APPENDIX A

USER MANUAL: MODBUS / RS-485

NANO

FIRE DETECTION & EXTINGUISHING CONTROL PANEL

Table of contents

1 DOCUMENT REVISION DETAILS

Issue	Modification Detail	Author	Date
2.0	1st 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 IMPORTANT NOTES – READ CAREFULLY

This manual should be thoroughly read and understood before installation and commissioning of the system is undertaken. This MODBUS manual is an integral part of the NANO manual version 2.1 of August 2024.

The NANO, with the associated connections, must be installed, commissioned, and maintained by a skilled, knowledgeable, and competent personnel that is trained to perform this work. It is assumed that the personnel who commission the system is familiar with objective of the equipment and the technical terminology associated with this. Except for the backup battery there are no user-serviceable parts in the NANO.

The NANO system is not to be regarded as properly used when it is used without regard to any relevant information or advice relating to its use that has been made available by the supplier. The NANO system and the associated connections must be installed, commissioned, and maintained by a skilled, knowledgeable, and competent person or organization that is qualified to perform this work and is familiar with the objective of the equipment and the associated technical terminology. This equipment is not guaranteed unless the complete installation is installed and commissioned in accordance with the laid down local and/or national standards.

3 INTRODUCTION

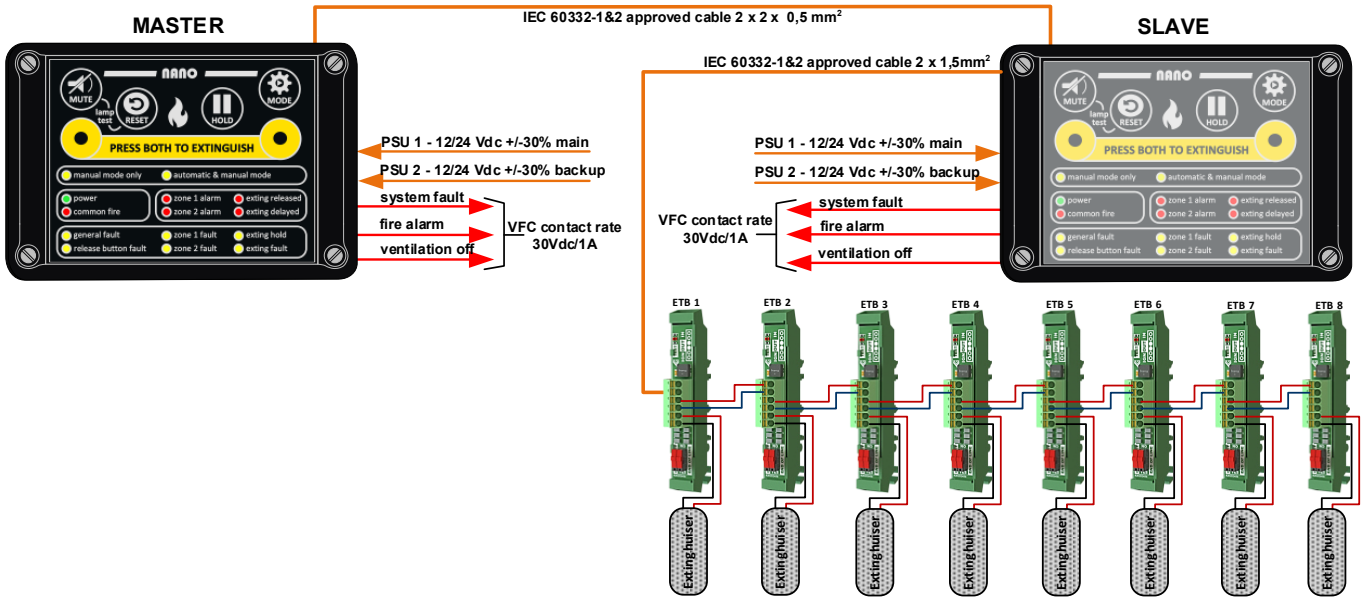
The NANO is designed to be used in a fully integrated system. Remote devices can read the status and parameters of the NANO by a digital bus system. The technology used is MODBUS. This is a very well-established bus technology that uses RS-485 as the underlaying physical layer. Please read the NANO User Manual before using the device. This manual only manages the data bus usage.

4 NANO MASTER/SLAVE SYSTEM

The purpose of the NANO master slave option is to expand the number of extinguishers or to build a remotely controlled extinguishing release system. Where the NANO master remotely controls the NANO slave, to which the extinguishers to be activated are connected. The communication between the NANO MASTER and NANO SLAVE is through a digital port. The NANO is designed to be used in a fully integrated system. Remote devices can read the status and parameters of the NANO by a digital bus system. The technology used is MODBUS. This is a very well-established bus technology that uses RS-485 as the underlaying physical layer. The NANO slave has no other function than to activate the extinguishers connected to the NANO slave at the command of the NANO master. Control activities on the NANO slave control panel are NOT permitted. Any malfunction or abnormality in the NANO slave control panel will be reported to the NANO master control panel.

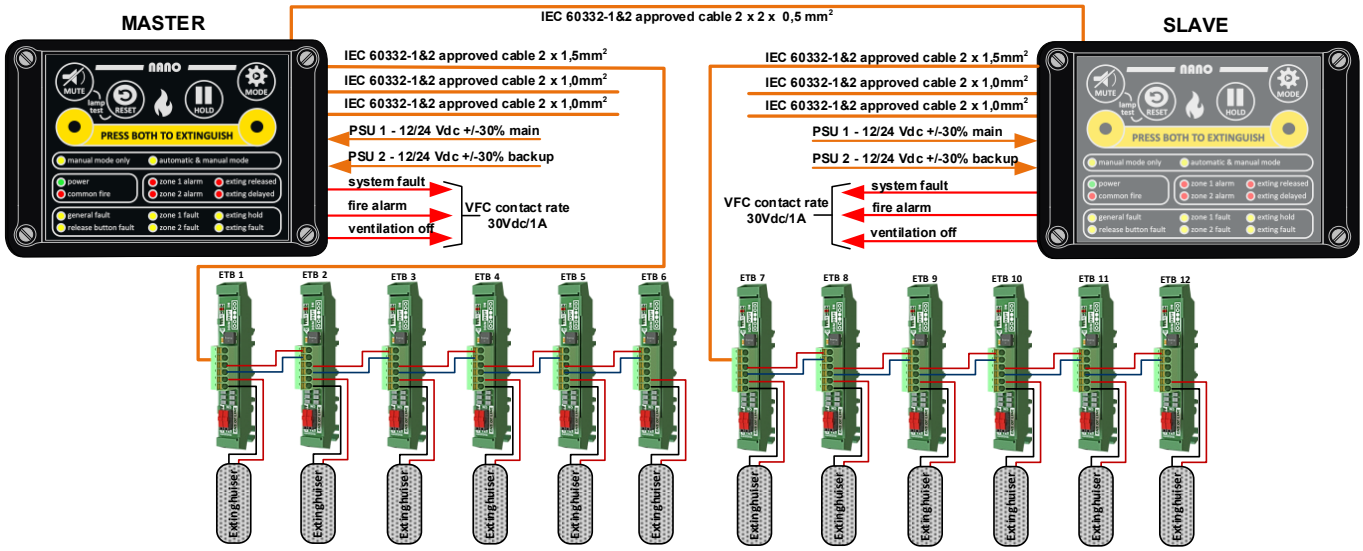
5 DIAGRAM MASTER / SLAVE CONFIGURATION A

A Master Slave configuration as shown in A is intended to be a remotely controlled extinguishing release system. Expanding capacity is not an issue here.



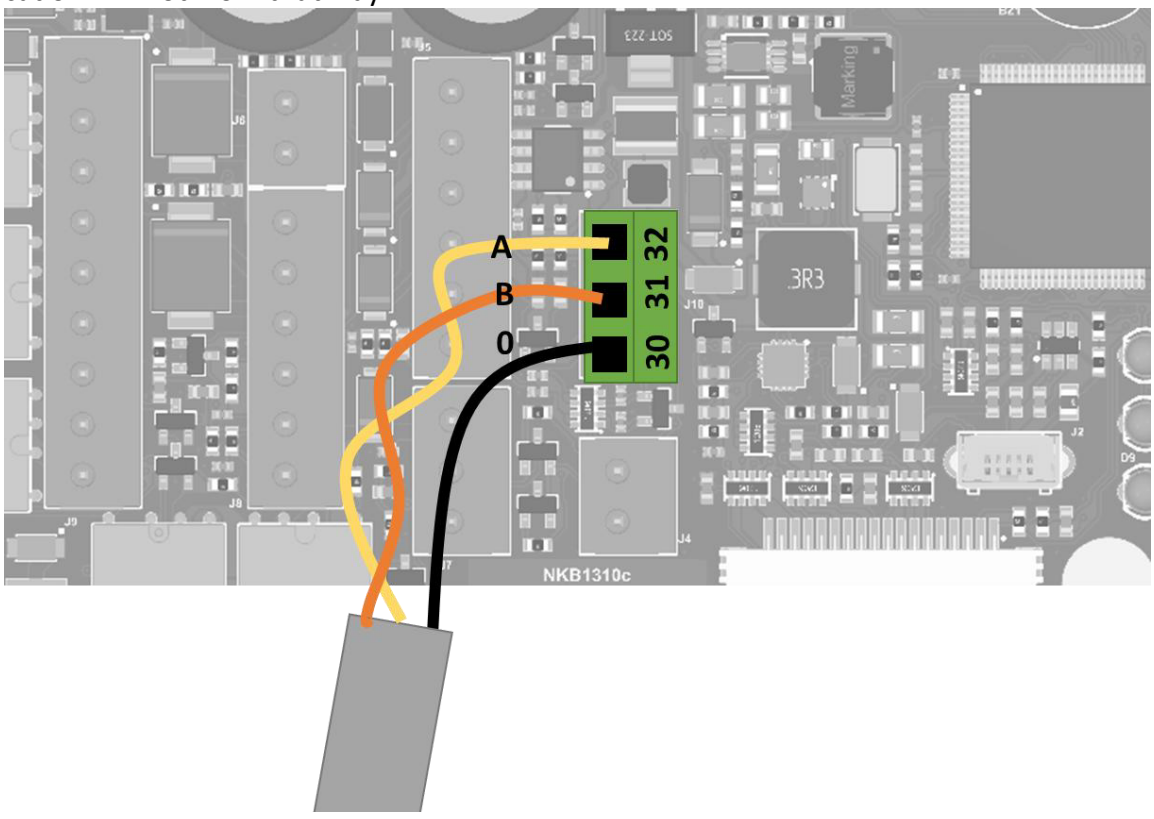
6 DIAGRAM MASTER / SLAVE CONFIGURATION B

A Master Slave configuration as shown in B is intended to expanding capacity of the extinguishers as described in chapter 4. All control is from the Master and the slave should be considered as blind.



7 CONNECTING THE DATA BUS

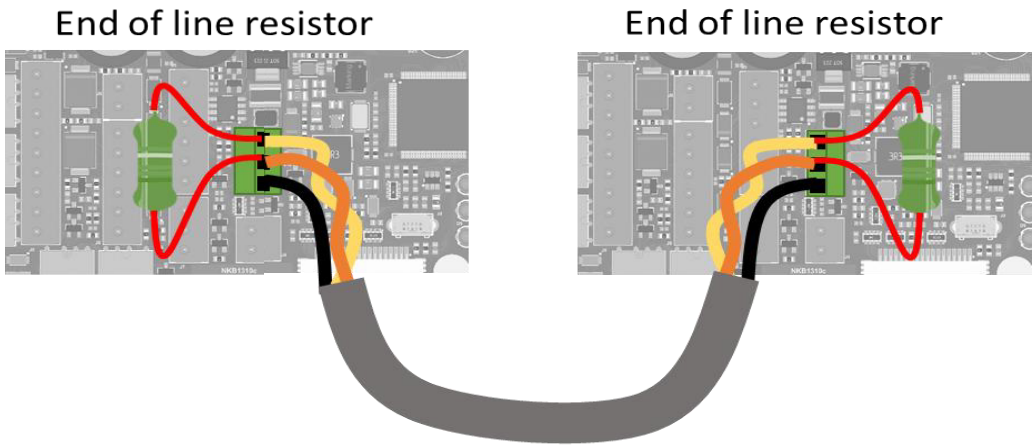
RS-485 is a 3-wire bus. Two wires for the communication data and one wire for the ground connection. Be aware that this ground wire must always be connected and physically kept together with the two data signal lines. Not connecting this wire can lead to communication faults and even damaged devices due to EFT or Surge events or Voltage level differences between different floating ground potentials. Make sure the A and B date lines are not reversed. Although nothing can be damaged, the communication will not work that way.



8 MODBUS WIRING

It is strongly recommended to use a twisted pair cable to reduce the risk of communication failures due to Electro Magnetic Interference (EMI). Twisting all four lines together instead of twisting in pairs of 2 is also a good solution. To avoid communication errors, make sure to place an end resistor on both ends of the cable. The value of this resistor must be equal to the characteristic impedance of the cable. That value must be provided by the cable manufacturer. For a twisted pair cable this normally is around 100 to 120 Ohm.

9 A MASTER SLAVE CONFIGURATION



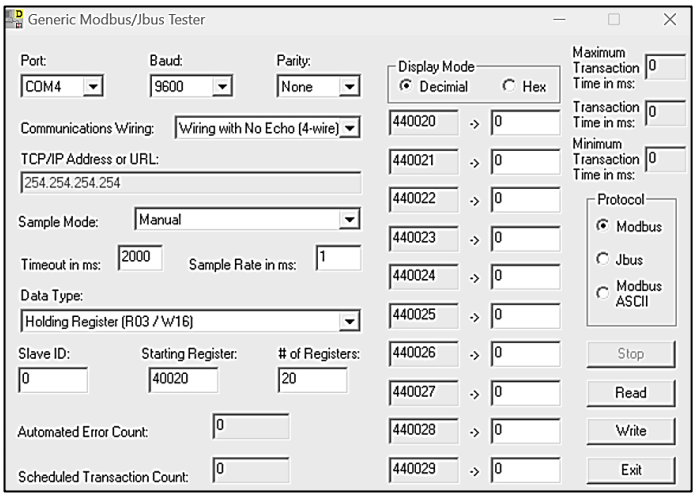
10 CONNECTION SETTINGS

The MODBUS type is RTU and the settings of the communication are 8N1 bautrate 9600.
This means:

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

11 TESTING THE CONNECTION

To test the connection and the communication, various tools are available in the market. For example, the FTDI USB-RS485-WE-1800-BT cable can be used to connect the hardware to a PC. A simple and easy to use test application, among others, is the Schneider Electric Modbus Tester application for Windows.



12 CHANGING THE MODBUS ADDRESS AND MODBUS DEVICE TYPE

It is possible to connect multiple devices to one data bus. The device registers can be read by an external device. It is also possible to allow devices to work together. One device on the bus can be configured as a master device. The master device has the following extended possibilities:

- It will give a general fault when no slave/default device is found on the bus
- It will give a general fault when one or more slave/default devices have a general fault
- It will initiate extinguish on Slave devices (not on Default devices!) when the Master extinguisher is released

It is very important to give each device in the data bus a unique address. This is done via the buttons on the NANO.

13 CHOOSE A MODBUS ADDRESS

It is possible to connect multiple devices to one data bus. It is very important to give each device in the data bus a unique address. This is done via the buttons on the NANO panel front.

13.1 STEP 1 MODBUS SETTINGS

Set the NANO in programming mode by pressing and holding the MODE and the MUTE button simultaneously for more than 3 seconds.

13.2 STEP 2 INDICATION

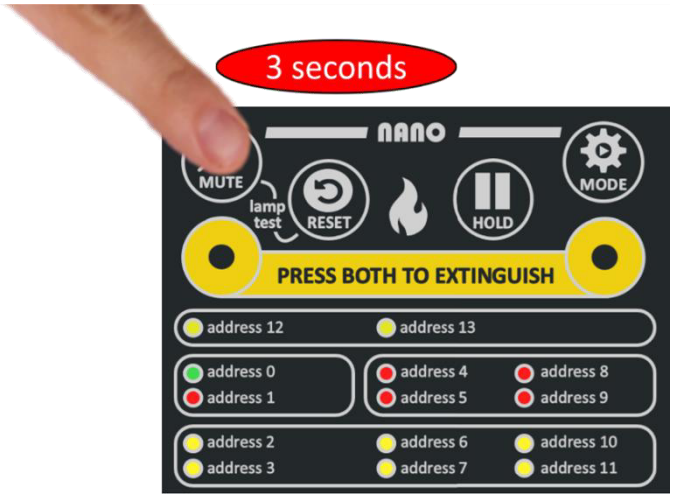
On the front of the NANO, the green power indicator will flash rapidly. This indicates the Modbus address of this NANO in the Modbus programming mode.

13.3 STEP 3 CHANGE ADDRESS

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

13.4 Step 4 confirm choice

To confirm the address, press the MUTE button for at least 3 seconds or press the Reset button to cancel. If there is no button pressed for 60 seconds during this MODBUS selection mode. The operation is automatically canceled.



14 Choose for master or slave

14.1 Master / slave address

You have chosen for the master address 0 (green led power) and for the slave 1 (red led common fire) then start the procedure again follow these instructions to determine the master or slave status.

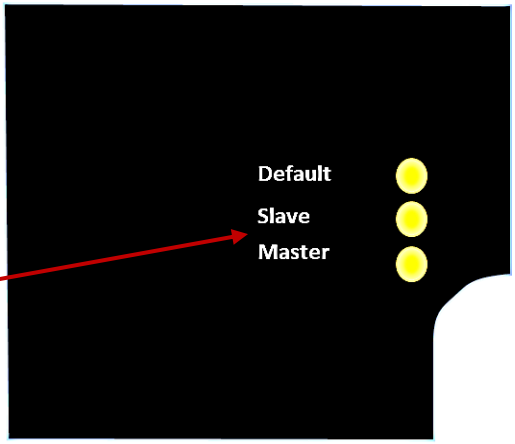
14.2 Step 1 Master / slave settings

Press both the mode and mute button for at least 3 seconds

14.3 Step 2 Indication

The power LED will be blinking fast. The internal LED image displays the MODBUS address that you have configured.

Internal LEDs



14.4 Step 3 change the master / slave status

Then Press the mode button shortly to change the Modbus device type. The selected status is shown by a blinking LED on the rear of the NANO

14.5 Step 4 Confirm choice

To confirm the master or slave status, press the MUTE button for at least 3 seconds or press the Reset button to cancel. If there is no button pressed for 60 seconds during this MODBUS selection mode. The operation is automatically canceled.

15 MODBUS REGISTER

All parameters are read only holding registers and can be read by a external MODBUS RTU master device via “Read hold register” commands. It is possible to read multiple registers with one command by changing the requested data length. All register contains 16 bits data. If data is requested beyond the last available register the data is cut-off at the end and the reply will have the corrected data length. The data has t he most significant byte first (MSB first) as this is the most common way to format the 16 bits register content in MODBUS RTU. The red registers can be written with a “write single register” command.

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 **C001** to unlock the register 40026 and 40027 for 5 seconds	1
40026	Remote extinguish command	Write 0x **0FF** to initiate extinguish	1
40027	Remote reset command	Write 0x **0FF** to initiate reset	1
40028	Remote mute command	Write 0x 0FF 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
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

Register	Name	Description	Length
40056	Current event state: Extinguish release by	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: firezone 1 fire	Nr. Of events occurred since reboot	1
40098	Event count: firezone 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
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

Register	Name	Description	Length
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 Celcius * 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	Firezone 1 Voltage	units: mV	1
40230	Firezone 2 Voltage	units: mV	1
40231	Firezone 1 Current	units: uA	1
40232	Firezone 2 Current	units: uA	1
40233	Firezone 1 Resistance	units: Ohm	1
40234	Firezone 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 answer	

16 NOTES

Reservations

The diagrams of operating principles of the NANO fire-/extinguisher system, included in this manual, are intended to support this manual and are therefore not intended and suitable for technical implementation or realization. No part of this manual may be reproduced, stored in an automated database, or made public in any form or by any means either electronically, mechanically or by photocopying, recording, or in any other way, without prior written permission from N2KB BV. The policy of the N2KB BV is one of continuous improvement and as such we reserve the right to make changes to product specifications at any time and without prior notice. Errors and omissions excepted.