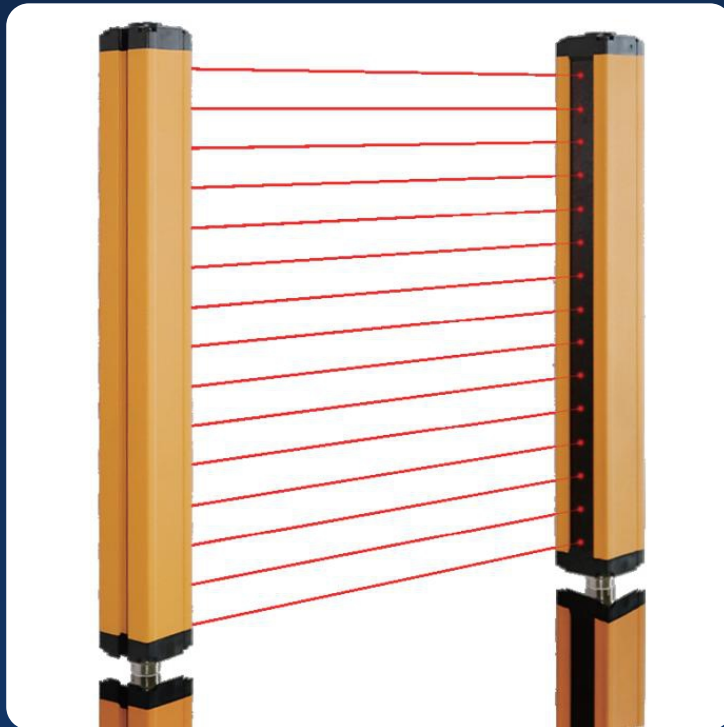


SAFETY LIGHT CURTAIN · TUV / CE CERTIFIED

MQ SERIES

Essence Edition

Photoelectric Safety Barrier | Transmitter / Receiver Pair



TECHNICAL MANUAL & INSTALLATION GUIDE

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Before you begin. This manual must be read in full by the person responsible for selecting, installing and commissioning the light curtain. Sections 8, 9, 10 and 13 contain information that is essential to the safety function of the device. Keep this manual with the machine documentation for the life of the installation.

1. Product Overview

The MQ Series "Essence Edition" Safety Light Curtain is a through-beam photoelectric protection device designed to guard personnel working at or near hazardous machine motion. The system consists of a matched transmitter (TX) and receiver (RX) pair housed in a slim 29 × 30 mm extruded aluminium profile. The transmitter projects an array of synchronised infrared beams across the opening to be protected; the receiver monitors every beam continuously. When a finger, hand, arm or body enters the protected field and interrupts any single beam, the receiver switches its output state within the rated response time of 10 ms or less, signalling the machine control system to stop the dangerous motion. Unlike mechanical guards, fences or interlocked doors, a light curtain creates an invisible, non-contact barrier that does not obstruct loading, unloading, visibility or material flow — making it the standard solution for high-cycle manual feeding operations where a physical guard would destroy productivity.

The MQ Essence Edition is the product of more than ten years of continuous research, development and field application experience across the metal forming, automation, packaging and plastics industries. Every unit is built around a self-monitoring CPU architecture, a proprietary cyclic optical synchronisation algorithm, and a narrow-angle infrared optical train that together deliver exceptional immunity to ambient light, welding flash, variable-frequency drive noise and adjacent-curtain crosstalk. With beam pitches of 10 mm, 20 mm and 40 mm, beam counts from 4 up to 256, a sensing range of 0.2 to 7 m, selectable NPN or PNP output in either normally open or normally closed logic, and IP65 sealing, one product family covers finger, hand and body protection across virtually any machine geometry.

2. Key Features

Complete Certification

The MQ series is TUV/CE certified. Certification covers both the product design and the manufacturing process, giving OEM machine builders and end users documented evidence for their own machine conformity files. This makes the series suitable for export machinery and for plants operating under formal EHS audit regimes.

CPU Self-Check Architecture

An onboard microcontroller continuously monitors the health of the light curtain itself, not only the beam status. It detects loss of light-source synchronisation, insufficient received light intensity, emitter drive circuit errors, main control circuit errors, cable faults, receiver drive circuit errors and CPU errors. A detected fault is annunciated — never silently ignored.

Optical Synchronisation Algorithm

A precision optical lens assembly, a narrow-angle infrared emitter and a cyclic scanning algorithm synchronise transmitter and receiver purely through the light path. No sync wire is required, which removes an entire cable, connector and failure mode. The two units may even be fed from separate 24V DC supplies.

Strong Anti-Interference Performance

Narrow emission angle, coded cyclic scanning and optical filtering reject both optical and electromagnetic disturbance. Ambient light immunity is rated at 10,000 Lux, allowing reliable operation under high-bay lighting, near welding stations and in areas with significant indirect daylight.

Compact 29 × 30 mm Profile

The aluminium housing measures only 29 × 30 mm in cross-section, one of the slimmest formats in its class. This allows the curtain to be mounted inside tight press uprights, machine columns, robot cell frames and existing guard structures where a bulkier barrier will not fit. The extruded body also provides rigidity, heat dissipation and shielding in a single part.

Wide Model Range and Versatility

Beam pitch is available in 10 mm, 20 mm and 40 mm, and beam count in even steps from 4 up to 256, giving protection heights from a few centimetres upwards. Sensing distance options span 0.2 to 7 m, output can be specified NPN or PNP with normally open or normally closed logic, and mounting can be top-and-bottom or side bracket.

IP65 Enclosure Protection

The housing, end caps and front window are sealed to IP65, providing complete protection against dust ingress and resistance to low-pressure water jets from any direction. Operating temperature is –10 °C to +55 °C, storage –40 °C to +70 °C, humidity 35 %RH to 85 %RH — reliable in oily stamping shops, humid moulding halls and washdown-adjacent packaging lines.

Easy M12 Plug-and-Play Wiring

Both units ship with a factory-terminated 3 m cable and a direct M12 aviation connector. There are no field-assembled terminals, no polarity guesswork and no sync wire to route in optical synchronisation mode. Built-in reverse polarity protection and output short-circuit protection safeguard the unit against the two most common commissioning errors.

Detection Types

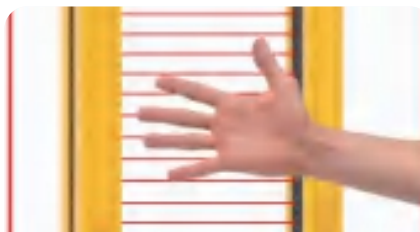
The beam pitch determines the smallest object the curtain can reliably detect, and therefore which part of the body it protects.



Finger Detection

Min. object Ø15 mm

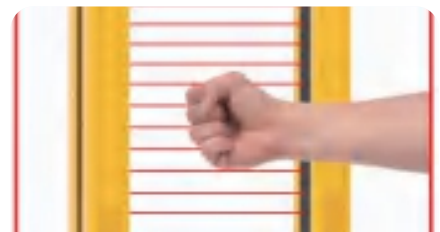
10 mm beam pitch



Hand Detection

Min. object Ø25 mm

20 mm beam pitch



Arm / Limb Detection

Min. object Ø45 mm

40 mm beam pitch

3. Working Principle

The MQ Essence Edition operates on the through-beam principle. The transmitter contains a vertical array of infrared emitting elements, spaced at the ordered beam pitch (10 mm, 20 mm or 40 mm). The receiver contains a matching array of photoelectric receiving elements at the same pitch, mounted directly opposite. Under control of the internal CPU, the transmitter energises its emitters one after another in a fixed cyclic sequence rather than all at once; the receiver, running the same sequence in lock-step, samples only the corresponding receiving element at each instant. The result is a dense grid of discrete, individually monitored optical channels spanning the full protection height. As long as every channel receives its expected pulse of infrared light at the expected moment, the field is judged clear and the safety output remains in its "machine may run" state.

When any object equal to or larger than the rated minimum detectable object enters the field, it blocks at least one beam. The receiver detects the missing pulse on that channel, and the output switches state within the specified response time of 10 ms or less. This output is wired into the machine's safety control circuit — a safety relay, safety controller or safety PLC input — which in turn removes power from the clutch, brake, valve or drive so that the hazardous motion is arrested. Because the beams are scanned continuously, detection occurs regardless of where along the height the intrusion happens and regardless of the direction of approach. The system is a presence-sensing device: the output remains in the stop state for as long as the obstruction is present.

Synchronisation between transmitter and receiver is what makes cyclic scanning possible, and the MQ series achieves it optically by default. Using a high-precision lens and a narrow-angle infrared source, the transmitter embeds timing information in the light beam itself, and the receiver's cyclic scanning algorithm locks onto that timing without any electrical connection between the two units. This eliminates the synchronisation cable entirely, simplifies installation, removes a mechanical failure point, and allows the transmitter and receiver to be powered from completely separate 24V DC supplies — a significant advantage when the two sides of a machine opening are fed from different panels. For applications where the customer's specification requires it, a wire-synchronised version is available (order code W). In this version a dedicated CP synchronisation conductor (black wire) is run between transmitter and receiver, and the timing reference is carried electrically instead of optically. Functionally the detection behaviour is identical; only the synchronisation method differs.

Optical Synchronisation (standard)

- No wire of any kind between TX and RX
- TX and RX may use separate 24V DC supplies
- Fewer cables, connectors and failure points
- Fastest installation

Wire Synchronisation (option W)

- Dedicated CP conductor links TX and RX
- TX and RX must share one supply and 0V
- Timing reference carried electrically
- Identical detection behaviour

4. How to Select

Selecting the correct light curtain is a matter of matching four independent parameters to the machine and the task: what must be detected, how tall the opening is, how wide the opening is, and how the machine's input circuit expects to be driven.

4.1 Select the beam pitch by the minimum detectable object

Beam pitch	Minimum detectable object	Protection class	Typical use
10 mm	Φ15 mm	Finger	Small press dies, punch tooling, manual insertion stations
20 mm	Φ25 mm	Hand / palm	Press brakes, stamping presses, general feeding openings
40 mm	Φ45 mm	Arm / limb / body	Perimeter guarding, robot cells, AGV lanes, conveyor pass-throughs

4.2 Select the protection height by the machine opening

The protection height H must cover the entire accessible opening. Measure the vertical distance a person could reach through, then choose a beam count whose protection height is equal to or greater than that dimension. Note that a blind zone equal to half the beam pitch exists above the first beam and below the last beam. Position the curtain so that these blind zones fall outside the reachable opening, or close them with mechanical guarding.

4.3 Select the sensing distance by the opening width

The sensing distance is the separation between transmitter and receiver; the MQ series covers 0.2 to 7 m. Order the range band that contains your actual installed distance, with a modest margin: **01** = 0–1 m, **03** = 1–3 m, **05** = 1–5 m, **07** = 1–7 m. Do not specify a longer range than needed — the correct band improves signal margin, and where several curtains are installed nearby, different range settings help prevent mutual interference.

4.4 Select NPN or PNP output

This must match the input circuit of the receiving device. **NPN (sinking)** switches the load to 0V and suits inputs with a common positive rail. **PNP (sourcing)** switches the load to +24V and suits inputs with a common negative rail, the more usual convention on European-specification machinery. Confirm the input type in the machine's electrical schematic before ordering.

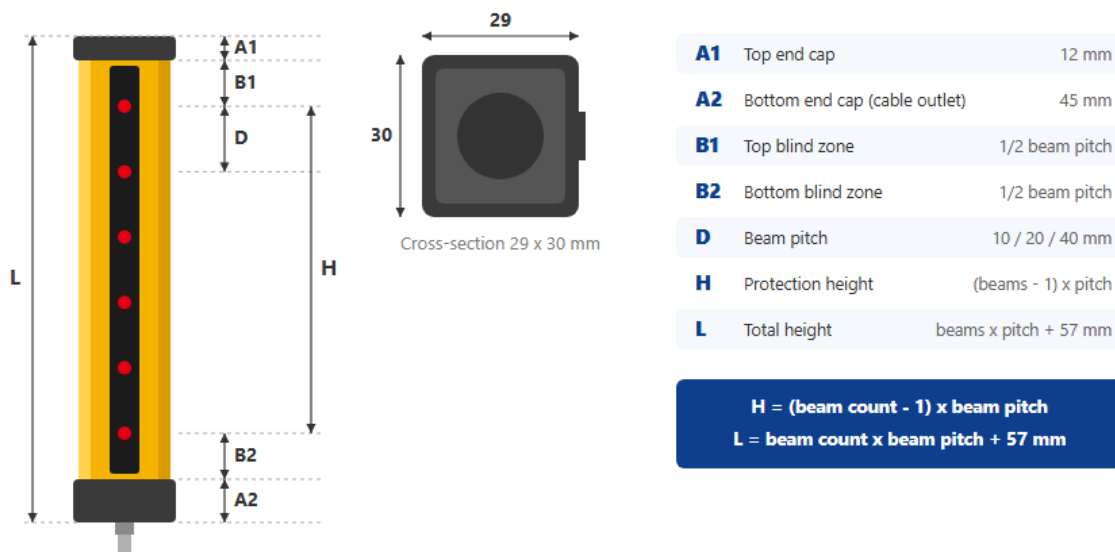
4.5 Select NO or NC signal logic

NC (normally closed, code C) means the output is closed / conducting when the light field is clear, and opens when a beam is interrupted or when power is lost. **NO (normally open, code O)** is the inverse. NC logic is the conventional choice for safety circuits, because a broken wire, lost supply or disconnected connector produces the same state as an intrusion — the machine stops. Choose NO only when the existing input logic specifically requires it.

4.6 Ordering code

MQ - 20 10 N C 03 E

5. Dimensions & Formulas



5.1 The two optical dimensions

D — Beam pitch. The centre-to-centre distance between two adjacent infrared beams: 10, 20 or 40 mm. It is the single most important optical parameter, because it sets the minimum detectable object size and therefore the class of protection. A finer pitch detects smaller objects, but requires more beams — and therefore a longer housing — to cover the same opening.

H — Protection height. The vertical distance from the centre of the first beam to the centre of the last beam. This is the genuinely protected zone, and the figure that must be compared against the opening you need to guard. A curtain with n beams has $n-1$ gaps between beams, so:

$$H = (\text{beam count} - 1) \times \text{beam pitch}$$

example

$$24 \text{ beams at } 20 \text{ mm pitch} \rightarrow H = 23 \times 20 = 460 \text{ mm}$$

Note that H is measured beam-centre to beam-centre, not end cap to end cap. The housing is always longer than the protection height, by the amount described on the following page.

5.2 The four dead-length dimensions

A1 — Top end cap (12 mm). Dead length at the top of the housing, occupied by the end cap and internal optical mounting. No beam exists within this 12 mm.

A2 — Bottom end cap and cable outlet (45 mm). Dead length at the bottom, longer than A1 because it houses the cable gland and M12 connector outlet in addition to the end cap. When planning the installation, always allow clearance below the curtain for the cable to exit and bend without strain.

B1 and B2 — Top and bottom blind zones (each = ½ beam pitch). B1 is the distance from the inner edge of the top end cap to the centre of the first beam; B2 is the equivalent distance at the bottom. Each equals half the beam pitch, which is why the housing is symmetrical about its beam array. These half-pitch margins must be accounted for when the curtain has to protect right up to a fixed edge — position the housing so that B1 and B2 overlap solid guarding rather than open access.

5.3 Total housing length

L — Total housing length. The overall physical length of the profile, end cap to end cap; the dimension that must fit your machine frame. Adding the segments together:

$$L = A1 + B1 + H + B2 + A2 = 12 + (D/2) + [(n - 1) \times D] + (D/2) + 45$$

which simplifies to

$$L = \text{beam count} \times \text{beam pitch} + 57 \text{ mm}$$

The constant 57 mm is simply $A1 + A2 = 12 + 45$; the two half-pitch blind zones B1 and B2 together add exactly one beam pitch, which is what turns $(n - 1)$ into n in the simplified formula. Using the same 24-beam, 20 mm pitch example: $L = 24 \times 20 + 57 = 537$ mm of housing to protect 460 mm of opening.

Symbol	Meaning	Value or formula
A1	Top end cap	12 mm
A2	Bottom end cap (cable outlet)	45 mm
B1 / B2	Top / bottom blind zone	½ × beam pitch
D	Beam pitch	10 / 20 / 40 mm
H	Protection height	(beam count – 1) × beam pitch
L	Total housing length	beam count × beam pitch + 57 mm
—	Cross-section	29 × 30 mm

Practical note. When selecting a model, first fix H from the opening you must guard, then confirm that the resulting L fits the available mounting space — remembering to add clearance at the bottom for the cable exit and at both ends for the mounting brackets.

6. Model Selection Tables

H = protection height, L = total housing length, both in millimetres. The standard range of 4 to 60 beams is tabulated here; beam counts up to 256 are available to order. Model numbers follow the pattern MQ + beam count (two digits) + beam pitch.

6.1 10 mm beam pitch — finger protection, minimum detectable object $\Phi 15$ mm

Model	Beams	H (mm)	L (mm)	Model	Beams	H (mm)	L (mm)
MQ0410	4	30	117	MQ3410	34	330	397
MQ0610	6	50	117	MQ3610	36	350	417
MQ0810	8	70	137	MQ3810	38	370	437
MQ1010	10	90	157	MQ4010	40	390	457
MQ1210	12	110	177	MQ4210	42	410	477
MQ1410	14	130	197	MQ4410	44	430	497
MQ1610	16	150	217	MQ4610	46	450	517
MQ1810	18	170	237	MQ4810	48	470	537
MQ2010	20	190	257	MQ5010	50	490	557
MQ2210	22	210	277	MQ5210	52	510	577
MQ2410	24	230	297	MQ5410	54	530	597
MQ2610	26	250	317	MQ5610	56	550	617
MQ2810	28	270	337	MQ5810	58	570	637
MQ3010	30	290	357	MQ6010	60	590	657
MQ3210	32	310	377				

Use the 10 mm pitch where the operator's fingers can reach the hazard directly — small press dies, punch tooling and manual insertion stations. It gives the finest detection but needs the most beams for a given height, so check the resulting total length L against your available mounting space.

6.2 20 mm beam pitch — hand protection, minimum detectable object $\Phi 25$ mm

Model	Beams	H (mm)	L (mm)
MQ0420	4	60	137
MQ0620	6	100	177
MQ0820	8	140	217
MQ1020	10	180	257
MQ1220	12	220	297
MQ1420	14	260	337
MQ1620	16	300	377
MQ1820	18	340	417
MQ2020	20	380	457
MQ2220	22	420	497
MQ2420	24	460	537
MQ2620	26	500	577
MQ2820	28	540	617
MQ3020	30	580	657
MQ3220	32	620	697

Model	Beams	H (mm)	L (mm)
MQ3420	34	660	737
MQ3620	36	700	777
MQ3820	38	740	817
MQ4020	40	780	857
MQ4220	42	820	897
MQ4420	44	860	937
MQ4620	46	900	977
MQ4820	48	940	1017
MQ5020	50	980	1057
MQ5220	52	1020	1097
MQ5420	54	1060	1137
MQ5620	56	1100	1177
MQ5820	58	1140	1217
MQ6020	60	1180	1257

The 20 mm pitch is the most common general-purpose choice, used on press brakes, stamping presses and general feeding openings. It balances detection resolution against housing length and is the pitch most often held in stock.

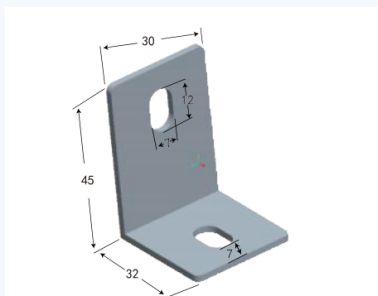
6.3 40 mm beam pitch — arm / limb protection, minimum detectable object $\Phi 45$ mm

Model	Beams	H (mm)	L (mm)
MQ0440	4	120	217
MQ0640	6	200	297
MQ0840	8	280	377
MQ1040	10	360	457
MQ1240	12	440	537
MQ1440	14	520	617
MQ1640	16	600	697
MQ1840	18	680	777
MQ2040	20	760	857
MQ2240	22	840	937
MQ2440	24	920	1017
MQ2640	26	1000	1097
MQ2840	28	1080	1177
MQ3040	30	1160	1257
MQ3240	32	1240	1337

Model	Beams	H (mm)	L (mm)
MQ3440	34	1320	1417
MQ3640	36	1400	1497
MQ3840	38	1480	1577
MQ4040	40	1560	1657
MQ4240	42	1640	1737
MQ4440	44	1720	1817
MQ4640	46	1800	1897
MQ4840	48	1880	1977
MQ5040	50	1960	2057
MQ5240	52	2040	2137
MQ5440	54	2120	2217
MQ5640	56	2200	2297
MQ5840	58	2280	2377
MQ6040	60	2360	2457

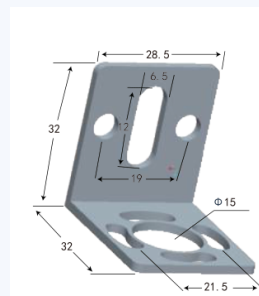
Beyond the standard range. Beam counts from 62 to 256, non-standard beam pitches, shielded cable versions (S20n), cross-beam scanning (X) and custom cable lengths (Cn) are all available to order. Contact your supplier with the required protection height, sensing distance and machine input type.

Mounting brackets



L-Type Side Mounting Bracket

Ordering code L



Top-and-Bottom Fixing Bracket

Ordering code E (default)

7. Technical Specifications

Product series	MQ Series — Essence Edition
Cross-section	29 × 30 mm extruded aluminium
Beam pitch	10 mm / 20 mm / 40 mm
Beam count	4, 6, 8, 10 ... 256 (even numbers)
Protection height	(beam count – 1) × beam pitch
Total length	beam count × beam pitch + 57 mm
Sensing distance (protection width)	0.2 ~ 7 m
Supply voltage	24V DC ± 10 %
Power consumption	3 ~ 8 W
Response time	≤ 10 ms
Insulation resistance	≥ 100 MΩ
Signal output	NPN or PNP, NO or NC selectable
Operating temperature	–10 °C ~ +55 °C
Storage temperature	–40 °C ~ +70 °C
Operating humidity	35 %RH ~ 85 %RH
Ambient light immunity	10,000 Lux
Synchronisation	Optical sync by default; wire sync optional (code W)
Enclosure rating	IP65
Certification	TUV / CE
Circuit protection	Reverse polarity protection; output short-circuit protection
Standard wiring	Direct M12 aviation connector; 3 m cable on TX + 3 m cable on RX
Minimum detectable object	Φ15 mm (10 mm pitch) / Φ25 mm (20 mm pitch) / Φ45 mm (40 mm pitch)

Note. All specifications apply at 24V DC ± 10 % supply, within the stated operating temperature and humidity range, with clean optical windows and correct alignment. Performance outside these conditions is not guaranteed.

8. Installation Guide

1 Mount the transmitter and receiver facing each other, parallel and aligned.

The two units must be installed on the same plane, at the same height, with their optical windows directly opposite one another. Any angular tilt, twist or vertical offset reduces received light intensity and shortens the usable sensing distance. Use a spirit level and, where possible, a straightedge or laser line to set both units before final tightening.

2 Orient both cable outlets in the same direction.

The transmitter and receiver are matched units with a defined beam sequence. Both cable outlets (the A2 end) must point the same way — normally both downward. Installing one unit inverted relative to the other reverses the scanning sequence and the curtain will not synchronise.

3 Verify one-to-one beam alignment.

Each emitter must face its corresponding receiver element. After mechanical mounting, power the system and fine-adjust the angle of each unit until the receiver indicates a stable clear condition across all beams, then lock the brackets. A stable indication with no flicker confirms correct alignment.

4 Keep the separation within 0.2 to 7 m and within the ordered range band.

Below 0.2 m the optics cannot be guaranteed; beyond 7 m the signal margin is insufficient. Also respect the range band actually ordered (01 / 03 / 05 / 07) — a unit configured for 0–1 m will not reliably span 5 m even though the series as a whole covers that distance.

5 Calculate and respect the safety mounting distance.

The light curtain must be positioned far enough back from the hazard that the machine has completely stopped before any part of the operator's body can reach the danger point. This distance depends on the total stopping time of the machine (including the response time of the light curtain, the safety relay and the machine's own brake or valve), the approach speed of the body, and the minimum detectable object size. Determine the machine's actual measured stopping time and apply the safety distance calculation required by the standard applicable in your region. Never mount the curtain closer to the hazard than that calculated distance, and re-verify it whenever brake or clutch components are serviced or replaced.

6 Avoid direct strong light into the receiver lens.

Although ambient light immunity is rated at 10,000 Lux, do not aim the receiver directly at the sun, a skylight, a halogen or high-intensity work lamp, a welding arc, or the headlights of forklifts and AGVs. Where such sources cannot be relocated, rotate the installation, fit a shade or hood, or reverse the transmitter and receiver positions so that the receiver faces away from the source.

7

Prevent mutual interference between adjacent curtains.

When two or more light curtains are installed close together, in parallel, or facing into a shared space, one transmitter can illuminate the neighbouring receiver and mask an intrusion. Prevent this by alternating the orientation of each pair — transmitter up / receiver down on the first curtain, receiver up / transmitter down on the second — so that no two transmitters face the same direction. Specifying different sensing-distance settings for adjacent units provides a further level of separation.

8

Keep highly reflective surfaces away from the beam path.

Polished stainless panels, mirrors, bright sheet stock, glossy paint, machine tables and even oil films can reflect an infrared beam around an obstruction, allowing an intrusion to pass undetected. Maintain adequate clearance between the beam path and any reflective surface; where clearance is impossible, mask the surface with matte, dark, non-reflective material. Always verify with the test rod that no reflective bypass exists after installation.

9

Mount on a rigid, vibration-free surface.

Press frames, vibrating conveyors and unbraced sheet-metal guards can shake the curtain out of alignment, producing intermittent nuisance stops or gradual misalignment. Fix the brackets to a solid structural member, use all supplied fixings, and where vibration is unavoidable add anti-vibration mounts or additional intermediate supports on long units.

10

Do not use the light curtain as a mechanical stop, handle or step.

The aluminium profile is not a structural member. Do not lean on it, stand on it, hang tooling from it, use it to arrest moving workpieces, or allow it to be struck by material handling equipment. Where impact is possible, fit a separate mechanical protection bar in front of the curtain.

11

Route the cables correctly.

Keep the light curtain cables physically separated from motor leads, inverter output cables, welding cables and other high-energy conductors; do not run them in the same conduit or tray section. Provide a strain-relief loop at the cable outlet and secure the cable so that machine motion cannot pull, chafe or crush it. Where the cable must move, specify the shielded cable version (S20n).

12

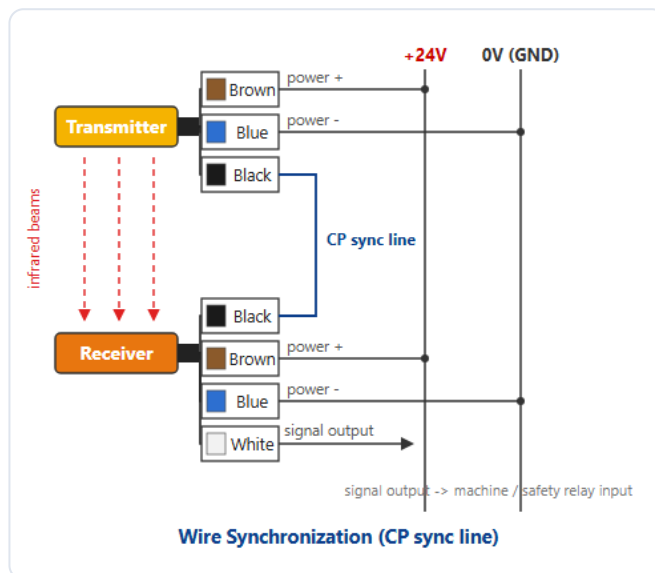
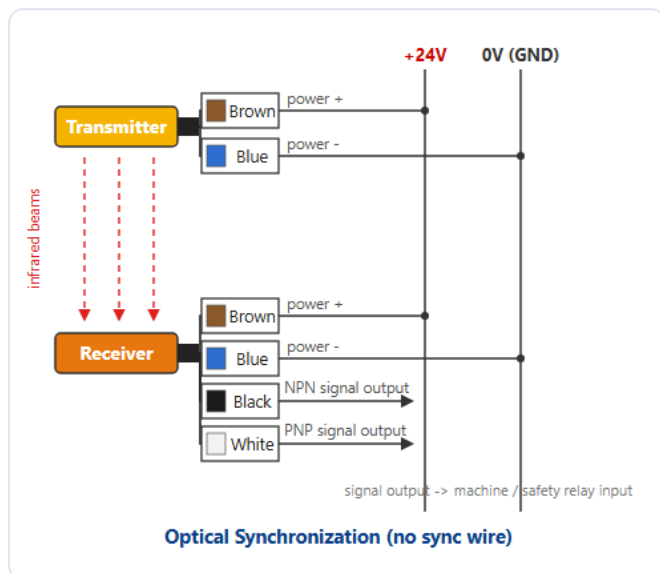
Protect the installation from process contamination.

Although the housing is IP65, heavy weld spatter, hot chips, coolant mist and adhesive overspray will progressively fog the front window and reduce signal strength. Fit a deflector or sacrificial shield in such environments and include the lens window in the routine cleaning schedule.

9. Wiring Instructions

9.1 General

Supply voltage is 24V DC $\pm$ 10 %, with total consumption of 3 to 8 W depending on beam count and length. **Always switch off and isolate the supply before connecting or disconnecting the M12 connectors.** All standard units are supplied with a factory-terminated 3 m cable on the transmitter and a 3 m cable on the receiver, each fitted with a direct M12 aviation connector, so no field termination of the curtain itself is required.



Wire colour	Transmitter (TX)	Receiver (RX)
 Brown	+24V DC	+24V DC
 Blue	0V / GND	0V / GND
 Black	CP sync line (wire-sync version only)	NPN signal output — or CP sync line on the wire-sync version
 White	—	PNP signal output — or signal output on the wire-sync version

9.2 Optical synchronisation wiring (standard)

In the default optically synchronised version the transmitter requires only power, and the receiver carries the signal outputs. Because synchronisation is carried by the light beam and not by a conductor, **no wire of any kind is run between transmitter and receiver.** This also means the two units may be fed from two entirely separate 24V DC supplies — for example from panels on opposite sides of a large machine — provided each supply is within the 24V DC $\pm$ 10 % tolerance. Bonding the 0V references of the two supplies is nevertheless recommended good practice where it is practical to do so.

9.3 Wire synchronisation wiring (option code W)

In the wire-synchronised version a dedicated CP synchronisation conductor links the two units. The CP conductors of transmitter and receiver must be connected directly to one another. In this configuration **the transmitter and receiver must share a common 24V DC supply and a common 0V reference**; separate supplies are not permitted, because the synchronisation signal requires a shared ground.

9.4 Connecting the output to the machine

Only one output type is used per installation — select it to match the machine input.

- **NPN (sinking):** connect the black output wire to the machine input terminal. The output switches the input to 0V when active. Use with input circuits that share a common +24V rail.
- **PNP (sourcing):** connect the white output wire to the machine input terminal. The output switches the input to +24V when active. Use with input circuits that share a common 0V rail.

Leave the unused output wire safely insulated and unconnected. **Do not connect both outputs simultaneously.** With NC (normally closed) logic the output is in the conducting / active state while the light field is clear, and changes state on beam interruption or loss of supply — the preferred configuration for safety circuits, because a cable break or power failure produces a machine stop rather than a false clear signal.

9.5 Circuit protection

The receiver incorporates reverse polarity protection on the supply input and short-circuit protection on the signal output. Should +24V and 0V be transposed during commissioning the unit will not be damaged; should the output be inadvertently shorted, the output stage is protected. These features guard against damage but are not a substitute for correct wiring — verify polarity and load before energising, and correct any fault condition before returning the system to service.

Integration requirement. The light curtain output must be connected to a machine control system capable of stopping the hazardous motion — typically a safety relay module, safety controller or safety PLC input, which in turn commands the machine's stop element. The output should never be relied upon as the sole means of interrupting motive power in an application whose risk assessment calls for a higher-integrity architecture.

10. Commissioning & Test

1 Pre-power checks

Confirm that the transmitter and receiver are a matched pair of the same model and beam count, that both are mechanically secure, that both cable outlets face the same direction, and that all wiring matches Section 9. Verify supply polarity with a meter before energising.

2 Power up

Apply 24V DC $\pm$ 10 % to both units. Allow a few seconds for the CPU self-check routine to complete and for the receiver to acquire optical synchronisation with the transmitter.

3 Check the indicator status

The transmitter should show a steady operating indication; the receiver a stable clear indication with no flicker and no fault annunciation. A flickering or marginal indication means the alignment or signal margin is inadequate — do not proceed until it is stable.

4 Optimise the alignment

With the field clear, slowly adjust the angle and position of each unit to find the centre of the stable zone rather than its edge. Note the range of movement over which the clear indication holds, set the units in the middle of that range, and tighten all bracket fixings. Recheck after tightening, as tightening can pull a unit out of alignment.

5 Perform the test rod check on every beam

Using an opaque test rod of the correct diameter — Φ 15 mm for 10 mm pitch, Φ 25 mm for 20 mm pitch, Φ 45 mm for 40 mm pitch — pass the rod slowly through the protected field at three positions: close to the transmitter, at the midpoint, and close to the receiver. At each position move the rod steadily from the top of the field to the bottom so that every beam is interrupted in turn. The receiver must indicate the blocked state and the output must change state at every point along the full protection height, with no gap where the rod passes undetected.

6 Verify that the machine actually stops

With the machine running under safe, controlled conditions and no personnel in the hazard zone, interrupt the field with the test rod and confirm that the hazardous motion is stopped. Repeat for each operating mode in which the light curtain is intended to be active.

7 Check for reflective bypass

Repeat the test rod pass while holding the rod close to any nearby reflective surface, table or panel. If the curtain fails to detect the rod at that location, an infrared reflection is bypassing the obstruction — mask or relocate the reflective surface and retest.

8 Check for adjacent-curtain interference

Where more than one curtain is installed nearby, power all of them and repeat the test rod check on each. If any curtain shows unstable behaviour or fails to detect, apply the alternating-orientation or differing-range-setting measures described in Section 8, and retest.

9 Verify the fault response

Simulate a fault by momentarily disconnecting the transmitter supply. With NC logic the machine must go to the stop condition. Restore the supply and confirm normal operation resumes.

10 Record and schedule routine testing

Record the commissioning results, the measured machine stopping time and the mounting distance in the machine's safety file. Thereafter perform the test rod check and the machine stop verification at the start of every shift, and after any machine maintenance, tooling change, collision or repositioning of the curtain.

11. Troubleshooting

Symptom	Possible cause	Solution
No output at all; receiver shows no indication or does not respond	Supply absent, out of tolerance or wired to the wrong pins; M12 connector not fully seated or damaged; break in the cable; wrong output wire connected to the machine input.	Measure the supply at the connector and confirm 24V DC $\pm$ 10 %; verify brown = +24V and blue = 0V on both units; reseal and lock the M12 connectors; inspect the full cable run for crushing or chafing; confirm whether the machine input is NPN or PNP and connect the black or white wire accordingly.
Output permanently in the ON / clear state; does not change when the field is blocked	Test object smaller than the rated minimum detectable object; an infrared reflection from a nearby mirror-like surface is bypassing the obstruction; TX and RX are not the same model or beam count; NO / NC logic opposite to what the circuit expects.	Use the correct test rod diameter (Φ 15 / Φ 25 / Φ 45 mm for 10 / 20 / 40 mm pitch); identify and mask, relocate or matte-finish the reflective surface and increase clearance from the beam path; confirm both units carry the same model number; check the ordering code signal character (C = NC, O = NO) against the machine schematic.
Intermittent or unstable output; occasional nuisance machine stops	Marginal alignment operating at the edge of the stable zone; mechanical vibration progressively shifting the units; contamination on the front lens window; supply voltage sagging under load; cable routed alongside inverter or welding cables.	Realign to the centre of the stable zone and retighten; move the mounting to a rigid structural member or add anti-vibration mounts and intermediate supports; clean both front windows; verify the supply holds within tolerance at full machine load; reroute the cables away from high-energy conductors or fit the shielded cable version.
Fault or alarm indication on the receiver	The CPU self-check has detected an internal fault — loss of light source synchronisation, insufficient received light intensity, emitter drive circuit error, main control circuit error, cable fault, receiver drive circuit error or CPU error.	Do not return the machine to service. Power down and check the external causes first: cable and connector integrity, supply stability, lens cleanliness, alignment, and whether both units face the same direction. Restore power and observe. If the fault persists after all external causes are eliminated, the unit has an internal failure and must be replaced — do not attempt internal repair.

Symptom	Possible cause	Solution
Short effective sensing distance; works close up but not at the installed span	Ordered sensing-distance band shorter than the actual installed separation; angular misalignment or tilt; dirty, oily, scratched or fogged lens window; airborne dust, coolant mist, smoke or steam in the beam path; separation exceeds the 7 m maximum.	Check the ordering code range digits (01 / 03 / 05 / 07) against the measured separation and replace with the correct band if undersized; realign carefully in both planes; clean both lens windows with a soft dry cloth; improve extraction or fit deflectors to keep the beam path clear; reduce the separation to within 7 m or fit a longer-range model.
Interference between adjacent light curtains	A neighbouring transmitter is illuminating this receiver and masking beam interruption; two curtains mounted in parallel or facing into a shared space with the same orientation; identical sensing-distance settings on closely spaced units.	Alternate the orientation of adjacent pairs so that no two transmitters face the same direction; specify different sensing-distance settings for neighbouring units; increase the physical separation or install an opaque divider; retest every curtain with the test rod after making the change.
Transmitter and receiver will not synchronise; receiver never reaches the clear state	One unit installed inverted, so the cable outlets face opposite directions and the scan sequences are reversed; on the wire-sync version the CP conductors are not connected or are broken; in wire-sync mode the two units are fed from separate supplies with no common 0V.	Reinstall so that both cable outlets point in the same direction; verify the black CP wire is connected TX-to-RX and is electrically continuous; in wire-sync mode feed both units from a common 24V DC supply with a shared 0V reference (only the optical-sync version supports fully separate supplies).
Machine does not stop although the receiver correctly indicates the blocked state	Output not connected to the machine's safety input, or connected to a non-safety input; safety relay or controller not correctly configured or not in the active operating mode; NO / NC logic mismatch; machine stopping element faulty.	Verify the output wiring into the safety relay, safety controller or safety PLC input; confirm the controller configuration and that the curtain is active in the selected machine operating mode; check the NO / NC logic against the input expectation; have the machine's stop element inspected and its stopping time re-measured, then re-verify the safety mounting distance.

12. Maintenance

1 Clean the front lens window regularly

Wipe both the transmitter and receiver windows with a soft, dry, lint-free cloth. For oily or greasy deposits, lightly dampen the cloth with clean water or a mild neutral detergent and dry immediately. Clean along the length of the window rather than in circles, to avoid grinding abrasive particles into the surface.

2 Never use corrosive or aggressive solvents

Do not clean the housing or window with acetone, thinner, benzene, alcohol-based cutting agents, acidic or alkaline cleaners, abrasive pads or scouring powders. These attack the optical window and the housing seals, permanently degrading both transmission and the IP65 rating. Never use compressed air containing oil or abrasive particles, and never scrape deposits off with a metal tool.

3 Set the cleaning interval by the environment

In clean assembly areas, monthly cleaning is normally sufficient. In stamping shops, moulding halls, welding cells and dusty or oily environments, clean weekly or daily as conditions require. Any gradual reduction in signal margin or the appearance of intermittent behaviour indicates the cleaning interval is too long.

4 Perform periodic functional tests

Repeat the full test rod procedure of Section 10 — all beams, three positions across the span, plus verification that the machine actually stops — before each shift, and record the result. Perform the complete commissioning sequence again at least annually, and always after any significant machine modification.

5 Check cable and connector integrity

Inspect the full cable run for chafing, crushing, cuts, heat damage, coolant ingress and strain at the outlet. Confirm that the M12 connectors are fully seated, locked, undamaged and free of moisture or corrosion. Replace any cable showing damage to the outer jacket — do not repair with tape or splices.

6 Verify alignment after any machine maintenance

Tooling changes, frame work, guard removal, forklift contact, welding repairs and any impact on the machine structure can shift the curtain out of alignment even if the mounting looks undisturbed. After any such event, check that both units are still square and opposed, confirm a stable clear indication, and repeat the test rod check before returning the machine to production.

7 Re-verify the safety mounting distance after brake or clutch service

The safety distance depends on the machine's total stopping time. Whenever brake linings, clutch components, valves or drive elements are serviced or replaced, re-measure the stopping time and confirm that the existing mounting distance remains adequate. Increase the distance if the stopping time has grown.

8 Replace, do not repair

The MQ light curtain contains no user-serviceable parts. Do not open the housing, modify the circuit, alter the optics or substitute components. Opening the unit voids both the certification and the IP65 rating. A unit that fails a functional test or shows a persistent internal fault must be replaced with an identical model.

13. Safety Notes & Cautions

WARNING — Read and observe every point below before installing or operating this product. Failure to do so may result in serious injury or death.

- **This is a safety device.** It must be selected, installed, commissioned and verified by qualified personnel who are competent in machine safety, familiar with the machine and the applicable regulations, and authorised to work on the equipment.
- **A risk assessment is mandatory.** The light curtain must be applied on the basis of a documented risk assessment for the specific machine and task, which determines whether a light curtain is an appropriate protective measure at all, and what beam pitch, protection height and mounting distance are required.
- **It must be integrated with a control system capable of stopping the hazard.** The light curtain only produces a signal; it cannot stop anything by itself. Its output must be connected to a safety relay, safety controller or safety PLC capable of reliably removing the hazardous motion, and the entire chain from curtain to stop element must be verified as a whole.
- **It does not protect against ejected or falling objects.** A light curtain detects intrusion into the protected field. It offers no protection against workpieces, tooling fragments, chips, sparks, splashes or swarf ejected from the machine, nor against objects falling from above. Fixed physical guarding must be provided in addition.
- **It does not prevent access from unprotected directions.** The curtain guards only the plane it spans. Approach from above, below, behind or around the sides must be prevented by mechanical guarding, additional curtains or other measures. Remember also that a blind zone equal to half the beam pitch exists at each end of the housing.
- **The mounting distance must account for total stopping time.** The calculation must include the light curtain response time (≤ 10 ms), the response time of the safety relay or controller, and the actual measured stopping time of the machine itself — not the manufacturer's nominal figure. Re-verify whenever the machine's stopping performance may have changed.
- **Never defeat, bypass or override the light curtain.** Do not bridge the output, disable the input in the control system, block the field with a fixed object, or otherwise circumvent the protection for convenience, setup or troubleshooting.
- **Do not modify the product.** Do not open the housing, alter the circuitry, change the optics, drill the profile, replace the cable with an unapproved type, or use non-original components. Any modification voids the TUV/CE certification, invalidates the IP65 rating and may cause the safety function to fail without warning.
- **Observe the electrical and environmental ratings.** Supply 24V DC ± 10 % only. Operate within -10 °C to $+55$ °C and 35 %RH to 85 %RH; store within -40 °C to $+70$ °C. Isolate the supply before any wiring work.
- **Verify before every shift and after every intervention.** Perform the test rod check and confirm the machine stop function before each shift, and after any maintenance, tooling change, collision or realignment. A curtain that fails any part of the test must be taken out of service immediately and the machine locked out until the fault is corrected.
- **Do not use the housing as a mechanical component.** The profile is not a stop, handle, step, guard rail or tooling support. Do not stand on it, lean on it or allow it to be struck.
- **Keep this manual with the machine.** This manual, together with the commissioning record, the measured stopping time and the calculated mounting distance, forms part of the machine's safety documentation and must remain available to operators and maintenance personnel for the life of the installation.

14. Packing List

Each MQ Series "Essence Edition" Safety Light Curtain is supplied as a complete, matched, ready-to-install set:

Qty	Item
1	Transmitter unit (TX) — 29 × 30 mm aluminium profile, factory-matched to the receiver, with a 3 m cable pre-attached and terminated in a direct M12 aviation connector
1	Receiver unit (RX) — 29 × 30 mm aluminium profile, factory-matched to the transmitter, with a 3 m cable pre-attached and terminated in a direct M12 aviation connector
1 set	Mounting brackets — top-and-bottom fixing brackets (type E, standard) or L-type side mounting brackets (type L), as specified in the ordering code, for both units
1 set	Mounting screws, washers and nuts — complete fixing kit for the supplied brackets
1	Instruction manual

Notes on delivery

- Cables are pre-attached at the factory: 3 m on the transmitter plus 3 m on the receiver, each fitted with a direct M12 aviation connector. No field termination of the light curtain is required. Non-standard cable lengths are available to order using the **Cn** suffix, and a shielded cable version using the **S20n** suffix.
- Transmitter and receiver are supplied as a matched pair and must be used together. Do not mix units from different sets or different model numbers.
- On receipt, inspect the packaging and both units for transit damage — particularly the optical windows, end caps and cable outlets — before installation. Report any damage before the units are fitted.
- Retain the original packaging for storage and transport. Store within –40 °C to +70 °C and 35 %RH to 85 %RH.

Industrial Safety Protection | Detection | Measurement | Sensing & Control Systems

For selection assistance, custom beam counts up to 256, special beam pitches, shielded cable or cross-beam versions, please contact your supplier with the required protection height, sensing distance and machine input type.