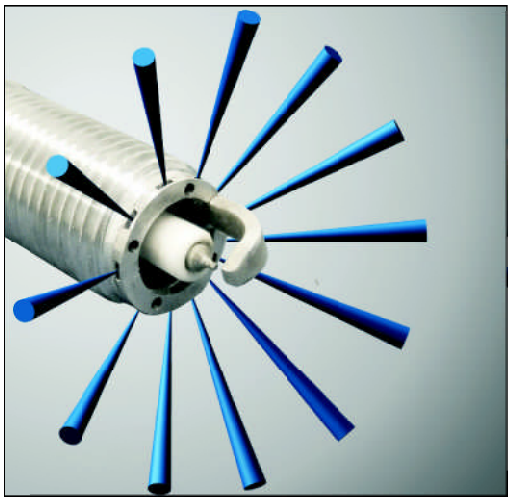
FOSP - Fiber Optic Spark Plug

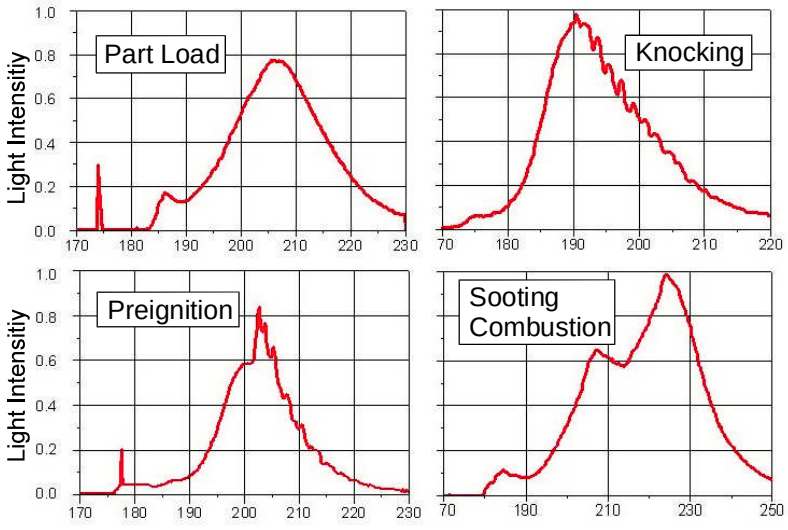


The fibre spark plug is a mass production spark plug fitted with up to 24 optical probes. The robust design of the fibre optic spark plug permits the use even at high temperature and high pressure in mass production engines. The special treatment of the spark plug does not change its thermal characteristics significantly because neither the ceramic is harmed nor the heat flow to the outer hull is handicapped.

Almost any mass production spark plug can be fitted with probes.
The optical probes in the spark plug thread receive the luminosity of the combustion and transmit it through flexible fibre optics to highly sensitive optoelectronic receivers which convert the luminosity into a responding voltage. The high sensitivity of the system permits the analysis of the combustion even at idle speed and cold start.

Because of the easy adaptation of the fibre optic spark plug it is possible to make quick statements about the combustion. The reconstruction of the early flame propagation provides a global understanding of the charge motion and allows the analysis of the ignition various operating conditions.

Especially the burning conditions in lean combustion can be analyzed. The signals of the probes can also be used for knock- and misfire-detection. It is also possible to control the combustion in conjunction with the detection of the 50% radiation location and the detection of the ignition time.



The figure beside shows different light signals detected with the FO-Spark Plug. At part load the ignition peak is very significant. After a delay the signal rises again. This is the luminosity of the flame emission mainly generated by hydro carbon radicals. The highest peak shows the radiation of all gas components in the exhaust area of the combustion chamber. The main signal is similar to the pressure signal.
Also the high frequent waves in the knocking signal are visible.
At preignition a signal is already detected before the spark event occurs.
A peak in the expansion stroke is typical for sooting combustion. These and much more information can be extract from the light signals.

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SME Tec Focus Engine

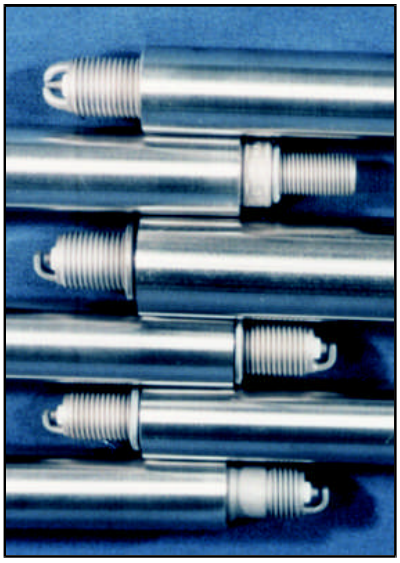
FOSP - Fiber Optic Spark Plug

Applications

- Combustion analysis
- Flame kernel development
- Knock detection
- Misfire detection
- Flame propagation
- Pre-Ignition detection
- Soot detection

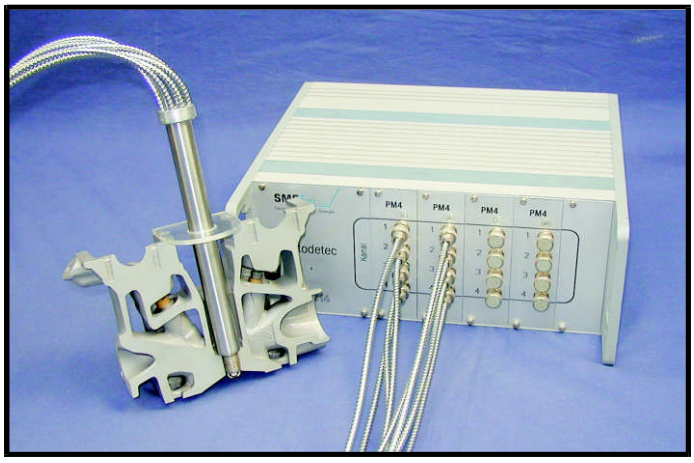
Advantages

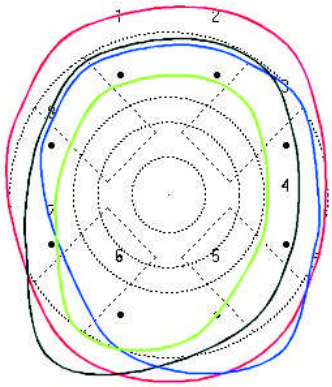
- Fitting of any mass production spark plug
- Robust design
- Quick adaptation
- European and american threads



Properties

Threads:	M8, M10, M12, M14
Type of Spark Plugs:	not limited
Number of Probes:	8 -24
Angle of View:	0° - 90°
Observation Cone:	7° - 20°
Optical Transmission:	UV - Range - Visible Range
Photo Detectors:	Photomultiplier Tubes (PMT)





Flame kernel development of
4 subsequent combustion cycles

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