

## Limitless™ Frac System



### TOOL DESCRIPTION

**Limitless** is a revolutionary fracturing sleeve system that allows reduced complexities, risks and costs. This patent pending technology enables any number of fracturing stages, non-stop frac stimulation without any need for well intervention.

**Limitless Frac System** features a compact, intelligent, programmable Limitless Dart made of dissolvable magnesium alloy. The dart is programmed and launched at surface to land in a specific sleeve. Reliable, miniature electronic onboard sensors allow the dart to track its location within wellbore and 'activate' the dart before landing on to the target sleeve. The dart dissolves after the fracturing treatment leaving behind a large bore for production.

**Limitless System** uses identical frac sleeves and allows for installation of sleeves in any order. Simple geometry (absence of intricate key profiles with sharp edges) of hardened inner profile on the sleeve prevents any erosion or washout.

Proprietary Limitless "Cluster Sleeves" allow for efficient completion method by creating multiple frac treatment entry points per stage. Multiple erosion resistant nozzle options are available to control the pressure drop across each sleeve.

### Features & Benefits

- Any number of stages, continuous stimulation
- No wireline/coiled tubing intervention required
- Sleeves are available in lock open and re-closable options
- Simple installation as all **Limitless** Landing Sleeves are identical in shape and size
- Multi-Point Entry fracturing facilitated by proprietary "Cluster Sleeves"
- Compact dissolvable dart can be programmed at the surface
- Large ID for production after the dart dissolves
- Proprietary CSR (contactless sleeve recognition) intelligent programmable darts, eliminates mechanical indexing
- All intelligence is contained in the dart – no electronics installed in the completion.
- High-rate dart launch and pumping capabilities, up to 94.3BPM (15m<sup>3</sup>/min)
- Simple and smooth internal profile on the sleeve is also hardened to prevent erosion or washout. Allows for high rates and tonnage pumping operations.

## Specifications

Tool Properties	Limitless™-Sleeve, 114.3	Limitless™-Dart, 114.3 (Std & BIP)
Casing Size mm (in)	114.3 (4.50)	114.3 (4.50)
Casing Weight kg/m (lbs/ft)	17.26 – 22.47 (11.6 – 15.1)	17.26 – 22.47 (11.6 – 15.1)
Tool OD mm (in)	Std-139.7 Slim-133.3 (Std-5.50 Slim-5.25)	86.4 (3.40)
Tool ID mm (in)	88.9 (3.50)	N/A
Makeup Length* m (in)	0.53 – 0.56 (20.7 – 22.0)	0.19 (7.3) – Std 0.20 (7.9) - BIP
Elastomer & Seals	HNBR or FKM	Degradable Elastomer
Max Temp Rating °C (°F)	204 (400)	TBD
Pressure Rating mPa (psi)	Matches or exceeds parent casing specifications	N/A
Tensile Rating mPa (psi)		
Min Flow Area cm <sup>2</sup> (in <sup>2</sup> )	62.06 (9.62)	7.61 (1.18)
Max ΔP mPa (psi)	N/A	58.6 (8,500)
Max Absolute Pressure mPa (psi)		Up to 103.4 (15,000)

\*LTC threaded tools listed, lengths may vary with alternative threads.



**Limitless Frac System Run History**

Job #	Sleeves Installation Date	Frac Date	Casing size	Lateral Length, (ft)	TVD, (ft)	Max Frac Rate, (m <sup>3</sup> /min)	Max Pumping Pressure, (psi)	Limitless zone length, (ft)	Sand per stage, (Tonnes)	Limitless Stages	No. of Limitless Sleeves	No. of clarts	Formation
1	2/8/21	2/23/21	4.5"x15.1lb/ft	7986	6070	101	10878	338	13	3	3	2	Braeburn/CL
2	4/10/21	5/2/21	4.5"x15.1lb/ft	9501	10499	82	10878	4101	155	20	74	19	Montney
3	6/19/21	7/13/21	4.5"x15.1lb/ft	9669	4970	101	10878	3081	16	16	16	15	Braeburn/CL
4	7/2/21	7/12/21	4.5"x15.1lb/ft	10043	4980	101	10878	3232	16	16	16	15	Braeburn/CL
5	3/15/21	7/22/21	4.5"x15.1lb/ft	14764	7546	75	10153	492	150	3	7	2	Montney
6	7/19/21	8/7/21	4.5"x15.1lb/ft	13212	6060	101	10878	6319	16	33	33	32	Braeburn/CL
7	8/12/21	9/10/21	4.5"x15.1lb/ft	8737	6506	94	10878	2890	13	16	16	15	Braeburn/CL
8	8/25/21	9/11/21	4.5"x15.1lb/ft	8681	6529	94	10878	2890	18	16	16	15	Braeburn/CL
9	9/6/21	9/30/21	4.5"x15.1lb/ft	9862	5108	94	10878	9695	13	49	49	48	Braeburn/CL
10	9/26/21	10/15/21	4.5"x15.1lb/ft	9459	5098	94	10878	9131	13	46	46	45	Braeburn/CL
11	10/18/21	10/26/21	4.5"x15.1lb/ft	7687	4993	50	10878	2415	10	15	15	14	Charlie Lake
12	10/20/21	10/27/21	4.5"x15.1lb/ft	11309	6066	94	10878	4715	18	22	22	21	Braeburn/CL
13	10/9/21	11/7/21	4.5"x15.1lb/ft	9925	4829	94	10878	4508	13	22	22	21	Braeburn/CL
14	11/18/21	1/1/22	4.5"x15.1lb/ft	9472	6486	94	10878	4780	18	25	25	24	Braeburn/CL
15	12/2/21	1/3/22	4.5"x15.1lb/ft	9331	6745	94	10878	4606	13	25	25	24	Valhalla/CL
16	12/15/21	1/4/22	4.5"x15.1lb/ft	9199	6598	94	10878	4544	18	25	25	24	Braeburn/CL
17	11/6/21	1/11/22	4.5"x15.1lb/ft	8048	8520	75	13488	5715	210	19	133	18	Montney
18	11/17/21	1/12/22	4.5"x15.1lb/ft	8802	8497	75	13488	2274	210	7	49	6	Montney
19	12/25/21	1/18/22	4.5"x15.1lb/ft	11617	5449	94	10878	3871	18	17	17	16	Braeburn/CL
20	1/26/22	2/9/22	4.5"x15.1lb/ft	15574	6033	94	10878	7992	18	38	38	37	Braeburn/CL
21	2/6/22	2/13/22	4.5"x15.1lb/ft	7300	5659	50	10878	2218	10	15	15	14	Charlie Lake
22	2/18/22	2/28/22	4.5"x15.1lb/ft	7546	4770	50	10878	2254	10	15	15	14	Charlie Lake
23	2/19/22	7/2/22	4.5"x15.1lb/ft	8783	7904	75	10153	728		4	16	3	Montney
24	3/4/22	3/12/22	4.5"x15.1lb/ft	7257	4872	50	10878	2277	10	15	15	14	Charlie Lake
25	3/8/22	6/1/22	4.5"x13.5 lb/ft	4557	7192			4341		37	37	36	Cardium
26	3/29/22	7/3/22	4.5"x15.1 lb/ft	9075	7884	75	10153	640		4	16	3	Montney
27	5/25/22	6/28/22	4.5"x15.1 lb/ft	3855	7799	75	13488	3553	180	12	84	11	Montney
28	6/9/22	6/28/22	4.5"x15.1 lb/ft	3747	7900	75	13488	3629	180	12	84	11	Montney

## GoldMax™ Toe Sub



### TOOL DESCRIPTION

The GoldMax™ Toe Sub is a pressure testable toe initiation fracturing sub. The sub is run on the casing to the toe of the well to establish communication with the formation, eliminating the need for coiled tubing perforation. The Toe Sub is activated by increasing pressure to pre-determined value providing assured flow area through all ports.

Simple construction establishes communication to reservoir after the liner/casing pressure test. The ports can be opened immediately or configured to be pressure testable after activation, with an opening delay of 1 - 150 hours depending on pressure, temperature, and fluid salinity. Internal atmospheric chambers ensure opening of ports. Protective shields ensure frac ports are not covered with cement or other debris that could impede functionality. The opening pressure is adjustable using a burst disk.

### Features & Benefits

- Full Drift ID
- No moving parts, doesn't require pup joints
- Rated to 15,000 psi casing pressure test
- Eliminates the need for perforating runs
- Reduces operating time and complexity of operation
- Port design and flow area can be customized
- Premium threads and NACE materials available for sour applications
- Short delivery time – manufactured in Canada

### Specifications

Tool Size mm (in)	114.3 (4.50)	114.3 Slim (4.50)	127.0 (5.0)	139.7 (5.50)
Tool OD mm (in)	146.7 (5.775)	133.3 (5.250)	155.6 (6.125)	171.5 (6.750)
Tool ID mm (in)	98.6 (3.88)	95.25 (3.65)	101.6 (4.00)	114.3 (4.50)
Elastomer & Seals	HNBR or FKM			
Flow Area cm <sup>2</sup> (in <sup>2</sup> )	17.4 (2.70) and up			
Temp Rating °C (°F)	204 (400)			
Pressure Rating mPa (psi)	Up to 103.4 (15,000) casing dependent			

**GoldMax™ Toe Sub Run History**

Date	PN	Size	No. of Ports	Burst disc	Testable	Burst Pressure@ 80°C (176°F)
16/01/2020	103042	5.5" 20 lb/ft P110 BTC	12	0.015	Y	70MPa/10.1Kpsi
16/01/2020	103042	5.5" 20 lb/ft P110 BTC	12	0.015	Y	70MPa/10.1Kpsi
30/01/2020	103038	4.5" 15.1 lb/ft L-80 VAM TOP	18	0.016		107.6MPa/15.6Kpsi
30/01/2020	103038	4.5" 15.1 lb/ft L-80 VAM TOP	18	0.016		107.6MPa/15.6Kpsi
18/03/2020	102253	4.5" 11.6 lb/ft P110 LTC	18	0.01	Y	51.4MPa/7.5Kpsi
18/03/2020	102253	4.5" 11.6 lb/ft P110 LTC	18	0.01	Y	51.4MPa/7.5Kpsi
5/11/2021	103039	5.5" 20 lb/ft P110 blanked	18	0.012		75MPa/10.9Kpsi
5/11/2021	103039	5.5" 20 lb/ft P110 blanked	18	0.012		75MPa/10.9Kpsi
5/11/2021	103039	5.5" 20 lb/ft P110 blanked	18	0.012		75MPa/10.9Kpsi
16/10/2020	103042	5.5" 20 lb/ft P110 BTC	12	0.015	Y	70MPa/10.1Kpsi
16/10/2020	103042	5.5" 20 lb/ft P110 BTC	12	0.015	Y	70MPa/10.1Kpsi
16/10/2020	103042	5.5" 20 lb/ft P110 BTC	12	0.015	Y	70MPa/10.1Kpsi
16/10/2020	103042	5.5" 20 lb/ft P110 BTC	12	0.015	Y	70MPa/10.1Kpsi
16/10/2020	103042	5.5" 20 lb/ft P110 BTC	12	0.015	Y	70MPa/10.1Kpsi
16/10/2020	103042	5.5" 20 lb/ft P110 BTC	12	0.015	Y	70MPa/10.1Kpsi
16/10/2020	103042	5.5" 20 lb/ft P110 BTC	12	0.015	Y	70MPa/10.1Kpsi
16/10/2020	103042	5.5" 20 lb/ft P110 BTC	12	0.015	Y	70MPa/10.1Kpsi
16/10/2020	103042	5.5" 20 lb/ft P110 BTC	12	0.015	Y	70MPa/10.1Kpsi
5/11/2021	103044	5.5" 20 lb/ft P110 blanked	18	0.012		75MPa/10.9Kpsi
5/11/2021	103044	5.5" 20 lb/ft P110 blanked	18	0.012		75MPa/10.9Kpsi
5/11/2021	103044	5.5" 20 lb/ft P110 blanked	18	0.012		75MPa/10.9Kpsi
5/11/2021	103044	5.5" 20 lb/ft P110 blanked	18	0.012		75MPa/10.9Kpsi
5/11/2021	103044	5.5" 20 lb/ft P110 blanked	18	0.012		75MPa/10.9Kpsi
5/11/2021	103044	5.5" 20 lb/ft P110 blanked	18	0.012		75MPa/10.9Kpsi
5/11/2021	103044	5.5" 20 lb/ft P110 blanked	18	0.012		75MPa/10.9Kpsi
5/11/2021	103044	5.5" 20 lb/ft P110 blanked	18	0.012		75MPa/10.9Kpsi
26/11/2021	106291	4.5" 15.1 lb/ft L-80 BTC	18	0.016		107.6MPa/15.6Kpsi
26/11/2021	106291	4.5" 15.1 lb/ft L-80 BTC	18	0.016		107.6MPa/15.6Kpsi
02/09/2020	104331	5.5" 26.8 lb/ft P110 LTC	24	0.031	N	108.2MPa/15.7Kpsi
15/09/2020	104331	5.5" 26.8 lb/ft P110 LTC	24	0.015/0.012	N	*107.3MPa/15.6Kpsi*
22/09/2020	104331	5.5" 26.8 lb/ft P110 LTC	24	0.015/0.012	N	*107.3MPa/15.6Kpsi*
09/11/2020	102801	5.5" 23 lb/ft P110 LTC	24	0.031	N	108.2MPa/15.7Kpsi
08/12/2020	104331	5.5" 26.8 lb/ft P110 LTC	24	0.012/0.012	N	*93.3MPa/13.5Kpsi*
25/05/2021	103042	5.5" 20 lb/ft P110 BTC	24	0.015	N	70MPa/10.1Kpsi
25/05/2021	103042	5.5" 20 lb/ft P110 BTC	24	0.015	N	70MPa/10.1Kpsi
25/05/2021	103042	5.5" 20 lb/ft P110 BTC	24	0.015	N	70MPa/10.1Kpsi
25/05/2021	103042	5.5" 20 lb/ft P110 BTC	24	0.015	N	70MPa/10.1Kpsi
16/06/2021	105539	5.5" 23 lb/ft P110 blanked	24	0.02	N	91.7MPa/13.3Kpsi
16/06/2021	105539	5.5" 23 lb/ft P110 blanked	24	0.02	N	91.7MPa/13.3Kpsi
16/06/2021	105539	5.5" 23 lb/ft P110 blanked	24	0.02	N	91.7MPa/13.3Kpsi
16/06/2021	105539	5.5" 23 lb/ft P110 blanked	24	0.02	N	91.7MPa/13.3Kpsi

16/06/2021	105539	5.5" 23 lb/ft P110 blanked	24	0.02	N	91.7MPa/13.3Kpsi
16/06/2021	105539	5.5" 23 lb/ft P110 blanked	24	0.02	N	91.7MPa/13.3Kpsi
07/06/2021	105457	4.5" 15.1 lb/ft L-80 VA-Superior	18	0.012	Y	75MPa/10.9Kpsi
07/06/2021	105457	4.5" 15.1 lb/ft L-80 VA-Superior	18	0.012	Y	75MPa/10.9Kpsi
07/06/2021	105457	4.5" 15.1 lb/ft L-80 VA-Superior	18	0.012	Y	75MPa/10.9Kpsi
07/06/2021	105457	4.5" 15.1 lb/ft L-80 VA-Superior	18	0.012	Y	75MPa/10.9Kpsi
07/06/2021	105457	4.5" 15.1 lb/ft L-80 VA-Superior	18	0.012	Y	75MPa/10.9Kpsi
07/06/2021	105457	4.5" 15.1 lb/ft L-80 VA-Superior	18	0.012	Y	75MPa/10.9Kpsi
24/08/2021	103042	5.5" 20 lb/ft P110 BTC	24	0.031	N	108.2MPa/15.7Kpsi
24/08/2021	105539	5.5" 23 lb/ft P110 LTC	24	0.02	N	91.7MPa/13.3Kpsi
24/08/2021	105539	5.5" 23 lb/ft P110 LTC	24	0.02	N	91.7MPa/13.3Kpsi
13/08/2021	105834	5.5" 23 lb/ft P110 BTC	24	0.015	Y	81MPa/11.7Kpsi
13/08/2021	105834	5.5" 23 lb/ft P110 BTC	24	0.015	Y	81MPa/11.7Kpsi
13/08/2021	105834	5.5" 23 lb/ft P110 BTC	24	0.015	Y	81MPa/11.7Kpsi
13/08/2021	105834	5.5" 23 lb/ft P110 BTC	24	0.015	Y	81MPa/11.7Kpsi
13/08/2021	105833	5.5" 23 lb/ft P110 BTC w/ball seat	24	0.015	Y	81MPa/11.7Kpsi
13/08/2021	105833	5.5" 23 lb/ft P110 BTC w/ball seat	24	0.015	Y	81MPa/11.7Kpsi
13/08/2021	105833	5.5" 23 lb/ft P110 BTC w/ball seat	24	0.015	Y	81MPa/11.7Kpsi
13/08/2021	105833	5.5" 23 lb/ft P110 BTC w/ball seat	24	0.015	Y	81MPa/11.7Kpsi
14/09/2021	103042	5.5" 20 lb/ft P110 BTC	24	0.031	Y	108.2MPa/15.7Kpsi
14/09/2021	103042	5.5" 20 lb/ft P110 BTC	24	0.031	Y	108.2MPa/15.7Kpsi
21/10/2021	105539	5.5" 23 lb/ft P110 blanked	24	0.02	Y	91.7MPa/13.3Kpsi
21/10/2021	105539	5.5" 23 lb/ft P110 blanked	24	0.02	Y	91.7MPa/13.3Kpsi
21/10/2021	105539	5.5" 23 lb/ft P110 blanked	24	0.02	Y	91.7MPa/13.3Kpsi
21/10/2021	105539	5.5" 23 lb/ft P110 blanked	24	0.02	Y	91.7MPa/13.3Kpsi
21/10/2021	105539	5.5" 23 lb/ft P110 blanked	24	0.02	Y	91.7MPa/13.3Kpsi
21/10/2021	105539	5.5" 23 lb/ft P110 blanked	24	0.02	Y	91.7MPa/13.3Kpsi
15/12/2021	105457	4.5" 15.1 lb/ft L-80 VA-Superior	18	0.016	Y	107.6MPa/15.6Kpsi
15/12/2021	105457	4.5" 15.1 lb/ft L-80 VA-Superior	18	0.016	Y	107.6MPa/15.6Kpsi
21/02/2022	105457	4.5" 15.1 lb/ft L-80 VA-Superior	18	0.016	Y	107.6MPa/15.6Kpsi
21/02/2022	105457	4.5" 15.1 lb/ft L-80 VA-Superior	18	0.016	Y	107.6MPa/15.6Kpsi
15/03/2022	105457	4.5" 15.1 lb/ft L-80 VA-Superior	18	0.015/0.005	Y	95.8MPa/13.9Kpsi
15/03/2022	105457	4.5" 15.1 lb/ft L-80 VA-Superior	18	0.015/0.005	Y	95.8MPa/13.9Kpsi
15/03/2022	105457	4.5" 15.1 lb/ft L-80 VA-Superior	18	0.015/0.005	Y	95.8MPa/13.9Kpsi
15/03/2022	105457	4.5" 15.1 lb/ft L-80 VA-Superior	18	0.015/0.005	Y	95.8MPa/13.9Kpsi
12/04/2022	105457	4.5" 15.1 lb/ft L-80 VA-Superior	18	0.015/0.005	Y	95.8MPa/13.9Kpsi
12/04/2022	105457	4.5" 15.1 lb/ft L-80 VA-Superior	18	0.015/0.005	Y	95.8MPa/13.9Kpsi
12/04/2022	105457	4.5" 15.1 lb/ft L-80 VA-Superior	18	0.015/0.005	Y	95.8MPa/13.9Kpsi
12/04/2022	105457	4.5" 15.1 lb/ft L-80 VA-Superior	18	0.015/0.005	Y	95.8MPa/13.9Kpsi
07/06/2022	105834	5.5" 23 lb/ft P110 BTC	8	0.015	Y	71.2MPa/10.3Kpsi
07/06/2022	105834	5.5" 23 lb/ft P110 BTC	8	0.015	Y	71.2MPa/10.3Kpsi
07/06/2022	105834	5.5" 23 lb/ft P110 BTC	8	0.015	Y	71.2MPa/10.3Kpsi

\*Testing was completed @ 145°C for these disc configurations.