



CHARGE PERFORMANCE DATA

Featuring MILLENNIUM™, MIRAGE® & MaxForce™ Shaped Charges



Quality, Health, Safety, Sustainability

Jet Research Center originated and introduced jet perforating to the energy industry, forever changing the way oil and gas are produced.

And what made JRC the leader in perforating technology then, continues today at JRC's Explosive Products Center.

Located on more than 800 acres (3.25 km²) near Fort Worth, Texas, JRC's Explosive Products Center is a fully integrated research, engineering, testing, and manufacturing plant that produces advanced perforating systems and specialty explosive devices for the oilfield, including shaped charge perforators, RF-safe detonators, tubing and casing cutters, and drill collar severing tools.

In its endeavor to manufacture world-class perforating tools, JRC uses the "Six Star" Management System to coordinate common goals for its Quality, Health, Safety and Environmental (QHSE) programs. This includes ISO 9001, ISO 14001, OHSAS 18001 and ISO RC14001.

Through its achievements in QHSE, JRC became the first organization anywhere in the world to earn all four certifications at a single time.

Our commitment to Quality, Health, Safety and Environment is embedded into every JRC product and sustains the trust our customers have placed in our hands for more than 50 years.

PERFORATING CHARGE PERFORMANCE CHART



GUN SIZE	PHASING	SHOTS PER FOOT	SHOTS PER METER	JRC P/N	CHARGE NAME	Explosive Load (Grams)	Case Material	Casing Size (in.)	Target Strength (psi)	EHD (in.)	EHD (mm.)	Total Target Penetration (in.)	Total Target Penetration (mm.)	Penetration Normalized to 5000 psi (5% per 1000) (in.)	Penetration Normalized to 5000 psi (5% per 1000) (mm.)	Data Type
CAPSULE GUNS																
1-11/16"	0	4	13	100005450	1-11/16" Dyna Star RDX DP	13.4	Steel	4-1/2"	5149	0.39	9.9	10.50	266.7	10.58	268.7	19B
1-11/16"	0	4	13	100005450	1-11/16" Dyna Star RDX DP	13.4	Steel	4-1/2"	5909	0.40	10.2	12.46	316.5	13.03	331	QC
1-11/16"	0	6	20	101398891	1-11/16" MILLENNIUM Dyna Star HMX	8	Steel	4-1/2"	5426	0.29	7.4	24.00	609.6	24.51	622.6	QC
1-11/16"	0	8	26	101602484	1-11/16" MILLENNIUM II Deep Star HMX	8	Steel	4-1/2"	6100	0.30	7.6	17.00	431.8	17.94	455.7	QC
1-11/16"	0	8	26	101521848	1-11/16" MaxForce Deep Star HMX	8	Steel	4-1/2"	7170	0.27	6.9	19.90	505.5	22.06	560.3	19B
2-1/8"	0	4,5,6,8	13,16,20,26	101210198	2-1/8" MILLENNIUM Deep Star HMX	15.9	Steel	5-1/2"	5189	0.35	8.9	30.70	779.8	30.99	787.1	RP43
2-1/8"	0	4,5,6,8	13,16,20,26	101210198	2-1/8" MILLENNIUM Deep Star HMX	15.9	Steel	5-1/2"	5435	0.40	10.2	30.60	777.2	31.27	794.3	QC
2-1/8"	0	6	20	101383082	2-1/8" MILLENNIUM Dyna Star HMX	15.9	Steel	5-1/2"	5633	0.39	9.9	29.07	738.4	29.99	761.7	QC
2-1/8"	0	6	20	100005448	2-1/8" Dyna Star RDX DP	15.5	Steel	5-1/2"	5538	0.42	10.7	16.61	421.9	17.06	433.3	RP43
2-1/8"	0	4	13	100005448	2-1/8" Dyna Star RDX DP	15.5	Steel	5-1/2"	5292	0.35	8.9	15.50	393.7	17.25	438.2	19B
2-1/8"	0 +/- 45	6	20	100009448	2-1/8" Deep Star HMX Tri-Phase DP	15	Steel	5-1/2"	6325	0.29	7.4	18.84	478.5	20.09	510.3	RP43
2-1/8"	90	4	13	101210198	2-1/8" MILLENNIUM Deep Star HMX DP	15.9	Steel	5-1/2"	5820	0.31	7.9	20.60	523.2	21.44	544.6	19B
2-1/8"	0/45/90	5.8	19	101210198	2-1/8" MILLENNIUM Deep Star HMX - PENTAPHASE Oscillating Spiral	15.9	Steel	5-1/2"	6740	0.30	7.6	20.60	523.2	22.39	568.7	19B
PORTED GUNS																
3-1/8"	90	4	13	101410556	3-1/8" GSC RDX DP	12	Steel	4-1/2"	5500	0.34	8.6	20.90	530.9	21.42	544.1	QC
4"	90		0	101288857	4" MILLENNIUM EXPRESS GSC RDX	19.5	Steel	5-1/2"	5600	0.51	13.0	27.18	690.4	27.95	709.9	QC
SLICKWALL GUNS																
3-1/8"	60/90	4,6	13,20	101618994	3-1/8" MILLENNIUM Express IS SDP RDX	21	Steel	4-1/2"	5745	0.38	9.7	37.90	962.66	39.31	998.5	QC
3-1/8"	60/90	4,6	13,20	101366678	3-1/8" MILLENNIUM IS HMX	21	Steel	4-1/2"	6200	0.40	10.2	38.30	972.8	40.60	1031.2	QC
3-1/8"	90	4	13	101204537	4" Basic MILLENNIUM EXPRESS RDX	19.5	Steel	5-1/2"	6277	0.50	12.7	16.65	422.9	17.71	449.8	QC

- Charge performance will vary due to well conditions.
- For wellbore condition simulation, please contact JRC for testing in our API Section IV "Perforation Flow Lab"
- Penetration Normalization is not certified by API for 19B.
- RP43 testing is no longer endorsed by API and will not be available on new or improved JRC Charges.

¹ Registered 19B data except fired in 7-5/8" 47# P110 Casing
² Registered 19B data except fired in 9-5/8" 71# N-80 Casing
³ Registered 19B data except fired in air instead of fluid

"IS" = Industry Standard design
 "BH" = Big Hole
 "LD" = Low Debris
 "SH" = Super Hole

PERFORATING CHARGE PERFORMANCE CHART



GUN SIZE	PHASING	SHOTS PER FOOT	SHOTS PER METER	JRC P/N	CHARGE NAME	Explosive Load (Grams)	Case Material	Casing Size (in.)	Target Strength (psi)	EHD (in.)	EHD (mm.)	Total Target Penetration (in.)	Total Target Penetration (mm.)	Penetration Normalized to 5000 psi (5% per 1000) (in.)	Penetration Normalized to 5000 psi (5% per 1000) (mm.)	Data Type	
					SCALLOPED GUNS												
1-9/16"	0	4	13	100157028	1-9/16" MILLENNIUM IS HMX	3.4	Steel	4-1/2"	5967	0.21	5.3	11.34	288	11.89	302	RP43	
1-9/16"	60	6	20	100157028	1-9/16" MILLENNIUM IS HMX	3.4	Steel	2-7/8"	6949	0.23	5.8	8.30	210.8	9.11	231.4	19B	
2"	60	6	20	101208224	2" MILLENNIUM HMX	6.8	Steel	3-1/2"	6470	0.26	6.6	19.20	487.7	20.61	523.5	RP43	
2"	60	6	20	101208224	2" MILLENNIUM IS HMX	6.8	Steel	2-7/8"	6019	0.22	5.6	18.30	464.8	19.23	488.4	19B	
2"	60	6	20	101603801	2" MaxForce IS HMX	7	Steel	2-7/8"	5697	0.24	6.1	20.30	515.6	21.01	533.7	19B	
2"	0	6	20	101206246	2"-HMX BH	6.8	Steel	3-1/2"	6418	0.39	9.9	4.83	122.7	5.17	131.3	RP43	
2"	60	6	20	101206246	2" IS-HMX BH	6.8	Steel	3-1/2"	7332	0.48	12.2	3.00	76.2	3.35	85.1	19B	
2-3/8"	60	6	20	101590845	2-3/8" MaxForce IS HMX	10	Steel	3-1/2"	5663	0.28	7.1	19.90	505.5	20.56	522.2	19B	
2"	0	6	20	100157018	2" Sidewinder II HNS DP	6.9	Steel	4-1/2"	5960	0.23	5.8	11.80	299.7	12.37	314.2	QC	
2-1/2"	60	6	20	101418095	2 1/2" MILLENNIUM II IS HMX	11.1	Steel	3-1/2"	5996	0.32	8.1	24.50	622.3	25.72	653.3	19B	
2-1/2"	60	6	20	101206251	2-1/2" MILLENNIUM HMX	11	Steel	3-1/2"	5854	0.32	8.1	26.50	673.1	27.63	701.8	RP43	
2-1/2"	60	6	20	101244923	2-1/2" HNS DP	11.1	Steel	3-1/2"	7128	0.26	6.6	12.60	320	13.94	354.1	19B	
2-3/4"	60	6	20	101233817	2-3/4" MILLENNIUM HMX	15	Steel	4-1/2"	6093	0.32	8.1	26.40	670.6	27.84	707.1	RP43	
2-3/4"	60	6	20	101233817	2-3/4" MILLENNIUM HMX	15	Steel	4-1/2"	6394	0.30	7.6	26.00	660.4	27.81	706.4	19B	
2-3/4"	60	6	20	101318485	2-3/4" MILLENNIUM HNS	15.1	Steel	4-1/2"	5694	0.30	7.6	27.55	699.8	28.51	724.2	QC	
2-3/4"	60	6	20	101206793	2-3/4" RDX BH	14.7	Steel	4-1/2"	6109	0.67	17.0	5.50	139.7	5.80	147.3	RP43	
2-3/4"	60	6	20	101270158	2-3/4" HMX BH	15	Steel	4-1/2"	7381	0.65	16.5	4.20	106.7	4.7	119.4	19B	
2-7/8"	60	6	20	101233817	2-3/4" MILLENNIUM HMX (Hvy Wall Gun)	15	Steel	4-1/2"	6388	0.31	7.9	27.30	693.4	29.19	741.4	19B	
2-7/8"	60	6	20	101233817	2-3/4" MILLENNIUM HMX (Hvy Wall Gun)	15	Steel	4-1/2"	5124	0.35	8.9	30.00	762	30.19	766.8	19B ³	
2-7/8"	60	6	20	101388406	2-7/8" MILLENNIUM HMX	17.5	Steel	4-1/2"	6522	0.38	9.7	26.63	676.4	28.6	726.4	QC	
2-7/8"	60	6	20	101388407	2-7/8" MILLENNIUM HNS	18.5	Steel	4-1/2"	6859	0.28	7.1	22.80	579.1	24.92	633	19B	
3-1/8"	60	6	20	101366678	3-1/8" MILLENNIUM IS HMX SDP	21	Steel	4-1/2"	6200	0.40	10.2	38.30	972.8	40.60	1031.2	QC	
3-1/8"	60	6	20	101618998	3-1/8" MILLENNIUM Express IS DP RDX	21	Steel	4-1/2"	5324	0.42	10.7	27.90	708.7	28.35	720.1	QC	
3-1/8"	135/45	10	33	101351605	3-1/8" MIRAGE HMX BH/LD	14	Zinc	5"	6100	0.64	16.3	3.80	96.5	4.01	101.9	QC	
3-3/8"	60	6	20	101233819	3-3/8" MILLENNIUM HMX	25	Steel	4-1/2"	6215	0.48	12.2	40.40	1026.2	42.85	1088.4	RP43	
3-3/8"	60	6	20	101233819	3-3/8" MILLENNIUM HMX	25	Steel	4-1/2"	5754	0.45	11.4	37.50	952.5	38.91	988.3	19B	
3-3/8"	60	6	20	101600039	3-3/8" MILLENNIUM Express IS RDX DP	23	Steel	4-1/2"	5704	0.42	10.7	25.60	650.2	26.5	673.1	QC	
3-3/8"	60	6	20	101589595	3-3/8" MILLENNIUM Express IS RDX SDP	23	Steel	4-1/2"	5219	0.39	9.9	43.00	1092.2	43.5	1104.9	QC	
3-3/8"	60	6	20	101365876	3-3/8" MILLENNIUM HNS	25	Steel	4-1/2"	6578	0.31	7.9	22.10	561.3	23.84	605.5	19B	
3-3/8"	60	6	20	101293450	3-3/8" RDX SUPER DP/LD	24	Zinc	4-1/2"	5602	0.38	9.7	27.00	685.8	27.81	706.4	QC	
3-3/8"	60	6	20	100008249	3-3/8" HMX SUPER DP	25	Steel	4-1/2"	6127	0.42	10.7	27.87	707.9	29.44	747.8	RP43	
3-3/8"	60	6	20	100008249	3-3/8" HMX SUPER DP	25	Steel	4-1/2"	5967	0.40	10.2	26.20	665.5	27.47	697.7	19B	
3-3/8"	60	6	20	100008249	3-3/8" HMX SUPER DP	25	Steel	5"	6097	0.40	10.2	28.70	729	30.27	768.9	RP43	
3-3/8"	135/45	12	39	101351605	3-3/8" MIRAGE HMX BH/LD	14	Zinc	5-1/2"	6100	0.63	16.0	4.15	105.4	4.01	101.9	QC	
3-3/8"	60	6	20	100005321	3-3/8" RDX BH	24	Steel	4-1/2"	6101	0.86	21.8	4.66	118.4	4.92	125	QC	
3-3/8"	150/30	12	39	100008251	3-3/8" OMNI RDX BH	14	Steel	5-1/2"	7802	0.62	15.7	5.33	135.4	6.08	154.4	RP43	
3-1/2"	135/45	12	39	101542642	3-1/2" MIRAGE HMX BH/LD	15	Zinc	5-1/2"	6100	0.65	16.5	4.20	106.7	4.43	112.5	QC	
4"	90	4	13	101355271	4" MILLENNIUM RDX	39	Steel	5-1/2"	6100	0.42	10.7	51.68	1312.7	54.52	1384.8	QC	
4"	90	4	13	101210636	4" MILLENNIUM HMX	39	Steel	5-1/2"	5490	0.39	9.9	44.60	1132.8	45.69	1160.5	RP43	
4"	90	4	13	101210636	4" MILLENNIUM HMX	39	Steel	5-1/2"	6365	0.38	9.7	43.40	1102.4	46.36	1177.5	19B	
4"	60	6	20	100005322	4-5/8" RDX DP	32	Steel	7"	5277	0.6	15.2	40.50	1028.7	41.06	1042.9	QC	
4-1/2"	60	5	16	101210636	4" MILLENNIUM HMX	39	Steel	7"	6775	0.37	9.4	39.60	1005.8	43.11	1095	19B	
4-1/2"	150/30	12	39	101210674	4-1/2" MILLENNIUM HMX	22.7	Steel	7"	8484	0.38	9.7	26.80	680.7	31.47	799.3	RP43	

PERFORATING CHARGE PERFORMANCE CHART



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					SCALLOPED GUNS												
4-5/8"	180	4	13	101446899	4-5/8" KleenZone G-FORCE HMX	39	Steel	7"	5208	0.36	9.1	42.80	1087.1	43.25	1098.6	19B	
4-5/8"	350/10	4	13	101446899	4-5/8" KleenZone G-FORCE HMX	39	Steel	7"	5412	0.35	8.9	41.70	1059.2	42.56	1081	19B	
4-5/8"	60	5	16	101210636	4" MILLENNIUM HMX	39	Steel	7"	5502	0.37	9.4	52.00	1320.8	53.31	1354.1	RP43	
4-5/8"	60	5	16	101210636	4" MILLENNIUM HMX	39	Steel	7"	5518	0.35	8.9	43.60	1107.4	44.73	1136.1	19B	
4-5/8"	60	5	16	101287306	4" HNS DP	39	Steel	7"	7559	0.33	8.4	31.20	792.5	35.19	893.8	19B	
4-5/8"	60	6	20	100005322	4-5/8" RDX DP	32	Steel	7"	5325	0.43	10.9	30.46	773.7	30.95	786.1	RP43	
4-5/8"	72	5	16	101702911	4-5/8" HMX MILLENNIUM II	39	Steel	7"	5319	0.40	10.2	53.10	1348.7	53.95	1370.3	19B	
4-5/8"	60	6	20	101332806	4-5/8" HNS DP	32	Steel	7"	5814	0.45	11.4	30.30	769.6	31.53	800.9	QC	
4-5/8"	150/30	12	39	101210674	4-1/2" MILLENNIUM HMX	22.7	Steel	7"	8484	0.38	9.7	26.80	680.7	31.47	799.3	RP43	
4-5/8"	150/30	12	39	101210674	4-1/2" MILLENNIUM HMX	22.7	Steel	7"	6322	0.38	9.7	24.40	619.8	26.01	660.7	19B	
4-5/8"	150/30	12	39	100005324	4-5/8" OMNI RDX DP	22.7	Steel	7"	9080	0.36	9.1	16.25	412.8	19.57	497.1	RP43	
4-5/8"	150/30	12	39	100014352	4-5/8" OMNI HMX DP	22.7	Steel	7"	9080	0.37	9.4	16.09	408.7	19.37	492	RP43	
4-5/8"	150/30	12	39	101343830	4-5/8" OMNI HNS DP	21.5	Steel	7"	5020	0.35	8.9	28.00	711.2	28.03	712	QC	
4-5/8"	150/30	12	39	100005340	4-5/8" OMNI HMX DP/LD	22.7	Zinc	7"	5685	0.30	7.6	18.37	466.6	19.00	482.6	RP43	
4-5/8"	150/30	12	39	100005319	4-5/8" OMNI RDX BH	25	Steel	7"	6840	0.74	18.8	6.41	162.8	7.00	177.8	RP43	
4-5/8"	150/30	12	39	100005326	4-5/8" OMNI RDX BH/LD	22.7	Zinc	7"	7346	0.65	16.5	5.51	140	6.16	156.5	RP43	
4-5/8"	150/30	12	39	100157006	4-5/8" HMX BH	25	Steel	7"	5723	0.75	19.1	7.02	178.3	7.27	184.7	QC	
4-5/8"	150/30	12	39	100005311	4-5/8" OMNI RDX SH	28	Steel	7"	6982	0.93	23.6	6.30	160	6.92	175.8	RP43	
4-5/8"	150/30	12	39	100156995	4-5/8" OMNI HMX SH	28	Steel	7"	5016	0.96	24.4	5.10	129.5	5.10	129.5	RP43	
4-5/8"	150/30	12	39	101228756	4-5/8" RDX SUPER HOLE/LD	28	Zinc	7"	5124	0.81	20.6	5.40	137.2	5.43	137.9	QC	
4-5/8"	150/30	12	39	101233690	4-5/8" HMX SUPER HOLE/LD	28	Zinc	7"	5622	0.85	21.6	5.30	134.6	5.46	138.7	RP43	
4-5/8"	135/45	18	59	100156990	4-5/8" RDX BH	20	Steel	7"	5553	0.73	18.5	6.18	157	6.35	161.3	RP43	
4-5/8"	180	4	13	101287306	4-5/8" HNS DP	39	Steel	7-5/8"	6349	0.29	7.4	30.20	767.1	32.24	818.9	19B	
4-3/4"	135	14	46	101787632	4-3/4" MIRAGE HMX BH	21	Zinc	7"	6506	0.71	18.0	5.90	149.9	6.34	161	19B	
5"	150/30	12	39	100005311	4-5/8" OMNI RDX SUPER HOLE	28	Steel	7"	5192	0.91	23.1	6.90	175.3	6.97	177	RP43	
5"	150/30	12	39	100005319	4-5/8" OMNI RDX BH	25	Steel	7"	6508	0.84	21.3	8.80	223.5	9.46	240.3	QC	
5"	150/30	12	39	100156995	4-5/8" OMNI HMX SUPER HOLE	28	Steel	7"	6487	1.00	25.4	6.00	152.4	6.45	163.8	QC	
5"	150/30	12	39	100005311	4-5/8" OMNI RDX SUPER HOLE	28	Steel	7-5/8"	7877	0.83	21.1	6.65	168.9	7.61	193.3	RP43	
5"	135	12	39	101307494	5" MIRAGE RDX SUPER HOLE/LD	32	Zinc	7-5/8"	6345	0.90	22.9	6.00	152.4	6.4	162.6	19B	
5"	120 Cluster	21	69	101292616	5" RDX BH	21	Steel	7-5/8"	5411	0.72	18.3	5.30	134.6	5.41	137.4	19B ¹	
5-1/8"	135	12	39	101307494	5" MIRAGE RDX SUPER HOLE/LD	32	Zinc	7-5/8"	5576	0.88	22.4	6.60	167.6	6.79	172.5	19B	
5-1/8"	120 Cluster	21	69	101292616	5-1/8" RDX BH	21	Steel	7-5/8"	6246	0.74	18.8	5.65	143.5	5.99	152.1	QC	
5-3/4"	60/120	18	59	101688614	5-3/4" MIRAGE RDX BH	28	Zinc	8-5/8"	6050	0.94	23.9	6.50	165.1	6.84	173.7	QC	
6-1/2"	135/45/138	12/14	39/46	101304878	6-1/2" MIRAGE RDX BH/LD	47	Zinc	8-5/8"	7043	1.07	27.2	5.60	142.2	6.17	156.7	19B	
6-1/2"	135/45/138	12/14	39/46	101304878	6-1/2" MIRAGE RDX BH/LD	47	Zinc	9-5/8"	5088	0.91	23.1	6.80	172.7	6.83	173.5	19B ²	
7"	135/45	12	39	101207997	7" MILLENNIUM HMX	39	Steel	9-5/8"	7006	0.36	9.1	43.30	1099.8	47.63	1209.8	RP43	
7"	135/45	12	39	101207997	7" MILLENNIUM HMX	39	Steel	9-5/8"	6397	0.42	10.7	38.70	983	41.4	1051.6	19B	
7"	138	12/14	39/46	101329124	6-1/2" MIRAGE HMX BH TWISTLOCK	47	Zinc	9-5/8"	5740	1.00	25.4	6.90	175.3	7.16	181.9	19B	
7"	135/45/138	12/14	39/46	101304878	6-1/2" MIRAGE RDX BH/LD	47	Zinc	9-5/8"	6178	1.07	27.2	6.10	154.9	6.46	164.1	19B	
7"	135/45/138	12/14	39/46	101213474	7" RDX SUPER HOLE	56.5	Steel	9-5/8"	5975	1.29	32.8	5.80	147.3	6.08	154.4	19B	
7"	135/45/138	14	46	101484232	7" MIRAGE RDX BH/LD	39	Zinc	9-5/8"	6270	1.04	26.4	6.30	160	6.7	170.2	19B	
7"	60/120	18	59	101711688	7" MIRAGE HMX BH	39	Zinc	9-7/8"	5950	1.03	26.2	7.64	194.1	8	203.2	QC	
7"	120	15	49	101716920	7" MIRAGE HMX BH	45	Zinc	9-5/8"	6262	0.85	21.6	4.80	121.9	5.1	129.5	19B	
7"	135/45/138	12/14	39/46	101228037	7" MIRAGE RDX SUPER HOLE	39	Zinc	9-5/8"	5746	1.03	26.2	4.70	119.4	4.88	124	19B	
7"	120	15	49	101716920	7" MIRAGE HMX BH	45	Zinc	9-5/8"	6262	0.85	21.6	4.80	121.9	5.1	129.5	19B	
7"	135/45/138	12/14	39/46	101228037	7" MIRAGE RDX SUPER HOLE	39	Zinc	9-5/8"	5746	1.03	26.2	4.70	119.4	4.88	124	19B	



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