Data transmission

Optical transmission

4.1

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Serial
It is generally indicative of a serial interface system, that is a system for data transmission across a medium (line) which is passed through by a sequence of single information pulses (baud, bit).
In this case it applies to the asynchro nous mode only, when the cha-racter transmitted is encoded by a 7/8 bit. The synchronism is ensured by the start bit preceding the sequence and the following stop.

Mark/Space
By RS232, when the line voltage between TX or RX and SGnd is higher than +3V, it means that there is one SPACE or a BIT of a code equivalent to a logic state 0.
When the line voltage is less than -3V it means that there is one MARK or a BIT of a code equivalent to a logic state 1.
By the other standard communications, when lines are double and balanced, there are other signal levels but the coding system is identical for TX- and RX- lines, opposite for TX+ RX+ lines.
In the gaps between two characters or when the line is activated but no characters are transmitted the sender keeps the line in the MARK condition.

Baud (rate)
It is indicative of the number of elementary information transmitted in one second through the communication channel.
It actually indicates the maximum number of mark/space switching per second which can occurr on the line.
It means that the minimum length of an 1 or a 0 on the line is, for example, 104µs for 9600 Baud and 416µs for 2400 Baud.
In the CS devices by M.D.the Baud rate indicates the top value and any lower Baud rate is admitted.
If the interconnection cables are no longer than a few meters the devices fit for 2400 Baud can operate correctly up to 4800 and the devices fit for 9600 Baud can operate correctly up to 19200.

Simplex, Half / Full Duplex
A SIMPLEX type transmission is indicative of a transmission where data are linked in just one direction and such a direction can not be inverted. Therefore there are only two elements: one is functioning as a sender and the other as a receiver. A typical example is the communication between a PC and a printer.
The HALF DUPLEX type transmission is a transmission where data can be linked in two opposite directions, but at different times (one at a time). The FULL DUPLEX type transmission is a transmission where data can be linked in two oposite directions at the same time (contemporaneously).
Two pairs of CSE/CSR devices are necessary on each side in order to realize an HALF or FULL DUPLEX system.

RS232C
It is the standard for serial data link indicative of the transmission from one most diffuse point to another.
It means a transmission speed up to 19200 Baud and distance up to 15m. Longer distances (i.e. up to 50m) are possible, provided that the total capacity of the connection cable does not exceed the value of 2500 pF.
The lines involved only in the data transmission are:
TX - Serial data output
RX - Serial data input
SGnd- Reference common run

RS423 / RS422
They are additional standards realized for higher Baud rate and di-stances:
RS423- Line off balanced, 2000m cable, 300KBaud speed
RS422- Line balanced, 4000m cable, 10MBaud speed
RS422 can be converted into a RS423 by earth connection of the terminal +RX whereas the terminal TX+ remains unconnected.
In general, interface between RS423 and RS232 is possbile, provided that the following conditions are respected:
a) The TX output terminal of RS232 driving the -RX input of RS423 should not provide a voltage higher than 12V.
b) The TX ouptut terminal of RS232 is able to drive only one -RX input of RS423.
c) Use a switching fronts ' gradient compatible with the two systems for a determinate maximum cable length and Baud rate.
When using the CS devices according to the wiring instructions it is possible to obtain an interoperability for cables with length up to 15m and Baud rate up to 9600.

RS485
This standard has evolved from the RS422 and maintains its electrical specifications. However, the transmission line consists of just one twin cable, +DATA and -DATA, or rather there is no longer a distinction between the pairs of wires +/-TX and +/-RX in that the same twin cable can transmit data in both directions.
The RS485 is therefore a MULTIDROP line, or rather a line to which many elements can be connected (max. 32) capable of operating as both operator and receiver. When one of these assumes the function of transmitter, all the others assume the function of receiver. It is therefore a line which always functions in HALF-DUPLEX mode.
As a rule, one of the connected elements acts as Master and will decide for all the others which single user in that moment should have the function of transmitter.
A CS*E device can be directly connected to the RS485 line with the same limitations as the RS422 line. It will be able to create for the line an element having the single function of receiver and can transmit to a CS*R device the data stored in the RS485. A CS*R device cannot be directly connected to the RS485 line but requires an RS232/RS485 interface..

Control lines
They are additional lines for the connection between the two systems and they are used to operate the transmission/reception protocols.
The two systems coordinate by these lines the listening and transmission phases, so that the data communication can occur only when the receiving device is ready to listen.
In an HALF or FULL DUPLEX system the control lines can be replaced by similar software procedures which use the TX/RX lines only.
The CS devices do not operate the control lines. Therefore, the user shall operate the connection as if it were realized with TX and RX lines only.

20mA TTY or Current Loop
It is an old standard actually used for connecting teleprinters over di-stances up to 1 Km.
The emitter consists of a current generator at 20mA, the current flow forms the MARK, the current gap forms the SPACE.
The receiver has the function of a current gauge.
Actually, it is now used as non standard interface among autoconstructed devices with optical decoupler as input element.

Active/ passive user
In CURRENT LOOP systems the ACTIVE USER is indicative of a line connected receiver which provides the necessary power for the transmission from its own feeder.
The PASSIVE USER is a line connected receiver which does not provide power, but with the load only. The power necessary to the transmission is supplied by the emitter.

Transfer delay or propagation
It is the time required from one fall or rise front to cover a distance: input terminals of the emitter (CSE), output terminals of the receiver (CSR). This rate can be considered as consisting of the sum of two factors, a constant delay which does not affect the integrity of asynchronous transmissions, a casual delay indicative of the distor-sion actually introduced by the system.
The distorsion introduced by CSE/CSR devices is 10% maximum. Asynchronous receivers generally accept maximum distorsions by 30%.

Slew rate
It is the maximum speed of supply voltage variation on the line.
It actually indicates the gradient of fall and rise fronts of voltage steps. This gradient must be controlled by TX in order to avoid any coupling among the adiacent cables.
The values indicated in the table refer to one loaded line (3KΩ 2500pF).

Maximum control voltage (emitter)
It is the max. supply voltage which can be applied to the DATA input of CSE devices in eventual non standard applications.

Maximum control consumption (emitter)
It is the maximum current consumption when the input polarity is at the maximum positive/negative rate applicable to the DATA input of CSE devices in eventual non standard applications.

ON/OFF control threshold (emitter)
IIt is indicative of the nominal rates of input threshold and corrispon-dent current consumption.
Please note that this input has been so realized as to be compatible with the most different control systems: TTL, CMOS, RS232, TTY...
It consists of two loads, a current generator which is series connected to a diode in case of positive polarity, a 4,7KΩ resistor which is series connected to a diode in case of negative polarity.

Common/separate supply
Terminals for data input of CSE devices are electrically isolated from the supply terminals for a great freedom in the connection.
The examples indicated as CURRENT LOOP applications are actually valid for every not standard application.
Actually, if the control device has a voltage supply between 12 and 24V able to provide the required current (100mA) you may use it with no restrictions in the wiring.
If the control device consists, for example, of a logic gate with supply voltage 5V, then it is not possible to use the same 5V to supply the emitter, but any other voltage between 12 and 24V (for example not-stabilized) present in the rack can be used to supply the emitter.

Applications
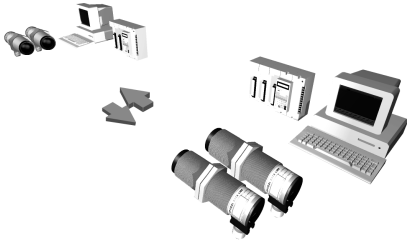
Possibility of bidirectional transmission through the simple use of two pairs (mono/bidirectional).
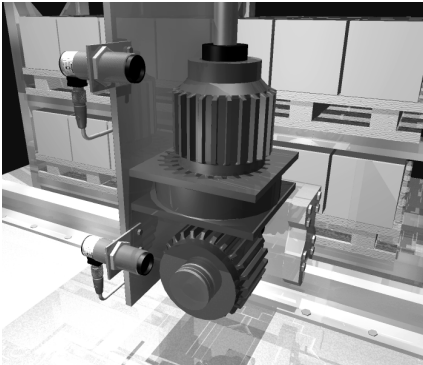
Transmission over long distances (50-100m) for automatic feeders, elevators, rail automations, etc... (CSF models)
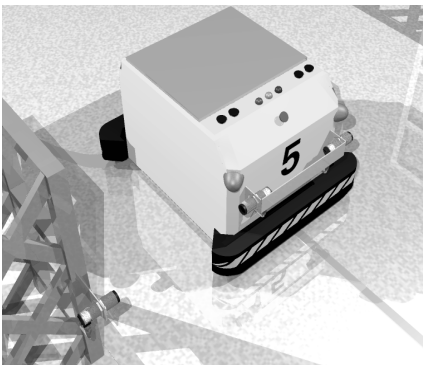
Wide beam transmission over short distances (3-6m) for the easier alignment of freehand auromations like AGV, trolleys, working stations, etc... (CSW models).

4.1

SERIE   CS

Serial data link - 12/24DC

◆ **Optical data link over distances up to 100m**
◆ **Speed rate up to 2400 or 9600 Baud**
◆ **RS232 transmission or 20mA TTY current loop**
◆ **Simplex or duplex connection**
◆ **Standard metal housing M30 for a great strenght**
◆ **3 LED indicators for easier installation**
◆ **M12 standard plug-in exit (metal)**
◆ **IP67 protection degree**
◆ **Complete protection against electrical damage**
◆ **Wide range of accessories available**

4.1

DIMENSIONAL DRAWING

CS**/*-*

Key

1	Right angle M12 plug-in exit		**4**	Yellow LED (receiver output state)
2	Green LED (supply)			Connectors **CD** serie
3	Yellow LED (emitter check)			Accessories **ST** serie
3	Red LED (receiver alignment)			

CE

Handlings free of any constraints

CS serie enables the translission of **serial data (RS232 or 20mA TTY current loop) over distances up to 100m, transmission rate of 2400 or 9600 Baud and modulated infrared mode.**
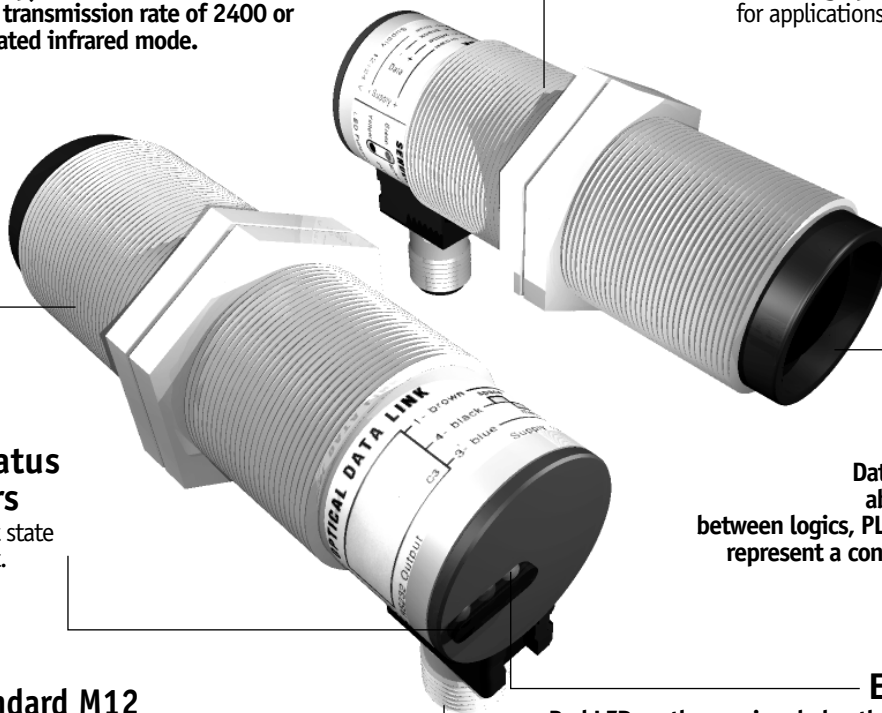
Great robustness

Nickel plated brass housing with very high protection degree (IP67) for applications in harsh environments.

3 LED status indicators

supply, output state and alignment.

### Data link, programs code, abilitation signals, etc... between logics, PLC or computer will not represent a constrint in handling your equipments anymore.

Standard M12 plug cable exit

for any wiring connection and maintenance.

Easy alignment

Red LED on the receiver helps the alignment functions, switching on in case the system is disaligned or lenses are dirty when used in dusty areas.

ORDERING SYSTEM

C S F E / 4 - 0

serie				
serial data link	**CS**			
model				
long distance	**F**			
short distance, wide angle beam	**W**			
type				
emitter	**E**			
receiver	**R**			

	output state
0	emitter
N	NPN output (20mA TTY current loop)
S	serial output (RS232)
	transmission frequency
4	2400 baud max.
5	9600 baud max.
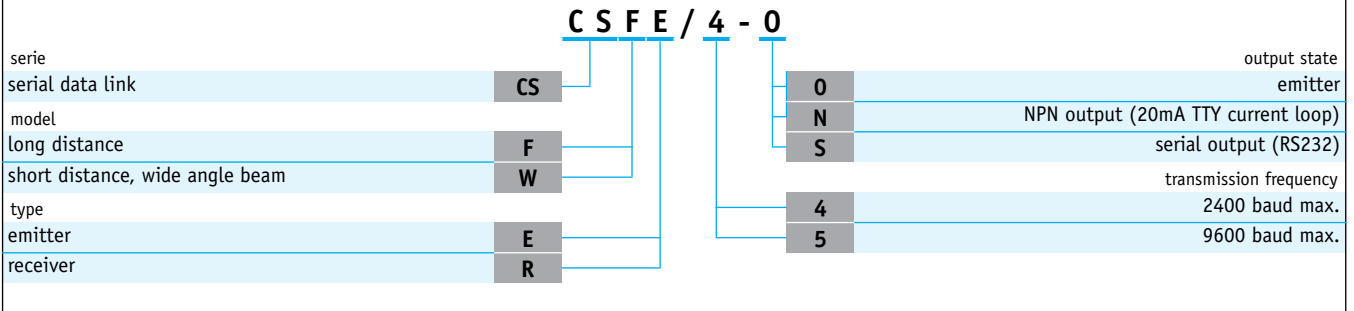
SPECIFICATIONS

Model	CSF*/4-*	CSF*/5-*	CSW*/4-*	CSW*/5-*
Nominal sensing distance Sn	100m	50m	6m	3m
Emission	infrared (880nm)			
Differential travel	≤10%			
Max. transmission delay	50µs	10µs	50µs	10µs
Max. distortion	10% (at max. Baud rate)			
Operating voltage	12-24Vdc ±10%			
Ripple	≤10%			
No-load supply current	100mA (emitter) - 35mA (receiver NPN) - 45mA (RS232C output type)			
Load current	≤100mA (NPN output)			
Leakage current	≤10µA (NPN output)			
Voltage drop	0,3Vmax. I_L = 100mA (NPN output)			
Output type	NPN/NC or RS232C			
Slew/rate	3-5V/µs			
Time delay before availability	100ms			
Supply electrical protections	polarity reversal			
Output electrical protections	short circuit			
Temperature range	-25...+50°C (without freeze)			
Check	max. voltage: ±30V; max. consumption: +3,5/-6,5mA; threshold on: 2,5V at 1,65mA; threshold off: 2,3V at 1,25mA			
Interference to external light	1500 lux (incandescent lamp), 50000 lux (sunlight)			
Protection degree (DIN 40 050)	IEC IP67			
LED indicators	see Dimensional drawing			
Housing material	nickel-plated brass (housing), polycarbonate (connector)			
Lenses material	PMMA			
Tightening torque	100Nm			
Weight (approx.)	2x300g			

4.1

CONNECTORS

M12

BLK — 4 3 — BL
BRW — 1 2 — WH
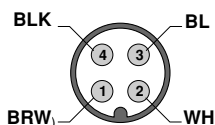
WIRING DIAGRAMS

Emitter/Receiver (serial RS232)	Emitter (NPN current loop)	Emitter (PNP current loop)	Receiver (current loop)

Emitter/Receiver (serial RS232)

RS 422

RS 232-C

Emitter (NPN current loop)

Common supplies

Separate supplies

Emitter (PNP current loop)

Common supplies

Separate supplies

Receiver (current loop)

Data for active user

Data for passive user

* cable with screen. R=120-240Ω 1/2W (optional)	R=1330Ω 1/2W is introduced to bring consumption to 20mA. It should be placed near the emitter.	R=1200Ω 1/4W

CHARACTERISTIC CURVES

4.1

Excess gain	Parallel displacement	Angular displacement	Mutual interference

CSF*/4-*

CSF*/5-*

CSW*/4-*

CSW*/5-*