

5. CONFIGURATIONS

Independent mode - DS # 1 (OFF <=>)  
MATRIX-4-S and MATRIX-4-D

Combined mode - DS # 1 (=> ON)  
MATRIX-4-D only

DS #	ASB mode	OFF <=>	=> ON
DS # 2	ASB mode	OFF	ON
DS # 3	Rel 1 : Detection mode	Presence Loop A	Pulse Loop A
DS # 4	Rel 2 : Detection mode	Presence Loop B	Pulse Loop B
DS # 5	Rel 1&2 : Pulse mode	Entry***	Exit
DS # 6	Memory effect*	OFF	ON

DS #	ASB mode	OFF <=>	=> ON
DS # 2	ASB mode	OFF	ON
DS # 3	Rel 1 : Detection mode	A -> B	B -> A
DS # 4	Rel 2 : Detection mode	Presence (A or B)	Opposite combined**
DS # 5	Rel 1&2 : Pulse mode	Entry	Exit
DS # 6	Memory effect*	OFF	ON

\* Memory Effect Mode: Only functional if ASB is set OFF by DS2.

\*\* See sticker on the product for more details.

\*\*\* If both relays are in pulse mode, DS5 setting applies to relay 1. Pulse of relay 2 is the opposite setting. (MATRIX-4-S only)

LED SIGNAL

GREEN LED



The green LED indicates that the sensor is powered.  
ON: correct line voltage  
OFF: internal problem or power line voltage is too low

The green LED flashes when a switch is changed without validation by the PB.

RED LED



The red LED indicates the corresponding output detection state. Each LED is assigned to one output.

When the voltage line is applied, the sensor measures the oscillation frequency of each loop. The result of this measurement is displayed on time by using the corresponding red LED. If a detection occurs during a frequency display procedure, the frequency display is cancelled and the relay status is displayed by the red LED.

FAILURE MODES

- When a loop default is detected, the corresponding relay of the loop is activated to prevent an accident as long as the default is not solved. This error is stored during the line voltage OFF/ON procedure only if the memory effect is functional.
- If the frequency oscillator of the loop (A or B) drifts out of its limits (+/- 10 %), the corresponding relay remains in a detection state and the red led flashes at 5 Hz frequency. When the frequency oscillator goes back to correct values, the MATRIX works normally again.
- If a switch value is changed without manual validation by the PB, the green led flashes at 5 Hz to signal an error. This information is stored to avoid an automatic validation after a power reset.
- On power ON, if the inductance of the loop is out of the predefined range (40 µH to 470 µH) the led gives an error signal status following to the table hereafter. The loop remains in this state until the problem is solved.

Loop Default	LED display
The inductance is > 470 µH	LED flashes 3x / 2 sec
The inductance is < 40 µH	LED flashes 4x / 1 sec
Loop oscillator failed	LED flashes 1x / 2sec

- If an internal failure of the µP is detected during the normal operation the 2 relays are activated, the green led is turned off and the 2 red led status is underdetermined. To restart the µP, you can launch a manual setup by pressing the PB at least 2.5 sec.

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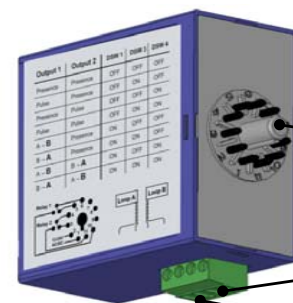
BEA hereby declares that the MATRIX is in conformity with the basic requirements and the other relevant provisions of the directives 1999/5/EC and 2004/108/EC. The complete declaration of conformity is available on our website: www.bea.be



MATRIX-4

Digital inductive loop sensor\*

DESCRIPTION

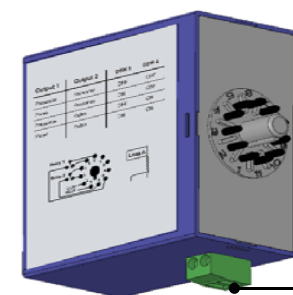


MATRIX-4-D

Main connector (86CP11)

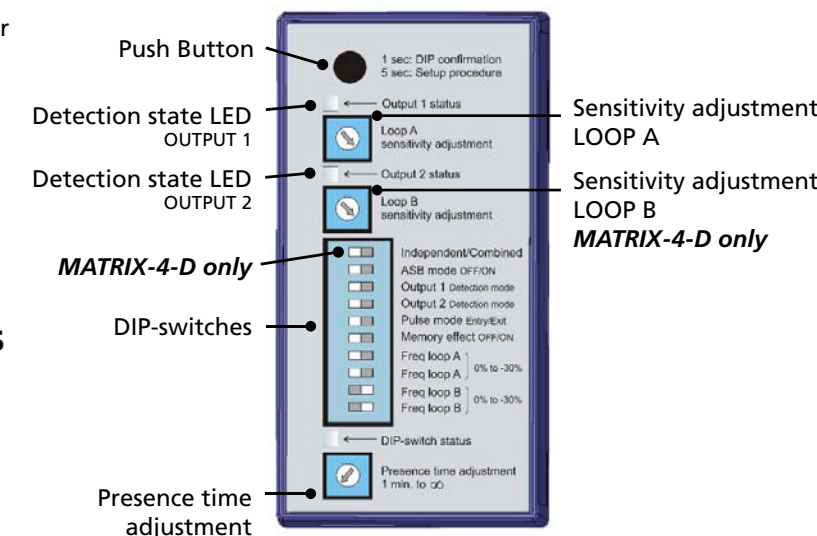
Connection LOOP B

Connection LOOP A



MATRIX-4-S

Connection LOOP A



Push Button

Detection state LED OUTPUT 1

Detection state LED OUTPUT 2

MATRIX-4-D only

DIP-switches

Presence time adjustment

1 sec: DIP confirmation  
5 sec: Setup procedure

Output 1 status

Output 2 status

Loop A sensitivity adjustment

Loop B sensitivity adjustment

Independent/Combined  
ASB mode OFF/ON  
Output 1 detection mode  
Output 2 detection mode  
Pulse mode Entry/Exit  
Memory effect OFF/ON  
Freq loop A 0% to -30%  
Freq loop B 0% to -30%  
DIP-switch status

Presence time adjustment  
1 min. to ∞

Sensitivity adjustment LOOP A

Sensitivity adjustment LOOP B

MATRIX-4-D only

TECHNICAL SPECIFICATIONS

<b>Technology</b>	inductive loop	<b>Storage temperature range</b>	-30 °C to +70 °C
<b>Tuning</b>	automatic	<b>Operating temperature range</b>	-30 °C to +55 °C
<b>Detection mode</b>	presence and motion	<b>2 Output relays (free potential change-over contact)</b>	2 relays, 0.5 @ 42 VAC on resistive load
<b>Presence time</b>	1 min to infinity (permanent presence) in 8 steps	<b>LED indicators</b>	• 1 green LED: power • 1 red LED: OUTPUT 1 • 1 red LED: OUTPUT 2
<b>Pulse time output</b>	100 ms	<b>Main connector</b>	standard 11-pin round connector 86CP11
<b>Inductance range</b>	40 µH to 470 µH	<b>Loop connector</b>	2 contacts for each loop, plug-in terminal for section cable up to 2.5 mm <sup>2</sup>
<b>Frequency range</b>	20 kHz to 130 kHz	<b>Dimensions</b>	77 mm (H) x 40 mm (W) x 75 mm (D)
<b>Frequency steps</b>	2 for each loop	<b>Weight</b>	< 200 gr
<b>Sensitivity (ΔL/L)</b>	0.004% to 0.512% in 8 steps	<b>Product compliance</b>	R&TTE 1999/5/EC EMC 2004/108/EEC
<b>Reaction time</b>	33 ms without memory effect 140 ms with memory effect		
<b>Power supply</b>	12-24 AC/DC +10% - 5%		
<b>Mains frequency</b>	48 to 62 Hz		
<b>Power consumption</b>	< 3 W		
<b>Degree of protection</b>	IP40		

Specifications are subject to changes without prior notice.

LOOPS INSTALLATION TIPS

1. CABLE SPECIFICATIONS FOR LOOP AND FEEDER

- 1.5 mm<sup>2</sup> cross section area
- Multi-strand cable
- Insulation material: PVC or Silicone
- For the feeder cable, the wire must be twisted at least 15 times by meter
- A foil screened cable is recommended for long feeder runs (earth at equipment end only)
- The feeder cable must be firmly fixed to avoid any false detection (max length: 100m)
- Waterproof cable junction box is required

\*Other use of the device is outside the permitted purpose and can not be guaranteed by the manufacturer.

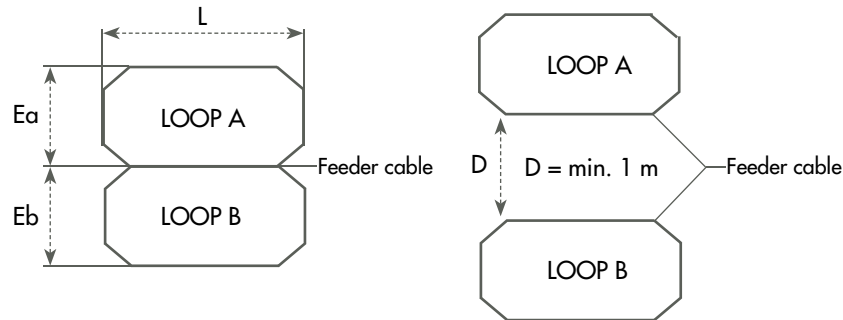
## 2. DETERMINATION OF THE NUMBER OF LOOP TURNS

### WARNING:

For conformity reasons, in any situation, the antenna factor defined as the loop surface multiplied by the number of turns should not exceed  $NA = 20$

For example:  
 Loop A: if  $L = 2$  m,  $E_a = 1$  m and the number of turns = 4, then the  $NA = 2 \times 1 \times 4 = 8 < 20$   
 Loop B: if  $L = 2$  m,  $E_b = 1$  m and the number of turns = 4, then the  $NA = 2 \times 1 \times 4 = 8 < 20$

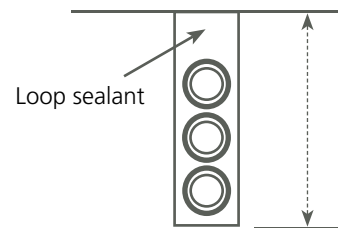
Surface	Number of loop turns
< 3 m <sup>2</sup>	4
3 - 5 m <sup>2</sup>	3
6 - 10 m <sup>2</sup>	2



**Rem:** Avoid large loops or long feeder (max 100 m), the sensitivity will be affected.

**Rem:** Make sure the distance D still allows any object to be detected on both loops at the same time with the **directional mode**.

## 3. SLOT DEPTH

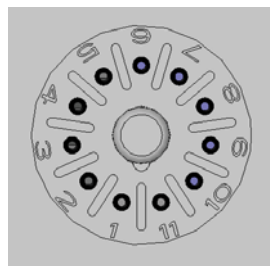


30 - 50 mm depending on cable turns number

Clean and dry slots prior to inserting cable

**Rem:** Make sure no metallic objects are present in proximity of the loops

## WIRING



<b>PIN 1</b> Power supply	<b>PIN 7</b> Not used
<b>PIN 2</b> Power supply	<b>PIN 8</b> Not used
<b>PIN 3</b> Relay 2 (NC)	<b>PIN 9</b> Not used
<b>PIN 4</b> Relay 2 (COM)	<b>PIN 10</b> Relay 1 (NO)
<b>PIN 5</b> Relay 1 (NC)	<b>PIN 11</b> Relay 2 (NO)
<b>PIN 6</b> Relay 1 (COM)	

## RELAY CONFIGURATIONS - PASSIVE MODE

	NO POWER	NO DETECTION	DETECTION
<b>NO</b> (PIN 10 & 11)			
<b>NC</b> (PIN 3 & 5)			

## ADJUSTMENTS

### 1. THE CONFIGURATIONS (see table on p.4 - MATRIX-4-D only)

Configuration # 1: Independent mode

Configuration # 2: Combined mode

### 2. THE PUSH BUTTON

The push button has two functions:

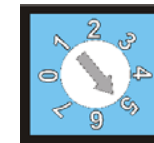
- **Short push** on the push button (max. 2.5 seconds): **confirmation of a setting by rotary or DIP-switch** (only 1 - 6). If a switch value is changed without a manual confirmation by the PB, the green LED flashes, but the sensor continues to work with its prior values.
- **Long push** on the push button (from 2.5 to 10 seconds): **launching of learn mode** after changing a loop frequency or after any modification concerning the loop installation. This function launches a similar self tuning as during the power on sequence.

## 3. ROTARY SWITCHES

After rotary switch change, confirm the setting with a push on the push button.

- A rotary switch for adjustment of the **sensitivity** for the **loop A**.
- A rotary switch for adjustment of the **sensitivity** for the **loop B (MATRIX-4-D only)**.
- A rotary switch for adjustment of the **presence time adjustment**: from 1 min to infinity

### SENSITIVITY



	Memory effect OFF	Memory effect ON
<b>0</b>	0.512 %	0.512 %
<b>1</b>	0.256 %	0.256 %
<b>2</b>	0.128 %	0.128 %
<b>3</b>	0.064 %	0.064 %
<b>4</b>	0.032 %	0.060 %
<b>5</b>	0.016 %	0.060 %
<b>6</b>	0.008 %	0.060 %
<b>7</b>	0.004 %	0.060 %

### PRESENCE TIME ADJUSTMENT



<b>0</b>	1 min
<b>1</b>	5 min
<b>2</b>	10 min
<b>3</b>	1 hour
<b>4</b>	2 hours
<b>5</b>	5 hours
<b>6</b>	20 hours
<b>7</b>	infinity

## 4. DIP SWITCHES

After each dip switch change, confirm the setting with a push on the push button.

DIP # 1	Independent or combined mode (see configuration table on p.4 - <b>MATRIX-4-D only</b> )															
DIP # 2	Automatic Sensitivity Boost - ASB (recommended for better trucks detection): during a detection, the sensitivity increases automatically to 8 times the present sensitivity given by the sensitivity rotary switch adjustment. It is limited to the maximum sensitivity ( $\Delta f = 0.004$ %). It goes back to the preset value after detection stops.															
DIP # 3	Relay 1 function: presence, pulse or directional pulse (see configuration table on p.4).															
DIP # 4	Relay 2 function: presence, pulse or directional pulse (see configuration table on p.4).															
DIP # 5	Relays 1 and 2 Pulse type (entry / exit).															
DIP # 6	Memory effect: the sensor keeps in memory the output states recorded just before a power cut. Only functional if ASB is set OFF on DS2.															
DIP # 7&8	<p><b>Loop A Oscillator frequency</b>                      These two switches are used to adjust the frequency of the loop oscillator A to avoid any intermodulation with other loop installed in the field.</p> <table border="1"> <thead> <tr> <th>DIP # 7</th> <th>DIP # 8</th> <th>Loop A oscillator frequency (in %)</th> </tr> </thead> <tbody> <tr> <td>OFF</td> <td>OFF</td> <td>0 %</td> </tr> <tr> <td>OFF</td> <td>ON</td> <td>-13 %</td> </tr> <tr> <td>ON</td> <td>OFF</td> <td>-23 %</td> </tr> <tr> <td>ON</td> <td>ON</td> <td>-30 %</td> </tr> </tbody> </table>	DIP # 7	DIP # 8	Loop A oscillator frequency (in %)	OFF	OFF	0 %	OFF	ON	-13 %	ON	OFF	-23 %	ON	ON	-30 %
DIP # 7	DIP # 8	Loop A oscillator frequency (in %)														
OFF	OFF	0 %														
OFF	ON	-13 %														
ON	OFF	-23 %														
ON	ON	-30 %														
DIP # 9&10	<p><b>Loop B Oscillator frequency (MATRIX-4-D only)</b>                      These two switches are used to adjust the frequency of the loop oscillator B to avoid any intermodulation with other loop installed in the field.</p> <table border="1"> <thead> <tr> <th>DIP # 9</th> <th>DIP # 10</th> <th>Loop B oscillator frequency (in %)</th> </tr> </thead> <tbody> <tr> <td>OFF</td> <td>OFF</td> <td>0 %</td> </tr> <tr> <td>OFF</td> <td>ON</td> <td>-13 %</td> </tr> <tr> <td>ON</td> <td>OFF</td> <td>-23 %</td> </tr> <tr> <td>ON</td> <td>ON</td> <td>-30 %</td> </tr> </tbody> </table>	DIP # 9	DIP # 10	Loop B oscillator frequency (in %)	OFF	OFF	0 %	OFF	ON	-13 %	ON	OFF	-23 %	ON	ON	-30 %
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OFF	OFF	0 %														
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