



Safety Light Curtain Wiring Handbook

27 labeled wiring diagrams for DAIDISIKE safety light curtains and safety relays: 5-core and 7-core color codes, NPN/PNP output wiring, dual-channel OSSD with EDM feedback, safety relay and PLC connection, brand replacement maps, the seven costliest wiring mistakes, and the commissioning trip test.

1. Wire Color Codes
2. Series Wiring Diagrams
3. OSSD, EDM and Output Logic
4. Safety Relay, PLC and Reset
5. Brand Replacement Maps
6. The Seven Costly Wiring Mistakes
7. Mounting Distance and Commissioning
8. Power, Muting and Cascading

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Wire colors per the DAIDISIKE catalogue pages cited on each diagram. Where the factory sheet does not publish a value, the diagram says so — always wire per the drawing shipped with your unit. Free to share with your team. © DAIDISIKE.

1. Wire Color Codes

5-Core Wire Color Code — DQC Standard

M12 5-pin aviation plug, transmitter and receiver

Color	Transmitter (Tx)	Receiver (Rx)	Rule
 Brown	+12–24 VDC	+12–24 VDC	check polarity
 Blue	0 V / GND	0 V / GND	shared 0 V
 Black	CP sync → Rx black	CP sync → Tx black	never floating
 White	—	OSSD safety output	to relay / PLC
 Yel-Grn	shield → PE / 0 V	shield → PE / 0 V	surge protection

Per [fsddsk.com/safety-light-barrier-wiring-diagram](https://www.fsddsk.com/safety-light-barrier-wiring-diagram) (DQC catalogue).

Fig. 1 — wire color code chart 5 core safety light curtain dqc

7-Core Wire Color Code — DQO Series

Two 7-core cables · dual OSSD + CE self-check line

Color	Function	Notes
 Brown	+12–24 VDC	supply
 Blue	0 V	supply return
 Black	CP wired synchronization	Tx ↔ Rx pair
 White	OSSD1 safety output	own fuse + routing
 Green	OSSD2 safety output	own fuse + routing
 Red	CE — self-check / comm. enhance	diagnostics line
 Yel/Gry	shield / ground	single-point earth

Per fsddsk.com/dqo-blind-spot-free-series-safety-light-curtain-wiring-guide.

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Fig. 2 — wire color code chart 7 core safety light curtain dqo

DQE Wire Colors — 6-Core (Single) / 7-Core (Dual Output)

IEC 60757 shorthand: BN brown · BU blue · BK black · WH white

Color	Function	Applies to
 BN	+24 VDC (fuse 5 A gL/gG in supply)	6- and 7-core
 BU	0 V	6- and 7-core
 BK	OSSD channel (see caution)	6- and 7-core
 WH	second OSSD channel (see caution)	7-core only
 other	sync CP/CE · reset · per drawing	remaining cores
 Yel-Grn	shield, single-end ground $\leq 4 \Omega$	both

⚠ Factory pages disagree on which of black/white is OSSD1 vs OSSD2 on DQE — wire per the drawing shipped with your unit and verify channel order at commissioning.

Per [fsddsk.com/safety-light-curtain-npn-pnp-plc-safety-relay](https://www.fsddsk.com/safety-light-curtain-npn-pnp-plc-safety-relay) and [/light-curtain-safety-relay-wiring](https://www.fsddsk.com/light-curtain-safety-relay-wiring).

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Fig. 3 — wire color code chart dqe 6 core 7 core light curtain

DAIDISIKE Series — Cable Cores & Synchronization at a Glance

What you will find in the junction box, series by series

Series	Cable cores	Output	Synchronization
DQA	5-core (std) or 7-core	NPN/PNP 500 mA · J = relay	confirm at order
DQB	Tx 4-core + Rx 5-core	NPN/PNP 500 mA	—
DQC	4 / 5 / 6-core (M12)	NPN/PNP, A/B/C/D logic	optical
DQE	6-core, or 2 × 7-core dual	transistor (cat. shows PNP)	wired (CP)
DQT	5-core or 7-core	single / dual selectable	—
DQT4	9-core	PNP only · dual OSSD + EDM	—
DQO	2 × 7-core	dual OSSD (WH + GN) + CE	wired (CP)
DQR	2 × 5 or 2 × 7 (M12 waterproof)	NPN/PNP, A/B/C/D	—
DQZ	Tx 4-core + Rx 5-core	NPN/PNP 500 mA	—
JER	Tx 3-core + Rx 5-core	NPN or PNP, NO + NC	optical (no sync wire)
MK	3-core or 5-core	NPN/PNP transistor	optical

Compiled from the individual series catalogue pages on fsddsk.com · response ≤ 15 ms where listed · blank = per factory drawing.

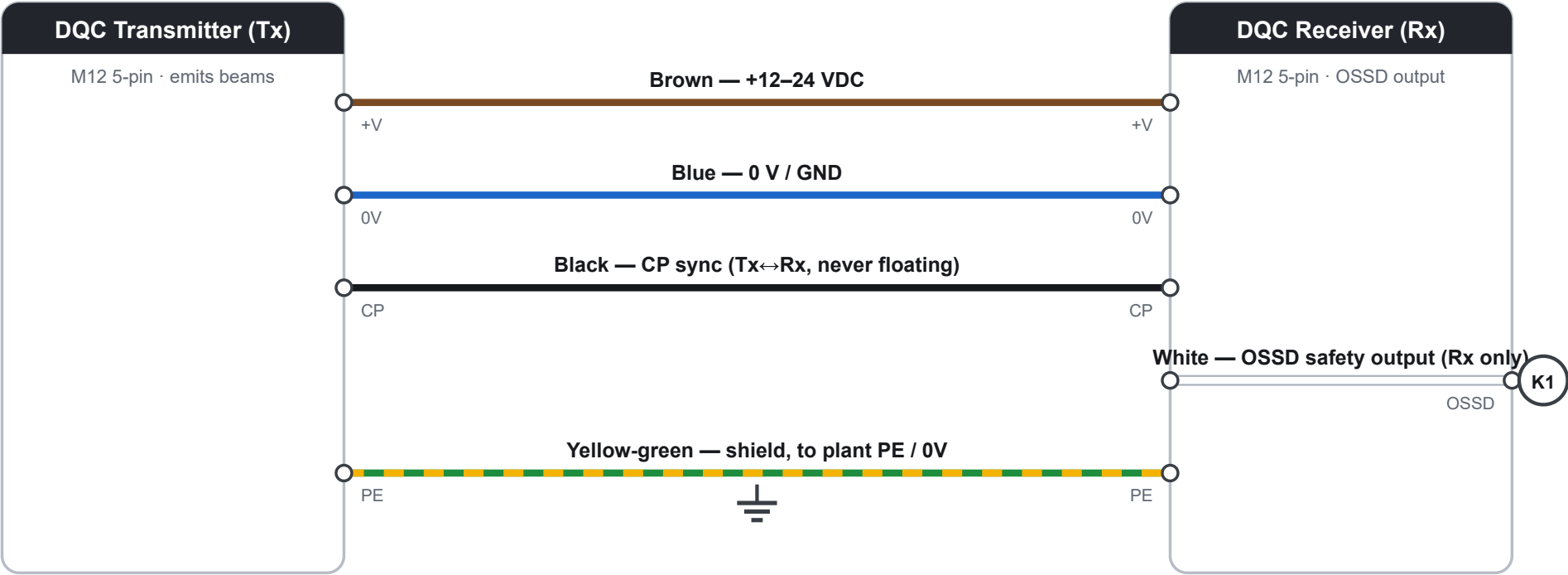
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Fig. 4 — safety light curtain series cable core count reference chart

2. Series Wiring Diagrams

DQC Safety Light Curtain — 5-Core NPN Wiring Diagram

Transmitter + receiver, M12 5-pin aviation connectors · response ≤ 15 ms · DC 12/24 V



Standard NPN single-output hookup. NPN output sinks current: load (K1 relay coil / PLC input) sits between +V and OSSD.

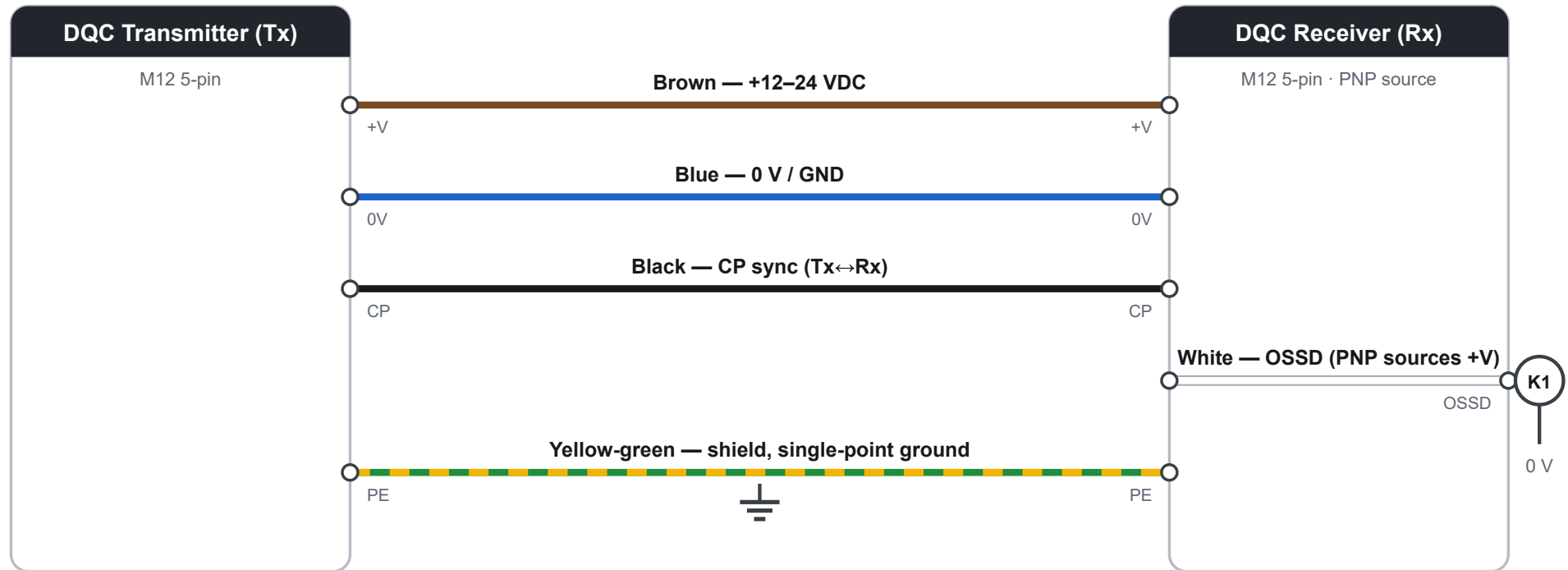
Wire colors per DAIDISIKE DQC catalogue. Output logic A/B/C/D suffix: A = NPN NC, B = PNP NC, C = NPN NO, D = PNP NO.

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Fig. 5 — dqc safety light curtain 5 core npn wiring diagram

DQC Safety Light Curtain — 5-Core PNP Wiring Diagram

Same 5-core cable, load position moves to the 0 V side · response ≤ 15 ms



PNP variant: output sources current from +V, so the load connects between OSSD and 0 V. Never mix PNP and NPN commons on one input block.

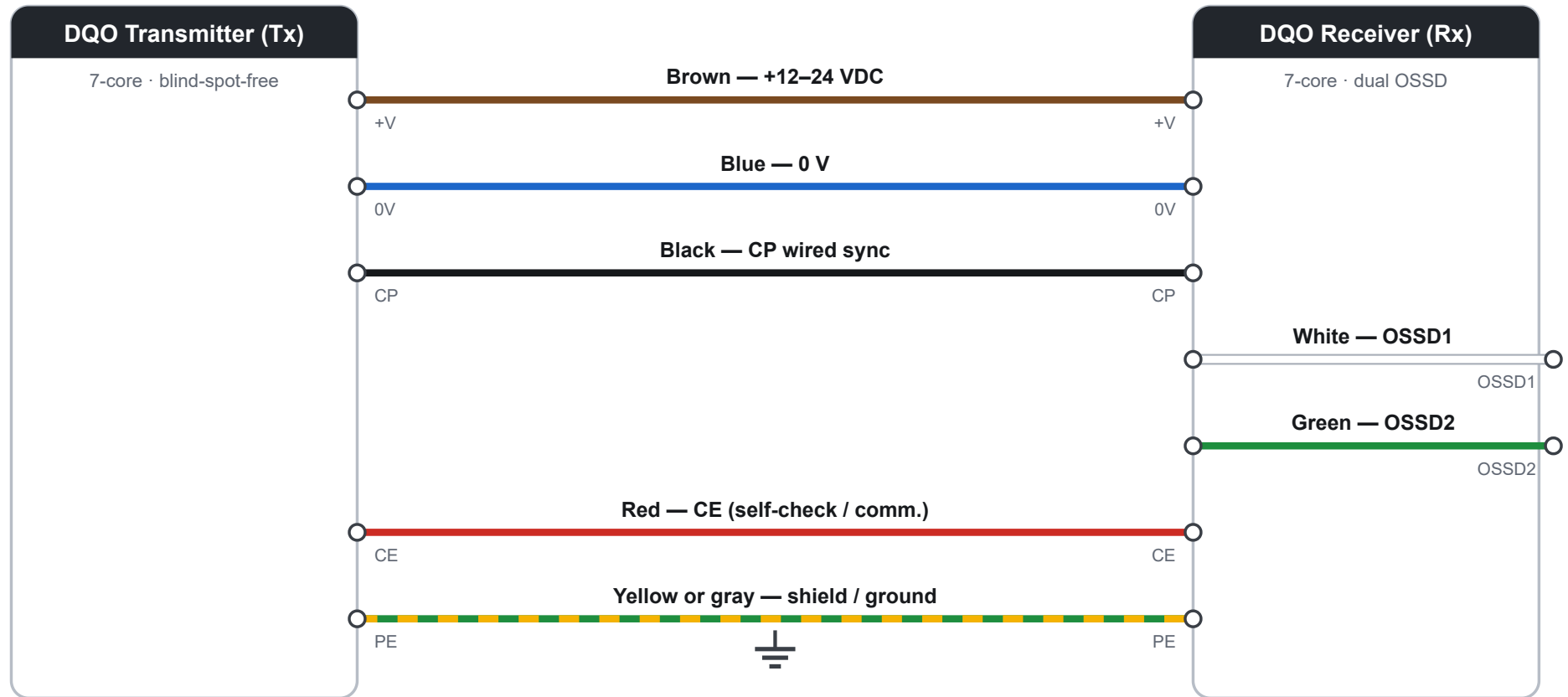
Wire colors per DAIDISIKE DQC catalogue. PNP common connects to 24 V+, NPN common to 0 V.

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Fig. 6 — dqc safety light curtain 5 core pnp wiring diagram

DQO Series — 7-Core Dual-OSSD Wiring Diagram

Blind-spot-free series, two 7-core cables · dual OSSD + CE self-check line · response ≤ 15 ms



Dual-channel safety output: OSSD1 and OSSD2 must run on separate fuses and separate routing — merging them destroys redundancy.

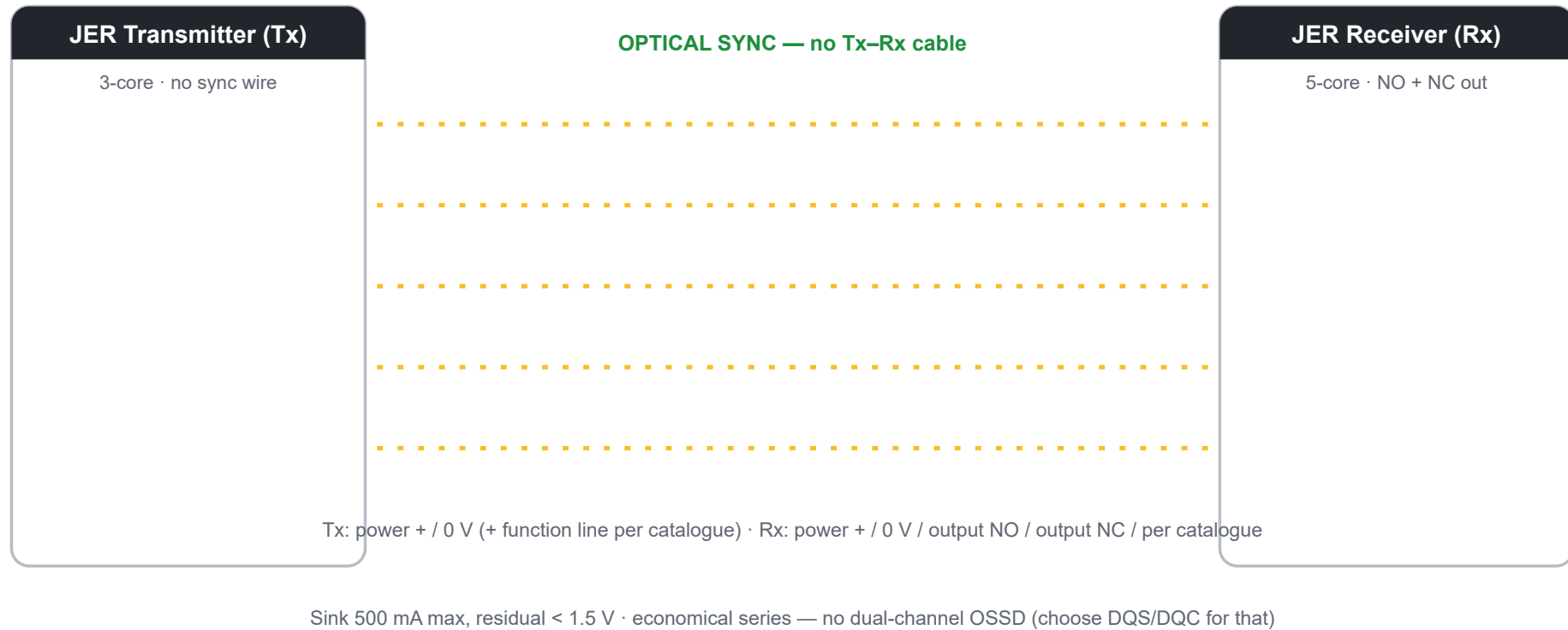
Wire colors per DQO wiring guide (fsddsk.com/dqo-blind-spot-free-series-safety-light-curtain-wiring-guide).

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Fig. 7 — dqo safety light curtain 7 core dual ossd wiring diagram

JER Series — 3-Core Tx + 5-Core Rx, Optical Synchronization

No synchronization cable between Tx and Rx — that is why the transmitter needs only 3 cores · $\leq 15\text{ ms}$ · DC 12/24 V



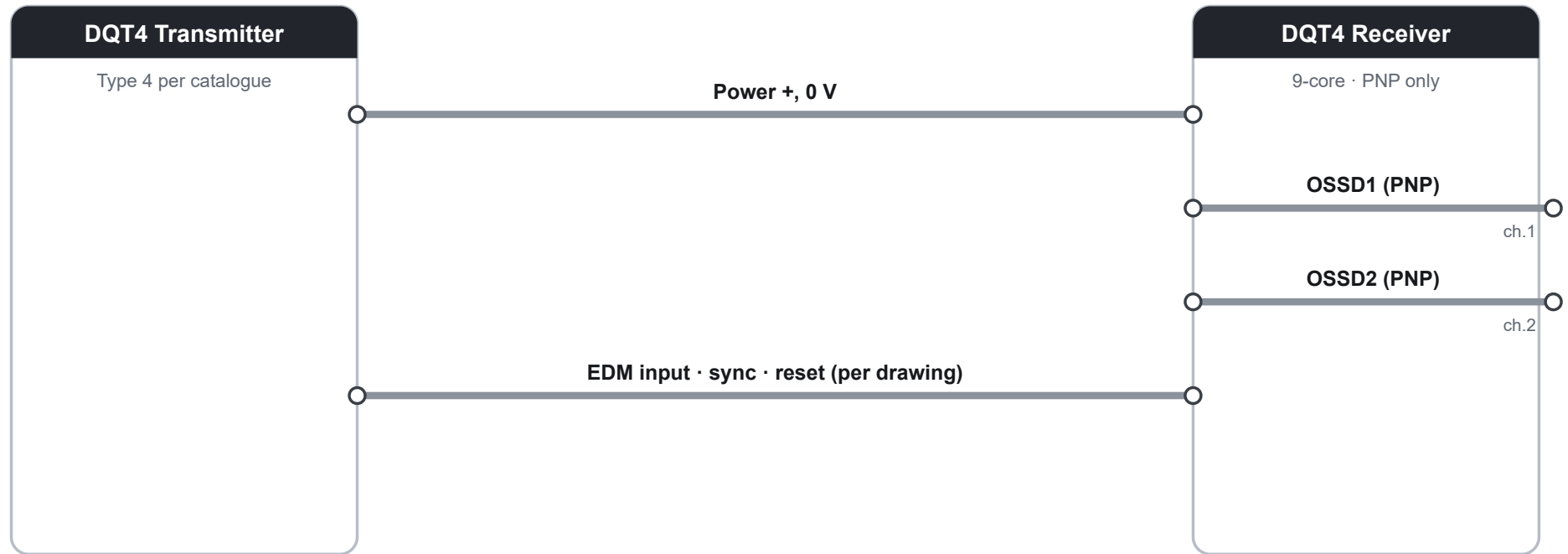
Core counts and output spec per JER catalogue page. Individual wire colors ship with the factory drawing — not published, not guessed here.

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Fig. 8 — jer safety light curtain 3 core 5 core optical sync wiring

DQT4 — 9-Core Architecture, PNP-Only Dual OSSD + EDM

Type 4 architecture series · 9-core cable · redundant PNP OSSD pair with EDM support



Redundant dual-channel PNP OSSD with self-diagnostics. Pair with a safety PLC or the DQSRN multi-input safety relay. This series is PNP-only — there is no NPN variant.

Per DQT4 catalogue page. Wire-by-wire colors ship with the factory drawing; gray lines here mark published functions only.

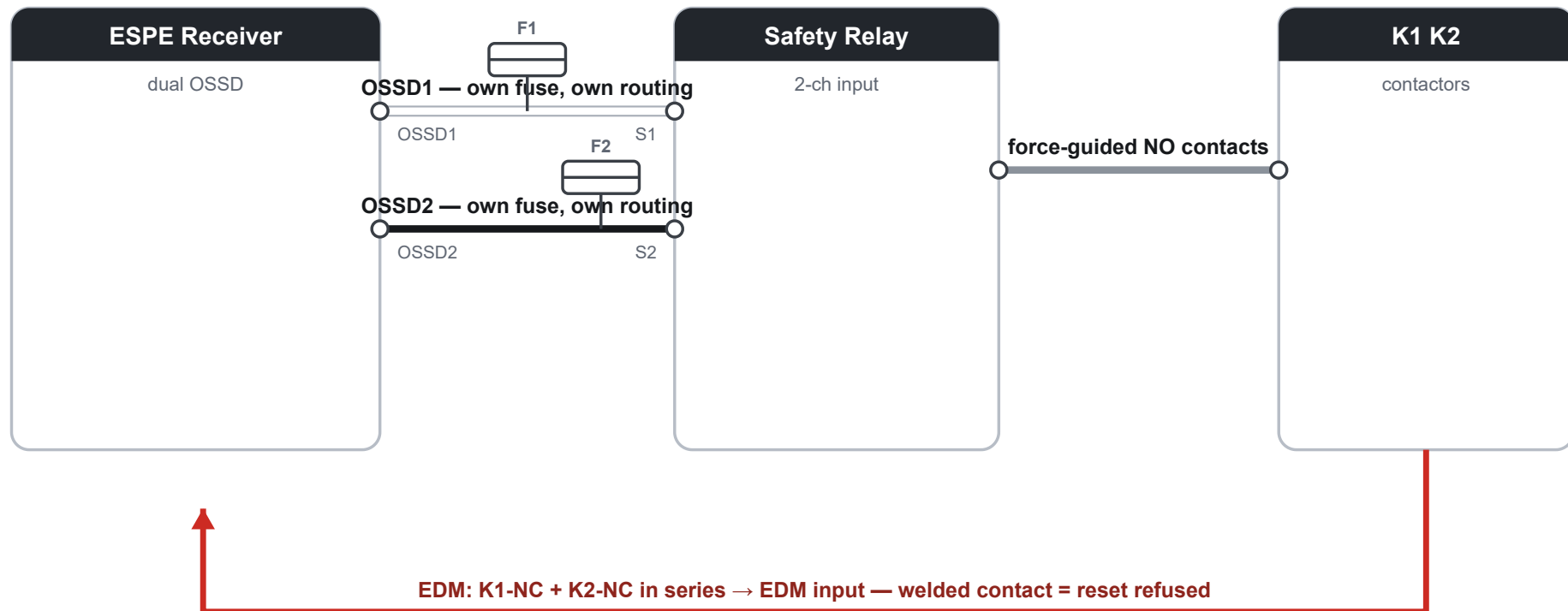
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Fig. 9 — dqt4 type4 safety light curtain 9 core pnp wiring architecture

3. OSSD, EDM and Output Logic

Dual-Channel OSSD + EDM Feedback — The Safety Loop

Why OSSD1/OSSD2 stay separate, and how EDM catches a welded contactor



Two independent channels let the relay cross-monitor: a short between OSSD1 and OSSD2, or one channel stuck high, is detected and the machine is held stopped.

Per fsddsk.com/ossd-wiring-npn-pnp-with-edm-dual-channel-loops-edm-feedback-common-wiring-mistakes.

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Fig. 10 — ossd dual channel edm feedback loop wiring diagram

NPN vs PNP OSSD — Where the Load Goes

The single most common cross-brand replacement mistake

NPN (sinking) — load to +V

+24 V

K1

OSSD (NPN) → sinks to 0 V

Input common of the relay/PLC block connects to 0 V.

PNP (sourcing) — load to 0 V

OSSD (PNP) → sources +V

K1

0 V

Input common of the block connects to 24 V+ (DQSRN NPN example: CP → 0 V).

Per fsddsk.com/safety-light-curtain-npn-pnp-plc-safety-relay · sink/source 500 mA, residual < 1.5 V on DQ-series transistor outputs.

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Fig. 11 — npn vs pnp ossd output load position wiring

4. Safety Relay, PLC and Reset

DQE Light Curtain → DA31 Safety Relay — Complete Loop

Dual OSSD into S1/S2, force-guided contacts out, EDM feedback, SR/SRC reset · DA31 release < 30 ms



Sequence check after power-up: beams clear → OSSD1/2 high → contacts close → block beam → trip → short K1 to simulate weld → reset must be refused.

⚠ DA31 EDM terminal detail is not in the public factory sheet — request the DA31 manual before final hookup. OSSD white/black order: verify against the drawing shipped with your unit.

Fig. 12 — dqe light curtain da31 safety relay wiring diagram

DA31 Safety Relay — Terminal Map & Contact Ratings

24 VDC +10/−20% · 2.9 W · force-guided contacts · release < 30 ms · 35 mm DIN rail

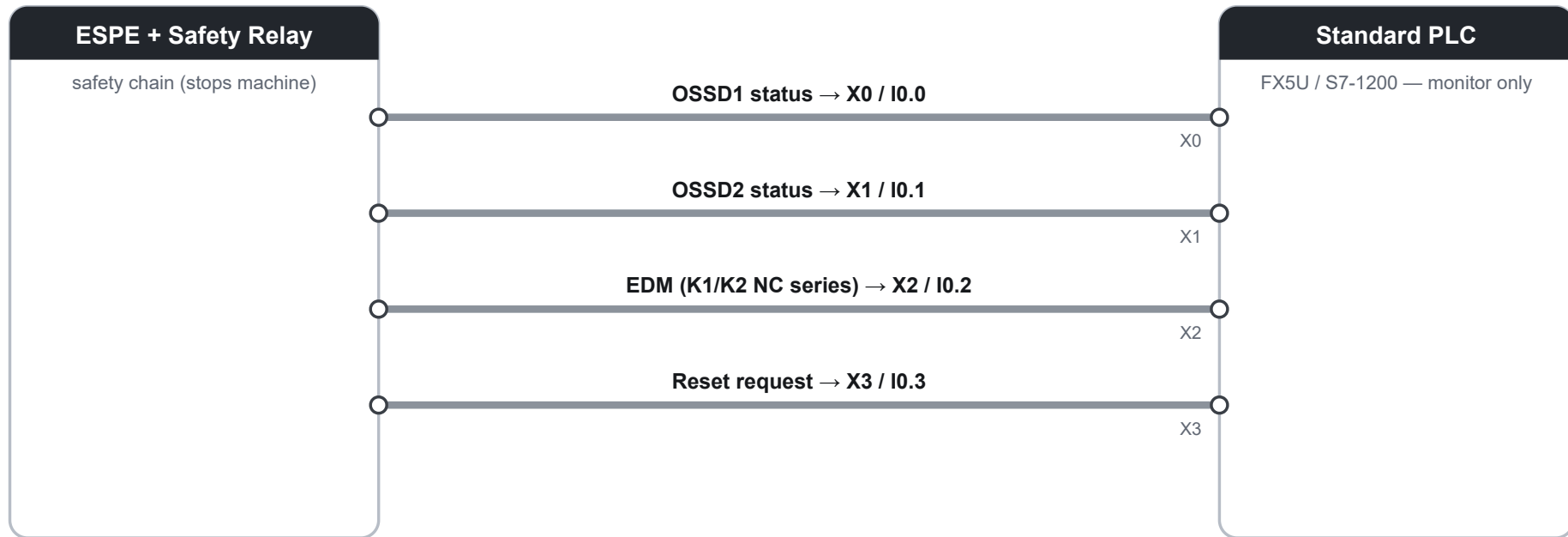
Terminals	Function	Rating / rule
(+) / (0V)	24 VDC supply	+10% / −20%, 2.9 W
S1 / S2	dual-channel safety inputs (OSSD1/2)	PNP or NPN compatible
13/14 · 23/24 · 33/34	3 × NO force-guided safety contacts	AC-1 6 A / 250 VAC · DC-1 6 A / 24 VDC
41/42	NC auxiliary (alarm / monitor)	non-safety signalling
SR / SRC	reset: shorted = auto, open + button = manual	two-step manual for high risk
contact material	AgSnO2 + 0.2 μm Au	min. load 10 mA / 5 V

⚠ EDM feedback and cross-short detection detail is not in the current public factory sheet — request the DA31 manual for those terminals.

Fig. 13 — da31 safety relay terminal map and contact ratings

Light Curtain Status into a Standard PLC — Monitoring Wiring

Mitsubishi FX5U / Siemens S7-1200 input mapping for diagnostics and HMI display



A standard PLC must NEVER perform the safety stop — it only logs and displays. The stop path stays: OSSD → safety relay → contactors.

Per [fsddsk.com/safety-light-curtain-npn-pnp-plc-safety-relay](https://www.fsddsk.com/safety-light-curtain-npn-pnp-plc-safety-relay) · safety stop must run through a safety relay or safety PLC.

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Fig. 14 — light curtain plc monitoring wiring fx5u s7 1200

Reset Wiring — SR/SRC Auto vs Manual

One terminal pair decides the restart behaviour of the whole cell

AUTO RESET

SR – SRC terminals shorted



Machine restarts as soon as the beam clears. Only for no-standing-behind zones.

MANUAL RESET (recommended high-risk)

SR – SRC open, momentary button in loop



Operator must verify the zone is clear, then give a rising-edge reset. Never latch the button.

Per fsddsk.com/light-curtain-safety-relay-wiring · risk assessment (ISO 13849) decides which mode is allowed.

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Fig. 15 — safety light curtain reset modes sr src auto vs manual

5. Brand Replacement Maps

Replacing Omron F3SG-SR with DQC — Function-to-Function Wiring Map

Match functions, not wire colors — connectors look alike but pinouts may differ

Omron F3SG-SR function	DQC equivalent	Rule when swapping
24 VDC / 0V power pair	24 VDC / 0V, keep PE	same polarity
OSSD1	OSSD1	own fuse + own routing
OSSD2	OSSD2	route away from drives
RST / EDM+RST block	DQC reset input	edge / two-step only
EDM / AUX IN	DQC EDM feedback	K1/K2 NC in series
Monitor / ERROR out	Diag / STATE out	non-safety → PLC

⚠ Verify every pin against the DQC wiring table shipped with your unit before first power-up — similar M12 connectors do not guarantee identical pinouts.

Per [fsddsk.com/omron-f3sg-sr-replacement-compare-dqc-parameters-accessories-wiring-compatibility](https://www.fsddsk.com/omron-f3sg-sr-replacement-compare-dqc-parameters-accessories-wiring-compatibility).

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Fig. 16 — omron f3sg sr to daidisiike dqc wiring function mapping

Keyence SL-V / GL-R → DQC — Replacement Wiring Checklist

Published compatibility points — pin-level mapping ships with the factory drawing

#	Check before energizing	Why
1	Confirm protective height + resolution match the original risk assessment	ISO 13855 distance
2	OSSD wiring order per DQC table — do not copy Keyence colors 1:1	pinouts differ
3	EDM loop rewired to DQC EDM input (K1/K2 NC series)	weld detection
4	L-bracket mounting is compatible — re-check beam alignment after swap	optical axis
5	Recalculate safety distance with DQC response time ≤ 15 ms	$S = K \times T + C$
6	Full trip test + reset-refusal test before releasing the machine	commissioning

Per fsddsk.com/keyence-sl-v-gl-r-vs-daidsike-dqc-comparison-and-compatibility · DQC response ≤ 15 ms.

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Fig. 17 — keyence sl v gl r to daidsike dqc swap checklist

SICK deTec / Pilz PSENopt → DQC — Replacement Wiring Checklist

Published compatibility points — mounting hole pitch is compatible, wiring must be re-verified

#	Check before energizing	Why
1	Keep the original OSSD → relay channel order when re-terminating	channel integrity
2	Keep the original EDM sequence; verify against DQC EDM input	weld detection
3	Bracket hole pitch compatible — verify beam-1 height is unchanged	detection zone
4	Do not assume wire colors carry over — terminate per DQC table	colors differ
5	Re-run muting/blanking configuration if the application used it	function parity
6	Document the swap + trip test for the machine safety file	audit trail

Per fsddsk.com/sick-detec-pilz-psenopt-replacements-mounting-and-wiring-compatibility.

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Fig. 18 — sick detec pilz psenopt to daidisike dqc swap checklist

6. The Seven Costly Wiring Mistakes

Mistake #1 — Mixing NPN and PNP on One Input Common

Inputs read permanently ON, permanently OFF, or intermittent

❌ Mixed polarities, one common

PNP sensor → common

NPN sensor → same common

Result: phantom states, intermittent faults,
inputs that pass a bench test and fail on site.

✅ One polarity per input block

PNP block: common → 24 V+

NPN block: common → 0 V

Segregate commons per module. Label the
polarity at the terminal strip.

Per the OSSD/EDM common-mistakes guide on fsddsk.com.

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Fig. 19 — wiring mistake mixed npn pnp commons

Mistake #2 — One Fuse / One Loom for Both OSSD Channels

A single failure now kills both channels — the redundancy is gone

❌ OSSD1 + OSSD2 share fuse & loom



One blown fuse, one chafed loom, one crushed conduit = both channels dead at once.

✅ Independent fuse & routing per channel



Each OSSD: own fuse, own conduit/sleeve.
Cross-short detection stays meaningful.

Fig. 20 — wiring mistake shared fuse ossd channels

Mistake #3 — Skipping the EDM Feedback Loop

A welded contactor and the machine restarts with the guard “active”

❌ EDM input left unwired

Contactor K1 welds closed.

Nothing notices. Reset accepted.

The “stopped” machine can still be powered through the welded contact.

✅ K1/K2 NC aux contacts → EDM

K1-NC and K2-NC wired in series into EDM.

Weld → EDM sees wrong state → reset refused.

Test at commissioning: short K1, confirm the relay refuses to re-arm.

Per the OSSD/EDM common-mistakes guide on fsddsk.com.

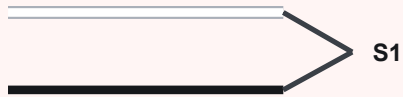
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Fig. 21 — wiring mistake no edm feedback

Mistake #4 — Merging OSSD1 and OSSD2 into One Input

The machine still stops — but it is no longer a safety-rated stop

❌ Both OSSDs on one terminal



Cross-monitoring and short-detection are blind.
Claimed PL is void.

✅ One channel per relay input



The relay compares both channels and detects
shorts between them.

Fig. 22 — wiring mistake merged ossd outputs

Mistake #5 — Running Signal Cables Parallel to VFD / Motor Power

Random trips and phantom resets that vanish when the drive is off

❌ In the same tray as motor power

VFD output cable



OSSD signal, same tray, 30 cm run

Induced noise → nuisance trips → operators
start bypassing the guard.

✅ ≥ 200 mm apart, cross at 90°

power tray



signal tray — ≥ 200 mm separation

Unavoidable crossings at 90°. Shield grounded.

Fig. 23 — wiring mistake parallel routing with vfd cables

Mistake #6 — Shield Floating or Grounded at Both Ends

Surge events print as random beam-blocked errors

❌ Floating, or a ground loop

shield unterminated at both ends



Or grounded at BOTH ends → loop current
through the shield → nuisance trips.

✅ Single-point ground, $\leq 4 \Omega$

one end bonded to plant PE



Single-end ground, resistance $\leq 4 \Omega$,
all shields to the same earth bar.

Per fsddsk.com/light-curtain-safety-relay-wiring · ground resistance $\leq 4 \Omega$.

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Fig. 24 — wiring mistake shield grounding floating multipoint

Mistake #7 — Latched or Held Reset Button

The cell restarts on its own the moment a fault clears

❌ Maintained switch on reset

Operator tapes the button down /
uses a maintained selector.

Any transient fault that clears = instant,
unattended restart.

✅ Momentary, edge-triggered reset

Momentary pushbutton, rising edge only,
or two-step press–release–press (0.5–3 s).

Restart is always a deliberate human act
after checking the zone.

Per the OSSD/EDM common-mistakes guide on fsddsk.com.

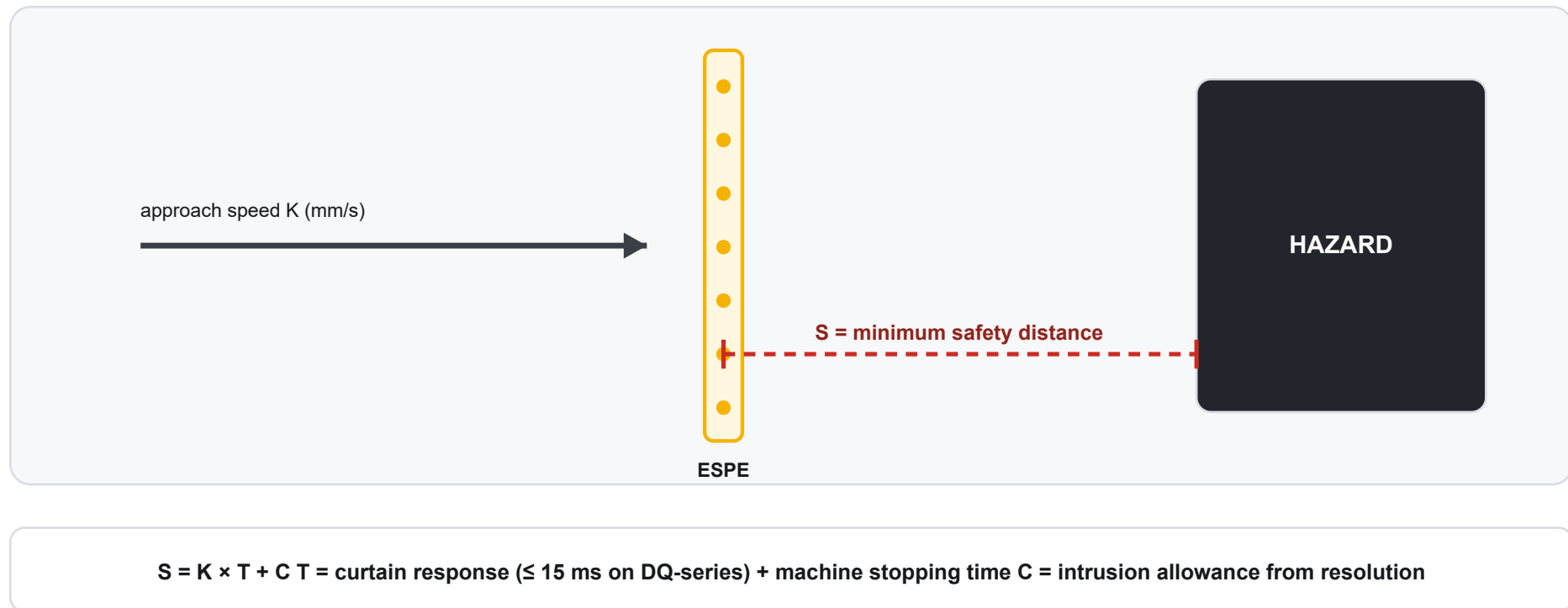
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Fig. 25 — wiring mistake latched reset button

7. Mounting Distance and Commissioning

ISO 13855 — Mounting Distance Is Part of the Wiring Job

A perfectly wired curtain mounted too close still fails the risk assessment



Formula per fsddsk.com/effective-protective-height-safety-light-curtain and the wiring guides · verify T with the machine stop-time measurement.

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Fig. 26 — iso 13855 safety distance formula light curtain mounting

Commissioning — The 6-Step Trip Test

Run after every new installation, rewiring, or brand swap



Per fsddsk.com/light-curtain-safety-relay-wiring · use the 14 / 25 / 30 mm test rod matching the curtain resolution.

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Fig. 27 — safety light curtain commissioning test sequence

8. Power, Muting and Cascading

OSSD Self-Test Pulses vs a Standard PLC Input Filter

Why a healthy safety output can look like a chattering signal on the wrong input

All three traces describe the SAME healthy output. Only the observer changes.

OSSD conductor — actual signal

high = safe to run



Why it matters

When t_{filter} is shorter than t_{pulse} , the input sees every self-test as a genuine interruption.

Safety relay / safety PLC input

expects the pulses

reads: CLOSED — machine may run



Standard (non-safety) PLC input

filter too fast

reads: chattering — phantom transitions and nuisance trips



⚠ Axes are symbolic. Take t_{pulse} from your curtain datasheet and t_{filter} from your PLC manual — no figure is published for these curtains. Never place a standard PLC input in the stop path

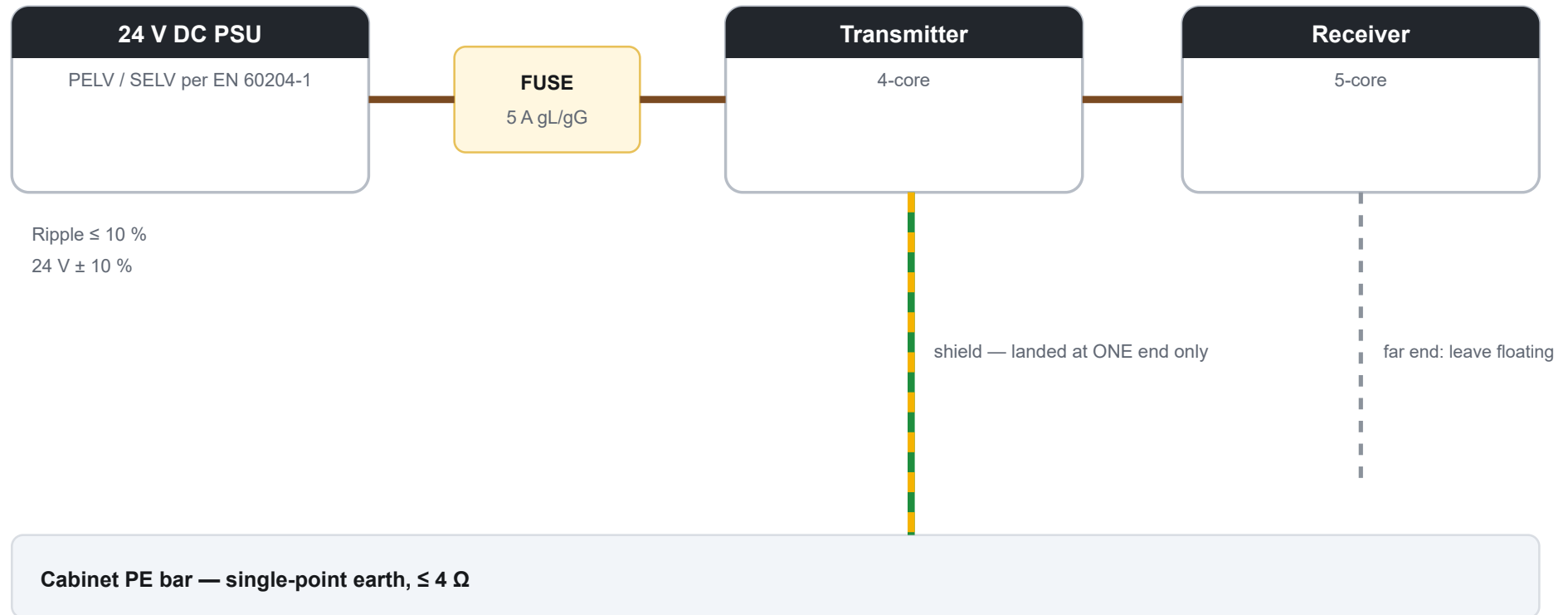
Waveform illustrates the mechanism only. Not to scale.

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Fig. 28 — ossd test pulse vs plc input filter timing

24 V Supply, Fusing and the Single-Point Earth

Power architecture ahead of the curtain — PELV supply, series fuse, one earth reference



Bonding the shield at both ends creates a ground loop and injects the very noise the shield exists to reject.

⚠ The 5 A gL/gG rating, the $\leq 10\%$ ripple limit and the $\leq 4\ \Omega$ earth figure are supply-side values published for the DQE safety-relay installation. A safety relay's OUTPUT contacts carry their own

Core counts per DAIDISIKE catalogue: 4 at the transmitter, 5 at the receiver. No PSU model or PE conductor size is specified.

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Fig. 29 — 24v supply pelv fusing single point earth

Four-Sensor T-Pattern Muting — Ports and Geometry

Sensor arrangement, muting lamp and override, labelled by function



⚠ Ports are named by FUNCTION, not terminal. No relay in this catalogue offers a muting mode — take terminal designations, the simultaneity window and any timeout from the manual of the

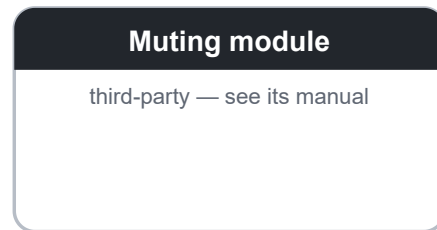
Schematic. Sensor spacing and mounting distance must be derived per IEC 62046 and ISO 13855 for the actual line.

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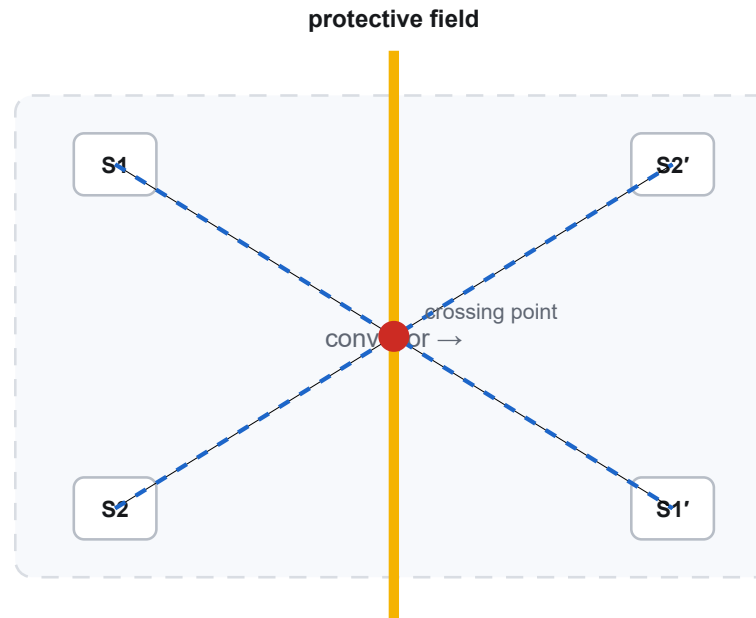
Fig. 30 — muting 4 sensor t pattern with lamp and override

Two-Sensor Crossed-Beam Muting

The minimum arrangement that can distinguish a pallet from a person



- muting input 1
- muting input 2
- lamp output
- override input



Two beams crossed ahead of the guard line. Muting begins only when both are broken in the correct ORDER. A single beam, or the wrong order, is a person — and must not mute.

⚠ Crossing distance from the guard line and beam angles are deliberately unlabelled — both are derived per IEC 62046 for the actual conveyor and load, and no general figure is valid. Termin

Schematic, not to scale.

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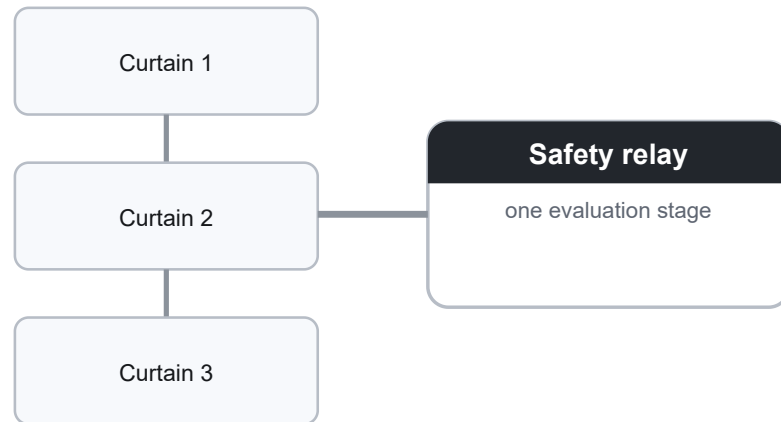
Fig. 31 — muting 2 sensor crossed I pattern

Cascading: Curtains in Series vs a Relay per Curtain

The trade is diagnosis and response time against panel cost

Two ways to guard several openings — and what each one costs you

A — Curtains in series, one relay

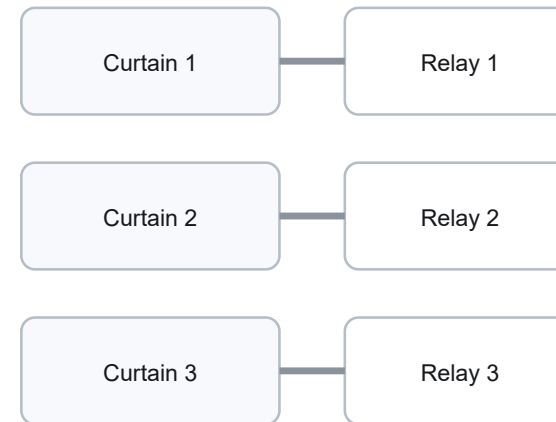


✓ cheapest — one relay, one panel slot

✗ response times ADD together

✗ no way to tell WHICH curtain tripped

B — One relay per curtain



✓ each zone diagnosable independently

✓ response time does not accumulate

✗ more panel space and more cost

Stop-time budget = curtain (≤ 15 ms) + relay (DA31: < 30 ms) + contactor drop-out (from ITS OWN datasheet)

Then recompute the mounting distance: $S = K \times T + C$ per ISO 13855. Every element you add lengthens T.

⚠ Never parallel two OSSD outputs, and never put E-stop NC contacts in series with pulsed OSSD lines — the self-test pulses will be read as faults. Only the curtain and DA31 figures above

Response figures per DAIDISIKE catalogue and the DA31 product data. The contactor term is deliberately symbolic.

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Fig. 32 — cascading series ossd vs relay per curtain