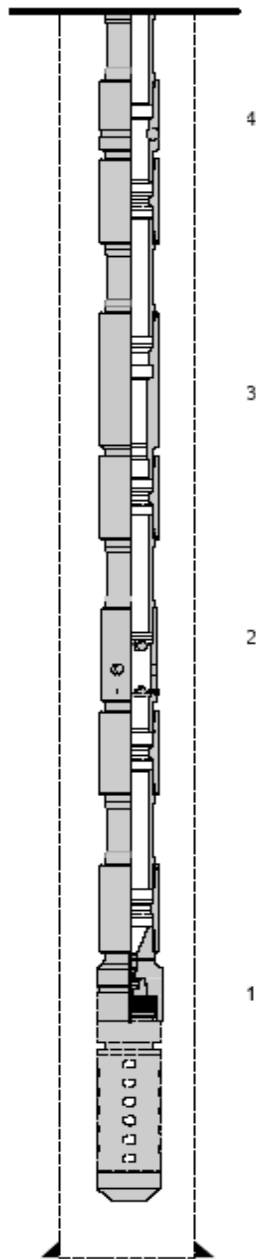


## TCP Bottom Hole Assembly 1

1	Mechanical Firing Head	Recommended	For detailed information please see Technical Data Sheets
2	Fill / Flow Sub	Recommended	
3	No-Go Nipple	Optional	
4	Radioactive Marker Sub	Optional	

### Technical Drawing



### Technical Information

**APPLICATION:**

Most basic TCP Bottom Hole Assembly.

The Mechanical firing head (1) is actuated with a drop bar released at surface into the tubing string.

The Fill/Flow Sub (2) allows the tubing string to fill and drain while running. It features a glass disc which avoids the settlement of debris on top of the firing pin, reducing the impact from the drop bar. The Fill/Flow Sub provides open ports to the annulus which can be used as production ports and in case circulation is required.

The No-Go Nipple (3) gives means to isolate the open ports of the Fill/flow sub from the above tubing as a contingency for well control.

The Radioactive Marker Sub (4) allows accurate depth control using a GR/CCL when the perforating guns are being positioned in the well.

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## TCP Bottom Hole Assembly 4

<b>1</b>	Hydraulic Firing Head	Recommended	For detailed information please see Technical Data Sheets
<b>2</b>	Bypass Valve	Recommended	
<b>3</b>	Hydraulic Tubing Drain	Optional	

### Technical Information

**APPLICATION:**

The toolstring configuration shown is designed to perforate horizontal wells with the aid of a bypass valve.

The Hydraulic Firing Head (1) has a number of shear pins which will shear and actuate the firing head at a predetermined pressure applied at surface.

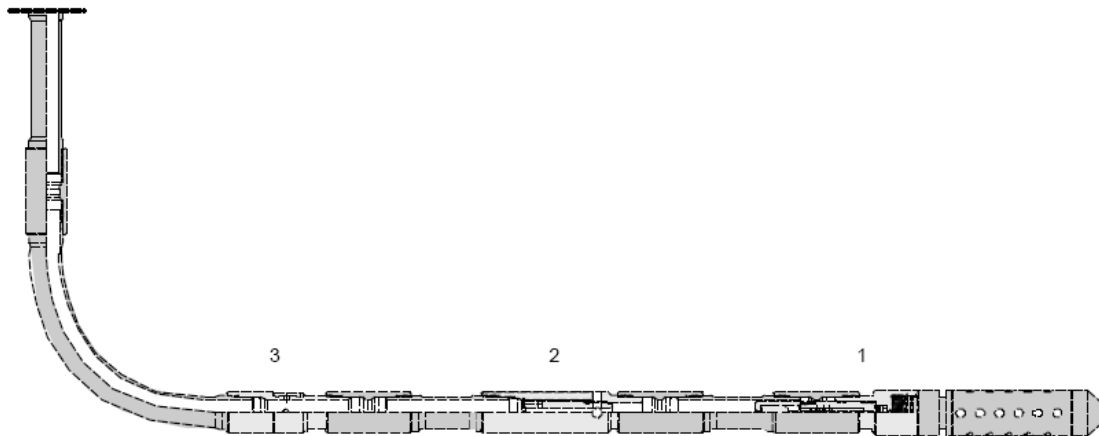
The Bypass Valve (2) allows the tubing string to fill and drain automatically while running and gives means of circulating. When desired a ball may be pumped down the string which will land in the valve and close the circulating ports allowing a pressure build up in the string.

The applied pressure will then actuate the Hydraulic Firing Head (1).

The ball may be retrieved by reverse circulation.

A further increase in pressure will open the Hydraulic Tubing Drain (3), to allow circulation.

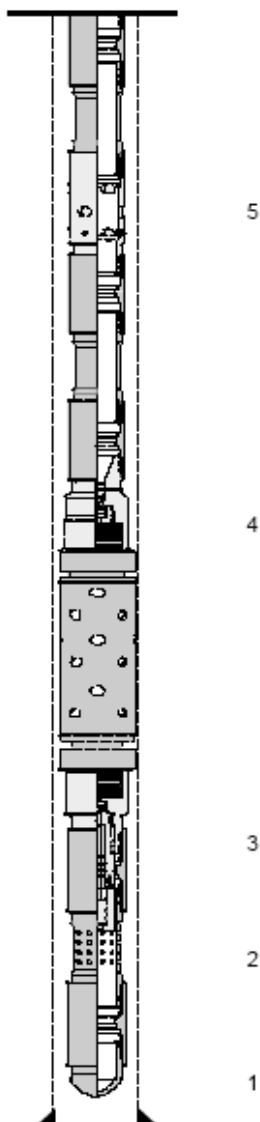
### Technical Drawing



## TCP Bottom Hole Assembly 3

1	Bull Plug	Recommended	For detailed information please see Technical Data Sheets
2	Perforated Pup Joint	Recommended	
3	Hydraulic Firing head	Recommended	
4	Mechanical Firing Head	Recommended	
5	Fill / Flow Sub	Recommended	

### Technical Drawing



### Technical Information

**APPLICATION:**

The toolstring configuration shown features a firing redundancy using a mechanical firing head as a primary firing system and a pressure actuated system as a back up.

The Bull Plug (1) and Perforated Pup Joint (2) have the function to have a cleared protected pressure entrance to the hydraulic actuated firing head.

The Hydraulic Firing Head (3) has a number of shear pins which will shear and actuate the firing head at a predetermined pressure applied at surface.

The Mechanical firing head (4) is actuated with a drop bar released at surface into the tubing string.

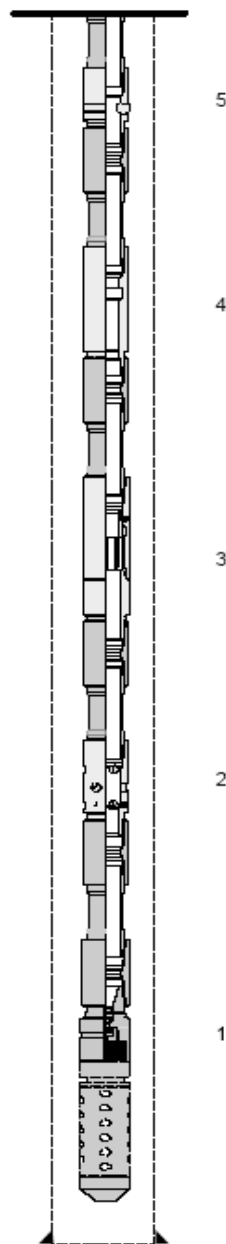
The Fill/Flow Sub (5) allows the tubing string to fill and drain while running. It features a glass disc which avoids the settlement of debris on top of the firing pin, reducing the impact from the drop bar. The Fill/Flow Sub provides open ports to the annulus which can be used as production ports and in case circulation is required.

Revision: RP000000AA

## TCP Bottom Hole Assembly 2

1	Mechanical Firing Head	Recommended	For detailed information please see Technical Data Sheets
2	Fill / Flow Sub	Recommended	
3	Mechanical Gun Release	Recommended	
4	No-Go Nipple	Optional	
5	Radioactive Marker Sub	Optional	

### Technical Drawing



### Technical Information

**APPLICATION:**

Basic TCP Bottom Hole Assembly with Gun release option.

The Mechanical firing head (1) is actuated with a drop bar released at surface into the tubing string.

The Fill/Flow Sub (2) allows the tubing string to fill and drain while running. It features a glass disc which avoids the settlement of debris on top of the firing pin, reducing the impact from the drop bar. The Fill/Flow Sub provides open ports to the annulus which can be used as production ports and in case circulation is required.

The Mechanical Gun Release allows to release the Perforating Assembly into the well bore after perforating. After releasing the Guns the temporary completion will have the full tubing bore for access with production logging tools or as a contingency when stuck in hole with the perforating assembly

The No-Go Nipple (3) gives means to isolate the open ports of the Fill/flow sub from the above tubing as a contingency for well control.

The Radioactive Marker Sub (4) allows accurate depth control using a GR/CCL when the perforating guns are being positioned in the well.

Revision: RP000000AA

## TCP Bottom Hole Assembly 5

<b>1</b>	Hydraulic Firing Head	Recommended	For detailed information please see Technical Data Sheets
<b>2</b>	Tubing Swivel	Recommended	
<b>3</b>	Bypass Valve	Recommended	
<b>4</b>	Hydraulic Tubing Drain	Optional	

### Technical Information

**APPLICATION:**

The toolstring configuration shown is designed to perforate horizontal wells orientating the perforating plains with the aid of swivels and centralizer-fins. Special Perforating Guns with individually designed phasing are used.

The centralizer-fins attached to the perforating gun assemblies will force the guns to the low side of the hole, orienting the perforating plains. The Tubing Swivel (2) will allow the torque to the workstring to be taken away.

The Hydraulic Firing Head (1) has a number of shear pins which will shear and actuate the firing head at a predetermined pressure applied at surface.

The Bypass Valve (3) allows the tubing string to fill and drain automatically while running and gives means of circulating. When desired a ball may be pumped down the string which will land in the valve and close the circulating ports allowing a pressure build up in the string. The applied pressure will then actuate the Hydraulic Firing Head (1).

The ball may be retrieved by reverse circulation.

A further increase in pressure will open the Hydraulic Tubing Drain (4), to allow circulation.

### Technical Drawing

