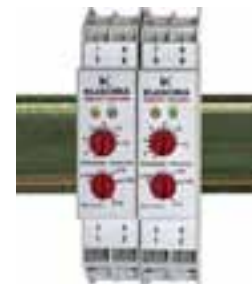


Evaluation Devices for Pulse Rate, Rotation Speed, Frequency, and Standstill

ALDIF Catalog

Edition 4.12



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

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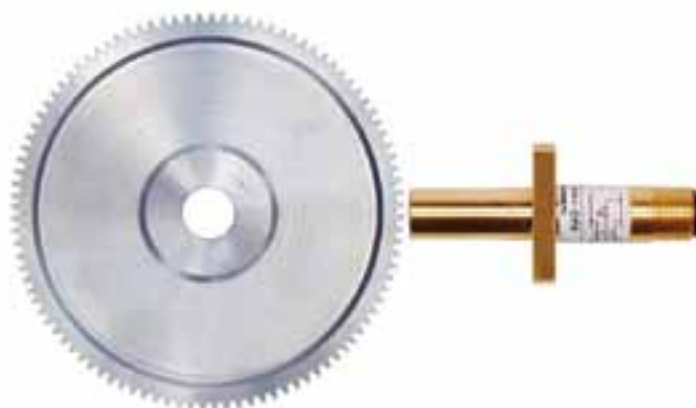
Articles sorted by ref. no. and type designation

Ref. no.	Type designation	Page	Type designation	Ref. no.	Page
17.11-01-007	ISN1/410ch-1.60-115/230VAC	1.1.1.2	FSN1/310ch-1.60-115/230VAC	17.11-03-007	1.2.1.1
17.11-01-003	ISN1/410ch-1.60-42VAC	1.1.1.2	FSN1/310ch-1.60-24VAC	17.11-03-005	1.2.1.1
17.11-01-005	ISN1/410ch-1.60-24VAC	1.1.1.2	FSN1/310ch-1.60-24VDC	17.11-03-006	1.2.1.1
17.11-01-006	ISN1/410ch-1.60-24VDC	1.1.1.2	FSN1/310ch-1.60-42VAC	17.11-03-003	1.2.1.1
17.11-02-007	ISN1/411cq-1.60-115/230VAC	1.1.1.3	FSN1/311cq-1.60-115/230VAC	17.11-04-007	1.2.1.2
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17.11-02-005	ISN1/411cq-1.60-24VAC	1.1.1.3	FSN1/311cq-1.60-24VDC	17.11-04-006	1.2.1.2
17.11-02-006	ISN1/411cq-1.60-24VDC	1.1.1.3	FSN1/311cq-1.60-42VAC	17.11-04-003	1.2.1.2
17.11-03-007	FSN1/310ch-1.60-115/230VAC	1.2.1.1	FWA1/6-1.60-115/230VAC	17.12-02-007	1.4.1.1
17.11-03-003	FSN1/310ch-1.60-42VAC	1.2.1.1	FWA1/6-1.60-24VAC	17.12-02-005	1.4.1.1
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17.11-03-006	FSN1/310ch-1.60-24VDC	1.2.1.1	FWA1/6-1.60-42VAC	17.12-02-003	1.4.1.1
17.11-04-007	FSN1/311cq-1.60-115/230VAC	1.2.1.2	ISN1/410ch-1.24-24VDC	17.11-07	1.1.1.1
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17.11-04-005	FSN1/311cq-1.60-24VAC	1.2.1.2	ISN1/410ch-1.60-24VAC	17.11-01-005	1.1.1.2
17.11-04-006	FSN1/311cq-1.60-24VDC	1.2.1.2	ISN1/410ch-1.60-24VDC	17.11-01-006	1.1.1.2
17.11-07	ISN1/410ch-1.24-24VDC	1.1.1.1	ISN1/410ch-1.60-42VAC	17.11-01-003	1.1.1.2
17.12-03-007	IWA1/5-1.60-115/230VAC	1.3.1.1	ISN1/411cq-1.60-115/230VAC	17.11-02-007	1.1.1.3
17.12-03-003	IWA1/5-1.60-42VAC	1.3.1.1	ISN1/411cq-1.60-24VAC	17.11-02-005	1.1.1.3
17.12-03-005	IWA1/5-1.60-24VAC	1.3.1.1	ISN1/411cq-1.60-24VDC	17.11-02-006	1.1.1.3
17.12-03-006	IWA1/5-1.60-24VDC	1.3.1.1	ISN1/411cq-1.60-42VAC	17.11-02-003	1.1.1.3
17.12-02-007	FWA1/6-1.60-115/230VAC	1.4.1.1	IWA1/5-1.60-115/230VAC	17.12-03-007	1.3.1.1
17.12-02-003	FWA1/6-1.60-42VAC	1.4.1.1	IWA1/5-1.60-24VAC	17.12-03-005	1.3.1.1
17.12-02-006	FWA1/6-1.60-24VDC	1.4.1.1	IWA1/5-1.60-24VDC	17.12-03-006	1.3.1.1
17.12-02-005	FWA1/6-1.60-24VAC	1.4.1.1	IWA1/5-1.60-42VAC	17.12-03-003	1.3.1.1
17.12-05-007	IWAS1/511ch-1.60-115/230VAC	1.5.1.1	IWAS1/511ch-1.60-115/230VAC	17.12-05-007	1.5.1.1
17.12-05-003	IWAS1/511ch-1.60-42VAC	1.5.1.1	IWAS1/511ch-1.60-24VAC	17.12-05-005	1.5.1.1
17.12-05-005	IWAS1/511ch-1.60-24VAC	1.5.1.1	IWAS1/511ch-1.60-24VDC	17.12-05-006	1.5.1.1
17.12-05-006	IWAS1/511ch-1.60-24VDC	1.5.1.1	IWAS1/511ch-1.60-42VAC	17.12-05-003	1.5.1.1

Evaluation devices



Pulse Sensors (see ALSEN catalog TK 2 + 12.1)



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.

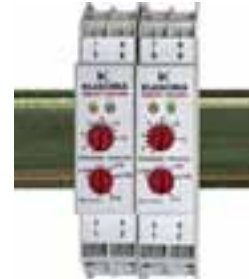
For decades, our sensors and devices have demonstrated our competence in detecting, modifying, monitoring and converting pulse rates, rotation speeds, frequencies, positions, linear and rotary speeds.

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
$$H = (A - B) / A \times 100 \%$$

Residual ripple: If a DC voltage has the average value U_m and a ripple voltage with a peak-to-peak value of U_{SS} is superimposed on it, the residual ripple is
$$R = U_{SS} / U_m \times 100 \%$$

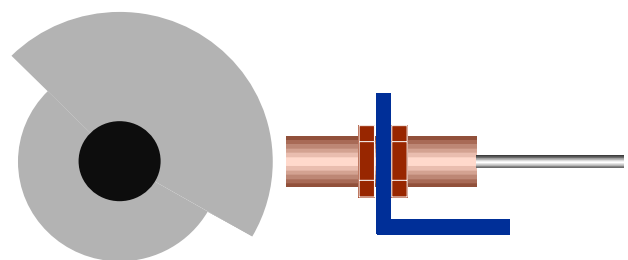
Threshold S: The value of the input quantity which, when exceeded, makes the relay change its status.

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
Tolerancy	± 10 %
Frequency	50 ... 60 Hz
DC	24 V DC
Tolerance range	± 15 %
Residual ripple	max. 10 %

Pulse sensors

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

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 10 ⁶ 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

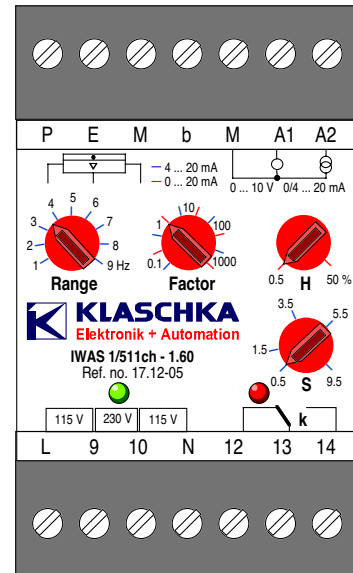
0 ... + 55 °C

Immunity to vibration

max. 4 g

Mounting orientation

arbitrary



Pulse rate, rotation speed, frequency, and standstill

Type	Ref. no.
Pulse rate measuring relay	
ISN1/410ch-1.24	17.11-07
ISN1/410ch-1.60-(Uv)	17.11-01
ISN1/411cq-1.60-(Uv)	17.11-02
Frequency measuring relay	
FSN1/310ch-1.60-(Uv)	17.11-03
FSN1/311cq-1.60-(Uv)	17.11-04
Pulse rate converter	
IWA1/5-1.60-(Uv)	17.12-03

Type	Ref. no.
Frequency converter	
FWA1/6-1.60-(Uv)	17.12-02
Pulse rate converter with threshold value monitoring rotation speed and standstill	
IWAS1/511ch-1.60-(Uv)	17.12-05

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

Housing Data

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 mm ² 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 ISO 2380-1-B0, 5 x 3

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 60664-1)
- Perpendicular circuit board clear. dist.	≥ 3.3 mm acc. to IEC 60664-1
- Perpendicular circuit board creep. dist.	≥ 4.5 mm acc. to IEC 60664-1
- Horizontal circuit board	≥ 4 mm

Net weight

42 g

Housing

- 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

- standard rail	snap-on to standard rail according to DIN 46 277, page 3
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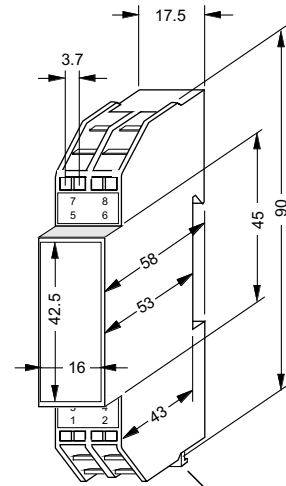
Temperature range

- 40 ... + 110 °C

Creepage distances and Clearances

acc. to VDE 0110	IGr C / 380 V AC
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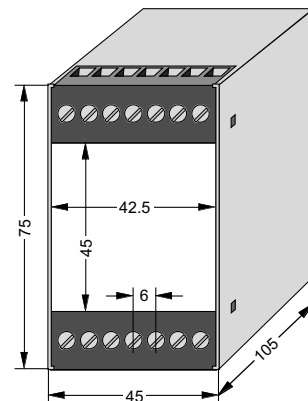
Housing .24 with 8 clamps



Unlocking at the bottom centre.

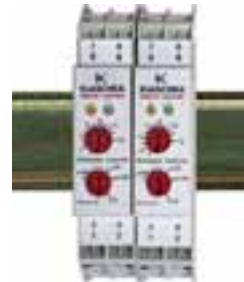
Keep mounting distance to the bottom of 10 mm.

Housing .60 with 14 clamps



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 signalled. 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 ISN1/410ch-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

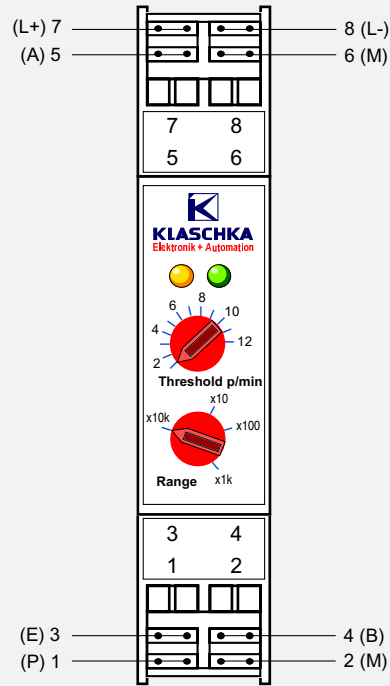
Type	Ref. no.	Page	Number of ranges	Measurement range B or B1 / B2		Operating voltage U _V
				Pulse rate / min	Frequency in Hz	
ISN1/410ch-1.24-24VDC	17.11-07	1.1.1.1	4	10 ... 120 k	0,167 ... 2 k	24 V DC
ISN1/410ch-1.60-115/230VAC	17.11-01-007	1.1.1.2	4	10 ... 120 k	0,167 ... 2 k	115/230 V AC
ISN1/410ch-1.60-42VAC	17.11-01-003	1.1.1.2	4	10 ... 120 k	0,167 ... 2 k	42 V AC
ISN1/410ch-1.60-24VAC	17.11-01-005	1.1.1.2	4	10 ... 120 k	0,167 ... 2 k	24 V AC
ISN1/410ch-1.60-24VDC	17.11-01-006	1.1.1.2	4	10 ... 120 k	0,167 ... 2 k	24 V DC
ISN1/411cq-1.60-115/230VAC	17.11-02-007	1.1.1.3	4	10 ... 120 k	0,167 ... 2 k	115/230 V AC
ISN1/411cq-1.60-42VAC	17.11-02-003	1.1.1.3	4	10 ... 120 k	0,167 ... 2 k	42 V AC
ISN1/411cq-1.60-24VAC	17.11-02-005	1.1.1.3	4	10 ... 120 k	0,167 ... 2 k	24 V AC
ISN1/411cq-1.60-24VDC	17.11-02-006	1.1.1.3	4	10 ... 120 k	0,167 ... 2 k	24 V DC

ISN Pulse Rate Measuring Relay

Device	Pulse Rate Measuring Relay ISN
For exact type designation and ref. no. see page 1.1.0.4	ISN1/410ch-1.24-24 VDC 17.11-07

Technical data	
Permitted operating range (L+, L-)	8 ... 24 ... 30 V DC
Power consumpt. 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 treshold S
Operating mode b	falling below treshold S
Accuracy	
Setting accuracy	± 5 %
Temperature influence	± 3 %
Operating voltage influence	± 0.1 %
Accessory	
	sliders for screw fixing

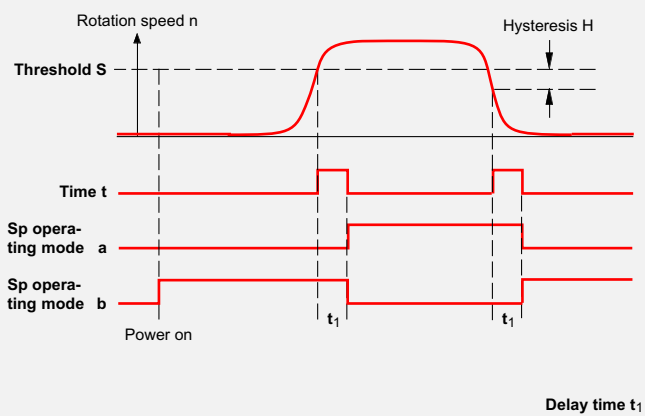
For common technical and housing data see catalog pages 1.0.1 to 1.0.4
For general description see catalog page 1.1.0.1



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

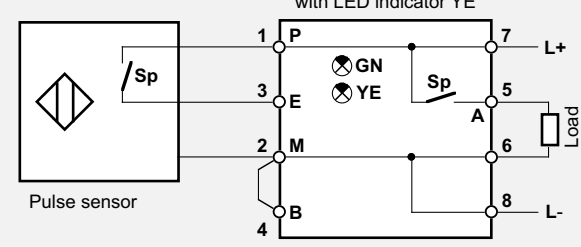
Range	Pulses / min	Frequency Hz	Delay time in ms
x 10	10 ... 120	0.167 ... 2	6.000 ... 500
x 100	0.1 k ... 1.2 k	1.67 ... 20	600 ... 50
x 1 k	1 k ... 12 k	16.7 ... 200	60 ... 5
x 10 k	10 k ... 120 k	167 ... 2 k	6 ... 0.5

Pulse diagram



Wiring

DC 3-pole



B = Bridge for operating modes

Operating mode a: without bridge 4-2 Nominal rotation speed monitor
Operating mode b: with bridge 4-2 Standstill monitor

1.1.1.1

ISN Pulse Rate Measuring Relay

Device	Pulse Rate Measuring Relay ISN
For the exact type designation and ref. no. please see under 1.1.0.4	ISN1/410ch-1.60-(Uv) 17.11-01-xxx

Technical Data	
Operating voltage Uv	please indicate when ordering
AC voltage	115 / 230, 42 or 24 V AC
Tolerance	± 10 %
Frequency or DC voltage	50 ... 60 Hz 24 V DC
Tolerance range	± 15 %
Ripple voltage	max. 10 %
Operating temperature / mode	0 ... + 55 °C / continuous
Current load	approx. 4 VA
Housing	.60 (see housing data)
Weight	approx. 300 g

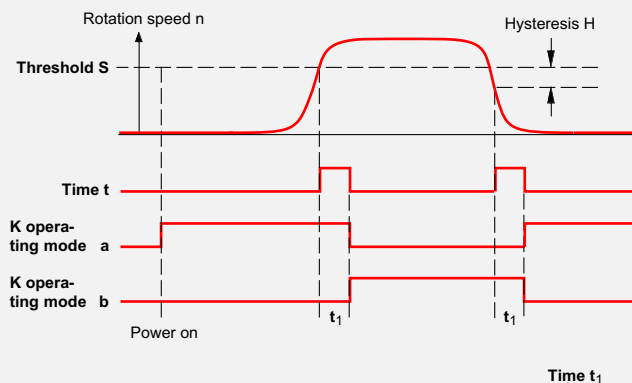
Input (E)	
Pulse sensors	see ALSEN catalog (TK 2)
More sensors	see ALSEN catalog (TK 1)
Connection P, E and M	to terminals 1, 2 and 3
Input frequency	0 Hz ... 1.0 kHz
Permitted duty cycle	1 : 0.7 ... 1.3
Level lo	0 ... 4
Level hi	12 ... 36 V
Threshold S	adjustable 1 ... 12 pulse(s) / min
Range switch-over	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	
Output type	relay contact
Category	1 potential-free changeover switch
Switching voltage / Switching current	24 ... 250 V / 0.05 ... 6 A
Switching performance:	
AC / DC	max. 1.250 VA / max. 50 W

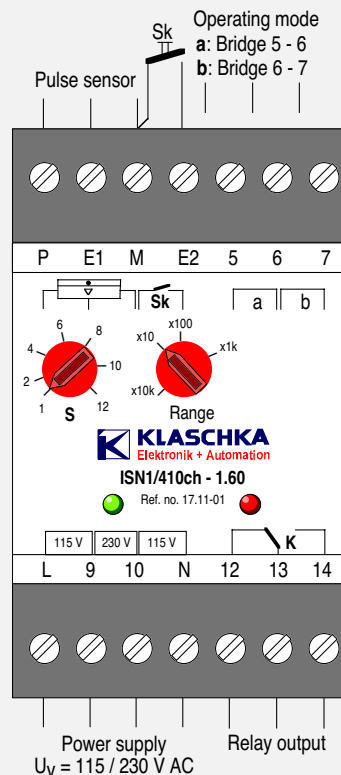
Indicators	
1 red LED	power on
1 red LED for output:	
Operating mode a	falling below threshold S
Operating mode b	exceeding threshold S
Accuracy	
Setting accuracy	≤ ± 5 %
Temperature influence	≤ ± 3 %
Operating voltage influence	≤ ± 0.2 %

Pulse diagram



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.

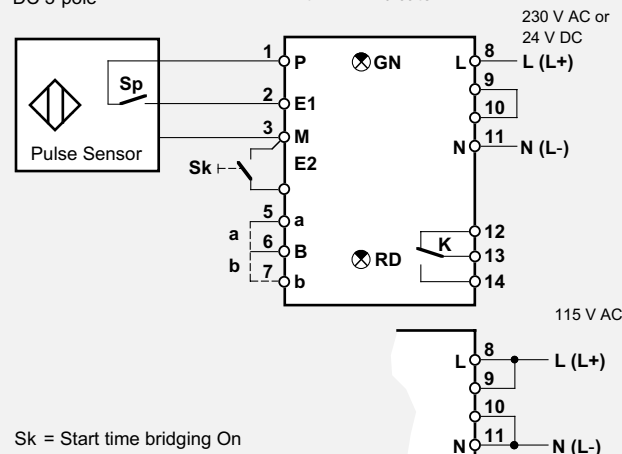
Range	Pulses/ min	Frequency Hz	Delay time ms
x 10	10 ... 120	0.167 ... 2	6.000 ... 500
x 100	0.1 k ... 1.2 k	1.67 ... 20	610 ... 60
x 1 k	1 k ... 12 k	16.7 ... 200	70 ... 15
x 10 k	10 k ... 120 k	167 ... 2 k	17 ... 11

Wiring

DC 3-pole

Pulse rate measuring relay

with LED indicator YE



Sk = Start time bridging On

B = Bridge for operating modes

Operating mode a: bridge 5-6 Standstill monitor

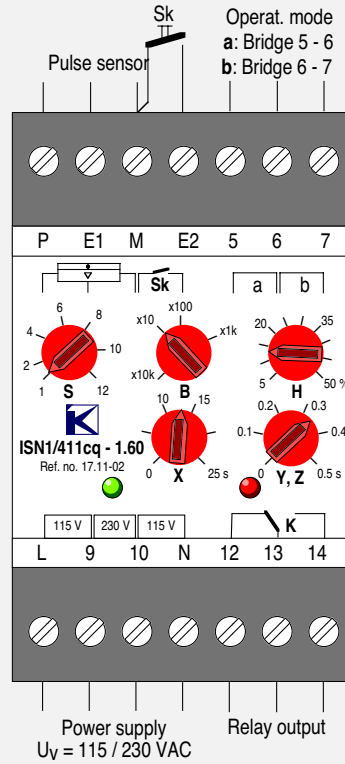
Operating mode b: bridge 6-7 Nominal rotation speed monitor

ISN Pulse Rate Measuring Relay

Device	Universal Pulse Rate Measuring Relay ISN
For exact type designation and ref. no. see page 1.1.0.4	ISN1/411cq-1.60-(Uv) 17.11-02-xxx

Technical data	
Operating voltage U _v	please indicate when ordering
AC voltage	115 / 230, 42 or 24 V AC
Tolerance	± 10 %
Frequency	50 ... 60 Hz
DC voltage	24 V DC
Tolerance range	± 15 %
Ripple voltage	max. 10 %
Operating temperature / mode	0 ... + 55 °C / continuous
Power consumption	approx. 4 VA
Housing	.60 (see housing data)
Weight	approx. 300 g
Input (E)	
Pulse sensors	see ALSSEN catalog (TK 2)
More sensors	see ALSSEN 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 1 ... 12 pulse(s) / min
Range switch-over	x10, x100, x1 k, x10 k
Hysteresis H	adjustable approx. 5 ... 50 % of S
Start time delay X	0 ... 25 s
Pull-in and drop-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 mode	relay contact
Category	1 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:	
Operating mode a	exceeding treshold S
Operating mode b	falling below treshold S
Accuracy	
Setting accuracy	± ± 5 %
Temperature influence	± ± 3 %
Operating voltage influence	± ± 0.2 %

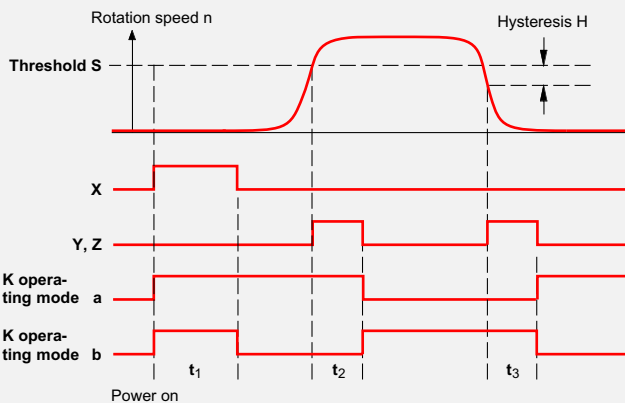
For common technical and housing data
see catalog pages 1.0.1 to 1.0.4
For general description see catalog page 1.1.0.1



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

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

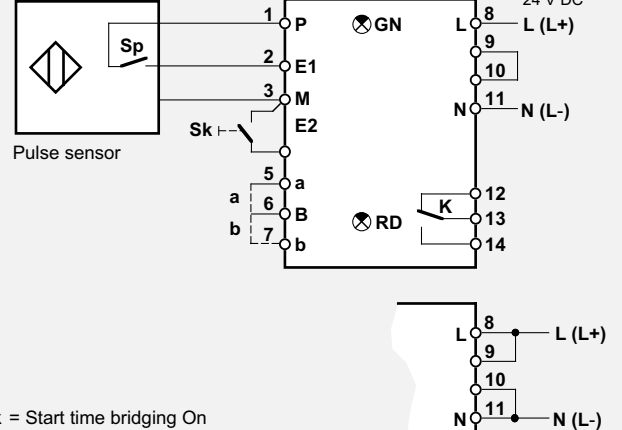
Pulse diagram



X = Start-time bridging t₁
Y = Pull-in delay t₂
Z = Drop-out delay t₃

Wiring

DC 3-pole



1.1.1.3

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

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

FSN Frequency measuring relay

Device	Universal Frequency and Pulse Rate Measuring Relay FSN
For exact type designation and ref. no. see page 1.2.0.2	FSN1/310ch-1.60-(Uv) 17.11-03-xxx

Technical data	
Operating voltage U _v	please indicate when ordering
AC voltage	115 / 230, 42 or 24 V AC
Tolerance	± 10 %
Frequency	50 ... 60 Hz
DC voltage	24 V DC
Tolerance range	± 15 %
Ripple voltage	max. 10 %
Operating temperature / mode	0 ... + 55 °C / continuous
Power consumption	approx. 2 VA
Housing	.60 (see housing data)
Weight	approx. 300 g

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

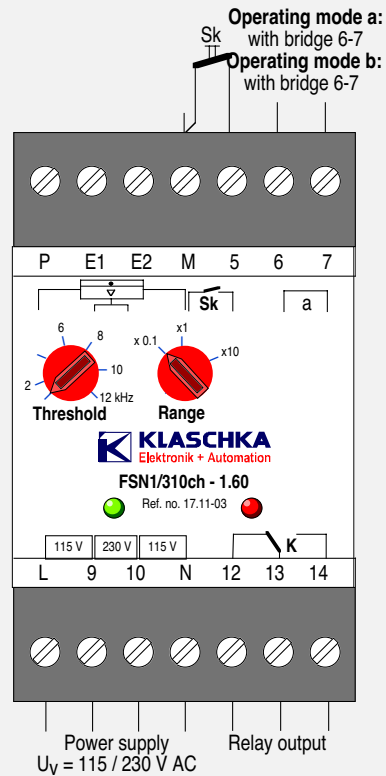
Output (P)	
supply pulse sensor	
* max. load capacity	≤ 35 mA

Output (A)	
signal output FSN	
Output mode	relay contact
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 treshold S
Operating mode b	exceeding treshold S

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

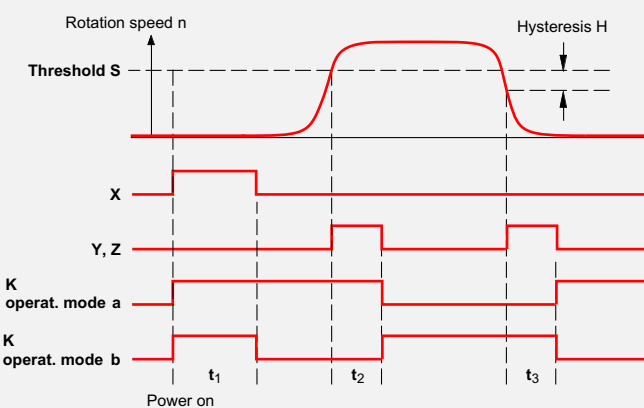
For common technical and housing data see catalog pages 1.0.1 to 1.0.4
For general description see catalog page 1.2.0.1



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

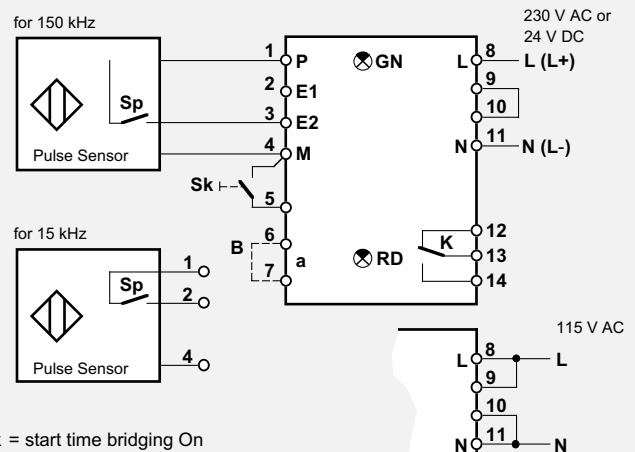
Input	Range	Frequency in kHz	Delay time in ms
E1	x 0.1	0.1 ... 1.2	250 ... 8
E1	x 1	1 ... 12	8
E2	x 10	10 ... 120	6

Pulse diagram



x = start time bridging t₁
y = pull-in delay t₂
z = drop-out delay t₃

Connection Frequency and pulse rate measuring relay with LED indicator RD



Sk = start time bridging On

B = bridge for operating modes

Operating mode a: with bridge 6-7 Standstill monitor

Operating mode b: without bridge 6-7 Nominal rotation speed monitor

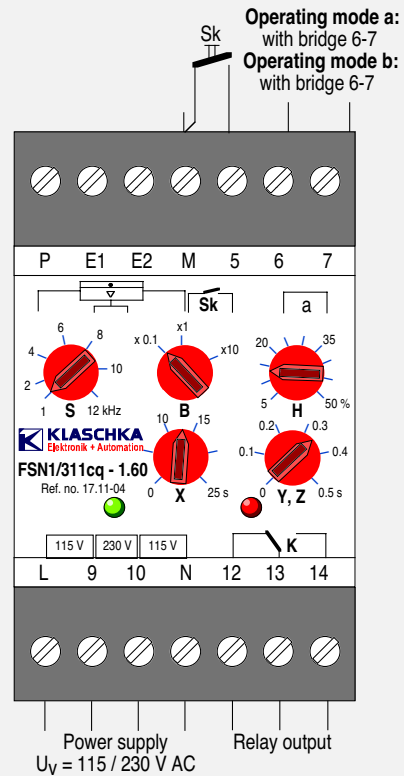
1.2.1.1

FSN Frequency measuring relay

Device	FSN Universal Universal frequency and pulse rate measuring relay
For exact type designation and ref. no. see page 1.2.0.2	FSN1/311cq-1.60-(Uv) 17.11-04-xxx

Technical data	
Operating voltage Uv	please indicate when ordering
AC voltage	115 / 230, 42 oder 24 V AC
Tolerance	± 10 %
Frequency	50 ... 60 Hz
DC voltage	24 V DC
Tolerance range	± 15 %
Ripple voltage	max. 10 %
Operating temperature / mode	0 ... + 55 °C / continuous
Power consumption	approx. 2 VA
Housing / weight	.60 / approx. 300 g
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 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 adjust
Output (P)	
supply pulse sensor	
* max. current load capacity	≤ 35 mA
Output (A)	
signal output FSN	
Output mode	relay contact
Category	1 potentialfree changeover switch
Switching voltage / current	24 ... 250 V / 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 %

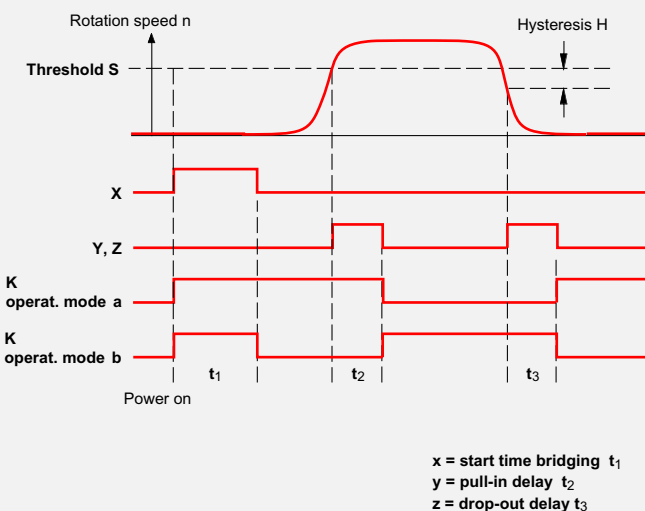
For common technical and housing data see catalog pages 1.0.1 to 1.0.4
For general description see catalog page 1.2.0.1



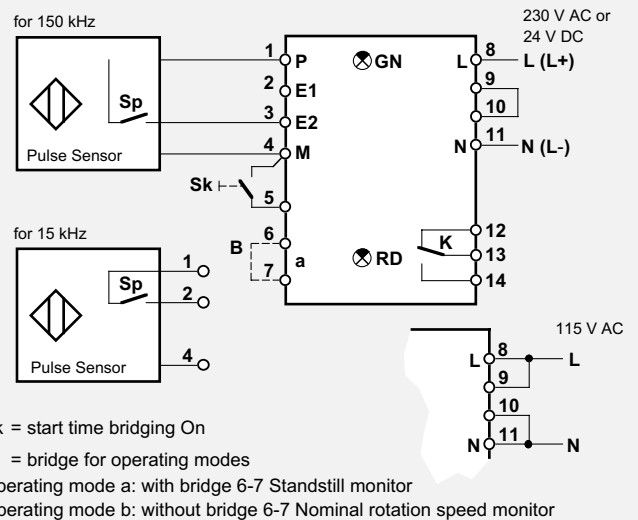
* For higher current loads an external power supply is necessary.

Input	Range	Frequency in kHz	Delay time in ms
E1	x 0,.	0.1 ... 1.2	250 ... 8
E1	x 1	1 ... 12	8
E2	x 10	10 ... 120	6

Pulse diagram



Connection Frequency and Pulse rate measuring relay with LED indicator RD



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 A 2 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

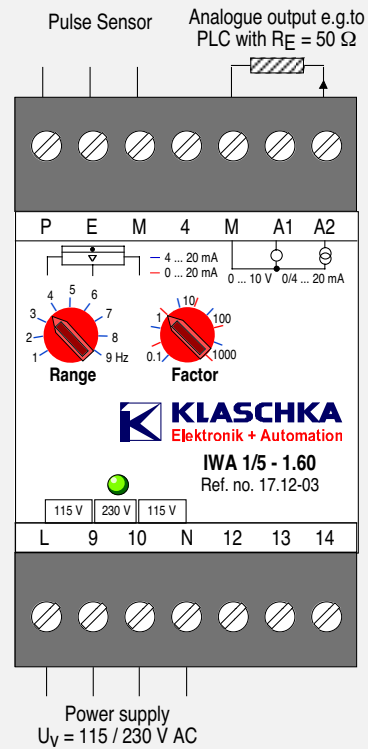
Type	Ref. no.	Page	Number of final range values	Measuring range B or B1 / B2		Operating voltage U _v
				Pulses / min	Frequency in Hz	
IWA1/5-1.60-115/230VAC	17.12-03-007	1.3.0.2	45	6 ... 540 k	0.1 ... 9 k	115/230 V AC
IWA1/5-1.60-42VAC	17.12-03-003	1.3.0.2	45	6 ... 540 k	0.1 ... 9 k	42 V AC
IWA1/5-1.60-24VAC	17.12-03-005	1.3.0.2	45	6 ... 540 k	0.1 ... 9 k	24 V AC
IWA1/5-1.60-24VDC	17.12-03-006	1.3.0.2	45	6 ... 540 k	0.1 ... 9 k	24 V DC

IWA Pulse Rate Converter

Device	IWA Pulse Converter
For the exact type designation and ref. no. please refer to page 1.3.0.1	IWA1/5-1.60-(Uv) 17.12-03-xxx

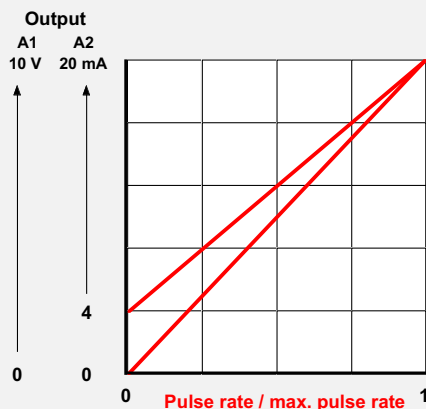
Technical Data	
Operating voltage Uv	please indicate when ordering
AC voltage	115 / 230, 42, 24 V AC
Tolerance	± 10 %
Frequency	50 ... 60 Hz
DC voltage	24 V DC
Tolerance range	15 %
Ripple voltage	max. 10 %
Line voltage	0 ... + 55 °C
Operation mode	continuous
Current consumption	approx. 6 VA
Housing	.60 (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	1 : 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)	
0 ... + 10 V DC	
Load resistance / ripple	≥ 10 kΩ / ≤ 0.5 %
Output A2 (current source)	
0 ... 20 mA or 4 ... 20 mA	
Load resistance / ripple	≤ 500 Ω / ≤ 0.5 %
Indicators	
1 LED green	power ON
Accuracy	
referred to end-of-range value	
Linearity error	≤ ± 0.25 %
Resolution	256 steps
Temperature influence	≤ ± 0.5 %
Operating voltage influence	≤ ± 0.1 %

For common technical and housing data see catalog pages 1.0.1 to 1.0.4 description see catalog page 1.3.0.1



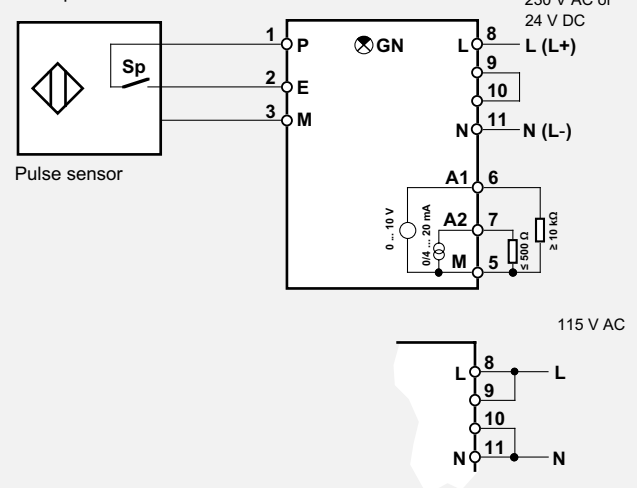
* For higher current loads an external power supply is necessary.

Pulse diagram



Connection

DC 3-pole



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.

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.

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.

Frequency converter

Type	Ref. no.	Page	Number of ranges	Measuring range B or B1 / B2		Operating voltage U _v
				Pulses / min	Frequency in Hz	
FWA1/6-1.60-115/230VAC	17.12-02-007	1.4.0.2	6	0 ... 7.2 Mio	0 ... 120 k	115/230 VAC
FWA1/6-1.60-42VAC	17.12-02-003	1.4.0.2	6	0 ... 7.2 Mio	0 ... 120 k	42 V AC
FWA1/6-1.60-24VDC	17.12-02-006	1.4.0.2	6	0 ... 7.2 Mio	0 ... 120 k	24 VDC
FWA1/6-1.60-24VAC	17.12-02-005	1.4.0.2	6	0 ... 7.2 Mio	0 ... 120 k	24 VAC

Device	Frequency Converter FWA
For the exact type designation and exact ref. no. please see page 1.4.0.1	FWA1/6-1.60-(U_V) 17.12-02-xxx

Technical data	
Line 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	15 %
Residual ripple	max. 10 %
Operating temperature	0 ... + 55 °C
Operation mode	continuous
Power consumption	approx. 4 VA
Housing	.60
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 ... 200kHz
Permitted duty cycle	1 : 0.7 ... 1.3
Number of ranges	6 (see table)

Output A1 (voltage source)	
0 ... + 10 V DC	
Load resistance	≥ 500 Ω

Output A2 (current source)	
0 ... + 20 mA	
Load resistance	≤ 680 Ω

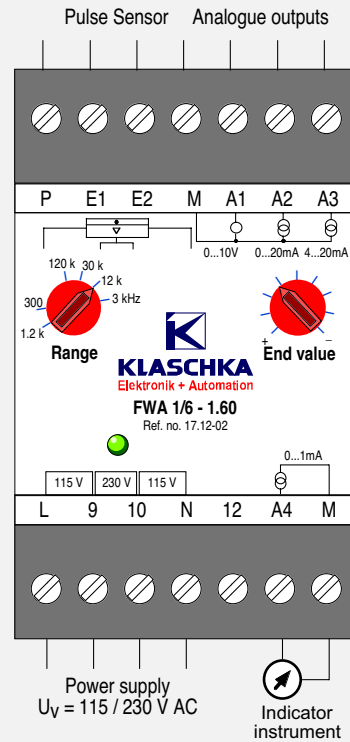
Output A3 (current source)	
+ 4 ... + 20 mA	
Load resistance	≤ 680 Ω

Output A4 (current source)	
0 ... + 1 mA	
Load resistance	≤ 10 kΩ

Indicators	
1 LED green	Power ON

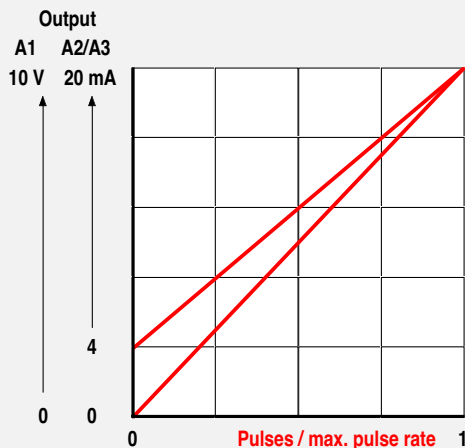
Accuracy	
referred to end-of-range value	
Linearity error	± 1 %
Temperature influence	± 3 %
Operating voltage influence	± 0.1 %

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**

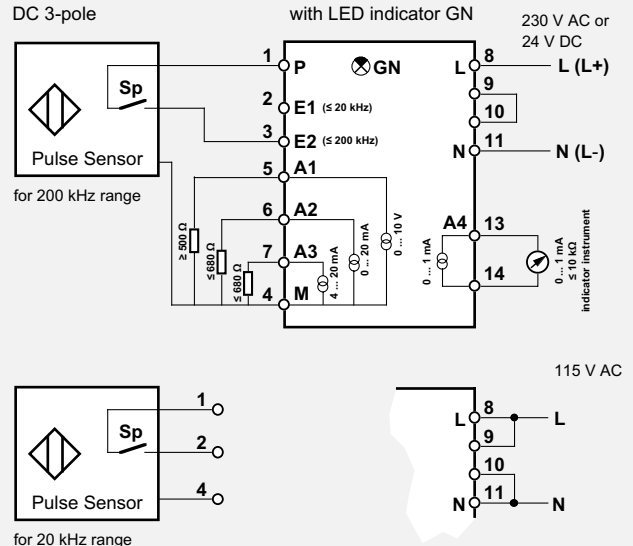


Input	Range kHz	Time setting ms	Residual ripple % at		
			0.1	0.5	1.0
E1	0 ... 0.3	40	100	51	2
E1	0 ... 1.2	40	10	0.5	0.2
E1	0 ... 3.0	4	100	5	2
E1	0 ... 12	4	10	0.5	0.2
E2	0 ... 30	0.4	50	2.5	1
E2	0 ... 120	0.4	5	0.3	0.1

Pulse diagram



Wiring



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)

Type	Ref. no.	Page	Number of end-of-range values	Measuring range B or B1 / B2		Operating voltage U_V
				Pulses / min	Frequency in Hz	
IWAS1/511ch-1.60-115/230VAC	17.12-05-007	1.5.1.1	45	6 ... 540 k	0.1 ... 9 k	115/230 V AC
IWAS1/511ch-1.60-42VAC	17.12-05-003	1.5.1.1	45	6 ... 540 k	0.1 ... 9 k	42 V AC
IWAS1/511ch-1.60-24VAC	17.12-05-005	1.5.1.1	45	6 ... 540 k	0.1 ... 9 k	24 V AC
IWAS1/511ch-1.60-24VDC	17.12-05-006	1.5.1.1	45	6 ... 540 k	0.1 ... 9 k	24 V DC

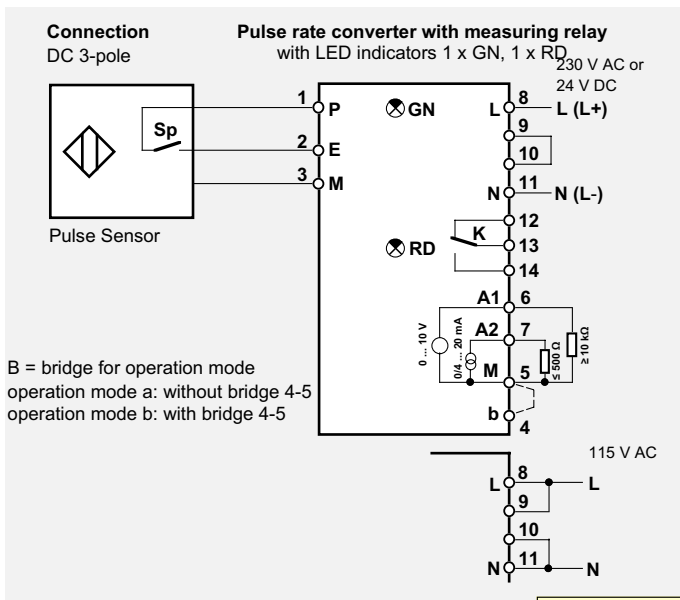
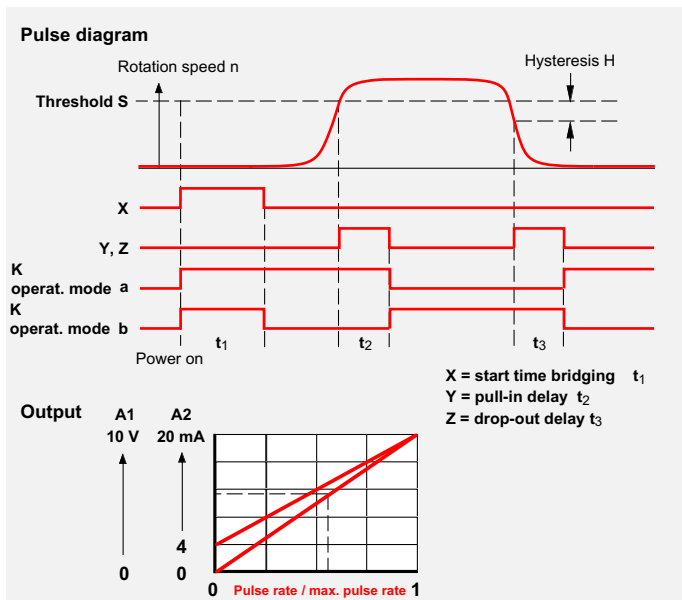
IWAS Pulse Rate Converter

Device	Pulse Rate Converter with Measuring Relay IWAS
For exact type designation and ref. no. please see page 1.5.0.1	IWAS1/511ch-1.60-(Uv) 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	.60 (see housing data)
Weight	approx. 350 g
Input (E)	
Pulse sensors	see ALSEN catalog (TK 2)
More sensors	see ALSEN catalog (TK1)
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 x factor 0.1 ... 1000
Threshold S (related to A1)	adjustable 0.5 ... 9.5 V
Hysteresis H	adjustable approx. 5 ... 50 % of S
Output (P)	
supply pulse sensors	≤ 35 mA
* max. current load capacity	
Output A1 (current source)	
0 ... + 10 V DC	
Load resistance / ripple	≥ 10 kΩ / ≤ 0.5 %
Output A2 (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	
referred to end-of-range value	
Linearity error	≤ ± 0.25 %
Resolution	256 steps
Temperature influence	≤ ± 0.5 %
Operating voltage influence	≤ ± 0.1 %

For common technical and housing data see catalog pages 1.0.1 to 1.0.4. For general description see catalog page 1.5.0.1

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



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