Manual Supplement

Manual Title:	434-II/435-II/437-II Users	Supplement Issue:	**8**
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This supplement contains information necessary to ensure the accuracy of the above manual.

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Change #1

On page 1-4, under ***Safety Information: Read First***:

Change: IEC/EN61010-1-2001

To: IEC 61010-1

On page 24-9, Table 24-1, Power

Change: Classic, Unified

To: Classic, Unified, IEEE

On page 24-10, in ⑬ replace the second sentence with:

Parameters to be set are: four different tariff rates, cable data (length in meters/feet, Area in square millimeter or acc. to AWG/American Wire Gauge and Material Cu or Al).

On page 26-2, under **Standard Accessories**:

Change: i430-FLEXI-TF (-4PK)

To: i430-FLEXI-TF-II (-4PK)

On pages 27-5 and 27-6, replace **i430-FLEX-TF** with **i430-FLEXI-TF-II** in all occurrences.

On page 27-12, under **SAFETY** Compliance:

Change: IEC/EN61010-1-2001

To: IEC 61010-1

On page A-2, under ***The Unified Method*** add:

- Power method IEEE uses calculations according to IEEE 1459

Change #2, 127

On page 1-7, under ***Safe Use of Li-ion Battery Pack***, remove the last sentence in the paragraph:

As a result they can be shipped unrestricted internationally by any means.

Change #3, 508

On page 1-5, add the following to the **Safety** table:

CAT III	Measurement Category III is applicable to test and measuring circuits connected to the distribution part of the building's low-voltage MAINS installation.
CAT IV	Measurement Category IV is applicable to test and measuring circuits connected at the source of the building's low-voltage MAINS installation.

On page 27-12, under **Safety**, replace Compliance with:

General Measurement	IEC 61010-1: Pollution Degree 2 IEC 61010-2-030: 600V CAT IV / 1000V CAT III

Under **Electro Magnetic Compatibility (EMC),** replace the table with:

Electromagnetic Compatibility (EMC)	
International	IEC 61326-1: Controlled Electromagnetic Environment CISPR 11: Group 1, Class A *Group 1: Equipment has intentionally generated and/or uses conductively-coupled radio frequency energy that is necessary for the internal function of the equipment itself.* *Class A: Equipment is suitable for use in all establishments other than domestic and those directly connected to a low-voltage power supply network that supplies buildings used for domestic purposes. There may be potential difficulties in ensuring electromagnetic compatibility in other environments due to conducted and radiated disturbances.* *Emissions that exceed the levels required by CISPR 11 can occur when the equipment is connected to a test object.*
Korea (KCC)	Class A Equipment (Industrial Broadcasting & Communication Equipment) *Class A: Equipment meets requirements for industrial electromagnetic wave equipment and the seller or user should take notice of it. This equipment is intended for use in business environments and not to be used in homes.*
USA (FCC)	47 CFR 15 subpart B. This product is considered an exempt device per clause 15.103.

On page 9-1, after the 2nd paragraph add:

The Dips and Swell function is a tool to identify low or high RMS values while trending at a high resolution. Due to the high RMS trend resolution, measurements that last more than 24 hours can create a large database file. For long recordings it is advised to adjust the interval.

To adjust:

1. Restart the measurement with HOLD RUN.
2. Select TIMED.

   Timed mode allows adjustment to the interval setting for an optimized RMS trend resolution.
3. Adjust the interval.

   For example, use a 10 s interval for 1 week and 1 minute interval for 30 days of recording.

The instrument continues to capture RMS values each half cycle and display trend data with maximum, minimum, and average RMS values for each interval. The Event Capture feature remains active and triggers on the same events with the same captured data results.

Change #4, 278

Throughout the user interface of the instrument HOLD/RUN soft key has been replaced with STOP/START. Functionality of the key has not changed.

On page 3-1, add the following table at the end of the ***Introduction*** section:

Default Functions firmware 5.0	**Fluke 434-II**	**Fluke 435-II**	**Fluke 437-II**	**Fluke 438-II**
Volt/Amp/Hertz	•	•	•	•
Dips & Swells	•	•	•	•
Harmonics	•	•	•	•
Power & Energy	•	•	•	•
Energy Loss Calculator	•	•	•	•
Power Inverter Efficiency	•	•	•	•
Unbalance	•	•	•	•

Inrush	•	•	•	•
Monitor	•	•	•	•
Flicker		•	•	•
Transients		•	•	•
Power Wave		•	•	•
Mains Signaling		•	•	•
Shipboard V/A/HZ			•	
Motor Analyzer				•
Event Capture		•	•	•
400 Hz			•	

For instructions on the Motor Analyzer, see the Fluke 438-II Users Manual

On page 12-1, add the following at the end of paragraph 7:

With firmware 5.0 the Analyzer will show losses due to load current and losses due to source voltage unbalance and distortion on separate pages to help identify the source of the energy losses.

On page 12-2, add the following after the menu navigation for the Energy Loss Calculator screen:

With firmware 5.0 the up/down arrow keys can be used to view energy loss due to load current or due to source voltage

On page 12-2, change section **Available function keys** as follows:

F1 Access to SETUP menu to view the settings used for Energy Loss Calculator. To change the settings, stop and save the current measurement, and select the Setup Function Preference menu (see chapter 24)

F2 Access to ANALYZER screen that indicates Losses relative to industry standards. The up down keys select between a performance graph or a pie chart that indicates the relative size of the Line losses.

F3 Access to Meter screen. For description see below.

F4 No Function

F5 Access to STOP and START of screen update.

On page 12-3, remove the 4th bullet.

On page 24-6, replace steps 8 and 9 with:

The Setup Function Preference menu has selection items for setting up: Trend, Harmonics, Dips & Swells and Flicker, Rapid Voltage Change, Wave Capture, Inrush, Energy Loss, Generic, and Motor Analyzer.

On page 24-9, bullet 10 change:

From: (available under Function key F1)

To: (available under the Setup Function Preference menu)

On page 24-9, bullet 11 change:

From: (available under Function key F2)

To (available under the Setup Function Preference menu)

On page 24-9, bullet 12 change:

From: (available under Function key F3)

To (available under the Setup Function Preference menu)

On page 24-10, bullet 13 change:

From: (available under Function key F3)

To: (available under the Setup Function Preference menu)

On page 24-10, bullet 13 add:

With firmware V5.0 and later the Energy Loss calculator automatic mode for determining line resistance is replaced with “Fuse Value”. The Fuse Value (Amps) is used to determine the line resistance that matches the specified Loss Ratio (default 3 %) when a nominal resistive load is applied to the system. Alternatively the user can use Cable Size or Resistance if this information is known.

Change #5, 360

On page 27-12, below the notes, add:

With firmware revision V05.02 and later, the operating range of the optional Motor Analyzer function to support voltage distortion is up to THD >3 % (also see Fluke 438-II Users Manual). Accuracy specification for the Mechanical Motor Power, Torque, rpm, and efficiency measurements in Motor Analyzer mode are met only if Voltage THD is <8 %.

Change #6, 598

On page 27-5, replace the last row with:

ACCURACY, RESOLUTION, AND RANGE

Volt/Amps/Hertz	Measurement Range	Resolution	Accuracy
Hz Fluke 435-II /437-II @ 50 Hz nominal	42.5 Hz to 57.5 Hz	0.001 Hz	±0.005 Hz
Fluke 435-II /437-II @ 60 Hz nominal	51 Hz to 69 Hz	0.001 Hz	±0.005 Hz
Fluke 437-II @ 400 Hz nominal	340 Hz to 460 Hz	0.01 Hz	±0.1 Hz

On page 27-6, replace the first row with:

Volt/Amps/Hertz	Measurement Range	Resolution	Accuracy
Fluke 434-II @ 50 Hz nominal	42.5 Hz to 57.5 Hz	0.01 Hz	±0.02 Hz
Fluke 434-II @ 60 Hz nominal	51 Hz to 69 Hz	0.01 Hz	±0.02 Hz

Change #7, 653, 661

On page A-1, replace ***Energy Loss Calculator*** with:

Energy Loss Calculator

The Energy Loss Calculator is a feature that estimates costs for energy lost during transportation of electrical energy. The Calculator processes the measurements for Power Loss **due to Load Current** (caused by the various currents flowing through the line resistance) and Power Loss **due to Source Voltage** (caused by Voltage Harmonics and Voltage Unbalance) for losses in Watt.
Causes of line power loss:

- Effective Loss — The optimal method to use electrical energy in 3-phase ac systems is when Voltage and Current are in phase, not distorted, and no unbalance exists. This requires current to flow through the wires and due to wire resistance causing an energy loss, called Effective Loss. To reduce this loss, lower line resistance, for example, use thicker or shorter wires, or replace aluminum busbars with copper bus bars.
- Reactive Loss — Reactive energy itself does not cause losses but flows in the system and causes loss due to wire resistance.
- Unbalance Loss — Unbalanced currents cause losses as it is not the optimum method to transfer energy and is less efficient than a balanced system. If unbalance exists in the source voltage this will create additional losses.
- Distortion Loss — Harmonic current and harmonic voltages also lead to additional losses.
- Neutral Loss — In an ideal balanced system without harmonics, the Neutral current is zero. Any deviation from this ideal system results in a Neutral current that leads to a loss of energy.

The line resistance can be entered in the Function Preference setting. For the automatic calculation of line resistance one of three methods can be selected:

- Fuse value (enter the fuse value, and the tool calculates resistance based upon a 3% Loss Ratio)

- Cable size (enter cable length, diameter and material and the tool calculates resistance of the line)
- Resistance (enter cable resistance in mΩ directly)

The calculator shows an estimated cost for the measured values and the cost for each kWh. The costs can be extrapolated by hour, day, week, month, or year.
In the Setup Function Preference menu (Figure 1), press F1 to enter the currency and F2 to change the rates for different start/stop times. This is used if multiple tariffs are applied that depend on the time of the day, such as a different tariff for day and night.
The losses are divided into two parts:

- Due to the Load Current (Figure 2)
- Due to Source Voltage (Figure 3)

Each fractional part of the current causes Joule losses in the cable. These losses register by the kWh usage meter and result in additional costs. In this example, a water pump running 24/7 is connected with a 2.5 mm^2 cable with a length of 500 m. The calculated energy loss monetizes the total cost/year. The outcome helps you take countermeasures and the return on investment (ROI) of these countermeasures is easy to calculate.
Besides this presentation, the losses show in relation to the active power (Figure 4). Line losses behind the common point-of-coupling are charged to the energy bill. By reducing these losses, the total energy distribution is more efficient.
The pie chart (Figure 5) shows the component that needs attention. In this example, the pie chart shows almost 50 % of the line loss is caused by reactive current. The reactive power itself is not causing losses in the load, but the reactive current is causing losses into the cable due to current flow that does not contribute to energy transfer. In this case, a capacitor bank of 8 kvar can reduce the losses by 50 % and save about $6000 in energy costs. An active filter also reduces the costs caused by harmonics.

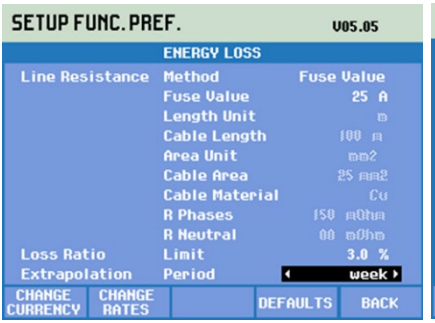


Figure 1.

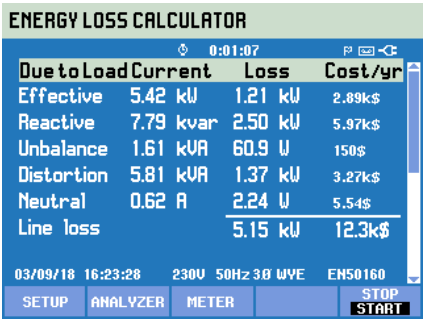


Figure 2.

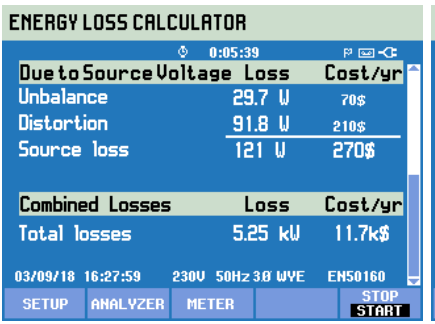


Figure 3.

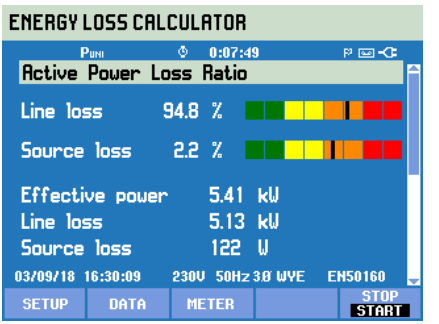


Figure 4.

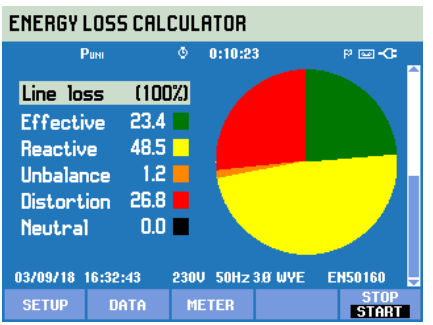


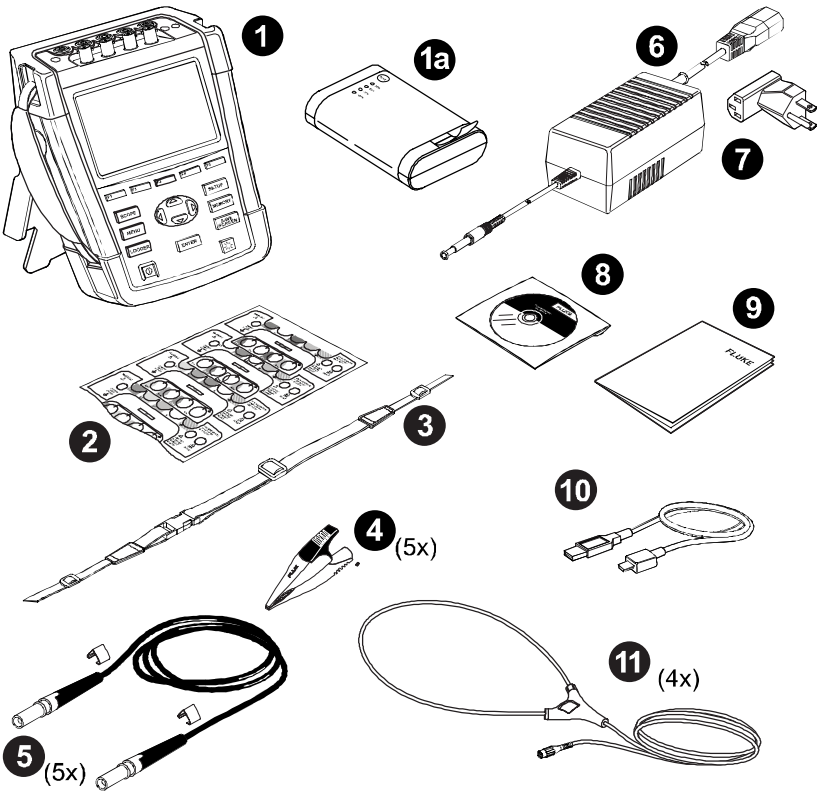
Figure 5.

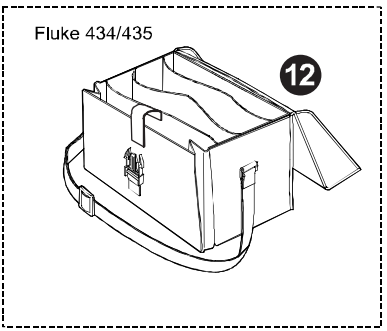
On page 1-4, replace item 1 in the table with:

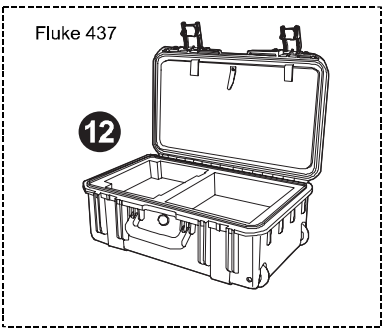
1	Power Quality Analyzer Fluke 43x Series II + Side Strap (installed), SD Memory Card (Installed) and Battery Pack BP290 (28 Wh) (see page 4-4 for installation)

Change #8, 676, 677

On page 1-3 replace Figure 1-1 with:







On page 1-4, replace item 1 and add 1a to the Table:

1	Power Quality Analyzer Fluke 43x Series II + Side Strap (installed), SD Memory Card (Installed)
1a	Battery Pack BP290 (28 Wh, packed outside the instrument, see page 4-4 for installation)

On page 3-1, under the **Introduction**, replace the last paragraph with:

In Fluke 434-II the Flicker, Transients, Power Wave and Mains Signaling functions are not installed and show in the menu as grey.

On page 9-2, under **Figure 9-3**, replace the paragraph with:

Rapid voltage changes (RVC) are quick transitions of the RMS voltage between two steady states. Rapid voltage changes are captured based on RVC threshold. RVC threshold is set as percentage of the nominal voltage and the threshold level is calculated over the preceding 100/120 Urms (1/2) values. (100/120 is defined as 100 values for 50 Hz nominal or 120 values for 60 Hz nominal.) An RVC Event is detected when the arithmetic mean of 100/120 Urms (1/2) value falls outside the RVC threshold. When a voltage change crosses the dip or swell thresholds, consider it a dip or swell and not a rapid voltage change. See Figure 9-4.

On page 9-3, replace **Figure 9-4** with:

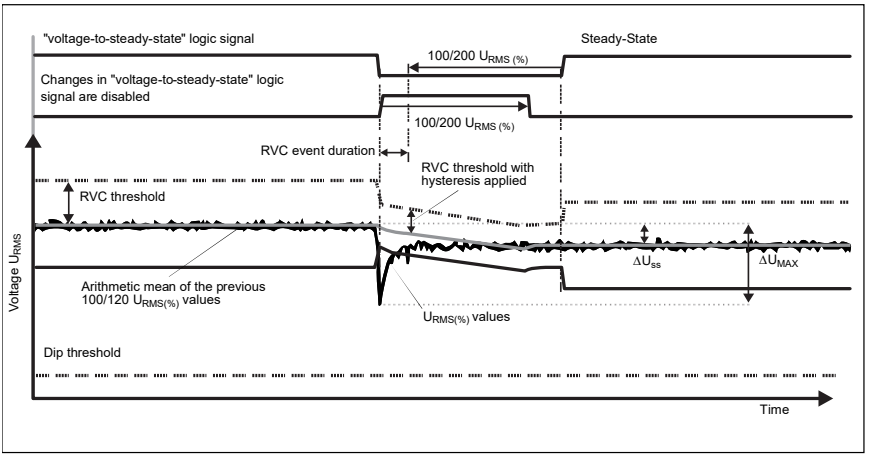


Figure 9-4. Characteristics of a rapid voltage change

On page 24-9, replace bullet ⑫ with:

⑫ Rapid Change (available under Function key F3): menu to set the parameters for the Rapid Voltage Change measurement (Threshold and Hysteresis). In this menu Function key F4 can be used to reset to Defaults and Function key F5 to leave the menu.

On page 27-6, replace the 2nd table with:

Power	Measurement Range	Resolution	Accuracy
Watt (VA, var) i430flex-TF 1 mV/A	 max 6000 MW max 2000 MW	 0.1 W … 1 MW 0.1 W … 1 MW	 ± 1% ± 10 counts ± 1% ± 10 counts
Power Factor (Cos ϕ /DPF)	0…1	0.01	0.1% @ nominal load conditions

On page 27-11, replace the 3rd row in the **POWER** table with:

Battery power	Rechargeable Li-ion battery BP290