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De / From	*Bernat García*	**Fecha / Date**	*28/09/2004*

EXTERNAL COMMUNICATIONS

PowerStudio & PowerStudio Scada:

Firstly, Power Studio must be suitably configured until correct communication is established with the power analyzers. It must be highlighted and borne in mind that the communication motor for this software operates at 19,200 bps meaning that the refresh times for the different variables will be very short.

A peripheral name is assigned to each CVM and this name will be the *Topic* of external sentences.

The web server function must be activated so that all of its variables are available through communications. In order to activate this server, open the *General* menu and select the *Preferences* option; once there, activate the *Web server* option (√) and enter port 80 which is the port for *http* requests.

Once the equipment is configured and operating, the application may be minimized and semi-hidden in the task bar (lower left), next to the clock.

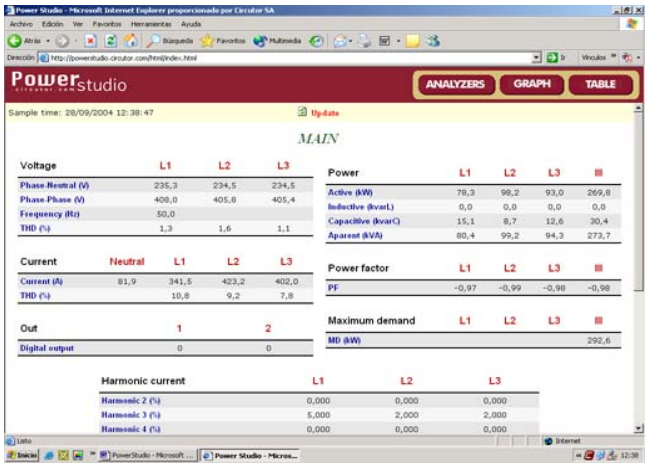
Once the application is minimized and with the communications motor activated, the WEB server, XML and DDE will be available to be questioned by any external application.

WEB COMMUNICATION

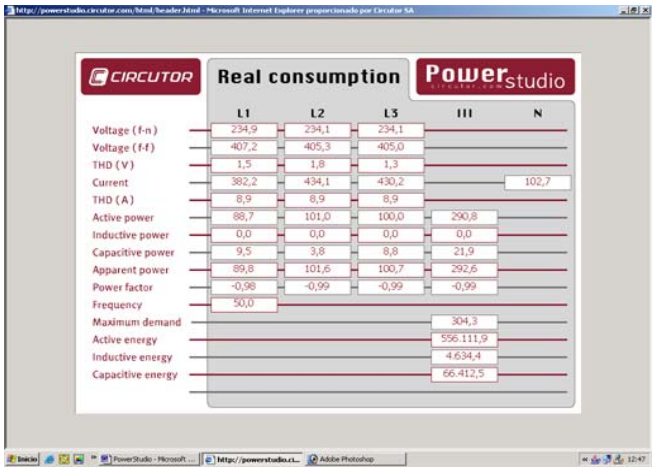
As standard software, Power Studio has a built in web server which operates, in the basic version, with different static screens which must be manually refreshed. In the Scada version, personalized, dynamic screens may be designed in which the variables will be automatically refreshed.

In order to move on to displaying the Web server's screens, it is vital and necessary to know the IP address of the computer which is carrying out the server function. Displaying via the web may be done internally (*Local Area Network – LAN*), or externally (*Internet*).

The way of displaying allows data recorded in the server storing the PowerStudio application to be seen and consulted. This avoids users who wish to have all of this information available having to go to this server.



Example of static PowerStudio screen



Example of dynamic PowerStudio Scada screen

DDE COMMUNICATION

Many times there are customers who, as well as knowing the data from the server, need to centralize all data from the CVMs into one overall system. This system may include parameters which may not be energy parameters on many occasions (air conditioning, process, …). In the majority of cases, this data is centralized on Scada systems available on the market. These allow DDE communication (Intouch by Wonderware, …).

These systems allow the inclusion of different equipment facilitating direct communication with them. The aim of this DDE system is to facilitate indirect communication with the equipment via this communication corridor. In this way, inclusion is much quicker and more easy. This avoids the integrator having to develop a communications protocol for each peripheral with Circutor communications.

The drawback with DDE communications is that the energy data logging system and the overall integration of the system must be located in the same computer and therefore share the same platform.

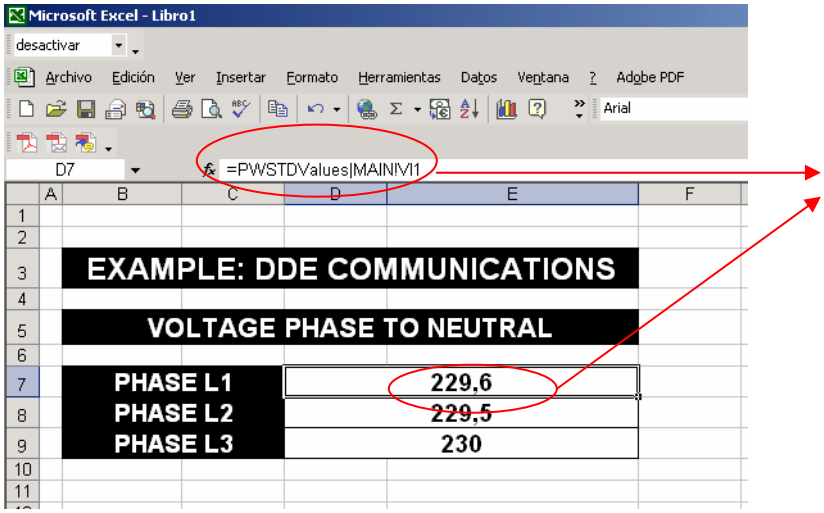
The sentences that comprise these external applications are based on three main parts:

1. *Conversation*: text which distinguishes between the applications; has to be unique per application. This prevents questions and answers from different applications crossing each other. *Conversation* makes exclusive mention of the PowerStudio communications motor or PowerStudio Scada "***"PWSTDValues***".
2. *Topic*: does not a specific meaning and depends on the use given to the application; for PowerStudio and PowerStudio Scada mentions the name previously assigned to the device (for example: "***Device1***").
3. *Item*: is the part which identifies each of the variables which is able to measure and send via communications, for example, for the CVM, the L1 voltage will have "***VI1***" as an item.

With these three components, we are now able to include each and every electrical or physical parameter into an external application. For example, to include an L1 phase-neutral voltage parameter for a CVM-NRG96, the sentence to compose will be as follows.

(*Note that the CVM-NRG96-ITF-RS485-C has been given as *Topic* (name of equipment), the name **MAIN**.)

=PWSTDValues|MAIN!VI1



DDE sentence and value in real time, obtained from PowerStudio

XML COMMUNICATION

Sometimes the integrators find that several external applications need data to be read from the same peripheral; this poses a large problem because the equipment with RS485 Communications are only likely to be questioned by a single master. In the event that there are more than one, there will be collisions in the communication and no application will correctly receive information from the analyzers.

With DDE integration it might be possible, as stated previously, that all external applications must be installed on the same platform, i.e. on the same personal computer. In the majority of cases, this type of installation is non-viable because there is no possibility of assembling all integrated systems.

The XML communication protocol resolves this problem because it can question any application that is on the same Local Area Network including the Internet; the only requirement is that it has an IP address to be questioned. In this way, any electrical or physical parameter may be requested which, using a peripheral, is collected by the PowerStudio System & PowerStudio Scada. In this way, using the XML communication protocol, many parameters can be collected from one or more PowerStudios installed on the same network including accessible external networks.

The sentences that must be made for the XML protocol and for the DDE server, must be correctly formed. If not, the application will return a variable error.

The chain *"**some.xml**", refers to instant variable requests:*

In the following example, an XML request is shown requesting the L1 phase-neutral voltage from the MAIN equipment.

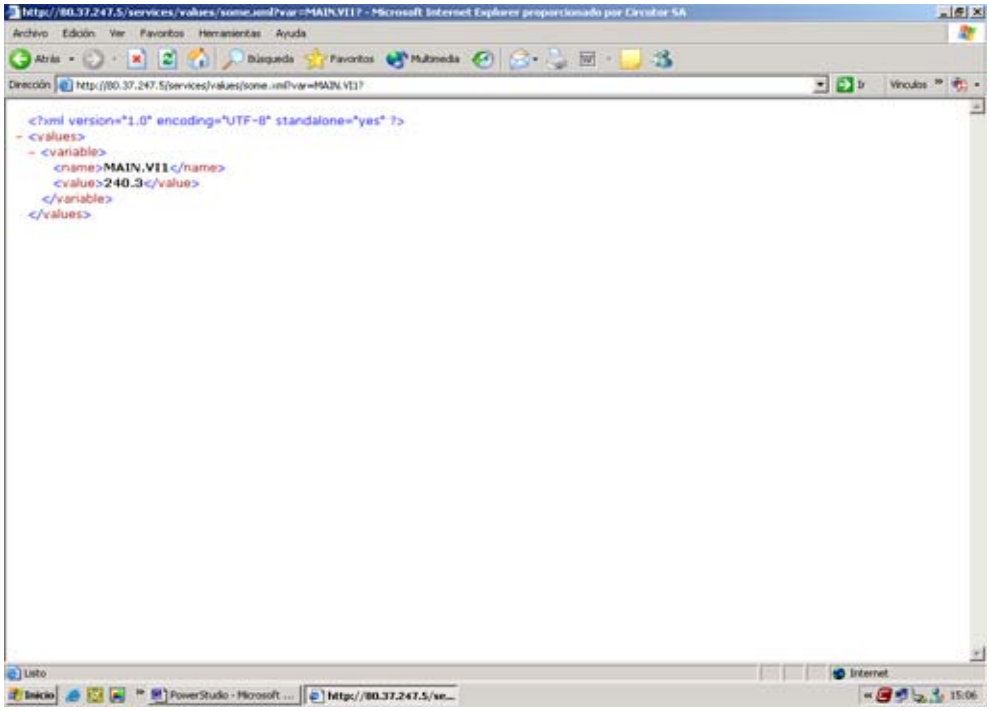
http://80.37.247.5/services/values/some.xml?var=MAIN.VI1?

If more than one variable is to be shown, a chain may be formed with more simultaneous variables.

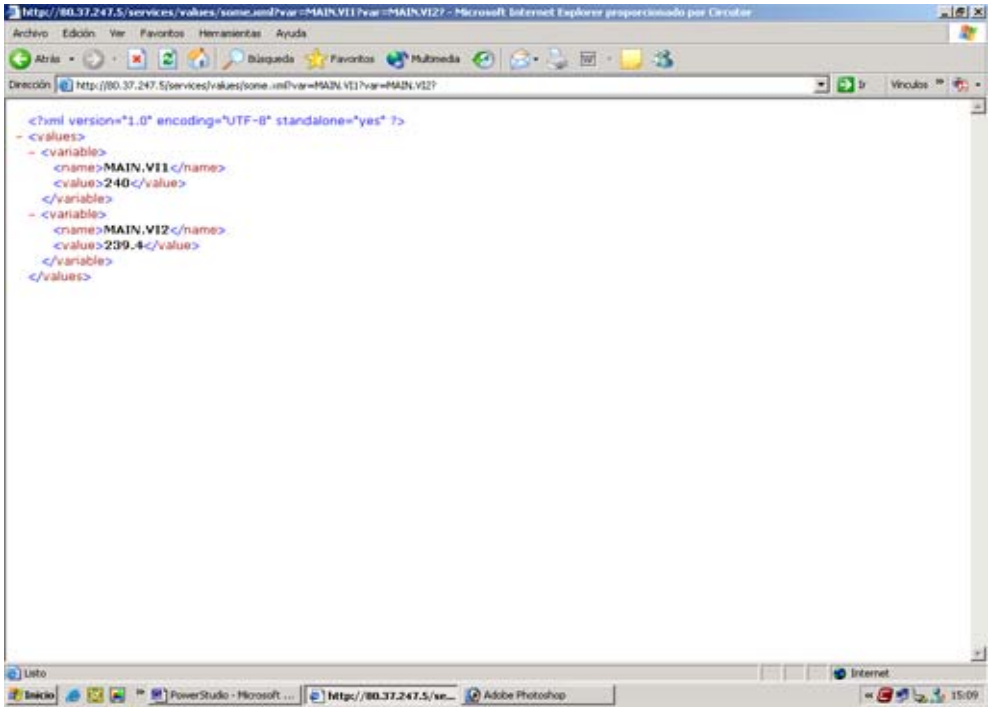
http://80.37.247.5/services/values/some.xml?var=MAIN.VI1?var=MAIN.VI2?

Following the structure shown above *n* variables may be requested.

Items that form the XML sentence are exactly the same as those used in DDE sentences; a list of available items is attached at the end of the document. Note that this list is being progressively expanded as communication drivers from the different peripherals are created.



Request example *http://80.37.247.5/services/values/some.xml?var=MAIN.VI1?*



Request example *http://80.37.247.5/services/values/some.xml?var=MAIN.VI1?var=MAIN.VI2?*

Requests may be different:

✓ some.xml	Instant parameters.
✓ records.xml	Variable values specified between two dates (stored history).
✓ varInfo.xml	Information on specified variables(units, decimals, name, etc…).
✓ alarms.xml	Active or non-active alarms and unrecognized alarms.
✓ alarmsgroups.xml	Groups of defined alarms.
✓ historicalarms.xml	Alarm history between two dates (stored).

Their composition for each case will be done in the following way:

✓ *some.xml* http://80.37.247.5/services/values/some.xml?var=MAIN.VI1?

```
<values>
  <variable>
    <name>…</name>          "NameDevice.CodeVariable"
    <value>…</value>        Value of the variable at this time
  </variable>
  ...
</values>
```

✓ *records.xml* http://80.37.247.5/services/logger/records.xml?begin=29032003?end=02042003?var=MAIN.VI1

```
<recordGroup>
  <period> ... </period>                Recording period
  <record>
    <dateTime>…</dateTime>              Date and time of the sample:
                                        DdMMyyyyhhmmss
    <fields>
      <field>
        <id> ... </id>                  "NameDevice.CodeVariable"
        <value> ... </value>            Value of the variable in this recording
      <field>
      ...
    </fields>
  </record>
  ...
</recordGroup>
```

✓ *varInfo.xml* http://80.37.247.5/services/logger/varInfo.xml?var=MAIN.VI1?

```
<varInfo>
  <var>
    <id>…</id>                          "NameDevice.CodeVariable"
    <title>…</title>                    Name of the variable.
    <sampleMode>…</sampleMode>          Type of variable, mode used to group:
                                        "none", "max", "min", "average", "pfAverage",
                                        "pfMin", "pfMax", "last", "differential"
    <measureUnits>…</measureUnits>      Variable units:
                                        "#NONE", "#V", "#A", "#750 W", "#W", "#varL",
                                        "#varC", "#PF", "#Hz", "#PERCENT", "#WH",
                                        "#VARLH", "#VARCH", "#DATETIME",
                                        "#MONETARY" and if not preceded with # it is a
                                        variable defined by the user.
```

<*unitsFactor*>…</*unitsFactor*>	Power of 10 indicating the value by which the variable in the file is multiplied.
<*decimals*>…</*decimals*>	Decimal points in this variable
<*userUnitsFactor*>…</*userUnitsFactor*>	Power of 10 indicating the value at which the user wishes to display it.
<*userDecimals*>…</*userDecimals*>	Decimal points which the user wishes to display.

```
  </var>
  ...
</varInfo>
```

✓ *alarms.xml* http://80.37.247.5/services/scada/alarms.xml

```
<alarms>
  <alarm>
    <id>…</id>                          (alarm identifier)
    <shortText>…</shortText>            (alarm short text)
    <longText>…</longText>              (alarm long text)
    <status>…</status>                  (status: activated (NACK) and recognized (ACK))
    <group>…</group>                    (name of the group to which the alarm belongs)
    <dateTime>…</dateTime>              (date and time of the alarm tripping)
    <ackDateTime>…</ackDateTime>        (date and time at which the alarm was recognized. This
                                        field may not exist if the alarm has not been recognized)
  </alarm>
  ...
</alarms>
```

✓ *alarmsgroups.xml* http://80.37.247.5/services/scada/alarmsgroups.xml

```
<groups>
  <group>
     <id>…</id>                         (group identifier)
     <name>…</name>                     (group name)
  </group>
  ...
</groups>
```

✓ *historicalarms.xml* http://80.37.247.5/services/scada/historicalarms.xml?begin=01082003?end=01022004

```
<alarms>
  <alarm>
    <shortText>…</shorText>             (alarm short text)
    <group>…</group>                    (alarm group or NONE if it does not belong to any group)
    <dateTime>…</dateTime>              (date and time at which the alarm tripped)
    <ackDelay>…</ackDelay>              (time in seconds that it took to recognize the alarm, does
                                        not appear if the alarm has been recognized)
    <disabledDelay>…</disabledDelay>    (time in seconds that it took to de-activate the alarm, does
                                        not appear if the alarm has been recognized)
  </alarm>
  ...
</alarms>
```

List of items for DDE and XML sentences:

Instantaneous voltage phase neutral phase 1	VI1
Instantaneous voltage phase neutral phase 2	VI2
Instantaneous voltage phase neutral phase 3	VI3
Mean instantaneous voltage phase three phase	VI
Instantaneous current phase 1	AI1
Instantaneous current phase 2	AI2
Instantaneous current phase 3	AI3
Instantaneous current three phase	AI
Instantaneous active power phase 1	API1
Instantaneous active power phase 2	API2
Instantaneous active power phase 3	API3
Instantaneous active power three phase	API
Instantaneous inductive power phase 1	IPI1
Instantaneous inductive power phase 2	IPI2
Instantaneous inductive power phase 3	IPI3
Instantaneous inductive power three phase	IPI
Instantaneous capacitive power phase 1	CPI1
Instantaneous capacitive power phase 2	CPI2
Instantaneous capacitive power phase 3	CPI3
Instantaneous capacitive power three phase	CPI
Instantaneous power factor phase 1	PFI1
Instantaneous power factor phase 2	PFI2
Instantaneous power factor phase 3	PFI3
Instantaneous power factor three phase	PFI
Active energy	AE
Reactive inductive energy	IE
Reactive capacitive energy	CE
Active energy tariff 1	AET1
Reactive inductive energy tariff 1	IET1
Reactive capacitive energy tariff 1	CET1
Active energy tariff 2	AET2
Reactive inductive energy tariff 2	IET2
Reactive capacitive energy tariff 2	CET2
Active energy tariff 3	AET3
Reactive inductive energy tariff 3	IET3
Reactive capacitive energy tariff 3	CET3
Max. instantaneous voltage phase neutral phase 1	VMX1
Max. instantaneous voltage phase neutral phase 2	VMX2
Max. instantaneous voltage phase neutral phase 3	VMX3
Max. mean instantaneous voltage phase three phase	VMX
Min. instantaneous voltage phase neutral phase 1	VMN1
Min. instantaneous voltage phase neutral phase 2	VMN2
Min. instantaneous voltage phase neutral phase 3	VMN3
Min. mean instantaneous voltage phase three phase	VMIN
Instantaneous voltage phase phase 12	VI12
Instantaneous voltage phase phase 23	VI23
Instantaneous voltage phase phase 31	VI31
Mean instantaneous voltage phase phase 123	VI123
Max. instantaneous voltage phase phase 12	VMX12
Max. instantaneous voltage phase phase 23	VMX23
Max. instantaneous voltage phase phase 31	VMX31
Max. mean instantaneous voltage phase phase 123	VMX123
Min. instantaneous voltage phase phase 12	VMN12
Min. instantaneous voltage phase phase 23	VMN23
Min. instantaneous voltage phase phase 31	VMN31

Min. mean instantaneous voltage phase phase 123	VMN123
Maximum instantaneous current phase 1	AMX1
Maximum instantaneous current phase 2	AMX2
Maximum instantaneous current phase 3	AMX3
Maximum instantaneous current three phase	AMX
Minimum instantaneous current phase 1	AMN1
Minimum instantaneous current phase 2	AMN2
Current instantaneous minimum phase 3	AMN3
Minimum instantaneous current three phase	AMN
Max. instantaneous active power phase 1	APMX1
Max. instantaneous active power phase 2	APMX2
Max. instantaneous active power phase 3	APMX3
Max. instantaneous active power three phase	APMX
Min. instantaneous active power phase 1	APMN1
Min. instantaneous active power phase 2	APMN2
Min. instantaneous active power phase 3	APMN3
Min. instantaneous active power three phase	APMN
Max. instantaneous inductive power phase 1	IPMX1
Max. instantaneous inductive power phase 2	IPMX2
Max. instantaneous inductive power phase 3	IPMX3
Max. instantaneous inductive power three phase	IPMX
Min. instantaneous inductive power phase 1	IPMN1
Min. instantaneous inductive power phase 2	IPMN2
Min. instantaneous inductive power phase 3	IPMN3
Min. instantaneous inductive power three phase	IPMN
Max. instantaneous capacitive power phase 1	CPMX1
Max. instantaneous capacitive power phase 2	CPMX2
Max. instantaneous capacitive power phase 3	CPMX3
Max. instantaneous capacitive power three phase	CPMX
Min. instantaneous capacitive power phase 1	CPMN1
Min. instantaneous capacitive power phase 2	CPMN2
Min. instantaneous capacitive power phase 3	CPMN3
Min. instantaneous capacitive power three phase	CPMN
Max. instantaneous power factor phase 1	PFMX1
Max. instantaneous power factor phase 2	PFMX2
Max. instantaneous power factor phase 3	PFMX3
Max. instantaneous power factor three phase	PFMX
Min. instantaneous power factor phase 1	PFMN1
Min. instantaneous power factor phase 2	PFMN2
Min. instantaneous power factor phase 3	PFMN3
Min. instantaneous power factor three phase	PFMN
Instantaneous apparent power phase 1	VAI1
instantaneous apparent power phase 2	VAI2
Instantaneous apparent power phase 3	VAI3
Instantaneous apparent power three phase	VAI
Max. instantaneous apparent power phase 1	VAMX1
Max. instantaneous apparent power phase 2	VAMX2
Max. instantaneous apparent power phase 3	VAMX3
Max. instantaneous apparent power three phase	VAMX
Min. instantaneous apparent power phase 1	VAMN1
Min. instantaneous apparent power phase 2	VAMN2
Min. instantaneous apparent power phase 3	VAMN3
Min. instantaneous apparent power three phase	VAMN
Negative active energy	NAE
Negative reactive inductive energy	NIE
Negative reactive capacitive energy	NCE
Negative active energy tariff 1	NAET1
Negative reactive inductive energy tariff 1	NIET1

Negative reactive capacitive energy tariff 1	NCET1
Negative active energy tariff 2	NAET2
Negative reactive inductive energy tariff 2	NIET2
Negative reactive capacitive energy tariff 2	NCET2
Negative active energy tariff 3	NAET3
Negative reactive inductive energy tariff 3	NIET3
Negative reactive capacitive energy tariff 3	NCET3
Instantaneous frequency	HZI
Max. frequency	HZMX
Min. frequency	HZMN
Max. demand active power phase 1	MDAP1
Max. demand active power phase 2	MDAP2
Max. demand active power phase 3	MDAP3
Max. demand active power three phase	MDAP
Max. demand apparent power phase 1	MDAP1
Max. demand apparent power phase 2	MDAP2
Max. demand apparent power phase 3	MDAP3
Max. demand apparent power three phase	MDAPI
Max. demand current phase 1	MDA1
Max. demand current phase 2	MDA2
Max. demand current phase 3	MDA3
Max. demand current three phase	MDA
Max. demand current three phase	MDI
Max. demand current maximum three phase	MDIMX
Max. demand maximum three phase	MDMX
Max. demand instantaneous phase 1	MDI1
Max. demand instantaneous maximum phase 1	MDIMX1
Max. demand maximum phase 1	MDMX1
Max. demand instantaneous phase 2	MDI2
Max. demand instantaneous maximum phase 2	MDIMX2
Max. demand maximum phase 2	MDMX2
Max. demand instantaneous phase 3	MDI3
Max. demand instantaneous maximum phase 3	MDIMX3
Max. demand maximum phase 3	MDMX3
Max. demand instantaneous tariff 1	MDIT1
Max. demand instantaneous maximum tariff 1	MDIMXT1
Max. demand maximum tariff 1	MDMXT1
Max. demand instantaneous tariff 2	MDIT2
Max. demand instantaneous maximum tariff 2	MDIMXT2
Max. demand maximum tariff 2	MDMXT2
Max. demand instantaneous tariff 3	MDIT3
Max. demand instantaneous maximum tariff 3	MDIMXT3
Max. demand maximum tariff 3	MDMXT3
Analogue input instantaneous X	AIIX
Max. analogue input instantaneous X	AIMXX
Min. analogue input instantaneous X	AIMNX
Digital input X	DIX
Digital output X	DOX
Counter X	CX
Relay state X	RX
THD voltage phase 1	DVI1
THD voltage phase 2	DVI2
THD voltage phase 3	DVI3
THD max. voltage phase 1	DVMX1
THD max. voltage phase 2	DVMX2
THD max. voltage phase 3	DVMX3
THD min. voltage phase 1	DVMN1
THD min. voltage phase 2	DVMN2

THD min. voltage phase 3	DVMN3
THD current phase 1	DAI1
THD current phase 2	DAI2
THD current phase 3	DAI3
THD max. current phase 1	DAMX1
THD max. current phase 2	DAMX2
THD max. current phase 3	DAMX3
THD min. current phase 1	DAMN1
THD min. current phase 2	DAMN2
THD min. current phase 3	DVMN3
Cos PHI instantaneous phase 1	COSI1
Cos PHI instantaneous phase 2	COSI2
Cos PHI instantaneous phase 3	COSI3
Cos PHI instantaneous three phase	COSI
Cos PHI max. phase 1	COSMX1
Cos PHI max. phase 2	COSMX2
Cos PHI max. phase 3	COSMX3
Cos PHI max. three phase	COSMX
Cos PHI min. phase 1	COSMN1
Cos PHI min. phase 2	COSMN2
Cos PHI min. phase 3	COSMN3
Cos PHI min. three phase	COSMN
Fundamental voltage phase 1	FV1
Fundamental voltage phase 2	FV2
Fundamental voltage phase 3	FV3
Fundamental current phase 1	FA1
Fundamental current phase 2	FA2
Fundamental current phase 3	FA3
Harmonic X voltage phase 1	ARMXV1
Harmonic X voltage phase 2	ARMXV2
Harmonic X voltage phase 3	ARMXV3
Harmonic X current phase 1	ARMXA1
Harmonic X current phase 2	ARMXA2
Harmonic X current phase 3	ARMXA3
PST phase 1	PST1
PST phase 2	PST2
PST phase 3	PST3
P0,1 phase 1	P011
P0,1 phase 2	P012
P0,1 phase 3	P013
P1 phase 1	P11
P1 phase 2	P12
P1 phase 3	P13
P3 phase 1	P31
P3 phase 2	P32
P3 phase 3	P33
P10 phase 1	P101
P10 phase 2	P102
P10 phase 3	P103
P50 phase 1	P501
P50 phase 2	P502
P50 phase 3	P503
Direct voltage (unbalance)	VD
Inverse voltage (unbalance)	VI
Homopolar voltage (unbalance)	VH
Instantaneous neutral current	ANI
Maximum neutral current	ANMX
Minimum neutral current	ANMN

Instantaneous leakage current	AELI
Maximum leakage current	AELMX
Minimum leakage current	AELMN
Type of event	EVET
Length of event	EVEL
Extreme voltage of event	HEBE
Mean voltage of event	EVEM
Previous voltage of event	EVEA
Waveform of voltage phase 1	FOV1
Waveform of voltage phase 2	FOV2
Waveform of voltage phase 3	FOV3
Waveform of current phase 1	FOA1
Waveform of current phase 2	FOA2
Waveform of current phase 3	FOA3
Measure (DH96)	ME
Peak (DH96)	PK
Valley (DH96)	VL
Instantaneous voltage phase neutral phase 1	VI1
Instantaneous voltage phase neutral phase 2	VI2
Instantaneous voltage phase neutral phase 3	VI3
Mean instantaneous voltage phase three phase	VI
Instantaneous current phase 1	AI1
Instantaneous current phase 2	AI2
Instantaneous current phase 3	AI3
Instantaneous current three phase	AI
Instantaneous active power phase 1	API1
Instantaneous active power phase 2	API2
Instantaneous active power phase 3	API3
Instantaneous active power three phase	API
Instantaneous inductive power phase 1	IPI1
Instantaneous inductive power phase 2	IPI2
Instantaneous inductive power phase 3	IPI3
Instantaneous inductive power three phase	IPI
Instantaneous capacitive power phase 1	CPI1
Instantaneous capacitive power phase 2	CPI2
Instantaneous capacitive power phase 3	CPI3
Instantaneous capacitive power three phase	CPI
Instantaneous power factor phase 1	PFI1
Instantaneous power factor phase 2	PFI2
Instantaneous power factor phase 3	PFI3
Instantaneous power factor three phase	PFI
Active energy	AE
Reactive inductive energy	IE
Reactive capacitive energy	CE
Active energy tariff 1	AET1
Reactive inductive energy tariff 1	IET1
Reactive capacitive energy tariff 1	CET1
Active energy tariff 2	AET2
Reactive inductive energy tariff 2	IET2
Reactive capacitive energy tariff 2	CET2
Active energy tariff 3	AET3
Reactive inductive energy tariff 3	IET3
Reactive capacitive energy tariff 3	CET3
Max. instantaneous voltage phase neutral phase 1	VMX1
Max. instantaneous voltage phase neutral phase 2	VMX2
Max. instantaneous voltage phase neutral phase 3	VMX3
Max. mean instantaneous voltage phase three phase	VMX
Min. instantaneous voltage phase neutral phase 1	VMN1

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Min. instantaneous voltage phase neutral phase 2	VMN2
Min. instantaneous voltage phase neutral phase 3	VMN3
Min. mean instantaneous voltage phase three phase	VMIN
Instantaneous voltage phase phase 12	VI12
Instantaneous voltage phase phase 23	VI23
Instantaneous voltage phase phase 31	VI31
Mean instantaneous voltage phase phase 123	VI123
Max. instantaneous voltage phase phase 12	VMX12
Max. instantaneous voltage phase phase 23	VMX23
Max. instantaneous voltage phase phase 31	VMX31
Max. mean instantaneous voltage phase phase 123	VMX123
Min. instantaneous voltage phase phase 12	VMN12
Min. instantaneous voltage phase phase 23	VMN23
Min. instantaneous voltage phase phase 31	VMN31
Min. mean instantaneous voltage phase phase 123	VMN123
Maximum instantaneous current phase 1	AMX1
Maximum instantaneous current phase 2	AMX2
Maximum instantaneous current phase 3	AMX3
Maximum instantaneous current three phase	AMX
Minimum instantaneous current phase 1	AMN1
Minimum instantaneous current phase 2	AMN2
Minimum instantaneous current phase 3	AMN3
Minimum instantaneous current three phase	AMN
Max. instantaneous active power phase 1	APMX1
Max. instantaneous active power phase 2	APMX2
Instant current leakage channel X (CBS-8, CDR-8)	AELIX
Current leakage detected channel X (CBS-8, CDR-8)	AELDX
Status of channel X (CBS-8, CDR-8)	STX
Operating mode (CBS-8, CDR-8)	WM
Remote trip in channel X (CBS-8, CDR-8)	RFCX
Reclosure counter (RRM-C)	RC
No. of reclosures selected (RRM-C)	RN
Time between reclosures selected (RRM-C)	RT
Equipment status (RRM-C)	ST