2 YEAR WARRANTY

CE

User's Guide

omega.com
e-mail: info@omega.com

For latest product manuals:
omegamanual.info

Made in China

DPF708, DPF808 Series
Flow Totalizers

OMEGAnet® Online Service www.omega.com	Internet e-mail info@omega.com

Servicing North America:

USA: ISO 9001 Certified
One Omega Drive, P.O. Box 4047
Stamford CT 06907-0047
TEL: (203) 359-1660 FAX: (203) 359-7700
e-mail: info@omega.com

Canada:
976 Bergar
Laval (Quebec) H7L 5A1, Canada
TEL: (514) 856-6928 FAX: (514) 856-6886
e-mail: info@omega.ca

For immediate technical or application assistance:

USA and Canada: Sales Service: 1-800-826-6342 / 1-800-TC-OMEGA®
Customer Service: 1-800-622-2378 / 1-800-622-BEST®
Engineering Service: 1-800-872-9436 / 1-800-USA-WHEN®
TELEX: 996404 EASYLINK: 62968934 CABLE: OMEGA

Mexico: En Español: (001) 203-359-7803 e-mail: espanol@omega.com
FAX: (001) 203-359-7807 info@omega.com.mx

Servicing Europe:

Benelux: Postbus 8034, 1180 LA Amstelveen, The Netherlands
TEL: +31 (0)20 3472121 FAX: +31 (0)20 6434643
Toll Free in Benelux: 0800 0993344
e-mail: sales@omegaeng.nl

Czech Republic: Frystatska 184, 733 01 Karviná, Czech Republic
TEL: +420 (0)59 6311899 FAX: +420 (0)59 6311114
Toll Free: 0800-1-66342 e-mail: info@omegashop.cz

France: 11, rue Jacques Cartier, 78280 Guyancourt, France
TEL: +33 (0)1 61 37 2900 FAX: +33 (0)1 30 57 5427
Toll Free in France: 0800 466 342
e-mail: sales@omega.fr

Germany/Austria: Daimlerstrasse 26, D-75392 Deckenpfronn, Germany
TEL: +49 (0)7056 9398-0 FAX: +49 (0)7056 9398-29
Toll Free in Germany: 0800 639 7678
e-mail: info@omega.de

United Kingdom: ISO 9002 Certified
One Omega Drive, River Bend Technology Centre
Northbank, Irlam, Manchester
M44 5BD United Kingdom
TEL: +44 (0)161 777 6611 FAX: +44 (0)161 777 6622
Toll Free in United Kingdom: 0800-488-488
e-mail: sales@omega.co.uk

CONTENTS

1. MODEL CONFIGURATION

Model	Description
DPF718**(*)-(***)-(****)-(*****)**	FLOW TOTALIZER 1/4 DIN
DPF728**(*)-(***)-(****)-(*****)**	FLOW TOTALIZER 1/4 DIN, with Light Bar
DPF738**(*)-(***)-(****)-(*****)**	FLOW TOTALIZER 1/8 DIN VERT
DPF748**(*)-(***)-(****)-(*****)**	FLOW TOTALIZER 1/8 DIN HORIZ
DPF818**(**)-(***)-(****)-(*****)**	FLOW TOTALIZER 1/4 DIN, with Temperature or Pressure compensation
DPF828**(**)-(***)-(****)-(*****)**	FLOW TOTALIZER 1/4 DIN, with Light Bar, with Temperature or Pressure compensation
DPF838**(**)-(***)-(****)-(*****)**	FLOW TOTALIZER 1/8 DIN VERT, with Temperature or Pressure compensation
DPF848**(**)-(***)-(****)-(*****)**	FLOW TOTALIZER 1/8 DIN HORIZ, with Temperature or Pressure compensation

***** *Specify input code from Flow Input Options table below*

****** *Specify input code (For Temperature or Pressure Compensation) from Flow Input Options table below*

******* *Specify batch control code from Batch Output Options table below*

******** *Specify alarm code from Alarm Options table below*

********* *Low voltage power supply option (-LV)*

Flow Input Option (*)

Option Type	*Flow Input Options*
For frequency signal flow sensor, with12VDC/50mA power supply	-F
For 0-5V/1-5V voltage signal flow sensor, with 12VDC/50mA power supply	-V
For 4-20mA/0-20mA current signal flow sensor, with 12VDC/50mA power supply	-C

Flow Input Option (**) *(For Temperature or Pressure Compensation)*

Option Type (For Temperature or Pressure Compensation)		Input Option
Temp. and Pressure Input:	Flow Input	
Dual input available, suit for two-wire re-transmitter	For frequency signal flow sensor, with12VDC/50mA power supply	-FC
	For 0-5V/1-5V voltage signal flow sensor, with 12VDC/50mA power supply	-VC
	For 4-20mA/0-20mA current signal flow sensor, with 12VDC/50mA power supply	-CC
Thermocouple, RTD or mV signal input; or 0-5V or 1-5V pressure sensor	For frequency signal flow sensor, with12VDC/50mA power supply	-FT
	For 0-5V/1-5V voltage signal flow sensor, with 12VDC/50mA power supply	-VT
	For 4-20mA/0-20mA current signal flow sensor, with 12VDC/50mA power supply	-CT

Batch Output Option (***)

Option Type	Output
Relay	-R1
DC SSR driver	-DC1

Alarm Options (****)

Option Type	Alarm Output
Relay	-R2
DC SSR driver	-DC2

Low voltage power supply option (*****)

Option Type	
24V AC/DC, 50/60 Hz	-LV
100~240VAC, 50/60Hz	Blank

2. TECHNICAL SPECIFICATION

Frequency units:	Hz
Temperature units:	℃
Pressure units:	MPa

Accumulation time:

Fixed at 1 hour for flow accumulation, and the unit can be freely set for batch control.

Momentary flow unit:

Different units can be set, like M^3/hour, kg/hour, ton/hour. The decimal point can be freely set.

Accumulation flow unit:

The unit and resolution is the same as momentary flow

Flow input type:

Frequency :	0-3200Hz, the low level signal is 0-1V, the high level signal is 3-24V Voltage
Voltage:	1-5V, 0-5V
Current and two wire re-transmitter	4-20mA, 0-20mA, 0-10mA

Temperature input type:

Thermocouple	K (0-999℃), E (0-800℃), J (0-999℃)
RTD	Pt100 (-200 ~ +600℃)
Voltage	0-20mV, 20-100mV, 0-100mV, 0-1V, 0.2-1V
Current	4-20mA, 0-20Ma
Two-wire re-transmitter	Directly connect to two wire re-transmitter.

Pressure input type:

Voltage :	1-5V, 0-5V
Current	4-20mA, 4-20mA
Two-wire re-transmitter	Directly connect to two wire re-transmitter.

Measurement accuracy:

±0.2% FS, for temperature 、pressure 、frequency 、momentary flow without temperature- pressure compensation.

Temperature drift:

≤0.01%FS /℃ (typical value is 50ppm/℃)

Momentary flow retransmission accuracy:

14 bit output resolution and 0.2%FS

Temperature/pressure compensation method (For DPF818,DPF828,DPF838,DPF848 only):

General gas:	Temperature- pressure compensation (Calculate by equation for ideal gases)
Saturated steam:	Temperature compensation (Refer to table , temperature range:100℃-276℃)
Saturated steam:	Pressure compensation (Refer to table , absolute pressure range: 0.1-3.2Mpa)
Superheated steam:	Temperature- pressure compensation (Refer to table , temperature range: 150℃-590℃ pressure range: 0.1-22Mpa)
General liquid:	Only use temperature compensation, PA is compensation factor.

Calculation accuracy for temperature- pressure compensation:

The calculation error is less than 0.3% FS, and after compensation, the overall error is less than 0.5% FS.

Accumulation accuracy:

The error is less than 0.01%FS (just the frequency error produced by crystal oscillator).

Electromagnetic compatibility (EMC) :

±4KV/5KHz according to IEC61000-4-4; 4KV according to IEC61000-4-5

Isolation withstanding voltage:

Between power, relay contact or signal terminal ≥2300VDC; between isolated electroweak terminals ≥600VDC

Power supply :

100 ～ 240VAC, -15%, +10% / 50-60Hz; 120 ～ 240VDC; or 24VDC/AC, 15%, +10%.

Power consumption:

≤5W

Operating Ambient :

Temperature -10～60℃; Humidity ≤90%RH

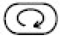
3. PARAMETERS AND SETTINGS

3.1 Parameter Lock (Loc) and Field Parameters

In order to protect important parameters from being modified by mistake, but also offer enough flexibility for field control, parameter lock (Loc) and field parameters are introduced.

The parameters need to be displayed and modified in the work field are called Field Parameters. The set of field parameters is a subset of the full parameter set, and can be freely chosen by the user . User can select up to 8 filed parameters through parameter EP1～EP8.

Loc can authorize different security privilege. For details, please read the description of parameter “Loc” in the full parameter table.

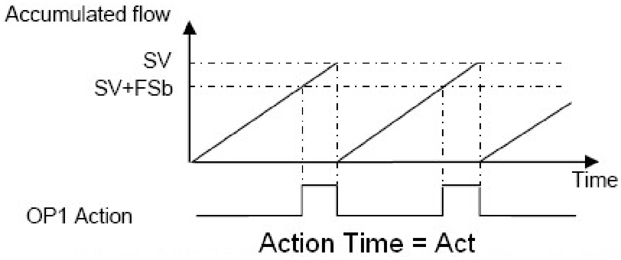
Setting Loc=808, and then pressing  to confirm, can enter the full parameter table and modify all parameters.

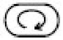
3.2 The Full Parameter Table

Code	Name	Description	Setting Range
FHIA	High limit alarm for momentary flow	Alarm is triggered when momentary flow >FHIA; alarm is released when momentary flow <FHIAF-FdF; Alarm action output can be defined by parameter ALP.	0 ～9999 units
FLoA	Low limit alarm for momentary flow	Alarm triggered when momentary flow<FLoA; alarm released when momentary flow>FLoA+FdF	
FdF	Alarm hysteresis for momentary flow	Avoid frequent alarm on-off action because of the fluctuation of PV	0 ～ 9999 units
CHIA	High limit alarm for temperature	Alarm is triggered when temperature >CHIA; alarm is released when temperature <CHIAF-1.0℃;	-199.9 ～ 999.9℃
CLoA	Low limit alarm for temperature	Alarm triggered when temperature <CLoA; alarm released when temperature >CLoA+1.0 ℃	

PHIA	High limit alarm for pressure	Alarm is triggered when pressure >PHIA; alarm is released when pressure <PHIAF-0.010MPa;	1.999 ～ 30.00MPa
PLoA	Low limit alarm for pressure	Alarm triggered when pressure <PLoA; alarm released when pressure > PLoA+0.010MPa	
ALP	Alarm output allocation	ALP defines the alarm output allocation. Its value is calculated as below: ALP=Ax1+Bx2+Cx4+Dx8+Ex16+Fx32 A=0, FHIA alarm triggers AL1 relay; A=1, FHIA triggers AL2. B=0, FLoA alarm triggers AL1 relay; B=1, FLoA triggers AL2. C=0, CHIA alarm triggers AL1 relay; C=1, CHIA triggers AL2. D=0, CLoA alarm triggers AL1 relay; D=1, CLoA triggers AL2. E=0, PHIA alarm triggers AL1 relay; E=1, PHIA triggers AL2. F=0, PLoA alarm triggers AL1 relay; F=1, PLoA triggers AL2.	0～63

Act	Relay action time for batch control	Act=0, batch control function is disabled, and the instrument is only used for flow accumulation. Act=1-254, when the flow accumulation for batch control gets to SV+FSb (setpoint+offset), OP1 relay (the relay installed in OUTP socket) will be triggered. Parameter “Act” determines the latching time of the relay, the unit of which is 0.48s. After the latching time passed, OP1 relay will be released, the accumulator for batch control will be reset to zero, and the accumulation start again. You can set parameter FSb to make it equal to the flow accumulation value during the relay latching time, this will make the actual flow accumulation equal to setpoint value SV.	0～255(x 0.48s)



When Act=255, the relay latching time is infinitely long, then after the action of batch control relay OP1 is triggered, it will not terminate or reset automatically. At this time, you can terminate or reset the batch control action, i.e., release the OP1 relay and start the next batch control, by pressing  key or triggering an external discrete input signal.

FSb	Batch control offset	When the instrument is used for batch control, the relay's actual action point is "SV+FSb". "FSb" is usually set to be a negative value. For example, if there is a 5 units of flow during the relay switching time, you can set FSb=-5 to make the actual control value equal to SV value. That is to say, if SV=1000, then when the 4 digits flow accumulation value reach 995, AL2 relay is triggered immediately, and make the actual control value just equal to 1000.	-1999 ～ +9999

SPE	Accumulation rate for batch control	When the instrument is used for flow accumulator, the time unit in accumulation rate is fixed, i.e., the time unit is 1 hour. When the instrument is used for batch control, you can modify parameter "SPE" to change the accumulation rate time. The formula is as the following: Accumulation rate time= SPE x0.48 (seconds) Normal setting is like the following: SPE=7500, represents that the time unit of the accumulation rate is 1 hour. SPE=750, represents that the time unit is 0.1 hour. SPE=125, represents that the time unit is 1 minute. In order to get good control accuracy, you can properly set parameter SPE according to the action period of batch control. For example, provided that the momentary flow keep 100.0 unchanged, the flow accumulation value will increase by 100.0 after 1 hour if you set the accumulation rate time to be 1 hour (SPE=7500), and the flow accumulation value will increase by 100.0 after 1 minute if you set the accumulation rate time to be 1 minute (SPE=125). The smaller the parameter SPE, the faster the flow is accumulated.	25～7500 (x0.48s)

<table>
<tr>
<td>Sn</td>
<td>Input Specification
(temperature / pressure
/ flow)</td>
<td>
This table is for DPF718,DP728, DPF738 and DPF748 only
<table>
<tr><td>Flow Input Option Code (*)</td><td>SN</td></tr>
<tr><td>-F (Frequency)</td><td>0</td></tr>
<tr><td>-V (0~5V / 1~5V)</td><td>1</td></tr>
<tr><td>-C (0~20mA / 4~20mA)</td><td>2</td></tr>
</table>

The following table is for (DPF818,DP828, DPF838 and DPF8480) only
For Temperature / Pressure Compensation type. The hundred’s place (SN_3) 、ten’s place (SN_2) and unit’s place (SN_1) of parameter. Sn represents the signal input specification for temperature 、pressure and flow respectively.

SN ---- [Temp.] [Pressure] [Flow]
| | |
| | |
| | Sn_1=0, Flow input signal is pulse frequency.
</td>
<td>0～999</td>
</tr>
</table>

<table>
<tr><td></td><td></td><td>|　　|　　Sn_1=1, Flow input signal is 0-5V/0-20mA.
|　　|　　Sn_1=2, Flow input signal is 1-5V/4-20mA.
|　　|
|　　|
|　　Sn_2=0, no pressure signal input.
|　　Sn_2=1, Pressure signal is 0-5V, at terminals 17+, 18-.
|　　　　(For FT, VT and CT input option only).
|　　Sn_2=2, Pressure signal is 1-5V, at terminals 17+, 18-.
|　　　　(For FT, VT and CT input option only).
|　　Sn_2=3, Pressure signal is 4~20mA or two wires transmitter.
|　　　　(For FC, VC and CC input option only).
|
|
Sn_3=0, no temperature signal input.
Sn_3=1, K type thermocouple (For FT, VT and CT input option only).</td><td></td></tr>
</table>

		Sn_3=2, E type thermocouple (For FT, VT and CT input option only). Sn_3=3, J type thermocouple (For FT, VT and CT input option only). Sn_3=4, N type thermocouple (For FT, VT and CT input option only). Sn_3=5, Cu 50 (For FT, VT and CT input option only). Sn_3=6, Pt100 (For FT, VT and CT input option only). Sn_3=7, Temperature signal input is 0～1V at terminals 19+, 18- (For FT, VT and CT input option only). Sn_3=8, Temperature signal input is 0.2～1V, at terminals 19+, 18- (For FT, VT and CT input option only). Sn_3=9, Temperature signal is 4~20mA or two wires transmitter. (For FC, VC and CC input option only). For Example: The temperature-pressure compensation is needed and the temperature sensor type is Pt100, the pressure input signal is 1～5V, the high scale of frequency input. Sn= 620	

CdIP	Temperature point position	It only works for customized compensation method. CdIP=0, the temperature display format is 0000; CdIP=1, the temperature display format is 000.0; CdIP=2, the temperature display format is 00.00; CdIP=3, the temperature display format is 0.000.	0～3
Co	Reference working temperature of the flow sensor	Parameter Co is used to set the reference working temperature of the flow sensor. If Sn-3=0 is set, and parameter bC is set to have temperature compensation, at this time, the system will assume that the temperature is fixed at Co for compensation calculation.	-199.9 ～ +999.9℃
CdIH	Temperature range	When the temperature input is a linear voltage or current signal such as 0.2-1V 、0-1V 、4-20mA and 0-10mA, this parameter is used to define the measurement range of temperature transmitter (the maximum temperature minus the minimum temperature). The low scale of temperature transmitter is defined by parameter “CSc”.	0～999.9℃

CSc	Temperature input offset / Temperature lower limit	When temperature input is RTD or thermocouple, parameter CSc is used to make input shift to compensate the error produced by sensor itself. Fox example, provided input signal keep unchanged, if when parameter "CSc" is set to 0.0 , the temperature measurement of the instrument is ℃ 101.0 , then when parameter "Sc" is set to ℃ -1.0℃, the temperature measurement display will be 100.0℃ When the temperature input is a linear voltage or current signal, parameter CSc is used to define the low scale of temperature transmitter. Fox example, if the measurement range of a temperature transmitter is 0-400℃, then you can set like the following: CSc=0.0, CdIH=400.0; if the measurement range of a temperature transmitter is 100-400℃, then you can set CSc=100.0 and CdIH=300.0	-199.9 ～ 999.9℃

PdIP	Pressure point position	It only works for customized compensation method. PdIP=0, the pressure display format is XXXX; PdIP=1, the pressure display format is XXX.X; PdIP=2, the pressure display format is XX.XX; PdIP=3, the pressure display format is X.XXX.	0～3
Po	Reference working pressure	This is gauge pressure. For absolute pressure, you should add 0.1013Mpa. When the set value is larger than 9.999Mpa, the display resolution will change from 0.001Mpa to 0.01Mpa automatically.	0 ～ 30.000MPa

PA	Atmospheric pressure at the instrument site / temperature compensation factor	If pressure compensation is needed, PA represents the atmospheric pressure at the instrument site. The unit is Mpa. The atmospheric pressure above sea level is set to be 0.101Mpa. If the temperature transmitter has a zero shift error, you can also use this parameter to make a input correction. When bC=5, the instrument has temperature compensation only. This case suits for general liquid measurement which need temperature compensation. At this time, PA represents temperature compensation factor. The setting range is from –1.999 to +9.999, and the unit is %/℃. The instrument compensation density formula is as the following: $\rho B / \rho o = 1 + PA \times (C - Co) / 100$ ρB is the density after compensation, ρo is the density at reference temperature of Co, C is the actual temperature of liquid, Co is the reference temperature.	0～1.000MPa or %/℃

PdIH	Range of pressure input	When the flow input is frequency signal, the pressure input can be 0-5V 、1-5V 、0-10mA or 4-20mA. When the set value is larger than 9.999Mpa, the display resolution will change from 0.001Mpa to 0.01Mpa automatically.	0 ～ 30.000MPa
PSc	Scale low limit of pressure input	Generally, it is set to 0. Or according to sensor measurement range to set.	-1999 ～ 9999MPa
Cut	The cut off ratio for small flow signal	For linear input: Cut=0.0～50.0%, if flow input is less than range multiply cut off ratio (FdIH x Cut), then the flow input is ignored or set to be zero. For frequency input: Cut=0.0～50.0Hz, if flow input is less than “Cut”, then the flow input is ignored or set to be zero.	0～50.0% Or 0～50Hz
Frd	Scale high limit of frequency input	It represents the scale high limit of frequency input (range), and is used to calculate the flow range for frequency input. You can set it to be a value which is a little larger than the maximum frequency in actual use.	5～3200Hz

FdIP	Decimal point place for flow display	FdIP=0, the flow display is like XXXX FdIP=1, the flow display is like XXX.X FdIP=2, the flow display is like XX.XX FdIP=3, the flow display is like X.XXX When the instrument is used for temperature-pressure compensation, the flow display value will exceed 9999, at this time, the decimal point place will move to right by 1 digit automatically. When the flow display is like XXXX (FdIP=0), and if the flow display value exceeds 9999, then the display mode will change to XX.XX because it is impossible for the decimal point place to move to right by 1 digit. Therefore in the application where the flow display value will exceed 9999, you had better set FdIP=3 to make the flow display be like X.XXX, and the unit can be changed from Kg to Ton or from Ton to Kton.	0～3

FdIH	Flow input range	FdIH represents the momentary flow value when the input voltage or current is at the maximum value, or the input frequency equals to the range high limit Frd. It is the range of flow transmitter. It is provided that the pressure and temperature equals to reference working pressure Po and reference working temperature Co respectively. For detail calculation of FdIH, please refer to latter description.	10 ～ 9999 flow units
FSc	Input shift for momentary flow	It is used to make input shift to compensate the error produced by sensor itself. The Input shift value equals to FSc x 0.005%. This parameter is only used to make input shift for analog flow input, it takes no action for frequency input.	-1000 ～ 2000 (x 0.005% of range)
FdL	Digital filter strength for flow signal	It is used to set the digital filter strength for flow signal. When a large value is set, the flow input is stabilized but the responsibility at the time is deteriorated. In the application where there is a small frequency input and the retransmission output is needed, you can properly set this parameter to make the fluctuated frequency value change into stable current retransmission output. When FdL=0, the filter function is disabled.	0～20

CF	Function selection	CF=A×1+C×4+D×8+E×16+F×32+G×64+Hx128 For frequency input, the instrument takes no square root extraction. For linear voltage or current input, parameter CF.A is used to define square root extraction like the following: A=0, there is no square root extraction for linear input signal and temperature-pressure compensation density ratio. A=1, the instrument takes square root extraction for linear input signal and temperature-pressure compensation density ratio. You should set like this for differential transmitter. But for frequency input, this setting takes no effect. A=2, there is no square root extraction for input signal, but the instrument takes square root extraction for temperature-pressure compensation density ratio. No matter what types of input, linear voltage/current or frequency, this setting takes effect. C=0, the accumulation continues when the flow input is over range. C=1, the accumulation stops when the flow input is over range. D=0, the display mode 3 、4 and 5 will switch back to mode 2A and 2B automatically after 30	0～255

		seconds. D=1, there is no automatic switching back, so the instrument can keep displaying temperature or pressure. E=0, For batch control, OP1 relay contact is normal open. When the flow accumulation value is greater than the setpoint, the relay contact will be closed. E=1, For batch control, OP1 relay contact is normal close. When the flow accumulation value is greater than the setpoint, the relay contact will be open. F=0, communication protocol is version V5.X. F=1, communication protocol is version V6.0. G=0, The flow input is linear input signal. G=1, With flow meters the relationship between the flow rate and the output signal may deviate from an ideal curve –linear or squared. The instrument is able to compensate for this deviation with an additional non-linear table (see latter text for details). H=0, display the frequency or flow before temperature-pressure compensation. H=1, no display the frequency or flow before temperature-pressure compensation.	

bC	Temperature-pressure compensation mode	bC=0, no compensation. bC=1, temperature-pressure compensation for common air (calculation with equation for ideal gases). bC=2, temperature compensation for saturated steam (Refer to table, temperature range: 100℃～276℃). bC=3, pressure compensation for saturated steam (Refer to table, absolute pressure range: 0.1～3.2Mpa). bC=4, temperature-pressure compensation for superheated steam (Refer to table, 150℃～590℃, 0.1～22Mpa). bC=5, temperature compensation for common liquid, PA is compensation factor. bC=6, use temperature difference to calculate heat, it equals to the temperature difference times the flow value. bC=8, for common air with saturated vapor. Temperature- pressure compensation, deduct vapor by looking up the table according to temperature. Other settings beyond 6 are used for special compensation calculation.	0～9999

FoH	Flow range for retransmission output	It is momentary flow range for retransmission output. For example, if you set like: FoH=5000, IoL=40, IoH=200, then when the momentary flow value is great than or equals to 5000, the retransmission output current is 20mA, and when the momentary flow value equals to 0, the retransmission output current is 4mA.	10～9999 flow unit
IoL	Low scale for retransmission output current	It is used to define the low scale for retransmission output current. If a retransmission output of 0-10mA is needed, you can set IoL=0. If a retransmission output of 4-20mA is needed, you can set IoL=40.	0～60 (x 0.1mA)
IoH	High scale for retransmission output current	It is used to define the high scale for retransmission output current. If a retransmission output of 0-10mA is needed, you can set IoH=100. If a retransmission output of 4-20mA is needed, you can set IoH=200.	0～220 (x 0.1mA)
Addr	Communication address	In the same communication line, different instrument should be set to different address.	0～100
bAud	Communication baud rate	The instrument can communicate with host computer. It is recommended to be 9600.	0～19200

CLn	Zero reset counter	When the instrument is used as flow accumulator, each time you make zero reset operation from key pad or when the 8 digits accumulator exceeds 99999999, the accumulation value will be reset to zero, and parameter CLn will increase by 1. Parameter CLn is for display only, modification by operator is impossible. When the instrument is used for batch control, not matter that the 4 digits batch accumulator is zero reset manually or automatically, parameter CLn will not change. Only when the 8 digits total acculator combined by FLJH and FLJL exceeds 99999999, parameter CLn will increase by 1. Therefore CLn 、FLJH and FLJL can be combined together to be a 12 digits accumulator. When CLn exceeds 9999, it will reset to zero automatically.	0～9999
FLJH	The most significant 4 digits of flow accumulator	It is the most significant 4 digits of the 8 digits flow accumulator. Parameter FLJH is for display only, cannot be modified by operator.	0～9999

FLJL	The least significant 4 digits of flow accumulator	It is the least significant 4 digits of the 8 digits flow accumulator. Parameter FLJL is for display only, modification by operator is impossible. When the instrument is used for batch control, you can get total flow accumulation value by reading parameter CLn 、FLJH and FLJL. Since this parameter is updated every 3 minutes, so the reading accumulation value maybe less than the real accumulation value.	0～9999
Loc	Parameter lock	Loc=0, modification of field parameters is allowed, and zero reset operation for flow accumulation from key pad is also allowed. Loc=1, modification of field parameters is allowed, but zero reset operation for flow accumulation from key pad is not allowed. Loc=2, modification of field parameters is not allowed, but zero reset operation for flow accumulation from key pad is allowed. Loc=3, modification of field parameters is not allowed, and zero reset operation for flow accumulation from key pad is not allowed either. Loc=808, modification of all parameters is allowed, and zero reset operation for flow accumulation from key pad is also allowed. If parameter set is locked, setting Loc=808 can	0～9999

		unlock temperately. After the temperate parameter changing, Loc will reset to zero again. Now you can set Loc to 808 again to unlock permanently.	
EP1～ EP8	Field parameter definition	1 to 8 field parameters can be defined by parameters EP1to EP8. If the number of the field parameters is less than 8, the first idle EP parameter should be set to “nonE”. You can define field parameters and Loc to change operation style. For example, user often modify the parameters FHIA and CHIA, Then the EP paramters and Loc should be set as below: Loc=0, EP1=FHIA, EP2=CHIA, EP3=none	nonE and all parameter codes

Compensated with an additional linearization table

With flow meters the relationship between the flow rate and the output signal may deviate from an ideal curve –linear or squared. The instrument is able to compensate for this deviation with an additional linearization.

The linearization table enables up to 60 pairs of values to be entered.

Set parameter Loc=3698, you will enter into the configuration of the linearization table (If former setting of parameter Loc is 808, at first you need to escape from the parameter setting status by setting Loc=0, and then enter into the parameter setting status again by setting Loc=3698.)

A00 function code. It is not used temporarily, and should be set to be 0.

A01 input type. For instrument, the input type is set by parameter Sn, so this parameter should be set to be 0.

A02 the low scale of input signal. The range is from –20000 to +20000.

A02= the low scale of input signal*20000/the range of amplifier. For example, if the flow input is 0-5V (the range of amplifier is 5V), and you expect to make compensation to get 1-5V input, you can set like: A02=1 x 20000/5=4000.

A03 input signal span. For example, for 1-5V input, the span is 5-1V=4V, and you can set like: A03=4 x 20000/5=16000.

A04 the span between adjacent sample points. The number of sample points=A03/A04. If only one sample point needed, then A04=A03.

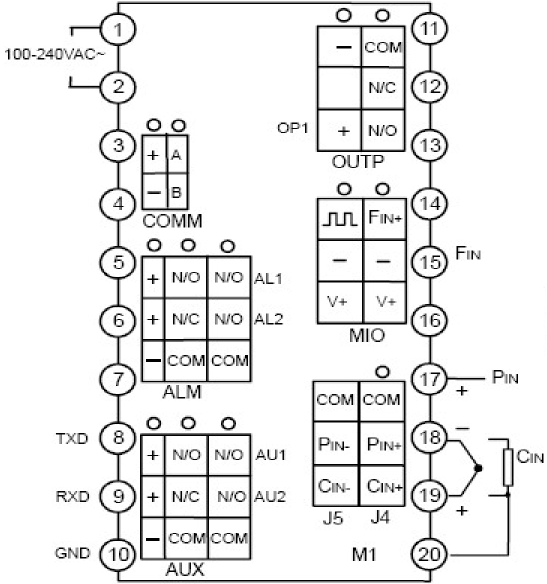
d00 the starting point of linearization table. It is the output of linearization table when the input signal is A02. You can set it to be 0.

d01 the first output point of linearization table. It is the output of linearization table when the input signal is A02+A04.

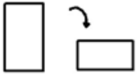
d02～d60: 2～60 output values of linearization table.

Sn-1 should be set according to the description in the parameter table. The instrument will process the input signal with offset, extraction and small signal cut function. If linearization compensation is needed, set G of parameter CF to 1, and set the above linearization compensation table.

4. WIRING AND REAR TERMINALS LAYOUT



Note: The graph suits for upright instruments with 1/4DIN or 1/16DIN Vertical



For instruments with horizontal, just clockwise rotate the graph 90 degree.

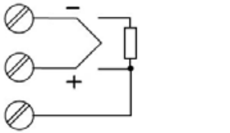
Note:

1. Fin, Cin and Pin indicate the input interface of flow, temperature and pressure.
2. 0-5V or 1-5V signal for pressure is inputted from terminals 17+ and 18-.
3. The compensation wires for different kinds of thermocouple are different, and should be directly connect to the terminals. When the internal auto compensation mode is used connecting the common wire between the compensation wire and the terminals will cause measurement error.
4. Terminal 16 “V+” indicate the positive polar of internal 24V power output.
5. For 2 wires flow retransmitter, terminal 16(+), terminal 14(-)

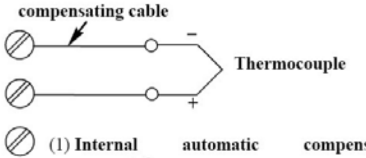
Select thermocouple reference junction compensation mode by using different wiring mode:

Reference junction compensation is needed junction for thermocouple input. Instrument supply good reference junction compensation for thermocouple input through 4 different compensation modes selective using software configuration and different external wiring.

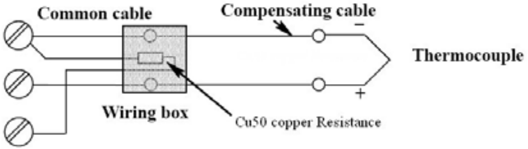
Wiring diagrams for the above compensation modes:



Corresponding wiring diagram of the instrument



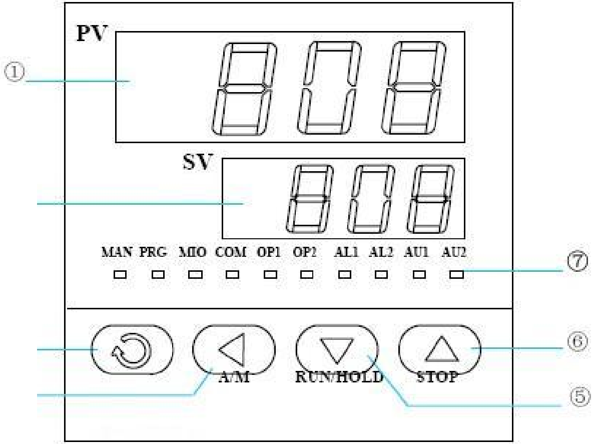
(1) **Internal automatic compensation connected**
(compensating cable directly connected to instrument's terminals)



(2) Automatic compensation mode by externally connected copper resistance
Note: wiring box should be well way from the heat generating object.

5. DISPLAYS AND OPERATIONS

5.1 Front Panel Description



① Upper display window, displays PV, parameter code, etc.

② Lower display window, displays SV, parameter value, or alarm message

③ Setup key, for accessing parameter tableland conforming parameter modification.

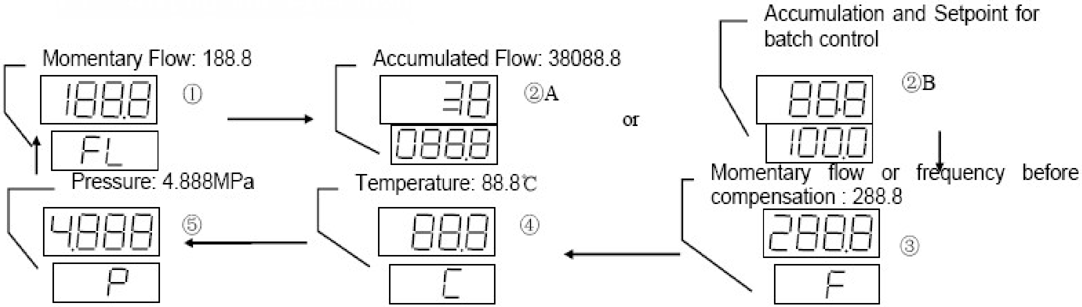
④ Data shift key

⑤ Data decrease key

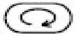
⑥ Data increase key

⑦ 10 LED indicators: MAN and PRG is non-applicable, MIO, OP1, OP2, AL1, AL2, AU1, AU2 individually indicates the input/output action of the according modules; COMM

5.2 Display and Operation



5.2.1 Display status switch

Press  key to switch between different display mode.

Mode ① (FL) : Displays monetary flow.

Mode ②A : When the instrument works for flow accumulation (parameter Act=0), display

8 digital accumulated flow.

Mode ②B : When the instrument works for batch control (parameter Act=1～255), the upper window display 4 digital accumulated flow, and the lower display window

displays ④ digit control setpoint.

Mode ③ (F) : When the flow input is voltage or current signal, it displays the momentary

flow before the compensation; when frequency signal, it displays the frequency.

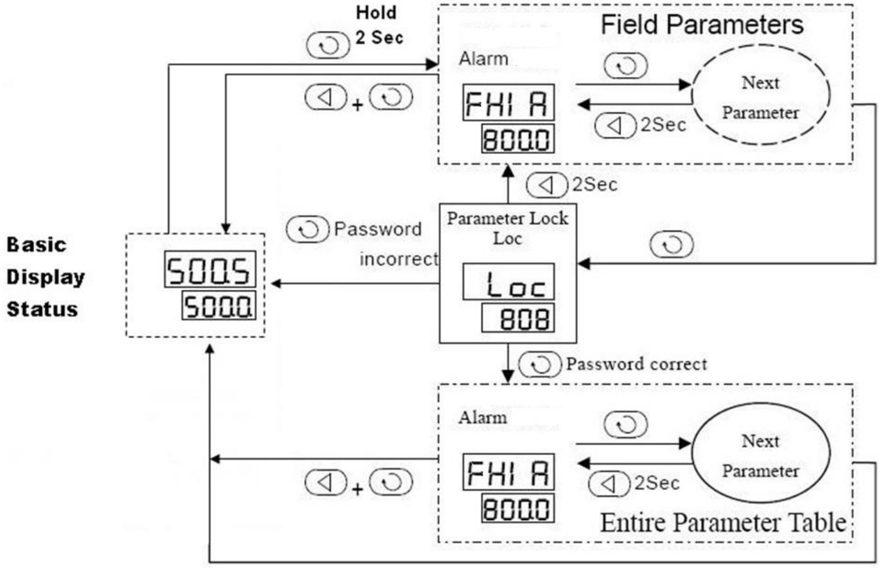
Mode ④ (C) : Displays temperature.

Mode ⑤ (P) : Displays pressure.

If automatic display switching function is set (refer to parameter CF), the display mode ①, ③, or ⑤ will automatically switch to display mode ②A or ②B after 30 seconds. If the temperature-pressure compensation function is disabled (parameter bC=0) and the flow input signal is not frequency, then the upper display window will not display the flow before compensation.

If the instrument has no temperature or pressure signal input, then the temperature or pressure will not be displayed.

5.2.2 Parameter Setting



5.2.3 Manually reset the accumulated value

When the instrument is used for flow accumulation (Act=0) and the parameter Loc=0 or 808, pressing ▲ and holding for about 2 seconds can reset the 8 digit accumulated value to zero.

After each zero reset operation, the accumulation time will be reset to zero also, and the zero reset counter Cn will increase by 1. The zero reset counter Cn recorders total zero reset times in the instrument.

When the flow accumulation value exceed 99999999, the accumulated flow will be automatically reset to zero, and Cn increases by 1.

If the accumulated value has not been manually reset, then Cn and the 8 digit accumulated value can work together as a 12 digit accumulator.

Cn and accumulated value can’t be manually modified. Cn will be automatically reset to zero after it is greater than 9999.

When the instrument works for batch control (Act=1 ～ 255), manually reset operation is disabled.

5.2.4 Power failure memory for accumulated value

The accumulated value is saved in memory, and will not be lost even when power failure.

5.3 Batch control

The instruments can work for flow accumulation and batch control. (set parameter Act=1～255).

When the instrument is used as batch control, there is a 4 digit accumulator for batch control. When the accumulated value reach the control setpoint (SV+FSb), a relay in OUTP socket will be triggered (OP1 light on). The accumulated value will be reset to zero automatically after the relay is released. The latching time of the relay can be set to any length. If it is set to infinite long, it need to release the relay from external operation. In batch control mode, the parameters CLn, FLJH and FLJL can work together as a 12 digital accumulator for calculating the total accumulated value.

When the parameter Act, the latching time for batch control relay, is set to 255, it means the time is infinite long, and after the relay is triggered, it will not be automatically released. At this situation, pressing key can release the relay, and make it available for next control action.

In mode 2B, pressing ◄ 、▲ or ▼can modify batch control setpoint SV.

6. CONFIGURATION EXAMPLES

To decide the reference pressure Po or the reference temperature Co, you should select the most commonly used pressure or temperature (or the highest pressure or temperature from re-transmissier) to avoid too big compensation factor (density ratio). If the flow value after compensation is too small, the resolution will be low and the error will be increased. If the flow value after compensation is greater than 25000, overflow will take place.

When the instrument is specially used for flow accumulation, the time unit for momentary flow must be “hour” to assure that the accumulated flow and the momentary flow have the same engineering unit. When the instrument is used for batch control, you can set parameter “SPE” to change the time unit. The numerical value of parameter “FdIH” (ignoring the decimal point) should be between 500 and 9999. You had better set it to be a four-digit number to guarantee good resolution and precision. At the same time, you should make sure that the momentary flow after compensation be less than 25000, otherwise overflow will take place and the excess will be ignored.

When decide on the decimal point place (parameter “FdIP”), you should keep in mind that is described as below:

When the instrument is used for temperature-pressure compensation, the flow display value maybe exceed 9999, at this time, the decimal point place will move to right by 1 digit automatically. So, if the flow display is like XXXX (FdIP=0), and the flow value exceeds 9999, then the display mode will change to XX.XX, because it is impossible for the decimal point place to move to right by 1 digit.

Therefore the application for flow display, you had better set FdIP=3 to make the flow display be like X.XXX, and the unit can be changed from Kg to Ton or from Ton to Kton.

Example 1:

Use a vortex flow transmitter to measure the flow of saturated steam, temperature compensation is needed and the temperature sensor type is Pt100, the flow factor (K) of the transmitter is 3200, and the reference temperature is 200℃ (if the flow transmitter supplier doesn't provide a reference temperature, you can use the most commonly used temperature as a reference temperature). By looking up table, you can get that the liquid density ρo =7.864Kg/M^3 when the reference temperature is 200℃. The required range of accumulated flow at the reference temperature is 2T/h . The time unit for the momentary flow is "hour", and you can set like below (t=3600):

Sn=600 (temperature input type is Pt100, no pressure, flow input signal is frequency)

Co=200.0℃

Frd=flow range x K / (ρo x t) = 2000 x 3200 / (3600 x 7.864) = 226.07 (Hz)

Since Frd should be an integer, and also some extra space should be saved to the flow range, Frd can be set to 190.

FdIH= t×Frd×ρo /K=3600×190×7.864/3200=1680.93 (Kg/h)=1.681 (T/h)

FdIP=3

bC=2 (saturated steam, temperature compensation)

Example 2:

A vortex flow transmitter is used to measure the mass flow or standard volumetric flow of compressed air. The temperature-pressure compensation is needed and the temperature sensor type is Pt100, the pressure input signal is 1～5V, the high scale of frequency input (Frd) from the transmitter is 300Hz, the flow factor (K) of the transmitter is 2000, the reference temperature is 50 ℃, and the reference pressure is 1Mpa (if the flow transmitter supplier doesn't provide a reference pressure, you can use the most commonly used pressure or the high limit scale as a reference temperature). By calculation, you can get that the liquid density ρo at the reference temperature and pressure is 11.882Kg/ m^3. The absolute pressure of air equals to the reference pressure plus 0.1013Mpa, i.e., 1.1013Mpa. At standard condition (0℃ and 1 standard atmosphere) the air density ρs is 1.293Kg/ m^3. You can set like below:

Sn=620

Co=50.0 (℃)

Po=1.000 (MPa)

PA=0.101 (MPa)

Frd=300 (Hz)

bC=1 (temperature-pressure compensation for common air, calculation with equation for ideal gases)

If it is needed to display and accumulate mass flow, you can set FdIH and dIP like below:

FdIH= (3600×Frd×ρo) / K = 3600×300×11.882/2000=6416Kg/h=6.416（T/h）

FdIP=3

If it is needed to display and accumulate standard volumetric flow, you can set FdIH and dIP like below:

FdIH=6416/ρs=6416/1.293=4962（m^3/h）,FdIP=0

If the momentary flow after compensation may exceed 9999, it is recommended to set like below:

FdIH=4.962（K m^3/h ），FdIP=3

Example 3:

Use orifice plate to measure flow of superheated steam, with differential pressure input, temperature-pressure compensation is needed. When the pressure is 5Mpa and the temperature is 400℃, the maximum momentary flow is 100T/h (input voltage is 5V). You can set like below:

Co=500（℃）; Po=5.000（MPa）

PA=0.101（MPa）

FdIH=100.0（T/h）

FdIP=1（the decimal point is at ten’s place）

bC=4 (superheated steam).

7. CALCULATION PRINCIPLE OF THE INSTRUMENT

7.1 Calculation procedure of flow compensation

Step 1:

Get the flow F before compensation at first

F=V×FdIH + FSc for voltage/current input

Or

F=f×FdIH/Frd + FSc for frequency or pulse input

Among which:

V is voltage or current signal input, the numerical value is 0-100%. Before used for calculation, V is processed by the functions of small signal cut off and square root/no square root according to the settings of parameter Cut and CF.

f is frequency signal input. The unit is Hz. Before used for calculation, signal preprocessing like small signal cut off is done on f according to the setting of parameter Cut.

F get from above formula is the flow at reference pressure Po and reference temperature Co.

Step 2:

Get temperature-pressure compensation density ratio ρB/ρo according to the setting of parameter bC. If the compensation need to look up table (for example, saturated steam and superheated steam), you can get the actual density ρB by looking up table using actual temperature C and actual pressure P, and you can also get the reference density ρo by looking up table using reference temperature Co and reference pressure Po. Then you can get temperature-pressure compensation density ratio ρB/ρo.

Step 3:

Get compensated flow FB

FB=F × ρB / ρo if no square root is need for temperature-pressure compensation density ratio.

FB=F× $\sqrt{\rho_B / \rho}$ if square root is need for temperature-pressure compensation density ratio.

7.2 Relevant compensation formula and table:

7.2.1 Temperature-pressure compensation for common air

When bC=1, the instrument make compensation for common air using the equation for ideal gases. The formula is below:

$\rho B / \rho o = (P+PA) \times (Co+273.2) / ((Po+0.1013) \times (C+273.2))$

Among which:

ρB is the actual density after temperature-pressure compensation.

ρo is reference density at reference temperature Co and reference pressure Po.

P is actual pressure (gauge pressure).

C is actual temperature (℃).

PA is atmosphere pressure at factory site, 0.1013 MPa is one standard air pressure.

7.2.2 Temperature compensation for common liquid

No compensation is needed for liquid. To get high precision, temperature compensation can be taken (bC=5). PA is temperature compensation factor, the range is from –1.999 to +9.999, the unit is %/℃. The formula is below:

$$\rho B / \rho o = 1 + PA \times (C - Co) / 100$$

Among which:

ρB is the actual density.

ρo is reference density at reference temperature Co.

C is actual temperature (℃).

Co is reference temperature.

7.2.3 Compensation for saturated steam and superheated steam

For steam, the compensation calculation by looking up table has a higher precision. You can look up relevant material for the relationship between steam density and temperature & pressure.

8. SYMBOL DESCRIPTIONS

Symbol	Description
orAL	Input specification setting is incorrect Or Input wiring is disconnected/ thermocouple problem Or Short circuited
EErr	IC Software error
8888	IC Software error

MADE IN USA

WARRANTY/DISCLAIMER

OMEGA ENGINEERING, INC. warrants this unit to be free of defects in materials and workmanship for a period of **25 months** from date of purchase. OMEGA's WARRANTY adds an additional one (1) month grace period to the normal **two (2) year product warranty** to cover handling and shipping time. This ensures that OMEGA's customers receive maximum coverage on each product.

If the unit malfunctions, it must be returned to the factory for evaluation. OMEGA's Customer Service Department will issue an Authorized Return (AR) number immediately upon phone or written request. Upon examination by OMEGA, if the unit is found to be defective, it will be repaired or replaced at no charge. OMEGA's WARRANTY does not apply to defects resulting from any action of the purchaser, including but not limited to mishandling, improper interfacing, operation outside of design limits, improper repair, or unauthorized modification. This WARRANTY is VOID if the unit shows evidence of having been tampered with or shows evidence of having been damaged as a result of excessive corrosion; or current, heat, moisture or vibration; improper specification; misapplication; misuse or other operating conditions outside of OMEGA's control. Components in which wear is not warranted, include but are not limited to contact points, fuses, and triacs.

OMEGA is pleased to offer suggestions on the use of its various products. However, OMEGA neither assumes responsibility for any omissions or errors nor assumes liability for any damages that result from the use of its products in accordance with information provided by OMEGA, either verbal or written. OMEGA warrants only that the parts manufactured by the company will be as specified and free of defects. OMEGA MAKES NO OTHER WARRANTIES OR REPRESENTATIONS OF ANY KIND WHATSOEVER, EXPRESSED OR IMPLIED, EXCEPT THAT OF TITLE, AND ALL IMPLIED WARRANTIES INCLUDING ANY WARRANTY OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED. LIMITATION OF LIABILITY: The remedies of purchaser set forth herein are exclusive, and the total liability of OMEGA with respect to this order, whether based on contract, warranty, negligence, indemnification, strict liability or otherwise, shall not exceed the purchase price of the component upon which liability is based. In no event shall OMEGA be liable for consequential, incidental or special damages.

CONDITIONS: Equipment sold by OMEGA is not intended to be used, nor shall it be used: (1) as a "Basic Component" under 10 CFR 21 (NRC), used in or with any nuclear installation or activity; or (2) in medical applications or used on humans. Should any Product(s) be used in or with any nuclear installation or activity, medical application, used on humans, or misused in any way, OMEGA assumes no responsibility as set forth in our basic WARRANTY/DISCLAIMER language, and, additionally, purchaser will indemnify OMEGA and hold OMEGA harmless from any liability or damage whatsoever arising out of the use of the Product(s) in such a manner.

RETURN REQUESTS/INQUIRIES

Direct all warranty and repair requests/inquiries to the OMEGA Customer Service Department. BEFORE RETURNING ANY PRODUCT(S) TO OMEGA, PURCHASER MUST OBTAIN AN AUTHORIZED RETURN (AR) NUMBER FROM OMEGA'S CUSTOMER SERVICE DEPARTMENT (IN ORDER TO AVOID PROCESSING DELAYS). The assigned AR number should then be marked on the outside of the return package and on any correspondence.

The purchaser is responsible for shipping charges, freight, insurance and proper packaging to prevent breakage in transit.

FOR **WARRANTY** RETURNS, please have the following information available BEFORE contacting OMEGA:

1. Purchase Order 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, consult OMEGA for current repair charges. Have the following information available BEFORE contacting OMEGA:

1. Purchase Order number to cover the COST of the repair,
2. Model and serial number of the product, and
3. Repair instructions and/or specific problems relative to the product.

OMEGA's policy is to make running changes, not model changes, whenever an improvement is possible. This affords our customers the latest in technology and engineering.

OMEGA is a registered trademark of OMEGA ENGINEERING, INC.

M-4547/0607