

Erriez BH1750 library for Arduino

1.1.0

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# Chapter 1

## BH1750 digital light sensor library for Arduino

This is a 16-bit [BH1750](#) digital ambient light sensor on a GY-302 breakout PCB:

### Arduino library features

- Measurement in LUX
- Three operation modes:
  - Continues conversion
  - One-time conversion
- Three selectable resolutions:
  - Low 4 LUX resolution (low power)
  - High 1 LUX resolution
  - High 0.5 LUX resolution
- Asynchronous and synchronous conversion

### [BH1750](#) sensor specifications

- Operating voltage: 3.3V .. 4.5V max
- Low current by power down: max 1uA
- I2C bus interface: max 400kHz
- Ambience light:
  - Range: 1 - 65535 lx
  - Deviation: +/- 20%
  - Selectable resolutions:
    - \* 4 lx (low resolution, max 24 ms measurement time)
    - \* 1 lx (mid resolution max 180 ms measurement time)
    - \* 0.5 lx (high resolution 180 ms measurement time)
- No additional electronic components needed

## GY-302 breakout specifications

- Supply voltage: 3.3 .. 5V
- 5V tolerant I2C SCL and SDA pins
- 2 selectable I2C addresses with ADDR pin high or low/floating

## Hardware

### Connection [BH1750](#) - Arduino / ESP8266 boards

<a href="#">BH1750</a>	Arduino UNO / Nano	Leonardo / Pro Micro	Mega2560	WeMos D1 & R2 / Node MCU	WeMos LOLIN32
GND	GND	GND	GND	GND	GND
VCC	5V (or 3.3V)	5V (or 3.3V)	5V (or 3.3V)	3V3	3V3
SDA	A4 (ANALOG pin)	2 (DIGITAL pin)	D20	D2	5
SCL	A5 (ANALOG pin)	3 (DIGITAL pin)	D21	D1	4

Other MCU's may work, but are not tested.

### WeMos LOLIN32 with OLED display

Change the following Wire initialization to:

```
1 {c++}
2 // WeMos LOLIN32 with OLED support
3 Wire.begin(5, 4);
```

### I2C address

- ADDR pin LOW for I2C address 0x23 (0x46 including R/W bit)
- ADDR pin HIGH for I2C address 0x5C (0xB8 including R/W bit)

**Note:** ADDR pin may be floating (open) which is the same as LOW.

## Examples

Examples | Erriez [BH1750](#):

- ContinuesMode | [BH1750ContinuesAsynchronous](#)
- ContinuesMode | [BH1750ContinuesBasic](#)
- ContinuesMode | [BH1750ContinuesHighResolution](#)
- ContinuesMode | [BH1750ContinuesLowResolution](#)
- ContinuesMode | [BH1750ContinuesPowerMgt](#)
- OneTimeMode | [BH1750OneTimeBasic](#)
- OneTimeMode | [BH1750OneTimeHighResolution](#)
- OneTimeMode | [BH1750OneTimeLowResolution](#)
- OneTimeMode | [BH1750OneTimePowerMgt](#)

## Documentation

- [Doxygen online HTML](#)
- [Doxygen PDF](#)
- [BH1750 chip datasheet](#)

## Example continues conversion high resolution

```
1 {c++}
2 #include <Wire.h>
3 #include <ErriezBH1750.h>
4
5 // ADDR line LOW/open:  I2C address 0x23 (0x46 including R/W bit) [default]
6 // ADDR line HIGH:      I2C address 0x5C (0xB8 including R/W bit)
7 BH1750 sensor(LOW);
8
9 void setup()
10 {
11     Serial.begin(115200);
12     Serial.println(F("BH1750 continues measurement high resolution example"));
13
14     // Initialize I2C bus
15     Wire.begin();
16
17     // Initialize sensor in continues mode, high 0.5 lx resolution
18     sensor.begin(ModeContinuous, ResolutionHigh);
19
20     // Start conversion
21     sensor.startConversion();
22 }
23
24 void loop()
25 {
26     uint16_t lux;
27
28     // Wait for completion (blocking busy-wait delay)
29     if (sensor.isConversionCompleted()) {
30         // Read light
31         lux = sensor.read();
32
33         // Print light
34         Serial.print(F("Light: "));
35         Serial.print(lux / 2);
36         Serial.print(F("."));
37         Serial.print(lux % 10);
38         Serial.println(F(" LUX"));
39     }
40 }
```

## Output

```
1 {c++}
2 BH1750 continues measurement high resolution example
3 Light: 15.0 LUX
4 Light: 31.2 LUX
5 Light: 385.0 LUX
6 Light: 575.1 LUX
7 Light: 667.5 LUX
```

## Usage

### Initialization

```
1 {c++}
2 #include <Wire.h>
3 #include <ErriezBH1750.h>
4
5 // ADDR line LOW/open:  I2C address 0x23 (0x46 including R/W bit) [default]
6 // ADDR line HIGH:      I2C address 0x5C (0xB8 including R/W bit)
```

```

7 BH1750 sensor(LOW);
8
9 void setup()
10 {
11     // Initialize I2C bus
12     Wire.begin();
13
14     // Initialize sensor with a mode and resolution:
15     //   Modes:
16     //     ModeContinuous
17     //     ModeOneTime
18     //   Resolutions:
19     //     ResolutionLow (4 lx resolution)
20     //     ResolutionMid (1 lx resolution)
21     //     ResolutionHigh (0.5 lx resolution)
22     sensor.begin(mode, resolution);
23 }

```

### Start conversion

```

1 {Wire.begin(); ``}
2
3 ``c++
4 sensor.startConversion();

```

### Wait for completion asynchronous (non-blocking)

The sensor conversion completion status can be checked asynchronously before reading the light value:

```

1 {c++}
2 bool completed = sensor.isConversionCompleted();

```

### Wait for completion synchronous (blocking)

The sensor conversion completion status can be checked synchronously before reading the light value:

```

1 {c++}
2 // Wait for completion
3 // completed = false: Timeout or device in power-down
4 bool completed = sensor.waitForCompletion();

```

### Read light value in LUX

**One-time mode:** The application must wait or check for a completed conversion, otherwise the sensor may return an invalid value. **Continues mode:** The application can call this function without checking completion, but is not recommended when accurate values are required.

Read sensor light value:

```

1 {c++}
2 // lux = 0: No light or not initialized
3 uint16_t lux = sensor.read();

```

For 4 lx low and 1 lx high resolutions:

```

1 {c++}
2 // Print low and medium resolutions
3 Serial.print(F("Light: "));
4 Serial.print(lux);
5 Serial.println(F(" LUX"));

```

For 0.5 lx high resolution:

```

1 {c++}
2 // Print high resolution
3 Serial.print(F("Light: "));
4 Serial.print(lux / 2);
5 Serial.print(F("."));
6 Serial.print(lux % 10);
7 Serial.println(F(" LUX"));

```



## Power down

The device enters power down automatically after a one-time conversion.

A manual power-down in continues mode can be generated by calling:

```
1 {c++}  
2 sensor.powerDown();
```

## Library dependencies

- Built-in `Wire.h`

## Library installation

Please refer to the [Wiki](#) page.

## Other Arduino Libraries and Sketches from Erriez

- [Erriez Libraries and Sketches](#)



## Chapter 2

# Class Index

### 2.1 Class List

Here are the classes, structs, unions and interfaces with brief descriptions:

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## Chapter 3

# File Index

### 3.1 File List

Here is a list of all documented files with brief descriptions:

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## Chapter 4

# Class Documentation

### 4.1 BH1750 Class Reference

BH1750 class.

```
#include <ErriezBH1750.h>
```

#### Public Member Functions

- **BH1750** (uint8\_t addrPinLevel=LOW)  
*Constructor.*
- void **begin** (BH1750\_Mode\_e mode, BH1750\_Resolution\_e resolution)  
*Set mode and resolution.*
- void **powerDown** ()  
*Power down. Call **startConversion()** to power-up automatically.*
- void **startConversion** ()  
*Start conversion.*
- bool **isConversionCompleted** ()  
*Wait for completion.*
- bool **waitForCompletion** ()  
*Wait for completion.*
- uint16\_t **read** ()  
*Read light level asynchronous from sensor The application is responsible for wait or checking a completed conversion, otherwise the last conversion value may be returned which may not be correct. The last value is also returned when the device is in power-down.*

#### Protected Member Functions

- void **writeInstruction** (uint8\_t instruction)  
*Write instruction to sensor.*
- void **setTimestamp** ()  
*Save current time + minimum delay before reading next conversion in ms.*

### 4.1.1 Detailed Description

[BH1750](#) class.

Definition at line 53 of file ErriezBH1750.h.

### 4.1.2 Constructor & Destructor Documentation

#### 4.1.2.1 BH1750::BH1750 ( uint8\_t *addrPinLevel* = LOW ) [explicit]

Constructor.

Parameters

<i>addrPinLevel</i>	Sensor I2C address: ADDR pin = LOW: 0x23 (default) ADDR pin = HIGH: 0x5C
---------------------	--

Definition at line 44 of file ErriezBH1750.cpp.

### 4.1.3 Member Function Documentation

#### 4.1.3.1 void BH1750::begin ( BH1750\_Mode\_e *mode*, BH1750\_Resolution\_e *resolution* )

Set mode and resolution.

Parameters

<i>mode</i>	ModeContinuous for continues mode Continues conversion requires more power ModeOneTime for one-time conversion mode Set in low power when conversion completed
<i>resolution</i>	Resolution05Lux for high resolution (max 180ms conversion) Resolution1Lux for normal resolution (max 180ms conversion) Resolution4Lux for low resolution (max 24ms conversion, low power)

Definition at line 66 of file ErriezBH1750.cpp.

#### 4.1.3.2 bool BH1750::isConversionCompleted ( )

Wait for completion.

Returns

true: Conversion completed false: Conversion busy

Definition at line 105 of file ErriezBH1750.cpp.



#### 4.1.3.3 `uint16_t BH1750::read ( )`

Read light level asynchronous from sensor The application is responsible for wait or checking a completed conversion, otherwise the last conversion value may be returned which may not be correct. The last value is also returned when the device is in power-down.

##### Returns

Light level in lux (0..65535) In high resolution, the last digit is the remainder

Definition at line 162 of file `ErriezBH1750.cpp`.

#### 4.1.3.4 `bool BH1750::waitForCompletion ( )`

Wait for completion.

##### Returns

true: Conversion completed false: Not initialized, or timeout

Definition at line 125 of file `ErriezBH1750.cpp`.

#### 4.1.3.5 `void BH1750::writeInstruction ( uint8_t instruction )` `[protected]`

Write instruction to sensor.

##### Parameters

<i>instruction</i>	Sensor instruction
--------------------	--------------------

Definition at line 215 of file `ErriezBH1750.cpp`.

The documentation for this class was generated from the following files:

- [ErriezBH1750.h](#)
- [ErriezBH1750.cpp](#)



## Chapter 5

# File Documentation

### 5.1 ErriezBH1750.cpp File Reference

[BH1750](#) digital light sensor library for Arduino.

```
#include "ErriezBH1750.h"  
#include "ErriezBH1750_regs.h"
```

#### 5.1.1 Detailed Description

[BH1750](#) digital light sensor library for Arduino.

Source: <https://github.com/Erriez/ErriezBH1750> Documentation: <https://erriez.github.io/ErriezBH1750>

### 5.2 ErriezBH1750.h File Reference

[BH1750](#) digital light sensor library for Arduino.

```
#include <Arduino.h>  
#include <Wire.h>
```

#### Classes

- class [BH1750](#)  
*[BH1750](#) class.*

#### Enumerations

- enum [BH1750\\_Mode\\_e](#) { [ModeContinuous](#) = 0x10, [ModeOneTime](#) = 0x20 }  
*Mode register bits.*
- enum [BH1750\\_Resolution\\_e](#) { [ResolutionLow](#) = 0x03, [ResolutionMid](#) = 0x00, [ResolutionHigh](#) = 0x01 }  
*Resolution register bits.*

### 5.2.1 Detailed Description

[BH1750](#) digital light sensor library for Arduino.

Source: <https://github.com/Erriez/ErriezBH1750> Documentation: <https://erriez.github.io/ErriezBH1750>

### 5.2.2 Enumeration Type Documentation

#### 5.2.2.1 enum BH1750\_Mode\_e

Mode register bits.

Enumerator

**ModeContinuous** Continues mode.

**ModeOneTime** One-time mode.

Definition at line 40 of file ErriezBH1750.h.

#### 5.2.2.2 enum BH1750\_Resolution\_e

Resolution register bits.

Enumerator

**ResolutionLow** 4 lx resolution

**ResolutionMid** 1 lx resolution

**ResolutionHigh** 0.5 lx resolution

Definition at line 46 of file ErriezBH1750.h.

## 5.3 ErriezBH1750\_regs.h File Reference

[BH1750](#) digital light sensor library for Arduino.

## Macros

- `#define BH1750_I2C_ADDR_L 0x23`  
*I2C address with ADDR pin low.*
- `#define BH1750_I2C_ADDR_H 0x5C`  
*I2C address with ADDR pin high.*
- `#define BH1750_POWER_DOWN 0x00`  
*Power down instruction.*
- `#define BH1750_POWER_ON 0x01`  
*Power on instruction.*
- `#define BH1750_RESET 0x07`  
*Reset instruction.*
- `#define BH1750_MODE_MASK 0x30`  
*Mode mask bits.*
- `#define BH1750_RES_MASK 0x03`  
*Mode resolution mask bits.*
- `#define BH1750_CONV_TIME_L 24`  
*Worst case conversion timing low res.*
- `#define BH1750_CONV_TIME_H 180`  
*Worst case conversion timing high res.*
- `#define IS_INITIALIZED(mode) (((mode) & BH1750_MODE_MASK) != 0x00)`
- `#define IS_CONTINUOUS_MODE(mode) (((mode) & BH1750_MODE_MASK) == ModeContinuous)`
- `#define IS_ONE_TIME_MODE(mode) (((mode) & BH1750_MODE_MASK) == ModeOneTime)`
- `#define IS_LOW_RESOLUTION(mode) (((mode) & BH1750_RES_MASK) == ResolutionLow)`
- `#define GET_TIMEOUT(mode)`

### 5.3.1 Detailed Description

[BH1750](#) digital light sensor library for Arduino.

Source: <https://github.com/Erriez/ErriezBH1750> Documentation: <https://erriez.github.io/ErriezBH1750>

### 5.3.2 Macro Definition Documentation

#### 5.3.2.1 `#define GET_TIMEOUT( mode )`

**Value:**

```
(( (mode) & BH1750_RES_MASK) == ResolutionLow) ? \
    BH1750_CONV_TIME_L :
    BH1750_CONV_TIME_H)
```

Macro low/high resolution timeout from mode

Definition at line 81 of file ErriezBH1750\_regs.h.

5.3.2.2 `#define IS_CONTINUES_MODE( mode ) (((mode) & BH1750_MODE_MASK) == ModeContinuous)`

Macro is continues mode enabled

Definition at line 63 of file ErriezBH1750\_regs.h.

5.3.2.3 `#define IS_INITIALIZED( mode ) (((mode) & BH1750_MODE_MASK) != 0x00)`

Return if mode is set (initialized)

Definition at line 57 of file ErriezBH1750\_regs.h.

5.3.2.4 `#define IS_LOW_RESOLUTION( mode ) (((mode) & BH1750_RES_MASK) == ResolutionLow)`

Macro is low resolution enabled from mode

Definition at line 75 of file ErriezBH1750\_regs.h.

5.3.2.5 `#define IS_ONE_TIME_MODE( mode ) (((mode) & BH1750_MODE_MASK) == ModeOneTime)`

Macro is one-time mode enabled from mode

Definition at line 69 of file ErriezBH1750\_regs.h.

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