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PowerTest

Special Modules

VERSION: **PowerTest Special Modules-AE-2.10**
DATE : **23/09/2011**

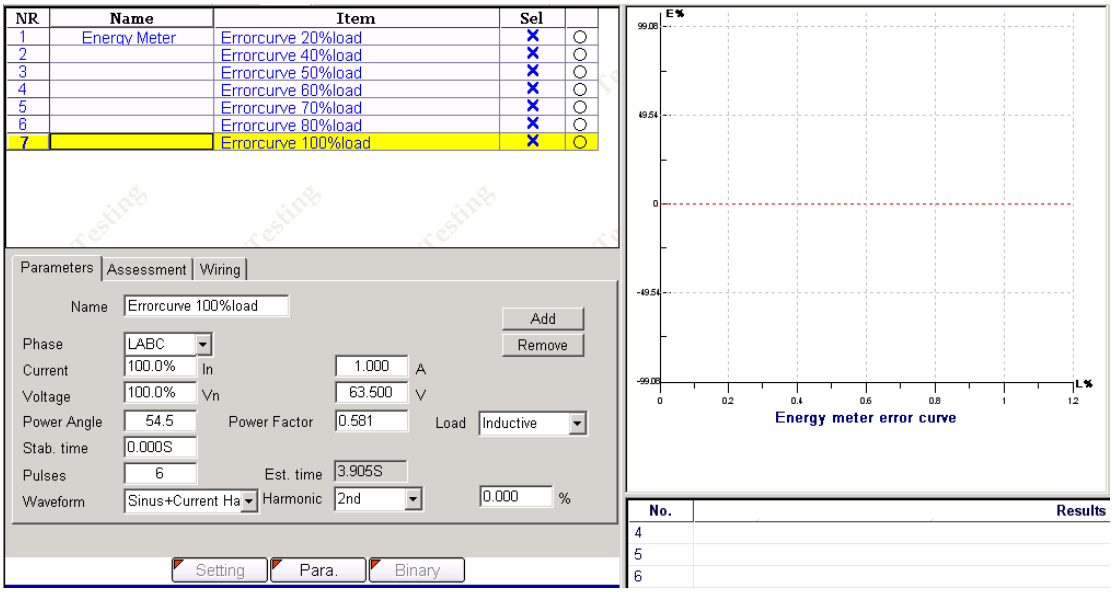
Contents

1. Energy Meter

This module is designed to check the functionality and accuracy of energy meter.

Following type of 1-phase or 3-phase energy meters can be checked.

- Active power meter
- Reactive power meter
- Apparent power meter



Note: to check some type energy meters the ***optional scanning head*** is required to turn the LED flash on energy meter into electrical pulse which can be sensed by the test set. Please contact the manufacture for more details regarding the scanning head

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Set group parameters

Click Para. button to enter into group parameter page. Group test parameter page along with default settings is shown bellow

Name	Value	Variable
Meter type	P	MeterType
Select	Pulse/kVARh(kWh,k	PulseType
Constant	50000.000	Constant
CT ratio	1.000	Kct
PT ratio	1.000	Kpt

Meter type

P Active power meter
Q Reactive power meter
S Apparent power meter

Select

Pulse/kVARh(kWh,kVAh)
Select pulse unit as pulse per kVARh((kWh, kVAh)

VARh(Wh,VAh)/Pulse
Select pulse unit as kVARh((kWh, kVAh) per pulse

Constant

Defines the number of pulse for 1 KVARh(kWh, kVAh) if we select ***Pulse/kVARh(kWh,kVAh)***

Defines the KVARh(kWh, kVAh) value for each pulse if we select ***kVARh(kWh,kVAh)/Pulse***

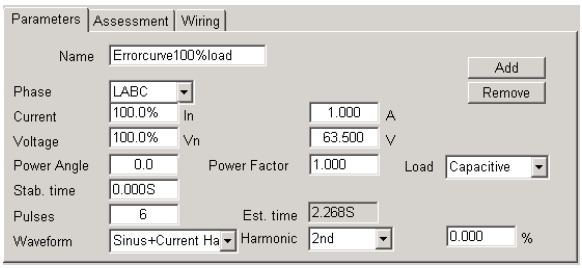
Example

- Select to test kWh meter
- Seect ***Pulse/kVARh(kWh,kVAh)***
- Set ***Constant*** as 100: indicate that each 100 pulses represents 1 kWh
- Set ***Pulses*** in test parameters page as 6: indicate that we are going to sense only 6 pulses for the whole test process. The total kWh measured for the whole test process should be 6/100=0.06kWh

PT ratio
Ratio for voltage in case

CT ratio
Ratio for Current

Set test parameters

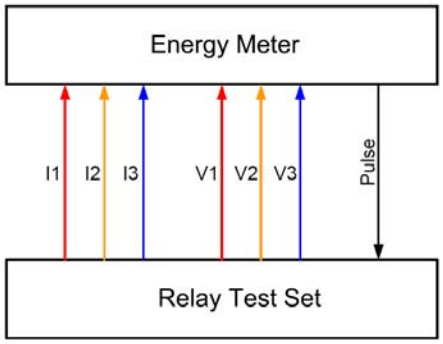


Name
Edit here the name for the current test point

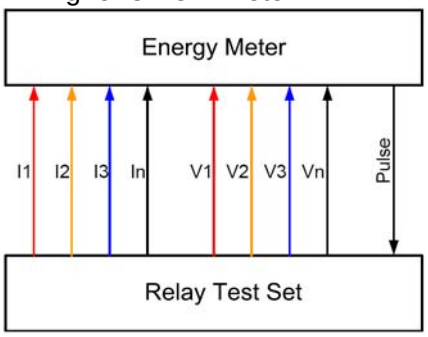
Phase
Indicate the wiring type for the energy meter.

LABC for 3-phase 3-wire meter and 3-phase 4-wiring meter

Wiring for 3P-3W meter

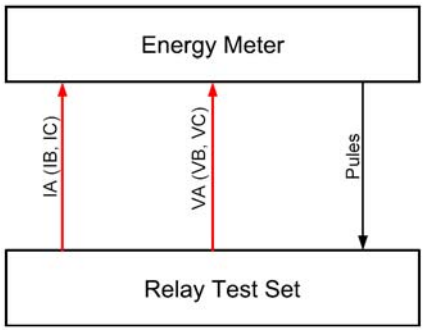


Wiring for 3P-3W meter



LA, LB,LC for single phase meter

Wiring for single phase meter



Note: Pulse output from energy meter or scanning head must be connected to binary input 1

Current
Percent of rate current

Voltage
Percent of rate voltage

Power angle, Power Factor, Load
Set angle or power factor which will be influenced by the selection of ***Load***

Stab. time
Stabilization time required for energy meter to enter into stable working condtion

Pulses
Pulses numbers to be sensed for testing.

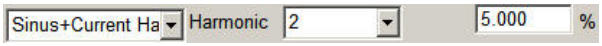
Est. time
Time required for the test and this time is calculated based on the ***Pulses*** number setting and the voltage and current settings.

Waveform
We can select to add harmonic to the voltage or current output.

Sinus	no harmonic in the output
Sinus+Current Harmonic	add harmonic to current output
Sinus+Current Harmonic	add harmonic to current output

The harmonic number and percentage can also be set

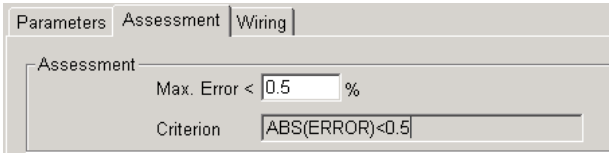
Example



In this example we have set to add 5% of 2nd harmonic to the current to be supplied to the energy meter.

Set assessment criterion

Click ***Assessment*** to enter into criterion setting page



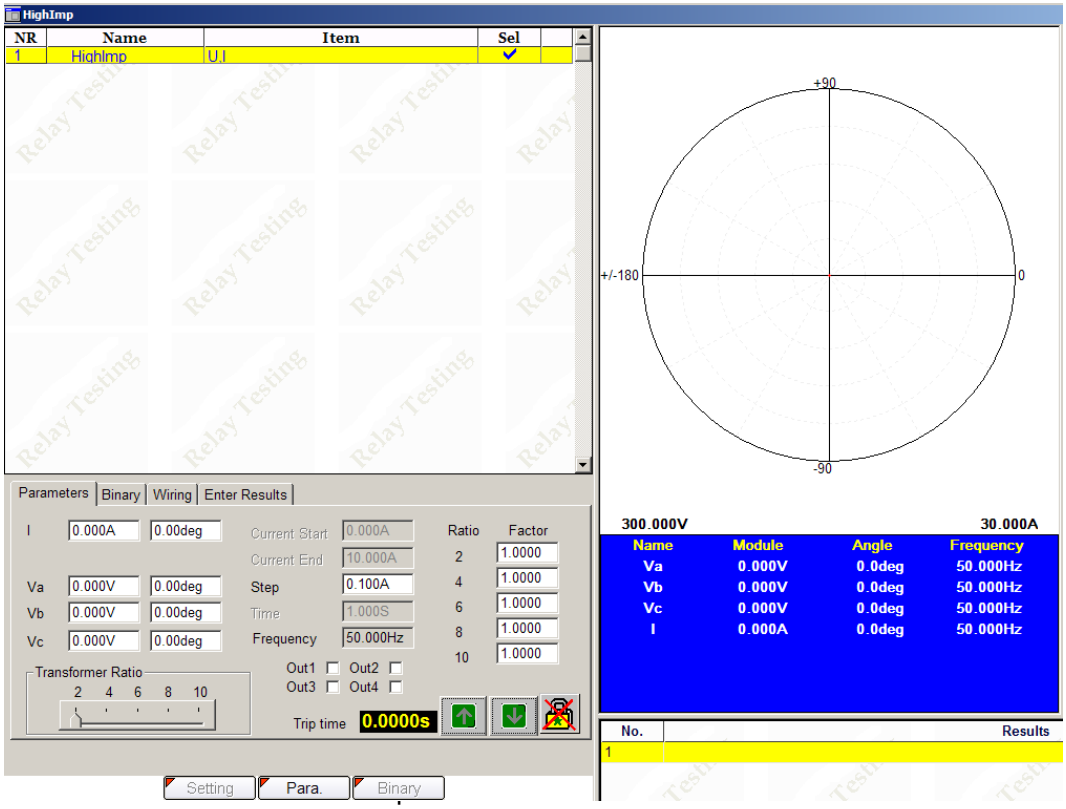
We can set the value based on the accuracy of the meter under test

2. High Burden Relay

This module is used to test high burden relay along with ***optional Phpc-01 Current Booster***.

Connected to the main test set the Phpc-01 Current Booster will provide one channel current source and will be controlled by this module.

Necessary voltage sources can also be provided to make relay in proper working condition.



refer to ***optional Phpc-01 Current Booster*** user manual

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3. Power Swing Simulation

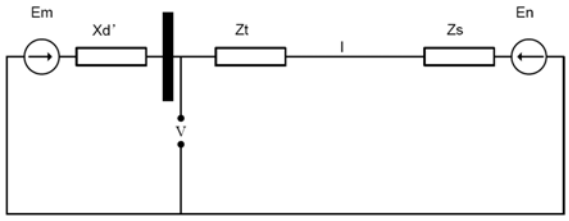
General

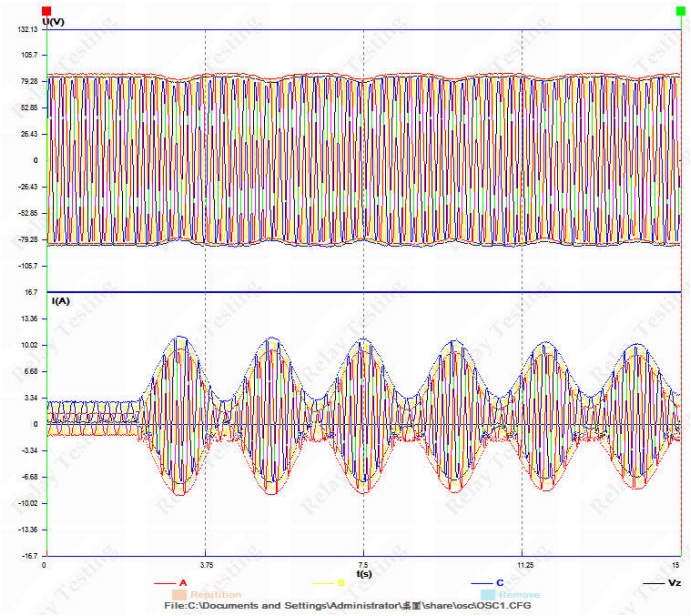
This module is used to simulate the power swing. This can be a tool for relay test engineer to observe the relay behavior during dynamic power swing process.

Principle of power swing

Important feature of power swing is as follow.

- phase angle between Generator and Load will swing
- The voltage and current will also have swing





Simulation principle

The typical system model used for simulating the power swing is as follows

For such a system the swing frequency is determined by swing cycle ***T.***

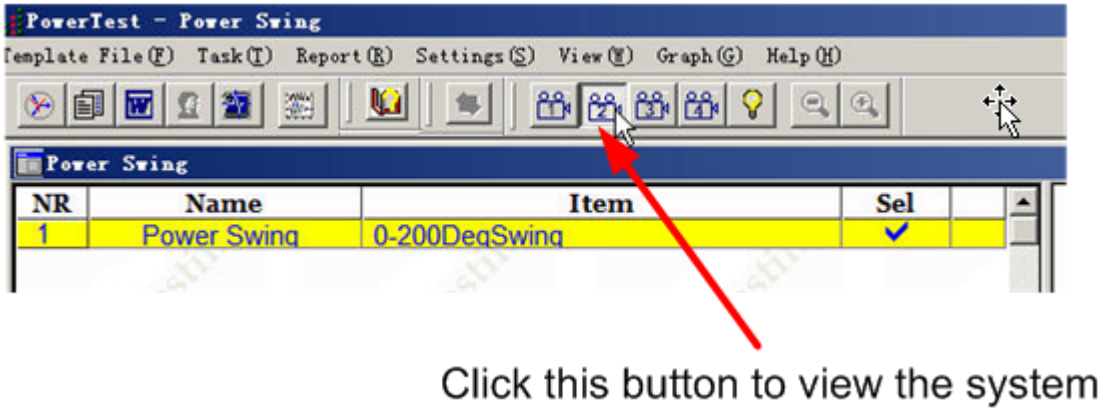
We can easily simulate the power swing by defining the following settings:

Power angle	angle between the Generator and Load
Swing cycle	the time used to complete one cycle of swing
Swing numbers	how many swing cycles we want to simulate
Em/En	the direction of power swing

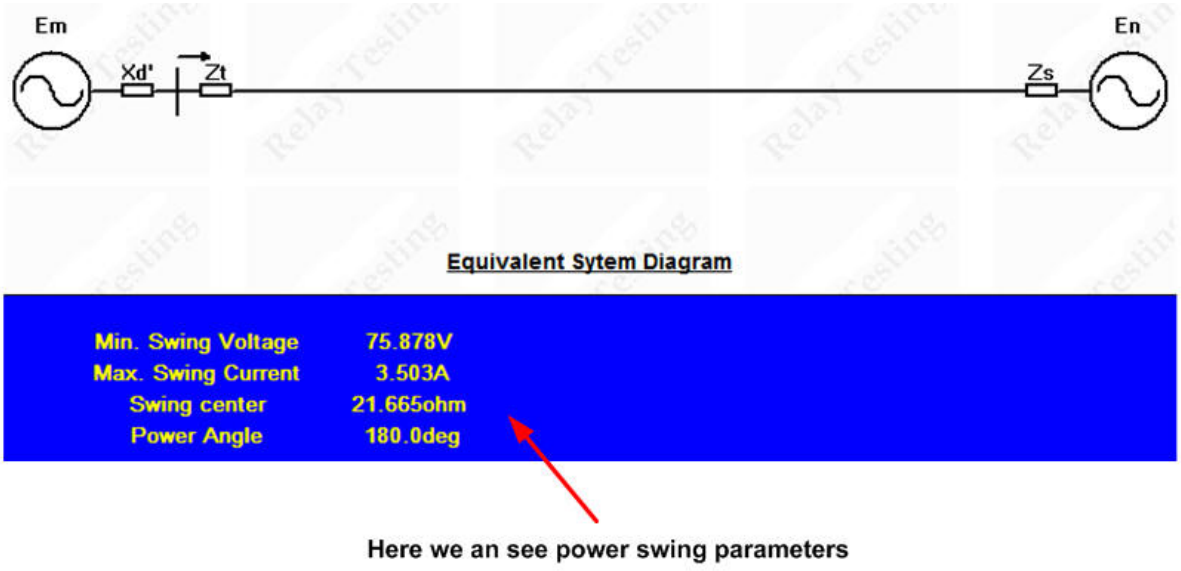
Internally the swing voltage and current will be calculated by taking account of the above parameters and other parameters in our power swing module.

Power swing parameters

Switch the view button to display swing model and parameters



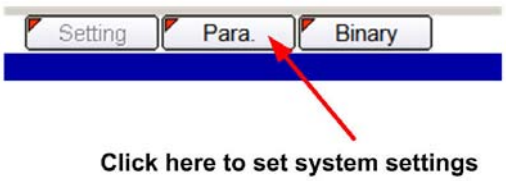
Then the follow window will pop up.



The power swing center is calculated by taking account of system settings set in group parameters.

The position of power swing center can be changed by changing the system settings

Set group parameters

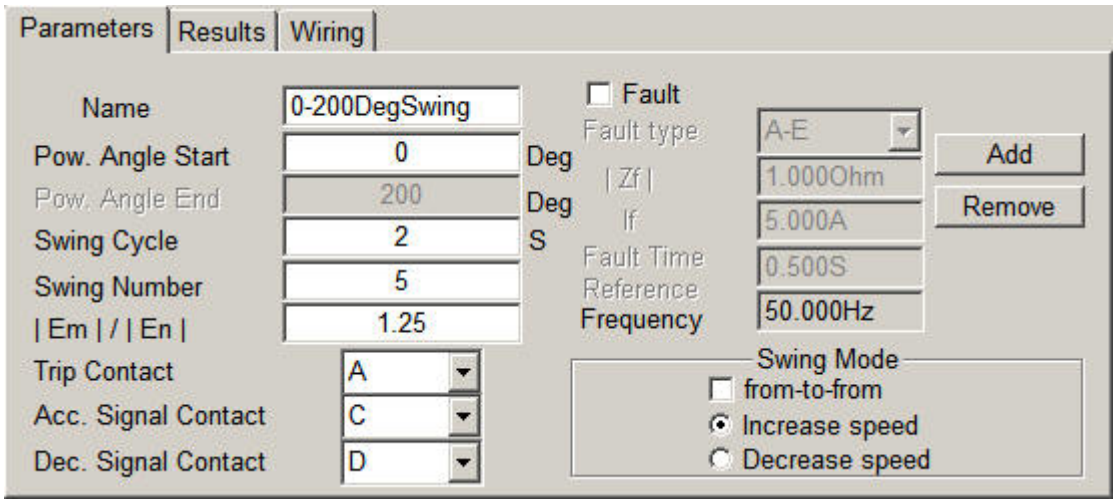


Group parameters setting page will appear

Name	Value	Variable
Tprefault	5.000S	PreFaultTime
CT Polarity	Line	CTPOINT
|Zs|	25.000Ohm	Zs
Phi(Zs)	90.000Deg	Phis
|Zt|	15.000Ohm	Zt
Phi(Zt)	78.000Deg	Phit
Xd'	1.000Ohm	Xd

Tprefault prefault time (will be used when simulating the power swing with fault)
CT Side select the installation position of CT (Line or Busbar)
\|Zs\| Equivalent system impedance for En
Phi(Zs) Impedance angle of Zs
\|Zt\| Line impedance
Phi(Zt) Impedance angle of Zt
Xd' Equivalent system impedance for Em

Set test parameters



Pow Angle Start start power angle

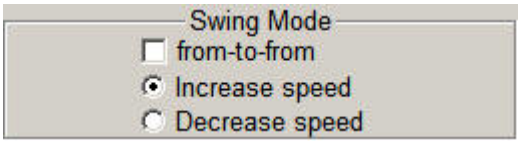
Pow Angle End end power angel (will be activated when 'from-to-from'is selected in 'Swing Mode')

Swing Cycle time used to complete on cycle of power swing (normally set range: 2-5s)

Swing Number number of power swing cycle to simulate

|Em|/|En| the ratio of Em/En

Swing mode selection



from-to-from swing angle will change from angle start to angle end and then from angle end to angle start

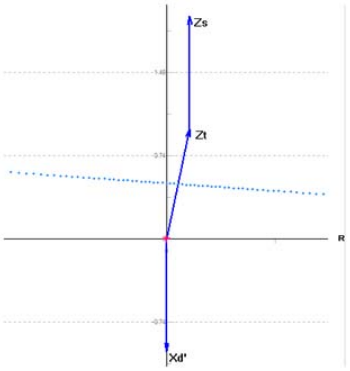
increase speed swing angle will change from angle start to angle end

decrease speed swing angle will change from angle end to angle start

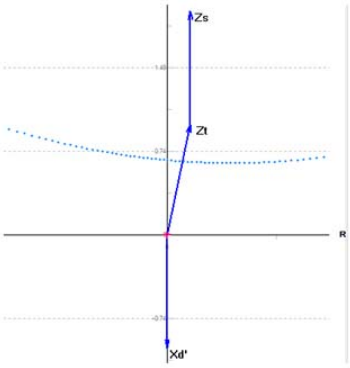
Set power swing center

The ratio of Em/En will influence the position of power swing center

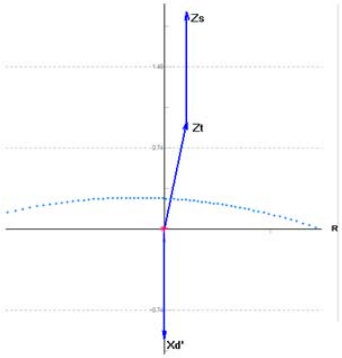
|Em|/|En| = 1



|Em|/|En| > 1



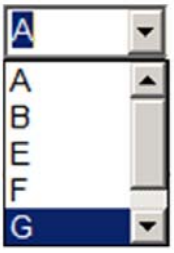
|Em|/|En| < 1



Set binary input

Trip Contact assign the binary input for sensing the tripping signal from the relay

Available binary inputs are A,B, E, F,G,H



Other settings

Acc. Signal Contact incoming ***Acceleration*** signal from relay

Dec. Signal Contact incoming ***Deceleration*** signal from relay

The above two parameters are mostly used when testing ***out-of-step relay***

Fault type fault type

|Zf| fault impedance

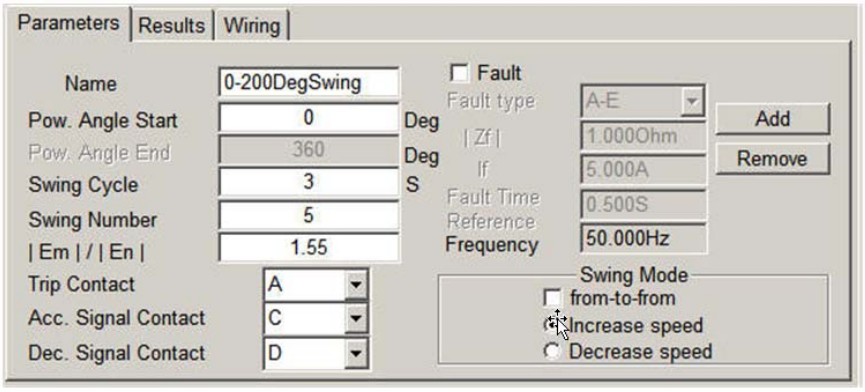
Fault time Reference this indicates when the fault will occur after power swing stars

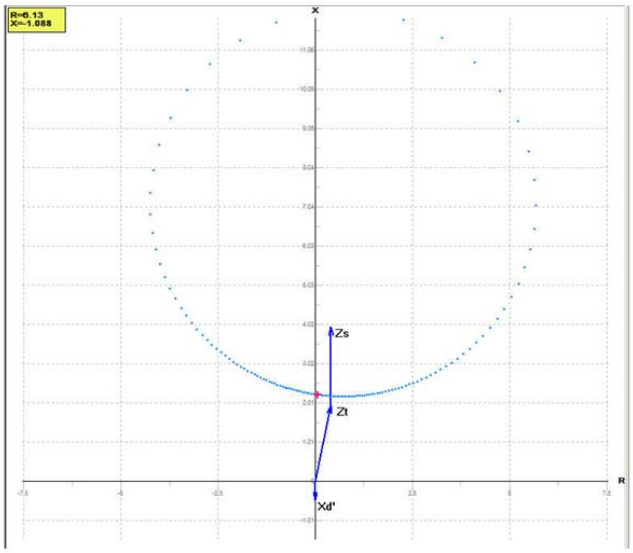
Frequency this is the reference frequency set in ***System Configuration***

Power swing example

In this example we have made the following settings

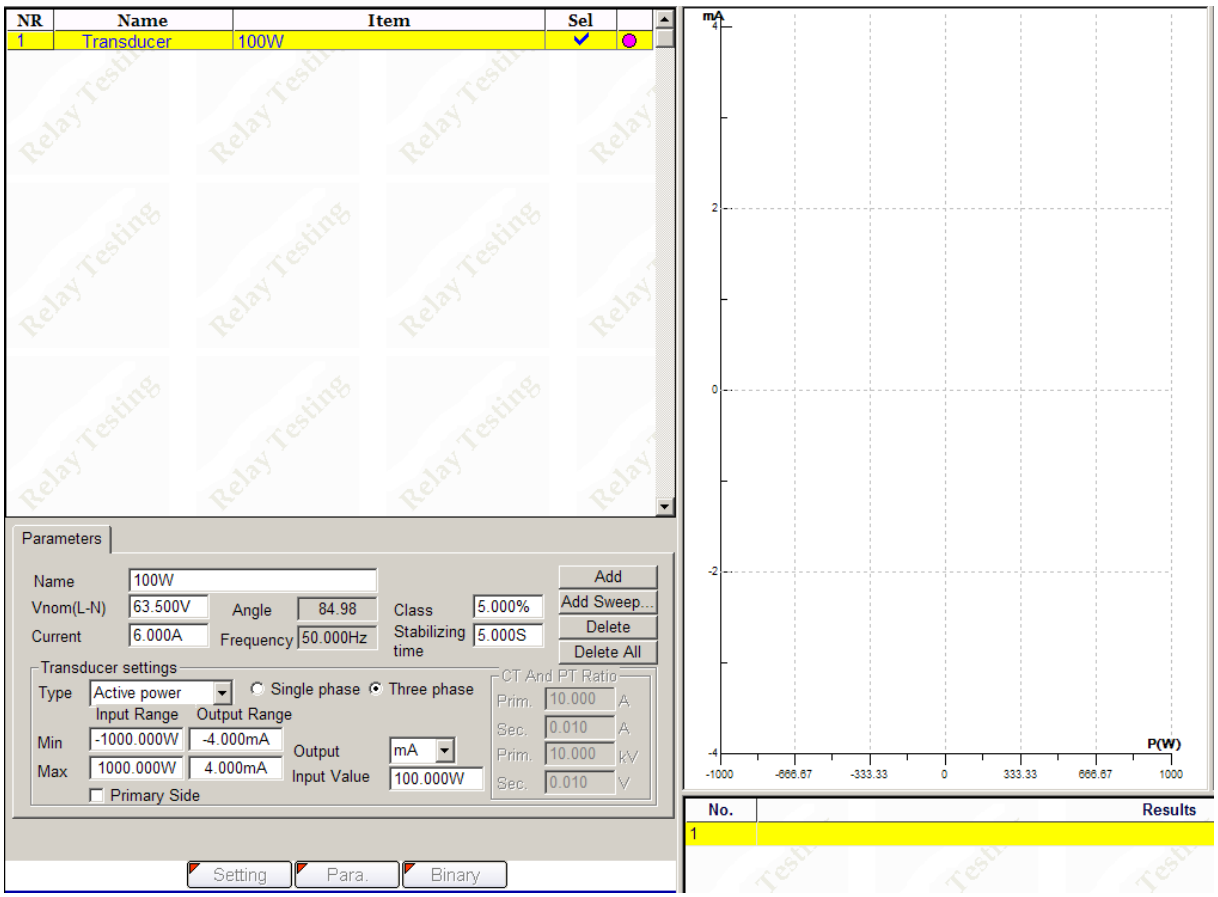
Name	Value	Variable
Tprefault	5.000S	PreFaultTime
CT Side	Line	CTPOINT
|Zs|	2.000Ohm	Zs
Phi(Zs)	90.000Deg	Phis
|Zt|	2.000Ohm	Zt
Phi(Zt)	78.000Deg	Phit
Xd'	0.500Ohm	Xd





4. Transducer

This module is used to check the accuracy of transducer

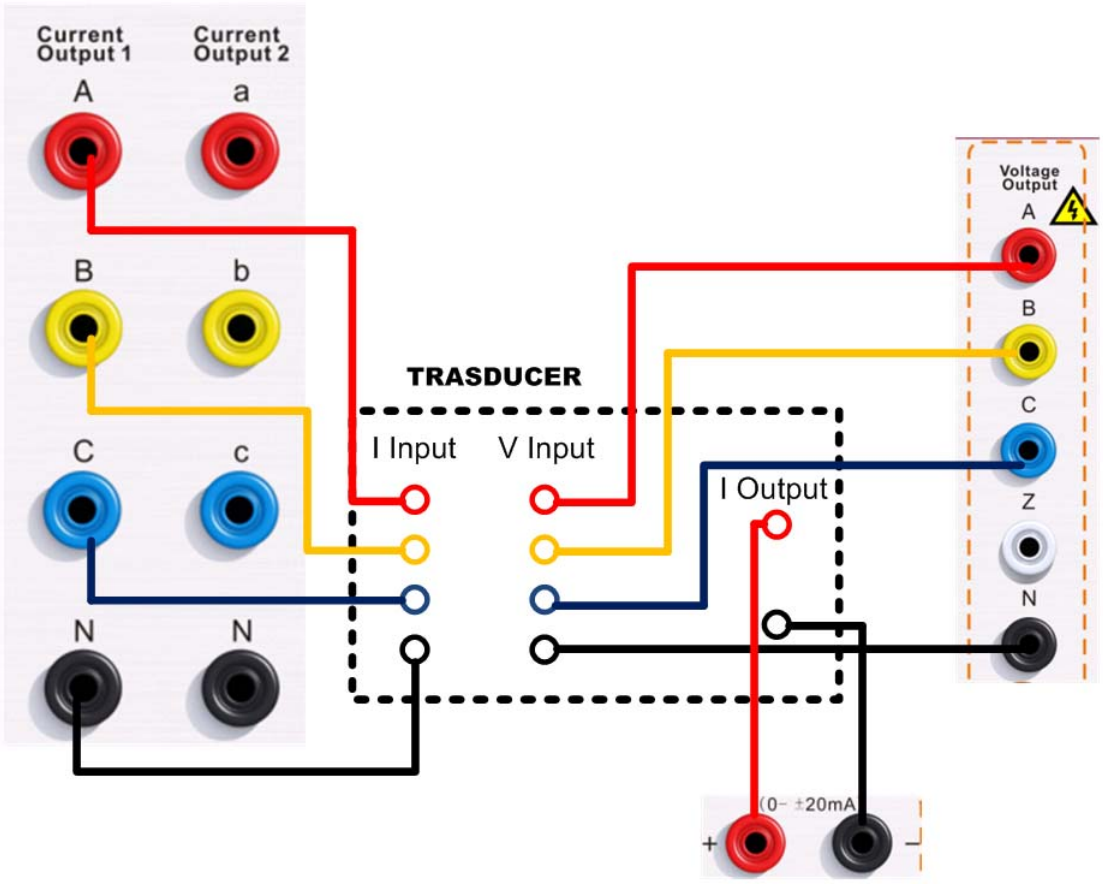


Example: test procedure for one typical transducer

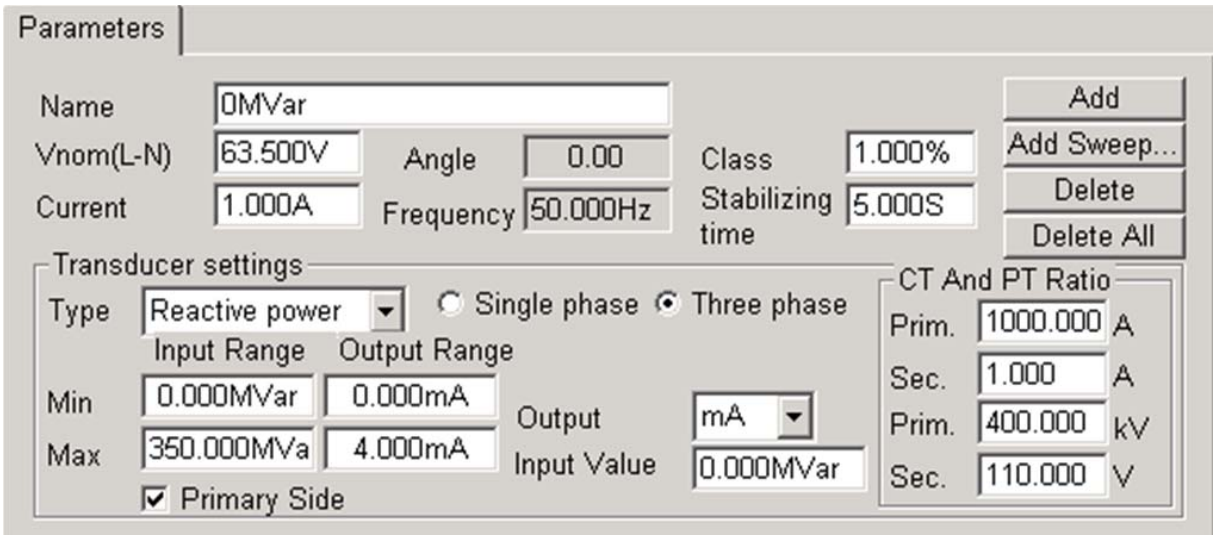
Transducer parameters

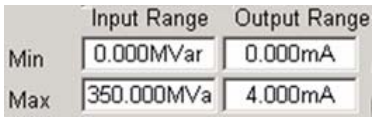
Transducer type	Var
Transducer connection	3 phase, 4 wires
Transducer range	0-350MVar
Transducer output type and range	Current, 0-4mA
Rate voltage:	110V
PT ratio	400KV/110V
Rate current	1A
CT ratio	1000A/1A

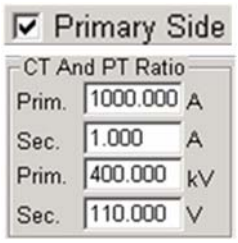
Test connection



Set test parameters

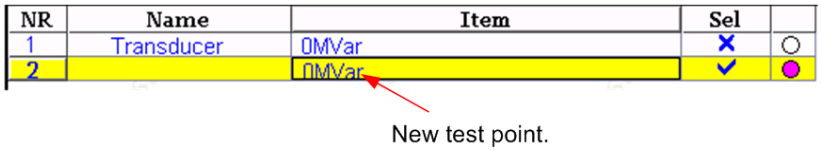


	nominal L-N voltage of transducer input
	output current to be injected into transducer
	angle between output voltage and current based on power
	power to be provided to the transducer
	select 3 phase (based on the type of transducer)
	Select Reactive power test (based on our test requirement)
	the measuring and output range of transducer
	the output type of transducer

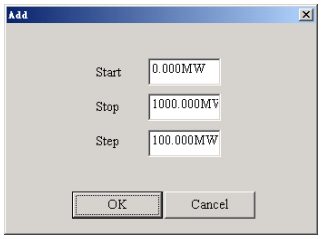
	Set the primary side rating in case transducer input reflects the primary side value
	The accuracy class of transducer and this setting will be used as the assessment criterion
	The average measuring values during this time will be used to reflect the actual accuracy of the transducer under test

Add test point

Click ***Add*** to add one point each time



Click ***Quick Add*** to add more test points each time



Start Start value of the test points.
Stop Stop value of the test points.
Step Step value.

Confirm the setting and we see new test points added in the test list

NR	Name	Item	Sel	
1	Transducer	0MVar	✗	○
2		50.000MVar	✓	●
3		100.000MVar	✓	●
4		150.000MVar	✓	●
5		200.000MVar	✓	●
6		250.000MVar	✓	●
7		300.000MVar	✓	●
8		350MVar	✓	●