

## APPLICATION AND USE



NR9002 is used for regulation of mechanical ventilation units with heat recovery device used to grant a correct air renewal considerably reducing thermal dispersion during winter time and thermal load during summer time with consequent primary energy saving. NR9002 is a digital controller able to manage delivery and discharge fans both three fixed speeds and proportional (0-10V), both with manual and automatic logic (on the basis of air quality or humidity); moreover it allows to manage a post-treatment hydronic battery (2 or 4-pipe) with ON/OFF, 3-point or proportional valves, a pre/reheating battery and a recovery device bypass circuit to perform free-cooling or free-heating on the basis of external and room temperature. NR9002 manages up to 4 aeratic configuration modes depending on the presence and position of the intake, discharge, by-pass and recirculation dampers. NR9002 is endowed with MODBUS (SLAVE) protocol to communicate with the supervisory system and/or other MODBUS (MASTER) devices, so it can be easily integrated in other HVAC system present in the building.

## TECHNICAL CHARACTERISTICS

NR9002 is composed by a M6 module for DIN bar mounting and a remote terminal (NR9002-RT) which can be used to modify the operating conditions.

Power supply:	85-265Vac (isolated, 3W max.);
protection degree:	IP20;
temperature:	2T45°C;
storage temperature:	-25T65°C.

### Inputs

Digital input (DI1):	flow meter;
digital input (DI2):	differential pressure switch;
digital input (DI3):	frost protection thermostat;
digital input (DI4):	controller switch off;
analogue input (S1):	supply sensor temperature;
analogue input (S2):	external temperature sensor;
analogue input (S3):	return temperature sensor*;
analogue input (S4):	quality or humidity air sensor (0-10V).

\* Sensor with sensing element NTC10kOhm @ 25°C.  
Accuracy  $\pm 1K$ ,  $\beta$  @ 25°C = 3435  
(reference Controlli sensor model S4xxA/B and SNTC-XL)

Digital inputs DI1, DI2, DI3 are always active. Input DI4 is not active by default. Power on and power off are remotely managed by default, it means through NR9002-RT sensor or supervisory system. Through a configuration tool (downloadable from [www.controlli.eu](http://www.controlli.eu)), it is possible to set DI4 as active, in this case DI4 will override the power off.

When digital inputs are in use, they have priority both over supervisory system and remote sensor. Activation status (normally open or normally closed) can be configured. Default status (factory settings) are shown in the paragraph "DEFAULT PARAMETERS".

### Outputs

- 4 TRIAC outputs for dampers (if DIP n. 8 OFF) or 3-point, ON/OFF valves (heating and cooling valve if DIP n. 8 ON). Contact rating 24-250V 4A;
- 6 relays outputs to manage the two 3-speed fans (if DIP n. 8 OFF) or of the dampers (if DIP n. 8 ON). Contact rating 24-250V 8A;

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- 2 analogue outputs 0-10V to manage modulating valves (if DIP n. 8 OFF) or of modulating fans (if DIP n. 8 ON);
- 2 Open Collector outputs (OC1 and OC2) with maximum rate of 18mA which can be used to drive external 12Vdc relays with maximum power of 220mW and windings resistance  $\geq 640\Omega$  (Controlli relays modules DGSRMV). The output OC1 drives, through the use of an external relay, the pre-heating and re-heating electrical coil. The output OC2 drives, through the use of an external relay, an electrical optical or acoustic indicator relating to the alarm status of the controller. The functions are described in the paragraph "Controller functions";
- 1 output for remote terminal NR9002-RT connection;
- 1 output for MODBUS connection.

### Directives and Standards

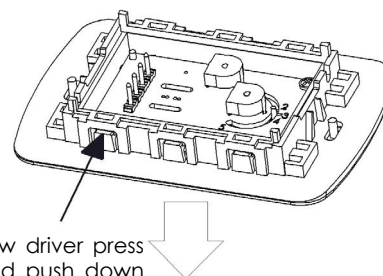
- Standard CEI EN 60730-1 for EMC Directive;
- standard CEI EN 60730-1 and CEI EN-60730-2-9 for LVD Directive.

### MAINTENANCE

The controller is maintenance free.

### INSTALLATION

NR9002 is suitable for DIN rail mounting with quick coupling; the remote sensor (NR9002-RT) is suitable for flush mounting in standard box 503E or for wall mounting on the basis of the model. The supporting frame is compatible with BTicino cover plates Livinglight (square cover) or Living International (round cover) otherwise with Vimar Plana cover plates modifying the supplied supporting frame as shown in the following figure:



Using a screw driver press the snap and push down the removable front part.

Connections shall be in compliance with existing rules and using max 2,5mm<sup>2</sup> cross section wires for J1 and J2 terminals and 1,5mm<sup>2</sup> cross section wires for J3 and J4.

To use wire terminals on power supply wires follow the instructions in order to prevent accidental contacts between cables at different voltages in case of wrong installation.

The main power is fully isolated but we suggest to install a protection device compliant to existing national rules with a 125mA intervention threshold and a minimum 3mm contact opening. The device is not supplied with the product.

## TERMINAL

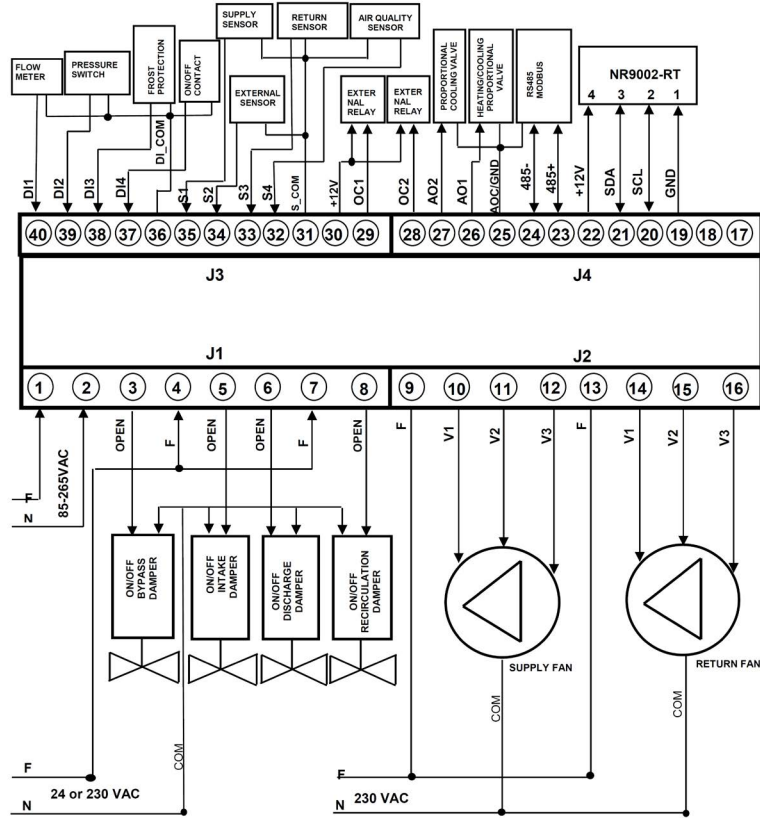
The controller is equipped with pluggable terminals (J1 & J2) 5,08mm pitch for low voltage signals (230Vac) and 3,5mm pitch (J3 & J4) for very low voltage signals. On the basis of the fan control (3 speed if DIP n. 8 OFF or proportional if DIP n. 8 ON), it is possible to identify two different kind of hardware configuration, whose signals are described in the following tables.

### Configuration with DIP n. 8 OFF (3-speed fans, ON/OFF dampers and proportional 0-10V valves)

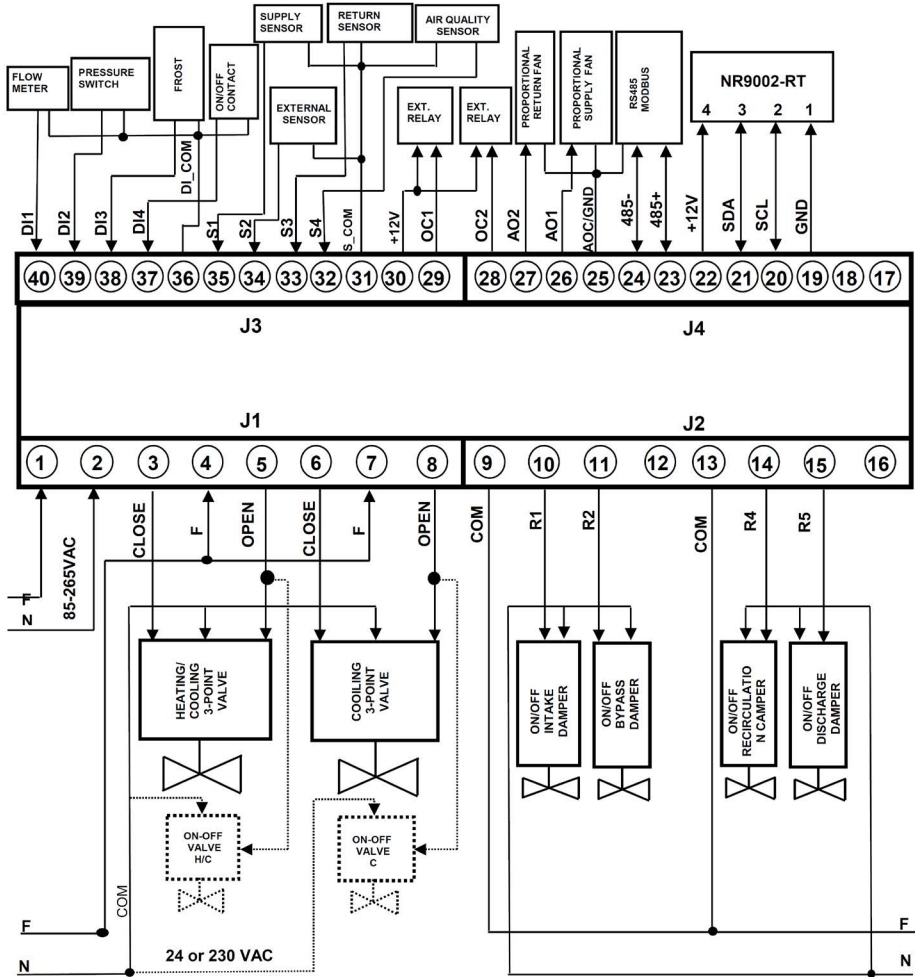
CONN	# pin	Signal	Direction	Type of signal	Description
J1	1	F	input	230Vac line phase	power supply
	2	N		230Vac line neutral	
	3	TRIAC 2	output	24-230Vac TRIAC 4A	bypass damper
	4	COM TR1 TR2	output	24-230Vac TRIAC COM	intake/bypass damper COM
	5	TRIAC 1	output	24-230Vac TRIAC 4A	intake bypass
	6	TRIAC 4	output	24-230Vac TRIAC 4A	expulsion bypass
	7	COM TR3 TR4	output	24-230Vac TRIAC COM	expulsion/recirculation damper COM
	8	TRIAC 3	output	24-230Vac TRIAC 4A	recirculation damper
J2	9	COM R1,2,3	output	24-230Vac COM	R1,R2,R3 COM
	10	R1	output	24-230Vac RELAY 8A	V1 supply fan
	11	R2	output	24-230Vac RELAY 8A	V2 supply fan
	12	R3	output	24-230Vac RELAY 8A	V3 supply fan
	13	COM R4,5,6	not used	24-230Vac COM	R4,R5,R6 COM
	14	R4	not used	24-230Vac RELAY 8A	V1 return fan
	15	R5	not used	24-230Vac RELAY 8A	V2 return fan
16	R6	not used	24-230Vac RELAY 8A	V3 return fan	
J3	40	DI1	input	digital 1-24Vac/dc	flowmeter status
	39	DI2	input	digital 2-24Vac/dc	pressure switch status
	38	DI3	input	digital 3-24Vac/dc	frost protection status
	37	DI4	input	digital 4-24Vac/dc	ON / OFF status
	36	COM DI	input	digital COM	digital input COM
	35	S1	input	analog input	supply temperature sensor
	34	S2	input	analog input	external temperature sensor
	33	S3	input	analog input	return temperature sensor
	32	S4	input	analog input	air H/Q sensor (0-10V)
	31	COM S	input	COM	analogue input COM
	30	OCC	output	COM Open Collector +12V	Open Collector COM (+12V)
	29	OC1	output	Open Collector 1	pre/reheating electrical coil
J4	28	OC2	output	Open Collector 2	alarm lamps
	27	AO1	output	analog output 1	H/C proportional valve (0-10V)
	26	AO2	output	analog output 2	C proportional valve (0-10V)
	25	GND	output	GND	COM (0-10V)/GND
					COM RS485
	24	485-	bidir.	BUS RS485 -	supervisor bus (-)
	23	485+	bidir.	BUS RS485 +	supervisor bus (+)
	22	+12V	output	+12V (NR9002-RT sensor)	+12V (NR9002-RT power supply)
	21	SDA	bidir.	BUS TX (NR9002-RT sensor)	BUS TX (NR9002-RT sensor)
	20	SCL	bidir.	BUS RX (NR9002-RT sensor)	BUS RX (NR9002-RT sensor)
	19	GND	bidir.	GND (NR9002-RT sensor)	GND (NR9002-RT sensor)
	18			not used	
17			not used		

CONN	# pin	SIGNAL	DIRECTION	TYPE OF SIGNAL	DESCRIPTION
J1	1	F	input	230Vac line phase	power supply
	2	N	input	230Vac line neutral	power supply
	3	TRIAC 2	output	24-230Vac TRIAC 4A	close heating/cooling valve
	4	COM TR1 TR2	output	24-230Vac TRIAC COM	heating/cooling valve COM
	5	TRIAC 1	output	24-230Vac TRIAC 4A	open heating/cooling valve
	6	TRIAC 4	output	24-230Vac TRIAC 4A	close cooling valve
	7	COM TR3 TR4	output	24-230Vac TRIAC COM	Cooling valve COM
	8	TRIAC 3	output	24-230Vac TRIAC 4A	open cooling valve
J2	9	COM R1,2,3	output	24-230Vac COM	common R1,R2,R3
	10	R1	output	24-230Vac RELAY 8A	intake damper
	11	R2	output	24-230Vac RELAY 8A	bypass damper
	12	R3			
	13	COM R4,5,6	output	24-230Vac COM	common R4,R5,R6
	14	R4	output	24-230Vac RELAY 8A	recirculation damper
	15	R5	output	24-230Vac RELAY 8A	discharge damper
	16	R6			
J3	40	DI1	input	digital 1-24Vac/dc	flow meter status
	39	DI2	input	digital 2-24Vac/dc	pressure switch status
	38	DI3	input	digital 3-24Vac/dc	frost protection status
	37	DI4	input	digital 4-24Vac/dc	ON/OFF status
	36	COM DI	input	digital COM	common digital inputs
	35	S1	input	analog input	supply temperature sensor
	34	S2	input	analog input	external temperature sensor
	33	S3	input	analog input	return temperature sensor
	32	S4	input	analog input	humidity/air quality sensor (0-10V)
	31	COM S	input	COM	common analogue inputs
	30	OCC	output	COM Open Collector +12V	common Open Collector (+12V)
	29	OC1	output	Open Collector 1	electrical pre/post-heating coil
J4	28	OC2	output	Open Collector 2	alarm LEDs
	27	AO1	output	uscita analogica 1	supply proportional fan (0-10V)
	26	AO2	output	uscita analogica 2	proportional return fan (0-10V)
	25	AOC/485	output	GND	common (0-10V)/GND
		GND			common RS485
	24	485-	Bidir	BUS RS485 -	supervisory system BUS (-)
	23	485+	Bidir	BUS RS485 +	supervisory system BUS (+)
	22	+12V	output	+12V (NR9002-RT sensor)	+12V (NR9002-RT sensor power supply)
	21	SDA	Bidir	BUS TX (NR9002-RT sensor)	BUS TX (NR9002-RT sensor)
	20	SCL	Bidir	BUS RX (NR9002-RT sensor)	BUS RX (NR9002-RT sensor)
	19	GND	Bidir	GND (NR9002-RT sensor)	GND (NR9002-RT sensor)
	18	not used			
17	not used				

Dip n. 8 OFF: proportional valves. In case of 2-pipe plants the only vale (3-point or ON/OFF) is connected on the heating output.



Dip n. 8 ON: 3-point or ON/OFF valves. Nel caso di impianti a 2 tubi l'unica valvola presente (3 punti oppure ON/OFF) è collegata sull'uscita del caldo.



## OPERATION

The controller operates through the parameters stored inside which can be modified using the remote sensor NR9002-RT or through the supervisory system (MODBUS protocol). The remote sensor NR9002-RT allows to set and visualize the following parameters:

- power on (label ON). Read/write parameter;
- power off (label OFF). Read/write parameter;
- fan speed (label F1,F2,F3,FA). Read/write parameter;
- supply set (label StP). Read/write parameter;
- air quality set (label StH). Read/write parameter;
- Summer/Winter changeover (label El). Read/write parameter;
- return temperature set (label tr). Read-only parameter;
- external temperature sensor (label tE). Read-only parameter;
- supply temperature sensor (label tP). Read-only parameter;
- humidity or air quality sensor (label SH). Read-only parameter;
- alarms (label Err). Read-only parameter.

All the other parameters can be modified only through supervisory system or a dedicated configuration tool.

The controller can operate also without NR9002-RT and supervisory system (MODBUS).

In this configuration the parameters can be modified only through the use of a dedicated configuration tool.

### System configuration

The system can be configured as stand alone (controller and remote terminal without supervisory system) or via MODBUS.

For the MODBUS connection refer to the paragraph "MODBUS-RS485 CONNECTION".

### Controller configuration

NR9002 can manage the following configuration schemes which can be set through the DIP switches (look also at DIP switch description):

- configuration type 1: configuration without dampers;
- configuration type 2: configuration with intake damper and possible bypass on intake;
- configuration type 3: configuration with discharge damper and possible bypass on discharge;
- configuration type 4: configuration with recirculation, intake and discharge damper.

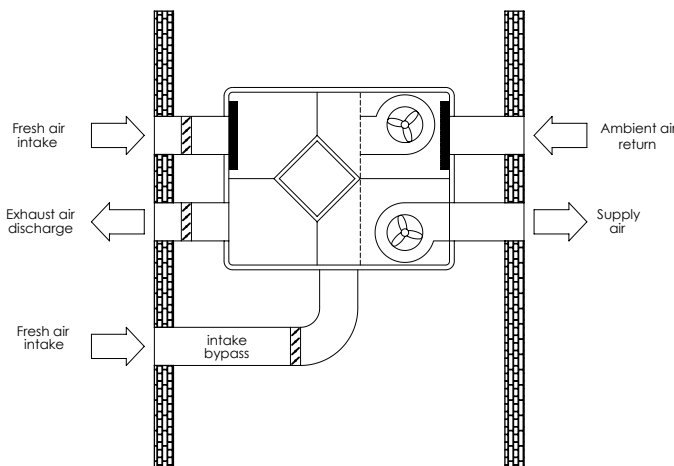
Configurations are described in the following paragraphs.

#### Configuration type 1

Aerualic configuration without dampers; outputs which drive them are not managed. Regulation intervenes only on fans management.

#### Configuration type 2

Aerualic configuration with intake, discharge damper and by-pass damper of the recovery device on the intake side.



#### Dampers Logic of Management:

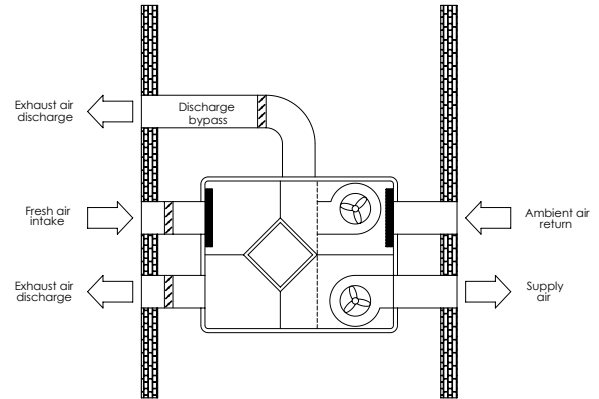
During normal operation intake and discharge dampers are open and the bypass damper is closed.

If the controller is powered off or the flowmeter has intervened, all dampers will be closed.

If the free-cooling is enabled, the intake damper will be closed, while the bypass and, if present, the discharge dampers will be open. If the bypass is integrated in the recovery device the intake damper will be open. If the frost protection thermostat has intervened the intake and the bypass dampers will be closed, while, if present, the discharge damper will be open.

#### Configuration type 3

Aerualic configuration with discharge, intake and recovery device bypass damper on discharge side.



#### Dampers Logic of Management:

During normal operation intake and discharge dampers are open and the bypass damper is closed.

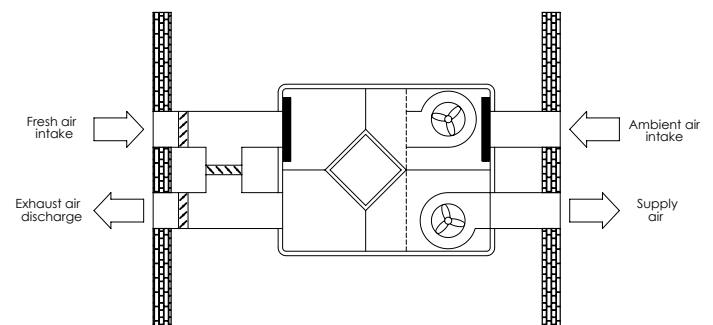
If the controller is powered off or the flow meter has intervened, all the dampers will be closed.

If the free-cooling is enabled the discharge damper will be closed, while the bypass and, if present, the intake dampers will be open. If the bypass is integrated in the recovery device, the discharge damper will be open.

If the frost protection thermostat has intervened the bypass and, if present, the intake dampers will be closed, while the discharge damper will be open.

#### Configuration type 4

In this configuration intake, discharge and recirculation damper are present.



During normal operation intake and discharge dampers will be open while the recirculation damper will be closed.

If the controller is off or the flowmeter has intervened, all the dampers will be closed.

Free-cooling is not expected.

If the frost protection thermostat has intervened, intake and discharge dampers will be closed and the recirculation damper will be open.

### Power On and Power Off

Controller NR9002 can be powered on and powered off in two ways:

1. "local" power on and power off through digital input DI4 by controller.
  - open contact = controller on;
  - closed contact = controller off.
2. "remote" power on and power off through MODBUS communication or NR9002-RT sensor.

The choice is made through the configuration tool. Power on and power off are "remotely" managed by default.

### Fan Management

Ventilation can be managed automatically or manually by the controller. Ventilation is automatic if the humidity or air quality sensor is present, otherwise it is manual. Usually supply and return fan have the same speed.

Two different type of fans can be managed (check at DIP n. 8 status):

1. proportional fans: they are managed by 0-10V outputs (DIP n. 8 ON);
2. 3-speed fans: they are managed by relays (DIP n. 8 OFF).

The fans choice defines the actuators for the control valves of the after-treatment coil (if present).

If ventilation is proportional, the after-treatment valves will be 3-point or ON/OFF and controlled by TRIAC outputs.

If ventilation is 3-speed fans, the after-treatment valves will be proportional and controlled by 0-10V outputs.

### Automatic Ventilation

Automatic ventilation is signalled by the FA label (Fan Auto), shown on the NR9002-RT sensor or in a parameter of the MODBUS communication. In this way the speed will be determined by a loop (P+I) which defines the percentage value (0-100%) and transformed in a 0-10V signal. Loop parameters are:

- humidity or air quality set (% value);
- proportional band;
- integration time.

When ventilation is automatic, through NR9002-RT sensor or the MODBUS communication it is possible to temporarily override a different speed. When the override time has elapsed regulation is automatic again; time is a changeable parameter.

In case of proportional fans the loop output value will define a particular speed.

In case of 3-speed fans, the default intervention thresholds (modifiable) are the following:

- speed 1 enabled → lower loop threshold = 33%
- speed 2 enabled → medium loop threshold = 66%
- speed 3 enabled → higher loop threshold = 100%

### Manual Ventilation

Through the NR9002-RT sensor or the MODBUS communication it is possible to enable the desired speed by setting the values 1, 2, 3.

In case of 3 fixed speed fans the number set will define the respective fan speed.

In case of proportional fans a correspondence between the speed set and the relating operation proportional value of the fans.

It will be necessary to set the following value:

- lower speed (value 33% modifiable) → speed 1
- medium speed (value 66% modifiable) → speed 2
- higher speed (value 100% modifiable) → speed 3

### Fan Override

If the plant is powered off or the flow meter has intervened, both fans will be stopped.

If the frost protection thermostat has intervened, fans will be subjected to override of their normal operation:

- if the aeraulic plant is configured with recirculation, the supply fan will be stopped for a preset time (modifiable); when this time has elapsed the speed will be again the same of the return fan;
- for other aeraulic configurations the supply fan will be stopped and the return fan will have the maximum speed as long as the frost protection thermostat will be enabled;
- if the pre-heating coil is present, fans will not be subjected to any override.

### Free Cooling/Heating

To manage the free cooling/heating the external temperature sensor and the intake temperature sensor (used as reference for the room temperature) must be present.

Two events are possible:

1. if post-heating coils for primary air treatment are not present or if they are present and the plant is 4-pipe, the free cooling will be managed automatically: bypass is active if return temperature is out of comfort temperature range (it can be set) and the external temperature is in the same range of values;
2. if post-heating coils for primary air treatment are present and the plant is 2-pipe, the free cooling is managed on the basis of the season defined by the summer/winter changeover (E/I):
  - during summer bypass on if external temperature is lower than the room temperature;
  - during winter bypass on if external temperature is higher than room temperature.

### Cooling/Heating Coils (After Treatment Air)

It is possible to manage the cooling/heating after treatment coils by conditioning the primary air which will be sent to the room. The controlled parameter is carried out by the supply temperature sensor. The control signal is defined by a heating P+I loop and by a cooling loop P+I.

Loop parameters are:

- supply temperature set;
- proportional band;
- dead zone;
- integration time.

Valves will be closed if the controller is off or if the flow meter or the frost protection thermostat have intervened. Actuators which can be managed depend on fans configuration:

- if ventilation is with 3-speed fans, it will be possible to manage a proportional actuator with 0-10V control signal;
- if ventilation is proportional (0-10V), it will be possible to manage a 3-point or ON/OFF actuator.

In case of 3-point actuator initial positioning to close the valves will be carried out at each switch on.

Three configuration are possible:

- **No coil:** no post-treatment coil management;
- **2-pipe plant with seasonal changeover:** if the plant is off or the flow meter has intervened, heating/cooling coils are closed. Otherwise during summer operation cooling loop will be enabled, while during winter operation heating loop will be enable.

If ventilation is 3-speed relay controlled, the heating/cooling coil (proportional) is controlled by an analogue output AO1 (0-10V). If ventilation is proportional, the heating/cooling coil is controlled by TRIAC1 and TRIAC2 output if there is a 3-point actuator, otherwise by TRIAC1 if the actuator is ON/OFF. The set is relating to the heating loop during winter and to cooling loop during summer. Seasonal changeover can be carried out by NR9002-RT sensor;

- **4-pipe plant:** if the plant is off or the flow meter has intervened, heating and cooling coils are closed, otherwise heating/cooling loop will be enabled.

If ventilation is 3-speed controlled by relays, the heating/cooling coils will be proportional and controlled through the analogue output AO1 (0-10V) for heating loop and through the analogue output AO2 (0-10V) for cooling loop.

In case of proportional ventilation, if the actuator is 3-speed, the heating/cooling coil will be controlled by TRIAC1 and TRIAC2 outputs for heating loop, and by TRIAC3 and TRIAC4 outputs for cooling loop; if the actuator is ON/OFF the coil will be controlled by TRIAC1 for heating loop and by TRIAC3 for cooling loop.

The set corresponds to the starting of the heating action, while the set of the cooling action is determined by the set + dead zone.

### Electric Coils

NR9002 can manage a pre-heating or post-heating electric coil.

**Pre-heating electric coil:** it is used to save the recovery device from icing. Pre-heating electric coil is enabled when frost protection thermostat has intervened.

**Post-heating coil:** in case of absence of the pre-heating coil, it is possible to enable a post-heating coil. The post-heating coil is used as an alternative or in parallel with the hydronic heating coil to heat the supply air through a ON/OFF regulation loop.

### Flow meter

If the flow meter does not reveal the air movement, after some time (fixed) a light signalling alarm will be activated. If the controller is off, no alarm will be enabled.

### Differential Pressure Switch

If the pressure switch reveals an overpressure (dirty filter), after some time (fixed) a light signalling alarm will be activated. If the controller is off, no alarm will be enabled.

### Alarm Signal

Alarms are signalled on output OC2 of the controller (Open Collector output) and they can be identified and visualized through the remote sensor, if present, or through supervisory system. The following alarms/errors and relating code errors can be identified:

Display visualization NR9002-RT	Alarm
1	Supply sensor
2	External sensor
4	Room sensor
8	Q/H sensor
16	Frost Protection thermostat
32	Flow meter
64	Differential pressure switch
128	NR9002-RT sensor communication

In case of multiple alarms a value equal to the sum of the single alarms detected will be visualized.

## SUPERVISORY SYSTEM

The following devices, which implements a MODBUS-RTU (master) protocol, can be used as supervisory systems:

- tool "Configuratore NR9002" downloadable from [www.controlli.eu](http://www.controlli.eu);
- Multinet, Micronet View or Touch Screen GT series can be used on demand getting in touch with our Technical Dept. It is possible to connect up to 48 controllers.

### MODBUS - RS485 connection

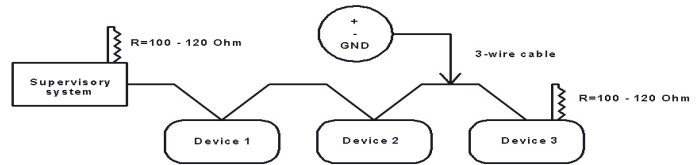
RS485 network is carried out using a three conductors cable, which will be identified from now on by "+" (pin 23), "-" (pin 24) and "GND" (pin 25). For wiring Belden® cable, model 8762 is recommended. In particularly "disturbed" room Belden® cable, model 3106A is recommended by connecting the twisted couple respectively to "+" and "-" signal, the reference to GND and the shield to the ground.

As an alternative a cable with the following electric and mechanical characteristics can be used:

- AWG20/22;
- characteristic impedance of 120Ω;
- "stranded" twisted copper conductors;
- braid shield and insulation protection.

The shield must be connected to the GND signal (pin 25) of the controller.

The network must be wired just on the basis of the "daisy chain" theory described here following (the device consists of just one RS485 port). No star connection is allowed.



### Connections warnings

For proper network cabling is recommended to take the following precautions:

1. Do not use different types of cable to achieve the same network, but always use only the same type of cable;
2. The network cable carries out safety voltage signals (SELV) and must not be wired together with dangerous voltage signals (eg 230V) or carriers of high currents, especially if in alternating current. Also avoid parallel paths to these power cables;
3. Wire the cable lying avoiding kinks, narrow bending radii and unnecessary wrapping in hanks or skeins;
4. Do not twist the cable cord around the power conductors and, if they should cross, consider an intersection at 90° between the cable and these conductors;
5. Keep away from sources of electromagnetic field in particular by large motors, electrical cabinet, reactors for neon, all types of antennas;
6. Do not pull the power cable exceeds 110 N (11.3 kg) to prevent ironing;
7. Assess in advance the route so that it will be as short as possible and note addresses of connected instruments with particular reference to its location in the orderly sequence. This can be very useful in maintenance; we recommend to note the Modbus Address on the product label.
8. Do not reverse the polarity "+" and "-" of the connection terminals;
9. Avoid short lengths of cable terminations in connection tools to make a maintenance without tearing or flues of the cables possible;
10. Identify start and ending terminations and avoid cuts "open";

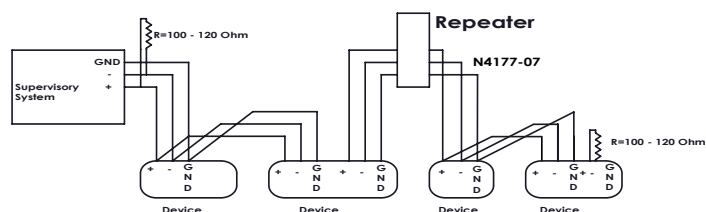
## Terminating transistors and network polarization

The slow rate control, mutual function in our 485 transceiver and the limited baud rate to 9600 baud make the terminating resistors not necessary.

RS485 network needs of polarization typically in charge of the master device; the controller doesn't have polarization resistors.

The transceiver used by the controller allows to drive up to 256 points. RS485 standards require a maximum length of 1200 m and / or 32 devices on the network.

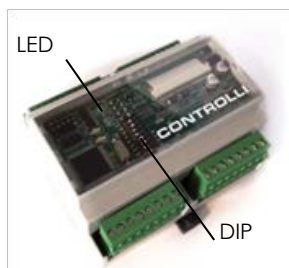
It should be noted that more limits are exceeded, higher is the probability that problems in communication arise. The phenomenon is not systematic and may not occur. Conversely, in case problems should arise and none of the points mentioned in this paragraph has solved them, it is recommended to connect a repeater (CONV-RS485-RIP), as shown in the picture below:



N.B.: Connect the repeater if cables length exceeds 1200m or if devices are more than 32.

## DIP SWITCHES AND LEDS

The controller has 1 switch with 8 DIP, which can be easily reached removing the upper cover, and 2 LEDs to identify the power on status (GREEN LED ON) and errors (RED LED ON or BLINKING).



For any DIP setting change it is necessary to power off and power on again the controller.

DIP switches are described in the figure and table below:



DIP	DESCRIPTION
1	Aeraulic configuration
2	Aeraulic configuration
3	Q/H sensor
4	H/C post-heating coil
5	2/4-pipe
6	ON/OFF - 3-point actuators
7	Electric pre-heating coil
8	3-speed/proportional ventilation

DIP	DESCRIPTION	OFF	ON
1	Aeraulic configuration	Look at the following table	
2			
3	Air quality sensor	Absent	present
4	H/C post-heating coil	Absent	Present
5	2/4-pipe plant	2	4
6	ON/OFF - 3-point actuators *	3-point	ON/OFF
7	Electric pre-heating coil	Absent	Present
8	3-speed/proportional ventilation	3-speed	proportional

\* enabled for porportional fan

TABLE A	DIP1	DIP2	DESCRIPTION
Configuration type 1	OFF	OFF	Without damper
Configuration type 2	ON	OFF	Bypass on intake
Configuration type 3	OFF	ON	Bypass on discharge
Configuration type 4	ON	ON	Recirculation damper

The controller is supplied with all DIP OFF.

## LEDs functionalities

LED functionality is described in the below table:

RED LED	GREEN LED	DESCRIPTION
OFF	OFF	Controller OFF
ON	ON	Controller alarm (look at alarm description)
BLINKING	ON	Remote sensor connection failed
OFF	ON	Controller ON



## DEFAULT PARAMETERS

The controller is supplied with all DIP switches OFF (2-pipe, MODBUS 1 address, proportional valves and 3-speed fan) and with regulation parameters described in the following table. Controller parameters can be seen and set through the configuration tool.

Controller configuration depends on DIP setting described in the previous table and with the parameter "status word" PSW2 defined through the configuration tool or the supervisory system.

### Description PSW2

BIT	Description	OFF (0)	ON (1)	NOTE	Default
0	Power on/power off	Local	Remote	Local = input DI4	Remote
1	Electric post-heating	Absent	Present	Electric pre-heating coil absent	Absent
2	Free-cooling (bypass)	Absent	Present		Absent
3	Bypass integrated in recovery device	Absent	Present		Absent
4	Not used				
5	Not used				
6	Not used				
7	Not used				

The remote sensor is automatically configured on the basis of the controller configuration.

### Remote sensor "status word" parameter

The following configuration is sent by the NR9002-RT and it is obtained from PSW1 and PSW2.

VALUE	DESCRIPTION	OFF (0)	ON (1)	DEFAULT
0	Q/H Sensor	Absent	Present	Absent
1	Cooling/heating post coil	Absent	Present	Absent
2	ON/OFF by remote	Disabled	Enabled	Disabled
3	Physical bypass	Disabled	Enabled	Disabled
4	2/4-pipe plant	2-pipe	4-pipe	2-pipe
5	electric post-heating	Absent	Present	Absent

## SUITABLE SENSORS

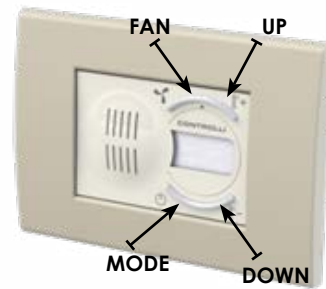
With the default configuration the product can be used with the remote sensor NR9002-RT. In this configuration on remote terminal only the following label will appear: F1, F2, F3, ON, OFF and Err (look at next page).

In case of use of additional functions, use sensors with the characteristics indicated in the table below:

FUNCTION	DEFAULT	ENABLE THROUGH	USED SENSORS	CONTROLLI SENSORS
H/C Post -heating hydronic coil	Absent	DIP #4	NTC 10K B 3435 sensor	SNTC-xL
Pre-heating electric coil	Absent	DIP #7	ON-OFF frost protection thermostat	
Electric post-heating coil	Absent	Supervisory system (with DIP #7 in OFF)	NTC 10K B 3436 sensor	SNTC-xL
Q/H sensor	Absent	DIP #3	Transmitters 0-10V	TQ-x31
Free-cooling	Absent	Supervisory system	NTC 10K B 3435 sensor (for external and return temperature)	SNTC-xL

## NR9002-RT REMOTE SENSOR

Remote sensor has 4 buttons and a 3-digit LCD display.



The FAN button allows the management of the fan speed (manual or automatic) (label F1, F2, F3, FA).

The MODE button allows the management of the following parameters:

- controller power on by remote (label ON);
- power off by remote (label OFF);
- supply temperature set (label StP);
- air quality set (label StH);
- S/W changeover setting (label El);
- return sensor reading (label tr);
- external temperature reading (label tE);
- supply sensor reading (label tP);
- humidity or air quality sensor reading (label SH);
- alarms status reading (label Err).

UP and DOWN buttons allow to modify and visualize parameters managed by the MODE button.

It is possible to set the value of the MODBUS address (label Add) of the connected controller through pushing the MODE button at least 10s when the sensor is OFF.

The remote sensor NR9002-RT is equipped with a two-color LED to identify the following status:

FUNCTION	RED LED	GREEN LED
Alarm	ON blinking	OFF
Bypass	ON	OFF
Powered on	OFF	ON
Powered off	OFF	ON blinking

### Navigation menu

Navigation menu of the remote sensor is shown in the figure at the next page. In case post-heating coil is not present, thus supply set will not be necessary and the remote sensor will display the fan speed. In case the post-heating coil is present, the remote sensor will display the supply set.

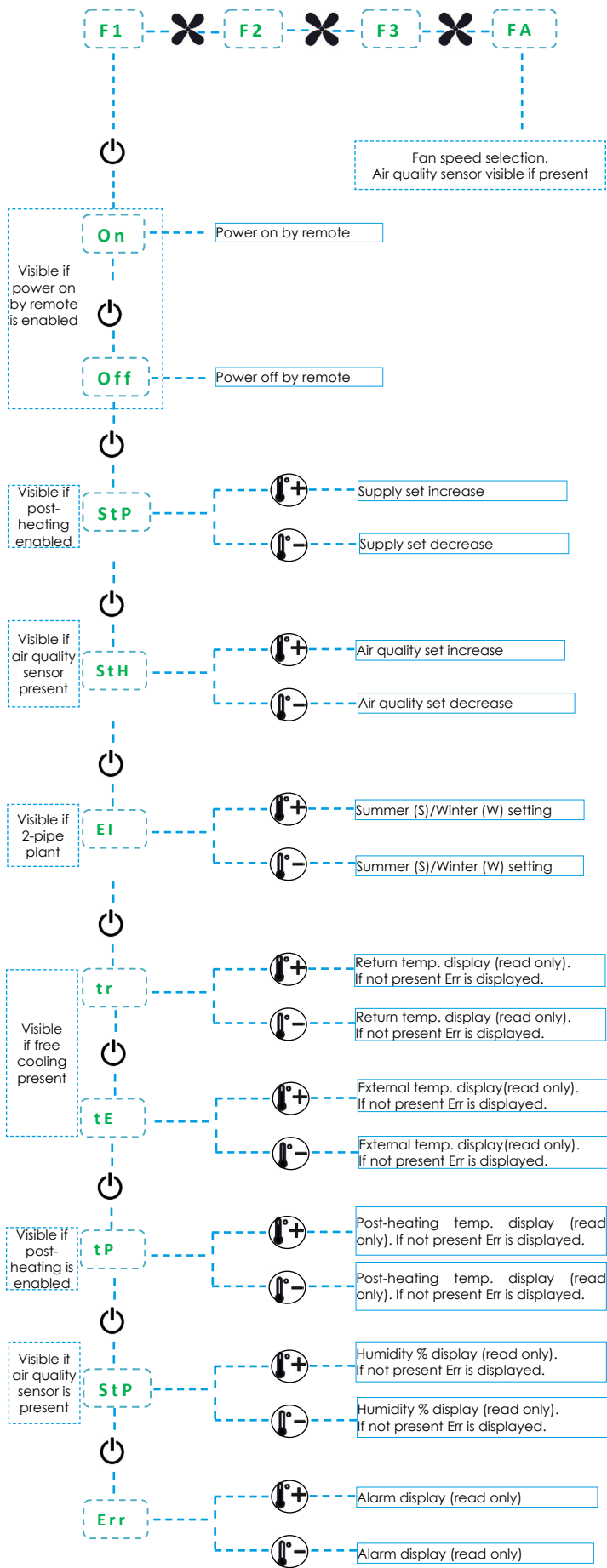
Depending on the controller configuration (look at controller "status word" parameter), the parameters will be displayed on the remote sensor only if they will be managed and used. All functionalities are enabled by default.

### Connection warnings

NR9002-RT sensor is connected to the controller through 4 wires, two for +12V power supply (pin 4 of the NR9002-RT sensor) and +GND (pin 1 of the NR9002-RT sensor) and two for data transmission (pin 2 and 3). Refer to the connection scheme.

For wiring Belden® cable model 9502 is recommended (two couples, one for power supply and one for transmission) and connect the shield to the controller GND signal.

For wiring use a max distance of 30m.



## DIMENSIONS [mm]

