Test I Go


DSP Logger Expert
Advanced 6CH Vibration Analyzer
Home
Energy
Motor
Load
Earn-e
F1
F2
F3
F4

Startup Information

Firmware: On the top left corner we see the Firmware Version.
Firmware: Test I Go v7.233.0.0

Moving to the right, we see the memory percentage left and a battery graphic.

Keep moving to the right, we see the SD Memory left.

Finally we see the date and hour on the top right corner.

Buttons

On regards to the *hardware* buttons or *hardware* keys we have basically eight of them to operate the Test I Go: four keys on the side and four on the lower part.

Side buttons:

<u>Two navigation keys</u> 

We use these keys to go up or down the options displayed on the window.

An enter key 

We use it to access the menus, submenus and options we select with the navigation keys.

An exit key 

Goes back to the previous menu or submenu. (Does not work on all cases, sometimes we need to use an “Exit” button on the screen to go back).

There are duplicates of these keys on the other side of the screen, they hold the same functions.

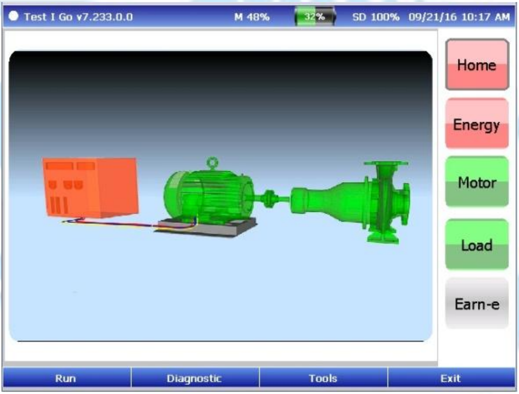
Lower part buttons

These are the Context Sensitive Function Keys; they could also be regarded as four *Multi-function* keys, since they do not have pre-programmed functions. They are the F1, F2, F3 and F4 keys. Each one of these *hardware* keys correlate to *software* digital buttons. This digital buttons change depending on the window that is displayed. This is why these *hardware* keys (F1, F2, F3, and F4) hold as many functions as the different windows can provide.

First Window

Once we run the test, the Test I Go displays a diagram of the energy, the motor and the load in different colors.

This is the Home Menu



Color Code

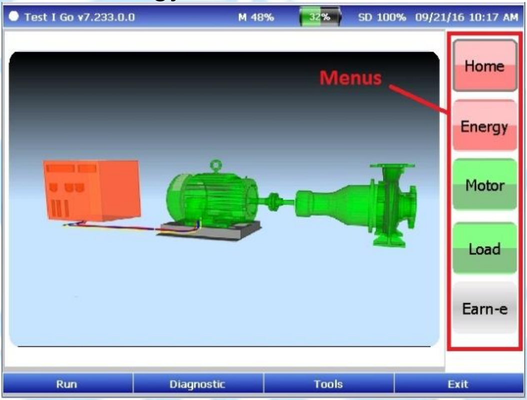
Green = Running within tolerances. No actions needed.

Yellow = Machine has exceeded a caution threshold. Action should be taken to avoid future problems.

Red = It has exceeded a warning threshold. Action needs to be taken to correct problem.

Blue = No applicable thresholds.

We can use the up and down blue keys on the DSP Logger Expert sides to navigate through the *menus* on the right side of the screen. These menus, from the top, are: Home, Energy, Motor, Load and Earn-e.



Home Menu

In this window, in addition to the menus on the right side of the window, we see blue buttons on the bottom. From left to right: Run, Diagnostic, Tools and Exit.

In this window the bottom blue buttons are from left to right: **Run**, **Diagnostic**, **Tools** and **Exit**.

Run

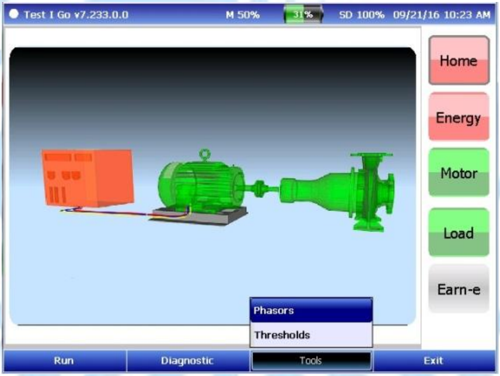
Performs the test.

Diagnostic

Shows a list of the elements tested by the Test I Go, alongside a color coded state indicator of the elements.

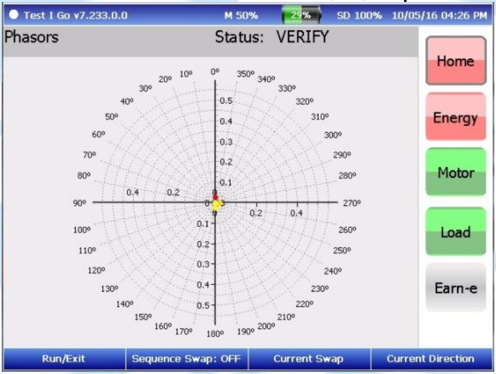
Tools

Within the “Tools” option we find another two options: “Phasors” and “Thresholds”.



Tools/Phasors

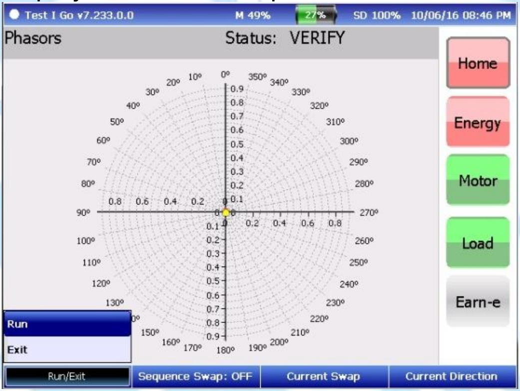
This window shows the a, b, c phasors.



Bottom blue buttons: **Run/Exit**, **Sequence Swap: OFF**, **Current Swap** and **Current Direction**.

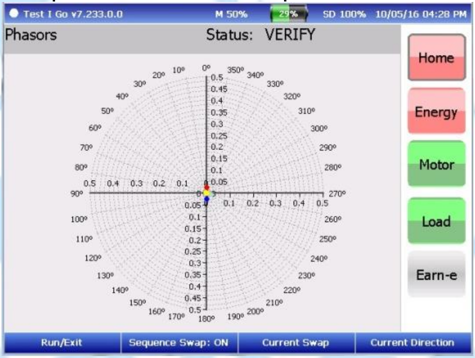
Tools/Phasors/Run/Exit

Displays another two options: “Run” and “Exit”.



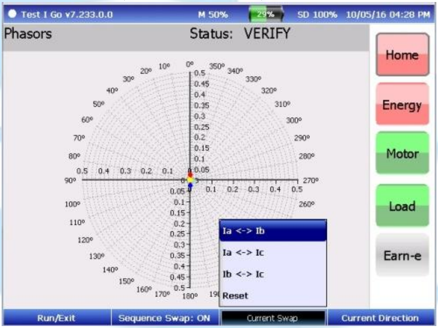
Tool/Phasors/Sequence Swap: Off

When we enter this key it switches from "Sequence: On" to "Sequence: Off".



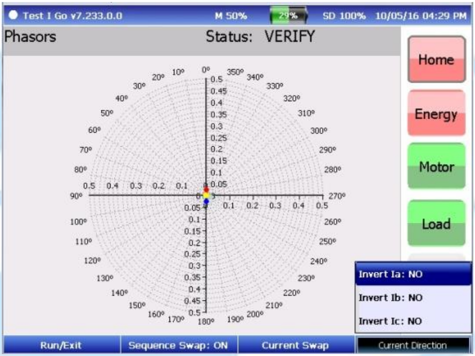
Tool/Phasors/Current Swap

This option displays another four options:
“Ia <-> Ib”, “Ia <-> Ic”, “Ib <-> Ic” and “Reset”.



This allows you to swap any two phases.

Tool/Phasors/Current Direction



This option displays another three options: “Invert Ia: NO”, “Invert Ib: NO” and “Invert Ic: NO”.

We can invert the direction of “Ia”, “Ib” and “Ic” by switching from “NO” to “YES” any of the three options displayed.

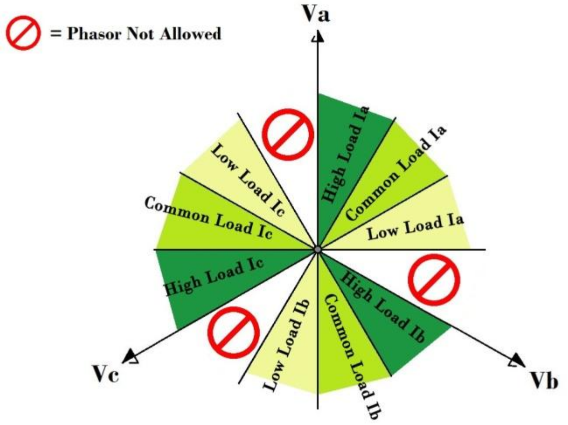
Adjusting Phasors Manually

There are two rules for this:

1) All phasors (currents and voltages) should have an angle between them of 120 degrees ±5.

2) For all induction motors, the current phasor must follow the voltage phasor by a maximum of 90 degrees.

The next image shows all phasor positions.



To get a correct setup all three current phasors must be in the same area. As an example we could say that if an Ia phasor is in the high load

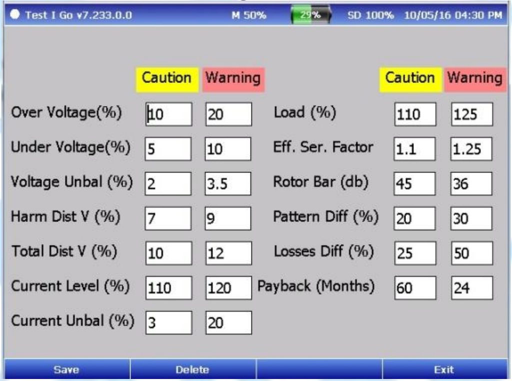
position, Ib and Ic must also be in the high load position.
The *Prohibited* sign shows the areas where phasors are not allowed. Although mathematically this can be achieved, phasors cannot physically reside in the prohibited areas (three phase induction motors) without Power Factor correcting devices.

There is the possibility that phasors can reside in the high load position or be rotated 180 degrees and be in the low load position. In order to minimize potential errors, we have provided a load estimate. If the phasors are setup in the high load position and the load estimate is 300 percent or higher, then the most likely correct solution is to rotate the phasors to the low load position.

To go from a high-load position to a low-load position, rotate each dial one position to the left. To go from a low load position to a high load position: rotate each dial to the right one position.

Tools/Phasors/Threshold

When entered we get the window below.

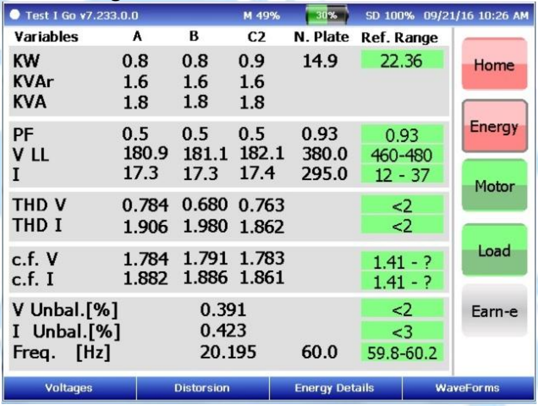


In this window we can define the thresholds against which the machines will be tested. In each test type, we must enter caution and warning thresholds. Using the navigation keys we can select any box we want to modify.

Keep in mind that we must enter caution and warning thresholds for over and under voltages independently from each other.

Energy Menu

In this menu we are provided with information of power qualities for each phase, along with the average / sum values.



The Energy Menu window is divided into five horizontal sections

The **first section** displays kilowatts (kW), kilovolt amperes reactive (kVAr), and kilovolt amperes (kVA).

The **second section** displays the power factor (PF), voltage (V), and current (I) values.

Total harmonic distortion voltage (THD V) and total harmonic distortion current (THD I) are presented in the **third section**.

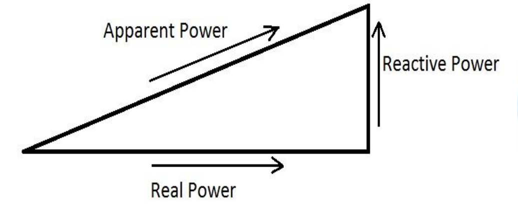
The crest factor voltage (c.f. V) and crest factor current (c.f. I) values are shown in the **fourth section**.

The voltage unbalance percentage (V Unbal. [%]), current unbalance percentage (I Unbal. [%], and frequency (Freq. [Hz]) are presented in the **fifth section**.

In the lower part of the window we can see that the blue buttons changed to a new four option menu (this happens every time we navigate to a new window). From left to right: Voltage, Distortion, Energy Details and WaveForms.

A quick approach to Power Factor

We understand power factor as the relation between the Real Power (energy that is producing real work) and the Apparent Power (energy that is being consumed, but is not in its entirety being used to produce work); and ultimately the Reactive Power (this is understood as the energy that does not provide any actual work).
The graphical representation of these three powers is the power triangle. Using this graphic we have a better understanding of the close relationship between the powers.



kW is the Real Power. It is the power that is actually doing work. It is also known as Actual Power or Active Power.

kVAR is the Reactive Power. This power is consumed by the magnetic field created in the winding. This power does not provide any actual work, but it is needed for the machine to work.

kVA is the Apparent Power. It's the product of Real Power (kW) and Reactive Power (kVAR).

Below we see an example of a corrected power factor.
Image number one shows a power factor of 83%. While image number 2 shows a corrected power factor of 97%.

Image 1

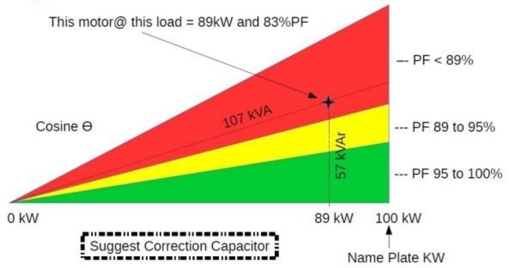
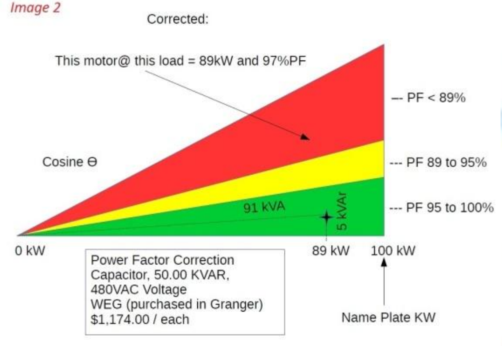


Image 2

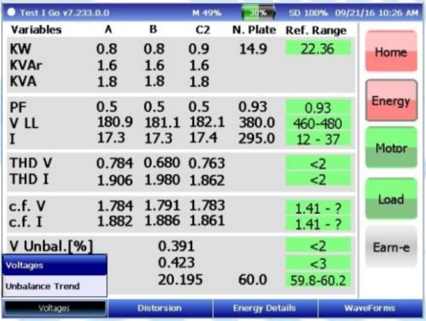


We can see that the amount of power provided by the motor is 89kW in both scenarios, but with the crucial distinction that when the power factor is corrected the Apparent Power is 16kVA less, that is, the motor consumes 16kVA less for the same amount of work. We can also see a 52kVAR difference in the Reactive Power.

Bottom Blue Buttons: Voltages, Distortion, Energy Details and WaveForms.

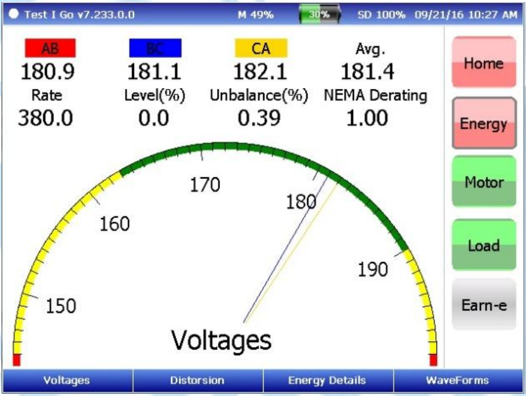
Voltages

When accessed, this option displays another two options: “Voltages” and “Unbalance Trend”.



Voltages/Voltages

When entered we get the next window



On the top with three different colors we see the voltages for the voltage phasors. Also on the top we see the Rate, Level (%), Unbalance(%) and NEMA Derating.

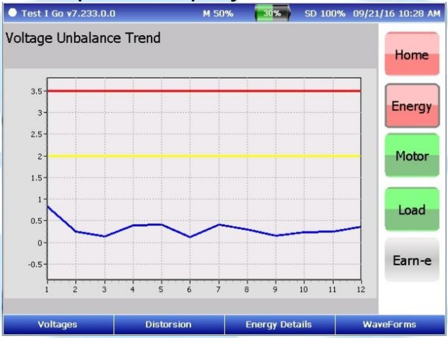
The Test I Go examines the single-phase voltage in the motor by calculating its percentage unbalance, utilizing NEMA derating. It compares the voltage unbalance level with the stored threshold.

Negative sequence currents within the stator can be caused by an unbalanced voltage condition, resulting in excessive heat. This voltage unbalance test determines if an unbalance voltage condition exists in the machine. The Test I Go uses the NEMA derating curve that

specifies a maximal load for each type of unbalance.
The rest of the window is occupied by a graphic indicator, a speedometer like graphic.

Voltages/Unbalance Trend

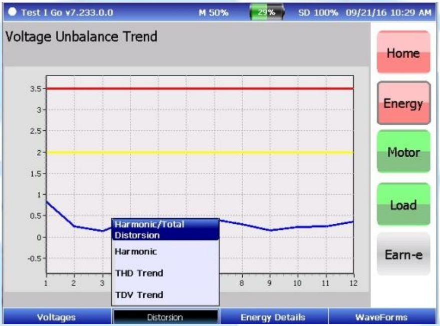
This option displays the next window:



Above we see the title “Voltage Unbalance Trend”, while on the bottom part we see graphically displayed the value of the monitored quantity (y-axis) against the test numbers (x-axis).

The x-axis shows the number of measurements performed for that particular motor ID.

Distortion



This is the second option on the bottom menu from left to right. When entered, it shows another four options:

1) "Harmonic/Total Distortion"
2) "Harmonic"
3) "THD Trend" and
4) "TDV Trend".

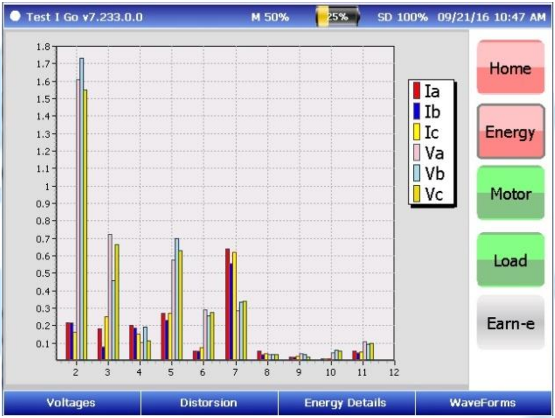
Distortion/Harmonic/Total Distortion

What this function does is it examines the total harmonic distortion of the three single phases to neutral voltages. The function compares the level of total harmonic distortion to the threshold values that you define.

On the top we see: THD V, THD I, C.F., TD V, TD I. The first three correspond to Harmonic distortion, while the other two correspond to Total Distortion.

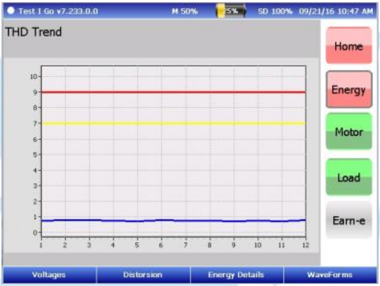
Two graphic and numeric indicators for Harmonic Distortion and Total Distortion can be seen on the lower part of the window.

Distortion/Harmonic

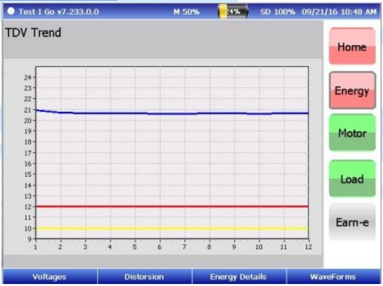


The Harmonic components compare the magnitude of the harmonic components to the fundamental currents and voltages of the system. The bar chart displays the distribution of the content on the different harmonic numbers for all currents and voltages.

Distortion/THD Trend



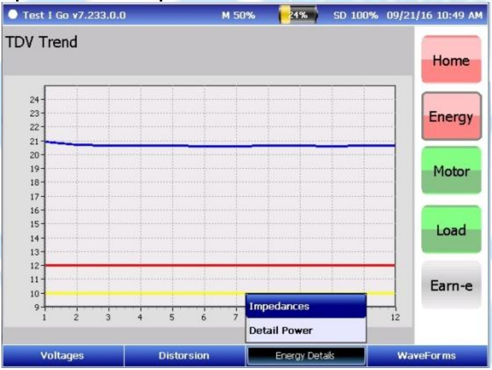
Distortion/TDV Trend



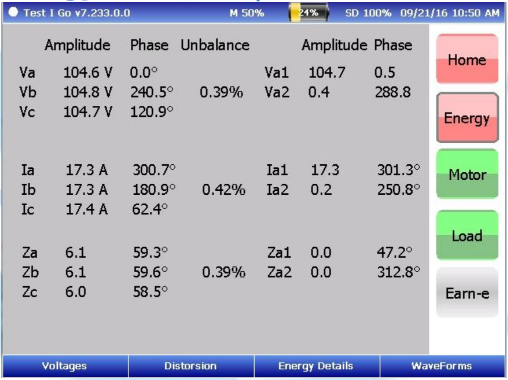
Energy Details

The third option in the bottom bar is Energy Details.

When entered, it displays another two options: “Impedances” and “Detail Power”.

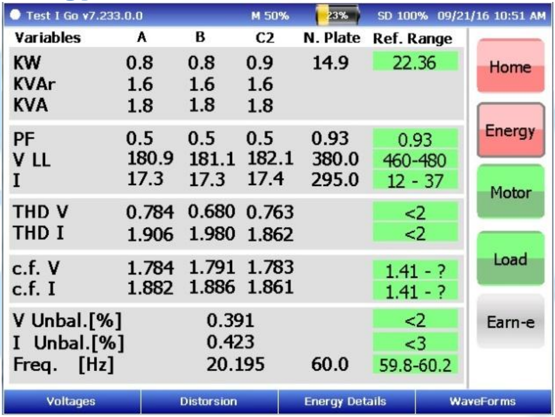


Energy Details/Impedances



This window displays the voltage, current and impedance unbalance, the positive sequence (accelerating), and the negative sequence (retarding) current, voltage, and impedance information.

Energy Details/Detail Power

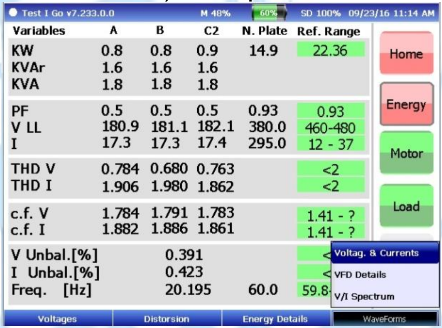


Variables	A	B	C2	N. Plate	Ref. Range
KW	0.8	0.8	0.9	14.9	22.36
KVAr	1.6	1.6	1.6		
KVA	1.8	1.8	1.8		
PF	0.5	0.5	0.5	0.93	0.93
V LL	180.9	181.1	182.1	380.0	460-480
I	17.3	17.3	17.4	295.0	12 - 37
THD V	0.784	0.680	0.763		<2
THD I	1.906	1.980	1.862		<2
c.f. V	1.784	1.791	1.783		1.41 - ?
c.f. I	1.882	1.886	1.861		1.41 - ?
V Unbal.[%]		0.391			<2
I Unbal.[%]		0.423			<3
Freq. [Hz]		20.195		60.0	59.8-60.2

When we enter Detail Power it displays the same data as the data that is displayed when we enter the Energy Menu that we see on the right side of the window.

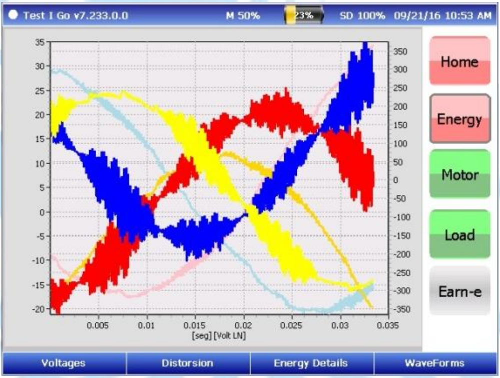
WaveForms

The fourth option in the bottom bar is WaveForms, when entered it displays another three options; 1) “Voltages & Currents” 2) “VFD Details” and 3) “V/I Spectrum”.



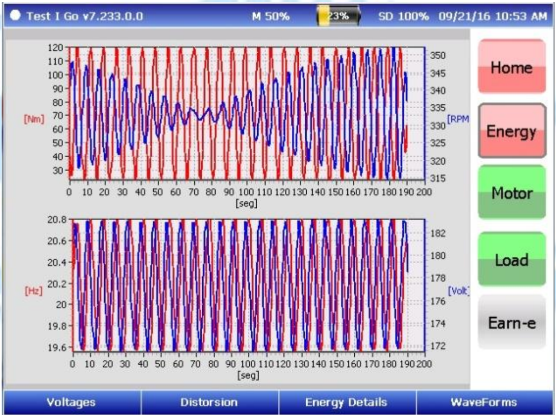
WaveForms/Voltages & Currents

Displays the waveforms for all three current and voltage measurements.



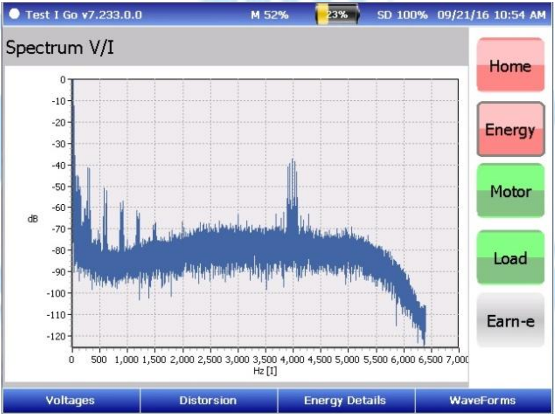
WaveForms/VFD Details

In this window we can find the dynamic behavior of voltage level, torque, frequency, and speed as a function of time.



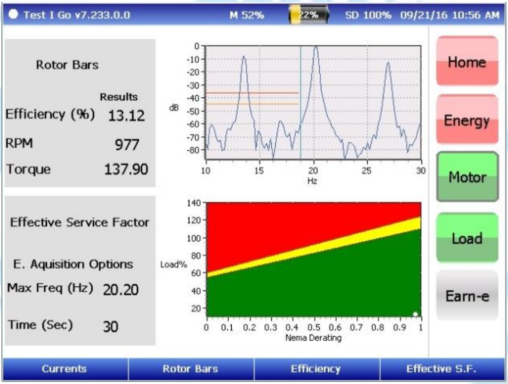
WaveForms/V/I Spectrum

Through this function we can analyze the frequency spectra of the three line-to-neutral voltage waveforms and the three line currents independently of each other.



Motor Menu

In this menu we find that the window is divided in two. The top part shows the Rotor Bar function, while on the bottom we see the Effective Service Factor function.



Rotor Bar

The way this function operates is: it records the relative amplitude of the rotor-bar sideband, and compares the rotor cage signature to stored thresholds.
An overall condition evaluation of the machine can be achieved with this function.
It’s been shown that situations like excessive heat on the machine, decreasing efficiency, shortening insulation life, and even possibly core damage can be the result of broken rotor bars.

Effective Service Factor

This function displays the estimated percentage load derated with the NEMA derating factor.

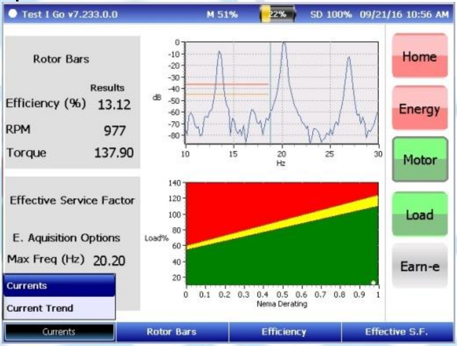
The Effective Service Factor test identifies how closely to its effective service factor is the motor operating. Through this test we can predict heat-based deterioration and provide an accurate thermal assessment of the motor.

Bottom blue buttons:

In the Motor Menu we find that the bottom blue buttons are now:
Currents, Rotor Bars, Efficiency and Effective S.F.

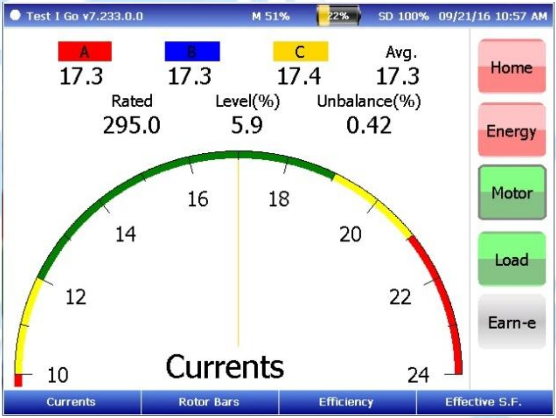
Currents

Within this option we find another two options: “Currents” and “Current Trend”.



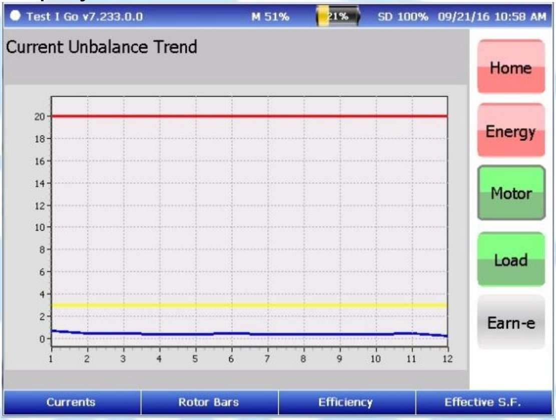
Currents/Currents

In this window we find information about the Rated current, Level(%) current and Unbalance(%) current.



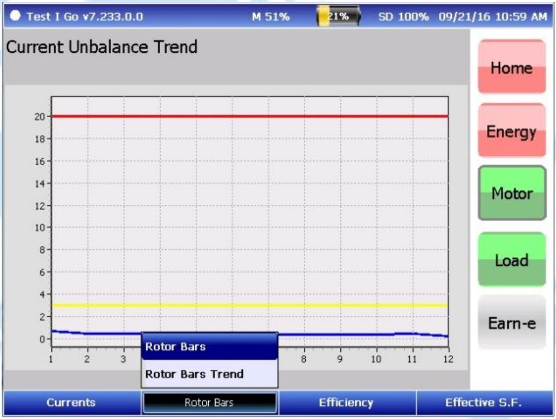
Currents/Current Trend

Displays the Current Unbalance Trend.



Rotor Bars

Within this option we find another two options: “Rotor Bars” and “Rotor Bars Trend”.

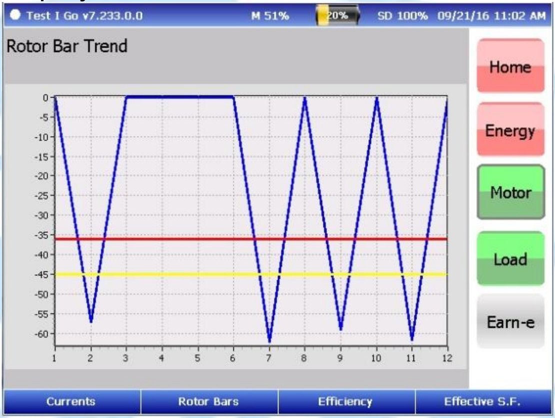


Rotor Bars/Rotor Bars

This option displays a more detailed approach to the Rotor Bar function that has been already described, by showing the Sideband Amplitude (db), the SideBand Frequency (Hz) and the Fund. Frequency (Hz).

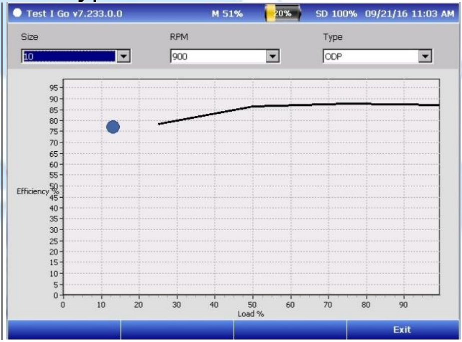
Rotor Bars/Rotor Bars Trend

Displays the Rotor Bar Trend.



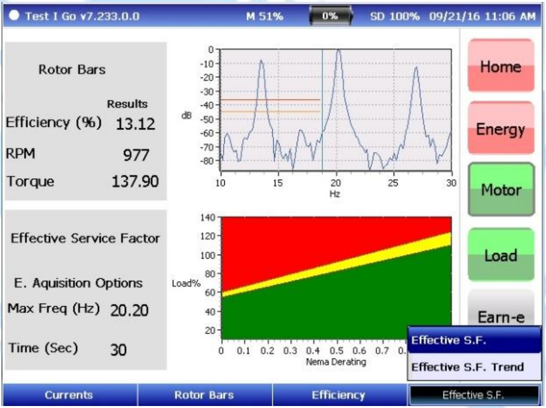
Efficiency

This window provides a graphic of the electrical data for the test. On the y-axis we see the efficiency % while on the x-axis we see the load %.
On top of the window we find three variables that we can modify: ODP, RPM and Type.



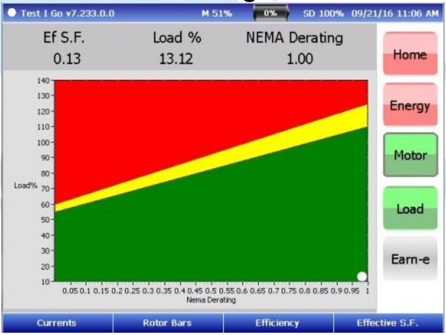
Effective S.F.

Within this option we find another two options: “Effective S.F.” and “Effective S.F. Trend”.



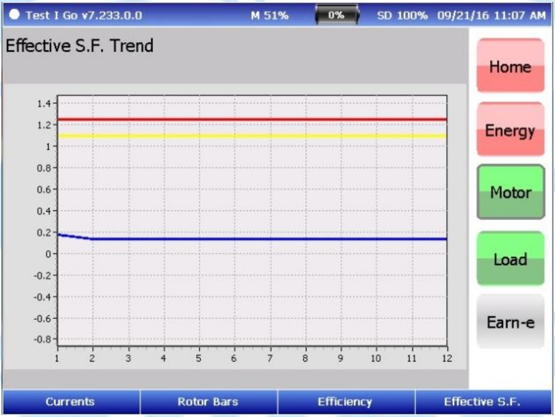
Effective S.F./Effective S.F.

This function takes a closer look into the Effective Service Factor function that has already been explained above. We find the NEMA Derating on the x-axis and the Load % on the y-axis.
Additionally we see specifications in the top part of the window: Ef S.F., Load % and NEMA Derating.



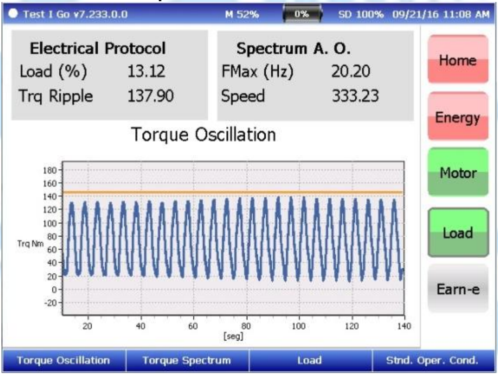
Effective S.F./Effective S.F. Trend

Displays the Effective S.F. Trend.



Load Menu

In this menu we find a graphical display of the torque oscillation; the window shows the measured torque over time compared to the rated torque calculated from the motor nameplate information.



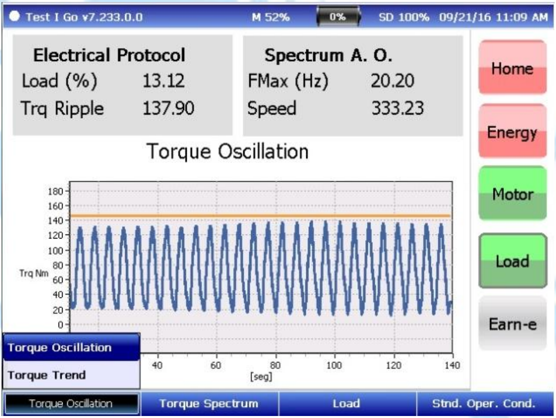
The “Electrical Protocol” division on the top left part of the window shows the Load (%) and the Torque Ripple. While the Spectrum A.O., on the right side, shows the Fmax (Hz) and the Speed.

Bottom blue buttons

The Load Menu bottom blue buttons are: **Torque Oscillation**, **Torque Spectrum**, **Load**, and **Stnd. Oper. Cond**.

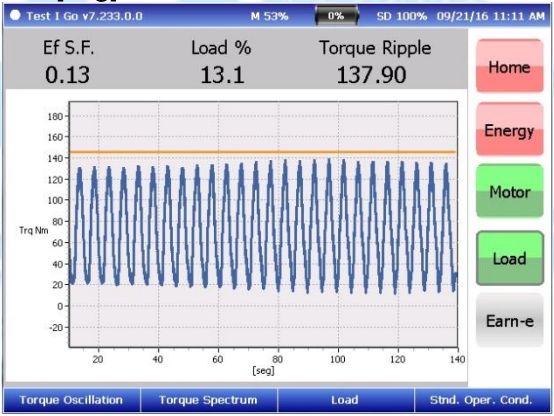
Torque Oscillation

When entered, this option displays another two options: “Torque Oscillation” and “Torque Trend”.



Torque Oscillation/Torque Oscillation

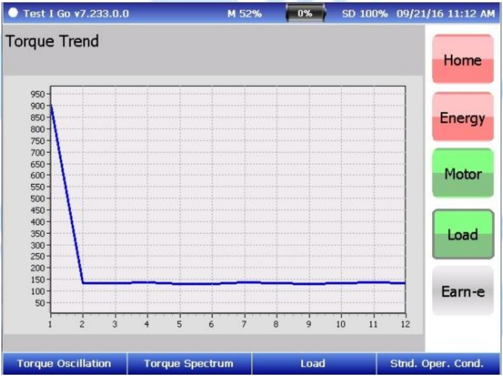
This window is very much like the main window that has already been described. We find the graphical display of the torque oscillation with Torque Newton Meter (Abbreviated as “Trq Nm”) on the y-axis, and [seg] on the x-axis.



In addition on the top we see the Effective Service Factor, the Load % and the Torque Ripple.

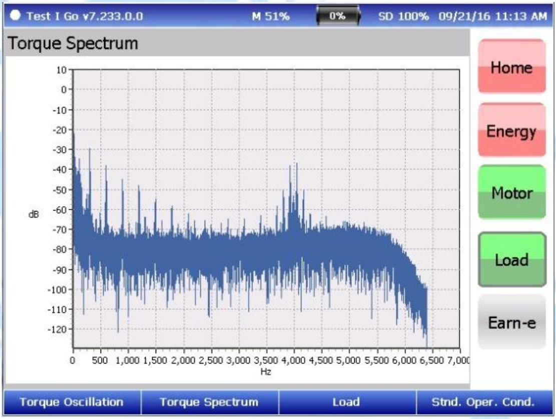
Torque Oscillation/Torque Trend

Displays the Torque Trend.



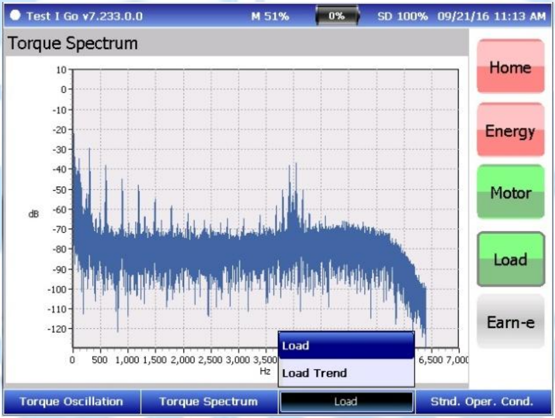
Torque Spectrum

This option displays a window in which it's shown the frequency spectra of torque; with dB on the y-axis and Hz in the x-axis.



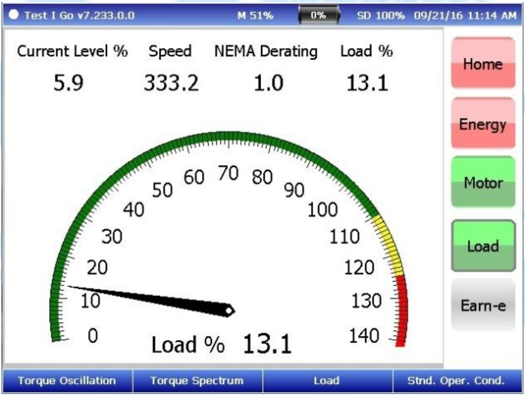
Load

This option displays another two options: "Load" and "Load Trend".



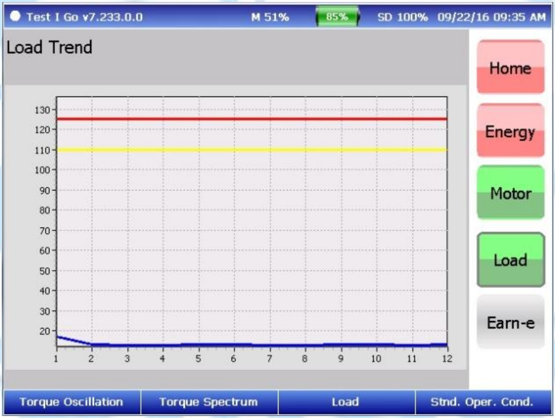
Load/Load:

Displays a window in which we see the Current Level %, the Speed, the NEMA Derating and Load %.
A Load % graphic is seen in the bottom part of the window.



Load/Load Trend

Displays the Load Trend.



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