What is claimed is:

1. A positional feedback system for sealing a hanger (21) within a subsea wellhead (13) with a hanger setting and sealing system, the feedback system comprising:

a seal assembly (23) releasably coupled to the running tool (17), the seal assembly (23) configured to be positioned between an outer diameter surface of the hanger (21) and an inner diameter surface of the wellhead (13), the seal assembly (23) having an upper portion (45) that moves relative to a lower portion (31) when the seal assembly (23) is being moved from an unset to a set position to form a seal between the seal assembly (23) and the inner and outer diameter surfaces of the wellhead (13) and the hanger (21), respectively;

a magnet (57) having a magnetic field (63), the magnet (57) disposed on the upper portion (45) of the seal assembly (23);

a running tool (17) configured to set the hanger (21)in the wellhead (13); and

one or more sensing devices (59, 61) disposed on running tool (17), the one or more sensing devices (59, 16) positioned in the magnetic field (63) of the magnet (57) in one or more of the set position and the unset position, the one or more sensing devices (59, 61) configured to communicate with a surface platform (25) when the magnet (57) passes the magnetic field (63) through the one or more sensing devices (59, 61).

2. The positional feedback system of Claim 1, wherein:

the running tool has a stem portion (53) and a piston portion (55), the piston portion (55) surrounding the stem portion (53) and axially movable relative to the stem portion (53);

the upper portion (45) of the seal assembly (23) releasably coupled to the piston portion (55) so that the upper portion (45) moves axially in response to movement of the piston portion (55);

the one or more sensing devices (59, 61) positioned on the stem portion (53) of the running tool (17); and

the piston portion (55) moves the upper portion (45) from the unset to the set position, thereby moving the magnet (57) proximate to the one or more sensing device (59, 61).

3. The positional feedback system of Claim 2, wherein the one or more sensing devices (59, 61) comprise a set sensing device (61) and an unset sensing device (59), both positioned on the stem portion (53) of the running tool (17), the unset sensing device (59) positioned axially above the set sensing device (61), the magnet (57) positioned proximate to the unset sensing device (59) in the unset position and proximate to the set sensing device (61) in the set position.

4. The positional feedback system of Claim 1, wherein the one or more sensing devices (59, 61) comprises an unset sensing device (59) positioned to detect the magnetic field (63) of the magnet (57) when the upper portion (45) of the seal assembly (17) is in the unset position.

5. The positional feedback system of Claim 1, wherein the one or more sensing devices (59, 61) comprises a set sensing device (61) positioned to detect the magnetic field (63) of the magnet (57) when the upper portion (45) of the seal assembly (23) is in the set position.

6. The positional feedback system of Claim 1, wherein:

the seal assembly (23) comprises a seal ring (31) and an energizing ring (45), the energizing ring (45) configured to be moved relative to the seal ring (31) from an unset position to a set position to set the seal ring; and

the magnet (57) disposed on the energizing ring (45).

7. The positional feedback system of Claim 1, wherein one or more riser magnets (57') having separate magnetic fields (63) are positioned in a riser (20) extending from the subsea wellhead (13) to the surface platform (25), and the one or more sensing devices (59, 61) are configured to communicate a tool elevation with the surface platform (25) when the one or more riser magnets (57') passes the magnetic field through the one or more sensing devices (59, 61).

8. A method for setting a seal assembly (23) between a hanger (21) and a subsea wellhead member (13), the method comprising:

(a) mounting a magnet (57) to an upper portion (45) of the seal assembly, and one or more sensing devices (59, 61) on a running tool (17);

(b) with the running tool (17), positioning the seal assembly (23) between an outer diameter surface of the hanger (21) and an inner diameter surface of the wellhead (13);

(c) moving the upper portion (45) relative to a lower portion (31) of the seal assembly (23) from an unset position to a set position to set the seal assembly (23) between the inner and outer diameter surfaces of the wellhead member (13) and the hanger (21), respectively;

(d) moving a magnetic field (63) of the magnet (57) through the one or more sensing devices (59, 61) disposed on the running tool (17); and

(e) communicating a signal to the surface platform (25) in response to passing the magnetic field (63) of the magnet (57) through the one or more sensing devices (59, 61), the signal indicating positional location of the upper portion (45).

9. The method of Claim 13, wherein the running tool (17) has a stem portion (53) and a piston portion (55), the piston portion (55) surrounding the stem portion and axially movable relative to the stem portion (53), the method further comprising:

releasably coupling the upper portion (45) to the piston portion (55) so that the upper portion moves axially in response to movement of the piston portion;

positioning the one or more sensing devices (59, 61) on the stem portion (55) of the running tool (17); and

moving the piston portion (55) to move the upper portion (45) from the unset to the set position, thereby moving the magnet (57) proximate to the one or more sensing device (59, 61).

10. The method of Claim 14, wherein the one or more sensing devices (59, 61) comprise a set sensing device (61) and an unset sensing device (59), the method further comprising positioning the unset sensing device (59) and the set sensing device (61) on the stem portion (55) of the running tool

(17), the magnet (57) positioned proximate to the unset sensing device (59) in the unset position and proximate to the set sensing device (61) in the set position.

11. The method of Claim 15, further comprising positioning the unset sensing device (59) axially spaced apart from the set sensing device (61).

12. The method of Claim 13, wherein the one or more sensing devices (59, 61) comprises an unset sensing device (59), the method comprising positioning the unset sensing device (59) to detect the magnetic field of the magnet (57) when the upper portion (45) is in the unset position.

13. The method of Claim 13, wherein the one or more sensing devices (59, 61) comprises a set sensing device (61), the method comprising positioning the set sensing device (61) to detect the magnetic field (63) of the magnet (57) when the upper portion (45) is in the set position.

14. The method of Claim 13, wherein the upper portion of the seal assembly comprises an energizing ring (45) and step (a) comprises mounting the magnet (57) to the energizing ring (45).

15. The method of Claim 13, wherein step (e) further comprises transmitting electro-magnetic waves through a running string (19) coupled to the running tool (17) to power the sensing devices (59, 61).

CLAIMS

What is claimed is:

1. A positional feedback system for sealing a hanger within a subsea wellhead with a hanger setting and sealing system, the feedback system comprising:

a seal assembly releasably coupled to a running tool, the seal assembly configured to be positioned between an outer diameter surface of the hanger and an inner diameter surface of the wellhead, the seal assembly having an upper portion that moves relative to a lower portion when the seal assembly is being moved from an unset to a set position to form a seal between the seal assembly and the inner and outer diameter surfaces of the wellhead and the hanger, respectively;

a magnet having a magnetic field, the magnet disposed on the upper portion of the seal assembly;

the running tool configured to set the hanger in the wellhead; and

one or more sensing devices disposed on the running tool, the one or more sensing devices positioned in the magnetic field of the magnet in one or more of the set position and the unset position, the one or more sensing devices configured to communicate with a surface platform when the magnet moves relative to the one or more sensing devices, thereby sensing a change in the magnetic field due to said relative movement.

2. The positional feedback system of claim **1**, wherein:

the running tool has a stem portion and a piston portion, the piston portion surrounding the stem portion and axially movable relative to the stem portion;

the upper portion of the seal assembly releasably coupled to the piston portion so that the upper portion moves axially in response to movement of the piston portion;

the one or more sensing devices positioned on the stem portion of the running tool; and

the piston portion moves the upper portion from the unset to the set position, thereby moving the magnet proximate to the one or more sensing devices.

3. The positional feedback system of claim **2**, wherein the one or more sensing devices comprise a set sensing device and an unset sensing device, both positioned on the stem portion of the running tool, the unset sensing device positioned axially above the set sensing

device, the magnet positioned proximate to the unset sensing device in the unset position and proximate to the set sensing device in the set position.

4. The positional feedback system of claim **1**, wherein the one or more sensing devices comprises an unset sensing device positioned to detect the magnetic field of the magnet when the upper portion of the seal assembly is in the unset position.

5. The positional feedback system of claim **1**, wherein the one or more sensing devices comprises a set sensing device positioned to detect the magnetic field of the magnet when the upper portion of the seal assembly is in the set position.

6. The positional feedback system of claim **1**, wherein:

the seal assembly lower portion comprises a seal ring and the seal assembly upper portion comprises an energizing ring, the energizing ring configured to be moved relative to the seal ring from an unset position to a set position to set the seal ring; and

the magnet disposed on the energizing ring.

7. The positional feedback system of claim **1**, wherein one or more riser magnets having separate magnetic fields are positioned in a riser extending from the subsea wellhead to the surface platform, and the one or more sensing devices are configured to communicate a current tool elevation with the surface platform when the one or more sensing devices passes through the separate magnetic fields of the one or more riser magnets.

8. A positional feedback system for sealing a hanger within a subsea wellhead with hanger setting and sealing system, tile system comprising:

a seal assembly releasably coupled to a running tool, the seal assembly configured to be positioned between an outer diameter surface of the hanger and an inner diameter surface of the wellhead, the seal assembly having a seal ring and an energizing ring, the energizing ring configured to be moved relative to the seal ring from an unset position to a set position to set the seal ring to form a seal between the seal ring and the inner and outer diameter surfaces of the wellhead arid the hanger, respectively;

a magnet having a magnetic field, the magnet disposed on the energizing ring of the seal assembly;

the running tool configured to set the hanger in tile wellhead; and

one or more sensing devices disposed on the running tool, the one or more sensing devices positioned in the magnetic field of the magnet in one or more of the set position and the unset position, the one or more sensing devices configured to communicate with a surface platform when the magnet moves relative to the one or more sensing devices, thereby sensing a change in the magnetic field due to said relative movement.

9. The positional feedback system of claim **8**, wherein:

the running tool has a stem portion and a piston portion, the piston portion surrounding the stem portion and axially movable relative to the stem portion;

the energizing ring of the seal assembly releasably coupled to the piston portion so that the energizing ring moves axially in response to movement of the piston portion;

the one or more sensing devices positioned on the stem portion of the running tool; and

the piston portion moves the energizing ring from the unset to the set position, thereby moving the magnet proximate to the one or more sensing devices.

10. The positional feedback system of claim **9**, wherein the one or more sensing devices comprise a set sensing device and an unset sensing device, both positioned on the stem portion of the running tool, the unset sensing device positioned axially above the set sensing device, the magnet positioned proximate to the upset sensing device in the unset position and proximate to the set sensing device in the set position.

11. The positional feedback system of claim **8**, wherein the one or more sensing devices comprises an unset sensing device positioned to detect the magnetic field of the magnet when the energizing ring is in the unset position.

12. The positional feedback system of claim **8**, wherein the one or more sensing devices comprises a set sensing device positioned to detect the magnetic field of the magnet when the energizing ring is in the set position.

13. A method for setting a seal assembly between a hanger and a subsea wellhead member, the method comprising:

(a) mounting a magnet to upper portion of the seal assembly, and one or more sensing devices on a running tool;

(b) with the running tool, positioning the seal assembly between an outer diameter surface of the hanger and an inner diameter surface of the wellhead;

(c) moving the upper portion relative to a lower portion of the seal assembly from an unset position to a set position to set the seal assembly between the inner and outer diameter surfaces of the wellhead member and the hanger, respectively;

(d) moving a magnetic field of the magnet through the one or more sensing devices disposed on running tool; and

(e) communicating a signal to the surface platform in response to passing the magnetic field of the magnet through the one or more sensing devices, the signal indicating positional location of the energizing ring.

14. A method of claim **13**, wherein the running tool has a stem portion and a piston portion, the piston portion surrounding the stem portion and axially movable relative to the stem portion, the method further comprising:

releasably coupling the upper portion to the piston portion so that the upper portion moves axially in response to movement of the piston portion;

positioning the one or more sensing devices on the stem portion of the running tool; and

moving the piston portion to move the upper portion from the unset to the set position, thereby moving the magnet proximate to the one or more sensing device.

15. The method of claim **14**, wherein the one or more sensing devices comprise a set sensing device and an unset sensing device, the method further comprising positioning the unset sensing device and the set sensing device on the stem portion of the running tool, the magnet positioned proximate to the unset sensing device in the unset position and proximate to the set sensing device in the set position.

16. The method of claim **15**, further comprising positioning the unset sensing device axially spaced apart from the set sensing device.

17. The method of claim **13**, wherein the one or more sensing devices comprises an unset sensing device and the upper portion of the seal assembly comprises an energizing ring, the method comprising positioning the unset sensing device to detect the magnetic field of the magnet when the energizing ring is in the unset position.

18. The method of claim **13**, wherein the one or more sensing devices comprises a set sensing device and the upper portion of the seal assembly comprises an energizing ring, the method comprising positioning the set sensing device to detect the magnetic field of the magnet when the energizing ring is in the set position.

19. The method of claim **13**, wherein the upper portion of the seal assembly comprises an energizing ring and step (a) comprises mounting the magnet to the energizing ring.

20. The method of claim **13**, wherein step (e) further comprises transmitting electro-magnetic waves through a running string coupled to the running tool to power the sensing devices.

21. The method of claim **13**, wherein step (e) further comprises generating an electro-magnetic signal with the sensing device in response to movement of the magnetic field of the magnet through the sensing device and transmitting the electro-magnetic signal to a surface through a running string coupled to the running tool.