

## Selekcija komada po visini na pokretnoj traci

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### **Rezime**

*Selekcija komada je zasnovana na bazi Balluff-ovog Light Grid fotoelektričnog senzora BLG 1-010-210-070-PV01-SX, koji ima svetlosnu mrežu visine 100mm što odgovara izlaznom signalu od 0 do 10V. Rad predstavlja model pokretne trake sa odgovarajućim kutijama za prihvatanje selektovanih komada (konkretno tri visine, a može ih biti max.14), čijim radom upravlja PLC firme FATEK tip FBs-20MAT2-AC. Model će biti korišćen za izvođenje vežbi iz predmeta Programabilni logički kontroleri u obrazovnom profilu Tehničar mehatronike. Praktična primena je moguća za selekciju otpada u zavisnosti od njegove krupnoće, a moguća je dogradnja za selekciju magnetnog i nemagnetnog materijala.*

**Ključne reči:** selekcija komada, fotoelektrični senzor, svetlosna mreža, PLC

### **Abstract**

*Selection of samples is based on Balluff's Light Grid photoelectric sensor BLG 1-010-210-070-PV01-SX, with light grid height of 100mm, which corresponds to exit signal ranging from 0 to 10V. The paper presents a model of conveyer belt with appropriate boxes for acceptance of selected samples (concretely, three heights, with maximum of 14 heights), whose operation is controlled by PLC of company FATEK tip FBs-20MAT2-AC. Model will be used for performing practical exercises within the subject of Programmable Logic Controllers in educational profile Technician of Mechatronics. Practical application is possible in waste selection depending on its volume, while there is a possibility of upgrade for selection of magnetic and non-magnetic materials.*

**Keywords:** *selection of samples, photoelectric sensors, light grid, PLC*

## **Uvod**

Rad je nastao kao doprinos autora poboljšanju uslova za izvođenje vežbi iz predmeta Programabilni logički kontroleri u četvrtoj godini obrazovnog profila Tehničar mehatronike. Praktičnu realizaciju rada izveli su učenici uz instrukcije i nadzor autora.

Polazna osnova za rad je svetlosna mreža BLG 1-010-210-070-PV01-SX firme Balluff ([www.balluff.com](http://www.balluff.com)-Photoelectrc Sensors-BLG Light Grids). Upravljanje radom modela izvedeno je pomoću PLC-a FBs-2MAT2-AC firme FATEK ([www.fatek.com](http://www.fatek.com)).

## **Glavni deo rada**

### 1.Svetlosna mreža BLG 100mm

Ovaj fotelekrični senzor se sastoji od emitera (TX) i resivera (RX) infracrvene svetlosti i pokriva površinu visine 100mm pri rezoluciji od 7mm.Na izlazu br.2 (slika 1.2.) resivera javlja se naponski signal od 0V do 10V u zavisnosti od pokrivenosti visine senzora objektom. Na osnovu vrednosti ovog signala možemo izvršiti selekciju komada po visini prisutnog između emitera i resivera. U radu su uzete tri različite visine komada.

Light grids are available in various measuring field heights of 100, 150 and 300 mm and include both long and short ranges. This means reliable detection of wide and very large objects is no longer a problem. The light grids with a measuring field height of 100 and 150 mm can be ordered with low or high resolution.

The light grid can be simply and quickly installed using the supplied mounting bracket. Alignment and installation is user-friendly and problem-free.

The system features an analog voltage output for direct representation of the height or width of an object. An additional switching output indicates whether the object is within the monitored range.

**Features**

- Easy to connect
- Easy to install
- Ready to use
- No cumbersome parameter setting
- Ranges
  - 150 mm...2.1 m
- Measuring field heights 100, 150, 300 mm
- Analog output

**Applications**

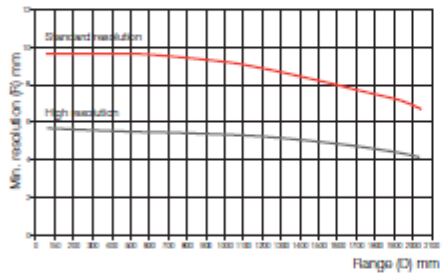
- Counting parts
- Height measurement and height checking
- Presence detection
- Slack and position checking
- Pallet checking
- Web monitoring
- Position and material monitoring



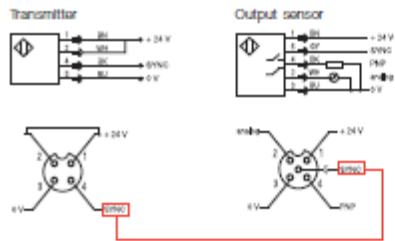
Slika 1.1. BLG svetlosna mreža

**Resolution Diagram**

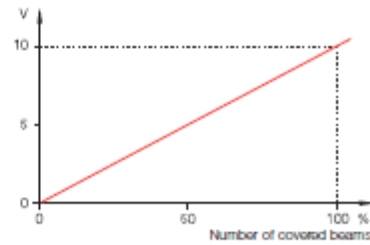
Range 0.15...2.1 m



**Wiring diagrams**



**Analog output**



**Mounting bracket (included)**



**Recommended accessories please order separately**

**Emitter:**  
4-pin connector  
Straight BKS-...10  
Right-angle BRS-...20



**Receiver:**  
5-pin connector  
Straight BKS-S137-17-PU-05  
Right-angle BKS-S134-17

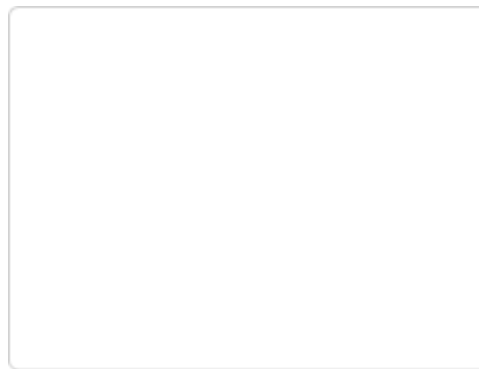


## 2. PLC FATEK:FBs-20MAT2-AC

Programabilni logički kontroler upravlja radom modela pokretne trake. Na osnovu vrednosti naponskog signala iz resivera fotoelektričnog senzora, koji se dovodi na njegov analogni ulaz, aktivira se odgovarajući digitalni izlaz koji uključuje elektromagnetni ventil. Pneumatski cilindar izvlači kutiju u koju sa pokretne trake upada selektovani komad.

Traku pokreće DC motor koga uključuje PLC. U slučaju nailaska komada veće visine od 100mm, traka se zaustavlja i aktivira se odgovarajuća signalizacija.

### Basic Main Units



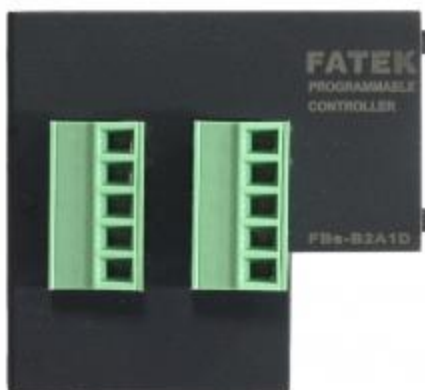
1. ◇ : R — Relay output ; T — Transistor SINK(NPN) output  
J — Transistor SOURCE (PNP) output
2. Δ : 2 — built-in RS232 port ; U — built-in USB port (non-standard)
3. ◎ : AC — 100~240VAC power supply  
D12 — 12VDC power supply  
D24 — 24VDC power supply
4. -C : Blank — Standard ; -C — add in RTC
5. The unmarked frequencies of Digital Input (DI) or Digital Output (DO) are low speed.

Model	Specification
FBs-10MA◇Δ-◎-C	6 points 24VDC digital input (2 points high speed 100KHz, 2 points medium speed 20KHz, 2 points medium speed total 5KHz); 4 points relay or transistor output (2 points high speed 100KHz, 2 points medium speed 20KHz); 1 RS232 or USB port(expandable up to 3); I/O is not expandable
FBs-14MA◇Δ-◎-C	8 points 24VDC digital input (2 points high speed 100KHz, 2 points medium speed 20KHz, 4 points medium speed total 5KHz); 6 points relay or transistor output (2 points high speed 100KHz, 4 points medium speed 20KHz); 1 RS232 or USB port(expandable up to 3); I/O is not expandable
FBs-20MA◇Δ-◎-C	12 points 24VDC digital input (2 points high speed 100KHz, 4 points medium speed 20KHz, 6 points medium speed total 5KHz); 8 points relay or transistor output (2 points high speed 100KHz, 6 points medium speed 20KHz); 1 RS232 or USB port(expandable up to 3)

<b>FBs-24MA</b> ◇△-◎-C	14 points 24VDC digital input (2 points high speed 100KHz, 6 points medium speed 20KHz, 6 points medium speed total 5KHz); 10 points relay or transistor output (2 points high speed 100KHz, 6 points medium speed 20KHz); 1 RS232 or USB port(expandable up to 3)
<b>FBs-32MA</b> ◇△-◎-C <b>FBs-32MB</b> ◇△-◎-C	20 points 24VDC digital input (2 points high speed 100KHz, 6 points medium speed 20KHz, 8 points medium speed total 5KHz); 12 points relay or transistor output (2 points high speed 100KHz, 6 points medium speed 20KHz); 1 RS232 or USB port(expandable up to 3); (MB is detachable terminal block)
<b>FBs-40MA</b> ◇△-◎-C <b>FBs-40MB</b> ◇△-◎-C	24 points 24VDC digital input (2 points high speed 100KHz, 6 points medium speed 20KHz, 8 points medium speed total 5KHz); 16 points relay or transistor output (2 points high speed 100KHz, 6 points medium speed 20KHz); 1 RS232 or USB port(expandable up to 3); (MB is detachable terminal block)
<b>FBs-60MA</b> ◇△-◎-C <b>FBs-60MB</b> ◇△-◎-C	36 points 24VDC digital input (2 points high speed 100KHz, 6 points medium speed 20KHz, 8 points medium speed total 5KHz); 24 points relay or transistor output (2 points high speed 100KHz, 6 points medium speed 20KHz); 1 RS232 or USB port(expandable up to 3); (MB is detachable terminal block)

Slika.2.1. PLC FBs-20MAT2-AC

### FBs-B2A1D



2 channels, 12-bit analog input + 1 channel, 12-bit analog output combo analog board (0~10V or 0~20mA)

Specification	FBs-B2A1D
Input point	2 points
Output point	1 points
Input / Output value	0~16380 (14-bit representation, valid 12-bit)
Input / Output polar	Unipolar
Input / Output counting range	0~10V
Conversion time	Conversion once for each scan
Accuracy	±1%
Isolation method	Non-isolation
Wiring mechanism	3.81 mm European terminal block

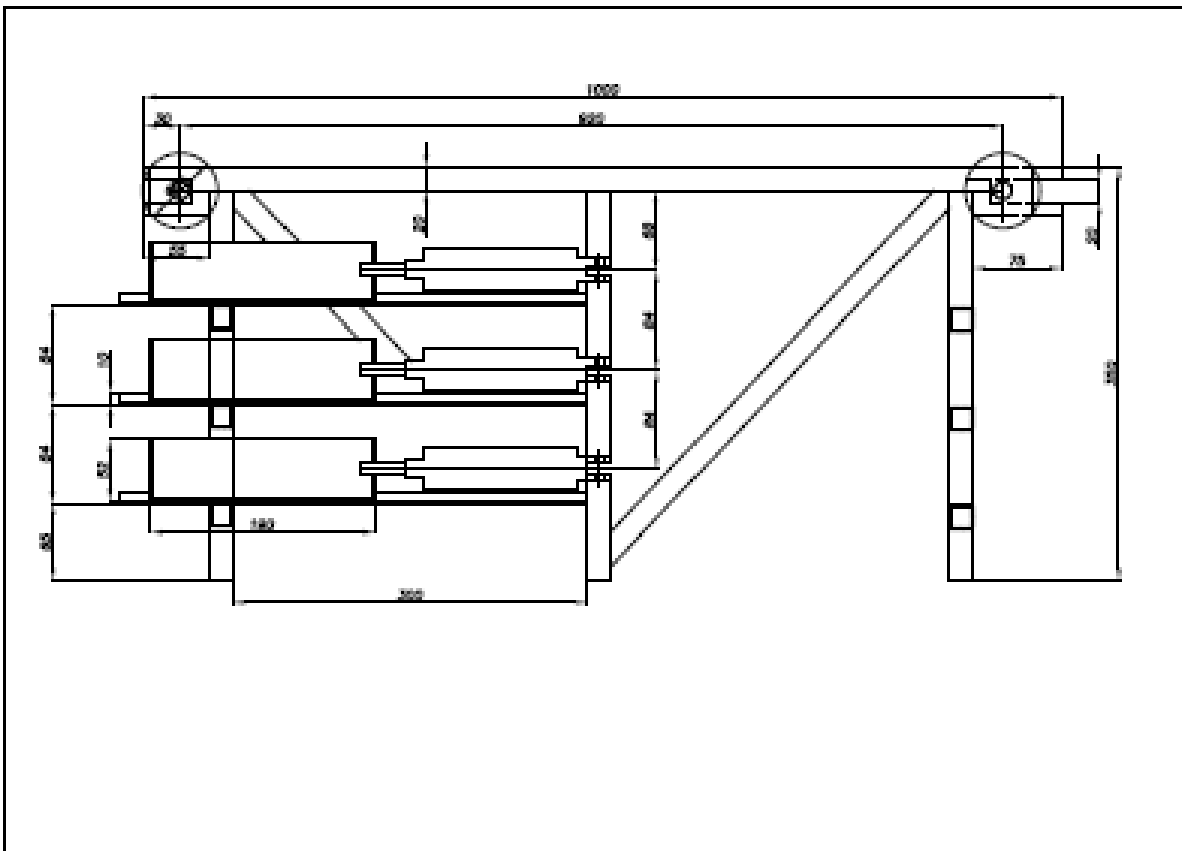
Slika 2.2.Modul za proširenje

### 3.Opis modela pokretne trake

Model pokretne trake ima dimenzije: širina 250 mm, dužina 950 mm. Traku pokreće vučni valjak spregnut sa DC motorom. Na drugom valjku je ugrađen sistem za zatezanje trake. Sa jedne strane trake je fiksiran emiter, a sa druge, naspram njega, resiver svetlosnog senzora.

Ispod izlaznog kraja trake ugrađene su ,jedna iznad druge, kutije za prihvatanje komada, koje u položaj za prihvatanje komada dovode pneumatski cilindri dvosmernog dejstva. Cilindre aktiviraju elektromagnetni ventili koje uključuju odgovarajući izlazi PLC-a.

Elektronske i pneumatske komponente su smeštene u zasebnim odeljcima ispod pokretne trake (crtež 3.1.).



Crtež 3.1.Konstrukcija modela pokretne trake.

## ***Zaključak***

Model pokretne trake poslužiće za realizaciju određenog broja vežbi iz predmeta: Programabilni logički kontroleri, Testiranje i dijagnostika mehatronskih sistema i Održavanje mehatronskih sistema na četvrtoj godini obrazovnog profila Tehničar mehatronike.

Praktična realizacija modela predstavlja veliko iskustvo za učenike, i razlikuje se od edukativnih iskustava na opremi za realizaciju vežbi.

Ideja za ovaj model može se primeniti u proizvodnim uslovima, na primer, za selekciju otpada u zavisnosti od njegove krupnoće.

## ***Reference***

- 1.Katalozi firme Balluff ([www.balluff.com](http://www.balluff.com));
- 2.Katalozi firme Fatek ([www.fatek.com](http://www.fatek.com));
- 3.Marinković M.Dragan, 2012, Programabilni logički kontroleri:uvod u programiranje i primenu