simultaneous fluid communication with a same one of the one or more inlets, and one or more subsea valve assemblies, each configured to selectively control hydraulic fluid communication from at least one of the one or more inlets to at least one of the outlets, where a first one of the outlets is configured to be in fluid communication with an actuation port of the hydraulically actuated device, and a second one of the outlets is configured to be in fluid communication with an outlet of a second subsea valve module.

[0016] According to an aspect of the present invention, there is provided a manifold for providing hydraulic fluid to a hydraulically actuated device of a blowout preventer comprise first and second subsea valve modules, each comprising one or more inlets, each configured to receive hydraulic fluid from a pressure source, one or more outlets, each in selective fluid communication with at least one of the one or more inlets, one or more vents configured to permit hydraulic fluid flow to at least one of a hydraulic reservoir and subsea environment; and one or more subsea valve assemblies, each changeable between: a first state in which at least one of the outlet(s) is in fluid communication with at least one of the inlet(s); a second state in which the at least one of the outlet(s) is in fluid communication with at least one of the vent(s); and a third state in which neither the inlet(s) nor the vent(s) are in fluid communication with the outlet(s); where at least one of the inlet(s) of the first subsea valve module is configured to receive hydraulic fluid from a first pressure source, and at least one of the inlet(s) of the second subsea valve module is configured to receive hydraulic fluid from a second pressure source that is different from the first pressure source; where at least one of the one or more outlets of the first subsea valve module is configured to be in simultaneous fluid communication with at least one of the one or more outlets of the second subsea valve module and an actuation port of the hydraulically actuated device.

[0017] Some embodiments of the present manifolds for providing hydraulic fluid to a hydraulically actuated device of a blowout preventer comprise first, second, and third subsea valve modules, each comprising one or more inlets, each configured to receive hydraulic fluid from a fluid source, one or more outlets, each in selectively fluid communication with at least one of the one or more inlets, and one or more subsea valve assemblies, each configured to selectively control hydraulic fluid communication from at least one of the one or more inlets to at least one of the one or more outlets, where at least one of the one or more outlets of the first subsea valve module is configured to be in simultaneous fluid communication with at least one of the one or more outlets of the second subsea valve module, at least one of

the one or more outlets of the third subsea valve module, and an actuation port of the hydraulically actuated device.

[0018] In some embodiments, at least one of the subsea valve modules is configured to be coupled to at least one other of the subsea valve modules. In some embodiments, at least two of the subsea valve modules define one or more conduits when the at least two of the subsea valve modules are coupled together, the one or more conduits each in fluid communication with at least one of the outlet(s) of each of the at least two subsea valve modules and configured to communicate hydraulic fluid to a respective actuation port of the hydraulically

CLAIMS

1. A manifold for providing hydraulic fluid to a hydraulically actuated device of a blowout preventer, the manifold comprising:

first and second subsea valve modules, each comprising:

one or more inlets, each configured to receive hydraulic fluid from a pressure source;

one or more outlets, each in selective fluid communication with at least one of the one or more inlets;

one or more vents configured to permit hydraulic fluid flow to at least one of a hydraulic reservoir and subsea environment; and

one or more subsea valve assemblies, each changeable between:

a first state in which at least one of the outlet(s) is in fluid communication with at least one of the inlet(s);

a second state in which the at least one of the outlet(s) is in fluid communication with at least one of the vent(s); and

a third state in which neither the inlet(s) nor the vent(s) are in fluid communication with the outlet(s);

where at least one of the inlet(s) of the first subsea valve module is configured to receive hydraulic fluid from a first pressure source, and at least one of the inlet(s) of the second subsea valve module is configured to receive hydraulic fluid from a second pressure source that is different from the first pressure source;

where at least one of the one or more outlets of the first subsea valve module is configured to be in simultaneous fluid communication with at least one of the one or more outlets of the second subsea valve module and an actuation port of the hydraulically actuated device.

2. The manifold of claim 1, where at least one of the subsea valve modules is configured to be coupled to at least one other of the subsea valve modules.

3. The manifold of claim 2, where at least two of the subsea valve modules define one or more conduits when the at least two of the subsea valve modules are coupled together, the one or more conduits each in fluid communication with at least one of the outlet(s) of each of the at least two subsea valve modules and configured to communicate hydraulic fluid to a respective actuation port of the hydraulically actuated device.

4. The manifold of claim 1, where at least one of the subsea valve modules comprises one or more isolation valves configured to selectively block fluid communication through at least one of the one or more inlets.

5. The manifold of claim 4, where at least one of the one or more isolation valves is configured to automatically block fluid communication through at least one of the one or more inlets upon decoupling of the fluid source from the subsea valve module.

6. The manifold of claim 1, where at least one of the subsea valve modules comprises one or more isolation valves configured to selectively block fluid communication through at least one of the outlet(s).

7. The manifold of claim 6, where at least one of the one or more isolation valves is configured to automatically block fluid communication through at least one of the outlet(s) upon decoupling of another of the subsea valve modules from the subsea valve module.

8. The manifold of claim 1, where at least one of the one or more subsea valve assemblies comprises:

a first two-way valve configured to selectively allow fluid communication from at least one of the one or more inlets to at least one of the outlet(s); and

a second two-way valve configured to selectively divert hydraulic fluid from at least one of the outlet(s) to at least one of the vent(s).

9. The manifold of claim 1, comprising:

one or more sensors configured to capture data indicative of at least one of hydraulic fluid pressure, temperature, and flow rate; and

a processor configured to control, based at least in part on the data captured by the one or more sensors, actuation of at least one of the one or more subsea valve assemblies.

10. The manifold of claim 1, where the manifold is configured to allow each outlet to be in simultaneous fluid communication with at least two of the inlets.

11. The manifold of claim 1, where at least one of the one or more subsea valve assemblies comprises a hydraulically actuated main stage valve.

12. The manifold of claim 11, where at least one of the one or more subsea valve assemblies comprises a pilot stage valve configured to actuate the main stage valve.

13. The manifold of claim 12, where the pilot stage valve is integrated with the main stage valve.

14. The manifold of claim 1, where at least one of the one or more subsea valve assemblies comprises a bi-stable valve.

15. The manifold of claim 1, comprising one or more batteries in electrical communication with at least one of the one or more subsea valve assemblies.

16. The manifold of claim 1, where at least one pressure source comprises a subsea pump.

17. The manifold of claim 1, where the manifold does not comprise a shuttle valve.

18. The manifold of claim 1, where at least one of the outlet(s) is in direct fluid communication with the actuation port of the hydraulically actuated device.