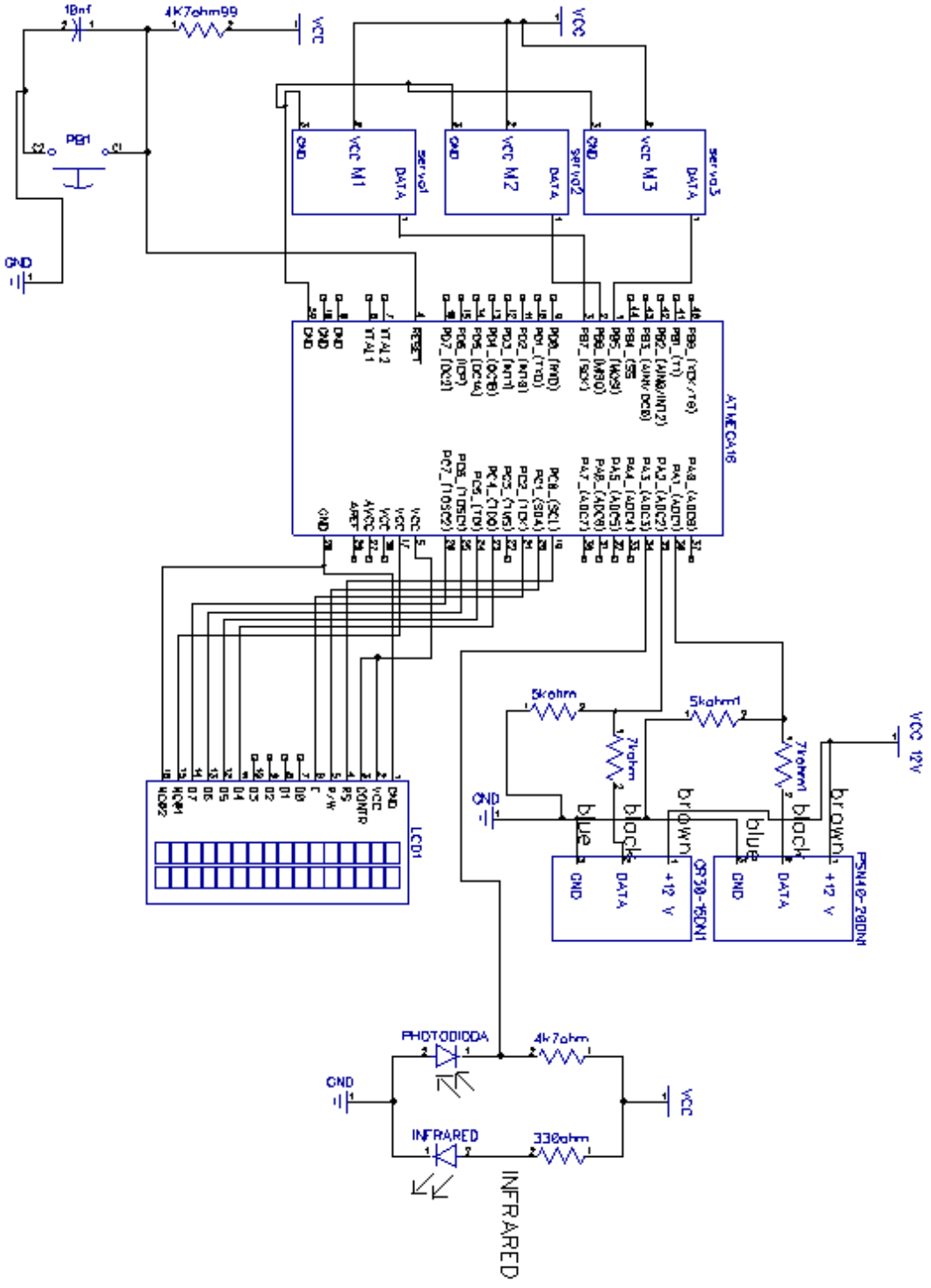
LAMPIRAN A
RANCANGAN SKEMATIK


18nf
4K7ohm99
VCC
PB1
GND
servo1
servo2
servo3
VCC M1
VCC M2
VCC M3
DATA
ATMEGA16
LCD1
5kohm
5kohm1
7kohm
7kohm1
brown
black
blue
VCC 12V
+12 V
PSN40-20DN
QR30-15DN1
PHOTODIODA
4k7ohm
330ohm
INFRARED

LAMPIRAN B
PROGRAM PADA PENGONTROL MIKRO
AT MEGA 16

```
/*****************************************************
This program was produced by the
CodeWizardAVR V2.04.4a Advanced
Automatic Program Generator
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Project :
Version :
Date    : 10/15/2011
Author  : NeVaDa
Company : gto
Comments:


Chip type               : ATmega16
Program type            : Application
AVR Core Clock frequency: 11.059200 MHz
Memory model            : Small
External RAM size       : 0
Data Stack size         : 256
*****************************************************/

#include <mega16.h>
#include <delay.h>

#asm
   .equ __lcd_port=0x15 ;PORTC
#endasm
#include <lcd.h>
int i;




void servo1tengah()    //tengah
{
for(i=0;i<100;i++)
{
PORTB.7=1;
delay_us(1100);
PORTB.7=0;
delay_us(18900);
}
}
```

```
void servo1belok()
{
for(i=0;i<100;i++)
{
PORTB.7=1;
delay_us(750);
PORTB.7=0;
delay_us(19350);
}
}


void servo2belok()
{
for(i=0;i<100;i++)
{
PORTB.6=1;
delay_us(750);
PORTB.6=0;
delay_us(19250);
}
}

void servo2tengah()
{
for(i=0;i<100;i++)
{
PORTB.6=1;
delay_us(1100);
PORTB.6=0;
delay_us(18900);
}
}


void servo3tutup()
{
for(i=0;i<100;i++)
{
PORTB.5=1;
delay_us(1070);
PORTB.5=0;
delay_us(19930);
}
}
```

```
void servo3buka()
{
for(i=0;i<100;i++)
{
PORTB.5=1;
delay_us(600);
PORTB.5=0;
delay_us(19400);
}
}



void main(void)
{
// Declare your local variables here

// Input/Output Ports initialization
// Port A initialization
// Func7=In Func6=In Func5=In Func4=In Func3=In Func2=In Func1=In
Func0=In
// State7=T State6=T State5=T State4=T State3=T State2=T State1=T
State0=T
PORTA=0xff;
DDRA=0x00;

// Port B initialization
// Func7=Out Func6=Out Func5=Out Func4=Out Func3=Out Func2=Out
Func1=Out Func0=Out
// State7=0 State6=0 State5=0 State4=0 State3=0 State2=0 State1=0
State0=0
PORTB=0x00;
DDRB=0xFF;

// Port C initialization
// Func7=In Func6=In Func5=In Func4=In Func3=In Func2=In Func1=In
Func0=In
// State7=T State6=T State5=T State4=T State3=T State2=T State1=T
State0=T
PORTC=0x00;
DDRC=0x00;

// Port D initialization
// Func7=In Func6=In Func5=In Func4=In Func3=In Func2=In Func1=In
Func0=In
```

```
        // State7=T State6=T State5=T State4=T State3=T State2=T State1=T
State0=T
        PORTD=0xff;
        DDRD=0x00;

        // Timer/Counter 0 initialization
        // Clock source: System Clock
        // Clock value: Timer 0 Stopped
        // Mode: Normal top=FFh
        // OC0 output: Disconnected
        TCCR0=0x00;
        TCNT0=0x00;
        OCR0=0x00;

        // Timer/Counter 1 initialization
        // Clock source: System Clock
        // Clock value: Timer1 Stopped
        // Mode: Normal top=FFFFh
        // OC1A output: Discon.
        // OC1B output: Discon.
        // Noise Canceler: Off
        // Input Capture on Falling Edge
        // Timer1 Overflow Interrupt: Off
        // Input Capture Interrupt: Off
        // Compare A Match Interrupt: Off
        // Compare B Match Interrupt: Off
        TCCR1A=0x00;
        TCCR1B=0x00;
        TCNT1H=0x00;
        TCNT1L=0x00;
        ICR1H=0x00;
        ICR1L=0x00;
        OCR1AH=0x00;
        OCR1AL=0x00;
        OCR1BH=0x00;
        OCR1BL=0x00;

        // Timer/Counter 2 initialization
        // Clock source: System Clock
        // Clock value: Timer2 Stopped
        // Mode: Normal top=FFh
        // OC2 output: Disconnected
        ASSR=0x00;
        TCCR2=0x00;
        TCNT2=0x00;
        OCR2=0x00;
```

```
// External Interrupt(s) initialization
// INT0: Off
// INT1: Off
// INT2: Off
MCUCR=0x00;
MCUCSR=0x00;

// Timer(s)/Counter(s) Interrupt(s) initialization
TIMSK=0x00;

// Analog Comparator initialization
// Analog Comparator: Off
// Analog Comparator Input Capture by Timer/Counter 1: Off
ACSR=0x80;
SFIOR=0x00;

// LCD module initialization
lcd_init(16);

while (1)
{


    if (PINA.3==0)
  {
   delay_ms (1000);
   if(PINA.1==0)          //A.1 sensor logam, 0 deteksi
  {
  lcd_clear();
  lcd_gotoxy (0,0);
  lcd_putsf("  SAMPAH LOGAM");
  servo2tengah();
  servo1belok();

  servo3buka();
  servo3tutup();
  }

  if(PINA.1==1 && PINA.2==1)
  {
  lcd_clear();
  lcd_gotoxy (0,0);
  lcd_putsf(" SAMPAH PLASTIK");
  servo1tengah();
  servo2tengah();
```

```
 servo3buka();
 servo3tutup();
 }

  if(PINA.2==0 && PINA.1==1)
 {
 lcd_clear();
 lcd_gotoxy (0,0);
 lcd_putsf("  SAMPAH KERTAS");
 servo1tengah();
 servo2belok();

 servo3buka();
 servo3tutup();
 }


 }

 else
 {
 lcd_clear();
 lcd_gotoxy (0,0);

 lcd_putsf("    menunggu        sampah");
 servo3tutup();
  }

    };
}
```

LAMPIRAN C
DATASHEET

DATASHEET Sensor proximity kapasitif CR30-15DN

Electric capacitive type proximity sensor

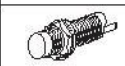
▣Features

- ●Sensing of iron, metal, plastic, water, stone, wood etc.
- ●Long life cycle and high reliability
- ●Integrated surge protection circuit
- ●Integrated reverse polarity protection circuit (DC type)
- ●Easy to adjust of the sensing distance with sensitivity adjuster
- ●Red LED status indication
- ●Easy to control of level and position

⚠ Please read "Caution for your safety" in operation manual before using.

▣Type

◎DC 3-wire type

Appearances		Model
M18		CR18-8DN
		CR18-8DP
		CR18-8DN2 ※
M30		CR30-15DN
		CR30-15DP
		CR30-15DN2 ※

◎AC 2-wire type

Appearances		Model
M18		CR18-8AO
		CR18-8AC
M30		CR30-15AO
		CR30-15AC

▶"※" mark can be customized.

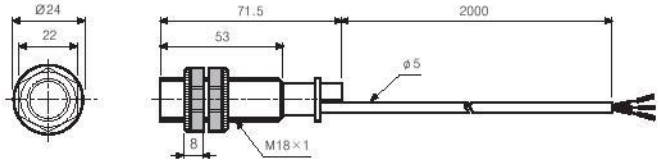
▣Specifications

Model	CR18-8DN CR18-8DP CR18-8DN2	CR30-15DN CR30-15DP CR30-15DN2	CR18-8AO CR18-8AC	CR30-15AO CR30-15AC
Sensing distance	8mm ±10%	15mm ±10%	8mm ±10%	15mm ±10%
Hysteresis	Max. 20% of sensing distance			
Standard sensing target	50×50×1mm(Iron)			
Setting distance	0 to 5.6mm	0 to 10.5mm	0 to 5.6mm	0 to 10.5mm
Power supply (Operating voltage)	12-24VDC (10-30VDC)		100-240VAC (85-264VAC)	
Current consumption	Max. 15mA		———	
Leakage consumption	———		Max. 2.2mA	
Response frequency(※1)	50Hz		20Hz	
Residual voltage	Max. 1.5V		Max. 20V	
Affection by Temp.	±10% Max. for sensing distance at 20℃ within temperature range of -25 to 70℃			
Control output	Max. 200mA		Max. 5 to 200mA	
Insulation resistance	Min. 50MΩ(at 500VDC megger)			
Dielectric strength	1500VAC 50/60Hz for 1 minute			
Vibration	1mm amplitude at frequency of 10 to 55Hz in each of X, Y, Z directions for 2 hours			
Shock	500m/s² (50G) in X, Y, Z direction for 3 times			
Indicator	Output operation indicator(Red LED)			
Ambient temperature	-25 to 70℃(at non-freezing status)			
Storage temperature	-30 to 80℃(at non-freezing status)			
Ambient humidity	35 to 95%RH			
Protection circuit	Surge protection circuit, Reverse polarity proteciton circuit		Overload & Short protection circuit	
Protection	IP66(IEC standard)	IP65(IEC standard)	IP66(IEC standard)	IP65(IEC standard)
Cable	φ4×3P, 2m		φ4×2P, 2m	
Unit weight	Approx. 72g	Approx. 212g	Approx. 63g	Approx. 220g

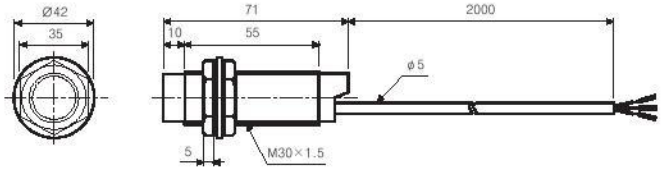
※(※1) The response frequency is the average value. The standard sensing target is used and the width is set as 2 times of the standard sensing target, 1/2 of the sensing distance for the distance.

▣Dimensions

●CR18-8D□ ●CR18-8A□



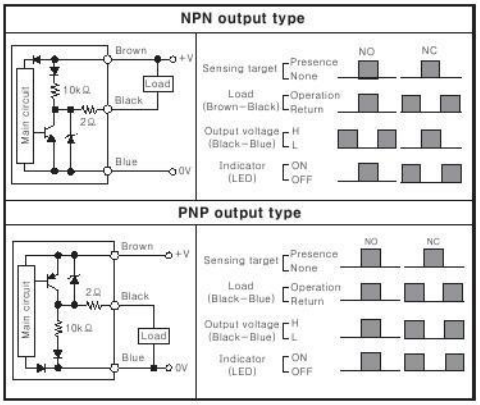
●CR30-15D□ ●CR30-15A□



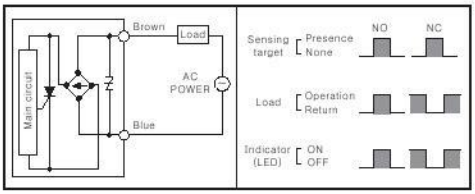
(Unit:mm)

▣Control output diagram

◎DC 3-wire type

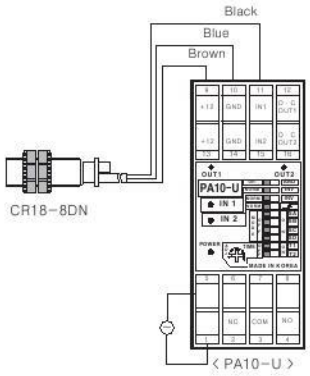


◎AC 2-wire type

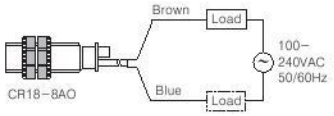


▣Connections

◎DC 3-wire type



◎AC 2-wire type



※The load can be connected to either wire.

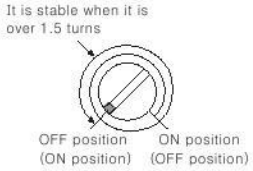
▣Sensitivity adjustment

Please turn potention VR to set sensitivity as below procedure.

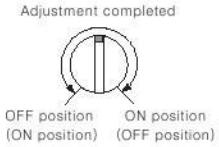
1 Without a sensing object, turn the potention VR to the right and stop at the proximity sensor is ON(OFF).

2 Put the object in right sensing position, turn the potention VR to the left and stop at the proximity sensor is OFF(ON).

3 If the difference of the number of potention VR rotation between the ON(OFF) point and the OFF(ON) point is more than 1.5 turns, the sensing operation will be stable.



4 If it is set in sensitivity adjustment position of potention VR at center between 1 and 2, sensitivity setting will be completed.



※When there is distance fluctuation between proximity sensor and the target, please adjust 2 at the farthest distance from this unit.
※Turning potention VR toward clockwise, it will be max. and turning toward counter clockwise, it will be min. the number of adjustment should be 15±3 revolution and if it is turned to the right or left excessively, it will not stop, but it idles without breakdown.
※( ) is for Normal Close type.

▣Grounding

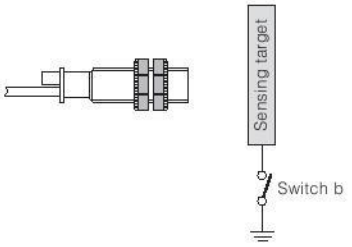
The sensing distance will be changed by grounding status of capacitive proximity sensor and the target[50×50×1mm(Iron)]. Please check the material when installing it on panel.

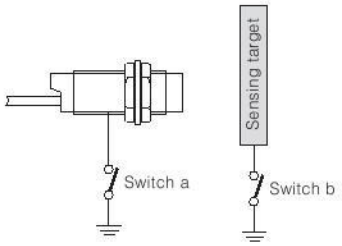
●CR18 Type

Ground condition (Switch b)	ON	OFF
Operating distance (mm)	8	4

●CR30 Type

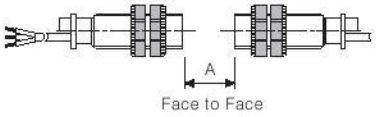
Ground condition	Switch a	ON	OFF	ON	OFF
	Switch b	ON	ON	OFF	OFF
Operating distance(mm)		15	18	6	6





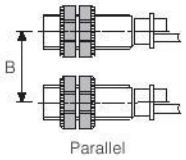
▣Mutual-interference & Influence by surrounding metals

When several proximity sensors are mounted close to one another a malfunction of the sensor may be caused due to mutual interference. Therefore, be sure to provide a minimum distance between the two sensors as below chart indicates.

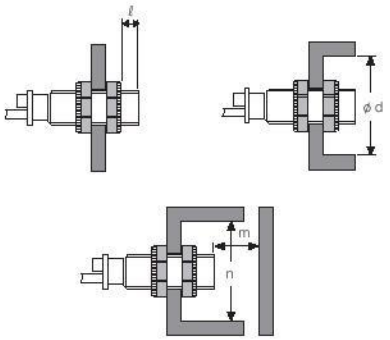


Item \ Model	CR18	CR30
A	48	90
B	54	90

(Unit:mm)



When sensors are mounted on metallic panel, you must prevent the sensors from being affected by any metallic object except target. Therefore, be sure to provide a minimum distance as below chart indicates.



Item \ Model	CR18	CR30
ℓ	20	10
ø d	54	90
m	24	45
n	54	90

(Unit:mm)

▣Materials

◎Materials of sensing targets

Sensing distance may be different by electrical characteristic of sensing target(conductivity, non dielectric constant)and status of water absorption, size etc.

◎Effect by high frequency electrical field

It may cause malfunction by machinery which generate high frequency of electrical field such as a washing machine etc.

◎Surrounding environment

There is water or oil on surface of sensing part, it may cause malfunction.
If the bottle for sensing of level is coated by oil etc., it may cause malfunction.
Especially, 15mm type has high sensitivity for induced objects, please be careful of waterdrops.

◎Oil

Do not let the oil or oil liquid is flowed into the sensor, the case is made by plastic.

DATASHEET Sensor proximity induktif PSN 40-20DN

PS/PSN Series

Rectangular type proximity sensor

▣Features

- ●Shorten the time of maintenance by changing the body
- ●Improve the noise resistance by adopting dedicated IC (DC 3−wire type)
- ●Built−in protection circuit of reverse power polarity (DC)
- ●Built−in surge protection circuit (DC/AC) except for PS12 type
- ●Long life span, high reliability with simple operation
- ●Available to check the status of operation by Red LED indicator
- ●Waterproof structure by IP67 (IEC standard)
- ●Wide range of applications for replacement of micro switch, limit switch

⚠ Please read "Caution for your safety" in operation manual before using.

▣Specifications

●DC 3−wire type

■The existing PS17 is upgraded its function and design and changed as PSN17.
※The case color of PNP output type is changed from orange to gray.

Model	PS12-4DN PS12-4DF PS12-4DN2 PS12-4DN2U PS12-4DPU PS12-4DN2U	PSN17-5DN PSN17-5DP PSN17-5DN2 PSN17-5DN2U PSN17-5DPU PSN17-5DN2U PSN17-5DN-F	PSN17-8DN PSN17-8DF PSN17-8DN2 PSN17-8DN2U PSN17-8DPU	PSN17-8DN-F PSN17-8DP-F PSN17-8DN2-F PSN17-8DNP-F PSN17-8DPU-F PSN17-8DN2U-F	PSN25-5DN PSN25-5DP PSN25-5DN2 PSN25-5DP2	PSN30-10DN PSN30-10DP PSN30-10DN2 PSN30-10DP2	PSN30-15DN PSN30-15DP PSN30-15DN2 PSN30-15DP2	PSN40-20DN PSN40-20DP PSN40-20DN2 PSN40-20DP2	PS60-30DN PS60-30DP PS60-30DN2 PS60-30DP2
Sensing distance	4mm ±10%	5mm ±10%	8mm ±10%		5mm ±10%	10mm ±10%	15mm ±10%	20mm ±10%	30mm ±10%
Hysteresis	Max. 10% of sensing distance□								
Standard sensing target	12×12×1mm (Iron)	18×18×1mm (Iron)	25×25×1mm (Iron)			30×30×1mm (Iron)	45×45×1mm (Iron)	60×60×1mm (Iron)	90×90×1mm (Iron)
Setting distance	0~2.8mm	0~3.5mm	0~5.6mm		0~3.5mm	0~7mm	0~10.5mm	0~14mm	0~21mm
Power supply (Operation voltage)	12−24VDC (1−30VDC)								
Current consumption	Max. 10mA								
Response frequency(※1)	500Hz	700Hz	200Hz		300Hz	250Hz	200Hz	100Hz	50Hz
Residual voltage	Max. 1.5V								
Affection by Temp.	±10% Max. for sensing distance at +20℃ within temperature range of −25 ~ +70℃								
Control output	Max. 200mA								
Insulation resistance	Min. 50MΩ (at 500VDC)								
Dielectric strength	1500VAC 60/60Hz for 1minute								
Vibration	1mm amplitude at frequency of 10 ~ 55Hz in each of X, Y, Z directions for 2 hours								
Shock	500m/s² (50G) in X, Y, Z direction for 3 times								
Indicator	Operation indicator (Red LED)								
Ambient temperature	−25 ~ +70℃ (at non−freezing status)								
Storage temperature	−30 ~ +80℃ (at non−freezing status)								
Ambient humidity	35 ~ 95%RH								
Protection circuit	Surge protection circuit, Reverse polarity protection		Surge protection circuit, Reverse polarity protection, Overload & short circuit protection						
Protection	IP67 (IEC standard)								
Cable spec.	ϕ4×2P, 2m					ϕ5×2P, 2m			
Approval	CE								
Unit weight	Approx. 62g	Approx. 71g	Approx. 70g			Approx. 111g		Approx. 158g	Approx. 220g

※(※1) The response frequency is the average value. The standard sensing target is used and the width is set as 2 times of the standard sensing target, 1/2 of the sensing distance for the distance.

▣Specifications

●DC 3-wire type

※The existing PS17 is upgraded its function and design and changed as PSN17.
※The case color of Normal Close type is changed from orange to gray.

Model	PSNT17-5DO PSNT17-5DC	PSNT17-5DOU PSNT17-5DCU
Sensing distance	5mm ±10%	
Hysteresis	Max. 10% of sensing distance	
Standard sensing target	18×18×1mm(Iron)	
Setting distance	0 ~ 3.5mm	
Power supply (Operating voltage)	24VDC (15~30VC)	
Leakage current	Max. 1.5mA	
Response frequency(※1)	700Hz	
Residual voltage	Max. 7V	
Affection by Temp.	±10% Max. for sensing distance at +20℃ within temperature range of −25 ~ +70℃	
Control output	2~50mA	
Insulation resistance	Min. 50MΩ (at 500VDC)	
Dielectric strength	1500VAC 60/60Hz for 1 minute	
Vibration	1mm amplitude at frequency of 10 ~ 55Hz in each of X, Y, Z directions for 2 hours	
Shock	500m/s² (50G) in X, Y, Z direction for 3 times	
Indicator	Operation indicator (Red LED)	
Ambient temperature	−25 ~ +70℃ (at non−freezing status)	
Storage temperature	−30 ~ +80℃ (at non−freezing status)	
Ambient humidity	35 ~ 95%RH	
Protection circuit	Surge protection circuit	
Protection	IP67 (IEC standard)	
Cable	ϕ4×3P, 2m	
Approval	CE	
Unit weight	Approx. 59g	

※(※1) The response frequency is the average value. The standard sensing target is used and the width is set as 2 times of the standard sensing target, 1/2 of the sensing distance for the distance.

●AC 2-wire type

※The case color of Normal Close type is changed from orange to gray.

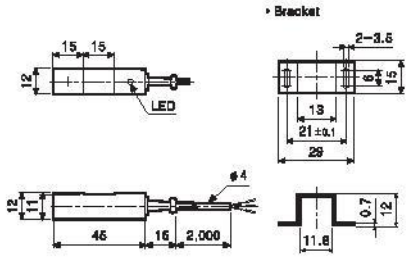
Model	PSN25-5AO PSN25-5AC	PSN30-10AO PSN30-10AC	PSN30-15AO PSN30-15AC	PSN40-20AO PSN40-20AC
Sensing distance	5mm ±10%	10mm ±10%	15mm ±10%	20mm ±10%
Hysteresis	Max. 10% of sensing distance			
Standard sensing target	25×25×1mm(Iron)	30×30×1mm(Iron)	45×45×1mm(Iron)	60×60×1mm(Iron)
Setting distance	0 ~ 3.5mm	0 ~ 7mm	0 ~ 10.5mm	0 ~ 14mm
Power supply (Operating voltage)	100~240VDC (85~264VC)			
Leakage current	Max. 2.5mA			
Response frequency(※1)	20Hz			
Residual voltage	Max. 10V			
Affection by Temp.	±10% Max. for sensing distance at +20℃ within temperature range of −25 ~ +70℃			
Control output	5 ~ 200mA			
Insulation resistance	Min. 50MΩ (at 500VDC)			
Dielectric strength	2500VAC 50/60Hz for 1 minute			
Vibration	1mm amplitude at frequency of 10 ~ 55Hz in each of X, Y, Z directions for 2 hours			
Shock	600m/s² (50G) in X, Y, Z direction for 3 times			
Indicator	Operation indicator (Red LED)			
Ambient temperature	−25 ~ +70℃ (at non−freezing status)			
Storage temperature	−30 ~ +80℃ (at non−freezing status)			
Ambient humidity	35 ~ 95%RH			
Protection circuit	Surge protection circuit			
Protection	IP67 (IEC standard)			
Cable	ϕ4×2P, 2m	ϕ5×2P, 2m		
Approval	CE			
Unit weight	Approx. 65g	Approx. 106g		Approx. 152g

※(※1) The response frequency is the average value. The standard sensing target is used and the width is set as 2 times of the standard sensing target, 1/2 of the sensing distance for the distance.

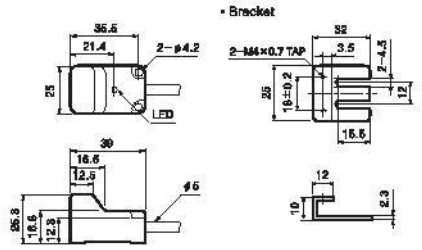
▣Dimensions

(Unit:mm)

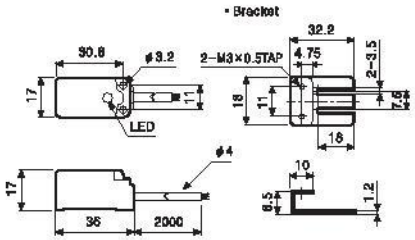
●PS12



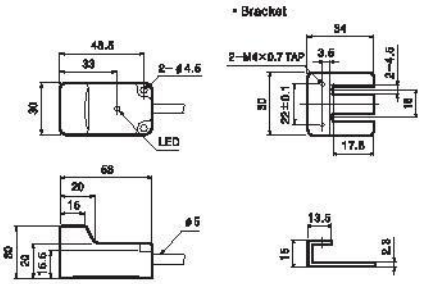
●PSN25



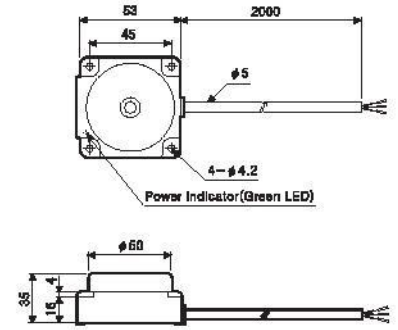
●PSN17 / PSNT17 (Former : PS17/ PST17)



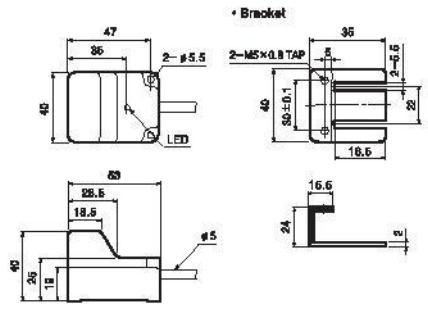
●PSN30



●PS50

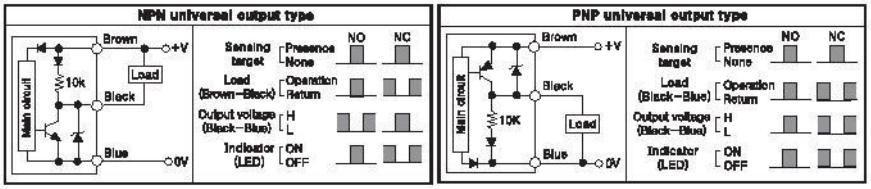


●PSN40

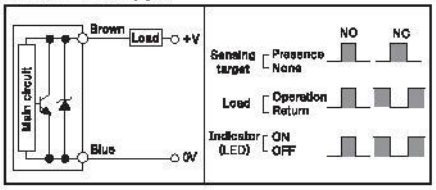


▣Control output diagram

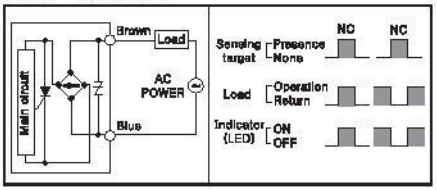
ODC 3-wire type



ODC 2-wire type

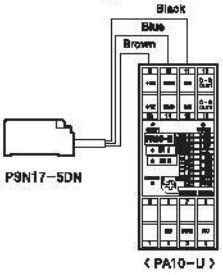


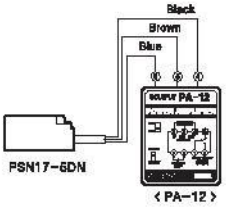
OAC 2-wire type



▣Connections

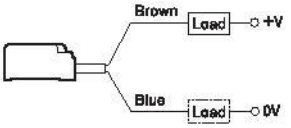
ODC 3-wire type





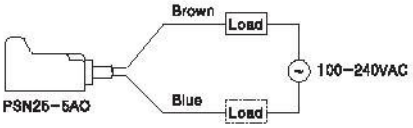
※There is NPN/PNP selection switch in PA–12.

ODC 2-wire type



※The load can be connected to either wire.

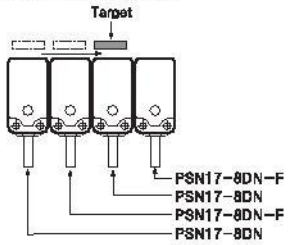
OAC 2-wire type



※The load can be connected to either wire.

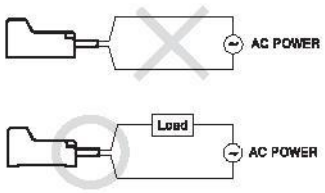
▣Proper usage

❍Differential frequency



When installing several proximity sensor closely, it may cause malfunction due to mutual interference. Therefore, please use differential frequency for the application.
※Differential frequency type is only for 17 square.

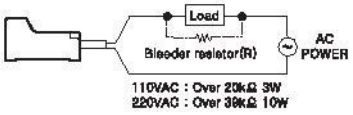
❍Connection of the power supply



When using DC 2-wire and AC 2-wire type, a load must be connected before applying power; otherwise, components can be damaged.

❍In case of the load current is small

●AC 2-wire type

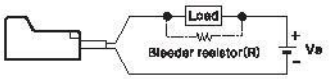


It may cause return failure of load by residual voltage.
If the load current is under 5mA, please make sure the residual voltage is less than the return voltage of the load by connecting a bleeder resistor in parallel with the load as shown in the diagram.

$$R = \frac{Vs}{I}\ (\Omega) \qquad P = \frac{Vs^2}{R}\ (W)$$

[I:Action current of load, R:Bleeder realstance, P:Permissible power]

●DC 2-wire type



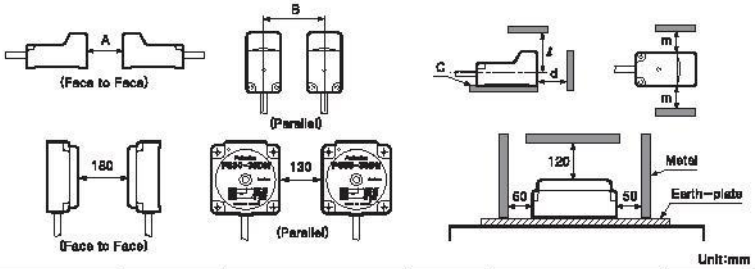
Please make the current on proximity sensor smaller than the return current of load by connecting a Bleeder resistor in parallel.
※W value of Bleeder resistor should be bigger for proper heat dissipation.

$$R = \frac{Vs}{Io - Ioff}\ (\Omega) \qquad P = \frac{Vs^2}{R}\ (W)$$

[Vs : Power supply, Io : Min. action current of proximity sensor
Ioff : Return current of load, P : Number of Bleeder realstance watt]

❍Mutual-interference & Influence by surrounding metals

When several proximity sensors are mounted closely, malfunction of sensor may be caused due to mutual interference. Therefore, be sure to provide a minimum distance between the two sensors, as below.



Unit:mm

Item \ Model	PS12	PSN17		PSN25	PSN30		PSN40
	4mm	5mm	8mm	6mm	10mm	15mm	20mm
A	24	30	48	30	60	90	120
B	24	36	40	40	50	85	70
C	5	6	5	5	6	5	5
d	12	15	24	15	30	45	60
ℓ	18	24	33	25	30	45	45
m	12	18	20	20	25	35	35

DATASHEET PHOTODIODA

AUK Semiconductor

SPI5842

Photo Diode

Features

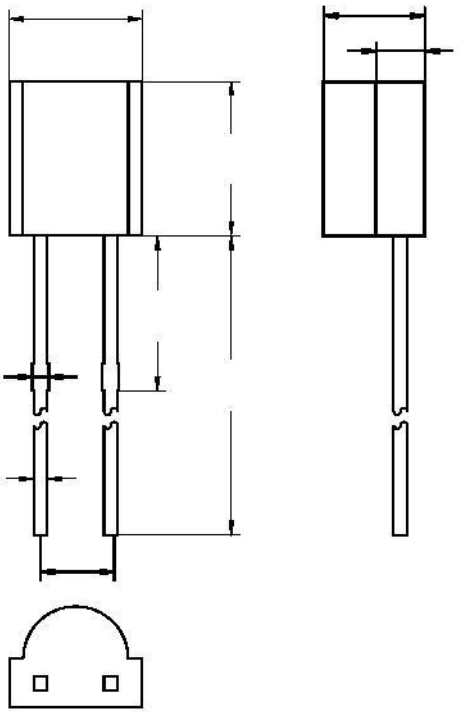
- Peak sensitivity wavelength matching with infrared LED(λ_P= 950nm)
- 4.8mm × 5.5mm side view package
- Black colored visible light cut-off lens

Application

- Infrared remote controllers for TVs, VCRs, Audio equipment etc

Outline Dimensions

unit : mm



PIN Connections
1. Anode
2. Cathode

Absolute maximum ratings

Characteristic	Symbol	Ratings	Unit
Reverse Voltage	V_R	40	V
Power Dissipation	P_D	170	mW
Operating Temperature	T_{opr}	-20 70	
Storage Temperature	T_{stg}	-25 85	
*[1]Soldering Temperature	T_{sol}	260 for 5 seconds	

*1.Keep the distance more than 2.0mm from PCB to the bottom of Photo Diode package

Electrical Characteristics

Characteristic	Symbol	Test Condition	Min.	Typ.	Max.	Unit
*[1]Short Circuit Current	I_{SC}	E_e= 6mW/	-	40	-	uA
Dark Current	I_D	V_R= 10V	-	-	50	nA
Capacitance	C_t	V_R= 10V, f= 1MHz	-	10	-	pF
Spectral Sensitivity		-	840 ~ 1,050			nm
Peak Sensitivity Wavelength	$_P$	-	-	940	-	nm
Half angle	$\theta^1/_2$	-	-	±55	-	deg

*1. E_e : Irradiance by infrared LED light source(λ_p= 940nm)

Characteristic Diagrams

Fig. 1 I_{SC} - E_e

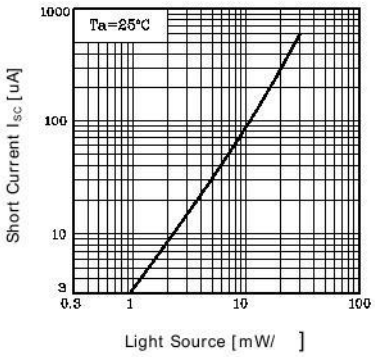


Fig. 2 I_D - T_a

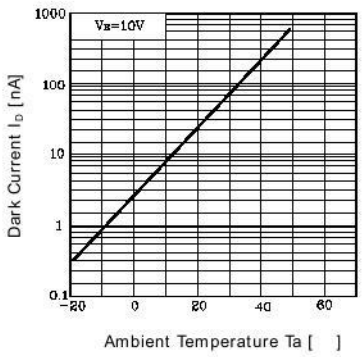


Fig. 3 C_t – V_R

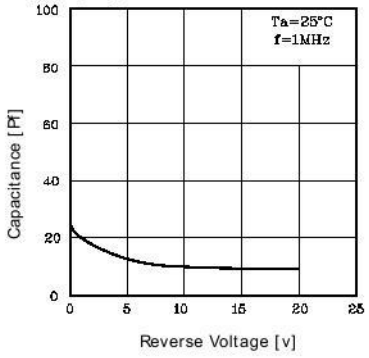


Fig.4 I_D – V_R

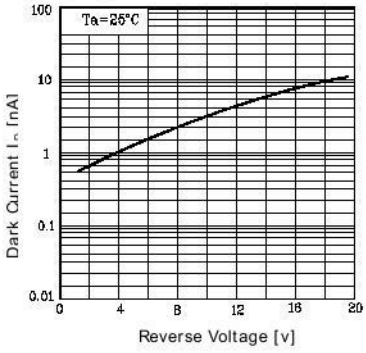


Fig.5 Spectrum Sensitivity

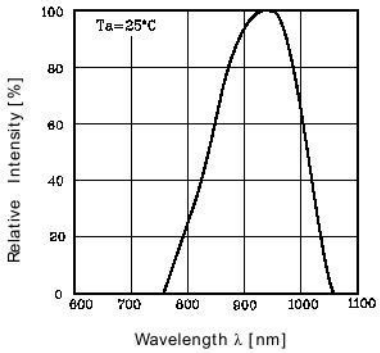
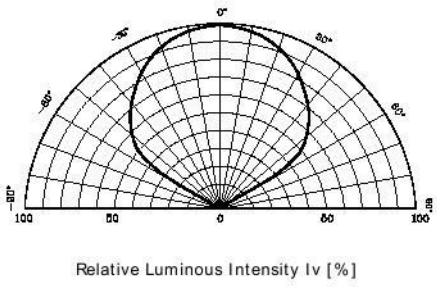


Fig. 5-1 Radiation Diagram



DATASHEET MOTOR SERVO

PARALLAX

Web Site: www.parallax.com
Forums: forums.parallax.com
Sales: sales@parallax.com
Technical: support@parallax.com

Office: (916) 624-8333
Fax: (916) 624-8003
Sales: (888) 512-1024
Tech Support: (888) 997-8267

Parallax Standard Servo (#900-00005)

The Parallax Standard Servo is ideal for robotics and basic movement projects.

Features

- Holds any position between 0 and 180 degrees
- 43.1 oz-in torque at 6 V
- Accepts four mounting screws
- Easy to interface with any Parallax microcontroller
- High precision gear made of the POM (polyacetal) resin makes the operation smooth causing no backlash.
- Manufactured for Parallax exclusively by Futaba

Technical Specifications

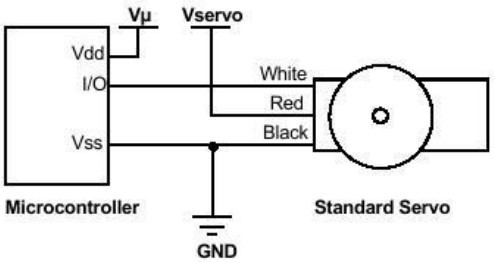
- Power requirements: 4 to 6 VDC* (see Power Requirement Notes below)
- Maximum current draw: 140 +/- 50 mA at 6 VDC when operating in no load conditions
  15 mA when in static state
- Communication: Pulse-width modulation
- Dimensions approx 2.2 x 0.8 x 1.6 in (5.58x 1.9 x 40.6 cm) excluding servo horn
- Operating temperature range: 14 to 122° F (-10 to 50° C)
- Weight: 1.55 oz (44 g)

*Power Requirement Notes

Futaba specifies 4-6 VDC for this servo. However, we find that this servo is tolerant of a 9 V battery for short periods of time when there is no load, as used in some activities in the Stamps in Class series of tutorials. (Slight jittering may be observed when batteries are fresh; this does not cause damage). Do not use this servo with an unregulated wall-mount supply, or a regulated wall mount supply exceeding 6 VDC.

Servo current draw can spike while under load. Be sure that your application's power supply and voltage regulator is prepared to supply adequate current for all servos used. Do not try to power this servo directly from a BASIC Stamp module's Vdd or Vin pins; do not connect the servo's Vss line directly to the BASIC Stamp module's Vss pin.

Quick-Start Circuit



Vμ = microcontroller voltage supply

Vservo = 4 to 6 VDC, regulated or battery (See **Error! Reference source not found.**, page **Error! Bookmark not defined.**)

I/O = PWM TTL or CMOS output signal, 3.3 to 5 V, not to exceed Vservo + 0.2 V

Specifications

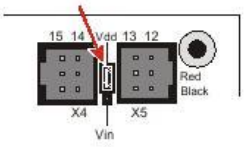
Pin	Name	Description	Minimum	Typical	Maximum	Units
1 (White)	Signal	Input; TTL or CMOS	3.3	5.0	Vservo + 0.2	V
2 (Red)	Vservo	Power Supply	4.0	5.0	6.0	V
3 (Black)	Vss	Ground		0		V

Power Precautions

- Do not use this servo with an unregulated wall-mount supply. Such power supplies may deliver variable voltage far above the stated voltage.
- Do not power this servo through the BASIC Stamp Module's Vdd pin.
- Servo current draw can spike while under peak load; be sure your application's regulator is prepared to supply adequate current for all servos used in combination.
- Some Stamps in Class tutorials, such as "What's a Microcontroller?" instruct the user to power these servos with a 9V battery when using a HomeWork Board; this does not cause damage.

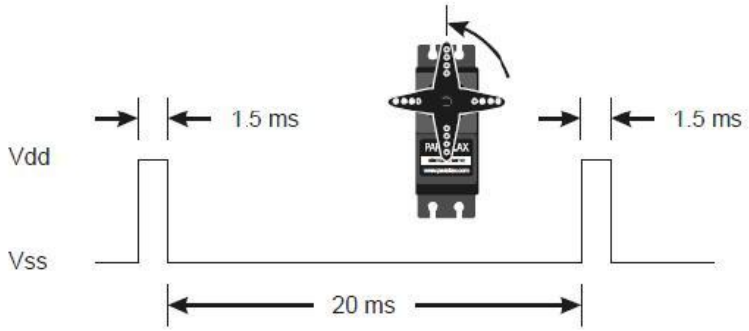
Board of Education Jumper Connection

When connecting the servo to the Board of Education Rev C's servo header, be sure the jumper is set to Vdd as shown in the figure below. Failure to place the jumper at this setting can cause damage your servo.



Communication Protocol

The Parallax Standard Servo is controlled through pulse width modulation, where the position of the servo shaft is dependent on the duration of the pulse. In order to hold its position, the servo needs to receive a pulse every 20 ms. Below is a sample timing diagram for the center position of the Parallax Standard Servo.



BASIC Stamp Programming Examples

PBASIC has a PULSOUT command that sets the I/O pin to an output and sends a pulse of a specified duration.

PULSOUT *Pin*, *Duration*

The example shown below for a BASIC Stamp 2 causes a servo connected to BASIC Stamp I/O pin 1 to turn to and hold its center position for approximately 5 seconds.

```
' {$STAMP BS2}
' {$PBASIC 2.5}

counter VAR Word

FOR counter = 1 TO 100

  PULSOUT 1, 750
  PAUSE 20

NEXT
```

For more examples with the BASIC Stamp 2, see "What's a Microcontroller?" Chapter 4, available for free download from the 90005 product page at www.parallax.com.

Different BASIC Stamp modules use different units for the PULSOUT command's *Duration* argument. When adapting BS2 code to another BASIC Stamp model, you may need to make adjustments. The table below lists the PULSOUT ranges for each BASIC Stamp microcontroller. See the BASIC Stamp Manual or BASIC Stamp Editor Help for more information.

BASIC Stamp Module	1.3 ms	1.5 ms	1.7 ms
BS1	100	150	200
BS2, BS2e, BS2pe	500	750	1000
BS2sx, BS2px, BS2p24/40	1250	1875	2500

You can figure out what the PULSOUT command's *Duration* argument has to be when you know how long you want the pulse to last. Just divide the PULSOUT *Duration* units into the time you want the pulse to last:

$$\text{Duration Argument} = \frac{\text{Pulse Duration (ms)}}{\text{PULSOUT } \textit{Duration} \text{ units } (\mu s)}$$

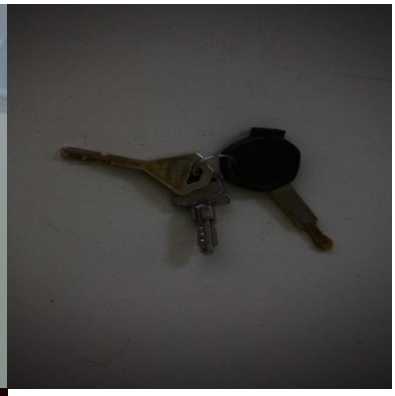
Propeller Application

Using counter modules, you can easily center the servo by using the code below. For more information about counter modules and PWM with the Propeller, see Chapter 7 in the Propeller Education Kit Labs: Fundamentals text, which is included as a PDF in the Propeller Tool IDE Help.

```
CenterServo.spin

CON
_clkmode = xtal1 + pll16x                       ' System clock → 80 MHz
_xinfreq = 5_000_000

PUB TestPwm | tc, tHa, t

ctra[30..26] := %00100                          ' Configure Counter A to NCO
ctra[8..0] := 0

frqa := 1
dira[0]~~

' Set up cycle and high times
tC  := (clkfreq/1_000_000) * 21_500
tHa := (clkfreq/1_000_000) * 1500
t   := cnt                                      ' Mark counter time

repeat                                          ' Repeat PWM signal
  phsa := -tHa                                  ' Set up the pulse
  t += tC                                       ' Calculate next cycle repeat
  waitcnt(t)                                    ' Wait for next cycle
```

LAMPIRAN D
PHOTO OBJEK SAMPAH

X01



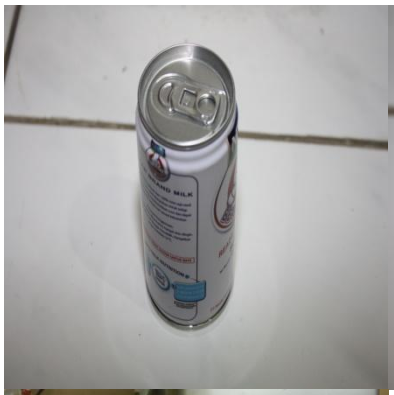
X02

X03

X04

X05

X06



X07 X08 X09

X10

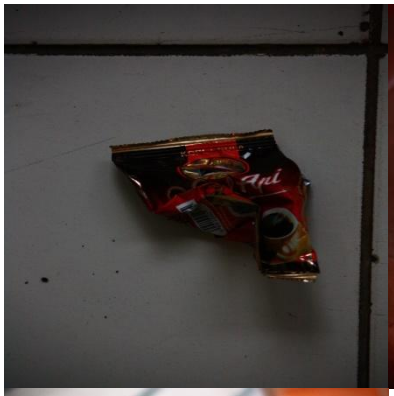
X11

X12

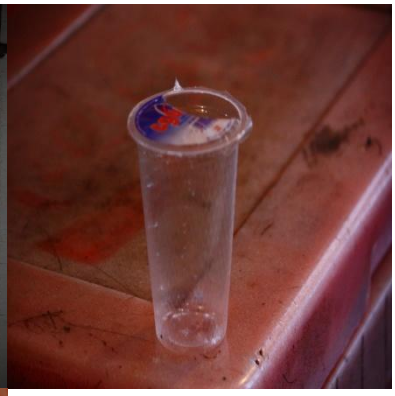
X13

X14

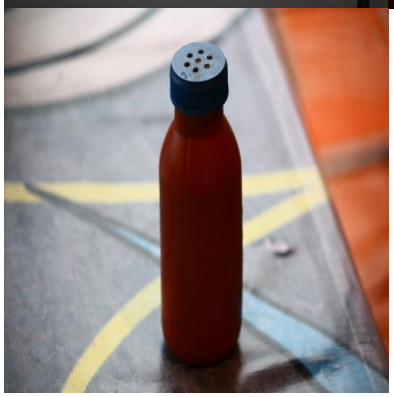
X15



X16



X17



X18

X19

X20

X21

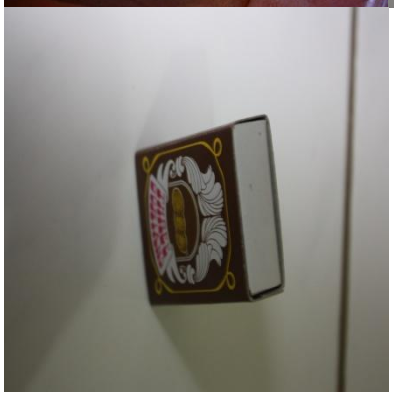

JOYKO CUTTER
A-300
Handy Cutter


MILD SEVEN
ORIGINAL
MEROKOK DAPAT MENYEBABKAN KANKER, SERANGAN JANTUNG, IMPOTENSI DAN GANGGUAN KEHAMILAN DAN JANIN

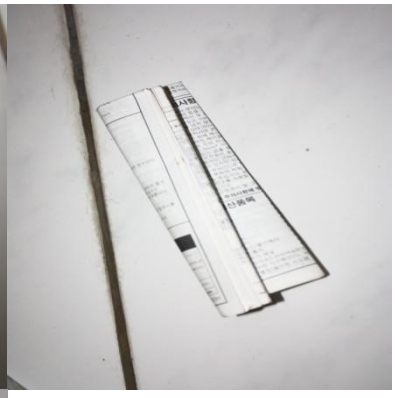

SAMPOERNA
Mild

X22 X23 X24


SNOWMAN BP-7
BALLPOINT PEN
New Technology



X25 X26 X27



X28 X29 X30

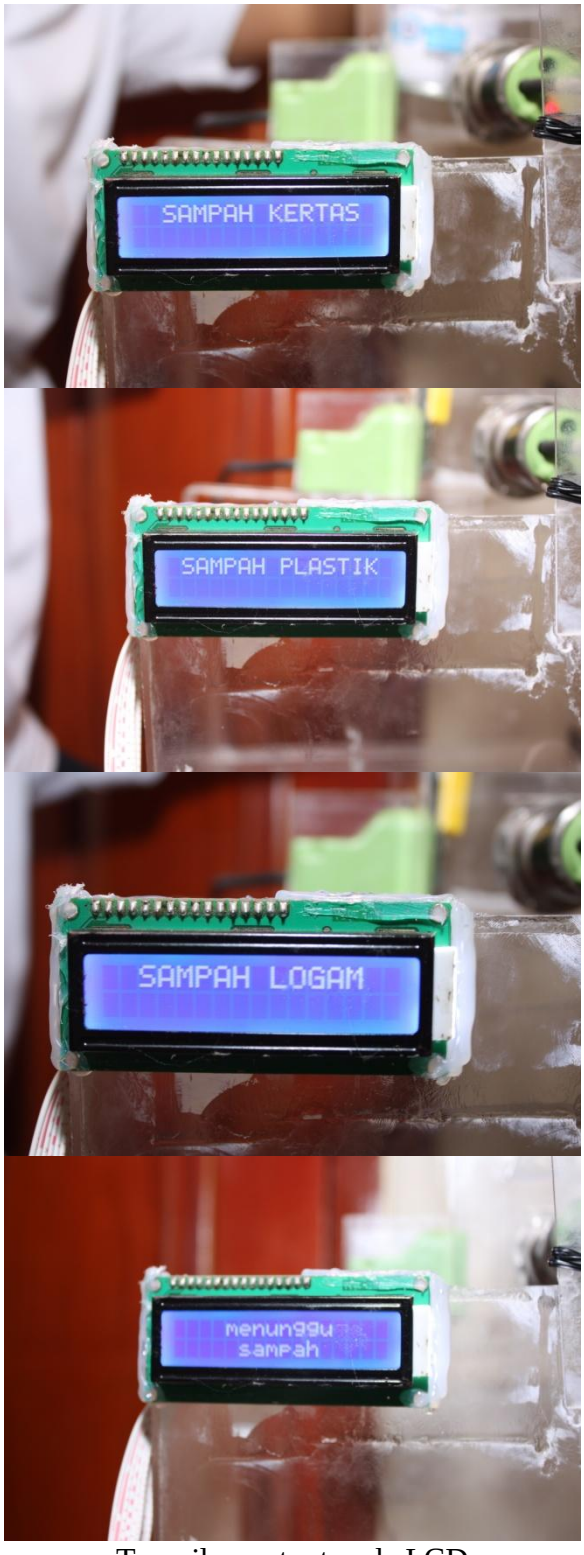
LAMPIRAN E
GAMBAR REALISASI ALAT

Tampak depan


Tampak belakang

Tampak samping kiri

Tampak samping kanan



Tampilan output pada LCD