



TESTED VALIDATED

DOCUMENTED ARCHITECTURE : Compact / Hardwired / Logic Controller M221

PLANT DESIGNATION : TVDA

DRAWING NUMBER : EIO00000001817.00

DEPARTMENT : Industry Business

PRODUCT DOMAIN : TVDA

CAE SYSTEM : ePlan P8 V 2.4.4

RELATED PRODUCTS : Logic Controller M221; Magelis HMI STU; TM3 Expansion Modules; Altivar 12; Altivar 312; Lexium 28; iEM3110

INCOMING SUPPLY : 400V 3~, N, PE, 50Hz

FEEDER : Oelflex Classic 100 5G2,5mm<sup>2</sup>

POWER INPUT : 2 kW

CONTROL VOLTAGE : 24V dc

MANUFACTURING DATE : 2015

CABINET TYPE : Spacial, RAL 7035

CHECKED TO : IEC 60364

RESPONSIBLE FOR PROJECT : Machine Solutions

CREATOR : TVDA

DATE CHANGED : 2015/03/24

REVISION DATE :

## VERSION INDEX

0

This document is based on European standards and is not valid for use in U.S.A.

|                               |                       |   |              |                                  |   |             |                           |   |   |
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| 0                             | 1                     | 2 | 3            | 4                                | 5 | 6           | 7                         | 8 | 9 |
| Structure identifier overview |                       |   |              |                                  |   |             |                           |   |   |
| First Level                   | Structure description |   | Second Level | Structure description            |   | Third Level | Structure description     |   |   |
| =COMM                         | Common pages          |   | +COVER       | Cover page                       |   | #PSD        | Power Supply Distribution |   |   |
| =WIRD                         | Wiring diagramm       |   | +CONT        | Table of Content                 |   | #SAF        | Safety                    |   |   |
| =REPORT                       | Report pages          |   | +INFO        | Informations                     |   | #PLC        | PLC Pages                 |   |   |
|                               |                       |   | +DEF         | Definitions                      |   | #HMI        | Human Machine Interface   |   |   |
|                               |                       |   | +LAYOUT      | Layout Pages                     |   | #CTRL       | Control                   |   |   |
|                               |                       |   | +TERP        | Terminal plan                    |   | #MOV        | Movement                  |   |   |
|                               |                       |   | +PLUG        | Plug Connection Plan             |   | #COM        | Communication             |   |   |
|                               |                       |   | +CABLE       | Cable Overview & Connection Plan |   |             |                           |   |   |
|                               |                       |   | +PART        | Partlist                         |   |             |                           |   |   |
|                               |                       |   | +ORDER       | Orderlist                        |   |             |                           |   |   |
|                               |                       |   | +MC          | Main Cabinet                     |   |             |                           |   |   |

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| =COMM +COVER   |      |                                       |            |           |
|                | 1    | Cover Page                            | 2015/01/21 | HKR       |
| =COMM +CONT    |      |                                       |            |           |
|                | 1    | Structure identifier overview         | 2014/02/11 | kJakob    |
|                | 2    | Table of contents                     | 2015/01/21 | HKR       |
|                | 3    | Table of contents                     | 2015/01/21 | HKR       |
|                | 4    | Table of contents                     | 2015/01/21 | HKR       |
| =COMM +INFO    |      |                                       |            |           |
|                | 1    | Disclaimer                            | 2014/02/03 | kJakob    |
|                | 2    | Safety Information 1                  | 2014/02/03 | kJakob    |
|                | 3    | Safety Information 2                  | 2014/02/03 | kJakob    |
|                | 4    | Informations about changes            | 2014/02/03 | kJakob    |
| =COMM +DEF     |      |                                       |            |           |
|                | 1    | Wiring, Plug and Terminal definitions | 2015/01/21 | HKR       |
| =COMM +LAYOUT  |      |                                       |            |           |
|                | 1    | Plant Layout                          | 2014/02/03 | kJakob    |
| =WIRD +MC #PSD |      |                                       |            |           |
|                | 1    | Power supply infeed                   | 2014/11/25 | HKR       |
|                | 2    | Cabinet Lamp, Socket, Fan             | 2014/11/25 | HKR       |
|                | 3    | Energy Measurement - iEM3110          | 2015/01/21 | HKR       |
|                | 4    | Emergency Stop Main Power Supply      | 2015/01/21 | HKR       |
|                | 5    | Power Supply 24V dc                   | 2014/11/25 | HKR       |
|                | 6    | Power Supply 24V dc                   | 2015/01/21 | HKR       |
|                | 7    | Power Supply 24V dc                   | 2014/11/25 | HKR       |
|                | 8    | Power Supply 0V dc                    | 2015/01/21 | HKR       |
| =WIRD +MC #SAF |      |                                       |            |           |
|                | 1    | Emergency Stop                        | 2014/11/25 | HKR       |
|                | 2    | TM3 Safety module E-Stop              | 2014/11/25 | HKR       |
|                | 3    | TM3 Safety module E-Stop              | 2015/01/21 | HKR       |

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| =WIRD +MC #PLCMain Cabinet / PLC Pages               |      |                                                           |            |           |
|                                                      | 1    | Assembly layout M221                                      | 2015/01/20 | HKR       |
|                                                      | 2    | Overview M221                                             | 2015/01/20 | HKR       |
|                                                      | 3    | Overview I/O module TM3                                   | 2015/01/20 | HKR       |
|                                                      | 4    | Power supply M221                                         | 2015/01/21 | HKR       |
|                                                      | 5    | Power supply TM3                                          | 2015/01/21 | HKR       |
| =WIRD +MC #HMIMain Cabinet / Human Machine Interface |      |                                                           |            |           |
|                                                      | 1    | HMI Magelis Panel Power Supply                            | 2014/11/25 | HKR       |
|                                                      | 2    | Remote Graphic Display for M221 (TMH2GDB)                 | 2015/01/21 | HKR       |
| =WIRD +MC #CTRLMain Cabinet / Control                |      |                                                           |            |           |
|                                                      | 1    | Digital inputs M221                                       | 2015/01/21 | HKR       |
|                                                      | 2    | Digital inputs M221                                       | 2015/01/21 | HKR       |
|                                                      | 3    | Digital inputs M221                                       | 2015/01/21 | HKR       |
|                                                      | 4    | Analog inputs M221                                        | 2015/01/21 | HKR       |
|                                                      | 5    | Digital outputs M221                                      | 2015/01/21 | HKR       |
|                                                      | 6    | Digital outputs M221                                      | 2015/01/21 | HKR       |
|                                                      | 7    | Digital outputs M221                                      | 2015/01/21 | HKR       |
|                                                      | 8    | Digital outputs TM3                                       | 2015/01/21 | HKR       |
|                                                      | 9    | Digital outputs TM3                                       | 2015/01/21 | HKR       |
|                                                      | 10   | Analog outputs TM3                                        | 2015/01/21 | HKR       |
|                                                      | 11   | Drive 1 Control Terminals Altivar 12                      | 2015/01/21 | HKR       |
|                                                      | 12   | Drive 2 Control Terminals Altivar 312                     | 2015/01/21 | HKR       |
|                                                      | 13   | Drive 3 - LXM28 Control Terminals - CN1 connection module | 2015/01/21 | HKR       |
|                                                      | 14   | Drive 3 - LXM28 STO connector - CN9                       | 2015/01/21 | HKR       |
| =WIRD +MC #MOVMain Cabinet / Movement                |      |                                                           |            |           |
|                                                      | 1    | Drive 1 Variable speed drive Altivar 12                   | 2015/01/21 | HKR       |
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| =WIRD +MC #COM |      | Main Cabinet / Communication |            |           |
|                | 1    | EtherNet switch              | 2015/01/20 | HKR       |
|                | 2    | Ethernet topology            | 2015/01/21 | HKR       |
|                | 3    | Modbus topology              | 2015/01/21 | HKR       |

General project information

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When selecting automation and control equipment and related software for a particular application, you must refer to the applicable local and national standards and regulations.

\*\*\*\*\*

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General project information

Equipment Grounding

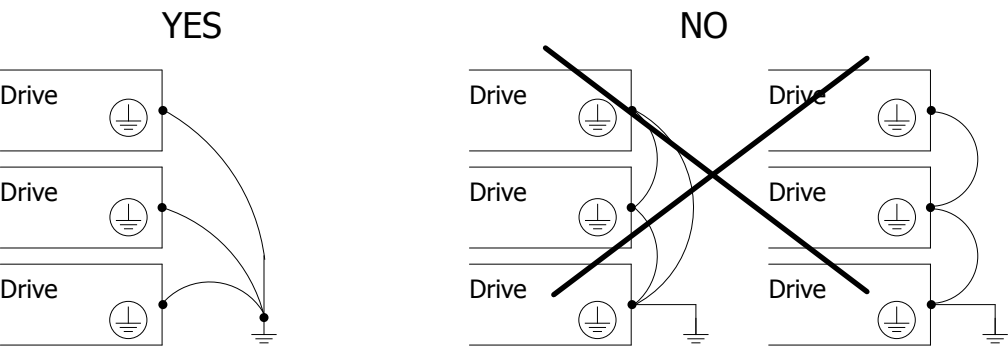
Secure the ground connection of the devices to the protective ground (PE) of your panel at a single point and in conformance with local and national electrical code requirements. Depending on these local and national code requirements, a minimum wire section (gauge) of 10 mm² (6 AWG) may be required to meet standards limiting leakage current.

⚡ ⚠ DANGER

ELECTRIC SHOCK

- Properly ground your panel and equipment before applying power.
- Always comply with local wiring requirements regarding grounding cables and grounding cable shields.
- Ground devices independently at a single point.

Failure to follow these instructions will result in death or serious injury.



- Ensure that the resistance of ground is one ohm or less.
- When grounding several drives, you must connect each one directly, as as shown in the figure to the left.
- Do not loop the ground cables or connect them in series.

General project information

 **DANGER**

**LOSS OF CONTROL, ELECTRIC SHOCK, EXPLOSION OR ARC FLASH**

- The designer of the machine and its control system must consider their potential failure modes and provide a means to achieve a safe state during and after a failure by installing and thoroughly testing security control devices.
- Power line and output circuits must be wired and fused in compliance with local and national regulatory requirements for the rated current and voltage of the particular equipment.
- The designer of the machine and its control system is responsible for compliance with all international and national electrical standards in force concerning protective grounding of all equipment.

**Failure to follow these instructions will result in death or serious injury.**

 **WARNING**

**REGULATORY INCOMPATIBILITY**

Be sure that all equipment applied and systems designed comply with all applicable local, regional, and national regulations and standards.

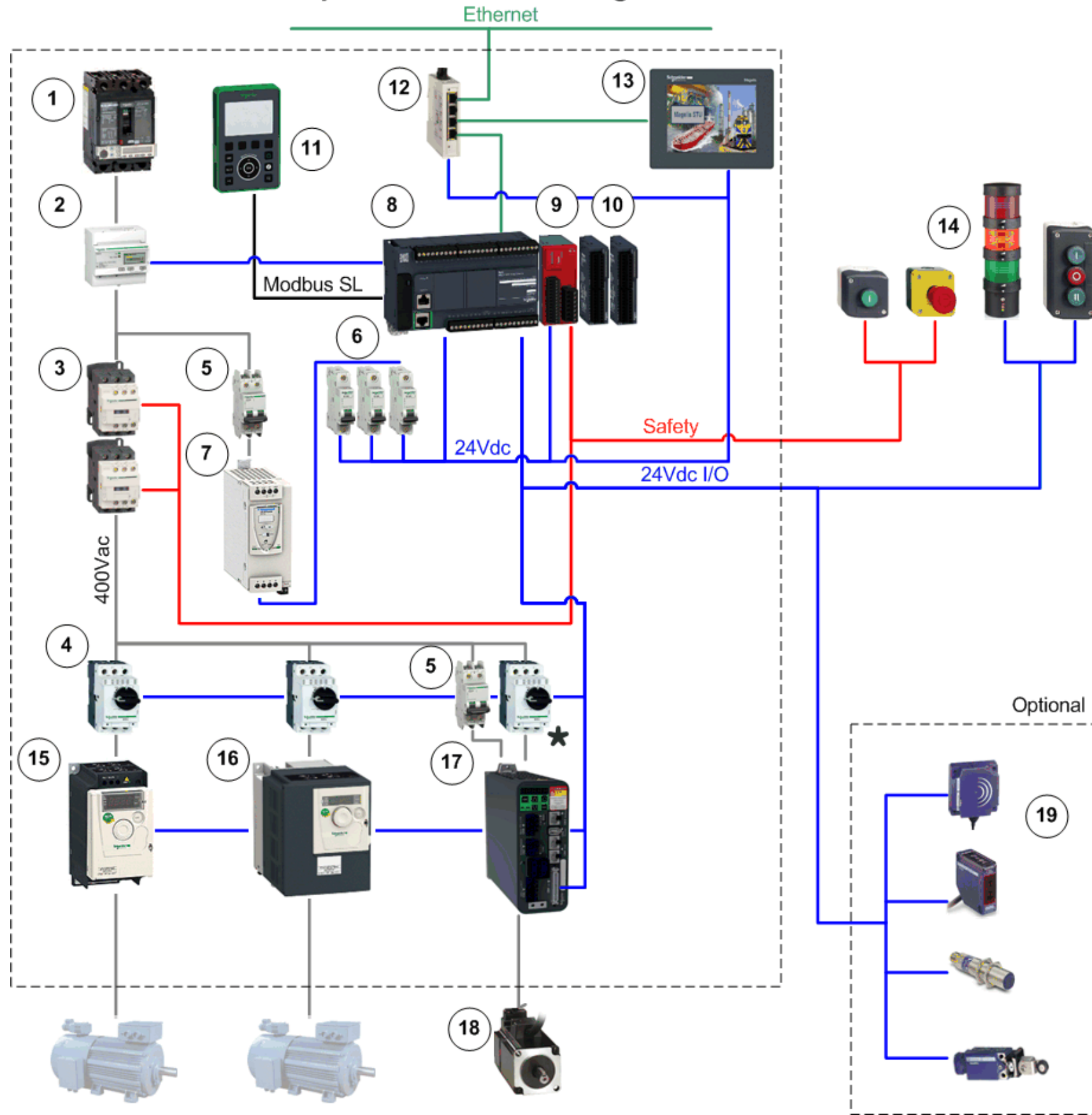
**Failure to follow these instructions can result in death, serious injury, or equipment damage.**



| Wiring Definitions                         |                 |             |
|--------------------------------------------|-----------------|-------------|
| Main circuit                               | Black           | 1,5/2,5mm²  |
| Neutral wire                               | Light-blue      | 1,5/2,5mm²  |
| Control circuit 230V ac                    | Red             | 0,75-2,5mm² |
| Control circuit 120V ac                    | Red             | 0,75-2,5mm² |
| Control circuit 24V dc                     | Dark-blue       | 0,75-2,5mm² |
| Control circuit 0V dc                      | Dark-blue/white | 0,75-2,5mm² |
| Control circuit ±15V dc                    | Violet          | 0,75mm²     |
| External voltage                           | Orange          | 0,75-2,5mm² |
| Cable glands: If shielded cable use metal! |                 |             |

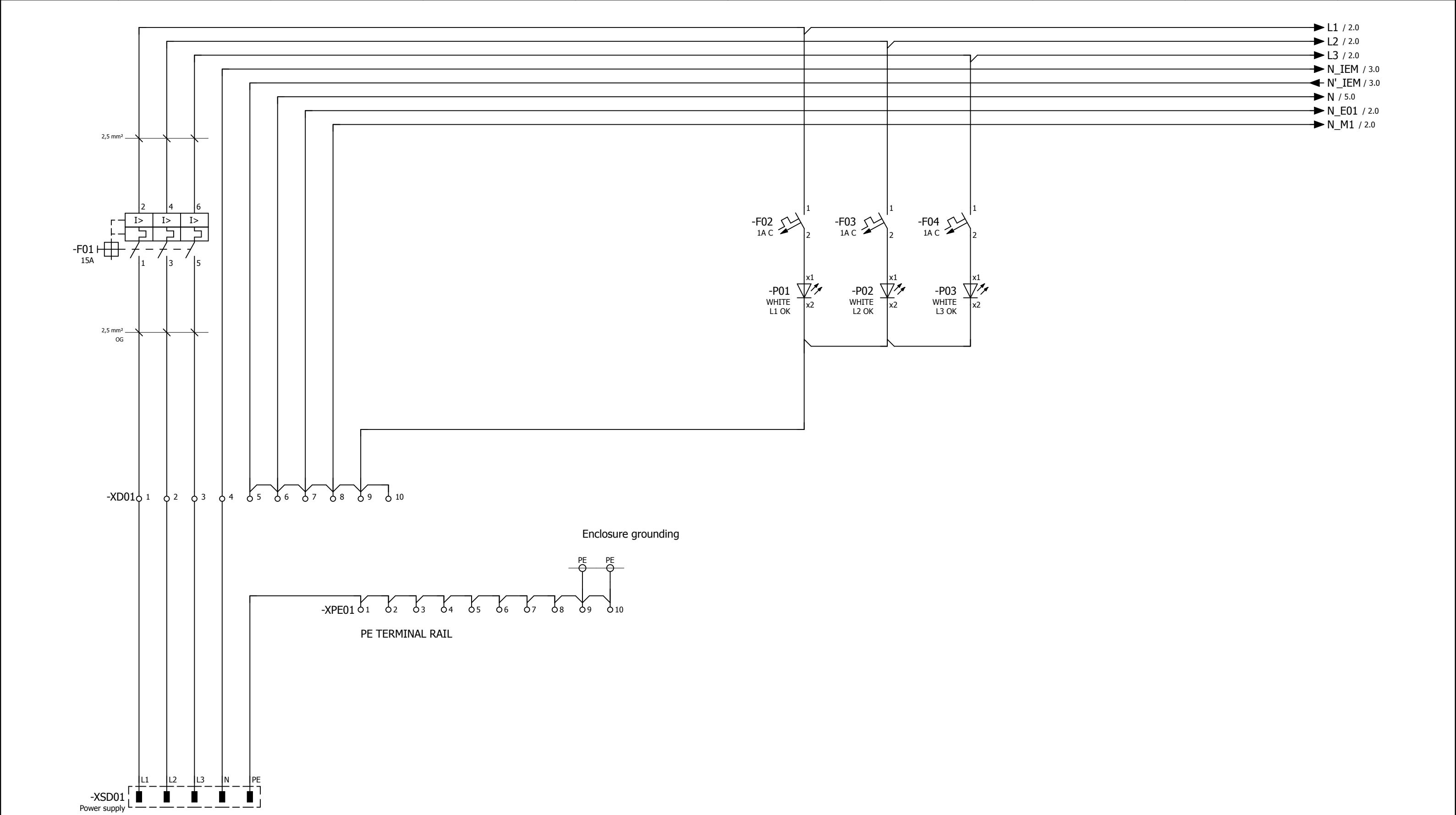
| Plugdefinitions                           | Terminaldefinitions                                                                                              |
|-------------------------------------------|------------------------------------------------------------------------------------------------------------------|
| +MC-XSETH01 = RJ45/M12 adapter - Ethernet | +MC-XD01 = Power Supply 400V ac<br>+MC-X01 = Power Supply 24V dc Distribution intern<br>+MC-XPE01 = PE Terminals |

## Compact / Hardwired / Logic Controller M221



- 1 PowerPact circuit breaker
- 2 Energy Meter iEM3110
- 3 TeSysD Contactor
- 4 TeSys Motor circuit-breaker GV2P (UL)
- 5 Multi9 Circuit-breaker C60N UL489
- 6 Multi9 Circuit-breaker C60N UL1077
- 7 Phaseo Power-Supply 24Vdc
- 8 Controller M221 (brick format)
- 9 TM3 Preventa Safety Module
- 10 TM3 expansion module
- 11 Remote Graphic DisplayTMH2GDB
- 12 Ethernet switch (unmanaged)
- 13 Magelis HMISTU Touch-Panel
- 14 Harmony signaling/control devices
- 15 Altivar 12
- 16 Altivar 312
- 17 Lexium 28 servo drive
- 18 Lexium BCH2 Servo motor
- 19 OsiSense Sensors & Switches

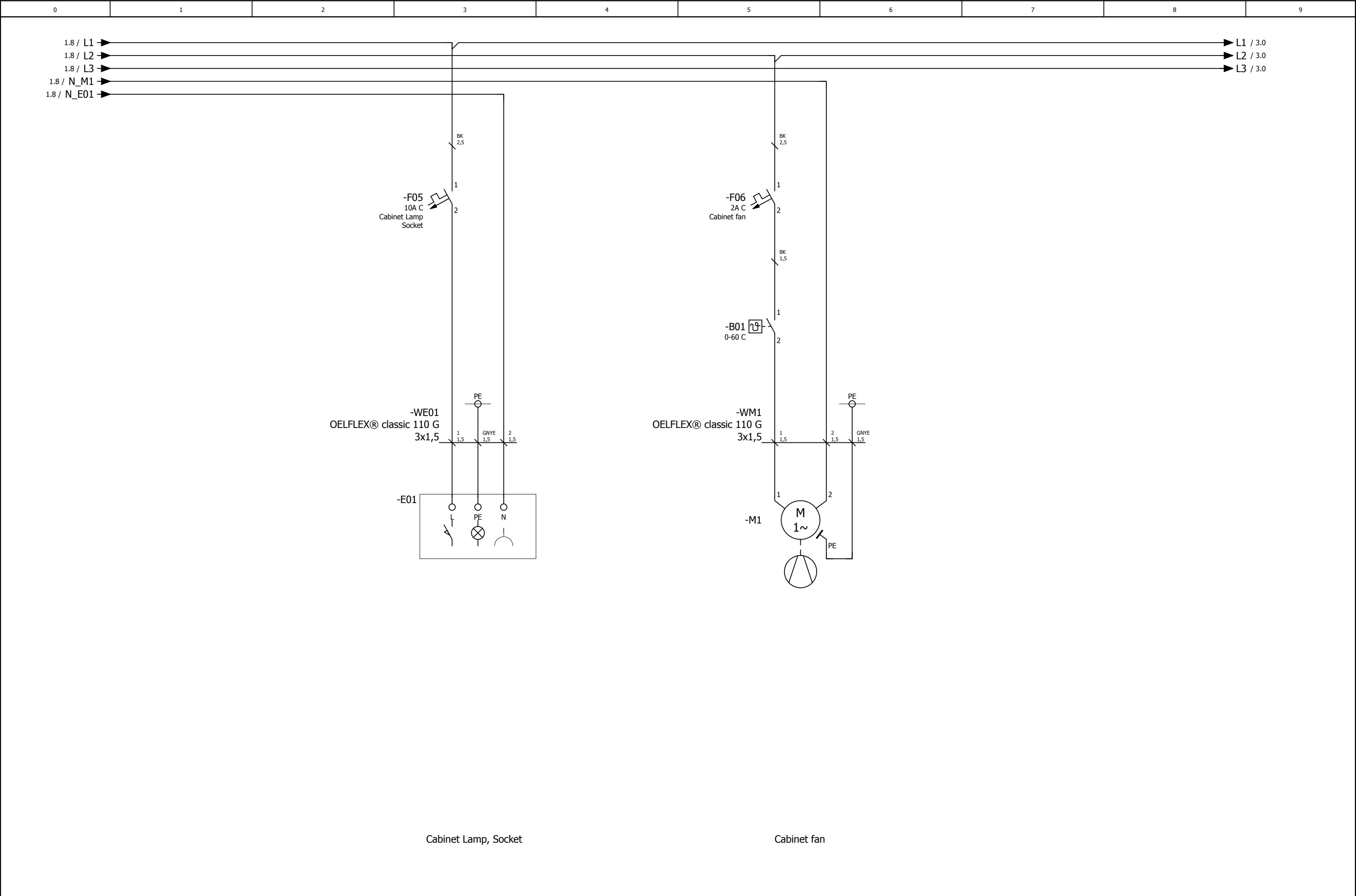
★ Conformance to UL standards requires that fuses as per UL248 or circuit breakers as per UL489 are used for the branch circuit protection in place of the motor circuit breakers depicted above in front of the Lexium servo drives. For more information, refer to the LXM28A and BCH2, Servo drive system, Product manual, 0198441114054-EN.

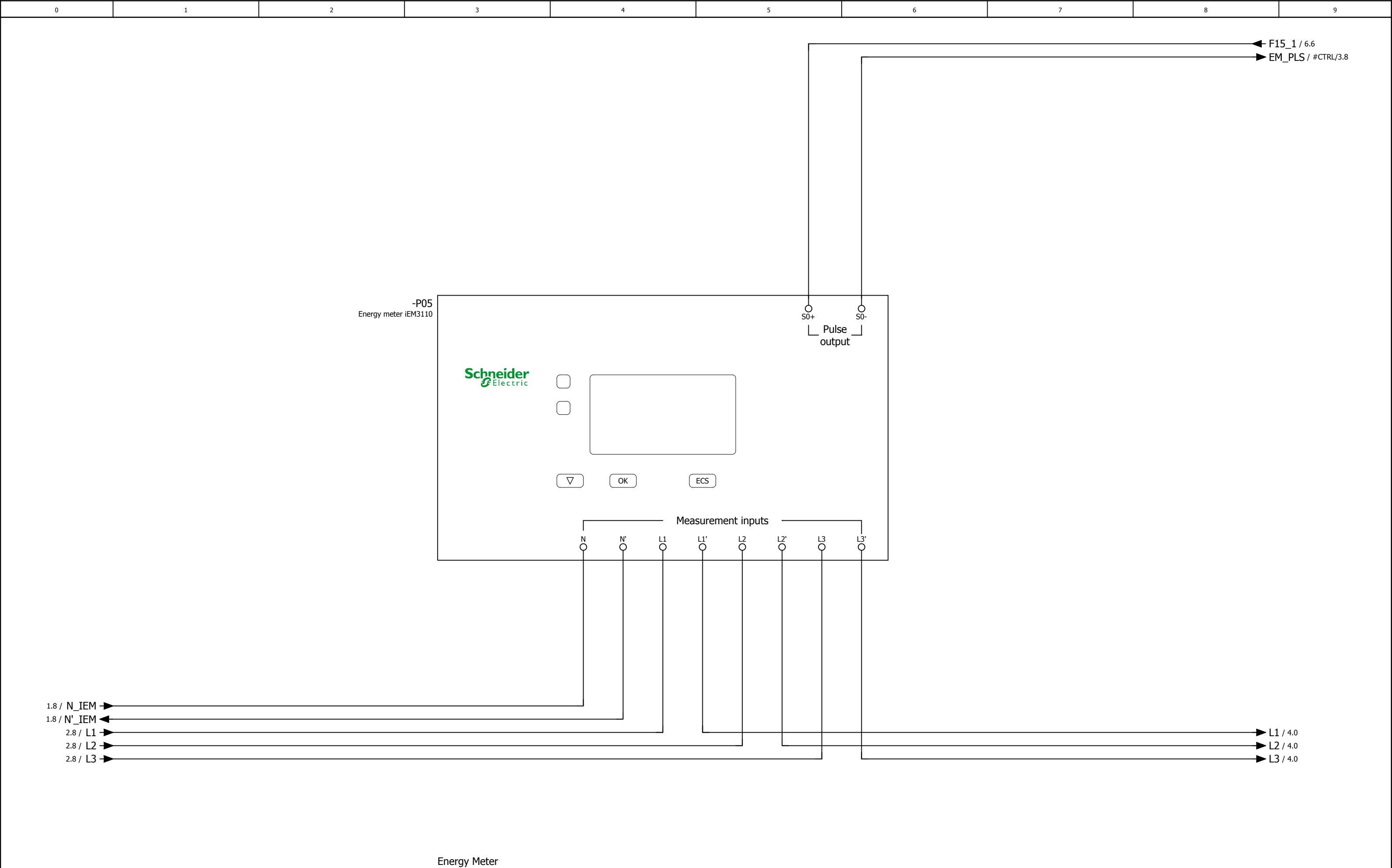


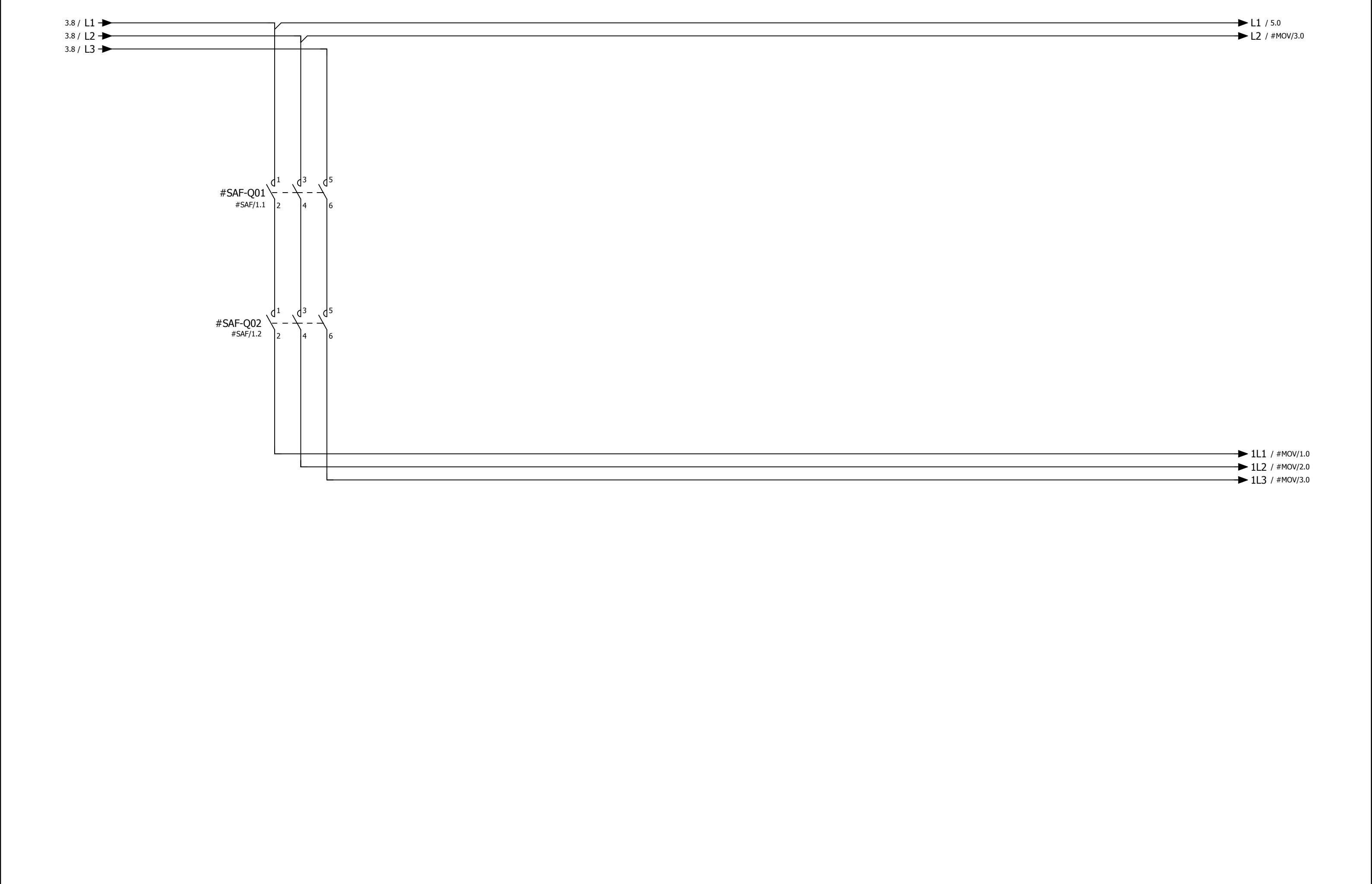
Note: In feed power supply must be adapted accordingly to the power consumption of the final plant.

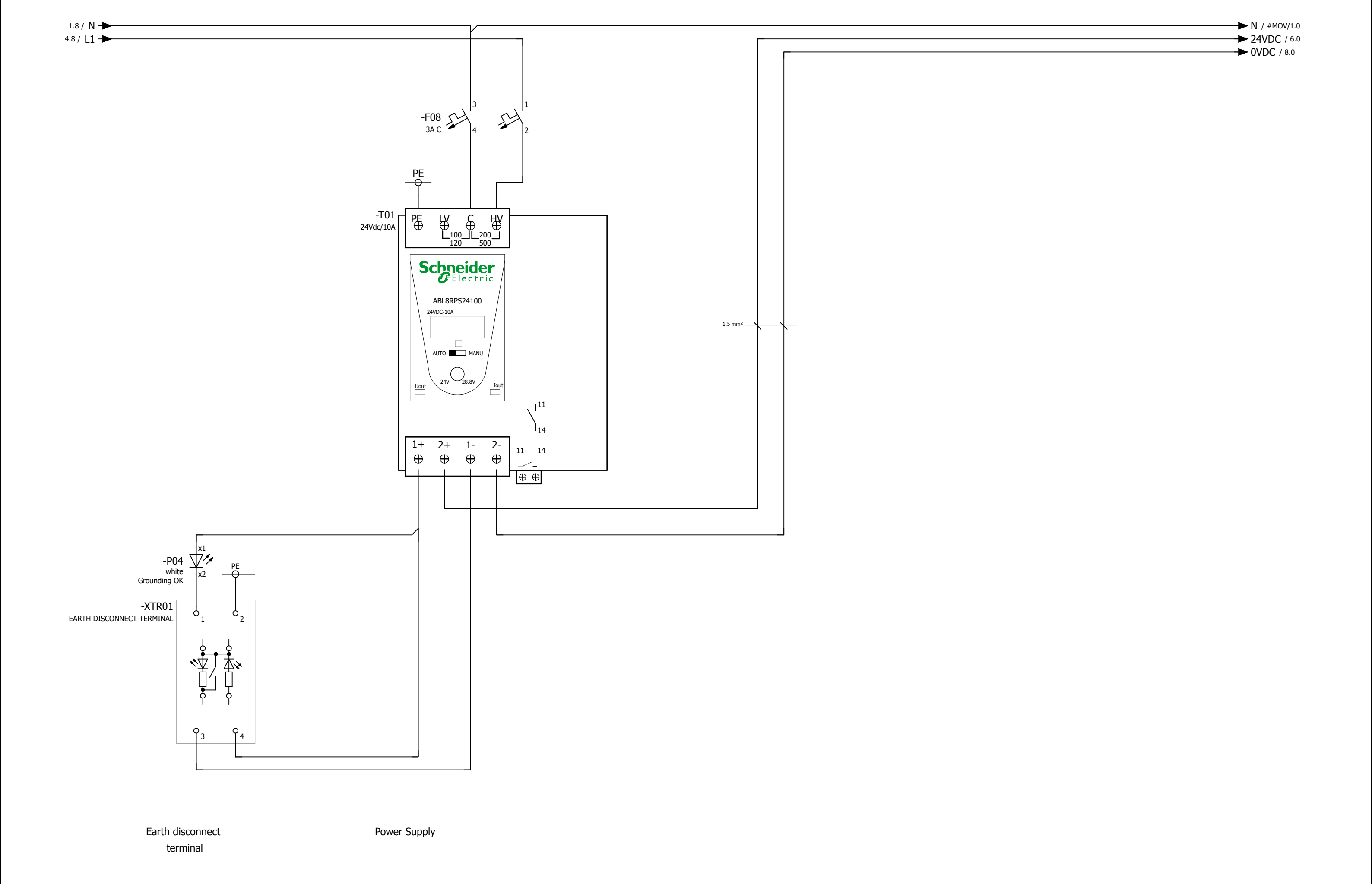
Power supply

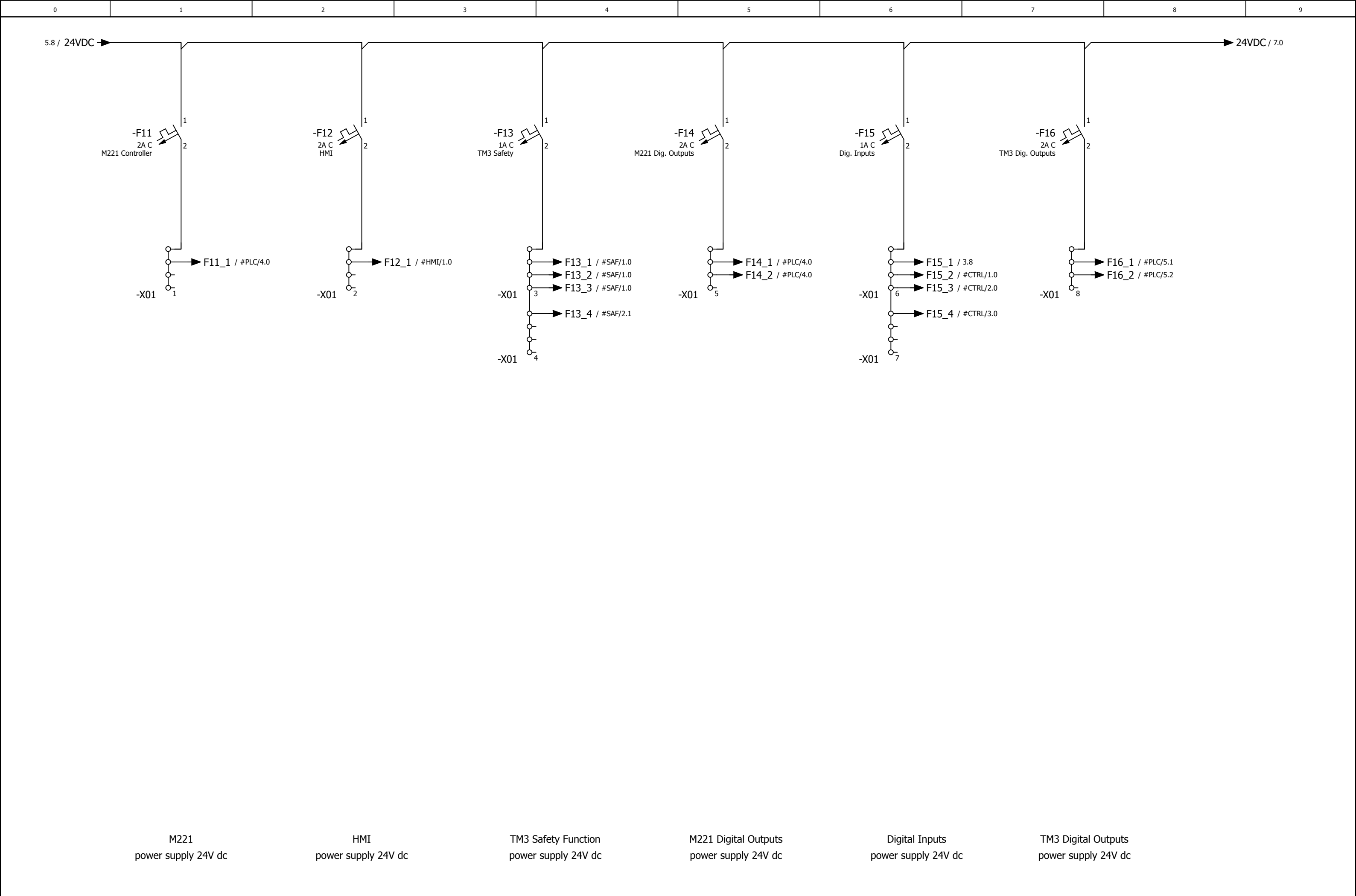
Phase control

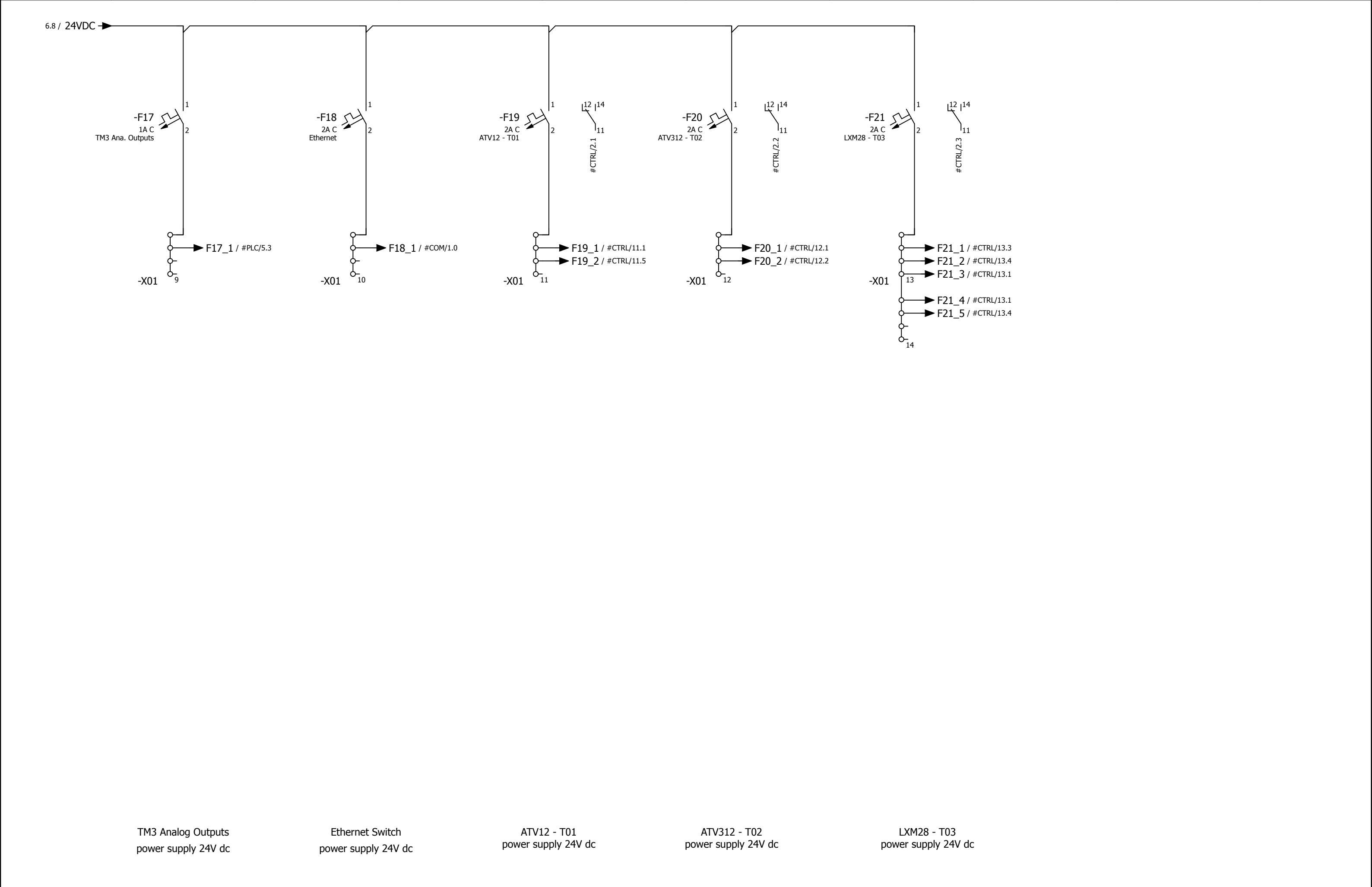


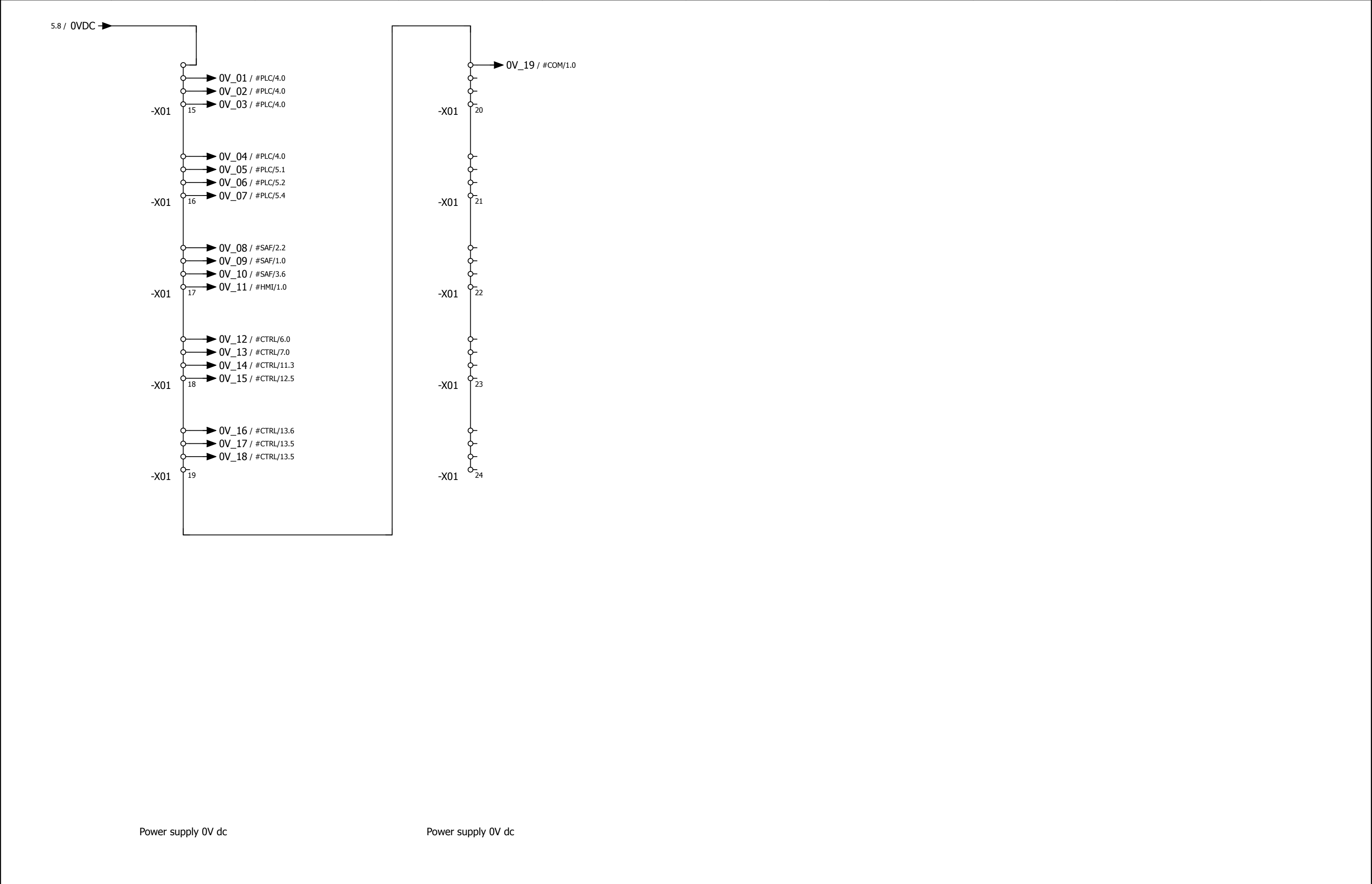


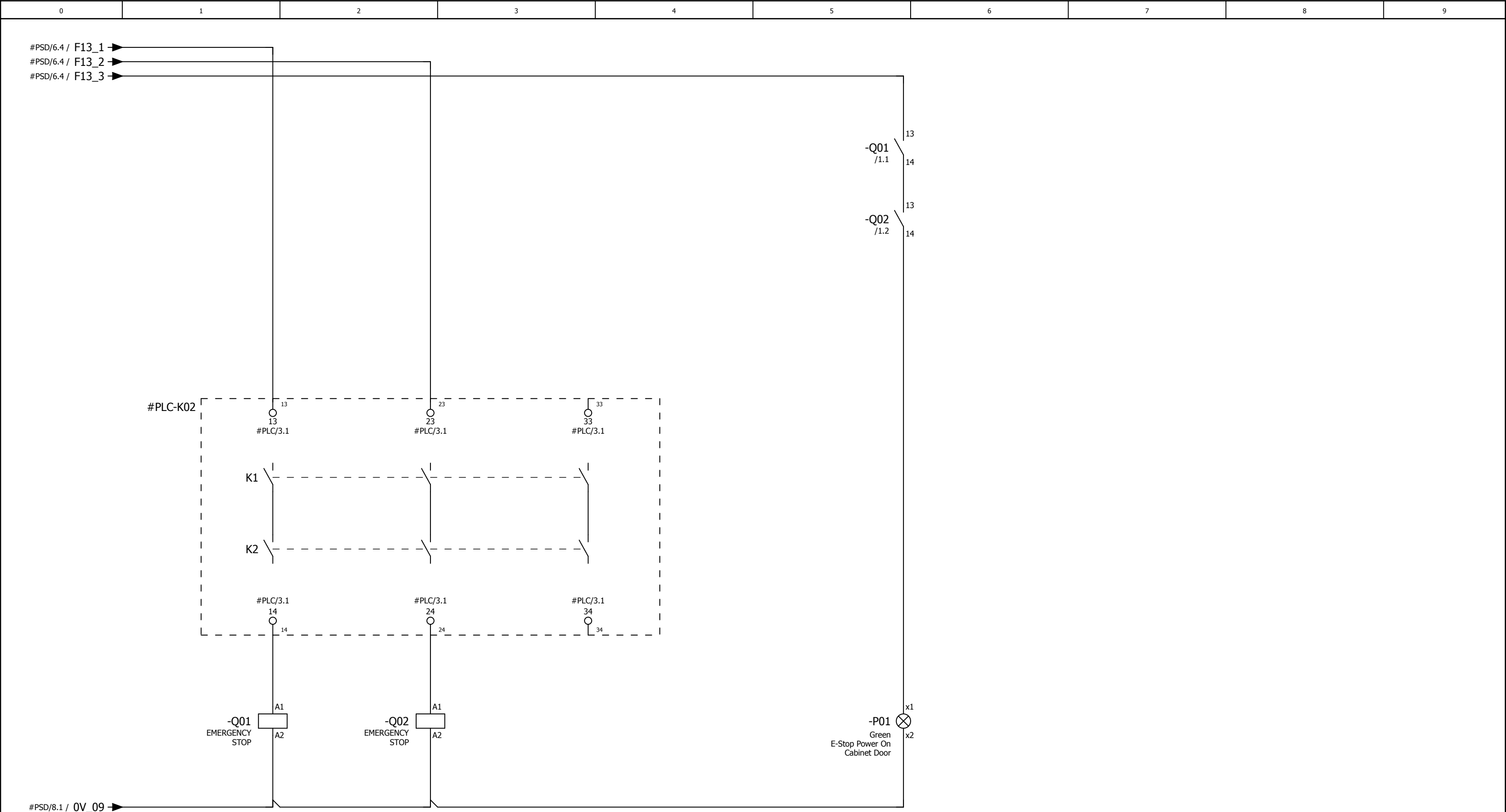












1 2 #PSD/4.2  
3 4 #PSD/4.2  
5 6 #PSD/4.2  
13 14 /1.5  
21 22 /3.2

Emergency Stop  
Main Contactor 1

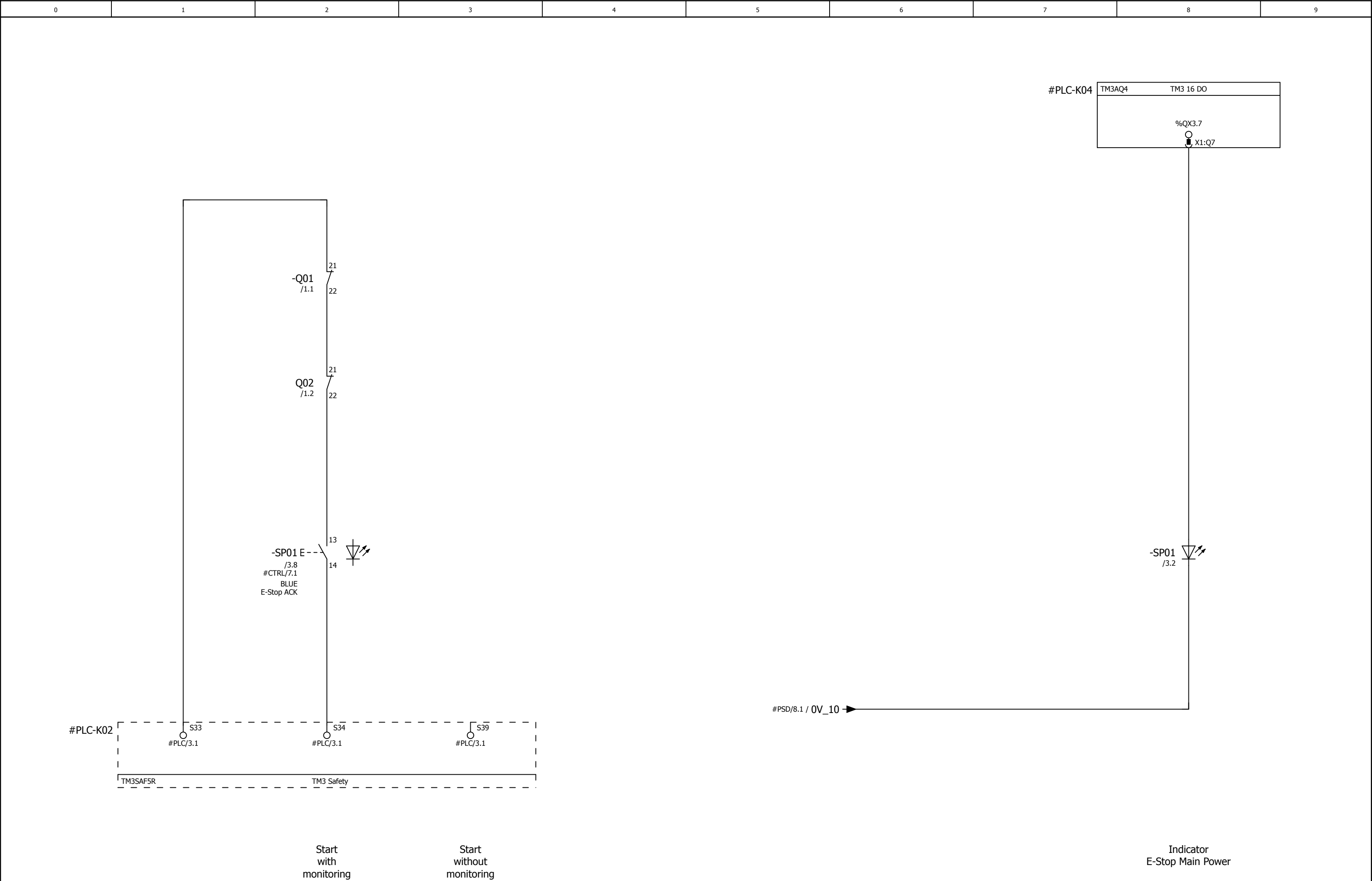
1 2 #PSD/4.2  
3 4 #PSD/4.2  
5 6 #PSD/4.2  
13 14 /1.5  
21 22 /3.2

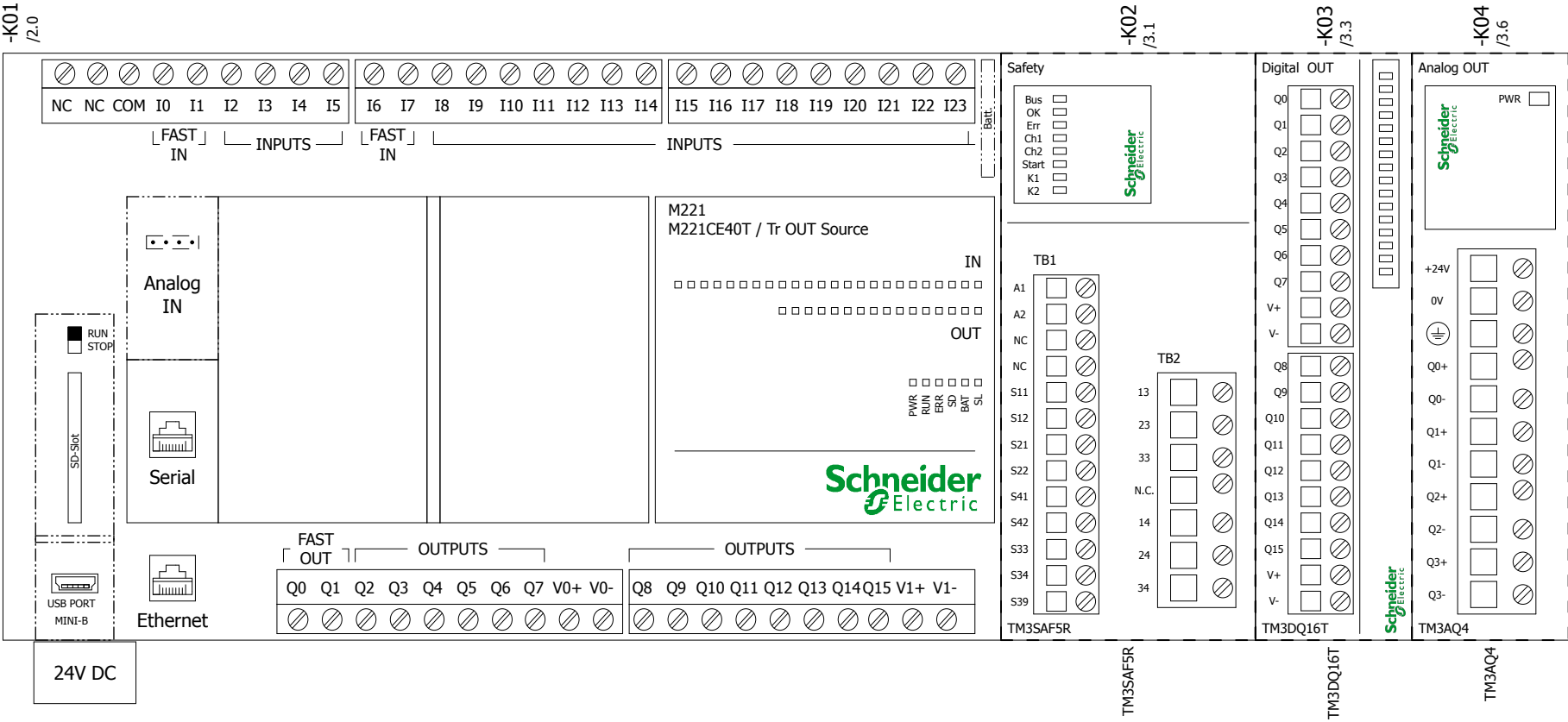
Emergency Stop  
Main Contactor 2

spare

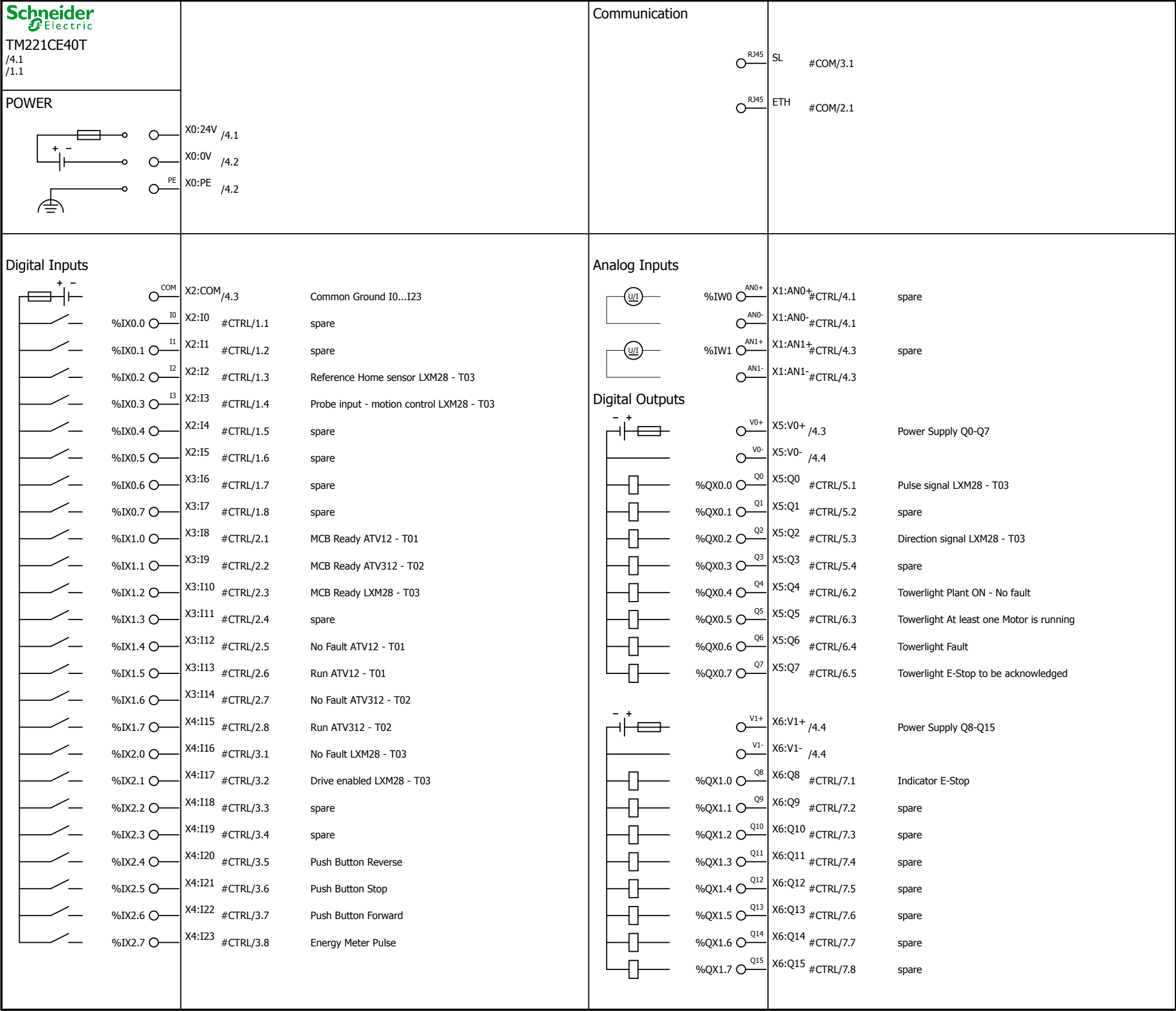
Emergency Stop  
Power-ON



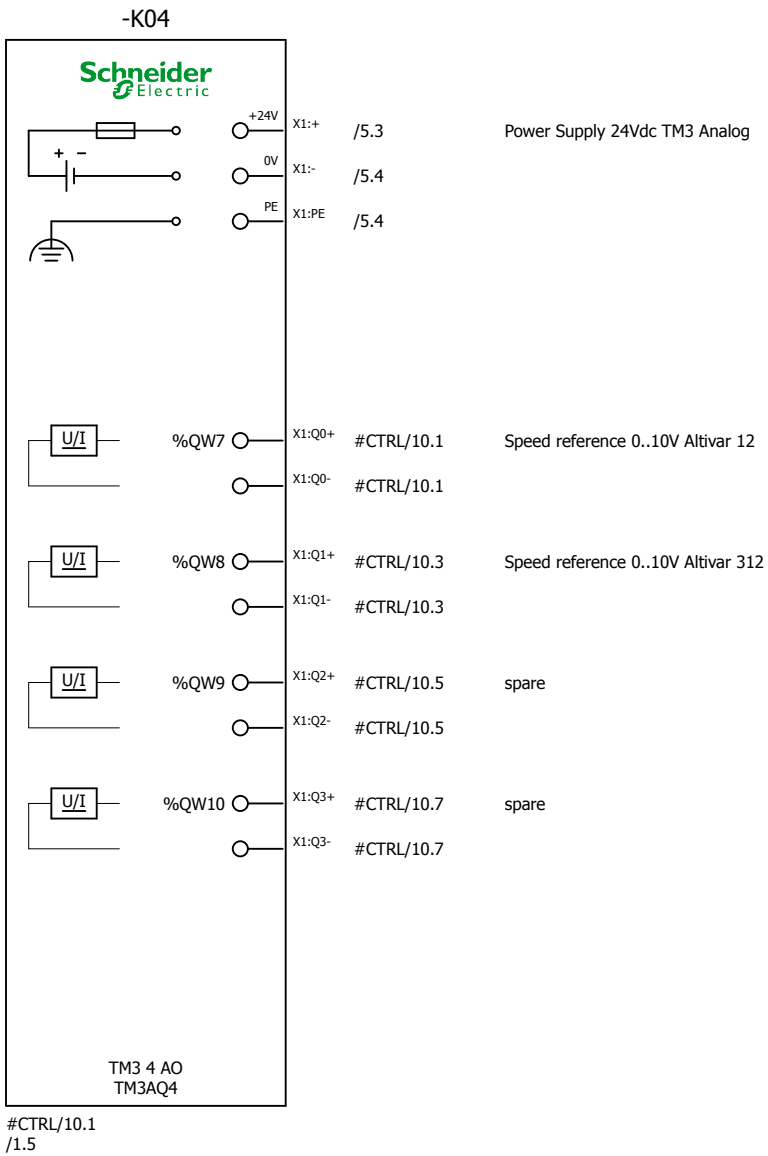
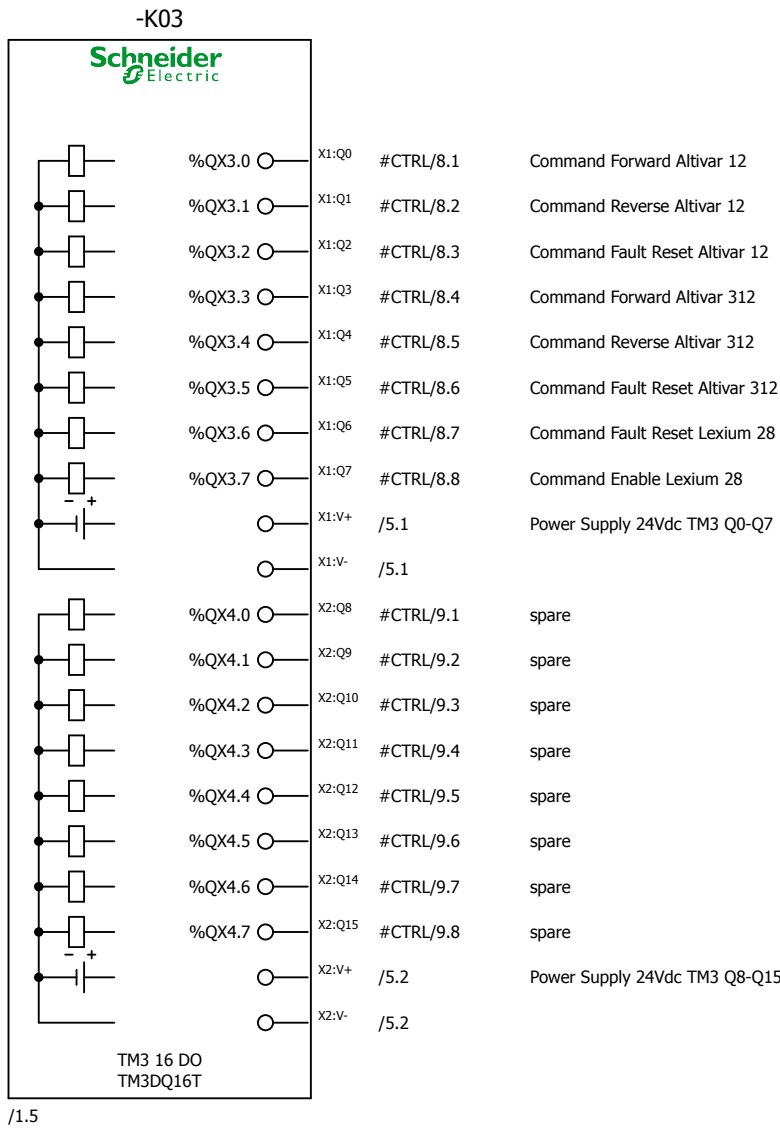
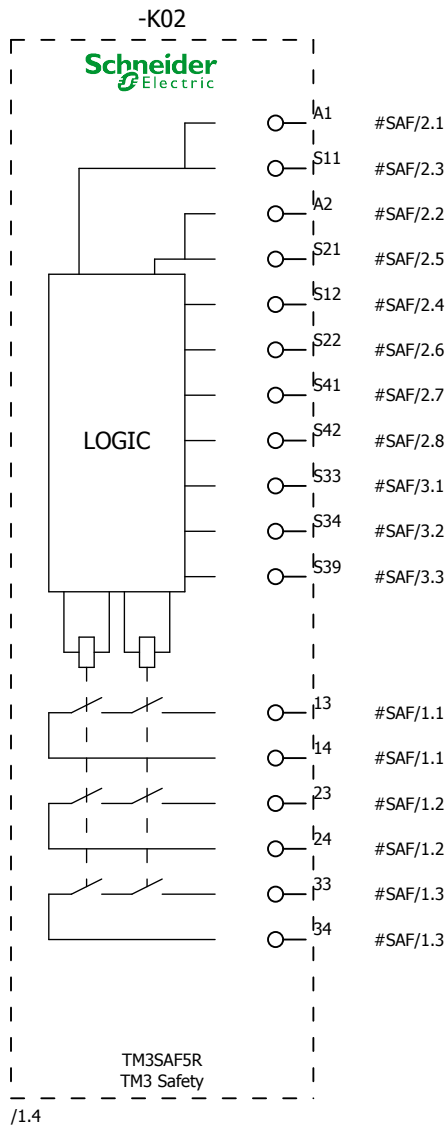




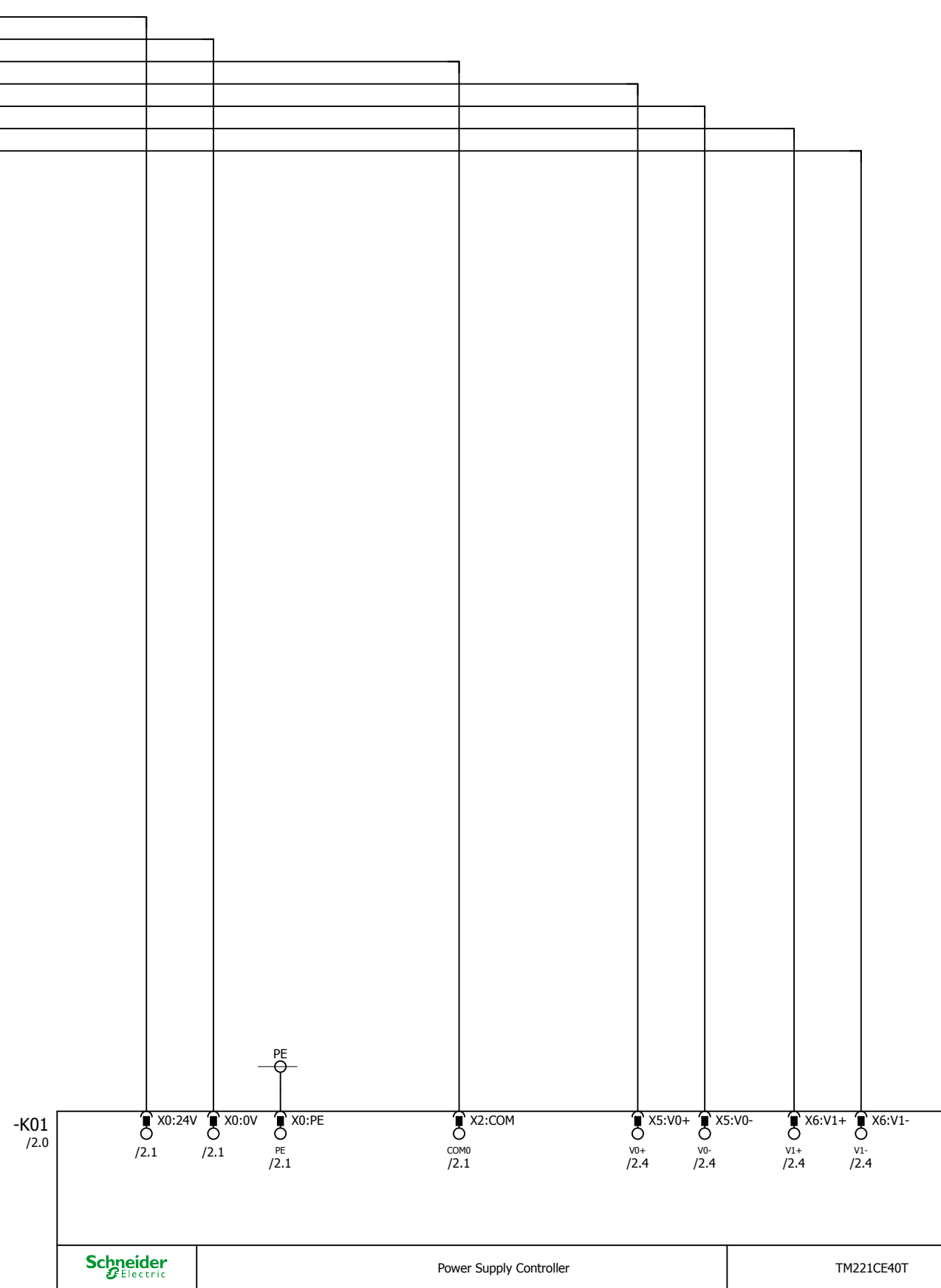
-K01



|   |   |   |   |   |   |   |   |   |   |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|



|              |      |      |          |            |                                             |             |                                                                                       |                         |                   |                  |       |   |      |
|--------------|------|------|----------|------------|---------------------------------------------|-------------|---------------------------------------------------------------------------------------|-------------------------|-------------------|------------------|-------|---|------|
|              |      |      | Date     | 2015/01/20 | Compact / Hardwired / Logic Controller M221 |             |  | Overview I/O module TM3 |                   |                  | =WIRD |   | +MC  |
|              |      |      | Ed.      | HKR        |                                             |             |                                                                                       |                         |                   |                  |       |   | #PLC |
|              |      |      | Appr     |            |                                             |             |                                                                                       |                         | TVDA              |                  |       |   |      |
| Modification | Date | Name | Original |            | Replacement of                              | Replaced by |                                                                                       |                         |                   | EIO0000001817.00 | Page  | 3 |      |
|              |      |      |          |            |                                             |             |                                                                                       |                         | =WIRD+MC#PLC/3 of |                  |       |   | 5    |

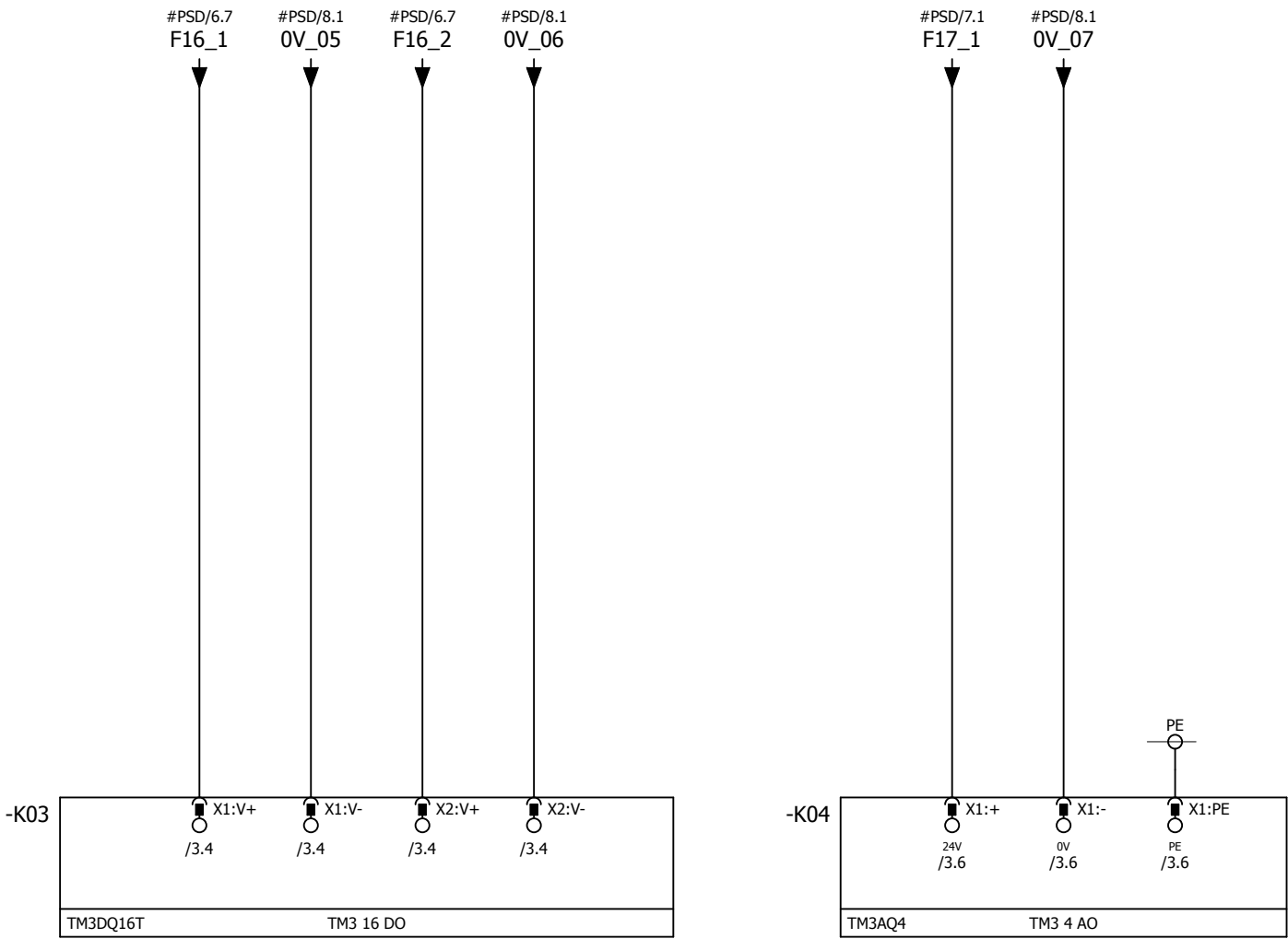


## Power Supply PLC M221

Common Ground  
I0...I23

Power Supply  
Q0-Q7

Power Supply  
Q8-Q15



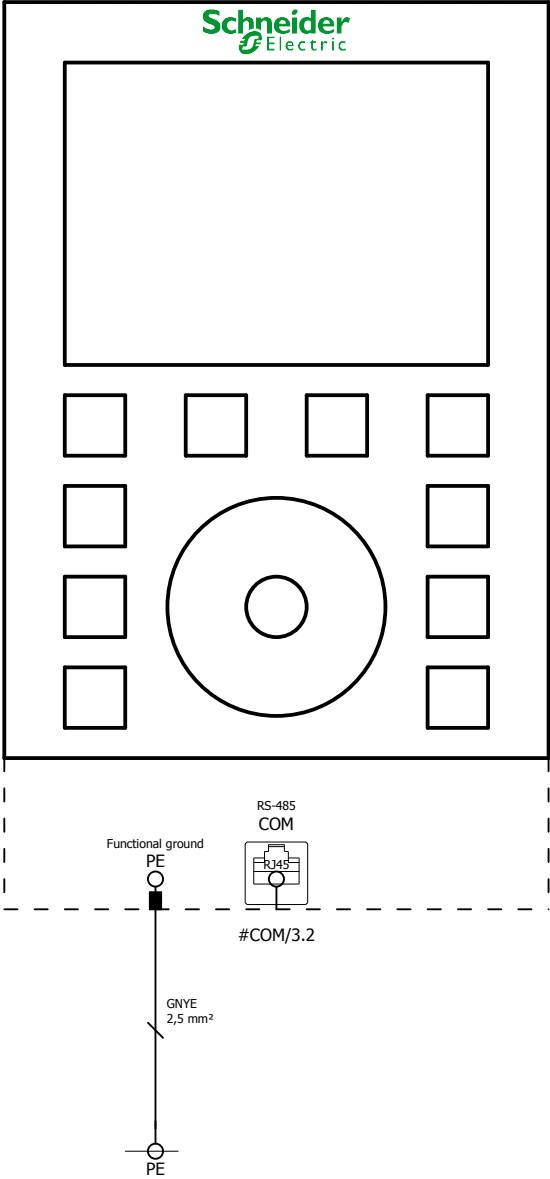
Power Supply 24Vdc  
TM3 Q0-Q7

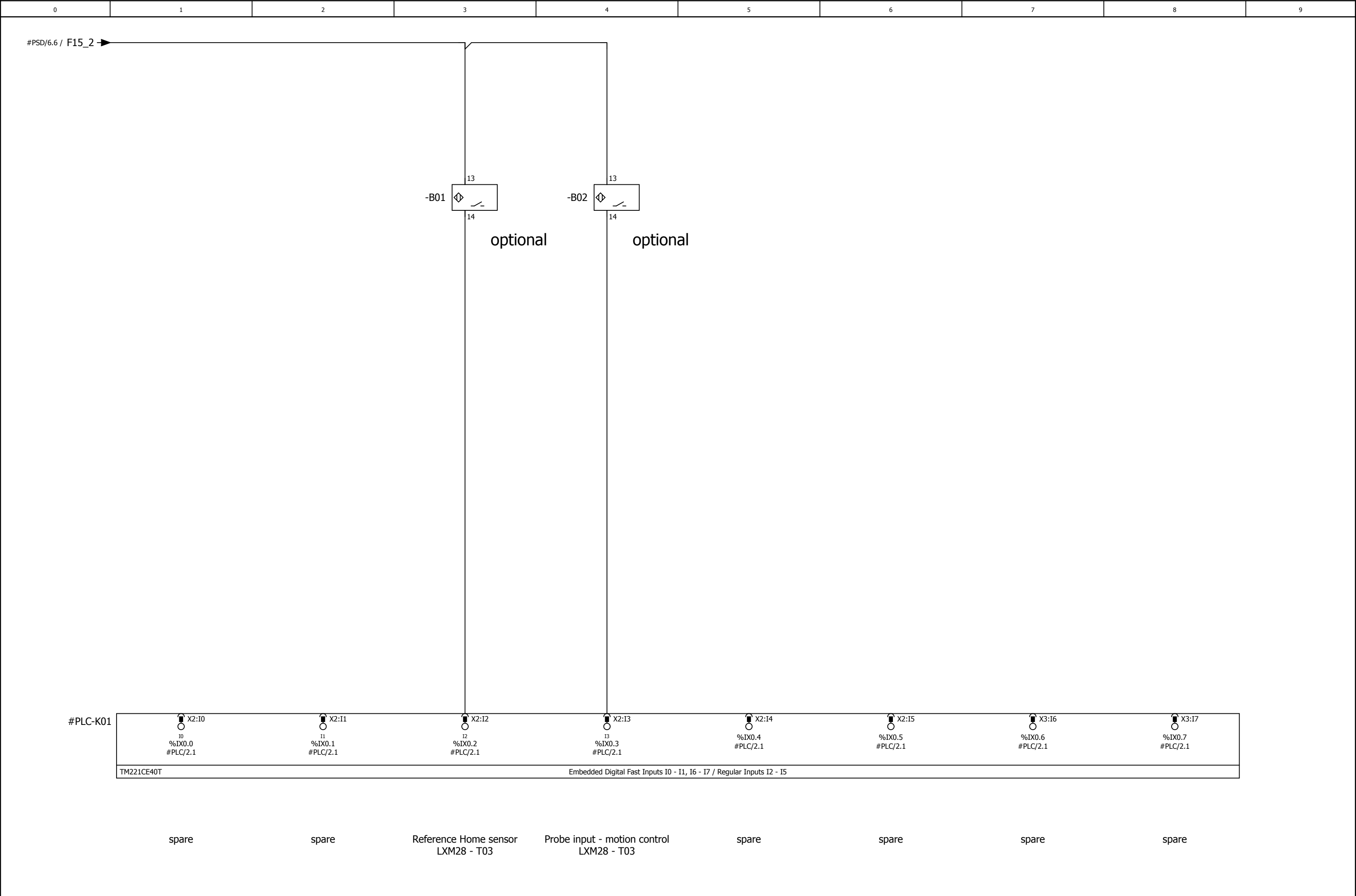
Power Supply 24Vdc  
TM3 Q8-Q15

Power Supply 24Vdc  
TM3 Analog



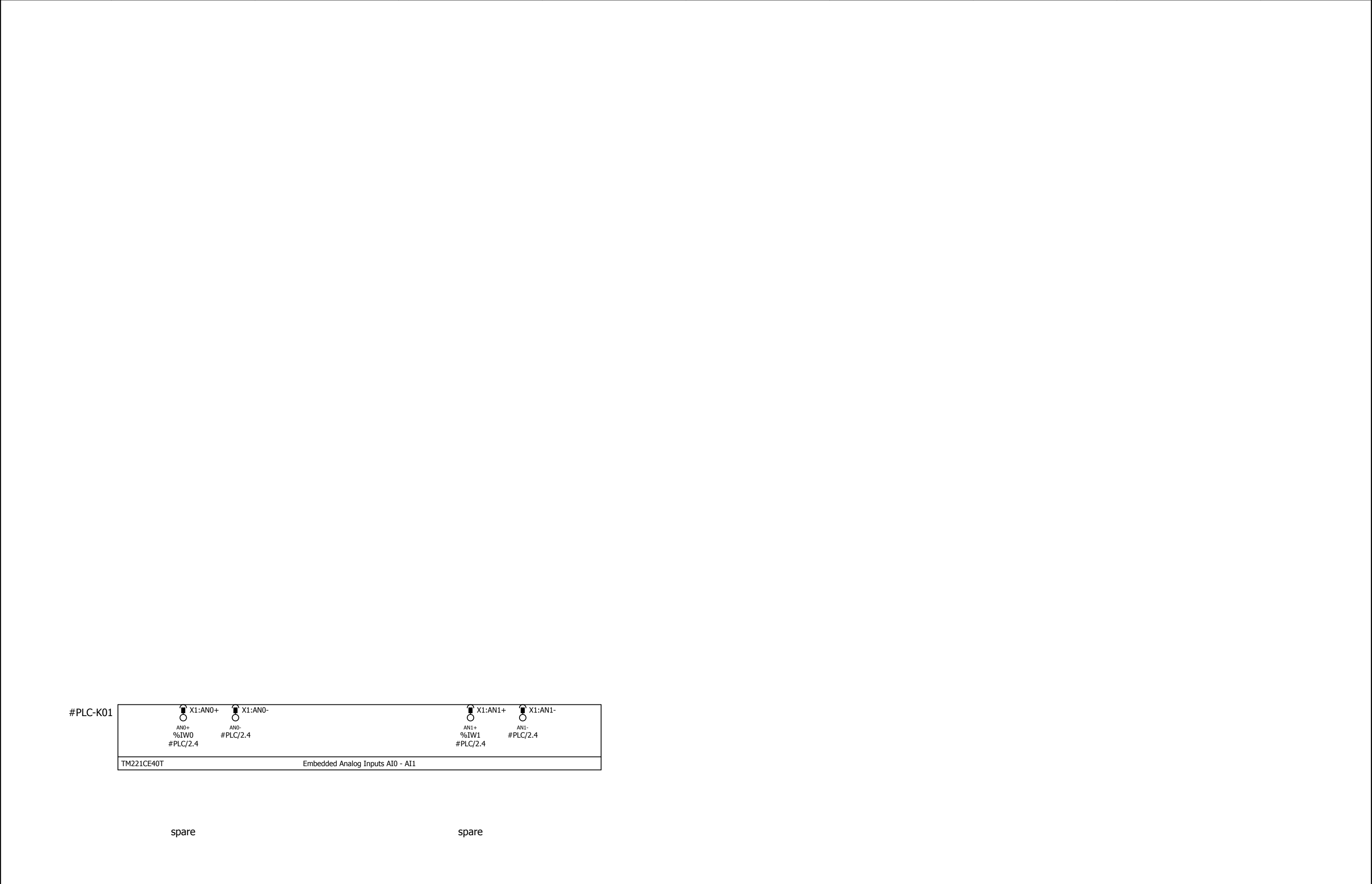
-P02  
TMH2GDB

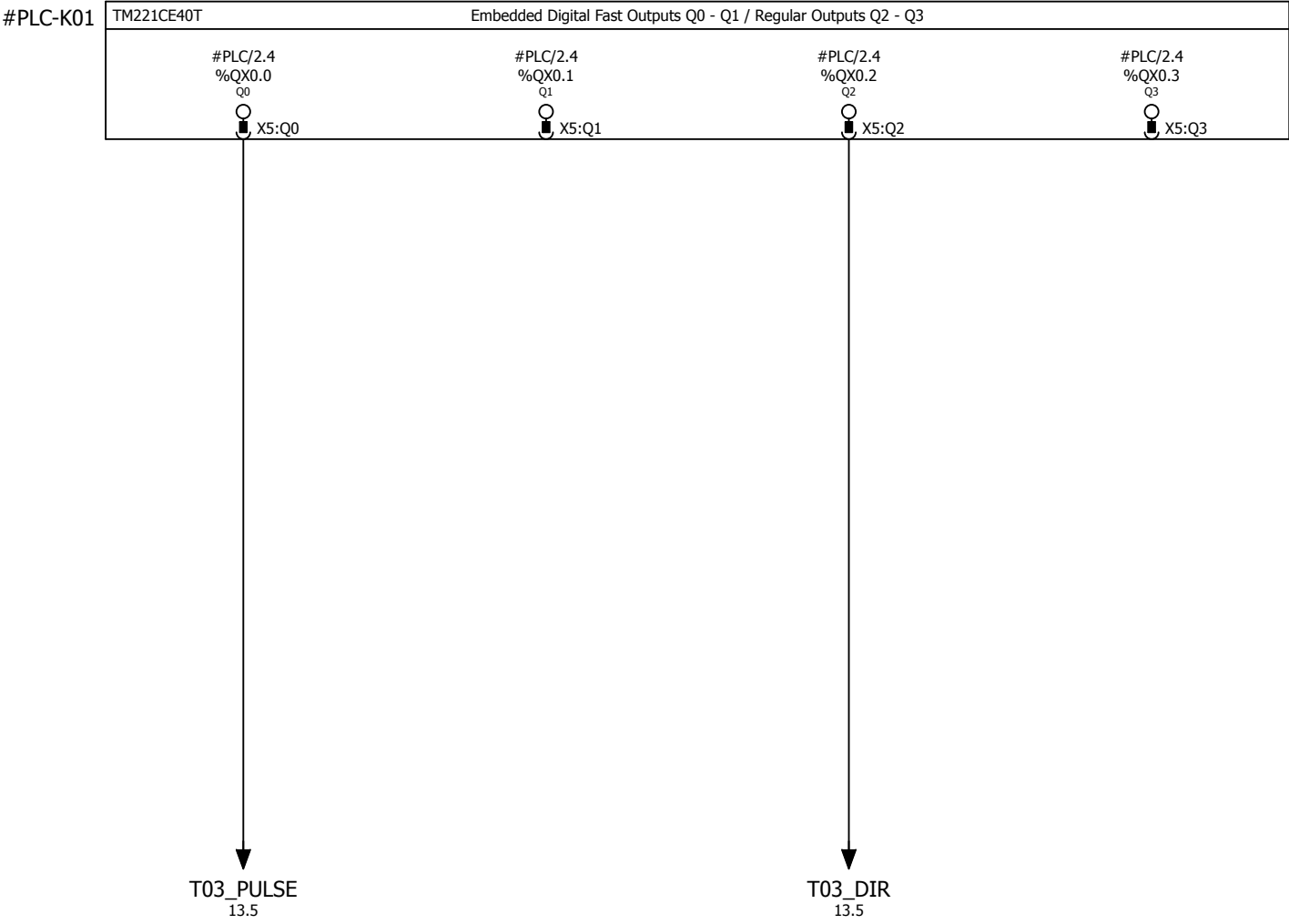










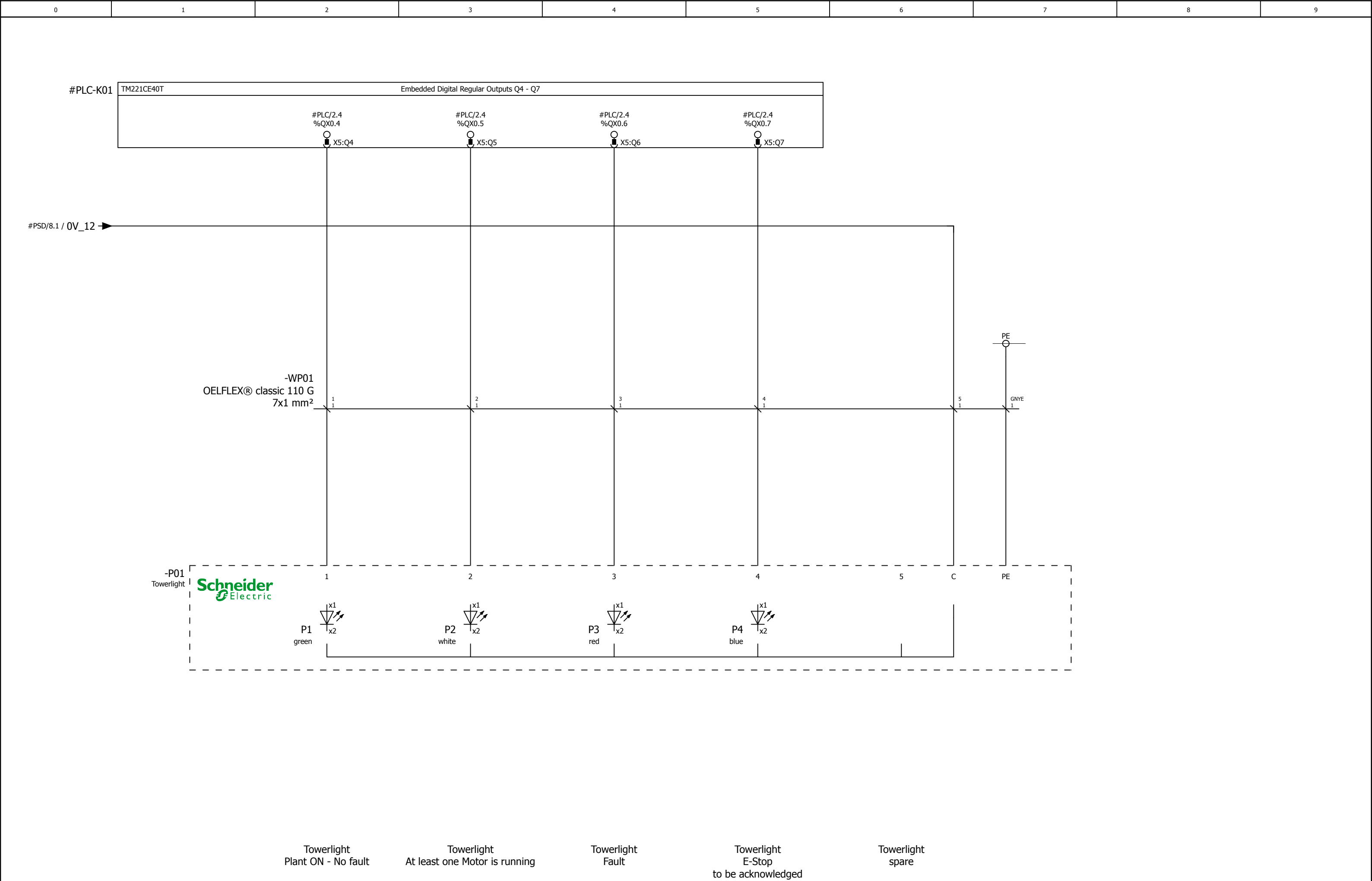


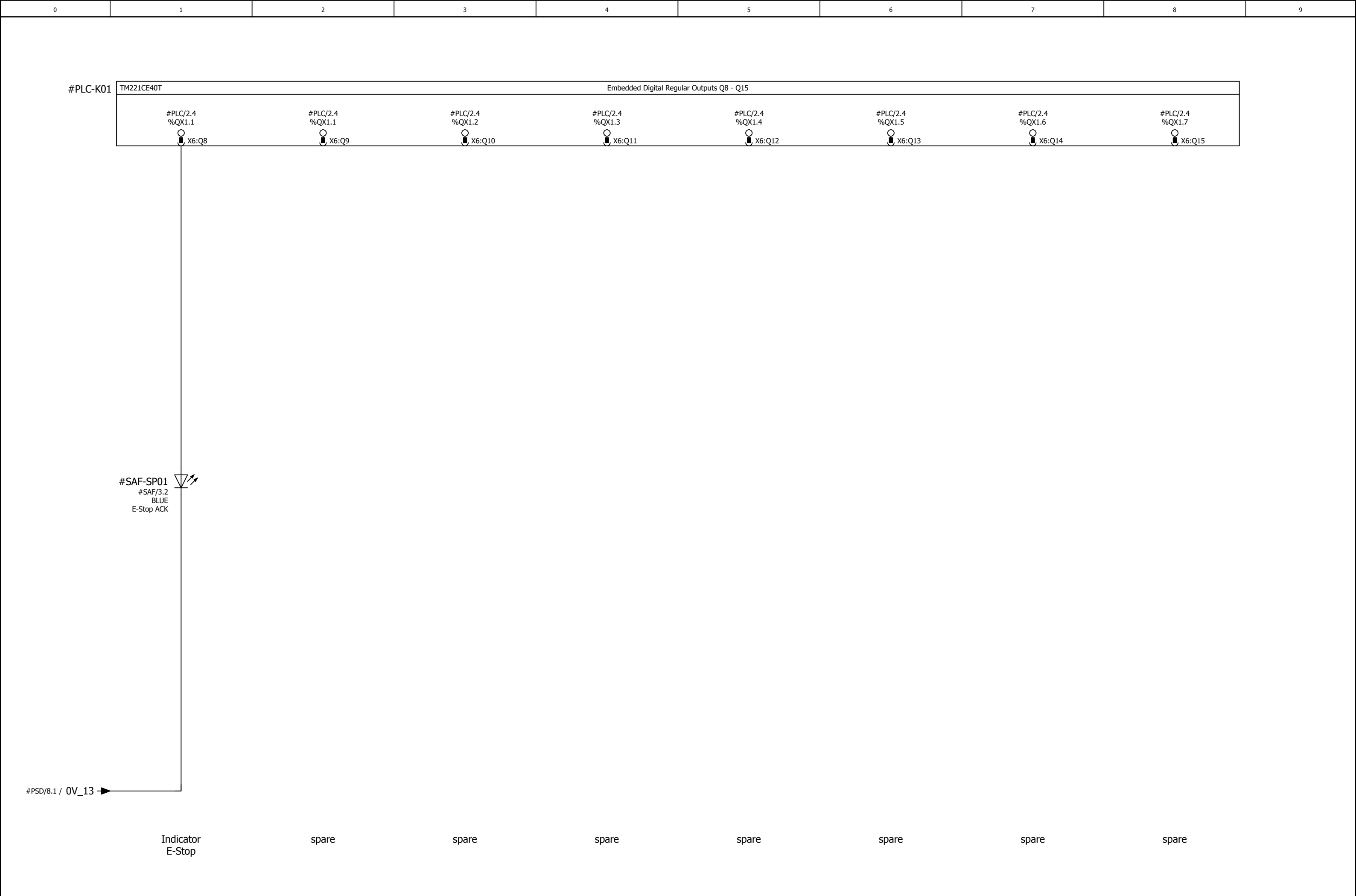
Pulse signal  
LXM28 - T03

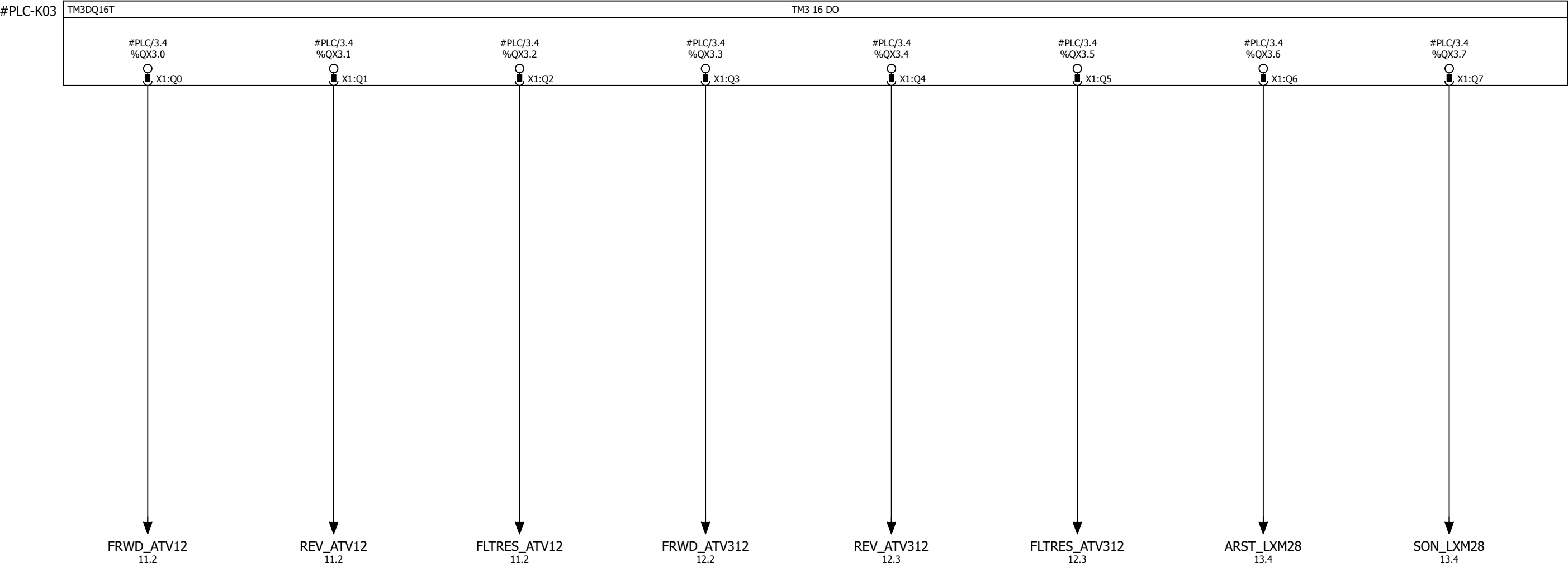
spare

Direction signal  
LXM28 - T03

spare







Command Forward  
Altivar 12

Command Reverse  
Altivar 12

Command Fault Reset  
Altivar 12

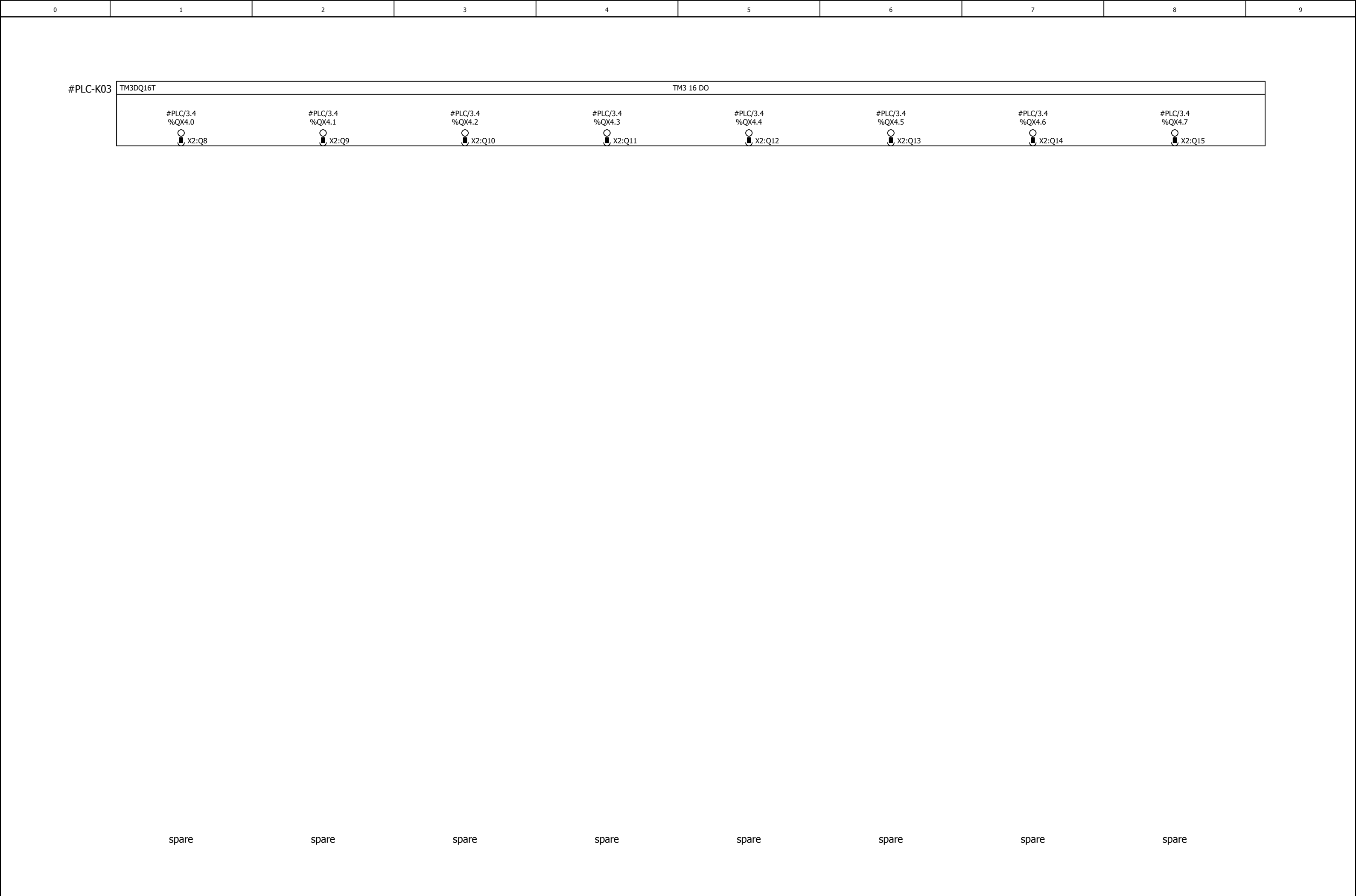
Command Forward  
Altivar 312

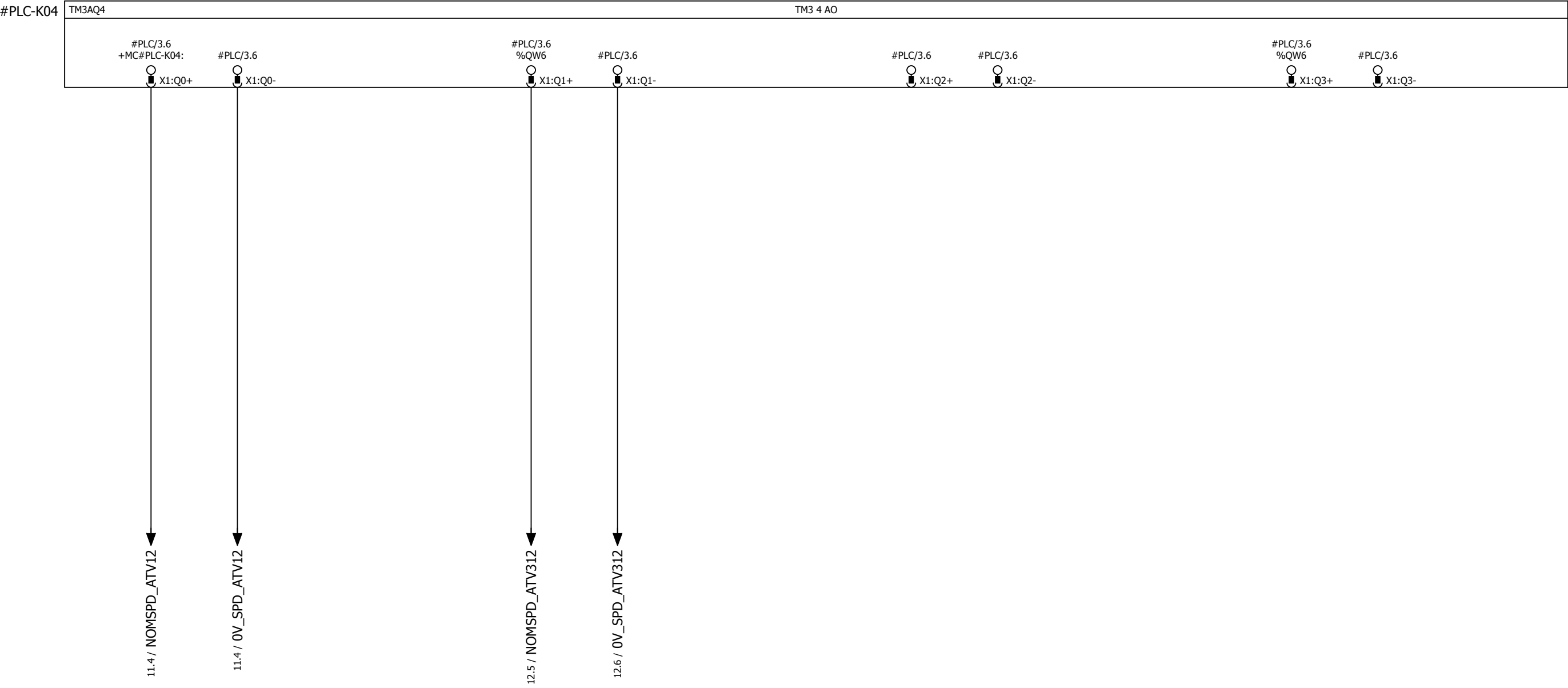
Command Reverse  
Altivar 312

Command Fault Reset  
Altivar 312

Command Fault Reset  
Lexium 28

Command Enable  
Lexium 28



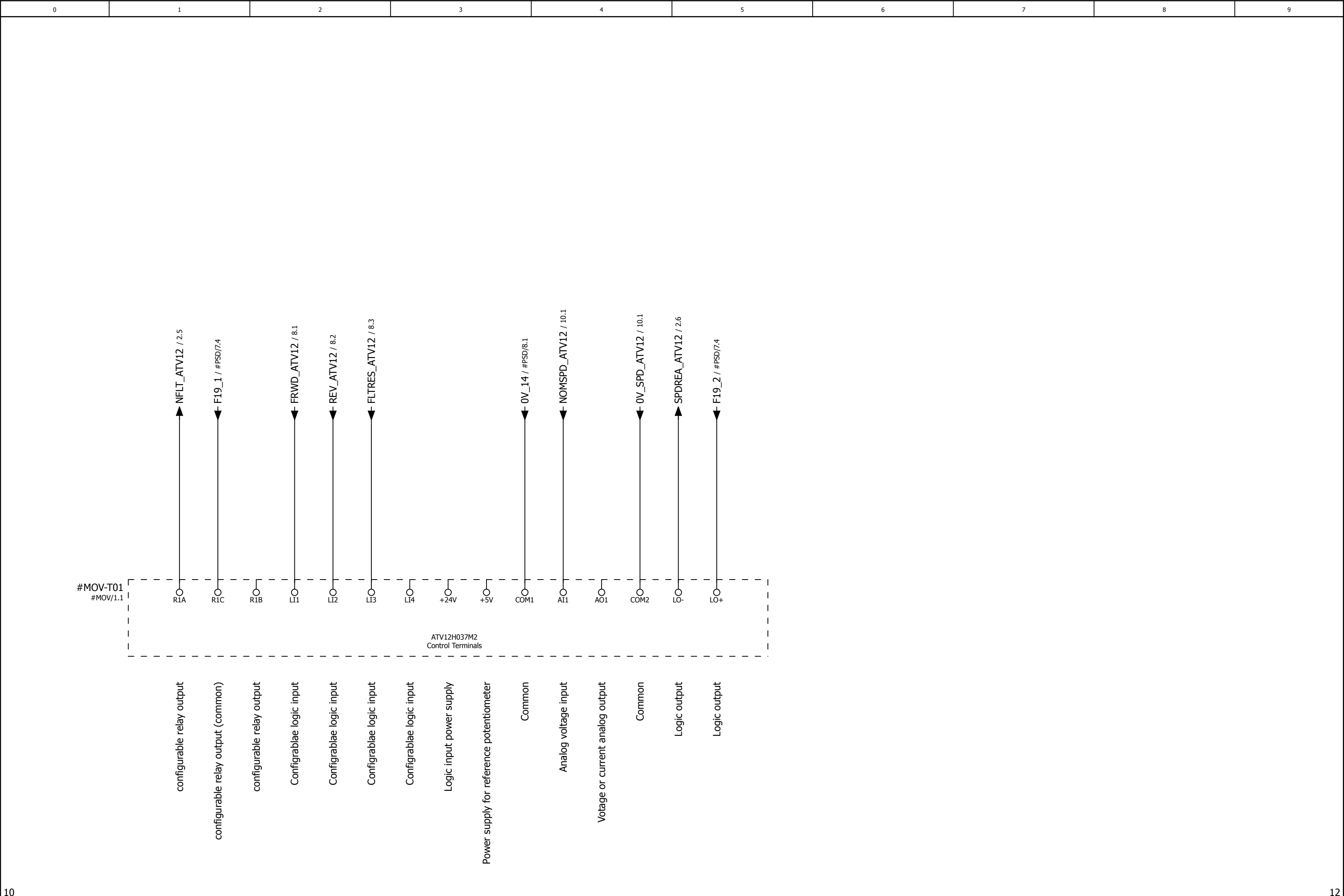


Speed reference 0..10V  
Altivar 12

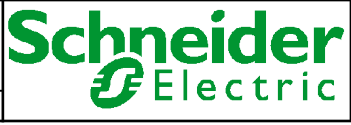
Speed reference 0..10V  
Altivar 312

spare

spare



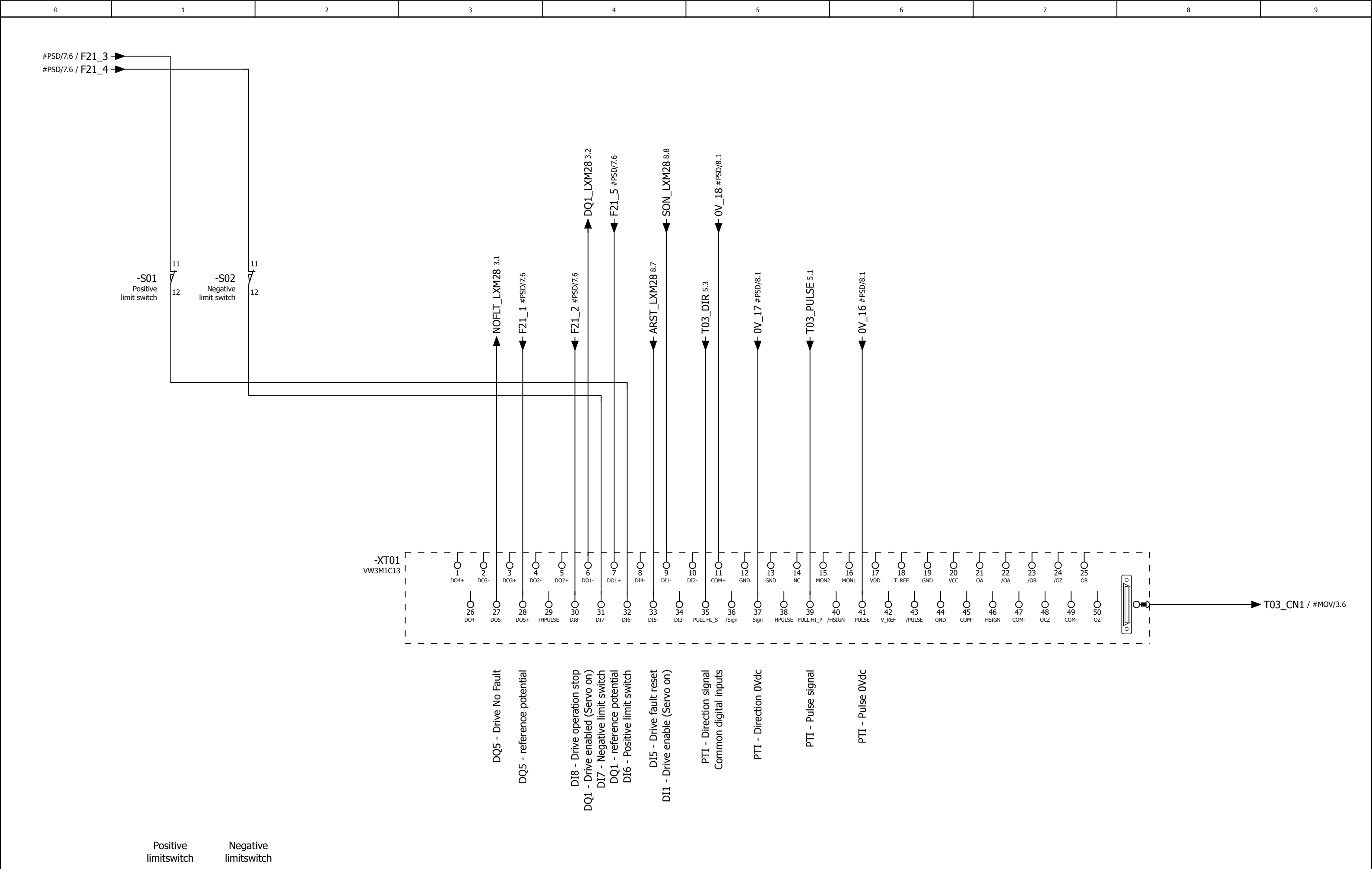
|              |      |      |          |            |                                             |             |
|--------------|------|------|----------|------------|---------------------------------------------|-------------|
|              |      |      | Date     | 2015/02/17 | Compact / Hardwired / Logic Controller M221 |             |
|              |      |      | Ed.      | HKR        |                                             |             |
|              |      |      | Appr     |            |                                             |             |
| Modification | Date | Name | Original |            | Replacement of                              | Replaced by |

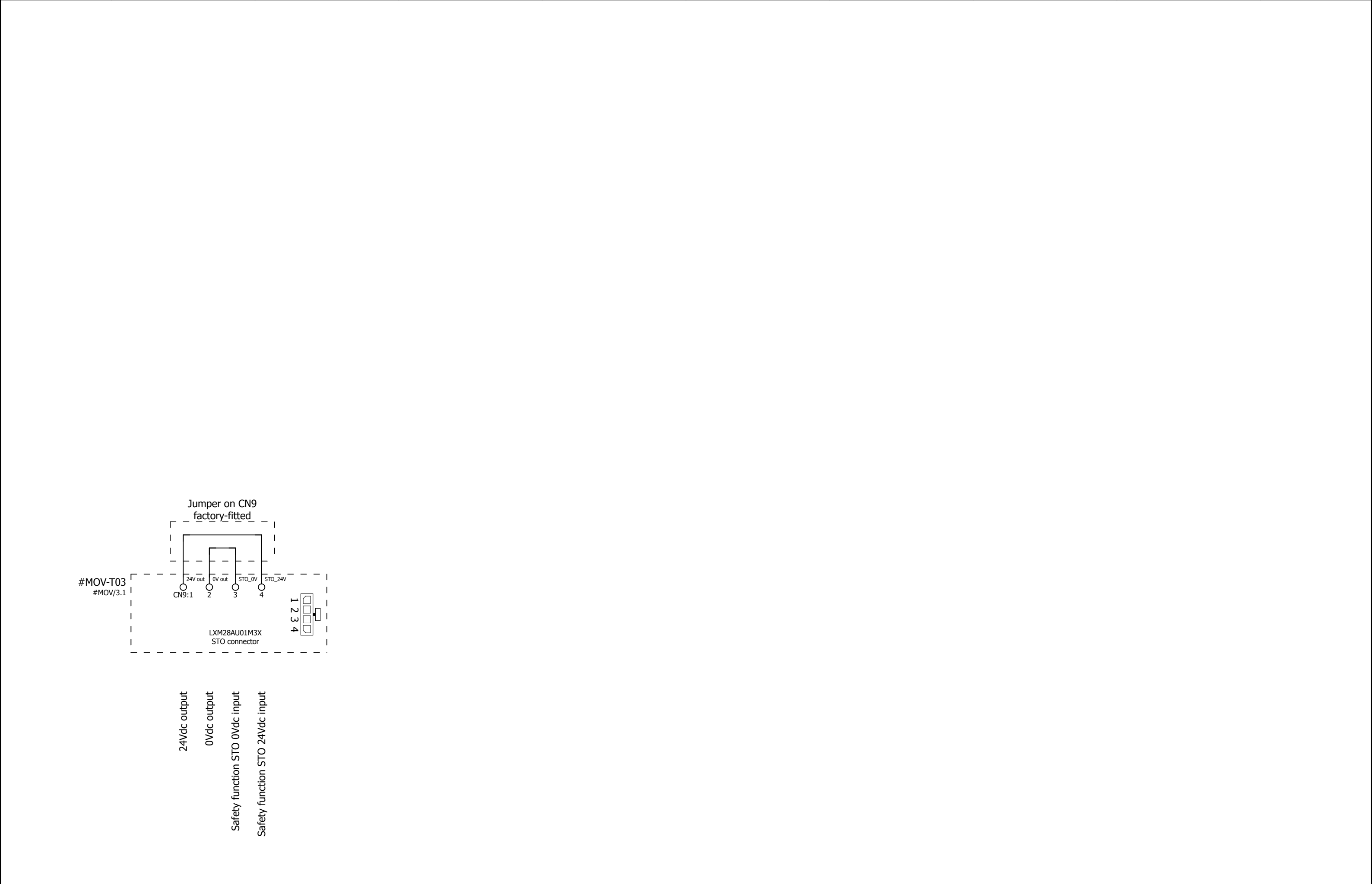


Drive 1 Control Terminals Altivar 12

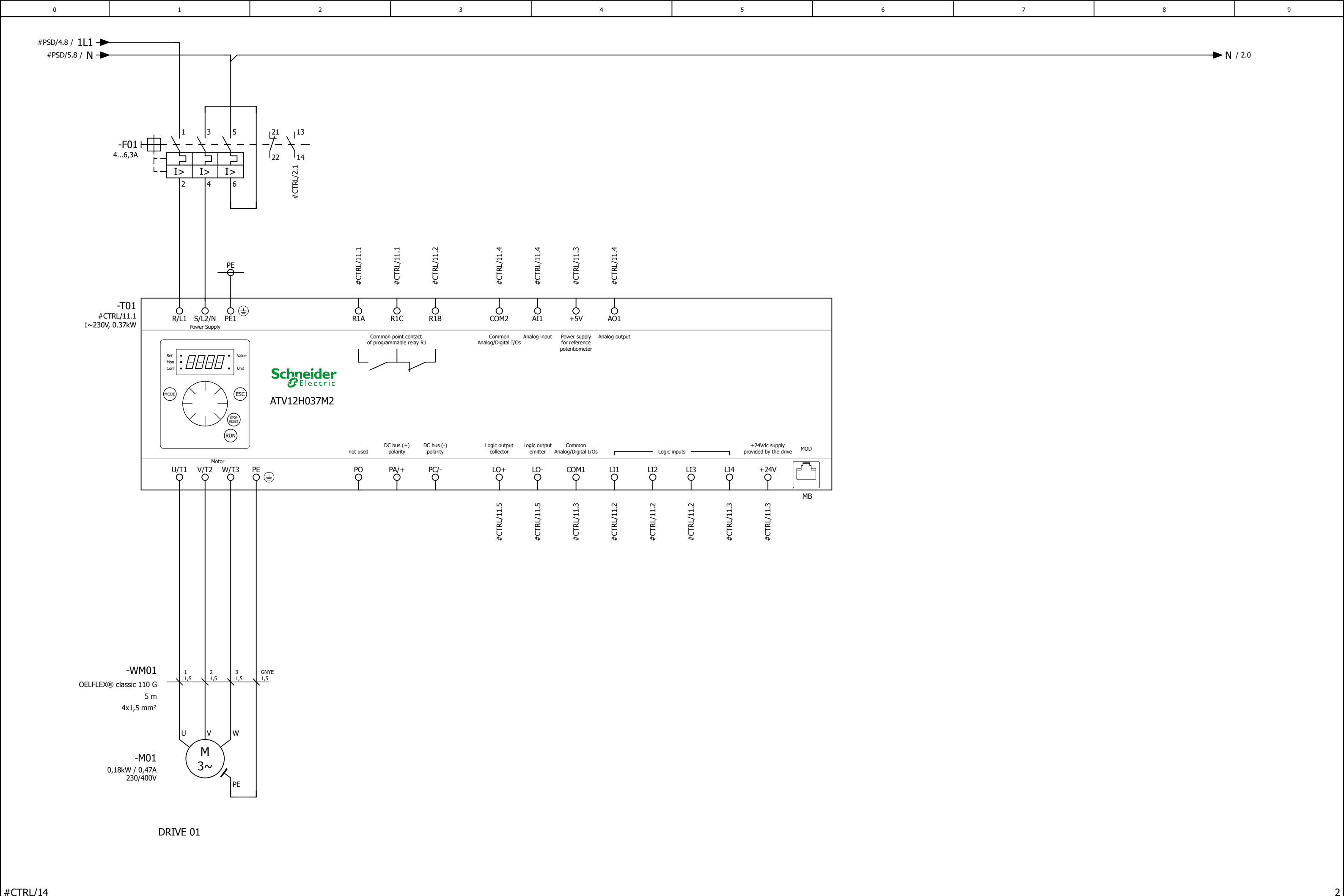
|  |  |  |                  |  |       |         |
|--|--|--|------------------|--|-------|---------|
|  |  |  | =WIRD            |  | +MC   |         |
|  |  |  |                  |  | #CTRL |         |
|  |  |  | EIO0000001817.00 |  |       | Page 11 |
|  |  |  | =WIRD+MC#CTRL/11 |  |       | of 14   |

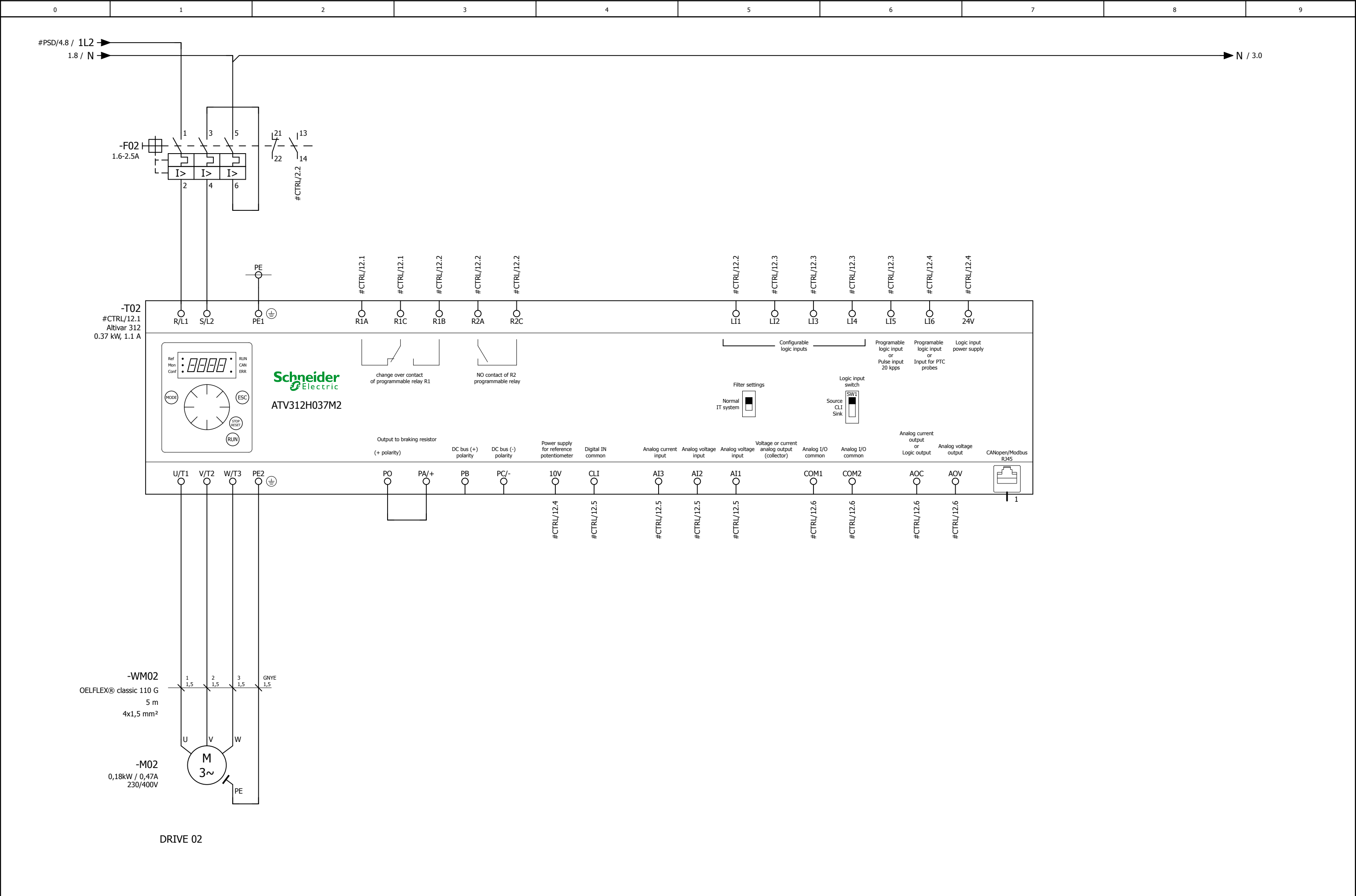


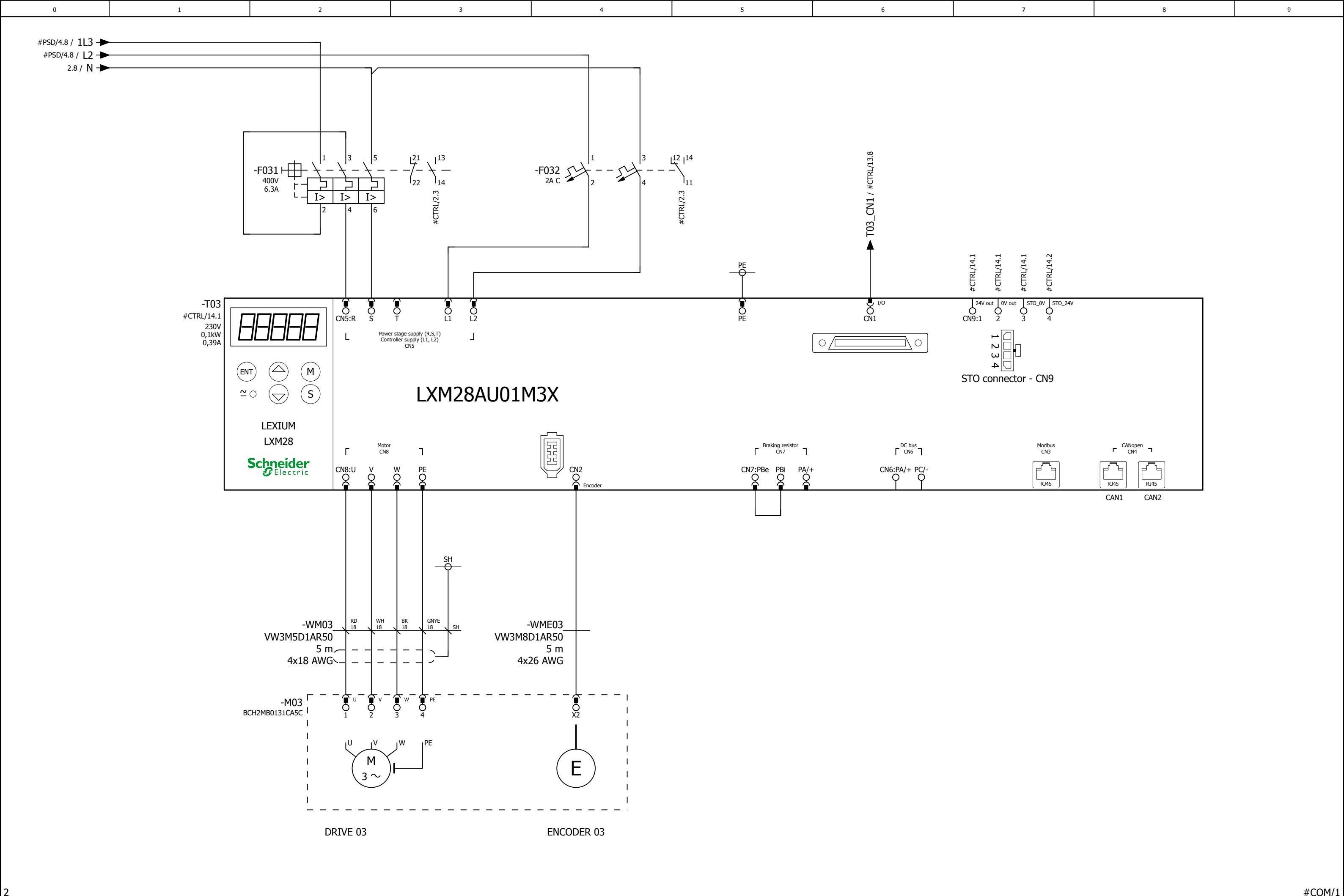




|              |      |      |          |            |                                             |             |                                                                                       |                                        |  |                     |       |    |       |    |
|--------------|------|------|----------|------------|---------------------------------------------|-------------|---------------------------------------------------------------------------------------|----------------------------------------|--|---------------------|-------|----|-------|----|
|              |      |      | Date     | 2015/03/24 | Compact / Hardwired / Logic Controller M221 |             |  | Drive 3 - LXM28<br>STO connector - CN9 |  |                     | =WIRD |    | +MC   |    |
|              |      |      | Ed.      | HKR        |                                             |             |                                                                                       |                                        |  |                     |       |    | #CTRL |    |
|              |      |      | Appr     |            |                                             |             |                                                                                       |                                        |  |                     |       |    |       |    |
| Modification | Date | Name | Original |            | Replacement of                              | Replaced by |                                                                                       |                                        |  | EIO0000001817.00    | Page  | 14 |       |    |
|              |      |      |          |            |                                             |             |                                                                                       |                                        |  | =WIRD+MC#CTRL/14 of |       |    |       | 14 |







|              |      |      |          |            |                                             |             |                                                                                       |                                  |      |  |                  |      |      |   |
|--------------|------|------|----------|------------|---------------------------------------------|-------------|---------------------------------------------------------------------------------------|----------------------------------|------|--|------------------|------|------|---|
|              |      |      | Date     | 2015/03/11 | Compact / Hardwired / Logic Controller M221 |             |  | Drive 3<br>Servo drive Lexium 28 |      |  | =WIRD            |      | +MC  |   |
|              |      |      | Ed.      | HKR        |                                             |             |                                                                                       |                                  |      |  |                  |      | #MOV |   |
|              |      |      | Appr     |            |                                             |             |                                                                                       |                                  | TVDA |  |                  |      |      |   |
| Modification | Date | Name | Original |            | Replacement of                              | Replaced by |                                                                                       |                                  |      |  | EIO0000001817.00 | Page | 3    |   |
|              |      |      |          |            |                                             |             |                                                                                       |                                  |      |  | =WIRD+MC#MOV/3   |      | of   | 3 |

