SUPERINTEND IM-01.IND*

IMD Insulation Monitoring device for non-grounded (IT) electrical networks for industrial applications

Instructions for installation and use v1.172

AC/DC

Table of Contents

INSTRUCTIONS

These instructions for use are intended for trained electrical engineering professionals. The IM-01.IND* devices are marked with the symbol shown below, which indicates that if the device has been installed incorrectly or used in violation of instructions, safety could be jeopardised. The description of the symbol is presented in this manual instead of on the device due to space constraints. Such sections are marked with the symbol shown below.

A symbol indicating possible danger. A description of the symbol may be placed on the device or provided in the instructions for use.

SYSTEM DESCRIPTION

IM-01.IND* is a device with which the insulation resistance and capacitance of floating electricity networks can be measured and monitored in industrial applications. If the system voltage of the network to be monitored exceeds 500 VAC or 700 VDC, a high voltage coupling device HVC-6_9AC, HVC-16AC, HVC-40AC or HVC-72AC (later abbreviated as HVC-*) is mandatory and it must be used between the IM-01.IND_* and the network to be monitored. The type of the high voltage coupling device shall be selected so that maximum system voltage of the network will not exceed the rated maximum system voltage of the coupling device. The exact type of IM-01.IND* shall be determined according to the following table, based on the selected coupling device.

Maximum system voltage (AC)	**Maximum system voltage (DC)**	**Coupling device**	**IM-01.IND* type**
500	700	-	IM-01.IND
690	950	HVC-6_9AC	IM-01.IND_HV
1600	950	HVC-16AC	IM-01.IND_16
4000	-	HVC-40AC	IM-01.IND_40
7200	-	HVC-72AC	IM-01.IND_72

CLT-01 is an optional accessory, which sends 0…20 / 4…20 mA standard current messages to the current loop of its output in accordance with the insulation resistance measured by IM-01.IND*. The system can also be equipped with devices PEC-01, TC-01, IC-01, RD-01 and RD-12, which have been developed originally for medical locations. With those devices, the continuity of the PE wire can be measured and alarms can be presented outside the monitoring device room. The system can also be equipped with fault location system FLI-01 + CTM-01, which has been developed originally for medical locations. The devices for medical locations are discussed in more detail in the Superintend IMD MED – Installation and User Manual.

INSTALLATION

PHYSICAL CONNECTION

The devices are connected to the electrical network, which may contain dangerous voltage. The device may be installed by a trained electrical engineering professional only. The device contains no user-serviceable parts and must not be opened. Using the device in violation of these instructions may compromise safety.

The IM-01.IND* unit is the control unit of the system and is installed in the switchboard. Two IM-01.IND* devices may not be installed galvanically in the same network, for example on the secondary side of the same transformer. The connection is performed as presented in Figures 1–6. The installation and wiring should be performed in accordance

with standards IEC 60364 as well as EN 50110. The operating voltage connection of IM-01.IND* must always be equipped with a coupler or a line protection switch so that the electricity supply can be disconnected for the duration of maintenance work, for example. The location of the disconnectors must be clearly marked in the switchboard. The coupler or line protection switch should also control a relay or contactor, which separates the measuring wires from the network to be measured. The IM-01.IND* device is equipped with an internal 1 A fuse. In spite of this, the wires of the operating voltage supply should still be protected with an external fuse. A suitable if the size is, for example, 6 A. In a DC operating voltage supply, an external Schurter 0001.2503 (T800mA) fuse should be used.

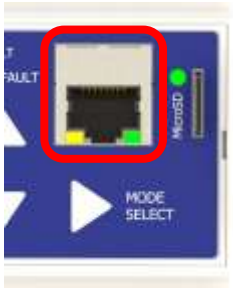
DEVICE MOUNTING

The IM-01.IND*, HVC-6_9AC, HVC-16AC and CLT-01 devices are intended for installation in a DIN TS35 rail in accordance with standard IEC 60715. They are installed by inserting the upper edge of the DIN TS35 rail in the groove intended for the DIN TS35 rail on the back of the device and by pushing the bottom edge of the device backward until the retaining latch clicks into place. HVC-40AC and HVC-72AC are intended to be mounted with screws.
The IM-01.IND* unit comes with the connections shown in the following table. The shaded parts are optional and are installed as needed, while installing the other parts is mandatory.

Category	Connector	Description
Operating voltage connection	⏚	Protective earth, to be connected to the earthing circuit connector
	L	110…240 VAC, 48…62 Hz phase conductor, internal fuse 1A slow +/-110…300 VDC, use an external fuse Schurter 0001.2503 (T800mA)
	N	110…240 VAC neutral conductor -/+110…300 VDC
RS-485	SH	RS-485 cable shield, internally connected to PE
	+12V	+12V output for the additional units, current limit 0.5 A, twisted pair 2
	A	RS-485 data+ (two-way data/twisted pair 1)
	B	RS-485 data- (two-way data/twisted pair 1)
	-	RS-485 network and 12V connection earth, twisted pair 2
Measuring connectors	Imeas	Load current measurement input, to be connected to the S1 terminal of the current transformer. A 50 mΩ resistance is also installed between S1–S2. Measuring range ±1.25Vpk
	Imeas	Load current measurement input, to be connected to the S2 terminal of the current transformer. Internally connected to PE
	TEMP	Isolation transformer temperature sensor's (NTC/PT100) input. Internally connected to PE
	TEMP	Isolation transformer temperature sensor's (NTC/PT100) input. Measuring range 0…2.5VDC
	TG	Alarm terminal of protective earth, to be connected to the PE rail
	MG	Electronics protective earth, to be connected to the PE rail
	M1	IM-01.IND: Connection 1 of the network to be monitored 1; Max 500VAC/700VDC IM-01.IND_*: Connection 1 to HVC-*

	M2	IM-01.IND: Connection 2 of the network to be monitored 1; Max 500VAC/700VDC IM-01.IND_*: Connection 2 to HVC-*
Alarm relays	AUX. ALARM NO	AUXiliary alarm relay. NO-COM is an open circuit when the alarm in inactive and closes when the alarm is active. NC-COM functions in a reverse manner. Max load 250VAC/3A or 30VDC 1A
	AUX. ALARM NC	
	AUX. ALARM COM	
	TRF. ALARM NO	Transformer's alarm relay. NO-COM is an open circuit when the alarm in inactive and closes when the alarm is active. NC-COM functions in a reverse manner. Max load 250VAC/3A or 30VDC 1A
	TRF. ALARM NC	
	TRF. ALARM COM	
	INS. ALARM NO	Alarm relay of the insulation resistance. NO-COM is an open circuit when the alarm in inactive and closes when the alarm is active. NC-COM functions in a reverse manner. Max load 250VAC/3A or 30VDC 1A
	INS. ALARM NC	
	INS. ALARM COM	

The Ethernet cable is connected to the RJ45 connector in the front panel.



Before connecting the device to the local area network, set the TCP/IP parameters suitable for the LAN (SETUP→IP Settings).

The HVC-* units to be installed in the switchboard have the following connections, all of which must always be installed.

Connector	**Description**
M1	Connection 1 to IM-01.IND_*
M2	Connection 2 to IM-01.IND_*
L1	Connection 1 of the network to be monitored; Max voltage according to the type of the unit.
L2	Connection 2 of the network to be monitored; Max voltage according to the type of the unit.

The CLT-01 unit to be installed in the switchboard has the following connections, all of which must always be installed.

RS-485	A	RS-485 data+ (two-way data/twisted pair 1)
	B	RS-485 data- (two-way data/twisted pair 1)
	-	RS-485 network and 12V connection earth, twisted pair 2
	SH	Chaining of the RS-485 cable shield
	+12V	+12V input from the IM-01.IND* unit, twisted pair 2

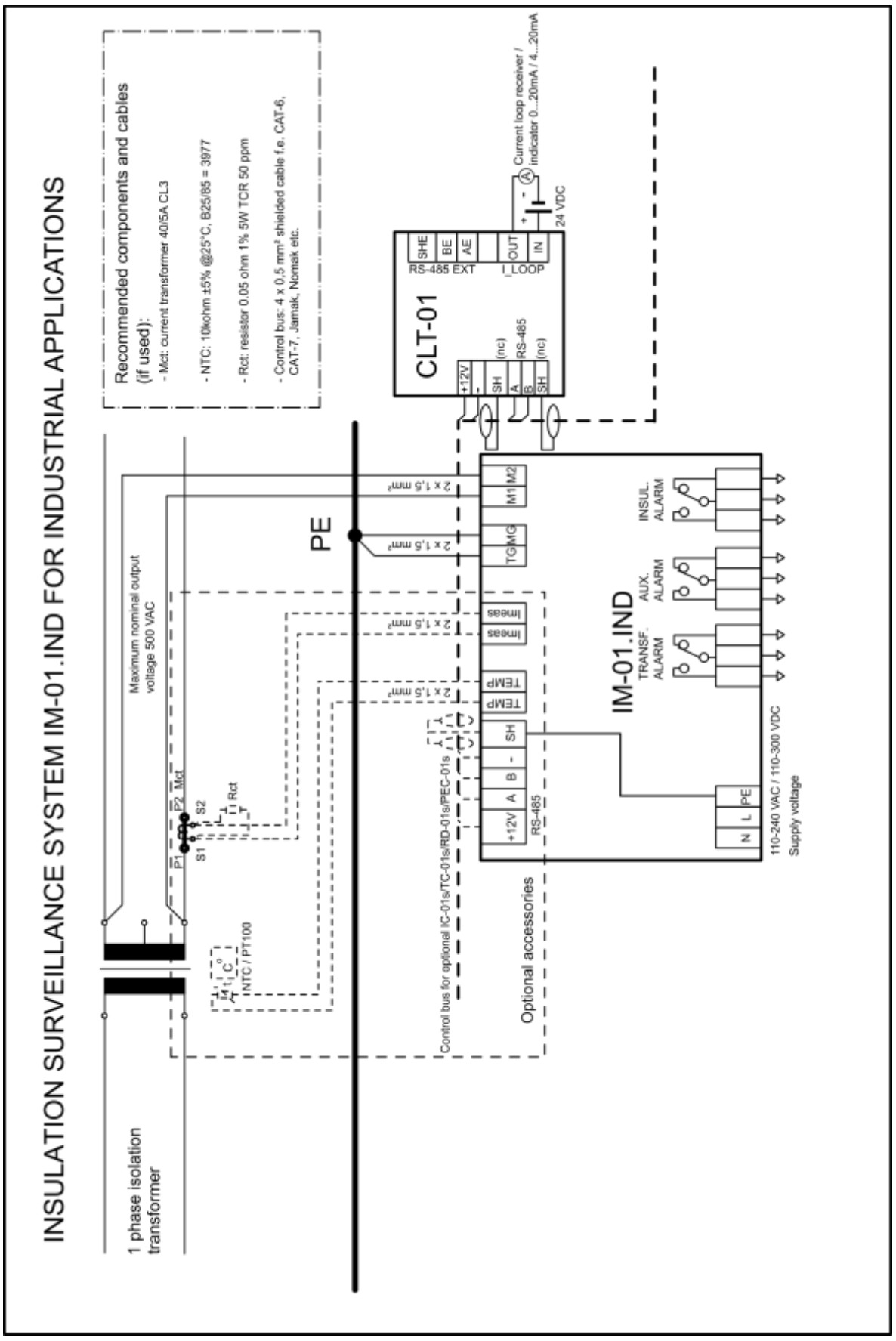


Figure 1. System connection of a 1 phase system (IM-01.IND).

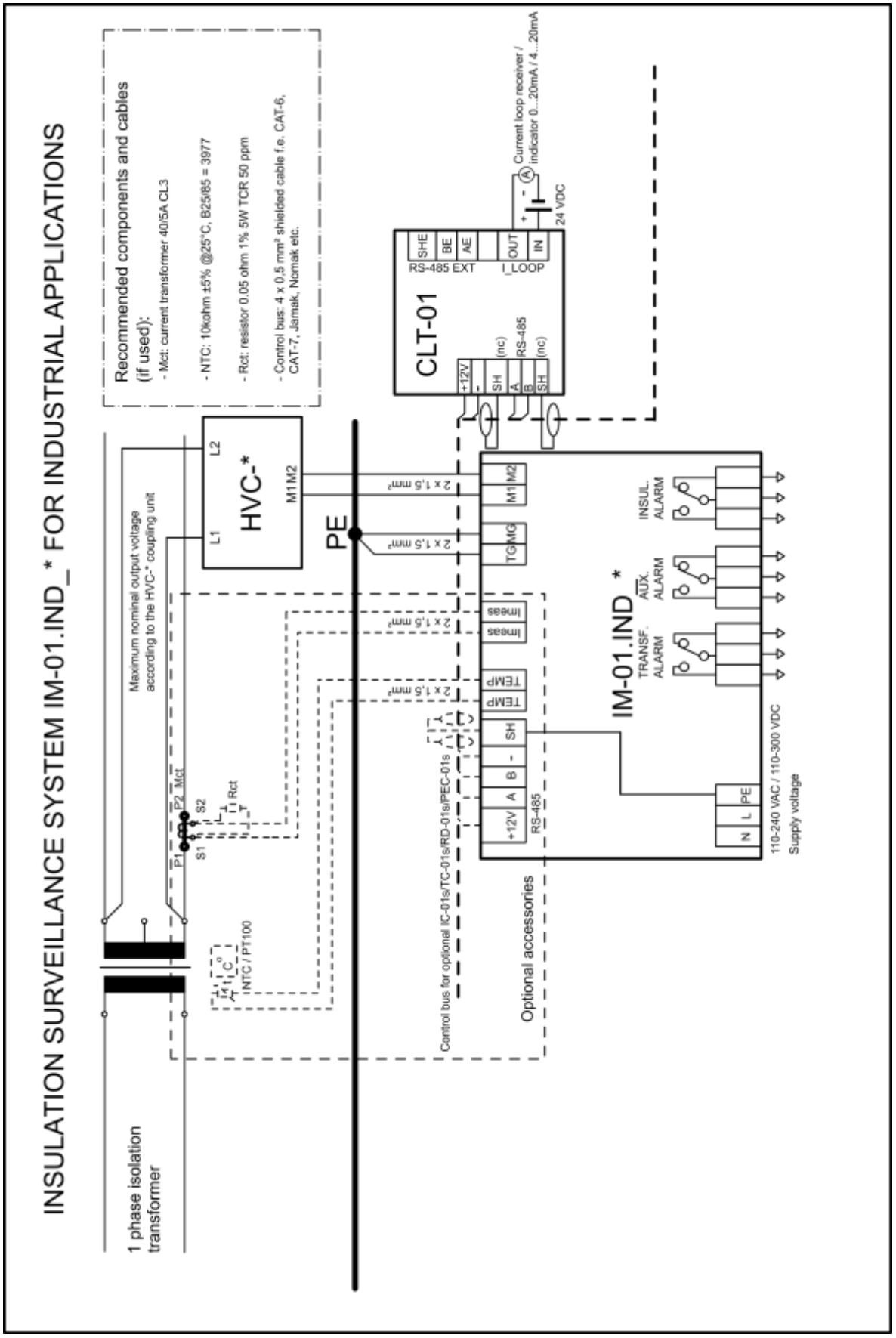


Figure 2. System connection of a 1 phase system (IM-01.IND_* + HVC-*).

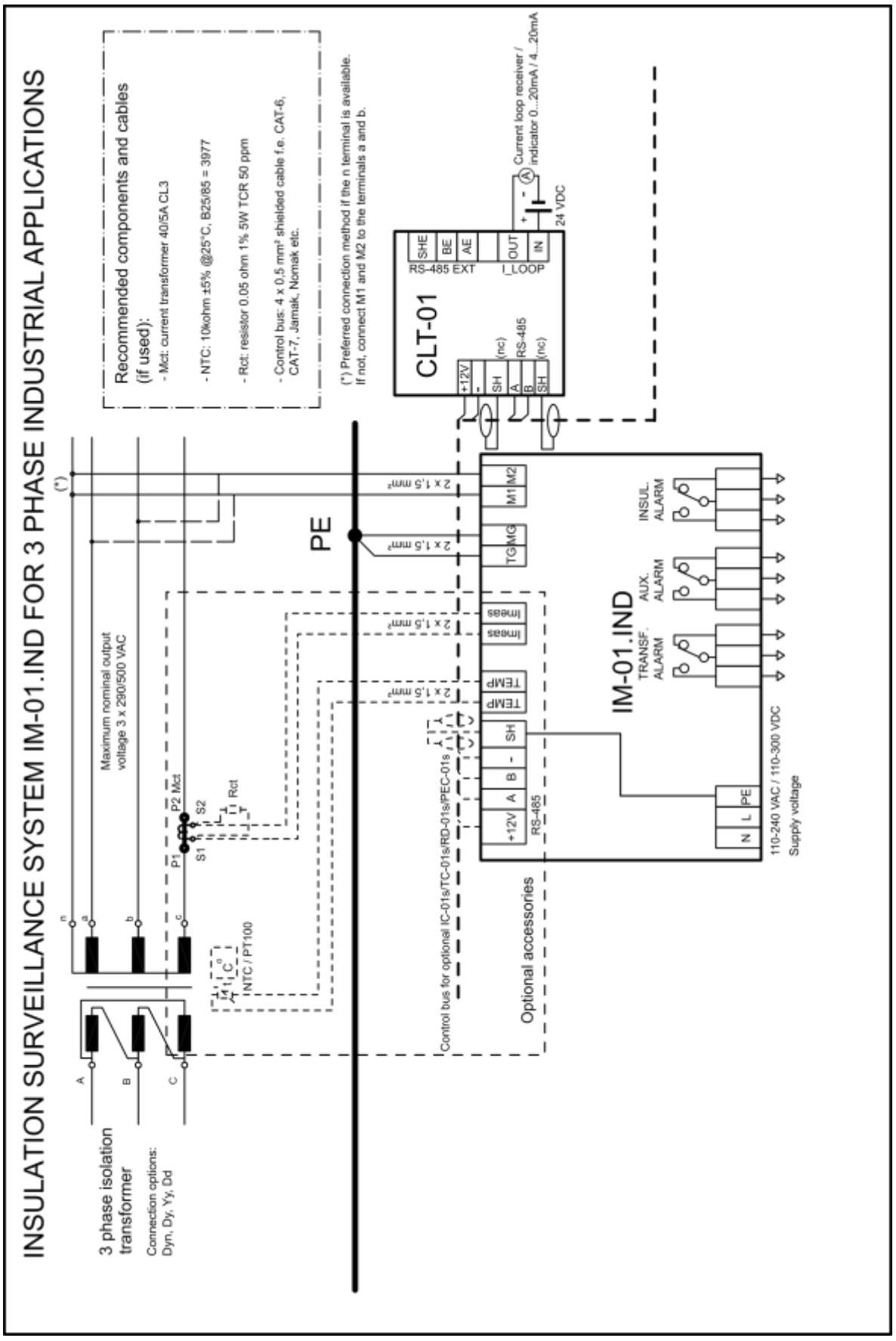


Figure 3. System connection of a 3 phase system (IM-01.IND).

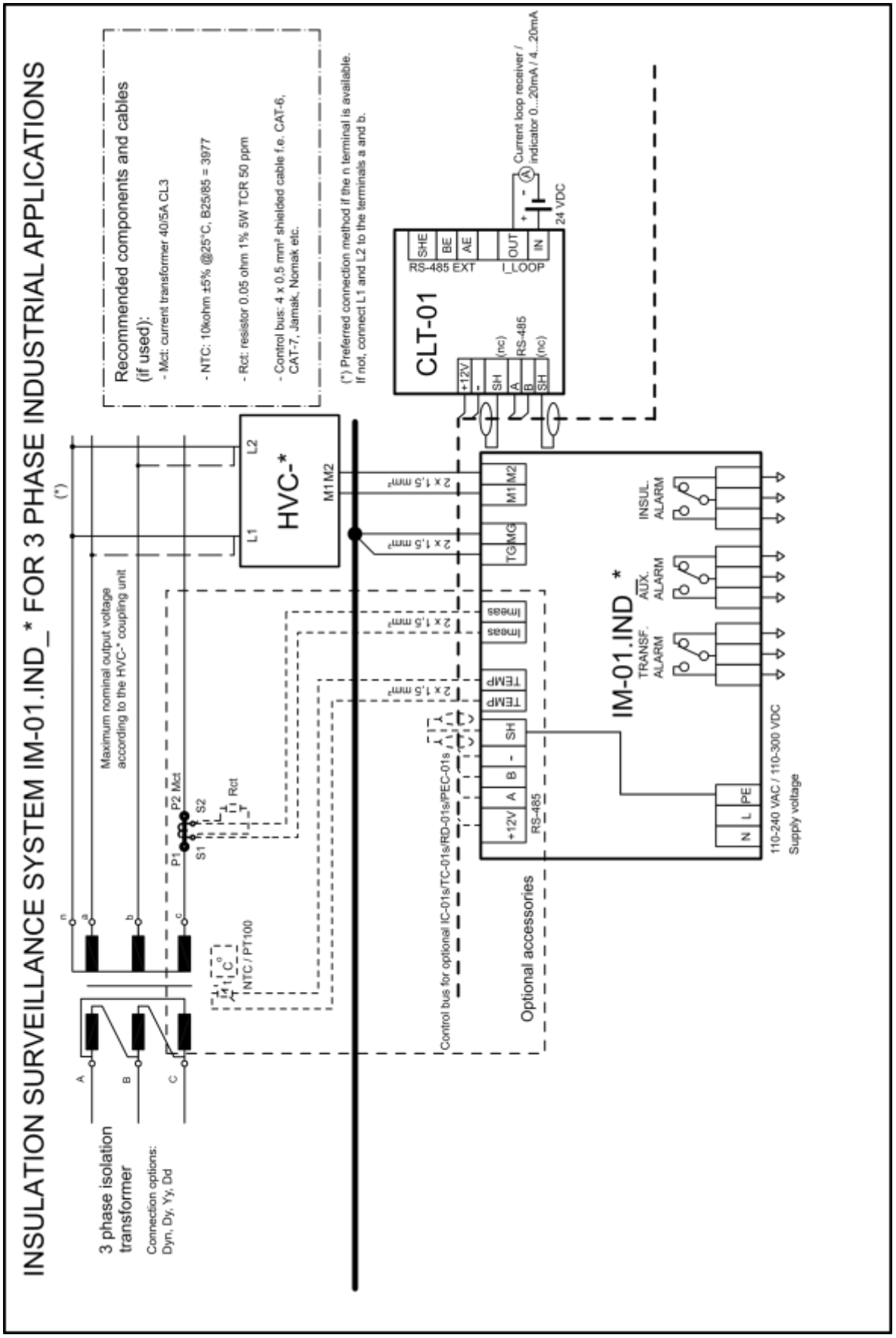


Figure 4. System connection of a 3 phase system (IM-01.IND_* + HVC-*).

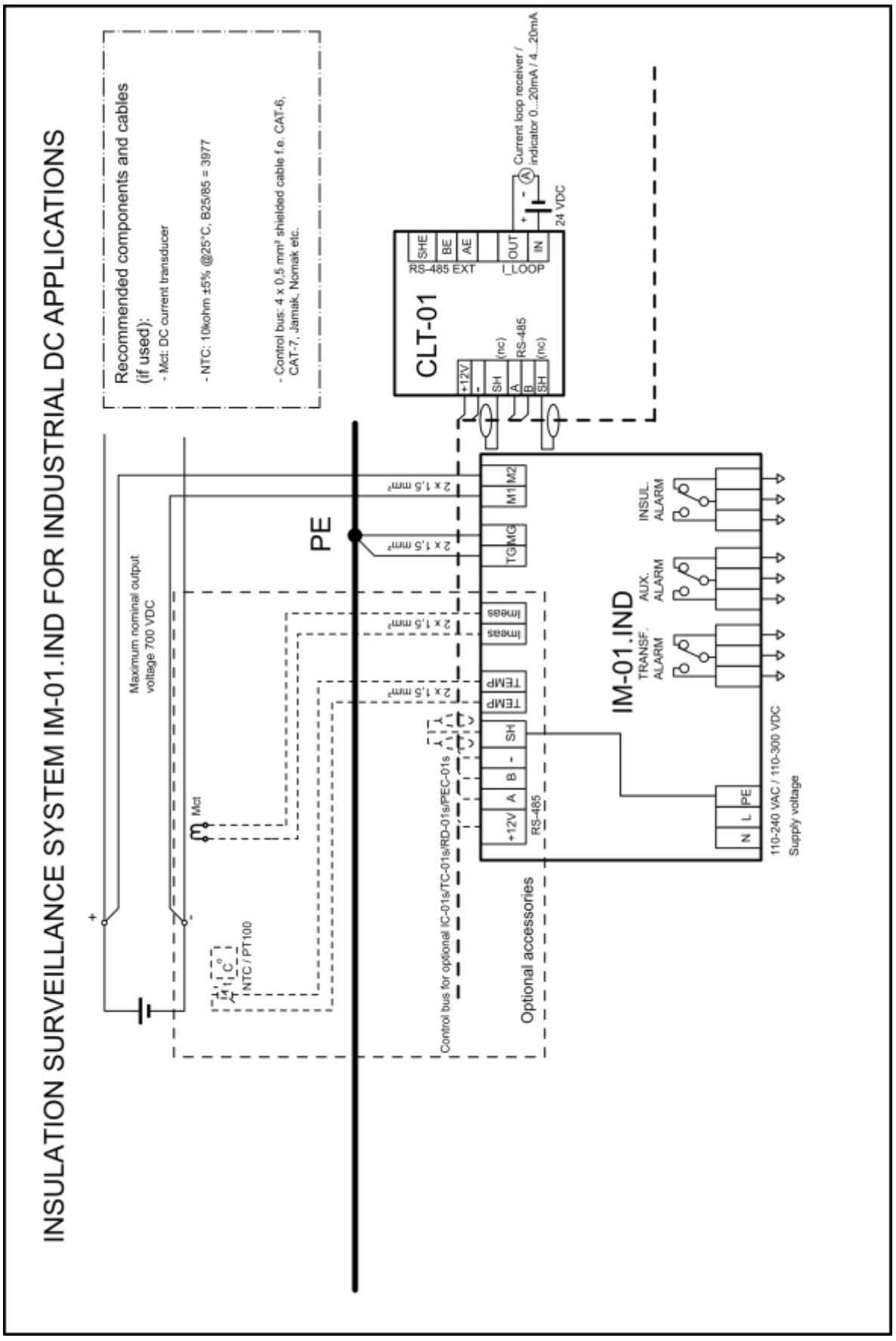


Figure 5. System connection of a DC system (IM-01.IND).

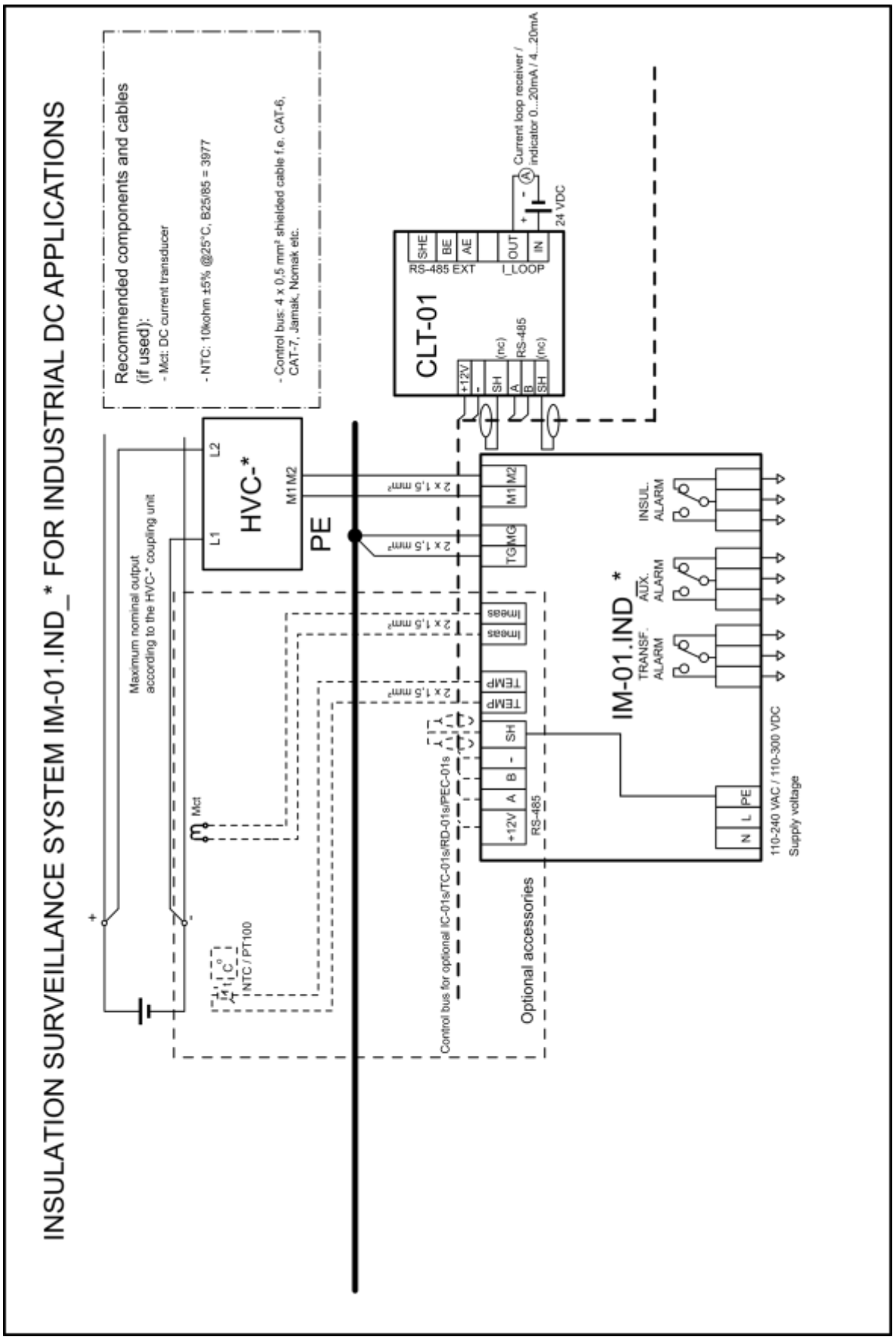


Figure 6. System connection of a DC system (IM-01.IND_* + HVC-*).

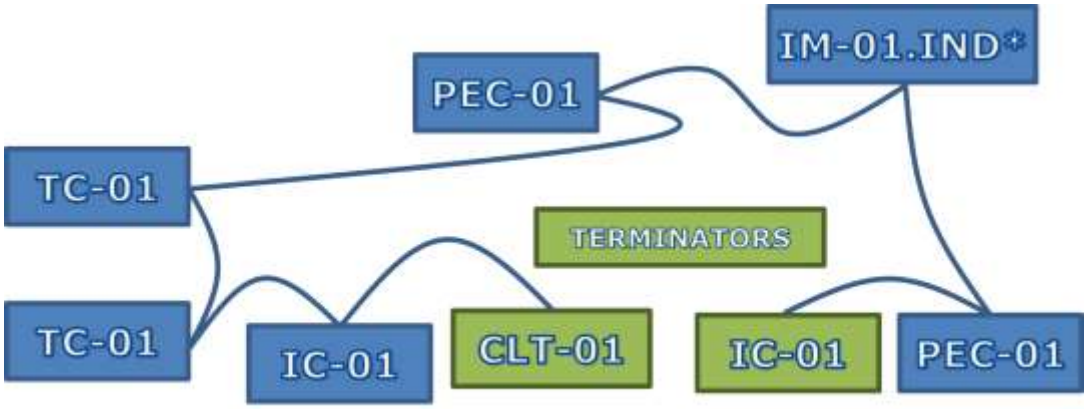
RS-485 NETWORK CONNECTION

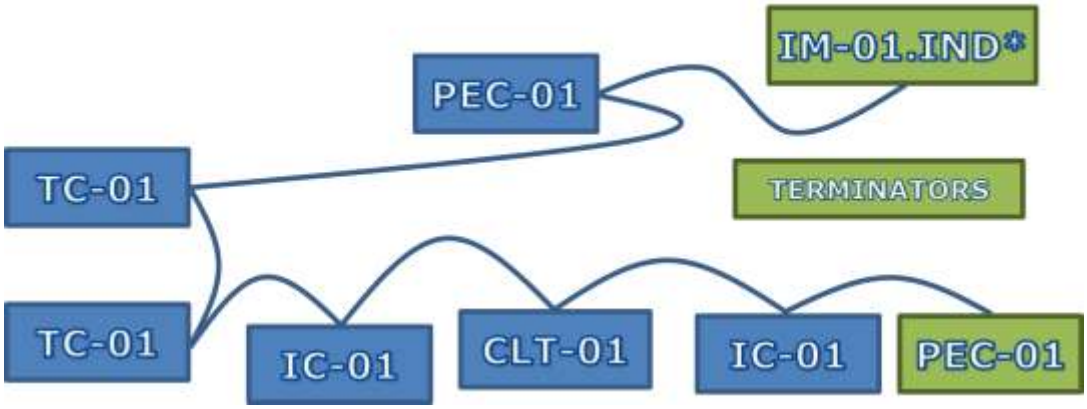
The IM-01.IND* unit is installed in the switchboard and connected to the mains current. The CLT-01 unit to be installed in the switchboard receives the +12V supply electricity from the IM-01.IND* unit. The devices for medical locations, which are available as accessories, are discussed in more detail in the Superintend IMD MED – Installation and User Manual.

All units are connected to each other via the RS-485 network. The network must form an uninterrupted chain, which is open at both ends, and contains no branches. Thus, a maximum of two RS-485 cables are installed in any unit; in other words, an incoming and an outgoing cable. A terminator is installed in the first and the last unit by means of a jumper or wire jumper equipped with the unit. In all other units, the resistance must be left open. The network units can be physically in any order. If the network is long (>200 m), it is recommended that the IM-01.IND* unit is physically located in the middle of the chain.

The cable shield is also connected to each unit and connected to protective earth in the IM-01.IND* unit. In other devices, the shields are floating and the connector only acts as a joining connector between two shields.

The RS-485 connection is made using a 2*2 twisted paired cable equipped with a shield (e.g. AWG22=0.32 mm²=106 Ω/km). In that case, the maximum length of the chain from the IM-01.IND* unit to the last remote unit is 500 m. If a thinner cable is used, the allowed length shortens inversely proportionately to the cable resistance. The cable shield is connected to the SH terminal of each unit. The shield is connected to the network protective earth in the IM-01.IND* unit. In other devices, the shields are floating and the connector only functions as a joining connector of two shields. The twisted pairs are connected so that the A–B signals are in one pair and the +12V–earth are in another pair.





Examples of network connection In the upper Figure, the IM-01.IND* unit is in the middle of the chain, and in the lower Figure, it is at the end of the chain. Terminators are installed in the green units.

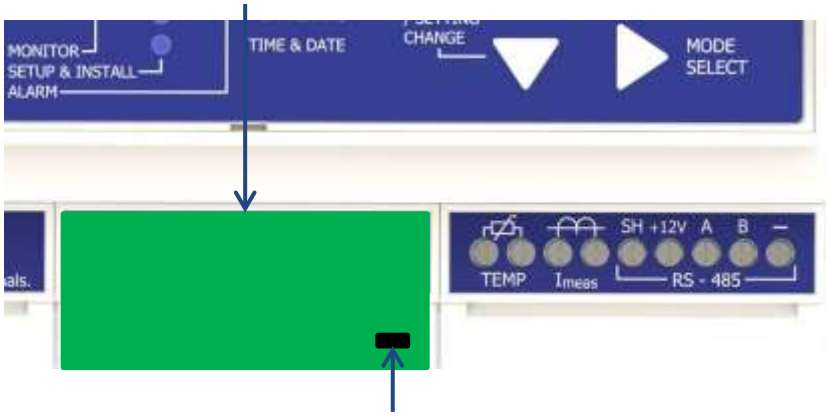
Checklist for the installation of the bus:

- No more than two RS-485 cables may be installed in any unit. Otherwise, the bus does not form an uninterrupted chain but has branches.
- The shields of the cables are connected to the SH terminal of each unit.
- The twisted pairs are connected so that the A–B signals are in one pair and the +12V–GNDs are in another pair.
- A terminator is installed at both ends of the bus, in other words, to those units that only have one of each wire. The CLT-01 and IM-01.IND* units are equipped with a jumper for this purpose.
- There is always a terminator in only two devices per chain.

HW SETTINGS OF THE IM-01.IND* UNIT

Setting a device address is not necessary in the IM-01.IND* unit. If the IM-01.IND* unit is at the end of the bus, a terminator must be connected. The terminator jumper is located under the centre cover in the location indicated in the Figure. Open the cover by using a small screwdriver between the cover and the case to pry the cover loose.

To open the cover: pry the cover loose with a screwdriver here and remove the cover

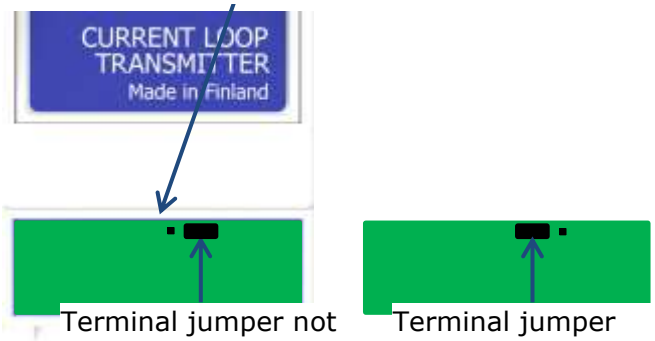


Terminator jumper

HW SETTINGS OF THE CLT-01 UNIT

Setting a device address is not necessary in the CLT-01 unit. If the CLT-01 unit is at the end of the bus, a terminator must be connected by changing the location of the terminator jumper to the left and middle pins. The terminal jumper is under the connector cover, above the terminal strip, as shown in the Figure. Open the cover by using a small screwdriver between the cover and the case to pry the cover loose.

To open the cover: pry the cover loose with a screwdriver here and remove the cover



Terminal jumper not connected

Terminal jumper connected

SYSTEM CONFIGURATION

The most sensible configuration order for the settings is as follows:

- If a microSD memory card has been connected to the device, enable it (SETUP→Mem Card: in use) and restart the device.
- Set the correct time. (SETUP→Time)
- Set the electrical network, load current measurement and isolation transformer parameters (SETUP→Filter, Max Cap, TranSize, Nom.Cur)
- Set the alarm parameters (SETUP→InsLimit, PrInsLim, Temp Lim, TsensTyp (Pt Calib, if needed), LoadLim, PEalarm%, AlarmDly). Remember to disable TempLim if temperature measurement has not been connected and to disable LoadLim if the load current measurement has not been connected.
- Set the AUX. ALARM mask (SETUP→AUXalarm), which defines the faults that cause the AUX. ALARM relay to trigger.
- If the system has devices for medical locations, which are available as accessories, configure them according to the Superintend IMD MED – Installation and User Manual.
- When needed, set the range for CLT-01 unit's current loop output (SETUP→LoopCurr)
- When needed, set the TCP/IP parameters (SETUP→IP Settings)
- If needed, enable the automatic alarm acknowledgement (SETUP→Auto ACK)

A more detailed description of the configuration is provided in the Manual section "SETUP menu".

USE

GENERAL

The Superintend IMD IND* consists of several separate modules integrating into an insulation monitoring system through an electronic communication bus. The system includes the following components:

- The **IM-01.IND* unit** is the central unit of the system. It performs most of the measurements independently and controls the operations of the other units and the alarm relays. The IM-01.IND* unit is installed in the switchboard.
- The **HVC-6_9AC, HVC-16AC, HVC-40AC and HVC-72AC units** are high voltage coupling devices. They are needed between the IM-01.IND_* and the network to be monitored. The HVC-* unit is installed in the switchboard.
- The **CLT-01 unit** is a current loop transmitter for insulation resistance with a standard 0…20 / 4…20 mA current message. It is installed in the switchboard.
- The **PEC-01, TC-01, IC-01, RD-01, RD-12, FLI-01 and CTM-01 units** are available as accessories. They have originally been designed for medical locations. These devices are discussed in more detail in the Superintend IMD MED – Installation and User Manual.

IM-01.IND* UNIT

The IM-01.IND* unit is the central unit of the system and the host of the RS-485 bus connected to it. The IM-01.IND* contains the user interface of the entire system, and it controls all CLT-01 and possible other units connected to it. The error notifications are displayed on the screen of the IM-01.IND*, and the fault information can be forwarded to another user-defined system through alarm relays. All alarm parameters are set through the user interface of the IM-01.IND* system.

In addition, the IM-01.IND* unit maintains three separate log files on the microSD memory card if the memory card is inserted in the card slot and enabled in the Setup menu. They are Excel-compatible text files, which can be transferred to any computer for more detailed analysis. For more detailed information, see section “Log files”. If the memory card function is not enabled, only the most recent information of each log entry is stored in the device memory. The information that is not stored on the memory card will not be preserved in the memory if the device loses operating voltage.

Measurement values can be monitored and settings can be changed using the Modbus/TCP protocol via the IM-01.IND* unit’s Ethernet connection. For this purpose, the device RJ45 must be connected to the local area network and the TCP/IP parameters must have been configured in the Setup menu.

The IM-01.IND* unit independently measures the insulation resistance and capacitance of the IT network to be monitored, in relation to protective earth. The measurement is performed by feeding two separate low-frequency alternating voltages between the network and the PE conductor. These generate a low current that travels through the insulation resistance and capacitance to be measured. The insulation resistance and capacitance are calculated by measuring the current amplitude and phase. In addition, the device measures the secondary current and temperature of the isolation transformer if the current transformer and the NTC/PT100 sensor have been connected to the measurement couplers reserved for them and have been enabled in the Setup menu.

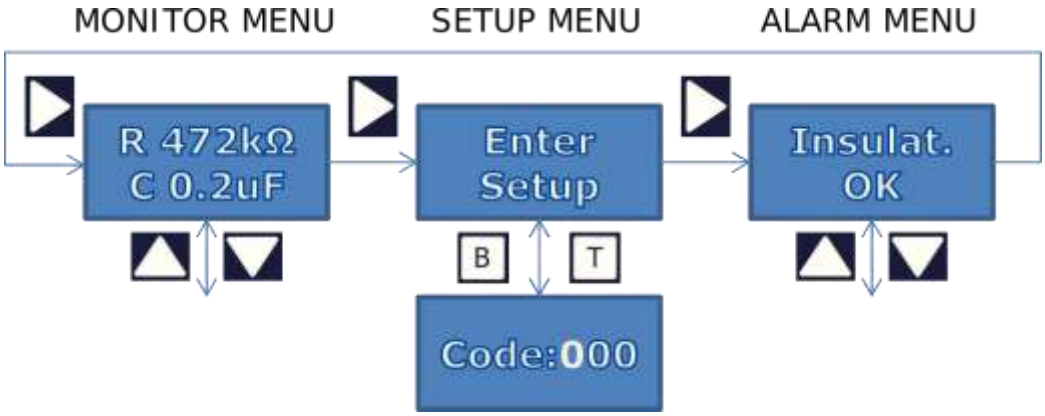
The system functioning can be tested by pressing the T button of the IM-01.IND* unit when the IM-01.IND* unit displays the Monitor menu. The device will test the functioning of the internal measurement circuit. More detailed information on this is provided in the description of the Monitor menu.

MENU STRUCTURE

The menus of the IM-01.IND* unit have three main levels: MONITOR, SETUP and ALARM. The ▶ button is used to navigate between the main levels when the topmost parameter of each menu is highlighted on the screen. The first item of the menu is accessed by pressing the B button at any menu level item. The LED lights, in addition to the LCD display, indicate the selection in the menu in question.

The menus can be browsed up and down with the ▲ and ▼ buttons. Access to the Setup menu is password-protected.

The Monitor menu is the default of the IM-01.IND* unit, to which the system returns in 20 minutes after the last time a button was pressed, or after a sufficient number of presses on the B button in any screen mode.



- The Monitor menu mainly has one level. Nearly all information to be displayed can be viewed by browsing the menu with the ▼ and ▲ buttons.
- The Alarm menu has two levels. The first level displays the reason for the alarm and the second level shows the alarm start time, the measured parameters, and alarm limits.
- The Setup menu mainly has two levels. The first level displays the valid parameter, which can be changed on the second level.

Hereafter, the screen modes are called as follows:

- The **main level** of the menu is the topmost menu level (MONITOR, SETUP and ALARM)
- The **menu level** is the sub-level of the aforementioned, and it is browsed using the ▼ and ▲ buttons
- The **screen mode** is the mode following the menu level, and it displays the value of the parameter/time; also displays a stopped AutoScroll mode. The screen mode can be accessed from the menu level by pressing the T button.
- The **AutoScroll** mode is in use in the Setup menu items where there are several parameters to display. In that case, the displayed parameters change every few seconds. You can stop the display with the ▼ and ▲ buttons and return from the screen mode to the AutoScroll mode with the B button. Use the T button to go to the edit mode or screen mode.
- The **Edit mode** is a Setup menu mode where the parameters to be displayed can be changed. In the Edit mode, the parameter to be changed flashes and it can be changed with the ▼ and ▲ buttons. If there are several parameters to be changed in the same screen, you can move to the next one by pressing the ▶ button. After the editing is completed, press the T button, after which the values given must be approved by selecting "Yes" in the Confirm menu and pressing T. By selecting "No" or pressing the B button in the conformation stage you return to the previous mode without saving the changes.

As a rule, the buttons function as follows:

Moving to the next parameter on the menu level and screen level. Reduces the parameter on the edit level. In the AutoScroll mode, stops the display.

Moving to the previous parameter on the menu level and screen level. Increases the parameter on the edit level. In the AutoScroll mode, stops the display.

Moving to the next menu on the main level. Moves to the next editable parameter on the edit level.

A general "approval button". On the menu level, takes you to the AutoScroll or edit mode. On the edit level, approves the changes made. Pressing the button in the first three items of the Monitor menu and approving the start of the test begins the system test.

A general "reject button". Returns to the previous mode from all modes. Pressing the B button an appropriate number of times takes you to the default mode of the main menu (insulation resistance/capacitance) from any mode.

MONITOR MENU

The Monitor menu is the default menu of the IM-01.IND* unit during use. All modes of the menu always return to the topmost item on the Monitor menu after 20 minutes from the last press of a button.

The following measured parameters are available in the Monitor menu screen:

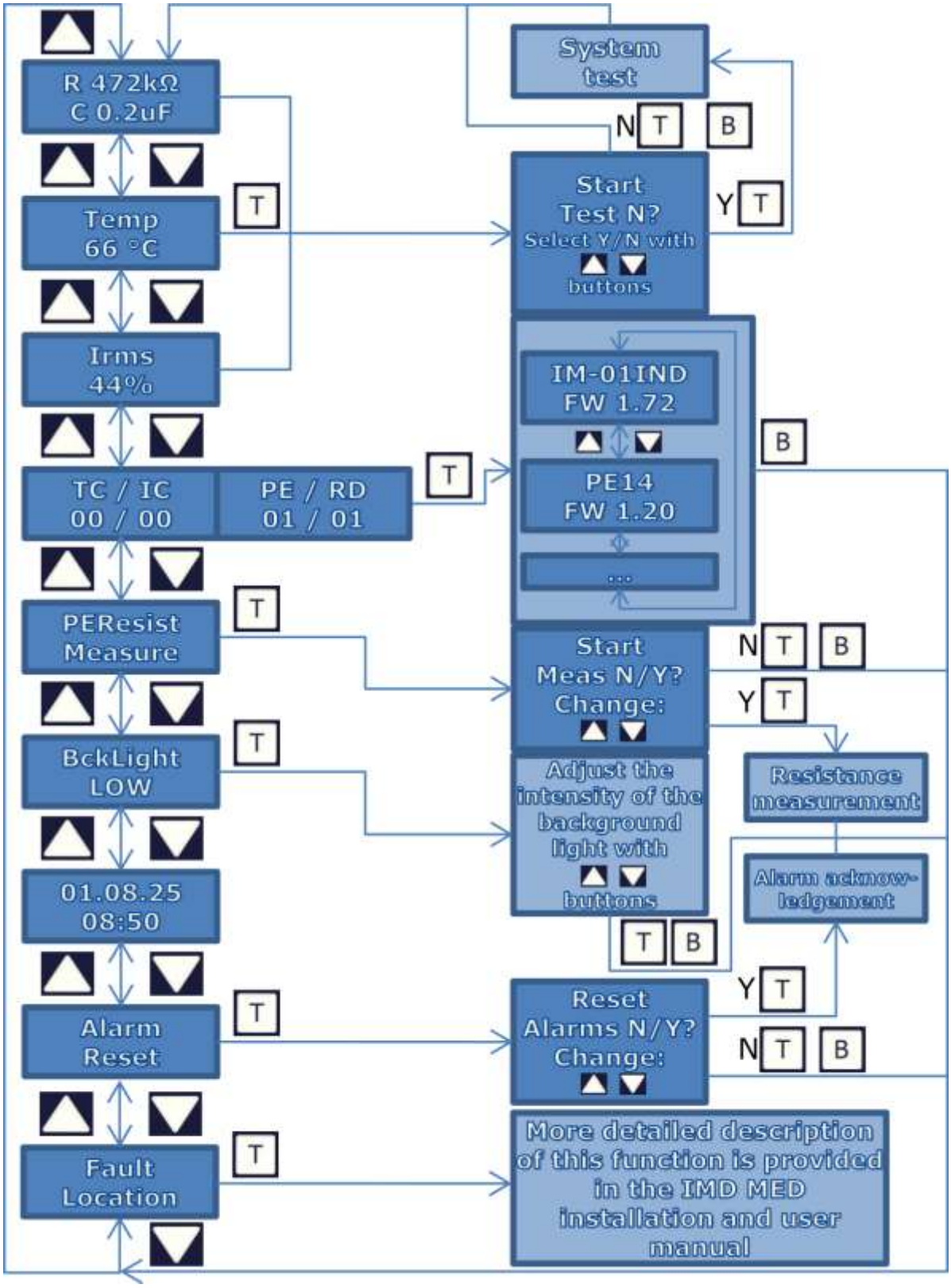
- IT network's insulation resistance and capacitance in relation to protective earth. Displayed in kOhms and micro farads.
- Temperature of the isolation transformer in degrees.
- Secondary current of the isolation transformer. Displayed in a percentage of the transformer's nominal current.
- The number of the TC-01, IC-01, RD-01 and PEC-01 units configured in the system and, if needed, the software versions of the units and IM-01.IND*.
- The manual resistance measurement of the PEC-01 units can be started.

- The intensity of the background light can be adjusted to four different levels. (LOW / MED-LOW / MED-HIGH / HIGH)
- Time and date
- All fixed alarms can be acknowledged on one go.
- Fault location process can be started and the results of it can be reviewed. If there is not a FLI-01 unit connected, the menu item text is Injector No Conn. For more detailed information, see Superintend IMD MED – Installation and User Manual.

The default display is insulation resistance and capacitance. Other parameters and functions can be viewed by using the ▽ and △ buttons.

The system test is started from the Monitor menu by pressing T and then selecting Y in the Start test menu and pressing T. This starts the test of the internal measurement circuit of the IM-01.IND* unit. If the test is completed successfully, the screen displays momentarily the text Test OK; otherwise the text shown in Test FAILED, and an insulation fault alarm is given to indicate that the insulation resistance can no longer be measured.

The Monitor menu functions as follows:

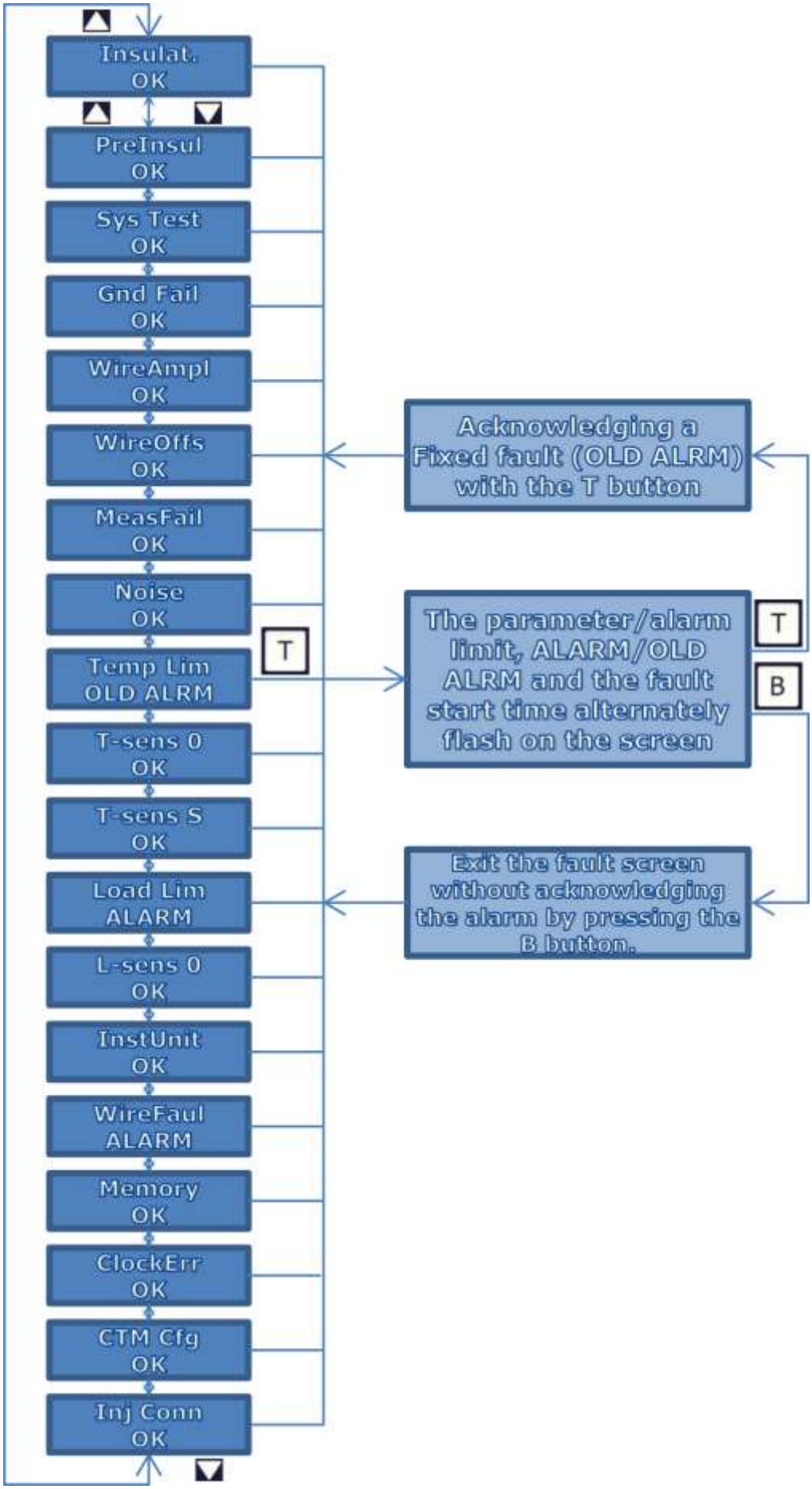


ALARM MENU

The alarm menu has two levels. The menu level shows if the alarm is active (ALARM), inactive but not acknowledged (OLD ALRM) or if the situation is normal (OK). The screen mode shows the value, alarm limit and time of the parameter that caused the alarm. Acknowledging the fault will remove the fault from the screen, but an entry of it remains in the event log of the memory card.

An alarm always indicates that the fault in question is still active. An active fault cannot be acknowledged until the issue that caused it has been fixed. The fixed fault is acknowledged when its time is checked and the T button is pressed. The B button takes you back to the menu level without acknowledging the fault.

All fixed faults can also be acknowledged on one go by means of the Alarm reset function in the Monitor menu.



The most important alarms are indicated by a red LED light, which BLINKS in fault situations and is on STEADILY if the fault has been fixed but not acknowledged (the OLD ALRM mode).

When navigating the menu, the warning LED lights indicate which menu item is in use.

The insulation resistance fault activates IMMEDIATELY when the measured parameter drops below the alarm limit. The delay set for the alarms applies to all faults except the insulation resistance measurement. The value to be measured must consistently be equal to the time that is above the alarm limit before an alarm is given. If the measured quantity drops below the alarm limit during the delay, time counting restarts.

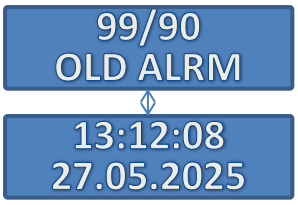
In addition, all alarms have a five-percent hysteresis. In other words, an alarm becomes active when the set limit is reached, but it is deactivated only when the measured value deviates by 5% in a safe direction from the limit given.

The screen mode of each parameter alternately displays the following:

- On the top row, the value / fault limit of the parameter that caused the fault, and on the bottom row, the current status: OK, ALARM or OLD ALRM
- Fault start time and date

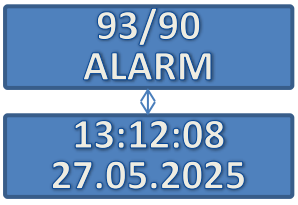
If the fault has been deactivated and becomes active again, the start time of the active fault is displayed. In items InstUnit, WireAmpl and WireOffs, there may be several faults, which are displayed one after the other. In the OK mode, nothing is displayed in the screen mode.

The screen always displays the smallest value (insulation resistance) or largest (all other measurements) value / fault limit measured during the fault first, followed by the fault start time.



The temperature alarm has been deactivated but not acknowledged.

The largest value measured during the fault, the alarm limit's set value and the fault start time are displayed.



The temperature alarm is active.

The highest temperature measured during the fault is 93 degrees and the alarm limit is 90 degrees.

The insulation fault alarm has been deactivated but not acknowledged.

The smallest value measured during the fault, the alarm limit's set value and the fault start time are displayed.

The **Insulat.** and **PreInsul** alarms are active if the measured insulation resistance is smaller than the alarm or pre-alarm limit.

The **Sys Test** alarm is active if the manual system test fails. In that case, the insulation resistance can not be measured either, so an insulation resistance alarm is also given.

The **GND Fail** alarm is active if the TG or MG wire of the IM-01.IND* unit is disconnected. In that case, the insulation resistance can not be measured either, so an insulation resistance alarm is also given.

The **WireAmpl** or **WireOffs** alarm is activated if the M1 or M2 wire of the IM-01.IND unit is disconnected or the insulation resistance is short-circuited. In that case, the insulation resistance can not be measured either, so an insulation resistance alarm is also given.

The **MeasFail** alarm is active if the system is unable to measure the insulation resistance. In that situation, an insulation resistance alarm is also always given. Reason for the fault may be, for example, capacitance that is too high.

The **Noise** alarm is active if network disturbances are too extensive for the selected Filter setting.

The **Temp Lim** alarm is active if the temperature of the isolation transformer is too high.

The **T-sens 0** alarm is active if one of the measurement wires of the NTC/PT100 sensor measuring the temperature of the isolation transformer has been disconnected from the IM-01.IND* unit.

The **T-sens S** alarm is active if the wires of the NTC/PT100 sensor measuring the temperature of the isolation transformer are short-circuited.

The **Load Lim** alarm is active if the secondary current of the isolation transformer is too high.

The **L-sens 0** alarm is active if one of the measurement wires of the current transformer measuring the output current of the isolation transformer has been disconnected from the IM-01.IND* unit.

InstUnit and **WireFaul**: see the Superintend IMD MED – Installation and User Manual.

The **Memory** alarm is active if writing on the memory card fails or the card has been removed. These alarms are activated only if the memory card has been enabled in the SETUP menu.

The **ClockErr** alarm is active if the operating voltage of the real time clock circuit has been too low. The fault is caused by a depleted battery. The fault can only be acknowledged once the time has been set. The device battery cannot be changed by the

user. Send the device to maintenance if the battery is empty. Under normal conditions, the useful life of the battery is more than 10 years.

CTM Cfg and **Inj Conn**: see the Superintend IMD MED – Installation and User Manual.

SETUP MENU

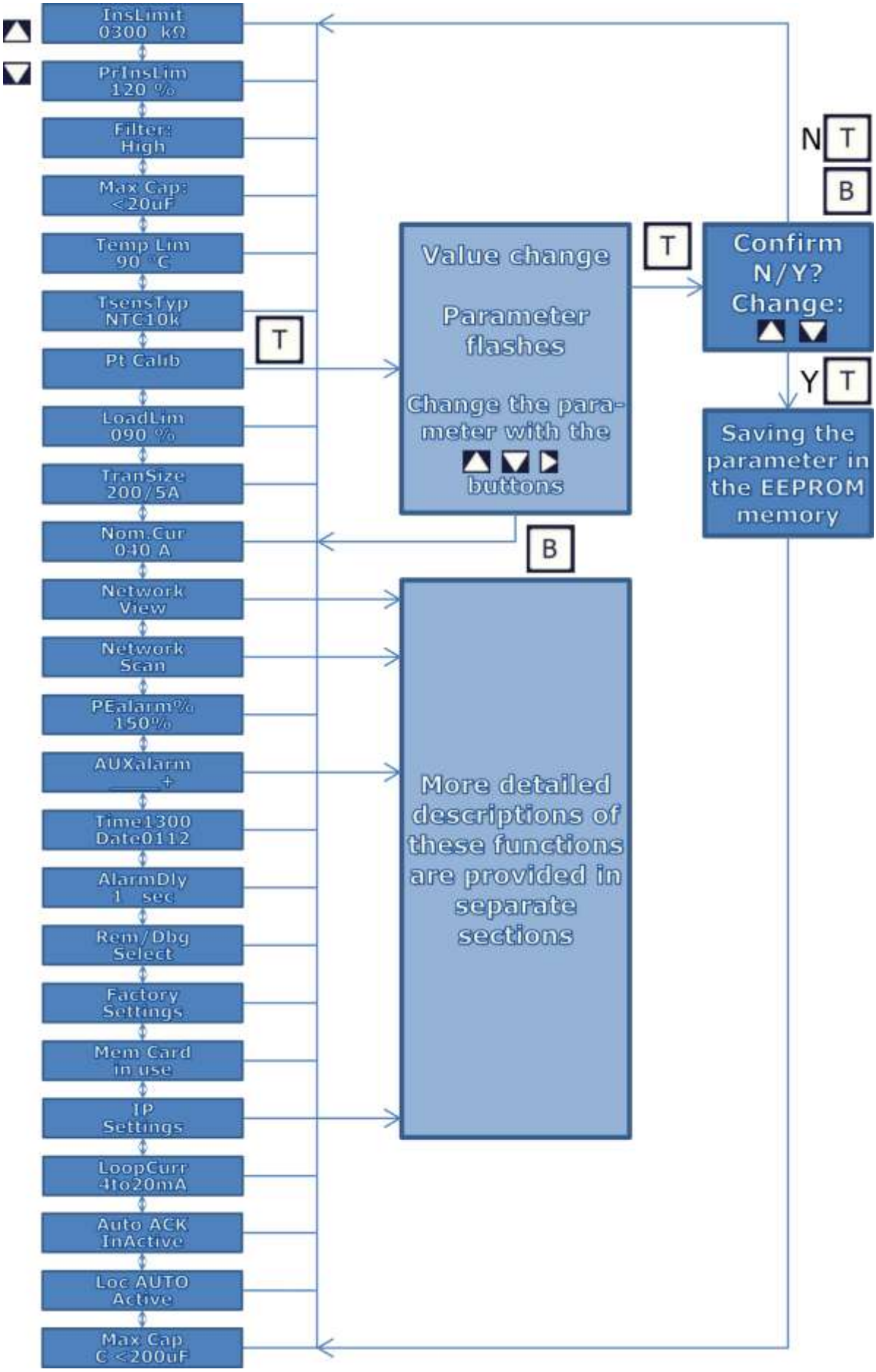
The Setup menu can be used to change system settings, alarm limits, time etc.

The Setup menu is password-protected and accessed as follows:

- Go to the Setup menu in the main menu. The screen displays "Enter Setup". Press T.
- Change the blinking number with the ▼ and ▲ buttons and press the ▶ button to move to the next digit. Enter the three digits and press T. After this, you can navigate the menu with the ▼ and ▲ buttons.
- The B button takes you to the initial mode.

The default password is "123". The password is saved in the setup log of the microSD card and can be changed by editing the setup log file in a text editor. The password change will become effective at the next start-up. If the password could not be read from the card during start-up (the card was removed or defective), the default password 123 can be used.

All information on the other settings of the device alarm limits and the system are saved in the internal EEPROM memory of the IM-01.IND* unit. The microSD card's setup log always includes a time-stamped copy of the EEPROM values.



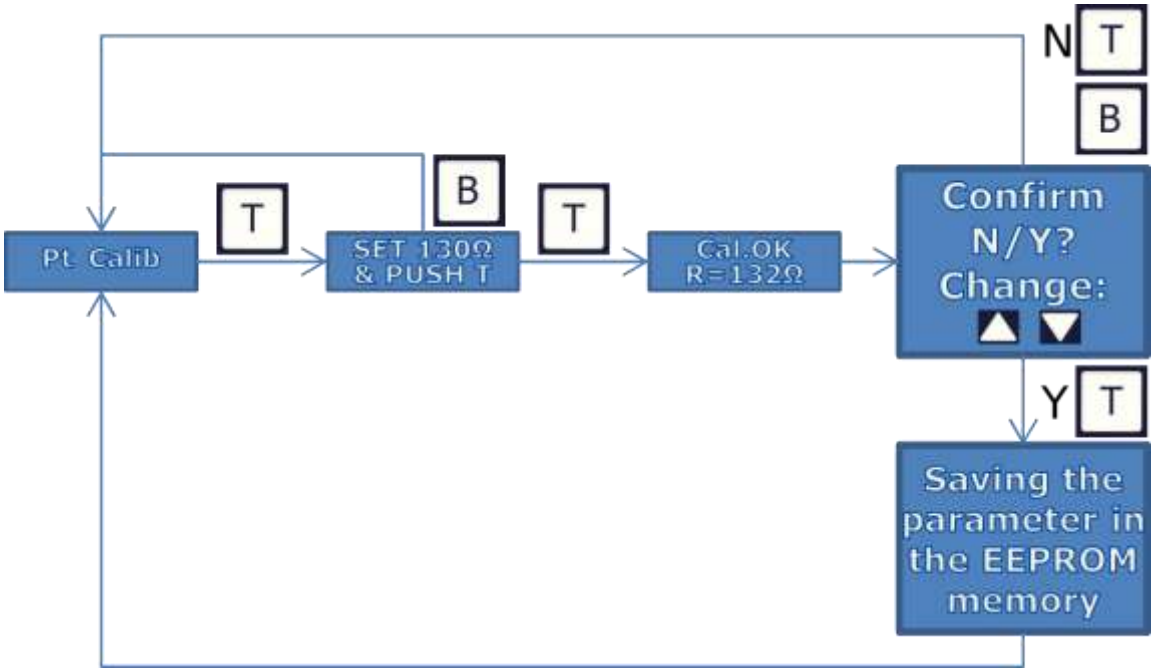
The following parameters can be changed in the Setup menu:

- **INSULATION LIMIT**: Alarm limit of the insulation resistance. If the measured value is lower than the alarm limit, an alarm is given. The setup range is 10…100 kΩ with 10 kΩ intervals and 100 kΩ…1,000 kΩ with 50 kΩ intervals.
- **PRE INSULATION LIMIT:** The pre-insulation limit of the insulation resistance. Given as a percentage of the insulation limit. Activates the AUX. ALARM relay, unless it is removed from the AUX alarm mask. The setup range is 100…200%, at 10% intervals.
- **Filter:** High, Medium or Low. Must be set according to the network frequency:

  20 – 400 Hz High

  10 – 20 Hz Medium

  1 – 10 Hz Low
- **Max Cap:** <20uF or >20uF. Must be set according to the maximum capacitance existing at the network to be monitored. This parameter affects how the insulation level measurement functions during a short-circuit condition.
- **TEMPERATURE LIMIT:** The alarm limit of the transformer temperature. Can be set between 30…140 °C or switched OFF if temperature measurement is not used.
- **TEMPERATURE SENSOR TYPE:** The type of the temperature sensor used (NTC or PT100).
- **PT100 CALIBRATION:** This setting is only used when PT100 is selected as the temperature sensor. It can compensate for the error caused by long measurement wires (the maximum loop resistance is 20 Ω) in the temperature value. A 130 Ω resistor is connected to the end of the measurement wires in the place of the PT100 sensor, after which calibration is performed:



If the resistance measured in calibration is too low or too high, the message displayed is Failed, instead of Cal.OK. In that situation, check the connection.

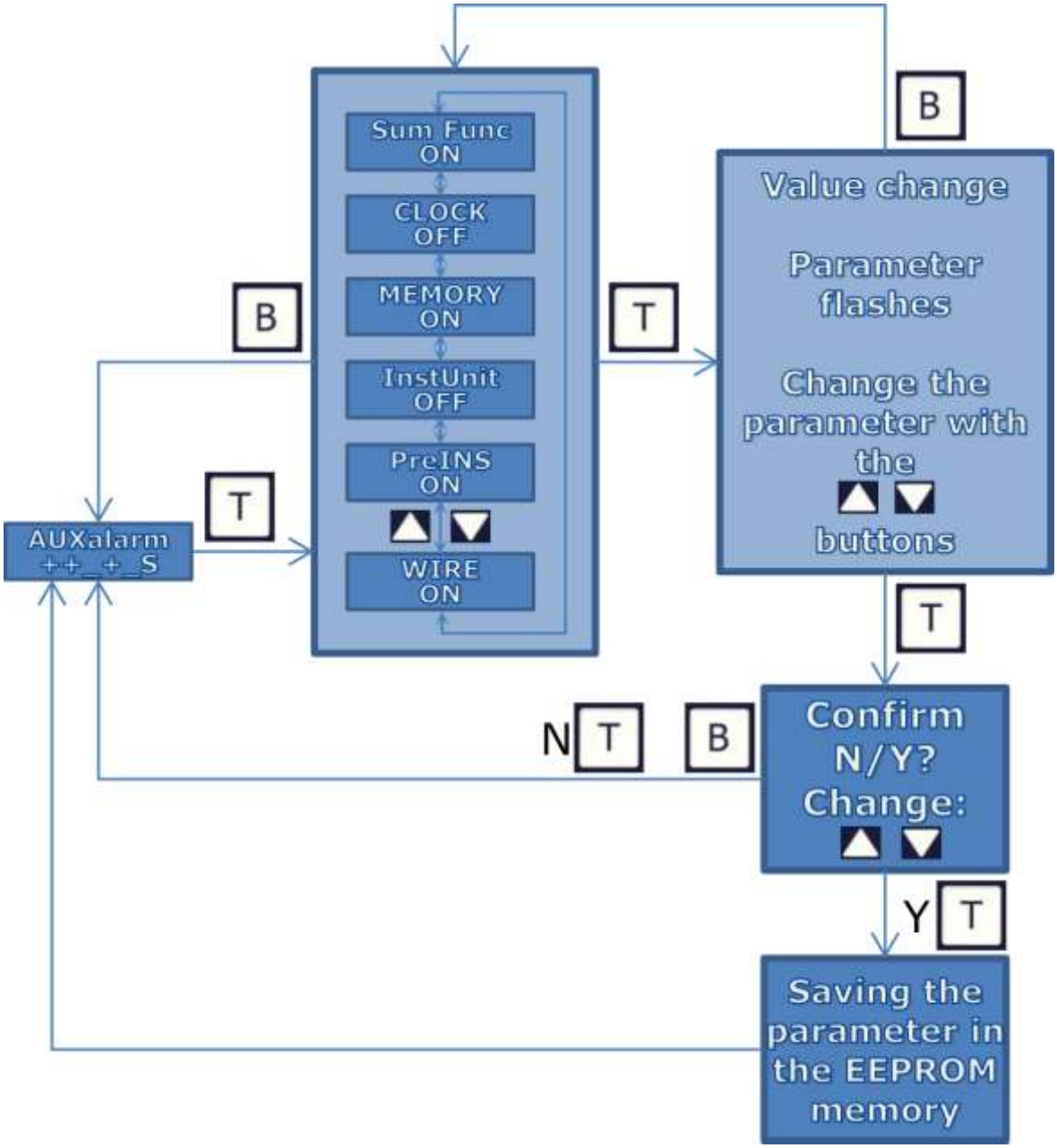
- **LOAD LIMIT:** The current limit of the transformer as a percentage of the transformer's nominal current. Can be set between 50…140% or switched OFF if load current measurement is not used.
- **TRAN SIZE:** The nominal value of the current transformer. The primary current that provides a current transformer output current of 5A. The setup range is 10–100 A.
- **NOMINAL CURRENT:** The nominal current of the isolation transformer at full power. SETUP RANGE 1–100 A.
- **NETWORK VIEW, NETWORK SCAN** and **PE ALARM %:** See the Superintend IMD MED – Installation and User Manual.
- **AUX ALARM MASK:** Defines, which errors affect the functioning of the AUX.ALARM relay. The alternatives are: An erroneous number of devices, a microSD card fault, insulation fault pre-alarm, PE wire fault, a wrong time, insulation level and transformer sum alarm. All parameters are switched on/off one by one. A more detailed description is provided below.
- **TIME:** The time of the realtime clock and date.
- **ALARM DELAY:** The alarm delay in seconds, the setup range of 1…30 s. Not applicable to the insulation resistance measurement.
- **DEBUG MODE:** Debug/normal mode. In the Debug mode, the IM-01.IND* unit becomes a slave and stops scanning the bus. Using this is permitted only during maintenance under supervision. The device exits the Debug mode automatically in 10 minutes after the last command has been received from the PC. During debugging, ALL remote units switch to the System Fail mode.
- **FACTORY SETTINGS:** Returns all settings to their original values and removes all RS-485 bus devices from the database.
- **MEM CARD:** Enables or disables the memory card. The factory setting is "not used", so when the memory card is inserted, it must be separately enabled here. The setting becomes effective when the device is restarted.
- **IP SETTINGS:** The device TCP/IP settings when using the Modbus/TCP remote management. A more detailed description is provided in the IP settings section.
- **LOOP CURRENT:** This setting determines the CLT-01 output current range of any current loop transmitters connected to the RS-485 bus. The options are 0…20 mA and 4…20 mA.
- **AUTOMATIC ALARM ACKNOWLEDGEMENT:** This setting determines whether all the alarms shall be acknowledged automatically as soon as they are deactivated.
- **AUTOMATIC LOCATION:** See the Superintend IMD MED – Installation and User Manual.
- **Max Cap:** C <200uF or C >200uF. Must be set according to the maximum capacitance existing at the network to be monitored. This parameter affects how the insulation level measurement signal is optimized in terms of measurement accuracy and response time.

AUX. ALARM MASK

The alarm mask is used to select the alarms that cause the AUX. ALARM relay to activate. An alarm is given if any of the selected (ON) conditions is met. The options are as follows:

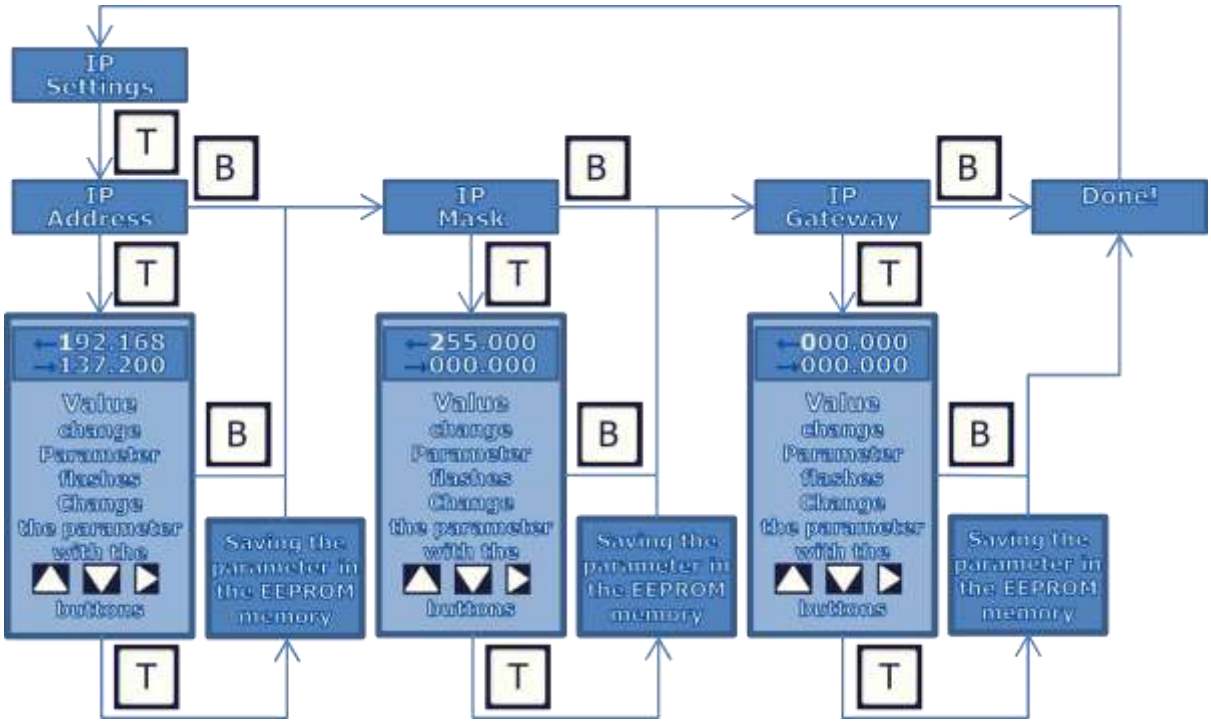
- **WIRE FAULT**: See the Superintend IMD MED – Installation and User Manual.
- **PREINSULATION ALARM**: The insulation resistance is lower than the insulation resistance alarm limit provided, plus the percentage of the PreInsulation Alarm. For example, if the Insulation Limit is 300 kΩ and the PreInsulation Limit is 150%, the AUX alarm is given at 450 kΩ.
- **INSTALLED UNITS**: See the Superintend IMD MED – Installation and User Manual.
- **MEMORY**: The microSD memory card is defective, full or missing.
- **CLOCK**: The time is incorrect. An alarm is given if the operating voltage of the circuit maintaining the real time clock has dropped too low. In that case, the time is incorrect. This alarm is a sign of a depleted battery, and the battery needs to be changed.
- **SUM FUNCTION**: Insulation and transformer sum alarm. Causes activation of AUX.ALARM relay if there is an insulation level, transformer overload or transformer over temperature alarm.

The screen level of the menu displays the status ON or OFF for each alarm. The menu level provides an illustrative presentation of the settings: Parameters marked with "+" (in the case of a sum alarm "S") cause an alarm. The parameter order is as shown above. The setting is changed on the edit level by setting the ON/OFF mode with the ▼ and ▲ buttons and approving the changes with the T button.



IP SETTINGS

When enabling the Modbus/TCP remote control of the IM-01.IND* device, the correct TCP/IP settings must be configured in the IP Settings menu item. The IP address, subnet mask and gateway are set in accordance with the following chart:



The IP address, subnet mask and gateway consist of four series of digits separated by dots, which are called octets (e.g. 192.168.137.200). The value range of each octet is 000…255. Whenever you move to the next octet with the ▶ button, the device verifies that the value of the previous octet is not more than 255. If this is not the case, the cursor returns to the beginning of the erroneous octet. Also, when saving the parameter with the T button, the device verifies the validity of all octets. If any octet is erroneous, the display returns to the edit mode of the erroneous octet.

Contact your network administrator for the correct TCP/IP settings parameters. If parameters that are not suitable for the local area network being used are entered in the settings, problems may occur in the functioning of the entire LAN to be used.

ERRORS

The following table lists the functioning of the IM-01.IND* unit in various error situations. The functioning of the devices for medical locations, which are available as accessories, is discussed in the Superintend IMD MED – Installation and User Manual.

Error	IM-01.IND* ALARM LEDs	IM-01.IND* ALARM menu	Alarm relay
The IM-01.IND* unit without operating voltage			INS AUX TRF
Memory fault (microSD card)	MEMORY FAULT	Memory	AUX*
Overload	LOAD	Load Lim	TRF
Over temperature	TEMPERATURE	Temp Lim	TRF
Insulation fault (R under InsLimit)	INSULATION	Insulat.	INS
Insulation fault (R under PrInsLim)	INSULATION	PreInsul	AUX*
Incorrect time		ClockErr	AUX*
The IM-01.IND* unit TG wire is disconnected	INSULATION	Gnd Fail	INS
The IM-01.IND* unit MG wire is disconnected	INSULATION	Gnd Fail	INS
The IM-01.IND unit M1 wire is disconnected	INSULATION(1)	WireAmpl WireOffs	INS(1)
The IM-01.IND unit M2 wire is disconnected	INSULATION(1)	WireOffs	INS(1)
IM-01.IND* is not capable of measuring insulation resistance and capacitance	INSULATION(2)	MeasFail(2)	INS(2)
System fault (manual test)	INSULATION	Sys Test	INS

(1) The IM-01.IND device monitors that measurement wires M1 and M2 are connected.

(2) Detecting a measurement error may take several minutes.

Alarm relays:

- TRF transformer alarm
- INS insulation alarm
- AUX alarm (*Can be configured through the alarm mask in the Setup menu)

Error situations are displayed by means of ALARM LEDs and the alarm menu of the IM-

01.IND* unit. A blinking LED always means that an alarm is active, and a steady indicator indicates a fixed and unacknowledged fault.

LOG FILES

IM-01.IND* stores event history on the microSD memory card. Compatible card types are microSD and microSDHC. The card type microSDXC is not compatible. The card must be pre-formatted to FAT32 and its maximum storage capacity is 32 GB. The maximum amount of card storage capacity used is 4 GB.

The event history is stored only when the card is inserted into the device and enabled in the SETUP menu. Once the memory card has been enabled, the device begins storing the event history after restart. The card is normally kept in the device and only removed when data is read from the card. When the card is removed (and set up for use), the MEMORY FAULT alarm is active.

The device maintains three different logs: an event log, measurement log and setup log. They are saved in the root directory of the microSD card with names EVENTLOG.TXT, MEASLOG.TXT and SETUPLOG.TXT. These are active files; in other words, they always contain the most recent data. In addition, the root directory may contain archives of each file.

Each active log file is updated for one year. After that, a new active log is created and the old one is archived by renaming it. The name format of the archived file is NAMEMMYY.TXT, where NAME is the file type (EVNT, MEAS, STUP), MM is the month and YY is the year of archiving. For example, the file EVNT0225.TXT is an event file of the EVENTLOG.TXT file from February 2025.

All files are text-based and can thus be read with any text editor. The separator used in the files is the tab, so the files are easier to read in Excel, for example.

Event log (EVENTLOG.TXT)

The event log stores all relevant events as plain text with a time stamp.

Power OFF (*)	The device operating voltage was lost.
Power ON	The device was restarted.
SD Card removed	The memory card was removed.
SD Card inserted	The memory card was reinserted.
Insulation Alarm ON [*N*kOhm][*L*kOhm]	The insulation resistance alarm activated with value *N*, whereas the limit value has been *L*.
Insulation Alarm OFF	The insulation alarm is no longer active.
Insulation Alarm Acknowledge	The insulation alarm that is no longer active was acknowledged manually.

Alarm Limit changed [Insulation] [*L1*kOhm]->[*L2*kOhm]	The insulation resistance alarm limit value was changed from *L1* to *L2.*
Insulation Prealarm ON [*N*kOhm][*L*kOhm]	The insulation pre-alarm activated with value *N*, whereas the limit value has been *L.*
Insulation Prealarm OFF	The insulation pre-alarm is no longer active.
Insulation Prealarm Acknowledge	The insulation pre-alarm that is no longer active was acknowledged manually.
Alarm Limit changed [PreInsulation] [*L1*%]->[*L2*%]	The insulation resistance pre-alarm limit value was changed from *L1* to *L2.*
System Parameter changed [Filter] [*F1*s]->[*F2*s]	Filter parameter was changed from *F1* to *F2*.
System Parameter changed [Capacitance] [*C1*s]->[*C2*s]	Max Cap parameter was changed from *C1* to *C2*.
OverTemperature ON [*N*C][*L*C]	The transformer temperature alarm activated with value *N*, whereas the limit value has been *L.*
OverTemperature OFF	The transformer temperature alarm is no longer active.
OverTemperature Acknowledge	The transformer temperature alarm was acknowledged manually.
Alarm Limit changed [Temperature] [*L1*C]->[*L2*C]	The transformer temperature limit value was changed from *L1* to *L2.*
Temperature Sensor Type Changed to NTC Temperature Sensor Type Changed to Pt100	The type of the transformer's temperature sensor was changed.
Temperature Sensor Calibrated [*O1* ADP]->[*O2* ADP]	The transformer's temperature sensor of type Pt100 was calibrated. The old offset value is *O1* as AD points, and the new measured offset value is *O2*.
Temperature Sensor Cut Alarm ON	The measuring circuit of the transformer's temperature sensor is cut.
Temperature Sensor Cut Alarm OFF	The measuring circuit of the transformer's temperature sensor recovered from an outage.
Temperature Sensor Cut Alarm Acknowledge	The measuring circuit of the transformer's temperature sensor recovered from an outage. The alarm was acknowledged manually.
Temperature Sensor Shortcut Alarm ON	The measuring circuit of the transformer's temperature sensor short-circuited.
Temperature Sensor Shortcut Alarm OFF	The measuring circuit of the

	transformer’s temperature sensor recovered from a short-circuit.
Temperature Sensor Shortcut Alarm Acknowledge	The measuring circuit of the transformer’s temperature sensor recovered from a short-circuit. The alarm was acknowledged manually.
Overload ON [*N*A][*L*A]	The overload alarm activated with value *N*, whereas the limit value has been *L*.
Overload OFF	The overload alarm is no longer active.
Overload Acknowledge	The overload alarm was acknowledged manually.
Alarm Limit changed [Load] [*L1*%]->[*L2*%]	The overload limit value was changed from *L1* to *L2.*
Load Sensor Cut Alarm ON	The transformer's current measuring circuit is cut.
Load Sensor Cut Alarm OFF	The transformer's current measuring circuit has recovered from an outage.
Load Sensor Cut Alarm Acknowledge	The transformer's current measuring circuit has recovered from an outage. The alarm was acknowledged manually.
Ground Failure ON	TG or MG has disconnected from PE.
Ground Failure OFF	The connection from the measurement connectors TG and MG to PE is fine after a detected outage.
Measure Failure ON	The insulation resistance measurement cannot be performed due to an internal fault.
Measure Failure OFF	The insulation resistance measurement can be performed after an internal fault has been corrected.
Wire Ampl Test Fail [*N*][*L*]	The Wire Test amplitude is too low (*N*, whereas the alarm limit is *L*) -> M1 has been disconnected from the network to be measured.
Wire Ampl Test OK	The Wire Test amplitude has recovered to the correct level; M1’s connection to the network to be measured has been restored.
Wire Offset Test Fail [*N*ADP][*L*ADP]	The Wire Test offset is too small (*N*, whereas the alarm limit is *L*) -> M1 or M2 has been disconnected from the network to be measured.

Wire Offset Test OK	The Wire Test offset has recovered to the correct level; the M1 and M2 connections to the network to be measured have been restored.
Too much noise [*N*%][*L*%]	The insulation resistance measurement continuously has a noise level too high (N) whereas the alarm limit is *L*.
Noise normal level	The noise level of the insulation resistance measurement has returned to normal.
PE Alarm ON [PE*XX* CH*CC*][*N*][*L*]	The resistance fault of channel *CC* of the PEC-01 unit in the PE address of *XX* has been activated with value *N*, whereas the limit value has been *L*.
PE Alarm OFF [PE*XX* CH*CC*]	The resistance fault of channel *CC* of the PEC-01 unit in the PE address of *XX* is no longer active.
PE Alarm Acknowledge [PE*XX* CH*CC*]	The resistance fault of channel *CC* of the PEC-01 unit in the PE address XX is no longer active. The alarm was acknowledged manually.
Alarm Limit changed [PEresist] [*L1*%]->[*L2*%]	The limit value of the resistance fault of the PEC-01 units was changed from *L1* to *L2*.
Missing TC Alarm ON [TC*XX*]	The TC-01 unit configured in the TC address *XX* is not responding.
Missing TC Alarm OFF [TC*XX*]	The TC-01 unit configured in TC address *XX* is responding again or has been removed.
Missing TC Acknowledge [TC*XX*]	Identification or removal of the TC-01 unit from the TC address *XX* was acknowledged manually.
TC Unit Removed [TC*XX*]	The TC-01 unit configured to TC address *XX* has been removed from the network.
TC Unit Added [TC*XX*]	The TC-01 unit has been added to TC address *XX*.
Missing IC Alarm ON [IC*XX*]	The IC-01 unit configured in the IC address *XX* is not responding.
Missing IC Alarm OFF [IC*XX*]	The IC-01 unit configured in IC address *XX* is responding again or has been removed.
Missing IC Acknowledge [IC*XX*]	Identification or removal of the IC-01 unit from the IC address *XX* was acknowledged

	manually.
IC Unit Removed [IC*XX*]	The IC-01 unit configured to IC address *X*X has been removed from the network.
IC Unit Added [IC*XX*]	The IC-01 unit has been added to IC address *XX*.
Missing PE Alarm ON [PE*XX*]	The PEC-01 unit configured in the PE address *XX* is not responding.
Missing PE Alarm OFF [PE*XX*]	The PEC-01 unit configured in PE address *XX* is responding again or has been removed.
Missing PE Acknowledge [PE*XX*]	Identification or removal of the PEC-01 unit from the PE address *XX* was acknowledged manually.
Missing PE Channel Alarm ON [PE*XX* CH*CC*]	The channel *CC* of the PEC-01 unit configured in PE address *XX* has been disconnected.
Missing PE Channel Alarm OFF [PE*XX* CH*CC*]	The channel *CC* of the PEC-01 unit configured in PE address *XX* has been restored from an outage or removed from the configuration.
Missing PE Channel Alarm Acknowledge [PE*XX* CH*CC*]	The channel *CC* of the PEC-01 unit configured in PE address *XX* has been restored from an outage or removed from the configuration. The alarm was acknowledged manually.
IC Unit Removed [IC*XX*]	The PEC-01 unit configured to PE address *X*X has been removed from the network.
PE Unit Added [PE*XX*]: CH*CC* R=*N* Ohm	The PEC-01 unit has been added to PE address *XX*. The channel *CC* with *N* set as a reference has been connected to the unit. All channels connected to the unit are listed here.
PE Channel Added [PE*XX* CH*CC*] R=*N* Ohm	The channel *CC* with *N* set as a reference has been connected to the PEC-01 unit configured in the PE address *XX*.
Network Scan Done, not confirmed	The Network Scan has been performed but the configuration identified was not approved.
Network Scan Confirmed: TC*XX*	The Network Scan was performed and the TC-01 unit in the TC address *CC* was approved in the network.
Network Scan Confirmed: IC*XX*	The Network Scan was performed and the IC-01 unit in the IC address *CC* was approved in the network.

Network Scan Confirmed: PE*XX*CH*CC* R=*N* Ohm	The Network Scan has been performed, and a PEC-01 unit in the PE address *XX* has been approved in the network. The channel *CC*, for which *N* was approved as a reference, was connected to the unit.
System Parameter changed [TranSize] [*N1*A]->[*N2*A]	The value of the TranSize parameter (the primary current of the current transformer in load measuring, with which the transformer secondary current is 5 A) was changed from *N1* to *N2*.
System Parameter changed [Nom.Cur] [*N1*A]->[*N2*A]	The value of the Nom.Cur parameter (the nominal current of the isolation transformer) was changed from *N1* to *N2*.
System Parameter changed [AUXalarm] [*XXX*]->[*YYY*]	The value of the AUXalarm parameter (situations which trigger an alarm in the AUX. ALARM relay) was changed from *XXX* to *YYY*.
New Time [DD.MM.YYYY HH:MM:SS]	The new time was set: DD=day MM=month YYYY=year HH=hour MM=minute SS=second
System Parameter changed [AlrmDly] [*T1*s]->[*T2*s]	The value of the AlrmDly parameter (the alarm delay in other than isolation level alarms) was changed from *T1* to *T2*.
Debug Mode ON	The RS-485 connection functions in the DEBUG mode (no communication with remote units).
Debug Mode OFF	The RS-485 connection functions in the normal mode (communication with remote units functions again).
Factory Settings activated	The factory settings were restored.
SD Card not in use	The memory card was disabled in the settings.
System Test Failed: too low amplitude (**)	The system test detected a measurement voltage that was too low.
System Test Failed: too high amplitude (**)	The system test detected a measurement voltage that was too high.
System Test Failed: too short group delay (**)	The system test detected a measurement delay that was

	too short.
System Test Failed: too long group delay (**)	The system test detected a measurement delay that was too long.
System Test OK	The system test was completed successfully.
System Time Reset	The real time clock was reset due to a low battery voltage. The time must be set again.

(*) When the system detects that the operating voltage drops below the critical threshold, it enters the time stamp for that moment in EEPROM. In the next start-up, the system retrieves that time stamp and enters an event for the time stamp.

(**) The values measured in the system test are displayed in the following format:
Ampl=*N1*V [*L1*V...*L2*V] delay=*N2*rad [*L3*rad...*L4*rad]
in which
N1 = the measured amplitude in volts with the range between *L1*, *L2* volts.
N2 = the measured group delay in radians with the limit between *L3*, *L4* radians.

Measurement log (MEASLOG.TXT)

The measurement log is used to store all measured data every hour on the hour. In addition, data is always saved when a measurement alarm (insulation resistance, overload or over temperature) is activated or deactivated. The data is written in the file in the following order:

[TIME][Rer(kOhm)][Cer(uF)][Load(A)][Ttra(C)][Tenv(C)][Active PE Channels]

[TIME] = time stamp

[Rer(kOhm)] = insulation resistance (in kOhms)

- If insulation resistance is "R>10M", the measurement range has been exceeded. This could be due to a disconnected wire, for example. Details of it can be found in the event log.
- If the value of insulation resistance is -1, a row has been added before the first measurement was completed after the start-up.

[Cer(uF)] = capacitance (in micro farads)

- If capacitance is "C<0.1", the measurement range has been exceeded. This could be due to a disconnected wire, for example. Details of it can be found in the event log.
- If the value of capacitance is -1, a row has been added before the first measurement was completed after the start-up.

[Load(A)] = load (in amperes)

[Ttra(C)] = transformer temperature (in Centigrade)

[Tenv(C)] = device temperature (in Centigrade)

[Active PE Channels] = a list of all active (configured) PE channels

- The format for one channel is PE*XX*CH*CC NN*%, in which *XX* = the PE address and *CC* = the channel number (1–6) and NN = channel resistance in relation to its reference value in then table as a percentage.
- If NN = -1.0, channel resistance has not been measured after the latest start-up.
- All active and configured channels are listed one after the other (separated by tabs).

After that, detailed information on the measurements that are not needed in normal use is printed on the row. Therefore, they are not discussed here in greater detail.

All fields are separated with tabs, so the file is easy to handle in Excel.

Setup log (SETUPLOG.TXT)

The setup log is a file in which ALL system parameters which the user can change in the Setup menu are entered. The Setup menu passcode is the only exception. It cannot be changed in the Setup menu but is always read from the card during start-up. The passcode default is always 123, which also works when the card cannot be read. If you want to change the passcode, the file must be changed.

A new row is added to the file only if the user changes a system parameter, or a new SETUPLOG.TXT file is created. The most recent parameter values are entered on the new row.

The data is written in the file in the following order:

[TIME][Password][InsLimit][PreInsLim][AlarmDly][Temp Lim][Load Lim][TC/IC/PE/RD][PEresist][TranSize][Nom.Cur][AUXalarm][Filter][MaxCap]

[TIME] = time stamp

[Password] = the passcode of the Setup menu

- The field format is PW=*NNN*, where *NNN* is a three-digit ID code.
- The ID code cannot be changed in the Setup menu; in the file, the value *NNN* must be changed.
- A new passcode will only become valid at the start-up.
- The passcode read at the start-up will be valid until the next start-up.

[InsLimit] = the limit value of the insulation resistance alarm (kOhms)

[PreInsLim] = the limit value of the pre-alarm of the insulation resistance measurement (percentage)

[AlarmDly] = measurement alarm delay (seconds), not applicable to the insulation resistance measurement

[Temp Lim] = the limit value of temperature alarms (transformer, device) (in Centigrade)

[Load Lim] = the limit value of load measurement (percentage of the nominal load of the isolation transformer)

[TC/IC/PE/RD] = the latest approved configuration at the unit level

[PEresist] = the limit value of the PE channel resistance measurement (percentage)

[TranSize] = the provided nominal primary/secondary current of the current transformer (amperes)

[Nom.Cur] = the provided nominal current of the isolation transformer (amperes)

[AUXalarm] = a configuration of alarms that will activate the AUX alarm relay

[Filter] = the cut-off frequency of the measurement circuit filter (High / Medium / Low)

[MaxCap] = the provided maximum capacitance of the network (<20uF / >20uF)

MODBUS/TCP REMOTE CONTROL

When IP settings suitable for a local area network are defined in the IM-01.IND* unit, the device can be connected to a LAN. The unit's Modbus/TCP slave server is now ready for use. The unit's Modbus/TCP register map is provided below. The Modbus functions to be used are Read Holding Registers (0x03) and Write Multiple Registers (0x10).

Register	R/W	Name	Type	Unit	Description
1	R	Measured insulation resistance	uint16	kOhm	The measurement result is provided as kOhms. The register value 100 corresponds to insulation resistance of 100,000 ohms. At the fastest, it updates in seconds and at the slowest in hundreds of seconds, depending on the measurement frequency used.
2	R	Measured capacitance	uint16	0.1 uF	The measurement result is provided as 0.1uF intervals. The register value 5 corresponds to capacitance of 0.5uF. It is updated at the same time as the insulation resistance.
3	R	Measured load	uint16	%	The measurement result is provided as a percentage of the announced nominal value. The register value 90 corresponds to the current value of 90% of the announced nominal value. It is updated once per second.
4	R	Measured temperature	uint16	°C	The measurement result is the transformer temperature and it is provided as degrees. The register value 50 corresponds to 50°C. It is updated four times per second.
5	R/W	Limit parameter of the insulation resistance alarm	uint16	kOhm	Read and written in kOhms. The register value 100 corresponds to 100,000 ohms. The minimum, maximum and interval values are in channels 16, 17 and 18.
6	R/W	The limit parameter of the insulation resistance pre-alarm.	uint16	%	Read and written in percentages. The register value 150 corresponds to 150%. The minimum, maximum and interval values are in channels 19, 20 and 21.
7	R/W	Limit parameter of the load alarm	uint16	%	Read and written in percentages. The register value 90 corresponds to 90%, The minimum, maximum and interval values are in channels 22, 23 and 24.
8	R/W	Limit parameter of the temperature alarm	uint16	°C	Read and written in degrees. The register value 90 corresponds to 90°C, The minimum, maximum and interval values are in channels 25, 26 and 27.
9	R/W	Current transformer's nominal value (primary current corresponding to 5 A secondary current), a device parameter	uint16	A	Read and written in amperes. The register value 40 corresponds to 40A. The minimum, maximum and interval values are in channels 28, 29 and 30.
10	R/W	Alarm delay, a device parameter	uint16	s	Read and written in seconds. The register value 2 corresponds to 2 seconds. The minimum, maximum and interval values are in channels 31, 32 and 33.
11	R	Password of the local user interface	uint16	none	A three-digit password. Range 000…999. Default value 123. When needed, this can be used to prevent the parameters from being set through the Modbus/TCP.

12	R	Device alarm and status register	uint16	none	Bit mask: 0x0001 = a fault or alarm related to insulation resistance, corresponds to the INSULATION alarm LED of the local user interface 0x0002 = insulation resistance pre-alarm 0x0004 = system test fault 0x0008 = fault in the M1 or M2 wire 0x0010 = fault in the TG or MG wire 0x0020 = load alarm 0x0040 = PE fault 0x0080 = temperature alarm 0x0100 = system test active 0x0200 = internal calibration active (the insulation level measurement values are invalid) the statuses remain active until their cause has been eliminated
13	R/W	Start of the device system test	uint16	none	Start of the system test. Value 1 starts the test, other values are not taken into account. IM-01.IND* resets the request after reading it.
14	R/W	Start of the resistance measurement of the PEC-01 units connected to the device	uint16	none	Start of the resistance measurement of the PE units. Value 1 starts the measurement, other values are not taken into account. IM-01.IND* resets the request after reading it.
15	R/W	Joint acknowledgement of alarms	uint16	none	Joint acknowledgement of unacknowledged alarms. Value 1 acknowledges all alarms, other values are not taken into account. IM-01.IND* resets the request after reading it. This does not acknowledge/inactivate active alarms.
16	R	The lowest allowed value of the limit parameter of the insulation resistance alarm	uint16	kOhm	50
17	R	The highest allowed value of the limit parameter of the insulation resistance alarm	uint16	kOhm	1000
18	R	The resolution (jog) of the limit parameter of the insulation resistance alarm	uint16	kOhm	50
19	R	The lowest allowed value of the limit parameter of the insulation resistance pre-alarm	uint16	%	100
20	R	The highest allowed value of the limit parameter of the insulation resistance pre-alarm	uint16	%	200
21	R	The resolution (jog) of the limit parameter of the insulation resistance pre-alarm	uint16	%	10
22	R	The lowest allowed value of the limit parameter of the load alarm	uint16	%	50, with an exception of value 0, which sets the alarm function to OFF mode
23	R	The highest allowed value of the limit parameter of the load alarm	uint16	%	100
24	R	The resolution (jog) of the limit parameter of the load alarm	uint16	%	5
25	R	The lowest allowed value of the limit parameter of the temperature alarm	uint16	°C	30, with an exception of value 0, which sets the alarm function to OFF mode
26	R	The highest allowed value of the limit parameter of the temperature alarm	uint16	°C	140
27	R	The resolution (jog) of the limit parameter of the temperature alarm	uint16	°C	5
28	R	The nominal value of the current transformer, the lowest allowed value of the device parameter	uint16	A	10
29	R	The nominal value of the current transformer, the highest	uint16	A	100

		allowed value of the device parameter			
30	R	The nominal value of the current transformer, the device parameter resolution (jog)	uint16	A	5
31	R	Alarm delay, the lowest allowed value of the device parameter	uint16	s	1
32	R	Alarm delay, the highest allowed value of the device parameter	uint16	s	30
33	R	Alarm delay, the device parameter resolution (jog)	uint16	s	1
34	R	Status register of the unacknowledged alarms of the device	uint16	none	Bit mask: 0x0001 = a fault or alarm related to insulation resistance is inactivated, corresponds to the INSULATION alarm LED of the local user interface 0x0002 = insulation resistance pre-alarm deactivated 0x0004 = system test fault deactivated 0x0008 = fault in the M1 or M2 wire deactivated 0x0010 = fault in the TG or MG wire deactivated 0x0020 = load alarm deactivated 0x0040 = PE fault deactivated 0x0080 = temperature alarm deactivated the statuses will activate when the corresponding active alarm has been deactivated and remain active until the cause has been acknowledged
35	R	PE units in the network	uint16	none	Bit mask: PE addresses 0…15, the corresponding bit is active if the PE unit has been approved in the network
36	R	PE#00 configuration	uint16	none	Bit mask: bit8 = if 1, the device is approved in the network bit0…5 = PE unit channels CH1…CH6: if 1, the channel is in use
37	R	PE#00 status	uint16	none	Bit mask: bit0…5 = PE unit channels CH1…CH6: if 1, the channel alarm is active bit8…13 = PE unit channels CH1…CH6: if 1, the channel alarm has been deactivated but not acknowledged
38	R	PE#01 configuration	uint16	none	Bit mask: bit8 = if 1, the device is approved in the network bit0…5 = PE unit channels CH1…CH6: if 1, the channel is in use
39	R	PE#01 status	uint16	none	Bit mask: bit0…5 = PE unit channels CH1…CH6: if 1, the channel alarm is active bit8…13 = PE unit channels CH1…CH6: if 1, the channel alarm has been deactivated but not acknowledged
40	R	PE#02 configuration	uint16	none	Bit mask: bit8 = if 1, the device is approved in the network bit0…5 = PE unit channels CH1…CH6: if 1, the channel is in use
41	R	PE#02 status	uint16	none	Bit mask: bit0…5 = PE unit channels CH1…CH6: if 1, the channel alarm is active bit8…13 = PE unit channels CH1…CH6: if 1, the channel alarm has been deactivated but not acknowledged
42	R	PE#03 configuration	uint16	none	Bit mask: bit8 = if 1, the device is approved in the network bit0…5 = PE unit channels CH1…CH6: if 1, the channel is in use
43	R	PE#03 status	uint16	none	Bit mask: bit0…5 = PE unit channels CH1…CH6: if 1, the channel alarm is active bit8…13 = PE unit channels CH1…CH6: if 1, the channel alarm has been deactivated but not acknowledged

44	R	PE#04 configuration	uint16	none	Bit mask: bit8 = if 1, the device is approved in the network bit0…5 = PE unit channels CH1…CH6: if 1, the channel is in use
45	R	PE#04 status	uint16	none	Bit mask: bit0…5 = PE unit channels CH1…CH6: if 1, the channel alarm is active bit8…13 = PE unit channels CH1…CH6: if 1, the channel alarm has been deactivated but not acknowledged
46	R	PE#05 configuration	uint16	none	Bit mask: bit8 = if 1, the device is approved in the network bit0…5 = PE unit channels CH1…CH6: if 1, the channel is in use
47	R	PE#05 status	uint16	none	Bit mask: bit0…5 = PE unit channels CH1…CH6: if 1, the channel alarm is active bit8…13 = PE unit channels CH1…CH6: if 1, the channel alarm has been deactivated but not acknowledged
48	R	PE#06 configuration	uint16	none	Bit mask: bit8 = if 1, the device is approved in the network bit0…5 = PE unit channels CH1…CH6: if 1, the channel is in use
49	R	PE#06 status	uint16	none	Bit mask: bit0…5 = PE unit channels CH1…CH6: if 1, the channel alarm is active bit8…13 = PE unit channels CH1…CH6: if 1, the channel alarm has been deactivated but not acknowledged
50	R	PE#07 configuration	uint16	none	Bit mask: bit8 = if 1, the device is approved in the network bit0…5 = PE unit channels CH1…CH6: if 1, the channel is in use
51	R	PE#07 status	uint16	none	Bit mask: bit0…5 = PE unit channels CH1…CH6: if 1, the channel alarm is active bit8…13 = PE unit channels CH1…CH6: if 1, the channel alarm has been deactivated but not acknowledged
52	R	PE#08 configuration	uint16	none	Bit mask: bit8 = if 1, the device is approved in the network bit0…5 = PE unit channels CH1…CH6: if 1, the channel is in use
53	R	PE#08 status	uint16	none	Bit mask: bit0…5 = PE unit channels CH1…CH6: if 1, the channel alarm is active bit8…13 = PE unit channels CH1…CH6: if 1, the channel alarm has been deactivated but not acknowledged
54	R	PE#09 configuration	uint16	none	Bit mask: bit8 = if 1, the device is approved in the network bit0…5 = PE unit channels CH1…CH6: if 1, the channel is in use
55	R	PE#09 status	uint16	none	Bit mask: bit0…5 = PE unit channels CH1…CH6: if 1, the channel alarm is active bit8…13 = PE unit channels CH1…CH6: if 1, the channel alarm has been deactivated but not acknowledged
56	R	PE#10 configuration	uint16	none	Bit mask: bit8 = if 1, the device is approved in the network bit0…5 = PE unit channels CH1…CH6: if 1, the channel is in use
57	R	PE#10 status	uint16	none	Bit mask: bit0…5 = PE unit channels CH1…CH6: if 1, the channel alarm is active bit8…13 = PE unit channels CH1…CH6: if 1, the channel alarm has been deactivated but not acknowledged

58	R	PE#11 configuration	uint16	none	Bit mask: bit8 = if 1, the device is approved in the network bit0…5 = PE unit channels CH1…CH6: if 1, the channel is in use
59	R	PE#11 status	uint16	none	Bit mask: bit0…5 = PE unit channels CH1…CH6: if 1, the channel alarm is active bit8…13 = PE unit channels CH1…CH6: if 1, the channel alarm has been deactivated but not acknowledged
60	R	PE#12 configuration	uint16	none	Bit mask: bit8 = if 1, the device is approved in the network bit0…5 = PE unit channels CH1…CH6: if 1, the channel is in use
61	R	PE#12 status	uint16	none	Bit mask: bit0…5 = PE unit channels CH1…CH6: if 1, the channel alarm is active bit8…13 = PE unit channels CH1…CH6: if 1, the channel alarm has been deactivated but not acknowledged
62	R	PE#13 configuration	uint16	none	Bit mask: bit8 = if 1, the device is approved in the network bit0…5 = PE unit channels CH1…CH6: if 1, the channel is in use
63	R	PE#13 status	uint16	none	Bit mask: bit0…5 = PE unit channels CH1…CH6: if 1, the channel alarm is active bit8…13 = PE unit channels CH1…CH6: if 1, the channel alarm has been deactivated but not acknowledged
64	R	PE#14 configuration	uint16	none	Bit mask: bit8 = if 1, the device is approved in the network bit0…5 = PE unit channels CH1…CH6: if 1, the channel is in use
65	R	PE#14 status	uint16	none	Bit mask: bit0…5 = PE unit channels CH1…CH6: if 1, the channel alarm is active bit8…13 = PE unit channels CH1…CH6: if 1, the channel alarm has been deactivated but not acknowledged
66	R	PE#15 configuration	uint16	none	Bit mask: bit8 = if 1, the device is approved in the network bit0…5 = PE unit channels CH1…CH6: if 1, the channel is in use
67	R	PE#15 status	uint16	none	Bit mask: bit0…5 = PE unit channels CH1…CH6: if 1, the channel alarm is active bit8…13 = PE unit channels CH1…CH6: if 1, the channel alarm has been deactivated but not acknowledged
68	R/ W	Isolation transformer nominal current, device parameter	uint16	A	Read and written in amperes. The register value 40 corresponds to 40A. The minimum, maximum and interval values are in channels 69, 70 and 71.
69	R	Isolation transformer nominal current, the lowest allowed value of the device parameter	uint16	A	1
70	R	Isolation transformer nominal current, the highest allowed value of the device parameter	uint16	A	100
71	R	Isolation transformer nominal current, the device parameter resolution (jog)	uint16	A	1
72	R/ W	The type of the transformer's temperature sensor	uint16	none	0= NTC, 1=Pt100
73	R/ W	Operating mode of the current loop	uint16	none	0= 4–20mA, 1=0–20mA

REMOTE CONTROL AND FAULT LOCATING UNITS

See the Superintend IMD MED – Installation and User Manual.

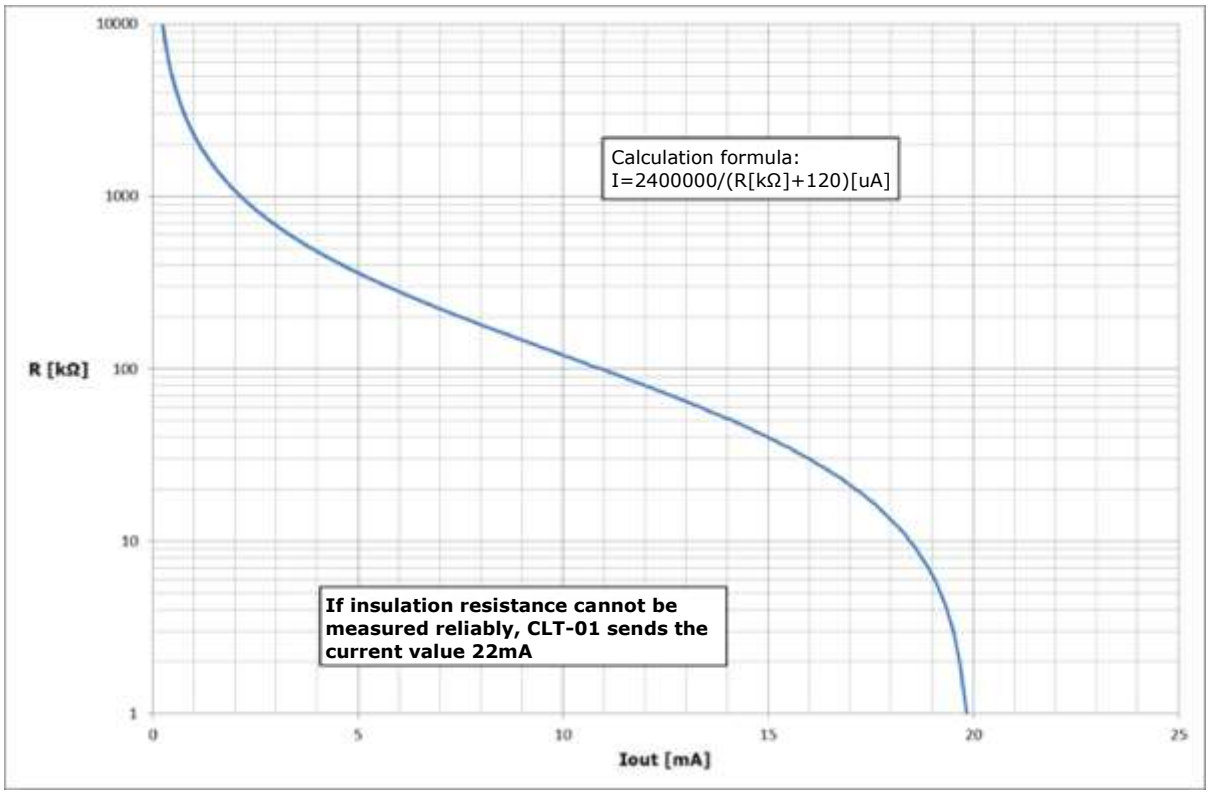
PEC-01 UNIT

See the Superintend IMD MED – Installation and User Manual.

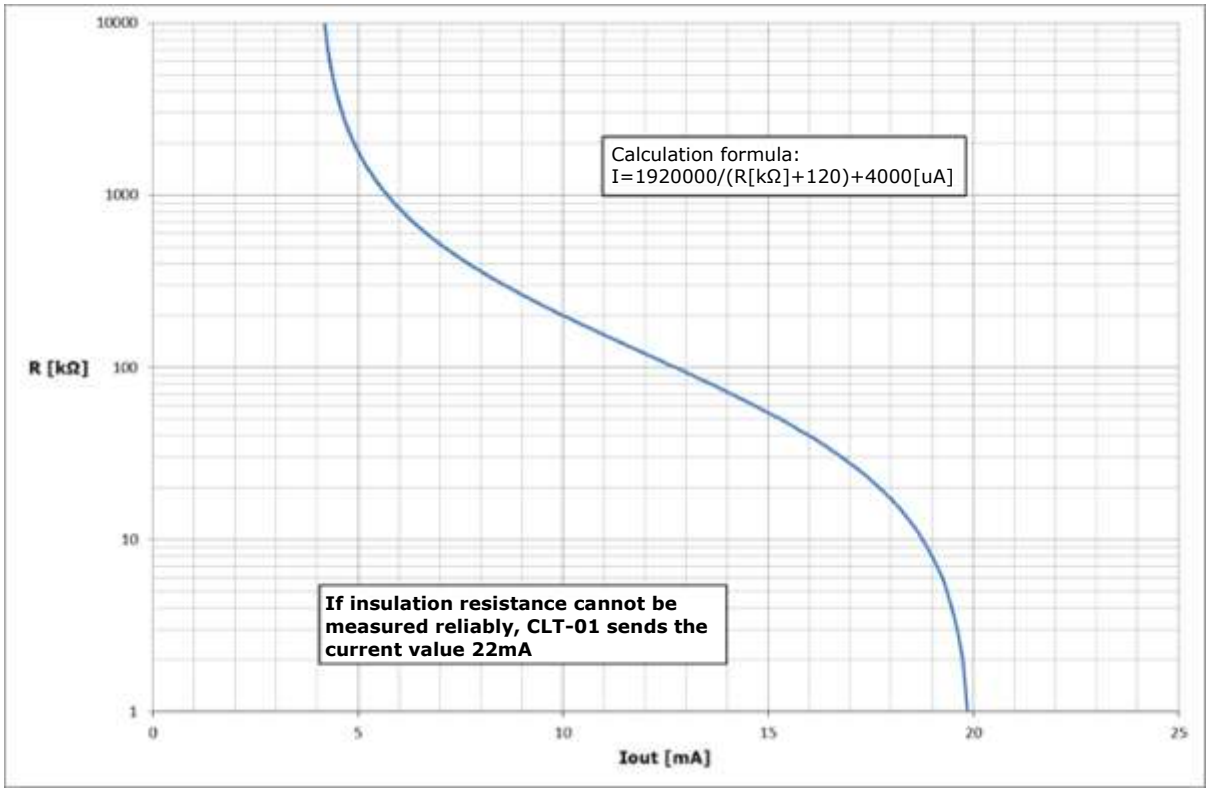
As an exception, the resistance measurement of the PEC-01 unit is continuous in the Superintend IMD IND* system. It is performed automatically at intervals of 5 minutes.

CLT-01 UNIT

The CLT-01 unit sends 0…20 / 4…20 mA standard current messages to the current loop of its output in accordance with the insulation resistance measured by IM-01.IND*. For the output to function, an external 24 VDC voltage source is needed.



The output current of CLT-01 as a function of insulation resistance at the loop current setting of 0…20 mA



The output current of CLT-01 as a function of insulation resistance at the loop current setting of 4…20 mA

TECHNICAL SPECIFICATIONS

IM-01.IND* UNIT

Voltage ranges

- Operating voltage [U_S]:
  110…240VAC, frequency 48…62 Hz
  110…300VDC (use an external fuse Schurter 0001.2503 (T800mA))
- Maximum voltage at the measurement connectors M1 and M2 or L1 and L2 [U_N]:
  - IM-01.IND: 500VAC or 700VDC
  - IM-01.IND_HV + HVC-6_9AC: 690VAC or 950VDC
  - IM-01.IND_16 + HVC-16AC: 1600VAC or 950VDC
  - IM-01.IND_40 + HVC-40AC: 4000VAC
  - IM-01.IND_72 + HVC-72AC: 7200VAC
- Frequency range of the network to be monitored: 10…500Hz
- Input power: 6W, when the 12VDC output is not loaded; 11W when it is loaded. Internal fuse of the operating voltage: 1AT

Monitoring of the insulation level:

- Measurement voltage [U_m]: ± 35Vp
- Highest measurement current ([R_f] = 0 Ω):
  - IM-01.IND: 233uA
  - IM-01.IND_HV + HVC-6_9AC: 350uA
  - IM-01.IND_16 + HVC-16AC: 350uA
  - IM-01.IND_40 + HVC-40AC: 70uA
  - IM-01.IND_72 + HVC-72AC: 35uA
- Measurement circuit resistance:
  - IM-01.IND: 150kΩ, impedance: 150kΩ (50…400Hz)
  - IM-01.IND_HV + HVC-6_9AC: 100kΩ, impedance: 100kΩ (50…400Hz)
  - IM-01.IND_16 + HVC-16AC: 100kΩ, impedance: 100kΩ (50…400Hz)
  - IM-01.IND_40 + HVC-40AC: 500kΩ, impedance: 500kΩ (50…400Hz)
  - IM-01.IND_72 + HVC-72AC: 100kΩ, impedance: 100kΩ (50…400Hz)
- Maximum leakage capacitance: ≤ 1000 uF
- Alarm limit [R_{an}]: 10kΩ…1MΩ
- Relative uncertainty: ±15%
- Hysteresis: 5%

Load monitoring

- Alarm limit: 0.5…100A
- Hysteresis: 5%
- Sensor: current transformer 10…100/5A CL3 + resistor 0.05Ω 1% 5W

Temperature monitoring

- Alarm limit: 30…140°C
- Hysteresis: 5%
- Sensor:
  NTC thermistor 10kΩ ±5% @25°C, $B_{25/85}$ = 3977K
  or PT100

Alarm switches

- 5A (NO) / 3A (NC) @ 30VDC for resistive load
- 5A (NO) / 3A (NC) @ 277VAC for resistive load
- Maximum power: 1400VA / 150W (NO) and 850VA / 90W (NC)
- Insulation strength between contacts: 750VAC 50/60Hz 1 min
- Useful life: 100,000 connections with the maximum nominal load

Serial bus

- RS-485, speed 9600bps, half duplex
- +12VDC supply for the RS-485 bus devices, maximum current: 300mA
- Maximum cable length: 500m

Other details

- For indoor use only
- Altitude up to 2000 m above sea level
- Operating temperature: 0…50ºC, relative humidity: < 95%, non-condensing
- Overvoltage category III
- Pollution degree 2
- Impact resistance: IK06 = 1J
- IP class (front panel): IP40
- IP class (other casing): IP20
- Connector tightening torque: 0.45…0.5 Nm
- Stripping length: 6,5 mm
- Weight: 0.38 kg
- Not suitable for connecting in parallel
- Voltage test (IEC 61010-1:2010, Annex F): 2.2 kVAC
- EMC standards: EN61326-2-4, EN55011, EN61000-3-2, EN61000-4-2, EN61000-4-3, EN61000-4-4, EN61000-4-5, EN61000-4-6, EN61000-4-11
- Other standards: IEC61557-8, IEC61010-1:2010+AMD1:2016

HVC-6_9AC, HVC-16AC, HVC-40AC AND HVC-72AC UNITS

- Operating temperature: 0…50ºC, relative humidity: < 90%, non-condensing
- Connection method:
  - HVC-6_9AC and HVC-16AC:
    - Connector terminals

        - Tightening torque: 0.5…0.6 Nm
    - HVC-40AC and HVC-72AC:
        - Wires M1 and M2: AWG 16, length: 2 m
        - Wires L1 and L2: AWG 18, length: 2 m, terminated with M4 ring terminals
- Weight:
    - HVC-6_9AC: 0.07 kg
    - HVC-16AC: 0.22 kg
    - HVC-40AC: 4.5 kg
    - HVC-72AC: 6.5 kg

CLT-01 UNIT

- Operating voltage: 12 VDC, 32 mA
- Operating temperature: 0…50ºC, relative humidity: < 90%, non-condensing
- RS-485 speed 9600 bps
- Connector tightening torque: 0.45…0.5 Nm
- Weight: 0.08 kg
- EMC standards: EN61326-2-4, EN55011, EN61000-4-2, EN61000-4-3, EN61000-4-4, EN61000-4-5, EN61000-4-6, EN61000-4-11

UNITS OF IMD MED PRODUCT FAMILY

See the Superintend IMD MED – Installation and User Manual.

MECHANICAL DIMENSIONS