



Casing Spacers and End Seals Engineering Manual and Buyers Guide

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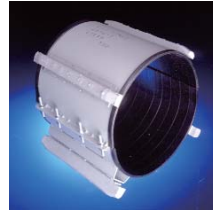
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Warranty and Conditions of Sale

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Metallic Casing Spacers



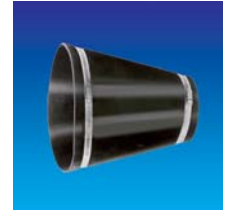
Painted

Non-metallic Casing Spacers



Model PE

Casing End Seals



Model C



Coated



Model HT



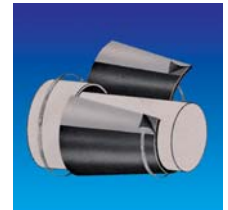
Model S



Stainless Steel



Model AZ



Model W

Casing Spacer Clarification

Casing Spacer and a Casing Isolator are the same product and serve the same application needs. Casing Isolator was the description that



Ranger II®
all non-metallic
casing spacer

originated in the Energy Market, dating back to the late 1960's. In the following manual, Casing Spacer will be the description used.

The Market or Industry has also used the following descriptions below referring to a Casing Spacer.

- Chalks
- Pipe Isolators
- Skids
- Pipe Supports
- Spiders
- Clusters



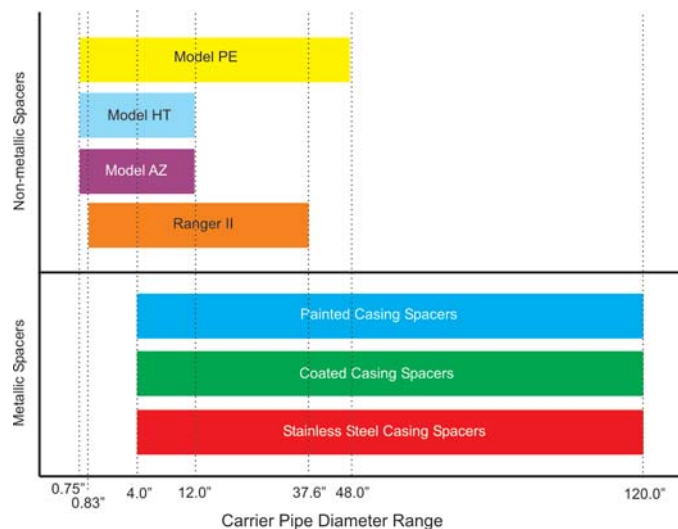
Model FW



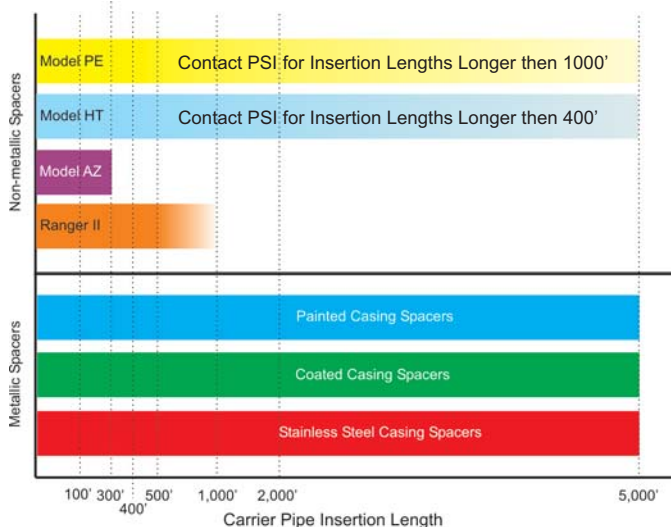
Model R

PSI Casing Spacer Standard Model Guidelines

Carrier Pipe Diameter Range Options



Carrier Pipe Insertion Length



Carrier Pipe Compatibility with Spacer Model - Guidelines

	Non-metallic Casing Spacers				Metallic Casing Spacers	
	Model PE	Model HT	Model AZ	Ranger II®	Models A, C & S with 8" Band	Models A, C & S with 12" Band
Steel	E	E	S	E	E	E
Steel (Mortar Coated)	U	U	U	U	NR	E
Ductile Iron	U	U	U	G	G	E
Cement	U	U	U	U	E	E
Profile Pipe	U	U	U	S	E	E
Clay	NR	NR	U	U	E	E
HDPE	NR	NR	S	E	E	E
PVC Water Pipe	NR	NR	G	E	E	E
PVC Sewer Pipe	NR	NR	G	E	E	E

E = Excellent
NR = Not Recommended
G = Good
F = Fair
S = Satisfactory
U = Unsatisfactory

General Notes:The foregoing performance data are intended as guidelines only. Performance suitability for specific applications should be determined by the user. Variation in carrier pipe type, carrier pipe diameter, casing length, casing condition, and position may preclude suggested service use. Casing Spacer selection is at the sole risk of the user. Consult with a specialist or PSI factory for specific applications. PSI's responsibilities will be limited to those listed in the PSI standard warranties. **Consult with a specialist or PSI factory for specific applications.**

Standard Material Property Comparison - PSI Casing Spacers

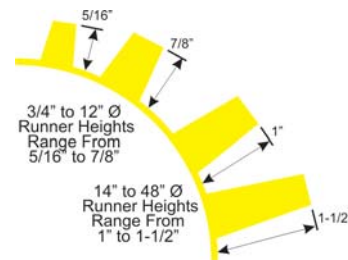
For detailed information and higher/lower metallic temp. range please view specific Model pages.

	Non-metallic Casing Spacers				Metallic Casing Spacers			
	Model PE	Model HT	Model AZ	Ranger II®	Models A8 - A12	Models C8 - C12	Models S8 - S12	Models SL8
Band Material	Polyethylene	Poly-carbonate	Polypropylene	Polypropylene	14 Gauge Painted Steel	14 Gauge PVC Coated Steel	14 Gauge 304 Stainless Steel	16 Gauge 304 Stainless Steel
Runner Material	Polyethylene	Poly-carbonate	Polypropylene	Polypropylene	Glass Reinforced Nylon	Glass Reinforced Nylon	Glass Reinforced Nylon	Glass Reinforced Nylon
Riser Material	None	None	None	None	10 Gauge Painted Steel	10 Gauge Coated Steel	10 Gauge Stainless Steel	12 Gauge Stainless Steel
Liner Material	None	HighTemp Plastic	None	None	Polyvinyl Chloride	Polyvinyl Chloride	Polyvinyl Chloride	Polyvinyl Chloride
Hardware	Plated Steel	Plated Steel	Plated Steel	None	Plated or 304 Stainless Steel	Plated or 304 Stainless Steel	304 Stainless Steel	304 Stainless Steel
Compressive Strength	3,200 psi	3,200 psi	3,200 psi	3,200 psi	18,000 psi	18,000 psi	18,000 psi	18,000 psi
Temperature Range	180°F. Max	280°F. Max	-40°F to +180° F	-22°F to +212° F	-40°F to +170° F	-40°F to +170° F	-40°F to +170° F	-40°F to +170° F

General Runner Height Options - PSI Casing Spacers

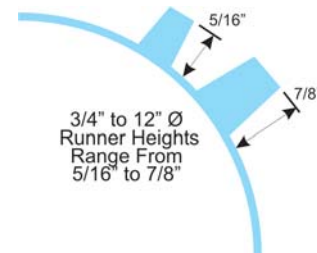
Model PE Non-metallic Casing Spacers

- Model PE runners are molded as an integral part of each segment.
- Runner heights range from 5/16" (7.94mm) to 1-1/2" (38.1mm) depending on model dimensions.
- Runner height is symmetrical around spacer.
- Runner/Band width for PE spacers is 3.0" (76.19mm) through 6.25" (158.75mm).
- Refer to pages 4 - 5 for detailed information on PE Casing Spacers.



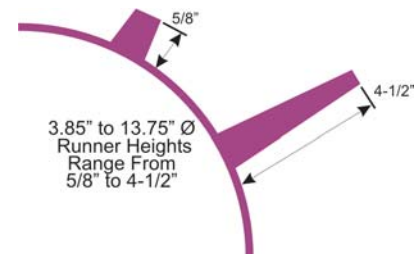
Model HT (High Temp) Non-metallic Casing Spacers*

- Model HT runners are molded as an integral part of each segment.
- Runner height range from 5/16" (8.0mm) to 7/8" (48.5mm) depending on model dimensions.
- Runner height is symmetrical around spacer.
- Runner/Band width for HT spacers is 3.0" (7.94mm) through 5.0" (127.0mm).
- Refer to pages 6 - 7 for detailed information on HT Casing Spacers.



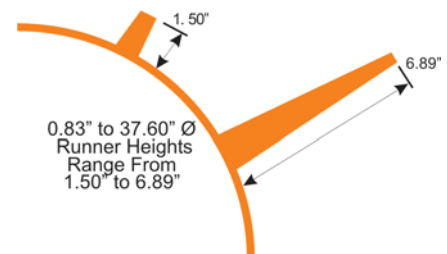
Model AZ Non-metallic Casing Spacers*

- Model AZ runners are molded as an integral part of each segment.
- Runner height range from 5/8" (15.9mm) to 4-1/2" (114.3mm).
- Runner height is symmetrical around spacer.
- Runner/Band width for AZ spacers is 5.2" (132.0mm).
- Refer to pages 8 - 9 for detailed information on AZ Casing Spacers.



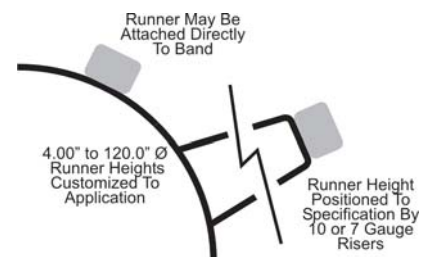
Ranger II® Non-metallic Casing Spacers*

- Ranger II runners are molded as an integral part of each segment.
- Runner height range from 1.50" (38.1mm) to 6.89" (175.0mm).
- Runners may be placed asymmetrically around spacer.
- Runner/Segment widths for Ranger II spacers is 2.13" (54.1mm) through 8.86" (225.04mm).
- Refer to pages 10 - 13 for detailed information on Ranger II Casing Spacers.



Metallic Casing Spacers Painted [(A), Coated (C) & Stainless Steel (S)]

- 1" (25.4mm) or 2" (50.8mm) wide nylon or polyester glass reinforced runners.
- Effective runner height = 1.07" (27.2mm) or 1.70" (43.2mm).
- Runners may be attached directly to spacer band.
- Runners may be attached on top of 10 or 7 gauge risers to accommodate any runner height configuration.
- Metallic spacers available in 8.0" (203.2mm) or 12.0" (304.79mm) wide bands.
- Refer to page 14 - 19 for detailed information on painted, coated or stainless steel casing spacers.

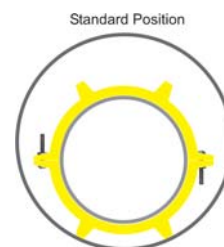


***Caution Note**
If casing pipe has offsets or weld beads in excess of 1/8",
consider using a metallic casing spacer.

Position Within Casing Options

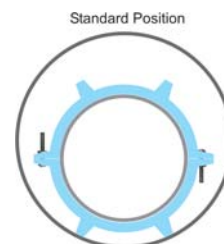
Model PE Non-metallic Casing Spacers

- Standard position within casing.
- Runner height must be symmetrical around spacer.
- Refer to pages 4 - 5 for detailed information on PE Casing Spacers.



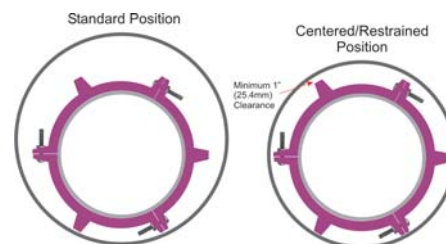
Model HT (High Temp) Non-metallic Casing Spacers

- Standard position within casing.
- Runner height must be symmetrical around spacer.
- Refer to pages 6 - 7 for detailed information on PE Casing Spacers.



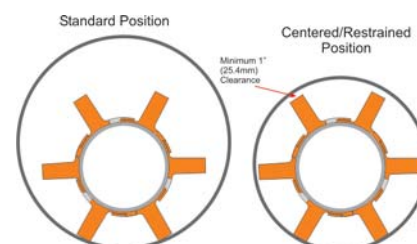
Model AZ Non-metallic Casing Spacers

- Two positions within casing possible - standard (clear bell) and centered-restrained.
- Runner height must be symmetrical around spacer.
- Refer to page 8 - 9 for detailed information on PE Casing Spacers.



Ranger II® Non-metallic Casing Spacers

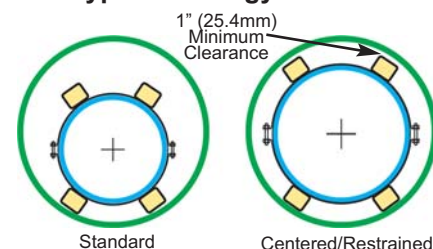
- Multiple positions within casing possible.
- Different height runner segments may be mixed around carrier pipe.
- Runner height may be asymmetrical around carrier pipe.
- Positioning options include: standard (clear bell), centered, centered-restrained and non-centered-restrained
- Refer to page 10 - 13 for detailed information on Ranger II® Casing Spacers.



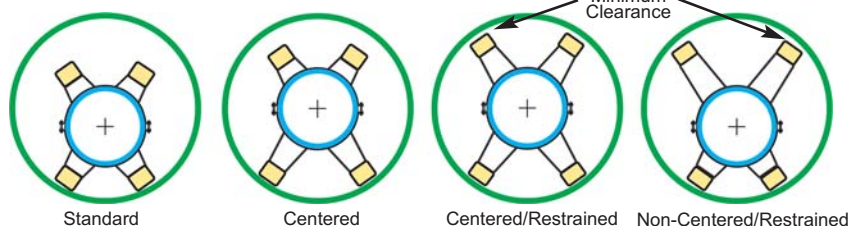
Metallic Casing Spacers [Painted (A), Coated (C) & Stainless Steel (S)]

- Multiple positions within casing possible.
- Runner height may be asymmetrical around carrier pipe.
- Positioning options include: standard (clear bell), centered, centered/restrained and non-centered/restrained
- Refer to pages 14-19 for detailed information on Metallic Casing Spacers.

Typical - Energy Market



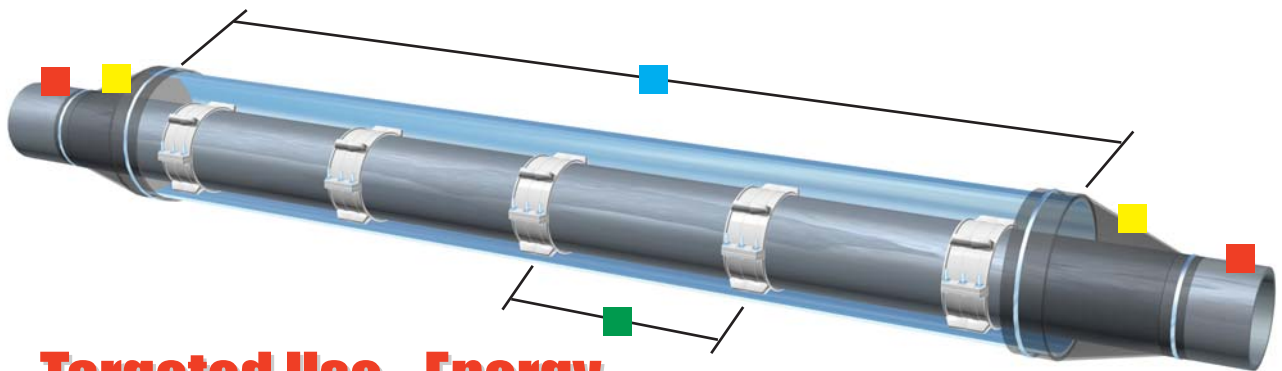
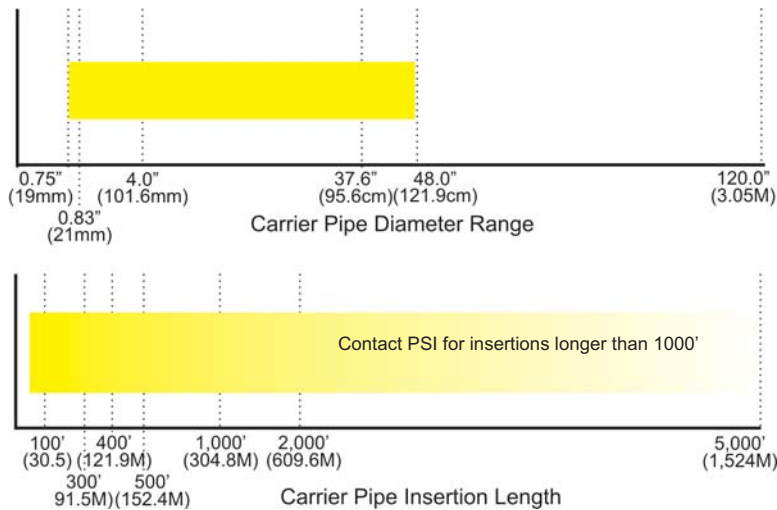
Typical - Water Market



Model PE

Non-metallic Casing Spacers

PSI Model PE Non-metallic Casing Spacers



Targeted Use - Energy

- For carrier pipe diameters (Nominal Steel & IPS) ranging from 3/4" (19.1mm) to 48" (121.92cm)
- For carrier pipe insertion lengths up to 1,000 feet.* (304.8M)
- Spacing Recommendation: Max 8' (243.8cm) between spacers, Max 2' (61.0cm) from casing pipe end.
- Recommended End Seals: Model C, S, W, R and FW.

*Model PE Casing Spacers are designed primarily for smaller diameter steel or polyethylene carrier pipes (ANSI O.D. pipe without a bell or mechanical joint). We do not recommend that they be used on any carrier pipe over 24" (61.0cm) in diameter or for installations over 400 feet (121.9M) long without consulting with PSI. PE Isolators should **not** be used on concrete carrier pipe.

Benefits/Features

- Ribbed inner surface prevents slippage & guards against coating damage.
- Molded from virgin polyethylene material.
- Lightweight for ease of handling and installation.
- Screwdriver is only tool needed for installation.
- Model available with non-metallic hardware.
- Eliminates the need for grout, blown sand or pea gravel.

High density (linear), injection molded virgin Polyethylene casing isolators/spacers provide positive insulation, high abrasion resistance and low coefficient of friction for a wide variety of double containment carrier/casing pipe applications. They are extremely light in weight and easy to handle during installation.

A ribbed inner surface prevents slippage and guards against carrier pipe coating damage while the outer surface may include any one of several molded runners to accommodate 2" (50.8mm) x 4" (101.6mm) or larger carrier/casing differentials.

One piece solid molded segments provide for maximum load bearing. Hardware includes cadmium plated steel bolts, nuts and washers. A screwdriver is the only tool needed for installation.



PSI Model PE Non-metallic Casing Spacers

Material Specifications

SPECIFICATION	ASTM TEST	VALUE
Band/Runner Segments		Injection Molded Virgin Polyethylene
Tensile Strength	D638, D651	3,100 - 5,500 psi 218 - 387 kg/cm ²
Compressive Strength	D693	3,200 psi (225kg/cm ²)
Water Absorption	D570	0.1%
Temperature		180°F. Max. (82°C.)
Impact Strength	D256	1.5-2.0 ft lb/in. (0.8-1.07 newton-meters/cm)
Dielectric Strength	D149	450 Volts/Mil.
Color		White
Liner - None		

Runners - Sizes and Configurations

3/4" (19mm) through 12" (305mm) = 2-piece with molded-in runners
 14" (356mm) and larger = Multiple segments with molded-in runners.

Hardware

Metallic - Bolts and Square Nuts = Plated Steel

Non-metallic - Bolts and Nuts = High Temp Plastic

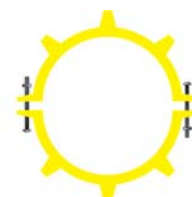
Model PE Band Width and Runner Height

Model Size	Band Width	Runner Height
3/4 X 2	3.0" (76.19mm)	5/16" (7.94mm)
1 X 3	3.0" (76.19mm)	1/2" (12.7mm)
1-1/4 X 3	3.0" (76.19mm)	1/2" (12.7mm)
1-1/2 X 3	3.0" (76.19mm)	1/2" (12.7mm)
2 x 4	4.0" (101.6mm)	5/8" (15.88mm)
2-1/2 X 5	4.0" (101.6mm)	5/8" (15.88mm)
3 x 6	4.0" (101.6mm)	5/8" (15.88mm)
4 X 6	4.0" (101.6mm)	9/16" (14.29mm)
4 X 8	4.0" (101.6mm)	1" (25.4mm)
6 x 8	4.0" (101.6mm)	9/16" (14.29mm)
6 X 10	4.0" (101.6mm)	1" (25.4mm)
6 X 10(S)	4.0" (101.6mm)	9/16" (14.29mm)
8 x 10	4.0" (101.6mm)	9/16" (14.29mm)
8 x 12	5.0" (127.0mm)	1" (25.4mm)
8 X 12(S)	5.0" (127.0mm)	7/8" (22.23mm)
10 X 14	5.0" (127.0mm)	7/8" (22.23mm)
10 X 16(S)	5.0" (127.0mm)	7/8" (22.23mm)
12 X 16	5.0" (127.0mm)	7/8" (22.23mm)
All Multiple Segments* (4" Differential)	6.25" (158.75mm)	1" (25.4mm)
All Multiple Segments* (6" Differential)	6.25" (158.75mm)	1-1/2" (38.1mm)

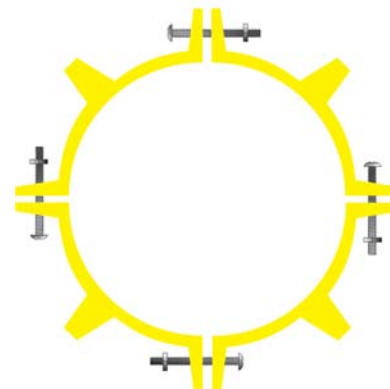
(S) = Somastic Coated Pipe

Note: Model PE Sized for Nominal Steel and IPS Pipe.

* = Download Model Size information from www.pipelineaseal.com

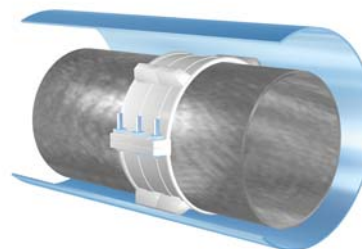


2-Piece
For 3/4" to 12" (1.9 to 30.48cm).



Multi-Segment
For 14" (35.56cm) and above.

Position In Casing

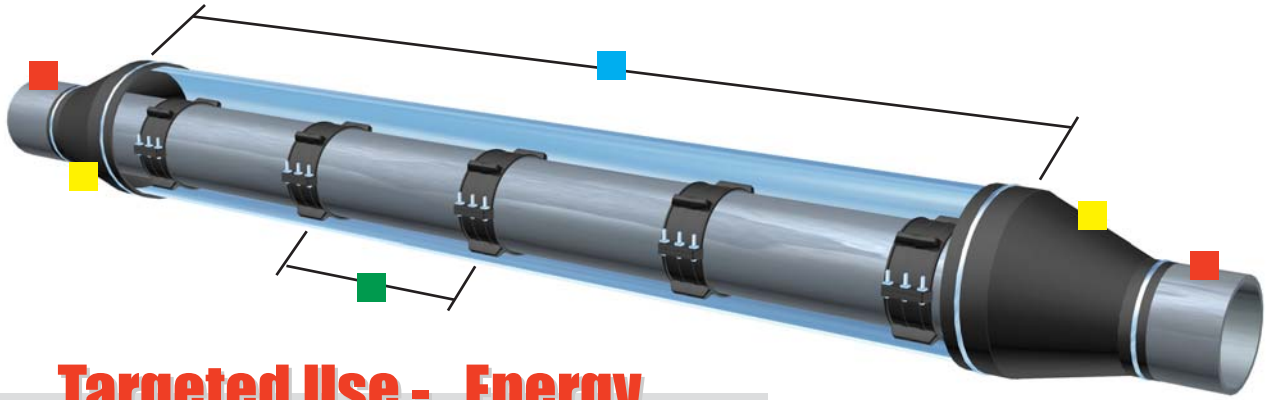
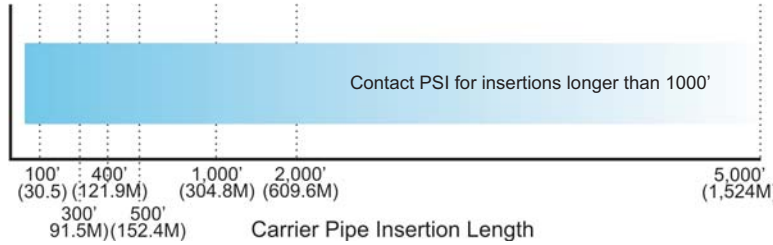
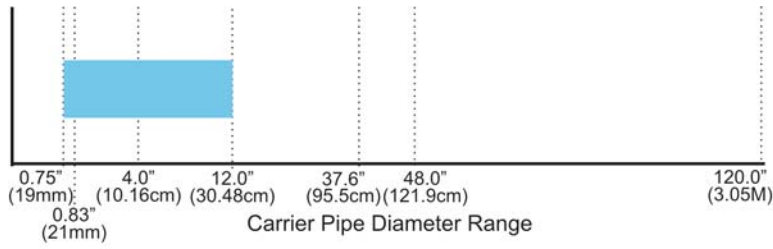


Model PE Standard
S = Standard



Circa. 1979, Model PE installed on steel pipe.
 Experience and today's application would target a steel casing spacer, or more PE's spaced at 6 ft. (1.83M).

PSI Model HT Non-metallic Casing Spacers



Targeted Use - Energy

- For carrier pipe diameters (Nominal Steel & IPS) ranging from 3/4" (19.1mm) to 12" (304.8mm)
- For carrier pipe insertion lengths up to 400 feet.* (121.9M)
- Spacing Recommendation: Max 8' (243.8cm) between spacers, Max 2' (61.0cm) from casing pipe end.
- Recommended End Seals: Model C, S, W, R and FW.

*Model HT Casing Isolators are designed primarily for smaller diameter steel or polyethylene carrier pipes (ANSI O.D. pipe without a bell or mechanical joint). We do not recommend that they be used on any carrier pipe over 12" (30.5cm) in diameter or for installations over 400 feet (121.9M) long without consulting with PSI. HT Isolators should **not** be used on concrete carrier pipe.

Benefits/Features

- May be used for high-temperature applications.
- Unique formulation of polymers allows isolator/spacer to be used in applications where temperatures may reach 280-degrees F. (138-degrees C.)
- Ribbed inner surface prevents slippage and guards against coating damage.
- Lightweight for ease of handling and installation.
- Screwdriver is only tool needed for installation.
- Model available with non-metallic hardware.
- Eliminates the need for grout, blown sand or pea gravel.

Polycarbonate is used in the manufacture of the Hi-Temp isolators/spacers giving them the ability to be used for applications that may reach 280-degrees F. (138-degrees C.). In addition to heat resistance, they also offer excellent insulation, high abrasion resistance and low coefficient of friction for a wide variety of double containment carrier/casing pipe applications. Light in weight and easy to handle during installation, Model HT casing isolators also feature ribbed inner surface that prevents slippage and guards against carrier pipe coating damage. The outer surface may include any one of several molded runners to accommodate 2" (50.8mm) x 4" (101.6mm) or larger carrier/casing differentials.

PSI Model HT Non-metallic Casing Spacers

Material Specifications

SPECIFICATION	ASTM TEST	VALUE
Band/Runner Segments		Injected Molded Virgin Polycarbonate
Tensile Strength	D790	8,100 - 9,000 psi
Compressive Strength	D695	12,500 psi
Water Absorption	D570	0.1%
Temperature		280°F. Max. (138°C.)
Impact Strength	D256	1.5 - 2.0 ft lb/in. (0.8 - 1.07 newton-meters/cm)
Dielectric Strength	D149	450 Volts/Mil.
Color		Black

Liner - T.P.E. Liner (HT Models 6x10 through 12x16)

Thickness	0.118" (3.0mm)
Hardness	Shore "A" 73
Dielectric Strength	
1/8" (3.18mm) Surge Test	60,000 V min.
Step-by-step Test	58,000 V min.
Water Absorption	1% max.

Runners - Sizes and Configurations

3/4" (19mm) through 12" (305mm) = 2-piece with molded-in runners

Hardware

Metallic - Bolts and Square Nuts = Plated Steel

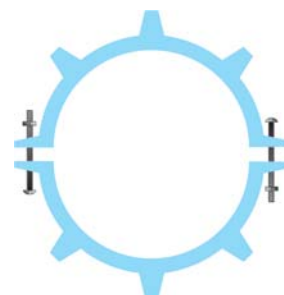
Non-metallic - Bolts and Nuts = High Temp Plastic

Model HT Band Width and Runner Height

Model Size	Band Width	Runner Height
3/4 X 2	3.0" (76.19mm)	5/16" (7.94mm)
1 X 3	3.0" (76.19mm)	1/2" (12.7mm)
1-1/4 X 3	3.0" (76.19mm)	1/2" (12.7mm)
1-1/2 X 3	3.0" (76.19mm)	1/2" (12.7mm)
2 x 4	4.0" (101.6mm)	5/8" (15.88mm)
3 x 6	4.0" (101.6mm)	5/8" (15.88mm)
4 X 8	4.0" (101.6mm)	1" (25.4mm)
6 X 10*	4.0" (101.6mm)	1" (25.4mm)
8 x 12*	5.0" (127.0mm)	1" (25.4mm)
10 X 14*	5.0" (127.0mm)	7/8" (22.23mm)
12 X 16*	5.0" (127.0mm)	7/8" (22.23mm)

* = Sold with Liner.

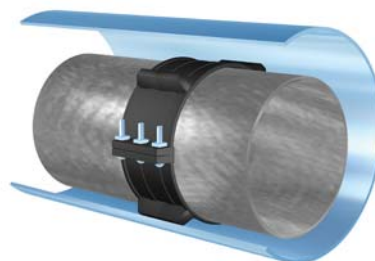
Note: Model HT Sized for Nominal Steel and IPS Pipe.



2-Piece
For 3/4" to 12" (1.9 to 30.48cm).



Position In Casing

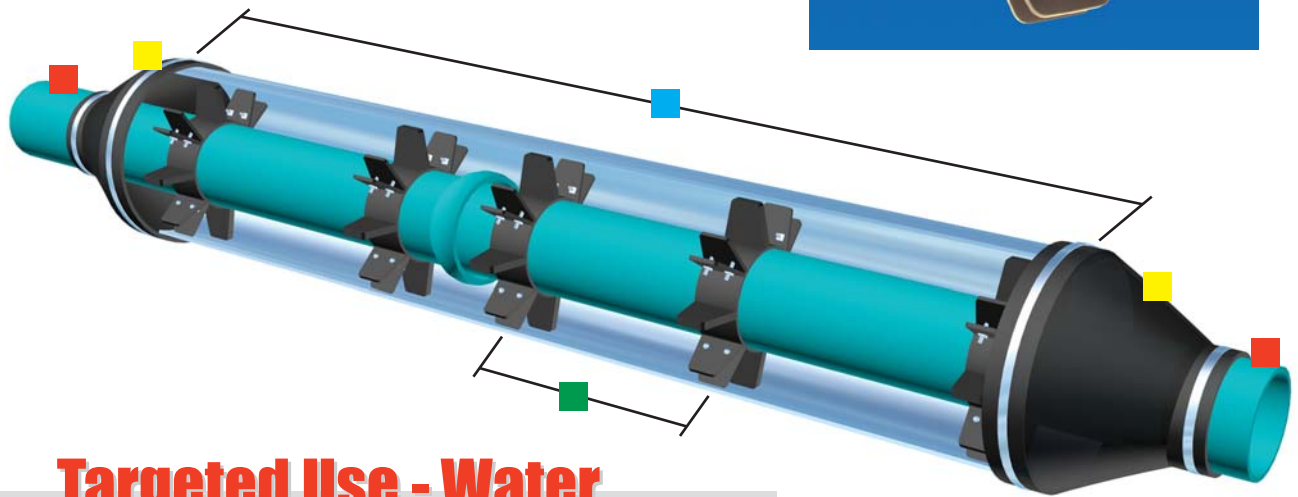
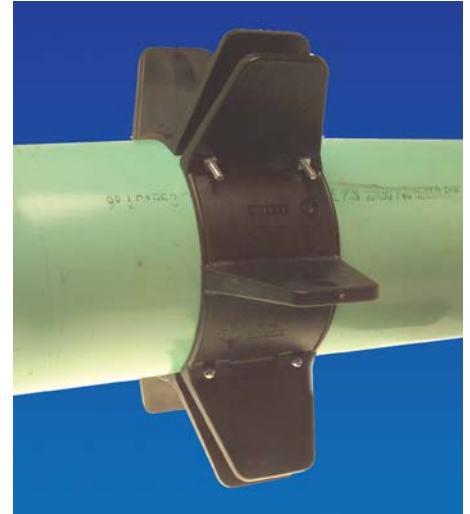
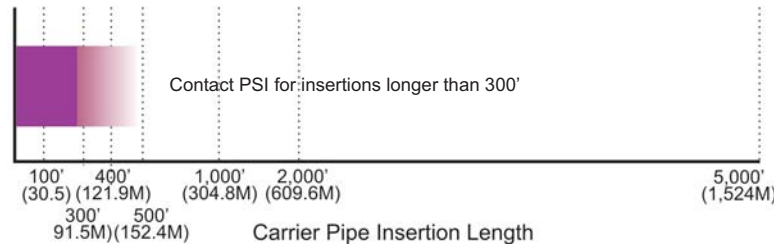
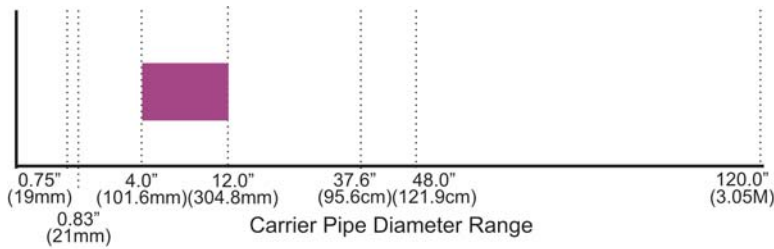


Model HT Standard
S = Standard



For Hi-Temp Applications over 12" Nominal O.D. Use Metallic Casing Spacers with T.P.E Liner. Model A Spacers used on an insulated steel pipe.

PSI Model AZ Non-metallic Casing Spacers



Targeted Use - Water

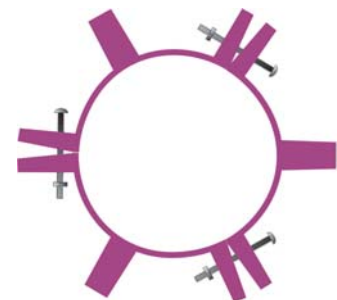
- For carrier pipe diameters ranging from 3.85" (9.78cm) to 13.75" (34.9cm).
- For carrier pipe insertion lengths up to 300 feet.* (91.5M)
- Spacing Recommendation: Max 8' (243.8cm) between spacers, Max 2' (61.0cm) from casing pipe end, Max 2' (61.0cm) on each side of bell or mechanical joint.
- Recommended End Seals: Model C, S, W, and R.

*Model AZ Casing Isolators are designed primarily for smaller diameter steel or polyethylene carrier pipes (ANSI O.D. pipe without a bell or mechanical joint). We do not recommend that they be used on any carrier pipe over 12" (30.5cm) in diameter or for installations over 400 feet (121.9M) long without consulting with PSI. AZ Isolators should **not** be used on concrete carrier pipe or heavy type pipe.

Benefits/Features

- Variable O.D.'s of casing spacer to fit multiple sized space.
- Manufactured from UV resistant polypropylene.
- Runner heights may be interchanged or field cut to adjust for grade.
- Corrosion protection - only metal components are steel bolts/nuts.
- One piece molded construction for maximum load bearing.
- Allen head bolts for improved spacer tightening.

Model AZ non-metallic casing spacers are designed for use with water and sewer pipes 3.85" (9.78cm) to 13.75" 34.9cm) in diameter. They are an economical alternative to banded wood skids and stainless steel bands for inserting pipes into casings. AZ spacers also eliminate the need for sand or grout filling of the annular space in the casing. All are adaptable to a wide variety of carrier pipe O.D.'s found on PVC Pressure/Sewer Pipe, DI-Ductile Iron, C-900, P.E., and IPS-Steel Pipes



PSI Model AZ Non-metallic Casing Spacers

Material Specifications

SPECIFICATION	ASTM TEST	VALUE
Band/Runner Segments		Injection molded virgin polypropylene
Tensile Strength	D790	8,100 - 9,000 psi
Compressive Strength	D695	3,000 psi (211 kg/sq. cm.)
Water Absorption	D570	0.1%
Temperature		-40°F. to +180°F. (-40°C. to +82°C.)
Impact Strength	D256	1.5 ft lb/in. (0.8 joules/cm)
Dielectric Strength	D149	800 Volts/Mil. Min.
Color		Black

Liner - None

Runners - Sizes and Configurations

4" (101.6mm) through 12" (305mm) = 3 to 5 segments/spacer. (See chart below.)

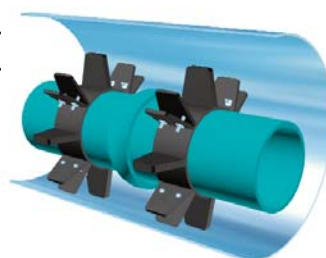
Hardware - Metallic - Allen Head Bolts and Square Nuts = Plated Steel

Nominal Pipe Diameter	O.D.Range	Segments Per Spacer	AZ1 Model Number	Runner Height (Inches)
4.0"	3.85" - 5.10" (9.8 - 13.0cm)	3 - AZ1	AZ1-16 AZ1-25 AZ1-36	5/8" (15.88mm) 1.0" (25.4mm) 1-1/2" (38.1mm)
6.0"	5.10" - 6.90" (13.0 - 17.5cm)	4 - AZ1	AZ1-55 ZA1-75	2-1/4" (57.15mm) 3.0" (76.2mm)
6.0"	6.37" - 8.50" (16.2 - 21.6cm)	5 - AZ1	AZ1-90 AZ1-110	3-1/2" (88.9mm) 4-1/2" (114.3mm)

Nominal Pipe Diameter	O.D.Range	Segments Per Spacer	AZ2 Model Number	Runner Height (Inches)
8.0"	7.99" - 9.05" (20.3 - 23.0cm)	3 - AZ2	AZ2-16 AZ2-25 AZ2-36	5/8" (15.88mm) 1.0" (25.4mm) 1-1/2" (38.1mm)
10.0"	10.23" - 12.20" (26.0 - 31.0cm)	4 - AZ2	AZ2-55 ZA2-75	2-1/4" (57.15mm) 3.0" (76.2mm)
12.0"	11.88" - 13.75" (30.2 - 35.0cm)	4 - AZ2 & 1 AZ1	AZ2-90 AZ2-110	3-1/2" (88.9mm) 4-1/2" (114.3mm)

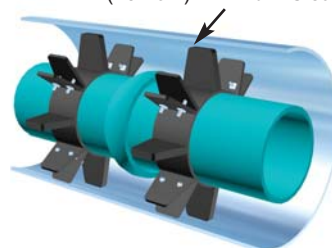


Position In Casing



Model AZ Standard
S = Standard

1" (25.4cm) Minimum Clearance



Model AZ Centered/Restrained
CR = Centered/Restrained

How to Size AZ Casing Spacer Applications with Examples

Centered and Restrained Application with Equal Length Runners

Following is an example on how to size AZ casing spacers for centered/restrained applications. For applications requiring adjusting for grade elevation changes, contact PSI.

Initial Specifications: 9.05"Ø C-900 pipe (9.05" O.D. barrel with 11.5" O.D. bell) inside a 18"Ø casing with a 0.375" wall thickness.

Step A. With carrier pipe O.D. (9.05"), from chart above, choose the proper size and number of AZ segments. One spacer would require 3-AZ2 segments.

Step B. Determine maximum runner height with equal length runners.

Casing I.D.	17.25" (18.0 - 0.750 [0.375x2] = 17.25)
Less Carrier Pipe O.D.	-9.05"
	8.20"
Less Annular space Clearance	-1.00"
	7.20"

Divide this number (7.20") by 2 to obtain the total allowable runner height = 3.60"

Step C. Choose a runner height of this value or less but no smaller than a height to clear bell. (smallest runner height = 1-1/2" to clear bell)

Solution: Use 3-AZ2-90 segments per spacer (Runner Height = 3-1/2") Bell clearance = 1.225"

Step D. Determine length of pull. Use spacing specifications above to determine number of spacers required for each pipe segment and total pull.

Application with Equal Length Runners to Clear Bell

Following is an example on how to size AZ casing spacers for applications just to clear bell. (Suggested minimum clearance is at least 0.8" [0.4" on both sides]).

Initial Specifications: 9.05"Ø C-900 pipe (9.05" O.D. barrel with 11.5" O.D. bell) inside a 18"Ø casing with a 0.375" wall thickness.

Step A. With carrier pipe O.D. (9.05"), from chart above, choose the proper size and number of AZ segments. One spacer would require 3-AZ2 segments.

Step B. Determine minimum runner height just to clear bell.

Bell O.D.	11.50"
Add 0.8" Clearance	+0.80"
	12.30"
Less Barrel O.D.	-9.05"
	3.25"

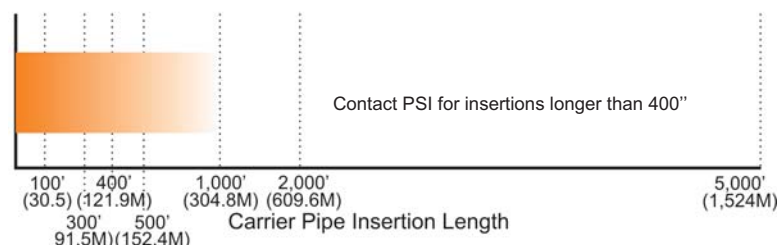
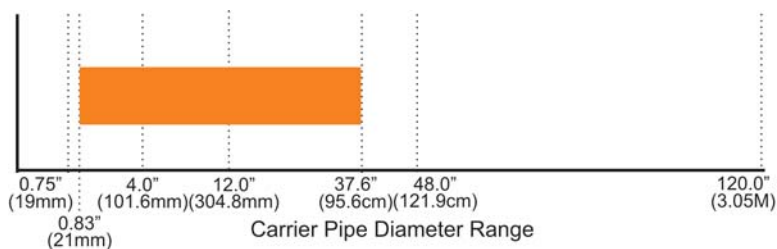
Divide this number (3.25") by 2 to obtain minimum runner height just to clear bell = 1.62"

Step C. Choose a runner height between 1.62" and the maximum allowable runner height (3.60") determined in the example on the left.

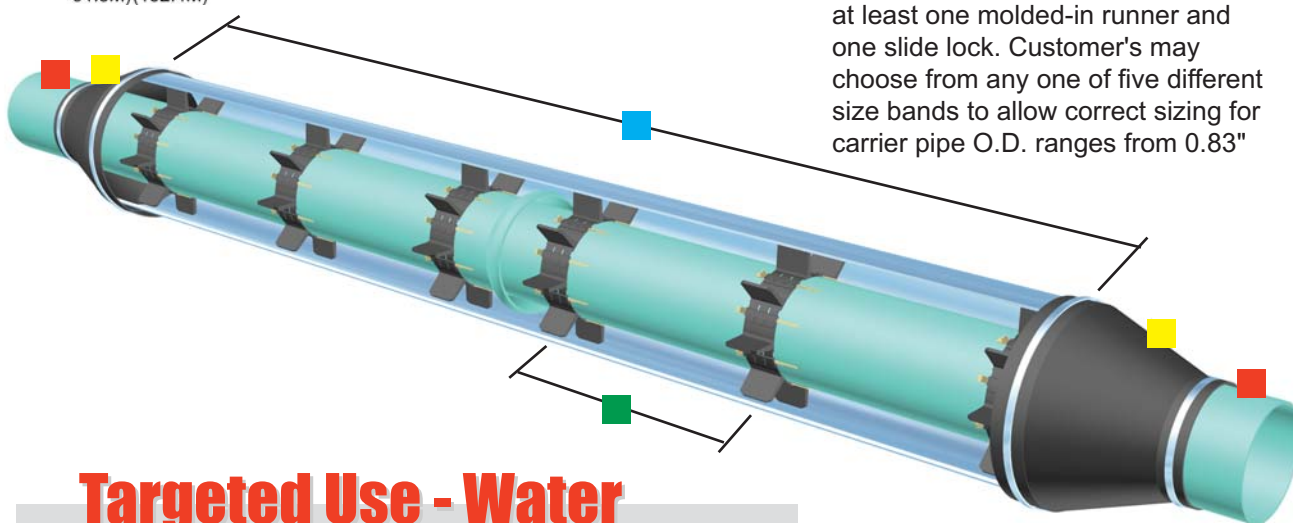
Solution: Use 3-AZ2-55 segments per spacer (Runner Height = 2-1/4")

Step D. Determine length of pull. Use recommended spacing specifications above to determine number of spacers required for each pipe segment and total pull.

PSI Ranger II® Non-metallic Casing Spacers



The Ranger II® is an all non-metallic casing isolator/spacer system that uses molded segments to encircle the carrier pipe. Each segment includes at least one molded-in runner and one slide lock. Customer's may choose from any one of five different size bands to allow correct sizing for carrier pipe O.D. ranges from 0.83"



Targeted Use - Water

- For carrier pipe diameters ranging from 0.83" (21mm) to 37.60" (955mm).
- For carrier pipe insertion lengths up to 400 feet.* (121.9M)
- Spacing Recommendation: Max 8' (243.8cm) between spacers, Max 2' (61.0cm) from casing pipe end, Max 2' (61.0cm) on each side of bell or mechanical joint.
- Recommended End Seals: Model C, S, W, and R.

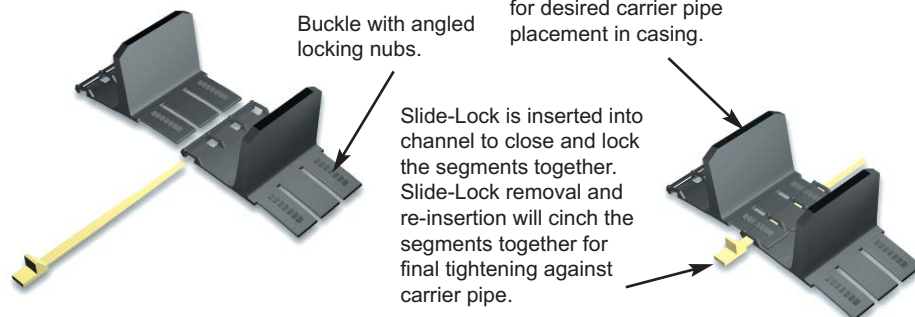
Ranger II® spacers should **not** be used on concrete carrier pipe. Engineered equal to 304 Stainless Steel Metallic Casing Spacers. Excellent for the Stacking Distributor.

(21.1mm) up to 37.60" (95.5cm) in diameter.

Once sized, the segments are placed around the carrier pipe and cinched together via non-metallic slide locks. Installation is quick and easy while only a small inventory of segments may be used to accommodate a large variety of pipe styles, types and diameters.

Separate segments are connected by inserting the buckles into slots on the adjacent segment. Slot accepts Slide-Lock. Arrow molded on segment indicates correct insertion direction.

Slide-Lock is used to tension the segments together after installation on pipe. Channels face up during insertion while the correct size Slide-Lock (micro, mini, midi, maxi) is molded on the flat (bottom) side.



Runners are available in a variety of heights to allow for desired carrier pipe placement in casing.

PSI Ranger II® Non-metallic Casing Spacers

Material Specifications

SPECIFICATION	ASTM TEST	VALUE
Band/Runner Segments		Injection molded virgin polypropylene
Tensile Strength	D790	8,100 - 9,000 psi
Compressive Strength	D695	3,000 psi (211 kg/sq. cm)
Water Absorption	D570	0.1%
Temperature		-22°F. to +212°F. (-30°C. to +100°C.)
Impact Strength	D256	1.5 ft lb/in. (0.8 joules/cm)
Dielectric Strength	D149	800 Volts/Mil. Min.
Color		Black
Liner - None		
Runners - Sizes and Configurations		
1.5" (38mm) through 6.89" (175mm)		1 Runners Per Segment (Micro, Mini, Midi) 2 Runners Per Segment (Medi, Maxi)
Hardware		
Non-metallic - Slide Locks - No Metallic Parts		



Features

- All non-metallic. No nuts, bolts, washers or any other metal parts to corrode or degrade over time.
- Designed for carrier pipe diameters from 0.83" (21mm) to 37.60" (955mm) in diameter.
- Segmented pieces - small inventory may be used to accommodate a large variety of pipe styles, types and diameters. No extra trips from job site to warehouse for additional parts.
- Easy assembly. Simply slide the segments together and cinch tight with the patented Slide-Lock connecting system.
- Wide variety of runner heights to allow numerous options for pipe positioning within the casing.
- Runner variations may be used to adjust for grade.
- Will accommodate small conduit attachment for communications or electrical cable.
- Medi and Maxi segments, 2 molded runners per segment.
- Segment band and runners molded as one piece.
- Manufactured from UV resistant polypropylene.
- High impact strength, 1.5 ft. lbs./inch (0.8 joules/cm)
- Excellent compressive strength, 3,000 psi (211 kg/square cm)
- 800 Volts/Mil. Dielectric Strength.
- Wide temperature range, -22° to +212° F. (-30° to +100° C.)
- Eliminates sand or grout fill.
- No special tools required for installation.
- Low coefficient of friction for ease of installation.

Weight Comparison 9.05" x 17.25" CR Application

**Ranger II
Non-Metallic**
2.79 lbs.

**Model S8GN2
Stainless Steel**
15 lbs.

**Ranger II® Advantage
Installer and Shipping Costs**

Weight and Spacing Guidelines

Ranger II® Casing Spacers Skid Height Spacing: (Maximum Distance Between Casing Spacer.)

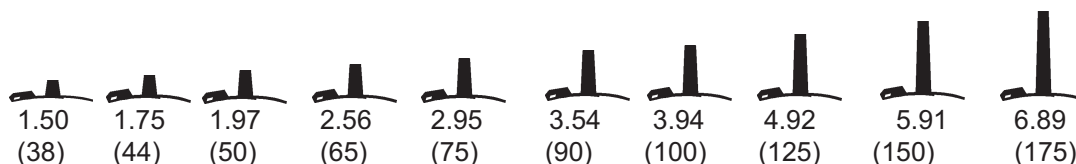
Skid Height 1.50" (38mm) to 1.97" (50mm)	8' (Feet)
Skid Height 2.56" (65mm) to 3.54" (90mm)	6' (Feet)
Skid Height 3.94" (100mm) and up	5' (Feet)

Installed On Various Pipe Types, Such As:

PVC Water, PVC Sewer, HDPE
Steel, Ductile Iron...etc.







Ranger II Casing Spacers Skid Height Max Load Per Spacer:

	MICRO	MINI	MIDI	MEDI	MAXI
Skid Height 1.50" (38mm) to 1.97" (50mm)	175 lb.	500 lb.	1,250 lb.	3,300 lb.	5,000 lb.
Skid Height 2.56" (65mm) to 2.95" (75mm)	135 lb.	400 lb.	1,000 lb.	2,600 lb.	4,000 lb.
Skid Height 3.54" (90mm) to 3.94" (100mm)	120 lb.	350 lb.	875 lb.	2,300 lb.	3,500 lb.
Skid Height 4.92" (125mm) to 5.91" (150mm)		250 lb.	625 lb.	1,650 lb.	2,500 lb.
Skid Height 6.89" (175mm)			550 lb.	1,400 lb.	2,300 lb.










PSI Ranger II® Non-metallic Casing Spacers

Ranger II - Micro for 0.83 to 3.07" (21 to 78mm) Diameter Carrier Pipe Band Width = 2.13" (54mm)











Carrier Pipe O.D. Range Inches (mm)	No. of Segments	Runner Height Options Inches (mm)
0.83 to 1.14 (21 to 29)	3	Verify that Slide-Locks match segment size: Make sure (Mini) matches name molded on the bottom of the Slide-Lock. Note: Micro & Mini segments both use the Mini Slide-Lock.
1.14 to 1.54 (29 to 39)	4	
1.54 to 1.85 (39 to 47)	5	
1.85 to 2.24 (47 to 57)	6	
2.24 to 2.48 (57 to 63)	7	
2.48 to 3.07 (63 to 78)	8	
		 1.50 (38)  1.97 (50)  2.56 (65)  2.95 (75)  3.54 (90)  3.94 (100)

Ranger II - Mini for 2.48 to 5.51" (63 to 140mm) Diameter Carrier Pipe Band Width = 3.15" (80mm)

Carrier Pipe O.D. Range Inches (mm)	No. of Segments	Runner Height Options Inches (mm)
2.48 to 3.07 (63 to 78)	4	 1.50 (38)  1.97 (50)  2.56 (65)  2.95 (75)  3.54 (90)  3.94 (100)  4.92 (125)
3.07 to 3.86 (78 to 98)	5	
3.86 to 4.49 (98 to 114)	6	
4.49 to 5.51 (114 to 140)	7	










Verify that Slide-Locks match segment size by checking to ensure the segment name (Mini) matches the name molded on bottom of the Slide-Lock. Note: Micro & Mini segments both use the Mini Slide-Lock.

Ranger II - Midi for 5.51 to 16.65" (140 to 423mm) Diameter Carrier Pipe Band Width = 5.12" (130mm)

Carrier Pipe O.D. Range Inches (mm)	No. of Segments	Runner Height Options Inches (mm)
5.51 to 6.89 (140 to 175)	4	 1.50 (38)  1.75 (44)  1.97 (50)  2.56 (65)  2.95 (75)
6.89 to 8.70 (175 to 221)	5	
8.70 to 10.31 (221 to 262)	6	
10.31 to 12.87 (262 to 327)	7	
12.87 to 14.41 (327 to 366)	8	
14.41 to 16.65 (366 to 423)	10	
		 3.54 (90)  3.94 (100)  4.92 (125)  5.91 (150)  6.89 (175)










Verify that Slide-Locks match segment size by checking to ensure the segment name (Midi) matches the name molded on the bottom of the Slide-Lock.

Ranger II - Medi for 16.77 to 25.98" (426 to 660mm) Diameter Carrier Pipe Band Width = 6.87" (174 mm)

Carrier Pipe O.D. Range Inches (mm)	No. of Segments	Runner Height Options Inches (mm)
16.77 to 21.22 (426 to 539)	4	 1.50 (38)  1.97 (50)  2.56 (65)  2.95 (75)  3.54 (90)  3.94 (100)  4.92 (125)  5.91 (150)  6.89 (175)
21.22 to 25.98 (539 to 660)	5	

Verify that Slide-Locks match segment size by checking to ensure the segment name (Maxi) matches the name molded on the bottom of the Slide-Lock. Note: Medi & Maxi segments both use the Maxi Slide-Lock.

Ranger II - Maxi for 25.98 to 37.60" (660 to 955mm) Diameter Carrier Pipe Band Width = 8.86" (225mm)

Carrier Pipe O.D. Range Inches (mm)	No. of Segments	Runner Height Options Inches (mm)
25.98 to 30.79 (660 to 782)	6	 1.50 (38)  1.97 (50)  2.56 (65)  2.95 (75)  3.54 (90)  3.94 (100)  4.92 (125)  5.91 (150)  6.89 (175)
30.79 to 37.60 (782 to 955)	7	

Verify that Slide-Locks match segment size by checking to ensure the segment name (Maxi) matches the name molded on the bottom of the Slide-Lock. Note: Medi & Maxi segments both use the Maxi Slide-Lock.

PSI Ranger II® Non-metallic Casing Spacers

Size your Installation Application

All Ranger II® Casing Spacers require more than one segment to complete a spacer. In addition, all Ranger II Casing Spacers are available with a number of different runner height options which are used to guarantee clearance of the mechanical joint, provide for options in carrier pipe positioning within the casing or to compensate for grade elevation adjustments. Following are examples on how to size Ranger II Casing Spacers for various applications. **Detailed**

Ranger II casing spacers weight & spacing guidelines on page 3. For exact centering and adjusting for grade elevation changes contact PSI.

Examples

Centered & Restrained with Equal Length Runners

20" Ductile Iron pipe (21.60" O.D. barrel & 28.63" O.D. bell) inside a 36" casing with a 0.375" wall thickness.

A. Find carrier pipe O.D. (21.60") from adjacent chart and choose the proper size and number of segments.

One spacer would require 5 - Medi segments.

B. Determine maximum runner height with equal length runners.

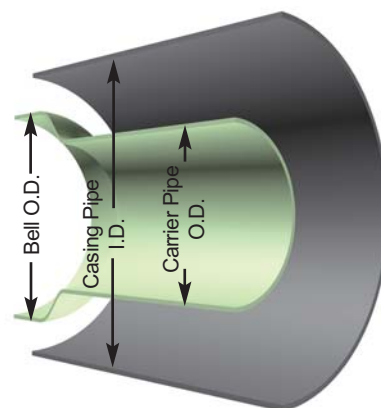
Casing I.D.	35.25"
Less Carrier Pipe O.D.	<u>-21.60"</u>
	13.65"
Less Space Allowance	<u>-1.00"</u>
	12.65"

Divide this number (12.65") by 2 to obtain the total maximum runner height = 6.325

C. Choose a runner height of this value or less.

Solution: Use 5 - Medi (150) segments with runner heights of 5.91".

Ordering Codes: See Back Page for Ordering Code Sequence.



Note: This combination will restrain the pipe from flotation within the casing pipe by allowing only about 1.8" of clearance between the top runners and the casing I.D. This will center the carrier pipe within approximately 0.9" of exact center.

To Clear the Bell (suggested minimum clearance is at least 0.8" (0.4" on both sides))

20" Ductile Iron pipe (21.60" O.D. barrel & 28.63" O.D. bell) inside a 36" casing with a 0.375" wall thickness.

Determine runner height.

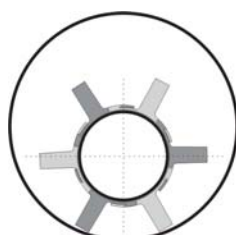
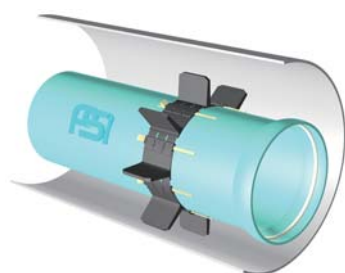
(Clear Bell)	Bell O.D.	28.63"
	Add 0.8" Clearance	<u>+0.80"</u>
		29.43"
	Less Barrel O.D.	<u>-21.60"</u>
		7.83"

Divide this number (7.83") by 2 to obtain the minimum runner height to clear the bell = 3.92"

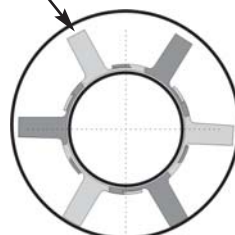
Choose a runner height between 3.92" and the maximum allowable runner height (6.32") determined in the above example.

Solution: Use 5 - Medi (100) segments with runner heights of 3.94".

Ordering Codes: See Back Page for Ordering Code Sequence.

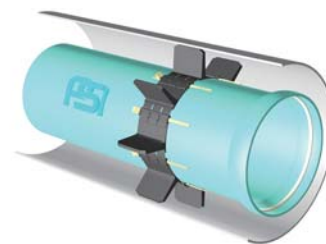


Standard To
Clear Bell



Centered/Restrained

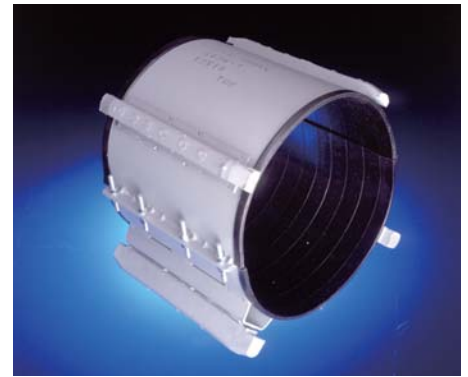
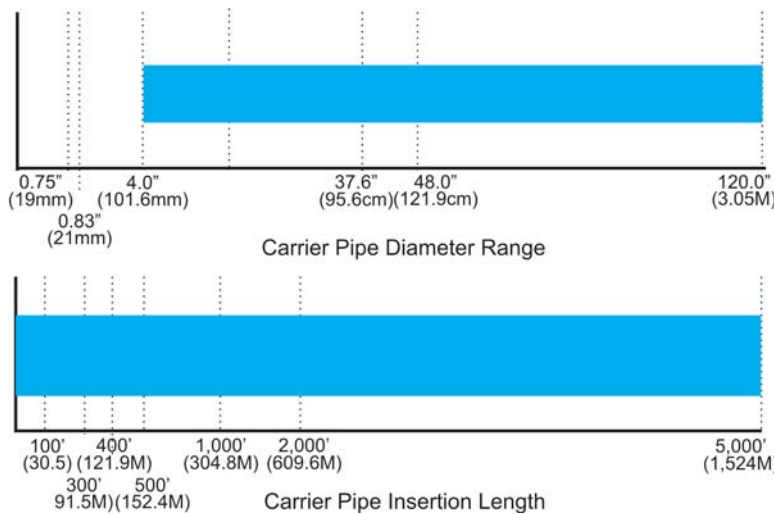
Min. 1" (25.4mm) clearance typical



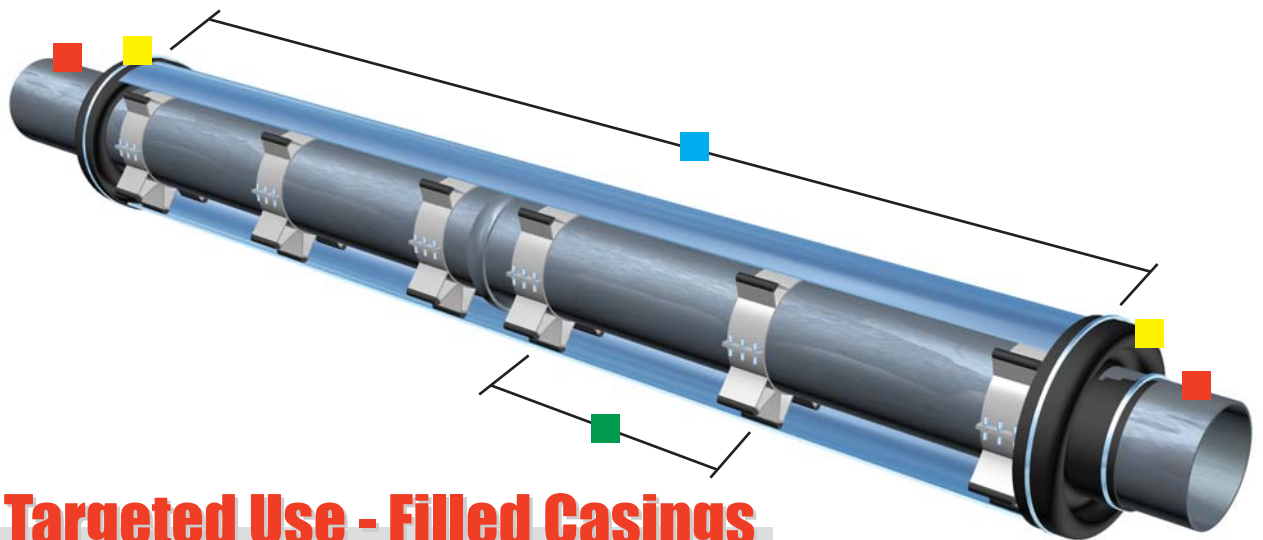
Model A

Painted Metallic Casing Spacers

PSI Model A Metallic Casing Spacers



Glass reinforced nylon runners are standard in 1" (25.4mm) or 2" (50.8mm) widths for Model A (painted).



Targeted Use - Filled Casings

- For carrier pipe diameters ranging from 4" (101.6mm) to 120" (304.8cm)
- For carrier pipe insertion lengths up to 5,000 feet.* (1,524M)
- Spacing Recommendation: Max 8' (243.8cm) between spacers, Max 2' (61.0cm) from casing pipe end, Max 2' (61.0cm) on each side of bell or mechanical joint.
- Recommended End Seals: Model C, S, W, R and FW.

* Pipe insertion lengths may vary depending on type of casing pipe, condition of casing pipe, misaligned casing joint or other factors that may cause excessive abrasion to runner materials.

Model Options:

Model A8G1, A8GN1 or A8G2, A8GN2

Painted Steel casing isolator with an 8" (203mm) wide steel band and 1" (25.4mm) or 2" (50.8mm) wide glass reinforced polymer runners.

Model A12G1, A12GN1 or A12G2, A12GN2

Painted Steel casing isolator with a 12" (305mm) wide steel band and 1" (25.4mm) or 2" (50.8mm) wide glass reinforced polymer runners.

PSI painted steel casing isolators are selected when strength and economy are your most important concerns. A rust inhibiting paint is applied over 14 gauge (0.074"/1.88mm) hot rolled and pickled mild steel for casing isolators 4" (101.6mm) diameter and up, in either 8" (203mm) or 12" (305mm) wide bands. The flanges of the spacer are deep embossed and the corners are chamfered. The GN2 runners are attached with 3/8" (9.5mm) diameter studs, which are fusion welded to the band before it is painted. They are recessed far below the wearing surface of the runner and, after the runner is anchored to the band, the stud counter-bore is filled to insure a water tight seal for the stud and the lock fastener. GN1 and G1 runners are attached by projection welded method.

PSI Model A Metallic Casing Spacers

Material Specifications

Painted Metallic Casing Spacers/Isolators

Band

14 Gauge (0.074" [1.88mm]) hot rolled and pickled mild steel.

12 Gauge (0.105" [2.66mm]) hot rolled and pickled mild steel.

(40" Ø & up.)

Flanges of the spacer are deep embossed and the corners are chamfered.

Configurations - Band

4" (101.6mm) through 36" (914mm) = 2 Piece

36" (914mm) through 48" (1,219mm) = 3 Piece

48" (1,219mm) and over = Consult Factory

Finish

Rust inhibiting paint

Liner - Polyvinyl Chloride Liner (Standard)

Thickness 0.090" (2.29mm) minimum

Hardness Durometer "A" 85-90

Dielectric Strength

1/8" (3.18mm) Surge Test 60,000 V min.

Step-by-step Test 58,000 V min.

Water Absorption 1% max.

Temperature -40 to 170°F (-40 to 76°C)

Liner - T.P.E. Liner (Temperature Extremes) Model A12 Only

Thickness 0.118" (3.0mm)

Hardness Shore "A" 73

Dielectric Strength

1/8" (3.18mm) Surge Test 60,000 V min.

Step-by-step Test 58,000 V min.

Water Absorption 1% max.

Temperature -50 to 270°F (-45 to 132°C)

Risers

10 gauge (0.135" [3.43mm]) steel MIG welded to band. (Standard)

7 gauge (0.179" [4.55mm]) steel MIG welded to band. (Contact PSI)

Runners (G and GN) Note: GN Material is the PSI Standard Material

Sizes and Configurations

Painted - 1" (25.4mm) or 2" (51mm) Wide Glass Reinforced Polyester (G) or Nylon Runners (GN)

4" (101.6mm) thru 12" (305mm) = 2 top & 2 bottom

14" (356mm) thru 36" (914mm) = 2 top & 4 bottom

38" (965.2mm) and over = Consult Factory

Runner Specifications (G and GN)

Tensile Strength, (ASTM D638) 17,600 psi (1,237 kg/cm²)

Flexural Strength, (ASTM D790) 25,300 psi (1,779 kg/cm²)

Compression Strength, (ASTM D695) 18,000 psi (1,266 kg/cm²)
(10% Deformation)

Deflection Temp. @ 264 psi - (ASTM D648) 405°F (205°C)

Hardware (Threaded Studs, Nuts and Washers)

Threaded Studs = 5/16" - 18 x 2 1/2" 304 stainless steel or plated

Hex Nuts = 5/16"

Washers = 5/16" SAE 2330

Configurations - Threaded Studs, Nuts and Washers

8" (203.2mm) Band = 6 studs, 12 nuts and washers

12" (305mm) Band = 8 studs, 16 nuts and washers



Model G



Model GN

Effective Runner Heights and Lengths - G and GN

Sizing carrier pipe O.D. and casing I.D. can be misleading at times due to a difference between nominal and effective dimensions. When sizing, make sure to consider effective runner height. Two heights are available/used; custom positioning in the casing can be achieved with riser heights.

Heights - Nominal versus Effective

1" and 2" Wide Glass Reinforced Nylon or Polyester Runners

Nominal 1.0" (25.4mm) - 1.5" (38.1mm)

Effective 1.07" (27.2mm) - 1.70" (43.2mm)

Lengths - Effective

1" Wide Glass Reinforced Nylon or Polyester Runners

8.5" (215.9mm) - 12.5" (317.5mm)

2" Wide Glass Reinforced Nylon or Polyester Runners

7.0" (177.8mm) - 11.0" (279.4mm)

Glass reinforced polymer runners are standard in 2" (50.8mm) widths for Model C (coated). PSI GN glass reinforced nylon runners have 5 times the compressive strength of polyethylene runners. Our Model G Polyester 2" wide runners are particularly designed for heavier pipes and longer pulls.



Model A Casing Spacers at job site. All metallic casing spacers are packaged on skids, banded and properly shrink wrapped.

Applications

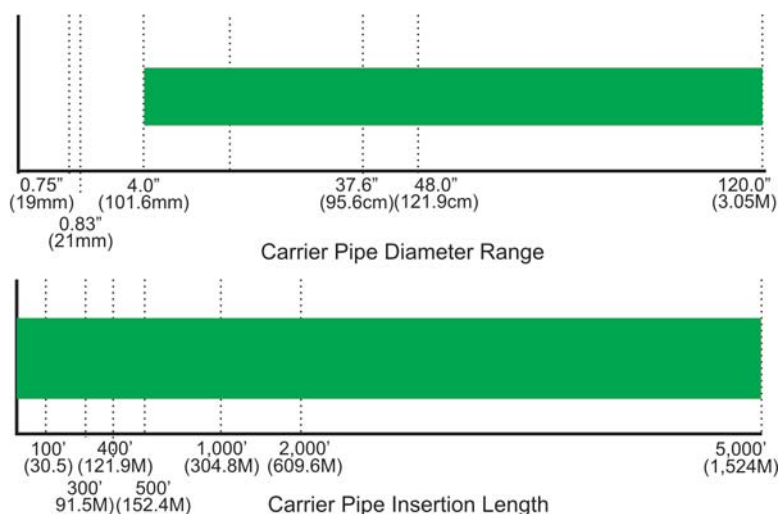
Rugged, heavy duty steel casing spacers with tough glass reinforced polymer insulating runners are designed for ease of installation on:

- Concrete Pipe • Ductile Iron Pipe
- Plastic Pipe • Steel Pipe

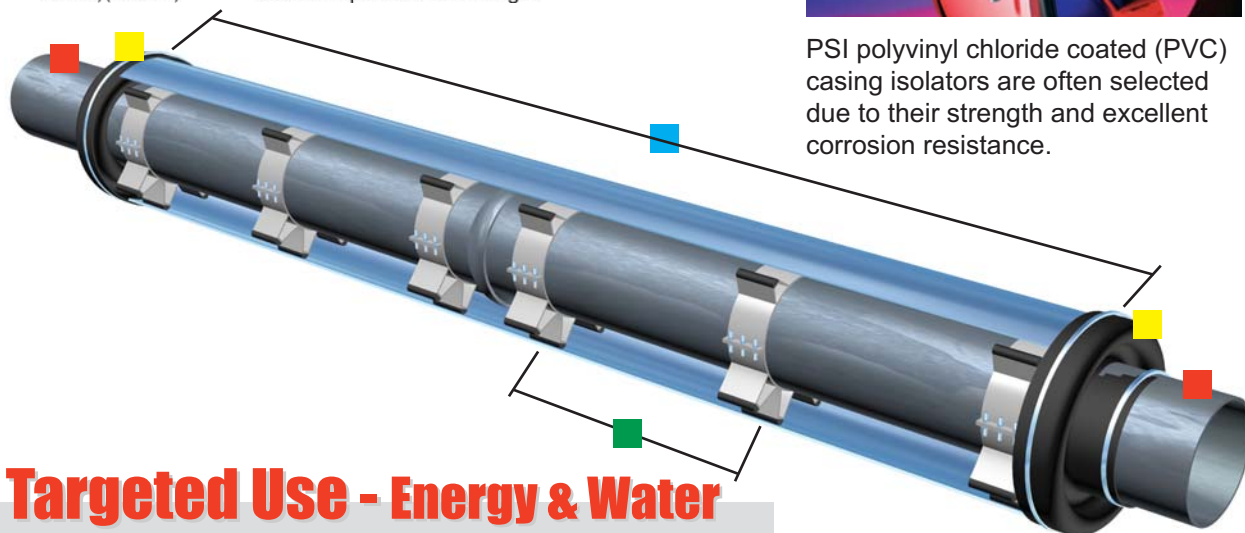
Spacers Accommodate

- Mechanical Joints • Push-on
- Restrained • Welded Joint Pipe
- Small or large carrier/casing differentials.
- Electrical isolation of carrier pipe from casing for corrosion protection.

PSI Model C Metallic Casing Spacers



PSI polyvinyl chloride coated (PVC) casing isolators are often selected due to their strength and excellent corrosion resistance.



Targeted Use - Energy & Water

- For carrier pipe diameters ranging from 4" (101.6mm) to 120" (304.8cm)
- For carrier pipe insertion lengths up to 5,000 feet.* (1,524M)
- Spacing Recommendation: Max 8' (243.8cm) between spacers, Max 2' (61.0cm) from casing pipe end, Max 2' (61.0cm) on each side of bell or mechanical joint.
- Recommended End Seals: Model C, S, W, R and FW.

* Pipe insertion lengths may vary depending on type of casing pipe, condition of casing pipe, misaligned casing joint or other factors that may cause excessive abrasion to runner materials.

Model Options:

Model C8G2 or C8GN2

Coated Steel casing isolator with an 8" (203mm) wide steel band and 2" (50.8mm) wide glass reinforced polymer runners.

Model C12G2 or C12GN2

Coated Steel casing isolator with a 12" (305mm) wide steel band and 2" (50.8mm) wide glass reinforced polymer runners.

An extremely tough and durable heat fused fluid bed PVC powder coating is offered on steel casing isolators 4" and larger, with 8" and 12" band widths. The cold formed steel casing isolator band, complete with runner studs installed, is vapor degreased, primed, heated and fusion coated with plastic, providing a minimum .010" (.254mm) thick coating over the entire band and runner studs. A post cured cycle strengthens the bond and provides an even more uniform coating. Polyvinyl chloride is available as a standard. Other heat fused plastic coatings are also available for custom orders and applications.

The runners are attached with 3/8" diameter studs, which are fusion welded to the band before it is PVC coated. They are recessed far below the wearing surface of the runner. After the runner is anchored to the band, the stud counter-bore is filled to assure a water tight seal for the stud and the lock fastener.

PSI Model C Metallic Casing Spacers

Material Specifications

Coated Metallic Casing Spacers/Isolators

Band

14 Gauge (0.074" [1.88mm]) hot rolled and pickled mild steel.

12 Gauge (0.105" [2.66mm]) hot rolled and pickled mild steel.

(40" Ø & up.)

Flanges of the spacer are deep embossed and the corners are chamfered.

Configurations - Band

4" (101.6mm) through 36" (914mm) = 2 Piece

36" (914mm) through 48" (1,219mm) = 3 Piece

48" (1,219mm) and over = Consult Factory

Finish - 10 to 16 mil. fusion bonded PVC coating (others available)

Durometer - shore A2 (10 sec.) (ASTM D1706-61) 80

Max. Operating Temp. (constant) 150° F. (65° C.)

Aging Properties Excellent

Electrical Properties (ASTM D149-61) (short time .010") 1,380 V/mil.

Resistance:

Salt Spray (ASTM B117) Excellent

Acids Good

Alkalies Good

Liner - Polyvinyl Chloride Liner (Standard)

Thickness 0.090" (2.29mm) minimum

Hardness Durometer "A" 85-90

Dielectric Strength

1/8" (3.18mm) Surge Test 60,000 V min.

Step-by-step Test 58,000 V min.

Water Absorption 1% max.

Temperature -40 to 170°F (-40 to 76°C)

Liner - T.P.E. Liner (Temperature Extremes) Model C12 Only

Thickness 0.118" (3.0mm)

Hardness Shore "A" 73

Dielectric Strength

1/8" (3.18mm) Surge Test 60,000 V min.

Step-by-step Test 58,000 V min.

Water Absorption 1% max.

Temperature -50 to 270°F (-45 to 132°C)

Risers

10 gauge (0.135" [3.43mm]) steel MIG welded to band. (Standard)

7 gauge (0.179" [4.55mm]) steel MIG welded to band. (Contact PSI)

Runners (G and GN) Note: GN Material is the PSI Standard Material

Sizes and Configurations

2" (51mm) Wide Glass Reinforced

Polyester (G) or Nylon Runners (GN)

4" (101.6mm) thru 12" (305mm) = 2 top & 2 bottom

14" (356mm) thru 36" (914mm) = 2 top & 4 bottom

38" (965.2mm) and over = Consult Factory

Runner Specifications (G and GN)

Tensile Strength, (ASTM D638) 17,600 psi (1,237 kg/cm²)

Flexural Strength, (ASTM D790) 25,300 psi (1,779 kg/cm²)

Compression Strength, (ASTM D695) 18,000 psi (1,266 kg/cm²)
(10% Deformation)

Deflection Temp. @ 264 psi - (ASTM D648) 405°F (205°C)

Hardware (Threaded Studs, Nuts and Washers)

Threaded Studs = 5/16" - 18 x 2 1/2" 304 stainless steel or plated

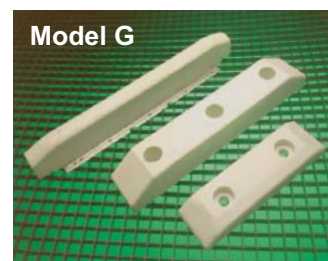
Hex Nuts = 5/16"

Washers = 5/16" SAE 2330

Configurations - Threaded Studs, Nuts and Washers

8" (203.2mm) Band = 6 studs, 12 nuts and washers

12" (305mm) Band = 8 studs, 16 nuts and washers



Effective Runner Heights and Lengths - G and GN

Sizing carrier pipe O.D. and casing I.D. can be misleading at times due to a difference between nominal and effective dimensions. When sizing, make sure to consider effective runner height. Two heights are available/used; custom positioning in the casing can be achieved with riser heights.

Heights - Nominal versus Effective

2" Wide Glass Reinforced Nylon or Polyester Runners

Nominal 1.0" (25.4mm) - 1.5" (38.1mm)

Effective 1.07" (27.2mm) - 1.70" (43.2mm)

Lengths - Effective

2" Wide Glass Reinforced Nylon or Polyester Runners

7.0" (177.8mm) - 11.0" (279.4mm)

Glass reinforced polymer runners are standard in 2" (50.8mm) widths for Model C (coated).

PSI GN glass reinforced nylon runners have 5 times the compressive strength of polyethylene runners. Our Model G polyester 2" wide runners are particularly designed for heavier pipes and longer pulls.



Model C12GN2 used on D.I Pipe, for 1,800 ft crossing under airport runway.

Applications

Rugged, heavy duty steel casing spacers with tough glass reinforced polymer insulating runners are designed for ease of installation on:

- Concrete Pipe • Ductile Iron Pipe
- Plastic Pipe • Steel Pipe

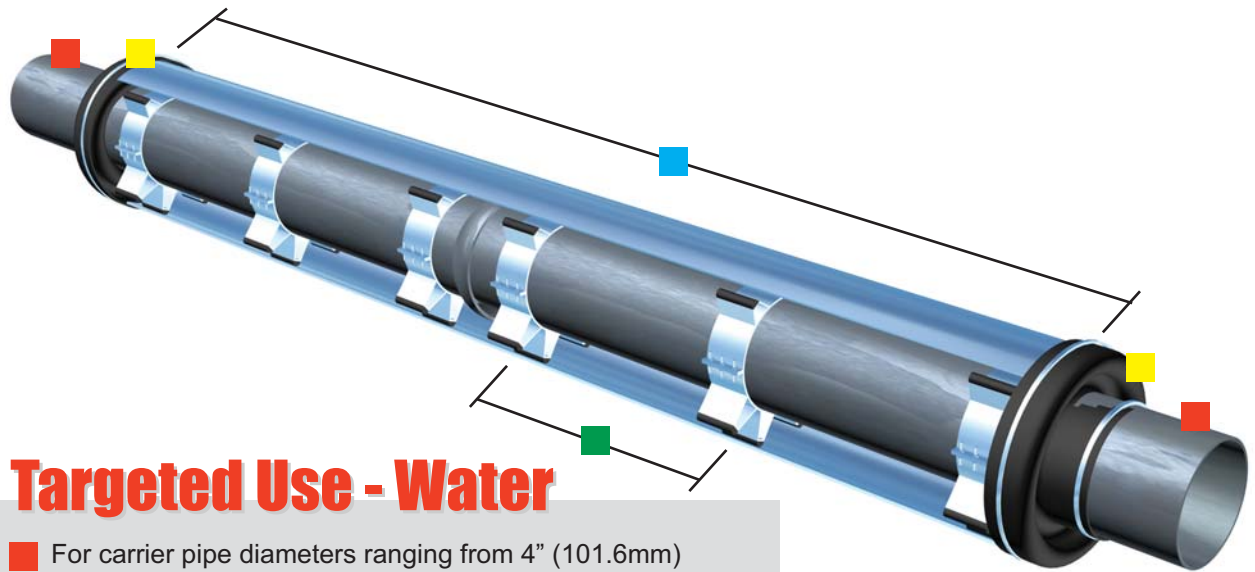
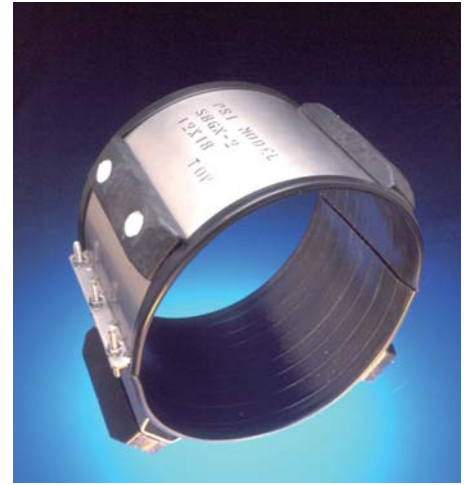
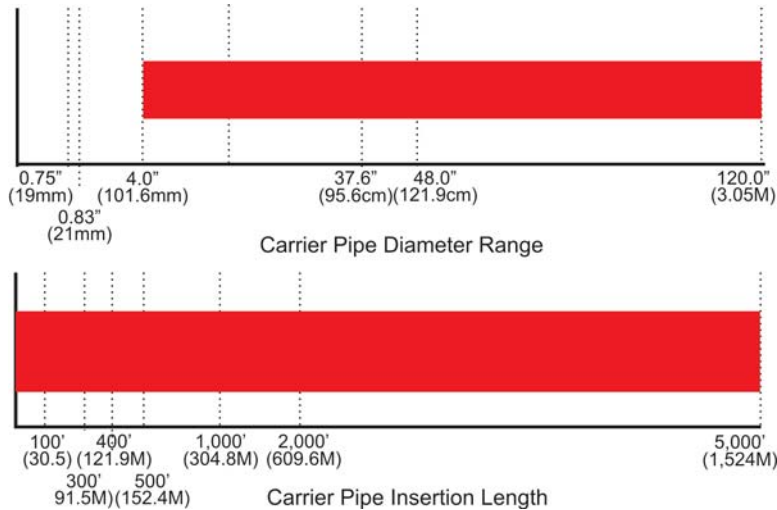
Spacers Accommodate

- Mechanical Joints • Push-on
- Restrained • Welded Joint Pipe
- Small or large carrier/casing differentials.
- Electrical isolation of carrier pipe from casing for corrosion protection.

Model S

Stainless Metallic Casing Spacers

PSI Model S Metallic Casing Spacers



Targeted Use - Water

- For carrier pipe diameters ranging from 4" (101.6mm) to 120" (304.8cm).
- For carrier pipe insertion lengths up to 5,000 feet.* (1,524M)
- Spacing Recommendation: Max 8' (243.8cm) between spacers, Max 2' (61.0cm) from casing pipe end, Max 2' (61.2cm) on each side of bell or mechanical joint.
- Recommended End Seals: Model C, S, W, R and FW.

* Pipe insertion lengths may vary depending on type of casing pipe, condition of casing pipe, misaligned casing joint or other factors that may cause excessive abrasion to runner materials.

Model Options:

Model S8G2 or S8GN2

Stainless Steel casing isolator with an 8" (203mm) wide steel band and 2" (50.8mm) wide glass reinforced polymer runners.

Model S12G2 or S12GN2

Stainless Steel casing isolator with a 12" (305mm) wide steel band and 2" (50.8mm) wide glass reinforced polymer runners.

Model SL8GN2 (Cost Effective Stainless Option.)

Stainless Steel casing isolator with a 8" (203mm) wide steel band and 2" (50.8mm) wide glass reinforced polymer runners. Designed for carrier pipe O.D's under 13.8" (35.0cm), targeting PVC pipe types for water market.

Tough, heavy duty 14 gauge (0.74"/1.88mm) 304 stainless steel isolators/spacers are available for use in highly corrosive environments. They offer maximum corrosion resistance while providing support for large diameter pipe, unusually heavy pipe or for long casing pulls.

The flanges of the spacer are deep embossed and the corners are chamfered.

The runners are attached with 3/8" (9.5mm) diameter studs, which are fusion welded to the band. The studs are recessed far below the wearing surface of the runner and, after the runner is anchored to the band, the stud counter-bore is filled to insure a water tight seal for the stud and the lock fastener.

PSI Model S Metallic Casing Spacers

Material Specifications

Stainless Steel Casing Spacers/Isolators

Band

14 Gauge (0.074" [1.88mm])	304 stainless steel. (S8 and S12)
12 Gauge (0.105" [2.66mm])	304 stainless steel. (S12 40" Ø & up.)
Engineer/Contractor must specify.	
16 Gauge (0.061" [1.56mm])	304 stainless steel. (Model SL8)
Flanges of the spacer are deep embossed and the corners are chamfered.	

Configurations - Band

4" (101.6mm) through 36" (914mm)	= 2 Piece
36" (914mm) through 48" (1,219mm)	= 3 Piece
48" (1,219mm) and over	= Consult Factory

Finish

None

Liner - Polyvinyl Chloride Liner (Standard)

Thickness	0.090" (2.29mm) minimum
Hardness	Durometer "A" 85-90
Dielectric Strength	
1/8" (3.18mm) Surge Test	60,000 V min.
Step-by-step Test	58,000 V min.
Water Absorption	1% max.
Temperature	-40 to 170°F (-40 to 76°C)

Liner - T.P.E. Liner (Temperature Extremes) Model S12 Only

Thickness	0.118" (3.0mm)
Hardness	Shore "A" 73
Dielectric Strength	
1/8" (3.18mm) Surge Test	60,000 V min.
Step-by-step Test	58,000 V min.
Water Absorption	1% max.
Temperature	-50 to 270°F (-45 to 132°C)

Risers

10 gauge (0.135" [3.43mm])	304 stainless steel MIG welded to band. (Standard S8 and S12)
7 gauge (0.179" [4.55mm])	steel MIG welded to band. (Contact PSI)
12 gauge (0.105" [2.667mm])	steel MIG welded to band. (Model SL8)

Runners (G and GN) Note: GN Material is the PSI Standard Material Sizes and Configurations

2" (51mm) Wide Glass Reinforced Polyester (G) or Nylon Runners (GN)
4" (101.6mm) thru 12" (305mm) = 2 top & 2 bottom
14" (356mm) thru 36" (914mm) = 2 top & 4 bottom
38" (965.2mm) and over = Consult Factory

Runner Specifications (G and GN)

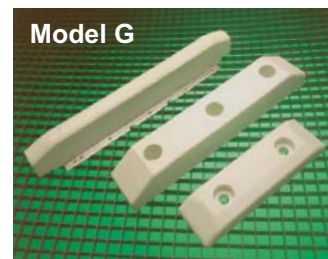
Tensile Strength, (ASTM D638)	17,600 psi (1,237 kg/cm ²)
Flexural Strength, (ASTM D790)	25,300 psi (1,779 kg/cm ²)
Compression Strength, (ASTM D695)	18,000 psi (1,266 kg/cm ²) (10% Deformation)
Deflection Temp. @ 264 psi - (ASTM D648)	405°F (205°C)

Hardware (Threaded Studs, Nuts and Washers)

Threaded Studs = 5/16" - 18 x 2 1/2"	304 stainless steel or plated
Hex Nuts = 5/16"	
Washers = 5/16"	SAE 2330

Configurations - Threaded Studs, Nuts and Washers

8" (203.2mm) Band = 6 studs, 12 nuts and washers
12" (305mm) Band = 8 studs, 16 nuts and washers



Effective Runner Heights and Lengths - G and GN

Sizing carrier pipe O.D. and casing I.D. can be misleading at times due to a difference between nominal and effective dimensions. When sizing, make sure to consider effective runner height. Two heights are available/used; custom positioning in the casing can be achieved with riser heights.

Heights - Nominal versus Effective

2" Wide Glass Reinforced Nylon or Polyester Runners

Nominal	1.0" (25.4mm) - 1.5" (38.1mm)
Effective	1.07" (27.2mm) - 1.70" (43.2mm)

Lengths - Effective

2" Wide Glass Reinforced Nylon or Polyester Runners

7.0" (177.8mm) - 11.0" (279.4mm)

Glass reinforced polymer runners are standard in 2" (50.8mm) widths for Model S (stainless).

PSI GN glass reinforced nylon runners have 5 times the compressive strength of polyethylene runners. Our Model G polyester 2" wide runners are particularly designed for heavier pipes and longer pulls.



Applications

Rugged, heavy duty steel casing spacers with tough glass reinforced polymer insulating runners are designed for ease of installation on:

- Concrete Pipe • Ductile Iron Pipe
- Plastic Pipe • Steel Pipe

Spacers Accommodate

- Mechanical Joints • Push-on
- Restrained • Welded Joint Pipe
- Small or large carrier/casing differentials.
- Electrical isolation of carrier pipe from casing for corrosion protection.

Multiple Carrier Pipe

Metallic Casing Spacers

Page 20

Ordering Procedure

Metallic Casing Spacers

1. Quantity
2. Type Finish
3. Band Width
4. Runner Width
5. Carrier Pipe O.D. (Type and coating thickness if applicable)
6. Casing Pipe I.D. (Type and coating thickness if applicable)
7. Carrier Pipe Joint O.D. (If applicable)
8. Carrier pipe position within casing
9. Length of crossing
10. Contact your local distributor or Pipeline Seal and Insulator, Inc.

Coated 12" (305mm) wide steel band casing spacer with 2" (50.8mm) wide glass reinforced nylon runners for a 16" (400mm) ductile iron pipe with a 17.40" (400mm) outside diameter within a casing pipe with a 23.25" (590mm) inside diameter. carrier pipe joint O.D. 20.00" (508mm). standard position.

A = Painted
C = Coated
S = 304 Stainless Steel
SL8 = Light Gauge 304 Stainless Steel

8 = 8" Band
12 = 12" Band

G1 = 1" Wide Glass Reinforced Polyester Runners*
GN1 = 1" Wide Glass Reinforced Nylon Runners*
G2 = 2" Wide Glass Reinforced Polyester Runners
GN2 = 2" Wide Glass Reinforced Nylon Runners

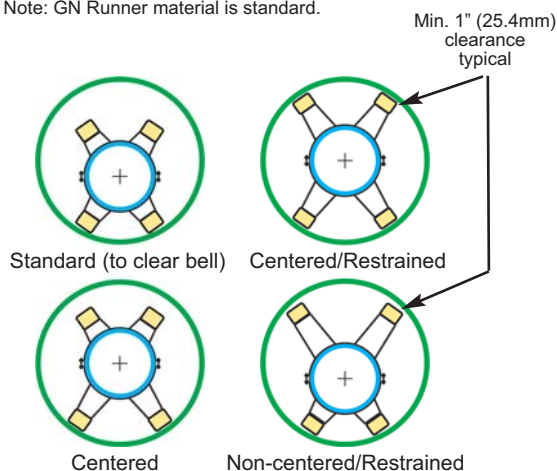
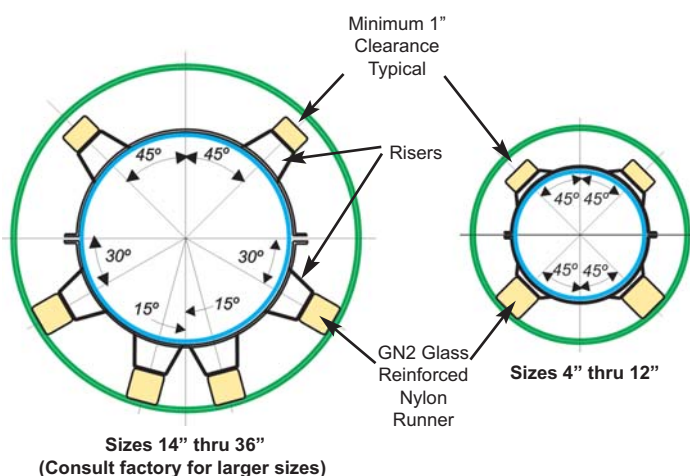
Indicate actual O.D. including coating.

Indicate actual I.D. including coating.

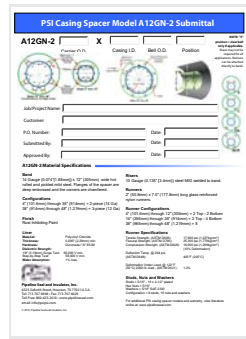
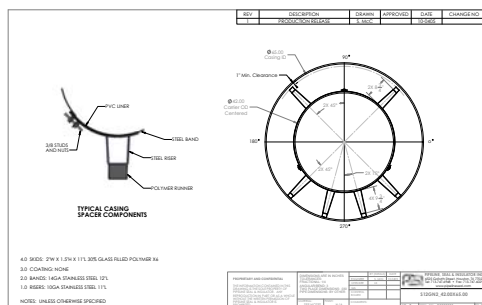
Indicate actual O.D. including coating.

S = Standard
C = Centered
CR = Centered/Restrained
NCR = Non-centered/Restrained
* = 1" Runners Available on Painted Models Only.
Note: GN Runner material is standard.

C 12 GN2 17.40 x 23.25 - 20.00" - S

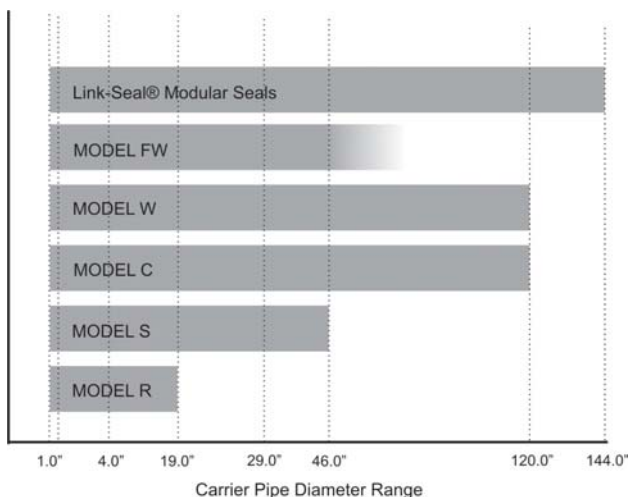


Metallic Casing Spacers are engineered, and CAD drawings are available for design discussions upon request. Detailed CAD drawings are provided upon order placement. For standard CAD casing/carrier pipe applications, drawings are available online at www.pipelinesseal.com.



are available online at
www.pipeline seal.com.

Casing End Seals



Material	Endseal Model					Material Specifications
	C	R	S	W	FW LS	
EPDM 60	X	X	X	X	*	Thickness = 1/8" (3.18mm) Color = Black Temperature = 250° F. (121° C.)
BUNA-N ¹	X			X	*	Thickness = 1/8" (3.18mm) Color = Black Temperature = 212° F. (100° C.)
NEOPRENE	X			X	*	Thickness = 1/8" (3.18mm)* Color = Black Temperature = 170° F. (77° C.)
NITRILE					X	Color = Green Temperature = 210° F. (99° C.)
SILICONE					X	Color = Grey Temperature = 400° F. (204° C.)
EPDM					X	Color = Black Temperature = 250° F. (121° C.)

NOTES:

Standard casing end seals are designed for below grade applications. For above grade applications please contact PSI.

LS = Link-Seal® Modular Seals.

* = Contact PSI For Material Specifications.

1. High grade Buna-N material available for oil/gas run off.

Model "C" End Seals (For New Installations) Water/Energy Market

Model "C" Custom Pull-on End Seals are designed to accommodate custom carrier/casing diameter combinations. They are made to customer supplied specifications so they may be used for any size casing/carrier differential. Manufactured from 1/8" thick specially compounded synthetic rubber, PSI Model "C" end seals are extremely robust, resistant to wide variations in environmental conditions while eliminating the possibility of foreign material entering the opening between carrier and casing pipes.

Benefits/Features

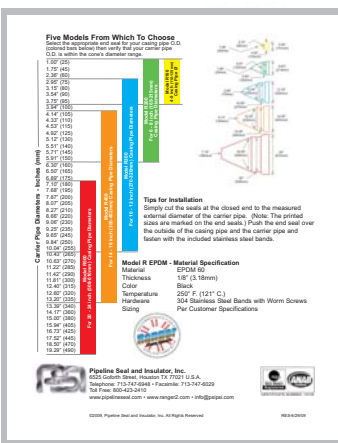
- Custom Made to Order
- Quick and Easy Installation
- Carrier Pipe Does Not Need To Be Centered Within Casing
- Screwdriver Is Only Tool Required for Installation
- Designed To Last for the Life of the Piping System
- Heavy Duty Stainless Steel Hose Clamps Supplied

Model "R" End Seals and Night Caps (For New Installations) Water/Energy Market

Model "R" End Seals are available in five (5) different sizes to accommodate a wide range of carrier/casing diameter combinations. A unique "cone" design, with molded-in dimensions, are easily cut to size for a correct fit on the carrier pipe.

Benefits/Features

- Low storage costs, only five end seal sizes to accommodate casings from 4" (10.2cm) to 24" (61.0cm) in diameter with all applicable carrier pipe sizes
- May be easily stocked in 5 model sizes
- Quick and Easy Installation
- Manufactured from 1/8" (3.18mm) thick high quality EPDM rubber
- Casing night cap prevents entry of debris and animals during install
- Sizes are clearly printed on sleeve to simplify cutting to the correct size
- Designed to last for the life of the piping system
- Stainless steel bands for clamping both ends of end seal provided
- May be used for new installations



For Model R End Seal sizing, download Model R literature. www.pipeline Seal.com

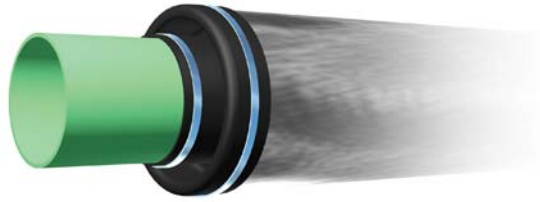
Casing End Seals

Model "S" Standard Pull-on End Seals (For New Installations) **Energy Market**

Model "S" Standard Pull-on End Seals are flexible and easily installed on Nominal Steel & IPS casing/carrier pipe combinations. PSI Model "S" end seals are extremely robust, resistant to wide variations in environmental conditions while eliminating the possibility of foreign material entering the opening between carrier and casing pipes.

Benefits/Features

- Quick and Easy Installation
- May be stocked
- Screwdriver Is Only Tool Required for Installation
- Designed To Last for the Life of the Piping System
- Heavy Duty Stainless Steel Hose Clamps Supplied.



Model "W" Wrap Around End Seals (For New and Existing Installations) **Water/Energy Market**

Model "W" Wrap Around End Seals are designed to accommodate customer supplied specifications so they may be used for any size casing/carrier differential. PSI Model "W" end seals are extremely robust, resistant to wide variations in environmental conditions while eliminating the possibility of foreign material entering the opening between carrier and casing pipes.

Benefits/Features

- Custom Made to Order
- Quick and Easy Installation
- Carrier Pipe Does Not Need To Be Centered Within Casing
- Can be installed on existing casing installations
- Screwdriver Is Only Tool Required for Installation
- Designed To Last for the Life of the Piping System
- Heavy Duty Stainless Steel Hose Clamps Supplied
- Self-Curing Seam - simply remove plastic backing and press together



Model "FW" Fire Resistant End Seals (For New and Existing Installations) **Energy Market**

Model "FW" Fire Resistant End Seals have been developed for applications specified as fire prone areas such as tank farms or pipes passing through fire walls. They are ordered to customer supplied specifications so they may be used for any size casing/carrier differential. These seals are excellent for eliminating the possibility of foreign material entering the opening between carrier and casing pipes.

Benefits/Features

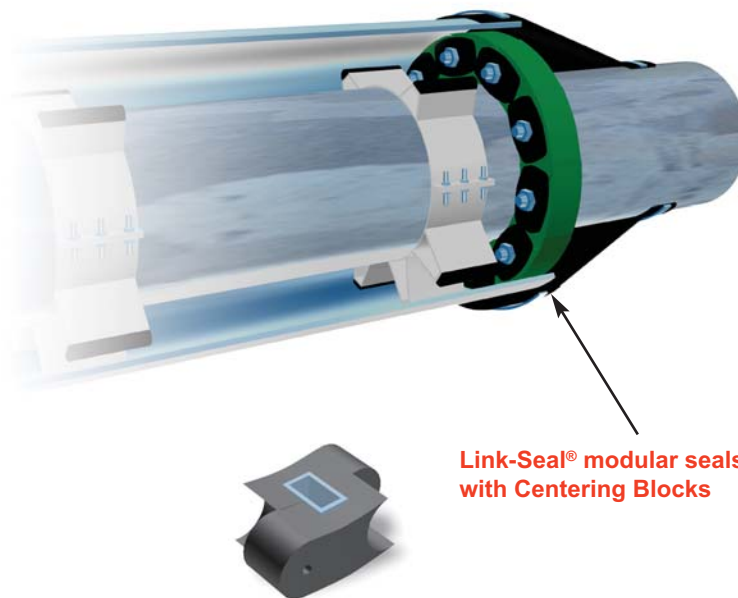
- Custom Made to Order
- Quick and Easy Installation
- Carrier Pipe Does Not Need To Be Centered Within Casing
- Screwdriver Is Only Tool Required for Installation
- Designed To Last for the Life of the Piping System
- Heavy Duty Hose Clamps Supplied



**Standard casing end seals are designed for below grade applications.
For above grade applications please contact PSI.**

Casing End Seals - Link-Seal® Modular Seals

For Double Sealing Pipeline Casing Ends when Carrier Pipe is Centered in Casing



Link-Seal® modular seals with Centering Blocks

Link-Seal® Modular Seals with Reinforced Centering Blocks.

A Link-Seal® modular seal assembly installed at each end of pipeline casings provides positive, hydrostatic protection against the entry of water, soil or other backfill materials and reduces corrosion and ice damage. If casing isolators are not used, starting with 14" diameter assemblies, we suggest Link-Seal® modular seals with "centering blocks" in 25% of the links. These centering blocks fit into molded openings in the Link-Seal® modular seals and are positioned in the lower 90° of each assembly. PSI centered casing isolators should also be placed within two feet of casing ends.

400 Series

For Casings Two Pipe Sizes Larger than Carrier Pipe

CARRIER X CASING PIPE IPS Nominal	COMPLETE CASING SEAL ASSEMBLY CONSISTS OF:			BASIC LINK-SEAL SIZE USED	COMPLETE ASSEMBLY ORDER NO
	PLAIN LINKS	LINKS WITH CENTERING BLOCKS	TOTAL LINKS		
2" X 6"	5	0	5	LS-410	26*
3" X 6"	7	0	7	LS-360	36*
4" X 8"	7	0	7	LS-475	48*
6" X 10"	10	0	10	LS-475	610*
8" X 12"	12	0	12	LS-475	812*
10" X 14"	10	0	10	LS-425	1014*
12" X 16"	12	0	12	LS-425	1216*
14" X 18"	9	4	13	LS-400	1418
16" X 20"	11	4	15	LS-400	1620
18" X 22"	13	4	17	LS-400	1822
20" X 24"	13	5	18	LS-400	2024
22" X 26"	16	5	20	LS-400	2226
24" X 28"	17	5	22	LS-400	2428
26" X 30"	17	6	23	LS-400	2630
28" X 32"	18	7	25	LS-400	2832
30" X 34"	20	7	27	LS-400	3034
32" X 36"	21	8	29	LS-400	3236
34" X 38"	22	8	30	LS-400	3438
36" X 40"	24	8	32	LS-400	3640

* = Centering Blocks are not required and not available for these models. (Maximum coating 3/16" thick - Casing pipe walls should not exceed 0.500" except for casing sizes 12", 14" and 16", which should not have a wall thickness greater than 0.312")

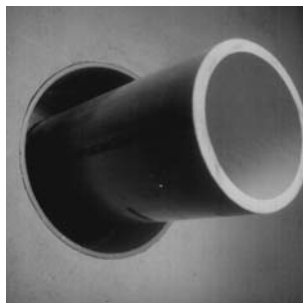
500 Series

For Casings Three Pipe Sizes Larger than Carrier Pipe

CARRIER X CASING PIPE IPS Nominal	COMPLETE CASING SEAL ASSEMBLY CONSISTS OF:			BASIC LINK-SEAL SIZE USED	COMPLETE ASSEMBLY ORDER NO.
	PLAIN LINKS	LINKS WITH CENTERING BLOCKS	TOTAL LINKS		
4" X 10"	6	0	6	LS-500	410**
6" X 12"	7	0	7	LS-500	612**
8" X 14"	11	0	11	LS-575	814**
10" X 16"	7	3	10	LS-525	1016
12" X 18"	9	3	12	LS-525	1218
14" X 20"	9	4	13	LS-500	1420
16" X 22"	11	4	15	LS-500	1622
18" X 24"	12	4	16	LS-500	1824
20" X 26"	13	5	18	LS-500	2026
22" X 28"	14	6	20	LS-500	2228
24" X 30"	15	6	21	LS-500	2430
26" X 32"	17	6	23	LS-500	2632
28" X 34"	18	6	24	LS-500	2834
30" X 36"	19	7	26	LS-500	3036
32" X 38"	21	7	28	LS-500	3238
34" X 40"	21	8	29	LS-500	3440
36" X 42"	23	8	31	LS-500	3642
42" X 48"	27	9	36	LS-500	4248
48" X 54"	30	11	41	LS-500	4854
54" X 60"	34	12	46	LS-500	5460

** = Centering Blocks are not required for these applications. (Maximum coating 3/16" thick - Casing pipe walls should not exceed 0.500" except for casing sizes 16" and 18" which should not have a wall thickness greater than 0.312")

Link-Seal® Modular Seals - Installation Techniques



1. Center the pipe, cable or conduit in wall opening or casing. Make sure the pipe will be adequately supported on both ends. Link-Seal® modular seals are not intended to support the weight of the pipe.



2. Loosen rear pressure plate with nut just enough so links move freely. Connect both ends of belt around the pipe.



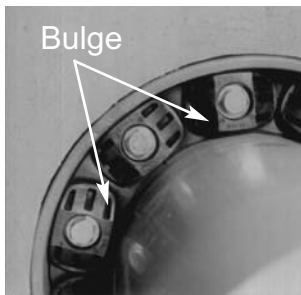
3. Check to be sure all bolt heads are facing the installer. Extra slack or sag is normal. Do not remove links if extra slack exists. **Note:** On smaller diameter pipe, links may need to be stretched.



4. Slide belt assembly into annular space. For larger size belts, start inserting Link-Seal modular seal assembly at the 6 O'Clock position and work both sides up toward the 12 O'Clock position in the annular space.



5. Using a hand socket or offset wrench **ONLY**, start at 12 O'Clock. Do not tighten any bolt more than 4 turns at a time. Continue in a clockwise manner until links have been uniformly compressed. (Approx. 2 or 3 rotations)



6. Make 2 or 3 more passes at 4 turns per bolt **MAXIMUM**, tightening all bolts clockwise until all sealing elements "bulge" around all pressure plates. On type 316 stainless steel bolts, hand tighten **ONLY** without power tool.



7. If the seal doesn't appear to be correct using the instructions provided, **Call PSI at 800-423-2410.**

Installation Notes: The Link-Seal® modular seal bolt heads are usually recessed below the wall opening or the edge of casing pipe and therefore a socket or offset wrench must be used.

Hand Tools: Use 5/16" hex or #6 screwdriver for LS-200. 1/2" hex requires 3/8" drive socket wrench. 9/16" and 3/4" hex requires 1/2" drive socket wrench. (Tools not provided.)

Always Wear Safety Equipment When Using Link-Seal® Modular Seals!

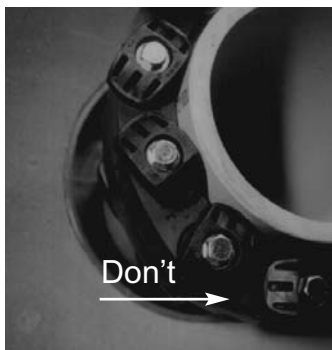
Link-Seal® Modular Seal - Do's



If the seal doesn't appear to be correct using the techniques provided, **Call PSI at 713-747-6948 or 800-423-2410.**

1. Make sure pipe is centered.
2. Install the belt with the pressure plates evenly spaced.
3. Install the exact number of links indicated in sizing charts.
4. Check to make sure pipe is supported properly during backfill operations. **Note:** Link-Seal modular seals are not intended to support the weight of the pipe.
5. Make sure seal assembly and pipe surfaces are free from dirt.
6. For tight fits, use non-polluting liquid detergent to assist with installation.

Link-Seal® Modular Seal - Don'ts



1. Don't Install the belt with the pressure plates aimed in irregular directions. (Staggered)
2. Don't Install Link-Seal® modular seals where weld-beds or other irregular surfaces exist without consideration of the sealing requirements.
3. Don't torque each bolt completely before moving on to the next.
4. Don't use high speed power tools (450 rpm or more)
5. Do not use power tools on Link-Seal modular seal 316 stainless steel bolts.
6. Don't use grease installing Link-Seal modular seals.

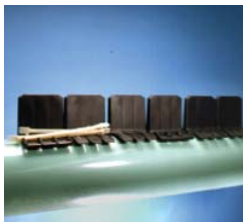
Installation Techniques

Link-Seal® Modular Seals

Ranger II® Casing Spacer Installation Techniques

Important Pre-Installation Factors:

- A) Always wear protective safety glasses, especially in low temperatures.
- B) Installation in Cold Climates: Keep Ranger II® segments and Slide-Locks in a warm environment while awaiting installation in colder climates.
- C) Installation in Warm Climates: Under hot installation conditions, allow the product to age a couple of hours at ambient temperature prior to assembly.
- D) Review Steps 1-3 on page 27.



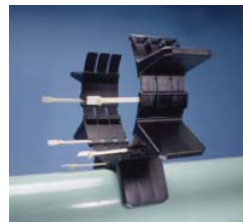
1. Size the Ranger II to make sure you have all the segments and Slide-Locks. Refer to the sizing chart on page 12.



2. Take the segments and align the buckles. Insert the buckles 1/4 of the way into the slots. This will vary after your first installation.



3. Locate the directional arrows on the segment and insert Slide-Lock until the tip exits the end of the segment.



4. Continue the process from the previous step until all segments are put together. You're now ready to wrap the Ranger II around the pipe. Note: In tight installation areas you might need to break the belt into two parts and then wrap the R- II around the pipe.



5. Align the buckles and lock into place. Take the final Slide-Lock and slide into place.

Always Use Appropriate Protective Safety Wear and Glasses!



6. Insert all Slide-Locks as far as possible by hand. Complete tightening by tapping each Slide-Lock with a hammer, while holding the Slide-Lock against the pipe.



7A. To tighten Ranger II securely to carrier pipe, back Slide-Lock completely out of the slot. If needed, push segments together by hand. **Note:** You may have to release tension by loosening other Slide-Locks.



7B. Re-insert Slide-Locks into segments or until tight by driving Slide-Lock back into position while holding the Slide-Lock against the pipe.



7C. Repeat steps 7A and 7B until Ranger II is secure against the carrier pipe and unable to move.



Note: Properly installed slide-locks will rarely be driven all the way in. To secure a tight fit drive as far as possible, but if all are driven completely, (bottomed out) it may not be tight enough. Verify Ranger II casing spacer cannot slide on carrier pipe.

Trouble Shooting Installation Procedure: Steps A-D



A) If a Slide-Lock should break during installation, remove and replace with a new Slide-Lock.



B) Remove Slide-Lock by backing it out, do not pull it through to remove broken piece. Tap broken piece back out.



C) Take a Slide-Lock and insert the opposite direction of the arrows. Push until you can grab the broken piece and remove.



D) If the Slide-Lock does not completely lock into place the following may have occurred. Two or more segments may have engaged completely. To rectify back Slide-Lock out and readjust segments by pulling them apart by hand. Re-insert Slide-Lock and adjust tightness of the spacer with another segment.

Slide-Lock will Not Insert Completely.

Installation Techniques for Metallic Casing Spacers

Installation Techniques for Metallic Casing Spacers (Models A, C and S)

Always Wear Appropriate Safety Equipment and Follow All Your Company Regulations!

In general, the actual physical insertion method is left to the expertise of the installation contractor and beyond the scope of PSI-Pipeline Seal and Insulator, Inc.

The following are suggested installation techniques and guidelines that should be taken into consideration when installing the casing spacers to the carrier pipe and handling prior to insertion.

1. It is absolutely critical that when installing the casing spacer that the spacers are lined up perfectly straight on the carrier pipe. All runners should line up straight like the sight through a gun barrel, making sure all segments of the spacer correspond to the drawing.
2. When handling the pipe it is also critical that the load is uniformly applied to all casing spacers on each joint of pipe and not just one. Furthermore, caution should be taken so they do not set the carrier pipe down with the casing spacers attached unless it is on a cut-a-way section of the casing pipe so the runners are bearing the weight uniformly.
3. The weight should be uniformly distributed to all bottom runners at one time. Better yet, until the pipe is being installed, have the contractor place sand bags or similar material under the pipe to bear the weight.

4. Metallic casing spacers are labeled **TOP** and **BOTTOM**; install accordingly.
5. The casing spacers should be uniformly tightened so that approximately $\frac{1}{2}$ " space (by design) exists at each flange of the casing spacer. The studs at each flange should be tightened uniformly which should result in a torque reading of 60 inch-pounds (5 foot-pounds)*.
6. Spacing between casing spacers is as detailed on the project or in accordance with the latest PSI literature.
7. It is desirable to restrict or minimize rotation or rifling of the carrier pipe within the casing unless the spacers are designed with equal length runners and specifically intended to allow for rotation.
8. Spacers are manufactured with requested clearance design. If weld beads are excessive (more than $\frac{1}{4}$ "), bore of casing beyond quality tolerances, bend or sags exist in the casing, these tolerances could be diminished. Call PSI @ 800-423-2410 if any of these conditions exist.

*In most installations, torque wrenches are not used. The nuts are tightened on the studs sufficiently, but not so much as to bend the flanges of the casing spacers.

Installation Techniques for Model PE, HT and AZ Casing Spacers

Steps 1-3 listed above should be followed for all PSI Casing Spacers.



1. Size the casing spacers using charts on appropriate product pages. When opening packaging, make sure you have the correct amount of segments, bolts and nuts for your application.



2. Pre-assemble segments by inserting bolts through spacer segments and hand tightening nuts. Leave one segment open so you can position the "belt of segments" around the pipe.



3. Position belt around pipe and secure all segments by tightening all bolts with standard screw driver.

Installation Techniques for PSI Casing End Seals

Installation Techniques - Model "C" & "S" End Seals (For New Installations Only)

Prior to installing the final carrier pipe section into casing, slide end seal loosely onto carrier pipe making sure large opening of end seal is facing toward casing pipe. Position end seal on carrier pipe so it will be near the casing opening **after** the insertion of the carrier pipe is complete.



1. Prepare outside surfaces by removing dirt from casing and carrier pipes.
2. After carrier pipe is completely inserted into casing and end seal is correctly positioned relative to both casing and carrier pipes, secure large end (casing end) with stainless steel hose/banding clamp. Hose/banding clamp should be positioned at least 1" (25.4cm) from the end of the casing pipe. Tighten screw with a standard screwdriver to secure end seal to casing pipe.
3. Fold end seal into an "S" shape so it will protrude into the casing. This is done to relieve stress during backfilling and allow for expansion and contraction both during and after installation is complete. The small end of the end seal will slide toward the casing as the "S" is constructed.
4. Position banding clamp approximately 1" from the small end of the end seal (on the carrier pipe) and tighten with a standard screwdriver to secure end seal to carrier pipe.

Installation Techniques - Model "R" End Seals (For New Installations Only)

Cut the seals at the closed end of the end seal to the measured external diameter of the carrier pipe. (Note: The printed sizes are marked or embossed on each end seal.) Prior to installing the final carrier pipe section into casing, slide end seal loosely onto carrier pipe making sure large opening of end seal is facing toward casing pipe. Position end seal on carrier pipe so it will be near the casing opening **after** the insertion of the carrier pipe is complete.

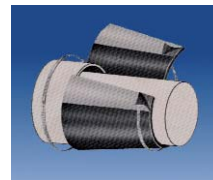


Prepare outside surfaces by removing dirt from casing and carrier pipe.

Follow steps 1 through 4 as shown for Model "C" and "S" End Seals.

Installation Techniques - Model "W" End Seals (For New or Retrofit Applications)

1. Prepare outside surfaces by removing dirt from casing and carrier pipe.
2. Wrap end seal around both carrier and casing pipes, making sure the widest portion of the end seal is wrapped around the casing pipe.
3. Overlap the edges of the end seal with the release papers facing each other.
4. Remove release papers and firmly press together along the entire edge of the sealing area. Repeat the pressing process to make sure seam is tight.
5. Secure large end (casing end) with stainless steel hose/banding clamp. Hose/banding clamp should be positioned at least 1" (25.4cm) from the end of the casing pipe. Tighten screw with a standard screwdriver to secure end seal to casing pipe.
6. Fold end seal into an "S" shape so it will protrude into the casing. This is done to relieve stress during backfilling and allow for expansion and contraction both during and after installation is complete. The small end of the end seal will slide toward the casing as the "S" is constructed.
7. Position banding clamp approximately 1" from the small end of the end seal (on the carrier pipe) and tighten with a standard screwdriver to secure end seal to carrier pipe.



Installation Techniques - Model "FW" End Seals (For New or Retrofit Applications)

Please contact PSI for Model "FW" installation techniques.



Typical Specification - Non-Metallic for Energy Market

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Model PE Non-Metallic Casing Spacers/Isolators

1. Energy Market
2. Nominal Pipe
3. Suggested Max. Casing Length = 1,000 ft.
4. Max. Carrier Pipe O.D. = 48.0" Ø
5. Position Within Casing = Standard

Casing spacers/isolators shall be PSI Model PE molded from high density virgin polyethylene plastic in two segments for applications on carrier pipe diameters of 12" and under. Model PE isolator/spacers will be provided in multiple segments for applications on carrier pipe diameters of over 12". Each spacer segment shall be a solid, non-welded molded piece designed for accommodating a specific size carrier pipe O.D.

The casing spacers shall be the PSI Model PE as manufactured by PSI - Pipeline Seal and Insulator, Inc., Houston, Texas or engineered approved equal. Alternate considerations shall be submitted to Engineer 10 days prior to bid opening.

Considerations

The above specification is considered sufficient for most nominal pipe sizes and types up to 36-inches and casing lengths up to 1,000 feet. For larger size pipes, exact pipe O.D.'s, longer or unusual casings, consider Metallic Casing spacers/isolators or please contact Pipeline Seal and Insulator, Inc.

End Seal Specification for Application

After insertion of the carrier pipe in the casing, the ends of the casing shall be closed by installing a PSI Model "C", Model "S", Model R or Model "FW" casing end seal as manufactured by Pipeline Seal and Insulator, Inc., Houston, TX.

Quality Assurance

Each casing spacer and end seal shall be manufactured at a facility that has a Registered ISO 9001:2008 Quality Management System. A copy of the current ISO 9001:2008 registration shall be provided with material submittal.

Model HT Non-Metallic Casing Spacers/Isolators

1. Energy Market (Hi Temp)
2. Nominal Pipe
3. Suggested Max. Casing Length = 1,000 ft.
4. Max. Carrier Pipe O.D. = 48.0" Ø
5. Position Within Casing = Standard

Casing spacers/isolators for applications that may reach 280° F shall be PSI Model HT molded from virgin polycarbonate in two segments for applications on carrier pipe diameters of 12" and under. Each spacer segment shall be a solid, non-welded molded piece designed for accommodating a specific size carrier pipe O.D.

The casing spacers shall be the PSI Model HT as manufactured by PSI - Pipeline Seal and Insulator, Inc., Houston, Texas or engineered approved equal. Alternate considerations shall be submitted to Engineer 10 days prior to bid opening.

Considerations

The above specification is considered sufficient for most nominal pipe sizes and types up to 12 inches and casing lengths up to 1,000 feet. For larger size pipes, exact pipe O.D.'s, longer or unusual casings, consider Metallic Casing spacers/isolators with T.P.E liners or please contact Pipeline Seal and Insulator, Inc.

End Seal Specification for Application

After insertion of the carrier pipe in the casing, the ends of the casing shall be closed by installing a PSI Model "C", Model "S", Model R or Model "FW" casing end seal as manufactured by Pipeline Seal and Insulator, Inc., Houston, TX.

Quality Assurance

Each casing spacer and end seal shall be manufactured at a facility that has a Registered ISO 9001:2008 Quality Management System. A copy of the current ISO 9001:2008 registration shall be provided with material submittal.

Typical Specification - Non-Metallic for Water Market

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Model Ranger II® Non-Metallic Casing Spacers

1. Water Market
2. Nominal Pipe
3. Suggested Max. Casing Length = 400 ft.
4. Max. Carrier Pipe O.D. = 37.60" Ø
5. Position Within Casing = Standard, Centered, Centered/Restrained

A. Casing Spacers

Upon completion of the installation of the steel pipe encasement, the contractor shall furnish and install a Ranger II® boltless casing spacer on the carrier pipe as described below.

Casing spacers shall be spaced a maximum of eight (8) feet apart along the length of the carrier pipe with one casing spacer within two (2) feet of each side of a pipe joint and the rest evenly spaced. Wood skids are not an acceptable method of supporting the carrier pipe.

1. Casing spacers shall be all non-metallic virgin (polypropylene), molded in segments for field assembly without any special tools. Spacer segments shall be secured around carrier pipe by insertion of a Slide-Lock. The casing spacer polymer shall contain ultraviolet inhibitors and shall have a minimum compressive strength of 3,000 psi, an 800 Volts/mil dielectric strength and impact strength of 1.5 ft-lbs./inch. Each casing spacer shall have full length, integrally molded skids extending beyond the bell or mechanical joint of the carrier pipe.
2. The casing spacers shall be the PSI Ranger II® Casing Spacers as manufactured by Pipeline Seal and Insulator, Inc., Houston, Texas or engineered approved equal.

Alternate considerations shall be submitted to Engineer 10 days prior to bid opening

3. Spacers shall be at least as wide as listed below.

Carrier Pipe Diameter Inches (mm)	Ranger II Model	Width In. (mm)
0.83 to 3.07" (21 to 78)	Micro	2.13" (54)
2.48 to 5.51" (63 to 140)	Mini	3.15" (80)
5.51 to 16.65" (140 to 423)	Midi	5.12" (130)
16.77 to 25.98" (426 to 660)	Medi	6.87" (174)
25.98 to 37.60" (660 to 955)	Maxi	8.86" (225)

B. End Seals

After insertion of the carrier pipe into the casing, the ends of the casing shall be closed by installing 1/8" thick synthetic rubber end seals equal to the PSI Model "C" or Model "R" end seal as manufactured by Pipeline Seal and Insulator, Inc., Houston, Texas.

Considerations

The above specification is considered sufficient for most pipe sizes and types up to 36-inches and casing lengths up to 400 feet. For larger size pipes, heavy pipe types, and longer or unusual casings, use metallic casing spacers or please contact Pipeline Seal and Insulator, Inc.

Quality Assurance

Each casing spacer and end seal shall be manufactured at a facility that has a Registered ISO 9001:2008 Quality Management System. Copy of current ISO 9001:2008 Registration shall be provided with material submittal.

Typical Specification - Metallic for Energy/Water Markets

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Metallic Casing Spacers

1. Energy/Water Markets

2. Nominal Pipe

3. Suggested Max. Casing Length = 5,000 ft.

4. Suggested Max. Carrier Pipe O.D. = 120.0" Ø

5. Position Within Casing = Standard, Centered, Centered/Restrained, Non-centered/Restrained and More

6. Model C Metallic Casing Spacers/Isolators

Factory made casing spacers/isolators of the following description shall be installed on any carrier pipe passing through a pipe casing. They are designed to protect the carrier pipe corrosion coating and electrically isolate the carrier pipe from the casing.

Casing spacers/isolators shall be PSI Model C8GN-2 for carrier pipes up to 24-inch diameters and Model C12GN2 for larger pipe sizes as manufactured by Pipeline Seal and Insulator, Inc., Houston, TX. Casing spacers/isolators shall have a minimum 14 gauge steel band and where required, 10 gauge risers. The band, risers and connecting studs shall be welded and cleaned at the factory before the application of a heat fused fluidized bed fusion bonded PVC powder coating of between 10-16 mils thickness. The PVC coating shall provide good resistance to acids and alkalis and excellent resistance under ASTM B117 salt spray tests.

The spacers/isolators shall have a flexible PVC inner liner of 0.09 inch thickness with a durometer "A" 85-90 hardness and a minimum 58,000 volt dielectric strength. The runners shall be high pressure molded glass reinforced nylon with a minimum compressive strength of 18,000 psi per ASTM D638. The runners shall be 2.0 inch in width and a minimum of 7.0 inches long for C8GN2 models and 11" for C12GN2 models (polyethylene runners are not an acceptable alternative). The runners shall be attached to the band or riser by 3/8" welded steel studs and lock nuts which shall be recessed far below the wearing surface on the runner. The recess shall be filled with a corrosion inhibiting filler. The band section shall be

bolted together with cadmium plated threaded studs, nuts and washers.

The casing spacers shall be PSI Model C Metallic Casing Spacers as manufactured by Pipeline Seal and Insulator, Inc., Houston, Texas or engineered approved equal. Alternate considerations shall be submitted to Engineer 10 days prior to bid opening.

Considerations

The above specification is considered sufficient for most pipe sizes and types up to 36-inches and casing lengths up to 1,000 feet. For larger size pipes or longer or unusual casings, please contact Pipeline Seal and Insulator, Inc. Heavy Gauge Steel Bands and Steel Risers may be required.

End Seal Specification

After insertion of the carrier pipe in the casing, the ends of the casing shall be closed by installing a PSI Model "C", Model "S", Model "W" or Model "R" casing end seal as manufactured by Pipeline Seal and Insulator, Inc., Houston, TX.

Energy Market Note: For Tank Farm Applications and Fire Resistant applications, specify Model "FW" casing end seal as manufactured by Pipeline Seal and Insulator, Inc., Houston, TX.

Link-Seal® End Seal Specification (Carrier Pipe Must Be Centered Within Casing)

After insertion of the carrier pipe in the casing, the ends of the casing shall be closed by installing the Link-Seal® end seals and 1/8" thick synthetic rubber end seals equal to the PSI Model "C" or Model "W" end seal. Both as manufactured by Pipeline Seal and Insulator, Inc., Houston, TX.

Quality Assurance

Each spacer/isolator and end seal shall be manufactured at a facility that has a Registered ISO 9001:2008 Quality Management System. Copy of current ISO 9001:2008 registration shall be provided with material submittal.

Typical Specification Metallic Casing Spacers for the Energy/Water Markets

Specification 60" Ø & Up - Metallic for Water Market

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Metallic Casing Spacers

1. **Water Market - Large Diameter, 60" Ø +**
2. **Nominal Pipe**
3. **Suggested Max. Casing Length = 1,000 ft.**
4. **Suggested Max. Carrier Pipe O.D. = 84.0" Ø**
5. **Position Within Casing = Standard, Centered, Centered/Restrained, Non-centered/Restrained and More**
6. **Model C Metallic Casing Spacers/Isolators**

Factory made casing spacers/isolators of the following description shall be installed on any carrier pipe passing through a pipe casing. They are designed to protect the carrier pipe corrosion coating and electrically isolate the carrier pipe from the casing.

Casing spacers/isolators shall be PSI Model C12GN2 for carrier pipes 60-inch diameters and up as manufactured by Pipeline Seal and Insulator, Inc., Houston, TX. Casing spacers/isolators shall have a minimum 12 gauge steel band and where required, 7 gauge risers. The band, risers and connecting studs shall be welded and cleaned at the factory before the application of a heat fused fluidized bed fusion bonded PVC powder coating of between 10-16 mils thickness. The PVC coating shall provide good resistance to acids and alkalies and excellent resistance under ASTM B117 salt spray tests.

The spacers/isolators shall have a flexible PVC inner liner of 0.09 inch thickness with a durometer "A" 85-90 hardness and a minimum 58,000 volt dielectric strength. The runners shall be high pressure molded glass reinforced nylon with a minimum compressive strength of 18,000 psi per ASTM D638. The runners shall be 2.0 inch in width and a minimum 11" long for C12GN2 models (polyethylene runners are not an acceptable alternative). The runners shall be attached to the band or riser by 3/8" welded steel studs and lock nuts which shall be recessed far below the wearing surface on the runner. The recess shall be filled with a corrosion inhibiting filler. The band section shall be bolted together with cadmium plated threaded studs, nuts and washers.

The casing spacers shall be PSI Model C Metallic Casing Spacers as manufactured by Pipeline Seal and Insulator, Inc., Houston, Texas or engineered approved equal. Alternate considerations shall be submitted to Engineer 10 days prior to bid opening

Considerations

The above specification is considered sufficient for most pipe sizes and types 60 to 84-inches and casing lengths up to 300 feet. For lengths 300 to 1,000 feet, a symmetrical runner design should be considered. For larger size pipes or longer or unusual casings, please contact Pipeline Seal and Insulator, Inc.

End Seal Specification

After insertion of the carrier pipe in the casing, the ends of the casing shall be closed by installing a PSI Model "C" or Model "W" casing end seal as manufactured by Pipeline Seal and Insulator, Inc., Houston, TX.

Link-Seal® End Seal Specification (Carrier Pipe Must Be Centered Within Casing)

After insertion of the carrier pipe in the casing, the ends of the casing shall be closed by installing the Link-Seal® end seals and 1/8" thick synthetic rubber end seals equal to the PSI Model "C" or Model "W" end seal. Both as manufactured by Pipeline Seal and Insulator, Inc., Houston, TX.

Quality Assurance

Each spacer/isolator and end seal shall be manufactured at a facility that has a Registered ISO 9001:2008 Quality Management System. Copy of current ISO 9001:2008 registration shall be provided with material submittal.

Specification Wax Filled Casing - Metallic for Energy Market

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Metallic Casing Spacers

1. Energy Market - Wax Filled Casings
2. Nominal Pipe
3. Suggested Max. Casing Length = 1,000 ft.
4. Suggested Max. Carrier Pipe O.D. = 48" Ø
5. Position Within Casing = Centered/Restrained
6. Model C Metallic Casing Spacers/Isolators

Factory made casing spacers/isolators of the following description shall be installed on any carrier pipe passing through a pipe casing. They are designed to protect the carrier pipe corrosion coating and electrically isolate the carrier pipe from the casing.

Casing spacers/isolators shall be PSI Model C12GN2 for all diameter carrier pipes as manufactured by Pipeline Seal and Insulator, Inc., Houston, TX. Casing spacers/isolators shall have a minimum 14 gauge steel band and where required, 10 gauge risers. The band, risers and connecting studs shall be welded and cleaned at the factory before the application of a heat fused fluidized bed fusion bonded PVC powder coating of between 10-16 mils thickness. The PVC coating shall provide good resistance to acids and alkalis and excellent resistance under ASTM B117 salt spray tests.

The spacers/isolators shall have a flexible T.P.E Hi-Temp inner liner of 0.118" inch thickness, a durometer "A" 73 hardness, a temperature range of -50 to 270° F and a minimum 58,000 volt dielectric strength. The runners shall be high pressure molded glass reinforced nylon with a minimum compressive strength of 18,000 psi per ASTM D638. The runners shall be 2.0 inch in width and a minimum of 11" long for C12GN2 models (polyethylene runners are not an acceptable alternative). The runners shall be attached to the band or riser by 3/8" welded steel studs and lock nuts which shall be recessed far below the wearing surface on the runner. The recess shall be filled with a corrosion inhibiting filler. The band section shall be bolted together with cadmium plated threaded studs, nuts and washers.

The casing spacers shall be PSI Model C Metallic Casing Spacers as manufactured by Pipeline Seal and Insulator, Inc., Houston, Texas or engineered approved equal. Alternate considerations shall be submitted to Engineer 10 days prior to bid opening.

Considerations

The above specification is considered sufficient for most pipe sizes and types up to 48-inches and casing lengths up to 1,000 feet. Casing Spacer Runner Configuration should be symmetrical - Near C/R position for the *body* and the Runner Configuration for the *ends* of the casing should be a 2 Top/4 Bottom - C/R for use with Link-Seal® modular seals; 2 casing spacers on each end of the casing are needed for a total of 4. (Consult PSI for spacing.) For larger size pipes or longer or unusual casings, please contact Pipeline Seal and Insulator, Inc.

End Seal Specification

After insertion of the carrier pipe in the casing, the ends of the casing shall be closed by installing PSI Link-Seal® modular seals (Model C) and Model "W" EPDM casing end seal as manufactured by Pipeline Seal and Insulator, Inc., Houston, TX. or engineered approved equal. Alternate considerations shall be submitted to Engineer 10 days prior to bid opening. *Wax Note:* Both end seal types must be installed, wax can reach temperatures of 250° F during filling process.

Quality Assurance

Each spacer/isolator and end seal shall be manufactured at a facility that has a Registered ISO 9001:2008 Quality Management System. Copy of current ISO 9001:2008 registration shall be provided with material submittal.

Specification - Wax Filled Casing Metallic Casing Spacers for the Energy Market

Casing Spacer Field Terminology

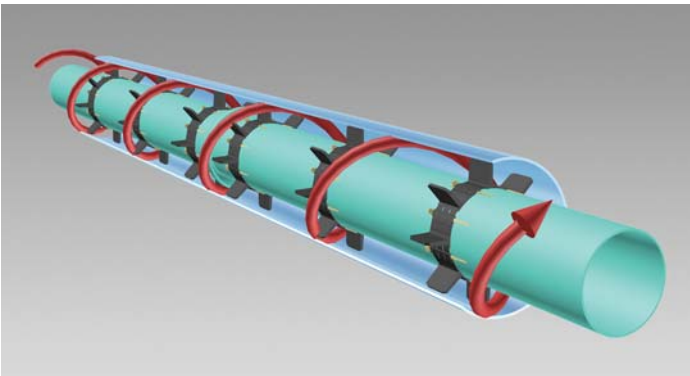
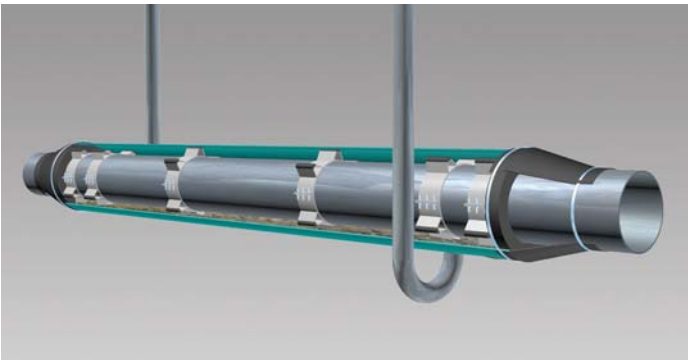
Casing Fill – Casing fill materials may include sand, gravel, cement or wax. Under normal circumstances Model A Painted Spacers are provide excellent support and durability for these applications, therefore it is not necessary to use stainless steel casing spacers for filled applications. Casing fill material encapsulates the spacers and carrier pipe, supports both, and provides an additional non-conductive barrier between casing and carrier pipes. For wax filling application, please specify the TPE Liner and use Link-Seal® Modular Seals in combination with Model W end seals.

Rifling – Rifling occurs when the carrier pipe rotates or turns, as much as 360-degrees, inside the casing as the push or pull progresses. Casing spacers with a symmetrical design are used to allow for rotation. Runner/Riser configurations are made to equal heights and uniform position to allow for uniform loading and equal carrier pipe support to accommodate rifling. The chance your carrier pipe will rifle during the push or pull will depend on a number of factors. Best engineering practice is to order casing spacers with a symmetrical runner configuration to accommodate the possibility of rifling in the first place.

Condition of Casing – It’s important to determine the condition of the inside surface of the casing pipe prior to installation. Rough, corroded and/or uneven surfaces - “high and low” weld beads and other anomalies on the interior pipe surface can drastically reduce the effectiveness of any casing spacer. PSI metallic casing spacers are suggested, when surface conditions are marginal, because runners on metallic casing spacers are much more resistant to abrasion then runners on plastic spacers. If you are unsure of the casing condition, pipe inspection services using cameras to analyze the interior of a pipe may be used or you may also simply pull a 20 ft section of pipe through the casing as a test or field trial .

7-Gauge vs. 10-Gauge Riser Material – An increase in applications requiring heavier, larger diameter pipes has initiated the need for more robust casing spacers. To meet this need, PSI offers 7-gauge riser material as a substitute for 10-gauge risers. 7-gauge risers provide additional strength and stability when supporting large diameter Steel ML&C (Mortar Lined and Coated) or Concrete pipe that may be carrying heavier, higher density fluids.

Wood Skids vs. Casing Spacers - Wood skids are a poor substitute for casing spacers. A casing spacer is an engineered product that has been used for decades to ease carrier pipe insertion, protect both casing and carrier pipes and maintain physical and electrical separation to preserve the corrosion mitigation (protection) program designed for the piping system.

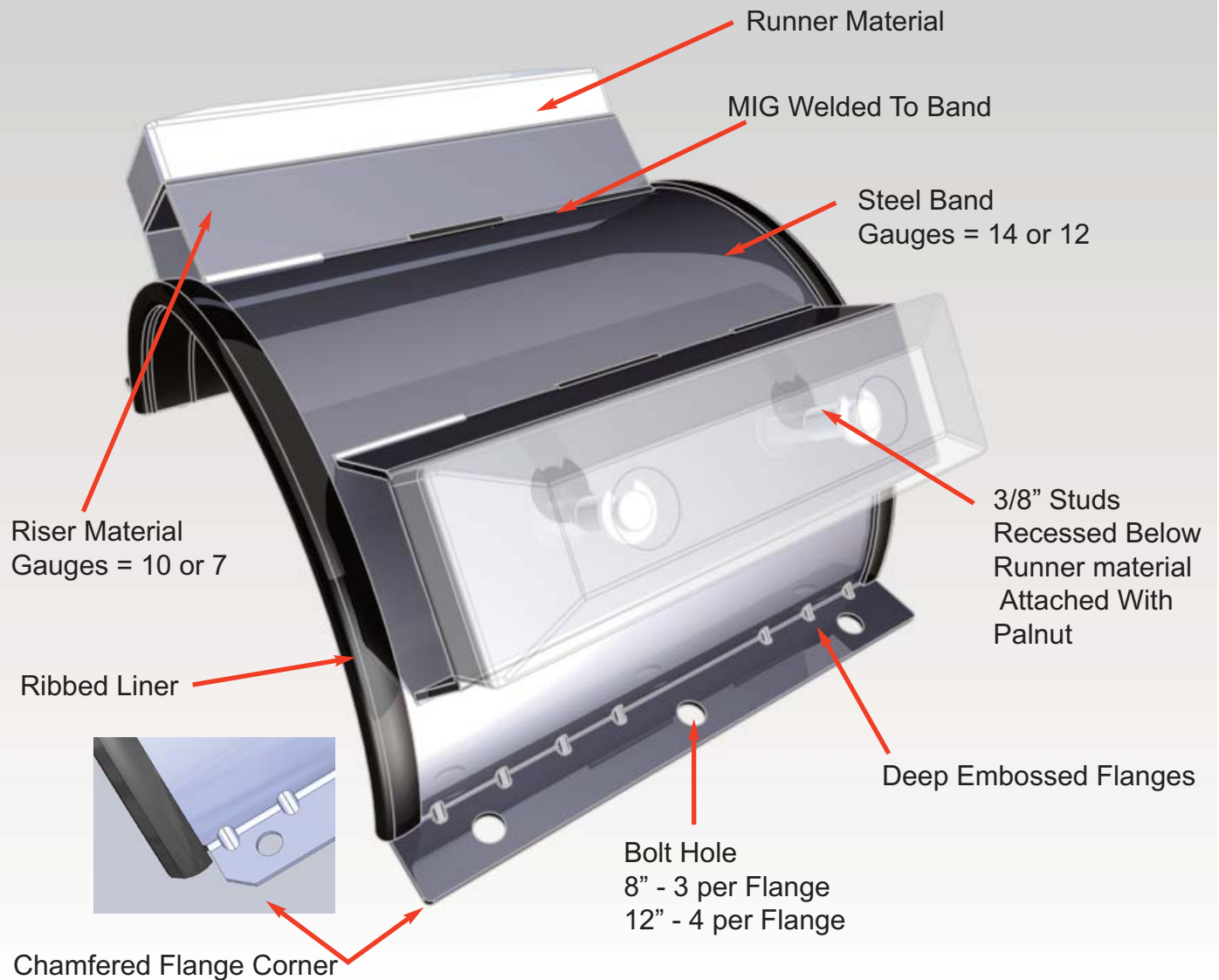


Wood Lagging Corrosion Issue: Wood should not be used in a cased crossing. It has the potential to accelerate corrosion concerns. When dry, wood has good dielectric resistance. When wet (as is likely in a buried casing) it has a dielectric resistance than can be magnitudes lower; allowing corrosion on metallic (Steel, D.I) carrier pipes. This presents concerns if wood were used in a casing to isolate or support the carrier pipe within the casing. Furthermore, when wood rots, the bacteria will attack metallic pipe in form of Microbiologically Influenced Corrosion.

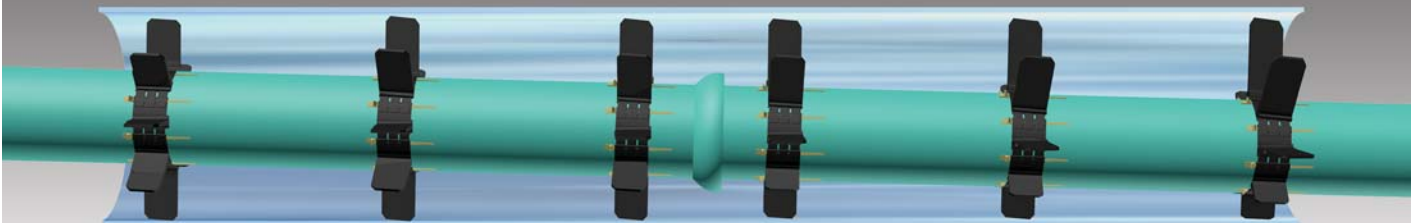
A comparison...PSI casing spacers versus banded wood skids		
PSI Casing Spacer		Banded Wood Skids
Low Labor Cost - Installed By One Person		Labor Intensive, High Labor Costs
Easily Secured In Place		Easily Dislodged
Quick Installation		Hard to Field Construct
Supports Pipe and Protects Coating		Rots and Allows Settlement
Assured Electrical Insulation		Non-Insulating - Allows Corrosion
Resists Weight of Pipe and Product		Uneven Load on Pipe
Long Term Corrosion Protection		Allows Bacteria & Differential Oxygen Concentration Corrosion
Eliminates Grout, Blown Sand or Pea Gravel		Requires Annulus Space Filler
Engineered for the Project		At Discretion of Job Site Laborer

Casing Spacer Field Terminology

Make-Up of an 8" - 12" Metallic Casing Spacer



Using Casing Spacers for Gravity Feed Pipe or to Adjust for Grade



Both metallic and non-metallic casing spacers may be used to create a sloped carrier pipe (i.e. gravity feed sewer pipe) within a level casing or to compensate for a non-level casing pipe by using spacers with varying height runners to level the carrier pipe.

Please contact PSI for more information on how to order casing spacers for these types of applications.

Casing - Steel Pipe Reference Schedules

The following wall thickness chart has been provided to help size C/R casing spacers in steel pipe sleeves of various wall thicknesses. To determine the Inside Diameter (I.D.) of the proposed steel wall sleeve subtract **2 times** the selected Wall Thickness (W.T.) from the actual Outside Diameter (O.D.) of the pipe.

Example: Find the I.D. for a 24" (INCH) Schedule 40 Pipe.

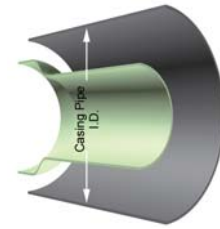
Use Chart Below:

O.D. of a 24" Schedule 40 Pipe = **24.00" (INCHES)**

Wall Thickness of 5" Schedule 40 Pipe = **.688"**

Wall Thickness multiplied by 2 (.688 x 2) = **1.376"**

I.D. of 24" Schedule 40 Pipe (24.00 - 1.376) = **"22.624**



Non Bold = Wall Thickness (Inches) **STD = Standard**

E.H. = Extra Heavy

Pipe Size	O.D. Inches	SCHEDULE					STD	SCHEDULE		E.H.	SCHEDULE				DBLE. E.H.
		5	10	20	30	40		60	80		100	120	140	160	
4"	4.500	.083	.120	--	--	.237	.237	.281	.337	.337	--	.438	--	.531	.674
4 1/2"	5.000	--	--	--	--	.247	.247	--	.355	.355	--	--	--	--	.710
5"	5.563	.109	.134	--	--	.258	.258	--	.375	.375	--	.500	--	.625	.750
6"	6.625	.109	.134	--	--	.280	.280	--	.432	.432	--	.562	--	.719	.864
7"	7.625	--	--	--	--	--	.301	--	--	.500	--	--	--	--	.875
8"	8.625	.109	.148	.250	.277	.322	.322	.406	.500	.500	.594	.719	.812	.906	.875
9"	9.625	--	--	--	--	--	.342	--	--	.500	--	--	--	--	--
10"	10.750	.134	.165	.250	.307	.365	.365	.500	.594	.500	.719	.844	1.000	1.125	1.000
11"	11.750	--	--	--	--	--	.375	--	--	.500	--	--	--	--	--
12"	12.750	.165	.180	.250	.330	.406	.375	.562	.688	.500	.844	1.000	1.125	1.312	1.000
14"	14.000	--	.250	.312	.375	.438	.375	.594	.750	.500	.938	1.094	1.250	1.406	--
16"	16.000	--	.250	.312	.375	.500	.375	.656	.844	.500	1.031	1.219	1.438	1.594	--
18"	18.000	--	.250	.312	.438	.562	.375	.750	.938	.500	1.156	1.375	1.562	1.781	--
20"	20.000	--	.250	.375	.500	.594	.375	.812	1.031	.500	1.281	1.500	1.750	1.969	--
22"	22.000	--	.250	.375	.500	--	.375	.875	1.125	.500	1.375	1.625	1.875	2.125	--
24"	24.000	--	.250	.375	.562	.688	.375	.969	1.219	.500	1.531	1.812	2.062	2.344	--
26"	26.000	--	.312	.500	--	--	.375	--	--	.500	--	--	--	--	--
28"	28.000	--	.312	.500	.625	--	.375	--	--	.500	--	--	--	--	--
30"	30.000	--	.312	.500	.625	--	.375	--	--	.500	--	--	--	--	--
32"	32.000	--	.312	.500	.625	.688	.375	--	--	.500	--	--	--	--	--
34"	34.000	--	.312	.500	.625	.688	.375	--	--	.500	--	--	--	--	--
36"	36.000	--	.312	.500	.625	.750	.375	--	--	.500	--	--	--	--	--
38"	38.000	--	--	--	--	--	.375	--	--	.500	--	--	--	--	--
40"	40.000	--	--	--	--	--	.375	--	--	.500	--	--	--	--	--
42"	42.000	--	--	--	--	--	.375	--	--	.500	--	--	--	--	--
48"	48.000	--	--	--	--	--	.375	--	--	.500	--	--	--	--	--
54"	54.000	--	--	--	--	--	.375	--	--	.500	--	--	--	--	--
60"	60.000	--	--	--	--	--	.375	--	--	.500	--	--	--	--	--

Disclaimer Note: The above steel pipe O.D.'s are generic, Pipeline Seal and Insulator, Inc. is not a pipe manufacturer. Please always refer to the pipe manufacturer's published/actual values.

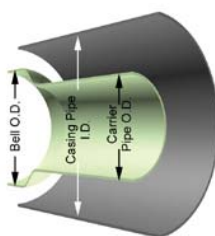
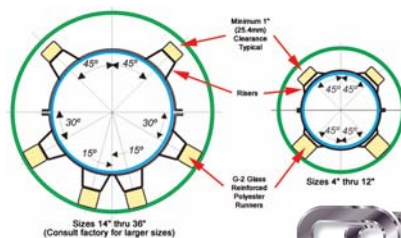
Wall Thickness Note: It's suggested casings be installed with standard (STD) wall thickness.

PSI Casing Spacer RFQ Worksheet

Contact Name: Date:
 Company: Telephone:

Project Information

Project Name:
 Location:
 City/State/Zip:
 Engineer:
 Bid Date:
 Award Date:



Pipeline Seal and Insulator, Inc.
 6525 Goforth Street, Houston, TX 77021
 Tel: 713-747-6948 • Fax: 713-747-6029
 Toll Free: 800-423-2410
 www.pipeline Seal.com

Attn:

Metallic Casing Spacers/Isolators

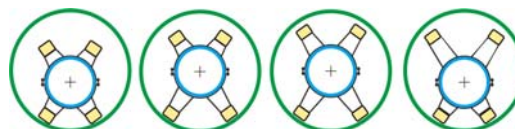
* = G-1 Runners available on painted models only.

Quantity or Length of Run	Number of Insertions	Spacer Type	Band Width	Runner Width*	Actual Carrier Pipe O.D.	Actual Casing Pipe I.D.	Actual Bell or Joint O.D.	Position in Casing	Price
<input type="text"/> Qty <input type="text"/> Length	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
<input type="text"/> Qty <input type="text"/> Length	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
<input type="text"/> Qty <input type="text"/> Length	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
<input type="text"/> Qty <input type="text"/> Length	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

End Seals

Filled Casing?

Comments:



S

C

CR

NCR

NOTE: "S" position = clear bell only if applicable.

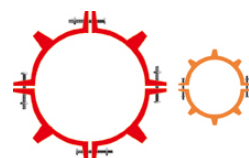
Non-metallic Casing Spacers/Isolators

Quantity or Length of Run	Number of Insertions	Spacer Type	Actual Carrier Pipe O.D.	Actual Casing Pipe I.D.	Actual Bell or Joint O.D.	Position in Casing	Price
<input type="text"/> Qty <input type="text"/> Length	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
<input type="text"/> Qty <input type="text"/> Length	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
<input type="text"/> Qty <input type="text"/> Length	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
<input type="text"/> Qty <input type="text"/> Length	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

End Seals

Filled Casing?

Comments:



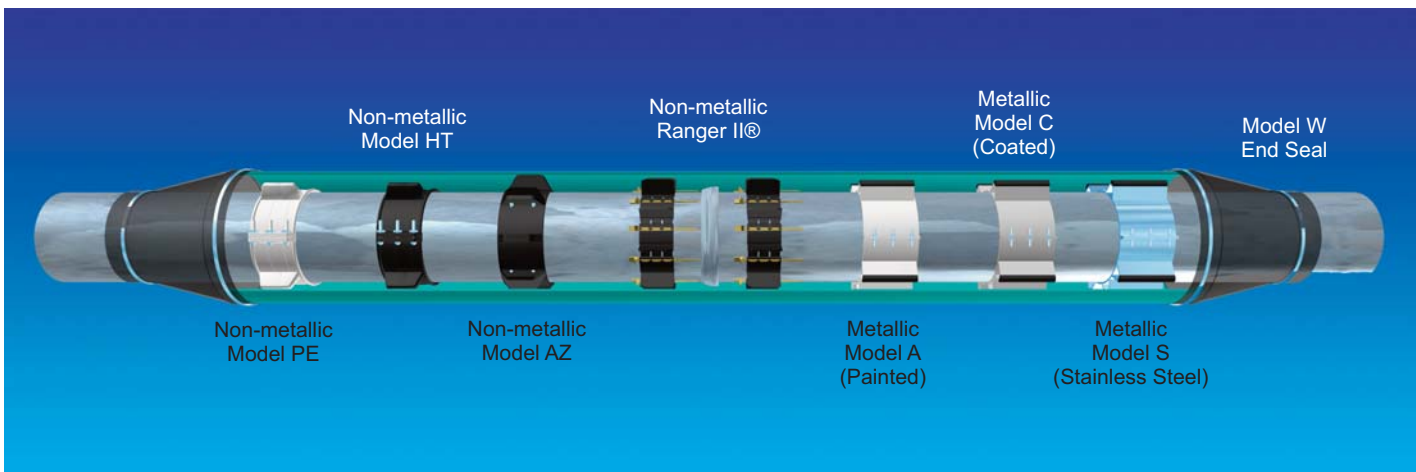
Multiple Segment 2-Piece
Model PE



CR

Standard To
Clear Bell

Ranger II® Spacers



Warranty and Conditions of Sale

The seller warrants that all goods furnished under this order will be free from defects in material and workmanship and will conform to Pipeline Seal & Insulator, Inc. published specifications.

The limit of Pipeline Seal & Insulator, Inc.'s liability for failure of any of our products to meet the foregoing warranty, or for breach of any other warranty, express, implied or statutory, shall be to supply an equivalent amount of product for any materials returned to us within 12 months of shipment and found to be defective by Pipeline Seal & Insulator, Inc.

Due to the widely varying conditions under which our products are used or installed, Pipeline Seal & Insulator, Inc. offers no warranty as to their merchantability, length of service or suitability for any particular purpose, express or implied, other than described above.

The Purchaser accepts full responsibility for installation of all goods furnished under this order and for any defects or damage suffered as a result of defective installation of such goods. No instructions, advice, or aid relative to installation given by the Seller to the Purchaser shall be construed as a warranty as to the accuracy or utility of such instructions, advice, or aid, but only as an accommodation to the Purchaser and an opinion of the Seller.

The foregoing conditions of sale shall not be modified or affected in any way whatsoever by reason of Seller's receipt or acknowledgement of Buyer's purchase order or any other related instrument of paper containing additional or different conditions and, to the extent there may be any terms or provisions in such a purchase order, etc. which may be in conflict with or modification of the foregoing, such terms and provisions of such purchase order, etc. shall be deemed to have no force or effect.



Certificate No. 10125

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