

Section Two

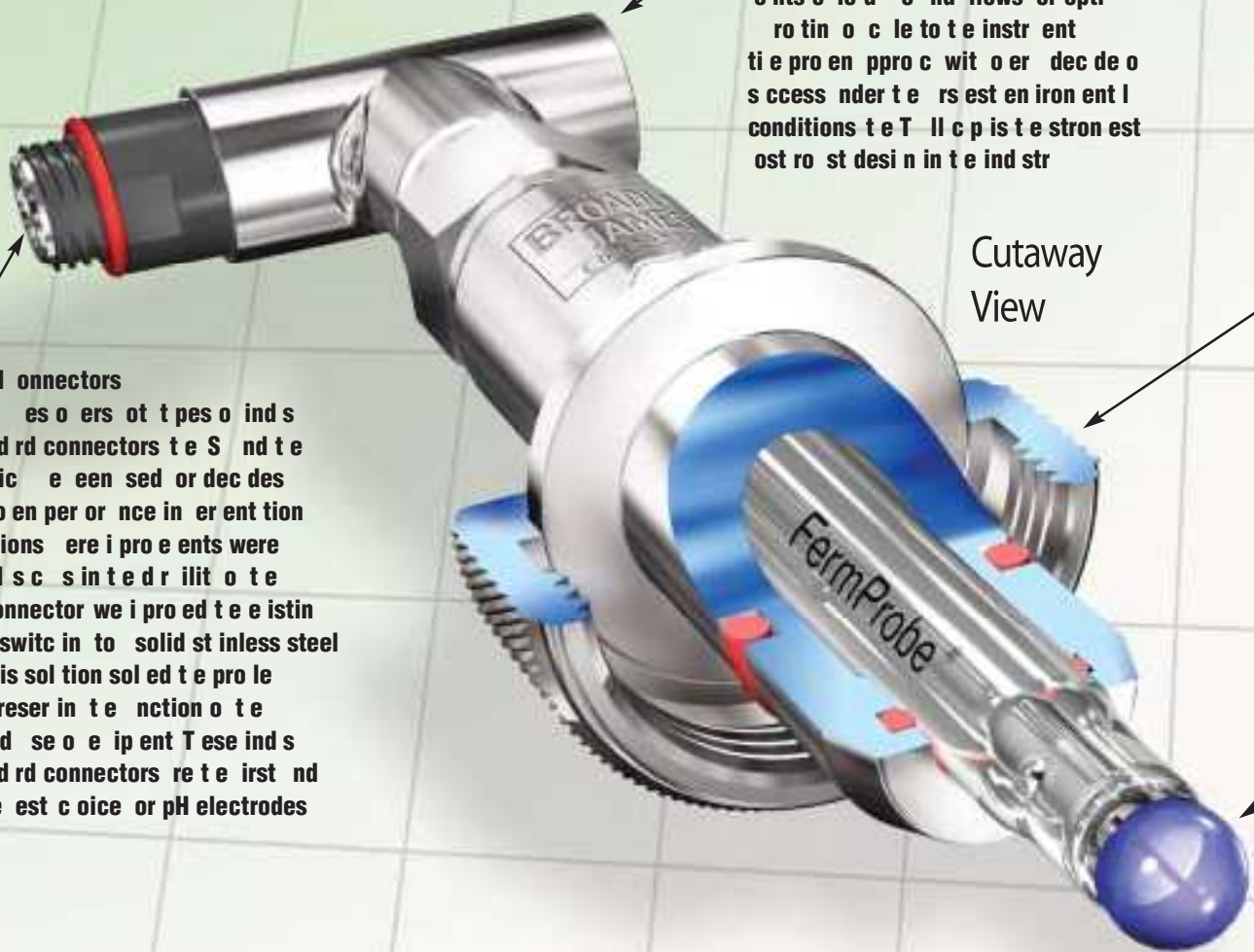
FermProbe® pH Electrodes

Steam Sterilizable and Autoclavable

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pH Electrode esi n

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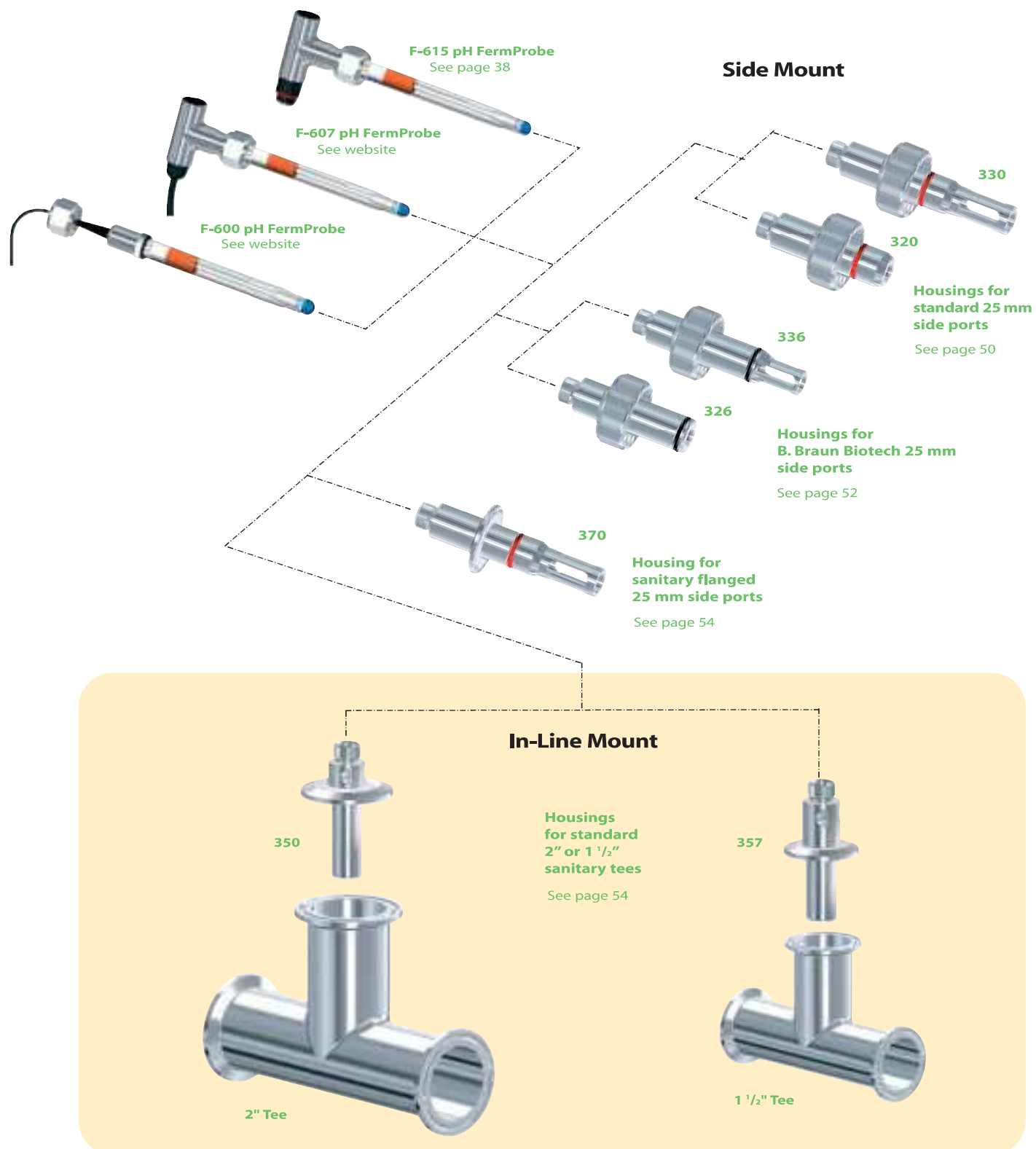
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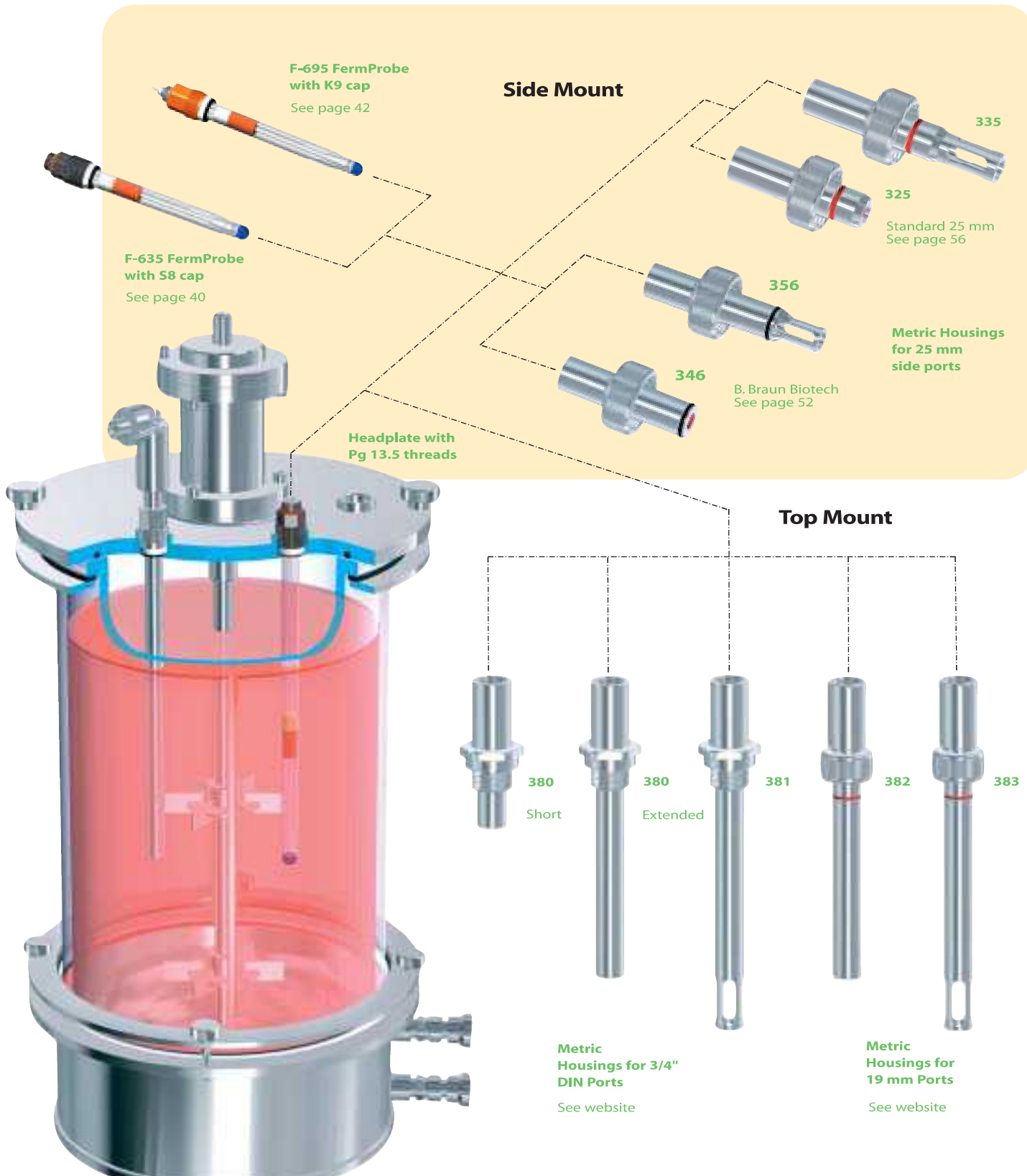
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FermProbe® pH Electrode and Housing System Overview





How to Select a FermProbe® pH Electrode

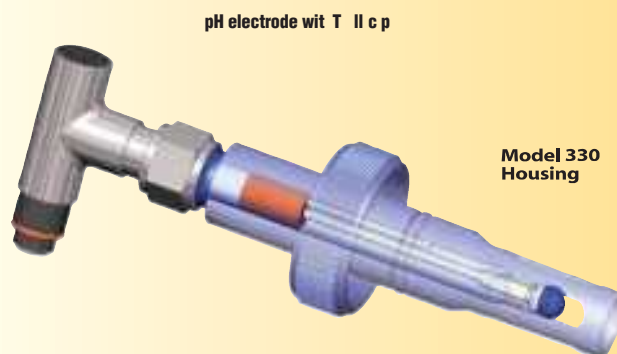
STYLE 1 (see page 38)

FermProbe® pH Electrodes with T-Pull® Cap

The T-Pull cap eases installation and removal of the electrode from the housing and greatly reduces fatigue of the extension cable. The electrode can be removed from the housing without rotating the electrode and twisting the cable, further reducing cable fatigue.

Features:

- Rugged T-Pull cap eases electrode removal. No tools required.
- T-Pull design greatly reduces cable fatigue.
- Electrode retainer nut is part of handle. Cannot be lost or misplaced.
- Standard S8 detachable cable connection
- Available in both disconnect cap and integral cabled versions.



Model F-615 pH FermProbe

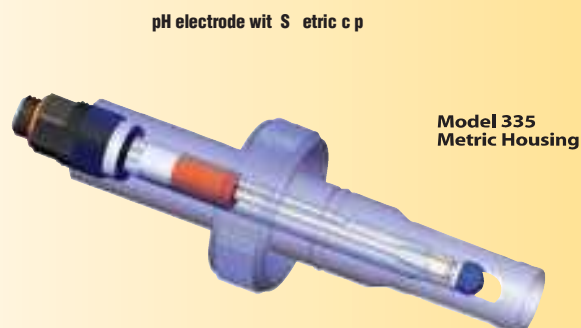
STYLE 2 (see page 40)

FermProbe® pH Electrodes with Standard S8 Metric Cap

This FermProbe style features a standard S8 detachable cable connection on a metric threaded polymer cap that allows the electrode to be used with European style electrode housings. The design requires the rotation of the electrode during installation. It is compatible with Euro-designed housings requiring a metric Pg13.5 threaded electrode cap.

Features:

- Standard S8 detachable cable connection
- Polymer disconnect cap with metric Pg13.5 threads.
- Compatible with European designed bioprocess housings.



Model F-635 pH FermProbe

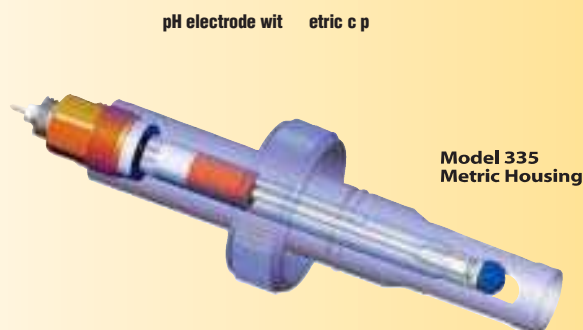
STYLE 3 (see page 42)

FermProbe® pH Electrodes with K9 Metric Cap

This FermProbe style features a K9 detachable cable connection on a metric threaded polymer cap that allows the electrode to be used with European style electrode housings. The design requires the rotation of the electrode during installation. It is compatible with Euro-designed housings requiring a metric Pg13.5 threaded electrode cap.

Features:

- K9 detachable cable connection
- Polymer disconnect cap with metric Pg13.5 threads.
- Compatible with European designed bioprocess housings.



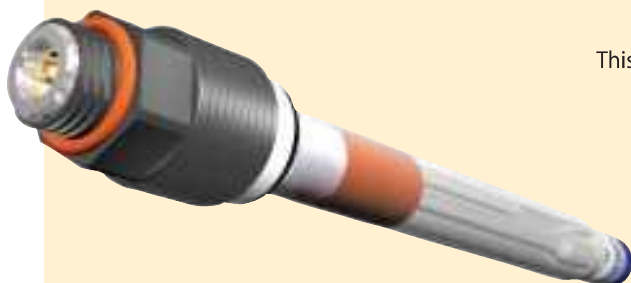
Model F-695 pH FermProbe

What's the difference between the 3 cap styles?



T-Pull® Cap

The T-Pull handle eases installation and removal of the electrode from the housing and greatly reduces fatigue of the extension cable. The electrode can be removed from the housing without rotating the electrode and twisting the cable. Also, the retainer nut is part of the handle and cannot be lost or misplaced. This FermProbe® style has a standard S8 detachable cable connection on a metric threaded polymer cap that allows it to be used with European style electrode housings.



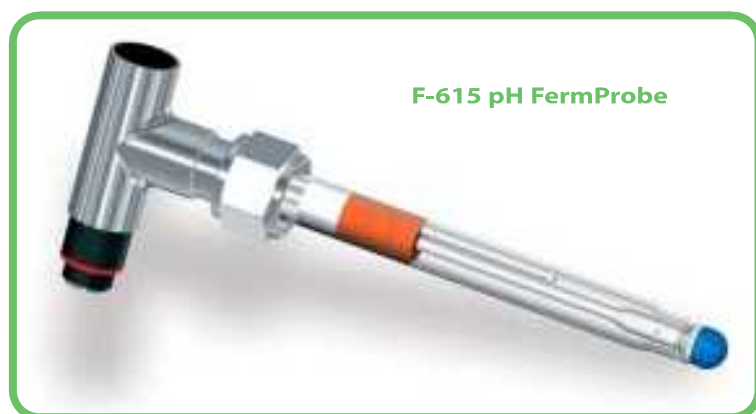
Standard S8 Metric Cap

This FermProbe® style features a standard S8 detachable cable connection on a metric threaded polymer cap that allows the electrode to be used with European style electrode housings. The standard metric cap is a newer autoclavable design that protects the connector pin from breakage. The design requires the rotation of the electrode during installation. It is compatible with Euro-designed housings requiring a metric Pg13.5 threaded electrode cap.



K9 Metric Cap

The original K9 autoclavable cap design is still used in many existing bioprocess systems. This FermProbe® style features a K9 detachable cable connection on a metric threaded polymer cap that allows the electrode to be used with European style electrode housings. The design requires the rotation of the electrode during installation. It is compatible with Euro-designed housings requiring a metric Pg13.5 threaded electrode cap.



F-615 pH FermProbe

T-Pull®
cap style



For electrode
see page 38

For cable
see page 98



F-635 pH FermProbe

Standard S8 Metric
cap style



For electrode
see page 40

For cable
see page 98



F-695 pH FermProbe

K9 Metric
cap style



For electrode
see page 42

For cable
see page 100

T-Pull pH FermProbe — Style 1

The T-Pull style FermProbe pH electrodes are designed to be used in bioprocess applications where the process media is resistant to withstand repeated sterilization cycles. The FermProbe pH electrode is constructed from high quality materials to ensure long life and precise pH measurements. The FermProbe pH electrode is designed to provide standard precise pH measurements in a wide range of process media.

The FermProbe pH electrode is designed to be used in bioprocess applications where the process media is resistant to withstand repeated sterilization cycles. The FermProbe pH electrode is constructed from high quality materials to ensure long life and precise pH measurements. The FermProbe pH electrode is designed to provide standard precise pH measurements in a wide range of process media.



FermProbe pH electrodes are available in various lengths to accommodate particular applications and housings.



Model
F-615
pH electrode
with T-Pull cap

130 mm
length

FermProbe pH Electrode Specifications:

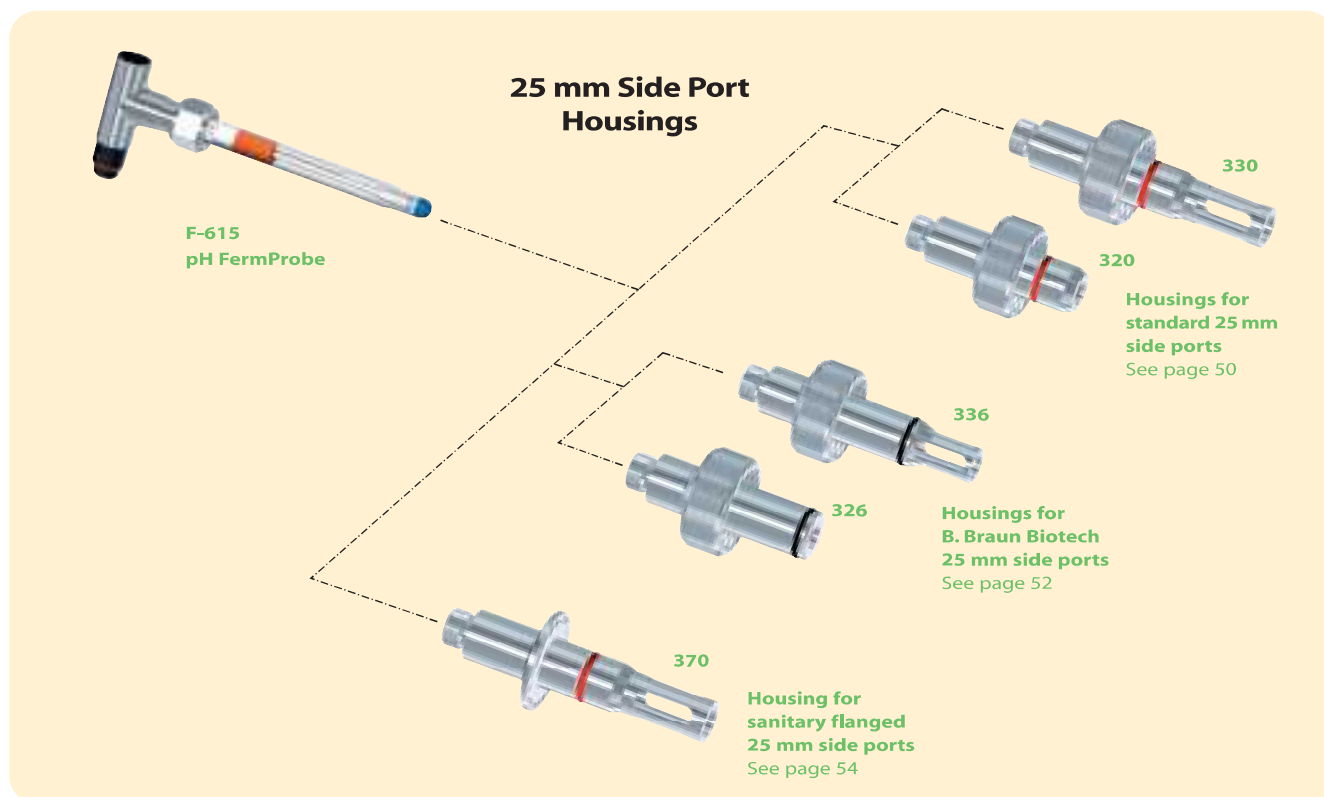
pH range
Sterilizable to
15 psi pressure
No leakage
Electrode secured to housing with threaded retainer nut
Standard disconnect connector in T-Pull cap

FermProbe pH Electrodes with T-Pull Cap

The T-Pull cap is used to install and remove the electrode from the process media without the need for tools. The electrode can be removed from the process media without rotating the electrode or twisting the cable. The electrode can be used in a wide range of process media.

Features:

The T-Pull cap is designed to remove the electrode from the process media without the need for tools. The electrode can be removed from the process media without rotating the electrode or twisting the cable. The electrode can be used in a wide range of process media.



How to Order an Electrode

Choose Electrode Model
The electrode needs to fit the installation. The connector and note its color. The connector is labeled A, B, or C. The connector is red or orange and the connector is blue or green.

Choose Electrode Length
The electrode length is selected based on the installation.

With these descriptions, you can select the correct electrode length to order. Do not forget to check the electrode length to order. Do not forget to check the electrode length to order.

Connector
The pH electrodes require a disconnect connector. See pages 50 and 54.

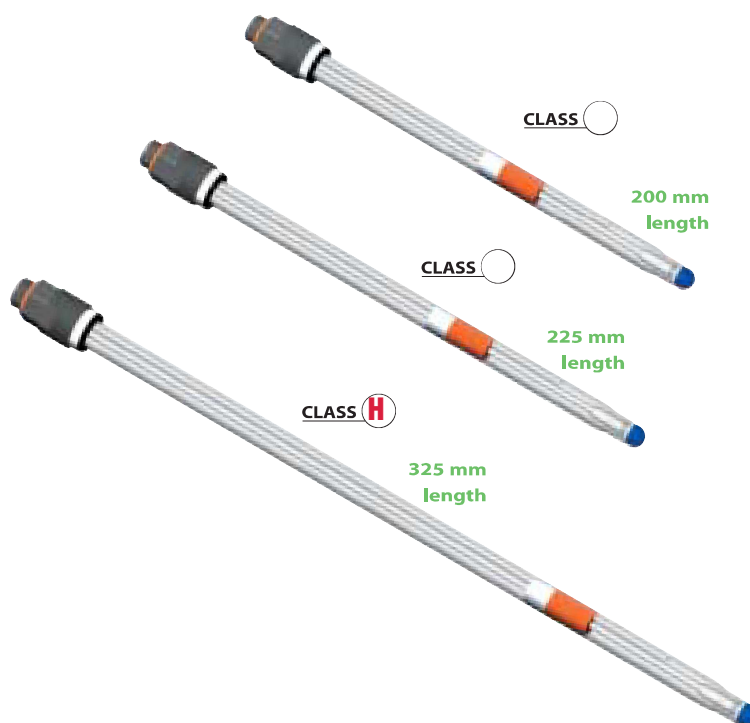
Ordering Information

Electrode Model	Class	Use With These Housing Models	Electrode Length	Electrode Part Number	Electrode Price
Model F-615 pH FermProbe with T-Pull Cap & S8 Disconnect Connector					
F-615	A	320, 330, 326, 336, 350, 357, 370	130 mm	F-615-B130-DH	
F-615	B	320, 330	160 mm	F-615-B160-DH	
F-615	C	320, 330	210 mm	F-615-B210-DH	

pH FermProbe with S8 Metric Cap — Style 2

This FermProbe pH electrode is the standard model with S8 connector. In addition, it features a metric threaded polycarbonate body which allows it to be used with European style electrode sockets.

Our FermProbe pH electrodes are designed to be used in bioprocess applications where standard procedures are required to withstand repeated sterilization cycles. The ergonomic design allows for safe exposure to the online inlet of other electrodes. This reduced impedance process pH electrode continues to provide standard precise pH measurements even after several prolonged storage periods.



FermProbe pH Electrode Specifications:

pH range
Sterilizable to
psi pressure
operation reference state
Electrode secures to socket with threaded
retainer nut
S8 disconnect connector in metric
threading

FermProbe pH Electrodes with S8 Metric Cap

This FermProbe electrode is the standard design with S8 connector. The metric threaded polycarbonate body allows it to be used with European style electrode sockets. The ergonomic design allows for safe exposure to the online inlet of other electrodes. This reduced impedance process pH electrode continues to provide standard precise pH measurements even after several prolonged storage periods.

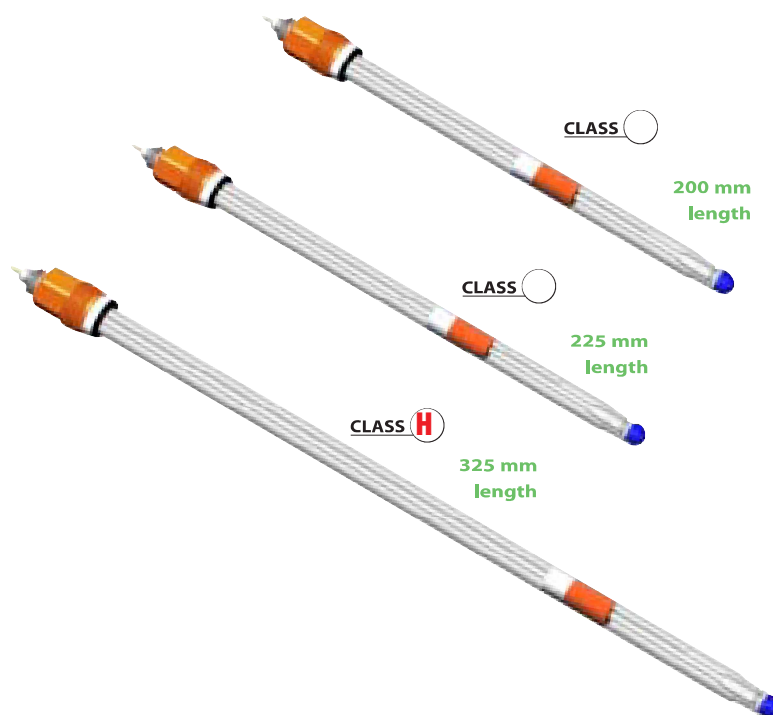
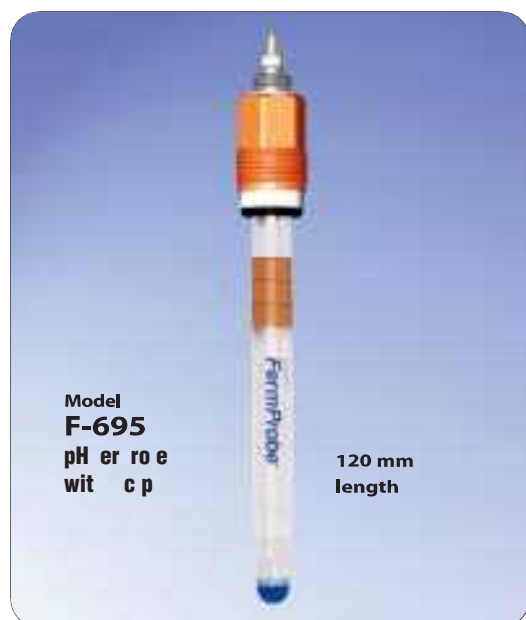
Features:

metric threaded cap is compatible with nearly all
European designed bioprocess electrode sockets
Sterilizable and toolless
first choice or use with standard toolless inserts
available in various lengths or different insertion
length requirements and applications

pH FermProbe with K9 Metric Cap — Style 3

The FermProbe pH electrode is available with the metric cap style. This connector depends on the role assigned to the electrode. It is completely compatible with the existing standard electrode installation type.

The FermProbe pH electrodes are designed to be used in bioprocess applications where sterility is required. The electrode is designed to be used in the process pH electrode continues to provide standard precise pH measurements and prolonged service life.



FermProbe pH Electrode Specifications:

pH range
Sterility level
psi pressure
operation reference state
Electrode secure to avoid with the dedicated
retention
disconnect connector in metric
thread cap

FermProbe pH Electrodes with K9 Metric Cap

This electrode is designed to be used in the process pH electrode continues to provide standard precise pH measurements and prolonged service life.

Features:

metric thread cap is compatible with the standard
bioprocess electrode design
Sterility level
first choice or second choice
the insertion or different insertion
length requirements and applications

How to Choose a Housing Style: Identifying the Vessel Port Style

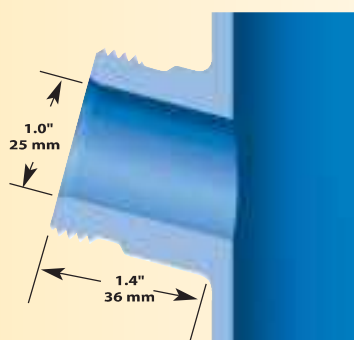
The electrode housing is designed to hold and protect the pH electrode while inserting it into the bioprocess vessel. There are various types of side entry ports and different

groups of housings to fit each port type. The size and make of the port must first be identified in order to narrow the selection process.

The three most common types of entry ports found on pilot and production scale vessels are as follows:

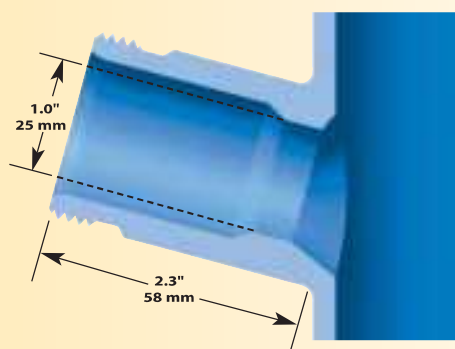
STANDARD 25 mm SIDE PORT

Found on nearly all vessels other than those manufactured by B. Braun Biotech. The port bore is 25 mm i.d. and the housing o-ring seals to the inside of the port. The housing is then secured to the port by a threaded retainer ring. The port is installed at a 15° angle for better electrode performance. See the cutaway drawing to the right for typical installation dimensions.



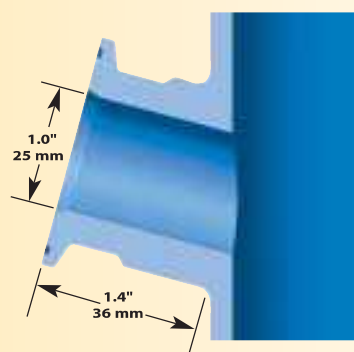
B. BRAUN BIOTECH 25 mm SAFETY SIDE PORT

Found exclusively on vessels manufactured by B. Braun Biotech. This style of port is longer than the standard port and needs a special housing to fit correctly. (Note: The port opening on newer tanks is 30 mm i.d. and the port narrows down to 25 mm i.d. at the critical point where the housing o-ring seals to the inside wall of the port.) Again, the port is installed at a 15° angle for better electrode performance. See the cutaway drawing to the right for typical installation dimensions.



SANITARY FLANGED 25 mm SIDE PORTS

This hybrid port uses the familiar 1.5" sanitary flange and clamp to secure the housing into a 25 mm i.d. port. The electrode housing o-ring still seals to the inside of the port. The sanitary flange seal is a backup seal in case of housing o-ring failure. The port is installed at a 15° angle for better electrode performance. See the cutaway drawing to the right for typical installation dimensions.

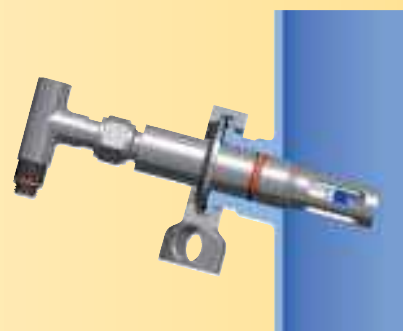
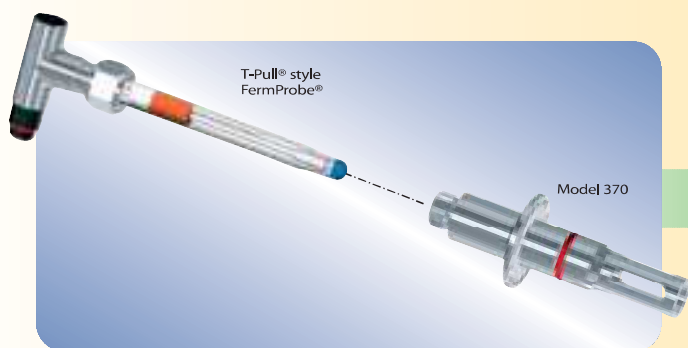
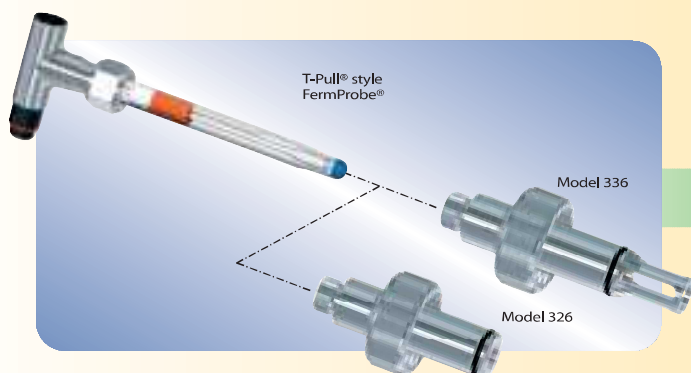
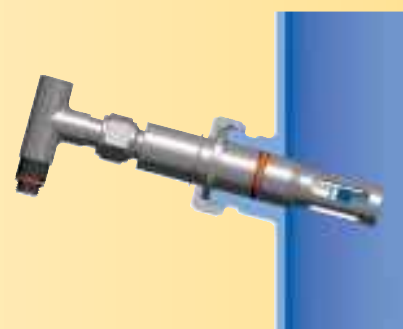
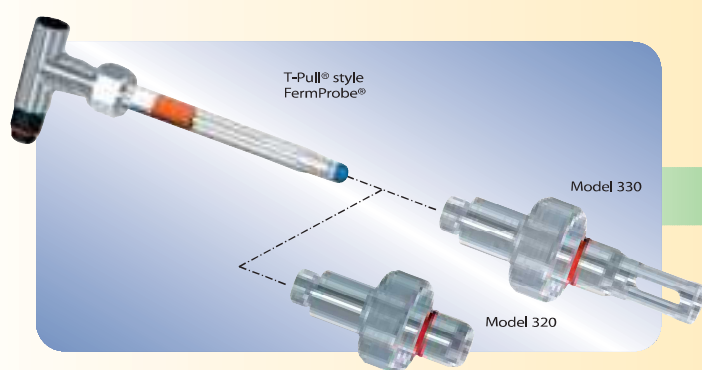


*Dual pH electrode and
D.O. sensor side ports on
a B. Braun Biotech 400
liter bioreactor.*



**pH electrodes and housings
available for this port.**

**Cutaway of vessel wall with housing
and electrode installed.**



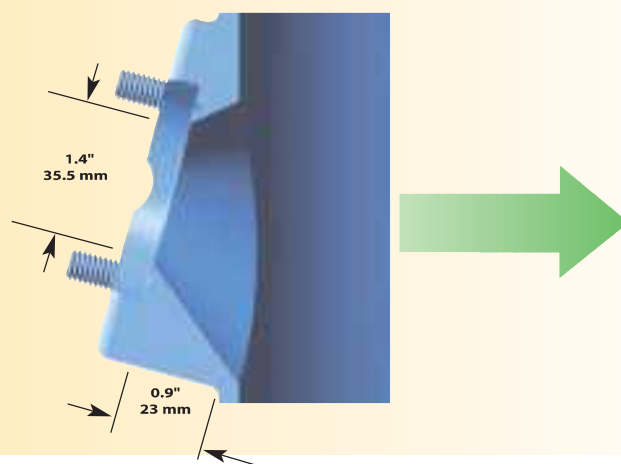
How to Choose a Housing Style: Additional Sanitary Installations

In addition to the standard types of entry ports found on the previous pages, there are other options for sanitary ports. These electrode housings are designed to hold and protect the pH electrode while insertion into sanitary pipe

tees and NovAseptic's sanitary side ports. Both entry ports require a unique housing with a narrow front end. Specifically housing models 357 and 367.

NOVASEPTIC SANITARY SIDE PORT

Sometimes found on vessels in biotech facilities, this style of port is flush to the vessel wall to minimize crevices. The unique design of the port offers increased drainage around the port and more effective Clean-In-Place (CIP). The NA-connect® port from NovAseptic is compatible with a special sanitary housing, which is secured to the port by a clamp. The port is installed at a 15° angle to allow for proper electrode performance. See the cutaway drawing to the right for typical installation dimensions.

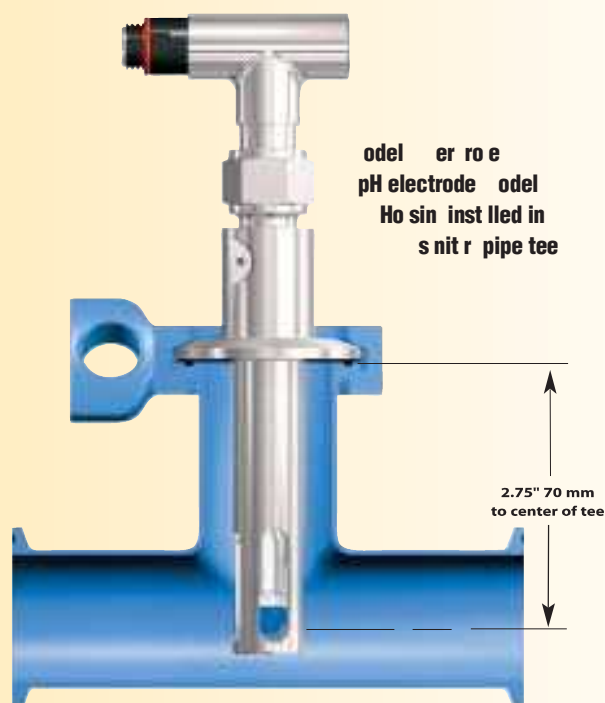


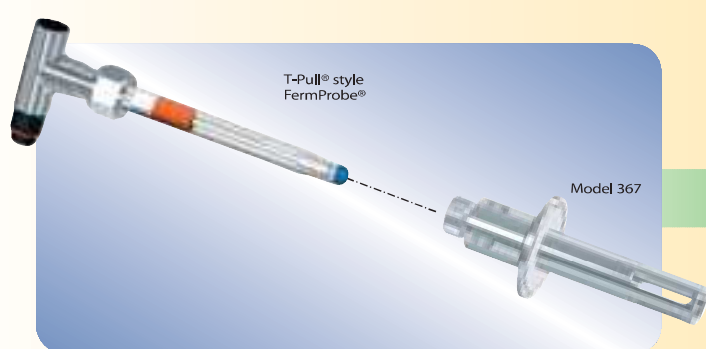
SANITARY PIPE TEE

In-line measurements in a sanitary pipe tee require sanitary flange housings. Since the sanitary gasket is the primary seal, no o-ring is required on the outer portion of the housing.

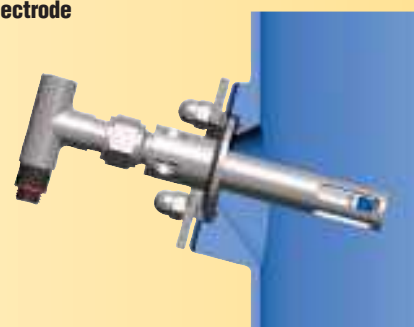
Commonly used in both the food and pharmaceutical industries, the Model 357 and 367 housings are suitable for sanitary pipe systems with CIP requirements. These housings are most often found in downstream processes such as purification.

The housings are secured into a sanitary pipe tee with a standard flange clamp sealed with a flange gasket. The pH electrode is then inserted into the housing for on-line measurements. When using a standard sanitary tee, the sensor is positioned such that the tip of the sensor is in the middle of the process flow.





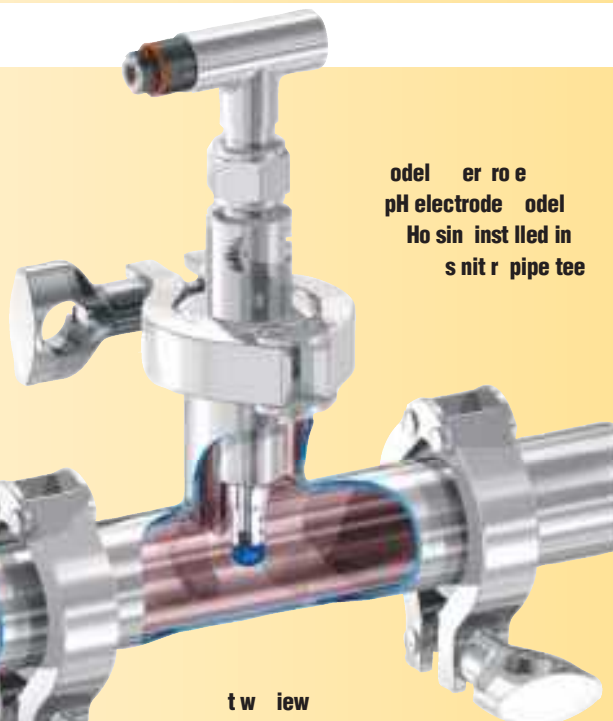
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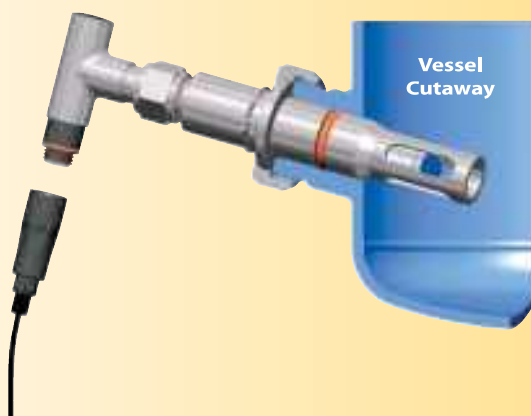


t w iew

Three Common pH Configurations

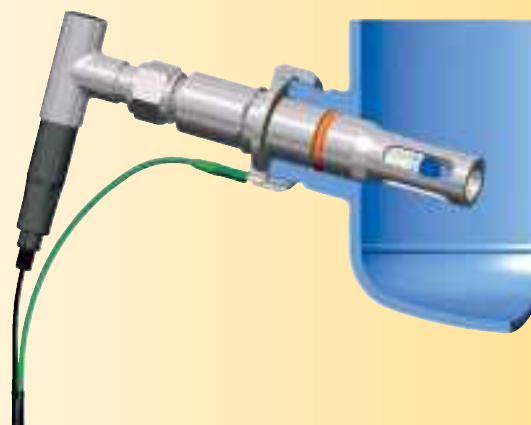
(1) F-615/330 Assembly with Guarded Bulb

This is our most popular combination of pH FermProbe and electrode housing for pilot and production scale vessels. The electrode of choice is the F-615-B130-DH with the rugged T-Pull® handle. The electrode is secured to the housing with a hex nut that can be tightened without twisting the electrode or the cable. The housing is the Model 330-61-H070 with a bulb guard to protect the glass electrode bulb from accidental impact as the housing and electrode are inserted into a 25 mm side port of a tank or vessel. This electrode and housing combination has long been the first choice of engineers needing rugged sensor equipment suited for the industrial environment.



(2) F-615/330 Assembly with Solution Ground Connection

All Broadley-James electrode housings have a built-in slot for a solution ground pin connection. The solution ground lead can be built into the cable assembly for quick and easy connection between the transmitter and the housing. No connection to the tank is necessary. See the pH cable assembly pages to select a cable with a solution ground lead.



(3) F-607 pH Electrode with Integral Cable

The Model F-607 pH FermProbe with integral cable is sometimes found in dairy applications. In areas of constant wash down, a cable that disconnects from the electrode may be prone to moisture contamination and failure. This can be a problem if the electrode/housing assembly is located near the very bottom of a tank or vessel. In such cases, the operators may prefer the F-607 pH electrode. The cable then routes from the electrode/housing assembly to a panel or J-box located in a drier area, away from the bottom of the tank. The same hex nut design described in (1) above allows for easy removal of the electrode from the housing without twisting the cable. See website for more details.



Two Most Frequently asked Questions

1. Do I want a Guarded or Unguarded Housing?

The electrode/housing assembly can accidentally “bump” into the 25 mm port when being installed. If the pH sensing glass bulb of the electrode is not protected by a housing bulb guard, the electrode can easily be shattered. A guarded housing design is often the engineer's first choice when choosing an electrode housing.

However, sometimes the media is so viscous that it will clog the housing guard and effectively smother the pH sensing glass bulb. In this case, an unguarded housing must be used to ensure that the pH sensing glass bulb is always in contact with fresh media.

The F-615/326 assembly with unguarded housing. Recommended for viscous media to ensure that the pH sensing bulb of the electrode is always in contact with fresh media.



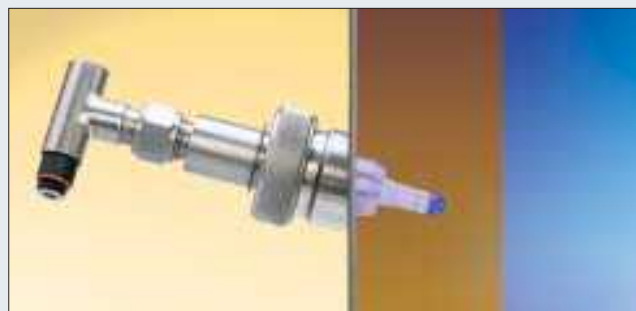
The F-615/336 assembly with guarded housing to protect the pH glass bulb of the electrode during installation.



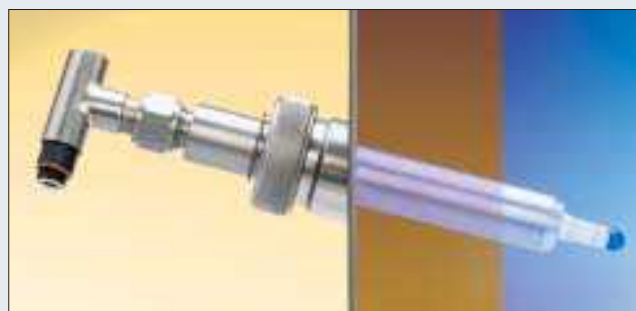
2. When do I Choose a Longer Housing Length?

Sometimes the tank wall can become coated with a thick layer of viscous material that does not mix well with the rest of the media. If the pH sensing bulb of the electrode is located just a couple of inches inside the tank wall, the bulb might be smothered by this viscous layer. Subsequent pH readings may not be representative of the bulk of the media circulating in the rest of the tank. In the illustration at the right, the pH electrode's bulb is trapped in this slow moving viscous layer near the tank wall. The electrode is only measuring the pH of this layer.

A solution to the problem described above is to choose an electrode and a matching housing that extends further into the tank. This will position the pH sensing bulb away from the tank wall and place it closer to the circulating media further inside the tank. The subsequent pH measurements will be much more representative of the circulating media. In the illustration to the right, the electrode and the housing protrude past the viscous zone and into the area of well stirred and circulated media within the production tank.



Bulb of electrode is trapped in thick viscous layer near the wall of the tank.



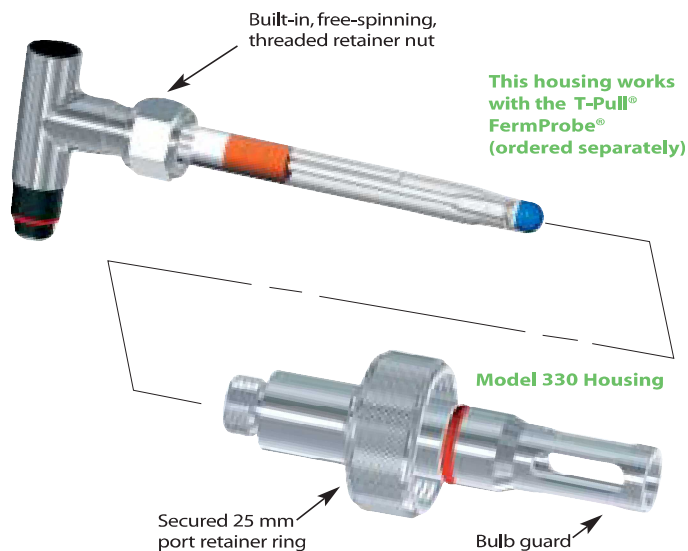
A longer electrode and housing extend further into the tank. The sensing bulb of the pH electrode is past the viscous zone.

Housings for Standard 25 mm Side Ports

The 320 and 330 style electrode housings are designed to be used with the Model F-615 style FermProbe® pH electrode. These housings fit nearly all standard 25 mm side ports found in production and pilot plant vessels and are available in a variety of different lengths to suit your application.

This design requires that the pH electrode be secured to the housing by a free-spinning threaded retainer nut. This allows the electrode to be installed into or removed from the housing without twisting or disconnecting the electrode cable. This feature is very helpful when calibrating the pH electrode tank side in a production environment.

These housings are also designed to be used with Model F-607 and F-600 style FermProbe pH electrodes found on our website.



Specifications:

- 316L stainless steel construction.
- Serialized for traceability to mill steel specifications.
- RA32 finish with electropolish on all wetted parts.
- FDA compliant silicone o-rings. (EPDM available upon request.)
- Permanently secured port retainer ring for additional operator safety.

Additional Features Include:

- Guarded versions for rugged handling while protecting the pH glass bulb in a production environment.
- Unguarded versions for viscous media.
- Available in a variety of lengths for different insertion length requirements.
- Custom designs and modifications promptly quoted.

Model 320 Insertion Lengths



Model 330 Insertion Lengths



How to Order a Housing







Confirm that the vessel has a standard 25 mm side port. Cutaway views and dimensions are shown on pages 44 and 45.

Determine whether the application will permit the use of a bulb guard on the housing. The bulb guard design is highly recommended for all types of applications except where the media is highly viscous. Highly viscous media is prone to clog the guard area of the housing which can cause erroneous measurements.

Determine how far the housing and electrode should extend for best performance (see illustration above). For most process media the minimum length is optimum. However, if the media is viscous and tends to thickly coat the inner vessel wall, then a longer length that protrudes farther into the vessel may provide better pH electrode performance.

Choose a pH electrode from among those listed on page 38. These rugged process pH electrodes secure to the housing with a free-spinning threaded retainer nut. The pH electrodes must be ordered separately.

o r d e r i n g i n f o r m a t i o n

Housing Model	Class	Typical Vessel Insertion Length		Used With pH Electrode Models	Used With Electrode Length	Housing Part Number	Housing Price
Unguarded Housings							
320		38 mm	1.5"	F-615	130 mm	320-61-H070	
320		66 mm	2.6"	F-615	160 mm	320-61-H100	
320		114 mm	4.5"	F-615	210 mm	320-61-H150	
Housings With Protective Bulb Guards							
330		53 mm	2.1"	F-615	130 mm	330-61-H070	
330		81 mm	3.2"	F-615	160 mm	330-61-H100	
330		127 mm	5.0"	F-615	210 mm	330-61-H150	

Housings for B. Braun Biotech 25 mm Safety Side Ports

There are two FermProbe® electrode housing designs, standard and metric, for B. Braun Biotech 25 mm side ports. These housings incorporate the latest B. Braun Biotech design requirements and are compatible with both the new 25 mm safety ports and the older 25 mm port designs.

When these housings are used with the new B. Braun Biotech safety port, the port will release internal steam pressure in the vessel before the housing is completely disengaged from the port.

The standard FermProbe pH electrode is secured to the Models 326 and 336 style housings by a free-spinning threaded retainer nut. This allows the electrode to be installed and removed from the housing without twisting or disconnecting the electrode cable. This feature is very helpful when calibrating the pH electrode tank side in a production environment.

The metric FermProbe pH electrodes thread directly into the Models 346 and 356 style housings, eliminating the need for the threaded retainer nut. In order to prevent twisting the cable, the metric FermProbes have a detachable cable.

Guarded and unguarded versions are available. Using a guarded housing is highly recommended for pH electrodes to provide maximum protection against damage to the sensing bulb. However, highly viscous media is prone to clog the guard.

The model 326 and 336 housings are also designed to be used with Model F-607 and F-600 style FermProbe pH electrodes found on our website.

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Storage of pH Electrodes

The first choice for storing FermProbe® electrodes is 2M KCl. If this is not available, buffer solution can be used, preferably pH 4 buffer. Deionized (DI) water should never be used to store pH electrodes. If an electrode has been stored in DI water the resistance of the junction will change, causing instability and noise in the reading. Soaking the electrode in 2M KCl overnight, prior to use, will usually reverse most of this effect.

Housings for Standard FermProbes



Housings for Metric FermProbes

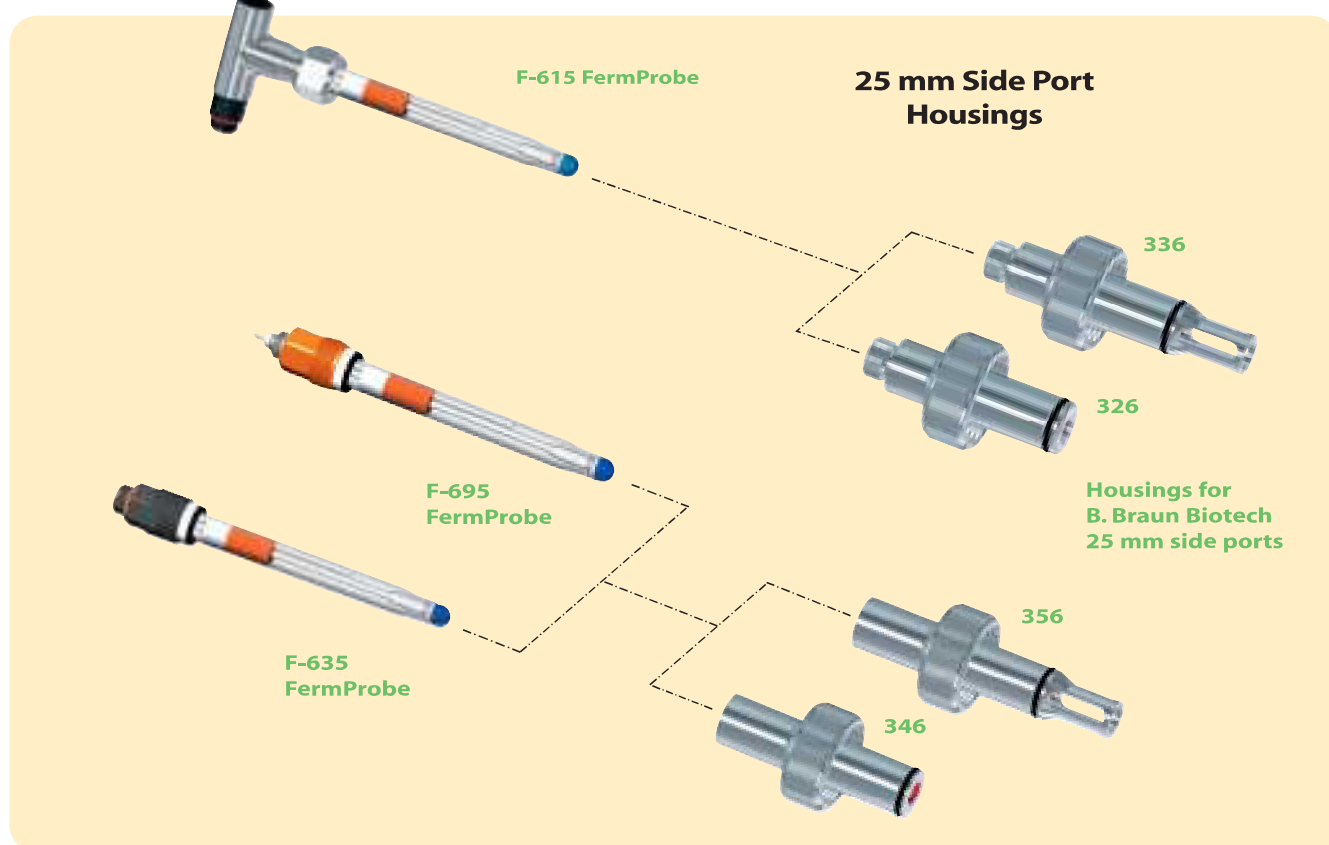


Specifications:

- 316L stainless steel construction.
- Serialized for traceability to mill steel specifications.
- RA32 finish with electropolish on all wetted parts.
- FDA compliant external EPDM o-rings.
- Permanently secured port retainer ring for additional operator safety.

Additional Features Include:

- Guarded versions for rugged handling while protecting the pH glass bulb in a production environment.
- Unguarded versions for viscous media.
- Custom designs and custom modifications promptly quoted.



How to Order a Housing

Confirm that the vessel has a B. Braun Biotech 25 mm side port. Cutaway views and dimensions are shown on pages 44 and 45.

Determine whether the application will permit the use of a bulb guard on the housing. The bulb guard design is highly recommended for all types of process applications except when media is highly viscous. Highly viscous media

is prone to clog the guard area of the housing. See bulb guard area in pictures on opposite page.

Choose the correct steam sterilizable FermProbe pH electrode.

- See pages 38 and 39 for T-Pull FermProbes.
- See pages 40–43 for Metric FermProbes.

order in or tion

Housing Model	Class	Vessel Insertion Length		Used With pH Electrode Models	Used With Electrode Length	Housing Part Number	Housing Price
Unguarded Housing							
326	A	25 mm	1"	F-615	130 mm	326-62-H085	
Housing With Protective Bulb Guard							
336	A	40 mm	1.6"	F-615	130 mm	336-62-H085	
Unguarded Housing							
346	D	25 mm	1"	F-635, F-695	120 mm	346-62-H085	
Housing With Protective Bulb Guard							
356	D	40 mm	1.6"	F-635, F-695	120 mm	356-62-H085	

Housings with Sanitary Flanges

**Housing for Sanitary Flanged
25 mm Side Ports**



Model 370
or
In ed side port

Housings for Sanitary Tees and Novasaptic Side Ports



Model 357
n rded
or
S nit r Tee



Model 367
rded
or
S nit r Tee

Housings for Vessels with Sanitary Flanged 25 mm Side Ports

The Model 370 housing is designed to fit into vessels with sanitary flanged 25 mm side ports. Vessels with these ports are sometimes found in food and pharmaceutical processes that utilize CIP. This housing has two seals to secure it into the vessel. In addition to the gasket seal at the flange, it has a 25 mm o-ring that seals it in the port near the point where the housing enters the vessel. This forward seal minimizes any crevice space when the housing is installed.

Flanged Housings for Sanitary Pipe Systems

Commonly used in both the food and pharmaceutical industries, the 350 series and 360 series housings are suitable for sanitary pipe systems with CIP requirements. These housings are most often found in downstream processes such as purification.

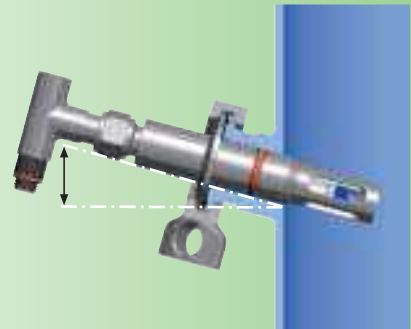
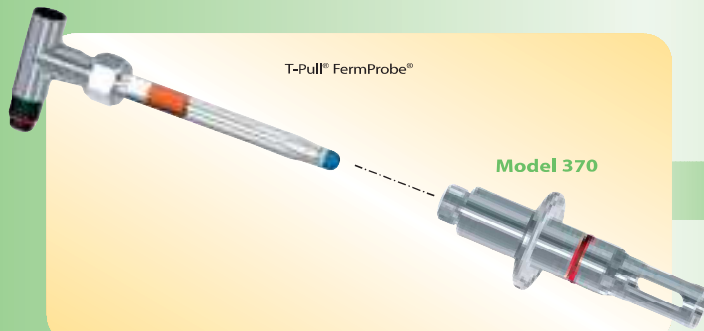
These housings are secured into a sanitary pipe tee with a standard flange clamp sealed with a flange gasket. The pH electrode is then inserted into the housing for on-line meas-

urements. When using a standard sanitary tee, the sensor will be positioned such that the tip of the sensor is in the middle of the process flow. T-Pull® FermProbes® are compatible with these housings.

These housing are also compatible with Novaseptic side ports.

o r d e r i n g i n f o r m a t i o n

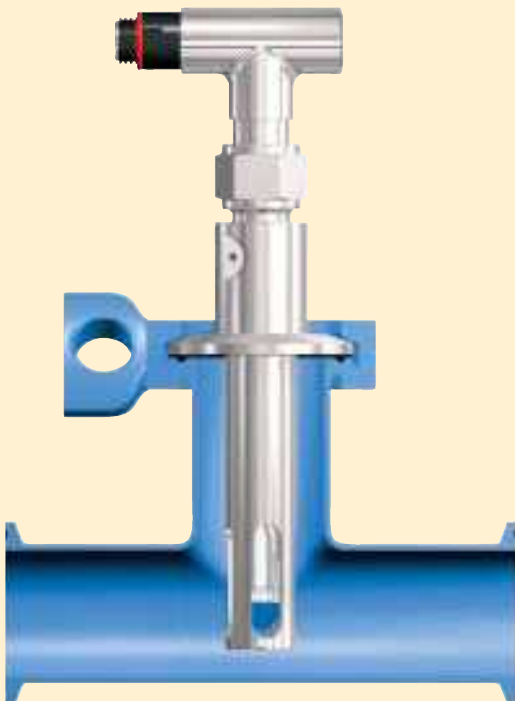
Housing Model	Class	Typical Insertion Length		Used With pH Electrode Model	Used With Electrode Length	Housing Part Number	Housing Price
Model 370 for Vessel with Flanged 25 mm Side Port, Guarded							
370	A	70 mm	2.8"	F-615	130 mm	370-61-H070	
Model 357 for 1.5" Sanitary Tee Fitting, Unguarded							
357	A	75 mm	3.0"	F-615	130 mm	357-61-H075	
Model 367 for 1.5" Sanitary Tee Fitting, Guarded							
367	A	90 mm	3.6"	F-615	130 mm	367-61-H075	
Model 350 for 2" Sanitary Tee Fitting, Unguarded (not shown)							
350	A	100 mm	3.9"	F-615	130 mm	350-61-H090	
Model 360 for 2" Sanitary Tee Fitting, Guarded (not shown)							
360	A	115 mm	4.5"	F-615	130 mm	360-61-H090	



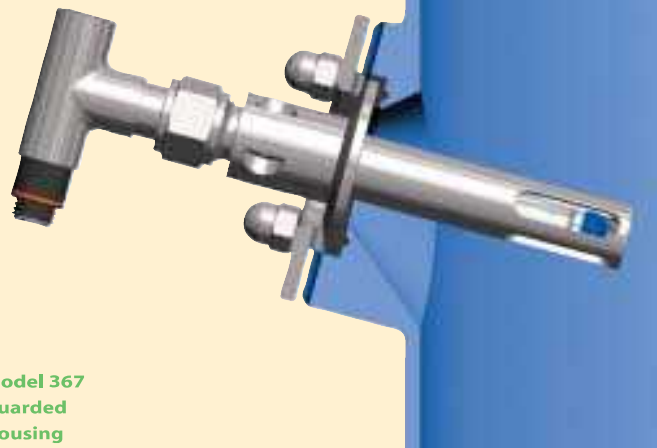
Sensor must be at least
15° above horizontal.

Exploded and Inserted Views

It is recommended to use
Model 370 in orientation port pH
electrodes sold separately.
Initial installation point in
downward see note



Cutaway of
vessel wall with
housing and
pH electrode
installed.



Metric Housings for Standard 25 mm Side Ports



CLASS ☐

Model 325

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CLASS ☐



CLASS ☐

Model 335

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CLASS ☐

These housings are designed to be used with models F-635 and F-695 Metric FermProbe® electrodes and models D140 and D145 12 mm OxyProbe® sensors. They are also compatible with any sensor that has Pg13.5 threads. These housings fit nearly all standard 25 mm ports found on production and pilot plant vessels. Different housing lengths are available to accommodate various application or vessel requirements.

The pH electrode or D.O. sensor threads directly into this metric housing, eliminating the need for a threaded retainer nut. In order to prevent twisting the cable, the metric FermProbes have a detachable cable.

Guarded and unguarded versions are also available. Using a guarded housing is highly recommended for pH electrodes to provide maximum protection against damage to the sensing bulb. However, highly viscous media is prone to clog the guard.

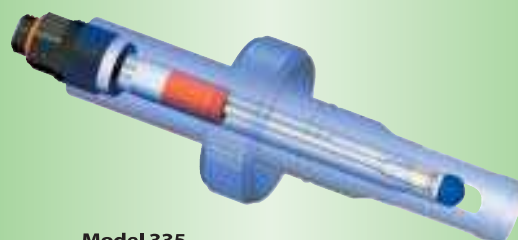
Specifications:

- 316L stainless steel construction.
- Serialized for traceability to mill steel specifications.
- RA32 finish with electropolish on all wetted parts.
- FDA compliant silicone o-rings.
- Permanently secured retainer ring for additional safety.

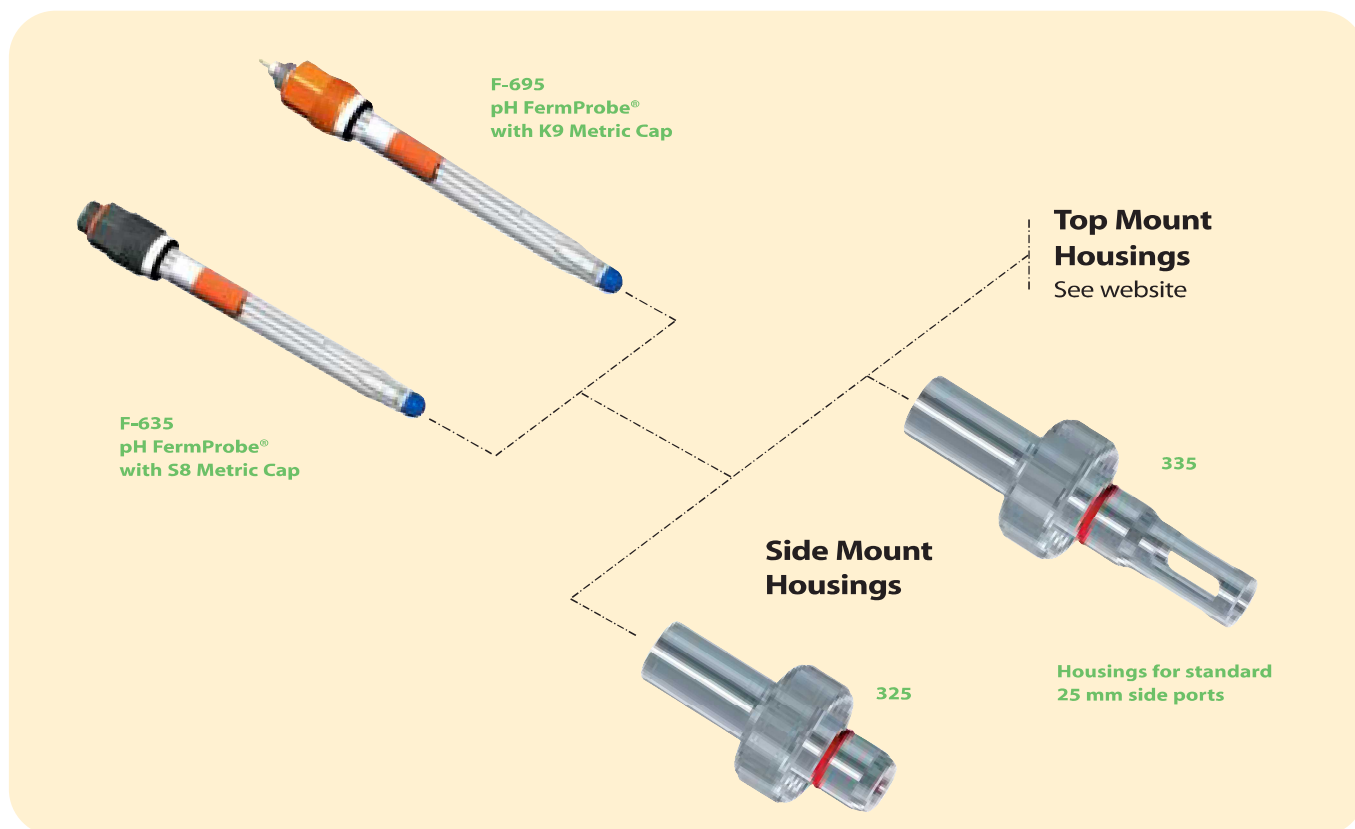
Additional Features:

- Guarded version for rugged handling while protecting the pH glass bulb in a production environment.
- Unguarded version for viscous media.
- Available in two lengths for different requirements.
- Custom designs and modifications promptly quoted.

electrode wit S etric
c p nd det c le c le



Model 335
Metric Housing



How to select the correct housing

- (1) Confirm that the opening is a standard 25 mm side port. Cutaway views and dimensions are shown on pages 44 and 45.
- (2) Determine whether the application will permit the use of a bulb guard on the housing. The bulb guard is highly recommended for all applications except when the media is very viscous. Highly viscous media is prone to clog the guard.
- (3) Determine how far the housing and pH electrode or D.O. sensor should extend into the vessel.
- (4) Confirm the electrode or sensor is a metric FermProbe®, 12 mm OxyProbe®, or European sensor with Pg13.5 threads.

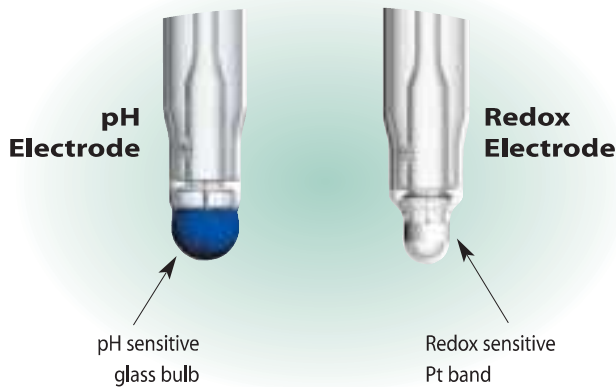
should extend into the vessel.

* See pages 40–43 for more information on metric FermProbe electrodes and electrode selection.

* See page 70 for more information on 12 mm OxyProbe sensors and sensor selection.

o r d e r i n g i n f o r m a t i o n							
Housing Model	Class	Typical Vessel Insertion Length		Used With pH Electrode and D.O. Sensor Models	Used With Sensor/ Electrode Length	Housing Part Number	Housing Price
Unguarded Housing							
325	D	38 mm	1.5"	F-695, F-635, D140, D145	120 mm	325-61-H070	
325	F	114 mm	4.5"	F-695, F-635, D140, D145	200 mm	325-61-H150	
Housing with Protective Bulb Guard							
335	D	53 mm	2.1"	F-695, F-635	120 mm	335-61-H070	
335	F	127 mm	5.0"	F-695, F-635	200 mm	335-61-H150	

Redox Electrodes



Redox FermProbes®

- Fits all suitable FermProbe housings
- Works with standard FermProbe cables
- Compatible with pH transmitters that have a millivolt display mode, such as the Models 30, 40, and 50

Reasons to Measure Redox in Fermentation Media

The metabolic activity of microorganisms depends on numerous factors including the redox potential of the culture environment. Measuring the redox potential allows theessel operator to monitor the addition of redox chemicals while ensuring that the potential is in the proper range for initiation of growth. It is also important to monitor the redox potential of theore inoculation

- ANAEROBIC FERMENTATION
Redox sensors are most commonly used to maintain anaerobic conditions in culture media. They can be used to ensure that the oxygen levels are low or that the redox potential is at a level suitable for anaerobic fermentation.

■ DOWNSTREAM PROCESSING

Sometimes used in steps performed downstream of the fermentation process, redox sensors can monitor changes in concentration or the absence or presence of specific chemicals. Monitoring the redox potential is necessary to control chemical conversions in the process.

■ PROTEIN FOLDING

The close regulation of redox potential is crucial to allow efficient formation of disulfide bonds, which facilitate folding and the stability of the folded protein. Overly oxidizing conditions can result in misfolding due to the formation of incorrect bonds.

■ METABOLIC PATHWAYS

Measuring the redox potential is necessary to determine its influence on the metabolic pathways of microorganisms. This is useful for substrate utilization or the production of specific metabolites.

Specifications:

- ± 5000 mV range
- Steam sterilizable to 135°C
- 150 psig maximum pressure
- Double junction, Ag-AgCl reference system
- Metric Pg13.5 threaded disconnect cap



F-935 Redox FermProbe
with S8 Metric Cap



F-995 Redox FermProbe
with K9 Metric Cap

How to Order a Redox Electrode

(1) Choose Electrode Model.

If the electrode needs to fit an existing cable, check the cable connector and note its color. If the cable connector is black and has an S8 connector, use the F-915 or F-935 Redox FermProbes. If the cable connector is red or orange and has a K9 connector, use the F-995 Redox FermProbe.

(2) Choose Electrode Length.

If you have already chosen a housing, select an electrode length with the same Class designation as the housing. For more information on selection of housings, see pages 44–47. The housing *ordering information* box also lists the correct electrode length to order. If you have not already chosen the housing, please review the recommendations next to each electrode model below.

(3) Confirm Cable Length and Connector.

Model F-915, F-935, and F-995 Redox electrodes require disconnect cable and connector assemblies. See pages 98–101.

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What is Redox (ORP)?

- The terms are interchangeable in meaning:
Redox = Oxidation-Reduction Potential (ORP)
- The term Redox is more commonly used for bioprocess applications in Europe and the U.S.
- The term ORP is more commonly used for industrial chemical process applications in the U.S.
- The redox potential of a solution is related to the concentration of electrons in the electrode. The redox potential is also related to the concentration of the solution. The redox potential is also related to the concentration of the solution.

Ordering Information

Electrode Model	Class	Use With These Housing Models	Electrode Length*	Electrode Part Number	Electrode Price
Series F-900 Redox FermProbes					
F-915	A	320, 330, 326, 336, 350, 357, 370	130 mm	F-915-B130-DH	
F-935	D	325, 335	120 mm	F-935-B120-DH	
F-995	D	325, 335	120 mm	F-995-B120-DK	

*Other lengths are available upon request.