

# MT40 Grounding System

## for FIBCs (Flexible Intermediate Bulk Containers)

### 'Big Bags'

CE  **IECEX** SIL 

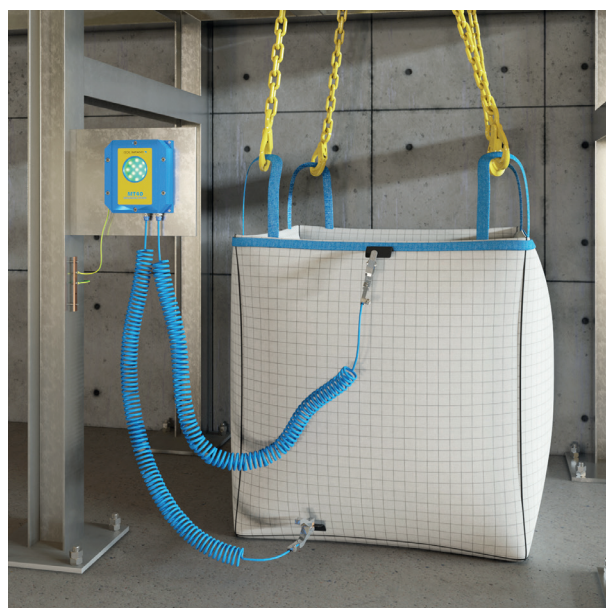
MT40 is a grounding system designed to prevent the accumulation of electrostatic charges which may generate while handling nonconductive powders and granulates, during filling and emptying operations of Flexible Intermediate Bulk Containers (FIBC). This is achieved by connecting the FIBC to earth during the entire handling 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.



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.
- Two cables with clamp, to connect the monitor to the FIBC.

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 connection to the inner liner of the FIBC (Flexible Intermediate Bulk Container) and the earth connection point, checking it does not exceed the threshold resistance of 10 MΩ according to IEC 61340-4-4 – (Electrostatic classification of flexible intermediate bulk containers), IEC 60079-32 – (Electrostatic hazards, guidance) and NPFA77 – (Recommended Practice on Static Electricity).

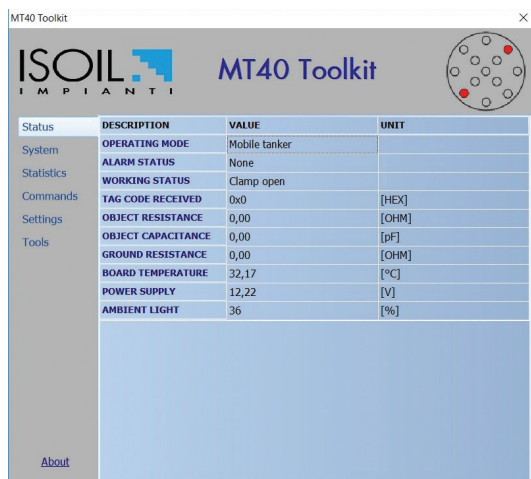
## Approvals

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

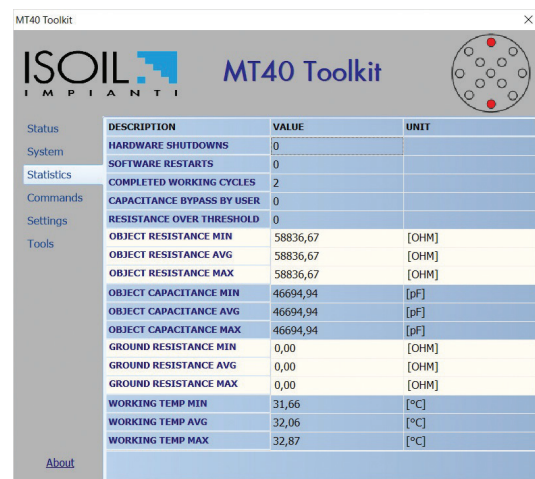
- Harmonized Standard EN 50495 (Safety devices required for the safe functioning of equipment with respect to explosion risks) under the ATEX Directive 2014/34/EU (Equipment for potentially explosive atmospheres)
- Technical Specification IEC TS 60079-42 (Electrical Safety Devices for the control of 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.



	DESCRIPTION	VALUE	UNIT
Status	OPERATING MODE	Mobile tanker	
System	ALARM STATUS	None	
Statistics	WORKING STATUS	Clamp open	
Commands	TAG CODE RECEIVED	0x0	[HEX]
Settings	OBJECT RESISTANCE	0,00	[OHM]
Tools	OBJECT CAPACITANCE	0,00	[pF]
	GROUND RESISTANCE	0,00	[OHM]
	BOARD TEMPERATURE	32,17	[°C]
	POWER SUPPLY	12,22	[V]
	AMBIENT LIGHT	36	[%]



	DESCRIPTION	VALUE	UNIT
Status	HARDWARE SHUTDOWNS	0	
System	SOFTWARE RESTARTS	0	
Statistics	COMPLETED WORKING CYCLES	2	
Commands	CAPACITANCE BYPASS BY USER	0	
Settings	RESISTANCE OVER THRESHOLD	0	
Tools	OBJECT RESISTANCE MIN	58836,67	[OHM]
	OBJECT RESISTANCE AVG	58836,67	[OHM]
	OBJECT RESISTANCE MAX	58836,67	[OHM]
	OBJECT CAPACITANCE MIN	46694,94	[pF]
	OBJECT CAPACITANCE AVG	46694,94	[pF]
	OBJECT CAPACITANCE MAX	46694,94	[pF]
	GROUND RESISTANCE MIN	0,00	[OHM]
	GROUND RESISTANCE AVG	0,00	[OHM]
	GROUND RESISTANCE MAX	0,00	[OHM]
	WORKING TEMP MIN	31,66	[°C]
	WORKING TEMP AVG	32,06	[°C]
	WORKING TEMP MAX	32,87	[°C]

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 clamps have been connected to the FIBC, the MT40 grounding monitor performs ground connection by means of a dedicated internal relay.


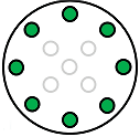
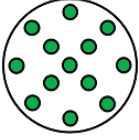

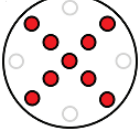
If grounding is correct, MT40 activates the circuit that has to monitor that the resistance remains below 10 M $\Omega$  during the entire operation, as recommended by the reference standards.

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
	<b>STAND-BY</b> MT40 waiting for the clamps to be connected.
	<b>GROUNDING CHECK</b> MT40 has detected connection to the FIBC. It then checks correct connection conditions (resistance < 10 M $\Omega$ ).
	<b>LOADING / UNLOADING ENABLED</b> Successful grounding. MT40 allows loading / unloading by activating the output relay (connector X2). The unit keeps monitoring the specific safety conditions.
	<b>GROUNDING NOT CORRECT</b> Ground connection corresponds to a resistive value higher than 10 M $\Omega$ or the MT40 detected a resistive value of the FIBC lower than 3.3 K $\Omega$ . MT40 denies consent to loading/unloading.
	<b>SIL SAFETY CIRCUIT FAULT</b> 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)

### RF-ID TAG CHARACTERISTICS

Frequency:	125 kHz (TAG compatibility: Q5 in configuration RF/64 ASK Manchester)
Dimensions:	50 x 35 x 7 mm

### ELECTRICAL CHARACTERISTICS

Main Power Supply:	AC Version: 115 / 230 V~ (-15 ÷ +10%) 50 - 60 Hz DC Version: 10 ÷ 30 VDC	
Maximum Power Consumption:	3W	
Output Relay:	Free Contact:	C (Common), NO (Normally Open)
	Max. Current:	5A
	Max. Working Voltage:	250V~, 30 VDC
	Max. Power Loading:	1250 VA, 150 W
	Minimum Load:	5 VDC, 10 mA
Serial Line Communication:	N° 1 RS 485 (2 wires)	
Intrinsically Safe Parameters	Uo:	14,2 V
x4 Clamp Connector:	Io:	212 mA
	Po:	624 mW
	Co:	4,39 µF
	Lo:	3.16 mH

### SAFETY CHARACTERISTICS (SIL)

Assessment Type:	FMEDA Assessment according IEC61508:2010
SIL Eligibility:	SIL 2
λ <sub>du</sub> :	976.3 FIT
λ <sub>dd</sub> :	119.8 FIT
λ <sub>s</sub> :	11256.3 FIT
SFF:	92.1 %
PFDavg, Tproof = 1 Year (8760 Hours)	4.30 x 10 <sup>-3</sup> (SIL2)
Response Time:	< 3 Sec

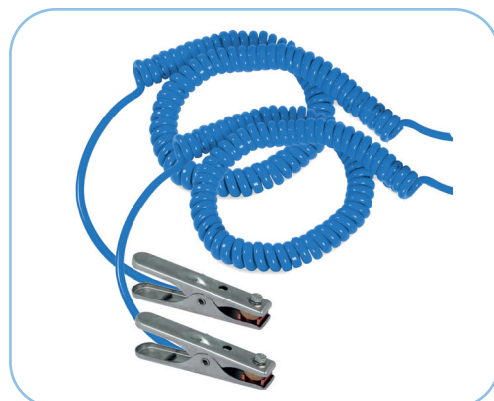
## Technical Specifications - Accessories

*BBC-1 Clamp*



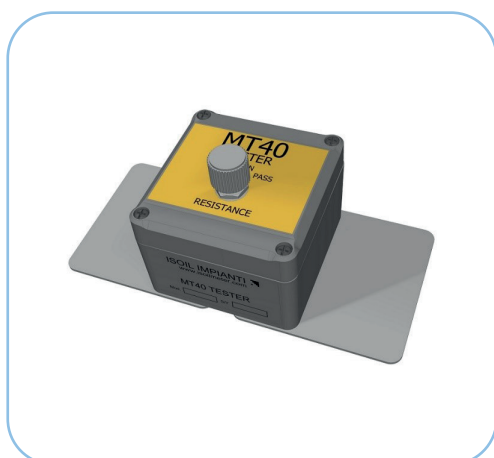
BBC-1 Clamp	
Poles:	1
Teeth Material:	Brass jaw with steel tips and copper contact bow
Body Material:	Stainless Steel 304
Opening Range:	13 mm max for flat surfaces up to Ø16 mm rods
Temperature Range:	-40 °C to +65°C

*CSB-2  
Double Coiled Cable with BBC-1 clamps*



Coiled Cable	
Length:	1.5 m (10 m extended)
Conductors:	1 x 1.5 mm <sup>2</sup>
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

*Tester/F*

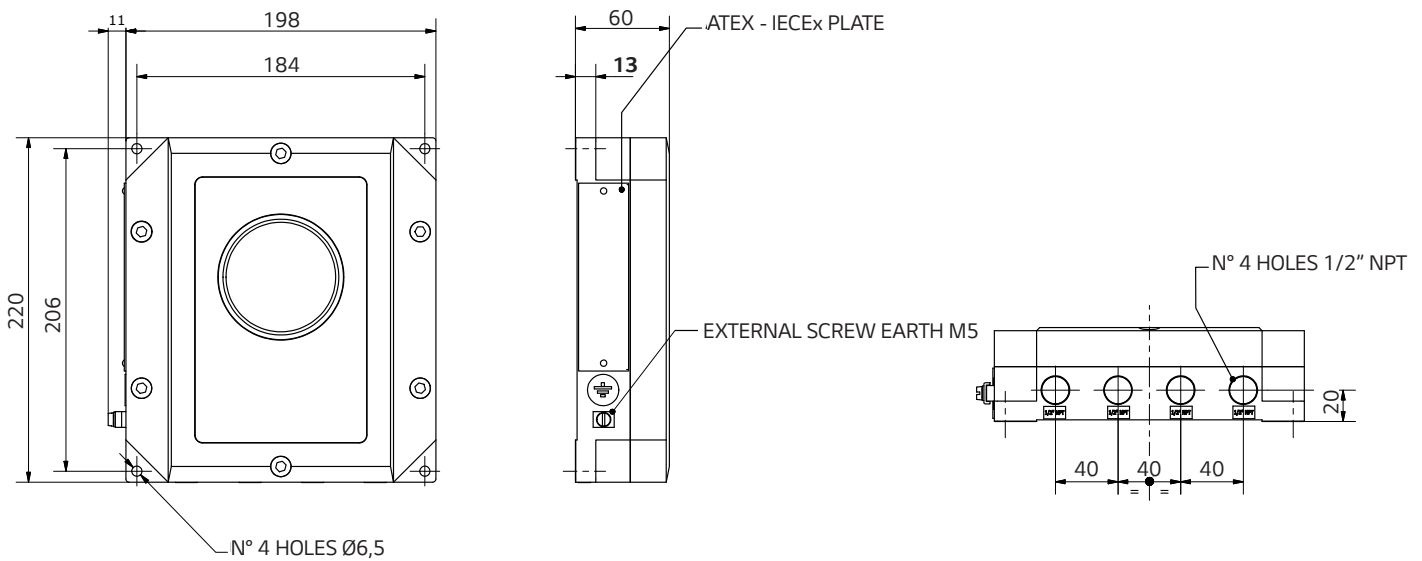


The MT40 Tester allows immediate and easy check of the grounding system working condition. In case MT40 is part of a SIL Safety System, this tester is useful to perform the periodical 'proof test'.

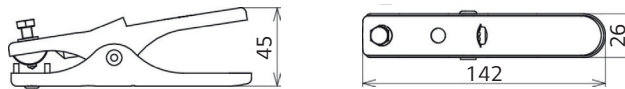
Tester/F	
Materials:	ABS, Stainless Steel
Dimensions:	130x80x80 mm
Ground cable length:	1 m
Temperature range:	-25°C to +55°C
Resistance levels:	Pass, Fail

## Dimensions

*MT40 Grounding Monitor*



*BBC-1 Clamp*



## Ordering Code

Grounding System Version	MT40	X	F	0	0
Power Supply 115/230 V		1			
Power Supply 10÷30 VDC		2			
Mode FIBC (loop with threshold @10 MOhm)			F		
Fixed Fields				0	0