Panametrics

Datasheet

PanaFlow FLI

Ultrasonic flow meter for gas

PanaFlow FLI is a robust and reliable ultrasonic flow measurement system for monitoring wide ranging gas flow in challenging conditions. PanaFlow FLI is available in either a flowcell (spoolpiece) or nozzle only design providing flexibility to your existing or new flow requirements.

Applications Examples

- Fuel gas
- Natural gas
- Vent gas
- Waste gas
- Shale gas
- Coal-seam gas
- Vapor recovery
- Biogas
- Flare gas
- Steam

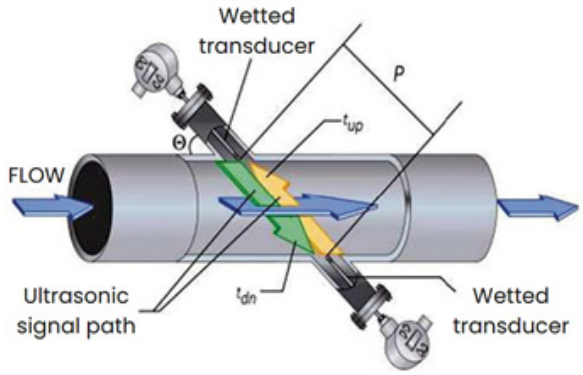
PANA080DS Rev. 7

Features and benefits

- Trusted ultrasonic technology with no drifting measurements or need for periodic calibration requirements.
- No restriction in the pipe to generate a pressure loss.
- Wide rangeability from 0-100m/s (328 ft/s) monitoring during all process scenarios.
- Robust and field proven legacy Panametrics titanium gas transducers; other materials available based on stream composition.
- New compact insertion mechanism for 24hr/7day continuous operation and access to transducer.
- Advanced diagnostics to understand and track the health and stability of the process.

Transit Time Flow Measurement

In this method, two transducers serve as both ultrasonic signal generators and receivers. They are in acoustic communication with each other, meaning the second transducer can receive ultrasonic signals transmitted by the first transducer and vice versa.



In operation, each transducer functions as a transmitter, generating a certain number of acoustic pulses, and then as a receiver for an identical number of pulses. The time interval between transmission and reception of the ultrasonic signals is measured in both directions. When the gas in the pipe is not flowing, the transit-time downstream equals the transit-time upstream. However, when the gas is flowing, the transit-time downstream is less than the transit-time upstream. The difference between the downstream and upstream transit times is proportional to the velocity of the flowing gas, and its sign indicates the direction of flow.

Proven Transducer Design Technology

PanaFlow FLI leverages the field proven T5 and T5Max transducers with numerous gas applications installed around the world. These transducers are tolerant of wet and corrosive gas environment in a superior design to handle the most difficult application while trustfully monitoring your normal or extreme low or high flow conditions.

Best Technology For Difficult Gases

Ultrasonic flow measurement is independent of gas properties and does not interfere with the flow in any way. All metal ultrasonic transducers installed in the pipe send sound pulses upstream and downstream through the gas. Panametrics advanced ultrasonic transmitters use advanced signal processing and correlation detection to calculate the flow rate in challenging conditions such as unsteady or even bidirectional flow, pulsating pressure, varying composition and temperature, harsh environment, and extreme wide-ranging flows.

Transducer Insertion & Retraction

PanaFlow FLI employs a unique insertion or retraction mechanism allowing access to the transducer at any time for continuous operation 24 hours a day, 7 days a week.

More Than Just a Flow Measurement

PanaFlow FLI with the appropriate Panametrics transmitter enhances your process understanding.

In biogas application, percent methane is calculated to understand the energy content of the gas. In fuel or waste gas, molecular weight is calculated to understand the energy content of the gas, to detect the location of possible leak sources, and minimize possible steam usage for proper combustion. With all systems, Panametrics uses advanced diagnostics such as sound speed, signal strength, and more to understand and track the health and stability of the process and the ultrasonic flowmeter during normal and extreme flow conditions.

Technical **Specifications**

Overall operation and performance

Fluid types	Gases
Flow measurement	Patented Correlation Transit-Time™ mode
Meter sizes	3 in to 24 in (80 mm to 600 mm) standard Optional: Different sizes may be available upon request
Accuracy	±1.5% of reading (flowcell, standard cal) ±1.0% of reading (flowcell, enhanced cal) ±1.5 to ±2.5% of reading (nozzle system) Velocity of 1.5 m/s (5 ft/s) or greater to Qmax ±0.02m/s (0.075 ft/s) of reading Velocities of 0.15 to 1.5 m/s (0.5 to 5 ft/s) Final installation assumes a fully developed flow profile (typically 20 diameters upstream and 5 diameters downstream of straight pipe run) without CFD analysis. Applications with piping arrangements that induce swirl (e.g., two out-of-plane elbows) may require additional straight run or flow conditioning. Shorter straight runs with CFD possible and consult Panametrics for details.
Repeatability	±0.5% of reading
Measurement Range	0 – 100 m/s (328 ft/s) Based on transmitter selected

Transmitter Specifications

Based on XGM868i, XGS868i, or XGS868 transmitters. Please see datasheets with specifications for each of these transmitters for specifications such as hazardous area location, power requirements, input/output capability, physical dimensions and characteristics.

Transducer Specifications

Temperature ranges	• Normal Temperature (NT): -55°C to 150°C • High Temperature (HT): -50°C to 250°C • Extreme Temperature (XT): -50°C to 300°C
Pressure range	Maximum allowable operating pressure 285 psig (18.63 bar); Retraction at 50 psig (4.46 bar or less)
Transducer materials	• Standard: Titanium • Monel, Hastelloy, or SS316 available as alternative materials
Hazardous Area classifications	Explosion-proof Class I, Div. 1, CD Optional: Group B upon request II 2G Ex d IIC T6..T2 Gb, IECEx & ATEX (II 2G) Other certifications available upon request. An integrated XAMP preamplifier may be installed in the certified assembly.

Insertion Mechanism

Design	• 1.5”, 150# insertion mechanism with packing material and O-ring seal • 1.5” NPT insertion mechanism with packing material and O-ring gland
Materials	• Stainless steel • Options: super duplex stainless steel, Hastelloy, Inconel (1.5”, 150# design only)
Temperature Rating	• FKM O-ring: -54°C to 204°C • Markez Z1321: -45°C to 250°C • Markez Z1400: -15°C to 335°C
Pressure Rating	• MAOP: 285 psig • Retraction Pressure: <50 psig

Isolation Valve

Insertion Materials	• 1.5” stainless steel NPT threaded mounted with packing gland • Optional steel NPT or flanged mounted, stainless steel mounted.

Flowcell

Paths	• One path (GZ1) • Two paths (GZ2)
Meter Body Sizing	• 3 in to 24 in (80 mm to 600 mm) standard • Optional: Different sizes may be available upon request
Meter Body Materials	• Carbon steel or stainless steel • Other materials such as stainless steel, hastelloy, and Inconel are available upon request
Meter Body Process Flange	150#
Meter Body Design	ASME B31.3 or PED NACE MR0103

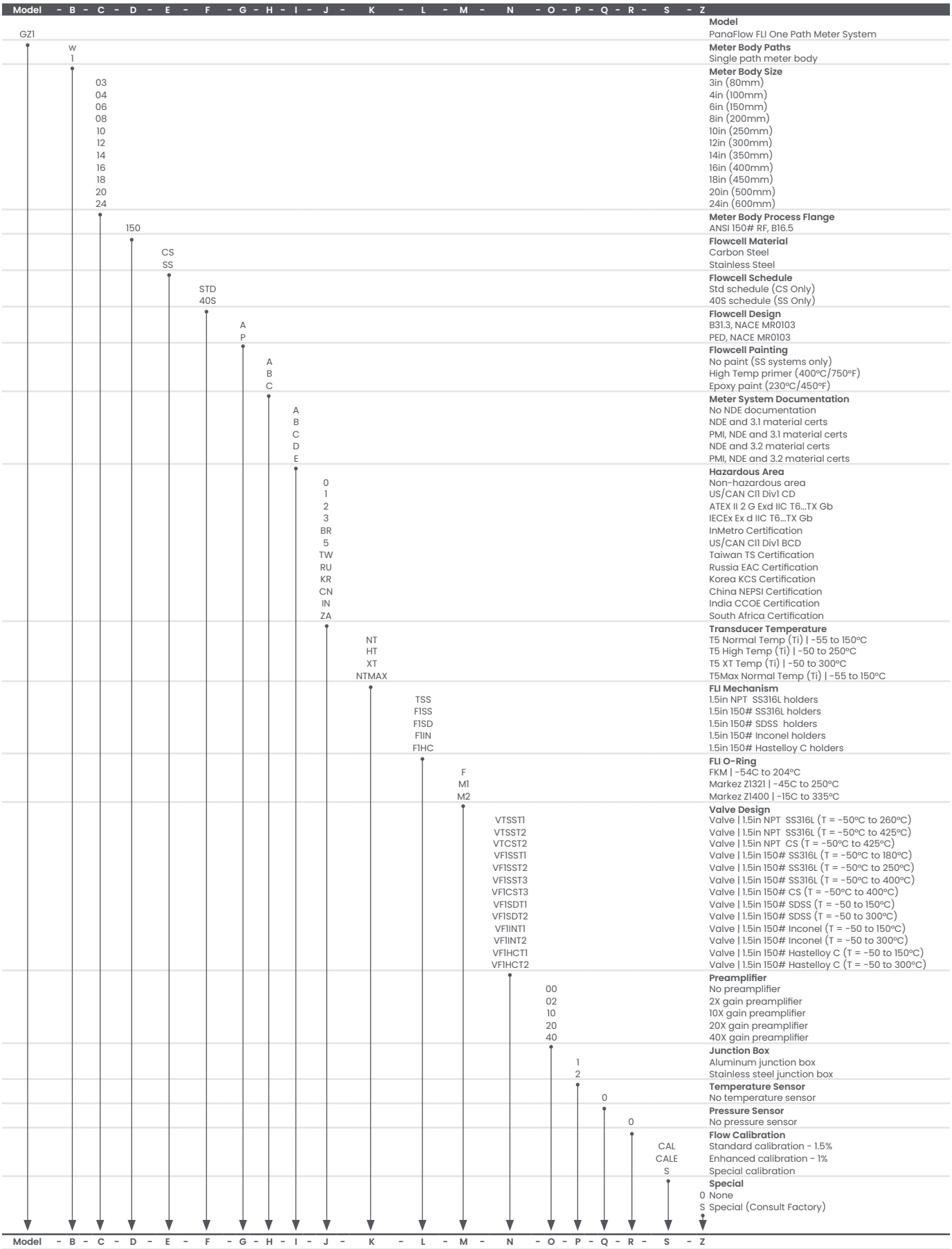
Nozzles

Paths	One path (GZNZ1) (if two paths are required, order quantity two)
Nozzle Pipe Sizes:	Angle cut for a 3 in to 24 in (80 mm to 600 mm) pipes Tilted diameter configurations only
Nozzle Design	1.5” 150# LWN nozzles
Nozzle Material	Carbon steel or stainless steel

Temperature & Pressure Sensor (Optional)

Contact Panametrics for details

Ordering Information – One Path Meter System



Model
PanaFlow FLI One Path Meter System

Meter Body Paths
Single path meter body

Meter Body Size
3in (80mm)
4in (100mm)
6in (150mm)
8in (200mm)
10in (250mm)
12in (300mm)
14in (350mm)
16in (400mm)
18in (450mm)
20in (500mm)
24in (600mm)

Meter Body Process Flange
ANSI 150# RF, B16.5

Flowcell Material
Carbon Steel
Stainless Steel

Flowcell Schedule
Std schedule (CS Only)
40S schedule (SS Only)

Flowcell Design
B31.3, NACE MR0103
PED, NACE MR0103

Flowcell Painting
No paint (SS systems only)
High Temp primer (400°C/750°F)
Epoxy paint (230°C/450°F)

Meter System Documentation
No NDE documentation
NDE and 3.1 material certs
PMI, NDE and 3.1 material certs
NDE and 3.2 material certs
PMI, NDE and 3.2 material certs

Hazardous Area
Non-hazardous area
US/CAN Cl1 Div1 CD
ATEX II 2 G Exd IIC T6...TX Gb
IECEx Ex d IIC T6...TX Gb
InMetro Certification
US/CAN Cl1 Div1 BCD
Taiwan TS Certification
Russia EAC Certification
Korea KCS Certification
China NEPSI Certification
India CCOE Certification
South Africa Certification

Transducer Temperature
T5 Normal Temp (Ti) | -55 to 150°C
T5 High Temp (Ti) | -50 to 250°C
T5 XT Temp (Ti) | -50 to 300°C
T5Max Normal Temp (Ti) | -55 to 150°C

FLI Mechanism
1.5in NPT SS316L holders
1.5in 150# SS316L holders
1.5in 150# SDSS holders
1.5in 150# Inconel holders
1.5in 150# Hastelloy C holders

FLI O-Ring
FKM | -54C to 204°C
Markez Z1321 | -45C to 250°C
Markez Z1400 | -15C to 335°C

Valve Design
Valve | 1.5in NPT SS316L (T = -50°C to 260°C)
Valve | 1.5in NPT SS316L (T = -50°C to 425°C)
Valve | 1.5in NPT CS (T = -50°C to 425°C)
Valve | 1.5in 150# SS316L (T = -50°C to 180°C)
Valve | 1.5in 150# SS316L (T = -50°C to 250°C)
Valve | 1.5in 150# SS316L (T = -50°C to 400°C)
Valve | 1.5in 150# CS (T = -50°C to 400°C)
Valve | 1.5in 150# SDSS (T = -50 to 150°C)
Valve | 1.5in 150# SDSS (T = -50 to 300°C)
Valve | 1.5in 150# Inconel (T = -50 to 150°C)
Valve | 1.5in 150# Inconel (T = -50 to 300°C)
Valve | 1.5in 150# Hastelloy C (T = -50 to 150°C)
Valve | 1.5in 150# Hastelloy C (T = -50 to 300°C)

Preamplifier
No preamplifier
2X gain preamplifier
10X gain preamplifier
20X gain preamplifier
40X gain preamplifier

Junction Box
Aluminum junction box
Stainless steel junction box

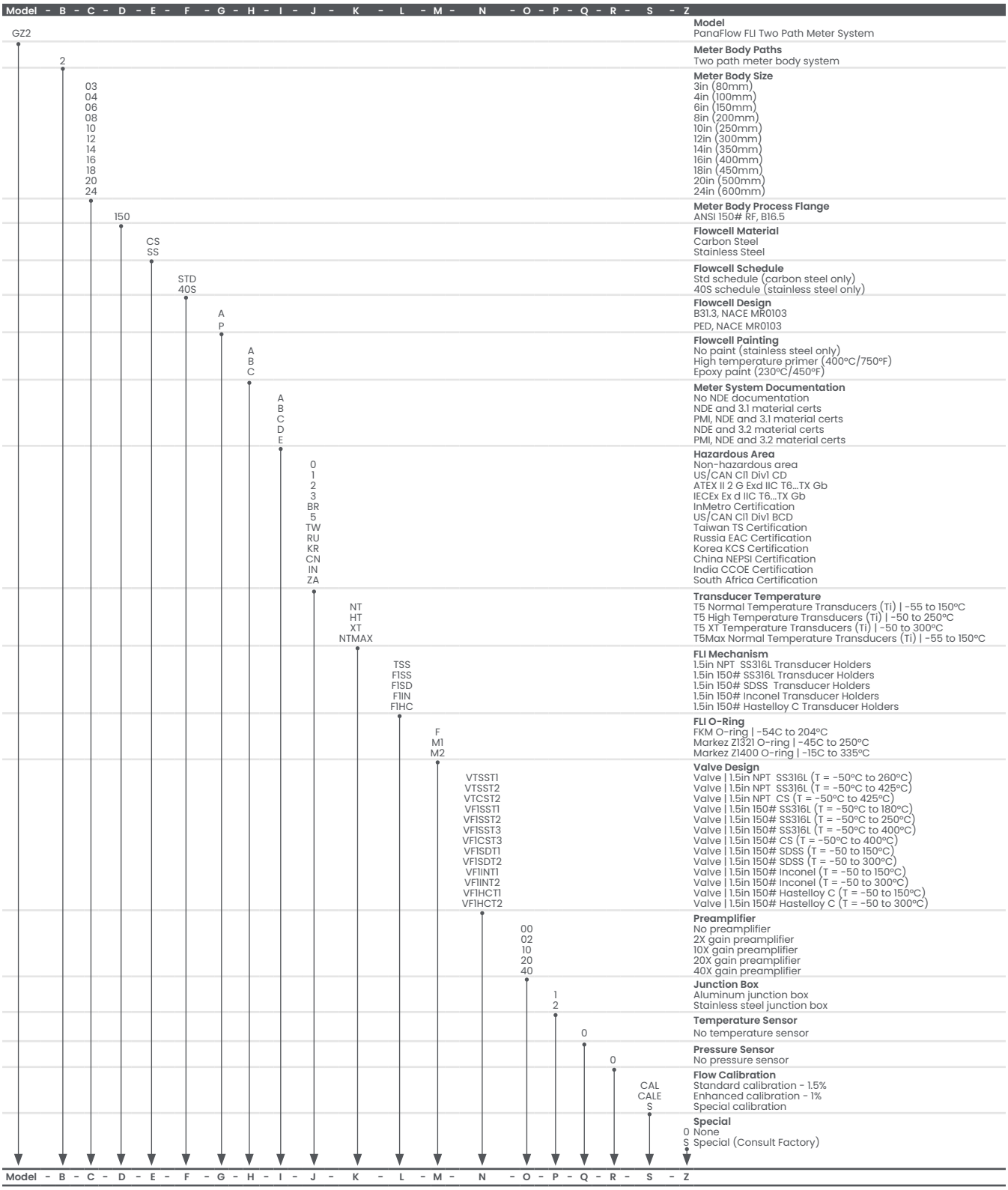
Temperature Sensor
No temperature sensor

Pressure Sensor
No pressure sensor

Flow Calibration
Standard calibration - 1.5%
Enhanced calibration - 1%
Special calibration

Special
0 None
S Special (Consult Factory)

Ordering Information – Two Path Meter System



Model
PanaFlow FLI Two Path Meter System

Meter Body Paths
Two path meter body system

Meter Body Size
3in (80mm)
4in (100mm)
6in (150mm)
8in (200mm)
10in (250mm)
12in (300mm)
14in (350mm)
16in (400mm)
18in (450mm)
20in (500mm)
24in (600mm)

Meter Body Process Flange
ANSI 150# RF, B16.5

Flowcell Material
Carbon Steel
Stainless Steel

Flowcell Schedule
Std schedule (carbon steel only)
40S schedule (stainless steel only)

Flowcell Design
B31.3, NACE MR0103
PED, NACE MR0103

Flowcell Painting
No paint (stainless steel only)
High temperature primer (400°C/750°F)
Epoxy paint (230°C/450°F)

Meter System Documentation
No NDE documentation
NDE and 3.1 material certs
PMI, NDE and 3.1 material certs
NDE and 3.2 material certs
PMI, NDE and 3.2 material certs

Hazardous Area
Non-hazardous area
US/CAN Cl1 Div1 CD
ATEX II 2 G Exd IIC T6...TX Gb
IECEx Ex d IIC T6...TX Gb
InMetro Certification
US/CAN Cl1 Div1 BCD
Taiwan TS Certification
Russia EAC Certification
Korea KCS Certification
China NEPSI Certification
India CCOE Certification
South Africa Certification

Transducer Temperature
T5 Normal Temperature Transducers (Ti) | -55 to 150°C
T5 High Temperature Transducers (Ti) | -50 to 250°C
T5 XT Temperature Transducers (Ti) | -50 to 300°C
T5Max Normal Temperature Transducers (Ti) | -55 to 150°C

FLI Mechanism
1.5in NPT SS316L Transducer Holders
1.5in 150# SS316L Transducer Holders
1.5in 150# SDSS Transducer Holders
1.5in 150# Inconel Transducer Holders
1.5in 150# Hastelloy C Transducer Holders

FLI O-Ring
FKM O-ring | -54C to 204°C
Markez Z1321 O-ring | -45C to 250°C
Markez Z1400 O-ring | -15C to 335°C

Valve Design
Valve | 1.5in NPT SS316L (T = -50°C to 260°C)
Valve | 1.5in NPT SS316L (T = -50°C to 425°C)
Valve | 1.5in NPT CS (T = -50°C to 425°C)
Valve | 1.5in 150# SS316L (T = -50°C to 180°C)
Valve | 1.5in 150# SS316L (T = -50°C to 250°C)
Valve | 1.5in 150# SS316L (T = -50°C to 400°C)
Valve | 1.5in 150# CS (T = -50°C to 400°C)
Valve | 1.5in 150# SDSS (T = -50 to 150°C)
Valve | 1.5in 150# SDSS (T = -50 to 300°C)
Valve | 1.5in 150# Inconel (T = -50 to 150°C)
Valve | 1.5in 150# Inconel (T = -50 to 300°C)
Valve | 1.5in 150# Hastelloy C (T = -50 to 150°C)
Valve | 1.5in 150# Hastelloy C (T = -50 to 300°C)

Preamplifier
No preamplifier
2X gain preamplifier
10X gain preamplifier
20X gain preamplifier
40X gain preamplifier

Junction Box
Aluminum junction box
Stainless steel junction box

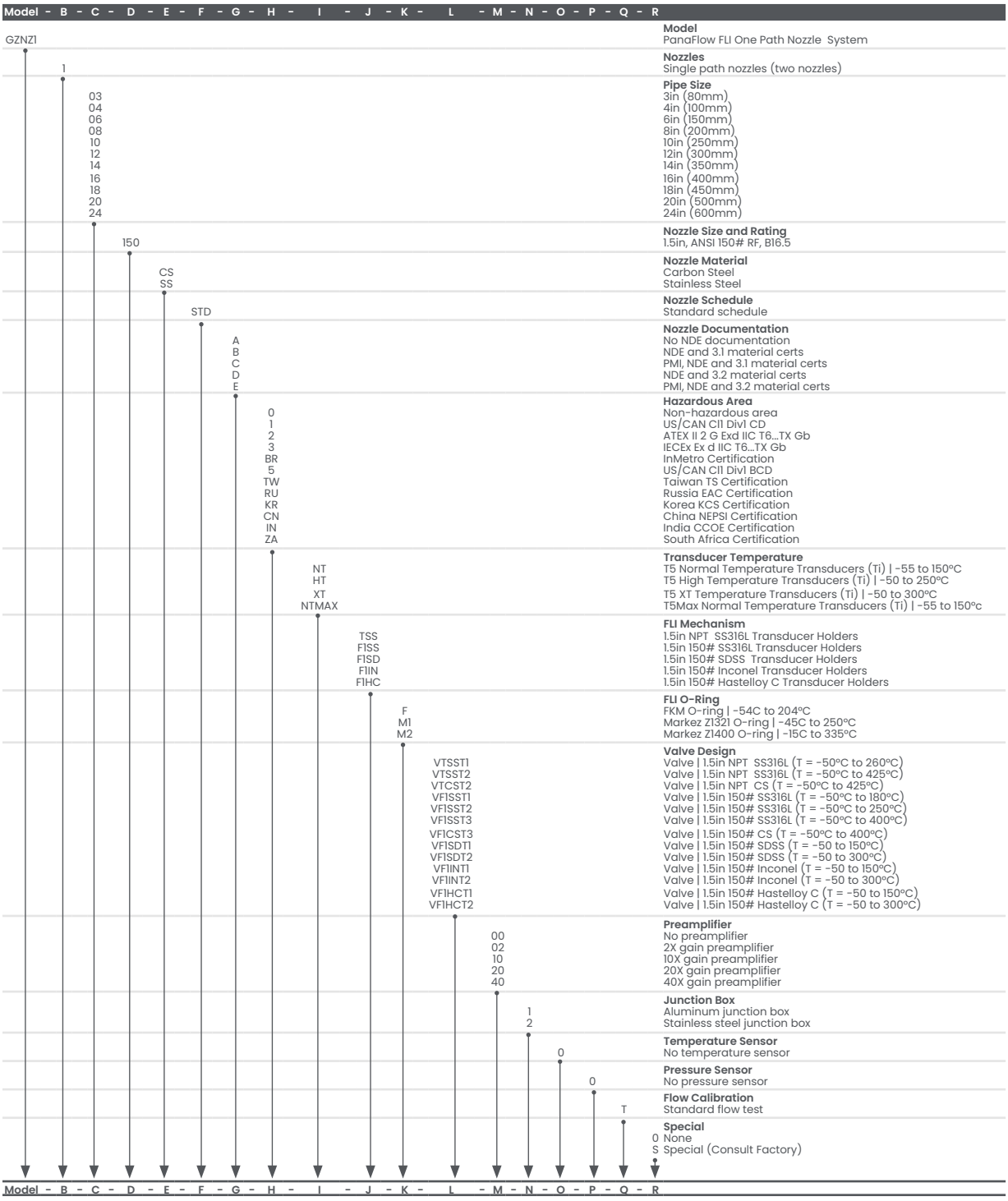
Temperature Sensor
No temperature sensor

Pressure Sensor
No pressure sensor

Flow Calibration
Standard calibration - 1.5%
Enhanced calibration - 1%
Special calibration

Special
0 None
S Special (Consult Factory)

Ordering Information – One Path Nozzle System



Model
PanaFlow FLI One Path Nozzle System

Nozzles
Single path nozzles (two nozzles)

Pipe Size
3in (80mm)
4in (100mm)
6in (150mm)
8in (200mm)
10in (250mm)
12in (300mm)
14in (350mm)
16in (400mm)
18in (450mm)
20in (500mm)
24in (600mm)

Nozzle Size and Rating
1.5in, ANSI 150# RF, B16.5

Nozzle Material
Carbon Steel
Stainless Steel

Nozzle Schedule
Standard schedule

Nozzle Documentation
No NDE documentation
NDE and 3.1 material certs
PMI, NDE and 3.1 material certs
NDE and 3.2 material certs
PMI, NDE and 3.2 material certs

Hazardous Area
Non-hazardous area
US/CAN Cl1 Div1 CD
ATEX II 2 G Exd IIC T6...TX Gb
IECEx Ex d IIC T6...TX Gb
InMetro Certification
US/CAN Cl1 Div1 BCD
Taiwan TS Certification
Russia EAC Certification
Korea KCS Certification
China NEPSI Certification
India CCOE Certification
South Africa Certification

Transducer Temperature
T5 Normal Temperature Transducers (Ti) | -55 to 150°C
T5 High Temperature Transducers (Ti) | -50 to 250°C
T5 XT Temperature Transducers (Ti) | -50 to 300°C
T5Max Normal Temperature Transducers (Ti) | -55 to 150°c

FLI Mechanism
1.5in NPT SS316L Transducer Holders
1.5in 150# SS316L Transducer Holders
1.5in 150# SDSS Transducer Holders
1.5in 150# Inconel Transducer Holders
1.5in 150# Hastelloy C Transducer Holders

FLI O-Ring
FKM O-ring | -54C to 204°C
Markez Z1321 O-ring | -45C to 250°C
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Valve | 1.5in NPT CS (T = -50°C to 425°C)
Valve | 1.5in 150# SS316L (T = -50°C to 180°C)
Valve | 1.5in 150# SS316L (T = -50°C to 250°C)
Valve | 1.5in 150# SS316L (T = -50°C to 400°C)
Valve | 1.5in 150# CS (T = -50°C to 400°C)
Valve | 1.5in 150# SDSS (T = -50 to 150°C)
Valve | 1.5in 150# SDSS (T = -50 to 300°C)
Valve | 1.5in 150# Inconel (T = -50 to 150°C)
Valve | 1.5in 150# Inconel (T = -50 to 300°C)
Valve | 1.5in 150# Hastelloy C (T = -50 to 150°C)
Valve | 1.5in 150# Hastelloy C (T = -50 to 300°C)

Preamplifier
No preamplifier
2X gain preamplifier
10X gain preamplifier
20X gain preamplifier
40X gain preamplifier

Junction Box
Aluminum junction box
Stainless steel junction box

Temperature Sensor
No temperature sensor

Pressure Sensor
No pressure sensor

Flow Calibration
Standard flow test

Special
0 None
S Special (Consult Factory)

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