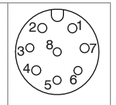
System, Power and PLC (SYS)

For connection of the power supply, one digital input, process RS232 interface and three digital outputs directly to a PLC.
- 8-pin Male connector
- 24 VDC ± 15%, I_{max} < 500 mA
- not electrically separated, polarity reversal protection, GND is electrically connected to GND for switching outputs.

Pin	Color [1]	Function	Description
1	White	IN0	Trigger input
2	Brown	V_+	Operating voltage (10 - 28 VDC)
3	Green	TX	Terminal (RS 232 transmit)
4	Yellow	RX	Terminal (RS 232 receive)
5	Gray	OUT0	Switching output (NPN/PNP/PP)
6	Pink	OUT1	Switching output (NPN/PNP/PP)
7	Blue	GND	Ground connection
8	Red	OUT2	Switching output (NPN/PNP/PP)


View of sensor flange connector



Pin sequence, 8-pin Cable socket, view from solder side

The three switching outputs are switchable push-pull outputs. The switching output logic level depends on the supply voltage V_+ connected.

Use: Direct for 3 individual colors or binary for 7 color groups

The switching state zero is not used to ensure reliable test performance in the face of a discontinuity. The switching state all switched is recommended as the standard `color not detected` output.

➡ Use shielded cable with a length < 30 m.

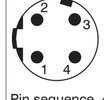
Ethernet (ETH)

For data transmission connection to an RJ45 Ethernet connector
- 4-pin female connector
- with Ethernet network (PC)

➡ Connect the sensor to the network using a shielded Ethernet cable (Cat5E) with a length < 100 m. Micro-Epsilon recommends use of the optionally available cable CAB-M12-4P-St-ge ... RJ45-Eth.

Pin	Color [2]	Function	Description [2]
1	Orange/white	TX+	Ethernet
2	Blue/white	RX+	Ethernet
3	Orange	TX-	Ethernet
4	Blue	RX-	Ethernet


View of sensor flange socket



Pin sequence, 4-pin Cable connector, view of solder side

The sensor can be configured using the HTTP-API commands.

1) Conductor color CAB-M12-8P-Bu-ge 2) Conductor color CAB-M12-4P-St-ge ... RJ45-Eth2
3) Specification pursuant to 100BASE-TX

Digital I/O

The five push-pull switching outputs on the 8-pin connector I/O [1] are electrically connected to the power supply. The switching output logic level depends on the supply voltage V_+ connected.

Use: Direct for a total of 8 individual colors or binary for 254 color groups.

The switching state zero is not used to ensure reliable test performance in the face of a discontinuity. The switching state all switched is recommended as the standard `color not detected` output.

The cable shield is connected to the housing.

➡ Connect the cable shield to the evaluation unit.

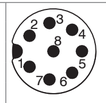
All GND conductors are interconnected with one another and to operating voltage ground.

➡ Use shielded cable with a length < 30 m.

Micro-Epsilon recommends use of the optionally available cable CAB-M12-8P-St-ge.

Pin	Color [2]	Function	Description
1	White	IN1	Trigger input
2	Brown	IN2	
3	Green	IN3	
4	Yellow	OUT3	Switching output (NPN/PNP/PP)
5	Gray	OUT4	
6	Pink	OUT5	
7	Blue	OUT6	
8	Red	OUT7	

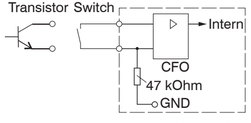

View of sensor flange socket



Pin sequence, 8-pin Cable connector, view of solder side

1) Applies only for colorSENSOR CFO200. 2) Conductor color CAB-M12-8P-St-ge

Switching Input Circuit

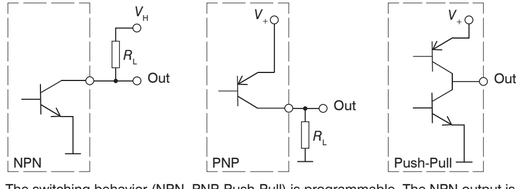


The switching input IN can be connected to the operating voltage potential V_+ as follows.

Model-specific Pin assignments, functions, descriptions and notes about this are available in the operating instructions.

Switching Output Circuit

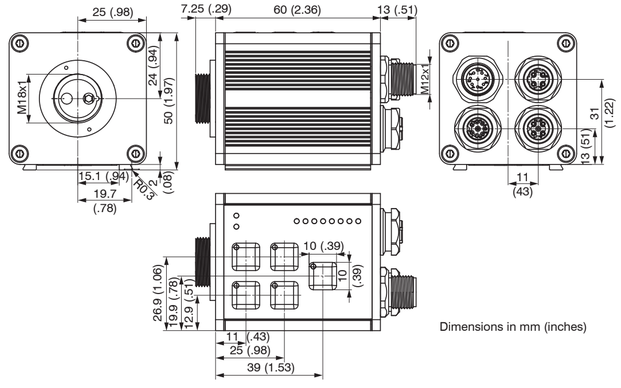
The switching outputs are connected as follows:



The switching behavior (NPN, PNP, Push-Pull) is programmable. The NPN output is, for example, suitable for adaptation to a local TTL logic circuit with auxiliary voltage of V_H = 5 V.

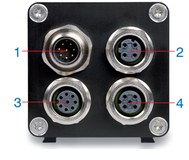
The switching outputs are protected against polarity reversal, overload (< 100 mA), excessive temperature and have an integrated self-induction recuperation diode for inductive loads. Not electrically separated, 24 V logic (HTL), low level GND, high level V_+ (max 28 V)

Dimensional Drawing



Dimensions in mm (inches)

Electrical Connections



Connector location on colorSENSOR CFO200


Electrical connections on colorSENSOR CFO200

1	SYS = System (Power/PLC)	Power supply, switching outputs, switching input, RS232
2	ETH = Ethernet	Connection to PC
3	I/O = Digital I/O (PLC), CFO200 only	Switching inputs and outputs
4	USB, CFO200 only	USB process interface

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MICRO-EPSILON

Assembly instructions colorSENSOR CFO

Warnings

Connect the power supply in accordance with the safety regulations for electrical equipment. Ensure that power supply does not exceed specified limits.
> Risk of injury, damage to or destruction of the sensor.

Protect the ends of the optical fibers against contamination, protect the cable against damage.
> Failure of the measuring device

Avoid shocks and impacts to the controller or the sensor.
> Damage to or destruction of the system

Proper Environment

- Protection class: IP65
- Temperature range:
  - Operation: -10 °C ... +55 °C (+14 ... +131 °F)
  - Storage: -10 °C ... +85 °C (+14 ... +185 °F)
- Humidity: 20 ... 80 % RH (non-condensing)
- Ambient pressure: Atmospheric pressure

You can find more information about the sensor in the operating instructions and the interface instructions. They are online at:
www.micro-epsilon.com/download/manuals/man--colorSENSOR-CFO--en.pdf
www.micro-epsilon.com/download/manuals/man--colorSENSOR-CFO-Interfaces-en.pdf
or with the QR codes at right.

Installation

i The supply voltage must not exceed the specified limits.

The colorSENSOR CFO can be placed on a level surface or fastened with the dovetail on the rear of the sensor.

i Position the sensor so that the connections, controls and displays are not concealed. We recommend maintaining a clearance of 2 - 3 cm at the cooling ribs on the left and right sides.

A mounting adapter is available separately for mounting with screws or with a mounting rail (TS35 top-hat rail) according to DIN EN 60715 (DIN rail).

Operation Using Foil Keyboard

The starting point is the main menu = operating mode/measuring mode: Display of the color group identified/selected setting for `No color detected`/all LEDs flash - sensor is overmodulated.

Default IP: 169.254.168.150

Submenu		Options / settings			Display / visualization
INT Press and hold > 2 sec.	Intensity menu	TEACH AUTO	Automatic setting to about 80 %	i While the settings are performed, the LEDs flash. Duration: about 5 seconds	GATE 1, TEACH 2, HOLD 3, MULTI 4, CLASSIFY 5, SPHERE 6, CYLINDER 7, BOX 8 Number of illuminated LEDs matches intensity All LEDs flash: sensor is overmodulated
		CLR / OPT	Intensity higher/lower about 10 %/key press		
TEACH AUTO Press and hold > 2 sec.	Color teach menu	CLR / OPT	Select color group CFO100 1 - 6 CFO200 1 - 254	TEACH AUTO: Teaching color: Press < 2 sec.: 1 color Press and hold > 2 sec.: Multi-teach	GATE 1, TEACH 2, HOLD 3, MULTI 4, CLASSIFY 5, SPHERE 6, CYLINDER 7, BOX 8 **Flashing** Medium-fast [1] = no color Fast [2] = at least 1 color Slow [3] = color within a group is detected.
			i LED of the group flashes.	CLR: Delete color group Press and hold > 2 sec.	
CLR Press and hold > 2 sec.	Delete entire color table	i Back to main menu		ESC TOL: Tolerance submenu	CLR / OPT: Tolerance stage higher/lower Tolerance setting, see table at right GATE 1, TEACH 2, HOLD 3, MULTI 4, CLASSIFY 5, SPHERE 6, CYLINDER 7, BOX 8 Tolerance stage is displayed (1- 8) higher/lower TEACH AUTO: Back to Color teach menu
OPT Press and hold > 2 sec.	Options menu	CLR / OPT	Four option groups are possible: **Switching input In0:** Triggered color evaluation (GATE) or triggered teaching (TEACH) **Switching output hold time:** 0 ms (LED off), 10 ms (LED flashes briefly), 1000 ms (LED flashes long) **Teaching behavior of color groups:** Multi-teach on/off **Tolerance mode for color detection:** CLASSIFY, SPHERE, CYLINDER, BOX	TEACH AUTO: Function: switch on/off/scroll	GATE 1, TEACH 2, HOLD 3, MULTI 4, CLASSIFY 5, SPHERE 6, CYLINDER 7, BOX 8 **Flashing** Fast = On Slow flashing = Off Or speed of flashing Tolerance mode is displayed directly.

i Back to main menu

INT Press and hold > 2 sec.	Save
ESC TOL Press and hold > 2 sec.	Cancel

Before	After	Action
Operating mode	Menu mode	Press and hold one of the keys > 2 sec. to change from operating mode to various menus.
Menu mode	Submenu	With the exception of the `ESC/TOL` key, all keys call a separate menu, see key label. Pressing the `TOL` key in the `TEACH` menu calls the submenu for Tolerance adaptation.
Change-over within menu		Press one of the / keys `CLR/OPT` for < 2 sec. to change over between colors, options, etc. within a menu.
Menu mode	Start action	Press the `TEACH/AUTO` key for < 2 sec. to start an action.
Menu mode	Operating mode	Press and hold the `INT/ENTER` key > 2 sec. to save or the `ESC/TOL` key to cancel and leave menu mode.

Key lock

ESC TOL + INT + ESC TOL

Controls and LEDs

The operating concept, as well as the function of the foil keyboard, are described in the Chapter Foil Keyboard, see operating instructions.

LED/key	Color	Meaning	Location
	Green	Operating voltage present	
	Red	Key lock active	
TEACH AUTO	White	Color teach menu Set level automatically	
INT ↵	White	Automatic illumination adjustment Enter/save	
CLR ←	White	Delete memory menu Arrow pointing left	
OPT →	White	Option selection menu Arrow pointing right	
ESC TOL	White	Escape/quit without saving Tolerance adaptation menu	

Tolerance Setting

Tolerance is subdivided into the following stages:

	Tolerance space					
	Sphere	Cylinder		Box		
Tolerance stage	ΔE_{rel}	ΔL	Δab	ΔL	Δa	Δb
1	0.3	0.6	0.3	0.6	0.3	0.3
2	0.5	1.0	0.5	1.0	0.5	0.5
3	1.0	2.0	1.0	2.0	1.0	1.0
4	2.0	4.0	2.0	4.0	2.0	2.0
5	4.0	8.0	4.0	8.0	4.0	4.0
6	6.0	12.0	6.0	12.0	6.0	6.0
7	8.0	16.0	8.0	16.0	8.0	8.0
8	12.0	24.0	12.0	24.0	12.0	12.0

1) 100 ms on/900 ms off
2) 2 periods:
   1.50 ms on/50 ms off
   2.50 ms on/850 ms off
3) 900 ms on/100 ms off