DTS0536-4

SMART RELAYS
D5096S – D5097S
D5293S - D5294S - D5295S

SIL 3 Relay with Line & Load Diagnostics

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OUTLINE

1. What Are Smart Relays?
   a. Relays + Diagnostics
   b. Models: D5096S, D5097S, D5293S, D5294S and D5295S

2. Why Choosing Smart Relays?

3. Real-World Applications
   a. Normally-Energized solenoid valves
   b. Strobes/beacons for Fire & Gas applications
   c. Dual tone sounders for Fire & Gas applications
   d. High-availability double-coil solenoid valves
   e. Single-phase load interruption solenoid valves

4. Conclusions

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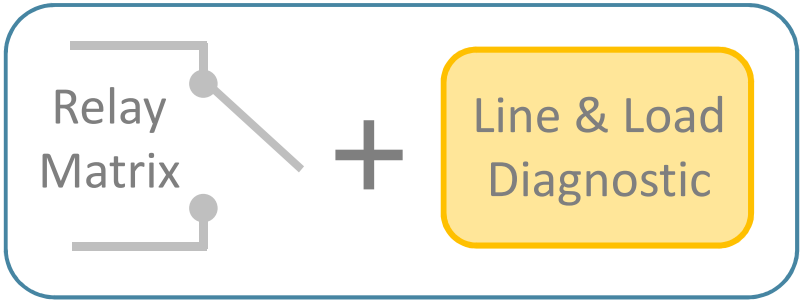
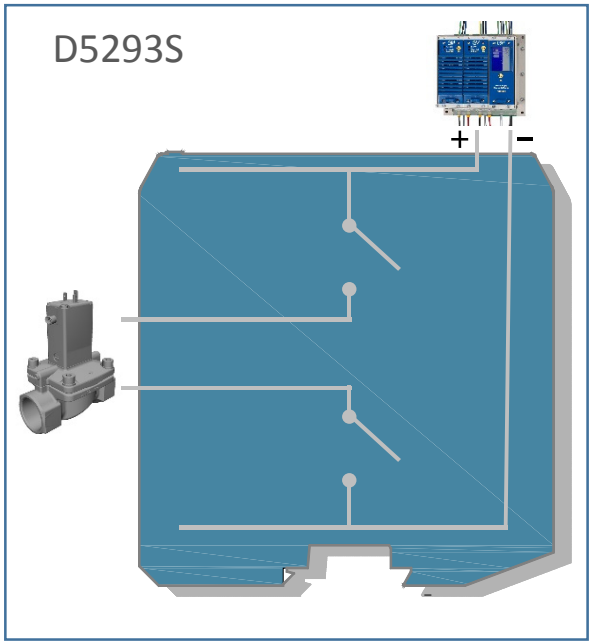
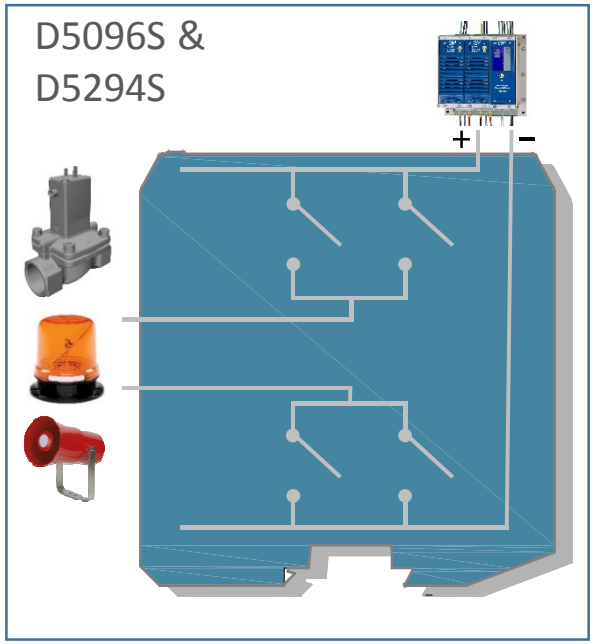
WHAT ARE SMART RELAYS?

Basic concept

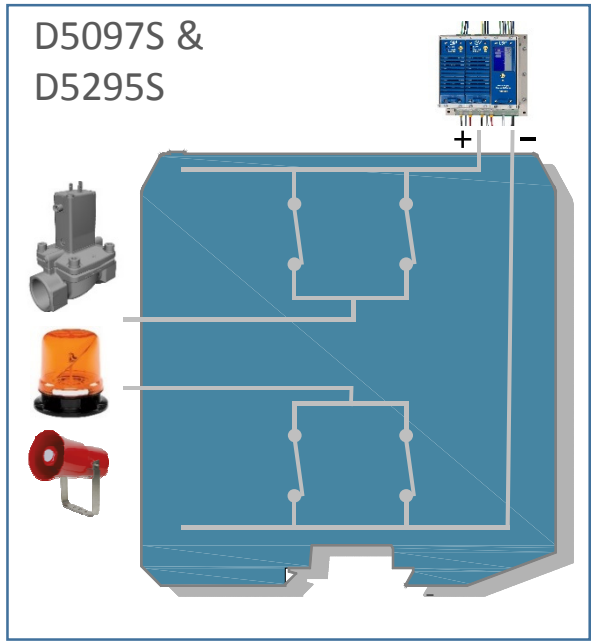




2 NO Contacts in series



2 x 2 NO Contacts



2 x 2 NC Contacts

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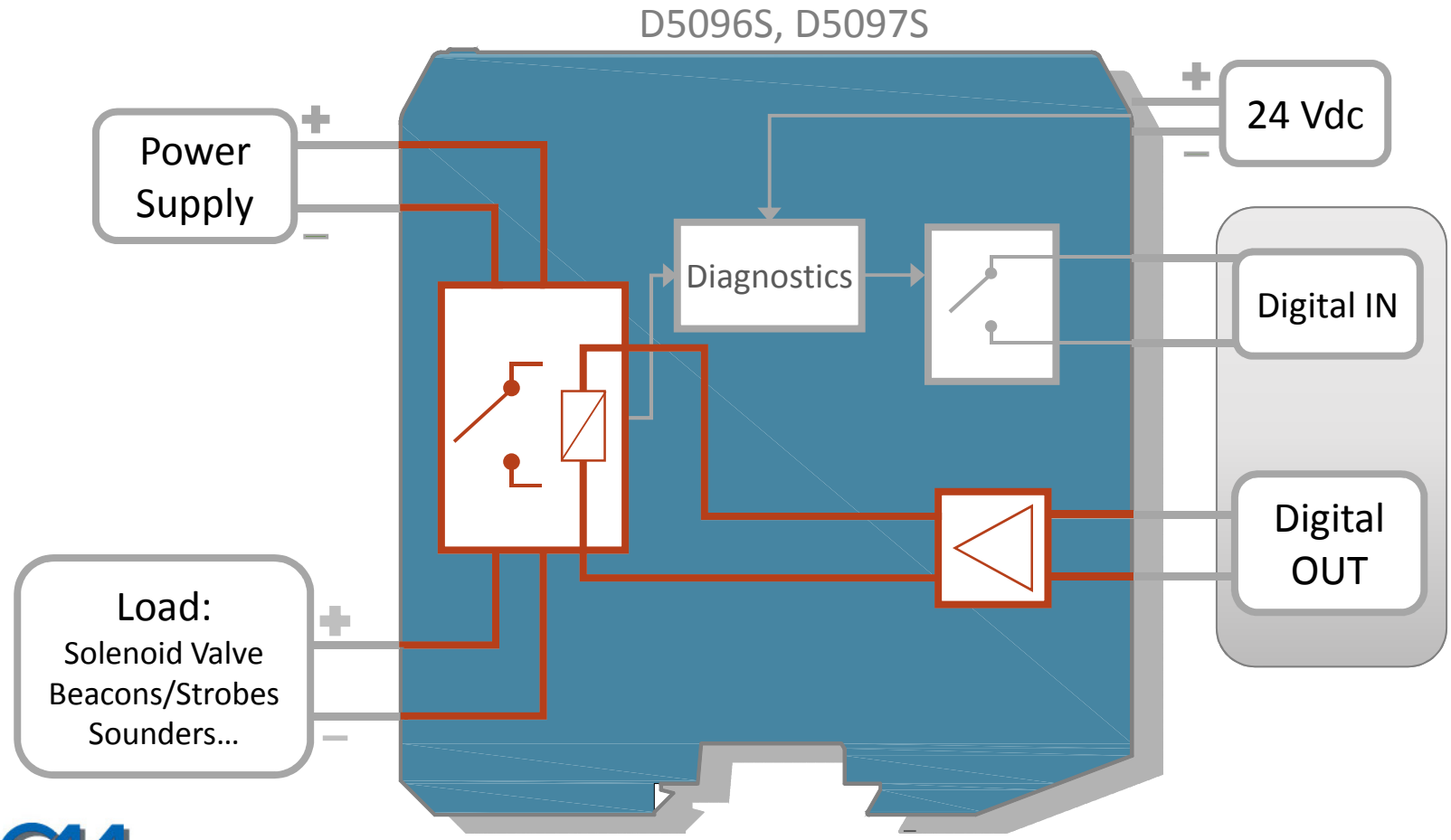
WHAT ARE SMART RELAYS?

- Coil-to-contacts function **(SIL 3)**
- Diagnostics functions
- Alarm: fault relay
- Contact rating: 5 A – 250 Vac
- Zone 2 Installation



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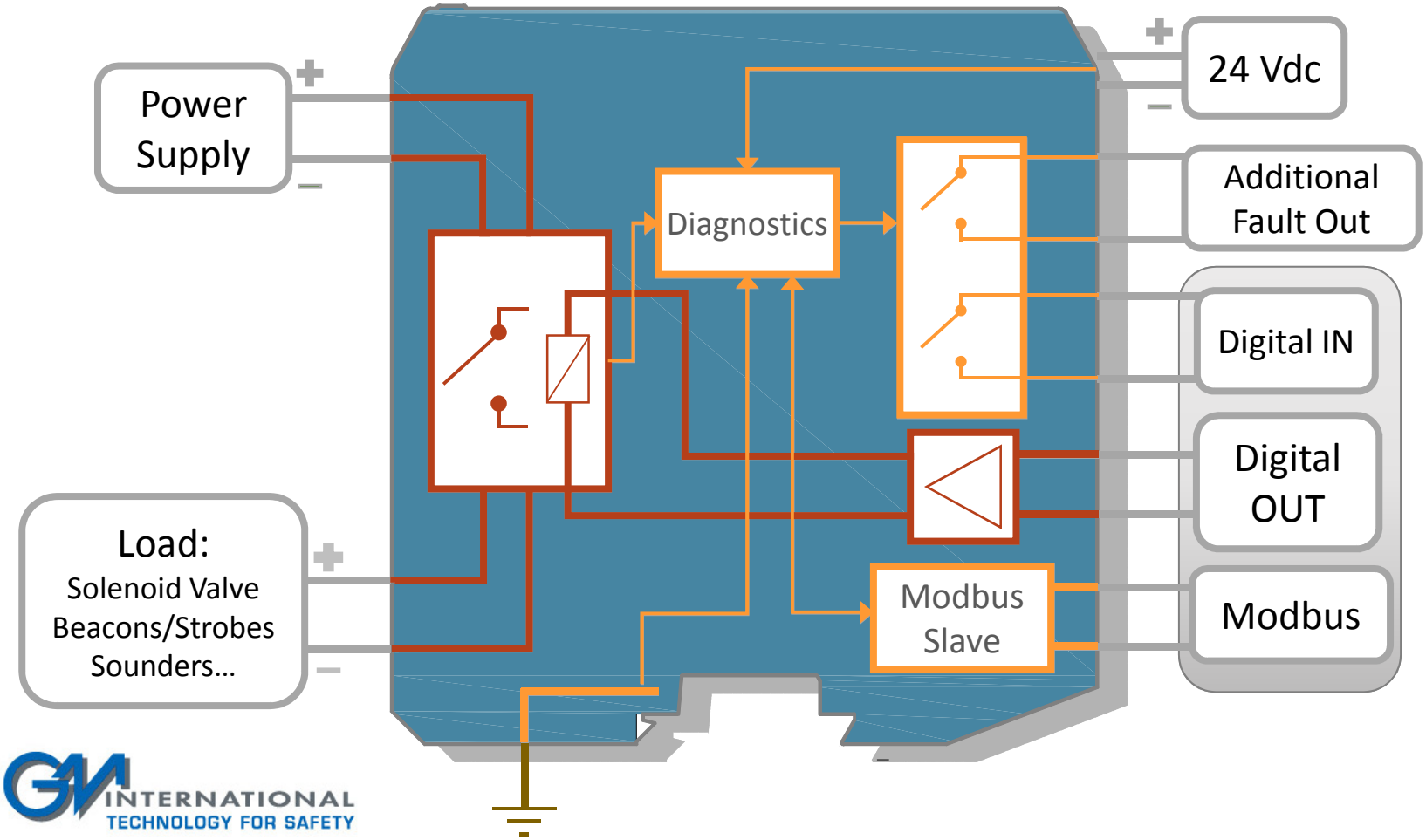
WHAT ARE SMART RELAYS?

- Coil-to-contacts function **(SIL 3)**
- Diagnostics functions **(SIL 2)**
- Alarm: fault relays, modbus
- Contact rating: 4 A – 250 Vac
- Zone 2 / Div. 2 Installation

D5293S, D5294S, D5295S



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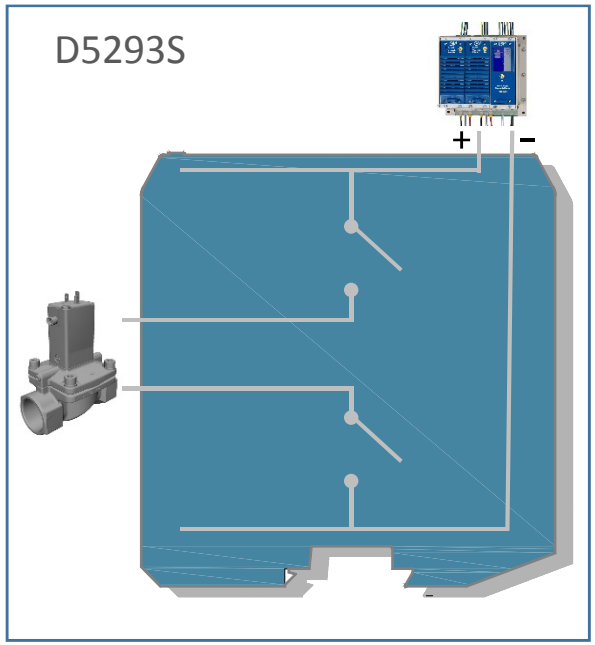
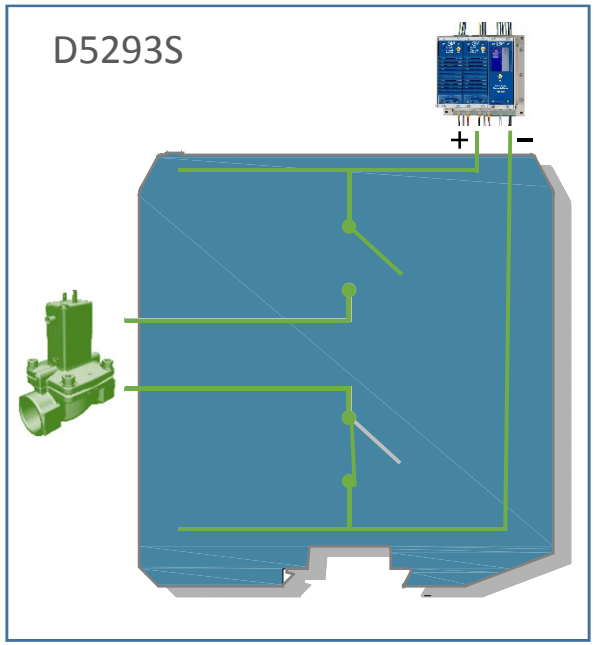
WHAT ARE SMART RELAYS?

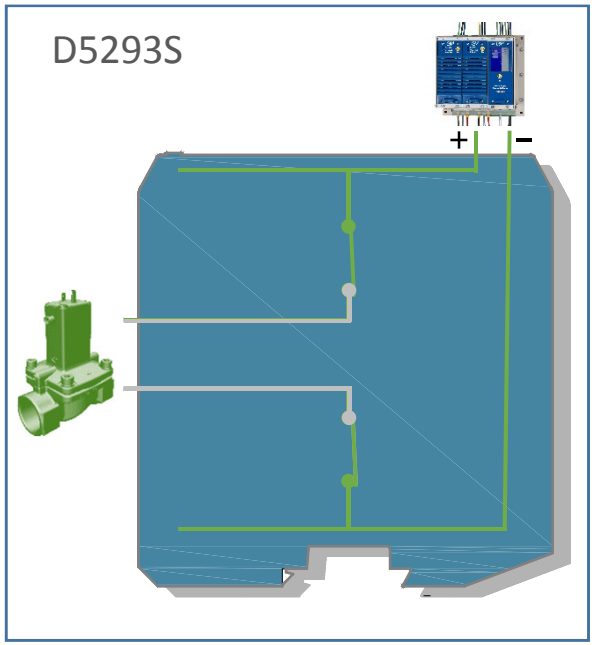
D5293S – SIL 3 for Normally Energized (NE) Loads



Off-line condition



Normal condition (NE)



Safe state condition

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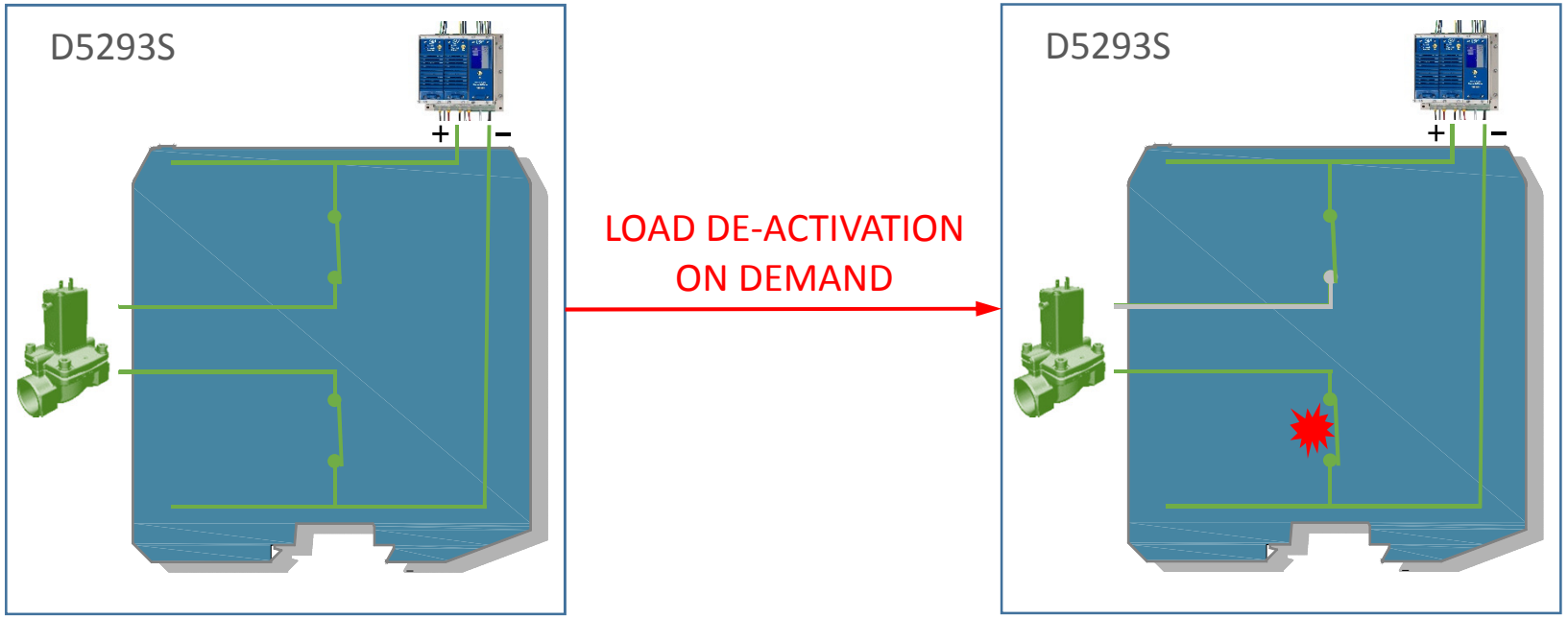

Normal condition (NE)

Safe state condition

1 relay fault
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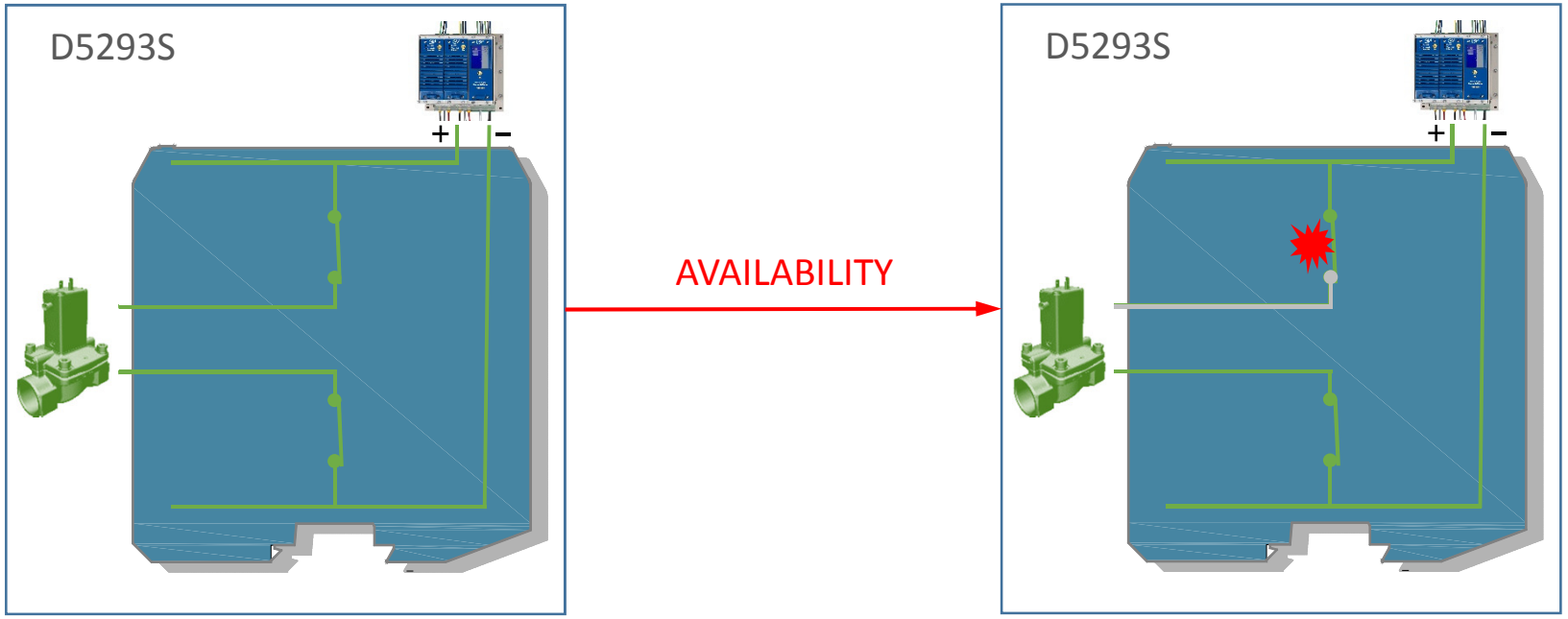

Normal condition (NE)

False trip condition

Low availability

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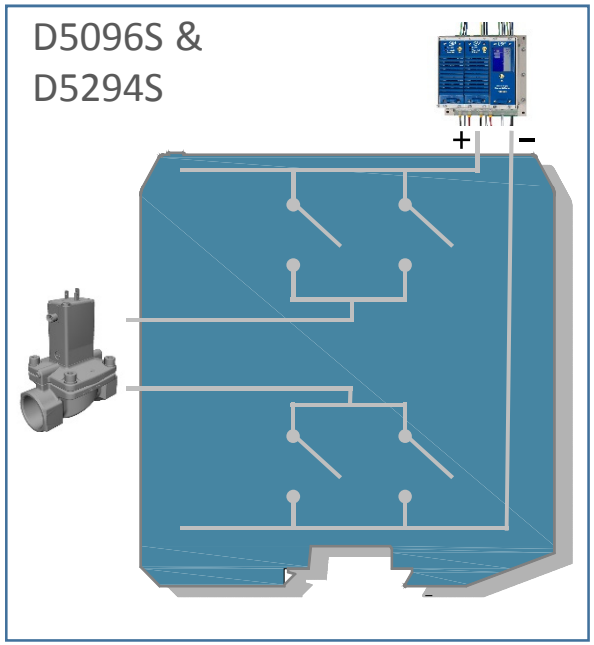
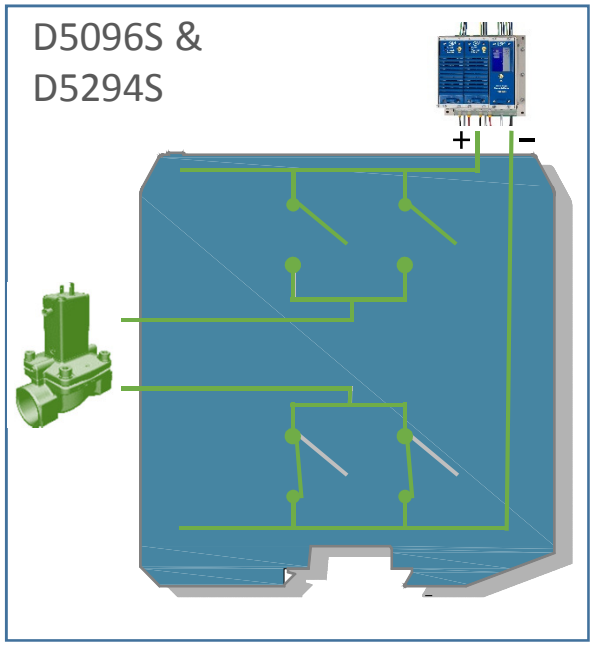
WHAT ARE SMART RELAYS?

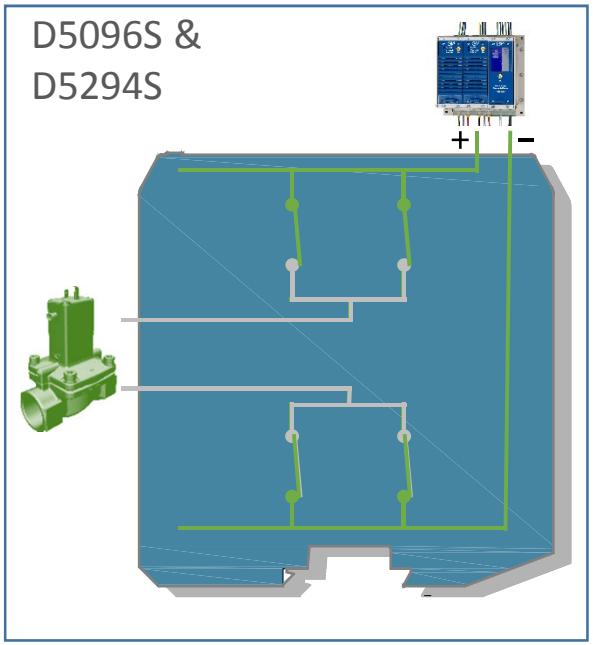
D5096S & D5294S – SIL 3 for Normally Energized (NE) Loads



Off-line condition



Normal condition (NE)



Safe state condition

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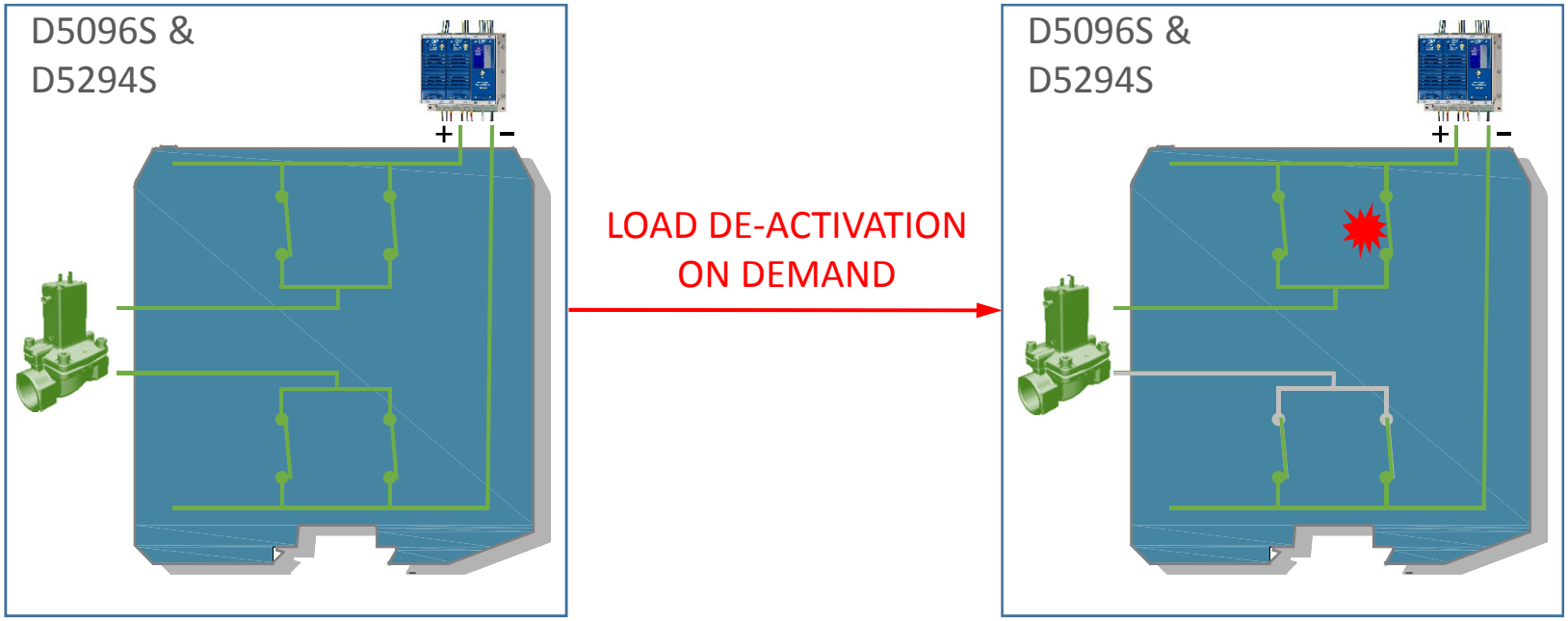

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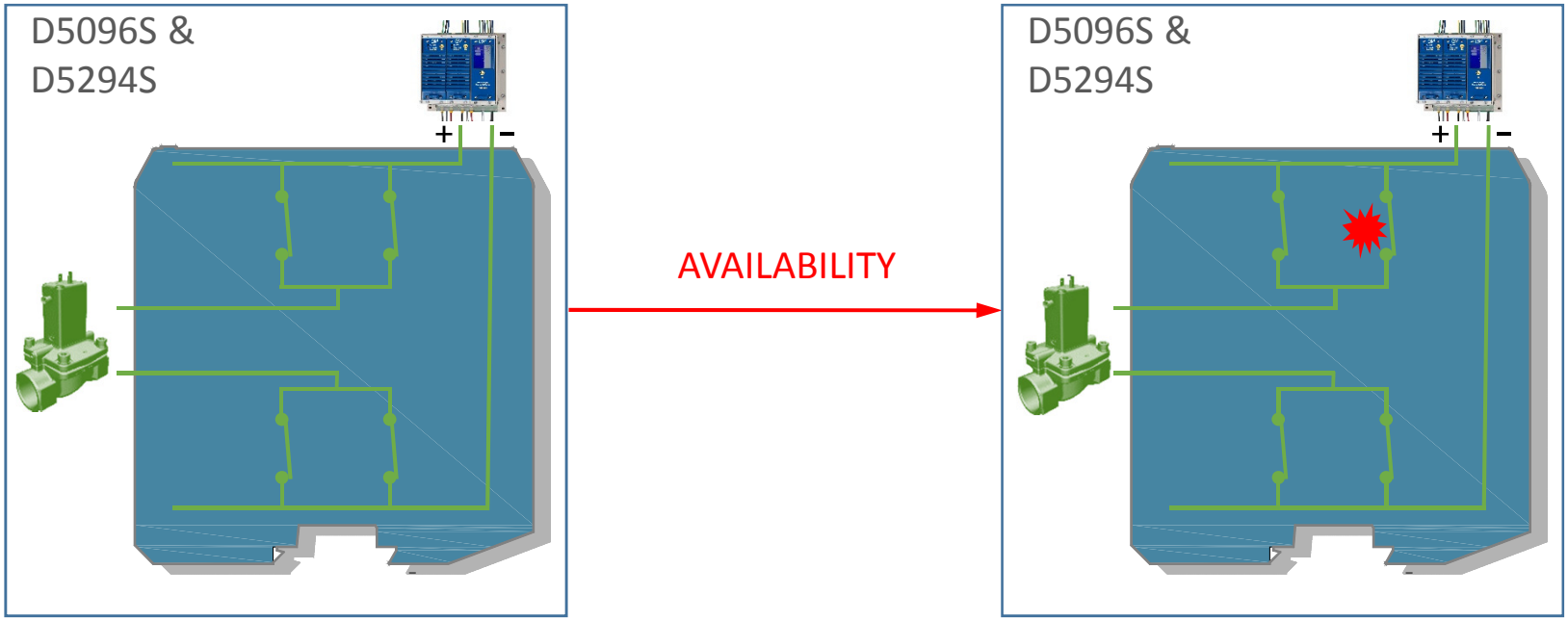


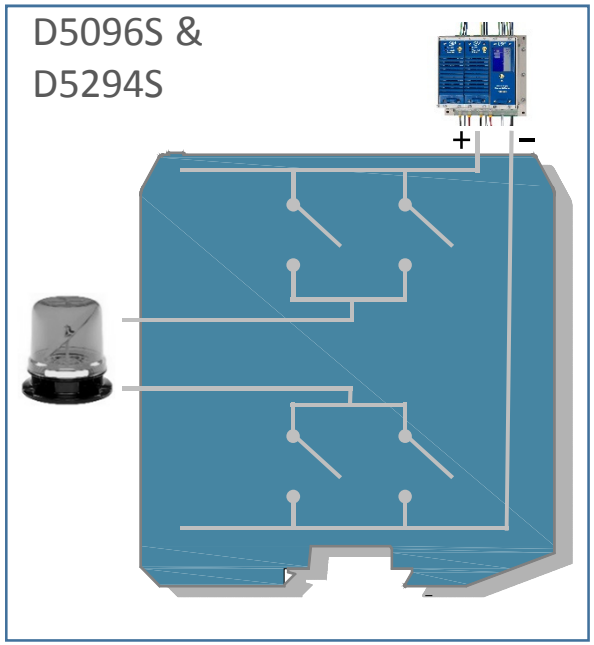
Normal condition (NE)

False trip condition

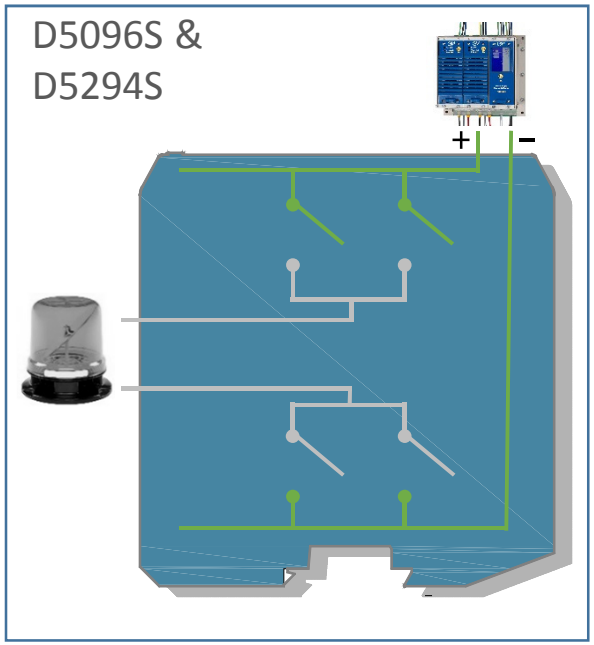
High availability

WHAT ARE SMART RELAYS?

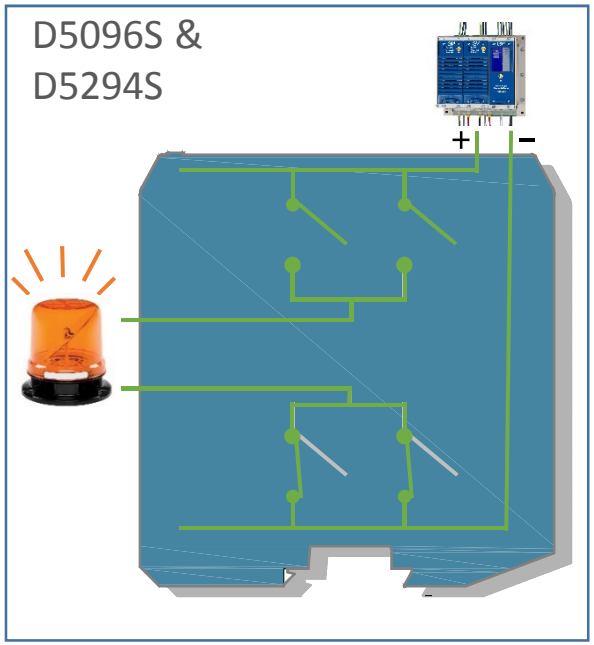
D5096S & D5294S – SIL 3 for Fire & Gas (F&G) / Normally De-Energized (ND) Loads



Off-line condition



Normal condition (ND)



Safe state condition

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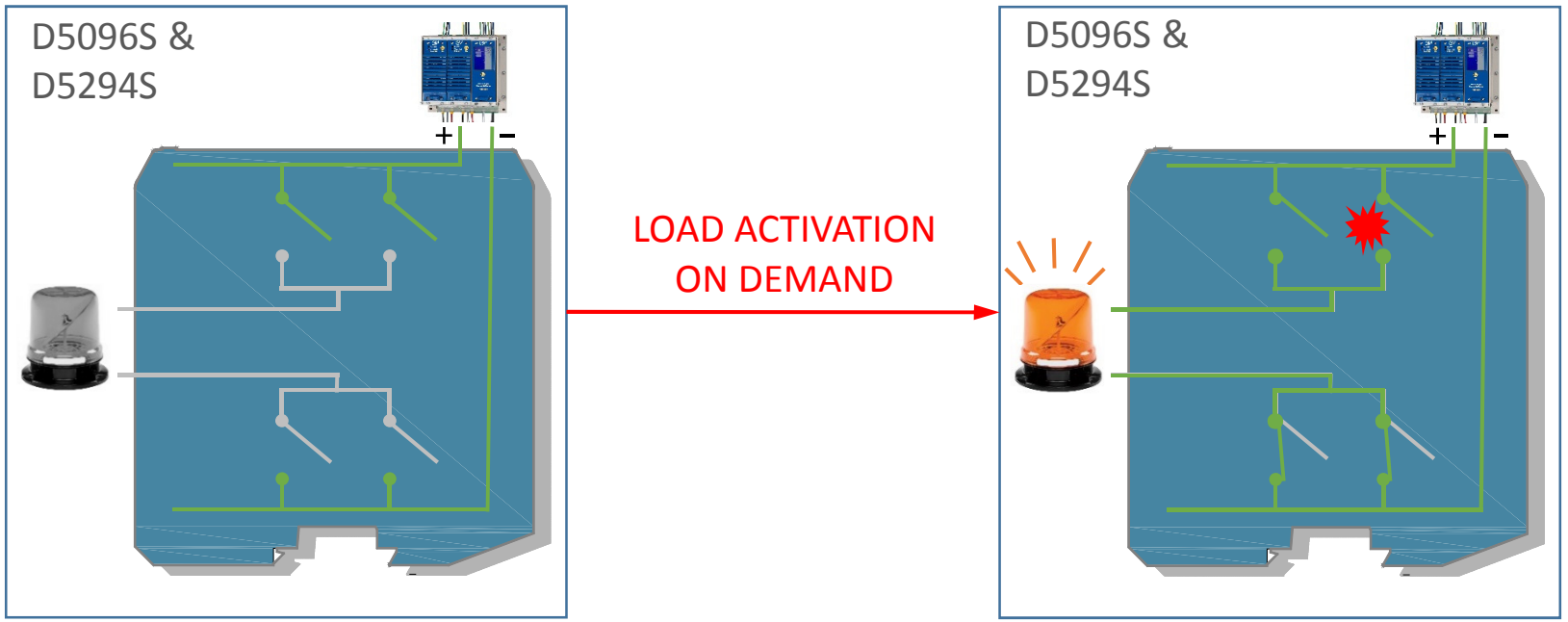

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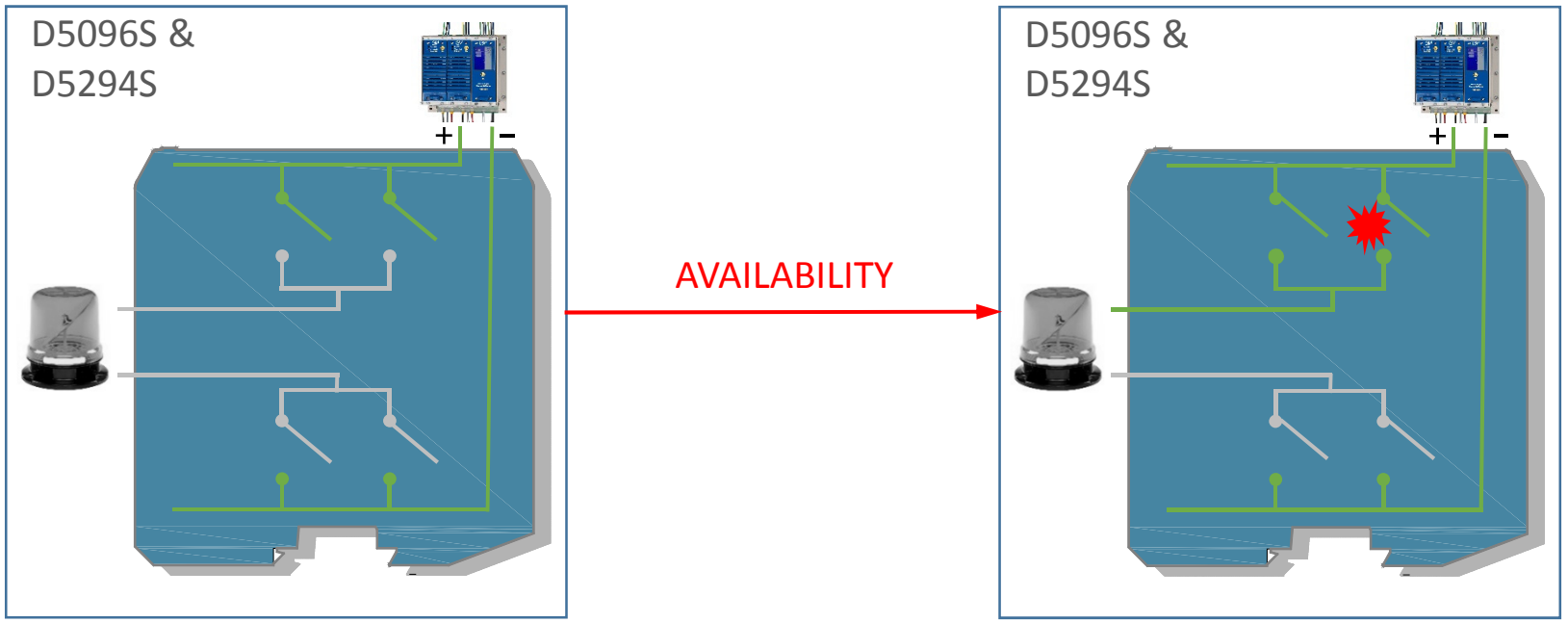

Normal condition (ND)

False trip condition

High availability

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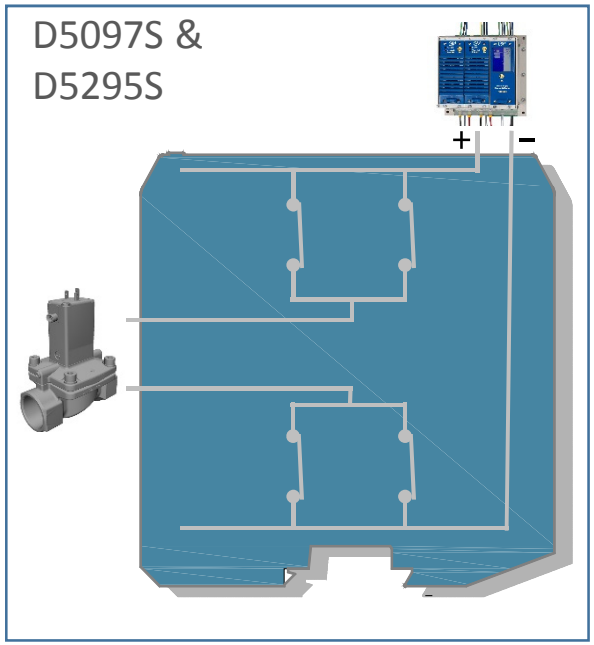

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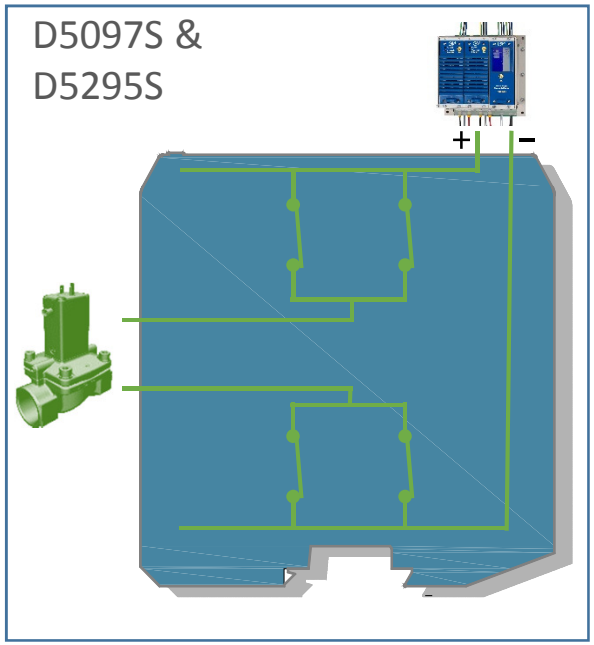

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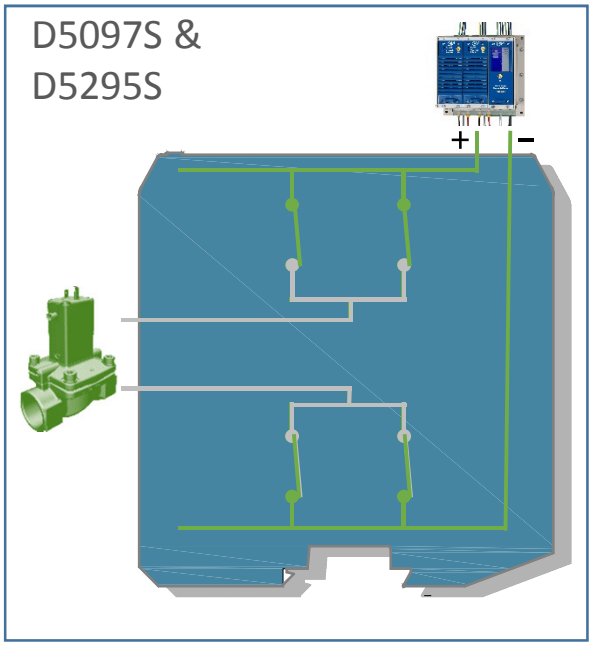

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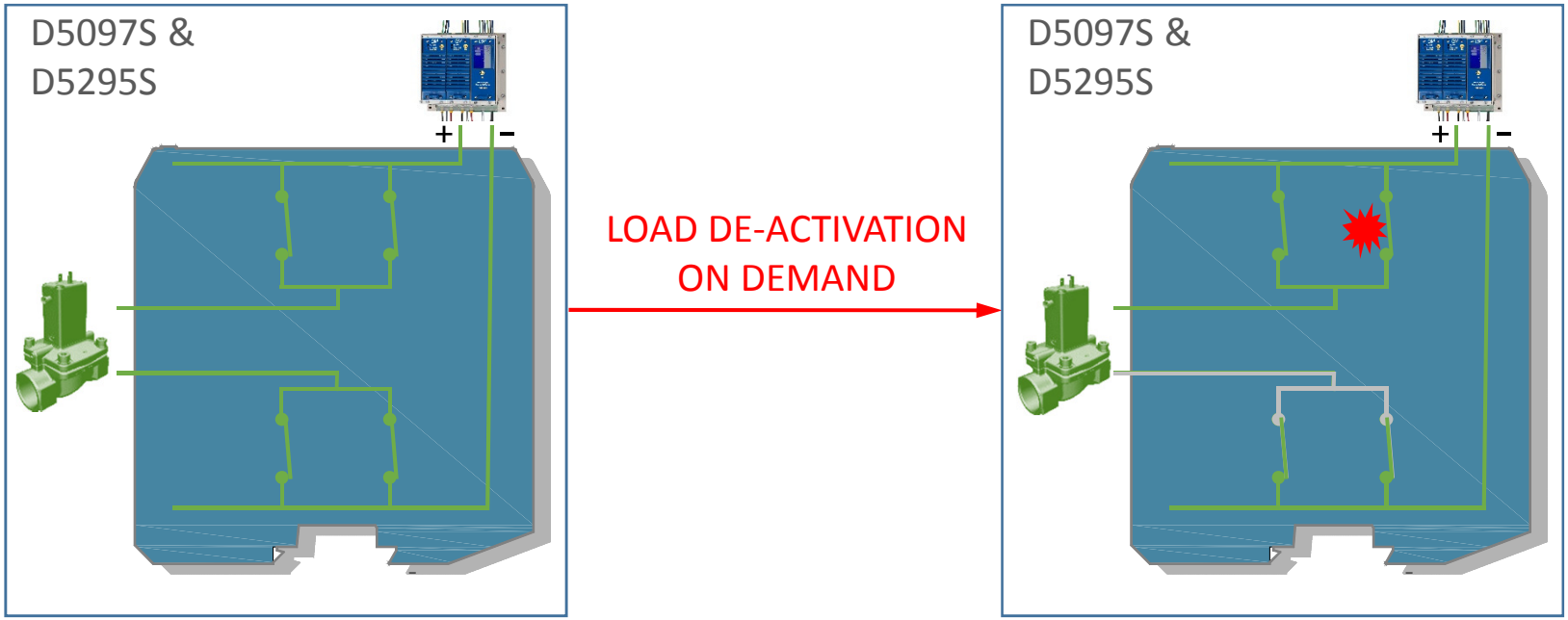

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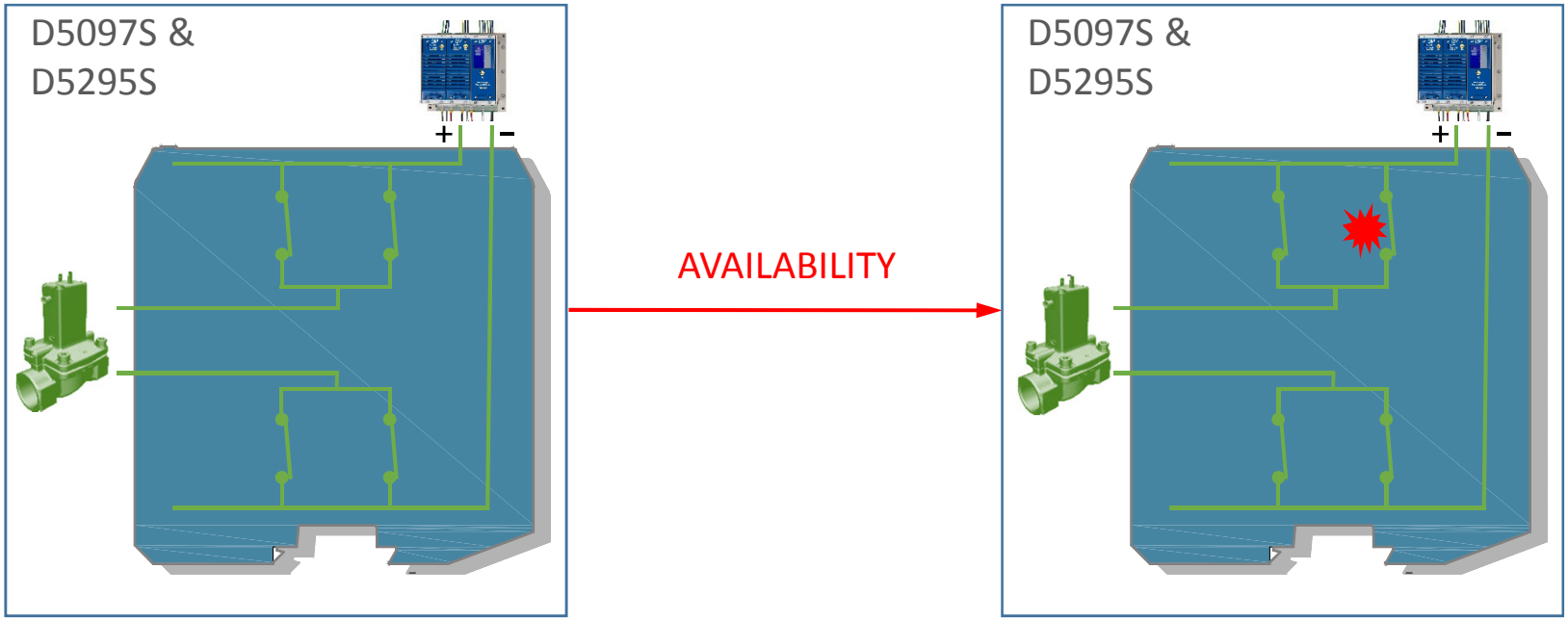

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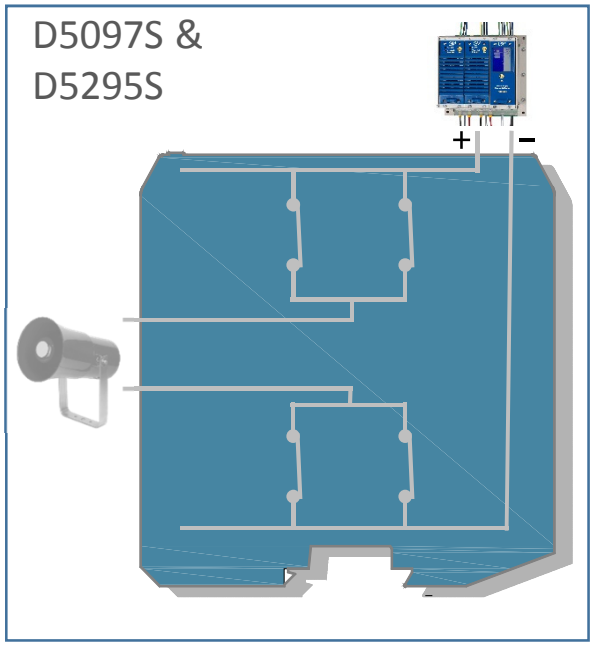

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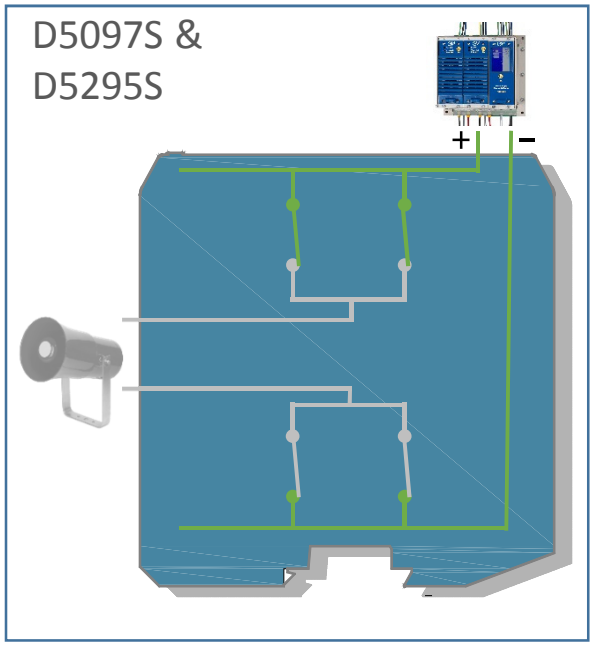

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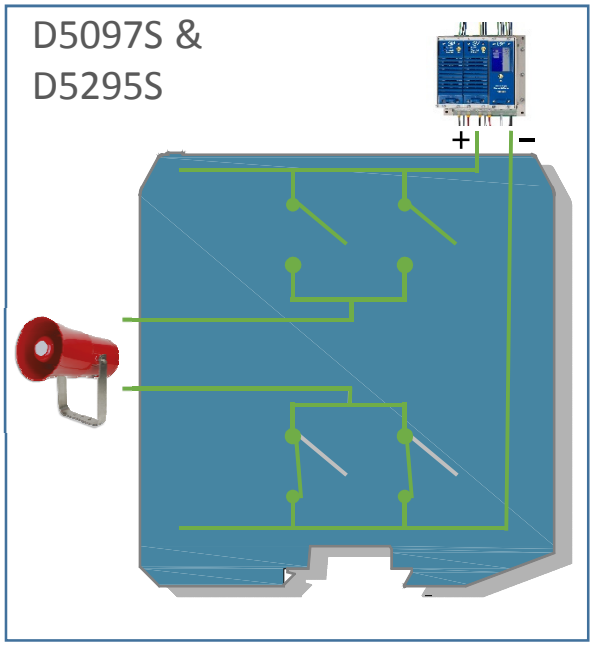

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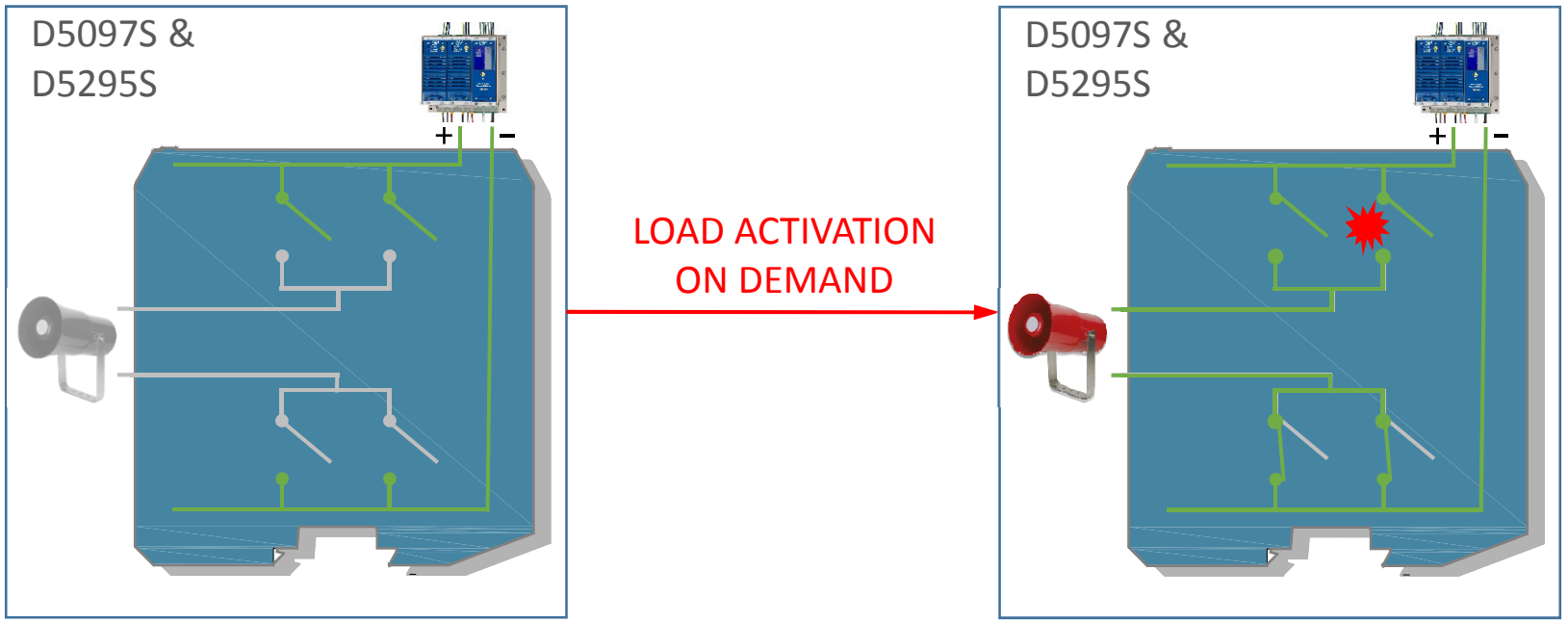

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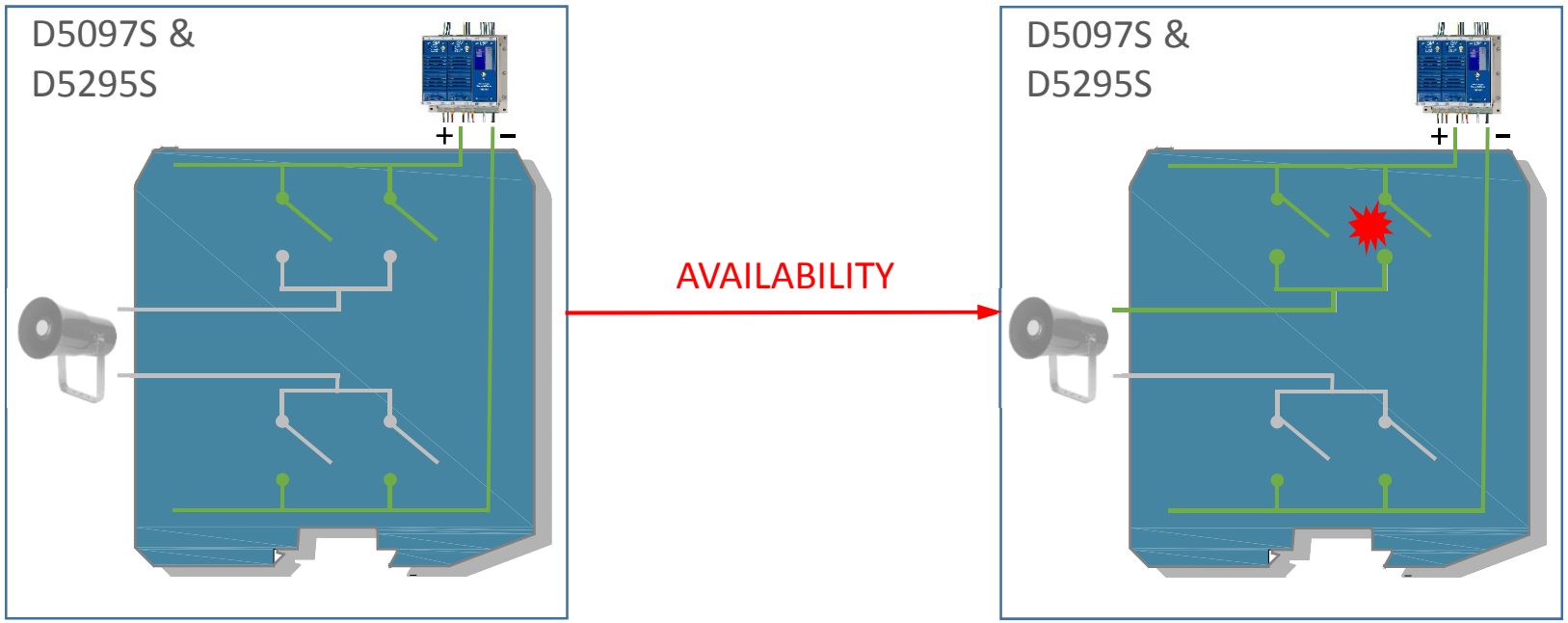

Normal condition (ND)

False trip condition

High availability

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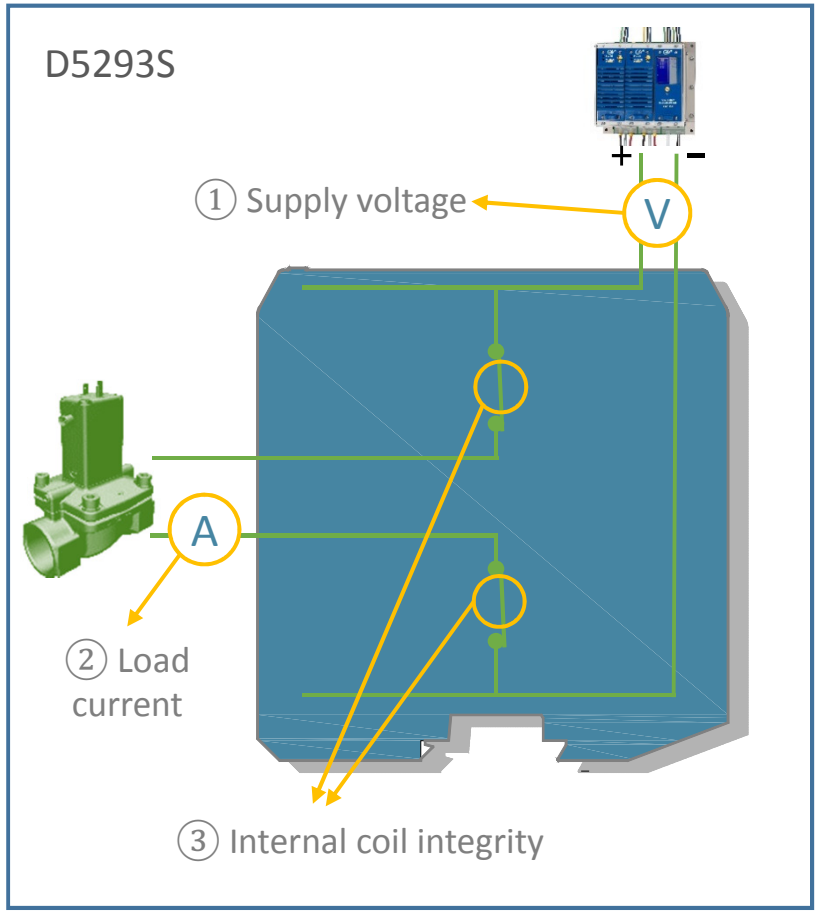
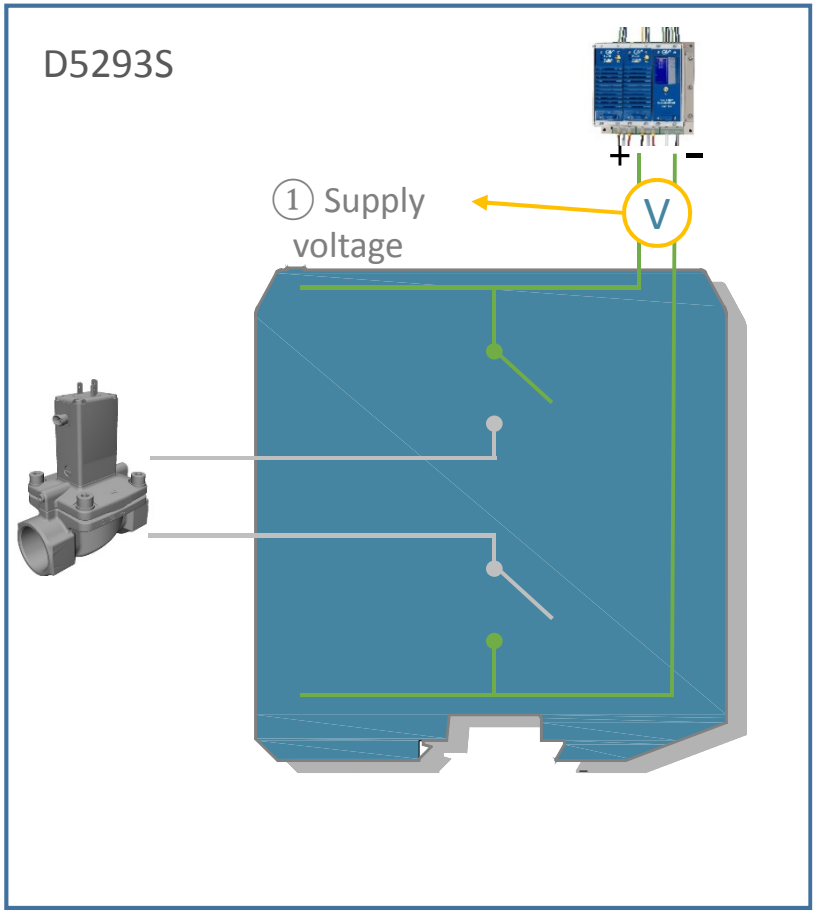
WHAT ARE SMART RELAYS?

Diagnostics



Load ON



Load OFF

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WHAT ARE SMART RELAYS?

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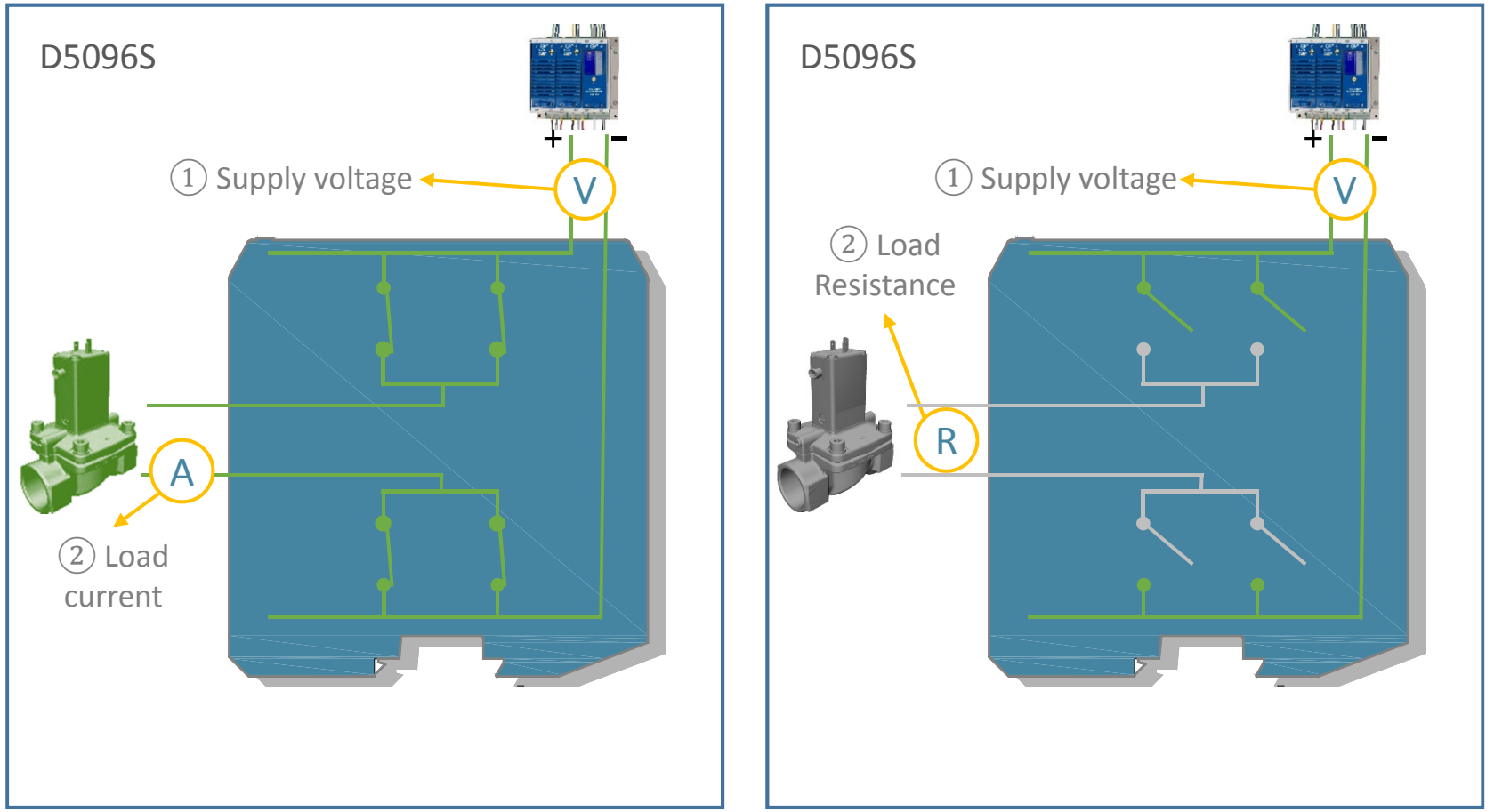

Load ON

Load OFF

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WHAT ARE SMART RELAYS?

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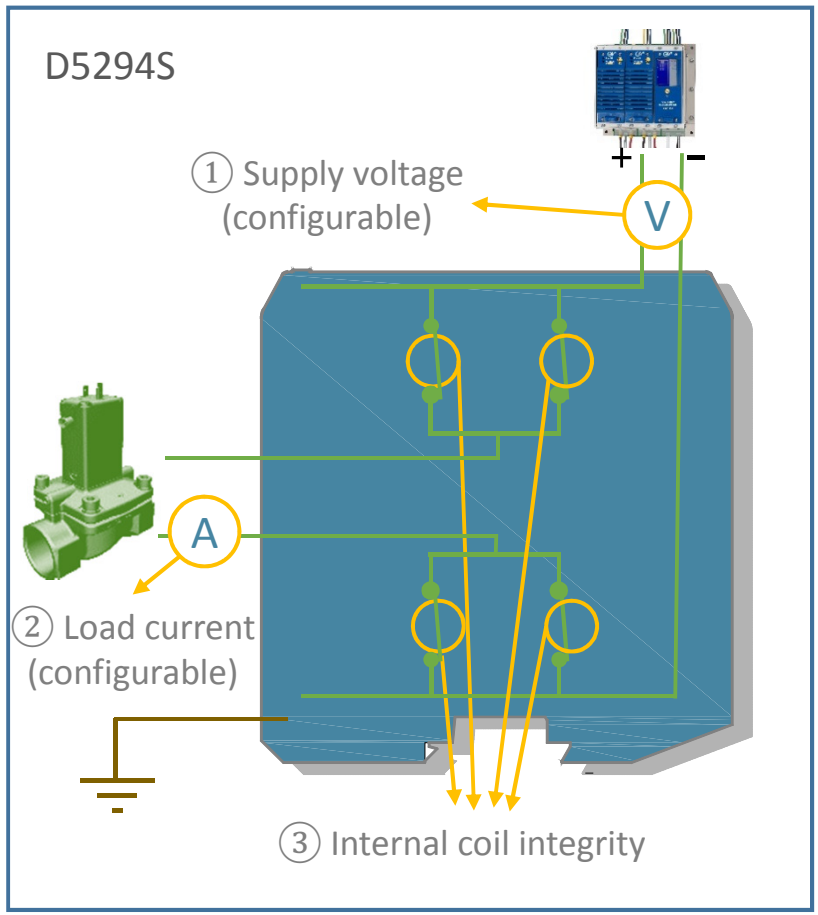

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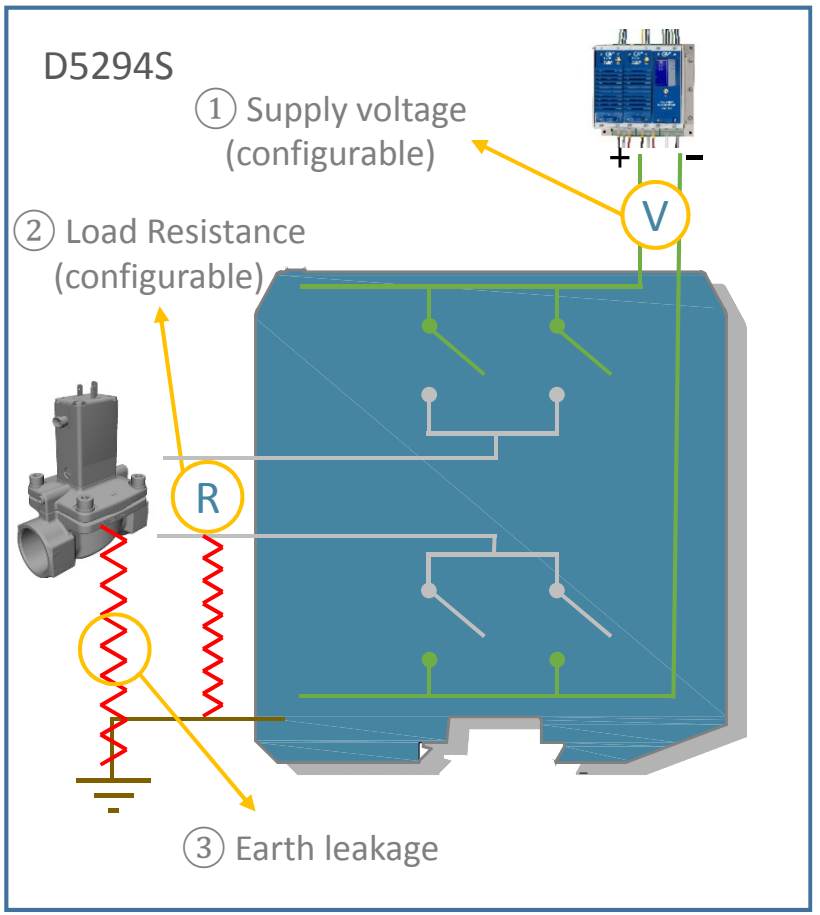

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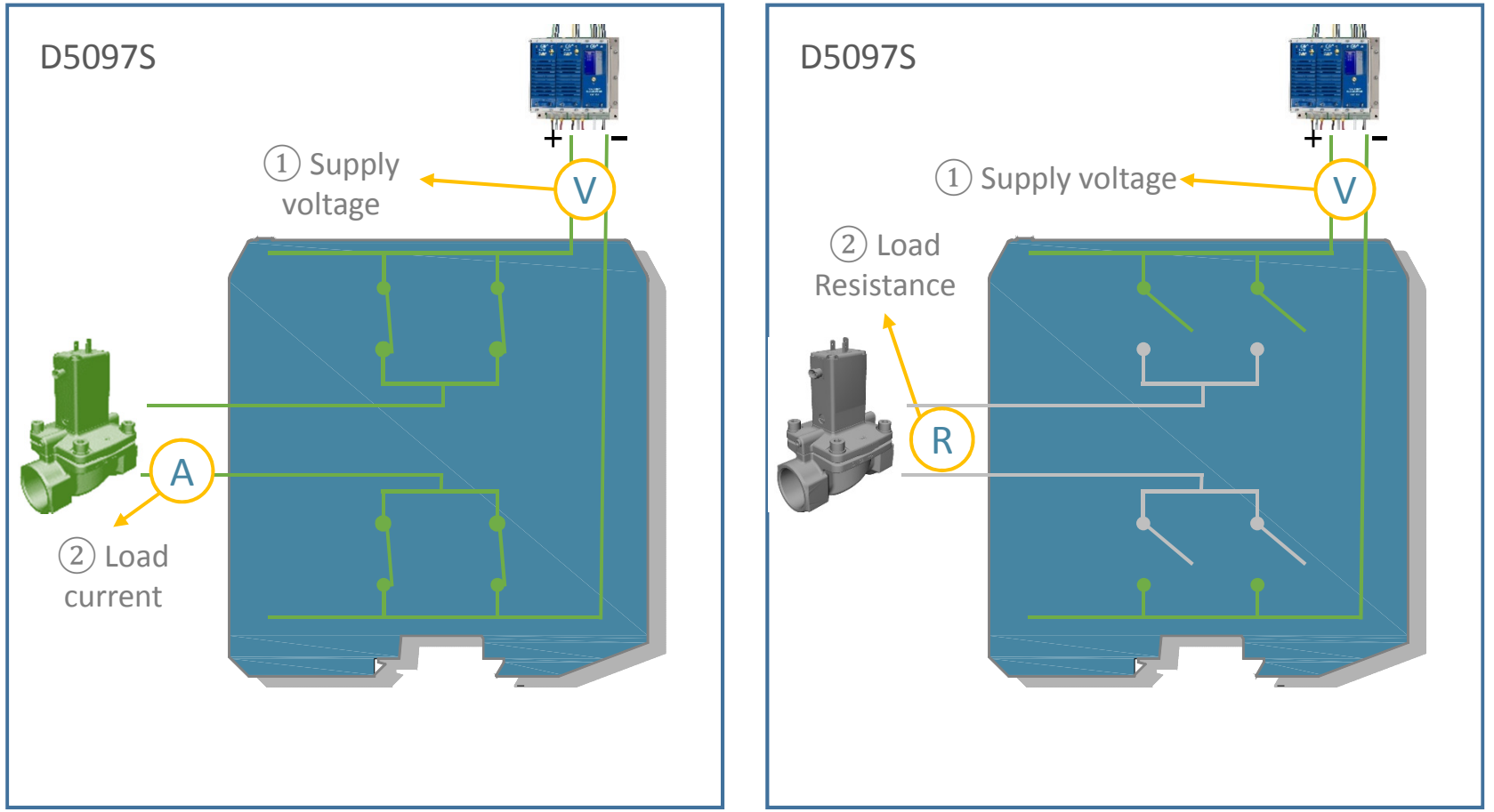

Load ON

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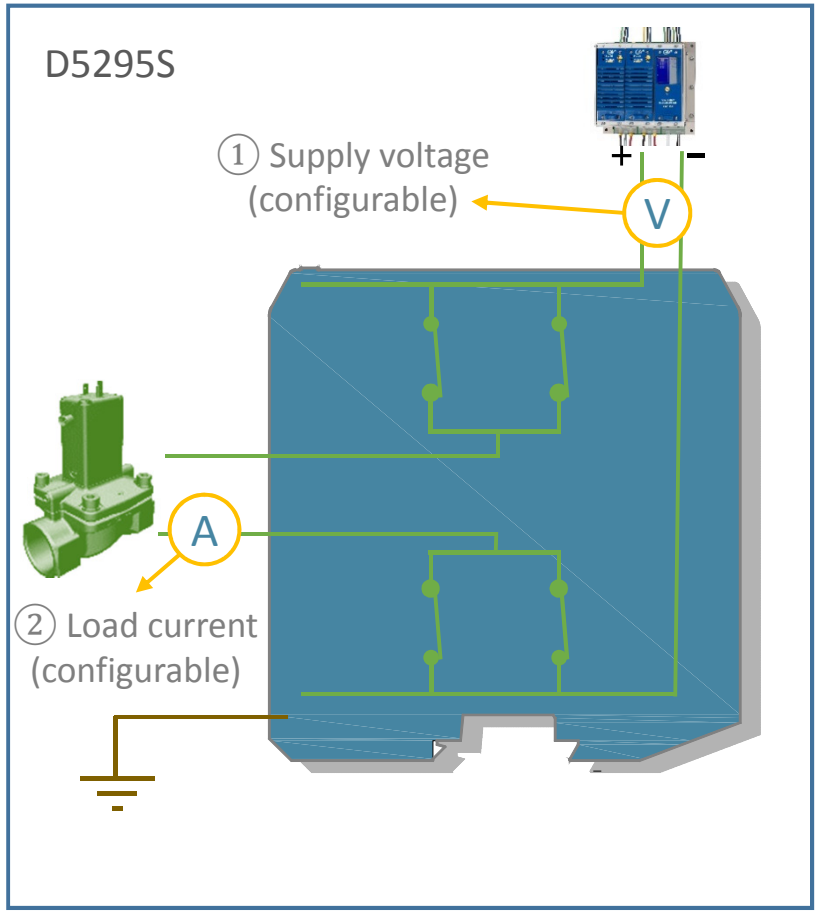

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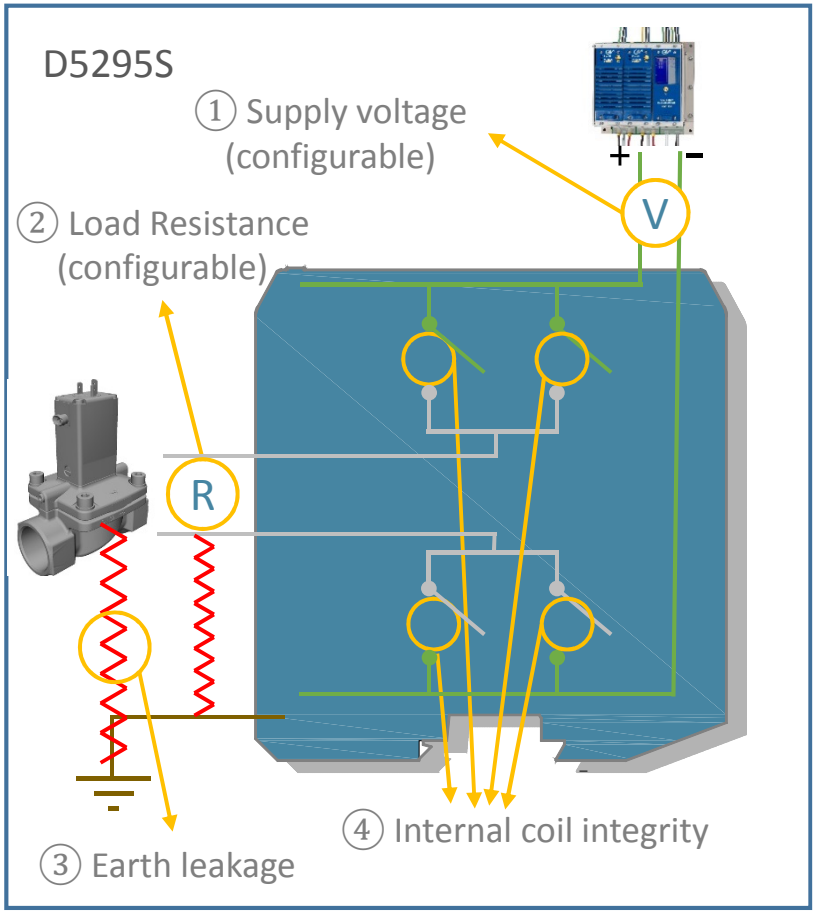

Load OFF

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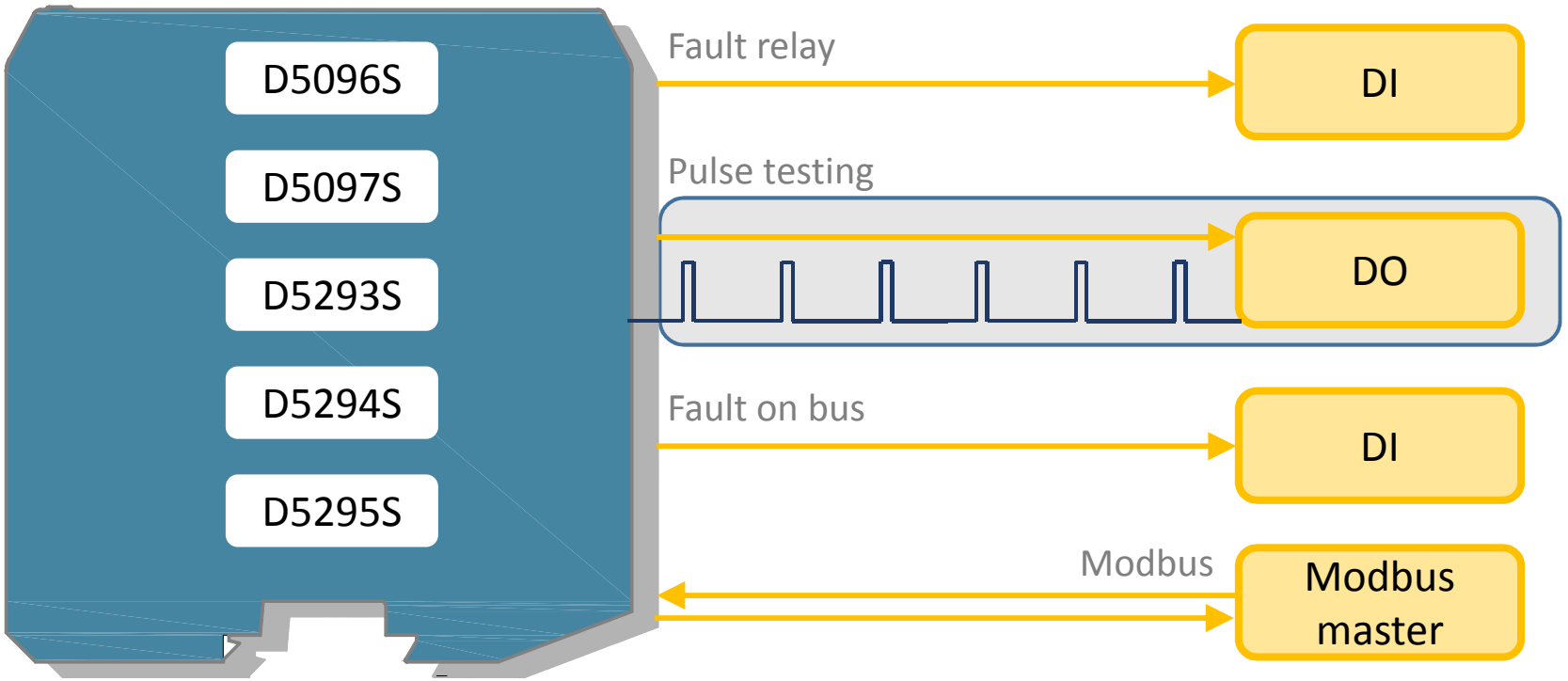
WHAT ARE SMART RELAYS?

Smart relay to System communication



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4. Conclusions

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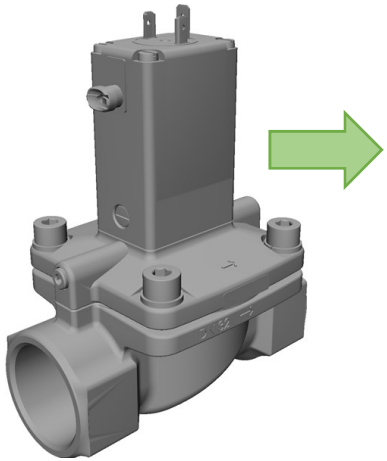
WHY CHOOSING SMART RELAYS?

1. Old systems DO do not support load diagnostics

Command /Power

Diagnostics



X

Solenoid Valve

System

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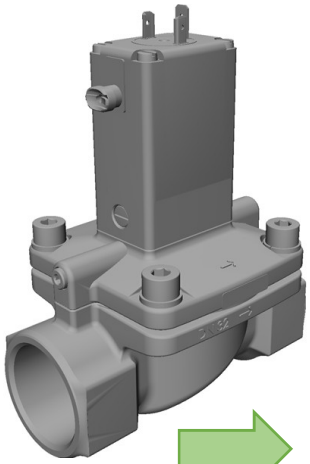
WHY CHOOSING SMART RELAYS?

1. Smart Relays make diagnostics available to the system

Command /Power

Diagnostics

Supply



Solenoid Valve

D5096S, D5097S,
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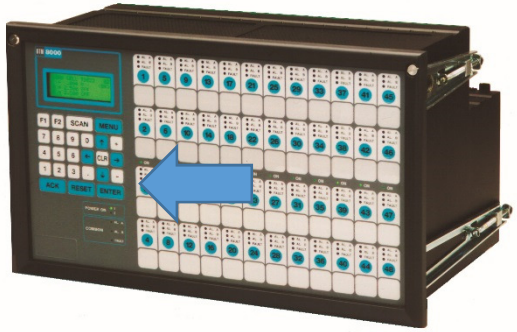

System

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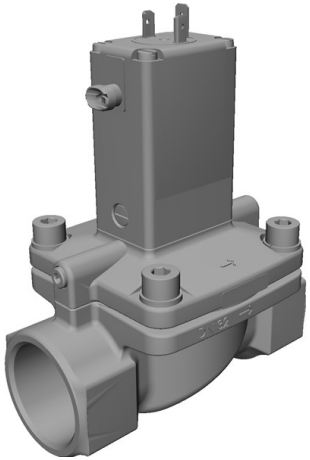
WHY CHOOSING SMART RELAYS?

2. All systems DO are voltage/current limited

Command /Power



Solenoid Valve

X

System

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TECHNOLOGY FOR SAFETY

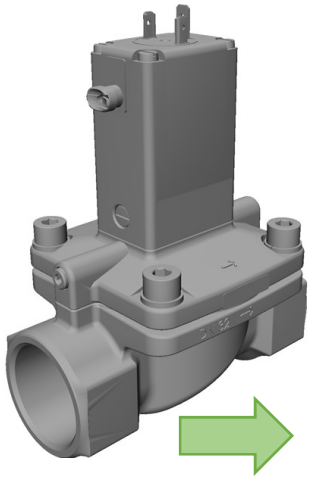
WHY CHOOSING SMART RELAYS?

2. Smart Relays extend voltage/current **with Diagnostics**

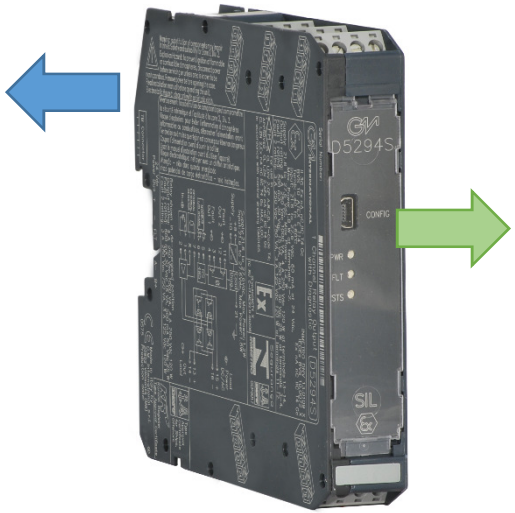
Command /Power

Diagnostics

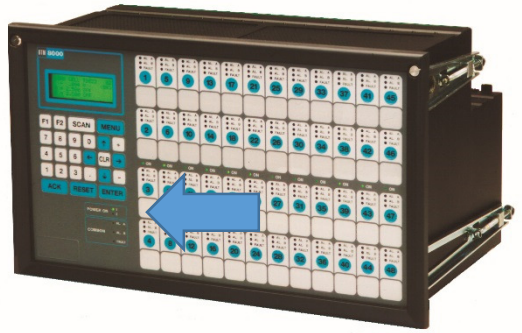
Supply



Solenoid Valve



D5096S, D5097S,
D5293S, D5294S, D5295S



System

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WHY CHOOSING SMART RELAYS?

3. DO Diagnostics limits (extreme loads, earth leakage…)

Command /Power

Diagnostics

Beacon

??

System

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WHY CHOOSING SMART RELAYS?

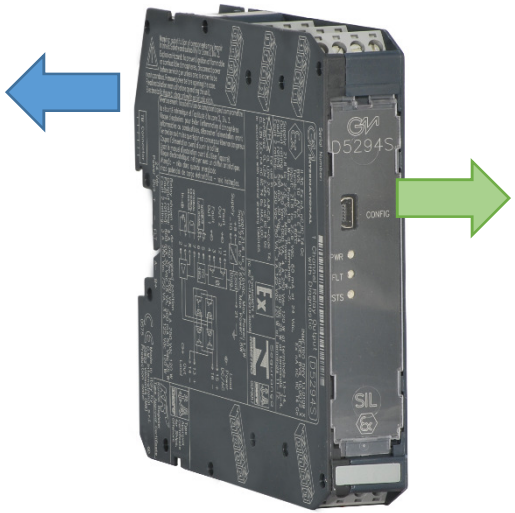
3. Smart Relays extend DO Diagnostics capabilities

Command /Power

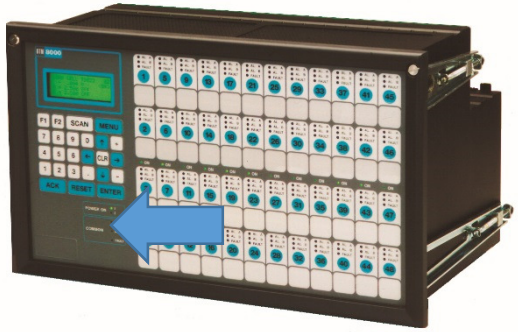
Diagnostics

Supply

Beacon



D5096S, D5097S,
D5293S, D5294S, D5295S



System

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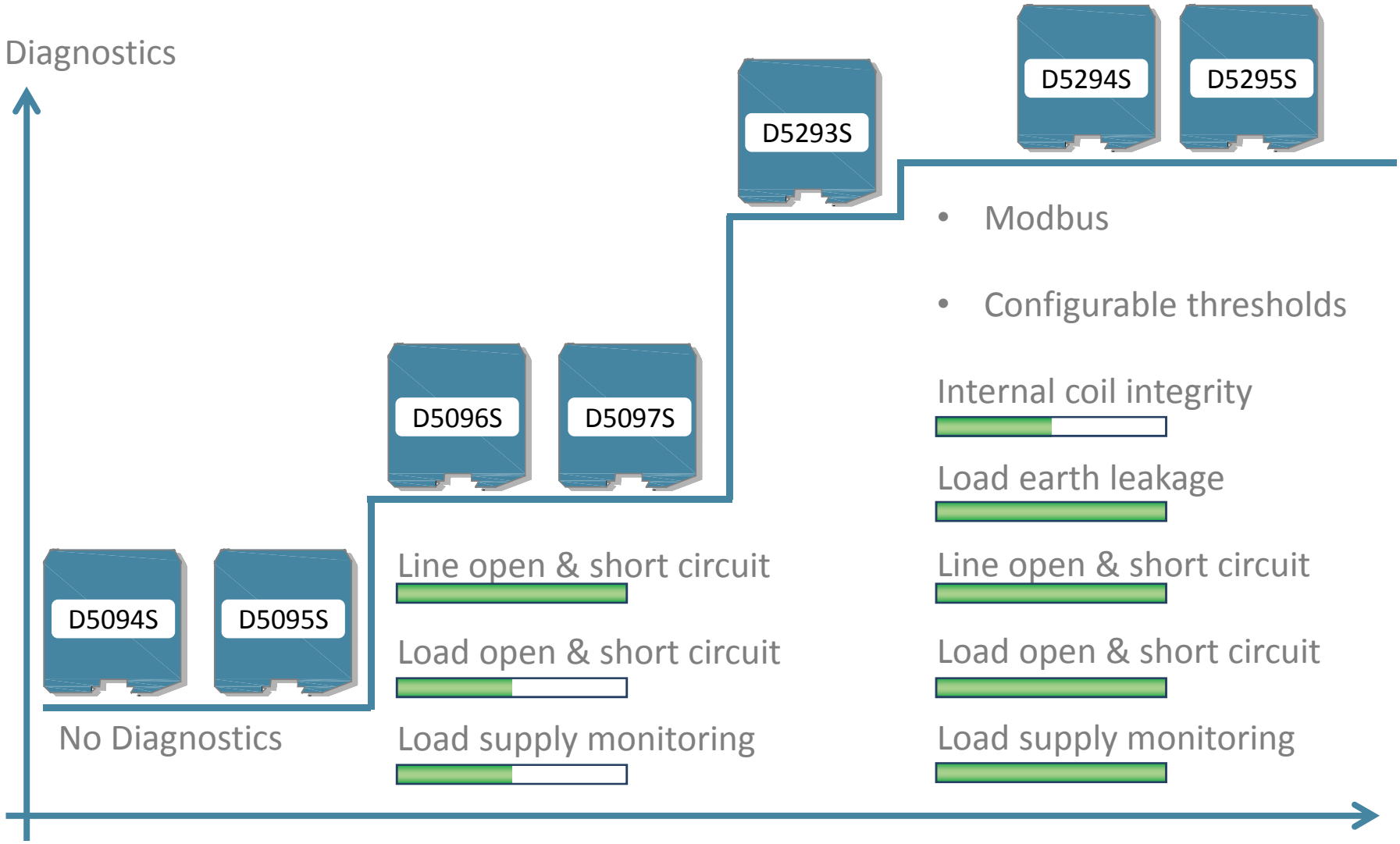
WHY CHOOSING SMART RELAYS?



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OUTLINE

1. What Are Smart Relays?
   a. Relays + Diagnostics
   b. Models: D5096S, D5097S, D5293S, D5294S and D5295S

2. Why Choosing Smart Relays?

3. Real-World Applications
   a. Normally-Energized solenoid valves
   b. Strobes/beacons for Fire & Gas applications
   c. Dual tone sounders for Fire & Gas applications
   d. High-availability double-coil solenoid valves
   e. Single-phase load interruption solenoid valves

4. Conclusions

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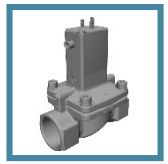
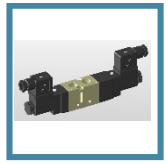
SMART RELAYS REAL WORLD APPLICATIONS



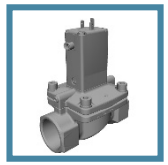
- Normally-energized **solenoid valves**

- **Strobes/beacons** for Fire & Gas applications

- **Dual - tone sounders** for Fire & Gas applications



- High-availability **double-coil solenoid valves**



- Single-phase load interruption **solenoid valves**

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NORMALLY-ENERGIZED SOLENOID VALVES

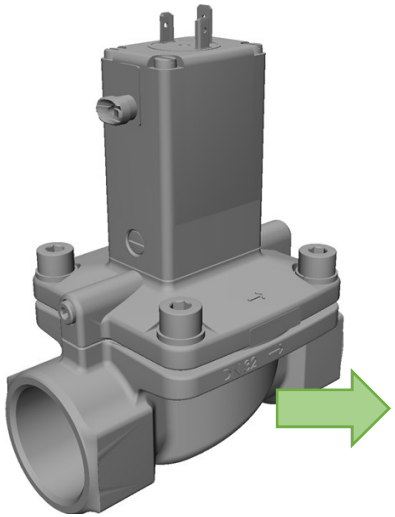
Command /Power

Diagnostics

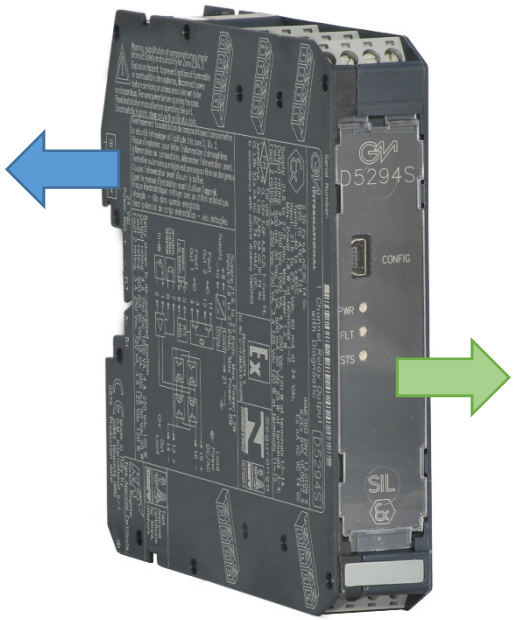
110 Vdc Supply

Project record #1

Name: *Bordolano*
System: *Emerson DeltaV SIS*
Load: *Biffi 110Vdc Solenoids*
Model: *D5294S (or D5096S)*



Solenoid Valve



D5294S
(or D5096S)

System

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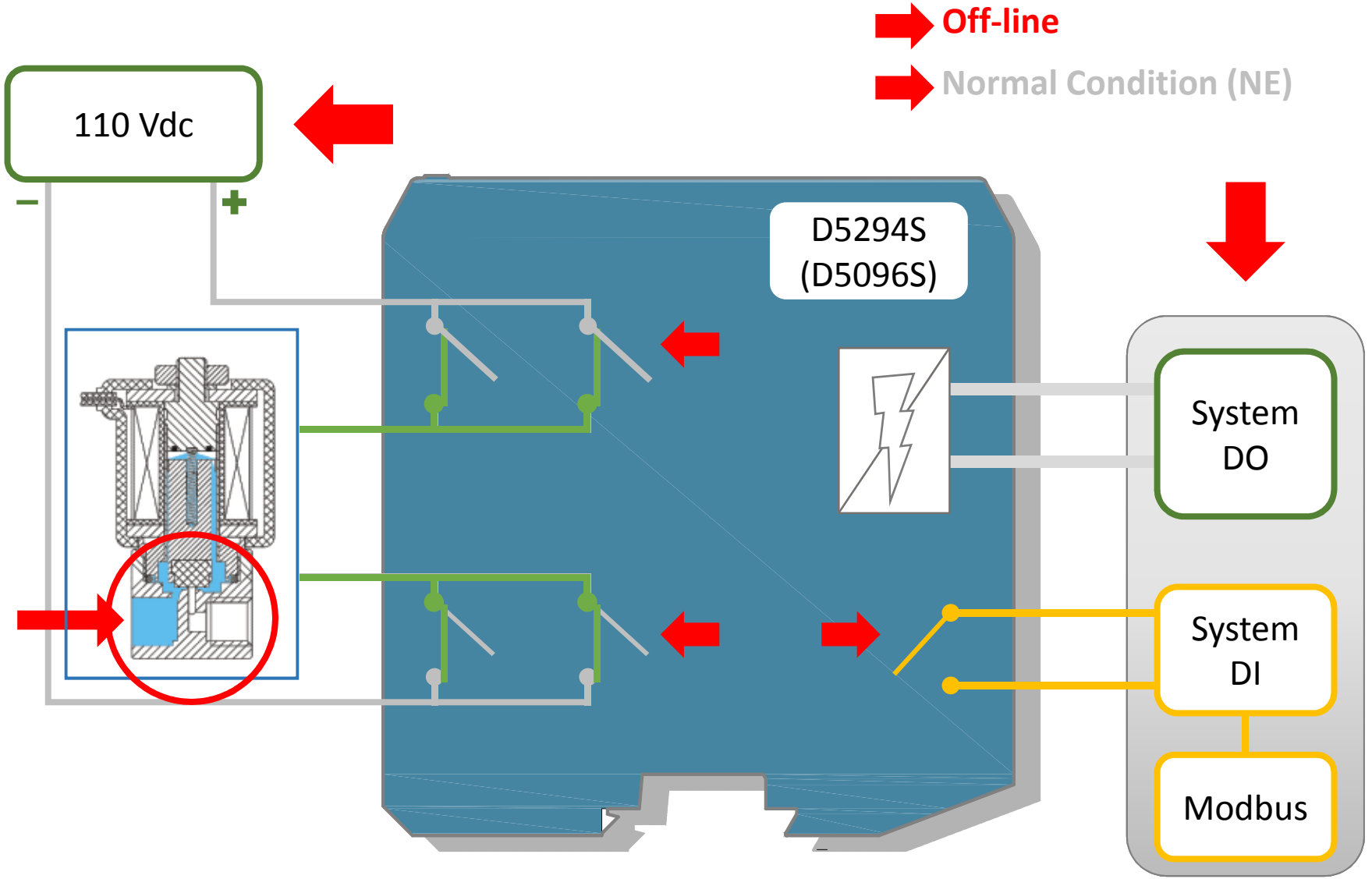
NORMALLY-ENERGIZED SOLENOID VALVES



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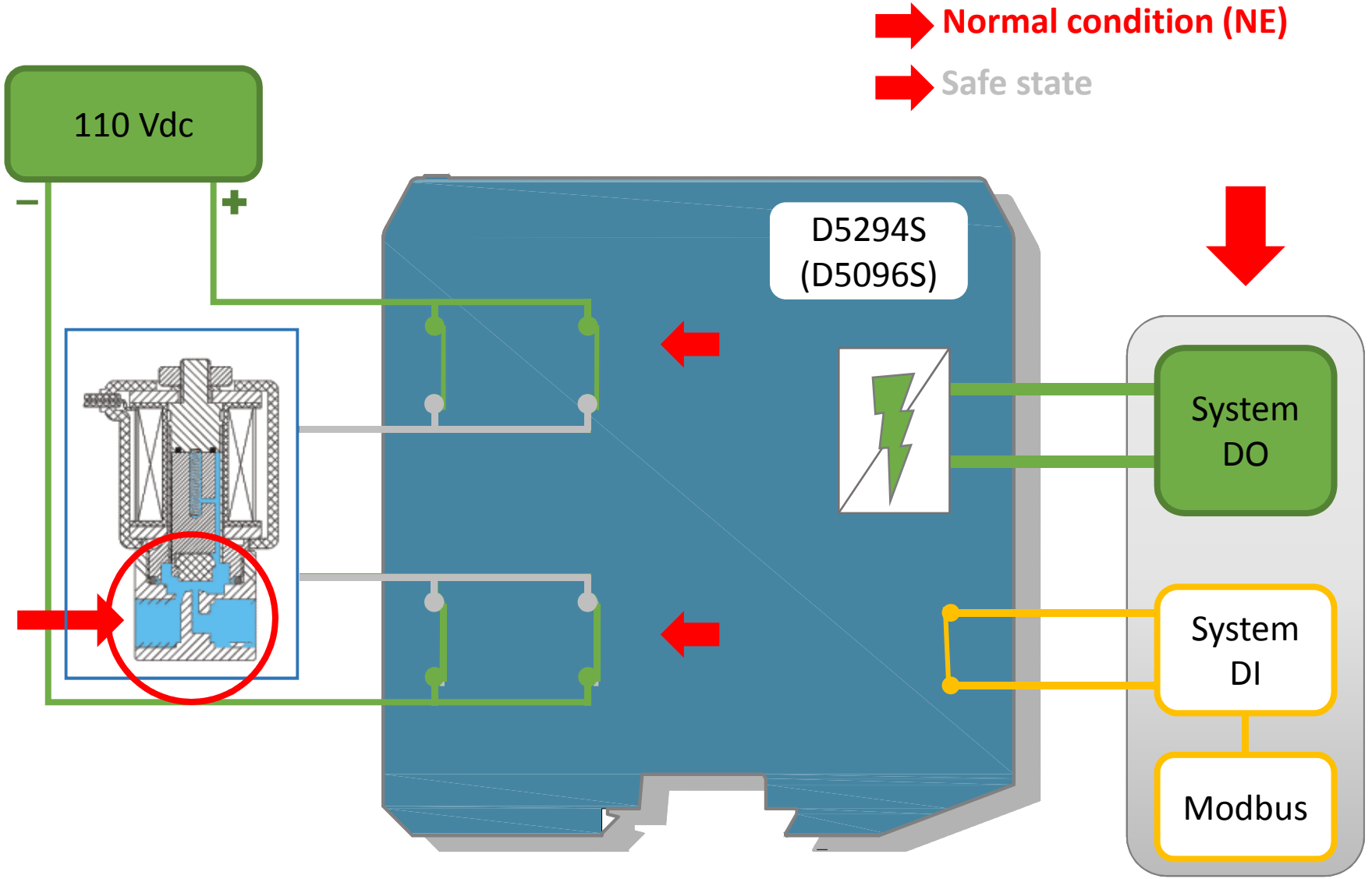
NORMALLY-ENERGIZED SOLENOID VALVES



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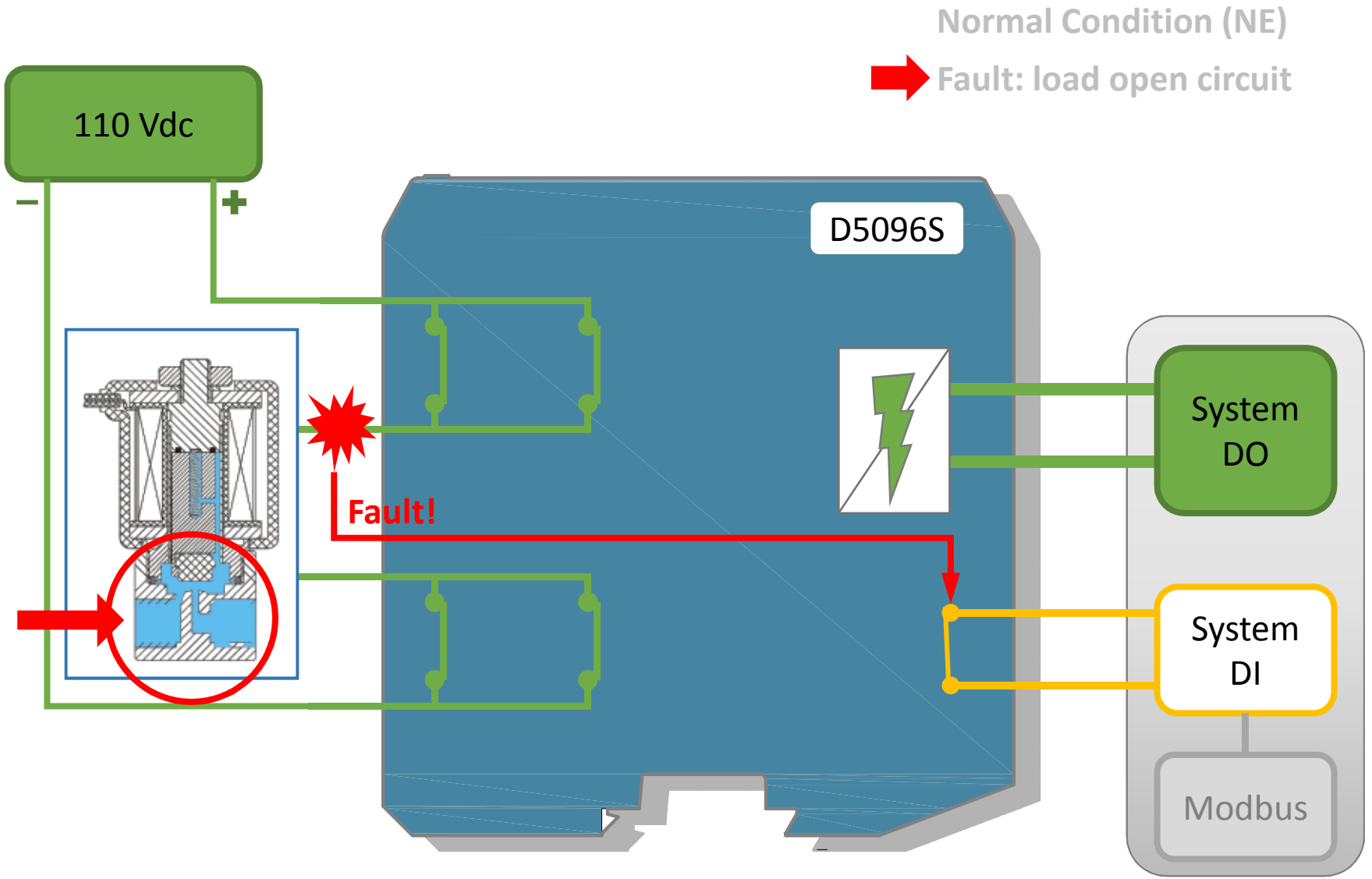
NORMALLY-ENERGIZED SOLENOID VALVES



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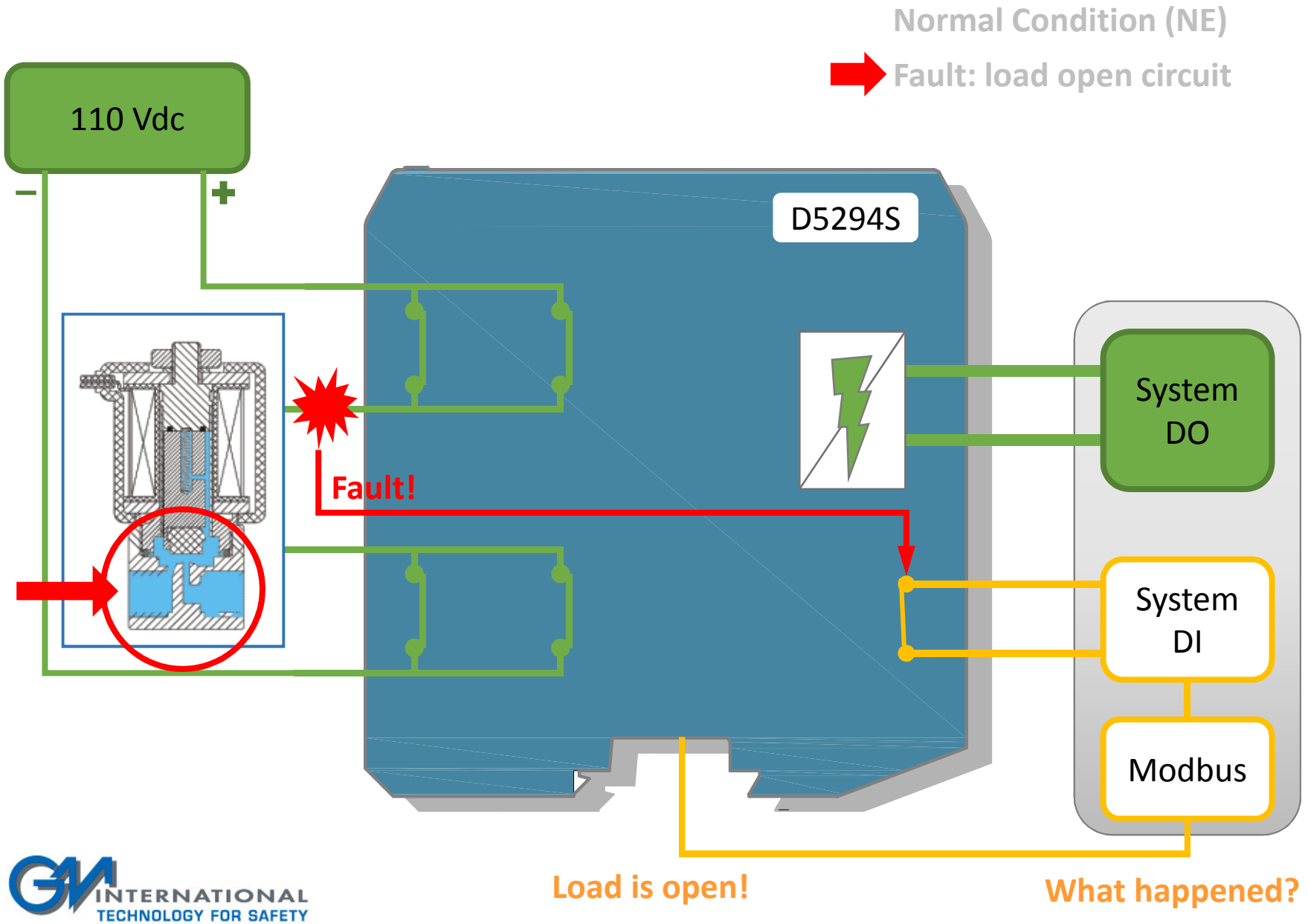
NORMALLY-ENERGIZED SOLENOID VALVES



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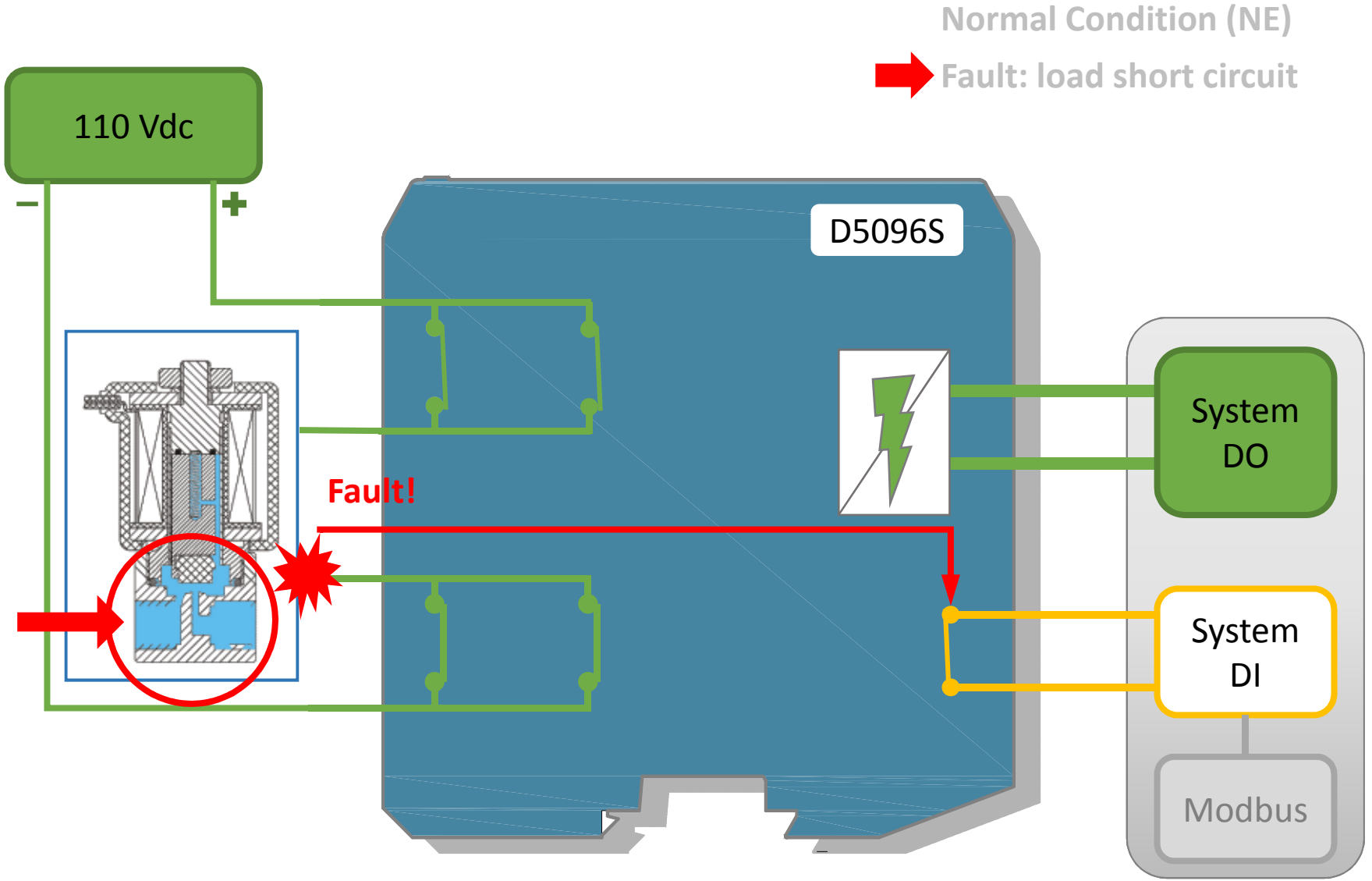
NORMALLY-ENERGIZED SOLENOID VALVES



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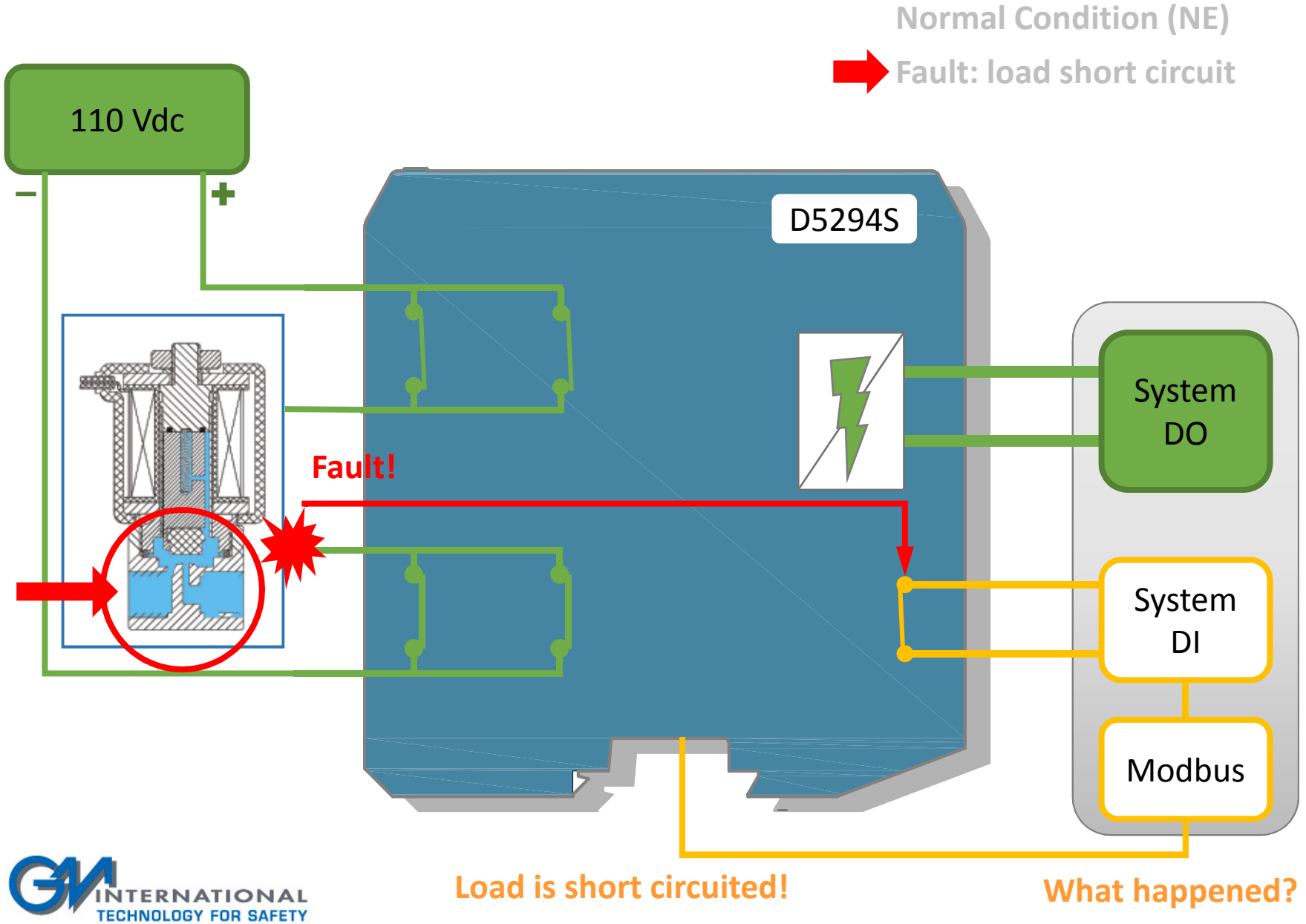
NORMALLY-ENERGIZED SOLENOID VALVES



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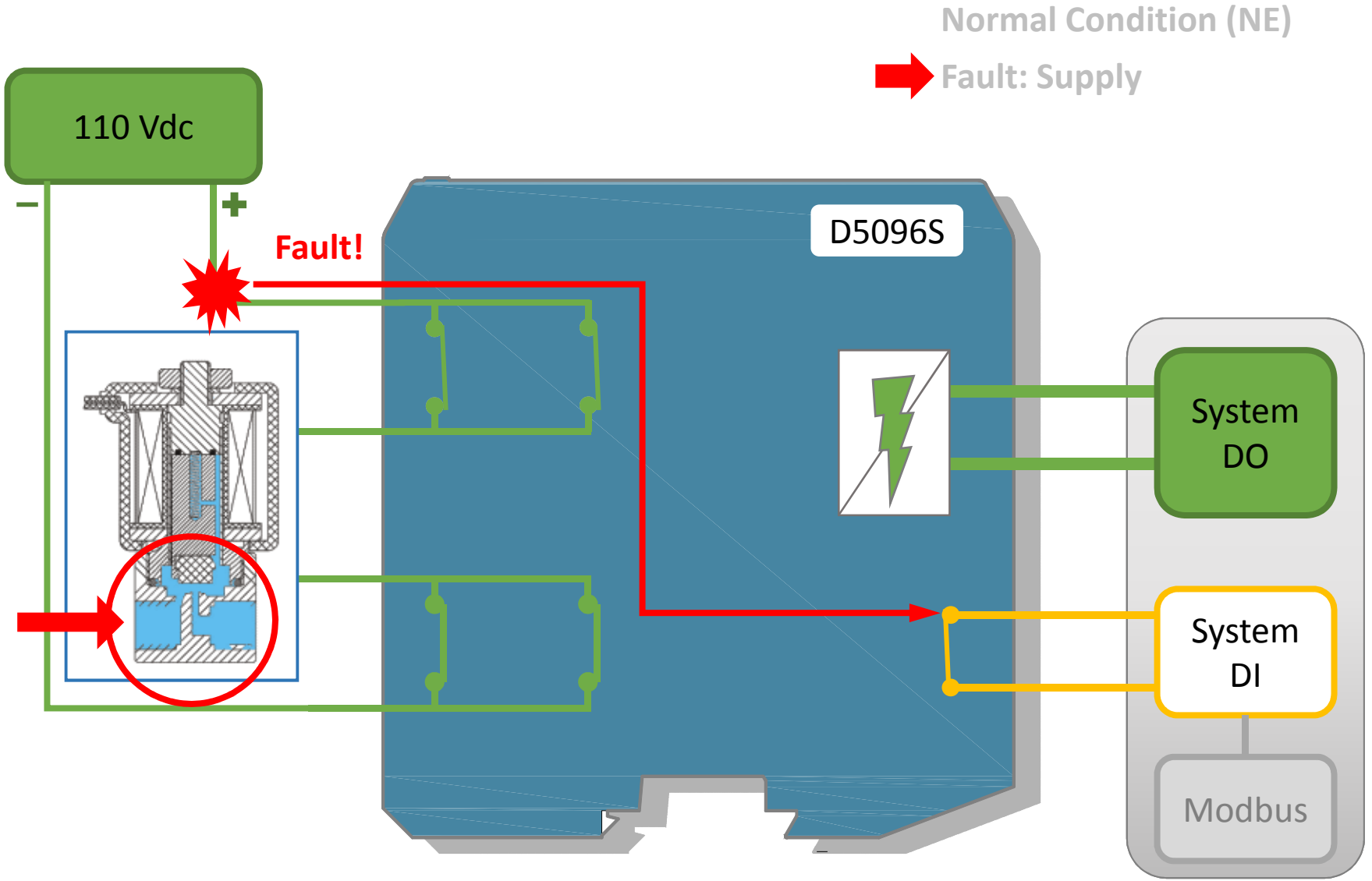
NORMALLY-ENERGIZED SOLENOID VALVES



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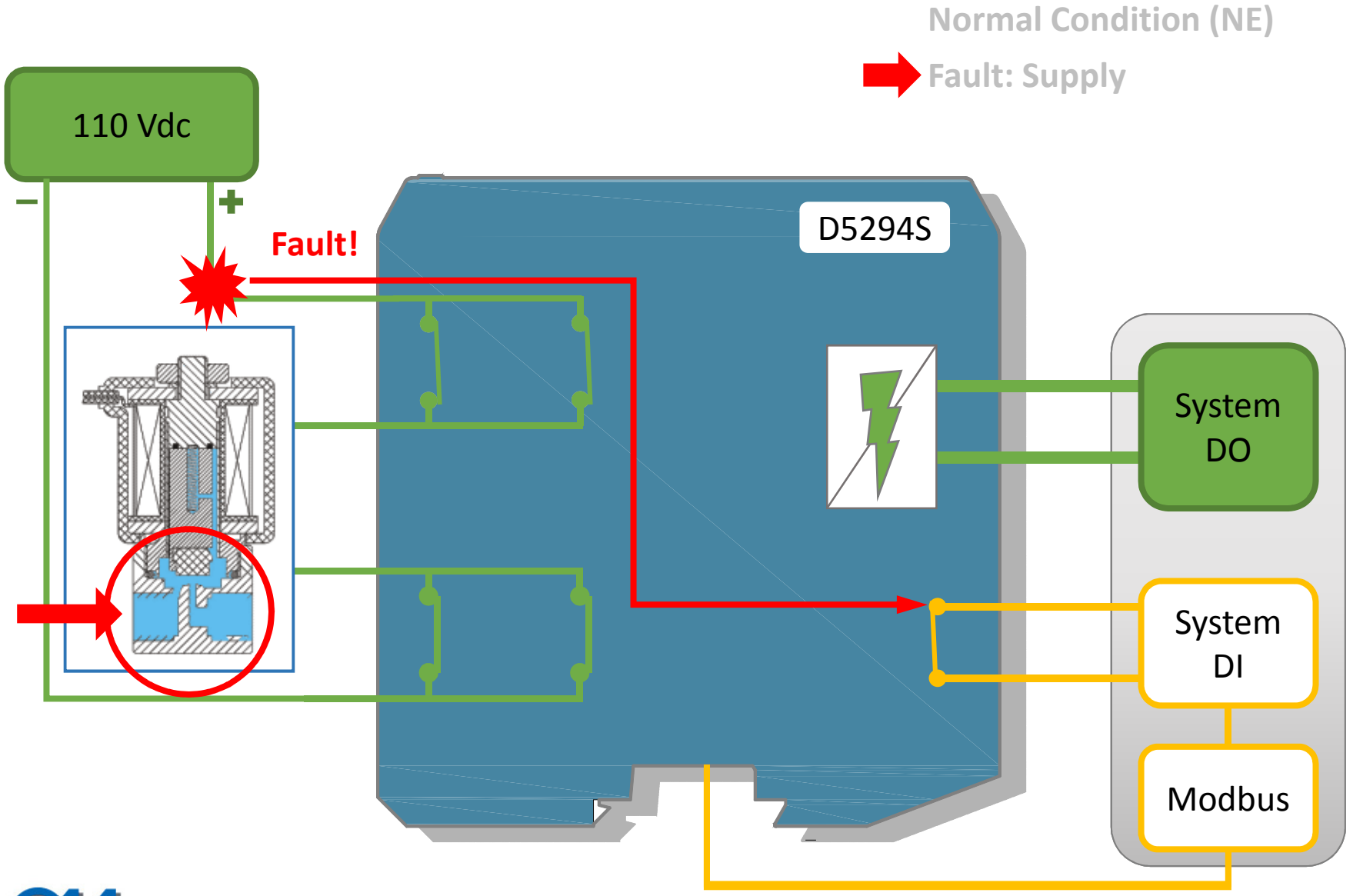
NORMALLY-ENERGIZED SOLENOID VALVES



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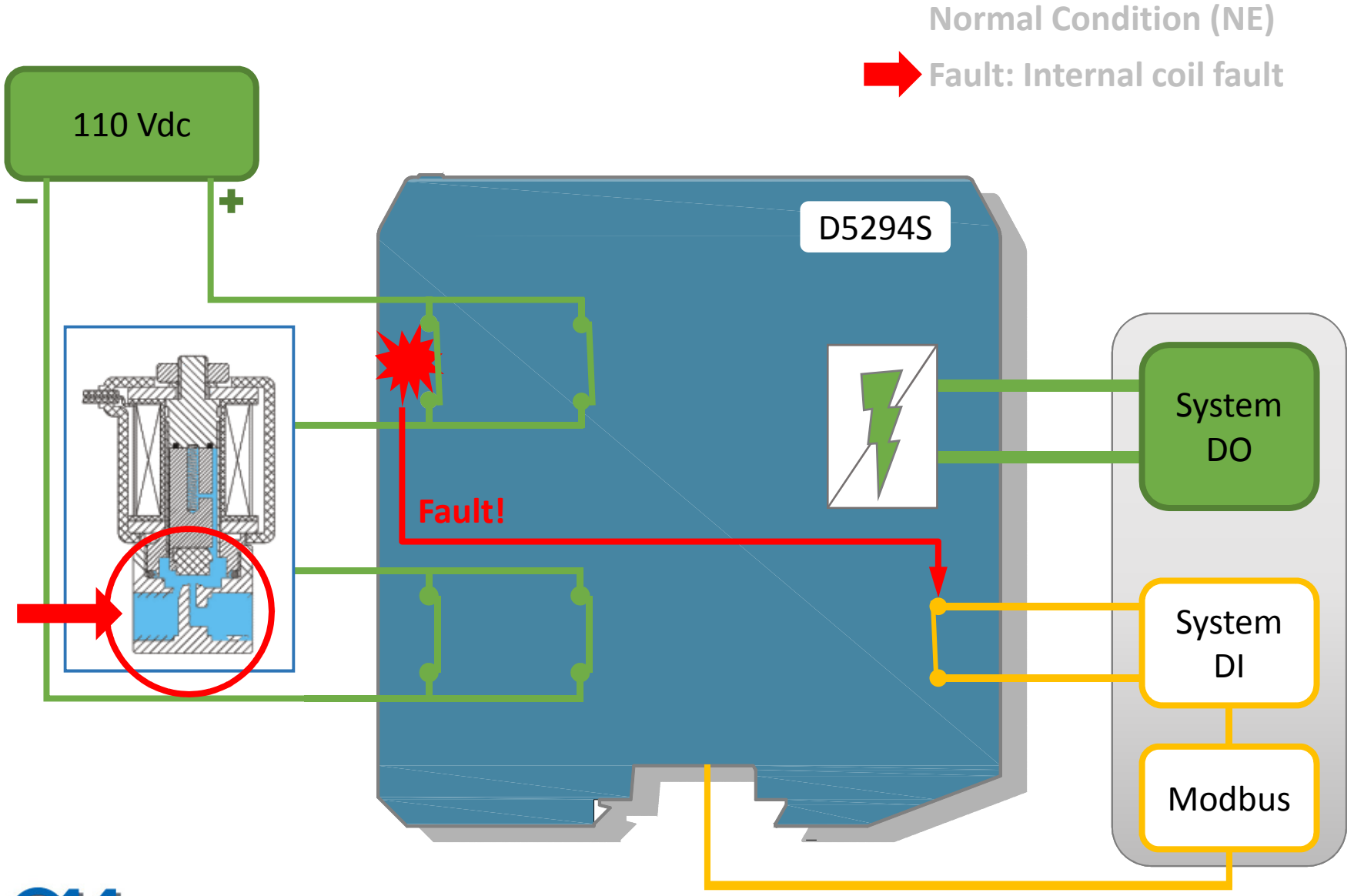
NORMALLY-ENERGIZED SOLENOID VALVES



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STROBES/BEACONS FOR F&G APPLICATIONS

Command /Power

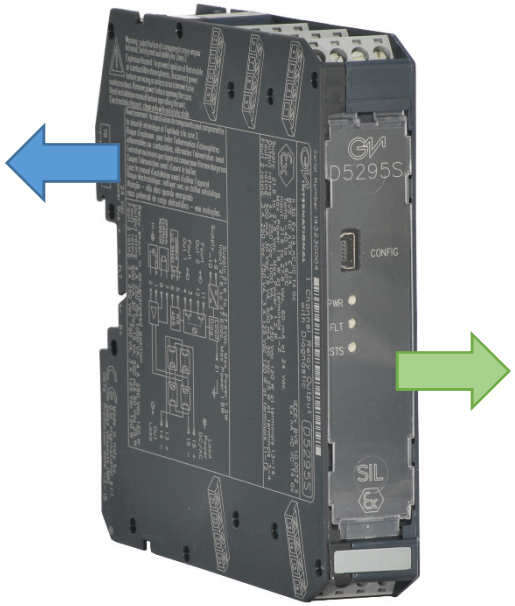
Diagnostics

220 Vac Supply

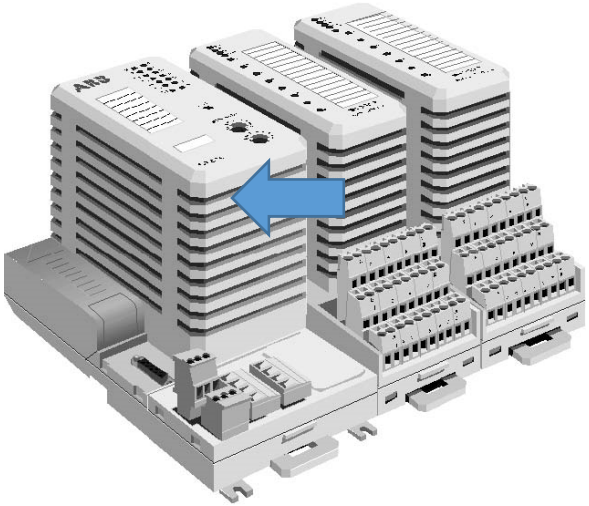
Project record #2

System: *ABB S800*
Load: *MEDC Beacon/Strobe*
Model: *D5295S (or D5097S)*

Beacon / Strobe



D5295S
(or D5097S)



System

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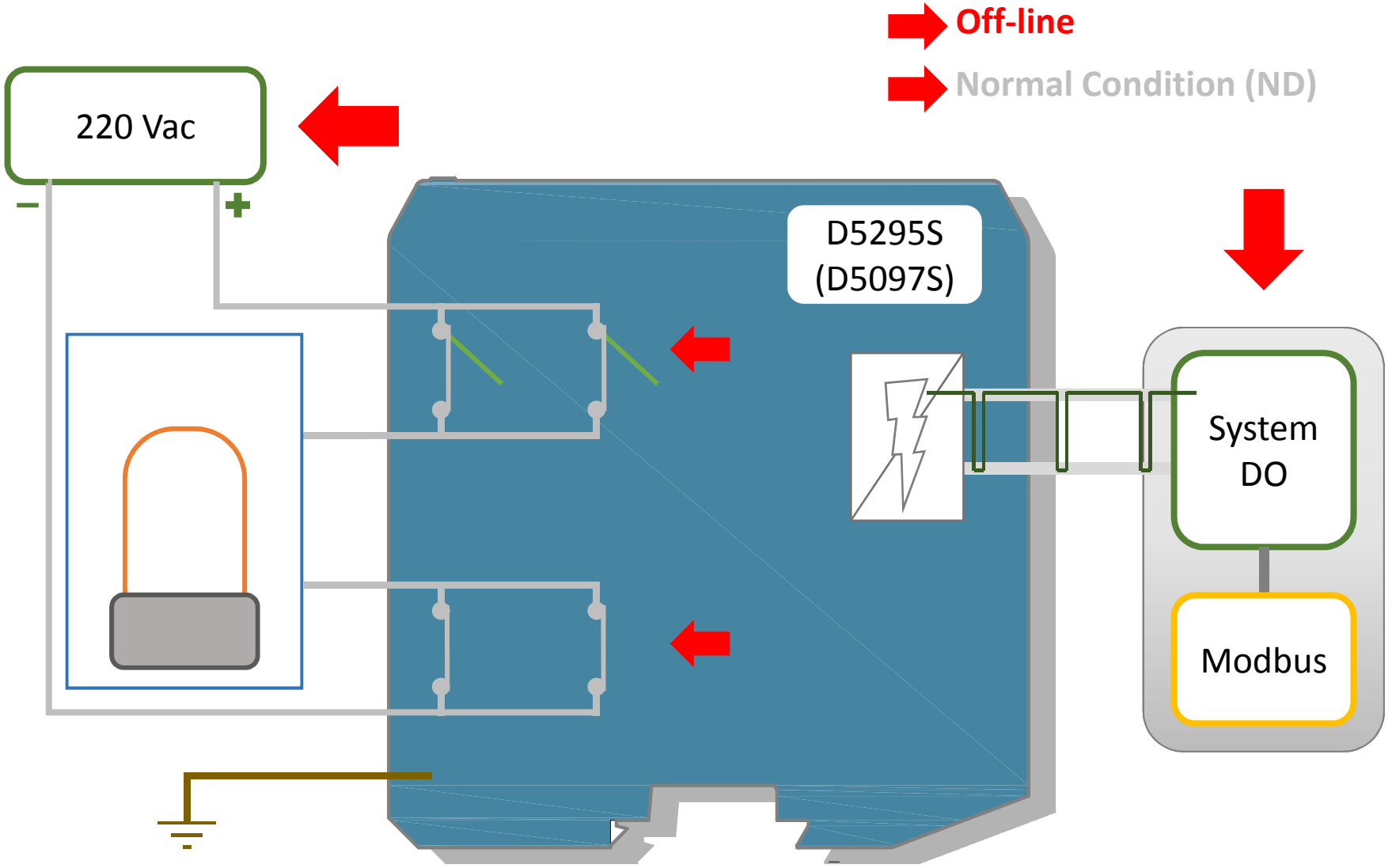
STROBES/BEACONS FOR F&G APPLICATIONS



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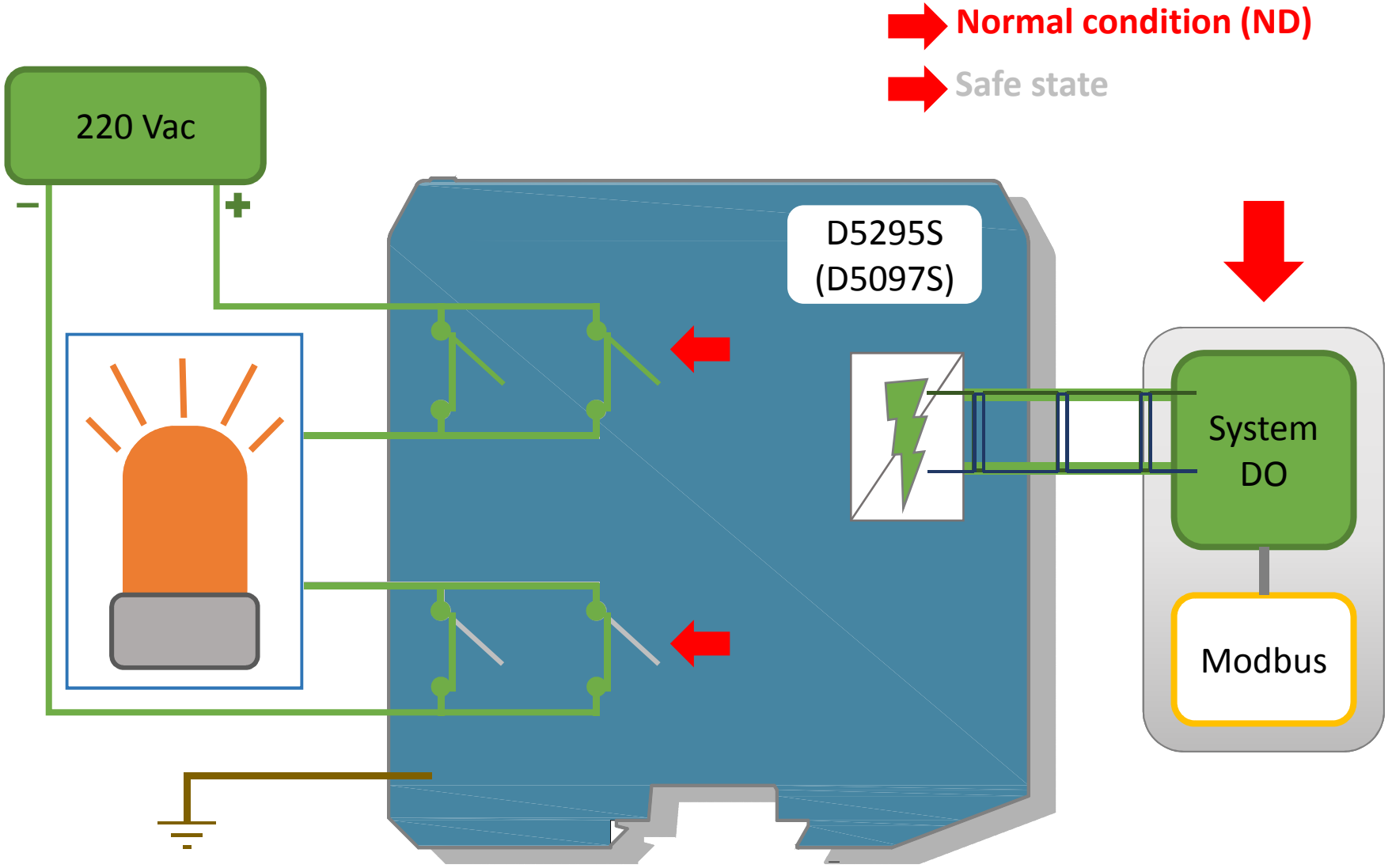
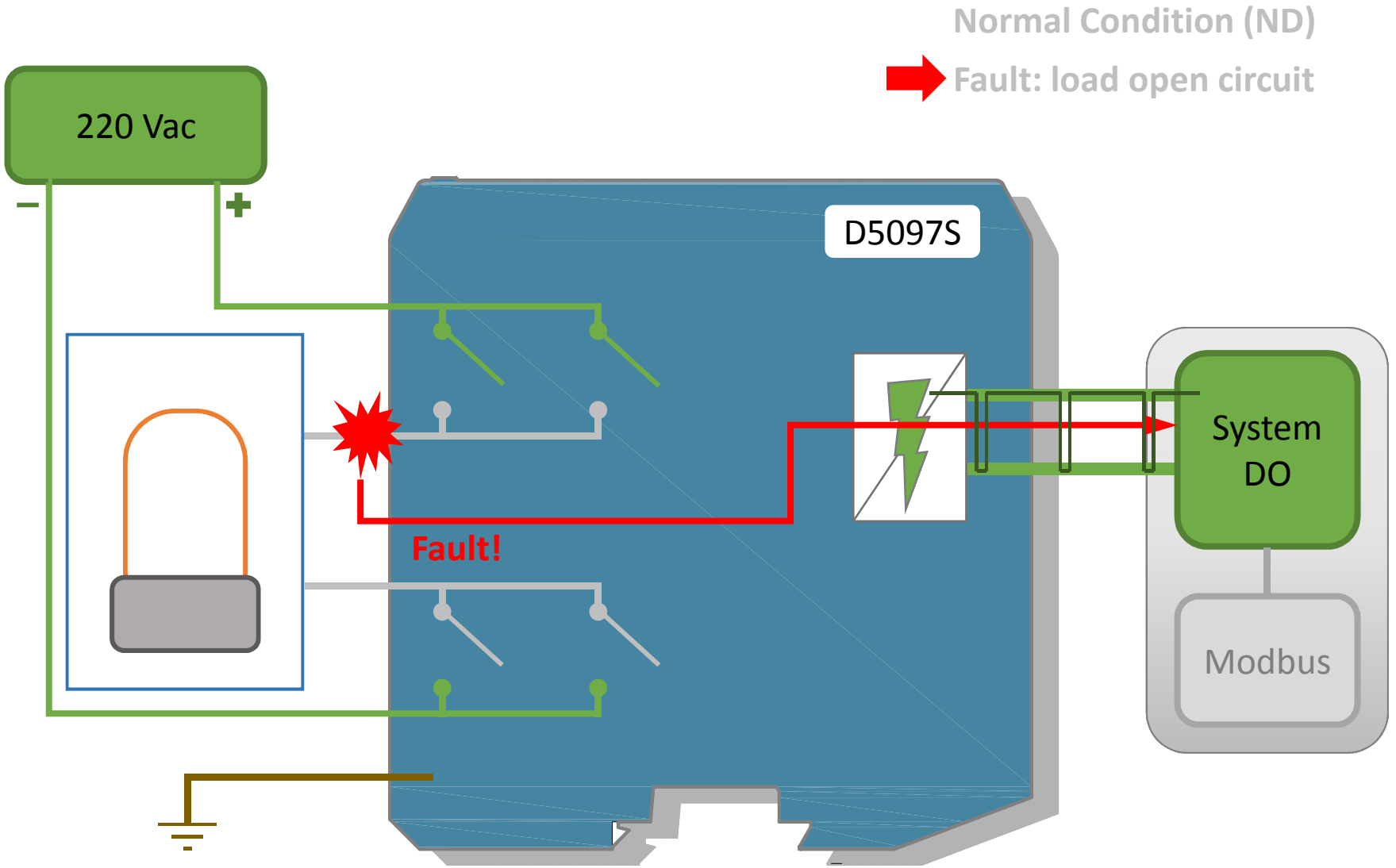
STROBES/BEACONS FOR F&G APPLICATIONS



STROBES/BEACONS FOR F&G APPLICATIONS



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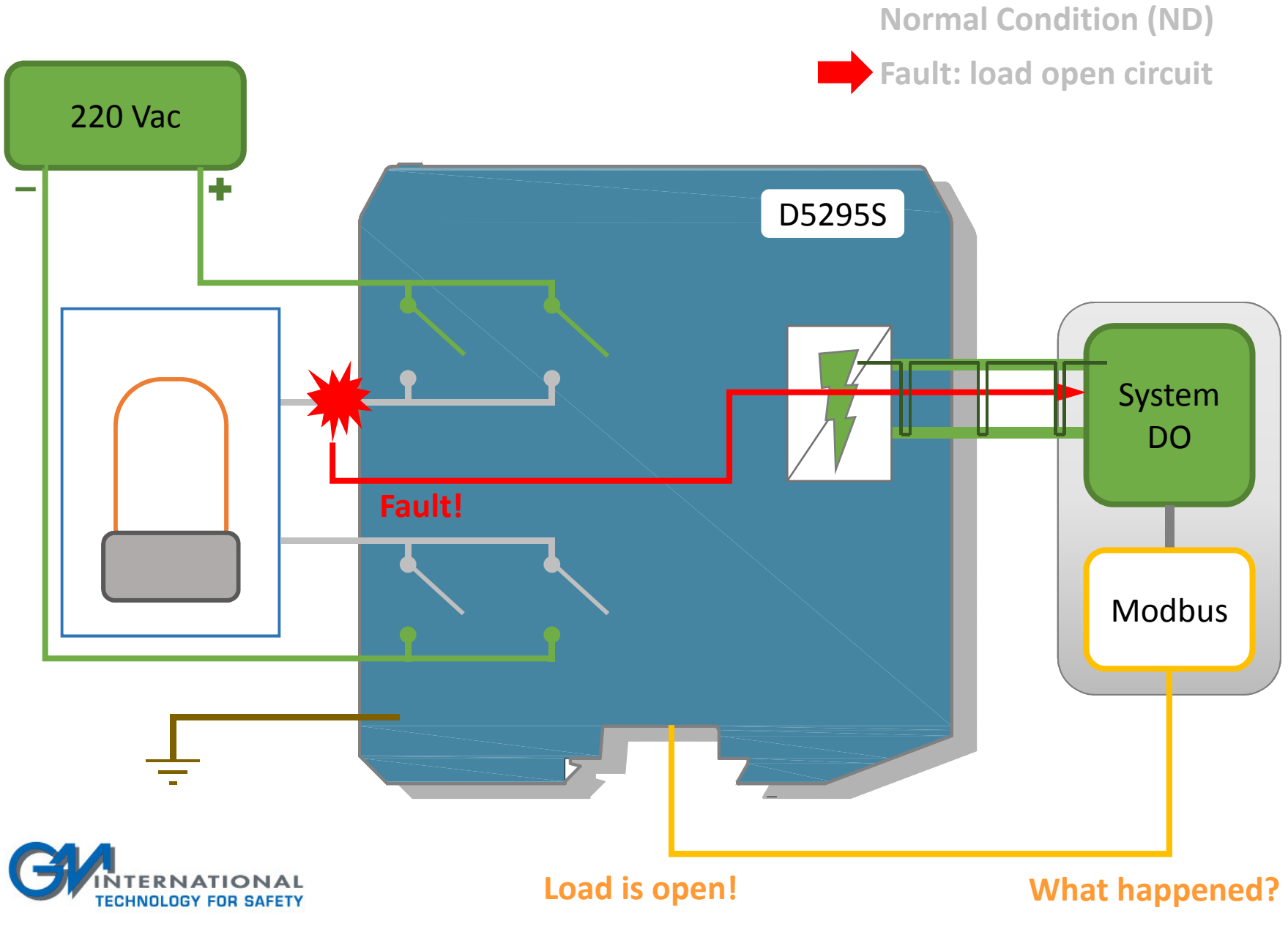
STROBES/BEACONS FOR F&G APPLICATIONS



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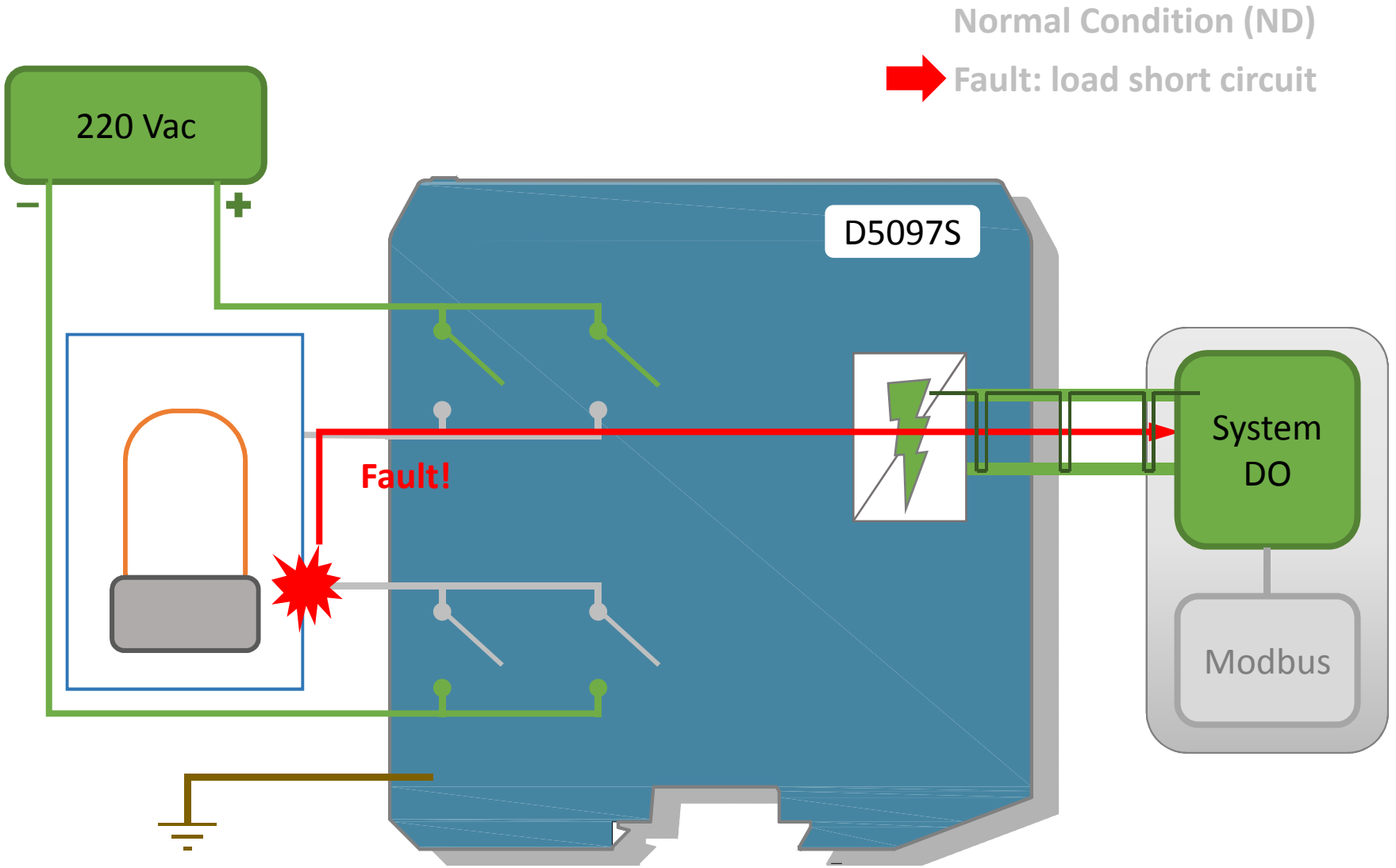
STROBES/BEACONS FOR F&G APPLICATIONS



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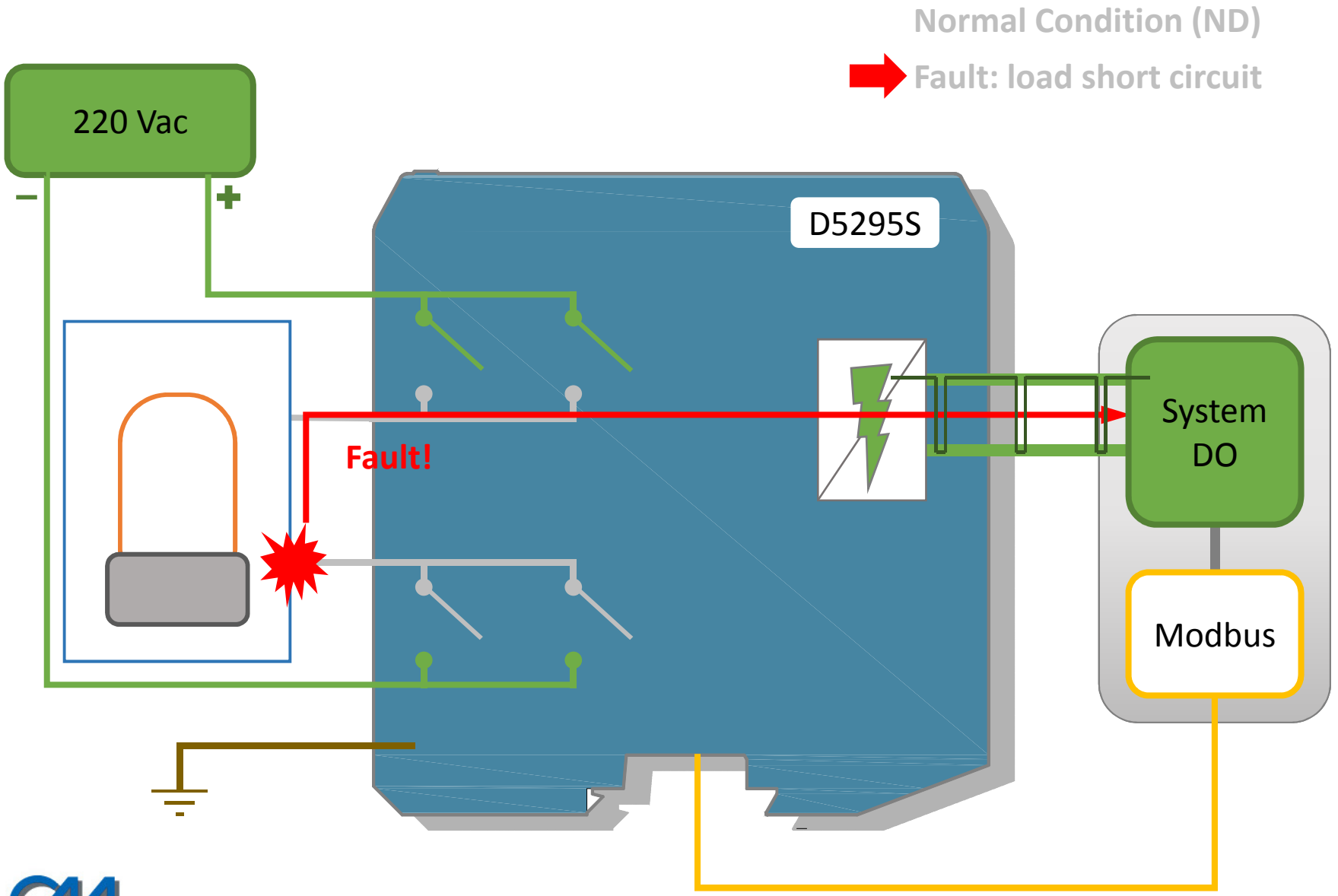
STROBES/BEACONS FOR F&G APPLICATIONS



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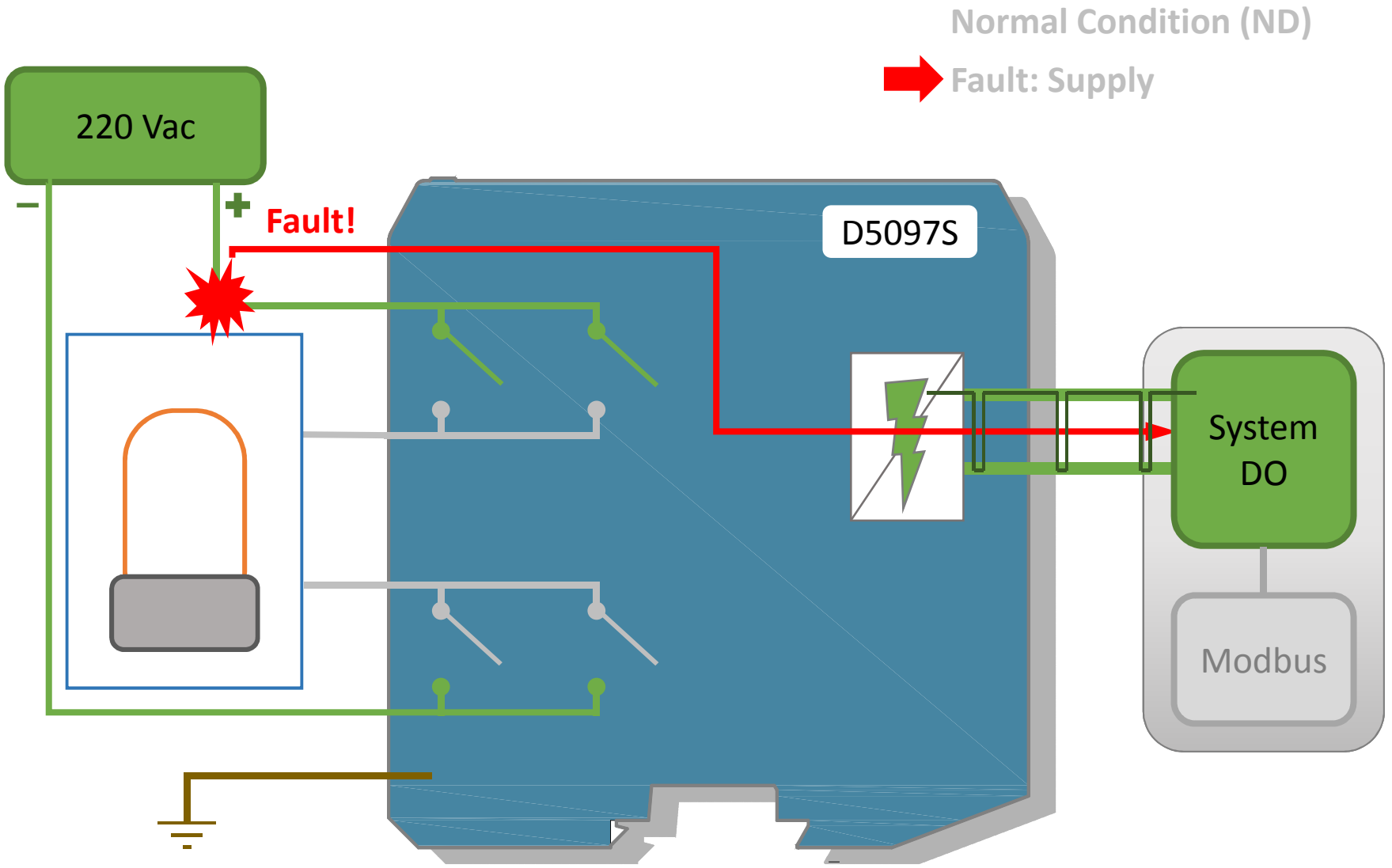
STROBES/BEACONS FOR F&G APPLICATIONS



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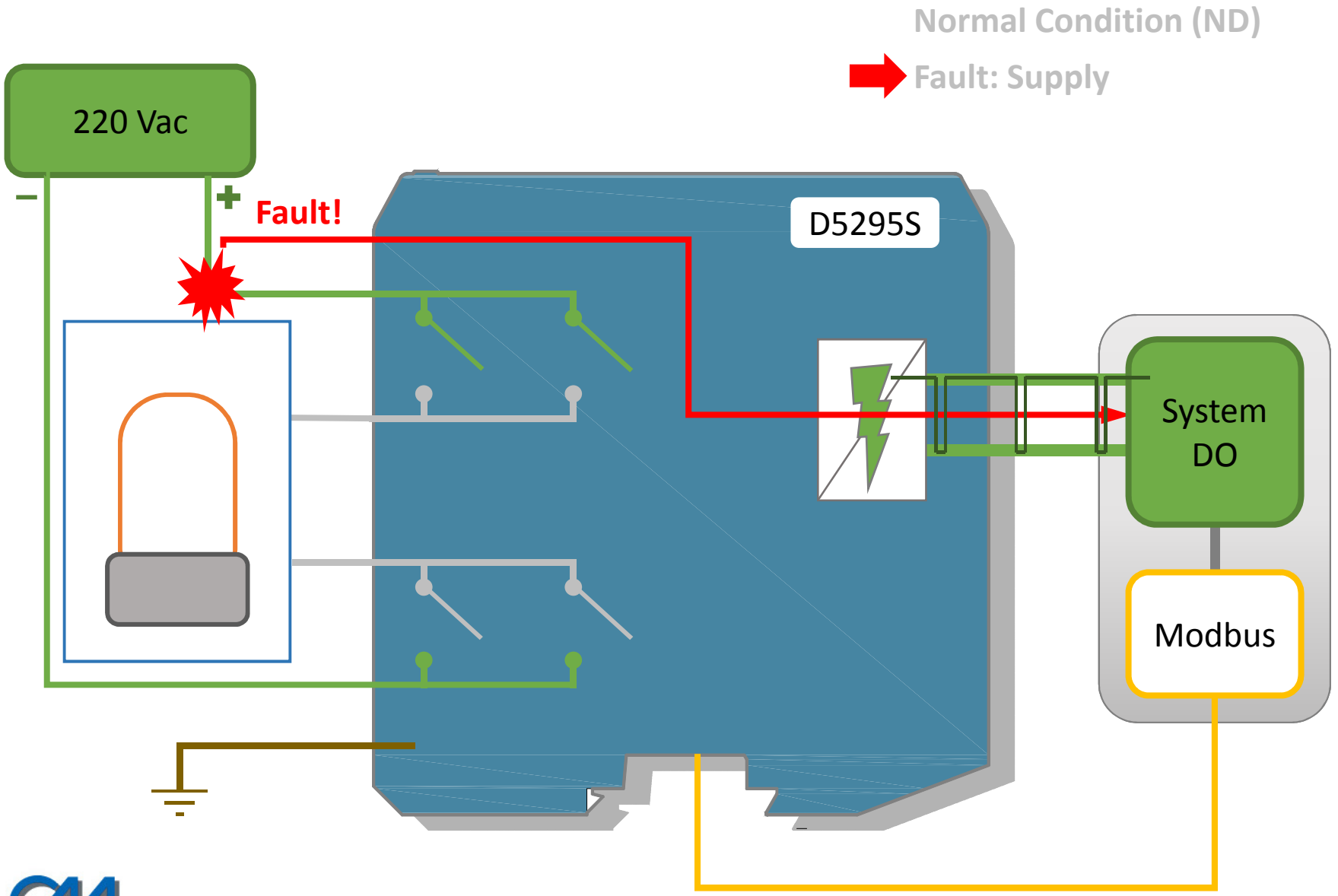
STROBES/BEACONS FOR F&G APPLICATIONS



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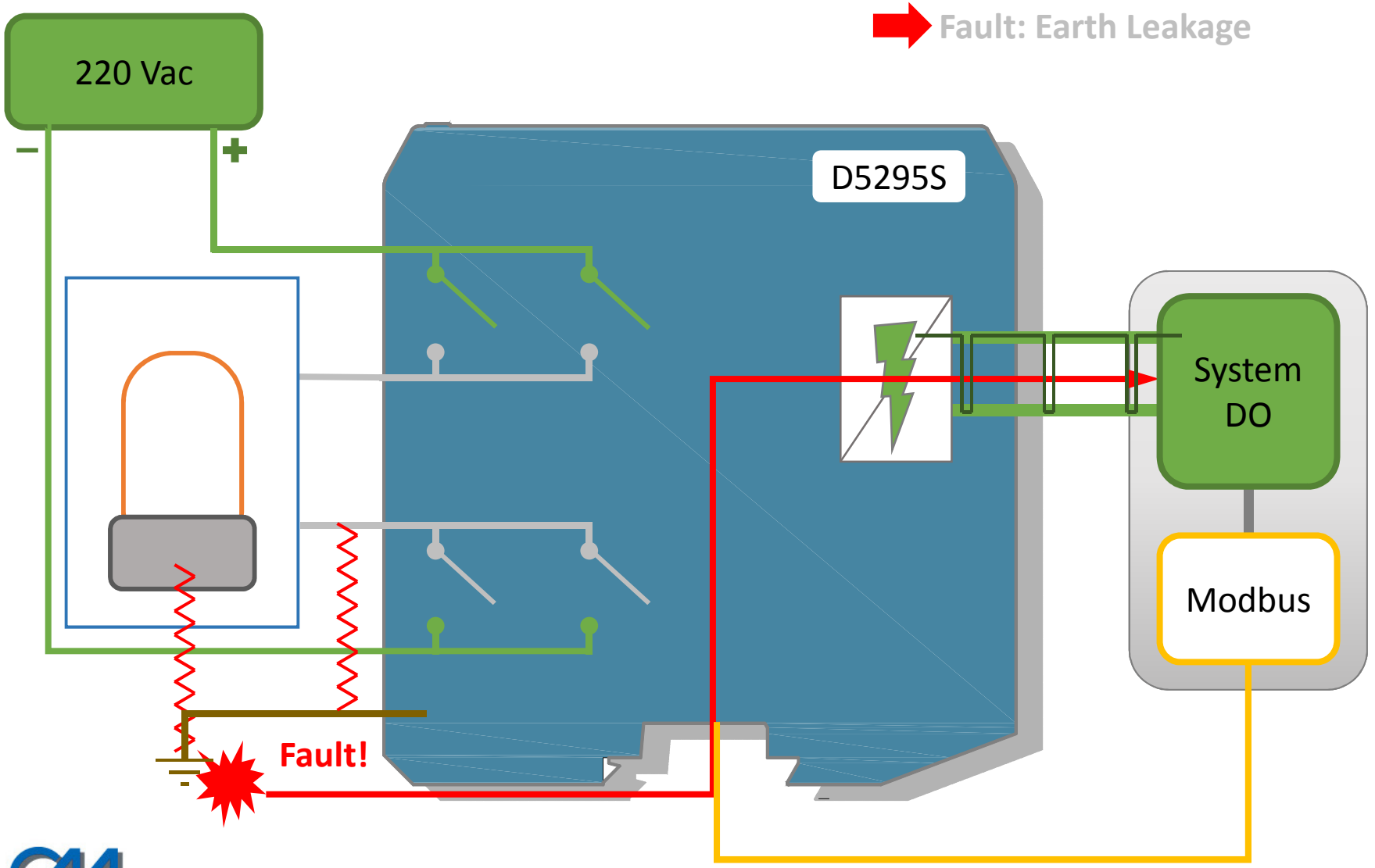
STROBES/BEACONS FOR F&G APPLICATIONS

Normal Condition (ND)

Fault: Earth Leakage



Earth leakage

What happened?

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DUAL - TONE SOUNDERS FOR F&G APPLICATIONS

Command /Power

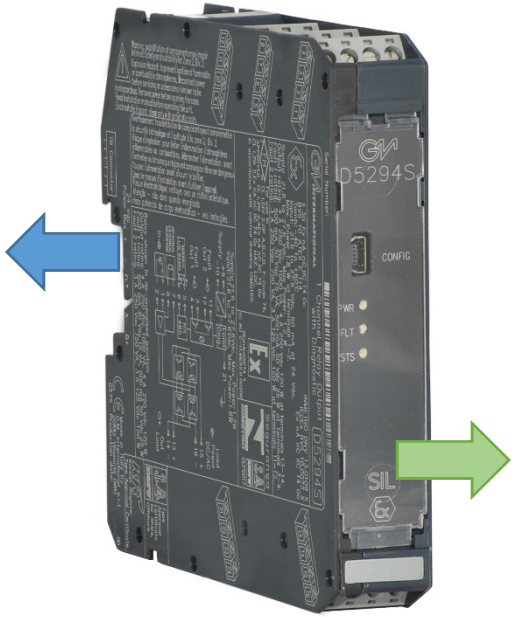
Diagnostics

220 Vac Supply

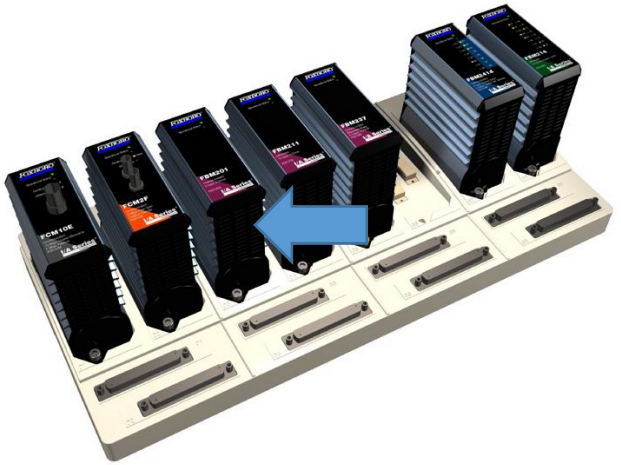
Project record #3

Name: *Kioc (Kuwait)*
System: *Invensys FBM200*
Load: *MEDC Sounder*
Model: *D5294S (or D5096S)*

Sounder



D5294S
(or D5096S)



System

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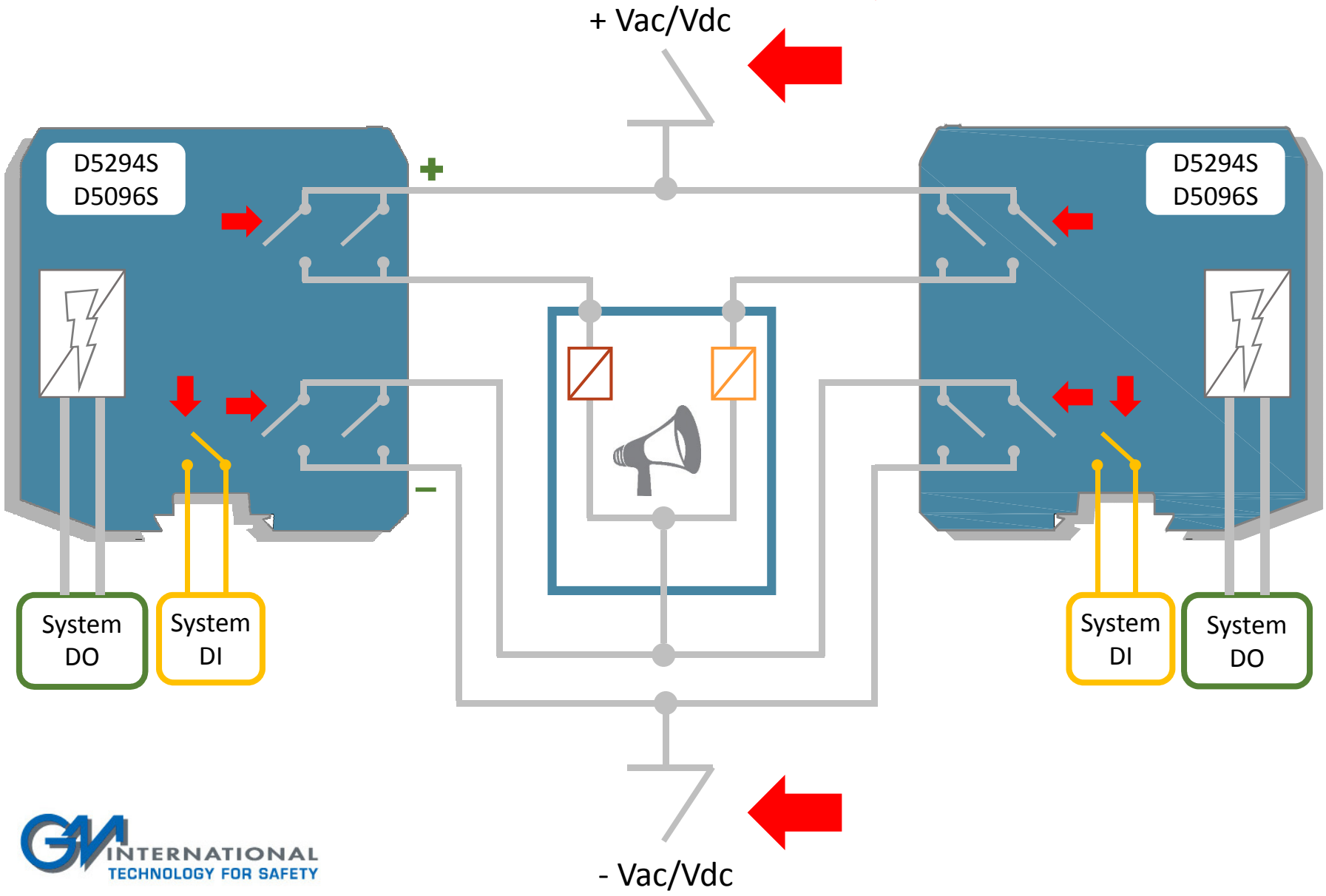
DUAL - TONE SOUNDERS FOR F&G APPLICATIONS

Off-line

Normal Condition (ND)



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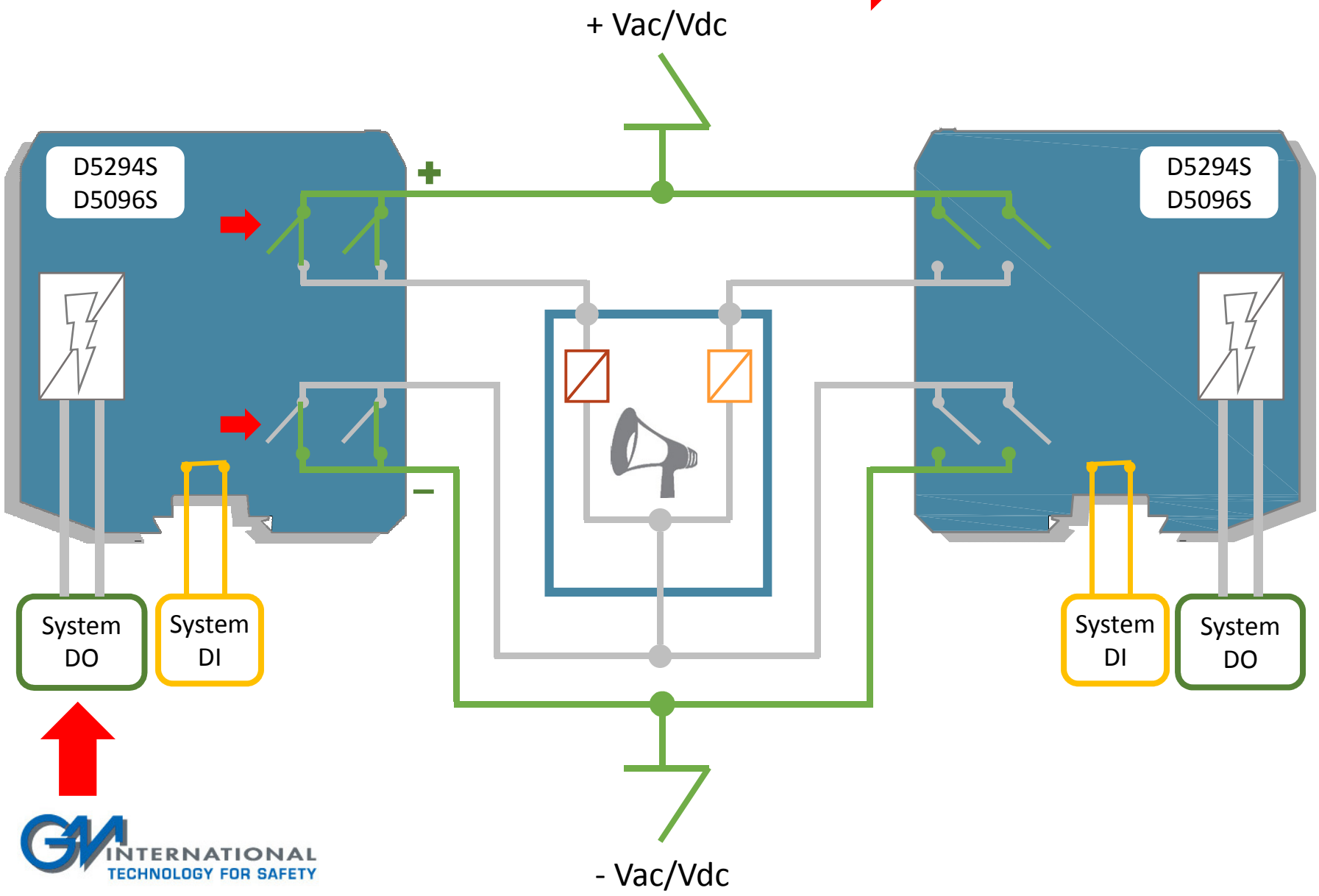
DUAL - TONE SOUNDERS FOR F&G APPLICATIONS

Normal condition (ND)

Safe state 1



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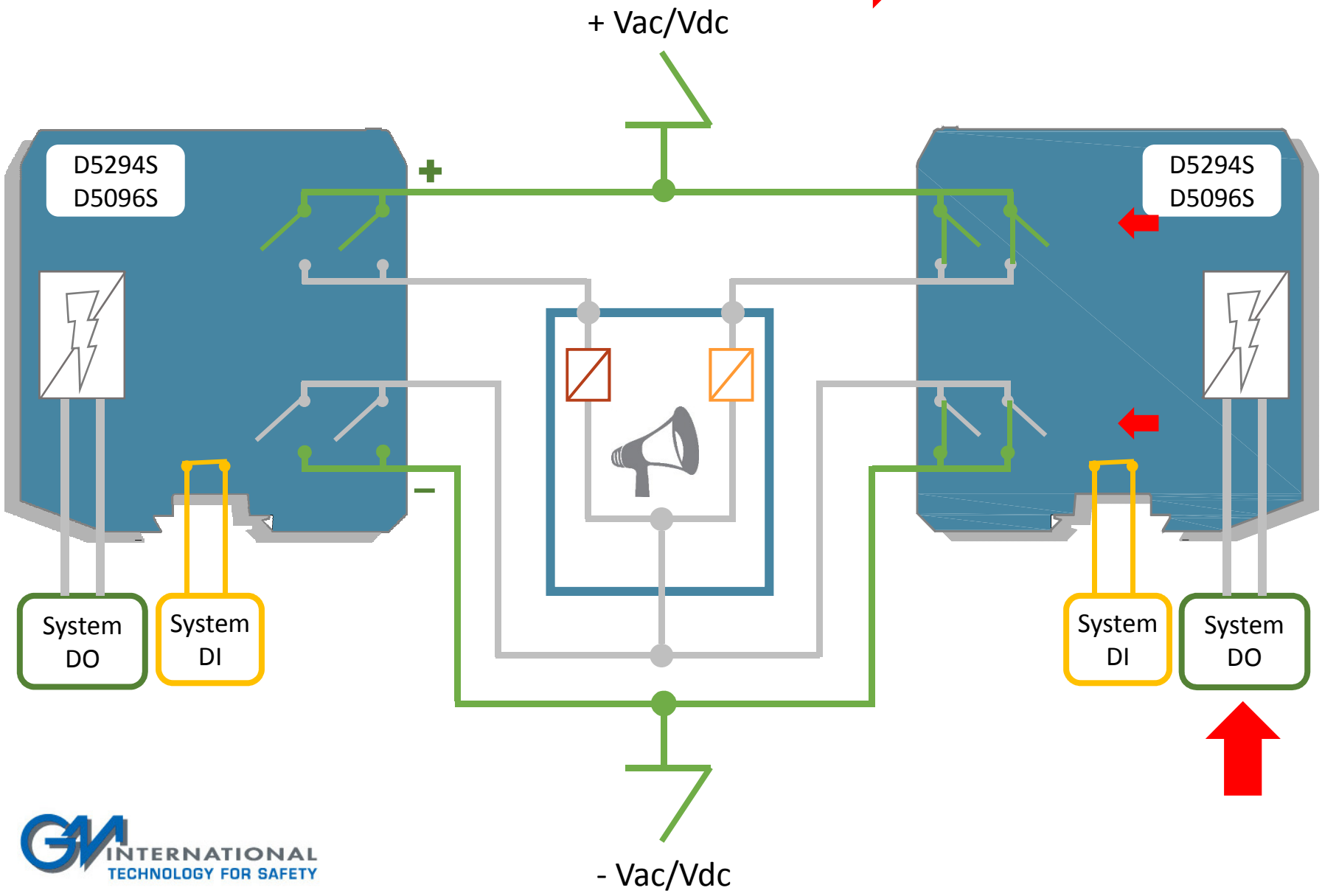
DUAL - TONE SOUNDERS FOR F&G APPLICATIONS

Normal condition (ND)

Safe state 2



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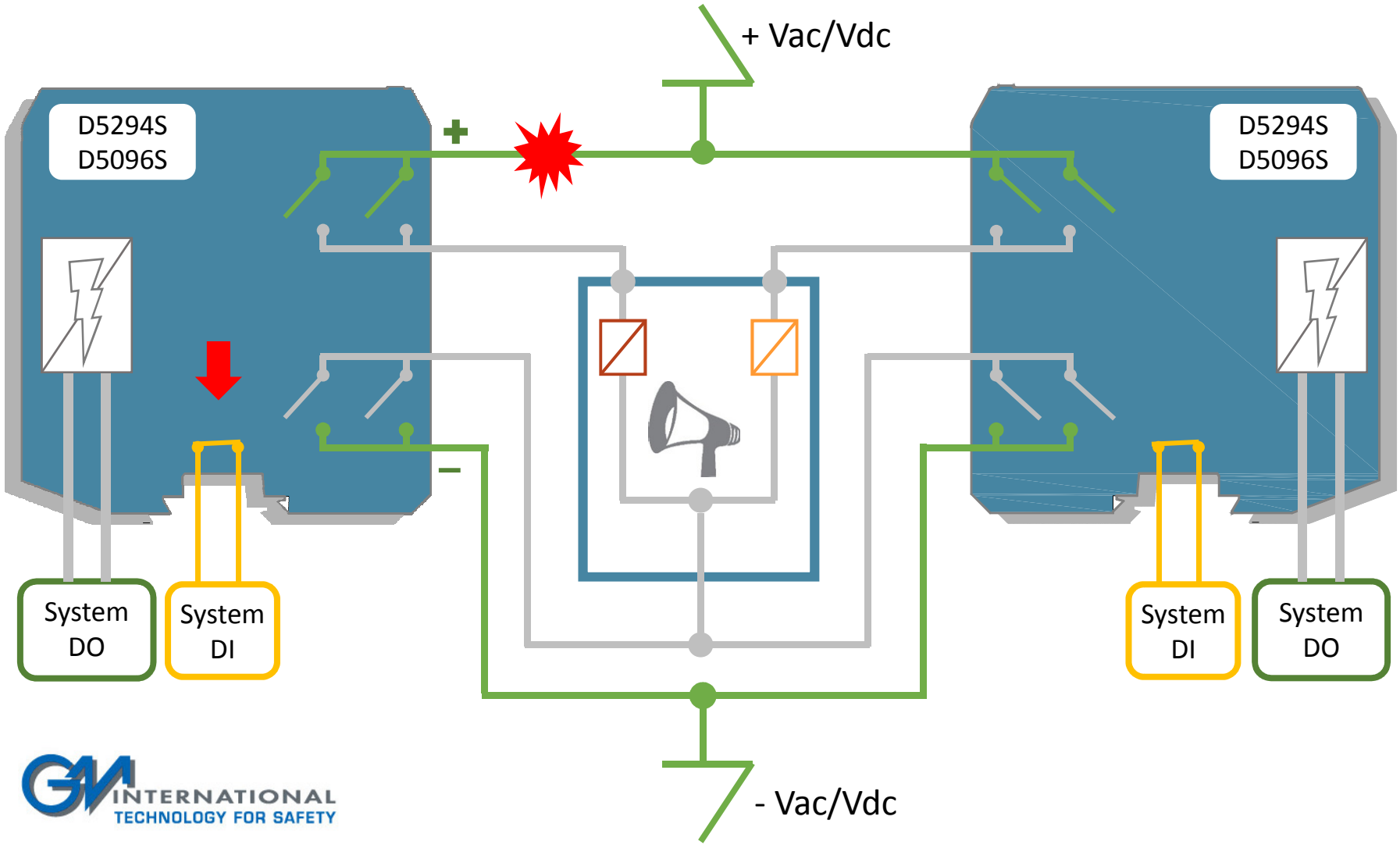
DUAL - TONE SOUNDERS FOR F&G APPLICATIONS

DETECTABLE FAULTS

Fault supply



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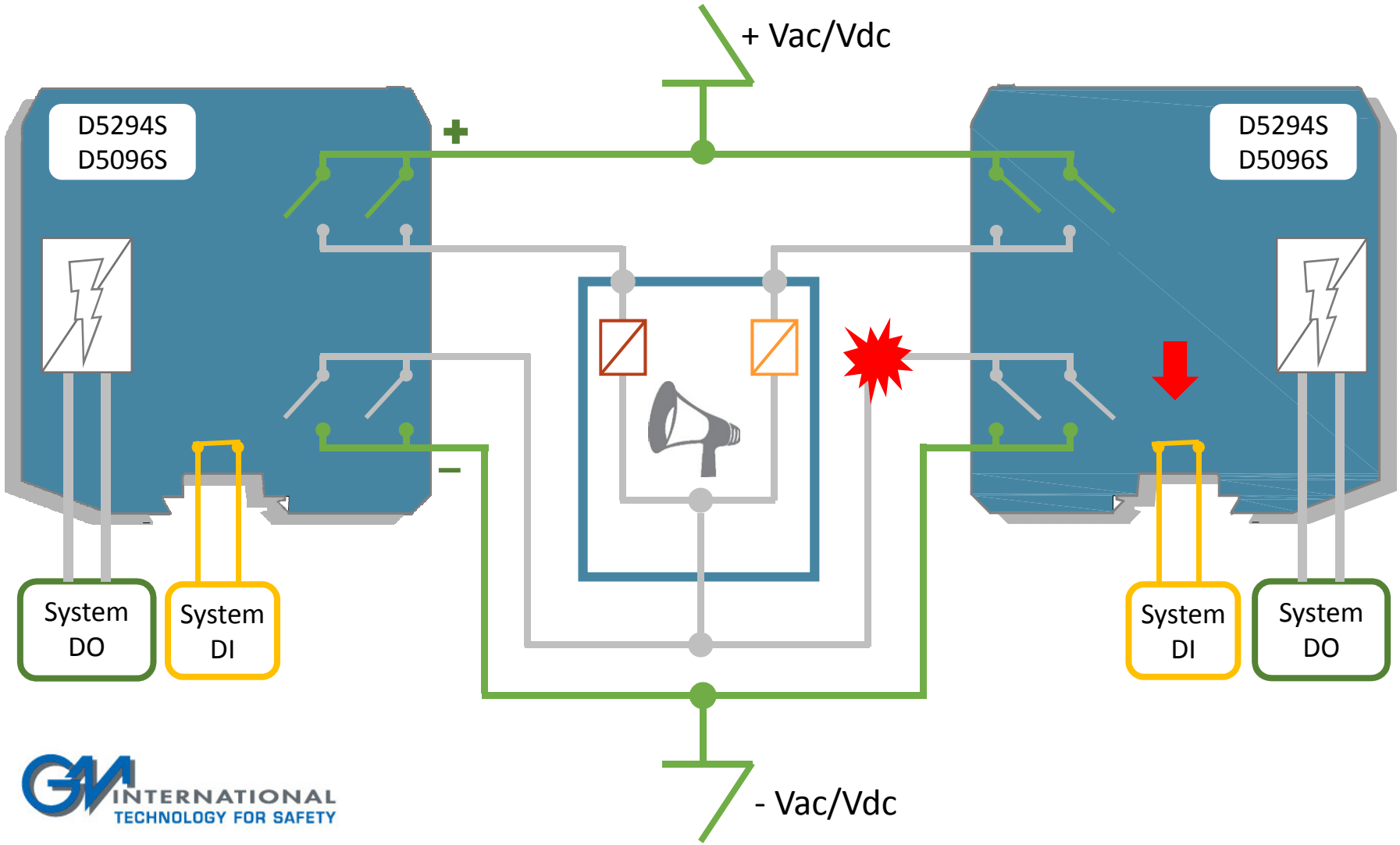
DUAL - TONE SOUNDERS FOR F&G APPLICATIONS

DETECTABLE FAULTS

Load short circuit



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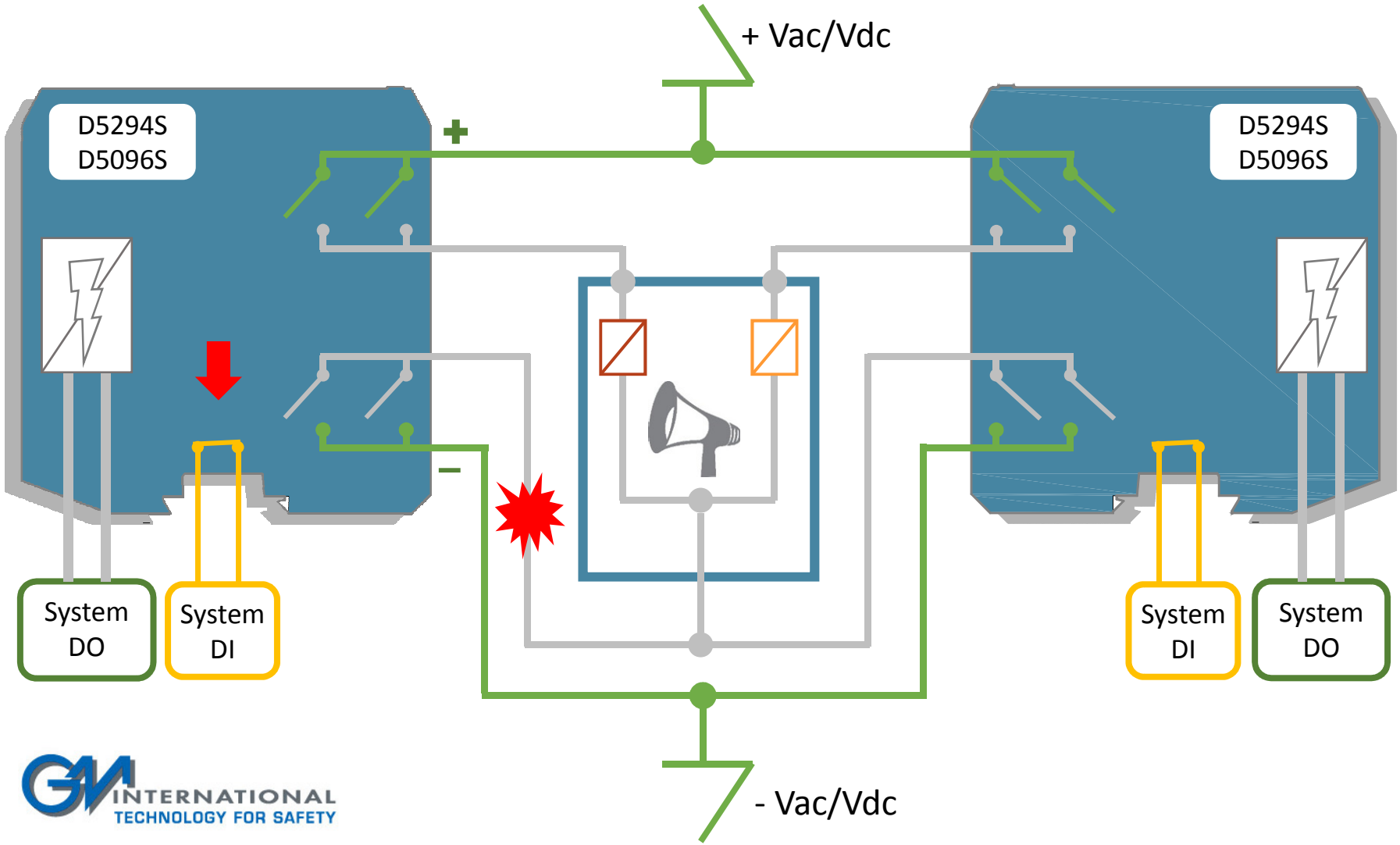
DUAL - TONE SOUNDERS FOR F&G APPLICATIONS

DETECTABLE FAULTS

Load open circuit



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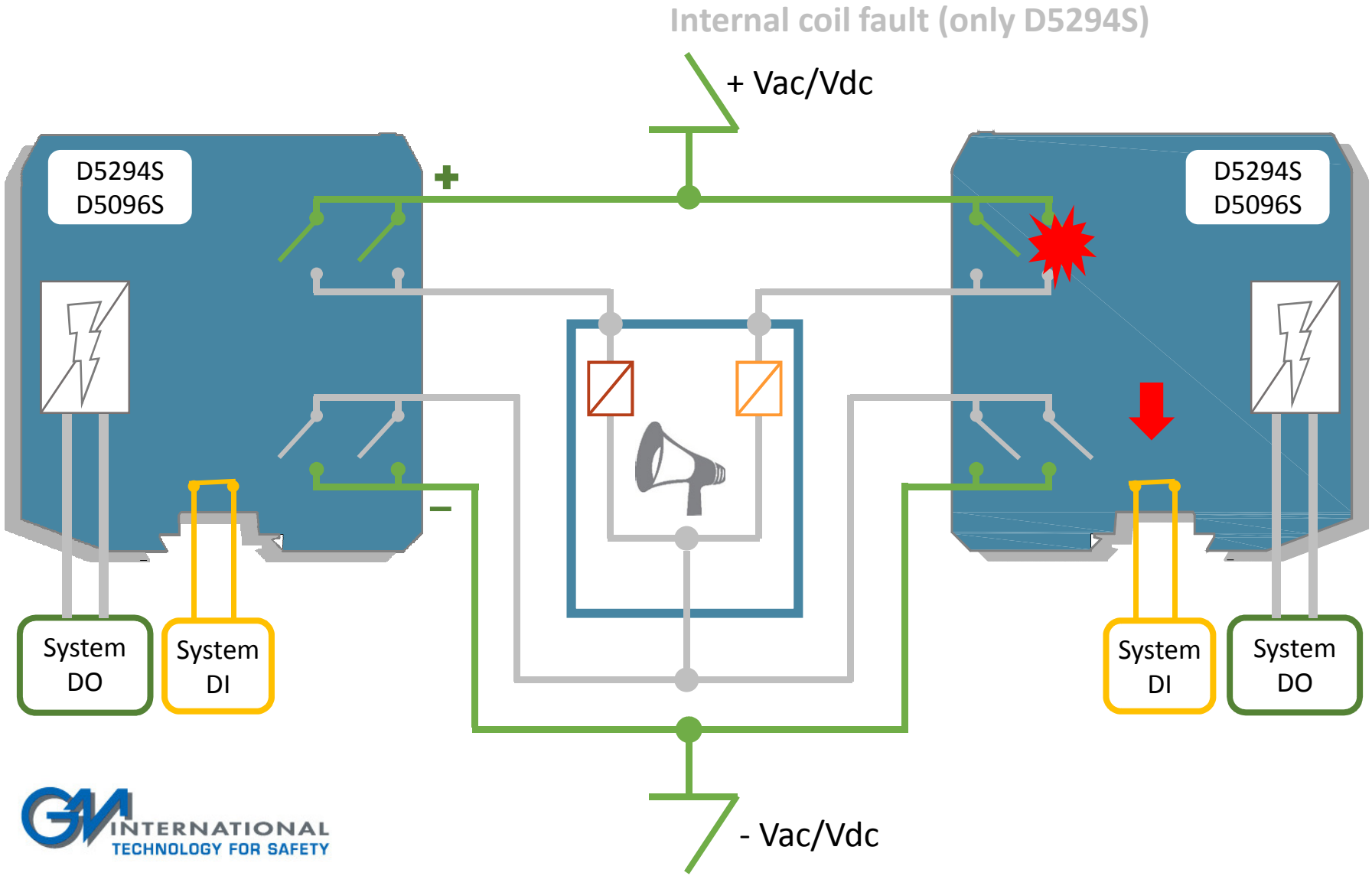
DUAL - TONE SOUNDERS FOR F&G APPLICATIONS

DETECTABLE FAULTS



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DUAL - TONE SOUNDERS FOR F&G APPLICATIONS

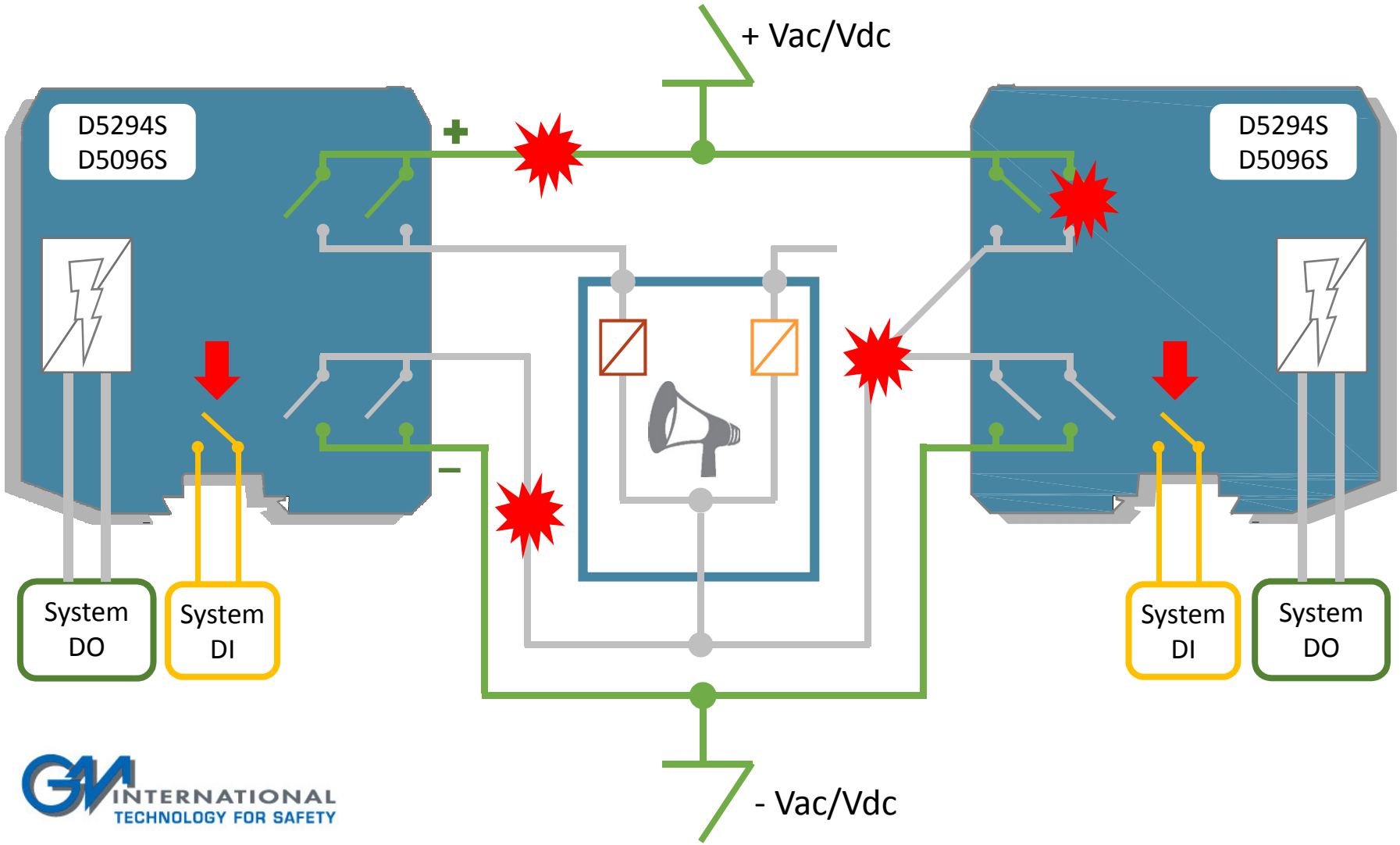
DETECTABLE FAULTS

Fault supply

Load short circuit

Load open circuit

Internal coil fault (only D5294S)



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NORMALLY-ENERGIZED DOUBLE COIL SOLENOID VALVES

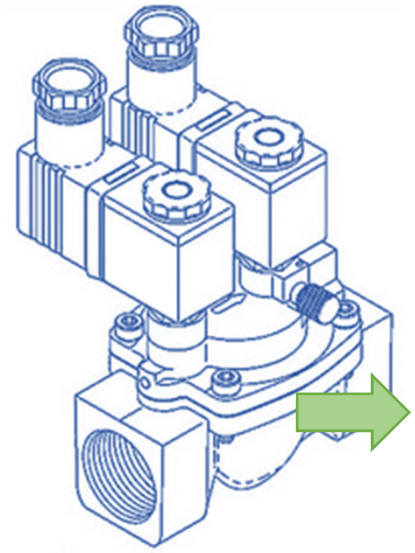
Command /Power

Diagnostics

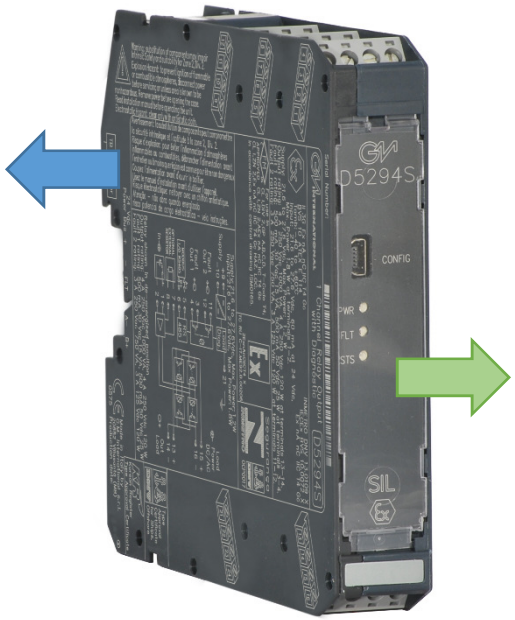
110 Vdc Supply

Project record #4

System: *Yokogawa RS Prosafe*
Load: *Double coil valve*
Model: *D5294S*



Double Solenoid Valve



D5294S

System

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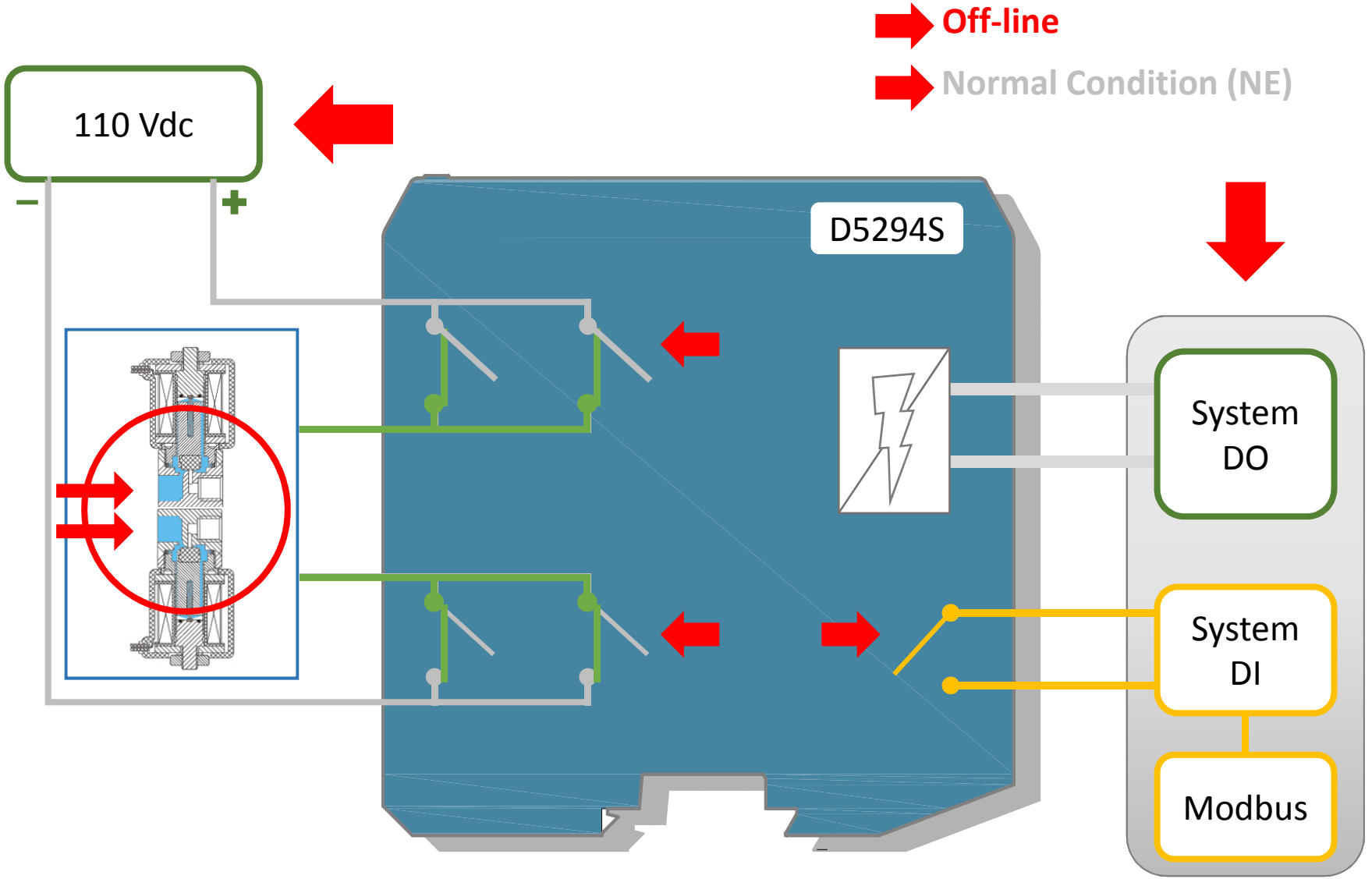
TECHNOLOGY FOR SAFETY

NORMALLY-ENERGIZED DOUBLE COIL SOLENOID VALVES



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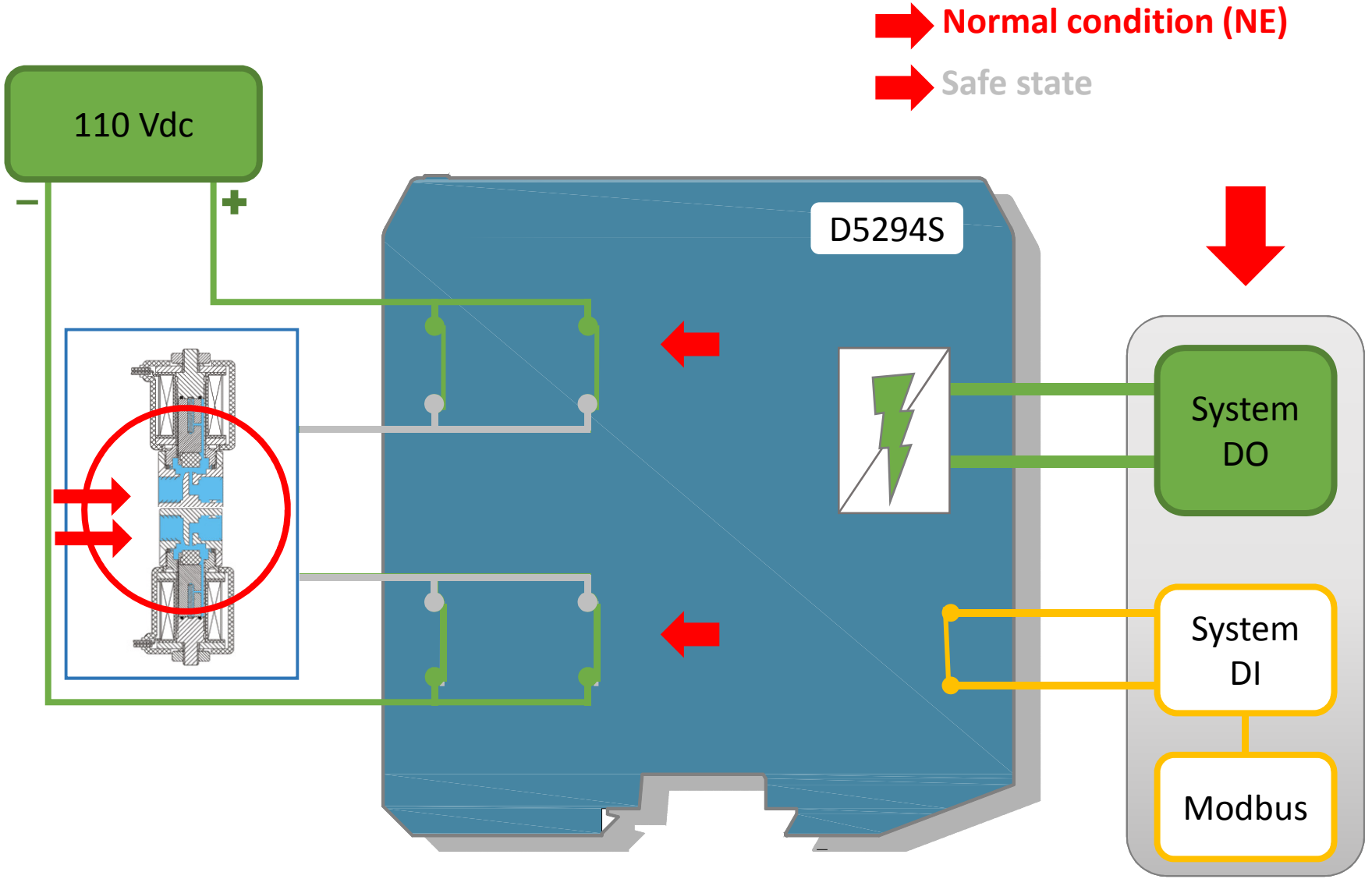
NORMALLY-ENERGIZED DOUBLE COIL SOLENOID VALVES



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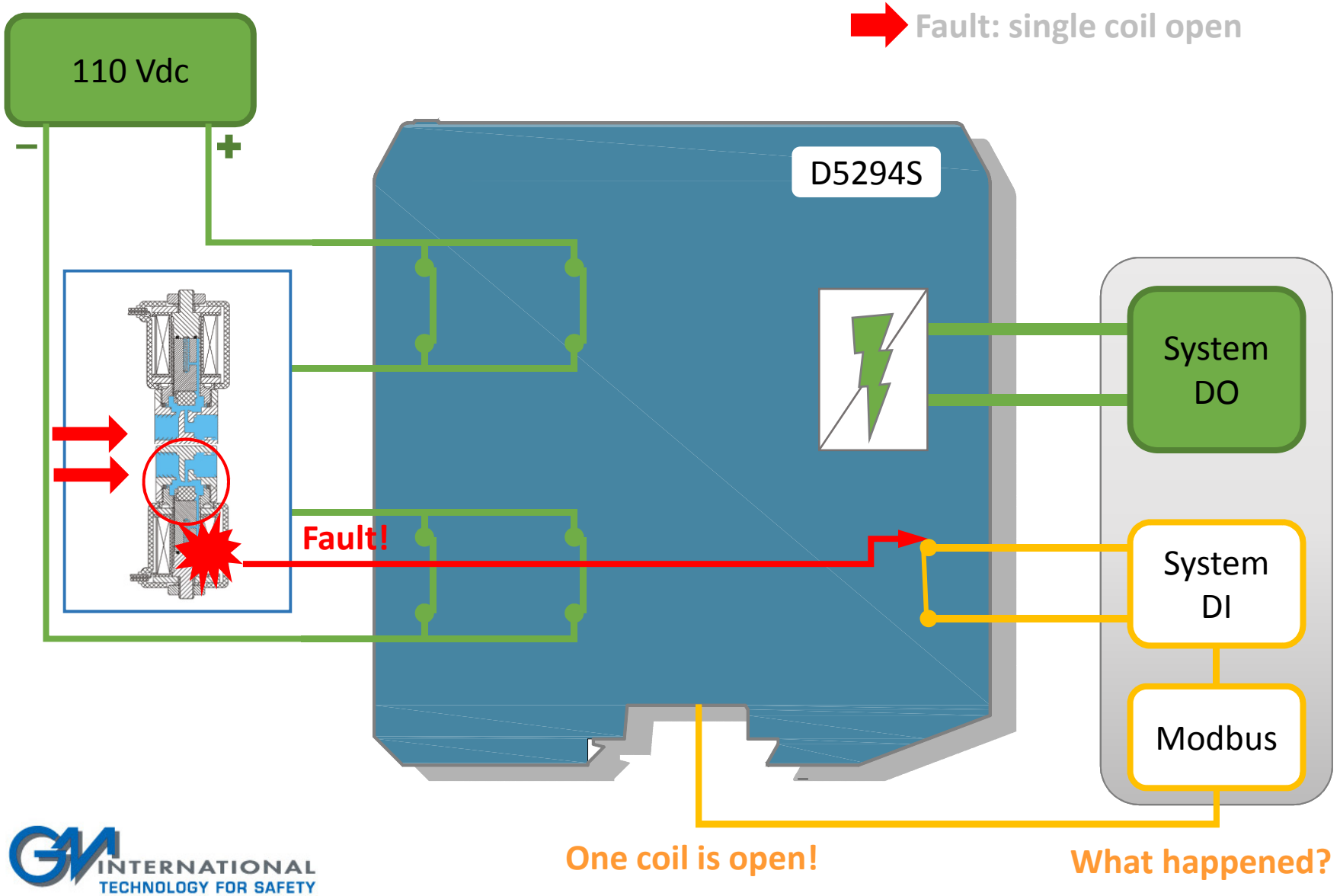
NORMALLY-ENERGIZED DOUBLE COIL SOLENOID VALVES

Normal Condition (NE)

Fault: single coil open



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SINGLE – PHASE LOAD INTERRUPTION

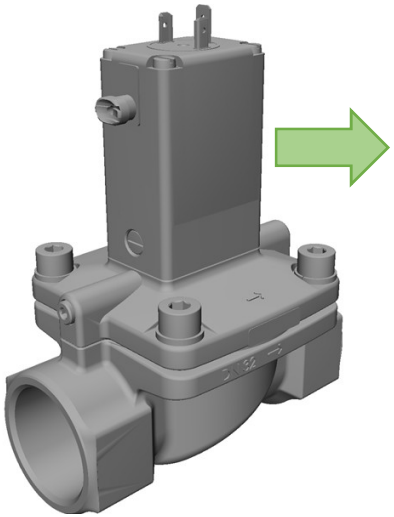
Command /Power

Diagnostics

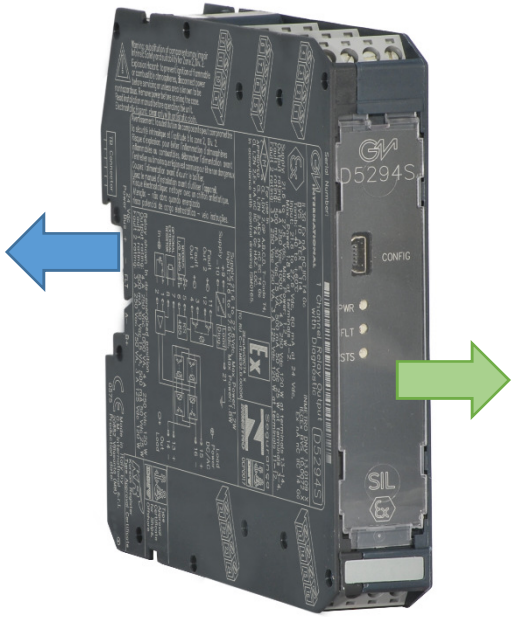
220 Vac Supply

Project record #5

System: *Honeywell C300*
Load: *Solenoid valve*
Model: *D5294S*



Sounder



D5294S
D5096S

System

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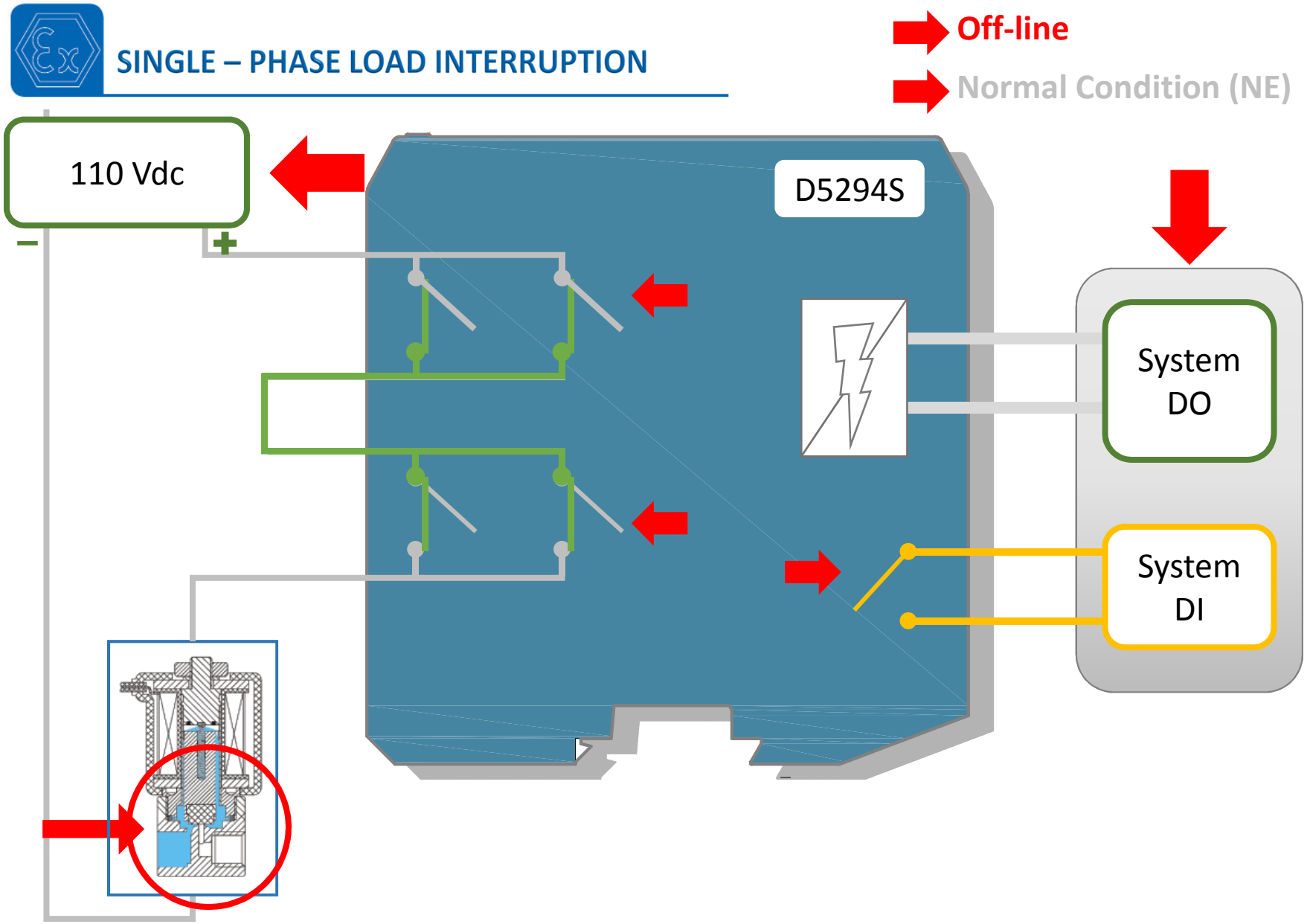
SINGLE – PHASE LOAD INTERRUPTION



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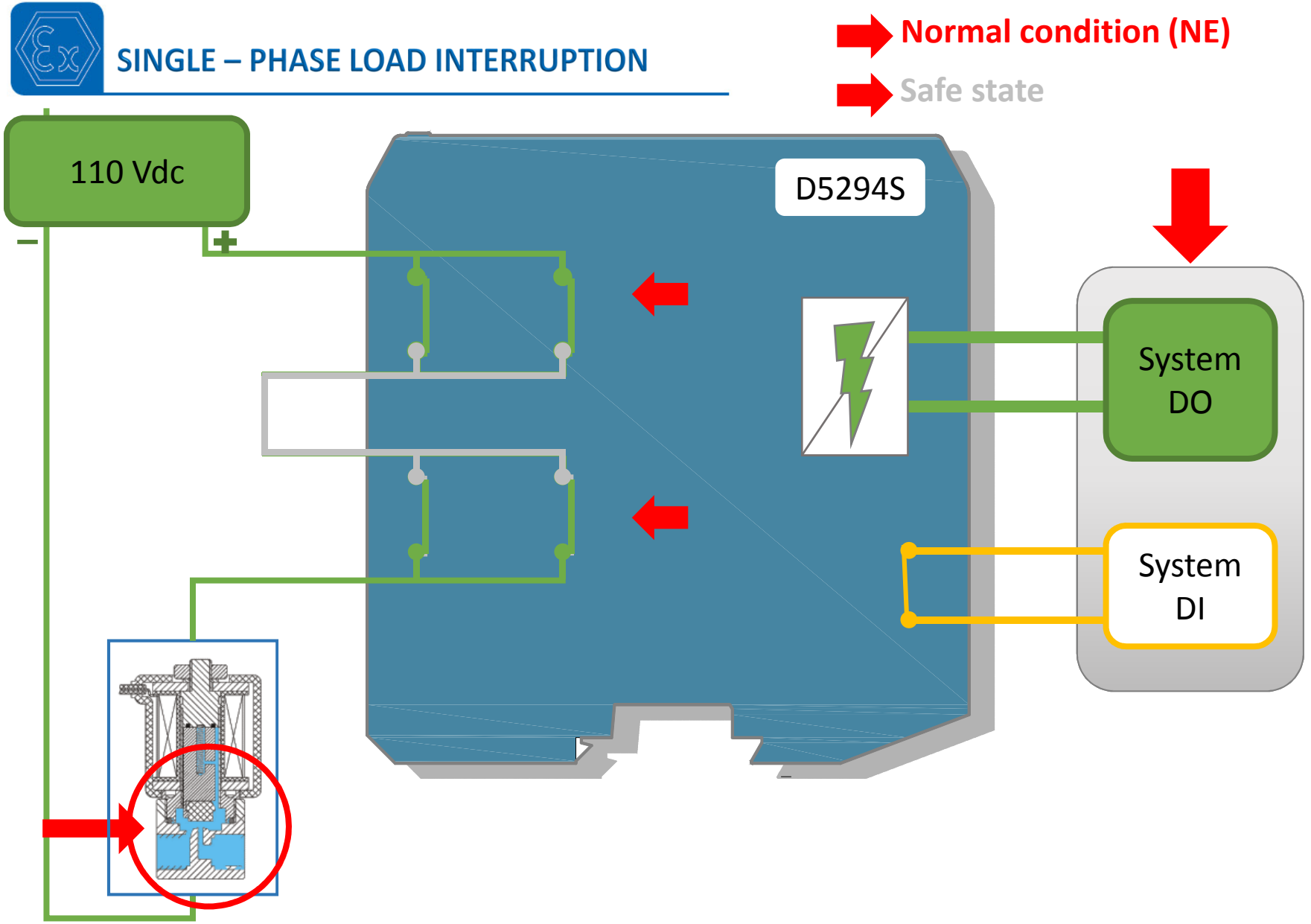
SINGLE – PHASE LOAD INTERRUPTION



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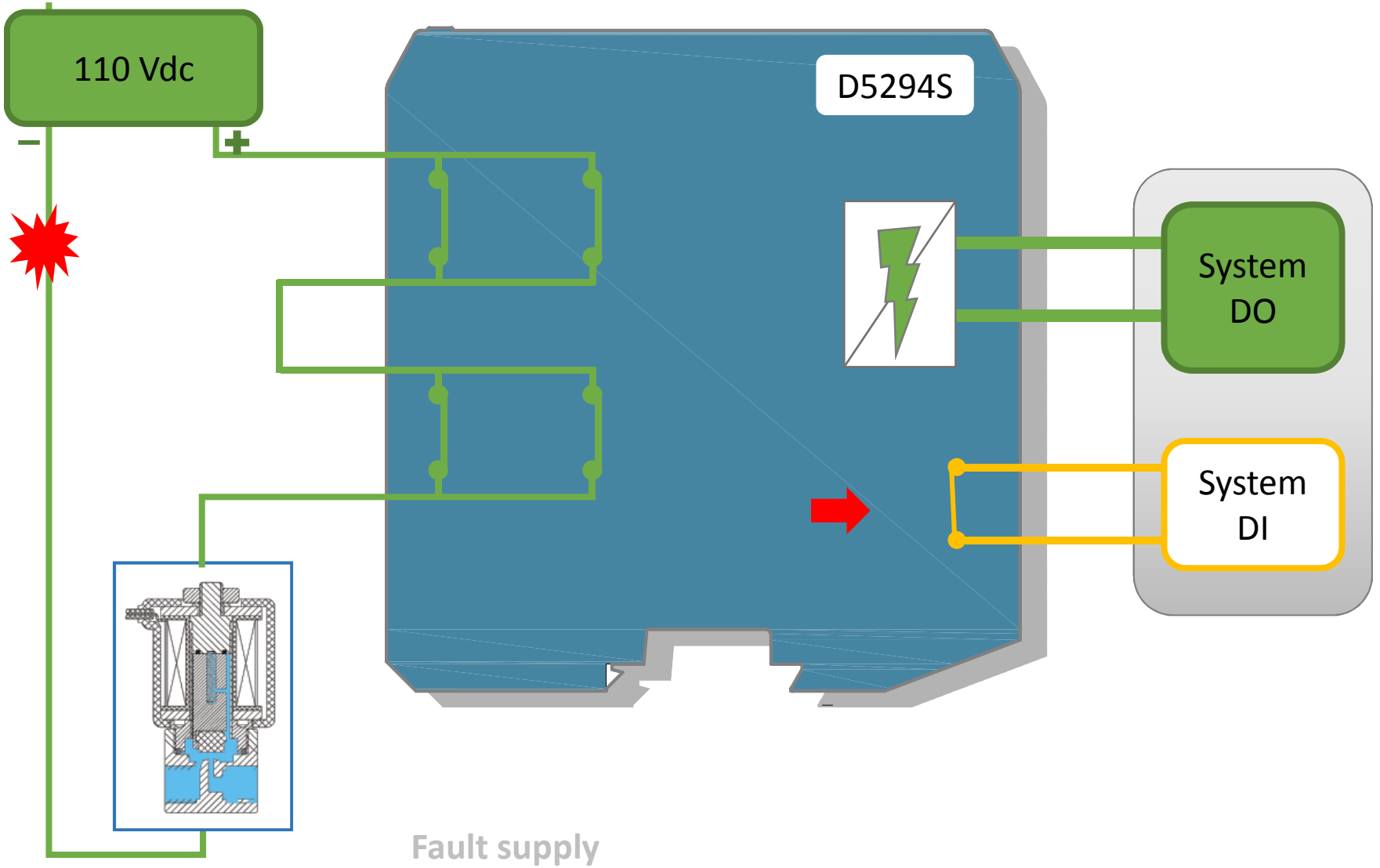
SINGLE – PHASE LOAD INTERRUPTION

DETECTABLE FAULTS



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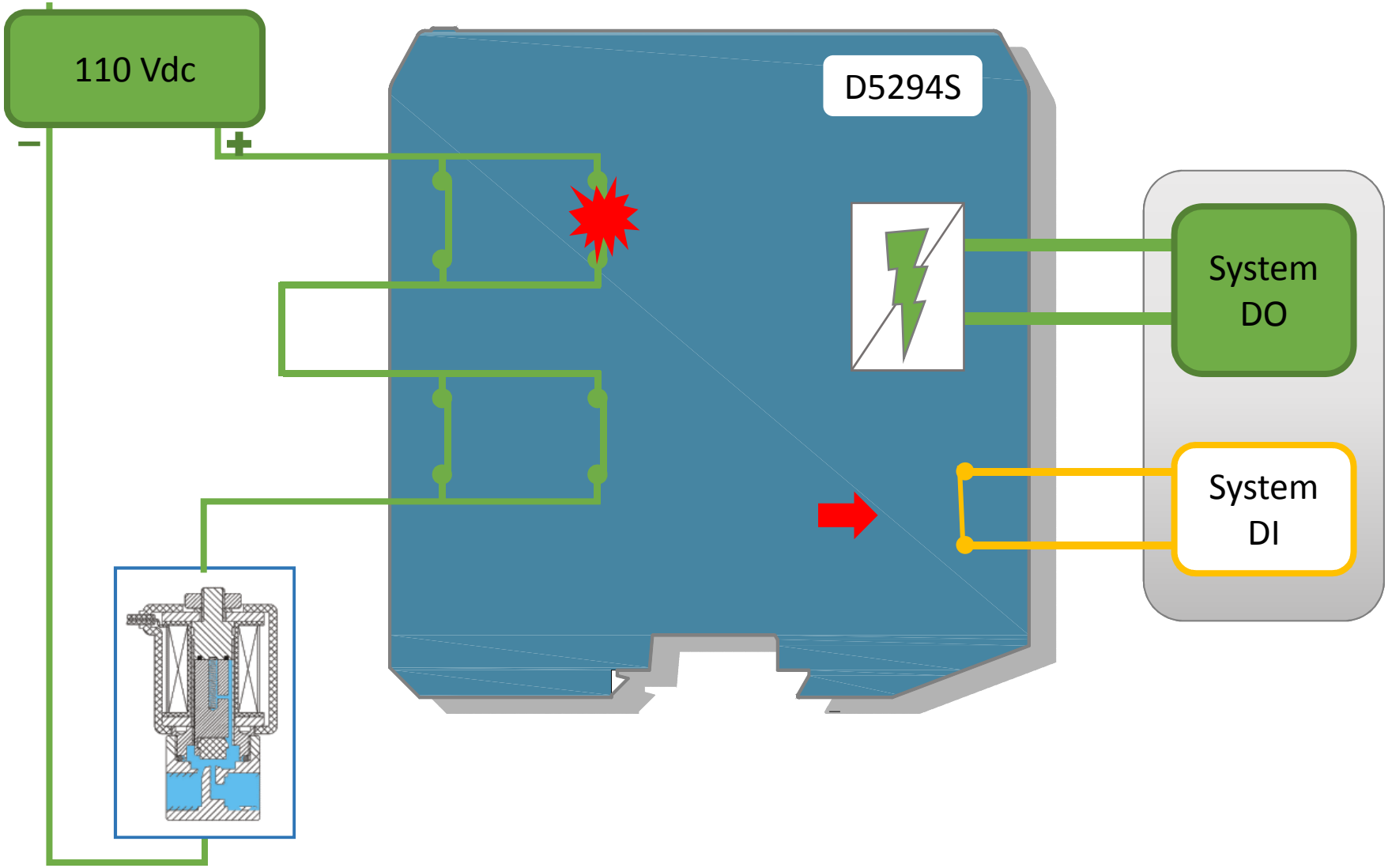
TECHNOLOGY FOR SAFETY

SINGLE – PHASE LOAD INTERRUPTION

DETECTABLE FAULTS



Internal coil fault

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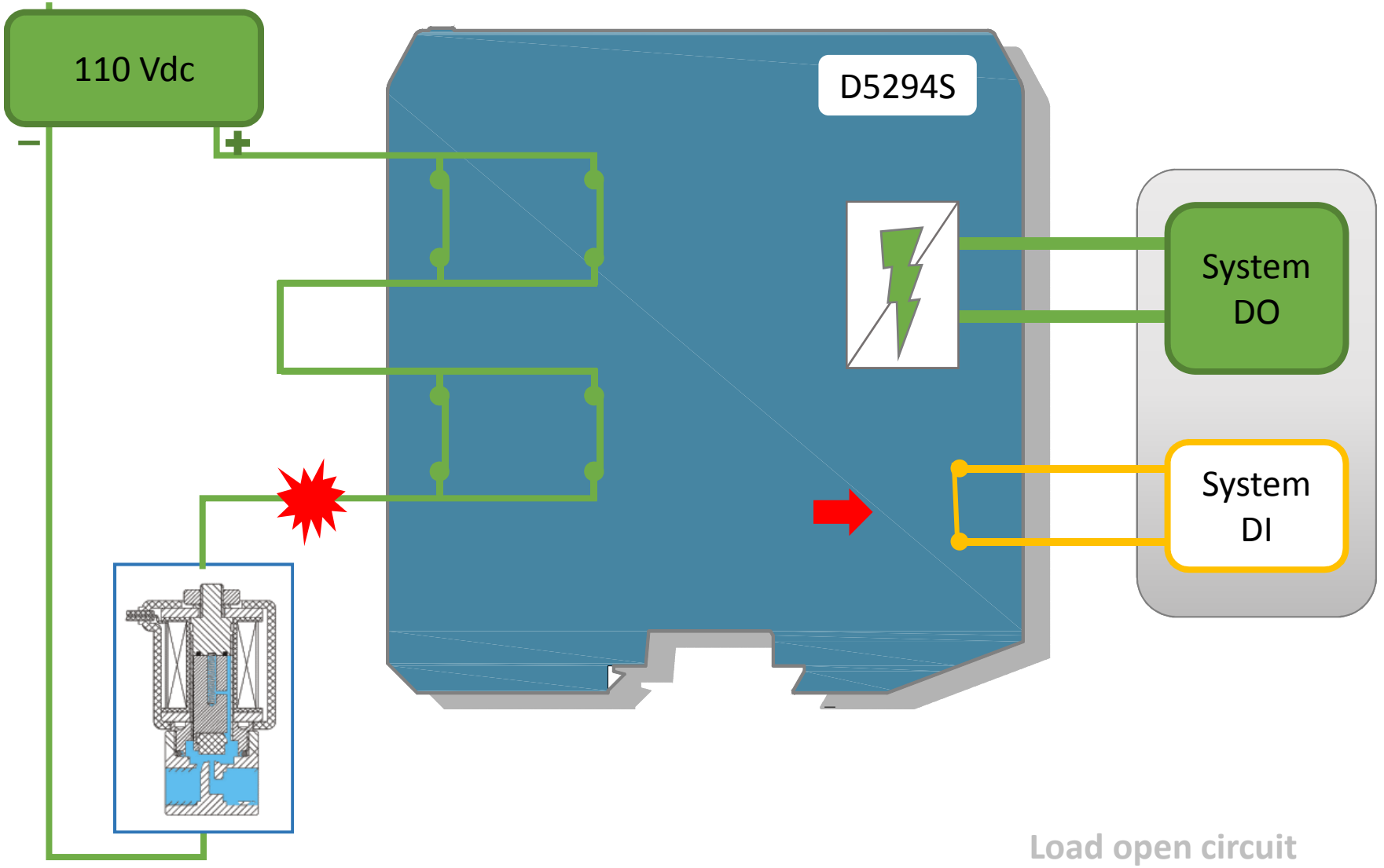
SINGLE – PHASE LOAD INTERRUPTION

DETECTABLE FAULTS



Load open circuit

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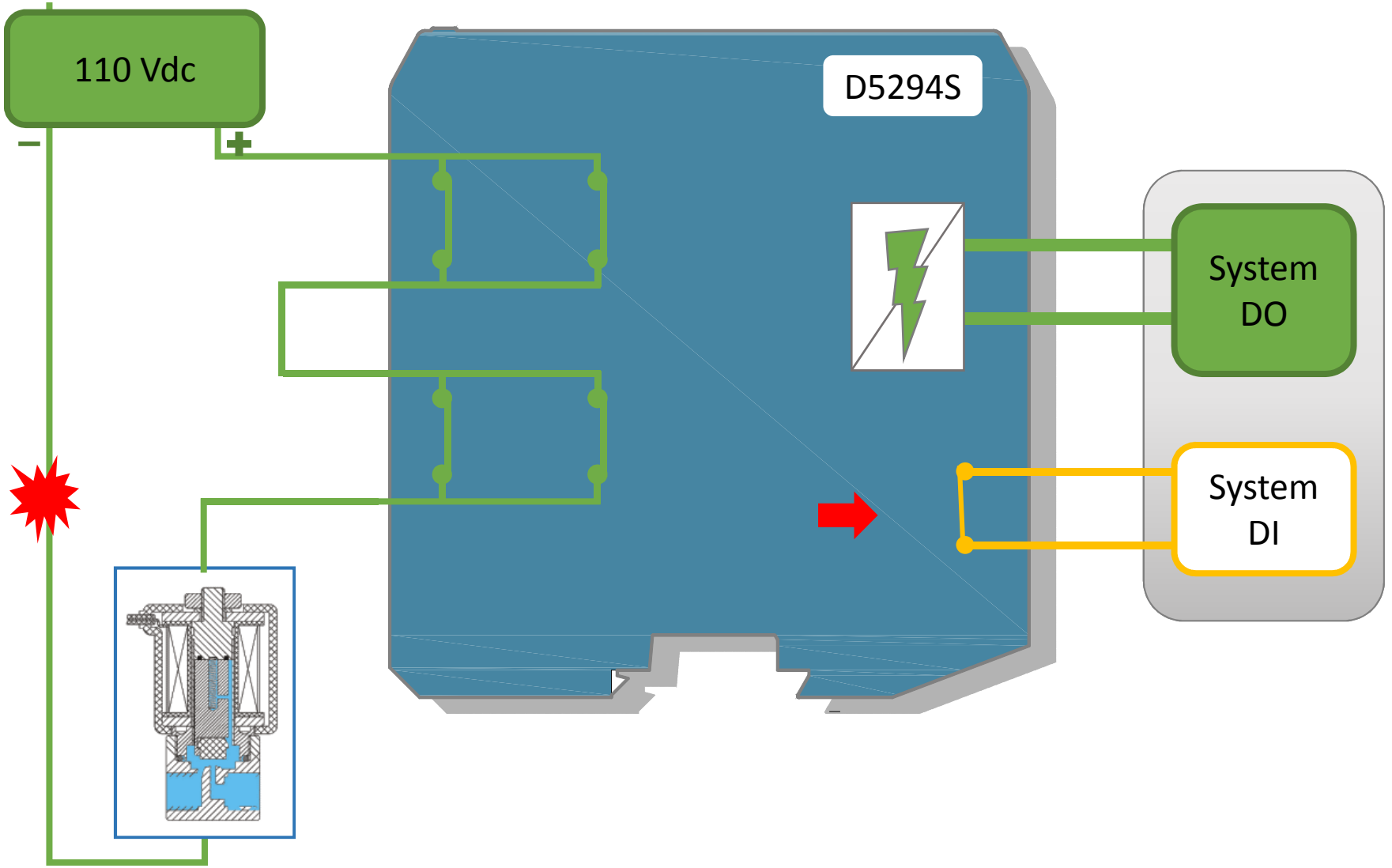
SINGLE – PHASE LOAD INTERRUPTION

DETECTABLE FAULTS



Load short circuit

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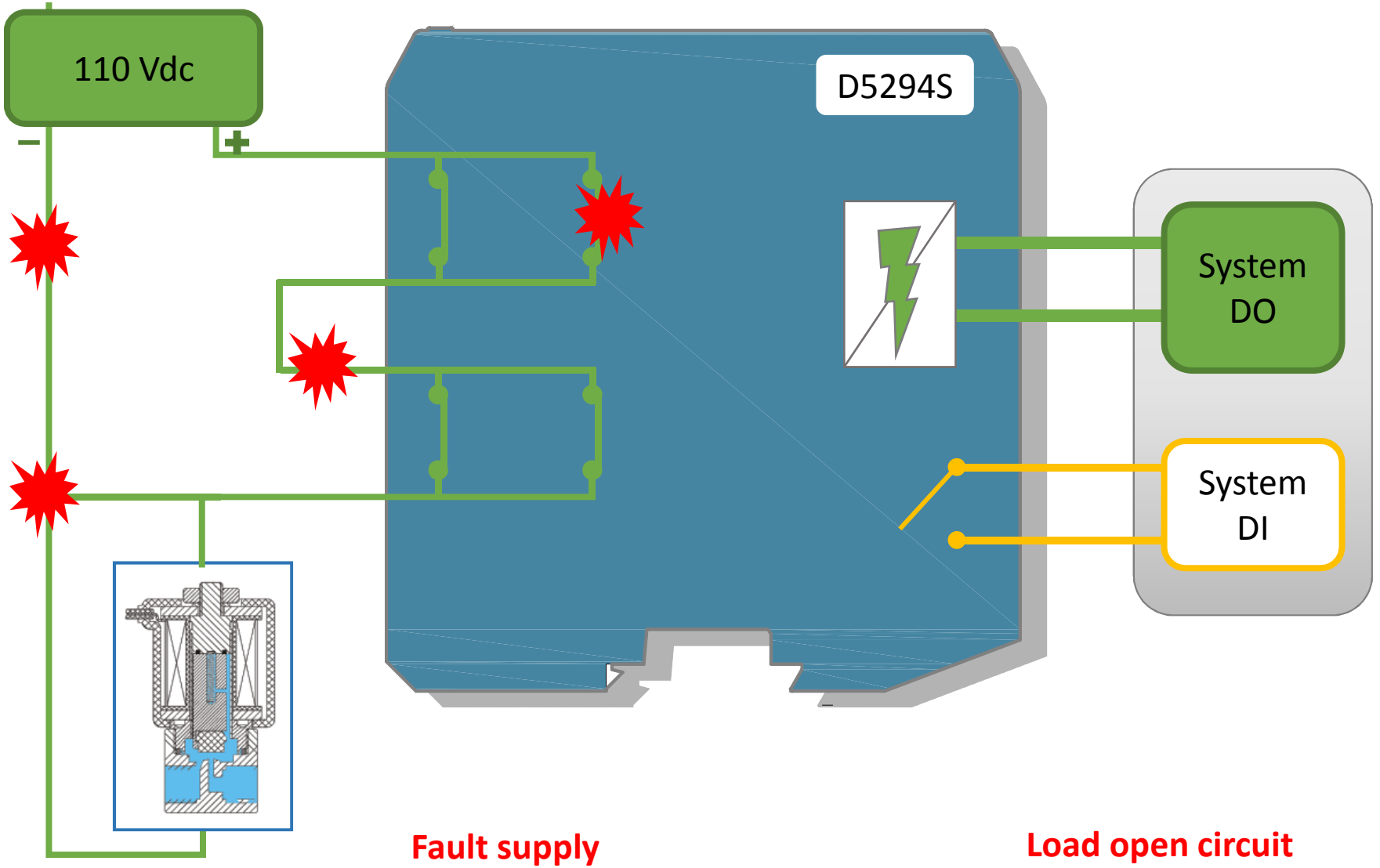
SINGLE – PHASE LOAD INTERRUPTION

DETECTABLE FAULTS



Fault supply

Internal coil fault

Load open circuit

Load short circuit

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TECHNOLOGY FOR SAFETY

OUTLINE

1. What Are Smart Relays?
   a. Relays + Diagnostics
   b. Models: D5096S, D5097S, D5293S, D5294S and D5295S

2. Why Choosing Smart Relays?

3. Real-World Applications
   a. Normally-Energized solenoid valves
   b. Strobes/beacons for Fire & Gas applications
   c. Dual tone sounders for Fire & Gas applications
   d. High-availability double-coil solenoid valves
   e. Single-phase load interruption solenoid valves

4. Conclusions

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CONCLUSIONS

1. Coil-to-contact SIL 3 -TUV Certified

2a. D5293S, D5294S, D5295S Complete Load & Line Diagnostics (SIL 2):
   a. Configurable voltage on load
   b. Configurable Current on load
   c. Configurable Load resistance (patented)
   d. Configurable Leakage from load to earth
   e. Coil integrity, internal faults

2b. D5096S, D5097S Load & Line Diagnostics :
   a. Line open & short circuit
   b. Load open & short circuit
   c. Load supply presence

3. Modbus RTU RS485 supported (only D5293S, D5294S, D5295S)

4. Compatible with DO Card Line Monitoring Pulse Test

5. Fault mirroring to the DO Card

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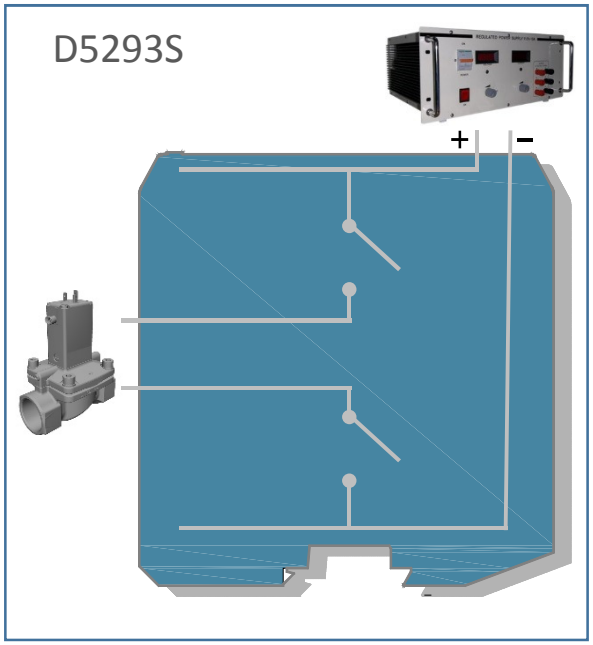
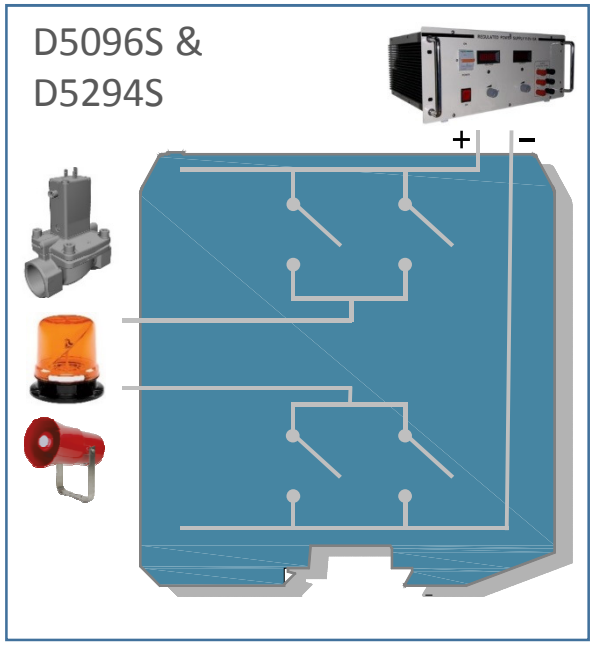
CONCLUSIONS

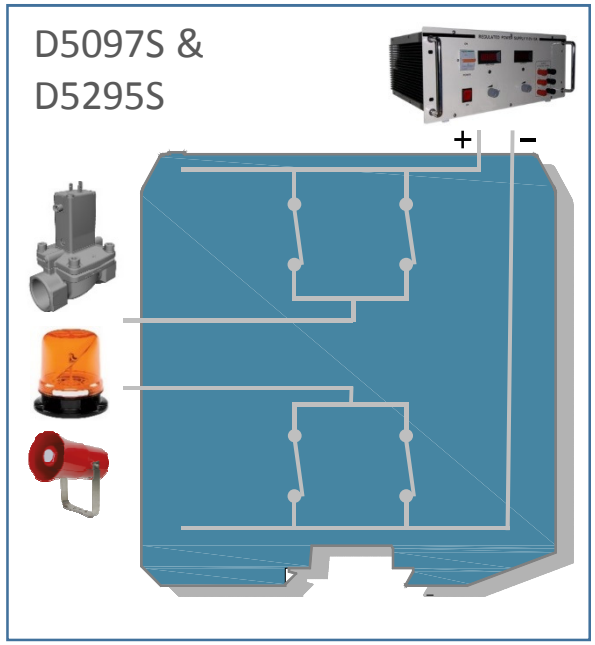
6. Suitable for many applications



- 2 NO Contacts in series
- **For NE or ESD Applications**



- 2 x 2 NO Contacts
- **For F&G or ND Applications / NE high availability**



- 2 x 2 NC Contacts
- **For F&G or ND Applications / NE high availability**

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