Excerpts from the instruction manual

Orion1 Extended

Safety light curtains

Type 4 Active Opto-electronic Protective Device (AOPD)

[EN] The complete instruction manual is delivered with the product in a digital format and can also be downloaded from:

[SE] Den fullständiga bruksanvisningen levereras med produkten i digitalt format och kan även laddas ned från:

[DE] Die vollständige Bedienungsanleitung in digitaler Form wird mit dem Produkt geliefert und steht auch unter dieser Adresse zum Download bereit:

[IT] Il manuale di istruzioni completo viene fornito in formato digitale con il prodotto e può anche essere scaricato da:

[FR] La notice d'instructions complète est fournie avec le produit au format numérique et peut également être téléchargée sur le site :

[ES] El manual de instrucciones completo se entrega junto con el producto en formato digital y también puede descargarse en este enlace:

www.abb.com/jokabsafety

Safety information

Warning! For a correct and safe use of the Orion1 Extended light curtains, the following points must be observed:

- The stopping system of the machine must be electrically controlled.
- This control system must be able to stop the hazardous movement of the machine within the total machine stopping time T as per paragraph “Minimum installation distance” of the instruction manual, and during all working cycle phases.
- Mounting and connection of the AOPD must be carried out by qualified personnel only, according to the indications included in the special sections of the instruction manual and in the applicable standards.
- The AOPD must be securely placed in a particular position so that access to the hazard zone is not possible without the interruption of the beams, see paragraph “Installation” of the instruction manual.
- The personnel operating in the hazard zone must be well trained and must have adequate knowledge of all the operating procedures of the AOPD.
- The TEST button must be located outside the hazard zone because the operator must check the hazard zone during all the test operations.
- The ACKNOWLEDGE/RESET button must be located outside the hazard zone because the operator must check the hazard zone during all acknowledge/reset operations. It must be impossible to reach the button from the hazard zone.

Please carefully read the instructions for the correct functioning before powering the AOPD.

Installation

Warning! Make sure that the protection level assured by the AOPD is appropriate for the machine to be controlled, see EN ISO 13849-1:2008.

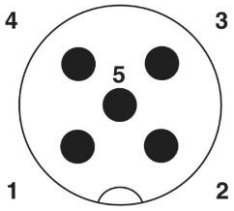
- The outputs (OSSD) of the AOPD must be used as machine stopping devices and not as command devices. The machine must have its own Start command.
- The dimension of the smallest object to be detected must be larger than the resolution of the AOPD.
- The AOPD must be installed in a room complying with the technical characteristics indicated in paragraph ”Technical data” of the instruction manual.
- Do not place the AOPD near strong and/or flashing light sources or similar devices.
- Strong electromagnetic interferences can jeopardise the function of the AOPD. Please contact your ABB Jokab Safety representative for advice.
- The operating distance of the device can be reduced in presence of smog, fog or airborne dust.
- A sudden change in environment temperature, with very low minimum peaks, can generate a small condensation layer on the lenses and so jeopardise the function.
- Reflecting surfaces placed near the light beams of the AOPD (over, under or laterally) can cause passive reflections. These reflections can compromise the recognition of an object inside the detection zone.
- The safety device must be positioned at a distance that prevents a person or part of a person to reach the hazard zone before the hazardous motion of the machine has been stopped by the AOPD. See the instruction manual for the calculation of this minimum installation distance.

Warning! The minimum installation distance must be respected. For more information about its calculation,please refer to the instruction manual or EN ISO 13855:2010.

Warning! Make sure to test the function and to perform the checks described in paragraph “Checks after first installation” of the instruction manual before machine start-up.

Electrical connections

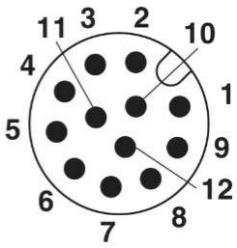
Transmitter, cable M12-C02PT2T

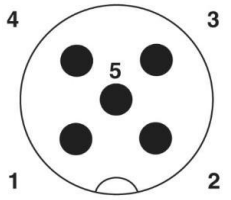


Pin	Wire[1]	Function	Connection to
1	Brown	Supply	+24 VDC
2	White	TEST	NO contact to +24 VDC
3	Blue	Supply	0 V
4	Black	EARTH	Earth
5	Grey	Not used	-

[1]Colours according to ABB Jokab Safety standard cable.

Receiver, cable for muting, M12-C02PT62RM





Receiver cable for muting, M12-12 connector

Pin	Wire[1]	Function		Connection to
1	Brown	Supply		+24 VDC
2	Blue	Supply		0 V
3	White	RESET/ ACKNOWLEDGE/ ALIGN	Auto. Reset with no function	Not connected
			Auto. Reset with Acknowledge function or Alignment mode	NO contact to +24 VDC
			Manual Reset	NO contact to +24 VDC
4	Green	OVERRIDE1		NO contact to +24 VDC
5	Pink	OSSD2		Safety control module for example
6	Yellow	EDM	Function used/activated	NC contact of a force guided relay
			Function not used/deactivated	Not connected
7	Black	MUTING SELECTION	Possibility to disable the Muting function during operation	NO contact to +24 VDC
			No possibility to disable the Muting function during operation	Not connected
8	Grey	OSSD1		Safety control module for example
9	Red	OVERRIDE2		NO contact to 0 V
10	Violet	MUTING LAMP		Lamp between output and +24 VDC - ON when Muting activated. - Flashing during override.
11	Grey-pink	OVERRIDE STATUS		Lamp, PLC input, HMI, etc. - High when Override active. - Low when Override inactive. NB: this output can fluctuate at start-up independently of the Override function.
12	Red-blue	EARTH		Earth

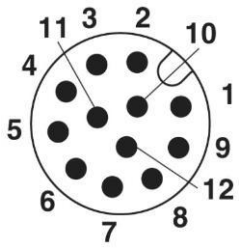
[1]Colours according to ABB Jokab Safety standard cable.

Receiver cable for muting, M12-5 connector

Pin	Wire[1]	Function	Connection to
1	Brown	Supply	24 VDC
2	White	MUTING2	Muting sensor Shall be high in presence of object
3	Blue	Supply	0 V
4	Black	MUTING1	Muting sensor Shall be high in presence of object
5	Grey	Not used	-

[1]Colours according to ABB Jokab Safety standard cable

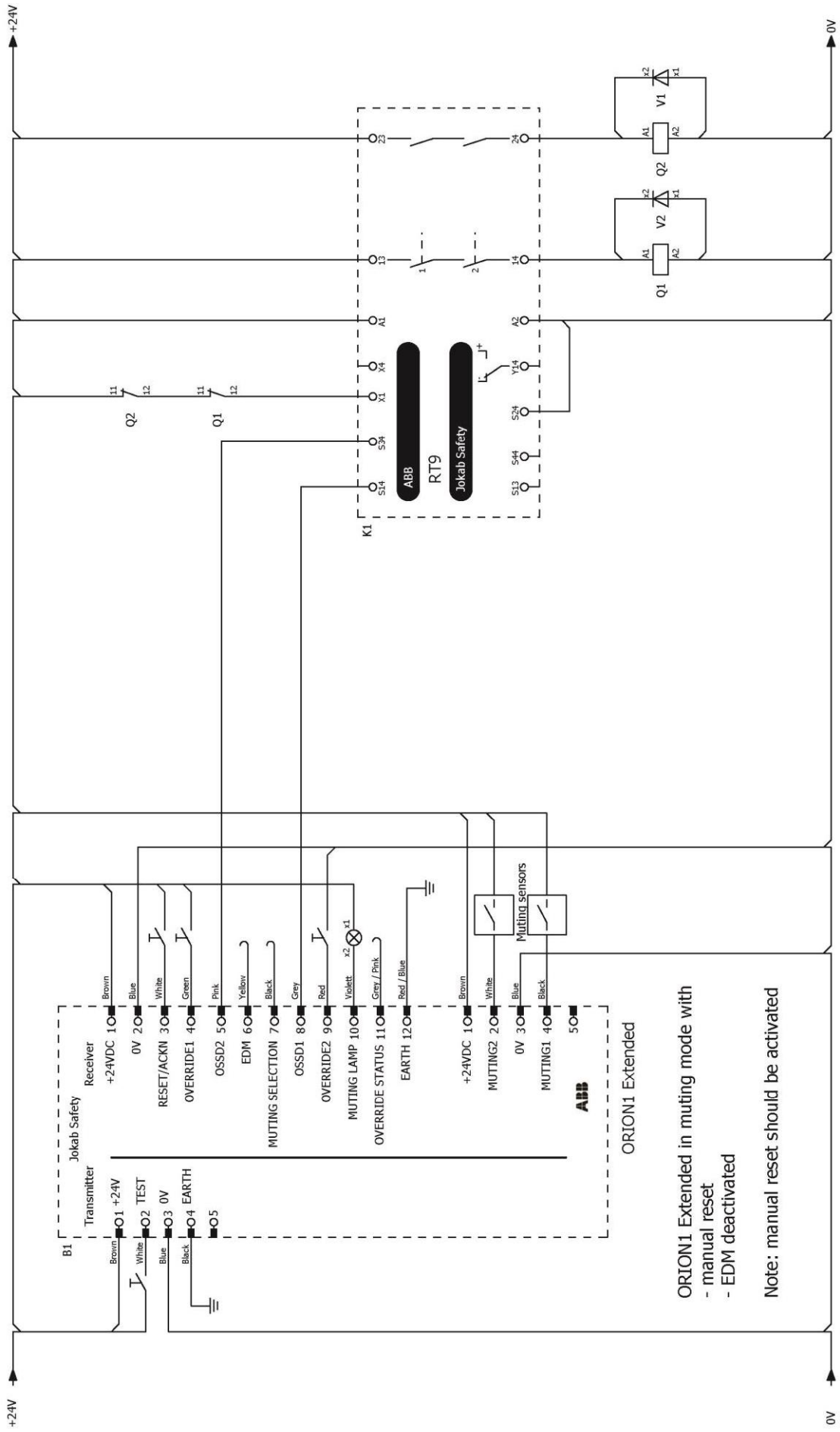
Receiver, cable for blanking, M12-C02PT6RB



Pin	Wire[1]	Function		Connection to
1	Brown	Supply		+24 VDC
2	Blue	Supply		0 V
3	White	RESET/ ACKNOWLEDGE /ALIGN	Auto. Reset with no function	Not connected
			Auto. Reset with Acknowledge function or Alignment mode	NO contact to +24 VDC
			Manual Reset	NO contact to +24 VDC
4	Green	TEACH IN	If "Teach-in" of blanking zone is to be used	NO contact to +24 VDC
5	Pink	OSSD 2		Safety control module for example
6	Yellow	EDM	Function used/activated	NC contact of a force guided relay
			Function not used/deactivated	Not connected
7	Black	Not used		
8	Grey	OSSD 1		Safety control module for example
9	Red	TOLERANCE	Activate the "Tolerance of fixed blanking" function	NO contact to +24 VDC
10	Violet	LAMP		Lamp between output and +24 VDC - ON when Blanking activated. - Flashing when Blanking error like one more beam blanked than configured for example.
11	Grey-pink	Not used		
12	Red-blue	EARTH		Earth

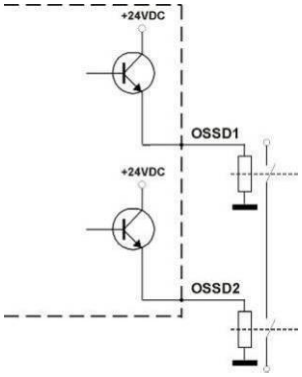
[1]Colours according to ABB Jokab Safety standard cable

Connection example to a RT9 safety relay

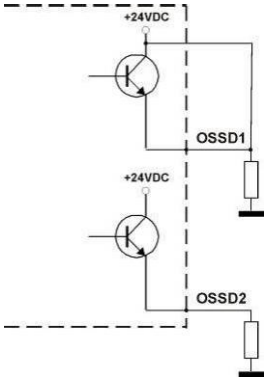


Connection of the OSSD outputs

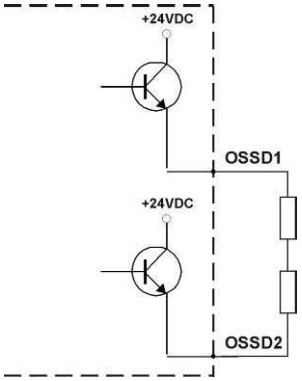
YES



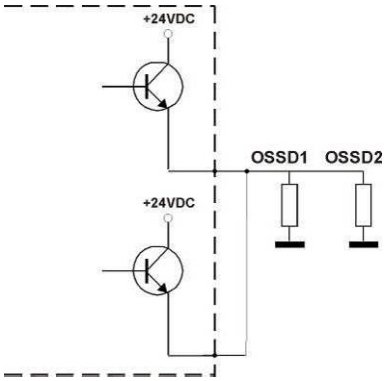
NO



NO



NO

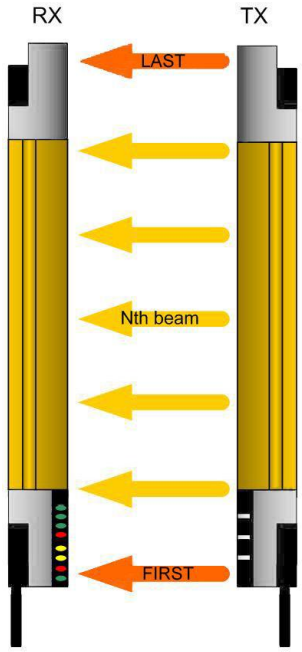


Alignment procedure

The alignment between the transmitter and the receiver is necessary to obtain the correct functioning of the AOPD. A good alignment prevents outputs instability caused by dust or vibrations.

The alignment is performed after having completed the mechanical installation and the electrical connections.

The alignment is perfect if the optical axes of the first and the last beams of the transmitter coincide with the optical axes of the corresponding elements of the receiver. Both first (close to the connector) and last beams are used as synchronization beams.



Indication	Display on receiver	Alignment Status	Output status when Normal Op. mode
No Synchronization, check FIRST		NONE	OSSD OFF
FIRST aligned		NONE	OSSD OFF
LAST aligned		NONE	OSSD OFF
One or more intermediate beams not aligned		NONE	OSSD OFF
All beams aligned		BAD	OSSD ON
All beams aligned			OSSD ON
All beams aligned			OSSD ON
All beams aligned		EXCELLENT	OSSD ON

A. Activate the Alignment mode by pushing the external NO contact (ACKNOWLEDGE/RESET/ALIGN push-button, pin 3 of the M12-12 pole connector on the receiver) at power on until the second LED (red) begins to flash indicating the activation of the Alignment mode.

B. Keep the receiver in a steady position and adjust the transmitter until the third LED (yellow) turns off. This condition shows the alignment of the first synchronisation beam.

C. Rotate the transmitter, pivoting around the lower optics axis, until the fourth LED (yellow) turns off. This condition shows the alignment of the last synchronisation beam.

D. Slightly turn both units both ways to find the limits of the area of maximum alignment level ( ). Place both units in the centre of this area.

E. Fix the two units firmly using brackets.

Check that the alignment level on the receiver is maximum when the beams are not interrupted. Then check that all level LEDs turn off when one single beam is interrupted. This check shall be made with the special cylindrical “Test Piece” having a suitable size for the resolution of the device used (see the paragraph “Checks after first installation” of the instruction manual).

F. Switch the device off and on to normal operating mode.

The alignment level is also monitored during normal operation mode and visualized on the same display (see paragraph “Display” of the instruction manual.

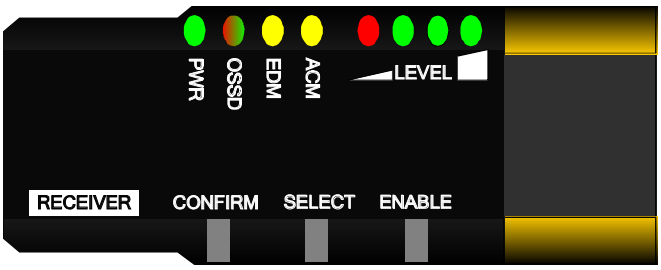
Once the AOPD has been aligned and correctly fastened, the signal on the display is useful both to check the alignment and to show a change in the environmental conditions (presence of dust, light disturbance and so on).

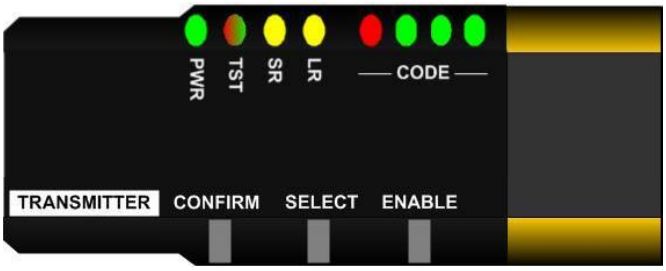
Basic configuration mode (BCM)

Warning! The device can enter Basic Configuration Mode during normal operation. As soon as a CONFIRM action is executed after configuration, the device automatically restarts in Normal Operation with the new configuration. Particular attention has to be taken during the basic configuration management and use.

Warning! Muting time-out "∞" does not comply with the requirements of IEC 61496-1:2013. Therefore, all possible risks must be considered and related precautions undertaken before selecting the "∞"option.

Use the special tool, provided with the device, to activate the push-buttons.





1. Keep the CONFIRM button pressed to enter the Basic Configuration Mode.
2. Check that you are in BCM: all the LEDs are lit in sequence from 2 to 8 informing you of the current configuration.
3. Select the function to configure with the SELECT push-button; the corresponding LED flashes.
4. Activate the selected function with the ENABLE push-button (switch LED on/off).
5. Repeat steps 3 and 4 until the desired configuration is visualized.
6. Keep the CONFIRM push-button pressed to activate the new configuration.

Function list on the transmitter

Function	LED number	Setting[1]	LED Status PWR TST SR LR CODE 1 2 3 4 5 6 7 8
Coding	2	Code 1	○ ● ○ ○ ○ ○ ○ ○
		Code 2	○ ● ○ ○ ○ ○ ○ ○
		No Code	○ ● ○ ○ ○ ○ ○ ○
Range selection	3	**Long**	○ ○ ● ○ ○ ○ ○ ○
		Short	○ ○ ● ○ ○ ○ ○ ○

[1] The default configuration (at delivery) is indicated in bold characters.

Function list on the receiver in Muting mode (LED 3 ON Yellow)

Function	LED number	Setting[1]	LED Status PWR OSSD EDM ACM LEVEL 1 2 3 4 5 6 7 8
Coding	2	Code 1	
		Code 2	
		No Code	
Muting/Blanking selection	3	**Muting**	
		Blanking	
EDM[2]	4	**Enabled**	
		Disabled	
Reset function	5	**Auto**	
		Manual	
Muting direction	6	**T/X (bidirectional)**	
		L (monodirectional)	
Muting timeout	7	**10 min**	
		Infinite	
Override trigger	8	**Level**	
		Edge	

[1] The default configuration (at delivery) is indicated in bold characters.
[2] Please look at the 4th LED, and not the one called “EDM”.

Function list on the receiver in Blanking mode (LED 3 OFF)

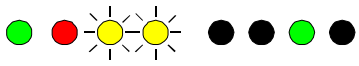
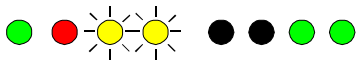
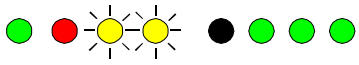
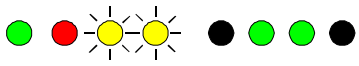
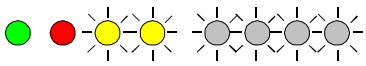
Function	LED number	Setting[1]	LED Status PWR 1 · OSSD 2 · EDM 3 · ACM 4 · LEVEL 5 6 7 8
Coding	2	Code 1	
		Code 2	
		No Code	
Muting/Blanking selection	3	**Muting**	
		Blanking	
EDM[2]	4	**Enabled**	
		Disabled	
Reset function	5	**Auto**	
		Manual	
Floating blanking selection	6-7	**Floating blanking disabled**	
		Floating blanking 1 beam	
		Floating blanking 2 beams	
		Reduced Res. 4 beams	
Fixed blanking selection	8	**1 Fixed blanking zone**	
		2 Fixed blanking zones	

[1] The default configuration (at delivery) is indicated in bold characters.
[2] Please look at the 4th LED, and not the one called "EDM".

Diagnostic functions

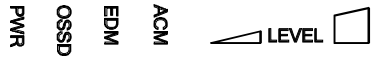
On the display on both receiver and transmitter, 8 LEDs help the user to control and check the state of the AOPD, in Alignment mode, Normal operation mode and Error mode.

Transmitter

AOPD mode	Status	LED configuration PWR TST SR LR —CODE— Off On Flashing Indifferent	Action
Normal operation	Short range emission		
	Long range emission		
	No code		
	Code 1		
	Code 2		
	Test		If undesired test, check the wiring and connections of the test input.
	Emission		
Error	Microprocessor error		Acknowledge. If the error persists, contact your ABB Jokab Safety representative.
	Optical error		Acknowledge. If the error persists, contact your ABB Jokab Safety representative.
	BCM configuration error		Perform a new BCM configuration. If the error persists, contact your ABB Jokab Safety representative.
	Communication error		Check the cascade connection and the presence of the terminator caps. Acknowledge.
	Critical error		Switch the AOPD off and on. If the error persists, contact your ABB Jokab Safety representative.

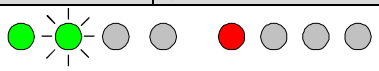
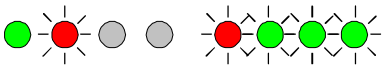
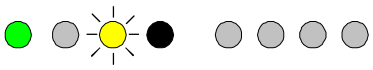
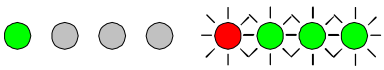
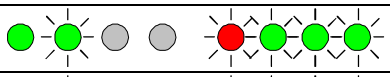
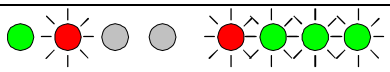
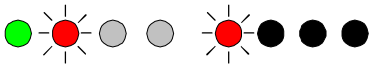
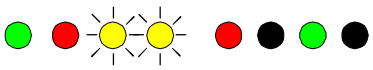
It is not possible to acknowledge a critical error. The device must be switched off and on. If the error persists, contact your ABB Jokab Safety representative.

Receiver

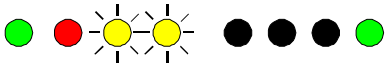
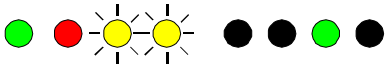
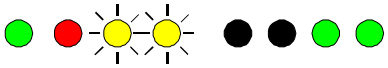
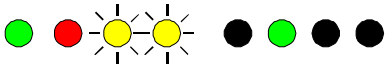
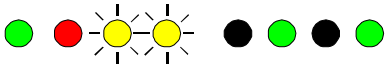
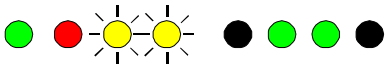
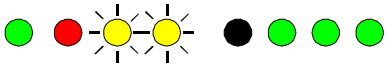
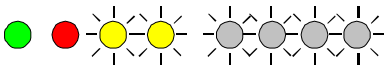


AOPD mode	Status	LED configuration Off On Flashing Indifferent	Action
Alignment	Not aligned		See the instruction manual paragraph “Alignment procedure”.
	FIRST aligned		See the instruction manual paragraph “Alignment procedure”.
	LAST aligned		See the instruction manual paragraph “Alignment procedure”.
	Minimum alignment signal level		See the instruction manual paragraph “Alignment procedure”.
	Maximum alignment signal level		See the instruction manual paragraph “Alignment procedure”.
Normal operation Manual Reset Only	Interlock Free beams		AOPD waiting for Reset. Push the RESET button.
	Interlock Interrupted beams		Free the detection zone and push the RESET button.
Normal operation	OSSD ON (maximum alignment)		
	OSSD OFF Code 1		
	OSSD OFF Code 2		
	OSSD OFF No code		
	Signal level on the beams	None Insufficient Low Good Best	
	EDM activated		

Receiver

AOPD mode	Status	LED configuration Off On Flashing Indifferent	Action
Normal operation Blanking only	Valid Blanking (OSSDs ON)		
	Invalid blanking (OSSDs OFF)		Blanking zones not respected. Reconfigure blanking (teach-in).
	BCM tolerance active		Check the effective resolution of the AOPD and if the tolerance function should be activated.
Normal operation Muting only	Muting Active		If unexpected OSSD OFF with muting active, check the configuration of partial muting.
	Override Active		OSSD ON, muting lamp flashing.
	Override attention status		Push the OVERRIDE button to force the OSSD outputs on.
	Override timing error		Check and repeat the override activation sequence. Check the connections and the wiring the override function.
	Lamp error		Check the connections and the wiring of the lamp and/or if the lamp is broken.

Receiver

AOPD mode	Status	LED configuration (Off / On / Flashing / Indifferent)	Action
Error	OSSD error		Check the wiring and connections of the OSSD outputs. Make sure that there is no short-circuit between them or with the power supply. Then Acknowledge. If the error persists, contact your ABB Jokab Safety representative.
	Microprocessor error		Acknowledge. If the error persists, contact your ABB Jokab Safety representative.
	Optical error		Acknowledge. If the error persists, contact your ABB Jokab Safety representative.
	EDM error		Check the connections and the wiring of the EDM function, inclusive EDM selection. Check the time sequence (see the instruction manual Time chart). Acknowledge.
	Reset error		Check the connections and the wiring of the Reset function. Acknowledge.
	Communication error		Check the cascade connection and the presence of the terminator caps. Acknowledge.
	BCM configuration error		Perform a new BCM configuration. If the error persists, contact your ABB Jokab Safety representative.
	Critical error		Switch the AOPD off and on. If the error persists, contact your ABB Jokab Safety representative.
	Power supply error		Check the connections and wiring of the power supply Connection. If the error persists, contact your ABB Jokab Safety representative.

It is not possible to acknowledge a critical error. The device must be switched off and on. If the error persists, contact your ABB Jokab Safety representative.

Technical data

Manufacturer	
Address	ABB JOKAB SAFETY Varlabergsvägen 11 SE-434 39 Kungsbacka Sweden
Electrical data	
Power supply (Vdd):	+24 VDC ± 20 %
Unit current draw (TX):	3 W max
Unit current draw (RX):	5 W max (without load)
Outputs:	2 PNP
Short-circuit protection:	1.4 A max
Output current:	0.5 A max / each output
Output voltage – status ON:	Vdd –1 V min
Output voltage – status OFF:	0.2 V max
Capacitive load	2.2 µF @ +24 VDC max
Response times:	See table below
Recovery time:	Typically 100 ms – Recovery Time may be longer if both first and last beams are interrupted.
Protected height:	300...1800 mm
Electrical protection:	Class III - use SELV/PELV
Current for External Lamp:	20 mA min; 300 mA max
Connections:	M12 12-poles + M12 5-poles for receiver (muting models) M12 12-poles for receiver (blanking models) M12 5-poles for transmitter (for both models)
Cables length (for power supply):	50 m. max
Optical data	
Emitting light (λ):	Infrared, LED (950 nm)
Resolution:	14 - 30 mm
Operating distance:	0.2…20 m for 30 mm 0.2…7 m for 14 mm
Ambient light rejection:	According to IEC-61496-2:2013
Mechanical and environmental data	
Operating temperature:	0…+ 50 °C
Storage temperature:	- 25…+ 70 °C
Temperature class:	T6
Humidity:	15…95 % (no condensation)
Mechanical protection:	IP65 (EN 60529: 2000)
Vibrations:	Width 0.35 mm, Frequency 10…55 Hz 20 sweep per axis, 1octave/min (EN 60068-2-6:2008)
Shock resistance:	16 ms (10 G) 103 shocks per axis (EN 60068-2-29: 2008)
Housing material:	Painted aluminium (yellow RAL 1003)
Front side material:	PMMA
Caps material:	PBT Valox 508 (pantone 072C)
Cover material:	PC LEXAN
Weight:	1.35 kg per linear meter for single unit

Functional safety data		
EN 61496-1:2013	Type 4	
EN ISO 13849-1:2008	PL e, Cat 4	
EN IEC 61508-1:2010 EN IEC 61508-2:2010 EN IEC 61508-3:2010 EN IEC 61508-4:2010	SIL 3	
EN IEC 62061:2005/A1:2013	SIL CL 3	
Prob. of Dangerous Failure/Hour (1/h)	PFHd	2.64×10^{-9}
Life span (years)	T1	20
Mean Time to Dangerous Failure (years)	MTTFd	444

EC Declaration of conformity

A copy of the EC Declaration of conformity can be found in the Instruction Manual and can also be downloaded from www.abb.com/jokabsafety