

H.O.G. Series
Positive Displacement Flowmeters

USER'S MANUAL



HP-294
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HOFFER
Flow Controls

Perfecting Measurement™

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NOTICE

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This manual has been provided as an aid in installing, connecting, calibrating, operating, and servicing this unit. Every precaution for accuracy has been taken in the preparation of this manual; however, Hoffer Flow Controls, Inc. neither assumes responsibility for any omissions or errors that may appear nor assumes liability for any damages that result from the use of the products in accordance with information contained in the manual.

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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HOFFER FLOW CONTROLS, INC. ("HFC") warrants HFC's Precision Series, API Series and CT Series of turbine flowmeters to be free from defects in material and workmanship under normal use and service, only if such goods have been properly selected for the service intended, properly installed and properly operated and maintained as described in the turbine flowmeter manual. Reference "turbine flowmeter manual" for specific details. This warranty shall extend for a period of five (5) years from the date of shipment to the original purchaser and covers the Precision Series and API Series of flowmeters supplied with their standard hybrid ceramic ball bearings only. All other HFC products carry a one (1) year warranty. This warranty is extended only to the original purchaser ("Purchaser"). *Purchaser's sole and exclusive remedy is the repair and/or replacement of nonconforming goods as provided in the following paragraphs.*

In the event Purchaser believes the Hoffer product is defective, the product must be returned to HFC, transportation prepaid by Purchaser, within the appropriate warranty period relative to the product. If HFC's inspection determines that the workmanship or materials are defective and the required maintenance has been performed and, has been properly installed and operated, the product 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 a transportation method selected by HFC.

Prior to returning the product 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 not 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 Hoffer product to be 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 receipt of Purchaser's written instructions and agreement to pay 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 the product 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 product 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 **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.
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1. Introduction

The H.O.G. Series of positive displacement meters incorporates smooth oval rotors in their design. The oval rotor principle has proven to be a reliable and highly accurate method of measuring flow. Along with the smooth oval rotors, exceptional repeatability and high accuracy over a wide range of viscosities and flow rates are features of the H.O.G. Series flow meter design.

The low pressure drop and high pressure rating means the Hoffer H.O.G. Series flow meter is suitable for both gravity and pump (in line) applications.

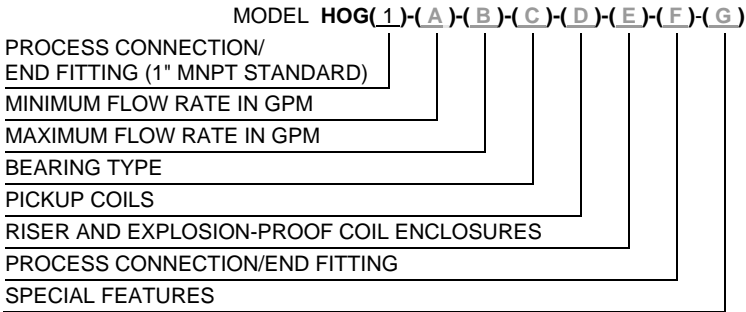
Please take a few minutes to read through this manual before installing and operating your meter. If you have any problems with the meter, refer to the maintenance and troubleshooting sections of this manual.

If you need further assistance, contact your local Hoffer Representative or contact Hoffer Flow Controls customer service department by telephone or fax for advice.

1.1 Model Number Designation

The Model number of the meter describes various fittings and options.

**H.O.G. (HOFFER OVAL GEAR)
POSITIVE PLACEMENT FLOWMETER**



PROCESS CONNECTION/END FITTING SIZE
 MODEL HOG(1)-()-()-()-()-()-()-()
 OPTION (1)
 HOG1 NOTE: 1" MNPT STANDARD

MINIMUM FLOW AND MAXIMUM FLOW RATE IN GPM
 MODEL HOG(1)-(A)-(B)-()-()-()-()-()

	<u>MINIMUM RATE</u>	<u>TO MAXIMUM RATE</u>	<u>LINEARITY</u>
STANDARD RANGE:	2.00 GPM	20.0 GPM	+/-0.25% OF READING OR BETTER ABOVE 100 CSTKS.
EXTENDED RANGE:	5.00 GPM	25.0 GPM	+/-0.25% OF READING OR BETTER ABOVE 100 CSTKS FROM 5 TO 20 GPM AND +/-0.50% OR BETTER FROM 20.0 TO 25.0 GPM. RECOMMENDED FOR INTERMITTENT USE ABOVE 20.0 GPM.
EXTENDED RANGE:	0.02 GPM*	25.0 GPM	+/-0.50% OF READING OR BETTER. RECOMMENDED FOR INTERMITTENT USE ABOVE 20.0 GPM.

*TO MEET THE MINIMUM RATED FLOW RANGE OF 0.02 GPM A BALL BEARING AND HALL EFFECT COILS MUST BE USED. WHEN A MAGNETIC COIL IS USED, THE MINIMUM FLOW RANGE IS 2.00 GPM.

BEARING TYPE

MODEL HOG(1)()-()-(C)-()-()-()-()

OPTION (C)

(B) STAINLESS STEEL BALL BEARING, SELF LUBRICATING

PICKUP COILS

MODEL HOG(1)()-()-()-(D)-()-()-()

OPTION (D)

(1HE) ONE HALL EFFECT COIL

(1M) ONE MAGNETIC COIL

(1ISM) ONE INTRINSICALLY SAFE MAG COIL, NORTH AMERICA

(IISM-ATEX) ONE ISM ATEX COIL(1DM_{xxx}) ONE REDI-PULSE INTRINSICALLY SAFE MAG COIL(1RPM_{xxx}) ONE REDI-PULSE MAG COIL

(-ATEX)* WHEN ANY COIL IS GOING TO HAVE AN ATEX ENCLOSURE MOUNTED ON THE FLOWMETER ADD (-ATEX) AFTER THE COIL PART NUMBER. **(THE COIL NEEDS TO BE MODIFIED TO FIT INTO A 3/4" RISER WELDED TO THE BODY REQUIRED BY ATEX)**

***OPTIONAL ATEX COIL TOOL: P/N A-TOOL-101**

IN ORDER TO REPLACE THE COIL IN THE FIELD, THIS SPECIAL WRENCH IS REQUIRED TO REPLACE THE COIL.

RISER AND EXPLOSION-PROOF COIL ENCLOSURES

MODEL HOG(1)()-()-()-()-(E)-()-()

OPTION (E)

(X) 1" MNPT RISER, WELDED TO BODY

(X-ATEX) 3/4" MNPT RISER, WELDED TO BODY

(XE2) 1" MNPT RISER WITH E2 ENCLOSURE*
INCLUDES STOCK #300-8375 1"X3/4" ADAPTER

(X-ATEX)E2 3/4" MNPT RISER WITH E2 ENCLOSURE*

(X8S) 8" LONG S/S 1" MNPT RISER
FOR FLUID TEMPERATURES BELOW -40°F (-40°C) OR
ABOVE +158°F (+70°C)

(X8S-ATEX) 8" LONG S/S 3/4" MNPT RISER
FOR FLUID TEMPERATURES BELOW -40°F (-40°C) OR ABOVE
+158°F (+70°C)

*NOTES: EXPLOSION-PROOF/FLAME-PROOF ENCLOSURE WITH 3/4" FNPT MOUNT AND 3/4" CABLE ENTRY

FM: CLASS I, DIV. 1, GR. ABCD, CLASS II/III, DIV. 1, GR. EFG, TYPE 4X

CSA: CLASS I, DIV. 1, GR. ABCD, CLASS II, DIV 1, GR. EFG, CLASS III, TYPE 4X EX D IIC, CLASS I, ZONE 1, IP 66

ATEX: EX II 2GD Ex d tD IIC, IP66/68

IEC: EX D IIC IP68

FOR UL LISTED ENCLOSURE CONTACT FACTORY

4 Introduction

PROCESS CONNECTION/END FITTING TYPE

MODEL HOG(1)-()-()-()-()-()-(E)-()

OPTION (F)

(MNPT) 1" MALE NATIONAL PIPE THREAD STANDARD

(F1CS) 1" THREADED FLANGES, RF 150# CARBON STEEL

(F1SS) 1" THREADED FLANGES, RF 150# 316 S/S

(F3CS) 1" THREADED FLANGES, RF 300# CARBON STEEL

(F3SS) 1" THREADED FLANGES, RF 300# 316 S/S

(F6CS) 1" THREADED FLANGES, RF 600# CARBON STEEL

(F6SS) 1" THREADED FLANGES, RF 600# 316 S/S

(F9CS) 1" THREADED FLANGES, RF 900# CARBON STEEL

(F9SS) 1" THREADED FLANGES, RF 900# 316 S/S

SPECIAL FEATURES

MODEL HOG(1)-()-()-()-()-()-()-(G)

OPTION (G)

(CE) CE MARK REQUIRED FOR EUROPE

(PED-CE) PED REQUIRES THAT BOTH THE OPERATING PRESSURE AND TEMPERATURE MUST BE KNOWN AND ENTERED ON THE ORDER. THIS INFORMATION WILL BE MARKED ON THE HOUSING TO MEET PED REQUIREMENTS

(SEP-CE) SOUND ENGINEERING PRACTICE

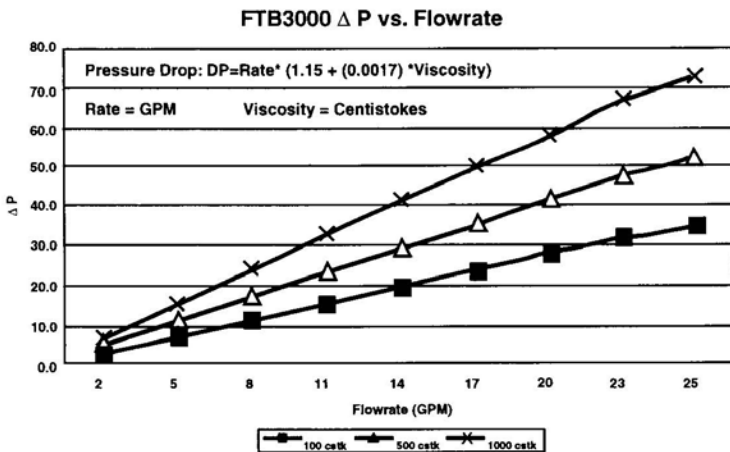
(SP) ANY SPECIAL FEATURES THAT ARE NOT COVERED IN THE MODEL NUMBER, USE A WRITTEN DESCRIPTION OF THE –SP

(X) NO SPECIAL FEATURES

- NOTES:
1. INCLUDES A 12-POINT CALIBRATION AT APPROXIMATELY 100 CENTISTOKES.
 2. VISCOSITY CALIBRATIONS AT THE USERS OPERATING VISCOSITY IS AVAILABLE.
 3. THE MINIMUM VISCOSITY FOR ACCURATE DATA IS 100 CENTISTOKES.

2. Specifications

Service Fluids:	Clean liquids, max particle size .125"
Accuracy:	± 0.25% of reading or better above 100 cstk
Repeatability:	± 0.05%
Flow Range:	
w/ Mag Coil Pickup	2 to 20 GPM
w/ Hall Effect Pickup	0.02 to 20 GPM
K-factor:	460 pulses per gallon (approximate)
Operating Temperature:	
w/ Mag Coil Pickup:	-268°C to +232°C (-450°F to +450°F)
w/ Hall Effect Pickup:	-40°C to +150°C (-40°F to +302°F)
Operating Pressure:	3000 PSIG standard
Minimum Fluid Viscosity:	100 cstk
Wetted Parts:	316 SS body and gears with peek gear seats
Bearings:	Shielded, self lubricating 440 SS ball bearings
Connections:	
Flange Option:	1" MNPT STD
Pickup Coil:	Magnetic Type or Hall Effect (6 to 24 vdc power)
Calibration:	10-point calibration traceable to NIST @ 100 cstk



6 Specifications

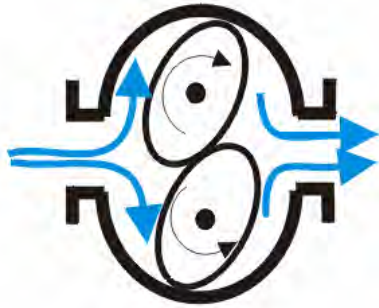
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3. Operation

3.1 Principle

The H.O.G. Series of positive displacement meters use a pair of smooth oval rotors to provide a reliable and highly accurate measurement of flow. The smooth oval rotors displace a precise volume of fluid which is passed through the measurement chamber during each revolution. The smooth oval rotor design along with the viscosity of the fluid provides a complete viscous seal within the measurement chamber.

The unique patented design of Hoffer's Oval Gear meter incorporates two smooth oval rotors 90 degrees out of phase. The phase relationship of the rotors is maintained by two oval timing gears which are out of the flow path. The oval timing gears have a pitch diameter equal to the outside diameter of the smooth oval rotors.



The flow through the meter measurement chamber follows the path of least resistance. Therefore no liquid passes through the center cavity between the rotors. The fluid is displaced from the inlet to the outlet via the area between the smooth oval rotors and the inner diameter of the meter housing.

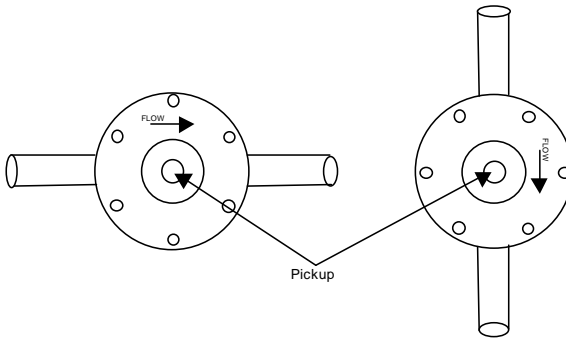
3.2 Precautions

- Before use, confirm the fluid to be used is compatible with the meter and make certain that the operating conditions conform to the meter specifications.
- To prevent damage to the meter slowly fill the system with fluid (this will prevent damage that may be caused by air purge).
- Keep the flowrate within the meter ratings.
- Remove meter from the piping, replacing with a short pipe, when cleaning the piping system by flushing. Costly damage to the meter may result if the assembly is cleaned by flushing with the meter installed.

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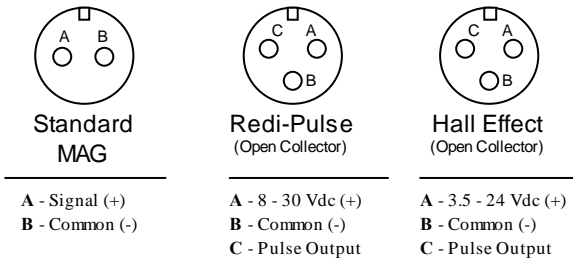
4. Installation

- Use thread sealant on all pipe threads.
- Install the meter carefully to avoid pipe strains.
- The meter must be installed on the discharge side of the pump.
- In tank-head operation, the head of the fluid must be higher than the pressure loss of the meter.
- The flow direction must conform to the arrow mark on the meter body.
- The meter must be installed in the correct orientation (see figure below).



- Connect appropriate connector from pick-up from DCS or electronics.

Pickup Connections



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5. Maintenance

5.1 General

The Hoffer H.O.G. Series flowmeters do not require routine maintenance and do not contain any field serviceable or replaceable parts.

5.2 Trouble Shooting

Refer to the following troubleshooting guide for assistance with possible meter malfunctions:

TROUBLE	CAUSE	REMEDY
Fluid will not flow through the meter	<ul style="list-style-type: none"> ▪ Meter installed with incorrect orientation. ▪ Line to meter blocked. ▪ Insufficient differential pressure. 	<p>Re-orientate the meter.</p> <p>Clear line to meter.</p> <p>Increase upstream pressure.</p>
Reduced flow through the meter	<ul style="list-style-type: none"> ▪ Line to meter partially blocked. ▪ Insufficient differential pressure. 	<p>Clear line to meter.</p> <p>Increase upstream pressure.</p>
Meter readings inaccurate	<ul style="list-style-type: none"> ▪ Fluid flowrate is too low. ▪ Fluid viscosity too low. ▪ Air in fluid. ▪ Meter drag due to incorrect installation. 	<p>See “Specifications” for min and max flowrates.</p> <p>Check fluid specifications.</p> <p>Bleed air from system.</p> <p>Re-adjust meter installation.</p>
Meter not giving pulse signal	<ul style="list-style-type: none"> ▪ Faulty pickup sensor. 	<p>Replace pickup sensor.</p>

Due to the precision alignment of the Hoffer H.O.G. Series flowmeter internals, field repairs are not recommended. Should the meter require internal repairs, return the meter to the factory.

5.3 Spare Parts

The following table contains the recommended spare parts for the Hoffer H.O.G. Series flowmeters:

Item No.	Qty	Part No.	Part Description
1	1	300-6005	MAG Coil Pickup; PC24-45G
1	1	300-6026	Intrinsically Safe MAG Pickup; ISM-001
1	1	300-6041	MAG Redi-Pulse Pickup; RPM01S
1	1	300-6052	Hall Effect Pickup; HE01S

NOTE: The meter pickup must be replaced with a pickup of the same type. Refer to the meter model number for the type of pickup being used.