ActiveSET™ CRTi2-5.5

Specification Summary

ActiveSET™ CRTi® Internal Grip Casing Running Tool

Volant's ActiveSET™ CRTi® 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 ActiveSET™ release feature, which must be installed with the vCAM™ latch mechanism, streamlines tool activation to a single-step process, which eliminates the need to manage set-down load while simultaneously rotating to the right.
- The vCAM latch mechanism provides the CRTi2-5.5 tool with a position-based latching function and enables disengagement of the tool by both the familiar operation of setting down and rotating to the left or by setting down directly into the latch from the break-out position.
- New ActiveSET CRTi2-5.5 tools come with a High-Capacity Mandrel (CRTi2-5.5HC225), unless otherwise stated.
- The Slim Cage option enables all CRTi2-5.5 base tools to run 5.5 in. 23.0 ppf pipe sizes, while reducing the torque capacity to 20,000 ft.lb.
- 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 insertion diameter (cage OD) of the base tool, selectable sizes of integral jaws and dies are used to configure the CRTi tool to support gripping casing of increasing internal diameter. Through the use of a patented extended reach die structure, the gripping diameter can be further increased to include casing sizes much greater than that of the base tool.

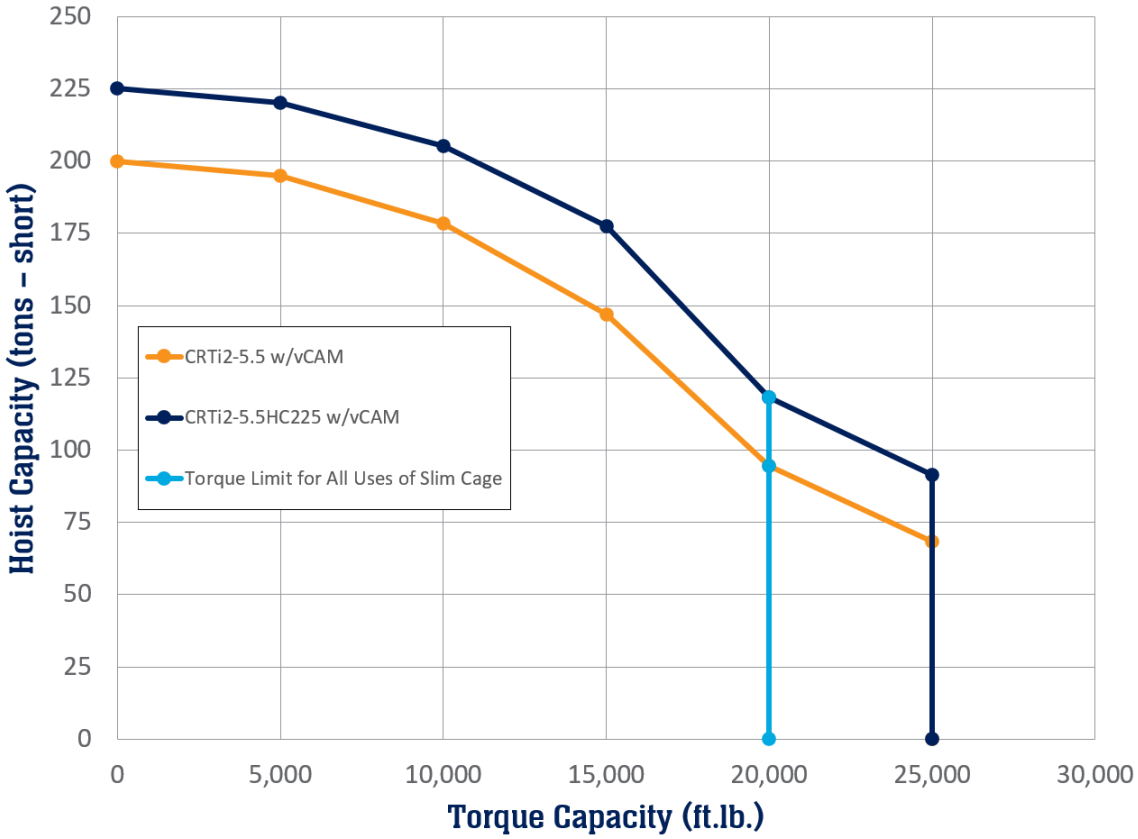
ActiveSET Base Tool Characteristics[1]			CRTi2-5.5	CRTi2-5.5HC225
CRTi Rated Load Capacity	Hoist	tn. (tonne)	200 (181)	225 (204)
	Torque	ft.lb. (N.m)	25,000 (33,800)	25,000 (33,800)
Set-Down Load Capacity[2]		tn. (tonne)	100 (90)	100 (90)
Typical Circulation Pressure Limit[3]		psi (MPa)	5,000 (34.4)	5,000 (34.4)
Maximum Pressure End Load		tn. (tonne)	125 (113)	125 (113)
Base Tool Length[4]		in. (mm)	50.5 (1,285)	50.5 (1,285)
Base Tool Weight[5]		lb. (kg)	758 (344)	758 (344)
Die Range		in. (mm)	5.5 (139.7) – 13.38 (339.7)	5.5 (139.7) – 13.38 (339.7)
Diametrical Stroke		in. (mm)	0.52 (13.0)	0.52 (13.0)
Through-Hole		in. (mm)	1.25 (32.0)	1.25 (32.0)
Maximum Flow Rate[6]		gpm (m^3/min.)	449 (1.70)	449 (1.70)
Maximum Rotational Speed[7]		RPM	Unlimited	Unlimited
Tool Joint			NC50	NC50
Turns to Stroke Out[8]			0.72	0.72

Casing Seal Assembly and Overall Tool Length

Casing Seal Description	Seal Type	Casing Size in. (mm)	CRTi2-5.5 CRTi2-5.5HC225 Overall Tool Length in. (mm)
Swivel Casing Seal	Packer Cup	5.5 (139.7) – 7.63 (193.8)	59.8 (1,520)
		8.63 (219.1) – 13.38 (339.7)	64.0 (1,630)

Combined Load Operation Curve

Please refer to the Base Tool Characteristics on page 1 of this Specification Summary for the numeric values such as CRTi Rated Load Capacity, Combined Load Large Hoist, and Combined Load High Torque illustrated in the graph below:



Tool Selection Guide

Step 1: Base Tool Selection

The CRTi tool is available in a variety of dimensions and ratings. The Base Tool Characteristics table contains the ratings and overall dimensions of the CRTi 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 sizes and weights with drift diameter above 4.54 in. (115.3 mm) are available for this CRTi tool. Find the appropriate die for casing size and weight in the Die Sizes table below. Some dies can run a range of casing weights.

Step 3: Die Hoist Capacity

CRTi 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 slip die 81129 used to run this casing is 80%. Therefore, the die hoist limit is:

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

or

80% × 211.3 tonne = 169.0 tonne

In case the base tool hoist rating is smaller than the calculated die hoist limit, the base tool hoist rating will be limiting.

Step 4: Die Torque Capacity

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

Where T_{die} is the torque limit due to slip die/casing interaction,
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, CRTi tool rating will be limiting for all standard casing grades. For example, for die 81129 to run 5.5 in. x 20.0 ppf L80 (139.7 mm x 29.76 kg/m L80) casing, the die torque limit is:

0.02222 ft.lb./psi/ppf × 20.0 ppf × 80,000 psi = 35,552 ft.lb.

or

2.936 N.m/MPa/(kg/m) × 29.76 kg/m × 551.6 MPa = 48,196 N.m

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

Step 5: Effect of Circulation Pressure

CRTi tool hoist capacity must be reduced by the pressure end load during circulation. The hoist reduction ($F_{EndPressure}$) depends on circulation pressure (P), casing nominal ID (ID_{casing}), and CRTi tool through-hole ($ID_{mandrel}$).

$F_{EndPressure} = 0.79 \times P \times (ID^2_{casing} - ID^2_{mandrel})$

For example, for circulation pressure of 1,000 psi (6.89 MPa) and casing nominal ID of 4.78 in. (121.4 mm) the hoist reduction is:

0.79 × 1,000 psi × ((4.78 in.)² – (1.25 in.)²) = 16,816 lb. ~ 8.4 tn.

or

0.79 × 6.89 MPa × ((121.4 mm)² – (31.8 mm)²) = 74,824 N ~ 7.6 tonne

Therefore, the maximum hoist for the standard CRTi2-5.5 tool reduces to 200.0 – 8.4 = 191.6 tn. (173.8 tonne) or the maximum hoist for die 81129 (in Step 3) must reduce to 186.4 – 8.4 = 178.0 tn. (161.4 tonne).

Please contact Volant for further information.

Summary of Selected Die Sizes[9]

Die P/N	Nominal Pipe Size		CRTi2-5.5 CRTi2-5.5HC225 Max. Pipe Weight[10] (W_{casing})		CRTi2-5.5 CRTi2-5.5HC225 Min. Pipe Weight[11] (W_{casing})		Slip-to-Pipe-Body Load Efficiency	Torque Factor (K_{torque})	
	in.	mm	ppf	kg/m	ppf	kg/m	% Fy	ft.lb./psi/ppf	N.m/MPa/(kg/m)
80913[12]	5.5	139.7	17.0	25.30	14.0	20.83	80%	0.02071	2.736
81129[13]	5.5	139.7	23.0	34.23	20.0	29.76	80%	0.02222	2.936
81129[12]	5.5	139.7	20.0	29.76	20.0	29.76	80%	0.02222	2.936
82165[12]	6.63	168.4	24.0	35.72	20.0	29.76	79%	0.01884	2.489
80981[12]	7.0	177.8	23.0	34.23	17.0	25.30	67%	0.01291	1.705
82013[12]	7.0	177.8	26.0	38.69	20.0	29.76	71%	0.01369	1.808
81284[12]	7.0	177.8	32.0	47.62	26.0	38.69	78%	0.0153	2.021
83076[12]	7.63	193.7	29.7	44.20	24.0	35.72	79%	0.01545	2.041
82710	7.0	177.8	23.0	34.23	17.0	25.30	67%	0.01291	1.705
82712	7.0	177.8	26.0	38.69	20.0	29.76	71%	0.01369	1.808
82711	7.0	177.8	32.0	47.62	26.0	38.69	78%	0.0153	2.021
82713	7.63	193.7	29.7	44.20	24.0	35.72	79%	0.01545	2.041
82904	8.63	219.1	28.0	41.67	24.0	35.72	76%	0.01493	1.972
80987	8.63	219.1	32.0	47.62	28.0	41.67	80%	0.0158	2.087
80824	8.63	219.1	36.0	53.57	32.0	47.62	80%	0.01614	2.132
82118	9.63	244.5	36.0	53.57	32.3	48.07	73%	0.01401	1.851
82749	9.63	244.5	40.0	59.53	36.0	53.57	74%	0.01429	1.888
80825	9.63	244.5	43.5	64.74	40.0	59.53	75%	0.01452	1.918
82157	9.63	244.5	47.0	69.94	43.5	64.74	76%	-	-
80988	9.63	244.5	53.5	79.62	53.5	79.62	73%	0.00845	1.116
82021	10.75	273.1	40.5	60.27	40.5	60.27	58%	0.00547	0.722
102335	10.75	273.1	45.5	67.71	43.5	64.74	65%	0.01258	1.662
81323	10.75	273.1	51.0	75.90	51.0	75.90	58%	0.00365	0.482
81085	10.75	273.1	60.7	90.33	60.7	90.33	58%	0.00435	0.574
81955	11.75	298.5	47.0	69.94	47.0	69.94	56%	0.01076	1.421

Summary of Selected Die Sizes[9] (continued)

Die P/N	Nominal Pipe Size		CRTi2-5.5 CRTi2-5.5HC225 Max. Pipe Weight[10] (W_{casing})		CRTi2-5.5 CRTi2-5.5HC225 Min. Pipe Weight[11] (W_{casing})		Slip-to-Pipe-Body Load Efficiency	Torque Factor (K_{torque})	
	in.	mm	ppf	kg/m	ppf	kg/m	% Fy	ft.lb./psi/ppf	N.m/MPa/(kg/m)
80833	11.75	298.5	54.0	80.36	54.0	80.36	58%	0.0111	1.466
82070	11.75	298.5	60.0	89.29	60.0	89.29	59%	-	-
82756	13.38	339.7	48.0	71.43	48.0	71.43	45%	0.0086	1.136
82327	13.38	339.7	54.5	81.10	54.5	81.10	49%	0.01122	1.482
80828	13.38	339.7	61.0	90.78	61.0	90.78	48%	0.00931	1.230
81064	13.38	339.7	72.0	107.14	72.0	107.14	50%	-	-

1. Characteristics are based on standard CRTi tool components and are independent of specific limitations of cage and accessories.
2. Maximum allowable set-down load applied to the CRTi tool. Some set-down load may be reacted through the coupling. This rating does not consider bearing load limitations of the coupling.
3. CRTi tool circulation pressure capacity is generally governed by packer cup pressure capacity. Pressure capacity may be less than indicated if alternative seal arrangements are used.
4. CRTi2-5.5 and CRTi2-5.5HC225 base tool length does not include casing seal assembly. To find overall tool length see ***Casing Seal Assembly and Overall Tool Length*** table.
5. CRTi tool weight is approximate and represents 5.5 in. base tool with ActiveSET configuration. Contact Volant sales at +1 780.784.7099 for further information on CRTi tool weight.
6. Maximum flow rate is based on minimizing erosion rates when using typical fluids. Erosion rates may vary depending upon the fluid contents. Please inspect CRTi 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 Stoke Out is the rotational limit during CRTi tool make-up. (This may be exceeded in combined load scenarios.)
9. Common die sizes shown. All API casing sizes and weights with drift diameter above 4.54 in. (115.3 mm) are available.
10. Maximum pipe weight is defined by the API Specification 5CT drift diameter of the heaviest weight casing into which the CRTi tool assembled with the specified die set will fit.
11. Indicated minimum pipe weight is based on the assumption that control of average pipe inside diameter over die grip interval does not allow pipe body area reduction less than 3.5% from nominal and additionally accounts for tool wear allowances, die penetration, casing deformation, and diametrical stroke.
12. This die has the option of being run with Slim Cage P/N 81128 and Keeper P/N 81134—though this Slim Cage reduces the CRTi tool torque capacity to 20,000 ft.lb.
13. In order to run Integral Slips P/N 81129 with 5.5 in. 23.0 ppf casing, the CRTi2-5.5 tool must be configured with Slim Cage P/N 81128 and Keeper P/N 81134—though this Slim Cage reduces the CRTi tool torque capacity to 20,000 ft.lb.