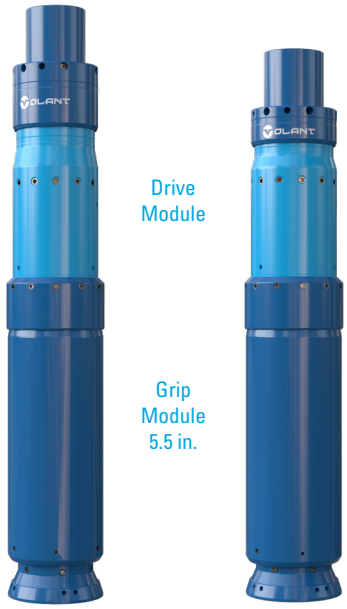
CRTe® External Grip Casing Running Tool

Volant's CRTe® casing running tool is fully mechanical and designed for casing running or drilling with top-drive equipped rigs to make up, break out, reciprocate, rotate, fill, circulate, and cement casing and liner strings, reducing non-productive time and associated costs. A simple rig-up and rig-down further increase operational efficiency.

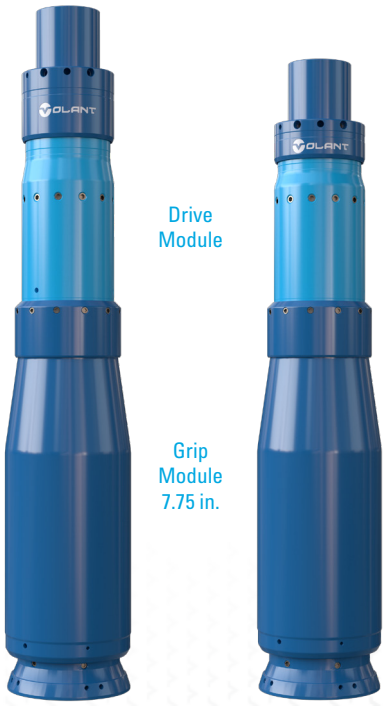
- The CRTe-1.0GM5.5 and CRTe-1.0GM7.75 models are both available in Float and Non-Float configurations. The Float configurations feature a longer top sleeve, which contains a float cushion for absorbing hoist loads.
- The ActiveSET™ release upgrade, which must be installed with the vCAM™ latch mechanism, streamlines tool activation to a single-step process. The vCAM provides a position-based latching function and enables disengagement of the tool by either setting down and rotating to the left or by setting down directly into the latch from the break-out position.
- All configurations are mechanically activated in tension and both rotational directions by top-drive control using patented TAWG™ torque activated wedge grip technology.

Starting from the bell diameter of the base tool, selectable sizes of jaws/dies are used to configure the CRTe tool to support gripping casing of decreasing external diameter.

CRTe-1.0 with Grip Module 5.5 in.
CRTe-1.0GM5.5



CRTe-1.0 with Grip Module 7.75 in.
CRTe-1.0GM7.75



Drive Module[1]

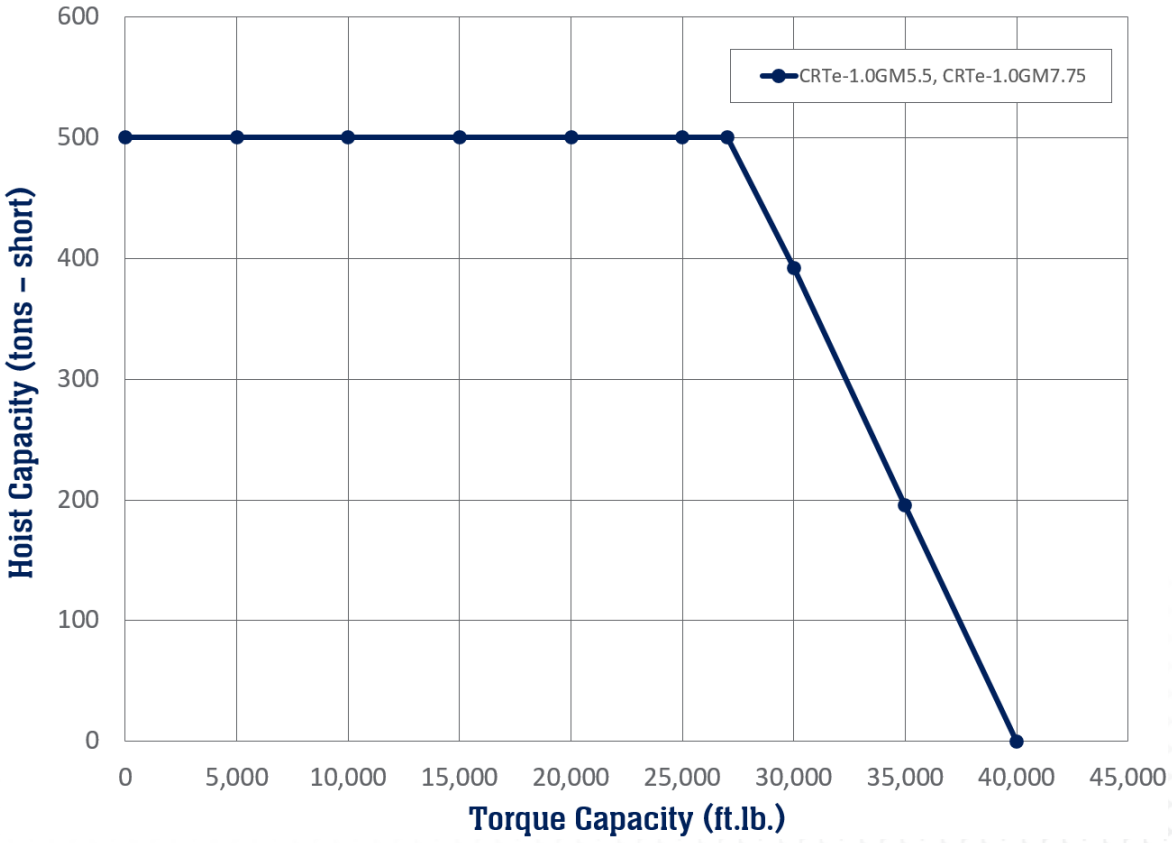
CRTe Rated Load Capacity	Hoist[2]	tn. (tonne)	500 (453)
	Torque	ft.lb. (N.m)	40,000 (54,200)
Set-down Load Capacity[3]		tn. (tonne)	200 (181)
Typical Circulation Pressure Limit[4,5]		psi (MPa)	5,000 (34.4)
Maximum Pressure End Load		tn. (tonne)	150 (136)
Maximum Pressure End Load with Retractable Stinger		tn. (tonne)	50 (45)
Float Length (Float Tool Only)		in. (mm)	6.0 (155)
Through Hole		in. (mm)	1.25 (31.5)
Maximum Flow Rate[6]		gpm (m^3/min.)	449 (1.70)
Maximum Rotational Speed[7]		RPM	Unlimited
Tool Joint			NC50
Turns to Stroke Out[8]			1.75

Configuration Characteristics[9]

		CRTe-1.0GM5.5		CRTe-1.0GM7.75	
		Float	Non-Float	Float	Non-Float
Overall Tool Length with Retractable Stinger	in. (mm)	87.6 (2,230)	75.6 (1,925)	95.5 (2,430)	83.5 (2,125)
Overall Tool Length with Fixed Mandrel Extension	in. (mm)	95.5 (2,430)	83.5 (2,125)	103.4 (2,630)	91.4 (2,325)
Min. Recommended Stump Height with Retractable Stinger	in. (mm)	42.0 (1,070)		46.0 (1,170)	
Min. Recommended Stump Height with Fixed Mandrel Extension	in. (mm)	50.0 (1,270)		56.0 (1,425)	
Maximum Tool Diameter	in. (mm)	13.7 (350)		16.3 (415)	
Approximate Tool Weight	lb. (kg)	1,900 (862)	1,750 (794)	2,400 (1,089)	2,200 (998)
Diametrical Stroke	in. (mm)	1.37 (34.5)		1.37 (34.5)	
Die Range	in. (mm)	3.50 (88.9) – 5.50 (139.7)		3.50 (88.9) – 7.63 (193.9)	

Combined Load Operation Curve

The graph below illustrates the full hoist and torque capabilities of the CRTe-1.0 tool. Please refer to the Base Tool Characteristics on page 1 of this Specification Summary for the numeric values for the rated hoist and torque capacities for the CRTe tool.



Tool Selection Guide

Step 1: Base Tool Selection

The CRTe is available in two configurations. The "Drive Module" and "Configuration Characteristics" tables contain the ratings and overall dimensions of the tool. The required hoist, torque, set-down load capacity, and maximum flow rate must be lower than or equal to the base tool rating. If combined hoist and torque is required for the casing running job, the combined hoist and torque point must fall below or on the combined load operation curve.

Step 2: Die Selection

Casing with a nominal pipe size below 5.50 in. (139.7 mm) can be used with the CRTe-1.0GM5.5, and casing with a nominal pipe size below 7.63 in. (193.8 mm) can be used with the CRTe-1.0GM7.75. Find the appropriate die for casing size and weight in the Die Sizes tables below. Some dies can run a range of casing weights.

Step 3: Die Hoist Capacity

CRTe tool hoist rating is based on API Specification 8C; however, casing load limit is further constrained by local interaction of slip dies with casing, which must not exceed the efficiency indicated for individual slip die sizes to avoid excess deformation. The slip to casing interaction hoist limit (F_{die}) can be found by the following formula where efficiency is the slip to pipe body load efficiency number (listed in the Die Sizes tables below for every die) and F_{casing} is the pipe body yield limit found in API TR 5C3.

F_{die} = efficiency x F_{casing}

For example, from API TR 5C3 the pipe body yield for 5.5 in. x 20.0 ppf L80 (139.7 mm x 29.76 kg/m L80) casing is 466,000 lb. (211.3 tonne). The slip efficiency for die 81813 used to run this casing is 80%. Therefore, the die hoist capacity is:

80% × 466,000 lb. = 372,800 lb. = 186.4 tn.

or

80% × 211.3 tonne = 169.0 tonne

Where the base tool hoist rating is lower than the calculated die torque hoist rating, the CRTe tool is limited to base tool hoist rating.

Step 4: Die Torque Capacity

A torque capacity limit is applied to prevent casing from yielding due to the radial load of applied torque. This limit is the Die to Casing Interaction Torque Capacity:

$T_{die} = K_{torque} \times W_{casing} \times \sigma Y_{casing}$

Where T_{die} is the Die to Casing Interaction Torque Capacity,
K_{torque} is the torque factor,
W_{casing} is the desired casing weight in ppf (kg/m), and
σY_{casing} is the casing yield strength in psi (MPa).

If no value is provided, CRTe tool rating will be limiting for all standard casing grades. For example, for die 81813 to run 5.5 in. x 20.0 ppf L80 (139.7 mm x 29.76 kg/m L80) casing, the die torque capacity is:

0.02812 ft.lb./psi/ppf × 20.0 ppf × 80,000 psi = 44,992 ft.lb.

or

3.716 N.m/MPa/(kg/m) × 29.76 kg/m × 551.6 MPa = 61,000 N.m

Where the base tool torque capacity is lower than the calculated die torque capacity, the CRTe tool is limited to base tool torque capacity.

Step 5: Effect of Circulation Pressure

CRTe tool hoist capacity must be reduced by the pressure end load during circulation. The pressure end load is calculated by taking the internal cross-sectional area of the casing bore and subtracting 2.0 in.² (representing the swept area of the bore seal) and multiplying the result by the circulating pressure.

$F_{EndPressure} = P \times (A_{casing} - 2.0)$

$F_{Hoist,Reduced} = F_{Hoist,Max.} - F_{EndPressure}$

Where $F_{EndPressure}$ is the amount the hoist must be reduced by due to pressure end load,
P is the circulation pressure,
A_{casing} is the nominal casing inner diameter cross-sectional area,
$F_{Hoist,Max.}$ is the max. rated hoist load of the CRTe tool, and
$F_{Hoist,Reduced}$ is the max. hoist capacity reduced by the pressure end load.

For example, for circulation pressure of 500 psi (3.45 MPa) and casing nominal ID of 4.778 in. (121.36 mm) the hoist reduction is:

$A_{casing} = \pi \times (4.778 \text{ in.} / 2)^2 = 17.93 \text{ in.}^2$

500 psi × (17.93 in.² – 2.0 in.²) = 7,965 lb. ~ 4.0 tn.

or

3.44 MPa × (11,568 mm² – 1,290 mm²) = 35,459 N ~ 3.6 tonne.

Therefore, the maximum hoist for the standard CRTe-1.0 tool reduces to 500.0 – 4.0 = 496.0 tn. (450.0 tonne) or the maximum hoist for die 81813 (in Step 3) must reduce to 186.4 – 4.0 = 182.4 tn. (165.4 tonne).

Please contact Volant for further information.

Summary of Selected Standard Die Sizes[10]

CRTe-1.0GM5.5

Die P/N	Nominal Pipe Size		Max. Coupling Diameter		Max. Coupling Length		Slip to Pipe Body Load Efficiency	Torque Factor (K_{torque})	
	in.	mm	in.	mm	in.	mm	% Fy	ft.lb./psi/ppf	N.m/MPa/(kg/m)
102965	3.50	88.9	4.64	117.5	13.5	345	80%	0.04007	5.294
82155	4.50	114.3	5.64	143.0	13.5	345	80%	0.03467	4.581
82408	5.00	127.0	6.16	156.0	13.5	345	80%	0.03081	4.071
81813	5.50	139.7	6.60	167.5	13.5	345	80%	0.02812	3.715

CRTe-1.0GM7.75

Die P/N	Nominal Pipe Size		Max. Coupling Diameter		Max. Coupling Length		Slip to Pipe Body Load Efficiency	Torque Factor (K_{torque})	
	in.	mm	in.	mm	in.	mm	% Fy	ft.lb./psi/ppf	N.m/MPa/(kg/m)
102965	3.50	88.9	4.93	125.0	13.5	345	80%	0.04007	5.294
82155	4.50	114.3	5.93	150.5	15.4	395	80%	0.03467	4.581
82408	5.00	127.0	6.42	163.0	15.4	395	80%	0.03081	4.071
81813	5.50	139.7	6.92	175.5	15.4	395	80%	0.02812	3.715
101730	6.00	152.4	7.29	185.0	15.4	395	80%	0.03060	4.043
101373	6.63	168.4	7.91	200.5	15.4	395	80%	0.02620	3.462
82854	7.00	177.8	8.19	208.0	15.4	395	80%	0.02577	3.405
81839	7.63	193.8	9.01	228.5	15.4	395	80%	0.02371	3.133

1. Characteristics are based on standard CRTe tool components and are independent of specific limitations of accessories such as dies.
2. Higher hoist ratings up to 550 tn. (500 tonne) are available upon special request.
3. Maximum allowable set-down load applied to the tool. Some set-down load may be reacted through the coupling. This rating does not consider bearing load limitations of the coupling.
4. CRTe circulation pressure capacity can be limited by packer cup pressure capacity and pressure end load. Pressure capacity may be less than indicated if alternative seal arrangements are used or if it surpasses the maximum allowable pressure end loads.
5. CRTe pressure end load depends on the type of casing seal arrangement. The result must not exceed the stated maximum pressure end loads.
6. Maximum flow rate is based on minimizing erosion rates when using typical fluids. Erosion rates may vary based on fluid contents. Please inspect CRTe tool bore regularly.
7. When rotating a casing/liner string during running/drilling operations, maximum rotational speeds are governed by top-drive or casing connection specific limits.
8. Turns to Stroke Out is the rotational limit during CRTe tool make-up. (This may be exceeded in combined load scenarios.)
9. Overall tool length and weight will vary depending on configuration used and casing seal arrangement.
10. Values given are valid for all pipe weights specified in API 5CT.