Operating instructions

Optical data transmission type OD22/2

1. Purpose
The serial data transfer system replaces conventional trailing or contact line systems which up to now served data communication between a central computer and a vehicle computer (on RBG or crane).
The advantage of this wireless system is that it is interference-free and not subject to wear. Compared to a radio procedure the advantages of the optical system lie in the physically-related selectivity and the high performance of transmission.

2. Description
The optical data transmission OD22/2 functions in accordance with a carrier frequency procedure with two discrete cut-off frequencies representing the high and low states of the data strings to be transmitted. As this involves a bi-directional transmission system as in the full duplex process, different carrier frequencies are used for the two channels.
In the OD22/2A appliance there is a transmitter with the frequency f_1 and a receiver with the frequency f_2 while the OD22/2B appliance has a transmitter with the frequency f_2 and a receiver with the frequency f_1. This reliably prevents reflections exerting an undesirable influence on the two systems. The transmitters are quartz crystal-stabilised.
The optical gauging of the transducer lens systems during production ensures that the transmitter and receiver of an appliance have optical axes directly parallel to each other. This fact makes adjusting easy as it is only necessary to adjust the two appliances in relation to each other. Furthermore, OD22/2 is fully compatible with its preceding system OD2 (up to and including OD2*07) and OD22. The possible rate of data transmission lies between 0 and 20 k baud, the maximum range at 500 m! Each OD22/2A can work together with each OD22/2B without matching.

3. Assembly
One OD22/2A and one OD22/2B in each case is mounted in the designated location in such a way that the lens systems of the two co-ordinated appliances are directed at each other. A and B appliances must be placed in such a manner that their optical systems have the same height and the same lateral distance from the RBG rails. The use of the R27SH type adjusting flanges is particularly recommended for greater distances as they facilitate a very uncomplicated, sensitive adjusting.
The appliances may be attached either horizontally or vertically.

4. Adjusting
Both appliances must then be adjusted according to the light beam method (see appendix). Laser is not necessary here but instead a strong lamp (storage-battery projector) and perhaps the JH2 adjusting aid. For this purpose the RBG must be moved as far away as possible from the stationary-mounted appliance in order to be able to set with particular accuracy. As soon as two of the four DIANA LEDs (level indicators) light up, there is sufficient power available.
The level indicator can also be used to optimise the adjustment of course. However, it must be taken into account here that the DIANA display range is considerably lower than the power range of the date transmission link. It is therefore advisable to place both appliances as far apart as possible; if all four DIANA LEDs light up in this situation, the respective light collectors are covered to such an extent that some LEDs go out; an attempt must now be made again by moving both appliances horizontally and vertically to get as many LEDs as possible to light up. When the A and B appliances have been optimised in this way, the cover over the optical system is removed and the maximum reserves against contamination are activated.

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If at any time the optical power drops below a minimum value (reserve <5), this is indicated by LED 3; moreover, the p-n-p transistor installed on terminal 7 switches over, which can be regarded as an early warning of contamination. If the reception signal quality deteriorates, the receiver switches to line current level. Data transmission is not possible again until the cause of the low reception power has been removed.

5. Connection

The operating voltage of 24 V DC $\pm$ 10 %, 180 mA with a residual ripple of a maximum 20 % is connected to **terminals 1 and 2**.
At **terminals 3 and 4** the data signal at an optoelectronic coupler transistor is connected and available. Normally this transistor is activated by an external power voltage source U, whereby its collector (terminal 3) is linked to the positive potential of U by means of a resistor R_s. The emitter (terminal 4) is linked to the anode of an optoelectronic coupler diode (LED) whose cathode is connected to the O potential of U. In every case the information from the manufacturer about the data system to be connected must be observed. **R_4 (kOhm) = (U[V]-4V)/20 mA**.
The floating data input is located at the **terminals 5 and 6**. The series-connected data source often has a 20 mA constant current driver which can be connected directly to the data input, whereby polarity must be observed. A polarity reversal will not actually cause damage to the hardware. However, if a voltage source with the value U_q is involved, the diode current of the data input coupler of OD22/2 must be limited to a value between 7 and 30 mA with a suitable resistor R_q. Data voltage sources between 3.3 and 6.6 V can be connected directly without a protective resistor. Higher data source voltages require a protective resistor which is calculated with the aid of the equivalent circuit diagram (shown in the appendix) of the data input of OD22/2. A 5V voltage source provided with an internal resistance of 150 ohm produces a current of approx. 8 mA. (The lower response threshold lies under 4 mA.)
At **terminal 7** is the open collector of the p-n-p transistor which turns off in the case of insufficient optical power if the switch "VK" is in position "h". This output has a short-circuit current limit of 60 mA. (See also section 4.)

6. Other points

The assignment in the second terminal strip located in the appliance is identical to that in the first one; it can be used to carry out any additional wiring required for the optoelectronic coupler inputs and outputs.
LED 1 shows if current is flowing in the data input. LED 2 shows if the output transistor is being driven. LED 3 shows if the indicator that power is too low has responded. It lights up independently of the "VK" switch if there is too little power. The "VK" switch makes it possible to invert the phase relation of the contamination indicator.
The transistor at terminal 7 outputs the operating voltage if the "VK" switch is at "d" and is blocked if the switch is at "h".
If power is sufficient (LED 3 out), terminal 7 also supplies an output level, depending on the position of the "VK" switch but in reverse logic however.
To check the signals' function and phase relation, the terminals for the input and output can be statically loaded which in the interest of simplicity can be done for the 20-mA interface in accordance with figure b in the data sheet. For normal operation the static wiring must be removed.

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