

RATAJ[®]

BEZOSÉ SPIRÁLOVÉ DOPRAVNÍKY

Instructions for Use

**Indicator operators are required to read these Instructions
for Use thoroughly.**

Spiral rotary movement indicator and evaluating unit

Name:	SPIRAL ROTARY MOVEMENT INDICATOR
Type:	SRP - 02
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1. Indicator assembly

1.1. Type versions

The type versions differ depending on the power voltage used: a) 24 V AC/DC
b) 230 V AC

1.2. Indicator purpose definition

The indicator has been developed to measure revolution speed and thus indicate the stopping (rupture) or deceleration of low-speed shafts, screw conveyors and spiral conveyors. It can also be used for monitoring periodic non-rotary movements. The indicator responds to changes in the distribution of ferromagnetic values around it.

It consists of an RTA - 01 evaluating unit and an ISN 520.1 sensor. To ensure correct operation, a rotary object that is symmetrical in the rotary dimension has to be given a "non-homogenous" feature: a piece of iron welded on, a protruding bolt, a hole drilled in, etc. The maximum frequency should not exceed 50 Hz. Similar conditions apply if the indicator is used for monitoring non-rotary movement. In spiral conveyors, the indication is guaranteed by the apparent relative movement of the helical blades to the sensor, as long as the conveyor tube is made of a magnetically non-conductive material (plastic). Where the speed indicator probe cannot respond to the above listed magnetic "non-homogeneity", use the magnetic field of a permanent magnet placed in a bracket on the rotating segment (helix). This makes it possible to detect pulses for evaluating the speed of rotation even through the steel wall of the conveyor casing. The size of the magnetic field of the magnet depends on the thickness of the material through which it passes, the casing diameter and the properties of the material conveyed. The sensitivity can be altered by increasing or reducing the distance of the probe to the conveyor casing along the full length of the exterior thread of the probe. As the revolution speed decreases, so does the distance of the induction indicator response and its electrical signal becomes impossible to process from a certain threshold distance.

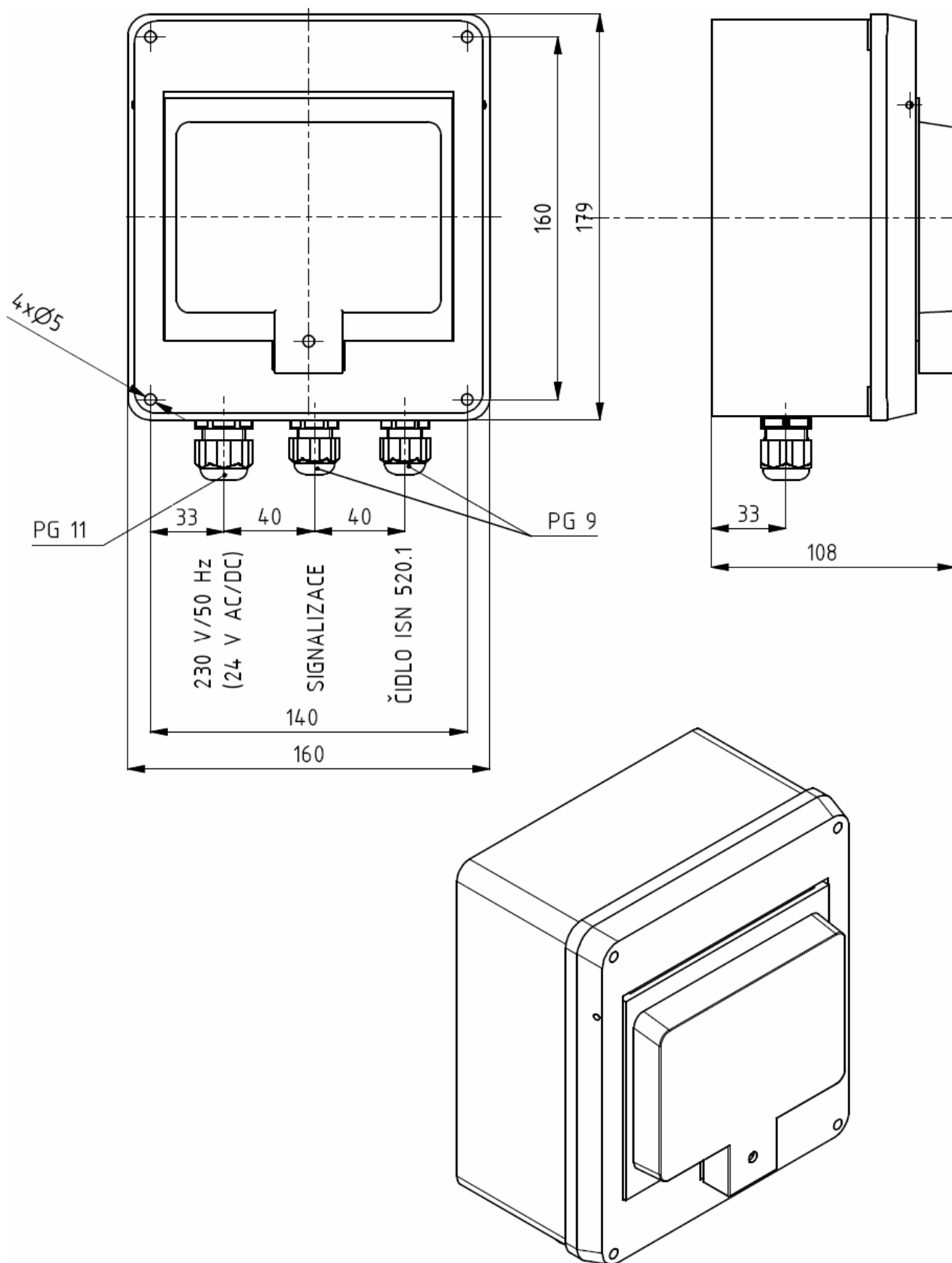
1.3. Operation principle

The indicator works on the electromagnetic induction principle. The ISN 520.1 sensor contains a coil with a core through which the electromagnetic field excited by the permanent magnet inside the sensor passes. The magnetic flow passing through the coil depends on the magnetic resistivity of the magnetic circuit. Since the magnetic circuit is an open one, its resistivity is strongly affected by ferromagnetic materials near the sensor: not only in front of it but also at its sides. The movement of such materials induces changes to the magnetic flow, and they induce electric current inside the coil, which is evaluated. The indicator is designed to respond to slow changes in the magnetic flow and to disregard the 50 Hz industrial magnetic field, which is most frequently found around motors and transformers.

The essence of evaluating the signal from the sensor is the measurement of the pulse period and its comparison to values set in the evaluating unit.

The evaluating unit processes the analogue signal from the sensor and converts it to a digital signal. The signal is then processed by the RTA 01 evaluating unit. Changes in the revolution speed are not responded to immediately because the revolution speed is converted to the average succession of preceding pulses each time a pulse arrives from the indicator. The minimum speed that can be processed is about 10 rpm. However, the rate can be significantly affected by ambient electromagnetic noise, the position of the indicator, and the magnetic properties of the material conveyed, which are all factors when operating spiral conveyors.

2. Evaluating unit RTA - 01



2.1. Functional and programme description for RTA - 01

The RTA - 01 indicator evaluating unit is a device enabling both optical supervision over the operation of a spiral conveyor and evaluation of conveyor defects and resulting shutdown. The unit is programmable and designed for comfortable operation and a fully automated work mode in co-operation with a sensor responding to the movement of ferromagnetic materials.

The device works under a bipolar ON/OFF mode; outputs 13 - 14 - 15 have a relay with switch contacts that can be loaded by resistance currents up to 8 A under a voltage of 230 V AC.

The following parameters are shown on the display:

Information on current revolution speed - **Ot**

Conveyor defect signalling - **Err/Stp** (Out 1 off, no revolution)

Conveyor start time reading signalling --- , if low in this mode, they alternate with **info** on the work mode.

Revolution speed below the switch-off threshold and off timer – (speed reading blinking)

If the output relay is in the OFF mode yet speed is evaluated, the speed reading alternates with the defect information **Err/Stp**.

Only OUT 1 is used; it is identical to V1.

2.2. Technical specifications

- Power supply depending on type: 24 V AC/DC +/-5 % or 230 V AC +/-15 %
- Power input: approx. 3 VA
- Inputs: 1 analogue for ISN 520.1 sensor
- Outputs: 1 relay with a switching contact

2.3. Mechanical specifications

- Dimensions: 179 x 160 x 108 mm (H x W x D). Weight: 1100 g
- Connections: screw-on terminal box up to 2.5 mm²
- Safety class: IP 20 / IP 55
- Operating temperature: 0° to 55° C
- Operating relative humidity: 30 - 95%, no condensation
- Storage temperature: -10°C to +60°C Altitude: 2000 m
- The evaluating unit is designed for environments defined in ČSN 33 2000-3 with the following external effects: AB5 - areas protected from weather effects with controlled temperature.
- **Do not install on vibrating structures!!!**

2.4. Functional data

- Controls: bipolar, ON/OFF
- Accuracy: +/- 0.15% of the range +/- 1 digit
- Resolution: 1 / 0.1 / 0.01 unit
- Sampling period: once or twice a second
- Control period: once a second

- Serial communications port: RS 485 not isolated galvanically
- Preset parameter registration: EEPROM memory

3. Sensor ISN 520.1

3.1. General characteristics

The ISN 520.1 sensor contains a permanent metal magnet and a coil with temperature resistance up to 150°C. Changes in the magnetic flow due to the movement of ferromagnetic objects near the sensor induce electric current in the coil. The signal produced in this way is conveyed via a shielded silicon cable to the RTA - 01 evaluating unit for processing.

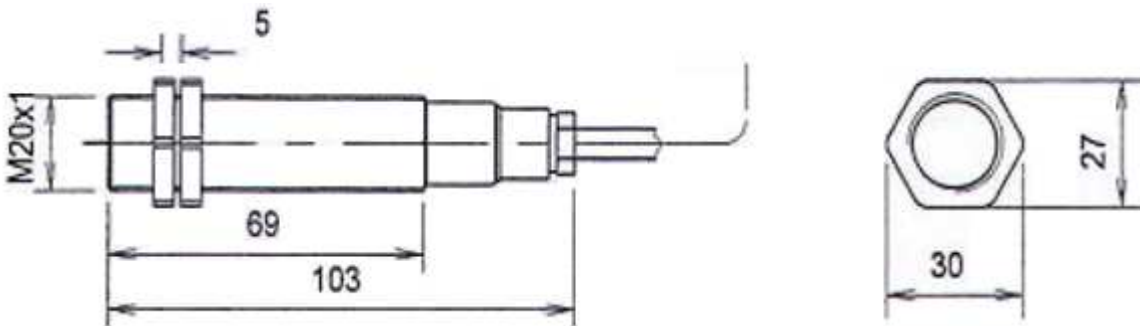
The sensor is made of an aluminium alloy with an oxidation-treated surface. It is designed to resist mechanical and chemical environmental effects and electromagnetic noise of the 50 Hz grid. The casing has an M20 thread. The sensor is attached to the machine to be monitored using two M20 nuts. The main dimensions of the sensor are shown in the picture below.

3.2. Sensor type and parameters

The passive sensor has a high temperature resistance (up to 150°C) and is capable of perceiving the movement of ferromagnetic objects up to a distance of 80 mm or through a metal wall. However, the sensor is sensitive to parasitic magnetic fields, such as ones generated by electric motors, transformers or power lines.

The sensor cannot be used for detection of movement of non-ferrous materials and metals (stainless steel, aluminium alloys, brass, copper).

A 5-metre-long cable is a standard integral component of the sensor; a length as required by the customer will be supplied.



ISN 520.1 passive induction sensor: parameters

- sensor service life: 5 years
- typical sensitivity of response to a ferromagnetic object moving at 100 mm/s perpendicular to the sensor axis (in open space):
 - for a weight of 10 g 25 mm
 - for a weight of 100 g 80 mm
- maximum cable length: 20 m

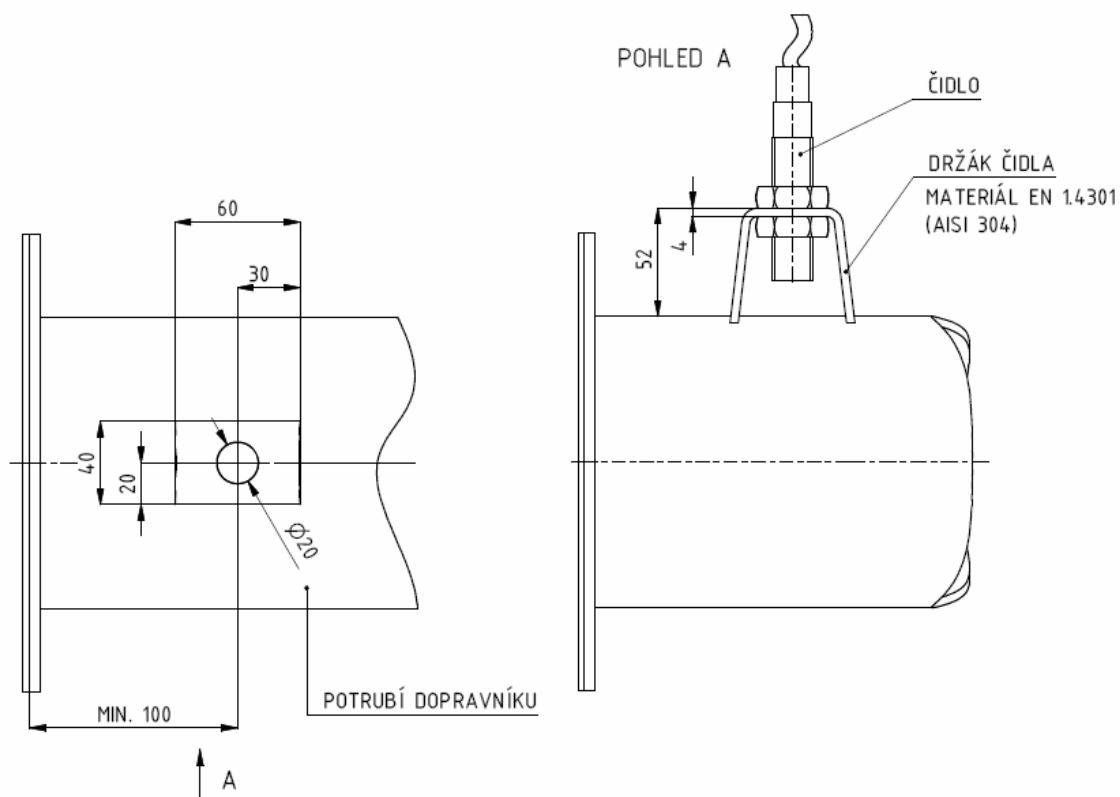
ISN 520.1 sensor: operating conditions

- working ambient temperature: -25°C to +150°C
- air pressure: 86 to 106 kPa
- protection: IP 65

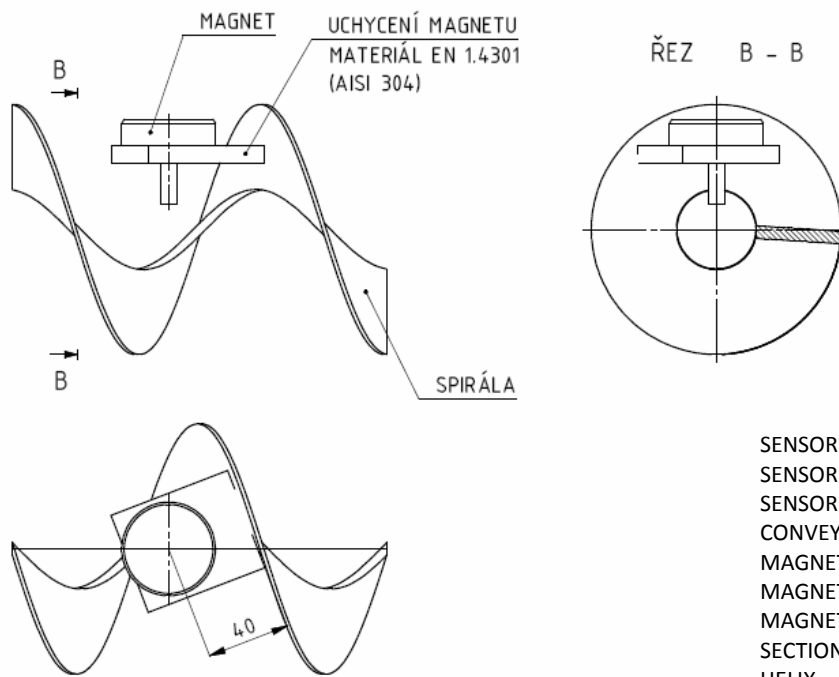
4. Installation

4.1. Mechanical assembly

DETAIL UPEVNĚNÍ DRŽÁKU ČIDLA



DETAIL UCHYCENÍ MAGNETU



SENSOR BRACKET ATTACHMENT DETAIL
 SENSOR
 SENSOR BRACKET
 CONVEYOR PIPELINE
 MAGNET ATTACHMENT DETAIL
 MAGNET
 MAGNET ATTACHMENT
 SECTION B-B
 HELIX

The size of the magnet may differ depending on the spiral diameter and the conveyor material (steel, stainless steel or plastic).

4.2. Electrical assembly

The device comes with a screw terminal box for connecting cables with a wire cross-section up to 2.5 mm². Before connecting any wires, make sure that the power supply voltage complies with the power supply voltage of the evaluating unit.

Locate the device as far as possible from sources of disruptive electromagnetic fields (such as motors, contactors, relays, servo actuators, solenoids, frequency converters).

We advise you to protect the device against pulse overvoltage. That can be achieved by adhering to the following principles:

- sensor cables, the communications link cable and the controller feeder cables have to run separately from cables powering the load, without any crossings and loops
- connect R-C filters to the contactor coils
- use shielded lines to the sensors
- shielded cables are required where an actuator unit is operated via a frequency converter
- outlet choking coils have to be installed where the motor is farther than 40 m away from the frequency converter
- the device has to be placed within an earthed metal casing where there is a strong radio wave field
- use overvoltage protection for the evaluating unit power supply, and for its outlets as needed
- observe the fuse currents in the power supply section of the speed indicator, which are, dependent on its version, 230 V AC = 32 mA or 24 V AC/DC = 125 mA
- if a noise filter has to be installed, you are advised to use a three-strand cable for the power supply.

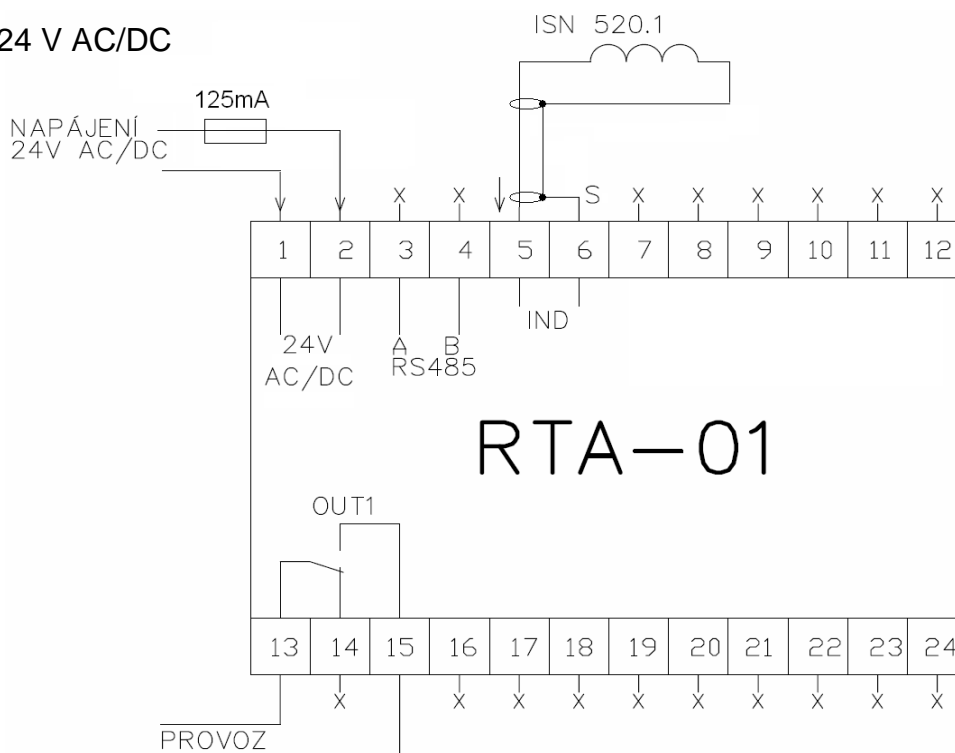
Do not exceed the maximum permissible current on the outlet contact.

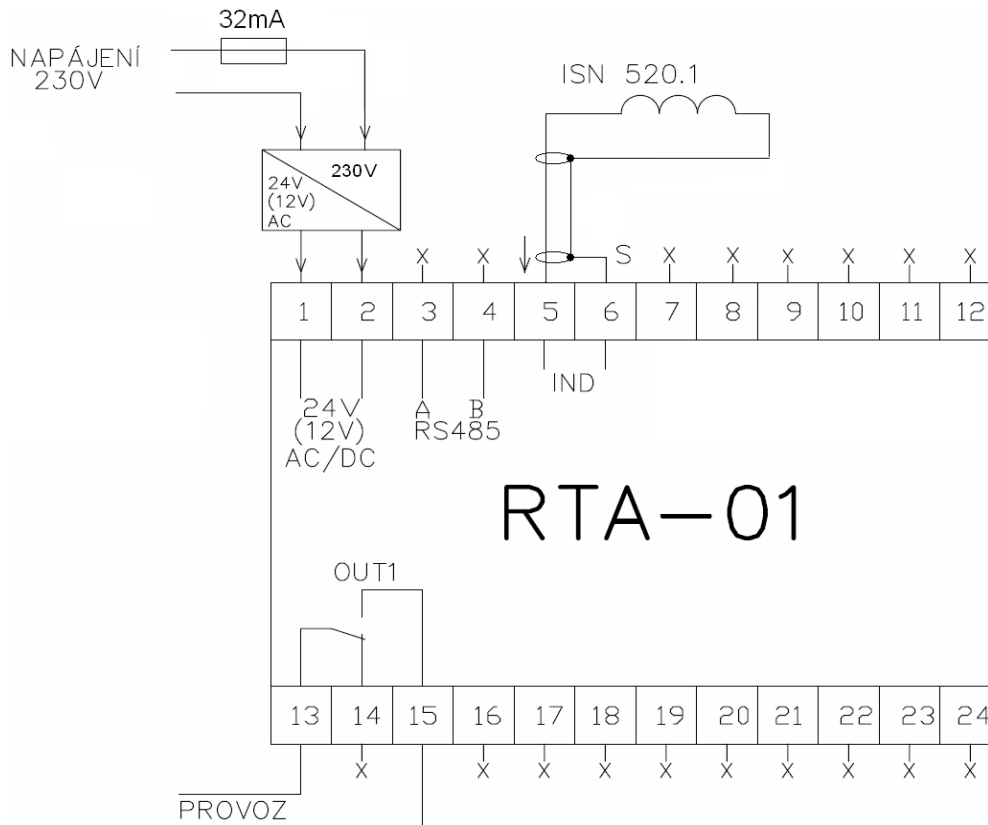
Use an appropriate external contactor for more demanding loads.

Install the sensor so that it cannot be damaged mechanically.

Wiring diagram

Version: 24 V AC/DC





POWER SUPPLY
OPERATION

5. Device controls

The device is designed with a view to easy operation and parameter setting. The basic preset parameters of the evaluating unit and their adjustment ranges are shown in the parameter table in 5.2. Access to parameter adjustment is password-protected.

Hold down the button **P** for 5 s to display **PAS**, then press **P** again to display **0**. Then enter the password combination. (The combination can be increased or decreased within its range using the buttons **▲** and **▼**). Press **P** again once you have entered the password. If the password is correct, a dot with a letter **S** blinks by the top right digit and you are allowed to edit the parameters. The values you have to enter are shown in the parameter table.

Use the buttons **▲** and **▼** to roll to the parameter you wish to adjust and press **P**. This displays the current parameter value, which you can adjust using **▲** and **▼**. Once you have chosen a new desired value, press **P**. This stores the new value in the memory and the parameter code is displayed. Press **▲** or **▼** to display the previous or next parameter code. The parameter values you can enter are shown in the parameter table. If you no longer wish to adjust any parameters, stop touching the buttons and the unit will return to the work display mode after a preset time period.

If this happens while you take a long break during entering parameters, you have to repeat the adjustment by re-entering the parameter adjustment access password.

5.1. Programme parameters and parameter description

Output OUT1 (V1) is activated after the controller power supply is turned on. This is followed by a time countdown based on the C-S parameter. After the time is counted down, the device starts counting pulses arriving from the indicator.

If the revolution speed decreases below o-E, the display begins to blink and the device switches to a switch-off mode with a timer preset with the C-P parameter. Once in that mode, the revolution speed has to grow above the o-S threshold (operating mode), otherwise the device is switched off automatically after the time lag is counted down.

The output OUT1 can switch on automatically again provided that pulses at the parameter o-S begin to arrive. If you switch the power supply off and on again, the RTA - 01 is brought into the startup mode and awaits pulses to arrive from the sensor. You can activate the output OUT1 (V1) by holding down the middle button for 5 seconds. If pulses begin to arrive within that time, the RTA - 01 enters the operating mode.

The programme contains the parameter E-b, which can be used to activate or deactivate acoustic signalling of arriving pulses.

5.2. Parameter table

Parameter	Name	Description	Range	Default	Setting
PAS	PASSWORD	Password required to access the next level	-999...1999	24	
C-S	C_START	Startup time lag	3 ... 60	5 sec	
C-P	C_PROV	Operating time lag	1 ... 60	5 sec	
o-S	OT_ST	Activation (startup) speed	4.0 ... 350	30.0 rpm	
o-E	OT_END	Monitored (shutdown) speed	4.0 ... 350	20.0 rpm	
C-i	C_INP	Time lag for next impulse validity	0.01 ... 5.00	0.50 sec	
E-b	E_BEEP	Beeper feature	OFF ... On	On	
E-o	E_OT	Speed display feature	OFF ... On	OFF	
E-S	E_STP	Defect display feature Err, Stp	Err ... Stp	Stp	
rES	RESOL	Display of decimal or integer speed values	OFF ... On	On	
TYP	TYPE	Indicators (Ind = induction / bAL = BALLUFF)	Ind ... bAL	Ind	
b-C	C BALL	Number of pulses per revolution for the BALLUFF indicator	1 ... 10	1	
EPS		Change of password required to access the next level	-999 ... 1999	24	

!Caution!

- The parameter "b-C" is invalid for the SRP - 02 indicator!!!
- The value "bAL" in the parameter "TYP" is invalid for the SRP - 02 indicator!!!
- When the evaluating unit is operated in the constant power supply mode (without switching on and off alongside the device), the parameter C-S is only applied on the first startup of the evaluation unit and only the parameter C-P is evaluated!!!

6. Possible user errors

The most common user errors include inappropriate parameter settings. They include, above all, settings of the parameters C-i (next pulse time lag) and the threshold values o-S and o-E.

Other frequent errors include installation in unsuitable environments. Moisture, high temperature, aggressive vapours, vibrations, movement of foreign magnetically conductive components near the sensor.

Pulse overvoltage and incidental radiation may cause faults in the evaluation process.

7. Maintenance

Disconnect the device from the power supply and any loads when cleaning it. You can clean the evaluating unit using a soft cloth and soapy water. Do not use petrol or any other chemicals. Take care that no liquids or other materials or objects get into the device.

8. Packaging, storage, handling, transportation, unpacking and inspection

8.1. Packaging and storage

- Store the device in its original packaging at temperatures between -10°C and +60°C.
- Only remove packaging before using the device to prevent any damage to the device.
- The packaging is made of recycled paper. Either submit it to an organization that specialises in collecting this material, or dispose of it in a waste paper collection bin.

8.2. Handling and transportation

- Handle the device and transport it to its installation site in its original packaging.
- Avoid dropping the device, hitting it against objects and with objects.

8.3. Unpacking and inspection

- After unpacking the device, check it for any mechanical or other damage.
- Do not use a damaged device.
- Check that the description on the label agrees with your order request.

9. Disposal at the end of service life

After the service life of the device has ended or as soon as any repair becomes uneconomical, dispose of the components after disassembling the device with respect to requirements of environmental protection regulations.

Separate the metal components according to the type of metal and offer to sell them to an organization dealing with reusable waste collection.

Separate any components made of plastic and other materials that do not undergo

natural decomposition and submit them to an organization dealing with collection of such materials.

10. General considerations

10.1. Familiarization with following instructions

- These Instructions are a component of the product and have to be stored near the device so that they are available for easy and quick reference.
- The device is not intended for use for any purposes other than those described in these Instructions for Use and Installation.
- The device must not be used as safety equipment.
- Check the range of conditions in your specific application before starting operation.



10.2. Safety precautions

- Before putting the evaluating unit into operation, the user has to specify authorized persons for using and cleaning it to ensure, above all, safety of persons and property.
- The evaluating unit may only be used for purposes for which it is technically qualified in compliance with the manufacturer's conditions.
- The evaluating unit may only be used without supervision by physically and mentally qualified workers older than 18 years of age who have been demonstrably trained in operating it and familiarized with these Instructions for Use. They have to be stored in a place accessible to the operators.
- The operators are required to perform periodic visual inspections of the device's condition and ensure its basic maintenance.
- The safety signs, symbols and lettering on the device have to be kept in a clean condition. If they become damaged or illegible, the user has to restore them to a condition in compliance with their original form.
- Work on the electrical equipment may only be performed by workers possessing adequate electrotechnical qualifications pursuant to COHSA and CMA Decree No. 50/1978 Coll. and familiar with the device as required.
- **CAUTION!** Only ever use one type of voltage in the evaluating unit output connectors: never connect safe and low voltage next to one another!
- Check the power supply voltage before connecting the device.
- Do not expose the device to effects of water or moisture and use it exclusively within the prescribed operating conditions. Prevent the effect of substantial fluctuations in the ambient temperature at high air humidity to prevent condensation of water vapour in the device.
- Do not expose the evaluating unit to the effect of vibrations.
- Disconnect all power supplies before commencing any maintenance work!
- Do not open the device: perform all connections via the device terminal boxes.
- In the event of a failure or malfunction, send the device back to the manufacturer along with a detailed description of the defect.
- Observe the prescribed maximum current loads on the outputs; see Electrical specifications.
- Make sure that supply lines to probes, supply lines to the load and power supply lines

are laid separately and at sufficient distances without any crossings and parallel sections. Use a grid filter and overvoltage protection if using the device in an environment with potentially increased industrial electromagnetic noise.

11. Warranty conditions

- A warranty period of 12 months from the date of purchase is provided for the SRP - 02 spiral rotary movement indicator.
- The original duly completed delivery note has to be presented as a proof when making a warranty claim. In addition, enclose a written description of the defect.
- During the warranty period, the manufacturer shall eliminate, free of charge, any defects caused by material or manufacturing flaws.
- The warranty excludes any damage caused by incorrect use, installation or connection, static electricity when installing the device, or unauthorized interventions with the device. In addition, the warranty does not cover damage caused by unpreventable events.

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