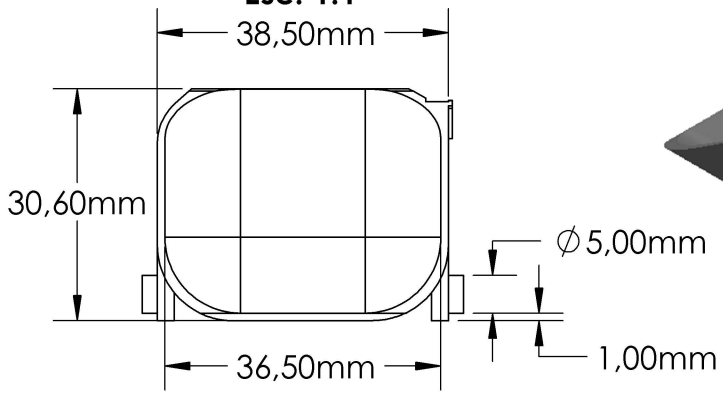
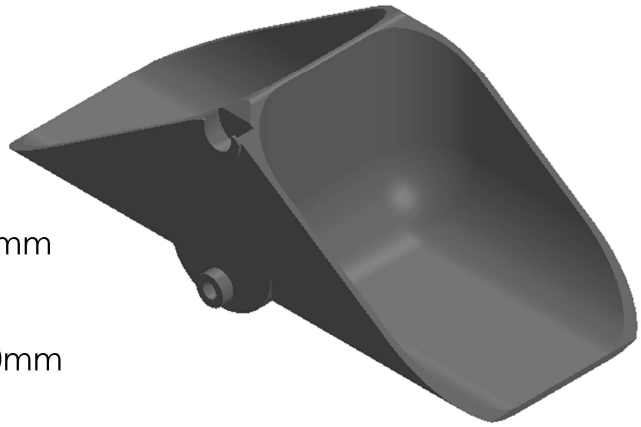
ANEXO 1.
PLANOS
SolidsWork.SLDDRW

PLANO DEL BALANCÍN

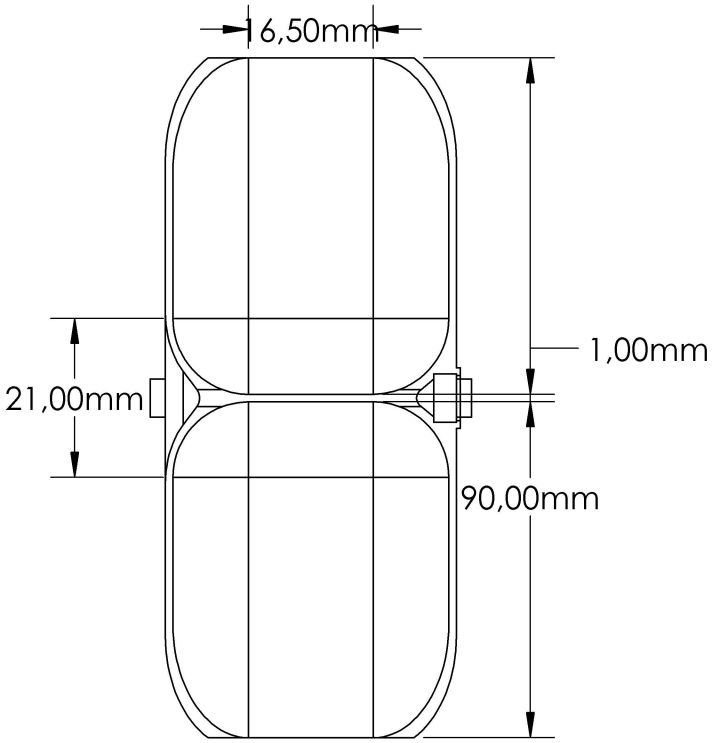
Vista frontal
Esc. 1:1



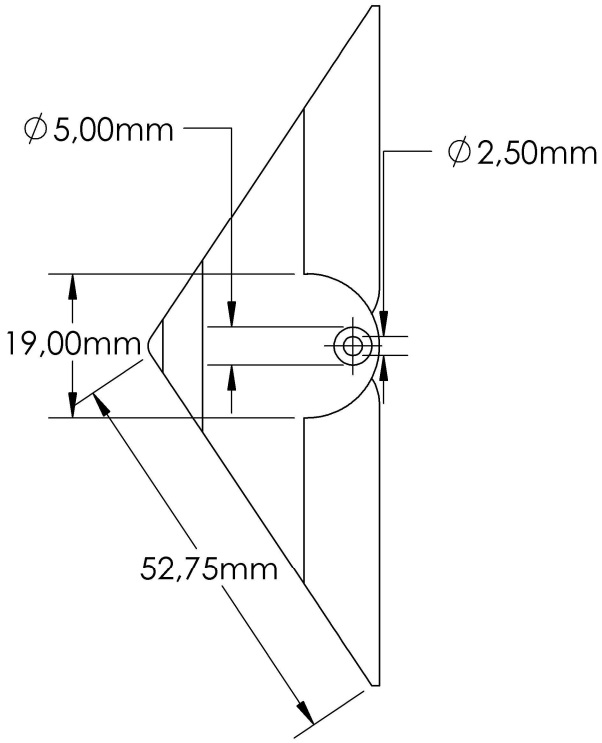
Vista Isométrica
Esc. 1:1



Vista en planta
Esc. 1:1



Vista lateral
Esc. 1:1



UNIVERSIDAD AUTÓNOMA JUAN MISAEL SARACHO
FACULTAD DE CIENCIAS Y TECNOLOGÍA

CARRERA: INGENIERÍA CIVIL	**AUTOR:** UNIV. ROMERO MIRANDA ALDO IVAN

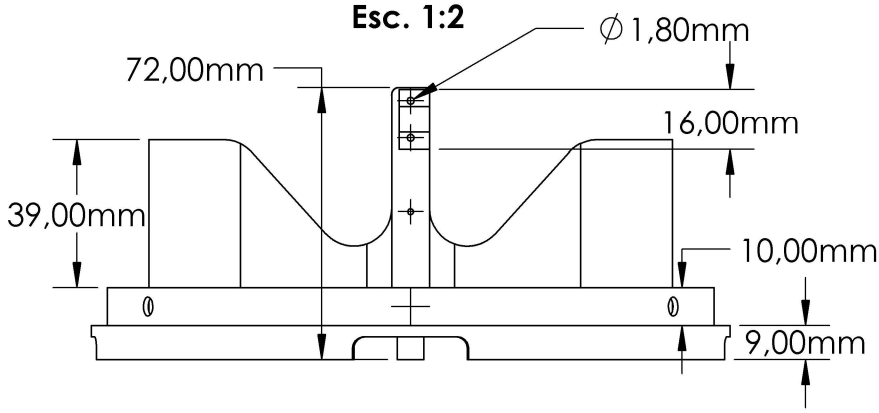
DESCRIPCIÓN:
COMPONENTE BASCULANTE QUE INCLUYE CUBETAS SIMETRICAS CON PERFORACIONES PARA EL EJE Y CABIDADES PARA EL IMÁN

ESCALA: INDICADA	**LUGAR Y FECHA:** TARIJA 25 DE ABRIL 2025	**No. Plano:** 01

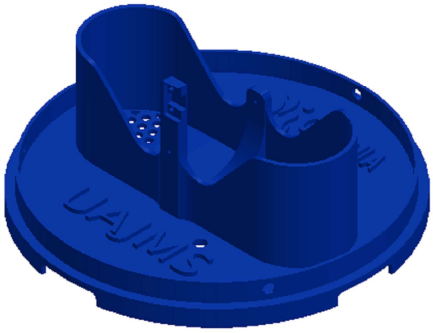
CIAGUA Centro de Investigación del Agua

PLANO DE LA BASE Y SALIDA DEL AGUA

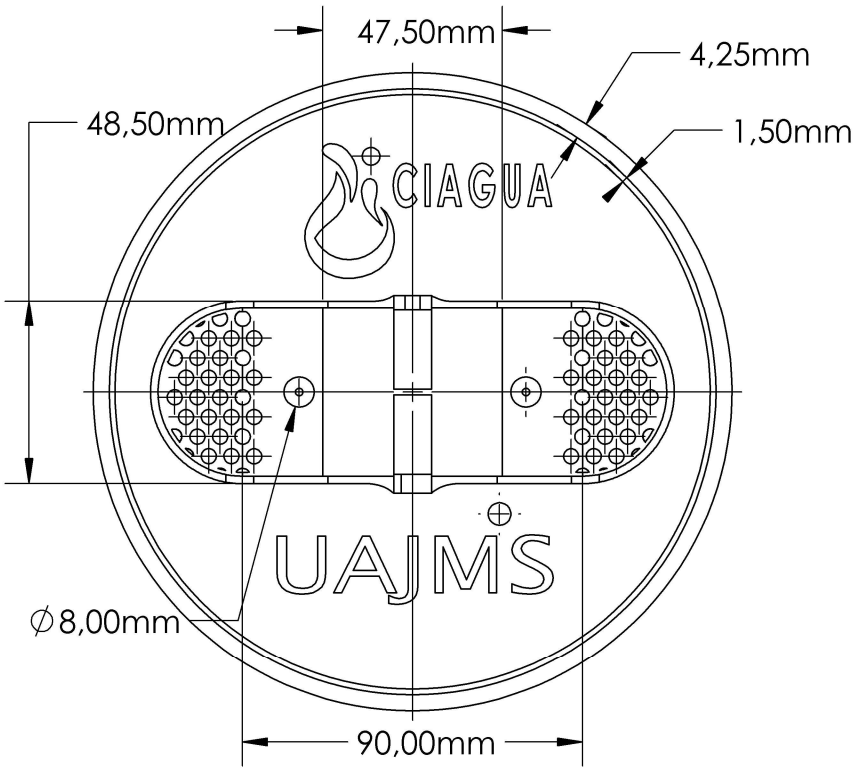
Vista frontal
Esc. 1:2



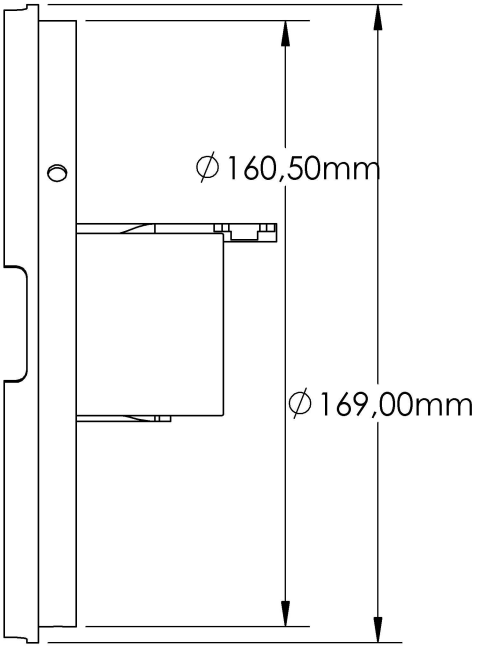
Vista Isométrica
Esc. 1:3



Vista en planta
Esc. 1:2



Vista lateral
Esc. 1:2



UNIVERSIDAD AUTÓNOMA JUAN MISAEL SARACHO
FACULTAD DE CIENCIAS Y TECNOLOGÍA

CARRERA:
INGENIERÍA CIVIL

AUTOR:
UNIV. ROMERO MIRANDA ALDO IVAN

DESCRIPCIÓN:
ESTRUCTURA BASE COMPUESTA CON SOPORTE LATERALES PARA EL BALACÍN Y ESPACIOS PARA DRENAJE EFICIENTE.

ESCALA:
INDICADA

LUGAR Y FECHA:
TARIJA 25 DE ABRIL 2025

No. Plano: 02

CIAGUA
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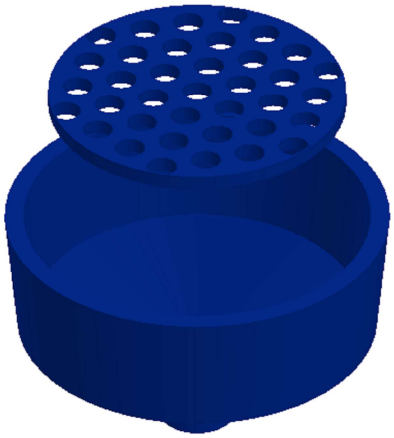
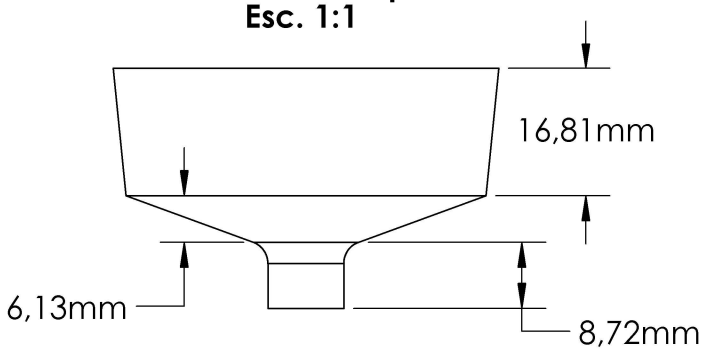
PLANO BOQUILLA Y REJILLA

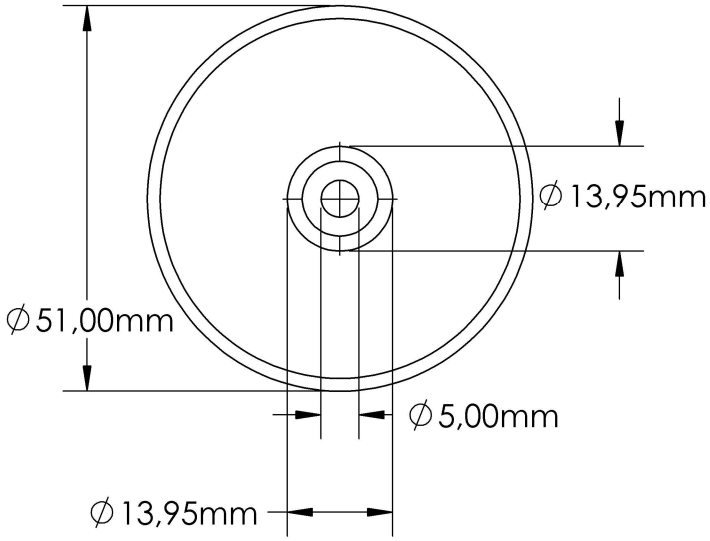
Vista Isométrica
Esc. 1:3



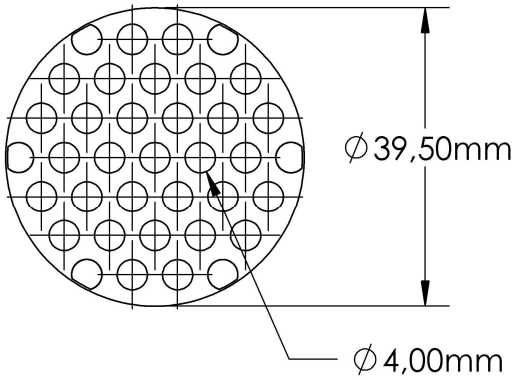
Vista lateral boquilla
Esc. 1:1



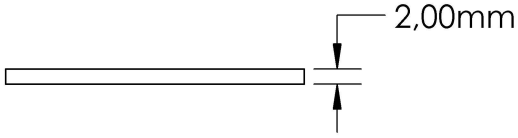
Vista en planta boquilla
Esc. 1:1



Vista en planta rejilla
Esc. 1:1



Vista lateral rejilla
Esc. 1:1



UNIVERSIDAD AUTÓNOMA JUAN MISAEL SARACHO
FACULTAD DE CIENCIAS Y TECNOLOGÍA

CARRERA: INGENIERÍA CIVIL	**AUTOR:** UNIV. ROMERO MIRANDA ALDO IVAN

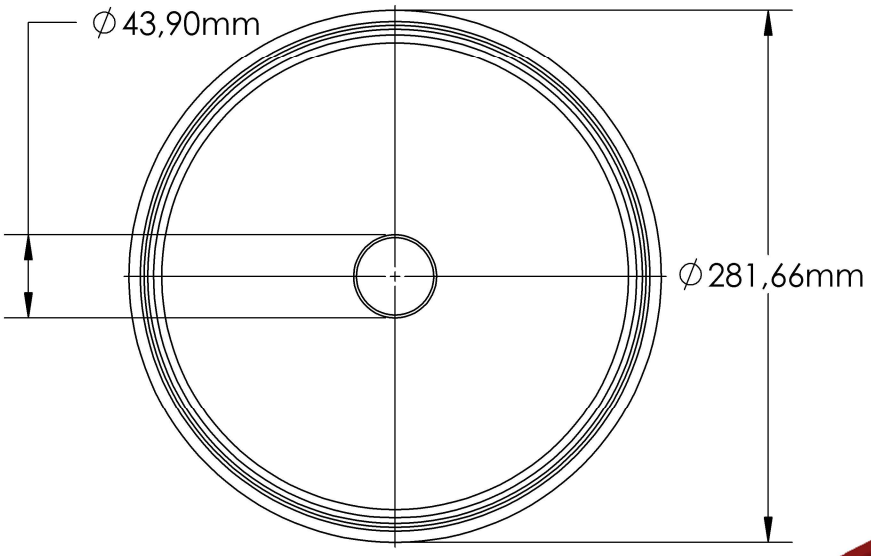
DESCRIPCIÓN:
BOQUILLA CILÍNDRICA CANALIZA EL AGUA DEL EMBUDO AL BALANCÍN INTEGRA UNA REJILLA PARA LIMPIEZA

ESCALA: INDICADA	**LUGAR Y FECHA:** TARIJA 25 DE ABRIL 2025	**No. Plano:** 03

CIAGUA Centro de Investigación del Agua

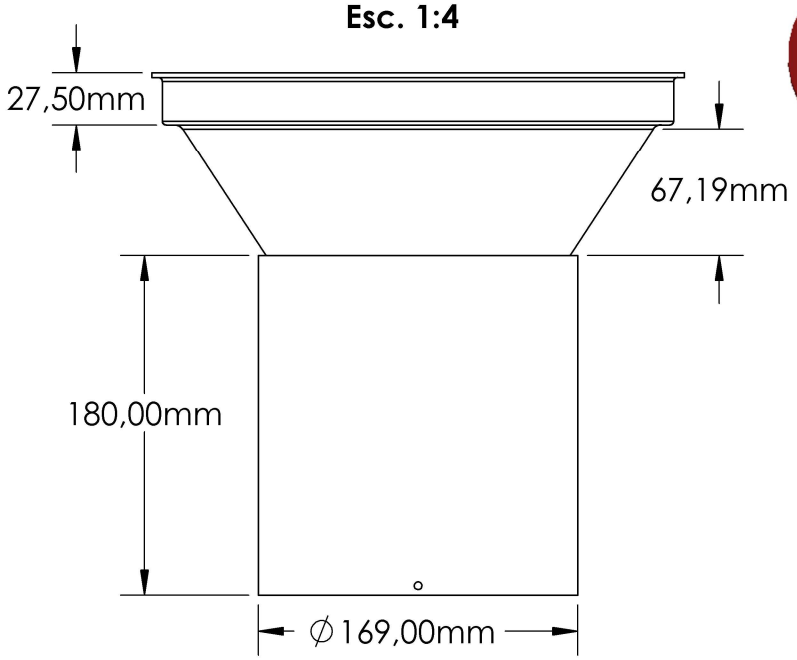
PLANO DE COLECTOR Y CÁSCARA PROTECTORA

Vista en planta
Esc. 1:4



Vista Isométrica
Esc. 1:4

Vista frontal
Esc. 1:4



UNIVERSIDAD AUTÓNOMA JUAN MISAEL SARACHO
FACULTAD DE CIENCIAS Y TECNOLOGÍA

CARRERA: INGENIERÍA CIVIL	**AUTOR:** UNIV. ROMERO MIRANDA ALDO IVAN

DESCRIPCIÓN:
EMDUDO DE CAPTACIÓN UNIDA A UNA CÁSCARA CILINDRICA, QUE CONECTA DIRECTAMENTE A LA BASE.

ESCALA: INDICADA	**LUGAR Y FECHA:** TARIJA 25 DE ABRIL 2025	**No. Plano:** 04

CIAGUA Centro de Investigación del Agua

ANEXO 3.
CÓDIGO DE PROGRAMACIÓN COMPLETO

```
#include <SPI.h>
#include <SD.h>
#include "RTClib.h"
#include <WiFi.h>
#include <ThingSpeak.h>
#include "esp_wifi.h"
#include "esp_bt.h"
#include <esp_sleep.h>

#define LED 2
#define SENSOR 4
#define SSpin 5
#define UMBRALTIEMPO 300
#define uS_TO_S_FACTOR 1000000
#define TIMER_5_MIN (5 * 60 * uS_TO_S_FACTOR)
void escribirArchivo(const char *path, const char *mensaje);
bool inicializarSD();
void conectarWiFi();
void enviarDatosThingSpeak();
void apagarWiFi();
void contadorPulsos();
void sendReport(int ISRContador);

volatile bool flagISR = false;
volatile int ISRContador = 0;

float precipitacion = 0;
long tiempocontador = 0;
long tiempohora = 0;

RTC_DS1307 rtc;
File archivo;

const char* ssid = "Humanidades-WiFi";
const char* password = "Fachum123";
unsigned long channelID = 2608955;
const char* WriteAPIKey = "Y8HKS85T5J6B2MCP";
WiFiClient cliente;

portMUX_TYPE mux = portMUX_INITIALIZER_UNLOCKED;
unsigned long tiempoConexionIntento = 0;
const unsigned long TIEMPO_RECONEXION = 5000;
bool wifiEncendido = false;

volatile unsigned long lastDebounceTime = 0;
const unsigned long debounceDelay = 500;
```

```
void IRAM_ATTR onPulse() {
  unsigned long currentTime = millis();
  if (currentTime - lastDebounceTime > debounceDelay) {
    ISRContador++;
    flagISR = true;
    lastDebounceTime = currentTime;
}

void setup() {
  Serial.begin(115200);

  esp_sleep_wakeup_cause_t wakeup_reason = esp_sleep_get_wakeup_cause();
  unsigned long tiempoInicio = 0;

  switch (wakeup_reason) {
    case ESP_SLEEP_WAKEUP_TIMER:
      Serial.println("Despertó por temporizador");

      // Inicializar RTC
      if (!rtc.begin()) {
        Serial.println("Error:   No   se   pudo   inicializar   el   RTC.
Continuando...");
      } else if (!rtc.isrunning()) {
        Serial.println("El  RTC  no  está  funcionando,  ajustando  la
hora...");
        rtc.adjust(DateTime(2024, 12, 14, 9, 38, 0));
      }

      // Inicializar tarjeta SD
      if (!inicializarSD()) {
        Serial.println("Error: No se pudo inicializar la tarjeta SD.
Continuando sin escribir en SD...");
      }
      sendReport(0);
      break;

    case ESP_SLEEP_WAKEUP_EXT0:
      Serial.println("Esta lloviendo");
      ISRContador = 1;

      attachInterrupt(digitalPinToInterrupt(SENSOR), onPulse, FALLING);
      tiempohora = millis();
```

```
      if (!rtc.begin()) {
        Serial.println("Error:   No   se   pudo   inicializar   el   RTC.
Continuando...");
      } else if (!rtc.isrunning()) {
        Serial.println("El RTC no está funcionando, ajustando la hora...");
        rtc.adjust(DateTime(2024, 12, 14, 9, 38, 0));
      }
      if (!inicializarSD()) {
        Serial.println("Error:  No  se  pudo  inicializar  la  tarjeta  SD.
Continuando sin escribir en SD...");
      }

      tiempoInicio = millis();
      while (millis() - tiempoInicio < 30000) {
        if (flagISR) {
          flagISR = false;
          Serial.printf("Pulso   detectado.   Contador   actual:   %d\n",
ISRContador);
          digitalWrite(LED, HIGH);
          delay(100);
          digitalWrite(LED, LOW);
        }
        delay(10);
      }
      sendReport(ISRContador);
      break;

    default:
      Serial.println("Causa de despertar desconocida");
      break;
  }
  esp_sleep_enable_timer_wakeup(TIMER_5_MIN);
  esp_sleep_enable_ext0_wakeup(static_cast<gpio_num_t>(SENSOR), 0);

  pinMode(LED, OUTPUT);
  pinMode(SENSOR, INPUT_PULLUP);

  // Entrar en Deep Sleep
  Serial.println("Entrando en Deep Sleep...");
  esp_deep_sleep_start();
}

void sendReport(int ISRContador) {
  Serial.printf("Pulsos: %d\n", ISRContador);
```

```
portENTER_CRITICAL(&mux);
  precipitacion = ISRContador * 0.1;
  portEXIT_CRITICAL(&mux);

  DateTime now = rtc.now();

  String dataString = String(now.year()) + "/" +
                      String(now.month()) + "/" +
                      String(now.day()) + ";" +
                      String(now.hour()) + ":" +
                      String(now.minute()) + ":" +
                      String(now.second()) + ";" +
                      "Precipitación mm: " + String(precipitacion);

  escribirArchivo("/datalog.txt", dataString.c_str());
  Serial.println(dataString);

  conectarWiFi();
  if (WiFi.status() == WL_CONNECTED) {
    wifiEncendido = true;
    enviarDatosThingSpeak();
  }
}

void conectarWiFi() {
  if (WiFi.status() == WL_CONNECTED) return;

  WiFi.mode(WIFI_STA);
  WiFi.begin(ssid, password);
  tiempoConexionIntento = millis();

  while (WiFi.status() != WL_CONNECTED && millis() - tiempoConexionIntento
< TIEMPO_RECONEXION) {
    delay(500);
    Serial.print(".");
  }

  if (WiFi.status() == WL_CONNECTED) {
    Serial.println("\u00a1WiFi conectado!");
    Serial.print("IP: ");
    Serial.println(WiFi.localIP());
    ThingSpeak.begin(cliente);
    wifiEncendido = true;
  } else {
    Serial.println("No se pudo conectar a WiFi");
  }
```

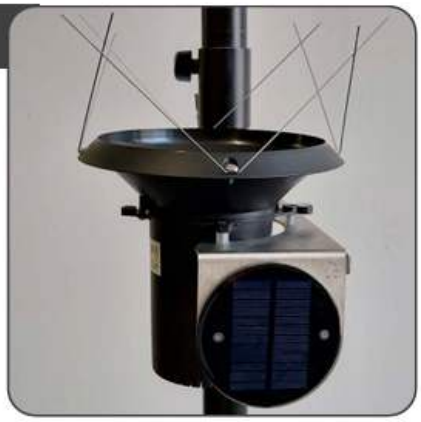
```
void enviarDatosThingSpeak() {
  Serial.print("Enviando datos a ThingSpeak... ");
  if          (ThingSpeak.setField(1,          precipitacion)          &&
ThingSpeak.writeFields(channelID, WriteAPIKey)) {
    Serial.println("Datos enviados exitosamente!");
  } else {
    Serial.println("Error al enviar datos.");
  }
}

void apagarWiFi() {
  WiFi.disconnect(true);
  WiFi.mode(WIFI_OFF);
  esp_wifi_stop();
}

bool inicializarSD() {
  for (int intentos = 0; intentos < 3; intentos++) {
    if (SD.begin(SSpin)) {
      Serial.println("Inicialización de la tarjeta SD correcta");
      return true;
    }
    Serial.println("Reintentando inicialización de la tarjeta SD...");
    delay(500);
  }
  return false;
}

void escribirArchivo(const char *path, const char *mensaje) {
  if (!SD.begin(SSpin)) {
    Serial.println("Error:  La  tarjeta  SD  no  está  disponible  para
escritura.");
    return;
  }

  File archivo = SD.open(path, FILE_WRITE);
  if (!archivo) {
    Serial.println("Error al abrir el archivo para escritura");
    return;
  }
  archivo.seek(archivo.size());
  archivo.println(mensaje);
  archivo.close();
  Serial.println("Escritura completada");
}
```

```
 // No se utiliza
}
```

ANEXO 4.
FICHAS TÉCNICAS DE PLUVIÓMETROS COMERCIALES

Barani MeteoRain SEB200

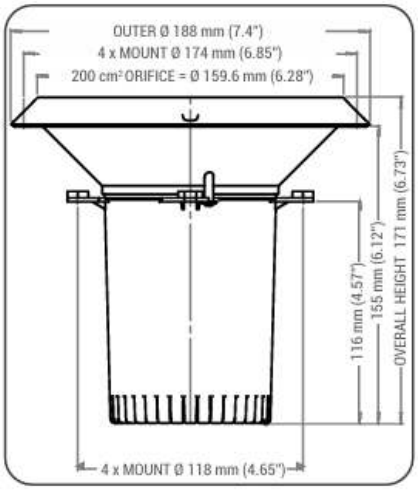
Wireless Set-and-Forget Automatic Rain Gauge



Wireless MeteoRain® IoT Compact records rain rate along with the cumulative rain amount to ensure that every rain drop is counted. Designed with a self-balancing measuring mechanism with very high repeatability of measurement and accuracy even during high-rain rates. Highly resistant to soiling of the internal measuring mechanism, mechanical friction, and residual water remaining in the measuring spoon from last rain event. Additionally, MeteoRain® products offer high resistance to vibrations and non-level mounting.

Notable features include:

- Solar powered with 4+ months of battery life without sun
- Robust and impact resistant funnel and housing
- Strong stainless steel mount with multiple mounting options
- Simple and highly reliable measuring mechanism and electronics
- Easy to maintain and simple to clean with a removable funnel sieve/sift
- Measures rain amount, rain intensity, and sends a raingauge frost warning
- Effect of non-level mounting is minimized with this self-balancing design
- Easy adjustment and recalibration of internal measuring mechanism
- High-speed (0.13 s) self-emptying mechanism for high precipitation rate accuracy
- High-dynamic range certified up to 600 mm/hour (10 mm/minute) rain rates but can measure up to 2000 mm/hr.
- Low-profile funnel for easy cleaning with a sharp edge for accuracy
- Bird-spikes and leaf fence are available



Self-balancing, self-emptying magnetic tipping bucket technology to ensure uninterrupted measurement of precipitation regardless of amount and intensity.

It measures rain by means of a standardized orifice funnel which collects water into the precision measuring mechanism. The mechanism offers more **consistent long-term response** than standard tipping-bucket rain gauges and is accurate even in high rain rates.

Individually tested and calibrated

Rain gauges are individually tested and use high quality sealed reed switches. Electronics are protected against salt spray, water, frost and heat by a weather-resistant coating.

Pluviometer type	Accuracy	Stability	Resolution	Measuring range	Operating range	Starting threshold *	Rain orifice area
Precipitation type: Liquid (Rain)	Field performance ±2% (calib. ±1%)	< 0.0125 mm per year	0.1, 0.2, 0.25 mm (0.01")	Up to 600 mm/hr in above freezing conditions	-33 °C... 80 °C (battery limitation)	Resolution + 0.07 mm (0.0027") *	200 cm² (Ø 16.0 cm, 6.3")

* Rain gauge starting value is the amount of precipitation required to register a first reading. All funnel based rain gauges trap a small mount of precipitation on the funnel surface, which includes drops remaining on funnel surface (~1.4 ml), evaporation from the funnel surface, wetting of debris, dirt, and dust in the funnel catch sieve/sift and water opening (together an additional 1 ml). Rain gauge inspection interval should be determined by user experience and the environmental conditions.

Electrical Interface	Wireless network compatibility	Battery type	Battery life	Shock resistance
Wireless	All regions LoRaWAN and Sigfox.	Lithium Ion	10+ years	15 g

EML SBS314

Applications

- National Met Services
- Hydrology catchment projects
- Hydro-Met stations
- Industrial customers that need Class A accurate data
- Weather enthusiasts
- Flood warning systems

Features and Benefits

- Optimum Aerodynamic shape from 10 years of extensive field research
- Self-emptying instrument
- Dual, removable reed switches as standard
- Choice of the UK Met Office
- 0.1, 0.2, 0.5mm resolution
- WMO Compliant

Technical Specifications	
Resolution	0.1 / 0.2 / 0.5mm 0.005 / 0.01 / 0.02inch available (See order information)
WMO Compliant	Yes
Output	Contact Closure (Reed Switch)
Typical Accuracy	99% up to 120mm/hr
Rainfall Intensity	SBS314 (0-1750 mm/hr), SBS500 (0-1200mm/hr), SBS1000 (0-600mm/hr) With mathematical correction over 120mm/hr - contact EML
Operating Temperature	0°C - 70°C
Funnel Diameter	SBS314 (20cm) SBS500 (25.2cm), SB1000 (35.7cm)
Funnel Area	SBS314 (314cm^2), SBS500 (500cm^2), SBS1000 (1000cm^2)
Height	SBS314 (43.5-46.5 cm) SBS500 46.0-49.0 cm) SBS1000 (53.0-56.0 cm)
Weight	SBS314 (5.2 kg), SBS500 (5.5 kg), SBS1000 (7.5 Kg)
Colour	White (or Green on request)

Ordering Information	
Order Code	**Product**
P-780-4050	SBS314 (0.1 mm)
P-780-405	SBS314 (0.2 mm)
P-780-4049	SBS314 (0.5 mm)
P-780-4081	SBS314 (0.01 inch)
P-780-4001	SBS500 (0.1 mm)
P-780-400	SBS500 (0.2 mm)
P-780-404	SBS500 (0.01 inch)
P-780-410	SBS1000 (0.1mm)
Other options available Contact EML for details	
Ordering Information - Accessories	
Order Code	**Product**
P-780-491	SBS spares kit Including Nozzle

Casella TBRG

Assembly

The rain gauge is manufactured from entirely non-corrosive materials. The base and septum ring are cast in Aluminium Alloy LM25, heat treated and protectively coated.

The outer ring and funnel are fabricated from aluminium alloy sheet and again protectively coated. Stainless steel mesh is employed to protect the inlet and outlet ports from the ingress of foreign bodies.

The use of sealed reed switches ensures the Rain Gauge is capable of long working life with little maintenance.

Applications

- Hydrology
- General rainfall monitoring
- Rainfall distribution and intensity
- Remote monitoring
- Leachate/run-off monitoring
- Ecological studies
- Agriculture
- Climate change studies

Specification

General Specifications:

Standards	BS7843-3:2012
Bucket sizes	0.1mm, 0.2mm or 0.5mm
Aperture	200 or 400cm²
Accuracy	± at 1 litre/hour
Capacity	Unlimited
Transducer	Magnetic/Reed Switch
Operating temp. range	1°C to 85°C
Output	Contact closure
Weight	2.6 kg

Heated Version - Additional Specifications:

Heater supply voltage	24 V AC
Heater power consumption	42 Watts
Cable rating	2 A at 24 V AC, 4-core
Thermostat range	-20°C to 40°C
Operating temp. range	-20°C to 85°C

Ordering Information

Type	Sensitivity	Output	Catalogue Reference
Standard non-heated	0.1mm	Single	102471E
	0.2mm	Single	100000E
	0.5mm	Single	100573E
Standard heated	0.1mm	Single	103590D
	0.2mm	Single	103589D
	0.5mm	Single	103591D

Kisters TB4

Applications

- Classical Meteorology and Climatology
- Hydrometeorology
- Environmental, Hydrological and Air Quality Monitoring
- Road Traffic Infrastructure
- Water Treatment Plants, Dams, Reservoirs
- Agrometeorology
- Airports and Airfields
- Water Resources Management

Technical Specifications					
Resolution	0.1 mm (0.004 inch)	0.2 mm (0.008 inch)	0.5 mm (0.02 inch)	0.254 mm (0.01 inch)	1.0 mm (0.04 inch)
Catch diameter	282.84 mm (11.14 inch)	200 mm (7.9 inch)			
Bucket	Teflon-impregnated ASA plastic UV-stabilized or synthetic ceramic-coated brass				Synthetic ceramic-coated brass
Pivot/Bucket Mechanism	Machined, robust stainless steel axle resting on corrosion-free sapphire pivots				
Enclosure	Anodized, powder-coated aluminium				
Base	UV-resistant ASA polymer				
Accuracy	– 0-250 mm per hour (0 to 9.8 inch per hour): +/-2 % – 250-500 mm per hour (9.8 to 19.7 inch per hour): +/-3 %				
Range	0-700 mm/h (0 to 27.6 inch per hour) (maximum intensity 700 mm/h / 27.6 inch per hour)				
Operating Temperature Ranges	– Measuring: 0 to 70 °C (32 to 158 °F) (without ice accretion or snow cumulation) – Deployment: -20 to 70 °C (-4 to 158 °F)				
Operating Humidity	0 to 100 %				
Dimensions and Mass	Ø 282.84 mm x H 410 mm (Ø 11.14 x H 16.14 inch) 2.7 kg (6 lbs)	Ø 200 mm x H 330 mm (Ø 7.9 x H 13 inch) 2.2 kg (4.9 lbs)			

Kisters TB3

Applications

- Classical Meteorology and Climatology
- Hydrometeorology
- Environmental, Hydrological and Air Quality Monitoring
- Road Traffic Infrastructure
- Water Treatment Plants, Dams, Reservoirs
- Agrometeorology
- Airports and Airfields
- Water Resources Management

Technical Specifications					
Resolution	0.1 mm (0.004 inch)	0.2 mm (0.008 inch)	0.5 mm (0.02 inch)	0.3 mm (0.01 inch)	1.0 mm (0.039 inch)
Catch diameter	282.84 mm (11.14 inch)	200 mm (7.87 inch)			
Bucket	Teflon-impregnated ASA plastic UV-stabilized or synthetic ceramic-coated brass				Synthetic ceramic-coated brass
Pivot/Bucket Mechanism	Machined, robust stainless steel axle resting on corrosion-free sapphire pivots				
Enclosure and base	Anodized, powder-coated aluminium				
Accuracy	– 0-250 mm (0-9.84 inch) per hour: +/-2 % – 250-500 mm (9.84-19.69 inch) per hour: +/-3 %				
Range	0-700 mm/h (0-27.56 inch/h) (maximum intensity: 700 mm/h (27.56 inch/h))				
Operating Temperature Ranges	– Measuring: 0 to 70 °C (32 °F to 158 °F) (without ice accretion or snow cumulation) – Deployment: -20 to 70 °C (-4 °F to 158 °F) (heater recommended below +4 °C (+39.2°F))				
Operating Humidity	0 to 100 %				
Dimensions and Mass	Ø 282.84 mm (11.14 inch) x H 410 mm (16.14 inch) 3.8 kg (8.38 lbs)	Ø 200 mm (7.87 inch) x H 330 mm (12.99 inch) 3.3 kg (7.28 lbs)			

Kisters TB7

Applications

- Classical Meteorology and Climatology
- Hydrometeorology
- Environmental, hydrological and air quality monitoring
- Water treatment plants, dams, reservoirs
- Agriculture, agrometeorology
- Water resources management
- Research, citizen scientists

Technical Specifications

Resolution	0.2 mm (0.008 inch), 0.5 mm (0.02 inch), 0.01"
Range	700 mm per hour (27.56 inch per hour)
Accuracy	

	Resolution		
	0.2 mm (0.008 inch)	**0.01"**	**0.5 mm (0.02 inch)**
Flow rate 0-200 mm/hr (0-7.87 inch/hr)	+/-5 %	+/-5 %	+/-5 %
Flow rate 200-500 mm/hr (7.87-19.69 inch/hr)	NA	NA	better than -8 %

Alternatively: Individual accuracy +/-2 % at any set intensity specified by the user, calibration required (Please note: additional costs for individually calibrated units)

Enclosure and Base	UV-resistant ASA
Pivots	Ground sapphire pivots
Bucket	Teflon impregnated injection moulded
Operating Temperature Ranges	- Measuring: 0 to 70 °C (32 °F to 158 °F) (without ice accretion or snow cumulation) - Deployment: -20 to 70 °C (-4 °F to 158 °F)
Dimensions	- Height: 310 mm (12.20 inch) - Catch: 200 mm (7.87 inch) diameter
Mass	2.1 kg (4.63 lbs)

Texas Electronics TR-525M

Rain Gauge Tipping Bucket

TR-525M Rainfall Sensor

Features & Benefits

- Interfaces with virtually all data acquisition systems
- Knife-edge collector optimizes rainfall catch
- Exceptional splash-out protection improves accuracy in high winds
- Easy installation and maintenance
- Rugged aluminum exterior
- Anodized aluminum collector for weather resistance
- Integrated bubble level

Specifications

Resolution:	0.1 mm Metric
Accuracy:	50 mm per hour; +/-1%
Range:	27" (700 mm) per hour
Collector diameter:	9.66" (245 mm) with knife-edge
Funnel depth:	7.2" (183 mm)
Splash out protection:	>2" (50 mm)
Operating Temp:	32 to 158° F (0 to 50° C)
Storage Temp:	-40 to 185° F (-40 to 70° C)
Humidity Limits:	0 to 100%
Weight:	8 lbs.
Height:	12" (305 mm)
Cable:	10', 24 gauge 2 conductor
Switch:	Momentary potted reed switch
Switch rating:	30 VDC @ 2 A, 115 VAC @ 1 A
Switch Closure Time:	135 ms
Bounce Settling Time:	0.75 ms
Pivot:	Ground bronze pivots with hardened stainless steel shaft
Bucket:	Black ABS iniection molded
Level:	Integral Bubble Level
Warranty:	3 years

Delta Ohm HD2013

[E] HD2013

PLUVIÓMETRO CON CUBETA BASCULANTE

El HD2013 es un pluviómetro con cubeta basculante confiable y robusto, interamente costruido con materiales no corosivos para garantizar una larga duración. Para asegurar una medida precisa también en condiciones climáticas con temperatura baja o en presencia de precipitaciones de nieve, hay una versión con calefacción que se activa automáticamente cerca de los +4 °C para impedir el depósito de la nieve y la formación del hielo.

El pluviómetro se compone de una base de metal sobre la qué se pone la cubeta oscilante. El cono de colección de la lluvia, fijado en el cilindro de aluminio, encamina el agua dentro la cubeta basculante: llegado el nivel establecido, la cubeta calibrada, bajo la acción de su peso, gira descargando el agua. Durante la rotación, el contacto normalmente cerrado del reed se abre para una fracción de segundo, proporcionando un pulso al contador.

La medida de la cantidad de lluvia se basa sobre el cálculo del número de vaciados de la cubeta: los contactos reed, normalmente cerrados, se abren cuando se va a girar una sección y la otra de la cubeta. El número de pulsos puede ser detectado y adquirido por un **datalogger como el HD2013-DB** de Delta OHM o por un contador de pulsos.

El pluviómetro está disponible con **salida analógica opcional (HD2013UA)** a elegir entre 4…20 mA o 0…10 Vdc (**que se determinará en el momento del pedido**) o con **salida digital SDI-12 opcional (HD2013UD)**.

Características técnicas

	HD2013R	HD2013	HD2013UA opción salida analógica	HD2013UD Opción salida SDI-12
Alimentación	Circuito de calefacción: 12 o 24 Vdc ± 10% (seleccionando cuando se va a pedir)	---	7…30 Vdc (salida 4…20 mA) 13…30 Vdc (salida 0…10 V)	7…30 Vdc
Consumo	165 W	---	26 mA máx. @ 18 Vdc (versión 4…20 mA) ≈ 4 mA @ 18 Vdc (versión 0…10 V)	≈ 100 µA @ 18 Vdc en modo SDI-12
Salida de contacto	Contacto NC (se abre durante la conmutación). Con las opciones HD2013UA y HD2013UD, la salida de contacto es una alternativa a la salida analógica o SDI-12 y **el pluviómetro es configurado en fábrica con salida analógica (HD2013UA) o SDI-12 (HD2013UD).**			
Salida analógica	---	---	4…20 mA o 0…10 V (seleccionando cuando se va a pedir)	---
Salida digital	---	---	---	SDI-12
Resolución	0,1 – 0,2 o 0,5 mm/ conmutación seleccionado cuando se va a pedir			
Precisión	Veáse la curva típica **normalizada** en la fig. 1. La curva está normalizada a la resolución 0,200 mm/conmutación @ 50 mm/h. Si se usa el datalogger HD2013-DB, la medida puede ser corregida automáticamente según está curva. Con las opciones HD2013UA y HD2013UD, la curva puede ser almacenada en el mismo pluviómetro (**previa solicitud en el pedido**).			
Rango de temperatura de trabajo	-20…+60 °C	+4…+60 °C		
Temperatura de intervención de la calefacción	+4 °C	---		
Grado de protección	IP 64			
Área del colector	400 cm²			
Sección mínima de los hilos del cable de conexión	0,5 mm² para la versión sin calefacción (HD2013) 2,5 mm² para la versión con calefacción (HD2013R)			

Technical Parameters

Bearing water caliber: Φ200 ± 0.6mm
Measuring range: 0-4mm/min (precipitation intensity)
Resolution: 0.1mm (3.14ml)
Accuracy: ± 4% (indoor static test, rain intensity of 2mm/min)
Power supply:
□ DC 5V
□ DC 12V-24V

Output:
□ Switch signal: reed switch on/off
□ Voltage: 0~2.5V
□ Voltage: 0~5V
□ RS485
□ Others
Instrument cable length: 5 meters
Operating Temperature: 0～60°C
Storage temperature：-40℃～80℃
Product weight: Bucket weight 2000 g, total weight 3500 g.