

# Mark 93 Series

## Sanitary Steam Traps

The Mark 93 is a balanced port, thermostatic steam trap designed specifically for use in validated clean steam systems. The sanitary design follows ASME BPE guidelines including a 20Ra  $\mu$ m finish on all internal wetted parts, self-draining design, and all relevant materials, marking and documentation guidelines.

The MK93 has been specifically designed to provide higher flow rates at low pressures and low subcooling levels. **In lab testing, the MK93 consistently exhibited excellent flow rates at subcooling levels of less than 3°F or less (<1,7°C).** Note: Low subcooling operation insures that condensate won't back up and wet (cool) the upstream validated temperature sensor.

There are two base designs within the MK93 product range: the standard MK93 – good for differential pressures (P1) up to 50 psi (3,4 bar), and the MK93 Option "P" for differential pressures ranging from 45 – 90 psi (3,1 – 6,2 bar). Both designs are rated to 90 psi (6,2 bar) operating pressure but are recommended for use within the specified inlet pressure ratings.

During start-up, the bellows element is contracted and fully open to discharge all non-condensable gas and condensate. The heat of entering steam causes the element to expand, closing the valve. As condensate accumulates in the body, the element cools, causing the bellows/stem tip to retract allowing condensate to drain.

### Features

- Fill fluid meets FDA/ICH Q3C/FDA Class 3 criteria designation
- Low subcooling operation reduces probability of temperature validation faults and resultant SIP delays
- CRN Registration Number available
- Thermostatic steam trap in 316L stainless steel that is designed for clean steam tracing, drip-leg and process applications
- All 316L stainless steel housing and internals
- Polished components – body interior and exterior are mechanically polished to 20Ra and 40Ra finish respectively
- Sanitary clamp ends standard, other ends (tube weld, threaded, ISO/DIN) available upon request
- Self draining when installed vertically (outlet side down)

NOTE! Order code and horizontal connection dimension change April 2020 (See lay-in dimension changes on pages 7-15)



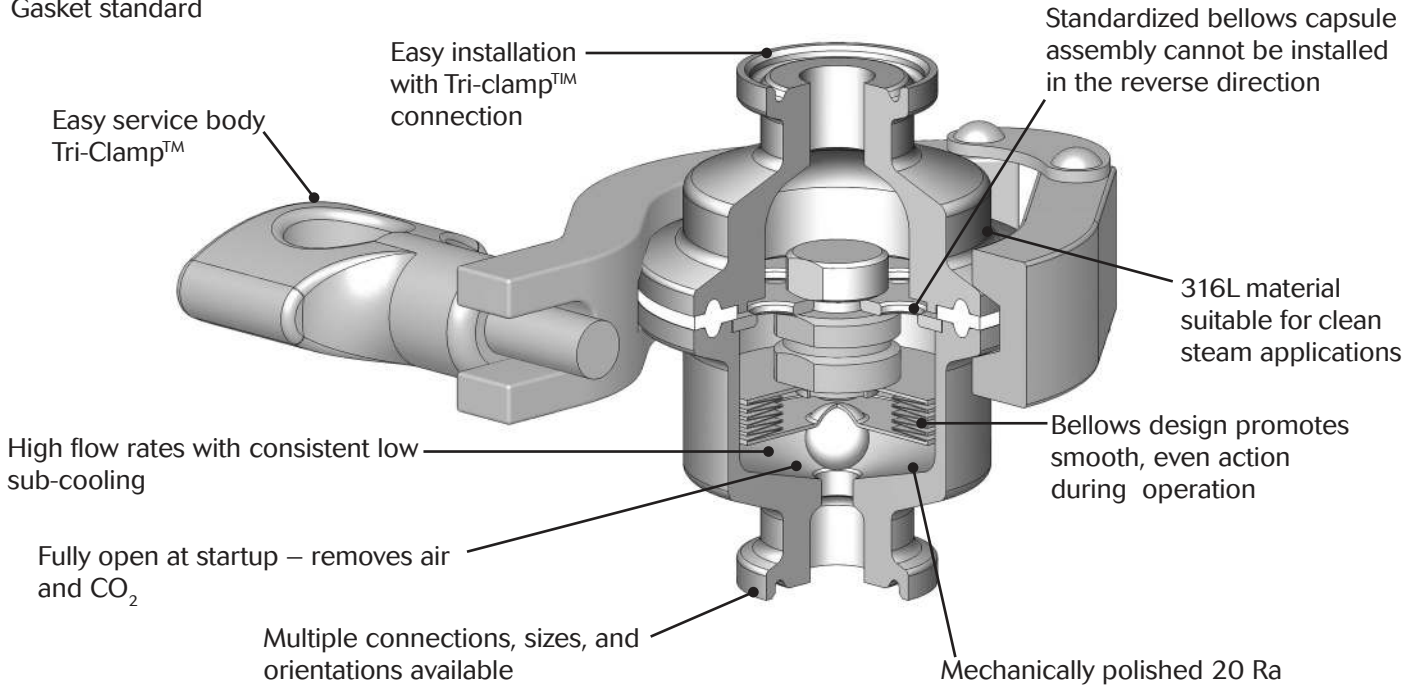
- New design provides excellent flow rates with low subcooling FDA and USP Class VI TFE-VIT gasket standard on clamped body, or FDA and USP Class o-ring on bolted option
- Option for electropolished body
- Warranties:
  - 5 year material and workmanship
  - 2 year low subcooling performance

### Applications

- Typical applications are: sterilization drainage for fermenters, bioreactors, separation and filtration equipment, lyophilizers, autoclaves, process piping equipment and steam barriers
- Condensate drainage from process systems using clean steam – fermenters, bioreactors, SIP systems and sterilizers

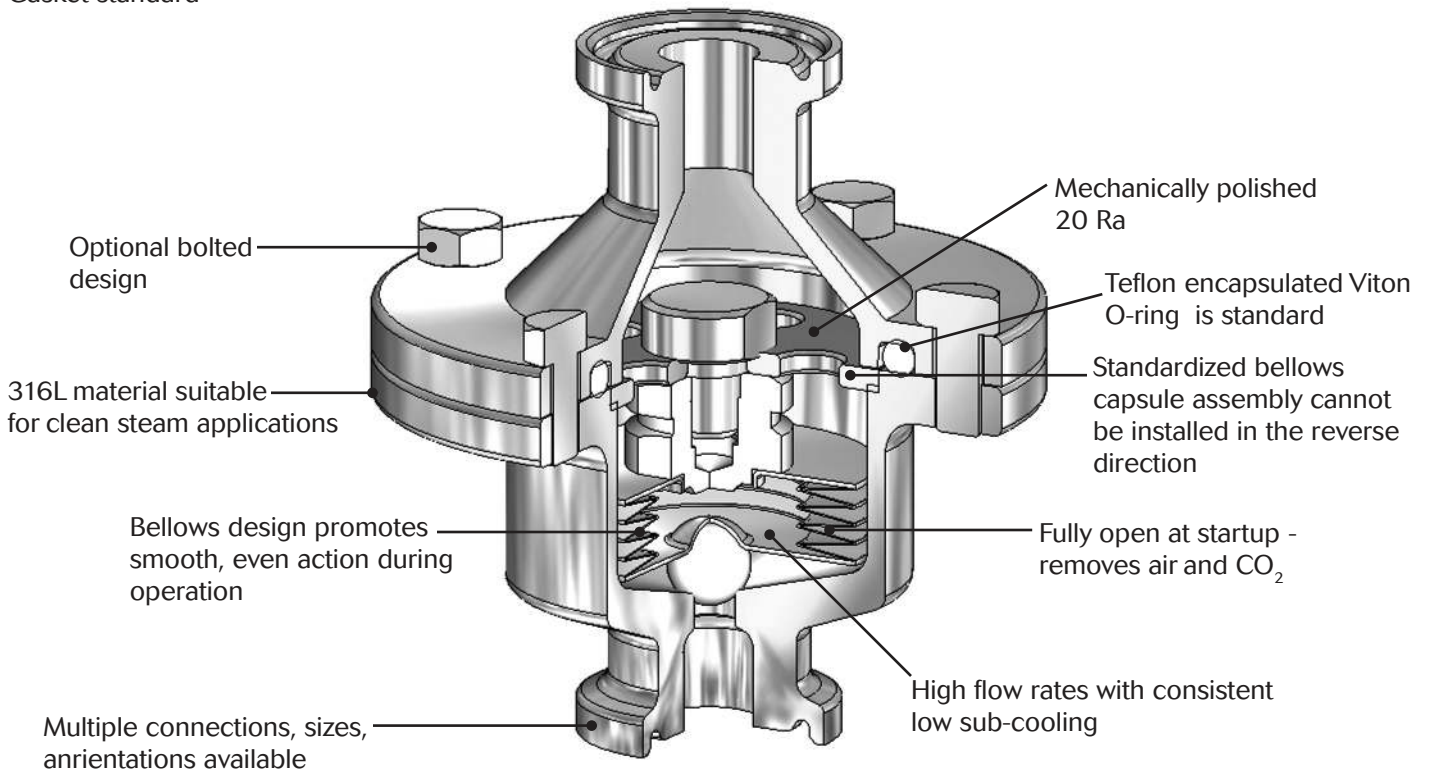
**FEATURES & BENEFITS – MK93 WITH TRI-CLAMP ENDS**

FDA, USP Class VI  
Gasket standard



**FEATURES & BENEFITS – MK93 WITH BOLTED BODY WITH TRI-CLAMP ENDS**

FDA, USP Class VI  
Gasket standard



**SPECIFICATIONS**

**Sizes:**

- 1/2", 3/4", 1", 1-1/2"
- DIN DN15, DIN DN20, DIN DN25, DIN DN40
- ISO DN15, ISO DN20, ISO DN25, ISO DN40

**End Connections**

- ASME, DIN/ISO Sanitary Tri-Clamp
- ASME/DIN/ISO Tube Ends

**Material**

- Body Inlet/Outlet: 316L Stainless Steel
- Thermal Element: 316L Stainless Steel
- Gaskets (Standard): PTFE/Viton - 350°F (177°C)  
Optional: PTFE/EPDM - 300°F (149°C), Tuf-Steel - 350°F (177°C), Silverback - 350°F (177°C), PTFE - 350°F (177°C) All gaskets are FDA and USP Class VI compliant
- Tri-clamp: 304 SST

Nominal Cv: 3.8

**Design Pressure/Temperature Rating**

- Maximum Allowable Pressure (PMA): 145 psig (10,0 bar)
- Maximum Allowable Temperature (TMA): 350°F (177°C)

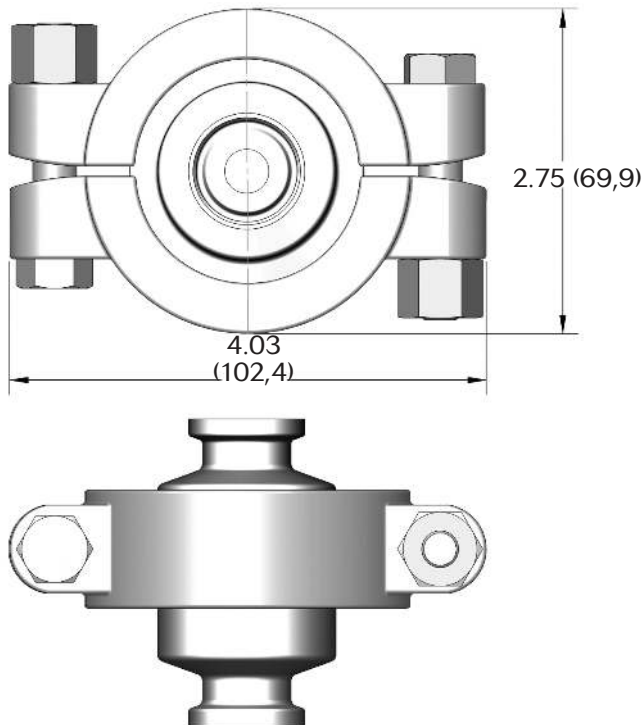
**Maximum Recommended Differential Pressure**

- MK93: 10 – 50 psi (0,7 – 3,4 bar)
- MK93 Option P: 45 – 90 psi (3,1 – 6,2 bar)

CRN Registration Number: OC12623.5

**DIMENSIONS - VERTICAL CONNECTIONS**

*Bolted Tri-Clamp (1/2", 3/4", DN15, DN20)*



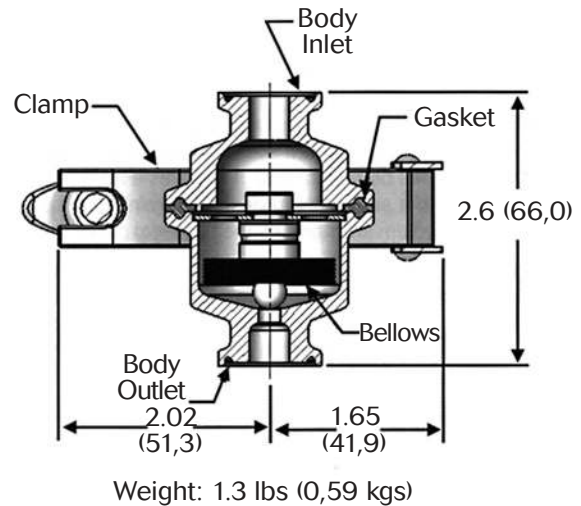
Weight: 1.4 lbs (0,64 kgs)

**FLOW CAPACITY TABLE**

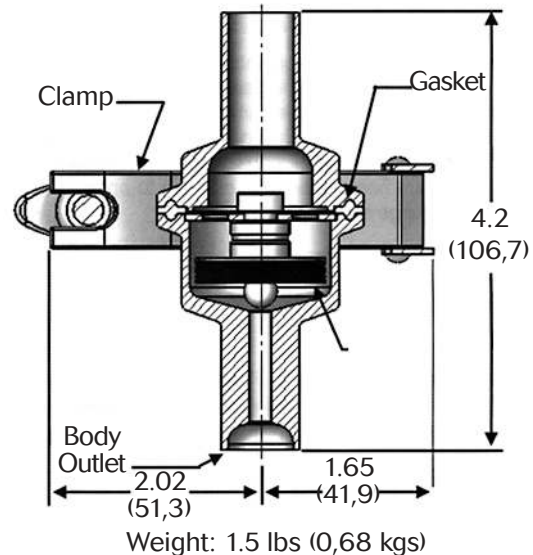
| Condensate Temp Below Saturation (Subcooled Temp) | Capacity - lbs/hr (kg/hr) @ Differential Pressure - psi (bar) |             |             |             |             |             |
|---|---|-------------|-------------|-------------|-------------|-------------|
|   | 10 (0,69)   | 20 (1,38)   | 30 (2,07)   | 50 (3,45)   | 75 (5,17)   | 90 (6,21)   |
| 5°F lbs/hr  | 195 (88,5)  | 373 (169)   | 549 (249)   | 870 (395)   | 1012 (459)  | 1165 (528)  |
| 10°F lbs/hr                                       | 490 (222)   | 813 (369)   | 1142 (518)  | 1715 (778)  | 2207 (1001) | 2437 (1105) |
| 20°F lbs/hr                                       | 1127 (511)  | 1697 (770)  | 2202 (999)  | 3074 (1394) | 3932 (1784) | 4139 (1877) |
| Cold Water lbs/hr                                 | 2580 (1170)   | 3648 (1655) | 4468 (2027) | 5768 (2616) | 6944 (3150) | 7504 (3404) |

**DIMENSIONS - VERTICAL CONNECTIONS**

*Tri-Clamp Ends (1/2", 3/4", DN15, DN20)*

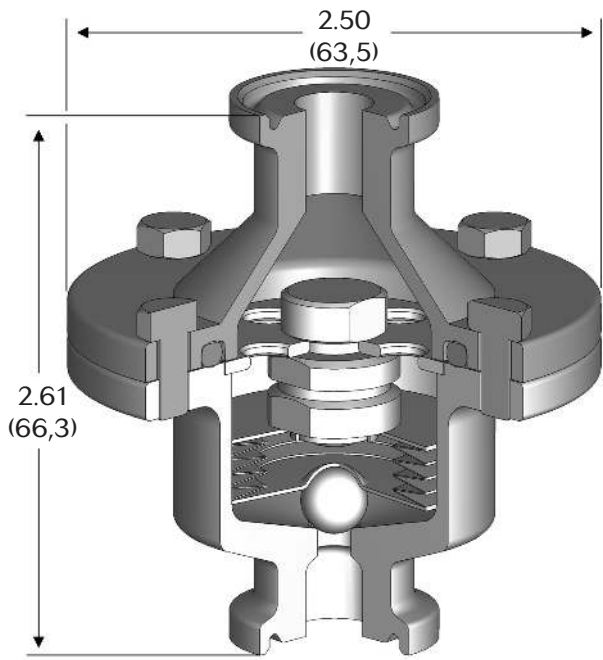


*Tube Weld Ends (1/2", 3/4", DN15, DN20)*



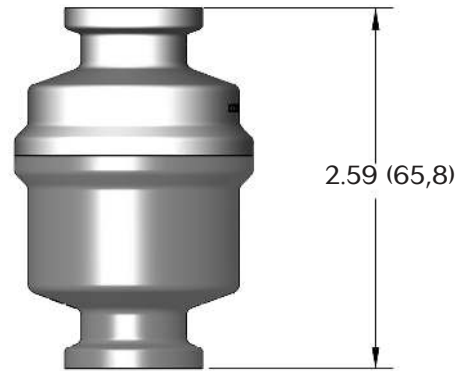
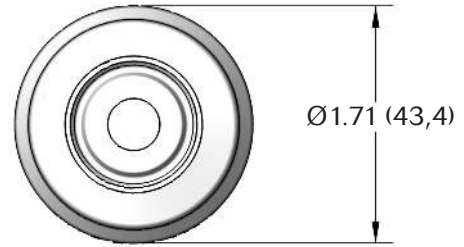
**DIMENSIONS - VERTICAL CONNECTIONS**

*Bolted Body (93B) (1/2", 3/4", DN15, DN20)*



Weight: 1.2 lbs (0,55 kgs)

*Welded Joint (93W) (1/2", 3/4", DN15, DN20)*

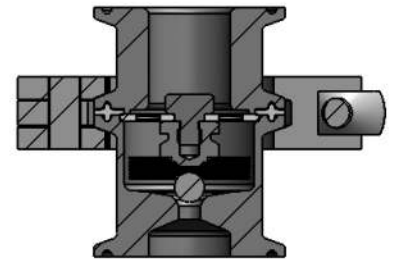
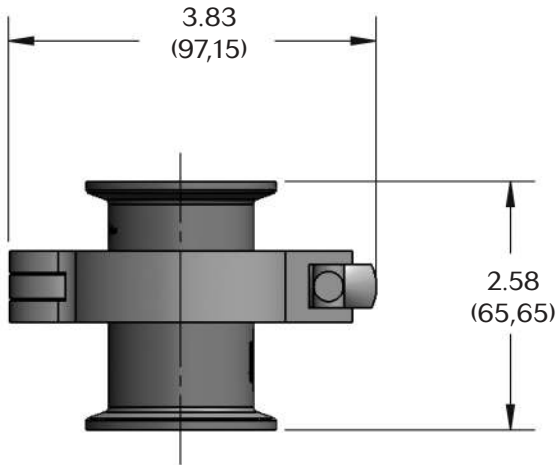
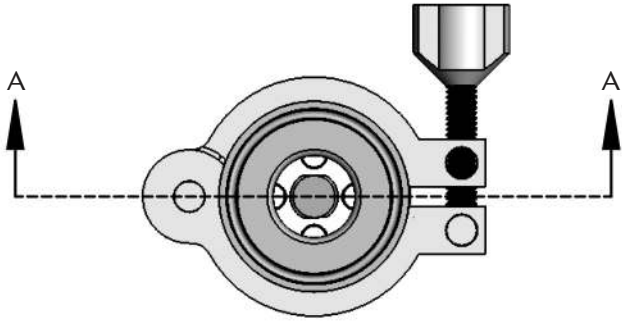


Weight: 1.0 lbs (0,45 kgs)

MK93 SANITARY STEAM TRAPS

**DIMENSIONS - VERTICAL CONNECTIONS**

*MK93C 1", DN25 Series*

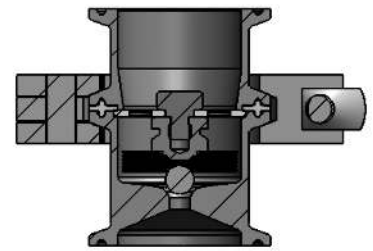
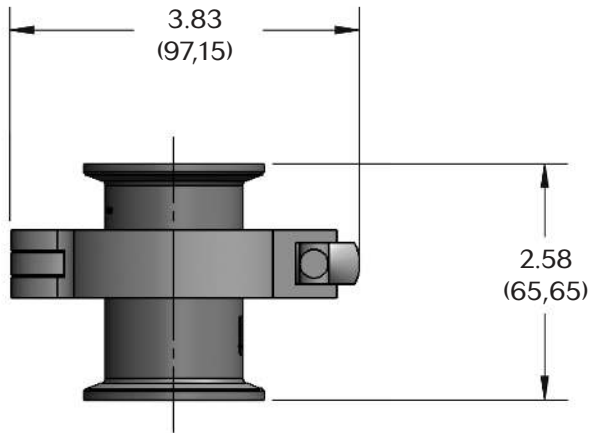
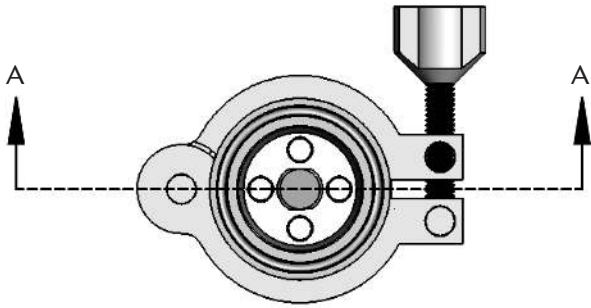


Section A-A

MK93 SANITARY STEAM TRAPS

**DIMENSIONS - VERTICAL CONNECTIONS**

*MK93C 1-1/2", DN40 Series*

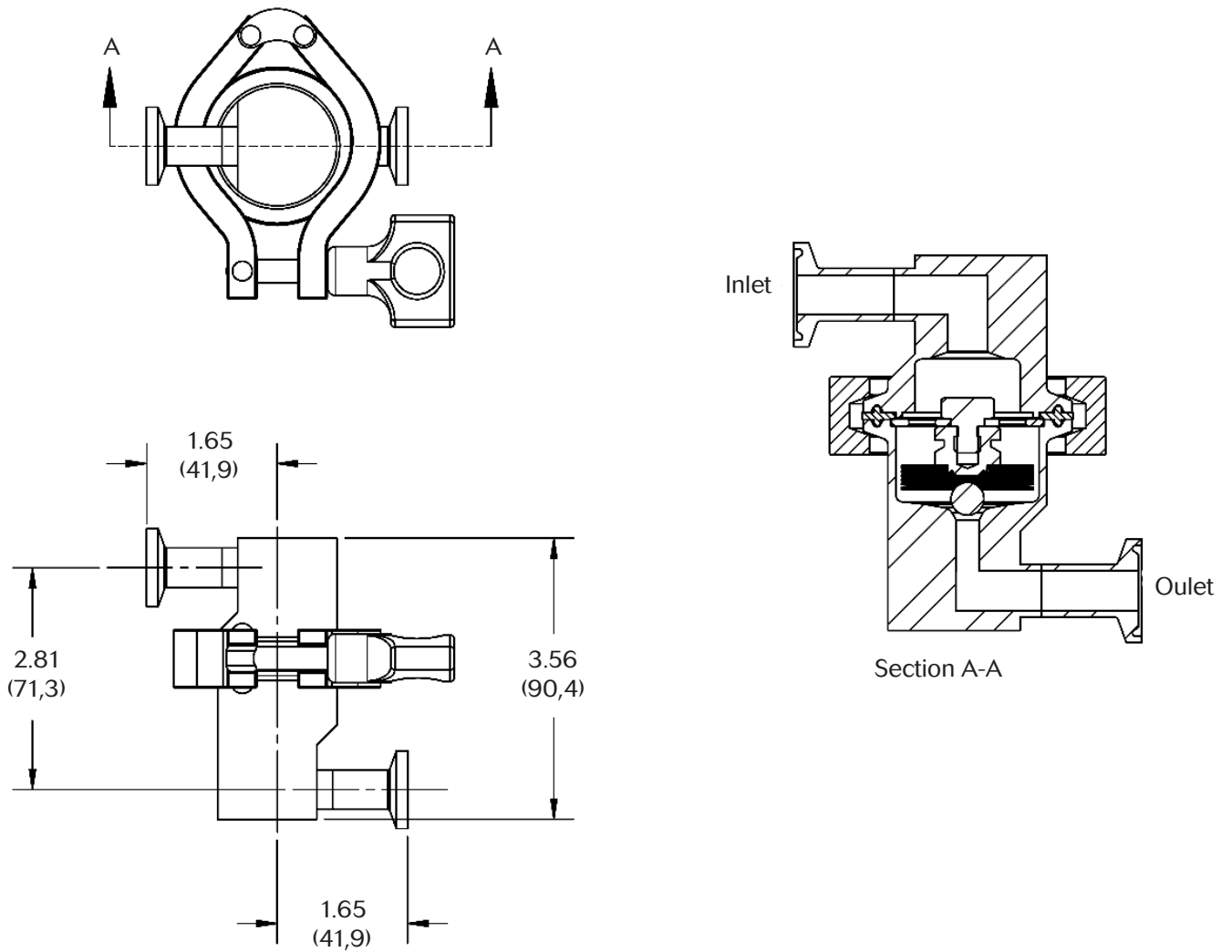


Section A-A

MK93 SANITARY STEAM TRAPS

**DIMENSIONS - HORIZONTAL CONNECTIONS**

*1/2", DN15 Horizontal Inlet/Outlet (93HHC, 93HHK)\**

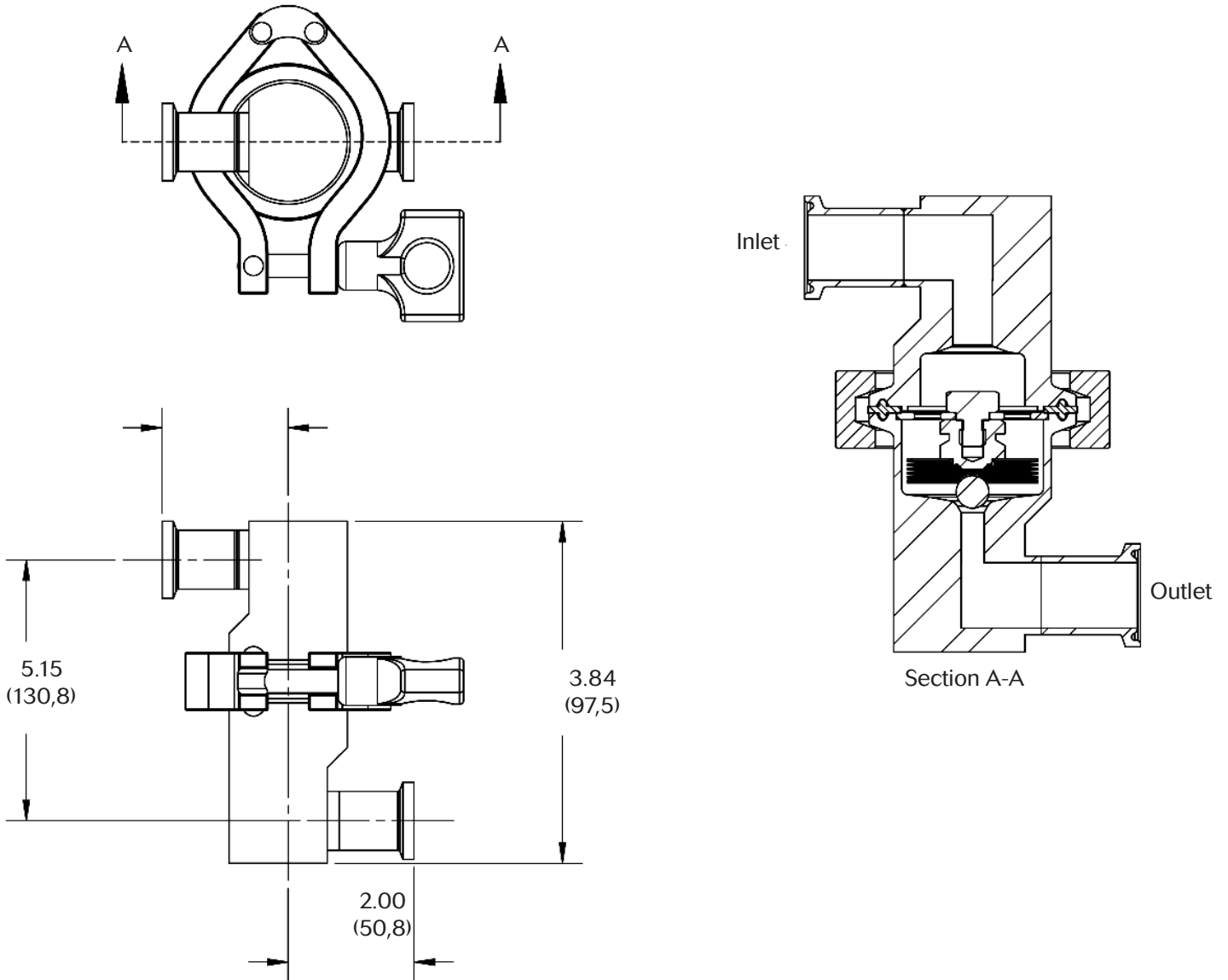


**\* Note: Model Code and Installation lay-in dimension were changed on this model in April 2020.**

MK93 SANITARY STEAM TRAPS

**DIMENSIONS - HORIZONTAL CONNECTIONS**

*3/4", DN20 Horizontal Inlet/Outlet (93HHC, 93HHK)\**

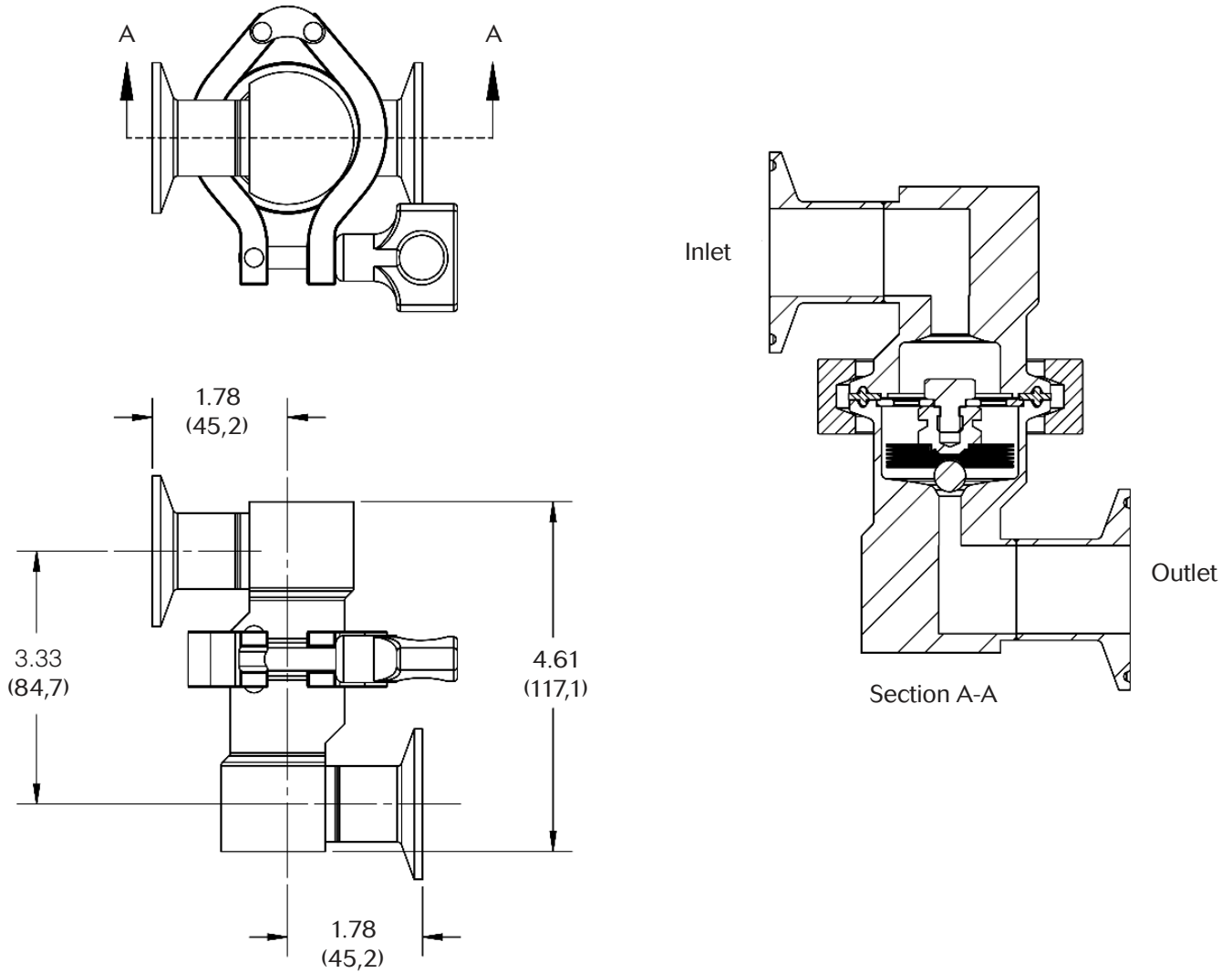


\* Note: Model Code and Installation lay-in dimension were changed on this model in April 2020.



**DIMENSIONS - HORIZONTAL CONNECTIONS**

*1", DN25 Horizontal Inlet/Outlet (93HHC, 93HHK)\**

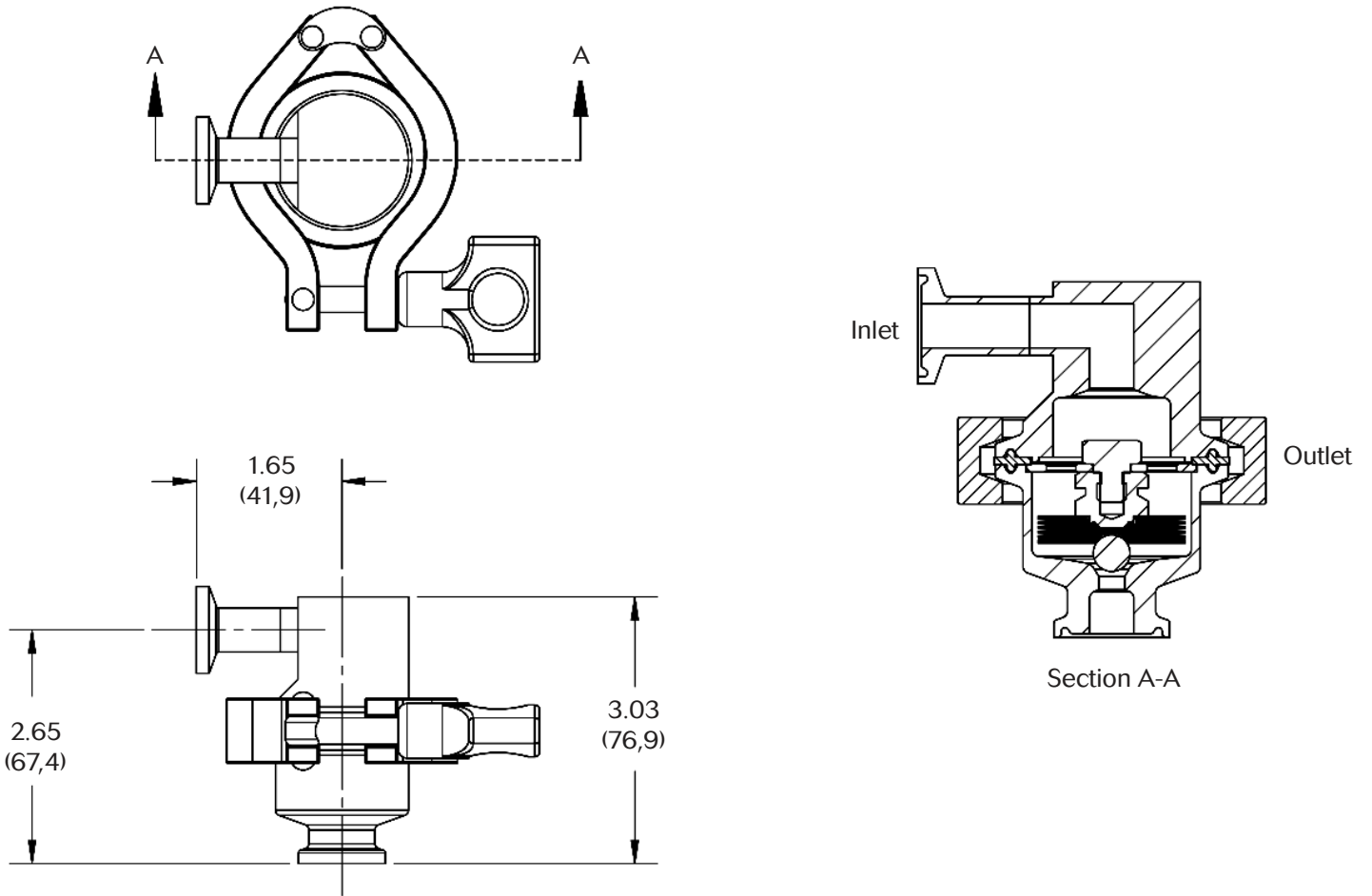


**\* Note: Model Code and Installation lay-in dimension were changed on this model in April 2020.**

MK93 SANITARY STEAM TRAPS

**DIMENSIONS - HORIZONTAL CONNECTIONS**

*1/2", DN15 Horizontal Inlet/Vertical Outlet (93HVC, 93HVK)\**

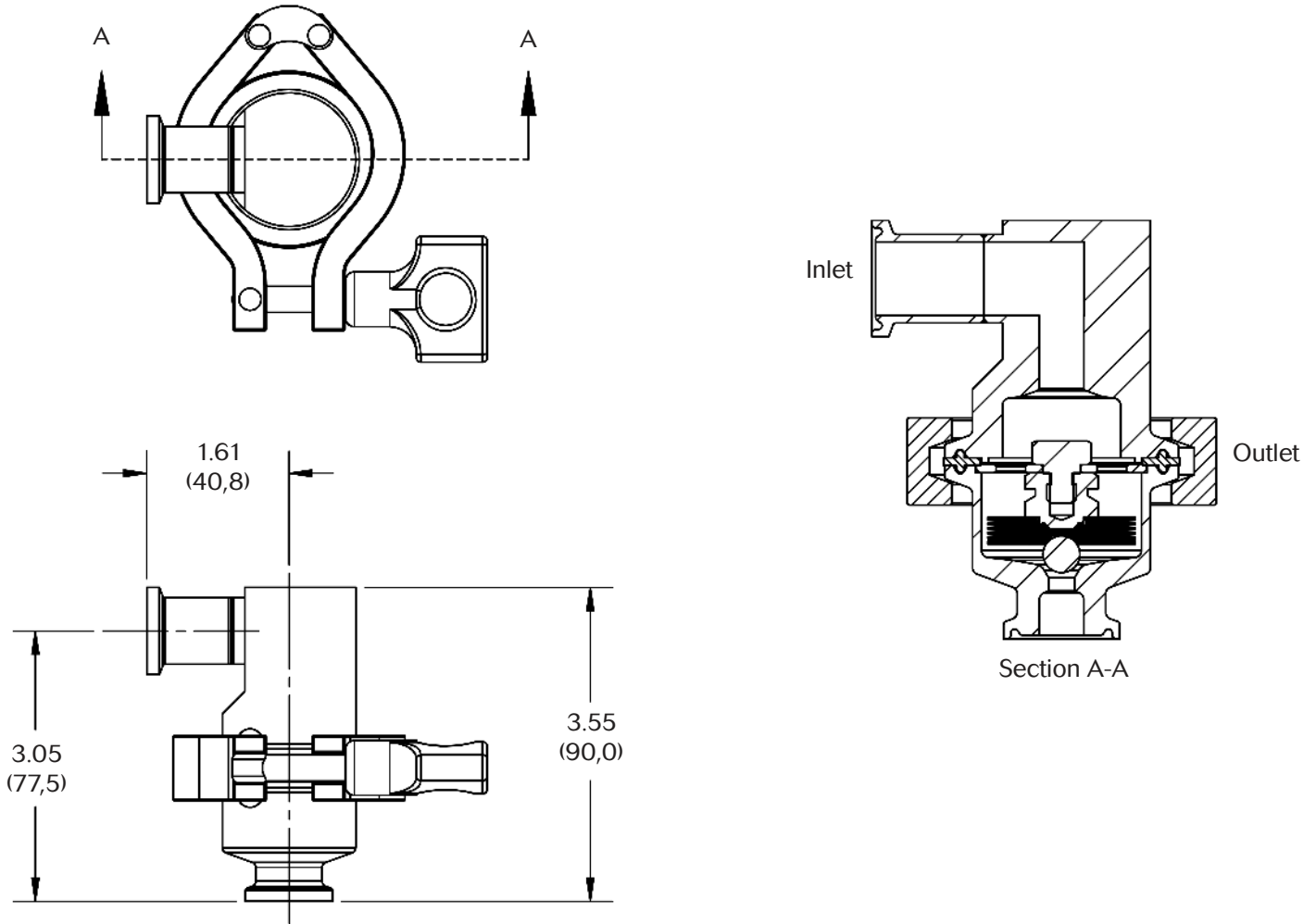


**\* Note: Model Code and Installation lay-in dimension were changed on this model in April 2020.**

MK93 SANITARY STEAM TRAPS

**DIMENSIONS - HORIZONTAL CONNECTIONS**

*3/4", DN20 Horizontal Inlet/Vertical Outlet (93HVC, 93HVK)\**

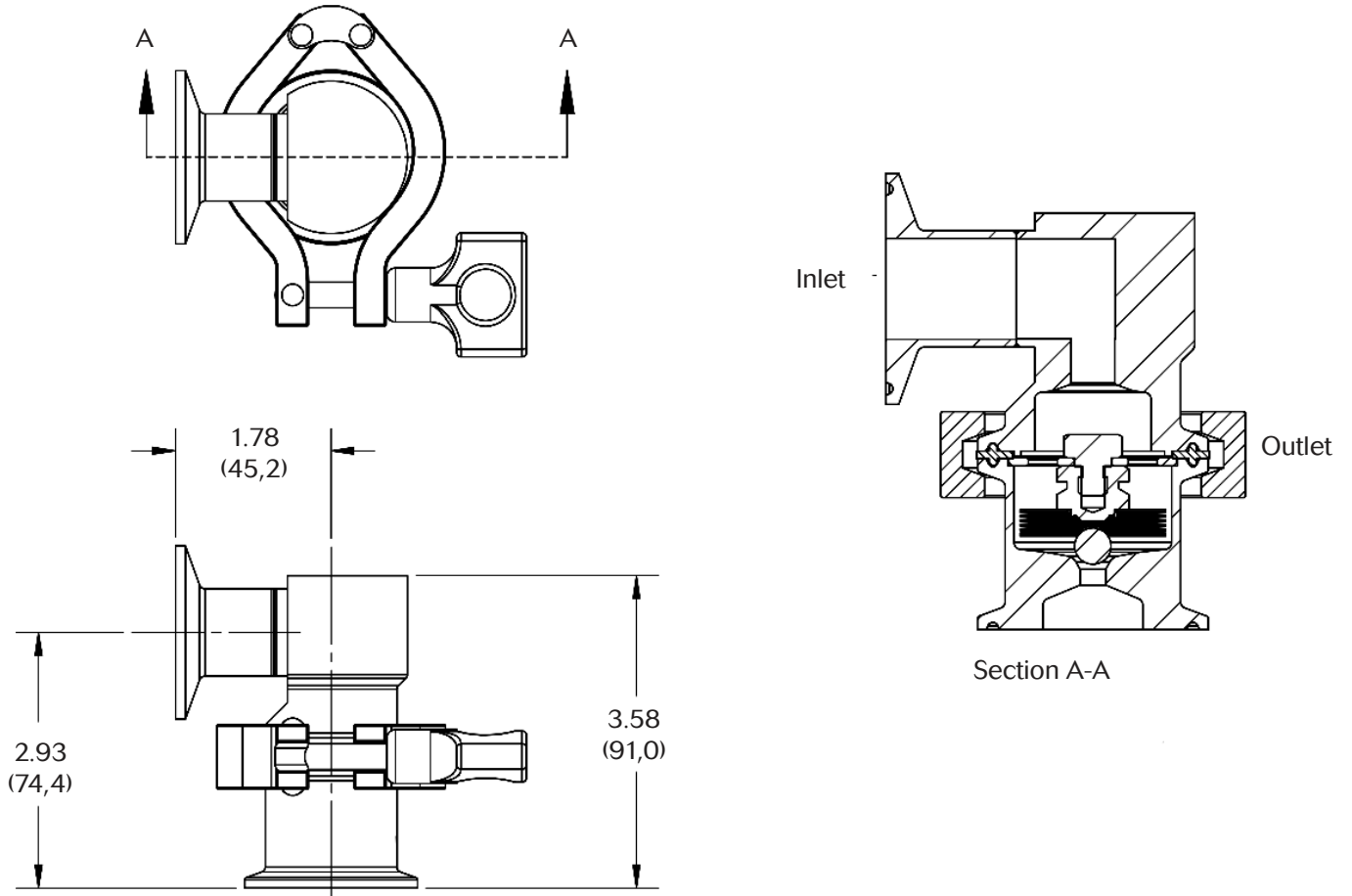


**\* Note: Model Code and Installation lay-in dimension were changed on this model in April 2020.**

MK93 SANITARY STEAM TRAPS

**DIMENSIONS - HORIZONTAL CONNECTIONS**

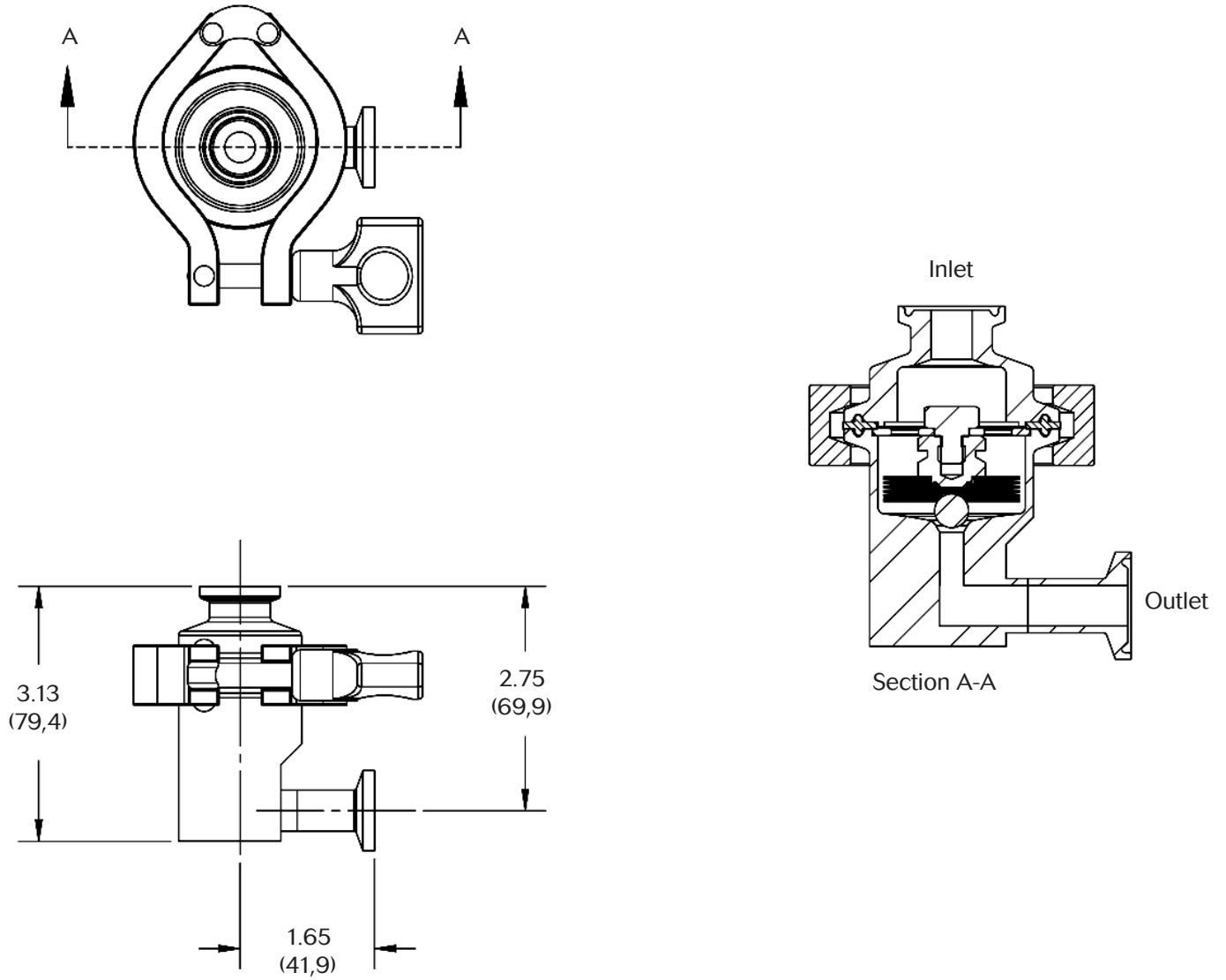
*1", DN25 Horizontal Inlet/Vertical Outlet (93HVC, 93HVK)\**



**\* Note: Model Code and Installation lay-in dimension were changed on this model in April 2020.**

**DIMENSIONS - HORIZONTAL CONNECTIONS**

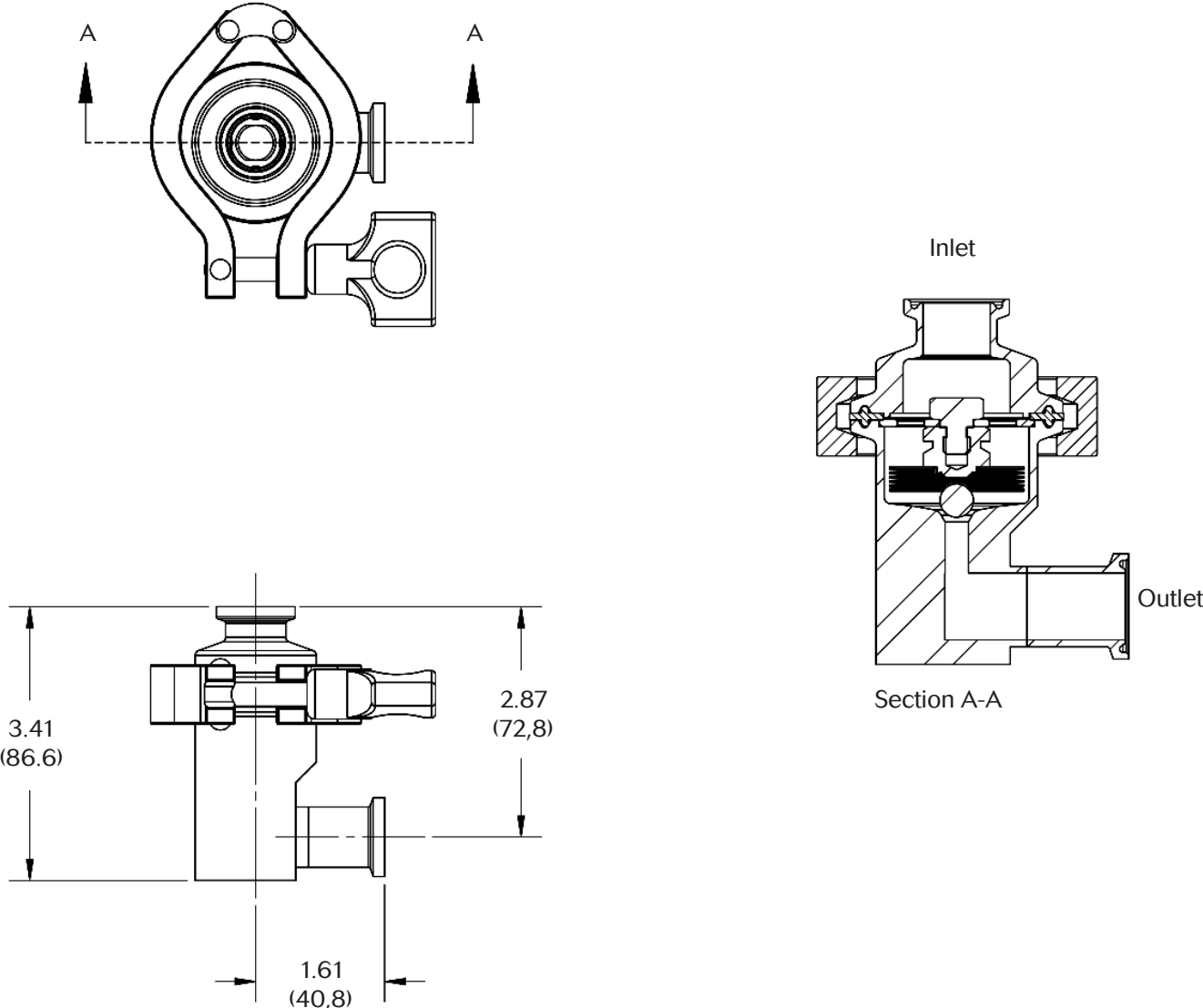
*1/2", DN15 Vertical Inlet/Horizontal Outlet (93VHC, 93VHK)\**



**\* Note: Model Code and Installation lay-in dimension were changed on this model in April 2020.**

**DIMENSIONS - HORIZONTAL CONNECTIONS**

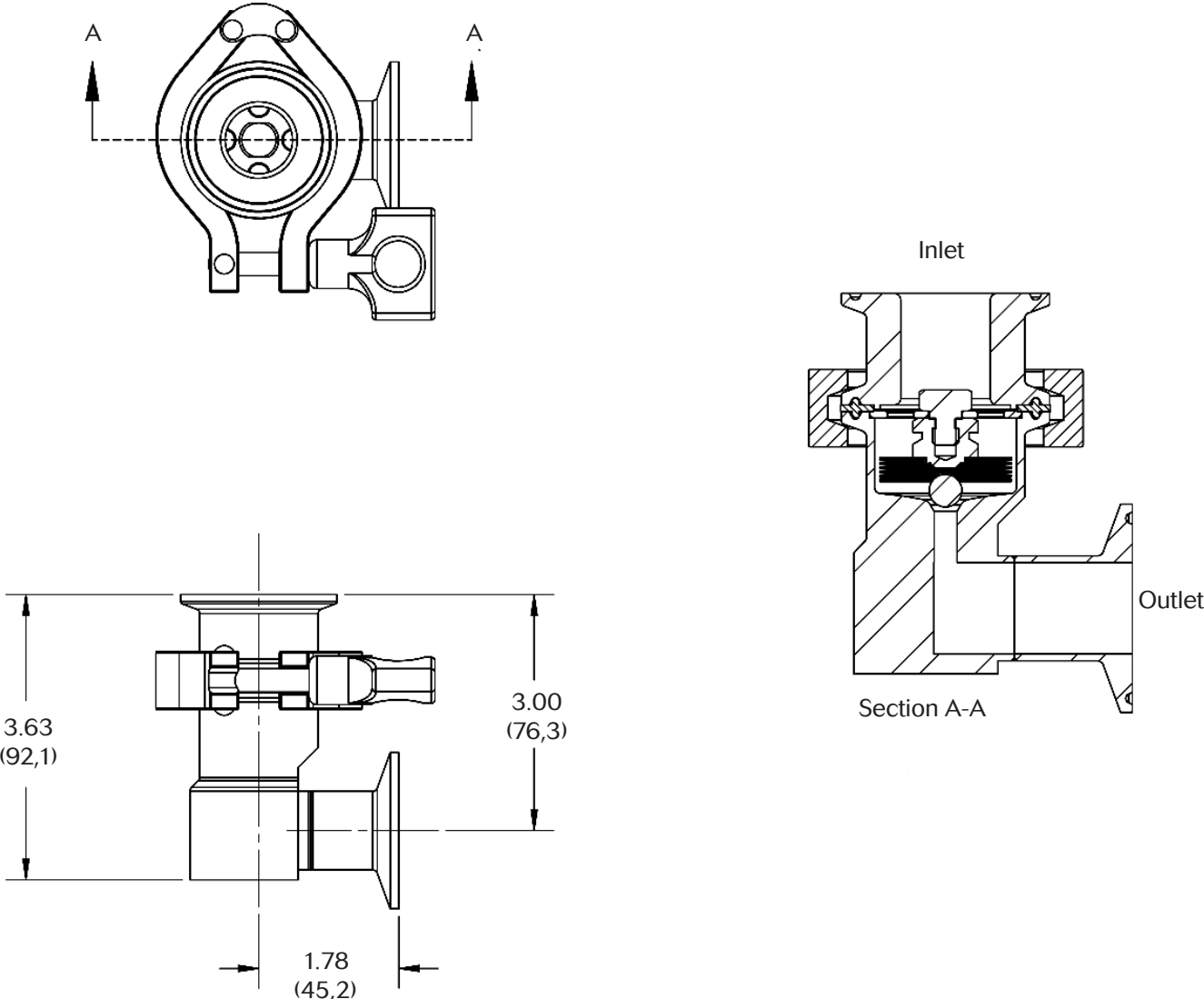
*3/4", DN20 Vertical Inlet/Horizontal Outlet (93VHC, 93VHK)\**



\* Note: Model Code and Installation lay-in dimension were changed on this model in April 2020.

**DIMENSIONS - HORIZONTAL CONNECTIONS**

*1", DN25 Vertical Inlet/Horizontal Outlet (93VHC, 93VHK)\**



**\* Note: Model Code and Installation lay-in dimension were changed on this model in April 2020.**

## ORDERING SCHEMATIC

**NOTE: If reordering a MK93 with horizontal connections to replace a previous purchase, or ordering an identical model for a new process, PLEASE NOTE THAT THE THE ORDER CODES AND LAY-IN DIMENSIONS CHANGED IN 2014 and 2020. If you have questions about a replacement trap, please provide the original serial number when reordering.**

| Model | Body | – | Size | – | End Connections | – | Special Options |
|-------|------|---|------|---|-----------------|---|-----------------|
| 93    | C    |   | 050  |   | C               |   | P               |

| 1     | Model/Body Joint   |
|-------|--|
| 93C   | Tri-Clamp Body/ Wingnut Clamp/ Vertical In/Out             |
| 93B   | Bolted Body/ Vertical In/Out                               |
| 93K   | Tri-Clamp Body/ Bolted Clamp                               |
| 93W   | Compact, Welded Body/ Vertical In/Out                      |
| 93HHC | Tri-Clamp Body/ Wingnut Clamp/ Horizontal In/Out           |
| 93HVC | Tri-Clamp Body/ Wingnut Clamp/ Horizontal In/ Vertical Out |
| 93VHC | Tri-Clamp Body/ Wingnut Clamp/ Vertical In/ Horizontal Out |
| 93HHK | Tri-Clamp Body/ Bolted Clamp/ Horizontal In/Out            |
| 93HVK | Tri-Clamp Body/ Bolted Clamp/ Horizontal In/ Vertical Out  |
| 93VHK | Tri-Clamp Body/ Bolted Clamp/ Vertical In/ Horizontal Out  |

| 2    | Size   |      |
|------|--------|------|
| 050  | 1/2"   | DN15 |
| 075  | 3/4"   | DN20 |
| 100* | 1"     | DN25 |
| 150* | 1-1/2" | DN40 |

\* Note: 1" and 1-1/2" (DN25, DN50) tubing size is generally used in higher condensate load applications. Make sure you check the capacity chart on page 3 to ensure the MK93 can handle your condensate load. If not, the MK94 or MK934 may be a more appropriate model choice.

| 3     | End Connections                     |  |
|-------|-------------------------------------|--|
| Inlet | Outlet                              |  |
| C     | Inch Tri-Clamp                      |  |
| S*    | ISO Tri-Clamp                       |  |
| D**** | DIN Tri-Clamp                       |  |
| N     | NPT Threaded Vertical Inlet/Outlet  |  |
| B     | BSPT Threaded Vertical Inlet/Outlet |  |
| T     | Inch Tube                           |  |
| M**   | DIN Tube                            |  |
| P***  | ISO Tube                            |  |

\* According to DIN 32676 Row B

\*\* According to DIN 1186, DIN 11850 Row A

\*\*\* According to ISO DIN 1186 line B, ISO 1127

\*\*\*\* According to DIN 32676 Row A

| 4              | Options   |
|----------------|---|
| B              | 20 Ra Ext. - Body Only                              |
| E              | TFE/EPDM, FDA USP Class VI                          |
| G              | Tuf-Steel, TFE/SST Body Gasket, FDA USP Class VI    |
| S              | Silverback Gasket TFE/SST Body Gasket, USP Class VI |
| P <sup>1</sup> | High Pressure Bellows                               |
| L              | Electropolish MK93C or K Body                       |
| R              | Electropolish, MK93B Bolted Body                    |
| F7*            | TFE/Viton FDA, USP Class VI @ 250°F (121°C)         |
| TF*            | PTFE, USP Class VI @ 250°F (121°C)                  |

1 For applications with inlet pressure > 45 psi (3 bar)

\* Document Part #25384 required when ordering

Note: if no gasket is specifically requested, a TFE/Viton gasket is provided. You can combine up to 2 options in alphabetical order.

For example: 93C-075-C-IS = MK93C with 3/4" Tri-Clamp Body, wingnut clamp, vertical inlet and outlet with Electropolish body and Silverback gasket