

## Subsurface Flow Control Systems



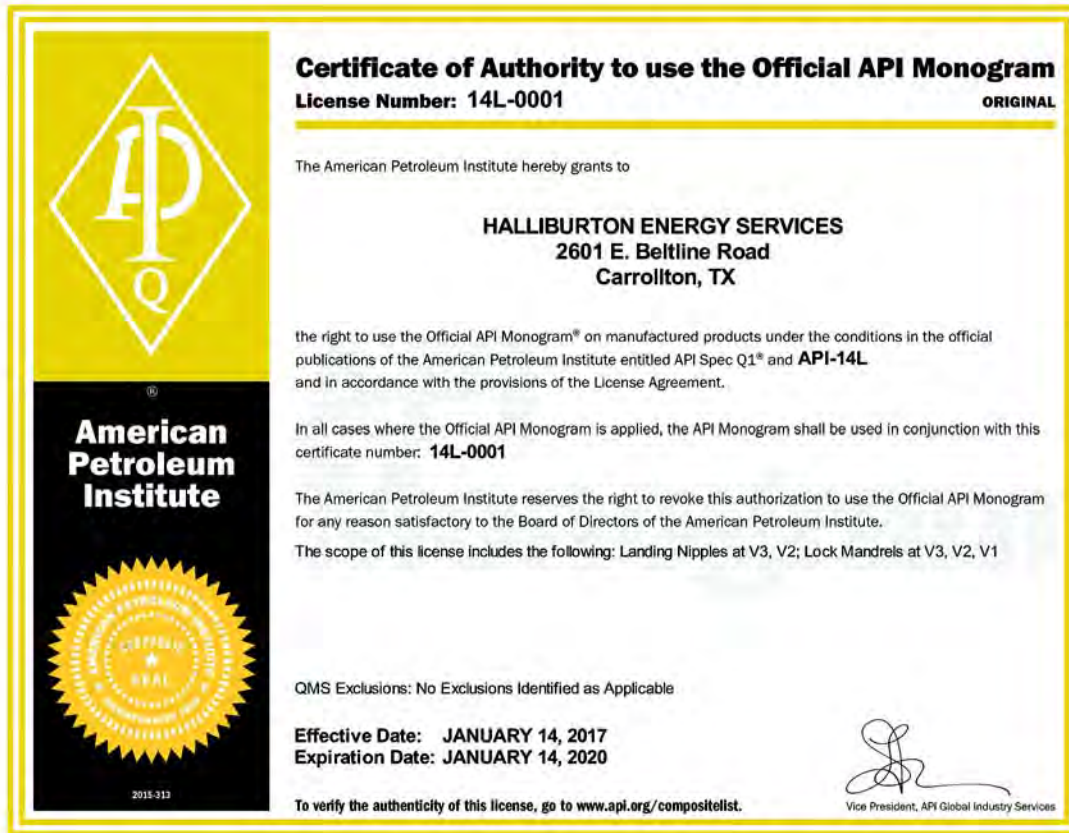
### Introduction

Halliburton subsurface flow control systems are designed to simplify completion programs and help maintain production control for the life of the well.

- » Manufactured in accordance with ISO 9000-series quality standards
- » Over 50 years of success in design and material selection
- » Strict tolerances to meet our latest design criteria
- » API monogrammed equipment available
- » Total traceability of each assembly by serial number and/or component job number
- » Functional testing of every lock mandrel by installing it into a nipple profile

Subsurface flow control equipment includes both tubular flow control equipment and production tool equipment. Tubular flow control equipment is made up as part of the production tubing string and includes landing nipples, circulation/production sleeves, blast joints, and flow couplings.

Production tool equipment includes lock mandrels, plugs, equalizing devices, chokes, tubing stops, packoffs, pressure and temperature gauge hangers, and other associated equipment.



API Certification 14L-0001

## Landing Nipple/Lock Mandrel Selection Guide

Nipple Profile	Landing Nipple Features and Applications																		
								Profile Available in Noted Tools			Part Number Prefix for Applicable Tools								
	Selective by Running Tool	Top No-Go	Bottom No-Go	Series of Nipples Can Be Used in Single Tubing String	Wellhead Plug Applications	Heavyweight Tubing Applications	SAFETYSET® Compatible	Landing Nipple	Safety Valve Landing Nipple	Sliding Side-Door® Circulating Device	Tubing-Retrieveable Safety Valve	Tubing Seal Divider	API Monogrammed*	Landing Nipple	Lock Mandrel	Running Tool	Pulling Tool	Equalizing Sub	Equalizing Prong/Plug Assembly
X®	●			●				●	●	●	●	●	●	11X	10XO	41XO	40GR	20XO	24PXX
													●	711X	710XO				
XN®			●					●				○	●	11XN	10XN	41XO	40GR	20XO	24PXX
													●	711XN	710XN				
R®	●			●		●		●	●	●	●	●	●	11R	10RO	41RO	40GR	20RO	24PRR
													●	711R	710RO				
RN®			●			●		●				○	●	11RN	10RN	41RO	40GR	20RO	24PRR
													●	711RN	710RN				
RQ		●				●	●	●	●	●			●	SVLN or TRSV	710RQ	41RXN	40GR	○	○
													●		710SS	41SS/41UP	40GR with 144SS		
FBN®	●			●		●		●		●		●	●	11FBN	10FBN	41FBN	40GR	20FBN	24FBN
													●	711FBN	710FBN				
RPT®		●		●	●	●	●	●	●	●	●	●	●	11RPT	10RPT	41RXN	40GR	20RPT	24RPT
													●	711RPT	710RPT				
													●		710RPV				○
													●	SVLN or TRSV	710SSA	41SS/41UP	40GR with 144SS	20RO	○
SRH		●		●	●	●		●				●	●	711SRH	710SRH/21SRH	41SRH	40GR		
SRP		●			●	●							●	Wellhead	710SRP/21SRP	41SRP	40GR		

● = Standard feature

○ = Non-standard capability

\*Part number prefix 710 or 711 indicates API monogrammed assembly; items with prefix 10 or 11 are not API monogrammed.

## Landing Nipples and Lock Mandrels

This section describes Halliburton landing nipples and lock mandrels as well as lock mandrels for wells without landing nipples.

### Selective by Running Tool

Halliburton selective by running tool landing nipples and lock mandrels include Otis® X® and R® series landing nipples and lock mandrels. Otis XN® and RN® no-go landing nipples and no-go lock mandrels are also available.

### Otis® X® and XN® Landing Nipples and Lock Mandrels

Halliburton Otis X landing nipples are selective by running tool and are run in the well on the completion tubing to provide a specific landing location for subsurface flow control equipment. These landing nipples feature common internal profiles. The Otis X landing nipple is designed for use in standard weight tubing.

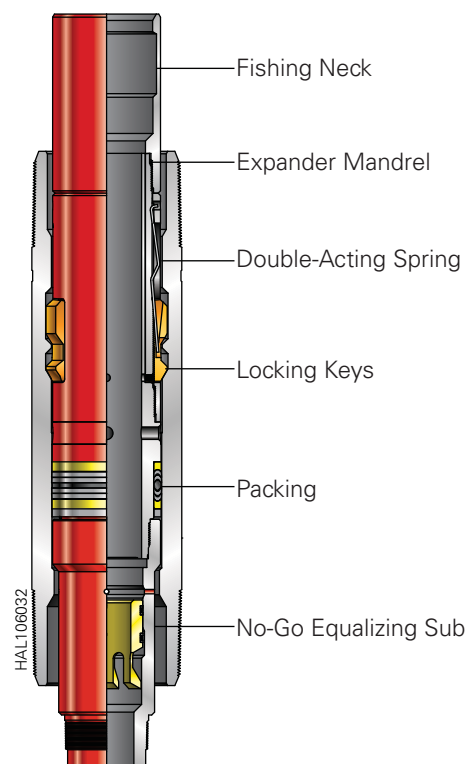
The completion can include as many selective nipples with the same ID in any sequence as desired in the tubing string. This versatility results in an unlimited number of positions for setting and locking subsurface flow controls. The flow control, which is attached to the required Otis X lock mandrel, is run in the well via the selective running tool on slickline.

The slickline operator using the selective running tool can set the flow control in any one of the landing nipples at the desired depth. If this location is unsatisfactory or if well conditions change, the flow control can be moved up or down the tubing string to another nipple location. These operations can be done by slickline under pressure without killing the well.

Otis XN no-go landing nipples are designed for use in single nipple installations or as the bottom nipple in a series of Otis X or R landing nipples. These landing nipples have the same packing bore ID for a particular tubing size and weight. Otis XN landing nipples are designed for use with standard weight tubing.



*Otis® X® Landing Nipple and Lock Mandrel*



*Otis® XN® Landing Nipple and Lock Mandrel*

## Otis® R® and RN® No-Go Landing Nipples and Lock Mandrels

Halliburton Otis® R® landing nipples are selective by running tool and are run in the well on the completion tubing to provide a specific landing location for subsurface flow control equipment. These landing nipples feature common internal profiles and are typically used with heavyweight tubing.

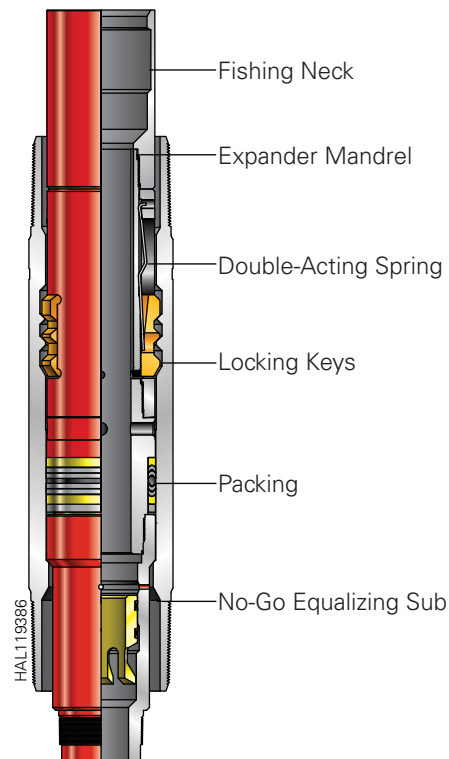
The completion can include as many selective nipples with the same ID in any sequence as desired in the tubing string. This versatility results in an unlimited number of positions for setting and locking subsurface flow controls. The flow control, which is attached to the required Otis R lock mandrel, is run in the well via the selective running tool on slickline.

The slickline operator using the selective running tool can set the flow control in any one of the landing nipples at the desired depth. If this location is unsatisfactory or if well conditions change, the flow control can be moved up or down the tubing string to another nipple location. These operations can be done by slickline under pressure without killing the well.

Otis RN® no-go landing nipples are designed for use in single nipple installations or as the bottom nipple in a series of Otis X or R landing nipples. These landing nipples have the same packing bore ID for a particular tubing size and weight and are designed for use with standard weight tubing.



*Otis® R® Landing Nipple and Lock Mandrel*



*Otis® RN® No-Go Landing Nipple and Lock Mandrel*

## Applications

- » Gauge hangers for bottomhole pressure/temperature surveys
- » Positive locator for straddle systems
- » Plugging under pressure
- » Almost unlimited locations for setting and locking subsurface flow controls

## Features

- » Landing nipples
  - Large bore for minimum restriction
  - Universal nipple with one internal profile
- » Lock mandrels
  - Retractable locking keys
  - Locks designed to hold pressure from above or below
  - Extra large ID for higher flow volumes

## Benefits

- » Landing nipples
  - Versatility helps reduce completion and production maintenance costs
  - Simple operation
  - Multiple options when running, setting, or retrieving subsurface flow controls
- » Lock mandrels
  - Faster slickline service because of retractable keys
  - Operator control of locating, landing, and locking in the selected nipple
  - Inside fishing neck provides large ID to maximize production

### Otis® X® and XN® Landing Nipples and Lock Mandrels

Tubing								For Standard Tubing Weights						Lock Mandrel ID	
								X® Profile		XN® Profile					
Size		Weight		ID		Drift		Packing Bore		Packing Bore		No-Go ID			
in.	mm	lb/ft	kg/m	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm
1.660	42.16	2.3	3.42	1.380	35.05	1.286	32.66	1.250	31.75	1.250	31.75	1.135	28.83	0.62	15.75
		2.4	3.57												
1.900	48.26	2.4	3.57	1.660	42.16	1.516	38.51	1.500	38.10	1.500	38.10	1.448	36.78	0.75	19.05
		2.76	4.11	1.610	40.89										
		2.9	4.32												
2.063	52.40	3.25	4.84	1.751	44.48	1.657	42.09	1.625	41.28	1.625	41.28	1.536	39.01	0.75	19.05
2 3/8	60.33	4.6	6.85	1.995	50.67	1.901	48.29	1.875	47.63	1.875	47.63	1.791	45.49	1.00	25.40
		4.7	6.99												
2 7/8	73.03	6.4	9.52	2.441	62.00	2.347	59.61	2.313	58.75	2.313	58.75	2.205	56.01	1.38	35.05
		6.5	9.67												
3 1/2	88.90	9.3	13.84	2.992	76.00	2.867	72.82	2.813	71.45	2.813	71.45	2.666	67.72	1.75	44.45
		10.2	15.18	2.922	74.22	2.797	71.04	2.750	69.85	2.750	69.85	2.635	66.93		
4	101.60	11	16.37	3.476	88.29	3.351	85.10	3.313	84.15	3.313	84.15	3.135	79.63	2.12	53.85
4 1/2	114.30	12.75	18.97	3.958	100.53	3.833	97.36	3.813	96.85	3.813	96.85	3.725	94.62	2.62	66.55
5	127.00	13	19.35	4.494	114.14	4.369	110.97	4.313	109.55	4.313	109.55	3.987	101.27	2.62	66.55
5 1/2	139.70	17	25.30	4.892	124.26	4.767	121.08	4.562	115.87	4.562	115.87	4.455	113.16	3.12	79.25

## Otis® R® and RN® Landing Nipples and Lock Mandrels

Tubing								For Heavy Tubing Weights						Lock Mandrel ID	
								R® Profile		Bore		RN® Profile			
Size		Weight		ID		Drift		Packing Bore				No-Go ID			
in.	mm	lb/ft	kg/m	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm
1.900	48.26	3.64	5.42	1.500	38.10	1.406	35.71	1.375	34.93	1.375	34.93	1.250	31.75	0.62	15.75
2 3/8	60.33	5.3	7.89	1.939	49.25	1.845	46.86	1.781	45.24	1.781	45.24	1.640	41.66	0.88	22.35
		5.95	8.85	1.867	47.42	1.773	45.03	1.710	43.43	1.710	43.43	1.560	39.62	0.75	19.05
		6.2	9.23	1.853	47.07	1.759	44.68								
		7.7	11.46	1.703	43.26	1.609	40.87	1.500	38.10	1.500	38.10	1.345	34.16	0.62	15.75
2 7/8	73.03	7.9	11.76	2.323	59.00	2.229	56.62	2.188	55.58	2.188	55.58	2.010	51.05	1.12	28.45
		8.7	12.95	2.259	57.38	2.165	54.99	2.125	53.98	2.125	53.98	1.937	49.20	0.88	22.35
		8.9	13.24	2.243	56.97	2.149	54.58								
		9.5	14.14	2.195	55.75	2.101	53.37	2.000	50.80	2.000	50.80	1.881	47.78	0.88	22.35
		10.4	15.48	2.151	54.64	2.057	52.25								
		11	16.37	2.065	52.45	1.971	50.06	1.875	47.03	1.875	47.03	1.716	43.59	0.88	22.35
		11.65	17.34	1.995	50.67	1.901	48.29								
3 1/2	88.90	12.95	19.27	2.750	69.85	2.625	66.68	2.562	65.07	2.562	65.07	2.329	59.16	1.38	35.05
		15.8	23.51	2.548	64.72	2.423	61.54	2.313	58.75	2.313	58.75	2.131	54.13	1.12	28.45
		16.7	24.85	2.480	62.99	2.355	59.82								
		17.05	25.37	2.440	61.98	2.315	58.80	2.188	55.58	2.188	55.58	2.010	51.05	1.12	28.45
4	101.60	11.6	17.26	3.428	87.08	3.303	83.90	3.250	82.55	3.250	82.55	3.088	78.44	1.94	49.28
		13.4	19.94	3.340	84.84	3.215	81.66	3.125	79.38	3.125	79.38	2.907	73.84	1.94	49.28
4 1/2	114.30	12.6	18.75	3.958	100.53	3.833	97.36	3.813	96.85	3.813	96.85	3.725	94.62	2.12	53.85
		13.5	20.09	3.920	99.57	3.795	96.39	3.688	93.68	3.688	93.68	3.456	87.78	2.38	60.45
								3.750	95.25	3.750	95.25	N/A		2.12	53.85
		15.5	23.07	3.826	97.18	3.701	94.01	3.688	93.68	3.688	93.68	3.456	87.78	2.38	60.45
		16.9	25.50	3.754	95.35	3.629	92.18	3.437	87.30	3.437	87.30	3.260	82.80	1.94	49.28
		17	25.30	3.740	95.00	3.615	91.82	3.63	92.20	3.63	92.20	N/A		1.94	49.28
		19.2	28.57	3.640	92.46	3.515	89.28	3.437	87.30	3.437	87.30	3.260	82.80	1.94	49.28
5	127.00	15	22.32	4.408	111.96	4.283	108.79	4.125	104.78	4.125	104.78	3.912	99.39	2.75	69.85
		18	26.79	4.276	108.61	4.151	105.44	4.000	101.60	4.000	101.60	3.748	95.20	2.38	60.45
5 1/2	139.70	17	25.30	4.892	124.26	4.767	121.08	4.562	115.87	4.562	115.87	4.445	113.16	2.85	72.39
		20	29.76	4.778	121.36	4.653	118.19								
		23	34.23	4.670	118.62	4.545	115.44	4.313	109.55	4.313	109.55	3.987	101.27	2.62	66.55
6	152.40	15	22.32	5.524	140.31	5.399	137.13	5.250	133.35	5.250	133.35	5.018	127.51	3.50	88.90
		18	26.79	5.424	137.77	5.299	134.59								
6 5/8	168.28	24	35.72	5.921	150.39	5.795	147.22	5.625	142.88	5.625	142.88	5.500	139.70	3.50	88.90
		28	41.67	5.791	147.09	5.666	143.92								
7	177.80	17	25.30	6.538	166.07	6.431	163.35	5.963	151.46	5.963	151.46	5.770	146.55	3.75	95.25
		20	29.76	6.456	163.98	6.331	160.81								
		23	34.23	6.366	161.70	6.241	158.52								
		26	38.69	6.276	159.41	6.151	156.24								
		29	43.16	6.184	157.07	6.059	153.90								
		32	47.62	6.094	154.79	5.969	151.61								
		35	52.09	6.004	152.50	5.879	149.33	5.875	149.23	5.875	149.23	5.750	146.05		

### Ordering Information

**Specify:** X® or XN®, R® or RN®, packing bore; tubing size, weight, grade, and thread; service environment (standard, %H<sub>2</sub>S, %CO<sub>2</sub>, amines/other chemicals, chloride content, temperatures, pressures, etc.); API monogramming or other certification requirements; special holddown (interference or shear pin on lock mandrel); special material and elastomer requirements, if applicable.

**Part Number Prefixes:** 11X, XN: landing nipple; 711X, XN: API/monogrammed landing nipple; 10XO, XN: lock mandrel; 710XO, XN: API/monogrammed lock mandrel; 11R, RN: landing nipple; 711R, RN: API/monogrammed landing nipple; 10RO, RN: lock mandrel; 710RO, RN: API/monogrammed lock mandrel

## FBN® Full Bore Landing Nipple and Lock Mandrel System

The FBN® full bore landing nipple and lock mandrel system allows an indefinite number of identical landing nipples to be installed in a tubing string. The FBN lock mandrel can be selectively set in any one of its associated landing nipples and when locked in place will withstand a differential pressure of up to 10,000 psi (690 bar) from either direction.

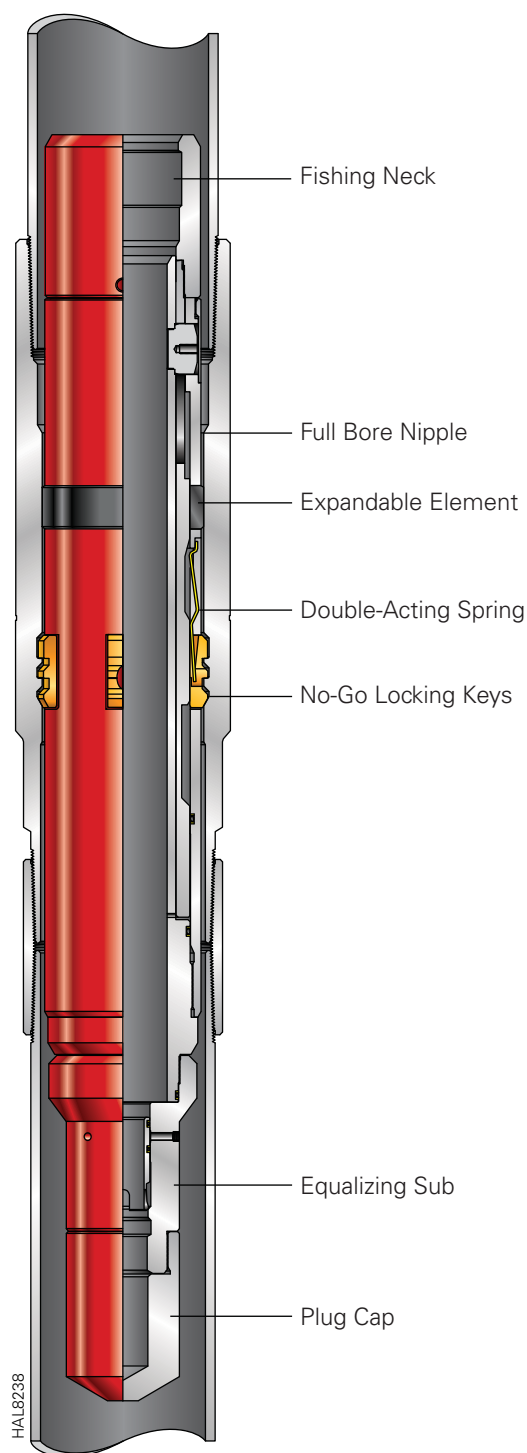
The lock mandrel's expanding seal element and the landing nipple's full-opening bore allow the lock to be run through any number of profiles before reaching the intended depth without the tendency to "hang up" in the higher profiles. This feature is particularly significant for large tubing and highly deviated well applications in which conventional selective locks will preset in higher profiles because of the interference-fit packing.

### Applications

- » Monobore well completions
- » Wells/fields/conditions in which problems exist for interference-type seals
- » High-angle/horizontal wells

### Features

- » Pressure ratings up to 10,000 psi (690 bar)
- » Seals protected during installation and retrieval of the lock
- » Can be run and retrieved on slickline or coiled tubing
- » Selective lock location
- » Element above keys



*FBN® Full Bore  
Landing Nipple and  
Lock Mandrel System*



## Benefits

- » Field proven
- » Any number of the identical nipples can be run
- » Smooth installation
- » Reduces time in the well with slickline
- » Seals on the locking mandrel protected from damage
- » Running/pulling with no interference
- » No need for restrictive sealbore landing nipples incompatible with some completion designs
- » Expandable element creates a seal downhole
- » Keys provide positive location in nipple

## FBN® Full Bore Landing Nipple and Lock Mandrel System

Tubing/ Casing Size		Casing Weight		Nominal ID		Drift		Standard Nipple ID		Minimum FBN Nipple ID		FBN Nipple Honed Bore		Lock Mandrel OD		Pressure from Above	Pressure from Below	Max. Temp
in.	mm	lb/ft	kg/m	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	psi	psi	°F
3 1/2	88.90	9.30	13.84	2.992	76.00	2.867	72.82	2.813	71.45	2.880	73.15	2.900	73.66	2.78	70.61	6,730	6,730	300
		10.2	15.18	2.922	74.22	2.797	71.04	2.750	69.85	2.810	71.37	2.830	71.88	2.73	69.34	10,000	10,000	300
4 1/2	114.30	12.60	18.75	3.958	100.53	3.833	97.36	3.813	96.85	3.840	97.54	3.920	99.57	3.79	96.27	6,400	6,400	300
		13.5	20.09	3.922	99.62	3.795	96.39	3.750	95.25	3.810	96.77	3.830	97.28	3.73	94.74	10,000	10,000	300
		16.90	25.15	3.740	95.00	3.615	91.82	3.688	93.688	3.630	92.20	3.710	94.23	3.60	91.44	10,000	6,400	300
5 1/2	139.70	20.00	29.76	4.788	121.36	4.653	118.19	4.562	115.87	4.665	118.49	4.685	119.00	4.54	115.32	9,290	9,190	300
		23.00	34.23	4.670	118.62	4.545	115.44	4.437	112.70	4.562	115.87	4.582	116.38	4.42	112.27	6,400	8,360	300
7	177.80	29.00	43.16	6.184	157.01	6.059	153.90	5.963	151.46	6.070	154.18	6.120	155.45	5.94	150.88	9,780	7,500	300
		32.00	47.62	6.094	154.79	5.969	151.61	5.963	151.46	5.980	151.89	6.000	152.40	5.86	148.84	8,529	7,526	300

### Ordering Information

**Specify:** tubing size, weight, grade, and thread connections; service environment (standard, %H<sub>2</sub>S, %CO<sub>2</sub>); temperature; pressure rating.

**Part Number Prefixes:** 10FBN: lock mandrels, 710FBN: lock mandrels, 11FBN: landing nipples, 711FBN: landing nipples, 20FBN: equalizing valves, 24FBN: equalizing prong/plug assembly

## No-Go Locks and Nipples

### Otis® RPT® No-Go Landing Nipple and Lock Mandrel Systems

The Halliburton Otis® RPT® no-go landing nipple system provides a means of running a series of positive location landing nipples in a tubing string with minimum restriction. Otis RPT no-go landing nipples are designed to accept Otis RPT and RPTS lock mandrels.

The Otis RPT and RPTS no-go lock mandrels locate on top of the nipple's polished bore; therefore, there are no secondary restrictions normally associated with bottom no-go profiles. This feature makes Otis RPT systems well suited for high-pressure, high-volume large bore completions. Otis RPT and RPTS lock mandrels in any given size range are designed to use the same running and pulling tool.

Some of the original RPT series lock mandrels were designed with large no-go profiles that were not compatible with the 1/16-in. sealbore ID reductions between nipples that are currently available. For these sizes, the RPTS series of locks was developed. All RPTS lock mandrels incorporate no-go profiles that allow a 1/16-in. sealbore stagger in the completion design. The reduction in no-go OD on the RPTS lock mandrel does not affect the pressure rating.

### Applications

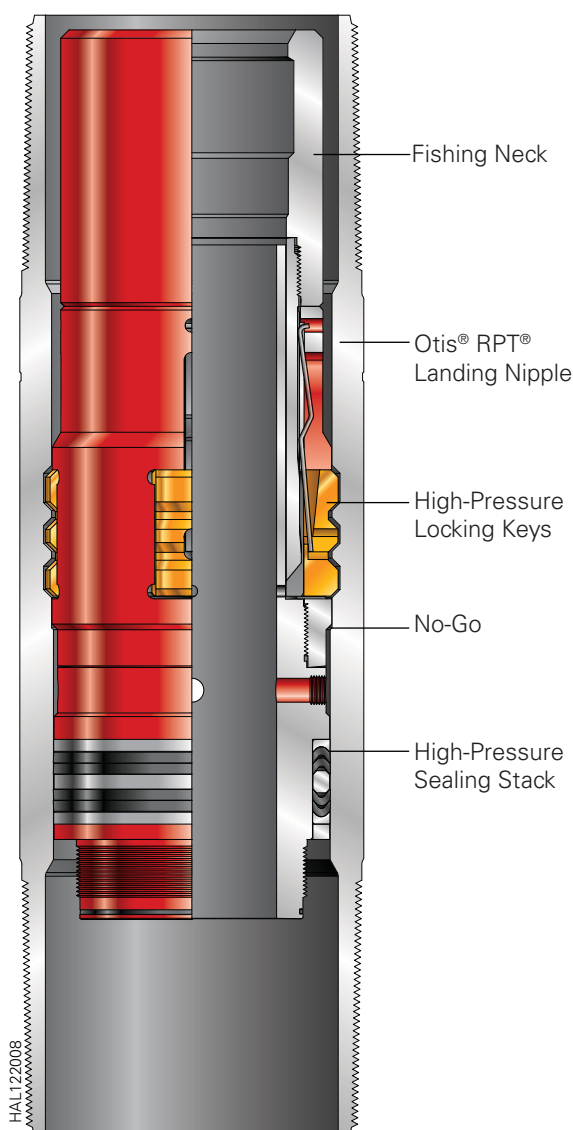
- » High-pressure/high-temperature large bore completions
- » Running a series of no-go nipples in a tubing string when positive location and minimal ID reduction are required

### Features

- » Large bore
- » All RPTS locks and most RPT locks will allow a 1/16-in. stagger in nipple bore sizes
- » Lock mandrel locates on top of the nipple's polished bore
- » A series of profile IDs are established for common tubing strings by size and weight
- » The reduction in no-go OD on the RPTS lock mandrel does not have any effect on their pressure rating

### Benefits

- » No secondary restrictions normally associated with bottom no-go profiles
- » Lock mandrels in a particular size range use the same running and pulling tool



*Otis® RPT® No-Go  
Landing Nipple with RPT Plug*

### Otis® RPT® Profile and Lock Dimensions

Tubing Size		Nipple Profile		Lock Mandrel			
		Sealbore (Minimum ID)		ID		OD	
in.	mm	in.	mm	in.	mm	in.	mm
2 3/8	60.33	1.500	38.10	0.75	19.05	1.560	39.62
		1.625	41.28			1.685	42.80
		1.781	45.24			1.841	46.76
		1.875	47.63			1.935	49.15
		2.000	50.80			2.060	52.32
		2.125	53.98			2.185	55.5
2 7/8	73.03	2.000	50.80	1.12	28.45	2.060	52.32
		2.125	53.98			2.185	55.5
		2.188	55.58			2.248	57.10
		2.313	58.75			2.373	60.27
		2.482	63.04			2.542	64.57
3 1/2	88.90	2.562	65.07	1.50	38.10	2.622	66.6
		2.650	67.31			2.710	68.83
		2.750	69.85			2.810	71.37
		2.813	71.45			2.860	72.64
		2.875	73.03			2.935	74.55
4 to 4 1/2	101.6 to 114.3	3.000	76.20	1.75	44.45	3.060	77.72
		3.125	79.38			3.210	81.53
		3.125	79.38	1.94	49.28	3.210	81.53
		3.313	84.15			3.395	86.23
4 1/2 to 5	114.3 to 127	3.437	87.30	1.94	49.28	3.520	89.41
		3.562	90.47			3.650	92.71
		3.688	93.68			3.770*	95.76
		3.750	95.25			3.807	96.70
		3.813	96.85			3.895	98.93
		4.000	101.60			4.090	103.89
5 1/2	139.70	4.188	106.38	2.75	69.85	4.270*	108.46
		4.250	107.95			4.332*	110.03
		4.313	109.55			4.395	111.63
		4.437	112.70			4.520*	114.81
		4.500	114.30			4.550	115.57
		4.562	115.87	3.12	79.25	4.650	118.11
		4.688	119.08			4.760*	120.90
		4.688	119.08			4.760*	120.90
		4.750	120.65			4.825	122.56
		4.813	122.25			4.890	124.21
7	177.80	5.250	133.35	3.68	93.47	5.334	135.48
		5.500	139.70			5.585	141.86
		5.625	142.88			5.710	145.03
		5.750	146.05			5.840*	148.34
		5.813	147.65			5.890*	149.61
		5.875	149.23			5.940	150.88
		5.963	151.46			6.025	153.04
		6.125	155.58			6.180	156.97
		6.250	158.75			6.330	160.78

\*No-go OD for these RPT® lock sizes might not be compatible with the next larger size nipple.

Special OD tools are available. These use part number prefix 10RPTS and 710RPTS.

## No-Go Locks for Safety Valves

The no-go nipple system allows positive placement of wireline safety valves, retrievable in predetermined nipples used in the completion. This section highlights the Halliburton Otis® RQ, Otis RPV, and Otis SAFETYSET® no-go lock mandrel/nipple systems.

### Otis® RQ No-Go Lock Mandrels

RQ lock mandrels are top no-go lock mandrels designed to land and lock in Otis RQ profiles in safety valve landing nipples and tubing retrievable safety valves.

### Otis RPV No-Go Lock Mandrels

RPV lock mandrels are top no-go lock mandrels designed to land and lock in Otis RPT® landing nipple profiles.

### Applications

- » Systems are designed for subsurface safety valve (SSSV) applications.
- » RQ mandrels are only used with Otis RQ landing nipple profiles in SSSV equipment.
- » RPV mandrels are only used with Otis RPT landing nipple profiles.

### Features

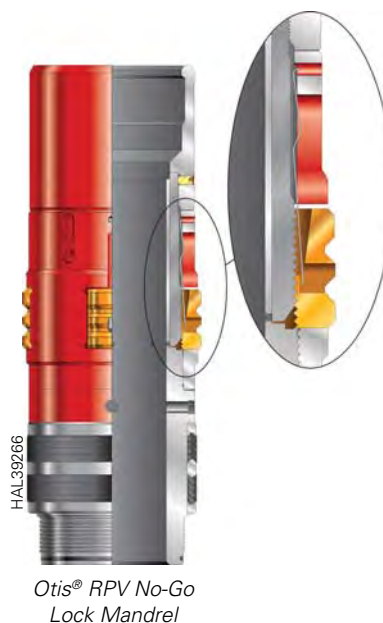
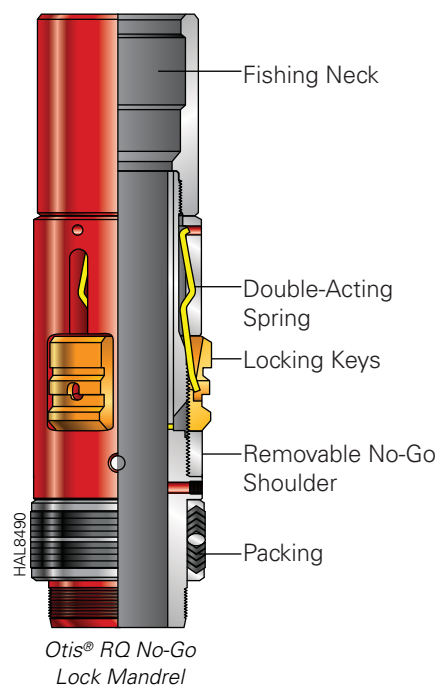
- » Matching non-helical teeth inside the keys and on the expander sleeve OD provide primary holddown.
- » Shear pin or interference-fit secondary holddown helps ensure the lock remains in place during extreme flowing conditions.
- » RQ mandrel features removable no-go ring.
- » RPV mandrel no-go takes the entire load.

### Benefits

- » Positive no-go location prevents wireline misruns
- » Installed and retrieved by standard slickline methods
- » Redundant holddown features
- » Teeth engage and become primary holddown when lock has pressure differential from below

### Options

- » Anti-vibration feature available



## Otis® SAFETYSET® Lock Mandrel System

The Halliburton Otis® SAFETYSET® lock mandrel system is a drive-down, jar-up-to-set, no-go-type system designed specifically for surface-controlled subsurface safety valve (SCSSSV) applications. This system consists of an Otis SAFETYSET lock mandrel, running tool, and unlocking tool. The SAFETYSET lock mandrel system is designed to help ensure valve-set integrity and hydraulic control communication to the safety valve.

The design features a locking sleeve that moves upward in the direction of flow to establish a locked safety valve. This locking allows unlimited drive-down action without the possibility of presetting the lock while it travels downhole. A no-go shoulder on the lock mandrel provides positive locating within the landing nipple. This system is designed to minimize operator guesswork at surface by requiring two independent conditions to exist before the running tool will release. The SCSSSV must be pressured open for lock keys to expand. Only when the locking sleeve is locked in place will the running tool release. A running tool retrieved to surface without the lock and valve indicates a functional valve securely locked into the landing nipple.

### Applications

- » Specifically designed for slickline-retrievable, SCSSSV applications
- » High flow rates

### Features

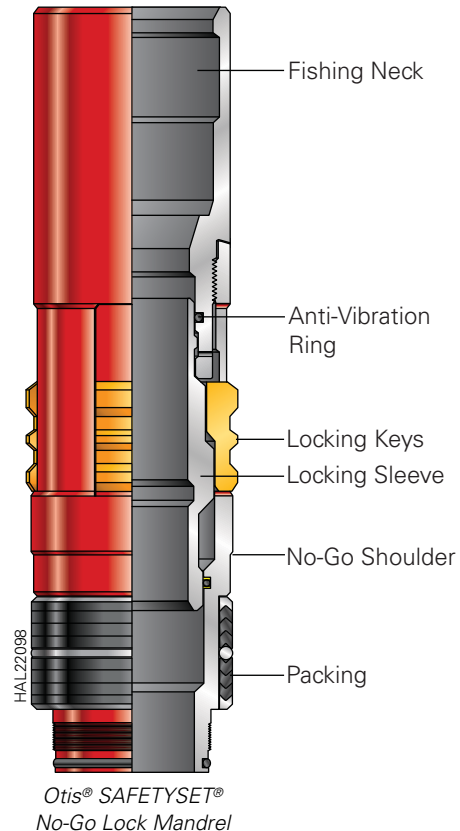
- » No shear pins in the running tool
- » Running tool can be released only after lock mandrel locks (locking keys fully extended into the profile) and SCSSSV is operable
- » Large ID
- » Locking sleeve locks in the direction of flow
- » Optimum pressure rating design on lock mandrel
- » Anti-vibration ring in lock mandrel

### Benefits

- » Helps eliminate the possibility of subsurface safety valves (SSSVs) being left downhole when improperly installed without control-line pressure integrity
- » No shear pin damage to safety equipment, seals, and sealing bores
- » No presetting and false-set indications from premature pin shearing
- » Helps prevent possible flow-out of the SSSVs to surface
- » Minimal metal-to-metal abrasion from vibration
- » Lock system protected from unintentional unlocking caused by slickline tools passing through the ID

### Options

- » Designs available for all Otis RQ and Otis RPT® landing nipple profiles
- » Models designed to land and lock in any safety valve landing nipple if there is a no-go
- » “UP” running tool allows for setting staggered and non-staggered sealbore safety valves



### Ordering Information

**Specify:** type nipple profile or part number of nipple, if known; packing bore of nipple; special material requirements, if applicable; service environment (standard, %H<sub>2</sub>S, %CO<sub>2</sub>, amines); necessity of API monogramming or other certification requirements; pressure rating.

**Part Number Prefixes:** 710SS: API monogrammed lock mandrel to fit RQ profile, 710SSA: to fit RPT profile

## SRH Plug

Halliburton SRH high-pressure plugs are designed for use in extreme temperature and pressure environments. The SRH plug uses the top no-go location and is designed such that pressure from above and below is held by key/nipple engagement. Special non-elastomer V-packing stacks are gas-tight qualified up to 25,000 psi at 450°F.

### Features

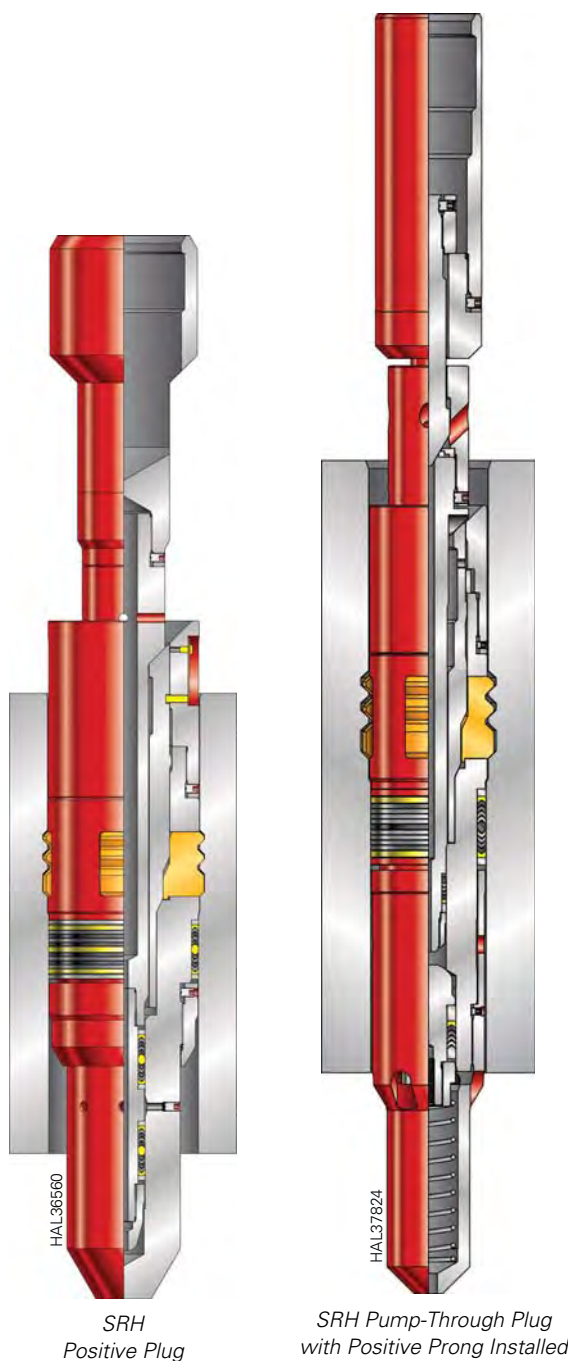
- » Robust and simple uni-body style plug with one moving part (key expander)
- » V0-qualified high-pressure/high-temperature (HP/HT) non-elastomer seal stack
- » 3 × 45° loading surfaces on key above and below, maximizing key bearing area
- » Up to 25,000 psi pressure rating at 450°F
- » Metal-to-metal (MTM) shear plug for equalizing in pump-through type
- » Holddown feature locks plug in the set position

### Benefits

- » Uni-body design eliminates internal leak paths
- » Bubble-tight seal performance at ultra-high pressures and temperatures
- » Key/nipple profile configuration provides ultra-high pressure capability while minimizing component stress levels
- » All seals are inert to all known well fluids and are unaffected by rapid gas decompression
- » Pump-through plug type allows for well kill while installed in the nipple profile
- » Pre-install capabilities of the positive-type plug in the completion helps eliminate the need to run wireline to set the plug body
- » Running tool does not release until lock is correctly and fully set
- » Pulling tool will not engage unless pressure equalizes across the plug

SRH plugs are available in pump-through and positive type. The pump-through type incorporates a poppet that has an MTM seal backed up by an HP/HT non-elastomer V-packing stack. An MTM knockout plug is provided for equalization. A test prong can be run to convert the pump-through plug into a positive plug for testing from above.

The two-trip prong-type plug is a positive plug with no pump-through feature. The packing on the prong uses the same type HP/HT V-packing stacks as used on the plug body. The prong is pressure balanced for easy removal under high-pressure differential to allow for equalizing before retrieving the plug.



SRH  
Positive Plug

SRH Pump-Through Plug  
with Positive Prong Installed



# Wellhead Plugs and Backpressure Valves

## SRP Wellhead Plugs

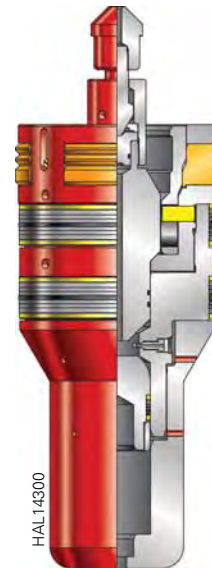
The Halliburton SRP plug system is designed primarily for use in horizontal subsea trees. Its compact size allows the tree to be shorter, which allows for smaller, less costly wellhead equipment. The top no-go design provides a positive locating means to simplify running procedures and eliminate misruns. Because the SRP plug is a dedicated wellhead plug, it can be used for any tree or tubing hanger plugging application.

## SRP Wellhead Backpressure Valves

SRP wellhead backpressure valves provide pump-in well-kill capability, while providing complete well control. The valve features the same compact design and multiple seal backup available in the SRP wellhead plug. A test prong is also available to allow testing of the hanger and tree from above. The SRP backpressure valve incorporates two equalizing methods and cannot be released before full equalization of pressure. Both the SRP wellhead backpressure valve and wellhead plug use the same service tools for running and retrieving.



SRP  
Wellhead Plug



SRP Wellhead  
Backpressure Valve  
(with Test Prong)

## SSP Wellhead Plugs

Halliburton SSP wellhead plugs feature a primary metal-to-metal seal and a composite packing stack. These plugs are typically rated for 10,000-psi (15,000-psi test) pressures from above and below. The wellhead plug features demonstrate the benefits of Halliburton design expertise and field experience.

### Applications

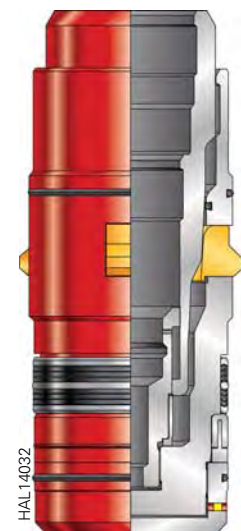
- » Conventional tubing hangers
- » Platform horizontal trees
- » Subsea horizontal trees

### Features

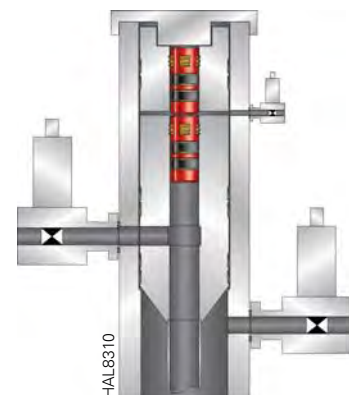
- » Dedicated wellhead design
- » Internal fish neck
- » Top no-go locator
- » Single or multiple seal stacks
- » Equalizing option
- » High-pressure seal stack

### Benefits

- » Helps reduce tubing hanger, tree housing, and services costs
- » Minimizes service riser dimension/costs
- » Helps save time and costs using slickline to install
- » Field-proven technology
- » Compatible with other Halliburton downhole landing nipples



SSP  
Wellhead Plug



Subsea  
Horizontal Tree

### Ordering Information

**Specify:** packing bore, pressure rating, special material requirements, service environment.

**Part Number Prefixes:** 10 and 710SRP: wellhead plugs; 21SRP: for backpressure valve; 14 SRP: for test prongs for BPV; 710SSP: for MTM seal

# Through-Tubing Plugging Equipment

## Plugs Set in Nipples

### Otis® One-Trip Plug Assemblies

*Note: Not recommended for use where debris can build up in or above the plug system. Please refer to the prong-type plug systems for a debris-tolerant solution.*

Otis® one-trip plug assemblies consist of a lock mandrel, equalizing subassembly, and plug cap. These plugs are run and pulled on slickline to plug the tubing during various operations.

Otis one-trip plugs are available for all Otis key-type locks. This style plug is also available for FBN® locks.

One-trip plug assemblies are designed to hold differential pressure from above or below during normal plugging operations. The equalizing sub provides an equalization path across the plug. Only one slickline trip is required to run or pull the plug.

### Applications

- » Normal plugging operations
- » Setting and testing packers
- » Removing the wellhead
- » Testing tubing
- » Separating zones during production tests or data gathering
- » Assemblies for X®, XN®, R®, RX, RPT®, and FBN locks and nipples

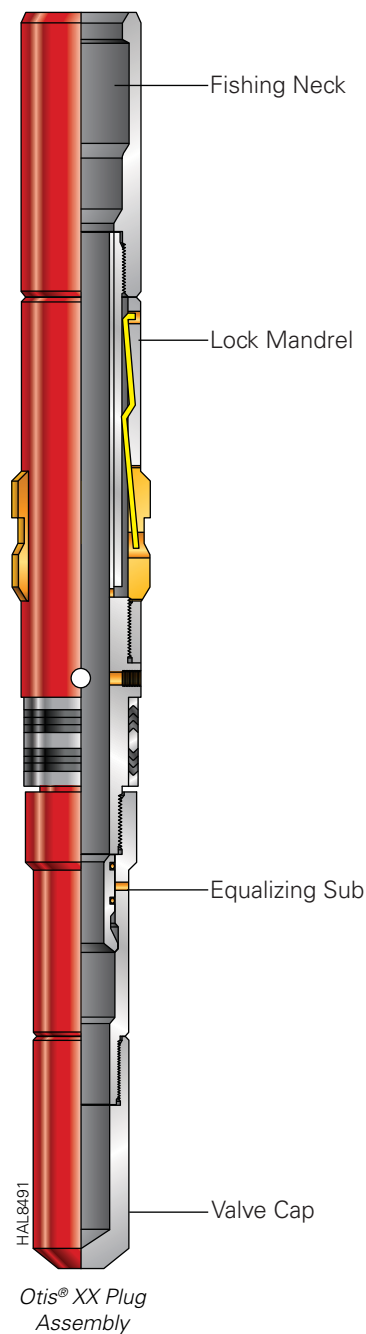
### Features

- » Balanced equalizing system
- » Fluid bypass during running or retrieving operations

### Benefits

- » Requires only one slickline trip to run or pull
- » Holds pressure from below or above

*Note: One-trip plugs require a lock mandrel, equalizing valve, and valve cap. Each are ordered separately.*



### Ordering Information

**Specify:** lock type and size or part number, if known; plug type (one-trip, two-trip, pump through); service environment (standard, %H<sub>2</sub>S, %CO<sub>2</sub>, amines); temperature and pressure rating requirements; special material requirements, if applicable.

**Part Number Prefixes:** 20XO, RO, RPT, FBN: equalizing valve for one-time plug. 20X, R: valve cap for one-trip plug.



## Otis® Prong-Type Plug Assemblies

Otis® prong-type plug assemblies consist of a lock mandrel and prong equalizing housing. Plugs are run and pulled on slickline and used to plug the tubing during various operations, such as setting and testing packers and testing tubing.

Otis prong-type plugs are made available for all Otis key-type lock mandrels.

Otis plug assemblies with equalizing prongs are used to plug the wellbore in either direction. They are designed for use where sediment might collect on the plug. Before the plug is retrieved from the wellbore on slickline, the prong is removed from the plug housing, providing an equalization path across the plug. Two slickline trips are required to run or pull the plug.

### Applications

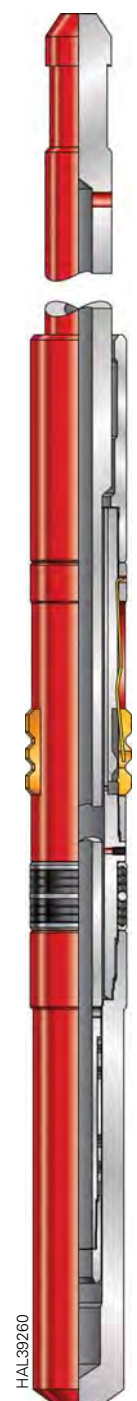
- » Setting and testing packers
- » High-pressure conditions
- » Removing the wellhead
- » Separating zones during production tests or data gathering
- » For use where sediment might collect on the plug
- » Available for X®, XN®, RN®, RPT®, and FBN® locks and nipples

### Features

- » Balanced equalizing prongs with seals for either standard or H<sub>2</sub>S service
- » Fluid bypass during running or retrieving operations
- » Extended-length prongs for use in completions with side-pocket mandrels or when a significant amount of sediment is expected
- » V-packing seals on equalizing prong

### Benefits

- » Set and retrieved on slickline
- » Holds pressure from below or above
- » Dependable sealing in extreme environments
- » Compatible with other Halliburton downhole landing nipples



HAL39260

Otis® PRR Plug Assembly

### Ordering Information

**Specify:** lock type and size or part number, if known; plug type (one-trip, two-trip, pump through); service environment (standard, %H<sub>2</sub>S, %CO<sub>2</sub>, amines); temperature and pressure rating requirements; special material requirements, if applicable.

**Part Number Prefixes:** 24PXX, PRR, RPT, FBN

## Otis® XR Pump-Through Plug Assemblies

Halliburton Otis® XR pump-through plug assemblies are designed to hold pressure differential only from below. They can be pumped through by applying tubing pressure above the plug until it overcomes the well pressure, thus allowing fluids to be pumped through the plug, to equalize across the plug, or to kill the well. One slickline trip is required to run or pull the plug. These plug chokes are run and pulled on slickline to plug the tubing during various operations. Otis XR pump-through plugs can be made up on Otis X®, XN®, R®, RN®, RPT® or FBN® lock mandrels and installed in Otis X, XN, R, RN, RPT, or FBN landing nipples.

### Applications

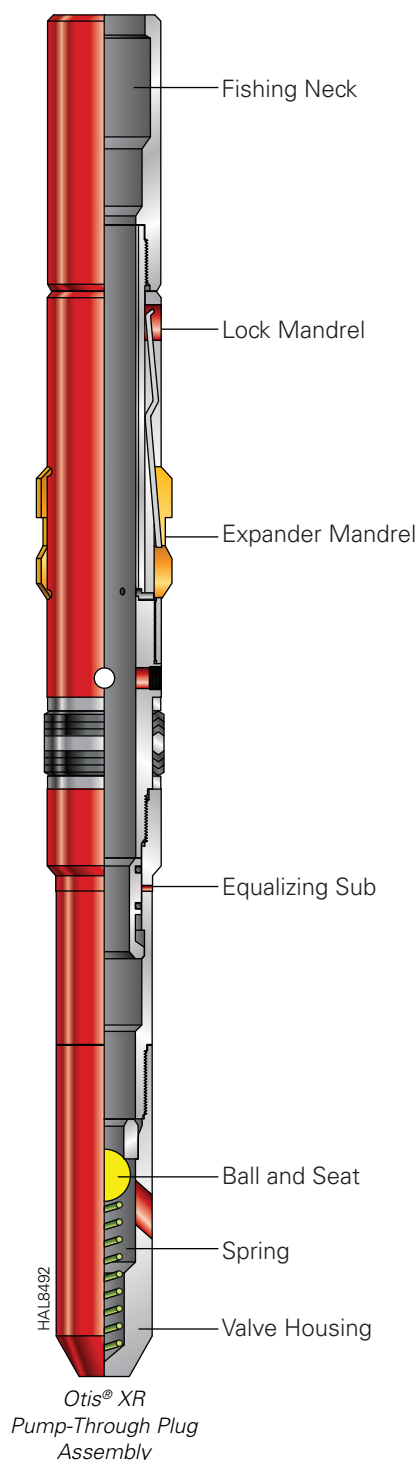
- » Killing the well
- » Removing the wellhead
- » Isolating high-pressure zones from lower-pressure zones

### Features

- » Holds pressure differential from below only
- » Uses a ball-and-seat assembly

### Benefits

- » Requires only one slickline trip to run or pull the plug
- » Allows kill fluids to be pumped through the plug



### Ordering Information

**Specify:** lock type and size or part number, if known; plug type (one-trip, two-trip, pump through); service environment (standard, %H<sub>2</sub>S, %CO<sub>2</sub>, amines); temperature and pressure rating requirements; special material requirements, if applicable.

**Part Number Prefix:** 21XR: pump-through plug

## Pump-Open Plugs

The pump-open plug is a positive plug that holds pressure from either direction but can be pumped open by applying excess surface pressure.

Pump-open plugs serve as temporary tubing plugs that can be pumped open and used for production without retrieval by slickline.

These plugs consist of a plug body, plug cap, and pump-open valve. They are designed to be run with equalizing valves and are available for all Otis® key-type lock mandrels.

### Applications

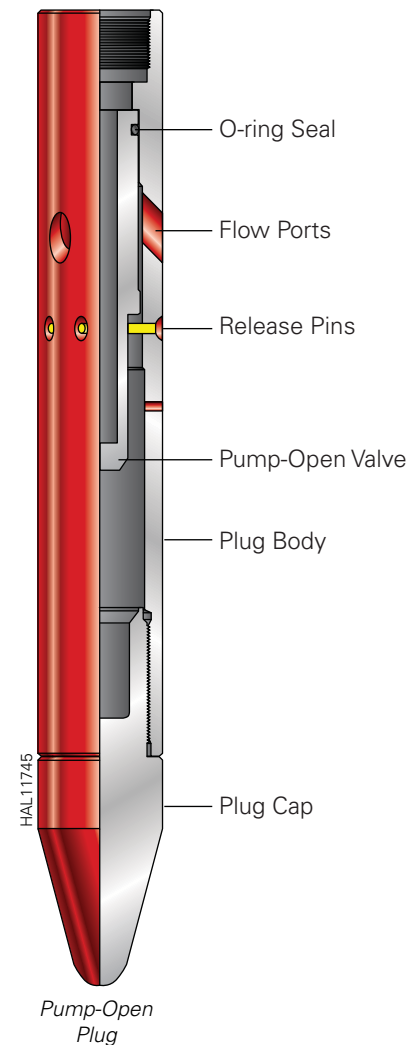
- » As a temporary tubing plug that can be pumped open and used for production without running slickline
- » For conventional plugging applications in sandy conditions in which equalizing through small bore equalizing devices might be difficult
- » To isolate perforations when run below a packer completion assembly

### Features

- » Only one moving part
- » Non-tortuous flow path
- » Balanced flow areas

### Benefits

- » Provides reliable, economical performance
- » Can be used with virtually any lock mandrel



### Ordering Information

**Specify:** lock/equalizing valve size and type or part number, if known; service environment (standard, %H<sub>2</sub>S, %CO<sub>2</sub>, amines, etc.); temperature rating; special material requirements, if applicable.

**Part Number Prefixes:** 21XPO, RPO: pump-open plug

## Equalizing Subs

Halliburton features many different equalizing subs to accompany the various lock mandrel models available. The various submodels differ in ID size, pressure-holding capability, equalizing valve design, lock mandrel compatibility, tubing weight, and service environment.

### Otis® XH Equalizing Subs

Halliburton Otis® XH equalizing subs feature button-type valves with a no-go OD that holds pressure from below only. They are designed to be used with Otis X® lock mandrels to allow ambient and pressure-differential safety valves to be reopened against differential pressures without being pulled.

The Otis XH equalizing valve has a flow bore compatible with the subsurface flow control bore.

### Applications

- » Used with Otis X lock mandrels
- » Allow ambient and pressure-differential safety valves to be reopened against differential pressures without being pulled
- » Suitable for H<sub>2</sub>S and standard service

### Features

- » Button valve
- » No-go OD
- » Holds pressure from below only

### Benefits

- » Ambient and pressure-differential safety valves can be reopened without being pulled

### Otis X and R® RPT® and FBN® Equalizing Subs

These Otis equalizing subs are used in one-trip plugs when pressure differentials are anticipated. They are designed to hold pressure from above or below.

These subs are run in the open position, and the running prong shifts the sleeve to the closed position during the setting procedure.

The pulling prong shifts the sleeve downward to the open position for equalization before pulling.

### Applications

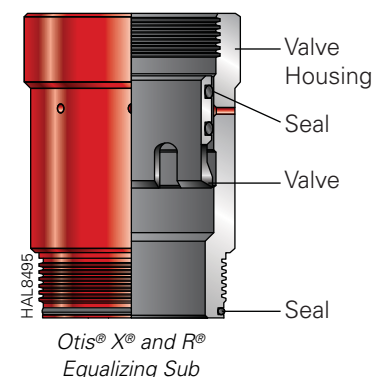
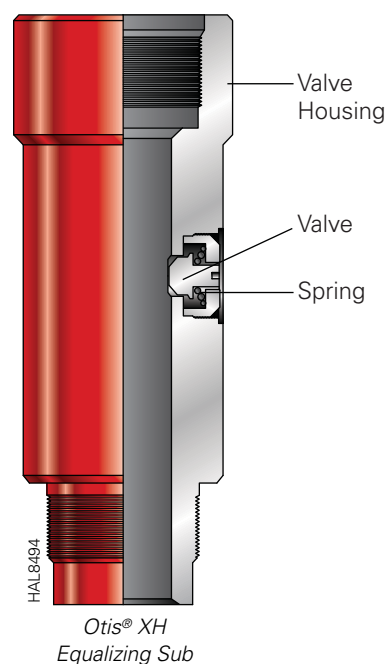
- » When pressure differentials are anticipated across a flow control device
- » Available for all Otis key-type lock mandrels

### Features

- » Holds pressure from above or below
- » Valve is closed when running tool is released and is opened when pulling tool is engaged
- » Pressure balanced

### Benefits

- » Ports opened during installation for fluid bypass
- » Can be adapted to numerous flow control devices and Storm Choke® safety valves



### Ordering Information

**Specify:** lock type and size or part number, if known; service environment (standard, %H<sub>2</sub>S, %CO<sub>2</sub>, amines); temperature and pressure rating requirements; special material requirements, if applicable.

**Part Number Prefix:** 20XO, XH, RO, RPT, FBN: equalizing subs

## Otis® Bottomhole Choke Beans

Halliburton Otis® bottomhole choke beans are designed to reduce the possibility of freezing surface controls by moving the point of pressure and temperature reduction to the lower portion of the wellbore. They can be run on any Halliburton Otis lock mandrel.

Otis choke beans are designed to prolong the flowing life of wells by liberating gas from the solution at the bottom of the hole. This liberation lightens the oil column and increases flow velocity. These choke beans also help prevent water encroachment by maintaining a consistent bottomhole pressure. Reducing water encroachment helps stabilize and maintain constant formation oil/water contact.

### Applications

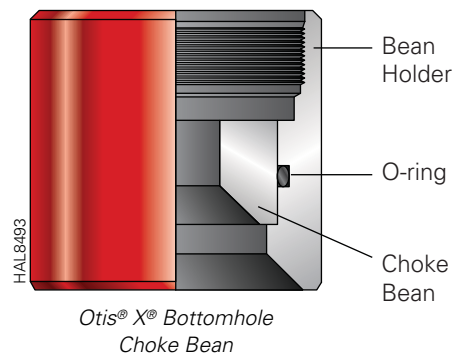
- » To help minimize the possibility of freezing surface controls

### Features

- » Can be connected to all Otis lock mandrels
- » Available in various sizes

### Benefits

- » Minimize water encroachment
- » Lighten the oil column
- » Increase flow velocity
- » Prolong the life of the well



### Ordering Information

**Specify:** lock type and size or part number, if known; service environment (standard, %H<sub>2</sub>S, %CO<sub>2</sub>, amines); temperature and pressure rating requirements; bean size for X® bottomhole choke.

*Note: Beanholder supplied with blank bean for custom sizing. Alternate beans are available under prefix 21X.*

**Part Number Prefix:** 21XO: beanholder with choke

## Bottomhole Pressure and Temperature Equipment

Halliburton softset gauge hangers and LO shock absorbers are designed to attach to bottomhole pressure and temperature tools and allow them to be positioned downhole.

### Softset Gauge Hanger

Softset gauge hangers are designed to set instruments virtually anywhere Otis® landing nipples are installed. Data surveys can be collected downhole using conventional slickline methods. This practice provides significant savings (1) when several wells in a field are to be surveyed and (2) in fields where a highly corrosive environment requires the slickline to be removed from the well during prolonged monitoring.

### Applications

- » Wells with a highly corrosive environment
- » Fields with several wells to be surveyed
- » Wells that require extended surveys

### Features

- » Soft mechanical release

### Benefits

- » Does not require jarring to set
- » Allows for data surveys using conventional slickline methods
- » Allows for accurate charts, rather than recording jarring effects
- » Can be set in one of many landing nipples to run surveys at known locations downhole

*Note: An Otis MR mechanical running tool is used to run the Otis softset bomb hanger. It is designed to carry weight in excess of the 140-lb (63.5 kg) weight limit of a hydraulic running tool. The Otis MR mechanical running tool features an emergency shear ring designed to release the core from the fishing neck if the bomb hanger becomes stuck and needs to be freed.*

### Shock Absorbers

The LO shock absorbers are designed to help prevent instrument damage caused by jarring and impacts during slickline operation. The assemblies suspended below the shock absorbers are supported by springs within the absorber. Any shocks transmitted from the slickline toolstring are absorbed by the shock absorbers.

The absorbers should be used only when the weight of the instruments attached below does not compress the spring to its stacked length.

#### Ordering Information Shock Absorbers

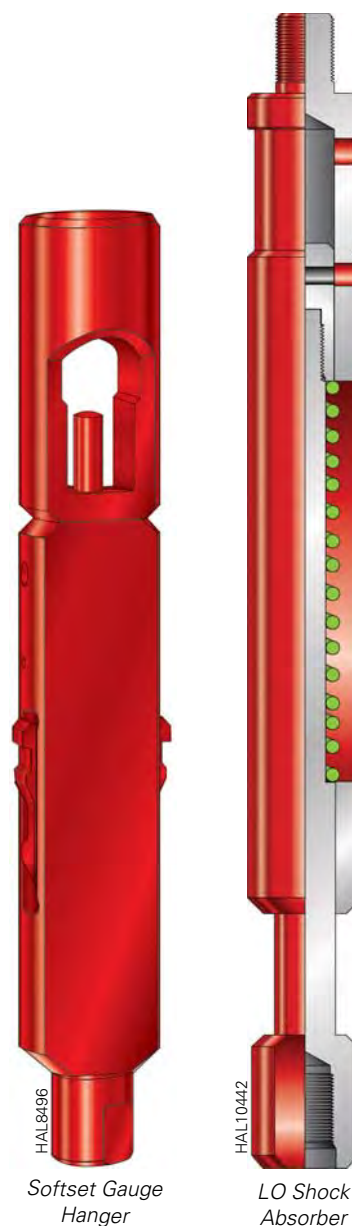
**Specify:** lock type and size; service environment (standard, %H<sub>2</sub>S, %CO<sub>2</sub>, amines); special material requirements, if applicable; weight of instruments.

**Part Number Prefix:** 33LO: bomb hanger or shock absorber

#### Ordering Information Softset Bomb Hanger

**Specify:** tubing size, weight, and thread; nipple profile and ID; service environment (standard, %H<sub>2</sub>S, %CO<sub>2</sub>, amines); special material requirements, if applicable; weight of instruments.

**Part Number Prefixes:** 33XN, RNS, 33RPT, 33FBN: softset bomb hanger



Softset Gauge Hanger

LO Shock Absorber

## Tubing-Installed Flow Control Equipment

### DuraSleeve® Sliding Side-Door® Circulation and Production Sleeve

The DuraSleeve® Sliding Side-Door® circulation and production sleeve is a full-opening device with an inner sleeve that can be repeatedly opened and closed to gain communication between the tubing/casing annulus. A nipple profile in the top sub and a polished bore in the bottom sub are standard features, which allow accessory tools, such as a Side-Door choke or separation tool to be set across the DuraSleeve device.

The DuraSleeve device incorporates Halliburton DURATEF™ engineered composite material (ECM) seals, thus completely eliminating any elastomers from the tool. These seals provide a more easily shifted sleeve while providing reliable service for the life of the well.

#### Applications

- » Single string selective completions
- » Providing a path for circulating heavier or lighter fluids
- » Secondary recovery

#### Features

- » Polished sealbores in both top and bottom subs
- » All seals are non-elastomer
- » Circulation/production flow area is equal to DuraSleeve device ID
- » Collet provides positive sleeve location in the closed, equalizing, and open position
- » Open up and open down versions available
- » Equalizing ports in the inner sleeve allow opening under high differential pressures
- » B profile provides automatic positioning tool release when sleeve is completely shifted

#### Benefits

- » Reliable operation during the life of the well
- » Can be opened repeatedly against high differential pressures
- » Can be shifted in high debris or sandy environments
- » Several sleeves can be shifted in a single slickline trip
- » Individual sleeves can be opened or closed selectively
- » Slickline-run accessory tools can be set within the DuraSleeve device



*DuraSleeve® Sliding Side-Door®  
Circulation/Production Sleeve*

## DuraSleeve® Sliding Side-Door® Circulation and Production Sleeve

Tubing Size		Sliding Side-Door® ID		Nipple Profile		
in.	mm	in.	mm	X®	R®	RPT®
2 3/8	60.33	1.875	47.63	○	●	●
		1.781	45.24		○	
		1.710	43.43		○	●
2 7/8	73.03	2.313	58.75	○	○	●
		2.188	55.58		○	●
		2.125	53.98		○	●
		1.875	47.63	○	○	●
		1.710	43.43		○	
3 1/2	88.90	2.813	71.45	○	○	○
		2.750	69.85	○	○	○
		2.562	65.07		○	●
		2.313	58.75	○	○	●
4	101.60	3.313	84.15	○		○
		3.125	79.38		○	○
4 1/2	114.30	3.813	96.85	○	○	○
		3.750	95.25		○	○
		3.688	93.68		○	○
		3.562	90.47			○
		3.500	88.90			○
		3.437	87.30		○	○
5	127.00	4.000	101.60		○	○
		3.813	96.85	○	○	●
		3.688	93.68		○	○
		3.562	90.47			○
		3.437	87.30		○	●
5 1/2	139.70	4.688	119.08			●
		4.562	115.87	○	○	○
		4.500	114.30			○
		4.437	112.70			○
		4.313	109.55	○	○	○
7	177.80	5.960	151.38		●	●
		5.875	149.23		○	●
		5.625	142.88		○	○
		5.500	139.70			○

○ = currently available

● = available on request



## Slimline DuraSleeve® Sliding Side-Door® Circulation and Production Device

Slimline DuraSleeve® Sliding Side-Door® circulation and production devices are available in 2 3/8- through 4-in. sizes. These Sliding Side-Door circulation devices retain

all the features of the regular Halliburton circulation devices but have reduced pressure and tensile ratings.

### Slimline Circulation and Production Equipment

Tubing Size		Tubing Weight		Tubing ID		Tubing Drift		Standard Weight ID		OD*	
in.	mm	lb/ft	kg/m	in.	mm	in.	mm	in.	mm	in.	mm
2 3/8	60.33	4.6	6.85	1.995	50.67	1.901	48.29	1.875	47.63	2.710	68.83
		4.7	6.99	1.995	50.67	1.901	48.29				
2 7/8	73.03	6.4	9.52	2.441	62.00	2.347	59.61	2.313	58.75	3.220	81.78
		6.5	9.67	2.441	62.00	2.347	59.61				
3 1/2	88.9	9.3	13.84	2.992	76.00	2.867	72.82	2.813	71.45	4.195	106.55
		10.3	15.33	2.992	76.00	2.797	71.04	2.750	69.85	3.925	99.69
4	101.6	11	16.37	3.476	88.29	3.351	85.10	3.313	84.15	4.635	117.73

\*ODs are based on 110-ksi minimum yield material.

#### Ordering Information

**Specify:** type (open up or down); tubing size, weight, grade, and thread; service environment (standard, %H<sub>2</sub>S, %CO<sub>2</sub>, amines); pressure and temperature requirements; dimensional constraints, if any; special material requirements.

**Part Number Prefix:** 62100

## Zonemaster™ Injection System

The Zonemaster™ injection system provides the ability to control injection for any interval in a well. When run with isolation packers, the Zonemaster system mandrels provide a positive and reliable method to shut off well segments. The Zonemaster system consists of two separate components. The ported landing nipple is generally run as part of the tubing string or liner and is used as the injection point into the production tubing. Zonemaster isolation sleeves can be installed or retrieved depending on whether the adjacent interval should be injected into or shut off.

### Applications

- » Selective injection
- » Formation isolation
- » Individual interval stimulation

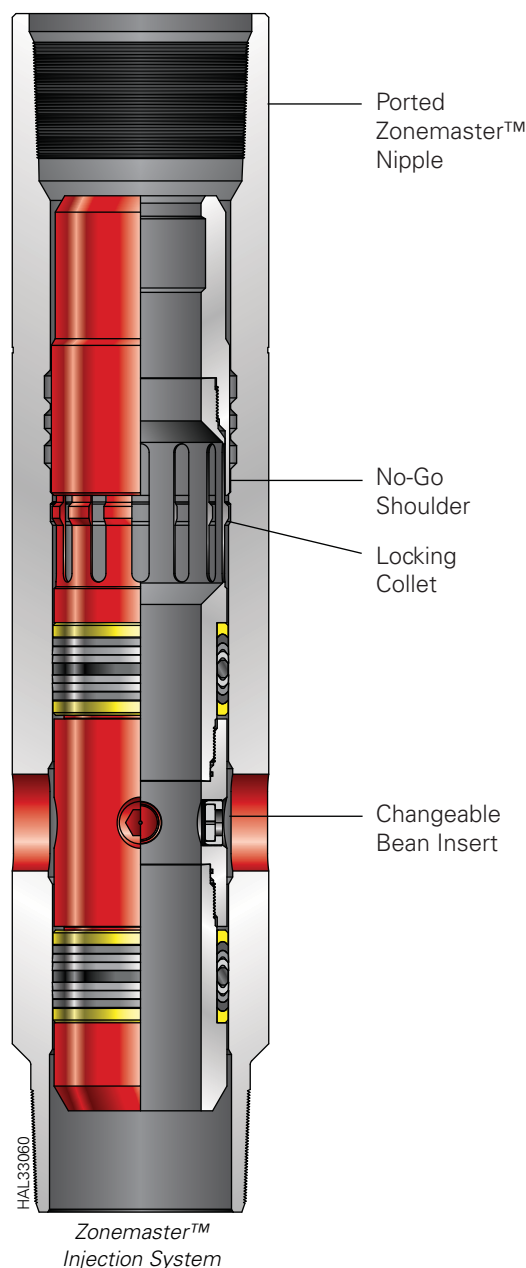
### Features

- » No-go positive positioning system
- » Large isolation sleeve ID
- » Collet holddown system simplifies setting
- » Nipple accepts RPT® lock mandrels
- » Installation capability with:
  - Wireline
  - Coiled tubing
  - Sucker rod
  - Pumpdown system
- » Available with sour service or premium service version

### Operation

Zonemaster sleeves with blank beans can be installed using slickline or pre-installed in the nipple before running in the well. This allows for pressure setting of hydraulic-set packers or for pressure testing the tubing string during well completion. The isolation sleeves can then be removed and replaced with sleeves with choke beans installed to control injection in each zone. If injection requirements change during the life of the well, the Zonemaster sleeves can be retrieved and bean sizes changed as needed. Each time the sleeves are retrieved, the seals can be redressed.

The isolation sleeves use a top no-go positive positioning system to provide for certainty during installation. They are generally installed using wireline in vertical wells and can be installed using either coiled tubing or sucker rods in horizontal wells.



## Zonemaster™ Injection System

Tubing OD		Sealbore		Bottom No-Go	
				Minimum Zonemaster™ Mandrel ID (Bottom No-Go)	
in.	mm	in.	mm	in.	mm
1.900	48.26	1.500	38.10	1.447	36.75
2 1/16	52.39	1.625	41.28	1.572	38.35
2 3/8	60.33	1.812	46.02	1.750	44.68
		1.875	47.63	1.822	46.28
2 7/8	73.03	2.250	57.15	2.197	55.80
		2.312	58.70	2.259	57.40
3 1/2	88.9	2.750	69.85	2.697	68.50
		2.812	71.40	2.759	70.08
4	101.6	3.125	79.40	3.072	78.00
		3.312	84.10	3.260	82.80
4 1/2	114.30	3.688	93.70	3.625	92.10
		3.750	95.30	3.700	94.00
		3.812	96.90	3.759	95.50
5	127.00	4.000	101.60	3.910	99.30
		4.125	104.80	4.035	102.50
		4.312	109.50	4.223	107.30
5 1/2	139.70	4.560	115.80	4.472	113.60
		4.750	120.60	4.660	118.40
6 5/8	168.20	5.250	133.40	5.150	130.80
		5.500	139.70	5.400	137.20
7	177.80	5.750	146.10	5.625	142.90
		5.900	149.86	5.800	147.32
7 5/8	193.60	6.125	155.60	6.000	152.40

### Ordering Information

**Specify:** lock type and size or part number, if known; service environment (standard, %H<sub>2</sub>S, %CO<sub>2</sub>, amines); temperature and pressure rating requirements; bean size.

**Part Number Prefix:** 10TPIA, 11TPLA: Zonemaster™ Injection System. For ordering information, specify bean size.

## Velocity String Hangers

Many mature gas wells experience decreased production over time. This can lead to liquid loading that can eventually cause the well to cease production. Contributing factors typically include declining reservoir pressures that reduce gas velocity and increase water production. If gas velocity is not sufficiently high to keep water entrained in the produced gas, the water will accumulate at the bottom of the well and the well might cease production.

An effective method to continue or restart production is by providing a smaller ID production string. The smaller ID increases the production velocity, thus preventing the well from loading with liquid. To accomplish this, a means of suspending this smaller “velocity” string must be provided. Various types of velocity string hangers (VSHs) have been used. However, they can prevent the use of the existing safety valve system, without incorporating a new safety valve system to protect the well.

Halliburton VSHs are installed in an existing tubing retrievable safety valve (TRSV) or safety valve landing nipple (SVLN) to support the velocity string, while using the existing hydraulic control system to operate a new subsurface safety valve (SSSV). The new safety valve can be a wireline-type safety valve or in some cases a tubing-retrievable type. The VSH uses the nipple profile in the existing TRSV or SVLN to suspend the full weight of the velocity string. Additionally, unique seals on the VSH packoff in the TRSV or SVLN sealbores preserve the integrity of the existing safety valve hydraulic system.

### Applications

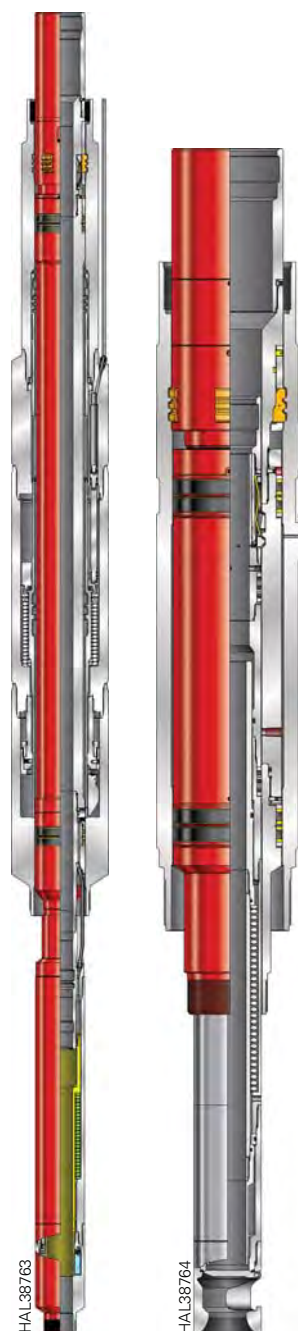
- » Wells with reduced production caused by liquid loading
- » Wells that have ceased production

### Features

- » Available to fit most Halliburton nipple profiles in SVLNs and TRSVs
- » Can incorporate a wireline-retrievable or TRSV
- » Unique seals provide pressure capability in damaged sealbores
- » Can carry loads up to 100,000 lb and more
- » Field proven

### Benefits

- » Adaptable to most landing nipple profiles
- » Maintains the use of an SSSV operated by the original hydraulic control system
- » Can seal off in damaged sealbores
- » Keyed-type hanger allows high tubing weights to be run
- » Designs available to fit many well architectures



*Velocity  
String Hangers*

**HALLIBURTON**

Completion Tools

## Tubing-Installed Plugging Equipment

### DP1 Anvil® Plugging System

The DP1 Anvil® plugging system is a temporary tubing plugging device. This device allows the operator to perform multiple production tubing pressure tests before packer setting and on command provides full bore, through-tubing access without well intervention. The Anvil plug incorporates a solid metal mechanical barrier that is removed by applying tubing pressure a predetermined number of times. No special surface equipment is required for operation and no debris results after actuation. The plug comes complete with a range of accessories to accommodate pre-fill, circulation, and secondary override facility.

- » Requires no special surface equipment that can occupy premium space on the rig floor

### Applications

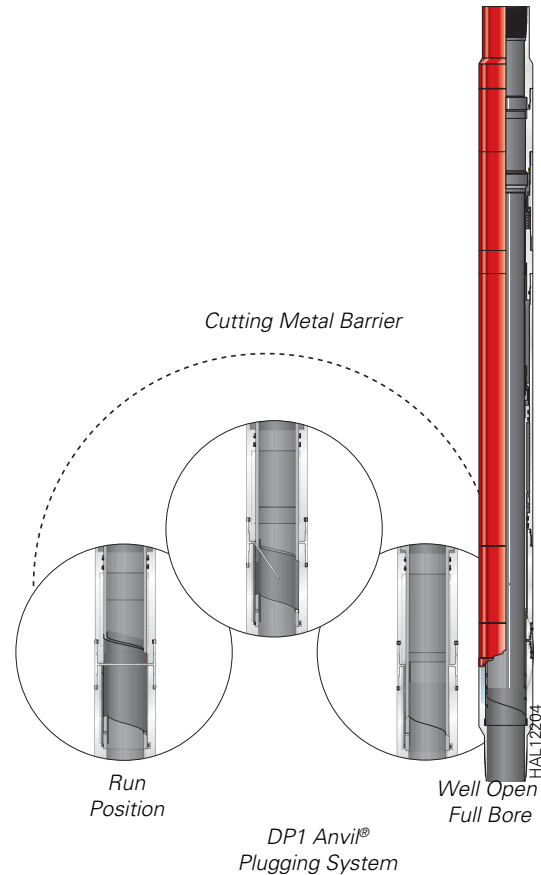
This tool is ideally suited for deep, highly deviated, or horizontal wells that normally require coiled tubing to run plugs to set hydraulically activated equipment.

### Features

- » Solid metal barrier
- » Depth limited only by ratings of hydrostatic chamber housings
- » Low-pressure differentials to activate
- » Feedback at surface of tool activation
- » No waiting on plug to open
- » No debris
- » No non-standard surface equipment required
- » Mechanical override
- » Easily millable

### Benefits

- » Totally interventionless completion installation
- » Can be used as a deep, downhole barrier during wireline valve removal
- » Produces no residual debris after activation



### DP1 Anvil® Plugging System

Casing Size		Thread				Maximum OD		Minimum ID		Pressure Rating			
		Size		Weight						Above		Below	
in.	mm	in.	mm	lb/ft	kg/m	in.	mm	in.	mm	psi	bar	psi	bar
7	177.80	4 1/2	114.30	12.60	18.75	5.890	149.61	3.875	98.43	6,000	413.40	2,000	137.80
9 5/8	244.48	5 1/2	139.70	17	25.28	7.650	194.31	4.625	117.48	6,000	413.40	2,000	137.80

Part Number Prefix: P.208DP1

## Mirage® Disappearing Plug

The Mirage® disappearing plug is a plugging device designed to run as an integral part of the tubing. The plug can be used to set a hydraulic-set packer or to test the tubing string. It is activated by hydraulic pressure, thus eliminating the need to use wireline or coiled tubing to run and retrieve the plugging device. Once the plug is expended, the plug material dissolves and disintegrates, leaving a full tubing ID through the plug. A fill sub is run above the plug when tubing autofill is required.

The Mirage plug is available in two versions. The MPB multi-cycle version allows for six pressure cycles before expending. The MPR single-cycle type has no moving parts and uses a rupture disk to select the expend pressure.

### Applications

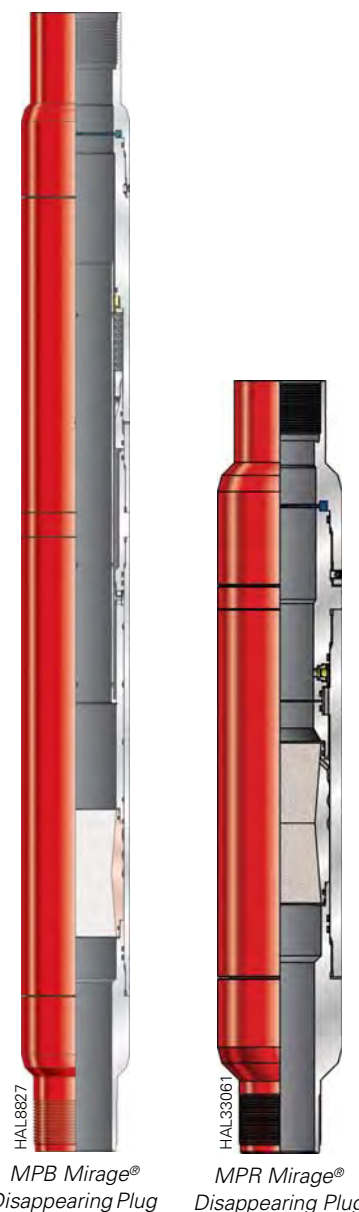
- » Horizontal and high-angle wells in which slickline or coiled-tubing unit (CTU) intervention after completion is undesirable
- » Setting production and isolation packers
- » Testing tubing
- » Wells in which retrievable plug use is undesirable

### Features

- » Multiple pressure-cycle capability (MPB version)
- » Rupture disk available from 500 to 16,000 psi in 500-psi increments (MPR version)
- » Automatically expends after final pressure cycle
- » Maximum particle size after expending is less than 1 mm
- » Helps reduce well risks, reduces number of slickline or CTU trips in the hole, and allows for multiple pressure tests before expending

### Benefits

- » Tubing can be tested without delay or the issues associated with other plugging methods
- » Helps reduce completion costs by eliminating trips to install and retrieve the plugging device
- » Water used to dissolve the plug is carried with the tool
- » A diaphragm is run in the top of the tool to keep debris off the plug matrix
- » Full non-restrictive ID after expending plug
- » Maximum particle size less than 1 mm after the plug material disintegrates, thus eliminating any well debris
- » Can be mechanically activated by wireline as a backup



## Mirage® Disappearing Plug

Nominal Size		OD		ID (After Expend)		Length		Pressure Rating				Temperature Rating	
								From Above		From Below			
in.	mm	in.	mm	in.	mm	in.	mm	psi	kPa	psi	kPa	°F	°C
3 1/2	88.90	5.40	139.70	2.88	72.64	62.34	1583.31	7,500	51 710.67	2,500	17 236.89	220	104.4
4 1/2	114.30	5.88	152.40	3.88	98.04	62.52	1587.88	5,000	34 473.79	2,500	17 236.89	220	104.4
5 1/2	139.70	7.02	178.31	4.77	118.87	64.33	1633.86	5,000	34 473.79	2,500	17 236.89	220	104.4
7	177.80	8.26	209.80	6.08	154.43	67.07	1703.45	5,000	34 473.79	2,500	17 236.89	220	104.4

Part Number Prefixes: 21MPB or 21MPR

## Autofill Sub

The autofill sub is run above the Mirage® or Anvil® plug when automatic filling of the tubing is required. The unique fill sub bladder design allows debris-laden annulus fluids to enter the tubing, while providing a reliable seal from the tubing side.

The tubing can be tested any number of times, provided the shear pressure of the lockout piston is not exceeded. Once the lockout pins shear, as a result of tubing pressure, the piston drives the ports in the isolation sleeve past the o-rings, locking the fill sub out of service. A simple interference fit retains the fill sub in the locked-out condition.

### Applications

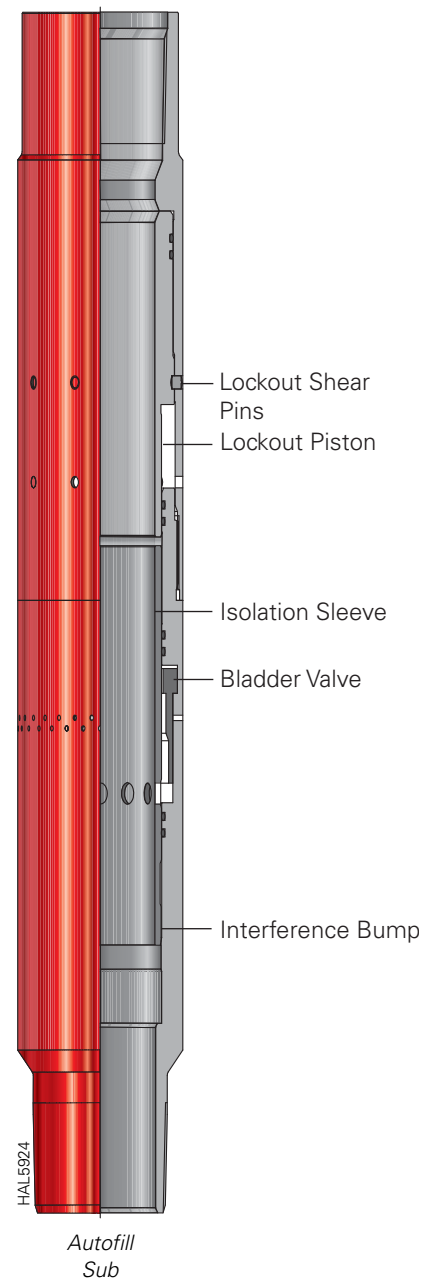
- » Used separately or in conjunction with Mirage and Anvil plugging systems
- » Completions that require automatic filling of tubing

### Features

- » Simple, robust design
- » Prevents fluid flow from tubing to casing
- » A mechanical override in the form of an isolation sleeve can permanently isolate the bladder, if necessary

### Benefits

- » Autofill valve automatically fills the tubing from below, eliminating manual fill from the surface.
- » Rubber sealing sleeve provides positive sealing in debris-laden fluid.



### Ordering Information

**Specify:** tubing size, weight, and grade; thread connection; material; service environment; pressure rating.

**Part Number Prefix:** 21FS

## Tubing-Installed Flow Control Accessories

### Flow Couplings

Flow couplings in the tubing are an important part of life-of-well completion planning. Flow couplings that have a wall thickness greater than the corresponding tubing are designed to extend the acceptable amount of erosion caused by flow turbulence within the tubing. Halliburton representatives are trained and able to design the appropriate length flow couplings for a well's produced fluid and rate parameters. Halliburton recommends flow couplings be installed above and below landing nipples, safety valve landing nipples (SVLNs), Sliding Side-Door® housing, and any other restrictions that can cause turbulent flow.

#### Applications

- » To help inhibit erosion caused by flow turbulence within the tubing
- » Installed above and below landing nipples, SVLNs, Sliding Side-Door housing, and any other restrictions that can cause turbulent flow

#### Features

- » Minimum of 3-ft (0.91-m) long
- » Used with landing nipples and flow controls
- » Wall thickness greater than tubing

#### Benefits

- » Helps extend the life of the well completion

### Blast Joints

Blast joints are installed in the tubing opposite perforations in wells with two or more zones. Otis® blast joints are sized to help prevent tubing damage caused by the jetting action of the zones' perforations.

#### Applications

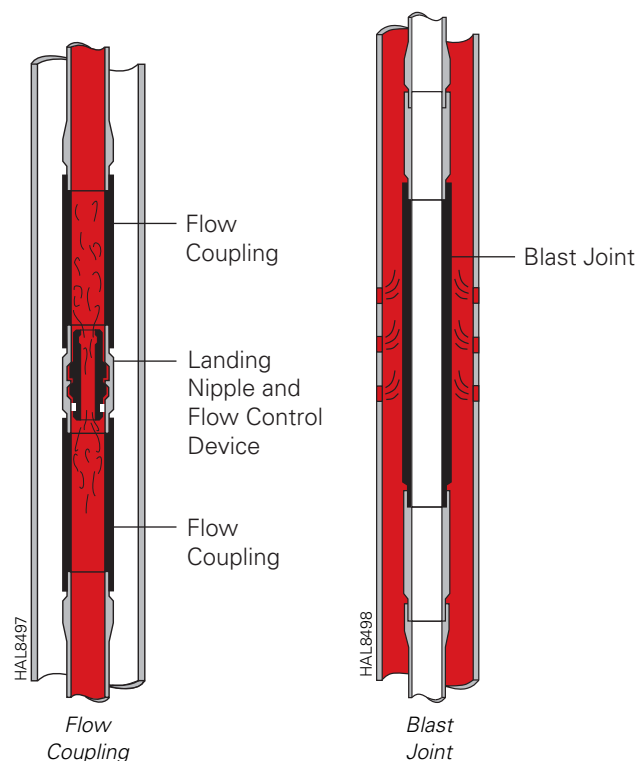
- » Used to help prevent tubing damage caused by the jetting action of the zones' perforations
- » Installed in the tubing opposite perforations in wells with two or more zones

#### Features

- » Available in lengths greater than 10 ft (3.048 m)
- » Wall thickness greater than tubing

#### Benefits

- » Increased production tubing life



#### Ordering Information

**Part Number Prefixes:** 11FN, FNC, FNM: flow coupling, standard length 3, 4, 6 ft (.9144, 1.2192, 1.524 m); 11BN: blast joints, standard length — 10 to 20 ft (3.048 to 6.096 m); specify length required



## Subsurface Service Tools

### Slickline Service Tools

Otis® designed and manufactured slickline service tools are a benchmark for the industry and are a requirement for all toolboxes worldwide. Known for dependable performance and low maintenance costs, these service tools can help reduce total operating costs. As the original equipment manufacturer (OEM), Halliburton continues to provide high-quality slickline service tools.

### Slickline Toolstring

#### Wireline Toolstring

A wireline toolstring is attached to the wireline to furnish the mechanical force necessary for setting, pulling, or servicing subsurface equipment under pressure without killing the well. Toolstrings are available in various ODs and component lengths that are designed to be compatible with various tubing sizes.

#### Otis® Rope Sockets

Otis rope sockets provide a means for connecting the wireline to the toolstring. The wireline is tied around a disk or dart in the socket to achieve a firm connection.

#### Otis Stems

Otis stems are used as weight to overcome stuffing-box packing friction and well pressure on the cross-sectional area of the wireline. The stem can also transmit force either upward or downward to set or retrieve subsurface controls. Stem size and weight is determined by the impact force required and the size of the subsurface control to be run or pulled. For normal conditions, 5 ft of 1 1/2-in. OD stem is made up by combining 2-, 3-, or 5-ft (0.61-, 0.91-, or 1.22-m) lengths of standard stem. During high-pressure applications when additional weight is needed, lead or molly-filled stems are available.

#### Ordering Information

##### Rope Socket

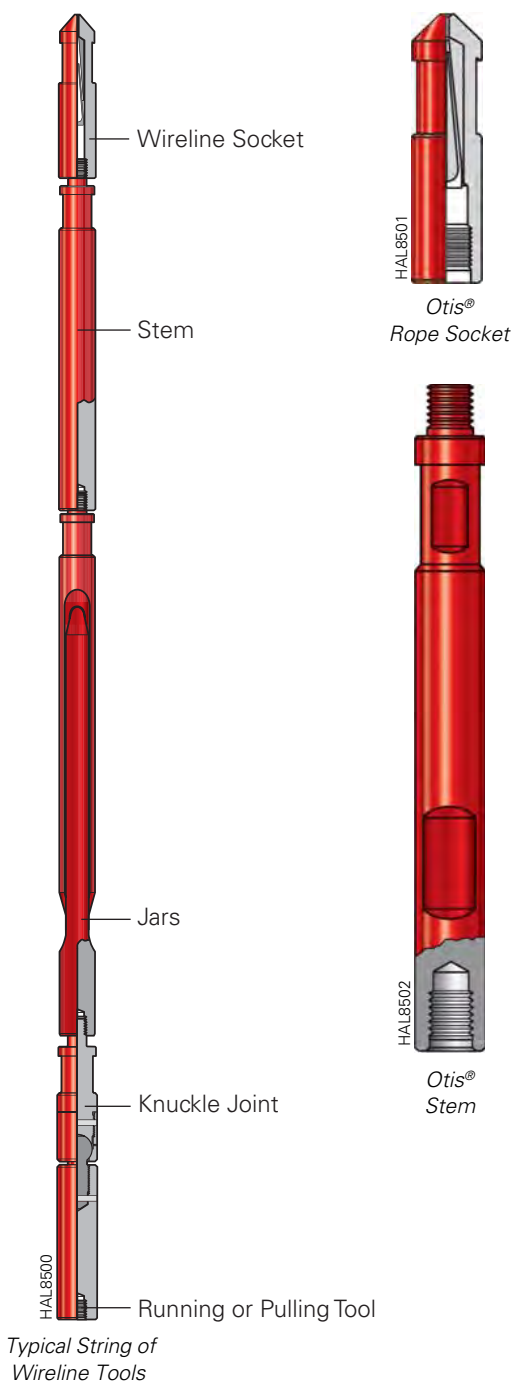
**Specify:** nominal size, wire size, type (knot, no-knot).

**Part Number Prefix:** 43BO

##### Stem

**Specify:** nominal size; length: 2, 3, 4 ft (0.61, 0.91, 1.22 m); solid or filled (Y/N — lead, molly).

**Part Number Prefixes:** 44B: solid stem, 44AO: filled stem



## Otis® Accelerators

Otis® accelerators are used with and just above hydraulic jars for shallow, weighty jarring. Accelerators help maintain constant pull as the hydraulic jars begin to open. The accelerator inhibits pulling the wireline out of the wireline socket at these shallow depths.

## Otis Knuckle Joints

Otis knuckle joints have a special ball and socket design, allowing angular movement between the jars and the running or pulling tool to help align them with the tubing. Knuckle joints are important if tubing is corkscrewed and when wireline work is performed in a directional hole. In these conditions, joints are used at every connection in the toolstring. When the stem and jars will not align or move freely, tool operation might be impossible; however, the knuckle joint inhibits wireline tools from hanging up.

## Otis Jars

Otis jars are available in mechanical and hydraulic types. With a set of mechanical jars below the stem, the weight of the jars and stem can be used to jar up or down by pulling and releasing the wireline. A Halliburton wireline specialist can easily feel the jars and manipulate the wireline. Hydraulic jars are designed to provide jarring action in wells in which it is difficult to obtain good jarring action with mechanical jars. Hydraulic jars that only allow an upward impact are usually run just above the regular mechanical jars. They require careful maintenance for maximum use in the toolstring. Jar operation is monitored by a weight indicator.

## Otis B Blind Box

An Otis B blind box serves as the impact point when downward jarring operations are required.

### Standard Wireline Toolstring

Normal Tool OD		Thread Connection*	Fishneck OD	
in.	mm		in.	mm
3/4	19.05	5/8 in. - 11 UNC	0.750	19.05
1	25.40	5/8 in. - 11 UNC	1.000	25.40
1 1/4	31.75	15/16 in. - 10 UNS	1.188	30.18
1 1/2	38.10	15/16 in. - 10 UNS	1.375	34.93
1 7/8	47.63	1 1/16 in. - 10 UNS	1.750	44.45
2	50.80	1 1/16 in. - 10 UNS	1.750	44.45
2 1/2	63.50	1 1/16 in. - 10 UNS	2.313	58.75

\*Other thread connections available

### Ordering Information

**Jars, Specify:** nominal size, stroke: 20 or 30 in. (50.8 or 76.2 cm) — mechanical only.

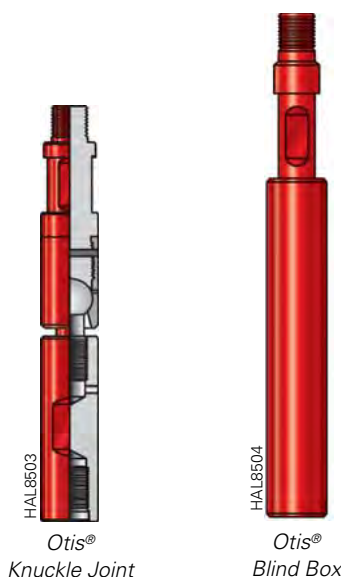
**Part Number Prefixes:** 44AO: mechanical jars, 44HO: hydraulic jars, 44BA: knuckle jars, 44AC: accelerator

**Blind Boxes, Specify:** nominal size and thread, maximum OD, tubing size and weight.

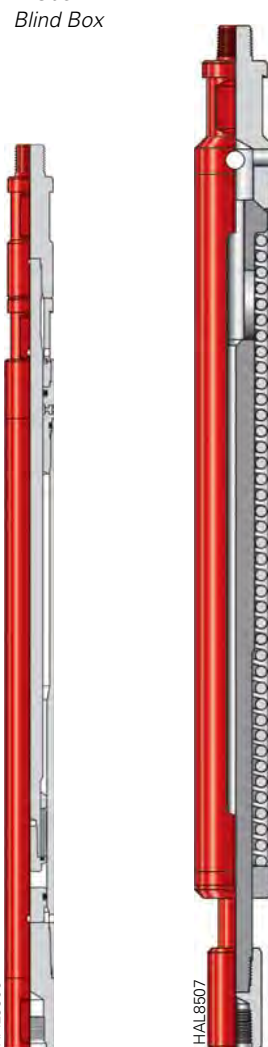
**Part Number Prefix:** 44B: blind box

**Knuckle Joints, Specify:** nominal size.

**Part Number Prefix:** 45BO: knuckle joint



Otis®  
Knuckle Joint



Otis®  
Mechanical Jar

Otis®  
Hydraulic Jar

Otis®  
Accelerator

**HALLIBURTON**

Completion Tools

## Slickline Detent Jars

The Halliburton detent jar is a mechanically operated jar run on slickline or wireline to deliver an impact through the toolstring when the release setting is overcome by tension. This jar has adjustable stroke and release settings that are predetermined on the surface before running the jar.

The detent jar can be run with an accelerator, weight bar, and link-type or spang jars to deliver an optimal impact load for releasing a stuck object or operating a downhole tool. The detent jar is resettable downhole by slacking weight at the jar to a collapsed mode. The jar can be tripped and reset rapidly multiple times downhole.

There are no seals in the detent jar; therefore, bottomhole temperature or pressure has minimal effect on the jar operation.

Sometimes in deep and deviated wells, the line tension on the weight indicator at the surface is not the same line tension at the rope socket. Modeling the slickline operation using Cerberus™ software provides calculated rope socket line tensions.

Cerberus™ is a trademark of National Oilwell Varco CTES.

### Detent Jars

Size		Standard Release		High Release		Stroke		Length		Tensile	
in.	mm	lb	kg	lb	kg	in.	mm	in.	mm	lb	kg
1.500	38.10	Up to 900	Up to 408	750 to 2,100	340 to 953	8 to 14	203.2 to 355.6	52	1320.8	37,500	17 010
1.875	47.63	Up to 1,400	Up to 635	1,300 to 3,500	590 to 1588	8 to 14	203.2 to 355.6	53	1346.2	62,000	28 123
2.250	57.15	Up to 3,100	Up to 1406	1,250 to 5,000	567 to 2268	8 to 14	203.2 to 355.6	50	1270	76,000	34 473



Slickline  
Detent Jar

## Otis® Quick Connect Toolstring Connection

Before its extensive field history, the Otis® quick connect was thoroughly tested in both the engineering laboratory and the Halliburton test well in Carrollton, Texas, USA. During the design-proving phase, a 1 1/2-in. (38.1-cm) Otis quick connect was jarred through 50,000 cycles at impact loads of 9,000 to 10,000 lb (4082.33 to 4535.92 kg) in both directions. Tensile testing on the tool after jarring revealed the Otis quick connect retained full strength throughout the operation.

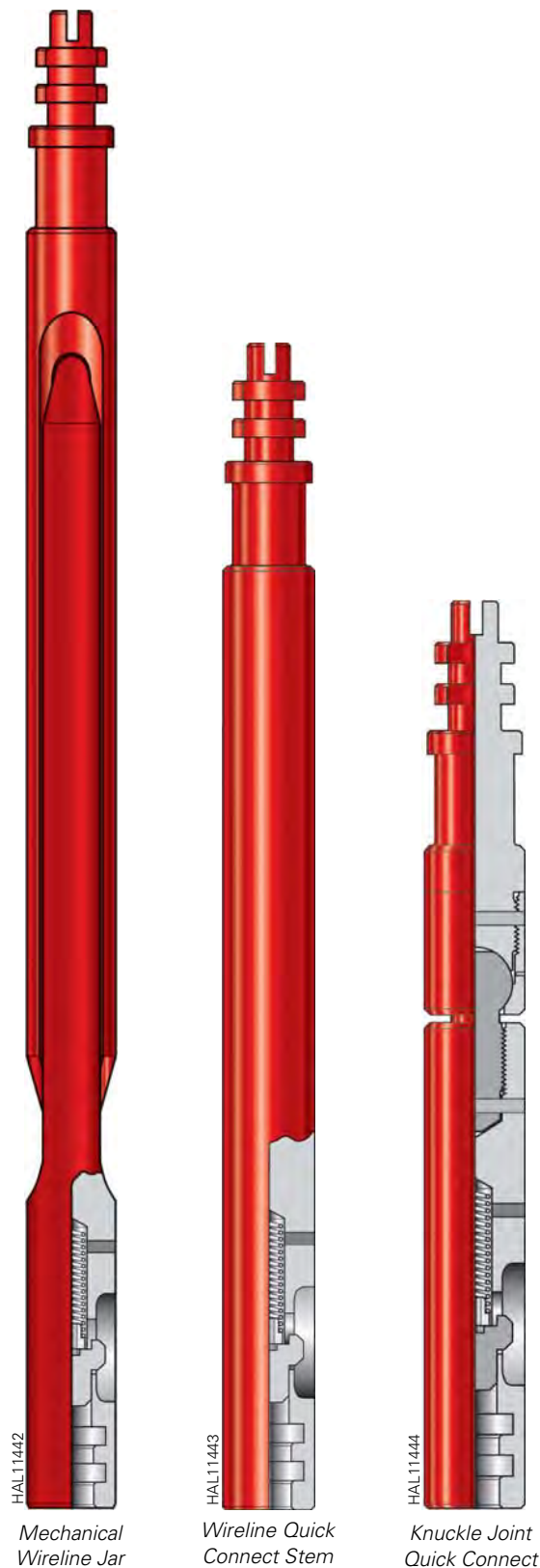
Halliburton toolstring components and wireline service tools are available with integral Otis quick connects.

### Features

- » Spacing of load-bearing shoulders will not allow coupling to connect until full engagement of all shoulders are in place
- » Self-washing feature minimizes sand buildup in the locking mechanism
- » Designed for manual operation; no special tools required

### Benefits

- » Otis quick connect design helps ensure proper toolstring makeup
- » Reliable disconnect, even in sandy environments
- » Safe assembly/disassembly on location; no special tools required
- » Faster turnaround on location minimizes operation time

**HALLIBURTON**

Completion Tools

## Auxiliary Tools for Use with Slickline Toolstring

### Otis® Gauge Cutter and Swaging Tools

It is important to run a gauge cutter before running subsurface controls to (1) determine if the flow control will pass freely through the tubing and (2) locate the top of the landing nipple or any restriction in the tubing. The gauge cutter knife (larger than the control OD) is designed to cut away paraffin, scale, and other debris in the tubing. Mashed spots in the tubing and large obstructions can be removed using the swaging tool. These tools are available in sizes for all tubing IDs.

### Otis Impression Tool

The Otis impression tool is a lead-filled cylinder with a pin through the lead-filled section to secure it to the tool body. It is used during a fishing operation to ascertain the shape or size of the top of the fish and indicate the type of tool necessary for the next operation.

### Otis Tubing Broach

An Otis tubing broach comprises three primary parts that include a mandrel, nut, and a set of three spools. Spools are tapered and used to cut burrs in the tubing ID caused by perforation, rust, bent tubing, etc. A small OD spool is run first, followed by the next larger size, followed by a spool corresponding to the original tubing ID. Broach assemblies are run on wireline.

### Otis M Magnetic Fishing Tool

Otis M magnetic fishing tools are designed to remove small particles of ferrous metals from the top of tools in the well.

### Otis G Fishing Socket

The Otis G fishing socket was designed primarily to extract prongs with fishing necks from Halliburton subsurface equipment, such as the Otis PS plug choke.

#### Ordering Information

##### Gauge Cutter, Swaging Tool, Impression Tool, Tubing Broach

**Specify:** nominal size and thread, maximum OD, tubing size and weight.

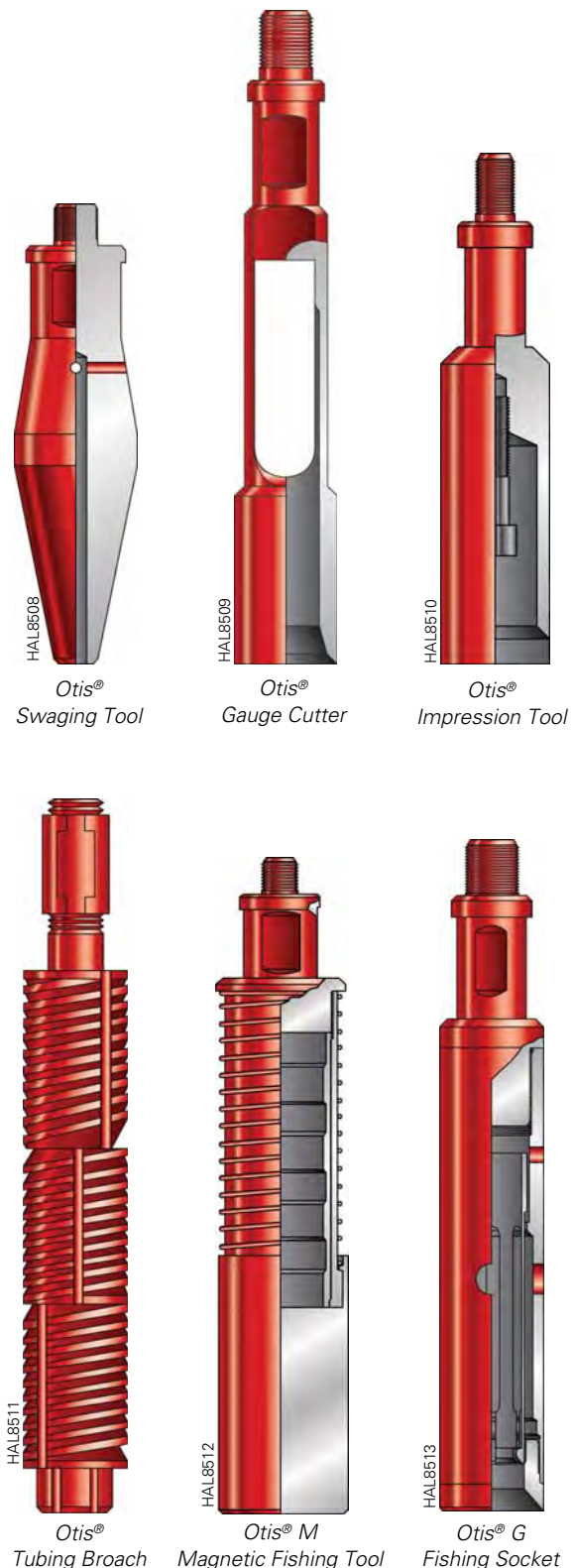
**Part Number Prefixes:** 65A: swaging tool, 65G: gauge cutter, 52C: impression tool, 65B: tubing broach

#### Ordering Information

##### Magnetic Fishing Tool, Fishing Socket

**Specify:** nominal size and thread.

**Part Number Prefixes:** 52MO: magnetic fishing tool, 52GO: G fishing socket



## Otis® P Wireline Grab

The Otis® P wireline grab is a fishing tool designed to extract broken wireline or cable from the tubing or casing.

## Otis Go-Devil

An Otis go-devil is a slotted stem with a fishing neck. If the tool becomes stuck, the go-devil can be attached to the slickline using a small strip of metal pinned in the slot to prevent the wireline from coming out. The go-devil is dropped from surface and slides down the wire until it hits a restriction or the top of the rope socket. The go-devil will cut the slickline at that point, allowing the slickline to be retrieved. Its use is usually limited to fishing operations in which the wireline socket is inaccessible, and the line must be cut. Otis go-devils designed to cut the wireline at the wireline socket are also available.

## Expandable Wirefinder

The expandable wirefinder is designed to locate wireline lost below a tubing restriction (e.g., a tubing-retrievable safety valve). The expandable wirefinder is held retracted in a sleeve that is run, located, and preferably latched in the tubing restriction. The wirefinder is then sheared out of the sleeve, allowing it to expand to the tubing ID. Once the lost wireline is located and deformed, the wirefinder can be returned to its running sleeve and retracted for retrieval. A wireline grab is then run to latch and retrieve the lost wireline.

### Ordering Information

#### Wireline Grab, Wireline Retrievers

**Specify:** tubing size and weight, wireline toolstring nominal size and thread.

**Part Number Prefixes:** 52P: wireline grab, 52PO: wireline retrievers

#### Go-Devil

**Specify:** nominal size, length, style bottom (flat or angled).

**Part Number Prefix:** 47AO

#### Expandable Wirefinder

**Specify:** tubing size and weight, restriction ID

**Part Number Prefix:** 65FO



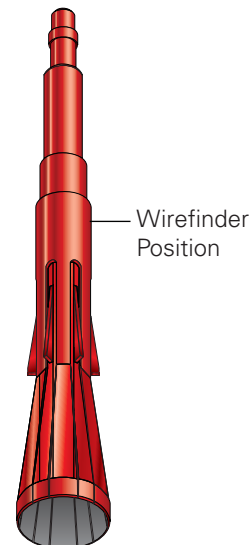
HAL8514  
Otis® P  
Wireline Grab



HAL8515  
Otis®  
Go-Devil



HAL14025  
Otis®  
Expandable Wirefinder





## Running Tools

### Otis® X® and R® Running Tools

Otis® X® and R® running tools are used to set Otis X, XN®, R, RN®, and RQ lock mandrels in their respective Otis landing nipples. These tools are designed with locator dogs serving to locate the proper landing nipple and positioning the lock mandrel before locating and locking. By selecting the position of the running tool, lock mandrel keys can be placed in the locating or retracted position.

### Otis RXN Running Tools

Otis RXN running tools set Otis X, XN, R, RN, RPT®, and RQ lock mandrels in their respective landing nipples. They are generally used to install wireline-retrievable subsurface valves in the uppermost landing nipple in staggered bore nipples, such as the RPT nipple. With this tool, the lock mandrel can be run with keys in the control (keys retracted) or locating (keys out) positions. The lock mandrel keys or no-go serve to locate the nipple, rather than the dogs on the running tool. When running a non-no-go lock, the keys must be run in the locating position, and the lock must be set in the first nipple in the bore of that lock size. The tool gives a positive indication when the lock is fully set.

### Otis SAFETYSET® Running Tools

Otis SAFETYSET® running tools set Halliburton surface-controlled, wireline-retrievable safety valves on Otis RP and RQ lock mandrels. Two independent conditions must exist in sequence before the running tool will release the valve and lock. First, the surface-controlled subsurface safety valve must be pressured open to activate the running tool. Second, only when the locking sleeve is moved upward into its locked position will the running tool release. A running tool retrieved to the surface without the lock and valve indicates a functional valve securely locked in the landing nipple.

For more information about Otis SAFETYSET lock systems, please refer to the “Landing Nipples and Lock Mandrels” section.

### Otis UP Running Tool

An Otis UP running tool is also available for running SAFETYSET lock mandrels and subsurface safety valves, which use staggered sealbores. The UP running tool is entirely mechanical and does not require control-line pressure to activate.

### Otis MR Running Tools

Otis MR running tools are used to run Otis XNS and RNS softset bomb hangers. This running tool is designed to carry weight exceeding the 140-lb (63.50-kg) weight limit of hydraulic running tools because no preset force needs to be overcome.

Running tool lugs hold the bomb hanger fish neck during the running of the bombs. The lugs are held in the expanded position by the core in the fully down position. When the bomb hanger locks into the nipple profile, the lock moves upward, pushing the core up by means of the core extension. Once the core is pushed up, the lock-out lug can be pushed into the core recess by the leaf spring, thus locking the core in the up position. In the up position, the core no longer holds the lugs out, and the running tool is disengaged from the hanger. The bomb hanger and pressure gauges are left suspended in the well.

#### Ordering Information

**Specify:** lock mandrel type and size, or running tool type and size (SS, MR, RXN, X®, R®).

**Part Number Prefix:** all wireline running tools carry a numeric prefix 41 followed by the alpha characters defining the type running tool as above (e.g., 41SS is the prefix for SS running tools).



Otis® RXN Running Tool



Otis® X® or R® Running Tool



Otis® SAFETYSET® Running Tool



Otis® UP Running Tool



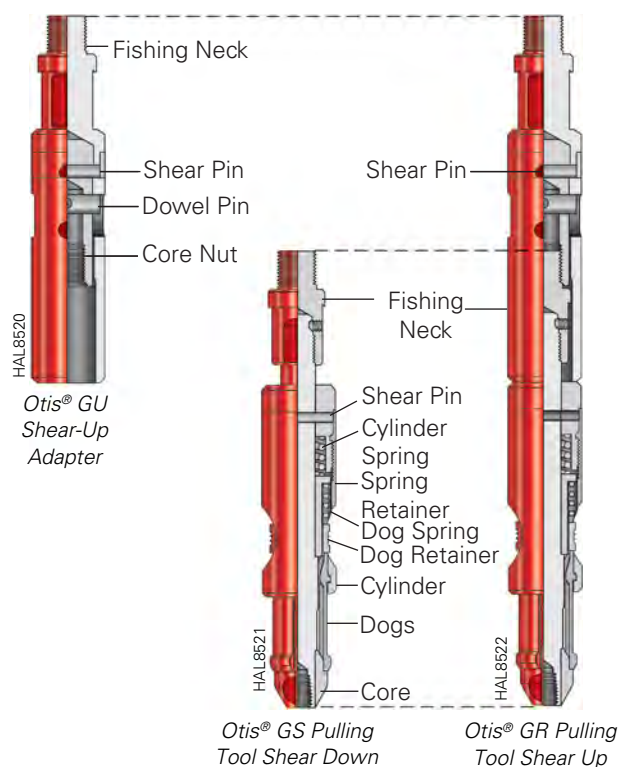
Otis® MR Running Tool

## Pulling Tools

### Internal Fishing Necks

Otis® GS pulling tools are used during wireline operations to unlock and pull a variety of subsurface controls with internal fishing necks, such as an Otis G pack-off assembly. Designed to shear with a jarring down action, this tool is used when excessive jarring upward is necessary to retrieve subsurface flow controls. In the running position, the dogs are designed to seat and lock in the internal recess of the mandrel being retrieved. If the device cannot be retrieved by upward jarring, the GS pulling tool can be released by jarring down, which shears the pin to allow for removal of the pulling tool and toolstring from the well. The shear-down-to-release feature allows the GS pulling tool to be used in many cases as a running tool for certain devices.

Otis GR pulling tools are used during wireline operations to unlock and pull a variety of subsurface controls with internal fishing necks, including Otis D bridge plugs, Otis X® and R® lock mandrels, Otis D mandrels, and Otis D collar stops. Designed to shear with a jarring up action, this pulling tool is used during routine wireline operations on controls when shear-down is not possible. The Otis GR pulling tool is assembled by incorporating an Otis GS pulling tool with an Otis GU shear-up adapter.



### External Fishing Necks

The Otis S pulling tool is designed to engage external fishing necks on subsurface devices within the wellbore. The pulling tools are available with three different core lengths, sized to accommodate the different reach lengths on industry-standard fishing necks. The pulling tools are categorized for easy reference. The first letter designates the direct of shear release. S indicates jar down to release. The second letter designates the effective reach, which depends on the core length.

- » B: long core, short reach
- » S: intermediate core, medium reach
- » M: to be used in gas lift operations

The pulling tool consists of a cylinder complete with top sub, inner core, and spring-loaded dog set. After the tool is engaged on an external fishing neck, a downward jarring action shears a pin to release the spring-loaded dogs and enable tool retrieval. S pulling tools are available in various sizes and supplied with industry-standard pin connections complete with fishing necks.



The Otis R pulling tool is designed to engage external fishing necks on subsurface devices within the wellbore. The pulling tools are available with four different core lengths, sized to accommodate the different reach lengths on industry-standard fishing necks. The pulling tools are categorized for easy reference. The first letter designates the direct of shear release. R indicates jar up to release. The second letter designates the effective reach, which depends on the core length.

- » B: long core, short reach
- » S: intermediate core, medium reach
- » J: short core, long reach
- » Q: special to latch male quick connection — extra shot core

The pulling tool consists of a cylinder complete with top sub, inner core, and spring-loaded dog set. Once the tool is engaged on an external fishing neck, an upward jarring action shears a pin to release the spring-loaded dogs and enable tool retrieval. R pulling tools are available in various sizes and supplied with industry-standard pin connections complete with fishing necks.



*Note: When used as a running tool, the core must be long enough to allow upward travel after shearing the pin before the skirt is stopped by the equipment being run. This action permits complete release of the running tool.*

#### Ordering Information

**Specify:** lock mandrel type and size, pulling tool type and size (GR, GS, GU, SB, SM, RB, RS, RJ)

**Part Number Prefix:** all wireline pulling tools carry a numeric prefix 40 followed by the alpha characters defining the type pulling tool as above (e.g., 40GR is the prefix for GR pulling tools).

**HALLIBURTON**

Completion Tools



## Slickline DPU® Downhole Power Unit

The Halliburton DPU® downhole power unit is a battery-powered, rig-safe, non-explosive electromechanical tool that expands well intervention capabilities. By generating a slow, precisely controlled linear force, the DPU tool optimizes settings and helps ensure maximum well completion performance, even in the most high-risk environments. With the advanced measurement system (AMS) for accurate depth control, the slickline-conveyed DPU tool performs reliable and flexible well intervention solutions beyond conventional methods.

The subsurface device (plug, packer, straddle) is attached to the DPU tool, which can be deployed on slickline, coiled tubing, or wireline tractor. The stroke length, setting force, and rate at which the force is applied during the setting operation are recorded in memory for later playback and quality-assurance purposes. The slow, controlled setting sequence maximizes sealing and anchoring of the wellbore device. When the designated setting force is achieved, the DPU tool separates from the subsurface device and is retrieved from the wellbore.

The DPU tool's motion control and high linear force provides an alternative to electric-line, jointed-pipe, and coiled-tubing well interventions. At the wellsite, the tool can be easily adapted to set or retrieve devices based on intervention requirements.

### Applications

The DPU tool provides numerous cost-effective solutions for operational requirements, including completion and workover activities, deepwater subsea interventions, and plug and abandonment operations.

Some of the applications for the DPU device include the following:

- » Setting/pulling retrievable bridge plugs
- » Setting permanent bridge plugs
- » Setting cement retainers
- » Activating dump bailers
- » Setting production packers
- » Punching holes in tubing or casing
- » Running straddles
- » Pulling subsea crown plugs
- » Running tubing/casing patches
- » Running high-expansion hangers

### Features

- » Proprietary technology provides the ability to communicate in real time with the DPU tool from surface
- » Built-in memory to analyze setting force, stroke length, and displacement rate for quality assurance and tool performance
- » Setting capability for multiple tubing/casing interventions with forces up to 60,000 lbf (266.9 kN) and 375°F (191°C)
- » Slow, controlled setting sequence allows sealing elements and anchoring devices to conform to the wellbore
- » Robust hardware and electronics capable of withstanding high-impact loads encountered during well intervention operations
- » Can be integrated with a tractor-conveyance system during high-angle applications



DPU® Downhole Power Unit

## Benefits

- » Improved safety and reliability through non-explosive operation
- » Eliminates logistical handling of explosives
- » Improves reliability through slow, controlled setting of downhole device
- » No jarring required
- » Compact heli-lift compliant for portable and rigless operations
- » Intervention versatility with dual setting and retrieving capability
- » Cost-effective solution compared to other deployment methods
- » Conveyance flexibility with solutions on slickline, electric line, coiled tubing, and wireline tractors

## DPU® Downhole Power Unit

Tool	OD		Pressure Rating		Temperature Rating		Set/Retrieve Force		Stroke Length		Length		Weight	
	in.	mm	psi	MPa	°F	°C	lbf	kN	in.	cm	in.	cm	lb	kg
DPU 1.69	1.69	42.9	15,000	103	300	149	15,000	66.7	9.0	22.9	46.94	119.23	29.5	13.4
DPU 2.5	2.50	63.5	15,000	103	300	149	30,000	133.5	8.5	21.6	56.14	142.60	69.8	31.7
DPU 2.75**	2.75	69.9	15,000	103	375	191	40,000	177.9	9.0	22.9	89.00	226.06	120.0	54.4
DPU 3.59*	3.59	91.2	10,000	69	250	121	60,000	266.9	36.0	91.4	160.00	406.40	308.5	139.9
DPU 3.59*	3.59	91.2	10,000	69	250	121	60,000	266.9	8.75	22.2	92.05	233.81	200.0	90.7
DPU 3.66*	3.66	93.0	10,000	69	250	121	60,000	266.9	8.75	22.2	86.55	219.84	201.2	91.3

\*Temperature rating of 329°F (165°C) with lithium batteries

\*\*Optional features with external flask

## Electric Line DPU® System

Maximum OD		Maximum Shear Force		Voltage	Amps	Maximum Temperature		Maximum Pressure		Maximum Effective Stroke	
in.	mm	lbf	N	V	A	°F	°C	psi	bar	in.	mm
1.70	43.2	15,000	66 720	50	0.6	400	204	15,000	1034.5	9	229
2.51	63.75	30,000	133 440	115	0.6	400	204	15,000	1034.5	8.5	216
3.81	96.77	60,000	266 880	200	0.75	400	204	20,000	1378	8.75	222

## Test Tools

### Otis® Selective Test Tools

Otis® selective test tools are used to test tubing, locate leaks, or set hydraulic-set packers. Designed to hold pressure from above, selective test tools can be set in compatible Otis X®, XN®, R®, or RN® landing nipples in the tubing string. With the keys retracted, the tool is run to a point below the desired nipple. Pulling up through the nipple releases the locking keys to set the tool with downward motion. Pressure from above can then be applied.

#### Benefits

- » Designed for high working pressure
- » Located in the lowest nipples first, these tools are then moved up the tubing and set in sequential nipples until a leak is not detected, thus reducing wireline trips

### Otis Non-Selective Test Tools

Otis non-selective test tools are designed to test the tubing string, set hydraulic packers, and protect lower zones when circulating through a Sliding Side-Door® circulating device or producing a zone above the lowermost zone. Designed to hold pressure from above only using a drop valve equalizing assembly, the non-selective test tools land in no-go landing nipples with compatible packing bores. When landed in the landing nipple, pressure from above is sealed by the drop, seal ring, and V-packing. To retrieve by wireline, the drop is moved off-seat with a pulling tool. This equalizes the pressure across the test tool, thus allowing retrieval.

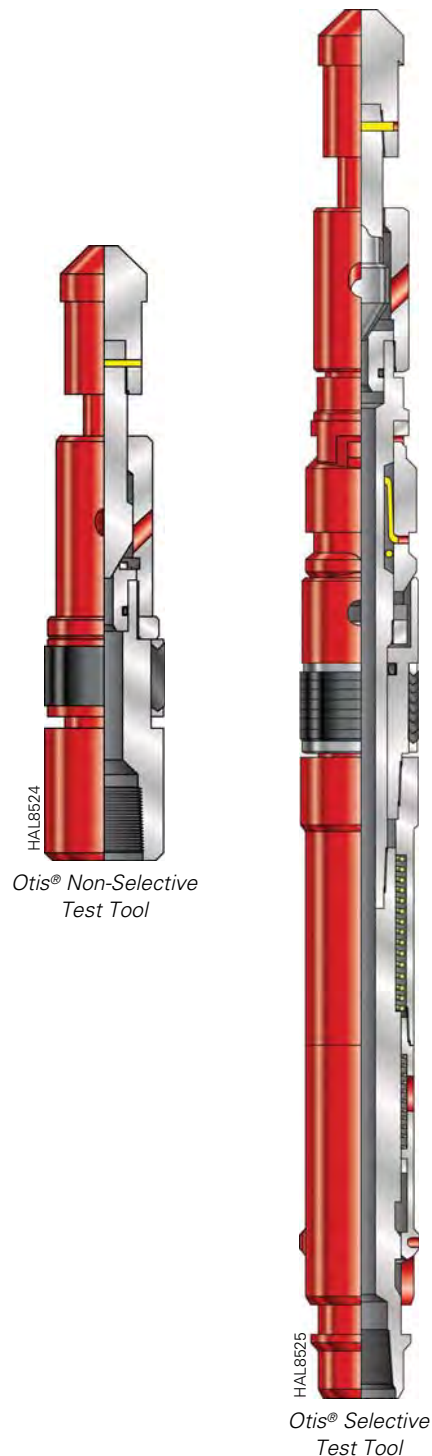
#### Benefits

- » Ease of running, setting, and retrieving
- » No-go OD on bottom of tool for positive location in landing nipple
- » Can be pumped into the well
- » Designed for high-pressure ratings

#### Ordering Information

**Specify:** nipple type and size.

**Part Number Prefixes:** 14NO: N test tool-non selective, 14XO: X test tool-selective



## Positioning Tools

### Otis® BO Positioning (Shifting) Tool

Otis® BO positioning tools are used to move the inner sleeve to its open or closed position in Sliding Side-Door® circulating devices.

*Note: The Otis BO positioning tool should not be used for shifting Otis XXO or RRO surface-controlled safety valve nipples. For these nipples, use the Otis XL or RL shifting tool.*

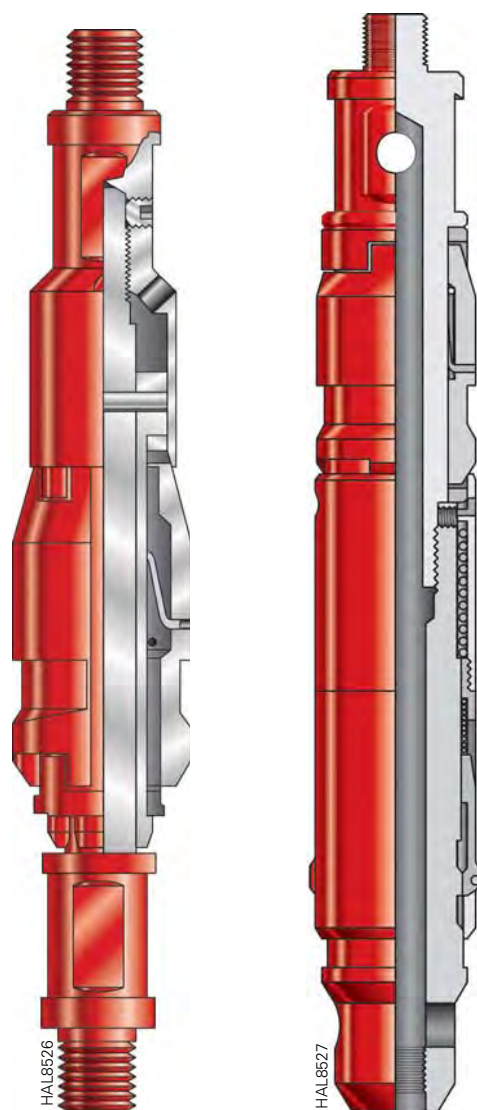
Otis BO standard positioning tools engage the recess in the upper (or lower) end of the inner sleeve to permit the sleeve to be shifted by a jarring action. It is designed to release itself only after the sleeve reaches its fully open or closed position. This automatic-releasing feature incorporates a releasing profile on the key itself that acts to compress the key spring and release the positioning tool. A shear pin is an added feature designed to release the tool in the event well conditions make it impossible to shift the sleeve.

A set of positive keys is available for this tool to permit upward movement of the inner sleeve of one among several Sliding Side-Door circulating devices in one wellbore. These keys do not have a releasing profile. The positioning tool pin must be sheared to release.

*Note: The Otis BO positioning tool will not pass through position Number 1 of Otis S landing nipples.*

Otis BO selective positioning tools are designed to selectively position Sliding Side-Door inner sleeves only to the down position. These tools are designed so one sleeve can be shifted to the down position at any level in the tubing string without shifting any other sleeve.

This positioning tool is designed with dogs that serve to locate the proper Sliding Side-Door circulating device and release the spring-loaded keys to engage the profile in the inner sleeve. The tool is designed to release itself only after the sleeve reaches the full-down position. This automatic-release feature incorporates a releasing profile on the key that acts to compress the key spring and release the positioning tool. The tool can then be raised to the next Sliding Side-Door circulating device to position its sleeve down or return to the surface.



HAL8526  
Otis® BO  
Standard Positioning Tool

HAL8527  
Otis® BO  
Selective Positioning Tool

#### Ordering Information

**Specify:** type and size of tool containing sleeve to be shifted, selective shifting required (Y/N)

**Part Number Prefixes:** 42BO (standard BO), 142BO (selective BO)

## Tubing Perforators and Bailers

Otis® A tubing perforators are mechanically operated and can be used with slickline (under pressure) to perforate both standard and heavyweight tubing.

### Applications

- » To provide access to the casing annulus to circulate or kill a well
- » To bring in additional productive zones
- » To permit production through a plugged tailpipe that cannot be opened using regular methods

### Benefits

- » No explosives used, minimizing the possibility of perforating the casing
- » Safety-release mechanism designed to permit perforator removal, without perforating
- » Greater tubing penetration
- » Perforator designed to retract the punch and release automatically after perforating
- » Service performed by Halliburton-trained personnel

Otis M sand pump bailers can be used to remove a sand bridge if one is encountered during normal wireline operations. The sand bailer consists of a piston encased in an outer cylinder. By working the wireline in the same manner used to set certain subsurface controls (lightly jarring up and down), the bailer acts to pull sand into the cylinder to remove the sand bridge.

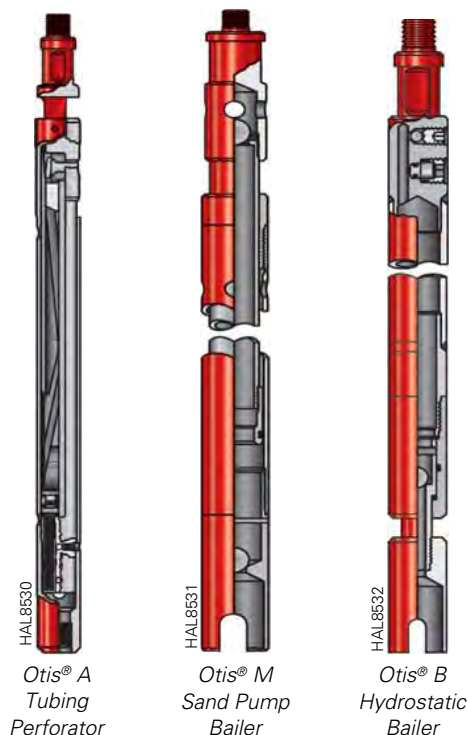
Various bailer bottoms are available.

- » Flat bottom for soft, easy-to-bail sand
- » Chiseled bottom for hard-packed sand
- » Flapper bottom for bailing metal particles too large to pass the ball and seat

Otis B hydrostatic bailers are designed for use when the substance to be bailed cannot be removed by a pump-type bailer. This can occur when small metallic particles become lodged on top of the locking mandrel dogs of a subsurface flow control.

The Otis B hydrostatic bailer is sealed at the surface and run into the tubing bore with the internal bailer chamber at atmospheric pressure. When the bailer reaches the object to be bailed, a few downward strokes of the wireline jars act to shear a small sealing disk and admit the well pressure and/or hydrostatic head (as well as the junk) into the bailer cylinder. A ball check valve acts to contain the junk in addition to the well pressure until the bailer is retrieved. For large pieces of junk, a flapper bottom and junk basket are available.

*Note: The internal chamber pressure should always be bled off through the bailer release valve before the bailer bottom is broken off at surface.*



## Slickline Skid Units and Trucks

Halliburton designs and manufactures top-quality skid-based units for offshore operations and trucks for land operations. The units are known worldwide for their user-focused design that provides the appropriate mix of

operator-friendly components to make both specialized and standard operations more productive. For more detailed information, please contact your local Halliburton representative.



*T800 Slickline Crane Truck*



*Offshore Three-Piece Skid Unit*



*Slickline Container Unit*



*Stainless Steel Skid Unit*



## RELAY™ Digital Slickline System

The RELAY™ digital slickline system combines the versatility and efficiency of traditional slickline with the real-time data streaming capability of electric line. The intelligent conveyance system easily adapts to existing slickline units for quick deployment and ease of use. Ruggedly built, it helps reduce uncertainty during well intervention operations. This system also offers depth and time correlation and bi-directional communication with downhole intervention and logging tools.

### Features

- » Streaming data to and from downhole tools: Command signals travel through the RELAY system, allowing operators to communicate with downhole tools in real time. Slick, small-diameter conveyance wire for efficient pressure control.
- » Mechanical strength comparable to traditional slickline: Ruggedly built and strong enough to provide activation for mechanical tools and fishing operations for stuck equipment in the well.
- » Reduced footprint and versatility: Comparable in size to a traditional slickline unit — perfect for tight spaces, such as offshore platforms.
- » Certified for hazardous zone operations: Designed for use in a variety of environments, including hazardous zones.

### Benefits

- » Versatile operations: Easily adapts to any current slickline package for mechanical, diagnostic, perforating, plug setting, and pipe recovery operations.
- » Simplified logistics: Fewer, smaller lifts reduce costs and logistical challenges.
- » Reduced health, safety, and environmental (HSE) exposure: Minimizes HSE risks by reducing personnel, rig ups, pressure-control equipment, and lifts.
- » Improved efficiency: One rig up covers all slickline and electric line services with real-time slickline depth control and downhole assurance feedback.
- » Small footprint: Unit size allows placement in tight spaces to perform services on and off the critical path.



*The RELAY™ digital slickline system helps improve operational efficiency, reduce uncertainty, and minimize environmental impact. Its small footprint makes it ideal for use in tight areas, such as crowded offshore rigs.*

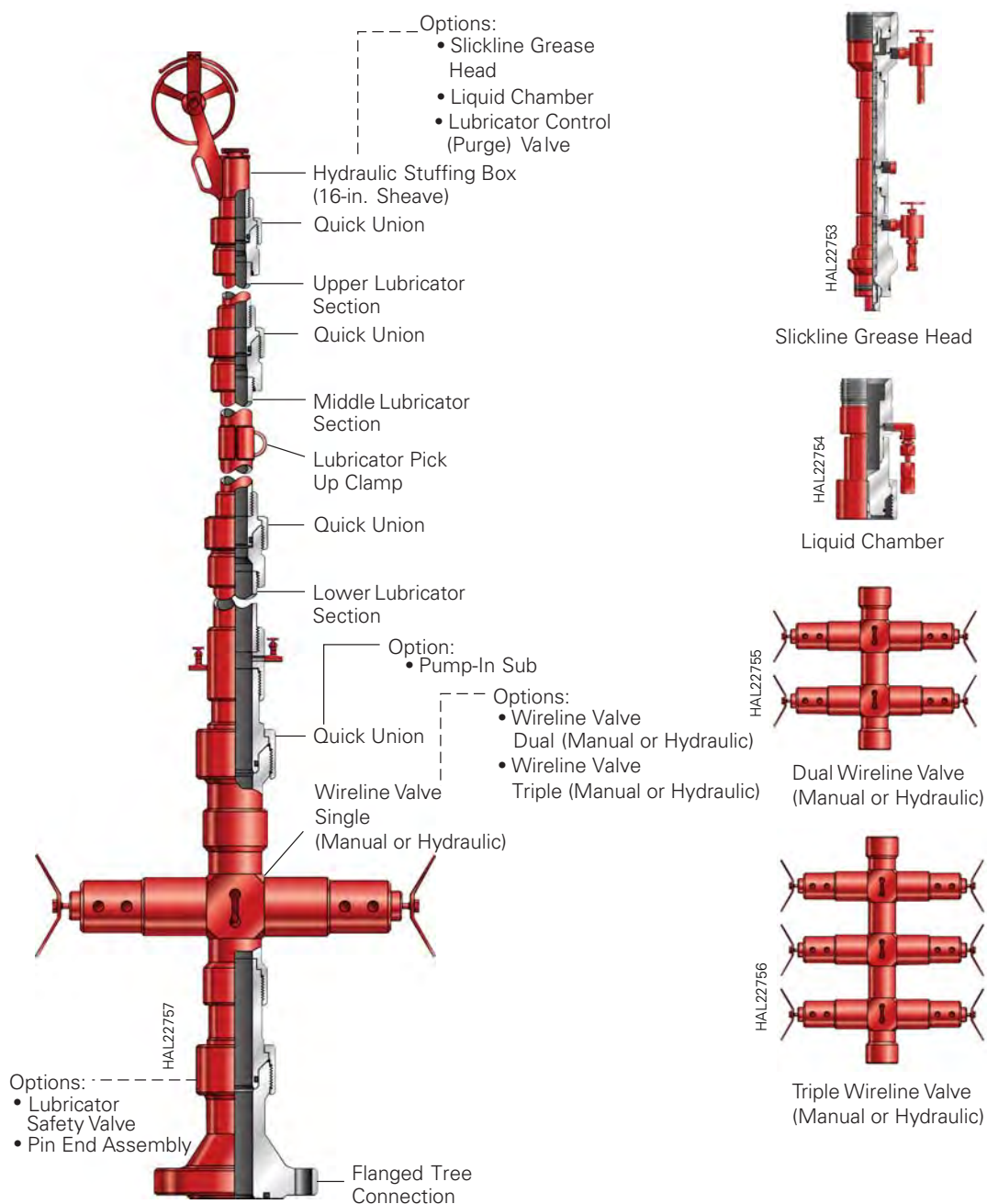
### RELAY™ Digital Slickline System

Diameter		Working Pressure		Working Temperature		Service Environment	Cycle Fatigue Life
in.	mm	psi	KPa	°F	°C		
0.160	4.064	15,000	103 421	-40 to 350	-40 to 176	H <sub>2</sub> S, CO <sub>2</sub> , CH <sub>4</sub> , brine, methanol	Comparable to stainless steel slickline

## Surface Service Equipment

Halliburton wellhead pressure control equipment provides for a safe and highly productive service operation. Unmatched equipment quality backed by available extensive training and maintenance instruction has made

Halliburton the industry's premier provider of these types of equipment and services. For more detailed information, please contact your local Halliburton representative.


**HALLIBURTON**

Completion Tools



## DPU® Downhole Power Unit Actuated Tubing Perforator

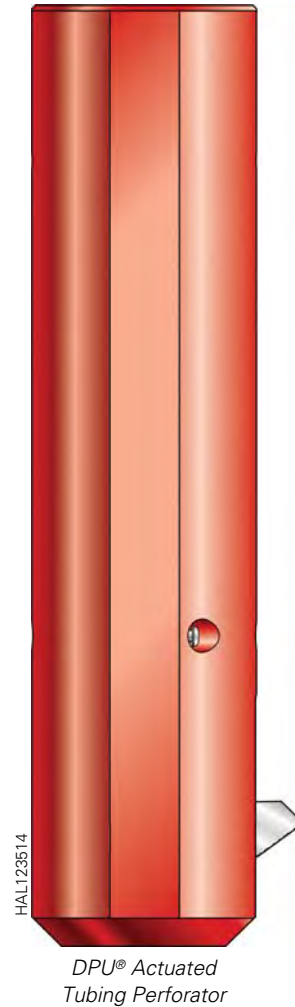
The Halliburton DPU® downhole power unit actuated tubing perforator offers a non-explosive, cost-effective solution to create a single perforation hole in tubing or casing. When workover requirements necessitate rapid mobilization, the tubing perforator helps cut costs while providing a safe, effective, and dependable solution for perforating the tubing. Offering conveyance flexibility, the perforator can be run on slickline, electric line, or coiled tubing, offering versatility and economy to meet multiple operational requirements.

### Features

- » Operates in multiple tubing grades: J55, L80, P110, and 13 CHR
- » Deployed on proven DPU technology
- » No jarring to achieve a communication hole
- » Does not require explosive-trained personnel
- » Offers proven, dependable perforating operation
- » Provides consistent penetration performance

### Benefits

- » Improved safety and reliability with explosive-free perforating
- » Eliminates logistical challenges of explosives
- » Health, safety, and environment (HSE) and user friendly
- » Can reduce the cost of perforating tubing
- » Reduces rig time by minimizing missed runs with other mechanical perforators
- » Conveyance flexible with solutions on slickline, electric line, and coiled tubing
- » Compact heli-lift compliant for portable, rapid deployment
- » No risk of damaging annular tubular



### DPU® Actuated Tubing Perforator

Tubing Size	Tubing Grades	Tubing Weight	Perforation Area	Tool OD	Running Tool
in.		lb	in. <sup>2</sup>	in.	in.
3.5	J55, L80, P110, 13 Cr	9.5 to 10.2	0.263	2.78	2.5 DPU®
4.5	J55, L80, P110, 13 Cr	11.5 to 13.5	0.335	3.80	3.59 DPU
4.5 Expandable	J55, L80, P110, 13 Cr	11.5 to 15.5	0.335	3.59	3.59 DPU
5.5	J55, L80, P110, 13 Cr	17 to 20	0.944	4.5	3.59 DPU
7	J55, L80, P110, 13 Cr	23 to 26	1.412	5.6	3.59 DPU
7	J55, L80, P110, 13 Cr	23 to 32	1.412	5.75	4.5 DPU-I*

\*Tool must be run on electric line with chip panel and appropriate power supply. Chart represents nominal values for industry-standard tubing.

