

# Norriseal Series 7100

## Flow-Lift® piston check valve

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The Norriseal series 7100 piston check valve is designed for the prevention of backflow in gas, air or liquid systems. Norriseal's expertise in the design of piston balanced control valves has introduced new concepts to the piston check valve industry.

The piston check valve, with its award-winning design, has been installed in critical services around the world.

### Working pressures

- ANSI Class 150 thru 2,500

### Applications

- Air and gas compressor service
- Gas or liquid pipe lines
- Oil and gas production leases
- Pulsating flows
- Safety systems

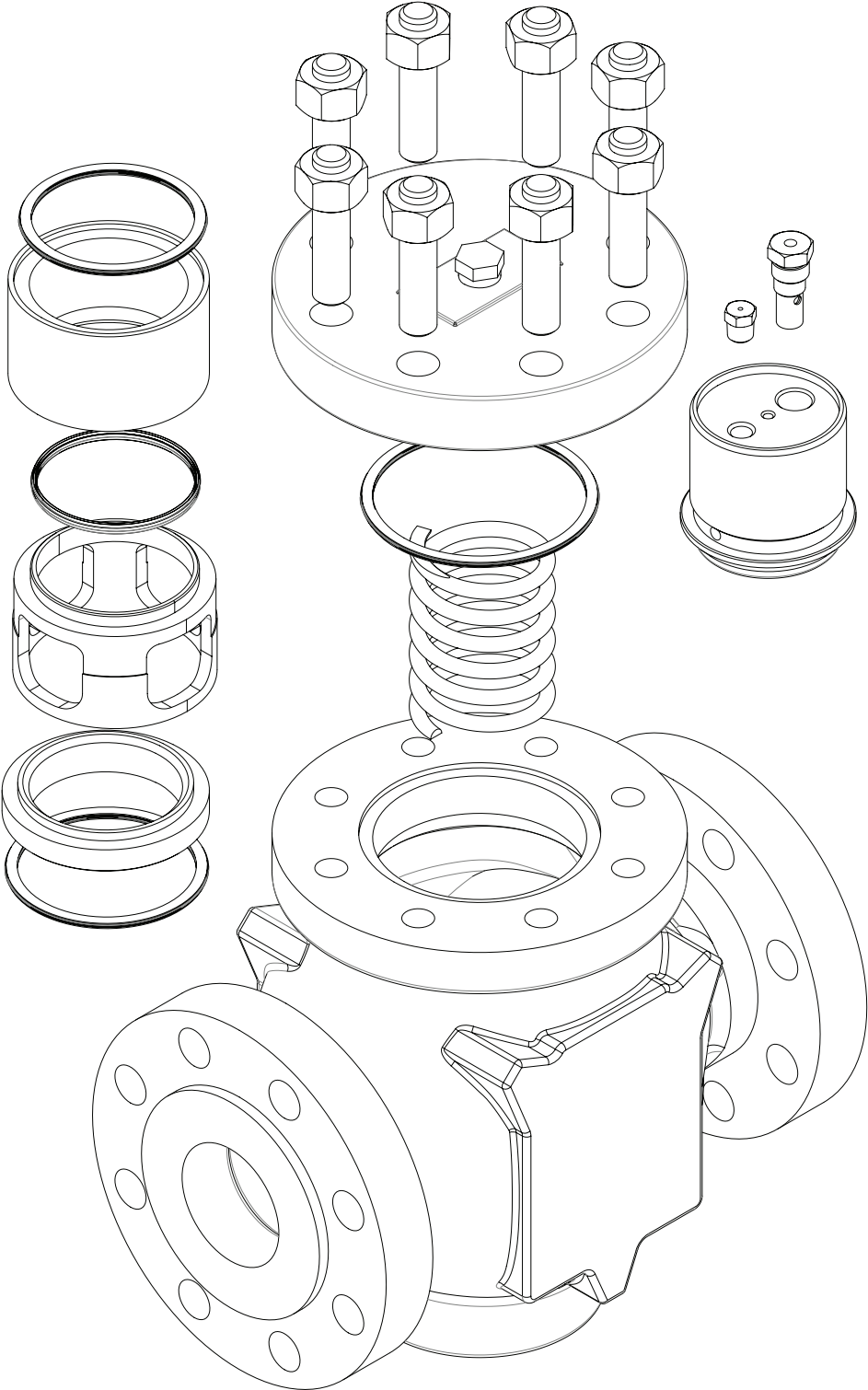
### Features

- No-slam closing
- No special tool required to change seat
- Low pressure drop
- High Cv values
- Smooth opening
- Special trims for abrasive and corrosive services
- Built-in lifting device for piston removal and inspection
- PTFE self lubricating piston seal
- Low maintenance costs
- Temperature ranges:
  - -20°F to 400°F (carbon steel body/bonnet)
  - -100°F to 400°F (stainless steel body/ bonnet)



# Valve assembly

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# Operation & installation

## Operation

Normal. Flow is directed under the valve piston and lifts it upward. When flow is stopped, the piston descends, closing the valve to prevent flow reversal.

Stabilized/non-slam piston. Pulsating flow through the valve, if unrestricted, would cause the piston to follow the rapidly cycling line pressure, resulting in vibration, chattering and possibly slamming of the piston. The ball check and orifice plug built into the piston are to prevent this from happening. (Fig. 1)

As the piston rises, the pressure in the PTFE sealed cavity above the piston increases, forcing open the ball check. This reduces the cavity pressure and allows the piston to rise smoothly. As the pressure and flow decrease, the piston moves downward. The ball check closes, and descent of the piston is restricted by fluid flowing through the orifice plug. This equalizes the pressure in the cavity above and below the piston and gives stability to the valve.

## Installation

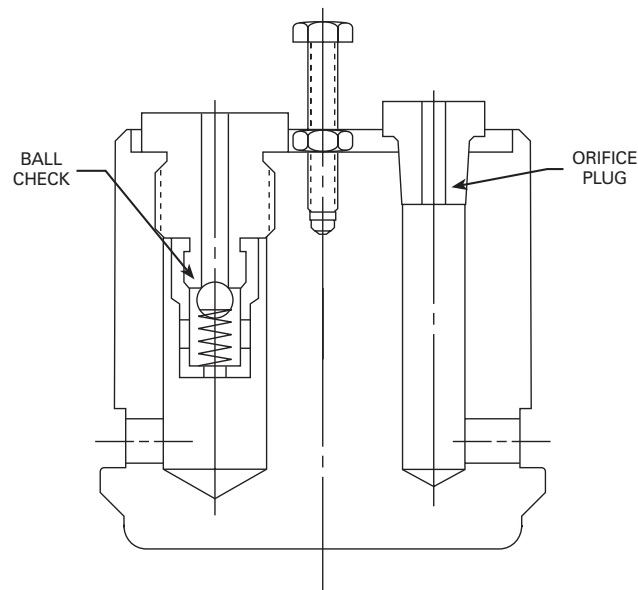
Valves 4.00" and smaller may be installed in a vertical position.

Warning: 6.00" and larger valves should NOT be installed in a vertical plane. If a vertical plane is required, please consult factory for special accessories.

## Application

Compressible fluids. Valves come with ballcheck and orifice plug in piston.

Non-compressible fluids. Valves furnished same as for compressible fluids; however, some applications where heavy, viscous liquids are present, the ball check should be removed so piston can stabilize quicker.



**Figure 1**

# Special features

## PTFE piston seal ring

Norriseal's use of a PTFE spring energized seal ring adds a new dimension to the piston check valve. By use of a full circle ring, leakage between piston and guide/cage is zero. Using a low friction, self-lubricating material allows the piston to move freely and quietly without seizing to the seal.

## Guide/cage

This feature by Norriseal provides positive piston and seat alignment which helps prevent piston vibration and assures stability for proper flow control.

## Valve spring

Furnished on all valves. This gives an added safety feature for shut-off in all pressure ranges.

## Seat – cage retained type

Held in position by guide/cage requiring no special tools for removal and can be easily removed by hand.

## Optional trim

For applications where a positive seal with a zero leakage is required, composition seating material is available. This style piston has the feature of a metal back-up in case of wash-out of the composition trim. (Fig. 3)

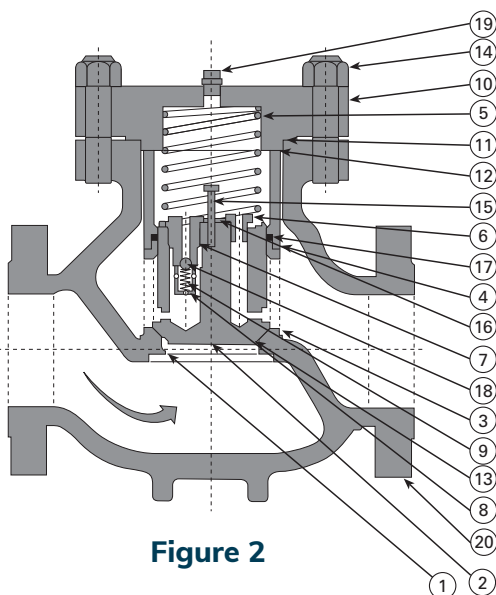
Abrasive resistant metal trim sets are available for special applications. Please consult factory. (Fig. 3)

## NACE

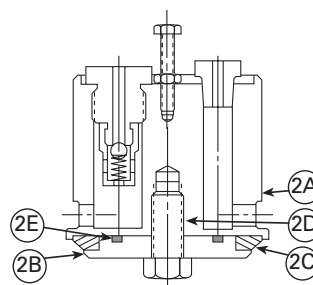
Optional trim available that meets MR0175 recommended practice. (See Materials of Construction)

## Easy maintenance

Norriseal's valve piston comes with a built-in lifting device. No special fittings or tools are required to remove the piston from the valve body.



**Figure 2**



**Figure 3**

Item No	Description
1	SEAT Valve
2	PISTON Valve Solid
2A	BUTT Piston Valve
2B	RETAINER Piston Valve
2C	INSERT Piston Valve
2D	SCREW Retainer Piston
2E	O-Ring Insert
3	CAGE Piston Valve
4	GUIDE Piston Valve
5	SPRING Valve
6	PLUG Orifice
7	SEAT Ball Check
8	CAGE Ball Check
9	SPRING Ball Check
10	BONNET
11	GASKET Bonnet
12	GASKET Guide
13	GASKET Seat
14	STUD Bonnet w/Nut
15	SCREW Lifting
16	NUT Hex Ring
17	SEAL Piston Guide
18	BALL Check
19	PLUG Pipe
20	BODY

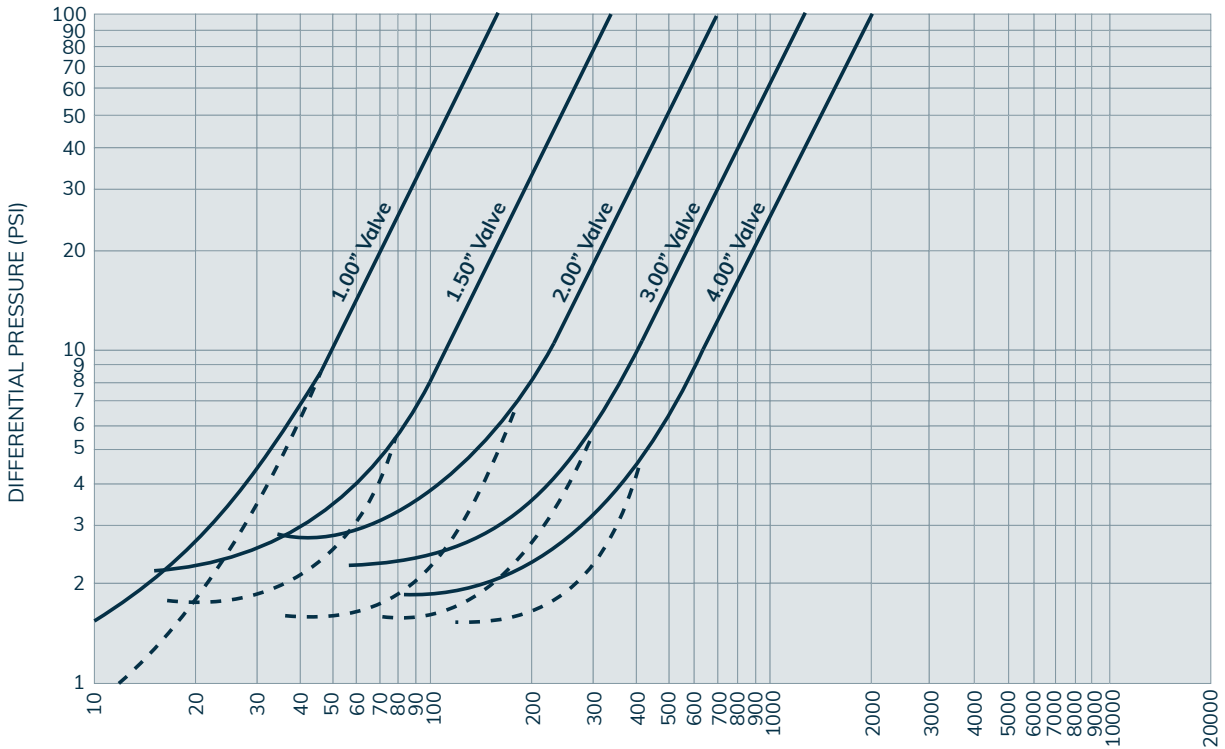
Note: Figure 3 shows piston with replaceable inserted material

# Materials

MATERIALS OF CONSTRUCTION					
Items	Valve Size (inches)	Material			
		Standard	NACE MR0175	Optional	
Body	1.00 - 4.00	ASTM A216, GR. WCC	ASTM A216, GR. WCC	ASTM A351, GR CF8A ASTM A352, GR. LCC	
Bonnet	1.00 - 4.00	ASTM A516, GR 70 or ASTM A216, GR. WCC	ASTM A516, GR 70 or ASTM A216, GR. WCC		
Valve Piston	1.00 - 4.00	17-4PH SST/H900	316 SST	316 SST	
Valve Seat	1.00 - 4.00	17-4PH SST/H1150-M	316 SST	316 SST	
Piston Insert (Optional)	1.00 - 4.00	Glass-Filled PTFE	Glass-Filled PTFE	Alloy 6	
Valve Cage	1.00, 2.00, 3.00, 4.00	17-4PH SST/H1150-M	17-4PH SST/H1150-M	316 SST	
	1.50	316 SST	316 SST	17-4PH SST/H1150-M	
Piston Guide	1.00	17-4PH SST/H1150-M	17-4PH SST/H1150-M	316 SST	
	1.50 - 4.00	316 SST	316 SST	Consult Factory	
Piston Seal	1.00	None	None	None	
	1.50 - 4.00	TFE/ELG Ring	TFE/ELG Ring	Consult Factory	
Ball Check Assembly	1.00 - 4.00	Seat	None	None	Consult Factory
		Cage	316 SST	316 SST	
		Ball	302 SST	302 SST	
		Spring	Inconel 600	Inconel 600	
Valve Spring	1.00	Inconel 600	Inconel 600	Consult Factory	
	2.00 - 4.00	316 SST	Inconel 600		
Bonnet Studs	1.00 - 4.00	ASTM A193, GR. B7	ASTM A193, GR. B7	Consult Factory	
Hex Nuts	1.00 - 4.00	ASTM A194, GR. 2H	ASTM A194, GR. 2H	Consult Factory	
Spiral Wound Gaskets	1.00 - 4.00	316L SST w/Graphite Filler	Inconel 600 w/Graphite Filler	Consult Factory	
Solid Metal Gaskets (ANSI 2500 and up)	1.00 - 4.00	316 SST	316 SST	Consult Factory	
Composition Gaskets (Non-ASB)					
Orifice Plug	1.00	None	None	None	
	1.50 - 4.00	316 SST	316 SST	Consult Factory	
Piston Lifting Attachment	1.00	None	None	316 SST	
	1.50 - 4.00	304 SST	304 SST		
Nameplate	1.00 - 4.00	316 SST	316 SST	Consult Factory	
Bonnet Vent Plug	1.00 - 4.00	CSTL/ASTM A105	CSTL/ASTM A105	316 SST	
Lifting Attachments (Eye Bolts)	1.00 - 2.00	None	None	None	
	1.00 - 4.00	Forged Alloy Steel	Forged Alloy Steel	Consult Factory	

# Flow characteristics

Pressure Drop vs Flow for Norriseal Series 7100 Piston Check Valves



### Water Flow (gpm) at 60°F

Note: Dotted portion of curves indicates flow with valve spring removed.

Flow (Water – S.G. = 1.0)  
vs.  
Pressure drop (psi)

For liquids other than water multiply by  $1/\sqrt{S.G.}$ .

For barrels per day multiply gpm by 34.3

Flow Coefficients (Cv) for Fully Open Valves	
Valve Size	Cv
1.00	16
1.50	34
2.00	70
3.00	128
4.00	198

The following formulas may be used to determine the actual flow coefficient (Cv) required by a given condition of flow.

#### 1. Liquid

$$C_v = Q \sqrt{\frac{G}{\Delta P}}$$

$$Q = C_v \sqrt{\frac{G}{\Delta P}}$$

#### 2. Gas

$$C_v = \frac{Q}{963} \sqrt{\frac{GT}{(\Delta P)(P_1 + P_2)}}$$

$$Q = 963 C_v \sqrt{\frac{GT}{(\Delta P)(P_1 + P_2)}}$$

#### Glossary of terms

**Q** = Flow Liquids – GPM  
Gas – SCFH

**Cv** = Flow coefficient

**P<sub>1</sub>** = Inlet pressure (PSIA)

**P<sub>2</sub>** = Outlet pressure (PSIA)

**ΔP** = P<sub>1</sub> – P<sub>2</sub>, Pressure drop  
[Critical flow (gas) use ½ P<sub>1</sub> for P<sub>2</sub> if P<sub>2</sub> is less than ½ P<sub>1</sub>]

**T** = Absolute temperature (°F + 460)

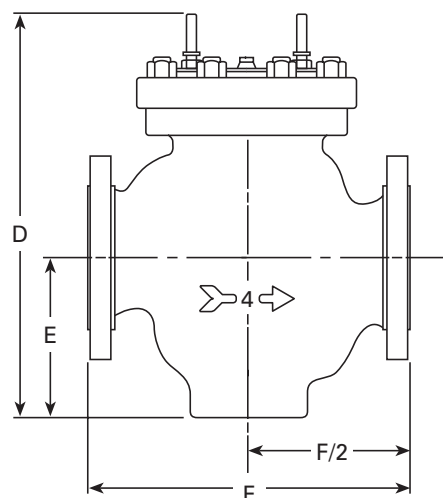
**G** = Specific gravity

# Specifications

DIMENSIONS (inches)								
End Connection Type								
Body Size	NPT*	ANSI Flanged						
		Flange Type	150	300	600	900	1500	2500
1.00	8.25	RF	7.25	7.75	8.25	9.38	9.38	N/A
		RTJ	7.75	8.25	8.25	9.38	9.38	N/A
1.50	13.00	RF	8.75	9.25	9.88	12.25	12.25	N/A
		RTJ	9.25	9.75	9.88	12.25	12.25	N/A
2.00	11.25	RF	10.00	10.00	11.25	14.75	14.75	16.88
		RTJ	10.50	11.12	11.38	14.88	14.88	17.00
3.00		RF	11.75	12.50	13.25	15.50	18.12	22.75
		RTJ	12.25	13.12	13.38	15.62	18.25	23.00
4.00		RF	13.38	14.50	15.50	17.00	20.88	26.50
		RTJ	14.38	15.12	15.62	17.12	21.00	26.88

\* For face-to-face dimensions other than those listed above, ie. API 6D, please consult factory  
 + ANSI 1500 C.L. Pressure Rating

BODY HEIGHT DIMENSIONS			
End Connection Type			
Valve Size	ANSI Class	"D"	"E"
1.00	150-1500	7.75	3.06
	150-600	9.75	3.50
1.50	900-1500	10.50	4.00
	150-1500	12.12	4.38
2.00	2500	15.12	5.25
	150-900	13.50	5.50
3.00	1500	16.88	6.25
	2500	23.12	7.62
4.00	150-900	18.38	7.00
	1500	19.38	7.50
	2500	23.12	7.62



STANDARD BODY END CONNECTIONS**		
Body Size	NPT	Flanged (ANSI Ratings)
1.00	*	150-1500
1.50	*	150-1500
2.00	*	150-2500
3.00		150-2500
4.00		150-2500

\*\*For valve body end connections other than those listed and higher pressure ratings, please consult factory.

# Model code

1. Determine required body size.
2. Use model number code below as illustrated to select proper valve type to suit operating conditions.

**7100 4 RF - 07 R G S - A E A - 4.00 QO 17-4**

A
B
C
D
E
F
G
H
I
J
K
L
M
N
O

**A**

VALVE SERIES	
Code	Series
7100	7100

**B**

VALVE END/CONNECTION SIZE	
Code	Size (Inches)
1	1"
1.5	1-1/2"
2	2"
3	3"
4	4"

**C**

BODY END CONNECTION	
Code	Type
S	Female NPT
RF	RF Flanged
RJ	RTJ Flanged

**D**

BODY/BONNET MATERIAL	
Code	Material (Studs/Nuts)
-	WCC/A696 (B7/2H)
N	WCC/A696 (B7/2H) - NACE
S	CF8M/A351 316SS (B8M/8M)
R	CF8M/A351 316SS (B8M/8M) - NACE

**E**

BODY RATING	
Code	Pressure Class
02	ANSI 150#
07	ANSI 300#
14	ANSI 600#
21	ANSI 900#
36	ANSI 1500#
60	ANSI 2500#

**F**

SPRING MATERIAL		
Code	Material	Orientation
R	316 SST	Horizontal
L	Inconel	Horizontal
V	316 SST	Vertical

**G**

BODY TYPE	
Code	Type
G	Globe Style w/o Bottom Drain

**H**

GASKET SEAL MATERIAL		
Code	Material	Service
S	316L/Graphite	Standard
N	Inconel/Graphite	NACE

**I**

BODY CONFIGURATION	
Code	Type
-	Standard Norriseal Face to Face (per ISA)

**J**

Code	Plug/Insert	Seat	Cage	Cage Guide
A	17-4ph SS	17-4ph SS	Gas or Air	Gas or Air
B*	316SS	17-4ph SS	Liquid	316SS
C*	316SS	316SS	Gas	316SS
E*	316SS/Stellite	316SS/Stellite	Gas	316SS
L*	316SS/TFEG	316SS	Gas	316SS

\*NACE Compliant

**K**

PISTON SEAL MATERIAL	
Code	Material
E	TFE/Elgiloy
J	Carbon Graphite
O	No Seal (1" Sizes only)

**L**

FLUID TYPE SERVICE	
Code	Service
A	Gas or Air
B	Liquid

**M**

TRIM SIZE	
Code	Size
1.00	1"
1.50	1-1/2"
2.00	2"
3.00	3"
4.00	4"

**N**

TRIM STYLE	
Code	Style
QO	Quick Open

**O**

TRIM MATERIALS				
Code	Plug/Insert	Seat	Cage	Cage Guide
17-4	17-4ph SS	17-4ph SS	17-4ph SS	316SS
316/17-4*	316SS	17-4ph SS	17-4ph SS	316SS
316*	316SS	316SS	316SS	316SS
STL6/316*	316SS/Stellite	316SS/Stellite	316SS	316SS
TFEG/316*	316SS/TFEG	316SS	316SS	316SS
TFEG/17-4	17-4ph SS/TFEG	17-4ph SS	17-4ph SS	316SS

\*NACE Compliant

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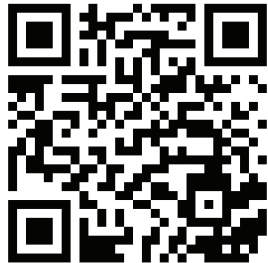
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NRS\_RFQ@championx.com



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Norriseal-Wellmark | 11122 W Little York Rd | Houston, TX 77041

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