Casing Running Tool with Internal Grip (CRTi™)

Volant's CRTi is designed for casing drilling or running 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. This tool is mechanically activated in tension and both rotational directions solely by top drive control using TAWG™ (Torque Activated Wedge Grip) technology.

This patented architecture puts control in the hands of the driller, reducing the need for third party support to run casing. Simple intuitive operating steps for pipe engagement and release closely emulate the familiar make and break steps used to run drill pipe – stab, rotate to the right to engage and reverse to disengage. Similarly, rig-in and rig-out steps are simple, intuitive and efficient.

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 patent pending extended reach die structure, the gripping diameter can be further increased to include casing sizes much greater than the base tool.

Tool Model: CRTi3-7.0
Specification Summary

Base Tool Characteristics[1]

CRTi Rated Load Capacity	Hoist	ton (tonne)	320 (290)
	Torque	ft.lbs (N.m)	50,000 (67,791)
Combined Load Large Hoist	Hoist	ton (tonne)	250 (227)
	Torque	ft.lbs (N.m)	23,000 (31,184)
Combined Load High Torque	Hoist	ton (tonne)	100 (91)
	Torque	ft.lbs (N.m)	40,000 (54,233)
Set-Down Load Capacity[2]		ton (tonne)	100 (91)
Typical Circulation Pressure Limit[3]		psi (MPa)	5,000 (34)
Maximum Pressure End Load		ton (tonne)	250 (227)
Base Tool Length[4]		in (mm)	53.2 (1,351)
Diametrical Stroke		in (mm)	0.61 (15.5)
Through Hole		in (mm)	1.5 (38.1)
Maximum Flow Rate[5]		gpm (m^3/min)	660 (2.5)
Tool Joint			NC50 or 6-5/8 REG
Turns to Stroke Out			1.48

Tool Configuration with

Integral Slip Dies | Extended Slip Dies | Extended Slip Dies and Bumper Extension

Give us a problem. Or just drop us a line if you want to know more.

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ISO 9001 QMI-SAI Global

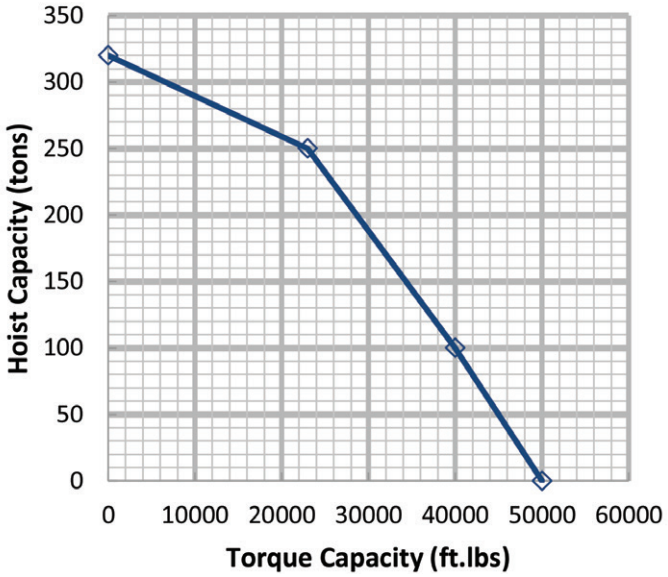
Tool Model: CRTi3-7.0 Specification Summary

Casing Seal Assembly and Tool Length[4]

Casing Seal Description	Seal Type	Casing Size in (mm)	Overall Tool Length in (mm)
Fixed Casing Seal	Packer Cup	7.0 (177.8)	62.5 (1,587)
		7.63 (193.7)	62.3 (1,582)
		8.63 (219.1)	62.5 (1,587)
		9.63 (244.5)	63.1 (1,603)
		10.75 (273.1)	63.5 (1,612)
		11.75 (298.5)	64.6 (1,642)
		13.38 (339.7)	66.0 (1,678)
Swivel Casing Seal	Packer Cup	7.0 (177.8)	64.5 (1,637)
		8.63 (219.1)	67.5 (1,714)
		9.63 (244.5)	67.5 (1,714)
		10.75 (273.1)	67.5 (1,714)
		11.75 (298.5)	67.5 (1,714)
		13.38 (339.7)	67.5 (1,714)
	Wedge Seal	13.0 (330.2)	62.6 (1,589)
		16.0 (406.4)	62.6 (1,589)
		18.63 (473.1)	62.6 (1,589)
		20.0 (508.0)	62.6 (1,589)

Combined Load Operation Curve

Please refer to the Base Tool Characteristics table on page 1 of this Specification Summary for numeric values (CRTi Rated Load Capacity, Combined Load Large Hoist, Combined Load High Torque) illustrated in the graph to the right.



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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 All API casing sizes and weights with drift diameter above 5.87 in (149.1 mm) are available for this tool. Find the appropriate die for casing size and weight in the die table below. Some dies can run a range of casing weights.

Step 3: Die Hoist Capacity 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 following table for every die) and F_{casing} is the casing hoist limit found in API Bulletin 5C2.

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

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 die 82157 used to run this casing is 75%. Therefore, the die hoist limit is:

75% × 916,000 lbs = 687,000 lbs = 343.5 ton

or

75% × 415.5 tonne = 311.6 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 Torque capacity may be limited by slip die/casing interaction. Where torque factors (K_{torque}) are provided, the slip die/casing interaction torque limit (T_{die}) is:

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

Where 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 82157 to run 9.63 in x 40.0 ppf L80 (244.5 mm x 59.53 kg/m L80) casing, the die torque limit is:

0.01587 ft.lbs/psi/ppf × 40.0 ppf × 80,000 psi = 50,784 ft.lbs

or

2.097 N.m/MPa/(kg/m) × 59.53 kg/m × 551.6 MPa = 68,858 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 1,000 psi (6.89 MPa) and casing nominal ID of 8.84 in (224.5 mm) the hoist reduction is:

0.79 × 1,000 psi × $((8.84 \text{ in})^2 - (1.5 \text{ in})^2)$ = 59,958 lbs ~ 30.0 ton

or

0.79 × 6.9 MPa × $((224.5 \text{ mm})^2 - (38.1 \text{ mm})^2)$ = 266,432 N ~ 27.2 tonne

Therefore, the maximum hoist for this tool reduces to 320.0 - 30.0 = 290.0 ton (262.8 tonne) or the maximum hoist for die 82157 (in step 3) must reduce to 343.5 - 30.0 = 313.5 ton (284.4 tonne).

Please contact Volant for further information.

Summary of Selected Die Sizes[6]

Die P/N	Nominal Pipe Size		Max. Pipe Weight[7] (W_{casing})		Min. Pipe Weight[8] (W_{casing})		Die Curv. Diameter		Max. Tool Diameter		Approximate Tool Weight		Slip to Pipe Body Load Efficiency	Torque Factor (K_{torque})	
	(in)	(mm)	(ppf)	(kg/m)	(ppf)	(kg/m)	(in)	(mm)	(in)	(mm)	(lbs)	(kg)	(% Fy)	(ft.lbs/psi/ppf)	(N.m/MPa/(kg/m))
80928	7.0	177.8	26.0	38.69	17.0	25.3	6.4	162.6	14.4	364	685	311	77%	0.01643	2.171
81062	7.0	177.8	35.0	52.09	26.0	38.69	6.16	156.4	14.4	364	685	311	80%	0.01899	2.509
80986	7.63	193.7	33.7	50.15	24.0	35.72	6.93	175.9	14.4	364	900	408	71%	0.01512	1.998
82279	7.63	193.7	39.0	58.04	29.7	44.2	6.76	171.7	14.4	364	900	408	76%	0.01632	2.157
80987	8.63	219.1	32.0	47.62	24.0	35.72	7.8	198.0	14.4	364	910	413	80%	0.01744	2.305
80824	8.63	219.1	36.0	53.57	28.0	41.67	7.7	195.6	14.4	364	910	413	80%	0.01744	2.305
82118	9.63	244.5	36.0	53.57	32.3	48.07	8.78	223.0	14.4	364	920	417	73%	0.0153	2.022
82749	9.63	244.5	40.0	59.53	32.3	48.07	8.68	220.6	14.4	364	920	417	73%	0.01235	1.632
80825	9.63	244.5	43.5	64.74	36.0	53.57	8.6	218.4	14.4	364	920	417	74%	0.01561	2.063
82157	9.63	244.5	47.0	69.94	40.0	59.53	8.53	216.5	14.4	364	920	417	75%	0.01587	2.097
80988	9.63	244.5	53.5	79.62	47.0	69.94	8.39	213.0	14.4	364	920	417	76%	0.01628	2.151
82021	10.75	273.1	40.5	60.27	32.8	48.74	9.9	251.5	14.4	364	950	431	63%	0.01296	1.713
81323	10.75	273.1	51.0	75.9	45.5	67.71	9.7	246.4	14.4	364	950	431	66%	0.01386	1.831
81085	10.75	273.1	60.7	90.33	55.5	82.59	9.51	241.6	14.4	364	950	431	68%	0.01429	1.889
81955	11.75	298.5	47.0	69.94	42.0	62.5	10.84	275.4	14.4	364	950	431	55%	0.01141	1.507
80833	11.75	298.5	54.0	80.36	47.0	69.94	10.72	272.4	14.4	364	950	431	56%	0.01171	1.548
82070	11.75	298.5	60.7	90.33	54.5	81.1	10.62	269.6	14.4	364	950	431	58%	0.01198	1.583
82327	13.38	339.7	54.5	81.1	48.0	71.43	12.48	316.9	14.4	364	960	435	45%	0.00934	1.234
80828	13.38	339.7	61.0	90.78	54.5	81.1	12.36	313.9	14.4	364	960	435	47%	0.00977	1.291
81064	13.38	339.7	72.0	107.15	68.0	101.2	12.19	309.7	14.4	364	960	435	49%	0.01033	1.365
81504	15.0	381.0	92.5	137.66	92.5	137.66	13.65	346.7	21.0	533	1,040	472	45%	0.00949	1.254
80826	16.0	406.4	65.0	96.73	65.0	96.73	15.06	382.6	21.0	533	1,040	472	25%	0.00545	0.72
82440	16.0	406.4	75.0	111.61	75.0	111.61	14.95	379.6	21.0	533	1,040	472	27%	0.00593	0.784
80832	18.63	473.1	87.5	130.21	87.5	130.21	17.57	446.2	21.0	533	1,060	481	22%	0.00489	0.646
81292	18.63	473.1	97.7	145.39	97.7	145.39	17.47	443.7	21.0	533	1,060	481	25%	0.00659	0.871
82956	18.63	473.1	106.0	157.75	106.0	157.75	17.36	441.0	21.0	533	1,060	481	26%	0.00683	0.903
81293	18.63	473.1	111.0	165.19	111.0	165.19	17.34	440.4	21.0	533	1,060	481	27%	0.00669	0.884
81991	20.0	508.0	94.0	139.89	94.0	139.89	19.39	492.5	21.0	533	1,250	567	27%	0.00591	0.781
81799	20.0	508.0	111.0	165.19	111.0	165.19	19.22	488.1	21.0	533	1,250	567	27%	0.00603	0.797

1 Characteristics are based on standard tool components and are independent of specific limitations of cage and accessories.

2 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.

3 CRTi 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 Base tool length does not include casing seal assembly. Overall tool length depends on the casing seal arrangement.

5 Maximum flow rate is based on minimizing erosion rates when using typical fluids. Erosion rates may vary based on fluid contents. Please inspect tool bore regularly.

6 Common die sizes shown. All API casing sizes and weights with drift diameter above 5.87 in (149.1 mm) are available.

7 Maximum pipe weight is defined by the API Specification 5CT drift diameter of the heaviest weight casing into which the CRTi assembled with the specified die set will fit.

8 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.