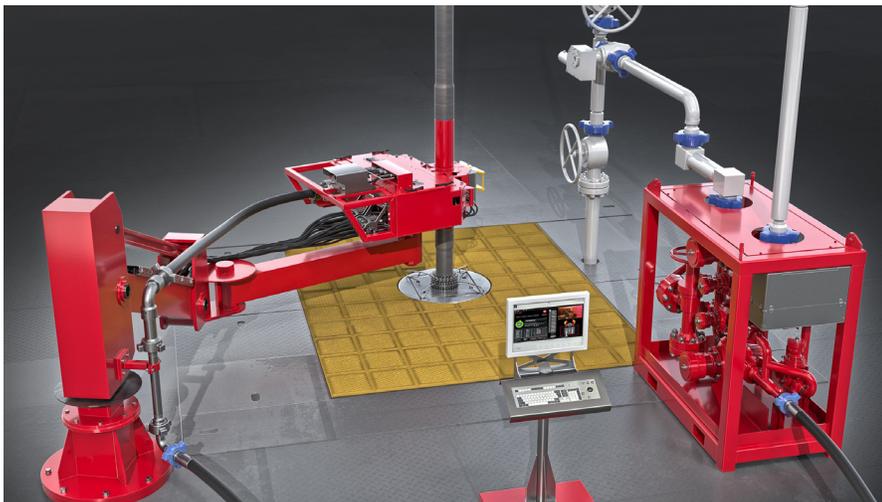


e-cd™ Plus System

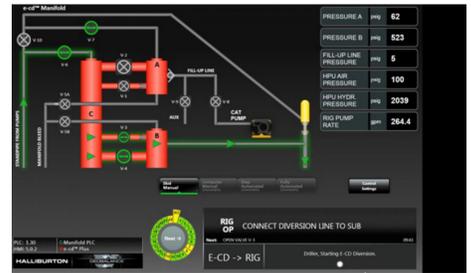
AUTOMATING THE CONTINUOUS CIRCULATION PROCESS

OVERVIEW

The e-cd™ Plus system automates the e-cd connection process, utilizing specialized software operated from a remote computer workstation via touchscreen technology. The e-cd Plus clamp is manually deployed to the e-cd sub via either an overhead lift or undermount delivery arm. Once attached, the software automatically controls all steps of the side port connection and flow diversion process. One of the biggest advantages is enhancement of personnel safety by eliminating the need to perform connections manually in the hazardous "red zone" in single pressure barrier environments. This e-cd Plus clamp can be used as a standalone solution for automated control of the e-cd manifold and e-cd pump, and in conjunction with managed pressure drilling (MPD) equipment in the most challenging wells.



This illustration of the e-cd™ Plus system is demonstrating remote control of the continuous circulation connection process through a common user workstation.



Screenshots of e-cd™ Plus software for monitoring and controlling the tool connection process (top), as well as manifold operations (bottom). Any other integrated equipment is automatically shown.

FEATURES

- » Software control of connection process by various levels of automation, depending on operational needs
- » Undermount delivery arm or overhead lift delivery options
- » Hydraulic failure protection, mechanical interlocks, and manual override at hydraulic power units (HPUs), if necessary
- » Seamless integration with MPD operations

BENEFITS

- » Increases efficiency by replacing manual connection process with automated system and touchscreen operation
- » Delivers the precise alignment required to install and remove threaded components
- » Utilizes existing, field-proven subs to maintain e-cd service history
- » Reduces operator effort, along with health, safety, and environmental (HSE) risks and non-productive time (NPT), by removing the operator from the red zone
- » Provides kick/loss detection if paired with mass flow meter
- » Decreases overall drillpipe connection time during drilling, tripping, or liner running operations

Equipment Specifications

	e-cd™ Plus Clamp	e-cd™ Plus Arm	e-cd™ Plus HPU	e-cd™ Plus Pump	Remote Station
Working Pressure, psi (bar)	7,500 (517)	–	–	1,230 (85)	–
Max Flow Rate, gpm (lpm)	900 (3,400)	–	–	60 (227)	–
Ambient Temperature, °F (°C)	14 to 104 (-10 to 40)	14 to 104 (-10 to 40)	14 to 104 (-10 to 40)	14 to 104 (-10 to 40)	14 to 104 (-10 to 40)
Process Fluid Temperature, °F (°C)	-20 to 200 (-29 to 93)	–	–	-20 to 200 (-29 to 93)	–
Service	Standard	–	–	Standard	–
Mud Weight, sg (ppg)	2.4 (20)	–	–	2.4 (20)	–
Weight, lb (kg)	(1): 1600 (590) (2): 2,257 (1,024)	3,000 (1,361)	5,071 (2,300)	5,071 (2,300)	200 (91)
Length, in. (cm)	(1): 65 (165) (2): 104 (264) - 86 (218)	Min. 121 (305) Max. 187 (473)	79 (200)	63 (160)	30 (76)
Width, in. (cm)	49 (124.5)	36 (92)	47 (120)	48 (120)	28 (71)
Height, in. (cm)	(1): 27 (69) (2): 35 (89)	Min. 76 (192) Max. 115 (291)	1,098 (2,790)	75 (189)	79 (200)
Air Pressure, psi (bar)	120 (8.3)	–	120 (8.3)	–	–
System Control	Pneumatic and Hydraulic (from HPU)	Hydraulic (from HPU)	Pneumatic, Hydraulic, Electric	Electric	Electric
Inputs	<ul style="list-style-type: none"> • 2-in. 1502 Process • 2x12-pin Hydraulic/Pneumatic Coupler • 21-pin Rota Signal • Rota DR4 	<ul style="list-style-type: none"> • 21-pin Rota Signal • Rota DR4 • 2x10-pin Hydraulic/Pneumatic Coupler 	<ul style="list-style-type: none"> • 120 psi (8.3 bar) • 230 VAC Power 	<ul style="list-style-type: none"> • 440/720 VAC Power • Amphenol Signal • 2-in. 1502 Process 	<ul style="list-style-type: none"> • 230 VAC Power • Rota DR4
Outputs	Dual ACME (Sub Connection)	<ul style="list-style-type: none"> • 21-pin Rota • Rota DR4 • 2x10-pin Hydraulic/Pneumatic Coupler 	<ul style="list-style-type: none"> • 21-pin Rota • 2x Rota DR4 • 230 VAC • Rota DR4 Ethernet • 2x10-port Hydraulic/Pneumatic Coupler 	2-in. 1502 Process	–
Design Specifications	<ul style="list-style-type: none"> • CE (ATEX Zone 1, PED, Machinery Directive) • IECEX • NORSOK Z-015 • DNVGL-OS-E101 	<ul style="list-style-type: none"> • CE (ATEX Zone 1, PED, Machinery Directive) • IECEX • NORSOK Z-015 • DNVGL-OS-E101 	<ul style="list-style-type: none"> • CE (ATEX Zone 1, PED, Machinery Directive) • IECEX • NORSOK Z-015 • DNVGL-OS-E101 	<ul style="list-style-type: none"> • CE (ATEX Zone 2, PED, Machinery Directive) • IECEX • NORSOK Z-015 • DNVGL-OS-E101 	<ul style="list-style-type: none"> • CE (ATEX Zone 1, PED, Machinery Directive) • IECEX • NORSOK Z-015
Optimal Location	Rig Floor	Rig Floor	< 50 ft (1524 cm) from Arm	< 50 ft (1524 cm) from Manifold	Rig Floor

- » The e-cd Plus clamp is delivered to the e-cd sub with either the e-cd Plus arm (1) or an overhead tigger line (2).
- » When using the e-cd Plus arm (1), the height is adjustable.
- » When using the overhead tigger line (2), the length of the tool will vary to fit the top drive on the rig for deployment.

For more information, contact your local Halliburton representative or visit us on the web at www.halliburton.com

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