



HIGH FREQUENCY LEVEL SWITCH

RFLS-53N



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USED SYMBOLS

To ensure maximum safety of control processes, we have defined the following safety instructions and information. Each instruction is labelled with the appropriate pictogram.



Alert, warning, danger

This symbol informs you about particularly important instructions for installation and operation of equipment or dangerous situations that may occur during the installation and operation. Not observing these instructions may cause disturbance, damage or destruction of equipment or may cause injury.



Information

This symbol indicates particularly important characteristics of the device.



Note

This symbol indicates helpful additional information.

SAFETY



All operations described in this instruction manual have to be carried out by trained personnel or by an accredited person only. Warranty and post warranty service must be exclusively carried out by the manufacturer.

Improper use, installation or set-up of the sensor can lead to crashes in the application.

The manufacturer is not responsible for improper use, loss of work caused by either direct or indirect damage, and for expenses incurred at the time of installation or during the period of use of the level sensors.

1. BASIC DESCRIPTION

The RFLS-53 sensor uses the principle of the capacity measurement on high frequency.

This means that the sensor reacts to the mass of material and ignores the deposits and remnants of material that remain on the measuring part - the active surface of the sensor. Thus, the sensor can be used in demanding applications to indicate powder, dust and hygroscopic materials and can replace mechanical rotary level switches or standard capacitive level switches.

The sensor is manufactured in several versions with extra low (24 V DC) or low supply voltage (230 V DC). With different types of outputs (PNP, relay, SSR) and electrical connection (M 12, valve connectors, cable).

RFLS-53 fully replaces the older CLS-53, but its electrical connection of the 230 VAC version is different (3 wires).

2. RANGE OF APPLICATION

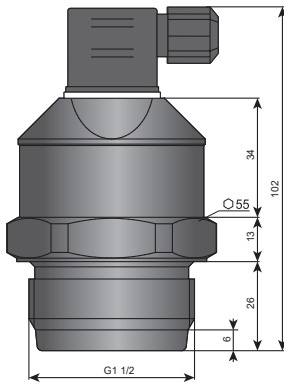
Detection of various kinds of bulk-solid materials (pellets, wood chips, sawdust, granulates, cereals, sand, gravel, ...) and other powder materials (flour, cement, fine mineral powders, metallic powders, ...) in hoppers, containers, silos, etc.

The sensor is not intended to be used for liquids or pasty media.

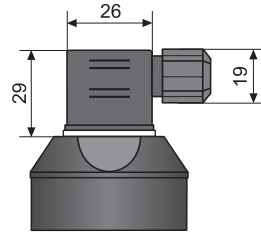
The sensor cannot be used in explosive atmospheres.

3. DIMENSIONAL DRAWING

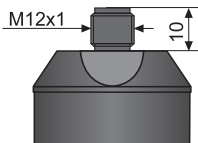
RFLS-35N



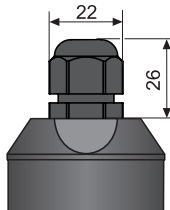
**Performance „G“
with valve connector**



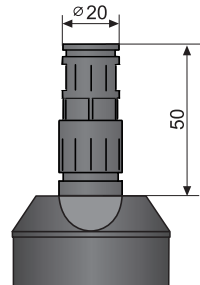
**Performance „C“
with connector M12**



**Performance „B“ with
plastic cable gland**



**Performance „H“ with cable
gland for protective hose**



4. INSTALLATION AND PUTTING INTO OPERATION

This procedure has the following three steps:

- **INSTALLATION** - chapter 5
- **ELECTRICAL CONNECTION** - chapter 6
- **SETTINGS** - chapter 7

5. INSTALLATION INSTRUCTIONS

- The sensor should be mounted to a slant or vertical wall of the hopper using a weld-on fitting with G1 ½" thread or appropriate fixing nut (PUM-G1,5). The front (active surface) of the sensor should remain 2-5 mm in front of the inner wall (inwards) or in front of the fixing nut – Fig. 1a, 1b.
- Although the influence of the build-ups is strongly eliminated, thick sediments might cause false activation (blocking) of the sensor (see Fig. 2). The function of the sensor is safe with a maximum sediment thickness of ca. 5 - 10 mm depending on the dielectric properties of the material.
- The sensor must not be installed in places with direct solar radiation and must be protected against weather conditions. In case the installation at places with direct solar radiation is inevitable, it is necessary to mount a shielding cover above the sensor (Fig. 3).
- If possible, mount the cable from the sensor down and let there a draining loop to avoid intrusion of humidity (Fig. 4). The cable gland as well as the connector's safety screw have to be tightened sufficiently.
- The placement of the sensor must be carried out in such a way that the material flow from the filling point does not interfere with the sensor's scanning field. Otherwise false activation (blocking) of the sensor could occur (Fig. 5).

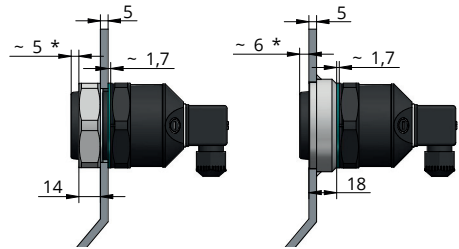


Fig. 1a: Installation of the sensor using a fastening nut

Fig. 1b: Installation of the sensor using a weld-on fitting

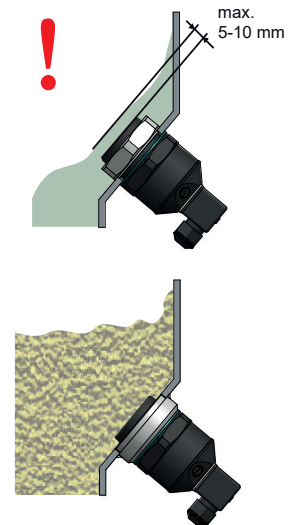


FIG. 2: The height of the sediment can be a maximum of 5-10 mm

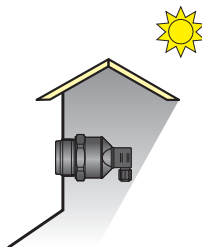


Fig. 3: Shielding cover against direct solar radiation

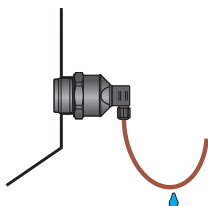


Fig. 4: Prevention to avoid intrusion of humidity

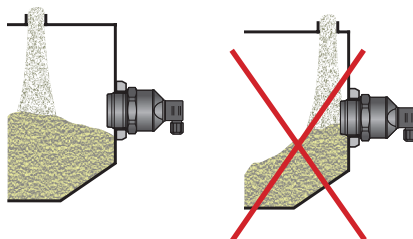


Fig. 5: Position of the sensor related with the filling point

6. ELECTRICAL CONNECTION



Electrical connection can only be made in a voltage - free state!

In the event that the level meter (sensor) is installed in an outdoor environment at a distance greater than 20 m from the outdoor switchboard, or from an enclosed building, it is necessary to supplement the electrical cable leading to the level meter (sensor) with suitable overvoltage protection.

In the event of strong ambient electromagnetic interference, paralleling of conductors with power distribution, or for distribution to distances over 30 m, we recommend using a shielded cable.



RFLS-53N-_-P-_-

The source of the power voltage must comprise of a stabilised safe low power source with galvanic separation. In the event that a switch-mode power supply is used, it is essential that its construction effectively suppresses common mode interference on the secondary side. In the event that the switch-mode power supply is equipped with a PE safety terminal, it must be unconditionally grounded!



RFLS-53N-_-RE(SSR)-_-

The device may only be connected to the power supply via an easy to reach switch with marked turned off/on positions and must be protected by a fuse or circuit breaker with a value of max. 6A!

The switch or circuit breaker used as the disconnect device must be in accordance with the IEC60947-1 and IEC60947-3, must be marked and must not be in the network inlet.



RFLS-53N-_-RE(SSR)-_-

The output wire of the device is not separated from hazardous circuits. It must not be connected to secondary accessible safety circuits.

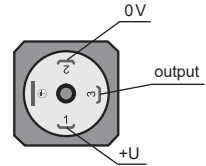
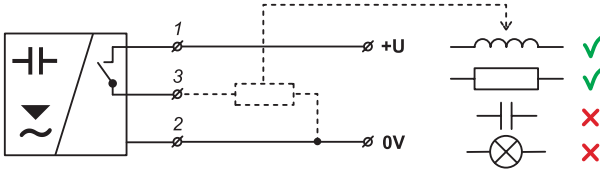
6.1. CONNECTION THROUGH VALVE CONNECTOR

Valid for: RFLS-53_--_-G



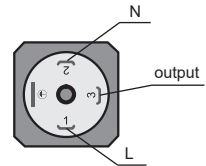
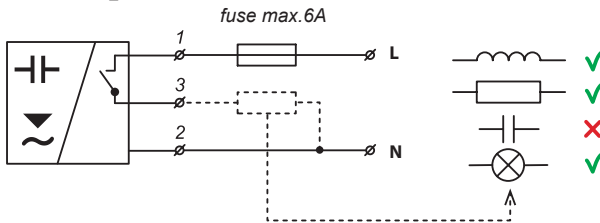
Performance, „G“
with valve connector

RFLS-53N_-P-G



Top view of the
connector

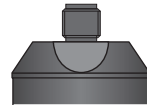
RFLS-53N_-RE-G
RFLS-53N_-SSR-G



Top view of the
connector

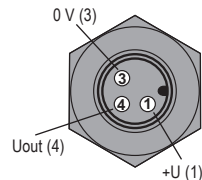
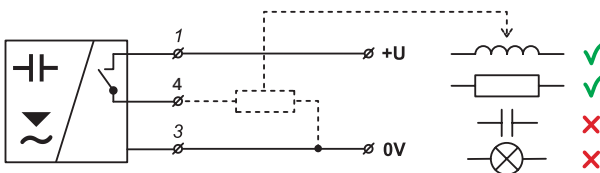
6.2. CONNECTION THROUGH CONNECTOR M12

Valid for: RFLS-53_--_-C



Performance, „C“
with connector M12

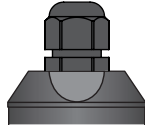
RFLS-53N_-P-C



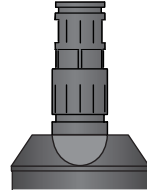
Top view of the
connector

6.3. CONNECTION VIA STANDARD CABLE GLAND OR GLAND FOR PROTECTIVE HOSES

Valid for: RFLS-53_ _ _ - B(H)

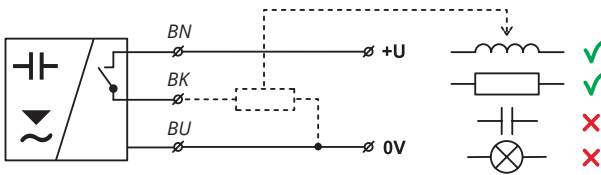


Performance „B“ with short cable gland

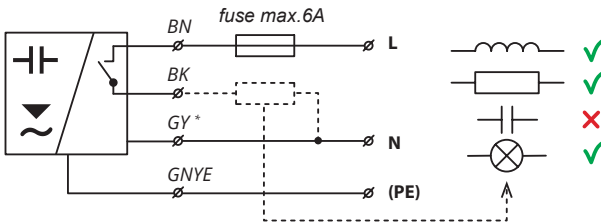


Performance „H“ with cable gland for protective hose

RFLS-53N_ _-P-B
RFLS-53N_ _-P-H



RFLS-53N_ _-RE-B
RFLS-53N_ _-RE-H
RFLS-53N_ _-SSR-B
RFLS-53N_ _-SSR-H



* Grey wire with blue wire ferrule.

7. SETTING

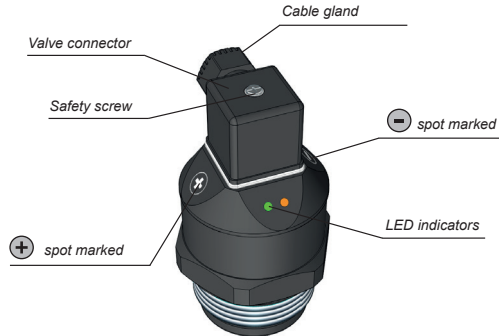


Fig. 6: Full view of capacitive level switch

Setting-up can be performed with a "MP-8" magnetic pen that is a part of the delivery. Settings are performed by touching a magnetic pen on sensitive spot indicated as \oplus or \ominus located beside the connector or cable gland.

1) Setting the Normally Open or Normally Closed switching mode:

Factory default mode is Normally Open. If the setting mode satisfies, you can skip next steps.

Setting the sensor to Normally Closed mode:

1. Disconnect the sensor from the power source (e.g. by disconnecting the connector).
2. Place the magnetic pen on \ominus spot in the voltage-free state and hold it.
3. Connect the power supply. Green and Orange LED lights up.
4. Take the magnetic pen away.

- Other settings of the sensor remain unchanged.
- Repeating this procedure will set the switching mode Normally Open again.

2) Adjusting sensitivity by short touch of magnetic pen (approx. 0,5 sec) to:

1. \oplus spot: increase sensitivity (every step is confirmed by 3-times flashing green LED)
 2. \ominus spot: decrease sensitivity (every step is confirmed by 3-times flashing green LED)
- When the end of sensitivity range is reached (min or max sensitivity), the frequency of green LED flashing slows down.
 - Verify the function by activation of the sensor and watch the sensor behavior.
 - The sensor is factory default set to basic sensitivity.

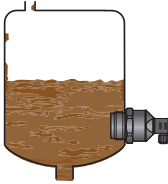

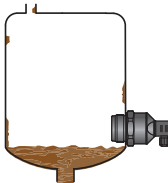

3) Factory default mode:

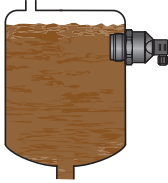

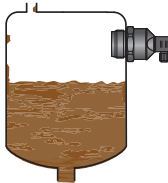

factory mode is Normally Open, setting of sensitivity is for materials about $\epsilon_r = 2$.

1. Disconnect the sensor from the power source (e.g. by disconnecting the connector).
2. Place the magnetic pen on \oplus spot in the voltage-free state and hold it.
3. Connect the power supply. Green and Orange LED lights up.
4. Take the magnetic pen away.
5. Now is Factory default mode set.

SETTING MODES

The sensor can be set to normally closed "O-mode" or to normally open "C-mode" switch types.

	level state	mode	output state	Orange LED
minimum level sensing		O	CLOSED	 (shining)
		O	OPEN	 (dark)

	level state	mode	output state	Orange LED
maximum level sensing		C	OPEN	 (dark)
		C	CLOSED	 (shining)

For safety reasons, for scanning min. level, we recommend you to use the "O" mode setting (sensor closes when submerged). A faulty sensor or wiring will take effect here in the same way as level emergency conditions by opening the sensor. Analogously for the max. level, we recommend you to set the "C" mode (sensor opens when submerged).

8. ORDER CODE

PRODUCT							
RFLS-53							
MECHANICAL PERFORMANCE							
N	for non-explosive areas						
TYPE OF DESIGN							
1	flat face						
OUTPUT TYPE							
P	PNP (open collector)						
RE	relay contact						
SSR	solid state relay						
ELECTRICAL CONNECTION							
G	valve connector DIN 43 650, form A						
C	connector M12, cannot be selected for output type RE, SSR						
B	standard cable gland						
H	cable gland for protective hose						
CABLE							
K	cable length in m, only for variants with connection type "B" and "H"						
RFLS-53	N	-	1	RE	B	K 2	POSSIBLE PRODUCT VARIANT

9. ACCESSORIES

standard - included in the price of the sensor

- 1 pcs. MP-8 magnetic pen
- 1 pcs. Seal
- 1 pcs. Connector with IP67 coverage (for version with valve connector)

10. SAFETY, PROTECTION AND COMPATIBILITY

RFLS-53N-_-P-_-

Protection against dangerous contact is provided by low safety voltage according to ČSN 33 2000-4-41 and degree of coverage IP 65.

RFLS-53N-_-RE(SSR)-_-

Equipment of protection class II. Protection against dangerous contact with live parts is ensured by the degree of protection IP 65. Electrical safety is ensured in accordance with the requirements of the standard EN 61010-1.

The operator of the equipment must be demonstrably acquainted with the operation and maintenance of the equipment.

Electromagnetic compatibility is provided by conformity with standards:

EN 55 011 (A), EN 61326-1, EN 61000-4-2 (A, 8 kV),

EN 61000-4-3 (A, 10 V), EN 61000-4-4 (A, 2 kV),

EN 61000-4-5 (A, 1 kV), EN 61000-4-6 (A, 10 V),

EN 61000-4-8 (A, 30 A), EN 61000-4-11 (A, B)

The sensor is equipped with protection against polarity reversal of the supply voltage and voltage peaks. RFLS-53N -_- RE (SSR) -_- sensors are not equipped with current overload protection! RFLS-53N -_- P-_- sensors are equipped with overload and short circuit protection at the output.

11. USE, MANIPULATION AND MAINTENANCE

The sensor does not require any personnel for its operation.

Maintenance of this equipment consists in verification of sensor's and supply cable's integrity. In case any visible defects are discovered, the manufacturer or reseller of this equipment must be contacted immediately.



Any changes or interventions without the permission of the manufacturer are forbidden to be performed on the RFLS-53 level sensor. Any repairs must be carried out only at the manufacturer site or by a service organization authorized by the manufacturer. The assembly, installation, commissioning, operation, and maintenance of the RFLS-53 level sensor must be performed following this manual and must comply with the provisions of the applicable standards for the installation of electrical equipment.

12. TECHNICAL SPECIFICATIONS

TECHNICAL SPECIFICATION		
Supply voltage	RFLS-53N-_-P-_ RFLS-53N-_-RE-_ RFLS-53N-_-SSR-_	7 ... 34 V DC 95 ... 230 V AC ($\pm 10\%$) / 50 ... 60 Hz 95 ... 230 V AC ($\pm 10\%$) / 50 ... 60 Hz
Supply current	RFLS-53N-_-P-_ RFLS-53N-_-RE-_ RFLS-53N-_-SSR-_	≤ 10 mA DC ≤ 60 mA AC ≤ 60 mA AC
Output	RFLS-53N-_-P-_ RFLS-53N-_-RE-_ RFLS-53N-_-SSR-_	open collector PNP output, max. 300 mA relay contact 1 A / 250 V / 250 VA AC solid state relay, max. 130 mA / 250 V AC
Tightening torque of cable gland	RFLS-53N-1-_-G	1 ... 2 Nm
Recommended cable	RFLS-53N-1-_-G external dimension RFLS-53N-1-_-G wire size	$\varnothing 4$... 9 mm 3x 1,5 mm ² max.
Cable	RFLS-53N-_-P-B (H) RFLS-53N-_-RE-B (H) RFLS-53N-_-SSR-B (H)	3x 0,5 mm ² , PVC 4x 0,75 mm ² , PVC 4x 0,75 mm ² , PVC
Max. remanent voltage (ON state)	RFLS-53N-_-P-_	max. 1,5 V
Max. switching frequency		0.5 Hz
Ambient temperature range		-20 ... +60° C
Protection class		IP65
Housing material		PP and PVC-U
Weight approx.		0,13 kg

13. MARKING OF LABELS

Label for device of the type **RFLS-53N**



Symbol of producer: logo Dinel®

Internet address: www.dinel.cz, Country of origin: Made in Czech Republic

Connection scheme and labelling of wires:

Cable length: Cable: __ m

Serial number: Ser. No.: _____ – (from the left: production year, serial production number)

Supply voltage: $U = \dots$ V

Supply current: $I = \dots$ mA

Maximum switching current: $I_{\text{out}} = \dots$ mA (A)

Ambient temperature range: $t_a = \dots$ °C

Impact rating: IK06

Protection class: IP6_

The character of double insulation (device of protection class II):

Compliance mark: **CE**

Electro-waste take-back system mark: ~~X~~

Dinel[®]

industrial electronics

Dinel, s. r. o.
U Tescomy 249
760 01 Zlín
Czech Republic

phone: +420 577 002 002
e-mail: sale@dinel.cz

www.dinel.cz

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version: 06/2021



QMS
ISO 9001

