Olsson
1027 S. Main Street,
Suite 503
Joplin, MO 64801
February 6, 2024

ADDENDUM NO. 2
Glendale Parallel Interceptor Improvements – Lower Reach
Joplin, MO – 2024
Bid Date/Time: February 21, 2024 at 10:00 AM
Olsson Project No. C17-0643

TO ALL WHO HAVE RECEIVED PLANS AND SPECIFICATIONS FOR THE REFERENCED PROJECT.

SCOPE

This Addendum covers the following additions, modifications, and clarifications to the Bid Manual and Drawings for the above-mentioned project scheduled to close 10:00 am CST, Wednesday, February 21, 2024.

FRONT-END DOCUMENTS

1. Refer to BID FORM.
   a. Add Item A-3, 'Rover and Associated Equipment' per description below.
   b. Add Item A-4, 'All other Items Necessary for the Perfection of the Work' to cover incidental costs and permitting.
   c. Add Item B-2, 'Branch Easement Clearing' to account for existing easement clearing as shown in the Construction Drawings.
   d. Add Item D-26, 'Rock Excavation' based on estimates from record drawings.
   e. Update Item D-27, 'Type 1, 60" Manhole'.
   f. Add Item D-52, 'Flow Monitoring Equipment' per description below.

SPECIFICATIONS

1. Rover/ Table
   a. Contractor to provide Carlson BRX7 Rover, Carlson RT4 Collector and accessories as shown in the attached quote and brochures. Contractor is requested to acquire this equipment as early in the project as possible. Equipment shall be shipped directly to the Owner after ordering.
2. Flow Monitoring Equipment
   a. Contractor to provide a sluice gate matching the attached submittal for the proposed 21" dia. Pipe.
   b. Contractor to provide revised spring ring and/or scissor ring for the installed velocity sensors.
   c. Work shall include installation into the new pipe and relocation of equipment found during construction.

DRAWINGS

1. Refer to Sheet 5 SUMMARY OF QUANTITIES.
   a. Table to be replaced with quantities shown in the BID FORM.

Each Bidder must acknowledge receipt of all addenda in the space provided on the Bid Form.

February 5, 2024

Glendale Parallel Interceptor Improvements – Lower Reach
Bidder Questions

1. Will alternative Sanitary Sewer Pipe Materials be allowed?
    a. Pipe meeting Section 4100 for materials will be allowed.
        - This includes ADS Polypropylene Pipe and Vylon PVC Close Profile.
    b. Equivalent class as listed in the construction plans will be reviewed during submittals for substitution.

2. Can Steel Casing be installed in place of HDPE?
    a. *Steel Casing shall meet Section 1600.2.4 for City Street Crossings or MoDOT requirements for Main Street Crossing.*

3. Can Restrained Joint Pipe in the casing be removed?
    a. *Pipe approved for gravity sewer may be used for the entire project, so an alternative pipe type is not required for the bore crossings.*

4. Who will be providing construction observation?
    a. The City of Joplin plans to provide observation depending on schedules and workload, Olsson may provide observation if staff is not available.

5. What is the estimated start date and schedule?
    a. *The anticipated start date should be in May with the plan schedule being 300 calendar days. Adjustments to the start and working days can be discussed during the notice of award depending on material delivery and schedules.*

6. What will happen with the contaminated materials?
    a. *Information is provided in the Notice for these materials. Native backfill can be used above the bedding in all locations not under the pavement.*
    b. *Full depth gravel backfill will be required for all pavement crossings.*
    c. *The City may be able to utilize excess material for the future Tin Cup Trail.*

7. *Existing Sluice Gates in the diversion structures are a larger diameter than the new pipe.*
    a. *A site visit is scheduled for Wednesday, February 7, and 10 AM onsite to review these gates and make a determination.*
    b. *The east diversion structure will require a new ring for the velocity flow meter and sluice gate for the increased pipe diameter. Existing equipment submittals will be included in Addendum 2.*

702 S. Main Street / Joplin, MO 64801
O 417.781.0643 / **olsson.com**

8. Can the Traffic Control Signs be adjusted to meet standards?
    a. *Utility Work Ahead signs may be used in place of TC Plans in the set. Contractor may submit adjustments to the plan during submittal phase for consideration.*

9. Utility potholing within the ROW may require a lane drop and additional traffic control.
    a. *If additional traffic control is required during construction, those costs should be included as incidental in the bid form under the provided line items.*

10. Additional line items to be included.
    a. *Several line items were discussed during the pre-bid and those revised line items are shown in the new bid form.*

702 S. Main Street / Joplin, MO 64801
O 417.781.0643 **olsson.com**

SIGN IN SHEET

olsson

Glendale Parallel Interceptor

Lower Reach

Pre-Bid Opening — 2/5/2024

Joplin, MO — 10:00am

	NAME	COMPANY/AGENCY	PHONE	EMAIL	PRIME (Y/N)
1	Rusty Snyder	Asbell Exc.	417.437-1165	rsnyder@jettasphalt.com	
2	LARRY Hudgens	Redford Const	816-540 2030	larry@redfordconstruction.com	
3	Eric McPeak	Dirks Heavy	660-464-1320	ericedirksheavy.com	Y
4	Mark Snowbarger	D3E Plumbing	417-725-5300		
5	Victor Rosetta	Rosetta Const. Co	417-830-1343	victor@rosettaconst.com	Yes
6	Eli Southard	Southard Construction Co. Inc.	417 673 5528	southardconst@gmail.com	/
7	Jesse Waller	Emery Sapp & Sons, Inc.	816-605-2211	Jesse.waller@emerysapp.com	Y
8	Sid Davis	South west mo Traffic Management	417-437 0285	SDavis@Joplin.com	N
9	Dirk Hudson	Advanced Drainage Systems	816-602-4201	dirk.hudson@adspipe.com	N
10	Jay Pearson	Advanced Drainage Systems	417-808-0151	jay.pearson@adspipe.com	N
11	Chris Parker	City of Joplin	624-0820 ext. 1584	cparker@joplinmo.org	N
12	Tony Becker	Dirks Heavy Const.	660-464-2520	TONY@DIRKSHEAVY.COM	
13	S. McConnaughey	Olsson		SMCCONNAUGHEY@OLSSON.COM	DE
14					
15					

REVISED BID FORM

ITEM DESCRIPTION			QTY	UNIT	UNIT COST	COST
SCHEDULE A - GENERAL (BASE BID)						
A	1	MOBILIZATION	LS	1		$
A	2	CONTRACTOR CONSTRUCTION STAKING	LS	1		$
A	3	ROVER AND ASSOCIATED EQUIPMENT	EA	2		$
A	4	ALL OTHER ITEMS NECESSARY FOR THE PERFECTION OF THE WORK	LS	1		$
SCHEDULE B - DEMOLITION (BASE BID)						
B	1	CLEARING AND GRUBBING	LS	1		$
B	2	BRANCH EASEMENT CLEARING (20' WIDE)	LF	1,200		$
B	3	REMOVAL OF IMPROVEMENTS	LS	1		$
B	4	PAVEMENT REMOVAL	SY	1,610		$
B	5	SAW CUT	LF	1,400		$
SCHEDULE C - EROSION CONTROL (BASE BID)						
C	1	EROSION & SEDIMENT CONTROL	LS	1		$
C	2	SEEDING, FERTALIZING & MULCHING	LS	1		$
SCHEDULE D - SANITARY SEWER (BASE BID)						
D	1	JACK AND BORE UNDER STREETS (28" DIA.)	LF	250		$
D	2	JACK AND BORE UNDER STREETS (30" DIA.)	LF	60		$
36" DIA. DEEP PIPE						
D	3	0'-6' DEEP TRENCH & BACKFILL GRAVITY SEWER PIPE	LF	40		$
D	4	6'-8' DEEP TRENCH & BACKFILL GRAVITY SEWER PIPE	LF	160		$
D	5	8'-10' DEEP TRENCH & BACKFILL GRAVITY SEWER PIPE	LF	150		$
D	6	10'-12 DEEP TRENCH & BACKFILL GRAVITY SEWER PIPE	LF	100		$
D	7	12'-14' DEEP TRENCH & BACKFILL GRAVITY SEWER PIPE	LF	30		$
30" DIA. DEEP PIPE						
D	8	0'-6' DEEP TRENCH & BACKFILL GRAVITY SEWER PIPE	LF	300		$
D	9	6'-8' DEEP TRENCH & BACKFILL GRAVITY SEWER PIPE	LF	138		$
D	10	10'-12 DEEP TRENCH & BACKFILL GRAVITY SEWER PIPE	LF	91		$
D	11	12'-14' DEEP TRENCH & BACKFILL GRAVITY SEWER PIPE	LF	194		$
D	12	14' PLUS DEEP TRENCH & BACKFILL GRAVITY SEWER PIPE	LF	136		$
21" DIA. DEEP PIPE						
D	13	0'-6' DEEP TRENCH & BACKFILL GRAVITY SEWER PIPE	LF	2,299		$
D	14	6'-8' DEEP TRENCH & BACKFILL GRAVITY SEWER PIPE	LF	1,284		$
D	15	8'-10' DEEP TRENCH & BACKFILL GRAVITY SEWER PIPE	LF	286		$
D	16	10'-12 DEEP TRENCH & BACKFILL GRAVITY SEWER PIPE	LF	31		$
D	17	12'-14' DEEP TRENCH & BACKFILL GRAVITY SEWER PIPE	LF	36		$

REVISED BID FORM

ITEM DESCRIPTION			QTY	UNIT	UNIT COST	COST
18" DIA. DEEP PIPE						
D	18	0'-6' DEEP TRENCH & BACKFILL GRAVITY SEWER PIPE	LF	890		$
D	19	6'-8' DEEP TRENCH & BACKFILL GRAVITY SEWER PIPE	LF	1,568		$
D	20	8'-10' DEEP TRENCH & BACKFILL GRAVITY SEWER PIPE	LF	574		$
D	21	10'-12 DEEP TRENCH & BACKFILL GRAVITY SEWER PIPE	LF	79		$
D	22	12'-14' DEEP TRENCH & BACKFILL GRAVITY SEWER PIPE	LF	23		$
D	23	14' PLUS DEEP TRENCH & BACKFILL GRAVITY SEWER PIPE	LF	193		$
10" DIA. DEEP PIPE						
D	24	0'-6' DEEP TRENCH & BACKFILL GRAVITY SEWER PIPE	LF	4		$
8" DIA. DEEP PIPE						
D	25	0'-6' DEEP TRENCH & BACKFILL GRAVITY SEWER PIPE	LF	6		$
D	26	ROCK EXCAVATION	CY	1,500		$
D	27	TYPE 1, 60" DIA. MANHOLE	EA	29		$
D	28	TYPE 1, 60" DIA. MANHOLE EXTRA DEPTH	VF	54		$
D	29	TYPE 1, 60" EXTERNAL DROP MANHOLE	EA	1		$
D	30	TYPE 1, 48" DIA. MANHOLE	EA	12		$
D	31	TYPE 1, 48" DIA. MANHOLE EXTRA DEPTH	VF	40		$
D	32	28" DR 11 HDPE CASING PIPE	LF	246		$
D	33	30" DR 11 HDPE CASING PIPE	LF	60		$
D	34	CONCRETE ENCASEMENT	LF	275		$
D	35	36" DIA. PS46 PVC GRAVITY SEWER PIPE AND BEDDING	LF	461		$
D	36	30" DIA. PS46 PVC GRAVITY SEWER PIPE AND BEDDING	LF	859		$
D	37	21" DIA. PS46 PVC GRAVITY SEWER PIPE AND BEDDING	LF	3,936		$
D	38	18" DIA. PS46 PVC GRAVITY SEWER PIPE AND BEDDING	LF	3,327		$
D	39	10" DIA. SDR 26 PVC GRAVITY SEWER PIPE AND BEDDING	LF	4		$
D	40	8" DIA. SDR 26 PVC GRAVITY SEWER PIPE AND BEDDING	LF	6		$
D	41	HYDROSTATIC TESTING OF TYPE 1, 48" DIA. MANHOLES	EA	20		$
D	42	HYDROSTATIC TESTING OF TYPE 1, 60" DIA. MANHOLES	EA	30		$
D	43	ABANDONMENT OF 48" MANHOLES UNDER TURF	EA	7		$
D	44	ABANDONMENT OF 48" MANHOLES UNDER PAVEMENT	EA	3		$
D	45	RECONNECTION OF EXISTING 4" DIA. SEWER SERVICE LAT. LINE	EA	2		$
D	46	RECONNECTION OF EXISTING 8" DIA. SEWER LINE	EA	12		$
D	47	RECONNECTION OF EXISTING 10" DIA. SEWER LINE	EA	5		$
D	48	RECONNECTION OF EXISTING 15" DIA. SEWER LINE	EA	3		$
D	49	RECONNECTION OF EXISTING 18" DIA. SEWER LINE	EA	4		$
D	50	RECONNECTION OF EXISTING 21" DIA. SEWER LINE	EA	1		$
D	51	RECONNECTION TO EXISTING STRUCTURE	EA	6		$
D	52	FLOW MONITORING EQUIPMENT	LS	1		$

REVISED BID FORM

ITEM DESCRIPTION			QTY	UNIT	UNIT COST	COST
SCHEDULE E - PAVEMENT (BASE BID)						
E	1	ASPHALT PAVEMENT REPAIR & REPLACEMENT	SY	1,700		$
E	2	ASPHALT PAVEMENT OVERLAY	SY	120		$
SCHEDULE F - TRAFFIC CONTROL (BASE BID)						
F	1	LOCAL TRAFFIC CONTROL (INCLUDING INCIDENTAL LANE DROPS)	LS	1		$
F	2	MODOT TRAFFIC CONTROL (INCLUDING INCIDENTAL LANE DROPS)	DAYS	15		$

Total Base Bid

($ _____) ($ _____)

(Write Out In Words) (Figures)

ITEM DESCRIPTION			QTY	UNIT	UNIT COST	COST
SCHEDULE A1 - JACKSON AVE. ENTRANCES (ALTERNATE 1)						
A1	1	CRUSHED STONE PAVEMENT REPAIR & REPLACMENT	LF	112		$
A1	2	SMOOTH STRAND WIRE FENCE	LF	204		$
A1	3	12' GATES	EA	6		$

Total Alternate Bid

($ _____) ($ _____)

(Write Out In Words) (Figures)

Laser Specialists Inc

19879 W 156th * Olathe, KS 66062 * 913-780-9990
www.lasergps.com

Sale
Rental
Service
Quote X

Customer PO:
Date
Drivers License

SOLD TO City of Joplin Missouri
602 Main Street
Joplin, MO 64801
Tim Johnson

SHIP TO

QTY	PART NUMBER	DESCRIPTION	RATE	UNIT PRICE	AMOUNT
		GNSS			
1	8030.020.037	Carlson BRX7 Rover		$9,950.00	$9,950.00
		includes: 2 batteries, Charger,Hard Case			
2	5218-20	Carbon Fiber Rover Pole		$245.00	$490.00
2	5217-04	Rod Bipod		$145.00	$290.00
		Data Collection			
2	6000.123.004	Carlson RT4 Cell US/N. Am. SurvPC GPS		$4,350.00	$8,700.00
2	5200-35	Data Collector Pole Clamp and Cradle		$225.00	$450.00
		Cellular Network Service			
1		RTK Net Service 1 GB Per month 3 Years		$900.00	$900.00
		Applicable Taxes not included			$0.00
		Please Contact Matt Todd 417-371-1927			$0.00
					$0.00

TOTAL	$20,780.00
SUB TOTAL	$20,780.00
TAX	$0.00
FREIGHT	
TOTAL PRICE	$20,780.00
DOWN PAY:	$0.00
BALANCE DUE	

TERMS AND CONDITIONS (FOR RENTALS ONLY)

1. CUSTOMER IS RESPONSIBLE FOR INSURANCE COVERAGE ON THIS EQUIPMENT FOR INSURANCE VALUE.
2. PROPER HITCHING AND TOWING SPEED IS CUSTOMER'S RESPONSIBILITY.
3. LESSEE AGREES TO PAY FOR ALL REPAIRS NECESSARY TO EQUIPMENT BECAUSE OF LESSEE'S FAILURE TO ABIDE BY CONDITION 3, SECTIONS (a) - (e) ON THE REVERSE SIDE.
4. ACCOUNTS UNPAID FOR OVER 30 DAYS WILL BE SUBJECT TO A 1.5% PER MONTH FINANCE CHARGE.
5. THIS LEASE IS SUBJECT TO THE TERMS AND CONDITIONS ON THE REVERSE HEREOF.

NORMAL MAINTENANCE TO KEEP MACHINERY IN OPERATING CONDITION IS THE RESPONSIBILITY OF LESSEE.

1. Rental Rates based on 8hr. Day - 40hr. Week and 176 hr. Month. If Equipment used exceeds there hours, additional charges will be made.
2. Lessee agrees to pay lessor for all loss and damages occasioned by fire, theft, flood, accident, explosion, wreck, an Act of God, or any other causes that may occur during the life of this lease, and until such machinery has been returned into the possession of the lessor and accepted by it.
3. No Warranties expressed or implied shall be binding against the Seller or Lessor unless expressly incorporated herein and made a part hereof. Lessor shall in no event be liable for consequential loss or damage or for loss or damage resulting from time lost because of repairs or resulting from the use of the equipment or resulting from the failure of the equipment or any parts hereof or attachments to operate properly.

Credit cards accepted, however credit card purchases above $2,500 will have a 3% fee added to invoice total.

Matt Todd	2/1/2024	Tim Johnson	
LESSOR	Date Received	LESSEE	Date Returned LESSEE

Accepted by Laser Specialists, Inc.

BRx7
GNSS Receiver

Carlson
BREAK NEW GROUND



The BRx7 is Carlson's all-new multi-GNSS, multifrequency smart antenna. The BRx7 provides robust performance and high precision in a compact, rugged package with tilt compensation ability. With multiple wireless communication ports and an open GNSS interface, the BRx7 can be used in a variety of operating modes.

Use the BRx7 as a precise network rover to work with your GNSS VRS network, or set up your BRx7 as an easy-to-use base-rover package with industry-leading performance via the internal long range and spread-spectrum radio or cellular communication via Carlson's Listen-Listen, a unique cloud-based low latency service that eliminates baseline length restrictions of UHF radios. With only an Internet connection, you can enjoy a simple, easy-to-use base-rover solution that can also support a single base with multiple simultaneous rover connections.

The BRx7 provides state-of-the-art RTK performance when receiving corrections from a static base station or network RTK correction system. With multiple connectivity options, the BRx7 allows for RTK corrections to be received over radio, cell modem, Wi-Fi, Bluetooth, or serial connection. The BRx7 delivers centimeter-level accuracy with virtually instantaneous initialization times and cutting edge robustness in challenging environments.

The BRx7 also features proprietary SureFix® technology to provide high fidelity information about the quality of the RTK solution, allowing enhanced and improved RTK accuracy, availability, and precision.

The built-in web user interface (WebUI) can be used to monitor and control the receiver status and operation, as well as to upgrade the BRx7 with new firmware and activations. The BRx7 is immune from magnetic interference, and is both Athena™ -enabled and Atlas®-capable (subscription required).

KEY FEATURES

- Multi-frequency GPS, GLONASS, BeiDou, Galileo, QZSS, IRNSS, and Atlas L-band
- Long-range RTK baselines up to 50 km with fast acquisition times with the use of Listen-Listen***
- UHF (400 MHz & 900 MHz), cellular, Bluetooth, and Wi-Fi wireless communication
- The BRx7 Athena GNSS engine providing best-in-class RTK performance
- Internal tilt sensor corrects collected point coordinates to within 2 cm

Carlson BRx7 GNSS Receiver - Specifications

GNSS Receiver Specifications

Receiver Type:	Multi-Frequency GPS, GLONASS, BeiDou, Galileo, QZSS, IRNSS, and Atlas L-band
Signals Received:	GPS L1CA/L1P/L1C/L2P/L2C/L5 GLONASS G1/G2/G3, P1/P2 BeiDou B1i/B2i/B3i/B10C/B2A/B2B/ACEBOC GALILEO E1BC/E5a/E5b/E6BC/ALTBOC QZSS L1CA/L2C/L5/L1C/LEX IRNSS L5 Atlas
Channels:	800+
RTK Formats:	RTCM2.1, RTCM2.3, RTCM3.0, RTCM3.1, RTCM3.2 including MSM, CMR, CMR+
Recording Intervals:	Selectable from 1, 2, 4, 5, 10 Hz (20 Hz or 50 Hz optional)

Accuracy

Positioning:	**RMS (67%)**	**2DRMS (95%)**
Autonomous, no SA:[1]	1.2 m	2.4 m
SBAS:[1]	0.3 m	0.6 m
Atlas (H10):[1,3]	0.04 m	0.08 m
RTK:[1,2]	8 mm + 1 ppm	15 mm + 2 ppm
Static Performance:[1]	2.5 mm + 1 ppm	5 mm + 1 ppm
Tilt Compensation	**(within 30°):**	2 cm (with 1.8 m pole)
	(within 60°):	5 cm (with 1.8 m pole)[4]
Initialization Time:		< 10 s

L-Band Receiver Specifications

Receiver Type:	Single Channel
Frequency Range:	1525 to 1560 MHz
Sensitivity:	-130 dBm
Channel Spacing:	5.0 kHz
Satellite Selection:	Manual and Automatic
Reacquisition Time:	15 seconds (typical)

Communications

Bluetooth:	Bluetooth 2.1 + EDR / 4.0 LE	
Wi-Fi:	802.11 b/g	
Network:	LTE FDD:	B1/B2/B3/B4/B5/B7/B8/B12/B13/ B18/B19/B20/B25/B26/B28
	LTE TDD:	B38/B39/B40/B41
	UMTS:	B1/B2/B4/B5/B6/B8/B19
	GSM:	B2/B3/B5/B8
Radio:	Frequency range:	410MHz - 470MHz and 902.4MHz - 928MHz
	Channel Spacing:	12.5 KHz / 25 KHz
	Protocol:	TrimTalk 450S, PCC EOT, TrimMark 111(19200)
WebUI:	To upgrade software, manage settings, data download, via smartphone, tablet or other electronic device,configure advanced radio settings	

Connector Ports

TNC:	For connecting to UHF radio antenna
LEMO 5-pin:	For connecting to external power supply, external radio
LEMO 7-pin:	For serial port, USB
Card Slots:	For Micro SIM card and Micro SD card

Data & Storage

Storage Type:	8 GB internal, SD card up to 32 GB

Physical

Weight:	1.12 kg (1 battery), 1.25 kg (2 batteries)
Dimensions:	156 x 76 mm

Environmental

Operating Temperature:	-30°C ~ +65°C
Storage Temperature:	-40°C ~ +80°C
Protection:	IP67. Protected from temporary immersion to a depth of 1 m
Shock Resistance:	MIL-STD-81 0G, method 516.6. Designed to survive a 2 m pole drop on concrete floor. Designed to survive a 1 m free drop on hardwood floor
Humidity:	Up to 100%
Vibration:	MIL-STD-810G, method 514.6E-I
Inflammability:	UL recognized, 94HB Flame Class Rating (3) 1.49 mm
Chemical Resistance:	Cleaning agents, soapy water, industrial alcohol, water vapor, solar radiation (UV)

Electrical

Input Voltage:	9 to 28 V DC
Battery:	With removable dual battery, for single battery parameter: 7.2 V, 3400 mAh, 24.48 Wh
Working Time:	Up to 12 hours (2 batteries hot swap)

User Interface

Button:	Switch receiver on/off, broadcast current operation mode and status
LEDs:	Power, Satellite, Data Link, Bluetooth
WebUI:	Supports software updates, receiver status and settings, and data downloads via smartphones, tablets, or other Wi-Fi capable devices.

1 Depends on multipath environment, number of satellites in view, satellite geometry, and ionospheric activity
2. Depends also on baseline length
3. Requires a subscription from Hemisphere GNSS
4. Higher error can be observed in the GPS RTK solutions with tilts over 30°
*** Requires a subscription from Carlson Software



SurvCE/SurvPC

Carlson's SurvCE/SurvPC is combined with the BRx7 on either the Surveyor 2 field computer or RT4 Windows tablet for a full field solution. SurvCE/SurvPC has full BRx7 configuration, system status and data logging via Bluetooth. For improved quality control and efficiency, SurvCE/SurvPC features an intuitive Live Digital Level with an auto record option when the BRx7 is level. With SurvCE/SurvPC, users leverage Carlson's expert team to expand features for quality and productivity.

020-270-32

Carlson Software Inc | 33 East Second Street | Maysville, KY 41056 USA | 800-942-2540 | info@carlsonsw.com | www.carlsonsw.com

RT4
Rugged Tablet

The Carlson RT4 is designed for surveying, stake out, construction layout and GIS mapping and is bundled with Carlson SurvPC – the Windows- based data collection program – with the option of running with the Esri OEM program for use in the field. Or use in the office with any Carlson office software. Along with 8GB of RAM, 128 GB storage options, collect and analyze your data quicker than ever before.

PERFORMANCE



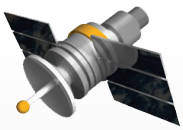
- Powerful Windows 10 for office-to-field use
- Plenty of memory - 8 GB RAM & 128 GB flash storage

EXPANDABLE BATTERY



- All-day battery runs 12–15 hours for minimal downtime
- Operates in extreme temperatures from -4 F to 122 F (-20° C to 50° C)

READY FOR ANYTHING



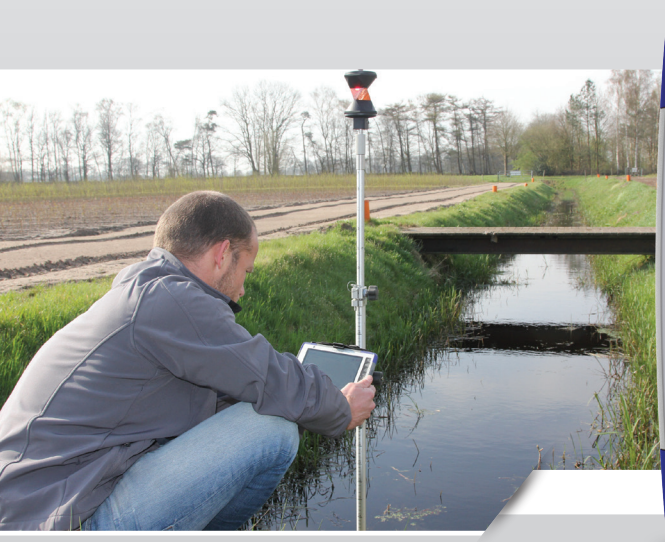
- Long-range Bluetooth® Smart Ready, Wi-Fi®, USB connectivity, 8 MP rear and 2 MP front cameras
- 4G LTE (CELL and GEO/CELL models)
- High-performance GNSS receiver (GEO/CELL model)

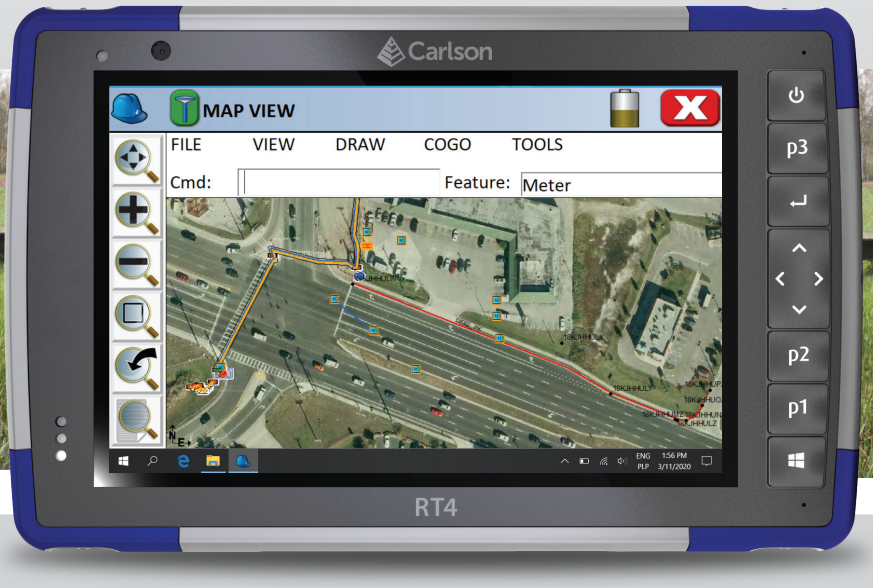
JUNIPER RUGGED™

- Maximum protection for your data
- Dustproof & waterproof (IP68 rating)
- Designed to MIL-STD-810G for ultra-ruggedness
- 2-year warranty

ILLUMIVIEW™ HIGH-VISIBILITY DISPLAY

- Large, 7-inch display for easy viewing
- IllumiView technology provides extraordinary visibility
- Optically-bonded capacitive touch screen for needle-sharp imagery
- Chemically-strengthened Dragontrail™ glass for excellent impact & scratch resistance





BREAK NEW GROUND

Carlson RT4 - Specifications

PROCESSOR
- Quad-core Intel® Pentium N4200 processor

OPERATING SYSTEM
- Microsoft® Windows 10
- Multiple languages supported (English, French, Spanish, German, Portuguese)

MEMORY AND DATA STORAGE
- 8 GB RAM (LPDDR4)
- 128 GB flash storage
- User-accessible MicroSDXC card slot

GRAPHICS
- Intel® HD Graphics

DISPLAY
- Active viewing area: 7" (178 mm)
- Resolution: WXGA (1280 x 800)
- High-visibility backlit LCD for best-in-class sunlight view-ability
- Portrait or landscape orientation with automatic screen rotation

TOUCH SCREEN
- Projected capacitive multi-touch interface for use with gloves, small tip stylus, and in wet conditions
- Optically bonded for increased visibility and strength
- Chemically-strengthened Dragontrail™ High Ion-Exchange (HIE™) cover glass for excellent impact and scratch resistance

KEYBOARD
- Adjustable LED backlit keys
- Four-way directional navpad
- Windows/home key
- Power key
- Enter key
- Three user-programmable function keys
- OEM configurable/customizable

PORTS
- USB 3.0 x 1
- 3.5 mm audio jack
- 12 VDC power input jack
- Docking port connections (Pwr, USB 2.0, HDMI, & ethernet)
- Loud output speaker for noisy environments
- Dual digital microphone input for improved clarity
- Optional RS-232 9-Pin D-Sub connector with 5VDC power output

BATTERY
- Removable Li-Ion battery, 43.2 Whr
- Operates 12–15 hours on one charge
- Removable battery, easily changeable in field
- Optimized for strong performance in cold temperatures
- Excellent lifecycle performance

PHYSICAL
- Size: 5.40" w x 8.48" lx 1.36" d (137 x 215 x 35 mm)
- Weight: 1.5-2 lbs (680-907 g) depending on battery configuration
- Durable, chemical- and shock-resistant design
- Easy-to-grip, impact-absorbing, overmolded bumpers
- Lightweight and ergonomic design

WIRELESS CONNECTIVITY OPTIONS
- Long-range Bluetooth® Smart Ready wireless technology, v5.0 +EDR, Class 1.5, BLE support
- Wi-Fi· 802.11 a/b/g/n/ac, 2.4 GHz and 5 GHz
- 4G LTE (CELL and GEO/CELL models)

CAMERA
- Rear: 8 MP with LED illumination
- Front:2MP
- Juniper Geotagging™: embed photo with date, time, and GNSS position

GPS/GNSS (GEO/CELL MODELS)
- 2 to 5 meter typical accuracy
- uBlox NEO-M8N GNSS receiver and integrated antenna
- Integrated real-time SBAS receiver (WAAS, EGNOS, etc.)
- 72 GNSS tracking channels

OTHER FEATURES
- Ambient light sensor
- Compass
- Accelerometer
- Gyroscope
- TPM (Trusted Platform Module) v2.0

CERTIFICATIONS AND STANDARDS
- FCC Class B
- CE Marking (applicable EMC, R&TTE, and LVD directives)
- Industry Canada
- EN60950 Safety
- RoHS 2 Compliant
- Optional Class I, Ii, & Iii, Division 2

JUNIPER RUGGED™
- IP68 waterproof and dustproof
- Operating Temperature: -4 F to 122 F (-20° C to 50° C)
- Storage temperature: -22 F to 158 F (-30° C to 70° C)
- Shockproof: multiple drops from 4' (1.2–1.5 m) onto concrete
- Designed for MIL-STD-810G test procedures: Method 500.5 Low Pressure (Altitude); Method 501.5 High Temperature; Method 502.5 Low Temperature; Method 503.5 Temperature Shock; Method 506.5 Rain; Method 507.5 Humidity; Method 510.5 Sand and Dust; Method 512.5 Immersion; Method 514.6 Vibration; Method 516.6 Shock

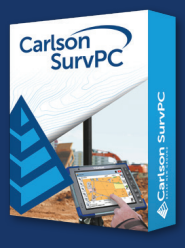
WARRANTY
- 2-Year Warranty
- Service Plans Available

STANDARD ACCESSORIES
- Standard removable battery
- AC wall charger with international plug kit
- Capacitive small-tip stylus w/tether
- Quick Start Guide
- Hand strap
- Connector port dust cover
- 2-year warranty

Available models
- STANDARD
- CELL
- GEO/CELL

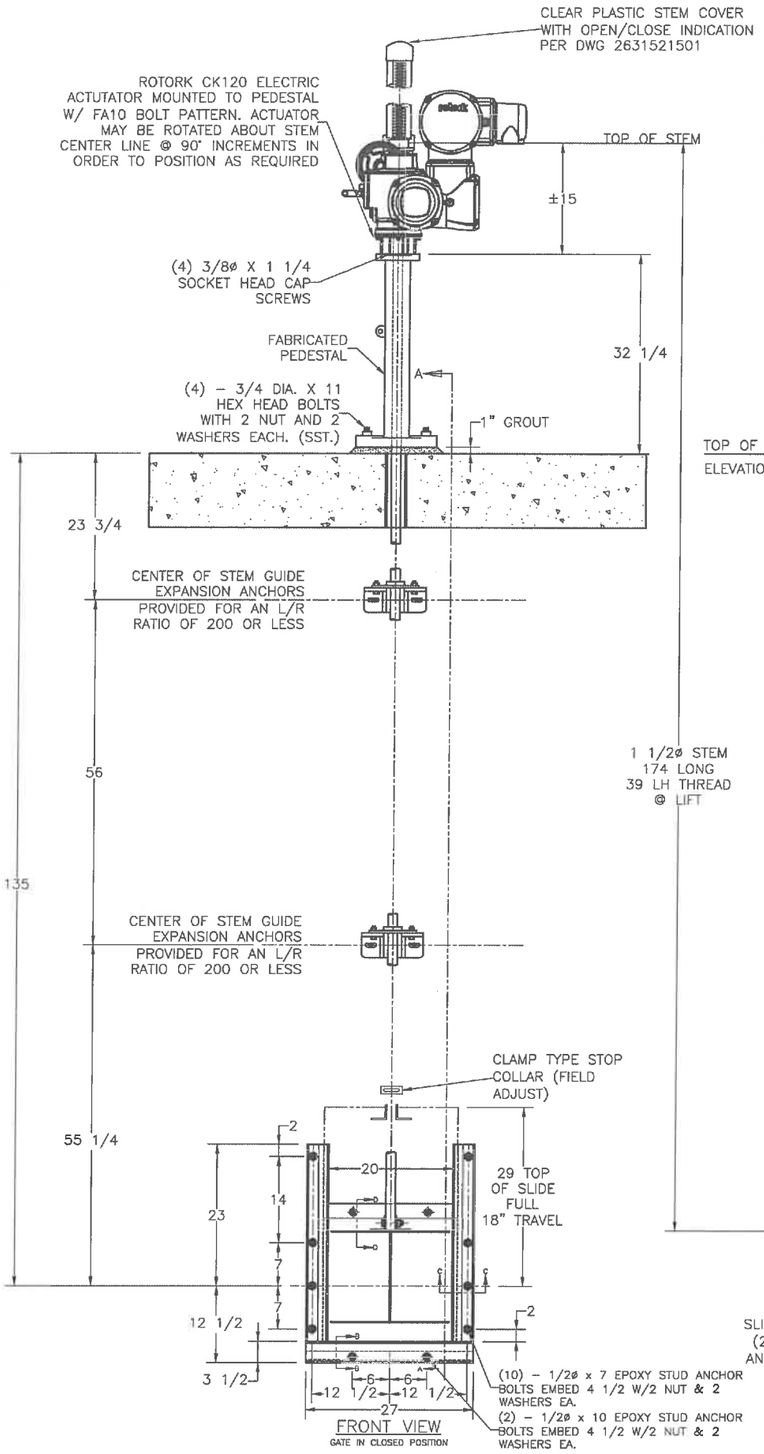
Bundle with SurvPC

The Windows-based data collection program - with the option of running with the Esri OEM program for use in the field. Or use in the office with any Carlson office software.

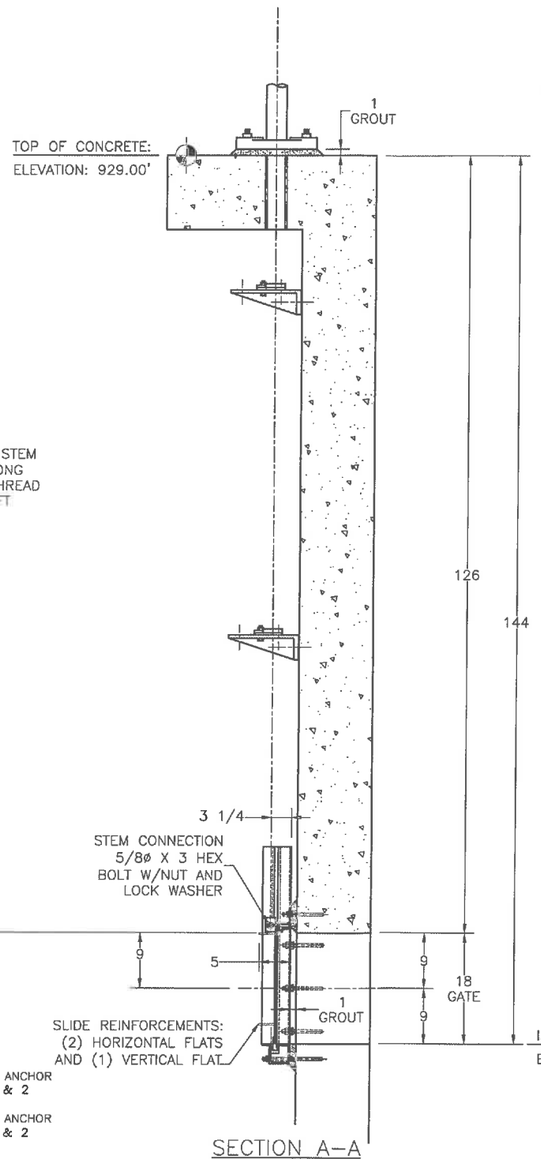


020-230-11

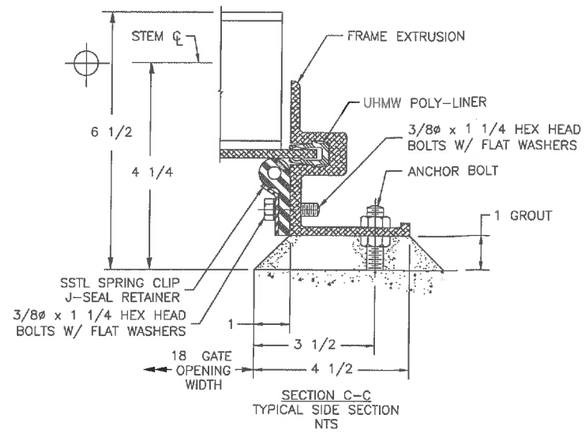
CARLSON SOFTWARE Inc | 33 East Second Street | Maysville, KY 41056 | 800-942-2540 | info@carlsonsw.com | www.carlsonsw.com



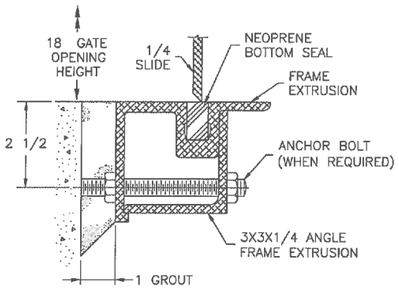
FRONT VIEW
GATE IN CLOSED POSITION



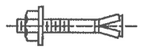
SECTION A–A
ANCHORS/STEM REMOVED FOR CLARITY



SECTION C–C
TYPICAL SIDE SECTION
NTS



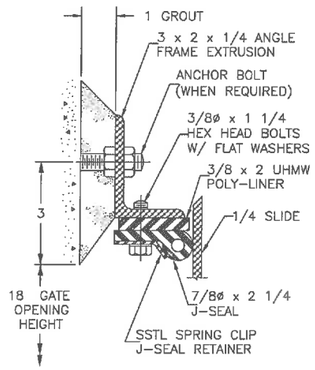
SECTION B–B
INVERT SECTION
NTS



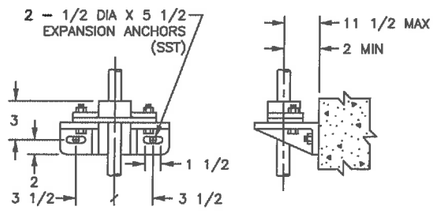
EXPANSION ANCHOR DETAIL



STUD ANCHOR DETAIL
(ADHESIVE NOT BY HYDRO)



SECTION D–D
TOP SECTION
NTS



TYPE B STEM GUIDE
WITH TWO PIECE SPLIT COLLAR

NOTES:

1. CASTING TOLERANCES APPLY ON ALL UNMACHINED SURFACES.
2. SEE MANUAL G–1900 FOR INSTALLATION AND ADJUSTMENT INSTRUCTIONS.
3. ALL DIMENSIONS IN INCHES UNLESS OTHERWISE NOTED.
4. MATERIAL SPECIFICATIONS AND COATINGS PER DRAWING: 2631521500
5. GATE HEAD DESIGN — SEATING: 13.00' / UNSEATING: 13.00'; MEASURED FROM GATE ℄ — OPERATING DESIGN HEAD — SEATING: 13.00' / UNSEATING: 13.00'; MEASURED FROM GATE ℄
6. TAG: SLG–301
7. ENGINEER: OLSSON
8. LOCATION: NORTHWEST DIVERSION STRUCTURE – JOPLIN, MO
9. REFERENCE SPECIFICATIONS SECTION: 15101
10. REFERENCE PLAN DRAWINGS: C2
11. PLEASE CONFIRM THE GATE SIZE & TRAVEL, THE TOP OF CONCRETE AND INVERT ELEVATIONS, AS WELL AS THE INVERT CONFIGURATION.

HYDRO GATE

18" X 18" FABRICATED ALUMINUM SLIDE GATE
NON SELF–CONTAINED, WALL MOUNT, RISING STEM
QUANTITY: 1 MATERIAL: AL–6061 SCALE: 1'=3/4"

THIS IS A PROPRIETARY DESIGN OF HYDRO GATE. THE DESIGN, DATA AND INFORMATION RELATING THERETO IS NOT TO BE USED, DISSEMINATED OR REPRODUCED IN WHOLE OR IN PART WITHOUT THE EXPRESS WRITTEN CONSENT OF HYDRO GATE.

REV.	DATE	INITIALS

DRAWN BY	CUSTOMER NO.	SALES
BWH	194340	2631521
CHECKED BY	DATE 12/21/19	DRAWING NO. 2631521–01

Bill of Materials Joplin, MO Twin Equalization Basin Improvements 2019

Southeast Diversion

Description	Quantity
P/N 98-4350-000 Signature® Area Velocity flowmeter system. Includes base meter 624300005, TIENet 350 area velocity sensor with 32.8 ft (10m) cable, instruction manual, pocket guide, and coupon for ISCO Open Channel flowmeter Handbook.	1
P/N 60-4354-113 TIENet 350 Area Velocity sensor with 32.8 ft (10m) cable	2
308 4/20ma Output	2
Kit Cord Grip	1
P/N 60-3200-011 Spring Ring for 15-inch Dia pipe	2
Scissors Ring for 16"-36" diameter pipes	1
P/N 60-4357-018 TIENet Network Expansion box with desiccator with 10 ft.	1
TIENet® bulk cable, cut to length, cable length. 275 foot	1
P/N 60-3204-029 Sensor Carrier for attaching low profile area velocity sensor	3

Signature®
Flowmeter

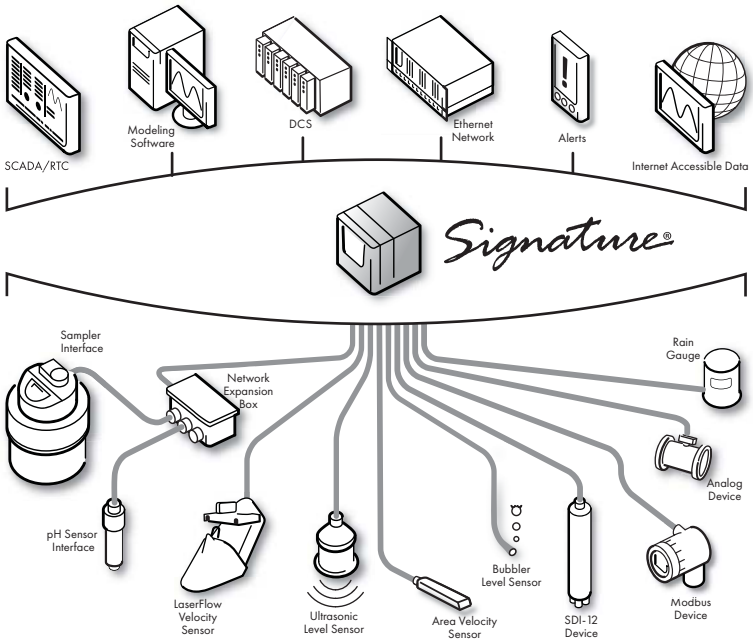


The Signature flowmeter is designed for open channel flow monitoring applications. It supports flow measurement technologies including bubbler, non-contact laser area velocity, submerged Doppler ultrasonic area velocity, and ultrasonic.

A highly flexible monitoring platform, adapting right along with your current need and any future changes in your monitoring requirements.

The meter can calculate flow using standard open channel level-to-flow and area velocity conversions, as well as user defined equations, level to area data points, or level to flow data points, depending on the application needed.

The Signature flowmeter has unique features to verify data integrity. It logs key events such as changes in calibration and power outages to validate data accuracy. Data can be easily reviewed to detect any type of data alteration. With multiple smart interface options and multi-parameter logging (such as pH), the Signature flowmeter provides a common platform for control, action, reporting, and communication.



Signature®

Applications:

- Industrial pretreatment compliance
- Shallow flow measurement in large and small pipes
- Permit enforcement
- Wastewater treatment plants
- Outfall
- Stormwater monitoring

Standard Features

- Multiple parameter data logging
- Program and summary reports
- Triggering, sampler enabling
- Compatibility with Flowlink® software
- Load calculation
- Add, subtract average multiple inputs

ISCO

TELEDYNE ISCO
Everywhereyoulook™

Data Collection

Flowlink® Data Analysis

Teledyne ISCO Flowlink® software is a powerful tool for analyzing flow and water quality data. It provides site setup and data retrieval/analysis, as well as advanced reporting and graphing. Flowlink software also gives you the ability to generate site data graphing and reports.

Remote Communication

Remote communication options allow meter configuration and data/report retrieval from remote locations. They also enable the transfer of data to a dedicated server running Flowlink Pro software.

USB Connectivity

With a USB flash drive attached, you can quickly update firmware in the Signature flowmeter and connected TIENet® devices, and download data files for use with Flowlink software. In addition, the USB port provides direct serial connection with a computer running Flowlink software.

Data Integrity

Data Integrity is ensured by logging event data types that can be verified, thereby producing confidence with verifiable data including; Summary, Diagnostic, Program, History and Verify Report files.

Signature Flow Meter

Size (HxWxD):	8.88 x 12.22 x 8.22 in (with mounting bracket) 16.74 x 13.58 x 10.48 in (with stand)
Materials:	PPO Polyphenylene Oxide
Enclosure:	IP66 (self-certified)
Power Required:	100 to 240 VAC 50/60 Hz 12V DC, Lead Acid Battery 12V DC (current consumption varies depending upon configuration)
Cable Entry:	Standard: ¾" NPT conduit Optional: ¾" NPT cord grips
Flow Measurement Technologies:	Ultrasonic (TIENet 310) Bubbler (TIENet 330) Area Velocity (TIENet 350, 360)
Inputs:	Two SDI-12, Two MODBUS ASCII/RTU, pH Measurement (TIENet 301) Analog In (TIENet 307), Rain In
Setup:	Front Panel Keypad-Flowlink Software with serial USB, remote cellular, or Ethernet
Flow Conversions:	Area Velocity, Weir, Flume, British Flume, Metering Insert, Manning Formula, Equation, Level to Flow Data, Points, Level to Area Data Points
Data Storage:	Non-volatile flash; retains stored data during program updates. Capacity: 8M Interval: 15 or 30 seconds; 1, 2, 5, 15, or 30 minutes; or 1, 2, 4, 12, or 24 hours Capacity: 180 days with 5 parameters logged at 1 minute intervals, reports once per day
Data Retrieval:	USB drive, Flowlink Software–with serial USB, remote cellular, or Ethernet
Outputs:	MODBUS ASCII/RTU, Analog (TIENet 308), Contact Output (TIENet 304), SMS Alarm
Sampler Interface:	TIENet 306

Input Options

- Multiple simultaneous flow technologies
- pH and temperature
- SDI-12
- RS-485 Modbus
- Rain gauge
- Analog (optional TIENet® 307 card)

Output Options

- RS-485 Modbus
- Analog (optional TIENet® 308 card)
- Contact (optional TIENet® 304 card)

Available Measurement Technologies

- Bubbler and Ultrasonic
- Non-Contact Laser Velocity
- Continuous Wave Area Velocity

Teledyne ISCO
P.O. Box 82531, Lincoln, Nebraska, 68501 USA
Toll-free: (800) 228-4373 • Phone: (402) 464-0231 • Fax: (402) 465-3091

teledyneisco.com

TELEDYNE ISCO
Everywhereyoulook™

Teledyne ISCO is continually improving its products and reserves the right to change product specifications, replacement parts, schematics, and instructions without notice.

L-2151 Rev 2.0
9/18

SECTION []
Teledyne Isco Signature® Flow Monitoring System
Engineering Specifications
Updated February 2015

PART [] PRODUCTS

1.1 Manufacturer

A. Flow monitoring equipment supplied by Teledyne Isco, 4700 Superior Street, Lincoln, NE, 68504-1398. Phone (402) 464-0231, fax (402) 465-3064, email IscoInfo@teledyne.com, web site www.isco.com.

2.1 Functional Design

The Signature open channel flow monitoring system shall be suitable for installations for enforcement, compliance, and in-plant process control.

A. The flow meter shall be able to utilize multiple flow and parameter sensing technologies simultaneously, using proprietary Teledyne Isco connectivity.[1]
    1. Isco TIENet® device options for flow measurement technology will include downward looking ultrasonic level measurement, non-contact laser area velocity, and submerged Doppler ultrasonic area velocity.
    2. Isco TIENet device options for parameter sensing will include a pH/temperature sensor.
    3. The flow meter shall be capable of running up to 9 connected TIENet devices simultaneously.

B. The flow meter shall be capable of variable-rate data storage, with the data storage interval changing based on level, velocity, flow rate, total flow, input voltage, or water quality parameter. It shall be possible to change the data storage setup for any data type at any time without disrupting the data storage of any other data types. It shall be possible to delete all data stored in the data storage memory.

C. The flow meter shall be capable of interfacing with an optional Isco wastewater sampler by means of an optional Isco TIENet device.[1] Via the interface device, the flow meter shall be capable of enabling and pacing the sampler based on multiple preprogrammed conditions, as well as receiving sampling data from the sampler.

D. The flow meter shall accept SDI-12 device data from up to two connected devices.

E. The flow meter shall accept rain data from one rain gauge.

F. The flow meter shall have optional 4-20mA input capability by means of field-installable Isco TIENet card(s). The TIENet card should be able to provide 17-26 VDC to a loop or two wire transmitter.

G. The flow meter shall have Modbus input capability.

H. The flow meter shall be able to record and transmit data from connected monitoring equipment.

I. The flow meter shall have optional contact output capability by means of field-installable Isco TIENet card (s).

J. The flow meter shall have optional 4-20mA output capability by means of field-installable Isco TIENet card(s).

K. The flow meter shall have Modbus output capability.

L. The flow meter shall be able to track event data that cannot be altered, in order to ensure that data integrity has not been compromised.

M. The flow meter shall optionally provide field-installable cellular communication for remote communication without physically visiting the monitoring site, for alarm notification, and for transmission of data to a central server. [2]
    1. The flow meter shall be capable of remote configuration and data transmission via a dedicated web browser (a function of FlowLink) that duplicates flow meter menu and keypad operation.

3.1 Description

A. Flow Meter Construction
    1. The flow meter electronics and connections will be housed in a PPO Polyphenylene Oxide, Noryl, NEMA4X/IP66, lockable enclosure suitable for conduit connection.
    2. Basic construction will consist of a two-piece electronics enclosure, front panel, and door.
    3. The enclosure door will have a clear polycarbonate window for viewing the LCD, optional mechanical totalizer, and LED indicator without opening the door.
    4. Connections will be accessible for addition and removal of optional devices by unlatching the door and then opening the front panel on the enclosure.
    5. The flow meter shall include a stainless steel bracket for wall mounting, and shall also be suitable for mounting on a rack or inside a console enclosure.
    6. Operating and storage temperature shall be -20 to 60°C (-4 to 140°F).
    7. The flow meter's primary user interface shall include a tactile keypad with audible feedback, and 4-inch, 320x240, backlit liquid crystal display with graphing functionality.
    8. The flow meter will have a two-color LED indicator next to the display to indicate activated alarms/events.
    9. The flow meter shall optionally include a 7-digit, non-resettable, electromechanical totalizer that can be removed or installed. [3]
    10. Operating power shall be nominal 12VDC.
        a. The flow meter's internal mains power supply will operate on 100VAC,50/60Hz or 240VAC,50/60Hz line power.
        b. The flow meter shall have the provision to be powered by an external 12VDC source.
        c. The flow meter shall have the option for external, uninterrupted battery backup power lasting a minimum of 4 hours.[4]
        d. The power circuit shall include trickle charge for a connected rechargeable Isco lead acid battery.
    11. TIENet device connection(s) shall be performed by wiring to easily accessible terminal strips and following simple instructions printed on the circuit board assembly.
        a. The flow meter shall provide nominal 12VDC output power to connected TIENet devices.
        b. The flow meter shall provide 17-26 VCD power to loop or two wire transmitter with optional TIENet Analog Input card.

B. Flow Meter Functionality
    1. Communication and User Interface
        a. Primary programming will be directly through the tactile keypad and programming menus on the front panel of the flow meter.
        b. Teledyne Isco Flowlink® software[5] shall be used to connect to the flow meter, either directly or remotely, and display web server pages with an internal browser for configuration and programming. The displayed pages will duplicate the flow meter keys and menus in appearance and function. Flowlink shall also provide a one-step control for downloading site and event data to a database.

c. An optional internal GSM or CDMA cellular modem or Ethernet modem shall provide remote communication for configuration and programming, data access, and alarm notifications.
d. The programing steps should allow the backlight of the display and the display of the flow meter to turn off.
e. Alarm status/events shall be indicated by the LED next to the display. Detailed information about the alarm/event(s) indicated will be accessed by pressing a key on the keypad.
f. Flowlink software shall be able to retrieve stored data from the flow meter, and generate graphs and reports from stored data.
g. Direct serial connection to a computer or USB flash drive will be through a micro A/B USB port located on the front panel of the flow meter.
    i. Updates to the flow meter and optional TIENet device software will be performed by connecting a USB flash drive to the flow meter.
    ii. The flow meter's program can be downloaded onto the connected flash drive. The saved program can then be duplicated onto other Signature flow meters via the flash drive.
    iii. Data shall be exported from the flow meter in .ddp or .csv format to a USB flash drive.
    iv. Verifiable text reports shall be exported from the flow meter to a USB flash drive.
    v. The flow meter shall include an adaptor for connecting a USB flash drive.
    vi. The flow meter shall optionally include a compatible adaptor cable for connecting to the USB port on a computer. [6]
h. Direct I.P. interface for local area network access will be through an internal Ethernet connection.

2. Outputs
    a. The flow meter shall be able to activate an optional connected sampler based on multiple user-selected trigger conditions.[7]
    b. The flow meter shall optionally provide industry standard 4-20 mA analog output via a factory- or field-installed internal card, and shall accept up to three such cards, allowing for up to six outputs. [8]
        i. Output range shall be from 4 to 20 mA.
        ii. Isolation shall be monolithic air core transformer technology.
        iii. Maximum load shall be 900Ω.
    c. The flow meter shall optionally provide industry standard contact output via a factory- or field-installed internal card, and shall accept up to three such cards, allowing for up to six outputs. [9]
        i. Output range shall 30 V, 1 A.
        ii. Output shall be Galvanically isolated.

    d. The flow meter shall act as a slave for Modbus interfacing via RS-485 terminal strip connection, using ASCII or RTU transmission coding.

3. Inputs
    a. The following data shall be received by the flow meter from an optional connected sampler:
        i. Sample event
        ii. Bottle number
        iii. Sampler voltage

b. The flow meter shall optionally provide industry standard 4-20 mA analog input via a factory- or field-installed internal card, and shall accept up to three such cards, allowing for up to six inputs. [10]
    i. Input range shall be 4-20 mA.
    ii. Output voltage (in active mode) shall be 17 VDC minimum.
    iii. Maximum impedance (in passive mode at 4-20 mA) shall be 400Ω.
    iv. Output shall be Galvanically isolated.

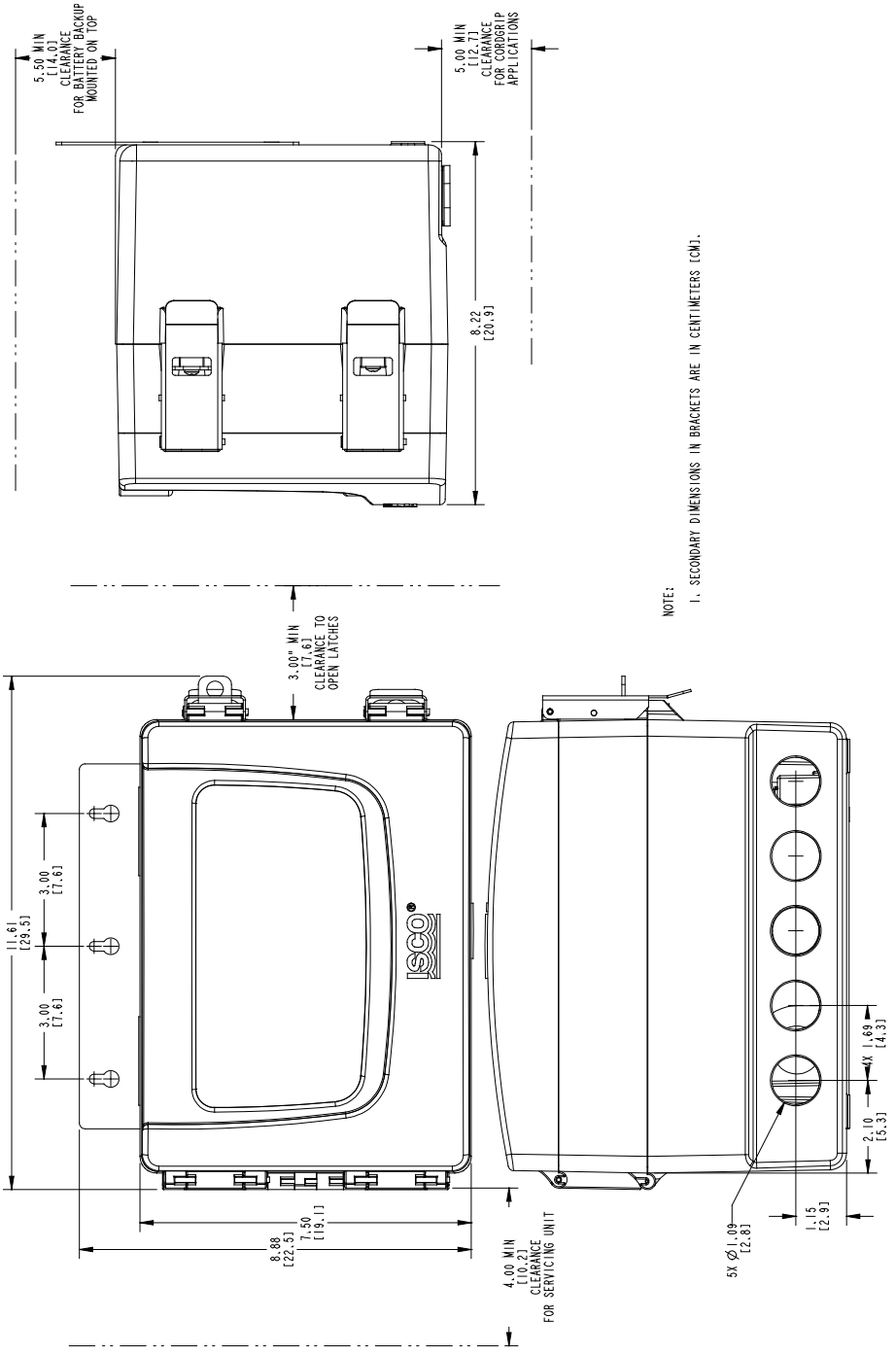
c. The flow meter shall record data from the rain gauge input. This data can be set up to measure per tip with an automatic roll-over to be set to a defined time (default to midnight).
d. The flow meter shall act as a master for Modbus interfacing via RS-485 terminal strip connection, using ASCII or RTU transmission coding.

e. The flow meter shall record flow and parameter data from optional connected TIENet devices.
f. The flow meter shall record parameter data from up to two optional connected SDI-12 devices.
g. The flow meter shall be capable of separate, simultaneous interfacing with multiple connected devices of the same type, i.e., one or more sampler interfaces, one or more pH/Temperature devices, etc.
h. The flow meter shall be capable of accepting inputs from multiple external TIENet devices via optional expansion box(es). For every expansion box, two more cabled devices can be added to the system, or one option card.[11]

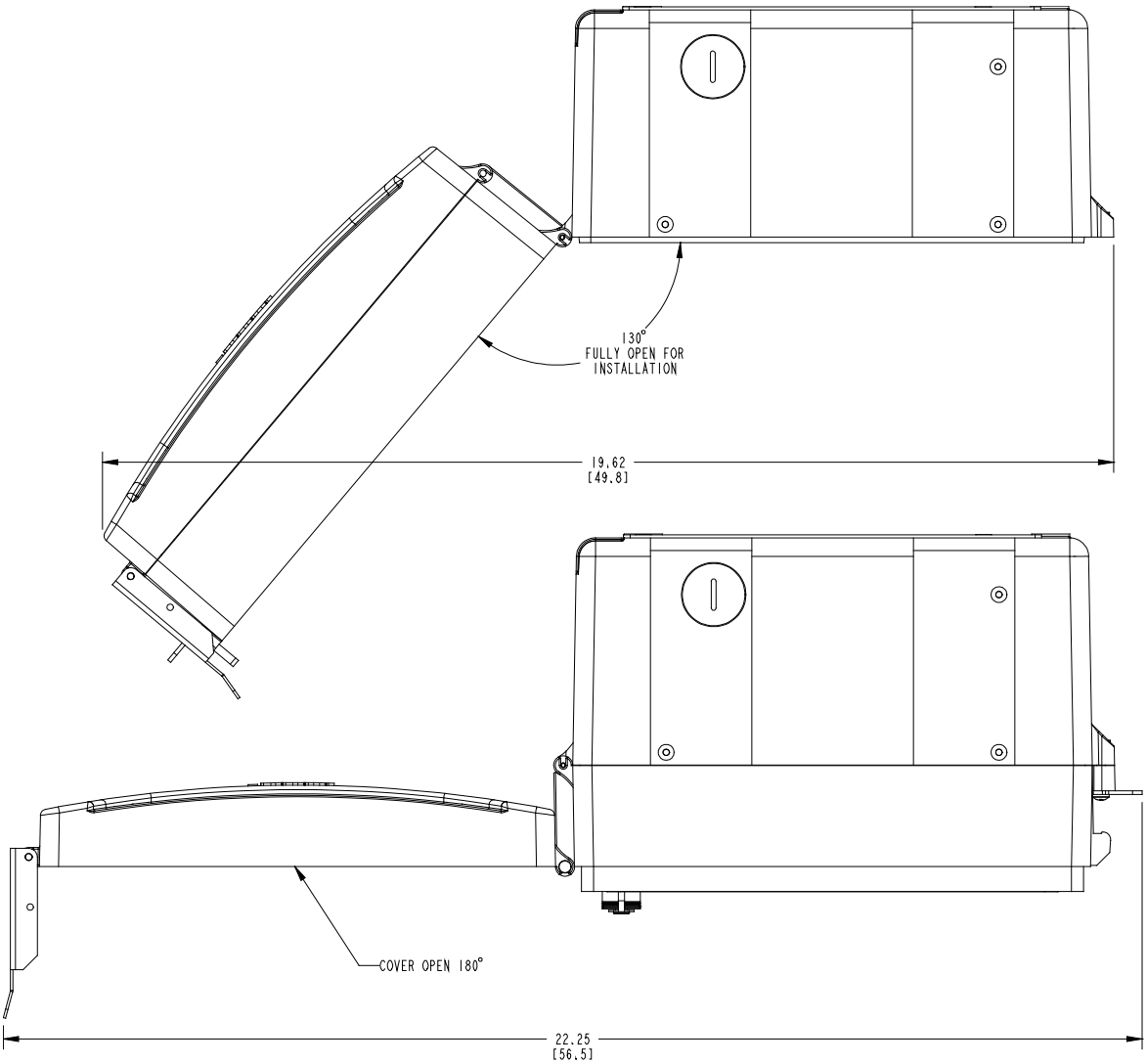
4. Expandability
    a. The meter shall be able to accept additional TIENet devices (total up to 9) through the expansion box.
5. Data Storage
    a. The flow meter will store recorded data and program settings on a recoverable, flash-based, secure, non-volatile digital memory card with standard 8M capacity (180 days with 5 parameters logged at 1-minute intervals and reports at 24-hour intervals).
    b. The program memory shall be capable of being updated via the USB port on the flow meter without opening the enclosure.
6. Data Integrity
   The flow meter shall be capable of collecting and storing event data that cannot be altered, to ensure that data integrity has not been compromised. Event types shall be:
    a. Program Report
       Tracks configuration changes to the flow meter.
    b. Two programmable Summary Reports
       Tracks measurement summaries.
    c. Diagnostic Report
       Tracks occurrences and results from diagnostic tests.
    d. History Report
       Tracks user events (such as calibration, etc.).
7. Flow Measurement Options
    a. Ultrasonic: Non-Contact Level Sensor
    b. Area Velocity: Non-Contact Laser Sensor
    c. Area Velocity: Submerged Doppler Ultrasonic Sensor
8. Level-to-Flow Calculation
   Measured liquid level readings shall be converted into corresponding flow rate readings

using internal conversion algorithms. The flow meter shall contain conversions for V-notch, rectangular and Cipolletti weirs, and Parshall, Palmer-Bowlus, trapezoidal, and H flumes. The flow meter shall accept up to 4 sets of level-flow rate points, with up to 50 pairs of points in each set. The flow meter shall accept a user-defined, one- or two-term, level-flow rate polynomial equation.

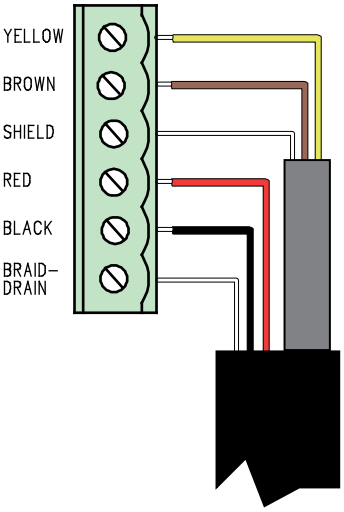
9. Level-to-Area Calculation
   Measured liquid level readings shall be converted into the area of the flow using internal conversion algorithms. The flow meter shall contain conversion information for round, U-shaped, rectangular trapezoidal and elliptical channels. The flow meter shall accept a silt level measurement and adjust the area of the flow appropriately. The flow meter shall also accept up to 50 pairs of level-area points.
10. Arithmetic Function
    The flow meter shall have several arithmetic functions available. The most common ones to use are Average, Addition, Subtraction, and Multiplication to derive new customer preferred data sets. For example, in a wide channel, customers can calculate the average flow from three different area velocity sensors installed across the channel. Another example is calculating Total Flow from channel A and channel B by using the Addition function. Calculated data shall be recoded as a dataset for reporting and control action (such as sampler enabling). The data shall be available for remote access.
11. Load Calculation
    The flow meter firmware shall allow customers to calculate the load and record it as a data set for reporting, control action (such as sampler enabling), and remote communication. To protect water bodies, the US EPA wants all states to monitor Pollutant Load (for example TMDL -Total Maximum Daily Load).



SIGNATURE BASE METER SPECIFICATIONS	
WEIGHT	
BASE W/O OPTIONS	10 LBS [4.5 KG]
BASE W/ALL INT OPTIONS	10.7 LBS [4.9 KG]
BASE W/ BAT BACKUP (TOP MT)	17.3 LBS [7.9 KG]
ENCLOSURE MATERIAL	
HOUSING	PPO PLASATIC (NORYL)
WINDOWS	POLYCARBONATE
LATCHES AND HARDWARE	STAINLESS STEEL
ELECTRICAL	
POWER SUPPLY	100-240 VAC 50/60Hz
BATTERY BACKUP	12VDC
DC POWER SUPPLY/BATTERY	12VDC
CABLE ENTRY	BOTTOM, 5 POSITION, ACCEPTS 3/4 NPT FITTINGS
ELECTRICAL CONNECTIONS	
POWER SUPPLY	SCREW TERMINAL, WIRE 14-22 AWG
TIENet DEVICE	PLUGGABLE SCREW TERMINAL, 6 POSITION
PARAMETER INPUTS	FIXED TERMINALS, 3 PIN, WIRE 14-30 AWG
ANALOG CARD	PLUGGABLE SCREW TERMINAL, 3 POSITION, WIRE 16-26 AWG
CELLULAR MODEMS	ANTENNA CUSTOM SMB CONNECTOR
EHTERNET	RJ-45 CONNECTOR

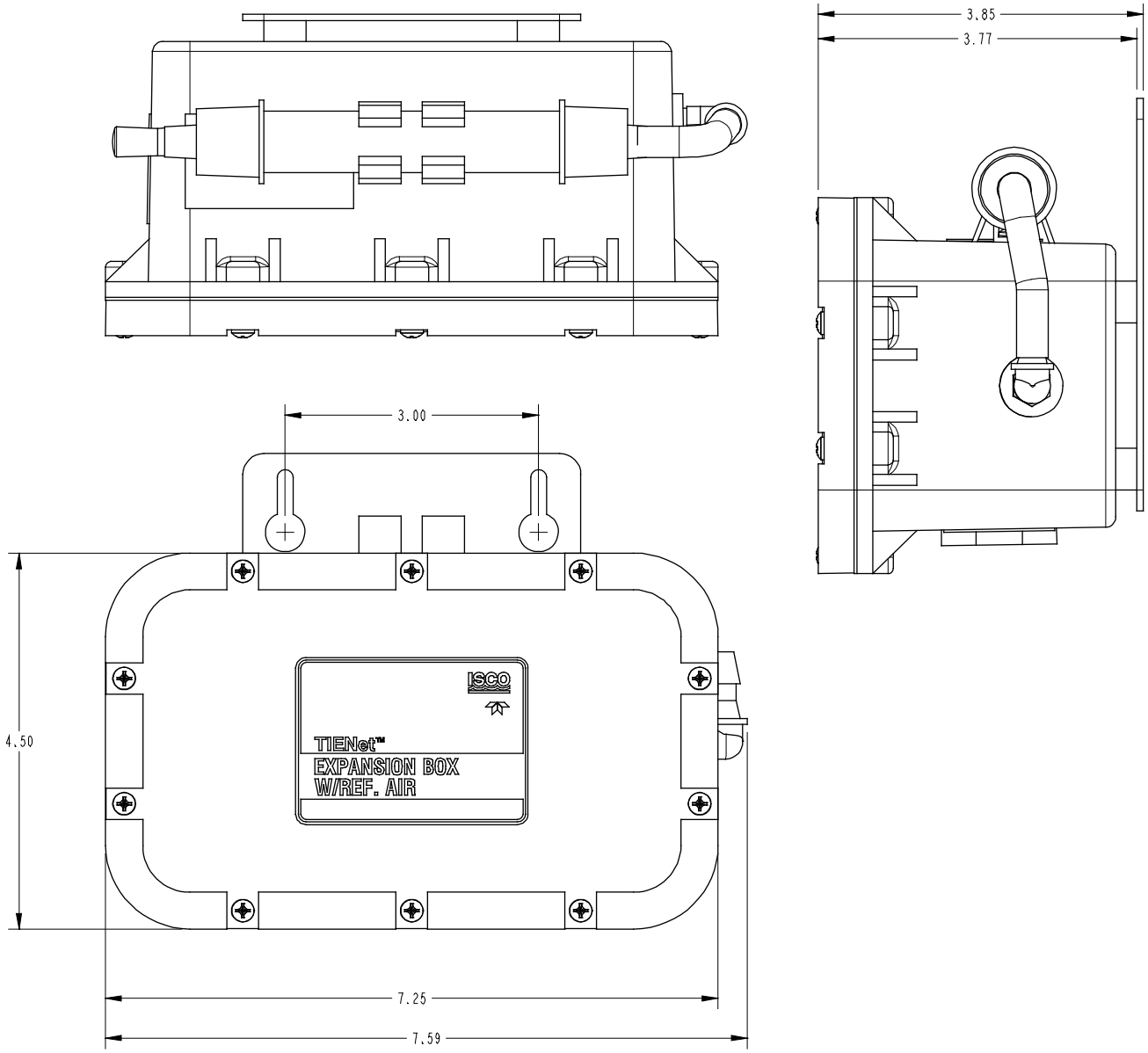

130°
FULLY OPEN FOR
INSTALLATION
19.62
[49.8]
COVER OPEN 180°
22.25
[56.5]

TIENet Device Wiring Connections



WIRING TABLE	
Description	**CBA**
D1	YELLOW
D0	BROWN
SHIELD	SHIELD
VP	RED
COMMON	BLACK
CHASSIS	BRAID DRAIN

TIENet Expansion Box



[1] Specify optional Isco TIENet device(s).
[2] Specify optional cellular or Ethernet modem.
[3] Specify optional battery backup power.
[4] Specify optional battery backup power.
[5] Specify Flowlink software.
[6] Specify optional USB adaptor cable.
[7] Specify optional 306 TIENet sampler interface.
[8] Specify optional 308 4-20 mA output card(s).
[9] Specify optional 304 4-20 mA output card(s).
[10] Specify optional 307 4-20 mA input card(s).
[11] Specify optional TIENet expansion box(es).

Teledyne ISCO One Year Limited Warranty

The Limited Warranty is exclusive to Teledyne ISCO ("Teledyne") trademarked Good(s) providing a one-year limited warranty against defects in material or workmanship for each Good(s) containing a serial number. The limited warranty shall, unless otherwise agreed, commence at the time of original shipment from Teledyne. Good(s) found to be defective during the warranty period will be repaired or replaced by the factory designated service center at no charge to the customer. The determination to repair or replace defective Good(s) shall reside solely with Teledyne. Teledyne's sole liability is exclusively limited to the repair or replacement of the defective Good(s).

No item may be returned for service without a Return Material Authorization (RMA) number issued by Teledyne.

Teledyne is not liable for consequential, administrative, or punitive damages including loss of use.

Teledyne will pay surface transportation charges to and from the service center within the 48 contiguous United States of America for the repair or replacement of Good(s) proved to be defective within the first 30 days of original shipment.

During the remainder of the warranty period, the customer will pay to return the defective Good(s) to Teledyne. Teledyne will not pay airfreight or customer's packing and crating charges.

The Limited Warranty does not cover loss or damage resulting from transportation between the customer's facility and the service center.

The limited warranty excludes damage caused by normal wear and tear, expendable/consumable items, including but not limited to, desiccant, pH sensors, charts, ribbon, lamps, tubing, and glassware; fittings and wetted parts including valves; check valves, pistons, piston seals, wash seals, cylinders, pulse damper, diaphragms, inlet lines and filter elements, and damage due to corrosion, misuse, accident, improper installation, or failure to properly maintain as specified in the Installation and Operation Manual applicable to the Good(s). This warranty does not cover products sold under any other trademark, or for which any other warranty is specifically stated.

THIS WARRANTY IS EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES AND OBLIGATIONS AND TELEDYNE ISCO SPECIFICALLY DISCLAIMS ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

****This warranty is only applicable within the United States of America and countries where Teledyne does not have an authorized representative.****

Issues may often be resolved without returning the instrument to the service center. Please call the applicable Repair Services number below prior to requesting an RMA

Additional warranty terms available at www.teledyneisco.com/en-us/terms-and-conditions/customer-terms-and-conditions

Shipping Address: Teledyne ISCO – Attention: Repair Services
4700 Superior Street
Lincoln, NE 68504 USA

Mailing Address: Teledyne ISCO
PO Box 82531
Lincoln, NE 68501 USA

Phone:
Repair Services: (800) 775-2965 (Scientific Instruments)
(866) 298-6174 (Water & WasteWater)
Customer Service: (800) 228-4373 (USA & Canada)
Fax: (402) 465-3001
Email: iscoservice@teledyne.com

P/N 601002040 Rev K
August 9, 2018

TELEDYNE ISCO
Everywhereyoulook™

TIENet™ Model 350 Area Velocity Sensor

Section 1 Introduction

The Teledyne Isco TIENet 350 Area Velocity Sensor measures flow stream average area velocity and liquid level. The Signature® Flow Meter uses this information to calculate the flow rate and total flow of the stream. To operate with the 350 sensor, the Signature requires software version **1.18** or later.

1.1 Description

The 350 sensor is mounted in the flow stream, normally at the bottom of the channel. It measures average velocity using continuous ultrasonic sound waves to produce a Doppler effect, in which the frequency of a wave (such as sound) passed between two bodies is relative to the motion of each. As they move nearer to each other, the frequency increases; as they move apart, the frequency decreases.

The 350 sensor measures liquid level using an internal differential pressure transducer.

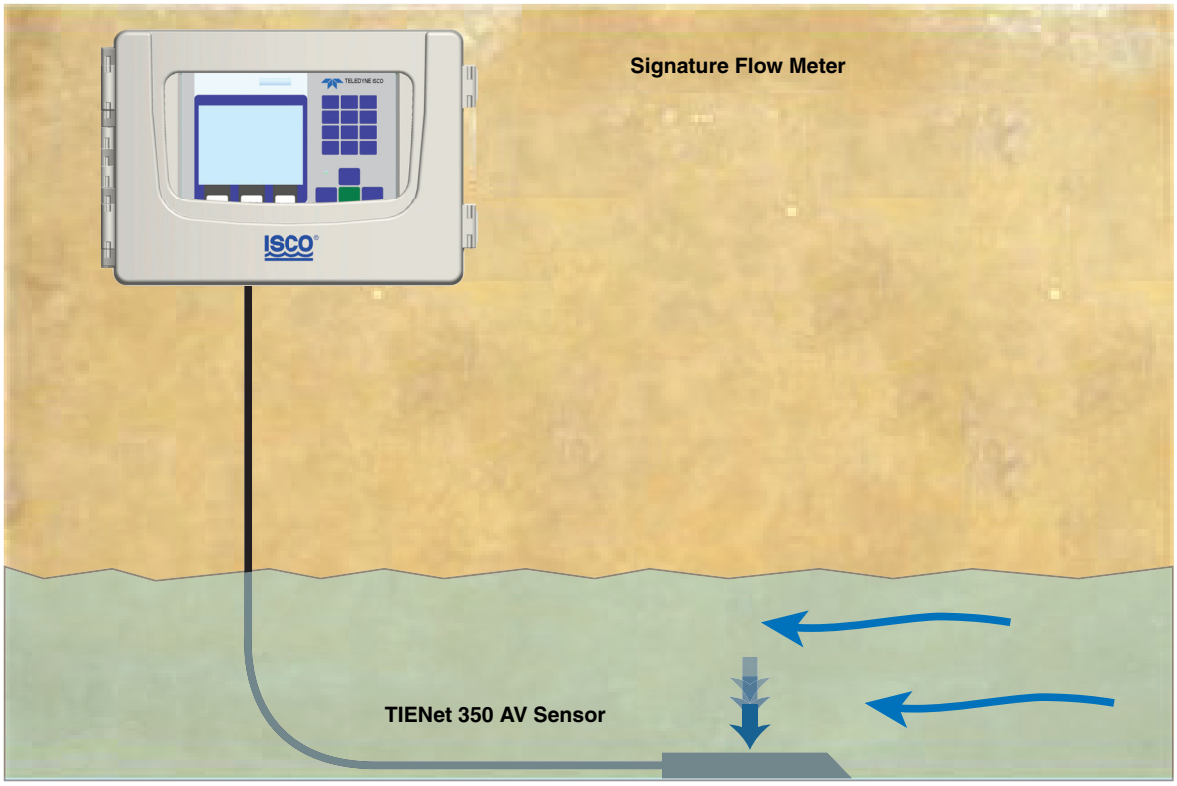


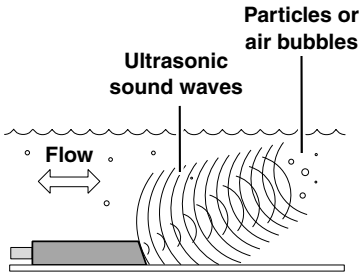
Figure 1-1 Basic Signature monitoring system with 350 (mounting hardware not shown)

The 350 AV sensor is available with a 5m, 10m, or 23m cable. For greater distances, external connection via conduit, and connection of additional TIENet devices, the TIENet Expansion Box is available. Bulk TIENet cable may also be used for greater distances.



Figure 1-2 TIENet Model 350 Area Velocity Sensor

1.1.1 350 Velocity Operation



The 350 area velocity sensor contains a pair of ultrasonic transducers. One transducer transmits the ultrasonic sound wave. As the transmitted wave travels through the stream, particles and bubbles carried by the stream reflect the sound wave back at the sensor. The second transducer receives the reflected wave.

The sensor determines the frequency shift between the transmitted and received waves. An increase or decrease in the frequency of the reflected wave indicates forward or reverse flow. The degree of change is proportional to the velocity of the flow stream.

1.1.2 350 Level Operation

The 350 sensor's internal differential pressure transducer measures the liquid level. The transducer is a small piezo-resistive chip that detects the difference of the pressures felt on the inner and outer face.

The stainless steel outer diaphragm is exposed to the flow stream through the ports under the sensor. The pressure felt on the outer diaphragm is transferred to the outer face of the transducer. The inner face of the transducer is referenced to the atmosphere through the internal vent tube that runs the full length of the sensor cable.

The difference between the pressures exerted on the transducer is the hydrostatic pressure, which is proportional to the level of the stream. The analog representation of the hydrostatic pressure is digitized and sent to the Signature as an RS-485 half-duplex signal.

1.2 Technical Specifications

Table 1-1 350 TIENet Sensor Specifications[a]

Sensor Dimensions	1.9 × 3.3 × 15.2 cm	0.75 × 1.31 × 6.00 in
Standard Cable Length	5, 10, or 23 m	16.4, 32.8, or 75.5 ft
Cable Diameter	10.2mm ±0.254mm	0.402 in ±0.010 in
Minimum Bend Radius	15.24 cm	6 in
Maximum Cabling from Signature Flow Meter	305 m	1,000 ft
Typical Weight w/ 5 m Cable w/ 10 m Cable w/ 23 m Cable	 0.88 kg 1.68 kg 3.10 kg	 1.95 lb 3.70 lb 6.84lb
Body Materials	Epoxy, PC, SST	
Cable Materials	UV-Rated PVC	
Temperature Range Operation Storage	 0 to 70 °C -40 to 70 °C	 32 to 158 °F -40 to 158 °F
Power Input Voltage Supply Current @ 12VDC Nominal	 7 to 14VDC Measurement: 100mA	
Level Measurement		
Technology	Submerged differential linear pressure transducer with integral digital temperature compensation coefficients.	
Range[b]	0.010 to 3.05 m	0.033 to 10 ft.
Pressure Rating	5 PSI	
Maximum Submersible Depth	10.55 m	34.6 ft
Accuracy[c]	± 0.10% FS	
Typical Long Term Stability	± 0.007m/yr	± 0.023 ft/yr
Compensated Temperature Range	0 to 70°C	32 to 158°F
Velocity Measurement		
Technology	Continuous wave Doppler ultrasonic	
Frequency	500 kHz	
Transmission Angle	20° from horizontal	
Velocity Direction	Bi-Directional (User selectable)	
Typical Minimum Depth for Velocity Measurement	2.5 cm	1.0 in
Range	-1.5 to +6.1 m/s	-5 to +20 ft./s
Accuracy[d]	Velocity Error -5 to +5 ft./s: -1.5 to +1.5 m/s 5 to 20 ft./s: 1.5 to 6.1 m/s	 ±0.1 ft./s (±0.03 m/s) ±2% of reading

a. All specifications are subject to change without notice.
b. Actual vertical distance between the area velocity sensor and the liquid surface
c. Maximum non-linearity, hysteresis, and temperature error from actual liquid level
d. Uniform velocity profile, speed of sound 1480 m/s (4850 ft/s)

Signature® Flow Meter Expansion Box

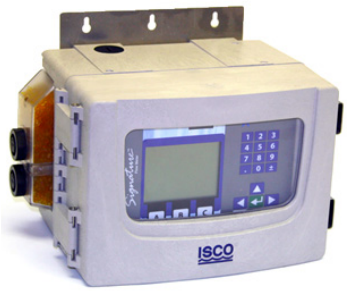
Custom Networking for Your Site Needs

Application Note

TELEDYNE ISCO Everywhereyoulook™

Expertise in Flow

Signature® Flow Meter



Standard Features:

- Multi-parameter data logging
- Program & summary reports
- Data integrity verification
- Triggering, sampler enabling
- Compatible w/ Flowlink® software
- Multiple simultaneous flow technologies
- pH and temperature input
- SDI-12 input
- RS-485 input
- RS-485 output
- Analog outputs
- Remote communication via cell phone or Ethernet

TIENet™ Expansion Box



- Rated IP67 (NEMA 4X, 6) w/ appropriate ID conduit connection, cord-grip fittings, or plugs
- Up to 3 TIENet terminal connections
- Option card mounting

TIENet™ 308 4-20mA 2-Channel Analog Output Card



"The Future of Flow!"™

Flow monitoring site requirements can often call for cable connections that are different from the available standard cable lengths of the devices.

The optional water-tight Signature Expansion Box enables a variety of configurations for adding length, as well as connecting multiple devices at once. The Expansion Box connects to a TIENet™ terminal strip in the Signature, and contains three additional strips inside, as well as a TIENet connection for an option card.



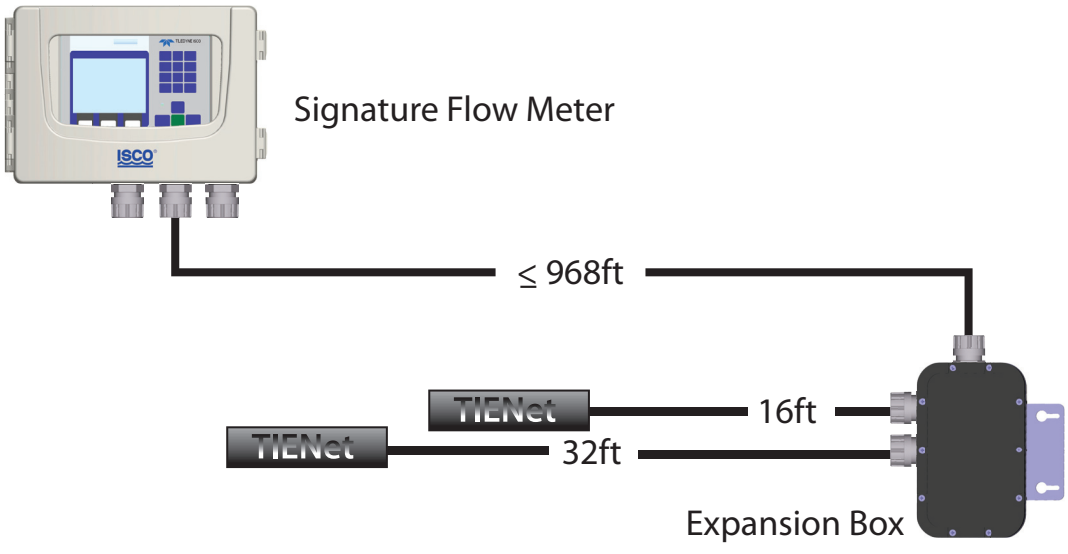
Adding Length Between Signature and Sensors

Distance can increased by installing the Expansion Box closer to the field-mounted TIENet device(s) and adding a custom-length TIENet cable between the box and the Signature. The maximum recommended distance between the LaserFlow sensor and its power source is 45.7 meters (150 feet). The maximum recommended distance between all other system components is 305 meters (1,000 feet). Longer distances may result in signal degradation and drops in voltage.

The exception to this rule is the internally mounted TIENet 308 Analog Output Card, which can operate at up to 914 meters (3,000 feet) from the next device, for a maximum total of 1,219 meters (4,000 feet).

TIENet Device	Standard Cable Length
~~301 pH Device~~ ~~310 Ultrasonic Sensor~~	~~5m, 10m, 23m~~ ~~16ft, 32ft, 75ft~~
~~306 Sampler Interface~~ ~~360 Laser Velocity Sensor~~	~~5m, 10m, 23m~~ ~~16ft, 32ft, 75ft~~
350 Area Velocity Sensor	5m, 10m, 23m 16ft, 32ft, 75ft LaserFlow surcharge kit: 350 w/ 2ft cable & TIENet plug

A Signature flow monitoring system can include up to nine TIENet™ devices connected to one Signature Flow Meter. When calculating the length of bulk cable required, factor in the length of the longest sensor cable.



☑ ***Note***

Cabling should be kept as short as possible in all installations.

Area Velocity Applications

Signature systems using the expansion box with the TIENet 350 Area Velocity sensor must have a means to vent the sensor's reference air line.

Distance of 100 Feet or Less:

If the total distance is 30.5 meters (100 feet) or less, the Signature's air system will normally supply adequate desiccated air through the TIENet cable air line to the interior of the expansion box,. This means the 350 AV sensor is referenced at the Signature's installation location.

The un-vented TIENet expansion box can be used for these applications.

Distances Greater than 100 Feet:

If the total distance is greater than 30.5 meters (100 feet), or a different reference location is required, the reference air line must be vented outside the expansion box.

The TIENet expansion box with reference air is designed for this purpose. The desiccator tube mounted on the side vents dried air to its interior.

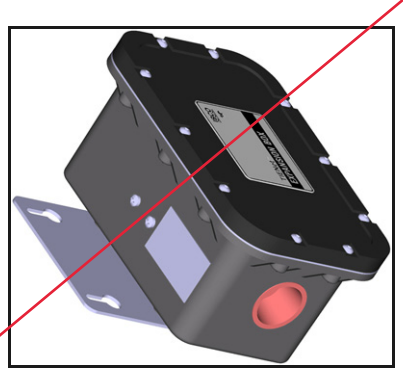
Surcharge Option for LaserFlow™

When configuring extended distances for a LaserFlow system with the optional surcharge kit installed, factor in the length of both the LaserFlow sensor cable, and the 2-foot terminated 350 AV sensor cable.

Distance of 100ft or less: Normal venting inside the Signature Flow Meter.



Signature Flow Meter



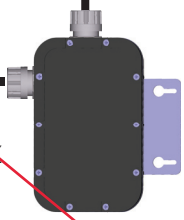
Un-vented TIENet expansion box
(60-4307-023)

≤ 68ft

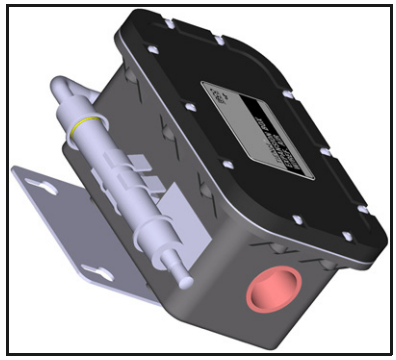
32ft

TIENet 350 AV Sensor

Expansion Box



Distance of 100 to 1,000 ft or different reference location: Vent outside the box.



TIENet expansion box w/ reference air
(60-4357-018)



Signature Flow Meter

275 ft

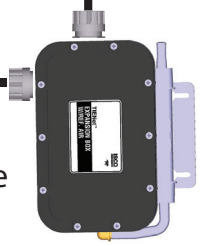
Example: Extension Cable
(max. length shown, minus sensor cable length)

(x3)

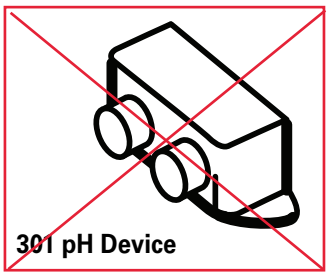
33 ft

Example: TIENet 350 AV Sensor
(max. standard length shown)

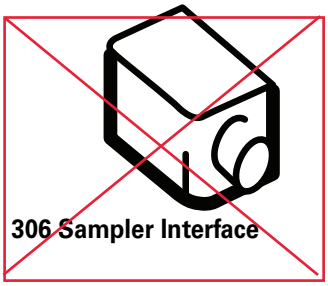
Expansion Box
w/ Desiccator Tube



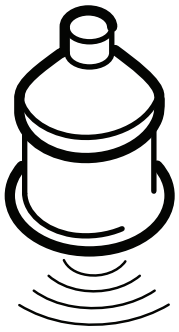
External TIENet™ Devices from Teledyne Isco:



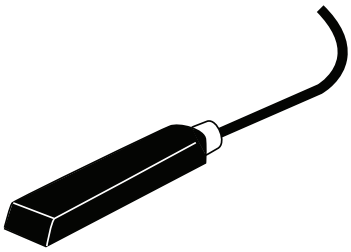
301 pH Device



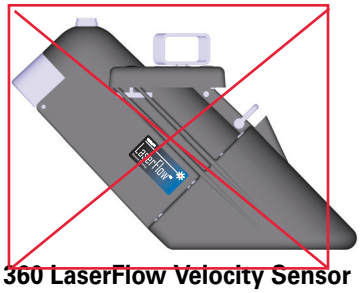
306 Sampler Interface



310 Ultrasonic Level Sensor



350 Area Velocity Sensor

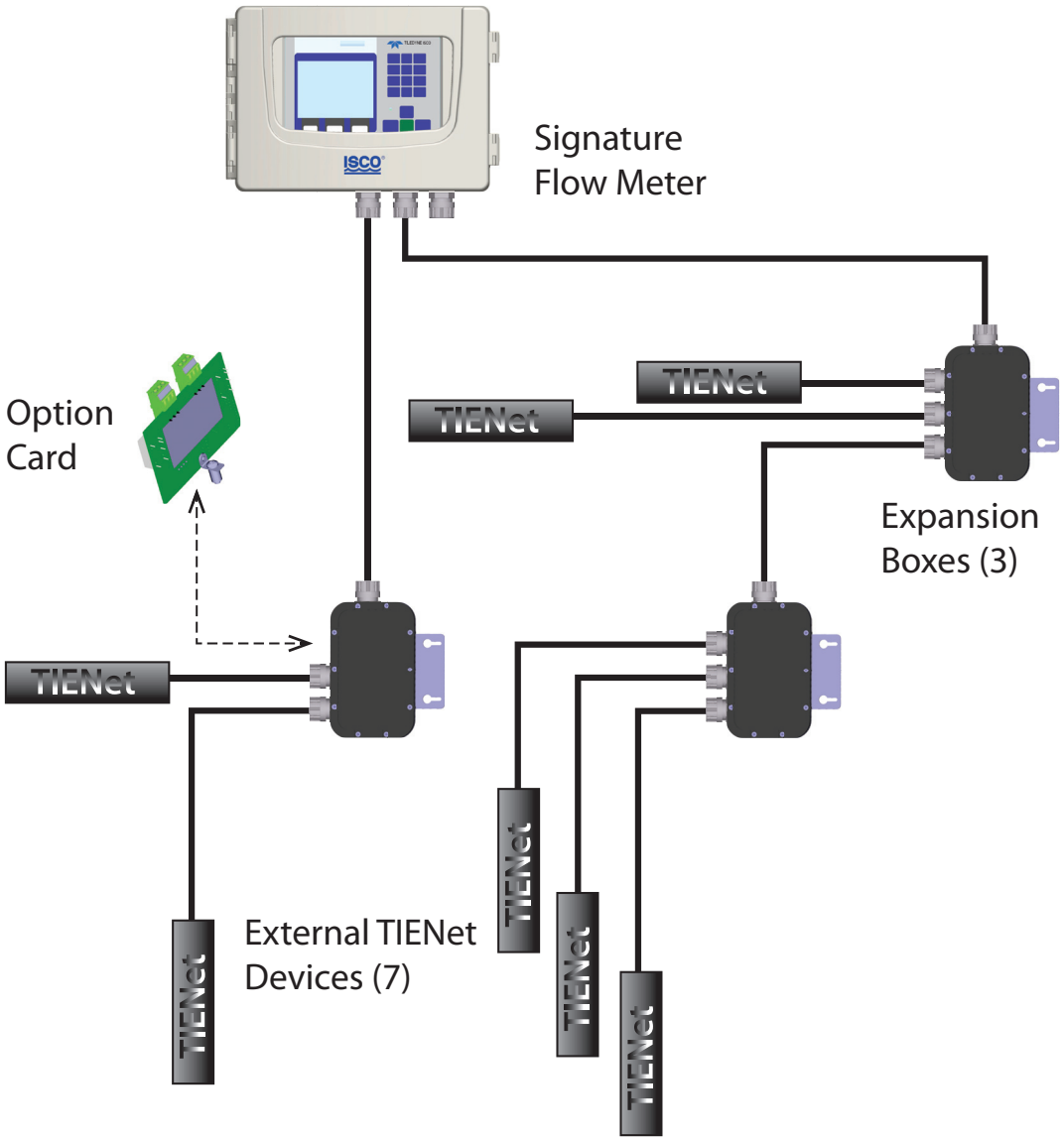


360 LaserFlow Velocity Sensor

Configuring Multiple TIENet Devices

As mentioned earlier, the Signature Flow Meter can have up to 9 connected TIENet devices running independently and simultaneously, including the internal 300 circuit board (all Signature flow meters), internal option cards, and 330 Bubbler Module.

Depending on the needs of the monitoring site, multiple expansion boxes can be used to connect multiple devices, creating any number of possible daisy-chain configurations.



Teledyne Isco
P.O. Box 82531, Lincoln, Nebraska, 68501 USA
USA & Canada: (800) 228-4373 • Phone: (402) 464-0231 • Fax: (402) 465-3091
Web site: www.isco.com • E-mail: IscoInfo@teledyne.com

TELEDYNE ISCO
Everywhereyoulook™

Teledyne Isco is continually improving its products and reserves the right to change specifications without notice.
©2012 Teledyne Isco L-0204-AN07 04/13