CVM-NET4 *POWER ANALYZER*

The **CVM-NET4 power analyzer** is an instrument that measures and calculates the primary electrical parameters in three-phase industrial power grids (balanced or unbalanced). It measures true effective (RMS) values, using three alternating and neutral voltage inputs and measurement of up to 4 circuits with three current inputs (through current transformers I_n/ 0.250 A) .
The measured and calculated parameters are shown in the table of variables.

This manual is available in electronic format at the CIRCUTOR web site: **www.circutor.es**

Disconnect the device from the power supply source before undertaking any form of maintenance, modification of connections, repairs, etc. If you suspect that there is an operational fault in the unit or in its protection system, remove the unit from service. The unit has been designed for easy replacement in case of failure.

1.- KEYPAD

The **CVM-NET4 power analyzer** has a single button; it can be used to restore the default communication parameters.

- To restore the default communication parameters (19200/8N/1 see section 2.1.-), disconnect the auxiliary power supply, then press the key RESET, and, while holding the button down, reconnect the power supply. After 5 seconds, the unit will restore its factory configuration.

2.- CONFIGURATION

As the unit has no keypad, the configuration settings must be sent to the device via Modbus/RTU© commands, or using the CIRCUTOR PowerStudio Software, which can be downloaded for free from the web site www.circutor.es.

2.1.- Configuration of configuration parameters

Two options are available for this:

2.1.1.- Using the peripheral number

The device has the following default communication parameters: 4 peripheral, 19200/8/N/1. The following records are available for changing the peripheral number or speed:

Modbus Address	Variable	Valid data window
2742	Protocol	0 - Modbus
2743	Peripheral number	00 to FF (0 to 255 dec)
2744	Speed (Baud)	0- 9600, 1- 19200, 2- 38400, 3- 57600
2745	Parity	0- No
2746	Length in bits	1- 8 bits
2747	Stop bits	0- 1 bit

***Example** of a write command. Changing the peripheral number. From 03 (3 decimal) to 0F (15 decimal), at 9600 bps.*

***TX**: NP 10 274200060C **0000 000F 0001 0000 0001 0000** CRC*
***RX**: NP 10 2742 0006 CRC*

2.1.2.- Using the serial number (broadcast)

The serial number of the unit can be found on the device's side label (e.g.: 1260000001). This number must be translated into hexadecimal language so that the sentence can be sent to the unit (*peripheral 00*):

1260000001 (Decimal) → 4B1A1301 (Hexadecimal)

Modbus Address	Variable	Valid data window
0BB8, 0BB9	Unit serial number	0 to FFFFFFFF (N)
0BBA Hi	Peripheral number	0 to FF (P)
0BBB Low	Port speed	0- 9600, 1-19200 (V)

Example of a write command. Changing the peripheral number. From 03 (3 decimal) to 0F (15 decimal), at 9600 bps.

***TX**: **00** 10 0BB8000306 **4B1A1301 0F 00** CRC*
***RX**: Time Out*

2.2.- Transformation ratios configuration

The CVM-NET4 power analyzer can perform indirect measurements (using voltage and current transformers). For this reason, it has an input table for setting the voltage and current transformation ratio configuration. If the voltage measurement is performed directly, the ratio is 1/1.

Channel 1 (C1) transformation ratios		
Modbus Address	**Variable**	**Valid data window**
2710, 2711	Primary voltage	0 to 0001 86A0 (100,000)
2712	Secondary voltage	0 to 03E7 (999)
2713	Primary current	0 to 7530 (30,000)

Example of programming voltage ratios; Forward voltage measurement (230 p-N), and current transformers with primary ratio of 400 A.

Primary voltage	1(Dec)	00000001 (Hex)
Secondary voltage	1(Dec)	0001 (Hex)
Primary current	400 (Dec)	0190 (Hex)

***TX**: NP 10 2710000408 **0000 0001 0001 0190** CRC*
***RX**: NP 10 2710000408 CRC*

Channel 2... 4 transformation ratios		
Modbus	**Variable**	**Valid data window**
271A	Channel 2 primary current	0 to 7530 (30,000)
2724	Channel 3 primary current	0 to 7530 (30,000)
272E	Channel 4 primary current	0 to 7530 (30,000)

2.2.1.- Transformation ratio reading

The user has a Modbus command as extra information for reading the programmed ratios on the device:

***TX**: NP 04 2710 0004 CRC*
***RX**: NP 04 06 **0000 0001 0001 0190** CRC*

2.2.2.- Selection of harmonic distortion calculation

The equipment has two calculation methods for voltage and current harmonic distortion: for basic (%d) and for effective value (%Thd).

Use of Digital Outputs		
Modbus Address	**Variable**	**Valid data window**
2774	Channel 1 - %d / %Thd	0000 – %d / 0001- %Thd
2775	Channel 2 - %d / %Thd	0000 – %d / 0001- %Thd
2776	Channel 3 - %d / %Thd	0000 – %d / 0001- %Thd
2777	Channel 4 - %d / %Thd	0000 – %d / 0001- %Thd

Example of harmonic distortion rate selection with regard to the effective value in Channel 2.

***TX**: NP 05 2775 0001 CRC*
***RX**: NP 05 2775 0001 CRC*

2.3.- Maximum demand configuration

The power analyzer can calculate the maximum value, using the sliding, fixed or heat window method, depending on the selection. The maximum demand is simultaneously calculated in kW, kVA, A and phase current.

Modbus Address	Variable	Valid data window
274C	Integration time	0 to 003C (0-60 minutes)
274D	Integration type	0000 – Sliding 0001 – Fixed 0002 – Heat

Example of maximum demand programming, with a 15-minute period in sliding system:

***TX:** NP 10 274C 0002 04 **000F 0000** CRC*
***RX:** NP 10 274C 0002 CRC*

2.3.1.- Maximum demand reading configuration

The user has a Modbus command as extra information for reading the maximum demand configuration:

***TX**: NP 04 274C 0002 CRC*
***RX**: NP 04 04 **000F 0000** CRC*

2.4.- Deleting maximum and minimum values

The power analyzer records all the maximum and minimum values for each parameter measured in the Modbus/RTU variables table. A command is available for resetting these records:

***TX**: NP 05 0838 FF 00 CRC*
***RX**: NP 05 0838 FF 00 CRC*

2.5.- Starting maximum demand

When calculated using the fixed window, the maximum demand can be reset, allowing the calculation to be restarted.

Modbus Address	Variable	Data margin
0839	Maximum Demand – Channel 1	FF
083A	Maximum Demand – Channel 2	FF
083B	Maximum Demand – Channel 3	FF
083C	Maximum Demand – Channel 4	FF
083D	Maximum Demand – 1, 2, 3 and 4	FF

Example of a write command. Starting the Channel 1 maximum demand.

***TX**: NP 05 0839 FF00 CRC*
***RX**: NP 08 0839 FF00 CRC*

2.6.- Deleting the maximum of maximum demand

Deleting the maximum of maximum demand is separate from the deletion of other maximums and minimums.

Modbus Address	Variable	Data margin
083F	Maximum Demand – Channel 1	FF
0840	Maximum Demand – Channel 2	FF
0841	Maximum Demand – Channel 3	FF
0842	Maximum Demand – Channel 4	FF

Example of a write command. Deleting the maximum of the Channel 1 maximum demand.

***TX**: NP 05 083F FF00 CRC*
***RX**: NP 08 083F FF00 CRC*

2.7.- Configuration and use of digital outputs

2.7.1.- Forcing digital outputs

The unit is fitted with four digital outputs that can be remotely managed in both their opening and closing functions.

Use of Digital Outputs		
Modbus Address	**Output**	**Open / Close**
000F	Output 1	00 / FF
0010	Output 2	00 / FF
0011	Output 3	00 / FF
0012	Output 4	00 / FF

Example of forcing Digital Output number 1:

***TX**: NP 05 **000F** FF 00 CRC*
***RX**: NP 05 000F FF 00 CRC*

2.7.2.- Reading the digital output status

The user can request a reading of the digital output status via Modbus/RTU using the following sentence:

***TX**: NP 04 4E21 0001 CRC*
***RX**: NP 04 04 02 000 CRC*

Converting to Binary - 1 Byte (0 = Open / 1 = Closed)							
Bit 8	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**
-	-	-	-	Out 4	Out 3	Out 2	Out 1

2.7.3.- Digital output configuration

Digital outputs, in addition to being remotely managed, can be used as alarm elements, associated with an electric variable by a maximum or minimum value, or can carry out the power impulse function associated with any power consumption parameter (active or reactive). The following input table is provided for programming them:

Digital output 1		
Modbus Address	**Variable**	**Valid data window**
2AF8, 2AF9	MAX value or W·h imp	Hexadecimal value
2AFA, 2AFB	MIN value	Hexadecimal value
2AFC	Variable number	00 (See table of variables)
2AFD	Delay / Pulse width	0 to 270F (9,999 Decimal)

**When a power variable is selected, the analyzer automatically recognises the power impulse function and applies the w·h value of the first record. The pulse width value is in milliseconds*

*Example of alarm programming by maximum and minimum value with voltage VL1. A maximum value of 240 V, a minimum value of 200 V (the voltage value must be sent multiplied by 10 (**as shown in the enclosed variables table**), and delay of 10 s are programmed.*

Maximum value 2400 (Decimal) → 00000960 (Hexadecimal)
Minimum value 2000 (Decimal) → 000007D0 (Hexadecimal)
Delay 10 (Decimal) → 000A (Hexadecimal)
Var number 01 (Decimal) → 01 (Hex)

***TX:** NP 10 **2AF8** 0006 0C **00000960 000007D0 000A 0010** CRC*
***RX:** NP 10 2AF8 0006 CRC*

Digital output 2		
Modbus Address	**Variable**	**Valid data window**
2B02, 2B03	MAX value or W·h imp	Hexadecimal value
2B04, 2B05	MIN value	Hexadecimal value
2B06	Variable number	00 (See table of variables)
2B07	Delay / Pulse width	0 to 270F (9,999 Decimal)

Digital output 3		
Modbus Address	**Variable**	**Valid data window**
2B0C, 2B0D	MAX value or W·h imp	Hexadecimal value
2B0E, 2B0F	MIN value	Hexadecimal value
2B10	Variable number	00 (See table of variables)
2B11	Delay / Pulse width	0 to 270F (9,999 Decimal)

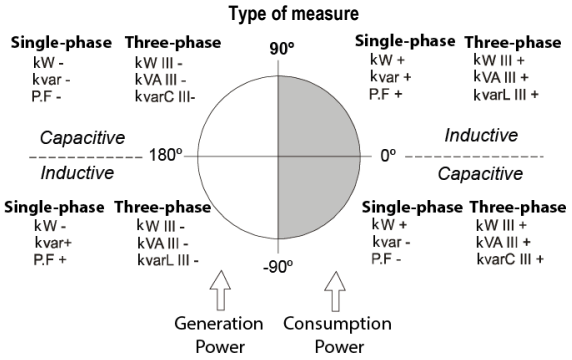
Digital output 4		
Modbus Address	**Variable**	**Valid data window**
2B16, 2B17	MAX value or W·h imp	Hexadecimal value
2B18, 2B19	MIN value	Hexadecimal value
2B1A	Variable number	00 (See table of variables)
2B1B	Delay / Pulse width	0 to 270F (9,999 Decimal)

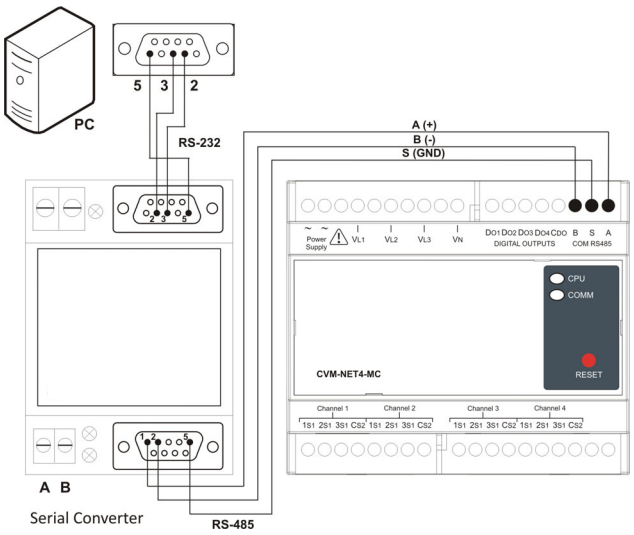
** Digital output configuration reading*

***TX**: NP 04 04 047**X** 0006 CRC*
***RX**: NP 04 0C 00000960 000007D0 000A 01 00 CRC*

(X: *value of initial registry of each output*).

- **FOUR CVM-NET4 QUADRANTS**





2.8.- CVM-NET4 COMMUNICATIONS

One or several **CVM-NET4** analyzers can be connected to a computer or PLC. This system makes it possible to centralise the data in a single record point, in addition to the normal operation of each of them (PowerStudio® System). The CVM-NET4 has an RS-485 serial communication output. If more than one analyzer is connected to a serial communication bus (RS-485), each analyzer must be assigned a peripheral number or address (from 01 to 255), with a maximum of 32 units per communication bus, so that the central computer sends the queries from the various records measured or calculated to these addresses.

The **CVM-NET4** power analyzer communicates using the MODBUS RTU© protocol (Pulling Question / Answer).

3.- MODBUS/RTU MEMORY MAP

3.1.- Instantaneous and energy electric variables

	VARIABLES MODBUS / MODBUS VARIABLES REGISTROS HEXADECIMALES / HEXADECIMAL REGISTERS		SÍMBOLO SYMBOL	CODIGO CODE	INSTANTANEO INSTANTANEOUS	MÁXIMO MAXIMUM	MÍNIMO MINIMUM	UNIDADES UNITS
Common for Channels 1, 2, 3 and 4	Tensión fase	Voltage phase to neutral	*V 1*	1	0000-0001	0144-0145	0248-0249	V x10
	Tensión fase	Voltage phase to neutral	*V 2*	2	0002-0003	0146-0147	024A-024B	V x10
	Tensión fase	Voltage phase to neutral	*V 3*	3	0004-0005	0148-0149	024C-024D	V x10
	Frecuencia (L1)	Frequency	*Hz*	4	0006-0007	014A-014B	024E-024F	Hz
	Tensión línea L1-L2	Voltage phase to phase L1-L2	*V12*	5	0008-0009	014C-014D	0250-0251	x100
	Tensión línea L2-L3	Voltage phase to phase L2-L3	*V23*	6	000A-000B	014E-014F	0252-0253	V x10
	Tensión línea L3-L1	Voltage phase to phase L3-L1	*V31*	7	000C-000D	0150-0151	0254-0255	mA
	%THD V 1	%THD V 1	*%THDV1*	8	000E-000F	0152-0153	0256-0257	% x 10
	%THD V 2	%THD V 2	*%THDV2*	9	0010-0011	0154-0155	0258-0259	% x 10
	%THD V 3	%THD V 3	*%THDV3*	10	0012-0013	0156-0157	025A-025B	% x 10
Channel 1	Corriente	Current	*A 1*	11	0014-0015	0158-0159	025C-025D	mA
	Potencia activa	Active power	*kW 1*	12	0016-0017	015A-015B	025E-025F	W
	Potencia reactiva	Reactive power	*kvar 1*	13	0018-0019	015C-015D	0260-0261	W
	Potencia aparente	Apparent power	*kVA 1*	14	001A-001B	015E-015F	0262-0263	W
	Factor de potencia	Power factor	*PF 1*	15	001C-001D	0160-0161	0264-0265	x100
	Corriente	Current	*A 2*	16	001E-001F	0162-0163	0266-0267	mA
	Potencia activa	Active power	*kW 2*	17	0020-0021	0164-0165	0268-0269	W
	Potencia reactiva	Reactive power	*kvar 2*	18	0022-0023	0166-0167	026A-026B	W
	Potencia aparente	Apparent power	*kVA 2*	19	0024-0025	0168-0169	026C-026D	W
	Factor de potencia	Power factor	*PF 2*	20	0026-0027	016A-016B	026E-026F	x100
	Corriente	Current	*A 3*	21	0028-0029	016C-016D	0270-0271	mA
	Potencia activa	Active power	*kW 3*	22	002A-002B	016E-016F	0272-0273	W
	Potencia reactiva	Reactive power	*kvar 3*	23	002C-002D	0170-0171	0274-0275	W
	Potencia aparente	Apparent power	*kVA 3*	24	002E-002F	0172-0173	0276-0277	W
	Factor de potencia	Power factor	*PF 3*	25	0030-0031	0174-0175	0278-0279	x100
	Potencia activa trifásica	Three phase active power	*kW III*	26	0032-0033	0176-0177	027A-027B	W
	Potencia inductiva trifásica	Three phase reactive inductive power	*kvarL III*	27	0034-0035	0178-0179	027C-027D	W
	Potencia capacitiva trifásica	Three phase capacitive inductive power	*kvarC III*	28	0036-0037	017A-017B	027E-027F	W
	Potencia aparente trifásica	Three phase aparent power	*KvaIII*	29	0038-0039	017C-017D	0280-0281	W
	Cos φ trifásico	Three phase cos φ	*Cos φ III*	30	003A-003B	017E-017F	0282-0283	x100
	Factor de potencia	Power factor	*PF III*	31	003C-003D	0180-0181	0284-0285	x100
	%THD I 1	%THD I 1	*%THDI1*	32	003E-003F	0182-0183	0286-0287	% x 10
	%THD I 2	%THD I 2	*%THDI2*	33	0040-0041	0184-0185	0288-0289	% x 10
	%THD I 3	%THD I 3	*%THDI3*	34	0042-0043	0186-0187	028A-028B	% x 10
	Máxima demanda kw	Maximum demand kw	*Md(Pd) kw III*	35	0044-0045	0188-0189	-	W
	Máxima demanda kva	Maximum demand kva	*Md(Pd) kva III*	36	0046-0047	018A-018B	-	W
	Máxima demanda A-AVG	Maximum demand A-AVG	*Md(Pd) A III*	37	0048-0049	018C-018D	-	mA

	Máxima demanda A1	Maximum demand A1	*Md(Pd) A 1*	38	004A-004B	018E-018F	-	mA
	Máxima demanda A2	Maximum demand A2	*Md(Pd) A 2*	39	004C-004D	0190-0191	-	mA
	Máxima demanda A3	Maximum demand A3	*Md(Pd) A 3*	40	004E-004F	0192-0193	-	mA
	Energía activa	Active energy	*kWh III*	41	0050-0051	-	-	W·h
	Energía reactiva inductiva	Reactive inductive energy	*kvarhL III*	42	0052-0053	-	-	W·h
	Energía reactiva capacitiva	Capacitive inductive energy	*kvarhC III*	43	0054-0055	-	-	W·h
	Energía Aparente trifásica	Three phase aparent energy	*kVAhIII*	44	0056-0057	-	-	W·h
	Energía activa generada	Three phase generated active energy	*kWhIII (-)*	45	0058-0059	-	-	W·h
	Energía inductiva generada	Three phase generated reactive inductive	*kvarLhIII (-)*	46	005A-005B	-	-	W·h
	Energía capacitiva generada	Three phase generated reactive capacitive	*kvarChIII (-)*	47	005C-005D	-	-	W·h
	Energía aparente generada	Three phase generated aparent energy	*kVAhIII (-)*	48	005E-005F	-	-	W·h
Channel 2	Corriente	Current	*A 1*	49	0060-0061	0194-0195	028C-028D	mA
	Potencia activa	Active power	*kW 1*	50	0062-0063	0196-0197	028E-028F	W
	Potencia reactiva	Reactive power	*kvar 1*	51	0064-0065	0198-0199	0290-0291	W
	Potencia aparente	Apparent power	*kVA 1*	52	0066-0067	019A-019B	0292-00293	W
	Factor de potencia	Power factor	*PF 1*	53	0068-0069	019C-019D	0294-0295	x100
	Corriente	Current	*A 2*	54	006A-006B	019E-019F	0296-0297	mA
	Potencia activa	Active power	*kW 2*	55	006C-006D	01A0-01A1	0298-0299	W
	Potencia reactiva	Reactive power	*kvar 2*	56	006E-006F	01A2-01A3	029A-029B	W
	Potencia aparente	Apparent power	*kVA 2*	57	0070-0071	01A4-01A5	029C-029D	W
	Factor de potencia	Power factor	*PF 2*	58	0072-0073	01A6-01A7	029E-029F	x100
	Corriente	Current	*A 3*	59	0074-0075	01A8-01A9	02A0-02A1	mA
	Potencia activa	Active power	*kW 3*	60	0076-0077	01AA-01AB	02A2-02A3	W
	Potencia reactiva	Reactive power	*kvar 3*	61	0078-0079	01AC-01AD	02A4-02A5	W
	Potencia aparente	Apparent power	*kVA 3*	62	007A-007B	01AE-01AF	02A6-02A7	W
	Factor de potencia	Power factor	*PF 3*	63	007C-007D	01B0-01B1	02A8-02A9	x100
	Potencia activa trifásica	Three phase active power	*kW III*	64	007E-007F	01B2-01B3	02AA-02AB	W
	Potencia inductiva trifásica	Three phase reactive inductive power	*kvarL III*	65	0080-0081	01B4-01B5	02AC-02AD	W
	Potencia capacitiva trifásica	Three phase capacitive inductive power	*kvarC III*	66	0082-0083	01B6-01B7	02AE-02AF	W
	Potencia aparente trifásica	Three phase aparent power	*KvaIII*	67	0084-0085	01B8-01B9	02B0-02B1	W
	Cos φ trifásico	Three phase cos φ	*Cos φ III*	68	0086-0087	01BA-01BB	02B2-02B3	x100
	Factor de potencia	Power factor	*PF III*	69	0088-0089	01BC-01BD	02B4-02B5	x100
	%THD I 1	%THD I 1	*%THDI1*	70	008A-008B	01BE-01BF	02B6-02B7	% x 10
	%THD I 2	%THD I 2	*%THDI2*	71	008C-008D	01C0-01C1	02B8-02B9	% x 10
	%THD I 3	%THD I 3	*%THDI3*	72	008E-008F	01C2-01C3	02BA-02BB	% x 10
	Máxima demanda kw	Maximum demand kw	*Md(Pd) kw III*	73	0090-0091	01C4-01C5	-	W
	Máxima demanda kva	Maximum demand kva	*Md(Pd) kva III*	74	0092-0093	01C6-01C7	-	W
	Máxima demanda A-AVG	Maximum demand A-AVG	*Md(Pd) A III*	75	0094-0095	01C8-01C9	-	mA
	Máxima demanda A1	Maximum demand A1	*Md(Pd) A 1*	76	0096-0097	01CA-01CB	-	mA
	Máxima demanda A2	Maximum demand A2	*Md(Pd) A 2*	77	0098-0099	01CC-01CD	-	mA
	Máxima demanda A3	Maximum demand A3	*Md(Pd) A 3*	78	009A-009B	01CE-01CF	-	Ma
	Energía activa	Active energy	*kWh III*	79	009C-009D	-	-	W·h
	Energía reactiva inductiva	Reactive inductive energy	*kvarhL III*	80	009E-009F	-	-	W·h
	Energía reactiva capacitiva	Capacitive inductive energy	*kvarhC III*	81	00A0-00A1	-	-	W·h
	Energía Aparente trifásica	Three phase aparent energy	*kVAhIII*	82	00A2-00A3	-	-	W·h
	Energía activa generada	Three phase generated active energy	*kWhIII (-)*	83	00A4-00A5	-	-	W·h
	Energía inductiva generada	Three phase generated reactive inductive	*kvarLhIII (-)*	84	00A6-00A7	-	-	W·h
	Energía capacitiva generada	Three phase generated reactive capacitive	*kvarChIII (-)*	85	00A8-00A9	-	-	W·h
	Energía aparente generada	Three phase generated aparent energy	*kVAhIII (-)*	86	00AA-00AB	-	-	W·h
Channel 3	Corriente	Current	*A 1*	87	00AC-00AD	01D0-01D1	02BC-02BD	mA
	Potencia activa	Active power	*kW 1*	88	00AE-00AF	01D2-01D3	02BE-02BF	W
	Potencia reactiva	Reactive power	*kvar 1*	89	00B0-00B1	01D4-01D5	02C0-02C1	W
	Potencia aparente	Apparent power	*kVA 1*	90	00B2-00B3	01D6-01D7	02C2-02C3	W
	Factor de potencia	Power factor	*PF 1*	91	00B4-00B5	01D8-01D9	02C4-02C5	x100
	Corriente	Current	*A 2*	92	00B6-00B7	01DA-01DB	02C6-02C7	mA
	Potencia activa	Active power	*kW 2*	93	00B8-00B9	01DC-01DD	02C8-02C9	W
	Potencia reactiva	Reactive power	*kvar 2*	94	00BA-00BB	01DE-01DF	02CA-02CB	W
	Potencia aparente	Apparent power	*kVA 2*	95	00BC-00BD	01E0-01E1	02CC-02CD	W
	Factor de potencia	Power factor	*PF 2*	96	00BE-00BF	01E2-01E3	02CE-02CF	x100
	Corriente	Current	*A 3*	97	00C0-00C1	01E4-01E5	02D0-02D1	mA
	Potencia activa	Active power	*kW 3*	98	00C2-00C3	01E6-01E7	02D2-02D3	W
	Potencia reactiva	Reactive power	*kvar 3*	99	00C4-00C5	01E8-01E9	02D4-02D5	W
	Potencia aparente	Apparent power	*kVA 3*	100	00C6-00C7	01EA-01EB	02D6-02D7	W
	Factor de potencia	Power factor	*PF 3*	101	00C8-00C9	01EC-01ED	02D8—02D9	x100
	Potencia activa trifásica	Three phase active power	*kW III*	102	00CA-00CB	01EE-01EF	02DA—02DB	W

	Potencia inductiva trifásica	Three phase reactive inductive power	*kvarL III*	103	00CC-00CD	01F0-01F1	02DC—02DD	W
	Potencia capacitiva trifásica	Three phase capacitive inductive power	*kvarC III*	104	00CE-00CF	01F2-01F3	02DE—02DF	W
	Potencia aparente trifásica	Three phase aparent power	*KvaIII*	105	00D0-00D1	01F4-01F5	02E0-02E1	W
	Cos φ trifásico	Three phase cos φ	*Cos φ III*	106	00D2-00D3	01F6-01F7	02E2-02E3	x100
	Factor de potencia	Power factor	*PF III*	107	00D4-00D5	01F8-01F9	02E4-02E5	x100
	%THD I 1	%THD I 1	*%THDI1*	108	00D6-00D7	01FA-01FB	02E6-02E7	% x 10
	%THD I 2	%THD I 2	*%THDI2*	109	00D8-00D9	01FC-01FD	02E8-02E9	% x 10
	%THD I 3	%THD I 3	*%THDI3*	110	00DA-00DB	01FE-01FF	02EA-02EB	% x 10
	Máxima demanda kw	Maximum demand kw	*Md(Pd) kw III*	111	00DC-00DD	0200-0201	-	W
	Máxima demanda kva	Maximum demand kva	*Md(Pd) kva III*	112	00DE-00DF	0202-0203	-	W
	Máxima demanda A-AVG	Maximum demand A-AVG	*Md(Pd) A III*	113	00E0-00E1	0204-0205	-	mA
	Máxima demanda A1	Maximum demand A1	*Md(Pd) A 1*	114	00E2-00E3	0206-0207	-	mA
	Máxima demanda A2	Maximum demand A2	*Md(Pd) A 2*	115	00E4-00E5	0208-0209	-	mA
	Máxima demanda A3	Maximum demand A3	*Md(Pd) A 3*	116	00E6-00E7	020A-020B	-	mA
	Energía activa	Active energy	*kWh III*	117	00E8-00E9	-	-	W·h
	Energía reactiva inductiva	Reactive inductive energy	*kvarhL III*	118	00EA-00EB	-	-	W·h
	Energía reactiva capacitiva	Capacitive inductive energy	*kvarhC III*	119	00EC-00ED	-	-	W·h
	Energía Aparente trifásica	Three phase aparent energy	*kVAhIII*	120	00EE-00EF	-	-	W·h
	Energía activa generada	Three phase generated active energy	*kWhIII (-)*	121	00F0-00F1	-	-	W·h
	Energía inductiva generada	Three phase generated reactive inductive	*kvarLhIII (-)*	122	00F2-00F3	-	-	W·h
	Energía capacitiva generada	Three phase generated reactive capacitive	*kvarChIII (-)*	123	00F4-00F5	-	-	W·h
	Energía aparente generada	Three phase generated aparent energy	*kVAhIII (-)*	124	00F6-00F7	-	-	W·h
Channel 4	Corriente	Current	*A 1*	125	00F8-00F9	020C-020D	02EC-02ED	mA
	Potencia activa	Active power	*kW 1*	126	00FA-00FB	020E-020F	02EE-02EF	W
	Potencia reactiva	Reactive power	*kvar 1*	127	00FC-00FD	0210-0211	02F0-02F1	W
	Potencia aparente	Apparent power	*kVA 1*	128	00FE-00FF	0212-0213	02F2-02F3	W
	Factor de potencia	Power factor	*PF 1*	129	0100-0101	0214-0215	02F4-02F5	x100
	Corriente	Current	*A 2*	130	0102-0103	0216-0217	02F6-02F7	mA
	Potencia activa	Active power	*kW 2*	131	0104-0105	0218-0219	02F8-02F9	W
	Potencia reactiva	Reactive power	*kvar 2*	132	0106-0107	021A-021B	02FA-02FB	W
	Potencia aparente	Apparent power	*kVA 2*	133	0108-0109	021C-021D	02FC-02FD	W
	Factor de potencia	Power factor	*PF 2*	134	010A-010B	021E021F	02FE-02FF	x100
	Corriente	Current	*A 3*	135	010C-010D	0220-0221	0300-0301	mA
	Potencia activa	Active power	*kW 3*	136	010E-010F	0222-0223	0302-0303	W
	Potencia reactiva	Reactive power	*kvar 3*	137	0110-0111	0224-0225	0304-0305	W
	Potencia aparente	Apparent power	*kVA 3*	138	0112-0113	0226-0227	0306-0307	W
	Factor de potencia	Power factor	*PF 3*	139	0114-0115	0228-0229	0308-0309	x100
	Potencia activa trifásica	Three phase active power	*kW III*	140	0116-0117	022A-022B	030A-030B	W
	Potencia inductiva trifásica	Three phase reactive inductive power	*kvarL III*	141	0118-0119	022C-022D	030C-030D	W
	Potencia capacitiva trifásica	Three phase capacitive inductive power	*kvarC III*	142	011A-011B	022E-022F	030E-030F	W
	Potencia aparente trifásica	Three phase aparent power	*KvaIII*	143	011C-011D	0230-0231	0310-0311	W
	Cos φ trifásico	Three phase cos φ	*Cos φ III*	144	011E-011F	0232-0233	0312-0313	x100
	Factor de potencia	Power factor	*PF III*	145	0120-0121	0234-0235	0314-0315	x100
	%THD I 1	%THD I 1	*%THDI1*	146	0122-0123	0236-0237	0316-0317	% x 10
	%THD I 2	%THD I 2	*%THDI2*	147	0124-0125	0238-0239	0318-0319	% x 10
	%THD I 3	%THD I 3	*%THDI3*	148	0126-0127	023A-023B	031A-031B	% x 10
	Máxima demanda kw	Maximum demand kw	*Md(Pd) kw III*	149	0128-0129	023C-023D	-	W
	Máxima demanda kva	Maximum demand kva	*Md(Pd) kva III*	150	012A-012B	023E-023F	-	W
	Máxima demanda A-AVG	Maximum demand A-AVG	*Md(Pd) A III*	151	012C-012D	0240-0241	-	mA
	Máxima demanda A1	Maximum demand A1	*Md(Pd) A 1*	152	012E-012F	0242-0243	-	mA
	Máxima demanda A2	Maximum demand A2	*Md(Pd) A 2*	153	0130-0131	0244-0245	-	mA
	Máxima demanda A3	Maximum demand A3	*Md(Pd) A 3*	154	0132-0133	0246-0247	-	Ma
	Energía activa	Active energy	*kWh III*	155	0134-0135	-	-	W·h
	Energía reactiva inductiva	Reactive inductive energy	*kvarhL III*	156	0136-0137	-	-	W·h
	Energía reactiva capacitiva	Capacitive inductive energy	*kvarhC III*	157	0138-0139	-	-	W·h
	Energía Aparente trifásica	Three phase aparent energy	*kVAhIII*	158	013A-013B	-	-	W·h
	Energía activa generada	Three phase generated active energy	*kWhIII (-)*	159	013C-013D	-	-	W·h
	Energía inductiva generada	Three phase generated reactive inductive	*kvarLhIII (-)*	160	013E-013F	-	-	W·h
	Energía capacitiva generada	Three phase generated reactive capacitive	*kvarChIII (-)*	161	0140-0141	-	-	W·h
	Energía aparente generada	Three phase generated aparent energy	*kVAhIII (-)*	162	0142-0143	-	-	W·h

3.2.- Voltage and current harmonics

VARIABLES MODBUS / MODBUS VARIABLES REGISTROS HEXADECIMALES / HEXADECIMAL REGISTERS			SÍMBOLO	CODIGO	TENSIÓN L1 / CORRIENTE 1S1	TENSIÓN L2 / CORRIENTE 2S1	TENSIÓN L3 / CORRIENTE 3S1	UNIDADES
			SYMBOL	CODE	VOLTAGE L1 / CURRENT 1S1	VOLTAGE L2 / CURRENT 2S1	VOLTAGE L3 / CURRENT 3S1	UNITS
Common for Channels 1, 2, 3 and 4	Fundamental	Foundamental	%THDV	-	0A28-0A29	0A38-0A39	0A48-0A49	% x 10
	Armónico 2 en tensión	Harmonic 2 in voltage	%THDV	-	0A2A	0A3A	0A4A	% x 10
	Armónico 3 en tensión	Harmonic 3 in voltage	%THDV	-	0A2B	0A3B	0A4B	% x 10
	Armónico 4 en tensión	Harmonic 4 in voltage	%THDV	-	0A2C	0A3C	0A4C	% x 10
	Amrónico 5 en tensión	Harmonic 5 in voltage	%THDV	-	0A2D	0A3D	0A4D	% x 10
	Armónico 6 en tensión	Harmonic 6 in voltage	%THDV	-	0A2E	0A3E	0A4E	% x 10
	Armónico 7 en tensión	Harmonic 7 in voltage	%THDV	-	0A2F	0A3F	0A4F	% x 10
	Amrónico 8 en tensión	Harmonic 8 in voltage	%THDV	-	0A30	0A40	0A50	% x 10
	Amrónico 9 en tensión	Harmonic 9 in voltage	%THDV	-	0A31	0A41	0A51	% x 10
	Amrónico 10 en tensión	Harmonic 10 in voltage	%THDV	-	0A32	0A42	0A52	% x 10
	Amrónico 11 en tensión	Harmonic 11 in voltage	%THDV	-	0A33	0A43	0A53	% x 10
	Amrónico 12 en tensión	Harmonic 12 in voltage	%THDV	-	0A34	0A44	0A54	% x 10
	Amrónico 13 en tensión	Harmonic 13 in voltage	%THDV	-	0A35	0A45	0A55	% x 10
	Amrónico 14 en tensión	Harmonic 14 in voltage	%THDV	-	0A36	0A46	0A56	% x 10
	Amrónico 15 en tensión	Harmonic 15 in voltage	%THDV	-	0A37	0A47	0A57	% x 10
Channel 1	Fundamental	Foundamental	%THDA	-	0A58-0A59	0A68-0A69	0A78-0A79	mA x10
	Armónico 2 en corriente	Harmonic 2 in current	%THDA	-	0A5A	0A6A	0A7A	% x 10
	Armónico 3 en corriente	Harmonic 3 in current	%THDA	-	0A5B	0A6B	0A7B	% x 10
	Armónico 4 en corriente	Harmonic 4 in current	%THDA	-	0A5C	0A6C	0A7C	% x 10
	Amrónico 5 en corriente	Harmonic 5 in current	%THDA	-	0A5D	0A6D	0A7D	% x 10
	Armónico 6 en corriente	Harmonic 6 in current	%THDA	-	0A5E	0A6E	0A7E	% x 10
	Armónico 7 en corriente	Harmonic 7 in current	%THDA	-	0A5F	0A6F	0A7F	% x 10
	Amrónico 8 en corriente	Harmonic 8 in current	%THDA	-	0A60	0A70	0A80	% x 10
	Amrónico 9 en corriente	Harmonic 9 in current	%THDA	-	0A61	0A71	0A81	% x 10
	Amrónico 10 en corriente	Harmonic 10 in current	%THDA	-	0A62	0A72	0A82	% x 10
	Amrónico 11 en corriente	Harmonic 11 in current	%THDA	-	0A63	0A73	0A83	% x 10
	Amrónico 12 en corriente	Harmonic 12 in current	%THDA	-	0A64	0A74	0A84	% x 10
	Amrónico 13 en corriente	Harmonic 13 in current	%THDA	-	0A65	0A75	0A85	% x 10
	Amrónico 14 en corriente	Harmonic 14 in current	%THDA	-	0A66	0A76	0A86	% x 10
	Amrónico 15 en corriente	Harmonic 15 in current	%THDA	-	0A67	0A77	0A87	% x 10
Channel 2	Fundamental	Foundamental	%THDA	-	0A88-0A89	0A98-0A99	0AA8-0AA9	mA x10
	Armónico 2 en corriente	Harmonic 2 in current	%THDA	-	0A8A	0A9A	0AAA	% x 10
	Armónico 3 en corriente	Harmonic 3 in current	%THDA	-	0A8B	0A9B	0AAB	% x 10
	Armónico 4 en corriente	Harmonic 4 in current	%THDA	-	0A8C	0A9C	0AAC	% x 10
	Amrónico 5 en corriente	Harmonic 5 in current	%THDA	-	0A8D	0A9D	0AAD	% x 10
	Armónico 6 en corriente	Harmonic 6 in current	%THDA	-	0A8E	0A9E	0AAE	% x 10
	Armónico 7 en corriente	Harmonic 7 in current	%THDA	-	0A8F	0A9F	0AAF	% x 10
	Amrónico 8 en corriente	Harmonic 8 in current	%THDA	-	0A90	0AA0	0AB0	% x 10
	Amrónico 9 en corriente	Harmonic 9 in current	%THDA	-	0A91	0AA1	0AB1	% x 10
	Amrónico 10 en corriente	Harmonic 10 in current	%THDA	-	0A92	0AA2	0AB2	% x 10
	Amrónico 11 en corriente	Harmonic 11 in current	%THDA	-	0A93	0AA3	0AB3	% x 10
	Amrónico 12 en corriente	Harmonic 12 in current	%THDA	-	0A94	0AA4	0AB4	% x 10
	Amrónico 13 en corriente	Harmonic 13 in current	%THDA	-	0A95	0AA5	0AB5	% x 10
	Amrónico 14 en corriente	Harmonic 14 in current	%THDA	-	0A96	0AA6	0AB6	% x 10
	Amrónico 15 en corriente	Harmonic 15 in current	%THDA	-	0A97	0AA7	0AB7	% x 10
Channel 3	Fundamental	Foundamental	%THDA	-	0AB8-0AB9	0AC8-0AC9	0AD8-0AD9	mA x10
	Armónico 2 en corriente	Harmonic 2 in current	%THDA	-	0ABA	0ACA	0ADA	% x 10
	Armónico 3 en corriente	Harmonic 3 in current	%THDA	-	0ABB	0ACB	0ADB	% x 10
	Armónico 4 en corriente	Harmonic 4 in current	%THDA	-	0ABC	0ACC	0ADC	% x 10
	Amrónico 5 en corriente	Harmonic 5 in current	%THDA	-	0ABD	0ACD	0ADD	% x 10
	Armónico 6 en corriente	Harmonic 6 in current	%THDA	-	0ABE	0ACE	0ADE	% x 10
	Armónico 7 en corriente	Harmonic 7 in current	%THDA	-	0ABF	0ACF	0ADF	% x 10
	Amrónico 8 en corriente	Harmonic 8 in current	%THDA	-	0AC0	0AD0	0AE0	% x 10
	Amrónico 9 en corriente	Harmonic 9 in current	%THDA	-	0AC1	0AD1	0AE1	% x 10
	Amrónico 10 en corriente	Harmonic 10 in current	%THDA	-	0AC2	0AD2	0AE2	% x 10
	Amrónico 11 en corriente	Harmonic 11 in current	%THDA	-	0AC3	0AD3	0AE3	% x 10
	Amrónico 12 en corriente	Harmonic 12 in current	%THDA	-	0AC4	0AD4	0AE4	% x 10
	Amrónico 13 en corriente	Harmonic 13 in current	%THDA	-	0AC5	0AD5	0AE5	% x 10
	Amrónico 14 en corriente	Harmonic 14 in current	%THDA	-	0AC6	0AD6	0AE6	% x 10

	Amrónico 15 en corriente	Harmonic 15 in current	*%THDA*	-	0AC7	0AD7	0AE7	% x 10
Channel 4	Fundamental	Foundamental	*%THDA*	-	0AE8-0AE9	0AF8-0AF9	0B08-0B09	mA x10
	Armónico 2 en corriente	Harmonic 2 in current	*%THDA*	-	0AEA	0AFA	0B0A	% x 10
	Armónico 3 en corriente	Harmonic 3 in current	*%THDA*	-	0AEB	0AFB	0B0B	% x 10
	Armónico 4 en corriente	Harmonic 4 in current	*%THDA*	-	0AEC	0AFC	0B0C	% x 10
	Armónico 5 en corriente	Harmonic 5 in current	*%THDA*	-	0AED	0AFD	0B0D	% x 10
	Armónico 6 en corriente	Harmonic 6 in current	*%THDA*	-	0AEE	0AFE	0B0E	% x 10
	Armónico 7 en corriente	Harmonic 7 in current	*%THDA*	-	0AEF	0AFF	0B0F	% x 10
	Armónico 8 en corriente	Harmonic 8 in current	*%THDA*	-	0AF0	0B00	0B10	% x 10
	Armónico 9 en corriente	Harmonic 9 in current	*%THDA*	-	0AF1	0B01	0B11	% x 10
	Armónico 10 en corriente	Harmonic 10 in current	*%THDA*	-	0AF2	0B02	0B12	% x 10
	Armónico 11 en corriente	Harmonic 11 in current	*%THDA*	-	0AF3	0B03	0B13	% x 10
	Armónico 12 en corriente	Harmonic 12 in current	*%THDA*	-	0AF4	0B04	0B14	% x 10
	Armónico 13 en corriente	Harmonic 13 in current	*%THDA*	-	0AF5	0B05	0B15	% x 10
	Amrónico 14 en corriente	Harmonic 14 in current	*%THDA*	-	0AF6	0B06	0B16	% x 10
	Amrónico 15 en corriente	Harmonic 15 in current	*%THDA*	-	0AF7	0B07	0B17	% x 10

4.- TECHNICAL FEATURES

Power circuit:	
- Single-phase:	85..265V AC / 95..300V DC
- Frequency:	50 - 60 Hz (AC mode.)
- Maximum consumption:	6.0 V·A
- Working temperature:	-10 .....+ 50 ºC
- Humidity (non-condensing):	5 ..... 95%
Mechanical features:	
- Case material:	V0 self-extinguishing plastic
- Fitted unit protection (front panel):	IP 51
- Non-fitted unit protection (sides and rear cover):	IP 31
- Dimensions (mm):	105 x 70 x 90 mm (6 modules)
- Weight:	0.250 kg
Accuracy Class:	
- Voltage:	0.5%
- Current:	0.5%
- Power / Energy:	1 %
Measurement sensors: Current / Voltage	External transformers / forward voltage
Power factor:	0.5 to 1
Full-scale measurement margin: ITF / Shunt	1,2 .... 105 %
Maximum operating height:	2,000 metres

Metering circuit:	
- Nominal voltage: phase-neutral / between phases	300 VAC / 520 VAC
- Frequency:	45 ~ 65 Hz
- Nominal current:	I_n / 0.250 A
- Permanent overload:	1.3 I_n
- Voltage consumption of the circuit:	0.7 V·A
- Current consumption of the circuit:	0.18 VA x 4 channels
Features of the output transistors	
- Type: Opto-isolated transistor (commutator open).	NPN
- Maximum operation voltage:	24 VDC
- Maximum operation current:	50 mA
- Maximum frequency:	5 pulse / s
- Impulse duration:	100 ms

Safety:
Category III - 300 VAC / 530 VAC EN-61010 Double-insulated electric shock protection class II. The unit must be connected to a power circuit protected with gl-type fuses, in compliance with IEC 369, or M-type, with values from 0.5 to 1A. It must be fitted with a circuit breaker switch or equivalent device, in order to be able to disconnect the device from the power supply. The power supply cable must have a cross-section of at least 1 mm^3.

Standards:
IEC 664, VDE 0110, UL 94, IEC 801, IEC 348, IEC 571-1, EN 61000-6-3, EN 61000-6-1, EN 61010-1, EN 61000-4-11, EN 61000-4-3, EN 61000-4-3, EN 61000-4-4, EN 61000-4-5, EN 55011, EC

5.- TECHNICAL SERVICE

If you have any questions about the operation of the unit or any failures, contact our service staff at **CIRCUTOR SA**

CIRCUTOR SA - After-Sales Service
Vial Sant Jordi, s/n
08232 -Viladecavalls (Barcelona)
Tel – 902 449459 (Spain) / (+34) 93 745 29 00 (International)
Fax: (+34) 93 745 29 14
E-mail: **sat@circutor.es**

6.- CONNECTIONS

Electrical connection diagram of 4 three-phase channels