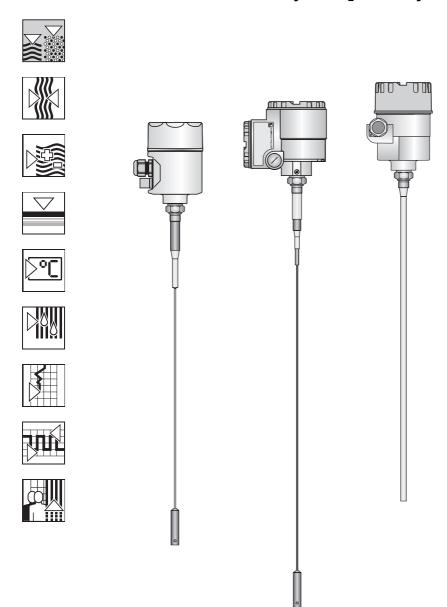
Technical Information TI 240F/00/en

# Level Probes multicap T DC 12 TE multicap T DC 11/16/21/26 TEN multicap T DC 11/16/21/26 TES

Compact capacitive level probes (with European certificates). Fully and partially insulated rod and rope probes



#### Application

Multicap T probes are designed for continuous level measurement and limit detection, primarily in liquids.
The DC 12 T probe with reinforced rod is also suitable for use in light bulk solids.

The probe rod or rope and insulation are made of corrosion-resistant materials able to withstand extremely aggressive products. The tried-and-tested rugged construction is gas-tight for pressures from vacuum to 25 bar. Seal and insulation materials enable probes to be used at operating temperatures in the vessel of - 80°C to +200°C.

#### **Features and Benefits**

Certificates from many European approval authorities

= the probes have universal use

Versions for a wide range of applications = ideally adapted to your application at a cost effective price

Wide range of process connections from G  $^{3}/_{4}$  A and  $^{3}/_{4}$  NPT

= easy mounting in tight spaces

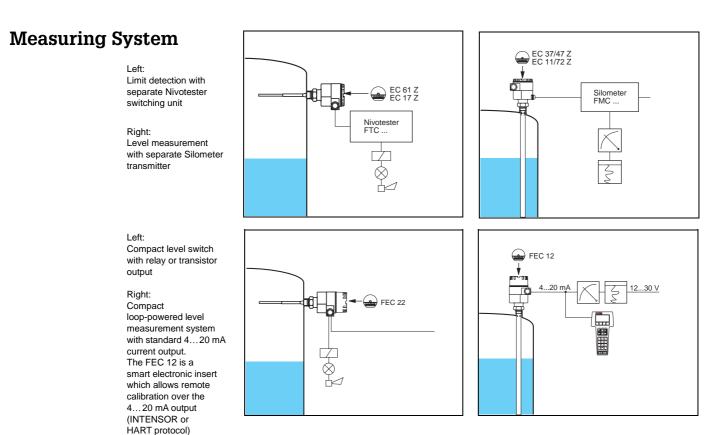
Screened against condensation in the nozzle

= reliable function even with condensation

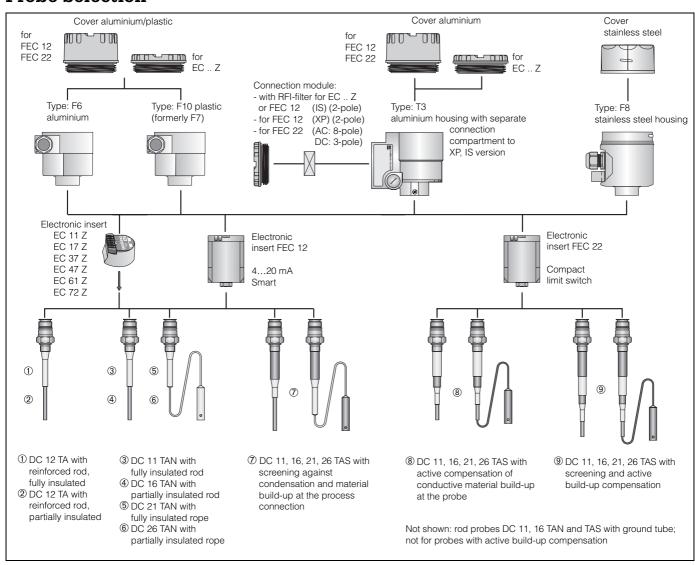
Active build-up compensation for limit detection

 steady and accurate switchpoint even with heavy contamination on the probe, no cleaning or recalibration





#### **Probe Selection**



#### **Dimensions**

#### **DC 12 TE**

L1 = Length of active probe rod L2 = Length of partial insulation minimum: 75 mm maximum: length L1 minus 50 mm

Thread options:

G <sup>3</sup>/<sub>4</sub> A, G 1 A <sup>3</sup>/<sub>4</sub> - 14 NPT, 1 - 11<sup>1</sup>/<sub>2</sub> NPT

DC 12 TE Rod probe with reinforced rod for high lateral load

Left: fully insulated

Right: partially insulated

#### 41 AF 41 AF NPT G NPT G Partial Insulation Active probe rod 100...3000 $L_2$ $\Gamma_2$ Active probe rod 100...3000 Ľ Ľ Ľ ø16

#### **Dimensions**

#### DC 11/16/21/26 TEN

L1 = Length of active probe rod or probe rop L2 = Length of partial insulation minimum: 75 mm

maximum: length L1 minus 50 mm

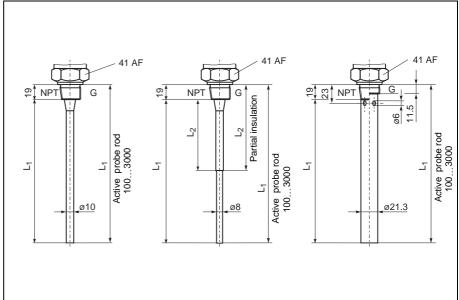
Thread options:

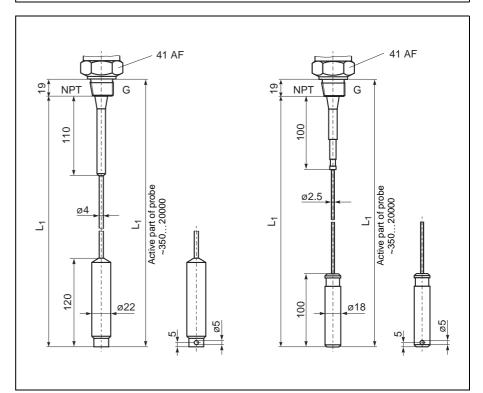
G <sup>3</sup>/<sub>4</sub> A, G 1 A <sup>3</sup>/<sub>4</sub> - 14 NPT, 1 -11 <sup>1</sup>/<sub>2</sub> NPT

Left: DC 11 TEN Fully insulated rod probe

Centre: DC 16 TEN Partially insulated rod probe

Right: DC 11, 16 TEN with ground tube (fully or partially insulated probe rod)





Left: DC 21 TEN Fully insulated rope probe

Right: DC 26 TEN Partially insulated rope probe

Tensioning weight with anchor hole

#### **Dimensions**

#### DC 11/16/21/26 TES

All probes on this page are shown with partial insulation. All versions are available with full insulation

L1 = Length of active probe rod or probe rope

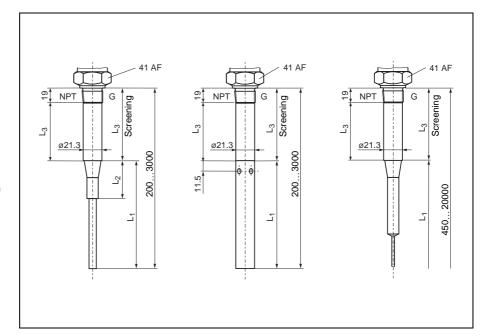
Length of partial insulation see page 3

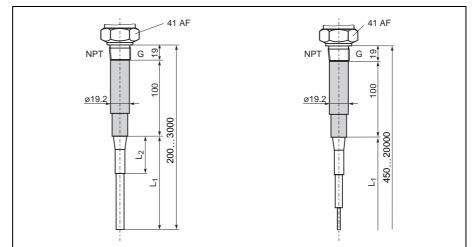
Thread options:

G <sup>3</sup>/<sub>4</sub> A, G 1 A <sup>3</sup>/<sub>4</sub> - 14 NPT, 1 - 11<sup>1</sup>/<sub>2</sub> NPT

Probes with **screening L3** against condensation and material build-up on the process connection

Left:
Rod probe DC 11 TES
or DC 16 TES
Centre:
Rod probe DC 11 TES
or DC 16 TES with
ground tube
Right:
Rope probe DC 21 TES
or DC 26 TES





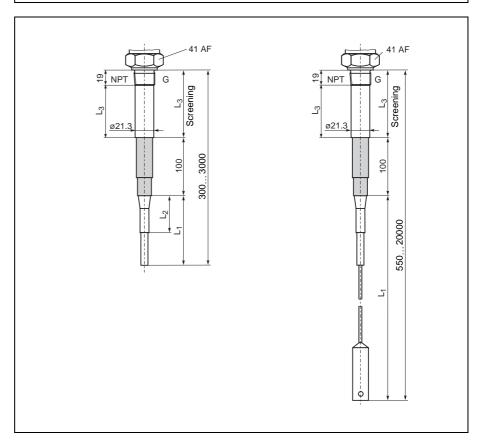
Probes with active build-up compensation (always 100 mm)

Left: Rod probe DC 11 TES or DC 16 TES Right: Rope probe DC 21 TES or DC 26 TES

Probes with screening L3 and with active build-up compensation

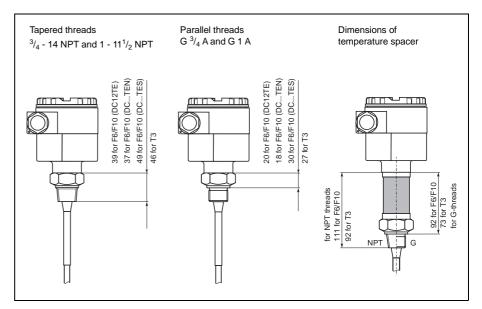
Left: Rod probe DC 11 TES or DC 16 TES Right: Rope probe DC 21 TES or DC 26 TES

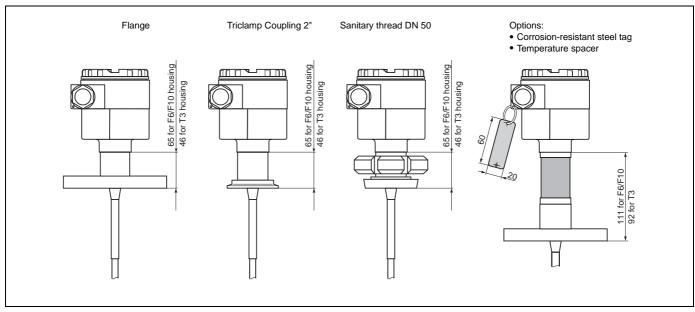
L3
The screening is available in three standard lengths:
L3 = 150 mm,
L3 = 250 mm,
L3 = 500 mm
Special lengths on demand
L3 min. 100 mm
L3 max. 1500 mm



#### Dimensions Continued/ Additional Process Connections

All probes shown with type F6/F10 housing Dimensions for type T3 housing are also shown





#### **Housing Dimensions**

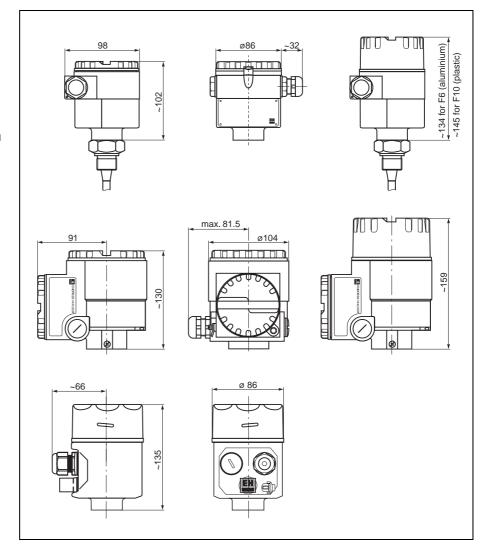
Top row: Housings in aluminium (type F6) or plastic (type F10, formerly F7)

Bottom row: Housings in aluminium (type T3) with separate connection compartment;

- with RFI filter for small with RFI filter for si electronic inserts
  EC 17 Z, EC 61 Z
  EC 37 Z, EC 47 Z,
  EC 11 Z, EC 72 Z
  with RFI filter and
- terminal connection module for FEC 12 (EEx ia)
- with RFI filter and safety barriers for FEC 12 (EEx d)
- terminal connection module for FEC 22

Stainless steel housing (type F8) for electronic inserts EC .. Z/FEC .. with two cable entries, one sealed with a blind plug.

- Both housings:
   with low cover for small electronic inserts EC .. Z,
- with raised cover for electronic inserts FEC 12, FEC 22; with two cable entries, one sealed with a blind



#### **Technical Data**

#### **General Information**

#### Operating data

Permitted operating pressures  $p_e$  and operating temperatures  $T_B$ 

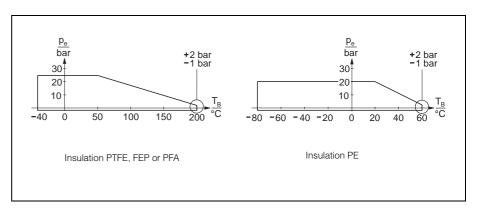
Mounting of the electronic insert as a function of operating temperature T<sub>B</sub> and ambient temperature T<sub>U</sub>: A Basic probe
B Probe with temperature spacer
C Electronic insert in separate housing
D Probe with temperature spacer and electronic insert in separate housing

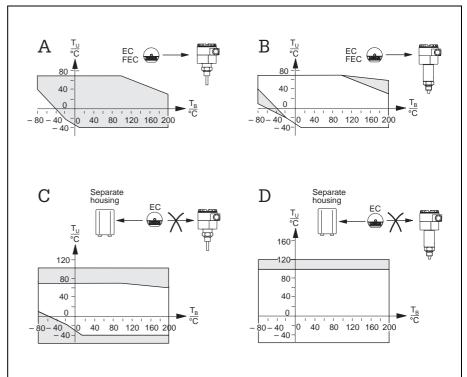
The graphs A and B apply to **all** electronic inserts

The graphs C and D apply to the small electronic inserts EC 17 Z, EC 61 Z, EC 37 Z, EC 47 Z EC 11 Z, EC 72 Z

Manufacturer	Endress+Hauser GmbH+Co. D-79689 Maulburg, Germany
Instrument family	Multicap T
Instrument types	DC 12 TE, DC 11, 16, 21, 26 TEN / TES
Function	Probes for capacitive level measurement and limit detection

	1	
Operating pressure	max. 25 bar	depending on material - see below
Operating temperature	max. 200 °C	depending on material - see below
Lateral load on probe rod	DC 12 TE: 30 Nm at 20 °C, static DC 11, 16: 15 Nm at 20 °C, static	
Max. tension on probe rope	200 N at 20 ℃, static	





#### Probe Lengths

Total length of rod probe	min. 100 mm, max. 3000 mm, see dimensions
Total length of rope probe	min. 350 mm, max. 20000 mm, see dimensions

#### Capacitance values of the probe

Basic capacitance:	approx. 30 pF
Temperature spacer:	approx. 5 pF
Active build-up compensation:	< 10 pF

## Operating data (continued)

Additional capacitances

Probe 250 mm from a	Probe rod: approx. 1.3 pF/10	
conductive vessel wall	Probe rope: approx. 1.0 pF/	100 mm in air
Insulated probe rod in water:	approx. 38 pF/100 mm DC 1 approx. 50 pF/100 mm DC 1	
Insulated probe rope in water:	approx. 20 pF/100 mm	
Rod probe with ground tube	insulated probe rod uninsulated probe rod	in air approx. 6.4 pF/100 mm in water approx. 50 pF/100 mm in air approx. 5.6 pF/100 mm

Probe Lengths for continuous measurement in conducting liquids

EC with $\Delta C_{max} = 2000 \text{ pF}$ (EC 47 Z, EC 72 Z, FEC 12)	Rope probe up to 8000 mm (up to 20000 mm in non conducting liquids) Rod probe up to 3000 mm	
EC with $\Delta C_{max} = 4000 \text{ pF}$ (EC 37 Z, EC 11 Z)	Rope probe up to 20000 mm Rod probe up to 3000 mm	

Accuracy:

Accuracy:		
Length tolerances	up to 1 m: +0 mm, - 5 mm rod probe/ -10 mm rope probe up to 3 m: +0 mm, - 10 mm rod probe/ -20 mm rope probe up to 6 m: +0 mm, - 30 mm up to 20 m: +0 mm, - 40 mm	
The following specifications ap	oly to <b>fully insulated</b> probes operating in <b>conducting</b> liquids	
Linearity error	<1 % for 1 m **	
Temperature dependence of the probe rod	< 0,1 % per K DC 12 TE ** < 0,12 % per K DC 11 TEN/TES **	
Pressure dependence of the probe rod	0,120,34 % per bar **	
Temperature dependence of the probe rope	< 0,1 % per K **	
Pressure dependence of the probe rope	< 0,1 % per bar **	
** Error in non-conducting materials insignificant		

#### Process Connections

100033 CONTICONONS		
Parallel thread G <sup>3</sup> / <sub>4</sub> A or G 1 A	DIN ISO 228/I, with sealing ring 27x32 or 33x39 to DIN 7603	
Tapered thread <sup>3</sup> / <sub>4</sub> - 14 NPT or 1 - 11 <sup>1</sup> / <sub>2</sub> NPT	ANSI B 1.20.1	
DIN flanges without raised face	DIN 2527, Form B	
DIN flanges with tongue	DIN 2512, Form F	
DIN flanges with groove	DIN 2512, Form N	
ANSI flanges	ANSI B 16.5	
Sanitary thread	DIN 11851	
Triclamp coupling	ISO 2852	

## Operating data (continued)

#### Materials

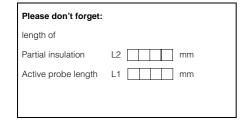
Materiale	
Aluminium housing (F6, T3)	GD-Al Si 10 Mg, DIN 1725, plastic coated (blue / grey)
Plastic housing (type F10)	fibre-glass reinforced polyester (blue/grey)
Stainless steel housing (type F8)	stainless steel 1.4301 (AISI 304), unvarnished
Seal for housing cover	type F6, T3 housings: O-ring in EPDM (elastomer) type F10 housing: O-ring in silicone rubber
Cable gland IP 66 for cable entry Pg 16	Polyamide with neoprene CR seal for cable diameter 712 mm; ambient temperature up to 80℃
Sealing ring for process connection G <sup>3</sup> / <sub>4</sub> A or G 1 A	Elastomer-fibre, asbestos-free, resistant to oils, solvents, steam, weak acids and alkalis; up to 300°C and 100 bar
Temperature spacer	Stainless steel SS 304 (1.4301) or similar
Probe rod, ground tube process connection, screening, build-up compensation, tensioning weight for rope probe	AISI 316L (1.4435)
Probe rope	AISI 316 (1.4401)
Further material specifications	see Product Structure on Page 1013

#### **Product Structure**



# **Product Structure** (Continued)

Flange Version (continued)	additional weights
ANSI-flanges  5A RF 1" 150 psi, ANSI B16.5  5B RF 1" 300 psi, ANSI B16.5  5E RF 1 1/2" 150 psi, ANSI B16.5  5F RF 1 1/2" 300 psi, ANSI B16.5  5G RF 2" 150 psi, ANSI B16.5  5H RF 2" 300 psi, ANSI B16.5  6A RF 1" 150 psi, ANSI B16.5  6B RF 1" 300 psi, PTFE coated, ANSI B16.5  6E RF 1 1/2" 150 psi, PTFE coated, ANSI B16.5  6E RF 1 1/2" 150 psi, PTFE coated, ANSI B16.5  6F RF 1 1/2" 300 psi, PTFE coated, ANSI B16.5  6G RF 2" 150 psi, PTFE coated, ANSI B16.5  6G RF 2" 300 psi, PTFE coated, ANSI B16.5  6H RF 2" 300 psi, PTFE coated, ANSI B16.5  Other	0.7 kg 1.2 kg 1.3 kg 2.5 kg 2.2 kg 3.0 kg 0.7 kg 1.2 kg 1.3 kg 2.5 kg 2.2 kg 3.0 kg
Electronic insert  A None (for type F6, F10 housing and for EC Z only)  2 None (for type F6, F10 housing and for FEC only)	0.3 kg <sup>●</sup>
Limit detection  B EC 61 Z (3-wire limit detection)  E EC 17 Z (PFM limit detection)  M* FEC 22 (90253V AC, DPDT-relais)  N* FEC 22 (1055V DC, PNP-three wire)  * not for EEx ia	0.2 kg 0.2 kg 0.3 kg <sup>•</sup> + 0.3 kg 0.3 kg <sup>•</sup> + 0.3 kg
Level measurement  C EC 11 Z (3-wire continuous 33 kHz)  D EC 72 Z (3-wire continuous 1 MHz)  G EC 37 Z (PFM 33 kHz)  H EC 47 Z (PFM 1 MHz)	0.2 kg 0.2 kg 0.2 kg 0.2 kg
K FEC 12 (420 mA loop-powered with HART protocol) L FEC 12 (420 mA loop-powered with INTENSOR protocol) Y Other	$0.3 \text{ kg}^{\bullet} + 0.3 \text{ kg}$ $0.3 \text{ kg}^{\bullet} + 0.3 \text{ kg}$
Housing and Cable Entry EEx d only with M, S, T A Plastic housing (F10) IP 66, Pg 16 (IP 66) B Aluminium housing (F6) IP 66, Pg 16 (IP 66) C Aluminium housing (T3) IP 66, Pg 16 (IP 66) K Plastic housing (F10) IP 66, M 20 x 1.5	1.0 kg
L Aluminium housing (F6) IP 66, M 20 x 1.5 M Aluminium housing (T3) IP 66, M 20 x 1.5 S Aluminium housing (T3) Nema 4X, <sup>3</sup> / <sub>4</sub> NPT T Aluminium housing (T3) IP 66, G <sup>1</sup> / <sub>2</sub> Sainless steel housing (F8) IP 66, Pg 13.5 (IP 66) Sainless steel housing (F8) IP 66, M 20 x 1.5 Sainless steel housing (F8) IP 66, M 20 x 1.5 Sainless steel housing (F8) IP 66, M 20 x 1.5 Coher	1.0 kg 1.0 kg 1.0 kg
Options 1 None 2 Stainless steel tag (e.g. for tag number) 3 Temperature spacer 4 Temperature spacer and stainless steel tag 9 Other	0.2 kg 0.2 kg
<ul> <li>         additional weight         for raised covered.     </li> </ul>	
Basic type Certificate Probe type Type of insulation Active probe length Process connection	
DC 12 TE - Complete product designation for DC 1	12 TE

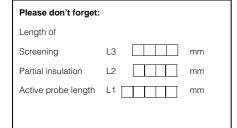


### **Product Structure**

DC 11 TEN-MULTICAP T DC 11 TEN Fully insulated rod probe for standard applications DC 16 TEN-MULTICAP T DC 16 TEN	Basic weights including 1.2 kg <sup>3</sup> / <sub>4</sub> " process connection and	
Partially insulated rod probe for standard applications  Partially insulated rod probe for standard applications  F10 housing (for rope probes with tensioning weight)  1.2 kg		
Fully insulated rope probe for standard applications  1.4 kg  DC 26 TEN-MULTICAP T DC 26 TEN		
Partially insulated rope probe for standard applications	1.4 kg	
DC 11 TES- MULTICAP T DC 11 TES Fully insulated rod probe with protection features	1.2 kg	
DC 16 TES- MULTICAP T DC 16 TES  Partially insulated rod probe with protection features	1.2 kg	
DC 21 TES- MULTICAP T DC 21 TES Fully insulated rope probe with protection features	1.4 kg	
DC 26 TES- MULTICAP T DC 26 TES Partially insulated rope probe with protection features	1.4 kg	
Certificate		
A None B EEx ia IIC T3T6 (CENELEC) E EEx d [ia] IIC T6 (CENELEC) Y Other		
Protection Features Against condensation and build-up of material	additional weights	
A None (DC ##TEN)	2.44 TEC	
The following protection features are available for the DC B With active guard (build-up compensation)	0.2 kg	
C 150 mm L3 screening D 250 mm L3 screening E 500 mm L3 screening	0.2 kg 0,3 kg 0.6 kg	
F mm L3 screening G 150 mm L3 screening and active guard	1.2 kg/m 0.4 kg	
H 250 mm L3 screening and active guard K 500 mm L3 screening and active guard L mm L3 screening and active guard Y Other	0.5 kg 0,9 kg 1.7 kg/m + 0.2 kg	
Probe Insulation  1 Full insulation, rod PTFE, rope FEP  A mm L2 partial insulation PTFE (for DC 16 only)  D Uninsulated rope Ø 2.5 mm (for DC 26 only)  9 Other	0.06 kg/m	
Active Probe Length  1 mm L1, fully insulated rod probe	(DC 11) 0.5 kg/m	
2 mm L1, fully insulated rod probe with ground tube	(DC 11) 1.2 kg/m	
1 mm L1, partially insulated rod probe 2 mm L1, partially insulated rod probe	(DC 16) 0.4 kg/m	
with ground tube  1 mm L1, fully insulated rope probe	(DC 16) 1.1 kg/m	
tensioning weight with anchor hole  1 mm uninsulated rope probe	(DC 21) 0.04 kg/m	
tensioning weight with anchor hole  9 Other	(DC 26) 0.03 kg/m	
Process Connection		
A Thread G <sup>3</sup> / <sub>4</sub> A B Thread G 1A C Thread <sup>3</sup> / <sub>4</sub> NPT	0.1 kg	
D Thread 1 NPT E Sanitary thread DIN 11851 DN 50	0,1 kg 0,5 kg	
F Triclamp (ISO 2852) 2" 5 Flange coupling Y Other	0,5 kg	
Continued Page 13		
	(6.1.	
DC TE Product designati	on (first part)	

# **Product Structure** (Continued)

	nge Version None
1H 1K 1L 2D 2F 2H 2K 2L 3F 3H 3H 3L	DN 25 PN 40, DIN 2527 Form B DN 32 PN 6, DIN 2527 Form B DN 32 PN 6, DIN 2527 Form B DN 32 PN 40, DIN 2527 Form B DN 40 PN 6, DIN 2527 Form B DN 40 PN 40, DIN 2527 Form B DN 50 PN 6, DIN 2527 Form B DN 50 PN 6, DIN 2527 Form B DN 50 PN 40, DIN 2527 Form B DN 50 PN 40, DIN 2527 Form B DN 25 PN 40, PTFE coating, DIN 2527 Form B DN 32 PN 40, PTFE coating, DIN 2527 Form B DN 40 PN 40, PTFE coating, DIN 2527 Form B DN 40 PN 40, PTFE coating, DIN 2527 Form B DN 50 PN 6, PTFE coating, DIN 2527 Form B DN 50 PN 60, PTFE coating, DIN 2527 Form B DN 50 PN 40, PTFE coating, DIN 2527 Form B DN 50 PN 40, PTFE coating, DIN 2527 Form B DN 50 PN 40, PTFE coating, DIN 2527 Form B DN 50 PN 40, PTFE coating, DIN 2527 Form F DN 40 PN 40 with tongue, DIN 2527 Form F DN 40 PN 40 with tongue, DIN 2527 Form F SO N 50 PN 40 with tongue, DIN 2527 Form F SO N 50 PN 40 with tongue, DIN 2527 Form F SO N 50 PN 40 with tongue, DIN 2527 Form F SO N 50 PN 40 with tongue, DIN 2527 Form F SO N 50 PN 40 with tongue, DIN 2527 FORM F SO N 50 PN 40 with tongue, DIN 2527 FORM F SO N 50 PN 40 with tongue, DIN 2527 FORM F SO N 50 PN 40 with tongue, DIN 2527 FORM F SO N 50 PN 40 with tongue, DIN 2527 FORM F SO N 50 PN 40 with tongue, DIN 2527 FORM F SO N 50 PN 40 with tongue, DIN 2527 FORM F SO N 50 PN 40 with tongue, DIN 2527 FORM F SO N 50 PN 40 with tongue, DIN 2527 FORM F SO N 50 PN 40 with tongue, DIN 2527 FORM F SO N 50 PN 40 with tongue, DIN 2527 FORM F SO N 50 PN 40 with tongue, DIN 2527 FORM F SO N 50 PN 40 with tongue, DIN 2527 FORM F
5A 5B 5E 5F 5G 5H 6A 6B 6E 6F 6G 6H	RF 1" 300 psi, ANSI B16.5 1.2 kg RF 1 "/z" 150 psi, ANSI B16.5 1.3 kg RF 1 "/z" 150 psi, ANSI B16.5 2.5 kg RF 2" 150 psi, ANSI B16.5 2.2 kg RF 2" 300 psi, ANSI B16.5 3.0 kg RF 1" 150 psi, PTFE coating, ANSI B16.5 0.7 kg RF 1" 300 psi, PTFE coating, ANSI B16.5 1.2 kg RF 1" 300 psi, PTFE coating, ANSI B16.5 1.3 kg RF 1"/z" 150 psi, PTFE coating, ANSI B16.5 1.3 kg RF 1"/z" 300 psi, PTFE coating, ANSI B16.5 2.5 kg RF 2" 150 psi, PTFE coating, ANSI B16.5 2.2 kg
	Electronic insert  A None (for type F6, F10 housing and for EC Z only)  2 None (for type F6, F10 housing and for FEC only)  0.3 kg  0.3 kg
	Limit detection  B EC 61 Z (3-wire limit detection) 0.2 kg  E EC 17 Z (PFM limit detection) 0.2 kg  M* FEC 22 (90253V AC, DPDT-relais) 0.3 kg● + 0.3 kg  * not for EEx ia  Limit detection 0.2 kg  0.3 kg● + 0.3 kg  0.3 kg● + 0.3 kg  0.3 kg● + 0.3 kg
	Level measurement         C       EC 11 Z (3-wire continuous 33 kHz)       0.2 kg         D       EC 72 Z (3-wire continuous 1 MHz)       0.2 kg         G       EC 37 Z (PFM 33 kHz)       0.2 kg         H       EC 47 Z (PFM 1 MHz)       0.2 kg         K       FEC 12 (420 mA loop-powered with HART protocol)       0.3 kg • + 0.3 kg         L       FEC 12 (420 mA loop powered with INTENSOR protocol)       0.3 kg • + 0.3 kg         Y       Other
	Housing and Cable Entry  EEx d only with M, S, T  A Plastic housing (F10) IP 66, Pg 16 (IP 66)  B Aluminium housing (F6) IP 66, Pg 16 (IP 66)  C Aluminium housing (T3) IP 66, Pg 16 (IP 66)  K Plastic housing (F10) IP 66, M 20 x 1.5  L Aluminium housing (F6) IP 66, M 20 x 1.5  M Aluminium housing (T3) IP 66, M 20 x 1.5  M Aluminium housing (T3) IP 66, M 20 x 1.5  S Aluminium housing (T3) IP 66, M 20 x 1.5  1.0 kg  T Aluminium housing (T3) IP 66, G 1/2  Sainless steel housing (F8) IP 66, Pg 13.5 (IP 66)  Sainless steel housing (F8) IP 66, G 1/2  Sainless steel housing (F8) IP 66, M 20 x 1.5  Sainless steel housing (F8) IP 66, M 20 x 1.5  Sainless steel housing (F8) IP 66, M 20 x 1.5  Sainless steel housing (F8) IP 66, M 20 x 1.5  Sainless steel housing (F8) IP 66, M 20 x 1.5  Other
	Options  1 None 2 Stainless steel tag (e.g. for tag number) 3 Temperature spacer 0.2 kg 4 Temperature spacer and stainless steel tag 0.2 kg 9 Other
Basic type Certificate Protection features Probe insulation Active probe length Process connection	<ul> <li>additional weight for raised cover</li> </ul>
DCTE	Complete product designation for DCTEN, DCTES



#### **Accessories**

- ☐ Protective cover for the small probe housing (type F6, F10) see Technical Information "Probe accessories"

  The protective cover shields the probe from excessive heat and prevents condensation from forming in the housing when temperatures vary over a wide range.
- ☐ Slip-on plate for partially insulated probe DC 12 TE for increasing the switching safety for limit detection
- ☐ Rope shortening kit for fully insulated probes
- ☐ Rope shortening kit for partially insulated probes

# **Supplementary Documentation**

#### **Technical Information**

- ☐ Probe accessories
  Technical Information TI 229F/00/en
- ☐ Electronic insert FEC 12
  Technical Information TI 250F/00/e
- ☐ Electronic insert FEC 22
  Technical Information TI 251F/00/e
- ☐ Electronic insert EC 17 Z
  Technical Information TI 268F/00/en
- ☐ Electronic insert EC 61
  Technical Information TI 267F/00/en
- ☐ Electronic insert EC 37 Z, EC 47 Z Technical Information TI 271F/00/en
- ☐ Electronic insert EC 11, EC 72
  Technical Information TI 270F/00/en
- Transmitters for limit detection and continuous level measurement on request

#### Certificates

- ☐ Certificate of Conformity KEMA No. Ex-95.D.9125 X Certificate ZE 148F/00/e
- ☐ Certificate of Conformity KEMA No. Ex-95.D.3217 X Certificate ZE 159F/00/e

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