



The Differential Sub is a tool which may be run in a TCP string to maintain a high differential pressure in favour of the annulus (underbalance), while keeping fluid from entering the tubing prior to gun detonation. This tool features a convex ceramic dome which can withstand high differential pressures imposed by fluid in the tubing-casing annulus.

A Drop Bar is released from surface to strike the Mechanical (Percussion) Firing Head. It also impacts the Differential Sub causing the ceramic dome to shatter. The instant the dome fragments, a passage is created for reservoir fluids to surge into the dry tubing after the guns fire. Since the formation is under pressure and the tubing is essentially dry, the fluid rushes into the tubing and cleans the perforation tunnels. This fluid cleaning action is the basis of underbalanced perforating.

The Ported Differential Sub is primarily designed to be located below the packer in the TCP string so that the ports allow produced reservoir fluids to enter the tubing. A Non-Ported Differential Sub may be run either above or below the packer in combination with perforated joints or nipples. A Differential Plug with 2 opposing ceramic domes is also available. The Differential Plug is designed to withstand maximum pressure from above or below the ceramic domes and can be used for overbalanced or underbalanced perforating.

### ADVANTAGES:

- The unique convex ceramic dome allows the tool to withstand a high differential pressure in favour of the annulus, which permits good cleaning action in the perforation tunnels
- High strength and more consistent properties of ceramic allow a thinner cross-section of the dome, ensuring better shattering properties than glass

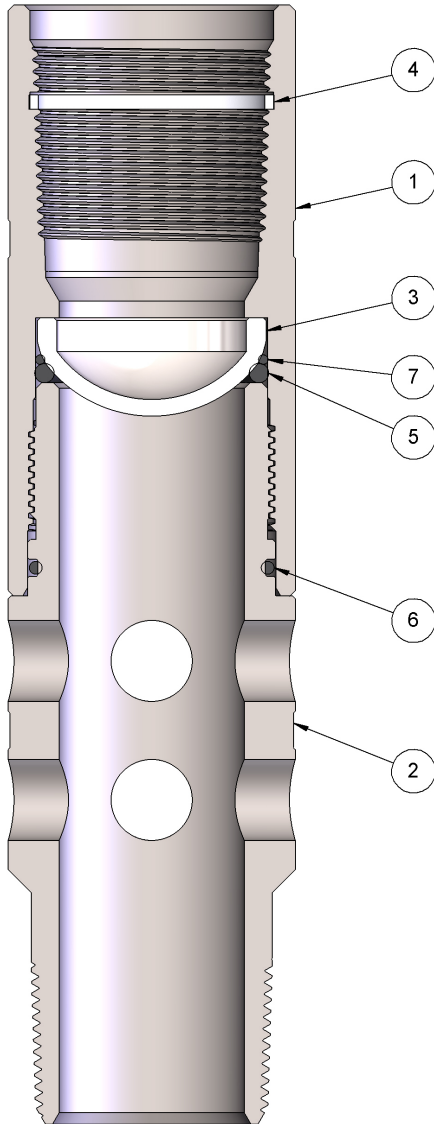
### SPECIFICATIONS:

	2-3/8 IN (60.3 MM)		2-7/8 IN (73.0 MM)		3-1/2 IN (88.9 MM)	
Maximum OD	3.093 in	78.6 mm	3.699 in	94.0 mm	4.531 in	115.1 mm
Minimum ID	1.995 in	50.6 mm	2.441 in	62.0 mm	3.070 in	78.0 mm
Overall Length	12.4 in	315 mm	13.0 in	330 mm	13.9 in	353 mm
Max Pressure <sup>2</sup>	10,000 psi (68.9 Mpa)					
Max Temperature <sup>1</sup>	250°F (121°C)					
Tensile	135,000 lb	60 048 daN	198,000 lb	88 070 daN	208,800 lb	92 878 daN
Connection	2-3/8 in (60.3 mm) EUE		2-7/8 in (73.0 mm) EUE		3-1/2 in (88.9 mm) EUE	
Flow Area <sup>3</sup>	4.8 in <sup>2</sup>	3100 mm <sup>2</sup>	6.2 in <sup>2</sup>	4050 mm <sup>2</sup>	8.0 in <sup>2</sup>	5160 mm <sup>2</sup>
Product: Ported	TC-081-2375-000		TC-081-2875-000		TC-081-3500-000	
Redress Kit	TC-080-2375-099		TC-080-2875-099		TC-080-3500-099	

<sup>1</sup>The maximum temperature can be increased to 450° (230°C) by substituting the 90 durometer Nitrile O-Rings with 90 durometer Viton O-Rings. Refer to the Time vs Temperature chart for Explosives to confirm any explosives requirements.

<sup>2</sup>The maximum pressure from above is 1,000 psi differential.

<sup>3</sup>Greater flow area than tubing bore.



ITEM	PART NUMBER	QTY	DESCRIPTION
--	TC-081-2875-000	--	Ported Differential Sub, 2-7/8" EU
1	TC-081-0004-000	1	Top Sub, 2-7/8" EU
2	TC-081-0003-000	1	Bottom Sub, 2-7/8" EU
3	TC-081-0005-000	1	Ceramic Dome, 2-7/8" Tool
4	MI-305-2875-000	1	2-7/8" EU Thread API Seal Ring
5	OOO-N569-334	1	O-Ring, 90 Durometer Nitrile
6	OOO-N569-234	1	O-Ring, 90 Durometer Nitrile
7	OOO-N569-232	1	O-Ring, 90 Durometer Nitrile
--	MAN-TC-081	--	Assembly Manual
--	TC-080-2875-099	--	Redress Kit, 2-7/8" Tool

ITEM	PART NUMBER	QTY	DESCRIPTION
--	TC-081-3500-000	--	Ported Differential Sub, 3-1/2" EU
1	TC-081-0006-000	1	Top Sub, 3-1/2" EU
2	TC-081-0007-000	1	Bottom Sub, 3-1/2" EU
3	TC-081-0008-000	1	Ceramic Dome, 3-1/2" Tool
4	MI-305-3500-000	1	3-1/2" EU Thread API Seal Ring
5	OOO-N569-339	1	O-Ring, 90 Durometer Nitrile
6	OOO-N569-240	1	O-Ring, 90 Durometer Nitrile
7	OOO-N569-237	1	O-Ring, 90 Durometer Nitrile
--	MAN-TC-081	--	Assembly Manual
--	TC-080-3500-099	--	Redress Kit, 3-1/2" Tool

ITEM	PART NUMBER	QTY	DESCRIPTION
--	TC-080-2375-099	--	Redress Kit, Ported Differential Sub, 2-3/8" EU
3	TC-081-0002-000	1	Ceramic Dome, 2-3/8" Tool
4	MI-305-2375-000	1	2-3/8" EU Thread API Seal Ring
5	OOO-N569-330	1	O-Ring, 90 Durometer Nitrile
6	OOO-N569-229	1	O-Ring, 90 Durometer Nitrile
7	OOO-N569-141	1	O-Ring, 90 Durometer Nitrile

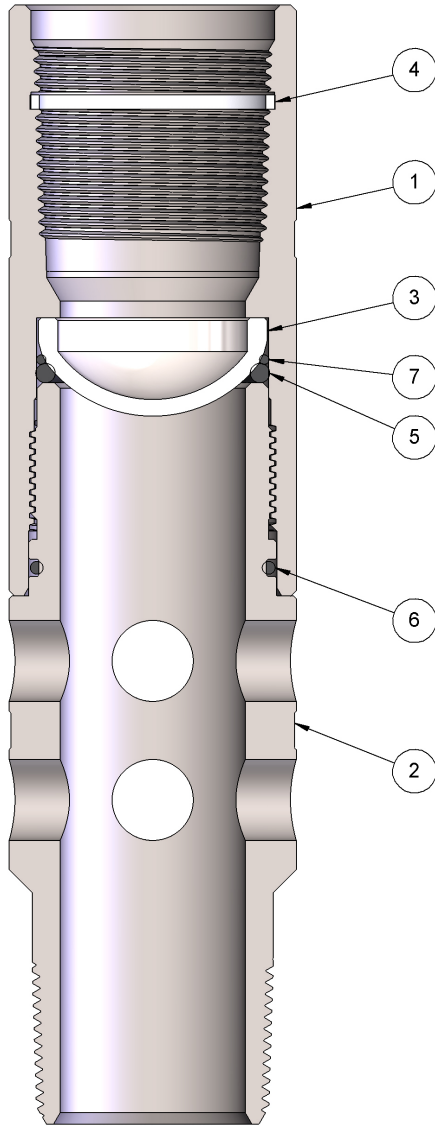
ITEM	PART NUMBER	QTY	DESCRIPTION
--	TC-080-2875-099	--	Redress Kit, Ported Differential Sub, 2-7/8" EU
3	TC-081-0005-000	1	Ceramic Dome, 2-7/8" Tool
4	MI-305-2875-000	1	2-7/8" EU Thread API Seal Ring
5	OOO-N569-334	1	O-Ring, 90 Durometer Nitrile
6	OOO-N569-234	1	O-Ring, 90 Durometer Nitrile
7	OOO-N569-232	1	O-Ring, 90 Durometer Nitrile

ITEM	PART NUMBER	QTY	DESCRIPTION
--	TC-080-3500-099	--	Redress Kit, Ported Differential Sub, 3-1/2" EU
3	TC-081-0008-000	1	Ceramic Dome, 3-1/2" Tool
4	MI-305-3500-000	1	3-1/2" EU Thread API Seal Ring
5	OOO-N569-339	1	O-Ring, 90 Durometer Nitrile
6	OOO-N569-240	1	O-Ring, 90 Durometer Nitrile
7	OOO-N569-237	1	O-Ring, 90 Durometer Nitrile

ITEM	PART NUMBER	QTY	DESCRIPTION
--	TC-081-2375-000	--	Ported Differential Sub, 2-3/8" EU
1	TC-081-0001-000	1	Top Sub, 2-3/8" EU
2	TC-081-0000-000	1	Bottom Sub, 2-3/8" EU
3	TC-081-0002-000	1	Ceramic Dome, 2-3/8" Tool
4	MI-305-2375-000	1	2-3/8" EU Thread API Seal Ring
5	OOO-N569-330	1	O-Ring, 90 Durometer Nitrile
6	OOO-N569-229	1	O-Ring, 90 Durometer Nitrile
7	OOO-N569-141	1	O-Ring, 90 Durometer Nitrile
--	MAN-TC-081	--	Assembly Manual
--	TC-080-2375-099	--	Redress Kit, 2-3/8" Tool

## TECHNICAL INFORMATION:

## Differential Sub, Ported L-80



ITEM	PART NUMBER	QTY	DESCRIPTION
--	TC-081-2875-080	--	Ported Differential Sub, 2-7/8" EU (L80)
1	TC-081-0004-080	1	Top Sub, 2-7/8" EU (L80)
2	TC-081-0003-080	1	Bottom Sub, 2-7/8" EU (L80)
3	TC-081-0005-000	1	Ceramic Dome, 2-7/8" Tool
4	MI-305-2875-000	1	2-7/8" EU Thread API Seal Ring
5	OOO-V569-334	1	O-Ring, 90 Durometer Viton
6	OOO-V569-234	1	O-Ring, 90 Durometer Viton
7	OOO-V569-232	1	O-Ring, 90 Durometer Viton
--	MAN-TC-081	--	Assembly Manual
--	TC-080-2875-098	--	Redress Kit, Viton, 2-7/8" Tool

ITEM	PART NUMBER	QTY	DESCRIPTION
--	TC-081-3500-080	--	Ported Differential Sub, 3-1/2" EU (L80)
1	TC-081-0006-080	1	Top Sub, 3-1/2" EU
2	TC-081-0007-080	1	Bottom Sub, 3-1/2" EU
3	TC-081-0008-000	1	Ceramic Dome, 3-1/2" Tool
4	MI-305-3500-000	1	3-1/2" EU Thread API Seal Ring
5	OOO-V569-339	1	O-Ring, 90 Durometer Viton
6	OOO-V569-240	1	O-Ring, 90 Durometer Viton
7	OOO-V569-237	1	O-Ring, 90 Durometer Viton
--	MAN-TC-081	--	Assembly Manual
--	TC-080-3500-098	--	Redress Kit, Viton, 3-1/2" Tool

ITEM	PART NUMBER	QTY	DESCRIPTION
--	TC-080-2375-098	--	Redress Kit, Viton, Ported Differential Sub, 2-3/8" EU
3	TC-081-0002-000	1	Ceramic Dome, 2-3/8" Tool
4	MI-305-2375-000	1	2-3/8" EU Thread API Seal Ring
5	OOO-V569-330	1	O-Ring, 90 Durometer Viton
6	OOO-V569-229	1	O-Ring, 90 Durometer Viton
7	OOO-V569-141	1	O-Ring, 90 Durometer Viton

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--	TC-080-2875-098	--	Redress Kit, Viton, Ported Differential Sub, 2-7/8" EU
3	TC-081-0005-000	1	Ceramic Dome, 2-7/8" Tool
4	MI-305-2875-000	1	2-7/8" EU Thread API Seal Ring
5	OOO-V569-334	1	O-Ring, 90 Durometer Viton
6	OOO-V569-234	1	O-Ring, 90 Durometer Viton
7	OOO-V569-232	1	O-Ring, 90 Durometer Viton

ITEM	PART NUMBER	QTY	DESCRIPTION
--	TC-080-3500-098	--	Redress Kit, Viton, Ported Differential Sub, 3-1/2" EU
3	TC-081-0008-000	1	Ceramic Dome, 3-1/2" Tool
4	MI-305-3500-000	1	3-1/2" EU Thread API Seal Ring
5	OOO-V569-339	1	O-Ring, 90 Durometer Viton
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7	OOO-V569-237	1	O-Ring, 90 Durometer Viton

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1	TC-081-0001-080	1	Top Sub, 2-3/8" EU (L80)
2	TC-081-0000-080	1	Bottom Sub, 2-3/8" EU (L80)
3	TC-081-0002-000	1	Ceramic Dome, 2-3/8" Tool
4	MI-305-2375-000	1	2-3/8" EU Thread API Seal Ring
5	OOO-V569-330	1	O-Ring, 90 Durometer Viton
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7	OOO-V569-141	1	O-Ring, 90 Durometer Viton
--	MAN-TC-081	--	Assembly Manual
--	TC-080-2375-098	--	Redress Kit, Viton, 2-3/8" Tool