Process transmitter

**RMA 421**

Multi-function 1 channel DIN rail mounted transmitter with universal input, loop power supply, limit monitor and analogue output

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**Application areas**
- Plant and machine construction
- Control panels
- Laboratory fittings
- Temperature display and monitoring
- Process display and monitoring
- Process control
- Signal match and transforming

**Features and benefits**
- Multi-functional: All normal measurement signals can be directly connected (bipolar voltage and current, thermocouple, RTD, resistance)
- Alarm: Flexible set point monitor with 2 changeover contacts
- Active: Scalable current or voltage output
- Power: Integrated loop power supply for connected sensors
- Communicative: RS232 interface for setting up and measured value output, HART® communication sockets for sensor setting up
- Operation: LC display and push buttons for front end setting up

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Endress+Hauser

Nothing beats know-how
**Function**

The presettable universal input enables direct connection of various sensors, whether current, voltage, potentiometer, RTD or thermocouple. Using the built-in loop power supply the unit can also power the connected sensor and then evaluate the returning sensor signal at the input of the transmitter. Two presettable set points monitor the measured value for any deviation from the preset conditions.

**Display/operating elements**

- HART® communication sockets
- LED’s
  - Operation display
  - Fault display
  - Alarm relay condition
- RS 232 interface
- Operating push buttons (Option)
- 5 digit LC display with set point indication (Option)
- Enter push button (Option)

**Interface/ReadWin PC software**

The RMA 421 can be set up extremely easily using the built-in RS232 serial interface and the ReadWin® 2000 PC software package. Safe and secure setting up is made possible by the on-line available help text. The ReadWin® 2000 software package as well as the interface cable are available as accessories.

**Special features:**
- Uniform Windows 95/98/NT4.0/2000/XP operating system.
- Storage of unit settings in a data bank
- Instantaneous value display
- Print out of unit settings
Linearisation

The RMA 421 process transmitter has a built-in linearisation function. It is possible for the user to set up a connection between the input signal and the process value. These points can be set up using the 3 front mounted push buttons or they can be comfortably defined and transmitted using the ReadWin operating software.

Example:
Linearisation of a vessel signal that describes the relationship between the filling height and the vessel volume.

Transmitter

Using the linearisation function and the analogue output the RMA 421 becomes a powerful and easy to use amplifier. In addition to the linearisation possibility the unit also has a large number of stored temperature sensor linearisation tables as well as a signal square root function. Selection of these can be easily done via the selection menu.

Example:
The signal from a temperature sensor is connected to the input of the unit and is to be displayed as a temperature value.

The analogue output is made available as a current/voltage signal proportional to the displayed value within preset values for further instrumentation e.g. data loggers or recorders.

Special features:
- Current/voltage output
- Galvanic isolation
- Infinite scaling within the display range
- Presettable fault operation to NAMUR recommendation NE43
- Invertable measurement signal output

Contactor

The alarm limit function monitors the measured signal once per second in order to check that the preset conditions have been adhered to. Both set points can be individually set up for minimum or maximum security, as a high or low set point with presettable hysteresis as well as being able to define a switch time delay. Monitoring the set points for a change in signal per time unit gives further possibilities for process control. Switch condition is indicated in accordance to NAMUR NE44 by an front mounted LED.

Further information to the set point condition can be displayed in the LC display when using the transmitter with the display/operation option. Front end setting up without the need for further equipment is also made possible with this option.

Special features:
- Presettable operating modes
- Setting up the switch points and hysteresis in engineering units
- Display of switch conditions according the NAMUR NE44 recommendation
- Simple front end setting up
Dimensions

Electrical connection

Power supply
- 18...36 VDC
- 20...28 VAC 50/60 Hz
- 90...250 VAC 50/60 Hz
The terminals are linked internally and can be used for series connection.

Loop power supply (internal circuit)
- HART® connection

Relays (internal circuit)
- Relay 1
- Relay 2
Contact position on alarm or power failure

Analogue output (internal circuit)
The analogue output can be selected as either a current or voltage source.

Current input
- +/-20 mA, 0/4...20 mA

Voltage input
- +/- 100mV/thermocouple
- +/- 10V, 0...1/10V

RTD/potentiometer
- 2 wire
- 3 wire
- 4 wire

Loop power supply
- 4 wire sensor with current output
- 4 wire sensor with voltage output
- 2 wire sensor

* Connect Pt500 and Pt1000 to terminal 15, link 13 and 11

Note!
*1 without HART® communication
*2 with HART® communication (Please note volt drop!!)

Please always take note of the safety instructions in the operating manual (51000853) before installing!
## Technical data

### General

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Endress+Hauser</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td>RMA 421</td>
</tr>
<tr>
<td>Application</td>
<td>Process transmitter for DIN rail mounting</td>
</tr>
</tbody>
</table>

### Application

- **Process transmitter**: Dependent on the model used the analogue measured value is displayed in the 5 digit display, transmitted as a scaled voltage or current signal at the analogue output and is monitored for infringement of preset conditions by the two programmable alarm relays.

### Operation and system construction

- **Principle**: The analogue signal connected is digitalised, analysed and indicated in the display. A digital/analogue convertor makes a proportional current or voltage signal available for additional peripheral equipment connected to the output terminals.

- **Measurement system**: Microcontroller controlled measurement system with LC display, analogue input, analogue output, alarm relays and loop power supply.

### Input

- **Input types**: Voltage, current, RTD, potentiometer (R), thermocouple (TC)
- **Measurement range**:
  - **Voltage**: +/- 100 mV; max. voltage +/- 5 V; +/- 10 V; (without damage) +/- 50 V; Ri: 1 MΩhm
  - **Current**: 0/4...20 mA; max. current +/- 150 mA; Ri: 10 Ohm (without damage)
  - **RTD**: 
    - Pt100: -200 °C...+ 850 °C (DIN EN60751)
    - Ni100: -60 °C...+ 180 °C (DIN 43760)
    - Pl500: -200 °C...+ 850 °C (DIN EN60751)
    - Pt1000: -200 °C...+ 850 °C (DIN EN60751)
    - Sensor current: approx. 250 µA, Connections: 2-, 3-, 4-wire
    - Cable compensation: Up to 40 Ohm
  - **R**: 0...4000 Ohm
  - **Sensor current**: approx. 250 µA, Connections: 2-, 3-, 4-wire
  - **Cable compensation**: Up to 40 Ohm
  - **TC**:
    - Type T: -270...+ 400 °C
    - Type J: -210...+ 1200 °C
    - Type K: -200...+ 1372 °C
    - Type R: -50...+ 1800 °C
    - Type S: 0...+ 1800 °C
    - Type W3: 0...+ 2315 °C
    - Type W5: 0...+ 2315 °C
    - Type T, J, K, R, S, B, N to DIN EN60584;
    - Type U, L to DIN 43710; Type W3, W5 to ASTME988-96
  - **Linearisation**: Possible using max. 32 points
  - **Integration time**: 1s

### Output (loop power supply)

- **Output signal**: Terminal 81: 24 V +/- 20 %, 30 mA
  - Terminal 83: 24 V +/- 20 % - 250 Ω ∙ I meas.
- **Communication resistance**: 250 Ω resistance for HART® - communication fitted.
- **Volt drop at terminal 83**!
- **Number of outputs**: 1
- **Galvanic isolation**: To all other current circuits

### Output (analogue)

- **Output signal**: 0/4...20 mA, 20...4/0 mA or 0...10 V, overrange + 10 %
- **Voltage**: max. load: 20 mA
- **Current**: max. load: 500 Ohm
- **Fault message**: Presettable 3.6 mA or 21 mA
  - Actions to NAMUR recommendation NE43
- **D/A resolution**:
  - Current: 13 bit, voltage: 15 bit
- **Number of outputs**: 1
- **Galvanic isolation**: To all other current circuits
### Output (relays)

<table>
<thead>
<tr>
<th>Output signal</th>
<th>Binary, switches when set point is reached.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of relays</td>
<td>2</td>
</tr>
<tr>
<td>Contact type</td>
<td>1 potential free changeover contact (SPDT)</td>
</tr>
<tr>
<td>Contact load</td>
<td>&lt;= 250 V AC, 5 A / 30 V DC, 5 A</td>
</tr>
</tbody>
</table>

### Accuracy

| Voltage | Accuracy: 0.05 % FSD  
Temp. drift: 0.01 % / 10 K ambient temperature |
|---------|---------------------------------------------|
| Current | Accuracy: 0.05 % FSD  
Temp. drift: 0.05 % / 10 K ambient temperature |
| RTD, R | Accuracy: 2 wire: +/- 0.8 °C  
3 wire: +/- 0.5 °C  
4 wire: +/- 0.3 °C  
Temp. drift: 0.01 % / 10 K ambient temperature (Pt100, Nt100)  
0.1 % /10 K UT (Pt500, Pt1000, 0...4000 Ohm) |
| TC | Type T: +/- 0.2 °C  
T< - 150 °C +/- 1.0 °C  
Type N: +/- 1.0 °C  
Type J: +/- 0.2 °C  
T< - 150 °C +/- 1.0 °C  
Type U: +/- 0.5 °C  
Type K: +/- 1.0 °C  
Type L: +/- 0.5 °C  
Type R: +/- 1.0 °C  
Type W3: +/- 1.0 °C  
Type W5: +/- 1.0 °C  
Type B: T > 400 °C +/- 1.0 °C  
Temp. drift: 0.01 % / 10 K ambient temperature |
| Analogue output | Accuracy: 0.04 % FSD  
Temp. drift: 0.05 % / 10 K ambient temperature |
| TC cold junction | Accuracy: +/- 0.5 °C;  
Res. resolution: 0.1 °C; |

### Application conditions

### Installation conditions

<table>
<thead>
<tr>
<th>Installation angle</th>
<th>No limit</th>
</tr>
</thead>
</table>

### Ambient conditions

| Ambient  
Temperature | -20 °C...+60 °C |
|---------------|-----------------|
| Storage  
Temperature | -30 °C...+70 °C |
| Climatic class | to IEC 60 654-1 Class B2 |
| Ingress protection | IP 20 |

### EMC/Immunity

<table>
<thead>
<tr>
<th>RF protection</th>
<th>To EN 55011 Group 1, Class A</th>
</tr>
</thead>
</table>

### Safety

| Norm | To IEC 61010-1 protection class 1,  
Overvoltage category II,  
Installation excess current protection ≤ 10 A |
|------|---------------------------------|

### Interference safety

<table>
<thead>
<tr>
<th>ESD</th>
<th>To IEC 61000-4-2, 6 kV/8 kV</th>
</tr>
</thead>
</table>
| Electromagnetic  
fields | To IEC 61000-4-3, 10 V/m |
### Application conditions

<table>
<thead>
<tr>
<th></th>
<th>To IEC 61000-4-4, 4 kV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Burst (supply)</td>
<td>To IEC 61000-4-4, 2 kV</td>
</tr>
<tr>
<td>Burst (signal)</td>
<td>To IEC 61000-4-5, sym. 1 kV</td>
</tr>
<tr>
<td>Surge (AC supply)</td>
<td>To IEC 61000-4-5, sym. 1 kV</td>
</tr>
<tr>
<td>Surge (DC supply)</td>
<td>To IEC 61000-4-5, unsym. 1 kV</td>
</tr>
<tr>
<td>Surge (signal)</td>
<td>To EN 61000-4-6, 10 V</td>
</tr>
<tr>
<td>Cable high frequency</td>
<td>To IEC 770, 110 dB at 250 V, 50/60 Hz</td>
</tr>
<tr>
<td>Common mode noise rejection</td>
<td>To IEC 770, 110 dB at 250 V, 50/60 Hz</td>
</tr>
<tr>
<td>Normal mode noise rejection</td>
<td>To IEC 770, 50 dB at measurement range 1/10, 50/60 Hz</td>
</tr>
</tbody>
</table>

### Mechanical construction

<table>
<thead>
<tr>
<th></th>
<th>To IEC 61000-4-6, 10 V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Display and operating level</td>
<td>To IEC 61000-4-6, 10 V</td>
</tr>
<tr>
<td>Display</td>
<td>Operation, 1 x green (2.0 mm)</td>
</tr>
<tr>
<td>LED: Fault condition, 1 x red (2.0 mm)</td>
<td></td>
</tr>
<tr>
<td>Limit, 2 x yellow (2.0 mm)</td>
<td></td>
</tr>
<tr>
<td>LC display, optional: Numeric display: 5 x 7 segment (6 mm)</td>
<td></td>
</tr>
<tr>
<td>Alarm condition: 2 x Channel number, 4 x 1 segment</td>
<td></td>
</tr>
<tr>
<td>Range</td>
<td>- 19999 to + 99999</td>
</tr>
<tr>
<td>Offset</td>
<td>- 19999 to + 99999</td>
</tr>
<tr>
<td>Operation</td>
<td>Software and/or 3 push button (-/+/E) operation</td>
</tr>
<tr>
<td>Interface</td>
<td>RS 232, 3.5 mm stereo socket in housing front</td>
</tr>
<tr>
<td>Limit function</td>
<td>Off, minimum safety, maximum safety, gradient (rate-of-change), alarm</td>
</tr>
<tr>
<td>Set point</td>
<td>- 19999 to + 99999</td>
</tr>
<tr>
<td>Hysteresis</td>
<td>- 19999 to + 99999</td>
</tr>
<tr>
<td>Time delay</td>
<td>0s to 99s</td>
</tr>
<tr>
<td>Number of set points</td>
<td>2</td>
</tr>
<tr>
<td>Display</td>
<td>1 yellow LED per set point, optional symbols in the LC display</td>
</tr>
<tr>
<td>Scan rate</td>
<td>1s</td>
</tr>
</tbody>
</table>

### Power supply

<table>
<thead>
<tr>
<th></th>
<th>90...250 VAC 50/60 Hz (operating altitude &lt; 2000 m above sea level)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power supply</td>
<td>18...36 VDC, 20...28 V AC 50/60 Hz</td>
</tr>
<tr>
<td>Power consumption</td>
<td>max. 11 VA</td>
</tr>
<tr>
<td>Fuses</td>
<td>315 mA, slow blow (90...250 V) 1 A, slow blow (20...28 V)</td>
</tr>
</tbody>
</table>

### Certification

<table>
<thead>
<tr>
<th></th>
<th>89/336/EWG and 73/23/EWG guide lines</th>
</tr>
</thead>
<tbody>
<tr>
<td>GL-Marine approval</td>
<td>Germanischer Lloyd / marine approval</td>
</tr>
</tbody>
</table>

### Order information

<table>
<thead>
<tr>
<th></th>
<th>See section “How to order”</th>
</tr>
</thead>
</table>

Technical alterations reserved.
RMA 421 process transmitter

<table>
<thead>
<tr>
<th>Certification</th>
<th>A Version for Non-Ex areas</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power supply</td>
<td>1 90...250 V, 50/60 Hz</td>
</tr>
<tr>
<td>2 18...36 VDC/20...28 VAC, 50/60 Hz</td>
<td></td>
</tr>
<tr>
<td>Input</td>
<td>1 0/4...20 mA, 0...1/10 V, +/- 100 mV, +/- 10 V, thermocouple and Pt100, Pt500, Pt1000, Ni100, 0...4000 Ω resistance</td>
</tr>
<tr>
<td>Display</td>
<td>A 5 digit LC display with front end operation</td>
</tr>
<tr>
<td></td>
<td>B No LC display, setting up using RS 232*</td>
</tr>
<tr>
<td>Analogue output/alarm relays</td>
<td>1 Analogue output and alarm relays not required*</td>
</tr>
<tr>
<td>2 2 alarm relays, each with one changeover contact</td>
<td></td>
</tr>
<tr>
<td>3 0/4...20 mA / 0...10 V analogue output</td>
<td></td>
</tr>
<tr>
<td>4 0/4...20 mA / 0...10 V analogue output and 2 alarm relays, each with one changeover contact</td>
<td></td>
</tr>
<tr>
<td>Model</td>
<td>A Standard</td>
</tr>
<tr>
<td></td>
<td>B Standard, with works calibration certificate</td>
</tr>
</tbody>
</table>

Order code: RMA421- [ ] [ ] [ ] [ ] [ ] [ ] - [ ] - [ ]

* RMA421- B 1 - Combination not possible!

Accessories

ReadWin®2000 PC software with connection cable (length approx. 1 m) with 9 pin Sub D connector and 3.5 mm stereo plug for setting the unit up.

Order No. RMA421A - VK

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