Fotoelektrik Pauly GmbH & Co. KG, Wahrbrink 6, D-59368 Werne, Telefon 02389/40227-70, Telefax 02389/40227-77, www.pauly-lichtschranken.de

Self-Checking Transmitter-Receiver Light Barrier, Cascadable PP2198

Operating Instructions

1. Task

This self-checking cascadable light barrier system, which is a development from tried and tested components, provides the user with high flexibility in the construction of optical safety barriers.
The basic unit consists of a master transmitter PP2198SS, a receiver PP2198E and a control unit PP2128ST.
From these three components it is possible to construct a high quality single-beam barrier with an operating range of up to 25 meters. The light beam can be deflected with mirrors in the usual way. The transmitter can be tested for restart inhibition or restart inhibition with start up testing.
The safety function is designed in such a way that on the one hand there is no lower limit to the operating range and on the other any number of homogeneous reflective light generators with any kind of scanning conditions do not give a proper receiver function. Even a second transmitter PP2198SS, which additionally illuminates the receiver optical unit, causes triggering of the safety function.

For reasons which are easy to understand (considerable adjustment work and possibly high sensitivity to de-adjustment with lasers), it may be required to do without mirrors in the construction of multi-beam barriers. In this case the above described basic unit can be extended with a suitable number of additional light barrier pairs, consisting of one receiver PP2198E for each and a slave transmitter PP2198SF.
The light barrier pairs are constructed antiparallel since each receiver triggers the transmitter PP2198SF following.

The comparatively small construction (30x65x100 mm, aluminium pressure die casting, IP65) of transmitters and receivers will no doubt be seen as convenient.
The level indicator **DIANA** (Digital-Analogue-Indicator) is included. A spring-supported adjustment flange (car headlamp principle) and use of the very flexible pipe clip assembling equipment with a 90° pipe bend are provided for adjustment.

A two-part compact system according to the same principle, with three or more light beams at various distances is also available.

2. Installation

The transmitter and receiver are installed opposite to one another, so that the area to be protected by the barrier cannot be by-passed.
The first transmitter is always of type PP2198SS, with a receiver of type PP2198E installed opposite to this. A transmitter of type PP2198SF is installed below the first receiver at the required distance (resolution). The clocked input of this transmitter is connected to the output of the first receiver. A receiver PP2198E is installed opposite to this transmitter, this receiver now being located below the first transmitter PP2198SS. In this way the transmitters and receivers alternate with one another on both sides. The output A of a receiver is always connected to the control input T of the transmitter following.
The output of the last receiver in this arrangement is fed to the input of the control unit (PP2128ST, up to 3 optic heads; if more optic heads have to be supplied, a correspondingly more efficient control unit must be used). The power supply for the optic heads, which is simply fed through from optic head to optic head, is also taken from this control unit.

The series of transmitters and receivers installed opposite to each other can be supplied from an independent 24V source and does not require any direct electrical connection to the opposite side.
It should be ensured that each transmitter illuminates only the receiver allocated to it, since otherwise the safety function may be triggered. In this connection it should be mentioned that if the optical path lengths are long and the distances between neighboring optic heads are short the light cone (aperture angle < 2°) may possibly fall on the wrong receiver. If in such a case undesirable triggering of the safety function results an attempt to remedy the situation can be made by carrying out adjustments measures. If this is unsuccessful the optical path length must be shortened, or the distance between neighboring optical units increased.

3. Adjustment

The transmitters and receivers should be aligned as accurately as possible to one another in pairs.
The adjustment measures necessary for carrying this out can best be carried out either using adjustment flanges of the type JF19H or with Stauff pipe clips, size III (for Ø21.3 mm) and a corresponding pipe bend (Ø21.3 mm).
Exact alignment can be achieved by first making the upper receiver lens smaller in the centre using an apertured diaphragm (cardboard), and then making the receiver LED light up by adjusting the transmitter **and** receiver. When this has been achieved the upper transmitter lens is also made smaller with an apertured diaphragm, which is so small that the receiver LED is again extinguished. Adjustment is then repeated until the LED lights up again. This procedure can be repeated with further receiver diaphragms, which have been reduced in size in order to improve the adjustment quality. When adjustment is completed the diaphragms are removed.
The receiver also has a “DIANA” level indicator, four additional LED’s which serve as adjustment aids and controls on the state of reception performance. With DIANA the input level can be estimated to approx. 25 times the response threshold.

4. Connection

The transmitters and receivers are connected as described above.
The control unit is connected to the appropriate connection voltage.
The resting contact should generally be used only for signaling purposes. It is essential to ensure that the required redundancy is created right up to the machine cut-off circuit. For this purpose a commercially available controller can be used.
However, it is also possible to carry out one of the two circuit recommendations given in the appendix (restart inhibiting device or start up testing with restart inhibiting; this, however, requires a changeover switch which is produced from **both** operating contacts, and as an exception from the resting contact. Testing is carried out at the appropriate connection of the first transmitter PP2198SS).

5. Switching times

The running time following an interruption is maximum (n – 1) x 6 ms, where n is the number of pairs of optic heads. The reaction time of the relay, of approx. 50 ms, is added to this value.