Table 39: Electrode Type *(continued)*

Electrode type	General characteristics
(Also see Table 40 and Table 41 for grounding options and installation)	Minimum conductivity of 100 microSiemens/cm
	Not recommended for electrolytic or galvanic corrosion applications
Bulletnose	Extended head protrudes into the flow stream for self-cleaning
	Best option for coating processes

Table 40: Process Reference Options

Grounding options	General characteristics
No Grounding Options (grounding straps)	Acceptable for conductive unlined pipe
	Grounding straps provided at no cost
Reference Electrode	Same material as measurement electrodes
	Sufficient grounding option when process fluid conductivity is greater than 100 microSiemens/cm
	Not recommended in electrolysis applications, galvanic corrosion applications, applications where the electrodes may coat, or non-conductive pipe.
Grounding Rings	Low conductivity process fluids
	Cathodic or electrolysis applications that may have stray currents in or around the process
	Variety of materials for process fluid compatibility

Table 41: Process Reference Installation

Type of pipe	Grounding straps	Grounding rings	Reference electrode	Lining protectors
Conductive unlined pipe	Acceptable	Not required	Not required	Not required
Conductive lined pipe	Not acceptable	Acceptable	Acceptable	Acceptable
Non-conductive pipe	Not acceptable	Acceptable	Not recommended	Acceptable

Transmitter specifications

Transmitter functional specifications

Transmitter coil drive current

500mA

Flow rate range

Capable of processing signals from fluids with velocities between 0.04 and 39 ft/s (0.01 to 12 m/s) for both forward and reverse flow in all sensor sizes. Full scale continuously adjustable between –39 and 39 ft/s (–12 to 12 m/s).

Conductivity limits

Process liquid must have a conductivity of 5 microSiemens/cm (5 micromhos/cm) or greater.

Power supply

- 90 - 250VAC @ 50/60Hz

- 12 - 42VDC

Line power fuses

- 90 - 250VAC systems:
  - 2 amp quick acting
  - Bussman AGC2 or equivalent
- 12 - 42VDC systems
  - 3 amp quick acting
  - Bussman AGC3 or equivalent

Power consumption

- 90 - 250VAC: 40VA maximum
- 12 - 42VDC: 15W maximum

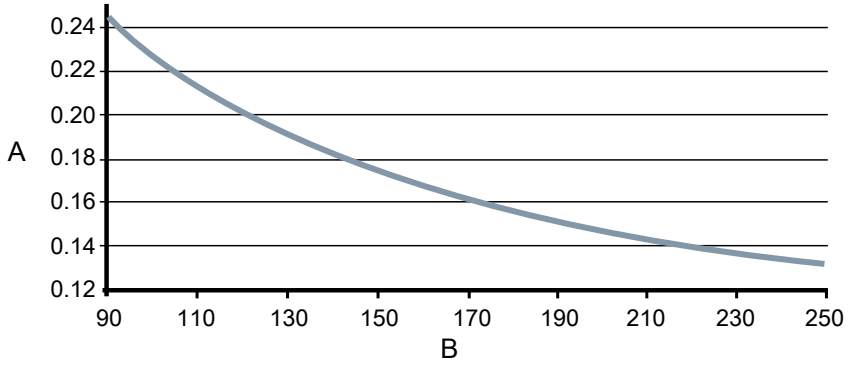
Switch-on current

- At 250VAC: Maximum 35.7A (< 5ms)
- At 42VDC: Maximum 42A (< 5ms)

AC power supply requirements

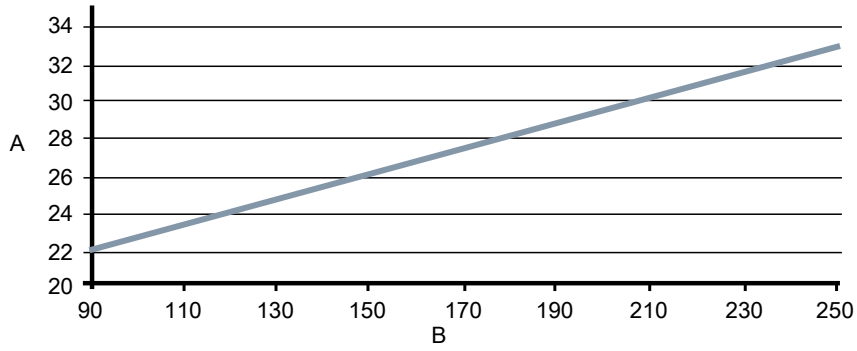
Units powered by 90 - 250VAC have the following power requirements. Peak inrush is 35.7A at 250VAC supply, lasting approximately 1ms. Inrush for other supply voltages can be estimated with: Inrush (Amps) = Supply (Volts) / 7.0

Figure 2: AC current requirements



A. Supply current (amps)
B. Power supply (VAC)

Figure 3: Apparent power

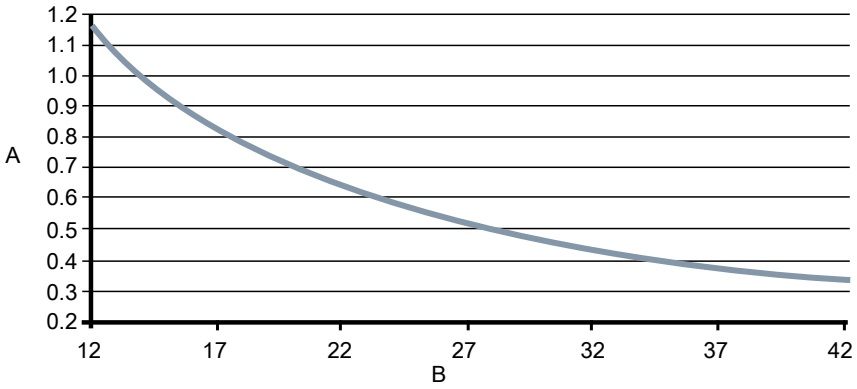


A. Apparent power (VA)
B. Power supply (VAC)

DC power supply requirements

Units powered by 12VDC power supply may draw up to 1.2A of current steady state. Peak inrush is 42A at 42VDC supply, lasting approximately 1ms. Inrush for other supply voltages can be estimated with: Inrush (Amps) = Supply (Volts) / 1.0

Figure 4: DC current requirements



A. Supply current (amps)
B. Power supply (VDC)

Ambient temperature limits

- Operating:
  - –58 to 140 °F (–50 to 60 °C) without LOI/Display
  - –4 to 140 °F (–20 to 60 °C) with LOI/Display
  - The LOI/Display will not be visible at temperatures below -20°C
- Storage:
  - –58 to 185 °F (–50 to 85 °C) without LOI/Display
  - –22 to 176 °F (–30 to 80 °C) with LOI/Display

Humidity limits

0–95% RH to 140 °F (60 °C)

Altitude

2000 meters maximum

Enclosure rating

Type 4X, IEC 60529, IP66 (transmitter)

Transient protection rating

Built in transient protection that conforms to:

- IEC 61000-4-4 for burst currents
- IEC 61000-4-5 for surge currents
- IEC 611185-2.2000, Class 3 up to 2kV and up to 2kA protection

Turn-on time

- 5 minutes to rated accuracy from power up
- 5 seconds from power interruption

Start-up time

50ms from zero flow

Low flow cut-off

Adjustable between 0.01 and 38.37 ft/s (0.003 and 11.7 m/s). Below selected value, output is driven to the zero flow rate signal level.

Overrange capability

Signal output will remain linear until 110% of upper range value or 44 ft/s (13 m/s). The signal output will remain constant above these values. Out of range message displayed on LOI/Display and the Field Communicator.

Damping

Adjustable between 0 and 256 seconds

Advanced diagnostics capabilities

Basic

- Self test
- Transmitter faults
- Analog output test
- Pulse output test
- Tunable empty pipe
- Reverse flow
- Coil circuit fault
- Electronics temperature

Process diagnostics (DA1)

- Ground/wiring fault
- High process noise
- Electrode coating diagnostic

Smart Meter Verification (DA2)

- Smart Meter Verification (continuous or on-demand)

- 4-20mA loop verification(2)

Output signals

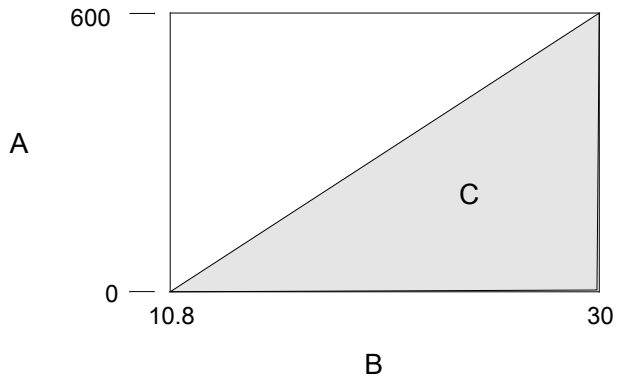
Analog output adjustment (3)

4–20mA, switch-selectable as internally or externally powered.

Analog loop load limitations

- Internally powered 24VDC max, 500 ohms max loop resistance
- Externally powered 10.8 - 30VDC max.
- Loop resistance is determined by the voltage level of the external power supply at the transmitter terminals:

Figure 5: Analog loop load limitations



A. Load (ohms)
B. Power supply (volts)
C. Operating region

- $R_{max} = 31.25 (V_{ps} – 10.8)$
- V_{ps} = power supply voltage (volts)
- Rmax = maximum loop resistance (ohms)

The analog output is automatically scaled to provide 4mA at lower range value and 20mA at upper range value. Full scale continuously adjustable between -39 and 39 ft/s (-12 to 12 m/sec), 1 ft/s (0.3 m/s) minimum span.

HART Communications is a digital flow signal. The digital signal is superimposed on the 4–20mA signal and is available for the control system interface. A minimum of 250 ohms loop resistance is required for HART communications.

Analog alarm mode

High or low alarm signal is user-selectable via the Alarm switch on the front of the electronics. NAMUR-compliant alarm limits are software configurable and can be preset via CDS (C1). Individual diagnostic alarms are also software configurable. Alarms will drive the analog signal to the following mA values. High or low alarm signal is user-selectable via the Alarm switch on the front of the electronics. NAMUR-compliant alarm limits are software configurable and can be preset via CDS (C1). Individual diagnostic alarms are also software configurable. Alarms will drive the analog signal to the following mA values.

Low	3.75 mA	Requires CDS (C1)
High	22.50 mA	Factory default
NAMUR Low	3.5 mA	Requires CDS (C1)

(2) Available with HART output only.
(3) For transmitters with intrinsically safe outputs (option code B), power must be supplied externally.

NAMUR High	22.6 mA	Requires CDS (C1)

FOUNDATION™ Fieldbus output

Output signal	Manchester-encoded digital signal that conforms to IEC 1158-2 and ISA 50.02
Scheduled Entries	Seven (7)
Links	Twenty (20)
Virtual Communications Relationships (VCRs)	One (1) predefined (F6, F7) Nineteen (19) configurable

FOUNDATION™ fieldbus function blocks

Table 42: Function block execution times

Block	Execution time (milliseconds)
Resource (RB)	—
Transducer (TB)	—
Analog Input (AI)	15
Proportional/Integral/Derivative (PID)	20
Integrator (INT)	25
Arithemetic (AR)	25
Discrete Output (DO)	15

Transducer Block The transducer block calculates flow from the measured induced voltage. The calculation includes information related to the calibration number, line size, and diagnostics.

Resource Block The resource block contains physical transmitter information, including available memory, manufacturer identification, device type, software tag, and unique identification.

Backup Link Active Scheduler (LAS) The transmitter is classified as a device link master. A device link master can function as a Link Active Scheduler (LAS) if the current link master device fails or is removed from the segment. The host or other configuration tool is used to download the schedule for the application to the link master device. In the absence of a primary link master, the transmitter will claim the LAS and provide permanent control for the H1 segment.

Diagnostics The transmitter automatically performs continuous self-diagnostics. The user can perform on-line testing of the transmitter digital signal. Advanced simulation diagnostics are available. This enables remote verification of the electronics via a flow signal generator built into the electronics. The sensor strength value can be used to view the process flow signal and provide information regarding filter settings.

Analog Input The AI function block processes the measurement and makes it available to other function blocks. The AI function block also allows filtering, alarming, and engineering unit changes.

Arithmetic Block Provides pre-defined application-based equations including flow with partial density compensation, electronic remote seals, hydrostatic tank gauging, ratio control and others.

Proportional/ Integral/Derivative The PID function block provides a sophisticated implementation of the universal PID algorithm. The PID function block features input for feed forward control, alarms on the process variable, and control deviation. The PID type (series or Instrument Society of America [ISA]) is user-selectable on the derivative filter.

Integrator The standard integrator block is available for totalization of flow.

- **Reverse Flow** Detects and reports reverse flow
- **Software Lockout** A write-lock switch and software lockout are provided in the resource function block.

	Totalizer	Non-volatile totalizer for net, gross, forward and reverse totals.
Discrete Output	The DO function block processes a discrete setpoint and saves it to a specified channel to produce an output signal. The block supports mode control, output tracking, and simulation.	

Modbus RS-485 output

Transmitters with a Modbus output provide an RS-485 signal to a Modbus host system; data rates can be configured from 1200 baud to 115.2 kilobaud.

Scalable pulse frequency adjustment

- 0-10,000Hz, switch-selectable as internally or externally powered (4)
- Pulse value can be set to equal desired volume in selected engineering units
- Pulse width adjustable from 0.1 to 650 ms
- Internally powered: Outputs up to 12VDC(5)
- Externally powered: Input 5 - 28VDC

Output testing

Analog output test (5)	Transmitter may be commanded to supply a specified current between 3.5 and 23mA.
Pulse output test	Transmitter may be commanded to supply a specified frequency between 1 and 10,000Hz.(4)

Optional discrete output function (AX option)

Externally powered at 5 - 28VDC, 240mA max, solid state switch closure to indicate either:

Reverse flow	Activates switch closure output when reverse flow is detected.
Zero flow	Activates switch closure output when flow goes to 0 ft/s or below low flow cutoff.
Empty pipe	Activates switch closure output when an empty pipe condition is detected.
Transmitter faults	Activates switch closure output when a transmitter fault is detected.
Flow limit 1, flow limit 2	Activates switch closure output when the transmitter measures a flow rate that meets the conditions established for this alert. There are two independent flow limit alerts that can be configured as discrete outputs.
Totalizer limit	Activates switch closure output when the transmitter measures a total flow that meets the conditions established for this alert.
Diagnostic status	Activates switch closure output when the transmitter detects a condition that meets the configured criteria of this output.

Optional discrete input function (AX option)

Externally powered at 5 - 28VDC, 1.4 - 20mA to activate switch closure to indicate either:

Reset Totalizer A (or B or C)	Resets Totalizer A (or B or C) value to zero.
Reset All Totals	Resets all totalizer values to zero.
Positive Zero Return (PZR)	Forces outputs of the transmitter to zero flow.

Security lockout

Security lockout switch on the electronics board can be set to deactivate all LOI and HART-based communicator functions to protect configuration variables from unwanted or accidental change.

(4) For transmitters with intrinsically safe outputs (option code B), frequency range is limited to 0-5000Hz.
(5) For transmitters with intrinsically safe outputs (option code B), power must be supplied externally.

LOI lockout

The display can be manually locked to prevent unintentional configuration changes. The display lock can be activated through a HART communication device, or by holding the UP arrow for 3 seconds and then following the on-screen instructions. When the display lock is activated, a lock symbol will appear in the lower right hand corner of the display. To deactivate the display lock, hold the UP arrow for 3 seconds and follow the on-screen instructions.

Display auto lock can be configured from the LOI with the following settings: OFF, 1 Minute, or 10 Minutes

Sensor compensation

Rosemount sensors are calibrated in a flow lab at the factory and are assigned a calibration number. The calibration number must be entered into the transmitter, enabling interchangeability of sensors without calculations or a compromise in standard accuracy.

Transmitters and other manufacturers' sensors can be calibrated at known process conditions or at the Rosemount NIST-Traceable Flow Facility. Transmitters calibrated on site require a two-step procedure to match a known flow rate. This procedure can be found in the operations manual.

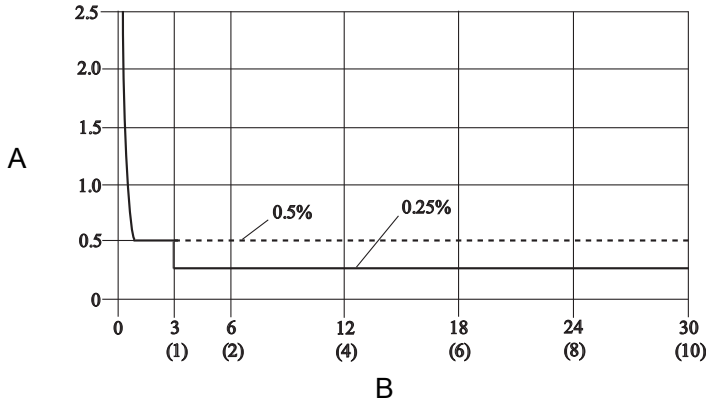
Performance specifications

System specifications are given using the frequency output and with the unit at reference conditions.

Accuracy

Includes the combined effects of linearity, hysteresis, and repeatability.

- Standard system accuracy:
  - ±0.5% of rate from 1 to 39 ft/s (0.3 to 12 m/s)
  - ±0.005 ft/s (0.0015 m/s) from the low flow cutoff to 1 ft/s (0.3 m/s)
- Optional high accuracy:(6)
  - ±0.25% of rate ±1.0 mm/sec from 3 to 39 ft/s (1 to 12 m/s)



A. Percentage of rate
B. Velocity in ft/s (m/s)

Analog output effects

Analog output has the same accuracy as frequency output plus an additional ±4 μ A at room temperature.

Repeatability	±0.1% of reading
Response time (analog output)	20 ms max response time to step change in input
Stability	±0.1% of rate over six months
Ambient temperature effect	±0.25% change over operating temperature range

(6) For sensor sizes greater than 12 in. (300 mm) the high accuracy is ±0.25% of rate from 3 to 39 ft/sec (1 to 12 m/sec).

Wall mount transmitter physical specifications

Materials of construction

Standard housing	Low copper aluminum Type 4X and IEC 60529 IP66
Paint	Polyurethane coat (1.8 to 2.2 mils thick)
Optional housing	Not available
Cover gaskets	Silicone

Electrical connections

Conduit entries	½ inch NPT or M20
Terminal block screws	6-32 (No. 6) suitable for up to 14 AWG wire
Safety grounding screws	External stainless assembly, M5; internal 8-32 (No. 8)

Vibration rating

2G per IEC 61298

Dimensions

See Dimensional drawings.

Weight

Wall mount transmitter	Aluminum	Approximately 9 lbs. (4 kg)

Add 1 pound (0.5 kg) for LOI/Display.

Field mount transmitter physical specifications

Materials of construction

Standard housing	Low copper aluminum Type 4X and IEC 60529 IP66
Paint	Polyurethane coat (1.8 to 2.2 mils thick)
Optional housing	316/316L unpainted, option code SH Type 4X and IEC 60529 IP66
Cover gasket	Aluminum housing: Buna-N

Ingress protection

Consult Emerson for installations requiring IP67/IP68/IP69K.

Electrical connections

Conduit entries	Available in 1/2 inch NPT or M20. See ordering table footnotes for details
Terminal block screws	6-32 (No. 6) suitable for up to 14 AWG wire
Safety grounding screws	External stainless assembly, M5; internal 8-32 (No. 8)

Vibration rating

Integral mount	2G per IEC 61298
Remote mount	5G per IEC 61298

Dimensions

See Dimensional drawings.

Weight

Field mount transmitter only	Aluminum	Approximately 7 lbs. (3.2 kg)
	316 stainless steel	Approximately 23 lbs. (10.5 kg)

Add 1 pound (0.5 kg) for LOI/Display.

Sensor specifications

Functional specifications

Service

Conductive liquids and slurries

Line sizes

½ –in. to 48-in. (15 mm to 1200 mm)

Sensor coil resistance

7 - 16 Ω

Interchangeability

System accuracy is maintained regardless of line size or optional features. Each sensor nameplate has a sixteen-digit calibration number that can be entered into a transmitter during configuration.

Upper range limit

39.37 ft/s (12 m/s)

Ambient temperature limits

- –20 to 140 °F (–29 to 60 °C) standard design

Pressure limits

See Process temperature limits.

Vacuum limits

PTFE lining	Full vacuum to +248 °F (+120 °C) through 4-in. (100 mm) line sizes. Consult Technical Support for vacuum applications with line sizes of 6 inches (150 mm) or larger
All other standard sensor lining materials	Full vacuum to maximum material temperature limits for all available line sizes.

Submergence protection IP68

The remote mount sensor is rated IP68 for submergence to a depth of 33 ft (10 m) for a period of 48 hours. IP68 rating requires that the transmitter must be remote mount. Installer must use IP68 approved cable glands, conduit connections, and/or conduit plugs.

For more details on proper installation techniques for IP68, reference Rosemount Technical Note 00840-0100-4750 available on www.emerson.com.

Conductivity limits

Process liquid must have a minimum conductivity of 5 microSiemens/cm (5 micromhos/cm) or greater.

Process temperature limits

PTFE lining	0 to +248 °F (–18 to +120 °C)
Polyurethane lining	0 to +140 °F (–18 to +60 °C)
Neoprene lining	0 to +176 °F (–18 to +80 °C)

Table 43: Temperature vs. Pressure Limits for ASME B16.5 class flanges (1)

Sensor temperature vs. pressure limits for ASME B16.5 class flanges (½ -in. to 24-in. Line Sizes)(2)					
Flange material	**Flange rating**	**Pressure**			
		@ -20 to 100 °F (-29 to 38 °C)	**@ 200 °F (93 °C)**	**@ 300 °F (149 °C)**	**@ 350 °F (177 °C)**
Carbon Steel	Class 150	285 psi	260 psi	230 psi	215 psi
	Class 300	740 psi	675 psi	655 psi	645 psi
304 Stainless Steel	Class 150	275 psi	235 psi	205 psi	190 psi
	Class 300	720 psi	600 psi	530 psi	500 psi

(1) Liner temperature limits must also be considered.
(2) 30-in. and 36-in. AWWA C207 Class D rated to 150 psi at atmospheric temperature.

Table 44: Temperature vs. Pressure Limits for AS2129 Table D and E flanges (1)

Sensor temperature vs. pressure limits for AS2129 Table D and E flanges (4-in. to 24-in. line sizes)					
Flange Material	**Flange Rating**	**Pressure**			
		@ -29 to 50 °C (-20 to 122 °F)	**@ 100 °C (212 °F)**	**@ 150 °C (302 °F)**	**@ 200 °C (392 °F)**
Carbon Steel	D	101.6 psi	101.6 psi	101.6 psi	94.3 psi
	E	203.1 psi	203.1 psi	203.1 psi	188.6 psi

(1) Liner temperature limits must also be considered.

Table 45: Temperature vs. Pressure Limits for EN 1092-1 flanges (1)

Sensor temperature vs. pressure limits for EN 1092-1 flanges (15 mm to 600 mm Line Sizes)					
Flange material	**Flange rating**	**Pressure**			
		@ -29 to 50 °C (-20 to 122 °F)	**@ 100 °C (212 °F)**	**@ 150°C (302 °F)**	**@ 175°C (347 °F)**
Carbon Steel	PN 10	10 bar	10 bar	9.7 bar	9.5 bar
	PN 16	16 bar	16 bar	15.6 bar	15.3 bar
	PN 40	40 bar	40 bar	39.1 bar	38.5 bar
304 Stainless Steel	PN 10	9.1 bar	7.5 bar	6.8 bar	6.5 bar
	PN 16	14.7 bar	12.1 bar	11.0 bar	10.6 bar
	PN 40	36.8 bar	30.3 bar	27.5 bar	26.5 bar

(1) Liner temperature limits must also be considered.

Table 46: Temperature vs. Pressure Limits for GB/T 9119 Flanges (1)

Temperature vs. Pressure Limits for GB/T 9119 Flanges				
Flange material	**Flange rating**	**Pressure (Mpa)**		
		≤ 20 °C	**@ 100 °C (212 °F)**	**@ 150 °C (302 °F)**
Carbon steel Group 3E0	PN 10	1.00	0.92	0.88
	PN 16	1.60	1.48	1.40
	PN 40	4.00	3.71	3.52
304 SST Group 11E0	PN 10	1.00	0.90	0.81
	PN 16	1.60	1.45	1.31
	PN 40	4.00	3.63	3.27

(1) Liner temperature limits must also be considered.

Table 47: Temperature vs. Pressure Limits for JIS B2220 Flanges (1)

Temperature vs. Pressure Limits for JIS B2220 Flanges			
Flange material	**Flange rating**	**Pressure (Mpa)**	
		≤ 50 °C (122 °F)	**@ 120 °C (248 °F)**
Carbon steel	10K	1.4	1.4
304 stainless steel (15 mm to 65 mm)	10K	1.4	1.4
304 stainless steel (≤ 80 mm)	10K	1.4	1.4

(1) Liner temperature limits must also be considered.

Physical specifications

Non-wetted materials

Sensor Pipe	Type 304/304L SST
Flanges	Carbon steel, Type 304/304L SST

Coil housing	Rolled carbon steel
Paint	Polyurethane coat (2.6 mils or greater)

Process-wetted materials

Lining	PTFE, Polyurethane, Neoprene
Electrodes	316L SST, Nickel Alloy 276 (UNS N10276)

Flat-faced flanges

Flat-faced flanges are manufactured with full-face liners. Available in Neoprene only.

Process connections

ASME B16.5	■ Class 150: ½ -in. to 24-in. (15 mm to 600 mm) ■ Class 300: ½ -in. to 24-in. (15 mm to 600 mm)
AWWA C207	■ Class D: 30-in. to 48-in. (750 mm to 1200 mm) ■ Class E: 30-in. to 48-in. (750 mm to 1200 mm)
EN 1092-1	■ PN10: 200 mm to 900 mm (8-in. to 36-in.) ■ PN16: 50 mm to 900 mm (2 -in. to 36-in.) ■ PN40: 15 mm to 900 mm (½-in. to 36-in.)
AS2129	■ Table D and Table E: 15 mm to 900 mm (½-in. to 36-in.)
AS4087	■ PN16, PN21: 2-in. to 40-in., 48-in. (8-in. excluded) (50 mm to 1000 mm, 1200 mm) ■ PN35: 2-in. to 36-in. (8-in. excluded) (50 mm to 900 mm)
GB/T9119	■ PN10: 8- and 24-, 36-, 40-, 48-in. (200 mm to 600 mm, 900 mm, 1000 mm, 1200 mm) ■ PN16: 4- and 24-, 36-, 40-in. (100 mm to 600 mm, 900 mm, 1000 mm) ■ PN40: ½- to 24-in. (15 mm to 600 mm)
JIS B2220	■ 10K, 20K: ½- to 24-in. (15 mm to 600 mm)

Electrical connections

Conduit entries	Available with 1/2 inch NPT and M20
Terminal block screws	6-32 (No. 6) suitable for up to 14 AWG wire
Safety grounding screws	External stainless assembly, M5; internal 8-32 (No. 8)

Process reference electrode (optional)

A process reference electrode can be installed similarly to the measurement electrodes through the sensor lining. It will be made of the same material as the measurement electrodes.

Grounding rings (optional)

Grounding rings can be installed between the flange and the sensor face on both ends of the sensor. Single ground rings can be installed on either end of the sensor. They have an I.D. slightly larger than the sensor I.D. and an external tab to attach ground wiring. Grounding rings are available in 316L SST, and Nickel Alloy 276 (UNS N10276). See Figure 5.

Dimensions

See Dimensional drawings.

Weight

See Table 48 through Table 55.

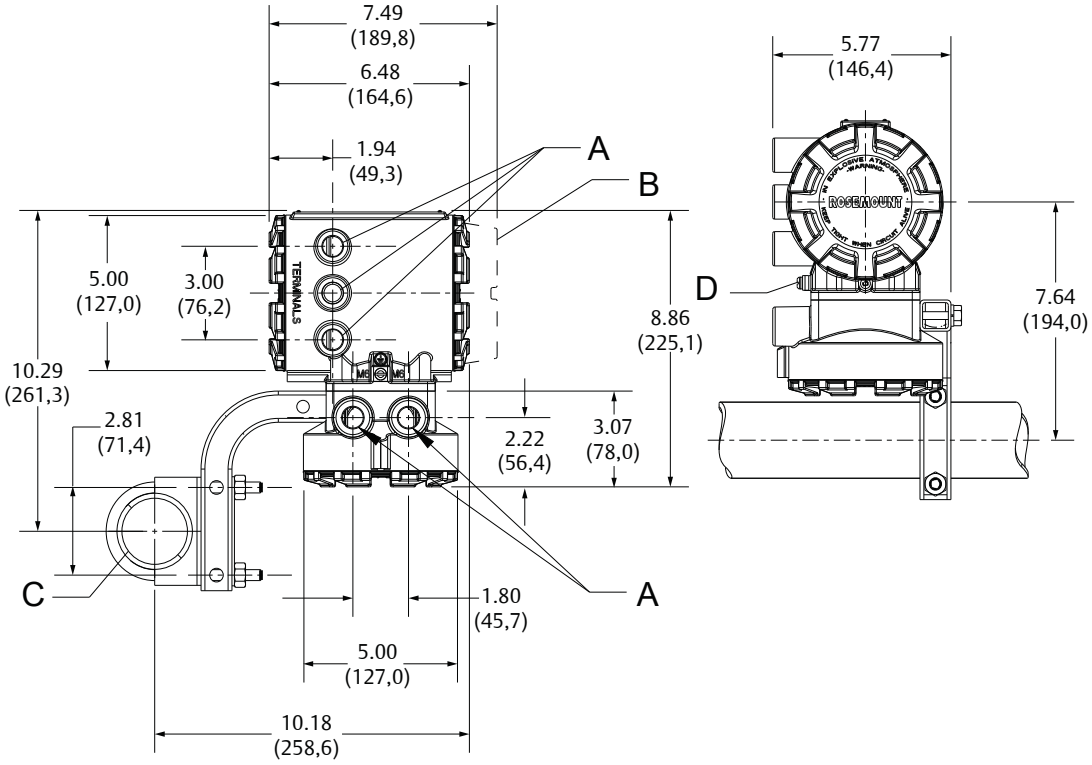
Product Certifications

For detailed approval certification information and installation drawings, please see the appropriate document listed below:

- Document number 00825-MA00-0004: *Rosemount 8750W Approval Document - IECEx and ATEX*
- Document number 00825-MA00-0005: *Rosemount 8750W Approval Document – Class Division*
- Document number 00825-MA00-0006: *Rosemount 8750W Approval Document – North America Zone*

Dimensional drawings

Figure 6: Remote field mount transmitter



A. ½-in.–14 NPT or M20 conduit entry
B. LOI cover
C. 2-in. pipe bracket
D. Ground lug

Figure 7: Integral field mount transmitter

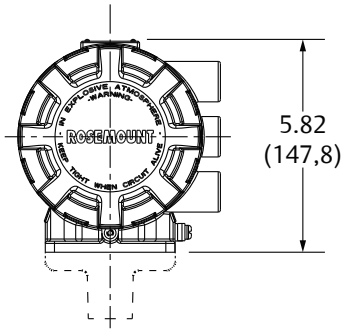
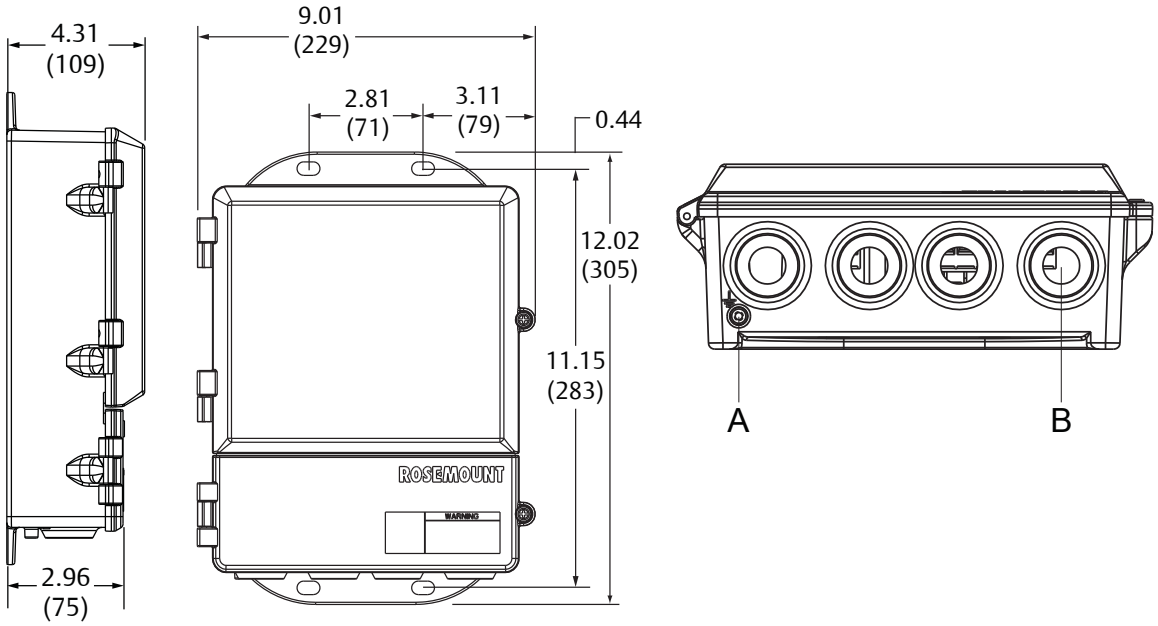


Figure 8: Wall mount transmitter with standard cover



A. Ground lug
B. ½-in.–14 NPT conduit connection (four places)

Figure 9: Wall mount transmitter with LOI cover

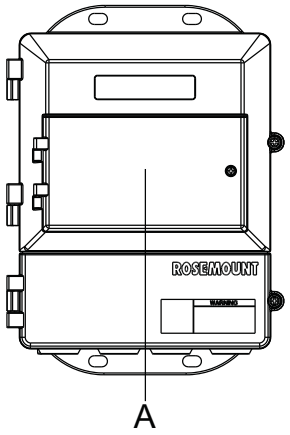
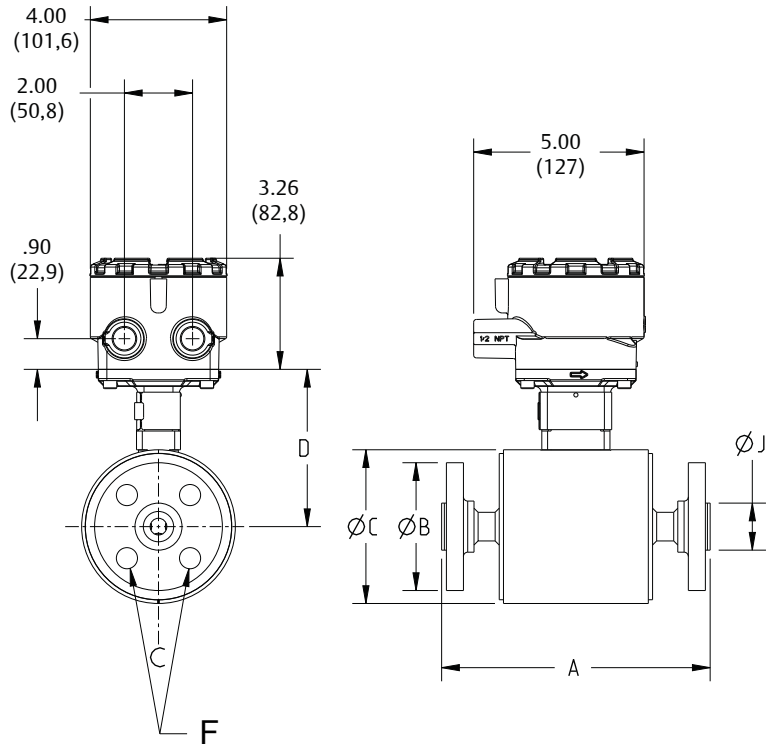


Figure 10: Raised face flanged sensor ½ - to 2½ -in. (15 mm to 65 mm)



- F – Flange bolts to straddle center line

Table 48: Raised face flanged sensor ½ - to 2½ -in. (15 mm to 65 mm) dimensions

Size, description	Overall length			Dim B	Dim C	Dim D	Dim J	Flow tube wgt (lbs./ kg)
	Dim A PTFE	Dim A Neoprene	Dim A Poly					
0.5-in. (15 mm) ASME - 150, SO/RF	7.88 (200)	7.88 (200)	7.88 (200)	3.50 (89)	4.50 (114)	4.41 (112)	1.38 (35)	9 (4)

Table 48: Raised face flanged sensor ½ - to 2½ -in. (15 mm to 65 mm) dimensions *(continued)*

Size, description	Overall length			Dim B	Dim C	Dim D	Dim J	Flow tube wgt (lbs./ kg)
	Dim A PTFE	Dim A Neoprene	Dim A Poly					
0.5-in. (15 mm) ASME - 300, SO/RF	7.88 (200)	7.88 (200)	7.88 (200)	3.74 (95)	4.50 (114)	4.41 (112)	1.38 (35)	10 (5)
0.5-in. (15 mm) EN 1092-1 - PN40, SO/RF	7.88 (200)	7.88 (200)	7.88 (200)	3.74 (95)	4.50 (114)	4.41 (112)	1.77 (45)	10 (5)
0.5-in. (15 mm) AS 2129 table D, SO/RF	7.88 (200)	7.88 (200)	7.88 (200)	3.74 (95)	4.50 (114)	4.41 (112)	1.85 (47)	8 (4)
0.5-in. (15 mm) AS 2129 table E, SO/RF	7.88 (200)	7.88 (200)	7.88 (200)	3.74 (95)	4.50 (114)	4.41 (112)	1.85 (47)	8 (4)
0.5-in. (15 mm) JIS B2220 - 10K, SO/RF	7.88 (200)	7.88 (200)	7.88 (200)	3.74 (95)	4.50 (114)	4.41 (112)	1.77 (45)	10 (5)
0.5-in. (15 mm) JIS B2220 - 20K, SO/RF	7.88 (200)	7.88 (200)	7.88 (200)	3.74 (95)	4.50 (114)	4.41 (112)	1.77 (45)	10 (5)
0.5-in. (15 mm) GB/T9119 PN40, SO/RF	7.88 (200)	7.88 (200)	7.88 (200)	3.74 (95)	4.50 (114)	4.41 (112)	1.77 (45)	10 (5)
1-in. (25 mm) ASME - 150, SO/RF	7.88 (200)	7.88 (200)	7.88 (200)	4.25 (108)	4.50 (114)	4.41 (112)	2.00 (51)	11 (5)
1-in. (25 mm) ASME - 300, SO/RF	7.88 (200)	7.88 (200)	7.88 (200)	4.88 (124)	4.50 (114)	4.41 (112)	2.00 (51)	14 (6)
1-in. (25 mm) EN 1092-1 - PN40, SO/RF	7.88 (200)	7.88 (200)	7.88 (200)	4.53 (115)	4.50 (114)	4.41 (112)	2.68 (68)	14 (6)
1-in. (25 mm) AS 2129 table D, SO/RF	7.88 (200)	7.88 (200)	7.88 (200)	4.53 (115)	4.50 (114)	4.41 (112)	2.56 (65)	10 (5)
1-in. (25 mm) AS 2129 table E, SO/RF	7.88 (200)	7.88 (200)	7.88 (200)	4.53 (115)	4.50 (114)	4.41 (112)	2.48 (63)	10 (5)
1 -in. (25mm) JISB2220-10K,SO/RF	7.88 (200)	7.88 (200)	7.88 (200)	4.92 (125)	4.50 (114)	4.41 (112)	2.64 (67)	13 (6)
1-in. (25 mm) JIS B2220 - 20K, SO/RF	7.88 (200)	7.88 (200)	7.88 (200)	4.92 (125)	4.50 (114)	4.41 (112)	2.64 (67)	14 (6)
1-in. (25 mm) GB/T9119 PN40, SO/RF	7.88 (200)	7.88 (200)	7.88 (200)	4.53 (115)	4.50 (114)	4.41 (112)	2.68 (68)	14 (6)
1.5-in (40 mm) ASME - 150, SO/RF	7.87 (200)	7.80 (198)	7.87 (200)	5.00 (127)	5.21 (132)	4.82 (122)	2.88 (73)	15 (7)
1.5-in. (40 mm) ASME - 300, SO/RF	7.87 (200)	7.80 (198)	7.87 (200)	6.12 (155)	5.21 (132)	4.82 (122)	2.88 (73)	21 (9)
1.5-in. (40 mm) EN 1092-1 - PN40, SO/RF	7.87 (200)	7.80 (198)	7.87 (200)	5.91 (150)	5.21 (132)	4.82 (122)	3.46 (88)	19 (9)
1.5-in. (40 mm) AS 2129 table D, SO/RF	7.87 (200)	7.80 (198)	7.87 (200)	5.31 (135)	5.21 (132)	4.82 (122)	3.07 (78)	12 (6)
1.5-in. (40 mm) AS 2129 table E, SO/RF	7.87 (200)	7.80 (198)	7.87 (200)	5.31 (135)	5.21 (132)	4.82 (122)	3.07 (78)	13 (6)

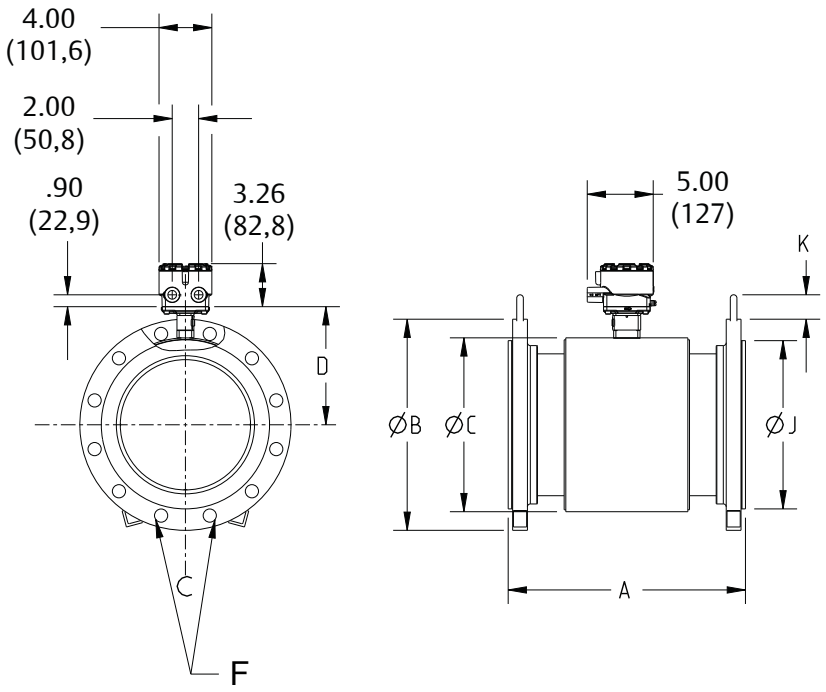
Table 48: Raised face flanged sensor ½ - to 2½ -in. (15 mm to 65 mm) dimensions *(continued)*

Size, description	Overall length			Dim B	Dim C	Dim D	Dim J	Flow tube wgt (lbs./ kg)
	Dim A PTFE	Dim A Neoprene	Dim A Poly					
1.5-in. (40 mm) JIS B2220 - 10K, SO/RF	7.87 (200)	7.80 (198)	7.87 (200)	5.51 (140)	5.21 (132)	4.82 (122)	3.19 (81)	16 (7)
1.5-in. (40 mm) JIS B2220 - 20K, SO/RF	7.87 (200)	7.80 (198)	7.87 (200)	5.51 (140)	5.21 (132)	4.82 (122)	3.19 (81)	17 (8)
1.5-in. (40 mm) GB/T9119 PN40, SO/RF	7.87 (200)	7.80 (198)	7.87 (200)	5.91 (150)	5.21 (132)	4.82 (122)	3.46 (88)	19 (9)
2-in. (50 mm) ASME - 150, SO/RF	7.87 (200)	7.80 (198)	7.87 (200)	6.00 (152)	5.21 (132)	4.82 (122)	3.62 (92)	20 (9)
2-in. (50 mm) ASME - 300, SO/RF	7.87 (200)	7.80 (198)	7.87 (200)	6.50 (165)	5.21 (132)	4.82 (122)	3.62 (92)	23 (11)
2-in. (50 mm) EN 1092-1 - PN40, SO/RF	7.87 (200)	7.80 (198)	7.87 (200)	6.50 (165)	5.21 (132)	4.82 (122)	4.02 (102)	24 (11)
2-in. (50 mm) AS 2129 table D, SO/RF	7.87 (200)	7.80 (198)	7.87 (200)	5.91 (150)	5.21 (132)	4.82 (122)	3.54 (90)	14 (6)
2-in. (50 mm) AS 2129 table E, SO/RF	7.87 (200)	7.80 (198)	7.87 (200)	5.91 (150)	5.21 (132)	4.82 (122)	3.54 (90)	15 (7)
2-in. (50 mm) JIS B2220 - 10K, SO/RF	7.87 (200)	7.80 (198)	7.87 (200)	6.10 (155)	5.21 (132)	4.82 (122)	3.78 (96)	18 (8)
2-in. (50 mm) JIS B2220 - 20K, SO/RF	7.87 (200)	7.80 (198)	7.87 (200)	6.10 (155)	5.21 (132)	4.82 (122)	3.78 (96)	19 (9)
2-in. (50 mm) AS 4087 PN16, SO/RF	7.87 (200)	7.80 (198)	7.87 (200)	5.91 (150)	5.21 (132)	4.82 (122)	3.54 (90)	16 (7)
2-in. (50 mm) AS 4087 PN21, SO/RF	7.87 (200)	7.80 (198)	7.87 (200)	6.50 (165)	5.21 (132)	4.82 (122)	4.06 (103)	34 (16)
2-in. (50 mm) AS 4087 PN35, SO/RF	7.87 (200)	7.80 (198)	7.87 (200)	6.50 (165)	5.21 (132)	4.82 (122)	4.06 (103)	96 (44)
2-in. (50 mm) GB/T9119 PN40, SO/RF	7.87 (200)	7.80 (198)	7.87 (200)	6.50 (165)	5.21 (132)	4.82 (122)	4.02 (102)	23 (11)
2.5-in. (65 mm) ASME - 150, SO/RF	7.82 (199)	7.76 (197)	N/A	7.00 (178)	6.31 (160)	5.37 (136)	4.12 (105)	27 (12)
2.5-in. (65 mm) ASME - 300, SO/RF	7.82 (199)	7.76 (197)	N/A	7.50 (191)	6.31 (160)	5.37 (136)	4.12 (105)	32 (15)
2.5-in. (65 mm) EN 1092-1 - PN16, SO/RF	7.82 (199)	7.76 (197)	N/A	7.28 (185)	6.31 (160)	5.37 (136)	4.80 (122)	27 (12)
2.5-in. (65 mm) EN 1092-1 - PN40, SO/RF	7.82 (199)	7.76 (197)	N/A	7.28 (185)	6.31 (160)	5.37 (136)	4.80 (122)	31 (14)
2.5-in. (65 mm) AS 2129 table D, SO/RF	7.82 (199)	7.76 (197)	N/A	6.50 (165)	6.31 (160)	5.37 (136)	4.06 (103)	17 (8)
2.5-in. (65 mm) AS 2129 table E, SO/RF	7.82 (199)	7.76 (197)	N/A	6.50 (165)	6.31 (160)	5.37 (136)	4.06 (103)	19 (9)

Table 48: Raised face flanged sensor ½ - to 2½ -in. (15 mm to 65 mm) dimensions *(continued)*

Size, description	Overall length			Dim B	Dim C	Dim D	Dim J	Flow tube wgt (lbs./ kg)
	Dim A PTFE	Dim A Neoprene	Dim A Poly					
2.5-in. (65 mm) JIS B2220 - 10K, SO/RF	7.82 (199)	7.76 (197)	N/A	6.89 (175)	6.31 (160)	5.37 (136)	4.57 (116)	25 (11)
2.5-in. (65 mm) JIS B2220 - 20K, SO/RF	7.82 (199)	7.76 (197)	N/A	6.89 (175)	6.31 (160)	5.37 (136)	4.57 (116)	26 (12)
2.5-in. (65 mm) AS 4087 PN16, SO/RF	7.82 (199)	7.76 (197)	N/A	6.50 (165)	6.31 (160)	5.37 (136)	4.06 (103)	18 (8)
2.5-in. (65 mm) AS 4087 PN21, SO/RF	7.82 (199)	7.76 (197)	N/A	7.28 (185)	6.31 (160)	5.37 (136)	4.80 (122)	24 (11)
2.5-in. (65 mm) AS 4087 PN35, SO/RF	7.82 (199)	7.76 (197)	N/A	7.28 (185)	6.31 (160)	5.37 (136)	4.80 (122)	27 (12)
2.5-in. (65 mm) GB/T9119 PN40, SO/RF	7.82 (199)	7.76 (197)	N/A	7.28 (185)	6.31 (160)	5.37 (136)	4.80 (122)	31 (14)

Figure 11: Raised face flanged sensor 3-in to 48-in. (75 mm to 1200 mm)



- F – Flange bolts to straddle center line

Table 49: Raised face flanged Sensor 3- to 6-in. (75 mm to 150 mm) dimensions

Size, description	Overall length			Dim B	Dim C	Dim D	Dim J	Dim K	Flow tube wgt (lbs./ kg)
	Dim A PTFE	Dim A Neoprene	Dim A Poly						
3-in. (80 mm) ASME - 150, SO/RF	7.87 (200)	7.75 (197)	7.87 (200)	7.50 (191)	7.21 (183)	5.82 (148)	5.00 (127)	1.70 (43)	34 (15)
3-in. (80 mm) ASME - 300, SO/RF	8.63 (219)	8.51 (216)	8.63 (219)	8.25 (210)	7.21 (183)	5.82 (148)	5.00 (127)	1.70 (43)	43 (19)
3-in. (80 mm) EN 1092-1 - PN40, SO/RF	7.87 (200)	7.75 (197)	7.87 (200)	7.87 (200)	7.21 (183)	5.82 (148)	5.43 (138)	1.70 (43)	38 (17)
3-in. (80 mm) AS 2129 table D, SO/RF	7.87 (200)	7.75 (197)	7.87 (200)	7.28 (185)	7.21 (183)	5.82 (148)	4.80 (122)	1.70 (43)	24 (11)
3-in. (80 mm) AS 2129 table E, SO/RF	7.87 (200)	7.75 (197)	7.87 (200)	7.28 (185)	7.21 (183)	5.82 (148)	4.80 (122)	1.70 (43)	25 (11)
3-in. (80 mm) JIS - 10K, SO/RF	7.87 (200)	7.75 (197)	7.87 (200)	7.28 (185)	7.21 (183)	5.82 (148)	4.96 (126)	1.70 (43)	28 (13)
3-in. (80 mm) JIS - 20K, SO/RF	7.87 (200)	7.75 (197)	7.87 (200)	7.87 (200)	7.21 (183)	5.82 (148)	5.20 (132)	1.70 (43)	34 (16)
3-in. (80 mm) AS 4087 PN16, SO/RF	7.87 (200)	7.75 (197)	7.87 (200)	7.28 (185)	7.21 (183)	5.82 (148)	4.80 (122)	1.70 (43)	20 (9)
3-in. (80 mm) AS 4087 PN21, SO/RF	7.87 (200)	7.75 (197)	7.87 (200)	8.07 (205)	7.21 (183)	5.82 (148)	5.55 (141)	1.70 (43)	56 (25)
3-in. (80 mm) AS 4087 PN35, SO/RF	7.87 (200)	7.75 (197)	7.87 (200)	8.07 (205)	7.21 (183)	5.82 (148)	5.55 (141)	1.70 (43)	109 (49)
3-in. (80 mm) GB/T9119 PN40, SO/RF	7.87 (200)	7.75 (197)	7.87 (200)	7.87 (200)	7.21 (183)	5.82 (148)	5.43 (138)	1.70 (43)	37 (17)
4-in. (100 mm) ASME - 150, SO/RF	9.84 (250)	9.69 (246)	9.84 (250)	9.00 (229)	7.91 (201)	6.17 (157)	6.19 (157)	1.70 (43)	45 (20)
4-in. (100 mm) ASME - 300, SO/RF	10.88 (276)	10.73 (273)	10.88 (276)	10.00 (254)	7.91 (201)	6.17 (157)	6.19 (157)	1.70 (43)	65 (29)
4-in. (100 mm) EN 1092-1 - PN16, SO/RF	9.84 (250)	9.69 (246)	9.84 (250)	8.66 (220)	7.91 (201)	6.17 (157)	6.22 (159)	1.70 (43)	41 (19)
4-in. (100 mm) EN 1092-1 - PN40, SO/RF	9.84 (250)	9.69 (246)	9.84 (250)	9.25 (235)	7.91 (201)	6.17 (157)	6.38 (162)	1.70 (43)	49 (22)
4-in. (100 mm) AS 2129 table D, SO/RF	9.84 (250)	9.69 (246)	9.84 (250)	8.46 (215)	7.91 (201)	6.17 (157)	6.06 (154)	1.70 (43)	31 (14)
4-in. (100 mm) AS 2129 table E, SO/RF	9.84 (250)	9.69 (246)	9.84 (250)	8.46 (215)	7.91 (201)	6.17 (157)	6.06 (154)	1.70 (43)	33 (15)
4-in. (100 mm) JIS - 10K, SO/RF	9.84 (250)	9.69 (246)	9.84 (250)	8.27 (210)	7.91 (201)	6.17 (157)	5.95 (151)	1.70 (43)	35 (16)
4-in. (100 mm) JIS - 20K, SO/RF	9.84 (250)	9.69 (246)	9.84 (250)	8.86 (225)	7.91 (201)	6.17 (157)	6.30 (160)	1.70 (43)	44 (20)
4-in. (100 mm) AS 4087 PN16, SO/RF	9.84 (250)	9.69 (246)	9.84 (250)	8.46 (215)	7.91 (201)	6.17 (157)	6.06 (154)	1.70 (43)	28 (13)

Table 49: Raised face flanged Sensor 3- to 6-in. (75 mm to 150 mm) dimensions *(continued)*

Size, description	Overall length			Dim B	Dim C	Dim D	Dim J	Dim K	Flow tube wgt (lbs./ kg)
	Dim A PTFE	Dim A Neoprene	Dim A Poly						
4-in. (100 mm) AS 4087 PN21, SO/RF	9.84 (250)	9.69 (246)	9.84 (250)	9.05 (230)	7.91 (201)	6.17 (157)	6.57 (167)	1.70 (43)	68 (31)
4-in. (100 mm) AS 4087 PN35, SO/RF	9.84 (250)	9.69 (246)	9.84 (250)	9.05 (230)	7.91 (201)	6.17 (157)	6.57 (167)	1.70 (43)	119 (54)
4-in. (100 mm) GB/T9119 PN16, SO/RF	9.84 (250)	9.69 (246)	9.84 (250)	8.66 (220)	7.91 (201)	6.17 (157)	6.22 (158)	1.70 (43)	41 (19)
4-in. (100 mm) GB/T9119 PN40, SO/RF	9.84 (250)	9.69 (246)	9.84 (250)	9.25 (235)	7.91 (201)	6.17 (157)	6.38 (162)	1.70 (43)	49 (22)
5-in. (125 mm) ASME - 150, SO/RF	9.79 (249)	9.71 (247)	N/A	10.00 (254)	9.61 (244)	7.02 (178)	7.31 (186)	1.70 (43)	54 (24)
5-in. (125 mm) ASME - 300,SO/RF	10.94 (278)	10.86 (276)	N/A	11.00 (279)	9.61 (244)	7.02 (178)	7.31 (186)	1.70 (43)	89 (40)
5-in. (125 mm) EN 1092-1 - PN16, SO/RF	9.79 (249)	9.50 (241)	N/A	9.84 (250)	9.61 (244)	7.02 (178)	7.40 (188)	1.70 (43)	55 (25)
5-in. (125 mm) EN 1092-1 - PN40, SO/RF	9.79 (249)	9.71 (247)	N/A	10.63 (270)	9.61 (244)	7.02 (178)	7.40 (188)	1.70 (43)	65 (29)
5-in. (125 mm) AS 2129 table D, SO/RF	9.79 (249)	9.71 (247)	N/A	10.04 (255)	9.61 (244)	7.02 (178)	7.32 (186)	1.70 (43)	43 (20)
5-in. (125 mm) AS 2129 table E, SO/RF	9.79 (249)	9.71 (247)	N/A	10.04 (255)	9.61 (244)	7.02 (178)	7.31 (186)	1.70 (43)	44 (20)
5-in. (125 mm) JIS - 10K, SO/RF	9.79 (249)	9.71 (247)	N/A	9.84 (250)	9.61 (244)	7.02 (178)	7.17 (182)	1.70 (43)	49 (22)
5-in. (125 mm) JIS - 20K, SO/RF	9.79 (249)	9.71 (247)	N/A	10.63 (270)	9.61 (244)	7.02 (178)	7.68 (195)	1.70 (43)	64 (29)
5-in. (125 mm) GB/T9119 PN16, SO/RF	9.79 (249)	9.50 (241)	N/A	9.84 (250)	9.61 (244)	7.02 (178)	7.40 (188)	1.70 (43)	51 (23)
5-in. (125 mm) GB/T9119 PN40, SO/RF	9.79 (249)	9.71 (247)	N/A	10.63 (270)	9.61 (244)	7.02 (178)	7.40 (188)	1.70 (43)	60 (27)
6-in. (150 mm) ASME - 150, SO/RF	11.81 (300)	11.61 (295)	11.73 (298)	11.00 (279)	9.98 (253)	7.30 (185)	8.50 (216)	1.70 (43)	68 (31)
6-in. (150 mm) ASME - 300, SO/RF	13.06 (302)	12.88 (327)	13.00 (330)	12.50 (318)	9.98 (253)	7.30 (185)	8.50 (216)	1.70 (43)	117 (53)
6-in. (150 mm) EN 1092-1 - PN16, SO/RF	11.81 (300)	11.61 (295)	11.73 (298)	11.22 (285)	9.98 (253)	7.30 (185)	8.35 (212)	1.70 (43)	67 (31)
6-in. (150 mm) EN 1092-1 - PN40, SO/RF	13.06 (332)	12.88 (327)	13.00 (330)	11.81 (300)	9.98 (253)	7.30 (185)	8.58 (218)	1.70 (43)	95 (43)
6-in. (150 mm) AS 2129 table D, SO/RF	11.81 (300)	11.61 (295)	11.73 (298)	11.02 (280)	9.98 (253)	7.30 (185)	8.31 (211)	1.70 (43)	52 (24)
6-in. (150 mm) AS 2129 table E, SO/RF	11.81 (300)	11.61 (295)	11.73 (298)	11.02 (280)	9.98 (253)	7.30 (185)	8.15 (207)	1.70 (43)	57 (26)

Table 49: Raised face flanged Sensor 3- to 6-in. (75 mm to 150 mm) dimensions *(continued)*

Size, description	Overall length			Dim B	Dim C	Dim D	Dim J	Dim K	Flow tube wgt (lbs./ kg)
	Dim A PTFE	Dim A Neoprene	Dim A Poly						
6-in. (150 mm) JIS - 10K, SO/RF	11.81 (300)	11.61 (295)	11.73 (298)	11.02 (280)	9.98 (253)	7.30 (185)	8.35 (212)	1.70 (43)	64 (29)
6-in. (150 mm) JIS - 20K, SO/RF	11.81 (300)	11.61 (295)	11.73 (298)	12.01 (305)	9.98 (253)	7.30 (185)	9.06 (230)	1.70 (43)	82 (37)
6-in. (150 mm) AS 4087 PN16,SO/RF	11.81 (300)	11.61 (295)	11.73 (298)	11.02 (280)	9.98 (253)	7.30 (185)	8.31 (211)	1.70 (43)	46 (21)
6-in. (150 mm) AS 4087 PN21,SO/RF	11.81 (300)	11.61 (295)	11.73 (298)	12.01 (305)	9.98 (253)	7.30 (185)	9.13 (232)	1.70 (43)	98 (45)
6-in. (150 mm) AS 4087 PN35, SO/RF	11.81 (300)	11.61 (295)	11.73 (298)	12.01 (305)	9.98 (253)	7.30 (185)	9.13 (232)	1.70 (43)	186 (84)
6-in. (150 mm) GB/T9119 PN16, SO/RF	11.81 (300)	11.61 (295)	11.73 (298)	11.22 (285)	9.98 (253)	7.30 (185)	8.35 (212)	1.70 (43)	64 (29)
6-in. (150 mm) GB/T9119 PN40, SO/RF	13.06 (332)	12.88 (327)	13.00 (330)	11.81 (300)	9.98 (253)	7.30 (185)	8.58 (218)	1.70 (43)	94 (43)

Table 50: Raised Face Flanged Sensor 8- to 12-in. (200 mm to 300 mm) dimensions

Size, description	Overall length			Dim B	Dim C	Dim D	Dim J	Dim K	Flow tube wgt (lbs./ kg)
	Dim A PTFE	Dim A Neoprene	Dim A Poly						
8-in. (200 mm) ASME - 150, SO/RF	13.78 (350)	13.53 (344)	13.65 (347)	13.50 (343)	11.92 (303)	8.27 (210)	10.62 (270)	1.70 (43)	105 (48)
8-in. (200 mm) ASME - 300,SO/RF	15.60 (396)	15.42 (392)	15.54 (395)	15.00 (381)	11.92 (303)	8.27 (210)	10.62 (270)	1.70 (43)	183 (83)
8-in. (200 mm) EN 1092-1 - PN10, SO/RF	13.78 (350)	13.53 (344)	13.65 (347)	13.39 (340)	11.92 (303)	8.27 (210)	10.55 (268)	1.70 (43)	97 (44)
8-in. (200 mm) EN 1092-1 - PN16, SO/RF	13.78 (350)	13.53 (344)	13.65 (347)	13.39 (340)	11.92 (303)	8.27 (210)	10.55 (268)	1.70 (43)	96 (43)
8-in. (200 mm) EN 1092-1 - PN25, SO/RF	13.78 (350)	13.53 (344)	13.65 (347)	14.17 (360)	11.92 (303)	8.27 (210)	10.94 (278)	1.70 (43)	120 (54)
8-in. (200 mm) EN 1092-1 - PN40, SO/RF	15.60 (396)	15.42 (392)	15.54 (395)	14.76 (375)	11.92 (303)	8.27 (210)	11.22 (285)	1.70 (43)	158 (72)
8-in. (200 mm) AS 2129 table D, SO/RF	13.78 (350)	13.53 (344)	13.65 (347)	13.19 (335)	11.92 (303)	8.27 (210)	10.55 (268)	1.70 (43)	77 (35)
8-in. (200 mm) AS 2129 table E, SO/RF	13.78 (350)	13.53 (344)	13.65 (347)	13.19 (335)	11.92 (303)	8.27 (210)	10.39 (264)	1.70 (43)	86 (39)
8-in. (200 mm) JIS - 10K, SO/RF	13.78 (350)	13.53 (344)	13.65 (347)	12.99 (330)	11.92 (303)	8.27 (210)	10.32 (262)	1.70 (43)	81 (37)
8-in. (200 mm) JIS - 20K, SO/RF	15.60 (396)	15.42 (392)	15.54 (395)	13.78 (350)	11.92 (303)	8.27 (210)	10.83 (275)	1.70 (43)	134 (61)

Table 50: Raised Face Flanged Sensor 8- to 12-in. (200 mm to 300 mm) dimensions *(continued)*

Size, description	Overall length			Dim B	Dim C	Dim D	Dim J	Dim K	Flow tube wgt (lbs./ kg)
	Dim A PTFE	Dim A Neoprene	Dim A Poly						
8-in. (200 mm) AS 4087 PN16, SO/RF	13.78 (350)	13.53 (344)	13.65 (347)	13.19 (335)	11.92 (303)	8.27 (210)	10.55 (268)	1.70 (43)	73 (32)
8-in. (200 mm) AS 4087 PN21, SO/RF	13.78 (350)	13.53 (344)	13.65 (347)	14.57 (370)	11.92 (303)	8.27 (210)	11.65 (296)	1.70 (43)	136 (62)
8-in. (200 mm) AS 4087 PN35, SO/RF	15.60 (396)	15.42 (392)	15.54 (395)	14.57 (370)	11.92 (303)	8.27 (210)	10.24 (260)	1.70 (43)	241 (109)
8-in. (200 mm) GB/T9119 PN10, SO/RF	13.78 (350)	13.53 (344)	13.65 (347)	13.39 (340)	11.92 (303)	8.27 (210)	10.55 (268)	1.70 (43)	96 (43)
8-in. (200 mm) GB/T9119 PN16, SO/RF	13.78 (350)	13.53 (344)	13.65 (347)	13.39 (340)	11.92 (303)	8.27 (210)	10.55 (268)	1.70 (43)	95 (43)
8-in. (200 mm) GB/T9119 PN40, SO/RF	15.60 (396)	15.42 (392)	15.54 (395)	14.76 (375)	11.92 (303)	8.27 (210)	11.22 (285)	1.70 (43)	154 (70)
10-in. (250 mm) ASME - 150, SO/RF	17.98 (457)	17.61 (447)	17.73 (450)	16.00 (406)	13.12 (333)	8.91 (226)	12.75 (324)	2.00 (51)	138 (63)
10-in. (250 mm) ASME - 300,SO/RF	17.88 (454)	17.61 (447)	17.73 (450)	17.50 (445)	13.12 (333)	8.91 (226)	12.75 (324)	2.00 (51)	247 (112)
10-in. (250 mm) EN 1092-1 - PN10, SO/RF	17.98 (457)	17.61 (447)	17.73 (450)	15.55 (395)	13.12 (333)	8.91 (226)	12.60 (320)	2.00 (51)	122 (55)
10-in. (250 mm) EN 1092-1 - PN16, SO/RF	17.98 (457)	17.61 (447)	17.73 (450)	15.94 (405)	13.12 (333)	8.91 (226)	12.60 (320)	2.00 (51)	126 (57)
10-in. (250 mm) EN 1092-1 - PN25, SO/RF	17.98 (457)	17.61 (447)	17.73 (450)	16.73 (425)	13.12 (333)	8.91 (226)	13.19 (335)	2.00 (51)	158 (72)
10-in. (250 mm) EN 1092-1 - PN40, SO/RF	17.98 (457)	17.61 (447)	17.73 (450)	17.72 (450)	13.12 (333)	8.91 (226)	13.58 (345)	2.00 (51)	221 (100)
10-in. (250 mm) AS 2129 table D, SO/RF	17.98 (457)	17.61 (447)	17.73 (450)	15.94 (405)	13.12 (333)	8.91 (226)	12.91 (328)	2.00 (51)	112 (51)
10-in. (250 mm) AS 2129 table E, SO/RF	17.98 (457)	17.61 (447)	17.73 (450)	15.94 (405)	13.12 (333)	8.91 (226)	12.91 (328)	2.00 (51)	127 (57)
10-in. (250 mm) JIS B2220 - 10K, SO/RF	17.98 (457)	17.61 (447)	17.73 (450)	15.75 (430)	13.12 (333)	8.91 (226)	12.76 (324)	2.00 (51)	118 (53)
10-in. (250 mm) AS 4087 PN16, SO/RF	17.98 (457)	17.61 (447)	17.73 (450)	15.94 (405)	13.12 (333)	8.91 (226)	12.91 (328)	2.00 (51)	168 (76)
10-in. (250 mm) AS 4087 PN21, SO/RF	17.98 (457)	17.61 (447)	17.73 (450)	16.93 (395)	13.12 (333)	8.91 (226)	13.74 (349)	2.00 (51)	258 (117)
10-in. (250) AS 4087 PN35, SO/RF	17.88 (454)	17.61 (447)	17.73 (450)	16.93 (395)	13.12 (333)	8.91 (226)	12.24 (311)	2.00 (51)	333 (151)
10-in. (250 mm) GB/T 9119 PN10, SO/RF	17.98 (457)	17.61 (447)	17.73 (450)	15.55 (395)	13.12 (333)	8.91 (226)	12.60 (320)	2.00 (51)	105 (48)
10-in. (250 mm) GB/T 9119 PN16, SO/RF	17.98 (457)	17.61 (447)	17.73 (450)	15.94 (405)	13.12 (333)	8.91 (226)	12.60 (320)	2.00 (51)	117 (53)

Table 50: Raised Face Flanged Sensor 8- to 12-in. (200 mm to 300 mm) dimensions *(continued)*

Size, description	Overall length			Dim B	Dim C	Dim D	Dim J	Dim K	Flow tube wgt (lbs./ kg)
	Dim A PTFE	Dim A Neoprene	Dim A Poly						
10-in. (250 mm) GB/T 9119 PN40, SO/RF	17.88 (454)	17.61 (447)	17.73 (450)	17.72 (450)	13.12 (333)	8.91 (226)	13.58 (345)	2.00 (51)	213 (97)
12-in. (300 mm) ASME - 150, SO/RF	19.91 (506)	19.58 (497)	19.70 (500)	19.00 (483)	15.12 (384)	9.91 (252)	15.00 (381)	2.00 (51)	238 (108)
12-in. (300 mm) ASME - 300,SO/RF	19.92 (506)	19.58 (497)	19.70 (500)	20.50 (521)	15.12 (384)	9.91 (252)	15.00 (381)	2.00 (51)	346 (157)
12-in. (300 mm) EN 1092-1 - PN10, SO/RF	19.91 (506)	19.58 (497)	19.70 (500)	17.52 (445)	15.12 (384)	9.91 (252)	14.57 (370)	2.00 (51)	187 (85)
12-in. (300 mm) EN 1092-1 - PN16, SO/RF	19.91 (506)	19.58 (497)	19.70 (500)	18.11 (460)	15.12 (384)	9.91 (252)	14.88 (378)	2.00 (51)	198 (90)
12-in. (300 mm) EN 1092-1 - PN25, SO/RF	19.91 (506)	19.58 (497)	19.70 (500)	19.09 (485)	15.12 (384)	9.91 (252)	15.55 (395)	2.00 (51)	243 (110)
12-in. (300 mm) EN 1092-1 - PN40, SO/RF	19.92 (506)	19.58 (497)	19.70 (500)	20.28 (515)	15.12 (384)	9.91 (252)	16.14 (410)	2.00 (51)	340 (154)
12-in. (300 mm) AS 2129 table D, SO/RF	19.91 (506)	19.58 (497)	19.70 (500)	17.91 (455)	15.12 (384)	9.91 (252)	14.88 (378)	2.00 (51)	185 (84)
12-in. (300 mm) AS 2129 table E, SO/RF	19.91 (506)	19.58 (497)	19.70 (500)	17.91 (455)	15.12 (384)	9.91 (252)	14.72 (374)	2.00 (51)	197 (89)
12-in. (300 mm) JIS B2220 - 10K, SO/RF	19.91 (506)	19.58 (497)	19.70 (500)	17.52 (445)	15.12 (384)	9.91 (252)	14.49 (368)	2.00 (51)	178 (81)
12-in. (300 mm) AS 4087 PN16, SO/RF	19.91 (506)	19.58 (497)	19.70 (500)	17.91 (455)	15.12 (384)	9.91 (252)	14.88 (378)	2.00 (51)	264 (120)
12-in. (300 mm) AS 4087 PN21, SO/RF	19.91 (506)	19.58 (497)	19.70 (500)	19.29 (490)	15.12 (384)	9.91 (252)	15.98 (406)	2.00 (51)	361 (164)
12-in. (300 mm) AS 4087 PN35, SO/RF	19.92 (506)	19.58 (497)	19.70 (500)	19.29 (490)	15.12 (384)	9.91 (252)	14.25 (362)	2.00 (51)	452 (205)
12-in. (300 mm) GB/T 9119 PN10, SO/RF	19.91 (506)	19.58 (497)	19.70 (500)	17.52 (445)	15.12 (384)	9.91 (252)	14.57 (370)	2.00 (51)	185 (84)
12-in. (300 mm) GB/T 9119 PN16, SO/RF	19.91 (506)	19.58 (497)	19.70 (500)	18.11 (460)	15.12 (384)	9.91 (252)	14.88 (378)	2.00 (51)	204 (92)
12-in. (300 mm) GB/T 9119 PN40, SO/RF	19.92 (506)	19.58 (497)	19.70 (500)	20.28 (515)	15.12 (384)	9.91 (252)	16.14 (410)	2.00 (51)	343 (156)

Table 51: Raised face flanged sensor 14- to 18-in. (350 mm to 450 mm) dimensions

Size, description	Overall length			Dim B	Dim C	Dim D	Dim J	Dim K	Flow tube wgt (lbs./ kg)
	Dim A PTFE	Dim A Neoprene	Dim A Poly						
14-in. (350 mm) ASME - 150,SO/RF	21.75 (553)	21.55 (547)	21.67 (550)	21.00 (533)	16.38 (416)	10.54 (268)	16.25 (413)	2.00 (51)	251 (114)

Table 51: Raised face flanged sensor 14- to 18-in. (350 mm to 450 mm) dimensions *(continued)*

Size, description	Overall length			Dim B	Dim C	Dim D	Dim J	Dim K	Flow tube wgt (lbs./ kg)
	Dim A PTFE	Dim A Neoprene	Dim A Poly						
14-in. (350 mm) ASME - 300, SO/RF	21.75 (553)	21.55 (547)	21.67 (550)	23.00 (584)	16.38 (416)	10.54 (268)	16.25 (413)	2.00 (51)	453 (205)
14-in. (350 mm) EN 1092-1 - PN10, SO/RF	21.75 (553)	21.55 (547)	21.67 (550)	19.88 (505)	16.38 (416)	10.54 (268)	16.93 (430)	2.00 (51)	198 (90)
14-in. (350 mm) EN 1092-1 - PN16, SO/RF	21.75 (553)	21.55 (547)	21.67 (550)	20.47 (520)	16.38 (416)	10.54 (268)	17.24 (438)	2.00 (51)	221 (100)
14-in. (350 mm) EN 1092-1 - PN25, SO/RF	21.75 (553)	21.55 (547)	21.67 (550)	21.85 (555)	16.38 (416)	10.54 (268)	17.72 (450)	2.00 (51)	297 (135)
14-in. (350 mm) EN 1092-1 - PN40, SO/RF	21.75 (553)	21.55 (547)	21.67 (550)	22.83 (580)	16.38 (416)	10.54 (268)	18.31 (465)	2.00 (51)	404 (183)
14-in. (350 mm) AS 2129 table D, SO/RF	21.75 (553)	21.55 (547)	21.67 (550)	20.67 (525)	16.38 (416)	10.54 (268)	17.24 (438)	2.00 (51)	181 (82)
14-in. (350 mm) AS 2129 table E, SO/RF	21.75 (553)	21.55 (547)	21.67 (550)	20.67 (525)	16.38 (416)	10.54 (268)	17.24 (438)	2.00 (51)	207 (94)
14-in. (350 mm) JIS B2220 - 10K, SO/RF	21.75 (553)	21.55 (547)	21.67 (550)	19.29 (490)	16.38 (416)	10.54 (268)	16.26 (413)	2.00 (51)	170 (77)
14-in. (350 mm) AS 4087 PN16,SO/RF	21.75 (553)	21.55 (547)	21.67 (550)	20.67 (525)	16.38 (416)	10.54 (268)	17.24 (438)	2.00 (51)	367 (167)
14 -in. (350mm) AS4087 PN21,SO/RF	21.75 (553)	21.55 (547)	21.67 (550)	21.65 (550)	16.38 (416)	10.54 (268)	18.07 (459)	2.00 (51)	409 (186)
14-in. (350 mm) AS 4087 PN35, SO/RF	21.75 (553)	21.55 (547)	21.67 (550)	21.65 (550)	16.38 (416)	10.54 (268)	16.50 (419)	2.00 (51)	622 (282)
14-in. (350 mm) GB/T 9119 PN10, SO/RF	21.75 (553)	21.55 (547)	21.67 (550)	19.88 (505)	16.38 (416)	10.54 (268)	16.93 (430)	2.00 (51)	192 (87)
14-in. (350 mm) GB/T 9119 PN16, SO/RF	21.75 (553)	21.55 (547)	21.67 (550)	20.47 (520)	16.38 (416)	10.54 (268)	17.24 (438)	2.00 (51)	219 (99)
14-in. (350 mm) GB/T 9119 PN40, SO/RF	21.75 (553)	21.55 (547)	21.67 (550)	22.83 (580)	16.38 (416)	10.54 (268)	18.31 (465)	2.00 (51)	421 (191)
16-in. (400 mm) ASME - 150, SO/RF	23.71 (602)	23.51 (597)	23.63 (600)	23.50 (597)	18.40 (467)	11.55 (293)	18.50 (470)	3.13 (80)	346 (157)
16-in. (400 mm) ASME - 300,SO/RF	23.71 (602)	23.51 (597)	23.63 (600)	25.50 (648)	18.40 (467)	11.55 (293)	18.50 (470)	3.13 (80)	632 (287)
16-in. (400 mm) EN 1092-1 - PN10, SO/RF	23.71 (602)	23.51 (597)	23.63 (600)	22.24 (565)	18.40 (467)	11.55 (293)	18.98 (482)	3.13 (80)	272 (123)
16-in. (400 mm) EN 1092-1 - PN16, SO/RF	23.71 (602)	23.51 (597)	23.63 (600)	22.83 (580)	18.40 (467)	11.55 (293)	19.28 (490)	3.13 (80)	306 (139)
16-in. (400 mm) EN 1092-1 - PN25, SO/RF	23.71 (602)	23.51 (597)	23.63 (600)	24.41 (620)	18.40 (467)	11.55 (293)	19.88 (505)	3.13 (80)	498 (226)
16-in. (400 mm) EN 1092-1 - PN40, SO/RF	23.71 (602)	23.51 (597)	23.63 (600)	25.98 (660)	18.40 (467)	11.55 (293)	21.06 (535)	3.13 (80)	606 (275)

Table 51: Raised face flanged sensor 14- to 18-in. (350 mm to 450 mm) dimensions *(continued)*

Size, description	Overall length			Dim B	Dim C	Dim D	Dim J	Dim K	Flow tube wgt (lbs./ kg)
	Dim A PTFE	Dim A Neoprene	Dim A Poly						
16-in. (400 mm) AS 2129 table D, SO/RF	23.71 (602)	23.51 (597)	23.63 (600)	22.83 (580)	18.40 (467)	11.55 (293)	19.25 (489)	3.13 (80)	243 (110)
16-in. (400 mm) AS 2129 table E, SO/RF	23.71 (602)	23.51 (597)	23.63 (600)	22.83 (580)	18.40 (467)	11.55 (293)	19.25 (489)	3.13 (80)	287 (130)
16-in. (400 mm) JIS B2220 - 10K, SO/RF	23.71 (602)	23.51 (597)	23.63 (600)	22.05 (560)	18.40 (467)	11.55 (293)	18.70 (475)	3.13 (80)	250 (114)
16-in. (400 mm) AS 4087 PN16, SO/RF	23.71 (602)	23.51 (597)	23.63 (600)	22.83 (580)	18.40 (467)	11.55 (293)	19.25 (489)	3.13 (80)	458 (208)
16-in. (400 mm) AS 4087 PN21,SO/RF	23.71 (602)	23.51 (597)	23.63 (600)	24.02 (610)	18.40 (467)	11.55 (293)	20.31 (516)	3.13 (80)	603 (273)
16-in. (400 mm) AS 4087 PN35, SO/RF	23.71 (602)	23.51 (597)	23.63 (600)	24.02 (610)	18.40 (467)	11.55 (293)	19.02 (483)	3.13 (80)	804 (364)
16-in. (400 mm) GB/T 9119 PN10, SO/RF	23.71 (602)	23.51 (597)	23.63 (600)	22.24 (565)	18.40 (467)	11.55 (293)	18.98 (482)	3.13 (80)	241 (109)
16-in. (400 mm) GB/T 9119 PN16, SO/RF	23.71 (602)	23.51 (597)	23.63 (600)	22.83 (580)	18.40 (467)	11.55 (293)	19.28 (490)	3.13 (80)	303 (137)
16-in. (400 mm) GB/T 9119 PN40, SO/RF	23.71 (602)	23.51 (597)	23.63 (600)	25.98 (660)	18.40 (467)	11.55 (293)	21.06 (535)	3.13 (80)	636 (289)
18-in. (450) ASME - 150, SO/RF	23.46 (596)	23.51 (597)	23.38 (594)	25.00 (635)	20.42 (519)	12.57 (319)	21.00 (533)	3.13 (80)	440 (200)
18-in. (450 mm) ASME - 300, SO/RF	23.46 (596)	23.51 (597)	23.38 (594)	28.00 (711)	20.42 (519)	12.57 (319)	21.00 (533)	3.13 (80)	849 (385)
18-in. (450 mm) EN 1092-1 - PN10, SO/RF	23.46 (596)	23.51 (597)	23.38 (594)	24.21 (615)	20.42 (519)	12.57 (319)	20.94 (532)	3.13 (80)	370 (168)
18-in. (450 mm) EN 1092-1 - PN16, SO/RF	23.46 (596)	23.51 (597)	23.38 (594)	25.20 (640)	20.42 (519)	12.57 (319)	21.65 (550)	3.13 (80)	423 (192)
18-in. (450 mm) EN 1092-1 - PN25, SO/RF	23.46 (596)	23.51 (597)	23.38 (594)	26.38 (670)	20.42 (519)	12.57 (319)	21.85 (555)	3.13 (80)	686 (312)
18-in. (450 mm) EN 1092-1 - PN40, SO/RF	23.46 (596)	23.51 (597)	23.38 (594)	26.97 (685)	20.42 (519)	12.57 (319)	22.05 (560)	3.13 (80)	759 (345)
18-in. (450 mm) AS 2129 table D, SO/RF	23.46 (596)	23.51 (597)	23.38 (594)	25.20 (640)	20.42 (519)	12.57 (319)	20.94 (532)	3.13 (80)	345 (156)
18-in. (450 mm) AS 2129 table E, SO/RF	23.46 (596)	23.51 (597)	23.38 (594)	25.20 (640)	20.42 (519)	12.57 (319)	21.73 (552)	3.13 (80)	403 (183)
18-in. (450 mm) JIS B2220 - 10K, SO/RF	23.46 (596)	23.51 (597)	23.38 (594)	24.41 (620)	20.42 (519)	12.57 (319)	20.87 (530)	3.13 (80)	362 (164)
18-in. (450 mm) JIS B2220 - 20K, SO/RF	23.46 (596)	23.51 (597)	23.38 (594)	26.58 (675)	20.42 (519)	12.57 (319)	22.05 (560)	3.13 (80)	693 (314)
18-in. (450 mm) AS 4087 PN16, SO/RF	23.46 (596)	23.51 (597)	23.38 (594)	25.20 (640)	20.42 (519)	12.57 (319)	21.73 (552)	3.13 (80)	312 (141)

Table 51: Raised face flanged sensor 14- to 18-in. (350 mm to 450 mm) dimensions *(continued)*

Size, description	Overall length			Dim B	Dim C	Dim D	Dim J	Dim K	Flow tube wgt (lbs./ kg)
	Dim A PTFE	Dim A Neoprene	Dim A Poly						
18-in. (450 mm) AS 4087 PN21, SO/RF	23.46 (596)	23.51 (597)	23.38 (594)	26.58 (675)	20.42 (519)	12.57 (319)	22.48 (571)	3.13 (80)	442 (200)
18-in. (450 mm) AS 4087 PN35, SO/RF	23.46 (596)	23.51 (597)	23.38 (594)	26.58 (675)	20.42 (519)	12.57 (319)	20.98 (533)	3.13 (80)	859 (390)
18-in. (450 mm) GB/T9119 PN10, SO/RF	23.46 (596)	23.51 (597)	23.38 (594)	24.41 (620)	20.42 (519)	12.57 (319)	20.94 (532)	3.13 (80)	370 (168)
18-in. (450 mm) GB/T9119 PN16, SO/RF	23.46 (596)	23.51 (597)	23.38 (594)	25.20 (640)	20.42 (519)	12.57 (319)	21.65 (550)	3.13 (80)	423 (192)
18-in. (450 mm) GB/T9119 PN40, SO/RF	23.46 (596)	23.51 (597)	23.38 (594)	26.97 (685)	20.42 (519)	12.57 (319)	22.05 (560)	3.13 (80)	782 (355)

Table 52: Raised face flanged sensor 20- to 36-in. (500 mm to 900 mm) dimensions

Size, description	Overall length			Dim B	Dim C	Dim D	Dim J	Dim K	Flow tube wgt (lbs./ kg)
	Dim A PTFE	Dim A Neoprene	Dim A Poly						
20-in. (500 mm) ASME - 150, SO/RF	23.46 (596)	23.51 (597)	23.38 (594)	27.50 (699)	22.44 (570)	13.58 (345)	23.00 (584)	3.13 (80)	544 (247)
20-in. (500 mm) ASME - 300, SO/RF	23.46 (596)	23.51 (597)	23.38 (594)	30.50 (775)	22.44 (570)	13.58 (345)	23.00 (584)	3.13 (80)	1027 (466)
20-in. (500 mm) EN 1092-1 - PN10, SO/RF	23.46 (596)	23.51 (597)	23.38 (594)	26.38 (670)	22.44 (570)	13.58 (345)	23.03 (585)	3.13 (80)	448 (204)
20-in. (500 mm) EN 1092-1 - PN16, SO/RF	23.46 (596)	23.51 (597)	23.38 (594)	28.15 (715)	22.44 (570)	13.58 (345)	24.02 (610)	3.13 (80)	542 (212)
20-in. (500 mm) EN 1092-1 - PN25, SO/RF	23.46 (596)	23.51 (597)	23.38 (594)	28.74 (730)	22.44 (570)	13.58 (345)	24.21 (615)	3.13 (80)	832 (378)
20-in. (500 mm) EN 1092-1 - PN40, SO/RF	23.46 (596)	23.51 (597)	23.38 (594)	29.72 (755)	22.44 (570)	13.58 (345)	24.21 (615)	3.13 (80)	913 (414)
20-in. (500 mm) AS 2129 table D, SO/RF	23.46 (596)	23.51 (597)	23.38 (594)	27.76 (705)	22.44 (570)	13.58 (345)	23.98 (609)	3.13 (80)	446 (203)
20-in. (500 mm) AS 2129 table E, SO/RF	23.46 (596)	23.51 (597)	23.38 (594)	27.76 (705)	22.44 (570)	13.58 (345)	23.98 (609)	3.13 (80)	503 (228)
20-in. (500 mm) JIS B2220 - 10K, SO/RF	23.46 (596)	23.51 (597)	23.38 (594)	26.58 (675)	22.44 (570)	13.58 (345)	23.03 (585)	3.13 (80)	428 (195)
20-in. (500 mm) JIS B2220 - 20K, SO/RF	23.46 (596)	23.51 (597)	23.38 (594)	28.74 (730)	22.44 (570)	13.58 (345)	24.21 (615)	3.13 (80)	819 (372)
20-in. (500 mm) AS 4087 PN16, SO/RF	23.46 (596)	23.51 (597)	23.38 (594)	27.76 (705)	22.44 (570)	13.58 (345)	23.98 (609)	3.13 (80)	428 (195)
20-in. (500 mm) AS 4087 PN21, SO/RF	23.46 (596)	23.51 (597)	23.38 (594)	28.94 (735)	22.44 (570)	13.58 (345)	24.96 (634)	3.13 (80)	602 (274)

Table 52: Raised face flanged sensor 20- to 36-in. (500 mm to 900 mm) dimensions *(continued)*

Size, description	Overall length			Dim B	Dim C	Dim D	Dim J	Dim K	Flow tube wgt (lbs./ kg)
	Dim A PTFE	Dim A Neoprene	Dim A Poly						
20-in. (500 mm) AS 4087 PN35,SO/RF	23.46 (596)	23.51 (597)	23.38 (594)	28.94 (735)	22.44 (570)	13.58 (345)	23.50 (587)	3.13 (80)	974 (442)
20-in. (500 mm) GB/T9119 PN10, SO/RF	23.46 (596)	23.51 (597)	23.38 (594)	26.38 (670)	22.44 (570)	13.58 (345)	23.03 (585)	3.13 (80)	445 (202)
20-in. (500 mm) GB/T9119 PN16, SO/RF	23.46 (596)	23.51 (597)	23.38 (594)	28.15 (715)	22.44 (570)	13.58 (345)	24.02 (610)	3.13 (80)	555 (252)
20-in. (500 mm) GB/T9119 PN40, SO/RF	23.46 (596)	23.51 (597)	23.38 (594)	29.72 (755)	22.44 (570)	13.58 (345)	24.21 (615)	3.13 (80)	978 (444)
24-in. (600 mm) ASME - 150, SO/RF	23.46 (596)	23.51 (597)	23.63 (600)	32.00 (813)	26.50 (673)	15.61 (396)	27.25 (692)	3.13 (80)	634 (287)
24-in. (600 mm) ASME - 300, SO/RF	23.46 (596)	23.51 (597)	23.63 (600)	36.00 (914)	26.50 (673)	15.61 (396)	27.25 (692)	3.13 (80)	1335 (606)
24-in. (600 mm) EN 1092-1 - PN10, SO/RF	23.46 (596)	23.51 (597)	23.63 (600)	30.71 (780)	26.50 (673)	15.61 (396)	26.97 (685)	3.13 (80)	466 (211)
24-in. (600 mm) EN 1092-1 - PN16, SO/RF	23.46 (596)	23.51 (597)	23.63 (600)	33.07 (840)	26.50 (673)	15.61 (396)	28.54 (725)	3.13 (80)	665 (302)
24-in. (600 mm) EN 1092-1 - PN25, SO/RF	23.46 (596)	23.51 (597)	23.63 (600)	33.27 (845)	26.50 (673)	15.61 (396)	28.35 (720)	3.13 (80)	938 (426)
24-in. (600 mm) EN 1092-1 - PN40, SO/RF	23.46 (596)	23.51 (597)	23.63 (600)	35.04 (890)	26.50 (673)	15.61 (396)	28.94 (735)	3.13 (80)	1207 (528)
24-in. (600 mm) AS 2129 table D, SO/RF	23.46 (596)	23.51 (597)	23.63 (600)	32.48 (825)	26.50 (673)	15.61 (396)	28.35 (720)	3.13 (80)	501 (227)
24-in. (600 mm) AS 2129 table E, SO/RF	23.46 (596)	23.51 (597)	23.63 (600)	32.48 (825)	26.50 (673)	15.61 (396)	28.23 (717)	3.13 (80)	625 (283)
24-in. (600 mm) JIS B2220 - 10K, SO/RF	23.46 (596)	23.51 (597)	23.63 (600)	31.30 (795)	26.50 (673)	15.61 (396)	27.17 (690)	3.13 (80)	451 (204)
24-in. (600 mm) AS 4087 PN16, SO/RF	23.46 (596)	23.51 (597)	23.63 (600)	32.48 (825)	26.50 (673)	15.61 (396)	28.35 (720)	3.13 (80)	1133 (514)
24-in. (600 mm) AS 4087 PN21,SO/RF	23.46 (596)	23.51 (597)	23.63 (600)	33.47 (850)	26.50 (673)	15.61 (396)	29.09 (739)	3.13 (80)	1605 (728)
24-in. (600 mm) AS 4087 PN35, SO/RF	23.46 (596)	23.51 (597)	23.63 (600)	33.47 (850)	26.50 (673)	15.61 (396)	27.52 (699)	3.13 (80)	1777 (806)
24-in. (600 mm) GB/T 9119 PN10, SO/RF	23.46 (596)	23.51 (597)	23.63 (600)	30.71 (780)	26.50 (673)	15.61 (396)	26.97 (685)	3.13 (80)	486 (221)
24-in. (600 mm) GB/T 9119 PN16, SO/RF	23.46 (596)	23.51 (597)	23.63 (600)	33.07 (840)	26.50 (673)	15.61 (396)	28.54 (725)	3.13 (80)	669 (304)
24-in. (600 mm) GB/T 9119 PN40, SO/RF	23.46 (596)	23.51 (597)	23.63 (600)	35.04 (890)	26.50 (673)	15.61 (396)	28.94 (735)	3.13 (80)	1282 (581)
30-in. (750 mm) AS 2129 table D, SO/RF	29.34 (745)	29.39 (747)	29.26 (743)	39.17 (995)	33.00 (838)	16.38 (416)	34.96 (888)	3.13 (80)	929 (421)

Table 52: Raised face flanged sensor 20- to 36-in. (500 mm to 900 mm) dimensions *(continued)*

Size, description	Overall length			Dim B	Dim C	Dim D	Dim J	Dim K	Flow tube wgt (lbs./ kg)
	Dim A PTFE	Dim A Neoprene	Dim A Poly						
30-in. (750 mm) AS 2129 table E, SO/RF	29.34 (745)	29.39 (747)	29.26 (743)	39.17 (995)	33.00 (838)	16.38 (416)	33.75 (857)	3.13 (80)	1059 (480)
30-in. (750 mm) AS 4087 PN16, SO/RF	29.34 (745)	29.39 (747)	29.26 (743)	39.17 (995)	33.00 (838)	16.38 (416)	34.96 (888)	3.13 (80)	975 (442)
30-in. (750 mm) AS 4087 PN21, SO/RF	29.34 (745)	29.39 (747)	29.26 (743)	39.96 (1015)	33.00 (838)	16.38 (416)	33.35 (898)	3.13 (80)	948 (430)
30-in. (750 mm) AS 4087 PN35, SO/RF	29.34 (745)	29.39 (747)	29.26 (743)	39.96 (1015)	33.00 (838)	16.38 (416)	33.35 (898)	3.13 (80)	2096 (950)
30-in. (750 mm) JIS B2220 - 10K, SO/RF	29.34 (745)	29.39 (747)	29.26 (743)	38.19 (970)	33.00 (838)	16.38 (416)	33.66 (855)	3.13 (80)	862 (392)
36-in. (900 mm) AS 2129 table D, SO/RF	35.25 (895)	35.30 (897)	35.17 (893)	46.26 (1175)	39.00 (991)	21.86 (555)	41.34 (1050)	3.13 (80)	1396 (633)
36-in. (900 mm) AS 2129 table E, SO/RF	35.25 (895)	35.30 (897)	35.17 (893)	46.26 (1175)	39.00 (991)	21.86 (555)	41.34 (1050)	3.13 (80)	1648 (747)
36-in. (900 mm) AS 4087 PN16, SO/RF	35.25 (895)	35.30 (897)	35.17 (893)	46.26 (1175)	39.00 (991)	21.86 (555)	41.34 (1050)	3.13 (80)	1574 (714)
36-in. (900 mm) AS 4087 PN21,SO/RF	35.25 (895)	35.30 (897)	35.17 (893)	46.26 (1175)	39.00 (991)	21.86 (555)	41.73 (1060)	3.13 (80)	2197 (997)
36-in. (900 mm) AS 4087 PN35, SO/RF	35.25 (895)	35.30 (897)	35.17 (893)	46.65 (1185)	39.00 (991)	21.86 (555)	40.55 (1030)	3.13 (80)	3133 (1421)
36-in. (900 mm) GB/T9119 PN10, SO/RF	35.25 (895)	35.30 (897)	35.17 (893)	43.9 (1115)	39.00 (991)	21.86 (555)	39.57 (1005)	3.13 (80)	1209 (549)
36-in. (900 mm) GB/T9119 PN16, SO/RF	35.25 (895)	35.30 (897)	35.17 (893)	44.29 (1125)	39.00 (991)	21.86 (555)	39.37 (1000)	3.13 (80)	1429 (649)
36-in. (900 mm) EN 1092-1 - PN10, SO/RF	35.25 (895)	35.30 (897)	35.17 (893)	43.90 (1120)	39.00 (991)	21.86 (555)	39.57 (1005)	3.13 (80)	1364 (619)
36-in. (900 mm) EN 1092-1 - PN16, SO/RF	35.25 (895)	35.30 (897)	35.17 (893)	44.29 (1125)	39.00 (991)	21.86 (555)	39.37 (1000)	3.13 (80)	1719 (780)
36-in. (900 mm) JIS B2220 - 10K, SO/RF	35.25 (895)	35.30 (897)	35.17 (893)	44.09 (1120)	39.00 (991)	21.86 (555)	39.57 (1005)	3.13 (80)	1194 (543)

Table 53: Raised face flanged sensor 40-in. and 48-in. (1000 mm and 1200 mm) dimensions

Size, description	Overall length			Dim B	Dim C	Dim D	Dim J	Dim K	Flow tube wgt (lbs./ kg)
	Dim A PTFE	Dim A Neoprene	Dim A Poly						
40-in. (1000 mm) EN 1092-1 - PN10, SO/RF	N/A	39.40 (1001)	NA	48.43 (1230)	47.27 (1201)	25.86 (657)	43.70 (1110)	3.38 86)	1444 (655)
40-in. (1000 mm) EN 1092-1 - PN16, SO/RF	N/A	39.40 (1001)	NA	49.41 (1255)	47.27 (1201)	25.86 (657)	43.90 (1115)	3.38 86)	1559 (707)

Table 53: Raised face flanged sensor 40-in. and 48-in. (1000 mm and 1200 mm) dimensions *(continued)*

Size, description	Overall length			Dim B	Dim C	Dim D	Dim J	Dim K	Flow tube wgt (lbs./ kg)
	Dim A PTFE	Dim A Neoprene	Dim A Poly						
40-in. (1000 mm) AS 2129 table D, SO/RF	N/A	39.40 (1001)	NA	49.41 (1255)	47.27 (1201)	25.86 (657)	44.61 (1133)	3.38 86)	1494 (678)
40-in. (1000 mm) AS 2129 table E, SO/RF	N/A	39.40 (1001)	NA	49.41 (1255)	47.27 (1201)	25.86 (657)	44.49 (1130)	3.38 86)	1806 (819)
40-in. (1000 mm) AS 4087 PN16, SO/RF	N/A	39.40 (1001)	NA	49.41 (1255)	47.27 (1201)	25.86 (657)	44.61 (1133)	3.38 86)	2175 (987)
40-in. (1000 mm) AS 4087 PN21, SO/RF	N/A	39.40 (1001)	NA	50.20 (1275)	47.27 (1201)	25.86 (657)	45.24 (149)	3.38 86)	2464 (1118)
40-in. (1000 mm) GB/T9119 PN10, SO/RF	N/A	39.40 (1001)	NA	48.43 (1230)	47.27 (1201)	25.86 (657)	43.70 (1110)	3.38 86)	1576 (715)
40-in. (1000 mm) GB/T9119 PN16, SO/RF	N/A	39.40 (1001)	NA	49.41 (1255)	47.27 (1201)	25.86 (657)	43.90 (1115)	3.38 86)	1735 (787)
48-in. (1200 mm) EN 1092-1 - PN10, SO/RF	N/A	47.20 (1199)	NA	57.28 (1455)	55.27 (1404)	29.86 (758)	52.36 (1330)	3.38 86)	1949 (884)
48-in. (1200 mm) AS 2129 table D, SO/RF	N/A	47.20 (1199)	NA	58.66 (1490)	55.27 (1404)	29.86 (758)	53.86 (1368)	3.38 86)	2068 (938)
48-in. (1200 mm) AS 2129 table E,SO/RF	N/A	47.20 (1199)	NA	58.66 (1490)	55.27 (1404)	29.86 (758)	53.74 (1365)	3.38 86)	2680 (1216)
48-in. (1200) AS 4087 PN16, SO/RF	N/A	47.20 (1199)	NA	58.66 (1490)	55.27 (1404)	29.86 (758)	53.86 (1368)	3.38 86)	2703 (1226)
48-in. (1200 mm) AS 4087 PN21,SO/RF	N/A	47.20 (1199)	NA	60.24 (1530)	55.27 (1404)	29.86 (758)	54.53 (1385)	3.38 86)	3152 (1430)
48-in. (1200 mm) GB/T9119 PN10, SO/RF	N/A	47.20 (1199)	NA	57.28 (1455)	55.27 (1404)	29.86 (758)	52.36 (1330)	3.38 86)	2081 (944)
48-in. (1200 mm) GB/T9119 PN16, SO/RF	N/A	47.20 (1199)	NA	58.46 (1485)	55.27 (1404)	29.86 (758)	52.36 (1330)	3.38 86)	2832 (1284)

Figure 12: Flat face sensor 30- to 48-kin. (750 mm to 1200 mm)

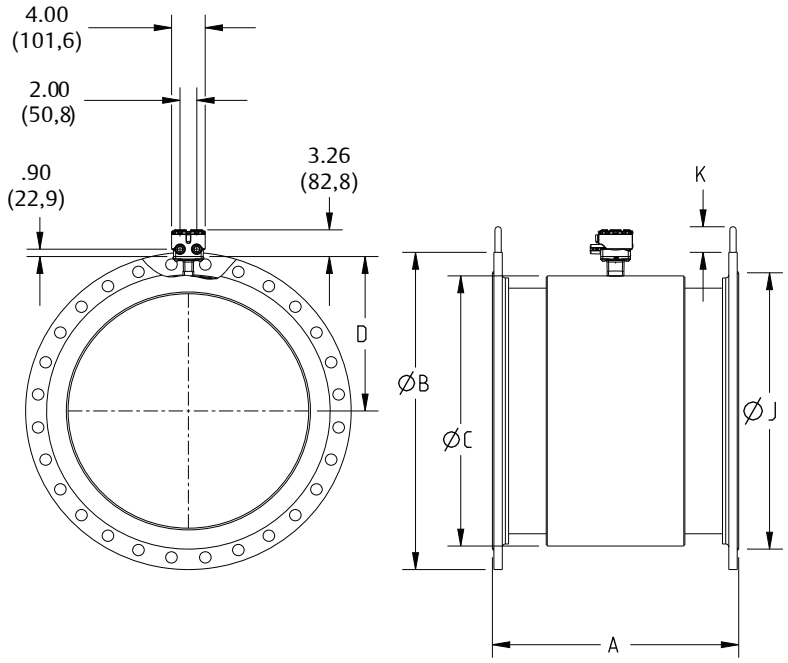


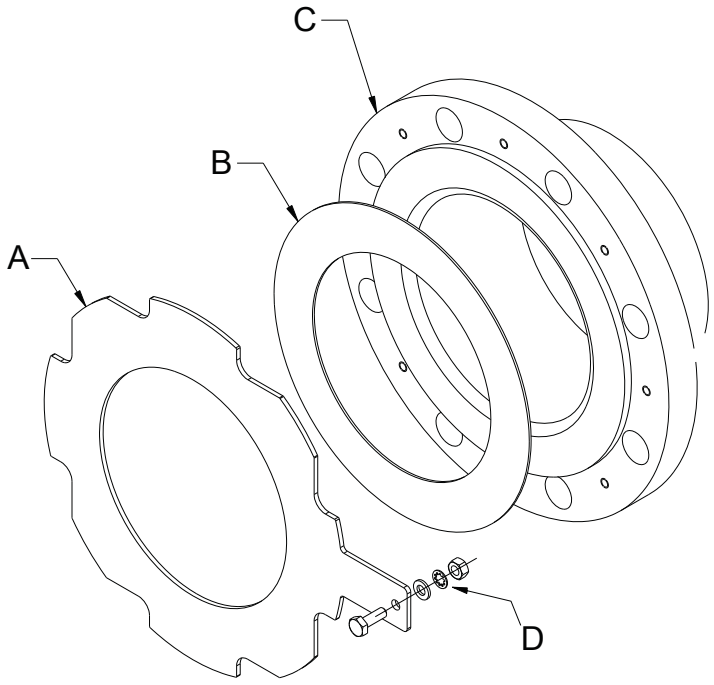
Table 54: Flat face sensor 30- to 48-in. (750 mm to 1200 mm) dimensions

Size, description	Length			Dim B	Dim C	Dim D	Liner Ø on face			Dim K	Flow tube wgt (lbs./kg)
	Dim A PTFE	Dim A Neoprene	Dim A Poly				Dim J PTFE	Dim J Neoprene	Dim J Poly		
30-in. (750 mm) AWWA CLASS D, SO/FF	29.34 (745)	29.39 (747)	29.26 (743)	38.75 (984)	33.00 (838)	16.38 (416)	33.75 (857)	38.75 (984)	33.75 (857)	3.13 (80)	789 (358)
30-in. (750 mm) AWWA CLASS E, SO/FF	29.34 (745)	29.39 (747)	29.26 (743)	38.75 (984)	33.00 (838)	16.38 (416)	33.75 (857)	38.75 (984)	33.75 (857)	3.13 (80)	1205 (548)
30-in. (750 mm) AWWA CLASS F, SO/FF	29.34 (745)	29.39 (747)	29.26 (743)	43.00 (1092)	33.00 (838)	16.38 (416)	33.75 (857)	43.0 (1092)	33.75 (857)	3.13 (80)	1795 (816)
36-in. (900) AWWA C207 CLASS D, SO/FF	35.25 (825)	35.3 (897)	35.17 (893)	46.00 (1168)	39.00 (991)	21.86 (555)	40.25 (1022)	40.25 (1022)	40.25 (1022)	3.13 (80)	1148 (521)
36-in. (900 mm) AWWA C207 CLASS E, SO/FF	35.25 (825)	35.30 (897)	35.17 (893)	46.00 (1168)	39.00 (991)	21.86 (555)	40.25 (1022)	46.00 (1168)	40.25 (1022)	3.13 (80)	1911 (867)
36-in. (900 mm) AWWA C207CLASS F, SO/FF	35.25 (825)	35.30 (897)	35.17 (893)	50.00 (1270)	39.00 (991)	21.86 (555)	40.25 (1022)	50.00 (1270)	40.25 (1022)	3.13 (80)	2651 (1202)
40-in. (1000 mm) AWWA CLASS D, SO/FF	N/A	39.40 (1001)	N/A	50.75 (1289)	47.27 (1201)	25.86 (657)	N/A	50.75 (1289)	N/A	3.38 (86)	1435 (651)
40-in. (1000 mm) AWWA CLASS E, SO/FF	N/A	39.40 (1001)	N/A	50.75 (1289)	47.27 (1201)	25.86 (657)	N/A	50.75 (1289)	N/A	3.38 (86)	2464 (1118)
42-in. (1050 mm) AWWA CLASS D, SO/FF	N/A	42.00 (1067)	N/A	53.00 (1346)	49.27 (1251)	26.86 (682)	N/A	53.00 (1346)	N/A	3.38 (86)	1550 (703)
42-in. (1050 mm) AWWA CLASS E, SO/FF	N/A	42.00 (1067)	N/A	53.00 (1346)	49.27 (1251)	26.86 (682)	N/A	53.00 (1346)	N/A	3.38 (86)	2400 (1089)

Table 54: Flat face sensor 30- to 48-in. (750 mm to 1200 mm) dimensions *(continued)*

Size, description	Length			Dim B	Dim C	Dim D	Liner Ø on face			Dim K	Flow tube wgt (lbs./kg)
	Dim A PTFE	Dim A Neoprene	Dim A Poly				Dim J PTFE	Dim J Neoprene	Dim J Poly		
48-in. (1200 mm) AWWA CLASS D, SO/FF	N/A	47.2 (1199)	N/A	59.50 (1511)	55.27 (1404)	29.86 (758)	N/A	59.50 (1511)	N/A	3.38 (86)	1892 (848)

Figure 13: Flanged sensor ½- to 48-in. (15 mm to 1200 mm) grounding ring



A. Grounding ring
B. Customer supplied gasket
C. Flow tube
D. Grounding strap hardware

Table 55: Flanged sensor ½- to 48-in. (15 mm to 1200 mm) grounding ring dimensions

	Single grounding ring thickness		Double grounding ring thickness	
	Min	Max	Min	Max
0.5-in. (15 mm)	0.059 (1,5)	N/A	0.12 (3)	N/A
1-in. (25 mm)	0.059 (1,5)	N/A	0.12 (3)	N/A
1.5-in. (40 mm)	0.059 (1,5)	N/A	0.12 (3)	N/A
2-in. (50 mm)	0.059 (1,5)	N/A	0.12 (3)	N/A
2.5-in. (65 mm)	0.059 (1,5)	N/A	0.12 (3)	N/A
3-in. (80 mm)	0.059 (1,5)	N/A	0.12 (3)	N/A
4-in. (100 mm)	0.059 (1,5)	N/A	0.12 (3)	N/A
5-in. (125 mm)	0.059 (1,5)	0.12 (3)	0.12 (3)	0.24 (6,1)

Table 55: Flanged sensor ½- to 48-in. (15 mm to 1200 mm) grounding ring dimensions *(continued)*

	Single grounding ring thickness		Double grounding ring thickness	
	Min	**Max**	**Min**	**Max**
6-in. (150 mm)	0.059 (1,5)	N/A	0.12 (3)	N/A
8-in. (200 mm)	0.059 (1,5)	N/A	0.12 (3)	N/A
10-in. (250mm)	0.059 (1,5)	N/A	0.12 (3)	N/A
12-in. (300mm)	0.059 (1,5)	0.12 (3)	0.12 (3)	0.24 (6,1)
14-in. (350mm)	0.12 (3)	0.25 (6,4)	0.24 (6,1)	0.5 (12,7)
16-in. (400mm)	0.12 (3)	0.25 (6,4)	0.24 (6,1)	0.5 (12,7)
18-in. (450mm)	0.12 (3)	0.25 (6,4)	0.24 (6,1)	0.5 (12,7)
20-in. (500mm)	0.12 (3)	0.25 (6,4)	0.24 (6,1)	0.5 (12,7)
24-in. (600mm)	0.187 (4,7)	0.25 (6,4)	0.374 (9.5)	0.5 (12,7)
30-in. (750mm)	0.187 (4,7)	0.25 (6,4)	0.374 (9.5)	0.5 (12,7)
36-in. (900mm)	0.187 (4,7)	0.25 (6,4)	0.374 (9.5)	0.5 (12,7)
40-in. (1000 mm)	0.25 (6,4)	N/A	0.5 (12,7)	N/A
42-in. (1050 mm)	0.25 (6,4)	N/A	0.5 (12,7)	N/A
48-in. (1200 mm)	0.25 (6,4)	N/A	0.5 (12,7)	N/A

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Emerson Automation Solutions
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China: (86) 21 2892 9000
India: (91) 22 6662 0566
Japan: (81) 3 5769 6803
South Korea: (82) 31 8034 0000
Singapore: (65) 6 363 7766

ROSEMOUNT™

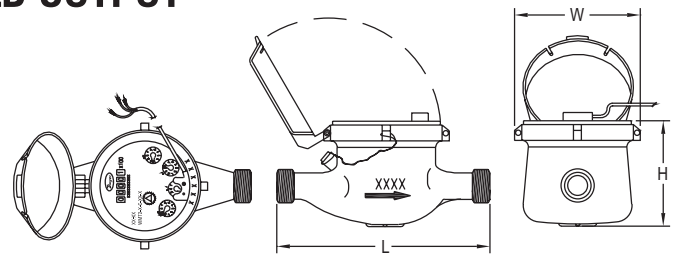
EMERSON™

Dwyer

SERIES WMT2

MULTI-JET WATER METER WITH PULSED OUTPUT

Economical, Brass Body, Dry Dial, Pulsed Output



Size in (mm)	Spud NPSM (BSPP)	Length 'L' in (mm)	Width 'W' in (mm)	Height 'H' in (mm)	Weight lb (kg)
5/8 x 1/2 (15)	3/4″ (3/4″)	6-1/2 (165)	3-45/64 (94)	4-15/64 (107.5)	3.75 (1.7)
5/8 x 3/4	1″ (1″)	7-1/2 (190)	3-45/64 (94)	4-15/64 (107.5)	3.97 (1.8)
3/4 (20)	1″ (1″)	7-1/2 (190)	3-45/64 (94)	4-15/64 (107.5)	4.9 (2.2)
1 (25)	1-1/4″ (1-1/4″)	10-1/4 (260)	3-55/64 (98)	4-5/8 (117.5)	6.4 (2.9)
1-1/4 (32)	1-1/2″ (1-1/2″)	10-1/4 (260)	3-55/64 (98)	4-5/8 (117.5)	8.2 (3.7)
1-1/2 (40)	2″ (2″)	11-13/16 (300)	4-51/64 (122)	5-9/16 (141.5)	13.52 (6.17)
2 (50)	2-1/2″ (2-1/2″)	11-13/16 (300)	5-45/64 (145)	6-31/32 (177)	18.74 (8.5)

The **SERIES WMT2** Multi-Jet Water Meters is a series of mechanical, water totalizing meters that display the total water usage in gallons or m^3 and provide a reed switch output proportional to flow rate. They are available in a range of body sizes and include NPT or BSPT couplings.

FEATURES/BENEFITS

- Multi-jet design allows for simplicity and accuracy with wide flow ranges, even in low flow applications
- Magnetically driven, hermetically sealed register does not leak or fog and is completely separated from the water
- Designed for long service life and maintenance-free operation, even under harsh conditions
- Integral strainer that protects meter from particulate damage
- Easy installation with included coupling adapters
- Pulsed output proportional to flow allows for remote flow totalization

SPECIFICATIONS

Service: Water.
Wetted Materials: Body: Brass, polyethylene; Couplings: Brass; Measuring chamber: Polyethylene, ABS plastic, ferrite, acetal.
Flow Range: See model chart.
Accuracy: Transitional flow: ±5%; Nominal flow: ±2%.
Temperature Limit: 104°F (40°C).
Pressure Limit: 232 psi (16 bar).
Totalizing Display Maximum: See model chart.
Output Signal: Pulse output with frequency proportional to flow rate.
Pulse Options: 0.1 gal, 1 gal, 10 gal, 100 gal per pulse (1 L, 10 L, 100 L per pulse).
Electrical Rating: 0.01 A @ 24 VAC/DC.
Electrical Connections: Color-coded lead wires, 4.5′ (1.5 m) long.
Mounting Orientation: Horizontal with the register face pointing up.
Weight: See dimension chart.

APPLICATIONS

- Irrigation
- Cooling systems
- Filtration systems
- Water monitoring

MODEL CHART

Model	Size	Coupling Size	Max Flow GPM (Gallons Per Minute)	Nominal Flow Range	Transitional Flow	Display Max (Gallons)	Pulse Rate (Gal./Pulse)
WMT2-A-C-01	5/8 x 1/2′	1/2′ NPT	20	1 to 10	0.25	9,999,999.99	0.1
WMT2-A-C-02	5/8 x 3/4′	3/4′ NPT	20	1 to 20	0.25	9,999,999.99	0.1
WMT2-A-C-03*	3/4′	3/4′ NPT	30	2 to 30	0.25	9,999,999.99	0.1
WMT2-A-C-04	1′	1′ NPT	50	3 to 50	0.75	99,999,999.9	0.1
WMT2-A-C-01-1	5/8 x 1/2′	1/2′ NPT	20	1 to 10	0.25	9,999,999.99	1
WMT2-A-C-02-1	5/8 x 3/4′	3/4′ NPT	20	1 to 20	0.25	9,999,999.99	1
WMT2-A-C-03-1*	3/4′	3/4′ NPT	30	2 to 30	0.25	9,999,999.99	1
WMT2-A-C-04-1	1′	1′ NPT	50	3 to 50	0.75	99,999,999.9	1
WMT2-A-C-06-10	1-1/2′	1-1/2′ NPT	100	5 to 100	1.5	99,999,999.9	10
WMT2-A-C-07-10	2′	2′ NPT	160	80 to 160	2	99,999,999.9	10
WMT2-A-C-04-100	1′	1′ NPT	50	3 to 50	0.75	99,999,999.9	100
WMT2-A-C-07-100	2′	2′ NPT	160	80 to 160	2	99,999,999.9	100

*Does not include inlet filter.

MODEL CHART

Model	Size	Coupling Size	Max Flow m^3/h	Nominal Flow Range	Transitional Flow	Display Max (m^3/h)	Pulse Rate (L/Pulse)
WMT2-B-C-08-1	15 mm	1/2′ BSPT	3	0.12 to 1.5	0.03	99,999.9999	1
WMT2-B-C-10-1*	20 mm	3/4′ BSPT	5	0.2 to 2.5	0.05	99,999.9999	1
WMT2-B-C-11-1	25 mm	1′ BSPT	7	0.25 to 3.5	0.07	99,999.9999	1
WMT2-B-C-12-1	32 mm	1-1/4′ BSPT	12	0.48 to 6	0.12	99,999.9999	1
WMT2-B-C-08-10	15 mm	1/2′ BSPT	3	0.12 to 1.5	0.03	99,999.9999	10
WMT2-B-C-12-10	32 mm	1-1/4′ BSPT	12	0.48 to 6	0.12	99,999.9999	10
WMT2-B-C-14-10	50 mm	2′ BSPT	30	1.2 to 15	0.3	999,999.9999	10
WMT2-B-C-12-100	32 mm	1-1/4′ BSPT	12	0.48 to 6	0.12	99,999.9999	100
WMT2-B-C-14-100	50 mm	2′ BSPT	30	1.2 to 15	0.3	999,999.9999	100

*Does not include inlet filter.

USA: California Proposition 65
⚠WARNING: Cancer and Reproductive Harm - www.P65Warnings.ca.gov

Specialty Switches – Continued

Portable Level Switch — Integral Mounting Magnet

Precisely monitors liquid level and is ideal for controlling filling operations and preventing overflows. Permanent magnet attaches unit securely to steel tank wall at exact level required.

LS-750 Series — Weighted for Suspension Cable

With a compact-sized float, slosh shield and weighted collar, the LS-750 provides liquid level detection for a wide variety of applications. Suspend in stand pipes or sumps for leak detection duty, or drop into wells for ground-water monitoring. Supplied with 25 feet of waterproof cable.

U.L. Recognized— File No. E-45168. CSA Listed-File No. LR-30200.

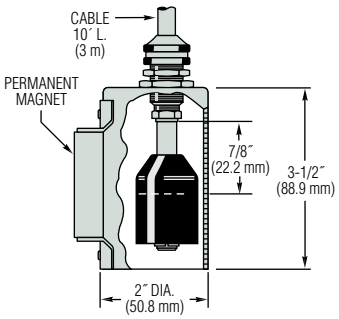
LS-700F Series

Overfill Protection for Refrigerant Tanks.The LS-700F enables safe compliance with EPA directives to recover refrigerants. These units are designed to fit standard 30# and 50# D.O.T. approved refrigerant tanks. They provide 80% full shutoff capability when used as an integral part of a recovery system.

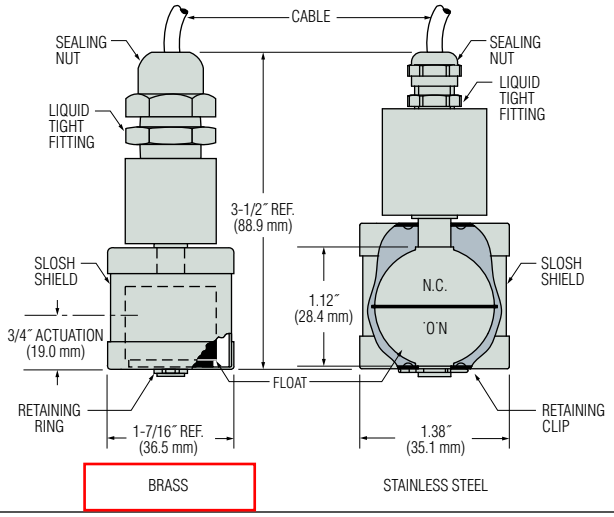
U.L. Recognized— File No. SA8857. CSA Listed-File No. LR-30200-31.

Dimensions

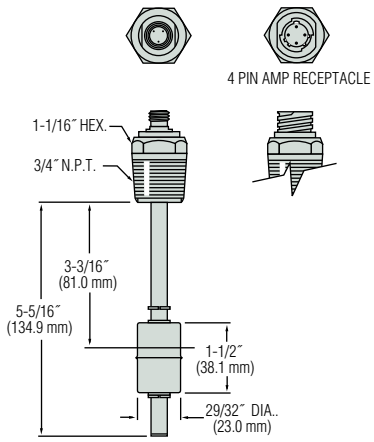
Portable Level Switch



LS-750



LS-700F



SJO, 18/2 10´L., Neoprene	22 AWG, 2-Wire Cable	3- or 4-Pin, Quick-Connect Receptacle

†L_1 = Switch actuation level. In liquid with specific gravity of 1.0, switch actuation is approximately half the distance from end of stem to mounting, or at the halfway point of float travel.

How To Order — Select Part Number based on specifications required.

Series	Material			Min. Liquid Sp. Gr.	Operating Temperature	Pressure PSI, Max.	Switch*	Electrical Termination Option	Part Number
	Stem and Mounting	Float	Other Wetted						
Portable	Brass	Buna N	Aluminum, 316 S.S.	.85	Oil: -40°F to +230°F (-40°C to +110°C) Water: to 180°F (82°C)	10	SPST, 20 VA N.O., Dry	—	**15208**
LS-750	Brass	Buna N	Nylon, PVC, Beryllium Copper	.45		150	SPST, 20 VA N.C., Dry	PVC Cable Jacket	**149350** ⚡
	316 S.S.**	316 S.S.	PVDF, Viton®	.65	-40°F to 212°F (-40°C to +100°C)	375	SPST, 10 VA N.C., Dry	Teflon® Cable Jacket	**197433**
LS-700F	Brass	304 S.S.	—	.98	-40°F to +221°F (-40°C to +105°C)	400	SPST, 20 VA N.C., Dry	3-Pin	**128500** ⚡
								4-Pin	**144900** ⚡

*See "Electrical Data" on Page X-5 for more information.

⚡ – Stock Items.

** Stainless steel is generally recognized as safe (GRAS) with FDA for food contact regulations.

GO TO GEOTECH

Pressure Transducers

Geotech Gauge Pressure Transducers

Geotech's submersible pressure transducers are designed for ruggedness and long life to meet the harsh environments encountered in liquid level measurement and control.

FEATURES

- High static accuracy and repeatability
- 100% computer tested, calibrated and temperature compensated
- 750' (229m) maximum cable length
- All wetted materials are #316 stainless steel
- Sensor has ¼" NPT process fitting with protective cap
- Vent line in cable allows barometric compensation of level readings
- Field replaceable desiccant cartridge or Aneroid Bellows for moisture protection
- Optional surge suppressor for lightning protection

SPECIFICATIONS

Electrical:	**Supply Voltage**	12-36 Volt DC
	Supply Current	25 mA
	Output	1-5 Volt DC, 4-20 mA
Performance:	**Pressure Ranges (psi)**	0-3, 0-5, 0-15, 0-30, 0-50, 0-100, 0-150
	Pressure Ranges (bar)	0-.2, 0-.34, 0-1, 0-2, 0-3.5, 0-7, 0-10 Custom ranges available
	Accuracy	0.25% of full scale 0.1% of full scale available
	Non-linearity	.07% of full scale
	Repeatability	0.015% of full scale
	Pressure Hysteresis	0.010% of full scale
	Zero Error	±0.1% of full scale
	Span Error	±0.1% of full scale
	Compensated Temperature	-4° to 185°F (-20° to 85°C)
	Operating Temperature	-40° to 257°F (-40° to 125°C)
	Response Time	2 milliseconds
	Life	1 million pressure cycles
Physical:	**Sensor Length (Includes 2" Strain Relief)**	8.6" (21.8 cm) with Surge Suppressor 7.7" (19.6 cm) without Surge Suppressor
	Sensor Diameter	.72" (1.8 cm)
	Sensor Weight	4.3 oz. (122 g)
	Proof Pressure	3x psi
	Burst Pressure	5x psi
	Media Compatibility	Liquids or gases compatible with 316 SS
Cable:	**Jacket**	Polyurethane or Tefzel®
	Diameter	.25" ±.01" (6.35mm ±.25mm)
	Conductors	2-24 AWG 7/32 tinned copper Red – White
	Drain	24 AWG 7/32 tinned copper bare
	Vent Tube	Nylon 6 / 6 vent tube

Note: Probe is protected from reverse polarity supply connection.

Field Replaceable Vent Line Desiccant Cartridge

Maintenance-Free Aneroid Bellows Option

Gauge Pressure Transducer

Gauge Pressure Transducer with Optional Surge Suppressor

APPLICATIONS

- Groundwater Monitoring
- Surface Water Monitoring
- Well Monitoring
- Wetland Studies
- Remediation Pump Control
- Landfill Pump Control
- Fluid Level Control

CALL GEOTECH TODAY (800) 833-7958

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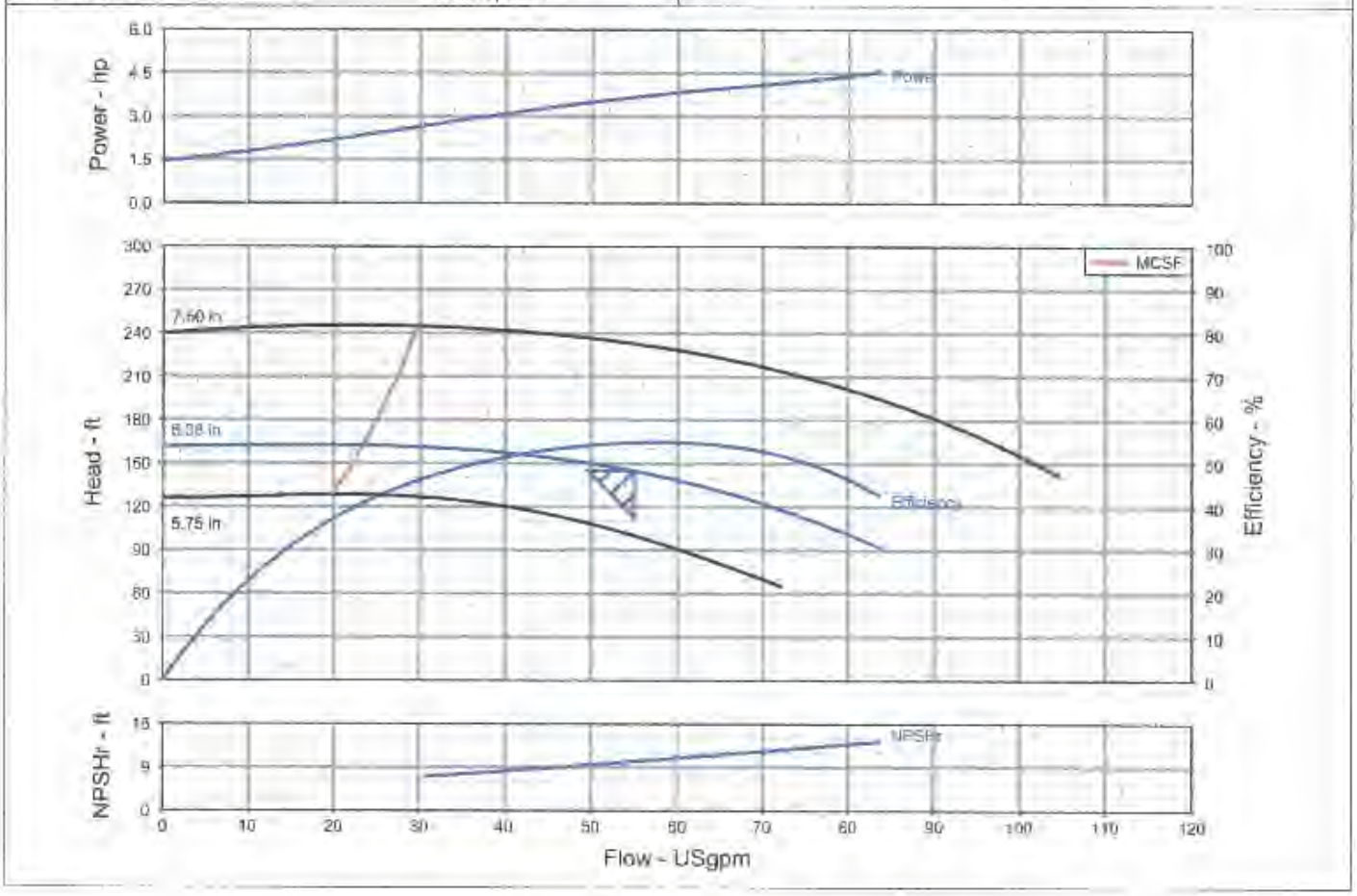
2650 East 40th Avenue • Denver, Colorado 80205
(303) 320-4764 • **(800) 833-7958** • FAX (303) 322-7242
email: sales@geotechenv.com website: www.geotechenv.com

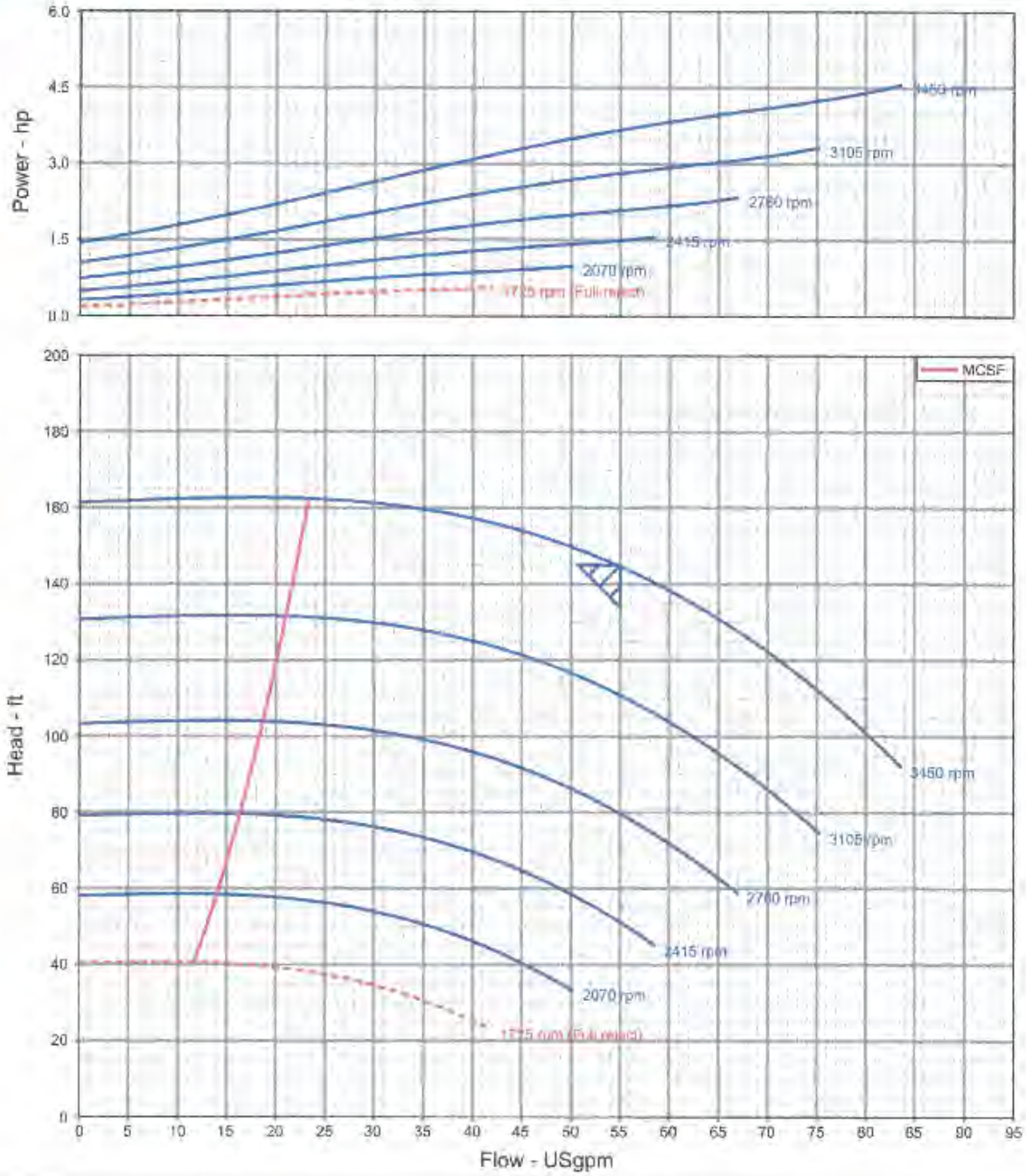
Pump Performance Datasheet

Customer	:	Quote number	:
Customer reference	:	Size	: 1 x 1-1/2 x 7 (B1WP)
Item number	: Default	Stages	: 1
Service	:	Based on curve number	: 8233
Quantity	: 1	Basic model number	: B1W
		Date last saved	: 11 Feb 2020 2:52 PM

Operating Conditions		Liquid	
Flow, rated	: 55.00 USgpm	Liquid type	: –Water
Differential head / pressure, rated (requested)	: 145.0 ft	Additional liquid description	:
Differential head / pressure, rated (actual)	: 144.0 ft	Solids diameter, max	: 0.00 in
Suction pressure, rated / max	: 0.00 / 0.00 psi.g	Solids concentration, by volume	: 0.00 %
NPSH available, rated	: Ample	Temperature, max	: 68.00 deg F
Frequency	: 60 Hz	Fluid density, rated / max	: 1.000 / 1.000 SG
Performance		Viscosity, rated	: 1.00 cP
Speed, rated	: 3450 rpm	Vapor pressure, rated	: 0.00 psi.a
Impeller diameter, rated	: 6.38 in	**Material**	
Impeller diameter, maximum	: 7.50 in	Material selected	: Not specified
Impeller diameter, minimum	: 5.75 in	**Pressure Data**	
Efficiency	: 54.81 %	Maximum working pressure	: 70.44 psi.g
PEI (CL)	: 0.74	Maximum allowable working pressure	: 210.0 psi.g
NPSH required / margin required	: 10.23 / 0.00 ft	Maximum allowable suction pressure	: N/A
Ns (Imp. eye flow) / Nss (Imp. eye flow)	: 562 / 4,328 US Units	Hydrostatic test pressure	: N/A
MCSF	: 23.34 USgpm	**Driver & Power Data (@Max density)**	
Head, maximum, rated diameter	: 162.7 ft	Driver sizing specification	: Rated power
Head rise to shutoff	: 11.53 %	Margin over specification	: 0.00 %
Flow, best eff. point	: 57.83 USgpm	Service factor	: 1.00
Flow ratio, rated / BEP	: 95.10 %	Power, hydraulic	: 2.01 hp
Diameter ratio (rated / max)	: 85.00 %	Power, rated	: 3.67 hp
Head ratio (rated dia / max dia)	: 62.10 %	Power, maximum, rated diameter	: 4.57 hp
Cq/Ch/Ce/Cn [ANSI/HI 9.6.7-2010]	: 1.00 / 1.00 / 1.00 / 1.00	Minimum recommended motor rating	: 5.00 hp / 3.73 kW
Selection status	: Acceptable		



Multi-Speed Performance Curve

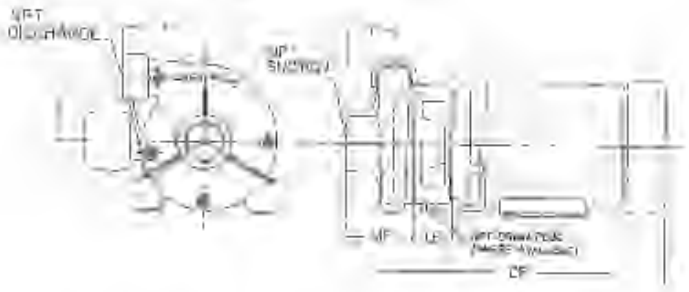


Customer	:	Quote number	:
Customer reference	:	Size	: 1 x 1-1/2 x 7 (B1WP)
Item number	: Default	Stages	: 1
Service	:	Based on curve number	: 8233
Quantity	: 1	Basic model number	: B1W
		Date last saved	: 11 Feb 2020 2:52 PM

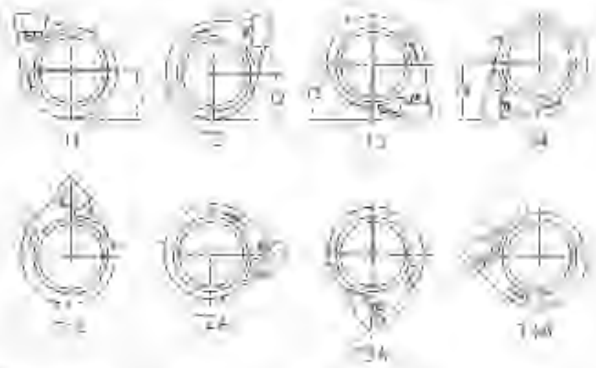
Flow, rated	: 55.00 USgpm	Efficiency	: 54.81 %
Differential head / pressure, rated	: 145.0 ft	PEI (VL)	: 0.74
Speed, rated	: 3450 rpm	Power, rated	: 3.67 hp
Impeller diameter, rated	: 6.38 in	NPSH required	: 10.23 ft
Frequency	: 60 Hz	Fluid density, rated / max	: 1.000 / 1.000 SG
Nominal speed	: 3450 rpm	Viscosity, rated	: 1.00 cP
		Cq/Ch/Ce/Cn [ANSI/HI 9.6.7-2010]	: 1.00 / 1.00 / 1.00 / 1.00

Motor Drive Dimensions

NPT (Threaded)



Volute Attachment Options



Note:

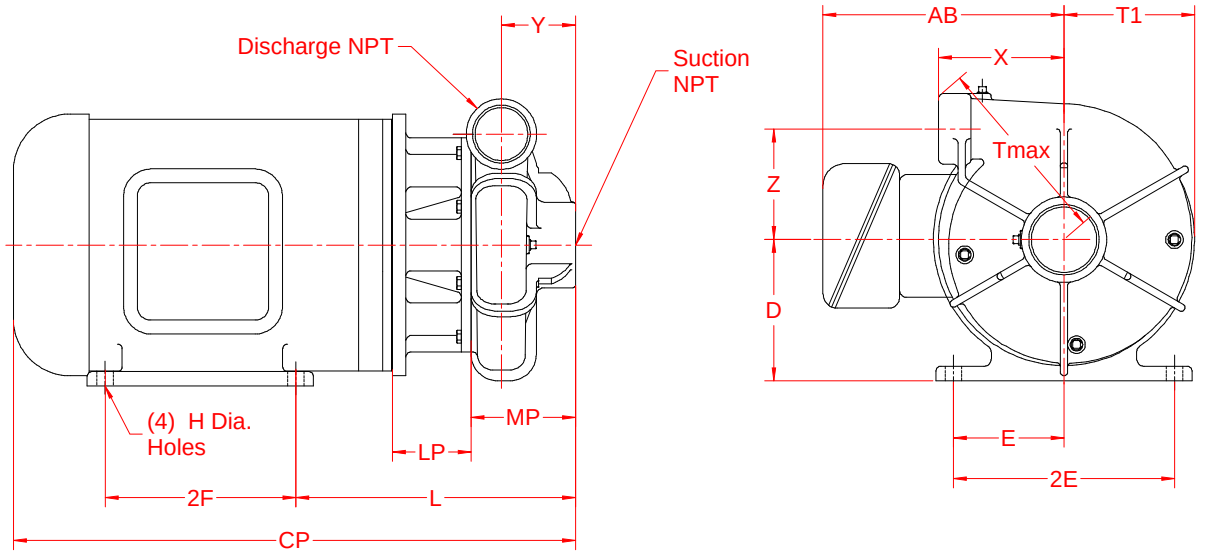
NPT (Threaded) – Single Stage

PUMP MODEL	SHAFT SEAL	RPM/ PHASE	FRAME GROUP*	SUCTION	DISCHARGE	W	V	BP	LP	Z	Y1	Y2	Y3	Y4	D1	CP (MAX)
S1W(T	Sealed	3600/1	C-1	1"	1"	5.00	2.50	4.19	5.44	4.72	4.72	4.94	5.30	5.94	5.75	20.40
		3600/3				4.00	2.50	4.19	5.44	4.72	4.72	4.94	5.30	3.94		17.00
S1W(T	Sealed	3600/3	C-1	1-1/2"	1"	5.00	2.50	4.19	5.44	4.72	4.72	4.94	5.30	3.94	5.75	20.40
S1WC*	Mechanical	3600/1	C-1	1-1/2"	1"	5.63	2.82	4.19	5.44	4.72	4.72	4.94	5.30	3.94		20.40
		3600/3	C-1	1-1/2"	1"	5.63	2.82	4.19	5.44	4.72	4.72	4.94	5.30	3.94		17.00
S1-1/2TFL	Sealed	3600/1	C-1	2"	1-1/2"	5.00	2.50	4.19	5.56	4.81	4.72	4.94	5.30	3.94	5.75	20.40
		3600/3	C-1	2"	1-1/2"	5.63	2.82	4.19	5.56	4.81	4.72	4.94	5.30	3.94		17.00
S1-1/2TFL	Mechanical	3600/1	C-1	2"	1-1/2"	5.63	2.82	4.19	5.56	4.81	4.72	4.94	5.30	3.94		20.40
		3600/3	C-1	2"	1-1/2"	5.63	2.82	4.19	5.56	4.81	4.72	4.94	5.30	3.94		17.00
S1-1/2TPW	Sealed	3600/1	C-1	2"	1-1/2"	5.63	2.82	4.19	5.56	4.81	4.72	4.94	5.30	3.94		20.40
		3600/3	C-1	2"	1-1/2"	5.63	2.82	4.19	5.56	4.81	4.72	4.94	5.30	3.94		17.00
S1-1/2TPWC*	Mechanical	3600/1	C-1	2"	1-1/2"	5.63	2.82	4.19	5.56	4.81	4.72	4.94	5.30	3.94		20.40
		3600/3	C-1	2"	1-1/2"	5.63	2.82	4.19	5.56	4.81	4.72	4.94	5.30	3.94		17.00
S2-2TFL	Sealed	3600/1	C-1	2"	1-1/2"	5.63	2.82	4.50	5.69	5.06	5.06	5.28	5.58	4.28	5.75	20.40
		3600/3	C-1	2"	1-1/2"	5.63	2.82	4.50	5.69	5.06	5.06	5.28	5.58	4.28	5.75	17.00
S2-2TFL	Mechanical	3600/1	C-1	2"	1-1/2"	5.63	2.82	4.50	5.69	5.06	5.06	5.28	5.58	4.28		20.40
		3600/3	C-1	2"	1-1/2"	5.63	2.82	4.50	5.69	5.06	5.06	5.28	5.58	4.28		17.00
S2-2TPW	Sealed	3600/1	C-1	2"	1-1/2"	5.63	2.82	4.50	5.69	5.06	5.06	5.28	5.58	4.28		20.40
		3600/3	C-1	2"	1-1/2"	5.63	2.82	4.50	5.69	5.06	5.06	5.28	5.58	4.28		17.00
S2-2TPWC*	Mechanical	3600/1	C-1	2"	1-1/2"	5.63	2.82	4.50	5.69	5.06	5.06	5.28	5.58	4.28		20.40
		3600/3	C-1	2"	1-1/2"	5.63	2.82	4.50	5.69	5.06	5.06	5.28	5.58	4.28		17.00
S3-3TFL	Sealed	3600/1	C-1	2"	1-1/2"	5.63	2.82	4.50	5.69	5.06	5.06	5.28	5.58	4.28	5.75	20.40
		3600/3	C-1	2"	1-1/2"	5.63	2.82	4.50	5.69	5.06	5.06	5.28	5.58	4.28	5.75	17.00
S3-3TFL	Mechanical	3600/1	C-1	2"	1-1/2"	5.63	2.82	4.50	5.69	5.06	5.06	5.28	5.58	4.28		20.40
		3600/3	C-1	2"	1-1/2"	5.63	2.82	4.50	5.69	5.06	5.06	5.28	5.58	4.28		17.00
S3-3TPW	Sealed	3600/1	C-1	2"	1-1/2"	5.63	2.82	4.50	5.69	5.06	5.06	5.28	5.58	4.28		20.40
		3600/3	C-1	2"	1-1/2"	5.63	2.82	4.50	5.69	5.06	5.06	5.28	5.58	4.28		17.00
S3-3TPWC*	Mechanical	3600/1	C-1	2"	1-1/2"	5.63	2.82	4.50	5.69	5.06	5.06	5.28	5.58	4.28		20.40
		3600/3	C-1	2"	1-1/2"	5.63	2.82	4.50	5.69	5.06	5.06	5.28	5.58	4.28		17.00
S4-4TFL	Sealed	3600/1	C-2	3"	1-1/2"	6.50	3.25	4.79	5.75	5.69	5.69	5.91	6.19	4.69	5.75	20.40
		3600/3	C-2	3"	1-1/2"	6.50	3.25	4.79	5.75	5.69	5.69	5.91	6.19	4.69		17.00
S4-4TFL	Mechanical	3600/1	C-2	3"	1-1/2"	6.50	3.25	4.79	5.75	5.69	5.69	5.91	6.19	4.69		20.40
		3600/3	C-2	3"	1-1/2"	6.50	3.25	4.79	5.75	5.69	5.69	5.91	6.19	4.69		17.00
S4-4TPW	Sealed	3600/1	C-2	3"	1-1/2"	6.50	3.25	4.79	5.75	5.69	5.69	5.91	6.19	4.69		20.40
		3600/3	C-2	3"	1-1/2"	6.50	3.25	4.79	5.75	5.69	5.69	5.91	6.19	4.69		17.00
S4-4TPWC*	Mechanical	3600/1	C-2	3"	1-1/2"	6.50	3.25	4.79	5.75	5.69	5.69	5.91	6.19	4.69		20.40
		3600/3	C-2	3"	1-1/2"	6.50	3.25	4.79	5.75	5.69	5.69	5.91	6.19	4.69		17.00
S5-5TFL	Sealed	3600/1	C-2	3"	1-1/2"	6.50	3.25	4.79	5.75	5.69	5.69	5.91	6.19	4.69		20.40
		3600/3	C-2	3"	1-1/2"	6.50	3.25	4.79	5.75	5.69	5.69	5.91	6.19	4.69		17.00
S5-5TFL	Mechanical	3600/1	C-2	3"	1-1/2"	6.50	3.25	4.79	5.75	5.69	5.69	5.91	6.19	4.69		20.40
		3600/3	C-2	3"	1-1/2"	6.50	3.25	4.79	5.75	5.69	5.69	5.91	6.19	4.69		17.00
S5-5TPW	Sealed	3600/1	C-2	3"	1-1/2"	6.50	3.25	4.79	5.75	5.69	5.69	5.91	6.19	4.69		20.40
		3600/3	C-2	3"	1-1/2"	6.50	3.25	4.79	5.75	5.69	5.69	5.91	6.19	4.69		17.00
S5-5TPWC*	Mechanical	3600/1	C-2	3"	1-1/2"	6.50	3.25	4.79	5.75	5.69	5.69	5.91	6.19	4.69		20.40
		3600/3	C-2	3"	1-1/2"	6.50	3.25	4.79	5.75	5.69	5.69	5.91	6.19	4.69		17.00

Berkeley Dimensional Drawing

Date	Job/Ref.
5/11/15	

Model	Fittings	HP	RPM	Phase	Encl.	Frame Size
B1WPS	NPT	5	3600	3	TEFC	184JM

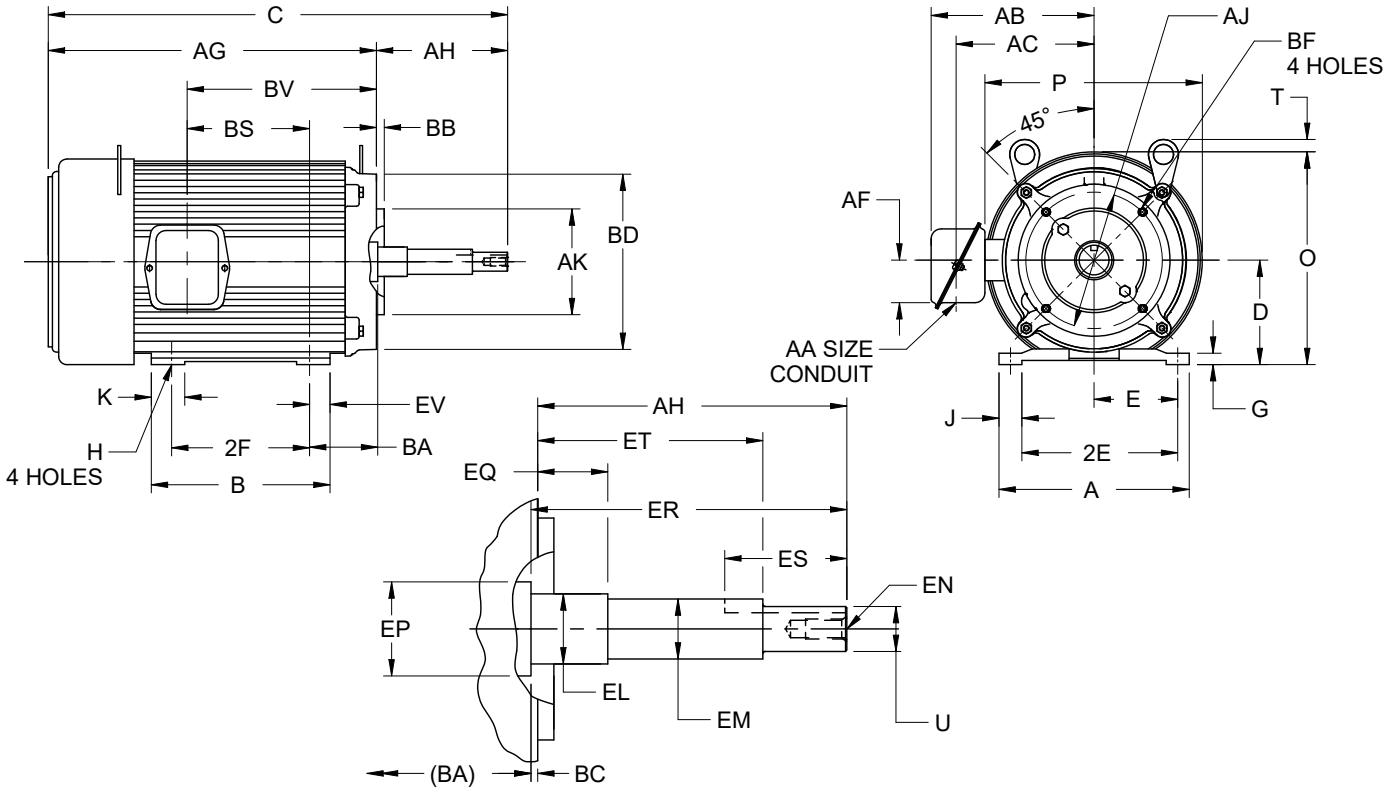


Note: Dimensions in inches. Drawing is typical and NOT to scale.

AB	CP	D	E	2E	2F	H	L	LP	MP	T1	Tmax	X	Y	Z	Suct	Disch
7.50	20.10	4.50	3.75	7.50	5.50	0.41	10.23	2.38	4.19	4.94	7.01	5.00	2.50	4.12	1½	1

Notes

EFFECTIVE: 21-JUN-18	DIMENSION PRINT UNIMOUNT CLOSE-COUPLED PUMP FRAME: 182-184JM BASIC TYPE: UT-4	PRINT: 07-2789
SUPERSEDES: 13-OCT-11		SHEET: 1 OF 1



ALL DIMENSIONS ARE IN INCHES AND MILLIMETERS

	UNITS	A	B	C	D -.06	E	2E ±.03	G	H +.05	J	K	O
	IN	8.38	6.38	17.81	4.50	3.75	7.50	.38	.41	.88	1.88	9.28
	MM	213	162	452	114	95	191	10	10	22	48	236

	UNITS	P [2]	T	U -.0005	AA	AB	AC	AF	AG	AH ±.031	AJ	AK -.003
	IN	9.56	.63	.8745	.75	7.50	6.31	2.13	13.56	4.250	5.875	4.500
	MM	243	16	22.212		191	160	54	344	107.95	149.23	114.30

	UNITS	BA	BB -.031	BC	BD MAX	BF [7]	BS	BV	EL -.002	EM -.0005	EN [7]	EP MIN
	IN	3.50	.156	.13	6.63	3/8-16 X .56	6.28	8.41	1.250	1.0000	3/8-16 X .75	1.25
	MM	89	3.96	3	168		160	214	31.75	25.400		32

	UNITS	EQ ±.015	ER MIN	ES MIN	ET ±.015	EV	SQ KEY
	IN	.625	4.25	1.65	2.875	.44	.188
	MM	15.88	108	42	73.03	11	4.78

	FRAME	UNITS	2F ±.03
	182JM	IN	4.50
		MM	114
	184JM	IN	5.50
		MM	140

TOLERANCES	
FACE RUNOUT	.004 T.I.R.
PERMISSIBLE ECCENTRICITY OF MOUNTING RABBET	.004 T.I.R.
PERMISSIBLE SHAFT RUNOUT	.002 T.I.R.

1. ALL ROUGH CASTING DIMENSIONS MAY VARY BY .25" DUE TO CASTING AND/OR FABRICATION VARIATIONS.
2. LARGEST MOTOR WIDTH.
3. FRAME REFERENCE: 8.250"/182/184
4. CONDUIT BOX MAY BE LOCATED ON EITHER SIDE OF MOTOR. CONDUIT OPENINGS MAY BE LOCATED IN STEPS OF 90 DEGREES REGARDLESS OF LOCATION. STANDARD AS SHOWN WITH CONDUIT OPENING DOWN.
5. TOLERANCES SHOWN ARE IN INCHES ONLY.
6. ALL TAPPED HOLES ARE UNIFIED NATIONAL COARSE, RIGHT HAND THREAD.
7. TAP SIZE AND BOLT PENETRATION ALLOWANCE.

07-2789/F

Nidec Motor Corporation
St. Louis, Missouri

ISSUED BY: F. RAMIREZ
APPROVED BY: R. TIMMERMAN

IHP_DP_NMCA (MAR-2011) SOLIDEDGE

FK38	UJ5P1DM	3	UTE4	184JM
	24048			

MPI:	89990	89991	179615	91521	179616
HP:	5	5	5	5	5
POLES:	2	2	2	2	2
VOLTS:	460	230	208	380	190
HZ:	60	60	60	50	50
SERVICE FACTOR:	1.25	1.25	1	1.15	1.15
EFFICIENCY (%):					
S.F.	87.5	87.5		82.8	82.8
FULL	88.5	88.5	87.5	86.1	86.1
3/4	90.1	90.1	89.4	88.9	88.9
1/2	89.3	89.3	89.4	89.9	89.9
1/4	84.2	84.2	85.1	87	87
POWER FACTOR (%):					
S.F.	88.4	88.4		89	89
FULL	87.1	87.1	88.2	88.6	88.6
3/4	83.7	83.7	86.3	86.6	86.6
1/2	75.7	75.7	80.7	80.4	80.4
1/4	56	56	63.5	62.1	62.1
NO LOAD	9.3	9.3	10.5	8.4	8.4
LOCKED ROTOR	56.4	56.4	55.4	60.2	60.2
AMPS:					
S.F.	7.6	15.1		8.8	17.7
FULL	6.1	12.2	13.4	7.4	14.9
3/4	4.7	9.3	10.1	5.5	11
1/2	3.5	6.9	7.2	3.9	7.8
1/4	2.5	5	4.8	2.6	5.2
NO LOAD	2.1	4.1	3.6	2	4.1
LOCKED ROTOR	46	92	81	42	84
NEMA CODE LETTER	J	J	G	F	F
NEMA DESIGN LETTER	B	B	B	B	B
FULL LOAD RPM	3520	3520	3495	2890	2890
NEMA NOMINAL / EFFICIENCY (%)	88.5	88.5	87.5	86.1	86.1
GUARANTEED EFFICIENCY (%)	86.5	86.5	85.5	82.5	82.5
MAX KVAR	1.4	1.4	1.1	1.1	1.1
AMBIENT (°C)	40	40	40	40	40
ALTITUDE (FASL)	3300	3300	3300	3300	3300
SAFE STALL TIME-HOT (SEC)	10	10	13	11	11
SOUND PRESSURE (DBA @ 1M)	64	64	0	60	0

TORQUES:					
BREAKDOWN{% F.L.}	301	301	239	234	234
LOCKED ROTOR{% F.L.}	239	239	188	184	184
FULL LOAD{LB-FT}	7.5	7.5	7.5	9.1	9.1

NEMA Nominal and Guaranteed Efficiencies are up to 3,300 feet above sea level and 25 ° C ambient

The Above Data Is Typical, Sinewave Power Unless Noted Otherwise

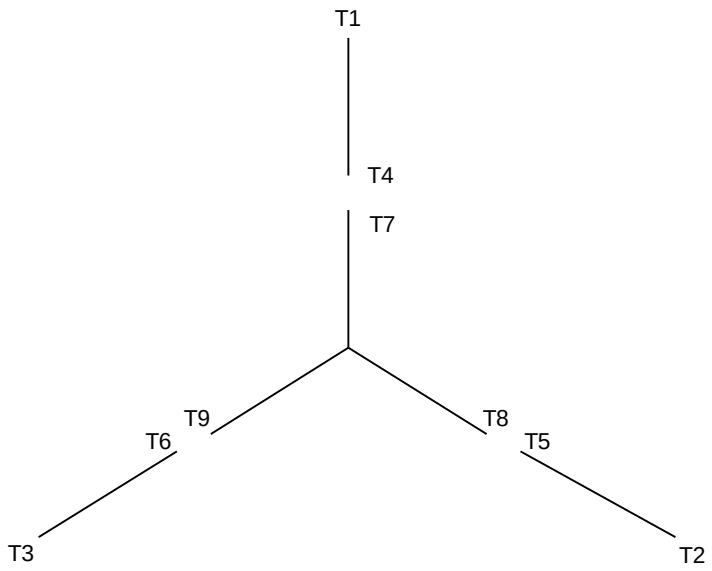
NIDEC MOTOR CORPORATION
ST. LOUIS, MO

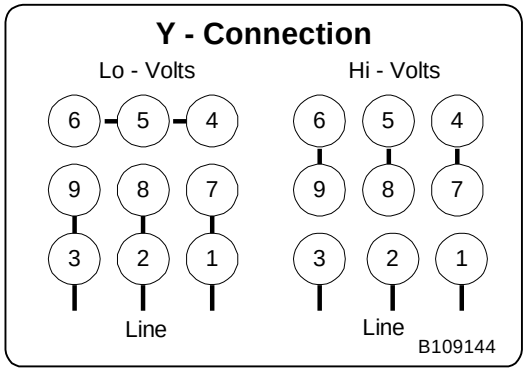
U.S. Motors

B109144

Motor Wiring Diagram

9 Lead, Dual Voltage (WYE Conn.)





To reverse direction of rotation interchange connections L1 and L2.

Each lead may have one or more cables comprising that lead.
In such case each cable will be marked with the appropriate lead number.

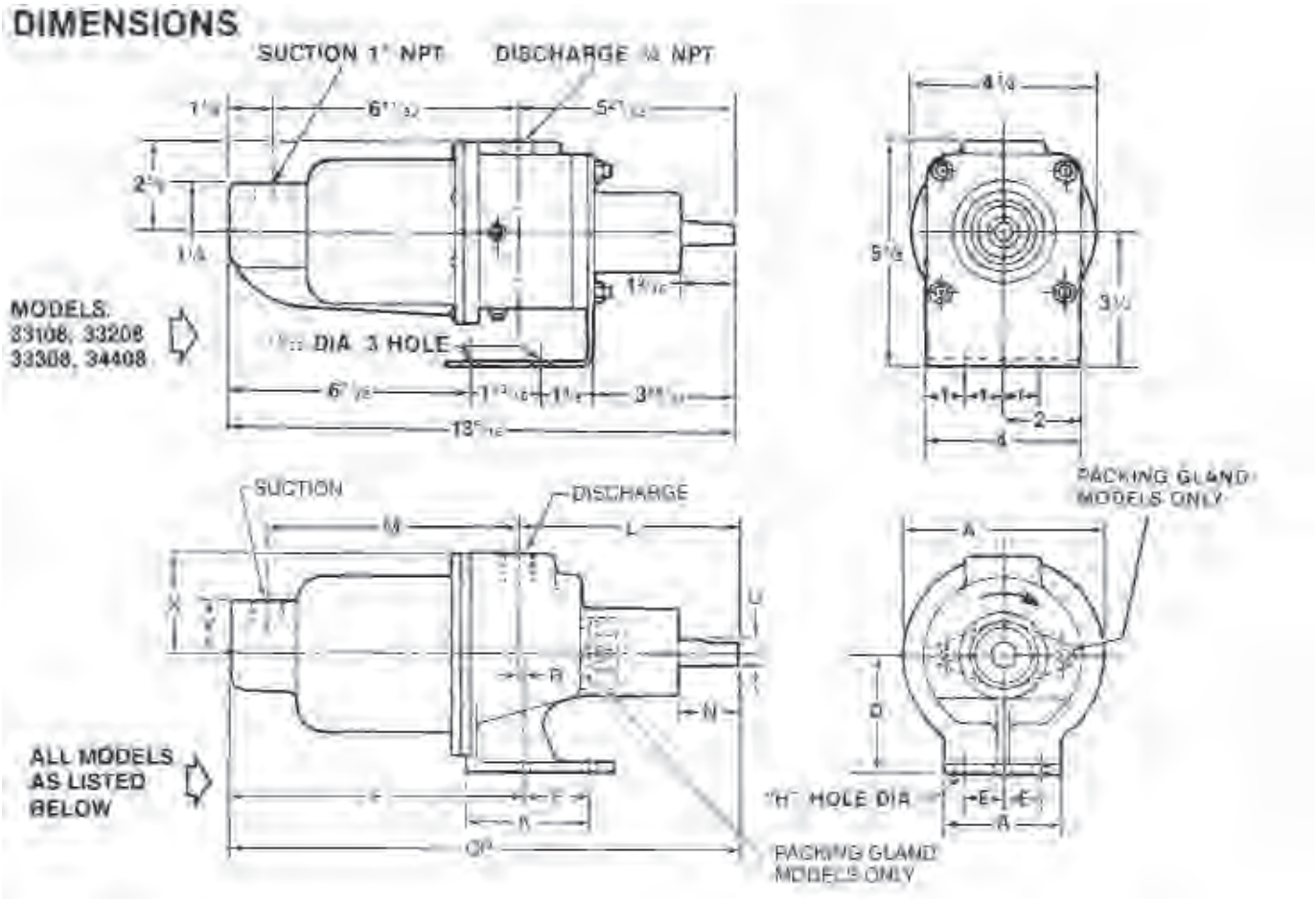
Connection Plate: B109144
Connection Decal: 344136

SPECIFICATION DATA

MOYNO® 500 PUMPS

300 SERIES
331, 332, 333, 344, 356 AND 367 MODELS

DIMENSIONS

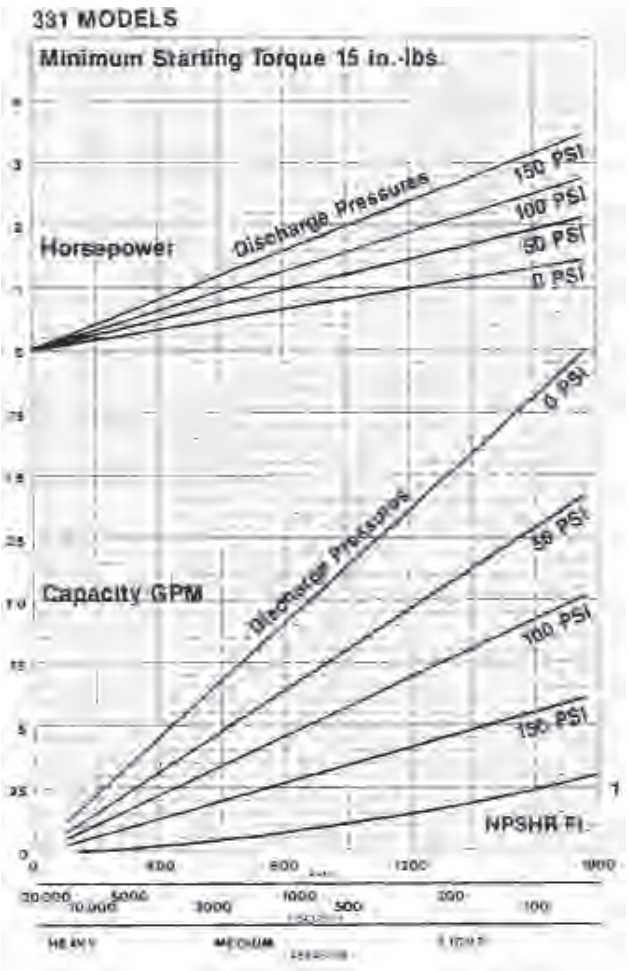


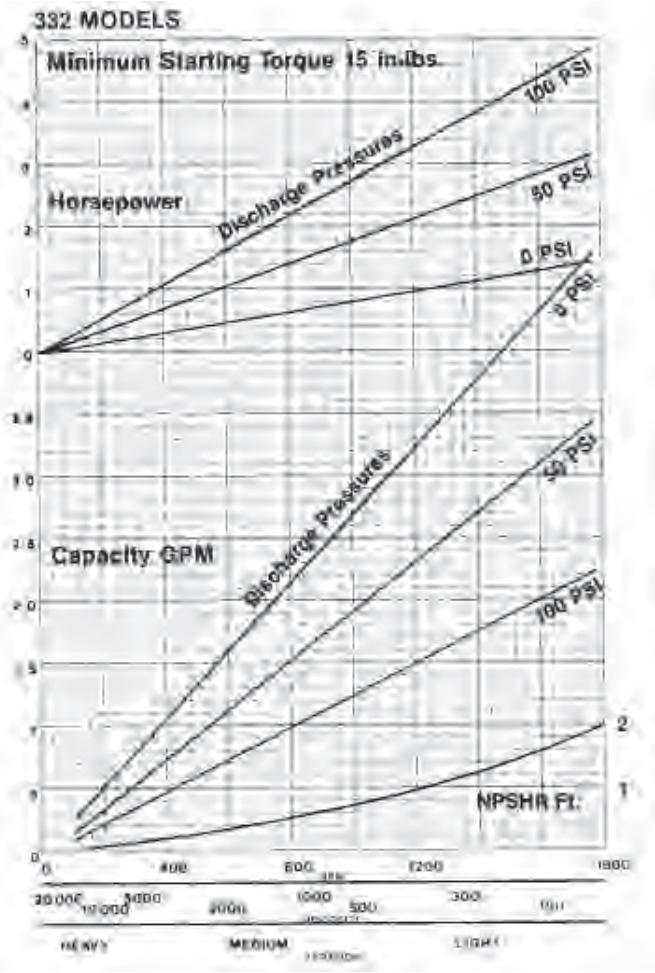
MODELS	CP	A	A[1]	D	E	F	F[1]	H	K	L	M	N	R	U	X	Y	SUCT (NPT)	DISCH (NPT)
33101, 33201 33301, 33104 33204, 33304 34401, 34404	$12^{5}/_{8}$	$3^{1}/_{8}$	$4^{3}/_{4}$	$2^{3}/_{4}$	1	$1^{13}/_{16}$	$6^{15}/_{16}$	$^{13}/_{32}$	$3^{1}/_{32}$	$5^{11}/_{16}$	$6^{1}/_{16}$	$1^{7}/_{16}$	—	$^{5}/_{8}$	$2^{3}/_{8}$	$1^{1}/_{4}$	$^{3}/_{4}$	$^{3}/_{4}$
*34411	$13^{15}/_{16}$	$3^{1}/_{4}$	$4^{3}/_{4}$	$2^{3}/_{4}$	$1^{1}/_{8}$	—	$7^{3}/_{16}$	$^{13}/_{32}$	$2^{7}/_{8}$	7	$6^{1}/_{16}$	$1^{3}/_{8}$	$^{1}/_{4}$	$^{5}/_{8}$	$2^{5}/_{16}$	$1^{1}/_{4}$	$^{3}/_{4}$	$^{3}/_{4}$
35601, 35604	$17^{1}/_{2}$	$6^{1}/_{2}$	$7^{9}/_{16}$	$4^{9}/_{32}$	$1^{3}/_{4}$	2	$10^{19}/_{32}$	$^{13}/_{32}$	$4^{1}/_{2}$	$7^{3}/_{8}$	$8^{5}/_{8}$	$2^{3}/_{8}$	$^{15}/_{32}$	$^{3}/_{4}$	$3^{25}/_{32}$	$2^{1}/_{8}$	$1^{1}/_{2}$	$1^{1}/_{4}$
*35611, *35613	$19^{3}/_{8}$	$6^{1}/_{2}$	$7^{9}/_{16}$	$4^{9}/_{32}$	$1^{3}/_{4}$	$2^{1}/_{2}$	$10^{19}/_{32}$	$^{13}/_{32}$	4	$9^{11}/_{32}$	$8^{5}/_{8}$	$2^{13}/_{32}$	$^{9}/_{16}$	$^{3}/_{4}$	$3^{25}/_{32}$	$2^{1}/_{8}$	$1^{1}/_{2}$	$1^{1}/_{4}$
36701, 36704	$20^{15}/_{16}$	$5^{1}/_{4}$	8	$4^{1}/_{2}$	2	$2^{5}/_{16}$	13	$^{9}/_{16}$	$4^{1}/_{16}$	$7^{15}/_{16}$	$11^{3}/_{16}$	$2^{1}/_{8}$	—	1	4	$2^{1}/_{2}$	2	2

*Packing Gland Model

All dimensions are in inches. Specifications subject to change without notice.

331, 332, 333 and 344 MODELS
PERFORMANCE (water at 70ºF)



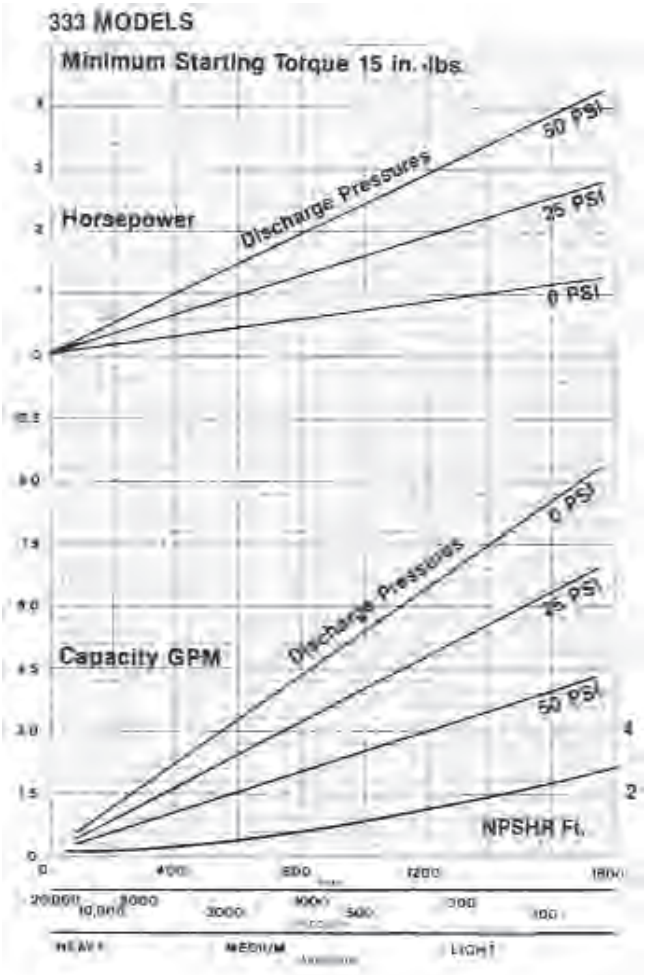


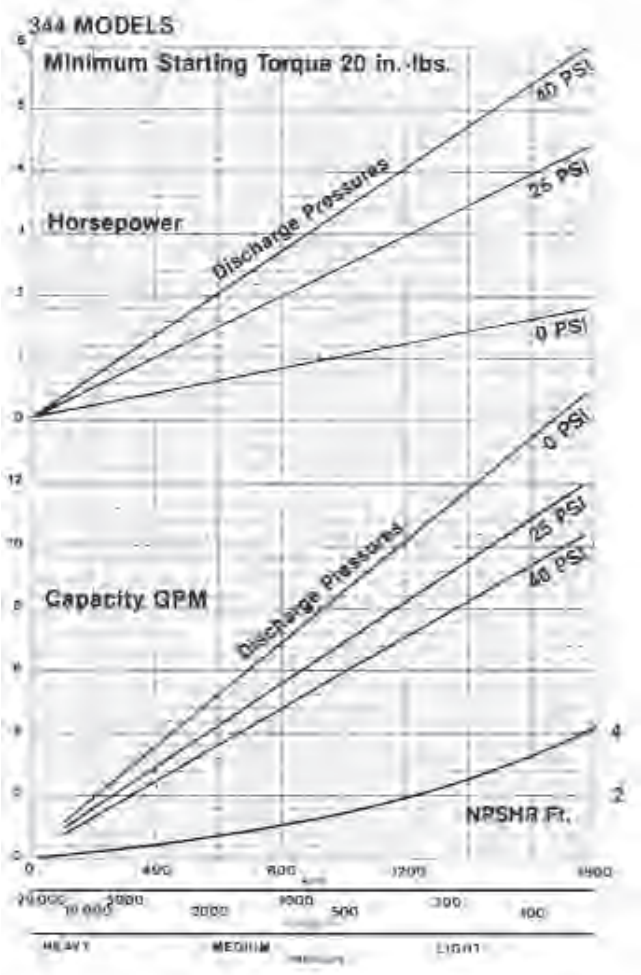
NOTE: For fluids with viscosity over 200 CP (1000 SSU), pump capacity is reduced by 20%.

MATERIALS OF CONSTRUCTION

COMPONENT	MODELS			
	33101, 33201 33301, 34401	33104, 33204 33304, 34404	33108, 33208 33308, 34408	*34411
Housing	Cast iron	316 SS	Nylon	Cast iron
Rotor	416 SS/CP	316 SS/CP	416 SS/CP	416 SS/CP
Stator	NBR (Nitrile)	NBR (Nitrile)	NBR (Nitrile)	NBR (Nitrile)
Weight (lbs)	16	16	8	16

* Packing Gland Model
CP = Chrome plated





NOTE: For fluids with viscosity over 200 CP (1000 SSU), pump capacity is reduced by 20%.

BALDOR
A MEMBER OF THE ABB GROUP

BALDOR • RELIANCE

Product Information Packet

M7010A

.75HP,1725RPM,3PH,60HZ,56,X3420M,XPFC,F1

Part Detail							
Revision:	X	Status:	PRD/A	Change #:		Proprietary:	No
Type:	AC	Prod. Type:	3420M	Elec. Spec:	34WG5721	CD Diagram:	
Enclosure:	XPFC	Mfg Plant:		Mech. Spec:	34-5323	Layout:	
Frame:	56	Mounting:	F1	Poles:	04	Created Date:	
Base:	RG	Rotation:	R	Insulation:	B	Eff. Date:	03-28-2011
Leads:	12#18	Literature:		Elec. Diagram:		Replaced By:	

Nameplate NP0016XP					
NO.		CC			
SER.					
SPEC.	34-5323-5721				
CAT.NO.	M7010A				
HP	.75	T. CODE	T3C		
VOLTS	208-230/460				
AMPS	3.2-3/1.5				
RPM	1725				
HZ	60	PH	3	CL	B
SER.F.	1.00	DES	B	CODE	K
RATING	40C AMB-CONT				
FRAME	56	NEMA-NOM-EFF	73	PF	58
USABLE AT 208V	3.2				

Parts List

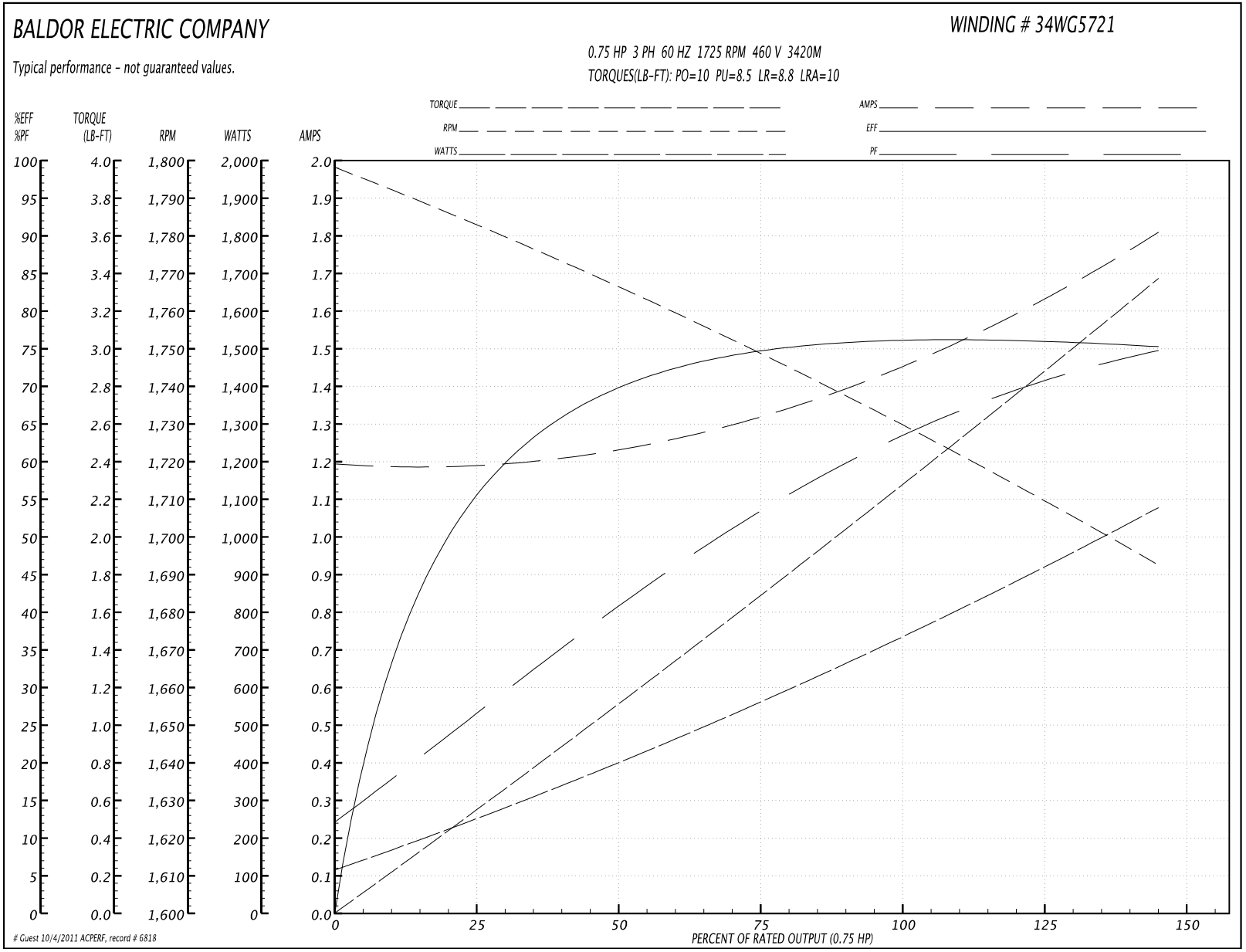
Part Number	Description	Quantity
SA008947	SA 34-5323-5721	1.000 EA
RA005394	RA 34-5323-5721	1.000 EA
TPMYJ64KL	THERMAL 3PH .75 AUT 105C X	1.000 EA
MJ5000A01	SEALANT, CHICO A COMPOUND	0.050 LB
35CB3001A01SP	EXPL CONDUIT BOX, MACH, 1/2" PIPE TAP LE	1.000 EA
11XW1032G06	10-32 X .38, TAPTITE II, HEX WSHR SLTD U	1.000 EA
HW3001B01	003SS CUP WASHER, FOR #8 SCREW	1.000 EA
51XW0832A07	8-32 X .44, TAPTITE II, HEX WSHR SLTD SE	2.000 EA
34EP3703A01	FR ENDPLATE, MACH XP	1.000 EA
HW4002A02	1-11.5X2LG PIPE NIPPLE (F/S)	1.000 EA
HA1025A13	WSHR,FELT,.38" THICK F-26 CLASS	1.000 EA
HW3021E06	1/8 DIA X 5/8 ROLLPIN (F/S)	1.000 EA
HW5100A03SP	WAVY WASHER (W1543-017)	1.000 EA
34EP3704A01	PU ENDPLATE, MACH XP	1.000 EA
XY3118A12	5/16-18 HEX NUT DIRECTIONAL SERRATION	4.000 EA
34FN3002A01SP	EXTERNAL FAN, PLASTIC, .637/.639 HUB W/	1.000 EA
34FH4002A01SP	IEC FH NO GREASER	1.000 EA
51XW1032A06	10-32 X .38, TAPTITE II, HEX WSHR SLTD S	3.000 EA
35CB3500A01SP	CONDUIT BOX LID, MACH	1.000 EA
51XN2520A16	SCREW, HEX WS SLT, ZN, 1/4-20 X 1.00	4.000 EA
HW2501D13SP	KEY, 3/16 SQ X 1.375	1.000 EA
HA7000A04	KEY RETAINER 0.625 DIA SHAFTS	1.000 EA
HA6001A01	THERMAL RETAINER (PLATED)	1.000 EA
12XF0632A06	6-32X3/8 TY F HEX HD SLT	2.000 EA

Parts List (continued)

Part Number	Description	Quantity
WD1000A16	2-520128-2 AMP FLAG TERMINAL(4M/RL)	12.000 EA
SP5037A01	TERMINAL PLATE ASS'Y MODEL 34 - 3 PHASE	1.000 EA
MG1025G29	PAINT 789.205 DARK GRAY METALLIC (USE W/	0.014 GA
85XU0407A04	#4-7 X 1/4 DRIVE PIN	6.000 EA
NP0018	NP- XP CONDUIT BOX	1.000 EA
WD1000A16	2-520128-2 AMP FLAG TERMINAL(4M/RL)	12.000 EA
HA3104A08	THRUBOLT-5/16-18X9.375 X X	4.000 EA
LB1118	LABEL,WARNING (ROLL LABEL)	1.000 EA
LB1125C01	STD (STOCK) CARTON LABEL BALDOR WITH FLA	1.000 EA
LC0007	CONN.DIAGRAM (3PHASE W/THERMAL)	1.000 EA
NP0016XP	UL/CSA, CLI GP-D,CLII GP-F&G,CC,ATO	1.000 EA
34PA1005	PACKING GROUP, BALDOR	1.000 EA

Performance Data at 460V, 60Hz, 0.75HP (Typical performance - Not guaranteed values)							
General Characteristics							
Full Load Torque:	2.25 LB-FT			Start Configuration:		DOL	
No-Load Current:	1.2 Amps			Break-Down Torque:		10.0 LB-FT	
Line-line Res. @ 25°C.:	17.7 Ohms A Ph / 0.0 Ohms B Ph			Pull-Up Torque:		8.5 LB-FT	
Temp. Rise @ Rated Load:	74 C			Locked-Rotor Torque:		8.8 LB-FT	
Temp. Rise @ S.F. Load:				Starting Current:		10.0 Amps	
Load Characteristics							
% of Rated Load	25	50	75	100	125	150	S.F.
Power Factor:	28.0	42.0	55.0	64.0	71.0	76.0	0.0
Efficiency:	56.1	69.7	74.7	76.2	76.1	75.2	0.0
Speed:	1783.0	1766.0	1749.0	1731.0	1711.0	1693.0	0.0
Line Amperes:	1.2	1.2	1.3	1.5	1.6	1.8	0.0

Performance Graph at 460V, 60Hz, 0.75HP Typical performance - Not guaranteed values



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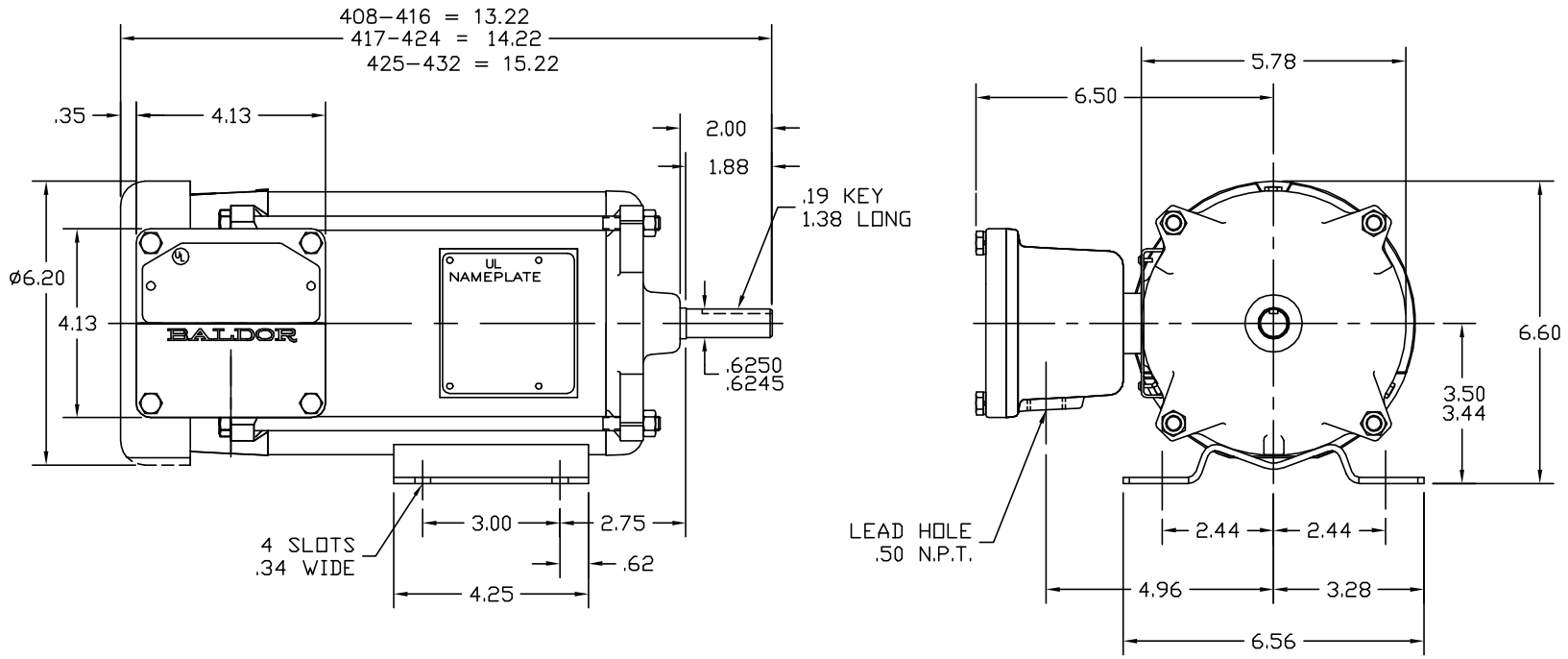
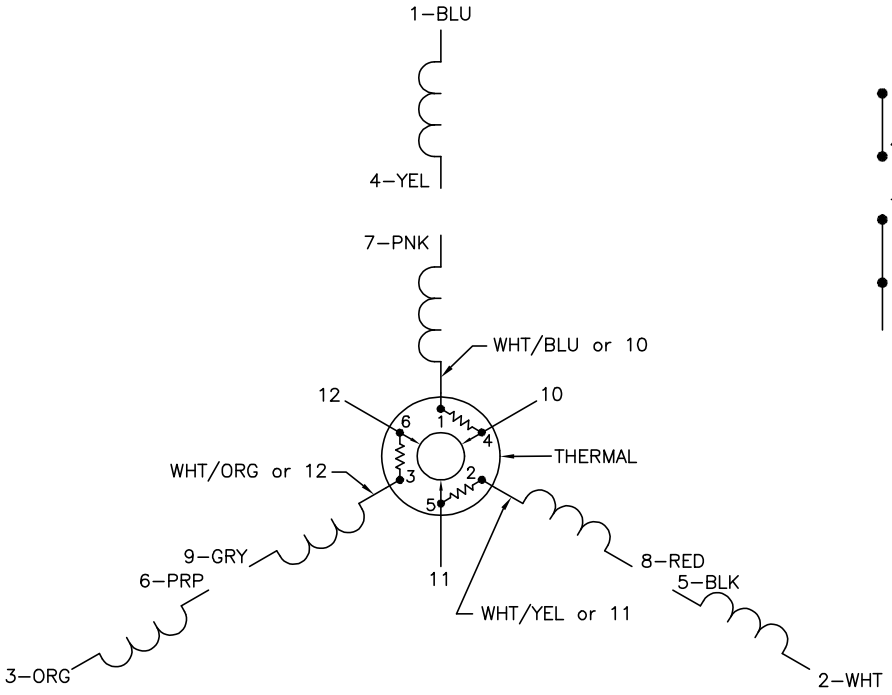


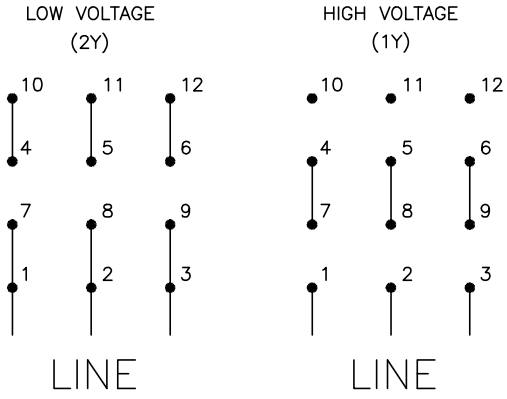
34LY5323

CUSTOMER IS RESPONSIBLE FOR DETERMINING THAT BALDOR'S PRODUCT WILL PERFORM SUITABLY IN THE INTENDED APPLICATION.

REV. DESC: REMOVED THE FAN SCREW FROM THE SIDE VIEW			BALDOR • DODGE • RELIANCE
REV. LTR: E	VERSION: 02	TDR: 000000482478	
FILE: \AAA\00026\312		REVISED: 16:40:54 11/12/2008	STD HORZ X34M NEMA 56 TEFC CL. 1 GP. D, CL. 2 GP. F&G
MTL: –		BY: ENDOUSO	SH 1 of 1

CD0007





NOTES:

1. INTERCHANGE ANY TWO LINE LEADS TO REVERSE ROTATION.
2. ACTUAL NUMBER OF INTERNAL PARALLEL CIRCUITS MAY VARY.
3. LEAD COLORS ARE OPTIONAL. LEADS MUST ALWAYS BE NUMBERED AS SHOWN.

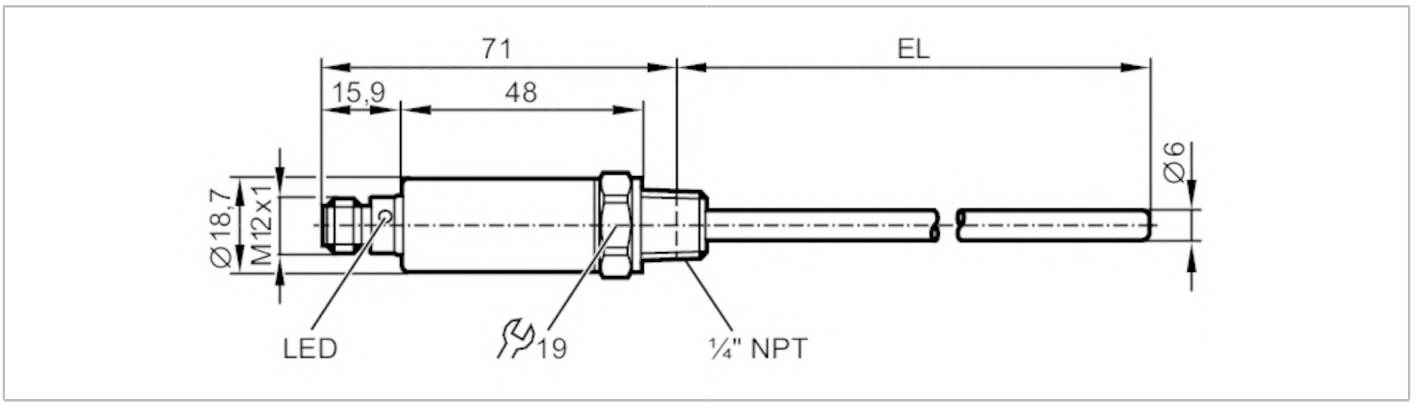
REV. DESC: ADDED "CK" PLANT CODE			BALDOR ELECTRIC Co.
REV. LTR: E	BY: EAH	REVISED: 05/06/99 17:1	TDR: 0181040
CD0007		FILE: AAA00008370	MDL: –
		MTL: –	3PH, DV, THERMAL, 12 LEADS

CD0007

TA2603

Temperature transmitter

TA025FLEN14-A-ZVG/US



Product characteristics		
Number of inputs and outputs		Number of analog outputs: 1
Measuring range	[°F]	-58...302
Process connection		threaded connection 1/4" NPT
Installation length EL	[mm]	25
Application		
System		gold-plated contacts
Measuring element		1 x Pt 1000; (to DIN EN 60751, class A)
Media		liquids and gases
Pressure rating	[bar]	400
Note on pressure rating		sensor When mounted in adapters the specifications of the adapter data sheet apply.
MAWP (for applications according to CRN)	[bar]	400
Electrical data		
Operating voltage	[V]	18...32 DC; (cULus - Class 2 source required)
Current consumption	[mA]	< 50
Protection class		III
Reverse polarity protection		yes
Power-on delay time	[s]	1
Inputs / outputs		
Number of inputs and outputs		Number of analog outputs: 1
Outputs		
Total number of outputs		1
Output signal		analog signal; IO-Link; (configurable)
Number of analog outputs		1
Analog current output	[mA]	4...20
Max. load	[Ω]	250; ((18...19 V); 19...32 V: 300 Ω)
Short-circuit protection		yes
Overload protection		yes

TA2603

Temperature transmitter

TA025FLEN14-A-ZVG/US

Measuring/setting range			
Measuring range	[°F]	-58...302	
Factory setting		0...300 °F	
Resolution			
Resolution of analog output	[K]	0.04	
Accuracy / deviations			
Precision analog output	[K]	± 0,3 + (± 0,1 % MS)	
Temperature coefficient [% of the span / 10 K]		0,1; (In case of deviation from the reference condition 25 ± 5 °C)	
Reaction times			
Dynamic response T05 / T09	[s]	1 / 3	
Interfaces			
Communication interface		IO-Link	
Transmission type		COM2 (38,4 kBaud)	
IO-Link revision		1.1	
Operating conditions			
Ambient temperature	[°C]	-25...80	
Storage temperature	[°C]	-40...100	
Protection		IP 67; IP 68; IP 69K	
Tests / approvals			
EMC		DIN EN 61000-6-2	
Shock resistance		DIN IEC 68-2-27	50 g (11 ms)
Vibration resistance		DIN IEC 68-2-6	20 g (10...2000 Hz)
MTTF	[years]	572	
UL approval		UL approval number	K002
Mechanical data			
Weight	[g]	87.5	
Dimensions	[mm]	Ø 18.7	
Material		stainless steel (1.4404 / 316L); PEI; FKM	
Materials (wetted parts)		stainless steel (1.4404 / 316L)	
Process connection		threaded connection 1/4" NPT	
Probe diameter	[mm]	6	
Installation length EL	[mm]	25	
Displays / operating elements			
Display		operating status	1 x LED, green
Remarks			
Remarks		MS = set measuring span	
Pack quantity		1 pcs.	
Electrical connection			

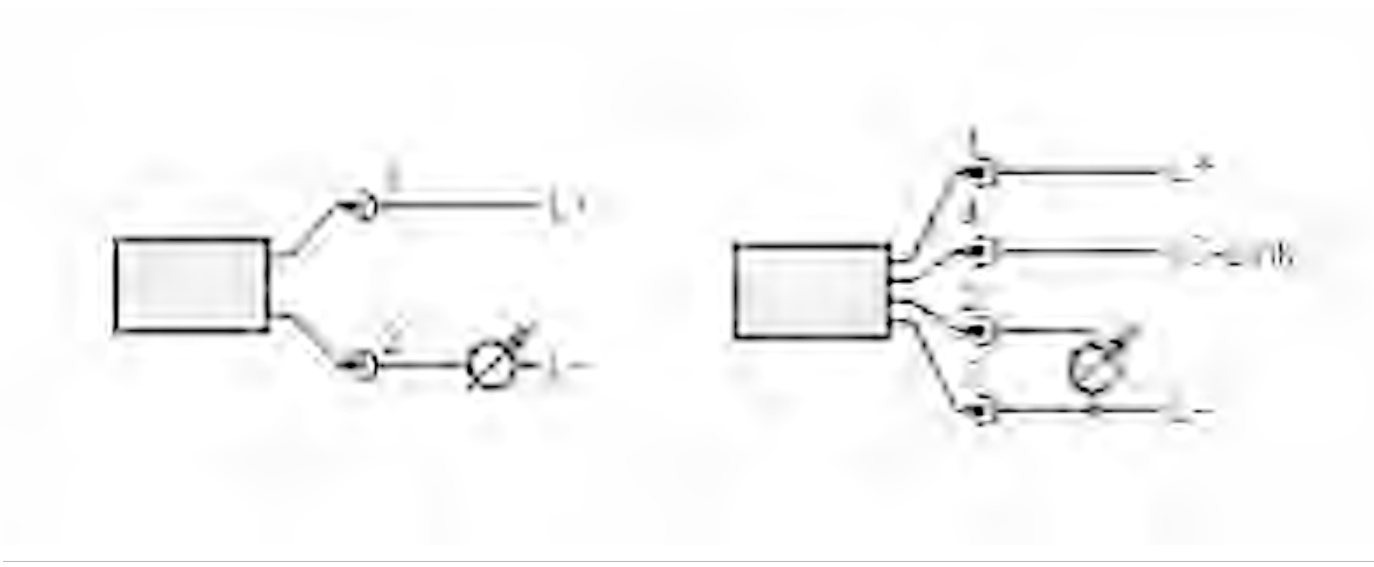
Connector: 1 x M12; Contacts: gold-plated

TA2603

Temperature transmitter

TA025FLEN14-A-ZVG/US

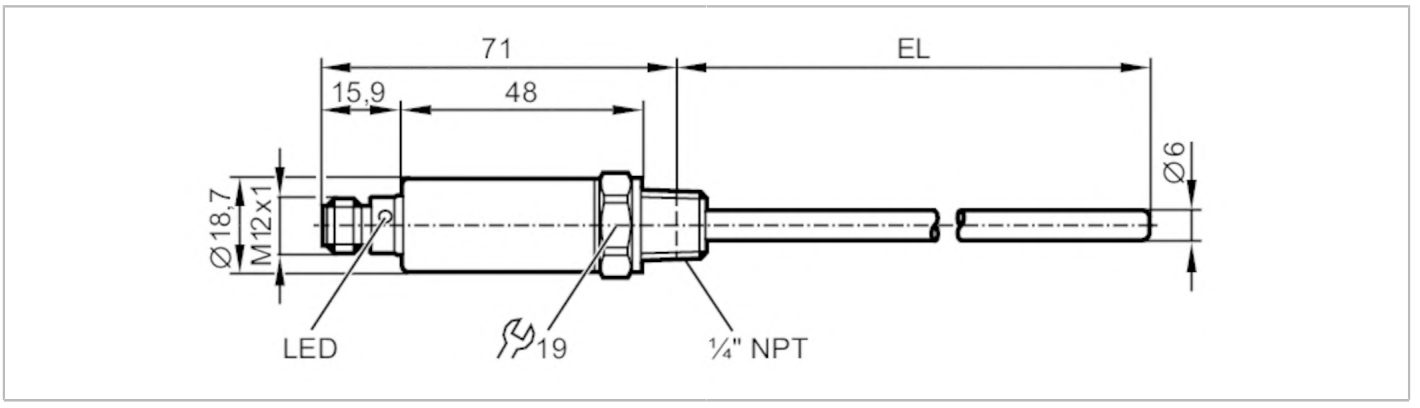
Connection



TA2613

Temperature transmitter

TA050FLEN14-A-ZVG/US



Product characteristics		
Number of inputs and outputs		Number of analog outputs: 1
Measuring range	[°F]	-58...302
Process connection		threaded connection 1/4" NPT
Installation length EL	[mm]	50
Application		
System		gold-plated contacts
Measuring element		1 x Pt 1000; (to DIN EN 60751, class A)
Media		liquids and gases
Pressure rating	[bar]	400
Note on pressure rating		sensor When mounted in adapters the specifications of the adapter data sheet apply.
MAWP (for applications according to CRN)	[bar]	400
Electrical data		
Operating voltage	[V]	18...32 DC; (cULus - Class 2 source required)
Current consumption	[mA]	< 50
Protection class		III
Reverse polarity protection		yes
Power-on delay time	[s]	1
Inputs / outputs		
Number of inputs and outputs		Number of analog outputs: 1
Outputs		
Total number of outputs		1
Output signal		analog signal; IO-Link; (configurable)
Number of analog outputs		1
Analog current output	[mA]	4...20
Max. load	[Ω]	250; ((18...19 V); 19...32 V: 300 Ω)
Short-circuit protection		yes
Overload protection		yes

TA2613

Temperature transmitter

TA050FLEN14-A-ZVG/US

Measuring/setting range			
Measuring range	[°F]	-58...302	
Factory setting		0...300 °F	
Resolution			
Resolution of analog output	[K]	0.04	
Accuracy / deviations			
Precision analog output	[K]	± 0,3 + (± 0,1 % MS)	
Temperature coefficient [% of the span / 10 K]		0,1; (In case of deviation from the reference condition 25 ± 5 °C)	
Reaction times			
Dynamic response T05 / T09	[s]	1 / 3	
Interfaces			
Communication interface		IO-Link	
Transmission type		COM2 (38,4 kBaud)	
IO-Link revision		1.1	
Operating conditions			
Ambient temperature	[°C]	-25...80	
Storage temperature	[°C]	-40...100	
Protection		IP 67; IP 68; IP 69K	
Tests / approvals			
EMC		DIN EN 61000-6-2	
Shock resistance		DIN IEC 68-2-27	50 g (11 ms)
Vibration resistance		DIN IEC 68-2-6	20 g (10...2000 Hz)
MTTF	[years]	572	
UL approval		UL approval number	K002
Mechanical data			
Weight	[g]	92	
Dimensions	[mm]	Ø 18.7	
Material		stainless steel (1.4404 / 316L); PEI; FKM	
Materials (wetted parts)		stainless steel (1.4404 / 316L)	
Process connection		threaded connection 1/4" NPT	
Probe diameter	[mm]	6	
Installation length EL	[mm]	50	
Displays / operating elements			
Display		operating status	1 x LED, green
Remarks			
Remarks		MS = set measuring span	
Pack quantity		1 pcs.	
Electrical connection			

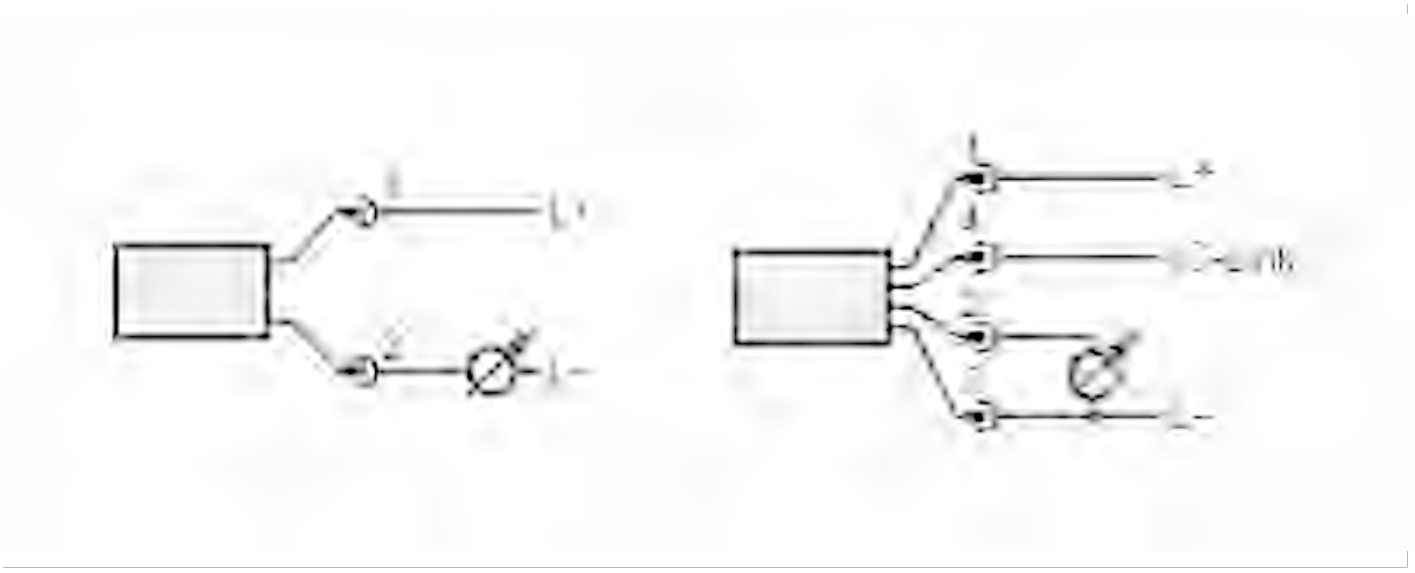
Connector: 1 x M12; Contacts: gold-plated

TA2613

Temperature transmitter

TA050FLEN14-A-ZVG/US

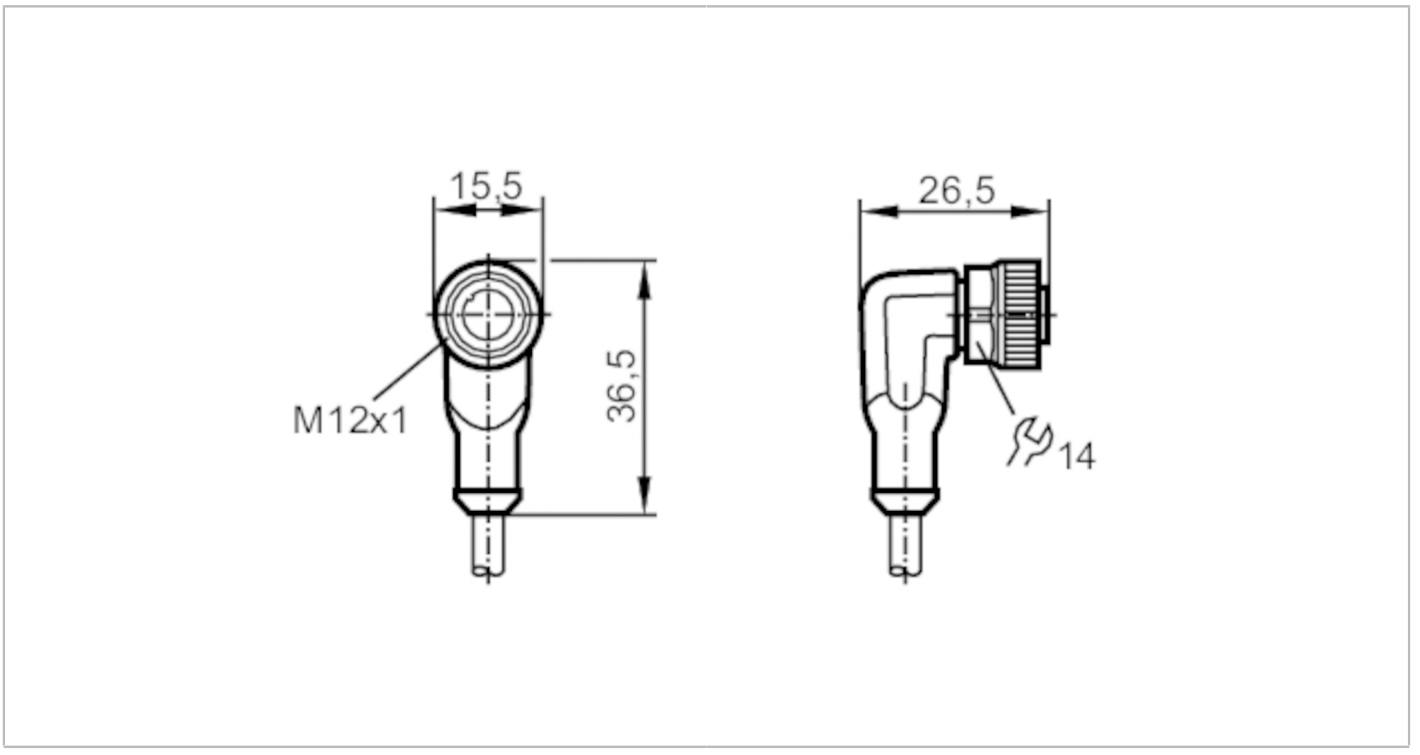
Connection



EVC005

Female cordset

ADOAH040MSS0005H04



Application		
Free from silicone		yes
Electrical data		
Operating voltage	[V]	< 250 AC / < 300 DC
Protection class		II
Max. current load total	[A]	4
Operating conditions		
Ambient temperature	[°C]	-25...90
Note on ambient temperature		cULus: ...75
Ambient temperature (moving)	[°C]	-25...90
Note on ambient temperature (moving)		cULus: ...75
Protection		IP 65; IP 67; IP 68; IP 69K
Mechanical data		
Weight	[g]	176.6
Dimensions	[mm]	26.5 x 15.5 x 36.5
Material		housing: TPU (urethane) orange; sealing: FKM
Material nut		brass, nickel-plated
Drag chain suitability		yes
Drag chain suitability		Bending radius for flexible applications: min. 10 x cable diameter
		Travel speed: max. 3.3 m/s for a horizontal travel length of 5 m and max. acceleration of 5 m/s²
		Bending cycles: > 5 Mio.
		Torsional strain: ± 180 °/m

EVC005

Female cordset

ADOAH040MSS0005H04

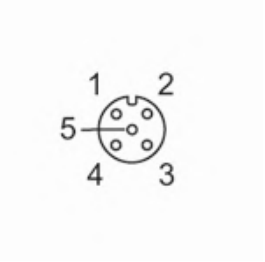
Remarks	
Pack quantity	1 pcs.

Electrical connection

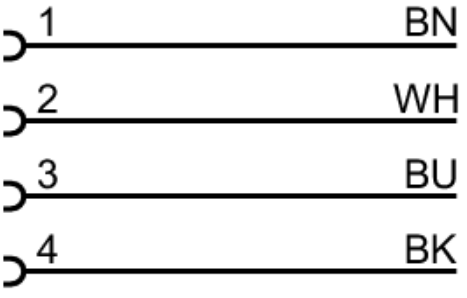
Cable: 5 m, PUR, Halogen-free, black, Ø 4.9 mm; 4 x 0.34 mm² (42 x Ø 0.1 mm)

Electrical connection - Socket

Connector: 1 x M12, angled; Locking: brass, nickel-plated; Contacts: gold-plated; Tightening torque: 0.6...1.5 Nm



Connection



	Core colors :
BK =	black
BN =	brown
BU =	blue
WH =	white

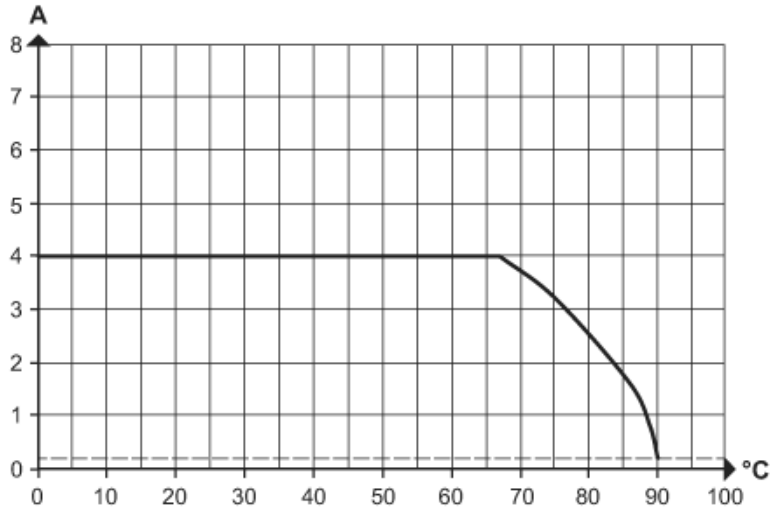
EVC005

Female cordset

ADOAH040MSS0005H04

Diagrams and graphs

Characteristic curve for derating



Derating Imax * 0.8 (DIN EN 60512-5-2)

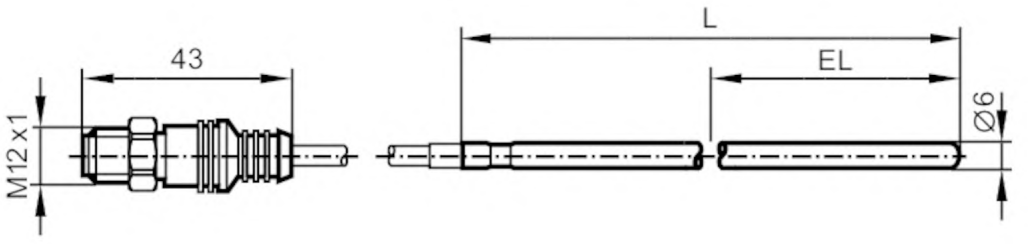
X Ambient temperature [°C]

Y Current [A]

TS2452

Temperature cable sensor with process connection

TS-200KLKD06 .../US



1 connection area, see remark

Product characteristics			
Measuring range		-100...600 °C	-148...1112 °F
Process connection		Diameter Ø 6 mm	
Installation length EL	[mm]	100; (medium temperatures < 200 °C: 150)	
Application			
Measuring element		1 x Pt 100; (to DIN EN 60751, class A)	
Media		liquids and gases	
Minimum installation depth	[mm]	15	
Electrical data			
Protection class		III	
Measuring/setting range			
Probe length L	[mm]	150	
Measuring range		-100...600 °C	-148...1112 °F
Accuracy / deviations			
Accuracy	[K]	± (0,15 K + 0,002 x |t|)	
Reaction times			
Dynamic response T05 / T09	[s]	12 / 34; (according to DIN EN 60751)	
Operating conditions			
Protection		IP 67	
Tests / approvals			
MTTF	[years]	11415.5	
Mechanical data			
Weight	[g]	87	
Dimensions	[mm]	Ø 6	
Material		stainless steel (1.4571/316Ti); PFA/PTFE	
Materials (wetted parts)		stainless steel (1.4571/316Ti)	
Process connection		Diameter Ø 6 mm	
Probe diameter	[mm]	6	
Installation length EL	[mm]	100; (medium temperatures < 200 °C: 150)	
Remarks			
Remarks		The values for accuracy apply to flowing water.	
Pack quantity		1 pcs.	

TS2452

Temperature cable sensor with process connection

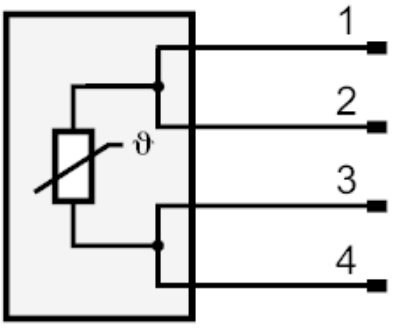
TS-200KLKD06 .../US

Electrical connection

Cable: 2 m, PTFE; temperature-resistant up to 250°C

Connector: 1 x M12

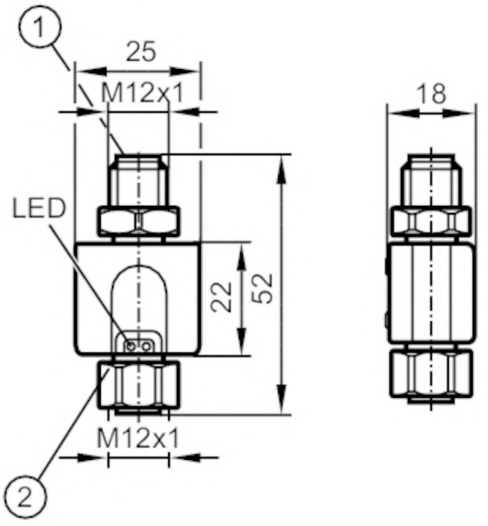
Connection



TP3232

Evaluation unit for PT100/PT1000 temperature sensors

TP- CEC -A-ZVG/US/



1 connection for voltage supply and output signals
2 connection for temperature sensor

Product characteristics			
Number of inputs and outputs		Number of analog outputs: 1	
Measuring range		-50...300 °C	-58...572 °F
Application			
System		gold-plated contacts	
Application		for Pt100 and Pt1000 measuring elements	
Electrical data			
Operating voltage	[V]	20...32 DC	
Protection class		III	
Reverse polarity protection		yes	
Power-on delay time	[s]	1	
Integrated watchdog		yes	
Inputs / outputs			
Number of inputs and outputs		Number of analog outputs: 1	
Outputs			
Total number of outputs		1	
Output signal		analog signal; IO-Link; (configurable)	
Number of analog outputs		1	
Analog current output	[mA]	4...20	
Max. load	[Ω]	300	
Short-circuit protection		yes	
Type of short-circuit protection		yes (non-latching)	
Overload protection		yes	
Measuring/setting range			
Measuring range		-50...300 °C	-58...572 °F
Factory setting		-50...300 °C	

TP3232

Evaluation unit for PT100/PT1000 temperature sensors

TP- CEC -A-ZVG/US/

Accuracy / deviations			
Precision analog output	[K]	± 0,3 + (± 0,1 % MS)	
Temperature coefficient [% of the span / 10 K]		0,1	
Reaction times			
Max. measuring/display cycle	[ms]	100	
Interfaces			
Communication interface		IO-Link	
Transmission type		COM2 (38,4 kBaud)	
IO-Link revision		1.0	
Operating conditions			
Ambient temperature	[°C]	-25...70	
Storage temperature	[°C]	-40...85	
Protection		IP 67	
Tests / approvals			
EMC		EN 61326-1	
Shock resistance		DIN IEC 68-2-27	50 g (11 ms)
Vibration resistance		DIN IEC 68-2-6	20 g (10...2000 Hz)
MTTF	[years]	449	
Mechanical data			
Weight	[g]	40.5	
Dimensions	[mm]	M12 x 1	
Thread designation		M12 x 1	
Material		PA; PET; sealing: FKM; knurled nut: stainless steel (1.4404 / 316L); plug: TPU (urethane)	
Material nut		stainless steel (1.4404 / 316L)	
Remarks			
Remarks		cULus - Class 2 source required MS = set measuring span	
Pack quantity		1 pcs.	

Electrical connection

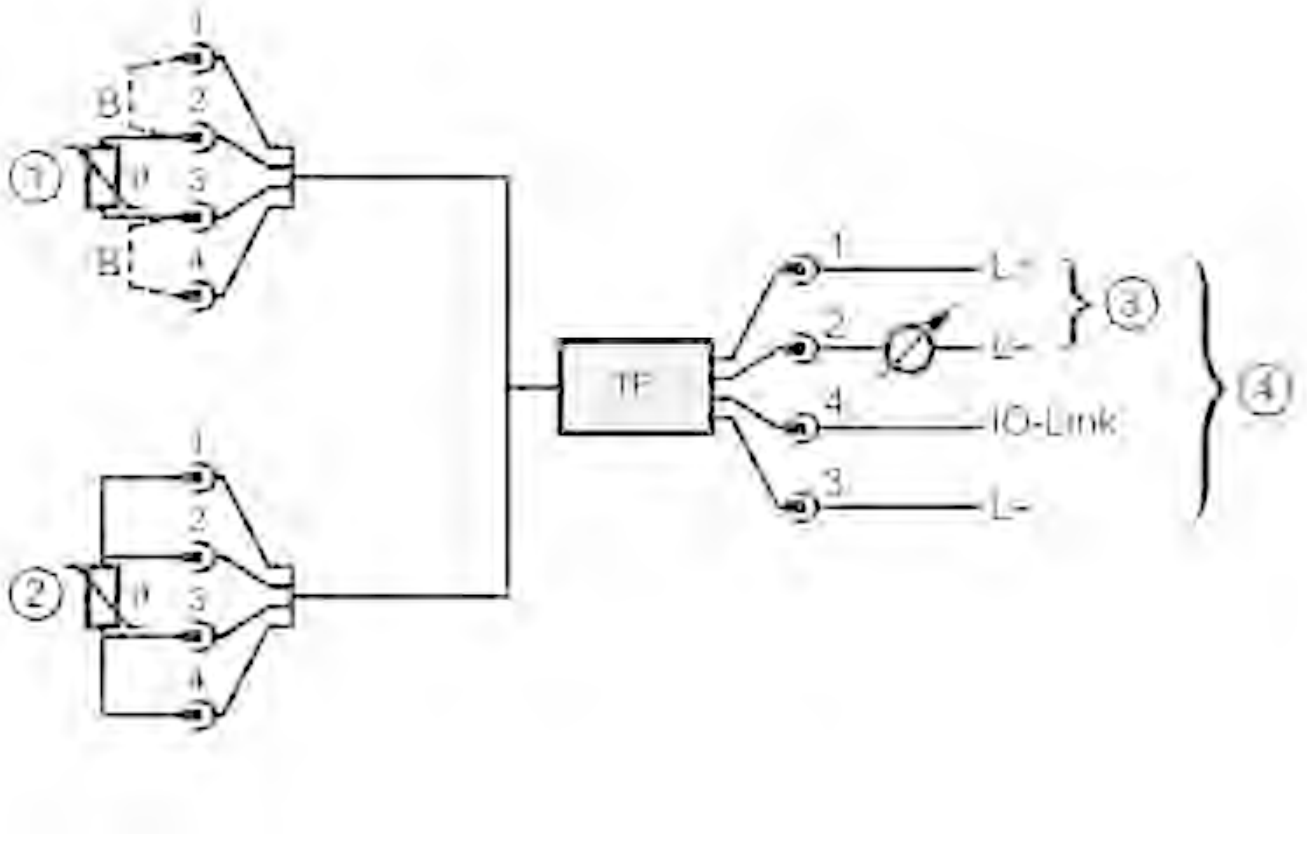
Connector: 1 x M12; Moulded body: TPU (urethane); Locking: stainless steel (1.4404 / 316L); Contacts: gold-plated

TP3232

Evaluation unit for PT100/PT1000 temperature sensors

TP- CEC -A-ZVG/US/

Connection

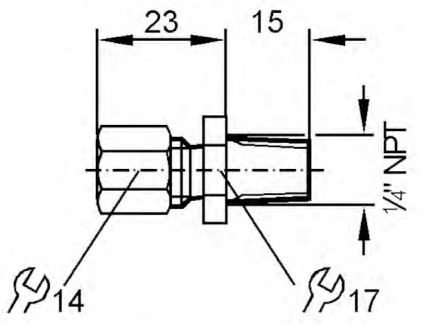


1:	Two-wire sensor
2:	Four-wire sensor
3:	Operation as 2-wire temperature transmitter
4:	Operation as 3-wire unit, IO-Link communication possible
B:	bridge

E30049

Compression fitting for temperature sensors

PROGRESSIVE RG FITTING D6 NPT



Application		
Pressure rating	[bar]	50
Tests / approvals		
Pressure equipment directive		A possible classification to PED depends on the application and has to be carried out by the user / operator.
Safety instructions		The compatibility between medium and product material has to be checked in all applications.
Mechanical data		
Weight	[g]	42.5
Material		stainless steel (1.4571/316Ti)
Sensor connection		Ø 6 mm
Process connection		1/4 NPT
Remarks		
Pack quantity		1 pcs.

BIMETAL THERMOMETERS

- External Reset Feature for Field Recalibration (3" & 5")
- 9 Dual Scale Ranges to 1,000°F (525°C)
- Hermetically Sealed Case Design
- 2", 3" and 5" Dials
- Stem Lengths to 24"
- 1% Full Scale Accuracy

Marsh Instruments Bimetal Thermometers combine the benefits of economy and reliability for local mounted temperature indication in the dual scale ranges from -50° to 1,000°F (-40° to 525°C). Additional advantages offered by the Series "L" Bimetal Thermometers include an easy-to-read dual scale, fast speed of response, and accurate temperature indication. The hermetically sealed and ruggedly built case is resistant to shock, vibration, dust and moisture. Corrosion resistance to most chemicals is provided by the all welded type 304 Stainless Steel construction. The extremely responsive bimetal sensing element provides an accuracy to within ±1% of scale. An external adjustment screw on the back of the 3" and 5" case provides convenient reset and field recalibration. Built-in over range protection is a standard feature.

Typical applications include process, offshore, power, chemical industries, HVAC and OEM applications.

SPECIFICATIONS

ACCURACY
±1% of span throughout entire range for 2" immersion in liquids, 4" in gases

CASE SIZES
2", 3", and 5" sizes

CASE MATERIAL
304 Stainless steel

STEM
2½", 4", 6", 9", 12", 15", 18" & 24" Stainless Steel; ¼" diameter

CONNECTIONS
¼" NPT: CB–Center Back connection (2" case only)
½" NPT: CB–Center Back connection or AJ–Adjustable connection (3" & 5")

DIALS
Dual scale in degrees Celsius and Fahrenheit

WINDOW
Glass, hermetically sealed

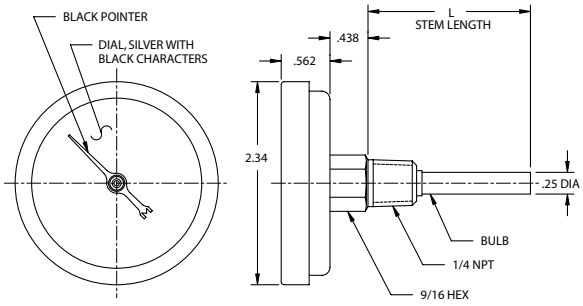
STANDARD RANGES & PART NUMBERS

TYPE	BIMETAL THERMOMETERS					
Size	2"					
Connection	¼ NPT					
Mounting	CB	CB	CB	CB	CB	
Stem Length	2½"	4"	6"	9"	12"	
-50° to 120°F /-40° to 50°C	L11101	L11201	L11301	L11401	L11501	
-40° to 160°F /-40° to 70°C	L11102	L11202	L11302	L11402	L11502	
0° to 200°F /-20° to 90°C	L11104	L11204	L11304	L11404	L11504	
0° to 250°F /-20° to 120°C	L11105	L11205	L11305	L11405	L11505	
50° to 300°F / 10° to 150°C	L11106	L11206	L11306	L11406	L11506	
50° to 400°F / 10° to 200°C	L11107	L11207	L11307	L11407	L11507	
50° to 550°F / 10° to 300°C	L11108	L11208	L11308	L11408	L11508	
150° to 750°F / 70° to 400°C	L11110	L11210	L11310	L11410	L11510	
200° to 1000°F / 100° to 525°C	L11111	L11211	L11311	L11411	L11511	
Size	3"					
Connection	½ NPT					
Mounting	CB	CB	CB	CB	CB	CB
Stem Length	2½"	4"	6"	9"	12"	15"
-50° to 120°F /-40° to 50°C	L31101	L31201	L31301	L31401	L31501	L31601
-40° to 160°F /-40° to 70°C	L31102	L31202	L31302	L31402	L31502	L31602
0° to 200°F /-20° to 90°C	L31104	L31204	L31304	L31404	L31504	L31604
0° to 250°F /-20° to 120°C	L31105	L31205	L31305	L31405	L31505	L31605
50° to 300°F / 10° to 150°C	L31106	L31206	L31306	L31406	L31506	L31606
50° to 400°F / 10° to 200°C	L31107	L31207	L31307	L31407	L31507	L31607
50° to 550°F / 10° to 300°C	L31108	L31208	L31308	L31408	L31508	L31608
150° to 750°F / 70° to 400°C	L31110	L31210	L31310	L31410	L31510	L31610
200° to 1000°F / 100° to 525°C	L31111	L31211	L31311	L31411	L31511	L31611
Size	3" Adjustable Angle					
Connection	½ NPT					
–50° to 120°F/-40° to 50°C	L33101	L33201	L33301	L33401	L33501	L33601
–40° to 160°F/-40° to 70°C	L33102	L33202	L33302	L33402	L33502	L33602
0° to 200°F/-20° to 90°C	L33104	L33204	L33304	L33404	L33504	L33604
0° to 250°F/-20° to 120°C	L33105	L33205	L33305	L33405	L33505	L33605
50° to 300°F/ 10° to 150°C	L33106	L33206	L33306	L33406	L33506	L33606
50° to 400°F/ 10° to 200°C	L33107	L33207	L33307	L33407	L33507	L33607
50° to 550°F/ 10° to 300°C	L33108	L33208	L33308	L33408	L33508	L33608
150° to 750°F/ 70° to 400°C	L33110	L33210	L33310	L33410	L33510	L33610
200° to 1000°F/ 100° to 525°C	L33111	L33211	L33311	L33411	L33511	L33611

STANDARD RANGES & PART NUMBERS

TYPE	BIMETAL THERMOMETERS							
Size	5″							
Connection	½ NPT							
Mounting	CB	CB	CB	CB	CB	CB	CB	CB
Stem Length	2½″	4″	6″	9″	12″	15″	18″	24″
–50° to 120°F/-40° to 50°C	L51101	L51201	L51301	L51401	L51501	L51601	L51701	L51801
–40° to 160°F/-40° to 70°C	L51102	L51202	L51302	L51402	L51502	L51602	L51702	L51802
0° to 200°F/-20° to 90°C	L51104	L51204	L51304	L51404	L51504	L51604	L51704	L51804
0° to 250°F/-20° to 120°C	L51105	L51205	L51305	L51405	L51505	L51605	L51705	L51805
50° to 300°F/ 10° to 150°C	L51106	L51206	L51306	L51406	L51506	L51606	L51706	L51806
50° to 400°F/ 10° to 200°C	L51107	L51207	L51307	L51407	L51507	L51607	L51707	L51807
50° to 550°F/ 10° to 300°C	L51108	L51208	L51308	L51408	L51508	L51608	L51708	L51808
150° to 750°F/ 70° to 400°C	L51110	L51210	L51310	L51410	L51510	L51610	L51710	L51810
200° to 1000°F/ 100° to 525°C	L51111	L51211	L51311	L51411	L51511	L51611	L51711	L51811
Size	5″ Adjustable Angle							
Connection	½ NPT							
Mounting	AJ	AJ	AJ	AJ	AJ	AJ	AJ	AJ
Stem Length	2½″	4″	6″	9″	12″	15″	18″	24″
–50° to 120°F/-40° to 50°C	L53101	L53201	L53301	L53401	L53501	L53601	L53701	L53801
–40° to 160°F/-40° to 70°C	L53102	L53202	L53302	L53402	L53502	L53602	L53702	L53802
0° to 200°F/-20° to 90°C	L53104	L53204	L53304	L53404	L53504	L53604	L53704	L53804
0° to 250°F/-20° to 120°C	L53105	L53205	L53305	L53405	L53505	L53605	L53705	L53805
50° to 300°F/ 10° to 150°C	L53106	L53206	L53306	L53406	L53506	L53606	L53706	L53806
50° to 400°F/ 10° to 200°C	L53107	L53207	L53307	L53407	L53507	L53607	L53707	L53807
50° to 550°F/ 10° to 300°C	L53108	L53208	L53308	L53408	L53508	L53608	L53708	L53808
150° to 750°F/ 70° to 400°C	L53110	L53210	L53310	L53410	L53510	L53610	L53710	L53810
200° to 1000°F/ 100° to 525°C	L53111	L53211	L53311	L53411	L53511	L53611	L53711	L53811

L11XXX



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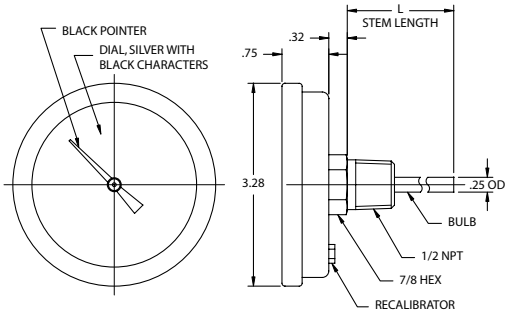

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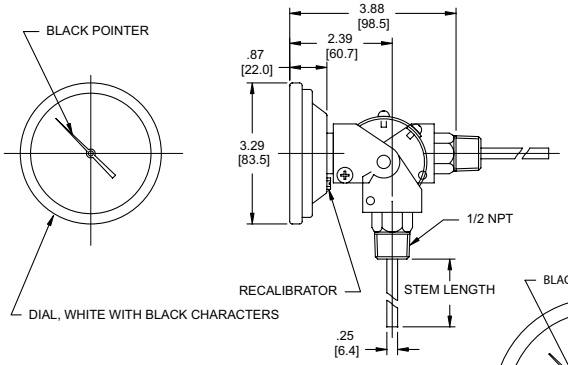

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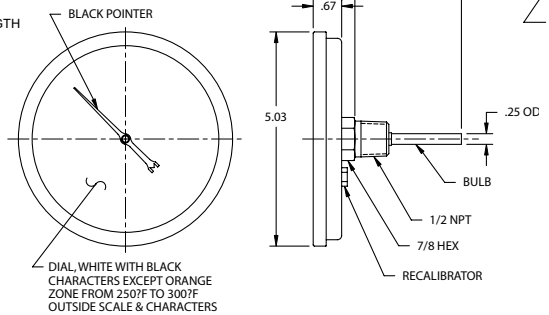

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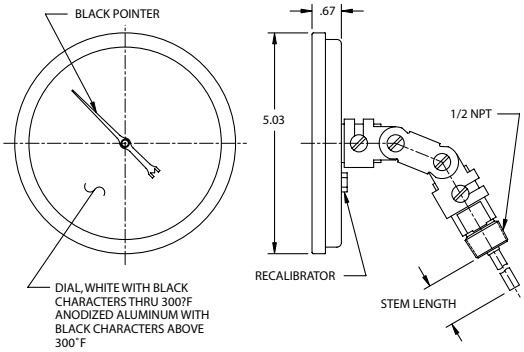

ALL DIMENSIONS ARE NOMINAL

ATTACHMENT 3

Standard Operation Procedure

Dual-Phase Extraction

Standard Operating Procedures

Chevron Environmental Management Company

July 2015
Version 1.0

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1.0 Introduction

1.1 Purpose

This standard operating procedure (SOP) document provides standard practices that Chevron Environmental Management Company (EMC) Marketing Business Unit (MBU) requires remediation contractors to follow who operate dual-phase extraction systems (DPE), a common configuration used for multi-phase extraction (MPE) systems in Chevron. The standards established in this document apply to operational DPE systems, and include monitoring, optimization, and performance reporting. Management of two-phase extraction system (TPE) configurations (MPE systems using a drop-tube to lift both water and air) will also follow a similar set of SOPs and data reporting sheets. However, project teams operating TPE systems require some modifications to the SOP and data reporting requirements that go beyond the scope of this document. Project teams operating TPE systems will develop site-specific SOP and data reporting plans via engagement and concurrence with the Remediation Advisor prior to startup. These procedures should improve operating efficiency for MBU projects by providing consistent operational standards, collection of necessary performance data, and communication of performance data and issues with MBU Remediation Advisors (Remediation Advisor).

1.2 Document Scope

This document lists and describes requirements for DPE system startup, operation and maintenance, optimization, and system shutdown. Operating or reporting outside of procedures listed herein and described in the Chevron EMC MPE Guidance document (2008) requires prior review and approval of the Remediation Advisor.

1.3 Revisions

The DPE SOP shall be reviewed every three years by SMEs in the required field, and utilize the EMC Management of Change (MOC) Process when revisions are required to ensure SOPs are current and accurate. In addition, the DPE SOP shall include revision dates and acceptance from the Remediation Advisor. The Remediation Advisor will maintain the System Optimization and Shutdown SharePoint site to ensure information is current.

2.0 Procedures

The following procedures require data reporting to MBU as well as notification to MBU when the system is not operating in accordance with specifications described herein. System data and updated groundwater monitoring reports will be sent to MBU on a quarterly basis via the System Optimization and Shutdown SharePoint site. Validation and verification of the adherence to the identified SOP shall be done by the Remediation Advisor during review of quarterly data reports. The business partner project manager or delegated technical staff will send e-mail notification of system performance issues as requested in sections of this document to the Remediation Advisor and copy the MBU Project Manager. Validation and verification of the adherence to the identified SOP shall be done by the Remediation Advisor during review of quarterly data reports.

A timeline of system operational phases and procedures described in this document is displayed as **Figure 1**.

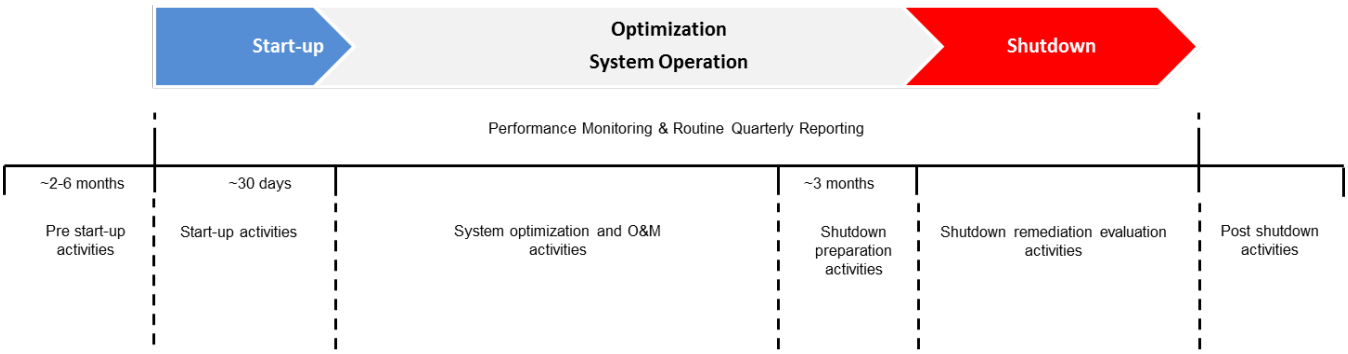

Figure 1: DPE System Operational Phases and Procedures

This SOP and associated Data Reporting sheets are meant to be used for Chevron review of remediation system performance. In particular, the Data Reporting sheets were not developed as a replacement for the O&M deliverable required by the regulatory agency. Prior to startup, the project team will obtain Chevron Project Manager review and concurrence on system data that will be submitted to the agency to meet remediation reporting requirements. Note on using the system Data Reporting sheets:

- Add new rows and columns by copying existing formatted rows and columns to preserve format and calculations; and
- Do not insert graphs or text in the system data reporting tabs outside of the specified cells. New tabs can be created for project team use. Footnotes can be placed in cell comment boxes

2.2 Remedial Objectives

Remedial Objectives for active remediation will be documented prior to system installation at the site. Remedial objectives should be approved by the MBU Decision Executive (DE) and agreed upon with the regulatory agency prior to system installation. It is critical to specify active remediation objectives, which may not be the same as shutdown objectives, and also to specify with the regulatory agency that the project team will attempt to achieve these objectives to the extent practicable. With demonstration that remedial objectives have been achieved or that active remediation has been applied to extent practicable, the project team will request closure or a change from an active source removal approach to a more cost-effective remedial approach to achieve site closure objectives. Remedial objectives will be documented in the Data Reporting Sheets - Remedial Objectives section.

Active remediation objectives should be specified, when applicable, in terms of numerical values, trend characteristics, or other objectives at specific sampling locations that will be used by the agency to judge remediation success for groundwater, soil, and/or soil vapor media. If confirmation soil borings will be required by the agency post-remediation, the project team will get agency input concerning planned sampling locations, and obtain baseline data in those locations if no prior soil data exists. The project team will document the specific soil and groundwater sampling and/or groundwater and soil vapor monitoring locations which the agency will use to evaluate remedial success (these locations are referred to in the SOP as performance monitoring points, and include extraction well locations). Groundwater and vacuum influence data will be collected from designated groundwater and/or soil vapor observation points, respectively. **All groundwater wells required by the agency for assessing remedial objectives shall be installed prior to system installation**, and baseline groundwater concentrations collected prior to system startup. Soil vapor monitoring points that the agency will require to support assessment of a soil vapor remedial objective will be installed and sampled before system startup (refer to the 2013 Chevron EMC Soil Vapor & Indoor Air Sampling Technical Toolkit). The project

team will contact the Remediation Advisor before installing additional monitoring points NOT required by the agency for assessing remediation success.

2.2.1 Performance Criteria

Standard performance criteria deemed critical for efficiently achieving DPE remediation objectives include:

- Maintain fully dewatered condition in extraction wells;
- Apply high vacuum to extraction wells;
- Proactive system optimization to maximize mass recovery rate (up to safe operational capacity of the vapor treatment unit); and
- Operation management to cost-effectively minimize unplanned system downtime.

2.2.2 Performance Monitoring

Performance monitoring includes data collection and assessment activities used to demonstrate that DPE system operation is meeting performance criteria and progressing efficiently towards system shutdown criteria. If the data indicate performance criteria are not being met during system operation, the project team will implement cost-effective actions (system operation or design modification) to achieve performance criteria as soon as practical.

- DPE Wells: Monitor depth to water, groundwater extraction flow rate, vacuum, airflow rate, and VOC influent concentrations; calculate extraction well VOC mass removal rates for system optimization;
- SVE System: Monitor vacuum, airflow rates, and VOC influent concentrations; calculate system mass removal rate trends;
- GWET System: Monitor cumulative flow and system flow rate;
- OBS Wells: At sites where remedial objectives will be measured at points other than extraction wells, water level and vacuum in observation wells should be monitored and documented to establish dewatering and vacuum ROI;
    - For cases where soil vapor compliance is an issue, VOC concentrations should be periodically sampled at soil vapor performance monitoring points and documented in the Data Reporting Sheets – OBS Wells;
- Monitor system downtime and seek assistance from the Remediation Advisor if a situation causing unplanned downtime cannot be resolved within a timely manner.

2.2.3 Shutdown Criteria

The project team will discuss and document system shutdown criteria for the DPE system with the agency prior to system installation, to ensure agreement on the technical basis for system performance monitoring and accelerate shutdown approval at the end of system operation. The project team will also get regulator input on other shutdown acceptance requirements prior to installation, such as rebound testing.

Shutdown criteria for a DPE system should be based on:

- Achieving active remediation objectives, or
- Achieving a low asymptotic mass removal rate for the system if remedial objectives have not been met. At that point, the practical limit of cost-effective operation of the DPE system to remove VOC source mass has been reached.
    - Demonstration may require SVE VOC mass recovery rebound evaluation. The project team should prepare analysis of system data to document system optimization to extent practicable.

The project team may seek opportunities to temporarily shut down the DPE system prior to achieving low asymptotic mass recovery rates to determine whether remedial objectives have been achieved. If remedial objectives have been achieved, no further system operation is warranted and permanent system shutdown should be requested at that time. However, once the system achieves low asymptotic mass removal rates, the project team should seek permanent system shutdown approval from the regulator regardless of groundwater and soil concentrations, based on data demonstrating that the system has reached its practical limit for source remediation.

If active remediation objectives have not been achieved after the system has achieved a low asymptotic mass recovery rate and further active remediation is required, **the project team will meet with RSRT to discuss alternatives**.

2.2 System Construction and Operation Database

A database of system and well construction details will be maintained for the DPE system on the System Optimization and Shutdown (SOS) SharePoint site. Items to be uploaded include:

- An as-built system P&ID in both AutoCAD and pdf format;
- A detailed equipment list in MS Excel format with the model and manufacturer of the equipment;
- A site map depicting the remediation well network, associated piping/lines, and all other existing wells on the site in pdf format;
- Remediation System Data reporting workbook;
- Groundwater monitoring analytical data exported out of EIM in MS Excel format, and RSRT specific EIM report template;
- A MS Word version of the System O&M Manual;
- System operation status information; and
- A completed remediation system operation and maintenance lean sigma tool.

At each extraction well location, the following equipment will be installed and documented in the as-built system design:

- A piezometer or drop tube, installed to allow periodic verification of well dewatering to actuation level of pump; deviation requires review and concurrence from the Remediation Advisor; and
- A cycle counter, installed in-line with the air supply hose to each extraction pump.

2.3 Pre-Startup Activities

2.3.1 Baseline Observations

Prior to system start-up, perform the procedures listed below.

1. Document well construction details on the Data Reporting Sheet – Well Construction tab:
    - Well Identifier (OBS-01, DPE-01, etc.);
    - Well Type (DPE well composed of groundwater extraction and vapor extraction components, and OBS for observation well used for evaluating system performance);
    - Casing Diameter (in.);
    - Depth to Top of Casing (ft. relative to ground surface/well pad);
    - Depth to Top of Screened Interval (ft. btoc);
    - Depth to Bottom of Screened Interval (ft. btoc);
    - Total Depth (ft. btoc); measured in each well with a water level meter;

- Pump type and configuration (e.g., top- or bottom-loading); and
- Drop Tube Installed in Well (yes/no) for product volatilization.

2. Document remedial performance monitoring points (e.g., DPE and/or OBS wells) in the Data Reporting Sheets – Remedial Objectives section.
3. Collect groundwater samples from all wells in the remediation area to determine concentrations **within two months of the planned startup** date to establish baseline concentrations prior to system startup;
    - Conduct at least two baseline sampling events for any newly installed OR modified wells;
        i. One sample will be taken after initial well purging and clean-up, and then a second sample on or preceding the date of startup; and
        ii. These data will be included in site groundwater monitoring reports.
4. Record the following DPE Wells parameters in the Data Reporting Sheets – Well Construction Database and DPE Wells GW:
    - DPE Depth to Water (ft. btoc); DTW measured with water level meter from each extraction well.
5. Record the following OBS Wells parameters in the Data Reporting Sheets – OBS Wells:
    - OBS Depth to Water (ft. btoc); DTW measured with water level meter;
    - OBS Depth to Product (ft. btoc); DTP measured with oil/water interface probe; and
    - Product Thickness (feet).

Note: If gasoline product is observed in OBS well(s) outside the operational influence of the system, the project team should consider expanding the treatment area to location(s) and seek Remediation Advisor input.

2.4 System Start-Up

DPE system start-up will proceed following agency notification and a Chevron EMC Process Safety and Facilities Design & Construction Operational Readiness Review (Chevron, 2015). D**o not start-up without prior system component verification by MBU or a designated representative.** Startup measurements and comments should be recorded in the Remediation System Data Reporting Sheets.

2.4.1 Start-Up: Procedures

Once the system is deemed ready for operation and agency notifications have been completed, the system should be started up and operated to observe whether the system performance is consistent with the design basis. Startup data will be recorded in the Data Reporting Sheets with "system start-up" noted in Comments column.

Start-up procedures are listed below.

1. Check position of all valves and control set points.
2. Start GWET system and verify smear zone dewatering by recording the following parameters in the DPE Wells GW sheet:
    - Pump Intake Depth (ft. btoc);
    - DPE GW Depth to Water (ft. btoc) in extraction well; and
    - Ensure GWET system is fully operational before proceeding.

    If the extraction well cannot be fully dewatered, contact the Remediation Advisor.
3. Prepare SVE system for initial operation by:
    - Open the manifold valve for each DPE well to 100% open;
    - Close the main manifold valve to the SVE system;
    - Open the manual dilution air valve 100% open to the ambient air; and

- Set the VFD, if equipped, to a lower output that will operate the SVE blower motor at a lower airflow rate.

4. Operation of the SVE system should increase vapor extraction/reduce dilution air to trigger the Catalytic Oxidizer (CATOX) auto-dilution valve to open. Adjust the VFD output to gradually increase the SVE blower output to the full airflow rate. Gradually open the SVE main manifold valve to induce vacuum on DPE wells and draw air from subsurface. Monitor oxidizer influent for vapor concentrations which may overwhelm the vapor treatment system (~15 % LEL for catalytic oxidizer; ~40% LEL for thermal oxidizer). Gradually close the manual air dilution valve to maintain oxidizer influent concentrations at the upper operation limit of the oxidizer. Record the following parameters in the SVE Total System and Oxidizer Unit field sheets:
    - Post-Blower Concentration (PID with dehumidifier tip, ppmv); or
    - Post-Blower Concentration (LEL, %) if PID concentration threshold is exceeded.
5. System airflow should be checked to ensure proper system operation and optimal mass recovery. Record the following SVE Total System parameters:
    - Pre-Blower Vacuum (in. Hg);
    - Post-Blower SVE Flow Rate (acfm);
    - Post-Blower Temperature (°F); and
    - Post-Blower Pressure (in. Hg).
6. During initial operation, vacuum is continuously applied to all DPE wells, or a selected subset of extraction wells, depending on the Project Team's intended optimization strategy. The manual dilution valve should be closed as soon as practicable to maximize system mass removal rates without overwhelming the vapor treatment system capacity.

Record the following parameters on the DPE Wells VE and SVE Total System sheets:

- DPE VE valve position (% open); and
- Manual dilution valve (open/closed).

7. Balance of system airflow between DPE VE wells should be checked and maintained to maximize extracted vapor concentrations/mass removal rates and maintainwellhead vacuums consistent with system design well (casing) vacuum objectives. Check the flow, vacuum, and vapor concentration, from each extraction well, and vacuum at the manifold for vacuum differential.

Record the following DPE Wells VE parameters:

- DPE VE flow (acfm);
- Well Vacuum (in. Hg);
- Manifold Vacuum (in. Hg); and
- DPE VE Concentration (ppmv).

8. Record CatOx data on CatOx tab.
9. Record vacuums and dewatering at extraction wells. Record the following DPE Wells - VE and DPE Wells - GW parameters:
    - Piezometer/Drop Tube Vacuum (in. Hg); and
    - DPE Well Fully Dewatered (yes/no); based on observed vacuum values in piezometer/drop tube.

    If the extraction well cannot be fully dewatered, contact the Remediation Advisor.

10. If there are additional remedial objective locations outside of the DPE well extraction network, record vacuums and dewatering at performance monitoring points. Record the following OBS Wells parameters:
    - Well Vacuum (in. Hg); and
    - Depth to Water (ft. btoc).
11. Compare operating data with equipment performance data for discrepancies. Record remediation system operational status on RSRT SOS Sharepoint Remediation Site Information summary:
    - Denote system is "In Operation", and in "Start-up Phase"; and

- Record date the system was put in operation (same as startup date).

The project moves from the start-up phase into the system operation & optimization phase once the system is fully operational and running reliably, the extraction wells are fully dewatered, the manual dilution valve is closed, and system VOC recovery is maximized. The project team will record the operational phase change in the RSRT Sharepoint SOS Remediation Site Information box:

- Change Operational Phase to "Optimization Phase"; and
- Record date that system moved into the optimization phase of operation.

2.5 System Operation and Maintenance

During routine operation and maintenance (O&M) site visits, monitoring data will be collected to track system performance and determine whether performance and/or shutdown criteria have been met. For DPE systems, a key O&M check is whether the extraction well is fully dewatered. If fully dewatered conditions cannot be achieved and sustained in extraction wells, the project team will implement timely maintenance actions. Maintenance and upkeep of the mechanical system shall be conducted in accordance with the manufacturer's recommendations for each mechanical component (blower, pump, gauges, etc.).

2.5.1 Data Collection Frequency and Reporting

Suggested schedule for recording remediation system data measurements is **weekly for the first month** of operation and **monthly** thereafter. Sampling of performance monitoring points should be conducted quarterly during system operation and shutdown periods, regardless of less frequent regulatory compliance site monitoring requirements. System and well monitoring frequencies may be modified to satisfy site-specific requirements and will be communicated to the Remediation Advisor prior to implementation.

The system data report and a groundwater monitoring report will be sent to the Remediation Advisor on a quarterly basis via the System Optimization and Shutdown SharePoint site.

2.5.2 System Performance Data Collection

Data to be collected during DPE operations from subsurface monitoring points, extraction wells, the aboveground GWET system, and the aboveground SVE system are listed in the following section and are further described in the Chevron EMC MPE Guidance document (2008).

2.5.2.1 GWET Total System

During monthly O&M site visits, the following parameters will be documented in the GWET Total System section of the Data Reporting Sheets:

- Date and Time (mm/dd/yy hh:mm);
- System Hour Meter (hours);
- No. Active DPE Extraction Wells (list number of wells);
- System Totalizer (for the current period, i.e. last visit to current visit);
- Cumulative Flow Removed (gal);
- System Flow Rate (gpm); and
- Comments (System Status).

2.5.2.2 SVE Total System

During monthly O&M site visits, the following parameters will be documented in the SVE Total System section of the Data Reporting Sheets:

- Date and Time (mm/dd/yy hh:mm);
- Active SVE Extraction Wells (list by Well ID);
- System Hour Meter (hours);
- Manual Dilution Valve (open/closed);
- Manifold vacuum (in. H_2O);
- Pre-Blower Vacuum (in. H_2O);
- Post-Blower Pressure (in. H_2O);
- Post-Blower Temperature (°F);
- SVE Flow Rate (post-blower) (acfm);
- Flow (pre-dilution) prior to manual dilution valve (acfm);
- Post-Blower Field VOC Concentration (PID with dehumidifier tip, ppmv);
- Post-Blower Field VOC Concentration measured with LEL if PID concentration threshold is exceeded (%);
- Post-Blower Laboratory VOC Concentration, collected in Tedlar bags, **submitted to the laboratory within 24-48 hours** per EPA recommendations, analyzed for total petroleum hydrocarbon (TPH) gasoline range using GC/MS according to EPA Method TO-15 **and reported in mg/m^3**;
- Mass Removal Rate (lbs/day), equation embedded in sheet for rate calculation;
- Cumulative Mass Removed (lbs), calculated as an average mass removal rate spanning current and previous operational periods; and
- Comments on the system operational status or any abnormal conditions.

2.5.2.3 DPE Wells – Groundwater Extraction Component (DPE Well – GW)

During monthly O&M site visits, the following parameters will be documented in the DPE Well - GW section of the Data Reporting Sheets:

- Date and Time (mm/dd/yy hh:mm);
- Pump Intake Depth (ft. btoc);
- Piezometer Depth (ft. btoc).
- DPE Well Fully Dewatered (yes/no); dewatering based on vacuum measurements in piezometer/drop tube;
- Counter Reading (counter #);
- Pump Cycle Volume (gal); refer to pump manufacturer specifications for cycle volume;
- DPE GW Discharge (current period) (gal);
- DPE GW Flow Rate (current period) (gpm); and
- Comments (Well Status).

2.5.2.4 DPE Wells – Vapor Extraction Component (DPE Well – VE)

During monthly O&M site visits, the following parameters will be documented in the DPE Well - VE section of the Data Reporting Sheets:

- Date and Time (mm/dd/yy hh:mm);
- DPE VE Valve Position (% open);
- Piezometer/Drop Tube Vacuum (in. Hg)
- Wellhead (casing) Vacuum for operating DPE wells (in. Hg);
- Manifold Vacuum (in. Hg);
- DPE VE Flow (at manifold) (acfm);
- DPE VE Field VOC Concentration (PID with dehumidifier tip, ppmv);
- DPE VE Field VOC Concentration measured with LEL if PID concentration threshold is exceeded (%);

- Mass Removal Rate (lbs/day) (equation embedded in sheet); and
- Comments on the well status or any abnormal conditions.

2.5.2.5 OBS Wells

During monthly O&M site visits, if there are additional performance monitoring objectives outside of the DPE extraction well network, the following parameters will be documented in the OBS Wells section of the Data Reporting Sheets:

- Date and Time (mm/dd/yy hh:mm);
- OBS vacuum (in. Hg);
- Depth to Water (ft. btoc);
- Depth to Product (ft. btoc);
- Product Thickness (ft); and
- Comments on the well status or any abnormal conditions.

2.5.2.6 CATOX Performance Data

If the system utilizes a catalytic oxidizer, , the following parameters will be measured and reported in the Oxidizer Unit section of the System Data Reporting Sheets during initial weekly and then monthly O&M site visits:

- Date and Time (mm/dd/yy hh:mm);
- System Flow Rate (scfm) (system post-blower flow value is linked from SVE Total System sheet for concurrent sample date and time);
- CATOX Inlet Temperature (°F);
- CATOX Intlet Set Temperature (°F);
- CATOX Outlet Temperature (°F);
- CATOX Calculated Mass Removal Rate (lbs/day) (equation embedded in sheet for comparison to SVE system mass removal rate); and
- Comments (System Status).

2.5.2.7 Maintenance Records

During monthly O&M site visits, the following parameters will be documented in the Maintenance Records section of the Data Reporting Sheets:

- Reporting Period (mm/dd/yy-mm/dd/yy);
- Date and Time (mm/dd/yy hh:mm);
- System Downtime (cumulative hours since last visit/period);
- System Downtime (whether it was planned or unplanned downtime with root cause description);
- DPE GW Comments (GW System Diagnosis for DPE systems); and
- DPE VE Comments (VE System Diagnosis for DPE systems).

2.5.3 DPE System Troubleshooting

The Chevron EMC MPE Guidance document (2008) describes common DPE (and TPE) system operational problems and suggested ways to evaluate or address those problems. Contact the MBU PM and Remediation Advisor for technical input/feedback in the event operational issues cannot be resolved within **one month**.

2.6 System Optimization

DPE system optimization typically involves fully dewatering extraction wells, maintaining a minimum design extraction well vacuum, maximizing system VOC mass recovery rates and effectiveness while minimizing treatment costs. Operational influence of the DPE system (full

dewatering and VE influence) should be observed at designated performance monitoring points. If performance criteria are not met at these points, the project team will make DPE system operational and/or design modifications to meet these objectives as soon as practical.

2.6.1 Balancing Mass Removal Rates

As system mass removal rates decrease and the vapor treatment system runs at less than capacity, system vapor extraction efficiency needs to be optimized. As groundwater levels decline, increased airflow may reduce the applied vacuum in vapor extraction wells, limiting mass removal efficiency. Optimization measures are generally used to maximize mass removal rates up to the vapor treatment unit's operational capacity, maximize applied vacuum to extraction wells, and to minimize operational costs. Individual extraction well mass recovery rates are used to make decisions on effective system optimization. Airflow from colder extraction wells should be eliminated to maximize mass removal rates from wells with higher relative VOC concentrations.

To optimize mass removal rates:

- Ensure **manual dilution valve is in closed position**;
- Using a PID with dehumidifier tip, determine which wells have high mass removal rates ("hot") and low mass removal rates ("cold"). Relative hot and cold wells will change over system operational life cycle and should be periodically assessed;
- Maximize vacuum on hot wells; and
- Shut off cold wells.

As the total system mass recovery rate declines and approaches a low asymptotic level, cold wells should be shut off permanently, with the remaining vacuum / flow targeting the hot wells.

Declining mass recovery trends will be monitored and used to indicate when the system is expected to reach a low asymptotic mass removal rate shutdown criterion. When the SVE system mass removal rate trend indicates the system is within approximately three months of shutdown, the Chevron Project Manager will contact the agency to discuss system shutdown plans.

2.6.2 Evaluation of Remedial Objectives Before System Achieves Practical Limit of Mass Recovery

The project team may seek to evaluate whether active remedial objectives have been achieved before the system has reached its practical limit of mass recovery, in an effort to minimize remediation system lifecycle cost. Such assessments should be considered as warranted by site conditions and remedial drivers, and may be performed during intentional or unintentional system shutdown periods.

During the final operating period, it is critical to ensure that cold DPE wells are permanently shut off. SVE extraction will then focus on driving remaining hot wells to "cold" conditions, and the system mass recovery to a low asymptotic mass recovery rate.

2.7 System Shutdown

2.7.1 System Shutdown Procedures

Once the system has achieved a low asymptotic VOC mass recovery rate, the project team will shut down the system to evaluate whether remedial objectives have been achieved. Typically, the regulator will require confirmation samples of groundwater, soil, and/or soil vapor to assess whether the site meets remediation and closure objectives. An extended period of time for

monitoring may be required after shutdown to demonstrate that groundwater (or soil vapor, if applicable) objectives have been met and sustained.

Record the change in system operational status in the SOS Sharepoint Remediation Site Information box:

- Change system status to “Shut down remediation assessment”, and record date the system was shut down for remediation assessment.

If post-remediation sampling demonstrates that remedial objectives have been met:

- Permanent system shutdown should be requested.

- **An SVE VOC mass recovery rebound test should not be performed unless specifically requested and required by the agency**.

If remedial objectives have not been met:

- The project team needs to ensure that sufficient system performance data is available to demonstrate that the practical limits of mass recovery have been achieved by the system. This data is typically needed to support system shutdown in cases where remedial objectives have not been attained.
- The project team should generate a dataset of mass recovery rate trends for DPE wells which demonstrates that all extraction wells have achieved low asymptotic removal rates while operated at high applied vacuum conditions. If there are wells that were shut off before meeting this criterion, the system should be restarted and high-vacuum extraction focused on those wells to generate the required mass recovery rate trends.
- Once the system has achieved low asymptotic mass recovery rates, the project team should petition for permanent system shutdown based on having achieved the practical limit of mass recovery. It should be conveyed to the agency that additional DPE operation will not be cost-effective to further reduce groundwater, soil or soil vapor concentrations.
    - The Remediation Advisor will provide support in outlining the case to the agency for system shutdown, if requested.
- If the agency requires additional remediation to address residual groundwater, soil, or soil vapor impacts, **the project team will seek RSRT input on remedial alternatives rather than continuing to operate the existing DPE system**.

Following system shutdown, the project team will record the change in system operation status and status of system equipment to the SOS Sharepoint Remediation Site summary:

- Denote system operation status to “Permanently Shut Down”, and record the date of permanent shutdown
- Report the condition and reuse potential of Chevron’s owned DPE system equipment to the SOS equipment list.

3.0 Reference List

- CEMC Multi-Phase Extraction Guidance Document
- CEMC Soil Vapor & Indoor Air Sampling Technical Toolkit
- CEMC Process Safety/Facility Design & Construction (PS/FD&C) Operational Readiness Review
- Unites States Army Corps of Engineers (USACE) Multi-Phase Extraction Manual