GE Panametrics

PanaFlow™

Meter System

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Process Control Instruments

PanaFlow™ Meter System

User's Manual *910-258A*

GE Panametrics

Table of Contents

Chapter 1: General Information

Introduction 1-1
Basic Features 1-1
Model Identification 1-2
Typical 1-Path, Block PanaFlow System 1-2
Typical 1-Path, Welded PanaFlow System 1-3
Typical 2-Path, Welded PanaFlow System 1-3
Model Numbers. 1-4
Transducer Options 1-6

Chapter 2: Installation

Introduction 2-1
Selecting the Site 2-1
Installing the PanaFlow Meter System 2-3
Mounting the Electronics. 2-3
Installing Optional Transmitters 2-4
Wiring the System 2-4
Local Electronics. 2-4
Remote Electronics 2-5
Programming the Electronics 2-5

Chapter 3: Typical Dimensional Drawings

Dimensions and Weights 3-1
Model LFA1 3-3
Model LFA2 3-4
Model LFA3 3-5
Model LFA4 3-6
Model GFA1 3-7
Model GFA2 3-8
Model GFA3 3-9
Model GFA4 3-10

Warranty

Each instrument manufactured by GE Infrastructure Sensing is warranted to be free from defects in material and workmanship. Liability under this warranty is limited to restoring the instrument to normal operation or replacing the instrument, at the sole discretion of GE Infrastructure Sensing. Fuses and batteries are specifically excluded from any liability. This warranty is effective from the date of delivery to the original purchaser. If GE Infrastructure Sensing determines that the equipment was defective, the warranty period is:

- one year for general electronic failures of the instrument
- one year for mechanical failures of the sensor

If GE Infrastructure Sensing determines that the equipment was damaged by misuse, improper installation, the use of unauthorized replacement parts, or operating conditions outside the guidelines specified by GE Infrastructure Sensing, the repairs are not covered under this warranty.

The warranties set forth herein are exclusive and are in lieu of all other warranties whether statutory, express or implied (including warranties or merchantability and fitness for a particular purpose, and warranties arising from course of dealing or usage or trade).

Return Policy

If a GE Panametrics instrument malfunctions within the warranty period, the following procedure must be completed:

1. Notify GE Infrastructure Sensing, giving full details of the problem, and provide the model number and serial number of the instrument. If the nature of the problem indicates the need for factory service, GE Infrastructure Sensing will issue a RETURN AUTHORIZATION NUMBER (RAN), and shipping instructions for the return of the instrument to a service center will be provided.
2. If GE Infrastructure Sensing instructs you to send your instrument to a service center, it must be shipped prepaid to the authorized repair station indicated in the shipping instructions.
3. Upon receipt, GE Infrastructure Sensing will evaluate the instrument to determine the cause of the malfunction.

Then, one of the following courses of action will then be taken:

- If the damage is covered under the terms of the warranty, the instrument will be repaired at no cost to the owner and returned.
- If GEInfrastructure Sensing determines that the damage is not covered under the terms of the warranty, or if the warranty has expired, an estimate for the cost of the repairs at standard rates will be provided. Upon receipt of the owner's approval to proceed, the instrument will be repaired and returned.

Chapter 1

General Information

Introduction 1-1

Basic Features 1-1

Model Identification 1-2

Introduction

The GE Panametrics *PanaFlow Meter System* is designed to integrate a *flowcell*, wetted ultrasonic *transducers* and either a local or a remote *electronics console*. The GFA models are used for gas (including steam) flow rate measurements, while the LFA models are used for liquid flow rate measurements. All standard flowmeter bodies are completely assembled and programmed at the factory prior to shipment.

Note: *Refer to the documentation for the specific flowmeter model for detailed information on the electronics console.*

The *PanaFlow Meter System* offers:

- *ease of installation* - simply install the fully-assembled flowmeter into an existing pipeline.
- *enhanced reliability* - all of the components are assembled and programmed as a self-contained system prior to shipment.
- *preprogrammed electronics* - the flowmeter system is factory programmed to eliminate programming errors at installation.
- *optimum accuracy* - the critical transducer geometry is established at the factory to guarantee accurate measurements.

A complete line of standard flowcell configurations are available to meet most application requirements.

Basic Features

The following basic features are characteristic of the *PanaFlow Meter System* flowcell:

- compliance with industry standards (e.g. ASME, MSS, ANSI, etc.)
- 2 to 24 in. NPS (50 to 600 mm DN) pipe sizes
- flanged inlet and outlet connections
- carbon steel or stainless steel flowcell material
- STD or XS pipe schedule
- 2-layer gray epoxy coating
- single-path or dual-path (for pipes ≥6 in. only) transducer configuration
- normal, high, or extended temperature ranges
- local- or remote-mounted flowmeter electronics
- ATEX or CSA certified junction boxes rated for the application

Model Identification

PanaFlow Meter Systems look similar to those shown in Figures 1-1 through 1-3 below and on the next page. However, before proceeding, you should properly identify your system so that you follow the correct instructions. The key to this identification is the complete model number for the system.

The four main parameters that determine the type of flowcell in a *PanaFlow Meter System* are: fluid type, number of paths, number of traverses, and flowcell construction type. Combinations of the above parameters lead to the eight basic models listed in *Table 1-1* below.

Table 1-1: Eight Basic Models

Model	Fluid Type	No. of Paths	No. of Traverses	Construction Type
LFA1	Liquid	1	1	Welded
LFA2	Liquid	2	1	Welded
LFA3	Liquid	1	1	Block
LFA4	Liquid	1	2	Welded
GFA1	Gas	1	1	Welded
GFA2	Gas	2	1	Welded
GFA3	Gas	1	1	Block
GFA4	Gas	1	2	Welded

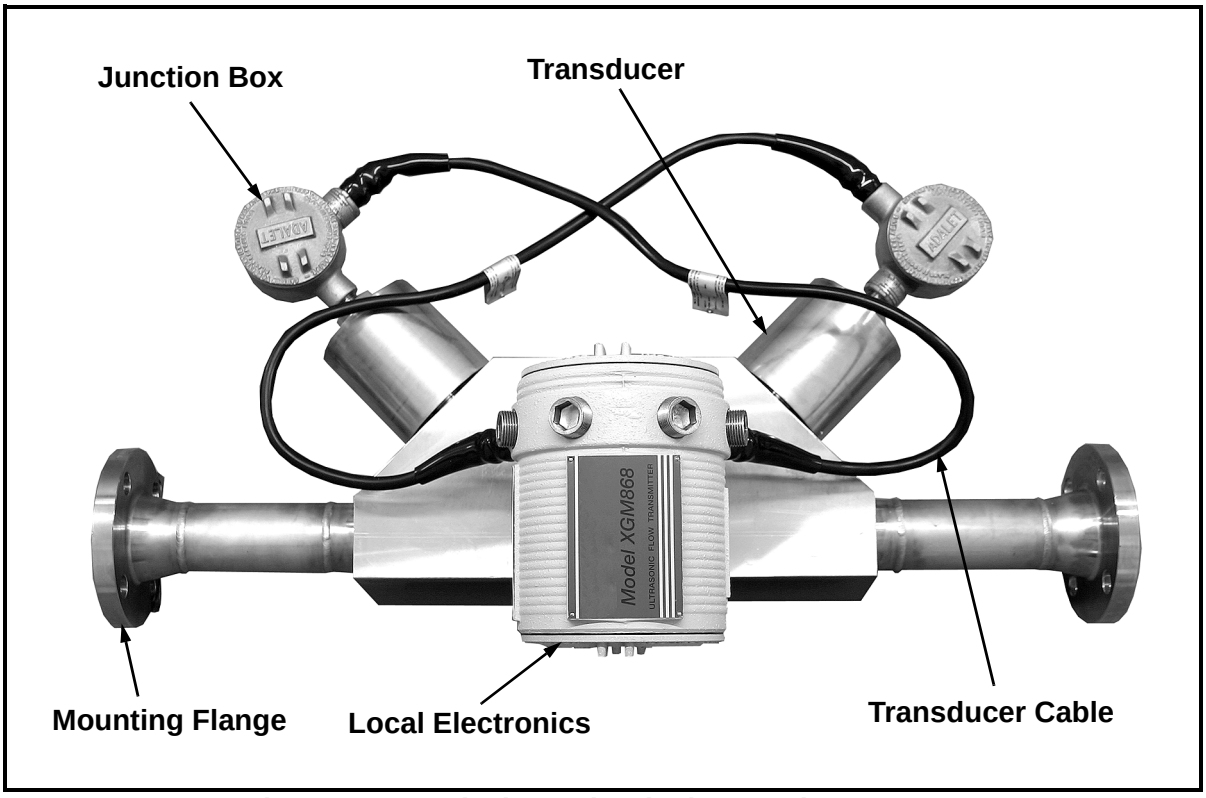

Figure 1-1: Typical 1-Path, Block PanaFlow System

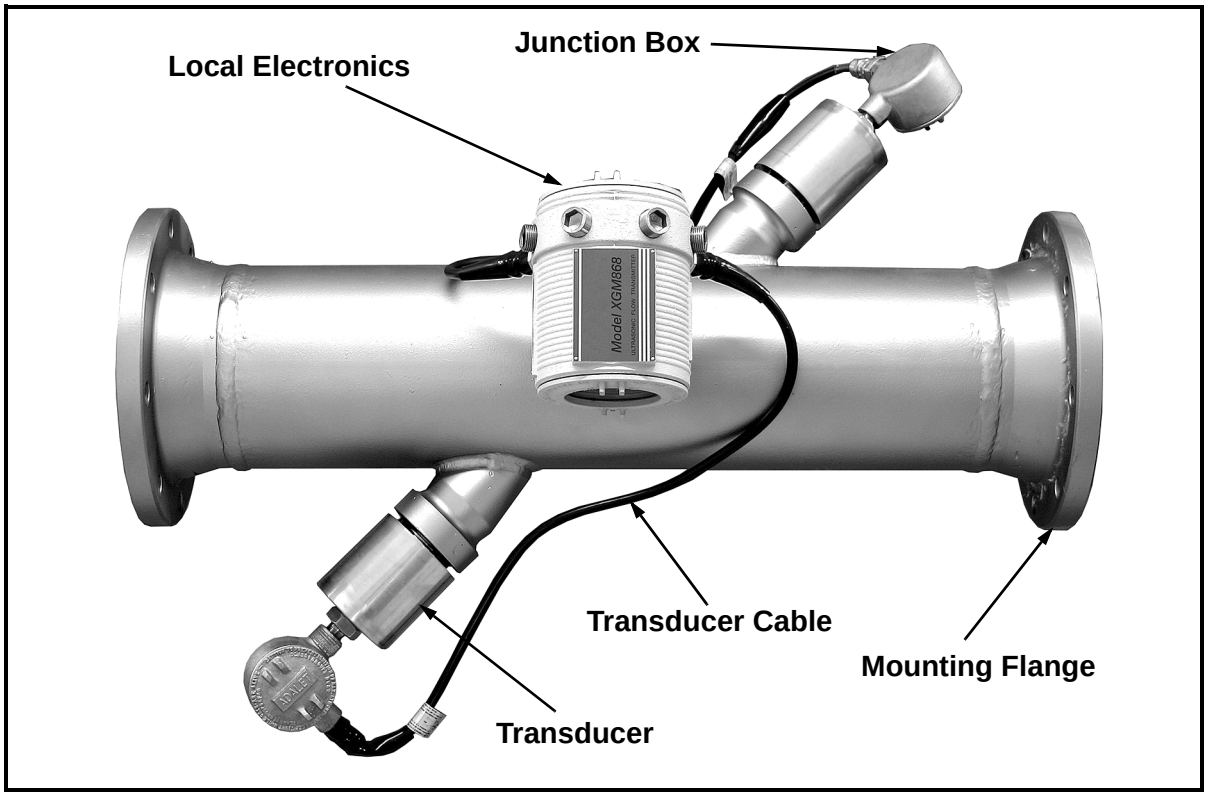

Figure 1-2: Typical 1-Path, Welded PanaFlow System

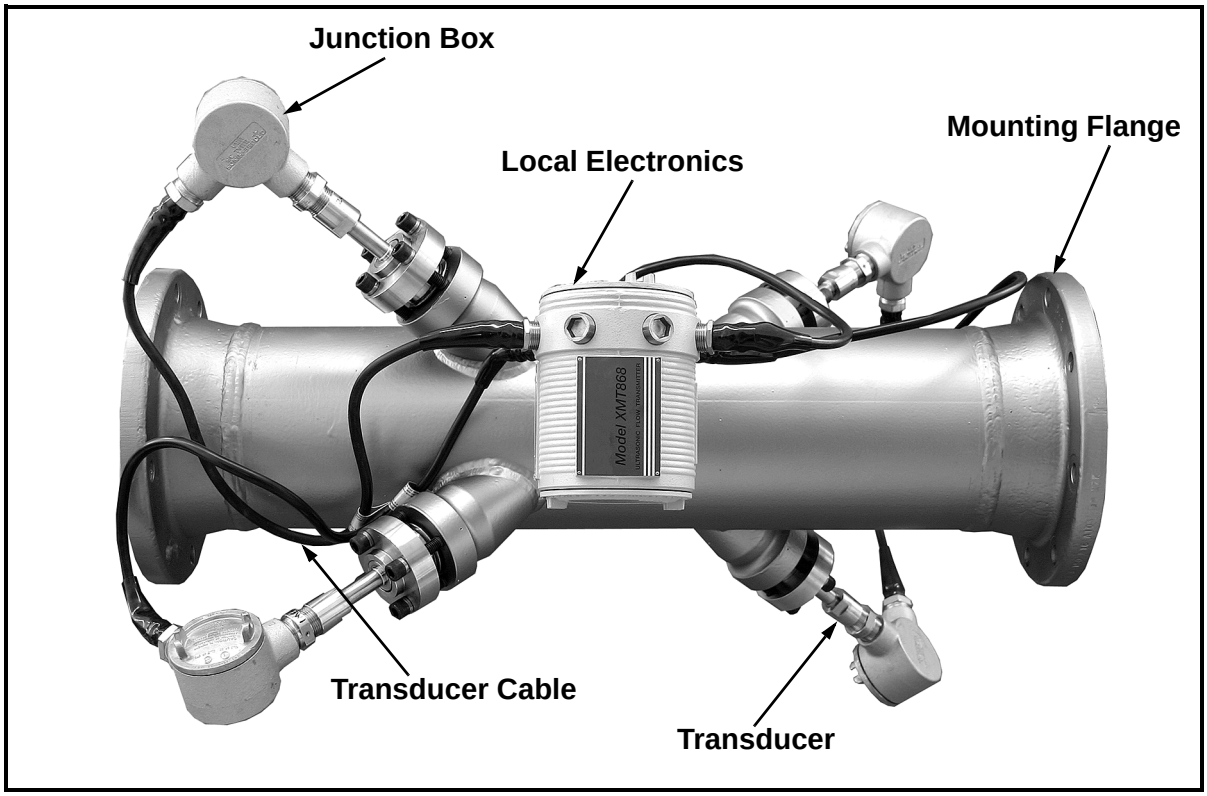

Figure 1-3: Typical 2-Path, Welded PanaFlow System

Model Numbers

The complete part numbers for the eight basic versions of the *PanaFlow Meter System* are listed in *Table 1-2* below.

Table 1-2: Basic Model Numbers

A - B - C - D - E - F - G - H - I - J - K
LFA1 - [ ] - [ ] - [ ] - [ ] - [ ] - [ ] - [ ] - [ ] - [ ] - [ ] - [ ]
LFA2 - [ ] - [ ] - [ ] - [ ] - [ ] - [ ] - [ ] - [ ] - [ ] - [ ] - [ ]
LFA3 - [ ] - [ ] - [ ] - [ ] - [ ] - [ ] - [ ] - [ ] - [ ] - [ ] - [ ]
LFA4 - [ ] - [ ] - [ ] - [ ] - [ ] - [ ] - [ ] - [ ] - [ ] - [ ] - [ ]
GFA1 - [ ] - [ ] - [ ] - [ ] - [ ] - [ ] - [ ] - [ ] - [ ] - [ ] - [ ]
GFA2 - [ ] - [ ] - [ ] - [ ] - [ ] - [ ] - [ ] - [ ] - [ ] - [ ] - [ ]
GFA3 - [ ] - [ ] - [ ] - [ ] - [ ] - [ ] - [ ] - [ ] - [ ] - [ ] - [ ]
GFA4 - [ ] - [ ] - [ ] - [ ] - [ ] - [ ] - [ ] - [ ] - [ ] - [ ] - [ ]

The components of each part number string are designated as follows:

A = model

B = nominal pipe size

C = bore

D = flange class

E = materials

F = paint

G = NDE

H = transducer

I = electronics

J = junction box

K = miscellaneous

Model Numbers (cont.)

Table 1-3 below lists the standard options available in each category.

Note: *D=2 (300 lb option) is not available if B=24 or if B=16, 18, 20 and C=1).*

D=3 (600 lb option) is not available if B=10,12, 14, 16, 18, 20, 24 or if B=6, 8 and C=1).

Table 1-3: Available Options

A	LFA1	LFA2	LFA3	LFA4	GFA1	GFA2	GFA3	GFA4
B*	6=6 (150) 8=8 (200) 10=10 (250) 12=12 (300) 14=14 (350) 16=16 (400) 18=18 (450) 20=20 (500) 24=24 (600)	6=6 (150) 8=8 (200) 10=10 (250) 12=12 (300) 14=14 (350) 16=16 (400) 18=18 (450) 20=20 (500) 24=24 (600)	2=2 (50) 3=3 (80)	4=4 (100)	6=6 (150) 8=8 (200) 10=10 (250) 12=12 (300) 14=14 (350) 16=16 (400) 18=18 (450) 20=20 (500) 24=24 (600)	6=6 (150) 8=8 (200) 10=10 (250) 12=12 (300) 14=14 (350) 16=16 (400) 18=18 (450) 20=20 (500) 24=24 (600)	2=2 (50) 3=3 (80)	4=4 (100)
C	1=ST 2=XS	1=ST 2=XS	1=ST 2=XS	1=ST 2=XS	1=ST 2=XS	1=ST 2=XS	1=ST 2=XS	1=ST 2=XS
D	1=150lb 2=300lb 3=600lb	1=150lb 2=300lb 3=600lb	1=150lb 2=300lb 3=600lb	1=150lb 2=300lb 3=600lb	1=150lb 2=300lb 3=600lb	1=150lb 2=300lb 3=600lb	1=150lb 2=300lb 3=600lb	1=150lb 2=300lb 3=600lb
E	1=CS 2=SS	1=CS 2=SS	1=CS 2=SS	1=CS 2=SS	1=CS 2=SS	1=CS 2=SS	1=CS 2=SS	1=CS 2=SS
F	1=None 2=STD	1=None 2=STD	1=None 2=STD	1=None 2=STD	1=None 2=STD	1=None 2=STD	1=None 2=STD	1=None 2=STD
G	1=LPI	1=LPI	1=LPI	1=LPI	1=LPI	1=LPI	1=LPI	1=LPI
H	1=Normal 2=High	1=Normal 2=High	1=Normal 2=High	1=Normal 2=High	1=Normal 2=High 3=Ext.	1=Normal 2=High 3=Ext.	1=Normal 2=High 3=Ext.	1=Normal 2=High 3=Ext.
I	1=Integral 2=Remote	1=Integral 2=Remote	1=Integral 2=Remote	1=Integral 2=Remote	1=Integral 2=Remote	1=Integral 2=Remote	1=Integral 2=Remote	1=Integral 2=Remote
J	1=Euro 2=US 3=Euro/SS	1=Euro 2=US 3=Euro/SS	1=Euro 2=US 3=Euro/SS	1=Euro 2=US 3=Euro/SS	1=Euro 2=US 3=Euro/SS	1=Euro 2=US 3=Euro/SS	1=Euro 2=US 3=Euro/SS	1=Euro 2=US 3=Euro/SS
K**	0=None S=Special	0=None S=Special	0=None S=Special	0=None S=Special	0=None S=Special	0=None S=Special	0=None S=Special	0=None S=Special

* **B** - Pipe sizes are listed as: in. NPS (mm DN)
** **K** - Consult the factory for special orders.

Transducer Options

The *PanaFlow Meter Systems* are available with the following transducer path/traverse options:

- **2” to 4” pipe:** 1-path, dual-traverse
- **6” to 24” pipe:** 1-path or 2-path, single-traverse

After the desired path/traverse option has been selected, the proper transducers for the fluid type and temperature conditions must be specified.The following guidelines are used:

LFA Models:

In liquid applications, transducers are provided according to the following guidelines:

- *pipe sizes ≤6 in.*: 1 MHz BWT/3/4” S.S. FTPA transducers
- *pipe sizes ≥8 in.*: 0.5 MHz BWT/1” S.S. FTPA transducers

Then, the temperature rating is chosen from the following options:

- *H=1*: normal temperature -310 to 600°F (-190 to 315°C)
- *H=2*: high temperature -310 to 1,112°F (-190 to 600°C)

GFA Models:

In gas applications, the transducers are provided according to the following guidelines:

- *normal and high temperature applications:*
  100 kHz, titanium T14 transducers
- *extended temperature applications:*
  0.2 MHz, BWT/1” FTPA S.S. transducers

Note: *In all cases, preamplifiers are included with the gas systems.*

The temperature ranges indicated above are defined as follows:

- *H=1*: normal temperature -60 to 300°F (-50 to 150°C)
- *H=2*: high temperature -60 to 500°F (-50 to 260°C)
- *H=3*: extended temperature -310 to 842°F (-190 to 450°C)

Chapter 2

Installation

Introduction 2-1

Selecting the Site 2-1

Installing the PanaFlow Meter System 2-3

Mounting the Electronics 2-3

Installing Optional Transmitters 2-4

Wiring the System 2-4

Programming the Electronics 2-5

Introduction

To ensure safe and reliable operation of the *PanaFlow Meter System*, the system must be installed in accordance with the guidelines established by GE Panametrics' engineers. Those guidelines, explained in detail in this chapter, include the following topics:

- selecting a suitable site for the meter system
- installing the flowcell
- mounting the electronics (remote electronics only)
- installing an optional temperature transmitter
- installing an optional pressure transmitter
- wiring the system
- programming the electronics

Selecting the Site

The ideal site for installation of the flowcell is a straight section of process pipe that meets the following criteria:

- The pipe section is horizontal and above ground.
- The pipe section is long enough to accommodate the overall length of the flowcell (see *Table 2-1* on the next page).
- There is sufficient clearance for the transducers to be oriented on the sides of the flowcell (i.e. at the 3 o'clock and 9 o'clock positions). Also, there should be enough clearance around the pipe for routine inspection and maintenance.
- For LFA (liquid) models, there are at least 10 pipe diameters of straight, undisturbed flow upstream and 5 pipe diameters of straight undisturbed flow downstream from the transducers.

Note: *Undisturbed flow means avoiding sources of turbulence such as valves, expansions, elbows, etc.*

- For GFA (gas) models, there are at least 20 pipe diameters of straight, undisturbed flow upstream and 10 pipe diameters of straight undisturbed flow downstream from the transducers.
- For remote-mounted electronics, the electronics console should be located as close as possible to the flowcell. [The maximum allowable distance is 1,000 ft (305 m).]
- If optional temperature and/or pressure transmitters are installed, they should be located at least 5 but no more than 20 pipe diameters from the transducers.

Selecting the Site (cont.)

Table 2-1: Standard Flowcell Lengths

B	Overall Length [in. (mm)]*			
	LFA1/GFA1	LFA2/GFA2	LFA3/GFA3	LFA4/GFA4
2	N.A.	N.A.	35.000 (889.0)	N.A.
3	N.A.	N.A.	37.000 (939.8)	N.A.
4	N.A.	N.A.	N.A.	39.000 (990.6)
6	42.500 (1,079.5)	42.500 (1,079.5)	N.A.	N.A.
8	42.500 (1,079.5)	42.500 (1,079.5)	N.A.	N.A.
10	42.500 (1,079.5)	42.500 (1,079.5)	N.A.	N.A.
12	48.000 (1,219.2)	48.000 (1,219.2)	N.A.	N.A.
14	48.000 (1,219.2)	48.000 (1,219.2)	N.A.	N.A.
16	52.000 (1,320.8)	52.000 (1,320.8)	N.A.	N.A.
18	52.000 (1,320.8)	52.000 (1,320.8)	N.A.	N.A.
20	57.500 (1,460.5)	57.500 (1,460.5)	N.A.	N.A.
24	61.000 (1,549.4)	61.000 (1,549.4)	N.A.	N.A.
* all measurements are ±0.125 in. (±3.2 mm)				

IMPORTANT: *For data on the weight, height, and width of the PanaFlow Meter Systems, see the figures in Chapter 3,* Typical Dimensional Drawings.

Installing the PanaFlow Meter System

To install the *PanaFlow Meter System*, complete the following steps:

1. Completely isolate the section of the process pipeline in which the *PanaFlow Meter System* will be installed.

!WARNING!
Do not proceed with these steps until the desired section of the process pipeline has been isolated from the process flow.

2. Remove a section of the process pipeline and install flanges on the cut ends that mate with the flanges on the flowcell. The distance between the process pipeline flanges must equal the length listed in *Table 2-1* on the previous page.

!WARNING!
In Step 3 below, use a lifting device that is rated for the full weight of the PanaFlow Meter System and do not exceed a 30° rigging angle. Failure to use a suitable lifting device or the use of improper lifting procedures can result in serious personal injury.

3. Lift the flowcell by the eyebolts provided and lower it into place between the process pipe flanges installed in Step 2 above.
4. After installing suitable flange gaskets, bolt the process flange and the flowcell flange together at both ends of the flowcell.

!WARNING!
In Step 4 above, be sure to use properly rated gaskets, studs, nuts, and washers (grade B7 studs and grade 8 nuts are recommended). Also, be sure to tighten the nuts to the appropriate torque.

Mounting the Electronics

If your *PanaFlow Meter System* is equipped with a local electronics package, please skip this section. However, if you have ordered an electronics enclosure intended for remote mounting, one of the following models will be included with your system:

- Model DF868 or XMT868 for liquids (LFA systems)
- Model GX868 or XGX868 Series for gases (GFA systems)

In either case, refer to the *User's Manual* for your specific electronics model for instructions on physically mounting the enclosure.

Installing Optional Transmitters

If you will be installing an optional temperature transmitter or an optional pressure transmitter, please refer to the *User's Manual* for your specific electronics model for instructions on choosing and installing a suitable transmitter. Also, be sure to note the location requirements listed on page 2-1.

Wiring the System

The wiring instructions for the system depend on whether the system includes *local* or *remote* electronics. Proceed to the appropriate section for instructions.

Local Electronics

If your *PanaFlow Meter System* includes a local electronics package (a Model XMT868 for liquids, a Model XGM868 for gases, or a Model XGS868 for steam), complete the following steps:

Note: *Refer to the* User's Manual *for your electronics model for a complete wiring diagram and detailed instructions.*

1. Wire the line power to the electronics console.
2. If desired, wire your serial device to the electronics console.
3. If desired, wire your analog output device to the electronics console.
4. If any option cards are installed in your electronics enclosure (alarm relays, analog outputs, analog inputs, RTD inputs, totalizer/ frequency outputs, MODBUS, or data logging), wire the card(s) to the appropriate device(s).

Remote Electronics

If your *PanaFlow Meter System* includes a remote electronics package (usually a Model DF868 for liquids, a Model GX868 Series for gases), complete the following steps:

Note: *Refer to the* User's Manual *for your electronics model for a complete wiring diagram and detailed instructions.*

1. Wire the line power to the electronics console.
2. Connect the transducer cables between the electronics console and the BNC connectors provided on the flowcell.
3. If desired, wire your serial device to the electronics console.
4. If desired, wire your analog output device to the electronics console.
5. If any option cards are installed in your electronics enclosure (alarm relays, analog outputs, analog inputs, RTD inputs, totalizer/ frequency outputs, MODBUS, or data logging), wire the card(s) to the appropriate device(s).

Programming the Electronics

Regardless of whether your *PanaFlow Meter System* is equipped with a local electronics enclosure or a remote electronics enclosure, all of the essential programming has been completed at the factory prior to shipment. The system is ready to begin taking measurements as soon as the physical installation steps have been completed.

IMPORTANT: *For systems with a* remote *electronics enclosure, you must be sure to match the tag # of the electronics enclosure with the tag # of the flowmeter body. This is the only way to be sure that parameters programmed into the electronics match the actual physical parameters of the flowcell.*

To program the more advanced features of your electronics or to set personal preferences for some system parameters, refer to the *Programming Manual* for your specific electronics model.

Chapter 3

Typical Dimensional Drawings

Dimensions and Weights. 3-1

Model LFA1 3-3

Model LFA2 3-4

Model LFA3 3-5

Model LFA4 3-6

Model GFA1. 3-7

Model GFA2. 3-8

Model GFA3. 3-9

Model GFA4. 3-10

Dimensions and Weights

The dimensions and weights for all available configurations of the 2-path flowcells are listed in Table 3-1 below. The corresponding data for the 1-path flowcells is listed in Table 3-2 on the next page.

Note: *In Table 3-1 below and Table 3-2 on the next page:*

A = Overall Length
B= Overall Width
C= Overall Height with Local Electronics
D = Overall Height without Local Electronics

Table 3-1: Physical Properties for 2-Path Flowcells

Pipe	Sch.	Flange (#)	Type	Wt. (lb)	A (in.)	B (in.)	C (in.)	D (in.)
6 in.	STD	150	Welded	220	42.500	31	31	31
	XS	150	Welded	250	42.500	31	31	31
	STD	300	Welded	260	42.500	31	31	31
	XS	300	Welded	300	42.500	31	31	31
	XS	600	Welded	350	42.500	31	31	31
8 in.	STD	150	Welded	280	42.500	31	31	31
	XS	150	Welded	325	42.500	31	31	31
	STD	300	Welded	330	42.500	31	31	31
	XS	300	Welded	380	42.500	31	31	31
	XS	600	Welded	467	42.500	31	31	31
10 in.	STD	150	Welded	360	42.500	31	31	31
	XS	150	Welded	415	42.500	31	31	31
	STD	300	Welded	440	42.500	31	31	31
	XS	300	Welded	495	42.500	31	31	31
12 in.	STD	150	Welded	440	48.000	34	34	34
	XS	150	Welded	500	48.000	34	34	34
	STD	300	Welded	545	48.000	34	34	34
	XS	300	Welded	610	48.000	34	34	34
14 in.	STD	150	Welded	505	48.000	34	34	34
	XS	150	Welded	575	48.000	34	34	34
	STD	300	Welded	665	48.000	34	34	34
	XS	300	Welded	730	48.000	34	34	34
16 in.	STD	150	Welded	600	52.000	37	37	37
	XS	150	Welded	685	52.000	37	37	37
	XS	300	Welded	885	52.000	37	37	37
18 in.	STD	150	Welded	660	52.000	37	37	37
	XS	150	Welded	755	52.000	37	37	37
	XS	300	Welded	1,030	52.000	37	37	37
20 in.	STD	150	Welded	790	57.500	41	41	41
	XS	150	Welded	910	57.500	41	41	41
	XS	300	Welded	1,230	57.500	41	41	41
24 in.	STD	150	Welded	1,010	61.000	44	44	44
	XS	150	Welded	1,185	61.000	44	44	44

Table 3-2: Physical Properties for 1-Path Flowcells

Pipe	Sch.	Flange (#)	Type	Wt. (lb)	A (in.)	B (in.)	C (in.)	D (in.)
2 in.	STD	150	Block	165	35.000	21	14	7
	XS	150	Block	170	35.000	21	14	7
	STD	300	Block	170	35.000	21	14	7
	XS	300	Block	170	35.000	21	14	7
	XS	600	Block	175	35.000	21	14	7
3 in.	STD	150	Block	195	37.000	23	16	9
	XS	150	Block	205	37.000	23	16	9
	STD	300	Block	205	37.000	23	16	9
	XS	300	Block	210	37.000	23	16	9
	STD	600	Block	210	37.000	23	16	9
	XS	600	Block	220	37.000	23	16	9
4 in.	STD	150	Welded	135	39.000	25	18	11
	XS	150	Welded	150	39.000	25	18	11
	STD	300	Welded	150	39.000	25	18	11
	XS	300	Welded	165	39.000	25	18	11
	XS	600	Welded	190	39.000	25	18	11
6 in.	STD	150	Welded	175	42.500	43	20	17
	XS	150	Welded	200	42.500	43	20	17
	STD	300	Welded	205	42.500	43	20	17
	XS	300	Welded	245	42.500	43	20	17
	XS	600	Welded	305	42.500	43	20	17
8 in.	STD	150	Welded	235	42.500	43	23	19
	XS	150	Welded	285	42.500	43	23	19
	STD	300	Welded	285	42.500	43	23	19
	XS	300	Welded	340	42.500	43	23	19
	XS	600	Welded	425	42.500	43	23	19
10 in.	STD	150	Welded	295	42.500	43	24	20
	XS	150	Welded	345	42.500	43	24	20
	STD	300	Welded	375	42.500	43	24	20
	XS	300	Welded	420	42.500	43	24	20
12 in.	STD	150	Welded	390	48.000	48	27	23
	XS	150	Welded	450	48.000	48	27	23
	STD	300	Welded	495	48.000	48	27	23
	XS	300	Welded	560	48.000	48	27	23
14 in.	STD	150	Welded	460	48.000	48	28	26
	XS	150	Welded	525	48.000	48	28	26
	STD	300	Welded	615	48.000	48	28	26
	XS	300	Welded	685	48.000	48	28	26
16 in.	STD	150	Welded	560	52.000	52	31	28
	XS	150	Welded	645	52.000	52	31	28
	XS	300	Welded	840	52.000	52	31	28
18 in.	STD	150	Welded	615	52.000	52	33	30
	XS	150	Welded	715	52.000	52	33	30
	XS	300	Welded	985	52.000	52	33	30
20 in.	STD	150	Welded	750	57.500	58	35	32
	XS	150	Welded	870	57.500	58	35	32
	XS		Welded	1,190	57.500	58	35	32
24 in.	STD	150	Welded	970	61.000	61	38	35
	XS	150	Welded	1,120	61.000	61	38	35

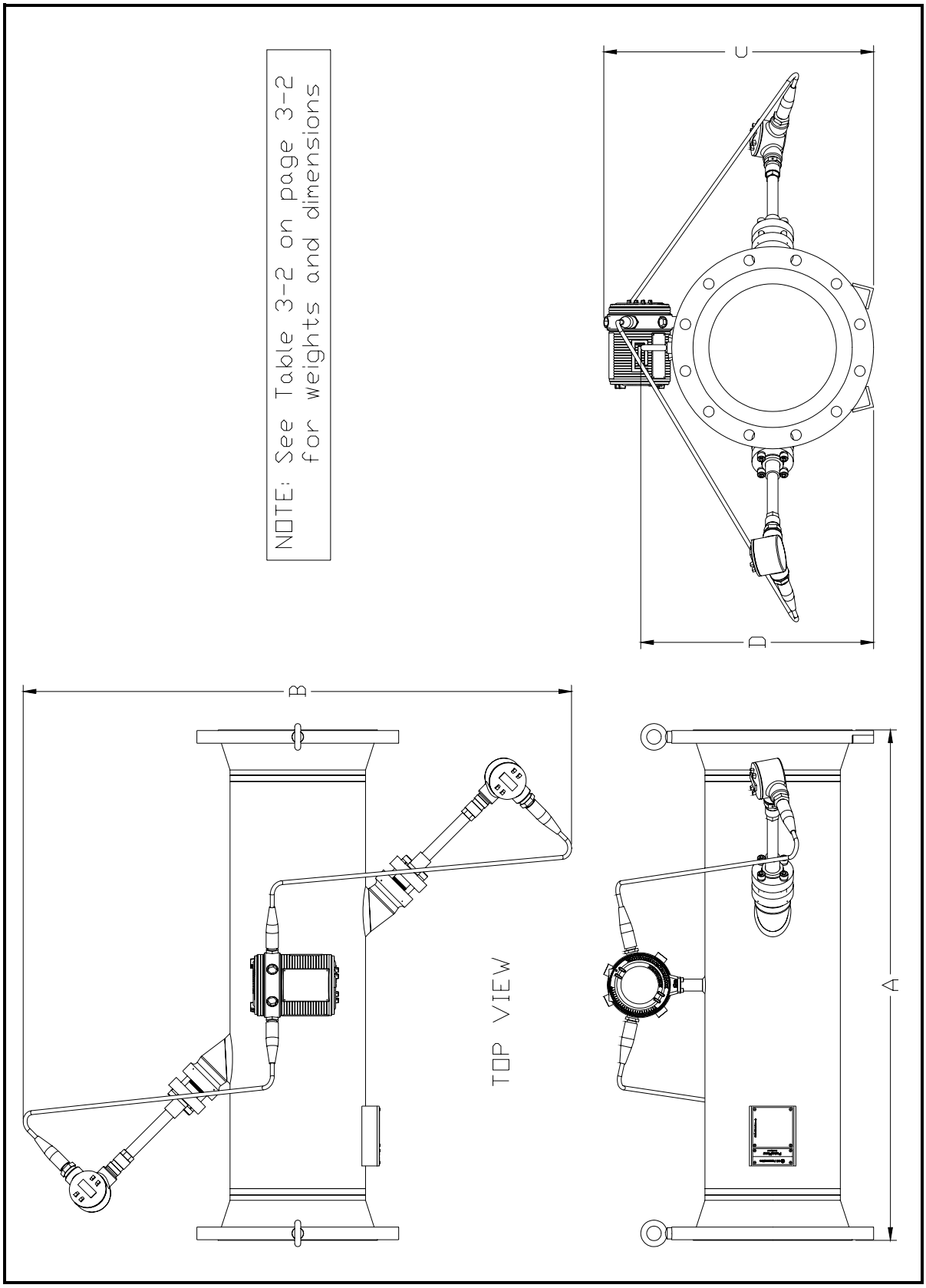

Figure 3-1: Model LFA1

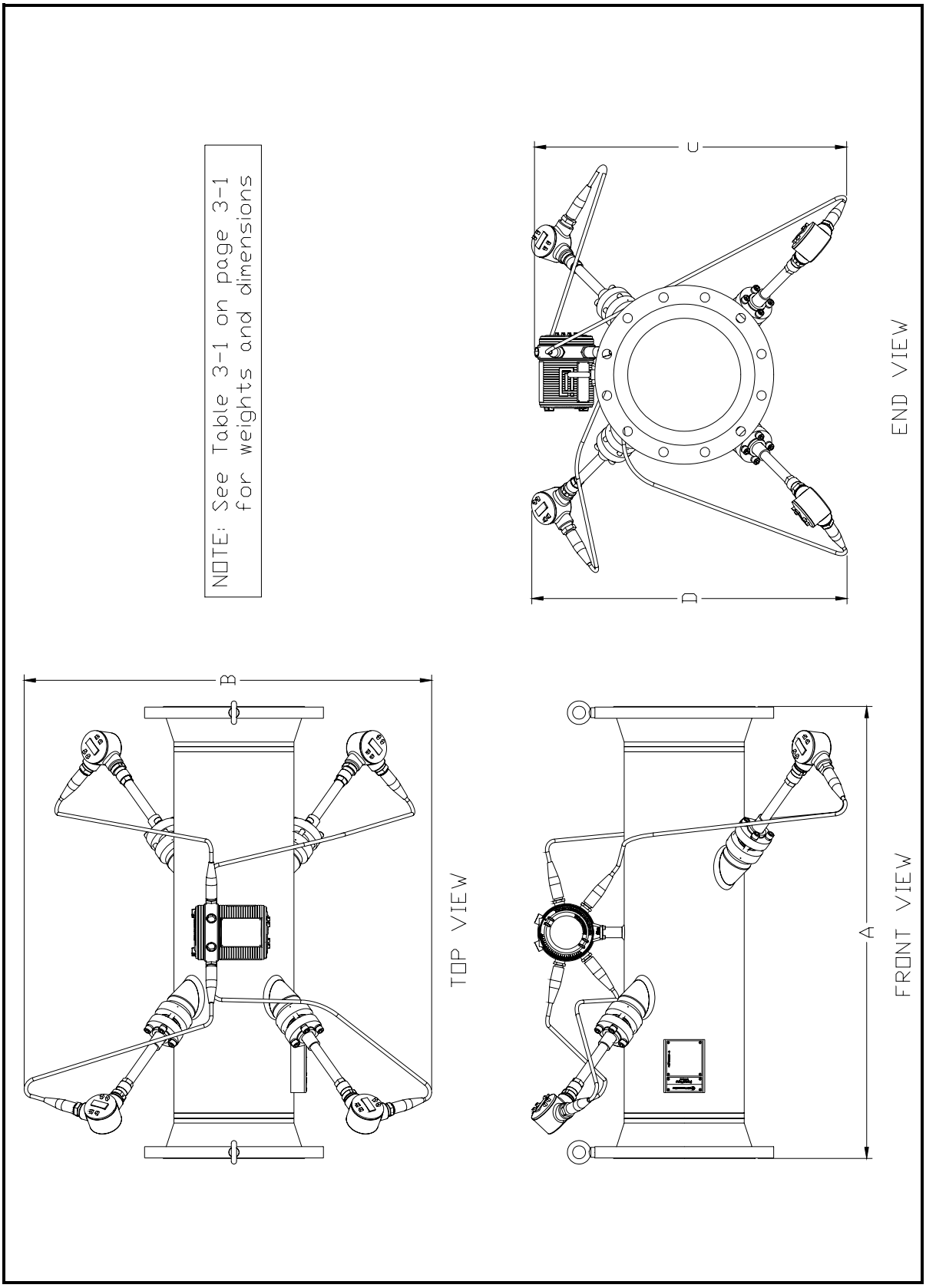

Figure 3-2: Model LFA2

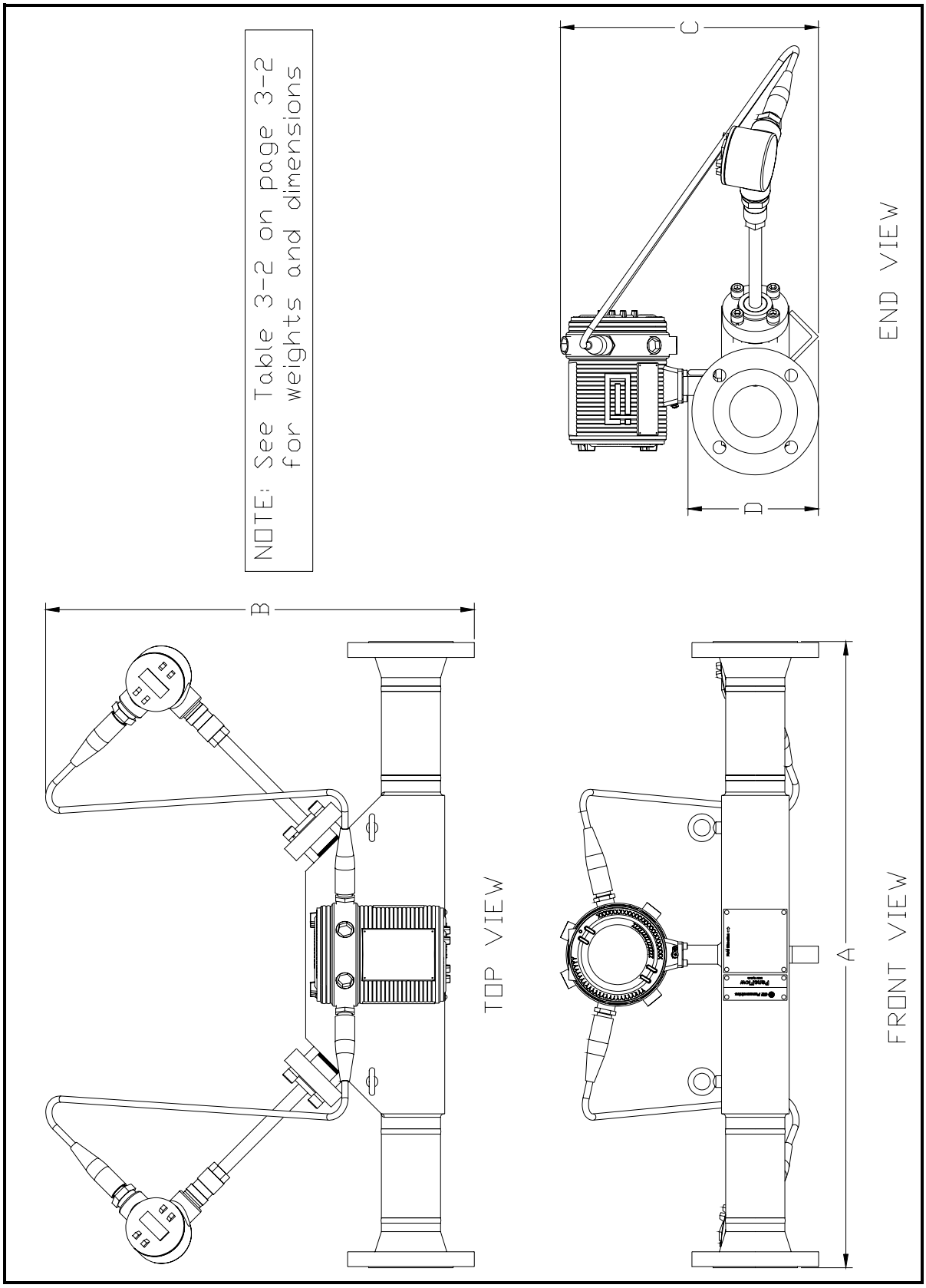

Figure 3-3: Model LFA3

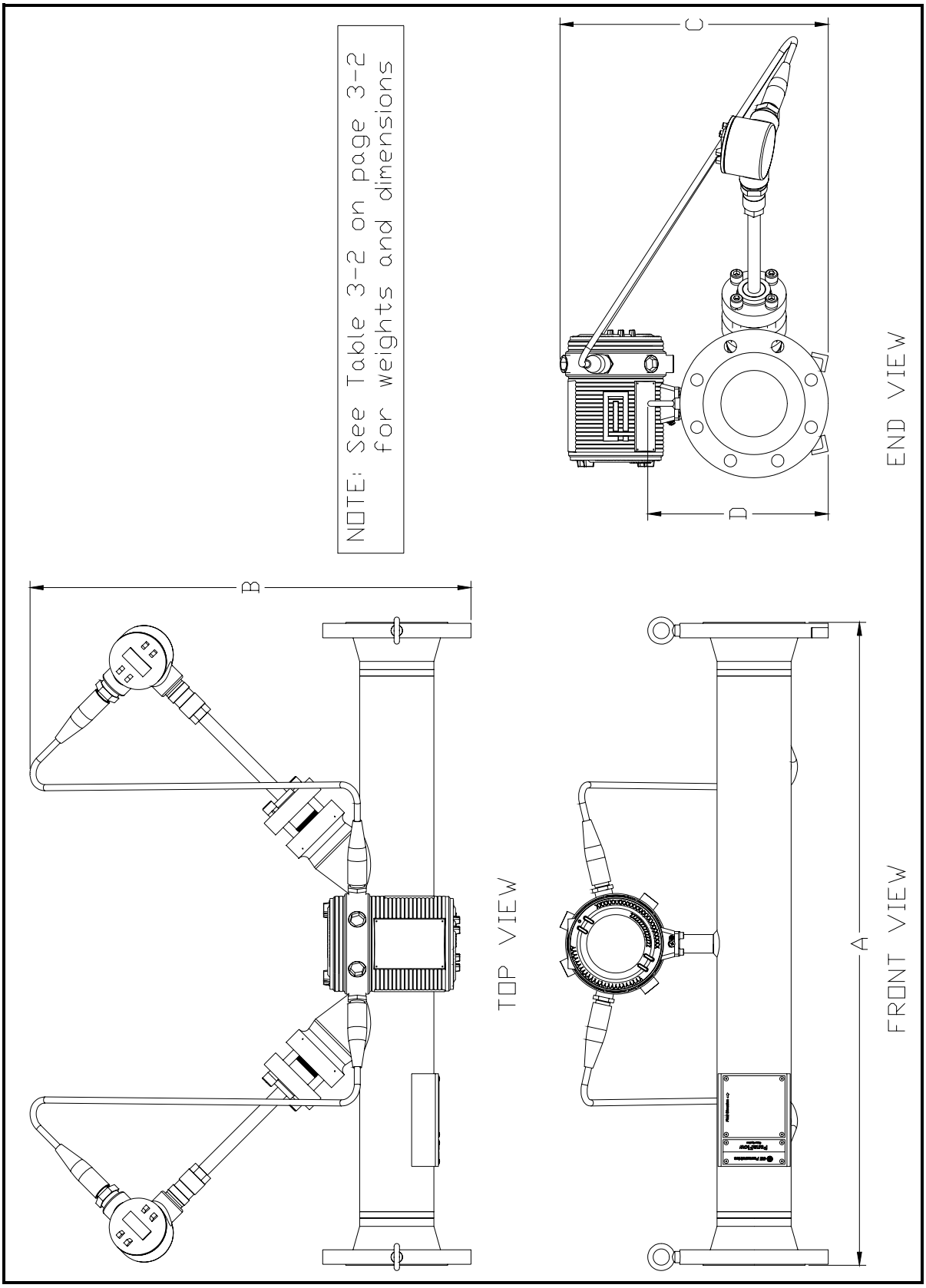

Figure 3-4: Model LFA4

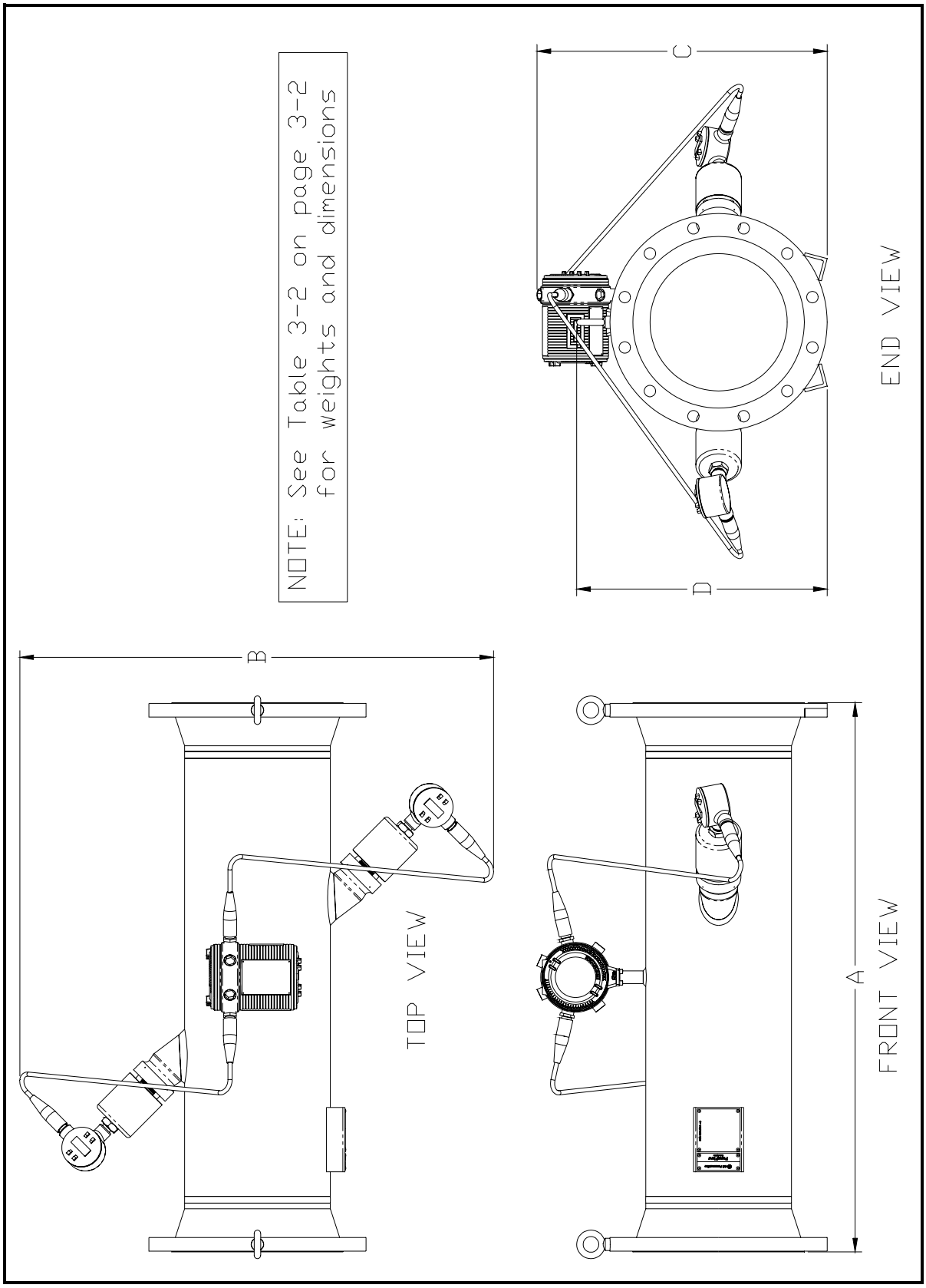

Figure 3-5: Model GFA1

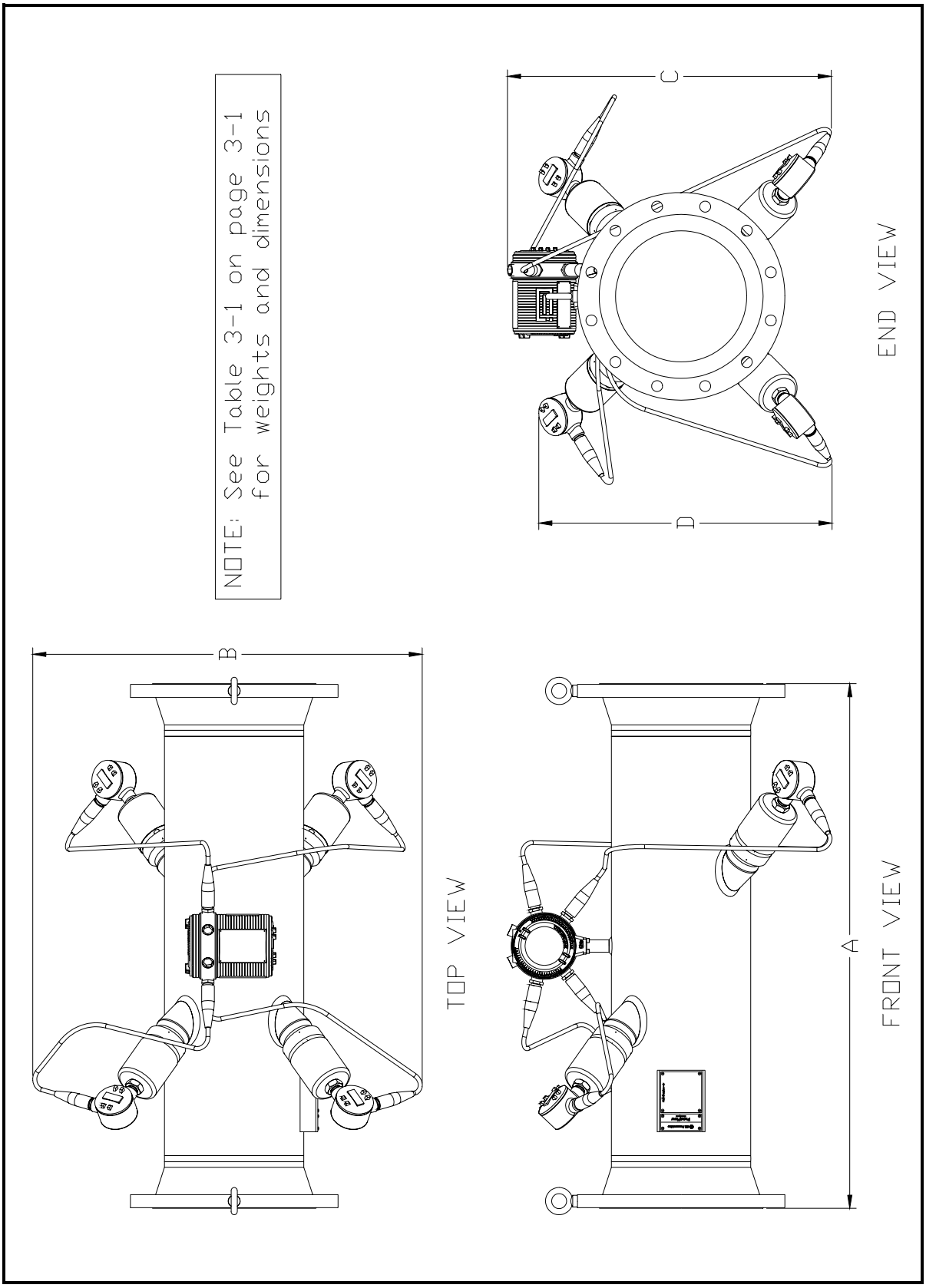

Figure 3-6: Model GFA2

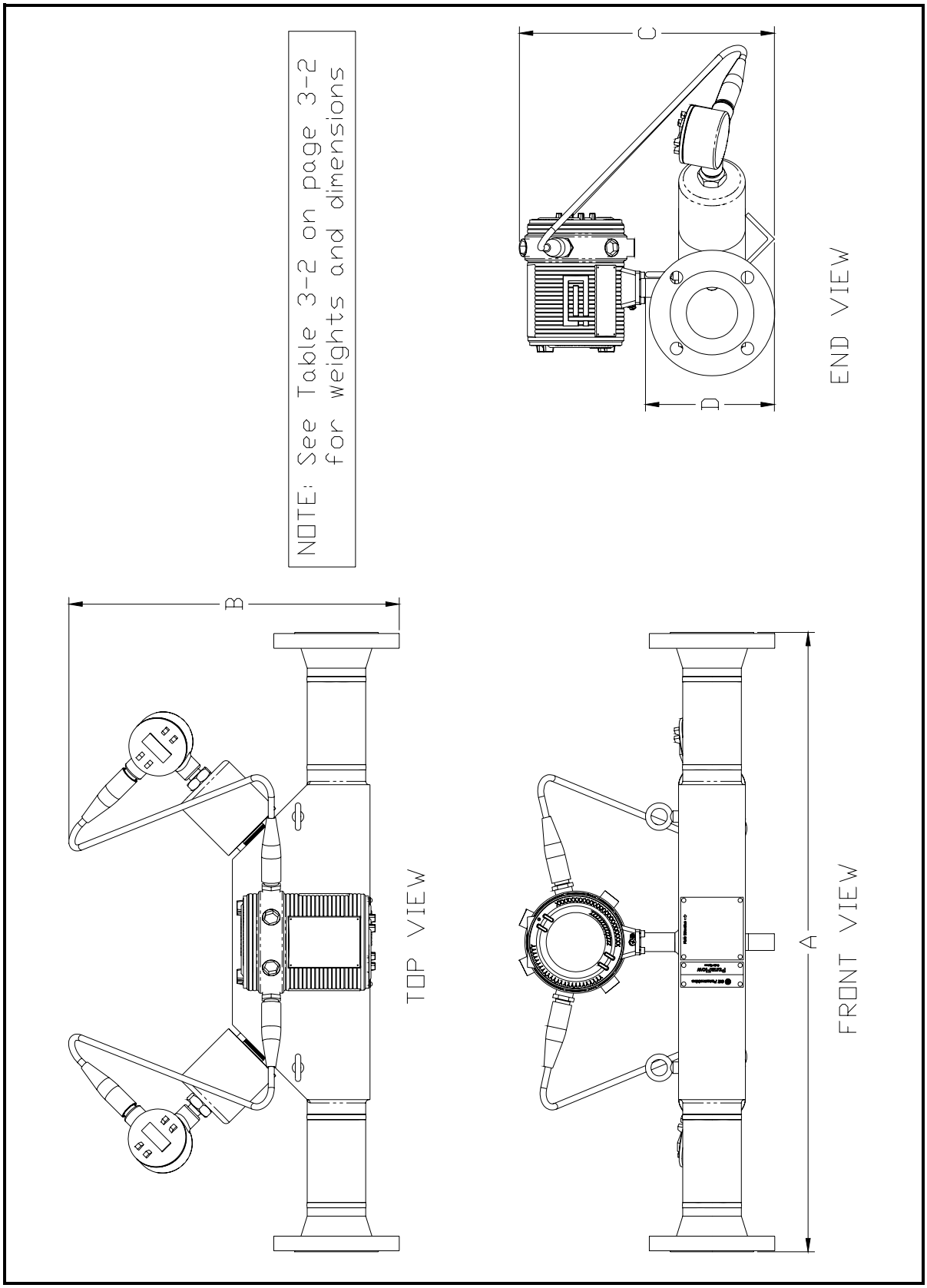

Figure 3-7: Model GFA3

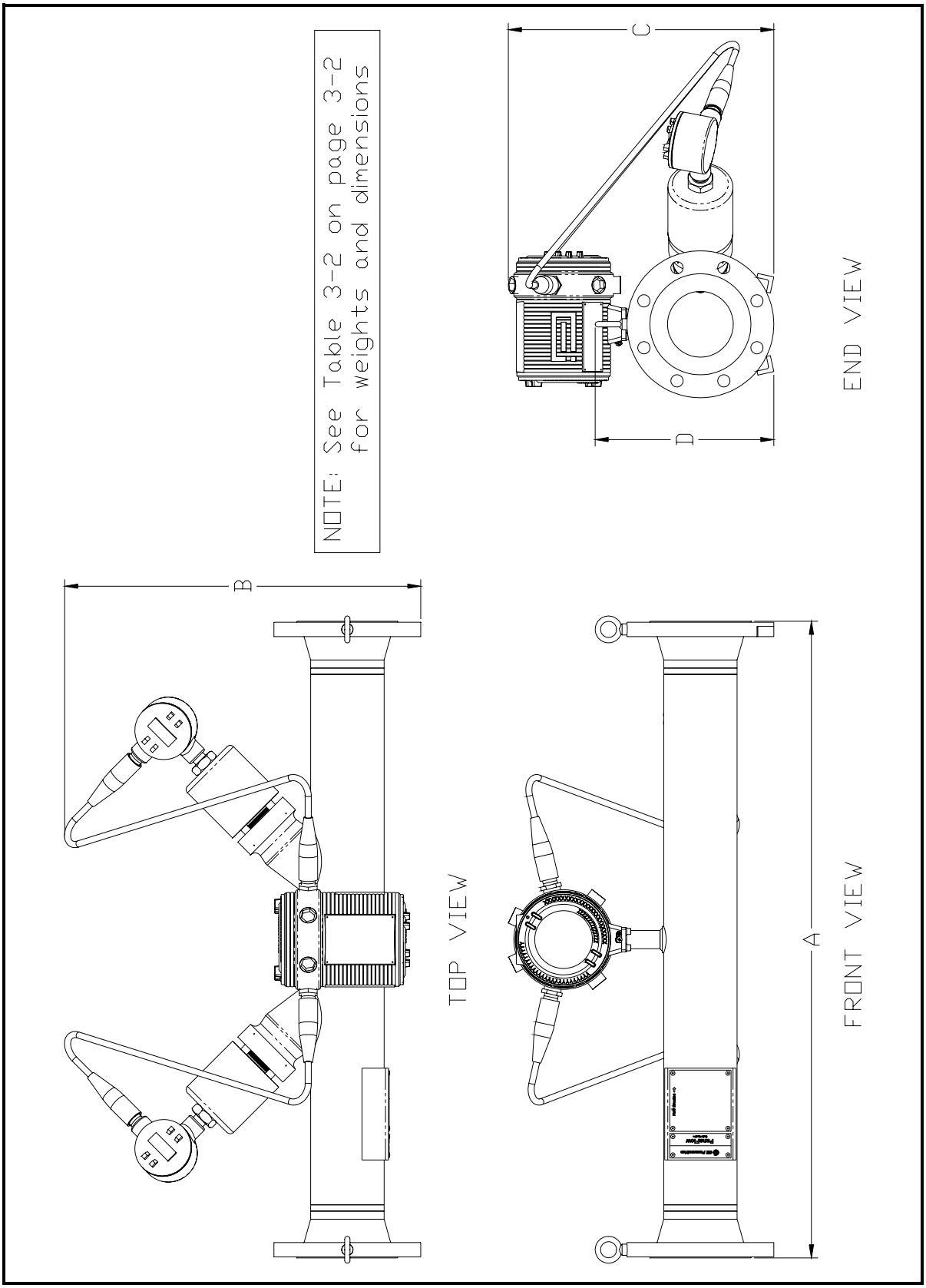

Figure 3-8: Model GFA4

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