UNIVERSITY OF Southampton

Estates and Facilities

Standard *Specification:*

*Automat*ic Metering System

Document Number
ES/021/E

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Revision Index

Revision	Date of Revision	Revised by	Revision Made
0	5/11/12	JB	First Issue
A	28/11/12	JB	Heat meter spec revised
B	8/02/13	JB	Labelling of meters spec expanded
C	12/03/2018	JB, JA	Update supplier contact details. Electricity and data logger spec revised
D	March 2020	JB	Providing more detail, update supplier contact details. Providing more information regarding Synapsys ddata loggers.
E	26/08/21	JB	Further update on Synapsys

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STANDARD SPECIFICATION: AUTOMATIC METERING SYSTEM

1 INTRODUCTION

1.1 Purpose of this Standard Specification Document

This Standard Specification is intended to give details to University design and operations teams as well as external contractors and consultants on the University's standards relating to metering and the collection of electricity, gas, and heat and water data.

There may be certain aspects of the Standard Specification which may not work for specialist project. In these cases alternative to the Specification MUST be agreed with the Liaison Engineer and the University's Energy Manager.

1.2 Scope of this Document

This Standard Specification Document details the University's requirements for metering installation and the collection of electricity, gas, heat and water data supplied to the Estate and used within buildings and by the areas and equipment within them.

It sets out general principles about where meters should be provided and which of those meters should be connected to Automatic Metering System (AMS).

It outlines details relating to supply company billing meters including the means of having them installed and replaced, the means of ensuring that they are appropriately read and, where applicable, the ways in which data can be collected and imported into the AMS.

It outlines the University's requirements for the University's owned meters, the type installed, the installation configuration, meter validation and their connection to the AMS.

It outlines details about set up and operation of the Automatic Metering System.

1.3 Liaison Engineers

Every Project will have one or two Liaison Engineers appointed.

Refer to Briefing Document: Liaison Engineers and Consulting Engineers.

The Liaison Engineers are the formal route for communication between the Project and the University's M&E teams including Energy and BEMS and all formal agreements shall be via them.

The Liaison Engineers will work alongside any appointed Project Manager.

1.4 Related Documents

This briefing Document should be read in conjunction with the latest revision of other relevant Briefing Documents, in particular:

- Liaison Engineers ES/003/D
- Briefing Notes for Electrical Services ES/002-C
- Asset Labelling ES/022/A

Where there is any discrepancy between documents the Liaison Engineers should be consulted.

All current Briefing Documents can be found at http://www.southampton.ac.uk/estates/standard-specifications.page .

1.5 Preferred Suppliers

Suppliers and equipment stated in this document are the University's standard. Proposals for alternative must first be agreed, via the Liaison Engineers, with the University's Energy Manager.

2 REQUIREMENT FOR AUTOMATIC METERING

Although metering is often needed for other purposes, for example in order to meet the BREEAM requirements or Planning Regulations the University does not require all such meters to be connected to its Automatic Metering System.

2.1 Services to Be Metered and Connected to AMS

2.1.1 Electricity

2.1.1.1 The main electricity supply to each building with a maximum demand in excess of 20kVA shall be metered separately and connected to the AMS.

2.1.2 Each distribution board with a maximum demand of greater than 20kVA shall be metered separately and connected to the AMS.

2.1.2.1 Each individual piece of equipment or load with an average maximum consumption in excess of 10kVA over a one hour period shall be metered separately and connected to the AMS.

2.1.2.2 Wherever practicable, small power and lighting shall be metered separately and connected to the AMS.

2.1.2.3 In every instance, electricity meters shall be arranged in order to achieve a 'meter chain' that includes the main building electricity meter and as described in 2.2 below.

2.1.3 Gas

2.1.3.1 Each main gas supply to a building shall be metered (whether it be a private meter or a utility company meter).

2.1.3.2 Main building meters of size U16 (a maximum capacity of 16m3/h) and above shall be connected to the AMS.

2.1.3.3 The gas supply to each item of equipment within a building with an input capacity of greater than 200kW shall be metered separately or in groups of similar type (e.g. a group of 3 boilers) and connected to the AMS and these meters shall be arranged to provide a 'meter chain as described in 2.2 below.

2.1.4 Heat

2.1.4.1 Each building's main supply of heat shall be metered and connected to the AMS.

2.1.4.2 Domestic hot water service (DHWS), variable temperature (VT) and constant temperature (CT) heat shall be metered separately and connected to the AMS.

2.1.4.3 The above arrangement will provide a 'meter chain' as described in 2.2 below.

2.1.5 Water

2.1.5.1 Each Southern Water meter of size of 28mm and above shall also have an internal water meter fitted within each building that the supply feeds and all of these meters shall be connected to the AMS.

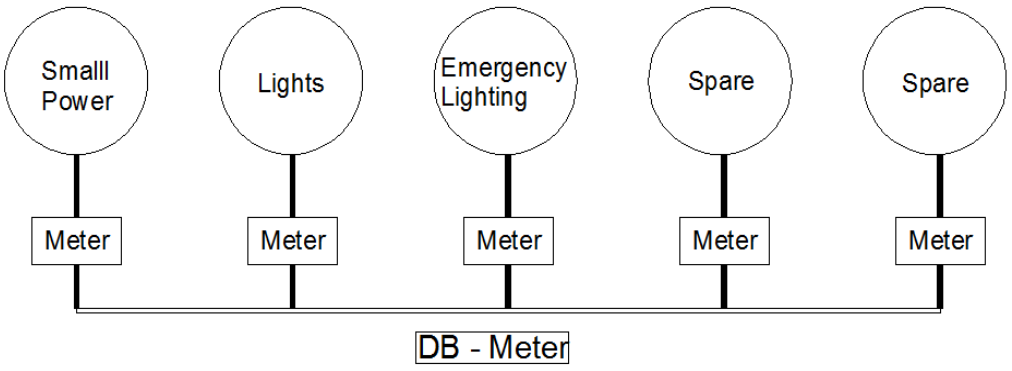
2.1.6 Water shall be metered both at the Southern Water supply meter and at the entry to each building supplied. (NOTE: Any external water supplies should be from a building and not directly from the buried water main). This will create a 'meter chain' as outlined in 2.2 below as well as allowing any leakage in the buried mains to be detected.

2.2 Meter Chains

2.2.1 Ensuring the correct operation of meters is key to the reliability and robustness of the AMS.

Meter chains will assist in ensuring the reliability and robustness of the data the University is collecting.

2.2.2 Wherever reasonably possible all efforts should be made to set, provide and configure automatic meters so that a 'meter chain' is formed as illustrated in the example below. In this case the DB Meter = the sum of the small power, lights, emergency lighting and two spare ways on the distribution board:



3 SUPPLY COMPANY BILLING METERS

Billing meters are those meters owned, maintained and operated by an external organisation from which the University purchases electricity, gas or water. It shall be the responsibility of the project to implement the following.

3.1 Half Hourly (HH) Electricity

3.1.1 Where a new supply will have a maximum demand in excess of 100kVA and where the annual consumption is estimated at greater than 200,000kWh a half hourly supply meter shall be utilised.

3.1.2 All applications for modifications to or new HH Electricity meters including the

installation of the supply, the supply agreement, the meter installation and meter operator agreement and the data collection and aggregation agreement shall be made in consultation with the University's Procurement Services Team.

3.1.3 **Meter Operator and Data Collector and Aggregator**

The University currently employs IMServ as both its Meter Operator and Data Collector and Aggregator.

Applications for new meters and changes in meters should be made to Annabelle Gulliver Account Manager, Annabelle.Gulliver@imserv.com Tel: 01908 257 555. The Imserv Customer Care team, customer.care@imserv.com, shall be copied in to all email correspondence. Please see section 3.1.5 for details of requirements of new meters and their connection to the AMS.

This is separate from the supply installation (refer to Electrical Briefing Document) and supply agreement (refer to University's Procurement Services team).

3.1.4 **Access to Meters on Site**

For existing buildings, all requests for access for meter maintenance, replacement or removal must be directed through the Estates and Facilities helpdesk. Helpdesk will raise a job for the Estates and Facilities Electrical Maintenance Team to provide access to the meter and provide any plant room access permits if required.

Where billing meters are replaced or removed Estates and Facilities Electrical Maintenance Team are responsible for taking a final read of the old meter and a start read of the new meter. Meter reads must be sent to the Energy Management team via email along with the date the read was taken and a picture of the new meter, metering@soton.ac.uk.

3.1.5 **Connection to AMS**

All new Half Hourly Meters shall have data collected in two ways:

3.1.5.1 Details of the new metered supply and MPAN shall be sent for the attention of the Energy Manager at metering@soton.ac.uk . IMServ shall be instructed to add the new MPAN's data to the list of data transmitted via email on a daily basis, to imserv@soton.ac.uk from where it will be automatically imported into the AMS.

3.1.5.2 IMServ shall be instructed to provide a Customer Connection point, which will provide a volt free contact for connection to the AMS.

3.1.6 In connecting the Customer Connection point to the AMS it is vital to check:

3.1.6.1 The correct polarity – the voltage from the AMS data logger will be approximately 29VDC and it is vital that the positive connection is connected to the positive terminal in the Customer Connection point.

3.1.6.2 The correct pulse rate – which must be entered into the channel description on the AMS.

3.2 Non Half Hourly (NHH) Electricity

3.2.1 For smaller sized electricity meters (below the specification for HH meters defined in 3.1 above 3.1.1 above) shall be installed as NHH Electricity Meters.

3.2.2 Any new or replacement of NHH electricity meters shall be applied for in consultation with the University's Procurement Services Team.

3.2.3 Where new or replacement meters are installed, start (and where applicable finish) meter reads shall be taken from the electricity meters by the contractor and emailed to the Energy Management Team along with the date the read was taken and a picture of the new (and where applicable old) meter, metering@soton.ac.uk.

3.3 Gas Meters

3.3.1 All new or replacement gas meters of size U16 or above shall be specified as being supplied with an intrinsically safe pulse output for connection into the University's AMS. This will normally be provided as a second pair of volt free contacts from a 'Cello type device as manufactured by Dresser. Meters below this size need not be connected to the AMS.

3.3.2 Any new or replacement gas meters shall be applied for in consultation with the University's Procurement Services Team.

3.3.3 Where applicable, the pulse output from the intrinsically safe device shall be connected from the Cello device into the AMS taking particular care to:

3.3.3.1 Ensure the correct polarity – the voltage from the AMS data logger will be approximately 29VDC and it is vital that the positive connection is connected to the positive terminal on the Cello device.

3.3.3.2 Record the pulse rate of the gas meter output and ensure this is included in the description for the meter channel.

3.3.4 Where gas meters are located in an external meter house, the preferred option is a buried duct connecting the pulse output to the data logger inside the building. Where a new duct would not be practicable, use of a radio system as described in 5.2.1.3 below can be considered as an alternative.

3.4 Water Meters

3.4.1 All new Southern Water meters shall be supplied with facility to connect to the AMS. Where existing meters are to be reused to supply new facilities, the meter shall be upgraded to a pulse output meter

3.4.2 Any new or replacement water meters shall be applied for in consultation with the University's Procurement Services Team.

3.4.3 Requests for facility to connect to the AMS shall be made to IMServ, contact Annabelle Gulliver Account Manager, Annabelle.Gulliver@imserv.com Tel: 01908 257 555. The Imserv Customer Care team, customer.care@imserv.com, shall be copied in to all email correspondence. NOTE: Before IMServ can connect their data logger to the water meter they will need to liaise with Southern Water. So the job may take a few weeks to complete.

3.4.4 When applying for a facility to connect to the AMS, the University Energy Manager must be notified when the connect will be completed, the meter ID number, a close up photograph of the meter, a distance photograph showing the meter pit and a site plan showing the meter location.

4 UNIVERSITY OWNED METERS

It shall be the responsibility of the project to implement the following.

4.1 Electricity Meters

4.1.1 Only electricity meters required to be connected to the AMS are specified here.

NOTE: The majority of the existing electricity meters across the University are simple pulsing devices. This standard has now been superseded by that defined below.

4.1.2 University Standard Pulse Count Electricity Meters – Installation

4.1.2.1 All new installations shall be ND Cube 400 with pulse count as shown in the photograph below. These are to be supplied by Northern Design Metering Solutions. Contact Tel 01274 750 620, email sales@ndmeter.co.uk.

4.1.2.2 All new meter installations and dataloggers must be located in the same room as the LV panel where they can be easily read and maintained. Note: the cross-section of the cable from the DB to the meter will need to be appropriately sized to the distance between the DB and the meter.

4.1.2.3 When installing electric meters it is crucial that the all CT's are connected. One missing CT on a 3 phase load would mean a third of the energy is not being recorded. It is also extremely important that the CT's are the right way round. Reversed CT's would result in negative figures. In addition, a CT per phase. If a single CT goes round more than one phase cable they will cancel each other out resulting in energy not being recorded.

4.1.2.4 Onsite programming of the meters is required. The meter handbook should be read upon programming of the meter.

4.1.2.5 The meters shall be programmed to the correct CT ratio for the supply.

4.1.2.6 The ND Cube 400 automatically sets the pulse ratio per kWh as per the connected load. The contractor must provide the Energy Management Team with the pulse ratio set value of each meter via metering@soton.ac.uk.

The contractor can view the pulse ratio by entering into the programming menu in the meter.

4.1.2.7 All meters must be clearly labelled, stating exactly what the load is being read in accordance with sections 6 and 7 below. The label must include the CT ratio.

4.1.2.8 All meters must be asset tagged in accordance with briefing document ES/022/A M&E Equipment Responsibility Matrix and Asset Labelling.

4.1.2.9 Once commissioned, meters shall be manually read at least twice over a fixed period and on the half hour interval and this shall be given to the Energy Management Team, via metering@soton.ac.uk, who will compare to the data collected using the AMS to verify correct set up.

4.1.2.10 The contractor must provide the Energy Management Team via metering@soton.ac.uk with an Electrical Metering Schematic which clearly shows the distribution boards, the meters connected to them and how they are connect linked back to the LV panel.

4.2 Gas Meters

4.2.1 It is the University's standard that all new and replacement gas meters are pulse counting. When installing new sub gas meters it shall include an intrinsically safe pulse output for connection into the University's AMS. This will normally be provided as a second pair of volt free contacts from a 'Cello type device as manufactured by Dresser.

4.2.2 University Standard Pulse Count Gas Meters – Installation.

All new installations shall Vemm tec IGTM – Wafer Type gas meter together with Cello intrinsically safe connection device supplied by Western Automation, Tel: 02380 343 377.

4.2.3 All gas meters shall be specified such that the pulse rate will be a minimum of 20 pulses in any one half hour period at times of minimum demand.

4.2.4 Once commissioned, meters shall be manually read at least twice over a fixed period and on the half hour interval and this shall be given to the Energy Management Team, via metering@soton.ac.uk, who will compare to the data collected using the AMS to verify correct set up.

4.2.4 All meters must be clearly labelled, stating exactly what the load is being read in accordance with sections 6 and 7 below.

4.2.5 All meters must be asset tagged in accordance with briefing document ES/022/A M&E Equipment Responsibility Matrix and Asset Labelling.

4.2.6 The contractor must provide the Energy Management Team via metering@soton.ac.uk with a Mechanical Metering Schematic which clearly shows where the gas meters sit within the mechanical distribution system.

4.3 Heat Meters

4.2.4 University Standard Pulse Count Heat Meters – Installation

Heat meters (also known as an integrator) shall be Kamstrup Mulitical There are a number of different models. The contractor shall therefore use the most appropriate model for the mechanical plant installation with appropriate flow section and temperature sensors for the installation. These meters can be obtained through Western Automation, Tel: 02380 343 377For technical information contact Kamstrup, Tel: 01787 319 081

4.2.5 The heat meters (integrators) are programmed at the factory it is therefore imperative that the correct programming information is given to the supplier. This includes the required pulse rate.

4.2.6 When installing the heat meters (integrators) they must integrator must be located in an accessible location where it can be easily be read and maintained. No higher 1.5m from ground level. The heat meters (integrators) do not need to be mounted on to the flow section. They can be mounted separately. If the flow section is in a difficult to access location and more than 1.5m from ground level. Then the heat meters shall be installed in a more appropriate location within the same room as the flow section. In some cases it may be necessary to run additional conduit for the meter to be mounted on. Note, however, that the temperature sensors cables must NOT be shortened or extended. It is imperative that the correct temperature sensor cable length is ordered.

4.2.7 It is vital that the flow section must been installed in a long straight piece of pipe away from any bends or other fittings or obstructions and that the system contains clean water with air and dirt eliminated (see ES/001 Mechanical Briefing Notes) in order to avoid turbulent water. In addition the Kamstrup installation guide provides detailed information about where to install the flow section.

4.2.8 Where possible the flow section should be:

4.2.8.1 In the horizontal but if this is impractical it should be located so that water flows upwards. Water should never flow downwards through the flow section.

4.2.8.2 The flow section must be sited in an easily accessible location for maintenance.

4.2.8.3 In the return pipe

4.2.9 When installing the sensors, heat sink compound plus must be applied to the sensor pins before installing into the sensor pockets to improve the thermal conductivity of the sensors. The sensors pockets need to be inserted into sockets, with one welded into the side of the flow pipe and one welded into the side of the return pipe**.** Care must be taken to ensure that the flow and return temperature sensors are inserted in to the correct pipe. If the flow and return sensors are the wrong way round the integrator will give a false reading. The sockets need to be the depth of the pipe insulation and the pockets long enough to go in the water flow. The integrator should be hard wired to the power supply via a fuse spur.

4.2.10 When connecting the pulse cable to the pulse output is connected correctly to avoid incorrect readings.

4.2.11 When connecting to the pulse output CE terminals 16 and 17 must be used (terminals 18 and 19 will give a measure of volume and not heat). As shown in the picture below. (Note this is these terminal number relate to Kamstrup Mulitical 602. The terminal numbers may be different with different models).

4.2.12 The integrator must be connected to the nearest SIP + EMT-IF data logger. The contractor is responsible for commissioning the integrator and flow section as well as ensuring the correct data is received by the AMS in the correct channel. The pulse rate of the integrator should be a minimum of 20 pulses per half an hour at low load and no more than 1 pulse per second at high load. The pulse rate must be specified upon ordering of the meter as this is programmed at the factory.

4.2.13 Once commissioned, meters shall be manually read at least twice over a fixed period and on the half hour interval and this shall be given to the Energy Management Team, via metering@soton.ac.uk, who will compare to the data collected using the AMS to verify correct set up.

4.2.14 All meters must be clearly labelled, stating exactly what the load is being read in accordance with sections 6 and 7 below.

4.2.15 All meters must be asset tagged in accordance with briefing document ES/022/A M&E Equipment Responsibility Matrix and Asset Labelling.

4.2.16 The contractor must provide the Energy Management Team via metering@soton.ac.uk with a Mechanical Metering Schematic which clearly shows where the gas meters sit within the mechanical distribution system.

4.3 Water Meters

4.3.4 The water meter shall be Multi-jet Type, Woltmann pulse counting. Supplied by Western Automation, Tel: 02380 343 377.

4.3.5 The meters shall be located in an easily accessible location for meter reading and maintenance purposes.

4.3.6 All water meters shall be connecting into the AMS and should be connected to the nearest SIP + EMT-IF using the specified method see section 5 below. The contractor is responsible for commissioning of the water meter as well as ensuring the correct data is received by the

AMS in the correct channel.

4.3.7 The pulse rate of the meter shall be programmed depending on the demand, so to pulse once every 10 to 100 litres. The pulse rate should be a minimum of 20 pulses per half an hour at low load and no more than 1 pulse per second at high load. The pulse rate must be specified upon ordering of the meter as this is programmed at the factory.

4.3.8 Once commissioned, meters shall be manually read at least twice over a fixed period and on the half hour interval and this shall be given to the Energy Management Team, via metering@soton.ac.uk, who will compare to the data collected using the AMS to verify correct set up.

4.3.9 All meters must be clearly labelled, stating exactly what the load is being read in accordance with sections 6 and 7 below.

4.3.10 All meters must be asset tagged in accordance with briefing document ES/022/A M&E Equipment Responsibility Matrix and Asset Labelling.

4.3.11 The contractor must provide the Energy Management Team via metering@soton.ac.uk with a Mechanical Metering Schematic which clearly shows where the water meters sit within the mechanical distribution system.

5 AUTOMATIC METERING SYSTEM

5.1 General Description

The University Automatic Metering System (AMS) is an energy and water monitoring and reporting system that primarily records cumulative consumption over each half hour interval.

In addition it is used to record maximum, minimum and average values of, for example, electrical power, temperature, wind speed and fume cupboard sash position.

The AMS is fundamental too much of the University's operation including its Carbon Management Plan, Devolved Charging System, and mandatory and voluntary internal and external reporting requirements.

The front end software is currently managed and maintained internally. The data loggers are supplied by Synapsys Solutions Ltd.

All new meters that are required to be connected into the University's AMS together with any associated data loggers.

NOTE: Meters shall NOT be connected to the Trend BMS or any other data collection system.

5.2 Data Loggers

5.2.1 The data logger installed shall be SIP + EMT-IF supplied by Synapsys Solutions Ltd, Tel: 01444 246 128, Email: enquries@synapsys-solutions.com. Each data logger requires a power supply and a TCP/IP network data point. The University's iSolutions team will need to be contacted regarding the installation of the data point.

5.2.2 It is the university's standard energy and water data collection is done via pulse count. Therefore, a device called a Pulse Acquisition module (PAM) is required in addition to the data logger. The PAM converts the pulse from the meters to a digital signal that can be picked up by the SIP + EMT-IF. These are supplied by Synapsys Solutions Ltd. (See the SIP + EMT-IF Data sheet in Appendix B and the PAM Data Sheet in Appendix C for further information.)

5.3 Installations and Programming

5.3.1 Upon installation of the data logger system Synapsys Solutions Ltd, Tel: 01444 246 128, Email: enquries@synapsys-solutions.com shall be connected for advice.

5.3.2 The data loggers are mains powered.

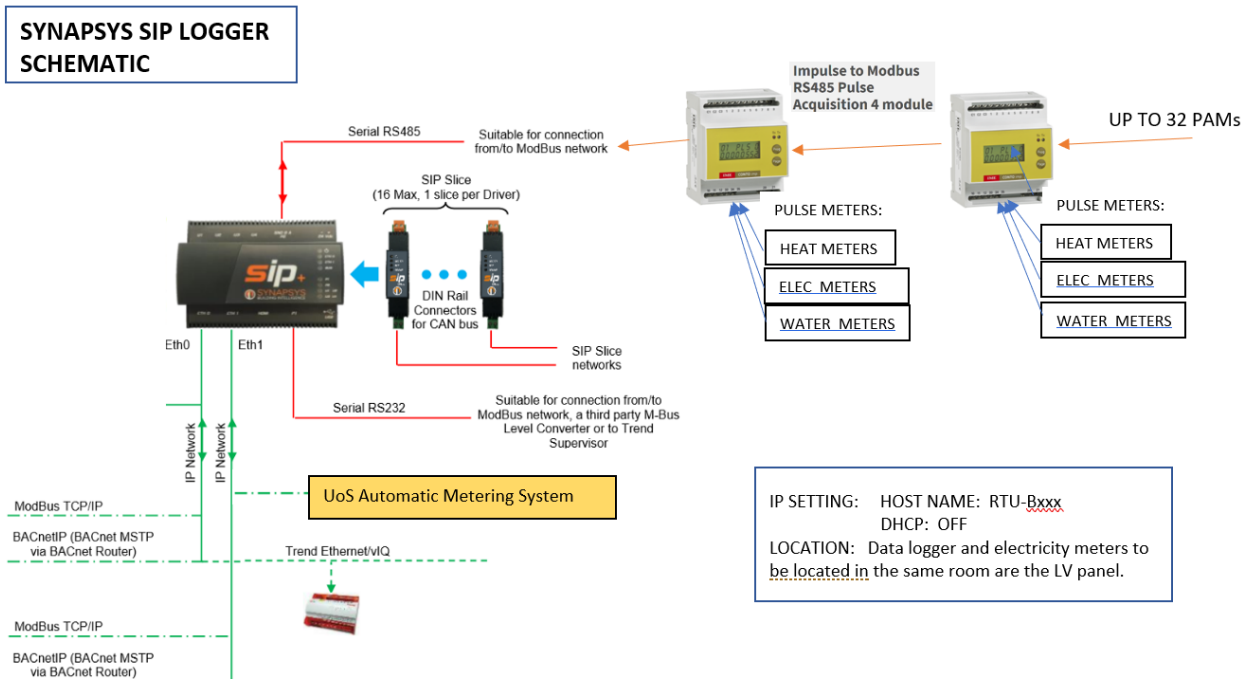
5.3.3 The data loggers must be installed in the same room as the LV panel.

5.3.4 Data loggers must be assigned IP address, connected to a data point. It shall be specified that the Contractor obtain a static IP address and data point for each data logger from the iSolutions department.

5.3.5 Data and power cables to the data logger's must be clearly labelled in accordance with clause 7 below.

5.3.6 The Pulse Acquisition module (PAM) is required to convert the pulse output of the meters to a digital output for the data logger to pick up. Each PAM can have a maximum of 12 meters connected to it. Each PAM has its own slave MAC address. The RS485 terminal in the SIP + EMT-IF data logger can receive a maximum of 32 slave MAC addresses. If it is necessary to connect more than 32 PAMs then an additional device called a SIP Serial Slice can be connected to the SIP + EMT-IF data logger to increase the number of slave MAC address that can be picked up. The SIP Serial Slice is supplied by Synapsys Solutions Ltd, Tel: 01444 246 128, Email: enquries@synapsys-solutions.com. (See the SIP Serial Slice data sheet in Appendix D)

5.3.7 The contractor shall be responsible for the physical wiring of the data logger and the physical wiring of the meters to the PAM's and PAM's to the data logger. (See below diagram of standard data logger and PAM set up.)



5.3.8 Synapsys Solutions Ltd, Tel: 01444 246 128, shall be commissioned to carry out the programming and connection of the SIP + EMT-IF data logger to the University's Automatic Metering System (AMS). To enable the data logger to be programmed the contractor is responsible for providing

the Synapsys engineer with all the meter information (meter ID and load) and the PAM it the meters are connected to.

5.3.9 To enable the data logger's to be programmed into the AMS a data logger schedule (see Appendix A) sheet must be filled in completely with information about the physical data logger's and the meters connected to that logger. The completed sheet must then be supplied to the Energy Management Team via metering@soton.ac.uk. With regards to new buildings this must be done before the building is handed over to the University.

5.3.10 A schedule that, for each meter that is being supplied, is entirely consistent with details shown on Asset Tags on site (refer to briefing document ES/022 latest revision for details of Asset Tag Labelling), on site record drawings, O&Ms and elsewhere and shows:

5.3.10.1 Planon Reference Number as shown on the Asset Tag (code) affixed to the meter.

5.3.10.2 A unique reference number for the meter concerned in the format shown in 6.1.1 below.

5.3.10.3 Data logger Reference number and channel it has been assigned to.

5.3.10.4 Detailed description of the meter load i.e. the equipment, DB number (for electricity meters), mechanical plant and what the plant does (for example AHU 1 Lecture theatre 1) and/or area that is supplied from the service being metered.

5.3.10.5 CT Ratio (electricity meters only)

5.3.10.6 Pulse rate (where applicable)

6. METER IDENTIFICATION

6.1 Meter ID System

6.1.1 Identification in AMS

Each meter (whether electricity, heat, gas or water) that is to be connected to the AMS shall be identified within the AMS using a unique reference number in the format given below:

S Bxx-yy Description (Pulse rate) Where:

S denotes	Service type (E for electricity, H for heat or cooling, G for gas, W for water)
xx denotes	Planon building number
yy denotes	A unique sequential number (with 01 normally being the primary supply to the building concerned)
Description denotes	A very brief description of the area or item being metered (the load)
Pulse rate denotes	The number of pulses per unit being measured

6.1.2 Examples of Meter IDs:

EB0001-04 Level 1 lights and Power (1 pulse/1 kWh)

WB02-01 Main Supply (1 pulse/10l)

6.1.3 Existing Buildings and Avoidance of Duplication

Where working in an existing building the project design team shall liaise, via the Liaison Engineers, with the Energy Manager to ascertain the existing meter numbers in order to avoid duplication.

6.1.4 Where a fiscal meter is being connected to the University's Automatic Metering System (AMS) the meter ID should include F which denotes the meter being fiscal/ For example:

GB0030-01 (F) Chemistry Main Supply (1 pulse/1m3)

6.2 Meter ID Schedules

6.2.1 The AMS and Planon identification details shall be recorded using the standard spreadsheet as attached (appendix A).

7 ON SITE IDENTIFICATION AND LABELLING

On site identification and labelling of the entire metering system is key to its robust and accurate use and the following guidance ensures that this will be achieved. Labelling shall be in accordance with the Planon System as defined in clause 7.1 below as well as the subsequent clauses that are specific to the metering system.

7.1 Meter ID in Planon

Each meter, SIP + EMT-IF data logger, Pulse Acquisition module (PAM) and SIP Serial Slice shall be identified in Planon as specified in Briefing Document ES/22 Asset Labelling.

7.2 Label Materials

7.2.1 Planon Asset labels shall be free and issued in accordance with the Briefing Document ES/22 Asset Labelling. The following additional labels shall be self-adhesive Dymo 45013 12mm high black font on white background 28 point font and shall be well affixed to cleaned and prepared surfaces.

7.3 Electricity Meters

7.3.1 Labels shall be affixed adjacent to the CT Coils on each metered circuit stating the Meter Identification as specified in clause 6.1.1 above.

7.3.2 Labels shall be fixed on the panel immediately adjacent to the meter face stating:

7.3.2.1 Meter Identification as specified in clause 6.1.1 above.

7.3.2.2 CT ratio of the associated CT Coils.

7.3.2.3 SIP + EMT-IF number and channel number that the meter is connected to.

7.3.2.4 The pulse ratio of the meter concerned (kWh/pulse)

7.4 Heat Meters

7.4.1 Labels shall be affixed in a clearly visible position to the flow section of the heat meter stating the Meter Identification as specified in clause 6.1.1 above and the pulse ratio of the flow section (pulses/litre).

7.4.2 Labels shall be affixed to each temperature sensor (flow and return) stating the Meter Identification as specified in clause 6.1.1 above.

7.4.3 Labels shall be affixed to each heat meter (integrator) or in an immediately visible location adjacent to each meter stating:

7.4.3.1 Meter Identification as specified in clause 6.1.1 above.

7.4.3.2 SIP + EMT-IF number and channel number that the meter is connected

7.4.3.3 The pulse ratio of the meter concerned (kWh/pulse)

7.5 Gas Meters

7.5.1 Labels shall be affixed to each gas meter or in an immediately visible location adjacent to each meter stating:

7.5.1.1 Meter Identification as specified in clause 6.1.1 above.

7.5.1.2 SIP + EMT-IF number and channel number that the meter is connected

7.5.1.3 The pulse ratio of the meter concerned (m3/pulse)

7.5.1.4 'Corrector fitted' or 'No corrector fitted' as the case may be.

7.6 Water Meters

7.6.1 Labels shall be affixed to each water meter or in an immediately visible location adjacent to each meter stating:

7.6.2 Meter Identification as specified in clause 6.1.1 above.

7.6.3 SIP + EMT-IF number and channel number that the meter is connected

7.6.4 The pulse ratio of the meter concerned (litres/pulse)

7.7 Data Loggers

7.7.1 Data Loggers shall be named according to the building they are located in. The data loggers

are referred to as RTU's in the university's AMS and so should be named as such. For example, RTU 0100-01, which refers to datalogger 1 in building 0100. If there are more than one data loggers in a building they should be labelled, RTU 0100-01, RTU 0100-02 and so on.

7.7.2 Labels shall be affixed to each data logger or in an immediately visible location adjacent to each data logger.

APPENDIX A: DATA LOGGER SCHEDULES

ENERGY METERING SYSTEM - [INSERT DATALOGGER NAME (RTU xxxxxx]

RTU Details	ip Address		RTU Type		
	Sub Mask		Database ID		
	Gateway		Date Installed		
	Mac Address		Location		
	Serial No.		Room		

ELECTRICAL METERS

								Meter Details									
Meter No.	**Energy**	**Meter Location**	**Load Description**	**Meter Subbed to;**	**Channel**	**PAM**	**Manufacturer**	**Model No.**	**Pulse Set**				**Serial No.**	**Date Installed.**	**CT Ratio :5**	**Asset tag No**	**Notes**
									E= KWhr	**G= KWhr**	**H= KWhr**	**W= ltr**					

APPENDIX B: SIP + EMT-IF DATA SHEET

SYNAPSYS
BUILDING INTELLIGENCE

SIP+ EMT/EMT-IF Energy Monitoring Range

INTRODUCTION

The SIP+ is one of a range of innovative products available for various applications. This has been developed to help reduce engineering time and cost, and to meet the demand for more information from between differing protocols and better energy monitoring.

This product exposes values from available protocol drivers for BeMS monitoring and control purposes.

APPLICATION

This product is a new hardware version of our SIPe/p product range. It has been designed to easily define input points from multiple protocols mapped directly to the internal EM&T (Energy Monitoring and Targeting), but also make them available as output points to an output protocol for BeMS (Building energy Management System) compatibility.

Note **Further protocols may be added according to the commercial and development viability.**

Features

Webserver (Commissioning pages)

CANBus (Increase hardware)

Max 2000 points

Suitable for small or large applications

Compatible EM&T functionality

Stand alone or BMS compatible version

Data logging

Hardware

Max. 16 SIP Slices per Master Controller

- SIP M-BUS Slice
  Max. meters according to Unit Loads (1 Unit Load = 1.5mA) dependant on M-Bus Converter (max. 250 unit loads)
  Max. 20 points per M-Bus meter
- SIP ModBus RS485/RS232 Slice
  Max. 32 meters according to ModBus RTU protocol

Protocol

M-Bus Serial and TCP/IP

1 (one) driver per hardware connection

ModBus RS485, RS232 Serial and TCP/IP

1 (one) driver per Serial connection

Trend Ethernet

Supports Trend Controller Ethernet connection

Trend Serial

Supports Trend Controller Supervisor port

VIQ

Supports single UDP Group, Trend LAN, but max. 100 vIQ OSs

DESIGN AND FUNCTION

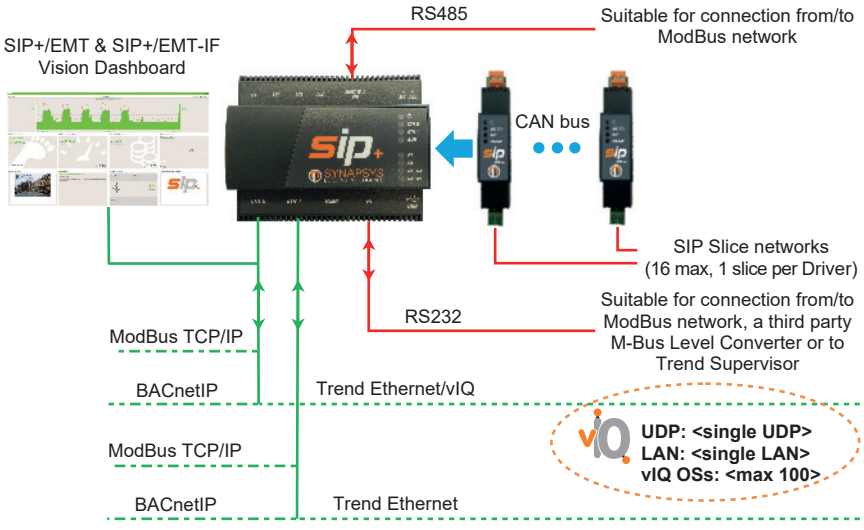
The product exploits the data capability of equipment communicating via any supported input protocol, by retrieving and transferring selected types of data, e.g. Energy, Temperatures or On/Off control to the internal EM&T and/or to any supported output protocol.

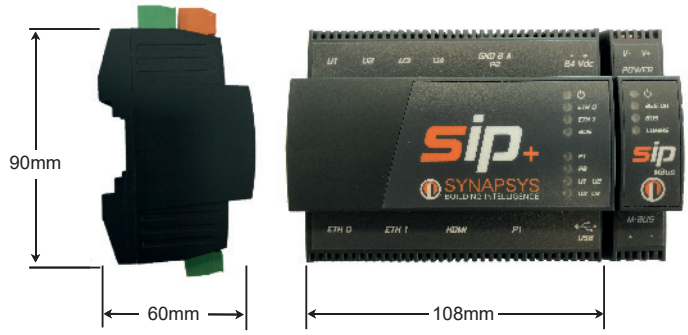
When requesting values from any input protocol it will operate according to that protocol requirements, e.g. M-Bus or ModBus Master when requesting values from this network, or a client when requesting values from Trend network (Future development).

The internal EM&T (SIP+/EMT(EMT-IF)) performs as per our existing energy monitoring product allowing building managers to prevent outages, understand where to optimise the energy distribution and maintain the control before any serious problem occurs.

When linking a value to an output protocol this product will operate according to that protocol requirements, e.g. Trend Comms directly to a Trend Controller, vIQ or BACnetIP Server (Future development).

SYSTEM OVERVIEW





SPECIFICATION

Dimensions

108W x 90H (110 with connectors) x 60Dmm
160g

Default Setup Parameters

IP address: 192.168.1.128 (255.255.255.0)

Power Input

Input Voltage Range: 24VDC
Power Consumption: 0.3A @ 24VDC

Hardware connections

Rail Connector:	1 connection (max 8A) for up to 16 additional Slices, powered directly through the DIN Rail Connector
Power Connector:	2 pin Terminal
RS232 Connector:	RJ45 Connector (Cable available)
RS485 Connector:	3 pin Terminal, Half duplex
Input Connector:	4 x Digital Inputs (>100k impedance), typ. Relay contact <1m cable length
Eth0 & Eth1:	2 x RJ45 connector supports 10BASE-T/100BASE-TX with auto-negotiation and auto-crossover
HDMI/USB:	For future use
LEDs:	Power, Eth0, Eth1, Bus, P1 (RS232), P2 (RS485), U1 & U2, and U3 & U4

Environmental

Operating Temperature: 0 - 55°C
Storage Temperature: -25°C - 85°C

INSTALLATION

DIN rail mounting (TS35).

Connect up to 16 SIP Slices using a CAN bus connector supplied with each slice.

Caution **An appropriate PSU is required according to the number of SIP Slices installed on the DIN Rail.**

Note **Contact the relevant device manufacturer for specific protocol cable recommendations.**

CONFIGURATION

Specifically designed HTML web pages from internal web server used to configure this unit.

PRODUCT CODES

PART NO.	DESCRIPTION
SIP+/EMT	
SIP+/EMT/25P SIP+/EMT/50P SIP+/EMT/100P SIP+/EMT/250P	Up to 25, 50, 100, or 250 input points from multiple protocols (inc. Trend) mapped directly to the internal EM&T (Energy Monitoring and Targeting).
SIP+/EMT-IF	
SIP+/EMT-IF/100P SIP+/EMT-IF/250P SIP+/EMT-IF/500P SIP+/EMT-IF/1000P SIP+/EMT-IF/1500P SIP+/EMT-IF/2000P	Up to 100, 250, 500, 1000, 1500, or 2000 input points from multiple protocols (inc. Trend) mapped directly to the internal EM&T (Energy Monitoring and Targeting), but also available to BeMS (Building energy Management System).
SIP+/Vision	
SIP+/Vision/FW	Firmware upgrade to add EM&T (Energy Monitoring and Targeting) Dashboard functionality to existing SIP+/EMT or SIP+/EMT-IF
SIP+/Vision/HW	Dedicated hardware for EM&T (Energy Monitoring and Targeting) Dashboard
Accessories	
PSU/24VDC/nA	24V nA DC Power Supply
SYN/CONV/…	M-Bus specific slice with SIP+ pack (below)
SYN/CON/SIP+	DIN rail connector for communications and power via the CAN bus from a SIP+ device
SYN/SER	ModBus Serial specific slice with SIP+ pack, inc. DIN Rail, RS485 3-pin terminal and RS232 cable
SYN/ESW5(8)	Ethernet switch with 5 (or 8) x 10/100BaseT(X) ports

REGULATIONS

With a comprehensive range of EM&T and interface products for BACnet, M-Bus, ModBus, SNMP and Trend protocols we can help you easily link meter, sub-meters and building plant to BeMS systems with energy management and monitoring functionality, and virtual metering.

Download brochures and datasheets from our website. Alternatively, contact us for more information or to request a quote.

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Issue 3, Apr. 2018

APPENDIX C: PULSE ACQUISITION MODULE (PAM) DATA SHEET

12 Digital Input Pulse Acquisition Module

INTRODUCTION

The 12 Input Pulse Acquisition Module is one of a range of products designed for the collection and processing of pulse related measurements. It is used to help reduce engineering time and cost, and to meet the demand for more information and better energy control.

These products, used in conjunction with our products connected to the Trend BeMS, can help ensure a building complies with latest Part L2 Building regulations.

APPLICATION

This smart transmitter product includes a Modbus RTU communication connection that provides a simple way for integrating digital signals to BeMS via our SIP range of products.

Features

Compatible with SIP ModBus/vIQ, SIPe IF-Logger and SIPe M-Logger products

12 Digital Input Connections

3 Programmable Input Configurations

9 Integer Digit LCD

Rx/Tx Communication Indicators

Isolated Digital Inputs

Auxiliary Supply

ModBus

Includes

- 3-wire isolated EIA-485 connection
- Supports JBus and ModBus
- Data bits: 8, Stop bits: 1, Parity: none-odd-even, Baud rate: 9600 or 19200, Max response time: ≤200ms

32 slaves per network (255 with repeaters)

1 to 255 slave address range

1200m max. to compatible hardware, depending on Baud rate and installation

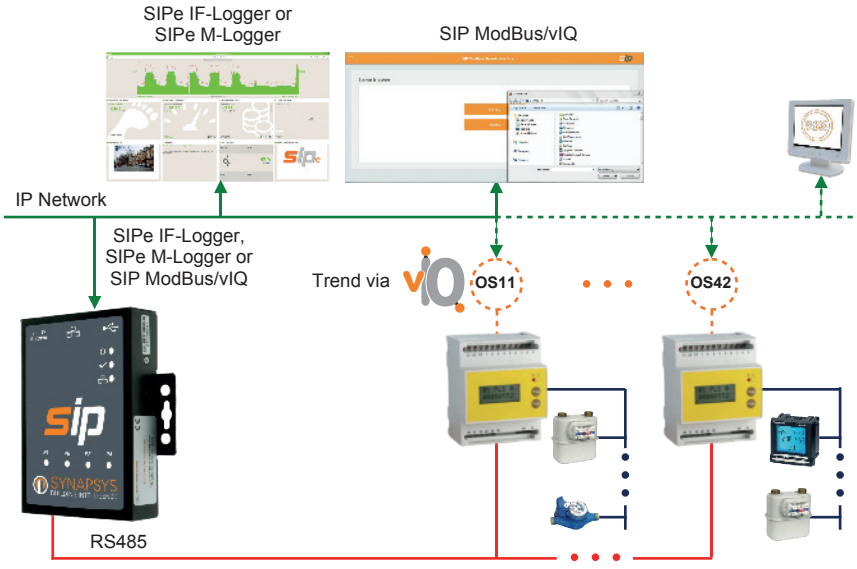
DESIGN AND FUNCTION

This product monitors 12 pulsed signals and transmits the data via RS485 two wire serial communication, and operates as ModBus slave in the Modbus RTU protocol. The serial interface is galvanically insulated from the input connections and the module supply.

The 12 connections support Pulse Inputs from energy, gas, water, heat meters etc. It supports 3 (three) Input Configuration modes (i.e. Passive, Active and SØ) that transfers count registers and configuration parameters. It is supplied as 12 Passive Inputs and typically, the Active and SØ configuration modes are not used.

Note **The unit and pulse weight is programmable for each input in each mode.**

SYSTEM OVERVIEW



SYNAPSYS
BUILDING INTELLIGENCE

Pulse Acquisition Module - 12 Digital Input

Technical Datasheet

SPECIFICATION

Dimensions

70W x 89.5H x 65.6D mm (280g)

Power Input - Auxiliary Supply

Rated value: 230V, Tolerance: 0.85 - 1.1Uaux,
Working Freq: 47 - 63Hz (Rated 50Hz), Rated Burden ≤5VA

Environmental

Storage temp: -25 to 70°C (-13 to 158°F), ≤75% RH
Operating temp: -5 to 55°C (23 to 131°F), ≤75% RH
Max power dissipation: ≤3W (Switchboard thermal calculation)

Connections

ModBus

1 x 3-wire ModBus RTU RS485

Input Pulse Waveform

Passive	**Default** - 12 potential free SPST-NO contact. 12 inputs with common points
Active	**N/A** - 6 potential free SPST-NO contact and 6 max 27V. 6 inputs with common points and 6 with common points (-)
SØ	**N/A** - 1 GME ENEL energy meter and 6 potential free SPST-NO contact. 6 inputs with common points.

Count

Passive	12 independent counters with programmable Max. Indication and Resolution parameters
Active	**N/A** - 12 independent counters with programmable Max. Indication and Resolution parameters
SØ	**N/A** - 16 Count registers and 6 independent counters

Insulation

AC voltage test: 2.5kV & 4kV r.m.s. 50Hz/1min

INSTALLATION

DIN rail mounting (TS35) using spring mechanism attached.

- ModBus RS485: ModBus protocol rules apply.
- Pulse Input: 15m cable length to last input device.

Note **Contact third party manufacturer for cable recommendations.**

TERMINAL	DESCRIPTION
Passive Configuration Connections	
1 to 12	Passive Inputs
21 & 20	230V Auxiliary Supply
N/A - Active Configuration Connections	
1 to 6	Passive Inputs
7 to 12	Active Inputs
N/A - SØ Configuration Connections	
1 to 6	Passive Inputs
7, 8, 9 & 10	Wh (+), varh (+), Wh (-) & varh (-) - GME ENEL ONLY
11 & 12	Tarif Sel 1 & Tarif Sel 0 - GME ENEL ONLY
Generic Connections	
33, 34 & 35	Rx (+), Tx (-) & GND
C1 to C3	Common

Warning **Incorrectly connecting the positive conductor will cause damage to this unit.**

CONFIGURATION

Full configuration, inc. via the 2 front keys, **Prog** & **Page**.

Note **The first register of each Input MUST ALWAYS be requested.**

PRODUCT CODES

PART NO.	DESCRIPTION
SYN/CONV/12C	12 Digital Inputs to RS485

REGULATIONS

CE Class A, FCC Class A, WEEE and RoHS.

The following Council Directives on the Approximation of the Laws for the Member States relating to Electromagnetic Compatibility (89/336/EEC) are applied.

- EN61010-1
- EN61326-1

With a comprehensive range of interface products for BACnet, ModBus, M-Bus and SNMP protocols we can help you easily link meter, sub-meters and plant to BeMS systems with energy management and monitoring functionality, and virtual metering.

Download brochures and datasheets from our website. Alternatively, contact us for more information or to request a quote.

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APPENDIX D: SIP SERIAL SLICE DATA SHEET

SYNAPSYS
BUILDING INTELLIGENCE

sip Serial slice

Overview

The Synapsys SIP Serial Slice has been developed to extend the number of RS232 and RS485 ports available to the SIP+ device for use with multiple ModBus network applications or additional devices which communicate on RS485 or RS232.

Designed for receiving and transmitting data utilising the ModBus protocol. SIP Serial Slices have a small footprint supporting communications via RS232 or RS485. The SIP Serial Slice is also resistant to sustained short circuit and available for a wide power supply range.

RS232 permitting a connection to a single device, RS485 permitting a connection to a network of up to 32 devices.

SIP Serial slice features

- LED's for power, Bus activity, Health and Comms
- 1 x RS232 connection
- 1 x RS485 connection
- Simple innovative DIN rail mounting system

Enhance your SIP+ device

- Multiple ModBus network solution
- Connect additional devices over RS485 or RS232
- Simple to use and install
- Small footprint
- Backed up by Synapsys technical support

Product codes

Part No.	Description
SYN+/SER/CONV	SIP serial slice for extending the number of RS232 and RS485 ports available to the SIP+ device for use with multiple ModBus network applications.

For more information about Synapsys and our product range please visit www.synapsys-solutions.com.

Alternatively to speak with one of our team in more detail or to arrange a demonstration of our products and solutions, please contact us on 01444 246 128 and we will be happy to discuss your requirements.

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