



SYSTEM CERTIFICATION
Oct. 16th, 2019



Technicians at Franklin Applied Physics and Simple Reliable Systems tested the RF-Safe Phire® System which comprises the following system

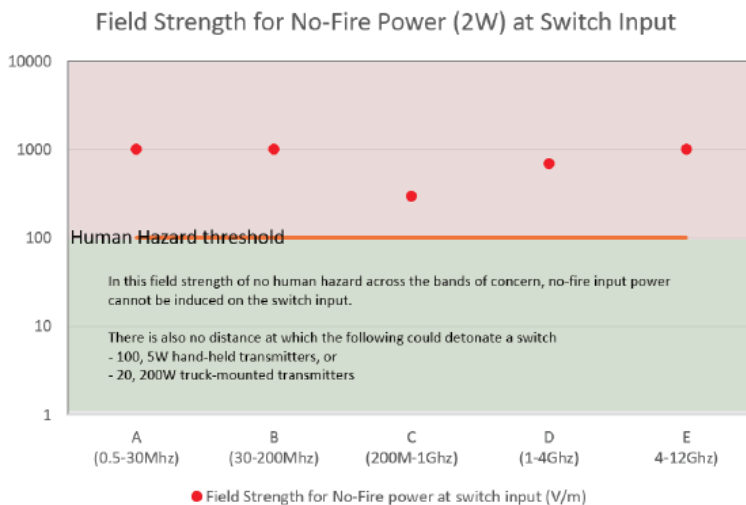
- 1) RF-Safe switch with 50Ω resistorized Phire® detonator
- 2) Verification Module
- 3) Verification Panel

The system designs are RP67 3rd Edition October 2019 compliant. They have been 3rd party verified to fail safe by having designs with no single point of failure.

Item 1 – RF-Safe switch with 50Ω resistorized Phire detonator

The switch withstands the following test conditions

- 240 rms volts AC, for five minutes.
- ±600VDC voltage standoff with less than 0.1% no fire current limit leakage across detonator, after 6hrs at 350DegF and 3 temperature cycles from ambient to 350DegF; exceeding the requirements defined in Paragraph 4.4.3.3 of MIL-DTL-23659E.
- For United States Department of Transportation, 1kVDC or -900VDC held for 5 minutes will maintain switch function and not result in detonation.
- Electro Static Discharge testing per MIL-DTL-23659F (2010) not resulting in detonation.
- Radio Frequency (RF) irradiation must exceed human hazard level to induce the no-fire power level at the switch.



Item 2 – Verification Module

The power output level is < 1/3 of the detonator no-fire power level, with more than 5 levels of different technology limiting the power.

Advanced switch diagnostics is available with a wireless connection.

Item 3 – Verification Panel

The Verification Module is upgraded and repackaged for the testing of switches thru cable and perforation tools, while the cable is grounded in its safe position. Optionally, it may be enabled only with the Cable Safety Switch (CSS) key, guaranteeing that the cable is grounded, and thereby exceeding the RP67 safety requirements.

Conclusion

Users of the RF-Safe Phire® system are safe from the stated conditions commonly found at inland or offshore oil-well sites. Such conditions cannot make the detonator of the RF-Safe Phire® System fire inadvertently.

The conclusions of this report apply only to Phire® system assemblies as described above.

References

- | | |
|--|----------------|
| API RP 67 3rd Edition | Oct 2019 |
| Franklin Applied Physics, Switch and Verification Module Report 20822-09 (FF), | Apr 19th 2018 |
| Report 20852-04 (85B6), | Oct 18th 2019 |
| Franklin Applied Physics, Verification Panel Report 20877-03 (E743), | Sept 16th 2020 |
| Simple Reliable System, Switch qualifications 1000302BB_ESD Analysis, | Apr 19th 2018 |
| 1000304BA_MMBSwitch Qualification, | Jul 23rd 2018 |
| 1000311AA_DOT800VTest, | Oct 17th 2019 |

