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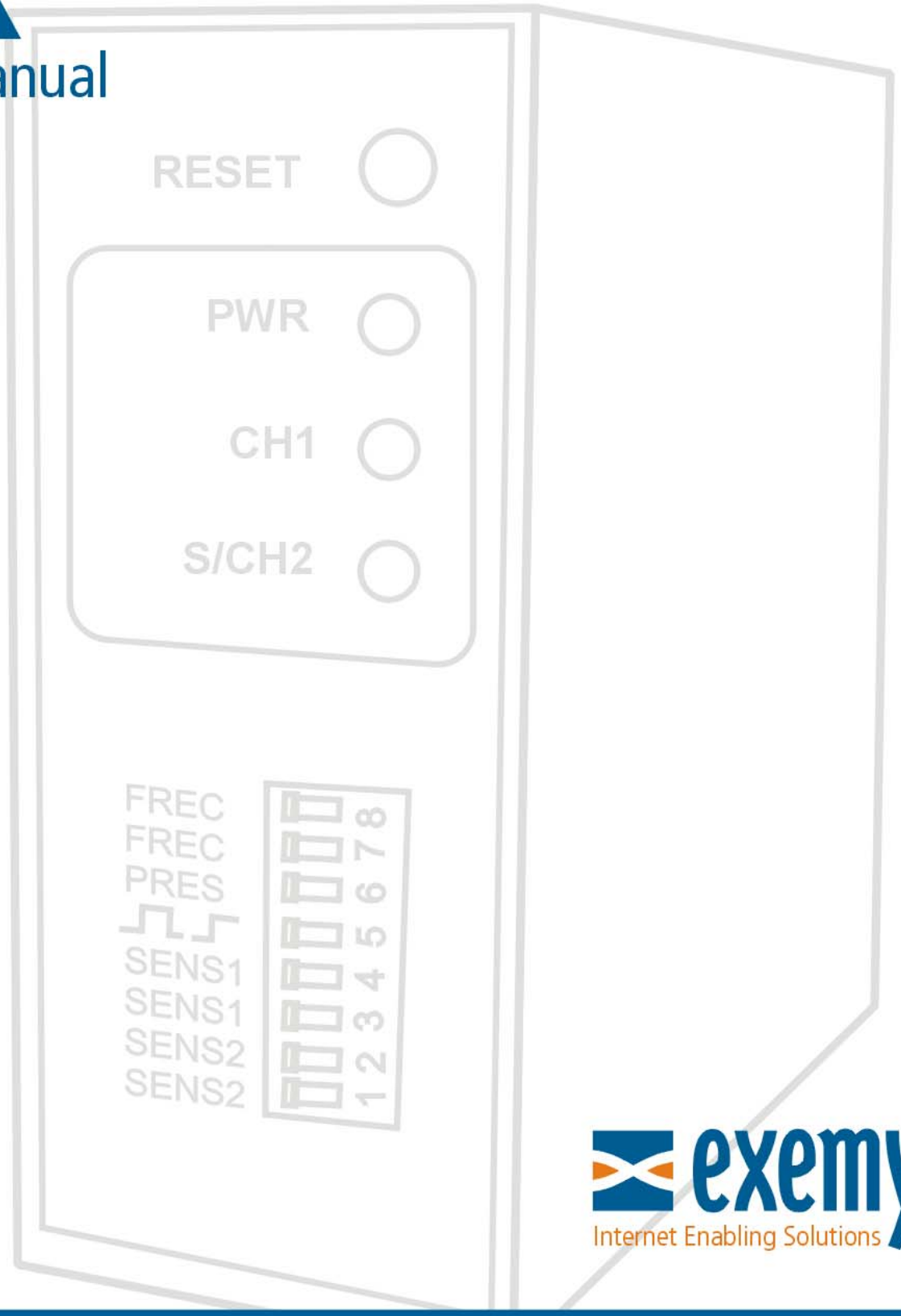
Inductive Loop Detector

IDx

User´s Manual



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For that reason, the specifications and capabilities are subject to change without prior notice.
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Rev. 4.0.0

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Features

- Microcontroller.
- 1 or 2 channels.
- Switching power supply.
- 4 settable sensibility levels.
- 4 settable frequency levels.
- Optoisolated, relay, transistor or digital outputs (TTL).
- Safe output in case of failure.
- Channel multiplexing.
- Advanced failure analysis.
- Auto-tuning.
- Output while present
- Drift compensation due to environmental fluctuations

Model Codes

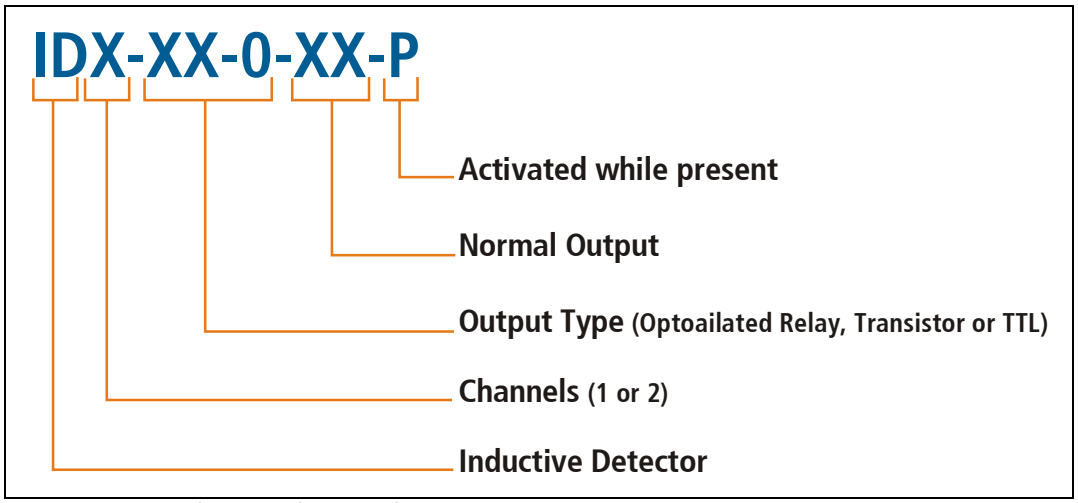

Figure 1 – Detail of the Codification of the models

PART NUMBER	OUTPUTS	CHANNELS
ID1-RL-0-NA-P	Normally Open Relay	1
ID2-RL-0-NA-P	Normally Open Relay	2
ID1-RL-0-NC-P	Normally Closed Relay	1
ID2-RL-0-NC-P	Normally Closed Relay	2
ID1-OP-0-NOFF-P	Optoisolated Normally OFF	1
ID2-OP-0-NOFF-P	Optoisolated Normally OFF	2
ID1-OP-0-NON-P	Optoisolated Normally ON	1
ID2-OP-0-NON-P	Optoisolated Normally ON	2
ID1-TR-0-NOFF-P	Transistor Normally OFF	1
ID2-TR-0-NOFF-P	Transistor Normally OFF	2
ID1-TT-0-N0-P	TTL Normally OFF	1
ID2-TT-0-N0-P	TTL Normally OFF	2

Figure 2 – Available Models

Working Principle

The IDx detects metallic masses measuring the inductance of a loop.
This loop is part of an oscillating circuit that generates a magnetic field. When a vehicle passes over the loop the oscillator's frequency changes. The IDx's microprocessor detects these changes and, depending on its configuration, generates the corresponding output.

Reset

The RESET button is used to configure the IDx with the DIP SWITCH's settings.

Every time the settings are changed the RESET button must be pressed.

Auto Tuning

When the IDx is turned on, the auto tuning process begins which determines the reference level. During this process, the indicating leds are turned on.
The environmental fluctuations produce frequency changes which are compensated due to the auto tuning process.

Indicating Leds

The IDx has three indicating leds. The channel leds turn on when a vehicle is detected and remain this way until the vehicle has completely left the loop.
Apart from indicating a vehicle's presence, these leds indicate channel failure.

Table 1 – Indicating LED's state

Led CH1 and CH2	STATE
1 Flash	Short-circuit in loop
2 Flashes	Disconnected loop or frequency too low.
3 Flashes	Frequency too high
Led on	Vehicle detection

Sensibility (SENS)

Each channel has 4 configurable sensibility levels. This sensibility is specified as δL/L [%]: the minimum change (δL), the loop's inductance must suffer, divided the loop's inductance (with no vehicle present). A cars typical sensibility is δL/L=3% approximately.

Table 2 - Sensibility

SENSIBILITY	δL/L %
Low	0.50
Medium	0.10
High	0.05
Very High	0.02

Outputs

8.1 Pulsed

The output signal activates when the vehicle enters the loop and remains on for 120 ms approximately.

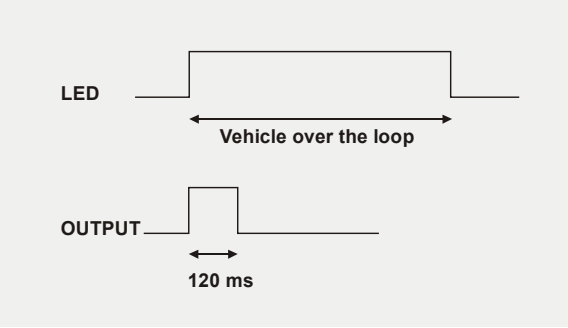

Figure 3 – Pulsed output signal

8.2 Permanent while present

The output signal activates when the vehicle enters the loop and remains on while the vehicle crosses the loop.

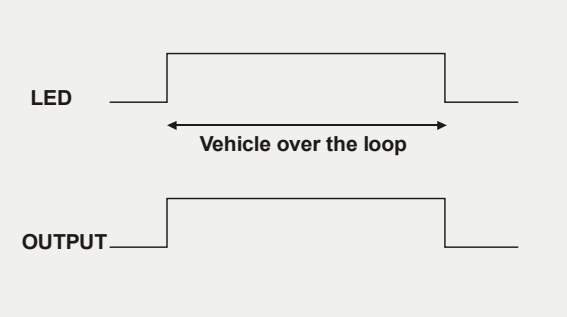

Figure 4 - Output signal permanent while present

Presence Time (PRES)

Regardless of the output signal type (pulsed or permanent while present), if a vehicle remains over the loop longer than a certain amount of time, the IDx will reset, causing a re-tuning. This period of time, called *presence time*, depends on the size of the metallic mass that's being detected. A car will reset the IDx after remaining over the loop for approximately an hour.

Frequency (FREC)

You can choose the working frequency of both channels to avoid interference with other detection systems. Frequencies differ from each other around 5%.
The frequency will depend on the loop's geometry. The detector works with frequencies from **25Khz** to **120KHz.** Above or below those frequencies the detector will indicate failure. To avoid interference between the IDx's channels, detection on each channel is done separately. When detection is taking place in one channel the other one is off, this way mutual interference is not possible. The IDx switches from one channel to the other with enough speed as not to affect normal operation.

Loop construction and installation

The wire used for the loop must reach the detector module without cuts. The ends of the wire are brought back to the enclosure. This sector of wire must be twisted, at least 25 turns per meter (8 per feet), and it can't exceed 100m (330 feet). If the cut in pavement is shared by the channels, increasing the number of turns per meter and using shield wires is recommended (shield must be ground connected in detection module).

The loop, unless under prohibitive conditions, should be rectangular. Shorter sides should follow traffic flow. Longer sides must be separated at least 1 meter (3 feet).
Wire section must be 1.5 mm square (14/16 AWG) or above. The wire may be multi core with silicon jacket.

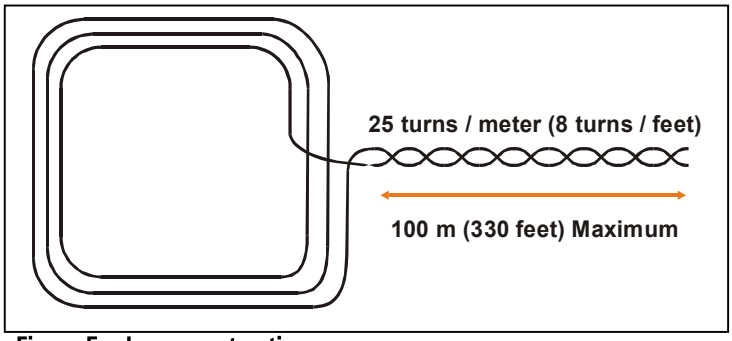

Figure 5 – Loop construction

Examples on loop size and number of turns:

- **Standard Loop**

2m x 1m (6.5 x 3 feet), 3 turns

When installing two loops, of different detection modules, at close ranges you should choose different working frequencies for each loop, to avoid interference. In any case, loops should be at least two meters apart. When both loops are connected to the same IDx this restriction doesn't apply.
The loop is installed in a cut in pavement. The cuts should be wider than the diameter of the wire used to form the loop; the depth should be N x wire's diameter + 20 mm (1/8 ") or deeper (where N is the number loop's of turns). Cutting the rectangle's corners at a 45º angle helps avoid curving the wire beyond the maximum curve-diameter.

Proper installation of the loop will result in optimal detection. If a loop fails, it can't be repaired due to the installation method.

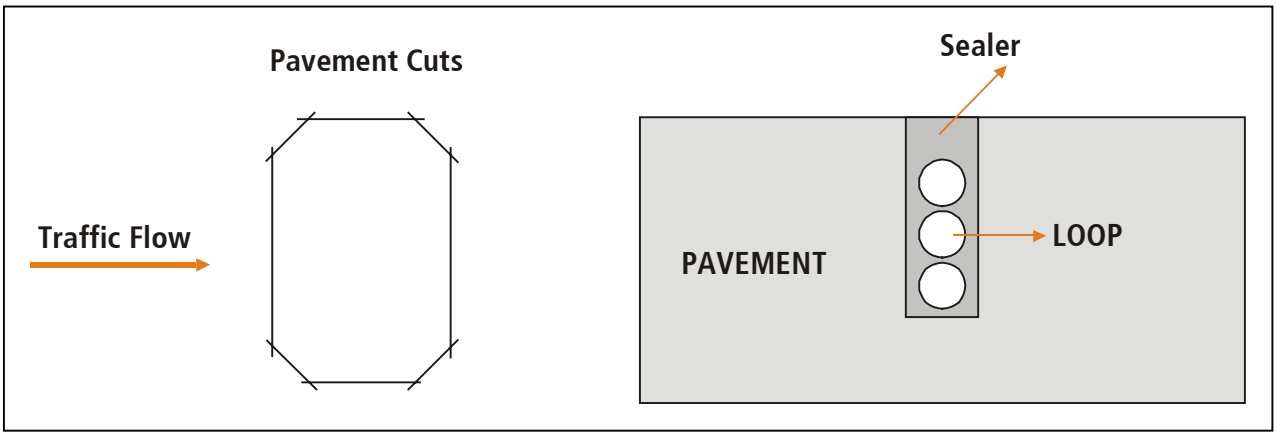

Figure 6 - Proper installation of the loop

Fill the pavement's cuts with epoxy resin, avoiding moisture or other materials since this could affect the measurements.
When placing a new loop, remove the old one. If this is not possible separate and isolate the wire ends.

Connection

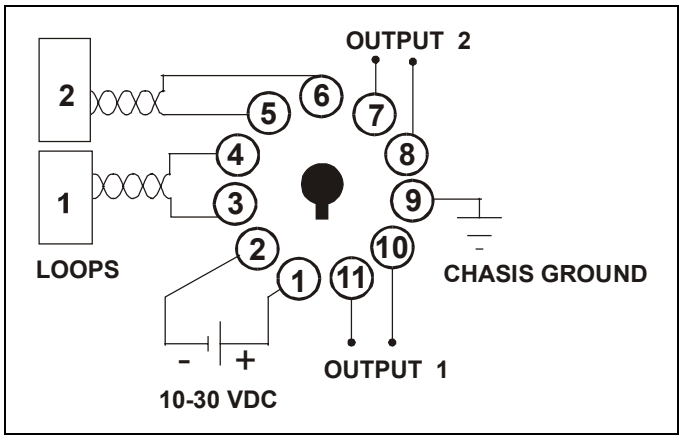

Figure 7 – Connection

12.1 Connecting each model

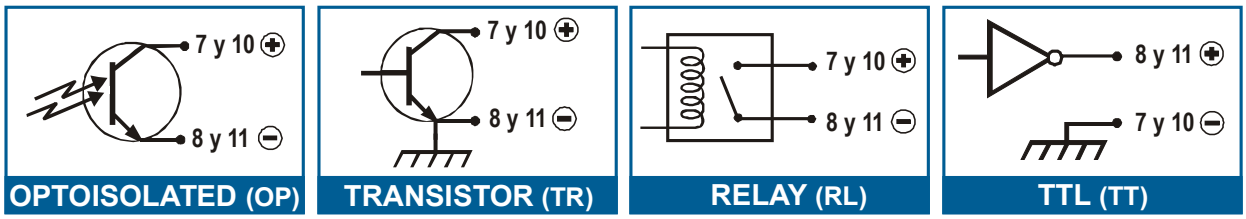

Figure 8 – Optoisolated outputs, Transistor, Relay and TTL.

Table 3 - Connection

Pin	Description
1	+ Vdc (10-30V)
2	GND
3	Loop Channel 1
4	Loop Channel 1
5	Loop Channel 2
6	Loop Channel 2
7	Relay output 2 (NA-NC) / Opto + / TR+ / GND
8	Relay output 2 (Common) / Opto - / GND / TTL
9	Chassis ground
10	Relay output 1 (NA-NC) / Opto + / TR+ / GND
11	Relay output 1 (Common) / Opto - / GND / TTL

Technical Specifications

Power Supply	10-30 Vdc, internal switching power source.
Operating current	100mA max.
Relay	0.5ª 120Vca, 1ª 24Vdc, 0.3ª 60Vdc.
Optoisolators	Optoisolated output, 30V max, 10mA max.
Transistor	Transistor output, 30V max, 100mA max.
TTL	Digital output TTL (0-5V)
Protections	Varistors in power supply and relay outputs. Lightning protection and ground terminators. Loop input isolation with transformer.
Inductance range	20uHy a 2000uHy. Factor Q>5
Frequency range	25Khz a 120Khz
Presence time	1hour for $\delta L/L = 3\%$
Sensibility	$\delta L/L = 0.02\%, 0.05\%, 0.1\%, 0.5\%$
Mux time	10mS
Enclosure	Polycarbonate (top) y Noril (base), UL94-V0, Grey RAL 7035.

Factory Configuration

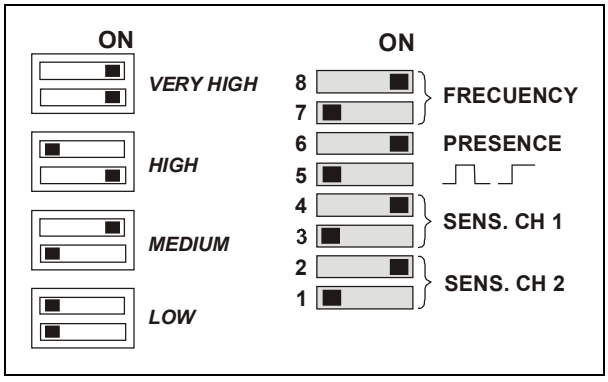

Figure 9 – Factory Configuration

Glossary

- **Drift:** Frequency change due to environmental fluctuations.
- **Delta L/L (δL/L):** change in the loop's inductance caused by an object over it, divided the loop's inductance without objects over it.
- **Loop:** wire wound in a given shape, placed in the detection zone.
- **Startup:** process that takes place when the detector is turned on, or when RESET is pressed, in which the settings of the DIP SWITCH are read and the reference level is determined.
- **Led**: Light emitting diode
- **Sensibility:** signal level that produces a detection output. Usually expressed in δL/L.
- **Presence time:** Maximum activation time of a loop before the detector resets.