IntelliFlo^{TM}
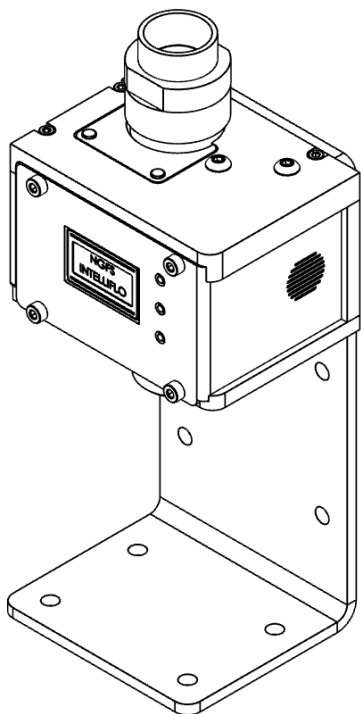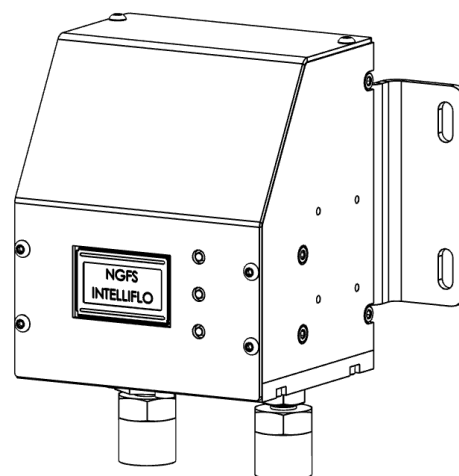# Robotic Arc Welding
Gas Flow Monitoring System

IntelliFlo-NGFS   IntelliFlo-IGFS

OWNER'S MANUAL

Effective with serial No. NG2505001 & following.   *Patent Pending*

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Safety Depends on You

DO NOT INSTALL, OPERATE, OR REPAIR THIS EQUIPMENT WITHOUT READING THIS MANUAL AND THE SAFETY PRECAUTIONS CONTAINED THROUGHOUT.

INTELLIFLO_GFSOM-1

Safety Information

Before installation and commissioning of the IntelliFlo, please read and understand all of the following safety information. Failure to follow these instructions may result in damage to the equipment or personal injury.

The IntelliFlo is constructed to be safe to operate provided that only authorized personnel perform the installation, commissioning and maintenance of the unit and all safety precautions in these operating instructions are observed. -The accident prevention regulations as well as the safety specifications referenced below are observed ANSI/RIA R15.06-2012 Industrial Robots and Robot Systems —Safety Requirements

This product shall be integrated into a robot cell with an independent safety system by plant engineering. Install within a secured area, which is only to be entered by qualified personnel for maintenance work or robot programming.

Before assembling, adjusting, or working with the IntelliFlo, ensure all equipment in the area is locked out and disabled.

The sensing unit is to be used only for welding gas flow detection within the parameters of its technical specification. Do not exceed the specified operating pressure of 60 PSI.

The IntelliFlo unit may only be operated with the cover closed when operated independently. Keep hands away from unit while in operation.
Additional fittings or accessories that are not offered from the manufacturer may only be installed with approval from the manufacturer.

Do not use the sensor with corrosive or aggressive vapors or liquids without first obtaining approval from the manufacturer.
Ensure that there is nothing in the sensor unit when shutting down the system.

Warning and instruction labels from the unit are not to be removed or defaced. For additional safety information, refer to the following publications:

ANSI/RIA R15.06-2012 Industrial Robots and Robot Systems – Safety Requirements
Robotic Industries Association, 900 Victors Way, Suite 140, Ann Arbor, Michigan, USA 48108
ANSI Z49.1:2012 Safety in Welding, Cutting, and Allied Processes, American Welding Society, 550 N.W. LeJeune Road, Miami, FL 33126
CAN/CSA-Z434-14 Industrial robots and robot systems,
Canadian Standards Association, 5060 Spectrum Way, Mississauga, Ontario, L4W 5N6, CANADA

Safety Information

⚠️	**⚠ WARNING** Disconnect power before servicing.
⚠️	**⚠ WARNING** Disconnect gas supply before servicing.
⚠️	**⚠ WARNING** Do not use damaged, frayed, or deteriorated air hoses and fittings.
🕐	**⚠ WARNING** Maintain safe operating pressure (80 psi).

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Table of Contents

1   Specifications

GAS FLOW SPECIFICATIONS	
Max Pressure: 60 PSI	Flow: Argon = 1 – 26 LPM (2.1 – 55 SCFH) AR90:C10 = 1 – 25 LPM (2.1 – 53 SCFH) AR75:C25 = 1 – 22 LPM (2.1 – 47 SCFH)
For use with Argon or mixed gas (AR:CO2)	

ELECTRICAL SPECIFICATIONS	
Voltage: 24 VDC +/- 10%	Current: 0.1 Amp DC (NGFS) 0.1 Amp DC (IGFS)

NOZZLE GAS FLOW SENSOR (NGFS) PHYSICAL DIMENSIONS			
HEIGHT 5.9 in. 244 mm	WIDTH 4.0 in. 102 mm	DEPTH 3.4 in. 86 mm	NET WEIGHT 5 lbs 2.3 kg

INLINE FLOW SENSOR (IGFS) PHYSICAL DIMENSIONS			
HEIGHT 5.8 in. 147 mm	WIDTH 5.9 in. 150 mm	DEPTH 3.6 in. 93 mm	NET WEIGHT 3 lbs 1.4 kg

2   Installation

Mounting Dimensions

The Nozzle Gas Flow Sensor mounting bracket provides through holes for mounting on the bottom or on the side. All holes are 0.28" (7mm) through.
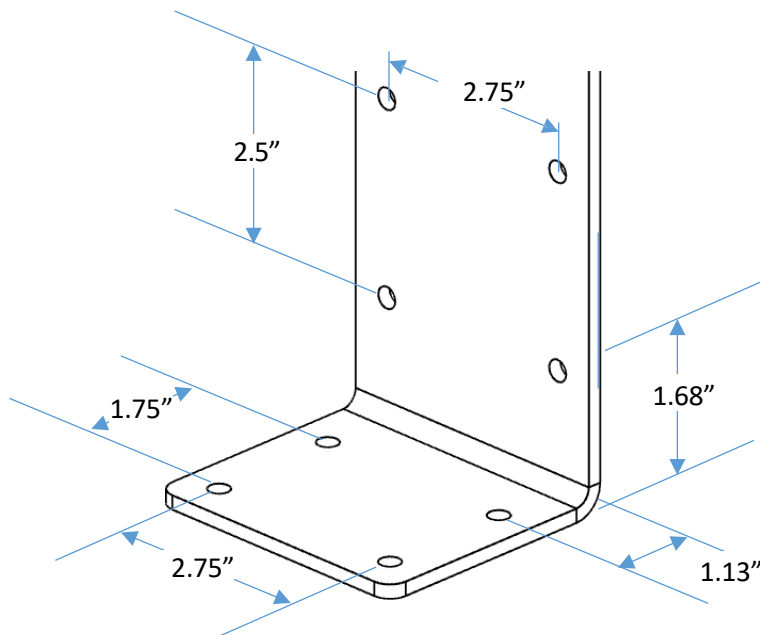
| inch	mm
1.13	28.7
1.68	42.6
1.75	44.4
2.5	63.5
2.75	69.8

The Inline Gas Flow Sensor mounting bracket provides holes for mounting to a fence or wall. All holes are 0.23" (5.7mm) wide x 0.32" (8mm) high.
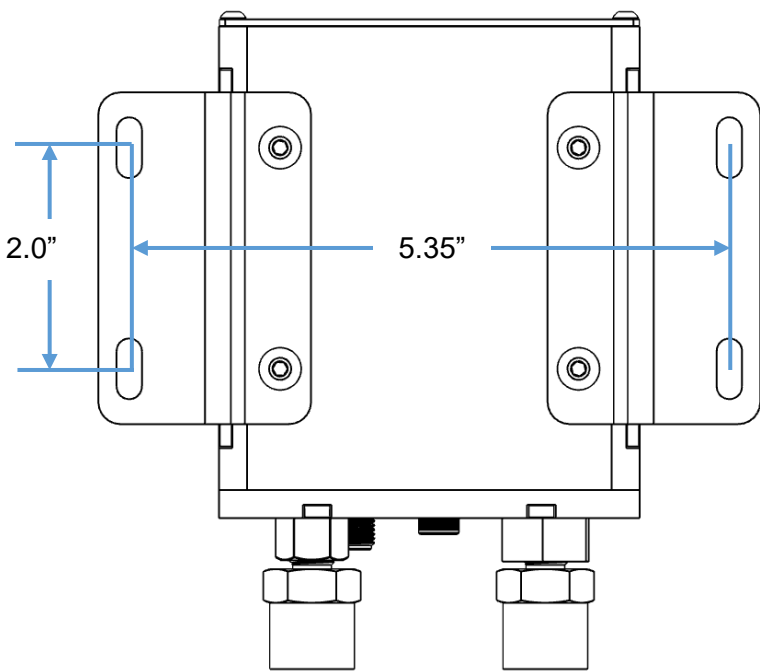
| inch	mm
5.35	136.0
2.0	50.0

2.1 Gas Connection

Use only regulated, dry, welding gas. Connect the inlet supply line to the AW-15A (5/8-18 RH) welding gas fitting located at the bottom right side of the IntelliFlo IGFS. Connect the outlet supply line to the AW-15A (5/8-18 RH) welding gas fitting located at the bottom right side of the IntelliFlo IGFS.

Output   Input

To Wire Feeder   From Flow Regulator
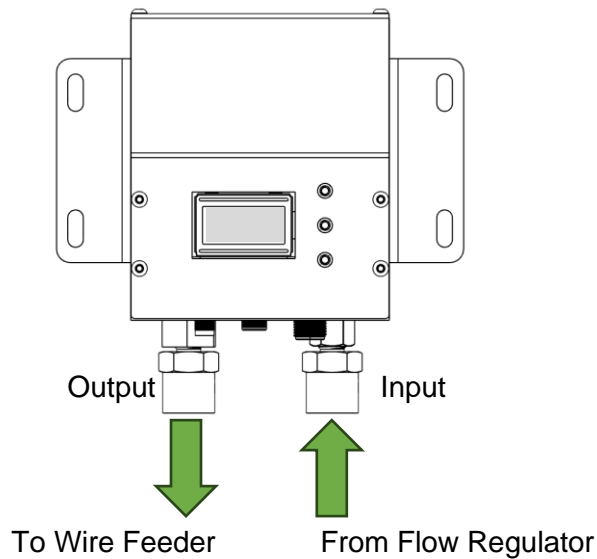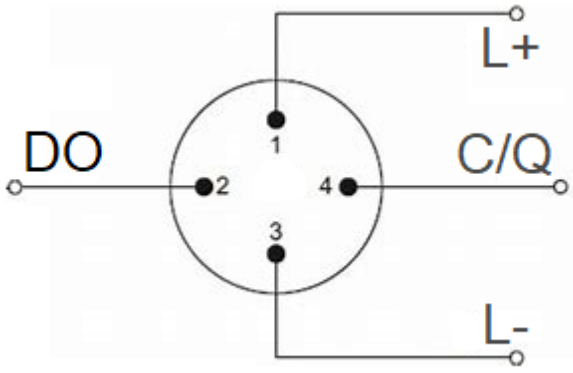
2.2 Electrical Connection

Damage to equipment may occur if connected improperly. Only a qualified technician should perform the following connections. The IntelliFlo NGFS must be connected to an IO-Link master for full functionality. Secure the M12 4-pin connector by threading the connector to the receptacle at the right under the display of the IntelliFlo NGFS. The IntelliFlo NGFS is powered through this connection and requires a 24 VDC, 0.1 Amp DC power supply, plus an additional 0.1 Amp for each IGFS that is connected in series. The wiring is according to M12 A-code standard.

M12 IO-Link

From IO-Link Master
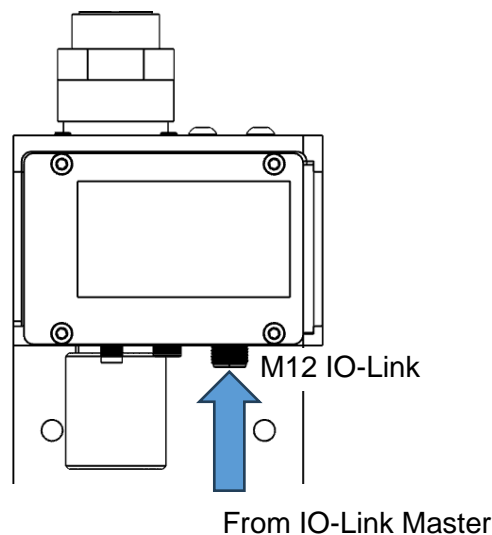
IntelliFlo

Connect the IO-Link M12 cable. Pin and wire colors have the following descriptions.

Pin. Color	Name	Description
1. Brown	+24 VDC	Power supply (+24 VDC, 0.75 Amp DC)
2. White	DO	PNP output: Nozzle Seal Detect
3. Blue	0 VDC	Power supply return.
4. Black	C/Q	IO-Link serial communication.

If used, connect the Inline Flow Sensor(s) using the smaller M8 plugs and receptacles in a daisy chain configuration.
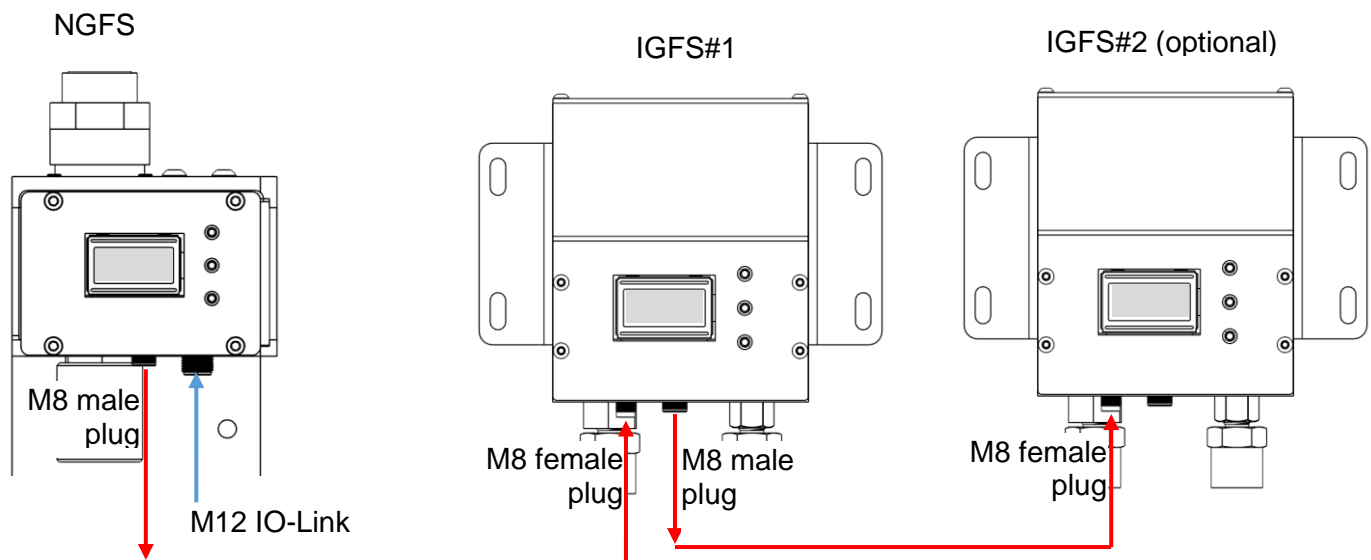
2.3 The final installation should resemble the following typical setups:

2.3.1 One robot with one NGFS
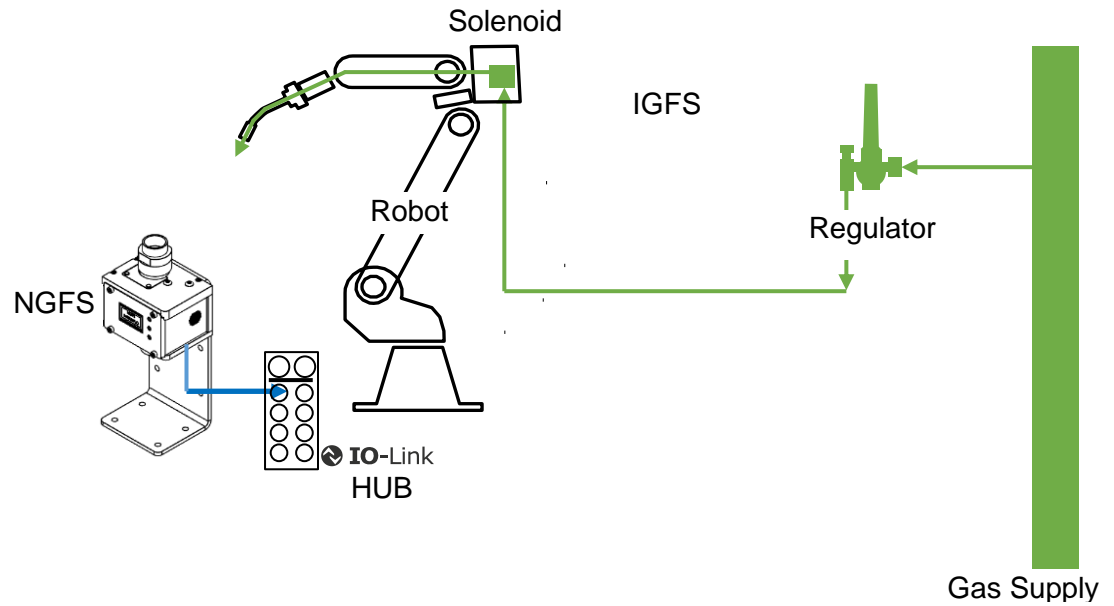
2.3.2 One robot with one IGFS and one NGFS.

IntelliFlo

2.3.4   Two robots sharing one NGFS and each with their one IGFS.

3 IO-Link Specification and Data Map

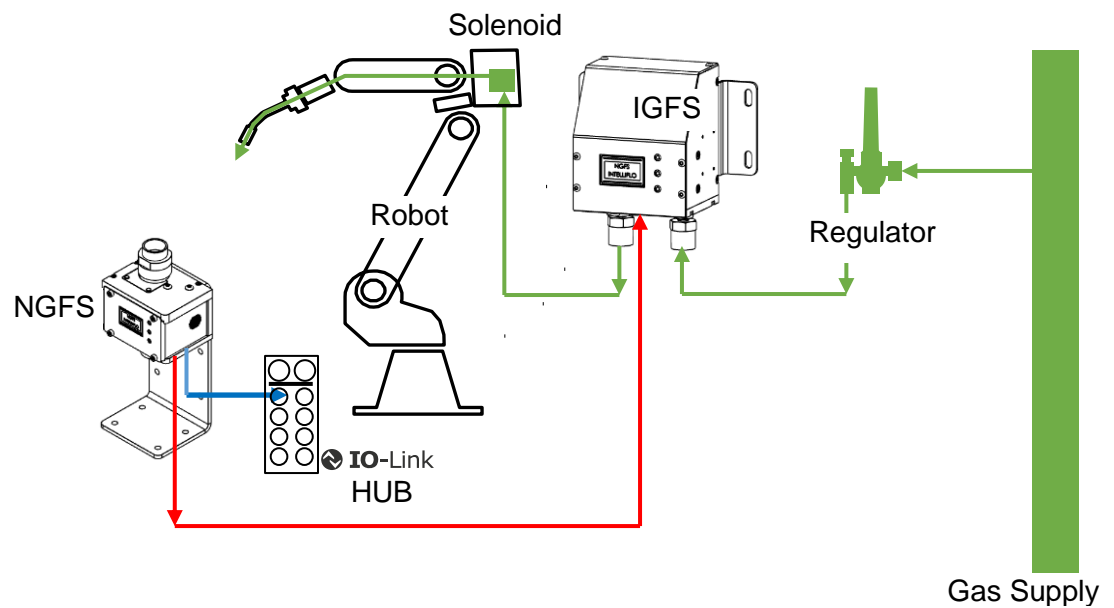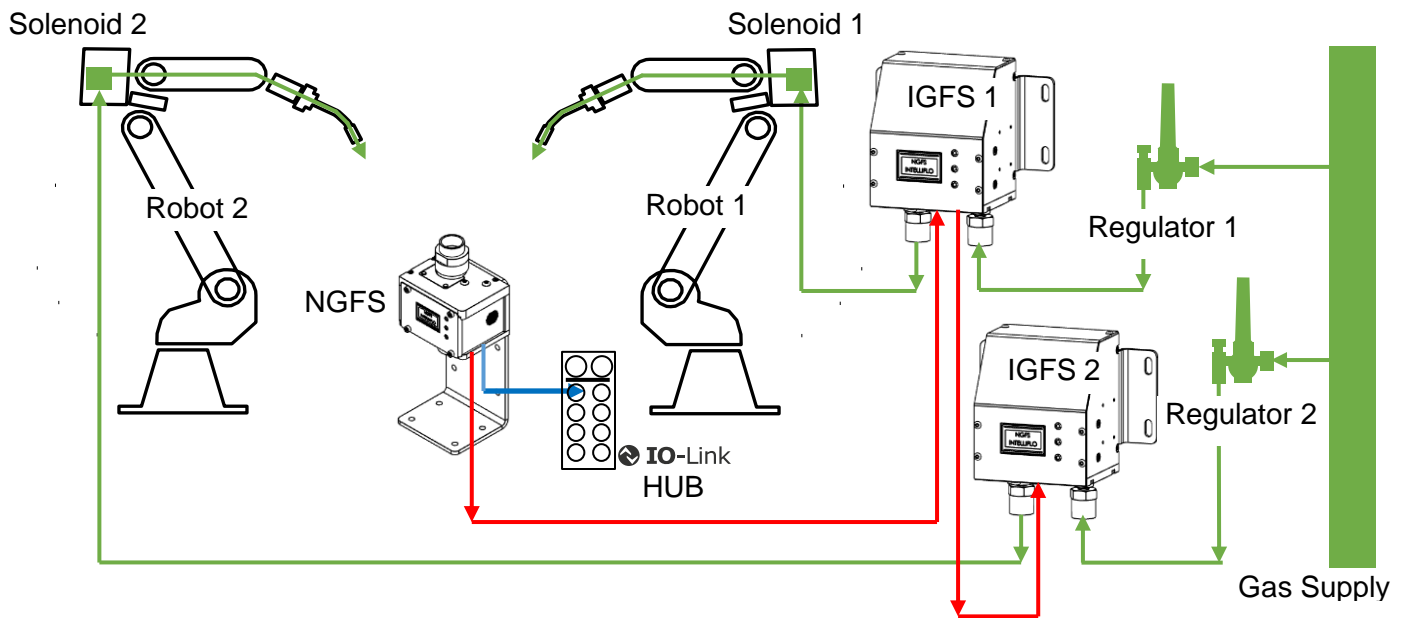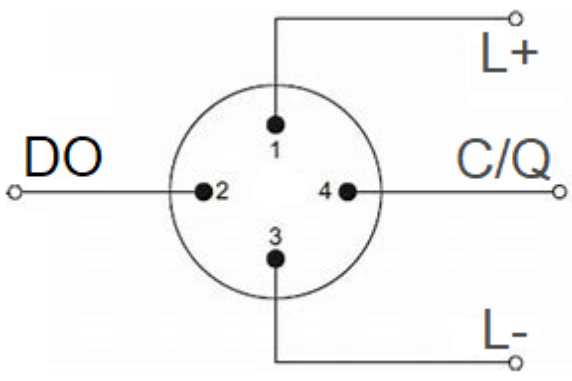|		
Data transmission rate	COM3 (230 kBaud)	M12 pinout
Minimal cycle time	10ms	
IO-Link Version	1.1	
IO-Link port type	Class A	
Vendor ID	1842	
Device ID	103	
Process Data In Length	144 bits (18 bytes)	
Process Data Out Length	16 bits (2 bytes)	
SIO mode	No	
DIO pin function	Output: Nozzle Detect signal	
Data Storage	No	

IO-Link Process Data In (IntelliFlo to In-Link Master)

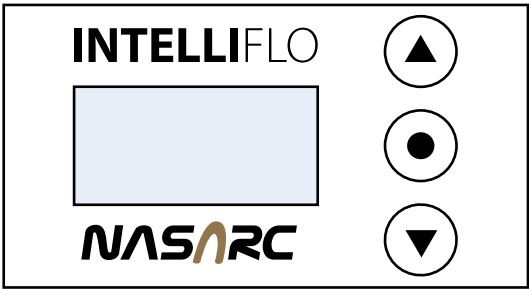| Address	Name	# Bits	Data Values	Notes
[0]	Nozzle Flow /10	16	0-65535	Tenths of measured flow (LPM or CFH)
[2]	In-Line #1 Flow /10	16	0-65535	Tenths of measured flow (LPM or CFH)
[4]	In-Line #2 Flow /10	16	0-65535	Tenths of measured flow (LPM or CFH)
[6]	In-Line #1 Pressure	16	0-65535	Measures Pressure (kPa or PSI_{x10})
[8]	In-Line #2 Pressure	16	0-65535	Measures Pressure (kPa or PSI_{x10})
[10]	Nozzle Flow Temperature	8	0-255	Measured Temperature (ºC or ºF)
[11].0	Gas Selection	3	0-7	0=Argon, 1=AR90C10, 2=AR75C25, 3=CO2 4=Air, 5=Custom
[11].3	Reserved*	1	0-1	Reserved
[11].4	Units	1	0-1	0=System International, 1=Imperial
[11].5	Nozzle Seal Detector	1	0-1	Nozzle Seal Detect Limit Switch 0=Off, 1=On
[11].6	In-Line#1 Comm OK	1	0-1	Communication Status with Inline Sensor 1
[11].7	In-Line#2 Comm OK	1	0-1	Communication Status with Inline Sensor 2
[12]	In-Line #1 Flow Total	24	0-9999999	Volume (tenths L or hundredths CF)
[15]	In-Line #1 Flow Total	24	0-9999999	Volume (tenths L or hundredths CF)

IO-Link Process Data Out (Master Hub to IntelliFlo)

Address	Name	# Bits	Data Values	Notes
[0].0	Gas Selection	3	0-7	0=Argon, 1=AR90C10, 2=AR75C25, 3=CO2 4=Air, 5=Custom
[0].3	Reserved*	1	0-1	Reserved
[0].4	Units	1	0-1	0=SI, 1=Imperial
[0].5	Reserved	1	0-1	Reserved
[0].6	Reset In-Line#1 Flow Total	1	0-1	Communication Status with Inline Sensor 1
[0].7	Reset In-Line#2 Flow Total	1	0-1	Communication Status with Inline Sensor 2
[1]	Reserved*	8	0-255	Reserved

Used for calibration procedures, see IntelliFlo calibration document for details.

4   User Interface

The User Interface displays all readings from the connected equipment.
- Navigate through the screens using the up (▲) and down (▼) buttons.
- Press Enter (●) to jump between similar screens.
- Press both up (▲) and down (▼) at the same time to return to the title screen at any time.

Several special characters are used in the screens.

	Argon		AR90:C10		AR75:C25
	CO2		Liters Per Minute		Cubic Feet Per Hour

4.1   LCD Navigation with one nozzle gas flow sensor.

1	Title Screen
2	Nozzle Flow
3	Nozzle Flow Temperature
4	Nozzle Seal Detect

IntelliFlo
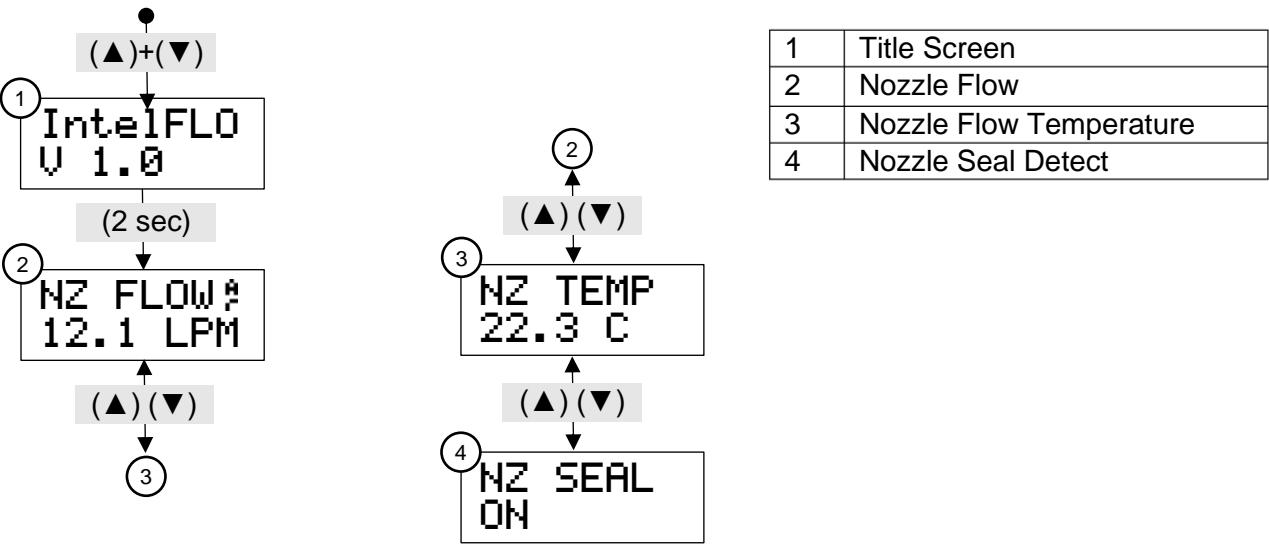
4.2 LCD Navigation with one inline flow meter.
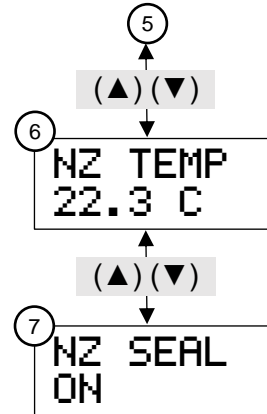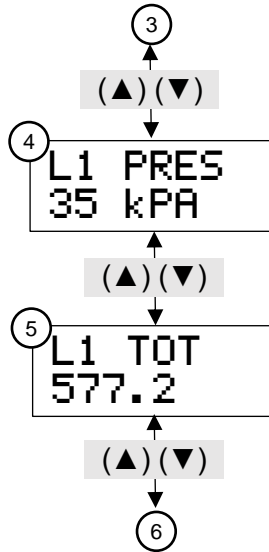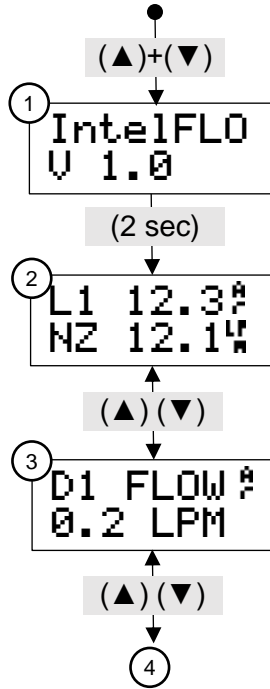
1	Title Screen
2	Inline 1 Flow / Nozzle Flow
3	Difference 1 (L1-NZ)
4	Inline 1 Pressure
5	Inline 1 Total (Volume) L / ft³
6	Nozzle Flow Temperature
7	Nozzle Seal Detect
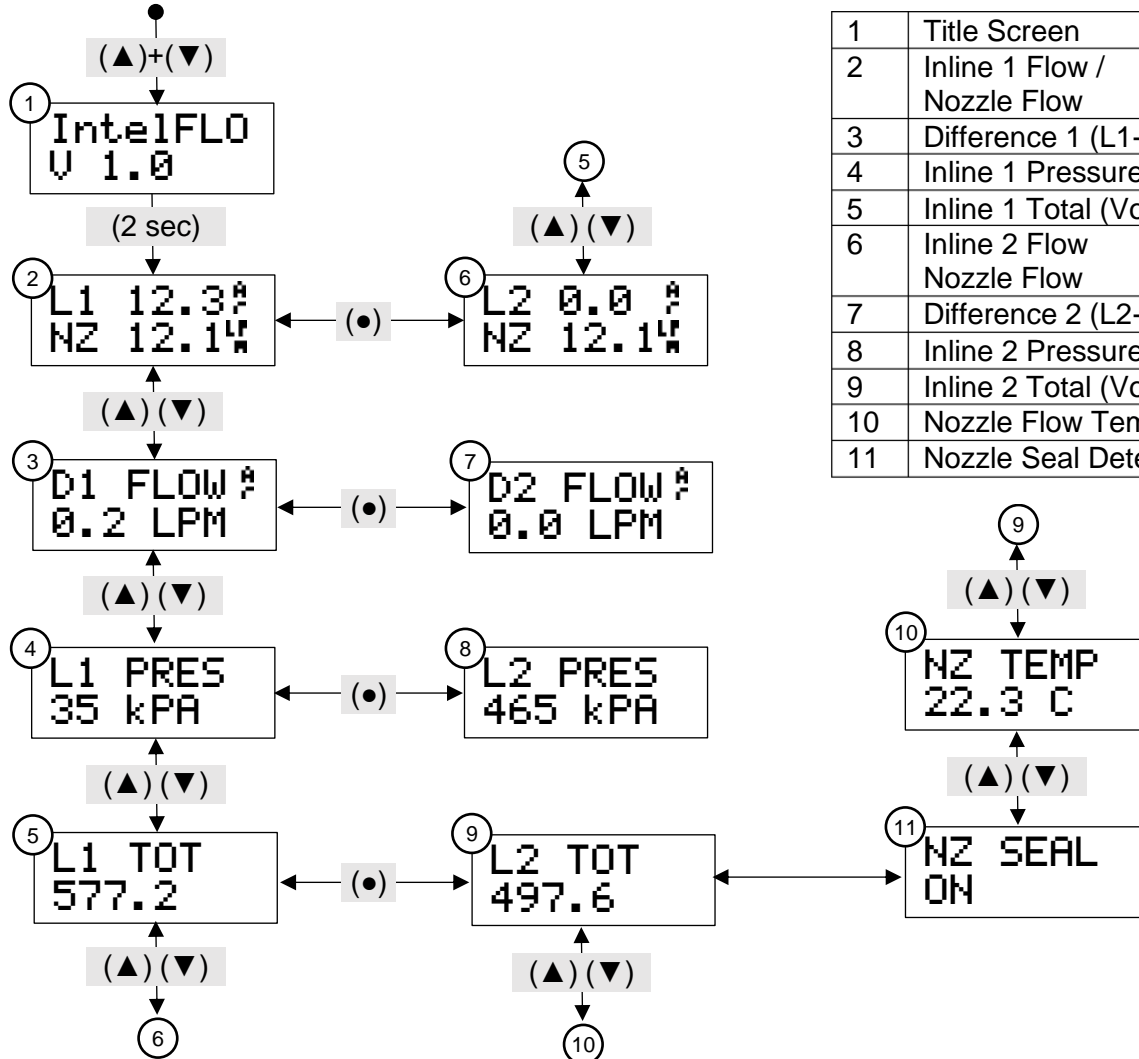
(▲)+(▼)

1 IntelFLO
   V 1.0

(2 sec)

2 L1 12.3?
   NZ 12.1?

(▲)(▼)

3 D1 FLOW?
   0.2 LPM

(▲)(▼)

4

3

(▲)(▼)

4 L1 PRES
   35 kPA

(▲)(▼)

5 L1 TOT
   577.2

(▲)(▼)

6

5

(▲)(▼)

6 NZ TEMP
   22.3 C

(▲)(▼)

7 NZ SEAL
   ON

4.3   LCD Navigation with two inline flow meters.

1	Title Screen
2	Inline 1 Flow / Nozzle Flow
3	Difference 1 (L1-NZ)
4	Inline 1 Pressure
5	Inline 1 Total (Volume) L / ft^3
6	Inline 2 Flow Nozzle Flow
7	Difference 2 (L2-NZ)
8	Inline 2 Pressure
9	Inline 2 Total (Volume) L / ft^3
10	Nozzle Flow Temperature
11	Nozzle Seal Detect

(▲)+(▼)

① IntelFLO
V 1.0

(2 sec)

② L1 12.3
NZ 12.1

(●)

⑥ L2 0.0
NZ 12.1

⑤

(▲)(▼)

(▲)(▼)

③ D1 FLOW
0.2 LPM

(●)

⑦ D2 FLOW
0.0 LPM

(▲)(▼)

④ L1 PRES
35 kPA

(●)

⑧ L2 PRES
465 kPA

⑨

(▲)(▼)

(▲)(▼)

⑩ NZ TEMP
22.3 C

⑤ L1 TOT
577.2

(●)

⑨ L2 TOT
497.6

(▲)(▼)

⑪ NZ SEAL
ON

(▲)(▼)

(▲)(▼)

⑥

⑩

5   Operation

Gas flow and pressure from the Inline Flow Sensor(s) is available at any time.

To read gas flow and temperature from the Nozzle Gas Flow Sensor;

1. Move the robot to position the nozzle at a point directly above the inlet flow cone.
2. Turn on the gas flow and slowly move the nozzle down into the flow cone until the spring engages or the "Nozzle Seal Detect" input has turned on.
4. Read the Inline Flow and Nozzle Gas Flow.
5. Turn off the gas flow.
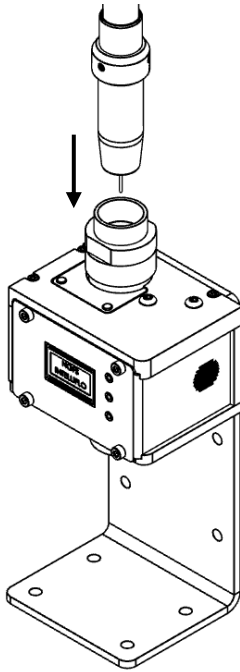
Note: When the welding gas solenoid turns on there is normally a surge of gas before the flow stabilizes to the steady state flow preset by the regulator. To avoid a false reading, it may be necessary to purge gas before taking a reading from the NGFS and/or IGFS.

6   <u>Gas Delivery Fault Detection</u>

Further troubleshooting of the gas delivery system is possible with readings from both the IGFS and NGFS.

| Gas Command	Inline Gas Flow	Inline Gas Pressure	Point-of-Use Gas Flow	Operational Condition
OFF	Zero	Peak	N/A	No Problem
OFF	Zero	Zero	N/A	Gas bottle / delivery system is not pressurized, or gas bottle is empty.
OFF	Above zero	Below Peak	Zero	Leak in gas system between inline flow sensor and solenoid, or solenoid defective
OFF	Above zero	Below Peak	Above Zero	Solenoid defective (open)
ON	In Tolerance	Below Peak	In Tolerance	No Problem
ON	In Tolerance	Below Peak	Below Tolerance	Leak between solenoid and nozzle.
ON	Below Tolerance	Peak	Below Tolerance	Solenoid defective (closed) or a block/kink between inline sensor and nozzle.

In the Table above, in-tolerance flow means that the gas flow value is within high/low setpoints. Regarding inline peak pressure, when the gas is fed from a pressurized gas bottle/tank the pressure observed is high (peak) when gas is not flowing (eg 40 to 80 psi). The in-line pressure falls when gas flows and returns when the flow stops. The in-line pressure may also be observed to fall slowly as the bottle/tank is drained over weeks/months (unless there is an upstream means to maintain this pressure). The peak pressure or no-flow pressure can be averaged out between cycles.

7 <u>Preventative Maintenance</u>

The Nozzle Gas Flow Sensor will require periodic maintenance to ensure a dependable service life.
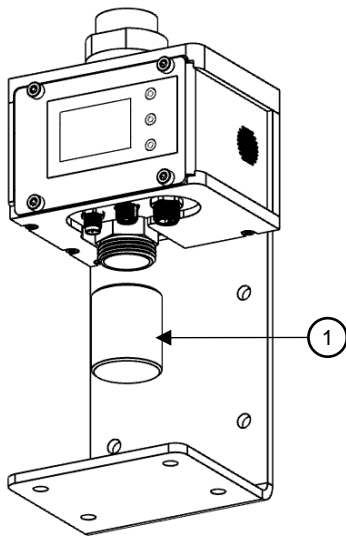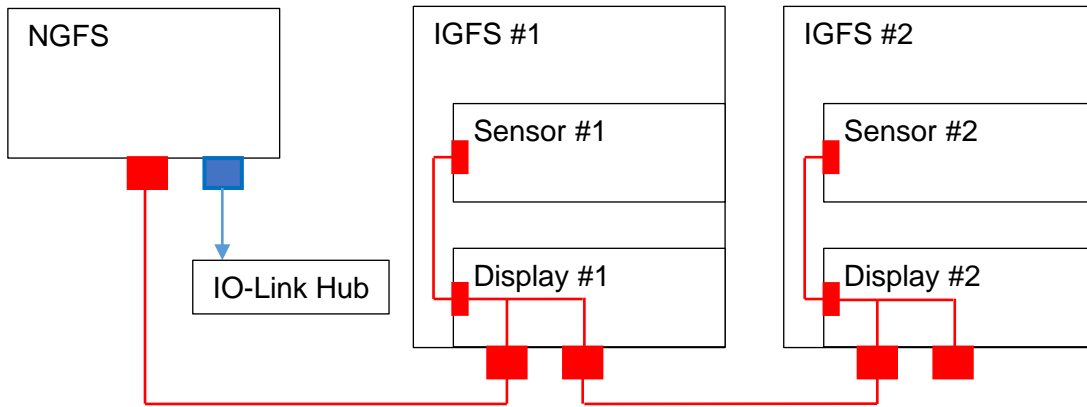

1. Clean debris from the drain plug by unthreading and removing the plug at the bottom, turn over to allow the debris to fall out.
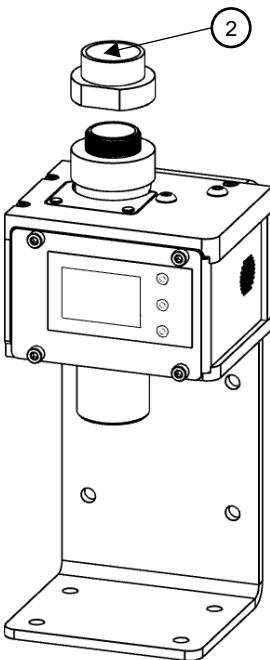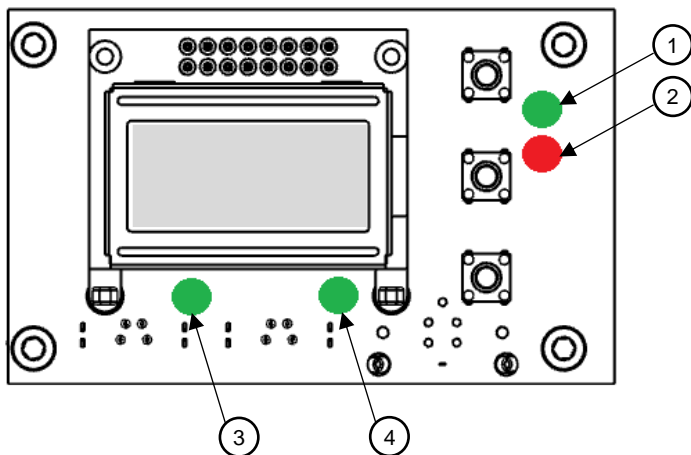

2. Clean the inside face of the flow cone (top) to remove surface buildup. Replace if necessary.

8   Troubleshooting

A subnet is used to communicate between nodes within the IntelliFlo system as shown below. The NGFS communicates with all nodes.

Several LED indicators on the circuit boards can be used to diagnose communication issues.

NGFS circuit board (NTE80-1)	
1	IO-Link Activity (fades in and out)
2	IO-Link Waiting (fades in and out)
3	Inline Flow Sensor 1 communication (toggles on/off)
4	Inline Flow Sensor 2 communication (toggles on/off)
IGFS display circuit board (NTE80-2)	
3	Communication from display with NGFS (toggles on/off)
4	Not used

IntelliFlo

9   Replacement Parts List - NGFS
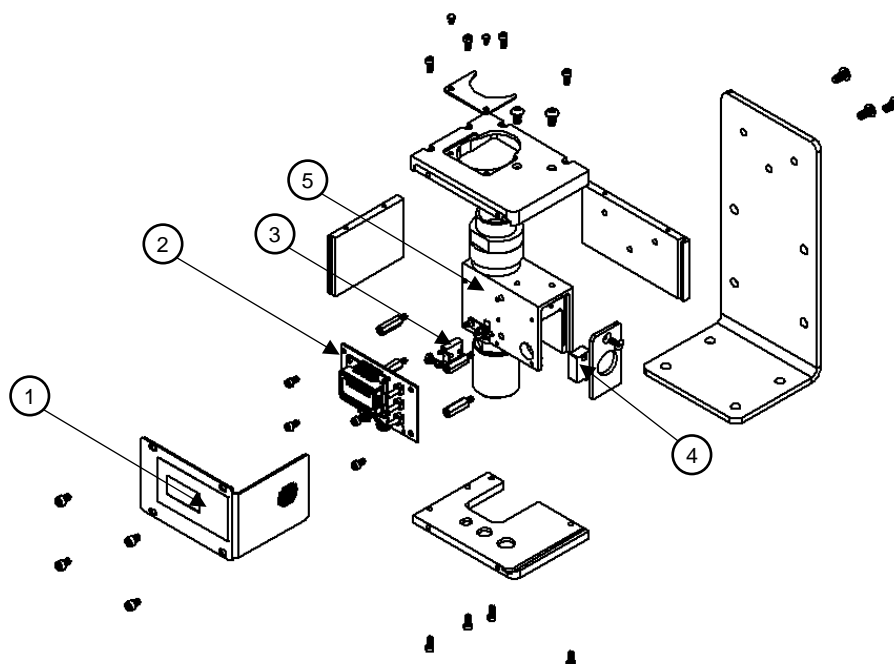
ITEM	PART #	DESCRIPTION
1	GFS20-11	MEMBRANE 20
2	NTE80-1R	PC BOARD GFS20 ASSEMBLY
3	GFS20-10R	LIMIT SWITCH W/WIRE ASSEMBLY
4	NTE37	GAS FLOW SENSOR
5	NAC40A	NGFS - SINGLE UNIT SUB ASSEMBLY

10 Replacement Parts List - IGFS
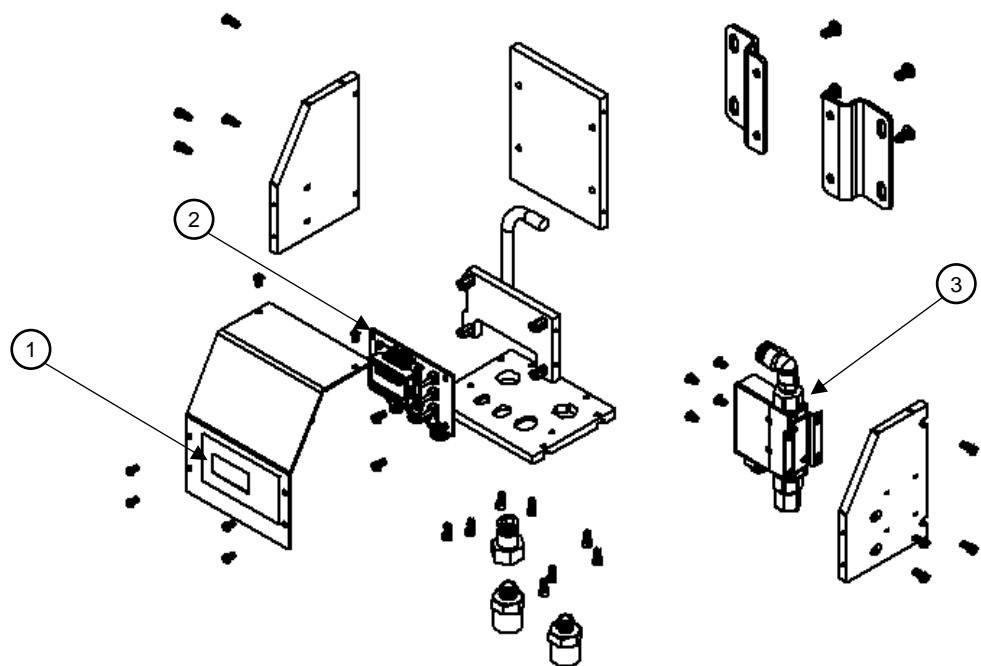
ITEM	PART #	DESCRIPTION
1	GFS30-11	MEMBRANE 30
2	NTE80-2	PC BOARD GFS30 ASSEMBLY
3	GFS30-9R	INLINE FLOW SENSOR ASSEMBLY

Accessories

PART #	DESCRIPTION
IRE060017-00	IO-Link Cable, 4 pin, 10M, M12
IRE060019-00	Communication Cable, 4 pin, 10M, M8
GFS01-9	IntelliFlo Nozzle Gas Flow Sensor Mounting Bracket
GFS01-10	IntelliFlo Nozzle Gas Flow Sensor Mounting Kit
GFS01-11	IntelliFlo Inline Gas Flow Sensor Mounting Kit
NAC40-5	Nozzle Gas Flow Sensor Discharge Cup
NAC40-11	Nozzle Gas Flow Sensor Cone

IntelliFlo

Warranty

<div align="center">

NASARC Cert-Equip WARRANTY POLICY

</div>

IntelliFlo is warranted by **NASARC** to the original commercial or institutional end user/owner against defects in materials and workmanship as follows:

> Circuit board, sensor – 1 year
> External parts, cables, and accessories – 90 days

The warranty becomes effective on the date of purchase. During the warranty period, equipment covered by the warranty and found to be defective will be repaired or replaced at the manufacturer's discretion without charge. The manufacturer's responsibility is limited to repair or replacement of damaged or defective parts. The equipment must be returned, transportation charges prepaid with proof of purchase date, to an authorized service center or to **NASARC.** If a product warranty card has not been completed or proof of purchase is not available, the warranty will be deemed to become effective at the time the product leaves the factory authorized **NASARC** warehouse. Warranty repair service does not extend the period of warranty beyond the original period. The warranty is not transferable.

This warranty does not cover defects in the equipment caused by ordinary wear and tear, abuse, misuse, accident, or any other cause that is not the result of defective materials or workmanship.

Repair or replacement is the exclusive remedy for defective equipment under this warranty. This warranty is in lieu of all other warranties written and implied, including any implied warranty of fitness for a particular purpose of this equipment. **NASARC** shall not be liable for any consequential or incidental damages for breach of any express or implied warranty of this equipment.

The month of manufacture can be found on the serial plate

```
  +------- yy:  Year
  | +----- mm:  Month (01 .. 12)
  | | +--- nnn: Unit number within the month (001..999)
  | | |
IFyymmnnn
```

For example, IF2408033 is the 33rd unit manufactured in August (08) of 2024 (22)