

ActiveSET™ CRTi3-7.0

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 CRTi3-7.0 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 CRTi3-7.0 tools come with a High-Capacity Mandrel (CRTi3-7.0HC350), unless otherwise stated.
- The High-Flow Mandrel (CRTi3-7.0HF260) option provides a larger through hole and a modified casing seal assembly arrangement to support higher fluid flow rate requirements for Casing while Drilling (CwD) operations.
- The Slim Cage option enables all CRTi3-7.0 base tools to run 6.63 in. 24.0–28.0 ppf and 7.0 in. 38.0–42.7 ppf pipe sizes, while reducing the torque capacity to 35,000 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 Characteristics¹

			CRTi3-7.0	CRTi3-7.0HC ₃₅₀	CRTi3-7.0HF ₂₆₀
CRTi Rated Load Capacity	Hoist	tn. (tonne)	320 (290)	350 (317)	260 (235)
	Torque	ft.lb. (N.m)	50,000 (67,700)	50,000 (67,700)	44,000 (59,600)
Set-Down Load Capacity ²		tn. (tonne)	100 (90)	100 (90)	100 (90)
Typical Circulation Pressure Limit ³		psi (MPa)	5,000 (34.4)	5,000 (34.4)	5,000 (34.4)
Maximum Pressure End Load		tn. (tonne)	250 (226)	250 (226)	190 (172)
Base Tool Length		in. (mm)	53.2 (1,351) ⁴	53.2 (1,351) ⁴	67.5 (1,715) ⁵
Base Tool Weight ⁶		lb. (kg)	825 (374)	825 (374)	820 (372)
Die Range		in. (mm)	6.63 (168.4)–20.0 (508.0)	6.63 (168.4)–20.0 (508.0)	6.63 (168.4)–20.0 (508.0)
Diametrical Stroke		in. (mm)	0.61 (15.5)	0.61 (15.5)	0.61 (15.5)
Through-Hole		in. (mm)	1.5 (38.1)	1.5 (38.1)	2.25 (57.2)
Maximum Flow Rate ⁷		gpm (m ³ /min)	660 (2.50)	660 (2.50)	1,460 (5.53)
Maximum Rotational Speed ⁸		RPM	Unlimited	Unlimited	Unlimited
Tool Joint			NC50 or 6 $\frac{5}{8}$ REG	NC50 or 6 $\frac{5}{8}$ REG	NC50 or 6 $\frac{5}{8}$ REG
Turns to Stroke Out ⁹			0.72	0.72	0.72

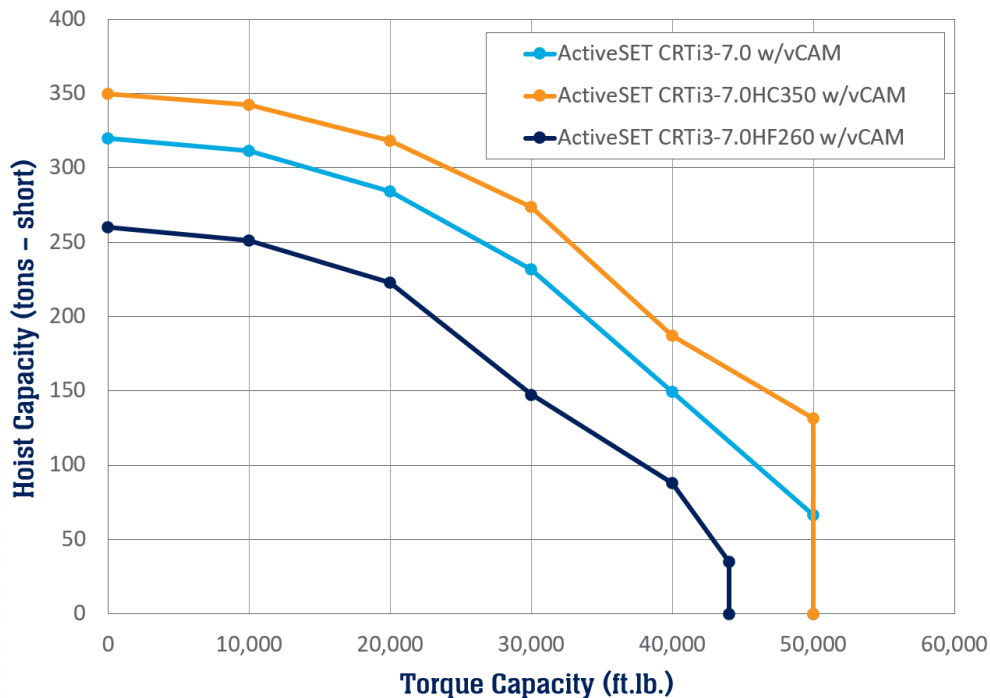


Casing Seal Assembly and Overall Tool Length

Casing Seal Description	Seal Type	Casing Size	CRTi3-7.0 CRTi3-7.0HC ₃₅₀ Overall Tool Length	CRTi3-7.0HF ₂₆₀ Overall Tool Length ⁵
		in. (mm)	in. (mm)	in. (mm)
Fixed Casing Seal	Packer Cup	6.63 (168.4)	62.5 (1,590)	-
		7.0 (177.8)	62.5 (1,590)	-
		7.63 (193.8)	62.3 (1,585)	-
		8.63 (219.1)	62.5 (1,590)	-
		9.63 (244.5)	63.1 (1,605)	-
		10.75 (273.1)	63.5 (1,615)	-
		11.75 (298.5)	64.6 (1,645)	-
		12.75 (323.9) – 13.38 (339.7)	66.0 (1,680)	-
Swivel Casing Seal	Packer Cup	6.63 (168.4) – 13.38 (339.7)	64.5 (1,640)	67.5 (1,715)
		8.63 (219.1) – 13.38 (339.7)	67.5 (1,715)	67.5 (1,715)
	WedgeSEAL™	13.38 (339.7) – 20.0 (508.0)	62.6 (1,595)	67.5 (1,715)

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 5.87 in. (149.1 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.

$$F_{die} = \text{efficiency} \times F_{casing}$$

For example, from API TR 5C3 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 lb. (415.5 tonne). The slip efficiency for slip die 82157 used to run this casing is 75%. Therefore, the die hoist limit is:

$$75\% \times 916,000 \text{ lb.} = 687,000 \text{ lb.} = 343.5 \text{ tn.}$$

or

$$75\% \times 415.5 \text{ tonne} = 311.6 \text{ tonne}$$

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 82157 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:

$$0.01587 \text{ ft.lb./psi/ppf} \times 40.0 \text{ ppf} \times 80,000 \text{ psi} = 50,784 \text{ ft.lb.}$$

or

$$2.097 \text{ N.m/MPa/(kg/m)} \times 59.53 \text{ kg/m} \times 551.6 \text{ MPa} = 68,858 \text{ N.m}$$

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 ($ID_{mandrel}$).

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

For example, for circulation pressure of 1,000 psi (6.89 MPa) and casing nominal ID of 8.84 in. (224.5 mm) the hoist reduction is:

$$0.79 \times 1,000 \text{ psi} \times ((8.84 \text{ in.})^2 - (1.5 \text{ in.})^2) = 59,958 \text{ lb.} \sim 30.0 \text{ tn.}$$

or

$$0.79 \times 6.89 \text{ MPa} \times ((224.5 \text{ mm})^2 - (38.1 \text{ mm})^2) = 266,432 \text{ N} \sim 27.2 \text{ tonne.}$$

Therefore, the maximum hoist for the standard CRTi3-7.0 tool reduces to $320.0 - 30.0 = 290.0 \text{ tn.}$ (262.8 tonne) or the maximum hoist for die 82157 (in Step 3) must reduce to $343.5 - 30.0 = 313.5 \text{ tn.}$ (284.4 tonne).

Please contact Volant for further information.





Summary of Selected Die Sizes¹⁰

Die P/N	Nominal Pipe Size		CRTi3-7.0 CRTi3-7.0HC350 CRTi3-7.0HF260 Max. Pipe Weight ¹¹ (W _{casing})		CRTi3-7.0 CRTi3-7.0HF260 Min. Pipe Weight ¹² (W _{casing})		CRTi3-7.0HC350 Min. Pipe Weight ¹² (W _{casing})		Slip-to-Pipe-Body Load Efficiency	Torque Factor (K _{torque})	
	in.	mm	ppf	kg/m	ppf	kg/m	ppf	kg/m	% Fy	ft.lb./psi/ ppf	N.m/MPa/ (kg/m)
105854 ¹³	6.63	168.4	28.0	41.66	24.0	35.72	24.0	35.72	80%	0.02094	2.767
80928	7.0	177.8	26.0	38.69	17.0	25.30	17.0	25.30	77%	0.01643	2.171
104759	7.0	177.8	32.0	47.62	23.0	34.23	26.0	38.69	80%	0.01822	2.408
81062	7.0	177.8	35.0	52.09	26.0	38.69	29.0	43.16	80%	0.01899	2.509
105854 ¹³	7.0	177.8	42.7	63.54	38.0	56.60	38.0	56.60	80%	0.02094	2.767
80986	7.63	193.7	33.7	50.15	24.0	35.72	26.0	38.69	71%	0.01512	1.998
82279	7.63	193.7	39.0	58.04	29.7	44.20	33.7	50.15	76%	0.01632	2.156
80987	8.63	219.1	32.0	47.62	24.0	35.72	24.0	35.72	80%	0.01744	2.304
80824	8.63	219.1	36.0	53.57	28.0	41.67	28.0	41.67	80%	0.01744	2.304
82118	9.63	244.5	36.0	53.57	32.3	48.07	32.3	48.07	73%	0.0153	2.021
82749	9.63	244.5	40.0	59.53	32.3	48.07	36.0	53.57	73%	0.01235	1.631
80825	9.63	244.5	43.5	64.74	36.0	53.57	40.0	59.53	74%	0.01561	2.062
82157	9.63	244.5	47.0	69.94	40.0	59.53	43.5	64.74	75%	0.01587	2.097
80988	9.63	244.5	53.5	79.62	47.0	69.94	53.5	79.62	76%	0.01628	2.151
82021	10.75	273.1	40.5	60.27	32.8	48.81	32.8	48.81	63%	0.01296	1.712
102335	10.75	273.1	45.5	67.71	35.8	53.28	40.5	60.27	63%	0.01331	1.759
81323	10.75	273.1	51.0	75.90	45.5	67.71	45.5	67.71	66%	0.01386	1.831
81085	10.75	273.1	60.7	90.33	55.5	82.59	55.5	82.59	68%	0.01429	1.888
104435	10.75	273.1	65.7	97.77	60.7	90.33	60.7	90.33	69%	0.01447	1.913
81955	11.75	298.5	47.0	69.94	42.0	62.50	42.0	62.50	55%	0.01141	1.507
80833	11.75	298.5	54.0	80.36	47.0	69.94	47.0	69.94	56%	0.01171	1.547
82070	11.75	298.5	60.0	89.29	54.0	80.36	54.0	80.36	58%	0.01198	1.583
83052	12.75	323.9	52.0	77.38	47.1	70.09	47.1	70.09	51%	0.01088	1.437
83002	12.75	323.9	58.4	86.91	50.0	74.41	50.0	74.41	51%	0.01098	1.450
82327	13.38	339.7	54.5	81.10	48.0	71.43	48.0	71.43	45%	0.00934	1.234
80828	13.38	339.7	61.0	90.78	54.5	81.10	61.0	90.78	47%	0.00977	1.291
81064	13.38	339.7	72.0	107.15	68.0	101.20	68.0	101.20	49%	0.01033	1.366
81504	15.0	381.0	92.5	137.66	92.5	137.66	92.5	137.66	45%	0.00949	1.254
80826	16.0	406.4	65.0	96.73	65.0	96.73	65.0	96.73	25%	0.00545	0.72
82440	16.0	406.4	75.0	111.61	75.0	111.61	75.0	111.61	27%	0.00593	0.783





Summary of Selected Die Sizes¹⁰ (continued)

Die P/N	Nominal Pipe Size		CRTi3-7.0 CRTi3-7.0HC ₃₅₀ CRTi3-7.0HF ₂₆₀ Max. Pipe Weight ¹¹ (W _{casing})		CRTi3-7.0 CRTi3-7.0HF ₂₆₀ Min. Pipe Weight ¹² (W _{casing})		CRTi3-7.0HC ₃₅₀ Min. Pipe Weight ¹² (W _{casing})		Slip-to-Pipe-Body Load Efficiency	Torque Factor (K _{torque})	
	in.	mm	ppf	kg/m	ppf	kg/m	ppf	kg/m	% Fy	ft.lb./psi/ ppf	N.m/MPa/ (kg/m)
100078	16.0	406.4	84.0	125.01	84.0	125.01	84.0	125.01	29%	0.0063	0.832
100079	16.0	406.4	109.0	162.21	109.0	162.21	109.0	162.21	33%	0.00715	0.944
83003	16.77	426.0	77.0	114.59	73.3	109.08	77.0	114.59	24%	0.00568	0.75
80832	18.63	473.1	87.5	130.21	87.5	130.21	87.5 ¹⁴	130.21 ¹⁴	22%	0.00489	0.646
81292	18.63	473.1	97.7	145.39	97.7	145.39	97.7 ¹⁴	145.39 ¹⁴	25%	0.00659	0.87
82956	18.63	473.1	106.0	157.75	106.0	157.75	106.0 ¹⁴	157.75 ¹⁴	26%	0.00683	0.902
81293	18.63	473.1	111.0	165.19	111.0	165.19	111.0 ¹⁴	165.19 ¹⁴	27%	0.00669	0.884
101407	18.63	473.1	115.0	171.14	115.0	171.14	115.0 ¹⁴	171.14 ¹⁴	25%	0.00567	0.749
81991	20.0	508.0	94.0	139.89	94.0	139.89	94.0 ¹⁴	139.89 ¹⁴	27%	0.00591	0.780
81799	20.0	508.0	111.0	165.19	111.0	165.19	111.0 ¹⁴	165.19 ¹⁴	27%	0.00603	0.796

- Characteristics are based on standard CRTi tool components and are independent of specific limitations of cage and accessories.
- 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.
- 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.
- CRTi3-7.0 and CRTi3-7.0HC₃₅₀ base tool length does not include casing seal assembly. To find overall tool length see *Casing Seal Assembly and Overall Tool Length* table.
- CRTi3-7.0HF₂₆₀ base tool length does not change with casing seal assembly; base tool length is the same as overall tool length. Fixed Casing Seal is not available with this CRTi tool model.
- CRTi tool weight is approximate and represents 7.0 in. base tool with ActiveSET configuration. Contact Volant sales at +1 780.784.7099 for further information on CRTi tool weight.
- 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.
- When rotating a casing/liner string during running/drilling operations, maximum rotational speeds are governed by top-drive or casing connection specific limits.
- Turns to Stoke Out is the rotational limit during CRTi tool make-up. (This may be exceeded in combined load scenarios.)
- Common die sizes shown. All API casing sizes and weights with drift diameter above 5.87 in. (149.1 mm) are available.
- 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.
- 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.
- In order to run Integral Slips P/N 105854, the CRTi3-7.0 tool must be configured with Slim Cage P/N 105853 and Keeper P/N 83001. All uses of Slim Cage P/N 105853, which can also be used with all other CRTi3-7.0 Integral Slips and Dies, reduce the CRTi tool torque capacity to 35,000 ft.lb.
- Hoist limited to 320 tn. (290 tonne).

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