ActiveSET™ CRTi2-8.63

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 makeup, breakout, 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 increases operational efficiency. The ActiveSET enhances the standard CRTi by streamlining tool activation to a single-step process by eliminating the need to manage set-down load while simultaneously rotating to the right. The tool engages by stabbing into the casing joint, allowing casing makeup to immediately begin. The vCAM™ provides the CRTi2-8.63 with a positional based latching function and enables disengagement of the tool by both the familiar operation of set down and rotate to the left and additionally by the operation of setting down directly into the latch from the breakout position.

The CRTi2-8.63 is available with various retrofit upgrades to improve function and performance, as well as enable a broader range of applications. All ActiveSET CRTi2-8.63 tools come standard with vCAM and high-capacity mandrel. All configurations are mechanically activated in tension and both rotational directions by top drive control using patented TAWG™ torque activated wedge grip.

Starting from the insertion diameter of the base tool (cage OD), selectable sizes of integral jaws/dies are used to configure the CRTi 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 the base tool.

ActiveSET Base Tool Characteristics[1]

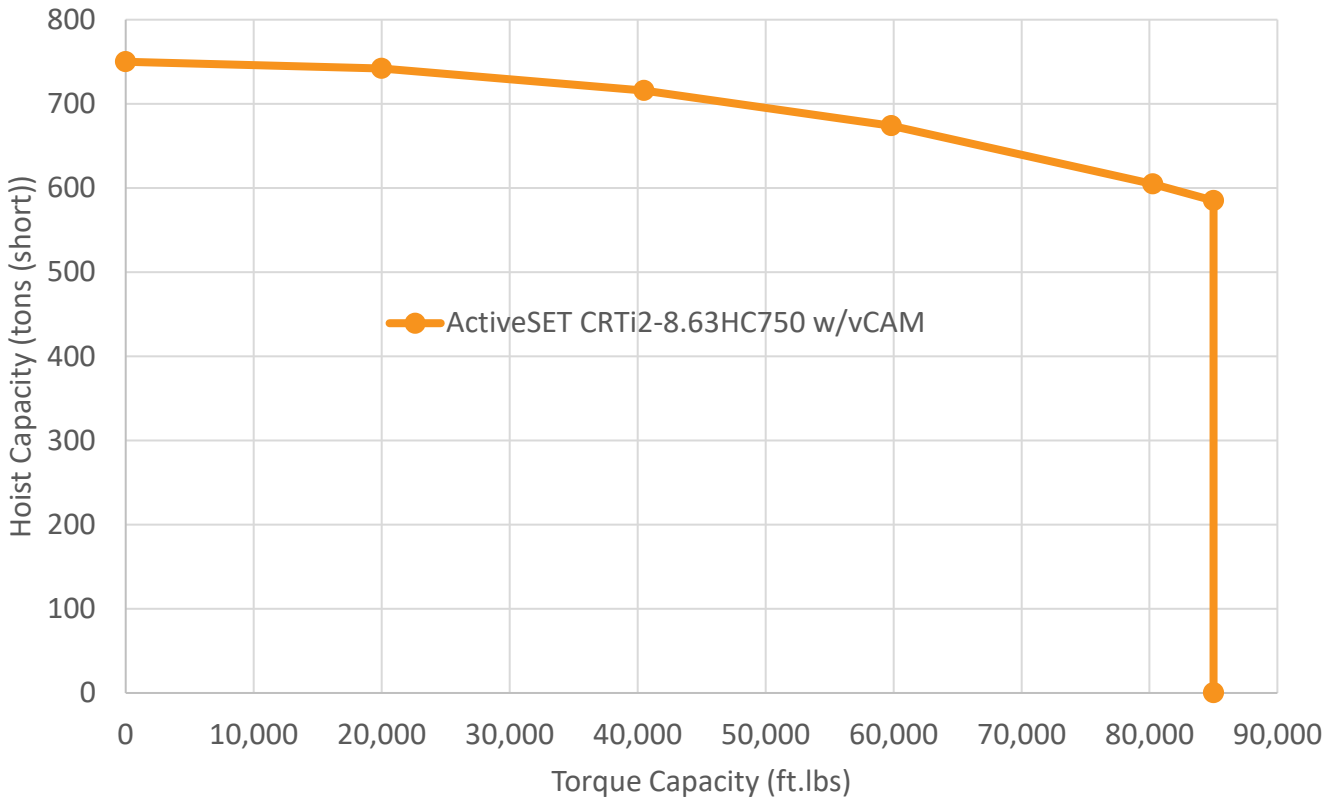
CRTi Rated Load Capacity	Hoist	ton (tonne)	750 (680)
	Torque[2]	ft.lbs (N.m)	85,000 (115,200)
Set-Down Load Capacity[3]		ton (tonne)	110 (99)
Typical Circulation Pressure Limit[4]		psi (MPa)	5,000 (34.4)
Maximum Pressure End Load		ton (tonne)	500 (453)
Base Tool Length[5]		in. (mm)	66.6 (1,692)
Base Tool Weight[6]		lbs (kg)	1,310 (600)
Die Range		in. (mm)	8.63 (219.1) – 30.0 (762.0)
Diametrical Stroke		in. (mm)	0.71 (18.0)
Through Hole		in. (mm)	2.0 (51)
Maximum Flow Rate[7]		gpm (m^3/min)	1,161 (4.40)
Maximum Rotational Speed[8]		RPM	Unlimited
Tool Joint			6-⅝ REG or 7-⅝ REG
Turns to Stroke Out[9]			0.6

Casing Seal Assembly and Overall Tool Length

Casing Seal Description	Seal Type	Casing Size in. (mm)	Overall Tool Length in. (mm)
Swivel Casing Seal	Packer Cup	8.63 (219.1) - 14.0 (355.6)	79.6 (2,022)
	Wedge Seal™	14.0 (355.6) - 30.0 (762.0)	79.6 (2,022)

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 is available in a variety of dimensions and ratings. The Base Tool Characteristics table contains 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 sizes and weights with drift diameter above 7.38 in. (187.4 mm) are available for this tool. 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

Tool hoist rating is based on API Specifications 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 below Die Sizes tables for every die) and F_{casing} is the pipe body yield limit found in API Bulletin 5C2.

F_{die} = efficiency x F_{casing}

For example, from API 5C2 the pipe body yield for 9.63 in. x 40.0 ppf L80 (244.5 mm x 59.53 kg/m L80) casing is 916,000 lbs (415.5 tonne). The slip efficiency for slip die 81756 used to run this casing is 80%. Therefore, the die hoist capacity is:

80% × 916,000 lbs = 732,800 lbs = 366.4 ton

or

80% × 415.5 tonne = 332.4 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, tool rating will be limiting for all standard casing grades. For example, for die 81756 to run 9.63 in. x 40.0 ppf L80 (244.5 mm x 59.53 kg/m L80) casing, the die torque capacity is:

0.02701 ft.lbs/psi/ppf × 40.0 ppf × 80,000 psi = 86,432 ft.lbs

or

3.569 N.m/MPa/(kg/m) × 59.53 kg/m × 551.6 MPa = 117,194 N.m

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

Step 5: Effect of Circulation Pressure

CRTi 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 through hole ($ID_{mandrel}$).

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

For example, for circulation pressure of 500 psi (3.45 MPa) and casing nominal ID of 8.84 in. (224.5 mm) the hoist reduction is:

0.79 × 500 psi × ((8.84 in.)^2- (2.0 in.)^2) = 29,288 lbs ~ 14.6 ton

or

0.79 × 3.44 MPa × ((224.5 mm)^2- (50.8 mm)^2) = 129,955 N ~ 13.3 tonne.

Therefore, the maximum hoist for the standard CRTi2-8.63 tool reduces to 690.0- 14.6 = 675.4 ton (612.7 tonne) or the maximum hoist for die 81756 (in step 3) must reduce to 366.4- 14.6 = 351.8 ton (319.1 tonne).

Please contact Volant for further information.

Summary of Specialty Mixed String Die Sizes[10,11]

Die P/N	Nominal Pipe Size		Max. Pipe Weight[12] (W_{casing})		Min. Pipe Weight[13] (W_{casing})		Slip to Pipe Body Load Efficiency	Torque Factor (K_{torque})	
	(in.)	(mm)	(ppf)	(kg/m)	(ppf)	(kg/m)	(% Fy)	(ft.lbs/psi/ppf)	(N.m/MPa/(kg/m))
105390	9.63	244.5	59.4	88.40	53.5	79.62	80%	0.02768	3.658
105385	10.75	273.1	35.8	53.28	20.0	29.76	78%	0.02211	2.922
105386	10.75	273.1	55.5	82.59	43.5	64.74	80%	0.02401	3.173
105388	10.75	273.1	73.2	108.93	65.7	97.77	80%	0.02445	3.231
105387	10.75	273.1	85.3	126.94	79.2	117.86	80%	0.02592	3.425
105389	10.75	273.1	100.3	149.26	97.1	144.5	80%	-	-
105308	10.75	273.1	109.0	162.21	109.0	162.21	80%	-	-

Summary of Standard Die Sizes[10]

Die P/N	Nominal Pipe Size		Max. Pipe Weight[12] (W_{casing})		Min. Pipe Weight[13] (W_{casing})		Slip to Pipe Body Load Efficiency	Torque Factor (K_{torque})	
	(in.)	(mm)	(ppf)	(kg/m)	(ppf)	(kg/m)	(% Fy)	(ft.lbs/psi/ppf)	(N.m/MPa/(kg/m))
81024	8.63	219.1	36.0	53.57	24.0	35.72	80%	0.02894	3.824
82301	9.63	244.5	32.3	48.07	32.3	48.07	80%	0.02817	3.722
81756	9.63	244.5	43.5	64.74	31.3	46.58	80%	0.02701	3.569
81154	9.63	244.5	53.5	79.62	43.5	64.74	80%	0.0291	3.845
81881	9.63	244.5	58.4	86.91	47.0	69.94	80%	0.02995	4.061
82276	10.75	273.1	40.5	60.27	32.8	48.81	80%	0.02477	3.273
82275	10.75	273.1	51.0	75.90	35.8	53.28	80%	0.02554	3.374
102777	10.75	273.1	55.5	82.59	43.5	64.74	80%	0.02432	3.463
82910	10.75	273.1	60.7	90.33	51.0	75.90	80%	0.0262	3.462
81255	10.75	273.1	65.7	97.77	55.5	82.59	80%	0.02647	3.497
81494	10.75	273.1	73.2	108.93	65.7	97.77	80%	0.02718	3.591
81138	10.75	273.1	79.2	117.86	71.1	105.81	80%	0.02785	3.680
81495	11.75	298.5	60.0	89.29	47.0	69.94	80%	0.02263	2.990
81757	11.75	298.5	71.0	105.66	60.0	89.29	80%	0.02348	3.102

Summary of Standard Die Sizes[10] (continued)

Die P/N	Nominal Pipe Size		Max. Pipe Weight[10] (W_{casing})		Min. Pipe Weight[13] (W_{casing})		Slip to Pipe Body Load Efficiency	Torque Factor (K_{torque})	
	(in.)	(mm)	(ppf)	(kg/m)	(ppf)	(kg/m)	(% Fy)	(ft.lbs/psi/ppf)	(N.m/MPa/(kg/m))
100703	11.75	298.5	82.6	122.92	71.0	105.66	80%	0.02425	3.204
82039	12.75	323.9	58.4	86.91	44.4	66.07	71%	0.02012	2.658
82168	13.38	339.7	54.5	81.10	48.0	71.43	74%	0.02048	2.706
81897	13.38	339.7	61.0	90.78	48.0	71.43	74%	0.02048	2.706
82164	13.38	339.7	68.0	101.20	54.5	81.10	75%	0.02094	2.766
81150	13.38	339.7	72.0	107.15	61.0	90.78	75%	0.0213	2.814
82588	13.38	339.7	77.0	114.59	68.0	101.20	75%	0.0213	2.814
83154	13.38	339.7	86.0	127.98	77.0	114.59	76%	0.02173	2.871
81431	16.0	406.4	65.0	96.73	65.0	96.73	59%	0.01627	2.149
81645	16.0	406.4	84.0	125.01	75.0	111.61	63%	0.01757	2.321
82100	16.0	406.4	97.0	114.35	94.5	140.63	61%	0.01713	2.263
81758	16.0	406.4	109.0	162.21	102.9	153.13	64%	0.01791	2.366
82532	16.77	426.0	77.0	114.59	69.4	103.28	55%	0.01548	2.045
102675	17.0	431.8	77.5	115.33	77.5	115.33	56%	0.01598	2.111
81752	17.88	454.0	105.0	156.26	93.5	139.14	53%	0.01485	1.962
100665	18.0	457.2	117.0	174.12	117.0	174.12	56%	0.01577	2.083
82976	18.63	473.1	87.5	130.21	87.5	130.21	45%	0.01269	1.676
81566	18.63	473.1	97.7	145.39	87.5	130.21	55%	0.0152	2.008
82101	18.63	473.1	111.0	165.19	96.5	143.61	55%	0.01525	2.015
82675	18.63	473.1	117.0	174.12	111.0	165.19	56%	0.01525	2.015
103097	18.63	473.1	126.0	187.51	117.0	174.12	56%	0.01560	2.061
81880	18.63	473.1	139.0	206.85	136.0	202.39	56%	-	-
82300	20.0	508.0	94.0	139.89	94.0	139.89	49%	0.01362	1.799
81759	20.0	508.0	106.5	158.49	94.0	139.89	49%	0.01362	1.799
81483	20.0	508.0	133.0	197.93	131.0	194.95	50%	0.01418	1.873
101434	20.0	508.0	147.0	218.76	147.0	218.76	49%	0.01387	1.832
82740	20.0	508.0	169.0	251.50	166.4	247.63	52%	-	-
82102	22.0	558.8	184.5	274.57	184.5	274.57	45%	-	-
81750	22.0	558.8	229.0	340.79	229.0	340.79	40%	-	-
100029	24.0	609.6	176.0	261.92	176.0	261.92	38%	0.01086	1.435

Summary of Standard Die Sizes[10] (continued)

Die P/N	Nominal Pipe Size		Max. Pipe Weight[12] (W_{casing})		Min. Pipe Weight[13] (W_{casing})		Slip to Pipe Body Load Efficiency	Torque Factor (K_{torque})	
	(in.)	(mm)	(ppf)	(kg/m)	(ppf)	(kg/m)	(% Fy)	(ft.lbs/psi/ppf)	(N.m/MPa/(kg/m))
101875	24.0	609.6	186.0	276.80	171.3	254.92	38%	0.01086	1.435
101050	24.0	609.6	201.0	299.12	201.0	299.12	39%	0.01131	1.494
104449	26.0	660.4	272.3	405.23	267.3	397.79	37%	-	-
81462	26.0	660.4	275.0	409.24	272.3	405.23	37%	-	-
104737	26.0	660.4	330.4	491.69	330.4	491.69	39%	-	-
82486	28.0	711.2	222.7	331.41	222.7	331.41	27%	0.00783	1.034
82506	30.0	762.0	239.0	355.67	239.0	355.67	24%	0.00717	0.947
105361	30.0	762.0	310.0	461.33	310.0	461.33	27%	-	-

*For details and availability on a High-flow option, contact Volant sales at +1 780.784.7099

1. Characteristics are based on standard tool components and are independent of specific limitations of cage and accessories.
2. Higher torque up to 100,000ft.lbs is possible. Contact Volant for details.
3. Maximum allowable set-down load applied to the tool. Some set-down load may be reacted through the coupling. This rating does not take into account bearing load limitations of the coupling. Minimum makeup torque requirements specified in running procedure 100027 must be followed to realize full set-down load capacity.
4. 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.
5. CRTi2-8.63 base tool length does not include casing seal assembly. To find overall tool length see ***Casing Seal Assembly and Overall Tool Length*** table.
6. Tool weight is approximate and represents 8.63 in. base tool configuration. Contact Volant sales for further information on tool weight at +1 780.784.7099
7. Maximum flow rate is based on minimizing erosion rates when using typical fluids. Erosion rates may vary depending upon the fluid contents. Please inspect tool bore regularly.
8. When rotating a casing/liner string during running/drilling operations, maximum rotational speeds are governed by top drive or casing connection specific limits.
9. Turns to Stoke Out is the rotational limit during tool makeup (this may be exceeded in combined load scenarios).
10. Common die sizes shown. All API casing sizes and weights with drift diameter above 7.38 in. (186.5 mm) are available.
11. Dies to be used with PN-105277 jaw only. Not compatible with standard jaw option.
12. 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.
13. 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 takes into account tool wear allowances, die penetration, casing deformation and diametrical stroke.