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Application Note AN0803

Using Current Transformers with the WattsOn® Power Transducer

Associated Product: WattsOn

Summary

The WattsOn® Power Transducer is a highly universal meter that can be used with a variety of Current Transformers. Because of this, care must be taken to properly scale the data values, pulse and analog outputs. This document discusses the methods used to properly configure a system using various CT types.

The WattsOn was designed from the perspective of ease of installation and use. As a result, it was required to streamline the method used for CT ratio configuration. To adhere to industry standards, the WattsOn treats all CT types as though they have a 5A output. This allows a consistent approach for system configuration, regardless of the CT type being used. For any given CT type, and full scale, the WattsOn effectively registers a 5.0A reading.

Although not all CTs have a 5A output, for the purpose of WattsOn's calculations, their ratio should be treated as such. The added advantage of this approach is that system software (DDC, PLC, SCADA, etc) may tread every WattsOn identically, regardless of the actual CT type in use.

Regardless of the CT type used, the correct CT ratio must be entered into the WattsOn Modbus registers (CT ratio Primary / Secondary ; register 40131, 40132 respectively) for WattsOn to compute the properly scaled values in the floating point register data bank.

5A CTs with WattsOn

When using 5A output CTs, the CT primary value must be written to register 40131, and the value "5" must be written in 40132.

Example: when using a 400:5 A CT
Set 40131 = 400
Set 40132 = 5

The effective CT ratio is 400/5 = 80. This multiplier may need to be used for the analog outputs (if they are computed without the CT ratio applied).

For model 1200 meters (analog outputs), in most cases, the Calibration Sheet shows the analog output configuration ***WITHOUT*** CT ratio multipliers since typically the factory is unaware of the CT ratio ahead of time. However, if known, this value can be specified during time of ordering.

mA CTs with WattsOn

When using mA (MCTx, MSCTx, MSxxx, etc), the CT primary value is the full scale rating of the WattsOn calibrated for use with those CTs. NOTE: It is *NOT* the maximum current input value of the CT.

Example: when using a MCTA with a
WattsOn-1100-MCTA-200A

Set 40131 = 200
Set 40132 = 5

The effective CT ratio is 200/5 = 40.

Typically, for mA meters, the Calibration Sheet shows the analog output configuration ***WITH*** CT ratio multipliers since the CT/Meter/Full Scale form a a set, and therefore is configured at the factory.

mV CTs with WattsOn

When using mV output (ie: 333mV CTs) the CT primary value is the full scale rating of the CT at a 333mV output.

Example: when using a 800-to-333mV CT
WattsOn-1100-333mV

Set 40131 = 800
Set 40132 = 5

The effective CT ratio is 800/5 = 160.

For model 1200 meters (analog outputs), this multiplier may need to be used for the analog outputs (if they are computed without the CT ratio applied).

In most cases, the Calibration Sheet shows the analog output configuration ***WITHOUT*** CT ratio multipliers since typically the factory is unaware of the CT ratio ahead of time. However, if known, this value can be specified during time of ordering.

Meter Input Type	CT Ratio Pre-Programmed?	Analog outputs include CT ratio multipliers?
5A	No	No
mA	Yes	Yes
mV	No	No

(typical factory programming)

Notes:

1. CT/PT Ratios may be programmed by the factory for 5A and mV meters, if the ratio is known during ordering.

2. CT/PT Ratios may be applied by the customer software for digital data, without being programmed into the Modbus registers.

3. For reading analog outputs only, the CT ratio does not need to be programmed, since the analog signal may be scaled arbitrarily by the user.

4. The CT ratio is computed as a numerator/denominator. As a result, it may be entered in any preferred method. Ie: a 400:5 ratio may be entered as 400/5 or 80/1, yielding identical results.

Integer Register Required Scaling

With the CT and PT ratios properly programmed into the meter, the Floating point registers do not require any additional scaling by the end user. These registers contain the proper CT/PT ratio multipliers and the decimal point is in the correct position.

If reading the integer registers, the CT/PT ratio multipliers must be applied to the registers. The table below shows how to properly calculate each register:

Register	Unit	Description	Multiplier
0x00 (40001)	Wh	Ttl Energy (32-bit)	* CTR * PTR
0x02 (40003)	W	Ttl W	* CTR * PTR
0x03 (40004)	VAR	Ttl VAR	* CTR * PTR
0x04 (40005)	VA	Ttl VA	* CTR * PTR
0x05 (40006)	Volts	Avg Volts (L-N)	* PTR * 0.1
0x06 (40007)	Volts	Avg Volts (L-L)	* PTR * 0.1
0x07 (40008)	Amps	Avg Current	* CTR * 0.001
0x08 (40009)		Ttl PF	* 0.0001
0x09 (40010)	Hz	Freq	* 0.1
0x0A (40011)	Volts	Volts, A-N	* PTR * 0.1
0x0B (40012)	Volts	Volts, B-N	* PTR * 0.1
0x0C (40013)	Volts	Volts, C-N	* PTR * 0.1
0x0D (40014)	Volts	Volts, A-B	* PTR * 0.1
0x0E (40015)	Volts	Volts, B-C	* PTR * 0.1
0x0F (40016)	Volts	Volts, A-C	* PTR * 0.1
0x10 (40017)	Amps	Current, A	* CTR * 0.001
0x11 (40018)	Amps	Current, B	* CTR * 0.001
0x12 (40019)	Amps	Current, C	* CTR * 0.001
0x13 (40020)	W	W, phase A	* CTR * PTR * 0.1
0x14 (40021)	W	W, phase B	* CTR * PTR * 0.1
0x15 (40022)	W	W, phase C	* CTR * PTR * 0.1
0x16 (40023)	VAR	VAR, phase A	* CTR * PTR * 0.1
0x17 (40024)	VAR	VAR, phase B	* CTR * PTR * 0.1
0x18 (40025)	VAR	VAR, phase C	* CTR * PTR * 0.1
0x19 (40026)	VA	VA, phase A	* CTR * PTR * 0.1
0x1A (40027)	VA	VA, phase B	* CTR * PTR * 0.1
0x1B (40028)	VA	VA, phase C	* CTR * PTR * 0.1
0x1C (40029)		PF, phase A	* 0.0001
0x1D (40030)		PF, phase B	* 0.0001
0x1E (40031)		PF, phase C	* 0.0001
0x1F (40032)	fixed	Version	* 0.1
0x20 (40033)	Wh	Wh (+), A	* CTR * PTR
0x22 (40035)	Wh	Wh (+), B	* CTR * PTR
0x24 (40037)	Wh	Wh (+), C	* CTR * PTR
0x26 (40039)	Wh	Ttl Wh (+)	* CTR * PTR
0x28 (40041)	Wh	Wh (-), A	* CTR * PTR
0x2A (40043)	Wh	Wh (-), B	* CTR * PTR
0x2C (40045)	Wh	Wh (-), C	* CTR * PTR
0x2E (40047)	Wh	Ttl (-)	* CTR * PTR
0x30 (40049)	Wh	Wh (+/-), A	* CTR * PTR
0x32 (40051)	Wh	Wh (+/-), B	* CTR * PTR
0x34 (40053)	Wh	Wh (+/-), C	* CTR * PTR
0x36 (40055)	Wh	Ttl Wh (+/-)	* CTR * PTR
0x38 (40057)	VARh	VARh (+), A	* CTR * PTR
0x3A (40059)	VARh	VARh (+), B	* CTR * PTR
0x3C (40061)	VARh	VARh (+), C	* CTR * PTR
0x3E (40063)	VARh	Ttl VARh (+)	* CTR * PTR
0x40 (40065)	VARh	VARh (-), A	* CTR * PTR
0x42 (40067)	VARh	VARh (-), B	* CTR * PTR
0x44 (40069)	VARh	VARh (-), C	* CTR * PTR
0x46 (40071)	VARh	Ttl VARh (-)	* CTR * PTR
0x48 (40073)	VARh	VARh (+/-), A	* CTR * PTR
0x4A (40075)	VARh	VARh (+/-), B	* CTR * PTR
0x4C (40077)	VARh	VARh (+/-), C	* CTR * PTR
0x4E (40079)	VARh	Ttl VARh (+/-)	* CTR * PTR
0x50 (40081)	VAh	VAh, A	* CTR * PTR
0x52 (40083)	VAh	VAh, B	* CTR * PTR
0x54 (40085)	VAh	VAh, C	* CTR * PTR
0x56 (40087)	VAh	Ttl VAh	* CTR * PTR
0x58 (40089)	WD	Power Demand	* CTR * PTR

CTR = (CT Ratio Primary / CT Ratio Secondary)
PTR = (PT Ratio Primary / PT Ratio Secondary)