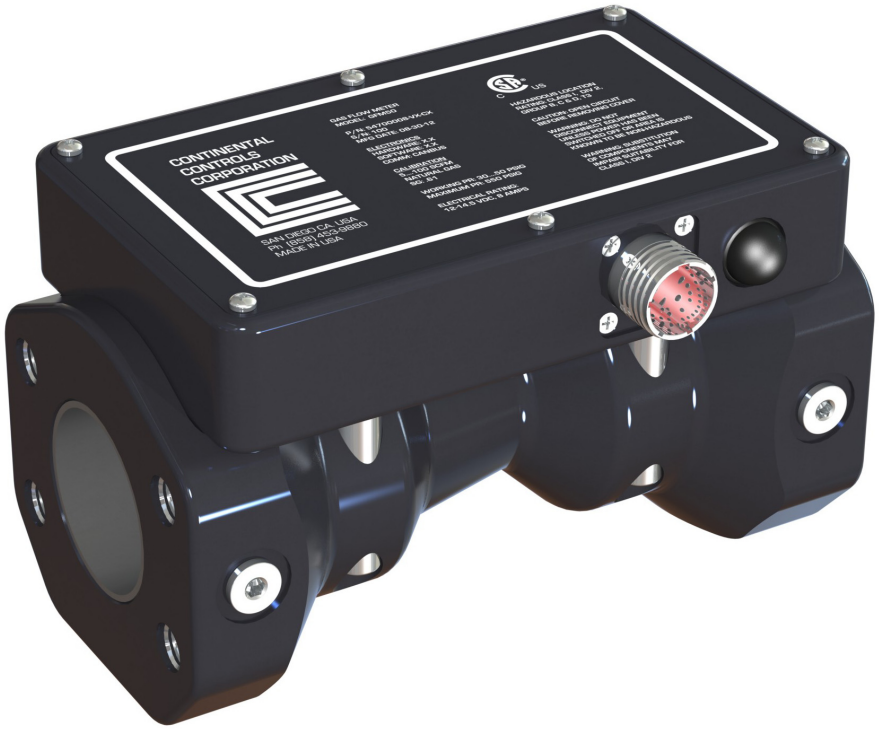
CONTINENTAL CONTROLS CORPORATION

Installation and Operating Manual

Flowmeter, FM50



Class I, Division 2, Group D: T4

ISO 9001:2015 CERTIFIED

Preface

This manual provides instruction and maintenance information for Flow Meter Model FM50.

It is highly recommended that the user read this manual in its entirety before commencing operations. It is the policy of Continental Controls Corporation that it is neither our intention nor our obligation, to instruct others on how to design or implement engine control systems. Continental Controls Corporation will not assume responsibility for engine controls not designed or installed by our authorized representatives.

This manual is intended to help the end user install and operate the Flow Meter Model FM50 in the manner in which they were intended and, in a way, to minimize risk of injury to personnel or damage to engine or equipment.

Do **NOT** attempt to operate, maintain, or repair the gas substitution system until the contents of this document have been read and are thoroughly understood.

Every attempt has been made to provide sufficient information in this manual for the proper operation and maintenance of the Flow Meter Model FM50.

All information contained within shall be considered proprietary information and its release to unauthorized personnel is strictly prohibited.

If additional information is required, please contact:

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Safety Warning!

The Continental Controls Flow Meter Model FM50 is normally used with natural gas. Natural Gas and Air, when combined together, the mixture becomes very combustible. When contained within an enclosure, such as exhaust system can explode in a violent manner when ignited. It is necessary to always use extreme caution when working with any fuel system.

Warning: Do not attempt to repair Flow Meter FM50. Return to Continental Controls Corporation for repairs.

Warning: Protective Earthing: Enclosure to be bonded to earth, min 14AWG.

Failure to follow the above rules may lead to possibly serious damage to equipment or injury to personnel!

Translations of Caution and Warning of Front Cover

1. **CAUTION: OPEN CIRCUIT BEFORE REMOVING COVER**

   I: ATTENZIONE: APRE CIRCUITO PRIMA DI TOGLIERE COPERCHIO L'L'IL

   G: ACHTUNG: OFFENER KREISLAUF VOR HERAUSNEHMEN VON DECKE

2. **WARNING:DO NOT DISCONNECT EQUIPMENT UNLESS POWER HAS BEEN SWITCHED OFF AND AREA IS KNOWN TO BE NON-HAZARDOUS**

   I: L'AVVERTIMENTO: NON DISINSERISCE L'APPARECCHIATURA A MENO CHE IL POTERE È STATO DISINSERITO Y L'AREA È SAPUTA PER ESSERE NON RISCHIOSO

   G: WARNEN: SCHALTEN Sie GERÄTE NICHT AB ES SEI DENN NETZSCHALTER AB UND GEBIET IST GEWUSST, SEI ZU SEIN

3. **KEEP COVER TIGHT WHILE CIRCUIT IS CLOSED**

   I: TENERE I COPERCHI STRETTI MENTRE CIRCUITO SONO VIVO

   G: BEHALTEN Sie DECKEN DICHT, WÄHREND KREISLAUF LEBEND IST

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FM50 Specifications

Flow Capacity:	1550 scfm (4341 lbs/hr) Natural Gas (supply pressure & fuel composition dependent)
Fuel:	Natural Gas, Propane Gas, Other Gaseous Hydrocarbons
Maximum Operating Pressure:	500 psig
Minimum Filtration Requirement:	50 Micron Absolute
Operating Temperature:	-40° C (-40° F) to +85° C (+185° F) (Temperature below 35°F require a supply voltage above 14VDC)
Flow Accuracy:	The greater of: ±2.0% of reading or 0.5 % of full scale
Fuel Feedback Signal:	4-20 mA Loop Power (Standard) & J1939 CAN Bus
Power Input:	10-30 Vdc (25 Watts) (Temperature below 35°F require a supply voltage above 14VDC)
Electrical Interface:	22 pin MS Connector MS D38999/20FC35PN
Communication Interface:	RS232 Modbus RTU, J1939 CAN Bus, 2.4 GHz Radio Modbus RTU
Valve Materials:	-Body: 6061-T6 Anodized Aluminum -Wetted Components: 300 Series Stainless Steel, 6061-T6 Anodized Aluminum - Seals: Nitrile
Flanges:	2" SAE Series 61, 4-Bolt
Minimum Pipe Requirements:	2" Schedule 40 pipe, 20” Upstream, 10” Downstream (straight pipe)
Dimensions:	8.0”L x 5.47”H x 4.97”W
Approximate Weight:	8.3 pounds
Certifications:	Class I, Division 2, Group D: T4

Theory of Operation (Why it works so well)

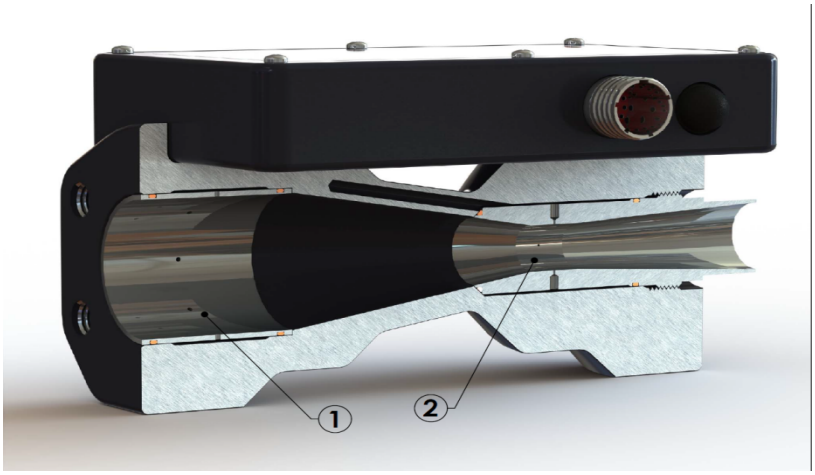
The FM50 flow meter measures flow by measuring the pressure drop across a Venturi. Typically, Venturi is a tube with large openings at both ends, and narrowing in the middle. This narrowing is referred to as the throat. Gas passes through the Venturi and accelerates while moving through the throat. The gas moving faster causes pressure to drop. This is known as the Bernoulli Effect. Just like an airplane wing or a carburetor, the faster the gas moves, the more significant the pressure drops.

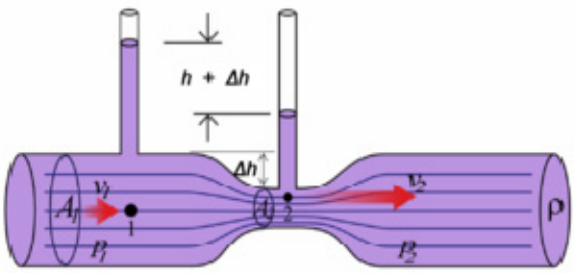
A Venturi flow measurement is similar to a measurement with a sharp edge orifice with the added advantage of a majority of the pressure drop being recovered as the gas leaves the Venturi. The FM50 has up to a 90% pressure recovery. This means that if the pressure drop is 10psi at the throat of the Venturi, the pressure will raise back up to 9psi as the gas leaves the Venturi.

Venturi tubes are more expensive to construct than a simple sharp edge orifice which uses the same principle as a tubular scheme, except the orifice plate causes significantly more pressure loss. A Venturi tube typically has an entry cone of 30 degrees and an exit cone of 5 degrees.

Three different sensors are used to measure the flow:

1) A pressure transducer that measures the absolute pressure upstream of the Venturi
2) A pressure transducer that measures the difference in pressure between the throat and upstream of the Venturi
3) A temperature sensor that measures the gas temperature





The pressure in the first measuring tube (1) is higher than at the throat (2), and the gas speed at "1" is lower than at "2," because the cross-sectional area at "1" is greater than at "2."

The limitation of the Venturi effect is when a gas reaches the state of choked-flow, where the gas velocity approaches the local speed of sound. This is commonly referred to as “sonic flow.” In choked-flow, the mass flow rate will not increase with a further decrease in the downstream pressure environment.

A Venturi can be used to measure the volumetric flow rate.

Since:

$$Q = v_1 A_1 = v_2 A_2$$

$$p_1 - p_2 = \frac{\rho}{2}(v_2^2 - v_1^2)$$

Then:

$$Q - A_1 \sqrt{\frac{2}{\rho} \cdot \frac{(p_1 - p_2)}{\left(\frac{A_1}{A_2}\right)^2 - 1}} - A_2 \sqrt{\frac{2}{\rho} \cdot \frac{(p_1 - p_2)}{1 - \left(\frac{A_2}{A_1}\right)^2}}$$

Safety Precautions

Continental Controls fuel control devices are normally used with natural gas. Natural gas and air, when combined together, become very combustible and when contained within a confined space, such as an engine enclosure or a building can explode in a violent manner when ignited. It is necessary to always use extreme caution when working with any fuel system.

WARNING!!!

DO NOT ATTEMPT TO REPAIR. THE FM50 MUST BE RETURNED TO CONTINENTAL CONTROLS CORPORATION FOR REPAIR AND SERVICES.

When installing the FM50 in Class I Division 2 Hazardous Locations, installation of all electrical equipment MUST be in compliance with the National Electric Code (NEC). Customer is responsible for termination of pigtail wires out of the cable harness assembly on the FM50.

The FM50 cables MUST be continuously supported and protected against physical damage using mechanical protection such as dedicated struts, angles or channels. The FM50 cables MUST be secured in conduit. After installation all connections should be inspected for leaks. Do not connect or disconnect the FM50 unless power is off. Make sure to disconnect the FM50 while welding.

If you have any doubt or questions, stop and call for support from your local dealer or Continental Controls Corporation.

Installation Instructions

The following are list of parts, system requirements, mechanical assembly, wiring, GSS and ECU communication, software settings, GSS laptop interface and etc.

List of parts

The FM50 is comprised of the following items.

CCC P/N	Description
54700008-X	Flow meter, model; FM50, Configuration; X See the configuration data for the value of X

54701507-2-30	Cable, interface, 30 feet, FM50	**SELECT 1**
54701507-2-60	Cable, Interface, 60 feet long, FM50	

54709039	Kit, Mounting, 2" pipe SAE split flange (MAIN P/N: MK2737)
54709019	Flange, Split, SAE, 4-bolt pattern, 2" pipe

54709029	Flange Head, NPTF threaded, 2" pipe SAE split flange	**SELECT 1**
54709049	Flange Head, Butt Weld, 2" pipe SAE split flange*****	

Software Settings

The FM50 has three buttons on the right side of the display. The top button and bottom buttons have two functions:

1) Cycle you through different items on the display.

2) Increment or decrement a value in the set-up menu.

The center button is like the enter key.

The items available for viewing are as follows:

- **CURRENT FLOW** – Instantaneous measurement.
- **ACCUM FLOW** –Total flow through the meter since the last time the accumulator variable was zeroed. The accumulator can be zeroed by pressing “Enter” (the middle button) while on this screen. This is the only accumulator that can be zeroed.
- **CURRENT HOUR** – The accumulated flow during the start of the current hour until present time.
- **PREVIOUS HOUR** – How much gas flowed in the last hour?
- **TODAY** – How much gas has flowed today.
- **YESTERDAY** – How much gas flowed yesterday?
- **MONTH TO DAY** – The accumulated flow from the beginning of the month to present.
- **LAST MONTH** – Accumulated flow for last month.
- **YEAR TO DAY** – Accumulated flow during the start of the current year to present.
- **LAST YEAR** – Accumulated flow for last year.
- **DIFFERENTIAL** – Differential pressure measurement. This should be zero when no gas is flowing through the meter.
- **TEMPERATURE** – Temperature of the gas in the meter.
- **PSIA** – Absolute pressure reading of the gas inside the meter. The calibration of the reading can be adjusted in the set-up menu. At sea level, pressure should read 14.7psia.

The last item is “SETUP MENU-ENTER.” If you press the “Enter” (middle) button while this is displayed, you will enter the set-up menu.

The set-up menu is used when the flow meter is first installed to set the time, change the password, zero the transducers and make adjustments to the flow calibration. The following items are in the set-up menu:

- **DATE** – For setting real-time clock date.
- **TIME** – For setting real-time clock time.
- **AUTO ZERO DP** – Enable or disable the auto zero function for the DP transducer.
- **NEW PASSWORD** – To change the password.
- **ZERO PRESSURE XDUCER** – To adjust the zero offset up or down.
- **ZERO DP XDUCER** – Manually zeroes the DP pressure transducer.
- **FLOW CONSTANT** – Adjusts the flow calibration to compensate for a different specific gravity.
- **MAIN MENU** – Exits set-up menu and returns to main menu.
- **PSIA** – To adjust the calibration of the pressure transducer in the flow meter.

Initial Setup

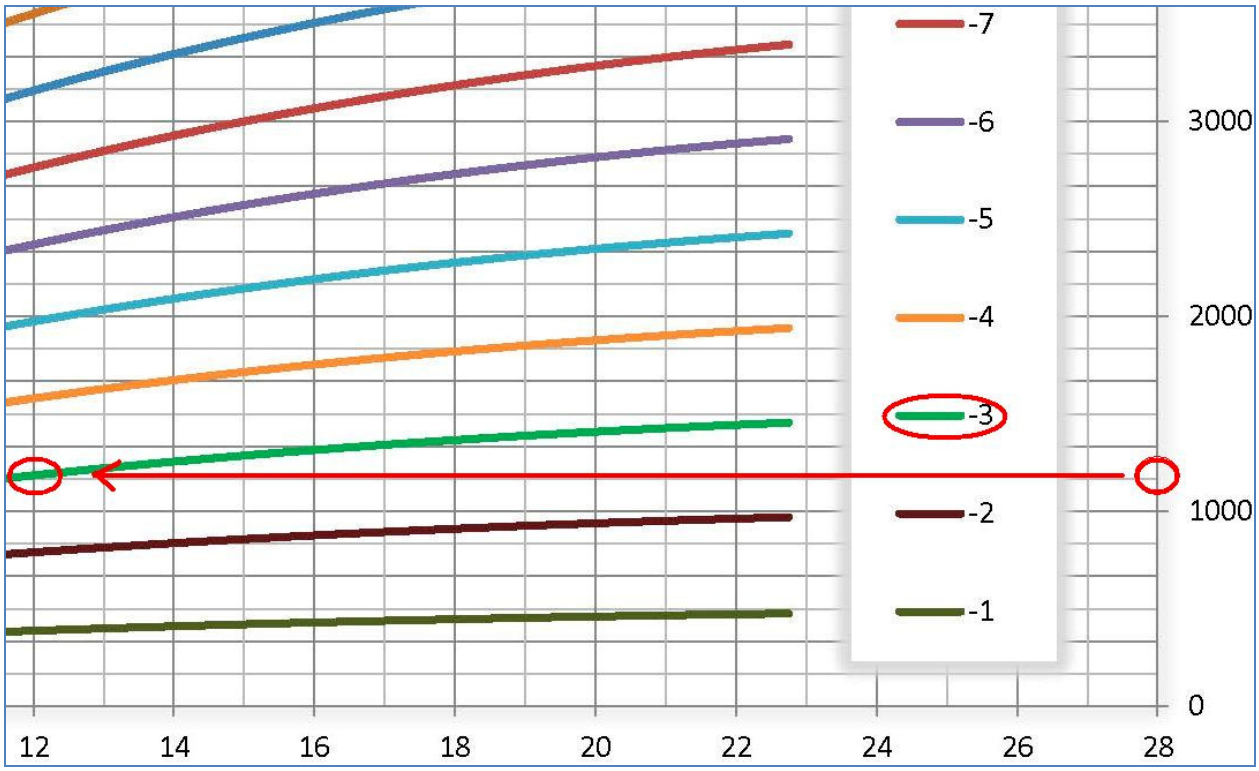
- Install the FM50 on the pipe. Pipe should be clean and free of debris.
- Connect ground (the black wire, pin 19) on the connector to the return/ground on the power supply or battery.
- With power off, connect the power (red, pin 22), and the 4-20ma (yellow, pin 9) power to the power supply.
- Connect the analog out (blue, pin 10) to PLC or SCADA system. Note: the power ground must have continuity to the analog ground of the reading device.
- Turn the power on.
- Sets the time and date.
- Sets the password (write it down).
- Zero the DP transducer. Turn on auto-zeroing if desired.
- Zero accumulator.
- Verify the temperature sensor is reading.
- Verify absolute pressure (PSIA) is correct for your altitude. Adjust (if required) the absolute pressure transducer.
- Turn the gas on.
- Check for leaks using “Snoop” or another method.

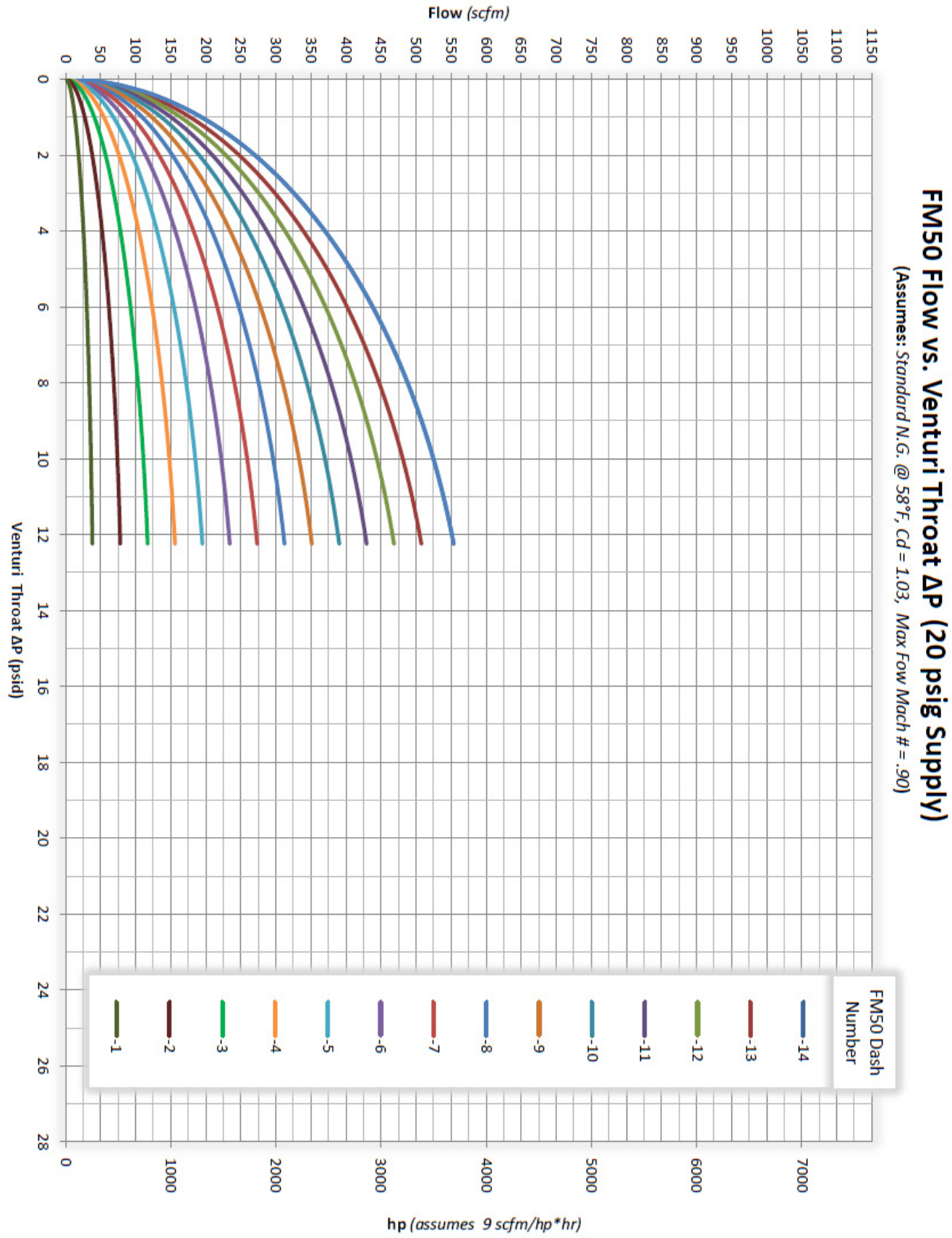
Configuration Data

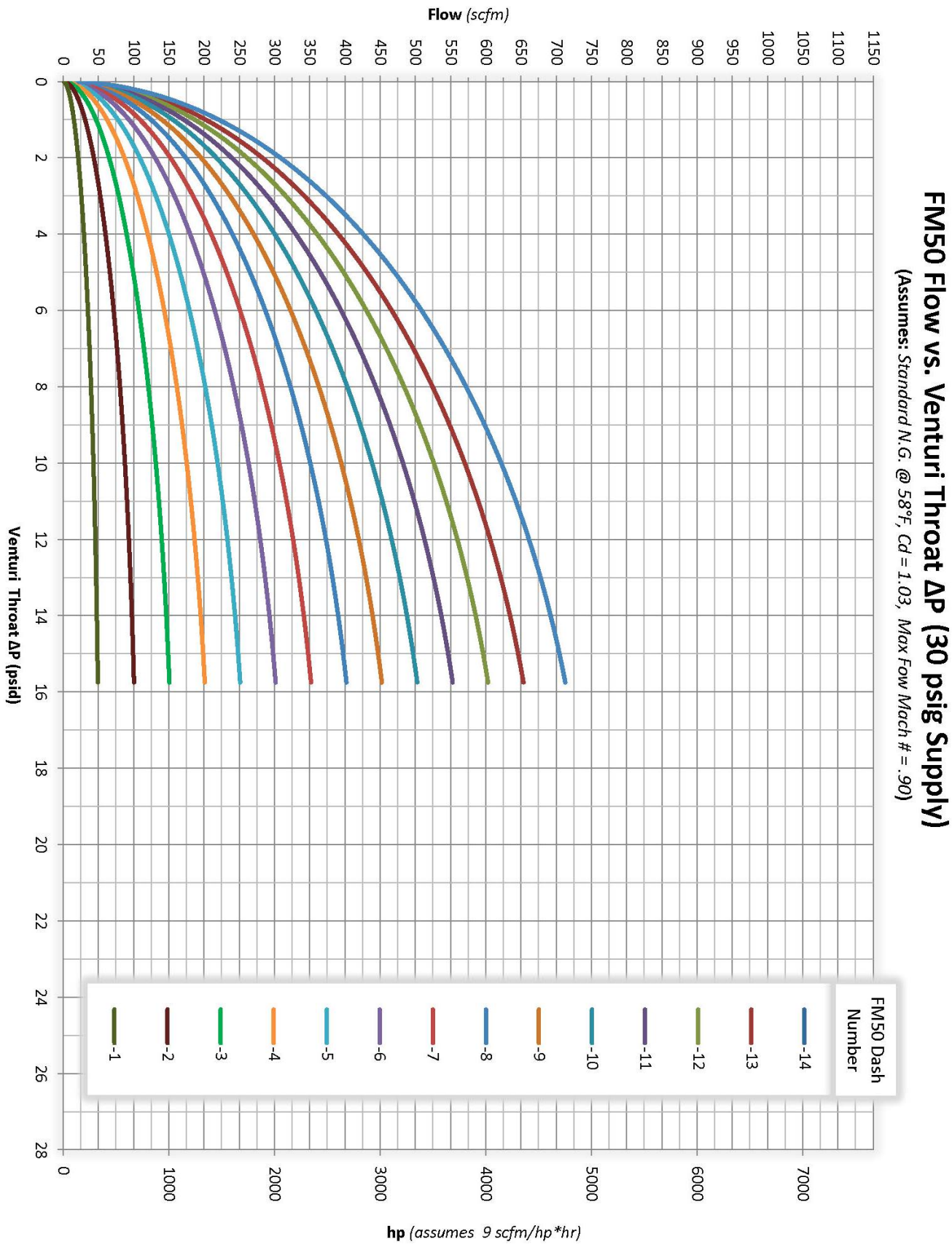
The following tables are provided to determine the correct sizing of the FM50 flow meter. To determine the correct dash number, select the proper table, based on the gas pressure where the meter will be located. Each table has the pressure located at the top of the table. On the right side of each table is a scale of the horsepower of the engine being supplied by the gas the FM50 will be measuring? This number is based on an estimate of 9 scfm per 100 horsepower.

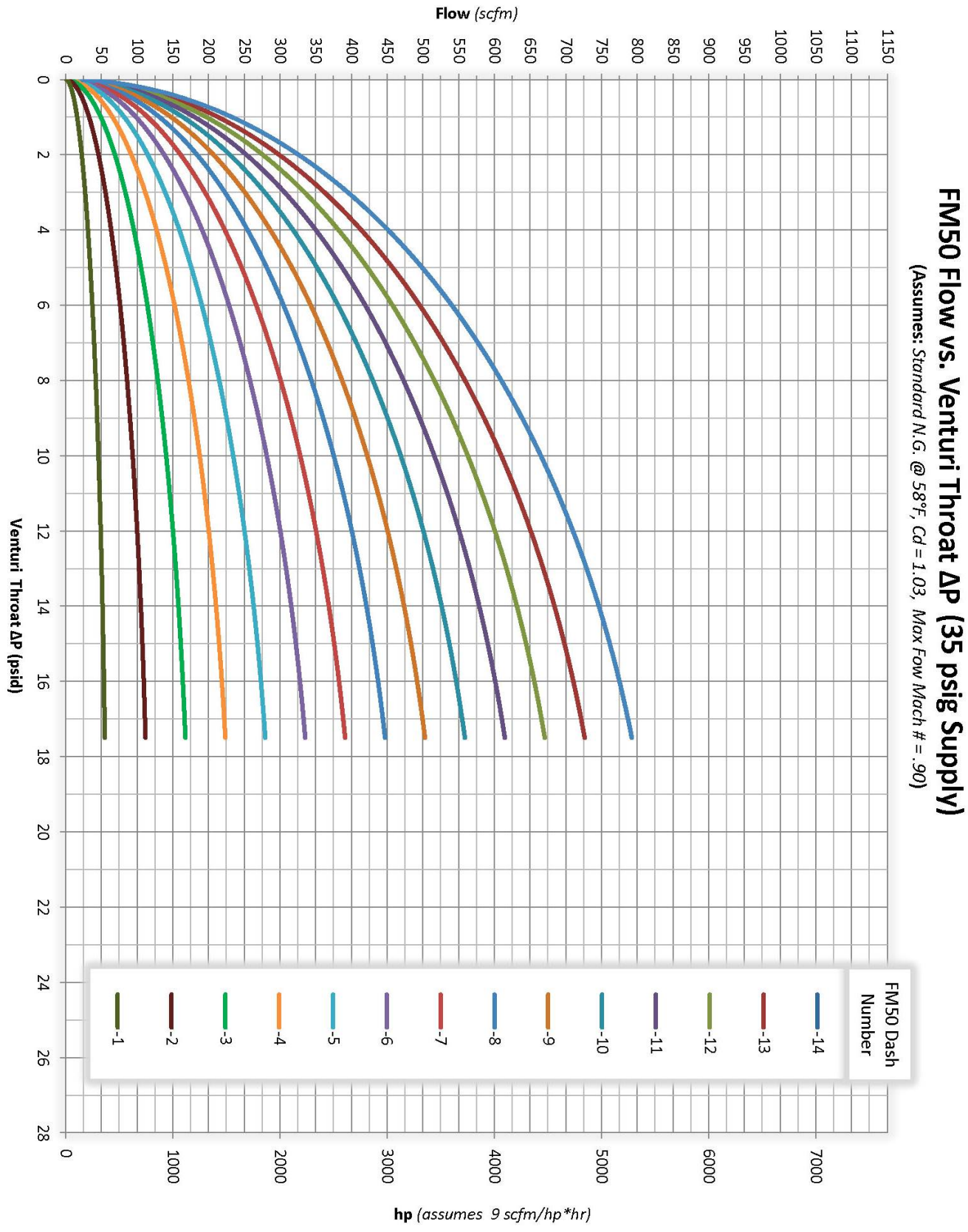
Locate the proper horsepower on the right of the appreciate chart, then follow the line to the left until it intersects with one of the colored lines on the graph. Find the dash number that corresponds with the colored line. This is the configuration, or dash number, for this application.

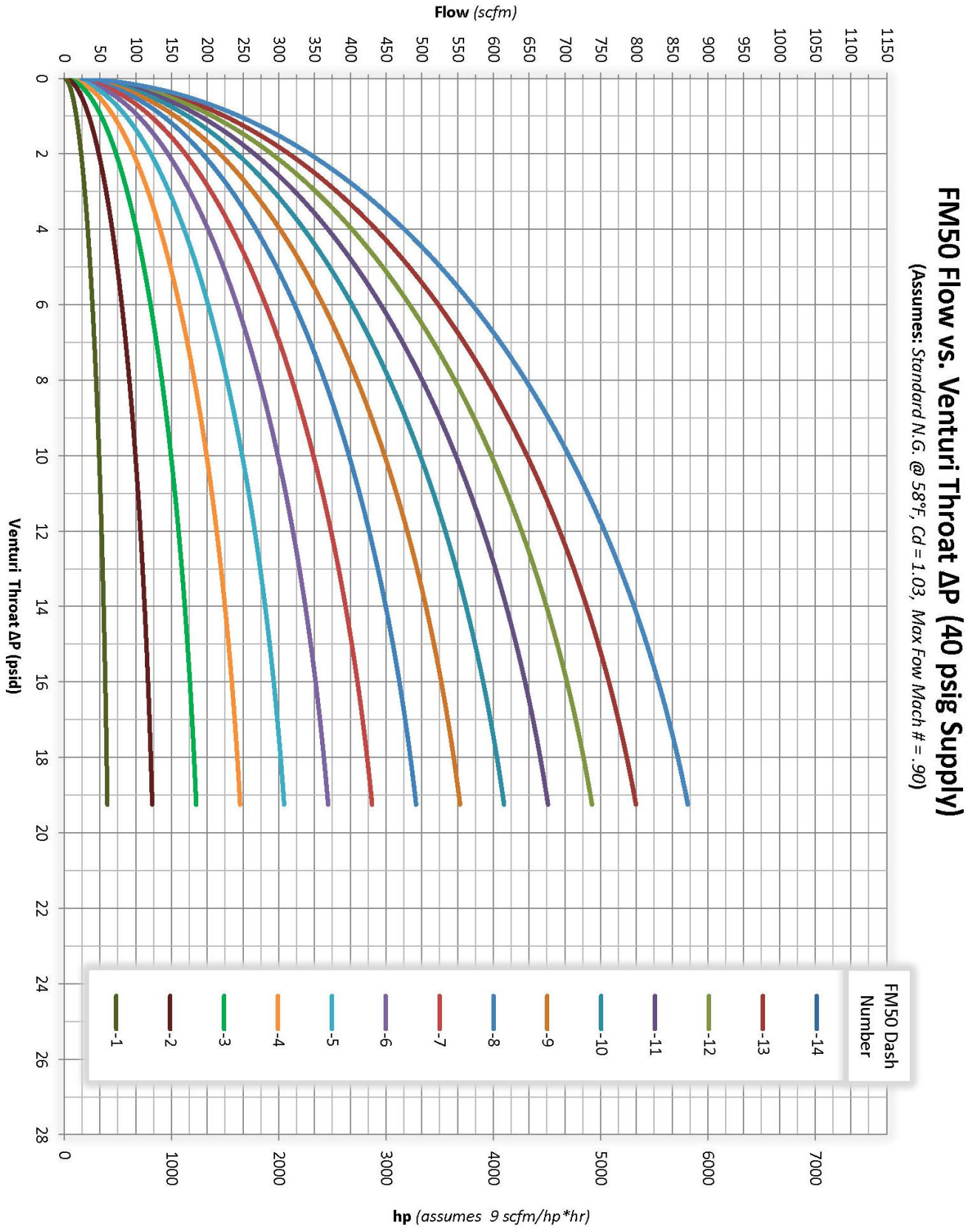
Example: A flow meter for a 1200 horsepower engine running on a supply pressure of 50pso would require a Dash-3 configuration.

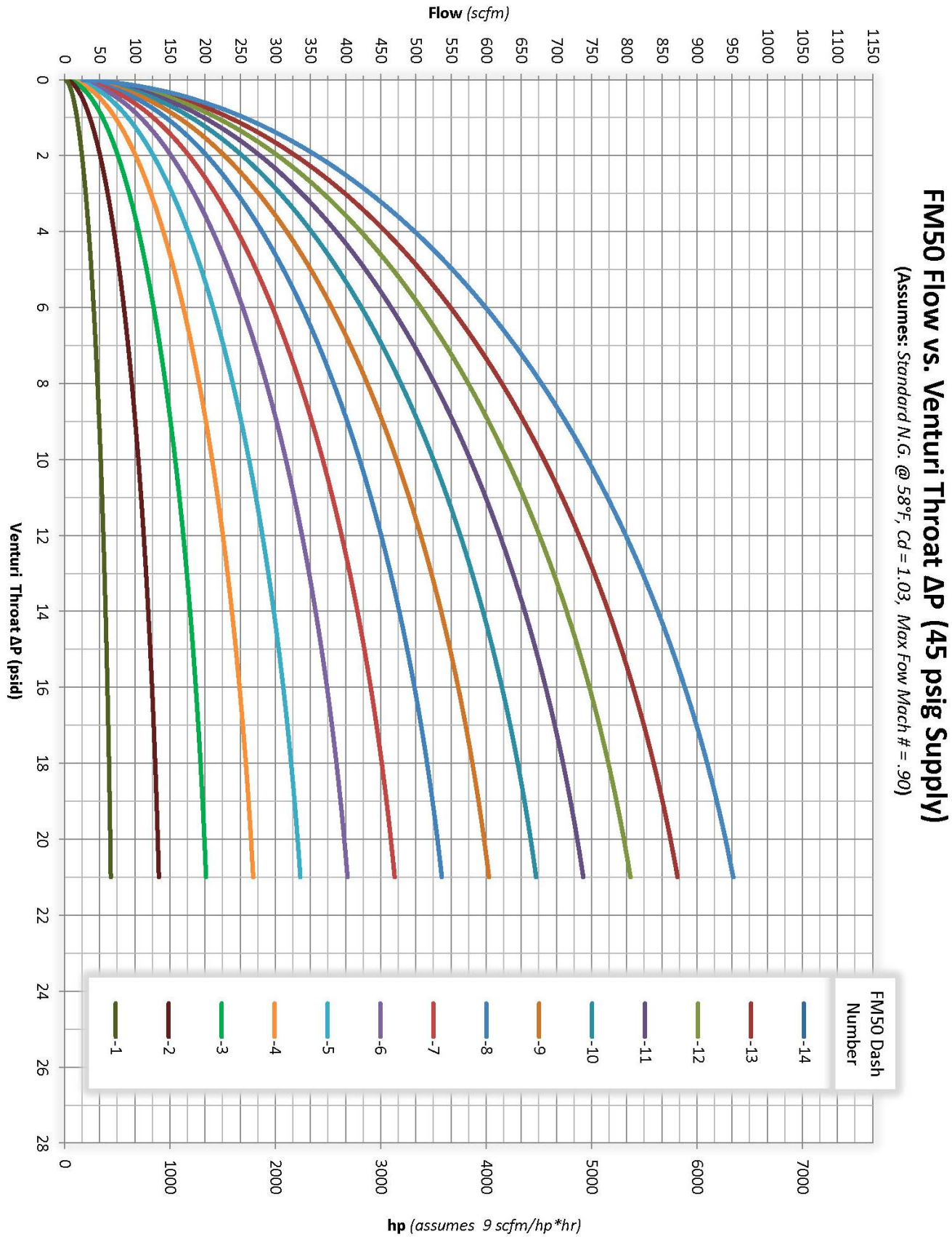


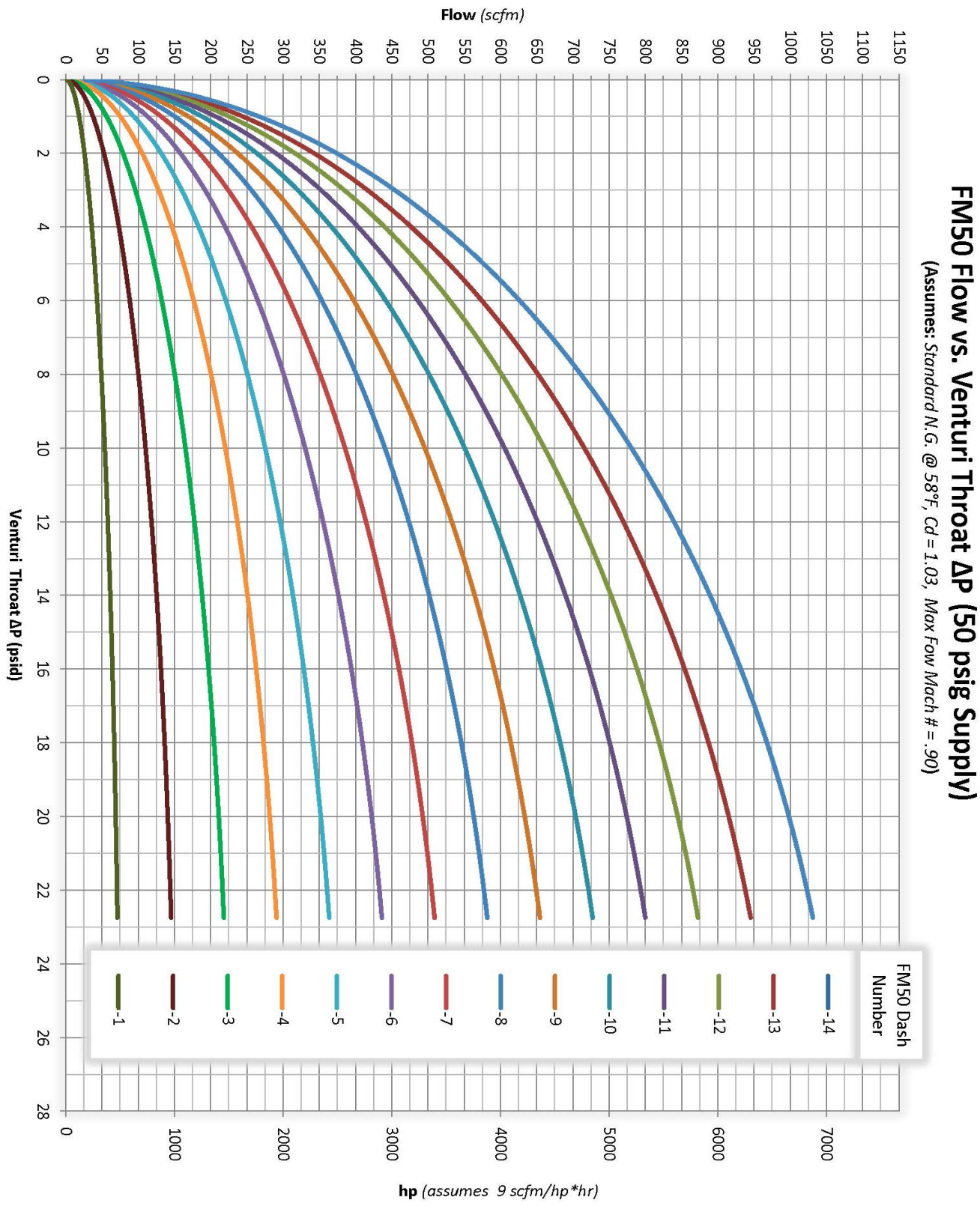

FM50 Flow vs. Venturi Throat ΔP (20 psig Supply)
(Assumes: Standard N.G. @ 58°F, Cd = 1.03, Max Fow Mach # = .90)
Flow (scfm)
0
50
100
150
200
250
300
350
400
450
500
550
600
650
700
750
800
850
900
950
1000
1050
1100
1150
Venturi Throat ΔP (psid)
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
hp (assumes 9 scfm/hp*hr)
0
1000
2000
3000
4000
5000
6000
7000
FM50 Dash Number
-1
-2
-3
-4
-5
-6
-7
-8
-9
-10
-11
-12
-13
-14


FM50 Flow vs. Venturi Throat ΔP (30 psig Supply)
(Assumes: Standard N.G. @ 58°F, Cd = 1.03, Max Fow Mach # = .90)
Flow (scfm)
0
50
100
150
200
250
300
350
400
450
500
550
600
650
700
750
800
850
900
950
1000
1050
1100
1150
Venturi Throat ΔP (psid)
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
hp (assumes 9 scfm/hp*hr)
0
1000
2000
3000
4000
5000
6000
7000
FM50 Dash Number
-1
-2
-3
-4
-5
-6
-7
-8
-9
-10
-11
-12
-13
-14

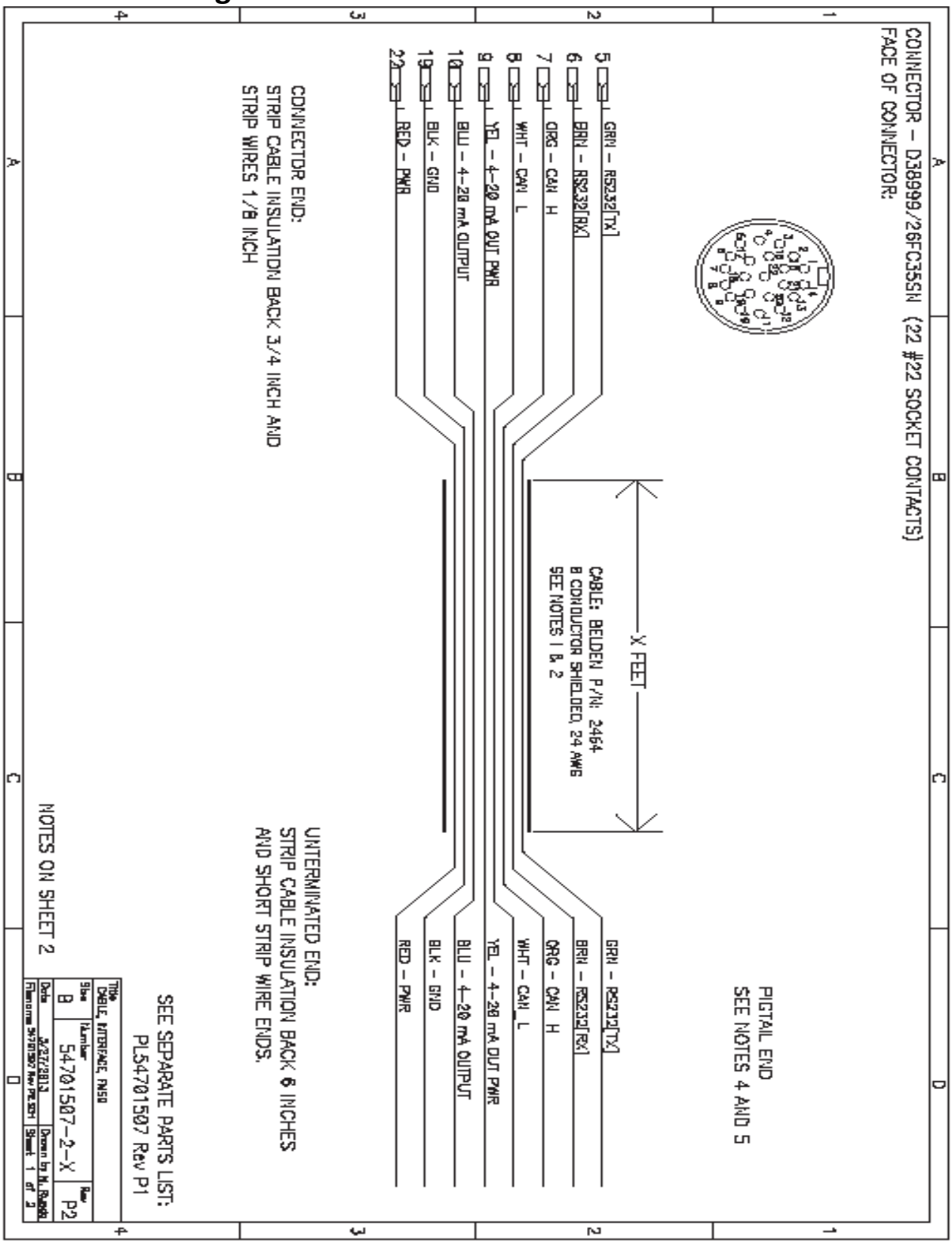

FM50 Flow vs. Venturi Throat ΔP (35 psig Supply)
(Assumes: Standard N.G. @ 58°F, Cd = 1.03, Max Fow Mach # = .90)
Flow (scfm)
0
50
100
150
200
250
300
350
400
450
500
550
600
650
700
750
800
850
900
950
1000
1050
1100
1150
Venturi Throat ΔP (psid)
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
hp (assumes 9 scfm/hp*hr)
0
1000
2000
3000
4000
5000
6000
7000
FM50 Dash Number
-1
-2
-3
-4
-5
-6
-7
-8
-9
-10
-11
-12
-13
-14


FM50 Flow vs. Venturi Throat ΔP (40 psig Supply)
(Assumes: Standard N.G. @ 58°F, Cd = 1.03, Max Fow Mach # = .90)
Flow (scfm)
Venturi Throat ΔP (psid)
hp (assumes 9 scfm/hp*hr)
FM50 Dash Number
-1
-2
-3
-4
-5
-6
-7
-8
-9
-10
-11
-12
-13
-14


FM50 Flow vs. Venturi Throat ΔP (45 psig Supply)
(Assumes: Standard N.G. @ 58°F, Cd = 1.03, Max Fow Mach # = .90)
Flow (scfm)
0
50
100
150
200
250
300
350
400
450
500
550
600
650
700
750
800
850
900
950
1000
1050
1100
1150
Venturi Throat ΔP (psid)
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
hp (assumes 9 scfm/hp*hr)
0
1000
2000
3000
4000
5000
6000
7000
FM50 Dash Number
-1
-2
-3
-4
-5
-6
-7
-8
-9
-10
-11
-12
-13
-14


FM50 Flow vs. Venturi Throat ΔP (50 psig Supply)
(Assumes: Standard N.G. @ 58°F, Cd = 1.03, Max Fow Mach # = .90)
Flow (scfm)
0
50
100
150
200
250
300
350
400
450
500
550
600
650
700
750
800
850
900
950
1000
1050
1100
1150
Venturi Throat ΔP (psid)
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
hp (assumes 9 scfm/hp*hr)
0
1000
2000
3000
4000
5000
6000
7000
FM50 Dash Number
-1
-2
-3
-4
-5
-6
-7
-8
-9
-10
-11
-12
-13
-14

Cable and wiring



NOTE 1: "X" IN THE P/N DENOTES CABLE LENGTH IN FEET.

NOTE 2: MARK CABLE P/N ON 2 INCH LENGTH OF WHITE HEAT SHRINK (ITEM 3) AND INSTALL WITHIN 4-8 INCHES OF END OF CONDUIT.

NOTE 3: SHIELD DRAIN WIRE ON MS CONNECTOR END IS NOT USED AND SHOULD BE CUT BACK TO WHERE CABLE INSULATION IS STRIPPED.

NOTE 4: ON PIGTAIL END, INSTALL HEATSHRINK (ITEM 4) OVER CABLE AT TERMINATION OF OVERALL INSULATION.

NOTE 5: INDIVIDUAL WIRES TO BE IDENTIFIED WITH FUNCTION USING ITEM 6 AT UNTERMINATED END.

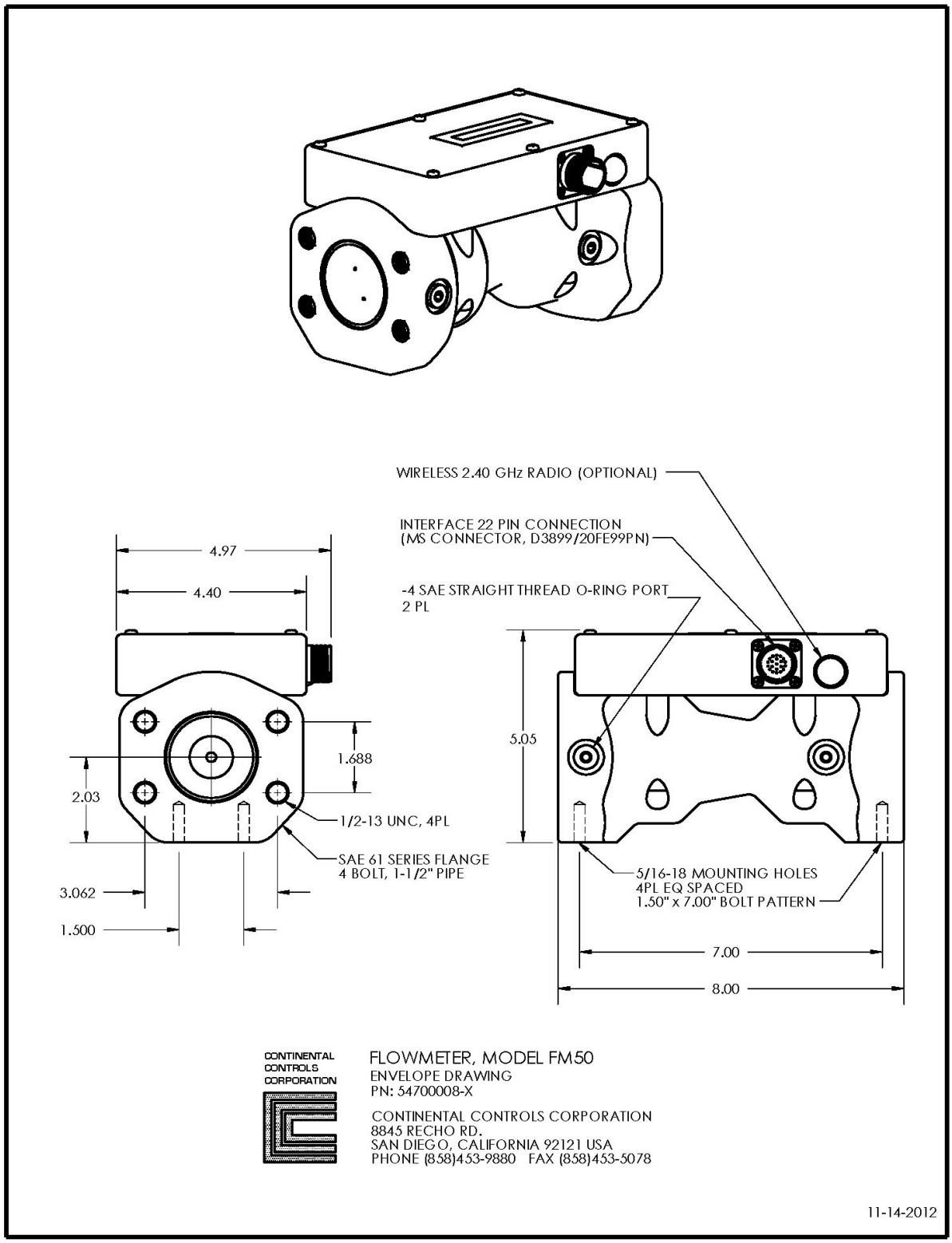
Title: CABLE, INTERFACE, FM50		
Size: B	Number: 54701507-2-X	Rev: P2
Date: 3/27/2013	Drawn by: M. Rabbit	
Filename:	Sheet 2 of 2	

Product Warranty

Continental Controls Corporation warrants that all goods furnished by CCC are free from defects in workmanship and material as of the time and place of delivery.
As a matter of general warranty policy, CCC honors an original buyer's warranty claim in the event of failure within 12 months of shipment to the end-user, when the equipment has been installed and operated under normal conditions and in accordance with installation instructions contained in the operating manual and generally accepted operating practices.

All warranty work must be performed and CCC's manufacturing facility in San Diego. The customer is responsible for shipment or delivery of the product to the CCC facility. CCC will pay return ground freight. The customer will pay any expedited freight fees.

Envelope Drawing



Modbus Register Map

Input Registers

Register	Description	Scaling Factor	Units
30001	Flow	1.00E-02	scfm
30002	Pressure	1.00E-02	psia
30003	Differential pressure	1.00E-03	psig
30004	Gas Temperature	1.00E-02	F
30005	Board Temperature	1.00E-02	F
30006	Real time clock: second	1.00E+00	sec
30007	Real time clock: minute	1.00E+00	min
30008	Real time clock: hour	1.00E+00	hour
30009	Real time clock: week day	1.00E+00	week
30010	Real time clock: date	1.00E+00	date
30011	Real time clock: month	1.00E+00	month
30012	Real time clock: year	1.00E+00	year
30013	Flow output (counts)	1.00E+00	DAC counts
30014	Flow calculated	1.00E-02	scfm
30015	Analog channel0 (counts)	1.00E+00	ADC counts
30016	Analog channel1 (counts)	1.00E+00	ADC counts
30017	Analog channel2 (counts)	1.00E+00	AdC counts
30018	Analog channel3 (counts)	1.00E+00	ADC counts
30019	Analog channel4 (counts)	1.00E+00	ADC counts
30020	Analog channel5 (counts)	1.00E+00	ADC counts
30021	Analog channel6 (counts)	1.00E+00	ADC counts
30022	Analog channel7 (counts)	1.00E+00	ADC counts

Holding Registers

Register	Description	Scaling Factor	Units
40001	Product type	Actual	NA
40002	Modbus address	Actual	NA
40003	FM Serial number	Actual	NA
40004	Save data command	Actual	NA
40005	Calibrated	Actual	NA
40006	Version	Actual	NA

Register	Description	Scaling Factor	Units
40007	Upstream pressure cal point1	1.00E-02	psia
40008	Upstream pressure point1 (counts)	1.00E+00	ADC counts
40009	Upstream pressure cal point2	1.00E-02	psia
40010	Upstream pressure point2 (counts)	1.00E+00	ADC counts
40011	Upstream pressure cal point3	1.00E-02	psia
40012	Upstream pressure point3 (counts)	1.00E+00	ADC counts
40013	Upstream pressure cal point4	1.00E-02	psia
40014	Upstream pressure point4 (counts)	1.00E+00	ADC counts
40015	Gas temperature cal point1	1.00E-02	F
40016	Gas temperature point1 (counts)	1.00E+00	ADC counts
40017	Gas temperature cal point2	1.00E-02	F
40018	Gas temperature point2 (counts)	1.00E+00	ADC counts
40019	Gas temperature cal point3	1.00E-02	F
40020	Gas temperature point3 (counts)	1.00E+00	ADC counts
40021	Gas temperature cal point4	1.00E-02	F
40022	Gas temperature point4 (counts)	1.00E+00	ADC counts
40023	Board temperature cal point1	1.00E-02	F
40024	Board temperature point1 (counts)	1.00E+00	ADC counts
40025	Board temperature cal point2	1.00E-02	F
40026	Board temperature point2 (counts)	1.00E+00	ADC counts
40027	Board temperature cal point3	1.00E-02	F
40028	Board temperature point3 (counts)	1.00E+00	ADC counts
40029	Board temperature cal point4	1.00E-02	F
40030	Board temperature point4 (counts)	1.00E+00	ADC counts
40031	Differential pressure cal point1	1.00E-03	psig
40032	Differential pressure point1 (counts)	1.00E+00	ADC counts
40033	Differential pressure cal point2	1.00E-03	psig
40034	Differential pressure point2 (counts)	1.00E+00	ADC counts
40035	Differential pressure cal point3	1.00E-03	psig
40036	Differential pressure point3 (counts)	1.00E+00	ADC counts
40037	Differential pressure cal point4	1.00E-03	psig
40038	Differential pressure point4 (counts)	1.00E+00	ADC counts
40039	Pressure Minimum	1.00E-02	psia
40040	LCD heater on temperature	1.00E-01	on/off switch
40041	Orifice diameter	1.00E-03	inch
40042	Orifice coefficient	1.00E-02	NA -correct. factor
40043	Gas constant	1.00E-02	NA
40044	LCD menu pw	Ignore	NA
40045	Flow constant	Ignore	NA

Register	Description	Scaling Factor	Units
40046	Minimum flow cutoff	1.00E-02	scfm
40047	Update real time clock	1.00E+00	on/off switch
40048	Minimum flow	1.00E-02	scfm
40049	Maximum flow	1.00E-02	scfm
40050	DAC gain	1.00E+00	NA
40051	DAC offset	1.00E+00	NA
40052	DAC flow maximum	1.00E+00	DAC counts
40053	Accumulated flow low word	1.00E-01	scf
40054	Accumulated flow high word	1.00E-01	scf
40055	Current hour flow low word	1.00E-01	scf
40056	Current hour flow high word	1.00E-01	scf
40057	Last hour flow low word	1.00E-01	scf
40058	Last hour flow high word	1.00E-01	scf
40059	Today flow low word	1.00E-01	scf
40060	Today flow high word	1.00E-01	scf
40061	Yesterday flow low word	1.00E-01	scf
40062	Yesterday flow high word	1.00E-01	scf
40063	Month flow low word	1.00E-01	scf
40064	Month flow high word	1.00E-01	scf
40065	Last month flow low word	1.00E-01	scf
40066	Last month flow high word	1.00E-01	scf
40067	Year flow low word	1.00E-01	scf
40068	Year flow high word	1.00E-01	scf
40069	Last year flow low word	1.00E-01	scf
40070	Last year flow high word	1.00E-01	scf
40071	Real time clock: second	1.00E+00	second
40072	Real time clock: minute	1.00E+00	minute
40073	Real time clock: hour	1.00E+00	hour
40074	Real time clock: week day	1.00E+00	week day
40075	Real time clock: date	1.00E+00	date
40076	Real time clock: month	1.00E+00	month
40077	Real time clock: year	1.00E+00	year
40078	Flow calc point0	1.00E-02	scfm
40079	Flow point0	1.00E-02	scfm
40080	Flow calc point1	1.00E-02	scfm
40081	Flow point1	1.00E-02	scfm
40082	Flow calc point2	1.00E-02	scfm
40083	Flow point2	1.00E-02	scfm
40084	Flow calc point3	1.00E-02	scfm

Register	Description	Scaling Factor	Units
40085	Flow point3	1.00E-02	scfm
40086	Flow calc point4	1.00E-02	scfm
40087	Flow point4	1.00E-02	scfm
40088	Flow calc point5	1.00E-02	scfm
40089	Flow point5	1.00E-02	scfm
40090	Flow calc point6	1.00E-02	scfm
40091	Flow point6	1.00E-02	scfm
40092	Flow calc point7	1.00E-02	scfm
40093	Flow point7	1.00E-02	scfm
40094	Flow calc point8	1.00E-02	scfm
40095	Flow point8	1.00E-02	scfm
40096	Flow calc point9	1.00E-02	scfm
40097	Flow point9	1.00E-02	scfm
40098	Flow calc point10	1.00E-02	scfm
40099	Flow point10	1.00E-02	scfm
40100	Flow calc point11	1.00E-02	scfm
40101	Flow point11	1.00E-02	scfm
40102	Flow calc point12	1.00E-02	scfm
40103	Flow point12	1.00E-02	scfm
40104	Flow calc point13	1.00E-02	scfm
40105	Flow point13	1.00E-02	scfm
40106	Flow calc point14	1.00E-02	scfm
40107	Flow point14	1.00E-02	scfm
40108	Total hours	Ignore	hour
40109	Total minutes	Ignore	minute
40110	Test mode	Ignore	on/off switch
40111	DAC output	1.00E+00	DAC counts
40112	Zero transducer flag	Ignore	on/off switch
40113	Dp zero init	Ignore	ADC counts
40114	Zero all accumulators	Ignore	on/off switch
40115	Zero Dp enable	1.00E+00	on/off switch
40116	Dp maximum offset	Ignore	ADC counts
40117	PO maximum offset	Ignore	ADC counts
40118	Orifice type	Actual	14-option switch (diam, coeff)
40119	ADC Filter rate	Actual	millisec
40120	Current week low word	0.1	scf
40121	Current week high word	0.1	scf
40122	Last week flow low word	0.1	scf

Register	Description	Scaling Factor	Units
40123	Last week flow high word	0.1	scf
40124	Minimum flow displayed	0.1	scfm
40125	Smoothing factor	Actual	NA

Scaling:

1. To scale data from Flow Meter multiply the reading by the scaling factor

Example: You read 32000 from register 400048 (Maximum Flow).

32000*0.01 = 320

Maximum flow = 320 scfm

2. To send data to Flow Meter, first multiply the actual setting by the scaling factor, then write data to the Modbus register.

Example: You want to set Maximum Flow to 300 scfm

300 * 100 = 30000

Write 30000 to Modbus register 40048.

Register 40004: Value 0x1234(Hex,) written to this register, directs the device to save all 4x holding registers into static memory for the next power cycle.

Note:

ADC - analog to digital converter

DAC - digital to analog converter