

High-Strength Steel Grades

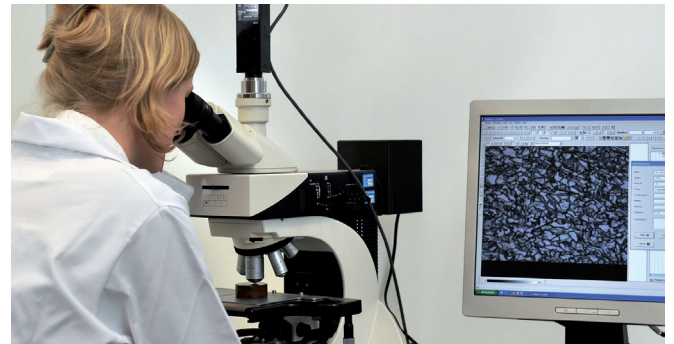
Designed to resist in the most extreme drilling conditions

VAM Drilling high-strength steel grades VM-140 DP, VM-150 DP and VM-165 DP are specially designed to perform in the most challenging drilling environments, like ultra-deep & extended reach wells, deep offshore or high temperature - high pressure conditions.

High-strength grades are used to reduce tube body wall thickness, which results in lighter drill pipe joints without any mechanical performance losses. This also improves hydraulic programs making it easier to reach drilling targets efficiently.

VAM Drilling guarantees the superior mechanical properties of its steel alloys through proprietary chemistry, strict quality procedures and true vertical integration – from steel making to drill pipe heat treatment, and dedicated manufacturing process controls.

Proprietary materials can be manufactured in standard API sizes as well as unique thin and thick wall configurations with different mechanical properties for each option. **VAM Drilling** encourages you to contact your closest **VAM Drilling** sales office to discuss engineering specific “fit-for-purpose” solutions.



VAM Drilling high-grade materials are characterized by:

● **Superior proprietary chemistry**

VAM Drilling high-strength steel grades have been developed in-house by VAM Drilling R&D facilities.

● **Precise manufacturing processes from steel making to heat treatment**

Through its truly vertically integration VAM Drilling ensures strict process controls and superior quality during the whole production process.

● **Improved tensile and torsional strengths**

VAM Drilling proprietary high-strength grades provide superior tensile and torsional strength compared to API grades.

● **Improved fracture toughness and hardness**

VAM Drilling high-strength steel grades provide improved fatigue resistance.

● **Lighter pipe bodies**

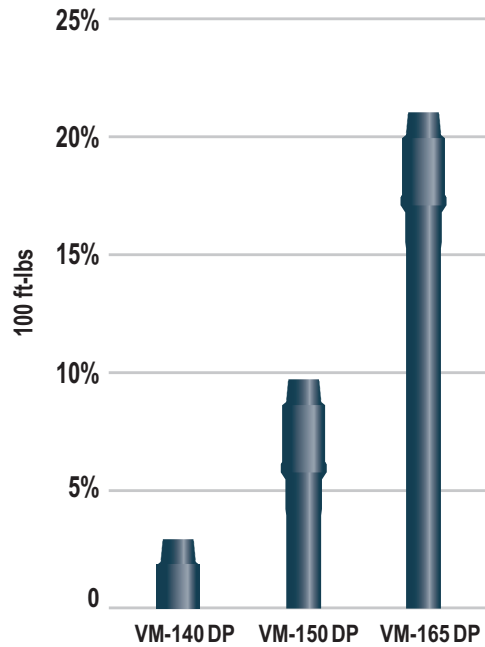
Using VAM Drilling proprietary high-strength grades allows reducing tube body wall thickness which results in lighter drill pipe joints without any mechanical performance losses.

Drill Pipe Configuration

	API	Proprietary
Grade	S-135	VM-165 DP
OD (in)	5	5
Wall Thickness (in)	0.362	0.300
ID (in)	4.276	4.400
Cross sectional area (in ²)	5.275	4.430
Connection	NC50	VX50
TJ OD (in)	6 5/8	6 5/8
TJ ID (in)	2 3/4	3 3/4
TJ Grade (ksi)	120	135
Assembly Approx Weight (lbs)	763	644
Tube tensile strength (lbs)	713,000	731,000
Tube torsional strength (ft-lbs)	74,100	77,900
Tube collapse pressure (psi)	15,700	11,000
Tube internal pressure (psi)	17,100	17,300
TJ tensile strength (lbs)	1,550,000	1,380,000
TJ torsional strength (ft-lbs)	63,400	87,000
Make-up torque (ft-lbs)	38,000	54,300

Tensile and Torsional Strength Improvement over S-135

(based on 5", 19.50 lbs/ft tube body)



Tensile and Toughness characteristics

Grade	Yield Strength (PSI) Min	Ultimate Strength (PSI) Min	Charpy Impact (ft-lbs) Average, 10x7.5 at -4°F
VM-140 DP	140,000	150,000	59
VM-150 DP	150,000	160,000	44
VM-165 DP	165,000	175,000	35