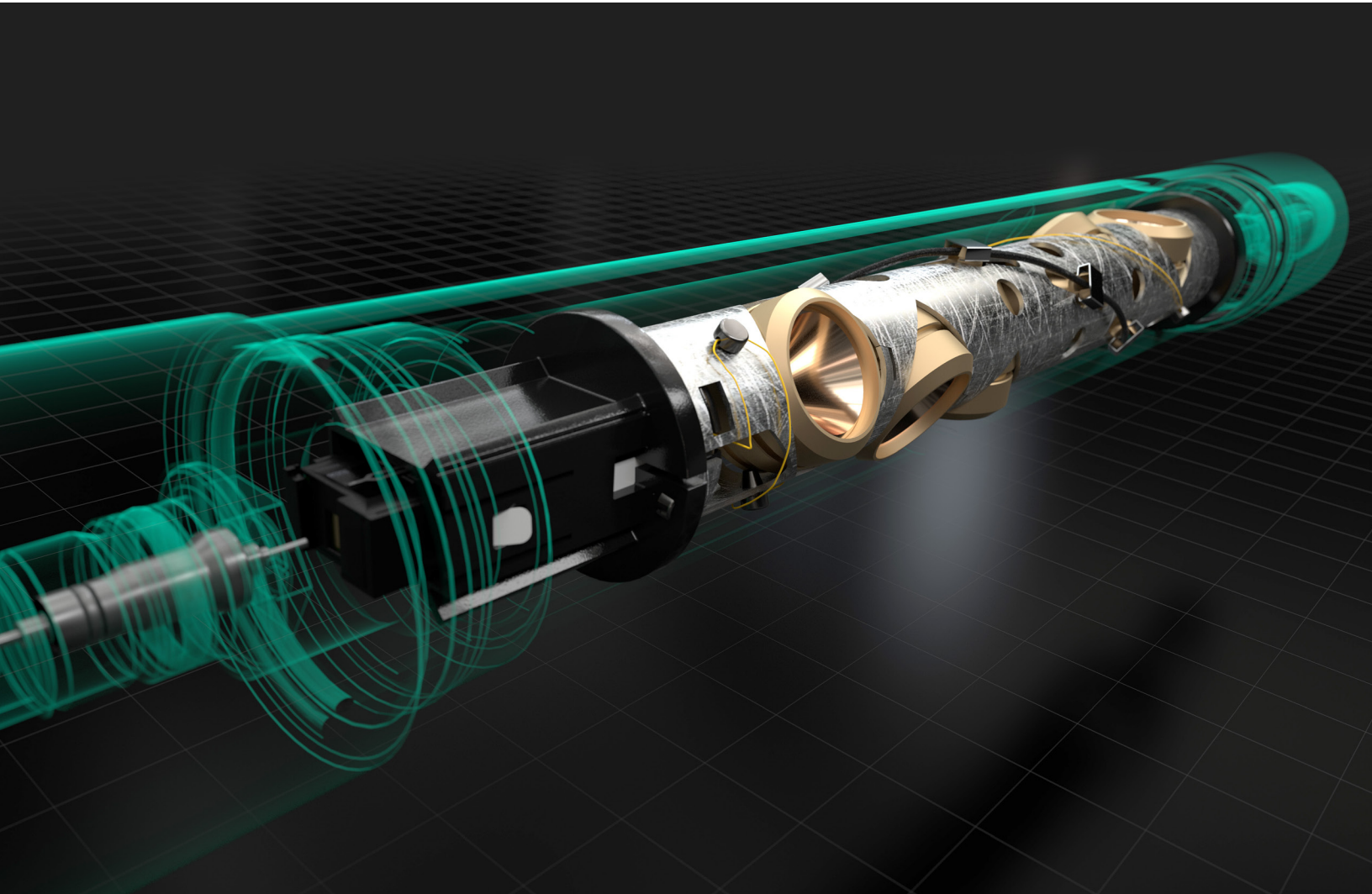


# Velocity™ Perforating System

PLUG-AND-PLAY GUNS FOR PUMPDOWN OPERATIONS



**JRC**

**JET RESEARCH CENTER®**

# Velocity™ Perforating System

## PLUG-AND-PLAY GUNS FOR PUMPDOWN OPERATIONS

### OVERVIEW

Combining premier engineering with industry-trusted digital technology, the Jet Research Center (JRC) Velocity™ perforating system provides safe, fast, efficient, and reliable perforating operations.

Continued evolutions in completions technology often require more guns to be deployed on each stage. The Velocity perforating system can be prepared more easily and in less time than traditional guns, while at the same time reducing the overall weight and makeup length.

In the fast-paced environment of pump down perforating, minimizing equipment complexity and improving run rate efficiencies are vital for operational success. With its unique modular design, the Velocity perforating system does not require any field wiring of guns, detonators, or igniters and can be fully verified on surface before making a trip in the well.

### FEATURES

- » Open architecture on digital switch technology. Our detonator module accepts most of the digital switch options available in the market
- » Push-in detonator and igniter
- » Redundant ground paths for reliability
- » Reduced connections and leak paths
- » Accepts JRC MaxForce®-FRAC, FracJet™ and other industry standard perforating charges

### BENEFITS

- » Gun strings prepared in less time
- » Shorter overall length (OAL)
- » Eliminate errors associated with gun wiring
- » Improved stage efficiency and reduced nonproductive time (NPT)
- » Reduced HSE exposure and environmental impact



### GUN ASSEMBLIES

Description	Part No.	Nominal Length	Makeup Length	Phasing	Shots per Gun	Pressure Rating*
3½-in. Velocity Carrier Assy V3-120	102952908	15.00 in.	13.56 in.	120	3	18000 psi
3½-in. Velocity Carrier Assy V4-90	102952913	17.00 in.	15.59 in.	90	4	18000 psi
3½-in. Velocity Carrier Assy V6-60	102942196	21.00 in.	19.59 in.	60	6	18000 psi
3½-in. Velocity Carrier Assy V9-60	102942226	27.00 in.	25.56 in.	60	9	18000 psi
3½-in. Velocity Carrier Assy V12-60	102942227	33.00 in.	31.56 in.	60	12	18000 psi

Velocity™ gun assemblies feature integrated threads to allow fast and reliable gun assembly that require no field-wired connections.

\* Higher pressure rating gun assemblies are available.

# Velocity™ Aligned™ Gun System

## PLUG-AND-PLAY GUNS FOR ORIENTED PERFORATING

### OVERVIEW

For high-volume, high-efficiency oriented perforating applications, the Velocity™ Aligned™ gun system provides an economic option for orienting perforations in 2.5° increments around the casing circumference. This accurate and efficient system is fully adjustable at the wellsite.

By orienting the charge tube rather than the gun carrier, Velocity Aligned guns make it unnecessary to have additional hardware (such as lock rings) and to orient subs between guns. This design also reduces the variability in gun-to-gun orientation by reducing the number of contact points required for the bottomhole assembly (BHA).

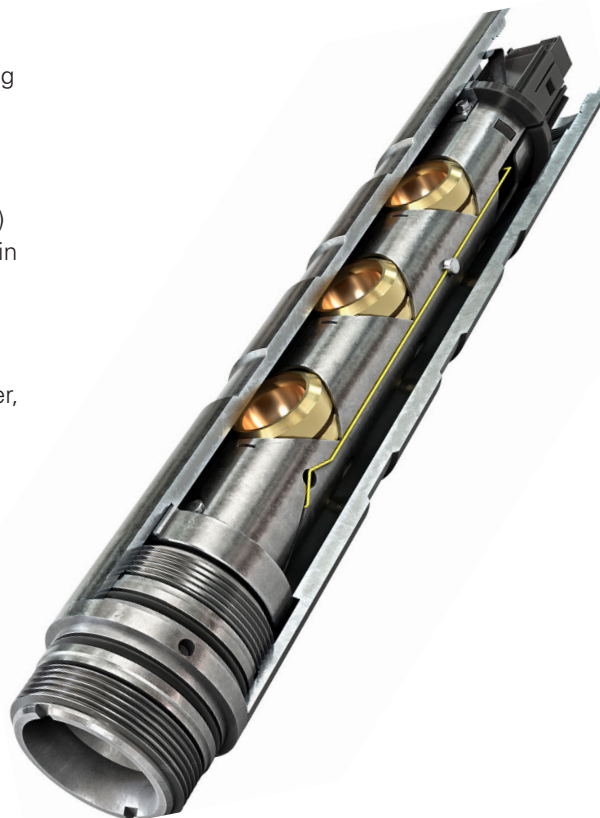
This orienting method is also more compact than alternate orienting mechanisms – thus keeping the resulting gun assembly lighter and shorter, decreasing the HSE exposures on location. Velocity Aligned gun systems include all of the benefits of the Velocity modular platform.

### FEATURES

- » Adjustable at the wellsite in 2.5° increments
- » Plug-and-play, and fully disposable platform
- » Minimal external orienting hardware required
- » Shorter length than competing systems
- » Broadest portfolio of charges in a fully modular oriented system

### BENEFITS

- » Requires minimal time to orient
- » Reduced variability on gun-to-gun orientation
- » Economic platform compared to other orienting options
- » Reduced HSE exposure relative to competing systems
- » Delivered loaded and ready to be run in hole



### GUN ASSEMBLIES

Description	Part No.	Nominal Length	Makeup Length	Phasing	Shots per Gun
3⅝-in. Velocity Carrier Assy V3-0	103047264	18.27 in.	16.59 in.	0	3
3⅝-in. Velocity Carrier Assy V3-180	103078923	18.27 in.	16.59 in.	180	3
3⅝-in. Velocity Carrier Assy V6-0	103047266	27.27 in.	25.59 in.	0	6
3⅝-in. Velocity Carrier Assy V9-0	103047267	36.27 in.	34.59 in.	0	9
3⅝-in. Velocity Carrier Assy V12-0	103047268	45.27 in.	43.59 in.	0	12

# Velocity™ Revolve™ Gun System

## PLUG-AND-PLAY GUNS FOR FIBER-OPTIC PERFORATING

With the increase of fiber-optic installations, the need to accurately orient perforations to avoid damaging fiber-optic cable is critical. Unintentionally damaging the fiber-optic hardware can negatively impact the well's treatment and production diagnostics.

The JRC Velocity™ Revolve™ oriented gun system is able to orient perforations within 5° of the desired perforating azimuth. The self-orienting mechanism eliminates the need for externally oriented hardware, such as eccentric weight bars.

As the first internally oriented, fully modular guns on the market, Velocity Revolve guns eliminate the need for additional hardware and failure-prone components. Revolve guns are modular, plug-and-play, and the orientation can easily be adjusted on location.

One gap in legacy oriented systems has been the additional hardware length that is often required, along with potential limitations in the perforating charge performance specifications. Velocity Revolve guns are up to 35% shorter than competitive gun systems and are better suited for more common industry-standard perforation charges, with a wider range of entry hole diameter specifications.

### FEATURES

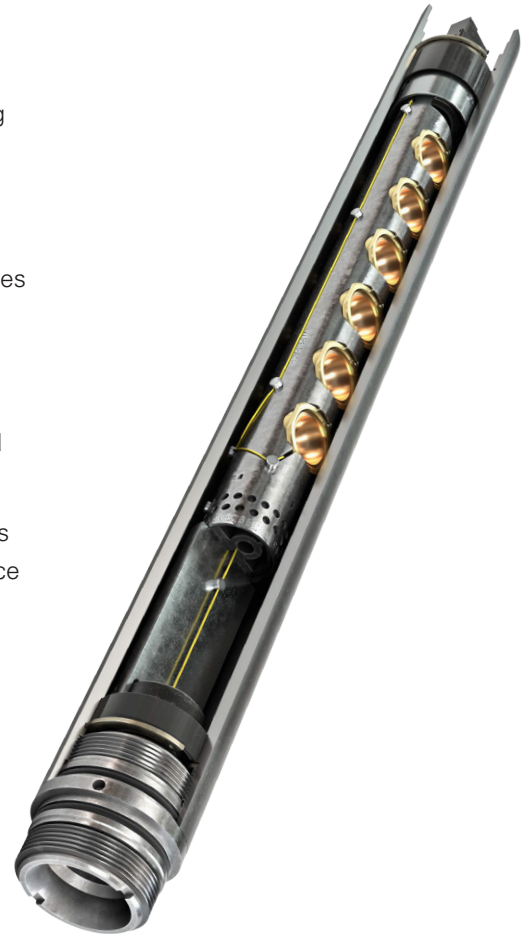
- » Orients charges within 5° of the desired angle
- » Orientation unaffected by wellbore conditions
- » Modular, disposable system
- » Shorter length than competing systems
- » Broader portfolio of charge options than traditional gun systems

### BENEFITS

- » Provides the most accurate and efficient internally oriented system in the industry
- » Offers the lowest total perforating cost for fiber-optic completions
- » Eliminates the tasks of redressing and cleaning equipment
- » Reduces the amount of equipment and personnel required to be on location

### GUN ASSEMBLIES

Description	Part No.	Nominal Length	Makeup Length	Phasing	Shots per Gun
3½-in. Velocity Carrier Assy 3-shot	103036716	23.68 in.	22.00 in.	0	3
3½-in. Velocity Carrier Assy 6-shot	102975042	30.93 in.	29.25 in.	0	6
3½-in. Velocity Carrier Assy 9-shot	103036690	38.18 in.	36.50 in.	0	9
3½-in. Velocity Carrier Assy 12-shot	102971200	44.43 in.	42.75 in.	0	12



## DETONATORS AND IGNITERS

Description	Part No.	UN No	Shipping Class	N.E.C.	Exposive Load	Temperature	RF Safe
Velocity Detonator CF	102895443	0255	1.4B	0.49 g	RDX	350°F/1 hr	Yes
Velocity Detonator SRS	102947849	0256	1.4B	0.49 g	RDX	350°F/1 hr	Yes
Velocity Igniter CF	102751633	0454	1.4S	2.95 g	Black Powder	350°F/1 hr	Yes
Velocity Igniter SRS	102849145	0455	1.4S	2.95 g	Black Powder	350°F/1 hr	Yes

The Velocity detonator and igniter cartridges have been tested by an independent third-party laboratory and are certified RF safe and voltage safe up to 500V.



**Detonator Cartridge**

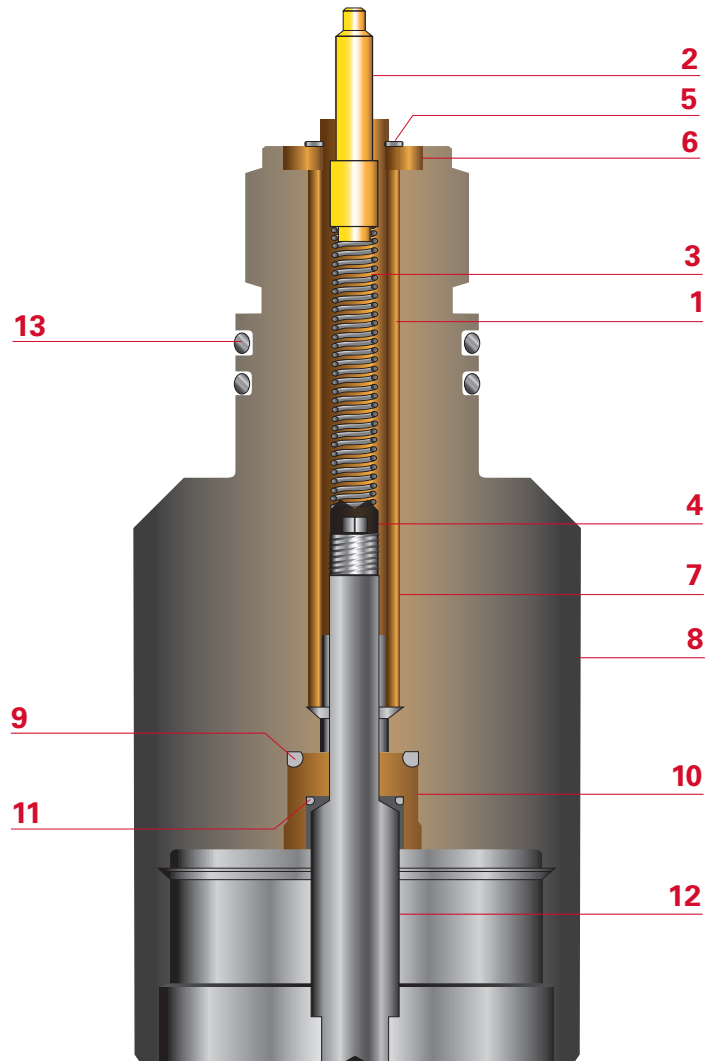


**Igniter Cartridge**

## TOP SUB ADAPTER – Direct Connect

Description	Part Number
Velocity 3½-in. Top Gun Firing Head Adapter	102941504
(1) Contact body	101965686
(2) Contact plunger	101965682
(3) Contact spring	101311658
(4) Set screw	101258671
(5) Support washer	101965683
(6) Insulator washer	101965684
(7) Insulator sleeve	101965685
(8) Cross over	102941470
(9) O-Ring, 95 Duro, AS 568-116	100000202
(10) Lower rod insulator	133928
(11) O-Ring, 95 Duro, AS 568-014	100010190
(12) Contact rod	102941467
(13) O-Ring, 95 Duro, AS 568-222 (2 req)	100000222

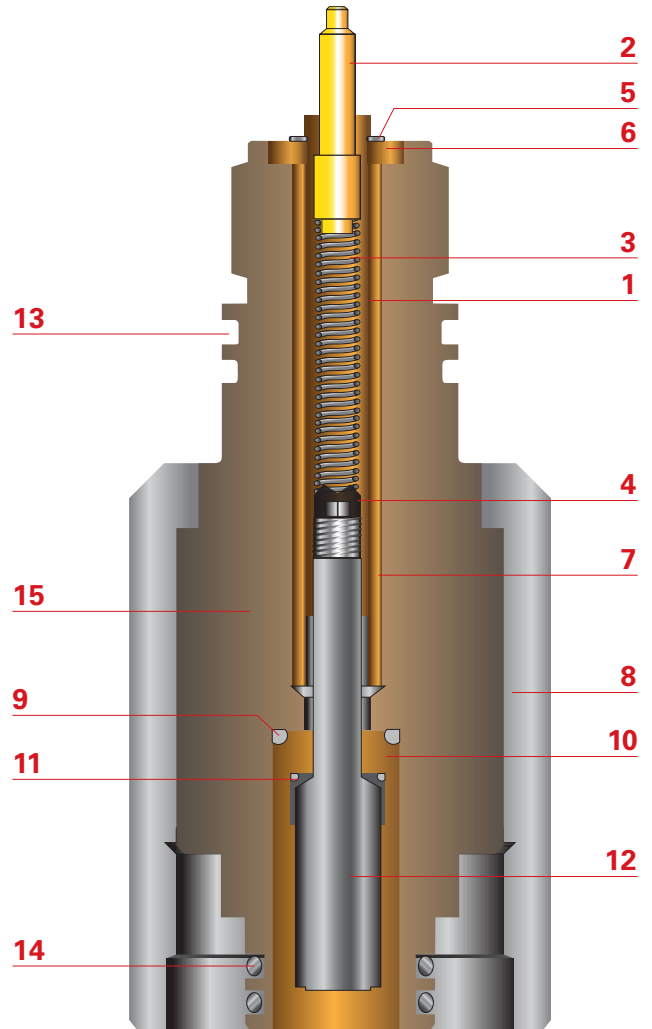
The Velocity Direct Connect is ideal for long gun strings as it eliminates high-bending moments on the neck of the quick change connections when picking up guns.





## SPIN COLLAR TOP SUB ADAPTER

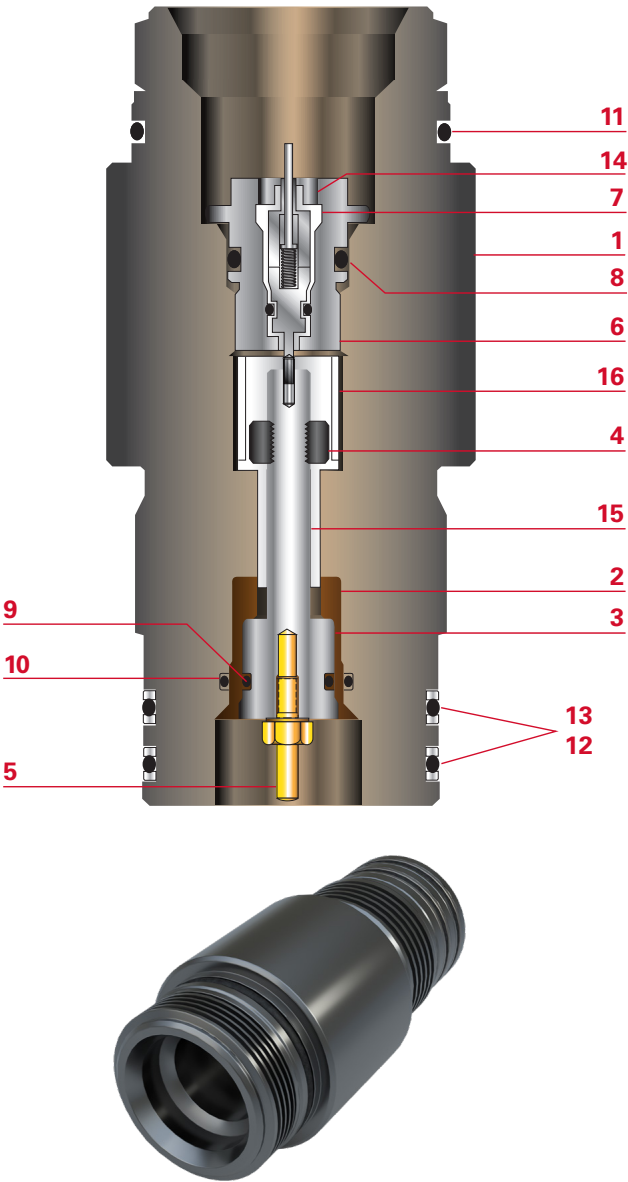
Description	Part Number
Velocity 3 1/8-in. Top Gun Firing Head Adapter	103100040
(1) Contact body	101965686
(2) Contact plunger	101965682
(3) Contact spring	101311658
(4) Set screw	101258671
(5) Support washer	101965683
(6) Insulator washer	101965684
(7) Insulator sleeve	101965685
(8) Cross over	102941470
(9) O-Ring, 95 Duro, AS 568-116	100000202
(10) Lower rod insulator	133928
(11) O-Ring, 95 Duro, AS 568-014	100010190
(12) Contact rod	102941467
(13) O-Ring, 95 Duro, AS 568-222 (2 req)	100000222
(14) O-Ring, 95 Duro, AS 568-218 (2 req)	100014636
(15) Cross over	103098907



PRESSURE ISOLATION SUB

Description	Part Number
Pressure Isolation Sub Assembly	102941472
(1) Cross Over	102941469
(2) Center Contact Insulator	102821696
(3) Center Contact Feedthru	102929446
(4) 3⁄8-in. HEX Nut	101869515
(5) Center Contact Rod	102780640
(6) Electrical Housing Nut	102942792
(7) Bulkhead Feedthru	102904619
(8) O-Ring, 94 Duro, AS 568-211	100064828
(9) O-Ring, 95 Duro, AS 568-113	100000200
(10) O-Ring, 94 Duro, AS 568-120	100064796
(11) O-Ring, 95 Duro, AS 568-230	100000230
(12) O-Ring, 94 Duro, AS 568-229	100012312
(13) Back Up O-Ring (4 req)	100157443
(14) Retainer Nut	102910078
(15) Isolation Washer	102819356
(16) Isolation Insert	102943110

The pressure isolation sub provides an effective barrier between the guns and setting tool and removes the need for a quick change.



SETTING TOOL FIRING HEAD ADAPTERS

Description	Part No.
3½-in. Shorty setting tool adapter	102805079
2½-in. Shorty setting tool adapter	102832083
Baker 20 Setting tool adapter	102806346
Baker 10 Setting tool adapter	102801430
3¾-in. Compact setting tool adapter	102807810

Velocity perforating guns are compatible with most setting tools, including high-power disposable setting tools.





## RECOMMENDED PERFORATING CHARGES

Gun O.D. (in.)	Target Casing	Avg. EHD (in.)	EHV	QC Pen. (in.)	Charge Name	Part Number	Explosive Load	Explosive Type
2.75	4.5 in. 13.5#	0.35	2.40%	22.5	150-MaxForce-FRAC RDX	102745134	15 g	RDX
		0.35	2.40%	23.7	150-MaxForce-FRAC HMX	102740045	15 g	HMX
3.125	4.5 in. 11.6#	0.46	4.70%	14.4	210-MaxForce-FRAC RDX	102045430	21 g	RDX
		0.49	5.80%	17.8	210-MaxForce-FRAC HMX	102127122	21 g	HMX
	4.5 in. 13.5#	0.32	2.80%	22.6	FracJet 453532	103097018	21 g	RDX
		0.41	2.30%	31.6	230-MaxForce-FRAC RDX	102736069	23 g	RDX
		0.42	3.00%	36.2	230-MaxForce-FRAC HMX	102732983	23 g	HMX
		0.47	4.00%	17.8	FracJet 453547	102771488	21 g	PETN
	5 in. 18#	0.32	6.70%	21.3	FracJet 501832	103092925	18 g	RDX
		0.34	3.10%	24.8	FracJet 501834	103097742	21 g	RDX
		0.39	11.90%	23.5	FracJet 501839	103002358	21 g	RDX
		0.38	4.80%	31.6	230-MaxForce-FRAC RDX	102736069	23 g	RDX
		0.43	8.90%	14.4	210-MaxForce-FRAC RDX	102045430	21 g	RDX
	5.5 in. 20#	0.32	3.50%	22.6	FracJet 552032	103097018	21 g	RDX
		0.34	4.40%	21.3	FracJet 552034	103092925	18 g	RDX
		0.35	2.55%	23.5	FracJet 552035	103002358	21 g	RDX
		0.39	8.90%	31.6	230-MaxForce-FRAC RDX	102736069	23 g	RDX
		0.40	14.20%	14.4	210-MaxForce-FRAC RDX	102045430	21 g	RDX
		0.40	7.10%	36.2	230-MaxForce-FRAC HMX	102732983	23 g	HMX
	5.5 in. 23#	0.42	13.20%	17.8	210-MaxForce-FRAC HMX	102127122	21 g	HMX
		0.32	6.30%	22.6	FracJet 552032	103097018	21 g	RDX
		0.35	3.37%	23.5	FracJet 552335	103002358	21 g	RDX
		0.36	5.30%	25.5	FracJet 552336	103002357	21 g	HMX
		0.39	10.80%	17.8	FracJet 552339	102771488	21 g	PETN
		0.40	5.90%	31.6	230-MaxForce-FRAC RDX	102736069	23 g	RDX
		0.42	3.80%	36.2	230-MaxForce-FRAC HMX	102732983	23 g	HMX
		0.43	11.70%	14.4	210-MaxForce-FRAC RDX	102045430	21 g	RDX
	6 in. 25#	0.45	13.80%	17.8	210-MaxForce-FRAC HMX	102127122	21 g	HMX
		0.36	17.40%	36.2	230-MaxForce-FRAC HMX	102732983	23 g	HMX
3.375	5.5 in. 17#	0.43	13.10%	14.4	210-MaxForce-FRAC RDX	102045430	21 g	RDX
		0.45	11.70%	17.8	210-MaxForce-FRAC HMX	102127122	21 g	HMX
	5.5 in. 23#	0.40	3.50%	31.6	230-MaxForce-FRAC RDX	102736069	23 g	RDX
		0.40	4.30%	36.2	230-MaxForce-FRAC HMX	102732983	23 g	HMX
		0.42	11.24%	17.8	FracJet 552342	102771488	21 g	PETN

## VELOCITY™ REVOLVE™ SHAPED CHARGES

Gun O.D. (in.)	Target Casing	Avg. EHD (in.)	EHV	QC Pen. (in.)	Charge Name	Part Number	Explosive Load	Explosive Type
3.125 in.	5.5 in. 23#	0.38	4.50%	26.2	FracJet 2103-S	103108333	21 g	RDX
		0.41	9.40%	27.3	FracJet 2300-S	102986369	23 g	HMX
		0.44	13.40%	20.0	FracJet 2100-S	103110311	21 g	RDX

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# FINAL ASSEMBLY

Velocity Perforating Guns provide up to 16 in. less makeup length (MUL) per carrier, allowing more guns to be run in the same footprint as standard guns.

Number of V3-120 Guns	Make-up Length	
	in.	ft
2	41.7	3.48
4	68.94	5.745
6	96.12	8.01
8	123.3	10.275
10	150.48	12.54
12	177.66	14.805
14	204.84	17.07
16	232.2	19.35
18	259.2	21.6
20	286.32	23.86



The Velocity ISO Sub connects directly to the setting tool firing head, eliminating the bottom quick change.

**Top Sub Assembly**  
**Direct Connect** \_\_\_\_\_  
(10941504)

**60 Degree Phase, 2.00 Spacing,**  
**6 Shot Loaded** \_\_\_\_\_  
(102957396)

**90 Degree Phase, 3.00 Spacing,**  
**4 Shot Loaded** \_\_\_\_\_  
(102957397)

**Detonator Insert Assembly**  
(102895443) \_\_\_\_\_

**120 Degree Phase, 2.00 Spacing,**  
**3 Shot Loaded** \_\_\_\_\_  
(102957398)

**Pressure Isolation Sub**  
(102941472) \_\_\_\_\_

**Igniter Insert Assembly**  
(102751633) \_\_\_\_\_

**Setting Tool Firing Head**  
**3-1/2 Shorty** \_\_\_\_\_  
(102805079)

**Power Charge**  
(102805079) \_\_\_\_\_

**3-1/2 Shorty**  
(101974666) \_\_\_\_\_



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