

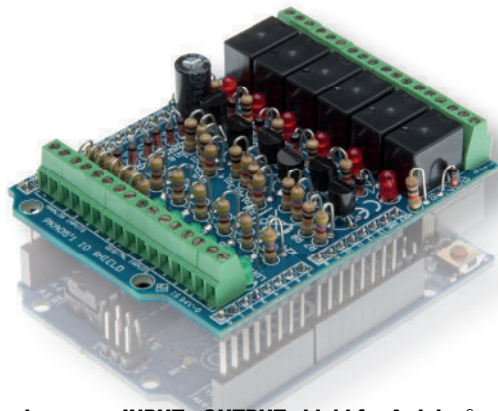
KA05

ILLUSTRATED ASSEMBLY MANUAL HKA05P'1

IN/OUT shield for Arduino®



velleman®
projects



General purpose INPUT - OUTPUT shield for Arduino®

Features

- For use with Arduino Due, Arduino Uno, Arduino Mega
- 6 analog inputs
- 6 digital input
- 6 relay contact outputs: 0.5A max 30V (*)
- Indicator leds for relay outputs and digital inputs

Specifications

- Analog inputs: 0..+5VDC
- Digital inputs: dry contact or open collector
- Relays: 12V
- Relay contacts: NO/NC 24VDC/1A max.
- Dimensions: 68 x 53mm / 2.67 x 2.08"



(*) It is required to power the Arduino UNO (not supplied) with a 12V DC 500mA power supply (not supplied).
This shield will not work with the Arduino Yún. Use the KA08 or VMA08 with the Arduino Yún.



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assembly hints

1. Assembly (Skipping this can lead to troubles !)

Ok, so we have your attention. These hints will help you to make this project successful. Read them carefully.

1.1 Make sure you have the right tools:

- A good quality soldering iron (25-40W) with a small tip.
- Wipe it often on a wet sponge or cloth, to keep it clean; then apply solder to the tip, to give it a wet look. This is called 'thinning' and will protect the tip, and enables you to make good connections. When solder rolls off the tip, it needs cleaning.
- Thin raisin-core solder. Do not use any flux or grease.
- A diagonal cutter to trim excess wires. To avoid injury when cutting excess leads, hold the lead so they cannot fly towards the eyes.
- Needle nose pliers, for bending leads, or to hold components in place.
- Small blade and Phillips screwdrivers. A basic range is fine.

☞ For some projects, a basic multi-meter is required, or might be handy.



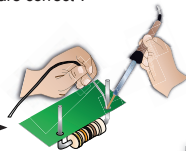
1.2 Assembly Hints :

- Make sure the skill level matches your experience, to avoid disappointments.
- Follow the instructions carefully. Read and understand the entire step before you perform each operation.
- Perform the assembly in the correct order as stated in this manual.
- Position all parts on the PCB (Printed Circuit Board) as shown on the drawings.
- Values on the circuit diagram are subject to changes, the values in this assembly guide are correct*.
- Use the check-boxes to mark your progress.
- Please read the included information on safety and customer service.

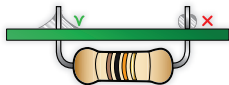
* Typographical inaccuracies excluded. Always look for possible last minute manual updates, indicated as 'NOTE' on a separate leaflet.

1.3 Soldering Hints :

1. Mount the component against the PCB surface and carefully solder the leads. →

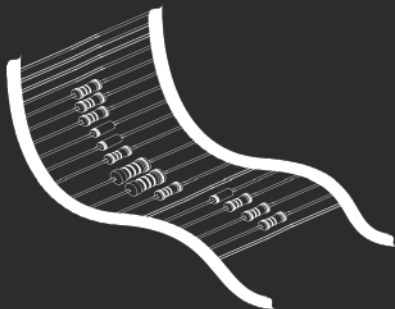


2. Make sure the solder joints are cone-shaped and shiny. →



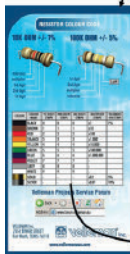
3. Trim excess leads as close as possible to the solder joint. →



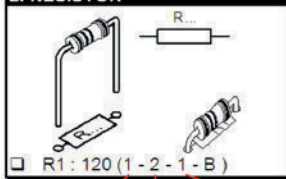


REMOVE THEM FROM THE TAPE ONE AT A TIME !

Included in
this kit



2. RESISTOR

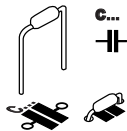


COLOUR	COLOUR NAME	1ST DIGIT/ STRIPE	2ND DIGIT/ STRIPE	3RD DIGIT/ STRIPE	MULTIPLIER STRIPE	TOLERANCE 4TH STRIPE
Black	BLACK	0	0	0	x1	1%
Brown	BROWN	1	1	1	x10	
Red	RED	2	2	2	x100	
Orange	ORANGE	3	3	3	x1.000	
Yellow	YELLOW	4	4	4	x10.000	
Green	GREEN	5	5	5	x100.000	
Blue	BLUE	6	6	6	x1.000.000	

DO NOT BLINDLY FOLLOW THE ORDER OF THE COMPONENTS ON THE TAPE. ALWAYS CHECK THEIR VALUE ON THE PARTS LIST!

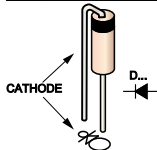
I CONSTRUCTION

1 Ceramic capacitor



□ C2: 100nF (104)

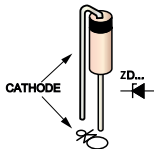
2 Diodes



Watch the polarity!

- | | |
|---------------|---------------|
| □ D1 : 1N4148 | □ D5 : 1N4148 |
| □ D2 : 1N4148 | □ D6 : 1N4148 |
| □ D3 : 1N4148 | □ D7 : 1N4148 |
| □ D4 : 1N4148 | □ D8 : 1N4148 |
| | □ D9 : 1N4148 |
| | □ D10: 1N4148 |
| | □ D11: 1N4148 |
| | □ D12: 1N4148 |

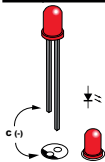
3 Zenerdiodes



- ZD1 : 5V1
- ZD2 : 5V1
- ZD3 : 5V1
- ZD4 : 5V1
- ZD5 : 5V1
- ZD6 : 5V1

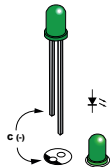
Watch the polarity!

4 LED



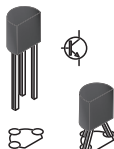
- LD1 : Red
- LD2 : Red
- LD3 : Red
- LD4 : Red
- LD5 : Red
- LD6 : Red

Watch the polarity!



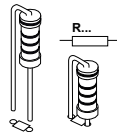
- LD7 : Green
- LD8 : Green
- LD9 : Green
- LD10: Green
- LD11: Green
- LD12: Green

5 Transistors



- T1: BC547B
- T2: BC547B
- T3: BC547B
- T4: BC547B
- T5: BC547B
- T6: BC547B

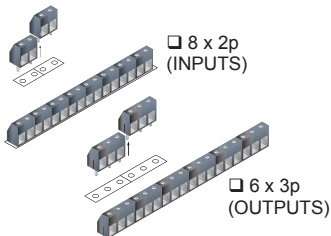
6 Resistors



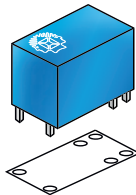
- | | |
|------------|-----------------|
| □ R1 : 1K | (1 - 0 - 2 - B) |
| □ R2 : 1K | (1 - 0 - 2 - B) |
| □ R3 : 1K | (1 - 0 - 2 - B) |
| □ R4 : 1K | (1 - 0 - 2 - B) |
| □ R5 : 1K | (1 - 0 - 2 - B) |
| □ R6 : 1K | (1 - 0 - 2 - B) |
| □ R7 : 4K7 | (4 - 7 - 2 - B) |
| □ R8 : 10K | (1 - 0 - 3 - B) |
| □ R9 : 4K7 | (4 - 7 - 2 - B) |
| □ R10: 10K | (1 - 0 - 3 - B) |
| □ R11: 4K7 | (4 - 7 - 2 - B) |
| □ R12: 10K | (1 - 0 - 3 - B) |

- ☐ R13: 4K7 (4 - 7 - 2 - B)
- ☐ R14: 10K (1 - 0 - 3 - B)
- ☐ R15: 4K7 (4 - 7 - 2 - B)
- ☐ R16: 10K (1 - 0 - 3 - B)
- ☐ R17: 4K7 (4 - 7 - 2 - B)
- ☐ R18: 10K (1 - 0 - 3 - B)
- ☐ R19: 470 (4 - 7 - 1 - B)
- ☐ R20: 470 (4 - 7 - 1 - B)
- ☐ R21: 470 (4 - 7 - 1 - B)
- ☐ R22: 470 (4 - 7 - 1 - B)
- ☐ R23: 470 (4 - 7 - 1 - B)
- ☐ R24: 470 (4 - 7 - 1 - B)
- ☐ R25: 4K7 (4 - 7 - 2 - B)
- ☐ R26: 4K7 (4 - 7 - 2 - B)
- ☐ R27: 4K7 (4 - 7 - 2 - B)
- ☐ R28: 4K7 (4 - 7 - 2 - B)
- ☐ R29: 4K7 (4 - 7 - 2 - B)
- ☐ R30: 4K7 (4 - 7 - 2 - B)

7 Terminal blocks

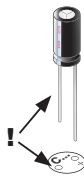


8 Relays



- ☐ RY1
- ☐ RY2
- ☐ RY3
- ☐ RY4
- ☐ RY5
- ☐ RY6

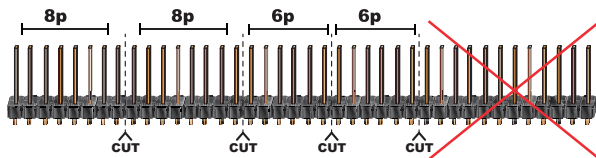
9 Electrolytic capacitors



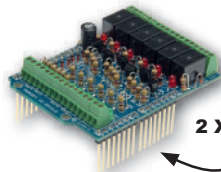
Watch the polarity!

☐ C1 : 100μF

10 Male header



2 X 6 pins



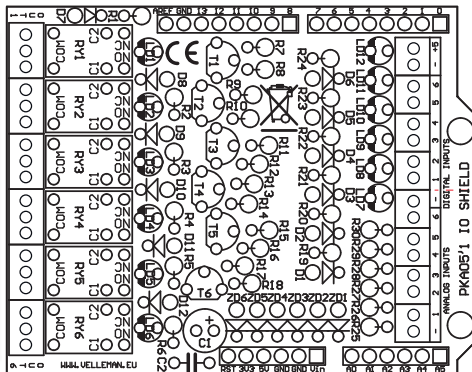
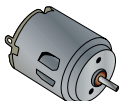
2 X 8 pins



II CONNECTION DIAGRAM

1 OUTPUT

MAX. 24VDC / 1A



2 DIGITAL INPUTS

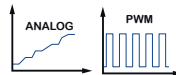


101011101011001...

...

3 ANALOG INPUTS

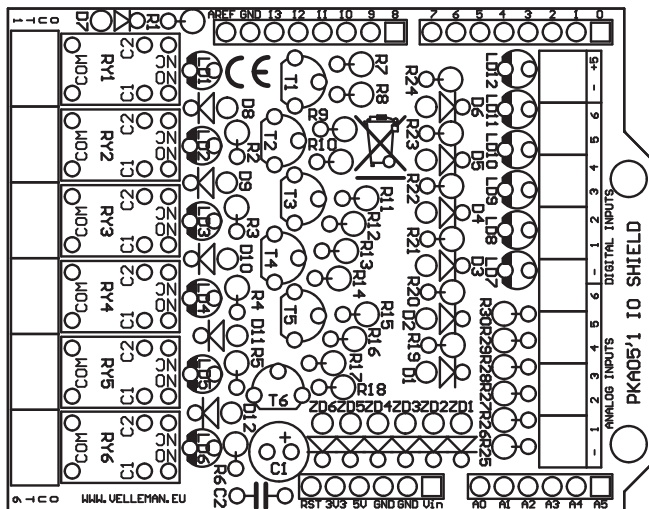
0 ... 5V



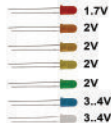
...

DOWNLOAD SAMPLE CODE FROM KA05 PAGE ON WWW.VELLEMAN.BE

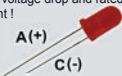




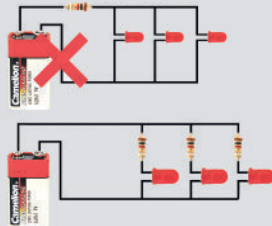
Leds and how to use them



Leds feature a specific voltage drop, depending on type and colour. Check the datasheet for exact voltage drop and rated current !



Never connect leds in parallel



How to Calculate the series resistor:

Example: operate a red led (1.7V) on a 9Vdc source.

Required led current for full brightness: 5mA (this can be found in the datasheet of the led)

$$\frac{\text{Supply voltage (V) - led voltage (V)}}{\text{required current (A)}} = \text{series resistance (ohms)}$$



$$\frac{9V - 1.7V}{0.005A} = 1460 \text{ ohm}$$

closest value :
use a 1k5 resistor

Required resistor power handling =
voltage over resistor x current passed trough resistor



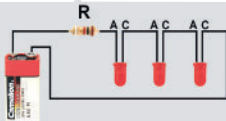
$$(9V - 1.7V) \times 0.005A = 0.036W$$

a standard 1/4W resistor
will do the job

LEDs in series:

Example: 3 x red led (1.7V) on 9V battery

Required led current for full brightness: 5mA
(this can be found in the datasheet of the led)



$$\frac{\text{Supply voltage (V) - (number of leds x led voltage (V))}}{\text{required current (A)}} = \text{series resistance (ohms)}$$

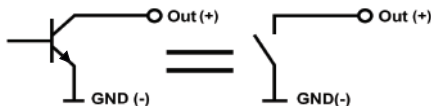


$$\frac{9V - (3 \times 1.7V)}{0.005A} = 780 \text{ ohm}$$

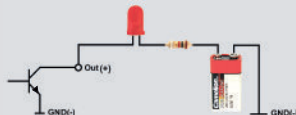
use an
820 ohm resistor

open collector outputs

An open collector output can be compared to a switch which switches to ground when operated



Example: How to switch an LED by means of an open collector output





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