(U) Remove obstructions to the crossbeams and apply L-Volts signal to the blue wire (ACTIVATE) momentarily. The amber LED status indicator will remain 'ON' and the two green LED status indicators will turn-'ON'.

(V) Following procedure (T) and (U) for the second crossbeam.

(W) Now obstruct both crossbeams within two seconds of each other. The amber and the two green LED status indicators remain at ON-state, the red LED status indicator will turn-ON indicating the mute function of the light curtain inhibited.

(X) Obstruct the light curtain sensing field. No change in the LED status indicators should occur confirming that the mute function is operational.

If all functional tests as described above have been completed satisfactorily, the Smartscan system is functioning as intended.

6. Assemble Material and Personnel

Ensure that all the material, drawings, wiring diagrams, tools, test equipment and skilled personnel required for the installation are available. The check list suggested in (4) above will be useful.

7. Mechanical Installation

Disconnect Power from the Machine and Lock it off

1. The Smartscan transmitter and receiver columns should be mounted at each side of the area to be safeguarded, in correct orientation relative to each other (see Section 10-figure 16).

2. Secure both columns to their respective mounting assemblies. Each column requires two M6 bolts for fixing.

3. Mount both columns in the same plane relative to each other.

4. Ensure that the tops of both columns are positioned at the same height relative to each other.

5. Ensure the entry/exit windows on the columns are directly facing each other.

8. Wiring

Identify the cables required to connect the elements of the light curtain system together from the Specification Sheet. Route the cables according to the design drawings and make connection to the 'D' connector and secure the screwlocks.

Terminate the 'B' cable flying leads to the appropriate terminals in the machine control panel. If a PS5000 (SMARTSCAN Power Supply Unit) is supplied terminate the 'B' cable flying leads, and appropriate wiring for the machine control panel, to the PS5000. The 'B' cables supplied with terminal box and/or all appropriate wiring from the machine control system must be terminated into the Smartscan terminal box. To avoid the possibility of short circuits between adjacent conductors, use crimp pin connectors or insulated bootlace ferrules on each conductor. The cross sectional area of the wires in the 'B' cable is 0.22 square mm. Overall diameter of all cables is 9.8 mm.

Check that the L-terminal and the shield terminal have a secure, low impedance connection to earth (ground).

Check that the voltage selector of the PS5000, if used, is correctly set for the supply voltage.

Ensure that all wiring is secured and supported and no wiring can cause a trip hazard or become caught by the machine or material being processed. Refit trunking covers, access covers, etc which were removed to facilitate the wiring.

9. Light Curtain Check-out

(a) Disconnect the Machine Prime Mover to ensure that no hazardous motion can occur when the machine is re-energised.

(b) Complete the checks and the installation log sheet (Appendix C).

(c) Re-check that the machine prime mover is disconnected.

(d) Reconnect Machine Power. Carry out the tests and complete the log sheet in Appendix C.

(e) Additionally, for self-muting light curtains only check alignment of the crossbeams. The mute initiating sensors are pre-aligned prior to despatch from the factory. However, when installed, limited adjustment of the sensors may be required.

To adjust the position of each mute initiating sensor it is necessary to remove the end caps from the horizontal arms of the light curtain.

Undo the four retaining screws which secure each end-cap to the aluminium extrusion and slide out the plastic window.

Loosen the locking screw securing the sensor mounting plate to the steel section inside the extrusion.

Slide the sensor mounting plate along the steel section until the sensor's optimum position is found.

When setting-up the crossbeam sensors at an INFEED zone ensure the cross-over point of the infra-red beams is INSIDE the detection field of the light curtain - see Figure 29.

Following alignment of the sensors ensure that each sensor mounting plate is securely locked to its corresponding steel section. Replace the plastic windows and secure the end caps to the aluminium extrusion.

Note: Never remove the end caps from the 'vertical' extruded sections housing the main light curtain transmitter and receiver assemblies.

10. External Equipment Check-out

(a) Disconnect and then re-apply power to the light curtain. The light curtain will now be in the lock-out condition.

Note: If the machine control system takes the light curtain through the start-up sequence, these circuits should be disabled.

(b) Check that the SSD output is open circuit, the MSCE is open circuit and that power is not available to the machine prime mover circuit.

(c) Check that the MPCE's is/are de-energised.

(d) Go through the start up sequence, ensuring the light curtain is clear and muting is off. Check that the SSD goes on, enabling power to the prime mover and that the MPCE(s) go on.

Interrupt the curtain and check that the MPCE(s) go off. Remove the obstruction and that that the MPCE(s) go on (auto restart mode) or go on following a restart (latched output mode).

(e) **ISOLATE THE MACHINE** Introduce a stuck-on fault into one MPCE. Reconnect power to the machine and repeat test (d) above. Check that following interruption of the curtain, the light curtain goes to lock-out and that the machine could not continue in operation with such a fault. **ISOLATE THE MACHINE AND REMOVE THE FAULT.**

(f) Repeat Test (e) for each MPCE fitted in the machine control system.

(g) **CHECK THAT THE MACHINE IS ISOLATED, THEN RECONNECT THE PRIME MOVER.**

(h) Refit access covers and lock closed control panel doors which had to be open for the above testing.

(i) Examine the brakes, clutches, pneumatic and hydraulic equipment associated with the safety related functions of the machine and ensure they are operating correctly as intended and within the design limits.

(j) Ensure the machine is returned to the normal use condition.

11. Final Inspection and System Functional Tests

Reconnect power to the machine.

Commissioning should be carried out by a person who is competent and who possesses all the information both machine and photo-electric safety system suppliers should provide.

The results of the examination should be recorded and copies of this record kept by the user and the suppliers of the machine and safety equipment.

The person carrying out the examination should ensure the general standard of performance is achieved:

(a) it should not be possible for the dangerous parts of the machine to be set in motion while any part of a person is in such a position as to actuate the photo-electric light-curtain,

(b) actuation of the photo-electric light curtain during a dangerous phase of the operating cycle should result in the dangerous parts being brought to a rest or, where appropriate, assume an otherwise safe condition before any part of any person can reach them. It should not be possible for the dangerous parts to be set in motion again until the safety system has been completely restored to its normal condition and the machine control re-operated;

SMARTSCAN 5000 SERIES LIGHT CURTAINS

12. FUNCTIONAL TESTING AND MAINTENANCE

DAILY TEST

The test sequence below must be undertaken at least every 24 hrs for BS6491 installations and as frequently as indicated by the risk assessment for other installations. Smartscan Limited recommends daily testing for point of operation machine guards and weekly testing for low risk perimeter guard applications.

Check:

TEST PROCEDURE 1

Models having a test piece with size equal to the object detection capability or not smaller than 2mm less than the detection capability:

1. Remove power from the light curtain for a minimum period of 10 seconds.

2. Place an obstruction in the light curtain which blocks at least one beam.

3. Restore power to the light curtain. The equipment will fail self test and go into a safe state with all the outputs and status indicators off.

4. Remove the obstruction. All status indicators should remain off and all the diagnostic red LEDs in the transmitter unit should run at on at low brightness.

5. Insert the test piece into the detection zone and receiver units about 150mm (6 inches) from the transmitter. Sweep the test piece up the transmitter side, down the centre and up the receiver side of the detection zone. Check that one diagnostic LED only is brightly lit and the others are all off at all the positions of the test piece within the detection zone. Remove the test piece.

6. Put the light curtain into its normal protective condition. (The sequence for this will depend upon the model and the interface to the machine). Check that all diagnostic LEDs are on at low brightness.

   Obstruct any beam in the light curtain using the test piece. Check that the machine cannot start hazardous motion.

7. Remove the test piece. Restart the light curtain and / or reset the machine if required. Start the machine and produce hazardous motion. Introduce the test piece into the detection zone such that any beam is obstructed. Check that hazardous motion stops without apparent delay.

   If any test is failed, isolate and lock off the machine. Arrange for specialist servicing.

TEST PROCEDURE 2

Models having a test piece at least 20mm smaller than the object detection capability:

1. Remove power from the light curtain for a minimum period of 10 seconds.

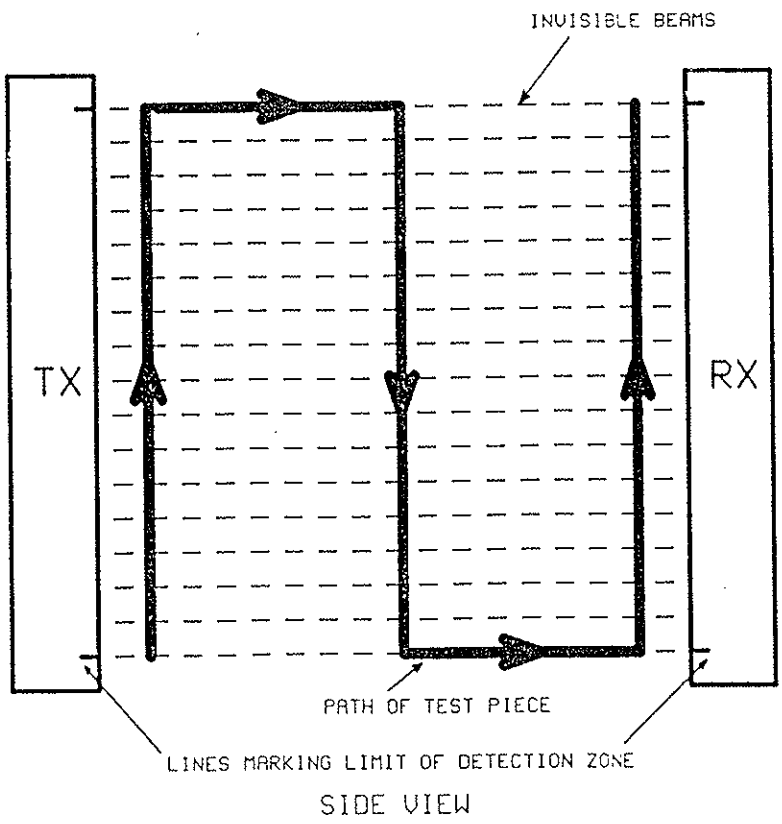
2. Place an obstruction in the light curtain, which blocks at least one beam.

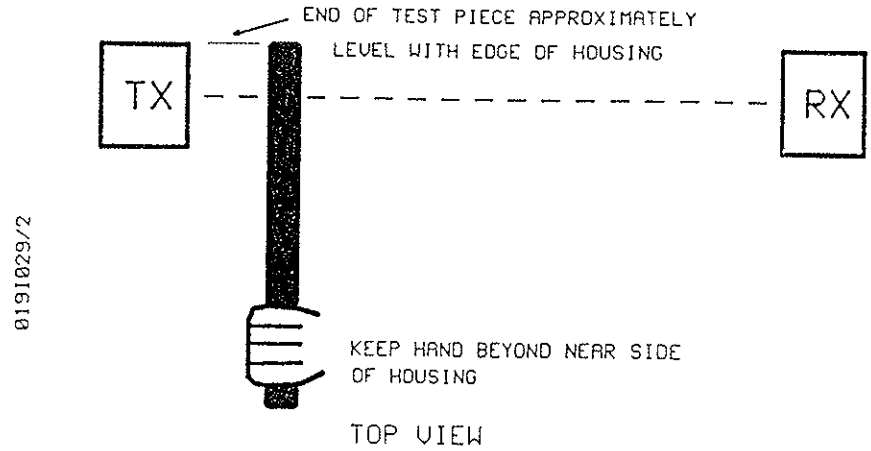
3. Restore power to the light curtain. The equipment will fail self test and go into a safe state with all the outputs and status indicators off.

4. Remove the obstruction. All status indicators should remain off and all the diagnostic red LEDs in the transmitter unit should run at low brightness.

5. Insert the test piece into the detection zone and sweep it slowly along the path shown in Figure 32. On obstructing each beam the corresponding red diagnostic LED illuminates brightly and all the others go off. During this procedure and as a result of the test piece being smaller than the object detection capability, the light curtain will revert to "all diagnostic LED's low" while the test piece is between beams.

Figure 32





TESTING LIGHT CURTAIN WITH TEST PIECE

6. Put the light curtain into its normal protective condition. (The sequence for this will depend upon the model and the interface to the machine). Check that all diagnostic LEDs are on at low brightness.

   Obstruct any beam in the light curtain using the test piece. Check that the machine cannot start hazardous motion.

7. Remove the test piece. Restart the light curtain and / or reset the machine if required. Start the machine and produce hazardous motion. Introduce the test piece into the detection zone such that any beam is obstructed. Check that hazardous motion stops without apparent delay.

   If any test is failed, isolate and lock off the machine. Arrange for specialist servicing.

PERIODIC TEST

These tests must be carried out at a maximum of six monthly intervals for BS6491 installations, and at regular intervals as indicated by the risk assessment on the other installations. Smartscan Limited recommends six monthly testing on medium/high risk machine point of operation guards and annual testing on other installations.

Inspection and tests must be undertaken by a competent person, familiar with light curtain guarding, machinery control systems and the statutory requirements, standards and codes of practice applicable to such installations.

1. It should not be possible for the dangerous parts of the machine to be set in motion while any part of a person is in a position to obstruct any of the beams within the light-curtain.

2. Actuation of any of the beams within the light-curtain during a dangerous phase of the operation should result in the dangerous parts being arrested or, where appropriate, assume a safe condition before any part of any person can reach them. It should not be possible for

the dangerous parts to be set in motion again until the photo-electric safety system has been completely restored to its normal condition and the machine's controls re-operated.

3. Confirm the machine stopping performance is acceptable in relation to the separation distance between the dangerous moving parts and the light-curtain.

4. Check for correct operation of the secondary switching device (SSD) and machine secondary control element (MSCE) as specified by the manufacturer.

5. Ensure examination of the machine's primary control elements is carried out to ensure they are functioning correctly and determine whether they require replacement.

6. A thorough inspection of the machine should be carried out to ensure that there are no other mechanical or structural aspects which would prevent it from stopping or assuming an otherwise safe condition when called upon by the photo-electric safety system to do so.

7. Examination of the machine's controls and connections to the light curtain must be carried out to ensure that no modification has been made which may adversely affect the safety system.

ROUTINE MAINTENANCE

No routine maintenance is required beyond periodic cleaning of the bezels through which the beams pass. These bezels (windows) should be cleaned with a soft clean damp cloth using a mild detergent only. Abrasive or corrosive cleaners must not be used. The frequency of cleaning depends entirely on the operating conditions. Dirt build up will eventually lead to a false blocked condition of the light curtain, which although safe, will prevent use of the machinery.

LAMP REPLACEMENT

The incandescent lamps used for condition indicator (blue) on AP light curtains may fail after an extended service period. Lamp replacement is straightforward.

Unscrew the coloured bezel, remove the defective lamp, fit the replacement and screw on the bezel, finger tight. The replacement lamp must be of identical specification to the original:

Standard AP - 28V - T1.3/4 - 6mm miniature flange 28V 40mA
AP L and T Systems - 14V - T1/3/4 - 6mm miniature flange 14V 50mA

These items may be ordered from Smartscan Ltd.

REPAIRS

Repair of 5000 Series light curtains must not be undertaken by persons other than Smartscan Limited and its appointed service agents. User repairs are by unit replacement. The end covers of the main curtain transmitter and receiver units and the remote control units must never be removed. The end covers of the horizontal parts of T and L model curtains may only be removed for alignment of the cross beams as described in Section 8. The following fault finding guide will allow most installation problems to be rectified.

SMARTSCAN 5000 SERIES LIGHT CURTAINS

FAULT FINDING

If the Smartscan equipment fails to operate correctly following pre-installation tests, as described in section 8, then refer to the fault finding chart below.

For 5000 Light Curtains - (Non-AP)

Problem	Possible Reason	Corrective Action
No diagnostic LED's illuminated after equipment turned ON	24V Power Supply	Check Power Supply is operating Red +24V Black 0V
	B Cable fault	Check continuity of 'B' cable. There is a fuse in the connector on the cable side. This is on Pin 1 of the plug
Only one red diagnostic LED is illuminated after power turned ON.	Alignment	Check the transmitters and receivers are properly aligned.
	Range	Check the equipment has the correct range cable for the operating distance
	Obstruction	There must be a clear path between the transmitters and receivers. The beams are sited very close to the ends of the units. Make sure these are clear.
	Low voltage	Check the power supply is 24V. Be suspicious of voltages which are more than 1 Volt out.
	'A' cable fault	Check the plug is installed correctly. Check continuity (pin to pin).
	Optical interference	Check that no xenon lights, focused quartz lights or direct sunlight falls on receivers.
All diagnostic LED's ON but no amber status LED	Failed self-test	Check range of light curtain within the specification of cable A.
		Check 'mute' signal present. If not in use the wires must be terminated to prevent accidental connection to other wires or ground.
		Check the transmitters and receivers are properly aligned.

Amber status LED goes out during initial light curtain set up.	Failed manual test or start test.	The beams must be interrupted or the restart activated for at least two seconds.
Guard stops on Beam 1 after testing	Restart interlock not connected to L-Volts.	If the restart interlock is not used the red/blue wire must be connected to L-Volts.
Guard goes to lock-out when tripped (should go to restart)	SMM not working correctly.	The SMM must close within <40ms seconds of the trip occurring. This may be a timing problem in the user SMM circuit.

Fault Find Guide for AP Models

The AP model guards have a microprocessor controller interface which performs the start sequence for the 5000 series guard. The microprocessor also adds additional mute functions and has a condition lamp. The fault finding procedures for the standard 5000 unit therefore apply. Also, if the condition lamp is flashing refer to section 8 to determine the fault code. If the condition lamp has failed the guard cannot be restarted. There is a lamp test procedure detailed on Page 12.4.

Additional Fault Diagnostics for AP Models

Problem	Possible Reason	Corrective Action
All diagnostic LEDs 'on' but no blinking amber status LED	Failed initial start-up test.	Remove any signal applied to external mutes. Check connection ground (earth) connection. L-Volts must be grounded (earthed). Check light curtain within specified range. Check alignment of L.C.
Continuous amber LED status indicator flashing but no start-up.	No 'Activate' function of light curtain.	Check for any mute signals - remove mute signals. lamp fused - replace. Apply L-Volts momentarily to blue wire to obsolete any switch faults.
Guard Stops on diagnostic LED beam 1 after testing.	Interlock	Check no signals to mutes (may be jammed mute), lamp blown - replace.
Amber status LED goes "off" after testing SMM (lock-out).	Failed SMM	Bypass SMM to verify operation, link wires green to green/red - user cable "B".
Intermittent guard tripping. PLC connected to SMM input	Incorrect SMM	When the SMM is employed with a PLC output signal should be inverted and connected directly to SMM in. If more than one guard is connected to the PLC then separate I/O should be used for each guard.

If the procedures above have failed to rectify the problem, please complete the questionnaire below and phone or fax Smartscan Limited for further assistance.

SMARTSCAN 5000 SERIES LIGHT CURTAINS

TECHNICAL ADVICE QUESTIONNAIRE

Fax to:

SMARTSCAN Limited
Pywell Road
Willowbrook Industrial Estate
Corby
Northants NN17 1XJ
England

Fax: 44 (0) 1536 268954
Phone: 44 (0) 1536 401313

Fax from:

Name _____

Company _____

Country _____

Smartscan Model Number _____

Serial Number of faulty unit _____

Supplier of unit _____

Date unit commissioned on site _____

Do you have an instruction manual? _____

Have you carried out the fault finding routine? _____

Is the guard completely "dead" (no LEDs "on")? _____

If some LEDs are on, which ones? _____

Is the guard operating at its correct range? _____

Has the guard been tried with all wires from the guard disconnected except the power supply (red wire and black wire)?

_____

If the guard operates, then fails, repeat the start-up sequence and record the exact status of all LEDs as the fault occurs:

_____

_____

_____

13. DECOMMISSIONING

REMOVAL FROM THE MACHINE

Isolate and lock off the power to the machine. Disconnect the wiring and remove the light curtain from the mountings by reversing the installation procedure given in Section 11. Ensure that the machine cannot be operated without guarding, either by installing a replacement light curtain or by disconnecting the power supply to the machine completely and fixing appropriate warning notices.

DISPOSAL

Smartscan 5000 series light curtains do not contain any hazardous substances and need no special treatment as waste. Smartscan Ltd recommends that at least the aluminium extrusions are recovered for recycling.

14. WARNINGS AND CAUTIONS

It is necessary to ensure that the Smartscan / machine electrical and mechanical interface meets the levels of performance demanded by the relevant safety Authorities and is in-line with specific standards relating to such equipment. The circuits should be designed so as not to endanger operator safety or cause damage to machinery.

NOTE: Emphasis is placed on a specific requirement, detailed in British Standard BS6491, for full consultation between the supplier and installer of the Smartscan equipment, to determine suitability of electrical interface between the safety system and machine control to ensure the installation as a whole performs with a high degree of reliability and integrity.

Certain categories of machinery require complex electrical monitoring systems. In these cases it is strongly advised that installation of the Smartscan system be undertaken only by personnel qualified to undertake such installations.

Light curtains should not be used in the following instances:

- to safeguard a mechanical power press fitted with a key clutch for engagement of the drive mechanism such that once started the machine can only be stopped when the cycle is complete.

- on a multi-station process where stopping between stations would create production problems

- where there is potential danger from stored energy in the form of pressure in pneumatic reservoirs or hydraulic accumulators.

- a machine with inconsistent or inadequate machine response time or stopping performance characteristics, i.e. poor brake design or slow reaction times of the machinery control circuitry, whether electrical, pneumatic or hydraulic.

- if there is a risk of injury from thermal or other radiation.

- on a machine with very high noise levels, in cases where it would be necessary to totally enclose the machine inside an acoustic enclosure.

- on a machine which is subject to violent vibration.

If the machinery relies on a brake to stop dangerous motion a stopping performance monitor (SPM) should be fitted.

The light-curtain must be mounted in a position that does not expose an operator to risk of injury from inadequate separation distance - see Section 10.

The mounting position of the light-curtain, in relation to any reflective surfaces, or workpieces, must be taken into account during installation.

Ensure operation of equipment is within the ranges specified.

Do not operate the machine unless all covers and doors are closed and secured.

Smartscan internal power supplies must not be used for connection to any other equipment.

Never apply voltages to the sensing units in excess of 24V DC. If 110/230VAC operation is required then an additional power supply module can be supplied. Any external power supply used with Smartscan equipment must meet the specification described in Section 6.

The L- line must be connected to GROUND (EARTH).

Activation of all input functions to the Smartscan control system is by connection of the L- Volts to the appropriate signal input connection. NEVER CONNECT SIGNAL INPUTS TO A POWER SOURCE as such action may damage the Smartscan electronic circuitry.

When operating in conjunction with a muting function the Smartscan system does not necessarily satisfy all the requirements of British Standard BS6491. Refer to sub-section 3.14 of BS6491 for further information.

Output signal switching contacts from the Smartscan equipment are of fail-safe design. The remaining safety related parts of the associated machine control system must provide a similar level of integrity.

All AC and DC loads should be suitably suppressed. For example, DC loads may employ a diode suppressor and AC loads an RC type suppressor.

Operator controls e.g. start/ restart interlocks should be suitably mounted. They must be positioned in order to prevent a person from operating the controls while standing inside the safeguarded area.

Smartscan equipment is unsuitable for use in potentially explosive atmospheres.

Ensure the START INTERLOCK control device is key operated.

All keys provided with the Smartscan system should be kept under strict control of a responsible or authorised person(s).

Following installation or modification to the equipment and prior to operation of the machinery, ensure all tests as indicated in Section 12 are undertaken.

The Smartscan equipment has no user serviceable parts and therefore no attempt should be made to remove the aluminium extruded housings from either the transmitter or receiver units.

CAUTION

If the User intends to use other infra-red devices having modulated beams in the vicinity of the sensing units, it should be determined that the devices produce no adverse affect on the function of the safety related system.

Terminology used in this manual is in line with that specified in European Standard prEN61496. To aid cross-reference with terminology contained in British Standard BS6491 the Glossary at the rear of this manual identifies differences in terminology between the two documents. The terminology appropriate to BS6491 is contained within parentheses following the prEN61496 terminology.

APPENDICES

A. GLOSSARY OF TERMS

B. BIBLIOGRAPHY

C. INSTALLATION CHECK LIST

D. INSPECTION RECORD

APPENDIX Ai

GLOSSARY OF TERMS

Automatic Check Internal: The maximum time between the completion of successive automatic or inherent checks that are made to ensure that the sensing unit and the control/monitoring unit are in normal operation.

Control/Monitoring Function: (Safety system control unit) : The part of the electro-sensitive protective equipment (ESPE) which:

- receives/processes information from the sensing function and provides signals to the output signal switching devices (OSSD), and;
- monitors the sensing function and the OSSDs.

Defined Signal Range: The sensing function parameter limit specified by the manufacturer.

Detection Zone: (Defined area) The zone within which a specified test piece will be detected by the electro-sensitive protective equipment (ESPE).

Electro-Sensitive Protective Equipment (ESPE): (Electro-sensitive safety system : ESSS). An assembly of devices and/or components working together for protective tripping or presence sensing purposes and comprising as a minimum:

- a sensing function
- a control/monitoring function
- output signal switching devices

Failure to Danger: A failure which prevents or delays all output signal switching devices going to and/or remaining in the OFF-state in response to a condition which, in normal operation, would result in their so doing.

Final Switching Device: The component which, when the sensing function or safety monitoring means is actuated responds by interrupting the circuit connecting the machine control system to the machine primary control element.

Lock out Condition: A condition preventing normal operation of the electro-sensitive protective equipment (ESPE) which is automatically attained when all output signal switching devices (OSSDs) and where applicable final switching devices(FSDs) and secondary switching devices (SSDs) are signalled to go to the OFF-state and, at least one OSSD is in the OFF-state.

Machine Primary Control Element (MPCE): The electrically powered element that directly controls the machines normal operating motion in such a way that it is the last element (in time) to operate when motion is to be initiated or arrested.

Machine Secondary Control Element (MSCE): A machine control element, independent of the machine primary control element(s), that is capable of removing the source of power from the prime mover of the relevant hazardous parts. Note: when fitted the MSCE is normally controlled by the secondary switching device.

Muting: A temporary automatic suspension of a safety function(s) by a safety related control system during normal operation of the machine.

Normal Operation: Operation of the electro-sensitive protective equipment (ESPE) in accordance with the manufacturers specification.

Off-State: The state in which the output circuit is broken and interrupts the flow of current.

On State: The state in which the output circuit is complete and permits the flow of current.

Output Signal Switching Devices (OSSD): The components of the electro-sensitive protective equipment (ESPE) which, when the sensing function or safety monitoring means are actuated, responds by going to the OFF-state.

Overall Stopping Performance: The time or travel occurring from the actuation of the sensing function to the cessation of hazardous motion, or to the machine assuming a safe condition.

Positively Guided Contacts: An arrangement of the contacts of a relay or a contactor whereby mechanical interlocking ensures that, when a contact is welded, complementary contacts on all poles cannot go to a closed position.

Response Time: The maximum time between the actuation of the sensing function and the output signal switching devices (OSSDs) being in the OFF-state.

Responsible Person: A person who has such practical and theoretical knowledge and actual experience of the type of machinery or plant which he has to examine as will enable him to detect defects or weaknesses which it is the purpose of the examination to discover; and to assess their importance in relation to the strength and functions of the particular machinery or plant.

Restart Interlock: A means for preventing automatic restarting of a machine after actuation of the sensing functions during a hazardous part of the machine operating cycle, or after a change in mode of the machine or mode of start of the machine.

Note: Modes of operation include inch, single stroke, automatic. Modes of actuation include foot switch, two hand control, single or double actuation of the ESPE sensing function.

Safety Monitoring Means (SMM): A device for generating signals to the safety related control system of the electro-sensitive protective equipment (ESPE) to provide information on the status of the machine primary control element (MPCEs) final switching devices (FSDs) secondary switching device (SSD) and stopping performance monitor.

Safety Relay: A relay using positively guided contacts which can be monitored.

AP Models: 5000 series light curtains having 'AP' in the Model Number and having an AP interface. APL and APT models are self muting. (See T, and L models).

T and L Models: 5000 Series light curtains with self muting by means of cross beams. The profile of the transmitter and receiver heads corresponds to the shape of the letter.

Safety Related Control System: A system or sub-system or device which responds to input signals from the equipment under control and/or from an operator, and generates safety related output signals causing the equipment under control to operate in a desired manner. The safety-related control system starts at the points where the safety-related signals are initiated and ends at the points where the safety-related output signals are available.

Safety Related Interface: The interface which, together with the electro-sensitive protective equipment (ESPE) provides a complete safety related control system. It receives signals from the ESPE and monitors the correct operation of the final switching devices (FSDs) and machine primary control elements (MPCEs).

Note: It may also receive signals from the machine control system and/or the operator.

Safety System Response Time: The maximum time between insertion of the test piece into the defined area and the output of a signal from the final switching devices.

Secondary Switching Device: The component of the electro-sensitive protective equipment (ESPE) which, in a lock-out condition, interrupts the circuit connecting it to the machine secondary control element.

SensingUnit: - That part of the electro-sensitive protective equipment (ESPE) which uses electro-sensitive means to determine the event or state that the ESPE is intended to detect, eg in an opto-electronic device the sensing function would detect an opaque object entering the detection zone.

Sensing Unit Detection Capability: (Detection capability) - The minimum size of test piece of specified type stipulated by the manufacturer which, when introduced into any part of the defined area, will cause actuation of the sensing unit.

Start Interlock: A means which causes the electro-sensitive protective equipment (ESPE) to go to a lock-out condition when the ESPE electrical supply is switched on, or is interrupted and restored.

Start Test: A manual test which is performed after the electro-sensitive protective equipment (ESPE) has been switched on in order to test its complete safety-related control system before the first machine operation is initiated.

Stopping Performance Monitor (SPM): a type of safety monitoring means which is designed to be applied to a machine to determine whether or not the overall system stopping performance is within pre-set limit(s).

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24. EN 50081-1 : 1992 Electromagnetic Compatibility - Generic emission standard. Part 1 : Residential, commercial and light industry.

25. EN 50081-2 : 1992 Electromagnetic Compatibility - Generic Immunity Standard. Part 2 : Residential, commercial and light industry .

26. pr EN 61496-1 Safety of Machinery - Electro-sensitive protective devices - Part 1 : Specification for general requirements

27. pr EN 61496-2 Safety of Machinery - Electro-sensitive protective devices Part 2 : Particular requirements for active opto-electronic protective devices.

28. EN 55022 : 1987 Limits and methods of measurement of radio interference characteristics of information technology equipment.

29. EN 60204-1 Electrical equipment of machines Part 1 : General Requirements.

30. EN 60445 : 1990 Identification of equipment terminals and of terminations of certain designated conductors; including general rules for an alpha-numeric system.

31. EN 60529 : 1991 Specification for degrees of protection provided by enclosures (IP code).

32. EN 60742 : 1989 Isolating transformers and safety isolating transformers.

33. H.S.E. Guidance Note PM 41 : The application of photo-electric safety systems to machinery.

34. ENV 1070 Terminology

A number of the European Standards (ENs), listed above, are not yet published. To obtain information regarding the expected publication dates of these standards contact:

British Standards Institution
389 Chiswick High Road
London W1

Tel: +44 (0) 181 996 7000

INSTALLATION CHECK LIST

APPENDIX C i

INITIAL CHECKS BEFORE APPLYING POWER

	INITIAL WHEN CHECKED
CHECK FOR SHIPPING DAMAGE	_____
ALL INSTALLATION BOLTS TIGHT	_____
ALL PLUGS SEATED AND RETAINED	_____
NAMEPLATE VOLTAGE CORRECT	_____
DC POWER FEED FUSE/BREAKER OK (1 AMP)	_____
LIGHT CURTAIN LOCATED ACCORDING TO DRAWINGS	_____
OTHER DEVICES LOCATED OK	_____
ALL ELECTRICAL SCREW CONNECTIONS TIGHT	_____
ALL INSTALLATION WIRING FIXED	_____
CHECK SMARTSCAN/MACHINE INTERFACE	_____

SMARTSCAN 5000 SERIES LIGHT CURTAINS

INSTALLATION CHECK LIST

APPENDIX C ii

CHECKS AFTER APPLYING POWER

	INITIAL WHEN CHECKED
RECORD INCOMING SUPPLY VOLTAGE	_____
CHECK ALL IR BEAMS ARE 'ON' (DIAGNOSTIC LEDS 'ON' AT LOW BRIGHTNESS)	_____
CHECK SELF-TEST - CHECK AMBER LED IS 'ON'	_____
VIBRATION TEST ALL WIRING	_____
CHECK MUTE FUNCTION IS OPERATING	_____
CHECK SENSING UNIT DETECTION CAPABILITY	_____

INSPECTION RECORD **APPENDIX Di**

USER INSPECTION RECORD - SHEET 1

Date	Engineer	Comments

Date	Engineer	Comments

INSPECTION RECORD

APPENDIX Dii

USER INSPECTION RECORD - SHEET 2

Date	Engineer	Comments

Date	Engineer	Comments