



Level



Pressure



Flow



Temperature

Liquid  
Analysis

Registration

Systems  
Components

Services



Solutions

## Technical Information

# Solicap M FTI55, FTI56

## Level Limit Switch

## Universal Capacitive Limit Switch for Bulk Solids



### Application

The compact transmitter is used for level limit detection in bulk solids and can be operated in minimum or maximum failsafe mode.

Due to its robust construction, it can also be used to provide accurate measurements in applications with very high tensile loads (up to 60 kN for rope version) or lateral loads (up to 300 Nm for rod version).

In combination with Fieldgate (for remote interrogation of measured values using internet technology), Solicap M represents an ideal solution for material provisioning and logistical optimization (inventory control).

### Your benefits

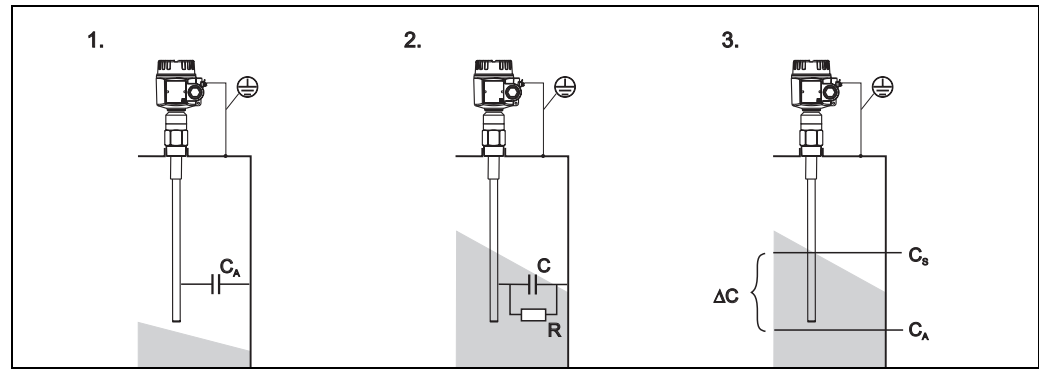
- Extremely robust design for harsh process conditions
- Easy and fast commissioning as calibration is performed at the press of a button
- Universal application thanks to wide range of certificates and approvals
- Two-stage overvoltage protection against static discharges from the silo
- Active buildup compensation for bulk solids with caking tendency (under development)
- Increased safety due to permanent automatic monitoring of electronics
- Reduction in storage costs thanks to easy-to-shorten rod model (for partial insulation) and rope model (for partial and full insulation)
- Two-point control (e.g. for controlling a handling device)

## Function and system design

### Measuring principle

The principle of capacitive level limit detection is based on the change in capacitance of a capacitor as a result of the probe being covered by bulk solids. The probe and container wall (conductive material) form an electric capacitor. When the probe is in air (1), a certain low initial capacitance is measured. If the container is being filled, the capacitance of the capacitor increases as more of the probe is covered (2), (3).

The limit switch switches when the capacitance  $C_S$  specified during calibration is reached. In addition, a probe with inactive length ensures that the effects of medium buildup or condensate near the process connection are avoided. A probe with active buildup compensation compensates for the effects of buildup on the probe in the area of the process connection.



$R$ : Conductivity of bulk solids  
 $C$ : Capacity of bulk solids  
 $C_A$ : Initial capacitance (probe not covered)  
 $C_S$ : Switching capacitance  
 $\Delta C$ : Change in capacitance

### Function

The electronic insert selected for the probe determines the change in capacitance depending on how much of the probe is covered. This ensures accurate switching at the switchpoint (level) calibrated for this purpose.

### Application examples

Sand, glass aggregate, gravel, moulding sand, lime, ore (crushed), plaster, aluminium shavings, cement, grain, pumice, flour, dolomite, sugar beet, kaolin, fodder and similar bulk solids.

In general:

Bulk solids with a relative dielectric constant  $\epsilon_r \geq 2.5$ .

### Electronic versions

FEI52

3-wire direct current version:

- Switch the load via the transistor (PNP) and separate supply voltage connection.
- Level limit adjustment directly at the level limit probe.

FEI53

3-wire direct current version with 3 to 12 V signal output:

- For separate switching unit, Nivotester FTC325 3-WIRE.
- Level limit adjustment directly at the switching unit.

FEI54

Universal current version with relay output:

- Switch the loads via 2 floating changeover contacts (DPDT).
- Level limit adjustment directly at the level limit probe.

FEI55

Signal transmission 8/16 mA on two-wire cabling:

- For separate switching unit (e.g. RN221N, RNS221, RMA421, RMA422).
- Level limit adjustment directly at the level limit probe.

## Certificates and approvals

### CE approval

The devices are designed to meet state-of-the-art safety requirements, have been tested and left the factory in a condition in which they are safe to operate. The devices comply with the applicable standards and regulations that are listed in the EC Declaration of Conformity and thus meet the legal requirements of the EC Directives. Endress+Hauser confirms the conformity of the device by affixing to it the CE approval.

### Ex approval

See "Ordering information", Page 36 ff.

### Other standards and guidelines

#### EN 60529

Degrees of protection by housing (IP code)

#### EN 61010

Protection measures for electrical equipment for measurement, control, regulation and laboratory procedures

#### EN 61326

Interference emission (Class B equipment), interference immunity (Appendix A - Industrial)

#### NAMUR

Association for Standards for Control and Regulation in the Chemical Industry

## Ordering information



Note!

In this list, versions which are mutually exclusive are not marked.

### Solicap M FTI55

<b>10</b>	<b>Approval:</b>		
	A	Non-hazardous areas	
	B	ATEX II 1/3 D	
	C	ATEX II 1/2 D	
	D	ATEX II 3 D	EEx nA/nL/nC
	F	ATEX II 1 D, II 1/2 GD	EEx ia IIC T6
	K	CSA General Purpose,	CSA C US
	L	CSA/FM IS Cl. I, II, III,	Div. 1+2, Gr. A-G
	M	CSA/FM XP Cl. I, II, III,	Div. 1+2, Gr. A-G
	N	CSA/FM DIP Cl. I, II, III,	Div. 1+2, Gr. E-G
	S	TIIS Ex ia IIC T3	
	T	TIIS Ex d IIC T3	
	Y	Special version, to be specified	
<b>20</b>	<b>Inactive length L3:</b>		
	A	Not selected	
	B	Not selected + 125 mm/5 inch	316L
		Active buildup compensation	
	1	.... mm	316L
	5	.... inch	316L
	9	Special version	
<b>30</b>	<b>Active length L1:</b>		
	A	.... mm,	steel
	B	325 mm,	steel
	C	.... mm,	316L
	D	325 mm,	316L
	H	.... inch,	steel
	K	13 inch,	steel
	M	.... inch,	316L
	N	13 inch,	316L
	Y	Special version, to be specified	
<b>40</b>	<b>Insulation:</b>		
	1	fully insulated PE,	max. 80 °C
	2	75 mm L2, partially insulated PPS,	max. 180 °C
	3	3 inch L2, partially insulated PPS,	max. 180 °C

<b>40</b>										<b>Insulation:</b>
										9 Special version, to be specified
<b>50</b>										<b>Process connection:</b>
										AFJ 2", 150 lbs RF 316/316L
										AGJ 3", 150 lbs RF 316/316L
										AHJ 4", 150 lbs RF 316/316L
										BSJ DN80, PN10/16 A 316L EN1092-1 (DIN2527 B)
										BTJ DN100, PN10/16 A 316L EN1092-1 (DIN2527 B)
										B3J DN50, PN25/40 A 316L EN1092-1 (DIN2527 B)
										KFJ 10K 50, RF 316L JIS B2220
										KGJ 10K 80, RF 316L JIS B2220
										KHJ 10K 100, RF 316L JIS B2220
										RGJ NPT 1½, 316L thread ANSI
										RG1 NPT 1½, steel thread ANSI
										RVJ R 1½, 316L thread DIN2999
										RV1 R 1½, steel thread DIN2999
										YY9 Special version, to be specified
<b>60</b>										<b>Electronics; output:</b>
										W Prepared for FEI5x
										Y Special version, to be specified
										2 FEI52; 3-wire PNP, 10 to 55 V DC
										3 FEI53; 3-wire, 3 to 12 V signal
										4 FEI54; relay DPDT, 19 to 253 V AC, 19 to 55 V DC
										5 FEI55; 8/16 mA, 11 to 36 V DC
										7 FEI57S; 2-wire PFM
<b>70</b>										<b>Housing:</b>
										1 F15 316L IP66, NEMA4X
										2 F16 polyester IP66, NEMA4X
										3 F17 aluminum IP66, NEMA4X
										4 F13 Alu + gas-tight probe seal IP66, NEMA4X
										5 T13 Alu + gas-tight probe seal + separate connection compartment IP66, NEMA4X
										9 Special version, to be specified
<b>80</b>										<b>Cable entry:</b>
										A M20 Threaded joint
										B Thread G ½
										C Thread NPT ½
										D Thread NPT ¾
										G Thread M20
										Y Special version, to be specified
<b>90</b>										<b>Probe design:</b>
										1 Compact
										2 2000 mm L4 cable > separate housing
										3 .... mm L4 cable > separate housing
										4 80 inch L4 cable > separate housing
										5 .... inch L4 cable > separate housing
										9 Special version, to be specified
<b>100</b>										<b>Additional equipment:</b>
										A Basic version
										D EN10204-3.1 material (316L wetted), Inspection certificate
										E EN10204-3.1 material (316L wetted), NACE MR0175 Inspection certificate
										Y Special version, to be specified
<b>FTI55</b>										Product designation

## Solicap M FTI56

<b>10</b>	<b>Approval:</b>			
	A	Non-hazardous areas		
	B	ATEX II 1/3 D		
	C	ATEX II 1/2 D		
	D	ATEX II 3 D	EEx nA/nL/nC	
	F	ATEX II 1 D, II 1/2 GD	EEx ia IIC T6	
	K	CSA General Purpose,	CSA C US	
	L	CSA/FM IS Cl. I, II, III,	Div. 1+2, Gr. A-G	
	M	CSA/FM XP Cl. I, II, III,	Div. 1+2, Gr. A-G	
	N	CSA/FM DIP Cl. I, II, III,	Div. 1+2, Gr. E-G	
	S	TIIIS Ex ia IIC T3		
	T	TIIIS Ex d IIC T3		
	Y	Special version, to be specified		
<b>20</b>	<b>Inactive length L3:</b>			
	A	Not selected		
	1	.... mm	316L	
	5	.... inch	316L	
	9	Special version		
<b>30</b>	<b>Active length L1; anchor weight:</b>			
	A	.... mm,	6 mm rope	316L; 316L
	B	.... mm,	12 mm rope	316L; 316L
	C	.... mm,	8 mm rope	galvanized steel; steel
	D	.... mm,	14 mm rope	galvanized steel; steel
	H	.... inch,	0.2" rope	316L; 316L
	K	.... inch,	0.5" rope	316L, 316L
	M	.... inch,	0.3" rope	galvanized steel; steel
	N	.... inch,	0.6" rope	galvanized steel; steel
	Y	Special version, to be specified		
<b>40</b>	<b>Insulation:</b>			
	1		fully insulated PA,	max. 120 °C
	2	500 mm L2,	partially insulated PTFE,	max. 180 °C
	9	Special version, to be specified		
<b>50</b>	<b>Process connection:</b>			
	AFJ	2",	150 lbs RF	316/316L
	AGJ	3",	150 lbs RF	316/316L
	AHJ	4",	150 lbs RF	316/316L
	BSJ	DN80,	PN10/16 A	316L EN1092-1 (DIN2527 B)
	BTJ	DN100,	PN10/16 A	316L EN1092-1 (DIN2527 B)
	B3J	DN50,	PN25/40 A	316L EN1092-1 (DIN2527 B)
	KFJ	10K 50,	RF	316L JIS B2220
	KGJ	10K 80,	RF	316L JIS B2220
	KHJ	10K 100,	RF	316L JIS B2220
	RGJ	NPT 1½		316L thread ANSI
	RG1	NPT 1½,		steel thread ANSI
	RVJ	R 1½,		316L thread DIN2999
	RV1	R 1½,		steel thread DIN2999
	YY9	Special version, to be specified		
<b>60</b>	<b>Electronics; output:</b>			
	W	Prepared for FEI5x		
	Y	Special version, to be specified		
	2	FEI52; 3-wire PNP,	10 to 55 V DC	
	3	FEI53; 3-wire,	3 to 12 V signal	
	4	FEI54; relay DPDT,	19 to 253 V AC, 19 to 55 V DC	
	5	FEI55; 8/16 mA,	11 to 36 V DC	
	7	FEI57S; 2-wire PFM		
<b>70</b>	<b>Housing:</b>			
	1	F15 316L	IP66, NEMA4X	
	2	F16 polyester	IP66, NEMA4X	



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