

The **MS41-22Ex0-R** is a single channel device with four intrinsically safe inputs that can be used as a bistable relay, or as a programmable switching amplifier without bistable characteristics.

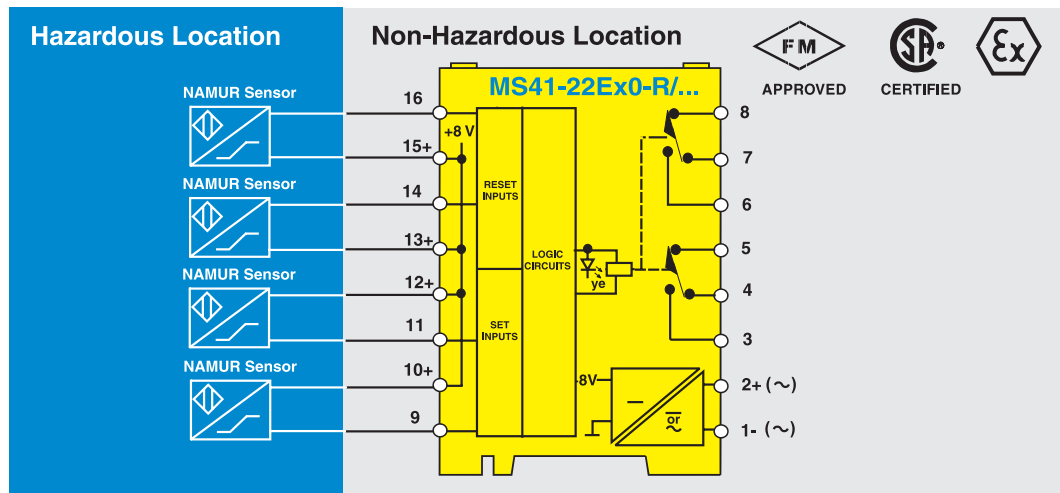
As a bistable relay, the switching functions can be programmed to perform “AND” (identity) or “OR” (exclusive OR) functions (set / reset control). By leaving the inputs open or closed, the desired function may be selected.

Please refer to the following pages for further information on logic functions. The input circuits can be configured for:

- Set-Reset Flip-Flop Control
- Programmable Switching Amplifier
- Exclusive OR Circuit
- Lockout Circuit
- Trigger Circuit
- Sequence Control
- Pump in
- Pump out

MS41-22Ex0-R/24VDC
MS41-22Ex0-R/115VAC
MS41-22Ex0-R/230VAC

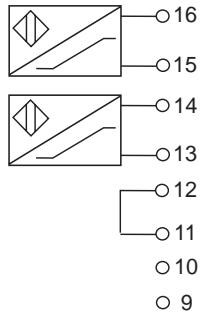
Connection Diagram



Bistable Switching Amplifier Intrinsically Safe MS41-22Ex0-R/...(24VDC/115VAC/230VAC)

Type	MS41-22Ex0-R/24VDC	MS41-22Ex0-R/110-120VAC	MS41-22Ex0-R/230VAC
ID Number	M5363700	M5363400	M5363100
Power Supply			
Supply voltage	20-28 VDC, ≤10% ripple	98-126 VAC, 48-62 Hz	184-250 VAC, 48-62 Hz
Power consumption	3.6 W	3.5 VA	3.5 VA
Galvanic isolation	between input circuit, output circuit and supply voltage, test voltage 2.5 kVrms	between input circuit, output circuit and supply voltage, test voltage 2.5 kVrms	between input circuit, output circuit and supply voltage, test voltage 2.5 kVrms
Input Circuit			
Nominal operating characteristics (per DIN 19234)			
- Voltage	8 V	8 V	8 V
- Current	4.5 mA	4.5 mA	4.5 mA
Switching threshold	1.55 mA	1.55 mA	1.55 mA
Hysteresis	0.2 mA	0.2 mA	0.2 mA
Intrinsic Safety Parameters	See page K14	See page K14	See page K14
Output Circuit			
Contact material	two SPDT relays AgCdO	two SPDT relays AgCdO	two SPDT relays AgCdO
Switching voltage	≤250 VAC/60 VDC	≤250 VAC/60 VDC	≤250 VAC/60 VDC
Switching current	≤4 A	≤4 A	≤4 A
Switching capacity	≤1000 VA/60 W	≤1000 VA/60 W	≤1000 VA/60 W
LED Indications			
- Output energized	yellow	yellow	yellow
Housing Style	Diagram E (page A18)	Diagram E (page A18)	Diagram E (page A18)

Exclusive OR Logic



Any time the **two sensors** have the same state:
Either both sense or do not sense a target, the relay is **energized**.

Any time the **two sensors** have a different state:
One is sensing a target and the other is not, the relay is **de-energized**.

Switching Amplifier

The MS41-22Ex0-R can be used as a single channel switching amplifier.

Programming	Input			Output Relay
	Dry Contacts	Inductive NAMUR	Capacitive NAMUR	
1				De-energized
				Energized
2				Energized
				De-energized

Diagram 1

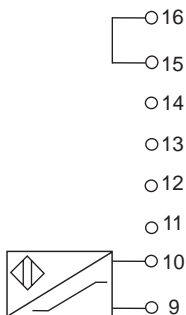
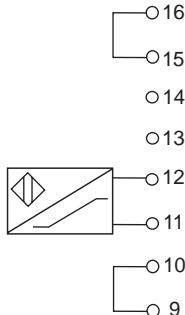


Diagram 2



Set-Reset Control

Table 1

Set Input	Reset Input	Output Relay
No Target (power up only)	No Target (power up only)	De-energized
Target	No Target	Energized
No Target	Target	De-energized
Target	Target	Energized (per diagrams 3 & 5)
		De-energized (per diagrams 4 & 6)
No Target	No Target	No change from previous state

The truth table for the **MS41-22Ex0-R** as a Set-Reset control is shown in *Table 1*.

Typical applications for the Set-Reset control are:

- Forward-Reverse operation of a work piece carrier.
- Detecting the leading edge of a large target to start (Set) and further down a line stop (Reset) work.

This is especially useful for a larger target that may be warped and drift in and out of the sensing range.

Diagram 3 Inductive Sensor Input

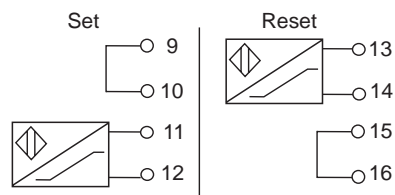


Diagram 4 Inductive Sensor Input

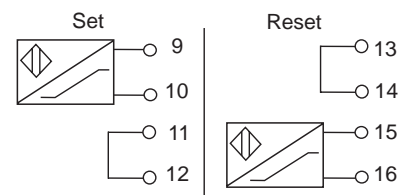


Diagram 5 Capacitive Sensor Input

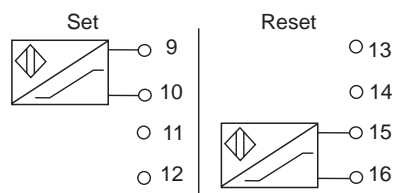
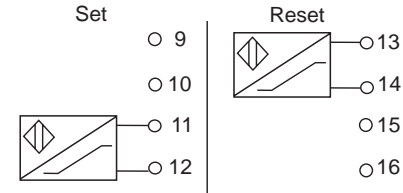
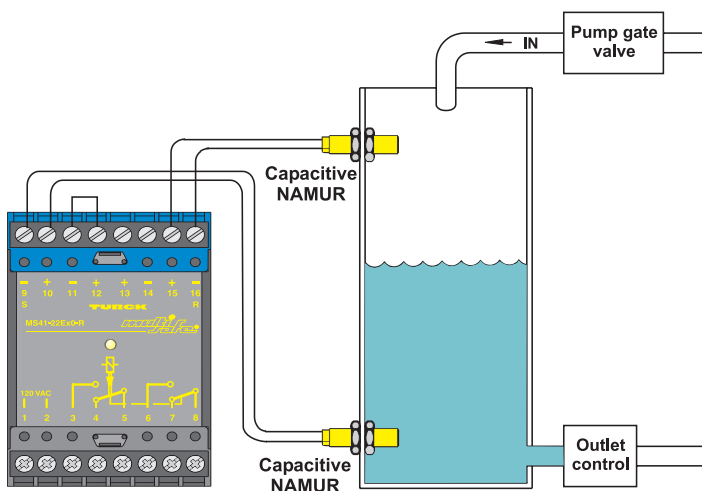


Diagram 6 Capacitive Sensor Input

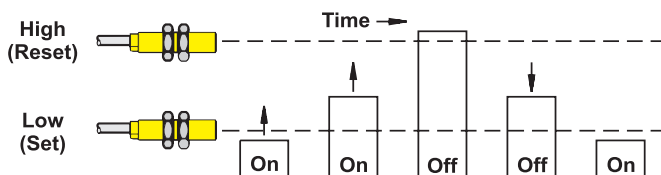


Sequence Control for Pump-in “Filling” a Tank

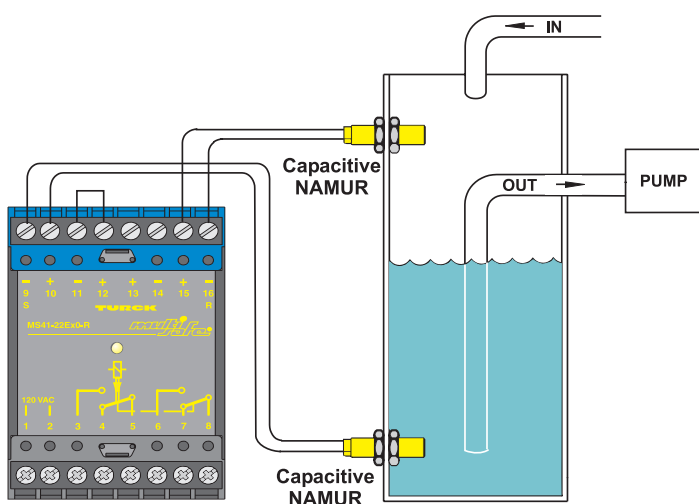


The **MS41-22Ex0-R** will start a pump or open a fill valve when the liquid drops below the low level sensor and remains on until the high level sensor is reached.

The relay then de-energizes and stays off until the low level is reached. The pump or valve does not cycle constantly as would be the case if only one sensor were used.

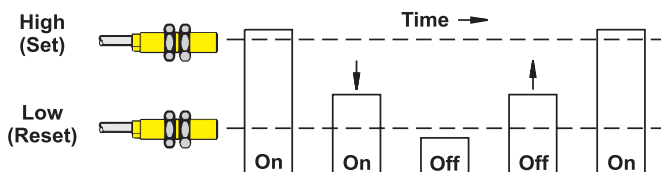


Sequence control for Pump-out “Draining” a Tank



The **MS41-22Ex0-R** will start a pump when the liquid reaches the high level sensor and remains on until the low level sensor is reached.

The relay then de-energizes and stays off until the high level is reached. The pump or valve does not cycle constantly as would be the case if only one sensor were used.



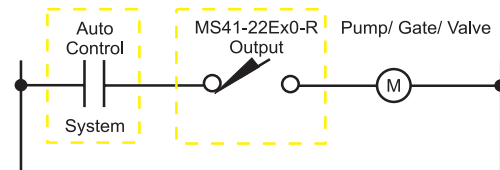
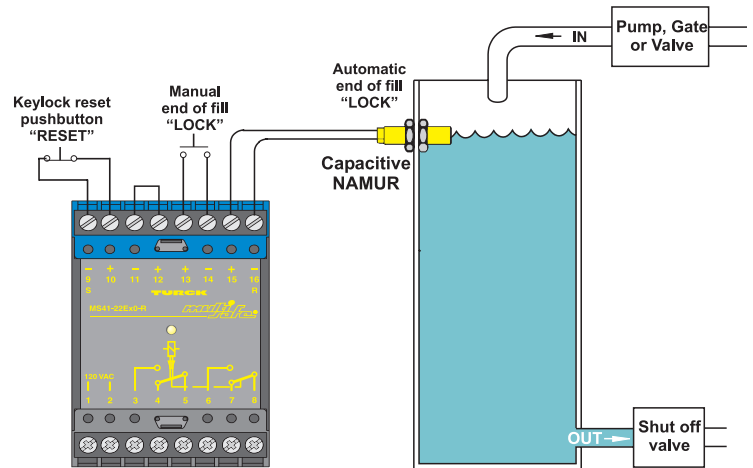
Lockout Control

The **MS41-22Ex0-R** can be used to control the filling of tanks or bins and then automatically lockout refilling. The lockout remains effective even if the power is recycled or the level in the vessel drops. The N.C. push-button contacts on terminals 9-10 must be opened when the level has dropped below the sensor to "Reset" the lockout.

The unit is also used where contamination of the product in the vessel is possible and the consequences are major.

The contamination may come from dissimilar products or even the same product where age must be considered, such as dairy products. Even with the best sensors to detect low level, product or residue is left in the vessel or outlet. Human control and inspection are needed.

TURCK has a complete line of Intrinsically Safe Capacitive NAMUR Sensors and a selection of through-the-wall sensor wells approved for food grade applications.



Trigger Control

The **MS41-22Ex0-R** can be used with two inputs to function as a trigger circuit. The ladder logic equivalent is shown.

The advantage of using the **MS41-22Ex0-R** is that it is all in one device. It replaces 2 channels of Intrinsically Safe switching amplifiers, or multiple barriers and one control relay.

The ready sensor detects a large target such as a container, a work piece carrier or clamp. The trigger sensor is looking for a leading edge or pin point index. When the trigger target is detected and the ready target is present, the output relays of the **MS41-22Ex0-R** are energized. They remain energized until the ready target moves out of range, even if the trigger is

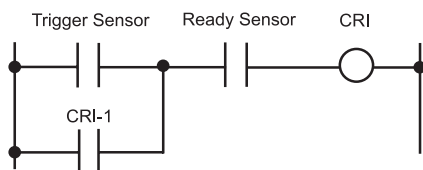


Diagram 7 Capacitive Sensors

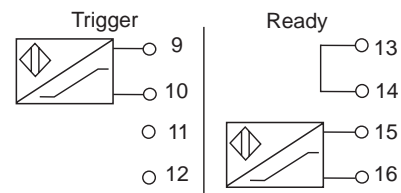


Diagram 8 Inductive Sensors

