

# USER MANUAL FEATURES

## MODBUS / RS-485

### NANO

## FIRE DETECTION & EXTINGUISHING CONTROL PANEL



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## 1 DOCUMENT REVISION DETAILS

| Issue | Modification Detail                      | Author | Date           |
|-------|------------------------------------------|--------|----------------|
| 2.0   | 1 <sup>st</sup> publishing document      | CvT    | 15 / 03 / 2024 |
| 2.1   | Add Master Slave option                  | CvT    | 01 / 09 / 2024 |
| 2.2   | Text improvement                         | CvT    | 01 / 02 / 2025 |
| 2.3   | Add the remote/repeater function to NANO | CvT    | 01 / 03 / 2026 |

## 2 IMPORTANT NOTES – READ CAREFULLY

This manual shall be read and fully understood before installing and commissioning the system. This MODBUS Manual forms an integral part of the NANO Manual, Version 2.1 (August 2024). The NANO and all associated connections shall be installed, commissioned, and maintained only by qualified and competent personnel trained for this work. It is assumed that commissioning personnel are familiar with the purpose of the equipment and the associated technical terminology. The NANO system shall not be considered to be used correctly if it is operated without due regard to the information and instructions provided by the supplier. The equipment warranty is valid only if the complete installation is carried out and the system is commissioned in accordance with all applicable local and/or national regulations and standards.

### 3 INTRODUCTION

The NANO is designed for use in a fully integrated system. Remote devices can read the status and parameters of the NANO via a digital bus system. The communication protocol used is MODBUS, a well-established bus technology that utilizes RS-485 as the underlying physical layer. Through this Modbus interface, the NANO can be programmed for various applications, for example as a remote/repeater panel or within a master/slave configuration. The primary purpose of a master/slave configuration is to increase the number of extinguishing generators that can be activated. The slave performs this activation upon command from the master, which controls the system in this configuration. Please refer to the NANO User Manual before operating the device. This manual describes the use of the data bus, the programming procedure, and the connection method.

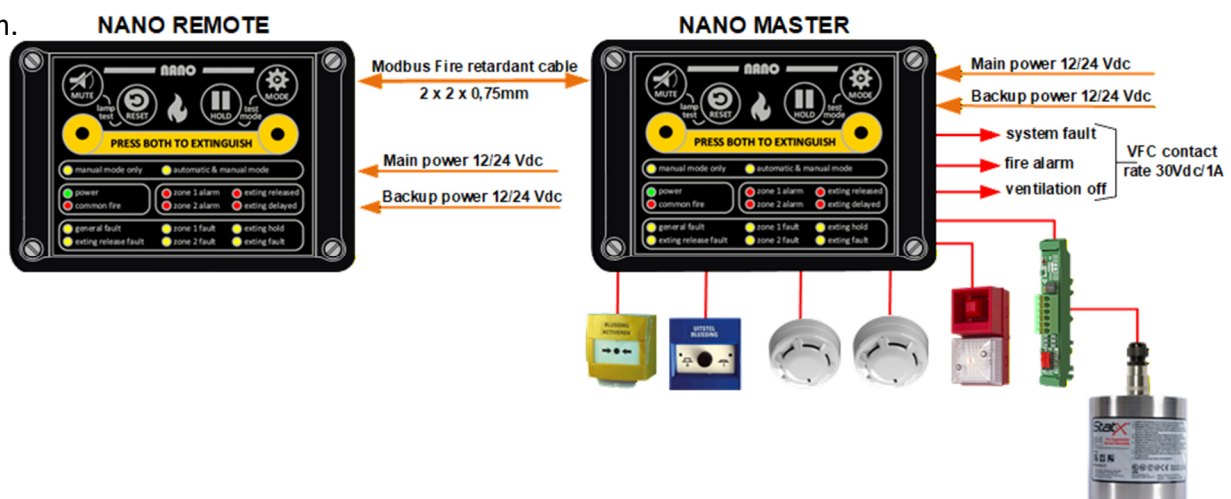
### 4 NANO OPTIONS

The NANO supports the following system configurations:

- Standalone fire detection and extinguishing control panel  
A standard NANO operates in Default Mode.
- Standalone system with a remote/repeater panel  
The remote/repeater panel operates in Remote Mode.
- Master–slave system for increasing the number of extinguishing generators  
The master panel operates in Master Mode and controls one or more slave panels.  
Each slave panel operates in Slave Mode.
- Master–slave system for remote operation and monitoring  
The master panel operates in Master Mode.  
Each slave panel operates in Slave Mode.
- Master–slave system with a remote/repeater panel  
The master panel operates in Master Mode.  
Each slave panel operates in Slave Mode.  
The remote/repeater panel operates in Remote Mode.

### 5 NANO INCLUDING REMOTE/REPEATER PANEL LAND BASED-APPLICATION

The NANO operating in Remote Mode is designed for connection to the MODBUS RS-485 interface of a NANO operating in Default Mode. As an active remote/repeater panel, it provides full control functionality together with clear and reliable status indication of the fire detection and extinguishing system.

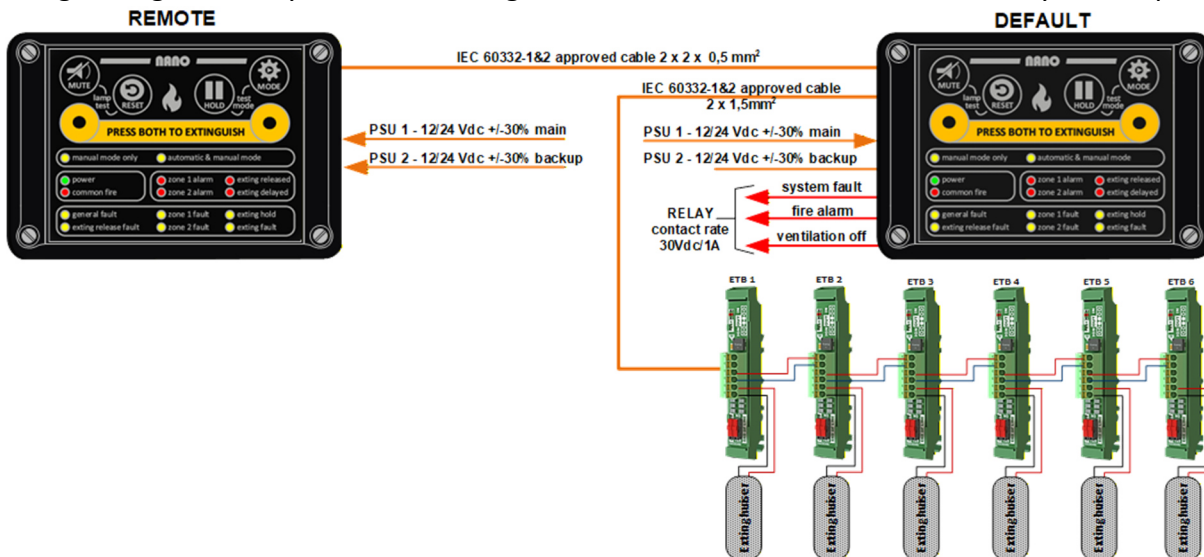


## 6 NANO MASTER/SLAVE SYSTEM

The purpose of the NANO Master-Slave configuration is to increase the number of extinguishing generators that can be controlled or to provide a remotely operated extinguishing release system. In this configuration, the NANO Master remotely controls a NANO Slave panel, to which the extinguishing generators are connected. Communication between the NANO Master and the NANO Slave is established via the MODBUS RS-485 communication interface. The NANO is designed for use as part of a fully integrated system. Remote devices can monitor the status of the NANO and access its parameters via the MODBUS communication bus. Local operation of the NANO Slave control panel is not permitted. Any fault or abnormal condition detected by the NANO Slave control panel is automatically reported to the NANO Master control panel.

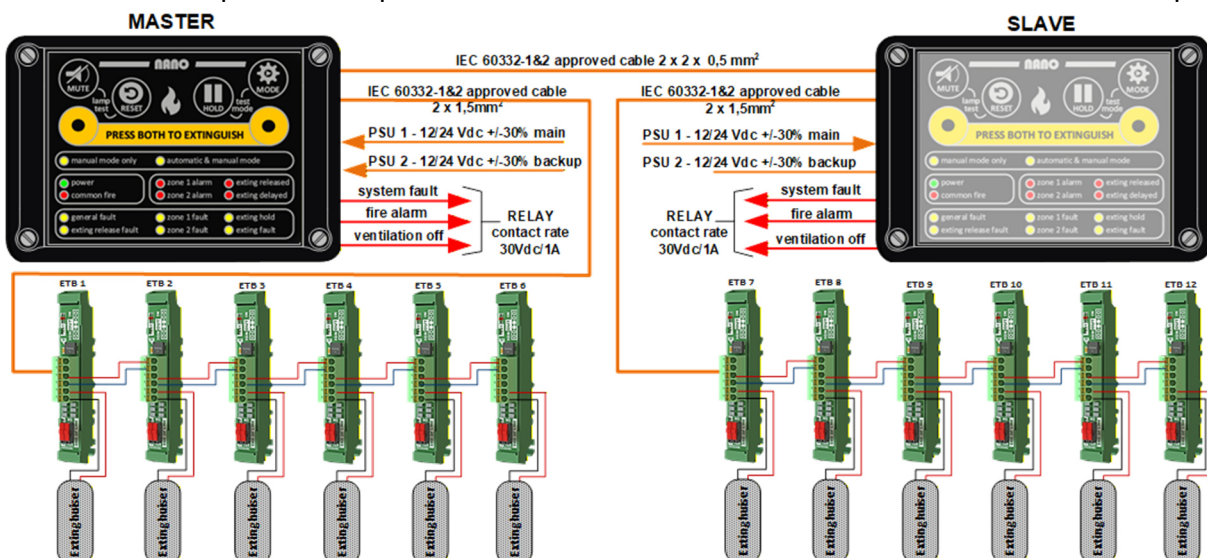
## 7 DIAGRAM MASTER / SLAVE CONFIGURATION A

A Master-Slave configuration, as shown in Figure A, is intended for use as a remotely controlled extinguishing release system. This configuration is not intended to increase the system capacity.



## 8 DIAGRAM MASTER / SLAVE CONFIGURATION B

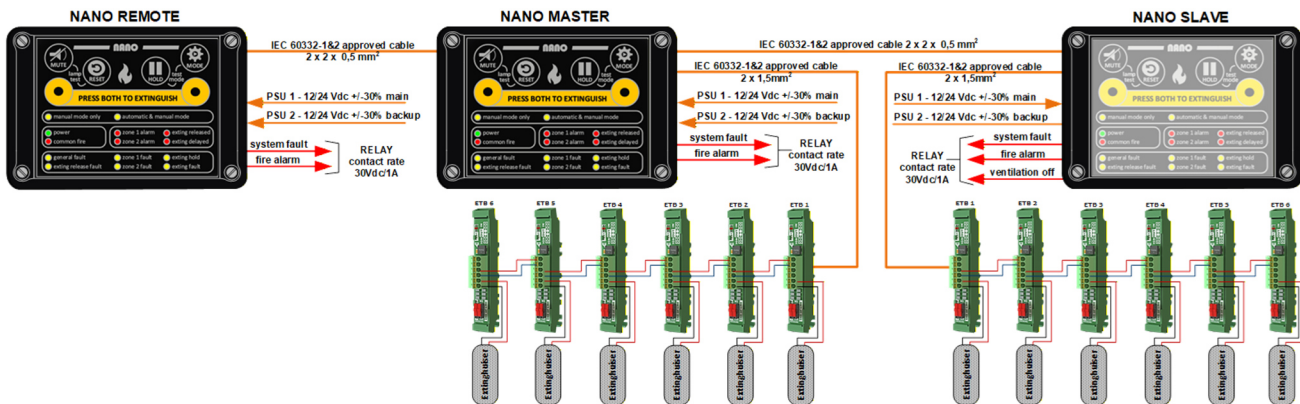
A Master-Slave configuration, as shown in Figure B, is intended to increase the number of extinguishing generators that can be controlled, as described in Chapter 6. All system control is performed by the Master. The Slave operates as a passive extension of the Master and is not intended for local operation.





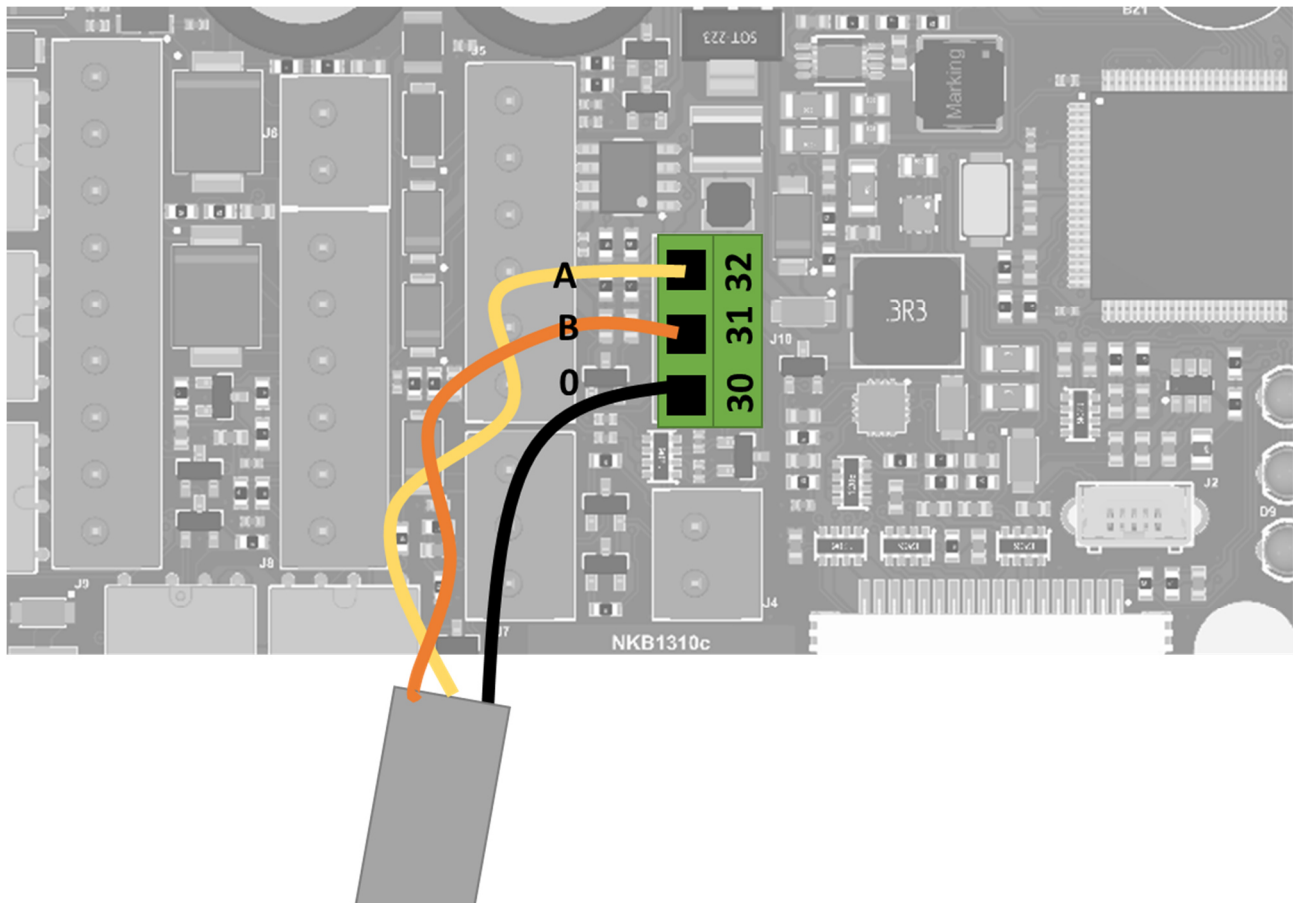
## 9 DIAGRAM MASTER / SLAVE / REMOTE CONFIGURATION C

A special application arises when a Master-Slave system is required to be monitored and controlled remotely. This can be achieved using the configuration shown below. In this configuration, it is essential that it is always clear which control panel has control of the fire suppression system to prevent conflicting operator actions.



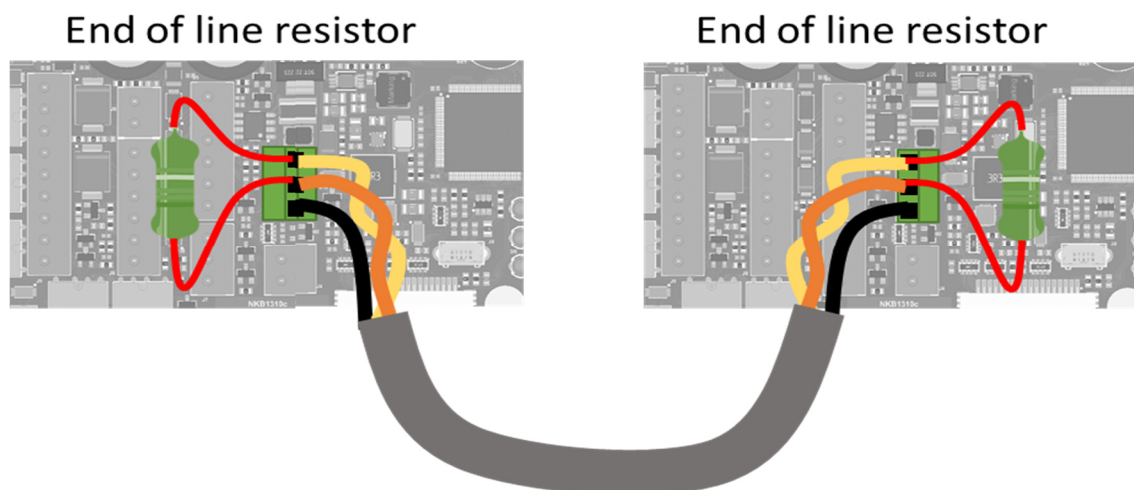
## 10 CONNECTING THE DATA BUS

RS-485 is a three-wire communication bus consisting of two differential data lines (A and B) and one signal ground conductor. The signal ground conductor shall always be connected and routed together with the two data conductors. Failure to connect the signal ground conductor may result in communication errors or damage to connected devices caused by electrical fast transients (EFT), surge events, or voltage differences between floating ground potentials. Ensure that the A and B data lines are connected correctly and are not reversed. Reversing the A and B connections will not damage the equipment, but communication will not function correctly.



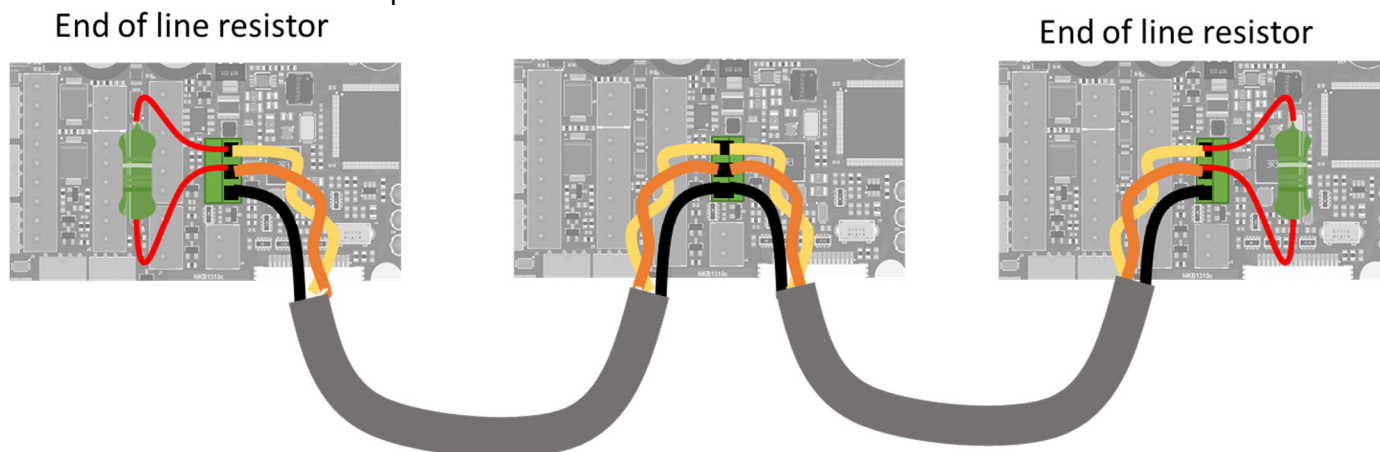
## 11 MODBUS WIRING

The use of twisted-pair cable is strongly recommended to minimize the risk of communication errors caused by electromagnetic interference (EMI). Where a four-conductor cable is used, all four conductors may be twisted together as a single bundle instead of being arranged as two separate twisted pairs. To ensure reliable communication, a termination resistor shall be installed at each end of the RS-485 communication bus. The resistance value shall match the characteristic impedance of the cable, as specified by the cable manufacturer. For most twisted-pair cables, the characteristic impedance is typically between 100  $\Omega$  and 120  $\Omega$ .



## 12 MASTER-SLAVE CONFIGURATION WITH A REMOTE SIGNALING AND CONTROL PANEL

In a Master-Slave configuration with an additional remote signaling and control panel, termination resistors shall be installed at both ends of the RS-485 communication bus. One termination resistor shall be connected at the MODBUS RS-485 interface of the remote panel, and the other at the MODBUS RS-485 interface of the Slave panel.



## 13 CONNECTION SETTINGS

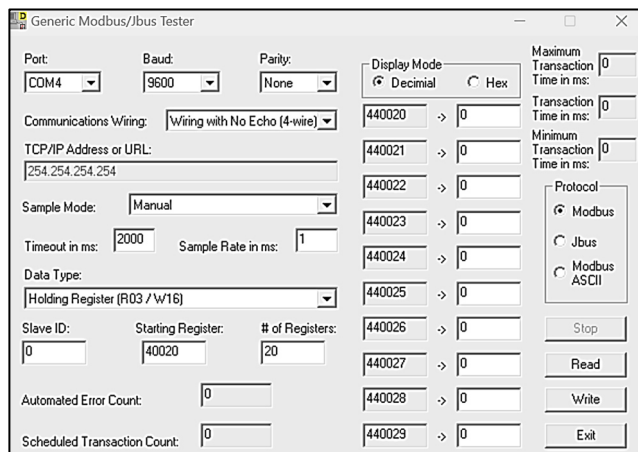
The MODBUS type is RTU and the settings of the communication are 8N1 baudrate 9600.

This means:

- Baudrate 9600 sps
- Startbit
- 8 databits
- No parity bit
- 1 stopbit

## 14 TESTING THE CONNECTION

Various software and hardware tools are available for testing the RS-485 connection and verifying MODBUS communication. For example, the FTDI USB-RS485-WE-1800-BT interface cable can be used to connect the NANO to a PC. A suitable test application is the Schneider Electric Modbus Tester for Windows. test the connection and the communication.



## 15 CONFIGURE THE MODBUS ADDRESS AND DEVICE TYPE

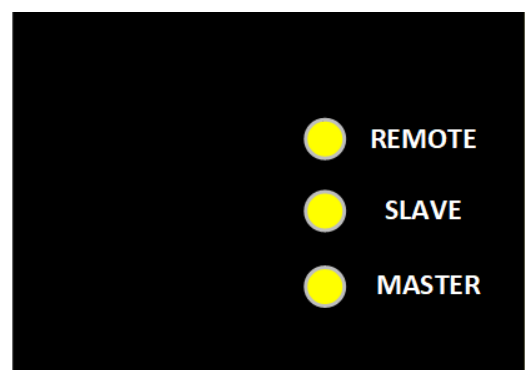
Multiple devices can be connected to a single MODBUS communication bus. Device status and register data can be read by an external system. Devices can also be configured to operate in a coordinated manner. One device on the communication bus can be configured as the Master. The Master provides the following additional functions:

- Generates a general fault indication if no Slave or Default device is detected on the communication bus.
- Generates a general fault indication if one or more Slave or Default devices report a general fault.
- Initiates extinguishing on all Slave devices (but not on Default devices) when the Master's extinguishing output is activated.

Each device connected to the communication bus shall be assigned a unique MODBUS address. The address is configured using the buttons on the NANO. The current operating mode and address are indicated by the three internal LEDs. Instructions for changing the operating mode and MODBUS address are provided in Chapter 16.

The LED indications are as follows:

- If no LED is illuminated, the NANO is configured for **Default Mode**.
- If LED 1 is illuminated, the NANO is configured for **Remote/Repeater Mode**.
- If LED 2 is illuminated, the NANO is configured for **Slave Mode**.
- If LED 3 is illuminated, the NANO is configured for **Master Mode**.



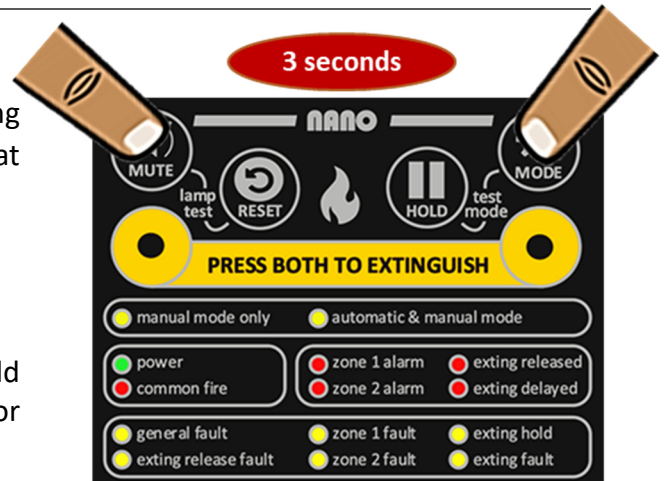
## 16 CHOOSE FOR DEFAULT, MASTER, SLAVE OR REMOTE/REPEATER PANEL

### 16.1 MASTER / SLAVE ADDRESS

The configuration process begins by defining the operating mode of the NANO. Next, assign the MODBUS address that the NANO will use on the MODBUS network.

### 16.2 STEP 1 OPEN DE SELECTION PROCEDURE

To open the function programming mode, press and hold the HOLD  and MUTE  simultaneously for **3 seconds**.



### 16.3 STEP 2 CHOOSE THE FUNCTIONALITY

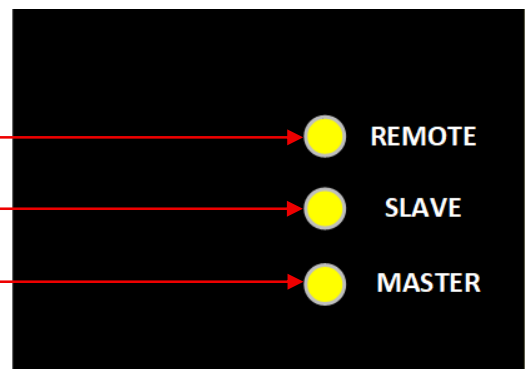
The green power LED will be blinking fast. The three internal LEDs indicate the operating function of the NANO. When **NO** LEDs are active, the NANO operates in its normal default mode. Press the MODE push button  to change NANO's function.



The internal LEDs indicate the selected function. Pressing MODE cycles the functions as follows:

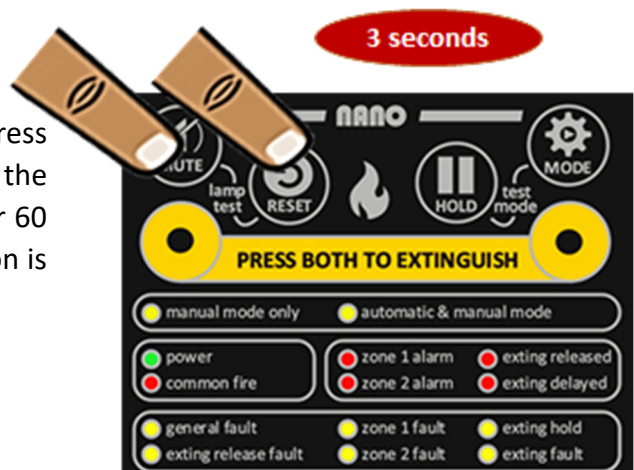
- Remote/Repeat → LED in position 1
- Slave → LED in position 2
- Master → LED in position 3
- NO LED is Default status

See the example for the function assigned to each LED.



### 16.4 STEP 3 CONFIRM CHOICE

To confirm the REPEATER, SLAVE, or MASTER status, press the MUTE  button for at least **3 seconds**. Or press the RESET  button to cancel. If no button is pressed for 60 seconds during MODBUS selection mode, the operation is automatically canceled.

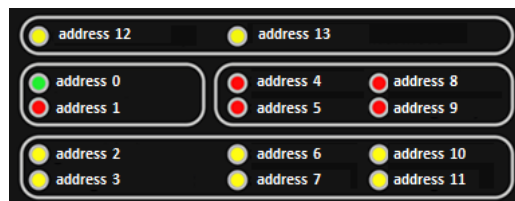




## 17 CHOOSE A MODBUS DEVICE ADDRESS

### 17.1 A MODBUS NETWORK,

Each device has a unique address that allows it to be identified within the network. this address is set using the buttons on the front panel of the nano.



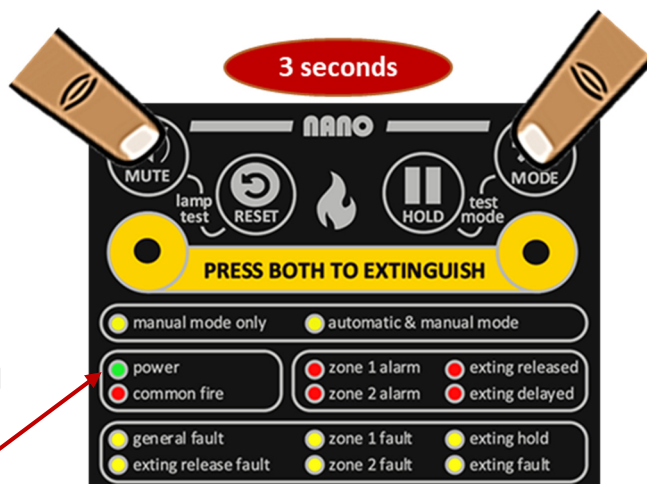
### 17.2 CONFIGURATION

In a NANO Master–Slave configuration, the Master is assigned address 0 and the Slave address 1.

In a NANO Default – Remote/Repeater configuration the Default NANO is assigned address 0 and the Remote/Repeater panel as address 1.

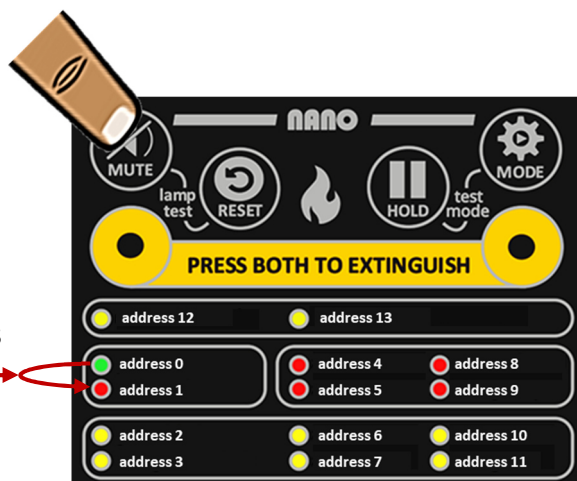
### 17.3 Step 1 Open de selection procedure

To open the function programming mode, press and hold the **HOLD** ⚙️ and **MUTE** 🔊 buttons simultaneously for **3 seconds**.



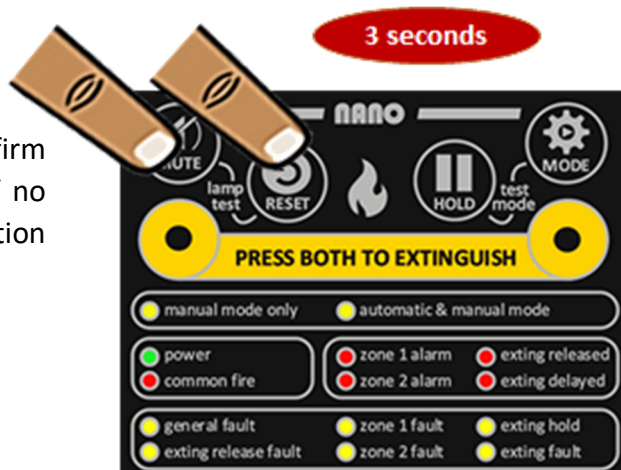
### 17.4 Step 2 Indication

The green power LED on the front of the NANO flashes rapidly, indicating its Modbus address is in programming mode. The address is 0.



### 17.5 Step 3 Change Address

Press the Mute 🔊 button shortly to change the address from address 0 to address 1.



### 17.6 Step 4 Confirm Choice

Press the MUTE 🔊 button for at least **3 seconds** to confirm the chosen address, or press RESET ⏮️ to cancel. If no button is pressed within 60 seconds in MODBUS selection mode, the operation is canceled automatically.



## 18 MODBUS REGISTER

All parameters are stored in 16-bit holding registers. These registers can be read by an external MODBUS RTU master using the Read Holding Registers function. Multiple consecutive registers can be read in a single request by specifying the required number of registers. All register data is transmitted as 16-bit values, with the most significant byte (MSB) transmitted first, which is the standard byte order for MODBUS RTU. If a read request extends beyond the last available register, the NANO returns all valid registers up to the end of the register map, and the response length is adjusted accordingly. The registers highlighted in red are writable and can be written using the Write Single Register function.

*Note: This behavior is specific to the NANO implementation and differs from the standard MODBUS RTU exception handling defined in the MODBUS specification.*

| Register | Name                                               | Description                                                                | Length |
|----------|----------------------------------------------------|----------------------------------------------------------------------------|--------|
| 40000    | Product name                                       | Always replies with the string "NKB1310"                                   | 20     |
| 40020    | Version                                            | Firmware version Major revision in high byte, minor revision in lower byte | 1      |
| 40021    | Reboots                                            | Number of reboots since first started                                      | 1      |
| 40023    | Sounder state                                      | External sounder state: 0 = IDLE, 1 = OPEN, 2 = SHORTED, 3 = ACTIVATED     | 1      |
| 40024    | General fault                                      | 0 = no fault, 1 = general fault                                            | 1      |
| 40025    | Unlock command extinguish/reset for 5s             | Write 0x <b>C001</b> to unlock the register 40026 and 40027 for 5 seconds  | 1      |
| 40026    | Remote extinguish command                          | Write 0x <b>OFF</b> to initiate extinguish                                 | 1      |
| 40027    | Remote reset command                               | Write 0x <b>OFF</b> to initiate reset                                      | 1      |
| 40028    | Remote mute command                                | Write 0x <b>OFF</b> to initiate mute                                       | 1      |
| 40030    | Current event state: fault exting open             | 1 = Active, 0 = Not active                                                 | 1      |
| 40031    | Current event state: fault exting shorted          | 1 = Active, 0 = Not active                                                 | 1      |
| 40032    | Current event state: fault firezone 1 open         | 1 = Active, 0 = Not active                                                 | 1      |
| 40033    | Current event state: fault firezone 1 shorted      | 1 = Active, 0 = Not active                                                 | 1      |
| 40034    | Current event state: fault firezone 2 open         | 1 = Active, 0 = Not active                                                 | 1      |
| 40035    | Current event state: fault firezone 2 shorted      | 1 = Active, 0 = Not active                                                 | 1      |
| 40036    | Current event state: fault sounder open            | 1 = Active, 0 = Not active                                                 | 1      |
| 40037    | Current event state: fault sounder shorted         | 1 = Active, 0 = Not active                                                 | 1      |
| 40038    | Current event state: fault extern hold open        | 1 = Active, 0 = Not active                                                 | 1      |
| 40039    | Current event state: fault extern hold shorted     | 1 = Active, 0 = Not active                                                 | 1      |
| 40040    | Current event state: fault extern hold midrange    | 1 = Active, 0 = Not active                                                 | 1      |
| 40041    | Current event state: fault extern release open     | 1 = Active, 0 = Not active                                                 | 1      |
| 40042    | Current event state: fault extern release shorted  | 1 = Active, 0 = Not active                                                 | 1      |
| 40043    | Current event state: fault extern release midrange | 1 = Active, 0 = Not active                                                 | 1      |
| 40044    | Current event state: fault power disconnected      | 1 = Active, 0 = Not active                                                 | 1      |
| 40045    | Current event state: external release              | 1 = Active, 0 = Not active                                                 | 1      |
| 40046    | Current event state: external hold                 | 1 = Active, 0 = Not active                                                 | 1      |
| 40047    | Current event state: firezone0 fire                | 1 = Active, 0 = Not active                                                 | 1      |
| 40048    | Current event state: firezone1 fire                | 1 = Active, 0 = Not active                                                 | 1      |
| 40050    | Current event state: charged cap                   | 1 = Active, 0 = Not active                                                 | 1      |
| 40053    | Current event state: vehicle mode                  | 1 = Active, 0 = Not active                                                 | 1      |

| Register | Name                                                           | Description                                | Length |
|----------|----------------------------------------------------------------|--------------------------------------------|--------|
| 40054    | Current event state: backup power mode                         | 1 = Active, 0 = Not active                 | 1      |
| 40055    | Current event state: usb power connected                       | 1 = Active, 0 = Not active                 | 1      |
| 40056    | Current event state: Extinguish release by modbus              | 1 = Active, 0 = Not active                 | 1      |
| 40057    | Current event state: no modbus slaves connect (in master mode) | 1 = Active, 0 = Not active                 | 1      |
| 40058    | Current event state: slave fault detected (in master mode)     | 1 = Active, 0 = Not active                 | 1      |
| 40080    | Event count: fault exting open                                 | Nr. Of events occurred since reboot        | 1      |
| 40081    | Event count: fault exting shorted                              | Nr. Of events occurred since reboot        | 1      |
| 40082    | Event count: fault firezone 1 open                             | Nr. Of events occurred since reboot        | 1      |
| 40083    | Event count: fault firezone 1 shorted                          | Nr. Of events occurred since reboot        | 1      |
| 40084    | Event count: fault firezone 2 open                             | Nr. Of events occurred since reboot        | 1      |
| 40085    | Event count: fault firezone 2 shorted                          | Nr. Of events occurred since reboot        | 1      |
| 40086    | Event count: fault sounder open                                | Nr. Of events occurred since reboot        | 1      |
| 40087    | Event count: fault sounder shorted                             | Nr. Of events occurred since reboot        | 1      |
| 40088    | Event count: fault external hold open                          | Nr. Of events occurred since reboot        | 1      |
| 40089    | Event count: fault external hold shorted                       | Nr. Of events occurred since reboot        | 1      |
| 40090    | Event count: fault external hold midrange                      | Nr. Of events occurred since reboot        | 1      |
| 40091    | Event count: fault external release open                       | Nr. Of events occurred since reboot        | 1      |
| 40092    | Event count: fault external release shorted                    | Nr. Of events occurred since reboot        | 1      |
| 40093    | Event count: fault external release midrange                   | Nr. Of events occurred since reboot        | 1      |
| 40094    | Event count: fault power disconnected                          | Nr. Of events occurred since reboot        | 1      |
| 40095    | Event count: external release                                  | Nr. Of events occurred since reboot        | 1      |
| 40096    | Event count: external hold                                     | Nr. Of events occurred since reboot        | 1      |
| 40097    | Event count: fire zone 1 fire                                  | Nr. Of events occurred since reboot        | 1      |
| 40098    | Event count: fire zone 2 fire                                  | Nr. Of events occurred since reboot        | 1      |
| 40100    | Event count: charged cap                                       | Nr. Of events occurred since reboot        | 1      |
| 40103    | Event count: vehicle mode                                      | Nr. Of events occurred since reboot        | 1      |
| 40104    | Event count: backup power mode                                 | Nr. Of events occurred since reboot        | 1      |
| 40105    | Event count: usb power connected                               | Nr. Of events occurred since reboot        | 1      |
| 40106    | Event count: Extinguish release by Modbus                      | Nr. Of events occurred since reboot        | 1      |
| 40107    | Event count: Current event state: no Modbus                    | Nr. Of events occurred since reboot        | 1      |
| 40108    | Event count: Current event state: slave fault                  | Nr. Of events occurred since reboot        | 1      |
| 40130    | Led state: ext release fault                                   | 0 = off, 1 = on, 2 = blink, 3 = blink fast | 1      |
| 40131    | Led state: power                                               | 0 = off, 1 = on, 2 = blink, 3 = blink fast | 1      |
| 40132    | Led state: manual mode                                         | 0 = off, 1 = on, 2 = blink, 3 = blink fast | 1      |
| 40133    | Led state: zone 1 alarm                                        | 0 = off, 1 = on, 2 = blink, 3 = blink fast | 1      |
| 40134    | Led state: zone2 alarm                                         | 0 = off, 1 = on, 2 = blink, 3 = blink fast | 1      |
| 40135    | Led state: zone1 fault                                         | 0 = off, 1 = on, 2 = blink, 3 = blink fast | 1      |
| 40136    | Led state: zone 2 fault                                        | 0 = off, 1 = on, 2 = blink, 3 = blink fast | 1      |
| 40137    | Led state: general fault                                       | 0 = off, 1 = on, 2 = blink, 3 = blink fast | 1      |
| 40138    | Led state: fire1                                               | 0 = off, 1 = on, 2 = blink, 3 = blink fast | 1      |
| 40139    | Led state: auto mode                                           | 0 = off, 1 = on, 2 = blink, 3 = blink fast | 1      |
| 40140    | Led state: released                                            | 0 = off, 1 = on, 2 = blink, 3 = blink fast | 1      |
| 40141    | Led state: delay                                               | 0 = off, 1 = on, 2 = blink, 3 = blink fast | 1      |
| 40142    | Led state: hold                                                | 0 = off, 1 = on, 2 = blink, 3 = blink fast | 1      |



| Register | Name                                   | Description                                      | Length |
|----------|----------------------------------------|--------------------------------------------------|--------|
| 40143    | Led state: exting fault                | 0 = off, 1 = on, 2 = blink, 3 = blink fast       | 1      |
| 40144    | Led state: sounder fault               | 0 = off, 1 = on, 2 = blink, 3 = blink fast       | 1      |
| 40145    | Led state: backup power                | 0 = off, 1 = on, 2 = blink, 3 = blink fast       | 1      |
| 40146    | Led state: ext hold fault              | 0 = off, 1 = on, 2 = blink, 3 = blink fast       | 1      |
| 40147    | Led state: fire2                       | 0 = off, 1 = on, 2 = blink, 3 = blink fast       | 1      |
| 40148    | Led state: fire3                       | 0 = off, 1 = on, 2 = blink, 3 = blink fast       | 1      |
| 40150    | VFC state: Fire                        | 1 = Active, 0 = Not active                       | 1      |
| 40151    | VFC state: Fault                       | 1 = Active, 0 = Not active                       | 1      |
| 40152    | VFC state: Fan                         | 1 = Active, 0 = Not active                       | 1      |
| 40153    | VFC state: Extinguish                  | 1 = Active, 0 = Not active                       | 1      |
| 40160    | Button state: Reset                    | 0 = not pushed, 1 = pushed, 2 = pushed long, 3 = | 1      |
| 40161    | Button state: Hold                     | 0 = not pushed, 1 = pushed, 2 = pushed long, 3 = | 1      |
| 40162    | Button state: Mode                     | 0 = not pushed, 1 = pushed, 2 = pushed long, 3 = | 1      |
| 40163    | Button state: Mute                     | 0 = not pushed, 1 = pushed, 2 = pushed long, 3 = | 1      |
| 40164    | Button state: Extinguish               | 0 = not pushed, 1 = pushed, 2 = pushed long, 3 = | 1      |
| 40170    | Button pushed count: Reset             | Nr. Of events occurred since reboot              | 1      |
| 40171    | Button pushed count: Hold              | Nr. Of events occurred since reboot              | 1      |
| 40172    | Button pushed count: Mode              | Nr. Of events occurred since reboot              | 1      |
| 40173    | Button pushed count: Mute              | Nr. Of events occurred since reboot              | 1      |
| 40174    | Button pushed count: Extinguish        | Nr. Of events occurred since reboot              | 1      |
| 40180    | Button pushed long count: Reset        | Nr. Of events occurred since reboot              | 1      |
| 40181    | Button pushed long count: Hold         | Nr. Of events occurred since reboot              | 1      |
| 40182    | Button pushed long count: Mode         | Nr. Of events occurred since reboot              | 1      |
| 40183    | Button pushed long count: Mute         | Nr. Of events occurred since reboot              | 1      |
| 40184    | Button pushed long count: Extinguish   | Nr. Of events occurred since reboot              | 1      |
| 40190    | Button pushed longer count: Reset      | Nr. Of events occurred since reboot              | 1      |
| 40191    | Button pushed longer count: Hold       | Nr. Of events occurred since reboot              | 1      |
| 40192    | Button pushed longer count: Mode       | Nr. Of events occurred since reboot              | 1      |
| 40193    | Button pushed longer count: Mute       | Nr. Of events occurred since reboot              | 1      |
| 40194    | Button pushed longer count: Extinguish | Nr. Of events occurred since reboot              | 1      |
| 40220    | Main voltage                           | units: mV                                        | 1      |
| 40221    | Internal voltage                       | units: mV                                        | 1      |
| 40222    | Backup power voltage                   | units: mV                                        | 1      |
| 40224    | Extinguish power capacitor voltage     | units: mV                                        | 1      |
| 40225    | Board temperature                      | units: degrees Celsius * 10                      | 1      |
| 40226    | Extinguish sense voltage               | units: mV                                        | 1      |
| 40227    | Sounder port voltage positive pole     | units: mV                                        | 1      |
| 40228    | Sounder port voltage negative pole     | units: mV                                        | 1      |
| 40229    | Fire zone 1 Voltage                    | units: mV                                        | 1      |
| 40230    | Fire zone 2 Voltage                    | units: mV                                        | 1      |
| 40231    | Fire zone 1 Current                    | units: uA                                        | 1      |
| 40232    | Fire zone 2 Current                    | units: uA                                        | 1      |
| 40233    | Fire zone 1 Resistance                 | units: Ohm                                       | 1      |
| 40234    | Fire zone 2 Resistance                 | units: Ohm                                       | 1      |
| 40235    | External release button resistance     | units: Ohm                                       | 1      |
| 40236    | External hold button resistance        | units: Ohm                                       | 1      |
| 40237    | Vehicle input Voltage                  | units: mV                                        | 1      |
| 40250    |                                        | Reading this register or higher will return no   |        |



### **Disclaimer**

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