2000.35.032

Description

Three phase energy meter with universal current input: current transformers with output in voltage or in current can be used on the same inputs.
One DIN box, perfect for electrical panel. Equipped with one serial output RS485 Modbus RTU for readings and one digital output for alarms. Configuration through free software.

Meter Characteristics

- Equivalent to class 0,5S (KWh) of EN62053-22
- Equivalent to class 0,5S (KVARh) of EN62053-24
- Accuracy ±0,5% RDG
- Universal input for current measurement
- Energy meter
- TRMS measurements of distorted sine waves (voltages/currents)
- Neutral current measurement
- One digital output (mosfet) for alarms
- Serial RS485 output
- Alarms signaling through front led
- Dimension: 1 DIN module
- Three variants available: Standard, Plus, Pro

Variants

Standard - 2000.35.032	**Plus**	**Pro**
$V_{RMS\ LL}$ e $V_{RMS\ LN}$[V]	Distorted power factor	Harmonics up to 63rd order
I_{RMS} [A]	Tan φ	Interharmonics
Power: • Active [W] • Reactive [VAR] • Apparent [VA]	Average, MAX and min: V_{LL}, V_{LN}, I, W, VAR, VA, Cos φ	Power quality: • Sag • Swell • Interruption
Cos φ	Phase sequence monitoring	
Crest Factor	Internal temperature [°C]	
Frequency [Hz]	MAX demand	Single phase device efficiency measurement
Peaks on: • Voltage V_{LL} [V] • Voltage V_{LN} [V] • Currents I [A]	Time above given threshold for P_1, P_2, P_3 o P_{3PH}	
Energies (pos, neg, total): • Active [Wh] • Reactive [VARh] • Apparent [Vah]	Inverter input (PWM modulated input)	
	THD, TDD	

GENERAL SPECIFICATION

Power supply specifications	
AC/DC Voltage	10 - 40 V_{DC} 19 - 28 V_{AC}
Power consumption	< 0,7 W
Input specifications	
Working frequency	1 - 70 Hz
Voltage	
Impedance	400 KΩ
Nominal voltage U_n	300 V_{LN} / 500 V_{LL}
Continuous overload U_{MAX}	400 V_{LN} / 700 V_{LL}
Overload for 500 ms	600 V_{LN} / 1000 V_{LL}
Current	
Type	Not isolated (external CTs necessary)
Current output CTs	
Nominal current I_n	5 A_{AC}
Crest factor	< 4 (20 A_{PK} MAX)
Impedance	< 0,5 VA per fase
Continuous overload I_{MAX}	6 A_{AC}
Overload for 500 ms	40 A_{AC}
Voltage output CTs	
Nominal voltage V_n	333 mV_{AC}
Crest factor	< 3 (1 V_{PK} MAX)
Impedance	220 KΩ
Continuous overload V_{MAX}	2,1 V_{PK}
Overload for 500 ms	13 V_{PK}
Accuracy (@ 25 ± 5 °C; freq = 50 Hz)	
Frequency	± 0,1 Hz (40..70 Hz)
Active energy	class C according to EN50470-1/3 class 0,5 S according to EN62053-22
Reactive energy (if measured, see ahead)	class 0,5 S according to EN62053-24
Power factor	± (0,001 +1%(1.00-PF))
Bandwidth (-3dB)	> 2KHz
Thermal drift	<100 ppm/°C
Energy backup	Via Flash, minimum lifetime: 3 years
Software functions	
Measurement type	TRMS
Sampling rate	6400 samples/s @ 50Hz, 7280 samples/s @ 60Hz
Measurement refresh rate	Software configurable; Default: 50 AC cycles MAX: 65535 cycles

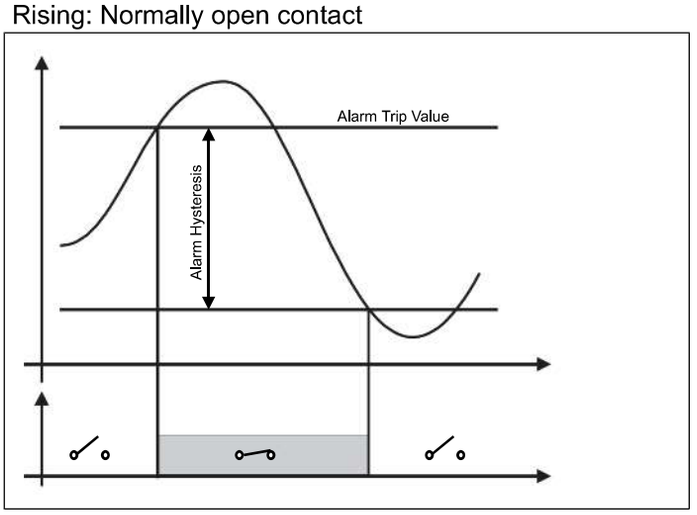
Transformer ratio	CT and VT default 1,0; software configurable
Transformer delay	0,0° @50 Hz default; software configurable
Minimum display cutoff	Configurable on voltage, current and power

Output specifications	
RS485	
Baudrate	from 1200 to 115200 Baud (standard 9600)
Address	from 1 to 247
Protocol	Modbus RTU
Connection	Through 3 poles pluggable terminals (activated via software as an alternative to the digital output) or via T-Bus (always active)
Uscita digitale	
Use for	Alarms
Numbers	1 (activated via software as an alternative to the RS485)
Type	Solid state (Mosfet)
Max values	< 40 V, < 100 mA

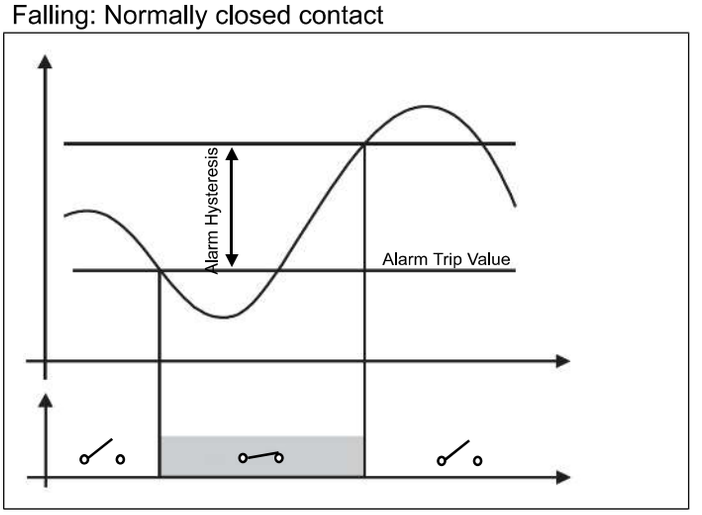
General specifications	
Operating temperature	-10°C... +60°C
Storage temperature	-40°C... +85°C
Humidity	10...90% not condensing
Altitude	Up to 2000 m s.l.m.
Installation category	Cat. III (IEC 60664, EN60664)
Isolation	4 KV_{RMS} between power supply and measuring inputs 4 KV_{RMS} between RS485 and measuring inputs 1,5 KV_{RMS} between power supply and RS485
Standards	
EMC / EMI	EN61000-6-4; EN61000-6-2; EN61000-4-2; EN61000-4-3; EN61000-4-4; EN61000-4-5 ; EN61000-4-6;
Safety	EN61010-1; EN61010-2-030;
Connections	n°1 removable terminals pitch 3,5 mm 2 poles n°1 removable terminals pitch 3,5 mm 3 poles n°1 removable terminals pitch 3,5 mm 6 poles n°1 removable terminals pitch 5.08 mm 4 poles
Housing	
Dimensions	93 x 17,7 x 68,3 mm (excluding terminal)
Material	PBT, gray
Dip-Switch	2 poles (for Baudrate and Address)
Protection degree IP	IP20
Mounting	Din rail mounting, designed for mounting on bus (connector not included)
Led	N°5: Power (Green), Fail (yellow), TX e RX (red), Digital output (Green)
Configuration	Comunication to free interface program for: - configuration of all the available parameters; - possibility of firmware upgrade (if available).

DIGITAL OUTPUT ALARMS

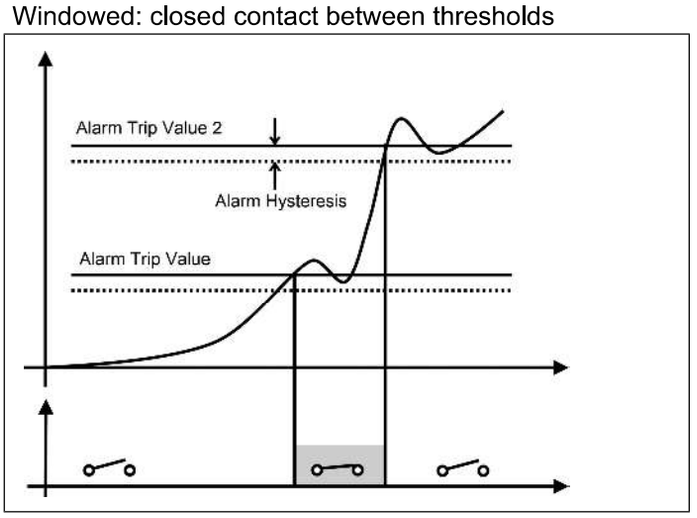
Rising: Normally open contact



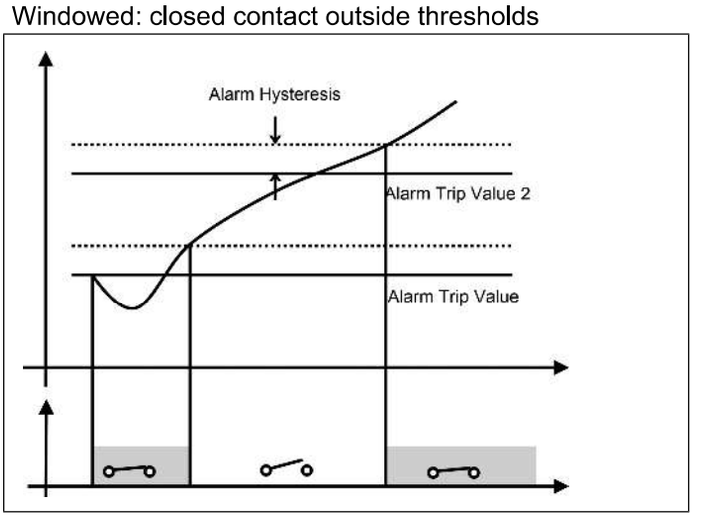
Falling: Normally closed contact



Windowed: closed contact between thresholds



Windowed: closed contact outside thresholds



Note: To enable digital output alarms, RS485 terminals must be configured for digital output. Communication will be available only on T-BUS.

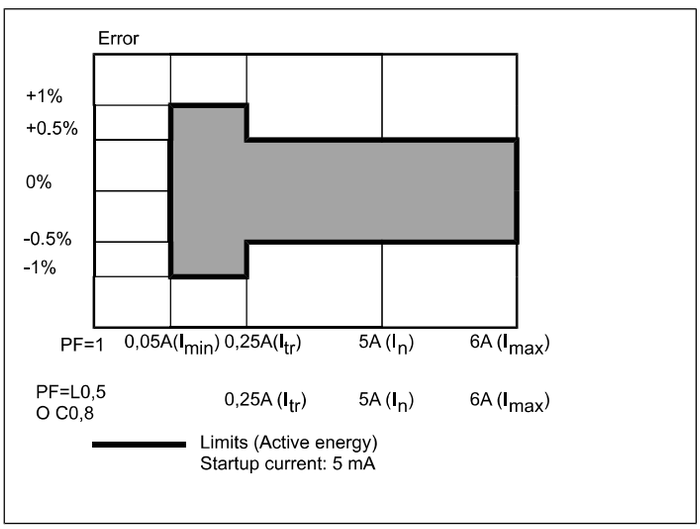
FRONTAL LEDS

Function	State	Note	
Power (green)	Steady on	*Powered device*	
Fail (yellow)	Blinking	*Bootloader active*.Can be executed through Modbus command, or because of program flash corruption.	
	Steady on	***At least one*** *of the following state is present:*	
		Eeprom fail	Error on storing flash for settings, calibration or energies
		Phase reversal	Phase sequence L_1, L_2 e L_3 is not correct
		I_i or V_i over-range	Current or voltage phase i has a too high positive value
		I_i or V_i under-range	Current or voltage phase i has a too high negative value
RX (rosso)	Blinking	The device is receiving data from RS485	
TX (rosso)	Blinking	The device is sending data from RS485	
D_{out} (verde)	Steady on	Digital output is closed	

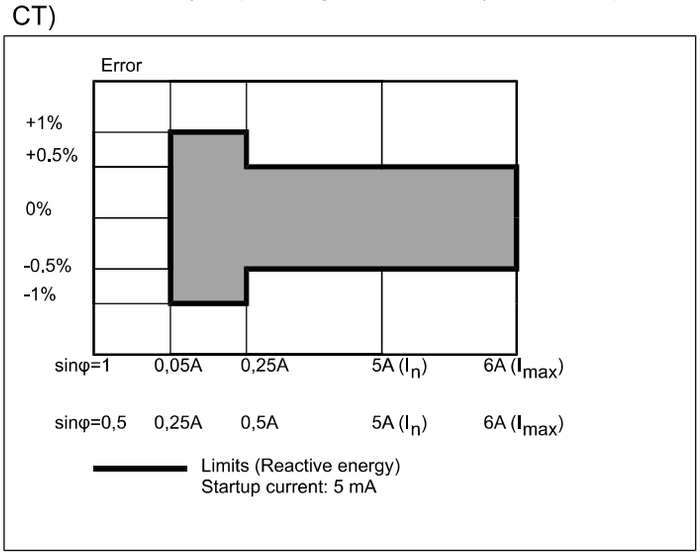
ADDITIONAL INFORMATION

ACCURACY (according to EN50470-3 and EN62053-24)

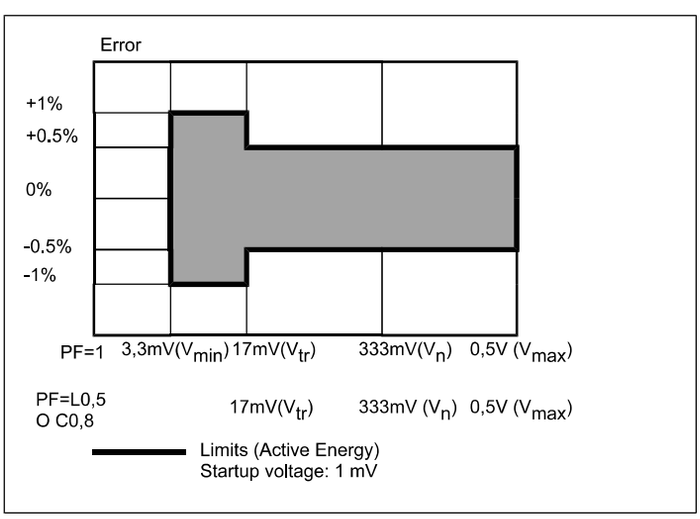
Wh, accuracy depending on the load (current output CT)



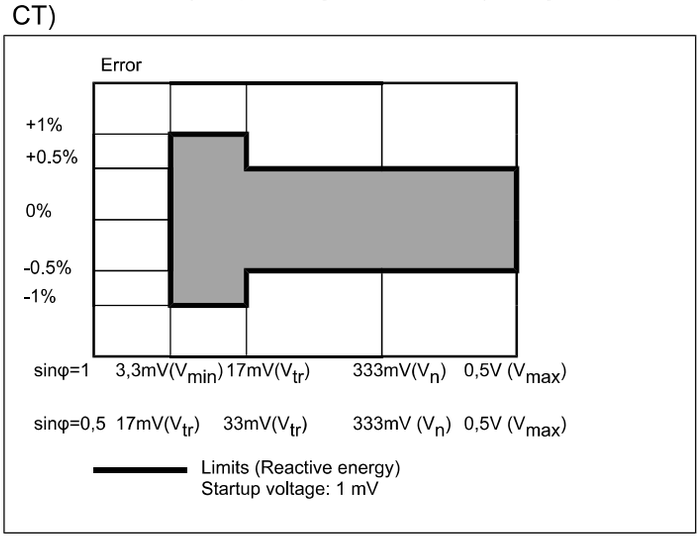
VARh, accuracy depending on the load (current output CT)



Wh, accuracy depending on the load (voltage output CT)



VARh, accuracy depending on the load (voltage output CT)



Note: Reactive power accuracy is granted if the instrument Q calculation is according Budeanu formula.

INSULATION BETWEEN INPUTS AND OUTPUTS

	Power supply	Measurement inputs	Communication port
Power supply		4 KV	1,5 KV
Measurement inputs	4 KV		4 KV
Communication port	1,5 KV	4 KV	

USED CALCULATION FORMULAS

Phase variables

RMS Voltage

$$V_i = \sqrt{\frac{1}{N}\sum_{1}^{N}(v_L)_i^2}$$

RMS Current

$$I_i = \sqrt{\frac{1}{N}\sum_{1}^{N}(i_L)_i^2}$$

Active Power

$$P_i = \frac{1}{N}\sum_{1}^{N} v_{Li}\ i_{Li}$$

Apparent Power

$$S_i = V_i\ I_i$$

Reactive Power

$$Q_i = \frac{1}{N} * \sum_{1}^{N} v_{Li}\hat{i}_{Li} \quad Budeanu$$

$$Q_i = \sqrt{S_i^2 - P_i^2} \quad triangular$$

Power factor

$$\cos\phi_i = \frac{P_i}{S_i}$$

System variables

Voltage average

$$V_{AVG} = \frac{V_1 + V_2 + V_3}{3}$$

Current average

$$I_{AVG} = \frac{I_1 + I_2 + I_3}{3}$$

Three phase active power

$$P_{3PH} = P_1 + P_2 + P_3$$

Three phase apparent power

$$S_{3PH} = S_1 + S_2 + S_3$$

Three phase reactive power

$$Q_{3PH} = Q_1 + Q_2 + Q_3$$

Three phase power factor

$$\cos\phi_{3PH} = \frac{P_{3PH}}{S_{3PH}}$$

Energy metering

Active Energy

$$Wh_i = \int_{t_1}^{t_2} P_i(t)dt \approx \Delta t \sum_{n_1}^{n_2} P(n)_i$$

Reactive Energy

$$VARh_i = \int_{t_1}^{t_2} Q_i(t)dt \approx \Delta t \sum_{n_1}^{n_2} Q(n)_i$$

Apparent Energy

$$VAh_i = \int_{t_1}^{t_2} S_i(t)dt \approx \Delta t \sum_{n_1}^{n_2} S(n)_i$$

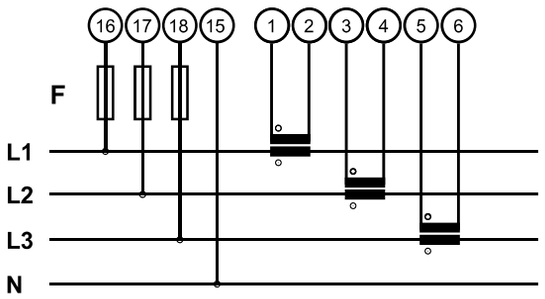
Where:
i= phase observed (L1, L2 or L3);
P= Active power;
Q= Reactive power;
t1, t2 = starting and ending time points of consumption recording;
n= time unit;
t= time unit length;
n1, n2 = starting and ending discrete time points of consumption recording.

DIP SWITCH SETTINGS

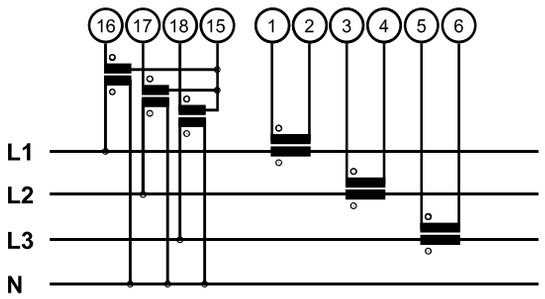
DIP 1	DIP 2	
0	X	RS485 settings from Eeprom
1	0	Address 1, Baudrate 9600, no parity
1	1	Address 1, Baudrate 38400, no parity

WIRING DIAGRAMS

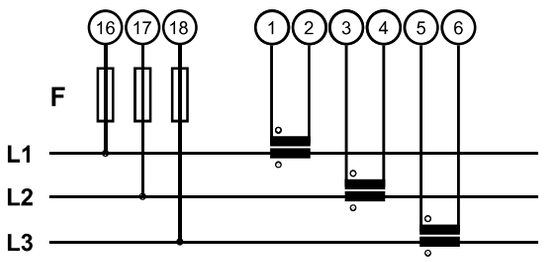
3-ph, 4 wires, 3 CTs connection — Fig. 1



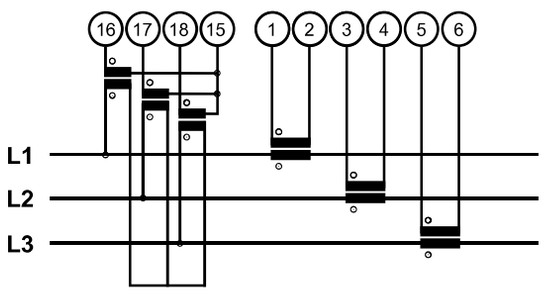
3-ph, 4 wires, 3 CTs and 3 VTs connection — Fig. 2



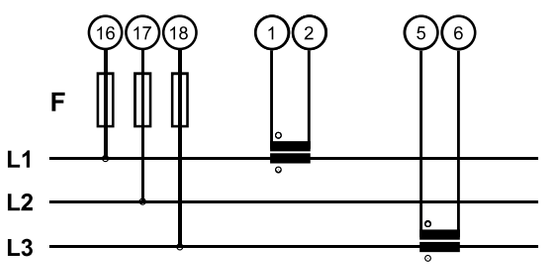
3-ph, 3 wires, 3 CTs connection — Fig. 3



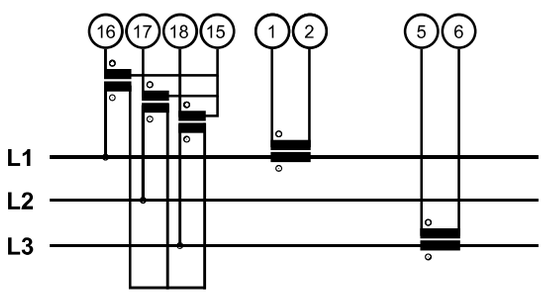
3-ph, 3 wires, 3 CTs and 3 VTs connection — Fig. 4



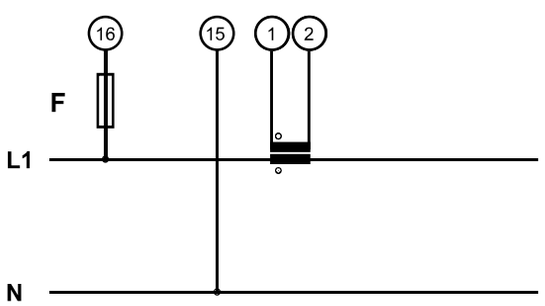
3-ph, 3 wires, 2 CTs connection (Aron) — Fig. 5



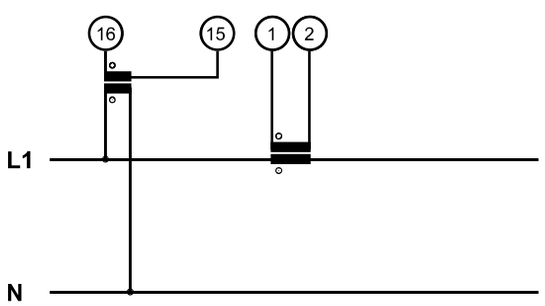
3-ph, 3 wires, 2 CTs 3 VTs connection (Aron) — Fig. 6



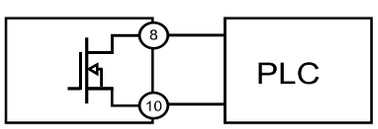
Monofase, 2 fili, connessione con 1 TA — Fig. 7



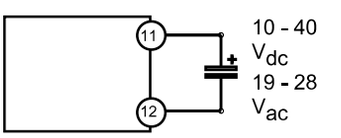
Monofase, 2 fili, connessione con 1 TA e 1 TV — Fig. 8



Digital output on terminal 8-9-10 in digital output configuration

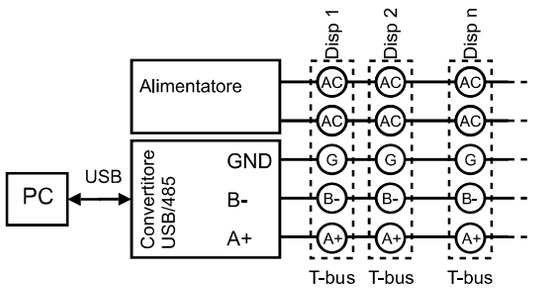


Power supply

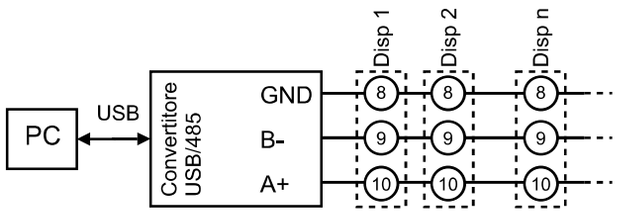


N.B.: Since this is a Class II device, as per "EN 61140:2004-05: Protection against electric shock – Common aspects for installation and equipment",**it is forbidden the earthing of the device**, to avoid damaging the device and reducing safety of the panel.

Communication via T-BUS (with the proper optional connector)



Communication con terminal 8-9-10 in RS485 configuration



"CONFIGURATION REGISTER" 40007

This 16 bit register sets the configuration of the device. Hereafter the details

Settings	Valore	Dettaglio
CT input type	xxxx xxxx xxxx xxx0	Current input (e.g. CT 5A)
	xxxx xxxx xxxx xxx1	Voltage input (e.g. CT 333 mV, Rogowski)
Insertion handling	xxxx xxxx xxxx x00x	Single phase insertion
	xxxx xxxx xxxx x01x	Three phase insertion: three wires, 2 CTs (Aron)
	xxxx xxxx xxxx x10x	Three phase insertion: three wires, 3 CTs
	xxxx xxxx xxxx x11x	Three phase insertion: four wires, 3 CTs
FFT representation	xxxx xxxx xxxx 0xxx	Absolute: each harmonic RMS is displayed.
	xxxx xxxx xxxx 1xxx	Relative to First harmonic: X_n/X_1 is displayed.
Reactive power formula	xxxx xxxx xx0x xxxx	Triangular method: this method gives you an indirect reactive power measurement. It's the most used in energy meters.
	xxxx xxxx xx1x xxxx	Phase shifting method (Budeanu). This method measures reactive power directly. Accuracy is given with this method
8-9-10 terminal usage	xxxx xxxx x0xx xxxx	Used as RS485: 8 = GND, 9 = B-, 10 = A-
	xxxx xxxx x1xx xxxx	Used as digital output between terminal 8 e 10. Communication RS485 is still present on T-Bus connector.
Frequency channel	xxxx xxxx 0xxx xxxx	Voltage channel, L1 phase
	xxxx xxxx 1xxx xxxx	Current channel, L1 phase
Voltage input type	xxxx xxx0 xxxx xxxx	Standard load
	xxxx xxx1 xxxx xxxx	PWM input voltage.
Energy saving	xxxx xx0x xxxx xxxx	Saving disabled
	xxxx xx1x xxxx xxxx	Saving enabled
Dynamic data representation	xxx0 0xxx xxxx xxxx	Float
	xxx0 1xxx xxxx xxxx	Float swapped
	xxx1 0xxx xxxx xxxx	Integer = Float/100
	xxx1 1xxx xxxx xxxx	Integer swapped = Float/100
Integrator	xx0x xxxx xxxx xxxx	Disabled
	xx1x xxxx xxxx xxxx	Enabled, for Rogowski input
Digital output behaviour	x0xx x0xx xxxx xxxx	Rising: Normally open contact
	x1xx x0xx xxxx xxxx	Falling: Normally closed contact
	x0xx x1xx xxxx xxxx	Windowed: closed contact between thresholds
	x1xx x1xx xxxx xxxx	Windowed: closed contact outside thresholds
Filtering	0xxx xxxx xxxx xxxx	Filtering disabled: less stable but faster measurement
	1xxx xxxx xxxx xxxx	Filtering enabled: more stable but slower measurement

Avaiable for 2000.35.032

Register Name	Description	Register Type	R/W	Default	Modbus Address
Machine_Id	Machine ID	unsigned short	R	23 , 28 or 32 (STD, PLUS, PRO)	**40001**
HW_FW_version	Hardware (MSB) and Firmware (LSB) Revision	unsigned short	R		**40002**
address	modbus address	unsigned short	R/W	1	**40003**
delay	answer delay expressed as cycles	unsigned short	R/W	1	**40004**
Baudrate	0 → 1200 1 → 2400 2 → 4800 3 → 9600 4 → 19200 5 → 38400 6 → 57600 7 → 115200	unsigned short	R/W	3	**40005**
Parity	0 -> NONE 1 -> ODD 2 -> EVEN	unsigned short	R/W	0	**40006**
Configuration_Flag	Bit 0: Current Measurement type 0 → Input 1A/5A 1 → Input 333 mV/ Rogowski Bit 1..2: Connection 0 → Single phase 1 → Three phase: 3 wires, 2 CT (Aron) 2 → Three phase: 3 wires, 3 CT 3 → Three phase: 4 wires, 3 CT (with neutral) Bit 3: FFT representation 0 → Absolute 1 → Relative to the I1 value Bit 5: Reactive power calculation method 0 → Triangle method 1 → Budeanu Bit 6: RS-485 as Switch 0 → RS-485 1 → Switch Bit 7: Frequency detection Channel 0 → Voltage 1 → Current Bit 8: Voltage input type 0 → Normal load 1 → PWM modulated input (Inverter Load) Bit 9: Energy saving 0 → Disabled 1 → Enabled Bit 11..12: Measurement type 0 → Float 1 → Float Swapped 2 → Hundredth (Float * 100) 3 → Hundredth swapped (Float * 100 SW) Bit 13: Integrator condition 0 → Integrator disabled 1 → Integrator enabled (Rogowski input) Bit 10, 14: Output switch initial condition 0 → Closed initial condition 1 → Windowed: closed contact between thresholds 2 → Open initial condition 3→ Windowed: closed contact outside thresholds Bit 15: Filtered measurement 0 → Filtering disabled 1 → Filtering enabled	unsigned short	R/W	16934: INPUT_1A_5A | THREE_PHASE_4W_3CT | FFT_REPRESENTATION_ABSOLUTE | BUDEANU | RS485_BEHAVIOUR | FREQUENCY_DETECTION_ON_VOLTAGE | NORMAL_INPUT | ENERGY_SAVING_ENABLED | FLOAT_TYPE | INTEGRATOR_DISABLED | OPEN_COND | FILTERED_OUTPUT_DISABLED	**40007**
Led_settings	Set Fail LED Bit: 0 → Fail Eeprom (settings, calibration or Energy) 1 → Phase reversal 2 → I1 Over-range 3 → I1 Under-range 4 → I2 Over-range 5 → I2 Under-range 6 → I3 Over-range 7 → I3 Under-range 8 → V1 Over-range 9 → V1 Under-range 10 → V2 Over-range 11 → V2 Under-range 12 → V3 Over-range 13 → V3 Under-range	unsigned short	R/W	1: Fail Eeprom	**40008**
CT_Transducer_ratio	If Input 1A/5A → Current transformer ratio M/N (Ex: 600:5 → transducer_ratio = 120) If Input Rogowski / 333mV → (1 / Sensitivity) [A/V] (Ex: 100mV/1KA → transducer_ratio = 10000, 333mV/5A → transducer_ratio = 15)	float	R/W	1	**40009**
CT_Transducer_delay	Current transformer delay in [°] @ 50 Hz for accurate power calculation	float	R/W	0	**40011**
VT_Transducer_ratio	Voltage transformer ratio M/N - Default 1.0 (Ex: 1000:100 → transducer_ratio = 10)	float	R/W	1	**40013**
VT_Transducer_delay	Voltage transformer delay in [°] @ 50 Hz for accurate power calculation	float	R/W	0	**40015**
minimum_voltage_ripple	Minimum threshold under which the instrument reads 0 independent from the input value	float	R/W	0	**40017**
minimum_current_ripple	Minimum threshold under which the instrument reads 0 independent from the input value	float	R/W	0	**40019**
minimum_power_ripple	Minimum threshold under which the instrument reads 0 independent from the input value (P, Q, and S)	float	R/W	0	**40021**
DC_Filter	Number of tenth seconds for I RMS value in DC	unsigned short	R/W	10	**40023**
AC_Filter	Number of zero crossings for I RMS value in AC	unsigned short	R/W	50	**40024**
minute_for_Max_demand	Minute for Max demand calculation (0..45)	unsigned short	R/W	15	**40025**
seconds_for_mean_RMS	Register in seconds (0..30) for RMS average	unsigned short	R/W	0	**40027**
seconds_for_MAX_RMS	Seconds 1..30 for MAX RMS value. If the register is 0, then the absolute MAX RMS is given	unsigned short	R/W	0	**40028**
seconds_for_min_RMS	Seconds 1..30 for min RMS value. If the register is 0, then the absolute min RMS is given	unsigned short	R/W	0	**40029**
Energy_unit_factor	Variable for changing Energy measurement unit: 0 -> [Wh/10] 1 -> [Wh] 4 -> [KWh]	unsigned short	R/W	0	**40030**
Alarm_Register_start_addres	Float value Starting address for alarm (40361 V_L1_N, 40363 V_L2_N, 40365 V_L3_N, ecc)	unsigned short	R/W	40361	**40036**
Alarm_trip_value	Alarm Threshold for "closed" and "open" condition OR first alarm Threshold for "within threshold" and "Outs	float	R/W	0	**40037**
Alarm_hysteresis	Alarm Hysteresis	float	R/W	1	**40039**
Alarm_trip_value_2	Second alarm Threshold for "within threshold" and "Outside threshold" condition	float	R/W		**40041**
Power_Threshold_for_exceed	Threshold for Power exceedings monitoring	float	R/W	0	**40043**
Nominal_Star_Voltage	Nominal Star Voltage for Sag, Swell, Interruption monitoring [V]	float	R/W	230	**40045**
Sag_percentage_level	Percentage over Nominal_Star_Voltage under which a Sag event is generated (default 0.9 = 90 %); must b	float	R/W	0.9	**40047**
Swell_percentage_level	Percentage over Nominal_Star_Voltage over which a Swell event is generated (default 1.1 = 110 %)	float	R/W	1.1	**40049**
Interruption_percentage_leve	Percentage over Nominal_Star_Voltage under which an Interruption event is generated (default 0.1 = 10 %	float	R/W	0.1	**40051**
Minimum_duration_cutoff	Sag, Swell or Interruption events must be above this cutoff to be displayed and saved [ms]	unsigned short	R/W	0	**40053**

Register Name	Description	Register Type	R/W	Default	Modbus Address
Status_1	bit 0: flash settings error; bit 1: flash calibration error; bit 2: Current I1 Over Range; bit 3: Current I1 Under Range; bit 4: Current I2 Over Range; bit 5: Current I2 Under Range; bit 6: Current I3 Over Range; bit 7: Current I3 Under Range; bit 8: Current V1 Over Range; bit 9: Current V1 Under Range; bit 10: Current V2 Over Range; bit 11: Current V2 Under Range; bit 12: Current V3 Over Range; bit 13: Current V3 Under Range; bit 14: Zero crossing detecting; bit 15: Switch open; bit 16: Wh storing error; bit 17..18: don't care; bit 19: Alarm detection; bit 20..27: don't care; bit 28: Leading Power factor PF1; bit 29: Leading Power factor PF2; bit 30: Leading Power factor PF3;	unsigned long	R		**40239**
Command	Flash settings save command = 0xC1C0; Reset command = 0xC1A0; Save energy command = 0xBABA Close Switch command = 0xDAAA (only if Digital Output is enabled) Open Switch command = 0xDAAB (only if Digital Output is enabled) Enter Bootloader command = 0xB000 Reset MAX Demand registers command = 0xF000	unsigned short	R/W		**40244**
KWh1	Active energy line 1 [Wh tenth]	signed long long	R/W		**40245**
KWh2	Active energy line 2 [Wh tenth]	signed long long	R/W		**40249**
KWh3	Active energy line 3 [Wh tenth]	signed long long	R/W		**40253**
KWh_SUM	Active energy three phase [Wh tenth]	signed long long	R/W		**40257**
KWh1_Plus	Positive Active energy line 1 [Wh tenth]	signed long long	R/W		**40261**
KWh2_Plus	Positive Active energy line 2 [Wh tenth]	signed long long	R/W		**40265**
KWh3_Plus	Positive Active energy line 3 [Wh tenth]	signed long long	R/W		**40269**
KWh_SUM_Plus	Positive Active energy three phase [Wh tenth]	signed long long	R/W		**40273**
KWh1_Neg	Negative Active energy line 1 [Wh tenth]	signed long long	R/W		**40277**
KWh2_Neg	Negative Active energy line 2 [Wh tenth]	signed long long	R/W		**40281**
KWh3_Neg	Negative Active energy line 3 [Wh tenth]	signed long long	R/W		**40285**
KWh_SUM_Neg	Negative Active energy three phase [Wh tenth]	signed long long	R/W		**40289**
KVARh1	Reactive energy line 1 [VARh tenth]	signed long long	R/W		**40293**
KVARh2	Reactive energy line 2 [VARh tenth]	signed long long	R/W		**40297**
KVARh3	Reactive energy line 3 [VARh tenth]	signed long long	R/W		**40301**
KVARh_SUM	Reactive energy three phase [VARh tenth]	signed long long	R/W		**40305**
KVARh1_Inductive	Inductive Reactive energy line 1 [VARh tenth]	signed long long	R/W		**40309**
KVARh2_Inductive	Inductive Reactive energy line 2 [VARh tenth]	signed long long	R/W		**40313**
KVARh3_Inductive	Inductive Reactive energy line 3 [VARh tenth]	signed long long	R/W		**40317**
KVARh_SUM_Inductive	Inductive Reactive energy three phase [VARh tenth]	signed long long	R/W		**40321**
KVARh1_Capacitive	Capacitive Reactive energy line 1 [VARh tenth]	signed long long	R/W		**40325**
KVARh2_Capacitive	Capacitive Reactive energy line 2 [VARh tenth]	signed long long	R/W		**40329**
KVARh3_Capacitive	Capacitive Reactive energy line 3 [VARh tenth]	signed long long	R/W		**40333**
KVARh_SUM_Capacitive	Capacitive Reactive energy three phase [VARh tenth]	signed long long	R/W		**40337**
KVAh1	Apparent energy line 1 [VAh tenth]	signed long long	R/W		**40341**
KVAh2	Apparent energy line 2 [VAh tenth]	signed long long	R/W		**40345**
KVAh3	Apparent energy line 3 [VAh tenth]	signed long long	R/W		**40349**
KVAh_SUM	Apparent energy three phase [VAh tenth]	signed long long	R/W		**40353**
Wh_storage_count	Number of Wh flash savings (every 20 seconds)	unsigned long	R		**40357**
V_L1_N	RMS star voltage L1-N [V]	float	R		**40359**
V_L2_N	RMS star voltage L2-N [V]	float	R		**40361**
V_L3_N	RMS star voltage L3-N [V]	float	R		**40363**
V_STAR_AVG	RMS star avg value voltage [V]	float	R		**40365**
V_L1_L2	RMS line voltage L1-L2 [V]	float	R		**40367**
V_L2_L3	RMS line voltage L2-L3 [V]	float	R		**40369**
V_L3_L1	RMS line voltage L3-L1 [V]	float	R		**40371**
V_LINE_AVG	RMS line avg value voltage [V]	float	R		**40373**
I_L1	RMS line current L1 [A]	float	R		**40375**
I_L2	RMS line current L2 [A]	float	R		**40377**
I_L3	RMS line current L3 [A]	float	R		**40379**
I_N	RMS line current N [A] (if 1 or 2 TA connection, I_N = 0)	float	R		**40381**
I_AVG	RMS avg value current [A] (excluding neutral current I_N)	float	R		**40383**
P1	RMS active power line 1 [W]	float	R		**40385**
P2	RMS active power line 2 [W]	float	R		**40387**
P3	RMS active power line 3 [W]	float	R		**40389**
P_SUM	RMS sum active power [W]	float	R		**40391**
Q1	RMS reactive power line 1 [VAR]	float	R		**40393**
Q2	RMS reactive power line 2 [VAR]	float	R		**40395**
Q3	RMS reactive power line 3 [VAR]	float	R		**40397**
Q_SUM	RMS sum reactive power [VAR]	float	R		**40399**
S1	RMS apparent power line 1 [VA]	float	R		**40401**
S2	RMS apparent power line 2 [VA]	float	R		**40403**
S3	RMS apparent power line 3 [VA]	float	R		**40405**
S_SUM	RMS sum apparent power [VA]	float	R		**40407**
PF1	Power Factor line 1	float	R		**40409**
PF2	Power Factor line 2	float	R		**40411**
PF3	Power Factor line 3	float	R		**40413**
PF_3PH	Three Phase Power Factor	float	R		**40415**
CF1	Crest Factor line 1	float	R		**40417**
CF2	Crest Factor line 2	float	R		**40419**
CF3	Crest Factor line 3	float	R		**40421**
CF_N	Crest Factor Neutral	float	R		**40423**
Frequency	Frequency [Hz]	float	R		**40425**
V_L1_N_peak	Star voltage L1-N peak [V]	float	R/W		**40427**

Register Name	Description	Register Type	R/W	Default	Modbus Address
V_L2_N_peak	Star voltage L2-N peak [V]	float	R/W		**40429**
V_L3_N_peak	Star voltage L3-N peak [V]	float	R/W		**40431**
V_L1_L2_peak	Line voltage L1-L2 peak [V]	float	R/W		**40433**
V_L2_L3_peak	Line voltage L2-L3 peak [V]	float	R/W		**40435**
V_L3_L1_peak	Line voltage L3-L1 peak [V]	float	R/W		**40437**
I_L1_peak	L1 current peak [A]	float	R/W		**40439**
I_L2_peak	L2 current peak [A]	float	R/W		**40441**
I_L3_peak	L3 current peak [A]	float	R/W		**40443**
I_N_peak	N current peak [A]	float	R/W		**40445**
DPF1	Distortion Power Factor line 1 (+ inductive, - capacitive)	float	R		**40467**
DPF2	Distortion Power Factor line 2 (+ inductive, - capacitive)	float	R		**40469**
DPF3	Distortion Power Factor line 3 (+ inductive, - capacitive)	float	R		**40471**
DPF_N	Neutral Distortion Power Factor (+ inductive, - capacitive)	float	R		**40473**
TAN_FI_1	Tangentθline 1 (+ inductive, - capacitive)	float	R		**40475**
TAN_FI_2	Tangentθline 2 (+ inductive, - capacitive)	float	R		**40477**
TAN_FI_3	Tangentθline 3 (+ inductive, - capacitive)	float	R		**40479**
TAN_FI_AVG	Average Tangentθ(+ inductive, - capacitive)	float	R		**40481**
Phase_Order	L1, L2, L3 = 0; L1, L3, L2 = 1	float	R		**40483**
Internal_temperature	Internal Temperature [°C]	float	R		**40485**
V_L1_N_RMS_AVG	Star voltage L1_N RMS average [V] over “seconds_for_mean_RMS”	float	R		**40487**
V_L1_N_RMS_MAX	Star voltage L1_N MAX RMS [V] over last “seconds_for_MAX_RMS”	float	R		**40489**
V_L1_N_RMS_min	Star voltage L1_N Min RMS [V] over last“seconds_for_min_RMS”	float	R		**40491**
V_L2_N_RMS_AVG	Star voltage L2_N RMS average [V] over “seconds_for_mean_RMS”	float	R		**40493**
V_L2_N_RMS_MAX	Star voltage L2_N MAX RMS [V] over last “seconds_for_MAX_RMS”	float	R		**40495**
V_L2_N_RMS_min	Star voltage L2_N Min RMS [V] over last“seconds_for_min_RMS”	float	R		**40497**
V_L3_N_RMS_AVG	Star voltage L3_N RMS average [V] over “seconds_for_mean_RMS”	float	R		**40499**
V_L3_N_RMS_MAX	Star voltage L3_N MAX RMS [V] over last “seconds_for_MAX_RMS”	float	R		**40501**
V_L3_N_RMS_min	Star voltage L3_N Min RMS [V] over last“seconds_for_min_RMS”	float	R		**40503**
V_STAR_AVG_RMS_AVG	Star voltage AVG RMS average [V] over “seconds_for_mean_RMS”	float	R		**40505**
V_STAR_AVG_RMS_MAX	Star voltage AVG MAX RMS [V] over last “seconds_for_MAX_RMS”	float	R		**40507**
V_STAR_AVG_RMS_min	Star voltage AVG Min RMS [V] over last“seconds_for_min_RMS”	float	R		**40509**
V_L1_L2_RMS_AVG	Line voltage L1-Line voltage L2-Line voltage L3-L1 RMS average [V] over “seconds_for_mean_RMS”	float	R		**40511**
V_L1_L2_RMS_MAX	Line voltage L1-Line voltage L2-Line voltage L3-L1 MAX RMS [V] over last “seconds_for_MAX_RMS”	float	R		**40513**
V_L1_L2_RMS_min	Line voltage L1-Line voltage L2-Line voltage L3-L1 Min RMS [V] over last“seconds_for_min_RMS”	float	R		**40515**
V_L2_L3_RMS_AVG	Line voltage L2-Line voltage L3-L1 RMS average [V] over “seconds_for_mean_RMS”	float	R		**40517**
V_L2_L3_RMS_MAX	Line voltage L2-Line voltage L3-L1 MAX RMS [V] over last “seconds_for_MAX_RMS”	float	R		**40519**
V_L2_L3_RMS_min	Line voltage L2-Line voltage L3-L1 Min RMS [V] over last“seconds_for_min_RMS”	float	R		**40521**
V_L3_L1_RMS_AVG	Line voltage L3-L1 RMS average [V] over “seconds_for_mean_RMS”	float	R		**40523**
V_L3_L1_RMS_MAX	Line voltage L3-L1 MAX RMS [V] over last “seconds_for_MAX_RMS”	float	R		**40525**
V_L3_L1_RMS_min	Line voltage L3-L1 Min RMS [V] over last“seconds_for_min_RMS”	float	R		**40527**
V_LINE_AVG_RMS_AVG	Line voltage AVG RMS average [V] over “seconds_for_mean_RMS”	float	R		**40529**
V_LINE_AVG_RMS_MAX	Line voltage AVG MAX RMS [V] over last “seconds_for_MAX_RMS”	float	R		**40531**
V_LINE_AVG_RMS_min	Line voltage AVG Min RMS [V] over last“seconds_for_min_RMS”	float	R		**40533**
I_L1_RMS_AVG	L1 RMS average [A] over “seconds_for_mean_RMS”	float	R		**40535**
I_L1_RMS_MAX	L1 MAX RMS [A] over last “seconds_for_MAX_RMS”	float	R		**40537**
I_L1_RMS_min	L1 Min RMS [A] over last“seconds_for_min_RMS”	float	R		**40539**
I_L2_RMS_AVG	L2 RMS average [A] over “seconds_for_mean_RMS”	float	R		**40541**
I_L2_RMS_MAX	L2 MAX RMS [A] over last “seconds_for_MAX_RMS”	float	R		**40543**
I_L2_RMS_min	L2 Min RMS [A] over last“seconds_for_min_RMS”	float	R		**40545**
I_L3_RMS_AVG	L3 RMS average [A] over “seconds_for_mean_RMS”	float	R		**40547**
I_L3_RMS_MAX	L3 MAX RMS [A] over last “seconds_for_MAX_RMS”	float	R		**40549**
I_L3_RMS_min	L3 Min RMS [A] over last“seconds_for_min_RMS”	float	R		**40551**
I_N_RMS_AVG	N RMS average [A] over “seconds_for_mean_RMS”	float	R		**40553**
I_N_RMS_MAX	N MAX RMS [A] over last “seconds_for_MAX_RMS”	float	R		**40555**
I_N_RMS_min	N Min RMS [A] over last“seconds_for_min_RMS”	float	R		**40557**
I_AVG_RMS_AVG	I_AVG RMS average [A] over “seconds_for_mean_RMS”	float	R		**40559**
I_AVG_RMS_MAX	I_AVG MAX RMS [A] over last “seconds_for_MAX_RMS”	float	R		**40561**
I_AVG_RMS_min	I_AVG Min RMS [A] over last“seconds_for_min_RMS”	float	R		**40563**
P1_RMS_AVG	P1 RMS average [A] over “seconds_for_mean_RMS”	float	R		**40565**
P1_RMS_MAX	P1 MAX RMS [A] over last “seconds_for_MAX_RMS”	float	R		**40567**
P1_RMS_min	P1 Min RMS [A] over last“seconds_for_min_RMS”	float	R		**40569**
P2_RMS_AVG	P2 RMS average [A] over “seconds_for_mean_RMS”	float	R		**40571**
P2_RMS_MAX	P2 MAX RMS [A] over last “seconds_for_MAX_RMS”	float	R		**40573**
P2_RMS_min	P2 Min RMS [A] over last“seconds_for_min_RMS”	float	R		**40575**
P3_RMS_AVG	P3 RMS average [A] over “seconds_for_mean_RMS”	float	R		**40577**
P3_RMS_MAX	P3 MAX RMS [A] over last “seconds_for_MAX_RMS”	float	R		**40579**
P3_RMS_min	P3 Min RMS [A] over last“seconds_for_min_RMS”	float	R		**40581**
P_SUM_RMS_AVG	P_SUM RMS average [A] over “seconds_for_mean_RMS”	float	R		**40583**
P_SUM_RMS_MAX	P_SUM MAX RMS [A] over last “seconds_for_MAX_RMS”	float	R		**40585**
P_SUM_RMS_min	P_SUM Min RMS [A] over last“seconds_for_min_RMS”	float	R		**40587**
Q1_RMS_AVG	Q1 RMS average [A] over “seconds_for_mean_RMS”	float	R		**40589**
Q1_RMS_MAX	Q1 MAX RMS [A] over last “seconds_for_MAX_RMS”	float	R		**40591**
Q1_RMS_min	Q1 Min RMS [A] over last“seconds_for_min_RMS”	float	R		**40593**
Q2_RMS_AVG	Q2 RMS average [A] over “seconds_for_mean_RMS”	float	R		**40595**
Q2_RMS_MAX	Q2 MAX RMS [A] over last “seconds_for_MAX_RMS”	float	R		**40597**
Q2_RMS_min	Q2 Min RMS [A] over last“seconds_for_min_RMS”	float	R		**40599**
Q3_RMS_AVG	Q3 RMS average [A] over “seconds_for_mean_RMS”	float	R		**40601**
Q3_RMS_MAX	Q3 MAX RMS [A] over last “seconds_for_MAX_RMS”	float	R		**40603**
Q3_RMS_min	Q3 Min RMS [A] over last“seconds_for_min_RMS”	float	R		**40605**
Q_SUM_RMS_AVG	Q_SUM RMS average [A] over “seconds_for_mean_RMS”	float	R		**40607**
Q_SUM_RMS_MAX	Q_SUM MAX RMS [A] over last “seconds_for_MAX_RMS”	float	R		**40609**
Q_SUM_RMS_min	Q_SUM Min RMS [A] over last“seconds_for_min_RMS”	float	R		**40611**
S1_RMS_AVG	S1 RMS average [A] over “seconds_for_mean_RMS”	float	R		**40613**
S1_RMS_MAX	S1 MAX RMS [A] over last “seconds_for_MAX_RMS”	float	R		**40615**
S1_RMS_min	S1 Min RMS [A] over last“seconds_for_min_RMS”	float	R		**40617**
S2_RMS_AVG	S2 RMS average [A] over “seconds_for_mean_RMS”	float	R		**40619**
S2_RMS_MAX	S2 MAX RMS [A] over last “seconds_for_MAX_RMS”	float	R		**40621**
S2_RMS_min	S2 Min RMS [A] over last“seconds_for_min_RMS”	float	R		**40623**
S3_RMS_AVG	S3 RMS average [A] over “seconds_for_mean_RMS”	float	R		**40625**
S3_RMS_MAX	S3 MAX RMS [A] over last “seconds_for_MAX_RMS”	float	R		**40627**
S3_RMS_min	S3 Min RMS [A] over last“seconds_for_min_RMS”	float	R		**40629**
S_SUM_RMS_AVG	S_SUM RMS average [A] over “seconds_for_mean_RMS”	float	R		**40631**
S_SUM_RMS_MAX	S_SUM MAX RMS [A] over last “seconds_for_MAX_RMS”	float	R		**40633**
S_SUM_RMS_min	S_SUM Min RMS [A] over last“seconds_for_min_RMS”	float	R		**40635**