# INSTRUCTION MANUAL

## Controller N322 RHT

Description


Technical changes reserved
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# INSTRUCTION MANUAL

## Foreword

Dear customer,

We thank you for having purchased the Controller N322 RHT and we are very glad that you decided to buy a product of B+B Thermo-Technik GmbH. We hope this product will fully satisfy you and will assist you effectively in your work.

This Device has been developed to be technically highly up-to-date and has been designed in accordance with the prevailing European and German national directives and rules. For a proper and effective usage of the product the customer shall observe the following Operating Instructions. In the case that against one's expectations any trouble occurs which you can not resolve yourself, please contact our service centers or our authorized dealer. We will provide you rapid and competent help to minimize the risk of long time outfalls.

The following operating Instruction is an indispensable part of this Product. It contains important advices for the starting up and further use of the device.

## General Information

This Operation Manual is intended to serve as an aid in the proper setup, installation and operating of the B+B product.

All essential details of the equipment and all actions required on the part are clearly presented and explained. We thus ask that you read this manual carefully before proceeding to work with the equipment. Keep this manual available for ready reference in a convenient and conspicuous location near the equipment.



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## Content


**Foreword** 02
**General Information** 02
**Symbols Employed** 04
**Warning Signs** 04
**Safety Instructions** 05
**Intended Use** 06
**Disposal** 06

**1. Product Description** 07
1.1. Scope of Delivery 08
1.2. Identification 08
1.3. Description of the buttons on the front of the Controller 08
1.4. Terminals 08

**2. Operations** 09
2.1. Level 1 - Setpoint Adjustment 10
2.2. Level 2 - Configuration - Parameters configuration Level 10
2.3. Level 3 - Calibration Level 12

**3. Working with the Controller** 13
3.1. Configuration Protection 13
3.2. Configuration Protection Usage 14
3.3. Master-Password 14

**4. Error Messages** 15

**5. Electrical Wiring** 15

**6. Technical Data** 15

**7. Article Numbers** 16
Questions 16

# INSTRUCTION MANUAL

## Symbols Employed

| Sign | Meaning | Notice |
|---|---|---|
|  | Advice | It is necessary to read the following advices before using the product. The used symbols in the manual acts first of all as eye catcher for security risks. The symbols do not replace the security advices. The text must be read completely. |
|  | Necessarily to observe | This symbol designates important advices and tips which are necessary for the success of a procedure. They have to be followed in order to get good results. |

## Warning Signs

| Warning Signs | Meaning |
|---|---|
|  | This symbol advises the user of danger for persons, material or environment. The text gives information that must be necessarily followed to avoid any risks |
|  | Caution against hot surfaces (BGV A8, GUV-V A8/W26) and hot liquids or substances |
|  | Caution against liquids and hot substances |
|  | Caution against dangerous explosive substances (BGV A8, GUV-V A8/W02) |
|  | Caution against moving maschines (W29)<br>Caution against moving parts |
|  | Caution against electromagnetic fields (BGV A8, GUV-V A8/W12) |
|  | Caution against severe cold (BGV A8, GUV-V A8/W17) |
|  | Caution against dangerous high electrical voltage (BGV A8, GUV-V A8/W08) |
|  | Caution against dangerous explosive atmosphere (BGV A8, GUV-V A8/W21) |
|  | Electronic waste |



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## Safety Instructions

For damages caused by failure to observe these safety and operating instructions, B+B Thermo-Technik GmbH assumes no liability for damages.

This device has been designed and tested in accordance to the safety regulations for electronic devices.
However, its trouble-free operation and reliability cannot be guaranteed unless the standard safety measures and special safety advises given in this manual will be observed when using it.

Trouble-free operation and reliability of the device can only be guaranteed if it is not subjected to any climatic conditions than those stated under “Specifications”. If the device is transported from a cold to a warm environment condensation may result in a failure of the function. In such a case make sure the device temperature has adjusted to the ambient temperature before trying a new start-up.

If device is to be connected to other devices the circuitry has to be designed most carefully. Internal connection in third party devices (e.g. connection GND and earth) may result in not-permissible voltages impairing or destroying the device or another device connected.

## Warning:

Only devices with mains input: If the device is operated with a defective mains power supply (e.g. short circuit from mains voltage to output voltage) this may result in hazardous voltages at the device (e.g. at sensor socket)

If there is a risk whatsover involved in running it, the device has to be switched off immediately and to be labeled accordingly to avoid re-starting. Operator safety may be at risk if:

- There is visible damage to the device
- The device is not working as specified
- The device has been stored under unsuitable conditions for a longer time

In case of doubt, please return device to manufacturer for repair or maintenance.

## Caution:

Do not use these product as safety or emergency stop devices, or in any other application where failure of the product could result in personal injury or material damage. Failure to comply with these instructions could result in death or serious injury and material damage.

# INSTRUCTION MANUAL

## Intended Use

The use of the unit in fields other than those indicated under “SAFETY INSTRUCTIONS” is not allowed for safety reasons.
This instruction manual does not at all substitute any additional instruction manuals of connected accessories!

## Disposal

This unit has been marked in accordance with the European Device 2002/96/EC on waste electrical and electronic equipment (WEEE).

At the end of its useful operating life, dispose of the unit as electrical scrap.

Please ask either B+B Thermo-Technik GmbH or your specialist dealer for information on your local collection point.
Within the scope of application if this Directive, B+B Thermo-Technik GmbH is responsible for proper disposal of this unit.



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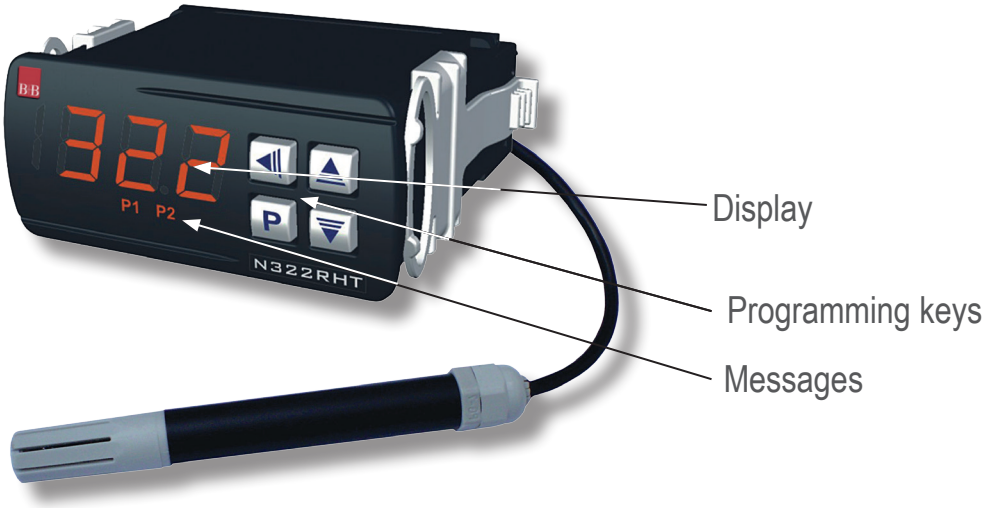
## 1. Product Description

The humidity and temperature controller N322 RHT is a digital controller for relative humidity and temperature. Two relay outputs can be configured individually to control the temperature or the relative humidity. The standard delivery scope includes a humidity and temperature sensor. The sensor is protected by a nylon cap and has a three meters connection cable. The display can alternate between the measured temperature and the measured relative humidity. The switch time between the two displays can be configured by the user freely. The control unit is CE (European Union) and UL (U.S. and Canada) certified.

## 1.1. Scope of Delivery

| Article Name | Article Number | Description |
|---|---|---|
| Controller N322 RHT<br>with Pt1000 RHT probe | 0556 0110 | 1 x Controller N322 RHT, 1x User Manual on CD<br>1 x Pt1000 RHT probe<br>1 x Operating instruction on CD |



## 1.2. Identification

The rating plate is located on the housing of the device. Verify that the properties described there comply with your order. The following controls can be found on the front panel of the device.

## 1.3. Description of the buttons on the front of the Controller

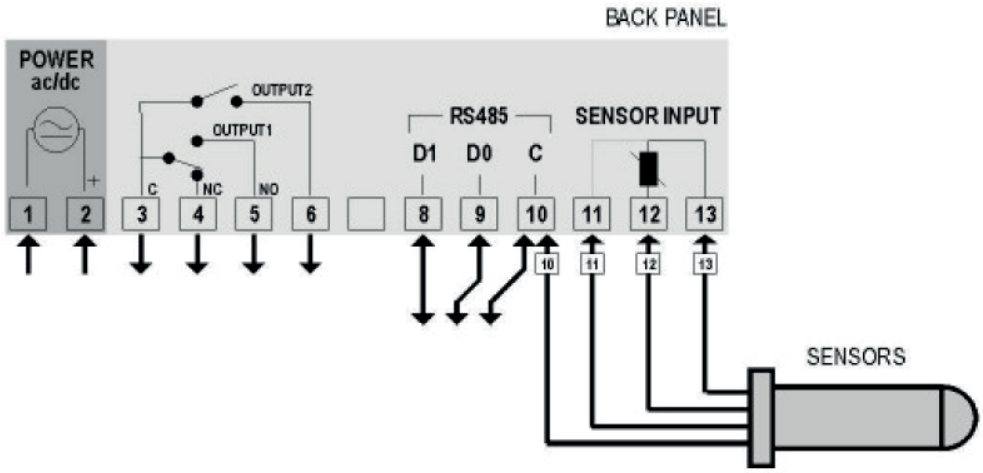
- P Programm-key (P)
- Back-key (R)
- Up-key
- Down-key

## 1.4. Terminals

It is important to follow these recommendations:

- Signal wires should be installed in grounded conduits and away from power or contactor wires.
- The instrument should have its own power supply wires that should not be shared with electrical motors, coils,
- contactors etc.
- Installing RC filters (47 R and 100 nF, series combination) is strongly recommended at contactor coils or any other
- inductors.
- System failure should always be taken into account when designing a control panel to avoid irreversible damage to equipment or people

The figure below shows the controller connections to sensor, main and outputs.



## 2. Operations

The controller requires the internal parameters to be configured according to the intended use for the instrument.
The parameters are organized in 4 groups or levels:

| Level | Function |
|---|---|
| 0 | Measurement |
| 1 | Setpoint setting |
| 2 | Configuration |
| 3 | Calibration |

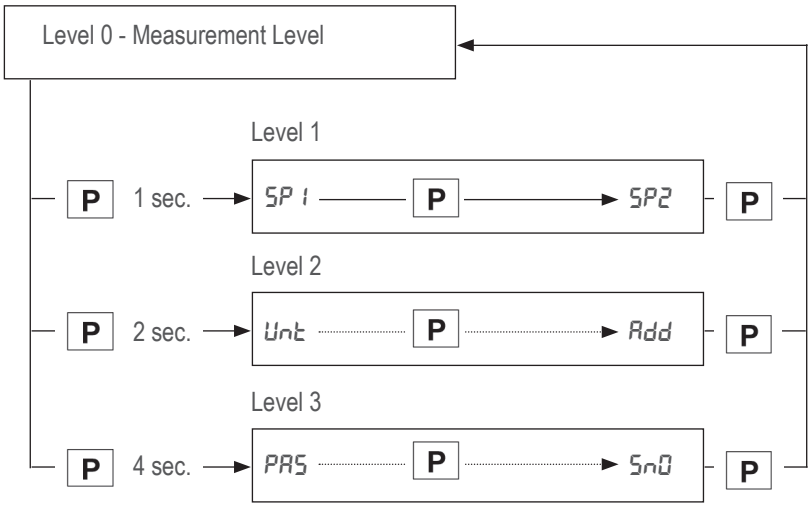
Upon power-up, the N322 RHT display shows for 1 second its firmware version. This information is useful when consulting the factory. Then, the measured variables by the sensor are shown on the display. This is the parameter level 0 (measurement level).

To access level 1, press P for 1 second until the SP 1 message shows up. Pressing P again shows SP2.
Pressing P again to go back to level 0.
To access level 2 of paramenters, press P for 2 seconds until the Unt message is shown. Release the P key to remain this level. Each new pressing on the P key will advance to the next parameter in the level. To return to the previous parameter in the actual level press once the key. At the end of the level, the controller returns to the first level (0). Use the and keys to alter a parameter value.
To access level 3, press P for 4 seconds until the display shows PAS. Each new pressing on the P key will advance to the next parameter in the level. At the end of the level, the controller returns to the first level (0). Use the and keys to alter a parameter value. The level 3 should be accessed only by experienced personell.

**Note:** At the level 3 should be accessed only by experienced and knowledgeable users!

**Notes:**

1. A parameter configuration is saved when the P key is pressed to advance to the next parameter in the cycle. The configuration is stored in a non-volatile memory, retaining its value when the controller is de-energized.
2. If no programm key is detected for over 20 seconds, the controller saves the current parameter value and returns to the measurement level.



## 2.1. Level 1 - Setpoint Adjustment

In this level only the Setpoint (SP 1 amd SP2) parameter is available, alternating the name with their respective values. Adjust the desired value for each setpoint using on the ▲ and ▼ keys.

| Level | Function |
|---|---|
| SP 1 | Set Point adjustment for control OUTPUT 1:<br>SP 1 value is limited to the values programmed in SPL and SPH in the programming level (Parameter configuration, level 2) |
| SP2 | Set Point adjustment for control OUTPUT 2:<br>SP2 value is limited to the values programmed in SPL and SPH |

## 2.2. Level 2 - Configuration - Parameters configuration Level

Contains the configuration parameters to be defined by the user, according to the system's requirements. Use ▲ and ▼ keys to set the value. The display alternates the parameter name and its value.

| Level | Function |
|---|---|
| rHt | Defines how the variables, relative humidity and temperature, will be displayed:<br>0 - Relative Humidity static<br>1 - Temperature static<br>2 - Toggles the indication every 2 seconds (temperature / humidity).<br>3 - Toggles the indication every 3 seconds (temperature / humidity).<br>4 - Toggles the indication every 4 seconds (temperature / humidity).<br>5 - Toggles the indication every 5 seconds (temperature / humidity). |
| Unt | Temperature Unit: Selects display indication for degrees Celsius or Fahrenheit.<br>0 - Temperature in degrees Celsius<br>1 - Temperature in degrees Fahrenheit |
| DFH | RH Offset: Offset value to be added to the displayed relative humidity to compensate for sensor mismatches (when replacing a sensor, for instance). Adjustment range: between -10.0 and 10.0% RHT. Default value: 0 |
| ofS | Temperature Offset: Offset value to be added to the measured temperature to compensate for sensor mismatches. Default value: 0 |
| SL 1 | Lower limit value for SP 1 (minimum value to which SP 1 can be configured). SL 1 must be programmed with a lower value than SH 1. |
| SH 1 | Upper limit value for SP 1 (maximum value allowed for SP 1). SH 1 must be programmed with a value higher than SL 1 |
| SL 2 | Lower limit value for SP2 (minimum value to which SP2 can be configured). SL 2 must be programmed with a value lower than SH2. |
| SH 2 | Upper limit for SH 2 (maximum value allowed for Sp 2). SH 2 must be programmed with a value lower than the one in SL2. |
| Hy 1 | Output 1 Hysteresis: defines the differential range between the input variable value at which the Output 1 is turned on and the value at which it is turned off. |
| Hy 2 | Output 2 Hysteresis: defines the differential range between the input variable value at which the Output 2 is turned on and the value at which it is turned off. |
| Ac 1 | Control action for Output 1:<br>0 - Reverse: For heating or humidification. Outputs turn on when variable is lower than SP<br>1 - Direct: For cooling or dehumidification. Output turns on when variable is above SP.<br>2 - Low (minimum value) alarm<br>3 - High (maximum value) alarm<br>4 - Low alarm with initial blocking<br>5 - High alarm with initial blocking |

## 2.2. Level 2 - Configuration - Parameters configuration Level

| Level | Function |
|---|---|
| Ac2 | Action 2 - Control Output 2 action or Alarm functions:<br>0 - Reverse control action (heating or humidification). See Cnt parmeter below<br>1 - Direct control action (cooling or dehumidification)<br>2 - Low (minimum value) alarm<br>3 - High (maximum value) alarm<br>4 - Alarm inside range<br>5 - Alarm outside range<br>6 - Low alarm with initial blocking<br>7 - High alarm with initial blocking<br>8 - Inside range alarm with initial blocking<br>9 - Outside range alarm with initial blocking<br>The section „Working with the RHT Controller“ describes how these function work |
| Cnt | Assigns the relays to each variable:<br>0 - Output 1 = RH, Output 2 = RH<br>1 - Output 1 = RH, Output 2 = Temperature<br>2 - Output 1 = Temperature, Output 2 = RH<br>3 - Output 1 = Temperature, Output 2 = Temperature |
| oF 1 | OFF time: Defines the minimum oFF time for control Output 1. Once Output 1 is turned off, it remains so for at least the time programmed in oF 1. This parameter is intended for refrigeration systems where longer compressor life is desired. For heating systems, programm oF 1 to zero. Value in seconds, 0 to 999 s. |
| on 1 | On time: Defines the minimum on time for control Output 1. Once Output 1 is turned on, Output 1 remains so for at least the time programmed in on 1. This parameter is intended for refrigeration systems where longer compressor life is desired. For heating systems, programm on 1 to zero. Value in seconds, 0 to 999 s. |
| dL 1 | Delay 1: Delay time to start control. Upon power-on, control Output 1 is kept off until the time programmed in dL 1 is elapsed. Its usage is intended to prevent multiple compressors to start simultaneously after the turn-on of a system with several instruments. Value in seconds, 0 to 250 s. |
| oF2 | OFF time: Defines the minimum oFF time for control Output 2. Once Output 2 is turned off, it remains so for at least the time programmed in oF2. This parameter is intended for refrigeration systems where longer compressor life is desired. For heating systems, programm oF2 to zero. Value in seconds, 0 to 999 s. |
| on2 | On time: Defines the minimum on time for control Output 2. Once Output 2 is turned on, Output 2 remains so for at least the time programmed in on 1. This parameter is intended for refrigeration systems where longer compressor life is desired. For heating systems, programm on2 to zero. Value in seconds, 0 to 999 s. |
| dL2 | Delay 2: Delay time to start control. Upon power-on, control Output 2 is kept off until the time programmed in dL2 is elapsed. Its usage is intended to prevent multiple compressors to start simultaneously after the turn-on of a system with several instruments. Value in seconds, 0 to 250 s. |
| Add | Adress: The parameter Add is presented in instruments loaded with the optional RS485 Modbus RTU communication interface. Set a unique Modbus adress for each equipment connected to the network.<br>Adress range is from 1 to 247. |

## 2.3. Level 3 - Calibration Level

The N322 RHT is factory calibrated. The following parameters should be accessed only by experienced personnel.
To enter this cycle, the P key must be kept pressed for 4 seconds.
Don't press the ▲ and ▼ keys if you are not sure of the calibration procedures. Just press the P key a few times until the temperature measurement level is reached again.

| Level | Function |
|---|---|
| PAS | Password: Enter the correct password to unlock write operations for the parameters in the following levels. |
| CAL | Calibration low: Offset value of the input. It adjusts the lower measurement range of the sensor. |
| CAH | Calibration High: Gain calibration. It adjusts the upper measurement range of the sensor. |
| CJL | Cold Junction Offset calibration: This parameter is available only for thermocouple. |
| FAC | Factory Calibration: Restores factory calibration parameters. Change from 0 to 1 to restore the calibration parameters with factory values. |
| PrT | Protection: Defines the levels of parameters that will be password protected. See „Configuration Protection" for details. |
| PAC | Password Change: Allows changing the current password to a new one. Values from 1 to 999 are allowed. |
| Sn2 | Serial number: First part of the controller electronic serial number. |
| Sn1 | Serial number: Second part of the controller electronic serial number. |
| Sn0 | Serial number: Third part of the controller electronic serial number. |

## 3. Working with the Controller

Multiple output controllers are suited for controlling multiple stage systems.
Other applications require Output 1 to be the control output and Output 2 to be alarm. There are eight distinct alarm functions implementet in Output 2, selected by the parameter Ac2, described below:

| Mode | Function |
|---|---|
| 2 | Low alarm: Output 2 is turned on when the selected variable, as assigned for Output 2 in the Cnt parameter, falls below the SP2. |
| 3 | High alarm: Output 2 is turned on when the selected variable exceeds the value programmed in SP2. |
| 4 | Inside range alarm: Output 2 is turned on when the selected variable is within the range defined by: (SP1 - SP2) and (SP1 + SP2) |
| 5 | Outside range alarm: Output 2 is turned on when the selected variable falls outside the range defined by: (SP1 - SP2) and (SP1 + SP2) |

Functions 6, 7, 8 and 9 are identical to the above ones except that they implement the initial blocking feature, which inhibits the output if an alarm condition is present at start-up. The alarm will be unblocked after the process reaches a non-alarm condition for the first time.

In a multiple stage application, SP1 and SP2 are configured to operate at different settings, creating a progressive sequence for turning on the outputs (compressors or resistances) in response to a systems demand. The output delays for turning on the compressors (dL1 and dL2) cause the outputs to be turned on one by one, minimizing energy demand.

Another usage for multiple output controllers is in systems that require both direct and reverse actions (for cooling and heating, simultaneously, for instance.) In these applications, one output is configured as reverse action and the other as direct action. The output status leds P1 and P2 in the instrument panel signal the current action beeing performed.


### 3.1. Configuration Protection

A protection system to avoid unwanted changes to the controller parameters is implemented. The level of protection can be selected from partial to full. The following parameters are part of the protection system:

| Mode | Function |
|---|---|
| PRS | When this parameter is presented, the correct password should be entered to allow changes of parameters in the following levels |
| Prt | Defines the level of parameters that will be password protected:<br>1. Only calibration level is protected (factory configuration)<br>2. Calibration and Configuration levels are protected<br>3. All levels are protected: Calibration, configuration and setpoints |
| PAC | Parameter to define a new password. The password is located in the calibration level, and can only be changed by a user that knows the current password. Valid passwords are in the range<br>1 to 999 |

## 3.2. Configuration Protection Usage

PAS-parameter:

PAS-parameter is displayed before entering a protected level. If the correct password is entered, parameters in all following levels can be changed. If a wrong or no password is entered, parameters in the following levels will be read only.

**Important notes:**

1. After five consecutive attempts to enter a wrong password, new tentative will be blocked for the next 10 minutes. If the current valid password is unknown, the master password can be used only to define a new password for the controller.
2. The password for a brand new device is 111.

## 3.3. Master-Password

The master password allows user to define a new password for the controller, even if the current password is unknown. The master password is based on the serial number of the controller, and calculated as following:

[ 1 ] + [ higher digit of SN2 ] + [ higher digit of SN1 ] + [ higher digit of SN0 ]
for example the master password for the device with serial number 987123465 is: 1 9 3 6
as follows: 1 + Sn2 = 987; Sn1 = 123; Sn0 = 465 = 1 + 9 + 3 + 6

1. Enter the master password value at PAS prompt.
2. Go to PAS parameter and enter the new password, which must not be zero (0).
3. Now you can use this new password to access all controller parameters with modify rights.

## 4. Error Messages

Sensor measurement errors force the controller outputs to be turned off. The cause for these errors may have origin in a bad connection, sensor defect (cable or element) or system temperature outside the sensor working range.
The display signs related to measurement errors are shown below:

| | |
|---|---|
| - - - | Overflow |
| _ _ _ | Underflow |
| - - - | Sensor error |

## 5. Electrical Wiring

It is important to follow the recommendations below:

- Signal wires should be installed in grounded conduits and away from power or contactor wires.
- The instrument should have its own power supply wires that should not be shared with electrical motors, coils, contactors, etc.
- Installing RC filters (47 R and 100 nF, series combination) is strongly recommended at contactor coils or any other inductors.
- System failure should always be taken into account when designing a control panel to avoid irreversible damage to equipment or people.

## 6. Technical Data

| Properties | Values |
|---|---|
| Input Sensor | Pt1000 RHT |
| Device accuracy | Temperature: ± 0,5°C at 25°C |
| | Humidity: ± 3% at 25°C |
| Measuring range | Temperature: -40...+120°C |
| | Humidity: 0...100% rel. humidity |
| Resolution | 1% over full range |
| Power supply | 100 - 240 V AC (± 10%) or 24 V AC/DC |
| | Caution: Check the power supply specification before energizing the controller |
| Environment | Operating temperature: 0 to +40°C |
| Case | Polycarbonate UL94, V-2, Suitable wiring: up to 4,0 $mm^2$ |
| Ingress Protection | Front panel: IP65, Box IP42 |
| Dimensions | 74 x 32 x 75 mm |
| Warm-Up | 15 minutes |
| CE-conformance | 2014/30/EU |
| Electromagnetic conductivity | EN 61326-1 |

## 7. Article Numbers

| Article Number | Description |
|---|---|
| 0556 0110 | Controller N322 RHT with RHT Probe |

## Questions

If you still have questions concerning this product of B+B Thermo-Technik GmbH, please do not hesitate to contact us at:

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We wish you a successful measuring!

Your Temperature-Partner
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