

# Calculation unit With multiple sensor inputs and calculation capabilities Model BSU-30

WIKA data sheet SP 89.04

For approvals, see  
page Seite 6

## Applications

- Gas monitoring
- Gas quality control
- Determination of molar mass, specific gravity and binary gas concentrations
- Management of density and temperature sensor (model DTG-30) and pressure sensor

## Special features

- Temperature-pressure compensated density (CD)
- Calculation of gas concentrations in binary mixtures (% gas A / % gas B), specific gravity (SG) and molar mass (M)
- Conversion into analogue and digital formats
- Calculated values available via 4 ... 20 mA outputs or RS-485 Modbus®
- Display of calculated values



Calculation unit, model BSU-30

## Description

The model BSU-30 is a calculation unit that combines several sensor inputs and calculates specific parameters. With its small footprint, the model BSU-30 is ideal for use in gas metering systems.

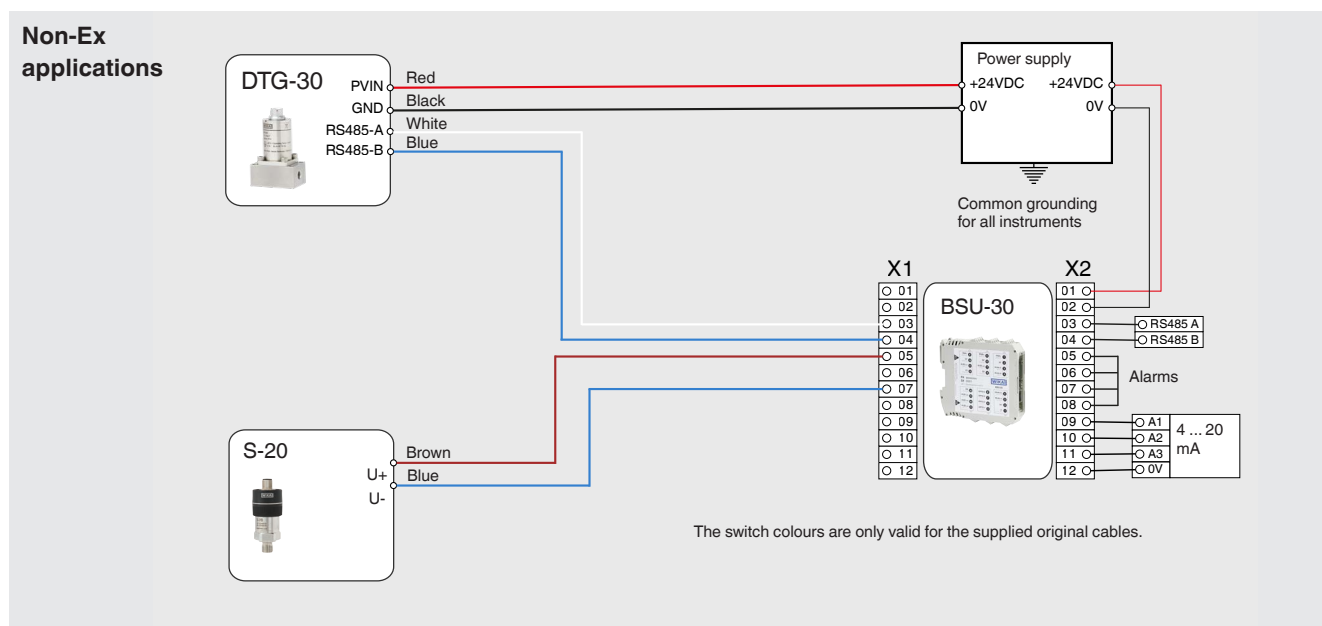
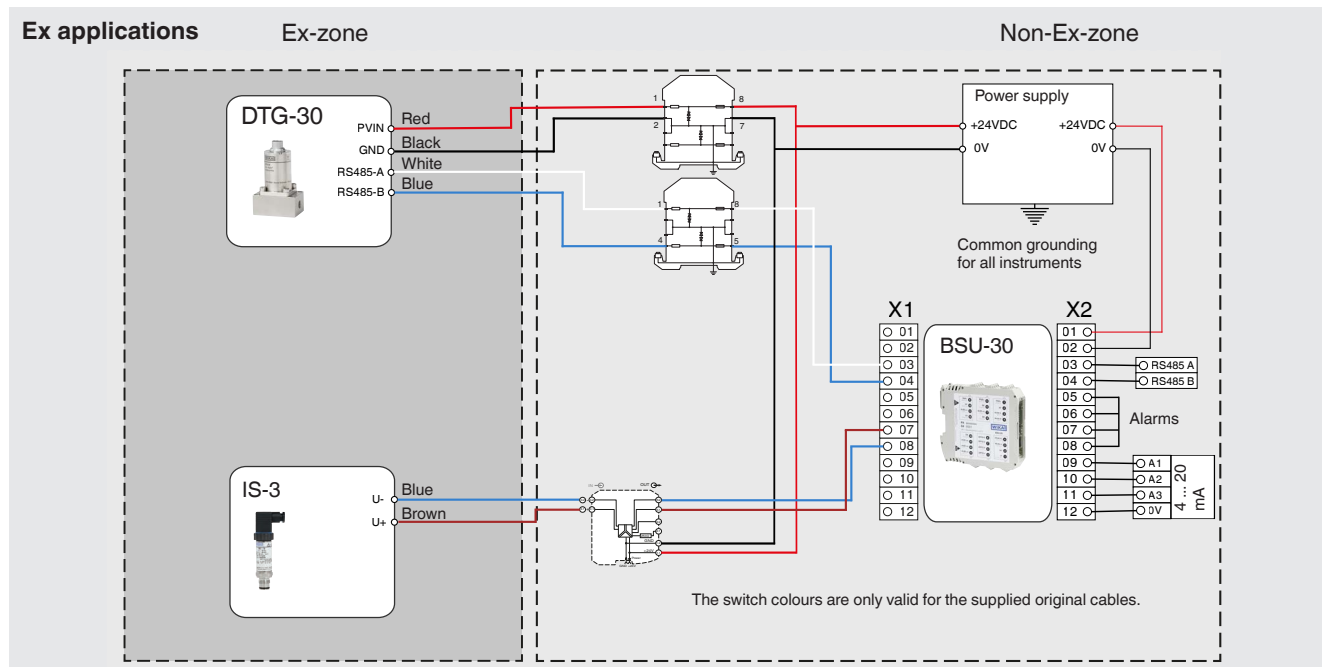
The BSU-30 is equipped with two 4 ... 20 mA analogue inputs for the connection of one or two pressure sensors (such as model IS-3 or model S-20) and with one RS-485 Modbus® input for the connection of one or two density and temperature sensors (model DTG-30).

The model BSU-30 can calculate secondary values such as average molar mass, specific gravity or gas concentration in binary mixtures from primary measurements (temperature, pressure and density).

In addition, the model BSU-30 can make available the calculated values as well as the primary measurements to other systems such as PLC, DCS or display in analogue or digital formats.

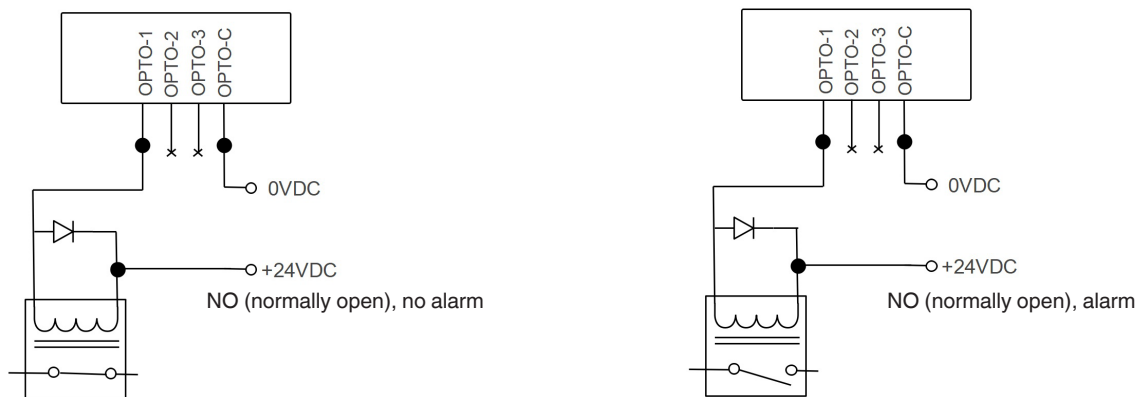
# Specifications

## Wiring scheme, example



→ The pin assignments vary depending on the selected connector type, which can be found in the respective data sheet of the pressure sensor.

## Optocoupler outputs



### Basic information

#### Compatible sensors

|                          |                         |
|--------------------------|-------------------------|
| Model DTG-30             | Temperature and density |
| Model IS-3 <sup>1)</sup> | Pressure, Ex            |
| Model S-20 <sup>1)</sup> | Pressure, non-Ex        |

#### Measuring range of the pressure sensor

- 0 ... 1.6 bar abs.
- 0 ... 2.5 bar abs.
- 0 ... 10 bar abs.
- Other measuring ranges on request

#### Calculated values

- Temperature- and pressure-compensated density (kg/m<sup>3</sup>)
- Molar mass (g/mol)
- Gas concentration in binary mixtures (% gas A, % gas B) for biogas and offgas profiles
- Other gas mixtures on request
- Specific gravity
- Other calculations on request

#### Mounting

Suitable for DIN rail per EN 60715, TH 35 rail (not included in delivery)

#### Case

|          |                 |
|----------|-----------------|
| Material | Polyamide, grey |
|----------|-----------------|

1) Sensor types recommended by the manufacturer. Other sensors with the same pressure range and accuracy can also be used.

### Input signal / Output signal

|                             |                                                                           |
|-----------------------------|---------------------------------------------------------------------------|
| <b>Analogue input</b>       | 4 ... 20 mA, for pressure sensor<br>→ Second 4 ... 20 mA input on request |
| <b>Digital input</b>        | Modbus® RTU (RS-485), for model DTG-30                                    |
| <b>Analogue output</b>      | 3 x 4 ... 20 mA (active)                                                  |
| <b>Digital output</b>       | Modbus® RTU (RS-485)                                                      |
| <b>Modbus® RTU (RS-485)</b> |                                                                           |
| Baud rate                   | 9600                                                                      |
| Data format (bits)          | 8                                                                         |
| Stop bit                    | 1                                                                         |
| Parity bit                  | 0                                                                         |
| Flow control                | No                                                                        |
| Bit numbering               | LSB (least significant bit)<br>→ 32-bit words first                       |
| Format                      | FLOAT32 (ABCD)                                                            |

| Input signal / Output signal |                                                                                                                                                              |
|------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Optocoupler output           | <ul style="list-style-type: none"> <li>■ OPTO1; active</li> <li>■ OPTO2; on request</li> <li>■ OPTO3; on request</li> <li>→ Galvanically isolated</li> </ul> |
| <b>Communication</b>         |                                                                                                                                                              |
| Network connection           | → Ethernet connection via RJ-45 connector, only for factory configuration.                                                                                   |
| Communication protocol       | Modbus® RTU                                                                                                                                                  |
| <b>Power supply</b>          |                                                                                                                                                              |
| Current consumption          | DC 12 ... 24 V<br>< 150 mA at DC 24 V<br>→ With one set of sensors connected and one 4 ... 20 mA output                                                      |

## Pin assignment

| X1 (left connection side) |              |                                 |                               |
|---------------------------|--------------|---------------------------------|-------------------------------|
| Pin                       | Designation  | Function                        | Sensor <sup>1)</sup>          |
| X1-1                      | + PSD        | Power supply DC 12 ... 24 V     | DTG-30                        |
| X1-2                      | Ground       | Common 0V                       | DTG-30                        |
| X1-3                      | RS-485-A (+) | RS-485-A input (Modbus® master) | DTG-30                        |
| X1-4                      | RS-485-B (-) | RS-485-B input (Modbus® master) | DTG-30                        |
| X1-5                      | +PSA         | Power supply                    | Pressure sensor               |
| X1-6                      | Ground       | Common 0V                       | Pressure sensor               |
| X1-7                      | Input 1      | Analogue input 1                | Pressure sensor               |
| X1-8                      | Ground       | Common 0V                       | Pressure sensor               |
| X1-9                      | +PSA         | Power supply                    | Pressure sensor <sup>2)</sup> |
| X1-10                     | Ground       | Common 0V                       | Pressure sensor <sup>2)</sup> |
| X1-11                     | Input 2      | Analogue input 2                | Pressure sensor <sup>2)</sup> |
| X1-12                     | Ground       | Common 0V                       | Pressure sensor <sup>2)</sup> |

1) Pressure sensors depending on version, see „Wiring scheme, example“

2) Connection for second pressure sensor on request.

| X2 (right connection side) |              |                                                        |
|----------------------------|--------------|--------------------------------------------------------|
| Pin                        | Designation  | Function                                               |
| X2-1                       | +V           | Power IN DC 12 ... 24 V                                |
| X2-2                       | Ground       | 0V                                                     |
| X2-3                       | RS-485-A (+) | RS-485-A terminal (Modbus® slave)                      |
| X2-4                       | RS-485-B (-) | RS-485-B terminal (Modbus® slave)                      |
| X2-5                       | OPTO-1-NO    | NO contact, alarm 1: default contact based on C1 < 0.9 |
| X2-6                       | OPTO-2-NO    | NO contact, alarm 2 (on request)                       |
| X2-7                       | OPTO-3-NO    | NO contact, alarm 3 (on request)                       |
| X2-8                       | OPTO-C       | Common optocoupler output (0V)                         |
| X2-9                       | A1 (+)       | Analogue output 1 (4 ... 20 mA)                        |
| X2-10                      | A2 (+)       | Analogue output 2 (4 ... 20 mA)                        |
| X2-11                      | A3 (+)       | Analogue output 3 (4 ... 20 mA)                        |
| X2-12                      | Ground       | Common 0V (for analogue outputs)                       |

| Analogue output configuration |                     |                       |              |                                                                                                                                         |                                                    |
|-------------------------------|---------------------|-----------------------|--------------|-----------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------|
| Setting                       | Name                | A1 (+)                | A2 (+)       | A3 (+)                                                                                                                                  | OLED display, every 5 s                            |
| 1A                            | Standard            | 233.15 K ... 378.15 K | 0 ... 20 bar | 0 kg/m <sup>3</sup> ... 10 kg/m <sup>3</sup> (density)                                                                                  | T, D, P, C1, F1, M, CD, SG                         |
| 1B                            | Exhaust gas         | 233.15 K ... 378.15 K | 0 ... 20 bar | 0 % ... 20 % CH <sub>4</sub>                                                                                                            | T, D, P, C1, % CO <sub>2</sub> , % CH <sub>4</sub> |
| 1C                            | Biogas              | 233.15 K ... 378.15 K | 0 ... 20 bar | 0 % ... 100 % CH <sub>4</sub>                                                                                                           | T, D, P, C1, % CO <sub>2</sub> , % CH <sub>4</sub> |
| 1D                            | Molar mass          | 233.15 K ... 378.15 K | 0 ... 20 bar | 0 g/mol ... 100 g/mol (molar mass)                                                                                                      | T, D, P, C1, M                                     |
| 1E                            | Specific gravity    | 233.15 K ... 378.15 K | 0 ... 20 bar | 0 ... 2 specific gravity                                                                                                                | T, D, P, C1, CD, SG                                |
| 1F                            | Compensated density | 233.15 K ... 378.15 K | 0 ... 20 bar | 0 kg/m <sup>3</sup> ... 11.5 kg/m <sup>3</sup> compensated density<br>(T <sub>ref</sub> = 273,15 K,<br>P <sub>ref</sub> = 1013,25 mbar) | T, D, P, C1, CD, SG                                |

T = temperature  
D = density  
P = pressure  
SG = specific gravity

CD = compensated density  
C1 = confidence factor, see model DTG-30 operating instructions  
F1 = resonance frequency of the sensor element

M = molar mass  
CO<sub>2</sub> = carbon dioxide  
CH<sub>4</sub> = methane

→ Other configurations on request.

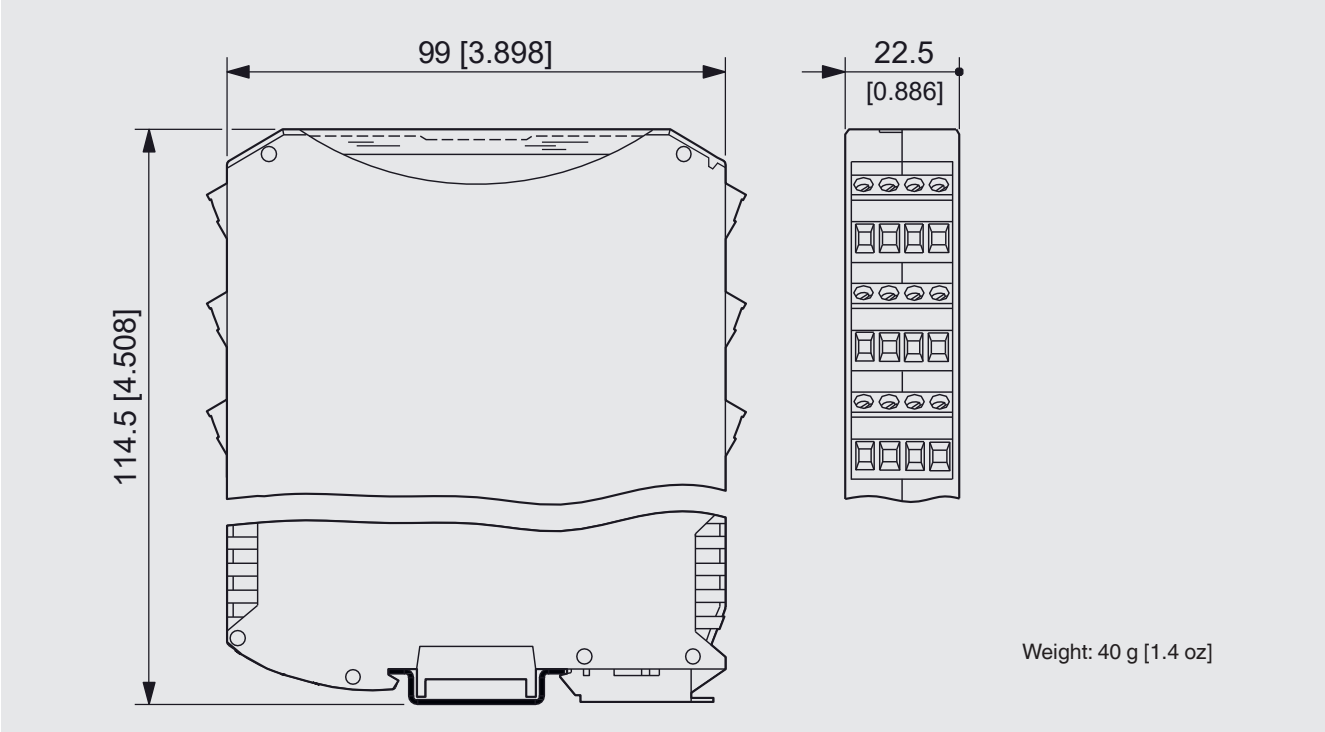
| Modbus® |             |     |                                                                   |                   |            |
|---------|-------------|-----|-------------------------------------------------------------------|-------------------|------------|
| Address | Length      | R/W | Designation                                                       | Unit              | Settings   |
| 102     | 2 x 16 bits | R   | Serial number                                                     | N/A               | N/A        |
| 104     | 2 x 16 bits | R   | Temperature                                                       | K                 | All        |
| 106     | 2 x 16 bits | R   | Density                                                           | kg/m <sup>3</sup> | All        |
| 108     | 2 x 16 bits | R   | Pressure                                                          | bar               | All        |
| 110     | 2 x 16 bits | R   | Compensated density (T <sub>ref</sub> , P <sub>ref</sub> )        | kg/m <sup>3</sup> | 1A, 1E, 1F |
| 112     | 2 x 16 bits | R   | Molar mass                                                        | g/mol             | 1D         |
| 114     | 2 x 16 bits | R   | Specific gravity                                                  | N/A               | 1E 1F      |
| 116     | 2 x 16 bits | R   | % gas A                                                           | %                 | 1B, 1C     |
| 118     | 2 x 16 bits | R   | % gas B                                                           | %                 | 1B, 1C     |
| 122     | 2 x 16 bits | R   | C1 (confidence factor)                                            | N/A               | All        |
| 126     | 2 x 16 bits | R   | Frequency (F1)                                                    | Hz                | All        |
| 128     | 2 x 16 bits | R/W | Temperature offset                                                | K                 | All        |
| 130     | 2 x 16 bits | R/W | Density offset                                                    | kg/m <sup>3</sup> | All        |
| 132     | 2 x 16 bits | R/W | Pressure offset                                                   | bar               | All        |
| 134     | 2 x 16 bits | R/W | Compensated density (T <sub>ref</sub> , P <sub>ref</sub> ) offset | kg/m <sup>3</sup> | 1A, 1E, 1F |
| 138     | 2 x 16 bits | R/W | Molar mass offset                                                 | g/mol             | 1D         |
| 140     | 2 x 16 bits | R/W | Specific gravity offset                                           | N/A               | 1E, 1F     |
| 142     | 2 x 16 bits | R/W | % gas A offset                                                    | %                 | 1B, 1C     |
| 144     | 2 x 16 bits | R/W | % gas B offset                                                    | %                 | 1B, 1C     |

| Operating conditions        |                                  |
|-----------------------------|----------------------------------|
| Operating temperature range | -20 ... +60 °C [-4 ... +140 °F]  |
| Storage temperature range   | -40 ... +70 °C [-40 ... +158 °F] |

Approvals

| Logo | Description                  | Region         |
|------|------------------------------|----------------|
| CE   | EU declaration of conformity | European Union |
|      | RoHS directive               |                |

Dimensions in mm [in]



Ordering information

Model / Setting / Pressure range

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