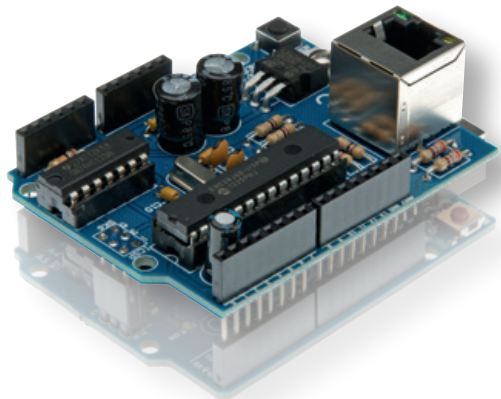


# KA04

ILLUSTRATED ASSEMBLY MANUAL HKA04IP'1

## Ethernet shield for Arduino®



**Configure your Arduino™ as a simple web server or let it get data from the worldwide web.**

### Features

- For use with Arduino Uno™, Arduino Mega™
- Based on Microchip ENC28J60
- IEEE 802.3 compatible Ethernet controller
- Integrated MAC & 10BASE-T PHY
- SPI interface
- With RJ45 connector

### Specifications

- Max. clock speed: 20MHz
- Transmit/receive buffer: 8kB
- Dimensions: 68 x 53mm / 2.67 x 2.08"



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**NEW FM353 LED CUBE**  
Cubeformer software available for download [here!](#)  
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**Velleman N.V.**  
**Legen Heirweg 33**  
**9890 Gavere**  
**(België)**

## 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

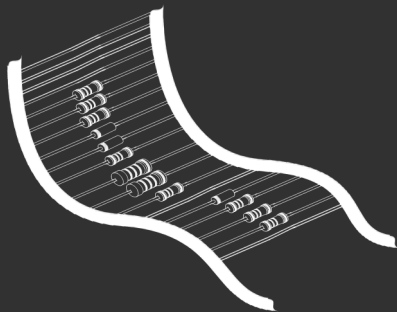


2. Make sure the solder joints are cone-shaped and shiny



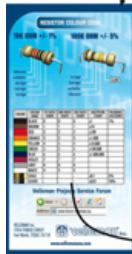
3. Trim excess leads as close as possible to the solder joint



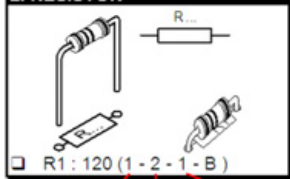


REMOVE THEM FROM THE TAPE ONE AT A TIME !

Included in  
this kit



## 2. RESISTOR



COLOUR	COLOUR NAME	1ST DIGIT/ STRIPE	2ND DIGIT/ STRIPE	3RD DIGIT/ STRIPE	MULTIPLIER STRIPE	TOLERANCE 4TH
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 ONTO THE TAPE. ALWAYS CHECK THEIR VALUE ON THE PARTS LIST!

# I CONSTRUCTION

## 1 Resistors



- R1: 47 (4-7-0-B)
- R2: 47 (4-7-0-B)
- R3: 18 (1-8-0-B)
- R4: 47 (4-7-0-B)
- R5: 47 (4-7-0-B)
- R6: 270 (2-7-1-B)
- R7: 270 (2-7-1-B)
- R8: 2K7 (2-7-2-B)
- R9: 10K (1-0-3-B)
- R10: 10K (1-0-3-B)
- R11: 10K (1-0-3-B)

## 2 Ceramic capacitors



- C1: 100nF (104)
- C2: 100nF (104)
- C3: 100nF (104)
- C4: 100nF (104)
- C10: 100nF (104)
- C7: 15pF (15)
- C8: 15pF (15)

## 3 Crystal



X1 : 25MHz

## 4 Push button



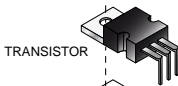
SW1 : Reset

## 5 Voltage regulator



M3 BOLT

VR1 : LD1086V33



TRANSISTOR



PCB



M3 NUT

## 6 IC socket



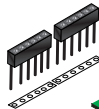
IC1 : 28p



IC1 : 14p

Watch the position of the notch!

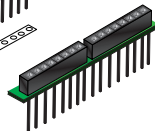
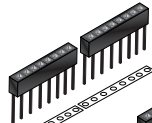
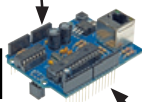
## 7 Female header

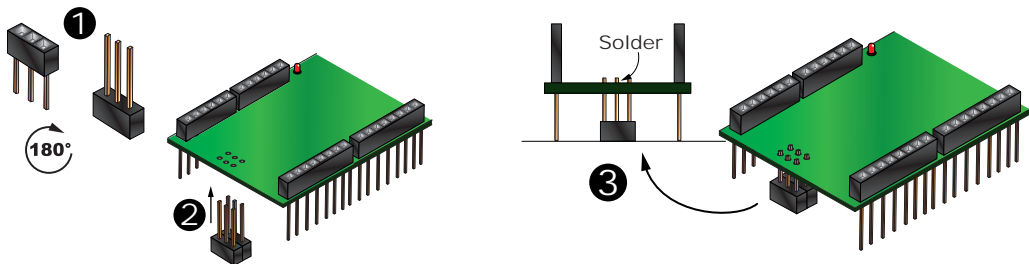


2 x 6p



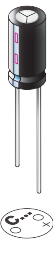
Do not cut the connector pins!





□ SK6: 2 x 3p

## 8 Electrolytic capacitors

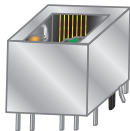


Watch the polarity!



- C5 : 470 $\mu$ F
- C6 : 10 $\mu$ F
- C9 : 470 $\mu$ F

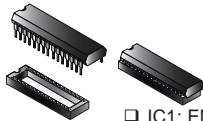
## 9 LAN connector



□ SK5



## 10 IC



□ IC1: ENC28J60-I/SP

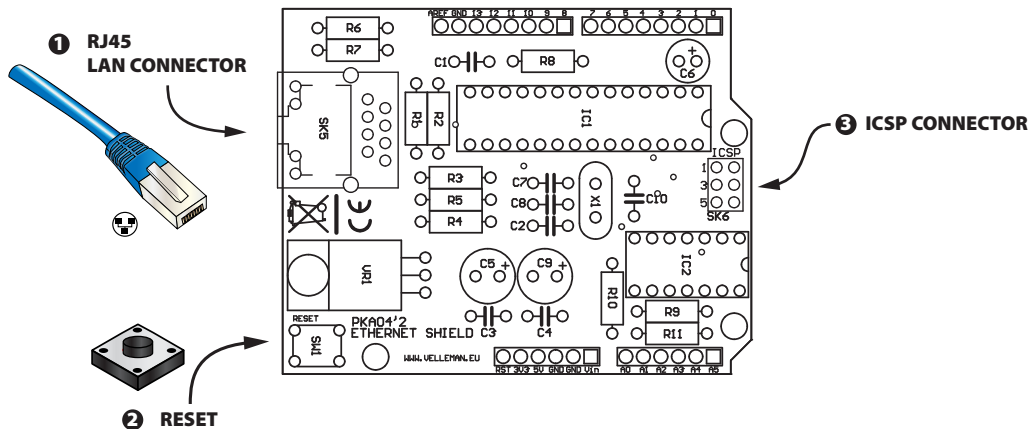


Watch the position of the notch!



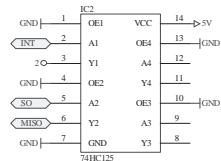
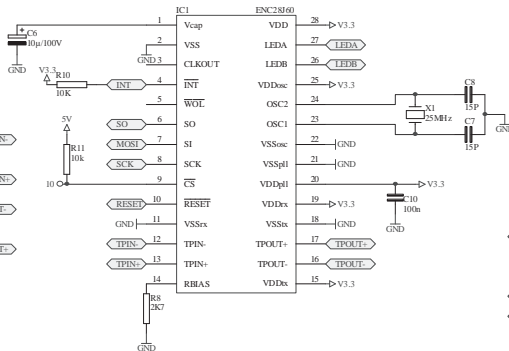
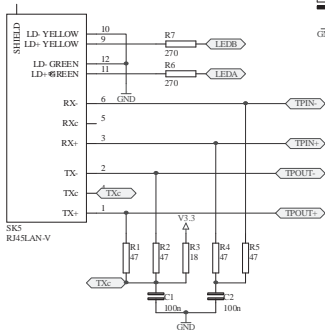
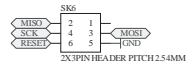
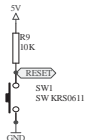
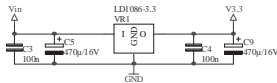
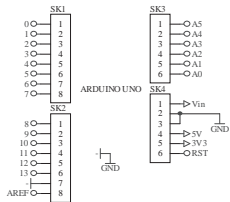
□ IC2: 74HC125

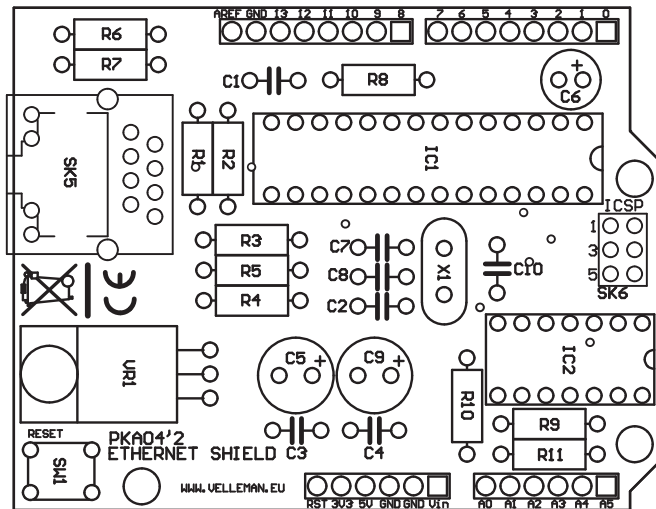
## II CONNECTION DIAGRAM



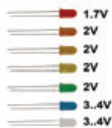
DOWNLOAD SAMPLE CODE FROM KA04 PAGE ON [WWW.VELLEMAN.BE](http://WWW.VELLEMAN.BE)



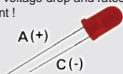




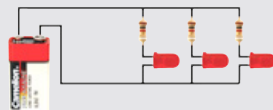
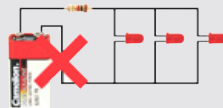
# Leds and how to use them



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

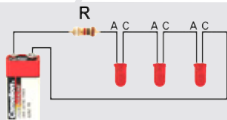


$$(9V - 1.7V) \times 0.005A = 0.036W$$

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)



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

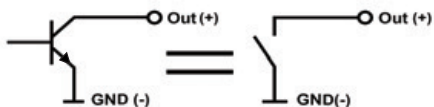


$$\frac{9V - (3 \times 1.7V)}{0.005A} = 780 \text{ ohm}$$

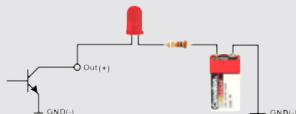
use an  
820 ohm resistor

## 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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