Introduction
This guideline gives some advice on good installation practice. Should you have further questions, please don't hesitate to contact Eltomatic - we will be happy to assist you.

Important
Before commencing installation of an ATEX encoder, it is necessary to read and understand the installation instructions applicable for the specific type-approval of the product.

Liquids
Even though the shaft encoder can withstand short-time exposure to liquids, we recommend some precautions to protect the shaft encoder from dripping or splashing liquids that can cause the following problems:

- Some liquids can wash out the bearing lubricants
- Some parts may rust
- Over time, a liquid can soak into the shaft encoder and cause electronic malfunction

If there is any risk of splashing or dripping liquids, we recommend that you mount a cover around the shaft encoder (Eltomatic can provide such covers). Even though there is no apparent risk of liquids, there may be from time to time, condensation present. Another pitfall is a liquid being lead to the shaft encoder via the electric cable. This can be avoided by providing the cable with a loop at a lower level than the shaft encoder. The shaft encoder bearings are pre-lubricated and do not need extra lubrication if the shaft encoder is handled correctly. If you decide, however, to oil the bearings, only a small drop should be applied or there will be a risk of oil being lead into the encoder via the bearings resulting in potential electronic malfunction.

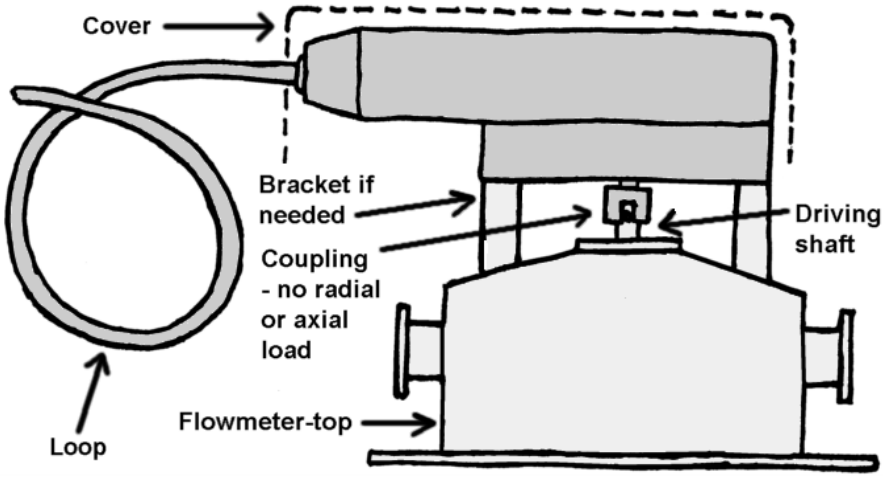

Figure 1

Coupling and mounting
The shaft of the encoder must not be submitted to axial or radial load. This is be achieved by choosing the correct coupling. A few examples are shown in Figure 1.

For other problems which may occur between a flow meter and a shaft encoder, such as 'jitter' or unwanted backwards turning, we can recommend various solutions:

- The shaft encoder coupling can have some degree of angle of mechanical backlash to its counterpart (e.g. 2b, 2c and 2d).
- The shaft encoder coupling can be supplied with a 15° to 30° mechanical backlash coupling (e.g. 2a).
- The shaft encoder could be supplied with a free wheel clutch, which will allow the shaft encoder to be turned in one direction only.
- The shaft encoder can be fitted with a microprocessor-controller, which can electronically simulate a mechanical backlash coupling, by suppressing the backward pulses.

The coupling on the left (2a) has a backlash built into the coupling, while coupling 2b, 2c and 2d have a backlash function contained in the mechanical interface with their counterparts. The coupling to the right (2e) has no backlash but a worm gear wheel to drive a gearbox or an integrated mechanical totalizer. The coupling "2e" is connected to a driving shaft and fixed with two screws. Great care must be taken during installation to avoid axial and radial load being applied to the shaft encoder coupling/shaft.

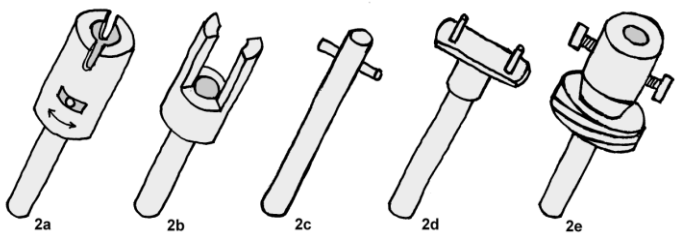

Figure 1

Power supply
The power supply must be a stable voltage without transient spikes. Do not use the same power supply or supply lines (Both supply "VCC" and "GND") for the shaft encoder which is used for fluorescent light, solenoids or motors. We recommend the power supply to be fused with maximum 100mA.

EMC (Electro Magnetic Compatibility)
A standard shaft encoders have very minimal emission thus EMC focus can normally be limited to immunity issues. However, shaft encoders with built-in microprocessors may emit noise generated by the clock oscillator and EMC emission might need to be addressed. The cable shield should be connected in both ends to achieve optimal immunity and emission characteristics. If the shield is connected in one end only, then the immunity against RF fields and magnetic near fields is poor.
The shaft encoder must not be exposed to unwanted DC or low frequency signals (often caused by leakage current). It is important to hold all metal parts in your installation at the same potential.

Cabling
To avoid common mode noise in the shaft encoder installation, the shaft encoder cable should not be placed alongside other cables carrying high current.

Cable shield
The cable shield is normally connected internally to the encoder housing and when installing the shaft encoder in a dispenser, it is important that the cable shield is connected to the calculator shield reference in order to achieve full EMC immunity against any ambient electromagnetic influence. There are three connecting possibilities:

- Cable shield connected directly to the calculator shield reference. There must not be any "illegal current" present in the cable shield (no potential voltage differences in the petrol pump installation). At the point where the cable end is separated into different wires, the shield (pigtail) must be kept as short as possible. If this method of installation is employed, there will most likely be no EMC problems using the shaft encoder.
- Cable shield connected to the calculator shield reference via a capacitor. It is an EMC requirement that no low frequency current is present in the cable shield due to potential differences. However, if there are potential differences in the petrol pump installation, an EMC acceptable solution could be a 10-50nF/500V Y capacitor coupled in series with the cable shield and the calculator ground reference.
- Cable shield not connected to the calculator shield reference. Because of possible potential differences (low frequency signals e.g. 50 Hz) in the installation, it may be decided not to connect the cable shield to the calculator shield reference. In this situation, the shield offers the shaft encoder no protection against RF interference, e.g. 'Burst' impulses from switches.

Shaft encoder signal coupled to the calculator
To achieve good noise immunity, the calculator-input circuit must have a hysteresis. For the shaft encoder output transistor, the typical maximum current is 30 mA and maximum supply voltage is 24V. An output current between 5 and 10mA is recommended when the cable between the shaft encoder and the calculator is in the range of 1 to 10 meters. The input circuit can be designed in many ways – a few examples are shown below.

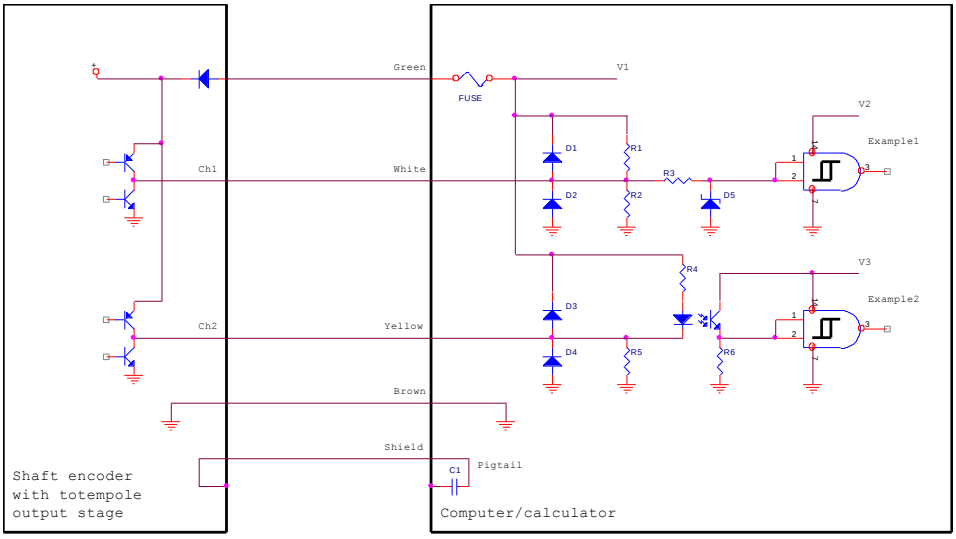

Figure 2 Totem pole output

An encoder with a totem pole output stage (Figure 2) is capable of both sinking and sourcing current thus both a pull-up and a pull-down resistor is needed in the calculator circuits. The value of both resistors are to be calculated not exceeding 30mA (5-10mA is recommended).

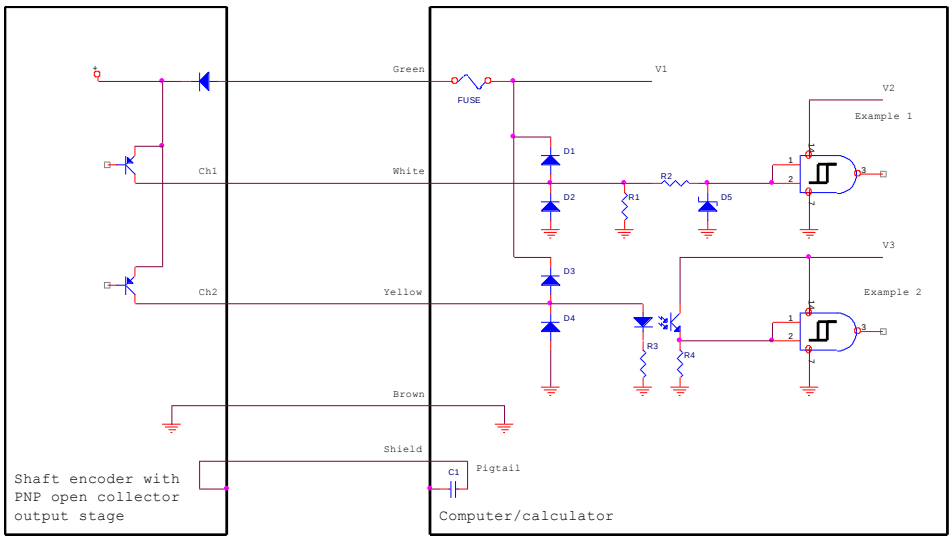

Figure 3 PNP

An encoder with a PNP output stage (Figure 3) can only source current thus a pull-down resistor is needed in the calculator circuit. The value of the resistors are to be calculated not exceeding 30mA (5-10mA is recommended).

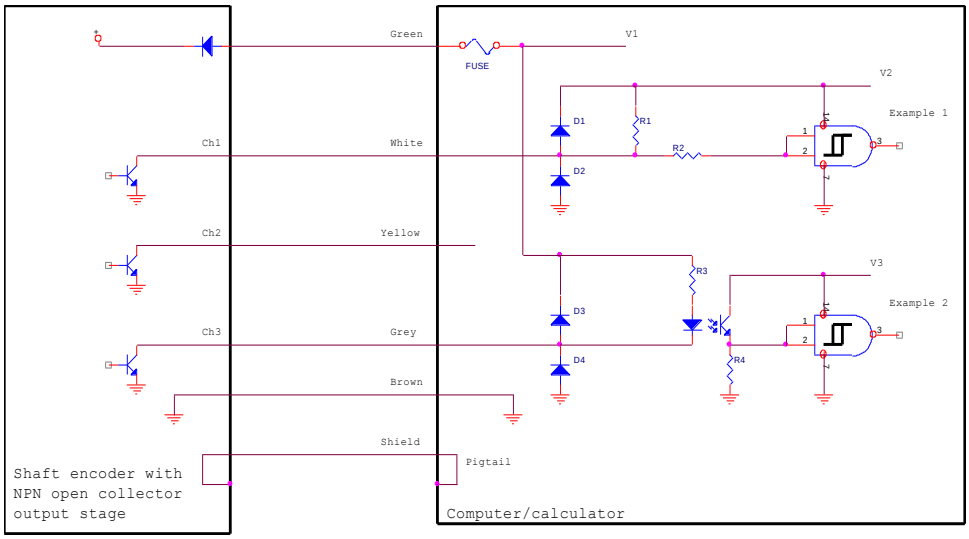

Figure 4 NPN

An encoder with a NPN output stage (Figure 4) can only sink current thus a pull-up resistor is needed in the calculator circuit. The value of the resistors are to be calculated not exceeding 30mA (5-10mA is recommended).

Interfacing to electronic counter

During “power on” initialization of the electronic counter, care must be taken, that the shaft encoders are not short circuited or are driven outside of specification. SW for monitoring of the shaft encoder signals must be robust to avoid timing tolerance problems and must be able to suppress jitter.

Caution: Do Not

- Apply higher or lower voltage supply than specified
- Use a power supply or supply lines which are shared with “noisy” equipment
- Place the shaft encoder cable alongside cables carrying heavy current
- Apply higher load to the output than specified
- Disconnect or connect any wires with power present
- Short circuit the output signal or short the outputs together
- Cut the cable - because of the potting, the cable cannot be replaced
- Apply axial or radial load to the coupling
- Attempt to change the coupling
- Lubricate the shaft (if necessary, only a small drop of oil must be applied)
- Expose the shaft encoder to liquids
- Expose the shaft encoder to leakage current