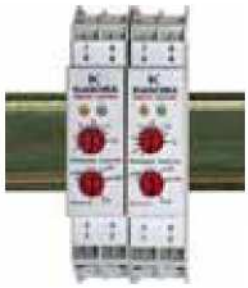
Evaluation Devices for Pulse Rate
Characteristics



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 mouvements 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 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

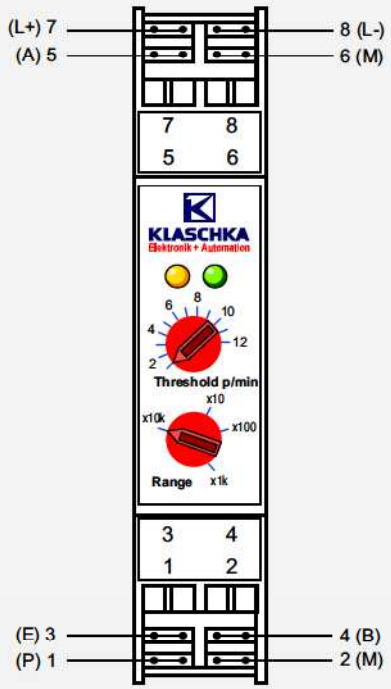
Type	Ref. no.	Page	Number of ranges	Measurement range B or B1 / B2		Operating voltage U_V
				Pulse rate / min	Frequency in Hz	
ISN1/410ch-1.24-24VDC	17.11-07	1.1.1.1	4	10 ... 120 k	0,167 ... 2 k	24 V DC
ISN1/410ch-1.60-115/230VAC	17.11-01-007	1.1.1.2	4	10 ... 120 k	0,167 ... 2 k	115/230 V AC
ISN1/410ch-1.60-42VAC	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	ISN1/410ch-1.24-24 VDC
ref. no. see page 1.1.0.4	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 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

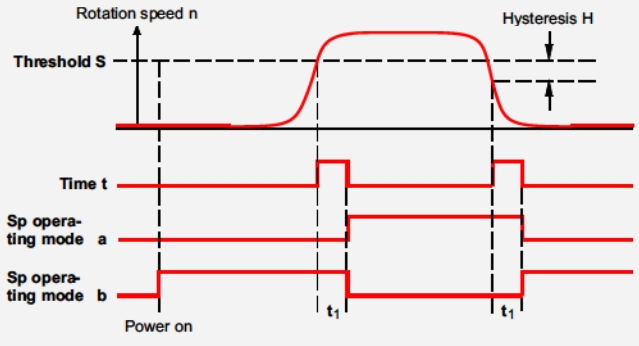
For common technical and housing data
see catalog pages **1.0.1** to **1.0.4**
For general description see catalog page **1.1.0.1**



* 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

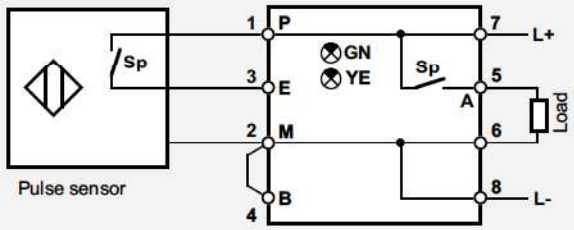
Pulse diagram



Delay time t_1

Wring
DC 3-pole

Pulse rate measuring relay
with LED indicator YE



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

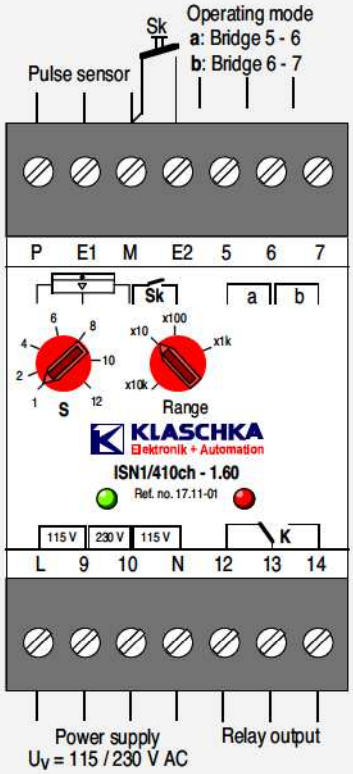
ISN Pulse Rate Measuring Relay

KLASCHKA Industrieelektronik

Device	Pulse Rate Measuring Relay **ISN**
For the exact type designation and	ISN1/410ch-1.60-(Uv)
ref. no. please see under 1.1.0.4	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	50 ... 60 Hz
or DC voltage	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 ... 2.5 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 %

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**

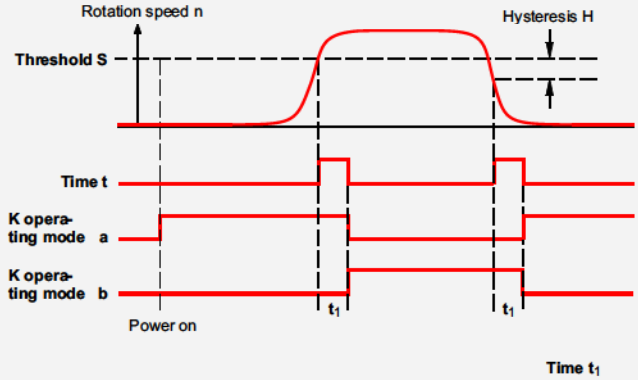


* For higher current loads an external power supply is necessary.

With power on, there is a Sk delay (start time bridging).
The pull-in/ drop-out delay is 0.5s Z/Y.

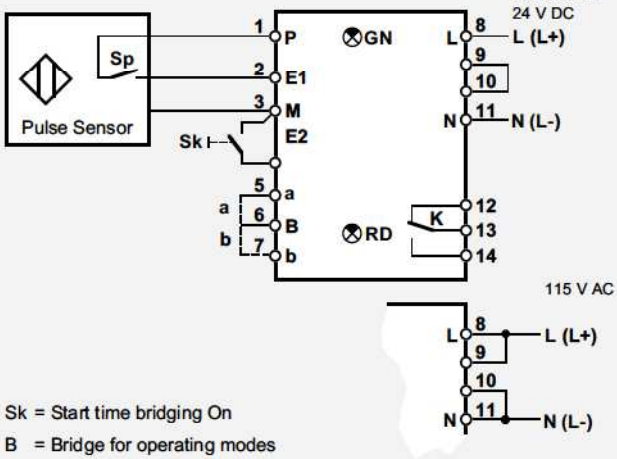
Range	Pulses/ min	Frequency Hz	Delay time ms
x 10	10 ... 120	0.167 ... 2	6.000 ... 500
x 100	0.1 k ... 1.2 k	1.67 ... 20	610 ... 60
x 1 k	1 k ... 12 k	16.7 ... 200	70 ... 15
x 10 k	10 k ... 120 k	167 ... 2 k	17 ... 11

Pulse diagram



Wring
DC 3-pole

Pulse rate measuring relay
with LED indicator YE



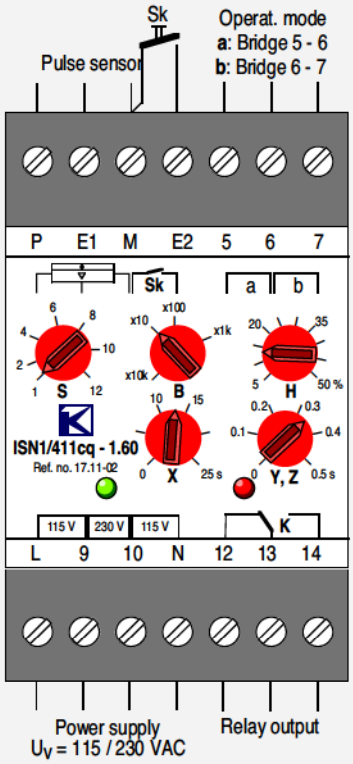
Sk = Start time bridging On
B = Bridge for operating modes
Operating mode a: bridge 5-6 Standstill monitor
Operating mode b: bridge 6-7 Nominal rotation speed monitor

ISN Pulse Rate Measuring Relay

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

Technical data	
Operating voltage Uv	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 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 ...2.5 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 %

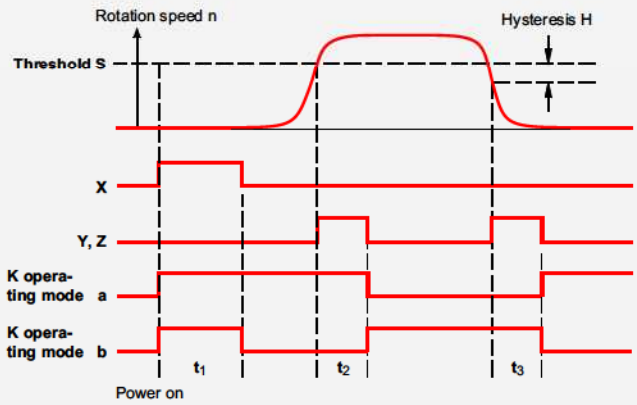
For common technical and housing data
see catalog pages **1.0.1** to **1.0.4**
For general description see catalog page **1.1.0.1**



* 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

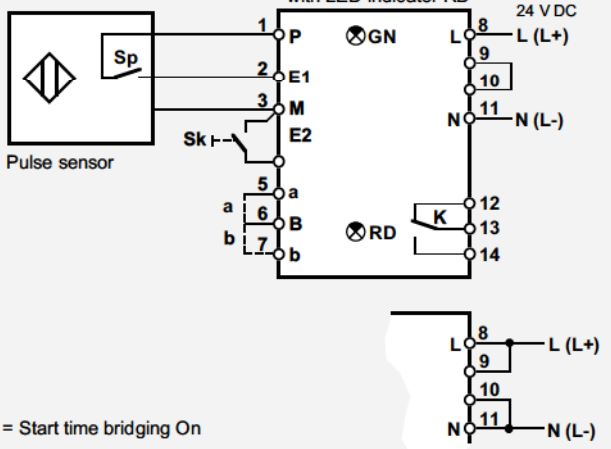


X = Start-time bridging t_1
Y = Pull-in delay t_2
Z = Drop-out delay t_3

Wiring
DC 3-pole

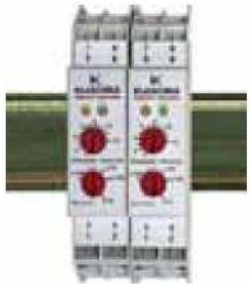
Pulse rate measuring relay
with LED indicator RD

230 V AC or
24 V DC



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

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 **$R = U_{ss} / U_m \times 100\ \%$.**

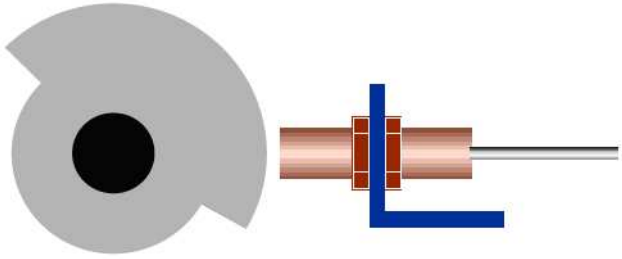
Threshold S: The value of the input quantity which, when exceeded, makes the relay change its status.

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.

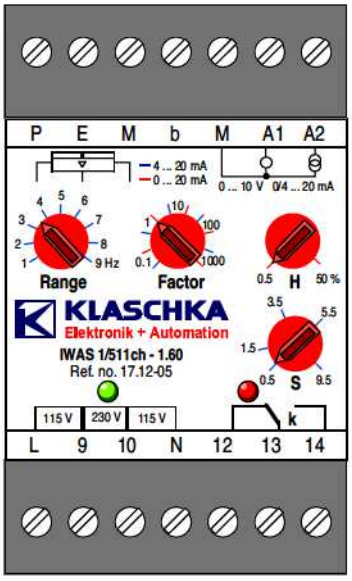
Repeat accuracy: With constant operating conditions, the switching threshold of a measuring relay will vary above and below an average value within the indicated tolerance range.



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	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 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

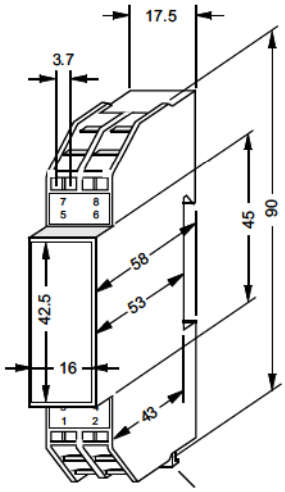
Evaluation devices for Pulse Rate, Rotation Speed, Frequency and Standstill
Housing Data

Technical Data

Housing	
- Designation	.24
- Housing material	PC-GF
- Housing of the isoliation 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 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	according to VDE 0100 part 750
- 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 ... + 110 °C
Creepage distances and Clearances	
acc. to VDE 0110	IGr C / 380 V AC

Housing .24 with 8 clamps



Depht: 55

Unlocking at the bottom centre.
Keep mounting distance to the bottom of 10 mm.

Housing .60 with 14 clamps