

PowerFactory 2021

Technical Reference

Measurement Block

RelMeasure, TypMeasure

Publisher:

DIgSILENT GmbH Heinrich-Hertz-Straße 9 72810 Gomaringen / Germany Tel.: +49 (0) 7072-9168-0 Fax: +49 (0) 7072-9168-88

info@digsilent.de

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1 General Description

The Measurement block is typically used in any relay model to calculate the current and/or the voltage RMS values used by the protective elements. It is described by the type class TypMeasure and the element class RelMeasure. The block is used to define the following features of a relay model:

- · Analog filters.
- · Digital filters.
- · Sequence components calculation.
- · Earth current and voltage calculation.

Figure 1.1 illustrates a typical protective relaying application.

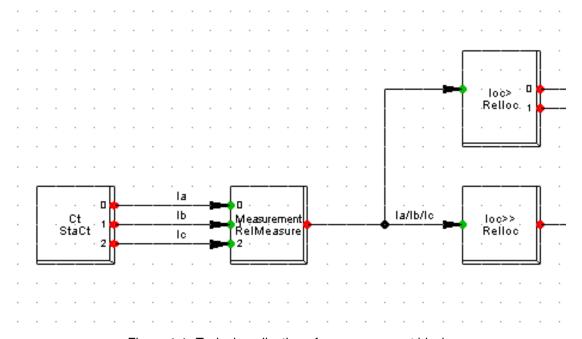


Figure 1.1: Typical application of a measurement block

The Measurement block receives always the inputs from a Ct and/or from a Vt block, while the output of the Measurement block will typically be sent to the protective element blocks. The function performed by a Measurement block will depend on whether a static or a dynamic simulation is being carried out. The output from a Measurement block will depend upon the status of the inputs as well as the operation that the user defines for the block.

1

1.1 Analog filters

A 2^{nd} order analog filter is active when a EMT simulation is run. Power Factory models an analog low pass filter with DC component filter.

The algorithm executed by the transfer procedure each simulation step is using two internal variables (S_1, S_2) and their derivative (S'_1, S'_2) . The algorithm is:

$$S_1' = (Value^n - Value^{n-1}) * 2\pi f$$

where:

 $S_1 = 1^{st} internal variable derivative$

 $Value^n = input value readduring then step of the simulation$

f = system frequency

$$S_2' = (Value^n - S_1 - S_2)/T_f$$

where:

 $S_2 = 2^{nd}internal variable derivative$

 $S_1, S_2 = 1^{st} and 2^{nd} internal variable$

 $Value^n = input value readduring then step of the simulation$

 $T_f = filtertime constant$

$$Output^n = \sqrt{2} * S_2 / \sqrt{1 + w^2 T_f^2}$$

where

 $Output^n = filter output value during then step of the simulation$

 $S_2 = 2ndinternal variable$

 $T_f = filter time constant$

1.2 RMS calculation using an Integral

A steady state (i.e.) voltage signal in the time domain can be described by the equation:

$$v(t) = V_{peak} * sin(\varpi t + \theta)$$

In a digital relay, this signal is sampled N times per cycle. Thus the input is represented by a series of samples, S_k , where k = 1 to N.

"Rectangle" method The following formula is used when the selected RMS calculation method is "Rectangles":

$$V = \sqrt{1/N \sum_{K=0}^{N-1} S_k^2}$$

"Trapeziums" method The following formula is used when the selected RMS calculation method is "Trapeziums":

$$V = \sqrt{1/N\sum_{K=0}^{N-1}(S_k^2 + S_{k+1}^2)/2}$$

1.3 Digital filters

The digital filters process the sampled data points, S_k , by multiplying each sample by a coefficient determined by the type of digital filter employed. The purpose of the digital filters is to remove the non-fundamental frequencies and to provide phasor information regarding the fundamental frequency.

The following digital filters are available:

- DFT
- DFT 1/2 cycle
- FFT
- · Cosine Filter

1.3.1 DFT

The equation

$$v(t) = V_{peak} * sin(\varpi t + \theta)$$

can be expanded as

$$v(t) = V_{peak} * sin(\varpi t) * cos(\theta_{\nu}) + V_{peak} * sin(\theta_{\nu})cos(\varpi t)$$

When v(t) is sampled, the resulting sample values are denoted by S_k . Since S_k represents sampled values with a fixed sample rate of N samples per cycle of sinusoidal voltage, the Discrete Fourier Transform Calculation of the fundamental components can be defined by the following equations:

$$V_{real} = (2/N) * \sum_{K=1}^{N} |S_K sin(2\pi * k/N)|$$

$$V_{imag} = (2/N) * \sum_{K=1}^{N} |S_K cos(2\pi * k/N)|$$

Applying these equations to the original voltage equation results in the following expressions:

$$V_{real} = V_{neak} * cos(\theta_{\nu})$$

$$V_{imag} = V_{peak} * sin(\theta_{\nu})$$

The magnitude of the voltage phasor can be calculated by the following equation:

$$V_{magn} = \sqrt{V_{imag}^2 + V_{real}^2}$$

The phase angle of the voltage phasor can be calculated by the following equation:

$$V_{angle} = \arctan(V_{imag}/V_{real})$$

With these definitions, the Discrete Fourier Transform calculation is able to convert the sinusoidal voltage wave shape to a phasor. The phasor is represented by two forms, the first form is the rectangular form where the real and imaginary components define the phasor; the second form is the polar form where the magnitude and the phase angle define the phasor. A measurement block using the Discrete Fourier Transform calculation determines the real and imaginary

parts of each of the currents and/or voltages present as block inputs. This means that each current and voltage sample is multiplied by a sine factor to obtain the real component and by a cosine factor to obtain the imaginary component. These quantities will then be summed over N consecutive samples to obtain the actual components. The measure block is currently using the rectangular form to represent the calculation results: for each input quantity the block will output 3 values: the magnitude (also described as instantaneous RMS), the real and the imaginary component of the RMS phasor. For instance the Phase A current block input will generate the I_A, Ir_A and Ii_A block outputs.

1.3.2 DFT 1/2 cycle

The Discrete Fourier Transform has the capability of working on different sized windows. The Full Cycle window generates the sums using all the sampled data collected over the last cycle. This means that the "window" includes the last full cycle's worth of data. The Half Cycle window generates the sums using the sampled data collected in the last half cycle. Therefore, the data "window" is a half cycle. Using a Half Cycle window allows the Discrete Fourier Transform to more quickly track a change in the sampled datathan is possible with a Full Cycle window. Also, less data will need to be saved for Half Cycle window than a Full Cycle window.

1.3.3 FFT

If the number of samples per cycle is great and equal to 2n it could be interesting to use a Fast Fourier Transform algorithm instead of the normal DFT method. The standard DIgSILENT FFT library is used when the "FFT" filter is selected.

1.3.4 Cosine Filter

The Discrete Fourier Transform described previously uses sine and cosine coefficients to develop the real and imaginary components of the filtered signals. In order to obtain the real and imaginary components, two signals 90 electrical degrees apart are required; the sine and cosine coefficient meet this requirement in the Fourier approach. Another approach is to only use the coefficients from the cosine with the second signal being the cosine value from the calculation 90 electrical degrees previous. This method requires that only one set of calculations be performed for each sample rather than the two sets required with the Fourier. The Cosine filter uses a one and a quarter cycle window rather than the one cycle window used by the Fourier, and therefore slower operating times may be expected.

1.4 Measurement block types

The following types of measurement block are available:

- · 3ph. RMS Currents.
- · 3ph. RMS Delta Currents.
- RMS Sequence Currents.
- 1ph. RMS Current.
- · 3ph. Currents and Voltages.

- · Single Phase Current or Voltage.
- 3ph. Currents/Delta Voltages.
- · Single Phase Current and Voltage.
- · Sequence Currents and Voltages.
- 1ph. RMS Current+Select.
- · 3ph.Delta Currents and Voltages.
- · ABB Discontinuity Current.

1.4.1 3ph. RMS Currents

This measurement type provides in a 3 phases system the phase current RMS values, the zero sequence current RMS value and the negative sequence current RMS values. The greater between the phase current RMS signals is returned in a separated output signal("Imax"). If the zero sequence current inputs (wl0x3r and wl0x3i) are connected the zero sequence RMS value is measured directly otherwise if the "Calculate earth current/Voltage" check box in the measurement type dialogue ("TypMeasure" class) is set, the value is calculated internally using the phase current values . The block returns only current RMS values, no voltage input/output signals are available.

1.4.2 3ph. RMS Delta Currents

This measurement type provides the same features and the same signal mapping of the *3ph. RMS Currents* measurement type but it calculates internally the delta currents values.

1.4.3 RMS Sequence Currents

This measurement type provides in a 3 phases system the positive sequence current RMS value, the zero sequence current RMS value and the negative sequence current RMS value. If the zero sequence current input signals ("wl0x3r" and "wl0x3i") are connected the zero sequence RMS value is measured directly otherwise if the *Calculate earth current/Voltage* check box in the type measurement dialogue is set, the value is calculated internally using the phase current values. The block returns only RMS values, no voltage input/output signals are available.

1.4.4 1ph. RMS Current

This measurement type provides for a single phase the current RMS value calculated using the current real and imaginary values.

1.4.5 3ph. Currents and Voltages

This measurement type provides in a 3 phases system the phase current and voltage RMS values and instantaneous values (real part and imaginary part), the zero sequence current

RMS value and instantaneous values (real part and imaginary part), the negative sequence current RMS values. The greater between the phase current RMS signals is returned in a separated output signal("Imax"). If the zero sequence current and voltage inputs ("wl0x3r", "wl0x3r", and "wU0x3i") are connected the zero sequence RMS values are measured directly otherwise if the *Calculate earth current/Voltage* check box in the measurement type dialogue (TypMeasure class) is set, the values are calculated internally using the phase current and voltage values. It is the widely used measurement block. It provides a whole set of current and voltage signals. Only when a complete set of sequence quantities instantaneous values is required the "Sequence current and voltage" measurement type must be used.

1.4.6 Single Phase Current and Voltage

This measurement type provides for a single phase the current and the voltage RMS values and instantaneous values (real part and imaginary part) calculated using the current and the voltage real and imaginary part input values.

1.4.7 3ph. Currents/Delta Voltages

This measurement type provides in a 3 phases system the phase current and the phase-phase voltage RMS values and instantaneous values (real part and imaginary part). This measurement type provides a whole set of phase current and phase-phase voltage signals. The phase-phase voltages are calculated internally. If the zero sequence current and voltage inputs ("wl0x3r" and "wl0x3i", "wU0x3r" and "wU0x3i") are connected the zero sequence RMS values are calculated otherwise if the *Calculate earth current/Voltage* check box in the measurement type dialogue (TypMeasure class) is set, the value are calculated internally using the phase current and voltage values .

1.4.8 Sequence Currents and Voltages

This measurement type provides in a 3 phases system the positive sequence current and voltage RMS values and instantaneous values (real part and imaginary part), the zero sequence current and voltage RMS values and instantaneous values (real part and imaginary part), the negative sequence current and voltage RMS values and instantaneous values (real part and imaginary part). If the zero sequence current and voltage inputs ("wl0x3r" and "wl0x3i", "wU0x3r" and "wU0x3i") are connected the zero sequence RMS value is measured directly otherwise if the *Calculate earth current/Voltage* check box in the type measurement dialogue is set, the values are calculated internally using the phase current and voltage values.

1.4.9 Single Phase Current or Voltage

This measurement type provides for a single phase the current or the voltage RMS value and instantaneous values (real part and imaginary part) calculated using the real and imaginary part input values (only 2 input values).

1.4.10 1ph. RMS Current+Select

This measurement type provides for a 3 three phases system the current RMS value and instantaneous values (real part and imaginary part) calculated using the real and imaginary part input

values of the phase corresponding to the value of the "iphase" input signal/parameter. Please set "iphase" equal to 0 to use the phase A values or set "iphase" equal to 1 to use the phase B values or set "iphase" equal to 2 to use the phase C values.

1.4.11 3ph.Delta Currents and Voltages

This measurement type provides in a 3 phases system the phase-phase current and the phase-phase voltage RMS values and instantaneous values (real part and imaginary part). The greater between the phase-phase current RMS signals is returned in a separated output signal ("Ilmax"). This measurement type provides a whole set of phase-phase current and voltage signals.

1.4.12 ABB Discontinuity Current

This measurement type provides the same signals of the *3ph. Currents and Voltages* measurement type (see1.4.5) plus the "I_DI" output signal.

The parameters used to configure the operation of the Measurement block are described in the following section.

2 Functional Parameter Descriptions

Parameters are referenced within this document using the following convention. A: B - C, where,

- *A* is the level of extraction of the block model at which the parameter can be edited.
- B is the description of the parameter used within the dialogue associated with A.
- *C* is the parameter name used within the software.

2.1 TypMeasure parameters

2.1.1 TypMeasure: Object modified - gnrl_modif

Purpose: To record the date and time at which the TypMeasure object was last modified to facilitate error tracking etc.

Definition: Each time the user edits the TypMeasure object, the date and time of the operation is recorded. The date and time recorded is the time at which the user accepts the modification.

Use: Info for the user.

2.1.2 TypMeasure: Object modified by - gnrl_modby

Purpose: To record the name of the user who last modified the TypMeasure object to facilitate error tracking etc.

Definition: The name of the user is derived from the *PowerFactory* username active at the time the object was modified. The username is recorded only when the user accepts the modification.

Use: Info for the user.

2.1.3 TypMeasure: Name - loc_name

Purpose: To allow the user to define a unique name for any TypMeasure object.

Definition: The user may input any name up to 40 characters in length.

Use: The chosen name is then used within multiple dialogues encountered throughout the user interface. In particular, when using the object browser.

2.1.4 TypMeasure: Nominal Current - rInom

Purpose: To define the range of nominal current settings that are available within the relay hardware model.

Definition: The range of available settings can be entered as a stepped, discrete or continuous range. A stepped range is entered using the following convention x-y;z. Where x is the minimum current setting in the range, y is the maximum current setting in the range and z is the step interval. A discrete range is entered using the convention, x;y;z;...etc up to a limit of 80 characters where x,y, and z represent discrete current settings. A continuous range is entered using the convention x-y where x is the minimum current setting in the range and y is the maximum current setting in the range.

Use: The selected range is presented when selecting parameter *RelMeasure: Current Setting - Inom* (see 2.2.3) so that a precise setting can be selected.

2.1.5 TypMeasure: Nominal Voltage - rUnom

Purpose: To define the range of nominal voltage settings that are available within the relay hardware model.

Definition: The range of available settings can be entered as a stepped, discrete or continuous range. A stepped range is entered using the following convention x-y;z. Where x is the minimum current setting in the range, y is the maximum current setting in the range and z is the step interval. A discrete range is entered using the convention, x;y;z;...etc up to a limit of 80 characters where x,y, and z represent discrete current settings. A continuous range is entered using the convention x-y where x is the minimum current setting in the range and y is the maximum current setting in the range.

Use: The selected range is presented when selecting parameter *RelMeasure: Current Setting - Unom* (see 2.2.4) so that a precise setting can be selected.

2.1.6 TypMeasure: Current Setting - rls

Purpose: To define the range of current settings that are available within the relay hardware model.

Definition: The range of available settings can be entered as a stepped, discrete or continuous range. A stepped range is entered using the following convention x-y;z. Where x is the minimum current setting in the range, y is the maximum current setting in the range and z is the step interval. A discrete range is entered using the convention, x;y;z;...etc up to a limit of 80 characters where x,y, and z represent discrete current settings. A continuous range is entered using the convention x-y where x is the minimum current setting in the range and y is the maximum current setting in the range.

Use: The selected range is presented when selecting parameter *RelMeasure: Current Setting - Is* (see 2.2.5) so that a precise setting can be selected.

2.1.7 TypMeasure: Type - atype

Purpose: To define which kind of input currents and voltage the block gets and which kind of output current and voltage values must be calculated.

Definition: Twelve types can be selected in a combobox. These are 3ph. RMS Currents, 3ph. RMS Delta Currents, RMS Sequence Currents, 1ph. RMS Current, 3ph. Currents and Voltages, 3ph. Currents/Delta Voltages, Single Phase Current and Voltage, Sequence Currents und Voltages, Single Phase Current or Voltage, 1ph. RMS Current+Select, 3ph.Delta Currents and Voltages, and ABB Discontinuity Current.

Use: To configure the inputs and the outputs configuration.

2.1.8 TypMeasure: Calculate Earth Current/Voltage Setting - icall0

Purpose: To define if the earth current and voltage output signal values must be calculated by the block or provided by

Definition: A check box in the TypMeasure dialogue which allows to enable or disable the feature. The setting can be equal to 0 ("false") or to 1 ("true").

Use: When the feature is enabled the earth current and the voltage values are calculated using the phase values and an Holmgreen's connection.

2.1.9 TypMeasure: Measuring Time - Tf

Purpose: To define the analog filter time constant.

Definition: A value ≥ 0 may be entered. The relevant edit box is visible only when the parameter *TypMeasure:RMS Calculation - ienablerms* (see 2.1.17) is 0 ("false").

Use: To define the delay of the analog filter which is available only when the RMS calculation feature is deactivated.

2.1.10 TypMeasure: RMS Updating Period - Trms

Purpose: To define the refresh time of the RMS value.

Definition: A value ≥ 0 may be entered. The relevant edit box is visible only when the parameter *TypMeasure:RMS Calculation - ienablerms* (see 2.1.17) is 1 ("true").

Use: To define how often the calculation of the RMS values must be executed.

2.1.11 TypMeasure: Samples per cycle - cyclesamples

Purpose: To define how many samples of the input values are given during each cycle.

Definition: A value ≥ 0 may be entered. The relevant edit box is visible only when the parameter *TypMeasure:RMS Calculation - inablerms* (see 2.1.17) is 1 ("true").

Use: This values is used by both the integral algorithms which calculate the RMS values and by the digital filter algorithms (DFT, Cosine filter, etc)

2.1.12 TypMeasure: RMS calculation samples - meassamples

Purpose: To define how many samples are used to calculate the input signal RMS value.

Definition: A value ≥ 0 may be entered. The relevant edit box is visible only when the parameter *TypMeasure:RMS Calculation - ienablerms* (see 2.1.17) is 1 ("true") and the parameter *TypeMeasure:Filter - idftenabled* is 0 ("Off").

Use: This values is used by the integral algorithms which calculate the RMS values.

2.1.13 TypMeasure: RMS calculation Method - integrtype

Purpose: To define which integral algorithm type is used to calculated the RMS values of the input signals.

Definition: a combobox with two items: "Rectangles" and "Trapeziums". The relevant edit box is visible only when the parameter *TypMeasure:RMS Calculation - ienablerms* (see 2.1.17) is 1 ("true") and the parameter *TypeMeasure:Filter - idftenabled* is 0 ("Off").

Use: To simulate the older microprocessor protective devices not using any digital filter.

2.1.14 TypMeasure: Oversampling factor - avgsamples

Purpose: To define how many samples are put together to calculate an average value and generate the set of values used by the integral algorithm and by the digital filters.

Definition: A value ≥ 0 may be entered. An edit box allows to insert the number of samples.

Use: To simulate the noise compensation algorithm used by some microprocessor protective devices (i.e. Siemens 7SA522 relay).

2.1.15 TypMeasure: Filter - idftenabled

Purpose: To enable the digital filters.

Definition: a combobox with five items: "Off", "DFT 1 cycle", "DFT 1/2 cycle", "FFT", and "Cosine".

Use: To simulate the digital filters of the microprocessor protective devices.

2.1.16 TypMeasure: DC Offset Compensation - dcmethod

Purpose: To enable the DC component compensation algorithm

Definition: A check box allows to enable or to disable an algorithm based on the average value of two samples taken at 180 of the sinusoidal wave; the algorithm considers the average value equal to the input wave DC component and subtracts such value to any sample taken between the two samples used to calculate the average value.

Use: To simulate the DC compensation algorithm available in some digital protective devices.

2.1.17 TypMeasure: RMS Calculation - ienablerms

Purpose: To enable the RMS calculation using an integration method or a digital filter ("DFT", "Cosine" etc).

Definition: A checkbox is present in the TypMeasure dialogue. If the check box is set the RMS calculation is active.

Use: To simulate a static or an digital measurement element.

2.1.18 TypMeasure: Harmonic - dftharmonic

Purpose: To define the harmonic number which is extracted from the input current and/or voltage samples by the "DFT" and the "Cosine" digital filter algorithm.

Definition: A value ≥ 0 may be entered. The relevant edit box is visible only when the parameter *TypMeasure:RMS Calculation - ienablerms* (see 2.1.17) is 1 ("true") and the parameter *TypeMeasure:Filter - idftenabled* is 1 ("DFT 1 cycle") or 4 ("Cosine").

Use: The parameter value is used by the "DFT" and by the "Cosine" digital filter algorithm. Only the harmonic specified in the parameter is extracted from the input samples.

2.1.19 TypMeasure: Firs Harmonic - fftfirstharm

Purpose: To define the first harmonic which is extracted from the input current and/or voltage samples by the "FFT" digital filter algorithm.

Definition: A value ≥ 0 may be entered. The relevant edit box is visible only when the parameter *TypMeasure:RMS Calculation - ienablerms* (see 2.1.17) is 1 ("true") and the parameter

TypeMeasure:Filter - idftenabled is 3 ("FFT").

Use: The parameter value is used by the "FFT" digital filter algorithm. The harmonic specified in the parameter is the lower harmonic extracted from the input samples.

2.1.20 TypMeasure: Last Harmonic - fftlastharm

Purpose: To define the last harmonic which is extracted from the input current and/or voltage samples by the "FFT" digital filter algorithm.

Definition: A value ≥ 0 may be entered. The relevant edit box is visible only when the parameter *TypMeasure:RMS Calculation - ienablerms* (see 2.1.17) is 1 ("true") and the parameter *TypeMeasure:Filter - idftenabled* is 3 ("FFT").

Use: The parameter value is used by the "FFT" digital filter algorithm. The harmonic specified in the parameter is the higher harmonic extracted from the input samples.

2.2 RelMeasure parameters

2.2.1 RelMeasure: Name - loc_name

Purpose: To allow the user to define a unique name for any RelMeasure object.

Definition: The user may input any name up to 40 characters in length.

Use: The name chosen is then used within multiple dialogues encountered throughout the user interface. In particular, when using the object browser.

2.2.2 RelMeasure: Type (TypMeasure*) - typ_id

Purpose: To allow the user to identify the associated TypMeasure object when looking at dialogues associated with the RelMeasure object.

Definition: A TypMeasure object reference is automatically assigned to this parameter when the RelMeasure object is entered as the parameter *ElmRelay: Net Elements - Pdiselm.* In the main RelMeasure dialogue a shortcut to the associated TypMeasure object dialogue is provided.

Use: To define the input and output signal configuration and which RMS and instantaneous values must be calculated.

2.2.3 RelMeasure: Nominal Current - Inom

Purpose: To allow the user to select a specific setting from the range of settings defined by parameter TypMeasure: Nominal Current - rInom

Definition: Any setting may be selected from the range of settings defined by the *Ranges* frame parameter *TypMeasure: Nominal Current - rInom*. The setting unit is secondary amperes.

Use: To calculate the measurement block output currents dividing the input currents by the parameter value.

2.2.4 RelMeasure: Nominal Voltage - Unom

Purpose: To allow the user to select a specific setting from the range of settings defined by parameter *TypMeasure: Nominal Current - rUnom*

Definition: Any setting may be selected from the range of settings defined by the Ranges frame parameter TypMeasure: Nominal Current - rUnom . The setting unit is secondary amperes.

Use: To calculate the measurement block output voltages dividing the input voltages by the parameter value.

2.2.5 RelMeasure: Nominal Current - Is

Purpose: To allow the user to select a specific setting from the range of settings defined by parameter *TypMeasure: Nominal Current - rls*

Definition: Any setting may be selected from the range of settings defined by the *Ranges* frame parameter *TypMeasure: Nominal Current - rls*. The setting unit is secondary amperes.

Use: To calculate the measurement block output currents dividing the input currents by the parameter value.

2.2.6 RelMeasure: Phase - iphase

Purpose: To define which phase is measured.

Definition: A combo box with three items: "a", "b", and "c". The combobox is visible only when the TypMeasure:Type - atype is "1ph RMS current + Select" (see 2.1.7)

Use: Define which phase must be measured.

2.2.7 RelMeasure: Object modified - gnrl_modif

Purpose: To record the date and time at which the RelMeasure object was last modified to facilitate error tracking etc.

Definition: Each time the user edits the RelMeasure object, the date and time of the operation is recorded. The date and time recorded is the time at which the user accepts the modification.

2.2.8 RelMeasure: Object modified by - gnrl_modby

Purpose: To record the name of the user who last modified the RelMeasure object to facilitate error tracking etc.

Definition: The name of the user is derived from the *PowerFactory* username active at the time the object was modified. The username is recorded only when the user accepts the modification.

2.2.9 RelMeasure: Characteristic Name - chr_name

Purpose: To specify a string which identifies the loc protective element.

Definition: a 20 characters long string.

Use: Documentation purposes.

2.2.10 RelMeasure: Foreign Key - for_name

Purpose: To specify a string which identifies the loc protective element in unique way.

Definition: a 40 characters long string.

Use: To allow to select the loc protective element with the database search tools.

2.2.11 RelMeasure: Data source - dat_src

Purpose: To specify a ID to identify the source of the data used to create the loc protective element.

Definition: a 3 characters long string.

Use: Short reference to the data source for documentation purposes.

Input parameters 3

Table 3.1: Type Parameters (Class: TypMeasure)

Parameter	Reference	Ob-	Default	Description	Selectable	Unit
name	ject type		Value		Values	
gnrl_modif				00bject modi-		int
			01:00:00	fied		
gnrl₋modby				Object modi-		char[40]
				fied by		
loc_name				Name		char[40]
rlnom				Nominal		char[80]
				Current		
rUnom				Nominal		char[80]
				Voltage		
rls				Current Set-		char[80]
				ting		
atype			3rms	Type		char[4]
icall0			0	Calculate	x=0 or	int
				Earth Cur-	x=1	
				rent/ Voltage		
Tf			0.001	Measuring		float
				Time		
Trms			1	RMS Updat-	x > 0	float
				ing Period		
cyclesamples			20	Samples per	x≥0	int
				cycle		
meassamples			20	RMS Cal-	x≥0	int
				culation		
				Samples		
iintegrtype			0	RMS cal-		int
				culation		
				Method		
avgsamples			1	Oversampling	x > 0	int
				Factor		
idftenabled			0	Filter	x≥0	int
dcmethod			0	DC Offset		int
				Compensa-		
				tion		
ienablerms			0	RMS calcu-	x≥0	int
				lation		
dftharmonic			1	Harmonic	x≥1	int
fftfirstharm			1	First Har-	x≥1	int
				monic		
fftlastharm			1	LAst Har-	x≥1	int
				monic		

Table 3.2: Element Parameters (Class: RelMeasure)

Parameter	Reference Ob-	Default	Description	Selectable	Unit
Name	ject Type	Value	-	Values	
loc₋name			Name		char[40]
typ₋id	TypMeasure		Type		DBObject*
Inom			Nominal		float
			Current		
Unom			Nominal		float
			Voltage		
Is			Current Set-		float
			ting		
iphase			Phase	x≥1 and	int
				x<5	
chr₋name			Characteristic		char[20]
			Name		
for_name			Foreign Key		char[40]
dat_src			Data source		char[3]

4 Signals

Table 4.1: 3ph. RMS Currents block input/output signals

Name	Description	Unit	Type	Model
wlr_A	Phase A input Current, real part	Secondary	IN	any
		Amperes		
wli_A	Phase A input Current, imaginary part	Secondary	IN	any except EMT
		Amperes		
wlr_B	Phase B input Current, real part	Secondary	IN	any
	·	Amperes		
wli_B	Phase B input Current, imaginary part	Secondary	IN	any except EMT
		Amperes		
wlr_C	Phase C input Current, real part	Secondary	IN	any
	·	Amperes		
wli_C	Phase C input Current, imaginary part	Secondary	IN	any except EMT
		Amperes		
wl0x3r	Ground current, real part	Secondary	IN	any
	-	Amperes		
wl0x3i	Ground current, imaginary part	Secondary	IN	any except EMT
		Amperes		
I_A	Phase A Current RMS value	Secondary	OUT	any
		Amperes		
I_B	Phase B Current RMS value	Secondary	OUT	any
		Amperes		
I_C	Phase C Current RMS value	Secondary	OUT	any
		Amperes		
10x3	Three times the zero sequence current	Secondary	OUT	any
	RMS value	Amperes		
10	Zero sequence current RMS value	Secondary	OUT	any
		Amperes		
Imax	Maximum value between the phase cur-	Secondary	OUT	any
	rent RMS values	Amperes		
12	Negative sequence current RMS value	Secondary	OUT	any
		Amperes		
12x3	Three times the negative sequence cur-	Secondary	OUT	any
	rent RMS value	Amperes		
clock	Clock signal	1/0	OUT	EMT

Table 4.2: 3ph. RMS Delta Currents block input/output signals

Name	Description	Unit	Type	Model
wlr_A	Phase A input Current, real part	Secondary	IN	any
		Amperes		
wli_A	Phase A input Current, imaginary part	Secondary	IN	any except EMT
		Amperes		
wlr_B	Phase B input Current, real part	Secondary	IN	any
		Amperes		
wli_B	Phase B input Current, imaginary part	Secondary	IN	any except EMT
		Amperes		
wlr_C	Phase C input Current, real part	Secondary	IN	any
		Amperes		

Table 4.2: 3ph. RMS Delta Currents block input/output signals

Name	Description	Unit	Туре	Model
wli_C	Phase C input Current, imaginary part	Secondary	IN	any except EMT
		Amperes		
wl0x3r	Ground current, real part	Secondary	IN	any
		Amperes		
wl0x3i	Ground current, imaginary part	Secondary	IN	any except EMT
		Amperes		
I_A	AB current RMS value	Secondary	OUT	any
		Amperes		
I_B	BC current RMS value	Secondary	OUT	any
		Amperes		
I_C	CA current RMS value	Secondary	OUT	any
		Amperes		
10x3	3 times the zero sequence current RMS	Secondary	OUT	any
	value	Amperes		
10	Zero sequence current RMS value	Secondary	OUT	any
		Amperes		
Imax	Maximum value between the phase cur-	Secondary	OUT	any
	rent RMS values	Amperes		
12	Negative sequence current RMS value	Secondary	OUT	any
		Amperes		
I2x3	3 times the negative sequence current	Secondary	OUT	any
	RMS value	Amperes		
clock	Clock signal	1/0	OUT	EMT

Table 4.3: RMS Sequence Currents block input/output signals

Name	Description	Unit	Type	Model
wlr_A	Phase A input Current, real part	Secondary	IN	any
		Amperes		
wli_A	Phase A input Current, imaginary part	Secondary	IN	any except EMT
		Amperes		
wlr_B	Phase B input Current, real part	Secondary	IN	any
		Amperes		
wli_B	Phase B input Current, imaginary part	Secondary	IN	any except EMT
		Amperes		
wlr_C	Phase C input Current, real part	Secondary	IN	any
		Amperes		
wli_C	Phase C input Current, imaginary part	Secondary	IN	any except EMT
10.0		Amperes		
wl0x3r	Ground current, real part	Secondary	IN	any
10.01		Amperes		
wl0x3i	Ground current, imaginary part	Secondary	IN	any except EMT
10.0	. 546	Amperes		
10x3	3 times the zero sequence current RMS	Secondary	OUT	any
	value	Amperes		
10	Zero sequence current RMS value	Secondary	OUT	any
	D 33	Amperes	OUT	
l1	Positive sequence current RMS value	Secondary	OUT	any
	l DMC :	Amperes	OUT.	
12	Negative sequence current RMS value	Secondary	OUT	any
		Amperes		

Table 4.3: RMS Sequence Currents block input/output signals

Name	Description	Unit	Type	Model
I2x3	3 times the negative sequence current	Secondary	OUT	any
	RMS value	Amperes		
clock	Clock signal	1/0	OUT	EMT

Table 4.4: 3ph. Currents and Voltages block input/output signals

Name	Description	Unit	Type	Model
wlr_A	A Phase A input Current, real part	Secondary	IN	any
		Amperes		
wli_A	Phase A input Current, imaginary part	Secondary	IN	any except EMT
		Amperes	l	
wlr_B	Phase B input Current, real part	Secondary	IN	any
!: D	Dhaca Diamet Commant imaginame nout	Amperes	INI	any avecant CMT
wli_B	Phase B input Current, imaginary part	Secondary	IN	any except EMT
wlr_C	Phase C input Current, real part	Amperes Secondary	IN	any
WII _O	i nase o input ourrent, real part	Amperes	""	arry
wli_C	Phase C input Current, imaginary part	Secondary	IN	any except EMT
	i nass s input surroint, imaginary part	Amperes		any except Livi
wl0x3r	Zero sequence current, real part	Secondary	IN	any
	, ,	Amperes		
wI0x3i	Zero sequence current, imaginary part	Secondary	IN	any except EMT
		Amperes		
wUr_A	Phase A input Voltage, real part	Secondary	IN	any
		Volts		
wUi_A	Phase A input Voltage, imaginary part	Secondary	IN	any except EMT
		Volts		
wUr₋B	Phase B input Voltage, real part	Secondary	IN	any
	Dhana Diagrat Valtana imagainam mant	Volts	INI	
wUi_B	Phase B input Voltage, imaginary part	Secondary Volts	IN	any except EMT
wUr_C	Phase C input Voltage, real part	Secondary	IN	any
WOI_C	Thase Chiput Voltage, real part	Volts	IIN	arry
wUi_C	Phase C input Voltage, imaginary part	Secondary	IN	any except EMT
1101_0	i nace e input veitage, imaginary part	Volts	'''	any except Livin
wU0x3r	Zero sequence Voltage, real part	Secondary	IN	any
		Volts		
wU0x3i	Zero sequence Voltage, imaginary part	Secondary	IN	any except EMT
		Volts		
I_A	Phase A Current RMS value	Secondary	OUT	any
		Amperes		
Ir_A	Phase A Current instantaneous value,	Secondary	OUT	any
	real part	Amperes		
li₋A	Phase A Current instantaneous value,	Secondary	OUT	any except EMT
	imaginary part	Amperes		with digital filter
1.0	Dhaca D Ouwent DMC at a	Casarda	OLIT.	disabled
I₋B	Phase B Current RMS value	Secondary	OUT	any
lr D	Phase R Current instantaneous value	Amperes	OUT	any
lr_B	Phase B Current instantaneous value,	Secondary Amperes	OUT	any
	real part	Amperes		

Table 4.4: 3ph. Currents and Voltages block input/output signals

Name	Description	Unit	Туре	Model
li₋B	Phase B Current instantaneous value,	Secondary	ΟÜΤ	any except EMT
	imaginary part	Amperes		with digital filter
				disabled
I_C	Phase C Current RMS value	Secondary	OUT	any
		Amperes		
lr_C	Phase C Current instantaneous value,	Secondary	OUT	any
	real part	Amperes	0.17	
li₋C	Phase C Current instantaneous value,	Secondary	OUT	any except EMT
	imaginary part	Amperes		with digital filter disabled
10x3	2 times the zero assumes surrent PMS	Cocondony	OUT	
1033	3 times the zero sequence current RMS value	Secondary Amperes	001	any
l0x3r	3 times the zero sequence current instan-	Secondary	OUT	any
IOXOI	taneous value, real part	Amperes	001	l uny
I0x3i	3 times the zero sequence current instan-	Secondary	OUT	any except EMT
	taneous value, imaginary part	Amperes		with digital filter
				disabled
10	Zero sequence current RMS value	Secondary	OUT	any
		Amperes		
I0r	Zero sequence current instantaneous	Secondary	OUT	any
	value, real part	Amperes		
l0i	Zero sequence current instantaneous	Secondary	OUT	any except EMT
	value, imaginary part	Amperes		with digital filter
less es c	Maxima wa valua batwa an the inhead and	Casandami	OUT	disabled
Imax	Maximum value between the phase current RMS values	Secondary Amperes	OUT	any
12	Negative sequence current RMS value	Secondary	OUT	any
12	Tregative sequence current rivio value	Amperes	001	arry
I2x3	3 times the negative sequence current	Secondary	OUT	any
12.10	RMS value	Amperes		
U_A	Phase A Voltage RMS value	Secondary	OUT	any
		Volts		
Ur_A	Phase A Voltage instantaneous value,	Secondary	OUT	any
	real part	Volts		
Ui₋A	Phase A Voltage instantaneous value,	Secondary	OUT	any except EMT
	imaginary part	Volts		with digital filter
11.5	Dhaca D. Valtagia DMC	Coordinate	CLIT	disabled
U₋B	Phase B Voltage RMS value	Secondary Volts	OUT	any
Ur_A	Phase B Voltage instantaneous value,	Secondary	OUT	any
01_7	real part	Volts	501	any
Ui_A	Phase B Voltage instantaneous value,	Secondary	OUT	any except EMT
0.2.	imaginary part	Volts		with digital filter
				disabled
U_C	Phase C Voltage RMS value	Secondary	OUT	any
		Volts		-
Ur_C	Phase C Voltage instantaneous value,	Secondary	OUT	any
	real part	Volts		
Ui_C	Phase C Voltage instantaneous value,	Secondary	OUT	any except EMT
	imaginary part	Volts		with digital filter
110-0	2 times the zero services Valtage DMC	Coconde	OUT	disabled
U0x3	3 times the zero sequence Voltage RMS	Secondary Volts	OUT	any
	value	งบเร		

Table 4.4: 3ph. Currents and Voltages block input/output signals

Name	Description	Unit	Туре	Model
U0x3r	3 times the zero sequence Voltage in-	Secondary	OUT	any
	stantaneous value, real part	Volts		
U0x3i	3 times the zero sequence Voltage in-	Secondary	OUT	any except EMT
	stantaneous value, imaginary part	Volts		with digital filter
				disabled
U0	Zero sequence Voltage RMS value	Secondary	OUT	any
		Volts		
U0r	Zero sequence Voltage instantaneous	Secondary	OUT	any
	value, real part	Volts		
U0i	Zero sequence Voltage instantaneous	Secondary	OUT	any except EMT
	value, imaginary part	Volts		with digital filter
				disabled
clock	Clock signal	1/0	OUT	EMT

Table 4.5: ABB Discontinuity Current block input/output signals

Name	Description	Unit	Type	Model
wl_A	Phase A input Current	Secondary	IN	any
		Amperes		
wl_B	Phase B input Current	Secondary	IN	any
		Amperes		
wl_C	Phase C input Current	Secondary	IN	any
		Amperes		
wlr_A	A Phase A input Current, real part	Secondary	IN	any
		Amperes		
wlr_B	Phase B input Current, real part	Secondary	IN	any
		Amperes		
wlr_C	Phase C input Current, real part	Secondary	IN	any
		Amperes		
I_DI	ABB discontinuity Current RMS value	Secondary	OUT	any
		Amperes		

Table 4.6: 3ph. Delta Currents and Voltages block input/output signals

Name	Description	Unit	Type	Model
wlr_A	A Phase A input Current, real part	Secondary	IN	any
		Amperes		
wli_A	Phase A input Current, imaginary part	Secondary	IN	any except EMT
		Amperes		
wlr_B	Phase B input Current, real part	Secondary	IN	any
		Amperes		
wli_B	Phase B input Current, imaginary part	Secondary	IN	any except EMT
		Amperes		
wlr_C	Phase C input Current, real part	Secondary	IN	any
		Amperes		
wli_C	Phase C input Current, imaginary part	Secondary	IN	any except EMT
		Amperes		

Table 4.6: 3ph. Delta Currents and Voltages block input/output signals

Name	Description	Unit	Туре	Model
wUr_A	Phase A input Voltage, real part	Secondary	IN	any
		Volts		
wUi_A	Phase A input Voltage, imaginary part	Secondary	IN	any except EMT
		Volts		
wUr_B	Phase B input Voltage, real part	Secondary	IN	any
		Volts		
wUi₋B	Phase B input Voltage, imaginary part	Secondary	IN	any except EMT
		Volts		
wUr₋C	Phase C input Voltage, real part	Secondary	IN	any
		Volts		
wUi₋C	Phase C input Voltage, imaginary part	Secondary	IN	any except EMT
		Volts		
II_A	Phase A Current RMS value	Secondary	OUT	any
		Amperes	OUT	
Ilr_A	Phase A Current instantaneous value,	Secondary	OUT	any
	real part	Amperes	OUT	
lli₋A	Phase A Current instantaneous value,	Secondary	OUT	any except EMT
	imaginary part	Amperes		with digital filter
шъ	Dhaca D Current DMC value	Casandami	OUT	disabled
II₋B	Phase B Current RMS value	Secondary Amperes	001	any
IIr_B	Phase B Current instantaneous value,	Secondary	OUT	any
III_D	real part	Amperes	001	ally
Ili₋B	Phase B Current instantaneous value,	Secondary	OUT	any except EMT
III_D	imaginary part	Amperes	001	with digital filter
		Amperes		disabled
II_C	Phase C Current RMS value	Secondary	OUT	any
11_0	Thase o ourrent timo value	Amperes	001	arry
IIr_C	Phase C Current instantaneous value,	Secondary	OUT	any
	real part	Amperes		"
Ili_C	Phase C Current instantaneous value,	Secondary	OUT	any except EMT
	imaginary part	Amperes		with digital filter
				disabled
Ilmax	Maximum value between the phase cur-	Secondary	OUT	any
	rent RMS values	Amperes		
UI₋A	Phase A Voltage RMS value	Secondary	OUT	any
		Volts		
Ulr₋A	Phase A Voltage instantaneous value,	Secondary	OUT	any
	real part	Volts		
Uli_A	Phase A Voltage instantaneous value,	Secondary	OUT	any except EMT
	imaginary part	Volts		with digital filter
				disabled
UI_B	Phase B Voltage RMS value	Secondary	OUT	any
		Volts		
Ulr_A	Phase B Voltage instantaneous value,	Secondary	OUT	any
1.11. 4	real part	Volts		
Uli₋A	Phase B Voltage instantaneous value,	Secondary	OUT	any except EMT
	imaginary part	Volts		with digital filter
111.0	Dhoos C Voltoria DMC vistoria	Cocond	CUT	disabled
UI_C	Phase C Voltage RMS value	Secondary	OUT	any
Ulr_C	Phase C Voltage instantaneous value	Volts	OUT	any
OII_C	Phase C Voltage instantaneous value, real part	Secondary Volts	001	any
	ισαι μαι ι	VUILO		

Table 4.6: 3ph. Delta Currents and Voltages block input/output signals

Name	Description	Unit	Type	Model
Uli₋C	Phase C Voltage instantaneous value, imaginary part	Secondary Volts	OUT	any except EMT with digital filter disabled
clock	Clock signal	1/0	OUT	EMT

Table 4.7: 3ph. Currents and Delta Voltages block input/output signals

Name	Description	Unit	Type	Model
wlr_A	A Phase A input Current, real part	Secondary	IN	any
		Amperes		
wli_A	Phase A input Current, imaginary part	Secondary	IN	any except EMT
		Amperes		
wlr_B	Phase B input Current, real part	Secondary	IN	any
		Amperes		
wli_B	Phase B input Current, imaginary part	Secondary	IN	any except EMT
		Amperes	l	
wlr_C	Phase C input Current, real part	Secondary	IN	any
		Amperes	l	
wli_C	Phase C input Current, imaginary part	Secondary	IN	any except EMT
10.0		Amperes		
wI0x3r	Zero sequence current, real part	Secondary	IN	any
	7	Amperes	INI	A TOTAL TOTAL
wI0x3i	Zero sequence current, imaginary part	Secondary	IN	any except EMT
) A 1 A	Dhace A input Voltage real part	Amperes	IN	201/
wUr_A	Phase A input Voltage, real part	Secondary Volts	IIN	any
wUi_A	Phase A input Voltage imaginary part		IN	any avaant EMT
WUI_A	Phase A input Voltage, imaginary part	Secondary Volts	IIN	any except EMT
wUr_B	Phase B input Voltage, real part	Secondary	IN	any
WOI_D	Thase Billput Voltage, real part	Volts	111	arry
wUi_B	Phase B input Voltage, imaginary part	Secondary	IN	any except EMT
WOILE	Thase B input voltage, imaginary part	Volts	" "	any except Livii
wUr_C	Phase C input Voltage, real part	Secondary	IN	any
W 01_0	That that that you	Volts		arry
wUi_C	Phase C input Voltage, imaginary part	Secondary	IN	any except EMT
	inace o input remage, imaginary part	Volts		a, except
I_A	Phase A Current RMS value	Secondary	OUT	any
		Amperes		
Ir_A	Phase A Current instantaneous value,	Secondary	OUT	any
	real part	Amperes		
li_A	Phase A Current instantaneous value,	Secondary	OUT	any except EMT
	imaginary part	Amperes		with digital filter
				disabled
I_B	Phase B Current RMS value	Secondary	OUT	any
		Amperes		
Ir_B	Phase B Current instantaneous value,	Secondary	OUT	any
	real part	Amperes		
li_B	Phase B Current instantaneous value,	Secondary	OUT	any except EMT
	imaginary part	Amperes		with digital filter
				disabled

Table 4.7: 3ph. Currents and Delta Voltages block input/output signals

Name	Description	Unit	Туре	Model
I_C	Phase C Current RMS value	Secondary	OUT	any
		Amperes		
Ir_C	Phase C Current instantaneous value,	Secondary	OUT	any
	real part	Amperes		
li₋C	Phase C Current instantaneous value,	Secondary	OUT	any except EMT
	imaginary part	Amperes		with digital filter
				disabled
10x3	3 times the zero sequence current RMS	Secondary	OUT	any
	value	Amperes		
l0x3r	3 times the zero sequence current instan-	Secondary	OUT	any
	taneous value, real part	Amperes		
I0x3i	3 times the zero sequence current instan-	Secondary	OUT	any except EMT
	taneous value, imaginary part	Amperes		with digital filter
				disabled
10	Zero sequence current RMS value	Secondary	OUT	any
		Amperes		
l0r	Zero sequence current instantaneous	Secondary	OUT	any
	value, real part	Amperes		
l0i	Zero sequence current instantaneous	Secondary	OUT	any except EMT
	value, imaginary part	Amperes		with digital filter
				disabled
Imax	Maximum value between the phase cur-	Secondary	OUT	any
	rent RMS values	Amperes		
l2	Negative sequence current RMS value	Secondary	OUT	any
		Amperes		
12x3	3 times the negative sequence current	Secondary	OUT	any
	RMS value	Amperes		
U_A	Phase A Voltage RMS value	Secondary	OUT	any
		Volts		
Ur₋A	Phase A Voltage instantaneous value,	Secondary	OUT	any
	real part	Volts		
Ui₋A	Phase A Voltage instantaneous value,	Secondary	OUT	any except EMT
	imaginary part	Volts		with digital filter
				disabled
U_B	Phase B Voltage RMS value	Secondary	OUT	any
		Volts	0.17	
Ur₋A	Phase B Voltage instantaneous value,	Secondary	OUT	any
	real part	Volts	O. I.T.	. = =
Ui₋A	Phase B Voltage instantaneous value,	Secondary	OUT	any except EMT
	imaginary part	Volts		with digital filter
	Disease O Valles a DMO all a	0	OUT	disabled
U₋C	Phase C Voltage RMS value	Secondary	OUT	any
110	Dhana O Valtana instantana ana malus	Volts	OUT	
Ur_C	Phase C Voltage instantaneous value,	Secondary	OUT	any
11: 0	real part	Volts	OUT	any avecant EMT
Ui₋C	Phase C Voltage instantaneous value,	Secondary	OUT	any except EMT
	imaginary part	Volts		with digital filter
LIOVO	2 times the zero sequence Valters DMC	Cocondani	OUT	disabled
U0x3	3 times the zero sequence Voltage RMS	Secondary	OUT	any
U0x3r	value	Volts	OUT	any
UUXOI	3 times the zero sequence Voltage instantaneous value, real part	Secondary Volts	001	any
	Stantaneous value, real part	VUILO		

Table 4.7: 3ph. Currents and Delta Voltages block input/output signals

Name	Description	Unit	Type	Model
U0x3i	3 times the zero sequence Voltage instantaneous value, imaginary part	Secondary Volts	OUT	any except EMT with digital filter disabled
U0	Zero sequence Voltage RMS value	Secondary Volts	OUT	any
U0r	Zero sequence Voltage instantaneous value, real part	Secondary Volts	OUT	any
U0i	Zero sequence Voltage instantaneous value, imaginary part	Secondary Volts	OUT	any except EMT with digital filter disabled
clock	Clock signal	1/0	OUT	EMT

Table 4.8: Sequence Currents and Voltages block input/output signals

Name	Description	Unit	Туре	Model
wlr_A	A Phase A input Current, real part	Secondary	IN	any
		Amperes		
wli_A	Phase A input Current, imaginary part	Secondary	IN	any except EMT
		Amperes		
wlr_B	Phase B input Current, real part	Secondary	IN	any
		Amperes		
wli_B	Phase B input Current, imaginary part	Secondary	IN	any except EMT
		Amperes		
wlr_C	Phase C input Current, real part	Secondary	IN	any
		Amperes		
wli_C	Phase C input Current, imaginary part	Secondary	IN	any except EMT
	7	Amperes	INI	
wl0x3r	Zero sequence current, real part	Secondary	IN	any
wl0x3i	Zoro goguenos gurrent imaginary part	Amperes	IN	any aveant EMT
WIUXSI	Zero sequence current, imaginary part	Secondary Amperes	IIN	any except EMT
wUr_A	Phase A input Voltage, real part	Secondary	IN	any
WOI_A	Thase A input voitage, real part	Volts	IIN	ally
wUi_A	Phase A input Voltage, imaginary part	Secondary	IN	any except EMT
WOILY	Triage 7 input voltage, imaginary part	Volts	"	any except Livii
wUr_B	Phase B input Voltage, real part	Secondary	IN	any
	That Tanaga, Tan part	Volts		"
wUi₋B	Phase B input Voltage, imaginary part	Secondary	IN	any except EMT
		Volts		
wUr_C	Phase C input Voltage, real part	Secondary	IN	any
		Volts		
wUi_C	Phase C input Voltage, imaginary part	Secondary	IN	any except EMT
		Volts		
wU0x3r	Zero sequence Voltage, real part	Secondary	IN	any
		Volts		
wU0x3i	Zero sequence Voltage, imaginary part	Secondary	IN	any except EMT
		Volts		
10x3	3 times the zero sequence current RMS	Secondary	OUT	any
	value	Amperes		
l0x3r	3 times the zero sequence current instan-	Secondary	OUT	any
	taneous value, real part	Amperes		

Table 4.8: Sequence Currents and Voltages block input/output signals

Name	Description	Unit	Туре	Model
I0x3i	3 times the zero sequence current instan-	Secondary	OUT	any except EMT
	taneous value, imaginary part	Amperes		with digital filter
				disabled
10	Zero sequence current RMS value	Secondary	OUT	any
10.4	Zava annuara augument instantananus	Amperes	OUT	
l0r	Zero sequence current instantaneous value, real part	Secondary Amperes	OUT	any
l0i	Zero sequence current instantaneous	Secondary	OUT	any except EMT
101	value, imaginary part	Amperes		with digital filter
	, , , , , , , , , , , , , , , , , , ,	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		disabled
l1	Positive sequence current RMS value	Secondary	OUT	any
		Amperes		
l1r	Positive sequence current instantaneous	Secondary	OUT	any
141	value, real part	Amperes	OUT	
l1i	Positive sequence current instantaneous	Secondary	OUT	any except EMT
	value, imaginary part	Amperes		with digital filter disabled
12	Negative sequence current RMS value	Secondary	OUT	any
"-	Trogative sequence carrent rime value	Amperes		l uny
l2r	Negative sequence current instanta-	Secondary	OUT	any
	neous value, real part	Amperes		
I2i	Negative sequence current instanta-	Secondary	OUT	any except EMT
	neous value, imaginary part	Amperes		with digital filter
				disabled
U0x3	3 times the zero sequence Voltage RMS	Secondary	OUT	any
U0x3r	value 3 times the zero sequence Voltage in-	Volts Secondary	OUT	any
OUXSI	stantaneous value, real part	Volts	001	ally
U0x3i	3 times the zero sequence Voltage in-	Secondary	OUT	any except EMT
	stantaneous value, imaginary part	Volts		with digital filter
				disabled
U1	Positive sequence Voltage RMS value	Secondary	OUT	any
		Volts		
U1r	Positive sequence Voltage instantaneous	Secondary	OUT	any
U1i	value, real part	Volts	OUT	any avant EMT
UII	Positive sequence Voltage instantaneous value, imaginary part	Secondary Volts	OUT	any except EMT with digital filter
	value, imaginary part	VOILS		disabled
U2	Negative sequence Voltage RMS value	Secondary	OUT	any
	0 : : : : : : : : : : : : : : : : : : :	Volts		'
U2r	Negative sequence Voltage instanta-	Secondary	OUT	any
	neous value, real part	Volts		
U2i	Negative sequence Voltage instanta-	Secondary	OUT	any except EMT
	neous value, imaginary part	Volts		with digital filter
olook	Clock signal	1/0	OUT	disabled EMT
clock	Clock signal	1/0	OUT	□IVI I

Out

clock

3 Current RMS value

Clock signal

Model Name Description Unit Туре wInpr Input Current, real part Secondary IN any Amperes Secondary Input Current, imaginary part wInpi IN any except EMT Amperes

Secondary

Amperes

1/0

OUT

OUT

any

EMT

Table 4.9: 1ph. RMS Current block input/output signals

Table 4.10: Single Phase Current and Voltage block input/output signals

Name	Description	Unit	Type	Model
wlr	Input Current, real part	Secondary	IN	any
		Amperes		
wli	Input Current, imaginary part	Secondary	IN	any except EMT
		Amperes		
wUr	Input Voltage, real part	Secondary	IN	any
		Volts		
wUi	Input Voltage, imaginary part	Secondary	IN	any except EMT
		Volts	<u>_</u>	
	Current RMS value	Secondary	OUT	any
		Amperes	O	
lr	Current instantaneous value, real part	Secondary	OUT	any
		Amperes	OUT.	. = . 4 =
li	Current instantaneous value, imaginary	Secondary	OUT	any except EMT
	part	Amperes		with digital filter
	Valta va DMC valva	0	OUT	disabled
U	Voltage RMS value	Secondary	OUT	any
Ur	Voltago instantanagua valua, roal part	Volts	OUT	any.
Of	Voltage instantaneous value, real part	Secondary Volts	001	any
Ui	Voltage instantaneous value, imaginary	Secondary	OUT	any except EMT
OI	part	Volts	001	with digital filter
	Part	VOILS		disabled
clock	Clock signal	1/0	OUT	EMT
CIOCIN	Olook signal	170		-1V1 I

Table 4.11: 1ph. RMS Current+Select block input/output signals

Name	Description	Unit	Type	Model
wlr_A	Phase A input Current, real part	Secondary Amperes	IN	any
wli_A	Phase A input Current, imaginary part	Secondary	IN	any except EMT
wlr_B	Phase B input Current, real part	Amperes Secondary	IN	any
wli_B	Phase B input Current, imaginary part	Amperes Secondary Amperes	IN	any except EMT

Table 4.11: 1ph. RMS Current+Select block input/output signals

Name	Description	Unit	Type	Model
wlr_C	Phase C input Current, real part	Secondary	IN	any
		Amperes		
wli_C	Phase C input Current, imaginary part	Secondary	IN	any except EMT
		Amperes		
Outl	Current RMS value	Secondary	OUT	any
		Amperes		

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