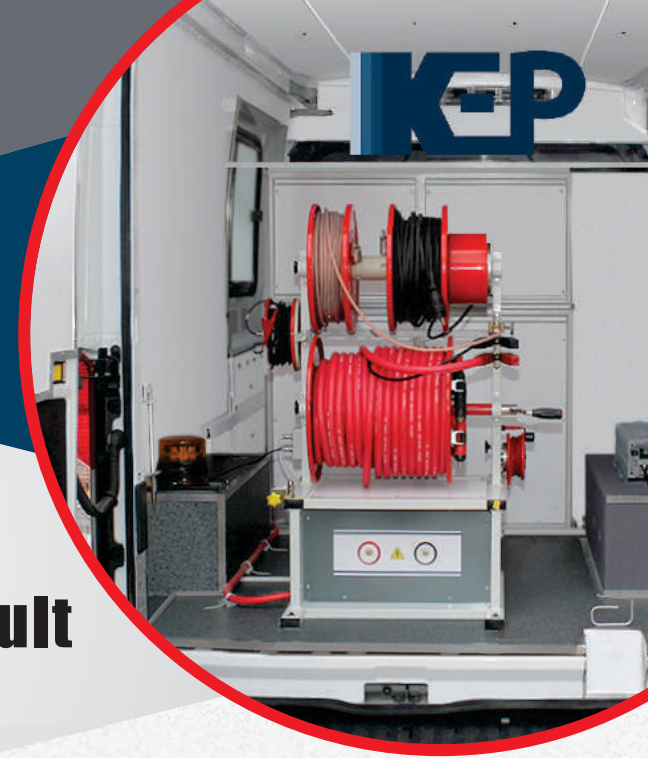


# ETL 40

## Van Mounted Power Cable Fault Locating System

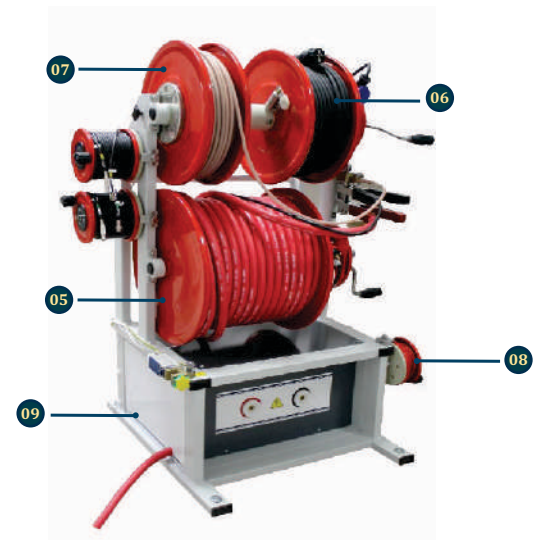


- **Centrally controlled, fully automatic cable fault locating system**
- **High measurement reliability**
- **Locate & pinpoint cable faults on low & high voltage power cables**
- **Quality power cable fault locating**
- **High safety standards**

# ETL-40 Van Mounted Cable Fault Locating System

ETL-40 is a van-mounted single-phase cable test and fault location system, for **locating & pinpointing** fault location on **low voltage to high voltage power cables**, providing the following capability:

- **Centrally controlled, fully automatic cable fault locating system**
- Direct measurement of **insulation resistance & leakage current** displayed
- **Testing high-voltage cables** with DC voltage up to **40 kV**
- **Fault conditioning** by burning faulty cable insulation with current up to **1 A @ 20 kV**
- **Multiple Pre-locating cable fault modes** with the reflectometer include:
  - Low-voltage pulse reflection method (**TDR**)
  - Current pulse method (**ICE**)
  - Arc reflection method (**ARC single shot / ARC multi-shot**)
  - High-voltage decay method (**DECAY**)
- **Pinpointing cable faults** with the acoustic method with **2000 J** surge energy at every surge level **8/16/32kV**
- **Trace and pinpointing faults in power cable utility lines** with the powerful low frequency generator LFG- 50 **Watt transmitter** and cable and pipe locator PT-14 (optional)
- **High safety standards**



Operator compartment contains all the switches, controls and displays, necessary to operate the System once it is properly connected to an object under test.



- 01 Wall for peripheral devices and accessories
- 02 Time-domain reflectometer RIF-9
- 03 Control unit
- 04 Power supply unit
- 05 HV Test cable
- 06 Power supply cable
- 07 Protective earthing cable
- 08 Earthing control cable
- 09 Automatic circuit breaker for insulation transformer

### High Voltage Fault Pre- Location & Localization:

The ETL40 system is designed for testing & cable fault location depending on fault type and condition, using the following 5 distinct modes:



### Low-Voltage Methods:

- **TDR (time-domain reflectometry):** low-resistance faults, measuring distance to a high resistance fault, distances to joints, open cable breaks, various impedance changes characterization (cable sleeves, branches, etc.), total cable length measurement (incl. on a drum or bundle) and cable shortening ratio measurement, when fault resistance  $<200\Omega$

### High-Voltage Methods:

- **ARC/ARC multi-shot (arc reflection method):** ARC Method allows precise measurement of distance to fault using either ARC Single shot or ARC multi-shot operating mode wherein a high voltage pulse causes a flashover at the point of a cable fault. Ideal for high-resistance and unstable faults with minimal harmful effects on a cable.
- **ICE (impulse current envelope method):** is utilised for those high-resistance faults that cannot be converted to low-resistance by burning faulty insulation.
- **DECAY (voltage wave oscillation method):** faults with high breakdown voltage.

It is possible to set maximum output voltage level, for a particular surge procedure.

**Automatic surge** can be activated to allow the system to automatically trigger surges, until deactivated – this is particularly effective during pinpointing procedure, when the operator has to walk along the cable with a surge receiver to pinpoint fault. Alternatively, Manual surge can be used to locate fault.

# ETL-40 Van Mounted Cable Fault Locating System



## Centralised Control:

The entire system is controlled from a **central operator station**. Microprocessor based operation ensures high measurement accuracy and reliability of the test results.

The Automatic Cable fault locating system comprises an **integrated touchscreen** and **knob control** for menu navigation and selection.

Clearly laid out control unit with visual indications of High Voltage status status & Emergency Stop button ensures that the operator has full control of the operation and test.



## DC Testing up to 40 kV:

ETL-40 cable test van allows to carry out cable acceptance tests with DC (rectified) high voltage up to 40 kV, allowing the operator to locate high resistive faults beyond the capability of standard cable fault locating systems, on 33kV cables and higher.

# ETL-40 Van Mounted Cable Fault Locating System



## Burn Unit:

ETL-40 systems are equipped as standard with a **burn unit** delivering up to **1A current** at up to **20 kV voltage**.

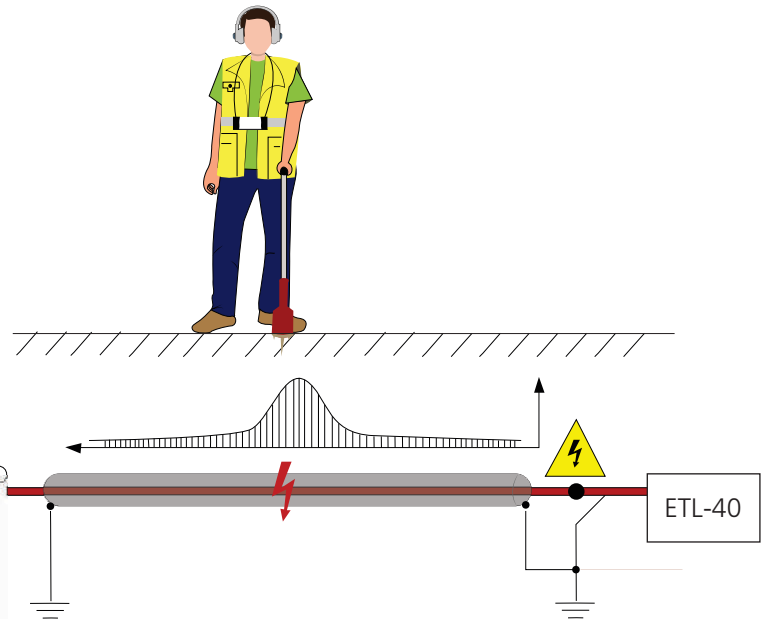
High-resistance cable faults may be converted to the low-resistance faults by burning faulting insulation, which allows to subsequently apply pre-location and/or pinpointing methods for precise fault localisation.



## High Voltage Fault Pinpointing:

ETL40 Surge Generator provides high energy of **2000 Joules** at each surge voltage level range of **8, 16 & 32 kV** for acoustic pinpointing of exact location of cable fault. High Energy of 2000J ensures that fault pinpointing is possible even on long distance or higher depth buried power cables.

A series of high voltage surge pulses are sent down the cable. During flash over, an **audible** acoustic signal generated can be detected on ground surface using P-900 pinpointing receiver or any industry-standard surge wave receiver.



LFG-50



LFG-200



## Optional 50 or 200 watt surge generator:

ETL40 can be further equipped with a 50 watt portable/mounted or 200 watt van mountable low frequency surge generator with multiple - 12 frequencies which can be used with an industry standard locating receiver to trace cable route quickly & precisely.

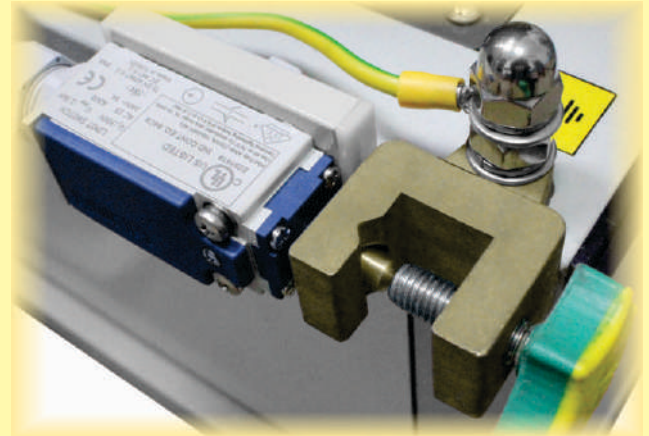
# ETL-40 Van Mounted Cable Fault Locating System



## Safety features:

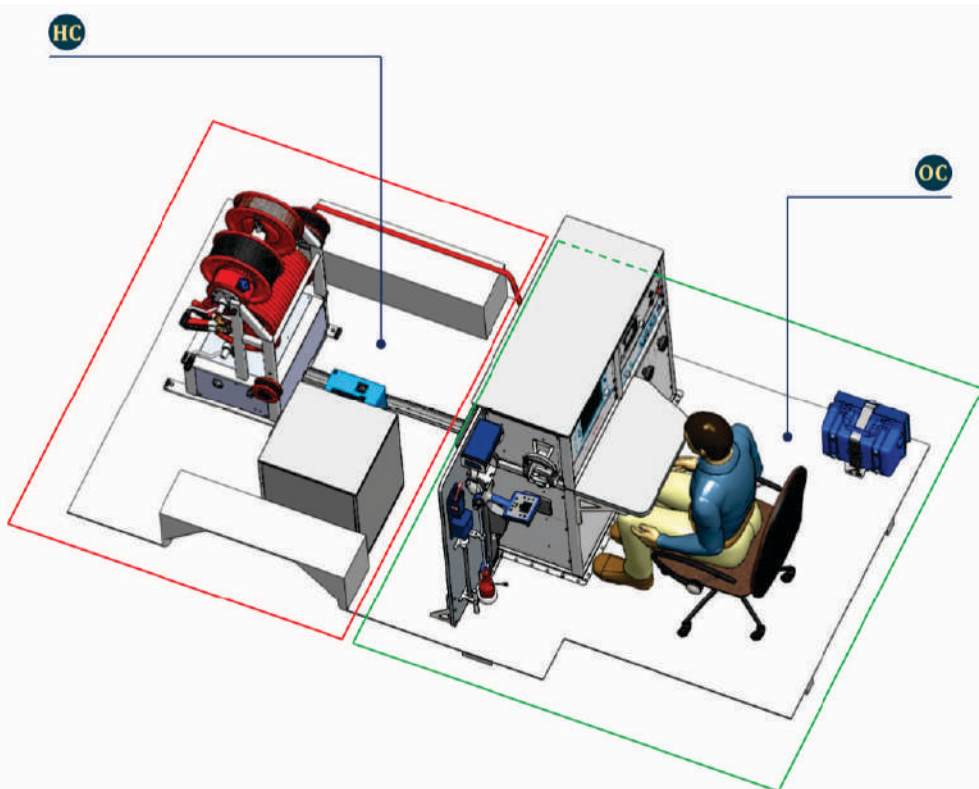
ETL-40 cable test vans are equipped with **all-round operator safety systems** consisting of the following modules and devices:

- ✓ Overvoltage and overcurrent protection.
- ✓ Overheating protection.
- ✓ Equipment and vehicle chassis protective earthing.
- ✓ Continuous grounding monitoring system.
- ✓ Emergency stop button.
- ✓ Automatic discharge device.
- ✓ Light and sound indication of high voltage.
- ✓ Vehicle high-voltage compartment door closure sensors.
- ✓ Safety ON/OFF keylock switch.
- ✓ Self-health and safety monitoring of high-voltage switches.



The System is mounted into a van and divided into two compartments:

- an operator compartment (OC)
- a high-voltage compartment (HC)



The system is designed to allow the operator work safely sitting inside the van. In addition, the system is equipped with system self health and safety monitoring. In case of any error, the system will display safety checks on centralised control unit screen with the list of errors , description and suggested resolution.

# ETL-40 Van Mounted Cable Fault Locating System

## Specifications:

<b>High-Voltage Testing (DC)</b>	Output voltage range (kV)	0...40
	Output current range (mA)	0...300
	Voltage adjustment type	Continuous
	Indication	Digital output voltage and leakage current in real time
	Insulation resistance	Value displayed M
	Test timer	10sec...60 min
<b>Fault Conditioning (Burn)</b>	Output voltage range (kV)	0 ... 20
	Output current range (A)	0 ...1
	Voltage adjustment type	Continuous
	Indication	Digital output voltage and leakage current in real time
<b>Fault Pre-Location</b>	Pre-location methods	<ul style="list-style-type: none"> <li>TDR</li> <li>ARC single shot</li> <li>ARC multi-shot</li> <li>ICE</li> <li>DECAY</li> </ul>
	Measurement ranges (for shortening coefficient of 1.50 or $V/2 = 100 \text{ m}/\mu\text{s}$ ) (m)	0...60 / 120 / 250 / 500 / 1000 / 2000 / 5000 / 10,000 / 20,000 50,000 /120,000
	Resolution: • for shortening coefficient of 1.5 ( $v/2 = 100 \text{ m}/\mu\text{s}$ ) • for shortening coefficient 1.87 ( $v/2 = 80.2 \text{ m}/\mu\text{s}$ )	0.5m 0.4m
	Distance measurement accuracy	0.2 % of measurement range
	Sampling rate	200MHz
	Time Mark Accuracy (%)	0.01
	Output impedance range	2 ... 100, resolution 2
	Probe pulse parameters: • voltage (V) • width range	45 10 ns ... 100 $\mu\text{s}$
	Gain range (dB)	-21 to + 69
	Shortening coefficient range	0.750 to 3.000, resolution 0.001
	Propagation velocity $v/2$ range ( $\text{m}/\mu\text{s}$ )	50.0 to 200.0 , resolution 0.1
	Probe pulse parameters: • Reflectograms with parameters • Data on cable shortening coefficients	1000 500
	<b>High Voltage Surge &amp; Pinpointing</b>	Surge Voltage range levels (kV)
Voltage adjustment within each level		Continuous
Surge energy at each level		2000 Joules in every voltage range
Surge rate		<ul style="list-style-type: none"> <li>Single discharge, manually triggered</li> <li>4 ...12 surges/min, automatic mode</li> </ul>
Indication		Digital output voltage in real time
<b>Controls &amp; Interfaces</b>	Communication Interfaces	<ul style="list-style-type: none"> <li>USB-A (user memory stick, formatted under FAT32)</li> <li>USB-B (service only)</li> </ul>
	Graphical display	Option1 : Built in interface, 6" touchscreen display, 320 x 240 px Option 2 (detachable) : RIF 9, 10.4" Display, touchscreen 800 x 600 px
	Surge Voltage level switch	Yes
	Internal memory	10,000 test results
<b>Visual Indicators</b>		High Voltage indicator Leakage current indicator
<b>Safety</b>	Isolating transformer (kVA)	4
	Continuous ground monitoring	Auxiliary earthing for earthing monitoring and protection
	Step Voltage Monitoring	Van chassis potential control
	Built in Automatic safety Circuit breaker	Safety circuit breaker will cut power to the System in event of a short circuit
	Protection	Overvoltage, overcurrent, overheating protection
	Safety Monitoring, Interlock & Emergency	On/Off key interlock to prevent unauthorised use of System, Emergency Stop button, Open rear door monitoring , Automatic discharge
<b>Connecting Cables</b>	HV Test Cable, in meters (m)	50
	Power supply cable, in meters (m)	50
	TDR Connecting cable, in meters (m)	50
	Protective earthing cable, in meters, $10\text{mm}^2(\text{m})$	50
	Earthing control cable, in meters (m)	15
<b>Power Supply</b>	Supply voltage	AC, 1 Ph, 230V +/-10 % , 50 Hz
	Power Consumption (kVA)	2.5
<b>Physical</b>	Weight (kg)	377



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