AmsCPU-NB/M

Description

The AmsCPU-NB/M module is the central processing unit in the Amplex Module System. Equipped with a powerful ARM9 processor and a Linux kernel, the module monitors and controls all other modules in the Amplex Module System. Direct communication and power supply between the modules are handled by means of an A-Bus interface, which is based on the industrially proven RS-485 technology.

The AmsCPU-NB/M module serves as a WAN communications and data concentrator module. Two-way communication with the central server takes place via NB-IoT (NB2) or LTE-M (M1) with a 2G fallback. The module has the ability to automatically switch between different available communication carriers in order to provide stable and reliable communication. New carrier types like, e.g. WIFI and LoRaWAN can be implemented later (using the USB or the Ethernet port on the module) to obtain the best, most reliable and cheapest communication in the future.

Data are either delivered to the server immediately or stored locally in the built-in flash memory of the AmsCPU-NB/M module until scheduled delivery. Software and configurations are updated remotely from the server and stored on the AmsCPU-NB/M module enabling it to autonomously execute tasks.

Voltage values on all three phases of the main supply are monitored by the AmsCPU-NB/M module. If the module is installed together with an AmsBattery module, the AmsCPU-NB/M will be supplied with backup power via the A-Bus in the event of power failure. This enables the AmsCPU-NB/M module to store data and send a main power failure alarm to the central server before it shuts down safely.

Functionality

Topic	Comments
Monitoring	Battery shutdown Battery low Communication class availability Over/under voltage (every phase) Main power failure Phase fault (every phase) Extra phase, for example cabinet door
Communications	The Amplex Communication Framework (AmpCom) enables two-way multi-carrier communication. AmpCom uses communication classes to define the priority of the data. One or more carriers are assigned to each class. If one carrier is not available, another carrier is used instead. Supported carriers: NB-IoT, LTE-M with a 2G fallback, Ethernet
Autodiscovery	All modules and meters connected to the AmsCPU-NB/M module are automatically discovered by the system. In case a module/meter is disconnected from the AmsCPU-NB/M, this is reported to the server application and the module/meter is listed as missing. If the module/meter is reconnected to the AmsCPU-NB/M or another AmsCPU-NB/M, it will be rediscovered by the system.
Real-time clock	The AmsCPU-NB/M module has a calendar and a real-time clock with an absolute maximum deviation of ± 7 seconds per 24 hours in the full temperature range. This is without synchronization with external units. Under normal conditions, clock deviation is automatically adjusted according to the Network Time Protocol (NTP) which gives a maximum deviation of ± 1 second.

Technical Specifications

Operational specifications

Storage temp.	-40°C to +85°C
Operating temp.	-20°C to +65°C
Max humidity	90% (non-condensing)
IP grade	IP20
Input voltage	190 to 250 V AC (3P + N)
Power consumption	Typical < 2 W
Current consumption (A-Bus powered)	Typical 100 mA Max 300 mA

Standards and approvals

2006/95/EC, Low Voltage Directive (LVD)

2004/108/EC, EMC Directive

1999/5/EC, R&TTE Directive

2002/95/EC, RoHS Directive

RoHS   CE 0682

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Functionality

Topic	Comments
Local storage of data	The collected data are stored in non-volatile memory which holds the values until they are sent to the server. The AmsCPU-NB/M module has the capacity to store data for at least 150,000 historical measurements, depending on the data size of the values.
PAK System	A software management system designed to maintain the software on AmsCPU-NB/M modules remotely. Enables installation, removal, and upgrade of software through a web user interface on one or more selected AmsCPU-NB/M modules. It also allows on-site upgrades with an authenticated USB memory stick.
Sub system software	Sub system software, e.g. GridLight™ logic etc. can be downloaded from the Data Centre application for installation and upgrade.
Battery	Internal backup battery for clock and tampering monitoring
Configuration data	From the server application, AmsCPU-NB/M configuration data can be changed, as required. The configuration data include: Communication classes Surveillance of communication classes GreenWise™/MeterMind™ features (an advanced metering infrastructure (AMI) system) GridLight™/AmpLight™ features (a low-voltage power network monitoring and control system)
LEDs	CPU LED (red): indicates whether the AmsCPU-NB/M module is up and running. Communication status LED (green): indicates whether a GSM or an Ethernet connection has been established with the server. AMS Status LED (green): indicates whether the A-Bus is up and running.

Connections

I/0	Comments
RS232 interface	Max data transfer rate 115.2 kbps
Service port	For use with Amplex service tools
A-Bus	12 V DC supply to client modules, 10 W (max) In case of power failure, the A-Bus also serves as backup power supply for the AmsCPU-NB/M module.
Phase voltage	Phase voltage measure (± 2% FSD in 190-250 V range, ± 5% FSD outside this range) on three-phase supply and one extra phase (230 V AC analog input). This phase may be used for, e.g. cabinet door monitoring.
Power supply	The AmsCPU-NB/M module can be powered by one, two or three phases + neutral. Nominal voltage: 230 V AC, Nominal frequency: 50/60 Hz. When powered by three phases, the AmsCPU-NB/M module will be able to detect phase faults on the main power supply. If a fault occurs on one or two phases, the AmsCPU-NB/M module will still be powered by the remaining phase(s). In this case, the AmsCPU-NB/M module will send an alarm to the central server.
USB	USB 2.0 (12 MB/s) for additional devices, host port, max 250 mA, 5 V
Analog inputs	Analog input 0-10 V, 4-20 mA (0-20 mA): Impedance = 510 Ohms (DC) Accuracy = ± 2% FSD Can also be used as digital input: Threshold of approximately 1 V Max input voltage = 12 V (A-Bus voltage can be used.)
Digital input/ Tamper detection	One digital input with 1 MOhm internal pull-up. Off resistance less than 100 kOhms. It is intended for use with a relay contact or an NPN open collector device on input connections 6 and 5. In addition to digital input, it can for example be used for tampering detection using the internal backup battery.
Ethernet	RJ45 connector, 100 Mbps/10 Mbps, half & full duplex
Cellular	SMA connector for external GSM antenna. B2/B3/B5/B8/B1/B2/B3/B4/B5/B8/B12/B13/B18/B19/B20/B25/B26/B27/B28/B66/B71/B85
SIM Card	SIM card is inserted behind top part of the cabinet.
Power consumption	If the AmsCPU-NB/M module is connected to the maximum number of client modules possible, the setup consumes max 18 W. In an average installation consisting of the AmsCPU-NB/M module and three AMS modules, the AmsCPU-NB/M module typically consumes less than 2 W.

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Data Sheet

Technical Specifications

Processor	Details
Family	ARM9
Performance	200 MIPS

Operating System	Details
OS	Linux® operating system

GSM cellular	Details
Bands	NB-IoT/LTE-M1 bands: B1 (2100), B2 (1900), B3 (1800), B4 (AWS 1700), B5 (850), B8 (900), B12 (700), B13 (700), B18 (800), B19 (800), B20 (800), B26 (850), B27, B28 (700), B66, B71, B85 – 2G bands: B2 (1900) B3 (1800) B5 (850) B8 (900)
Technology	LTE UE Cat M1/NB2 – EGPRS (2G Fallback)
Max DL speed	LTE-M1 588 kbps – NB2 120 kbps – EGPRS 264 kbps
Max UL speed	LTE-M1 1 Mbps – NB2 160 kbps – EGPRS 210 kbps
MIMO support	Yes
SIM interface	Supported SIM card: 3 V

Reliability & Maintainability

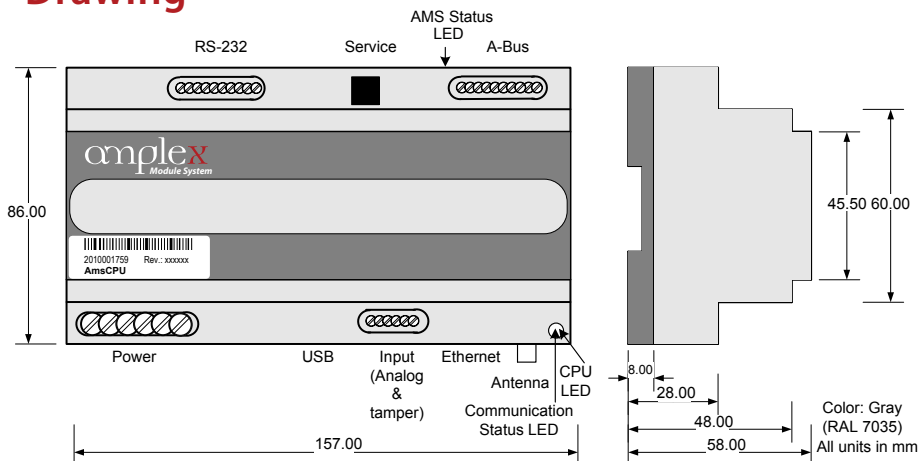| Topic	Comments
Software upgrade	The software on the AmsCPU-NB/M module can be updated remotely from the central server.
Multi-layer system health	Various internal processes ensure that the system is up and running at all times. In case a process is stalled, it is restarted without disturbing other processes.
Installation of new software	New software is transferred without interrupting the normal functionality of the AmsCPU-NB/M module. When the software has been transferred, the integrity of the software is checked and the software is installed.
Self-test	A built-in self-test (BIST) is performed after power-up.

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Installation Guide

The AmsCPU-NB/M module can be connected to any client module in the Amplex Module System, e.g. AmsRS485, AmsSwitch. The A-Bus connections are internally daisy-chained for easy installation.

Topic	Comments
A-Bus cable	Use shielded twisted pair cable.
A-Bus cable length	< 3 m
Input cable length	< 3 m
USB cable length	< 3 m
RS-232 cable length	< 3 m
Ethernet cable length	< 3 m
0.5 mm² terminals	Use a 2 mm slotted screwdriver to loosen/tighten the terminal screws.
Functional earth	It is recommended that the A-Bus connection 1 or 6 is connected to functional earth. This is not for safety protection as the AmsCPU-NB1/M1 module is protection class II equipment.
Enclosure	The AmsCPU-NB/M module must be installed in an enclosure of protection degree IP65 or installed at a location that provides the module with the same level of protection.
Antenna	Insert the antenna in the antenna socket of the AmsCPU-NB/M module and tighten it gently with your fingers. Do not use tools.

Drawing

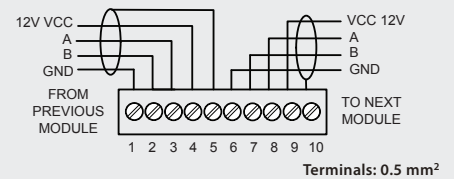## Physical Specifications

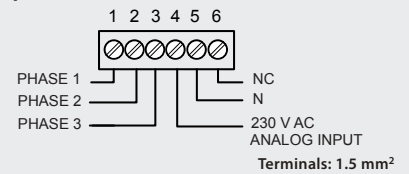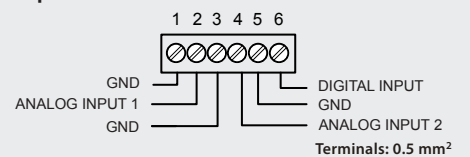|	
Weight	262 g
Top part	Gray (RAL 7035)
	Lexan 940
Base part	Black (RAL 7021)
	Noryl VO 1550
Coating	Conformal coated
A-Bus connector	0.14 - 0.5 mm² (AWG 26-20)
RS-232 connector	0.14 - 0.5 mm² (AWG 26-20)
Power connector	0.14 - 1.5 mm² (AWG 26-16)
Input connector	0.14 - 0.5 mm² (AWG 26-20)
Mounting	DIN-rail (EN50022)

I/O Schematic

A-Bus connection

Terminals: 0.5 mm²

RS-232 connection

Terminals: 0.5 mm²

Main power connection

Terminals: 1.5 mm²

Input connection

Terminals: 0.5 mm²

Ordering Information

Product	Order number	Product	Order number
AmsCPU-NB/M	100-10-005	Amplex SIM Mini	260-10-000
Wifi USB Module	250-50-000	Analog light sensor	250-40-000

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All specifications are subject to changes