SCALAMAX Protocol
Node NM-92

Technical Manual,
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Contents

Warning

This guide is for persons who have received training and are qualified to work with electricity and electrical metering equipment. All applicable national and local electrical codes and standards must be followed. Failure to follow proper procedures may result in serious bodily harm including death.

Disclaimer

The information in this guide has been compiled with care, but SCALAMAX, LLC makes no warranties as to the accuracy or completeness. Further, the product described herein may be changed or enhanced from time to time. This information does not constitute commitments or representations by SCALAMAX, LLC and is subject to change without notice.

Images shown are a representation only. They may not match exactly with the real equipment.

1. Overview

1.1 SCALAMAX Protocol Node

The SCALAMAX Protocol Node is a device that allows transmission and reception of data by the low voltage electrical network using OFDM multi-carrier modulation technology (orthogonal frequency division multiplexing). It communicates with a head end and other nodes.
It uses a bandwidth of 10 MHz (2 - 12 MHz) and its programming allows the management of multipoint MACs (Auto Access Point) with auto repeat capabilities, so that each node can extend the network. At the same time, it
self-regeneration of the same depending on the changes in the environment in the electrical network.
The nodes use an optimal path selection protocol. The technology finds the best route in terms of attenuation and number of repeaters to connect to the Header.
The equipment has an error correction system that provides the maximum robustness in any environment of the electrical network and the data encryption system (DES, 3DES and AES) guarantees a total security in the transmission of the information.
The nodes have a Plug and Play configuration, which facilitates their installation.

1.2 NM-92 Node

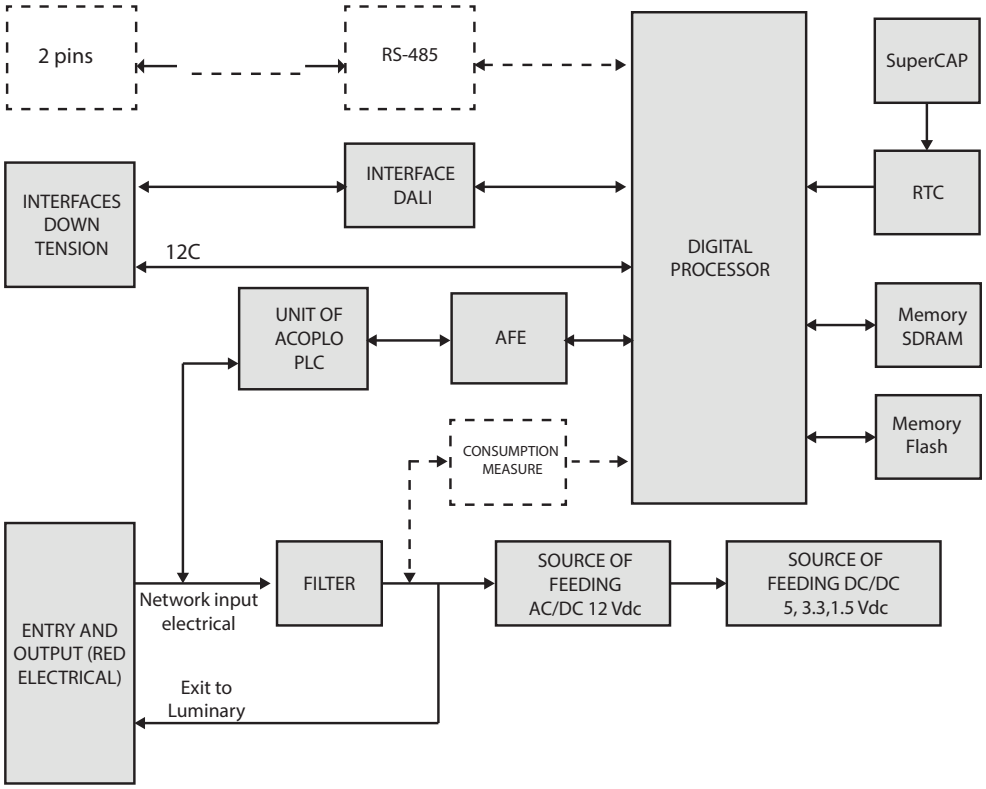
The Node NM-92 is a SCALAMAX Protocol Node that incorporates in an envelope of aluminum and NEMA format with base NEMA 7, with the following functionalities:

- DALI interface for control with the driver (power supply) of the luminaire.
- Certified electric power meter / meter.
- Real Time Clock, which ensures the maintenance of the date and time at startup after a disconnect status.

The DALI interface allows controlling the luminosity of the luminaires, through the driver of the same. The Node is installed from the NEMA 7 connector on the corresponding base of the luminaire.

1.3 Block Diagram

This is the block diagram of the NM-92 Node.



NOTE: Optional items are shown in dashed lines.

The power grid enters the node and a filter independent of the PLC signal injection feeds. Once filtered, it is taken to the output through a relay, which will serve to provide the electrical supply to the luminaire.
At the same time, an AC / DC power supply and DC / DC converters are available behind the filter to generate the electrical voltages required by the circuits.
The digital processor manages the communications and has SDRAM and Flash memories. The Real Time Clock (RTC) allows you to know the date and time at all times, even after a long disconnection of the node, by having a SuperCAP, which keeps it active.
The PLC communication passes through the AFE, block of amplifiers and filters of transmission and reception, to be injected in the electrical network by means of the Unit of Encounter, always to the other side of the filter, just in the entrance of the network.
The DALI communication is generated by a microcontroller of exclusive use.

1.4 NEMA 7 Connector

The equipment has the NEMA 7 connector, and uses the connections:

- Neutral	Neutral of the electrical network
- Line IN	Input phase of the mains
- Line OUT	Output of the phase to the driver
- DALI +	"+" connection of the DALI interface
- DALI -	Connection "-" of the DALI interface

2. Electrical Specifications

Input

Input Voltage Range (VAC):	100 ~ 277 VAC
Maximum current range:	15mA – 40mA
Input Frequency:	50 - 60 Hz
Power Factor:	> 0.80
Maximum power:	4W

The equipment incorporates PTC protection to limit the input current to the equipment at 60mA.

Output VAC[1]

Output Voltage Range (VAC):	100 ~ 277 VAC
Maximum Output Current:	4A

PLC Bandwidth

Start Frequency:	2 MHz
Final Frequency:	12 MHz
Bandwidth:	10 MHz

1. The maximum charge is defined by the maximum power and maximum current, the one it reach before.
2. International Electrotechnical Commission, 3 Rue de Varembé, PO Box 131, CH-1211 Geneva 20, Switzerland
3. National Electrical Manufacturers Association, 1300 North 17th Street, Rosslyn, VA 22209

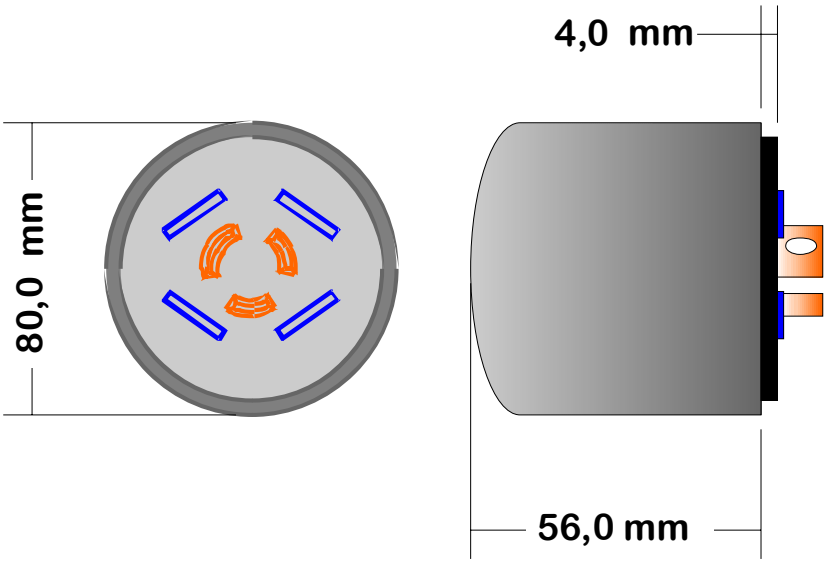
3. Environment

Usage for open type applications:
- IEC[1] 60529, IP-67.
- Nema[2], Type-1.

Environment working temperature:	-25 ºC ~ 50ºC.
Environment storage temperature:	-25 ºC ~ 85ºC
TC:	55 ºC

4. Dimensions and weight

- 77 mm (W) x 183 mm (L) x 33.5 mm (H).
- 410 g



The Node is housed in an extruded aluminum profile housing with two plastic caps bolted to the sides.
Four cable glands, at most, are located on the side where the connectors are located. They will be used to pass the input cables of the mains (1), output to the luminaire (2), low voltage control (3) and Ethernet (4) signals. This cover will unscrew to access the connectors.
On the aluminum is located the model of the node, the serial number, the MAC, the electrical characteristics and the distribution of the terminals of the connectors, to facilitate its installation.

1. 1 International Electrotechnical Commission, 3 Rue de Varembé, PO Box 131, CH-1211 Geneva 20, Switzerland
2. 2 National Electrical Manufacturers Association, 1300 North 17th Street, Rosslyn, VA 22209

5. Approvals

2006/95/CE	EN 60950-1:2007 + /CORR:2007 + /A11:2009 + /A1:2011 + /A12:2011 + /AC:2012 + /A2:2015 EN 60950-1:2006 + /A11:2009 + /AC:2011 + /A1:2010 + /A12:2011 + /A2:2013
2004/108/CE	EN 55022:2010 EN 55024:2010 EN 61000-3-2:2006 + A1:2009 EN 61000-3-3:2008 TGN 17 v2.0
	EN 60068-2-1:2007 EN 60068-2-2:2007

6. Installations, cautions and warnings

- Do not install if the device is damaged. Inspect the housing for obvious defects such as cracks in the housing.
- This device does not have replaceable or interchangeable elements, so it should not be manipulated.
- If the device is installed or used in a manner not specified by the accompanying documents, the safety of the device may be affected.
- If the device operates abnormally, proceed with caution. The security of the device may be affected.
- Do not install near combustible gas or combustible gas vapor.
- Do not install it in an electrical service with current or voltage outside the specified limit of the device.
- Check that all connections are reliable and correct before connecting the device.
- Do not install with electric voltage.
- Refer to the instructions for connection diagrams.
- Provide the installation or point of connection of the equipment to the electrical network with elements and devices to protect against surges and transients.