USER MANUAL

Z-LINK2-LO

Modbus Gateway – Remote IO radio and repeater with Lora technology

SENECA s.r.l.

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11/04/2023	1	First edition	MM
11/04/2023	1	Translated into English	MM
20/03/2024	3	Added states in which the product can be used	MM
08/04/2024	4	Corrected DIP-SWITCH for setting the 'BRIDGE' mode	AZ
10/04/2024	5	Corrected DIP-SWITCH for setting the device	AZ
17/12/2025	6	Added information on the maximum number of Modbus registers that can be managed	MM

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Seneca
Z-LINK2-LO

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The user assumes full responsibility and/or risk with regard to the configuration of the product to achieve the intended results in relation to the specific installation and/or end application.
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Qualified personnel means personnel who, on the basis of their training, competence and experience, are able to identify risks and avoid potential hazards that could occur during the use of this product.
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1. COUNTRIES WHERE THE PRODUCT MAY BE USED

The states in which Z-LINK2-LO devices can be used implement ERC 70-03, February 2023, Annex 1, h1.7 (band centre 869.525MHz).

Please refer to the following table for more information:

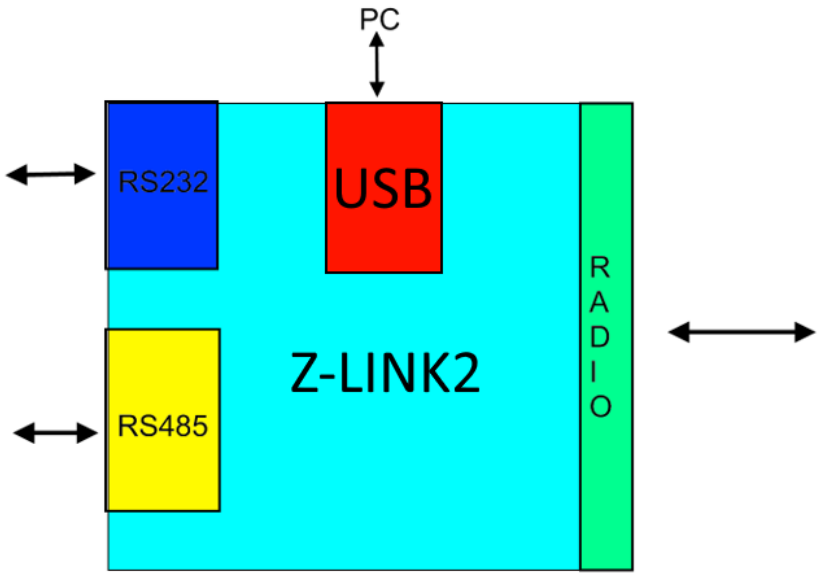
Annexes to ERC/REC 70-03	AL	AD	AT	AZ	BE	BA	BU	CY	CZ	D	DK	E	EST	F	FIN	G	GE	GR	HG	HO	HR	I	IRL	IS	LIE	LT	LU	LV	MC	MDA	MK	MLT	MNE	NOR	PO	PR	ROU	S	SMR	SRB	SUI	SVK	SW	TUR	UKR
ANNEX 1: NON-SPECIFIC SHORT RANGE DEVICES																																														
Annex h1.7: 869.4-869.65 MHz	Y	Y	Y	*	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	*	Y	Y	Y	Y	Y	N

Highlighted yellow = not implemented or no information | Y = implemented | L = limited implementation | P = planned | U = under study | N = not implemented | R = not regulated

2. INTRODUCTION

The Z-LINK2-LO device is designed to transparently transfer serial packets over a wireless network.

The simplified outline of Z-LINK2-LO is:



The Z-LINK2-LO USB port can only be used for programming Z-LINK2-LO from a Windows™ PC with the Easy Setup software.

For the connection with Modbus RTU devices it is possible to use the RS232 or RS485 port.

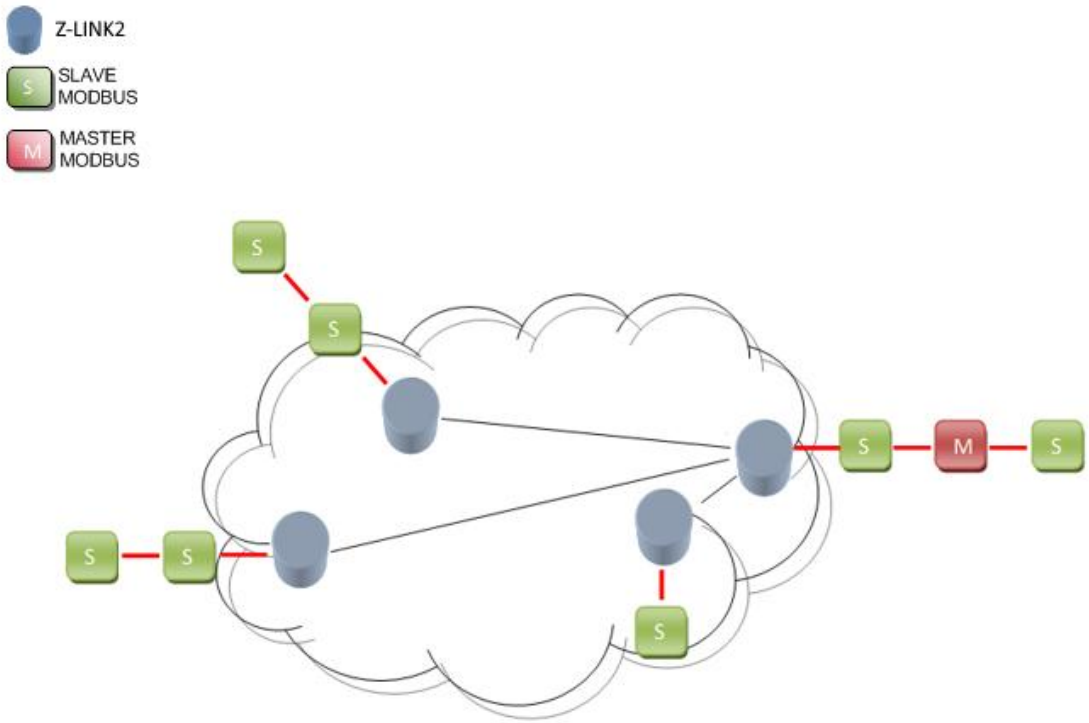
The radio connects two or more Z-LINK2-LO devices.

Two working modes are supported: "Bridge Mode" and "Remote I/O Mode".

It is also possible to configure a device as a radio signal repeater.

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The figure shows a typical application of the Z-LINK2-LO device in "Bridge mode" within a ModBUS RTU network:

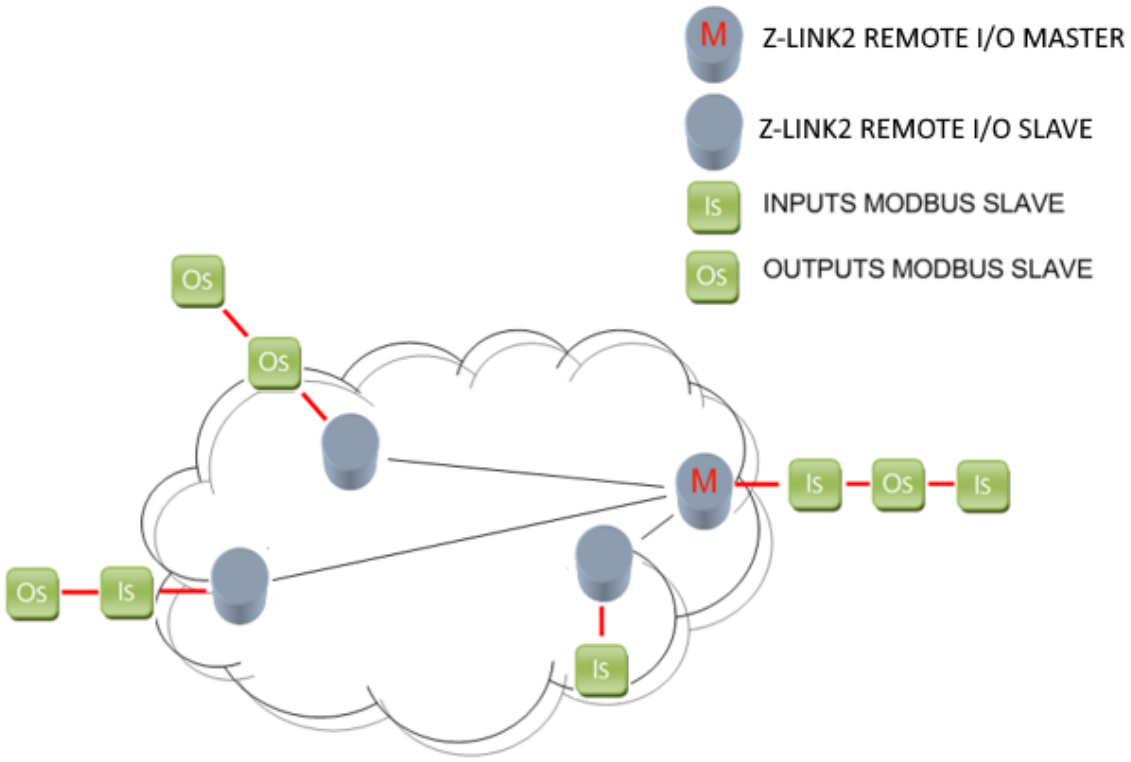


In this mode the Modbus fieldbus is transparently connected "over the air".

Note that the Z-LINK2-LO in “Bridge” mode does not act as Modbus Master, an external Modbus Master “M” device is always required.

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The figure shows a typical application of the Z-LINK2-LO device in "Remote I/O" mode within a ModBUS RTU network:



The inputs are replicated on the outputs. If the inputs are digital it is possible to negate them, if they are analogue it is possible to scale their values. A fault condition can be used for safety requirements.

Note that an external Modbus RTU Master device is not required in this mode because the Z-LINK2-LO also acts as a Modbus RTU Master on the bus.

ATTENTION!

-ONLY THE MODBUS RTU PROTOCOL IS SUPPORTED

-ONLY ONE PORT (RS232 OR RS485) CAN BE USED AT THE SAME TIME.

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2.1. REPEATER FUNCTION

In each of the previous modes it is possible to activate the repeater function. When a Z-LINK2-LO works as a repeater, the received radio signal is also retransmitted in order to increase the signal range.

2.2. MAXIMUM NUMBER OF Z-LINK2-LOS

There is no maximum number of Z-LINK2-LOs that can be used in a network, but Seneca recommends not installing more than 30 Z-LINK2-LOs in a single network.

For more complex networks it is possible to use two or more parallel networks by changing the network key.

2.3. MAXIMUM NUMBER OF MODBUS REGISTERS MANAGED BY Z-LINK2-LO

The maximum number of Modbus registers on a single communication is:

-Max 73 Modbus registers Read Multiple Holding Register

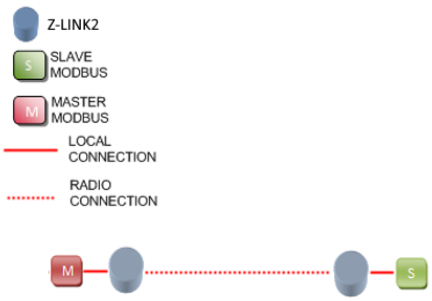
-Max 71 Modbus registers Write Multiple Holding Register

3. Z-LINK2-LO BRIDGE MODE

Z-LINK2-LO can be used to connect two or more Modbus RTU buses wirelessly.

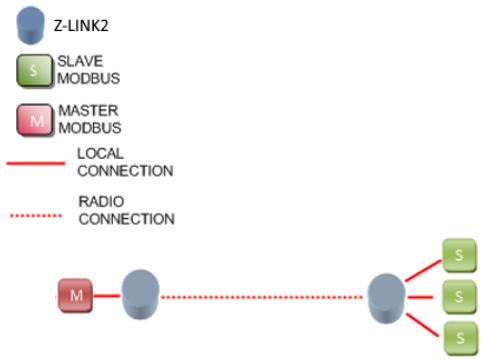
Examples of point-to-multipoint connections are shown in the following figures:

The simplest is the point-to-point connection: 1 Modbus master connected to 1 remote Modbus slave:

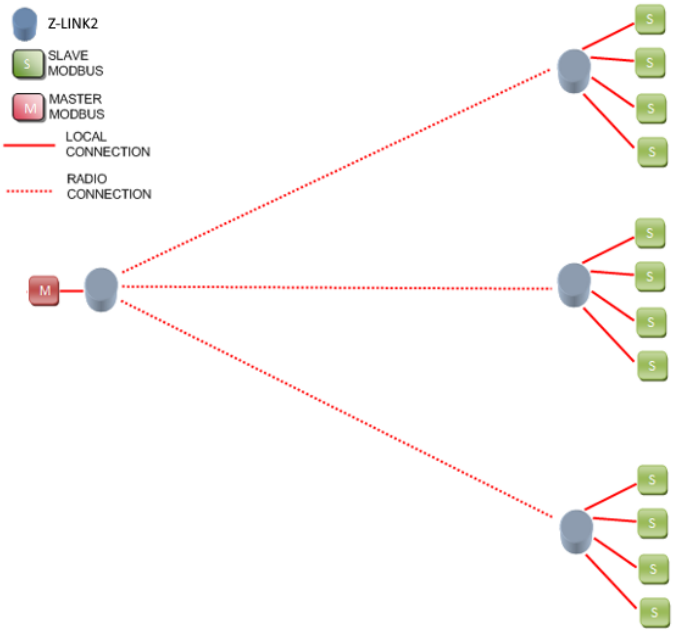


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More complex, it is possible to connect 1 Modbus master with multiple Modbus slaves:

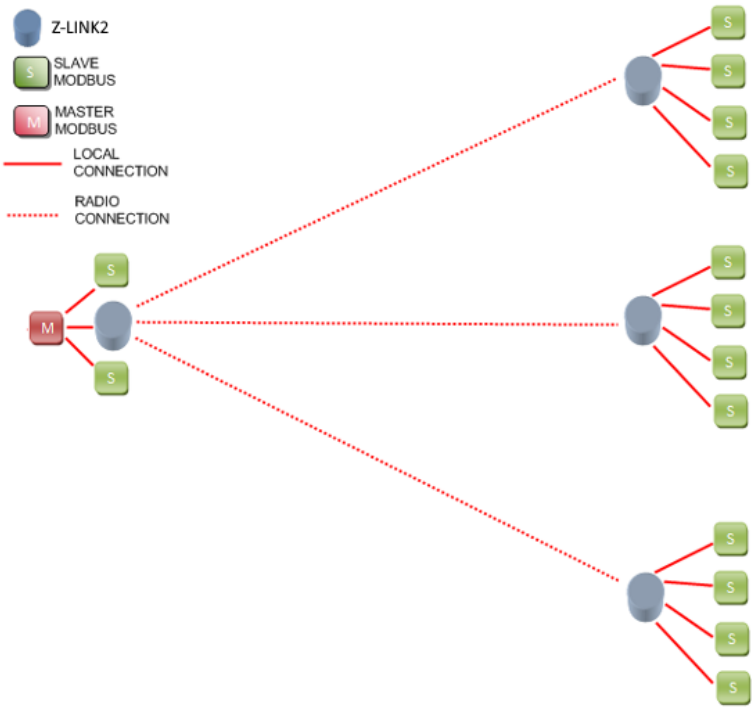


Furthermore, it is possible to connect 1 Modbus master without local Modbus slaves (point-to-multipoint):

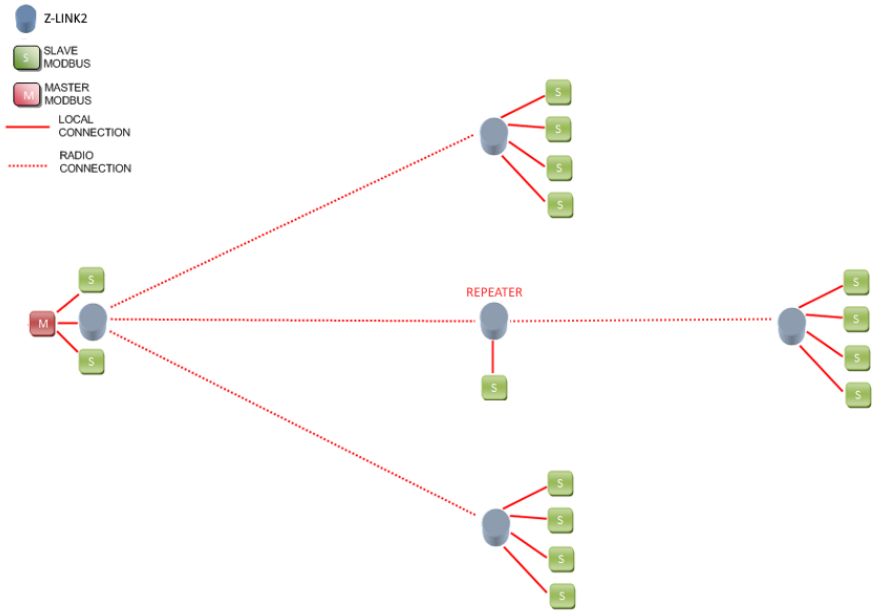


It is also possible to connect Modbus Slaves on the local Modbus master bus:

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If a Z-LINK2-LO is not easily accessible, it is possible to configure one as a "repeater", note that Modbus RTU Slave devices can also be connected to the repeater:



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SETTING Z-LINK2-LO AS "BRIDGE" MODE

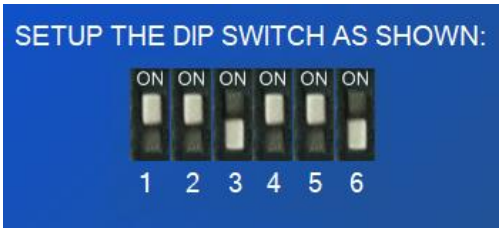
To configure the device, use the Easy Setup software which can be downloaded from the Seneca website in the Z-LINK2-LO section.

ATTENTION!

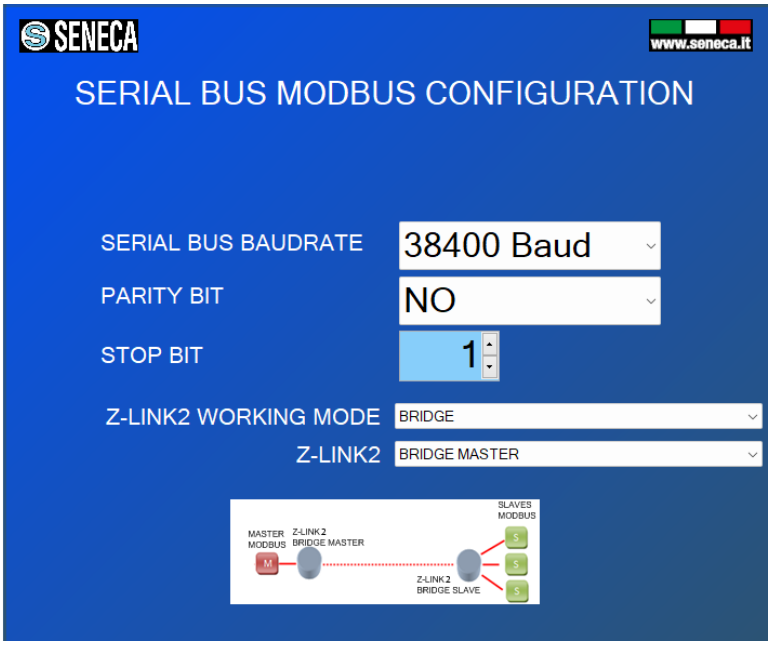
Before starting any configuration operation it is necessary to TURN OFF the Master Radio device

For programming you need to:

1) Turn off the Modbus master
2) Set the dip switches on Z-LINK2-LO to programming mode and power up the device:



3) connect the USB cable to the PC



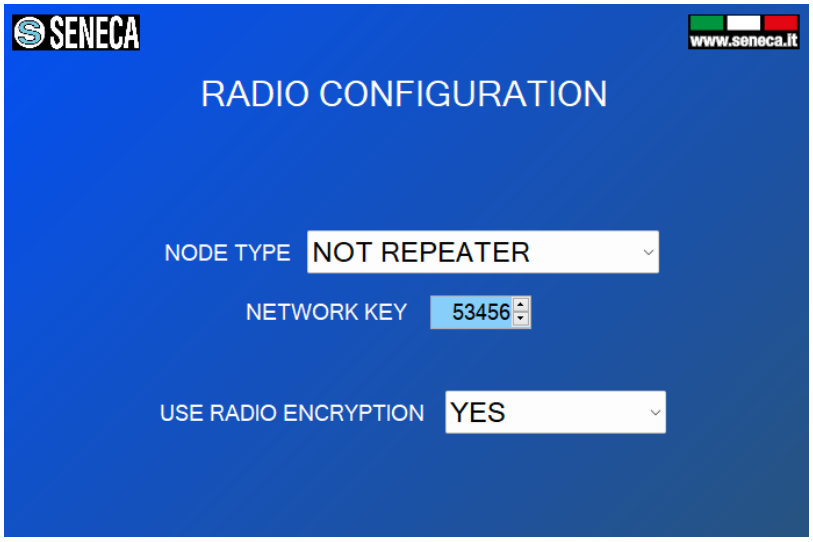
The Z-LINK2-LO connected to the Master is called "Bridge Master", while the other Z-LINK2-LOs (connected to the slaves) are called "Bridge Slaves".

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ATTENTION!

ONLY ONE Z-LINK2-LO CAN BE CONFIGURED AS "BRIDGE MASTER", ALL OTHERS MUST BE CONFIGURED AS "BRIDGE SLAVES".

4) Now that the local bus configuration has been completed, we need to configure the radio:



It is possible to choose if the device is of the repeater type, the network key and if the radio packets are encrypted.
All Z-LINK2-LOs on the same network must have the same network key. If you want to create, for example, 3 parallel networks, you need to create 3 different network keys.

There is no maximum number of parallel networks, but to obtain acceptable performance, the number of 8 networks must not be exceeded.

ATTENTION!

TWO Z-LINK2-LOs WITH DIFFERENT NETWORK KEYS CANNOT BE INSERTED INTO THE SAME NETWORK BECAUSE THEY ARE NOT VISIBLE TO EACH OTHER.

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5) Once the configuration has been sent to the Z-LINK2-LO, turn off the Z-LINK2-LO and set the dip switches:

For Z-LINK2-LO "Bridge Master":



For Z-LINK2-LO "Bridge Slave":

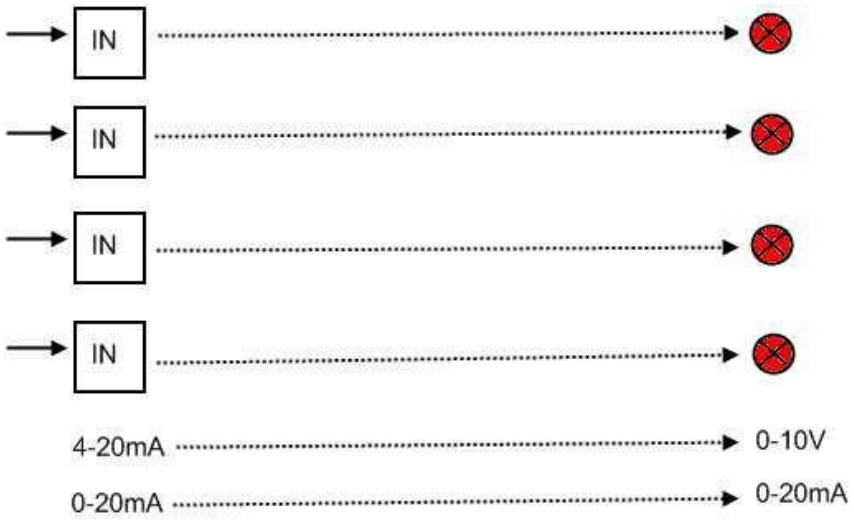


6) Now you can connect Modbus devices via the Rs485 or Rs232 port.
The RS485 port is available via the 7-8-9 terminal screw or via the IDC10 bus connector.
The RS232 port is available via the 4-5-6 terminal screw.

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4. Z-LINK2-LO "REMOTE I/O MODE”

The Z-LINK2-LO can be used to copy inputs to remote outputs, for example it is possible to shift alarm indications or retransmit an analogue measurement without connecting cables:



Using Seneca I/O Modbus RTU slave modules, the above example can be achieved with:

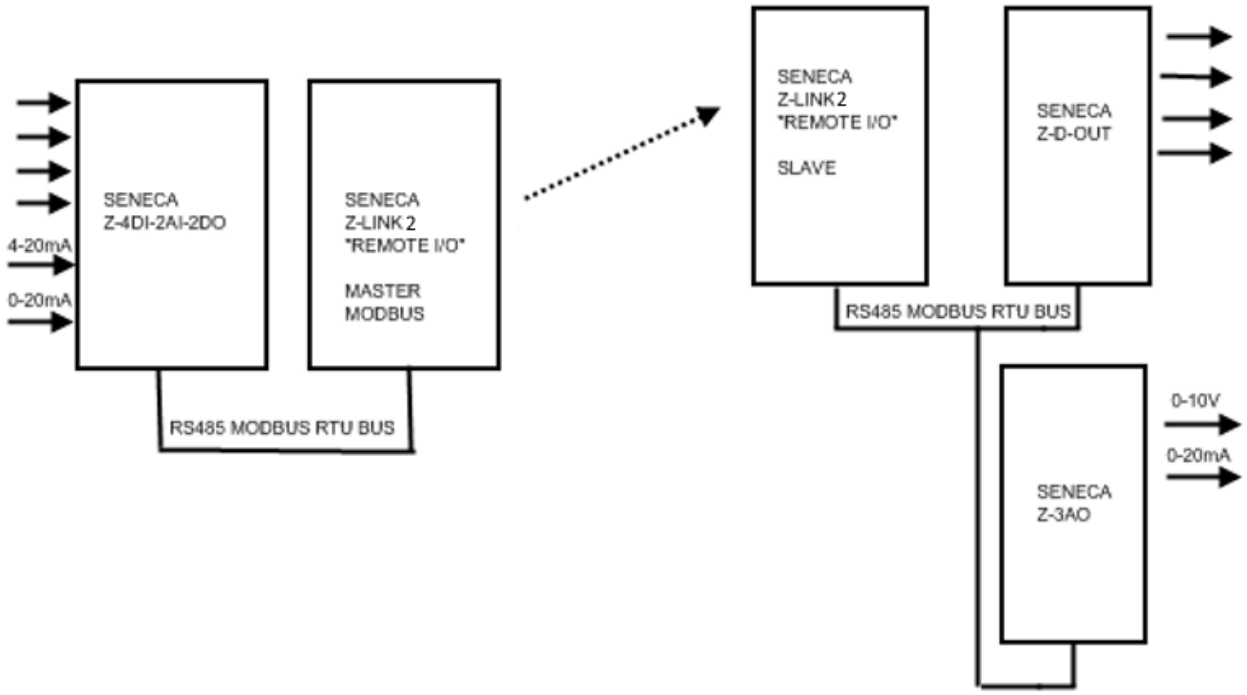
NR1 Seneca Z-4DI-2AI-2DO Station address 1

NR1 Z-DOUT Station 2 address

NR1 Z-3AO Station 3 address

NR2 Z-LINK2-LOs in remote I/O mode

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Digital inputs can be negated before retransmission while analogue measurements can be scaled before retransmission.

The maximum number of digital inputs supported is 20.

The maximum number of analogue inputs/outputs supported is 50.

On the output side a fault condition can be triggered: if there is a fault on the inputs, the outputs can be switched into a programmed safety condition.

ATTENTION!

To use the output fault condition, it is best to connect the inputs to the "Remote I/O Master" and the outputs to the "Remote I/O Slave".

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4.1. SETTING THE Z-LINK2-LO AS "REMOTE I/O MODE"

To configure the device, use the Easy Setup software which can be downloaded from the Seneca website in the Z-LINK2-LO section.

ATTENTION!

Before starting any configuration operation it is necessary to TURN OFF the Master Radio device

For programming you need to:

1) Turn off any Z-LINK2-LO configured as Modbus Master
2) Set the dip switches on Z-LINK2-LO to programming mode and power up the device:



3) connect the USB cable to the PC

The Z-LINK2-LO that will function as Master is called "Remote I/O Modbus Master", while the other Z-LINK2-LOs (connected to slaves) are called "Remote I/O Modbus Slaves".

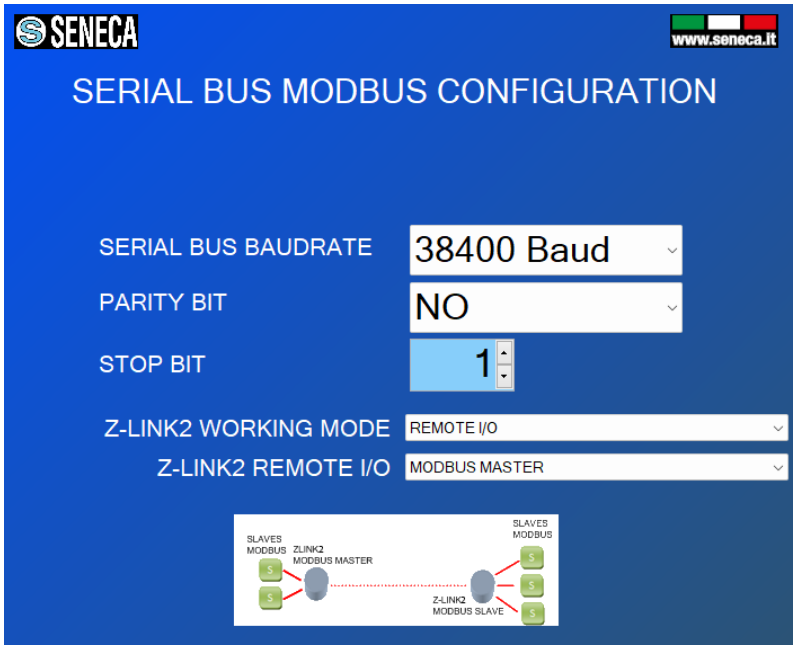
ATTENTION!

ONLY ONE Z-LINK2-LO CAN BE CONFIGURED AS "REMOTE I/O MASTER", ALL OTHERS MUST BE CONFIGURED AS "REMOTE I/O SLAVEs".

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4.1.1. SETTING THE Z-LINK2-LO AS "REMOTE I/O MODBUS MASTER".

1) In the Modbus serial bus configuration section, select the baud rate of the Modbus Master and the working mode:



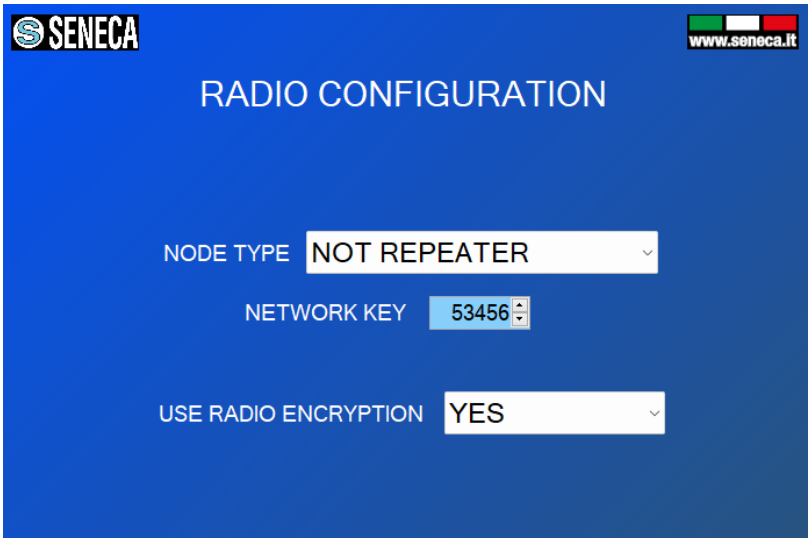
The Z-LINK2-LO acting as Modbus Master is called "Remote I/O Modbus Master".

ATTENTION!

ONLY ONE Z-LINK2-LO CAN BE CONFIGURED AS "MODBUS MASTER", ALL OTHERS MUST BE CONFIGURED AS "MODBUS SLAVEs".

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2) Now that the local bus configuration has been completed, we need to configure the radio:



It is possible to choose if the device is of the repeater type, the network key and if the radio packets are encrypted.
All Z-LINK2-LOs on the same network must have the same network key. If you want to create, for example, 3 parallel networks, you need to create 3 different network keys.

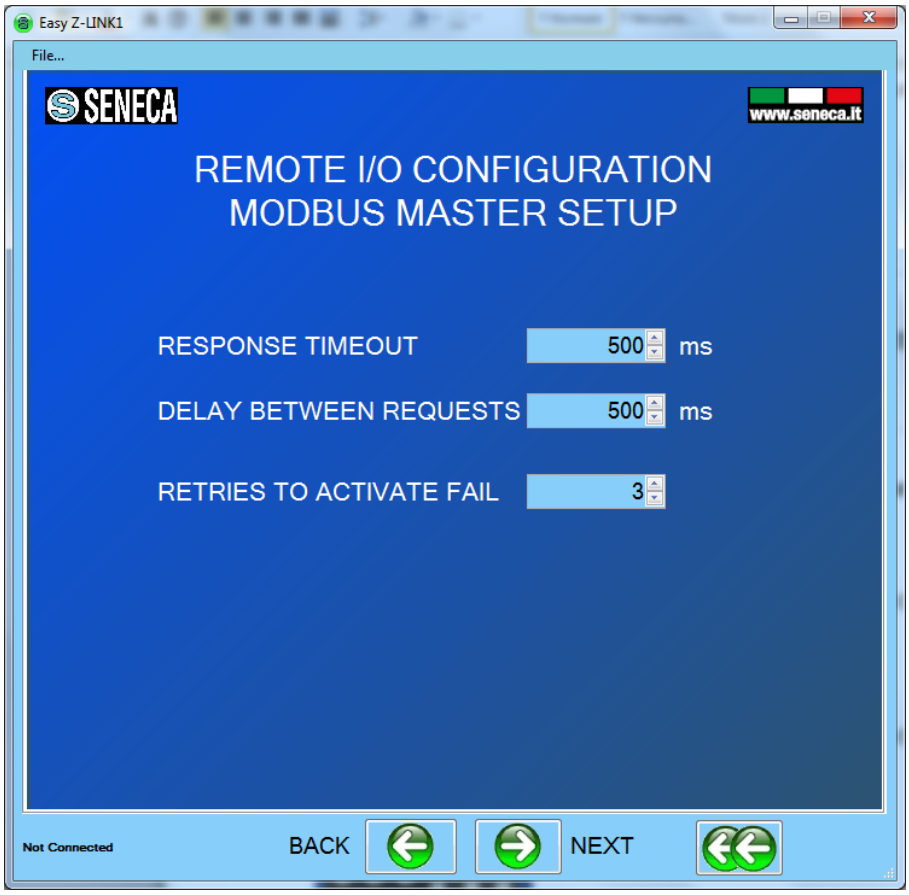
There is no maximum number of parallel networks, but to obtain acceptable performance, the number of 8 networks must not be exceeded.

ATTENTION!

TWO Z-LINK2-LO WITH DIFFERENT NETWORK KEYS CANNOT BE INSERTED INTO THE SAME NETWORK BECAUSE THEY ARE NOT VISIBLE TO EACH OTHER.

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3) Now we need to configure the Modbus Master parameters:



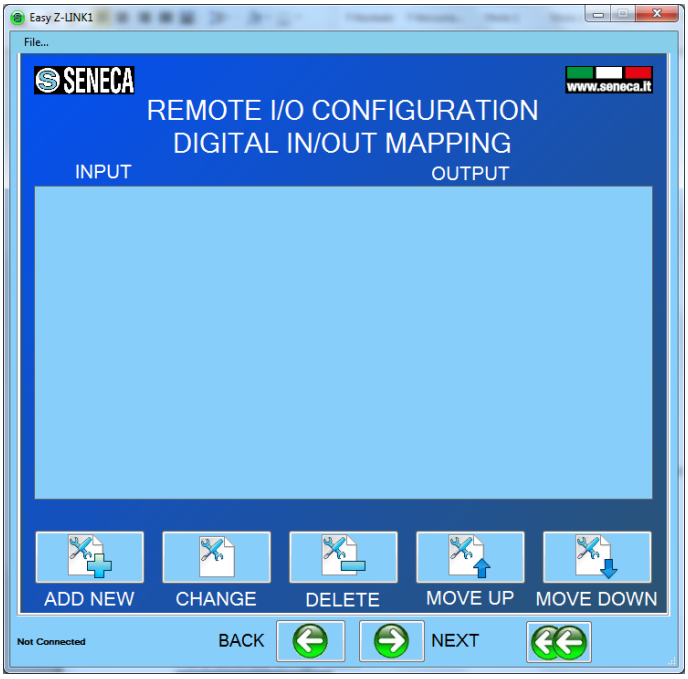
Response Timeout is the time that the master waits to declare a communication timeout (the slave did not respond)

Delay Between Requests is the pause between one query from the master and the next

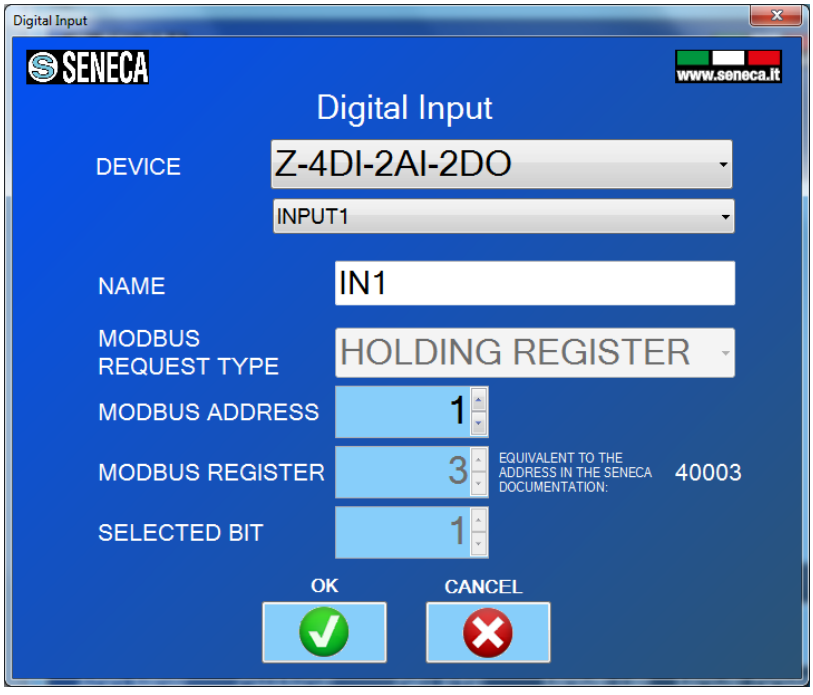
Retries to activate Fail is the number of communication attempts before declaring a fail.

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4) Now let's configure the digital inputs that are to be retransmitted to the digital outputs:

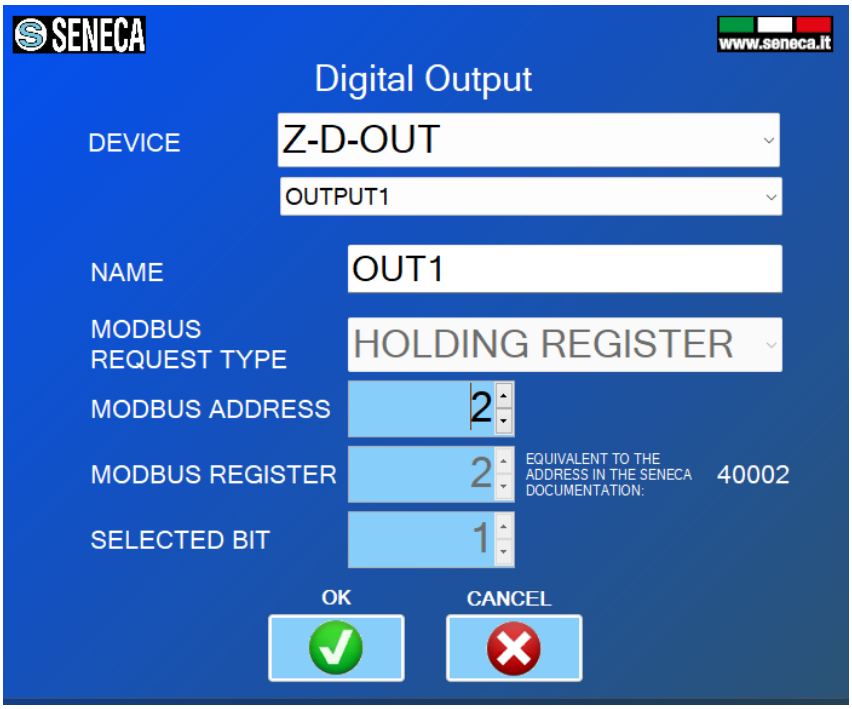


Press "Add new" and select from the internal Seneca database the digital input that must be retransmitted to the output:

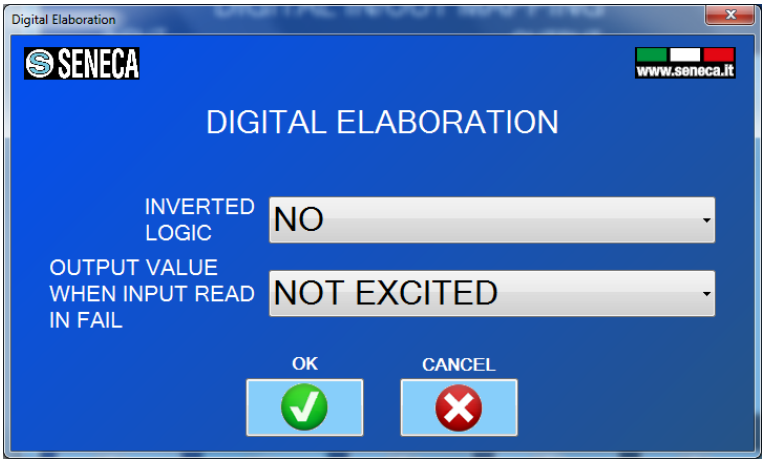


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Then select the digital output that retransmits the digital input:

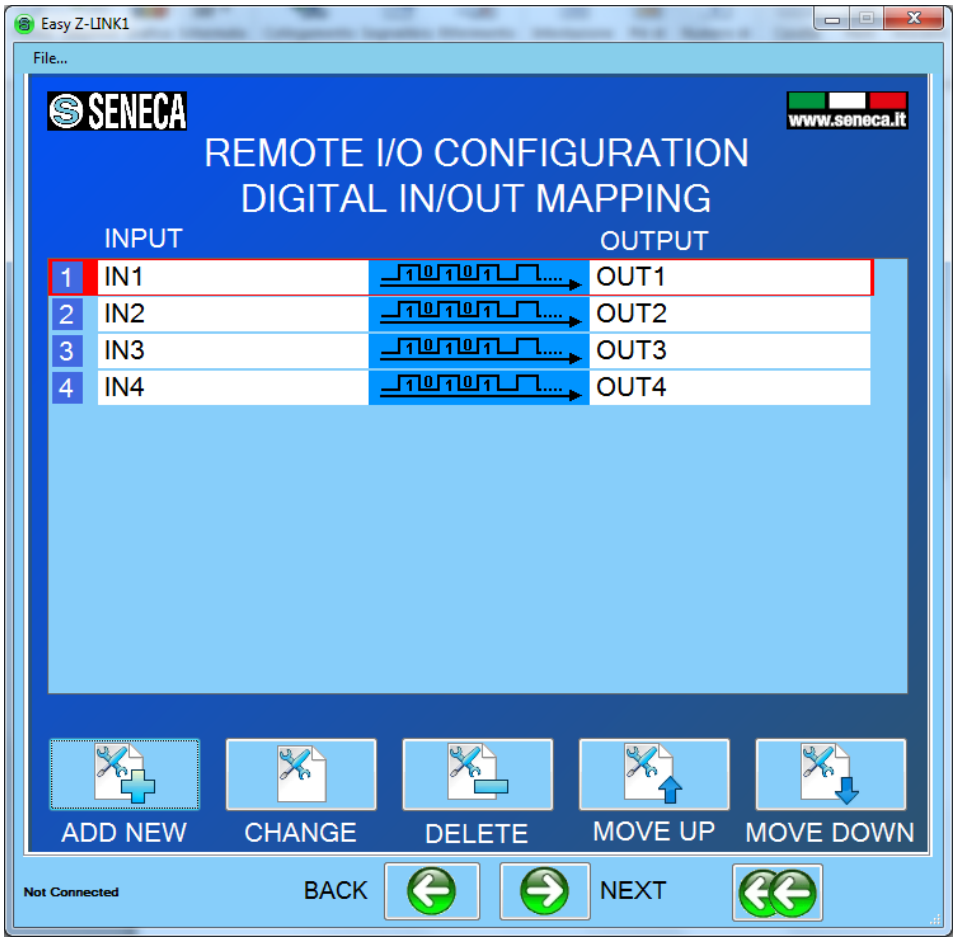


Now select whether you want digital signal processing and what the output value will be if the digital input fails:



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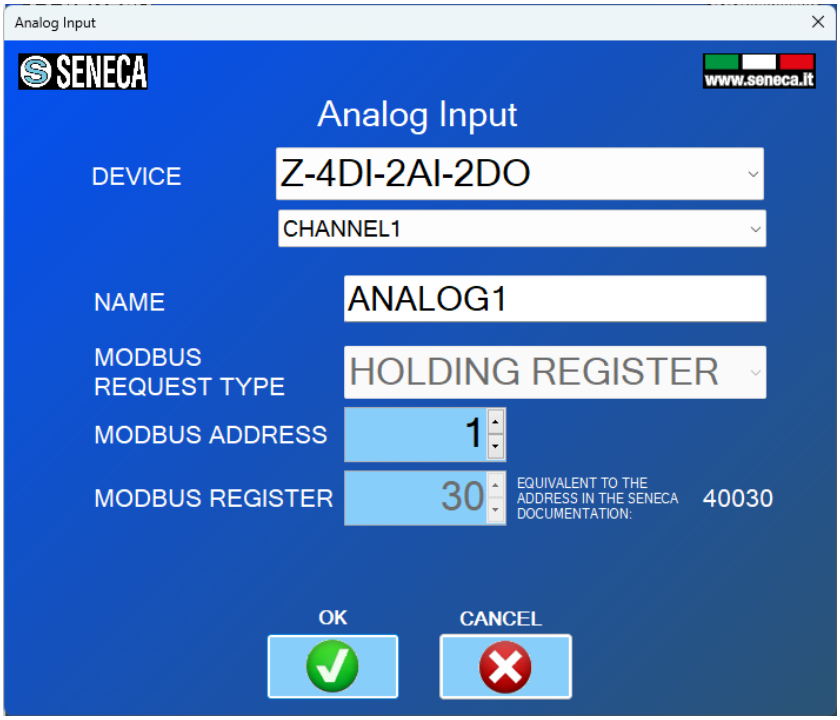
After complete setup, you will see something like this:



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5) Now let's configure the analogue inputs that are to be retransmitted to the analogue outputs:

Press "Add new" and select from the internal Seneca database the digital input that must be retransmitted to the output:

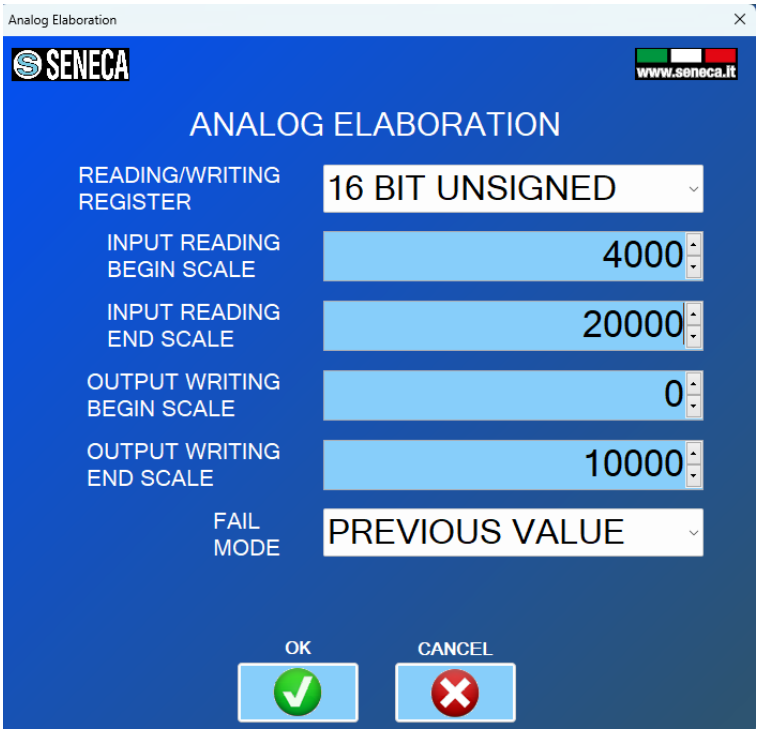


Then select the analogue output that retransmits the analogue input:



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Now select whether you want analogue signal processing and what the output value will be if the digital input fails:



So if you want to scale an input of 4000-20000uA to an output of 0-10000mV you would enter:

Scale start Reading Input = 4000 uA

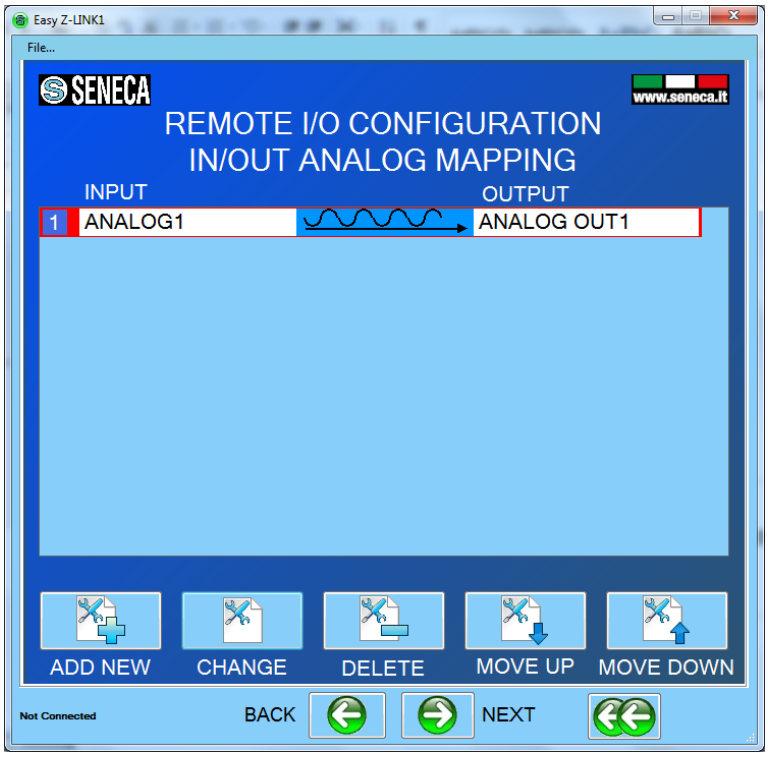
Full Scale Reading Input = 20000 uA

Scale Start Output Writing = 0 mV

Full Scale Writing Output = 10000 mV

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After complete setup, you will see something like this:



6) Once the configuration has been sent to the Z-LINK2-LO, turn off the device and set the dip switches:

   For Z-LINK2-LO "Remote Master I/O":



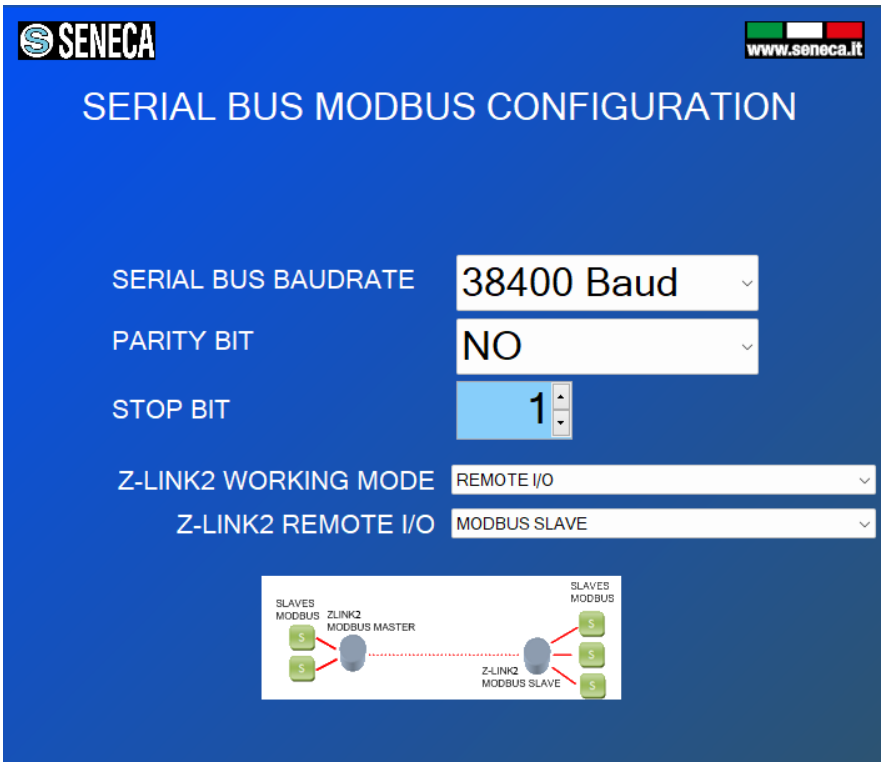
7) Now you can connect Modbus devices via the Rs485 or Rs232 port.
   The RS485 port is available via the 7-8-9 terminal screw or via the IDC10 bus connector.
   The RS232 port is available via the 4-5-6 terminal screw.

   ATTENTION!
   -On an RS485 bus it is possible to connect a maximum number of devices which depends on the manufacturer (typically 32).
   -Only 1 device can be connected on one RS232 port

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4.1.2. SETTING THE Z-LINK2-LO AS "REMOTE I/O MODBUS SLAVE".

1) In the Modbus serial bus configuration section, select the bus baud rate and working mode:



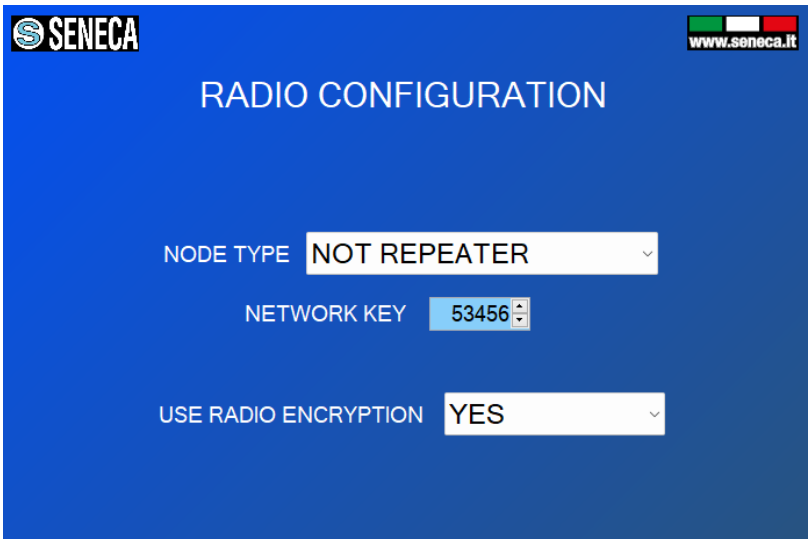
The Z-LINK2-LO acting as Modbus Slave is called "Remote I/O Modbus Slave".

ATTENTION!

ONLY ONE Z-LINK2-LO CAN BE CONFIGURED AS "REMOTE I/O MASTER", ALL OTHERS MUST BE CONFIGURED AS "REMOTE I/O SLAVEs".

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2) Now that the local bus configuration has been completed, we need to configure the radio:



It is possible to choose if the device is of the repeater type, the network key and if the radio packets are encrypted.
All Z-LINK2-LOs on the same network must have the same network key. If you want to create, for example, 3 parallel networks, you need to create 3 different network keys.

There is no maximum number of parallel networks, but to obtain acceptable performance, the number of 8 networks must not be exceeded.

ATTENTION!

TWO Z-LINK2-LOs WITH DIFFERENT NETWORK KEYS CANNOT BE INSERTED INTO THE SAME NETWORK BECAUSE THEY ARE NOT VISIBLE TO EACH OTHER.

3) Once the configuration has been sent to the Z-LINK2-LO, turn off the Z-LINK2-LO and set the dip switches:

For Z-LINK2-LO "Remote I/O Slave":



4) Now you can connect Modbus devices via the Rs485 or Rs232 port.
The RS485 port is available via the 7-8-9 terminal screw or via the IDC10 bus connector.

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The RS232 port is available via the 4-5-6 terminal screw

ATTENTION!
-On an RS485 bus it is possible to connect a maximum number of devices which depends on the manufacturer (typically 32).
-Only 1 device can be connected on one RS232 port

5) Now program all the other Z-LINK2-LOs as "Remote I/O Slaves".

5. MODBUS RTU PROTOCOL

The supported protocol for both RS232 or RS485 ports is Modbus RTU; for more information on this protocol, see the Modbus specification website:

http://www.modbus.org/specs.php

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6. FIRMWARE UPDATE

With a new revision of Easy Setup, Seneca can include new device firmware.

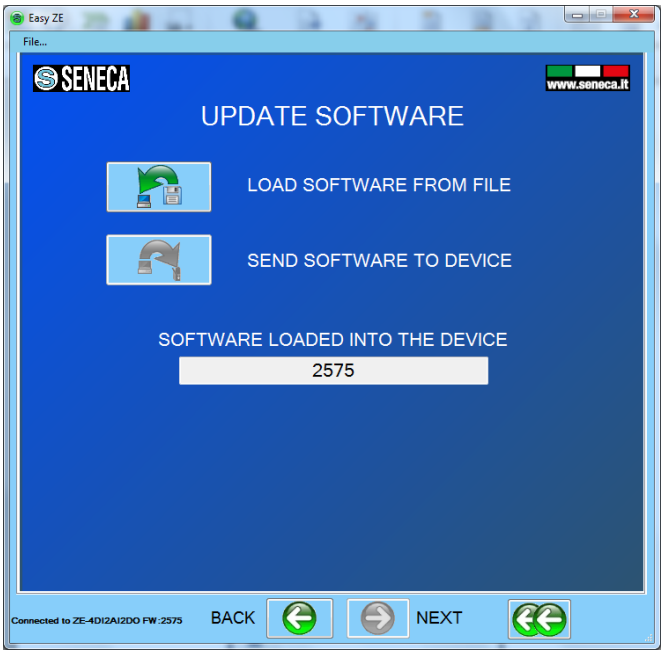
A new firmware update may include new features or bug fixes.

ATTENTION!

Once the firmware update has started, do not turn off the device until the procedure is complete.

Turn on the Z-LINK2-LO device and connect it to the PC using the USB port.

In the configuration menu click on "Software Update":



By pressing the "Load software from file" button, the software will open the firmware directory.

If the revision of the "new software" is more recent than that of the "software in the device", click on "Send the software to the device".

The firmware update takes about 1 minute.

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7. OPERATION DIAGNOSTICS THROUGH LEDS

The device has 3 LEDs:

L1 takes the name of RF-RX/BUS

L2 takes the name of RF-TX

L4 takes the name of RUN

7.1. OPERATION OF THE LEDS ACCORDING TO THE OPERATING MODE

7.1.1. BRIDGE MODBUS MASTER / REMOTE I/O MODBUS MASTER

In this mode, the device must transmit the Modbus RTU protocol both on the RS485/RS232 bus and via radio. Then the RF-RX/BUS led will light up first followed by the RF-TX led.

7.1.2. BRIDGE MODBUS SLAVE / REMOTE I/O MODBUS SLAVE

In this mode, the device receives the Modbus RTU protocol from the radio and transmits it on the RS485/RS232 bus. Then the RF-RX/BUS led will light up, if the slave being interrogated is connected to the bus then the RF-TX led will also light up.

If the node is configured as a Repeater, the RF-TX LED will light up even if there is no slave on the BUS, this because the received radio packet is always re-launched.

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8. TROUBLESHOOTING

PROBLEM	SOLUTION
On the Master side, LEDs L1 and L2 flash, but none of the LEDs flash on the Slave side.	-The Z-LINK2-LO slave side is out of radio range, install the Z-LINK2-LO Slave closer to the Z-LINK2-LO Master. Insert a Z-LINK2-LO in repeater mode halfway. Replace the supplied antennas with external antennas (for further information, see www.seneca.it in the Z-LINK2-LO section). -Check the correct configuration of the dip switches
Bridge mode: On the Master side, LEDs L1 and L2 do not flash.	The Modbus Master does not send packets through the RS232 or RS485 port: -Turn on the external Modbus Master device
On the master side, leds L1 and L2 flash and also on the slave side but there are always communication errors	-The Z-LINK2-LO slave side is out of radio range, install the Z-LINK2-LO Slave closer to the Z-LINK2-LO Master. Insert a Z-LINK2-LO in repeater mode halfway. Replace the supplied antennas with external antennas (for further information, see www.seneca.it in the Z-LINK2-LO section).
Remote I/O mode: I need more than 20 digital inputs to repeat to more than 20 outputs	Create 2 or more parallel networks by changing the network keys of the Z-LINK2-LO

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