# MANUAL

# KFU8-FSSP-1.D-Y

**Frequency voltage converter
(40 kHz version)**

$\mathsf{C}\mathsf{E}$

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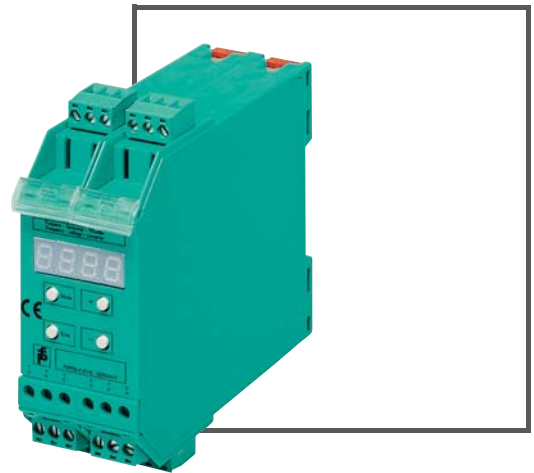
With regard to the supply of products, the current issue of the following document is applicable: The General Terms of Delivery for Products and Services of the Electrical Industry, published by the Central Association of the Electrical Industry (Zentralverband Elektrotechnik und Elektroindustrie (ZVEI) e.V.) in its most recent version as well as the supplementary clause: "Expanded reservation of proprietorship"

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# 1 Safety

## 1.1 Introduction

### 1.1.1 Content of this Document

This document contains information required to use the product in the relevant phases of the product life cycle. This may include information on the following:

- Product identification
- Delivery, transport, and storage
- Mounting and installation
- Commissioning and operation
- Maintenance and repair
- Troubleshooting
- Dismounting
- Disposal

**Note!**

For full information on the product, refer to the further documentation on the Internet at www.pepperl-fuchs.com.

The documentation comprises the following parts:

- This document
- Datasheet

In addition, the documentation may comprise the following parts, if applicable:

- EU-type examination certificate
- EU declaration of conformity
- Attestation of conformity
- Certificates
- Control drawings
- Instruction manual
- Other documents

### 1.1.2 Manufacturer

| Pepperl+Fuchs GmbH<br>Lilienthalstraße 200, 68307 Mannheim, Germany |
| --- |
| Internet: www.pepperl-fuchs.com |

### 1.1.3 Target Group, Personnel

Responsibility for planning, assembly, commissioning, operation, maintenance, and dismounting lies with the plant operator.

Only appropriately trained and qualified personnel may carry out mounting, installation, commissioning, operation, maintenance, and dismounting of the product. The personnel must have read and understood the instruction manual and the further documentation.

Prior to using the product make yourself familiar with it. Read the document carefully.

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## 1.1.4 Symbols Used

This document contains symbols for the identification of warning messages and of informative messages.

### Warning Messages

You will find warning messages, whenever dangers may arise from your actions. It is mandatory that you observe these warning messages for your personal safety and in order to avoid property damage.

Depending on the risk level, the warning messages are displayed in descending order as follows:

***Danger!***

This symbol indicates an imminent danger.

Non-observance will result in personal injury or death.

***Warning!***

This symbol indicates a possible fault or danger.

Non-observance may cause personal injury or serious property damage.

***Caution!***

This symbol indicates a possible fault.

Non-observance could interrupt the device and any connected systems and plants, or result in their complete failure.

### Informative Symbols

***Note!***

This symbol brings important information to your attention.

Action

This symbol indicates a paragraph with instructions. You are prompted to perform an action or a sequence of actions.

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# 2        Product Description

## 2.1      Device description

The frequency voltage/current converter KFU8-FSSP-1.D-Y is a device for displaying and monitoring periodical signals which occur in almost all areas of process automation, i.e. from general frequencies to specific speeds.

The input signals are evaluated and converted into a frequency or speed by a powerful $\mu$-controller in accordance with the cycle method. The $\mu$-controller calculates a voltage or current value proportional to the input frequency and produces it with a digital/analog converter in accordance with the selected limit value of the measurement range.

You can select either of the following analog signals:

- 0 V ... 10 V
- 2 V ... 10 V
- 0 mA ... 20 mA
- 4 mA ... 20 mA

The pulse output produces the input frequency which is subdivided by the adjustable factor of 1 ... 9999.

### Note!

Close attention was paid to the special case of speed measurement during the development of the device. The indicators and inputs can therefore occur in Hz or in rpm.

Furthermore, in applications involving slow processes, where sensors deliver multiple pulses per revolution, it is possible to automatically operate with the actual speed of the drive by specifying the number of pulses per revolution.

The input or output signal is displayed on a 7-segment LED display on the front of the device. The display has 4 digits and up to 3 decimal places. The parameterization is performed using the 4 buttons below the display.

The frequency voltage/current converter is supplied with 24 $V_{DC}$.

### Note!

All currently available two, three or four-wire proximity switches and incremental rotary encoders are acceptable as sensors.

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# 3 Operation

## 3.1 Operating mode

### Signal frequency

The frequency voltage/current converter processes input signals of 0.002 Hz ... 40000 Hz or speeds of 0.01 rpm ... 9999 rpm. Signals not having a duty rate of 1:1 must have a minimum pulse pause or pulse duration of 12 µs in order to be detected with certainty behind the input filter.

### Measurement underrange, message ⊟⊟⊡⊡

This message appears when no input signal is recognized.

### Measurement overrange, message 🮸🮸⊟⊟

The preset display and measurement range was exceeded.

*Note!*

Select a wider measurement range.

### Very low signal frequencies, displayed value is not valid, message ☒☒☒⊟

During the measurement of very low signal frequencies, the measuring system has detected that the signal has fallen below the last computed frequency. The time between the last two signal edges has already elapsed. The device is now waiting for the next positive signal edge in order to compute the next measured value. Here, 'XXX' represents the positions of the first three digits of the last measured value.

## 3.2 Setup mode

→ see Figure 4.4 on page 15

### Transition operating mode → setup mode

Starting setup mode

Press the "Mode" and "+" buttons at the same time.

↪ The display shows the parameters in text form.

*Note!*

You can modify the parameters in the parameter value display (flashing digits). The parameters come into effect temporarily until the operating voltage is interrupted.

### Transition setup mode → operating mode

Exiting setup mode

Press the "Enter" and "+" buttons at the same time.

↪ The parameters are stored in an EEPROM in a non-volatile manner.

### Button functions for the parameter display

| | |
|---|---|
| "+" | Switch to next parameter. |
| "-" | Switch to previous parameter. |
| "Mode" | Switch modes of parameter display. |
| "Enter" and "+" | Closes parameter editor and stores all parameters in the EEPROM. |

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## Button functions for the parameter value display (one digit flashes)

| | |
|---|---|
| "+" | Increase the value of the flashing digit. |
| "-" | Decrease the value of the flashing digit. |
| "Mode" | Move flashing digit. |
| "Enter" and "+" | Transfer from parameter value display to parameter display. |

## Function selection ᖴᑌᑎᑕ

(factory preset: Rotational speed measurement in rpm)

2 measurement functions are available:

1. Frequency measurement in Hz (parameter value = 0)

   The established cycle duration of the input signal is converted into a frequency in Hz through the formation of a reciprocal value.

   Range: 0.002 Hz ... 9999 Hz

2. Rotational speed measurement in rpm (parameter value = 1)

   The signal frequency calculated from the cycle duration is multiplied by 60, then divided by the pulse divider amount (PULS parameter) and displayed in rpm.

   Range: 0.01 rpm ... 9999 rpm

## Pulse divider ᑭᑌᒪᔕ

(factory preset: 1 pulse/revolution)

Applications involving slow processes are frequently equipped with sensors which provide several pulses per revolution. In the rotational speed measuring function, the device undertakes the conversion to the actual value of rpm by inputting the numerical value (of pulses/revolution), i.e. both the indication and the input of the measurement range end value are obtained from the actual rate of rotation of the drive.

Range: 1 ... 1200

*Note!*

The pulse separator is only active for rotational speed measurement.

## Measurement range full scale reading ᖴᖇᕼ�I

(factory preset: 9999)

In frequency measurement, the set value is measured in Hz or in speed measurement it is measured rpm (depending on **function selection**) it determines the frequency or speed at the analog output of the maximum voltage of 10 V or the maximum current of 20 mA.

Range: see display and measurement range.

Teaching in

Press the "Mode" button only and then press "Enter".

↳ The frequency or speed of the current pending input signal are taught in.

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## Analog output OUTP

(factory preset: 0 V ... 10 V)

Selection of the analog output signal. You can only use the current output (terminals 5 and 6) or current output (terminals 4 and 5).

| Parameter value | Analog output |
|---|---|
| 0 | 0 V ... 10 V |
| 1 | 2 V ... 10 V |
| 2 | 0 mA ... 20 mA |
| 3 | 4 mA ... 20 mA |

## Display function FdSP

(factory preset: frequency or speed)

The display shows the determined frequency or speed in Hz and rpm (depending on **Function selection**) or the output voltage in V.

| Display function | Function selection | Analog output | Display |
|---|---|---|---|
| 0 | 0 | - | Frequency in Hz |
| | 1 | - | Rotational speed in rpm |
| 1 | - | 0 | Voltage in V |
| | - | 1 | Voltage in V |

## Display rate tdSP

(factory preset: 0.33 s)

In order to ensure good readability of the display, the time taken to indicate the current measured value in the display can be selected between 0.01 s and 2.5 s.

*Note!*

The display rate influences neither the time required to calculate the measured value nor the switching characteristics of the output relay.

## Display and measurement range dECi

(factory preset: 0 ... 9999)

Four measuring and display ranges are available for frequency measurement and three measuring and display ranges are available for speed measurement:

| Display in parameter editor | Frequency range in Hz | Speed range in rpm | Number of decimal places |
|---|---|---|---|
| 0000 | 0 ... 9999 | | 0 |
| 000.1 | 0,0 ... 999,9 | | 1 |
| 00.02 | 0,0 ... 99,99 | | 2 |
| 0.003 | 0,0 ... 9,999 | ---- | 3 |

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Example:
The maximum permissible rotational speed of the drive is 600.5 rpm. You can select the first two measuring ranges. Select the second measurement range in order to fully utilize the accuracy of the display.

## Message ⌐ ⊓ ⊏

This message appears when an attempt has been made to change the range in such a way that previously input limiting values lie outside the display and measuring range, or the respective places following the decimal point would be cut off.

## Division factor for the pulse output ⊓ ⊏⊓

(factory preset: 1)

If the division factors is set to 1, the pulse output goes to high level approx. 10 μs after the positive slope of the input signal and to low level approx. 10 μs after the negative slope.



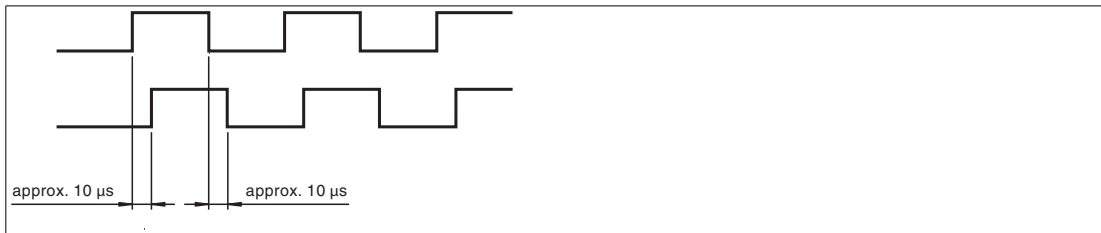approx. 10 μs          approx. 10 μs

Figure 3.1          Division factor 1

With division factors greater than 1, the pulse output goes to approx. 20 μs after the first positive input signal slope.

For even division factors the output level goes approx. 20 μs after the 'division factor'/2-period to low level for the following periods.



4 periods

2 periods

Example:
division factor = 4

output level high:
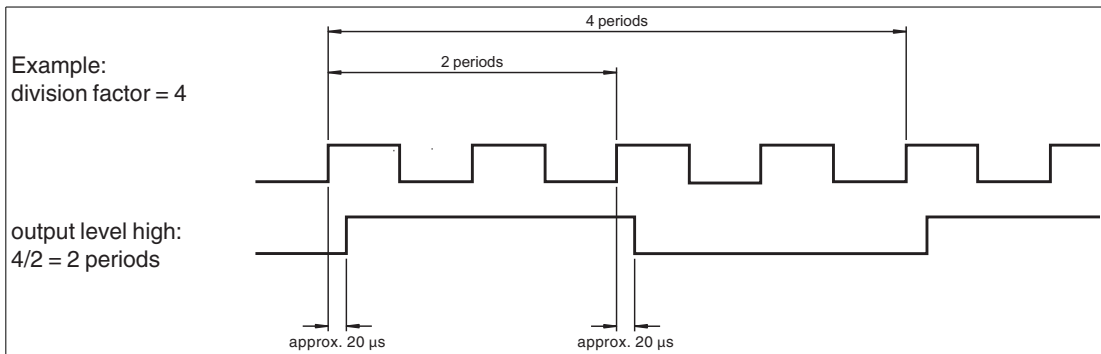4/2 = 2 periods

approx. 20 μs          approx. 20 μs

Figure 3.2          Division factor 4

For uneven division factors the output level goes approx. 20 μs after the ('division factor'-1)/2 period to low level for the following periods.
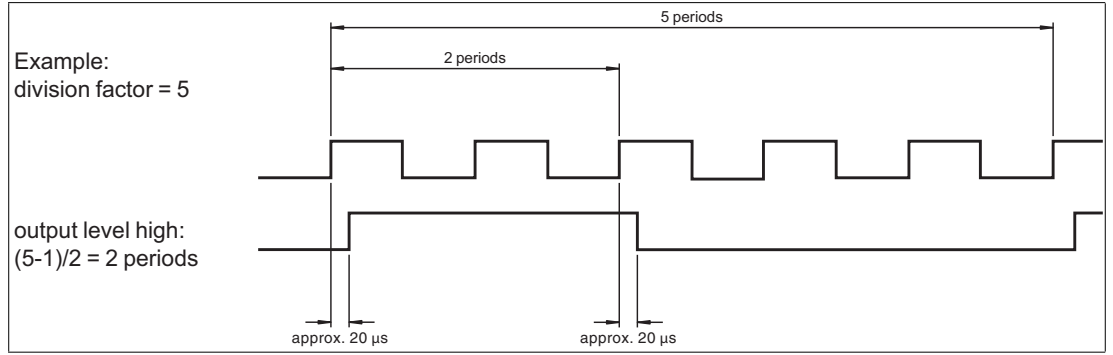
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Figure 3.3          Division factor 5

Range: 1 ... 9999

### Software version number 5OFE

**Note!**

You can only read out the version number of the software.

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# 4 Appendix

## 4.1 Terminal assignment

Term. 1:  Sensor power supply GND

Term. 2:  Pulse output

Term. 3:  Not connected

Term. 4:  Analog output I -

Term. 5:  Analog output U +

Term. 6:  Analog output U -

Term. 7:  Sensor power supply + 24 $V_{DC}$

Term. 8:  Not connected

Term. 9:  Not connected

Term. 10: Not connected

Term. 11: Power supply 24 $V_{DC}$, L +

Term. 12: Power supply 24 $V_{DC}$, L -

Term. 13: Sensor power supply GND

Term. 14: PNP, NPN input - (cathode)

Term. 15: PNP, NPN input + (anode)

Term. 16: Not connected

Term. 17: Not connected

Term. 18: Not connected

## 4.2 Dimensions, operating and display devices



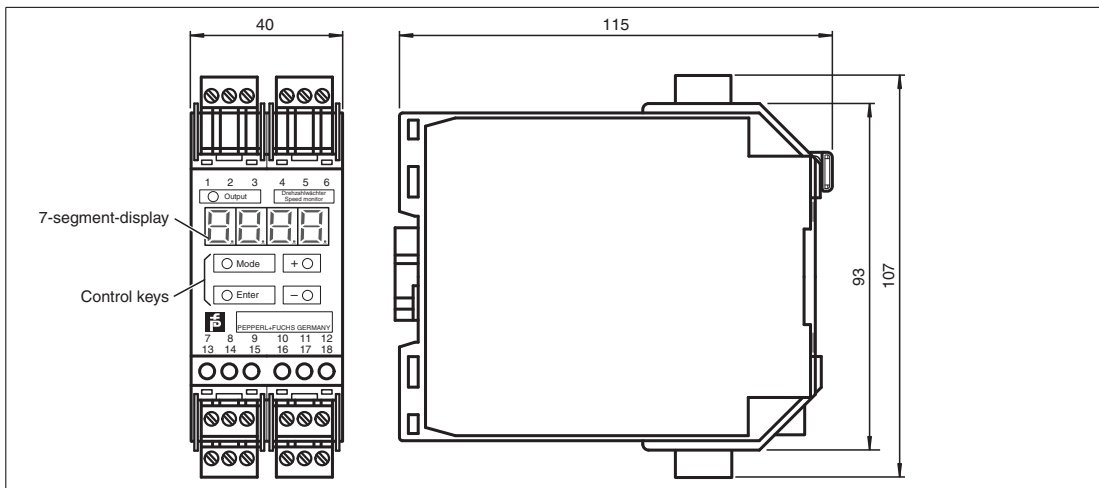Figure 4.1        KFU8-FSSP-1.D-Y with screw terminal

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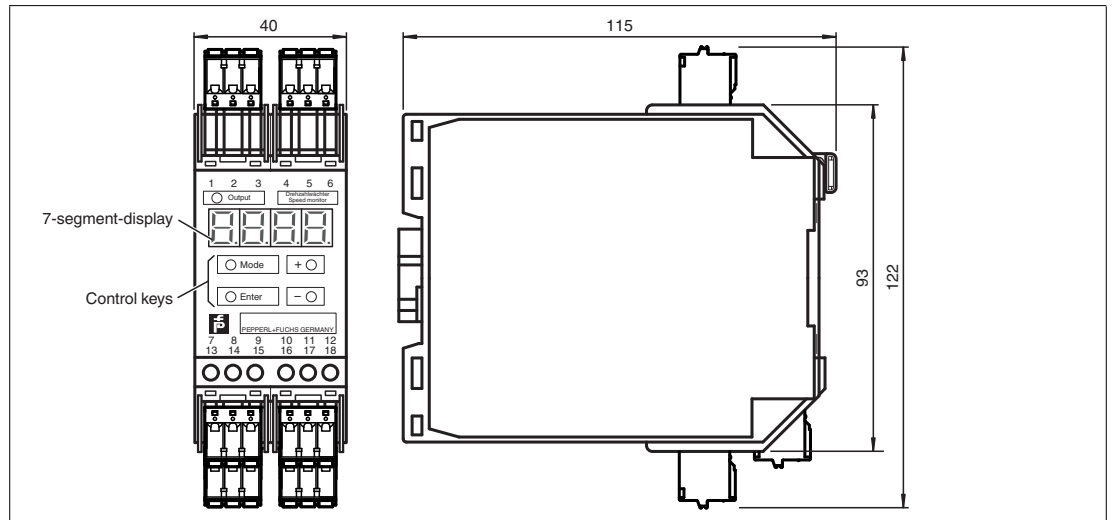
Figure 4.2        KFU8-FSSP-1.D-Y with spring terminals

| "Mode" and "+": | Start parameter editor |
| --- | --- |
| "+": | Advance to next parameter selection or increase the value of the flashing digit |
| "-": | Advance to next parameter selection or decrease the value of the flashing digit |
| "Mode": | Display parameter value (right digit flashes) or shift the flashing digit to the left |
| "Enter": | Exit parameter value display, the device now operates temporarily with the altered parameter. |
| "Enter" and "+": | Exit parameter editor, the parameters are now stored in the EEPROM in a non-volatile manner. |

## 4.3 Connection diagram



Figure 4.3          Anschlussplan

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## 4.4 Functional description



**Function selection:**
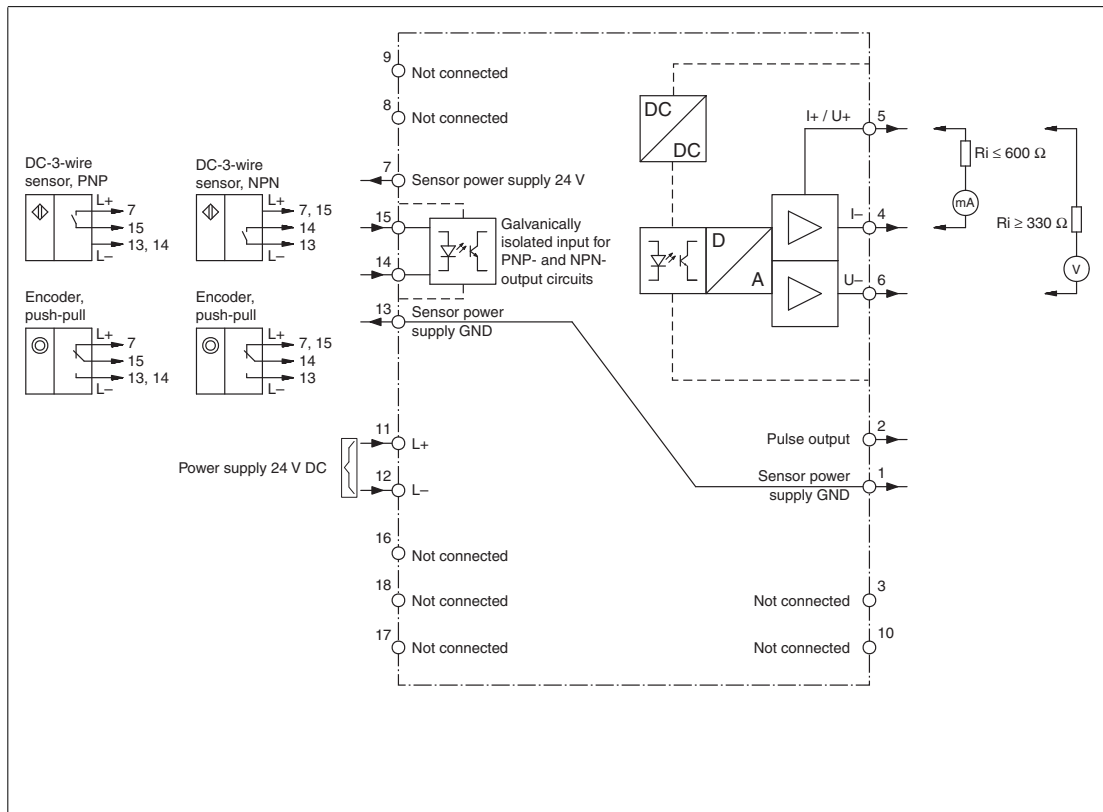X=0: Frequency measurement 0.002 Hz...9999 Hz
X=1: Speed measurement 0.01 min$^{-1}$...9999 min$^{-1}$
Factory set: X = 1

**Display and measurement range:**
$0 \leq X \leq 3$ at frequency measurement
$0 \leq X \leq 2$ at speed measurement
Factory set: X = 0

| X | Frequency [Hz] | Speed [min$^{-1}$] |
|---|---|---|
| 0000 | 0 ... 9999 | |
| 000.1 | 0 ... 999.9 | |
| 00.02 | 0 ... 99.99 | |
| 0.003 | 0 ... 9.999 | – |

**Signal divider:**
Number of signals per rotation
(is ignored during frequency measurement)
$1 \leq XXXX \leq 1200$, Factory set: XXXX = 1

**Measurement range final value:**
Frequency or speed, by which 10 V or 20 mA are
applied to the analog output.
$0 \leq XXXX \leq 9999$, Factory set: XXXX = 9999
Teach in of the current frequency or speed value
as a measurement range final value by pressing
the "MODE" button and then the "ENTER" button.

| X | Analog output |
|---|---|
| 0 | 0 V ... 10 V |
| 1 | 2 V ... 10 V |
| 2 | 0 mA ... 20 mA |
| 3 | 4 mA ... 20 mA |

Factory set: X = 0

**Display:**
X=0: Frequency or speed
X=1: Voltage display or current display
Factory set: X = 0

**Display rate:**
$0.01\ s \leq X.XX \leq 2.5\ s$
Factory set: X.XX = 0.33 s

**Division factor for pulse output:**
$1 \leq XXXX \leq 9999$
Factory set: XXXX = 1

**Software-version number:**
Can only be read.

Figure 4.4          Graphic function description

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