

## DIGITROLL 7000

MODEL	DESCRIPTION
NR 7312	Microprocessor controller for two-pipes fan coils with motorised valve MVA41/42.
NR 7314	Microprocessor controller for four-pipes fan coils with motorised valves MVA41/42.
NR 7412	Microprocessor controller for two-pipes fan coils with motorised valve MVT4.
NR 7414	Microprocessor controller for four-pipes fan coils with motorised valves MVT4.



Operation diagrams

### APPLICATIONS AND USE

NR controllers are used in air-conditioning systems controlling room temperature by fan coils.

### OPERATION

Controllers have been designed to operate in connection with the Control Unit NC7311. Each Control Unit can control up to 160 controllers. The connection is polarised and performed through a line consisting of two shielded wires. The following operating parameters may be set from the Control Unit:

- set point in COMFORT mode (W) = 11.0... 29.0 °C
- dead zone (Xz) = 0... 6 K
- bidirectional actuators stroke time adjustable from 48 to 480 s for both cool and heat
- control type = P or P + I
- integrator rescheduling time = 1 to 30 sec for both cool and heat.
- proportional band = 0.8... 7.2 K (it may be set from Trimmer 1-see the positioning on Dimensions drawing)
- summer and winter compensation
- summer/winter change-over
- enable to cooling in UNOCCUPIED mode
- general enables to heating and cooling
- operating mode (COMFORT mode, UNOCCUPIED Mode, Anti-Frost Mode)
- daily and weekly change-over schedules, bank holidays and holiday periods schedules.

Integrator rescheduling time amounts to 1/10 of integration time

### Set Point

When the controller is in COMFORT mode, it receives from Control Unit the set point value, which has already been corrected through the compensation, and then processes it according to the correction factor selected on STA sensor (if installed). The resulting value corresponds to the heating process beginning.

When the controller is in UNOCCUPIED mode, set point is either lowered (in the winter) or increased (in the summer) by 3.5 K.

### Dead Zone

The dead zone value transmitted by Control Unit is added to point in order to obtain the cooling process starting point.

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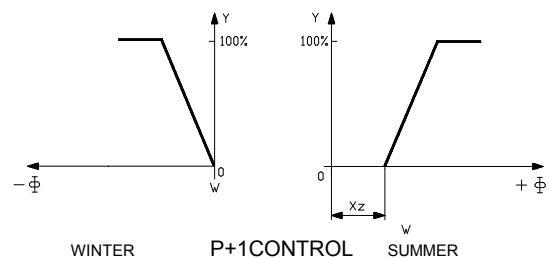
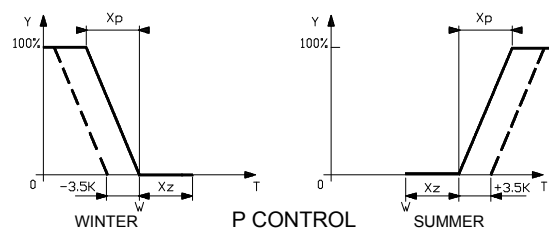
## CONTROLLI

ISO 9000

CONTROLLI

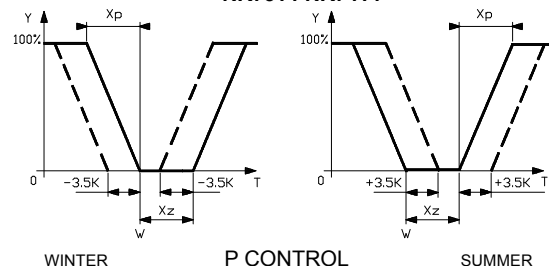
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### NR7312-NR7412

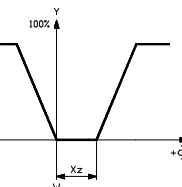


N1016F1/2

### NR7314-NR7414



N1017F1/2



### LEGEND

T	Temperature in °C	Xp	Proportional band
Y	Output signal	Xz	Dead zone
W	Set point in Normal Mode	Φ	Load

### Winter and Summer Compensation

Winter and summer compensation is automatically calculated by Control Unit according to set compensation starting value and authority. The set point transmitted to controllers is then automatically corrected according to the winter and summer compensation.

### Winter/Summer Change-over

This information, sent by Control Unit (selectable by digital input), is used by NR 7312 and NR 7412 controllers to reverse the two-pipe systems operating direction.

This information is also used by both the NR 7312/NR 7412 controllers and the NR 7314/7414 controllers to determine whether to add or subtract 3.5 K when the UNOCCUPIED mode has been selected.

In case controllers operate in stand-alone, it is possible to use local change-over (see example No. 5).

### Cooling Enabling

By UNOCCUPIED mode cooling can be disabled from Control Unit keyboard.

### Cooling and Heating General Enabling

Both cooling and heating process can be disabled (by digital input) from Control Unit, regardless of controller operating mode; this is useful when automatic load switch-off devices, alarm conditions, etc. are arranged.

### Operating Modes

The controllers operate with different set points depending on the mode selected among the four possible ones through the Control Unit.

#### COMFORT mode (NM)

Heating process starting point corresponds to the set point selected through the Control Unit and corrected with the compensation effects and the ambient recalibration (using STA 75/STA 80S sensors or the RM 77/RMS77 remote selector). Cooling process starting point is set by adding the dead zone stated on Control Unit to heating process starting point.

#### UNOCCUPIED mode

UNOCCUPIED mode is usually selected to reduce energy consumption. When this operating mode is selected, heating process starting point is shifted by -3.5 K in winter and by + 3.5 K in summer.

Cooling process starting point is set below the dead zone.

To prevent NR 7314/NR 7414 controllers from cooling during the transition to UNOCCUPIED mode, it is advisable to disable cooling through Control Unit once UNOCCUPIED mode is on.

#### UNOCCUPIED mode (RF)

This operating mode is selected by Control Unit and may not be modified from the room.

#### ANTI-FROST Mode (AF)

When Control Unit selects this operating mode, the controller performs one single heating action to maintain a room temperature not lower than 8°C.

Cooling battery valve is brought in CLOSED position.

### Cut-Off

NR7412 and NR7414 controllers are equipped with a cut-off function; this stops MVT4 actuators whenever they are operated to end stroke for a period of time 1,5 times higher than the setted stroke time.

### Remote Change-over

The operating mode selected by the Control Unit may be modified from the room as follows:

if the controller is either in COMFORT mode or in UNOCCUPIED mode (RC), it may be switched to the UNOCCUPIED mode (RF) by a jumper connection between terminals 11 and 13 or by connecting the same terminals to an occupancy sensor or to a contact (for instance an "open window" contact).

### Fan Control

Fan may be controlled directly by the controller only if terminals 9 and 10 are connected to the 24 V coil of a relay whose contact is normally closed and which drives the fan.

This way the fan is continuously operating and it is switched off only when the controller is in Anti-Frost mode.

To avoid a start-up with circulation of cold air, by modifying the TP1 jumper on the card, it is also possible to enable a programme which controls the fan as follows:

Programme enabled (TP1 closed)

When in Anti-Frost mode, the fan is off.

In the other modes (COMFORT and UNOCCUPIED) the fan operates as follows:

- With NR 7312 and NR 7412 controllers, during the winter operation, fan is switched off when the valve is almost closed and switched on again with a 3-minute delay after the valve opening command.
- With NR 7314 and NR 7414 controllers fan operation is similar to NR 7312 and NR 7412 controllers but the delayed start-up is activated also from the cold water pipe.

### Controller Stand-Alone Capability

When a controller is operating normally, it is checked periodically by the Control Unit. If the Control Unit has a breakdown or if the communication line is interrupted, the controller changes over to stand-alone operation after a 10-minute delay and then operates according to the following preset data:

Set point	20 °C
Dead zone	4 K
Operating mode	COMFORT
Compensation	Off
Operation	Winter
Control type	P+I
Actuator stroke	165 sec.
Integration time	4 min.
Integrator rescheduling time	1/10 Tn = 24 sec.
Proportional band	0,8...7,2 K (selectable from Trimmer 1)

If you wish to change over to summer operating mode with these parameters it is necessary to supply controller terminals 17 and 18 with 24 V voltage. All the operating mode change-over functions described in "Remote Change-over" are also activated.

## CONSTRUCTION CHARACTERISTICS

The electronic card is encased in a shockproof thermoplastic container which makes possible to install it inside the fan coil on a normalised track.

On the container cover there is a slot to insert the address card which allows NC 7311 Control Unit to identify the controller.

### TECHNICAL CHARACTERISTICS

Power supply	24 V~ ±10 %
Controller consumption	3 VA
Max. load at terminals	
3-4, 3-5 6-7, 6-8, 9-10	25 VA
Terminal boards	screw board for max. 2.5 mm <sup>2</sup> conductors
Protection degree	IP 20 (DIN 40 050)
Operating temperature	2T 45
Storage temperature	-25T 65
Sensitivity	0,3 K (0...50 °C)
Microprocessor	INTEL 80C52
Programme storage	8 Kbyte
Data storage	256 byte
Command type:	
- NR73XX	proportional time by triac (24V ~ - 1A max)
- NR74XX	3 positions by triac (24V ~ - 1A max)
Communication with NC 7311 Control Unit	
Interface	RS485
Speed	1200 BAUD
Cable	polarised twisted coupled not shielded wire min. section 0,3 mm <sup>2</sup>

**for perturbed environment**  
Belden type 9841 is advised

Product conforms to EMC 89/336 directive with reference to the below mentioned standards:

EN 50081-1 for emission                      EN50082-1 for immunity

### SYSTEM LAYOUT CRITERIA

By 24 V ~ power supply transformers suitable for the expected consumption are required: autotransformers must not be used. For the consumption and the design criteria of the power supply and the communication line see NC7311 Unit data sheet. The wiring is to be carried out in compliance with the reported wiring diagrams and the existing regulations.

### INSTALLATION AND START-UP

NR 7000 controllers are designed for quick plug-in assembly on a DIN guide (35x27x7.5).

Every controller must be provided with its **address card** before connecting the power supply. The address card must be selected and described as required in the NC 7311 Control Unit "User Manual".

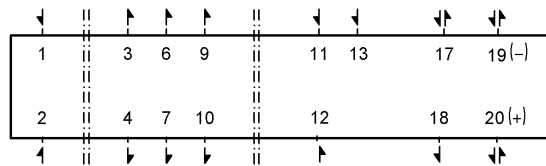
It is essential to verify that the communication line has been connected correctly: if not, one or more controllers will operate in stand-alone mode as if the Control Unit had not been connected.

If you wish to enable the function described in the paragraph "Fan Control", disconnect the controller power supply, remove the cover and close the TP1 jumper on the electronic card.

**Note:** When 7412 and 7414 controllers are switched on, they command the closure of the MVT4 actuator for an amount of time equal to 1.5. times the set stroke time.

### TERMINAL BOARD

NR7312-NR7314



N3042 F1

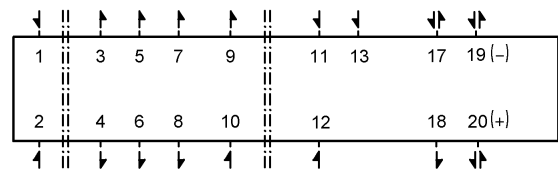
#### LEGEND

1	Power supply	24V~
2		
3	Phase Control	MVA4 motorized valve. (*)
4		
6	Phase Control	MVA4 motorized valve. (NR7314: cooling valve)
7		
9	Control	Relays for fan control
10	Phase	
11	Common measurements (5V=)	
12	Sensor signals	
13	Remote control signal	
17	Contact input	S/W
18	Phase	Changeover
19(-)	Bus (**)	to terminal 19 of other NR or RT1 terminal of NC7311
20(+)	Bus	to terminal 20 of other NR or RT2 terminal of NC7311

(\*) In case of NR7314 (4 pipes) connect the heating valves  
(\*\*) Warning: the connection is polarized, respect the phases

### TERMINAL BOARD

NR7412-NR7414



N3042F2

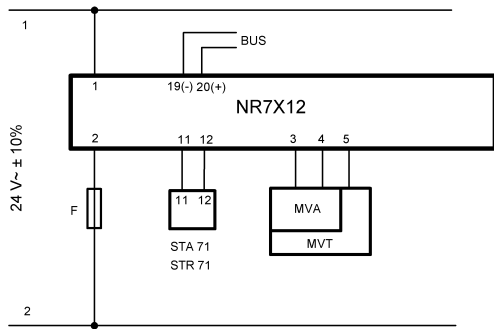
#### LEGEND

1	Power supply	24 V~
2		
3	Phase	
4	Closing control	MVT4 motorized valve (*)
5	Opening control	
6	Phase	MVT4 motorized valve
7	Closing control	(NR7414: cooling valve)
8	Opening control	
9	Control	Relays for fan control
10	Phase	
11	Common measurements (5V=)	
12	Sensor signals	
13	Remote control signal	
17	Contact input	S/W
18	Phase	Changeover
19(-)	Bus (**)	to terminal 19 of other NR or RT1 terminal of NC7311
20(+)	Bus	to terminal 20 of other NR or RT2 terminal of NC7311

(\*) In case of NR7414 (4 pipes) connect the heating valve  
(\*\*) Warning: the connection is polarized, respect the phases in the connection with other controllers and with the NC7311 central unit

**Example 1**

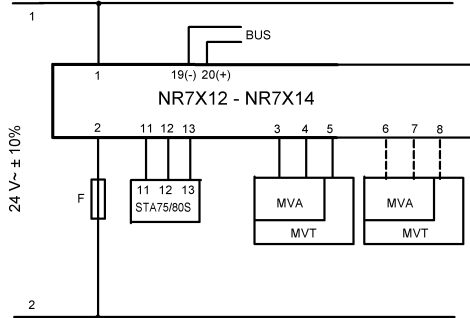
Two-pipe fan coils control with room sensor or return air sensor.



**Item identification note:** X = 3 with MVA4.  
X = 4 with MVT4

**Example 3**

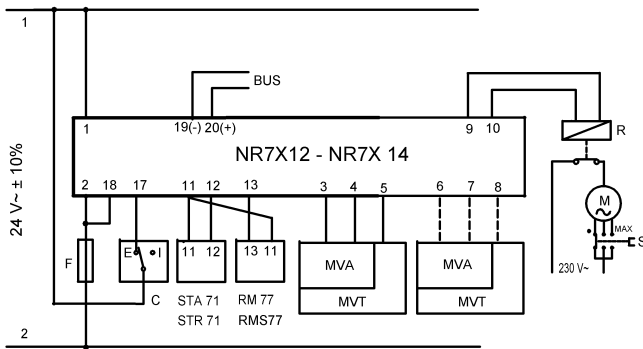
Two and four-pipe fan coils control room sensor and set-point adjustment (STA 75)



**Item identification note:** X = 3 with MVA4.  
X = 4 with MVT4

**Example 5**

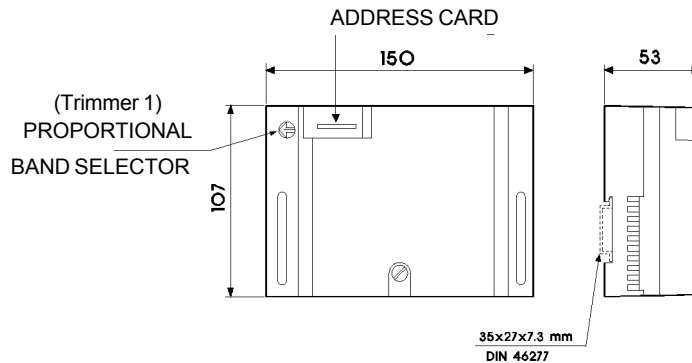
Two and four-pipe fan coils control with local emergency S/W change-over, room sensor or return air sensor, remote adjustment and fan control.



**Item identification note:** X = 3 with MVA4.  
X = 4 with MVT4

N3043

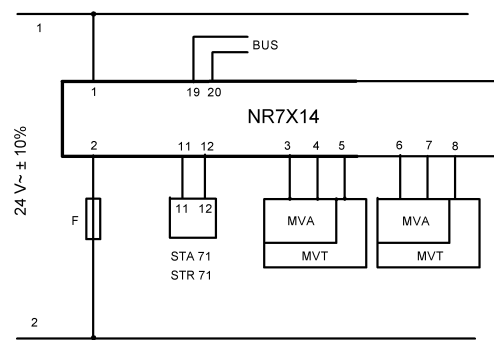
**OVERALL DIMENSIONS**



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**Example 2**

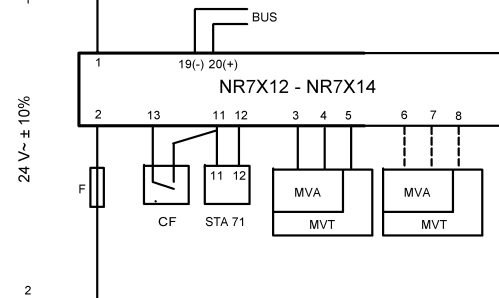
Four-pipe fan coils control with room sensor or return air sensor.



**Item identification note:** X = 3 with MVA4.  
X = 4 with MVT4

**Example 4**

Two and four-pipe fan coils control with occupancy sensor and room sensor.



**Item identification note:** X = 3 with MVA4.  
X = 4 with MVT4

**LEGEND**

- STA 71 Room sensor
  - STA 75 Room sensor with set-point adjustment
  - STA 80S Room sensor with set-point adjustment, speed selector and fan control switch
  - STR 71 Return air sensor
  - RM 77 Remote adjustment
  - RMS 77 Remote adjustment - speed selector and fan
  - MVA/V.T. or V.Z. Control valves (with NR7312/7314)
  - MVT/V.T. Floating valves (with NR7322/7324)
- Connections between controllers NR and actuators:**
- | NR terminal | MVT4 actuator | MVA4. actuator |
|-------------|---------------|----------------|
| 3 and/or 6  | white colour  | white colour   |
| 4 and/or 7  | green colour  | brown colour   |
| 5 and/or 8  | brown colour  |                |
- R Out. relay (coil: 24 V ~ - 1A max - NC contact)
  - S Manual fan speed selector
  - M Fan Motor
  - C Manual S/W change-over switch or 37T thermostate (red wire to terminal 1, black wire to terminal 17)
  - CF Window contact (NA contact)
  - F Fuse 3,15 A (4A in case 3 floating valves MVA4 are connected, parallel)

The performances stated on this sheet can be modified without any prior notice due to design improvement.



Automatic control systems for:  
air conditioning/heating/industrial thermal process.

ISO 9000