



## CRTi® Internal Grip Casing Running Tool

Volant's 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.

- All new standard CRTi2-8.63 tools come with Low-Release Quad-Cams, which reduce the turns required to set and release the CRTi tool and lower the release torque ratio. The Low-Release Quad-Cams are also available to upgrade legacy Quad-Cam CRTi tools.
- All new standard CRTi2-8.63 tools come with a High-Capacity Mandrel (CRTi3-70HC750), unless otherwise stated.
- 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 insertion diameter (cage OD) of the base tool, selectable sizes of integral jaws/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.

Base Tool Characteristics <sup>1</sup>		CRTi2-8.63	CRTi2-8.63HC750	
CRTi Rated Load Capacity	Hoist	tn. (tonne)	690 (625)	750 (680)
	Torque	ft.lb. (N.m)	85,000 (115,200)	85,000 (115,200)
Set-down Load Capacity <sup>2</sup>		tn. (tonne)	110 (99)	110 (99)
Typical Circulation Pressure Limit <sup>3</sup>		psi (MPa)	5,000 (34.4)	5,000 (34.4)
Maximum Pressure End Load		tn. (tonne)	500 (453)	500 (453)
Base Tool Length <sup>4</sup>		in. (mm)	66.6 (1,692)	66.6 (1,692)
Base Tool Weight <sup>5</sup>		lb. (kg)	1,310 (600)	1,310 (600)
Die Range		in. (mm)	8.63 (219.1) – 30.0 (762.0)	8.63 (219.1) – 30.0 (762.0)
Diametrical Stroke		in. (mm)	0.75 (19.0)	0.75 (19.0)
Through Hole		in. (mm)	2.0 (51.0)	2.0 (51.0)
Maximum Flow Rate <sup>6</sup>		gpm (m <sup>3</sup> /min.)	1,161 (4.40)	1,161 (4.40)
Maximum Rotational Speed <sup>7</sup>		RPM	Unlimited	Unlimited
Tool Joint			6% REG	6% REG or 7% REG
Turns to Stroke Out <sup>8</sup>			0.60	0.60

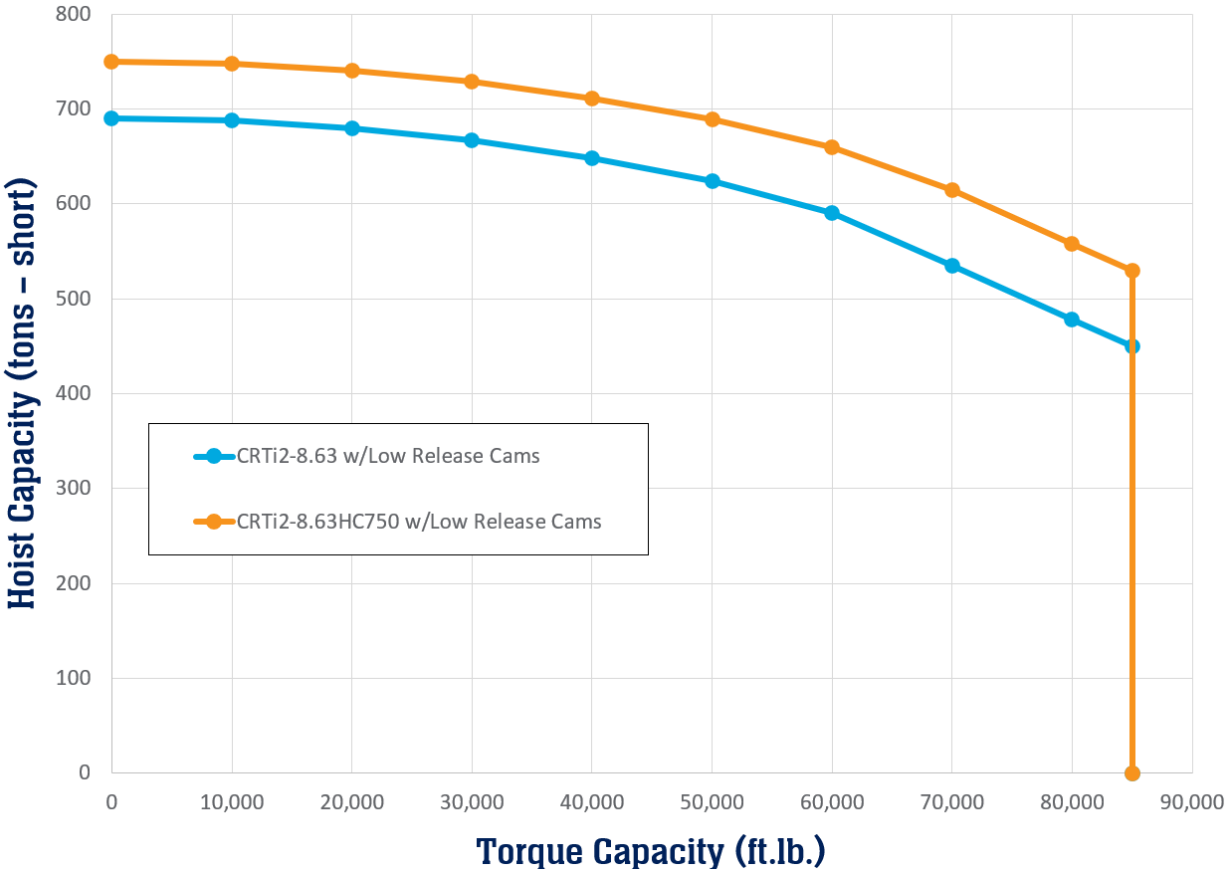


## Casing Seal Assembly and Overall CRTi Tool Length

Casing Seal Description	Seal Type	Casing Size	CRTi2-8.63 CRTi2-8.63HC750 Overall Tool Length
		in. (mm)	in. (mm)
Swivel Casing Seal	Packer Cup	8.63 (219.1) – 14.0 (355.6)	79.6 (2,022)
	WedgeSEAL™	14.0 (355.6) – 30.0 (762.0)	79.6 (2,022)

## Combined Load Operation Curve

The graph below illustrates the full hoist and torque capabilities of each CRTi2-8.63 tool configuration. 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 each CRTi tool configuration.





### 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 7.38 in. (187.4 mm) are available for this CRTi 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** 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 integral slip 81756 used to run this casing is 80%. Therefore, the die hoist capacity is:

$$80\% \times 916,000 \text{ lb.} = 732,800 \text{ lb.} = 366.4 \text{ tn.}$$

or

$$80\% \times 415.5 \text{ tonne} = 332.4 \text{ tonne}$$

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

### 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  $\sigma Y_{casing}$  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 integral slip 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:

$$0.02701 \text{ ft.lb./psi/ppf} \times 40.0 \text{ ppf} \times 80,000 \text{ psi} = 86,432 \text{ ft.lb.}$$

or

$$3.569 \text{ N.m/MPa/(kg/m)} \times 59.53 \text{ kg/m} \times 551.6 \text{ MPa} = 117,194 \text{ N.m}$$

Where the base tool torque capacity is lower than the calculated die torque capacity, the CRTi 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 ( $ID_{mandrel}$ ).

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

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:

$$0.79 \times 500 \text{ psi} \times ((8.84 \text{ in.})^2 - (2.0 \text{ in.})^2) = 29,288 \text{ lb.} \sim 14.6 \text{ tn.}$$

or

$$0.79 \times 3.44 \text{ MPa} \times ((224.5 \text{ mm})^2 - (50.8 \text{ mm})^2) = 129,955 \text{ N} \sim 13.3 \text{ tonne.}$$

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

Please contact Volant for further information.



### Summary of Selected Specialty Mixed String Die Sizes<sup>9,10</sup>

Die P/N	Nominal Pipe Size		CRTi2-8.63 CRTi2-8.63HC750 Max. Pipe Weight <sup>11</sup> (W <sub>casing</sub> )		CRTi2-8.63 Min. Pipe Weight <sup>12</sup> (W <sub>casing</sub> )		CRTi2-8.63HC750 Min. Pipe Weight <sup>12</sup> (W <sub>casing</sub> )		Slip to Pipe Body Load Efficiency	Torque Factor (K <sub>torque</sub> )	
	in.	mm	ppf	kg/m	ppf	kg/m	ppf	kg/m		% Fy	ft.lb./psi/ppf
105390	9.63	244.5	59.4	88.40	47.0	69.94	53.5	79.62	80%	0.02768	3.658
105385	10.75	273.1	35.8	53.28	20.0	29.76	20.0	29.76	78%	0.02211	2.922
105386	10.75	273.1	55.5	82.59	40.5	60.27	43.5	64.74	80%	0.02401	3.173
105388	10.75	273.1	73.2	108.93	60.7	90.33	65.7	97.77	80%	0.02445	3.231
105387	10.75	273.1	85.3	126.94	79.2	117.86	79.2	117.86	80%	0.02588	3.420
105389	10.75	273.1	100.3	149.26	91.0	135.42	91.0	135.42	80%	-	-
105308	10.75	273.1	109.0	162.21	100.3	149.26	109.0	162.21	80%	-	-

### Summary of Selected Standard Die Sizes<sup>9</sup>

Die P/N	Nominal Pipe Size		CRTi2-8.63 CRTi2-8.63HC750 Max. Pipe Weight <sup>11</sup> (W <sub>casing</sub> )		CRTi2-8.63 Min. Pipe Weight <sup>12</sup> (W <sub>casing</sub> )		CRTi2-8.63HC750 Min. Pipe Weight <sup>12</sup> (W <sub>casing</sub> )		Slip to Pipe Body Load Efficiency	Torque Factor (K <sub>torque</sub> )	
	in.	mm	ppf	kg/m	ppf	kg/m	ppf	kg/m		% Fy	ft.lb./psi/ppf
81024	8.63	219.1	36.0	53.57	24.0	35.72	24.0	35.72	80%	0.02894	3.824
82301	9.63	244.5	32.0	47.62	28.0	41.67	28.0	41.67	80%	0.02817	3.722
81756	9.63	244.5	43.5	64.74	28.0	41.67	31.3	46.58	80%	0.02420	3.198
81154	9.63	244.5	53.5	79.62	40.0	59.53	43.5	64.74	80%	0.02910	3.845
81881	9.63	244.5	58.4	86.91	47.0	69.94	47.0	69.94	80%	0.02995	3.957
82276	10.75	273.1	40.5	60.27	32.8	48.81	32.8	48.81	80%	0.02477	3.273
82275	10.75	273.1	51.0	75.90	35.8	53.28	35.8	53.28	80%	0.02554	3.374
102777	10.75	273.1	55.5	82.59	40.5	60.27	43.5	64.74	80%	0.02397	3.167
82910	10.75	273.1	60.7	90.33	45.5	67.71	51.0	75.90	80%	0.02620	3.462
81255	10.75	273.1	65.7	97.77	51.0	75.90	55.5	82.59	80%	0.02647	3.497
81494	10.75	273.1	73.2	108.93	60.7	90.33	65.7	97.77	80%	0.02718	3.591
81138	10.75	273.1	79.2	117.86	71.1	105.81	71.1	105.81	80%	0.02785	3.680
81495	11.75	298.5	60.0	89.29	47.0	69.94	47.0	69.94	80%	0.02263	2.990
81757	11.75	298.5	71.0	105.66	60.0	89.29	60.0	89.29	80%	0.02376	3.140



### Summary of Selected Standard Die Sizes<sup>9</sup> (continued)

Die P/N	Nominal Pipe Size		CRTi2-8.63 CRTi2-8.63HC750 Max. Pipe Weight <sup>11</sup> (W <sub>casing</sub> )		CRTi2-8.63 Min. Pipe Weight <sup>12</sup> (W <sub>casing</sub> )		CRTi2-8.63HC750 Min. Pipe Weight <sup>12</sup> (W <sub>casing</sub> )		Slip to Pipe Body Load Efficiency	Torque Factor (K <sub>torque</sub> )	N.m/MPa/ (kg/m)
	in.	mm	ppf	kg/m	ppf	kg/m	ppf	kg/m			
100703	11.75	298.5	82.6	122.92	71.0	105.66	71.0	105.66	80%	0.02425	3.204
82039	12.75	323.9	58.4	86.91	44.4	66.07	44.4	66.07	78%	0.02248	2.970
82168	13.38	339.7	54.5	81.10	48.0	71.43	48.0	71.43	74%	0.02048	2.706
81897	13.38	339.7	61.0	90.78	48.0	71.43	48.0	71.43	74%	0.02048	2.706
82164	13.38	339.7	68.0	101.20	54.5	81.10	54.5	81.10	75%	0.02094	2.766
81150	13.38	339.7	72.0	107.15	61.0	90.78	61.0	90.78	75%	0.02130	2.814
82588	13.38	339.7	77.0	114.59	61.0	90.78	68.0	101.20	75%	0.02130	2.814
83154	13.38	339.7	86.0	127.98	72.0	107.15	77.0	114.59	76%	0.02173	2.871
81431	16.0	406.4	65.0	96.73	65.0	96.73	65.0	96.73	63%	0.01744	2.304
81645	16.0	406.4	84.0	125.01	75.0	111.61	75.0	111.61	63%	0.01757	2.321
82100	16.0	406.4	97.0	114.35	84.0	125.01	94.5	140.63	61%	0.01713	2.264
81758	16.0	406.4	109.0	162.21	97.0	144.35	102.9	153.13	64%	0.02013	2.660
82532	16.77	426.0	79.9	118.90	69.4	103.28	69.4	103.28	59%	0.01675	2.213
106930	16.77	426.0	83.7	124.56	69.4	103.28	73.3	109.08	59%	0.01675	2.213
102675	17.0	431.8	77.5	115.33	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	93.5	139.14	53%	0.01485	1.962
100665	18.0	457.2	117.0	174.12	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	87.5	130.21	51%	0.01415	1.870
81434 <sup>13</sup>	18.63	473.1	94.5	140.63	87.5	130.21	87.5	130.21	51%	0.01415	1.869
81566	18.63	473.1	99.5	148.07	87.5	130.21	87.5	130.21	55%	0.01520	2.008
82101	18.63	473.1	111.0	165.19	96.5	143.61	99.5	148.07	55%	0.01525	2.015
82675	18.63	473.1	117.0	174.12	106.0	157.75	106.0	157.75	56%	0.01525	2.015
103097	18.63	473.1	126.0	187.51	112.0	166.67	117.0	174.12	56%	0.01560	2.061
81880	18.63	473.1	139.0	206.85	136.0	202.39	136.0	202.39	56%	-	-
82300	20.0	508.0	94.0	139.89	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	94.0	139.89	49%	0.01362	1.799
81483	20.0	508.0	133.0	197.93	118.0	175.60	129.3	192.42	50%	0.01418	1.873
101434	20.0	508.0	147.0	218.76	129.3	192.42	147.0	218.76	49%	0.01387	1.833
82740	20.0	508.0	169.0	251.50	166.4	247.63	166.4	247.63	52%	-	-
82102 <sup>14</sup>	22.0	558.8	184.5	274.57	184.5	274.57	184.5	274.57	45%	-	-



### Summary of Selected Standard Die Sizes<sup>9</sup> (continued)

Die P/N	Nominal Pipe Size		CRTi2-8.63 CRTi2-8.63HC750 Max. Pipe Weight <sup>11</sup> (W <sub>casing</sub> )		CRTi2-8.63 Min. Pipe Weight <sup>12</sup> (W <sub>casing</sub> )		CRTi2-8.63HC750 Min. Pipe Weight <sup>12</sup> (W <sub>casing</sub> )		Slip to Pipe Body Load Efficiency	Torque Factor (K <sub>torque</sub> )	
	in.	mm	ppf	kg/m	ppf	kg/m	ppf	kg/m		% Fy	ft.lb./psi/ppf
81750	22.0	558.8	228.8	340.49	228.8	340.49	228.8	340.49	40%	-	-
106696	24.0	609.6	125.6	186.91	125.6	186.91	125.6	186.91	36%	0.01063	1.405
100029	24.0	609.6	176.0	261.92	156.2	232.45	171.3	254.92	38%	0.01086	1.435
101875	24.0	609.6	186.0	276.80	171.3	254.92	171.3	254.92	38%	0.01117	1.476
101050	24.0	609.6	201.0	299.12	201.0	299.12	201.0	299.12	39%	0.01131	1.494
104449 <sup>14</sup>	26.0	660.4	272.3	405.23	267.3	397.79	267.3	397.79	37%	-	-
81462	26.0	660.4	272.3	405.23	272.3	405.23	272.3	405.23	37%	-	-
104737 <sup>14</sup>	26.0	660.4	330.7	492.14	330.7	492.14	330.7	492.14	39%	-	-
82486	28.0	711.2	222.7	331.41	222.7	331.41	222.7	331.41	27%	-	-
82506	30.0	762.0	239.0	355.67	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	310.0	461.33	27%	-	-

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

- 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.
- CRTi2-8.63 and CRTi2-8.63HC750 length does not include casing seal assembly. To find overall CRTi tool length see **Casing Seal Assembly and Overall Tool Length** table.
- CRTi tool weight is approximate and represents 8.63 in. base tool 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 Stroke 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 7.38 in. (186.5 mm) are available.
- Dies to be used with PN-105277 jaw only. Not compatible with standard jaw option.
- 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 CRTi tool wear allowances, die penetration, casing deformation, and diametrical stroke.
- No longer available for sale but included as reference only for legacy users.
- For CRTi2-8.63HC750, hoist limited to 690 tn. (625 tonne) for this die.

