GE Oil & Gas
Subsea Systems

FLX360 flying lead, multi-function subsea connection system

Innovative design increases long term equipment reliability and operating efficiency while eliminating costs and risks inherent in traditional designs

Subsea connections

Electrical and hydraulic flying leads (EFLs and HFLs) are key components of subsea distribution systems – providing chemical/hydraulic and electrical connections between umbilical termination assemblies (UTAs), subsea distribution units (SDUs), trees and manifolds, etc.

Fixed MQCs are installed on the structures and 'flying' MQCs are attached to each end of the HFL; the integrity of these connections is paramount to the reliability of the subsea distribution system.

MQC mechanisms must perform four critical functions in high-pressure conditions:

- Alignment of the flying MQC to the fixed MQC before engagement of the multiple connections carried by the flying lead
- Pulling the flying MQC into the fixed MQC against the separation force of the hydraulic couplers (up to 300 kN)
- Holding MQCs together and resisting the separation force exerted by the couplers (up to 300 kN)
- Pushing MQCs apart against the hydrostatic head of seawater (up to 250 kN)

Traditional design limitations

Traditional designs use threaded screw mechanisms to pull and push the MQCs into position. Since these remain exposed to harsh subsea conditions, corrosion and debris build-up over time can render them unworkable when the remotely operated vehicle (ROV) needs to disconnect the plates. This has created significant cost and operability implications for many operators around the world.

A superior solution

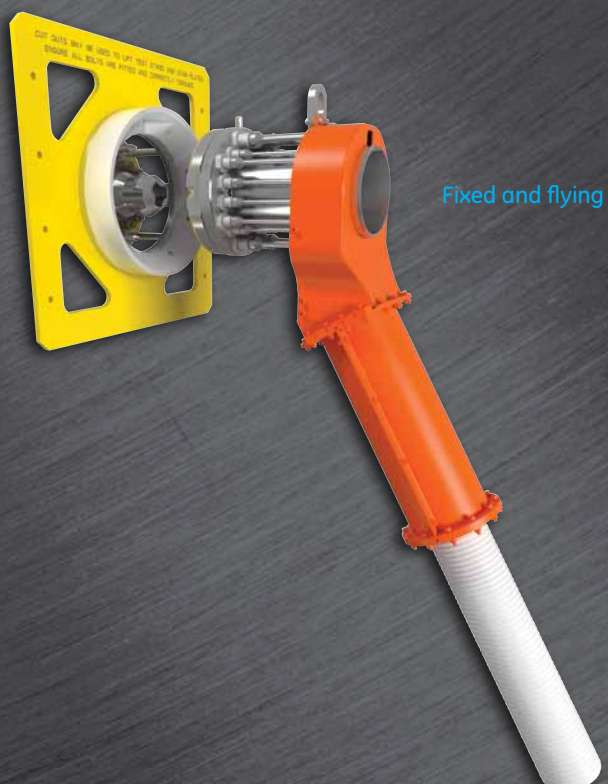
The GE Oil & Gas FLX360 is an innovative new system that improves corrosion resistance and connection reliability over multiple make/break cycles – while speeding up the actual connection time.

The new design has removed the screw-thread mechanism from every flying MQC and replaced it with ROV-mounted tooling that activates a simple bayonet latch to hold the two plates together.

The solution provides field-wide connection capabilities and applications including:

- Fixed and flying half MQCs
- Logic plates
- Long- and short-term protective covers
- Parking plates
- Choice of thermoplastic, steel tube or hybrid flying lead bundles

The tooling package attaches to the ROV with a standard interface and was developed in conjunction with one of the leading ROV design companies.



Fixed and flying MQCs

GE imagination at work

Fast & reliable

When moving an HFL with FLX360, the typical MQC sequence is as follows:

HFL disconnection

- ROV tool docks into HFL MQC
- Tool locks onto fixed plate and exerts preload
- Bayonet latch operated to release flying MQC from fixed MQC
- Tool separates plates
- Tool unlocks from fixed plate and ROV is free to fly HFL to a new location

Connection at new location

- ROV pushes the flying MQC into the fixed MQC using the guidance and alignment features provided
- Tool locks onto fixed plate and pulls the flying plate into the fixed plate
- Bayonet latch is operated to lock the flying and fixed MQCs together
- Tool unlocks from fixed plate and ROV is free to move away

Key features & benefits

- Eliminates risk of cross threading, galling or seizing of subsea screw threads by entirely removing threads from mechanism
- Increases connection speed and reliability through a more versatile and durable mechanism
- Ability to exercise latch without de-mating couplers
- Mitigation of calcareous deposits and marine growth
- Faster makeup time reduces likelihood of seals blowing out for hydraulic lines
- Coarse and fine guidance features on the tool and both MQC halves provide for an excellent range of angular, rotational and lateral misalignment possibilities
- Integral lifting points and buoyancy attachment
- Integrated engineered attachment point for flying lead bundles
- Two versions of the tool are available – a shop tool for workshop and offshore use and the ROV-operated tool for subsea applications
- Tooling packages are available for purchase or rental

Number of couplings at various pressure ratings

Line pressure	5k	10k		15k	
Coupler size	½"	½"	1"	½"	1"
Base case	-	12	4	-	-
Variant Example 1	2	2	-	8	2

The FLX series significantly reduces the number of active mechanical components that remain on the seabed once the flying lead connection is made-up by an ROV; helping us deliver increased long-term subsea reliability.

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GE imagination at work

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