

Detonating Cords

RDX	40 GRAINS/FT FLAT, RIBBON
10000149	RDX 40 GRAINS/FT LS / NYLON JACKET - ENSIGN BICKFORD
101208988	RDX 40 GRAINS/FT LS / NYLON JACKET - ENSIGN BICKFORD - EB AIR PACK
HMX	40 GRAINS/FT FLAT, RIBBON
10000363	HMX 40 GRAINS/FT LS / NYLON JACKET - ENSIGN-BICKFORD
101205518	HMX 40 GRAINS/FT LS / NYLON JACKET - ENSIGN-BICKFORD - EB AIR PACK
HNS	40 GRAINS/FT FLAT, RIBBON
10000531	HNS 40 GRAINS/FT LEAD JACKET - ENSIGN-BICKFORD
2 3/4 in. – 7 in. Gun Systems	
RDX	
101001671	RDX 80 GRAIN LS/XHV – DETOTEC
100157035	RDX 80 GRAIN LS/XHV – DETOTEC – DETOTEC AIR PACK
100005339	RDX 80 GRAIN LS/XHV – ENSIGN-BICKFORD
100157022	RDX 80 GRAIN LS/XHV – ENSIGN-BICKFORD – EB AIR PACK
100157031	RDX 80 GRAIN LS/XHV – ENSIGN-BICKFORD – OWEN AIR PACK
HMX	
101001672	HMX 80 GRAIN LS/XHV – DETOTEC
100157037	HMX 80 GRAIN LS/XHV – DETOTEC – DETOTEC AIR PACK
100005338	HMX 80 GRAIN LS/XHV – ENSIGN-BICKFORD
100157024	HMX 80 GRAIN LS/XHV – ENSIGN-BICKFORD – EB AIR PACK
100156998	HMX 80 GRAIN LS/XHV – ENSIGN-BICKFORD – OWEN AIR PACK
PYX/HNS	
100005337	PYX 80 GRAIN LS – ENSIGN-BICKFORD
100157025	PYX 80 GRAIN LS – ENSIGN-BICKFORD – EB AIR PACK
100005317	PYX 80 GRAIN LS – ENSIGN-BICKFORD – OWEN AIR PACK
100157001	HNS 80 GRAIN LS – DYNAMIT NOBEL
100157000	HNS 80 GRAIN LS – DYNAMIT NOBEL – DYNAMIT NOBEL AIR PACK
Bi-Directional Boosters	
160251	HMX BI-DIRECTIONAL BOOSTER - DYNAMIT NOBEL
100157004	HNS BI-DIRECTIONAL BOOSTER - DYNAMIT NOBEL
Detonating Cord Initiators	
101653762	HMX DET CORD INITIATOR - JRC 12.7 mm
101653965	NONA DET CORD INITIATOR - JRC 12.7 mm

Deep-Star™ Recommendations

RDX: For conditions to 300 °F, 15,000, 1 hr.				
Manufacturer	Cord Type	Jacket	Part No.	Air Ship Part No.
Detotec	Low Shrink	Nylon	101001669	101340946
Ensign Bickford	Low Shrink	Nylon	100005308	100157019
Detotec	Low Shrink-XHV	Nylon	101001671	101340952
HMX: For conditions to 350 °F, 15,000, 1 hr.				
Manufacturer	Cord Type	Jacket	Part No.	Air Ship Part No.
Detotec	Low Shrink	Zytel	100157032	101340954
Detotec	Low Shrink-XHV	Zytel	101001672	101340955
Accurate Arms	Lead	Lead	100010620	100157211
HNS: For conditions to 450 °F, 15,000, 1 hr.				
Manufacturer	Cord Type	Jacket	Part No.	Air Ship Part No.
Accurate Arms	Lead	Lead	100010620	100157211

Steel Protectors

For a VannGun™ Firing Head Crossover Pin Thread

101272858	1 11/16	VannGun™ Firing Head Pin
100014411	2 3/4	VannGun Firing Head Pin
100014399	3 3/8	VannGun Firing Head Pin

For a VannGun™ Pin Thread

101282714	1 9/16	VannGun Pin
101282716	2	VannGun Pin
101282724	2 1/2	VannGun Pin
100014411	2 3/4	VannGun Pin
N/A	2 7/8	VannGun Pin
102182729	3 1/8	VannGun Pin
100014399	3 3/8	VannGun Pin
100014404	4	VannGun Pin
101207231	4 5/8	VannGun Pin
100157305	5	VannGun Pin
100157305	5 1/8	VannGun Pin
101279004	5 3/4	VannGun Pin
100157302	6	VannGun Pin
N/A	6 1/2	VannGun Pin
101282733	7	VannGun Pin

For a VannGun™ Box Thread (Vented)

102189271	1 11/16	VannGun Box
101289287	2	VannGun Box
101289288	2 1/2	VannGun Box
101284726	1/4 in. NPT Melt Plug for 2 1/2 in. and larger VannGuns	
101289289	2 3/4	VannGun Box
N/A	2 7/8	VannGun Box
101289291	3 1/8	VannGun Box
101287878	3 3/8	VannGun Box
N/A	4	VannGun Box
101287911	4 5/8	VannGun Box
101287905	5	VannGun Box
102187905	5 1/8	VannGun Box
N/A	5 3/4	VannGun Box
N/A	6	VannGun Box
N/A	6 1/2	VannGun Box
101287901	7	VannGun Box
101270234	3/4 in. NPT Melt Plug for 2 3/4 in. and larger VannGuns	

Tools

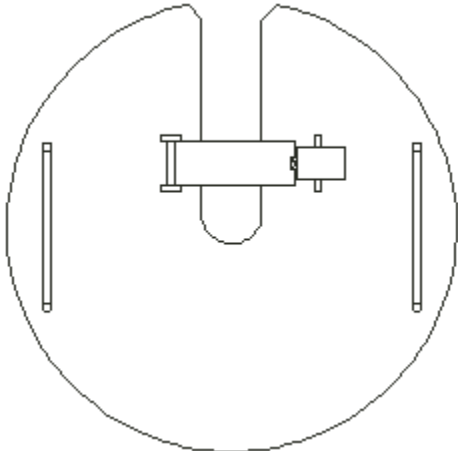
100008024	VannGun™ Spacer Kit - size PAI
100014389	VannGun™ Spacer Kit - size PAI
100005384	DC-4 O-ring Lubricant (>350 °F)
100026254	Dry Moly Thread Lubricant (350 °F)
100157361	LPS - A -151 Degreaser - 15 oz. aerosol
100157362	LPS - A -151 Degreaser - 1 oz. aerosol
100157363	LPS - A - 151 Degreaser - 5 oz.

Lift Sub Bushings

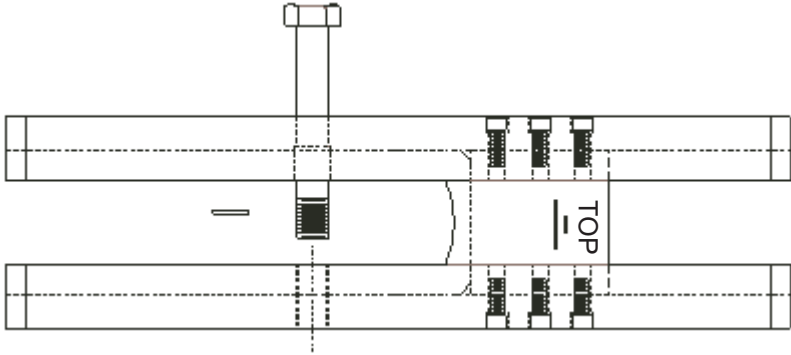
For a VannGun™ Firing Head		
101289612	1 11/16	VannGun™ Firing Head
100014393	2 3/4	VannGun™ Firing Head
100163437	3 3/8	VannGun™ Firing Head
For a VannGun™		
101274049	1 9/16	VannGun™
100014283	2	VannGun™
101274055	2 1/2	VannGun™
100014393	2 3/4	VannGun™
N/A	2 7/8	VannGun™
N/A	3 1/8	VannGun™
100163437	3 3/8	VannGun™
101292656	4	VannGun™
100156611	4 5/8	VannGun™
100156633	5	VannGun™
100156633	5 1/8	VannGun™
101288072	5 3/4	VannGun™
N/A	6	VannGun™
N/A	6 1/2	VannGun™
100156612	7	VannGun™
Tubing Lift Sub		
148332	3/8 in. EUE 8rd Tubing Lift Sub	
VannGun™ Support Plate Assemblies		
120042522	1 9/16	VannGun™
100155768	2	VannGun™
101226363	2 1/2	VannGun™
100156573	2 3/4	VannGun™
100153573	2 7/8	VannGun™
100156573	3 1/8	VannGun™
100156573	3 3/4	VannGun™
100156573	4	VannGun™
100156583	4 5/8	VannGun™
100156633	5	VannGun™
100156633	5 1/8	VannGun™
101288072	5 3/4	VannGun™
100156578	6	VannGun™
100456578	6 1/2	VannGun™
100156588	7	VannGun™

Miscellaneous	
100008024	VannGun™ Spacer Kit - size PAI
100014389	VannGun™ Spacer Kit - size PAI
100005384	DC-4 O-ring Lubricant (>350 °F)
100026254	Dry Moly Thread Lubricant (350 °F)
100157361	LPS - A -151 Degreaser - 15 oz. aerosol
100157362	LPS - A -151 Degreaser - 1 oz. aerosol
100157363	LPS - A - 151 Degreaser - 5 oz.

Gun Support Assemblies



1 9/16 in.	VannGun™	120042522
2.00 in.	VannGun™	100155768
2 1/2 in.	VannGun™	101226363



2 3/4 in.	VannGun™	100156573
3 1/8 in.	VannGun™	100156573
3 3/8 in.	VannGun™	100156573
4 in.	VannGun™	N/A
4 5/8 in.	VannGun™	100156583
5 in.	VannGun™	101016456
5 1/8 in.	VannGun™	101016456
5 3/4 in.	VannGun™	101016456
6 in.	VannGun™	100156578
6 1/2 in.	VannGun™	100156578
7 in.	VannGun™	100156588

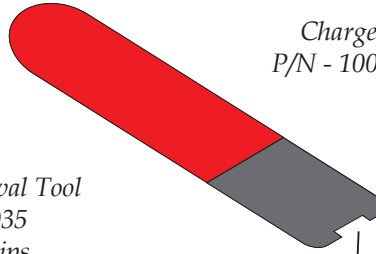
Charge Clips and Associated Tools



Charge Clip
P/N - 100005336



Charge Clip
P/N - 100156506



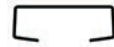
Installation/Removal Tool
P/N 101298035
for Charge Clips
P/N's 100005336 and 100156506



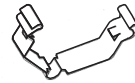
Charge Clip
P/N - 100005477



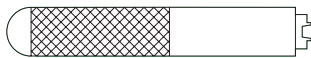
Charge Clip
P/N - 100157866



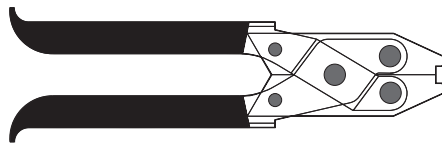
Deep-Star™ Charge Clip
P/N - 100157947



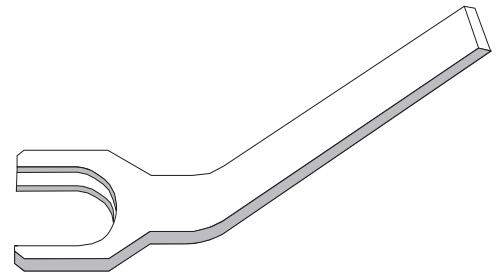
OMNI™ Charge Clip
P/N - 100005250



Installation Tool for
Deep-Star™ Charge Clip
P/N - 100009586

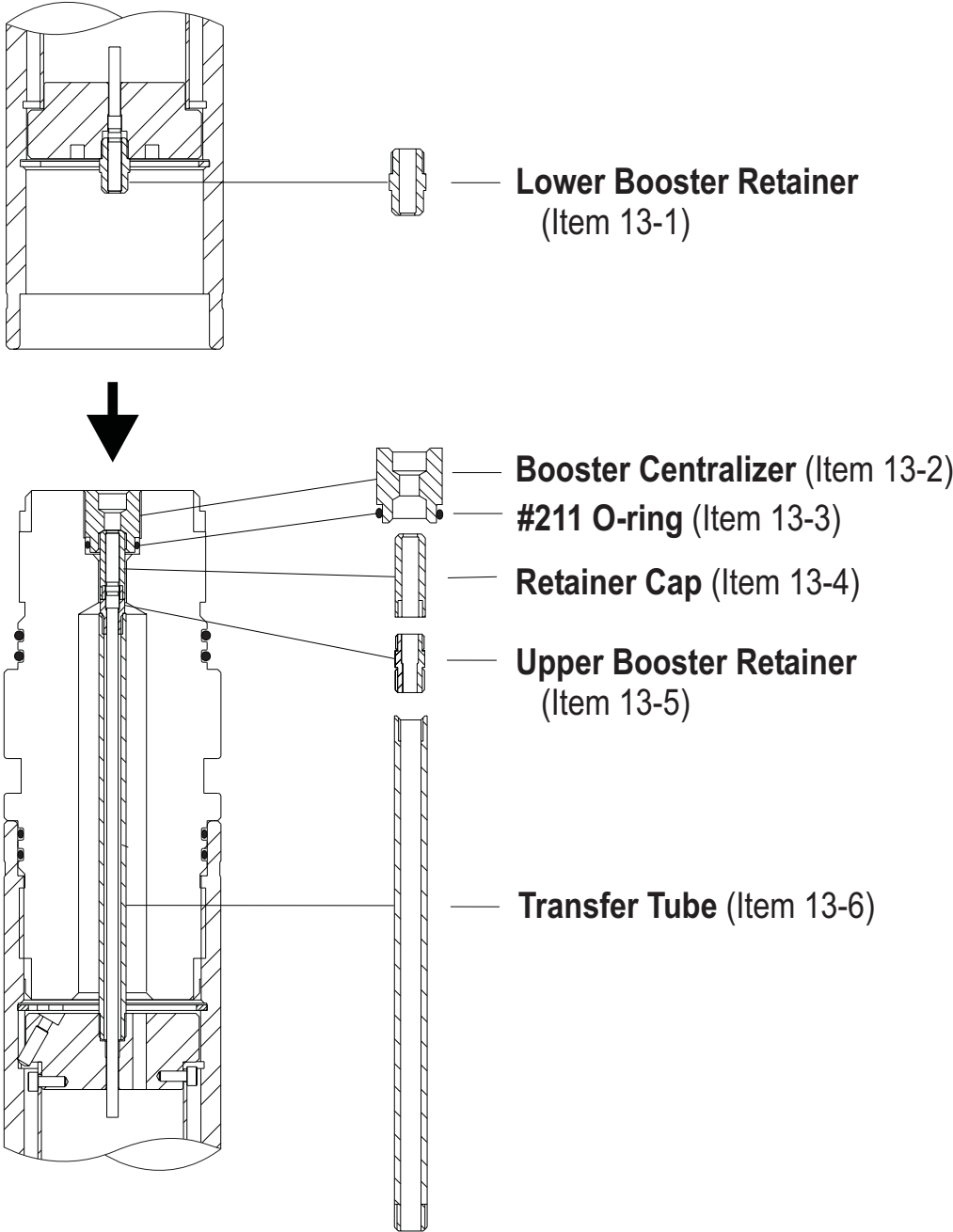


Removal Tool for
Deep-Star™ Charge Clip
P/N - 100009585



OMNI™ Charge Downloading Tool
P/N - 100157374

Bi-Directional Booster Transfer Kit



Gun Swell Information

GUN					CHARGE		TEST RESULTS	
O.D.	Shots	Shot Phase	Material	Wall Thk	Type	Explosive Wt. (gms)	Tested In Air/Water	Max Swell (In.)
	per ft.	(Deg)	CR / HF	(In.)				
1 9/16	6	60	CR	.171	Millennium™	3.40	water	1.760
	6	0	CR	.171	Millennium	3.40	water	1.680
2	4	0	CR	.215	SDP	6.75	water	2.166
	6	60	CR	.215	SDP	6.75	water	2.221
	6	60	CR	.215	Millennium	6.80	water	2.225
2 1/2	6	60	CR	.250	DP	11.00	water	2.676
2 3/4	4	22 LS	CR	.312	DP LD	13.00	water	2.781
	5	180	CR	.312	SDP	14.70	water	2.971
	5	180	CR	.312	DP LD	12.50	water	2.810
	6	60	CR	.312	DP	12.50	water	2.835
	6	60	CR	.312	DP	12.50	air	2.867
	6	60	CR	.312	DP	12.50	water	2.853
	6	60	CR	.312	DP LD	13.00	water	2.893
	6	60	CR	.312	BH	14.70	water	2.850
	6	60	HF	.312	SDP	14.70	water	2.954
	6	60 LS	CR	.312	DP	12.50	water	2.819
	6	60 LS	CR	.312	DP	12.50	air	2.821
	6	60 LS	CR	.312	Millennium	15.00	water	2.915
2 7/8	6	60	CR	.312	Millennium	15.00	water	3.047
3 3/8	4	60	CR	.375	DP	32.00	air	3.676
	4	60	HF	.375	DP	32.00	water	3.592
	4	90	CR	.375	SDP	25.00	air	3.524
	4	90	HF	.375	DP	32.00	water	3.555
	4	180	CR	.375	SDP	25.00	water	3.546
	4	40 LS	HF	.375	SDP	25.00	air	3.533
	6	60	CR	.375	DP LD	23.00	water	3.608
	6	60	CR	.375	SDP	25.00	water	3.600
	6	60	CR	.375	DP	22.00	air	3.599
	6	60	CR	.375	SDP LD	25.00	water	3.615
	6	60	HF	.375	DP LD	22.70	water	3.618
	6	60	HF	.375	DP	26.00	water	3.625
	6	60 LS	HF	.375	SDP	25.00	water	3.600
	6	60 LS	CR	.375	DP	26.00	air	3.614
	8	180	CR	.375	BH	14.00	water	3.458
	12	150	CR	.375	BH	14.75	water	3.520
12	150	HF	.375	BH LD	14.00	water	3.538	
12	150	HF	.375	BH	14.00	water	3.568	
4	4	90	HF	.375	Millennium	39.00	water	4.260
	5	60	HF	.375	Millennium	39.00	water	4.864
4 1/2	5	60	HF	.375	Millennium	39.00	water	4.864
4 5/8	5	72	CR	.438	SDP	39.00	air	4.780
4 5/8	5	135	HF	.438	SH	56.50	water	4.904

Gun Swell Information

GUN					CHARGE		TEST RESULTS	
O.D.	Shots	Shot Phase	Material	Wall Thk	Type	Explosive Wt.	Tested In	Max Swell
	per ft.	(Deg)	CR / HF	(In.)		(gms)	Air/Water	(In.)
4 5/8	6	60	CR	.438	DP	32.00	air	4.876
4 5/8	6	60	HF	.438	DP	32.00	water	4.806
4 5/8	8	180	CR	.438	SH	28.00	water	4.770
4 5/8	8	180	CR	.438	DP LD	23.00	air	4.860
4 5/8	8	180	CR	.438	DP LD	23.00	water	4.780
4 5/8	12	150	CR	.438	BH LD	22.70	water	4.815
4 5/8	12	150	CR	.438	DP	23.00	water	4.834
4 5/8	12	150	CR	.438	DP LD	22.70	water	4.925
4 5/8	12	150	HF	.438	BH LD	22.70	water	4.840
4 5/8	12	150	HF	.438	BH	28.00	water	4.813
4 5/8	12	150	HF	.438	DP	23.00	water	4.959
4 5/8	12	150	HF	.438	DP LD	23.00	water	5.050
4 5/8	12	150	HF	.438	DP LD	23.00	water	5.044
4 5/8	12	150	HF	.438	SH LD	28.00	water	4.895
4 5/8	12	150	CR	.438	SH	28.00	water	4.727
4 5/8	12	150	CR	.438	SH LD	28.00	water	4.846
4 5/8	14	135	CR	.438	SH	28.00	water	4.790
5	12	235	CR	.437	SH	28.00	water	5.196
5	14	231	CR	.437	SH	28.00	water	5.207
5	14	231	CR	.437	SH LD	28.00	water	5.304
5	18	60/120	CR	.437	SH	28.00	water	5.229
5 1/8	6	135	CR	.438	SH	56.50	air	5.413
5 1/8	12	150	CR	.438	BH LD	22.70	water	5.210
5 1/8	14	135	CR	.438	SH	32.00	water	5.380
5 1/8	21	60/120	CR	.438	BH	23.00	water	5.224
5 3/4	14	231	CR	.500	SH	32.00	water	5.804
5 3/4	14	231	CR	.500	SH LD	34.00	water	5.945
6 1/2	14	138	CR	.500	SH LD	56.5	water	6.680
7	12	135	CR	.500	SH LD	56.50	water	7.125

Notes:

1. The above chart was taken from actual tests conducted by JRC Engineering on RDX and HMX charges. It can be used as a general guideline for all explosives. If you have questions regarding these systems, or systems that are not listed, please contact JRC Engineering.
2. All tests were conducted at ambient temperature and pressure.

O-Ring Selection Chart

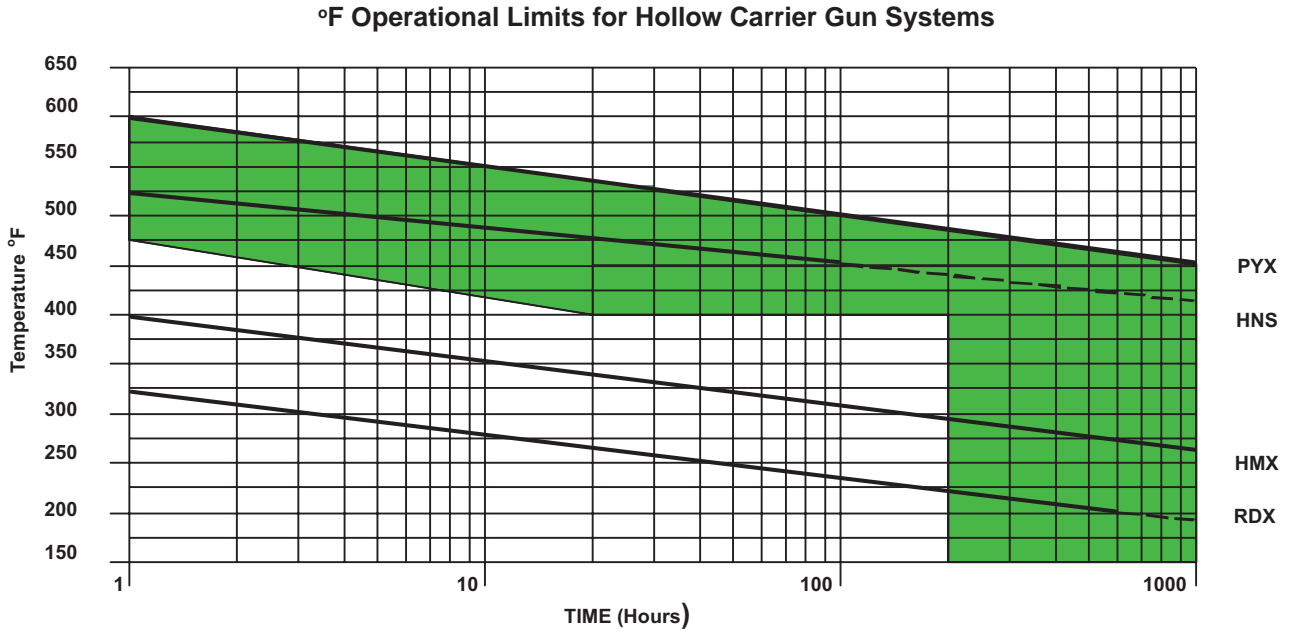
	100°F	325°F	350°F	400°F	500°F
Calcium Bromide		5,3,4	5,3,4	5	5
Carbon Dioxide		1,2,3,4,5	3,4	4,5	5
Hydrochloric Acid		3,4,5	3,4,5	4,5	5
Hydrofluoric Acid		5	5	5	5
Hydrogen Sulfide		5,4	5	5	5
Potassium		1,2,3,4,5	3,4,5	4,5	5
Sodium Chloride		1,2,3,4,5	3,4,5	4,5	5
Sodium Bromide		5,3,4	5,3,4	5	5
Zinc Bromide		5,3,4	5,3,4	5	5
Hydrocarbons		1,2,3,4	3,4	4,5	5

1. Nitrile (Packer-N-1059-90 or National C-67)
2. Nitrile (Packer-N-1059-90 or National C-67 w/Engineering Spec. backups)
3. Viton (National V-25)
4. Viton with Backups (National V-25 w/Engineering Spec. backups)
5. Aflas with Backups (Engineering Spec. on both)

Notes:

1. When more than one choice exists in a box, the choices are listed in order of decreasing preference.
2. If a number appears in any row in any temperature range, it will also be an acceptable choice for any temperature range lower than the one in which it appears in that row. It will not, however, be the preferred choice.
3. Backup rings should **always** be used if well pressures are to exceed 13,000 psi.

Time Vs. Temperature Chart

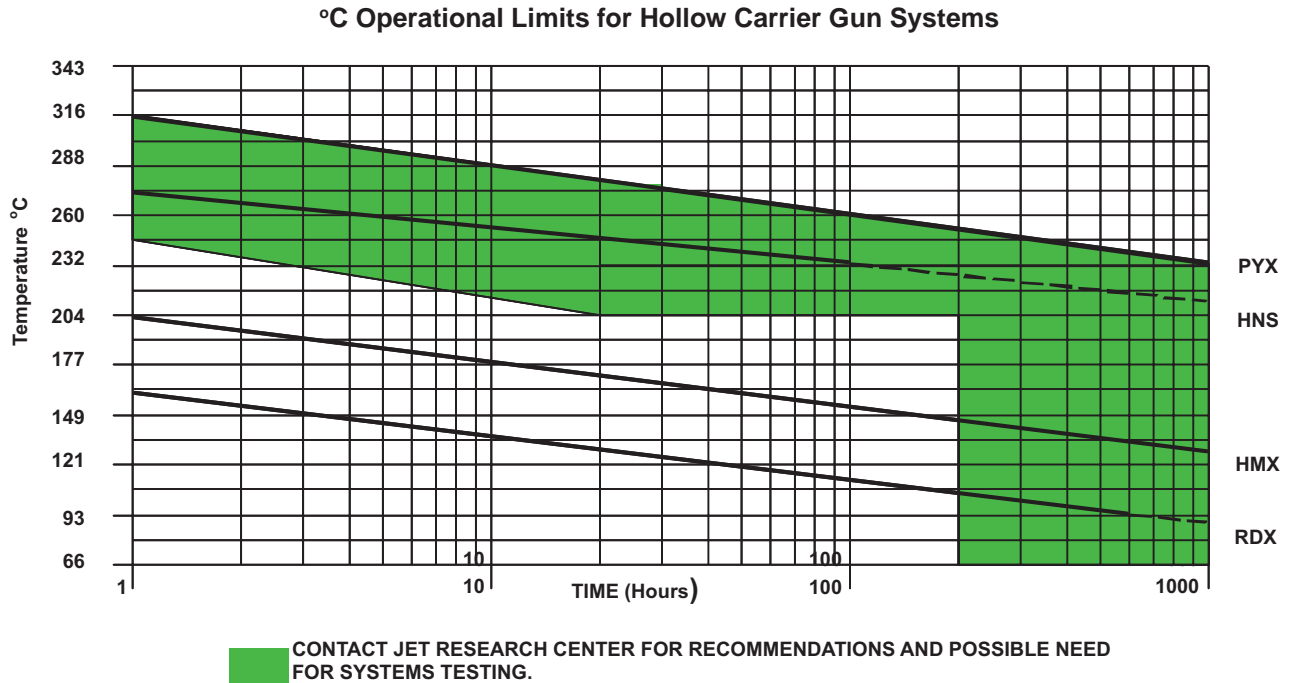


CONTACT JET RESEARCH CENTER FOR RECOMMENDATIONS AND POSSIBLE NEED FOR SYSTEMS TESTING.

Notes:

1. This chart is valid for the explosive train inside Hollow Carrier Guns only: Non-Electric Boosters, Detonating Cord, and Shaped Charges.
2. It is not valid for TCP Firing Systems, Electric Detonators, or Capsule Guns.
3. Contact JRC for information regarding these other components.

Time Vs. Temperature Chart



Notes:

1. This chart is valid for the explosive train inside Hollow Carrier Guns only: Non-Electric Boosters, Detonating Cord, and Shaped Charges.
2. It is not valid for TCP Firing Systems, Electric Detonators, or Capsule Guns.
3. Contact JRC for information regarding these other components

