

How to Read IEC Industrial Control Schematic Diagrams

IEC Example Industrial Control Schematic Set

LEARNING RESOURCE ONLY!

*NOT TO BE USED AS A DESIGN
REFERENCE!*

How to Read IEC Industrial Control Schematic Diagrams

IEC Sample Schematic Learning Resource

This sample schematic set replicates drawing features found in an industrial control panel. The drawing contains typical power and control devices, such as; DOL motor controllers, a VFD or “inverter, a temperature controller, a PLC with multiple module positions, field I/O, wiring terminals, a front panel layout, interior back panel equipment layout and example BOM. Part numbers of various panel components are listed, otherwise generic equipment is used. It is encouraged that a student view electrical equipment specification documentation to become familiar with the respective component. This can readily be done online.

NOTES:

1. This example schematic set is drawn to the IEC format and uses IEC electrical symbols.
2. Components and wires are sequentially numbered.
3. This drawing set uses alphanumeric page co-ordinate locations for parent and child components.
4. The 3-phase power wiring is labelled L1, L2, L3 for line and N for neutral. Each new segment of line power increments sequentially, example: 1L1, 1L2, 1L3 then 2L1, 2L2, 2L3 then 3L1, 3L2, 3L3 and so on.
5. The control wiring is numbered using sequential wire labelling. The system starts at a given number and increments with each new wire segment added. Wire numbers are created when a component is added to the system and the wire is split.
6. Wire numbers do not change when passing through a connection terminal.
7. PLC input and output wires are labelled with the PLC input and output addresses.
8. The PLC inputs are configured sink or “positive logic”, (0V Input common connection 24VDC input wiring).
9. The PLC outputs are relay type. There are two groups of four outputs with a separate power supply common for each.
10. This drawing set also uses alphanumeric page co-ordinate locations for off and on page wiring references and continuation arrows. See example below:

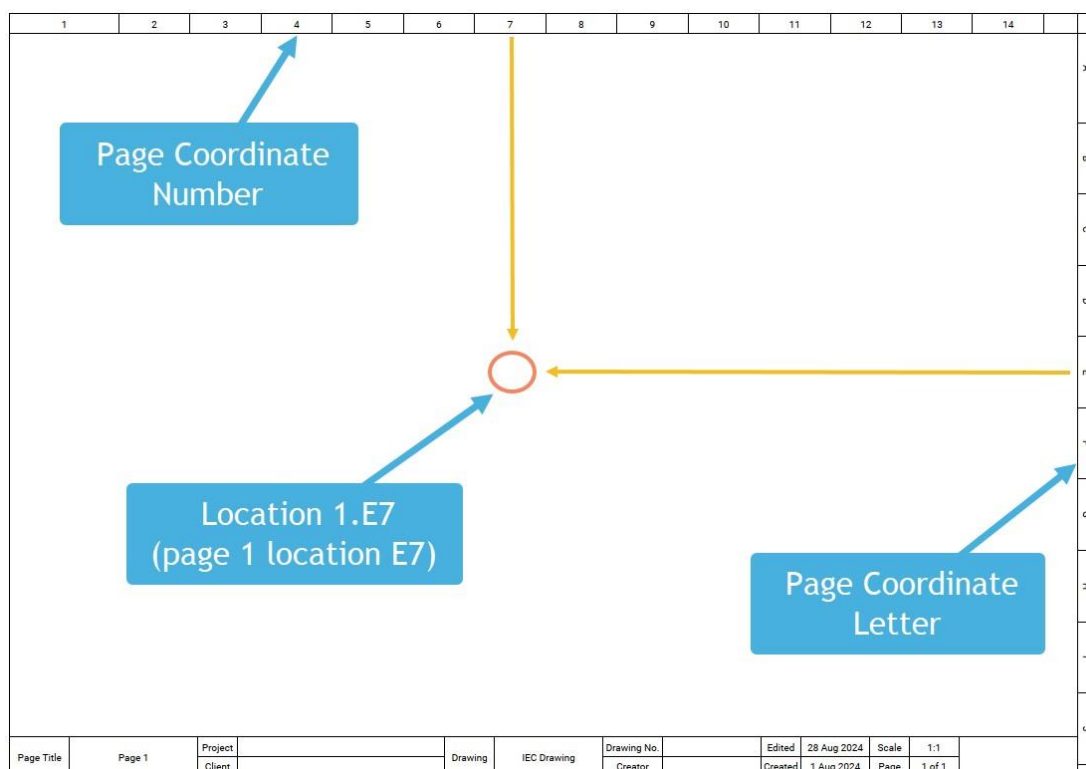
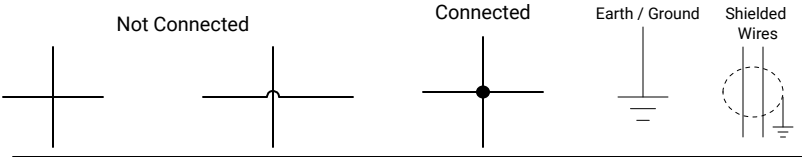


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Drawing Acronyms

- CPU = Central Processing Unit
- F = Fuse
- GND = Equipment Earth or Ground Connection
- Inverter = Frequency Inverter or Variable Frequency Drive Motor Controller
- MCB = Molded Case Circuit Breaker
- NO = Normally Open or Make Contact
- NC = Normally Closed or Break Contact
- PE = Incoming Protective Earth Connection
- PLC = Programmable Logic Controller
- PL = Pilot Light
- TB = Terminal Block
- TOR = Thermal Overload Relay

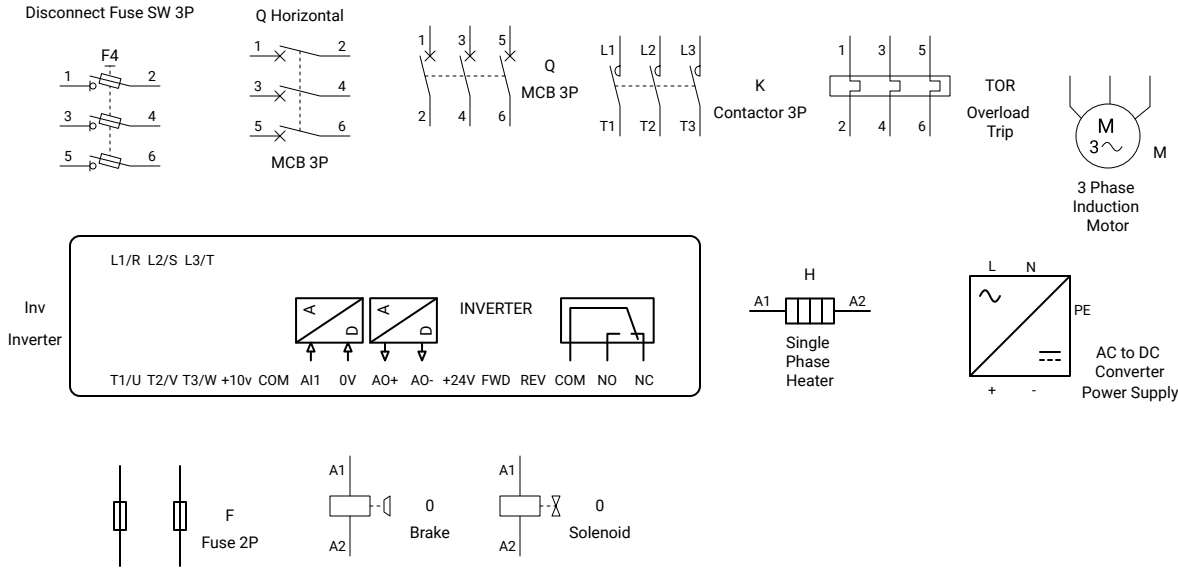
Wires Connections



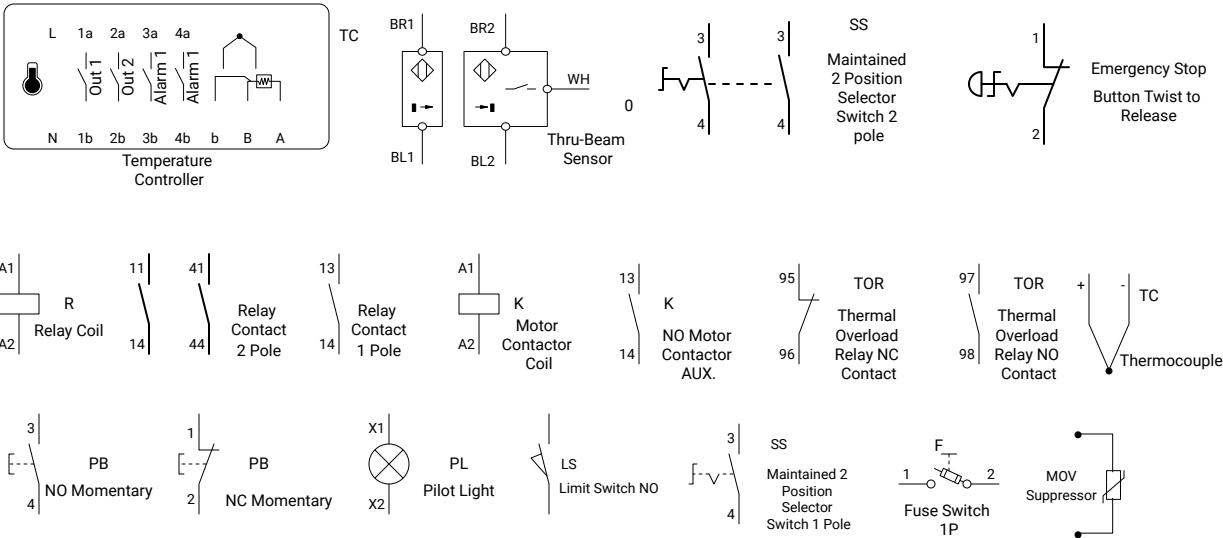
Wire Colours

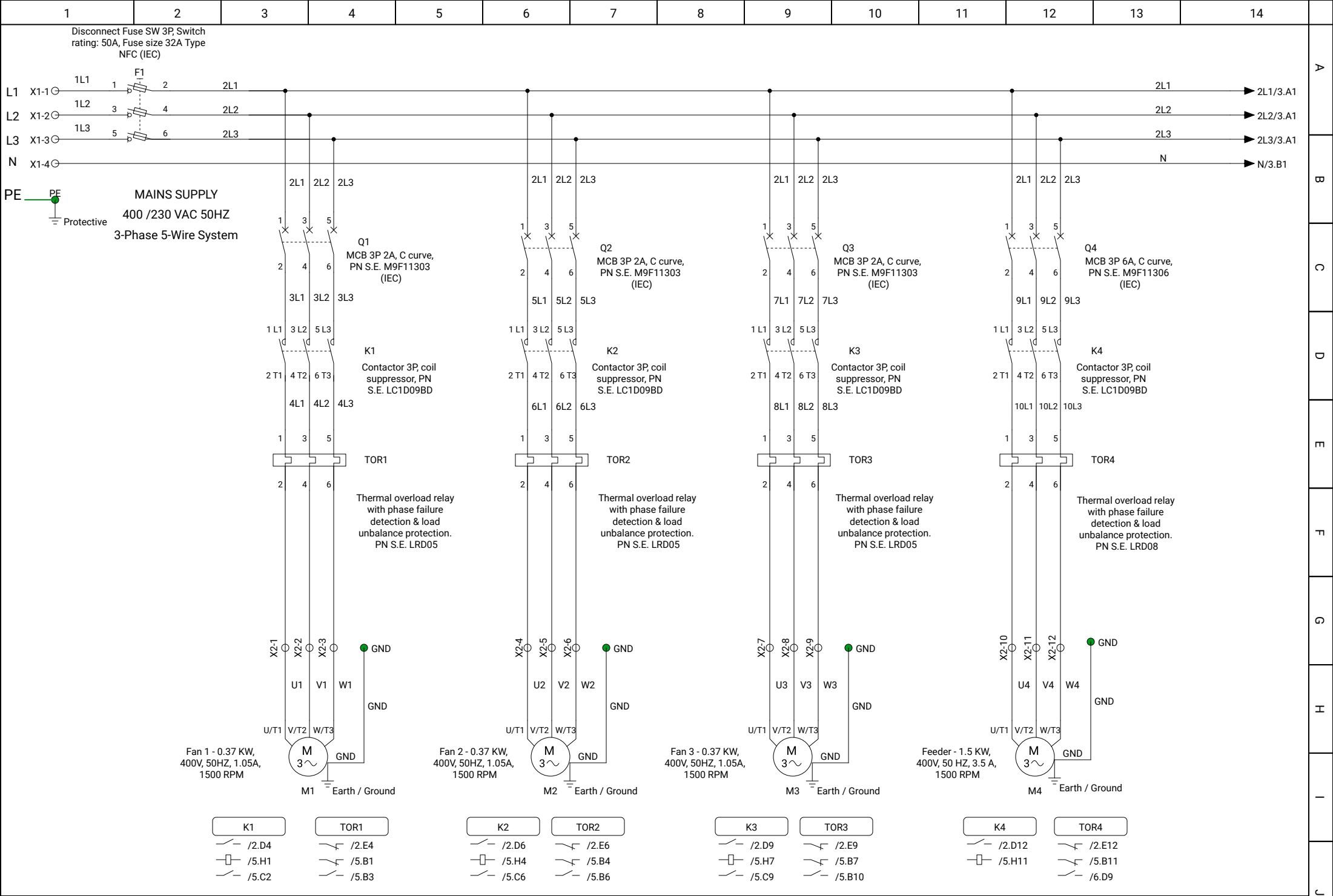
- BLACK:** 3-Phase Line Power
- GREEN / YELLOW:** Protective conductor
- LIGHT BLUE:** Neutral Conductor
- RED:** AC control circuits
- BLUE:** DC control circuits

Power Component Symbols



Control Component Symbols





K4

/2.D12

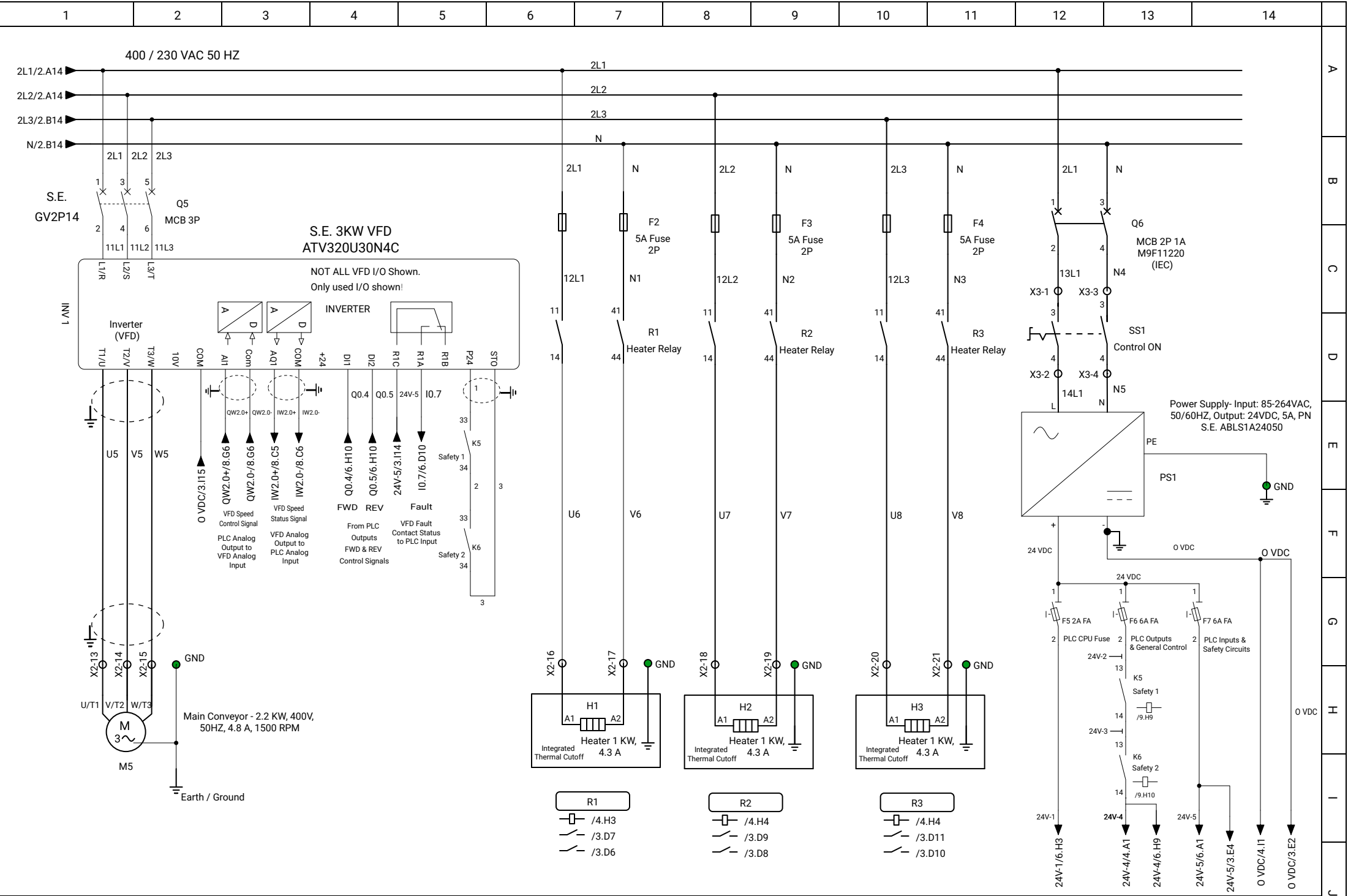
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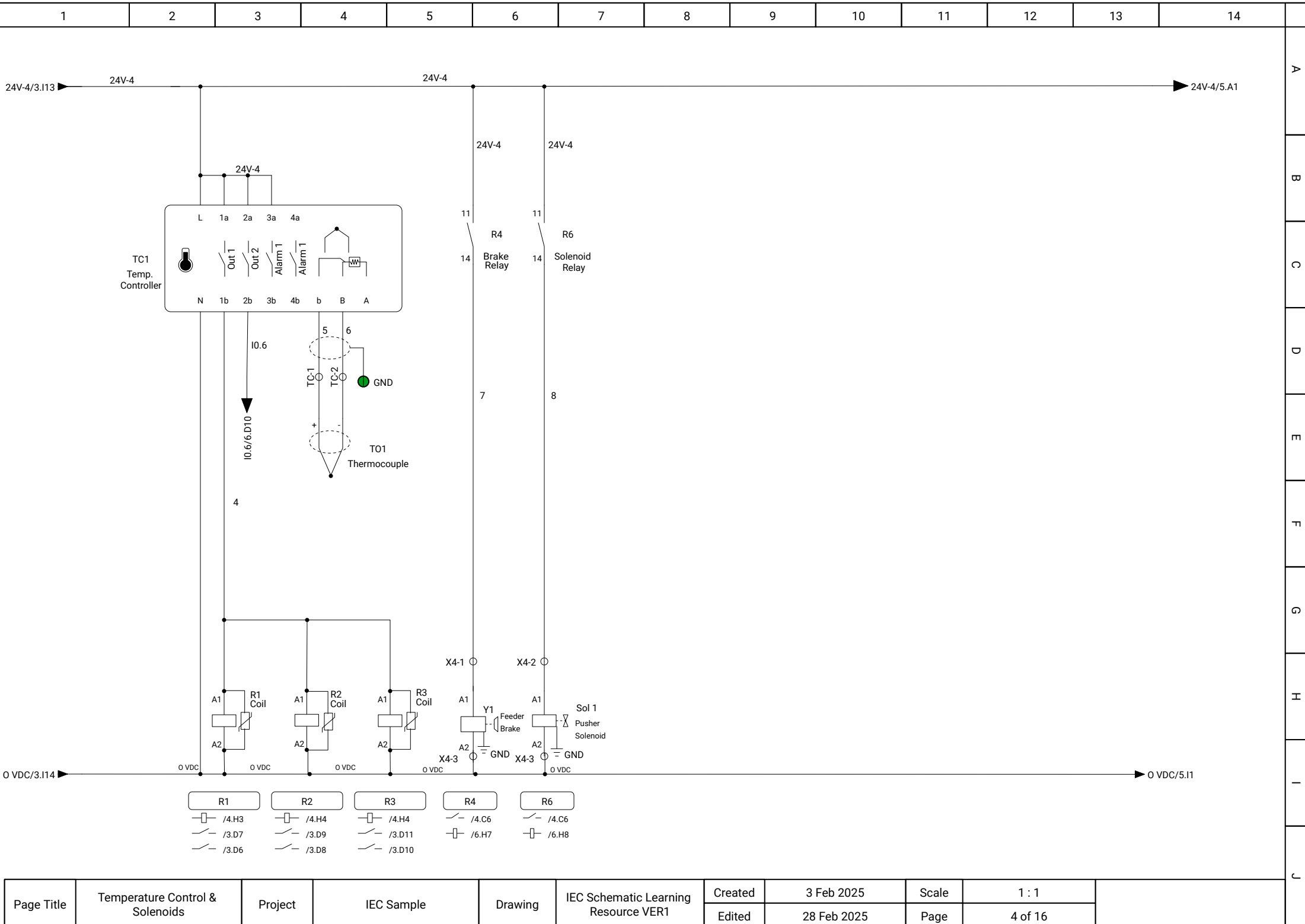
TOR4

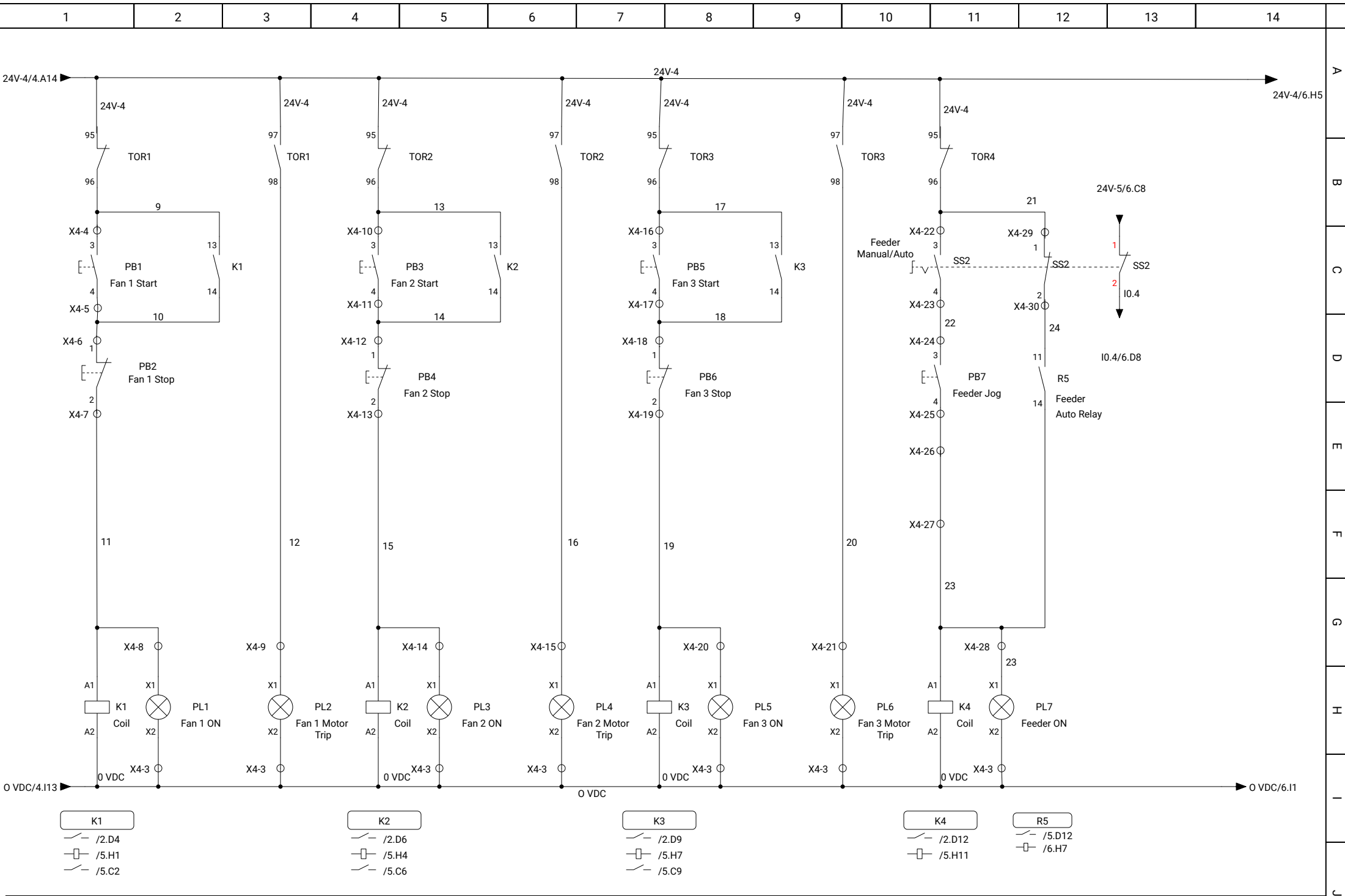
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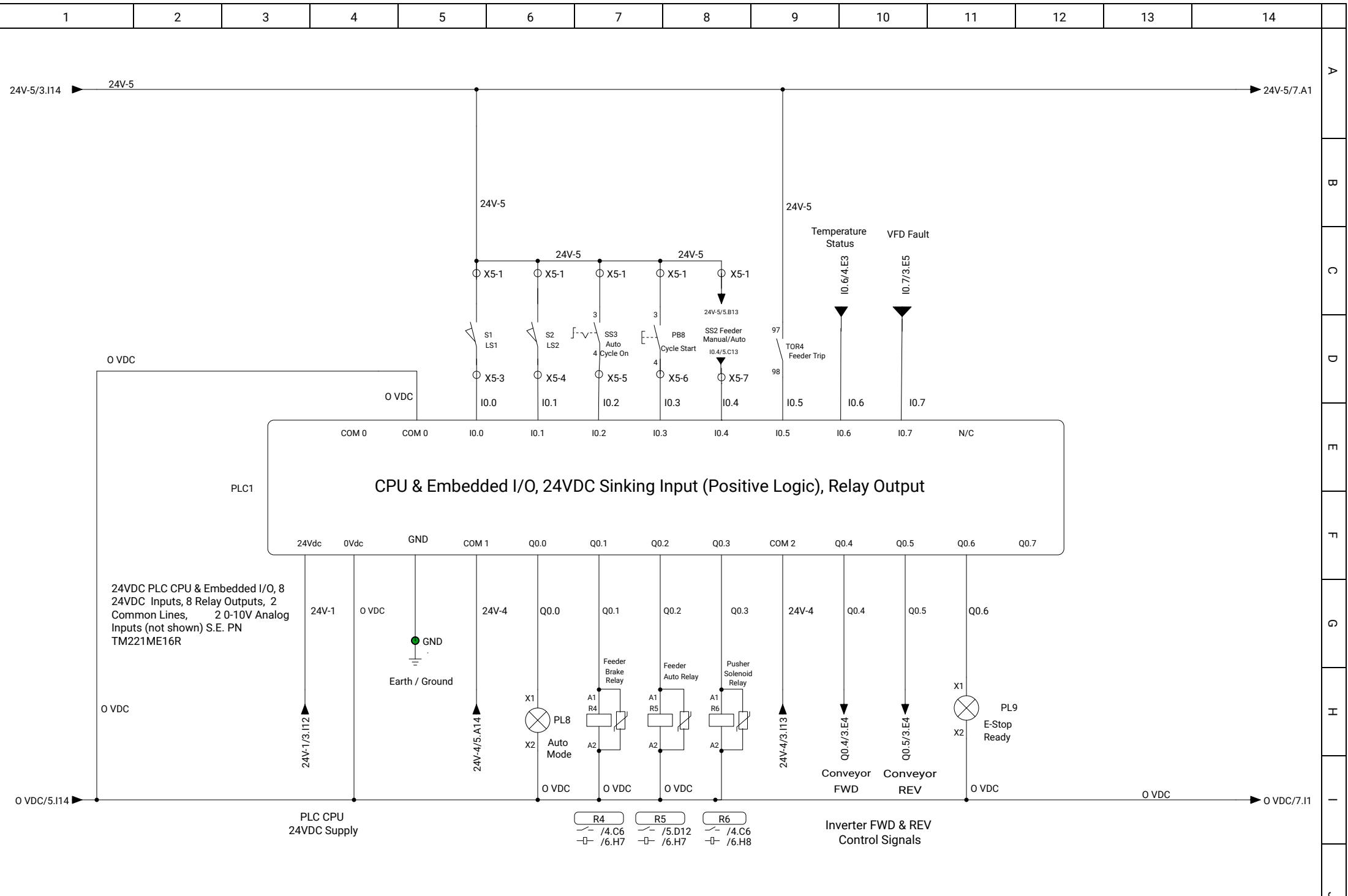
/5.B11

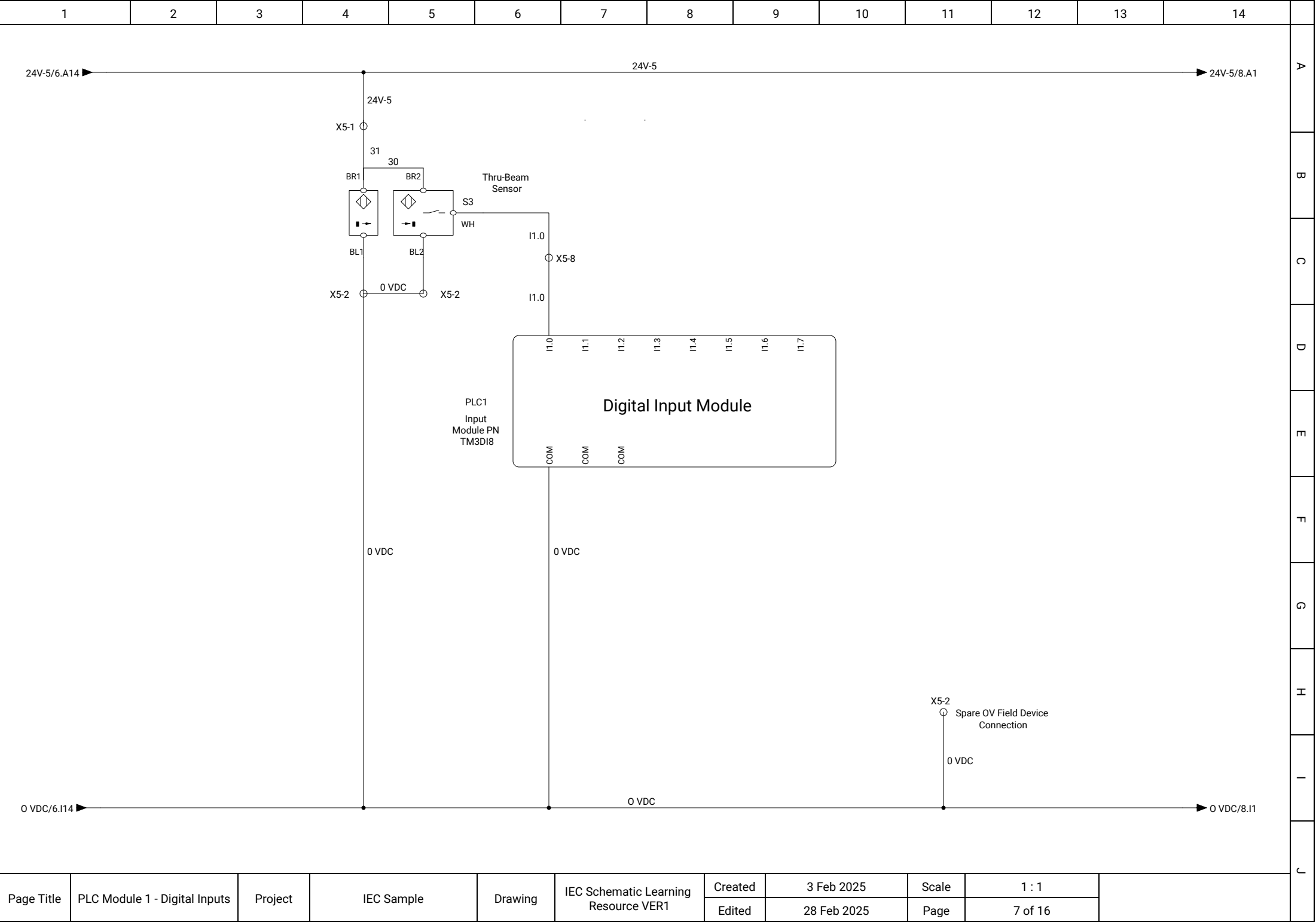
/6.D9

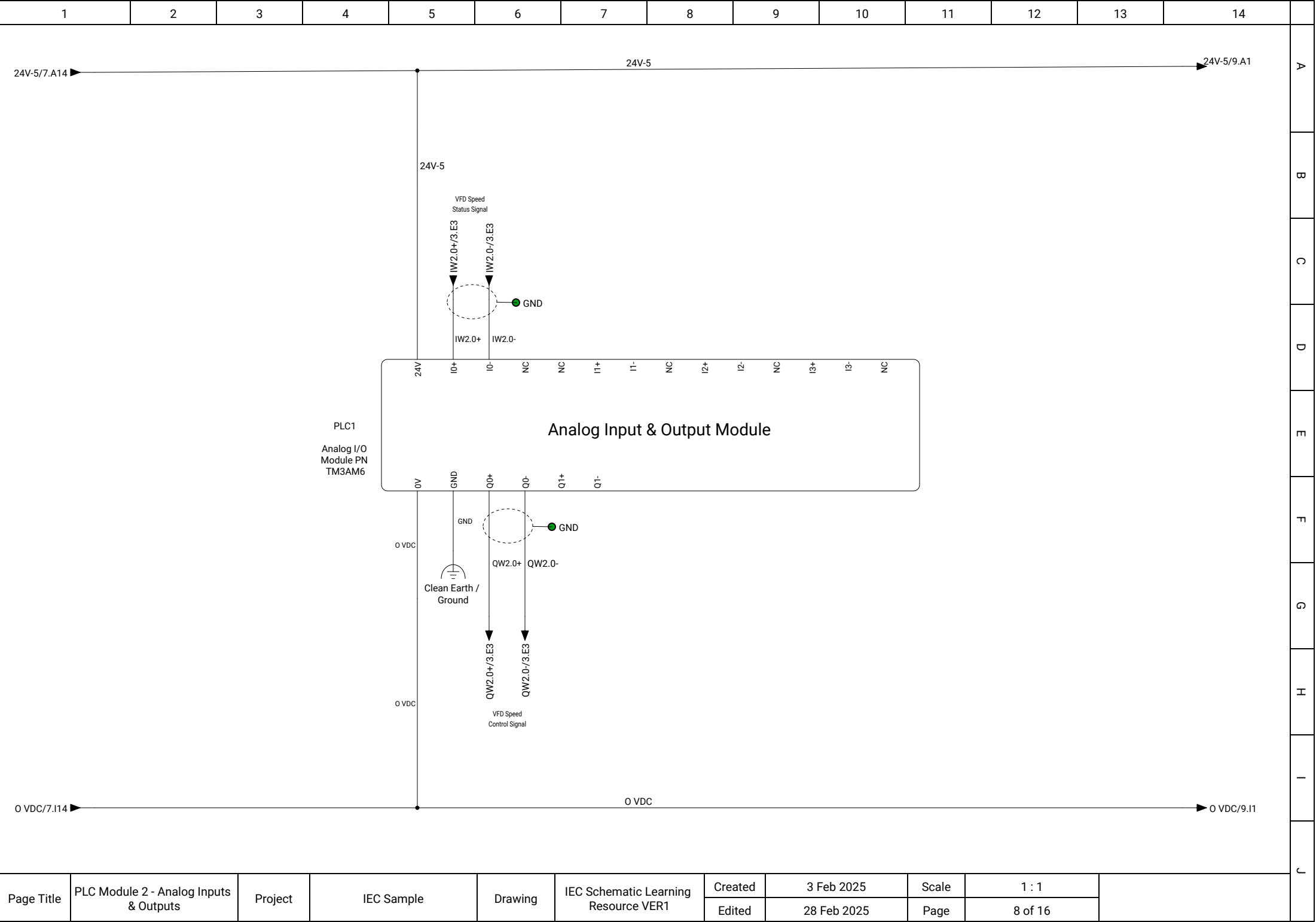


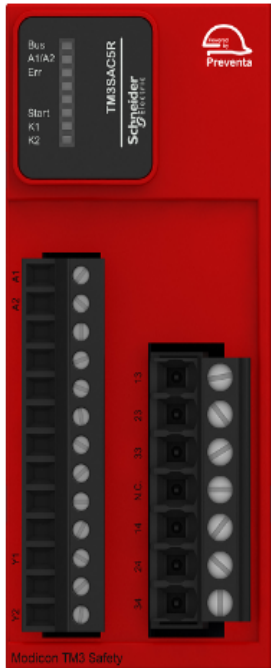


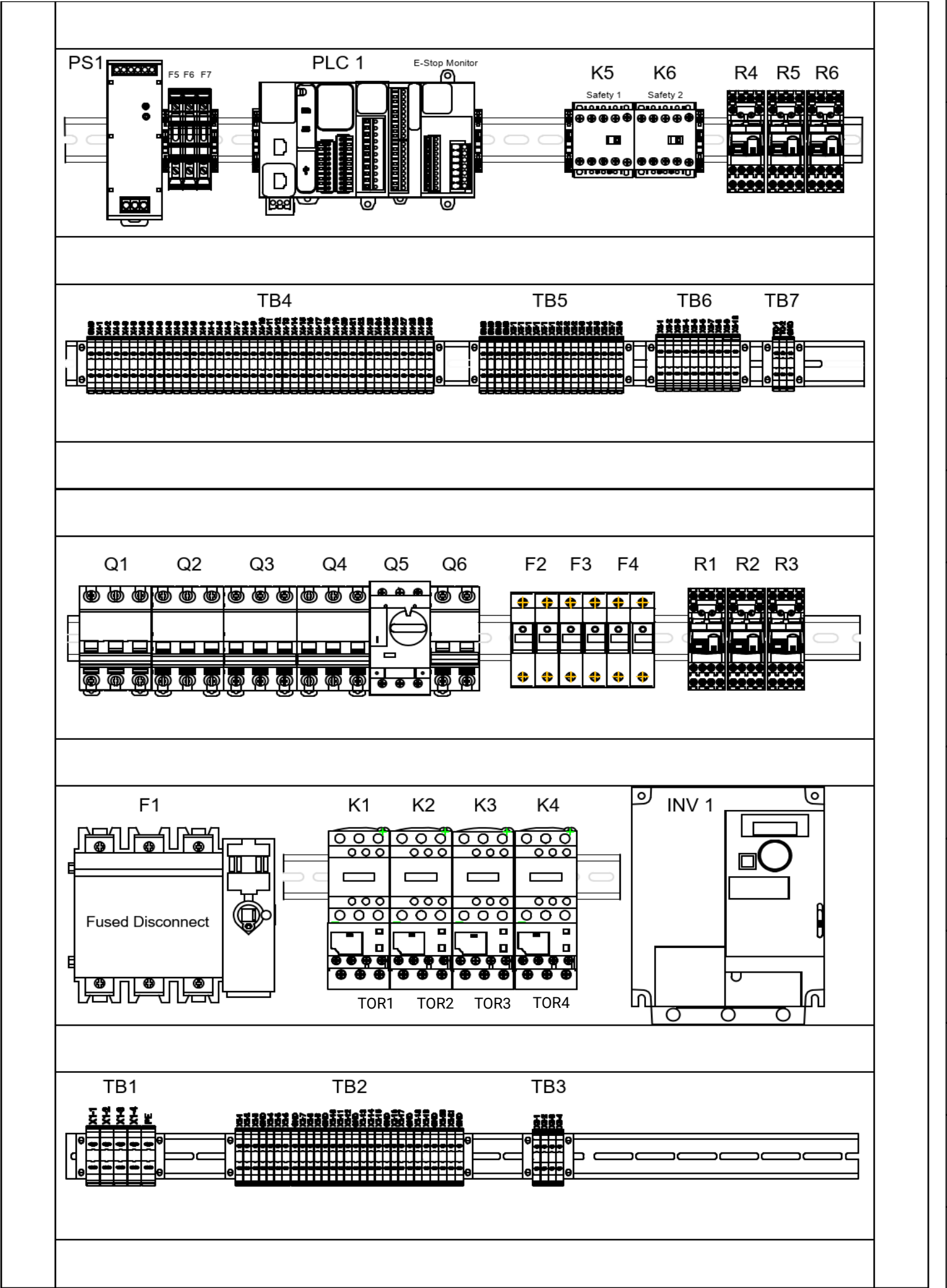








1	2	3	4	5	6	7	8	9	10	11	12	13	14	
														A
														B
														C
														D
														E
														F
														G
														H
														I
														J
TM221ME16R  Module 0 CPU & Embedded I/O + Serial & Ethernet Ports TM3DI8  Module 1 8 24VDC Inputs TM3AM6  Module 2 Mixed Analog Input & Output TM3SAC5R  Module 3 Safety Relay/Monitor Graphics Display TMH2GBD														



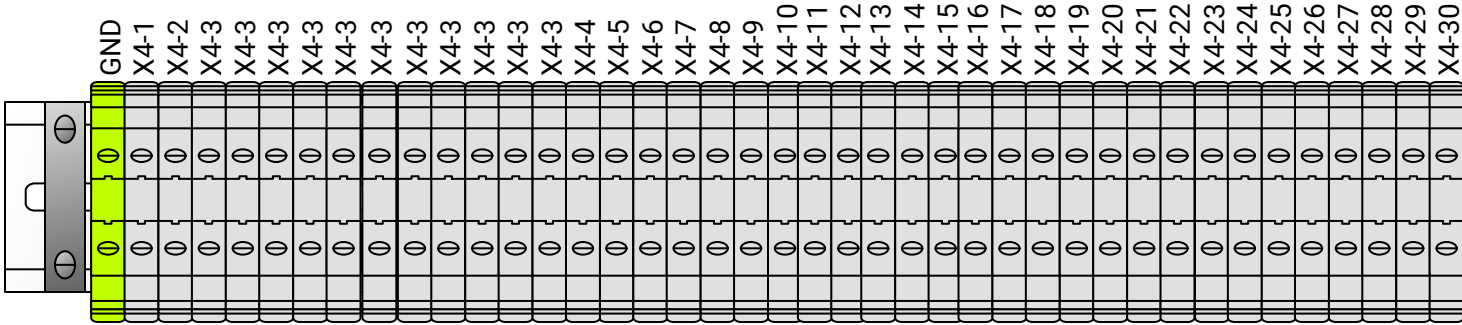
1	2	3	4	5	6	7	8	9	10	
Feeder Setup Console ES2  FEEDER JOG  PB 7 FEEDER AUTO MANUAL  SS2										A
										B
										C
										D
										E
										F
										G
										H
										I
										J
										K
										L
										M
										N
Page Title	Feeder Jog/Setup Console	Project	IEC Sample	Drawing	IEC Schematic Learning Resource VER1	Create d	3 Feb 2025	Scal e	1 : 4	
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[illegible]

Terminal Block (TB) Layout, Name & Description

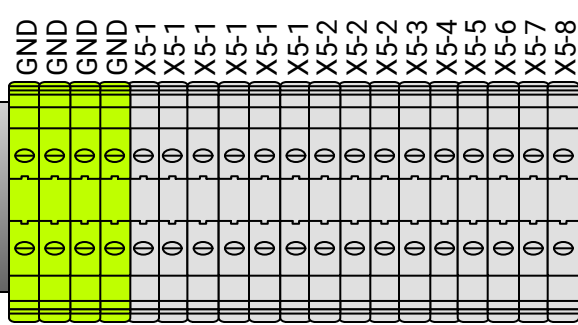
TB4

24 VDC Control - Heater, DOL, Solenoids & VFD Run Signals



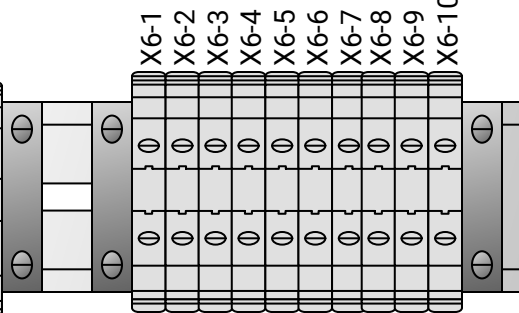
TB5

24VDC PLC Inputs



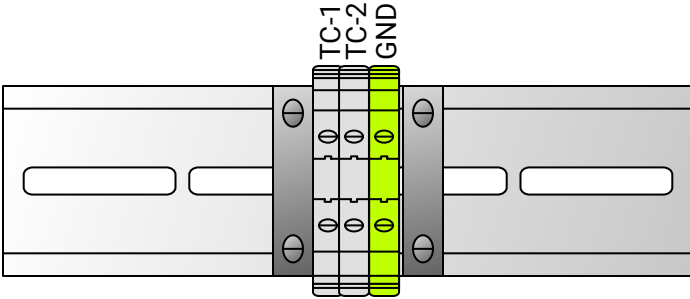
TB6

Emergency Stop Devices



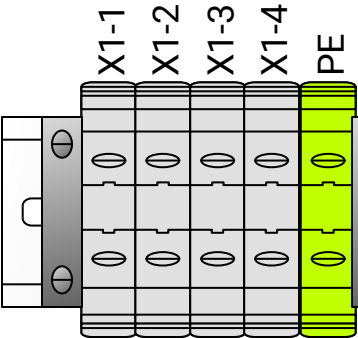
TB7

Thermocouple Connection



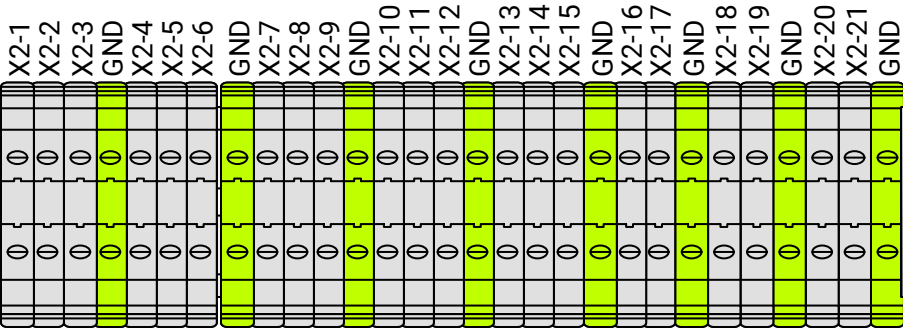
TB1

Incoming Mains Supply
& Protective Earth



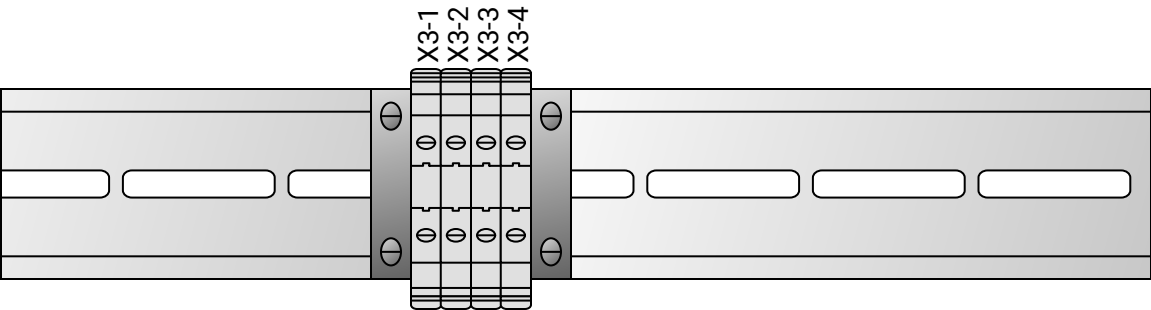
TB2

Motor Connections &
Heater Connections



TB3

Control Power
Selector Switch



1	2	3	4	5	6	7				
Sample Industrial Control Schematic BOM							A			
Manufacturer	Part Number	Name & Description				QTY				
Enclosure							B			
Rittal	8017558	IP54 (NEMA12) Mounting plate included.				1				
Mains Disconnecter / Isolator Fused										
S.E.	GS2FG3	Switch disconnecter fused				1				
S.E.	GS2AH520	Handle for front mounted Red/Yellow				1				
S.E.	GS2AE2	Shaft for external operator				1				
Siemens	3NW8112-1	NFC CYLINDRICAL FUSE, 500V,32A				3				
Breakers Motor Circuit Protection, VFD and Control Power Supply							C			
S.E.	M9F11303	Multi9 - C60N - MCB - 3P - 3 A - C Curve				3				
S.E.	M9F11306	Multi9 - C60N - MCB - 3P - 6 A - C Curve				1				
S.E.	M9F11220	Miniature circuit breaker (MCB), Multi9 20 A				1				
S.E.	GV2P14	Motor circuit breaker, 3P, 6 to 10A				1				
Motor Control DOL and VFD Components							D			
S.E.	LC1D09BD	Contactor, TeSys Deca, 3P(3NO), AC-3/3e, <=440V, 9A, 24V DC coil				4				
S.E.	LRD05	Thermal overload relay, TeSys Deca, 690VAC, 0.63 to 1A, 1NO+1NC, class 10A,				3				
S.E.	LRD08	Thermal overload relay, TeSys Deca, 690VAC, 3P, 2.5 to 4A, 1NO+1NC, class 10A				1				
S.E.	ATV320U30N4C	variable speed drive, Altivar Machine ATV320, 3kW, 380 to 500V, 3 phase				1				
Fuse Holders & Fuses							E			
Edison	EHM2DU	2 pole midget fuse holder, finger safe.				3				
Edison	MEN5	Edison fuse, MEN series, Class Midget, time-delay, 5A, 250 VAC, ferrule.				6				
Pheonix Contact	3004249	6.3mm x 32mm Fuse holder				3				
Generic	Generic	2 AMP 6.3mm x 32mm Glass Fuse Fast Acting				1				
Generic	Generic	6 AMP 6.3mm x 32mm Glass Fuse Fast Acting				2				
Heaters							F			
Generic	Generic	1 KW Heater, thermal protected				3				
Control Power Supply							G			
S.E.	ABLS1A24050	Regulated Power Supply, 100-240V AC, 24V 5 A, single phase				1				
Control Relays							H			
S.E.	RXM2AB2BDPVM	Relay & socket, 10A, 2CO, LED, 24V DC				6				
Temperature Controller										
Generic	Generic	24VDC Temperature controller.				1				
Generic	Generic	Thermocouple T-sensor				1				
PLC Components							I			
S.E.	TM221ME16R/G	PLC, CPU & I/O + Communications				1				
S.E.	TM3DI8/G	24 Vdc digital input expansion module				1				
S.E.	TM3AM6	Mixed analog input & output expansion module				1				
S.E.	TM3SAC5R/G	Safety module, 1 function, CAT3,				1				
S.E.	TNH2GBD	Graphics Display				1				
Expansion Safety Contactor Relays							J			
S.E.	CA4KN31BW3	Contactor, 3P, AC-3/AC-3e, 440V, 12A, 1NO aux, 24V DC				2				
Field Installed Sensors, Switches & Actuators							K			
Generic	Generic	24VDC 20W Electro mech brake				1				
Generic	Generic	24VDC 0.4A Push pull solenoid				1				
Auto-Direct	FMRE-00-0A	Thru beam emitter 24VDC				1				
Auto-Direct	FMRR-0P-0A	Thru beam receiver 24VDC				1				
Auto-Direct	ABP2H41Z11	Limit Switch N.O.				2				
Operators & Indicators							L			
Generic	Generic	Emergency stop pushbutton, 22mm, twist-to-release, (2) N.C.				2				
Generic	Generic	Push button, 22mm, momentary, red (1) N.C. contact				3				
Generic	Generic	Push button, 22mm, momentary, green (1) N.O. contact				4				
Generic	Generic	Push button, 22mm, momentary, white (1) N.O. contact				1				
Generic	Generic	Push button, 22mm, momentary, black (1) N.O. contact				1				
Generic	Generic	Selector switch, 22mm, 2 position, maintained, (1) N.O. contact				3				
Generic	Generic	LED pilot light, 22mm 24VDC, white				1				
Generic	Generic	LED pilot light, 22mm 24VDC, green				4				
Generic	Generic	LED pilot light, 22mm 24VDC, red				4				
Electric Motors							M			
Generic	Generic	Fan 1-3 - 0.37 KW, 400V, 50HZ, 1.05A, 1500 RPM				3				
Generic	Generic	Feeder - 1.5 KW, 400V, 50 HZ, 3.5 A, 1500 RPM				1				
Generic	Generic	Main Conveyor - 2.2 KW, 400V, 50HZ, 4.8 A, 1500 RPM				1				
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