Product Data

Electrical Data

		SST (Transmitter)	SSR (Receiver)
Supply voltage		18 – 30 V dc	
Max. Voltage ripple		15 % (within supply range)	
Current consumption		100 mA (RMS)	75 mA
Max. outputs load	Digital	-	100 mA
	Analogue	-	Voltage: $Z_{load} \geq 1k\Omega$ Current: $Z_{load} \leq 600\Omega$
Reverse polarity protected		Yes	
Short circuit protected		Yes	
Inductive load protection		-	Yes

Environmental Data

Light immunity @5º incidence	> 100.000 lux
Temperature, operation	-30 to + 60 ºC
Sealing class	IP 67
Marking	CE

Available Models

	Model	Beam spacing	Sensing Range
Transmitter	SST 02-10-xxx-xxx-05-H-1D1-0.5-J5	5 mm	10 m
	SST 02-10-xxx-xxx-10-H-1D1-0.5-J5	10 mm	
	SST 02-10-xxx-xxx-20-H-1D1-0.5-J5	20 mm	
	SST 02-10-xxx-xxx-40-H-1D1-0.5-J5	40 mm	
Receiver	SSR 02-10-xxx-xxx-05-H-UUK-ZZW--0.5-J12	5 mm	0.5 m – 10 m
	SSR 02-10-xxx-xxx-10-H-UUK-ZZW--0.5-J12	10 mm	
	SSR 02-10-xxx-xxx-20-H-UUK-ZZW--0.5-J12	20 mm	
	SSR 02-10-xxx-xxx-40-H-UUK-ZZW--0.5-J12	40 mm	

Connection

Wiring Diagrams

SST 5 pole M12 male connector

SSR 12 pole M12 male connector

Transmitter Model	Black wire connected to (-)	Black wire not connected	Black wire connected to (+)
SST 02-10-xxx-xxx-xx-H-1D1-0.5-J5	not transmitting	transmitting	transmitting

Wiring diagram

UUK-ZZW	Pin 5 Pink	Pin 6 Yellow	Pin 7 Black	Pin 8 Green	Pin 9 Red	Pin 10 Violet
AC2 - DN2	Dig. NPN Out 2	Dig. Input 1	Analog Out +	Analog Out -	-	Dig. NPN Out 1
AC2 - DP2	Dig. PNP Out 2	Dig. Input 1	Analog Out +	Analog Out -	-	Dig. PNP Out 1
ANN - DN4	Dig. NPN Out 2	-	-	Dig. NPN Out 3	Dig. NPN Out 4	Dig. NPN Out 1
ANN - DP4	Dig. PNP Out 2	-	-	Dig. PNP Out 3	Dig. PPN Out 4	Dig. PNP Out 1

" - " = Not used

Type name: SSR 02-10-xxx-xxx-xx-H-**UUK-ZZW**--0.5-J8.
The letters **UUK-ZZW** determine the output configuration of the SSR 02.

Output configurations

Installation & Adjustments

Installation

The light curtain is configured by the PC program 'Telco Space Scan Terminal', described in the following pages. Before using it, check the power supply complies with electrical data.

1	Mount the transmitter (SST) and receiver (SSR) facing each other and correctly aligned.
2	Wire the sensor according to the wiring diagram. Notice that the pin 2 on the SSR and the pin 3 on SST (blue wires) must be connected together to a common GND (–). Make sure the SSR output load does not exceed 100 mA.
3	Check for correct wiring before turning power on.
4	When the power on indicator (green LED) on SSR and SST is on, the system is operating.
5	The position of the receiver and transmitter must not be changed after power-up. The light curtain is only intended for static applications.

SST Test Input

The transmitter SST can be externally disabled and enabled via the black control wire for test purposes. When the transmitter is disabled the action of the receiver corresponds to breaking all beams.

SSR Digital Input 1

The digital input can be used to switch between two different output readings on the analogue output.
The time from a transition on the digital input to a transition on the analogue output is dependent on the number of beams.
The maximum transition time can be calculated as 500us + the number of beams multiplied by 15us.
Using cross beam scan mode will double the number of beams.
While communication on the RS485 in ongoing, the transition time will be considerably longer.

Indicators

SSR	Red LED	Status indicator
SSR	Yellow LED	Follows state of Digital Output 1
SSR & SST	Green LED	Power on indicator

Troubleshooting

Probable Reason	Corrective Action
1. Symptom: Status indicator (Red LED) on SSR is constant on.	
SST has no power.	Check supply and supply cable to the SST
SST & SSR white, grey and blue wires are not connected correctly.	Connect the wires.
2. Symptom: Output indicator (Yellow LED) on SSR is flashing.	
Severe electrical interference.	Separate SSR and SST supply cable from high voltage cables.
Severe ambient light.	Swap position of SSR and SST.
Cross talk from another light curtain or photo sensor	Swap position of SSR and SST.
Cross talk from a nearby HF strip light	Swap position of SSR and SST or remove the strip light.
3. Symptom: Digital outputs do not response when IR beams are obstructed.	
One or more beams are blocked or the rails are out of sensing range.	Remove obstruction or reduce the distance between the rails.
The test input on SST is activated	Remove SST pin 4 (black wire) from ground.
Outputs are not configured for simple detection of obstructions	If needed factory reset the SSR using the System Information page in the PC program 'Telco Space Scan Terminal'

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Made in Denmark

Warning
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SSR02 and PC connection

To setup or adjust a SS02 it is required to use the Telco Space Scan Terminal software together with an RS485 data link.

1. Start by selecting the **RS485 Serial Port and Modbus Set Up** and select the correct port to communicate with the SS02. If the port number is not known it is possible to press the **Get Com Port Information**. This will list all COM Ports used by the PC. (Full Com port details in Win7, WinXP only basic details are shown). The **RS485 BUS ADDRESS** is default 127, but address can be changed in the menu Function -> System Information.

2. Next press **Connect** and wait a few seconds before the connection is active.

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File menu

RS485 Serial Port and Modbus Setup:
See SSR02 and PC connection.

Search for Telco light curtains on a Modbus.
Used for finding and identifying the Modbus address(es) of one or more light curtains on the Modbus. For more info see below.

Connect
See SSR02 and PC connection.

Load configuration
Used to load a file that will configure all functions of the light curtain in one go. The information is stored in a previously saved configuration file in ASCII format.

Save configuration
Saves information about the current configuration of the light curtain.

Colour Preference
It is possible to set up to 7 different colours for the beams on the screen.

Exit
Exit and close the program.

Language
Language selection.

File -> Search for Telco Light curtain on a Modbus

Use this function to find the **Modbus Address(es)** of Telco Light curtains on a Modbus, if the address(es) are unknown.

Functions menu

Overview:
For configuration of outputs and measurement functions and for reading output states.

System Information:
For basic system information and configuration of Modbus address.

Status Messages:
Status messages are logged and displayed by choosing this menu item.
Each functions associated with each of these menu items will be described in detail the following.

Functions -> Overview -> General Setup tab

General Setup:
Right side shows the light curtain and the beam pattern. Unbroken or made beams are indicated by green and broken beams by red. The light curtain is in the setup oriented with the cable entry in the bottom.

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Scan Mode. Parallel or Cross beam selection.
On cross beam mode, the number of actual beams are increased from N straight beams to (3*N)-2 beams giving a more dense beam pattern, with larger detection certainty.
If objects are positioned in the centre, or close to the centre, between transmitter and receiver the measurement resolution is increased to the double, i.e. the crossed beam mode adds an additional virtual beam between each of the straight beams, in total N-1 extra virtual beams. When crossed beam mode is selected the number of beams is increased to (2*N)-1 in total, which therefore also will be the new maximum of the analogue output. Be aware that objects has to be taken out of the light curtain when switching from parallel beam mode into crossed beam mode when it is in automatic gain mode. The reason is that the gain of the crossed beams has to be initialised.

Gain Control:
In the **Manual Gain** it is possible to set **the Manual Gain Level** (a fixed gain level). In **Automatic Gain mode** it is possible to set the **excess gain level**. In both manual and automatic gain is it possible to set the **Hysteresis level**. Keep objects out of the light curtain when switching to automatic gain mode or when adjusting the excess gain level, because the initial setting of each beam requires information about signal strength for an unbroken beam.

Operation Mode:
It is set by choosing between **Digital Output INV** (digital output inverted) and **Digital Output NOT INV** (digital output not inverted) and possibly by check-selecting the **Hole Detection**.

When the digital output **is not inverted** the logical value of all the digital outputs will correspond to the logical value of the Boolean expressions set up in the definition of the digital outputs. This means that when the Boolean expression is TRUE, the output will be HIGH/energized/activated and the corresponding LED indicator on this page (Digital Output 1, 2, 3, 4) will be yellow, as shown below.

If **Hole Detection** is activated, the status of all beams will be individually inverted, that means that 'made beams' are converted to 'broken beams' (and inversely), whereby holes (unbroken beams) will be perceived as objects obstructing beams for the following analysis.

Blanking:
It means to deactivate beams resulting one or more areas in the light curtain where the status of the beams are ignored. Blanking can either be setup by writing directly which beams to be blanked in the text box. Writing '12-16, 20' means that all beams starting from beam no 12 and ending with beam no.16, and beam no. 20 are blanked. When the blanking is written, it shall be transferred to the light curtain pressing the button **Write to Light Curtain**, whereby it becomes active. Blanked beams are marked blue as seen below.

Beams can also be blanked by simply reading obstructed beams from the light curtain by pressing the button **Measure From Light Curtain**, whereby the obstructed and now blanked beams will be written in the text box. It is not necessary to press **Write to Light Curtain** for activating the blanking.

Smoothing Function (Minimum Size of Coherent Area):
The Smoothing Function tells the SSR to ignore objects which are smaller than a specific size. If the Smoothing Function is set to 3, any object that interrupts 3 or less adjacent beams will be ignored. Smoothing can be used, e.g., to ignore interference caused by wood chips while sawing a log.

The effect is obtained by a pre-processing of the beams status where all groups of adjacent broken beams with less than or equal to 3 beams are substituted by made beams.
This smoothing function is carried out after the 'hole detection' pre-processing.

Input and Output Status
Activated/energised/logical high digital output is indicated by yellow; else the indicator will be grey.

Digital Input 1 indicator: green for high input and grey for low input.

Signal OK indicator: when the signal level is sufficient for stable operation of the light curtain the Signal OK indicator will be green. If the Signal OK indicator is off, the gain should be increased or distance between transmitter and receiver should be decreased. The Signal OK indicator will also go out if there is a loss of synchronisation between the SST02 and the SSR02.

Analogue Output value shows the value of the **Analogue output function** that is chosen in the tab **Analogue Output**. The measurement unit is the beam number. This value will be scaled correspondingly in the analogue current output or in the analogue voltage output. If Crossed Beam Mode is selected the span of the output values will be doubled, reflecting the double resolution achieved (objects has to be positioned in the centre of the light curtain, see Scan Mode)

Save settings permanently: When checked the settings will be saved to the permanent memory in the SSR02 light curtain, so that they will not be deleted when taking off the power. When using a PLC to continually writing settings to the SSR02, this setting should be unchecked because repeated writing to the permanent memory is only guaranteed for a minimum of 10000 times. This setting is checked as factory default. When the checkbox is unchecked the latest setting will be remembered. The checkbox will only work with light curtain software version 1R18 or newer.

Change light curtain orientation: When this is checked the illustration of the light curtain will be reverted.

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Functions -> Overview –> Analogue output tab

The figure below shows the window that appears when the Analogue Output tab is selected under **Function->Overview.** On this tab it is possible to define the operation of the analogue output i.e. the measurement on the beam pattern that is going to be performed. The tab contains a number of marked areas; Analogue Output, Analogue Output Function and Set Analogue output.

Analogue Output: In this box it is possible to **Enable Output** and **Disable Output**. When the output is enabled it is possible to select between **Current** output (4-20mA)* and **Voltage** output (0-10V)* using the pull down box.
*Referred to 0 Vdc, pin 8 green wire (Analogue Out -)

Analogue Output Function: The function of the analogue output depends on the setting of the control input on the receiver. If the **Digital Input 1** is connected to + (high), the function selected in the pull down box next to **Control input high** is active. If the **Digital Input 1** is connected to – (i.e. low) or not connected (N.C.), the function selected in the pull down box next to **Control input low (NC)** will be active. The functions selectable in the two boxes are identical. Notice that the status of the **Digital Input 1** can be read in the **Input and Output Status** field. Following function can be selected.

Analogue Output Moving Average: The time constant defines how long the averaging is. The value can be from 0 to 2000 ms.

Measurement functions:

DIS: Disabled output. Output is disabled, i.e. constantly de-energised.

FBB: First Beam Blocked. Position of the first beam blocked.

FBM: First Beam Made. Position of the first beam made.

LBB: Last Beam Blocked. Position of the last beam blocked.

LBM: Last Beam Made. Position of the last beam made.

MBB: Middle Beam Blocked. Position of the (FBB+LBB)/2 rounded to nearest integer

TBB: Total Beams Blocked. Total number of beams blocked.

TBM: Total Beams Made. Total number of beams made.

CBB: Contiguous Beams Blocked. Reads out the number of beams in the largest group of adjacent beams blocked.

CBM: Contiguous Beams Made. Reads out the number of beams in the largest group of adjacent beams made.

TRN: Number of Transitions. The number of transitions in the beam pattern between made beams and blocked beams.

OD: Outside dimensions. Reads out LBB - FBB+1, corresponding to the size of a single object contained in the beam pattern, counted in beam breaks.

ID: Inside dimensions. Reads out the count of beams made between first beam broken and last beam broken. This corresponds to the size of a hole in a single solid object in the light curtain.

CFBB: Contiguous First Beam Blocked. Reads out the number of the first beam in the largest group of adjacent beams blocked.

CLBB: Contiguous Last Beam Blocked. Reads out the number of the last beam in the largest group of adjacent beams blocked.

Force Set Enable: Marking the checkbox **Force Set Enable** disables all measurements and enables the user to set the output value in the textbox next to **Analogue Output Value**.
This function can be used for test and calibration purposes.

SD: Speed and Direction. Reads out the velocity of an object. The input box 'minimum speed' is used to define the velocity that corresponds to 4 mA/ 0 V. The input box 'maximum speed' is used to define the velocity that corresponds to 20 mA / 10 V. Notice that both negative and positive values in the interval between -40 m/s and +40 m/s can be used. If objects are moving in direction of larger beam numbers the beam number the velocity is positive. If the objects are moving in the direction of smaller beam numbers the velocity is negative.

Note: The beams are counted starting with one from the end of the cable entry**.**

Note: Unintended use of pre-filtering, i.e. hole detection or Maximum Area of adjacent beams blocked set different from 0 can lead to unexpected results!
If crossed beam setting is used, the effective beam number is increase by a factor of 2.

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Functions -> Overview –> Digital Output tabs

The **Digital Output 1** tab, selected under **Function->Overview,** it is possible to define the operation of **Digital Output 1**.
If the light curtain is equipped with multiple digital outputs, the other outputs can be configured by using the other identical digital output tabs.
The digital output tab contains 3 marked areas: **Digital Output**, **Digital Output Function** and **Set Digital Output**.

Digital Output: To **Enable Output** and **Disable Output**.

Digital Output Function:
A digital output can read out only two values which are associated with the Boolean values true and false; the output is either high = true or low= false.
The output value is the result of the evaluation of a Boolean expression, that here is set up using the two pull down-boxes and text input box.
The first box contains the same list of functions as available under Analogue Output Function, plus the ABBA function.
The second box contains a list of comparison operators.
The third box is used to type in a number. If the expression is true, the out will be high, and if the expression is false, the output will be low.
The selection "Any Beam Blocked in Area" has two values minimum and maximum. The output is high if one or more beams are broken with beam numbers that are larger than or equal to Minimum and smaller than or equal to Maximum.
With the selection "Signal Alarm" the output is set high if the signal is not OK.

Set Digital Output
Marking the checkbox **Force Set Enable** disables the **Digital Output Function** and enables the user to set the digital output high by selecting **Output Forced High** or low by selecting **Output Forced Low**. The function is primarily intended for test purposes.

Output delay: On-delay specify the time between the expression becomes true and the output is switched accordingly. Off-delay specify the time between the expression becomes false and the output is switched. On-delay and off-delay is selectable between 0 and 10 s.

Functions -> System information

System information contains the information displayed in the figure below. The MODBUS address can be modified using the Change MODBUS Address button.

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Functions -> Status Messages

Selecting **Functions -> Status messages** makes the window below appears. Status messages and error messages are logged and displayed. The log can be cleared by pressing the button **Clear Status Messages**.

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