# SCC Inc.

# TS Series

## TS-CE… Combustion Enclosures with LMV5…



## Description

TS-CE… series combustion enclosure with Siemens LMV5 linkageless controller sets the standard for combustion control and monitoring technologies. The preprogrammed touchscreen and optional PLC annunciation packages provide monitoring, configuration flexibility, and simple connectivity to an SCC Master Lead/Lag panel for any boiler and burner/boiler installation. The TS-CE… combustion enclosure also provides easy installation.

The TS-CE… combustion control panels with LMVs provide a common centralized center to monitor and retrieve information, resulting in efficient operation of the burner.

All burner flame safeguard and combustion safety control is performed by the advanced Siemens linkageless controller.

Touchscreen options include Modbus TCP/IP communication to a separate master lead/lag panel, or to a third party BMS, as standard with touchscreens. Optional capability to communicate with building management systems is available via Modbus RTU, RS232 or RS485 connections, Johnson Metasys N2, BACnet MS/TP or BACnet IP, Ethernet/IP, LonWorks, Profinet, and Profibus.

## Features

TS-CE… combustion enclosure with LMV52 is UL 508 listed and includes the following:

- 6", 10", 12" and 15" touchscreen option
- LMV51 or LMV52 Siemens linkageless control and flame safeguard
- Backlit AZL52 display
- Control for up to six (6) SQM45/48/91 actuators, up to 5 simultaneously
- Programmable logic controller (PLC)
- Steam or hot water boiler control
- Flame supervision and flame strength monitoring
- UV or IR scanners
- Single or dual fuel
- Oil pump control
- Blower motor control
- Atomizing compressor control
- Lead/lag ready with SCC TS… master lead/lag panel
- VSD control
- Blower motor sensor for motor RPM monitoring
- $O_2$ trim and monitoring, with LMV52 only
- Efficiency calculation with $O_2$, with LMV52 only
- Thermal shock protection, PT1000 RTD required for steam boilers
- Low fire hold based on temperature setpoint
- Temperature based stepping start
- Time based stepping start
- Combination of temperature and time based stepping start
- FGR low temperature hold
- Shell water temperature monitoring
- External and proven interlocks
- Actuator position display
- LMV5 lockout and fault history
- Stack temperature monitoring
- Burner operation phase display
- Local touchscreen interface with Siemens LMV…/RWF controllers
- Configurable boiler graphics and field tag information
- LMV… static, fuel, lockout, and error history displayed
- Fuel-Air Ratio control curve displayed on touchscreen
- Alarm history for most recent 250 faults/alarms
- Detailed annunciation of LMV… digital inputs and outputs

- Variable Speed Drive information and setup when preprogrammed VFD provided by SCC Inc.
- Remote setpoint, firing rate, and/or enable the LMV… or RWF… via BMS
- Standard or Metric units display
- English or Spanish languages
- Local touchscreen interface with Siemens LMV/RWF controllers, and VFDs.
- Boiler graphics and field tag information are field-configured
- LMV… static, fuel and internal lockout and error history displayed
- Fuel-air ratio control curve displayed
- Alarm history stored for most recent 250 faults/alarms
- Detailed annunciation of LMV… digital inputs and outputs
- Remote setpoint, firing rate and/or enable of the LMV… or RWF… via BMS
- Water level control option and status via RWF55, or PLC
- One or three element feedwater control
- Circulating pump VFD control hot water boilers
- Metric or Standard units displayed
- Clear English or Spanish text for alarms
- Circulating pump/isolation valve control outputs for hydronic boilers (option with expanded annunciator)
- Expanded annunciator options include:
  - Four analog inputs with field configurable label, span and type (0-10V, 2-10V, 0-20mA or 4-20mA), low and high alarm setpoints, with auto or manual reset.  Totalization available per minute or per hour.
  - Two analog outputs with field configurable span and type (0-10V, 2-10V, 0- 20mA or 4-20mA); low and high alarm setpoints, with auto or manual reset.  Totalization available per minute or per hour.
  - Two dedicated analog outputs for circulating pump VFD control, and water level control, with field configurable span (4-20mA); low and high alarm setpoints, with auto or manual reset.
  - Twelve universal inputs to be field configured for either 1000, or 100 ohm RTDs, or thermocouples type K, or J temperature inputs, analog inputs 4-

20mA, with field configurable label, low and high alarm setpoints, with auto or manual reset.
- Two digital outputs with field configurable logic, including on and off delays. Manual or automatic reset.
- Eight field configured monitored value output relays
- First-out annunciation option, including Thirty 120 VAC inputs with field labeling capability
- Eight selectable data logging variables stored in CSV format on USB drive.
- Four selectable variables for trending up to 7 days.
- Economizer temperature monitoring.
- Draft control with SQM5 actuator.
- Connection for two additional RWF55 controllers.

- Screen saver with PV, setpoint, demand, and status
- Standard Modbus TCP/IP to BMS communications
- Additional BMS communication options available
- Email communications and text messaging for up to six (6) recipients include alarms, faults, and screen shots (screen shot viewer via USB)
- Remote monitoring via mobile device (smartphone, tablet, etc.)
- Compatible with SCC Master Panel Lead/Lag system

## Application

TS-CE…combustion enclosure panels with LMV5 systems are suited for hot water and steam boilers, with up to 600 in/lb. of actuators torque, for single or dual fuel applications.

## Standard Components

- LMV5 linkageless parallel positioning flame safeguard
- LMV5 CANbus power supply transformer
- Power fail relay
- System alarm
- Circuit breaker, 3 Amp, single pole
- Circuit breaker, 10 Amp, single pole
- Non-fused disconnect switch
- Burner ON/OFF switch
- Fuel selector switch
- Safety limits powered, white indicator light
- Safety limits complete, green indicator light
- Pilot burner ON, yellow indicator light
- Gas valve open, blue indicator light
- Oil valve open, yellow indicator light
- Power fail, red illuminated indicator light with reset push button
- Low water, red illuminated indicator light with reset push button
- LMV lockout, red illuminated indicator light with reset push button
- Alarm reset push button
- Alarm horn
- Gray terminals, general
- White terminals, 120 VAC neutral
- Black terminals, 120 VAC hot
- Red terminals, 24 VDC +
- Blue terminals, 24 VDC -
- Orange terminals, 24 VAC
- Yellow terminals, dry contact powered from second source
- Green non-grounding, shield terminals
- Green/yellow PE terminals

## Optional Components

- 6", 10", 12" or 15" touchscreen
- Programmable Logic Controller with additional annunciation inputs/outputs
- Additional digital inputs and outputs for various boiler applications such as coil boilers
- Second CANbus power transformer fuse protection with fuses and fuse holder
- LWCO manual, auto reset, or dual function with high water alarm Warrick relays for probe type level control
- Draft control with Siemens SQM5 actuator with type "A" control board only
- Analog inputs/outputs for water Level one or three element PLC feedwater control
- Analog inputs/outputs for circulating pumps steam or hot water PLC VFD control
- Fan air cooling
- Additional RWF... external load or water level controller
- BMS communication options other than Modbus TCP/IP
- Three phase 480 VAC power option includes the following:
    - Main three phase fused disconnect 30Amps/ 60Amps/100 Amps
    - VSD three phase fuses and fuse holders
    - Blower motor starter for up to 20hp with overload and built in disconnect
    - Oil motor starter for up to 10hp with overload and built in disconnect
    - Compressor motor starter for up to 20hp with overload and built in disconnect
    - 1000 VA circuit control transformer
- Deaerator/Surge control panels (See TS-3000)
- Master lead/lag control panels (See TS-2000)

# Product Part Numbers

```
TS  -  CE   2    1    X  -  0    D    4    D  -  S    1    3    1  -  X    X    X    X
```

**Touchscreen**
**Combustion Enclosure**
**LMV Model**
 1 = LMV51.140C1
 2 = LMV52.240B1
 4 = LMV52.440B1
**LMV Transformer**
 1 = (1) AGG5.210 transformer
 2 = (2) AGG5.210 transformers
**Load Controller (LC) or Water Level (WL)**
 X = LMV5 internal load control no RWF5 included
 1 = RWF50.30A9 external load controller
 2 = RWF50.30A9 water level controller with SKB/C/D transformer
 3 = RWF55.50A9 external load controller
 4 = RWF55.50A9 water level controller with SKB/C/D transformer
 5 = (2) RWF50.30A9 for load/WL control w/ SKB/C/D transformer
 6 = (2) RWF55.30A9 for load/WL control w/ SKB/C/D transformer
**Touch Screen**
 X = No touchscreen    2 = 12" touchscreen
 6 = 6" Schneider touchscreen  5 = 15" touchscreen
 0 = 10" Schneider touchscreen
 A = 6" touchscreen w/bezel for future 10" TS (10" TS ordered separately)
 B = No touchscreen, bezel for future 10" TS (10" TS ordered separately)
**Draft Control**
 X = No Draft Control
 D = Draft control
**PLC Circulating Pump VFD/Water Level Control/Additional Digital Inputs Outputs**
**(Touchscreen/Annunciation Selection Required)**
 X = No feedwater or circulating pump VFD control included
 3 = PLC three elements feedwater and level control (Steam boilers only)
 4 = PLC single element feedwater and level control (Steam boilers only)
 5 = PLC circulating pump VFD, and water level control
 6 = PLC circulating pump VFD/Water level control, and additional 2 digital inputs/8 digital outputs
 7 = Additional (2) digital Inputs and (8) digital outputs
**Annunciation and Monitoring (Touchscreen Selection Required)**
 X = No annunciation inputs
 A = Standard annunciation, (14) 120 VAC inputs
 B = (14) 120 VAC inputs, (4) analog inputs, and (2) analog outputs
 C = (14) 120 VAC inputs and (4) universal inputs* (AI, RTD, or TC)
 D = (14) 120 VAC inputs and (8) universal inputs* (AI, RTD, or TC)*
 E = (14) 120 VAC inputs and (12) universal inputs* (AI, RTD, or TC)
 F = (14) 120 VAC inputs, (4) analog inputs, (4) universal inputs* (AI, RTD, or TC), and (2) analog outputs
 G = (14) 120 VAC inputs, (4) analog inputs, (8) universal inputs* (AI, RTD, or TC), and (2) analog outputs
 H = (14) 120 VAC inputs, (4) analog inputs, (12) universal inputs* (AI, RTD, or TC), and (2) analog outputs
 Z = Room available for annunciation to be added in future
**BMS Communication**
 X = Modbus RTU RS232 (standard option if TS not included)
 S = Modbus TCP/IP (standard option if TS included)
 B = BACnet /IP, or Ethernet/IP
 M = N2 Johnson Metasys, or BACnet MS/TP
 R = Modbus RTU RS485
 N = Profinet
 P = Profibus
**Enclosure (Powder Quoted Steel)**
 1 = NEMA 1
 2 = NEMA 12, includes cover over touchscreen and AZL/RWF (if applicable)
 4 = NEMA 4X (indoor), includes cover over AZL/RWF (if applicable)
 A = NEMA 1 with cooling fan
 B = NEMA 12 with cooling fan, includes cover over touchscreen and AZL/RWF and NEMA 12 fan filter (if applicable)
 C = NEMA 4X with cooling fan, includes cover over touchscreen/AZL/RWF, and Stainless Steel cover over fan (if applicable)
**Warrick Relays**
 X = None
 1 = One manual reset Warrick relay  E = One manual reset Warrick relay, and highwater alarm light only
 2 = One auto reset Warrick relay  F = One auto reset Warrick relay, and highwater alarm light only
 3 = One auto and one manual reset Warrick relays G = One auto and one manual reset Warrick relays, and highwater alarm light only
 D = High water alarm light only no Warrick relays H = Dual function Warrick manual reset LWCO and highwater alarm and light
 J = Dual function Warrick manual reset LWCO, highwater alarm and light, and Warrick auto reset LWCO
**Fuel**
 1 = Single fuel, gas    D = Single fuel, heavy oil nozzle purge, blower VFD purge proven
 2 = Dual fuel, gas/oil    E = Dual fuel, gas/heavy oil nozzle purge, VFD purge proven
 3 = Single fuel, oil    F = Single fuel, gas with blower starter purge proven
 4 = Single fuel, heavy oil with nozzle purge G = Dual fuel, gas/oil with blower starter purge proven
 5 = Dual fuel, gas/heavy oil nozzle purge H = Single fuel, oil with starter purge proven
 A = Single fuel, gas with blower VFD purge proven K = Single heavy oil nozzle purge, blower starter purge proven
 B = Dual fuel, gas/oil with blower VFD purge proven L = Dual fuel, gas/heavy oil nozzle purge, starter purge proven
 C = Single fuel, oil with blower VFD purge proven
**Voltage 3 Phase**
 X = 110-120 VAC, Internal 3 Phase not included
 4 = 440 - 480 VAC
**Blower Motor Horsepower Starter or VSD Control**
 X = Internal 3 phase not included
 D = Blower motor starter for 3 HP  2 = Connections for blower motor VSD 3 HP
 E = Blower motor starter for 5 HP  3 = Connections for blower motor VSD 5 HP
 G = Blower motor starter for 7.5 HP  4 = Connections for blower motor VSD 7.5 HP
 J = Blower motor starter for 10 HP  5 = Connections for blower motor VSD 10 HP
 O = Blower motor starter for 15 HP  6 = Connections for blower motor VSD 15 HP
 T = Blower motor starter for 20 HP  7 = Connections for blower motor VSD 20 HP
**Oil Pump Starter HP**
 X = Internal 3 phase not included
 A = Oil pump motor starter for 1 HP  E = Oil pump motor starter for 5 HP
 B = Oil pump motor starter for 1.5 HP  G = Oil pump motor starter for 7.5 HP
 C = Oil pump motor starter for 2 HP  J = Oil pump motor starter for 10 HP
 D = Oil pump motor starter for 3 HP
**Air Compressor Pump Starter HP**
 X = Internal 3 phase not included
 D = Compressor motor starter for 3 HP  J = Compressor motor starter for 10 HP
 E = Compressor motor starter for 5 HP  O = Compressor motor starter for 15 HP
 G = Compressor motor starter for 7.5 HP  T = Compressor motor starter for 20 HP

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## *Universal inputs:

There are four universal inputs per input module.  Each module must be configured for the same input, either 4-20 mA, Thermocouple type K or J, or RTD 1000 or 100 ohms.  If the maximum of three universal modules are included, the first and second modules may each be configured for a different input type, and the third module will automatically be the same as the second universal module.

## Specifications without 3-Phase Power

| | | With Touchscreen | W/out Touchscreen |
|---|---|---|---|
| Electrical characteristics | | | |
| | Main power | 120 VAC | 120 VAC |
| | Frequency | 60 Hz | 60 Hz |
| | Component power | 24 VDC/VAC | 120 VAC |
| | Power consumption | ≤ 960 VA | ≤ 740 VA |
| Operating environment | Operating temperature | 32 to 122 °F [0 to 50 °C] | -4 to 140 °F [-20 to 60 °C] |
| | Humidity | Max. 85% with no condensation | Max. 85% with no condensation |

## Specifications with 3-Phase Power

| | | With Touchscreen | W/out Touchscreen |
|---|---|---|---|
| Electrical characteristics | | | |
| | Main power | 480 VAC | 480 VAC |
| | Frequency | 60 Hz | 60 Hz |
| | Current | ≤ 72 Amps | ≤ 72 Amps |
| | Component power | 24 VDC/VAC | 120 VAC |
| | Power consumption | ≤ 35 KVA | ≤ 35 KVA |
| Operating environment | Operating temperature | 32 to 122 °F [0 to 50 °C] | -4 to 140 °F [-20 to 60 °C] |
| | Humidity | Max. 85% with no condensation | Max. 85% with no condensation |

# Connections

**THREE PHASE CONTROL DISCONNECT SWITCH**

30A DISCONNECT SWITCH MINIMUM
60A DISCONNECT SWITCH
100A DISCONNECT SWITCH MAXIMUM

DS1

CONNECT 480VAC HOT LINE TO
DISCONNECT SWITCH TERMINAL "1L1"

CONNECT 480VAC HOT LINE TO
DISCONNECT SWITCH TERMINAL "3L2"

CONNECT 480VAC HOT LINE TO
DISCONNECT SWITCH TERMINAL "5L3"

480VAC/60HZ/3PH

| LUG | GND |

**MOTOR THREE PHASE CONNECTIONS (STARTER CONTROL)**

BLOWER MOTOR STARTER
WITH OVERLOAD TERMINALS

2T1
4T2
6T3

BLOWER MOTOR 20HP MAX
480VAC/60HZ/3PH

AIR COMPRESSOR MOTOR STARTER
WITH OVERLOAD TERMINALS

2T1
4T2
6T3

AIR COMPRESSOR MOTOR 20HP MAX
480VAC/60HZ/3PH
DUAL FUEL ONLY

OIL PUMP MOTOR STARTER
WITH OVERLOAD TERMINALS

2T1
4T2
6T3

OIL PUMP MOTOR 10HP MAX
480VAC/60HZ/3PH
DUAL FUEL ONLY

**MOTOR THREE PHASE CONNECTIONS (BLOWER WITH VFD AND OTHERS WITH STARTER CONTROL)**

FUSE BLOCK

BLOWER VSD
TERMINALS

L1 U
L2 V
L3 W

BLOWER MOTOR 20HP MAX
480VAC/60HZ/3PH

AIR COMPRESSOR MOTOR STARTER
WITH OVERLOAD TERMINALS

2T1
4T2
6T3

AIR COMPRESSOR MOTOR 20HP MAX
480VAC/60HZ/3PH
DUAL FUEL ONLY

OIL PUMP MOTOR STARTER
WITH OVERLOAD TERMINALS

2T1
4T2
6T3

OIL PUMP MOTOR 10HP MAX
480VAC/60HZ/3PH
DUAL FUEL ONLY

# Connections (continued)

## CONTROL DISCONNECT SWITCH

| DS1 | L |
| DS1 | N |
| LUG | GND |

120VAC/60HZ/1PH
MIN CKT AMPS 10A
BRANCH CKT PROTECTION BY OTHERS

NOTE: DO NOT USE WHEN THREE PHASE DISCONNECT SWITCH
AND CONTROL TRANSFORMER ARE SUPPLIED BY SCC INC.

## SAFETY LIMIT TERMINALS

SAFETY LIMITS ARE DEVICES THAT MUST BE CLOSED AT ANY TIME THEY ARE POWERED. IF THEY ARE OPENED, THEY WILL CAUSE A LOCKOUT ALARM. JUMPERS IF NOT USED FOR TERMINALS SAFE-1 TO SAFE-5.

| SAFE | 1 | E-STOP |
| SAFE | 2 | MR-HL    MR-LWCO-NC |
| SAFE | 3 | MR-LWCO-NO |
| SAFE | 4 | SPARE |
| SAFE | 5 | |
| SAFE | 6 | COMMON TO ELECTRONIC MRLWCO RESET |
| SAFE | 7 | NC CONTACT TO MRLWCO RESET (WARRICK) |
| SAFE | 8 | |
| SAFE | 9 | NO CONTACT TO MRLWCO RESET |
| SAFE | 10 | NEUTRAL TO ELECTRONIC MRLWCO |

## AUXILIARY CONNECTION TERMINALS NO PURGE SWITCH

AUXILIARY CONNECTIONS ARE PILOT DUTY ONLY. DO NOT USE ON MOTOR LOADS WITHOUT INTERPOSING RELAY OR STARTER. MAX 120VAC/3A.

| AUX | 1 | DRY CONTACT TO START THE BURNER BLOWER (OR VFD). MAX 120VAC/3A LOAD. |
| AUX | 2 | (WILL NOT START MOTOR DIRECTLY) |
| AUX | 3 | DRY CONTACT TO START THE OIL PUMP. MAX 120VAC/3A LOAD. |
| AUX | 4 | (WILL NOT START MOTOR DIRECTLY) |
| AUX | 5 | GAS BOOSTER OUTPUT. DRY CONTACT CLOSES WHEN FUEL SWITCHED TO GAS |
| AUX | 6 | (FUEL 0). MAX 120VAC/3A LOAD. |
| AUX | 7 | OIL AUXILIARY OUTPUT. DRY CONTACT CLOSES WHEN FUEL SWITCHED TO OIL |
| AUX | 8 | (FUEL 1). MAX 120VAC/3A LOAD. |
| AUX | 9 | BLOWER MOTOR STARTER AUXILIARY CONTACT TO PROVE STARTER CLOSED OR |
| AUX | 10 | FGR PRESSURE SWITCH (SEE LV5-1000 FOR FUNCTION IN YOUR SYSTEM). |
| AUX | 11 | NOT USED |
| AUX | 12 | |

## RUNNING INTERLOCK TERMINALS

RUNNING INTERLOCKS ARE DEVICES THAT MUST BE PROVEN PRIOR TO PREPURGE STARTING. START RELEASE GAS AND OIL MUST BE PROVEN TO ALLOW BLOWER TO START. SEE QSG PHASE DIAGRAMS FOR YOUR PARTICULAR FUEL CONFIGURATION. RUNNING INTERLOCKS WILL CAUSE A LOCKOUT AND ALARM IF OPENED.

| RIL | 1 | START RELEASE OIL |
| RIL | 1 | START RELEASE GAS |
| RIL | 1 | COMB. AIR PRESSURE |
| RIL | 2 | RUN-INTERLOCK (CA DAMPER/CA FAN ETC.) |
| RIL | 3 | |
| RIL | 4 | |
| RIL | 5 | |

## RECYCLE LIMIT TERMINALS

RECYCLE LIMITS ARE DEVICES THAT WILL PREVENT THE BURNER FROM STARTING, CAUSING AN ORDERLY BURNER SHUTDOWN, BUT WILL NOT CAUSE A LOCKOUT ALARM. JUMPERS IF NOT USED FOR TERMINALS RECY-4 & 5.

| RECY | 1 | OP-LIMIT    AR-LWCO-ALARM |
| RECY | 2 | AR-LWCO-NO |
| RECY | 3 | SPARE 1 |
| RECY | 4 | SPARE 2 |
| RECY | 5 | |
| RECY | 6 | |
| RECY | 7 | NEUTRAL TO ELECTRONIC LWCO |

# Connections (continued)



**AUXILIARY CONNECTION TERMINALS WHEN WITH PURGE SWITCH**

AUXILIARY CONNECTIONS ARE PILOT DUTY ONLY. DO NOT USE ON MOTOR LOADS WITHOUT INTERPOSING RELAY OR STARTER. MAX 120VAC/3A.

| AUX | 1 | DRY CONTACT TO START THE BURNER BLOWER (OR VFD). MAX 120VAC/3A LOAD. |
| AUX | 2 | (WILL NOT START MOTOR DIRECTLY) |
| AUX | 3 | DRY CONTACT TO START THE OIL PUMP. MAX 120VAC/3A LOAD. |
| AUX | 4 | (WILL NOT START MOTOR DIRECTLY) |
| AUX | 5 | GAS BOOSTER OUTPUT. DRY CONTACT CLOSES WHEN FUEL SWITCHED TO GAS |
| AUX | 6 | (FUEL 0). MAX 120VAC/3A LOAD. |
| AUX | 7 | OIL AUXILIARY OUTPUT. DRY CONTACT CLOSES WHEN FUEL SWITCHED TO OIL |
| AUX | 8 | (FUEL 1). MAX 120VAC/3A LOAD. |

MS OR VFD RUN    VFD ALARM

| AUX | 9 | BLOWER MOTOR STARTER AUX. (FCC), FGR PRESSURE SWITCH, OR VFD RUN AND VFD |
| AUX | 10 | ALARM (IF APPLICABLE) |
| AUX | 11 | PURGE SWITCH |
| AUX | 12 | |
| AUX | 13 | NOZZLE PURGE VALVE      AUX | N1 |

SEE NOTE *                             SEE NOTE *

| AUX | 14 |    OL     OIL PUMP MOTOR STARTER     AUX | N1 |

HEATER THERMOSTAT    OIL AUX PUMP    OIL HEATER CONTACTOR

NOTE: * TERMINALS AUX-13, AUX-14, AND AUX-N1 ARE ONLY AVAILABLE WHEN HEAVY OIL NOZZLE PURE IS SELECTED.

# Connections (continued)

## GAS TRAIN TERMINALS

| | | |
|---|---|---|
| GT | 1 | GAS VALVE PROVING SW |
| GT | 1 | PROOF OF CLOSURE SW |
| GT | 1 | HIGH GAS PRESSURE SW |
| GT | 1 | LOW GAS PRESSURE SW |
| GT | 2 | |
| GT | 3 | |
| GT | 4 | |
| GT | 5 | PILOT GAS SOLENOID VALVE / PILOT GAS SOLENOID VALVE / PILOT VENT VALVE |
| GT | 6 | UP STREAM GAS VALVE |
| GT | 7 | DOWN STREAM GAS VALVE |
| GT | 8 | |
| GT | 8 | |
| GT | 8 | |
| GT | 9 | |
| GT | 10 | VENT VALVE |

## OIL TRAIN TERMINALS

| | | |
|---|---|---|
| OT | 1 | HIGH OIL PRESSURE SW |
| OT | 1 | LOW OIL PRESSURE SW |
| OT | 2 | |
| OT | 3 | |
| OT | 4 | UP STREAM OIL VALVE |
| OT | 5 | DOWN STREAM OIL VALVE |
| OT | 6 | |
| OT | 6 | |

## FLAME SCANNER TERMINALS

| | | QRI-IR | QRA75-UV |
|---|---|---|---|
| FL-SCN | 1 | FSV | FSV-4 |
| FL-SCN | 2 | | PE-G |
| FL-SCN | 3 | N | N-2 |
| FL-SCN | 4 | | L-1 |
| FL-SCN | 5 | PWR | PWR-3 |

## SECOND SERVO POWER TRANSFORMER (IF APPLICABLE)

| | | |
|---|---|---|
| XF-2 | 12VAC1 | WHEN SECOND SERVO POWER TRANSFORMER IS USED, REFER TO LMV QSG FOR PROPER CONNECTIONS TO ALL MODULES. |
| XF-2 | M | |
| XF-2 | 12VAC2 | |

## IGNITION TRANSFORMER TERMINALS

| | | IGNITION TRANSFORMER |
|---|---|---|
| IGN | 1 | L          N |
| IGN | 2 | |

## HVAC TERMINALS

| | | |
|---|---|---|
| HVAC | 1 | START SIGNAL TO OPEN DAMPERS ETC. BEFORE BLOWER IS ALLOWED TO START PILOT DUTY ONLY. MAX 120VAC/3A |
| HVAC | 2 | |

# Connections (continued)



**ANALOG I/O DIRECT CONNECTION TO LMV5x TERMINALS**

**VFD DIRECT CONNECTION TO LMV5x TERMINALS**

**FUEL METER DIRECT CONNECTION TO LMV5x TERMINALS**

NOTE: SEE LV5-1000 FOR PROGRAMMING AND PULSE RATE LIMITS. IT MAY BE NECESSARY TO USE A SIGNAL CONDITIONER TO MEET LMV5x PULSE RATE LIMITS.

# Connections (continued)

## Connections (continued)



Note:  Only 4 actuators may be connected on an LMV51 controller.

# Connections (continued)

# Connections (continued)

## RWF55 WATER LEVEL TERMINALS

| WTRLV | 1 | 120VAC POWER CONNECTION TO RWF55 |
| WTRLV | 2 | NEUTRAL CONNECTION TO RWF55 |
| WTRLV | 3 | SPARE TERMINALS |
| WTRLV | 4 | |
| WTRLV | 5 | HIGH OR LOW WATER CONTACT |
| WTRLV | 6 | |
| WTRLV | 7 | ANALOG INPUT 4-20mA |
| WTRLV | 8 | |
| SHLD | | |
| WTRLV | 9 | ANALOG OUTPUT 4-20mA |
| WTRLV | 10 | |
| WTRLV | 11 | 24AC POWER |
| WTRLV | 12 | 24AC POWER |

DP XMTR
- O −
- O +

SKB/C/D ACTUATOR
- O Y +
- O M −
- O G0
- O G

## RWF50 WATER LEVEL TERMINALS

| WTRLV | 1 | 120VAC POWER CONNECTION TO RWF50 |
| WTRLV | 2 | NEUTRAL CONNECTION TO RWF50 |
| WTRLV | 3 | SPARE TERMINALS |
| WTRLV | 4 | |
| WTRLV | 5 | SPARE TERMINALS |
| WTRLV | 6 | |
| WTRLV | 7 | ANALOG INPUT 4-20mA |
| WTRLV | 8 | |
| SHLD | | |
| WTRLV | 9 | ANALOG OUTPUT 4-20mA |
| WTRLV | 10 | |
| WTRLV | 11 | 24AC POWER |
| WTRLV | 12 | 24AC POWER |

DP XMTR
- O −
- O +

SKB/C/D ACTUATOR
- O Y +
- O M −
- O G0
- O G

# Connections (continued)

**WARRICK RELAY FOR PROBE TYPE LEVEL CONTROL IF INSTALLED OUTSIDE OF SCC COMBUSTION ENCLOSURE**

**MANUAL RESET CONNECTIONS**

COMBUSTION PANEL
TERMINAL STRIP "SAFE"

WARRICK RELAY -26MC1B0Z
TERMINALS

| SAFE | 3 | PROBE RELAY HOT -SAFETY LIMIT- | 1 (L1) |
| SAFE | 10 | PROBE POWER NEUTRAL | 3 (L2) |
| | | | 5 (G) | WARRICK PROBE TANK REFERENCE |
| | | | 6 (LWCO) | WARRICK PROBE LOW LEVEL (ALWCO) |
| SAFE | 6 | | 7 |
| SAFE | 7 | MANUAL RESET BUTTON NC CONTACT | 8 |
| SAFE | 4 | NORMAL WATER LEVEL -SAFETY LIMIT- | 10 (NO) |
| SAFE | 8 | LOW WATER LIGHT ALARM | 11 (NC) |

**WARRICK RELAY FOR PROBE TYPE LEVEL CONTROL IF INSTALLED INSIDE OF SCC COMBUSTION ENCLOSURE**

**MANUAL RESET CONNECTIONS**

WARRICK RELAY -26MC1B0Z
TERMINALS

| 5 (G) | WARRICK PROBE TANK REFERENCE |
| 6 (LWCO) | WARRICK PROBE LOW LEVEL (ALWCO) |

# Connections (continued)

**WARRICK RELAY FOR PROBE TYPE LEVEL CONTROL IF INSTALLED OUTSIDE OF SCC COMBUSTION ENCLOSURE**

**AUTOMATIC RESET CONNECTIONS**

| COMBUSTION PANEL TERMINAL STRIP "RECY" | | | WARRICK RELAY -26MC1B0Z TERMINALS | |
|---|---|---|---|---|
| RECY | 2 | PROBE RELAY HOT -RECYCLE LIMIT- | 1 (L1) | |
| RECY | 7 | PROBE POWER NEUTRAL | 3 (L2) | |
| | | | 5 (G) | WARRICK PROBE TANK REFERENCE |
| | | | 6 (LWCO) | WARRICK PROBE LOW LEVEL (LWCO) |
| | | | 7 | NOT USED |
| | | | 8 | |
| RECY | 3 | NORMAL WATER LEVEL -RECYCLE LIMIT- | 10 (NO) | |
| RECY | 6 | LOW WATER LIGHT ALARM | 11 (NC) | |

**WARRICK RELAY FOR PROBE TYPE LEVEL CONTROL IF INSTALLED INSIDE OF SCC COMBUSTION ENCLOSURE**

**AUTOMATIC RESET CONNECTIONS**

WARRICK RELAY -26MC1B0Z TERMINALS

| 5 (G) | WARRICK PROBE TANK REFERENCE |
|---|---|
| 6 (LWCO) | WARRICK PROBE LOW LEVEL (LWCO) |

**HIGH WATER ALARM**

| HW | 1 | HIGH WATER ALARM |
|---|---|---|
| HW | 2 | |

# Connections (continued)

**WARRICK RELAY DUAL FUNCTION CONTROL IF INSTALLED OUTSIDE OF SCC COMBUSTION ENCLOSURE**

**MANUAL RESET CONNECTIONS**

COMBUSTION PANEL                                          WARRICK RELAY DUAL FUNCTION
TERMINAL STRIP "SAFE"                                     DFXXXXX-XX-XX-XX TERMINALS

| SAFE | 3 | PROBE RELAY HOT -SAFETY LIMIT- | L1 (L1) |

| SAFE | 10 | PROBE POWER NEUTRAL | L2 (L2) |

| | | | G | — — — — — — — WARRICK PROBE TANK REFERENCE |

| | | | LLCO | — — — — — — — WARRICK PROBE LLCO LEVEL (ALWCO) |

| | | | H | — — — — — — — WARRICK PROBE HIGH LEVEL |

| SAFE | 6 | | RESET SW. |
| | | MANUAL RESET BUTTON  NC CONTACT |
| SAFE | 7 | | RESET SW. |
| SAFE | 4 | NORMAL WATER LEVEL -SAFETY LIMIT- | NO  LLCO RELAY |
| SAFE | 8 | LOW WATER LIGHT ALARM | NC  LLCO RELAY |

COMBUSTION PANEL
HIGH WATER TERMINALS

| HW | 1 | | COM FILL RELAY |
| | | HIGH WATER ALARM AND LIGHT |
| HW | 2 | | NO    FILL RELAY |

**WARRICK RELAY DUAL FUNCTION CONTROL IF INSTALLED INSIDE OF SCC COMBUSTION ENCLOSURE**

**MANUAL RESET CONNECTIONS**

WARRICK RELAY DUAL FUNCTION
DFXXXXX-XX-XX-XX TERMINALS

| G | — — — — — — — — WARRICK PROBE TANK REFERENCE |
| LLCO | — — — — — — — — WARRICK PROBE LLCO LEVEL (ALWCO) |
| H | — — — — — — — — WARRICK PROBE HIGH LEVEL |

# Connections (continued)

Additional RWF55 loop control Modbus connection. Only for kits with annunciation options for up to two connections:
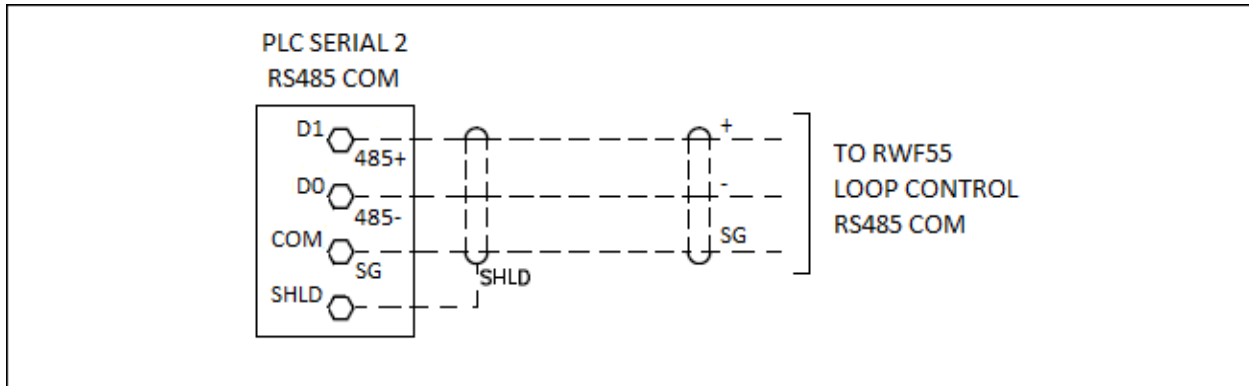


Modbus RS485 serial connection with Yaskawa drive:
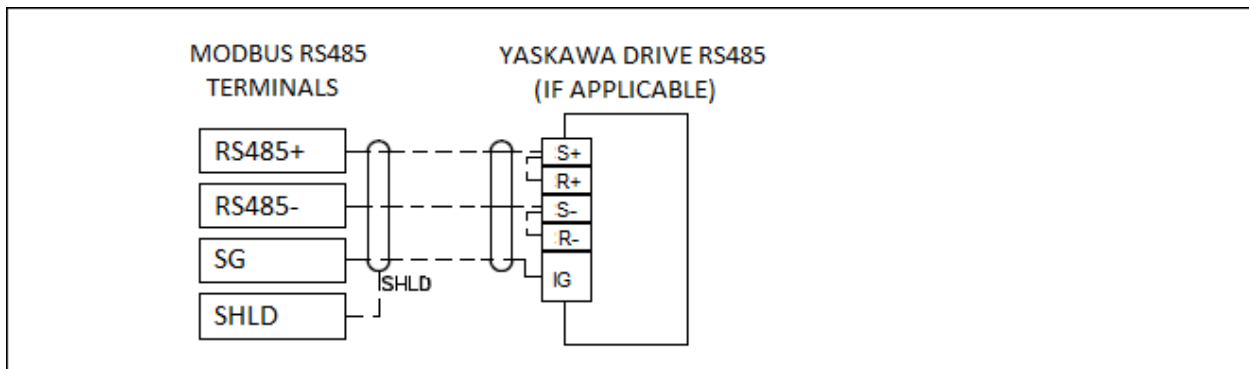


Modbus RS485 serial connection with RWF55 water level and Yaskawa drive:
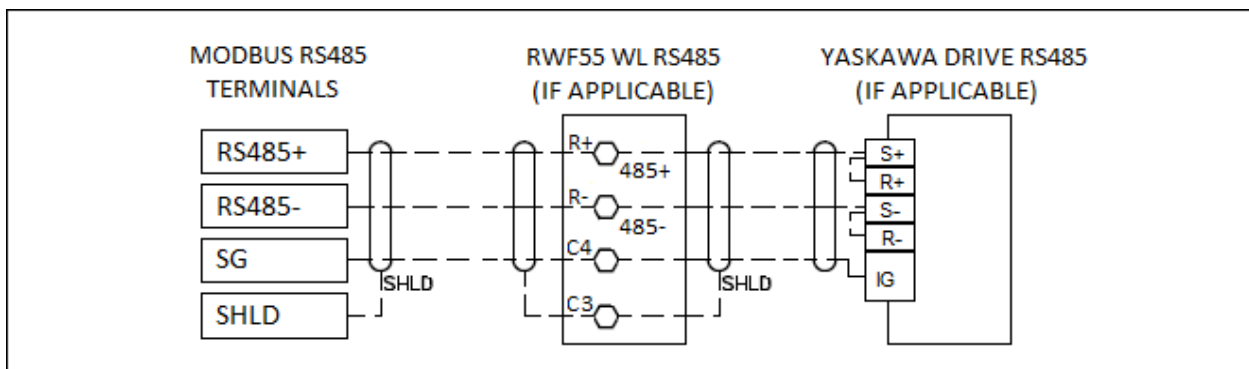
# Connections (continued)

Standard annunciation fourteen (14) 120 VAC inputs:



| | | |
|---|---|---|
| NEUTRAL | N1 | NEUTRAL |
| SAFE | 1 | POWER TO SAFETY LIMIT |
| SAFE | 2 | E-STOP CLOSED |
| SAFE | 3 | MR-HIGH LIMIT |
| SAFE | 4 | MR-LWCO |
| | | SPARE |
| | | SPARE |
| RECY | 1 | BURNER ON/OFF |
| RECY | 2 | OPERATION LIMIT |
| RECY | 3 | AR-LWCO |
| | | SPARE |
| RIL | 2 | COMB. AIR PRESSURE |
| RIL | 3 | AIR DAMPER ON |
| | | SPARE |
| | | SPARE |

CR404, CR405, CR406, CR407, CR409, CR410, CR411, CR412, CR414, CR415, CR416, CR417, CR418, CR419

RELAY JUMPER

# Connections (continued)

Standard annunciation fourteen (14) 120 VAC inputs with draft control:
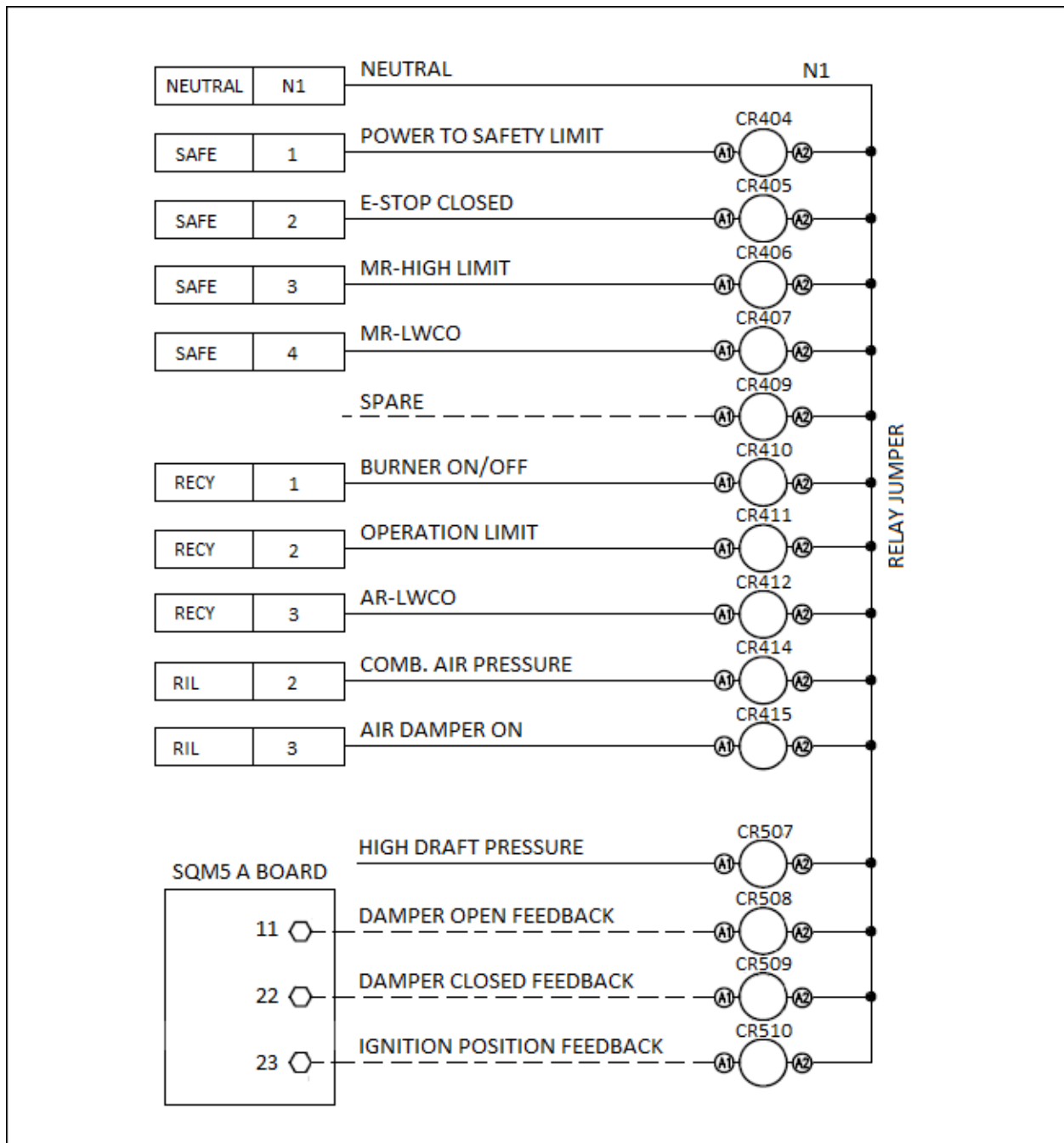
# Connections (continued)

Standard annunciation sixteen (16) 120 VAC inputs:

| | | | | |
|---|---|---|---|---|
| NEUTRAL | N1 | NEUTRAL | | N1 |
| SAFE | 1 | POWER TO SAFETY LIMIT | CR543 | |
| SAFE | 2 | LLWCO RELAY | CR544 | |
| SAFE | 3 | HIGH HIGH WATER RELAY | CR545 | |
| SAFE | 4 | EXCESS PRESSURE | CR546 | |
| SAFE | 5 | STACK TEMPERATURE | CR547 | |
| SAFE | 5A | COIL TEMPERATURE | CR548 | RELAY JUMPER |
| RECY | 1 | BURNER ON/OFF | CR549 | |
| RECY | 2 | OPERATION LIMIT | CR550 | |
| RECY | 3 | AR-LWCO | CR551 | |
| RECY | 4 | HIGH WATER | CR552 | |
| RIL | 2 | COMB. AIR PRESSURE | CR553 | |
| | | SPARE | CR554 | |
| 120VAC | | LOW ATOM AIR #1 | CR555 | |
| 120VAC | | LOW ATOM AIR #2 | CR556 | |
| 120VAC | | CIRC PUMP AUX | CR557 | |
| 120VAC | | LOW PILOT GAS PRESS SW | CR558 | |
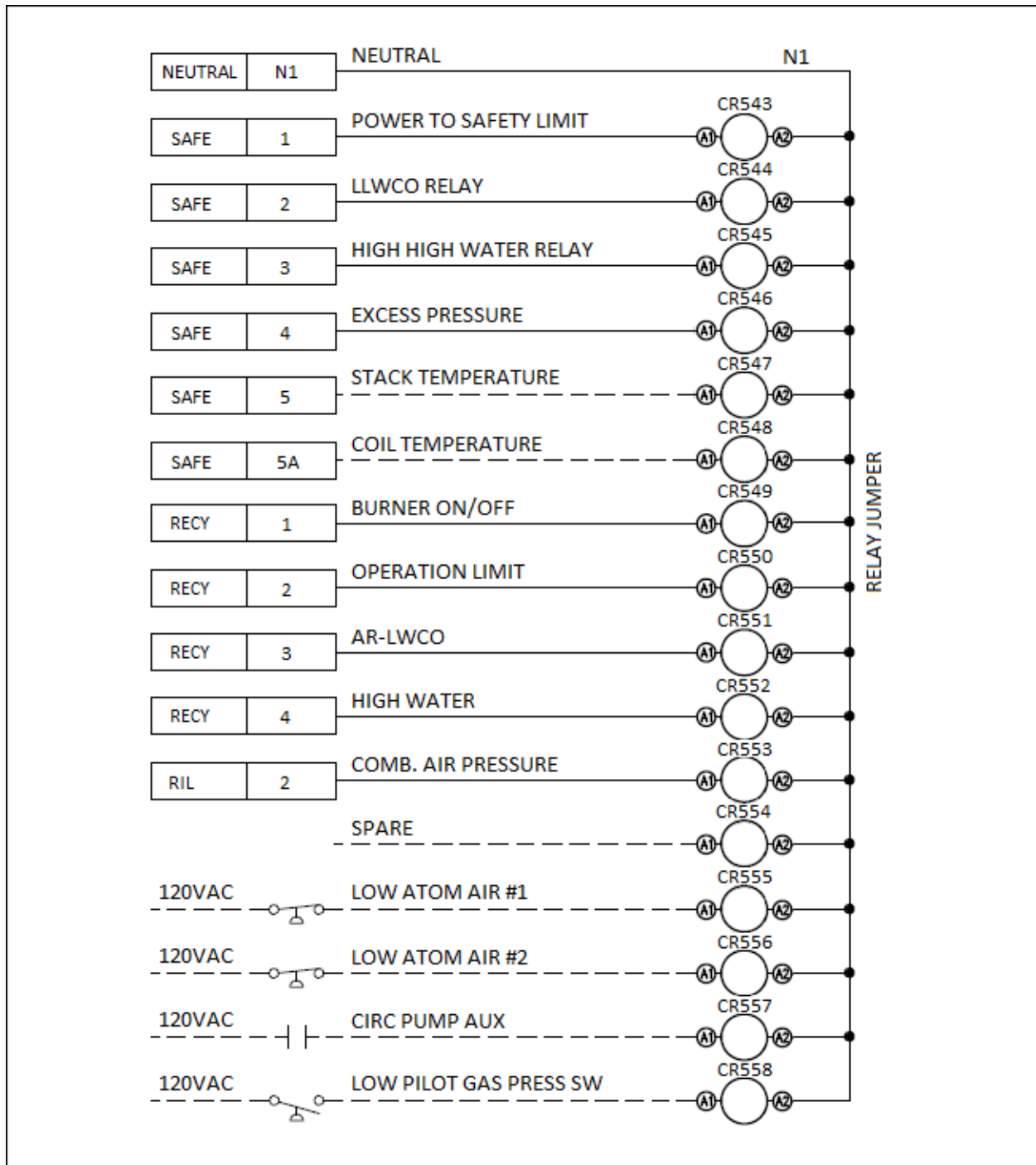
# Connections (continued)

Standard annunciation sixteen(16) 120VAC inputs with additional three (4) inputs for draft control:
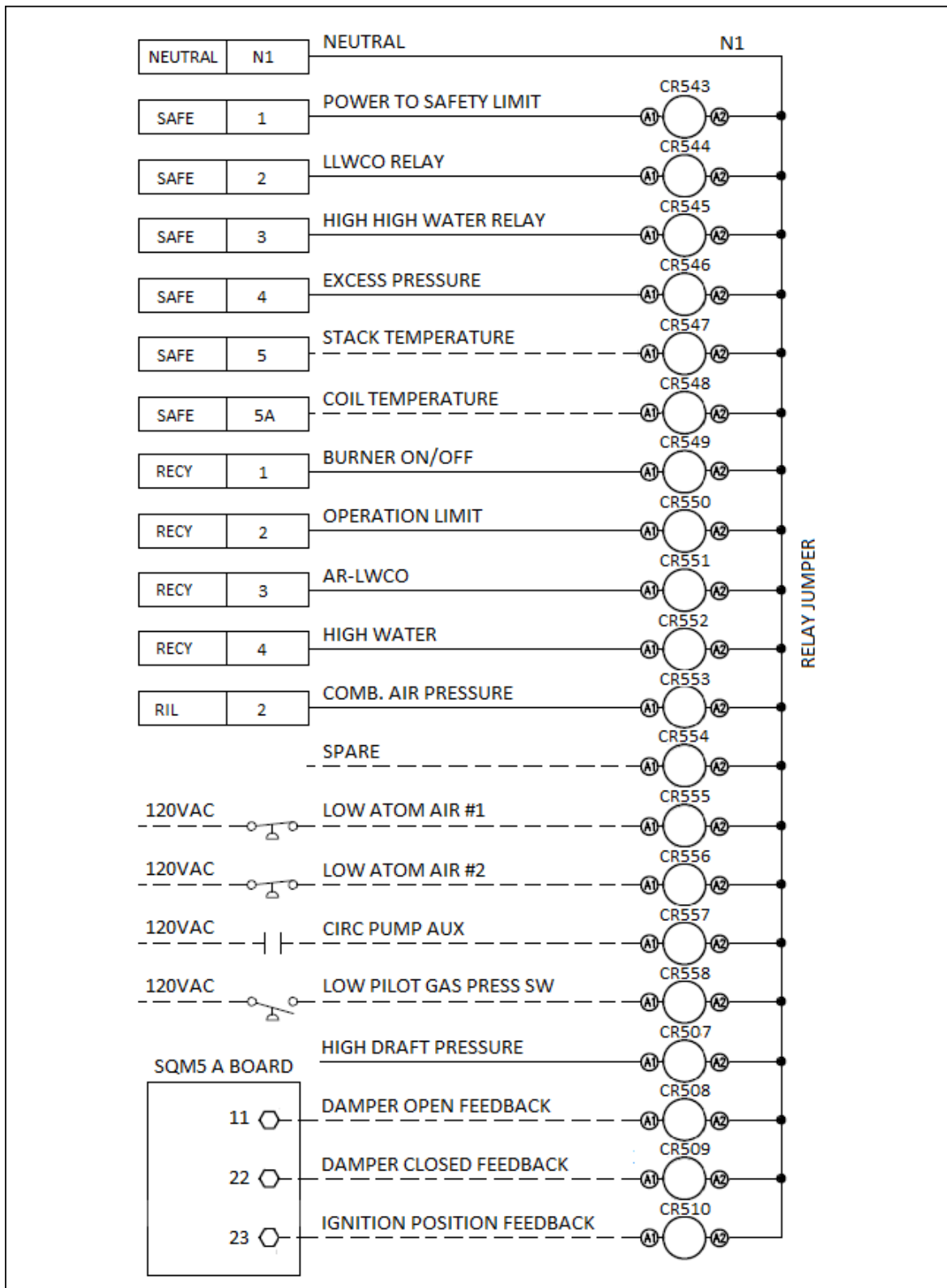
# Connections (continued)

Output relay terminals:
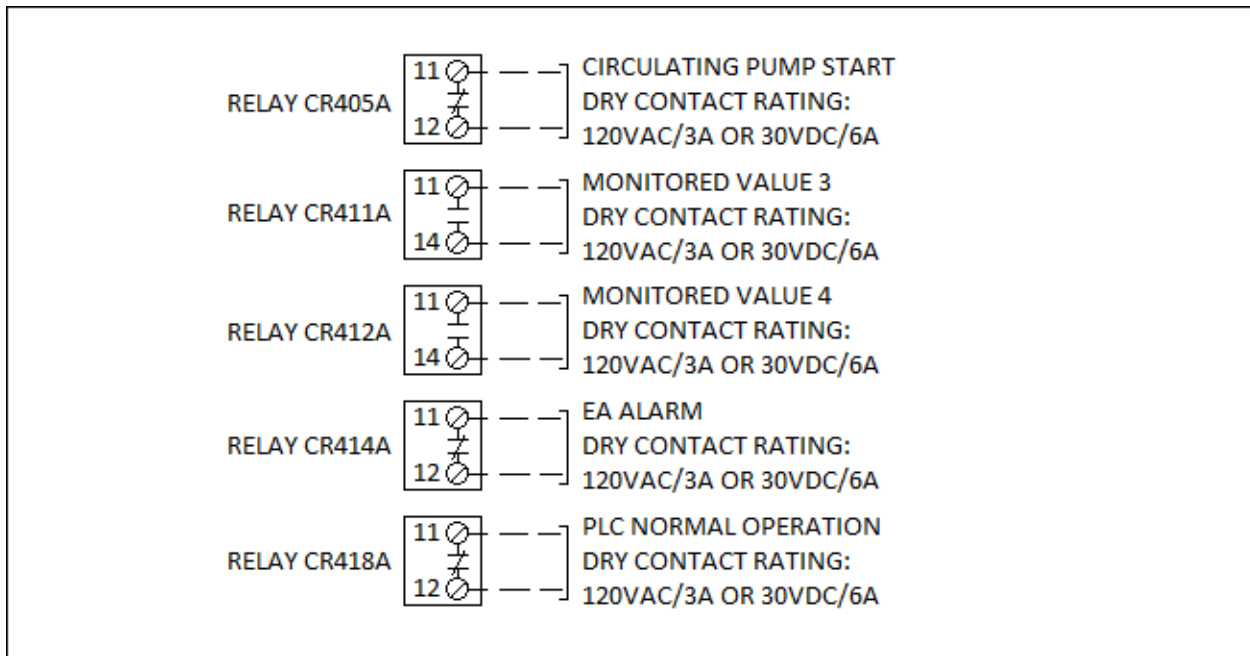
# Connections (continued)

Additional output relay terminals:

| | | |
|---|---|---|
| RELAY 550A | 11 / 14 | MONITORED VALUE 5<br>DRY CONTACT RATING:<br>120VAC/3A OR 30VDC/6A |
| RELAY 551A | 11 / 14 | MONITORED VALUE 6<br>DRY CONTACT RATING:<br>120VAC/3A OR 30VDC/6A |
| RELAY 552A | 11 / 14 | MONITORED VALUE 7<br>DRY CONTACT RATING:<br>120VAC/3A OR 30VDC/6A |
| RELAY 553A | 11 / 14 | MONITORED VALUE 8<br>DRY CONTACT RATING:<br>120VAC/3A OR 30VDC/6A |
| RELAY 555A | 11 / 14 | MONITORED VALUE 9<br>DRY CONTACT RATING:<br>120VAC/3A OR 30VDC/6A |
| RELAY 556A | 11 / 14 | MONITORED VALUE 10<br>DRY CONTACT RATING:<br>120VAC/3A OR 30VDC/6A |
| RELAY 557A | 11 / 14 | MONITORED VALUE 11<br>DRY CONTACT RATING:<br>120VAC/3A OR 30VDC/6A |
| RELAY 558A | 11 / 14 | MONITORED VALUE 12<br>DRY CONTACT RATING:<br>120VAC/3A OR 30VDC/6A |

# Connections (continued)

Analog input terminals:



| AI | 24+ |
| AI | 24- |

**EXAMPLE FOR CURRENT INPUT CONNECTION**

**ANALOG INPUT CHANNEL 1 FIELD CONFIGURED**

| AI1 | 24+ |
| AI1 | V |
| AI1 | I |
| AI1 | C |

4-20mA LOOP POWER TYPICAL SENSOR

| SH |

**EXAMPLE FOR VOLTAGE 7MF... 0-10V**

**ANALOG INPUT CHANNEL 2 FIELD CONFIGURED**

| AI2 | 24+ |
| AI2 | V |
| AI2 | I |
| AI2 | C |

0-10V, 3WIRE VOLTAGE TRANSMITTER

**ANALOG INPUT CHANNEL 3 FIELD CONFIGURED**

| AI3 | 24+ |
| AI3 | V |
| AI3 | I |
| AI3 | C |

**EXAMPLE FOR VOLTAGE INPUT CONNECTION**

0-10V, 2WIRE VOLTAGE TRANSMITTER

| SH |

**ANALOG INPUT CHANNEL 4 FIELD CONFIGURED**

| AI4 | 24+ |
| AI4 | V |
| AI4 | I |
| AI4 | C |

**EXAMPLE FOR CURRENT INPUT CONNECTION**

4-20mA ACTIVE POWER SENSOR

NOTE: FOR 0-10V VOLTAGE INPUTS, REMOVE JUMPERS BETWEEN TERMINALS AI1-V AND AI1-I, AI2-V AND AI2-I, AI3-V AND AI3-I, AI4-V AND AI4-I.

# Connections (continued)

Analog output terminals:
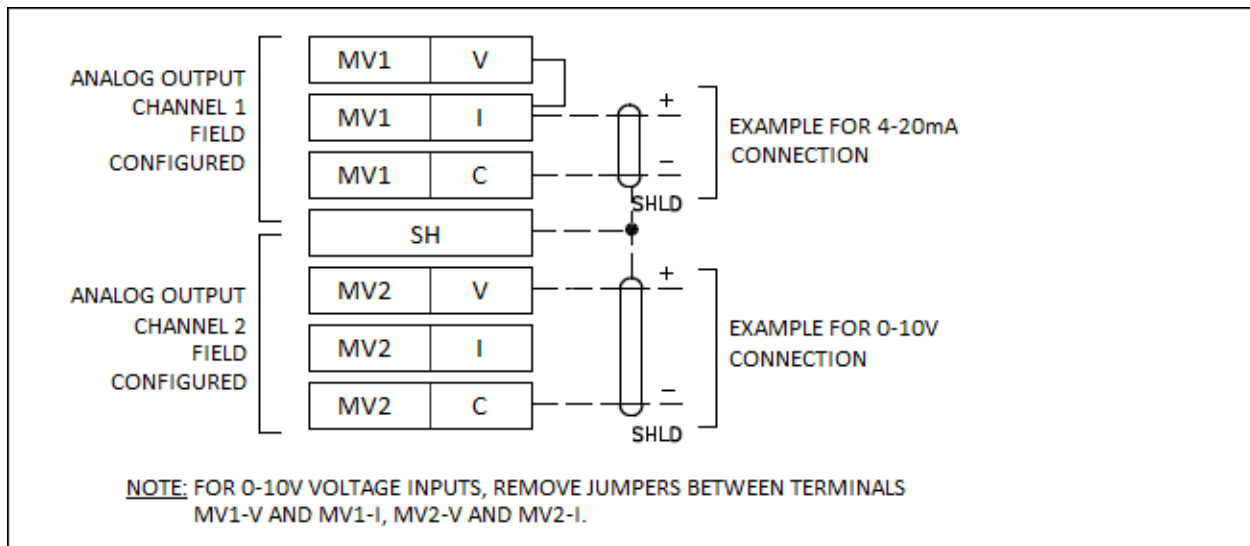


Dedicated analog outputs option, used for feedwater and circulating pump VFD control, 4-20mA only terminals:
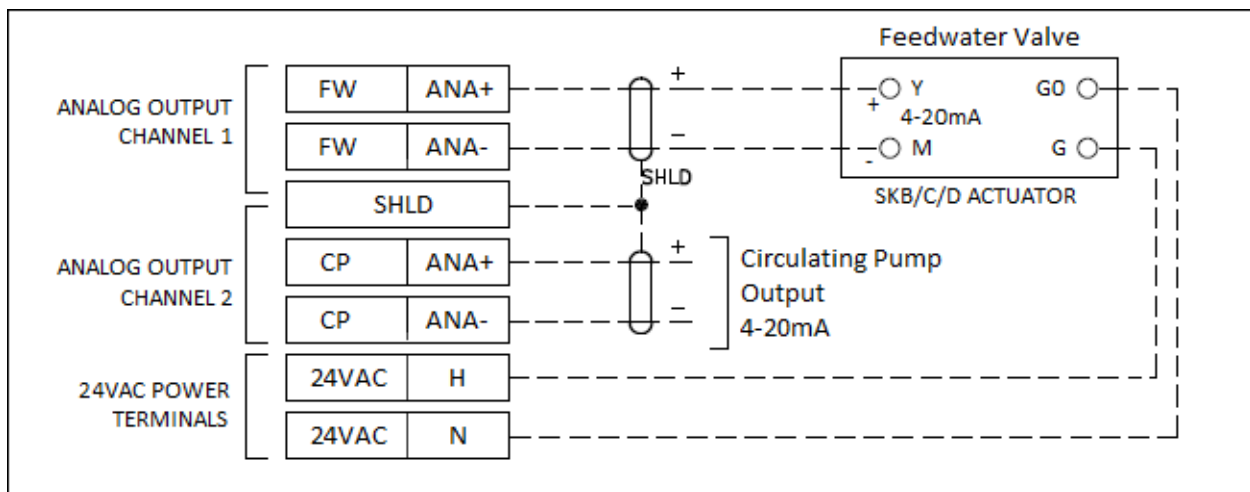
# Connections (continued)

Universal input configured for 4-20mA

The first four universal input terminals with current transmitter example connections:



NOTE: THERE ARE NO VOLTAGE INPUT SENSORS CONNECTED TO ANALOG INPUT CARD 3, 4, AND 5.
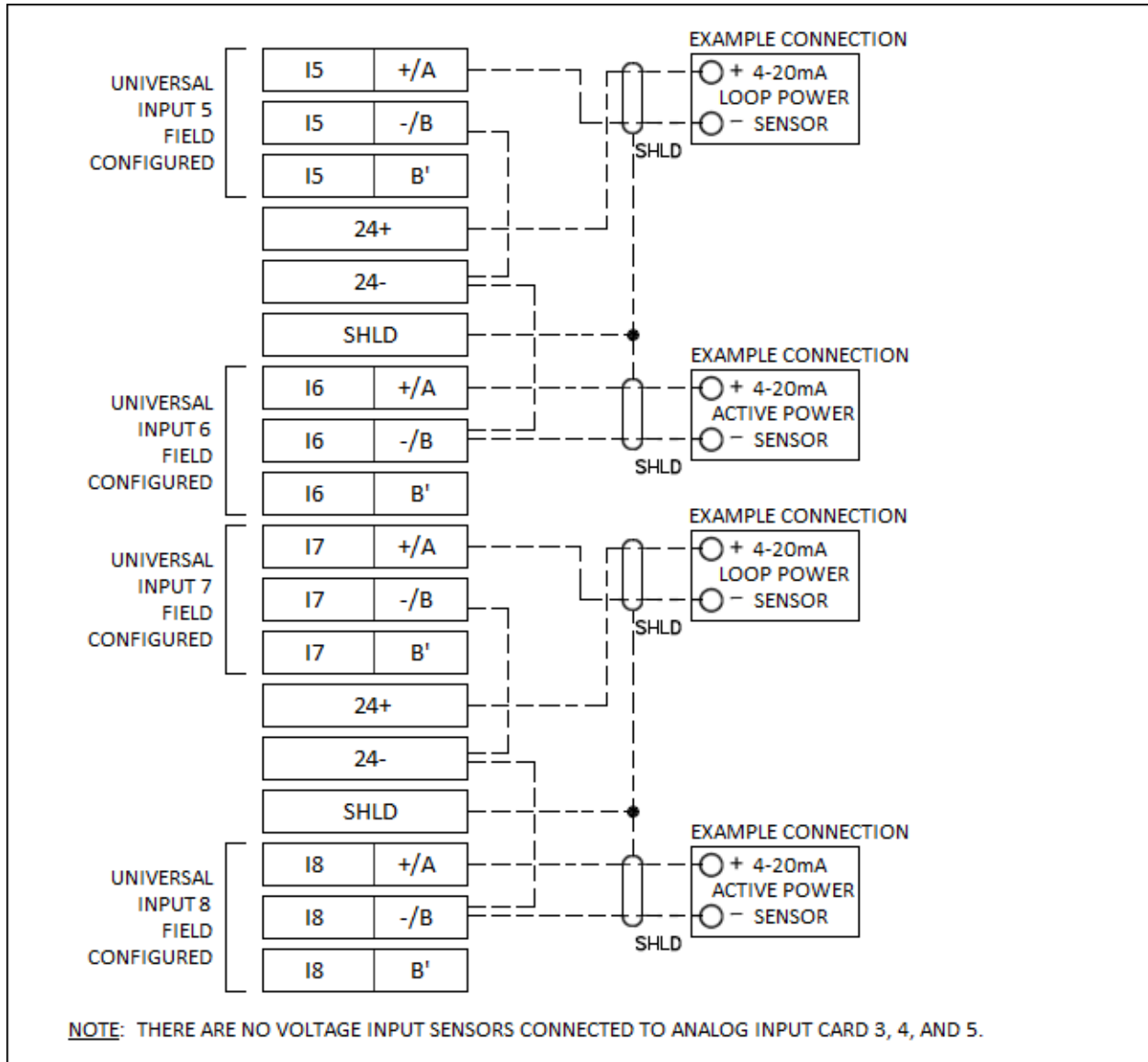
# Connections (continued)

Universal inputs configured for RTD 1000 Ohm

The first four universal input terminals with RTD 1000 Ohm example connections:
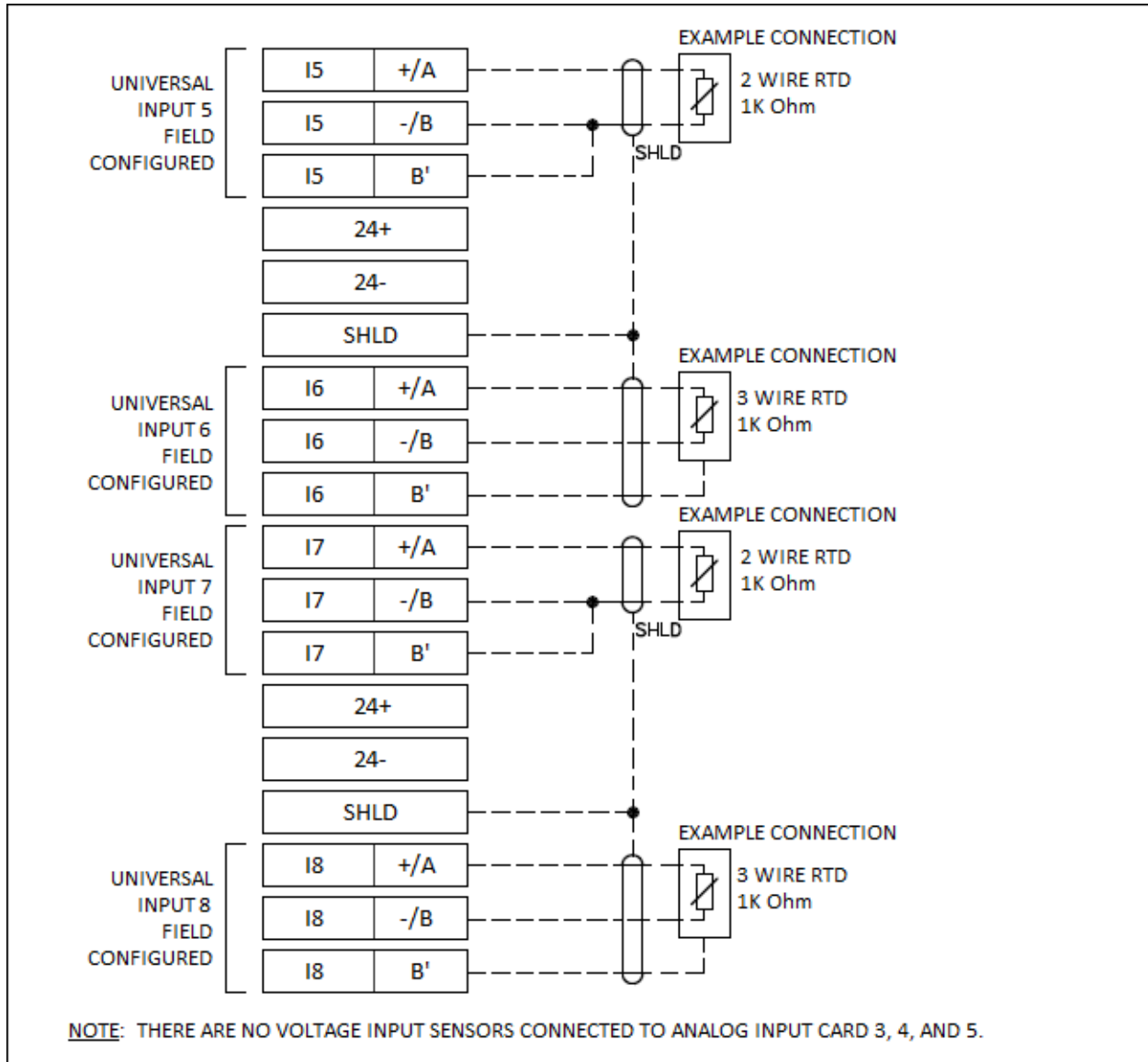
# Connections (continued)

Universal input configured for 100 Ohm RTD

The first four universal input terminals with RTD 100 Ohm example connections:
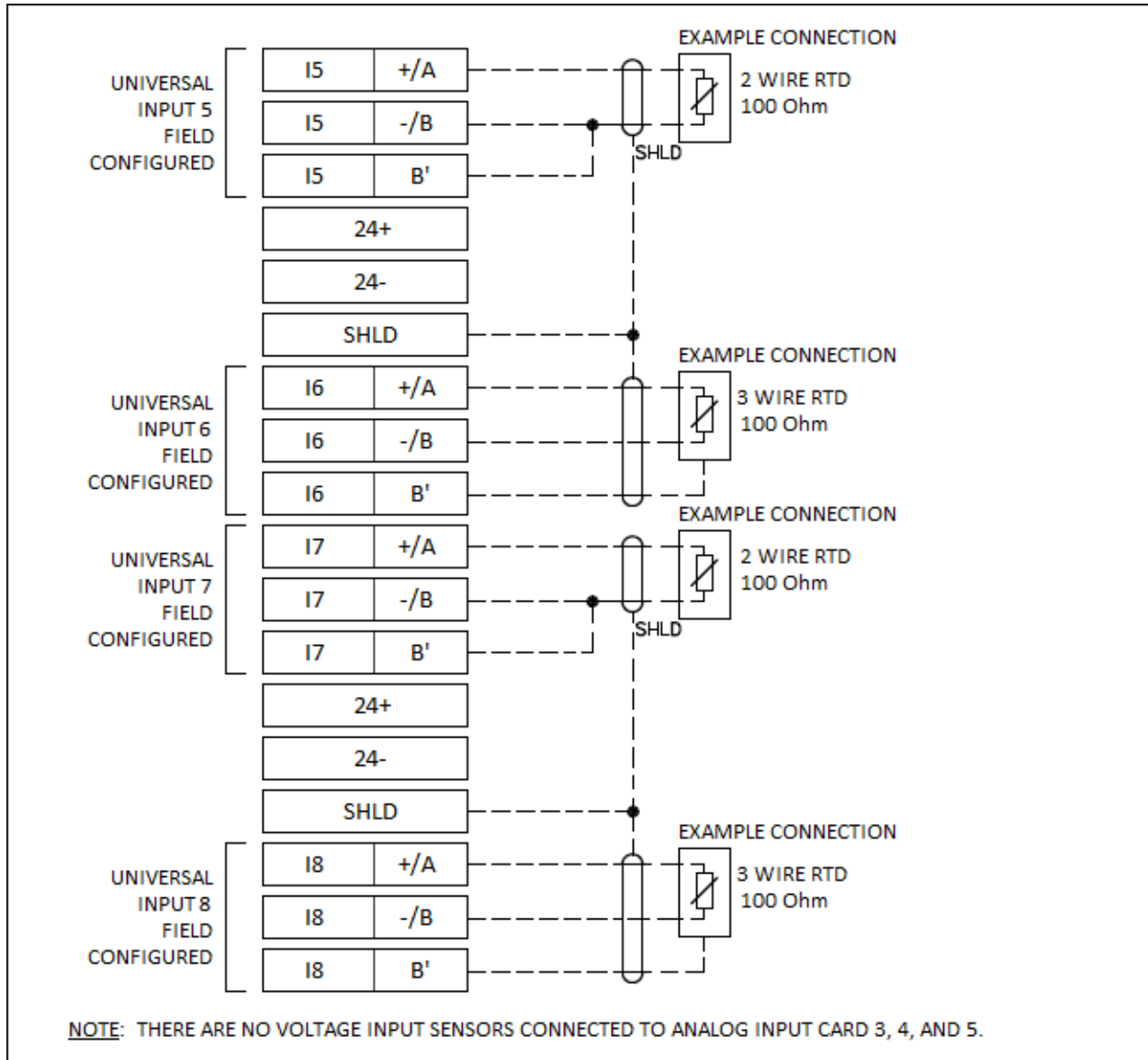
# Connections (continued)

Universal input configured for Thermocouple either Type K, or J

The first four universal input terminals with thermocouple type J/K example connections:



| | | |
|---|---|---|
| UNIVERSAL INPUT 5 FIELD CONFIGURED | I5 | +/A |
| | I5 | -/B |
| | I5 | B' |
| | 24+ | |
| | 24- | |
| | SHLD | |
| UNIVERSAL INPUT 6 FIELD CONFIGURED | I6 | +/A |
| | I6 | -/B |
| | I6 | B' |
| UNIVERSAL INPUT 7 FIELD CONFIGURED | I7 | +/A |
| | I7 | -/B |
| | I7 | B' |
| | 24+ | |
| | 24- | |
| | SHLD | |
| UNIVERSAL INPUT 8 FIELD CONFIGURED | I8 | +/A |
| | I8 | -/B |
| | I8 | B' |

NOTE: THERE ARE NO VOLTAGE INPUT SENSORS CONNECTED TO ANALOG INPUT CARD 3, 4, AND 5.
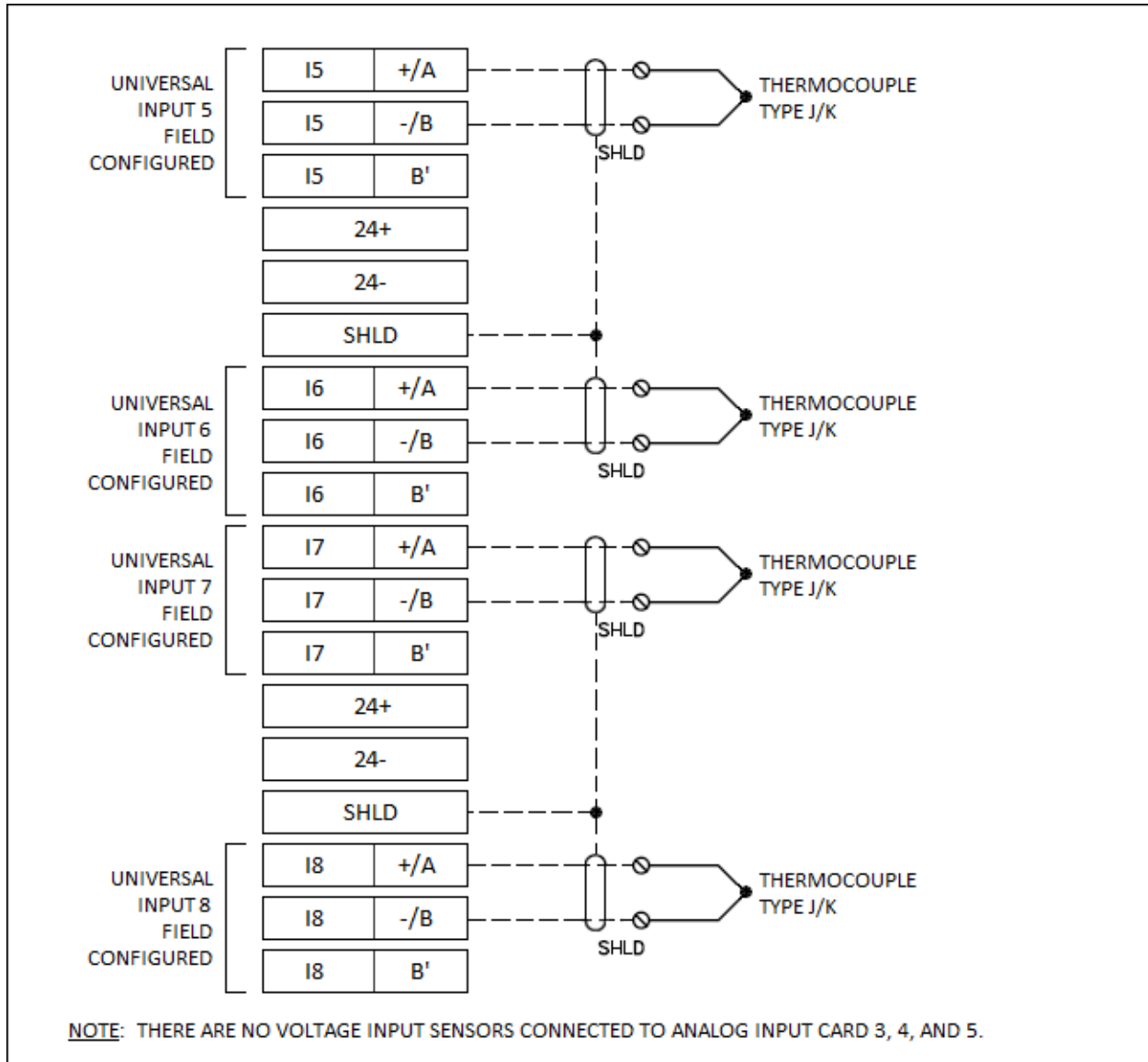
# Connections (continued)

Universal input configured for 4-20mA

The second four universal input terminals with current transmitter example connections:



NOTE: THERE ARE NO VOLTAGE INPUT SENSORS CONNECTED TO ANALOG INPUT CARD 3, 4, AND 5.
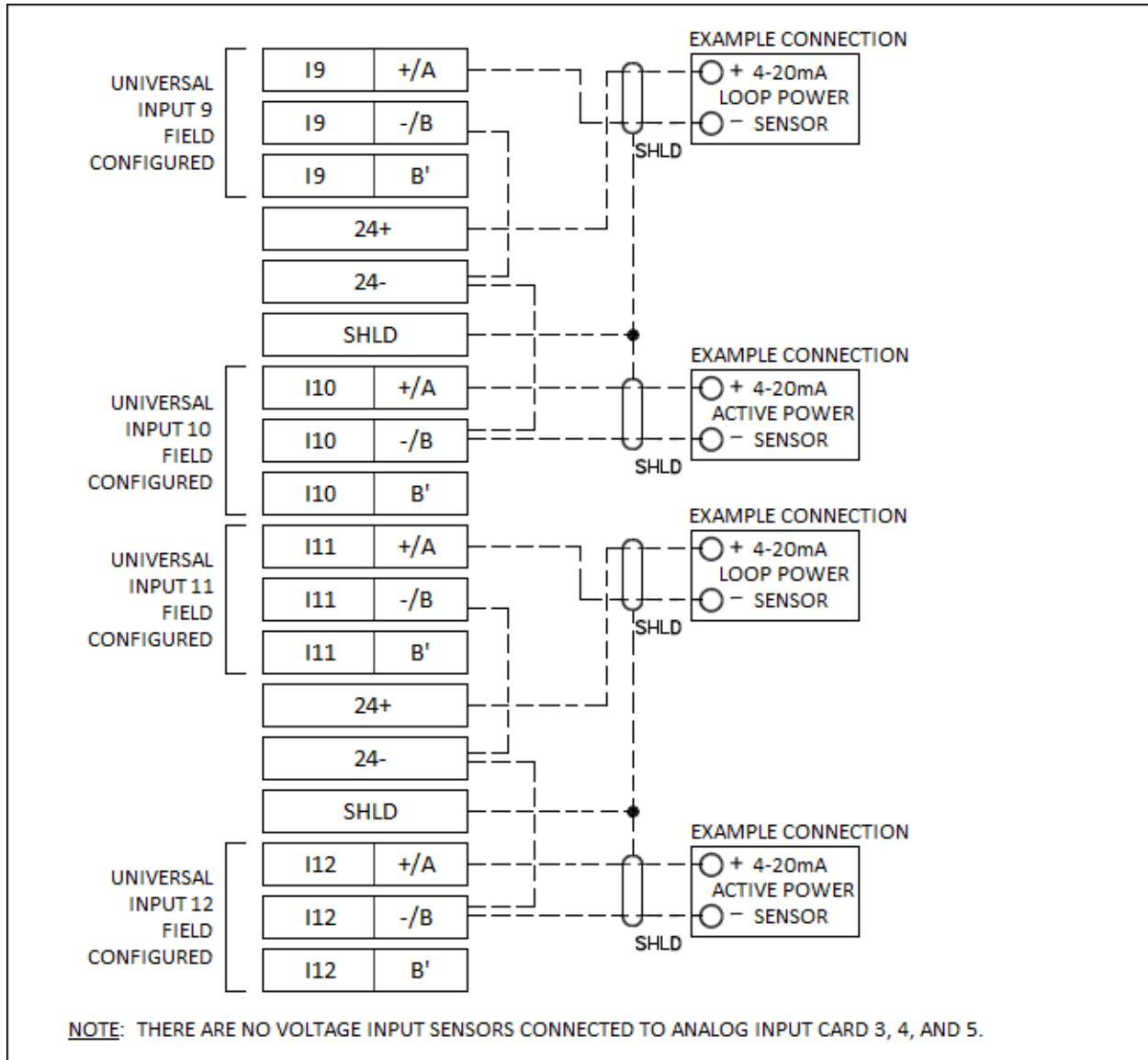
# Connections (continued)

Universal input configured for 1000 Ohm RTD

The second four universal input terminals with RTD 1000 Ohm connections:
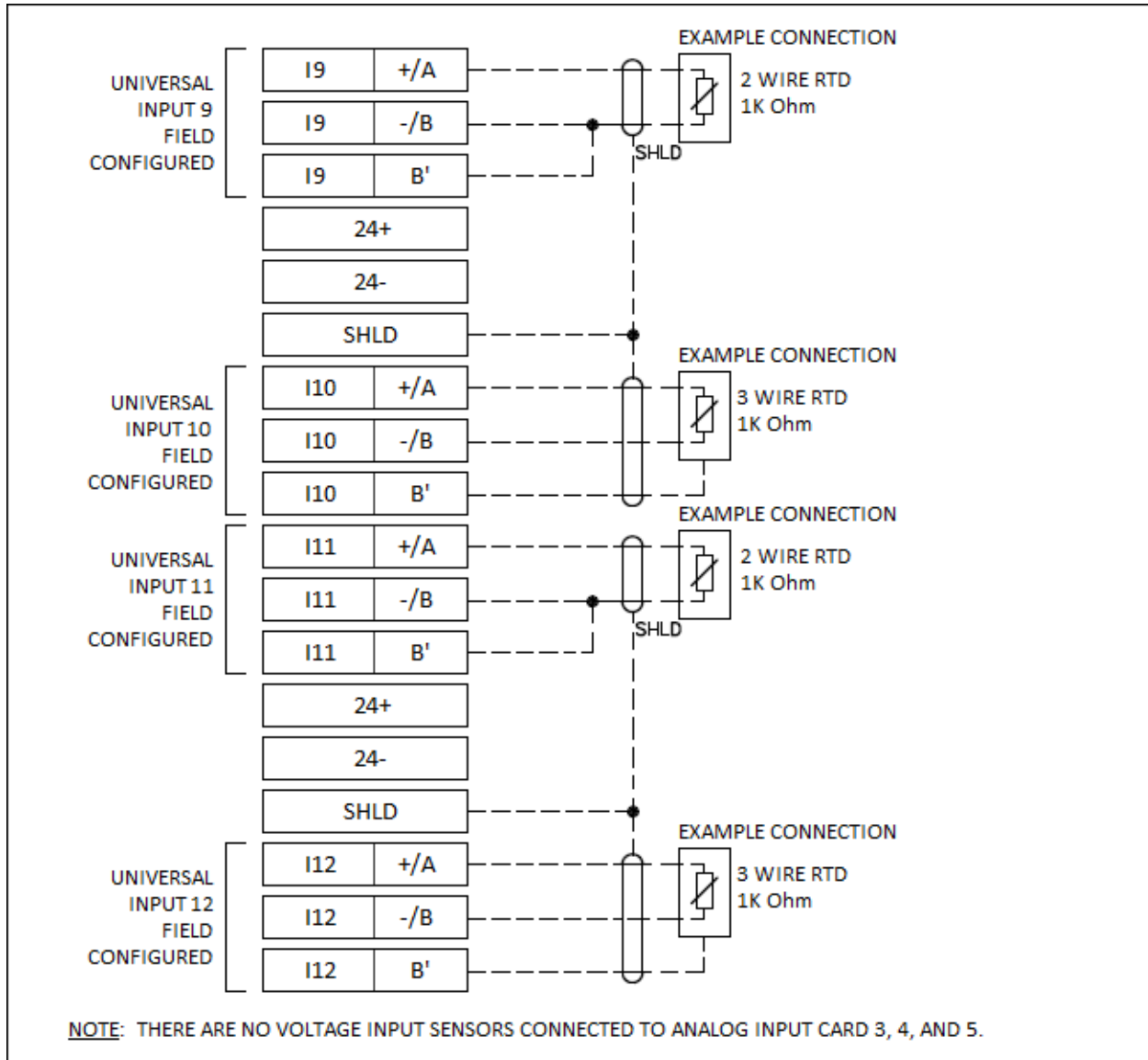
# Connections (continued)

Universal input configured for 100 Ohm RTD

The second four universal input terminals with RTD 100 Ohm connections:
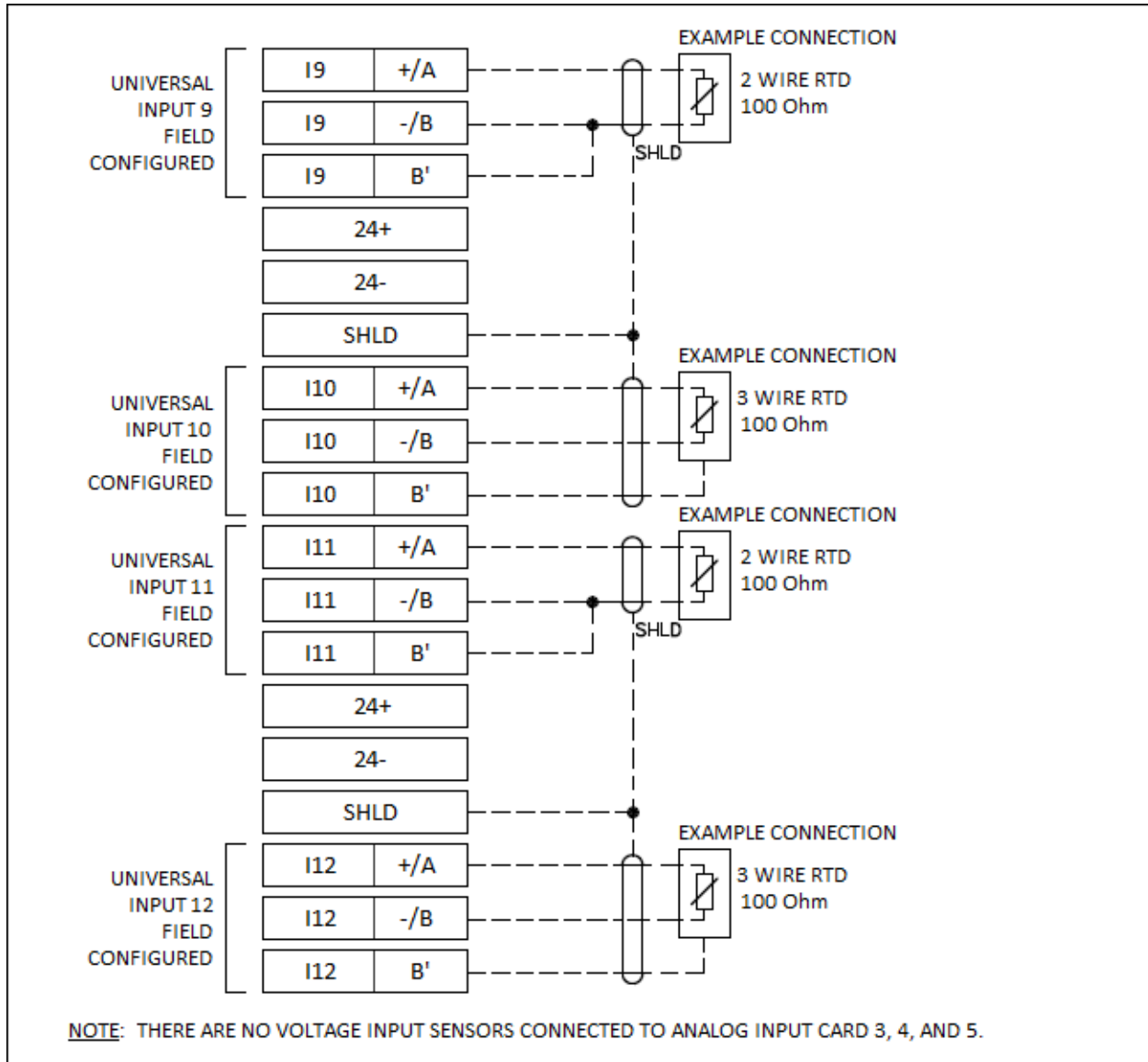
## Connections (continued)

Universal input configured for Thermocouple either Type J, or K

The second four universal input terminals with thermocouple type J/K example connections:
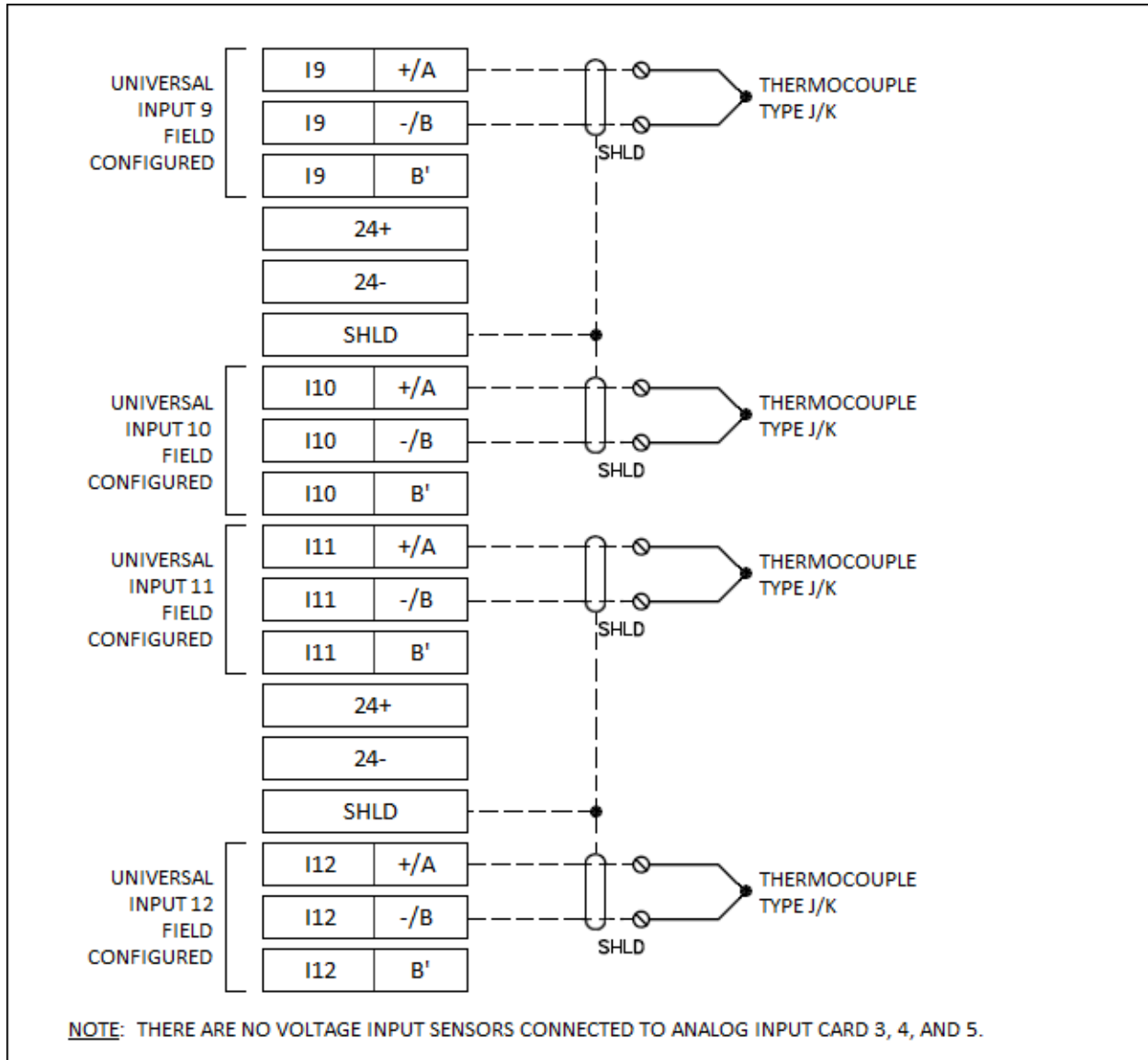
# Connections (continued)

Universal input configured for 4-20mA

The third four universal input terminals with current transmitter connections:
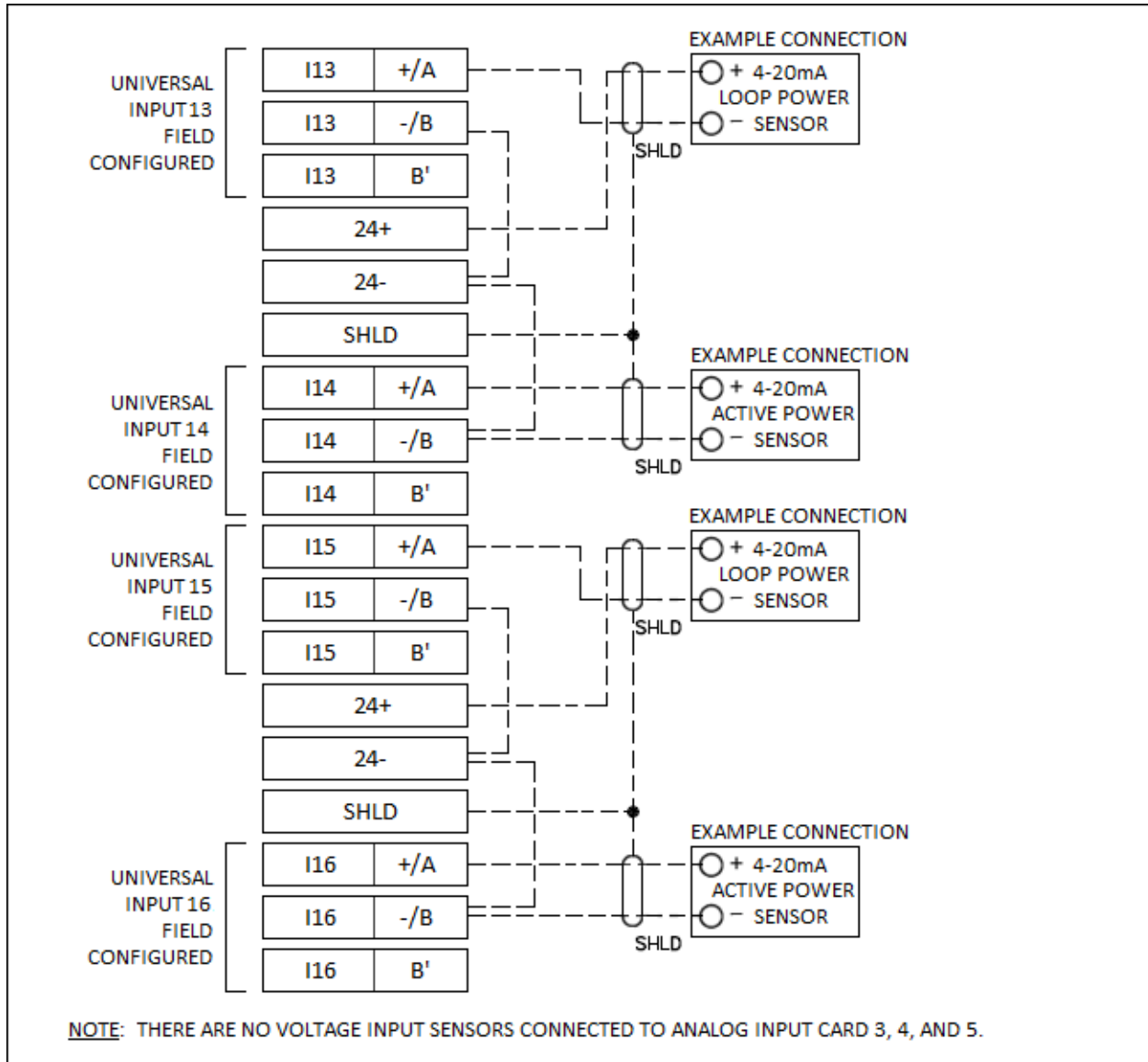
## Connections (continued)

Universal input configured for 1000 Ohm RTD

The third four universal input terminals with RTD 1000 Ohm connections:
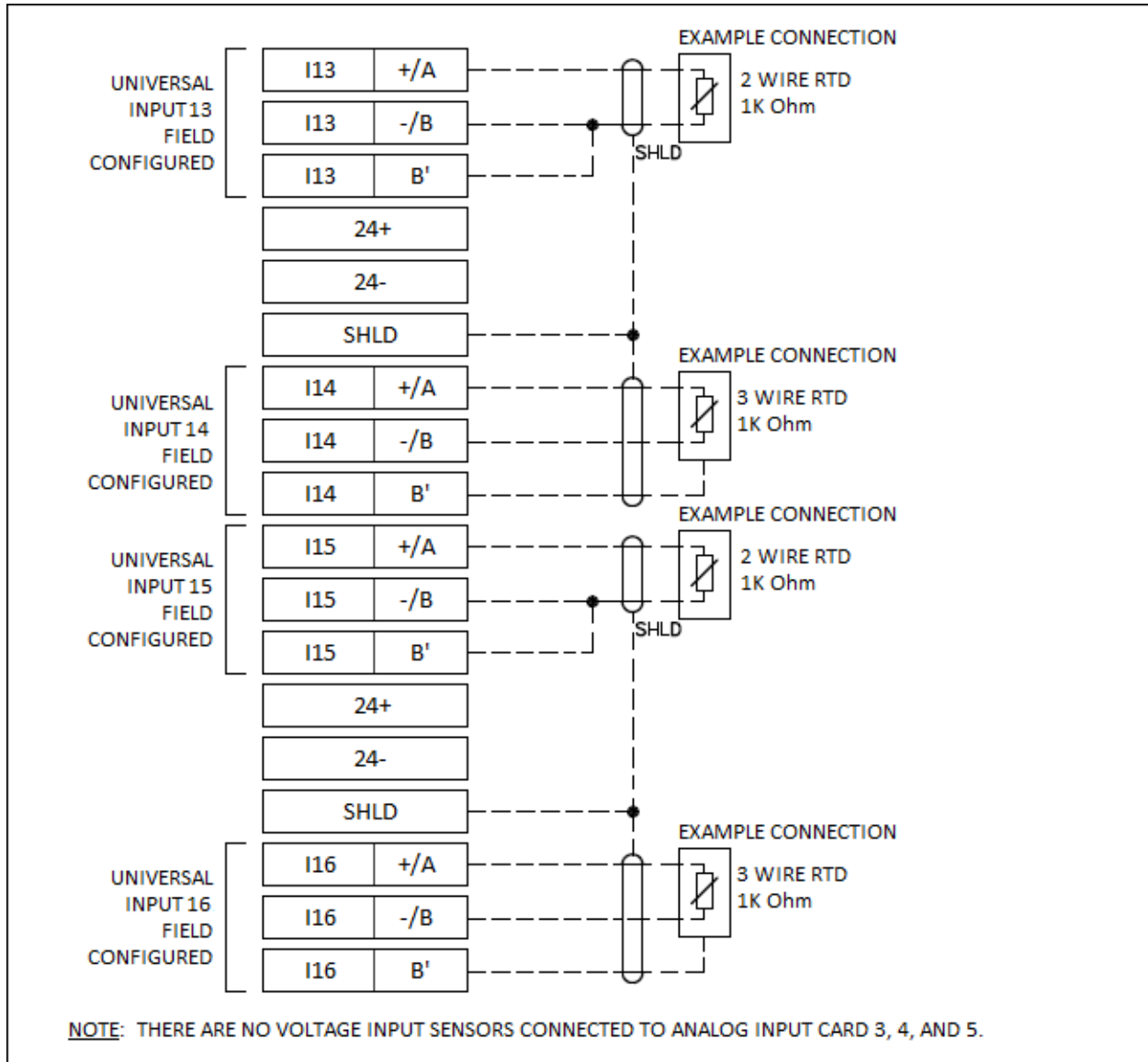
# Connections (continued)

Universal input configured for 100 Ohm RTD

The third four universal input terminals with RTD 100 Ohm connections:
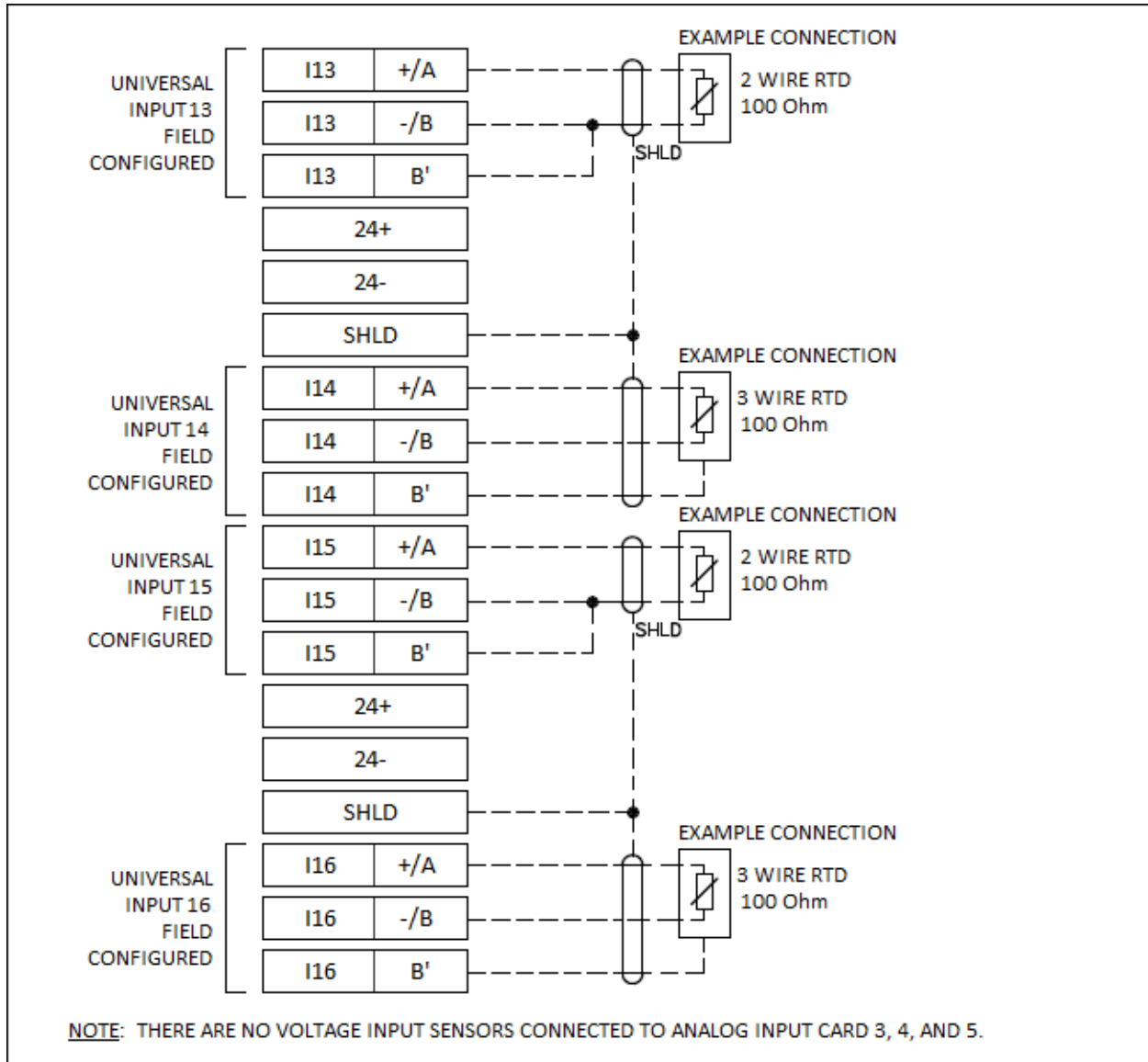


NOTE: THERE ARE NO VOLTAGE INPUT SENSORS CONNECTED TO ANALOG INPUT CARD 3, 4, AND 5.

# Connections (continued)

Universal input configured for Thermocouple either Type J, or K

The third four universal input terminals with thermocouple type J/K example connections:
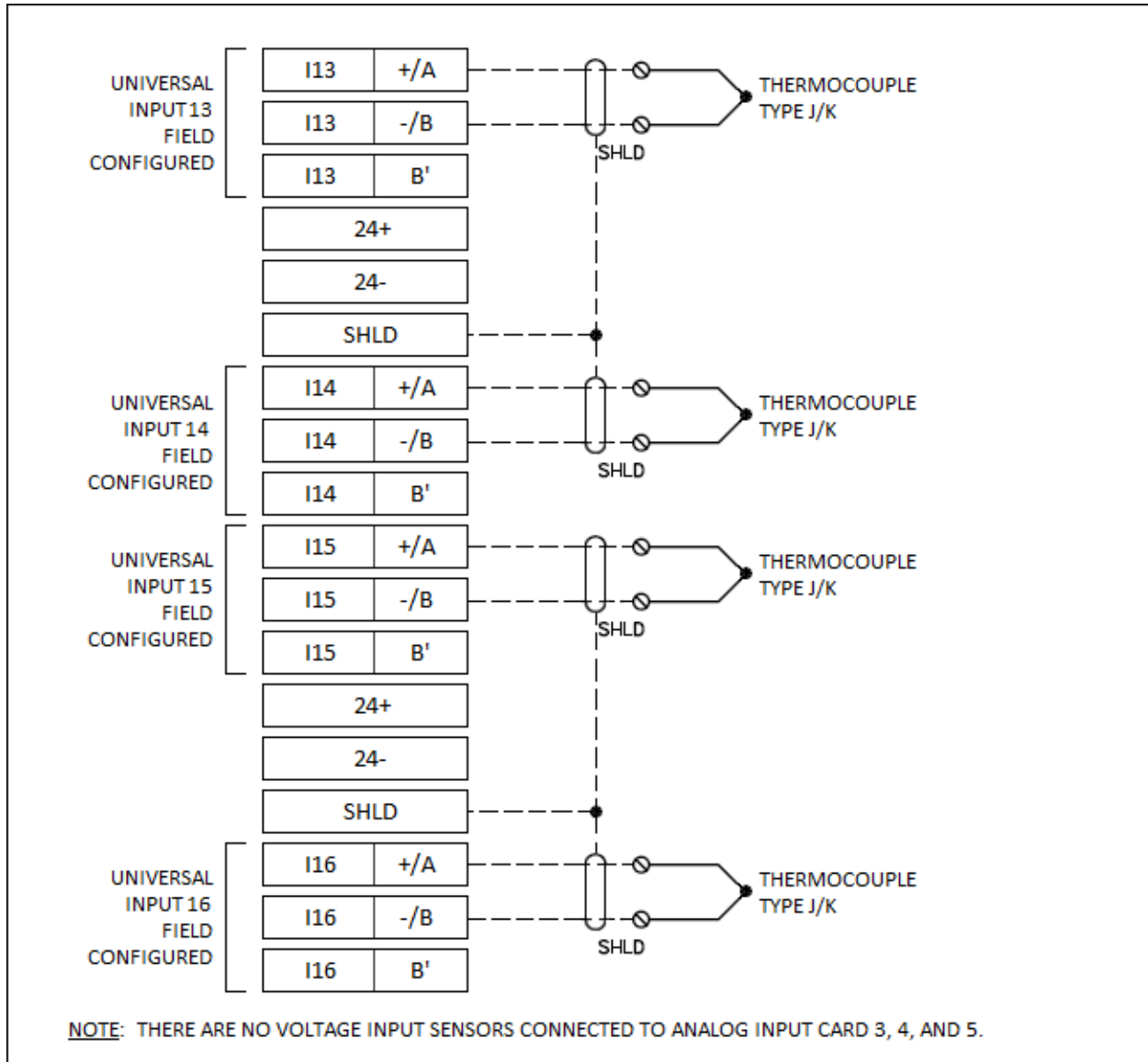
# Connections (continued)

Draft Control:
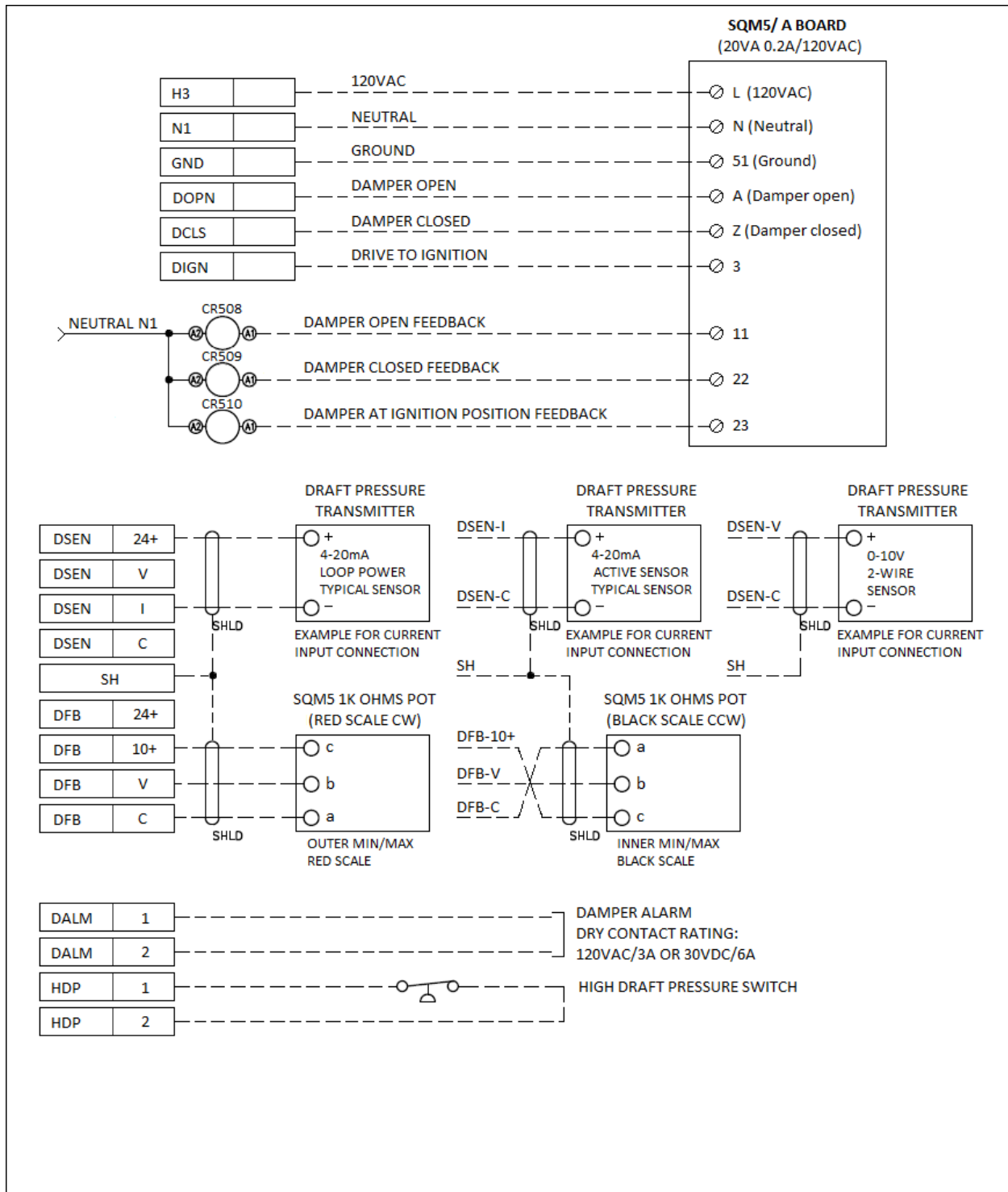
# Connections (continued)

## BMS Communication Connections

Standard Modbus TCP/IP with 6" touchscreen:
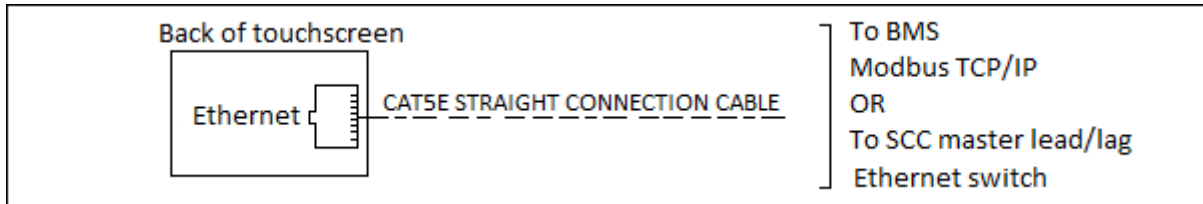


Standard Modbus TCP/IP with 7"/10"/12"/15" touchscreen:
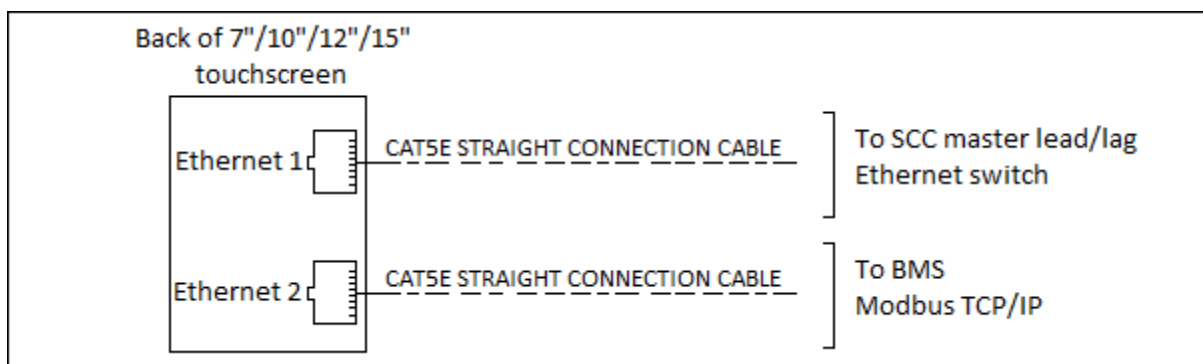


Standard Modbus TCP/IP with 6" touchscreen with PLC annunciation:
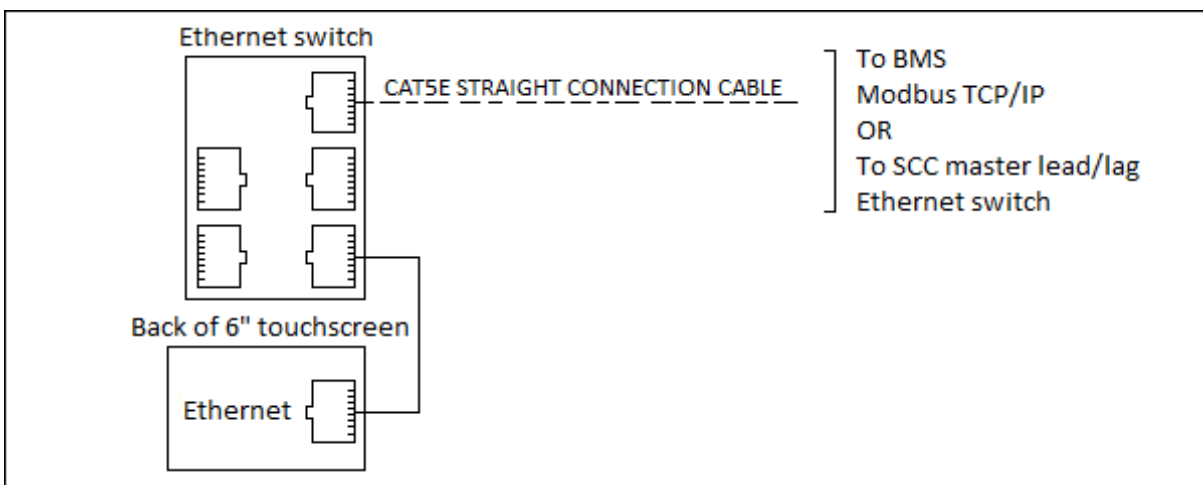
# Connections (continued)

Standard Modbus TCP/IP with 7"/10"/12"/15" touchscreen with PLC annunciation:
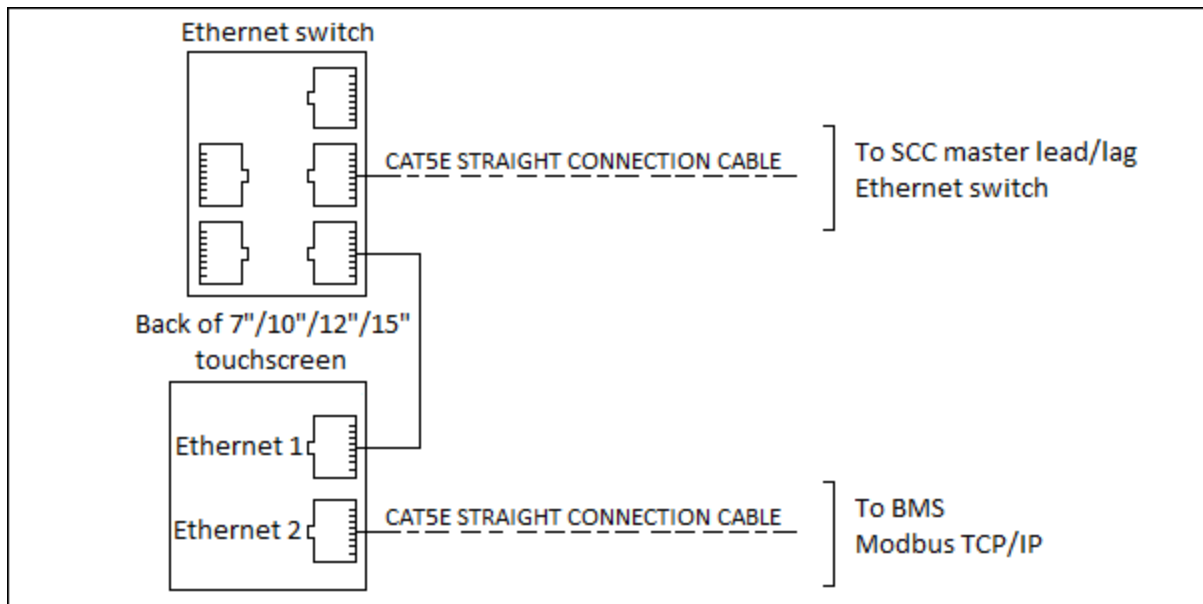


BACnet/IP, Ethernet/IP, or Modbus TCP/IP: Ethernet connection

BACnet MS/TP, N2 Johnson Metasys, or Modbus RTU: RS485 connection
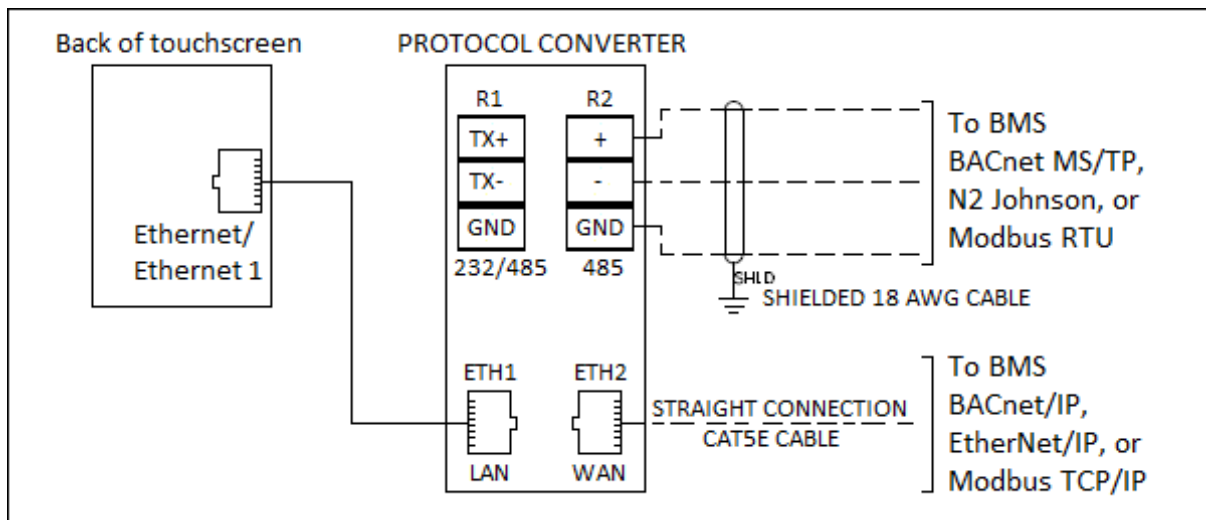
# Connections (continued)

BACnet/IP, Ethernet/IP, or Modbus TCP/IP with PLC annunciation: Ethernet connection

BACnet MS/TP, N2 Johnson Metasys, or Modbus RTU with PLC annunciation: RS485 connection
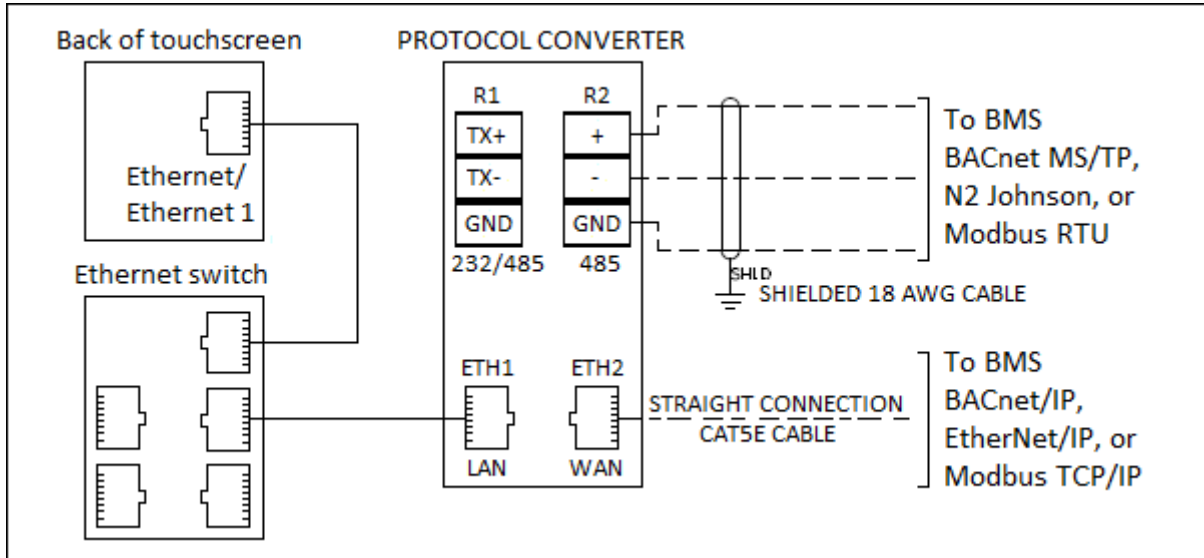


PROFINET:
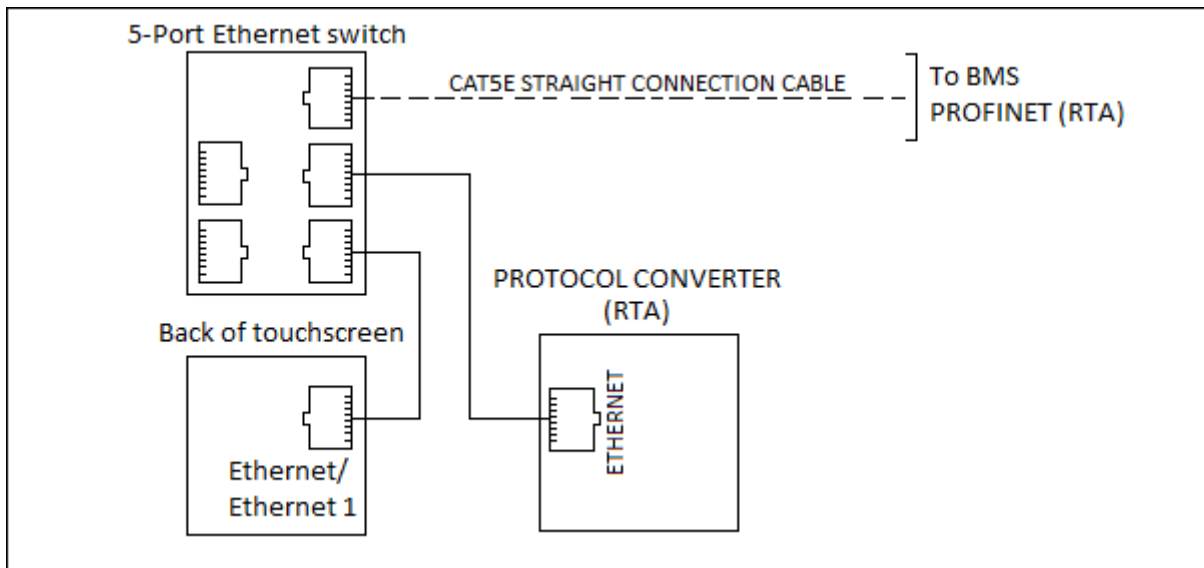
## Connections (continued)

PROFIBUS:
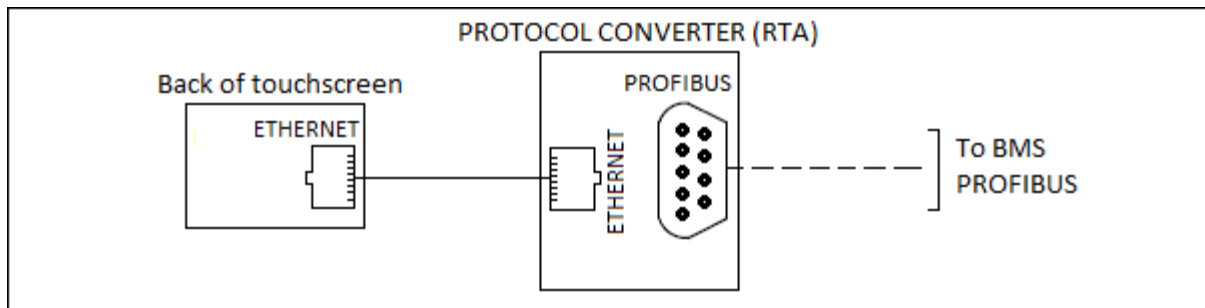


LonWorks:
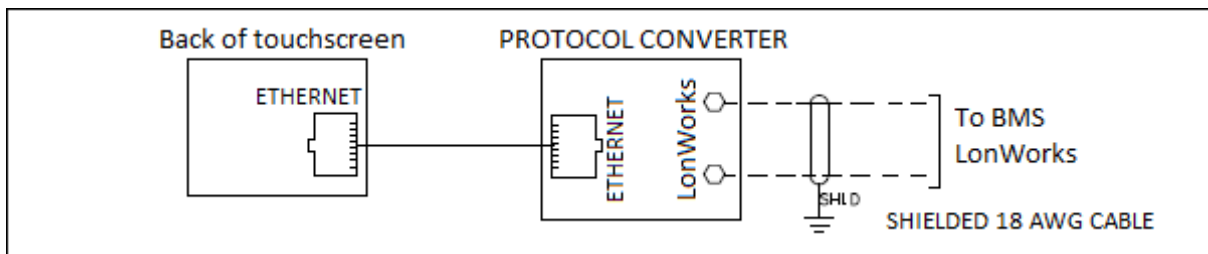


BMS serial connection RS232 without touchscreen:
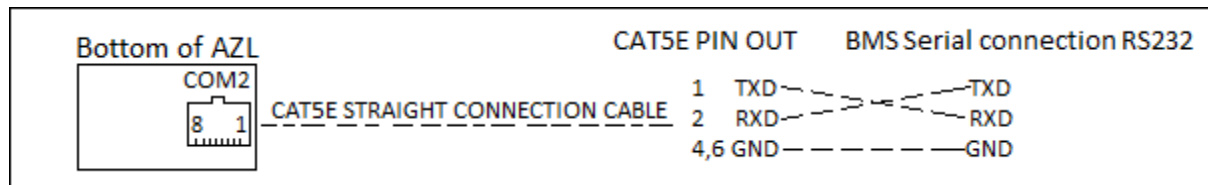


BMS serial connection RS485:
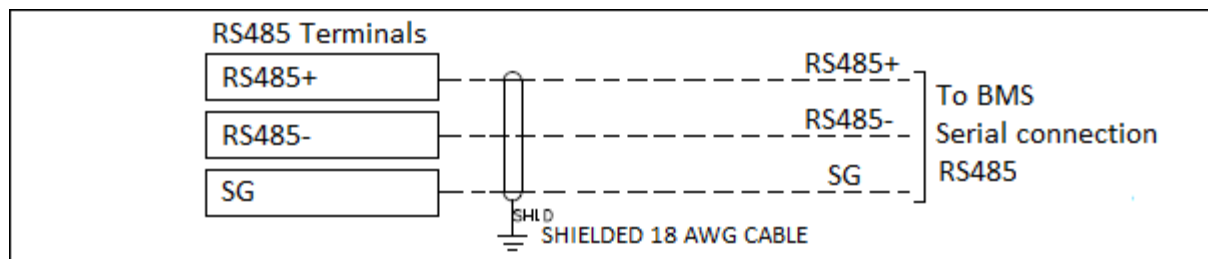
## Parts Descriptions
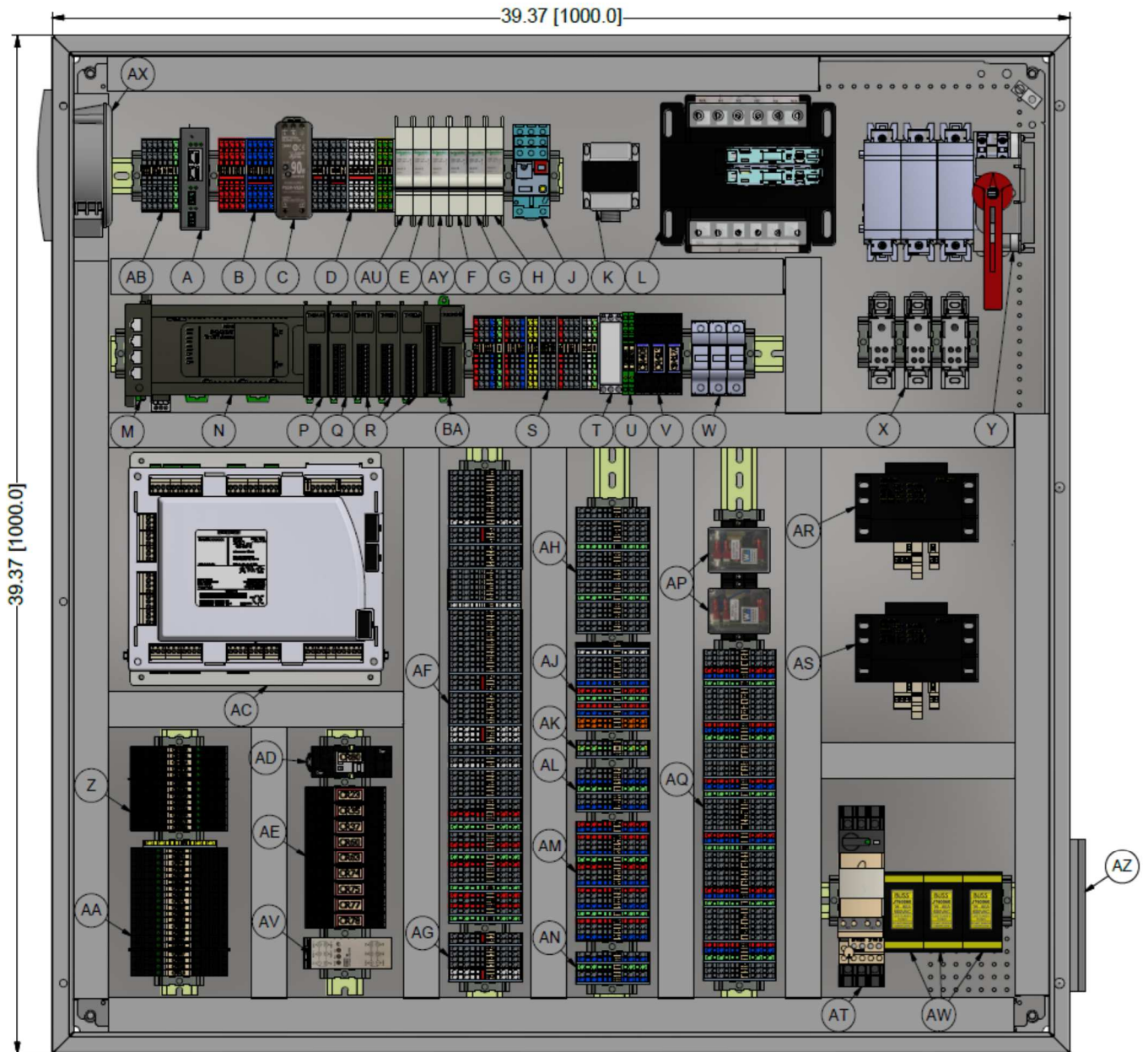
## Parts Descriptions (continued)

| | | | | | | |
|---|---|---|---|---|---|---|
| A | Protocol Converter | BMS Communication Other than Modbus TCP/IP | X | Power Distribution Blocks | 440 – 480 VAC |
| B | 24 VDC Terminals | Standard Component | Y | Disconnect Switch | Standard Component Fused with 440 – 480 VAC Non-Fused with 110 – 120 VAC |
| C | 24 VDC Power Supply | Standard Component | Z | 24 VDC SPDT Output Relays | Annunciation |
| D | 120 VAC and Ground Terminals | Standard Component | AA | 120 VAC SPDT Relays | Annunciation/Draft Control |
| E | 1 Amp Draft Control Circuit Breaker | Draft Control | AB | Modbus RS232 and RS485 Terminals | Standard Component |
| F | 3 Amp Load Control and Water Level Control Circuit Breaker | Load Control/Water Level Control | AC | LMV5 | Standard Component |
| G | 3 Amp 24 VDC Power Supply Circuit Breaker | Standard Component | AD | DPDT LMV5 Lockout Relay | Standard Component |
| H | 10 Amp Main Circuit Breaker | Standard Component | AE | DPDT LMV5 Output Relays | Standard Component |
| J | Power Fail Relay | Standard Component | AF | LMV5 Terminals (Safey Limit, Running Interlocks, Recycle Limits, Auxiliary Devices, Pilot and Gas Train, Ignition Transformer, Flame Scanner, HVAC) | Standard Component |
| K | 24 VAC SKB/C or D Transformer | Water Level Control | AG | Oil Train Terminals | Dual Fuel/Single Fuel, Oil |
| L | 750/1000 VA Transformer | 440 – 480 VAC | AH | Load Control Terminals | Load Control |
| M | Ethernet Switch | Annunciation or BACnet/IP, or Ethernet/IP BMS Communication | AJ | Water Level Control Terminals | Water Level Control |
| N | Programmable Logic Controller (PLC) | Annunciation or Draft Control | AK | 12 VAC Terminals | (2) AGG5.210 Transformers |
| P | Analog I/O Module | (4) Dedicated Analog Inputs and (2) Analog Outputs | AL | Analog Output Terminals | (4) Dedicated Analog Inputs and (2) Analog Outputs |
| Q | Analog Output Module | PLC Feedwater/Water Level or Circulating Pump VFD Control | AM | Dedicated Analog Input Terminals | (4) Dedicated Analog Inputs and (2) Analog Outputs |
| R | Analog Input Module(s) | (4) Universal Inputs per Module | AN | PLC Feedwater/Water Level and Circulating Pump VFD Control Terminals | PLC Feedwater/Water Level and Circulating Pump VFD Control |
| S | Draft Control Terminals | Draft Control | AP | Automatic/Manual Reset Warrick Relay | Auto and Manual Reset Warrick Relay |
| T | Off Delay Timer | Draft Control | AQ | Universal Input Terminals | (4), (8) or (12) Additional Universal Input Terminals |
| U | 24 VDC Solid State Relays | Draft Control | AR | AGG5.210 Transformer | Standard Component |
| V | 24 VDC DPDT Relays | Draft Control | AW | Fuse Holders/Fuses | VSD Control for Blower Motor |
| W | 4A Fuses | (2) AGG5.210 Transformers | | | |

## Parts Descriptions (continued)

| | | | | | |
|---|---|---|---|---|---|
| AS | 2nd AGG5.210 Transformer | (2) AGG5.210 Transformers | AX | Cooling Fan | Cooling Fan |
| AT | Motor Starters | Up to (3) Motor Starters for Blower, Oil Pump or Compressor | AY | 2A Cooling Fan Breaker | Cooling Fan |
| AU | 1A RS232 to RS485 Converter Breaker | Modbus RTU RS485 | AZ | Air Intake Filter | Cooling Fan |
| AV | RS232 to RS485 Converter | Modbus RTU RS485 | BA | Digital Input/Output Module | (16) Additional Digital inputs and (8) Additional Digital Outputs |

## Combustion Enclosure Layouts General Note:

Reference pages 41-42 for item balloon descriptions

Lowercase "x" in part number denotes any selection
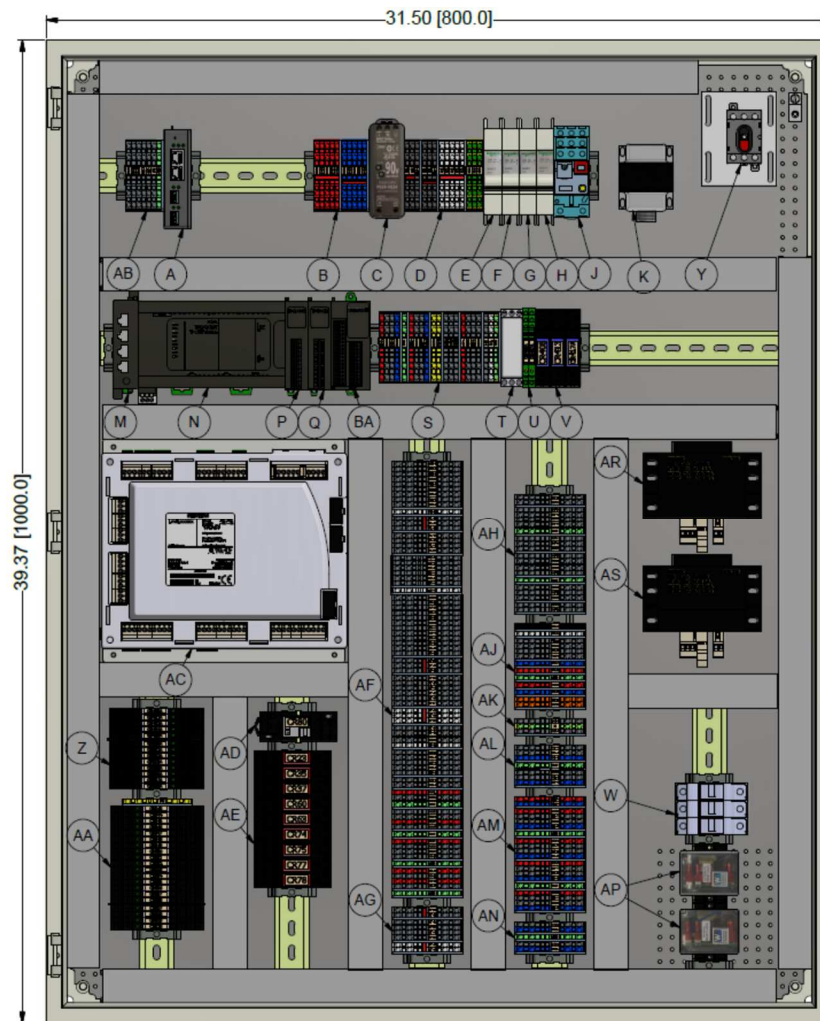
Dimensions in inches; millimeters in brackets

## TS-CExxx-xxxX-xxxx-XXXX
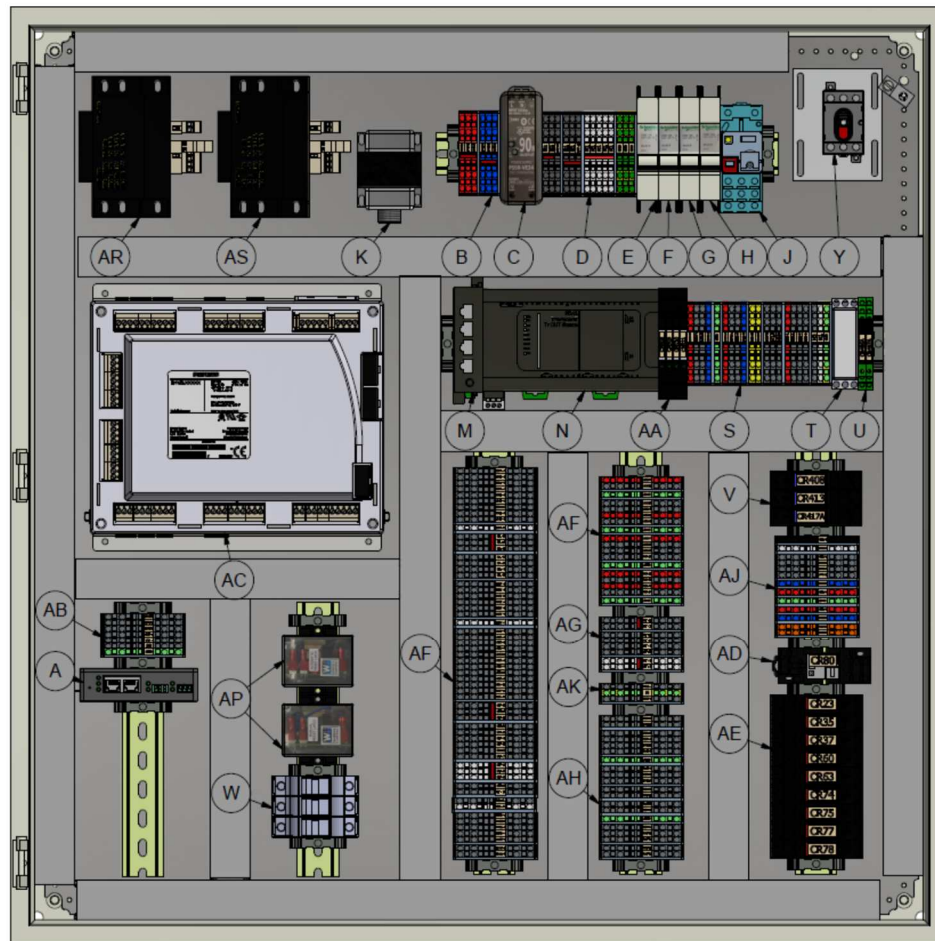


**TS-CE226-xDXX-Bx32-XXXX**

| Options for Kit in Enclosure | (2) AGG5.210 Transformers Components (W, AK, AS) | Water Level Control Components (F, K, AJ) | Load Control Components (F, AH) | *Draft Control Components (E, N, S, T, U, V, AA) | Warrick Relays (AP) |
|---|---|---|---|---|---|
| TS-CE22x-xxXX-Bx2x-XXXX | X | | | | |
| TS-CE2x3-xxXX-Bx2x-XXXX | | X | | | |
| TS-CE2x4-xxXX-Bx2x-XXXX | | | X | | |
| TS-CE2xx-xDXX-Bx2x-XXXX | | | | X | |
| TS-CE2xx-xxXX-B32x-XXXX | | | | | X |

Notes:

24"x24" Enclosure used with (0-1) options
32"x32" Enclosure used with (2) or more options
* Option not available in 24"x24" enclosure

## TS-CExxx-xxxX-xxxx-4xxx
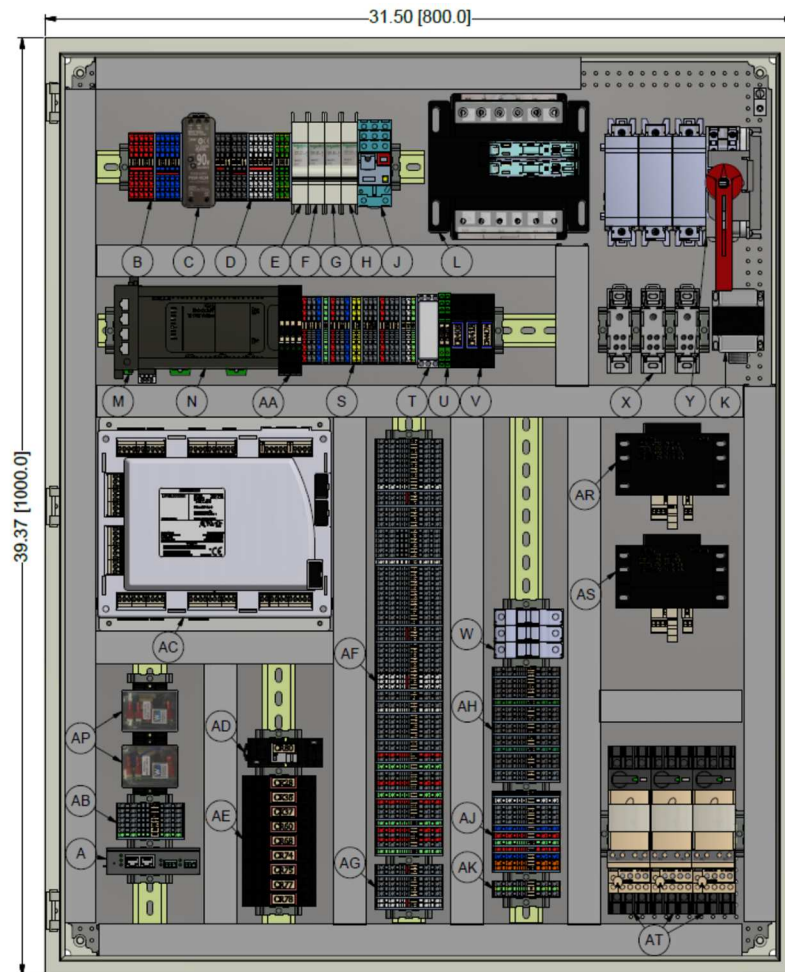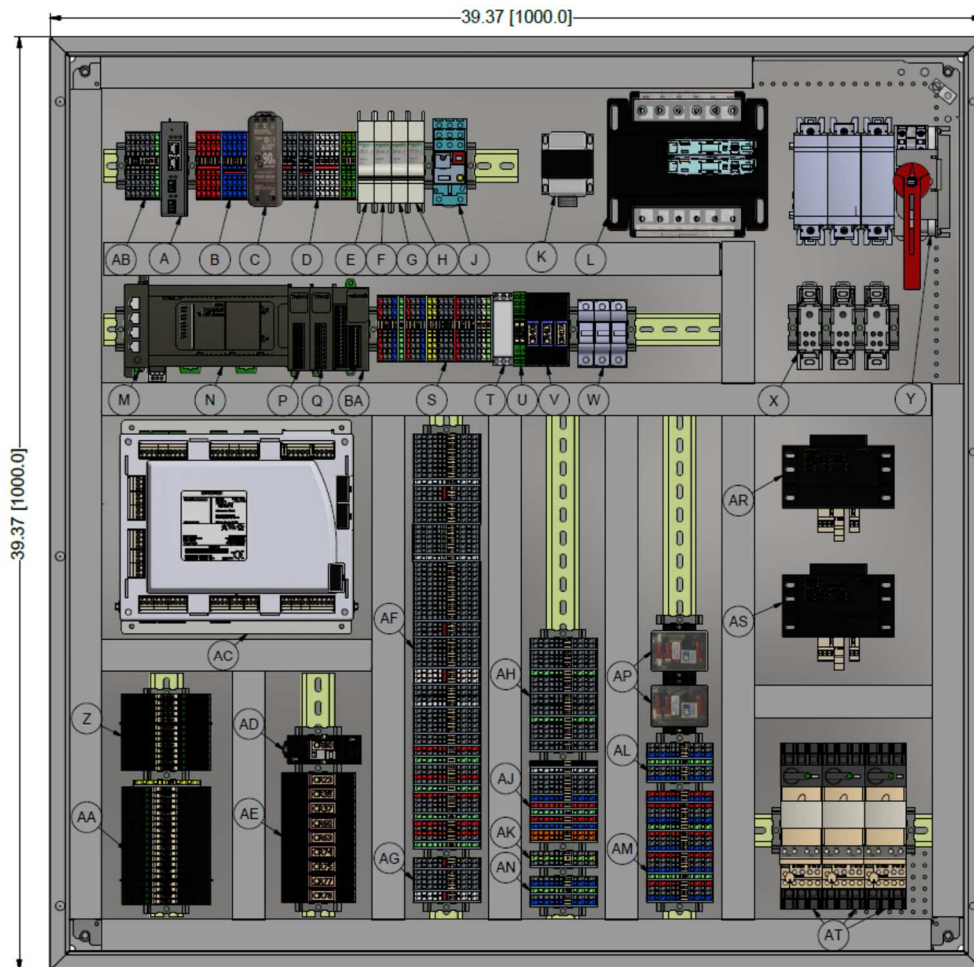


**TS-CE226-xDXX-Bx32-4CAC**

| Options for Kit in Enclosure | (2) AGG5.210 Transformers Components (W, AK, AS) | Water Level Control Components (F, K, AJ) | Load Control Components (F, AH) | Draft Control Components (E, N, S, T, U, V, AA) | Warrick Relays (AP) | Motor Starters (AT) |
|---|---|---|---|---|---|---|
| TS-CE22x-xxXX-Bx2x-4xxx | X | | | | | |
| TS-CE2x3-xxXX-Bx2x-4xxx | | X | | | | |
| TS-CE2x4-xxXX-Bx2x-4xxx | | | X | | | |
| TS-CE2xx-xDXX-Bx2x-4xxx | | | | X | | |
| TS-CE2xx-xxXX-B32x-4xxx | | | | | X | |
| TS-CE2xx-xxXX-Bx2x-4CAC | | | | | | X |

32"x32" Enclosure used with (0-1) options
40"x32" Enclosure used with (2) or more options
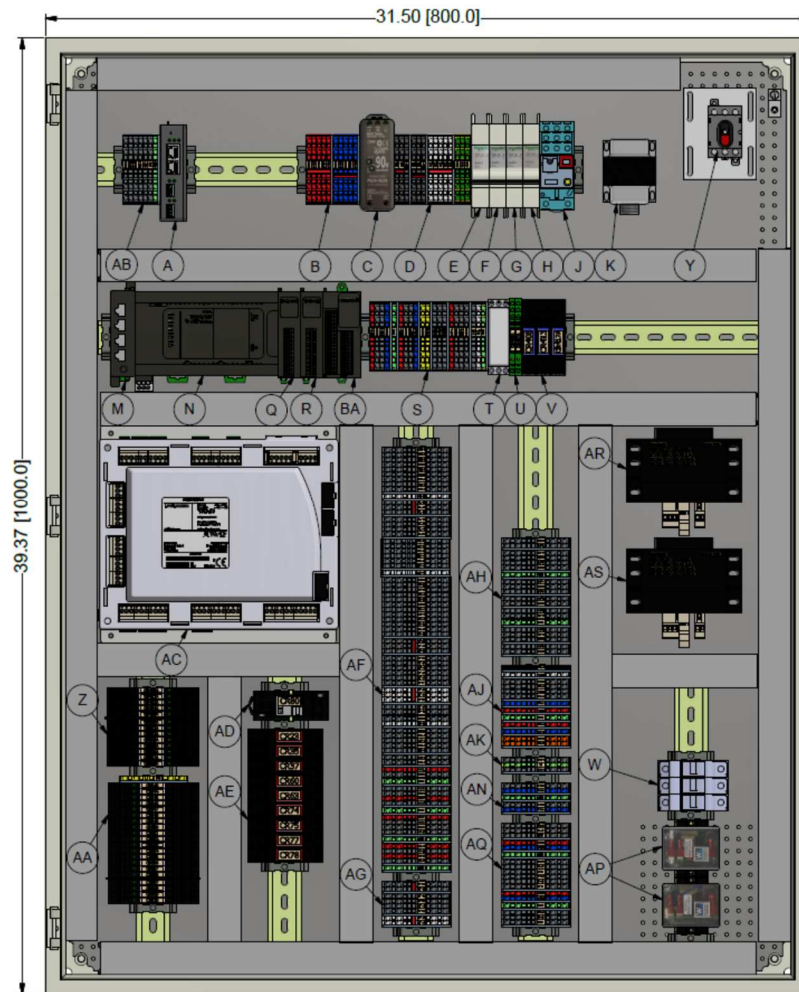
## TS-CExxx-xxxA-xxxx-XXXX
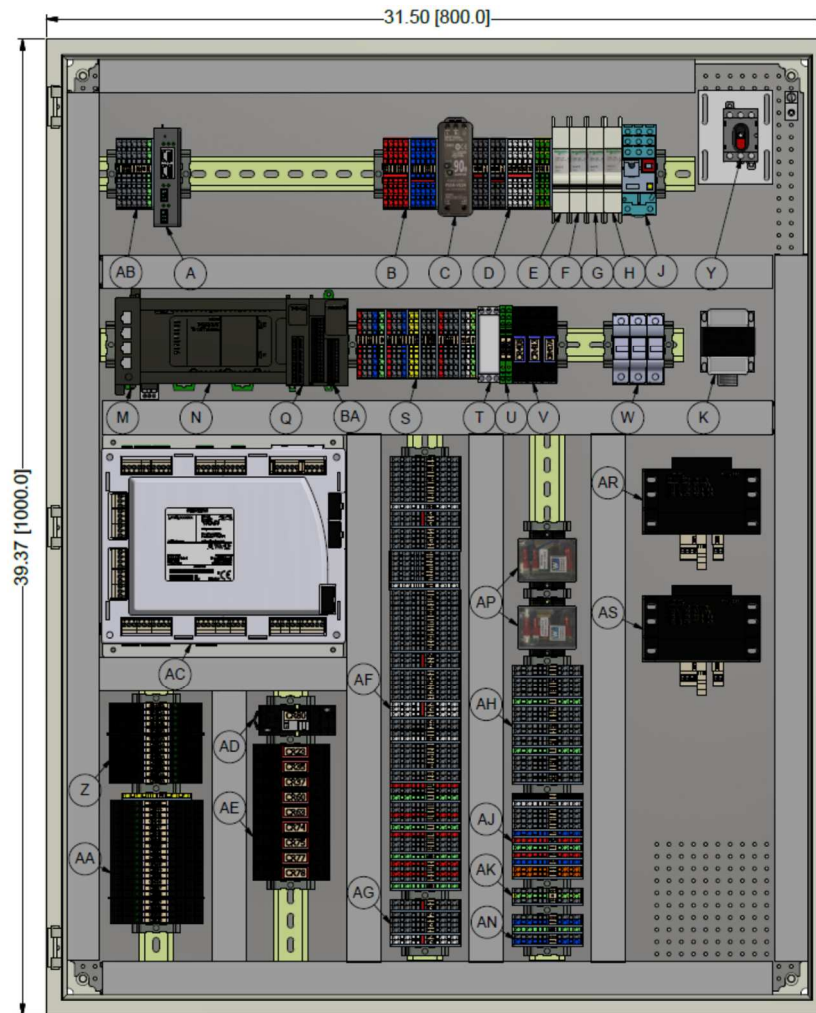


**TS-CE226-xD6A-Bx32-XXXX**

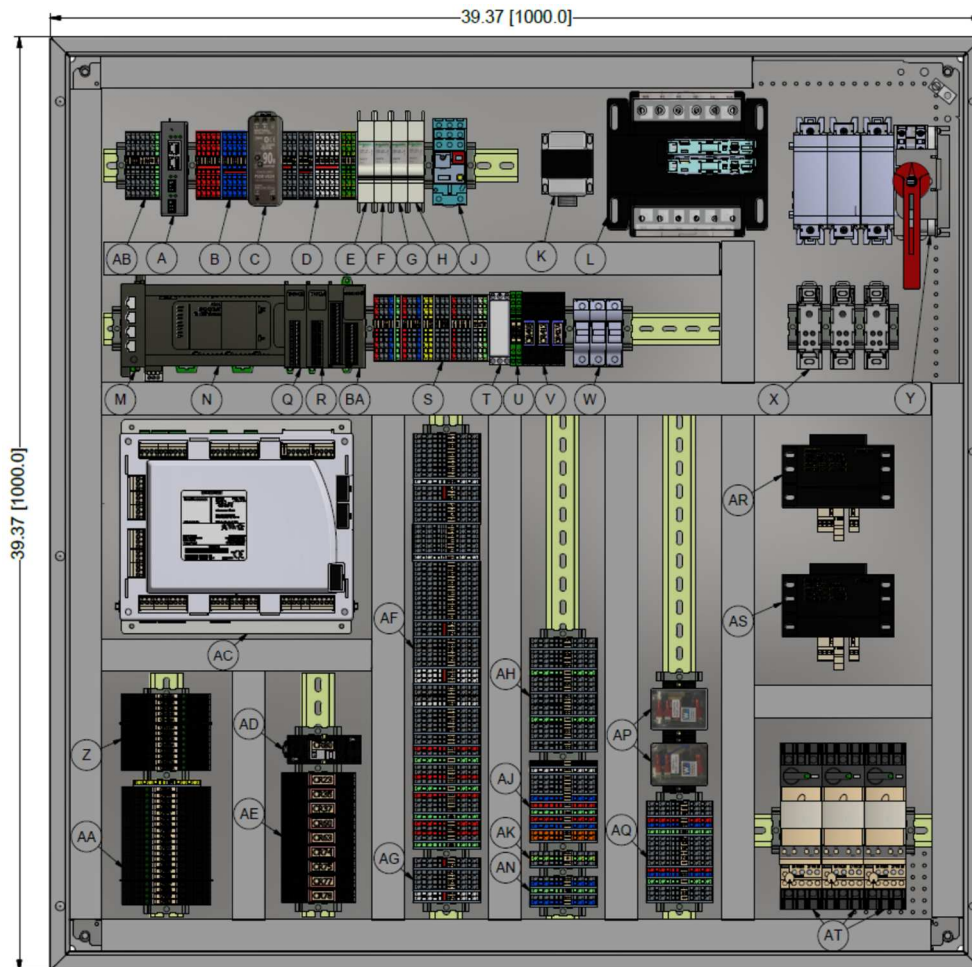| Options for Kit in Enclosure | (2) AGG5.210 Transformers Components (W, AK, AS) | Water Level Control Components (F, K, AJ) | Load Control Components (F, AH) | Draft Control Components (E, S, T, U, V) | PLC Output Components (Q, AN) | Additional Digital Inputs and Outputs (BA) | Warrick Relays (AP) |
|---|---|---|---|---|---|---|---|
| TS-CE2**2**x-xxxA-Bx2x-XXXX | X | | | | | | |
| TS-CE2x**3**-xxxA-Bx2x-XXXX | | X | | | | | |
| TS-CE2x**4**-xxxA-Bx2x-XXXX | | | X | | | | |
| TS-CE2x4-x**D**xA-Bx2x-XXXX | | | | X | | | |
| TS-CE2x4-xx**3**A-Bx2x-XXXX | | | | | X | | |
| TS-CE2x4-xx**6**A-Bx2x-XXXX | | | | | | X | |
| TS-CE2x4-xxxA-B**32**x-XXXX | | | | | | | X |

## TS-CExxx-xxxA-xxxx-4xxx
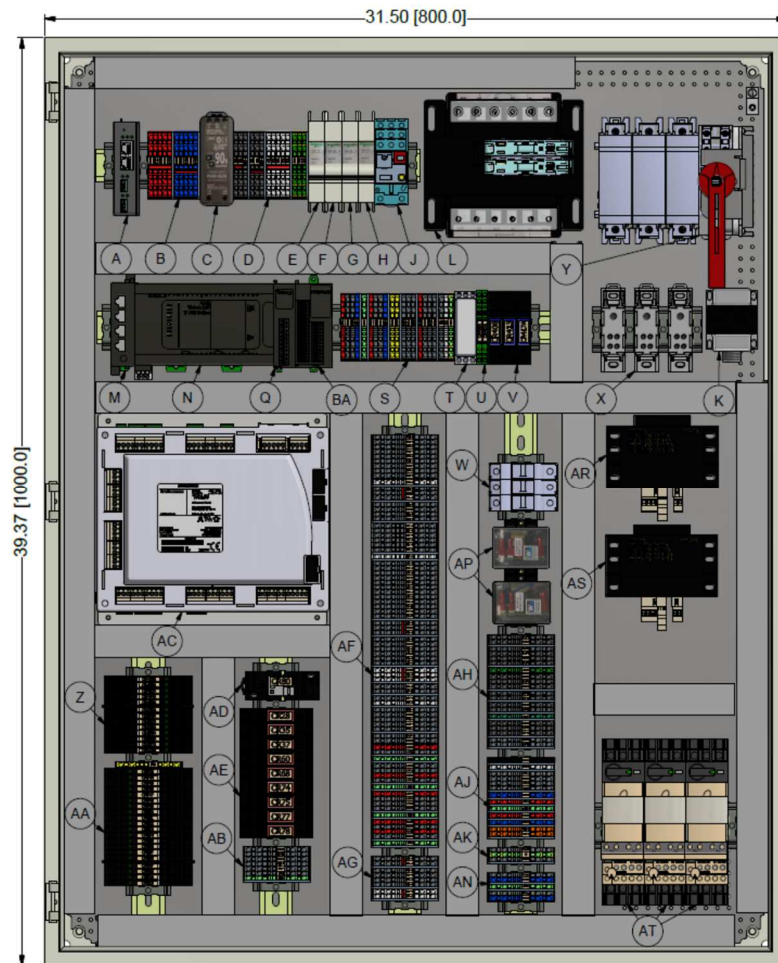


**TS-CE226-xD6A-Bx32-4CAC**

| Options for Kit in Enclosure | (2) AGG5.210 Transformers Components (W, AK, AS) | Water Level Control Components (F, K, AJ) | Load Control Components (F, AH) | Draft Control Components (E, S, T, U, V) | PLC Output Components (Q, AN) | Additional Digital Inputs and Outputs (BA) | Warrick Relays (AP) | Motor Starters (AT) |
|---|---|---|---|---|---|---|---|---|
| TS-CE2**2**x-xxxA-Bx2x-4xxx | X | | | | | | | |
| TS-CE2x**3**-xxxA-Bx2x-4xxx | | X | | | | | | |
| TS-CE2x**4**-xxxA-Bx2x-4xxx | | | X | | | | | |
| TS-CE2x4-x**D**xA-Bx2x-4xxx | | | | X | | | | |
| TS-CE2x4-xx**3**A-Bx2x-4xxx | | | | | X | | | |
| TS-CE2x4-xx**6**A-Bx2x-4xxx | | | | | X | X | | |
| TS-CE2x4-xxxA-B**3**2x-4xxx | | | | | | | X | |
| TS-CE2x4-xxxA-Bx2x-4**CAC** | | | | | | | | X |

## TS-CExxx-xxxB-xxxx-XXXX



**TS-CE226-xD6B-Bx32-XXXX**

| Options for Kit in Enclosure | (2) AGG5.210 Transformers Components (W, AK, AS) | Water Level Control Components (F, K, AJ) | Load Control Components (F, AH) | Draft Control Components (E, S, T, U, V) | PLC Output Components (Q, AN) | Additional Digital Inputs and Outputs (BA) | Warrick Relays (AP) |
|---|---|---|---|---|---|---|---|
| TS-CE2**2**x-xxxB-Bx2x-XXXX | X | | | | | | |
| TS-CE2x**3**-xxxB-Bx2x-XXXX | | X | | | | | |
| TS-CE2x**4**-xxxB-Bx2x-XXXX | | | X | | | | |
| TS-CE2x4-x**D**xB-Bx2x-XXXX | | | | X | | | |
| TS-CE2x4-xx**3**B-Bx2x-XXXX | | | | | X | | |
| TS-CE2x4-xx**6**B-Bx2x-XXXX | | | | | X | X | |
| TS-CE2x4-xxxB-B**32**x-XXXX | | | | | | | X |

Notes:

32"x32" Enclosure used with (0-5) options
40"x32" Enclosure used with (6) or more options

## TS-CExxx-xxxB-xxxx-4xxx



**TS-CE226-xD6B-Bx32-4CAC**

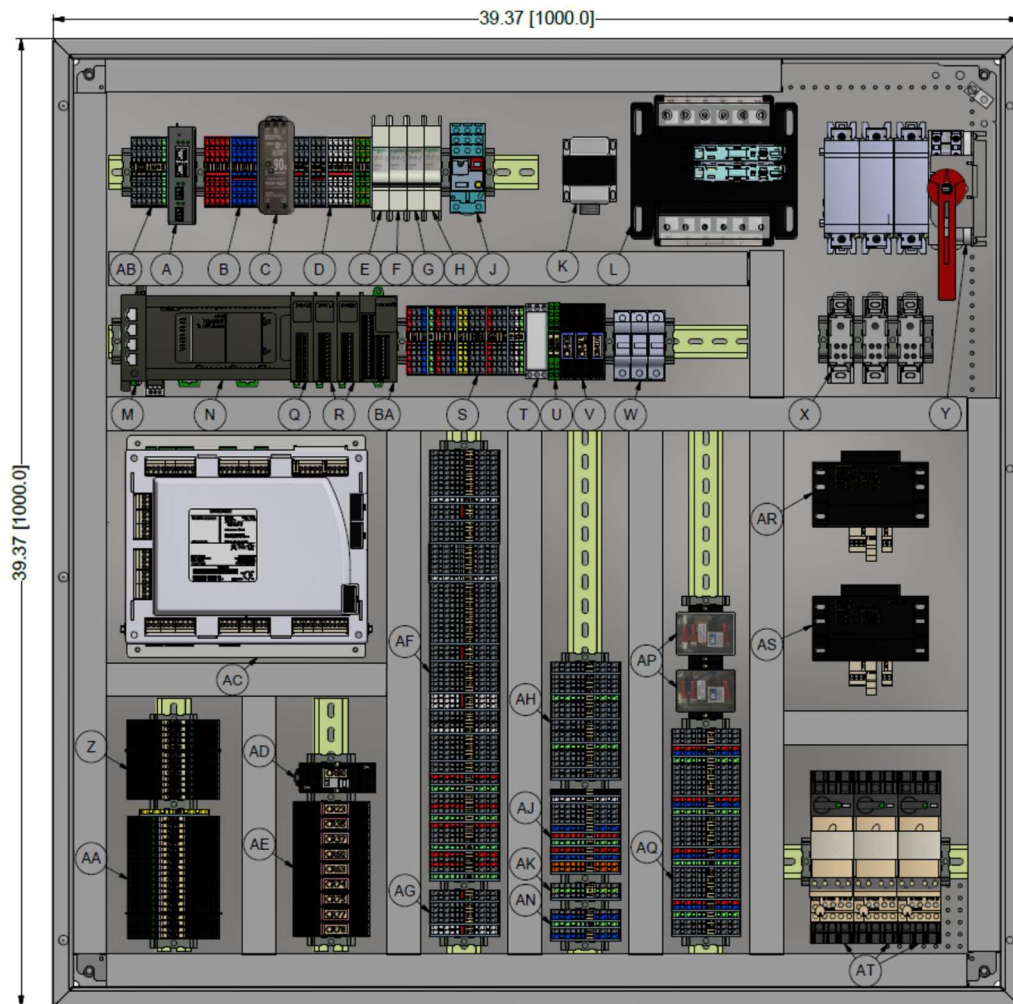| Options for Kit in Enclosure | (2) AGG5.210 Transformers Components (W, AK, AS) | Water Level Control Components (F, K, AJ) | Load Control Components (F, AH) | Draft Control Components (E, S, T, U, V) | PLC Output Components (Q, AN) | Additional Digital Inputs and Outputs (BA) | Warrick Relays (AP) | Motor Starters (AT) |
|---|---|---|---|---|---|---|---|---|
| TS-CE22**2**x-xxxB-Bx2x-4xxx | X | | | | | | | |
| TS-CE2x**3**-xxxB-Bx2x-4xxx | | X | | | | | | |
| TS-CE2x**4**-xxxB-Bx2x-4xxx | | | X | | | | | |
| TS-CE2x4-x**D**xB-Bx2x-4xxx | | | | X | | | | |
| TS-CE2x4-xx**3**B-Bx2x-4xxx | | | | | X | | | |
| TS-CE2x4-xx**6**B-Bx2x-4xxx | | | | | X | X | | |
| TS-CE2x4-xxxB-B**3**2x-4xxx | | | | | | | X | |
| TS-CE2x4-xxxB-Bx2x-4**CAC** | | | | | | | | X |

## TS-CExxx-xxxC-xxxx-XXXX



**TS-CE226-xD6C-Bx32-XXXX**

| Options for Kit in Enclosure | (2) AGG5.210 Transformers Components (W, AK, AS) | Water Level Control Components (F, K, AJ) | Load Control Components (F, AH) | Draft Control Components (E, S, T, U, V) | PLC Output Components (Q, AN) | Additional Digital Inputs and Outputs (BA) | Warrick Relays (AP) |
|---|---|---|---|---|---|---|---|
| TS-CE22x-xxxC-Bx2x-XXXX | X | | | | | | |
| TS-CE2x3-xxxC-Bx2x-XXXX | | X | | | | | |
| TS-CE2x4-xxxC-Bx2x-XXXX | | | X | | | | |
| TS-CE2x4-xDxC-Bx2x-XXXX | | | | X | | | |
| TS-CE2x4-xx3C-Bx2x-XXXX | | | | | X | | |
| TS-CE2x4-xx6C-Bx2x-XXXX | | | | | X | X | |
| TS-CE2x4-xxxC-B32x-XXXX | | | | | | | X |

Notes:
32"x32" Enclosure used with (0-5) options
40"x32" Enclosure used with (6) or more options

## TS-CExxx-xxxC-xxxx-4xxx



**TS-CE226-xD6C-Bx32-4CAC**

| Options for Kit in Enclosure | (2) AGG5.210 Transformers Components (W, AK, AS) | Water Level Control Components (F, K, AJ) | Load Control Components (F, AH) | Draft Control Components (E, S, T, U, V) | PLC Output Components (Q, AN) | Additional Digital Inputs and Outputs (BA) | Warrick Relays (AP) | Motor Starters (AT) |
|---|---|---|---|---|---|---|---|---|
| TS-CE2**2**x-xxxC-Bx2x-4xxx | X | | | | | | | |
| TS-CE2x**3**-xxxC-Bx2x-4xxx | | X | | | | | | |
| TS-CE2x**4**-xxxC-Bx2x-4xxx | | | X | | | | | |
| TS-CE2x4-x**D**xC-Bx2x-4xxx | | | | X | | | | |
| TS-CE2x4-xx**3**C-Bx2x-4xxx | | | | | X | | | |
| TS-CE2x4-xx**6**C-Bx2x-4xxx | | | | | X | X | | |
| TS-CE2x4-xxxC-B**32**x-4xxx | | | | | | | X | |
| TS-CE2x4-xxxC-Bx2x-4**CAC** | | | | | | | | X |

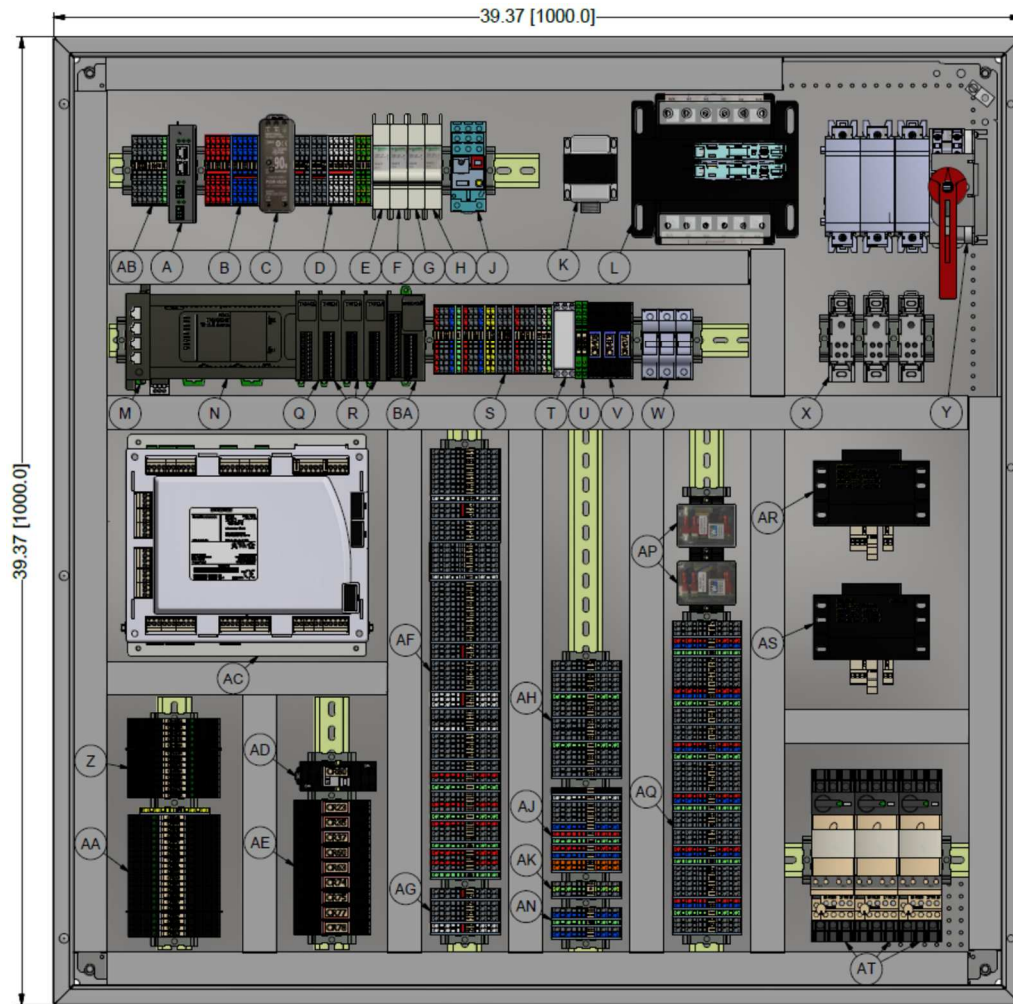## TS-CExxx-xxxD-xxxx-XXXX
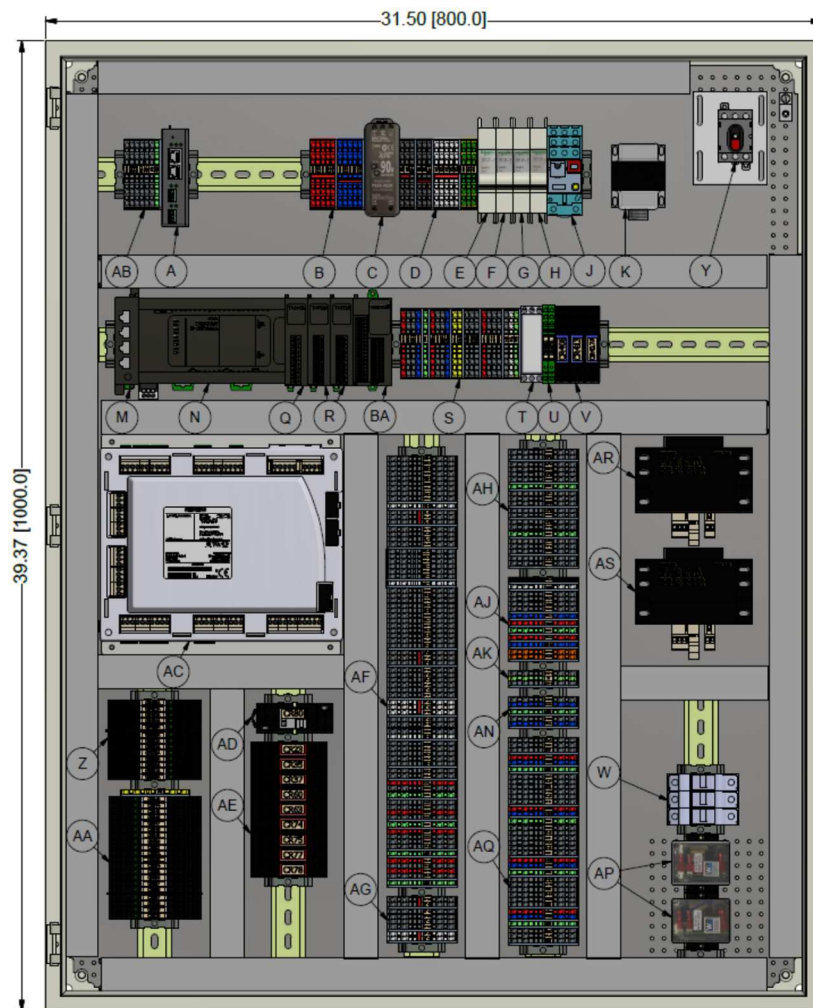


**TS-CE226-xD6D-Bx32-XXXX**

| Options for Kit in Enclosure | (2) AGG5.210 Transformers Components (W, AK, AS) | Water Level Control Components (F, K, AJ) | Load Control Components (F, AH) | Draft Control Components (E, S, T, U, V) | PLC Output Components (Q, AN) | Additional Digital Inputs and Outputs (BA) | Warrick Relays (AP) |
|---|---|---|---|---|---|---|---|
| TS-CE22x-xxxD-Bx2x-XXXX | X | | | | | | |
| TS-CE2x3-xxxD-Bx2x-XXXX | | X | | | | | |
| TS-CE2x4-xxxD-Bx2x-XXXX | | | X | | | | |
| TS-CE2x4-xDxD-Bx2x-XXXX | | | | X | | | |
| TS-CE2x4-xx3D-Bx2x-XXXX | | | | | X | | |
| TS-CE2x4-xx6D-Bx2x-XXXX | | | | | X | X | |
| TS-CE2x4-xxxD-B32x-XXXX | | | | | | | X |

Notes:

32"x32" Enclosure used with (0-4) options
40"x32" Enclosure used with (5) or more options
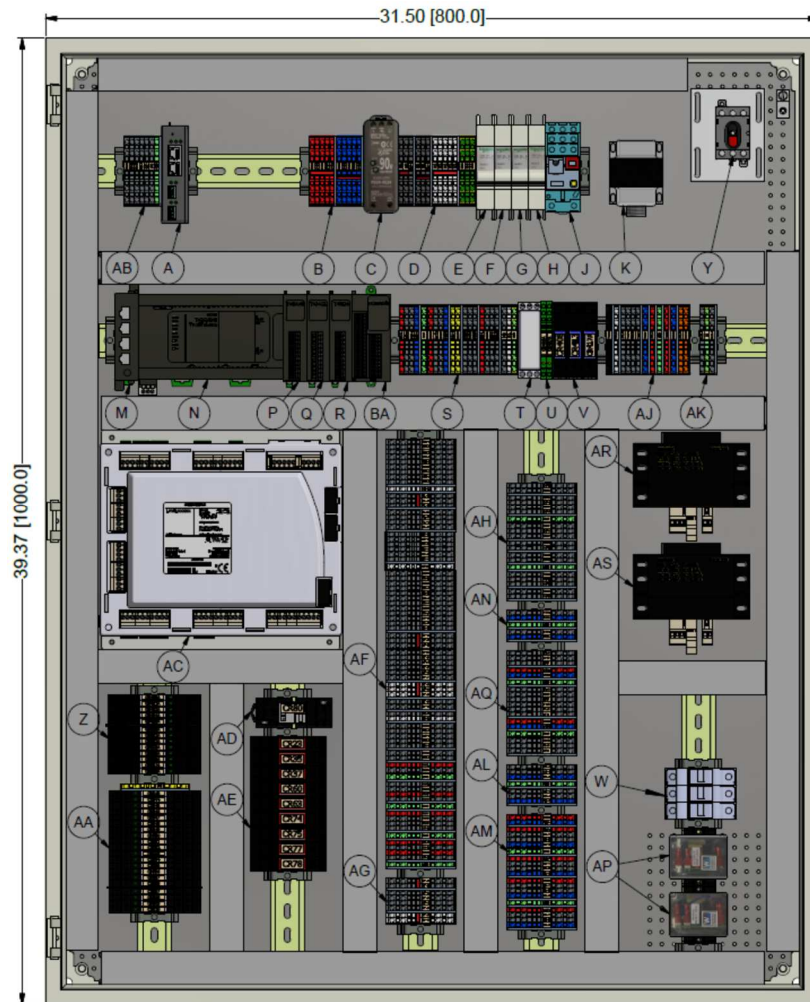
## TS-CExxx-xxxD-xxxx-4xxx



**TS-CE226-xD6D-Bx32-4CAC**

| Options for Kit in Enclosure | (2) AGG5.210 Transformers Components (W, AK, AS) | Water Level Control Components (F, K, AJ) | Load Control Components (F, AH) | Draft Control Components (E, S, T, U, V) | PLC Output Components (Q, AN) | Additional Digital Inputs and Outputs (BA) | Warrick Relays (AP) | Motor Starters (AT) |
|---|---|---|---|---|---|---|---|---|
| TS-CE2**2**x-xxxD-Bx2x-4xxx | X | | | | | | | |
| TS-CE2x**3**-xxxD-Bx2x-4xxx | | X | | | | | | |
| TS-CE2x**4**-xxxD-Bx2x-4xxx | | | X | | | | | |
| TS-CE2x4-x**D**xD-Bx2x-4xxx | | | | X | | | | |
| TS-CE2x4-xx**3**D-Bx2x-4xxx | | | | | X | | | |
| TS-CE2x4-xx**6**D-Bx2x-4xxx | | | | | X | X | | |
| TS-CE2x4-xxxD-B**3**2x-4xxx | | | | | | | X | |
| TS-CE2x4-xxxD-Bx2x-4**CAC** | | | | | | | | X |

Notes:

40"x32" Enclosure used with (0-6) options
40"x40" Enclosure used with (7) options
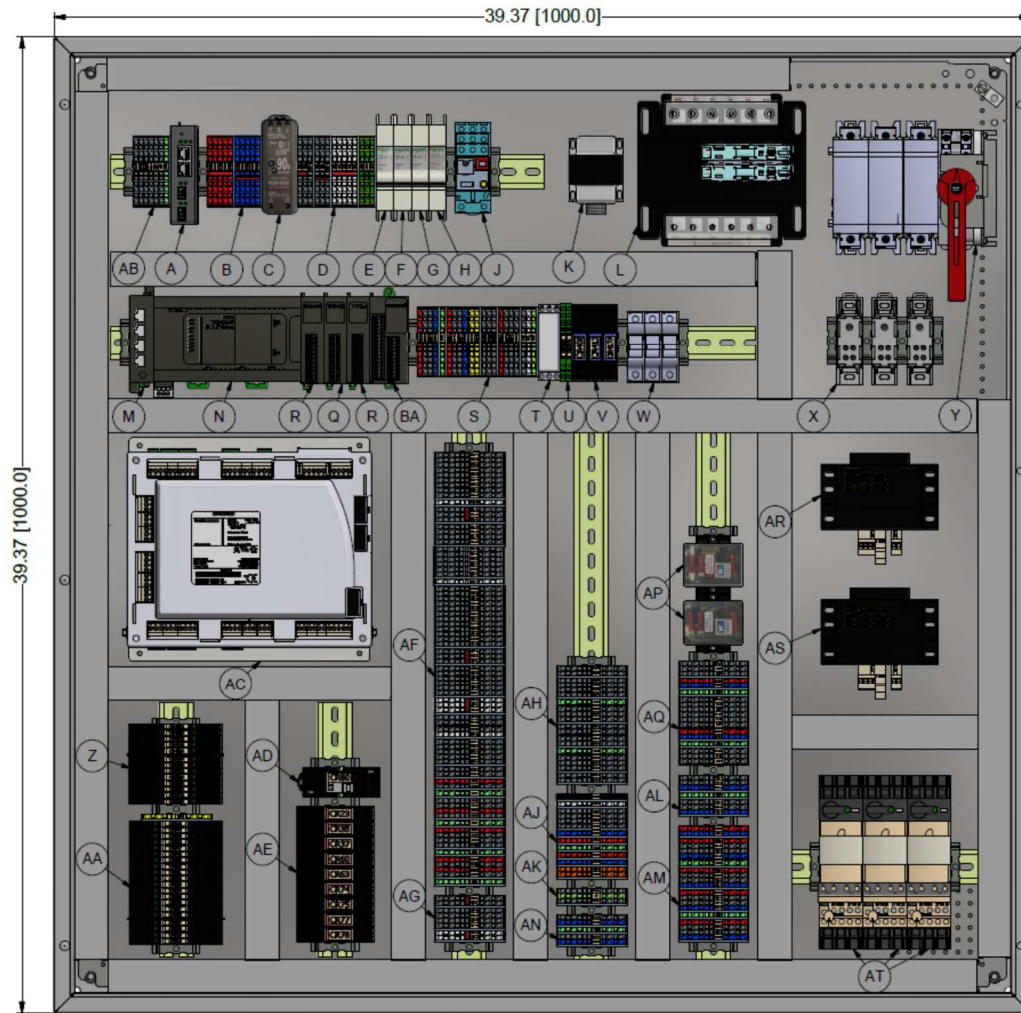
## TS-CExxx-xxxE-xxxx-XXXX
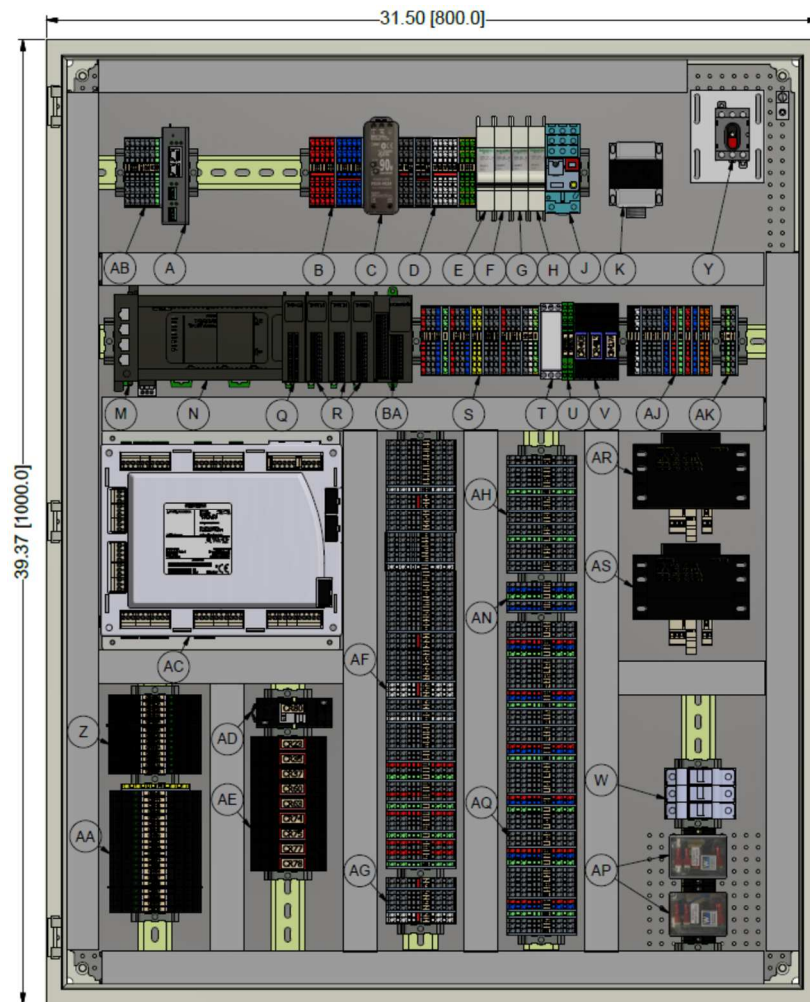


**TS-CE226-xD6E-Bx32-XXXX**

| Options for Kit in Enclosure | (2) AGG5.210 Transformers Components (W, AK, AS) | Water Level Control Components (F, K, AJ) | Load Control Components (F, AH) | Draft Control Components (E, S, T, U, V) | PLC Output Components (Q, AN) | Additional Digital Inputs and Outputs (BA) | Warrick Relays (AP) |
|---|---|---|---|---|---|---|---|
| TS-CE2**2**x-xxxE-Bx2x-XXXX | X | | | | | | |
| TS-CE2x**3**-xxxE-Bx2x-XXXX | | X | | | | | |
| TS-CE2x**4**-xxxE-Bx2x-XXXX | | | X | | | | |
| TS-CE2x4-x**D**xE-Bx2x-XXXX | | | | X | | | |
| TS-CE2x4-xx**3**E-Bx2x-XXXX | | | | | X | | |
| TS-CE2x4-xx**6**E-Bx2x-XXXX | | | | | X | X | |
| TS-CE2x4-xxxE-B**32**x-XXXX | | | | | | | X |

Notes:

32"x32" Enclosure used with (0-3) options
40"x32" Enclosure used with (4) or more options
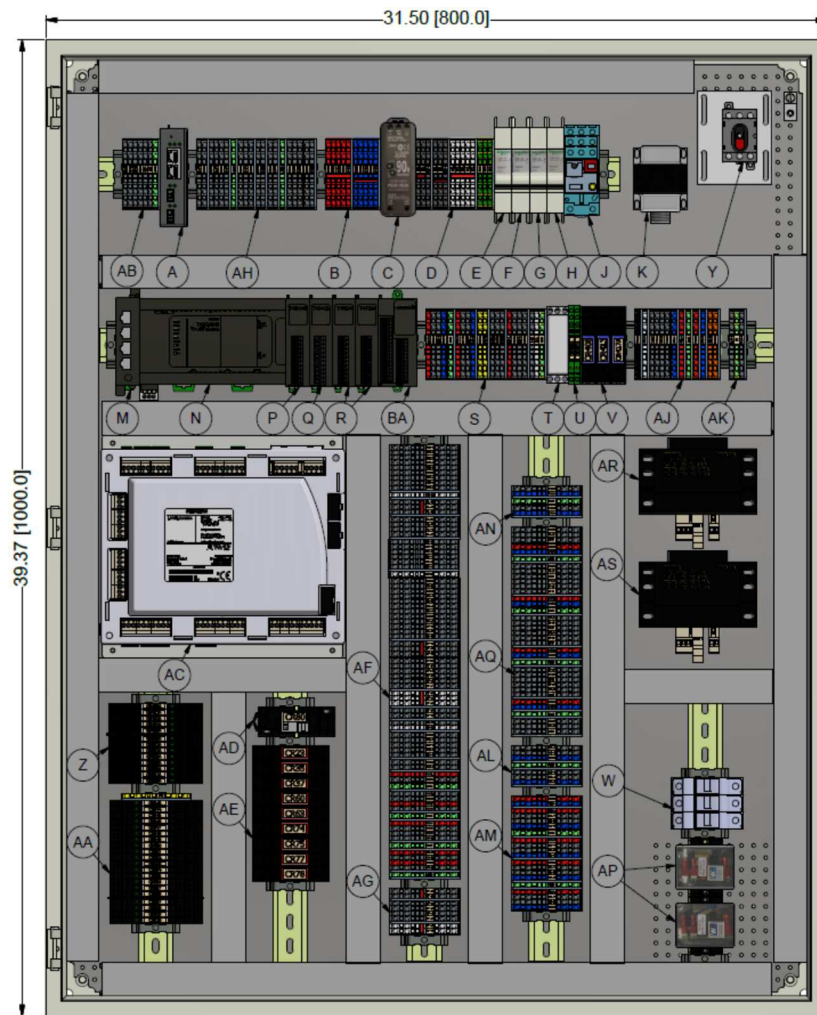
## TS-CExxx-xxxE-xxxx-4xxx



**TS-CE226-xD6E-Bx32-4CAC**

| Options for Kit in Enclosure | (2) AGG5.210 Transformers Components (W, AK, AS) | Water Level Control Components (F, K, AJ) | Load Control Components (F, AH) | Draft Control Components (E, S, T, U, V) | PLC Output Components (Q, AN) | Additional Digital Inputs and Outputs (BA) | Warrick Relays (AP) | Motor Starters (AT) |
|---|---|---|---|---|---|---|---|---|
| TS-CE2**2**x-xxxE-Bx2x-4xxx | X | | | | | | | |
| TS-CE2x**3**-xxxE-Bx2x-4xxx | | X | | | | | | |
| TS-CE2x**4**-xxxE-Bx2x-4xxx | | | X | | | | | |
| TS-CE2x4-x**D**xE-Bx2x-4xxx | | | | X | | | | |
| TS-CE2x4-xx**3**E-Bx2x-4xxx | | | | | X | | | |
| TS-CE2x4-xx**6**E-Bx2x-4xxx | | | | | X | X | | |
| TS-CE2x4-xxxE-B**3**2x-4xxx | | | | | | | X | |
| TS-CE2x4-xxxE-Bx2x-4**CAC** | | | | | | | | X |

Notes:

40"x32" Enclosure used with (0-5) options
40"x40" Enclosure used with (6) or more options
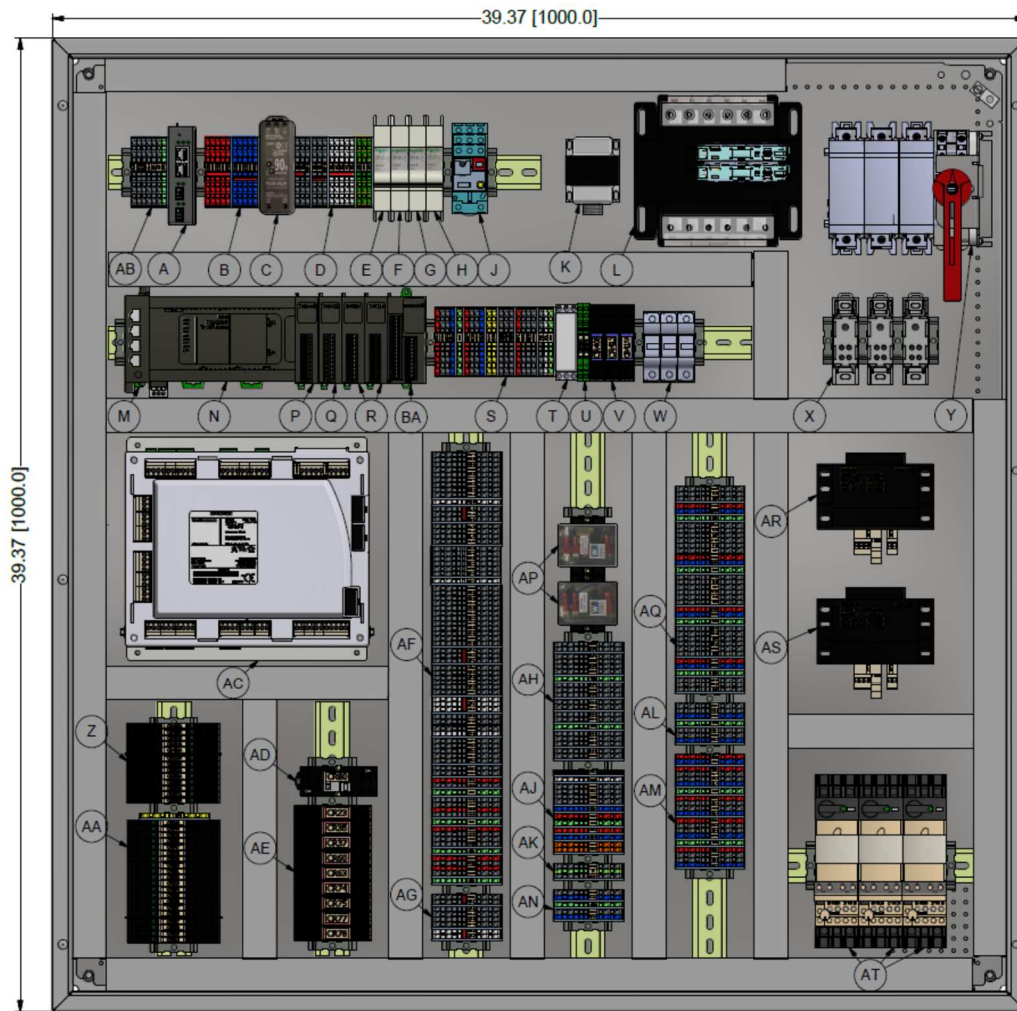
## TS-CExxx-xxxF-xxxx-XXXX



**TS-CE226-xD6F-Bx32-XXXX**

| Options for Kit in Enclosure | (2) AGG5.210 Transformers Components (W, AK, AS) | Water Level Control Components (F, K, AJ) | Load Control Components (F, AH) | Draft Control Components (E, S, T, U, V) | PLC Output Components (Q, AN) | Additional Digital Inputs and Outputs (BA) | Warrick Relays (AP) |
|---|---|---|---|---|---|---|---|
| TS-CE2**2**x-xxxF-Bx2x-XXXX | X | | | | | | |
| TS-CE2x**3**-xxxF-Bx2x-XXXX | | X | | | | | |
| TS-CE2x**4**-xxxF-Bx2x-XXXX | | | X | | | | |
| TS-CE2x4-x**D**xF-Bx2x-XXXX | | | | X | | | |
| TS-CE2x4-xx**3**F-Bx2x-XXXX | | | | | X | | |
| TS-CE2x4-xx**6**F-Bx2x-XXXX | | | | | | X | |
| TS-CE2x4-xxxF-B**32**x-XXXX | | | | | | | X |

Notes:

32"x32" Enclosure used with (0-3) options
40"x32" Enclosure used with (4) or more options
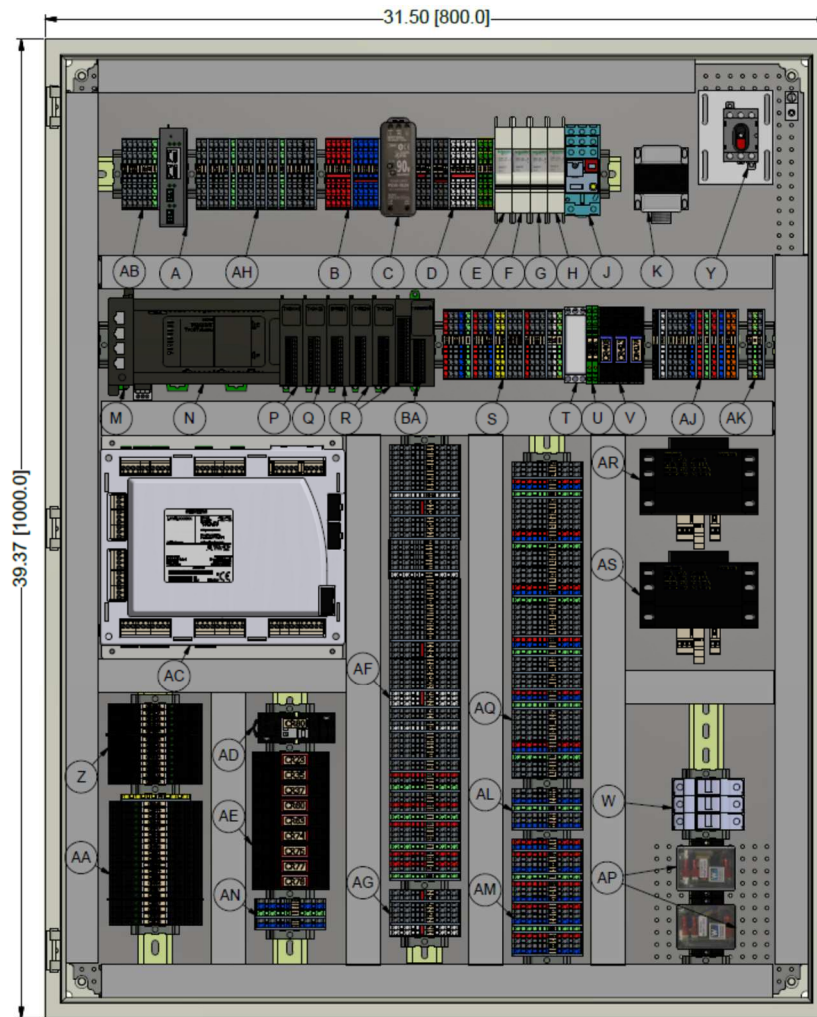
## TS-CExxx-xxxF-xxxx-4xxx



**TS-CE226-xD6F-Bx32-4CAC**

| Options for Kit in Enclosure | (2) AGG5.210 Transformers Components (W, AK, AS) | Water Level Control Components (F, K, AJ) | Load Control Components (F, AH) | Draft Control Components (E, S, T, U, V) | PLC Output Components (Q, AN) | Additional Digital Inputs and Outputs (BA) | Warrick Relays (AP) | Motor Starters (AT) |
|---|---|---|---|---|---|---|---|---|
| TS-CE2**2**x-xxxF-Bx2x-4xxx | x | | | | | | | |
| TS-CE2x**3**-xxxF-Bx2x-4xxx | | x | | | | | | |
| TS-CE2x**4**-xxxF-Bx2x-4xxx | | | x | | | | | |
| TS-CE2x4-x**D**xF-Bx2x-4xxx | | | | x | | | | |
| TS-CE2x4-xx**3**F-Bx2x-4xxx | | | | | x | | | |
| TS-CE2x4-xx**6**F-Bx2x-4xxx | | | | | x | x | | |
| TS-CE2x4-xxxF-B**3**2x-4xxx | | | | | | | x | |
| TS-CE2x4-xxxF-Bx2x-4**CAC** | | | | | | | | x |

Notes:

40"x32" Enclosure used with (0-5) options

40"x40" Enclosure used with (6) or more options
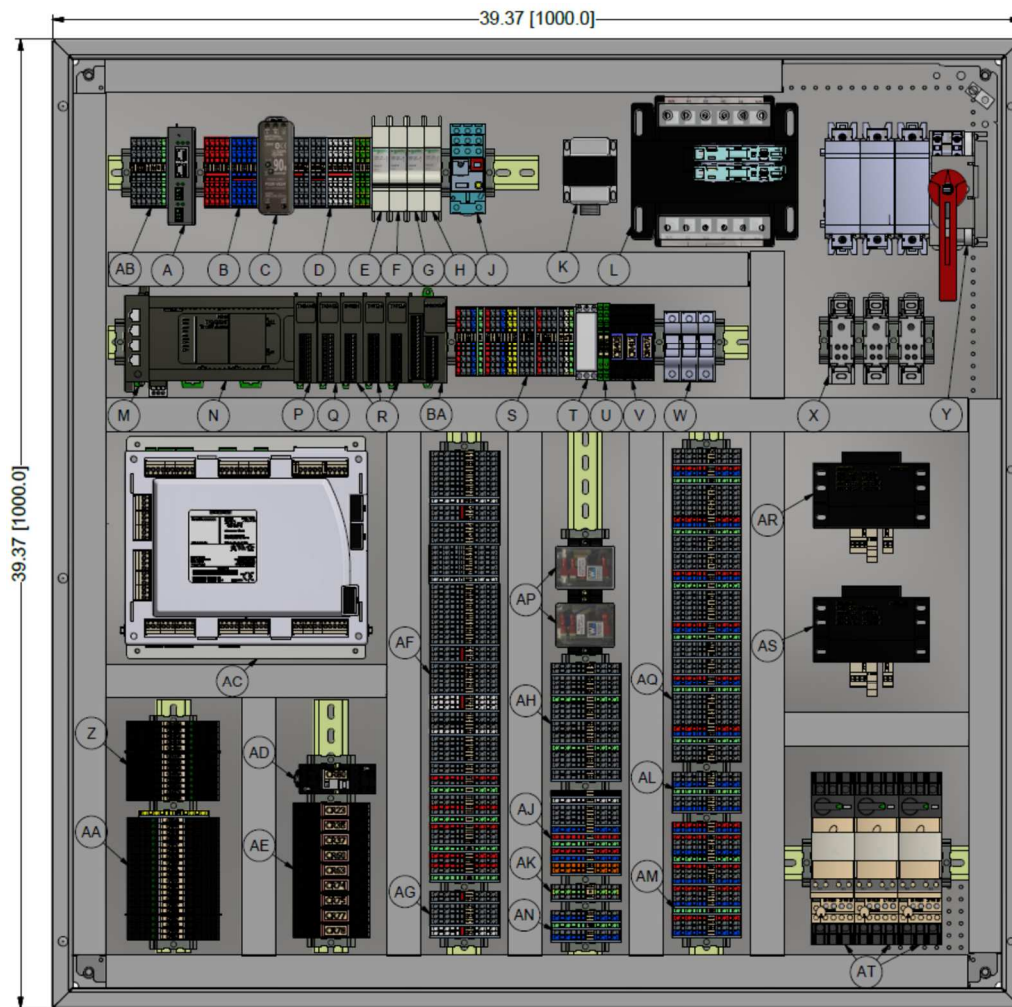
## TS-CExxx-xxxG-xxxx-XXXX



**TS-CE226-xD6G-Bx32-XXXX**

| Options for Kit in Enclosure | (2) AGG5.210 Transformers Components (W, AK, AS) | Water Level Control Components (F, K, AJ) | Load Control Components (F, AH) | Draft Control Components (E, S, T, U, V) | PLC Output Components (Q, AN) | Additional Digital Inputs and Outputs (BA) | Warrick Relays (AP) |
|---|---|---|---|---|---|---|---|
| TS-CE2**2**x-xxxG-Bx2x-XXXX | X | | | | | | |
| TS-CE2x**3**-xxxG-Bx2x-XXXX | | X | | | | | |
| TS-CE2x**4**-xxxG-Bx2x-XXXX | | | X | | | | |
| TS-CE2x4-x**D**xG-Bx2x-XXXX | | | | X | | | |
| TS-CE2x4-xx**3**G-Bx2x-XXXX | | | | | X | | |
| TS-CE2x4-xx**6**G-Bx2x-XXXX | | | | | X | X | |
| TS-CE2x4-xxxG-B**3**2x-XXXX | | | | | | | X |

Notes:

32"x32" Enclosure used with (0-2) options
40"x32" Enclosure used with (3) or more options

## TS-CExxx-xxxG-xxxx-4xxx



**TS-CE226-xD6G-Bx32-4CAC**

| Options for Kit in Enclosure | (2) AGG5.210 Transformers Components (W, AK, AS) | Water Level Control Components (F, K, AJ) | Load Control Components (F, AH) | Draft Control Components (E, S, T, U, V) | PLC Output Components (Q, AN) | Additional Digital Inputs and Outputs (BA) | Warrick Relays (AP) | Motor Starters (AT) |
|---|---|---|---|---|---|---|---|---|
| TS-CE2**2**x-xxxG-Bx2x-4xxx | X | | | | | | | |
| TS-CE2x**3**-xxxG-Bx2x-4xxx | | X | | | | | | |
| TS-CE2x**4**-xxxG-Bx2x-4xxx | | | X | | | | | |
| TS-CE2x4-x**D**xG-Bx2x-4xxx | | | | X | | | | |
| TS-CE2x4-xx**3**G-Bx2x-4xxx | | | | | X | | | |
| TS-CE2x4-xx**6**G-Bx2x-4xxx | | | | | X | X | | |
| TS-CE2x4-xxxG-B**32**x-4xxx | | | | | | | X | |
| TS-CE2x4-xxxG-Bx2x-4**CAC** | | | | | | | | X |

Notes:

40"x32" Enclosure used with (0-4) options
40"x40" Enclosure used with (5) or more options

## TS-CExxx-xxxH-xxxx-XXXX



**TS-CE226-xD6H-Bx32-XXXX**

| Options for Kit in Enclosure | (2) AGG5.210 Transformers Components (W, AK, AS) | Water Level Control Components (F, K, AJ) | Load Control Components (F, AH) | Draft Control Components (E, S, T, U, V) | PLC Output Components (Q, AN) | Additional Digital Inputs and Outputs (BA) | Warrick Relays (AP) |
|---|---|---|---|---|---|---|---|
| TS-CE2**2**x-xxxH-Bx2x-XXXX | X | | | | | | |
| TS-CE2x**3**-xxxH-Bx2x-XXXX | | X | | | | | |
| TS-CE2x**4**-xxxH-Bx2x-XXXX | | | X | | | | |
| TS-CE2x4-x**D**xH-Bx2x-XXXX | | | | X | | | |
| TS-CE2x4-xx**3**H-Bx2x-XXXX | | | | | X | | |
| TS-CE2x4-xx**6**H-Bx2x-XXXX | | | | | X | X | |
| TS-CE2x4-xxxH-B**3**2x-XXXX | | | | | | | X |

Notes:

32"x32" Enclosure used with (0-1) options
40"x32" Enclosure used with (2) or more options

## TS-CExxx-xxxH-xxxx-4xxx



**TS-CE226-xD3H-Bx32-4CAC**

| Options for Kit in Enclosure | (2) AGG5.210 Transformers Components (W, AK, AS) | Water Level Control Components (F, K, AJ) | Load Control Components (F, AH) | Draft Control Components (E, S, T, U, V) | PLC Output Components (Q, AN) | Additional Digital Inputs and Outputs (BA) | Warrick Relays (AP) | Motor Starters (AT) |
|---|---|---|---|---|---|---|---|---|
| TS-CE22x-xxxH-Bx2x-4xxx | X | | | | | | | |
| TS-CE2x3-xxxH-Bx2x-4xxx | | X | | | | | | |
| TS-CE2x4-xxxH-Bx2x-4xxx | | | X | | | | | |
| TS-CE2x4-xDxH-Bx2x-4xxx | | | | X | | | | |
| TS-CE2x4-xx3H-Bx2x-4xxx | | | | | X | | | |
| TS-CE2x4-xx6H-Bx2x-4xxx | | | | | X | X | | |
| TS-CE2x4-xxxH-B32x-4xxx | | | | | | | X | |
| TS-CE2x4-xxxH-Bx2x-4CAC | | | | | | | | X |

Notes:

40"x32" Enclosure used with (0-3) options

40"x40" Enclosure used with (4) or more options

## 24" X 24" X 10" Enclosure Dimensions
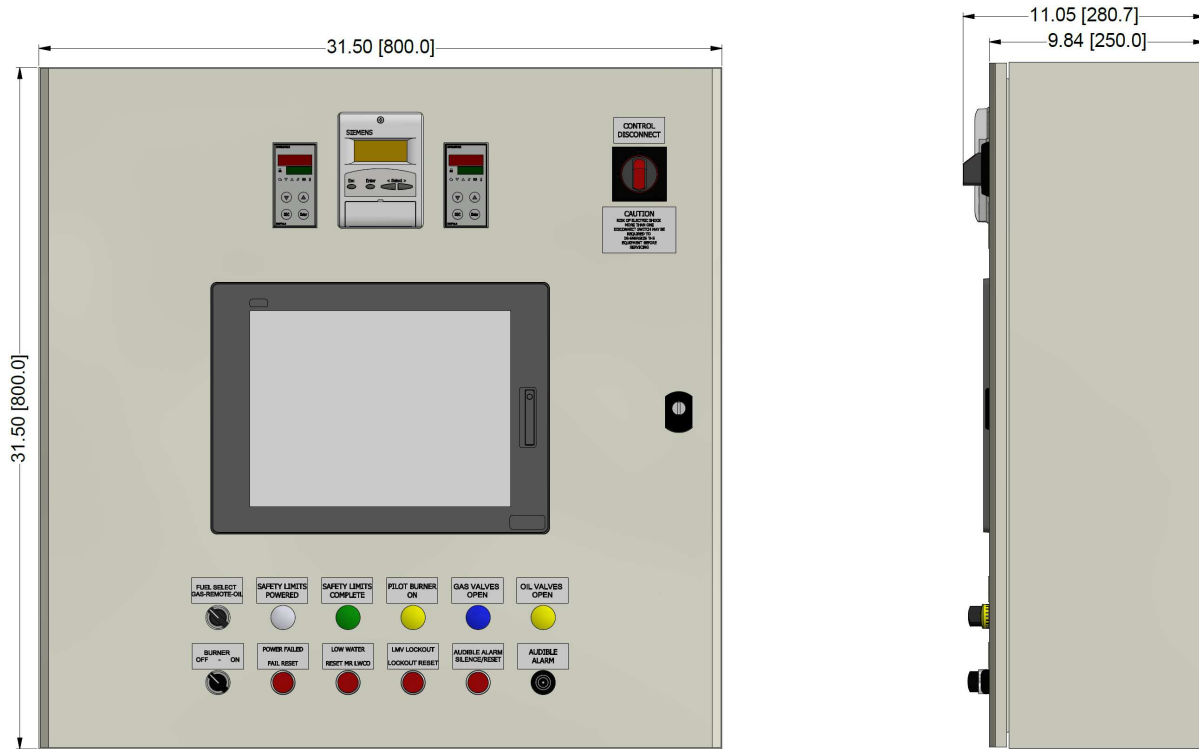
### TS-CExx(3/4)-2xxx-x1x2-xxxx
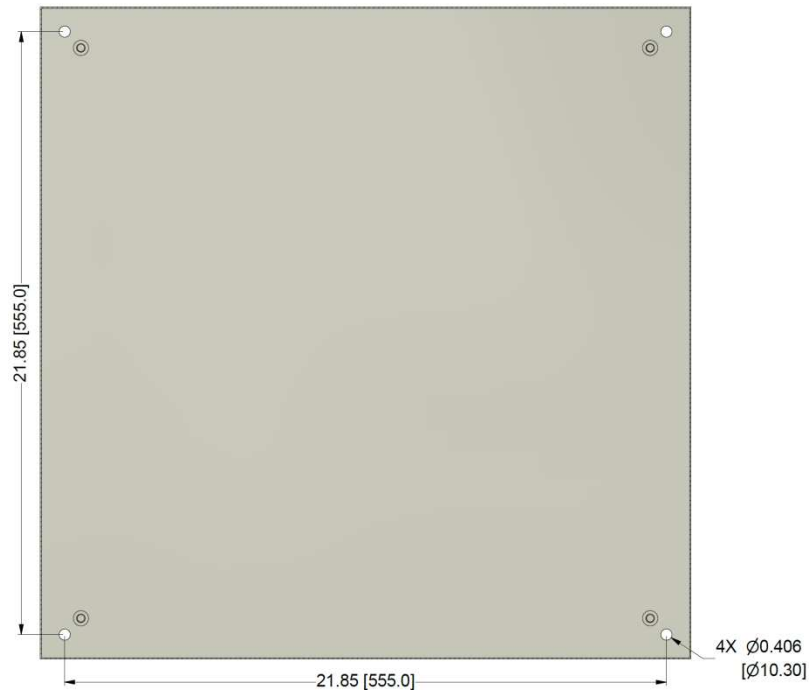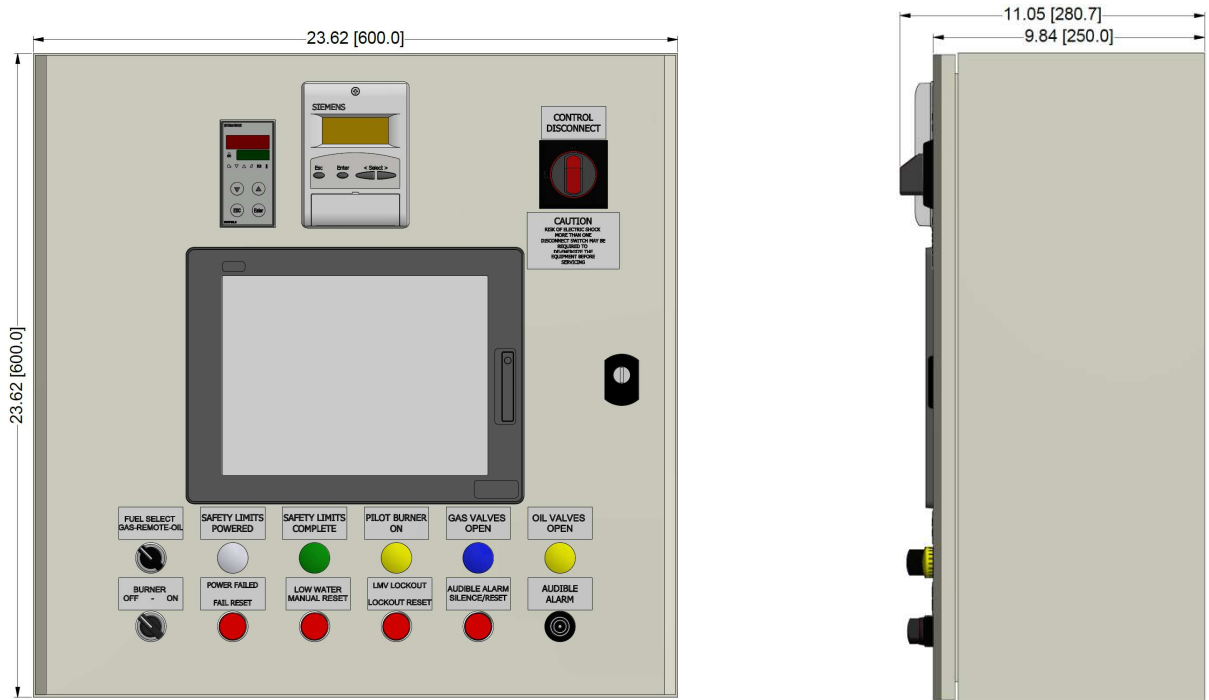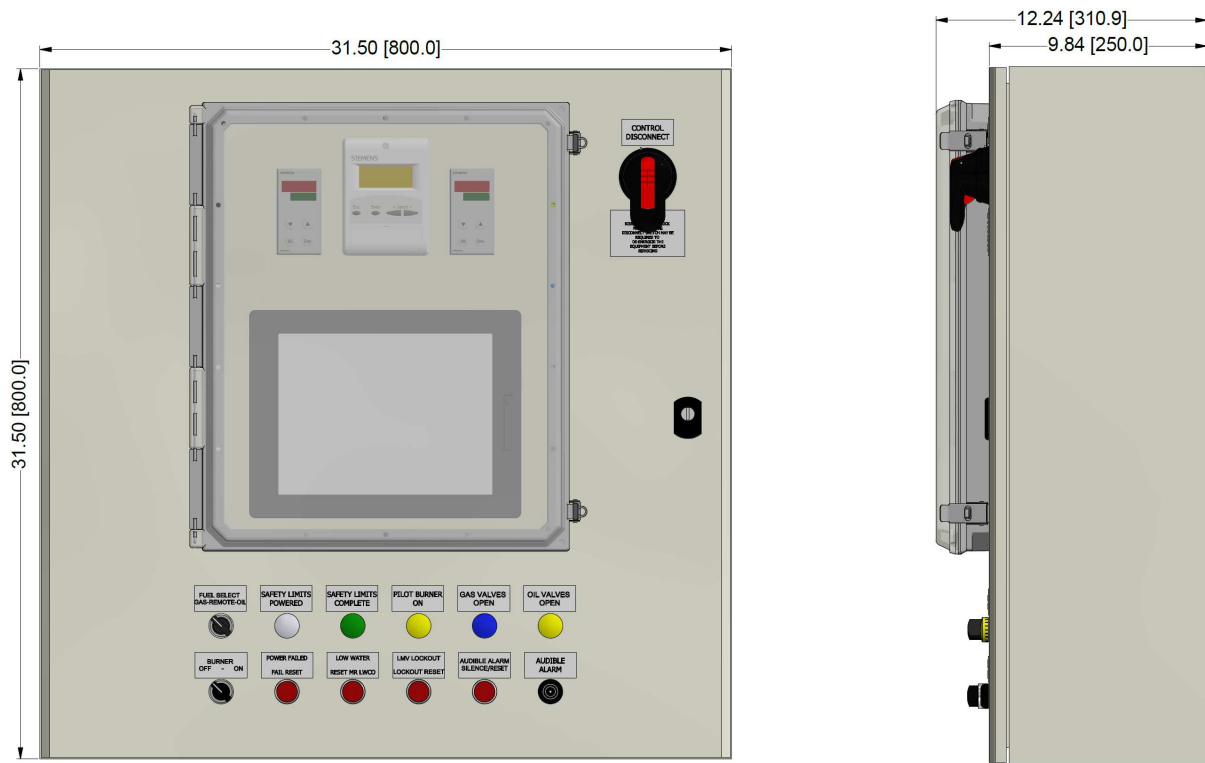
## TS-CExx(3/4)-6xxx-x2x2-xxxx
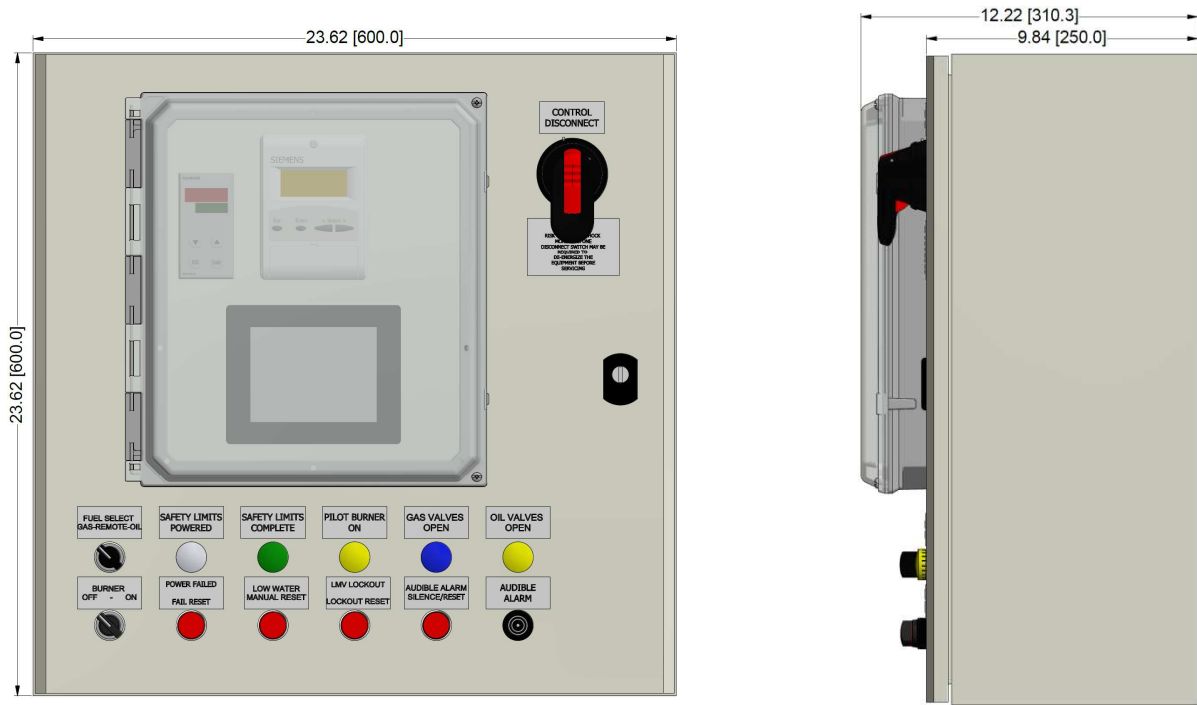
## 32" X 32" X 10" Enclosure Dimensions

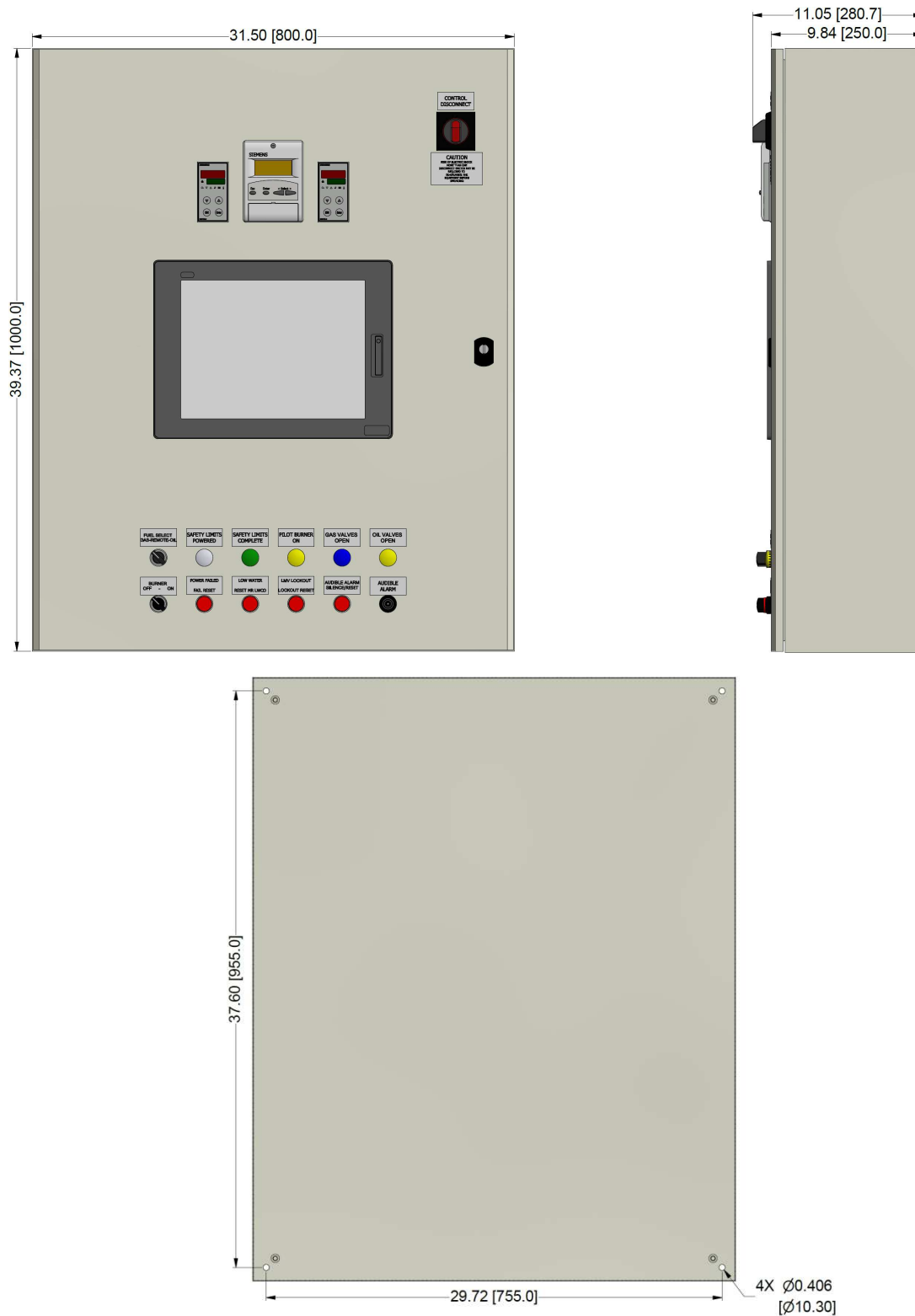### TS-CExx(3/4)-5xxx-x1x2-xxxx
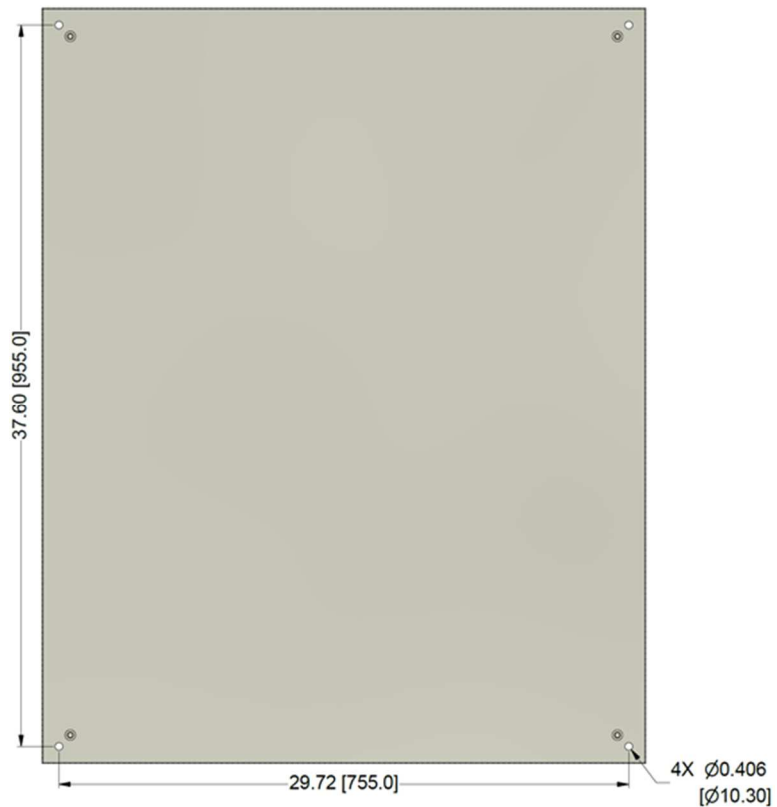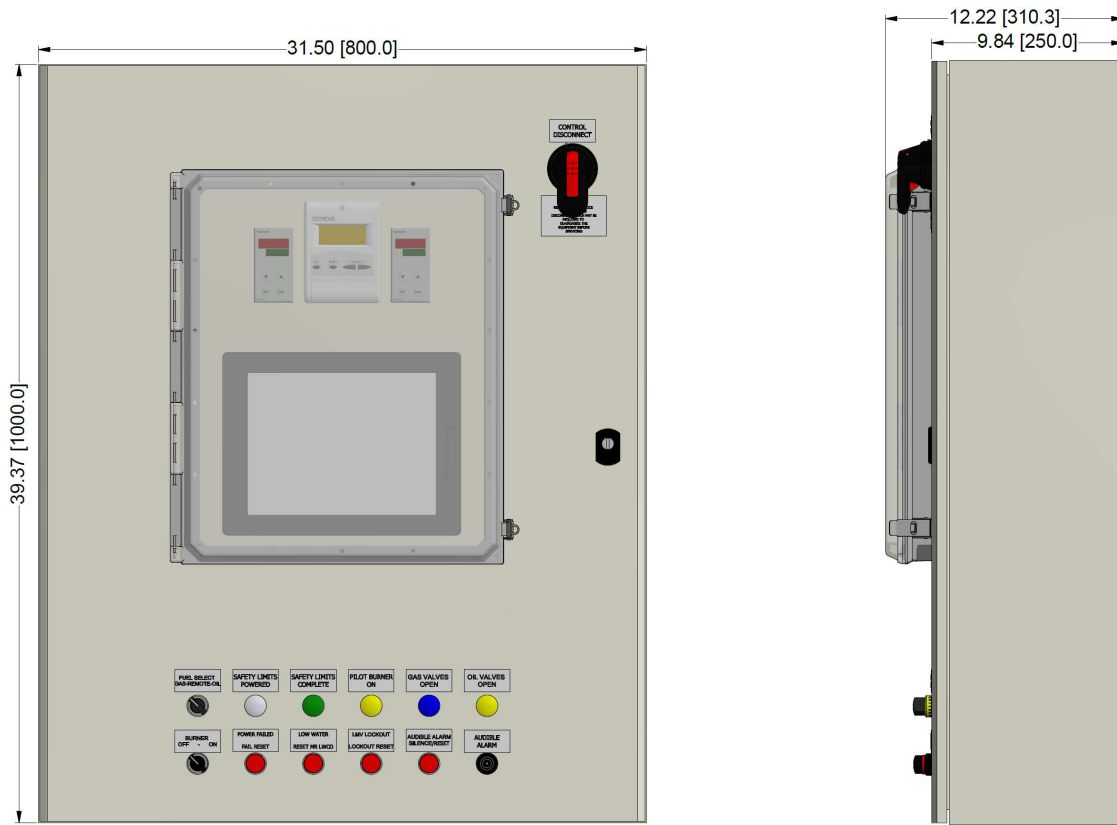
## TS-CExx(3/4)-2xxx-x2x2-xxxx

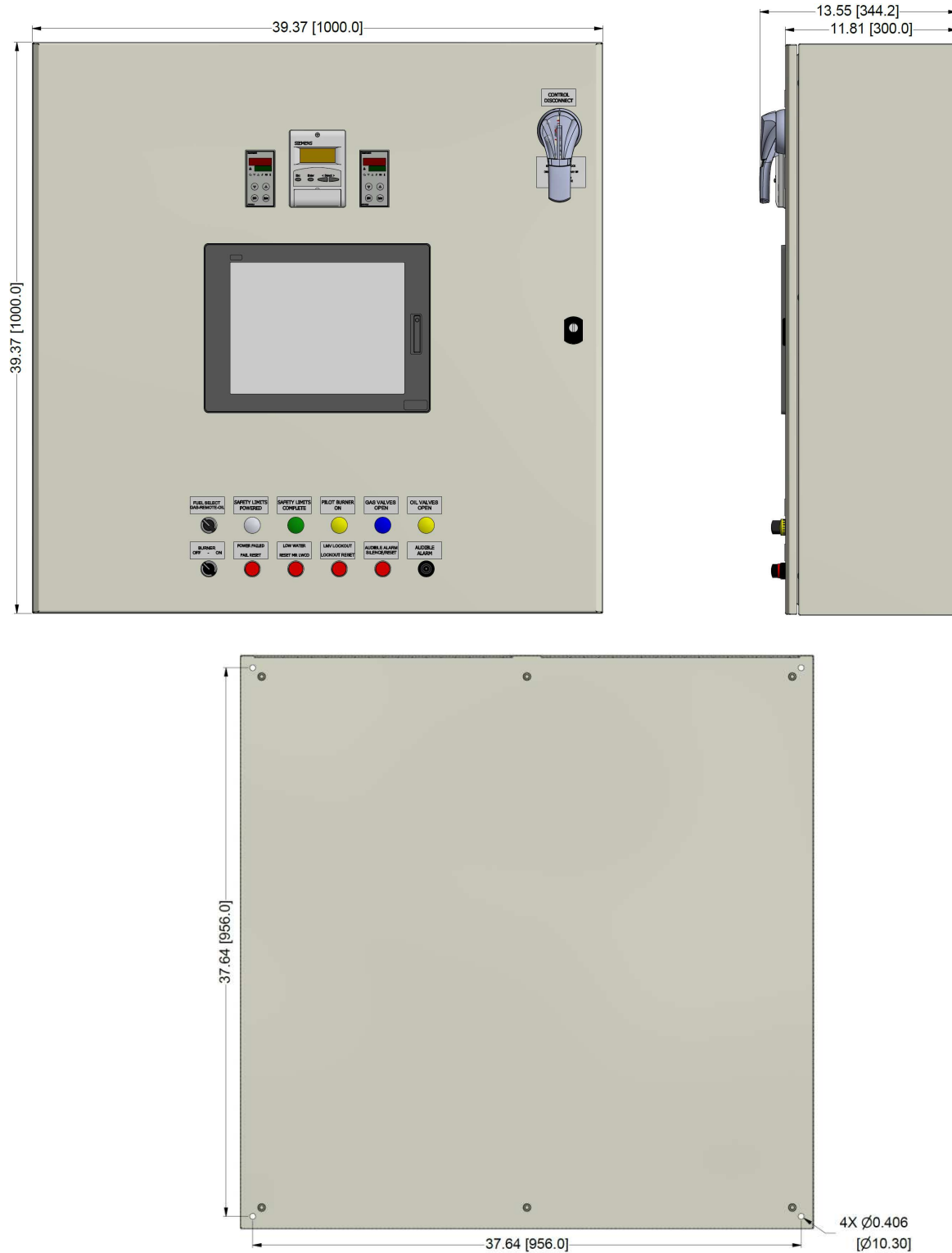## 40" X 32" X 10" Enclosure Dimensions

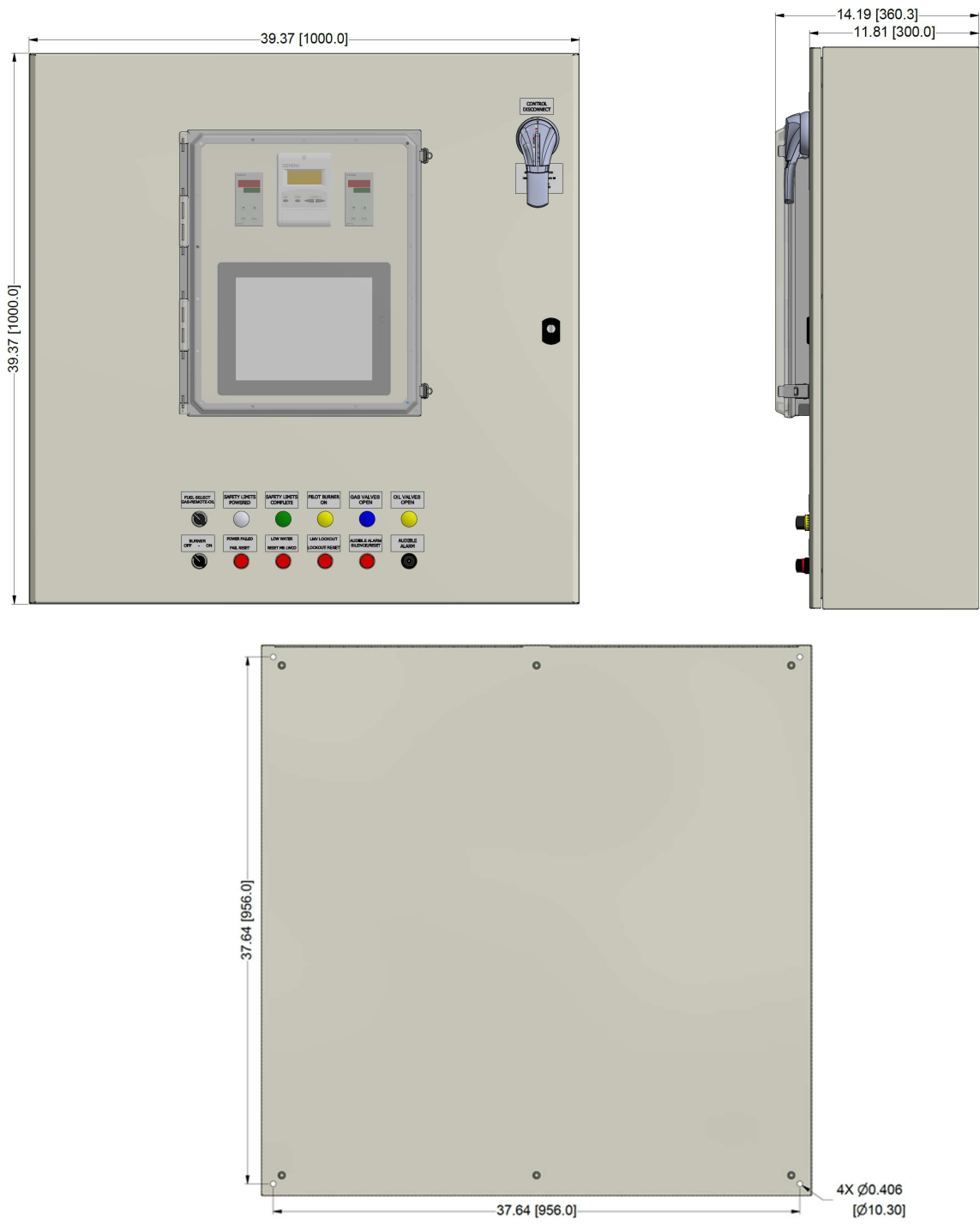### TS-CExx(3/4)-5xxx-x1x2-xxxx

## TS-CExx(3/4)-2xxx-x2x2-xxxx

## 40" X 40" X 12" Enclosure Dimensions

### TS-CExx(3/4)-5xxx-x1x2-xxxx

## TS-CExx(3/4)-2xxx-x2x2-xxxx



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