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MT40 Grounding System

for Installation on Tank Trucks

CE Ex IECEx SIL 2

MT40 is a grounding system designed to prevent the accumulation of electrostatic charges which may generate while handling nonconductive liquids, powders and granulates, thus avoiding possible sparks from causing dangerous events in hazardous atmospheres. This is achieved by connecting the tank to earth during the entire loading/ unloading operation, and thanks to a constant monitoring of such a connection. If, for whichever reason, the connection is interrupted, the system generates an alarm so that the operation can be stopped.

This is the typical situation of a tank truck delivering fuel and unloading it into an underground/above ground tank; like for example a gas station. In this scenario there are no means available in the unloading area to guarantee the connection of the tank truck to earth during the delivery operations and grant the necessary safety conditions.

The MT40 grounding monitor is designed to be mounted on the tank truck itself, so that, wherever it operates, the truck operator will be independently able to perform the necessary grounding connection and monitoring it during the entire unloading operation.

The system consists of:

- A grounding monitor with a bright LED user interface showing the status of the connection and all the necessary information to the user, for mounting in the loading/unloading area.
- A cable with a clamp, to connect the monitor to the vehicle.

Additional accessories are available, like a tester, to periodically check the setting and the performances of the device “off line”, as well as a software toolkit for system diagnostic.

Reference Standards

MT40 monitors the resistance between the mobile tanker (Road tanker, Vacuum trucks) ed il punto di collegamento a terra, verificando che questa non superi la soglia di 10 Ω secondo IEC 60079-32 – (Electrostatic hazards, guidance) e NPFA77 – (Recommended Practice on Static Electricity).

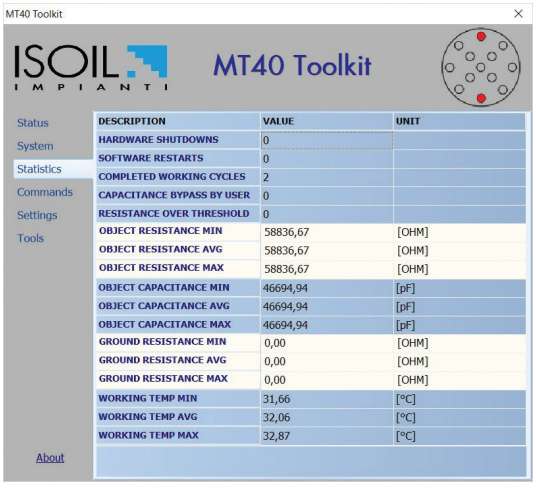
Approvals

MT40 is an approved Safety Device, with SIL2 level (Safety Integrity Level 2), according to:

- Harmonized Standard EN 50495 (Safety devices required for the safe functioning of equipment with respect to explosion risks) under the ATEX Directive 2014/34/EU (Equipment for potentially explosive atmospheres)
- Technical Specification IEC TS 60079-42 (Electrical Safety Devices for the control of potential ignition sources from Ex-Equipment) under international IECEx scheme.
- IEC 61508 (Functional Safety of Electrical/Electronic/Programmable Electronic Safety-related Systems).

Connectivity

The MT40 monitor is equipped with a serial port RS485 through which the unit can be connected to external devices with ModBus RTU protocol. This allows retrieving diagnostic and statistical information (device status, working cycles, average resistance and capacitance measurements, faults, etc.), useful for optional detailed remote control of the instrument.



The Freeware Toolkit app for Windows platform, can be used for diagnostic purpose via RS485 serial line, and for maintenance purpose via practical USB link.

Working Mode

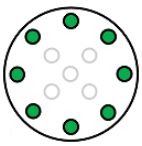
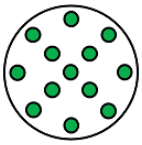
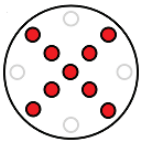
LOOP-RESISTIVE MODE

In the loop-resistive configuration, after identifying that the bipolar clamp has been connected to a metal object, the MT40 grounding monitor performs ground connection by means of a dedicated internal relay.
If grounding is correct, MT40 activates the circuit that has to monitor that the resistance remains below 10Ω during the entire operation, as recommended by the reference standards.

The specific relay output allows enabling or stop of the operations, in compliance with functional safety, according to the monitoring status of the resistive threshold.

Display

The LED matrix display, through conventional shapes and colors, provides the operator with a clear and immediate perception of the operating status.

DISPLAY	MEANING
	STAND-BY MT40 waiting for clamp connection.
	GROUNDING CHECK Valid measurement or bypass made by the Operator. MT40 earths the clamp by using an internal relay. It then checks correct connection to the ground potential.
	LOADING / UNLOADING ENABLED Successful grounding. MT40 allows loading / unloading by activating the output relay (connector X2). The unit keeps monitoring the specific safety conditions.
	GROUNDING NOT CORRECT Ground connection corresponds to a resistive value higher than that required by the standards. Loading/unloading is interrupted.
	SIL SAFETY CIRCUIT FAULT Grounding is successful but there is an inconsistency in the safety circuit. MT40 denies consent to loading / unloading.

Technical Specifications: Monitor

ENVIRONMENTAL CHARACTERISTICS	
Ambient Working Temperature:	-40°C to +55°C (233 K to 328 K)
Ambient Storage Temperature:	-40 °C to +65°C (233 K to 338 K)
Humidity:	5 to 95 % UR

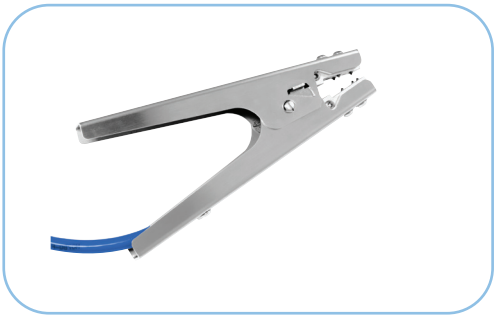
ENCLOSURE PROTECTION		
ATEX-IECEX:	II 2 (1) GD	Ex db [ia Ga] IIB T6 Gb Ex tb [ia Da] IIIC T85°C Db
Mechanical Protection	IP66 (according IEC 60529), outdoor use	

MECHANICAL CHARACTERISTICS	
Enclosure Material:	Aluminium
Dimensions:	200 x 220 x 60 mm
Weight:	5 kg approximately
Mounting:	On wall using the due holes (n°4) 8,5mm On panel with n°4 threaded holes M6x12mm
Cable Entries:	n° 4 holes threaded ½" NPT (ANSI ASME B1.20.1)

ELECTRICAL CHARACTERISTICS		
Main Power Supply:	DC Version: 10 ÷ 30 VDC	
Maximum Power Consumption:	3W	
Output Relay:	Free Contact: Max. Current: Max. Working Voltage: Max. Power Loading: Minimum Load:	C (Common), NO (Normally Open) 5A 250V~, 30 VDC 1250 VA, 150 W 5 VDC, 10 mA
Serial Line Communication:	N° 1 RS 485 (2 wires)	
Intrinsically Safe Parameters x4 Clamp Connector:	Uo: Io: Po: Co: Lo:	14,2 V 212 mA 624 mW 4,39 µF 3.16 mH

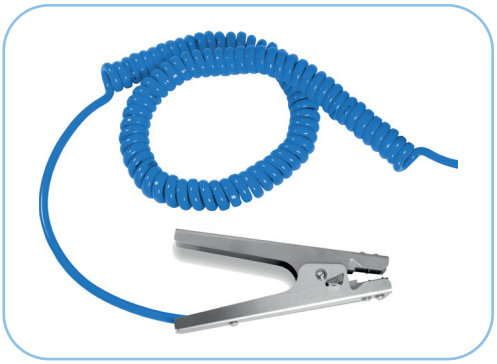
SAFETY CHARACTERISTICS (SIL)	
Assessment Type:	FMEDA Assessment according IEC61508:2010
SIL Eligibility:	SIL 2
λdu:	976.3 FIT
λdd:	119.8 FIT
λs:	11256.3 FIT
SFF:	92.1 %
PFDavg, Tproof = 1 Year (8760 Hours)	4.30×10^{-3} (SIL2)
Response Time:	< 1 Sec

Technical Specifications - Accessories



SSC Clamp	
Poles:	2
Teeth Material:	Stainless Steel 304
Body Material:	Stainless Steel 304
Opening Range:	3 to 25 mm
Temperature Range:	-40 °C to +65°C
ATEX Marking:	Ex II 2 GD - Ex h IIB T6 Gb Ex h IIIC T85°C Db

CST
Coiled Cable with SSC clamp

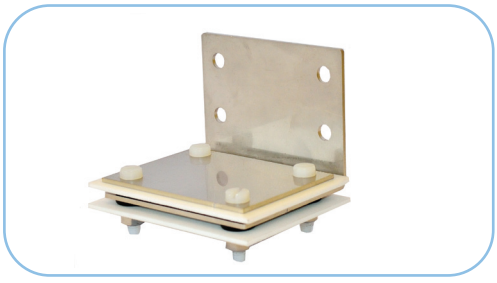


Coiled Cable	
Length:	1.5 m (10 m extended)
Conductors:	2 x 1.5 mm^2
Sheath:	Blue polyurethane, oil and water resistant, flame retardant
Temperature range:	-30°C to +70°C
Resistance:	13.3 Ω/Km
Capacitance:	190 pF/m
Inductance:	0.57 mH/Km

The MT40 Tester allows immediate and easy check of the grounding system working condition, and the verification of the capacitance measurement circuit. In case MT40 is part of a SIL Safety System, this tester is useful to perform the periodical 'proof test'.

Tester/T	
Materials:	ABS, Stainless Steel
Dimensions:	130x80x80 mm
Ground cable length:	1 m
Temperature range:	-25°C to +55°C
Resistance levels:	Pass, Fail

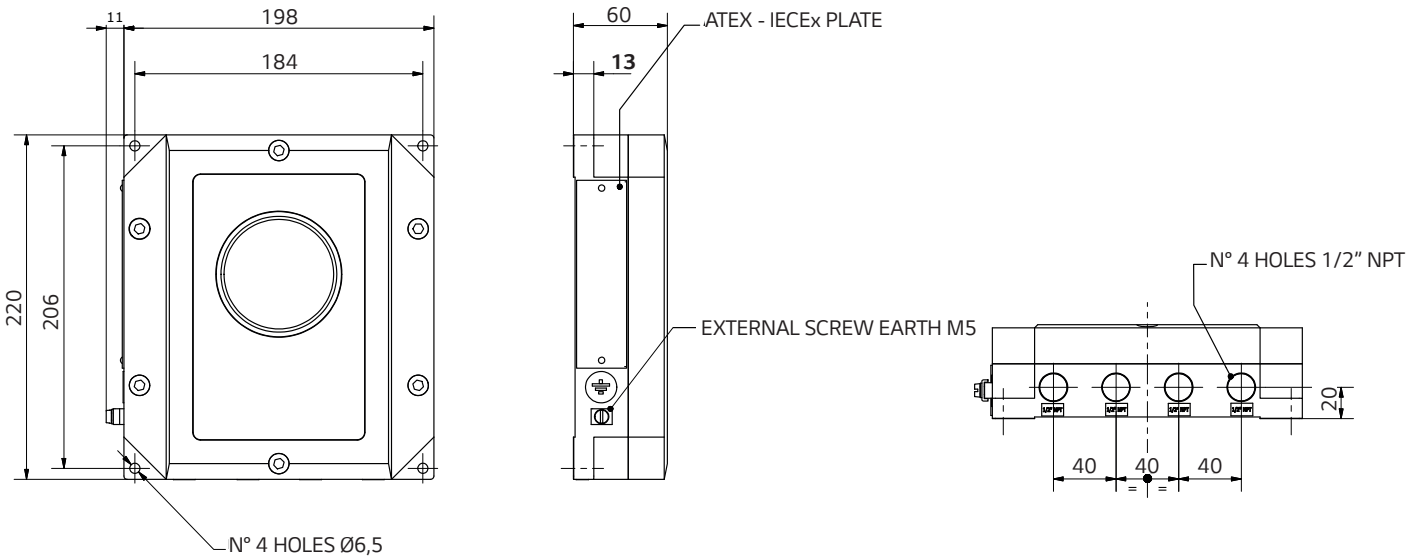
The SI-1 insulated support is used to park the earthing clamp when not in use: when hooked up to this support, there is no electrical continuity between the clamp poles thanks to the insulating plate. The MT40 grounding system identifies the clamp as disconnected from the tank truck.



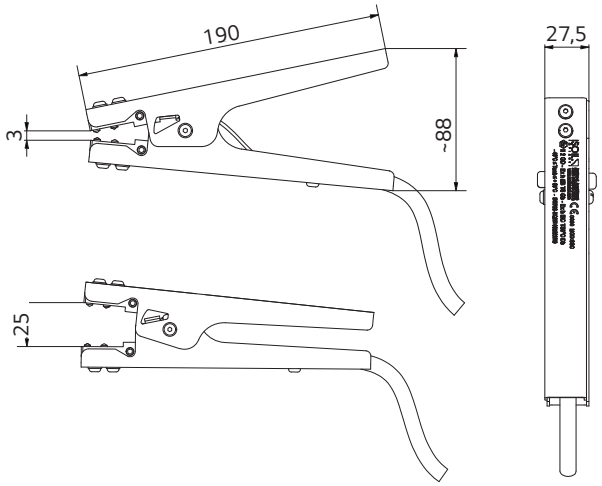
SI-1 Insulated Support	
Wall Mounting Plate:	Stainless Steel
Clamp Hook Up Plate:	Stainless Steel
Isolating Plate:	Teflon
Screws:	Teflon
Washers:	Stainless Steel

Dimensions

MT40 Grounding Monitor



SSC Clamp



Ordering Code

Grounding System Version	MT40	2	T	0	0

Power Supply 10÷30 VDC	2
Mode Mobile Tank (loop with threshold @10 Ohm)	T
Fixed Fields	0 0

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ISOIL Impianti S.p.A. - Italy
24061 Albano S. Alessandro (BG) - Italy
74, via Madonna delle Rose
Tel. +39 02 91988.5 Fax +39 02 66012457
sales@isoil-impianti.it
www.isoilmeter.com

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