Solenoid Valve for Improved Spurious Trip Rate

The below drawings are guidelines ONLY, and should be modified/changed for site specific conditions. Guidelines are not specific to customer need, application, process conditions, environmental conditions, and safe state functions and should be finalized in consultation with the customer before implementation. Reference to make and model number of specified third party vendor products is not to be construed as an endorsement from Emerson Process Management—Fisher Controls International LLC.

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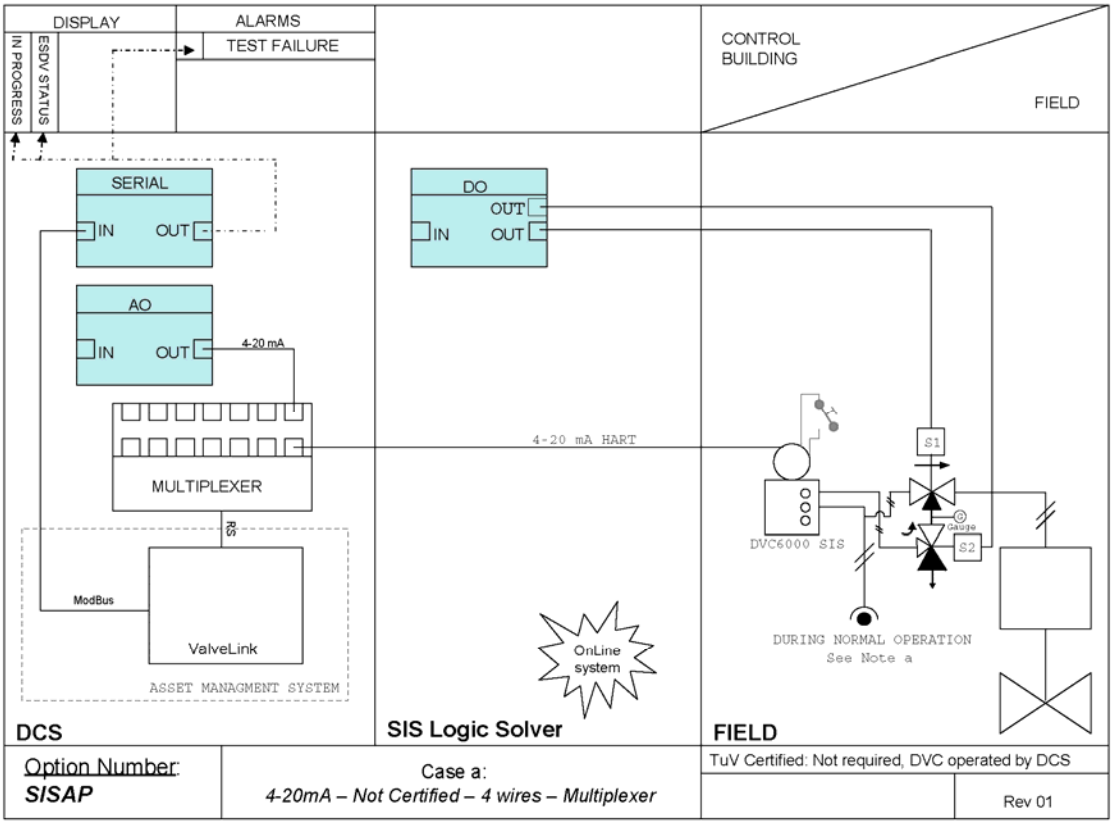
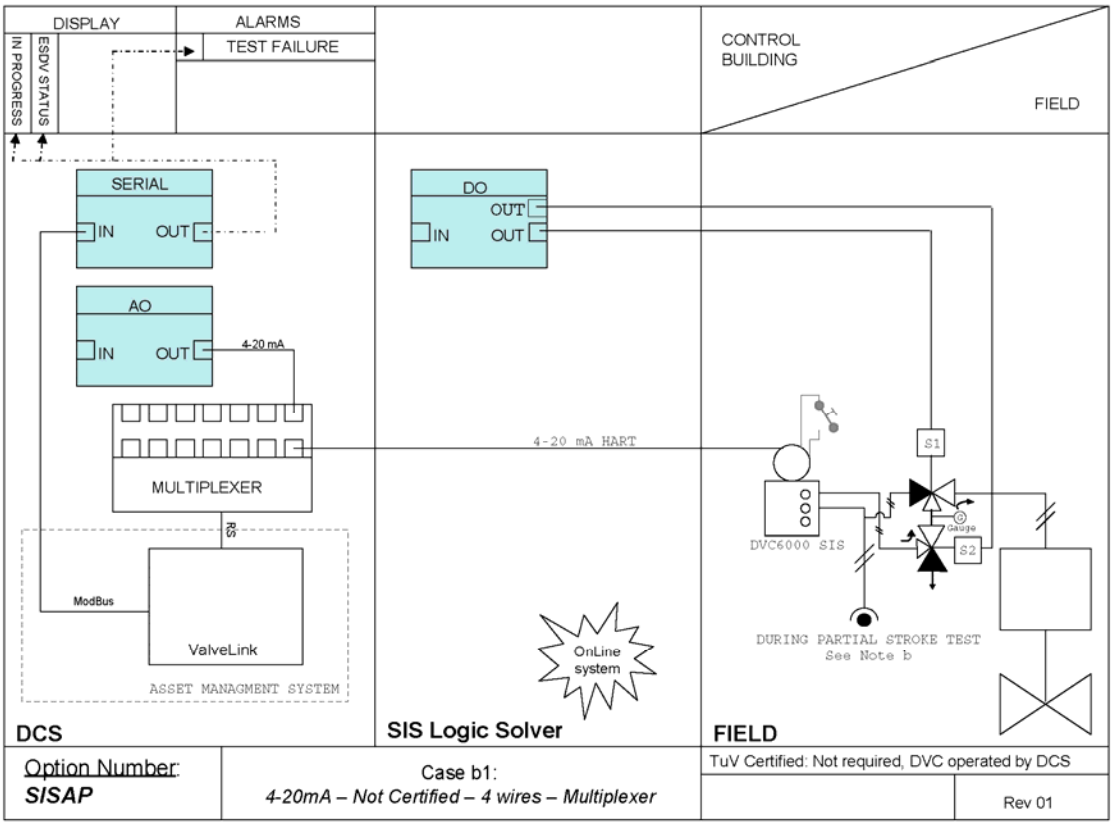
Coil burning used to be a concern when older plants were using 110V AC/DC or other combinations of electrical ratings to operate solenoid valves used for SIS applications. Though industry has moved away from 110V AC/DC and all newer plants are designed to operate solenoid valves by 24VDC for SIS applications, the likelihood of coil burning is lower because solenoid valves are available in low power consumption versions as well as high temperature coil construction.

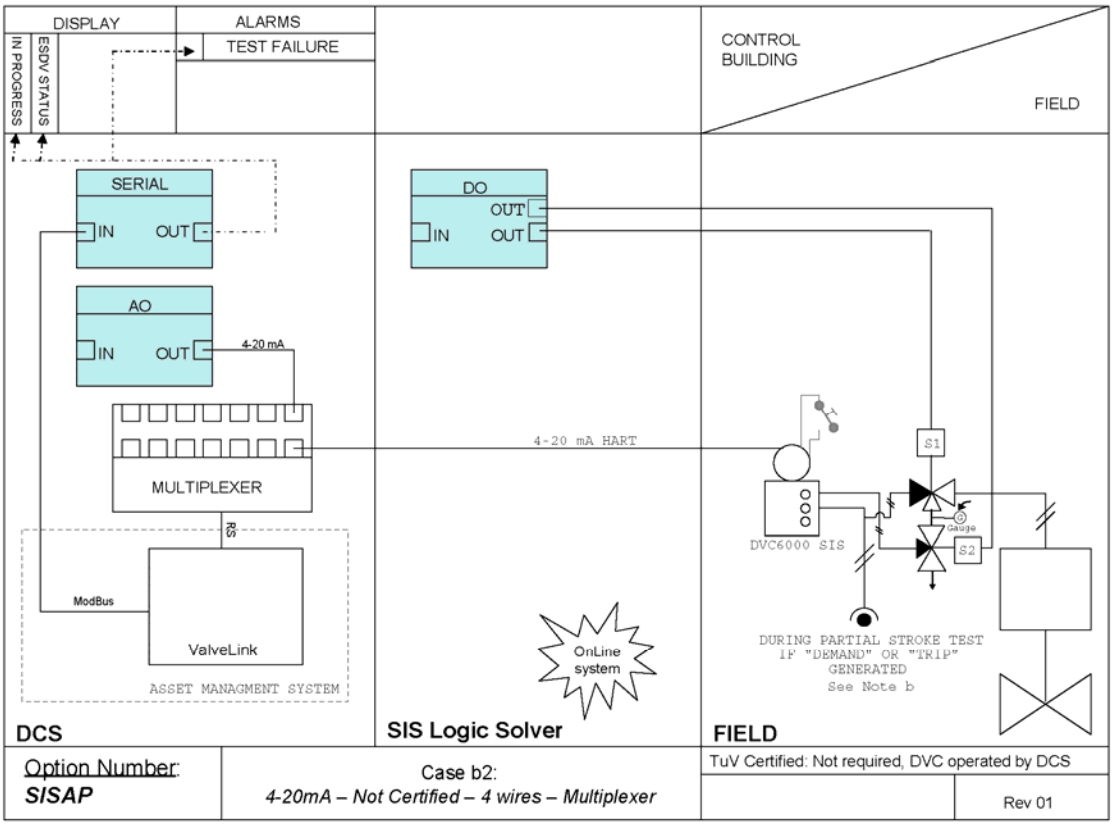
However, “plant availability” is still the key factor and customers still think that under such circumstances plant operation should not be compromised.

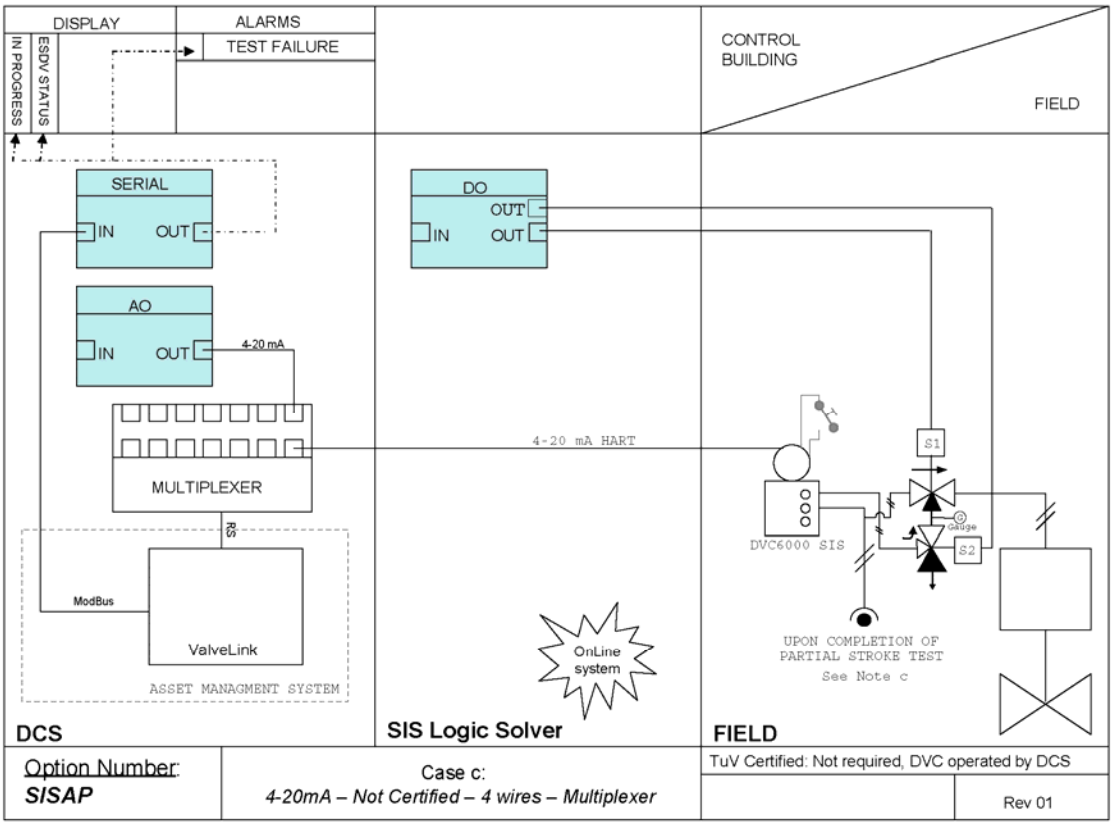
The attached schematics are one possible way to keep spurious trip rates lower by using two solenoid valves. There are various possible pneumatic hookups when using a DVC6000 SIS with one or two solenoid valve configurations. However, final selection depends on customer preference.

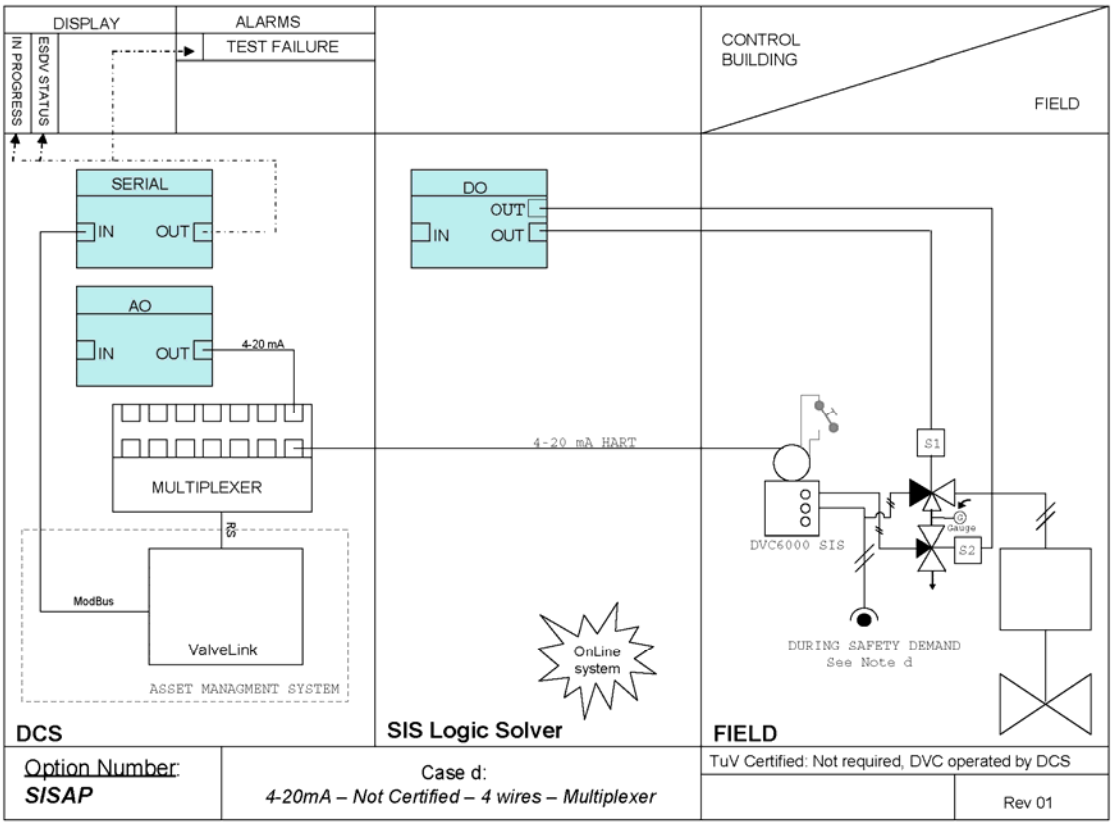
The attached schematic show a DVC6000 SIS operated by a 4-20 mA (point to point mode), but it is also possible to use a DVC6000 SIS operated by a 0-24VDC (multi-drop mode) binary signal from logic solver or DCS. A DVC6000 SIS in multi-drop mode needs a line conditioner or external HART impedance device such as a MUX with a HART pass through.


DISPLAY
ALARMS
IN PROGRESS
ESDV STATUS
TEST FAILURE
CONTROL BUILDING
FIELD
SERIAL
IN
OUT
AO
IN
OUT
4-20 mA
MULTIPLEXER
RS
ModBus
ValveLink
ASSET MANAGMENT SYSTEM
DO
OUT
IN
OUT
4-20 mA HART
OnLine system
DVC6000 SIS
S1
S2
Gauge
DURING NORMAL OPERATION
See Note a
DCS
SIS Logic Solver
FIELD
Option Number:
SISAP
Case a:
4-20mA – Not Certified – 4 wires – Multiplexer
TuV Certified: Not required, DVC operated by DCS
Rev 01


DISPLAY
ALARMS
IN PROGRESS
ESDV STATUS
TEST FAILURE
CONTROL BUILDING
FIELD
SERIAL
IN
OUT
DO
OUT
IN
OUT
AO
IN
OUT
4-20 mA
4-20 mA HART
MULTIPLEXER
RS
ModBus
ValveLink
ASSET MANAGMENT SYSTEM
DVC6000 SIS
S1
S2
Gauge
DURING PARTIAL STROKE TEST
See Note b
OnLine system
DCS
SIS Logic Solver
FIELD
Option Number:
SISAP
Case b1:
4-20mA – Not Certified – 4 wires – Multiplexer
TuV Certified: Not required, DVC operated by DCS
Rev 01


DISPLAY
ALARMS
IN PROGRESS
ESDV STATUS
TEST FAILURE
CONTROL BUILDING
FIELD
SERIAL
IN
OUT
DO
OUT
IN
OUT
AO
IN
OUT
4-20 mA
4-20 mA HART
MULTIPLEXER
RS
ModBus
ValveLink
ASSET MANAGMENT SYSTEM
DVC6000 SIS
S1
S2
Gauge
DURING PARTIAL STROKE TEST
IF "DEMAND" OR "TRIP"
GENERATED
See Note b
OnLine system
DCS
SIS Logic Solver
FIELD
Option Number:
SISAP
Case b2:
4-20mA – Not Certified – 4 wires – Multiplexer
TuV Certified: Not required, DVC operated by DCS
Rev 01


DISPLAY
ALARMS
IN PROGRESS
ESDV STATUS
TEST FAILURE
CONTROL BUILDING
FIELD
SERIAL
IN
OUT
DO
OUT
IN
OUT
AO
IN
OUT
4-20 mA
4-20 mA HART
MULTIPLEXER
DVC6000 SIS
S1
S2
Gauge
RS
ModBus
ValveLink
ASSET MANAGMENT SYSTEM
OnLine system
UPON COMPLETION OF PARTIAL STROKE TEST
See Note c
DCS
SIS Logic Solver
FIELD
Option Number:
SISAP
Case c:
4-20mA – Not Certified – 4 wires – Multiplexer
TuV Certified: Not required, DVC operated by DCS
Rev 01


DISPLAY
ALARMS
IN PROGRESS
ESDV STATUS
TEST FAILURE
CONTROL BUILDING
FIELD
SERIAL
IN
OUT
DO
OUT
IN
OUT
AO
IN
OUT
4-20 mA
4-20 mA HART
MULTIPLEXER
RS
ModBus
ValveLink
ASSET MANAGMENT SYSTEM
DVC6000 SIS
S1
S2
Gauge
DURING SAFETY DEMAND
See Note d
OnLine system
DCS
SIS Logic Solver
FIELD
Option Number:
SISAP
Case d:
4-20mA – Not Certified – 4 wires – Multiplexer
TuV Certified: Not required, DVC operated by DCS
Rev 01

NOTES:

De-Energize to Trip (DETT) System, Normally OPEN Valve, CLOSES Upon "SAFETY DEMAND"

a) Normal Operation - Valve OPEN
S1 and S2 are energized by the SIS Logic Solver

b) During the Partial Stroke Test -
S1 is de-energized by the SIS Logic Solver. The digital valve controller is pneumatically connected through S2 to S1 to actuator. The digital valve controller performs the partial stroke test. If during the partial stroke test the SIS trip signal is generated, S2 is de-energized and the valve moves to the fail safe state.

c) Upon Completion of the Partial Stroke Test -
S1 energizes, and the digital valve controller output is blocked through exhaust port of S1 through S2.

d) During Safety Demand - Valve CLOSED
S1 and S2 are de-energized by the SIS Logic Solver, air from the actuator is exhausted by S1 and S2, and the valve moves to the fail safe state.

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