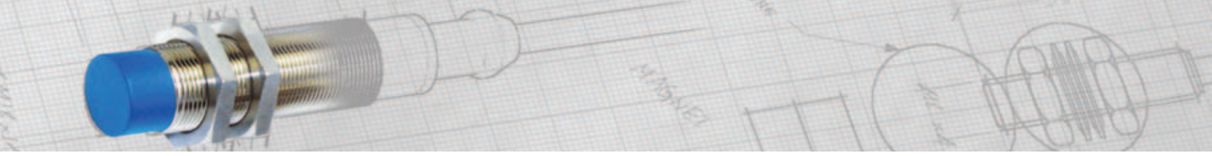


RATED OPERATIONAL CURRENT (I_e)

It's the load current which the sensor can withstand in all temperature and operational voltage range.

OFF-STATE CURRENT (I_r)

It's the current which flows through the 2 wire amplified sensors in off condition. It is recommended to check that this current doesn't exceed the minimum activation current of the load.

MINIMUM OPERATIONAL CURRENT (I_m)

It's the minimum current needed for a proper working of the 2 wire amplified sensors in on condition.

IMPULSE WITHSTAND VOLTAGE

All sensors are protected against the overvoltages coming from the supply line or from the load. The minimum value is 1KV and is tested according to EN60947-5-2 standards.

CHARACTERISTIC OF THE OUTPUT STAGES

NON AMPLIFIED IN d.c. NAMUR SERIES

The sensors of this series contain only the oscillator stage and an output filter. This allows the reduction of space and costs. Thanks to a small number of components and being used with low currents, these sensors ensure a very high reliability. The driving of a load is possible using them with a proper amplifier (AM… series. See section G) or connected to equipment with specific input stage for NAMUR devices.
ATEX sensors category 1G - 1D must be used with associated apparatus with ATEX certification.

Working:
With references to fig. 3, apply Un between 5 and 30 Volts: the I current flows through the sensor crossing the **Rx** resistance giving the **Vo** voltage. The current value will decrease in proportion to how a metal approaches its sensible surface, following the characteristic curve shown.
With Vo voltage we can control a trigger stage having then an exact switching point and giving an ON/OFF output. For the scaling of Rx look the table below:

Un (V)	Rx (Ω)
5	390
8,2	1000
12	1800
24	3900

It's important to consider that the NAMUR rules recommend the applications of these sensors in a supply range between 7,7 and 9 Vdc with an Rx of 1000 Ω.

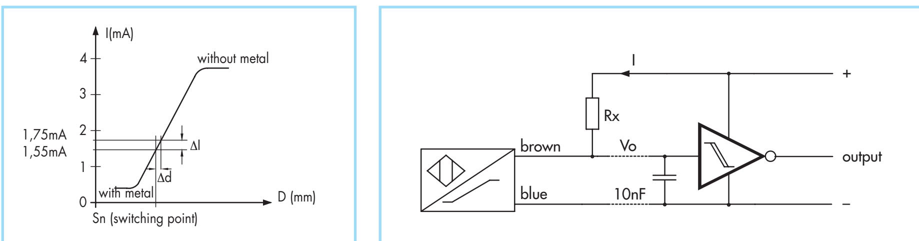
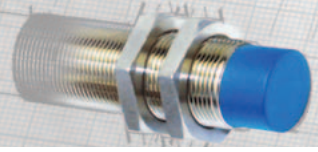


Fig. 3

NAMUR WITH LED SERIES

This series has a LED for the output condition and thanks to the integrated trigger, it has an exact switching point which permits to control PLC inputs and direct loads up to 10 mA without any interface module.



AMPLIFIED SERIES IN d.c. with 3 or 4 wires

The sensor of this series implements a power output stage and the outputs protection (only K versions). They are suitable for direct driving of typical devices such as relais, PLC, contactors.

OUTPUT LOGIC

The choice for the output logic (NPN or PNP) depends on the connection type of load.

The typical output stages are shown in fig. 4. Open collector versions are available upon request.

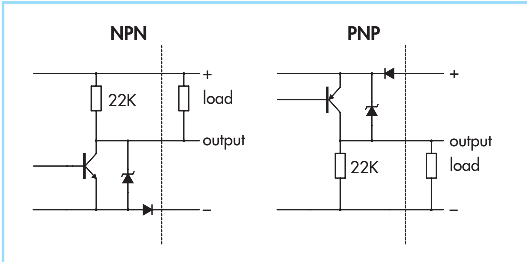


Fig. 4

PROTECTION AGAINST SHORT CIRCUIT

For the “K” version sensors, there is a protection against short circuits and overload in output. This protection starts to work at a value just a bit higher than the rated operational current, stopping the current until there is an excessive absorption. On d.c. sensors the sensor restarts to work as soon as the fault condition is removed. On a.c. sensors the power supply must be taken off in order to reset the protection stage. In some cases the protection can start because of the high capacitive loads, like filter capacitors higher than 100 nF or either lamps.In this case we recommend to use our specific proximity switches.

SERIES CONNECTION: AND LOGIC

With this connection the load is powered only when all switches are closed. The number of switches which can be connected in this way is limited by three factors:

1) from the residual voltage drop typical of selected switch, which is 2,2V (max for some types) at maximum load current;

2) from the maximum load current of switches employed, because it’s important to consider that the self consumption of each sensor must be added to the final load.

3) from the delay time of availability. For each sensor there can be a maximum delay of 30 ms. which has to be multiplied for the number of sensors used.

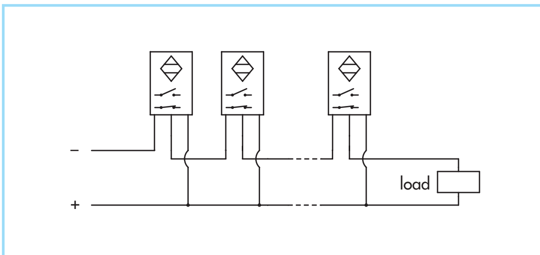


Fig. 5
Example of series connection with NPN sensors.

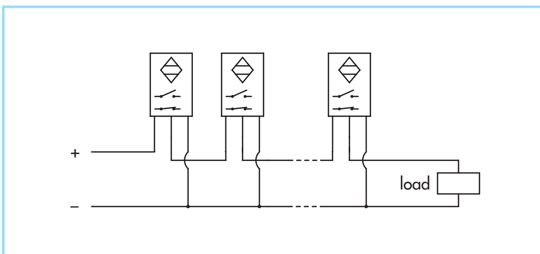


Fig. 6
Example of series connection with PNP sensors.

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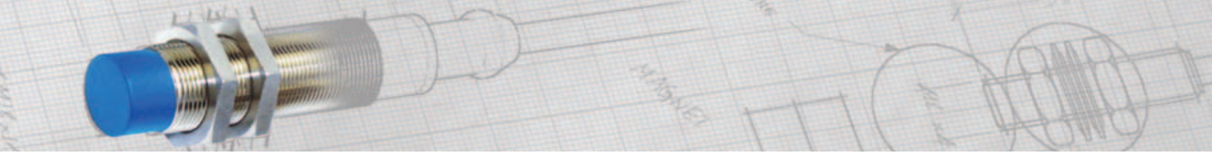

PARALLEL CONNECTION: OR LOGIC

With this type of connection, the load is powered whenever any of the switches is closed (or its output is conducting). In switches which are parallel connected, it must be considered that every connected sensor is loaded by other sensors internal resistor (collector resistor RC). It is possible to avoid this, using open collector types, or putting some de-coupling diodes as shown in fig 7-8.

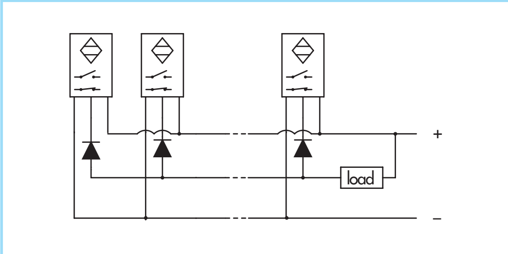

Fig. 7
Example of parallel connection with NPN sensors.

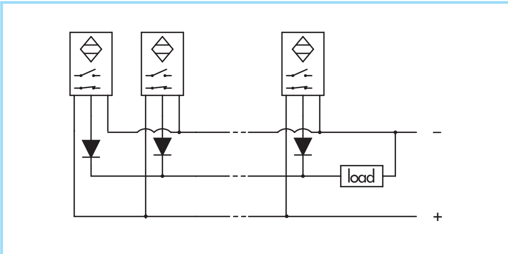

Fig. 8
Example of parallel connection with PNP sensors.

AMPLIFIED SERIES IN d.c. or a.c.

They are connected in series to the load like electro-mechanical micro-switches. It's important to verify that, subtrahend the voltage drop (U_d) by the supply voltage (U_B), there is enough voltage on the load for a correct working.
Another important factor in this sensor is the minimum operational current (Im), below which the sensor doesn't work properly.
In open conditions, there will always be a Off-state current (I_r) which will go across the load: make sure that the current isn't enough to keep the load active.
If this would happen it will be necessary to connect a resistance in parallel to the load itself.

SERIES CONNECTION: AND LOGIC

If several sensors must be connected in series, it is necessary to verify that summing all sensor voltages drop the load continues to have sufficient voltage for the correct working. We must also consider that in the open condition the supply voltage is divided by the number of sensors: make sure that on each sensor there is a voltage not lower than minimum value of UB.

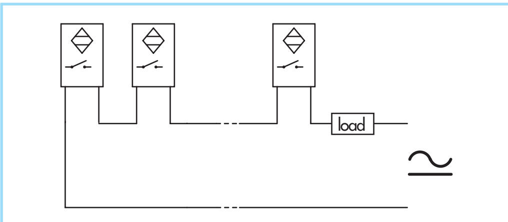

Fig. 9
Example of series connection with
2 wires amplified sensors.

AMPLIFIED SERIES IN a.c. 3 wires + earth

This series of sensors (ACB, ACBF) is suitable to solve minimum load, residual current and voltage drop problems typical on 2 wires series. They've got two wires for supply, one for the output and one for the earthing.

Their connection is similar to the amplified models in d.c. (fig. 10).

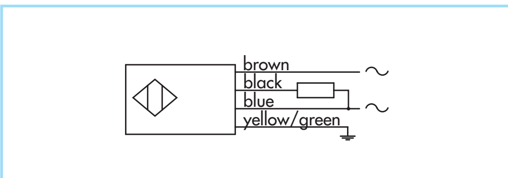

Fig. 10