

# ES-660 Series Spring-Loaded Hatch

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 **WARNING**

Failure to follow these instructions or to properly install and maintain this equipment could result in an explosion, fire and/or chemical contamination causing property damage and personal injury or death.

Enardo spring-loaded hatch must be installed, operated and maintained in accordance with federal, state and local codes, rules and regulations and Emerson Process Management Regulator Technologies Tulsa, LLC instructions.

Failure to correct trouble could result in a hazardous condition. Call a qualified service person to service the unit. Installation, operation and maintenance procedures performed by unqualified person may result in improper adjustment and unsafe operation. Either condition may result in equipment damage or personal injury. Only a qualified person shall install or service the spring-loaded hatch.



MODEL ES-660



MODEL ES-660-LB

Figure 1. ES-660 Series Spring-loaded Hatch

North America Only

# ES-660 Series

## Specifications

The Specifications table lists the specifications for the ES-660 Series spring-loaded hatch. Specification is stamped on the nameplate attached to the hatches.

<b>Available Constructions</b> See Product Description	<b>Construction Material</b> <i>Casting:</i> Aluminum (non-sparking) <i>Pressure Gasket:</i> HNBR (standard) and Viton® <i>Vacuum Gasket:</i> Fluorosilicone (standard), Viton® and Teflon®
<b>Bolt Pattern</b> 8 in. API	<b>Optional Equipment</b> Base Gasket, Bolt Set, Non-Corrosive Coating
<b>Pressure Setting Range<sup>(1)</sup></b> 4, 6, 8, 12, 16, 24 and 32 oz./sq. in.	<b>Approximate Shipping Weight</b> <i>Model ES-660 :</i> 25 lbs / 11.3 kg <i>Model ES-660-B:</i> 28 lbs / 12.7 kg <i>Model ES-660-L/LB:</i> 45 lbs / 20.4 kg
<b>Vacuum Setting Range<sup>(1)</sup></b> 0.4, 0.9 and 3.5 oz./sq. in.	

1. The pressure/temperature limits in this Instruction Manual and any applicable standard or code limitation should not be exceeded.

## Introduction

### Scope of the Manual

This Instruction Manual provides instructions for installation, startup, maintenance and parts ordering information for the ES-660 Series spring-loaded hatch.

### Product Description

The ES-660 Series is the new generation hatch designed with precision-manufactured internal components, a base and cover and is intended for use in applications where ultra-tight sealing is required such as sour crude/gas or where strict environmental emissions standards are enforced.

### ES-660 Series Spring-Loaded Hatch Models

- **Model ES-660:** is a spring-loaded thief hatch designed with a round base and cover. It is intended for use on steel and fiberglass tanks which require a tighter seal for reduced vapor loss.
- **Model ES-660-L:** is a spring-loaded thief hatch designed with a long basin and cover. The long basin serves as a thief shelf. The design also includes an inclining base to keep the basin level. This is a long configuration.

- **Model ES-660-B:** is a spring-loaded thief hatch designed with a round base and cover. This hatch is provided with a bleeder attachment making it possible to relieve tank pressure before opening the hatch. This bleeder prevents a spray from discharging when the hatch cover is raised. This is a bleeder vent configuration.
- **Model ES-660-LB:** is a spring-loaded thief hatch designed with a long basin and cover with an inclining base. This is a long and bleeder vent configuration.

## Principle of Operation

Enardo gauge hatches are designed to control evaporation losses and protect tanks against excessive pressure or vacuum. When the tank pressure is above the setpoint of the hatch, the center assembly opens to relieve excess pressure. When the overpressure has dissipated, the center assembly reseats onto the base to provide tight seal.

## Tagging Information

The ES-660 Series hatch is shipped with a tag already attached to the hatch.

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For retrofit ES-660 Series center assemblies, the order includes a tag, stainless steel wire and a drive screw. User has the option to attach the tag with wire to the existing hatch lid or to drill a small hole and attach tag with a drive screw on the top of the lid. Examples of tag locations are shown in Figure 2. Location 1 is the hinge pin on the back of the hatch and location 2 is the holes in the ears on the front of the hatch.

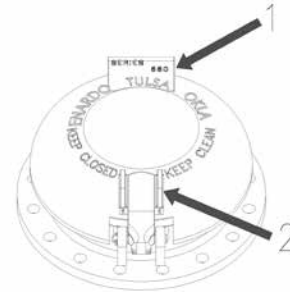


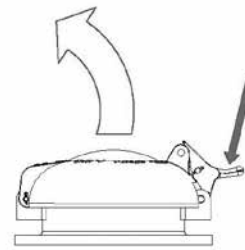
Figure 2. Example Tag Wire Locations

## Installation

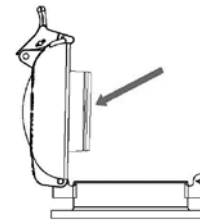
### CAUTION

**Ensure the tank is at atmospheric pressure before opening. A pressure build-up inside the tank can cause a spray to be emitted from the hatch if opened under pressure.**

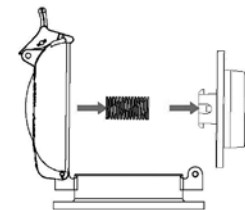
**Springs are energy storage devices and are dangerous if handled improperly. Always use appropriate safety equipment including safety glasses or shields anytime you are working with a spring-loaded hatch.**



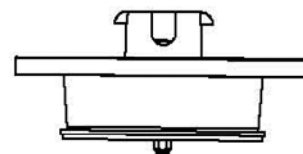
1. Open existing 660 Series hatch by pushing down on lid and opening latch.



2. Remove the existing center assembly by pressing the center assembly inward against the spring pressure and turning one quarter rotation to the right or left.



3. Remove existing center assembly and associated pressure spring.



4. New ES-660 Series center assembly can be identified by bright red anodized vacuum pallet.

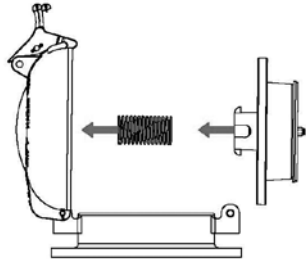
## Complete ES-660 Series Hatch

1. Install the spring-loaded thief hatch on a mating API flange bolting circle of 16 bolt holes on a 10 - 3/8 in. circle for a normal 8 in. opening.
2. For installation of the hatch directly to the tank roof, place the base gasket on the bottom of the hatch flange and place on the tank roof with holes lined up. Insert the 16 bolts from the bottom up by reaching inside the tank, through the hatch and opening in the tank roof. Attach each nut to the bolt from the outside. Tighten all nuts in a circular manner and make sure the hatch is fastened securely.
3. For installation of the hatch to a flanged pipe with an 8 in. API flange pattern, simply place the base gasket on the flanged pipe, line up bolt holes and place hatch on top of base gasket. Install nuts and bolts and tighten in a circular manner. Ensure hatch is fastened securely.

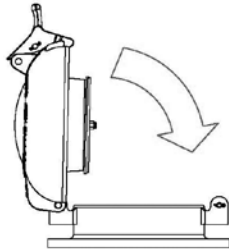
## Retrofit ES-660 Series Center Hatch

The ES-660 Series center assembly can also be installed as a retrofit into an existing 660 Series hatch by following six simple steps.

# ES-660 Series



5. Install existing or new pressure spring and ES-660 Series center assembly. Place the pressure spring into the center assembly, then press this combination into the lid. Once the center assembly is pressed fully into lid, turn center assembly one quarter rotation to the right or left, then slowly allow spring to push the center assembly back out until center assembly is secured in the grooves in the lid. If center assembly comes back out fully, follow instructions in this step again until the center assembly is properly secured in the lid.



6. Close the hatch by pressing down on the lid and latching the hatch.

## Maintenance

Perform a scheduled maintenance every three (3) months and more frequently in corrosive or dusty atmospheres. To perform normal maintenance, inspect the pressure gaskets and vacuum gaskets.

To ensure efficient operation of all hatches, use a clean, nonabrasive, lint-free cloth or paper towel to carefully wipe off the pressure and vacuum seats and gaskets every time the hatch is opened. This prevents accumulation of residue that can deteriorate the performance of the valves.

Under average operating conditions, replace the pressure and vacuum gaskets once a year. Replace the base gasket only when a leak is noticed at the bolting area or if the hatch is removed, breaking the seal. If the hatch is continually relieving, the user

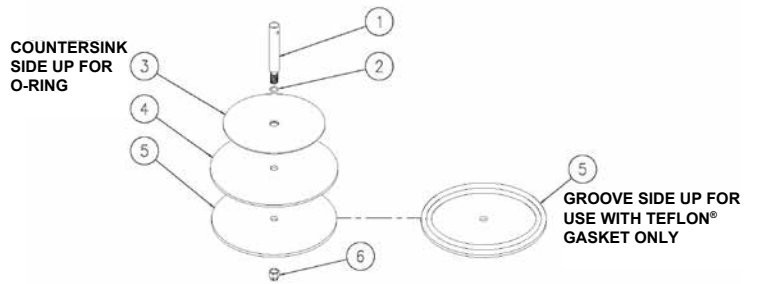


Figure 3. ES-660 Series Vacuum Assembly

should be alerted that there is a problem and a close inspection should be made to determine the cause.

To easily identify the parts, see Figure 5 for an exploded view of ES-660 Series.

### Note

**For parts information refer to the catalog data sheet on each model.**

## Gasket and Spring Replacement

### Vacuum Assembly

1. The vacuum gasket is located between the vacuum pallet and the seal support on the vacuum assembly. The vacuum assembly seals against the underside of the center assembly. To remove the center assembly, depress the center assembly inward and turn one quarter rotation to the right or left (See installation of *Retrofit ES-660 Series Center Hatch, Step 2*). Once the center assembly is removed, remove the cotter pin and the conical shaped vacuum spring from the vacuum stem.
2. Pull the vacuum assembly out from the bottom side of the center assembly. Remove and replace the vacuum gasket (See Table 2 for vacuum gasket options) from between the vacuum pallet and the seal support. Note that the vacuum disk (key 5 in Figure 3) has a flat side and a grooved side. The grooved side is only for use with a Teflon® gasket. If handling a Teflon® vacuum seal, avoid bending the seal as this can damage the seal and affect sealing performance.
3. Reassemble the vacuum assembly, spring and cotter key in the reverse order of removal. Replace center assembly into lid (See installation of *Retrofit ES-660 Series Center Hatch, Step 5*).

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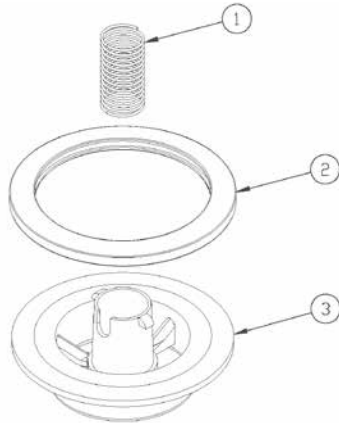


Figure 4. ES-660 Series Center and Pressure Gasket

## Pressure Assembly

1. To remove the center assembly, depress the assembly inward and turn one quarter rotation to the right or left (See installation of *Retrofit ES-660 Series Center Hatch, Step 2*).
2. The pressure gasket or pressure spring can simply be removed and replaced. The pressure gasket (See Table 1 for pressure gasket options) is enveloped around the edge of the center assembly.
3. Stretch the old gasket off and fit the new one around the circular lip. Ensure that the envelope pressure gasket is installed squarely and flat around the circumference of the center.
4. When the center is assembled, replace the center assembly into the lid (See installation of *Retrofit ES-660 Series Center Hatch, Step 5*). Under average operating conditions, springs should be replaced every two (2) years.

## Parts Ordering

When corresponding with your local Sales Office about this equipment, always reference the equipment serial number that can be found etched on the body.

## Parts List (Figure 5)

Key	Description	Part Number
1	Hatch 63 Enardo Casting Lid, Aluminum	4522000
2	Pressure Spring	See Table 3
3	Cotter Pin - 1/8 by 1, 304 Stainless steel	2022101
4	Vacuum Spring	See Table 4
5	Hatch 72 Center, Aluminum	4500900

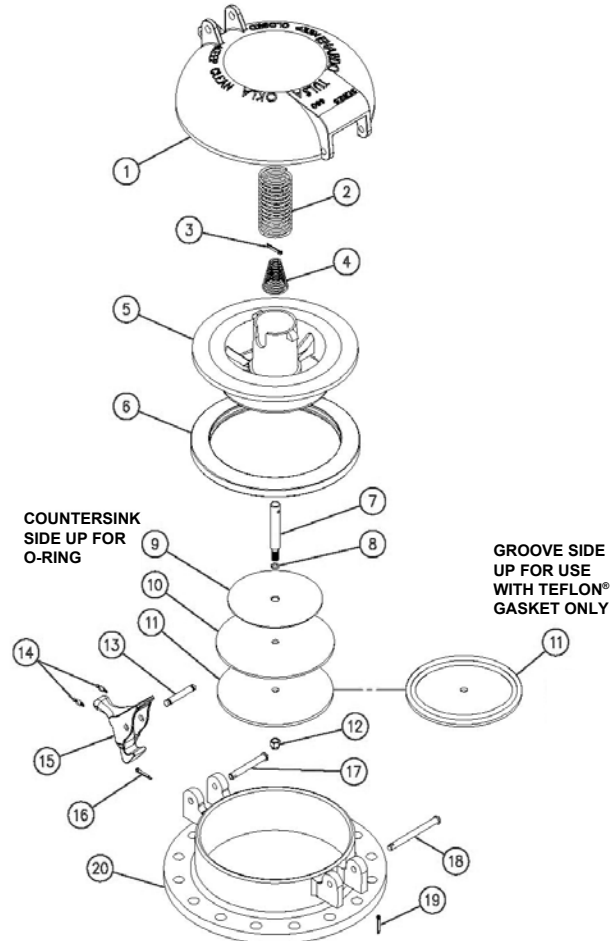
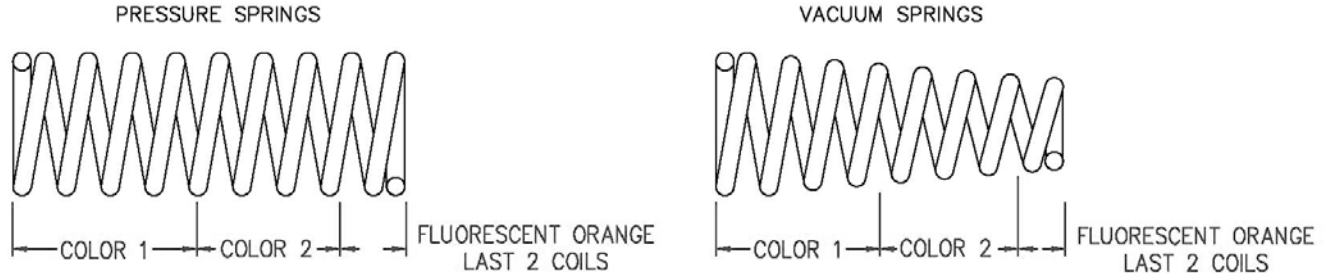


Figure 5. ES-660 Series Exploded View

Key	Description	Part Number
6	Envelope Pressure Gasket	See Table 1
7	Vacuum Stem, Aluminum	8568824
8	010 O-ring, Viton®	2012710
9	Vacuum Seal Support, Aluminum	8554636
10	Vacuum Gasket	See Table 2
11	Vacuum Pallet Disk (Anodized Red), Aluminum	8559017
12	3/8-16 in. Hex Nylock Nut, 316 Stainless steel/Nylon (PA)	2059201
13	Latch #5-C Pin, Zinc-plated Carbon steel	4505103
14	Hinge Pin #HPC-148 Clip, Zinc-plated Carbon steel (2 required)	2027100
15	Hatch 9 Casting Latch, Aluminum	4524100
16	Cotter Pin, 1/8 x 1/2, Zinc-plated Carbon steel	2000703
17	Clevis Pin, 5/16 x 2 1/2, Zinc-plated Carbon steel	4505110
18	Clevis Pin, 5/16 x 3 1/2, Zinc-plated Carbon steel	4505112
19	Cotter Pin, 1/8 x 1/2, Zinc-plated Carbon steel	2000703
20	Hatch 61 Base, Aluminum	4507302

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**Figure 6.** ES-660 Series Spring Identification

**Table 1.** Pressure (Envelope) Gasket Options

MATERIAL	PART NUMBER
HNBR (Standard)	4504601
Viton®	4504603
Fluorosilicone	4504605

**Table 2.** Vacuum Gasket Options

MATERIAL	PART NUMBER
Fluorosilicone (Standard)	4504705
Teflon®	4504706
Viton® (Sponge)	4504707

**Table 3.** Pressure Spring Options

SETTING, OZ./SQ. IN.	MATERIAL	COLOR 1	COLOR 2	PART NUMBER
2	H.D. Steel (Galvanized)	Black	Black	4502100
4	H.D. Steel (Galvanized)	Dark Green	Dark Green	4502300
6	H.D. Steel (Galvanized)	Brown	Brown	4502500
8	H.D. Steel (Galvanized)	Orange	Orange	4502700
12	H.D. Steel (Galvanized)	Pink	Pink	4502900
16	H.D. Steel (Galvanized)	Dark Blue	Dark Blue	4503100
24	Drawn Carbon steel Wire (Galvanized)	Red	Red	4503300
32	H.D. Steel (Galvanized)	Purple	Purple	4503201
2	Inconel®	Black	White	4502200
4	Inconel®	Dark Green	White	4502400
6	Inconel®	Brown	White	4502600
8	Inconel®	Orange	White	4502800
12	Inconel®	Pink	White	4503000
16	Inconel®	Dark Blue	White	4503200
24	Inconel®	Red	White	4503400
32	Inconel®	Purple	White	4503600

**Table 4.** Vacuum Spring Options

SETTING, OZ./SQ. IN.	MATERIAL	COLOR 1	COLOR 2	PART NUMBER
0.4	H.D. Steel (Galvanized)	Light Blue	Light Blue	4503700
0.9	Drawn Carbon steel Wire (Galvanized)	Gray	Gray	4504100
3.5	H.D. Steel (Galvanized)	Yellow	Yellow	4503900
0.4	Inconel®	Light Blue	White	4503800
0.9	Inconel®	Gray	White	4504200

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Inconel® is a mark owned by Special Metals Corporation.

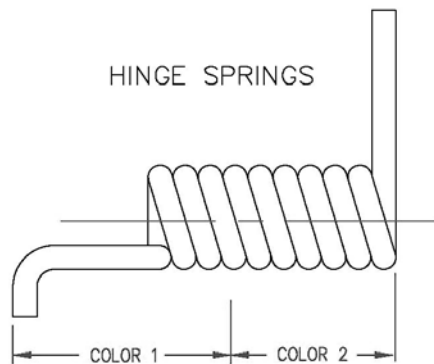
GASKET COMPATIBILITY CHART		COMPOUND				
		NITRILE BUNA-N	HYDROGENATED NITRILE	TEFLON®	VITON®	FLUORO-SILICONE
		NBR	HNBR	FEP	FKM	FVMQ
CHEMICAL	AMINES	4	4	1	4	4
	BUTANE	1	1	1	1	3
	CRUDE OIL	2	2	1	1	2
	DIESEL OIL	1	1	1	1	1
	ETHANE	1	1	1	1	3
	GASOLINE	1	1	1	1	1
	GLYCOL	1	1	1	1	1
	HEXANE	1	1	1	1	3
	ISOOCTANE	1	1	1	1	1
	ISOPENTANE	1	1	1	1	1
	METHANE	1	1	1	1	3
	NATURAL GAS	1	1	1	1	3
	NATURAL GAS CONDENSATE					
	HYDROGEN SULFIDE (<= 200 ppm)	4	4	1	2	3
	HYDROGEN SULFIDE (> 200 ppm)	4	4	1	3	3
	MERCAPTANS	1	1	1	1	1
	CARBON DIOXIDE (CO2)	1	1	1	1	1
	PARAFFINS (ALKANES)	1	1	1	1	1
	CYCLOHEXANE	1	1	1	1	1
	AROMATICS					
	BENZENE	4	4	1	1	3
	TOLUENE	4	4	1	1	2
	ETHYL BENZENE	4	4	1	1	1
	XYLENE	4	4	1	1	1
	PENTANE	1	1	1	1	3
	PROPANE	1	1	1	1	2
	PRODUCED WATER	1	1	1	2	1
	SATURATED STEAM	4	4	1	4	3
HIGH TEMPERATURE OPERATING LIMIT (F)	212	300	400	400	350	
LOW TEMPERATURE FLEXIBILITY (F)	-20	-30	-100	0	-100	
WEATHERING RESISTANCE	3	2	1	1	1	

DISCLAIMER:	COMPATABILITY RATING
THIS COMPATIBILITY CHART IS FOR REFERENCE ONLY. DATA IS LIMITED TO CHEMICALS THAT MIGHT BE ENCOUNTERED IN HYDROCARBON PRODUCTION FIELD APPLICATIONS. DUE TO THE VARIETY OF OPERATING CONDITIONS AND APPLICATIONS FOR GASKET MATERIALS, THE USER, THROUGH HIS OR HER OWN ANALYSIS AND TESTING, IS SOLELY RESPONSIBLE FOR MAKING THE FINAL SELECTION OF GASKET MATERIAL, AND ASSURING THAT ALL PERFORMANCE, SAFETY, AND WARNING REQUIREMENTS OF THE APPLICATION ARE MET.	1 SATISFACTORY
	2 FAIR
	3 DOUBTFUL
	4 UNSATISFACTORY

Figure 7. Compatibility Chart

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# ES-660 Series



**Figure 8. ES-660 Series Hinge Spring Identification**

**Table 4. Hinge Spring Options<sup>(1)</sup>**

MATERIAL	COLOR 1	COLOR 2	PART NUMBER
Drawn Carbon steel Wire (Galvanized)	Light Green	Light Green	4504400
Inconel®	Light Green	White	4504500

1. Only used with 2 oz./sq. in. pressure settings.

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