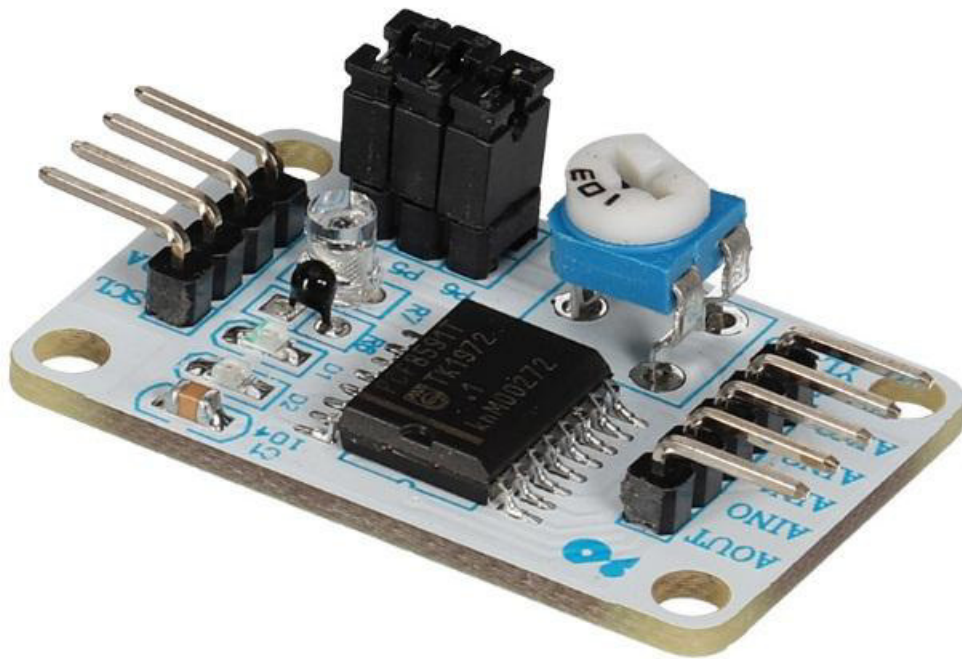


velleman[®]

VMA344

A/D D/A CONVERTER MODULE PCF8591



USER MANUAL



USER MANUAL

1. Introduction

To all residents of the European Union

Important environmental information about this product



This symbol on the device or the package indicates that disposal of the device after its lifecycle could harm the environment. Do not dispose of the unit (or batteries) as unsorted municipal waste; it should be taken to a specialized company for recycling. This device should be returned to your distributor or to a local recycling service. Respect the local environmental rules.

■ If in doubt, contact your local waste disposal authorities.

Thank you for choosing Velleman®! Please read the manual thoroughly before bringing this device into service. If the device was damaged in transit, do not install or use it and contact your dealer.

2. Safety Instructions



- This device can be used by children aged from 8 years and above, and persons with reduced physical, sensory or mental capabilities or lack of experience and knowledge if they have been given supervision or instruction concerning the use of the device in a safe way and understand the hazards involved. Children shall not play with the device. Cleaning and user maintenance shall not be made by children without supervision.



- Indoor use only.
Keep away from rain, moisture, splashing and dripping liquids.

3. General Guidelines



- Refer to the Velleman® Service and Quality Warranty on the last pages of this manual.
- Familiarise yourself with the functions of the device before actually using it.
- All modifications of the device are forbidden for safety reasons. Damage caused by user modifications to the device is not covered by the warranty.
- Only use the device for its intended purpose. Using the device in an unauthorised way will void the warranty.
- Damage caused by disregard of certain guidelines in this manual is not covered by the warranty and the dealer will not accept responsibility for any ensuing defects or problems.
- Nor Velleman nv nor its dealers can be held responsible for any damage (extraordinary, incidental or indirect) – of any nature (financial, physical...) arising from the possession, use or failure of this product.
- Due to constant product improvements, the actual product appearance might differ from the shown images.
- Product images are for illustrative purposes only.
- Do not switch the device on immediately after it has been exposed to changes in temperature. Protect the device against damage by leaving it switched off until it has reached room temperature.
- Keep this manual for future reference.

4. What is Arduino®

Arduino® is an open-source prototyping platform based in easy-to-use hardware and software. Arduino® boards are able to read inputs – light-on sensor, a finger on a button or a Twitter message – and turn it into an output – activating of a motor, turning on an LED, publishing something online. You can tell your board what to do by sending a set of instructions to the microcontroller on the board. To do so, you use the Arduino programming language (based on Wiring) and the Arduino® software IDE (based on Processing).

Surf to www.arduino.cc and www.arduino.org for more information.

5. Overview

The VMA344 - PCF8591 is a monolithically integrated, low-power, 8-bit CMOS data acquisition device. The PCF8591 has four analogue inputs, one analogue output and a serial I2C bus interface.

For testing purposes, the VMA344 contains a LDR, NTC and a trimmer, which are connected to the PCF8591 by 3 jumpers.

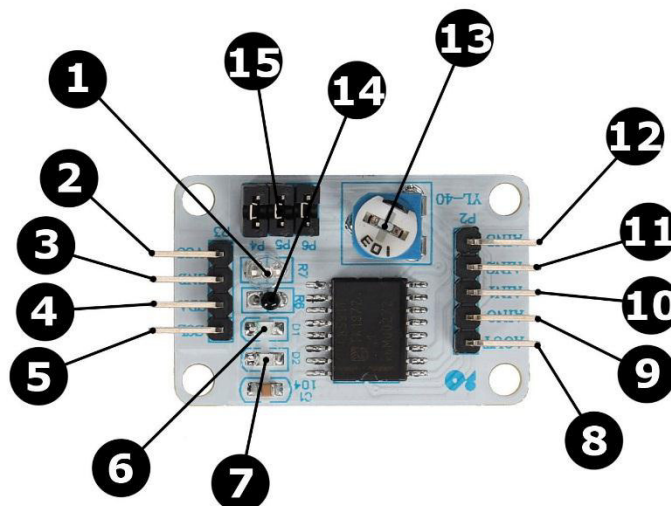
- single power supply
- operating supply voltage..... 2.5-6.0 V
- low standby current
- serial input and output via I2C-bus
- max. sampling rate given by I2C-bus speed
- 4 analogue inputs configurable as single-ended or differential inputs
- auto-incremented channel selection
- analogue voltage range from VSS to VDD
- on-chip track and hold circuit
- 8-bit successive approximation A/D conversion
- multiplying DAC with one analogue output

6. Connection

VMA344	description	VMA100 (UNO)
AOUT	DA output	A0 (example 2)
AIN0	analogue input 0	
AIN1	analogue input 1	
AIN2	analogue input 2	
AIN3	analogue input 3	
SCL	I2C clock	A5
SDA	I2C data	A4
GND	ground	GND
VCC	power supply 3.3-5 V	5 V (or 3.3 V)

The VMA344 contains 3 removable jumpers, which are connected to:

P4	AIN1	NTC
P5	AIN0	phototransistor
P6	AIN3	potentiometer



1	light sensor
2	VCC
3	GND
4	SDA
5	SCL
6	power LED
7	signal LED
8	AOUT

9	AIN0
10	AIN1
11	AIN2
12	AIN3
13	potentiometer
14	temperature sensor
15	jumpers P4, P5, P6

7. Test Example 1: Reading the 4 Analogue Inputs

1. Make the connections as mentioned before. You will not need the A0 connection for this example.
2. Click [here](#) to download and extract VMA344 Test file from our website.
3. Run the Arduino® IDE and load the VMA344 test software.
4. Compile and upload to the VMA100.
5. Open the serial monitor and if everything works well You should have a similar result:

```

COM5 (Arduino/Genuino Uno)
66,223,103,28
67,223,104,28
65,223,99,28
71,223,105,28
69,223,107,28
68,223,164,28

```

The first row is AIN0, connected to the photodiode (if the jumper is set). Change the light intensity and you will see the value changing. The third row is "floating" as nothing is connected to AIN2.

8. Test Example 2: Controlling the Analogue Input

1. Connect the AOUT to the A0 of your VMA100.
2. Click [here](#) to download, extract and load the VMA344 Output file.
3. On the serial monitor you will see how the AOUT voltage increases step by step.
As AOUT is connected to LED D2, you will notice that the LED will follow the AOUT voltage.

```

COM5 (Arduino/Genuino Uno)
DAC Out = 229   DAC Target Voltage = 4.473   Raw ADC Value = 848   Voltage = 4.141
DAC Out = 230   DAC Target Voltage = 4.492   Raw ADC Value = 848   Voltage = 4.141
DAC Out = 231   DAC Target Voltage = 4.512   Raw ADC Value = 848   Voltage = 4.141
DAC Out = 232   DAC Target Voltage = 4.531   Raw ADC Value = 849   Voltage = 4.146
DAC Out = 233   DAC Target Voltage = 4.551   Raw ADC Value = 849   Voltage = 4.146
DAC Out = 234   DAC Target Voltage = 4.570   Raw ADC Value = 849   Voltage = 4.146
DAC Out = 235   DAC Target Voltage = 4.590   Raw ADC Value = 849   Voltage = 4.146
DAC Out = 236   DAC Target Voltage = 4.609   Raw ADC Value = 849   Voltage = 4.146
DAC Out = 237   DAC Target Voltage = 4.629   Raw ADC Value = 849   Voltage = 4.146

```

9. Software Example

```
#include "Wire.h"
#define PCF8591 (0x90 >> 1)
byte adcvalue0, adcvalue1, adcvalue2, adcvalue3;

void setup()
{
  Wire.begin();
  Serial.begin(9600);
}

void loop()
{
  Wire.beginTransmission(PCF8591);
  Wire.write(0x04);
  Wire.endTransmission();
  Wire.requestFrom(PCF8591, 5);

  adcvalue0=Wire.read();
  adcvalue0=Wire.read();
  adcvalue1=Wire.read();
  adcvalue2=Wire.read();
  adcvalue3=Wire.read();

  Serial.print(adcvalue0);
  Serial.print(" ,");
  Serial.print(adcvalue1);
  Serial.print(" ,");
  Serial.print(adcvalue2);
  Serial.print(" ,");
  Serial.print(adcvalue3);
  Serial.println();
  delay(1000);
}
```

Example 2 software :

```
// Henry's Bench
// PCF8591 Simple DAC
// Controlling voltage output with your Arduino
```

```
#include "Wire.h"
#define PCF8591 (0x90 >> 1)

int Ain = 0;

int RawValue0 = 0;
int DACout = 0;
float DACoutVolt = 0.0;
float Voltage = 0.0;

void setup()
{
  Wire.begin();
```

```

Serial.begin(9600);
}
void loop()
{
  for (int i = 0; i < 256; i++)
  {
    Wire.beginTransmission(PCF8591);
    Wire.write(0x40); // sets the PCF8591 into a DA mode
    Wire.write(i); // sets the outputn
    Wire.endTransmission();

    delay(500);

    DACout = i;
    RawValue0 = analogRead(Ain);
    Voltage = (RawValue0 * 5.0 ) / 1024.0;
    DACoutVolt = (DACout * 5.0)/256.0;
    Serial.print("DAC Out = ");
    Serial.print(DACout);
    Serial.print("\tDAC Target Voltage = ");
    Serial.print(DACoutVolt, 3);
    Serial.print("\tRaw ADC Value = ");
    Serial.print(RawValue0);
    Serial.print("\tVoltage = ");
    Serial.println(Voltage, 3);
  }
}

```

10. More Information

Please refer to the VMA344 product page on www.velleman.eu for more information.

Use this device with original accessories only. Velleman nv cannot be held responsible in the event of damage or injury resulting from (incorrect) use of this device. For more info concerning this product and the latest version of this manual, please visit our website www.velleman.eu. The information in this manual is subject to change without prior notice.

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Velleman® Service and Quality Warranty

Since its foundation in 1972, Velleman® acquired extensive experience in the electronics world and currently distributes its products in over 85 countries.

All our products fulfil strict quality requirements and legal stipulations in the EU. In order to ensure the quality, our products regularly go through an extra quality check, both by an internal quality department and by specialized external organisations. If, all precautionary measures notwithstanding, problems should occur, please make appeal to our warranty (see guarantee conditions).

General Warranty Conditions Concerning Consumer Products (for EU):

- All consumer products are subject to a 24-month warranty on production flaws and defective material as from the original date of purchase.
- Velleman® can decide to replace an article with an equivalent article, or to refund the retail value totally or partially when the complaint is valid and a free repair or replacement of the article is impossible, or if the expenses are out of proportion.

You will be delivered a replacing article or a refund at the value of 100% of the purchase price in case of a flaw occurred in the first year after the date of purchase and delivery, or a replacing article at 50% of the purchase price or a refund at the value of 50% of the retail value in case of a flaw occurred in the second year after the date of purchase and delivery.

• Not covered by warranty:

- all direct or indirect damage caused after delivery to the article (e.g. by oxidation, shocks, falls, dust, dirt, humidity...), and by the article, as well as its contents (e.g. data loss), compensation for loss of profits;
- consumable goods, parts or accessories that are subject to an aging process during normal use, such as batteries (rechargeable, non-rechargeable, built-in or replaceable), lamps, rubber parts, drive belts... (unlimited list);
- flaws resulting from fire, water damage, lightning, accident, natural disaster, etc....;
- flaws caused deliberately, negligently or resulting from improper handling, negligent maintenance, abusive use or use contrary to the manufacturer's instructions;
- damage caused by a commercial, professional or collective use of the article (the warranty validity will be reduced to six (6) months when the article is used professionally);
- damage resulting from an inappropriate packing and shipping of the article;
- all damage caused by modification, repair or alteration performed by a third party without written permission by Velleman®.
- Articles to be repaired must be delivered to your Velleman® dealer, solidly packed (preferably in the original packaging), and be completed with the original receipt of purchase and a clear flaw description.
- Hint: In order to save on cost and time, please reread the manual and check if the flaw is caused by obvious causes prior to presenting the article for repair. Note that returning a non-defective article can also involve handling costs.
- Repairs occurring after warranty expiration are subject to shipping costs.
- The above conditions are without prejudice to all commercial warranties.

The above enumeration is subject to modification according to the article (see article's manual).