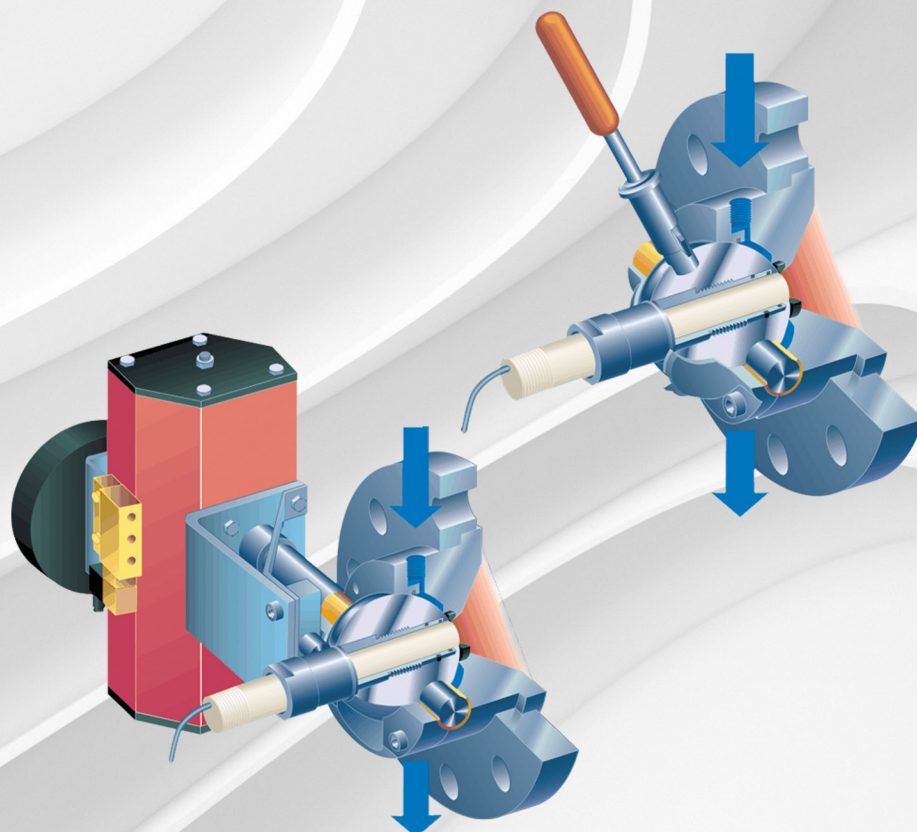


ABB MEASUREMENT & ANALYTICS | DATA SHEET

TB18

Safe-T-Clean valve



Measurement made easy

Promotes worker safety, increases sensor performance and eliminates manual maintenance

Safe operation

- No process leakage

Enables purging of process fluids before removal

Keeps sensor wet or cleans sensor between batches

Measures only when needed during batch operations

Extends sensor life

Manufactured for ABB by Satron Instruments

Process side flushing/cleaning available

Automatic or manual operation

Non-intrusive cleaning of process sensors

Flange mount, flow-through and weld types

Compatible with automatic calibration routines

Perfect for chemical and pulp and paper industries

Uses patented ABB sensor technology

Manual insertion design

- Ensures complete sensor contact with process media

TB18 Safe-T-Clean sensor valve

The TB18 Safe-T-Clean sensor valve increases sensor performance, eliminates manual maintenance and promotes worker safety. It uses a special ball valve construction allowing process sensors to be mounted and serviced without interrupting the process. Rotary movement of the ball causes the valve to open and close. Uniquely shaped PTFE and graphite gaskets clean the ball surface and resist the grinding effects of solid particles. All seals and gaskets are field replaceable. Operation is not affected by the presence of process pressure or high consistency slurries such as pulp stock.

The valve can be mounted using a single flange, or welded to a process pipe, vessel or tank. Flanged or threaded flow-through and 15-degree container (tank weld for vertical lines only) versions are also available. A manual insertion version enables the TB561, TBX561, TB564 and TBX564 sensors to be inserted past the valve face. This helps guarantee accurate measurements by keeping the sensor in the process fluid.

There are two separate ports available for process side flushing and sensor flushing – see Figure 1. The process side flushing port permits cleaning and flushing while the sensor is in the measurement position. A small metal plate (not shown) welded in place controls the direction of the cleaning spray. The sensor flushing port can be used for sensor cleaning, sensor flushing, or sensor buffer calibration when the sensor is in the service and cleaning position – see Figure 2.

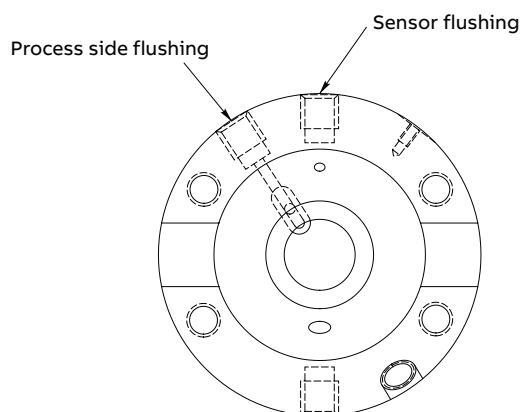


Figure 1 Process side and sensor flushing ports

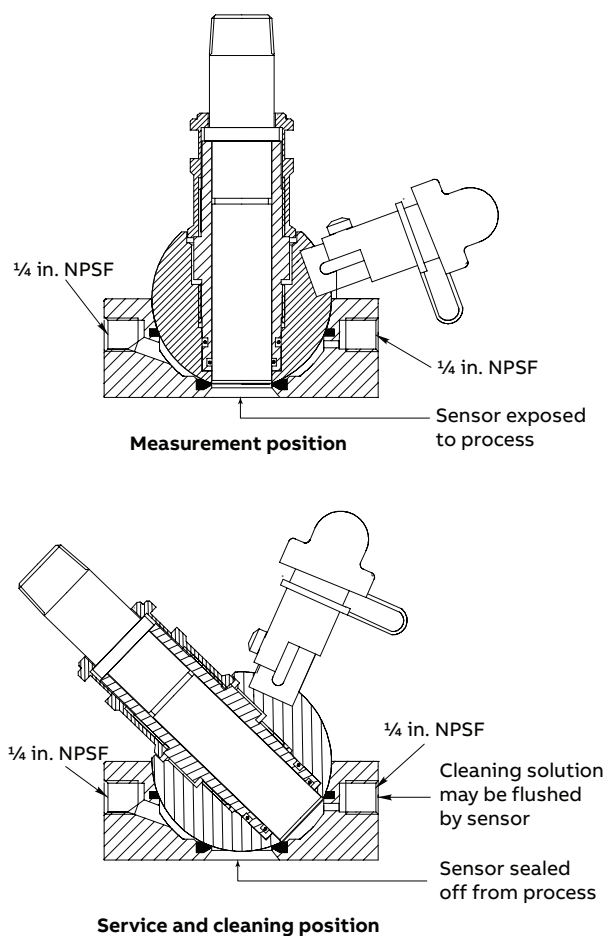


Figure 2 Safe-T-Clean valve positions

Manual operation

There are two models available, manual and manual insertion. Manual involves moving the valve between the measurement and service and cleaning positions. Manual insertion entails insertion of the sensor past the valve face. The manually operated version offers numerous advantages over standard insertion type devices including superior cost, operation and maintenance solutions and worker safety.

A number of design considerations provide easy operation and enhance worker safety. No safety restraints are required to keep the sensor in the measurement position. A removable handle (see Figure 3) can enable a locking mechanism to prevent unauthorized operation. Removal of the sensor when in the measurement position is mechanically prevented.

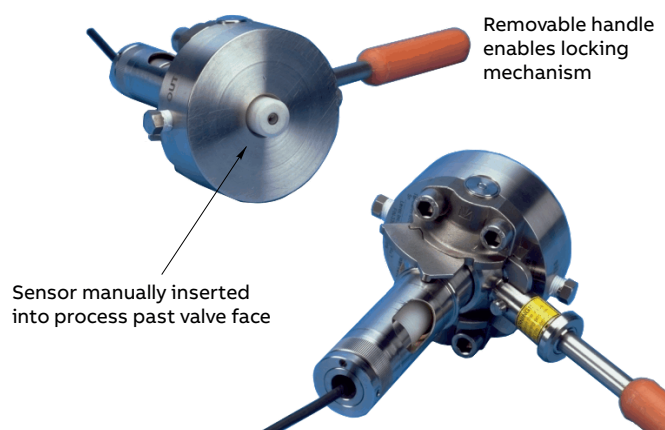


Figure 3 Manually-operated valve with manual insertion sensor

Valve operators are never exposed to process solutions when moving the valve between the measurement and service and cleaning positions. There are two 1/4 in NPSF ports that enable access to the sensor chamber when in the service position. A flush line and valve can be attached to these ports to flush away residual chemicals before removing the sensor. These ports can also be used for sensor cleaning and may completely eliminate the need for sensor maintenance.

Automatic operation

Ordering a pneumatic or electric actuator makes automatic operation of the Safe-T-Clean valve possible. Spring return, double action and electric actuators are available. A number of solenoid valves can be ordered to activate the actuators.

Automatic operation provides many added benefits. Routine, automatic maintenance improves measurement accuracy and response as well as controller performance. Rather than removing the sensor from the process and putting it in beakers of calibration standards, automatic calibration can be accomplished by flowing calibration standards through the Safe-T-Clean valve ports. Both cleaning and calibration can be initiated by a remote manual switch, programming, or any outside activation such as a dump valve for a batch reactor. ABB's AX400 and TB84 analyzers contain relays and programming options to initiate cleaning on a timed basis.

Batch processing is an ideal application for the Safe-T-Clean valve. The valve enables sensors to be removed from vessels for a water flush between batches. This prevents both sensor dry out and chemical precipitation. These conditions reduce sensor life and response. The valve can be automatically rotated out of batches that do not require continuous measurement and cause periodically harsh process conditions such as heat, pressure and chemical reactions. It can be rotated back into the reactor when conditions are favorable.

Patented design

The Safe-T-Clean valve is a version of the Pasve™ valve designed and manufactured exclusively for ABB pH, ORP and conductivity sensors by Satron Instruments. Used successfully in thousands of pressure measurement applications, the Pasve mounting and service valve is protected by patents in over 12 countries.

The valve is designed for use with ABB TB561 and TBX561 sensors with 100 mm (3.94 in) insertion depths. Flat glass Type 1 electrode versions are advised in order to gain all benefits from the exacting engineering of both the sensor and valve. There is a manual insertion style that enables insertion past the face of the Safe-T-Clean valve. This valve design enables the use of notched TB561 and TBX561 sensors with bulb Type 5, F and J electrodes and TB564 and TBX564 sensors. It also helps guarantee that the sensor remains constantly in process fluid providing consistent and accurate measurements. The ABB TB264 two-electrode and TB464 four-electrode conductivity sensors are designed for use with the Safe-T-Clean. Both these sensors are built with 316 stainless steel bodies.

The most durable pH/ORP sensors in the world

Patented solid state Reference, Next Step™ reference half cells and Next Step Advantage™ sensors with solution ground rod, along with recent advancements to these technologies, are the foundations on which all ABB sensors are built. The Ag/AgCl (silver/ silver chloride) based reference is permanently charged with KCl (potassium chloride). This delivers a nonfluid reference that all but eliminates poisoning, plugging and pumping problems plaguing liquid, slurry, and gel-filled sensors. Figure 4 compares the ABB technologies to those of the competing slurry and gel-filled sensors.

ABB sensors use a large, annular liquid junction – see Figure 5. It is continuous throughout the reference, resisting fouling and ensuring a low resistance interface to the process. This interface is free of junction potentials that cause erratic measurements.

It is possible to combine all measurement functions into one compact body. These functions are: reference, electrode, temperature compensation and solution ground rod. An integral cable, potted inside the sensor, provides a completely sealed assembly without in-process high impedance connections.

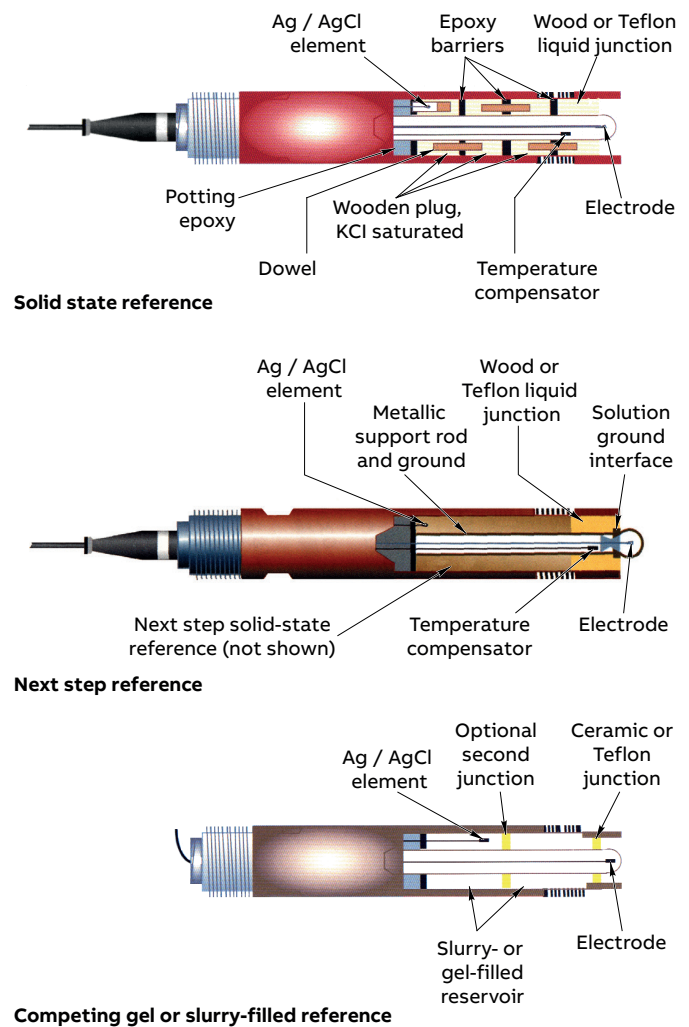


Figure 4 Sensor technologies



Figure 5 Wood and Teflon liquid junctions

Electrodes

The design of ABB measurement electrodes eliminates failure due to thermal stress caused by rapid temperature excursions. Unlike other sensors that use an air bubble for expansion absorption, ABB uses a plunger style electrode. Plunger electrodes allow for expansion and contraction of the fill solution volume in response to temperature changes without large, internal air bubbles.

The manufacturing process for pH glass uses non-offensive chemicals. The glass contains no barium, cobalt, or uranium oxides. The impedance is low enough to maintain signal integrity, yet high enough to remain chemically durable with little or no Na⁺ error.

Table 1 lists available electrode types, including descriptions and ratings available for use with the TB18. Flat glass (type 1) electrodes must be used with manual and automatic versions of the Safe-T-Clean.

When using the manual insertion version of the valve, all of the electrodes in Table 1 can be used on the condition that a notched liquid junction is selected with all bulb type 5, F and J electrodes. Selecting a sensor with a flush liquid junction with anything other than a flat glass type 1 electrode will cause the electrode to be broken when the sensor is inserted into the Safe-T-Clean valve.

Type	Description	Range	Operating temperature		Impedance
			°C	°F	
1	Flat glass – for use with all Safe-T-Clean valve types including manual insertion version. Suitable for high density applications or processes where heavy fouling is expected. Electrode flush with liquid junction. Low Na ⁺ error.	0 to 14 pH	0 to 1001	32 to 2121	650 MΩ at 25 °C (77 °F)
5	ORP – only for use with manual insertion version of Safe-T-Clean valve. Must select notched liquid junction. Pt (platinum) electrode as active element.	± 2000	0 to 140	32 to 284	<1 kΩ
F	Fluoride / Acid resistant glass – only for use with manual insertion version of Safe-T-Clean valve. Must select notched liquid junction. Resistant to etching of HF and strong acids up to several percent concentration.	0 to 12 pH	10 to 802	50 to 1762	300 MΩ at 25 °C (77 °F)
J	Coating resistant glass – only for use with manual insertion version of Safe-T-Clean valve. Must select notched liquid junction. Very versatile and suitable for both high and low pH measurements, strong chemicals and high purity water.	0 to 14 pH	10 to 140	50 to 284	300 MΩ at 25 °C (77 °F)

- Notes.
- 0 to 121 °C (32 to 250 °F) for sterilization cycles.
 - 50 °C (122 °F) max. for high HF concentration.

Table 1 Electrode types and ratings for TB561 and TBX561 sensors

Liquid junctions

Liquid junctions available with TB561 and TBX561 sensors come in two materials and two styles. The two materials are wood and porous Telfon. The two styles are flush and notched.

A wood junction is recommended for all processes except known wood delignifiers. Wood delignifiers such as strong caustics and oxidizers, or substances with a continuous pH above 11.5, cause wood to lose its texture. Porous Teflon should be used in processes known to delignify wood or with a continuous pH of 11.5 or above.

Table 2 lists the two liquid junction styles and provides a description of each.

Style	Description
Flush	Liquid junction flush with end of sensor body. For use with manual, manual insertion, and automatic versions of Safe-T-Clean valve, but only those equipped with sensors with flat glass Type 1 electrodes.
Notched	Sensor body material extends beyond liquid junction surface to provide electrode protection. For use only with manual insertion version of Safe-T-Clean valve equipped with sensors with any electrode type (Type 5, F, and J).

Table 2 Liquid junction styles

TB561 and TBX561 sensors

Figures 6 and 7 show the Model TB561 and TBX561 sensors with standard and manual insertion hardware. They are designed for measurements in process vessels and pipe lines. The sensor dimensions are shown in Figure 8.

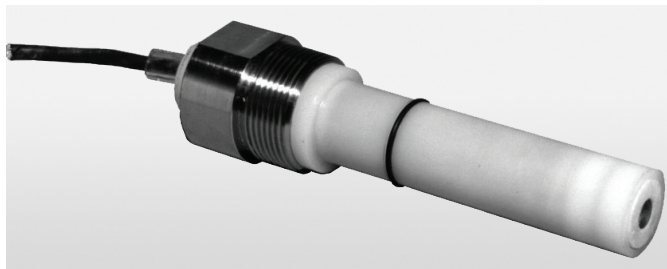


Figure 6 Standard hardware

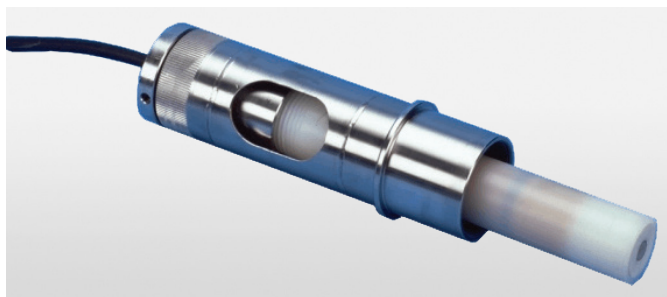


Figure 7 Manual insertion hardware

Specification

Applications

- Batch processing with or without steam
- Chemical sterilization
- Fermentors
- Pulp and paper
- Scrubbers
- Chemical processing
- Hazardous applications

Maximum pressure / temperature

- 276 kPag (40 psig) at 140 °C (284 °F)
- 448 kPag (65 psig) at 121 °C (250 °F)
- 690 kPag (100 psig) at 90 °C (194 °F)

Material

Body

Kynar®, wood

Liquid junction

PTFE

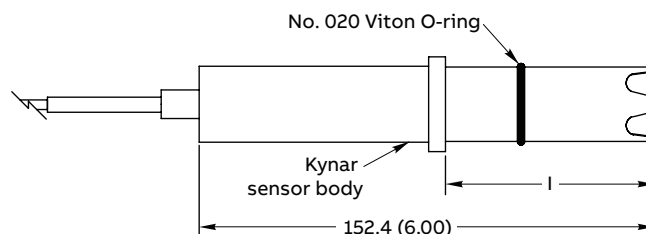
Liquid junction types

- Flush
- Notched

Specifications subject to change without notice

D imensions

Dimensions in mm (in)



Order code 100: I = 100.0 (3.94)

Note. Does not include hardware.

...TB561 and TBX561 sensors

Ordering information

Sterilizable pH/ORP sensor assembly, Kynar (7 bar @ 112 °C [100 PSI @ 234 °F] , 2.75 bar @ 140 °C [40 PSI @ 284 °F])	TB561	X	X	X	XXX	X	XX
Measuring electrode							
Flat glass, 5 to 100 °C (41 to 212 °F), 0 to 14 pH	1						
Platinum, Redox (ORP)	5						
Glass, pH, fluoride-resistant, 10 to 80 °C (50 to 176 °F), 0 to 12 pH	F						
Coat-resistant glass, 5 to 140 °C (41 to 284 °F), 0 to 14 pH	J						
Integral temperature compensation							
None	0						
3 kΩ, tinned leads (for TB561-1/F/J only)	1						
Pt 100, tinned leads (for TB561-1/J only) ¹	3						
Liquid junction							
Wood	1						
Teflon	3						
Wood, notched	5						
Teflon, notched	6						
Wood, Next Step	A						
Teflon, Next Step	B						
Wood, notched, Next Step	D						
Teflon, notched, Next Step	E						
Body style²							
100 mm insertion depth					100		
Integral sensor cable³							
BNC connector						F	
Tinned / PIN leads ⁴						T	
Length, integral sensor cable in m (ft)							
<1.5 (1 to 5)							XX
1.8 to 3 (6 to 10)							XX
3.4 to 6.1 (11 to 20)							XX
6.4 to 9.1 (21 to 30)							XX

¹ Compatible with ABB AX400, TB82PH, TB84PH, ML82PH, ML84PH and 4600.

² Insertion depth measured from wetted face of sensor flange to tip of reference or notched guard.

³ To connect with TB82 or TB84 there are 2 options:

Option 1: use Part Number 4TB9515-0166 (BNC/TC to pin TB8 adapter with conduit fitting) or Part Number 4TB9515-0164 (BNC/TC to pin adapter)

Option 2: order sensor with integral sensor cable option "T". Option "T" is not designed for use with extension cables or junction box.

⁴ Integral sensor cable option 'T' is designed for direct connection to TB82PH, TB84PH, 4630, AX400 and competitive electronics that use terminal blocks.

Sterilizable pH/ORP sensor assembly, Kynar (7 bar @ 112 °C [100 PSI @ 234 °F], 2.75 bar @ 140 °C [40 PSI @ 284 °F])		TBX561	X	X	X	X	X	XX	X	XX	X
Measuring electrode											
Flat glass, 5 to 100 °C (41 to 212 °F), 0 to 14 pH			1								
Platinum, Redox (ORP)			5								
Glass, pH, fluoride-resistant, 10 to 80 °C (50 to 176 °F), 0 to 12 pH			F								
Coat-resistant glass, 5 to 110 °C (41 to 230 °F), 0 to 14 pH			J								
Integral temperature compensation											
None			0								
3 KΩ, tinned leads (for TB561-1/F/J only)			1								
Pt 100, tinned leads (for TB561-1/J only) ¹			3								
Liquid junction											
Wood					1						
Teflon					3						
Wood, notched					5						
Teflon, notched					6						
Wood, Next Step					A						
Teflon, Next Step					B						
Wood, notched, Next Step					D						
Teflon, notched, Next Step					E						
Solution ground material											
316 Stainless Steel					1						
Titanium					2						
Hastelloy B2					3						
O-ring material											
Viton						1					
EPDM						2					
Silicone						3					
Kalrez ²						4					
Body style³											
100 mm insertion depth							10				
Terminations, integral sensor cable											
Tinned / PIN leads ⁴									T		
Length, integral sensor cable in m (ft)											
<1.5 (1 to 5)										XX	
1.8 to 3 (6 to 10)										XX	
3.4 to 6.1 (11 to 20)										XX	
6.4 to 9.1 (21 to 30)										XX	
Tags											
None											0
Mylar (4TB5003-0002)											1
Stainless steel (4TB5003-0003)											2

¹ Not compatible with ABB instruments except AX400, TB82PH, TB84PH, ML82PH and ML84PH.² Kalrez o-rings for solution ground sleeve only. All external o-rings are viton. Kalrez O-ring kits for external o-rings are sold separately.³ Insertion depth measured from wetted face of sensor flange to tip of notched guard.

Safe-T-Clean valve

General specification

Manufacturer

Satron Instruments

Model

Pasve

Materials

Seals PTFE or PTFE with carbon graphite filling
O-rings Viton, EPDM, or Kalrez
Valve 316L stainless steel, Kynar (for TB181),
and titanium (for TB181, TB182, and TB186)

Maximum operating pressure and temperature

Determined by pH sensor specifications;
valve is 2,000 kPag (290 psig), 250 °C (482 °F)

Shipping weight in kg (lb)

TB181	8.9 (19.6)
TB182	4.7 (10.4)
TB183	4.8 (10.6)
TB1844	8.8 (19.4)
TB1845	10.0 (22.0)
TB1846	10.9 (24.0)
TB1847	11.8 (26.0)
TB185E	11.0 (24.3)
TB185F	16.3 (35.9)
TB186	5.2 (11.5)

Specification – actuator

Manufacturer

Remote Control

Model

Spring return	RC 240 SR
Double action	RC 240 DA
Electric	Bernad 0A8

Maximum working pressure

Spring return

Double action

Spring return	1,034 kPag (150 psig)
Double action	569 kPag (82.5 psig)

Power requirements (electric actuator)

120 V AC at 60 Hz, 240 V AC at 50 Hz

Operating media

Air or inert gas

Ambient temperature

–20 to 80 °C (–4 to 176 °F)

Shipping weight in kg (lb)

Spring return	7.0 (15.4)
Double action	4.9 (10.8)
Electric	6.8 (15.0)

Specification – solenoid

Manufacturer

Lucifer

Spring return

Model	341 N01
Type	3/2 Solenoid valve, closed when de-energized

Port size	G ¼ (⅜ in)
Safe body working pressure (sbwp)	Up to 3,200 kPag (464 psig)

Media	Dry or lubricated air, inert gas
-------	----------------------------------

Ambient temperature	–10 to 50 °C (14 to 122 °F)
---------------------	-----------------------------

Enclosure rating	IP65 (NEMA 4)
------------------	---------------

Voltage	120 V AC at 60 Hz, 240 V AC at 50 Hz, 24 V DC
---------	--

Power consumption	2.0 W AC, 2.5 W DC
-------------------	--------------------

Double action

Model	341 N01
Type	5/2 directional control valve with continuous energized coil

Port size	G ¼ (⅜ in)
Manual override	Standard screwdriver operated
Range of admissible pressure drops	Δp min.: 100 kPag (14.5 psig) Δp max.: 1,000 kPag (145 psig)

Media	Dry or lubricated air, inert gas
Ambient temperature	–10 to 50 °C (14 to 122 °F)

Enclosure rating	IP65 (NEMA 4)
------------------	---------------

Voltage	120 V AC at 60 Hz, 240 V AC at 50 Hz, 24 V DC
---------	--

Power consumption	2.0 W AC, 2.5 W DC
-------------------	--------------------

Specifications are subject to change without notice.

Dimensions

Dimensions in mm (in)

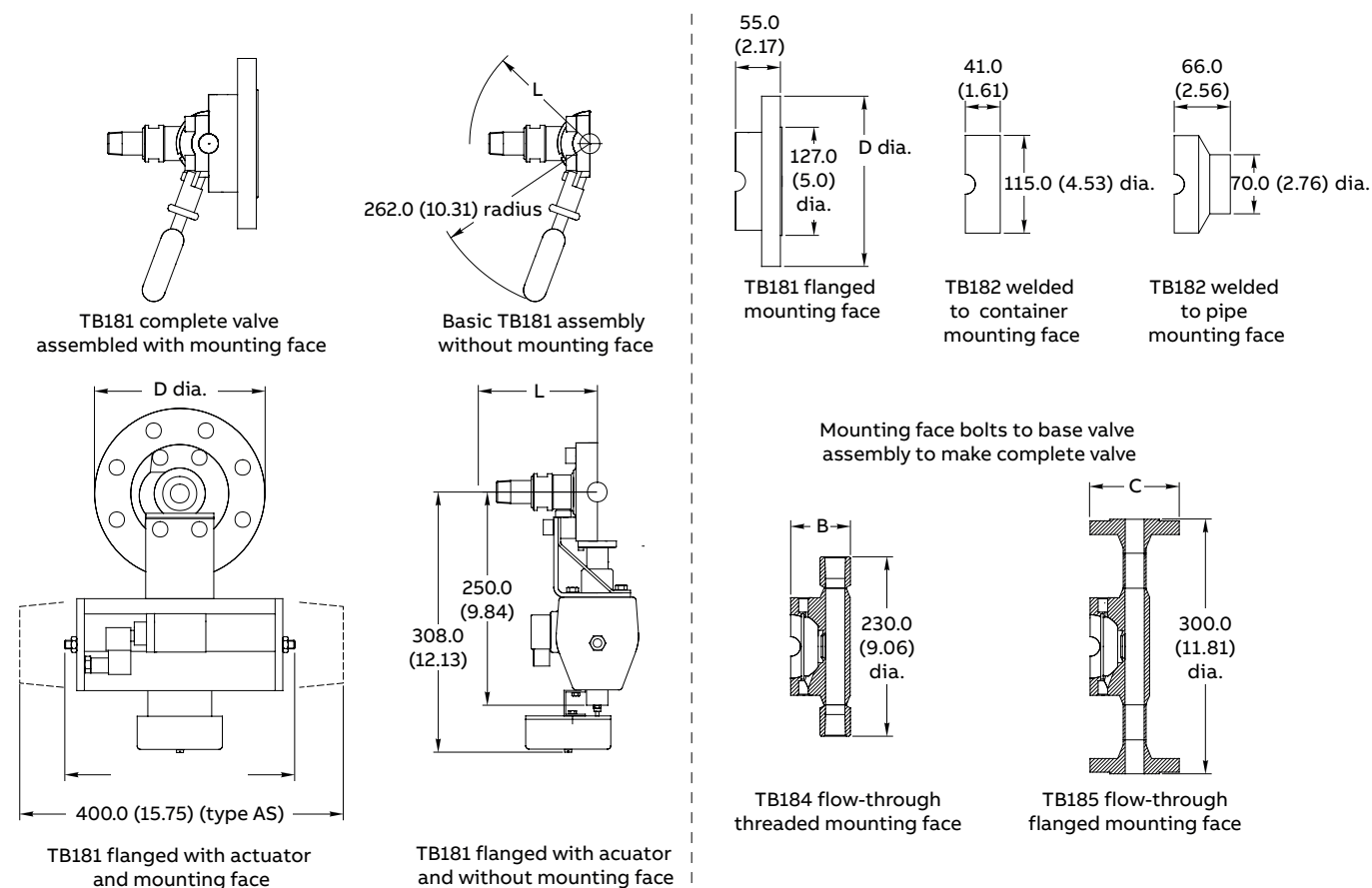
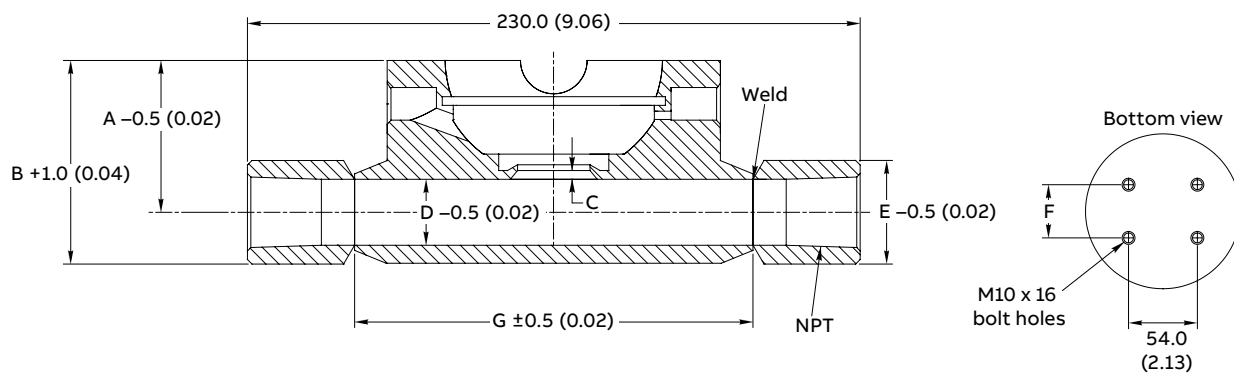


Figure 8 Safe-T-Clean valve dimensions



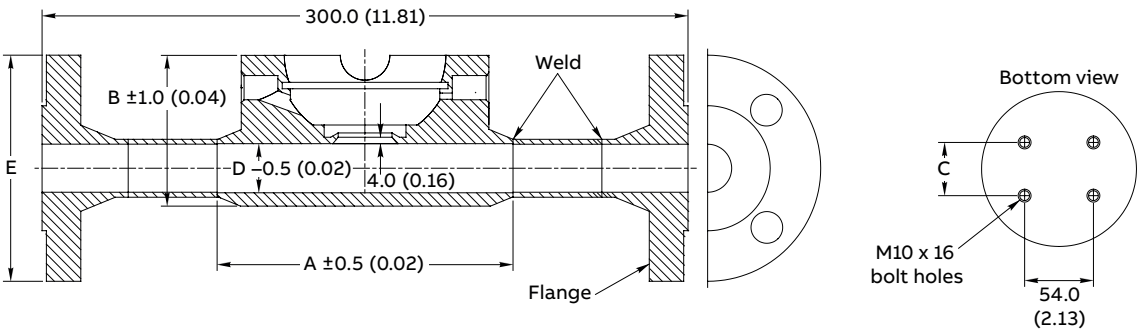
Dimension in mm (in)							
NPT	A	B	C	D	E	F	G
3/4	52 (2.0)	72 (2.8)	4 (0.16)	22 (0.9)	22 (0.9)	42 (1.7)	136 (5.4)
1	55 (2.2)	77 (3.0)		28 (1.1)	28 (1.1)	48 (1.9)	134 (5.3)
1 1/2	63 (2.5)	92 (3.6)		43 (1.7)	43 (1.7)	64 (2.5)	130 (5.1)
2	68 (2.7)	104 (4.1)		54 (2.1)	52 (2.0)	76 (3.0)	126 (5.0)

Figure 9 TB184 flow-through threaded dimensions

...Safe-T-Clean valve

Dimensions

Dimensions in mm (in)



Model	Flange	Dimension in mm (in)				
		A	B	C	D	E
TB1858	ANSI 1 in 150 lb	134 (5.3)	77 (3.0)	48 (1.9)	28 (1.1)	108 (4.3)
TB1859	ANSI 1 in 300 lb	134 (5.3)	77 (3.0)	48 (1.9)	28 (1.1)	124 (4.9)
TB185A	ANSI 2 in 150 lb	126 (5.0)	104 (4.1)	76 (3.0)	54 (2.1)	152 (6.0)
TB185B	ANSI 2 in 300 lb	126 (5.0)	104 (4.1)	48 (1.9)	54 (2.1)	165 (6.5)
TB185E	DN25 PN40	134 (5.3)	77 (3.0)	76 (3.0)	28 (1.1)	115 (4.5)
TB185F	DN50 PN40	126 (5.0)	104 (4.1)	76 (3.0)	54 (2.1)	165 (6.5)

Figure 10 TB185 flow-through flanged dimensions

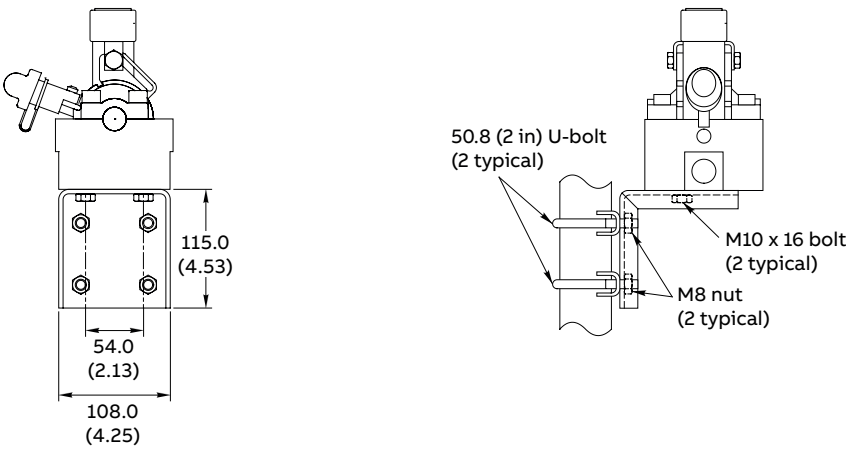


Figure 11 Angle mounting bracket for flow-through TB184 and TB185 dimensions

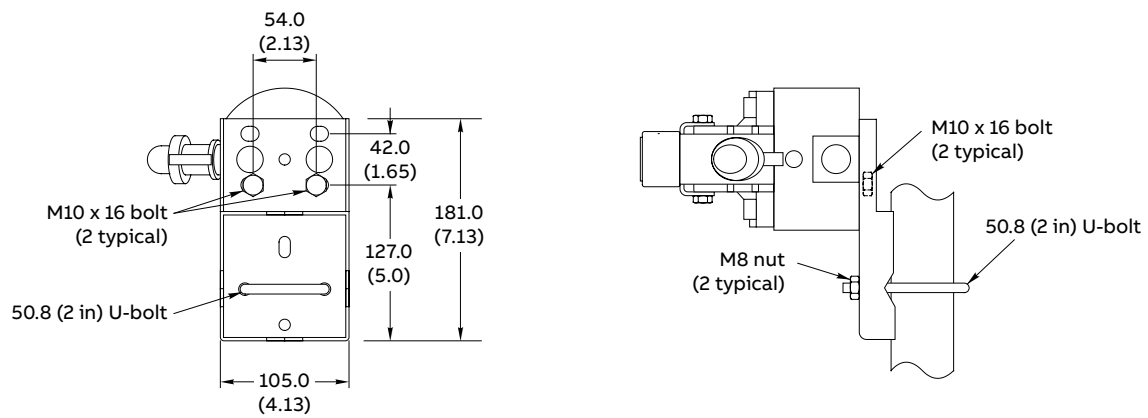


Figure 12 Straight mounting bracket for flow-through TB184 and TB185 dimensions

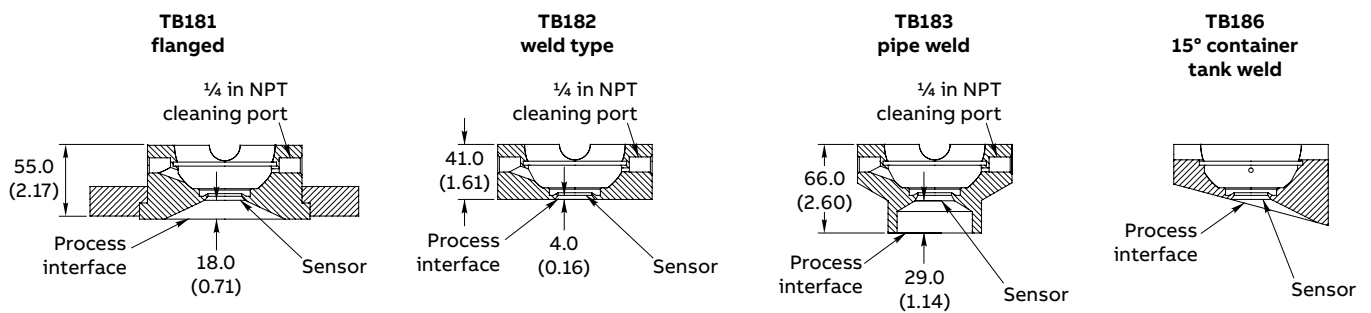


Figure 13 Mounting face dimensions

Ordering information

Safe-T-Clean valve ¹	TB18	X	X	X	X	O	X	X	X	X
Mounting type										
Flange	1									
Weld type (tank or pipe larger than 152.4 mm [6 in])	2									
Pipe weld (for pipes less than 152.4 [6 in]) ²	3									
Flow-through threaded	4									
Flow-through flanged (2 flanges)	5									
15 degree container / tank weld	6									
Process connection type										
Weld or threaded type (TB182, TB183 and TB186 only)	0									
Single DN80 flange (TB181 only)	1									
Single ANSI 3 in 150# flange (TB181 only)	2									
Single ANSI 3 in 300# flange (TB181 only)	3									
Flow-through, ¾ in NPT (TB184 only)	4									
Flow-through, 1 in NPSF (TB184 only)	5									
Flow-through, 1½ in NPT (TB184 only)	6									
Flow-through, 2 in NPSF (TB184 only)	7									
Flow-through with 1 in ANSI 150# flanges (TB185 only)	8									
Flow-through with 1 in ANSI 300# flanges (TB185 only)	9									
Flow-through with 2 in ANSI 150# flanges (TB185 only)	A									
Flow-through with 2 in ANSI 300# flanges (TB185 only)	B									
Flow-through with DIN DN25 PN40 flanges (TB185 only)	E									
Flow-through with DIN DN50 PN40 flanges (TB185 only)	F									
Wetted material										
316 stainless steel	1									
Titanium (TB181, TB182 and TB184 only)	2									
Kynar, PVDF (TB181 only)	3									
Seals										
Teflon with carbon and graphite / Viton O-rings	1									
100 % Teflon / Viton O-rings	2									
Teflon with carbon and graphite / EPDM O-rings	3									
100 % Teflon / EPDM O-rings	4									
Teflon with carbon and graphite / Kalrez O-rings	5									
100 % Teflon / Kalrez O-rings	6									
Sensor type										
ABB TB561 and TBX561 (100 mm [4 in] length, flat glass only)	1									
ABB TB561 and TBX561 manual insertion (100 mm [4 in], flat glass, stainless steel / titanium valve only)	5									
Special options										
Standard	0									
Process side flushing (TB181, TB182 and TB183 only)	1									
Actuator										
No actuator									0	
Double-action actuator (sensor type 1 only)									1	
spring return actuator (sensor type 1 only)									2	
Electric actuator (Bernad OA8) (sensor type 1 only)									3	
Actuator solenoid										
No actuator (actuator option 0 only)										0
230 V AC, 50 Hz										1
24 V DC										2
115 V AC, 60 Hz										3
230 VA C, 50 Hz, EXM coil										4
24 V DC, EXM coil										5
115 V AC, 60 Hz, EXM coil										6
No solenoid										7
Accessories										
None										0
Actuator limit switches										1
Straight mounting plate (TB184 and TB185 only)										2
Angled mounting plate (TB184 and TB185 only)										3
Actuator limit switches and straight mounting plate (TB184 and TB185 only)										4
Actuator limit switches and angled mounting plate (TB184 and TB185 only)										5
Exi (Nemur) actuator limit switches										6
Exi (Nemur) actuator limit switches and straight mounting plate (TB184 and TB185 only)										7
Exi (Nemur) Actuator limit switches and angled mounting plate (TB184 and TB185 only)										8

¹ Sensor must be purchased separately.

The ABB Group A conductivity sensor, TB464 is also compatible with the Safe-T-Clean, but only for the manual insertion style. Please consult factory on availability.

² Base must be machined to curvature of pipe and saddle welded to pipe.

Acknowledgements

Kynar is a registered trademark of Arkema Inc.

Teflon is a registered trademark of the Chemours Company.

Service



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