

DISPLAY UNITS SERIES TTU-32.15, TTU-32.16, TTU-32.17 AND TTU-32.18



DESIGNATION

The display units TTU-32.15, TTU-32.16, TTU-32.17 and TTU-32.18 represent a new generation of tachograph display units from the company MESIT aerospace, s.r.o. These units, with a modern look, make use of new construction elements and technology and enable the cooperation with all of the so far manufactured variations of the recording units of the series TTZ-12, TTZ-22 and TTZ-32. Likewise, the dimensions of these units are the same as the so far utilized display units of the series TTU-12, TTU-22 and TTU-32, which allows them to be used as a replacement for all of the so far operated variations of display units used in the tachograph sets of the series TT-12, TT-22 and TT-32. Their design allows the user to utilize them, just by changing the SW, in the sets of all of the types of the so far manufactured tachographs from the company MESIT aerospace, s.r.o. and thereby to unify the spare parts for various types of tramways, trolleys and busses.

ADVANTAGES

- Modern design and new technologies
- Easy replacement for older types of display units
- Variable solutions, possibility of the selection of the indicator shape and the display color

DESIGN

The display units are manufactured in four basic designs, differing only in the shape and the method of displaying the speed:

- ❑ TTU-32.15 – circular display unit with digital display of speed
- ❑ TTU-32.16 – rectangular display unit with digital display of speed
- ❑ TTU-32.17 – circular display unit analog display of speed
- ❑ TTU-32.18 – rectangular display unit analog display of speed

Furthermore, these basic designs can be delivered in variations enabling the user to select the display color for the displaying of speed for the digital indicator, and the extent of the scale for the analog display of speed design and language mutations.

The following functioning and control elements are located on the front panel of the display unit:

- speed indicator with a multifunction display covered by antireflective glass. In the basic mode on the non-resettable counter the multifunction display shows the total distance driven by the vehicle, and on the counter which is resettable by the driver it shows the vehicle's daily driven route. Using the keypad it is also possible to randomly choose further information on this display, which is stated in the following text,
- keypad – allows the selection of the functions and the displaying of the information on the multifunction display,
- the signaling LED diode “MEM” (red) – signals the loss of the recording of the tachograph on to the card,
- three LEDs (yellow, green and red) – signals the status of the batteries and the charging of the vehicle,
- the signaling LED – signals the exceeding of the preselected speed

On the rear side of the indicator there are located the communication connectors and two types of connectors for the connecting of the charging voltage, voltage for the Batteries (AKU) and sensors. In operation these connectors enable the utilization of the already installed cables in the vehicle, without the necessity of replacing the connectors.

DESCRIPTION OF FUNCTIONS

The display units enable the following functions:

- the displaying of the vehicle's instantaneous speed in digital form with the possibility of regulating the contrast or in analog form on the scale with the possibility of regulating the lighting,
- the signaling of the exceeding of the speed value,
- the signaling of the condition of the batteries or the failure of the vehicle's accumulators charging,
- the signaling of a failure in case of a recording failure of the tachograph with the possibility of calling-up the probable cause of the failure,
- the displaying of the vehicle's instantaneous speed,
- the displaying of the total covered kilometers without the possibility of resetting by the driver,
- the displaying of the daily number of covered kilometers with the possibility of resetting by the driver,
- the displaying of time,
- diagnostics of the connected signals,
- the displaying of the results of the braking test,
- the displaying of the buss's fuel status,
- when using the energy metering box, the displaying of the consumed and recovered energy and the value of the track voltage for trolleys and tramways,
- in connection with the sensor it fulfills the function of a speed indicator, and the function of a tachograph after the connecting of a recording unit,
- regulation of brightness

TECHNICAL PARAMETERS

Speedometer range (standard supplies)	0 to 80 km/h or 0 to 140 km/h
Nominal supply voltage	24 V DC
Supply voltage range	16.8 V DC to 36 V DC
Consumption	max. 150mA (at 24V)
Operating temperature range	-25°C to +85°C
Working position	optional
Operation time	continuous operation
Communication interface	RS 485

336-01/16/E



MESIT
aerospace

MESIT aerospace, s.r.o.
Sokolovská 573, Mařatice
686 01 Uherské Hradiště
Czech Republic

aerospace@mesit.cz
T +420 572 522 200
www.mesit.cz

Sales Department
sales.aerospace@mesit.cz
T +420 572 522 804, +420 572 522 707
F +420 572 522 806

Company Reg. No.: 60709235
VAT Reg. No: CZ60709235
Commercial register Brno - C 15427
All data are subject to change.
It is not an offer for a contract.

TT-62 TACHOGRAPH SET



PURPOSE

The TT-62 tachograph serves to record the travel course and parameters of trams, trolleybuses and buses (hybrid, electrobus) employed in the city public transport. The last 1 500 m of the travel is recorded with the accuracy of 0,25 m and serves to analyze vehicle accidents. The display unit with the connected sensor and the power supply system works independently as a speedometer and allows you to enter the wheel diameter and the gear ratio. After it is completed with the replaceable memory SD card, the set works as a tachograph capable of communicating with other units through an IBIS, RS-485, CAN, ETHERNET and USB bus.

SET

The speedometer set consists of the following components:

- Speed sensor with a cable;
- Display unit with an analog (needle) speed indicator and a graphic LCD display, or display unit with a digital speed indicator and graphic LCD display;
- Cable to interconnect the sensor and the display unit.

The tachograph set consists of the following components:

- Speed sensor;
- One or two display units;
- Display unit with a memory SD card;
- Cables.

Each of the delivered sets is accompanied with the operating instructions for the tachograph.

With the first delivery of the tachographs, a free of charge software (one license only) is supplied allowing you to evaluate records and set parameters.

DESCRIPTION

The display units are circular or rectangular with analog or digital speed indicator. The dial ranges of analog display units are 80 km/h and 140 km/h.

The display unit allows the following functions:

- Function of speedometer when combined with the sensor, and function of tachograph after connected to the recording unit;
- Display of the instantaneous speed of a vehicle in analog or digital form; illuminated scale;
- Display of the instantaneous speed of a vehicle on the auxiliary display;
- Time display on the auxiliary display;
- Counting of the accumulated total of covered kilometers and display on the auxiliary display (no reset is possible);
- Display of the daily number of covered kilometres on the auxiliary display (reset is possible);
- Display of requested parameters by customers (consumed energy, recovered energy, motohours, temperature of water, saloon temperature, fuel level, battery voltage, traction voltage, etc);
- Indication that a value entered by the user is exceeded (e.g. speed);

The recording unit allows:

- Connection of one or more display units;
- Recording on SD card with memory capacity up to 8GB;
- Recording on internal memory, capacity up to 2 GB;
- Recording up to 24 – 30 status signals or 6 analog signals. The number of recorded signals may be increased through CAN;
- Short record of status signals and speed over 1 500 m path with 0,25 m record accuracy;
- Long record of status and analog signals and speed with selectable values of the recording accuracy of 0,25 m and 1-10m;
- Change record over the period when the vehicle is standing;
- Brake testing with 5 cm accuracy;
- For trolleybuses and trams equipped with the unit, measurement of energy and recording of consumed or recovered energy;
- Fuel quantity display for buses;

The speed sensor is inductive, contactless and can be easily mounted in the vehicle.

The sensors are made in various variants. If agreed, it is possible to use sensors already installed in the vehicle.

Cables – The tachograph set for the specified vehicle type includes also a cable set. These are the following cables in particular:

- Cable to interconnect the sensor and the recording unit, or in case of the speedometer, the sensor and the display unit;
- Cable to interconnect the recording unit and the display unit;
- Connectors or the common cable to connect the input signals and the supply voltage to the recording unit;

Note: The cables are supplied in lengths as required by the user.

Software – With the first delivery of the tachographs, a free of charge software (one license only) is required to use the tachograph (record evaluation and tachograph parameters setting) is also delivered, including the assembly and operating instructions and examples. The software is intuitive and user-friendly.

The user program allows:

- Easy control incl. context-sensitive help;
- Graphical and tabular display of the records;
- Display mode selection;
- Selection of a section from the whole record;
- Browsing and searching for selected recorded data;

- Indication of the battery condition or a battery recharging failure (AKU signalling);
- Display and dial brightness adjustment,
- Diagnostics of the connected signals on the auxiliary display;
- Indication of a recording failure of the tachograph memory, or incorrectly inserted card etc., with possible displaying a probable cause of the failure on the auxiliary display;
- Entry of parameters (current date and time, vehicle number, wheel diameter and gear ratio, k-factor, traction parameters);
- Fuel quantity indication for buses;
- Display traction voltage and electric energy consumption on auxiliary display at trolleybuses and trams equipped with energy measurement box.

- 5 outputs used to control other devices of the vehicle depending on the speed or status of recorded signals (ABS, retarder, control system etc.);
- Cooperation with the vehicle computer of the directional information system;
- Communication with other devices of the vehicle IBIS, RS 485, CAN, ETHERNET, USB bus;
- Connection of the display unit, signals and communication through connectors; the signals may be connected through one wire (with common earth) or two wires;
- Data storage when the tachograph supply voltage is disconnected from the vehicle network;
- Indication of the card including indication on the display unit;
- Record failure indication.

- Cables to connect the unit to other units (vehicle computer, vehicle exchange etc.);
- Hub unit for cables.

- Cursor searching;
- Driver's report printing;
- Accident history records printing;
- Orientation in record according to the driver's number or bus stop title.

BASIC TECHNICAL SPECIFICATION

Speedometer range (standard supplies)		0 to 80 km/h or 0 to 140 km/h
Input binary signals	Log 0	0 to 1 V
	Log 1	16,8 to 60 V
Input analog signals	Voltage	0 to 10 V
	Current	0 to 20 mA
Nominal supply voltage		24 V DC
Supply voltage range		16,8 V DC to 36 V DC
Operating temperature range		-25°C to +85°C
Operation time		continuous operation
Working position		optional

400-01/16/E



MESIT aerospace, s.r.o.
Sokolovská 573, Mařatice
686 01 Uherské Hradiště
Czech Republic

aerospace@mesit.cz
T +420 572 522 200
www.mesit.cz

Sales Department
sales.aerospace@mesit.cz
T +420 572 522 804, +420 572 522 707
F +420 572 522 806

Company Reg. No.: 60709235
VAT Reg. No: CZ60709235
Commercial register Brno - C 15427
All data are subject to change.
It is not an offer for a contract.

ELECTRONIC RECORDING DEVICE

TT-43.1A



PURPOSE

The electronic recording device is designed for use in railway engine-vehicles, allowing for recording and evaluation of the history of the traffic operation of these vehicles. It replaces the mechanical recording tachometers available from Hasler and other manufacturers. The electronic recording facility is designed for use also on electric traction.

ASSEMBLY

The assembly of the electronic recording device consists of the following components:

- control unit with keyboard and display,
- display unit with dial indicator with display
- recording unit,
- velocity sensor,
- sensor of air pressure in brake piping,
- cables and interconnections of the individual components of the assembly,
- accessories:
- for time synchronization: DCF and GPS receiver
- fuel measuring
- vehicle monitoring system

With the first delivery, the evaluation user software is delivered to the user.

DESCRIPTION

The display unit with dial indicator and the control unit with keyboard are located in the field of view on the engine driver desk. The display and control units allow for:

- a) analog velocity display in the range 0 to 160 km/hour or in a range as specified by the user, allowing for regulation of the scale illumination brightness. The scale is fitted with a red scale-line indicating maximal design speed for the given vehicle type;
- b) digital display of velocity on the control unit display,
- c) display of the value of pressure in the brake piping on the control unit display,
- d) signalling of a loss of recording by a LED diode (signals a failure of the recording tachometer or an incorrectly inserted card),
- e) signalling of filling up of the memory capacity, by a LED diode,
- f) signalling of a failure of the sensor by a LED diode (signals a fault of one or more phases of the velocity sensor),
- g) signalling of exceeding of the maximal allowable velocity of the vehicle by a LED diode,
- h) input of parameters into the recording unit using a keyboard. There are two levels for the input of parameters:
 - by the engine driver – free access to inputting parameters into the recording tachometer by the engine driver,
 - by the maintenance staff – coded access only for the maintenance staff purposes

Note: The data are input and recovered using a keyboard, which is a part of the control unit, every change in the input data is recorded in the recording unit.

i) the use of a multi-functional display (allowing for regulation of its brightness) which allows for recovering and displaying the following information:

- real time (basic mode of the display) – the time information is obtained from an own clock of a high accuracy allowing for adjustment of the time by the maintenance or via the vehicle bus-bar from the source of uniform time,
- date – automatic mode allowing for adjustment of the time by the maintenance or via the vehicle bus-bar,
- total distance travelled in km – automatic reading up of the travelled distance allowing for adjustment by the maintenance (for the case of mounting on another vehicle),
- daily distance travelled in metres, may be reset to zero by the engine driver,
- statistical registration number of the engine driver – information input by the engine driver,
- number of the train – information input by the engine driver,

- departure station for the given railway section or the point of changing of the engine crew,
- train weight – information input by the engine driver,
- braking mode – information input by the engine driver,
- braking power rate – information input by the engine driver,
- statistical registration number of the vehicle – information input by the maintenance,
- home service station of the vehicle – information input by the maintenance,
- diameter of vehicle wheel set in the range of 750 to 900 mm or as specified by the user – information input by the maintenance,
- max. allowable vehicle speed – information input by the maintenance,
- diagnostic data – checking of correct function of the connected signals and equipment, probable cause of failure of the assembly etc.,
- manufacturing number of the recording tachometer assembly – information input by the manufacturer.

The recording unit is located at an arbitrary place out of the deformation zone of the vehicle. It allows for:

- vehicle traffic operation recording with record length of at least 200'000 km. The recording of the traffic operation is time wise, with the frequency of recording of 0.1 ms;
- recording of the vehicle velocity and other 48 signals from the vehicle + 4 analogue channels. To eliminate recording of random signals (interference, etc.), only signals longer than 0.2 ms are recorded, i.e. the signals for which a change appears in two consecutive samples. The signals are related to a common frame of the recording tachometer (minus feeding), which is not the same as the vehicle frame. Records are read using a notebook an evaluated by means of software supplied by the recording tachometer manufacturer,
- the use of eight relay outputs.

The velocity sensor is:

- a four-phase optical sensor – two phases are sufficient to sense the vehicle speed and distinguish the direction of driving; the remaining two phases are used as spare. In case of a failure of any of these phases, this failure is signalled on the display unit by a LED diode; however, the functionality of the unit is fully retained. The assembly is fully functional also in case of a failure of two phases of the sensor.
- located on the bearings housing of the wheel set; it's mechanical dimensions allow for replacing it by velocity sensors supplied by Metra and Hasler. The mechanical design is fit for operation under heavy service conditions.
- fed from the source that is a part of the recording unit of the recording tachometer.

Sensor of air pressure in the brake piping – the temperature sensor DMP 331 may be used for the unit, or another sensor based on an agreement.

The cables for connecting the velocity sensor to the recording unit are (for the purpose of an easy mounting and dismantling of the sensor during operation) divided in two parts. The individual parts are to be interconnected using a connection box or using a connector supplied by the manufacturer of the recording tachometer. The length of the cables from the velocity sensor to the connection box (or connector) is assumed to be approx. 1.5 m, and the length from the connection box (or connector) to the recording unit approx. 4 m (depending on vehicle type). Based on an agreement with the manufacturer, the cables can be supplied in lengths according to the user requirements.

BASIC TECHNICAL PARAMETERS

Rated feeding voltage		48V DC (24V DC, 115V DC), 24 -72 V
Tachometer range (standard delivery)		0 to 160km/hour or as required by the user
Number of inputs – recorded signals		48 + velocity + 4 analogue
Communication		2 x RS485; 1 x RS232/RS485; 1x LAN; 2 x CAN
Number of relay outputs		8
Operating ambient temperature	- of the assembly except for the sensor	-30°C to +60°C
	- of the velocity sensor	-40°C to +70°C
Working position		Any
Mechanical resistance in operation	impacts	
	- of the assembly except for the sensor	3 g
	- of the velocity sensor	40 g
Mechanical resistance out of operation	impacts	
	- of the assembly except for the sensor	15 g
	- of the velocity sensor	60 g
Protection		by external circuit breaker, by a built-in fusible cut-out
Insulating voltage of inputs and outputs against the frame, against each other, and against other circuits of the recording tachometer		1500V
Protection of inputs against reversing of polarity		Permanent
Relative humidity of air		max. 95% within the entire range of operating temperature
Protection level	- of the assembly except for the sensor	IP 30 according to the standard ČSN EN 60 529
	- of the velocity sensor	IP 56 according to the standard ČSN EN 60 529
Interference suppression		according to the standard ČSN 33 4200
Reliability of the assembly		min. 10.000 hours (according to the standard ČSN 01 0606)
Lifetime		min. 25 years

401-02/16/E



MESIT aerospace, s.r.o.
Sokolovská 573, Mařatice
686 01 Uherské Hradiště
Czech Republic

aerospace@mesit.cz
T +420 572 522 200
www.mesit.cz

Sales Department
sales.aerospace@mesit.cz
T +420 572 522 804, +420 572 522 707
F +420 572 522 806

Company Reg. No.: 60709235
VAT Reg. No: CZ60709235
Commercial register Brno - C 15427
All data are subject to change.
It is not an offer for a contract.

ES-62.X CARD READER



USE

The ES-62.X module is designed to be used in all road and railway vehicles. It provides authorized driver access to TT-62 tachograph sets, as well as blocking vehicle travel. The card reader is connected to a driver database.

SET

- ES-62.X card reader
- Access cards
- KC-9XX.ES connection cables

BASIC TECHNICAL PARAMETERS

Nominal supply voltage, current consumption: 24VDC, 70mA

Operating frequency:

- ES-62.1 13.56MHz
- ES-62.2 125kHz

Communication: RS485, RS232, CAN bus

Inputs and outputs:

- 1x change-over relay contact (2A)
- 4x galvanically separated outputs with opened collector (36V/50mA) or 4x galvanically separated inputs (9V to 36V)

Login notification: Two-colour LED and auditory signal

Firmware upload: via RS232

Internal memory capacity: 1,534 users

Approx. maximum distance for card reading: 7cm

Ambient temperature: -20°C to +65°C

Ambient storage temperature: -40°C to +80°C

Operating position: any

Electrical strength of galvanically separated communication lines: min. 500V

Input polarity-protection: permanent

Relative humidity: max. 95% in the entire range of operating temperatures, non-condensing

Degree of protection: IP40 compliant with ČSN EN 60 529

Max. external device dimensions: 96 x 96 x 65mm

484-06/16/EN



MESIT
aerospace

MESIT aerospace, s.r.o.
Sokolovská 573, Mařatice
686 01 Uherské Hradiště
Czech Republic

aerospace@mesit.cz
T +420 572 522 200
www.mesit.cz

Sales Department
sales.aerospace@mesit.cz
T +420 572 522 804, +420 572 522 707
F +420 572 522 806

Company Reg. No.: 60709235
VAT Reg. No: CZ60709235
Commercial register Brno - C 15427
All data are subject to change.
It is not an offer for a contract.

GPS-62.1 MODUL



USE

The GPS-62.1 module is designed to be used in all road and railway vehicles.

It receives GPS or GLONASS signals and allows for exact synchronisation of time with current vehicle coordinates in TT-62 tachograph systems.

SET

- GPS-62.1 module
- Active, pre-amplified GPS antenna and a 5m long AGPS 5 cable
- KC-9XX.GPS communications and power cable

BASIC TECHNICAL PARAMETERS

Nominal supply voltage, current consumption: 24V DC, 50mA

Receiver: GPS, GLONASS

Communication: RS232, galvanically separated

Time synchronization accuracy: 10ns

Position identification accuracy (horizontal): better than 2.5m

Speed measurement accuracy: better than 0.1m/s

Ambient temperature: -40°C to +80°C

Ambient storage temperature: -45°C to +105°C

Operating position: any

RS232 communication line insulation voltage: 1,500V

Input polarity-protection: permanent

Relative humidity

- max. 95% in the entire range of operating temperatures, non-condensing

Degree of protection: IP40 compliant with ČSN EN 60 529

Max. external dimensions of the device in mm: 111 x 75 x 23mm

Installation method: installation on DIN rail

485-06/16/EN



MESIT
aerospace

MESIT aerospace, s.r.o.
Sokolovská 573, Mařatice
686 01 Uherské Hradiště
Czech Republic

aerospace@mesit.cz
T +420 572 522 200
www.mesit.cz

Sales Department
sales.aerospace@mesit.cz
T +420 572 522 804, +420 572 522 707
F +420 572 522 806

Company Reg. No.: 60709235
VAT Reg. No: CZ60709235
Commercial register Brno - C 15427
All data are subject to change.
It is not an offer for a contract.

EARTH-LEAKAGE RELAY HIST-1 FOR TROLLEYBUS



DETERMINATION

The Earth-Leakage Relay HIST-1 is a device designed for continuous monitoring of isolation state during operation of trolleybuses on traction mains with the voltage rating 600 or 750 VDC. HIST-1 continuously monitors the state of basic and auxiliary isolations of electric circuits of the trolleybus and signals its possible deterioration under the allowed limits. By timely warning about risk of electric shock, it increases safety of passengers and the driver. The automated isolation status control brings significant **reduction in work difficulty** during preparation of the trolleybus before its leaving for the line and makes the **operation more efficient and safe** for the whole trolleybus lifetime.

ADVANTAGES

- The unit allows you to measure the total isolation state of the vehicle as well as of the individual isolations in all types of traction networks – isolated symmetrical, isolated unsymmetrical, grounded or combined networks.
- The traction network type is selected by setting the central register and the unit selects the corresponding method of measurement automatically according to the network type. Therefore all the measurement methods can be performed using one device.
- It is resistant to the polarity reversal of the grounded traction network.
- It allows you to measure vehicle isolation states using an artificial centre of the traction voltage, earthed trolley wire or earth-wire.
- It allows you exactly measure values of isolation resistances by means of an own built-in 48VDC source.
- It allows you to test and to measure the isolation resistance by means of an own built-in 1000VDC source (simple measurement of the vehicle state before it leaves the depot) just only by pressing one button by the driver, the result is recorded into the memory of the unit.
- In case of a lower isolation state, it records such events and save them into the internal memory.
- It allows you to communicate with other units through state outputs or communication interface CAN or RS 232 as required by the user.

DESCRIPTION

The Earth-Leakage Relay is designed as a numerical measuring instrument with a microprocessor control and memory of evaluated limits. The microprocessor periodically starts measuring twelve power inputs (10 inactive parts and 2 three-phase IT mains) against two reference inputs (vehicle body and trolley wire). All inputs are equipped with protective impedances. It allows you to measure up to 24 combinations of inputs and you can use up to four methods of measurement to evaluate the isolation state:

- ◆ Measurement of crest voltage
- ◆ Measurement of earth-leakage current
- ◆ Measurement of current from the internal 48VDC power supply and computation of isolation resistance
- ◆ Measurement of current from the internal 1,000VDC power supply and computation of isolation resistance

Note:

For safety reasons, the measurement, which uses the 1,000VDC voltage supply, is allowed only when the collectors are retracted and it can be started using the button on the front panel of the unit. The earth-leakage relay checks the compliance of two conditions – a signal is present that the link contractor of the electrical part is ON but no voltage is detected on inputs from trolley collectors (the red LED is off). If the 1kV power supply is not used, then it is safely disconnected by the relay. If required by the user, the 1000VDC test can be started also from a superior vehicle system.

The period of measurement is adjustable. The measurement result for each of the power inputs is indicated by a pair of LEDs (white and red) on the front panel. The course and method of measurement are signalised by four yellow LEDs.

Independently on the above mentioned measurements, the voltage between the terminal "Box" and the channel terminal "R02" is checked in the common mode continually. This is a voltage comparator that is set at the fixed comparison voltage of 58V. If the comparison voltage is exceeded, extraordinary measurement of the voltage is started by the digital input of the device. It measures this foreign voltage amplitude and if the value is still >58V, the processor measures also the foreign current. If the foreign input does not exceed the value set for the trolley-ground channel, the message "Danger" will not be activated. However, if the current is bigger, the message "Danger" will be activated and the measured values will be written into the memory of the unit including their times.

All adjustable parameters necessary for correct operation of the unit and measured limits are saved in three memory blocks, which keep data also in case of a voltage failure:

- ◆ Memory of modes – allows you to adjust date, time and interval of measurement and to select, which methods of measurement will be used in the individual combinations of power inputs. Only authorized person can perform this change of function using a laptop.
- ◆ Memory of limits – allows you to adjust two limits for each method of measurement and each combination of power inputs for signalisation (WARNING, DANGER) of their overrunning/underrunning. The adjustment of limits for signalisation can be done only by an authorised person using a laptop.
- ◆ Memory of exceeded limits – records up to 128 cases of exceeded limits of voltage, current or isolation resistance incl. their numerical values and the corresponding date and time of the event. Presence of unread records in this memory is signalised by a lighting LED. After the records are loaded into the laptop, the LED gets off. If the memory is full, the oldest data are rewritten by the new ones.

CONSTRUCTION

The earth-leakage relay is located into one plastic box (230 x 200 x 95 mm) with a transparent door, under which there is a front panel with LEDs, two buttons and instrument terminals. Inputs of inactive parts and electrical centres of active parts are connected to the terminals, which allows you to measure resistances of the individual isolation layers directly on them (e.g. using Megmet) when the earth-leakage relay is OFF, or to simulate reduced isolation states when the earth-leakage relay is ON.

The earth-leakage relay is connected with electrical circuits of the trolleybus by means of connectors. Their counterparts to connect wires are supplied in the accessories.

There is a connector on the top wall of the box for two-wire connection of three binary inputs and three binary outputs, which are not power supplied and are galvanic-separated by optocouplers from the internal circuits of the earth-leakage relay as well as among each other.

There are two power connectors on the bottom wall of the box - each of them has 12 outlets with bigger spacings. The right connector connects the power supply from the 24 VDC board network and monitored inactive parts according to the vehicle equipment and requirements of the user. The left connector connects the BOX and active parts of the vehicle body – the supplied direct trolley voltage (its electrical centre indicated as TROLLEY is created by a pair of resistors) and two alternating three-phase networks from the static inverter (the electrical centres indicated as ITA and ITB are created by a pair of resistor triplets). The resistors permanently take the electric current.

297-01/16/E



MESIT aerospace, s.r.o.
Sokolovská 573, Mařatice
686 01 Uherské Hradiště
Czech Republic

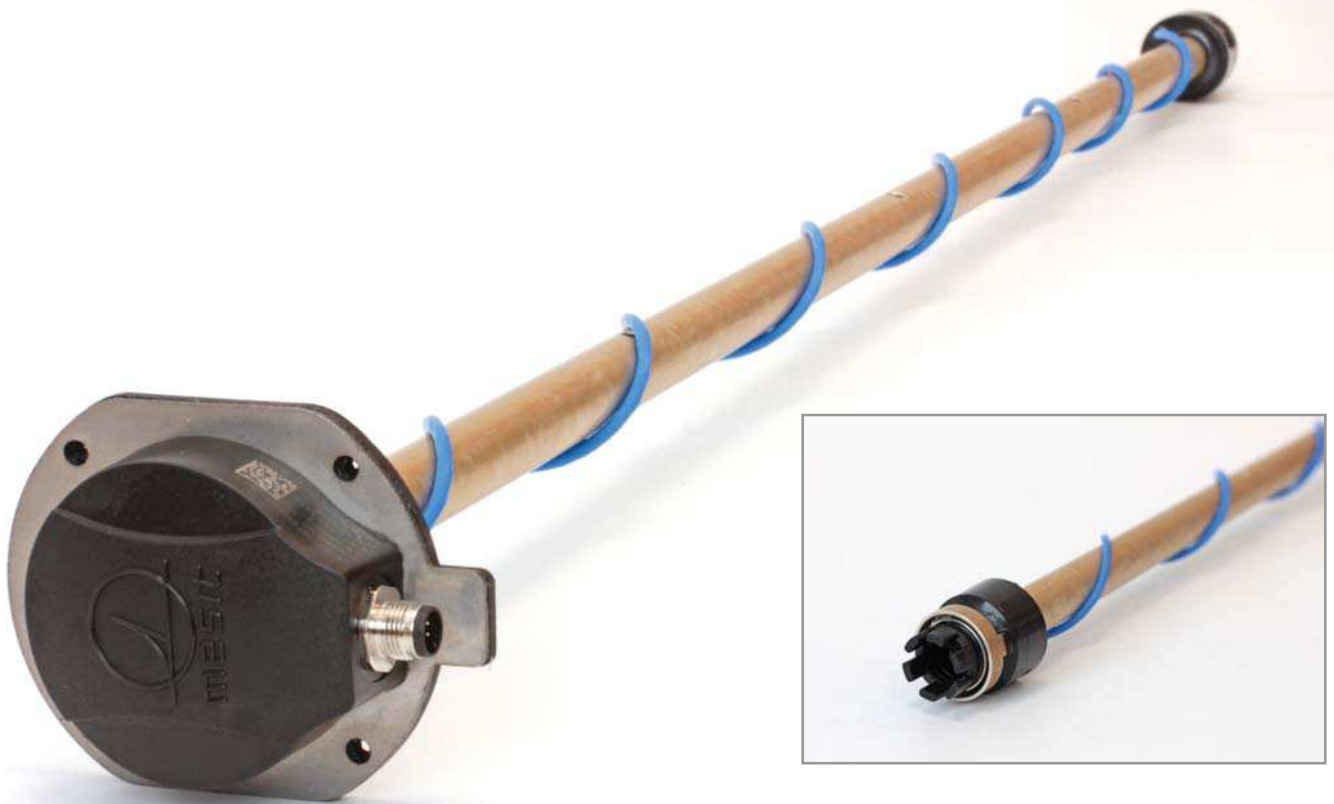
aerospace@mesit.cz
T +420 572 522 200
www.mesit.cz

Sales Department
sales.aerospace@mesit.cz
T +420 572 522 804, +420 572 522 707
F +420 572 522 806

Company Reg. No.: 60709235
VAT Reg. No: CZ60709235
Commercial register Brno - C 15427
All data are subject to change.
It is not an offer for a contract.

Fuel Level Meter LM4

A new solution for high-accuracy fuel measurement for road vehicles and machinery. The meter analyses the physical properties of various types of fuels, including biofuels.



Intelligent fuel measurement

Robust and highly reliable design

Easy installation with the possibility of shortening the length of the level meter

Multi-tank solution

Rapid detection of unauthorized fuel handling

Easy calibration and set-up via a PC

Option of automatic detection of the ignition key (according to the on-board voltage level)

Remote firmware updates

Simple sealing of the level meter

Sophisticated diagnostics of operational reports

Quick-coupling connector with IP69K protection



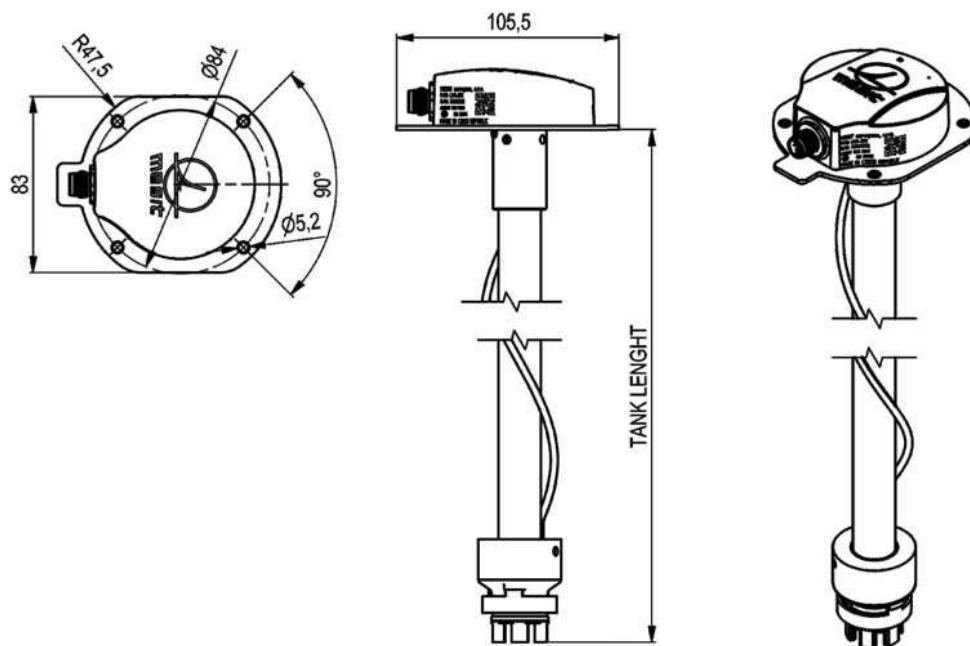
MESIT
aerospace

Fuel Level Meter LM4

The LM4 capacitive level meter is primarily intended for measuring the fuel tank level of road vehicles and machinery. It allows for continuous measurement of fuel levels (diesel, bio-diesel, petrol and oils). Capacitive level meters can also be installed for similar applications in stationary tanks, reservoirs, wells, etc. In vehicles, they are installed vertically in the upper part of tanks.

The capacitive level meter is a structural unit consisting of:

- transmitter head with built-in electronics,
- capacitive probe for fuel level sensing,
- capacitive compensation sensor for the measurement of the dielectric properties and temperature of the medium.



TECHNICAL PARAMETERS

Non-linearity	max. $\pm 0.85\%$
Temperature inaccuracy	max. $\pm 1\%$
Change compensation inaccuracy	max. $\pm 0.5\%$
Interface	CAN, RS 232
Measured medium	diesel, oil, petrol, biodiesel
Supply voltage	9 V to 36 V DC
Alarm input	open collector max. 50V/50 mA
Operating temperature	$-40\text{ }^{\circ}\text{C}$ to $+80\text{ }^{\circ}\text{C}$
Electrical, mechanical, chemical and climate resistance	ISO 16750
Electrical protection	IP69K – DIN 40050
Cable length (accessory)	10 m
Sensing probe length	1000 mm
Hole diameter for inserting the level meter into the tank	41 mm
Weight (without a cable)	0.7 kg



MESIT aerospace, s.r.o.
Sokolovská 573, Mařatice
686 01 Uherské Hradiště
Czech Republic

aerospace@mesit.cz
T +420 572 522 200

Sales Department
sales.aerospace@mesit.cz
T +420 572 522 804
F +420 572 522 806

www.mesit.cz

ID: 60709235
VAT No.: Cz60709235
Brno Commercial Register - C 15427
The document is subject to change.
It is not an offer for a contract.