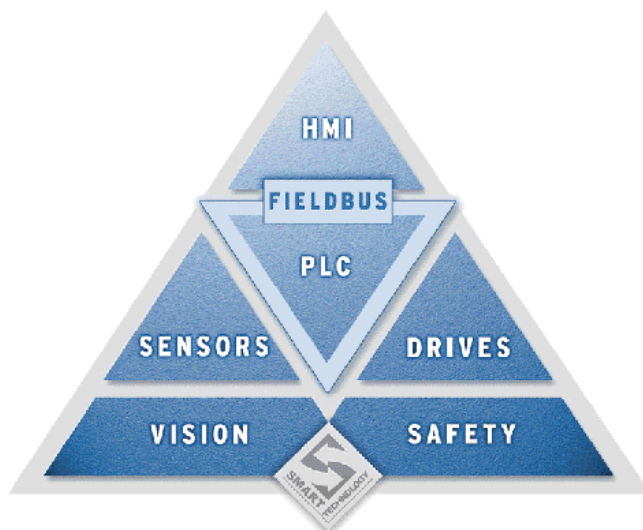




TOTAL SAFETY SOLUTIONS

Guide to safety sensor applications.

Collection of wiring diagrams
















Introduction

OMRON is able to offer a wide variety of safety solutions.
Safety light curtains and single beam PES cover the requirements of electro-sensitive protective equipment according EN 61496-1 and 2.

In combination with the safety control units G9Sx and F3SP there is a big number of possible solutions.

To clarify the required cables and to have quick access for the wiring diagram, this collection offers you the common information.

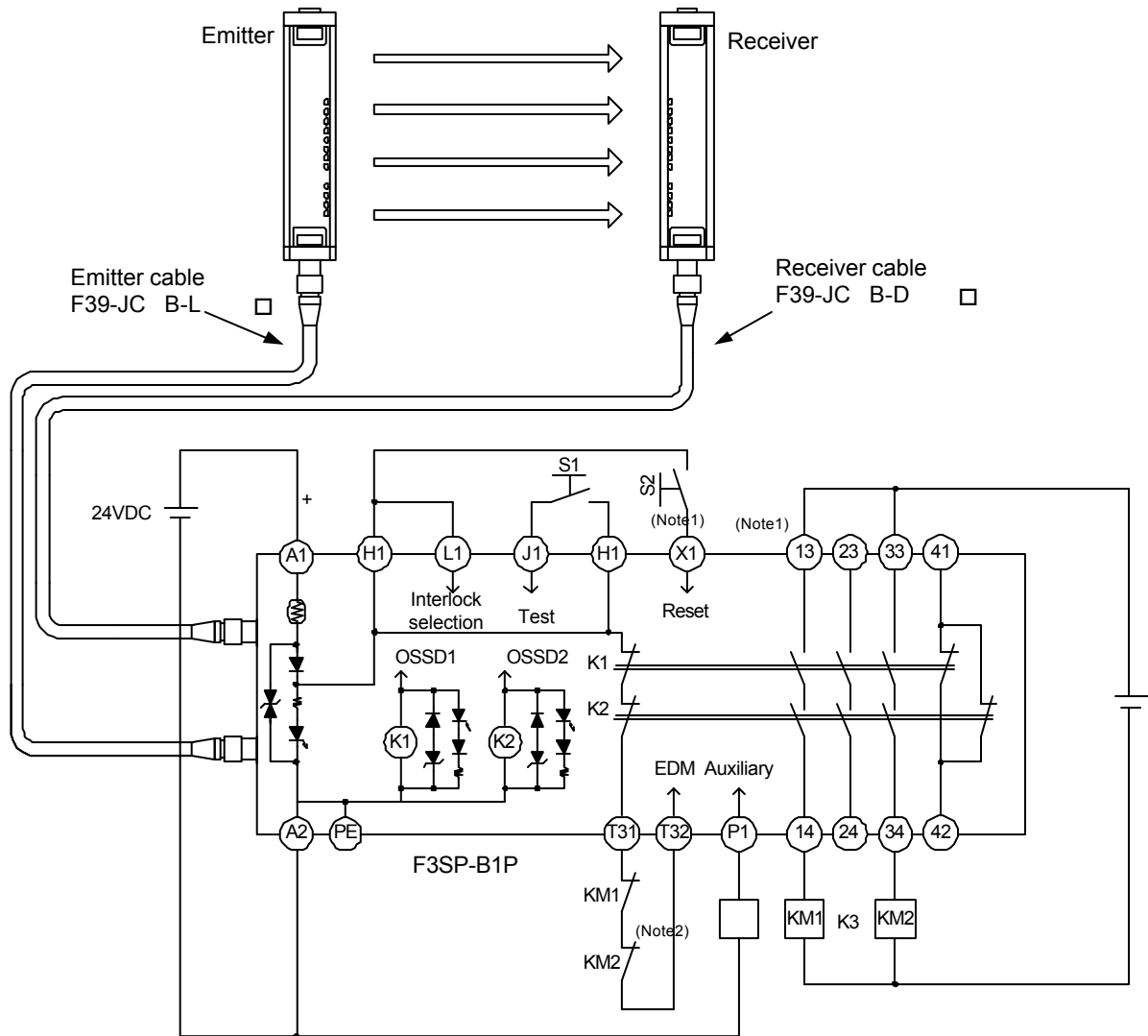
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Safety Sensor		Controller							
Type EN 61496	Model	 G9SA-301 G9SA-321T G9SA-501	 G9SB-200-B/D G9SB-301-B/D	 F3SP-B1P	 F3SP-U2P-TGR	 F3SP-U1P-TGR	 G9SA-300-SC	 CQM1-SF200 CS1W-SF200	 G9S-301 G9S-321T G9SA-501
4	 F3SN	● F39-JC_A	● F39-JC_A	■ F39-JC_B	● F39-JC_A	⊗	○ F39-JC_C	● F39-JC_A	● F39-JC_A
	 F3SH	● F39-JC_A	● F39-JC_A	■ F39-JC_B	● F39-JC_A	⊗	○ F39-JC_C	● F39-JC_A	● F39-JC_A
	 F3S-A_P	● F39-JA_C	● F39-JA_C	⊗	● F39-JA_C	⊗	● F39-JA_D	● F39-JA_C	● F39-JA_C
2	 F3S-B	● F39-JB_A	● F39-JB_A	⊗	● F39-JB_A	⊗	⊗	● F39-JB_A	● F39-JB_A
	 E3F-S	⊗	⊗	⊗	⊗	■ XS2F-D_	⊗	⊗	⊗

●	Can be combined with E-Stop function
■	Possible with dedicated cable
○	Planned
⊗	Not possible

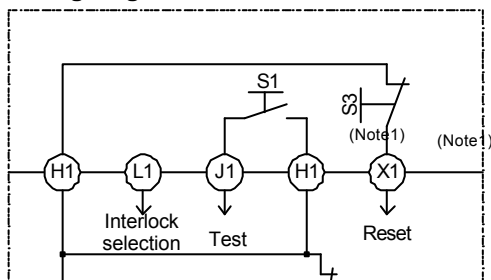
1.1.1 F3SN-A and F3SP-B1P

Wiring diagram with manual reset



S1: External test switch
 S2: Interlock/Lockout reset switch
 KM1, KM2: Relay that control the dangerous zone, etc.
 K3: Load, PLC, etc. (Used for monitoring)

Wiring diagram with auto reset



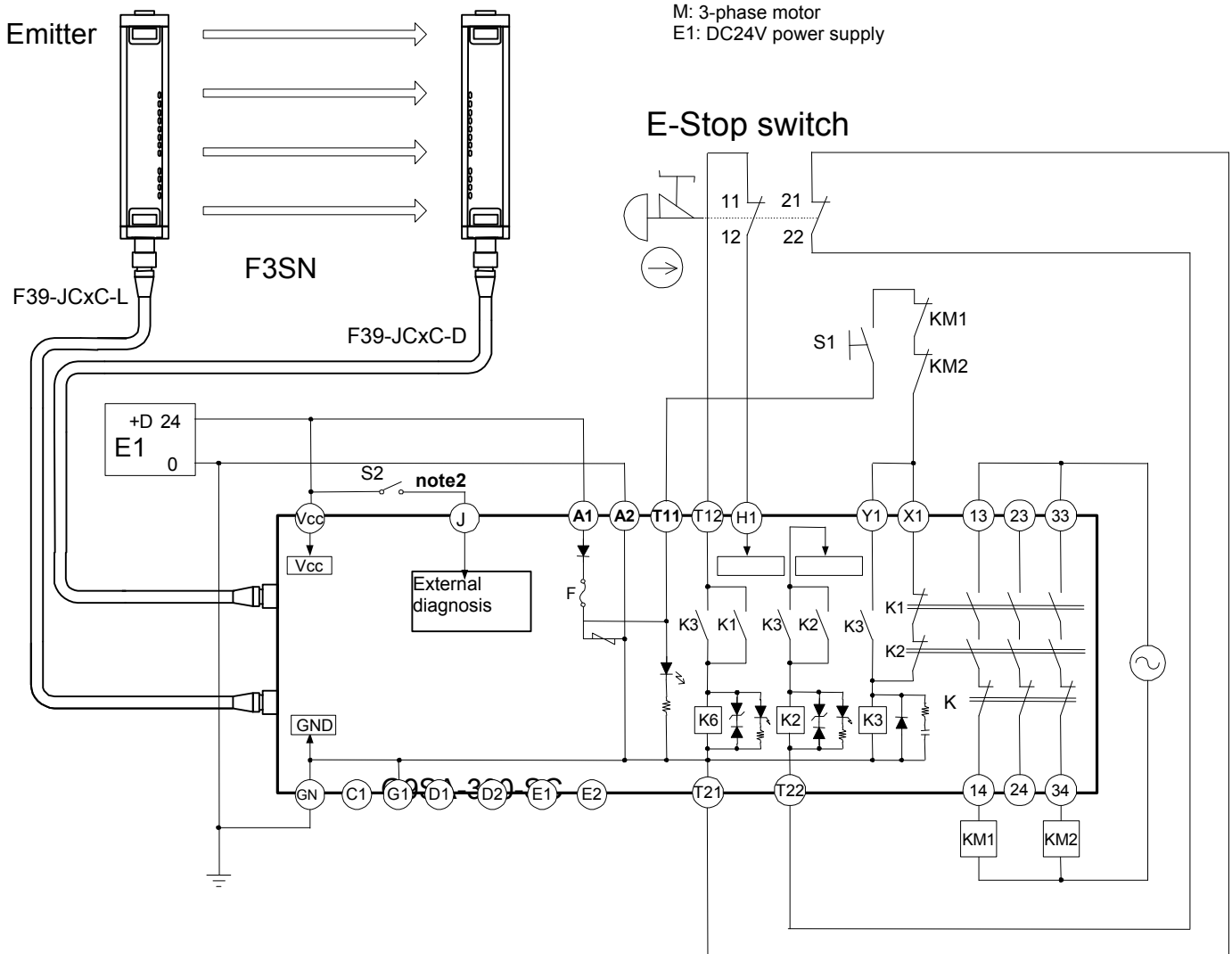
S3: Lockout reset switch
 (If the switch is not necessary, connect between X1 and H1.)

Note1: Use a switch which can apply small load.
Note2: If the EDM is not necessary, short-circuit T31 and T32.

1.1.2 G9SA-300SC and F3SN-A

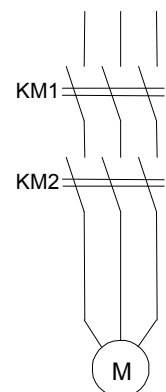
Application with manual reset and E-Stop

S1: Reset Switch
 S2: External Diagnosis switch
 Normal operation is performed when the switch is short-circuited
 KM1, KM2: Contactor
 M: 3-phase motor
 E1: DC24V power supply



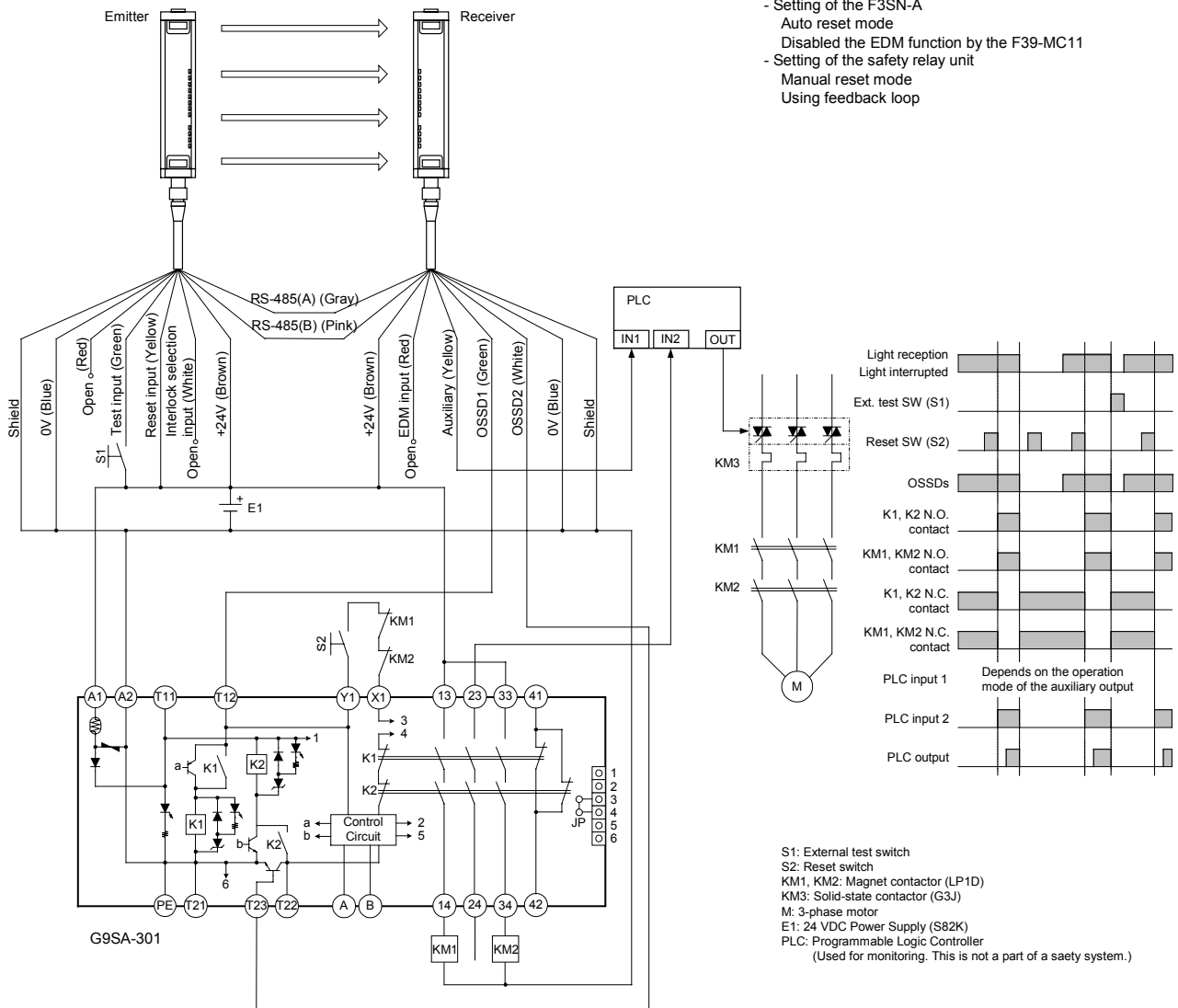
Note

1. External relay monitoring function and auxiliary output are disable.
2. Normal operation is performed when the switch S2 is opened and external diagnosis is performed when it is short-circuited.
3. Don't connect C1. D2. E1. E2 terminal.



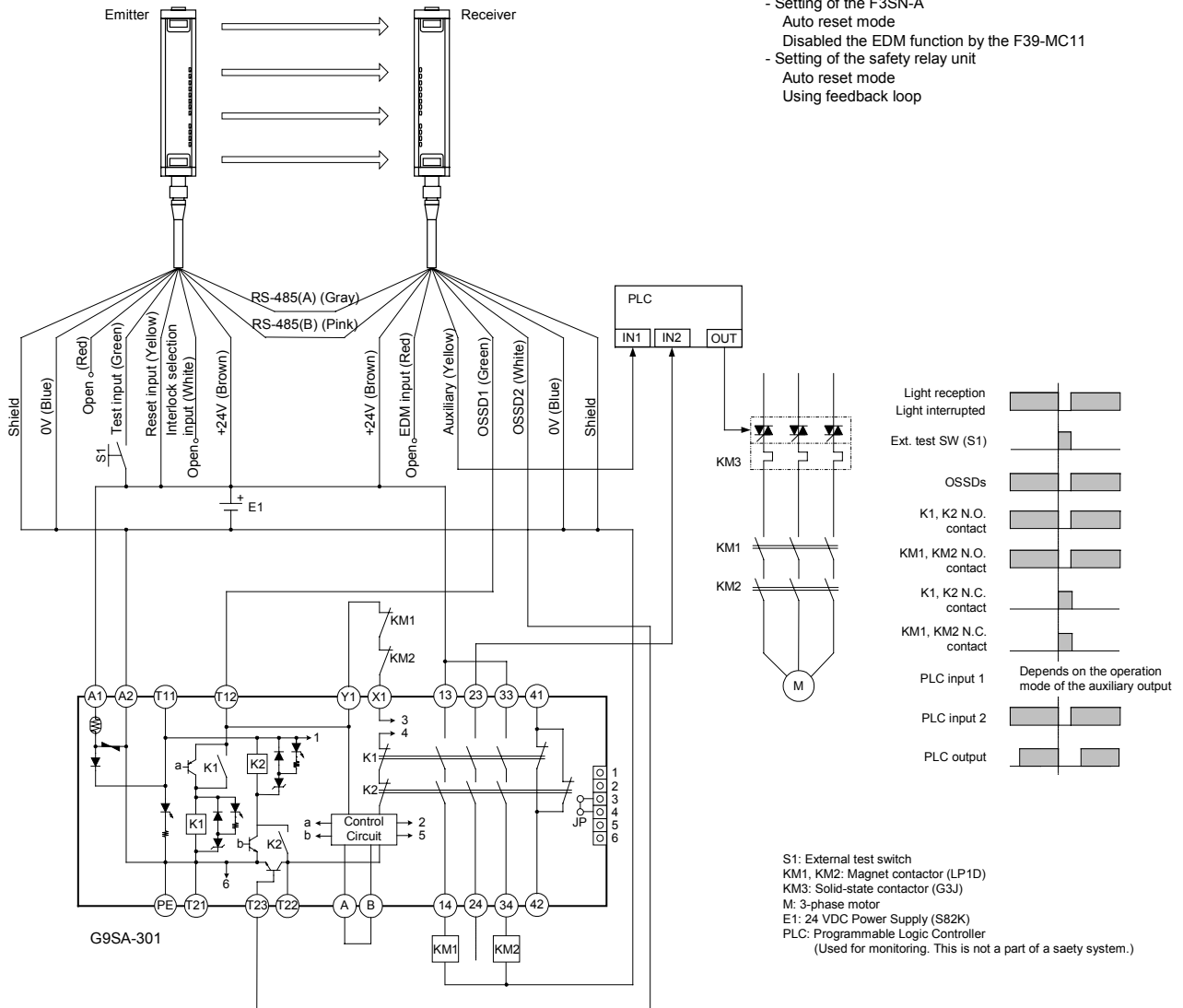
1.1.3 F3SN-A with G9SA-301 (Manual reset mode)

- Combination with the safety relay unit G9SA-301
- Setting of the F3SN-A
 - Auto reset mode
 - Disabled the EDM function by the F39-MC11
- Setting of the safety relay unit
 - Manual reset mode
 - Using feedback loop

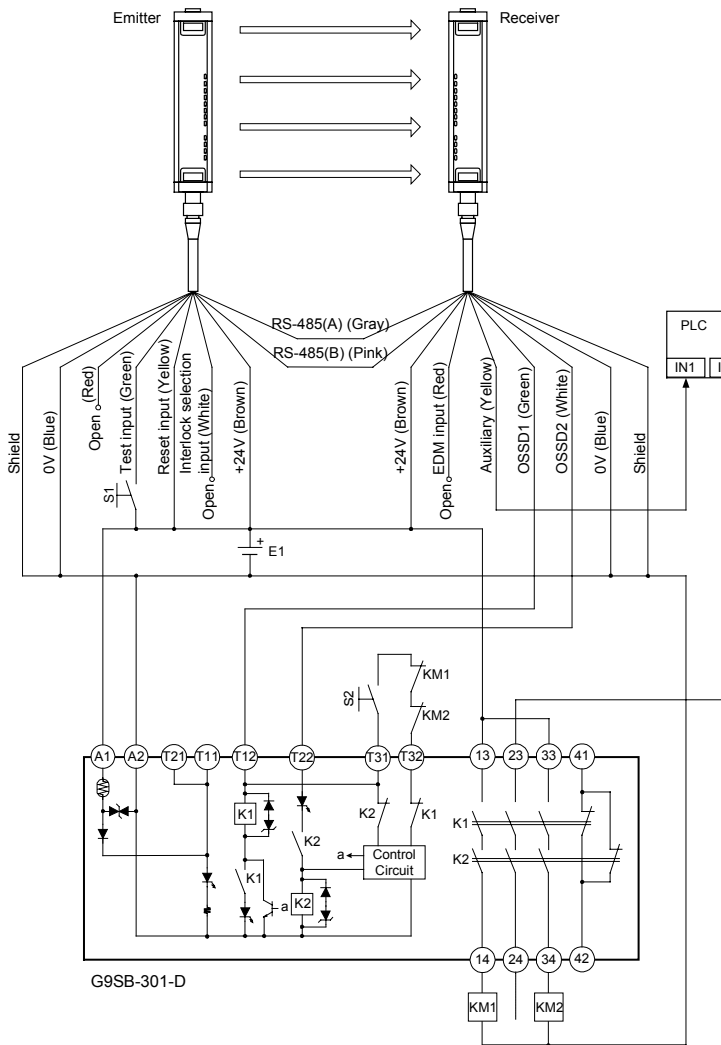


1.1.4 F3SN-A with G9SA-301 (Auto reset mode)

- Combination with the safety relay unit G9SA-301
- Setting of the F3SN-A
 - Auto reset mode
 - Disabled the EDM function by the F39-MC11
- Setting of the safety relay unit
 - Auto reset mode
 - Using feedback loop

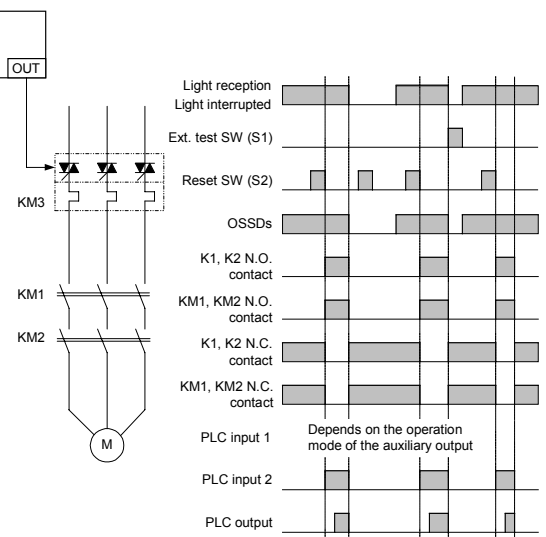


1.1.5 F3SN-A with G9SB-301-D (Manual reset mode)



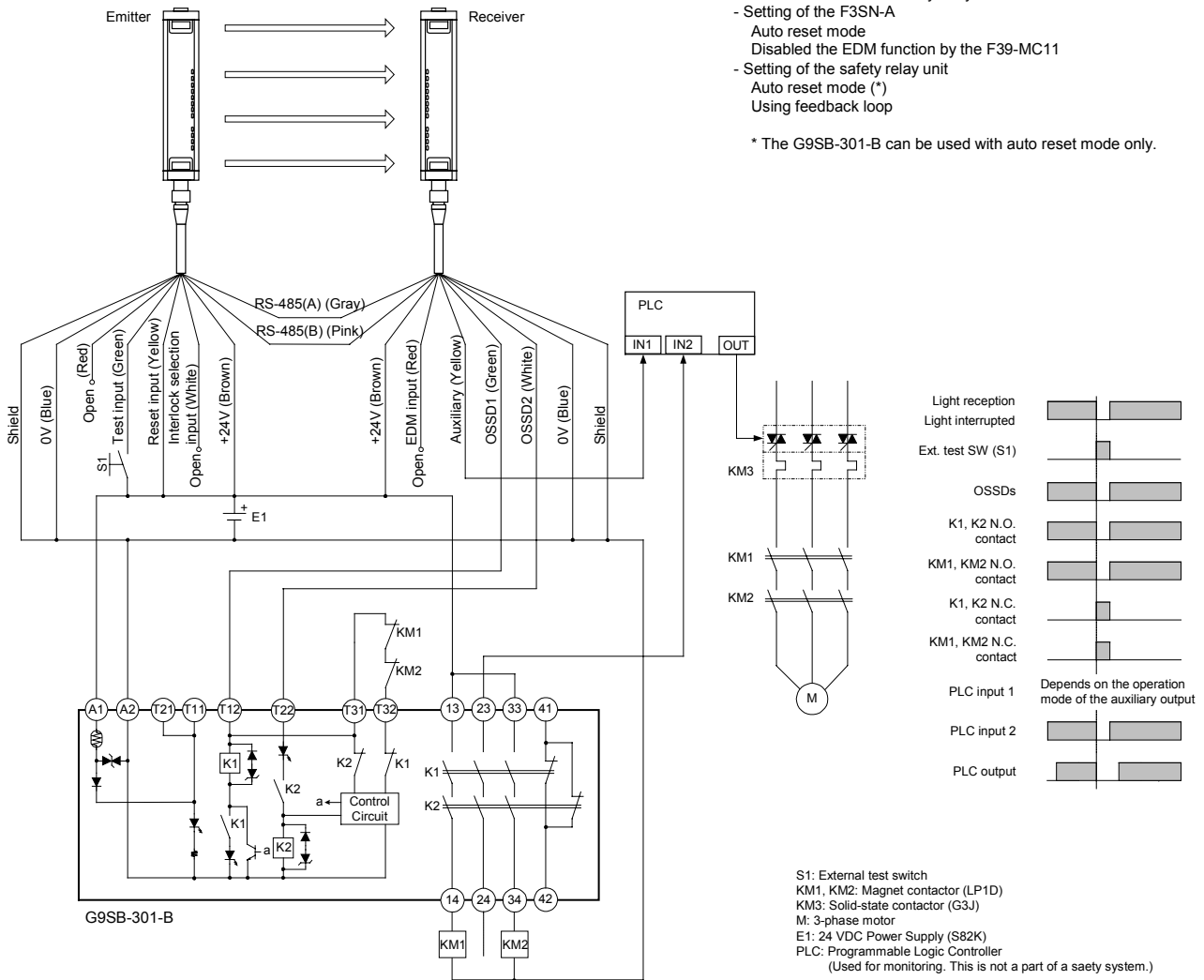
- Combination with the safety relay unit G9SB-301-D
- Setting of the F3SN-A
 - Auto reset mode
 - Disabled the EDM function by the F39-MC11
- Setting of the safety relay unit
 - Manual reset mode (*)
 - Using feedback loop

* The G9SB-301-D can be used with manual reset mode only.



- S1: External test switch
- S2: Reset switch
- KM1, KM2: Magnet contactor (LP1D)
- KM3: Solid-state contactor (G3J)
- M: 3-phase motor
- E1: 24 VDC Power Supply (S82K)
- PLC: Programmable Logic Controller
(Used for monitoring. This is not a part of a safety system.)

1.1.6 F3SN-A with G9SB-301-B (Auto reset mode)

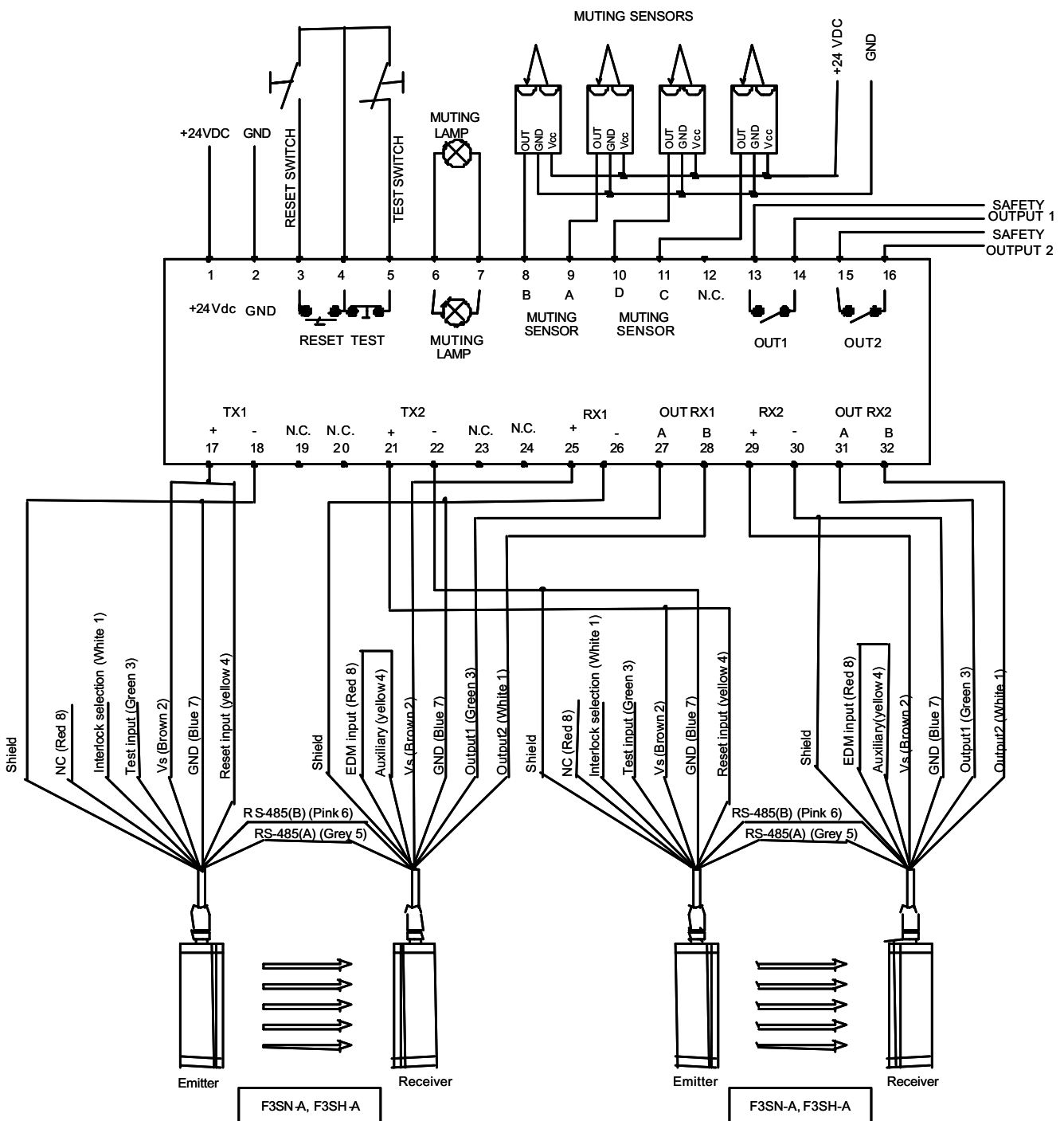


1.1.7 F3SN-A and F3SP-U2P-TGR, Muting application

Connection of two F3SN-A light curtains or two F3SH-A multi-beam sensors to the control unit F3SP-U2P-TGR with four muting sensors.

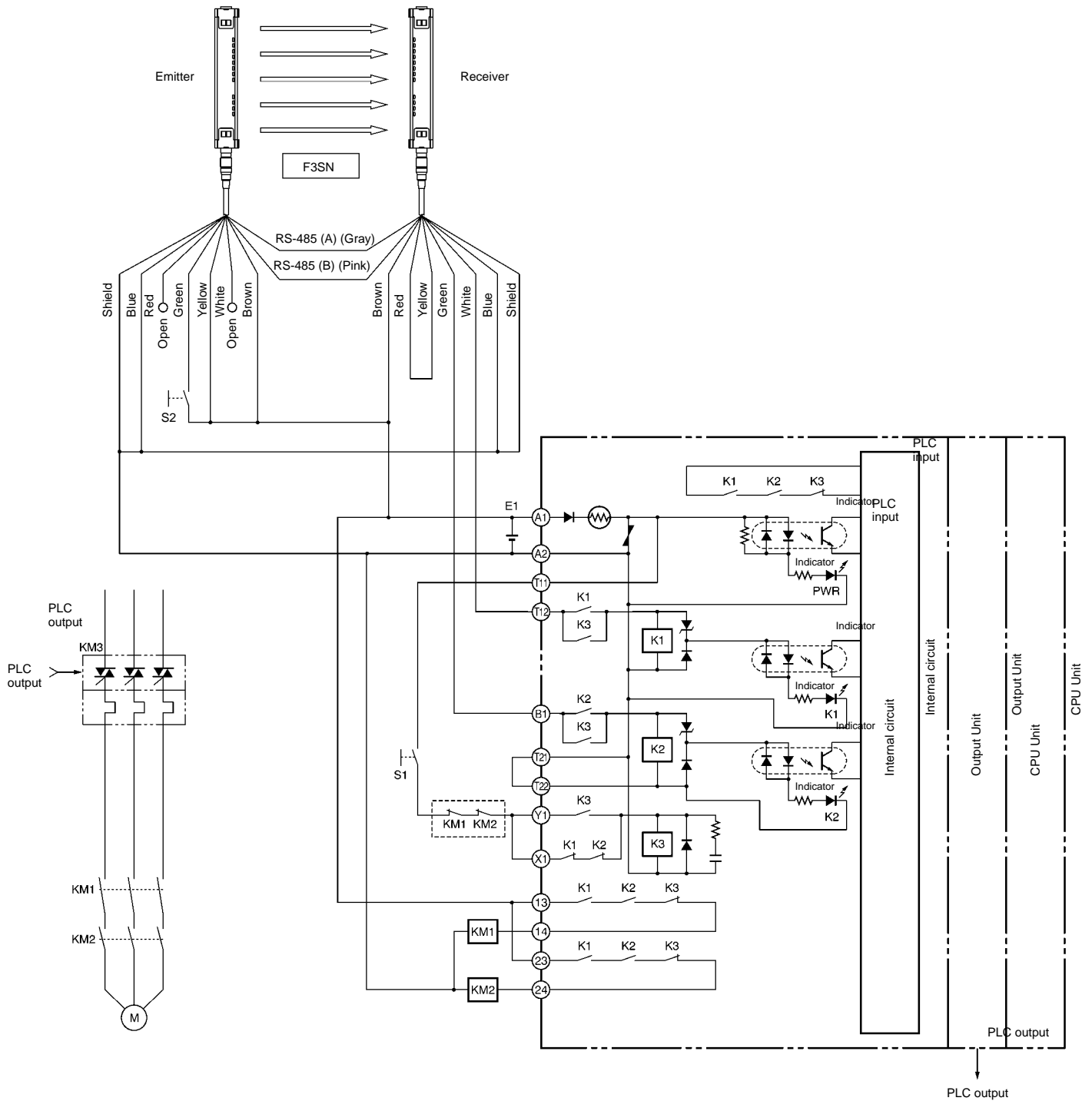
F3SN-A, F3SH-A function mode

- Automatic reset
- No external device monitoring
- No lockout reset



1.1.8 F3SN-A and CQM-1-SF200 or CS1W-SF200

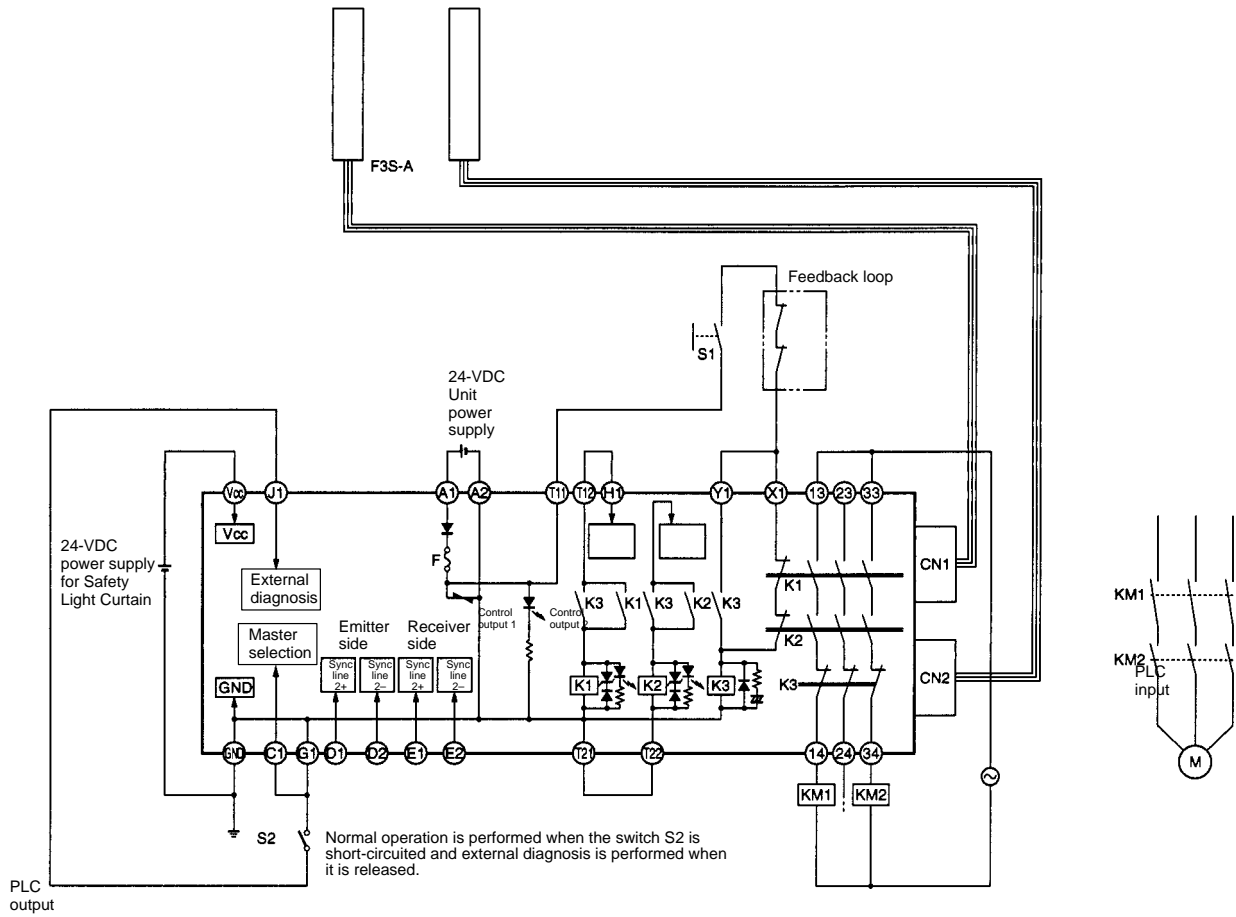
Wiring example with manual reset



- F3SN: Safety area sensor
- S1: Reset switch
- S2: External test switch
- KM1 and KM2: Magnetic Contactor
- KM3: G3J Solid-state Contactor (G3J)
- M: 3-phase motor
- E1: 24-VDC Power Supply (S82K)

Note: This circuit achieves EN954-1 Safety Category 4.

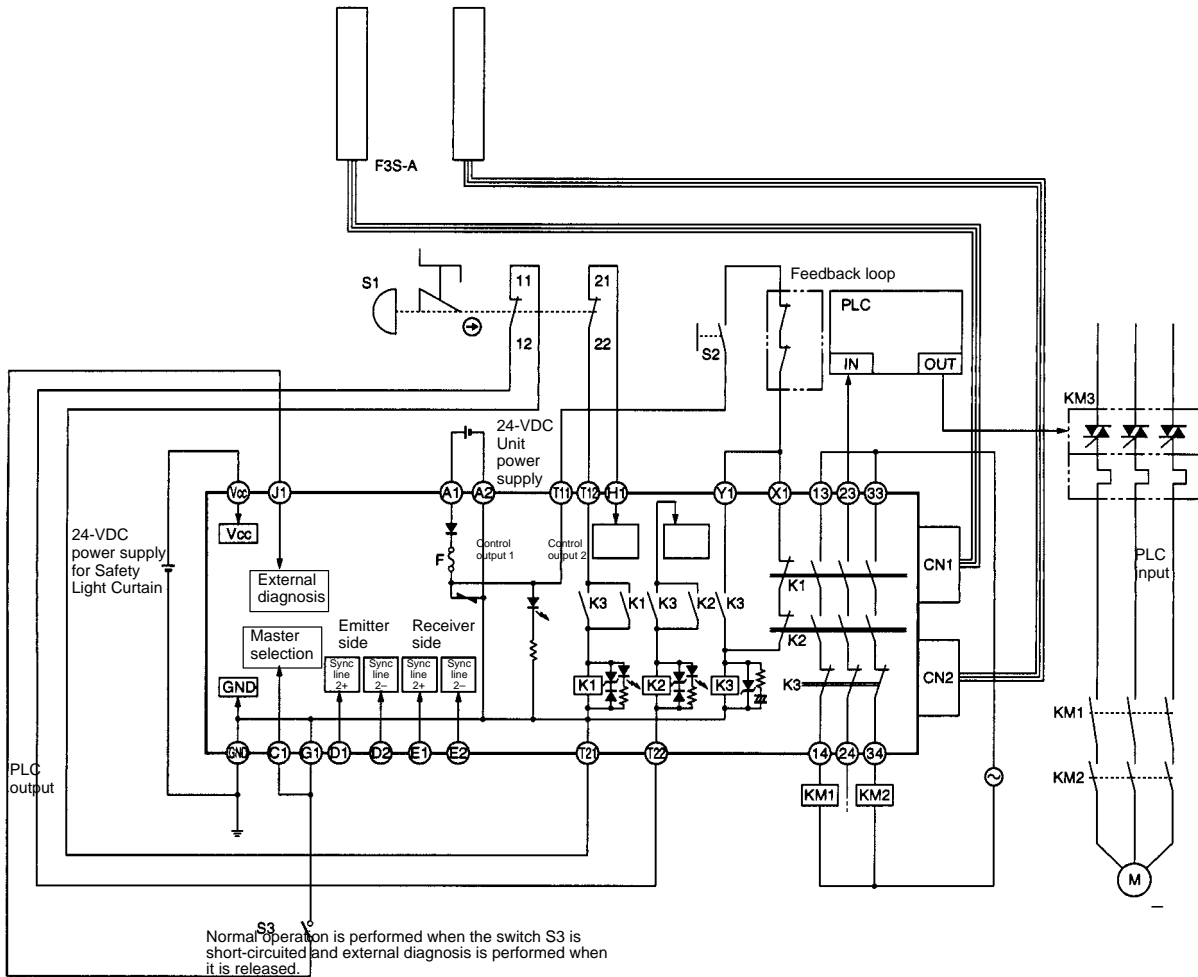
1.2.1.1 G9SA-300-SC and F3S-A



- F3S-A: Safety Light Curtain
- S1: Reset switch (momentary action switch)
- KM1 and KM2: Magnetic Contactor
- M: 3-phase motor

1.2.1.2 G9SA-300-SC and F3S-A

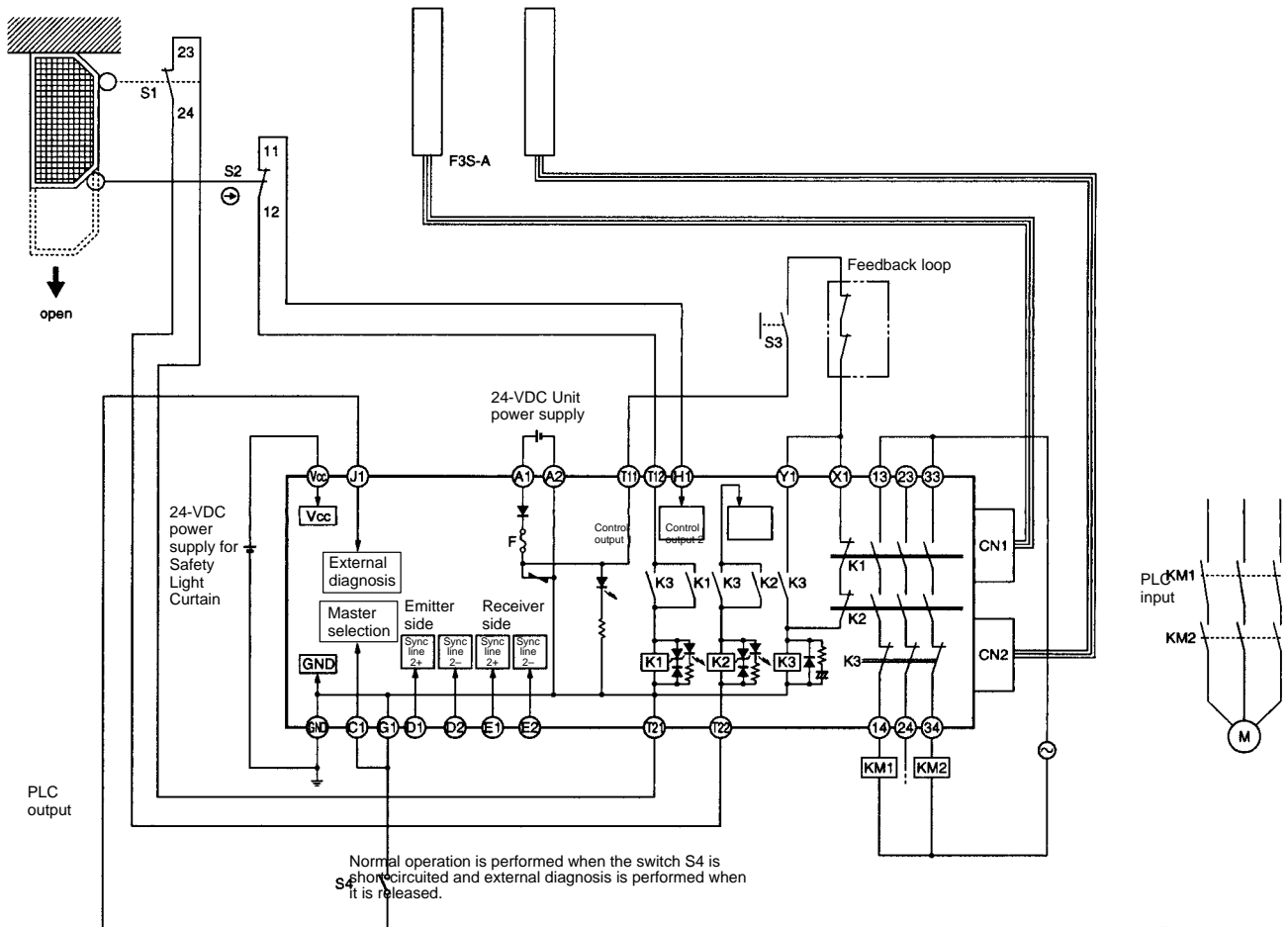
Wiring diagram with F3S-A light curtain and E-Stop switch



- F3S-A: Safety Light Curtain
- S1: Emergency stop switch ⊖
- S2: Reset switch (momentary operation switch)
- S3: External diagnosis switch (for Safety Light Curtain)
- KM1 and KM2: Magnetic Contactor
- KM3: G3J Solid-state Contactor
- M: 3-phase motor

1.2.1.3 G9SA-300-SC and F3S-A

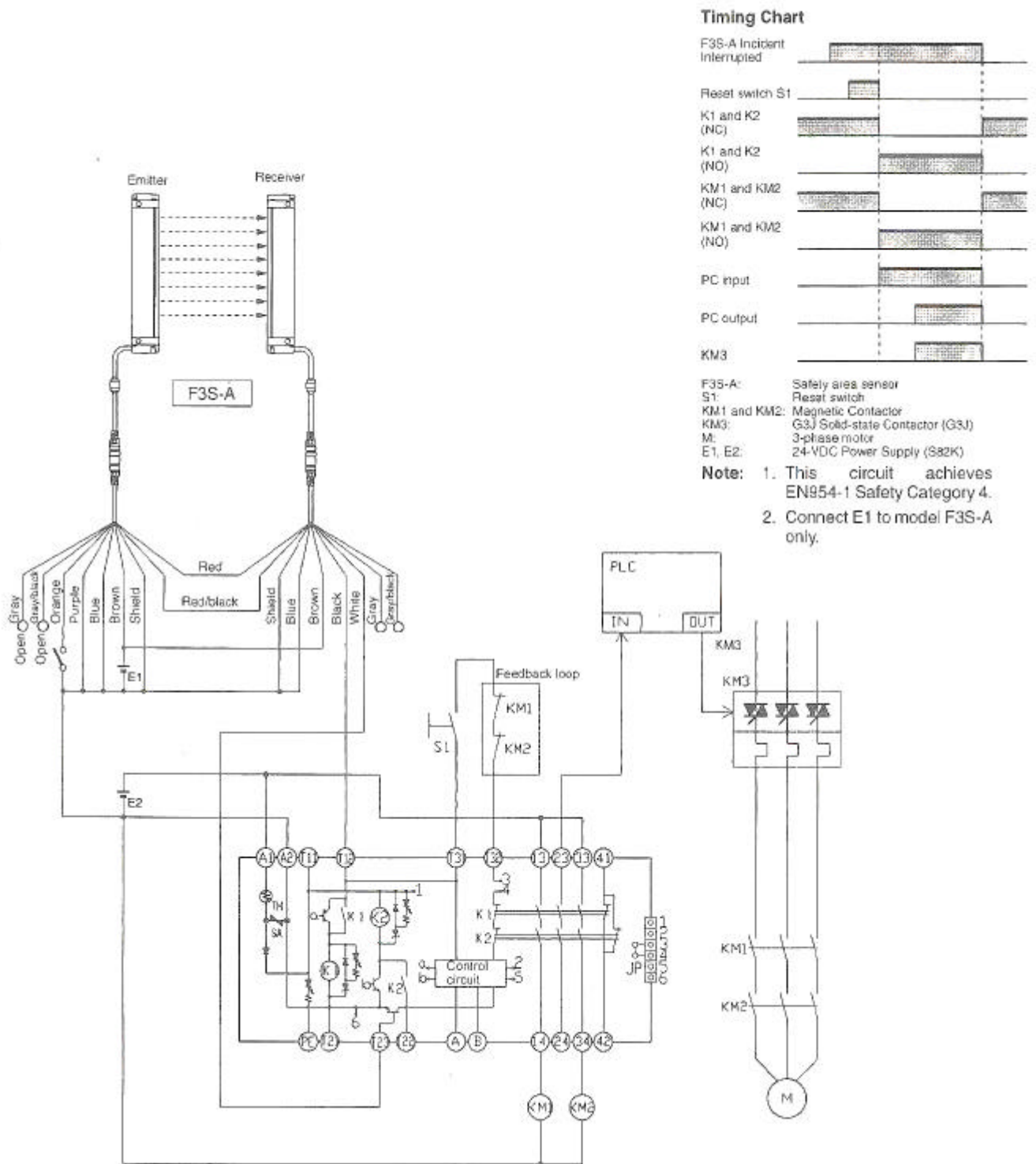
Wiring diagram with F3S-A light curtain and door monitoring



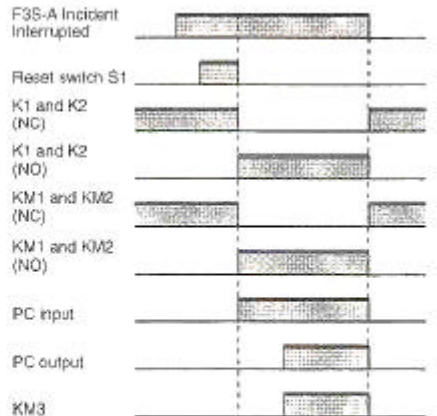
- F3S-A: Safety Light Curtain
- S1: Limit switch
- S2: Safety Limit Switch with positive opening mechanism (D4D or D4B) ⊕
- S3: Reset switch (momentary operation switch)
- S4: External diagnosis switch (for Safety Light Curtain)
- KM1 and KM2: Magnetic Contactor
- M: 3-phase motor

1.2.2 G9SA and F3S-A

G9SA-301 (24 VAC/VDC) with 2-channel Safety Area Sensor/Manual-reset



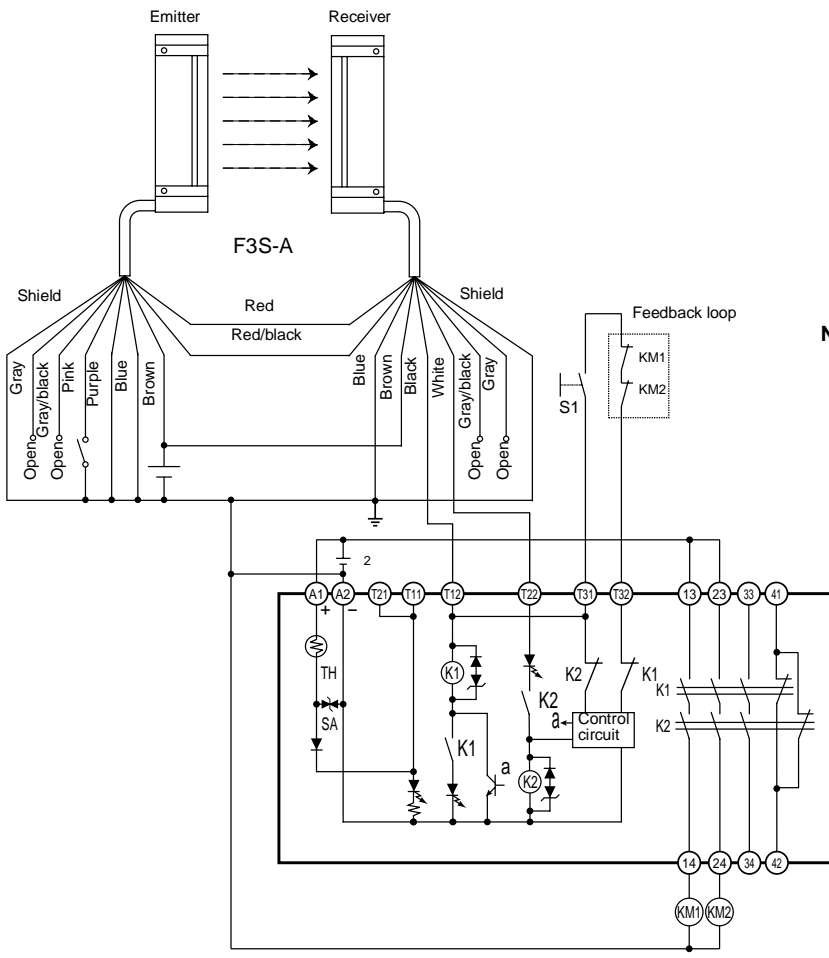
Timing Chart



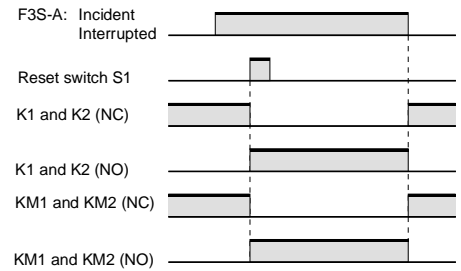
- F3S-A: Safety area sensor
- S1: Reset switch
- KM1 and KM2: Magnetic Contactor
- KM3: G3J Solid-state Contactor (G3J)
- M: 3-phase motor
- E1, E2: 24-VDC Power Supply (S82K)

- Note:**
1. This circuit achieves EN954-1 Safety Category 4.
 2. Connect E1 to model F3S-A only.

1.2.3 G9SB200 / 301 -D and F3S-A



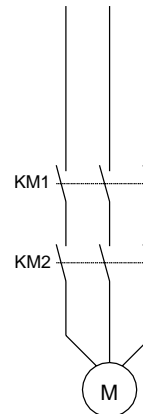
Timing Chart



Note Output turns ON with the rising edge of reset switch S1, but will not operate if there is a short breakdown in S1.

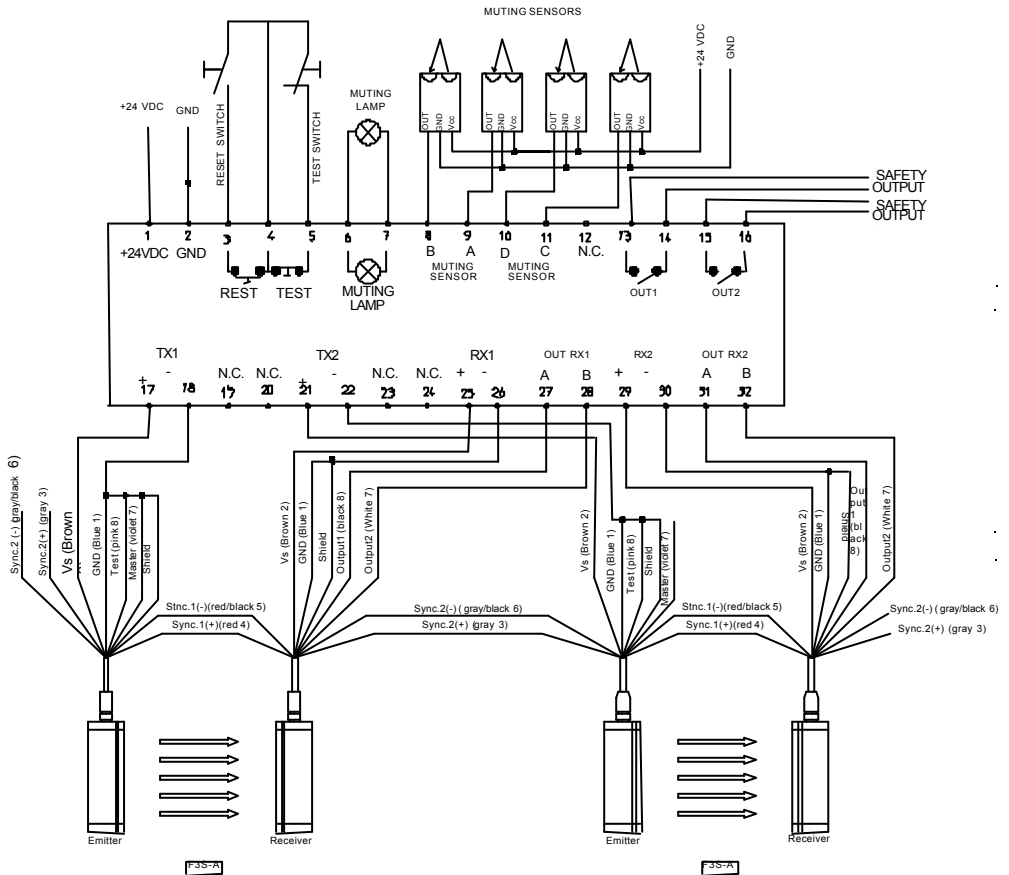
- F3S-A: Safety Area Sensor
- S1: Reset switch
- KM1 and KM2: Magnetic Contactor (LC1D)
- M: 3-phase motor
- E1 and E2: 24-VDC power supply (S82K)

- Note:**
1. Connect E1 to model other than the F3S-A.
 2. Only the G9SB-301-D model has terminals 33-34 and 41-42.



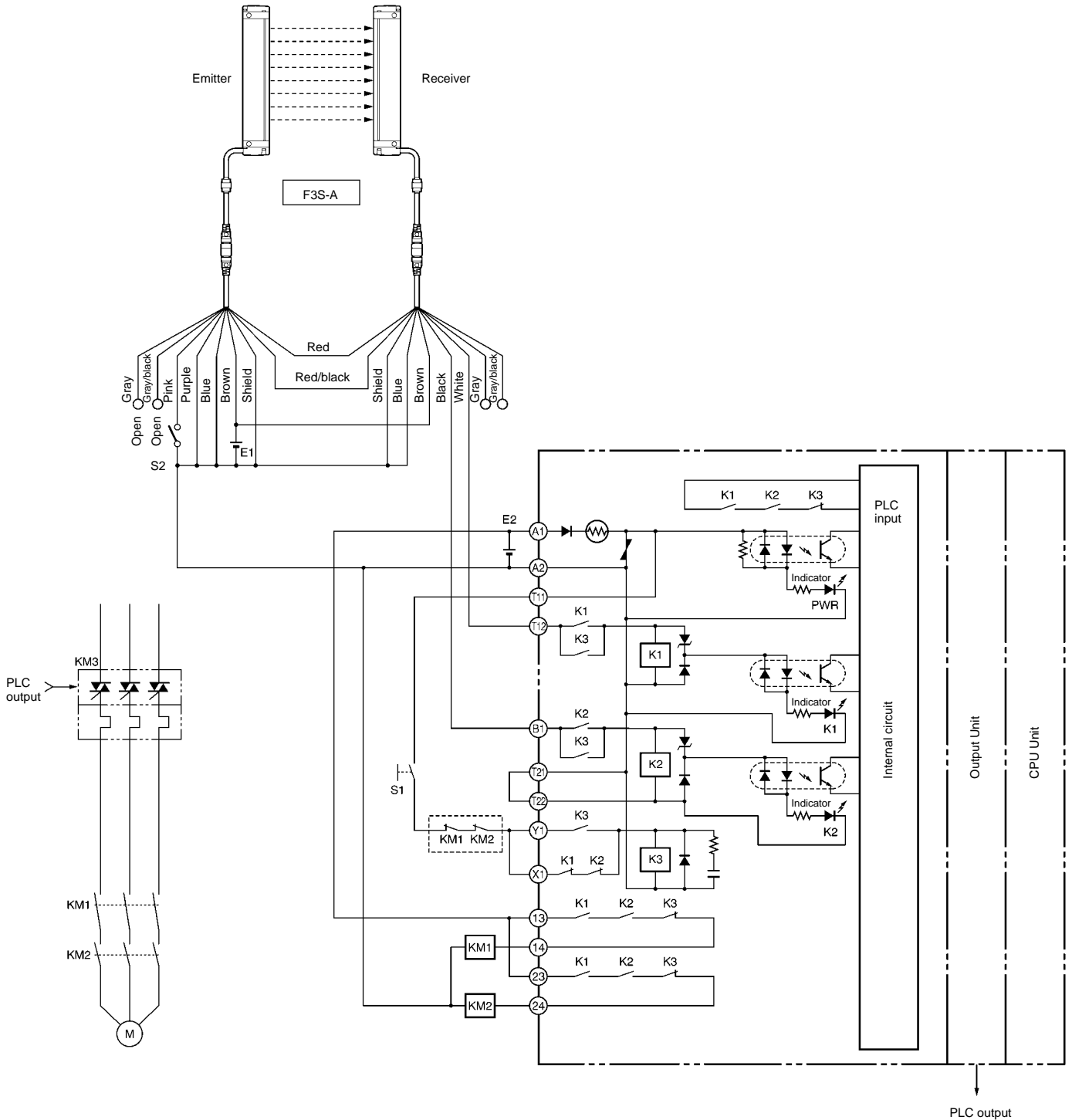
1.2.4 F3S-A and F3SP-U2P-TGR

Wiring diagram with 2 F3-SA.



1.2.5 F3S-A and CQM1-SF200 or CS1W-SF200

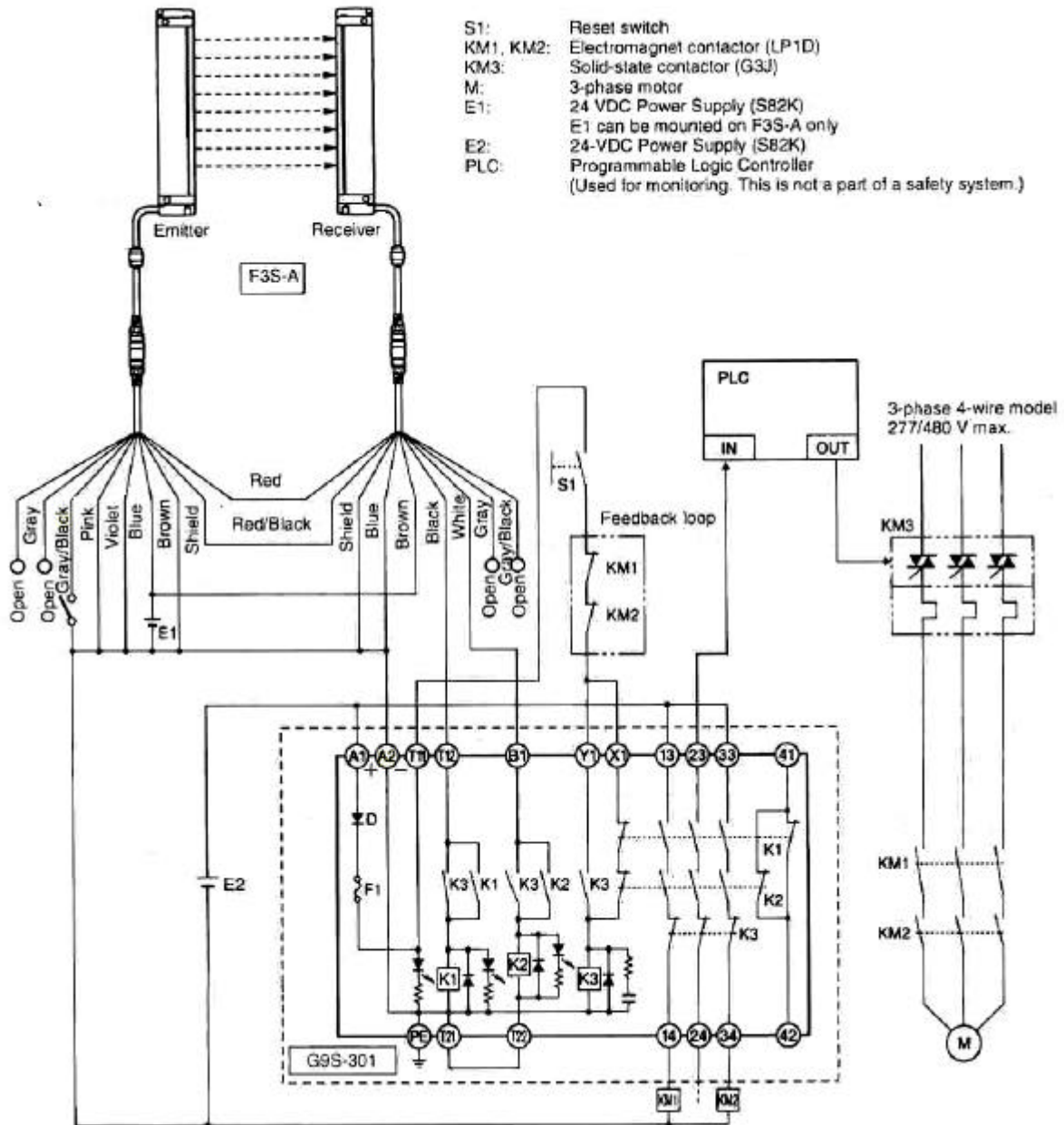
wiring diagram with manual reset



F3S-A: Safety area sensor
 S1: Reset switch
 S2: Test input switch
 KM1 and KM2: Magnetic Contactor
 KM3: G3J Solid-state Contactor (G3J)
 M: 3-phase motor
 E1, E2: 24-VDC Power Supply (S82K)

Note: 1. This circuit achieves EN954-1 Safety Category 4.
 2. Connect E1 to model F3S-A only.

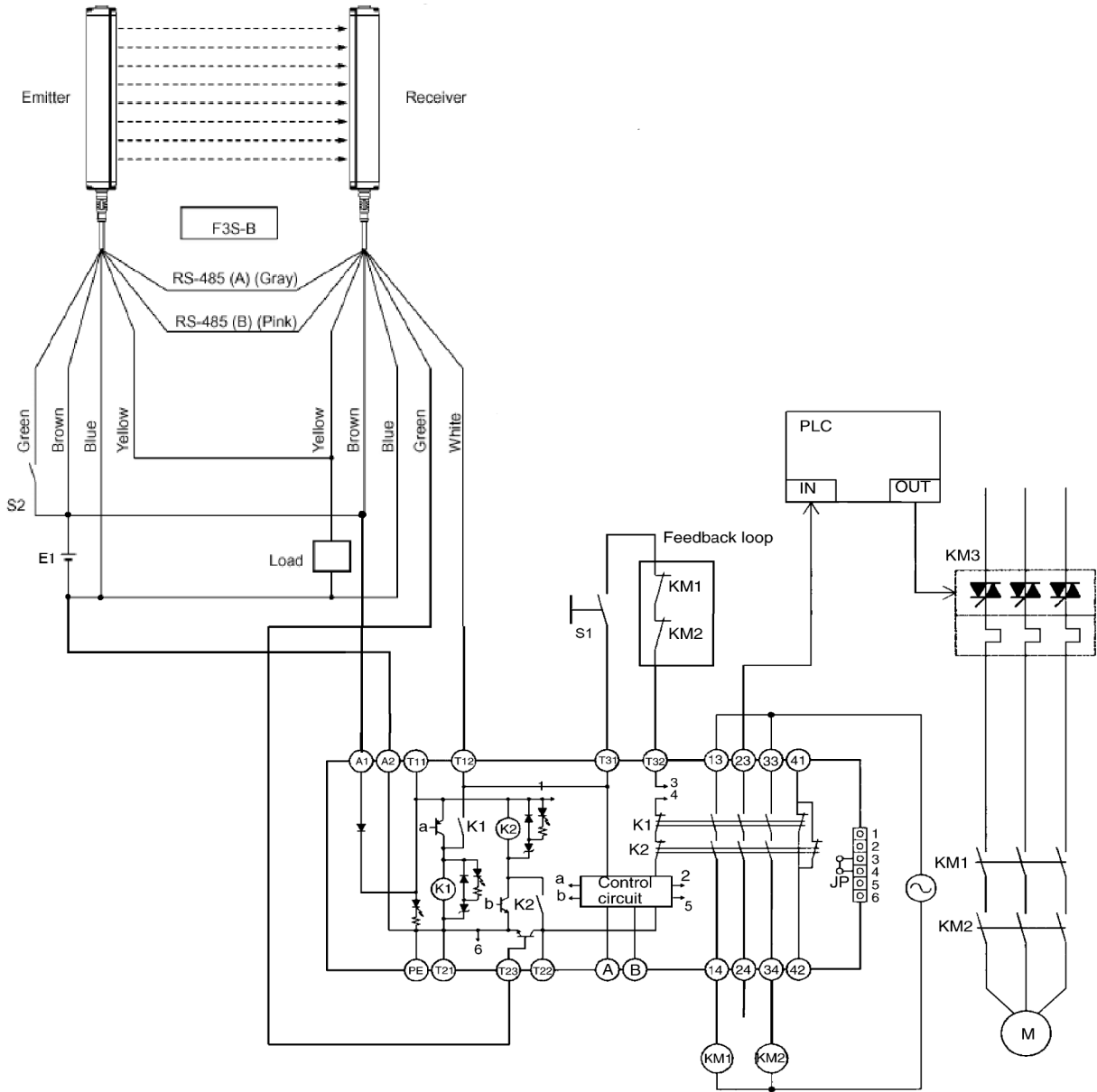
1.2.6 G9S and F3S-A



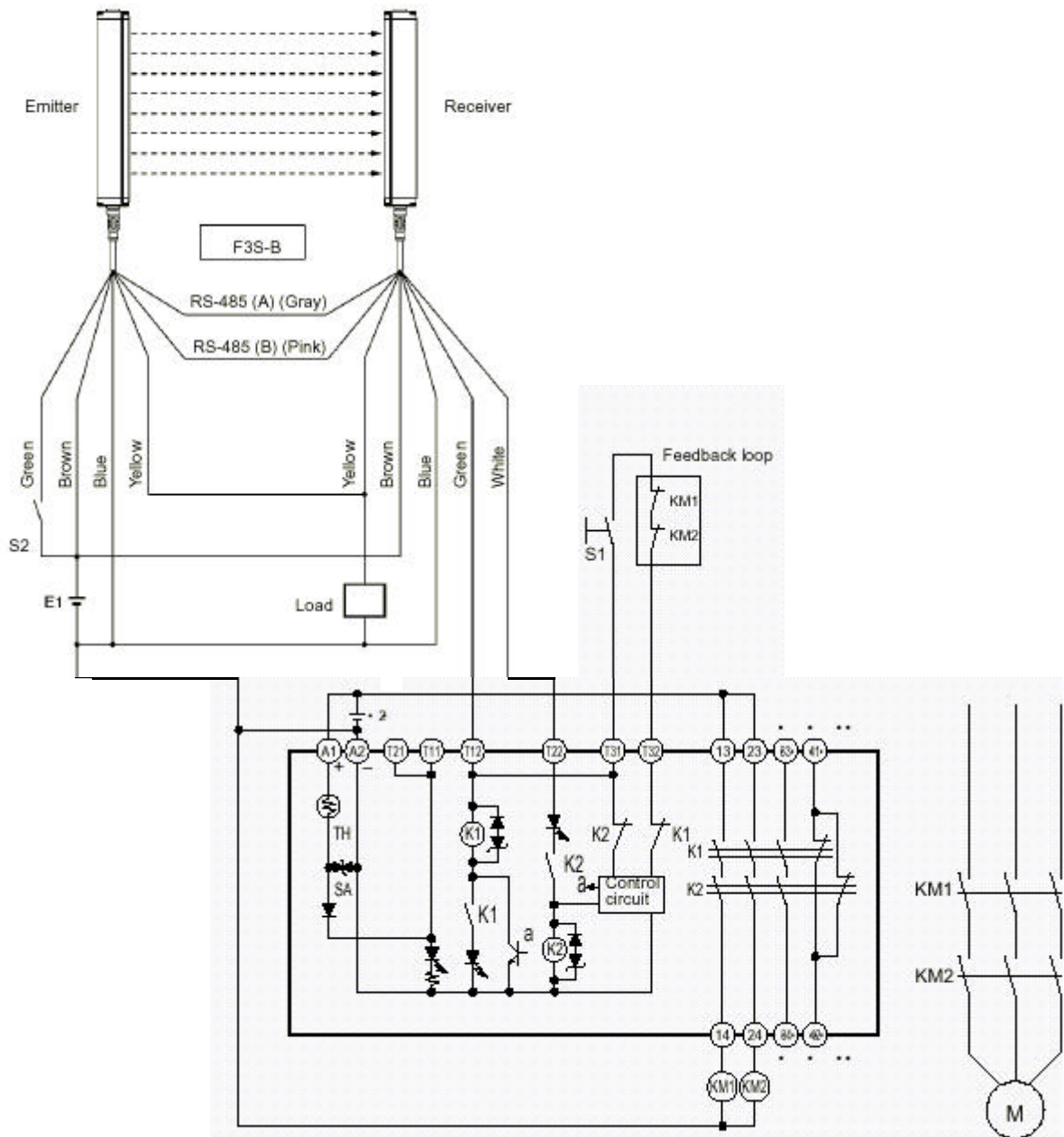
Application Examples

G9SA-301 (24 VAC/VDC) with F3S-B 2-channel Light Curtain Input/Manual-reset

2.1.1 G9SA and F3SB

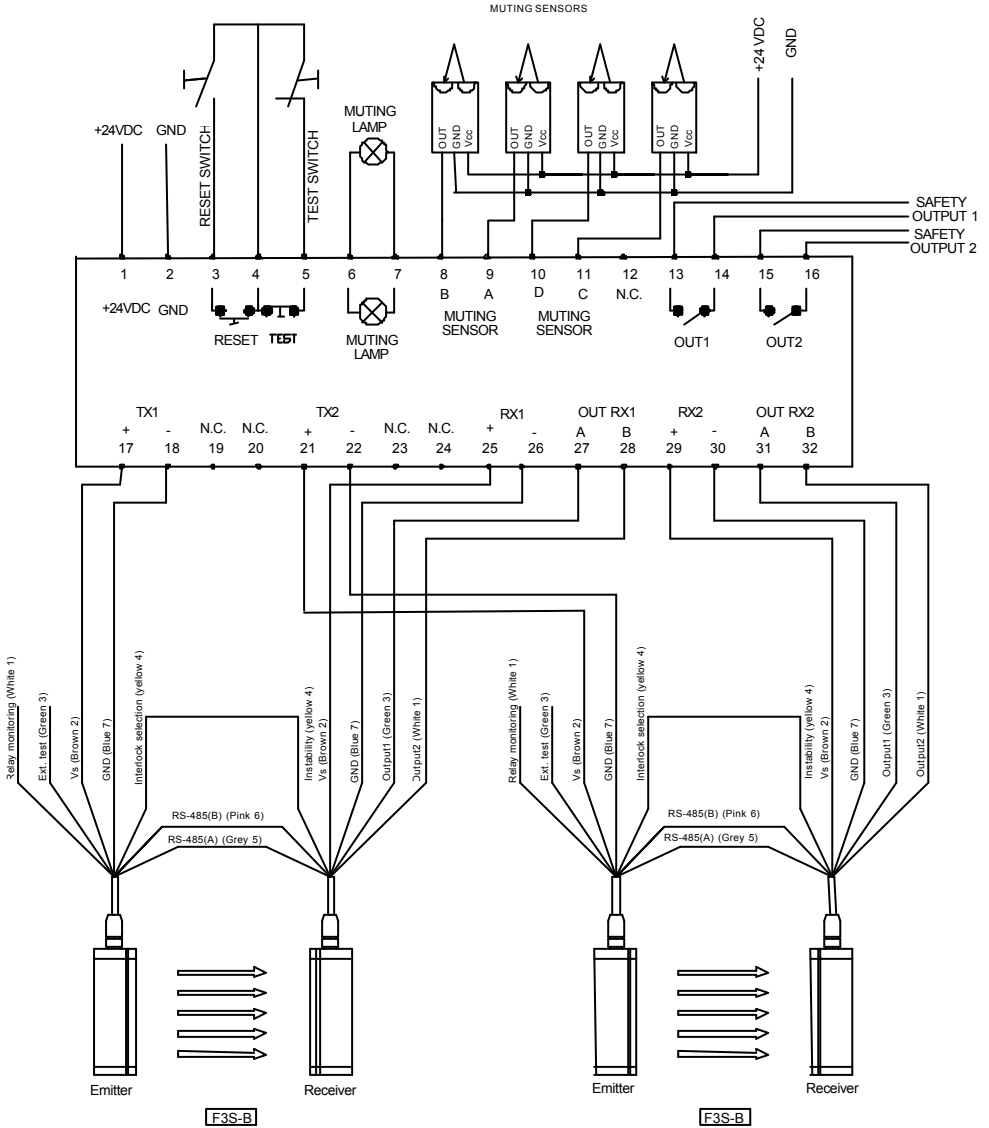


2.1.2 F3S-B and G9SB-200-D or G9SB-301-D



2.1.3 F3S-B and F3SP-U2P-TGR

Wiring diagram with 2 F3S-B.

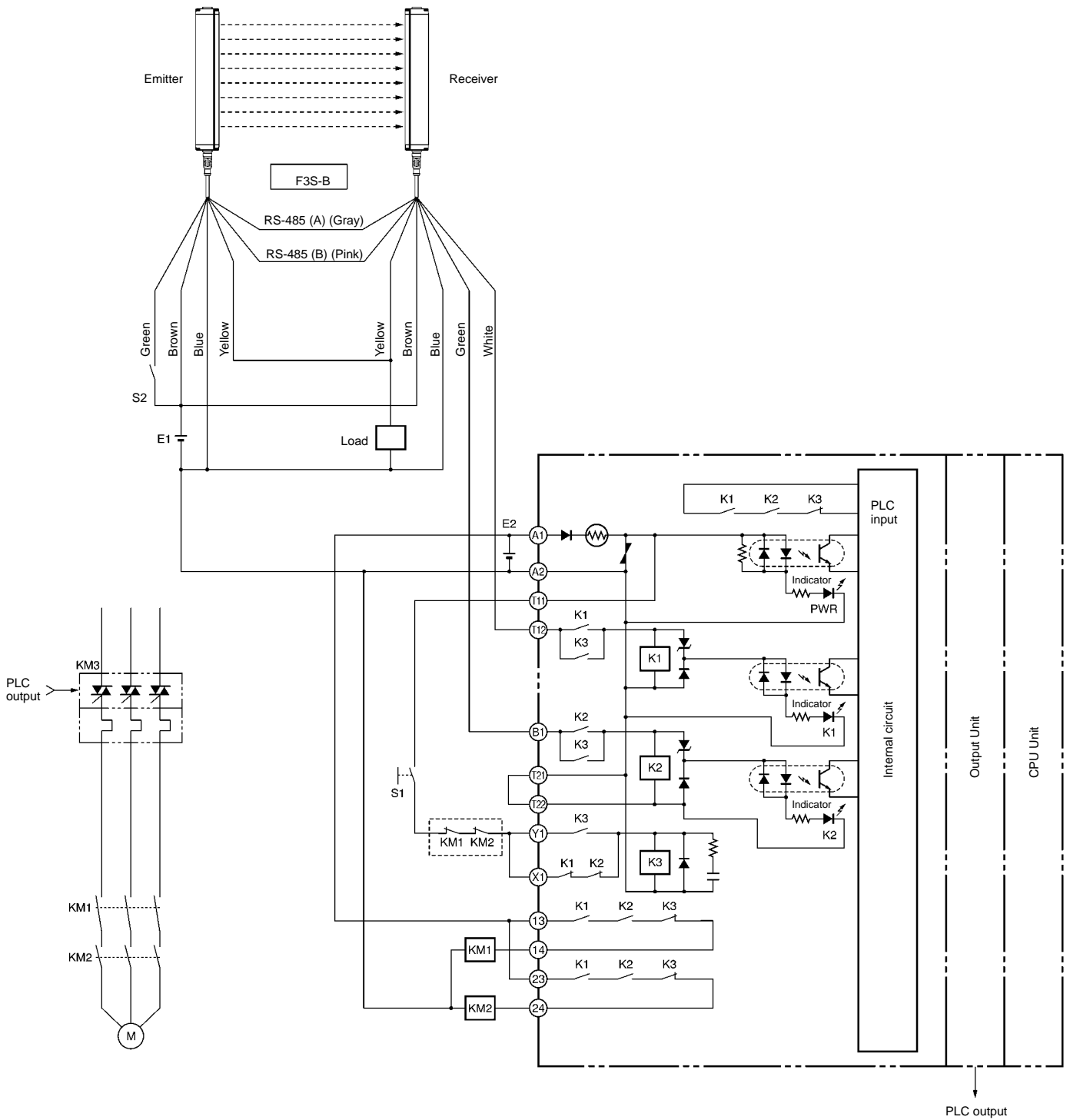


Note

For use with 1 F3S-B safety light curtain connect terminal 29 to 31 and 32 .

2.1.4 F3S-B and CQM1-SF200 or CS1W-SF200

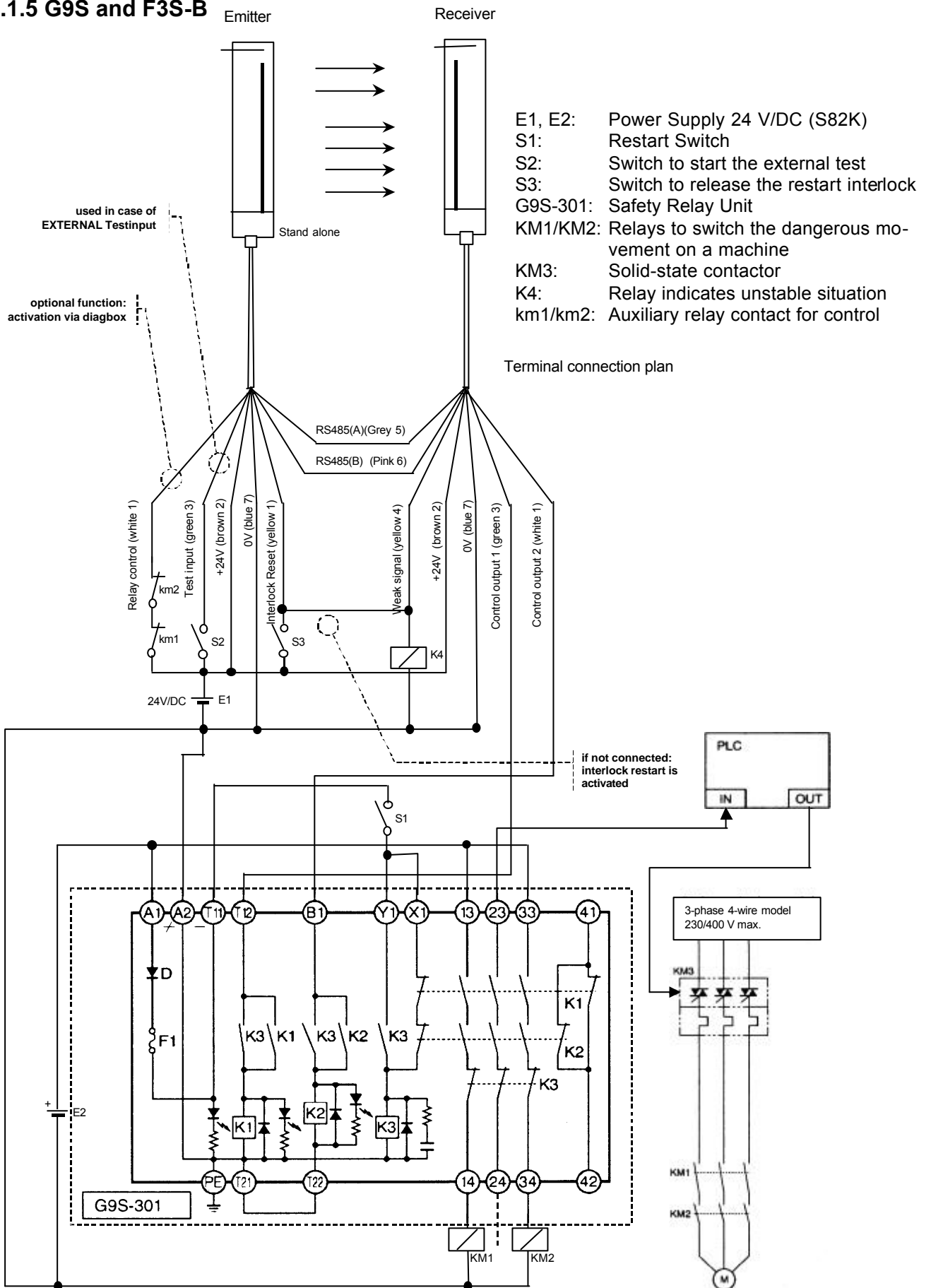
Wiring diagram with manual reset



F3S-B: Safety area sensor
 S1: Reset switch
 S2: Test input switch
 KM1 and KM2: Magnetic Contactor
 KM3: G3J Solid-state Contactor (G3J)
 M: 3-phase motor
 E1, E2: 24-VDC Power Supply (S82K)

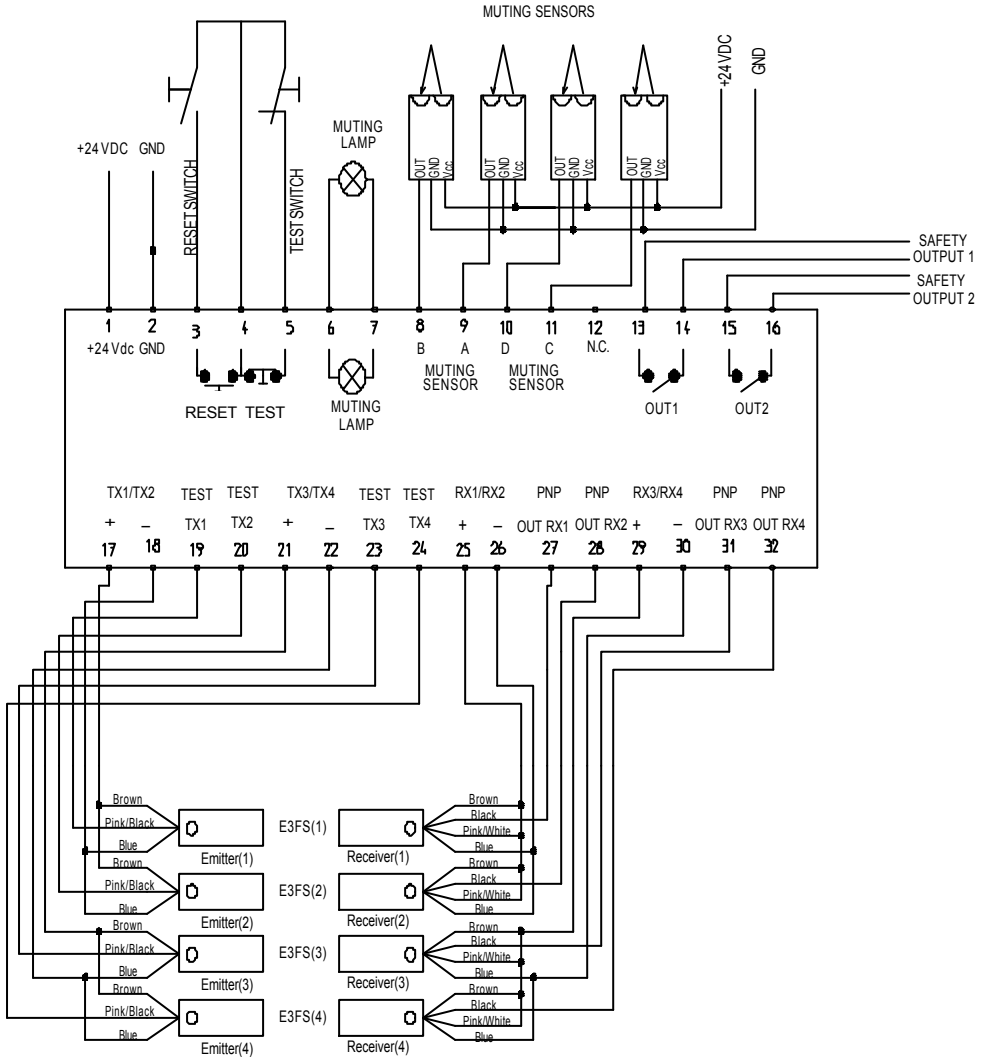
Note: 1. This circuit achieves EN954-1 Safety Category 2.
 2. Connect E1 to model F3S-B only.

2.1.5 G9S and F3S-B



2.2.1 E3FS and F3SP-U1P-TGR type 2 muting application

Wiring diagram with 4 single beam photoelectric switches



Note:

If less than 4 PES should be used these Terminals have to be bridged

No. of unused E3FS	Connection Terminals
1	19 and 27
2	20 and 28
3	23 and 31
4	24 and 32