



Smart Sensing Solutions Since 1954



**Extremely High Speed Dual-Function Sensor**



## Extremely High Speed (10µs) Photoelectric Sensor

The **SMARTEYE® X-PRO XP10** registration mark sensor reliably detects the position of registration marks on various webs of material running at very high speed.

The switching frequency of the sensor is 50Khz with a repeatability of 5µs. This provides unprecedented stability of the mark position. It is ideal in processes where timing is critical such as high-speed printing.

Not all high-speed applications are registration mark applications. With the press of a few buttons this dual-function sensor can be configured to function as a standard photoelectric sensor for any high-speed application.

The sensor is primarily used with glass and plastic fiber optics but can be configured with any of our optical blocks to tailor it to your application. In addition, this sensor has five memory locations for the storage and retrieval of sensor set-up's. Retrieval of settings can be done remotely via a one wire interface. The XP10 can either be side mounted or Din rail mounted. Epoxy encapsulated, it is rugged and vibration proof.



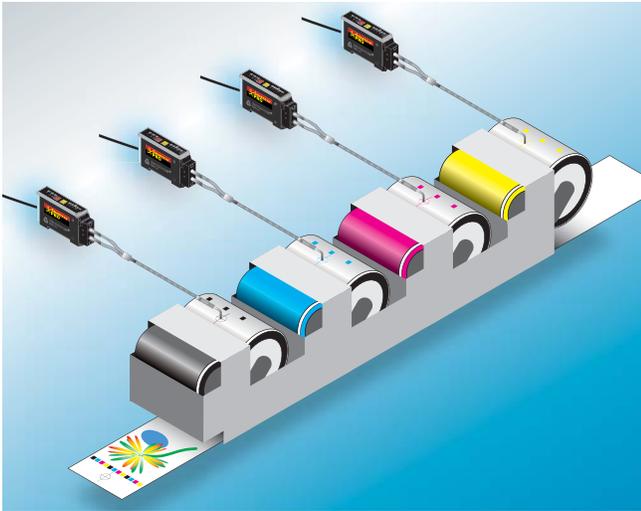
### Features

- 10µs response time
- 5µs repeatability
- Dual-Function sensor
  - Mark Mode – For registration
  - Standard Mode – Object sensing
- Five memory locations
- External programming through the remote input line
- Available in white, red and infrared LED
- Patents No. 5,621,205 and No. 6,950,778
- AUTOSET – one-touch Setup
- 10-LED dual-function bar graph

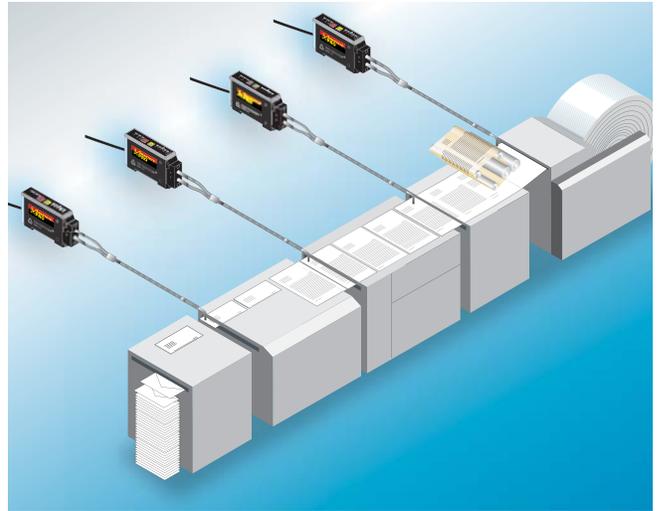
### Benefits

- Increase edge accuracy at all speeds
- Virtually eliminate setup time
- Reduce material scrap
- Eliminate compensation software
- Repeatable leading edge or trailing edge accuracy consistently at 5µs
- Increase throughput capacity
- Eliminate machine speed constraint

# Applications

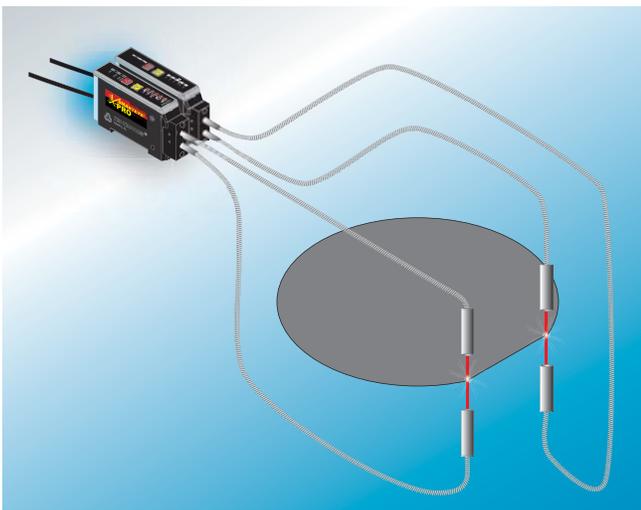


High Speed Offset Printing

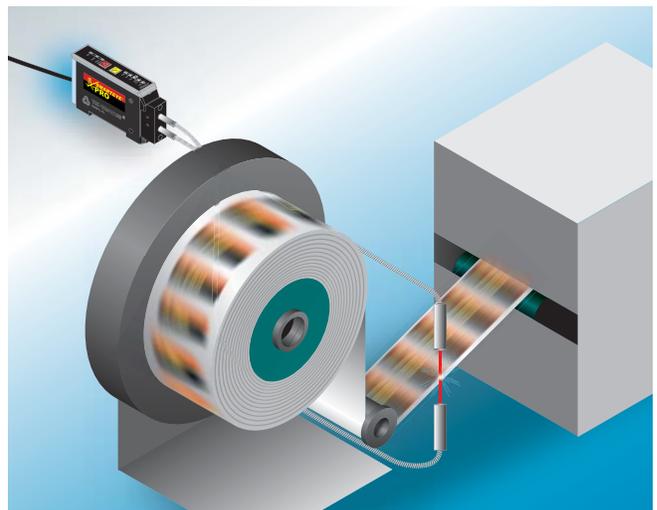


High Speed Paper Converting

# When Timing is Everything!



High Speed Edge Detecting



High Speed Label Rewinding

# Features



## AGS

AGS (Automatic Gain Select) provides automatic digital selection of the amplifier gain based upon application requirements.

## AUTOSET ADJUSTMENT

The AUTOSET adjustment routine requires only pushing one button once. Even in dynamic operating conditions, with ongoing input events, just one push of one button to get a perfect setting. This is dependent upon at least a 4:1 duty cycle ratio.

## AUTOSET/ REMOTE PROGRAMMING (Patent No. 6,950,778)

Remotely AUTOSET or program the sensor's multiple options by applying a sequential momentary contact closure from the AUTOSET input wire to negative as shown in the wiring diagram. The remote AUTOSET command will duplicate the last manual AUTOSET.

## EDR® (Patent No. 5,621,205)

The EDR (Enhanced Dynamic Range) circuit is digitally controlled. EDR prevents dark state saturation and expands the operating range without reducing amplifier gain.

## 10 LED DUAL-FUNCTION BAR GRAPH

**Contrast Indicator** – Provides at-a-glance performance data.

**Status Indicator** – Displays status of selectable options:

**Lock** – When this option is enabled the sensor becomes tamperproof.  
*Note: The Remote AUTOSET and Remote Programming are not affected by the Lock option.*

**Mark** - When this feature is enabled, the sensor buttons function like a MARK•EYE® PRO: Push and hold yellow button for light background and red button for dark background.

**Pulse Stretcher (PS)** – When the OFF delay pulse stretcher is enabled, the output duration is extended by 10 or 20 milliseconds (not additive). Enabling the Timer allows ample time for the controller to respond. The time durations of the gap between marks must be longer than the selected delay. **Enable** – Provides access to MEM-1 thru MEM-5 locations and enables remote programming.

*NOTE: Any changes to the sensor will automatically be saved to current MEM # location.*

## HIGH SPEED

10µs response time when responding to light or dark state.  
5µs repeatability.

## CONNECTIONS

Built-in 5-pin M12 connector, or 6ft Cable.

## MOUNTING OPTIONS

Built-in DIN rail snap-on design, through-hole, or bracket mount.

### DUAL FUNCTION BAR-GRAPH

Primary function: Contrast indicator  
Secondary function: Option Status indicator of ten selectable options

### #10 LOCK

Tamperproof operation

### #9 MARK

When illuminated – ON = Mark Mode  
When not illuminated – OFF = Standard Mode

### #8, #7 PULSE STRETCHER (PS)

10 or 20 millisecond Pulse Stretcher  
OFF Delay

### #6 ENABLE

Illuminates when advanced features are enabled:  
MEM 1 - MEM 5 and Remote Programming.

### #5 – #1 MEMORY (MEM)

Illuminates to indicate Active Memory.

### OPTION STATUS INDICATOR

Illuminates when in Option Status mode.

### OUTPUT INDICATOR

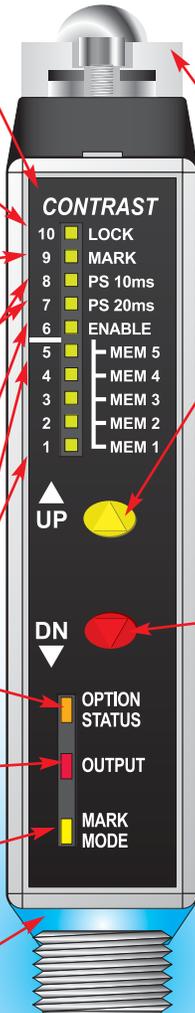
Illuminates when output is ON.

### MARK MODE INDICATOR

Illuminates when Mark mode is enabled.

### LARGE HIGH VISIBILITY OUTPUT INDICATOR

Illuminates when output is ON.



### TEN INTERCHANGEABLE OPTICAL BLOCKS

See page 144 for details.

### YELLOW PUSH-BUTTON – Four Functions

1. Manual UP adjustment
2. Options select & AUTOSET programming
3. Toggle selected option to opposite state and return to normal operation.
4. When holding red AUTOSET button, tap to alter AUTOSET mode: Light State/Dark State.

### RED PUSH-BUTTON – Four Functions

1. Manual DOWN adjustment
2. Options select & AUTOSET programming
3. When in Option Status mode, tap to desired function to be altered.
4. When holding yellow AUTOSET button, tap to alter AUTOSET mode: Light State/Dark State.

*Note: Press and hold both red and yellow buttons simultaneously for three seconds to enter Options mode.*

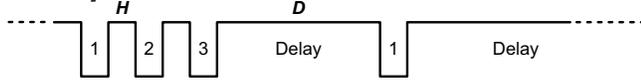
# Special Features



## REMOTE PROGRAMMING

The Remote Programming feature of the SMARTEYE® X-PRO XP10 allows the customer to configure AUTOSET and tweak the sensor using a PLC pulse-train, HMI, NPN transistor output, or momentary PUSH-BUTTON switch to 0VDC/ground. This provides the customer with control over every aspect of the sensor configuration without having to physically touch the sensor. Having several sensors on the machine; have sensors buried deep within the mechanical structure of the machine; or have sensors in safe areas behind interlocks, sensors are easily accessible remotely to perform a digital changeover due to this unique, special feature.

### Example Selection of MEM 1



Each pulse (L) is low for 40ms to 400ms. The idle time (H) between pulses is 40ms to 400ms. The delay (D) between sets of pulses is .75 seconds to five seconds.



HMI - Human Machine Interface

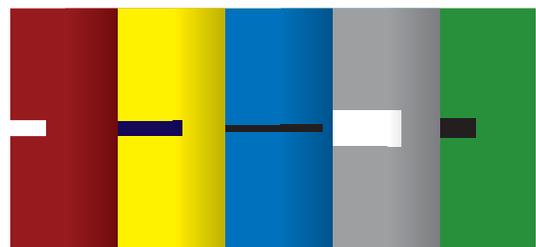
## FIVE MEMORY LOCATIONS

There are five memory locations available to store various configurations of the sensor for particular applications. For instance, with five different web materials, the background colors are different, the mark colors are different, and the marks are different sizes. A different AUTOSET would be needed for each background, and possibly need to add a Pulse Stretcher timer for the different sized marks. The SMARTEYE® X-PRO XP10 sensor stores and recalls that information so the setup time is eliminated completely, reducing down-time and change-over complications when running different materials. Having Memory Locations is also a benefit for any other application with changing conditions: different sized bottles, different colored labels, varying background materials, varying product textures, etc.

Packaging Five Memory locations together with the unique Remote Programming feature makes the SMARTEYE® X-PRO XP10 sensor a fast sensor for rapid digital changeover, as well as for speed and accuracy.

NOTE: Any changes to the sensor will automatically be saved to current MEM # location.

### Ex. Five Registration Marks



(Mark Samples)



# Optical Block Selection



## Convergent V-Axis Blocks

Narrow beam optics useful for proximity sensing to minimize response to reflected light from background objects.



**V4**  
**Convergent 1in V-Axis**  
 Useable range of 1in to 5in.  
**V4A**  
**Convergent 1in V-Axis, Apertured**  
 Useable range of 1in to 5in.



**V6**  
**Convergent 1.5in V-Axis**  
 Useable range of 1.5in to 8in.



**V8**  
**Convergent .5in V-Axis**  
 Useable range of .25in to 5in.

## Proximity Blocks



**O4**  
**Proximity**  
 Wide beam optics useful for short-range sensing of a variety of objects.



**O5**  
**Proximity**  
 Narrow beam optics useful in long-range sensing of medium to large size objects.

## Retroreflective Blocks



**R4**  
**Retroreflective**  
 Narrow beam optics designed to sense reflectors or reflective materials at long range.



**R5**  
**Polarized Anti-Glare Retroreflective**  
 Polarized to reduce response to hot-spot glare from shiny surfaces. Use with visible light source.

## Fiber Optic Blocks



**F4**  
**Glass Fiber Optics**  
 Adapter for use glass fiber optic light guides.



**F5**  
**Plastic Fiber Optics**  
 Adapter for use plastic fiber optic light guides.

# Sensing Range Guidelines

| Optical Blocks         | Convergent / Proximity / Retroreflective |                 |                | Glass Fiber Optics    |                |                |                 | Plastic Fiber Optics  |                |                |                 |                 |
|------------------------|--|-----------------|----------------|-----------------------|----------------|----------------|-----------------|-----------------------|----------------|----------------|-----------------|-----------------|
|                        | IR                                       | RED             | WHITE          | Optical Blocks        | IR             | RED            | WHITE           | .04in Diameter        |                | .02in Diameter |                 |                 |
|                        |  |                 |                |                       |                |                |                 | RED                   | WHITE          | RED            | WHITE           |                 |
| V4, V4A                | 1in (25.4mm)                             | 1in (25.4mm)    | 1in (25.4mm)   | <b>Opposed Mode</b>   |                |                |                 | <b>Opposed Mode</b>   |                |                |                 |                 |
| V6                     | 1.5in (38.1mm)                           | 1.5in (38.1mm)  | 1.5in (38.1mm) | F4                    | 6in (152.4mm)  | 6in (152.4mm)  | 11in (279.4mm)  | F5                    | 4in (101.6mm)  | 4in (101.6mm)  | 1in (25.4mm)    | 1in (25.4mm)    |
| V8                     | 0.5in (12.7mm)                           | 0.5in (12.7mm)  | 0.5in (12.7mm) | F4 w/lens             | 6ft (1,829mm)  | 6ft (1,829mm)  | 6ft (1,829mm)   | F5 w/lens             | 4ft (1,219mm)  | 3ft (914.4mm)  | N/A             | N/A             |
| O4                     | 4in (101.6mm)                            | 3.75in (92.3mm) | 5in (127mm)    | <b>Proximity Mode</b> |                |                |                 | <b>Proximity Mode</b> |                |                |                 |                 |
| O5                     | 30in (762mm)                             | 26in (660.4mm)  | 18in (457.2mm) | F4                    | 2.0in (50.8mm) | 2.0in (50.8mm) | 1.75in (44.5mm) | F5                    | 1in (25.4mm)   | 1in (25.4mm)   | 0.25in (6.35mm) | 0.25in (6.35mm) |
| R4                     | 15ft (4,572mm)                           | 12ft (3,657mm)  | 8ft (2,438mm)  | F4 w/lens             | 6in (152.4mm)  | 6in (152.4mm)  | 6in (152.4mm)   | F5 w/lens             | 1.5in (38.1mm) | 1.5in (38.1mm) | N/A             | N/A             |
| R5                     | N/A                                      | 3ft (914.4mm)   | 1ft (304.8mm)  |                       |                |                |                 |                       |                |                |                 |                 |
| No Prox on craft paper |  |                 |                |                       |                |                |                 |                       |                |                |                 |                 |
| R4                     | 4ft (1,219mm)                            | 6ft (1,829mm)   | 4ft (1,219mm)  |                       |                |                |                 |                       |                |                |                 |                 |

Note: Proximity tests utilized a 90% reflective white target. Retroreflective tests utilized a 3in diameter round reflector, Model AR3.

Note: Proximity tests utilized a .125in diameter fiber bundle.

# How to Specify



**1.** Select Sensor:  
XP10

**2.** Select LED Light Source required:

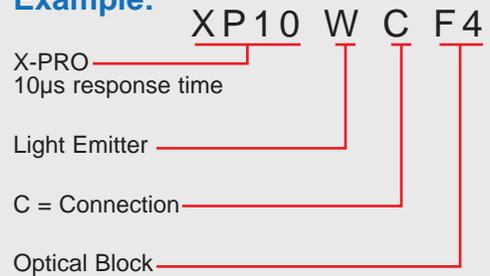
I = Infrared  
R = Red  
W = White

**3.** Select Connection required:

Blank = Cable 6ft (1.8m)  
C = Connector, M12

**4.** Select Optical Block based on mode of sensing required (see Sensing Range Guidelines).

**Example:**



## Hardware & Accessories

### 5-Wire Shielded MicroCable, M12



**GSEC-6**  
6ft (1.8m) cable

**GSEC-15**  
15ft (4.6m) cable

**GSEC-25**  
25ft (7.62m) cable



**GRSEC-6**  
6ft (1.8m) cable/right angle

**GRSEC-15**  
15ft (4.6m) cable/right angle

**GRSEC-25**  
25ft (7.6m) cable/right angle

### 5-Wire Unshielded Cable, M12



**GSEC-2MU**  
6.5ft (2.0m) cable

**GSEC-5MU**  
16.4ft (5.0m) cable

### 5-Wire Extension Cable, M12



**GX-25**  
25ft (7.6m) extension cable

### Mounting Brackets



**FMB-1** (8.4 mm diam.)  
Standard Fiber Optic



**SEB-3**  
Stainless L Bracket



**FMB-2** (5.1 mm diam.)  
Mini Glass Fiber Optic



**FMB-3** (3.1 mm diam.)  
Mini Plastic Fiber Optic

### Lens Kit



**LK-4**  
Includes: F4, F5, O4, O5, R4, R5, V4, V4A, V6, V8

# Specifications

## SUPPLY VOLTAGE

- 12 to 24VDC
- Polarity Protected
- Intended for use in Class 2 circuits.

## CURRENT REQUIREMENTS

- 45mA (exclusive of load)

## OUTPUT TRANSISTORS

- (1) NPN and (1) PNP sensor output transistors
- Outputs sink or source up to 150mA (current limit).
- All outputs are continuously short circuit protected.

## REMOTE AUTOSET INPUT

- Opto-isolated momentary sinking input (10mA)

## RESPONSE TIME

- Light/Dark = 10µs
- Repeatability = 5µs

## LED LIGHT SOURCE

- Infrared = 880nm, Red = 660nm, White = Broadband Color Spectrum

## PUSH-BUTTON CONTROL

- AUTOSET
- Manual adjustments
- Set status of ten options: 10) Lock, 9) Mark, 8) PS 10ms, 7) PS 20ms, 6) Enable, 5-1) Five Memory Locations

*NOTE: Any changes to the sensor will automatically be saved to current MEM # location.*

## HYSTERESIS

- Set for high resolution – less than one bar on the contrast indicator.

## LIGHT IMMUNITY

- Responds to sensor's pulsed modulated light source – immune to most ambient light including indirect sunlight.

## DIAGNOSTIC INDICATORS

- 10-LED dual-function bar graph operates in one of two modes: 1. Contrast Indicator – Displays scaled reading of sensor's response to contrasting light levels (light to dark).

2. Status Indicator – Displays status of ten selectable options
- Red LED output indicator – Illuminates when the sensor's output transistors are ON. *NOTE: If Output LED flashes, a short circuit condition exists.*
  - Amber LED – Illuminates when in the Option Status Mode.
  - Yellow LED – Illuminates when Mark Mode feature is activated.
  - Blue LED output indicator - Illuminates when output is ON.

## AMBIENT TEMPERATURE

- -40°C to 70°C (-40°F to 158°F)

## RUGGED CONSTRUCTION

- Chemical resistant, high impact polycarbonate housing
- Waterproof ratings: NEMA 4X, 6P and IP67
- Conforms to heavy industry grade CE requirements Patents No. 5,621,205 and No. 6,950,778

RoHS Compliant  
Product subject to change without notice

## Connections and Dimensions

## SMARTEYE® X-PRO XP10

