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APPROVAL REPORT

SOLICAP S FTI77 CAPACITIVE LEVEL TRANSMITTER FOR USE IN HAZARDOUS (CLASSIFIED) LOCATIONS

Prepared for:

**Endress+Hauser GmbH+Co. KG
Hauptstrasse 1
79689 Maulburg
Germany**

Project ID: 3036115

Class: 3610, 3615, 3611

Date of Approval: 13 August 2009

Authorized by: J.E. Marquedant
J.E. Marquedant, Group Manager Electrical

**SOLICAP S FTI77
FOR USE
IN
HAZARDOUS (CLASSIFIED) LOCATIONS**

from

**Endress+Hauser GmbH+Co. KG.
Hauptstrasse 1
79689 Maulburg
Germany**

I INTRODUCTION

- 1.1 Endress+Hauser GmbH+Co. KG. has requested examination of the design for the apparatus Listed in Section 1.4 to be in compliance with the applicable requirements of the following standards Listed in Section 1.3.
- 1.2 This Report may be freely reproduced only in its entirety and without modification.
- 1.3 **Standards** – The following standards were used as described.

Title	Class Number	Date
Electrical Equipment for Use in Hazardous (Classified) Locations – General Requirements	3600	November 1998
Intrinsically Safe Apparatus and Associated Apparatus for Use in Class I, II & III, Division 1, Hazardous (Classified) Locations	3610	January 2007
Explosionproof Electrical Equipment	3615	1998
Nonincendive Electrical Equipment for Use in Class I & II, Division 2, and Class III, Divisions 1 & 2, Hazardous (Classified) Locations	3611	December 2004
Electrical Equipment for Measurement, Control and Laboratory Use	3810	January 2005
Electrical Apparatus for Explosive Gas Atmospheres – Part 0: General Requirements	ANSI/ISA-12.00.01 (IEC 60079-0 Mod)	1999
Electrical Apparatus for Use in Class I, Zone 2 Hazardous (Classified) Locations – Type of Protection “n”	ANSI/ISA-12.12.02 (IEC 60079-15)	2003
Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use – Part 1: General Requirements	ANSI/ISA-82.02.01 (IEC 61010-1 Mod)	2004
Enclosures for Electrical Equipment (1,000 Volts Maximum)	ANSI/NEMA 250	1991

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Title	Class Number	Date
Degree of Protection provided by enclosures (IP Code)	ANSI/IEC 60529	2004

1.4 **Evaluation** – The following was evaluated as described.

1.4.1 **Listing (US)** – The following was evaluated as Explosionproof for use in Class I, Divisions 1, Groups A, B, C & D; DIP Class I & III, Division 1, Groups E, F & G; IS Class I, II & III, Division 1, Groups A, B, C, D, E, F & G; NI Class I, Division 2, Groups A, B, C & D, Type 4X or 6P, IP65; Hazardous (Classified) Locations. The product will appear in the Approval Guide, an online resource of FM Approvals, as follows:

Solicap S FTI77-Lbcdefghij

IS / I, II, III / 1 / A, B, C, D, E, F, G / T* - 960009417; Entity*; Type 4X / Type 6P, IP66 / IP67 / IP68;

NI / I / 2 / A, B, C, D / T* - 960009417; NIFW*; Type 4X / Type 6P, IP66 / IP67 / IP68; AEx ia IIC T6;

*For Entity Parameters, Nonincendive Field Wiring Parameters, and temperature class reference control drawing 960009417.

For option g = 4 or 5 environmental rating is Type 6P and IP68.

b - Application: 1 - fine grained; 2 - coarse solids

c - Inactive Length L3 A - not selected; B - 200mm, steel; C - 400mm, steel; E - 200mm, 316L, G -mm, 316L; H -mm, 316L + 125mm active build-up; * -inch

d - Active Probe Length L1 AB - 200mm, sword, steel; AC - 400mm, sword, steel; AD - 700mm, sword, steel; BB - 200mm, sword, 316L; BC - 400mm, sword, 316L; BR -mm, sword, 316L; CR -mm, 6mm rope, steel zinc coated, tension weight steel; CS -mm, 12mm rope, steel zinc coated, tension weight steel; DR -mm, 6mm rope, 316L, tension weight 316L; DS -mm, 12mm rope, 316L, tension weight 316L; * -inch

e - Process Connection * - Thread (EN, ANSI, JIS); * - Flanges (EN, ANSI, JIS); * any triple letter or number

f - Electronics: Output H - FEI50H, 4...20mA HART + display; 5 - FEI55, 8/16 mA; 7 - FEI57S, 2-wire PFM

g - Housing 1 - F15 316L; 3 - F17 Alu; 4 - F13 Alu + gas-tight seal; 5 - T13 Alu + gas-tight seal

h - Cable Entry B - G ½; C - ½ NPT; D - ¾ NPT; G - M20x1.5

i - Type of Probe 1 - compact Version; 2 - 2000mm L4 cable > separate housing; 3 -mm L4 cable > separate housing; 4 - 80inch L4 cable > separate housing; 5 -inch L4 cable > separate housing

j - Additional options A, D, F Not verified by FM Approvals, Y - not safety relevant

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XP - AIS / I / 1 / A, B, C, D / T5 Ta = 70°C; Type 4X / Type 6P, IP66 / IP67 / IP68;
NI / I / 2 / A, B, C, D / T* - 960009417; NIFW*; Type 4X / Type 6P, IP66 / IP67 / IP68;

- b - **Application:** 1 - fine grained; 2 - coarse solids
- c - **Inactive Length L3** A - not selected; B - 200mm, steel; C - 400mm, steel; E - 200mm, 316L, G -mm, 316L; H -mm, 316L + 125mm active build-up; * -inch
- d - **Active Probe Length L1** AB - 200mm, sword, steel; AC - 400mm, sword, steel; AD - 700mm, sword, steel; BB - 200mm, sword, 316L; BC - 400mm, sword, 316L; BR -mm, sword, 316L; CR -mm, 6mm rope, steel zinc coated, tension weight steel; CS -mm, 12mm rope, steel zinc coated, tension weight steel; DR -mm, 6mm rope, 316L, tension weight 316L; DS -mm, 12mm rope, 316L, tension weight 316L; * -inch
- e - **Process Connection** * - Thread (EN, ANSI, JIS); * - Flanges (EN, ANSI, JIS); * any triple letter or number
- f - **Electronics: Output H** - FEI50H, 4...20mA HART + display (only T13 housing & supply module); 1 - FEI51, 2-wire AC; 2 - FEI52, 3-wire PNP; 4 - FEI54 relay, 19-253VAC, 19-55VDC; 5 - FEI55, 8/16 mA (only T13 housing & supply module)
- g - **Housing 4** - F13 Alu + gas-tight seal; 5 - T13 Alu + gas-tight seal
- h - **Cable Entry B** - G ½ ; C - ½ NPT; D - ¾ NPT; G - M20x1.5
- i - **Type of Probe 1** - compact Version;
- J - **Additional options A, D, F** Not verified by FM Approvals, Y - not safety relevant

Special condition of use:

1. when the FEI50H and FEI55 Electronic Insert is installed in this version of the Solicap S Type FTI77, the connection module must be installed in the product.

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DIP-AIS / II, III / 1 / E, F, G / T5 Ta = 70°C; Type 4X / Type 6P, IP66 / IP67 / IP68

For option g = 4 or 5, environmental rating is Type 6P and IP68.

b - Application: 1 - fine grained; 2 - coarse solids

c - Inactive Length L3: A - not selected; B - 200mm, steel; C - 400mm, steel; E - 200mm, 316L; G -mm, 316L; H -mm, 316L + 125mm active build-up; * -inch

d - Active Probe Length L1 AB - 200mm, sword, steel; AC - 400mm, sword, steel; AD - 700mm, sword, steel; BB - 200mm, sword, 316L; BC - 400mm, sword, 316L; BR -mm, sword, 316L; CR -mm, 6mm rope, steel zinc coated, tension weight steel; CS -mm, 12mm rope, steel zinc coated, tension weight steel; DR -mm, 6mm rope, 316L, tension weight 316L; DS -mm, 12mm rope, 316L, tension weight 316L; * -inch

e - Process Connection * - Thread (EN, ANSI, JIS); * - Flanges (EN, ANSI, JIS)

* any triple letter or number

f - Electronics: Output H - FEI50H, 4...20mA HART + display (only T13 housing & supply module); 1 - FEI51, 2-wire AC; 2 - FEI52, 3-wire PNP; 4 - FEI54 relay, 19-253VAC, 19-55VDC; 5 - FEI55, 8/16 mA (only T13 housing & supply module)

g - Housing 1 - F15 316L; 3 - F17 Alu; 4 - F13 Alu + gas-tight seal; 5 - T13 Alu + gas-tight seal

h - Cable Entry B - G ½; C - ½ NPT; D - ¾ NPT; G - M20x1.5

i - Type of Probe 1 - compact Version; 2 - 2000mm L4 cable > separate housing; 3 -mm L4 cable > separate housing; 4 - 80inch L4 cable > separate housing; 5 -inch L4 cable > separate housing

j - Additional options A, D, F Not verified by FM Approvals, Y - not safety relevant

Special condition of use:

1. when the FEI50H and FEI55 electronic inserts are installed in this version of the Solicap S Type FTI77, the connection module must be installed in the product

II DESCRIPTION

- 2.1 **General** – The Solicap S Type FTI77 is a compact level detection instrument for bulk solids. The rope or sword of the instrument is mounted in a vessel or silo which forms a capacitor with the vessel or silo walls. The level of the process material causes changes of the capacitance for the silo system and level information is derived by measurement of the capacitance between the probe's central conductor and the silo.

Depending on the application, four different enclosures (F15, F13, F17 or T13) and five different electronic inserts can be selected. Enclosures F13 and T13 were FM Approved for Explosionproof applications under FM Approvals Project 3023722.

The electronic inserts FEI50H (4...20mA Hart), FEI57S (2-wire PFM), and FEI55 (8/16mA), FEI54 (relay, 19-253VAC, 19-55VDC), FEI52 (3 wire PNP), FEI51 (AC Two wire) were previously FM Approved under FM Approvals Projects 3025403 and 3034077.

- 2.2 The manufacturer has made available all necessary component information, system specification and test procedures, which have been examined. Installation and operation manuals are available which thoroughly describe each major assembly, initial installation, testing and trouble shooting techniques.

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- 2.3 All installation wiring, unless otherwise specified in accordance to the manufacturer's control installation drawing, intended to be installed in Division 2 areas is to be wired using Division 2 incandive wiring techniques which comply with the relevant requirements of the National Electrical Code® (ANSI/NFPA 70) where applicable.

III EXAMINATIONS AND TESTS

- 3.1 Representative samples of the Solicap S FTI77 Capacitive Level Transmitters were reviewed at Endress+Hauser GmbH+Co Kg in Maulburg, Germany, were considered to be representative of the product lines and were examined, tested, and compared to the manufacturer's drawings. Samples of the Solicap S FTI77 were also examined and witness testing conducted at the Endress+Hauser GmbH Co. KG facility in Maulburg, Germany. All data is on file at FM Approvals along with other documents and correspondence applicable to this program.

3.2 Intrinsic Safety Evaluation (Class I)

- 3.2.1 The products electronic inserts, FEI50H (4...20mA HART with display type D62), FEI57S (2-wire PFM), FEI55 (8/16mA), FEI54 (relay, 19-253Vac, 19-55Vdc), FEI52 (3-wire PNP) were Approved under FM Approvals Project 3025403. The products electronic insert FEI51 (AC 2-wire) was Approved under FM Approvals project 3034077. These electronic inserts can be used in combination with the D62 display and some of the electronic inserts are required to be used in combination with the connection module. All electronic inserts are mounted in an isolating plastic housing and the electronics are potted using Wacker Sigel 612 (CTI > 600, continuous operating temperature > 180°C).

- 3.2.2 The Sensors were also assessed under FM Approvals project 3025403. The sensors have two basic designs, a sword probe and a rope probe. The sensors themselves are, for all practical purposes, passive devices with no significant inductive or capacitive electronic circuitry, therefore they are considered intrinsically safe. The output power to the sensors is limited by the circuitry from one of the electronic inserts to the appropriate sensors. The probes (rope and sword) are electro-statically grounded by way of a 1MΩ resistor at the sensor connector and also at the electronics insert

3.2.3 General Requirements

- 3.2.3.1 **Temperature Evaluation** - The maximum surface temperatures of the enclosure were measured under the following conditions:

- Solicap S instrument without a dust layer in a windless ambient
- Under Ex ia fault conditions (power dissipation of 1W in F15, T13 and F17 enclosures)

The maximum thermal rise was with the F15 (stainless steel) enclosure which was $T_{max} \leq 31.8^{\circ}\text{C}$ at $T_a = 27.2^{\circ}\text{C}$. This results in a T6 at $T_a = 70^{\circ}\text{C}$. The stainless steel enclosure was used for all further thermal testing.

- 3.3 **Nonincendive Examination** - The products electronic inserts, FEI50H (4...20mA HART with display type D62), FEI57S (2-wire PFM), FEI55 (8/16mA), FEI54 (relay, 19-253Vac, 19-55Vdc), FEI52 (3-wire PNP) were assessed and Approved under FM Approvals Project 3025403 as suitable for use in a Class I, Division 2, Groups A, B, C & D hazardous

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(classified) locations. The products electronic insert FEI51 (AC 2-wire) was assessed and Approved under FM Approvals project 3034077 as suitable for use in a Class I, Division 2, Groups A, B, C & D hazardous (classified) locations.

3.3.1 **Dust Blanketing Temperature Test** – The maximum surface temperatures of the enclosure were measured under the following conditions:

- Solicap S completely immersed in cocoa dust
- Under Ex ia fault conditions (power dissipation of 1W in F15, T13 and F17 enclosures)

The maximum thermal rise was $T_{max} \leq 45^{\circ}\text{C}$ at $T_a = 25^{\circ}\text{C}$. This results in a T_5 at $T_a = 70^{\circ}\text{C}$.

3.4 **Dust-Ignitionproof Evaluation** - The F13 and T13 enclosures were assessed as complying with the requirements of FM3615 under FM Approvals projects 3023722. The enclosures were assessed with a gas tight glass feed-thru and threads into the electronics compartment sealed with an O-ring. The F15 and F17 enclosures were assessed as dust ignition proof with the glass feet through ensuring dust tight separation between the clamp housing and the enclosure under FM Approvals Project 3025403.

3.5 **Explosionproof Evaluation** – The products explosionproof enclosures, F13 and T13, were assessed as complying with the requirements of FM3615 under FM Approvals projects 3023722. The enclosures were assessed with a gas tight glass feed-thru and threads into the electronics compartment sealed with an O-ring.

3.6 **Environmental Testing** – Environmental assessment was accomplished under FM Approvals project 3028395 to the requirement of NEMA 250 and to IEC60529. Testing was performed at Endress+Hauser GmbH+Co KG in Maulburg, Germany under the Laboratory Qualification Program J.I. 1B8A5.AE.

3.7 **Protection Against Electrical Shock, Fire and Injury** - Electrical equipment acceptability is based on the ability of the equipment to minimize the risk of electrical shock, fire and personal injury. All spacing requirements are satisfactory based on the table for Pollution Degree 2, Category II.

IV MARKING

4.1 The following information appears on the apparatus identified in Sections 1.4 which meets Standard requirements:

- Manufacturer's name and manufacturing location
- Type number and Serial number
- Maximum ambient temperature and temperature class
- The FM Approvals mark
- Hazardous (Classified) Location Ratings
- Control drawing reference

V REMARKS

5.1 Installations shall comply with the relevant requirements of the National Electrical Code® (ANSI/NFPA 70).

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- 5.2 Installations shall comply with the latest edition of the manufacturer's control drawing and instruction manual.

VI FACILITIES AND PROCEDURES AUDIT

Endress+Hauser GmbH+Co. KG controls the design and manufacture of the Solicap S - FTI77 at their Maulburg, Germany facility. The facility and quality control procedures were examined and were found to be satisfactory to manufacture the products identical to that described herein. The facility is subject to follow-up audit inspections.

VII MANUFACTURERS RESPONSIBILITIES

- 7.1 Documentation considered critical to this Approval is on file at FM Approvals and listed in the Documentation Section (VIII) of this report. No changes of any nature shall be implemented unless notice of the proposed change has been given and written authorization obtained from FM Approvals. The Approved Product Revision Report, Form 797, shall be forwarded to FM Approvals as notice of proposed changes.
- 7.2 The manufacturer shall make the instruction manual available to users of the subject equipment.
- 7.3 The manufacturer shall make the control drawings available to users of the subject equipment. The manufacturer shall make additional copies available upon request.

VIII DOCUMENTATION

The following drawings are considered critical and describe the Solicap S - FTI77 Capacitive Level Transmitter. The drawings are filed within the blueprint files under Project ID 3036115:

Drawing No.	Drawing Title	Revision
960006477	Ex d connecting module	A
960006858	Enclosure T13 EEx d / EEx ia	-
960006867	Enclosure F13 EEx d / EEx ia	A
960006871	Enclosure F15	-
960006872	Electronics insert	-
960007055	Cover T13 / open version	-
960007057	Cover F13 / open version	-
960007058	Flame proof gland	-
960007093	Warning label	-
960007217	Terminal module 8-pol	-
960007259	Conductive pattern layer B1 FEI50 HART	D
960007260	Conductive pattern layer A1 FEI50 HART	D
960007261	Conductive pattern layer B2 FEI50 HART	D
960007262	Conductive pattern layer A2 FEI50 HART	D
960007263	Conductive pattern layer B3 FEI50 HART	D
960007264	Conductive pattern layer A3 FEI50 HART	D
960007265	Assembly plan side B FEI50 HART	D
960007266	Assembly plan side A FEI50 HART	D
960007267	Schematic Power supply FEI50 HART	C
960007268	Schematic Main CPU FEI50 HART	C
960007269	Schematic DC-DC Conversion FEI50 HART	D
960007270	Schematic Measure FEI50 HART	D
960007287	Gasket materials	-
960007344	Enclosure F17 EEx ia	-
960007654	Connection cable separate version LCAP	-
960007859	Assembly plan side A FEI52	-
960007860	Assembly plan side B FEI52	-
960007861	Schematic Power supply FEI52	-
960007862	Schematic Measure FEI52	-
960007863	Conductive pattern layer A1 FEI52	-
960007864	Conductive pattern layer A2 FEI52	-

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Drawing No.	Drawing Title	Revision
960007865	Conductive pattern layer B2 FEI52	-
960007866	Conductive pattern layer B1 FEI52	-
960007867	Schematic FEI54	-
960007868	Schematic Measure FEI54	-
960007869	Assembly plan side A FEI54	-
960007870	Assembly plan side B FEI54	-
960007871	Conductive pattern layer A1 control FEI54	-
960007872	Conductive pattern layer A2 control FEI54	-
960007873	Conductive pattern layer A3 control FEI54	-
960007874	Conductive pattern layer B3 control FEI54	-
960007875	Conductive pattern layer B2 control FEI54	-
960007876	Conductive pattern layer B1 control FEI54	-
960007877	Schematic Outputstage control FEI54	-
960007882	Assembly plan side A Outputstage control FEI54	-
960007883	Assembly plan side B Outputstage control FEI54	-
960007884	Conductive pattern layer A1 Outputstage control FEI54	-
960007885	Conductive pattern layer A2 Outputstage control FEI54	-
960007886	Conductive pattern layer B2 Outputstage control FEI54	-
960007887	Conductive pattern layer B1 Outputstage control FEI54	-
960007888	Schematic Power supply FEI55	-
960007889	Schematic 8..16 mA FEI55	-
960007890	Schematic Measure FEI55	-
960007891	Assembly plan side A FEI55	-
960007892	Assembly plan side B FEI55	-
960007893	Conductive pattern layer A1 FEI55	-
960007894	Conductive pattern layer A2 FEI55	-
960007895	Conductive pattern layer B2 FEI55	-
960007896	Conductive pattern layer B1 FEI55	-
960007897	Schematic Power supply FEI57S	-
960007898	Schematic DC-DC Conversion FEI57S	-
960007899	Schematic Measure FEI57S	-
960007900	Assembly plan side A FEI57S	-
960007901	Assembly plan side B FEI57S	-
960007902	Conductive pattern layer A1 FEI57S	-
960007903	Conductive pattern layer A2 FEI57S	-

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Drawing No.	Drawing Title	Revision
960007904	Conductive pattern layer B2 FEI57S	-
960007905	Conductive pattern layer B1 FEI57S	-
960008130	Assembly Solicap remote connection	-
960008509	Schematic Power supply FEI51	-
960008510	Schematic Measure FEI51	-
960008511	Assembly plan side A FEI51	-
960008512	Assembly plan side B FEI51	-
960008513	Conductive pattern layer A1 FEI51	-
960008514	Conductive pattern layer A2 FEI51	-
960008515	Conductive pattern layer A3 FEI51	-
960008516	Conductive pattern layer B3 FEI51	-
960008517	Conductive pattern layer B2 FEI51	-
960008518	Conductive pattern layer B1 FEI51	-
960009204	Assembly Solicap S FTI77 (Fine grained solids)	-
960009205	Assembly Solicap S FTI77 (Coarse solids)	-
960009416	FM XP nameplate	-
960009417	FM control drawing Solicap S	A
960009419	FM IS nameplate	-
960009420	FM IS-XP modelcode Solicap S	-
960362-0082	Terminal module 3-pol	A
960533-0022	Terminal module	-
960541-0020	Schematic EEx d connecting module	a
960541-0022	Conductive pattern cs	a
960541-0023	Conductive pattern ss	a
960541-0026	Assembly plan cs	a
960541-0027	Assembly plan cs	a
960595-0001	Conductive pattern ss display	B
960595-0002	Conductive pattern cs display	B
960595-0101	Assembly plan ss display	C
960595-0102	Assembly plan cs display	A
960595-1000	Schematic Power and Ex protection display	B
960595-2000	Schematic Main display	B

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IX CONCLUSION

- 9.1 The apparatus described in Sections 1.4 meets FM Approvals requirements. Since a duly signed Master Agreement is on file for this manufacturer, Approval is effective the date of this report.

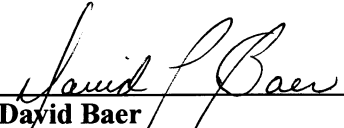
EXAMINATION AND TESTING BY: David Baer, FM Approvals

REPORT WRITTEN BY: David Baer, FM Approvals

PROJECT DATA RECORD: 3036115

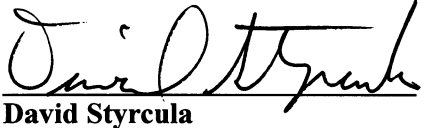
ATTACHMENTS: Label Drawing, 960007093, 960009416, 960009419
Control Drawing 960009417-A
Model Code Drawing 960009420

REPORT BY:



David Baer
Senior Engineer
Hazardous Locations

REPORT REVIEWED BY:



David Styrcula
Technical Team Manager
Hazardous Locations



Werkstoff: Polyesterfolie, silbermatt, t= 0,08
 CSA zugelassen als selbstklebend auf
 Haftgrund Pulverbeschichtung (Polyester)
 CSA-Gruppe VIII (alte Gruppe 10)
 outdoor
 bei Umgebungstemperatur -40°C...+80°C

Beschriftung: positiv, RAL 7016
 Druck, Laserbeschriftung, Thermotransfer Beschriftung
 oder geätzt

Material: Polyesterfoil, silver matt, t=0,08
 CSA approval as self-adhesive on
 prepared surface powder coating (polyester)
 CSA-groupe VIII (old groupe 10)
 outdoor
 at ambient temperature -40°C...+80°C

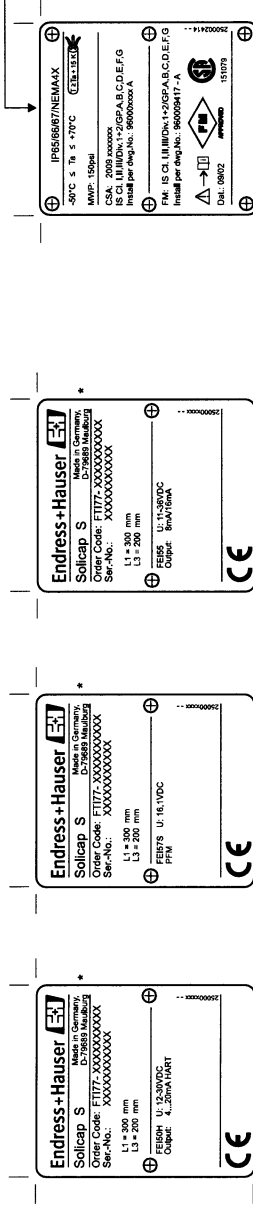
Lettering: positiv, RAL 7016
 printed, laser printed, thermotransfer printed
 or etched

Endress+Hauser Endress+Hauser GmbH+Co.KG Maulburg Germany	Schutzvermerk ISO 16016 beachten	Refer to protection notice ISO 16016			Toleranz / tolerance		
	Benennung / title Warnschild / warning label Gehaeuse / cover T13	Erzeuger-Sys. creator-sys.	CorelDRAW	letzt.Bearbei. last editor	03.12.04	ZimmermannA	
		Format format	DIN A4	geprüft approved	07.12.04	SteffanA	
		Maßstab / scale 1:1		gezeichnet drawn	03.12.04	ZimmermannA	
				entworfen designed	03.12.04	ZimmermannA	
		Dokument-Nr. / No. of document 960007093 - -			Doku-Nr. alt / Docu-No. old		
	Mitt.-Nr. / Notif.-No.						
Material / material	SAP-Material-Nr. / SAP-Material-No.			Änderung / changes	kommt vor / appears		

* Optional: Assembled in USA

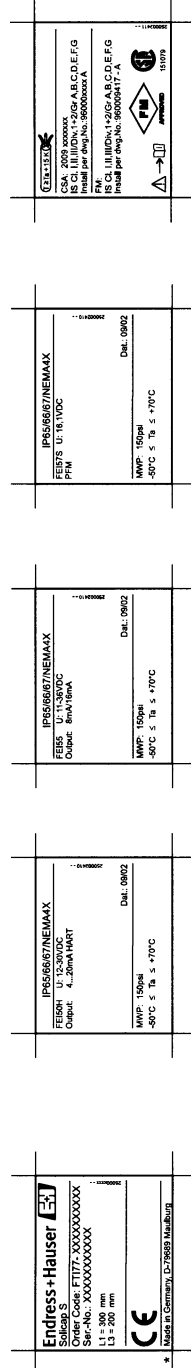
Typenschild Gehäuse F13/F17 nameplate cover F13/F17

Note: Additionally Type 6P
and IP68 only F13 enclosure



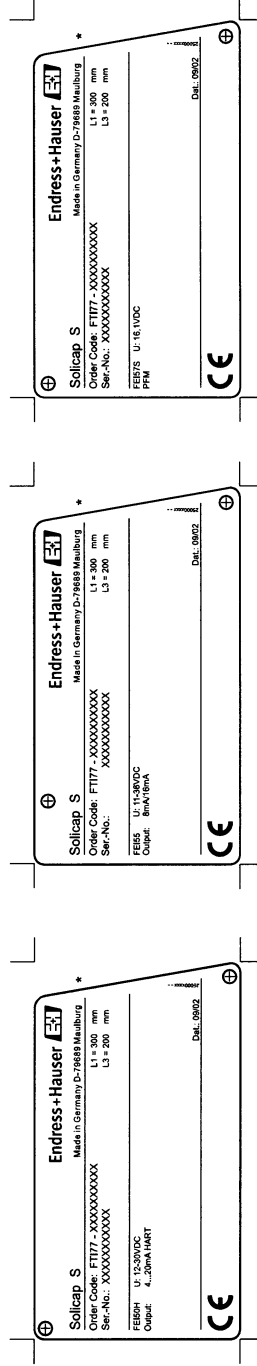
Material:
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Typenschild Gehäuse F15 nameplate cover F15



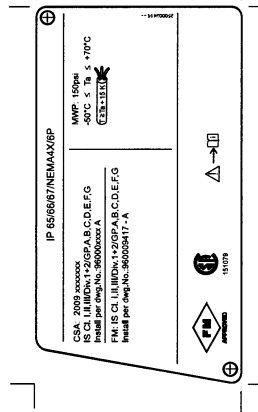
Material:
Gehäuse 1.4301

Typenschild Gehäuse T13 nameplate cover T13



Material:
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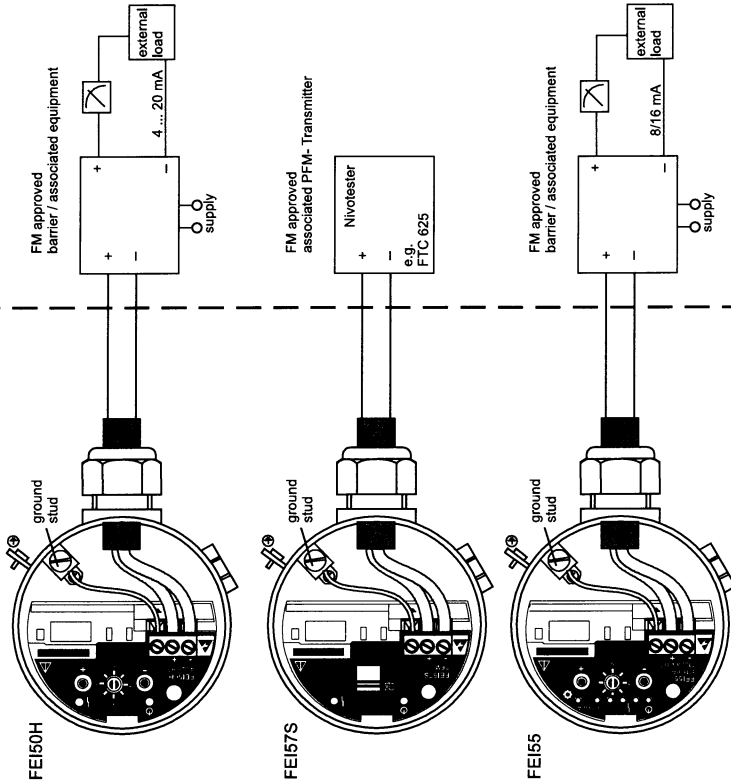
* Optional: Assembled in USA



		Refer to protection notice ISO 16016			Toleranz / tolerance
Schulzvermerk ISO 16016 beachten		Erzeuger-Sym. creator-sys.		26.02.2009 BuelowT	
Benennung / title Solicap S FT177 FM IS		Format DIN A3		27.02.2009 SteffanA	
Typenschild Beschriftung Solicap S FT177 FM IS nameplate lettering		Maßstab / scale 1:1		26.02.2009 BuelowT	
Material / material Endress+Hauser GmbH & Co. KG Maulburg		Dokument-Nr. / No. of document 960009419 - -		26.02.2009 SteffanA	
Agency controlled drawing. No changes without prior Agency approval.		SAP-Material-Nr. / SAP-Material-No.		Änderung / changes kommt vor / appears	

Hazardous classified location

Class I, Div.1, 2, Groups A, B, C, D
Class I, Zone 0
Class II, Div.1, 2, Groups E, F, G
Class III



Non hazardous location

Intrinsically safe (AEx ia), Class I Div.1, Group A,B,C,D Class II Div.1, Group E,F,G; Class III AEx ia IIC T6

Hazardous Location Installations

- Control room equipment may not use or generate over 250 Vrms.
- Wire all circuits for power supply per NEC ANSI / NFPA 70 and ISA RP 12.06.01.
- For entity installations use certified safety barrier or other associated equipment that satisfy the following conditions:

$V_{oc} \leq V_{max}$, $I_{sc} \leq I_{max}$, $C_a \geq C_1 + C_{cable}$, $L_a \geq L_1 + L_{cable}$ transmitter entity parameters are as follows:

FEI50H insert:
Entity Parameters:
 $V_{max} \leq 30V$
 $I_{max} \leq 120mA$
 $P_i \leq 1W$
 $C_i \leq 2.4nF$
 $L_i \approx 0$

FEI57S insert:
Entity Parameters:
 $V_{max} \leq 16.1V$
 $I_{max} \leq 100mA$
 $P_i \leq 1W$
 $C_i \leq 2.4nF$
 $L_i \approx 0$

FEI55 insert:
Entity Parameters:
 $V_{max} \leq 36V$
 $I_{max} \leq 100mA$
 $P_i \leq 1W$
 $C_i \leq 2.4nF$
 $L_i \approx 0$

for T-code see table.

- WARNING: SUBSTITUTION OF COMPONENTS MAY IMPAIR INTRINSIC SAFETY.
- Intrinsic safety barrier manufacturer's installation drawing must be followed, when installing this equipment.
- Use supply wires suitable for 5°C above surrounding ambient.

Nonincendive Class I, Div. 2 Group A,B,C,D Class II, Div. 1 Group E,F,G; Class III

Hazardous Location Installations

- Installation shall be in accordance with NEC using threaded conduit or other wiring methodes in accordance with articles 500 to 510.
- Nonincendive field wiring installation.
The Nonincendive Field Wiring Circuit Concept allows interconnection of nonincendive field wiring apparatus with associated nonincendive field wiring apparatus not specifically examined in combination as a system using any of the wiring methods permitted for unclassified locations, when:
 $V_{oc} \leq V_{max}$, $I_{sc} \leq I_{max}$, $C_a \geq C_1 + C_{cable}$, $L_a \geq L_1 + L_{cable}$ transmitter parameters are as follows:

FEI50H insert:
Entity Parameters:
 $V_{max} \leq 36V$
 $I_{max} \leq 120mA$
 $P_i \leq 1W$
 $C_i \leq 2.4nF$
 $L_i \approx 0$

FEI57S insert:
Entity Parameters:
 $V_{max} \leq 16.1V$
 $I_{max} \leq 100mA$
 $P_i \leq 1W$
 $C_i \leq 2.4nF$
 $L_i \approx 0$

FEI55 insert:
Entity Parameters:
 $V_{max} \leq 36V$
 $I_{max} \leq 100mA$
 $P_i \leq 1W$
 $C_i \leq 2.4nF$
 $L_i \approx 0$

- For these current and voltage controlled circuits the parameters I_{max} is not required and need not to be aligned with parameters I_{sc} and I_1 of the associated nonincendive field wiring or associated apparatus

- WARNING: EXPLOSION HAZARD - Do not disconnect equipment unless power has been switched off or the area is known to be non hazardous.
- WARNING: Substitution of Components may impair suitability for Class I, Div.2., Zone 2

Temperature code	permissible ambient temperature electronic compartment
T6	-50°C ... +60°C
T5	-50°C ... +70°C
T4	
T3	

Agency controlled drawing.
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Endress+Hauser
Germany
Malburg

Schutzvermerk ISO 16016
beachten

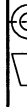
Benennung / title

FM control drawing Solicap S (IS and NI)

ENTITY INSTALLATION

Material / material

Toleranz / tolerance



Erzeuger-Sym.
creator-sym.

Conform
conform

Norm
norm

Mediatur / scale

Document-Nr. / No. of document

25.02.09

27.02.09

26.02.09

26.02.09

26.02.09

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