250mm/10", HNBR, Planar	2.1 kg
	W	300mm/12", HBNR, Planar	
	X	300mm/12", FKM, Planar	2.5 kg
	Y	Special version	

30	Prozessanschluss:		Additional weight
		— EN-Flanges —	
	CWJ	DN150 PN10/16 B1, 316L flange EN1092-1 (DIN2527 C)	10.6 kg
	C1J	DN150 PN25 B1, 316L flange EN1092-1 (DIN2527 C)	14.7 kg
	CXJ	DN200 PN16 B1, 316L flange EN1092-1 (DIN2527 C)	16.5 kg
	CZJ	DN200 PN25 B1, 316L flange EN1092-1 (DIN2527 C)	22.7 kg
	C6J	DN250 PN16 B1, 316L flange EN1092-1 (DIN2527 C)	25.6 kg
	C8J	DN300 PN16 B1, 316L flange EN1092-1 (DIN2527 C)	36.1 kg
		— ANSI-Flanges —	
	AVJ	6" 150lbs RF sch.40, 316/316L flange ANSI B16.5	11.3 kg
	AWJ	6" 300lbs RF sch.40, 316/316L flange ANSI B16.5	20.9 kg
	A3J	8" 150lbs RF sch.40, 316/316L flange ANSI B16.5	19.6 kg
	AXJ	8" 300lbs RF sch.40, 316/316L flange ANSI B16.5	34.3 kg
	A5J	10" 150lbs RF sch.40, 316/316L flange ANSI B16.5	28.8 kg
	A7J	12" 150lbs RF, 316/316L flange ANSI B16.5	43.2 kg
		— JIS-Flanges —	
	KVJ	10K 150 RF, 316L flange JIS B2238	
	KWJ	20K 150A RF, 316L flange JIS B2238	14.7 kg
	KDJ	10K 200A RF, 316L flange JIS B2238	13.8 kg
	KXJ	20K 200A RF, 316L flange JIS B2238	21.2 kg
	K5J	10K 250A RF, 316L flange JIS B2238	22.5 kg
		— Miscellaneous—	
	XXJ	With flange hub, 316L	
	XVU	UNI-Flange 6"/DN150/150, 304 max 14.5lbs/PN1/1K, compatible with 6" 150lbs / DN150 PN16 / 10K 150	3.5 kg
	X3U	UNI-Flange 8"/DN200/200, 304 max 14.5lbs/PN1/1K, compatible with 8" 150lbs / DN200 PN16 / 10K 200	5.2 kg
	X5U	UNI-Flange 10"/DN250/250, 304 max 14.5lbs/PN1/1K, compatible with 10" 150lbs / DN250 PN16 / 10K 250	7.5 kg
	X7U	UNI-Flange 12"/DN300/300, 304 max 14.5lbs/PN1/1K, compatible with 12" 150lbs / DN300 PN16 / 10K 300	10.8 kg
	Y	Special version	

40	Output; Operation:	
	A	4-20mA HART; 4-line display VU331, envelope curve display on site
	Y	Special version

FMR532-					Product designation (Part 1)

FMR532 continued

50							**Housing:**				
							C	T12 Alu, coated IP65 NEMA4X, separate conn. compartment			
							Y	Special version			
60								**Cable entry:**			
								2	Gland M20		
								3	Thread G1/2		
								4	Thread NPT1/2		
								Y	Special version		
70									**Weight + measure approval:**		
									A	NMi + PTB (<1mm) type approval	
									F	NMi witnessed initial verificat. (<1mm) type approval	
									G	PTB witnessed initial verificat. (<1mm) type approval	
									R	Not selected; Inventory control version (3mm)	
									Y	Special version	
80										**Additional option:**	
										A	Basic version
										S	GL/ABS marine certificate
										Y	Special version
FMR532-											Complete product designation

Micropilot S FMR533

This overview does not mark options which are mutually exclusive.

10	Approval:		Basic weight
	A	Non-hazardous area	7.1 kg
	1	ATEX II 1/2G EEx ia IIC T6 - XA Note safety instruction (electrostatic charging)!	
	6	ATEX II 1/2G EEx ia IIC T6, WHG - XA Note safety instruction (electrostatic charging)!	
	G	ATEX II 3G EEx nA II T6	
	S	FM IS Cl.I Div.1 Gr. A-D	
	U	CSA IS Cl.I Div.1 Gr. A-D	
	K	TIIS Ex ia IIC T3	
	L	TIIS Ex ia IIC T6	
	Y	Special version	

20	Antenna:		Additional weight
	A	450mm/20", Parabolic,no wetted O-ring	
	Y	Special version	

30	Prozessanschluss:		Additional weight
		— EN-Flanges —	
	CWJ	DN150 PN10/16 B1, 316L flange EN1092-1 (DIN2527 C)	10.6 kg
	CXJ	DN200 PN16 B1, 316L flange EN1092-1 (DIN2527 C)	16.5 kg
	C6J	DN250 PN16 B1, 316L	25.6 kg
		— ANSI-Flanges —	
	AVJ	6" 150lbs RF, 316/316L	11.3 kg
	A3J	8" 150lbs RF, 316/316L	19.6 kg
	A5J	10" 150lbs RF, 316/316L	28.8 kg
		— JIS-Flanges —	
	KVJ	10K 150 RF, 316L flange JIS B2238	9.9 kg
	KDJ	10K 200 RF, 316L flange JIS B2238	13.8 kg
	K5J	10K 250 RF, 316L flange JIS B2238	22.9 kg
		— Miscellaneous—	
	XXJ	With flange hub, 316L	
	XVU	UNI-Flange 6"/DN150/150, 304 max 14.5lbs/PN1/1K, compatible with 6" 150lbs / DN150 PN16 / 10K 150	3.5 kg
	Y	Special version	

40	Output; Operation:	
	A	4-20mA HART; 4-line display VU331, envelope curve display on site
	Y	Special version

50	Housing:	
	C	T12 Alu, coated IP65 NEMA4X, separate conn. compartment
	Y	Special version

60	Cable entry:	
	2	Gland M20
	3	Thread G1/2
	4	Thread NPT1/2
	Y	Special version

70	Weight + measure approval:	
	A	NMi + PTB (<1mm) type approval
	F	NMi witnessed initial verificat. (<1mm) type approval
	G	PTB witnessed initial verificat. (<1mm) type approval
	R	Not selected; Inventory control version (3mm)
	Y	Special version

80	Additional option:	
	A	Basic version
	Y	Special version

FMR533-	Complete product designation

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