Claims

1. A jumper termination apparatus for a subsea jumper flowline, the jumper termination apparatus comprising:
a body;
a jumper coupling means configured to couple the body to a jumper flowline;
an access interface disposed on the body; and
a connector coupling means configured to couple the body to a subsea manifold connector~~; and~~ so that the access interface is arranged above the connector coupling means and is vertically oriented to enable access from above;
~~an access interface disposed on the body;~~
wherein the jumper termination apparatus is configured for the body ~~defines~~to define a first flow path from a coupled jumper flowline to a coupled subsea manifold connector, and to define a second flow path from the access interface to the ~~first flow path or the~~ subsea manifold connector; and
wherein the access interface is configured to be connected to a termination apparatus of a second jumper flowline~~.~~ in a vertically stacked arrangement.

~~2. The jumper termination apparatus according to claim 1, wherein the access interface is vertically oriented to enable access from above.~~

~~3. The jumper termination apparatus according to claim 1, wherein the access interface is oriented on an axis inclined to the main axis of the manifold connector.~~

~~4.~~2. ~~The~~ jumper termination apparatus ~~according to any of claims 1 to 3~~, wherein the jumper coupling means comprises a gooseneck section configured to be disposed between the body and the coupled jumper flowline.

~~5.~~3. The jumper termination apparatus according to ~~any preceding~~ claim 1 or claim 2, wherein the access interface is configured to provide access for fluid intervention or mechanical intervention operations on the flow system.

4. The jumper termination apparatus according to any preceding claim, configured for the second flow path to connect the access interface to the first flow path.

6.5. A jumper termination apparatus for a subsea jumper flowline, the jumper termination apparatus comprising:

a body;

a jumper coupling means configured to couple the body to a jumper flowline; and

an interface coupling means configured to couple the body to an access interface of a jumper flowline termination headapparatus according to any of claims 1 to 4 of a further jumper flowline, in a vertically stacked arrangement.

7.6. The jumper termination apparatus according to claim 65, comprising a guide funnel with a cut-away or relief configured to accommodate the further jumper flowline.

8.7. The jumper termination apparatus according to claim 65 or claim 76, comprising a further access interface configured for connection of a jumper termination apparatus.

9.8. A method of connecting subsea flowlines to a subsea manifold, the method comprising:

providingusing a first jumper flowline having a first jumper termination apparatus according to any of claims 1 to 4 connected to a first subsea manifold connector and comprising a first access interface;

providing and a second jumper flowline having a second jumper termination apparatus; and according to any of claims 5 to 7; the method comprising:

connecting the second jumper flowline to the subsea manifold via the first access interface and the first subsea manifold connector.

The method according to claim 9, comprising by vertically stacking the second jumper termination apparatus on the first jumper termination apparatus.

10.9. The method according to claim 9 or 108, wherein the second jumper termination apparatus comprises a guide funnel, and wherein the method comprises orienting a cut-away or relief of the guide funnel to accommodate the first jumper flowline.

11.10. The method according to any of claims 9 to 11claim 8 or claim 9, wherein the second jumper termination apparatus comprises a second access interface, and the method comprises:

providingconnecting a further jumper flowline having a further jumper termination apparatus; and

connecting the further jumper flowline to the subsea manifold via the second access interface, the first jumper termination apparatus, and the first subsea manifold connector.

12.11. The method according to claim 1210, wherein the further jumper termination apparatus comprises a further access interface.

13.12. The method according to claim 1210 or claim 1311, wherein the further jumper termination apparatus comprises a guide funnel, and the method comprises orienting a cut-away or relief of the guide funnel to accommodate the second jumper flowline.

14.13. The method according to any of claim 9claims 8 to 1412, wherein the method comprises performing fluid intervention or mechanical intervention operations on the flow system via the first access interface, and/or the second access interface and/or the further access interface.

15.14. The method according to claim 1513, wherein fluid intervention operations are fluid intervention operations from the group comprising: fluid sampling, fluid pumping, fluid diversion, fluid recovery, fluid injection, fluid circulation, fluid measurement fluid metering, artificial/gas lift, and/or well scale squeeze operations.

16.15. The method according to claim 1513, wherein mechanical intervention operations are cleaning and/or pigging operations.

17.16. A flow system for a subsea hydrocarbon production or injection installation, the flow system comprising:

a subsea manifold;

a first jumper flowline having a first jumper termination apparatus according to any of claims 1 to 4 connected to a first subsea manifold connector and comprising a body and a first access interface;

wherein the body defines a first flow path from the first jumper flowline to the subsea manifold connector, and a second flow path from the access interface to the first flow path or the subsea manifold connector; and

and wherein the first access interface is configured to be connected to a termination apparatus of a second jumper flowline in a vertically stacked arrangement.

18.17. The flow system according to claim 1816, wherein the subsea manifold is a collection manifold.

19.18. The flow system according to claim 1816 or claim 1917, wherein the flow system comprises a second jumper flowline having a second jumper termination apparatus, and wherein according to any of claims 5 to 7, and wherein the first jumper termination apparatus and the second jumper termination apparatus are vertically stacked such that the second jumper flowline is connected to the subsea manifold via the first access interface and the subsea manifold connector.

20. The flow system according to claim 20, wherein the first and second jumper termination apparatus are vertically stacked.

21.19. The flow system according to any of claims 16 to 18 to 21, wherein the first jumper flowline and/or the second jumper flowline comprise a composite jumper flowline.

22.20. The flow system according to any of claims 1816 to 2219, wherein the first jumper flowline and/or the second jumper flowline are production jumper flowlines which facilitate production flow from respective subsea wells into the subsea manifold.

23.21. The flow system according to any of claims 1816 to 2321, wherein the subsea manifold, and the first jumper flowline and/or the second jumper flowline comprise multiple flow lines or flow bores.

24.22. The flow system according to 2421, wherein the first jumper termination apparatus and/or second jumper termination apparatus define a further flow path or flow paths which correspond to the multiple flow lines or flow bores of the subsea manifold and the first and/or second jumper flowlines.

23. The flow system according to any of claims 16 to 22, wherein the second flow path connects the access interface to the first flow path.