DATALOGIC

S65-PA-5-W09
Contrast sensor

INSTRUCTION MANUAL

CONTROLS

OUTPUT LED
The yellow LED ON indicates the active output status.

DISPLAY (green-coloured 4-digit display)
During normal functioning, the display indicates a value relative to the quantity of light diffused by the target.
Please refer to the 'SETTING' paragraph for the correct indications to follow during the acquisition or setting phase.

STABILITY LED (S)
The green LED ON indicates that the output is ON or OFF in a stable manner.

DELAY ON LED (1)
The green LED ON indicates the DELAY function activation at the ON output status.

DELAY OFF LED (2)
The green LED ON indicates the DELAY function activation at the OFF output status.

+/- and SET push-buttons
Please refer to the 'SETTING' paragraph for the correct indications to follow during the acquisition or setting phase.

INSTALLATION

The sensor can be mounted by means of the three housing's holes using two screws (M4x25 or longer, 1 Nm maximum tightening torque) with washers. The use of fixing brackets is recommended if the supporting surface doesn't have a good planarity. Various orientable fixing brackets to ease the sensor positioning are available (please refer to the accessories listed in the catalogue). The operating distance is measured from the front surface of the sensor optics.
The M12 connector can be oriented at three different positions using the specific fastening spring and rotating the block of 180° until reaching the lock position. If the target to detect is very shiny (metal plate), we suggest to angle the sensor 5°-20° respect to the material to detect and the material movement direction.
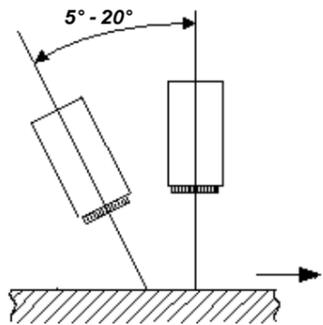

CONNECTION

M12 5-pole CONNECTOR
standard versions
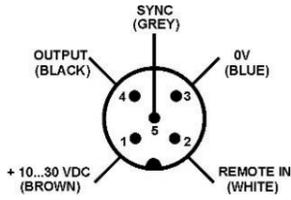
M12 8-pole CONNECTOR
versions with RS485 serial interface
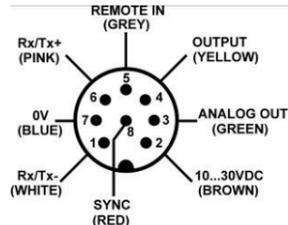
TECHNICAL DATA

Power supply:	10 … 30 Vdc limit values
Ripple:	2 Vpp max.
Consumption (output current excluded):	50 mA max. @ 24Vdc
Output:	1 PNP or NPN output 30 Vdc max. (short-circuit protection)
Output current:	100 mA max.
Output saturation voltage:	≤ 2 V
Response time:	16 µs
Switching frequency:	30 kHz
Analog output:	0…5 V (90% white 4.5 V)
Analog output impedance:	1kΩ (short circuit protection)
Digital resolution:	12 bit (4095 steps)
Operating temperature:	-10 … 55 °C
Storage temperature:	-20 … 70 °C
Electrical protection:	Class 2
Operating distance:	12…20 mm
Depth of field:	± 2 mm
Minimum spot dimension:	3x1 mm at 19 mm
Emission type:	white light LED (400-700nm)
Ambient light rejection:	according to EN 60947-5-2
Vibrations:	0.5 mm amplitude, 10 … 55 Hz frequency, for each axis (EN60068-2-6)
Shock resistance:	11 ms (30 G) 6 shock for each axis
Housing material:	ABS
Lens material:	Glass window and lenses
Mechanical protection	IP67
Connection:	M12-5 pole connector for standard versions / M12-8 pole connector for versions with RS485 serial interface
Weight:	100 g. max.

DIMENSIONS

mm
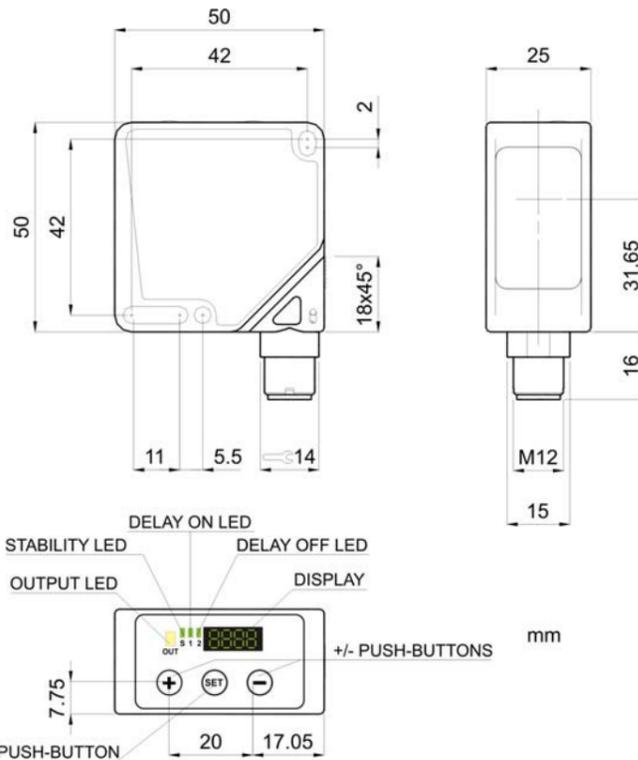
ANALOG OUTPUT (only for S65-PA-5-W09-xxZ versions)

The analog output supplies a voltage proportional to the signal received by the sensor, with monitoring or alignment purposes only.
The use of the serial interface, or the display indicator, is recommended in case of precise measurement.

SETTING

NORMAL FUNCTIONING

During normal functioning, the sensor indicates on the display the value of received light quantity.

EASY TOUCH™ DETECTION
Before effecting target detection, the sensor must be set in the correct DARK/LIGHT operating mode:
- light target on dark background: set LIGHT mode;
- dark target on light background: set DARK mode.
The light mode is the default setting; to change mode the user must access into the menu (refer to PARAMETER SETTING).
Beginning of EASY_TOUCH detection:

- *Position the target to detect inside the operating distance, in front of the sensor.*

- *Press the SET push-button until the "EASY" text appears and release it immediately.*
- *Releasing the push-button, the sensor ends the target detection phase and returns to normal functioning.*

- *The sensor is ready to detect the target.*

FINE DETECTION (DARK TARGET)
An improved precision in the target–background contrast detection is obtained in this mode.
The DARK/LIGHT operating mode is selected automatically by the sensor.
Position correctly at the right operating distance the sensor spot on the target to detect:
- *Press the SET push-button until the "SEt1" text appears and release it immediately.*
- *Releasing the push-button the text blinks.*

- *Wait for the "SEt2" text and the blinking of the output OUT LED.*

- *Position the background under the sensor spot.*
- *Press the SET push-button a second time.*
- *Release the push-button, the sensor ends the target detection phase and returns to normal functioning.*

- *The sensor is ready to detect the target.*

DYNAMIC DETECTION
This mode allows to detect targets moving in front of the sensor. The threshold value is set automatically during the target movement. The beginning and the end of the detection phase are controlled externally (keyboard, REMOTE signal, RS485).
Like the EASY_TOUCH detection mode, the DARK/LIGHT operating mode must be set beforehand:
- *Press the SET push-button until the "dYn.." text appears.*
- *Releasing the push-button the text blinks and the sensor is in the detection phase.*


- *Press the SET push-button in order to end the dynamic detection procedure.*
- *Releasing the push-button, the sensor ends the detection phase and returns to normal functioning.*
- *The sensor is ready to detect the target.*

PARAMETER SETTING

Entering in the menu the user can change some parameters: DELAY ON, DELAY OFF, DARK/LIGHT mode and display turning ON/OFF.
To enter in the parameter programming phase, press the + and - push-buttons together until the "MEnu" text appears.


Releasing the push-button the first DELAY ON parameter appears.
Pressing the + and – push-buttons the parameter list is visualised in the following sequence:
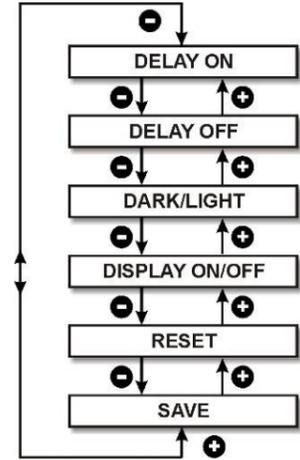
DELAY ON setting
The DELAY ON represents the output activation delay after the reference target has entered in the detection area. The delay obstacles the detection of events that occur in a very rapid sequence. An application example is a target with shaded colouring (light-dark-light) that can be detected twice.
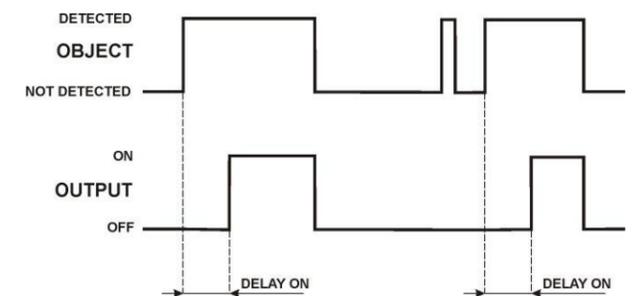
To set the DELAY ON function select in the menu parameters the "dlOn" text.

- *Pressing the SET push-button, the user enters in the parameter programming and the "dxxx" text appears where xxx represents the previously set value (from 0 to 100).*

- *Pressing the + and – push-buttons, the delay value increases or decreases reaching 1 ms up to a delay maximum of 100 ms. If the delay value is different from zero, the LED 1 turns on (ON DELAY LED) to signal that the function has been activated.*
- *To confirm the value and return to the parameter menu, press the SET push-button.*

DELAY OFF setting
The DELAY OFF represents the output delay deactivation after the reference target has moved out of the detection area. The delay extends the output activation allowing the interface system to detect also shorter pulses.
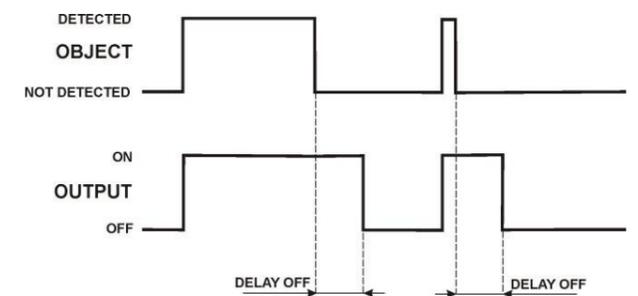
To set the DELAY OFF function select the "dlOF" text from the parameter menu.

dlOF

- *Pressing the SET push-button the users enters in the parameter programming and the "dxxx" appears where xxx represents the previously set value (da 0 a 100).*
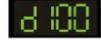
d 100

- *Pressing the + and – push-buttons, the delay value increases or decreases reaching 1 ms up to a delay maximum of 100 ms. If the delay value is different from zero, the LED 2 turns on (OFF DELAY LED) to signal that the function has been activated.*
- *To confirm the value and return to the parameter menu, press the SET push-button.*

DARK/LIGHT MODE setting
The DARK/LIGHT operating mode allows to set the detection of light targets on dark backgrounds (light mode) or dark targets on light backgrounds (dark modes).
To set the DARK/LIGHT function, select "L_ON" or "D_ON" text from the parameter menu.

L_On **d_On**

- *Press the SET push-button to change the previously set operating mode.*

DISPLAY ON/OFF setting
The selection of the display ON/OFF turns the display ON or OFF.
Setting the OFF mode, when the sensor is functioning normally, the display is OFF, and turns on for 3s after receiving a command from the keyboard or REMOTE signal.
To set the display turning ON or OFF, select the "dSOn" or "dSOF" text from the parameter menu.

dSOn **dSOF**

- *Press the SET push-button to change the previously set display mode.*

RESET of the default set parameters
To reset the default parameters, select the "rSEt" text from the parameter menu.
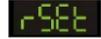
rSEt

- *Pressing the SET push-button, the "rSEt" text blinks, releasing the push-button the sensor to normal functioning.*

The reset parameters are:

PARAMETER	DISPLAY	DESCRIPTION
threshold	2050	*Switching threshold at 2050*
hysteresis	HYno	Medium hysteresis *(Normal)*
DELAY ON	d 0	*DELAY ON deactivated*
DELAY OFF	d 0	*DELAY OFF deactivated*
DARK/LIGHT	L_On	*LIGHT mode*
display	dSOn	*display ON*

NOTE: If the parameter resetting is the last operation before turning OFF the sensor, at the powering ON the "rSEt" text blinks for 3s before returning to normal visualisation.

Salving of "SAVE" set parameters
To save the parameter setting select the "SAVE" text from the parameter menu.

SAVE

- *Pressing the SET push-button all the parameters set are saved and releasing the push-button the sensor returns to normal visualisation.*

NOTE: After having set the data the user exits from the menu effecting "SAVE" or "RESET" operations. If these operations are not made after 25s from the last set the sensor returns to the normal mode saving the changed parameters.

OTHER SETTINGS

Switching threshold setting
In this mode the sensor switching threshold can be set.
- *Press the + push-button until the "AdJ" text appears.*

AdJ

- *Releasing the push-button the threshold value begins to blink.*

2004

- *Pressing the + and – push-buttons repetitively the switching threshold value increases or decreases accordingly.*

- *Pressing the SET push-button the new threshold value is saved and releasing the push-button the sensor returns to normal visualisation.*

Hysteresis setting
The different sensor hysteresis levels can be set in this mode.
- *Press the – push-button until the "HYSt" text appears.*

HYSt

- *Releasing the push-button the previously set value appears.*
- *Pressing the +/- push-buttons repetitively the different levels available are visualised.*
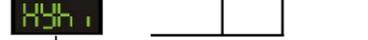
LARGE HYSTERISIS	HYhi	
NORMAL HYSTERISIS	HYno	
NARROW HYSTERISIS	HYlo	
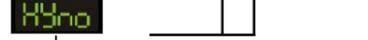
- *Pressing the SET push-button the hysteresis level is confirmed.*
- *Releasing the push-button the sensor returns to normal visualisation.*

ERROR MESSAGGES

"FAIL" message
In presence of critical contrast conditions, during double target detection, the "FAIL" text blinks on the sensor display to signal the detection error.

FAIL

After 3s the text finishes to blink and the sensor continues to function according to the previous setting.

"Lo" message
In presence of low contrast levels, during dynamic target detection, the "Lo" text blinks on the sensor display to signal a very small contrast discrimination.

Lo

- *Press the + push-button to repeat the dynamic detection.*
- *Press the SET push-button to return to normal functioning.*

REMOTE FUNCTIONS

KEYLOCK function (keyboard lock)
The KEYLOCK function (keyboard lock) allows to deactivate the keyboard avoiding accidental changes in the sensor setting.
If at sensor powering the REMOTE wire is connected to +Vdc for at least 1 s., the *keyboard lock* function is activated and the push-buttons are no longer active.
To deactivate the *keyboard lock*, the sensor must be turned off and repowered with the REMOTE wire not connected or connected to GND.

REMOTE input
Different detection functions can be made with the REMOTE signal, without using the SET push-button.
The REMOTE wire connected to +Vdc is equal to pressing the SET push-button.
The REMOTE wire connected to GND or not connected is equal to not pressing the SET push-button.
The connection duration of the REMOTE wire to +Vdc determines the detected type requested:

- *0.4s…1.5s*   *EASY_TOUCH detection;*
- *1.6s…3.1s*   *target_background detection;*
- *> 3.2s*   *dynamic detection.*

SYNC input
The user can determine exactly when to enable the sensor to detect the target.
The identification cycle begins after the SYNC signal transaction from passive to active.
The connection of the SYNC wire to Vdc corresponds to the passive logic status while SYNC not connected or connected to 0 V corresponds to the active logic status.
(SYNC passive = Vdc ; SYNC active = 0 V).

When the SYNC signal is passive the output LED is OFF if the sensor is in the LIGHT mode, is ON if the sensor is in the DARK mode.
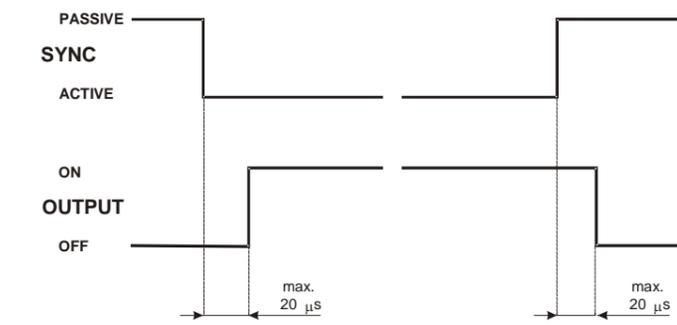
RS485 (only for S65-PA-5-W09-xxZ versions)

RS485 serial connection
The RS485 line consents the complete remote control of the sensor.
This function is available only in the 8-pole connector version.
The pole 1 Tx/Rx- (white) has to be connected to the negative cable of the serial (and to the relative pull-down resistance), the pole 6 Tx/Rx+ (pink) has to be connected to the positive cable of the serial (and to the relative pull-up resistance).
The serial communication parameters are: 9600 baud, no equity, 8 data bits, 1 stop bit.

RS485 serial commands
All the functions like the sensor configuration selection and the functioning mode can be accessed using this serial line.
All the commands have to be send via terminal in an ASCII format and with an interval between the successive digit transmission of at least 2 ms.
Commands available using RS485 serial:

- *Sensor data receipt*:
  The received light intensity or the sensor parameter configuration can be read in any moment (switching threshold, hysteresis, ON DELAY, OFF DELAY, LIGHT/DARK mode, display status).

COMMAND	RESPONSE
r s <CR> <LF>	vxxxx <CR> <LF>
r c <CR> <LF>	txxxx hxx dNxxx dFxxx X dsY <CR> <LF>

where x represents the numeric value and X represents the DARK/LIGHT mode set (L,D) and Y represents the display status (ON, OFF).

- *Remote detection mode*:
  To access the remote detection mode, the SYNC input has to be passive for at least 300ms.
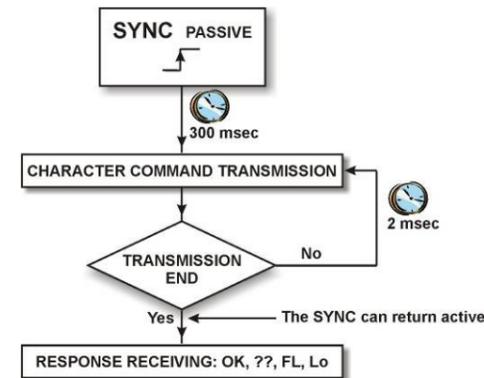

The commands available are:
@ s e <CR> <LF>   EASY_TOUCH detection selection
@ s 1 <CR> <LF>   target-background detection beginning (target detection)
@ s 2 <CR> <LF>   target-background detection end (background detection)
@ s d b <CR> <LF>   dynamic detection beginning
@ s d e <CR> <LF>   dynamic detection end.

The commands of the target 'detection beginning' or dynamic detection have to be followed by the 'detection end' commands, on the contrary the transmission of another command generates a **?? <CR> <LF>** error signal and the sensor returns to the 'normal' mode.
If a **FL <CR> <LF>** detection error is transmitted, in the dynamic mode, the contrast discrimination is too small and the **Lo <CR> <LF>** error signal is transmitted.
If the SYNC input is active at the receipt of the @ xxx **<CR> <LF>** command the sensor doesn't effect the command and replies with: **?? <CR> <LF>.**
After effecting the commands the sensor visualises **OK <CR> <LF>.**

- *Sensor configuration*:
  To access the sensor configuration, the SYNC input must be passive for at least 300ms. The commands available are:
  @ r s t <CR> <LF>   default parameter setting
  @ c <CR> <LF> STRINGA   selected parameter setting
  where **STRINGA** is a parameter sequence:
  switching threshold, hysteresis, ON DELAY, OFF DELAY, LIGHT/DARK mode, display status, **e** or **q** letter. With the last letter of the sequence the user can determine the parameter setting execution (**e** letter) or quitting (**q** letter).

PARAMETER	VALUE	SEQUENCE
threshold	170…4095	t xxxx <CR> <LF>
hysteresis	20…60	h xx <CR> <LF>
DELAY ON	0…100	dN xxx <CR> <LF>
DELAY OFF	0…100	dF xxx <CR> <LF>
DARK/LIGHT	L, D	L | D <CR> <LF>
display	ON, OFF	ds ON | OFF <CR> <LF>
command confirmation	e, q	e | q <CR> <LF>

where x represents the numeric value to set. If this value has a number of digits minor than the numeric value set, initial zeros have to be added.

If the SYNC input is active at the receipt of the @ xxx **<CR> <LF>** command the sensor replies with: **?? <CR> <LF>.**
After effecting the commands the sensor visualises **OK <CR> <LF>.**

Sequence programming example of sensor setting

COMMAND	SEQUENCE	DESCRIPTION
threshold	t *0500* <CR> <LF>	*switching threshold at 500*
hysteresis	h *40* <CR> <LF>	*medium hysteresis (40)*
DELAY ON	dN *000* <CR> <LF>	*DELAY ON deactive*
DELAY OFF	dF *010* <CR> <LF>	*DELAY OFF active at 10ms*
DARK/LIGHT	*L* <CR> <LF>	*LIGHT mode*
display	ds *ON* <CR> <LF>	*display ON*
command confirmation	*e* <CR> <LF>	*confirmation of the parameters transmitted*

@ c<CR><LF>t0500 <CR><LF>h40 <CR><LF>dN000 <CR><LF>dF010 <CR><LF>L <CR><LF>dsON <CR><LF>e <CR><LF>

RS232 serial interface
The sensor can be connected to the RS232 serial using a specific interface adapter.
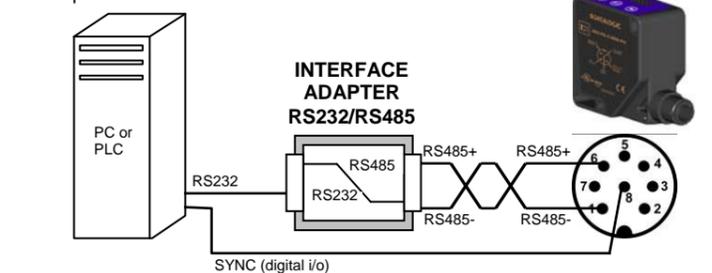
The sensors are NOT safety devices, and so MUST NOT be used in the safety control of the machines where installed.