Model: CAT2
Versatile DC or AC Transmitter
(Can Be Interfaced With Any Hoffer Flow Sensor)

USER’S MANUAL

HP-311
July 2019

Hoffer Flow Controls
Perfecting Measurement™
107 Kitty Hawk Lane • P.O. Box 2145 • Elizabeth City, NC 27909
1-800-628-4584 • (252) 331-1997 • Fax (252) 331-2886
www.hofferflow.com        email: info@hofferflow.com
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HOFFER FLOW CONTROLS’ policy is to provide a user manual for each item supplied. Therefore, all applicable user manuals should be examined before attempting to install or otherwise connect a number of related subsystems.

During installation, care must be taken to select the correct interconnecting wiring drawing. The choice of an incorrect connection drawing may result in damage to the system and/or one of the components.

Please review the complete model number of each item to be connected and locate the appropriate manual(s) and/or drawing(s). Identify all model numbers exactly before making any connections. A number of options and accessories may be added to the main instrument, which are not shown on the basic user wiring. Consult the appropriate option or accessory user manual before connecting it to the system. In many cases, a system wiring drawing is available and may be requested from HOFFER FLOW CONTROLS.

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Return Requests / Inquiries

Direct all warranty and repair requests/inquiries to the Hoffer Flow Controls Customer Service Department, telephone number (252) 331-1997 or 1-800-628-4584. BEFORE RETURNING ANY PRODUCT(S) TO HOFFER FLOW CONTROLS, PURCHASER MUST OBTAIN A RETURNED MATERIAL AUTHORIZATION (RMA) NUMBER FROM HOFFER FLOW CONTROLS’ CUSTOMER SERVICE DEPARTMENT (IN ORDER TO AVOID PROCESSING DELAYS). The assigned RMA number should then be marked on the outside of the return package and on any correspondence.

FOR WARRANTY RETURNS, please have the following information available BEFORE contacting HOFFER FLOW CONTROLS:
1. P.O. number under which the product was PURCHASED,
2. Model and serial number of the product under warranty, and
3. Repair instructions and/or specific problems relative to the product.

FOR NON-WARRANTY REPAIRS OR CALIBRATIONS, consult HOFFER FLOW CONTROLS for current repair/calibration charges. Have the following information available BEFORE contacting HOFFER FLOW CONTROLS:
1. P.O. number to cover the COST of the repair/calibration,
2. Model and serial number of the product and
3. Repair instructions and/or specific problems relative to the product.

HFC 9708
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In the event Purchaser believes the goods are defective, the goods must be returned to HFC, transportation prepaid by Purchaser, within twelve (12) months after delivery of goods (or eighteen (18) months for goods delivered outside he continental United States) for inspection by HFC. If HFC's inspection determines that the workmanship or materials are defective, the goods will be either repaired or replaced, at HFC's sole determination, free of additional charge, and the goods will be returned, transportation paid by HFC, using he lowest cost transportation available.

Prior to returning the goods to HFC, Purchaser must obtain a Returned Material Authorization (RMA) Number from HFC's Customer Service Department within 30 days after discovery of a purported breach of warranty, but no later than the warranty period; otherwise, such claims shall be deemed waived. See the Return Requests/Inquiries Section of this manual.

If HFC's inspection reveals the goods are free of defects in material and workmanship or such inspection reveals the goods were improperly used, improperly installed, and/or improperly selected for service intended, HFC will notify the purchaser in writing and will deliver the goods back to Purchaser upon (i) receipt of Purchaser's written instructions and (ii) the cost of transportation. If Purchaser does not respond within thirty (30) days after notice from HFC, the goods will be disposed of in HFC's discretion.

HFC does not warrant these goods to meet the requirements of any safety code of any state, municipality, or other jurisdiction, and Purchaser assumes all risk and liability whatsoever resulting from the use thereof, whether used singly or in combination with other machines or apparatus.

This warranty shall not apply to any HFC goods or parts thereof, which have been repaired outside HFC's factory or altered in any way, or have been subject to misuse, negligence, or accident, or have not been operated in accordance with HFC's printed instructions or have been operated under conditions more severe than, or otherwise exceeding, those set forth in the specifications for such goods.

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1. INTRODUCTION

The CAT2 is a versatile DC or AC powered transmitter, which provides pulse output, analog output and High/Low flow alarm options. Up to 3 circuit boards may be installed to provide a variety of input/output options.

**CAT2 Block Diagram**

Many enclosure options are available including the standard extruded aluminum enclosure, an optional bracket for DIN rail mounting or direct flowmeter mounting using an optional NEMA 4X or EX enclosure.
1.1 Model Number Designation

**MODEL** \text{CAT2-}(\text{A})-(\text{B})-(\text{C})-(\text{D})-(\text{E})-(\text{F})-(\text{G})

<table>
<thead>
<tr>
<th><strong>PULSE INPUT</strong></th>
<th>MODEL CAT2-(A)-(B)-(C)-(D)-(E)-(F)-(G)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>OPTION (A)</strong></td>
<td>(1) MAG COIL, PULSE, DRY CONTACT</td>
</tr>
<tr>
<td></td>
<td>(2) MC3P</td>
</tr>
<tr>
<td></td>
<td>(3) ISOLATED PULSE, RPM, RPR COILS</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>PULSE OUTPUT</strong></th>
<th>MODEL CAT2-(A)-(B)-(C)-(D)-(E)-(F)-(G)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>OPTION (B)</strong></td>
<td>(1) 0-5V TTL / CMOS</td>
</tr>
<tr>
<td></td>
<td>(2) OPEN COLLECTOR</td>
</tr>
<tr>
<td></td>
<td>(3) OPEN COLLECTOR WITH PULL UP TO V+</td>
</tr>
<tr>
<td></td>
<td>(4) AC SQUARE WAVE</td>
</tr>
<tr>
<td></td>
<td>(5) 0-10V SQUARE WAVE</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>ANALOG OUTPUT</strong></th>
<th>MODEL CAT2-(A)-(B)-(C)-(D)-(E)-(F)-(G)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>OPTION (C)</strong></td>
<td>(1) 4-20 MA</td>
</tr>
<tr>
<td></td>
<td>(3) 0-5 VDC</td>
</tr>
<tr>
<td></td>
<td>(4) 0-10 VDC</td>
</tr>
<tr>
<td></td>
<td>(5) 1-5 VDC</td>
</tr>
</tbody>
</table>
POWER SUPPLY
MODEL CAT2-(__)-(__)-(__)-(D)-(__)-(__)
OPTION (D)
(DC) 13-30 VDC
(AC) 100-240 VAC
NOTE: WHEN (AC) IS SELECTED, THE ALARM OPTION IS NOT AVAILABLE. USE REMOTE ACC39B POWER SUPPLY.

ALARM OUTPUT
MODEL CAT2-(__)-(__)-(__)-(__)-(E)-(__)
OPTION (E)
(1) HIGH / LOW OPEN COLLECTOR
(2) HIGH / LOW TTL / CMOS
(3) HIGH / LOW RELAY TWO SPDT, CONTACT RATED @ 2A 30V
(4) HIGH OPEN COLLECTOR
(5) HIGH TTL / CMOS
(6) HIGH RELAY ONE SPDT, CONTACT RATED @ 2A 30V
(7) LOW OPEN COLLECTOR
(8) LOW TTL / CMOS
(9) LOW RELAY ONE SPDT, CONTACT RATED @ 2A 30V
NOTE: WHEN ALARM OPTION IS SELECTED, (AC) POWER IS NOT AVAILABLE. USE REMOTE ACC39B POWER SUPPLY.

ENCLOSURE STYLE
MODEL CAT2-(__)-(__)-(__)-(__)-(F)-(__)
OPTIONS (F)
(1) GENERAL PURPOSE:
2.6"L X 2.6"H X 2.6"W MINIMUM MOUNTING SPACE.

(D) 2" LONG DIN RAIL MOUNT SINGLE UNIT.
UP TO 20 CAT2 UNITS CAN BE MOUNTED ON A SINGLE RAIL. ADD 2" PER UNIT.

(E3) EXPLOSION-PROOF (ALL CONDUIT PORTS ARE ¾" FNPT)

(E3M) EXPLOSION-PROOF (CONDUIT PORTS D2 & D3 = M20 THR’D;

(E4)* EXPLOSION-PROOF - FOR USE WITH AC POWERED CAT ONLY
(NOT Ex d SYSTEM CERTIFIED)
*FOR Ex d CERTIFIED SYSTEM USE E6 OR E6M ENCLOSURE

(E6) EXPLOSION-PROOF STAINLESS STEEL
(ALL CONDUIT PORTS ARE ¾"FNPT)

(E6M) EXPLOSION-PROOF STAINLESS STEEL (M20 NOT AVAILABLE FOR CANADA)

NOTE: FOR UL LISTED EXPLOSION-PROOF APPLICATIONS CONTACT FACTORY.
SPECIAL FEATURES
MODEL CAT2-(__)-(__)-(__)-(__)-(__)-(__)-(__)-(G)

OPTIONS (G)

(CE) MARK REQUIRED FOR EUROPE

(SP) ANY SPECIAL FEATURES THAT ARE NOT COVERED IN THE MODEL NUMBER, USE A WRITTEN DESCRIPTION OF THE −SP.

(CFX) 6.75" LONG RISER AND UNION FOR EXPLOSION-PROOF SYSTEM CERTIFIED ENCLOSURES MOUNTED ON TURBINE. USED WITH “X” RISER TURBINE OPTION AND (EXP) OR (EX) SPECIAL FEATURES OPTION UNDER FLOWMETERS AS FOLLOWS:
- (EXP) FOR CANADIAN INSTALLATION OR
- (EX) FOR NON-CANADIAN INSTALLATION.

NOTE: IF PROCESS TEMP IS < −40°C AND > 79°C, EX-PROOF ENCLOSURE MUST BE MOUNTED REMOTELY.

(C) REMOTED MOUNTED FOR EXPLOSION-PROOF SYSTEM CERTIFIED ENCLOSURE. FOR USE WITH (C-EXP) OR (C-EX) SPECIAL FEATURES UNDER FLOWMETERS AS FOLLOWS:
- (EXP) FOR CANADIAN INSTALLATION OR
- (EX) FOR NON-CANADIAN INSTALLATION.

NOTE: “X” RISER, CERTIFIED UNION, REDUCER AND ENCLOSURE (TO BE SPECIFIED) MOUNTED ON FLOWMETER.

(X) NO SPECIAL FEATURES

STYLE E3, E3M, E6 AND E6M SYSTEM CERTIFIED RATINGS
- CSA/FM: CLASS I, DIV. 1, GR. BCD; CLASS II, DIV. 1, GR. EFG;
  CLASS III, TYPE 4X,
  CLASS I ZONE 1 AEx db IIB + H2 T6/T5 Gb,
  Ex d IIB+H2 T6/T5; Gb; Ex tb T80°C/T86°C IIIC Db; IP66
  CLASS I, ZONE 21 AEx tb T80°C/T86°C IIIC Db; IP 66

- ATEX/IECEx: II 2 G Ex db IIB + H2, T6/T5 Gb
  II 2 D Ex tb IIIC T80°C/T86°C Db; IP66
  T6: -40°C ≤ Ta ≤ 79°C; T5: -40°C ≤ Ta ≤ 85°C

NOTES:
1. IF ENCLOSURE IS MOUNTED ON TURBINE FLOWMETER, RISER MUST BE SPECIFIED ON METER.
2. PULSE SCALING IS SUPPLIED AS A STANDARD. THE PULSE OUTPUT IS SCALED SO THAT THE MAX FLOW IS BETWEEN 75-150 HZ WHEN THE ANALOG OPTION IS SELECTED.
2. SPECIFICATIONS

General Specifications

Input Signal Type: Magnetic pick up, MCP pick up, Contact Closure, Pulse

Input frequency range: 0.2 Hz to 4 KHz

Signal level: 10 mV rms to 30 Vdc

Power supply: 13-30 Vdc (Reverse polarity protected)
100-240 Vac (Fuse rating 0.5A, 250 Vac

Analog Output: 4-20mA, 1-5V, 0-5V, 0-10V

Load resistance: Max 550 Ohms at 24 Vdc

Accuracy: +/- 0.1% of full scale @ 20° C

Temperature drift: 200ppm/deg C

Pulse output 0-5, 0-10V, Open Collector, AC square
Internal pull-up resistor 2.7k Ohms
Recommended load min. 50k Ohms

Pulse scaling Divide by 2, 4, 8, 16, 32

Hi/Lo Alarm Relay (2A, 30, Vdc), 0-5V,
Open Collector (0.5A, 30V)

Operating temperature: T5 and STD: -40° ≤ Ta ≤ 85° C
T6: -40° ≤ Ta ≤ 79° C

Humidity: 0-90% Non-condensing

Enclosure: Extruded aluminum
DIN rail mount
Explosion Proof

Regulatory: CE compliant
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3. INSTALLATION

3.1 Power Supply

DC Power (13-30 VDC)

AC Power (100-240 VAC)

AC power for CAT2 requires an optional circuit board, PCA182. The Alarm option (PCA184) is not available when the AC Power option is equipped.
3.2 Flowmeter Input

The Preamp circuitry for conditioning the flow signal is located on PCA180. The following drawings illustrate typical connections and switch settings on PCA180 for various input signals.

**Magnetic Pickup Coil**

![Magnetic Pickup Coil Diagram]

**MCP/RF Coil**

![MCP/RF Coil Diagram]
Redi-Pulse (TTL Pulse)

Redi-Pulse (Open Collector)
3.3 Pulse Output

The pulse output circuitry for CAT2 is located on PCA180. The pulse output is scalable by a factor of 1, 2, 4, 8, 16 and 32 of the input frequency by selecting the proper switch on SW2. Scaling of the pulse output may be limited if an analog output is used in conjunction with the pulse output. The following drawings illustrate typical connections and switch settings for various pulse output options.

Pulse Scaling

<table>
<thead>
<tr>
<th>Scaling Factor (Divide by N of Input)</th>
<th>Switch Setting (SW2, PCA180)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>SW2-1 ON</td>
</tr>
<tr>
<td>2</td>
<td>SW2-2 ON</td>
</tr>
<tr>
<td>4</td>
<td>SW2-3 ON</td>
</tr>
<tr>
<td>8</td>
<td>SW2-4 ON</td>
</tr>
<tr>
<td>16</td>
<td>SW2-5 ON</td>
</tr>
<tr>
<td>32</td>
<td>SW2-6 ON</td>
</tr>
</tbody>
</table>

TTL(0-5V), 0-10V, High Level (DC In), AC Square
Open Collector, Isolated Pulse

![Diagram of Open Collector and Isolated Pulse Connections]

- **USER DCS**: V+
- **PULSE INPUT**: 2.7k
- **PCA180 SW2**
  - Open Collector
- **PCA180 SW2**
  - Isolated Pulse
3.4 Analog Output

CAT2 provides an Analog Output option that will output an analog current or voltage that is proportional to the flow rate. The Analog Output for CAT2 requires an optional circuit board, PCA181.

Analog Output

The input frequency is scaled using SW2 on PCA180 so that the preamp output frequency at max flow is between 75 and 150 Hz. For example, if the max flow input signal is 1,000 Hz, SW2-4 should be in the ON position to divide the preamp signal by 8 so that the max frequency out of the preamp is 125 Hz. Refer to the table in the previous section for the appropriate switch settings. If the Pulse Output option is used in conjunction with the Analog Output, the Pulse Output frequency will be limited by this scaling factor.

There are 3 potentiometers on PCA181 for ZERO and SPAN adjustment. The ZERO pot adjusts the no flow output, while COURSE SPAN and FINE SPAN adjusts the max flow output. All pots are labeled accordingly on the circuit board and may be accessed by removing the top plate from CAT2. The 0-20mA, 0-5V and 0-10V options require no ZERO adjustment. Contact the factory for detailed calibration instructions before making any adjustments.

**Analog Output Response Time:** The analog output response time to reach steady state due to a change in the flow rate is approximately two (2) seconds.
3.5 Alarm Outputs

CAT2 provides an optional High/Low Flow Alarm feature. The Alarms require an optional circuit board, PCA184. The Alarm option is not available when the AC Power option is equipped. The following drawings illustrate typical connections and switch settings for various alarm output options.

**Hi/Lo Alarm Relay**

![Hi/Lo Alarm Relay Diagram]

**Hi/Lo Alarm TTL(0-5V)**

![Hi/Lo Alarm TTL Diagram]
3.6  Wiring Note

When installing CAT2, it is a good practice to use shielded cables for all input and output signals. The shield should be connected to the earth ground lug on the CAT2. The shield on the opposite end of the cable should be left open. Connections are made to the CAT2 terminal blocks using wire gauges 16 to 28 AWG and 12 to 26 AWG (AC Power), tightening Torque 0.22 to 0.25Nm.

This wiring practice is mandatory in order to comply with the requirements for Electromagnetic Compatibility, as per EMC-Directive 2014/30/EU of the Council of European Community.
APPENDIX A – Declaration of Conformity

EU Declaration of Conformity – CAT Series Transmitters

Manufacturer: Hoffer Flow Controls Inc, 107 Kitty Hawk Ln, Elizabeth City, NC 27909

Equipment: Flame Proof Transmitters


NOTE: “X” in Model number may be any combination of numbers and characters representing specific options.

Marking: With Aluminum Explosion Proof Enclosure

Class I, Division 1, Groups BCD; Class II, Division 1, Groups E,F,G; Class III; Type 4X;
Ex d IIB+H2 T6/T5; Gb; Ex tb T80°C/T86°C IIIIC Db; IP66;
Class I, Zone 1, AEx db IIB+H2 T6/T5; Gb; Class I, Zone 21, AEx tb T80°C/T86°C IIIIC Db; IP66:

II 2 G Ex db IIB+H2 T6/T5 Gb
II 2 D Ex tb IIIC T80°C/T86°C Db IP66
T6 = -40°C to +79°C; T5 = -40°C to +85°C

Seal within 50mm of enclosure.

Marking: With Stainless Steel Enclosure

Class I, Division 1, Groups BCD; Class II, Division 1, Groups E,F,G; Class III; Type 4X;
Ex d IIB+H2 T6/T5; Gb; Ex tb T80°C/T86°C IIIIC Db; IP66;
Class I, Zone 1, AEx db IIB+H2 T6/T5; Gb; Class I, Zone 21, AEx tb T80°C/T86°C IIIIC Db; IP66:

II 2 G Ex db IIB+H2 T5/T6 Gb
II 2 D Ex tb IIIC T86°C Db IP66
T6 = -40°C to +79°C; T5 = -40°C to +85°C

Seal within 18” of enclosure.
We hereby declare that the product, which is subject of this declaration, is in conformity with the following standards:

|--------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|

EC-Type Examination Certificate and IECEx Certificate issued by:

TUV Rheinland Industrie Service GmbH
Am Grauen Stein
D-51105 Köln
Country : Germany

Notified Body Number: 0035

CSA-Type Examination Certification issued by:

CSA Group Testing & Certification Inc.
Edmonton, AB, Canada T6N 1E6
APPENDIX B – Installation and Conditions for Safe Use Drawings for Certified Systems
Appendix B - Installation and Safe Use Drawings

**Conditions for Safe Use of Device**
- Do not exceed the order limits and a tolerance of 20% of the rated value.
- Select an installation location so that the enclosure will not be subjected to impacts or shocks.
- All metallic conductors must be insulated and their category of use and correctly installed.

**Warning**
- Use only the specified dimensions in order to prevent misapplication.
- Use only the specified components and accessories.
- Use only the specified installation method and mounting method.
- Use only the specified materials and coatings.

**Installation (ATEX/IEEX Ex I, II 3G Edition, 958920 CAT-3112)**
- Install the device in a horizontal position.
- Ensure that the device is properly grounded.
- Verify that all connections are securely made.
- Ensure that the device is properly labeled.

**Note:**
- Use only the specified dimensions and tolerances.
- Use only the specified materials and coatings.
- Use only the specified installation method and mounting method.

**Manufacturer:**
Huffer Flow Controls, Inc.
Elizabeth City, NC 27930

**Part Number:**
CAT-3112

**Model:**
HP-311 CAT2

**Date:**
2023-02-01
### Conditions for Safe Use - ATEx/EX

1. Do not remove the process values and labels of incompatible gas types or units.
2. All EESs must be installed in accordance with EES manufacturers' instructions.
3. The equipment and material must be in accordance with the applicable testing and marking requirements.
4. All user equipment must be in accordance with the equipment requirements.

### Remote Installation Notes

1. The equipment is suitable for use in the presence of flammable, flammable and inert.
2. The equipment is intended for installation in hazardous locations.
3. The equipment is not designed for the protection of equipment against damage.
4. All signs and labels must be present for a minimum of 5 years.
5. Installation shall be supervised by the installation specialist.
6. The equipment is not suitable for use in a flammable environment.

### Table: Installation Data

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
<th>Size</th>
<th>Voltage</th>
<th>Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAT-311</td>
<td>Installation Drawing</td>
<td>Remote Mounted</td>
<td>HP-311</td>
<td>CAT-818</td>
</tr>
</tbody>
</table>

### Diagram

[Diagram of equipment installation]