Evaluation Devices for Pulse Rate, Rotation Speed, Frequency, and Standstill

ALDIF Catalog

Edition 4.12
Evaluation devices for Pulse Rate, Rotation Speed, Frequency, and Standstill

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Introduction

Evaluation devices

The detection and evaluation of pulse rate and rotation speed for the automation of plant and machinery are our core competences. Since 1964 Klaschka has developed and manufactured
- non-contact, high resolution and fast pulse sensors,
- pulse rate measuring relays and converters,
- programmable logic controls with pulse counter,
- accessories such as pulse wheels (module 1) in various diameters, couplings, mounting parts and connecting leads.

For decades, our sensors and devices have demonstrated our competence in detecting, modifying, monitoring and converting pulse rates, rotation speeds, frequencies, positions, linear and rotary speeds.

Klaschka also has many years of experience in combining these sensors and devices with programmable logic controls.

In this catalog you will find evaluation devices for pulse rate, rotation speed, frequency, and standstill.

You will find pulse sensors and switches in the ALSEN catalog.
Evaluation Devices for Pulse Rate, Rotation Speed, Frequency, and Standstill

Overview

Measuring relays and converters for pulse rates and frequencies evaluate the signals from a pulse sensor for the generation of digital and analogue signals and switching commands.

The ISN pulse rate measuring relay can be used for monitoring standstill or nominal speed for a total of 4 ranges from 10 pulses / min ... 120 k pulses / min all together.

The FSN frequency measuring relay completes the ISN pulse rate measuring relay by including high frequencies. Thresholds can be set to any frequency from 100 Hz ... 120 kHz in 3 ranges.

The IWA pulse rate converter generates in 45 ranges between 6 pulses / min ... 540 k pulses / min at the output a signal analogue to the pulse rate.

The IWAS pulse rate converter with measuring relay is equipped with an additional limit value switch with relay output used for monitoring standstills or nominal pulse rates.

The FWA Frequency converter for pulse rates ranging from 3 Hz to 120 kHz has the same purpose like the IWA pulse rate converter.

Terms

Start time bridging X: During the start bridging time, the status of the output relay is independent of the input signal of the measuring relay. Normally, the output relay remains pulled-in during this time.

Pull-in delay Y: The time between the monitored quantity exceeds or falls below the threshold and the output relay pulls-in.

Drop-out delay Z: The time between the monitored quantity exceeds or falls below the threshold and the output relay drops out.

Setting accuracy: Relative error which occurs when setting a threshold (variable) for a measuring relay relative to the required threshold value.

Hysteresis H: If a measuring relay is activated at the moment as the input signal exceeds value A and alters its switching status at the moment as the input signal falls below value B, the switching hysteresis is
\[ H = \frac{(A - B)}{A} \times 100 \%
\]

Residual ripple: If a DC voltage has the average value \( U_{\text{avg}} \) and a ripple voltage with a peak-to-peak value of \( U_{\text{pp}} \) is superimposed on it, the residual ripple is
\[ R = \frac{U_{\text{pp}}}{U_{\text{avg}}} \times 100 \%
\]

Threshold S: The value of the input quantity which, when exceeded, makes the relay change its status.

Duty cycle: Ratio of pulse to period duration.

Temperature influence: Percentage change in the threshold of a measuring relay resulting from a temperature change.

Power supply influence: Percentage change in the threshold of a measuring relay resulting from a change in the power supply.

Repeat accuracy: With constant operating conditions, the switching threshold of a measuring relay will vary above and below an average value within the indicated tolerance range.
Common technical data

Unless no other specifications are given in the single descriptions, the following data are valid for all our devices:

**Power supply**
- **AC**: 230, 115, 42, and 24 V AC
- **Tolerance**: ± 10 %
- **Frequency**: 50 ... 60 Hz
- **DC**: 24 V DC
- **Tolerance range**: ± 15 %
- **Residual ripple**: max. 10 %

**Pulse sensors**
- **P-switching three- and two-pole**

**Nominal voltage**: 24 VDC
- **Output current (terminal P)**: max. 35 mA
- **Input current (terminal E)**: approx. 10 mA

**Signal levels** of logical inputs
- **Level lo**: 0 ... + 4 V DC or open input
- **Level hi**: + 12 ... + 30 V DC

**Output relays**
- **potential-free output contacts**
- **Switching voltage**: 24 ... 250 V
- **Switching current**: 0.05 ... 6 A
- **Switching capacity**
  - **AC**: max. 1.250 VA
  - **DC**: max. 50 W
- **Switching frequency**: max. 3,000 switching cycles / h
- **Lifetime**: 30 x 10⁶ switching cycles
- **Insulation group, open contacts C / 250 according to VDE 0110**
- **Test voltage, contact / coil**: 2.000 V
- **Bounce time**: ≤ 5 ms

**Device design principle**
- acc. to VDE 0435 /11.94 EN60255-6

**Operating mode**
- **continuous**

**Ambient temperature range**
- 0 … + 55 °C

**Immunity to vibration**
- max. 4 g

**Mounting orientation**
- arbitrary

**Pulse rate, rotation speed, frequency, and standstill**

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<th>Type</th>
<th>Ref. no.</th>
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<tr>
<td>ISN1/411cq-1.60-(Uv)</td>
<td>17.11-02</td>
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| Frequency measuring relay                         |          |
| FSN1/310ch-1.60-(Uv)                              | 17.11-03 |
| FSN1/311cq-1.60-(Uv)                              | 17.11-04 |

| Pulse rate converter                              |          |
| IWAS1/511ch-1.60-(Uv)                             | 17.12-05 |

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<td>Frequency converter</td>
<td>FWA1/6-1.60-(Uv)</td>
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</table>

| Pulse rate converter with threshold value monitoring rotation speed and standstill |
| IWAS1/511ch-1.60-(Uv)                           | 17.12-05 |
# Technical Data

## Housing
- **Designation**: .24
- **Housing material**: PC-GF
- **Housing of the isolation material**: acc. to DIN 43880 with cage clamp terminals
- **Protection rating acc. to IEC 60529**: IP 40
- **Colour**: light grey according to RAL 7035
- **Outer dimensions**: see pictures

## Terminals
- **Number**: 4 rows, each with 2 clamps, per clamp with two interfaces
- **Clamp material**: stainless steel, blanc / copper alloy, tin-plated
- **Max. terminal cross section**: 2 x 15 mm² each
- **Max. contact feed-through resistance**: 10 mΩ (to the circuit board)
- **Max. current charge**: 10 A
- **Insulation lengths of the leads**: 8 mm
- **Protection rat. of connecting openings**: IP 20 acc. to IEC 60529
- **Protection against electric shock**: acc. to VBG 4
- **Colour**: light grey acc. to RAL 7035

## Lead fixing
- **Type**: cage clamp
- **Tool**: screw driver with cutting edge

## Fixing of the housing
- **1)** Snap-on attachment on hat rail EN 50022
- **2)** Snap-on attachment M4 90 mm grid with 2nd slider as accessory

## Temperature range
- **According to UL 746B**: 125 °C
- **According to Vicat ISO 306 Meth. B**: 148 °C
- **According to ISO 75-2 Math. A**: 138 °C
- **According to ISO 75-2 Math. B**: 144 °C

## Creepage distances and clearances
- **Creepage current resistance**: CTI 175 = Insulation material III a (acc. to IEC 60811-1)
- **Perpendicular circuit board clear. dist.**: ≥ 3.3 mm acc. to IEC 60811-1
- **Perpendicular circuit board creep. dist.**: ≥ 4.5 mm acc. to IEC 60811-1
- **Horizontal circuit board**: ≥ 4 mm

## Net weight
- **Housing .24 with 8 clamps**: 42 g

## Housing .60 with 14 clamps
- **Designation**: .60
- **Protection rate acc. to DIN 40 050**: IP 40
- **Dielectric strength acc. to DIN 53 481**: 500 kV / cm
- **Colour**: light grey acc. to RAL 7035

## Clamps
- **Number**: 2 rows with 7 clamps each
- **Clamp screw**: captive, self-releasing
- **Cross section of connecting leads**: max. 4 qmm
- **Nominal current**: max. 20 A
- **Protection rating according to DIN 40 050**: IP 20
- **Contact protection**: according to VBG 4
- **Colour**: anthracite

## Attachment
- **Snap-on to standard rail**: standard rail according to DIN 46 277, page 3

## Temperature range
- **-40 °C ... +110 °C**

## Creepage distances and Clearances
- **acc. to VDE 0110 IGr C / 380 V AC**

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Evaluation Devices for Pulse Rate Characteristics

Pulse rate measuring relays (ISN) can be used for monitoring standstill or nominal pulse rates for a total of 4 measurement ranges between 10 pulses/min ... 120 k pulses/min.

ISN pulse rate measuring relays are used to monitor plant or machinery parts. Equipped with proximity switches, they can detect the idle state or obligatory movements of machinery.

Applications

One example for an application is that they can detect the idle state or the minimum speed of conveyors. In another case the indication is possible whether an idle state has been achieved or not or a maximum speed can be signalised. Another example for an application is the monitoring of the rotation rate of a mixer. Before feeding it, the mixer should achieve normal operation speed.

ISN pulse rate measuring relays can operate in 4 measurement ranges, beginning with 10 to 120, with 100 to 1,200, with 1,000 to 12,000 and with 10,000 to 120,000 pulses per minute.

When closing the starting contact (SK) of the ISN 1/410ch-1.60 and ISN 1/411cq-1.60 the relay is held approx. 5 sec.

For the ISN pulse rate measuring relay, a frequency-dependent undetermined delay time of maximally 1/2f has to be considered.

Type ISN 1/410ch-1.60-(Uv) Ref. no. 17.11-01
Type ISN 1/411cq-1.60-(Uv) Ref. no. 17.11-02
Type ISN 1/410ch-1.24 Ref. no. 17.11-07

Purpose

Extremely fast monitoring of rotation speeds for exceeding or falling below a threshold.

Applications

Monitoring the nominal speed or standstill of rotating parts in plant and machinery, vehicles, ships, processing technology, and in numerous other fields.

Function

A pulse sensor interrogates the rotating shaft. The period of the rectangular pulses generated is measured and converted with negligible delay into an analogue value proportional to the input frequency. This signal is available immediately after the first positive rectangular pulse edge. In mode a, the relay drops out when threshold S is exceeded (monitor for standstill); in mode b, the relay pulls-in when threshold S is exceeded (monitor for nominal speed). In addition, an external relay can be used to activate the start time bridging (relay pulled-in).

Hysteresis H and Times X, Y, Z

Version/410ch:
Hysteresis H fixed approx. 5% of S,
Start time bridging X fixed approx. 5 s,
Pull-in and drop-out delays Y, Z fixed approx. 50 ms.

Version/411cq:
Hysteresis H adjustable approx. 5% ... 50% of S,
Start time bridging X adjustable to approx. 25 s,
Pull-in and drop-out delays Y, Z adjustable together up to approx. 0.5 s.

See catalog pages 1.1.1.1, 1.1.1.2, and 1.1.1.3
### Pulse rate measuring relay

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<th>Ref. no.</th>
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<th>Number of ranges</th>
<th>Pulse rate / min</th>
<th>Frequency in Hz</th>
<th>Operating voltage</th>
<th>Uv</th>
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## Technical data

- **Permitted operating range (L+, L-)**: 8...24...30 V DC
- **Power consumption without pulse sensor, no load**: < 35 mA
- **Operating temperature**: 0...+55 °C
- **Operation mode**: Continuous
- **Housing**: 24 (see housing data)
- **Weight**: approx. 60 g

### Input (E)
- **Pulse sensors**: see ALSEN catalog (TK 2)
- **More sensors**: see ALSEN catalog (TK 1)
- **Input frequency**: 0.167 Hz...2.5 kHz
- **Permitted duty cycle**: 1:0.7...1.3
- **Level lo**: 0...1.5 V DC or open entry
- **Level hi**: 5...30 V DC
- **Threshold S**: adjustable 1...12 pulses / min
- **Range switch-over**: x10, x100, x1 k, x10 k
- **Hysteresis H**: fixed approx. 5% of S
- **Input current**: max. 14 mA

### Output (P)
- **supply pulse sensor**
  - *max. current load capacity*: ≤ 100 mA
- **Output (A)**: signal output ISN
  - **Output type**: without contact
  - **Category**: P-switching
  - **Output voltage**: operating voltage - 0.8 V DC
  - **Current load**: ≤ 200 mA

### Safety
- **Short-circuit proof**: ? / reverse polarity protect. ? yes / yes

### Indicators
- **1 green LED**: power on
- **1 LED yellow for the output**:
  - Operating mode a: exceeding threshold S
  - Operating mode b: falling below threshold S

### Accuracy
- **Setting accuracy**: ± 5%
- **Temperature influence**: ± 3%
- **Operating voltage influence**: ± 0.1%

### Accessory
- **sliders for screw fixing**

### Wiring
- **DC 3-pole**

### Pulse diagram

![Pulse diagram](image)

---

**For exact type designation and ref. no. see page 1.1.0.4**

**ISN1/410ch-1.24-24 VDC**

**17.11-07**

---

*For higher current loads an external power supply is necessary.*
Technical Data

<table>
<thead>
<tr>
<th>Operating voltage Uv</th>
<th>please indicate when ordering</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC voltage</td>
<td>115 / 230, 42 or 24 V AC</td>
</tr>
<tr>
<td>Tolerance</td>
<td>± 10 %</td>
</tr>
<tr>
<td>Frequency</td>
<td>0.5 ... 60 Hz</td>
</tr>
<tr>
<td>or DC voltage</td>
<td>24 V DC</td>
</tr>
<tr>
<td>Tolerance</td>
<td>± 15 %</td>
</tr>
<tr>
<td>Ripple voltage</td>
<td>max. 10 %</td>
</tr>
<tr>
<td>Operating temperature / mode</td>
<td>0 ... + 55 °C / continuous</td>
</tr>
<tr>
<td>Current load</td>
<td>approx. 4 VA</td>
</tr>
<tr>
<td>Housing</td>
<td>80 (see housing data)</td>
</tr>
<tr>
<td>Weight</td>
<td>approx. 300 g</td>
</tr>
</tbody>
</table>

Input (E)

- Pulse sensors: see ALSEN catalog (TK 2)
- More sensors: see ALSEN catalog (TK 1)
- Connection P, E and M: to terminals 1, 2 and 3
- Input frequency: 0 Hz ... 1.0 kHz
- Permitted duty cycle: 1 : 0.7 ... 1.3
- Level lo: 0 ... 4
- Level hi: 12 ... 36 V
- Threshold S: adjustable 1 ... 12 pulse(s) / min
- Range switch-over: x10, x100, x1 k, x10 k
- Hysteresis H: fixed approx. 5 % of S

Output (P)

- Supply pulse sensor
- * max. current load capacity: ≤ 35 mA

Output (A)

- Signal output ISN
- Relay contact

Indicators

- 1 red LED: power on
- 1 red LED for output:
  - Operating mode a: falling below threshold S
  - Operating mode b: exceeding threshold S

Accuracy

- Setting accuracy: ≤ ± 5 %
- Temperature influence: ≤ ± 3 %
- Operating voltage influence: ≤ ± 0.2 %

Housing .60 (see housing data)

Weight approx. 300 g

For the exact type designation and ref. no. please see under 1.1.0.4

For common technical and housing data see catalog pages 1.0.1 to 1.0.4

For general description see catalog page 1.1.0.1

For higher current loads an external power supply is necessary.

With power on, there is a Sk delay (start time bridging).

The pull-in/ drop-out delay is 0.5s Z/Y.

Range | Pulses/ min | Frequency Hz | Delay time ms
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>x 10</td>
<td>10 ... 120</td>
<td>0.167 ... 2</td>
<td>6.000 ... 500</td>
</tr>
<tr>
<td>x 100</td>
<td>0.1 k ... 1.2 k</td>
<td>1.67 ... 20</td>
<td>610 ... 60</td>
</tr>
<tr>
<td>x 1 k</td>
<td>1 k ... 12 k</td>
<td>16.7 ... 200</td>
<td>70 ... 15</td>
</tr>
<tr>
<td>x 10 k</td>
<td>10 k ... 120 k</td>
<td>167 ... 2 k</td>
<td>17 ... 11</td>
</tr>
</tbody>
</table>

Wiring

DC 3-pole

Pulse rate measuring relay with LED indicator YE

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### Technical data

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating voltage $U_v$</td>
<td>please indicate when ordering</td>
</tr>
<tr>
<td>AC voltage</td>
<td>115 / 230, 42 or 24 V AC</td>
</tr>
<tr>
<td>Tolerance</td>
<td>± 10 %</td>
</tr>
<tr>
<td>Frequency</td>
<td>50 ... 80 Hz</td>
</tr>
<tr>
<td>DC voltage</td>
<td>230 V DC</td>
</tr>
<tr>
<td>Tolerance range</td>
<td>± 15 %</td>
</tr>
<tr>
<td>Ripple voltage</td>
<td>max. 10 %</td>
</tr>
<tr>
<td>Operating temperature / mode</td>
<td>0 ... ± 55 °C / continuous</td>
</tr>
<tr>
<td>Power consumption</td>
<td>approx. 4 VA</td>
</tr>
<tr>
<td>Housing</td>
<td>60 (see housing data)</td>
</tr>
<tr>
<td>Weight</td>
<td>approx. 300 g</td>
</tr>
</tbody>
</table>

### Input (E)

- Pulse sensors: see ALSEN catalog (TK 2)
- More sensors: see ALSEN catalog (TK 1)
- Connection P, E and M to terminals 1, 2 and 3
- Input frequency: 0 Hz ... 1.0 kHz
- Permitted duty cycle: $1 : 0.7 ... 1.3$
- Threshold $S$: adjustable 10 ... 12 pulse(s) / min
- Range switch-over: 0.10 x 100, 1 x 1, 10 x 10
- Hysteresis $H$: adjustable approx. 5 ... 50 % of $S$
- Start time delay $X$: 0 ... 25 s
- Pulsel-out delay $Y$, $Z$: together up to approx. 0.5 s

### Output (P)

- Supply pulse sensor
  - *max. current load capacity*: ≤ 35 mA

### Output (A)

- Signal output ISN
- Output contact: relay contact
- Category: changeover potential-free
- Switching voltage / current: 24 ... 250 V / 0.05 ... 6 A
- Switching performance for AC / DC: max. 1.250 VA / max. 50 W

### Indicators

- 1 LED green: operating voltage ON
- 1 LED red: for output

### Accuracy

- Setting accuracy: ≤ ± 5 %
- Temperature influence: ≤ ± 3 %
- Operating voltage influence: ≤ ± 0.2 %

---

### Wiring

**Pulse diagram**

- Rotation speed $n$
- Threshold $S$
- Hysteresis $H$
- Power on
- $X$ = Start-time bridging $t_1$
- $Y$ = Pulsel-out delay $t_2$
- $Z$ = Drop-out delay $t_3$
- $K$ operating mode $a$
- $K$ operating mode $b$

**DC 3-pole**

- Pulse sensor
- Sk = Start time bridging On
- B = Bridge for operating modes
- Operating mode $a$: bridge 5-6 Standstill monitor
- Operating mode $b$: bridge 6-7 Nominal rotation speed monitor

---

**Device**

<table>
<thead>
<tr>
<th>Universal Pulse Rate Measuring Relay ISN</th>
</tr>
</thead>
<tbody>
<tr>
<td>For exact type designation and ref. no. see page 1.1.0.4</td>
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<tr>
<td>ISN1411eq-1.60-(Uv)</td>
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<tr>
<td>17.11-02-xxx</td>
</tr>
</tbody>
</table>

**For common technical and housing data see catalog pages 1.0.1 to 1.0.4**

**For general description see catalog page 1.1.0.1**

---

**Range**

<table>
<thead>
<tr>
<th>Range</th>
<th>Pulses / min</th>
<th>Frequency in Hz</th>
<th>Delay time in ms</th>
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</thead>
<tbody>
<tr>
<td>x 10</td>
<td>10 ... 120</td>
<td>0.167 ... 2</td>
<td>6.000 ... 500</td>
</tr>
<tr>
<td>x 100</td>
<td>0.1 k ... 1.2 k</td>
<td>1.67 ... 20</td>
<td>610 ... 60</td>
</tr>
<tr>
<td>x 1 k</td>
<td>1 k ... 12 k</td>
<td>16.7 ... 200</td>
<td>70 ... 15</td>
</tr>
<tr>
<td>x 10 k</td>
<td>10 k ... 120 k</td>
<td>167 ... 2 k</td>
<td>17 ... 11</td>
</tr>
</tbody>
</table>

---

**Wiring**

- Pulse rate measuring relay with LED indicator RD
- 230 V AC or 24 V DC

---

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<table>
<thead>
<tr>
<th>Range</th>
<th>Pulses / min</th>
<th>Frequency in Hz</th>
<th>Delay time in ms</th>
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<td></td>
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</table>
Frequency Evaluation Devices

Characteristics

FSN Frequency and pulse rate measuring relays complete the ISN pulse rate measuring relay with high frequencies. Three threshold ranges from 100 Hz to 120 kHz can be selected.

Type FSN 1/310ch-1.60-(Uv)        Ref. no. 17.11-03
Type FSN 1/311cq-1.60-(Uv)        Ref. no. 17.11-04

Purpose

They monitor whether a value exceeds or falls below a preset threshold.

Applications

As nominal frequency or standstill monitor of rotating parts in machinery or plant, in vehicles and ships, in mining, in process engineering as well as in many other ranges.

Function

A pulse sensor or encoder interrogate the rotating shaft (maximum frequency has to be considered) at entries E1 or E2 (for high frequencies). In mode a the relay k drops out when threshold S is exceeded (standstill monitor); in mode b the relay pulls-in when threshold S is exceeded (nominal rotation speed monitor). In addition, an external start contact (SK) can be used to activate the start time bridging X (relay pulled-in).

Hysteresis H and X, Y, Z times

Version/310ch:
- Hysteresis H fixed approx. 5% of S,
- start time delay X fixed approx. 5 s,
- pull-in and drop-out delay Y, Z fixed approx. 50 ms.

Version/311cq:
- Hysteresis H adjustable approx. 5 to 50% of S,
- start time delay X adjustable up to 25 s,
- pull-in and drop-out delay Y, Z together adjustable up to 0.5 s.

See catalog pages 1.2.1.1 and 1.2.1.2
## Frequency measuring relays

<table>
<thead>
<tr>
<th>Type</th>
<th>Ref. no.</th>
<th>Page</th>
<th>Number of ranges</th>
<th>Measurement range B or B1 / B2</th>
<th>Pulses / min</th>
<th>Frequency in Hz</th>
<th>Operating voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>FSN1/310ch-1.60-115/230VAC</td>
<td>17.11-03-007</td>
<td>1.2.1.1</td>
<td>3</td>
<td>6 k ... 7200 k</td>
<td>100 ... 120 k</td>
<td>115/230 V AC</td>
<td></td>
</tr>
<tr>
<td>FSN1/310ch-1.60-42VAC</td>
<td>17.11-03-003</td>
<td>1.2.1.1</td>
<td>3</td>
<td>6 k ... 7200 k</td>
<td>100 ... 120 k</td>
<td>42 V AC</td>
<td></td>
</tr>
<tr>
<td>FSN1/310ch-1.60-24VAC</td>
<td>17.11-03-005</td>
<td>1.2.1.1</td>
<td>3</td>
<td>6 k ... 7200 k</td>
<td>100 ... 120 k</td>
<td>24 V AC</td>
<td></td>
</tr>
<tr>
<td>FSN1/310ch-1.60-24VDC</td>
<td>17.11-03-006</td>
<td>1.2.1.1</td>
<td>3</td>
<td>6 k ... 7200 k</td>
<td>100 ... 120 k</td>
<td>24 V DC</td>
<td></td>
</tr>
<tr>
<td>FSN1/311cq-1.60-115/230VAC</td>
<td>17.11-04-007</td>
<td>1.2.1.2</td>
<td>3</td>
<td>6 k ... 7200 k</td>
<td>100 ... 120 k</td>
<td>115/230 V AC</td>
<td></td>
</tr>
<tr>
<td>FSN1/311cq-1.60-42VAC</td>
<td>17.11-04-003</td>
<td>1.2.1.2</td>
<td>3</td>
<td>6 k ... 7200 k</td>
<td>100 ... 120 k</td>
<td>42 V AC</td>
<td></td>
</tr>
<tr>
<td>FSN1/311cq-1.60-24VAC</td>
<td>17.11-04-005</td>
<td>1.2.1.2</td>
<td>3</td>
<td>6 k ... 7200 k</td>
<td>100 ... 120 k</td>
<td>24 V AC</td>
<td></td>
</tr>
<tr>
<td>FSN1/311cq-1.60-24VDC</td>
<td>17.11-04-006</td>
<td>1.2.1.2</td>
<td>3</td>
<td>6 k ... 7200 k</td>
<td>100 ... 120 k</td>
<td>24 V DC</td>
<td></td>
</tr>
</tbody>
</table>
FSN Frequency measuring relay

**Technical data**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating voltage UV</td>
<td>please indicate when ordering</td>
</tr>
<tr>
<td>AC voltage</td>
<td>115 / 230, 42 or 24 V AC</td>
</tr>
<tr>
<td>Tolerance</td>
<td>± 10 %</td>
</tr>
<tr>
<td>Frequency</td>
<td>50 ... 60 Hz</td>
</tr>
<tr>
<td>Tolerance range</td>
<td>± 15 %</td>
</tr>
<tr>
<td>Ripple voltage</td>
<td>max. 10 %</td>
</tr>
<tr>
<td>Operating temperature / mode</td>
<td>0 ... + 55 °C / continuous</td>
</tr>
<tr>
<td>Power consumption</td>
<td>approx. 2 VA</td>
</tr>
<tr>
<td>Housing</td>
<td>50 (see housing data)</td>
</tr>
<tr>
<td>Weight</td>
<td>approx. 300 g</td>
</tr>
</tbody>
</table>

**Input (E)**

- Pulse sensors: see ALSEN catalog (see TK 2)
- More sensors: see ALSEN catalog (see TK 1)
- Connection P, E1 or E2 and M: to terminals 1, 2, 3 and 4
- Input frequency E1 / E2: 0 Hz ... 15 kHz / 0 Hz ... 150 kHz
- Permitted duty cycle: 1 : 0.7 ... 1.3
- Threshold S: adjustable from 1 ... 12 kHz
- Range switch-over: x 0.1, x 1, x 10
- Hysteresis H: fixed approx. 5 % of S

**Output (P)**

- Supply pulse sensor: max. load capacity ≤ 35 mA

**Output (A)**

- Signal output FSN: relay contact
- Output mode: Category 1: potential-free changeover switch
- Switching voltage: 24 ... 250 V
- Switching current: 0.05 ... 6 A
- Switching performance: AC / DC max. 1.250 VA / max. 50 W

**Indicators**

- 1 LED green: operating voltage ON
- 1 LED red for output:
  - Operating mode a: falling below threshold S
  - Operating mode b: exceeding threshold S

**Accuracy**

- Setting accuracy: ≤ ± 5 %
- Temperature influence: ≤ ± 3 %
- Operating voltage influence: ≤ ± 0.2 %

**Pulse diagram**

See diagram for pulse diagram.

**Connection**

See diagram for connection.

**Frequency and pulse rate measuring relay with LED indicator RD**

- For 150 kHz
- For 15 kHz

For common technical and housing data see catalog pages 1.0.1 to 1.0.4
For general description see catalog page 1.2.0.1

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FSN Frequency measuring relay

### Technical data

<table>
<thead>
<tr>
<th>Operating voltage (U_v)</th>
<th>please indicate when ordering</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC voltage (U_{ac})</td>
<td>115 / 230, 42 oder 24 V AC</td>
</tr>
<tr>
<td>Tolerance</td>
<td>± 10 %</td>
</tr>
<tr>
<td>Frequency (f)</td>
<td>50 ... 60 Hz</td>
</tr>
<tr>
<td>DC voltage</td>
<td>24 V DC</td>
</tr>
<tr>
<td>Tolerance range</td>
<td>± 15 %</td>
</tr>
<tr>
<td>Ripple voltage</td>
<td>max. 10 %</td>
</tr>
<tr>
<td>Operating temperature / mode</td>
<td>0... + 55 °C / continuous</td>
</tr>
<tr>
<td>Power consumption</td>
<td>approx. 2 VA</td>
</tr>
<tr>
<td>Housing / weight</td>
<td>60 / approx. 300 g</td>
</tr>
</tbody>
</table>

### Input (E)

- **Pulse sensors**
  - see ALSEN catalog (see TK 2)
  - More sensors, see ALSEN catalog (see TK 1)

### Connection

- Connection P, E1 or E2 and M to terminals 1, 2, 3 and 4

### Input frequency

- E1 / E2: 0 Hz ... 15 kHz / 0 Hz ... 150 kHz

### Permitted duty cycle

- 1 : 0.7 ... 1.3

### Threshold S

- adjustable 1 ... 12 kHz

### Range switch-over

- x 0.1, x 1, x 10

### Hysteresis H

- adjustable approx. 5 ... 50 % of S

### Start time delay \(X\)

- up to 25 s adjustable

### Pull-in and drop-out delay \(Y, Z\)

- up to approx. 0.5 s together adjustable

### Output (P)

- Supply pulse sensor
  - max. current load capacity: \(\leq 35 \text{ mA}\)

### Output (A)

- Signal output FSN
- Relay contact

### Switching performance

- AC / DC: max. 1.250 VA / max. 50 W

### Indicators

- 1 LED green: operating voltage ON
- 1 LED red for output:
  - Operating mode a: falling below threshold S
  - Operating mode b: exceeding threshold S

### Accuracy

- Setting accuracy: \(\leq 5 \%\)
- Temperature influence: \(\leq 3 \%\)
- Operating voltage influence: \(\leq 0.2 \%\)

### Pulse diagram

- Rotation speed \(n\)
- Threshold S
- Hysteresis H
- \(x\) = start time bridging \(t_1\)
- \(y\) = pull-in delay \(t_2\)
- \(z\) = drop-out delay \(t_3\)

### Output (A) signal output FSN

- Relay contact

### Connection

- DC 3-pole

For exact type designation and ref. no. see page 1.2.0.2

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Evaluation devices for pulse rates with analogue signal

Characteristics

The IWA pulse rate converter generates for a total of 45 ranges between 0.06 pulses / min ... 540 k pulses / min at its output a signal analogue to the pulse rate.

Type IWA 1/5-1.60-(Uv) Ref. no. 17.12-03

Purpose

Quick conversion of pulse rates and rotation speeds to proportional analogue currents or voltages. They cover a wide frequency range from 0.001 Hz to 9 kHz, corresponding to 0.06 up to 540 k pulses per minute.

Applications

For the open or closed-loop speed control of drives, or, as a substitute for expensive DC Tachodynamos (which are subject to wear), to indicate speeds of rotation.

Function

A pulse sensor interrogates the rotating shaft. The period of the rectangular pulses generated is measured and converted with negligible delay into an analogue value proportional to the input frequency. This signal is available at outputs A1 and A2 immediately after each rectangular pulse.

Ranges

At two rotary switches a total of 45 ranges between the limiting values (1 ... 9 Hz x factor 0.1 ... 1000) can be set. Each linear measurement range covers from 1 to 100 % of the selected end-of-range value.

Analogue outputs

0 to 10 V, 0 or 4 mA to 20 mA. At the rotary switch for the factor, the lower limit for the current output can be set to either 0 or 4 mA.

In addition, the IWAS (on page 1.5.0.1) can monitor a preset threshold.

Pulse converters

<table>
<thead>
<tr>
<th>Type</th>
<th>Ref. no.</th>
<th>Page</th>
<th>Measuring range B or B1 / B2</th>
<th>Operating voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Pulses / min</td>
<td>Frequency in Hz</td>
</tr>
<tr>
<td>IWA1/5-1.60-115/230VAC</td>
<td>17.12-03-007</td>
<td>1.3.0.2</td>
<td>45</td>
<td>6...540 k</td>
</tr>
<tr>
<td>IWA1/5-1.60-42VAC</td>
<td>17.12-03-003</td>
<td>1.3.0.2</td>
<td>45</td>
<td>6...540 k</td>
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<tr>
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<td>17.12-03-005</td>
<td>1.3.0.2</td>
<td>45</td>
<td>6...540 k</td>
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<td>17.12-03-006</td>
<td>1.3.0.2</td>
<td>45</td>
<td>6...540 k</td>
</tr>
</tbody>
</table>
IWA Pulse Rate Converter

Device
For the exact type designation and ref. no. please refer to page 1.3.0.1

IWA Pulse Converter
IWA1/5-1.60-(Uv)
17.12-03-xxx

Technical Data

- Operating voltage Uv: please indicate when ordering
- AC voltage: 115 / 230, 42, 24 V AC
- Tolerance: ±10 %
- Frequency: 50 ... 60 Hz
- DC voltage: 24 V DC
- Tolerance range: 15 %
- Ripple voltage: max. 10 %
- Line voltage: 0 ... + 55 °C
- Operation mode: continuous
- Current consumption: approx. 6 VA
- Housing: 80 (see housing data)
- Weight: approx. 350 g

Input (E)
- Pulse sensors: see ALSEN catalog (TK 2)
- More sensors: see ALSEN catalog (TK 1)
- Connections P, E and M to terminals 1, 2 and 3
- Input frequency: 0 Hz to 25 kHz
- Permitted duty cycle: 0.7 ... 1.3
- Indicator ranges: 45, adjustable 1 ... 9 Hz
- X factor: 0.1 ... 1000

Output (P)
- Supply pulse sensor
  * max. current load capacity: ≤ 35 mA
- Output A1 (voltage source)
  - Load resistance / ripple: ≤ 10 kΩ / ≤ 0.5 %
- Output A2 (current source)
  - Load resistance / ripple: ≤ 500 Ω / ≤ 0.5 %

Indicators
- 1 LED green
- Power ON

Accuracy
- Linearity error: ≤ ± 0.25 %
- Resolution: 256 steps
- Temperature influence: ≤ ± 0.5 %
- Operating voltage influence: ≤ ± 0.1 %

Pulse diagram

- Output A1: 10 V
- Output A2: 20 mA

For commun technical and housing data see catalog pages 1.0.1 to 1.0.4
Description see catalog page 1.3.0.1

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1.3.1.1
Evaluation devices for Frequency Rates with Analogue Signal Characteristics

The **FWA Frequency Converter** for pulse rates ranging from 3 Hz to 120 kHz has the same purpose like the IWA Pulse Rate Converter.

**Type FWA 1/6-1.60-(Uv) Ref. no. 17.12-02**

**Purpose**
Conversion of pulse rates and rotation speeds to a proportional analogue current or voltage. Frequencies range from 30 Hz to 120 kHz, corresponding to 1.8 k up to 7.2 million pulses per minute.

**Function**
A pulse sensor interrogates the rotating shaft. The integrator stage of the device converts the generated rectangular pulses to an analogue value which is proportional to the input frequency.

**Applications**
For the open and closed-loop speed control of drives, or, as a substitute for expensive DC Tachodynamos (which are subject to wear), to indicate speeds of rotation.

### Frequency converter

<table>
<thead>
<tr>
<th>Type</th>
<th>Ref. no.</th>
<th>Page of ranges</th>
<th>Measuring range B or B1 / B2</th>
<th>Operating voltage Uv</th>
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<tr>
<td>FWA1/6-1.60-115/230VAC</td>
<td>17.12-02-007</td>
<td>1.4.0.2</td>
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<td>0 ... 7.2 Mio</td>
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<tr>
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<td>17.12-02-003</td>
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<td>FWA1/6-1.60-24VDC</td>
<td>17.12-02-006</td>
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<td>0 ... 7.2 Mio</td>
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<tr>
<td>FWA1/6-1.60-24VAC</td>
<td>17.12-02-005</td>
<td>1.4.0.2</td>
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<td>0 ... 7.2 Mio</td>
</tr>
</tbody>
</table>

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Technical data

Line voltage Uv: please indicate when ordering
AC voltage: 115 / 230, 42, 24 V AC
Tolerance: ± 10 %
Frequency: 50 ... 60 Hz
DC voltage: 24 V DC
Tolerance range: 15 %
Residual ripple: max. 10 %
Operating temperature: 0 ... + 55 °C
Operation mode: continuous
Power consumption: approx. 4 VA
Housing: ≤ 60 mm
Weight: approx. 300 g

Input (E)

Pulse sensors: see ALSEN catalog (TK 2)
More sensors: see ALSEN catalog (TK 1)
Connections P, E1 or E2 and M to terminals 1, 2, 3 and 4
Input frequency E1 / E2: 0 Hz ... 20 kHz / 0 ... 200 kHz
Permitted duty cycle: 1 : 0.7 ... 1.3
Number of ranges: 6 (see table)

Output A1 (voltage source)
Load resistance: ≥ 500 Ω
Output A2 (current source)
Load resistance: ≤ 680 Ω
Output A3 (current source)
Load resistance: ≤ 680 Ω
Output A4 (current source)
Load resistance: ≤ 10 kΩ

Indicators
1 LED green: Power ON

Accuracy
Linearity error: ≤ ± 1 %
Temperature influence: ≤ ± 3 %
Operating voltage influence: ≤ ± 0.1 %

For the exact type designation and exact ref. no., please see page 1.4.0.1

Frequency Converter FWA
FWA1/6-1.60-(Uv)
17.12-02-xxx

For common technical and housing data see catalog pages 1.0.1 to 1.0.4
For general description see catalog page 1.4.0.1

Pulse Sensor Analogue outputs

Power supply
Uv = 115 / 230 V AC

Indicator instrument

Input
Range kHz
Time setting ms
Residual ripple % at 0.1 x end-of-range
End value 1.0

E1 0 ... 0.3 40 100 51 2
E1 0 ... 1.2 40 10 0.5 0.2
E1 0 ... 3.0 4 100 5 2
E1 0 ... 12 4 10 0.5 0.2
E2 0 ... 30 0.4 50 2.5 1
E2 0 ... 120 0.4 5 0.3 0.1

Wiring
DC 3-pole

Frequency converter with LED indicator GN

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Evaluation Devices for Pulse Rate with Threshold Monitoring

Characteristics

Type IWAS 1/511ch-1.60-(Uv) Ref. no. 17.12-05

Purpose

Quick conversion of pulse rates and rotation speeds to proportional analogue currents or voltages. They cover a wide frequency range from 0.1 Hz to 9 kHz, corresponding to 6 up to 540 k pulses per minute.

They monitor whether a value exceeds or falls below a preset threshold, i.e. they can function as a nominal rotation speed or standstill monitor.

Applications

For the open and closed-loop speed control of drives, or, as a substitute for expensive DC Tachometers (which are subject to wear), to indicate speeds of rotation.

Function

A pulse sensor interrogates the rotating shaft. The period of the rectangular pulses generated is measured and converted with negligible time delay into an analogue value proportional to the input frequency. This signal is available at outputs A1 and A2 immediately after each rectangular pulse.

The output voltage is transmitted to a threshold value monitor which controls the output relay K. In mode a (no bridge between clamps b and M) the relay K drops out when threshold S is exceeded; in mode b (bridge between b and M) the relay pulls-in when threshold S is exceeded.

Ranges

At two rotary switches a total of 45 ranges between the limiting values (1 … 9 Hz x factor 0.1 … 1000) can be set. Each linear measurement range covers 1 to 100 % of the selected end-of-range value.

Analogue outputs

0 to 10 V, 0 or 4 mA to 20 mA. At the rotary switch for the factor, the lower limit for the current output can be set to either 0 or 4 mA.

Pulse rate converter (rotation speed and standstill)

<table>
<thead>
<tr>
<th>Type</th>
<th>Ref. no.</th>
<th>Page</th>
<th>Number of end-of-range values</th>
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<th>Operating voltage</th>
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<td>17.12-05-007</td>
<td>1.5.1.1</td>
<td>45</td>
<td>6 ... 540 k</td>
<td>115/230 V AC</td>
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<tr>
<td>IWAS1/511ch-1.60-42VAC</td>
<td>17.12-05-003</td>
<td>1.5.1.1</td>
<td>45</td>
<td>6 ... 540 k</td>
<td>42 V AC</td>
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<tr>
<td>IWAS1/511ch-1.60-24VAC</td>
<td>17.12-05-005</td>
<td>1.5.1.1</td>
<td>45</td>
<td>6 ... 540 k</td>
<td>24 V AC</td>
</tr>
<tr>
<td>IWAS1/511ch-1.60-24VDC</td>
<td>17.12-05-006</td>
<td>1.5.1.1</td>
<td>45</td>
<td>6 ... 540 k</td>
<td>24 V DC</td>
</tr>
</tbody>
</table>
IWAS Pulse Rate Converter

Device

Pulse Rate Converter with Measuring Relay IWAS

IWAS/511-ch-1.60-(Uv)

For exact type designation and ref. no. please see page 1.5.0.1

17.12-05-xxx

Technical data

- Operating voltage \(U_v\): please indicate when ordering
- AC voltage: 115 / 230, 42, 24 V AC
- Tolerance: ± 10 %
- Frequency: 50 ... 60 Hz
- DC voltage: 24 V DC
- Tolerance range / ripple voltage: 15 % / max. 10 %
- Operating temperature / mode: 0 ... + 55 °C / continuous
- Power consumption: approx. 6 VA
- Housing: 0.60 (see housing data)
- Weight: approx. 350 g

Input (E)

- Pulse sensors: see ALSEN catalog (TK 2)
- More sensors: see ALSEN catalog (TK 1)
- Connection P, E and M: to terminals 1, 2 and 3
- Input frequency: 0 Hz ... 25 kHz
- Permitted duty cycle: 1 : 0.7 ... 1.3
- Indicator ranges: 45, adjustable 1 ... 9 Hz
- Factor: 0.1 ... 1000
- Threshold \(S\) (related to \(A_1\)): adjustable 0.5 ... 9.5 V
- Hysteresis \(H\): adjustable approx. 5 ... 50 % of \(S\)

Output (P)

- supply pulse sensors
- * max. current load capacity: ≤ 35 mA
- Output \(A_1\) (current source): 0 ... + 10 V DC
- Load resistance / ripple: ≤ 10 kΩ / ≤ 0.5 %
- Output \(A_2\) (current source): 0 ... 20 mA or 4 ... 20 mA
- Load resistance / ripple: ≤ 500 Ω / ≤ 0.5 %

Indicators

- 1 LED green: operating voltage ON
- 1 LED red for output: relay pulled-in
- Operation mode \(a\): falling below threshold \(S\)
- Operation mode \(b\): exceeding threshold \(S\)

Accuracy

- Linearity error: ≤ ± 0.25 %
- Resolution: 256 steps
- Temperature influence: ≤ ± 0.5 %
- Operating voltage influence: ≤ ± 0.1 %

* For higher current loads an external power supply is necessary.

Pulse diagram

- Threshold \(S\)
- Rotation speed \(n\)
- Hysteresis \(H\)
- Power on
- \(X\) = start time bridging
- \(Y\) = pull-in delay
- \(Z\) = drop-out delay
- \(t_1\) = time
- \(t_2\) = time
- \(t_3\) = time

Connection

DC 3-pole

- Pulse sensor
- Analogue output e.g. to PLC with \(R_C\) = 50 Ω

Relay output

Power supply

\(U_v\) = 115 / 230 V AC

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    - sales@klaschka.de
    - www.klaschka.de

### Other countries

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