

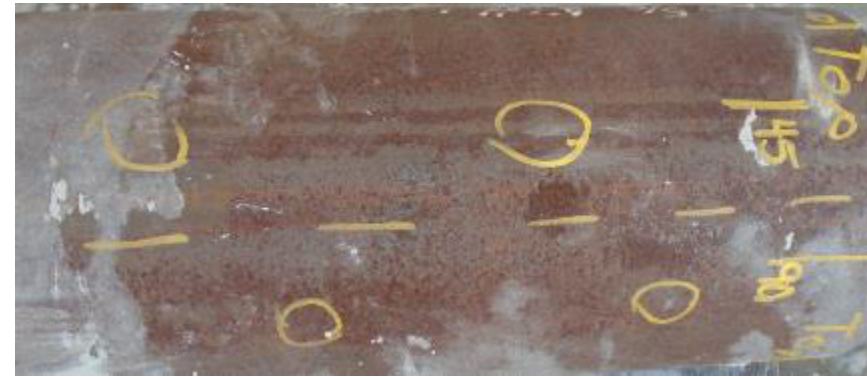
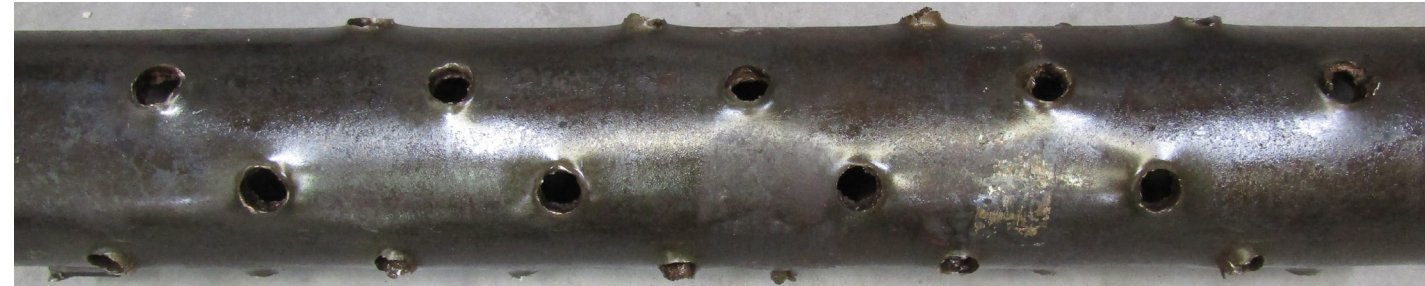
KnockOut 360

The KnockOut 360 Test Regimen

Knockout 360 charges were developed using actual standard API oilfield casings. Targets were constructed with primary and secondary casings at various standoffs with fluid between the casings. Various casing weights were tested to ensure effective perforations were produced in the primary casing with minimal collateral damage on the secondary casing.

Testing Regimen

	Internal Casing	External Casing	Gun Position	Casing Position	Annulus Material
1	Lowest Weight	Lowest Weight	Centralized -0.50"	Decentralized +0.50"	Fluid
2	Highest Weight	Lowest Weight	Centralized -0.50"	Decentralized +0.50"	Fluid
3	Lowest Weight	Lowest Weight	Centralized -0.00"	Decentralized +0.00"	Fluid

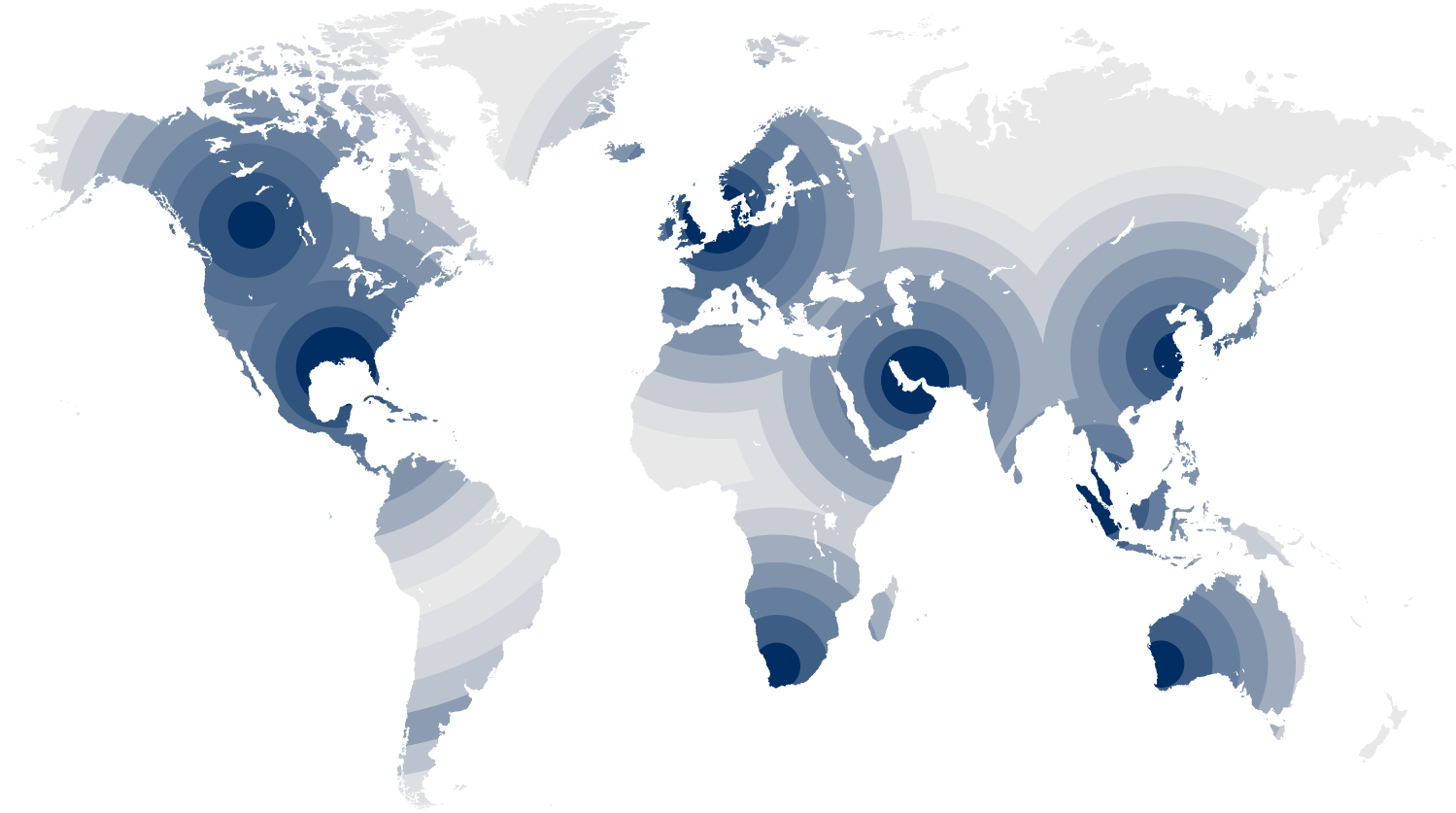


Proprietary Technology

Hunting develops innovative technology that improves the way oil and gas are extracted, with a full range of applications below the wellhead including mud motors, premium connections, well perforating, logging and intervention tools.

Geographic Footprint

Manufacturing and distribution locations are strategically located in the key energy producing regions of the world.



Further Information

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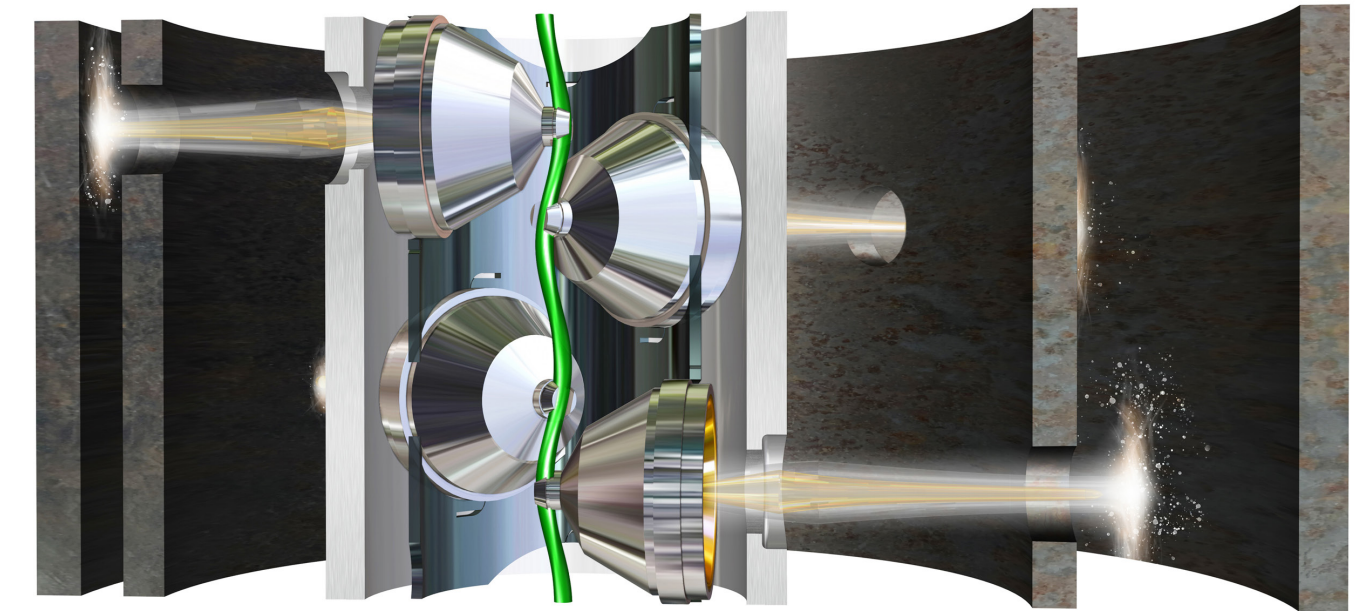
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'Excellence in Energy Services for over 100 years'

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KnockOut 360



Ideal for plug and abandon (P&A) applications

Knockout 360 Shaped Charges and Perforating System

KnockOut 360

For 5-1/8" Perforating Systems

Hunting's KnockOut 360 is the ideal circulating shaped charge line for plug and abandon (P&A) applications.

Hunting's KnockOut 360 charges perforate 360° of the primary casing while maintaining consistent hole diameter, leaving the secondary casing with minimal controlled damage regardless of primary to secondary casing orientation. The Knockout 360 perforating system increases open flow area in casing to improve cement placement and assist in plugging the well.

Features

- High shot density, 360° perforation coverage
- Limited penetration perforations
- Large and consistent hole sizes
- Utilized in 5-1/8" conventional guns

Benefits

- More effective communication with annulus compared to 0/180° systems
- Minimal collateral impact on secondary casing
- Increased flow area, providing optimal cleaning and placement of cement
- Ideal for P&A applications

Gun Specifications

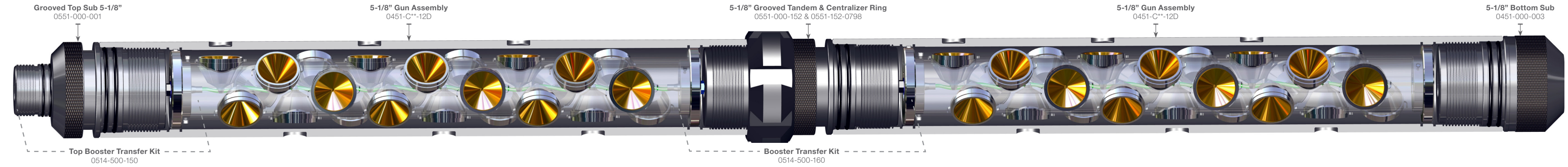
MECHANICAL	
Nominal O.D. (in)[mm]	5-1/8 [130]
Nominal Thickness (in)[mm]	0.44 [11.2]
Typical Gun Swell (in)[mm]	5.33 [135]
Ambient Liquid Conditions REF. 6/60	
Min. I.D. Running Restriction (in)[mm]	5.68 [144]
Drift Gauge O.D. for Gun Body I.D. (in)[mm] using Gauge Length 12in [305]	4.19 [106]
Min. Washover Pipe Clearance: Casing Drift I.D. to Nominal Washover O.D. Washover Drift I.D. to Nominal Gun O.D.	0.38 [10] 0.31 [8]
Min. Detonating Cord Velocity (ft/s)[m/s] 6/60	24,750 [7,500]
Upper & Lower Head Connection	4-1/2" - 6 Acme
Max. Tension (lbf) [kN]	500,000 [2,224]

ENVIRONMENTAL

Temperature Rating (°F)[°C]	325 [163]
Pressure Rating (psi)[MPa]	12 SPF 17,000 [117]

HARDWARE & ASSOCIATED ITEMS	PART NUMBER
	5-1/8" OD
Grooved Top Sub	0551-000-001
Grooved Tandem	0551-000-152
Centralizer Ring	0551-152-0556 0551-152-0798
Top Booster Transfer Kit	0514-500-150
Booster Transfer Kit	0514-500-160
Booster HMX Bi-Directional	BOOSTER-HMX-600-T
Detonating Cord 80 g. (RDX LS XHV)	CORD-80RDX-LS-XHV-T CORD-80RDX-LS-XHV-AIR-T

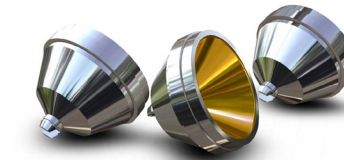
Knockout 360 Shaped Charges and Perforating System



KnockOut 360 Shaped Charges

Gun O.D. (in)[mm]	Charge Part Number	Shot Density (spf)[spm]	Phase	Casing Size (in)[mm]	Casing Weight (lbs/ft)[kg/m]	Flow Area Per Length (in²/ft)[cm²/m]	Average Entry Hole (in)[mm]	Max Depth in Outer Casing (in)[mm]	Gun Position
5-1/8 [130]	CIR-5131-3C501	12 [39]	360°	7 [177.8]	29-32# [43.16-47.62]	9.81 [205.5]	1.02 [25.90]	0.08 [2.03]	Centralized
	CIR-5131-3C502	12 [39]	360°	9-5/8 [244.5]	47-53.5# [69.94-79.62]	5.02 [105.3]	0.73 [18.54]	0.10 [2.54]	Centralized
2	CIR-2107-4T381	6 [34.5]	60°	2-7/8 [73.0]	6.4# [9.52]	1.81 [67.2]	0.62 [15.75]	0.145 [3.68]	Decentralized
	CIR-2107-4C631	6 [34.5]	60°	3-1/2 [88.9]	9.3# [13.84]	0.75 [28.0]	0.40 [10.16]	0.125 [3.18]	Decentralized

Refer to gun systems catalog for 2 inch perforating systems
*Reference testing regimen on outer cover

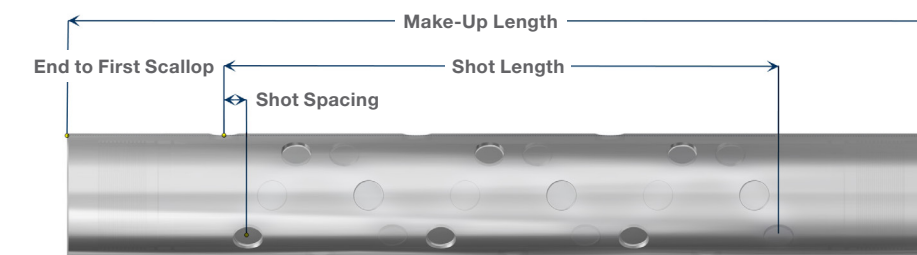


Gun Specifications 5-1/8" [130 mm] Continued

Shot Density	Shots	Phase	Part Number	Make-up Length (in)[mm]	Shot Length (in)[mm]	Weight Unloaded (lb)[kg]
12 SPF [39 SPM]	72	135°	0451-C07-12D	84.00 [2133]	71.00 [1803]	29.0 lb per ft [13.2]
	120		0451-C11-12D	132.00 [3353]	119.00 [3023]	
	168		0451-C15-12D	180.00 [4572]	167.00 [4242]	
	240		0451-C21-12D	252.00 [6401]	239.00 [6071]	

Shot Density	Vertical Shot Spacing (in)[mm]
12 SPF [39 SPM]	1.0 [25.4]

Gun End to First Scallop (in)[mm]
6.5 [165]



KnockOut 360 - Associated Hardware and Shaped Charges

Centralized 5-1/8" Knockout 360 System

