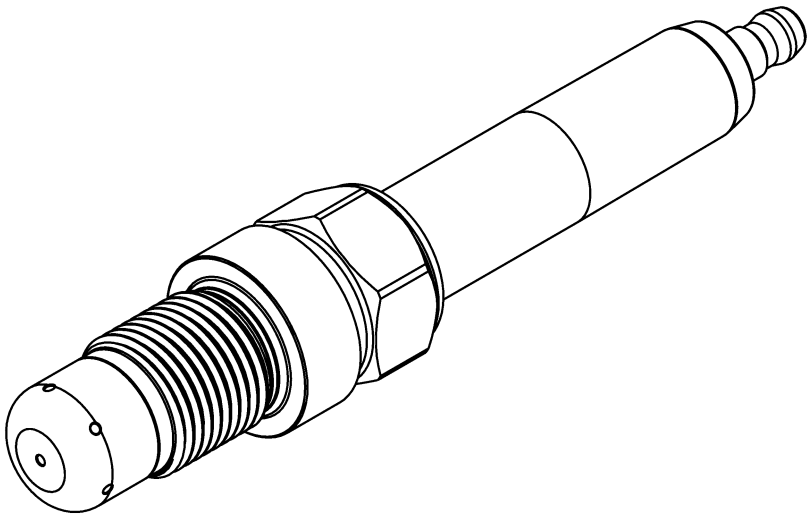
ERS

TECHNICAL INSTRUCTION

ER – System spark plugs

(English)



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Revision Chart

EDIT	EDITOR	DATE	INTENTION / REVISION	APPROVAL
1.0	Steiner V.	17.01.2022	Creation of document	Schnöll J.

ER-System Mechatronic GmbH
Holzerfeld 395
5440 Golling an der Salzach
Austria

1.0 Introduction

ER-System spark plugs have been optimised in recent years through continuous development. The components are entirely developed, produced, and assembled at our location in Austria. The new robust housing design and revised “Hot-Lock” process ensure best performance and safe operation for your engine. This enables us to guarantee best quality for all our products.

In order to enable ERS spark plugs to deliver full efficiency and performance when using in your gas engine, it is essential to set specific measures and perform regular checks. ERS spark plugs are basically maintenance free until the end of their lifetime. Hence it is necessary to do regular ignition voltage measurements.

This document contains following information and instructions concerning ERS spark plugs:

- Operational conditions and limits for ERS spark plugs.
- Necessary inspection and cleaning within the cylinder head before installing ERS spark plugs.
- Correct installation of ERS spark plugs and specific torque.
- Maximal ignition voltages which will cause a spark plug replacement.
- Check of spark plug connectors and troubleshooting.

2.0 Required tools

- spark plug wrench (for removal / installation)
- Fluke 123 for ignition voltage measurements
- spark plug thread cleaning tool
- torque wrench 10-100 [Nm]

3.0 Required parts

- spark plug sealing-ring

4.0 Instruction

4.1 Operational conditions and limits

ERS spark plugs have been developed and optimized specifically for OEM gas engines within the following operational parameters:

type	NOx limit [mg/m3]	Sulphur limit [mg/10kWh] *	RPM [1/min]
ERS spark plug	250 - 700	700	750 - 1800

Figure 1: Operational conditions and limits.

* 10[kWh] = lower heating value

ERS spark plugs can be installed with any ignition system. By initial installation of ERS spark plug an adjustment of ignition timing [°bTDC] can be essential for pre-chamber spark plugs. (Chapter 5.5 – Check of spark plug connectors and troubleshooting)

It is non permissible to combine ERS spark plugs, with one’s other manufacturer! Only apply them as full sets!

4.2 Cleaning of spark plug threads prior to installation

Especially as a safety measure it is important to clean the cylinder head's spark plug thread prior to every installation and removal of ERS spark plugs.

This follows from the fact that there are different lengths of the spark plug threads. Therefore, it may occur that the reinstalled ERS spark plug needs more or less thread pitches in the cylinder head compared to the previously installed spark plug which are not filling all cylinder head thread-pitches. (see figures 2 & 3)

It might occur that there are hard remains within the last thread-pitches in the cylinder head which were equipped with OEM spark plugs prior to switching to ERS spark plugs.

This circumstance can cause the spark plugs to block while installation and reach the recommended torque before they are fully screwed in and are sealed, thus preventing optimal temperature conduction, and allowing a potential bypass of fuel gas.

Finally, this non-compliant installation will lead to heat up the spark plug resulting in a potentially LETHAL shoot out of the ceramics base body!

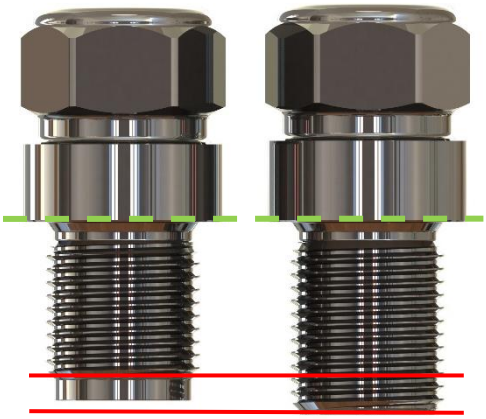

Figure 2: Comparison between different lengths of spark plug threads.

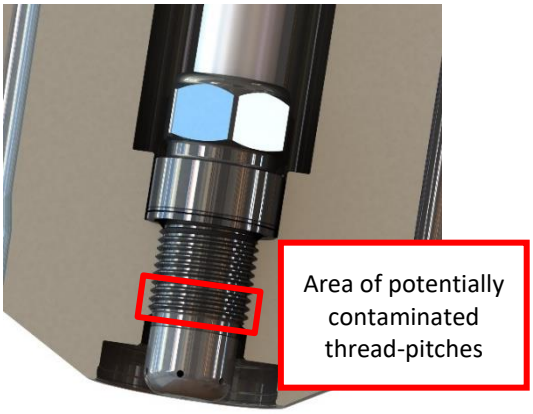

Figure 3: 3D cutup of a cylinder head with installed ERS spark plug

The cleaning measures serve both, for technically correct installation and as a performance measure. As described in chapter 4.3, the temperature conduction decreases due to dirty threads or incorrect installation!

To ensure cylinder head threads are free from deposits and ERS spark plugs can be installed technically correct, we offer a specially designed cleaning tool (figure 4). Use your standard wrench, put some thermal conductivity lubricant on the threads so the debris sticks to the tool. Screw the tool in the cylinder head until the spring gets compressed, then unscrew the tool.

Figure 4: cleaning tool - spark plug thread

4.3 Correct installation of ERS spark plugs and specific torques

It is essential to follow the installation instructions below to ensure full efficiency as well as to prevent accidents and damages!

Spark plugs are directly connected to the combustion chamber and are exposed high temperature swings and pressure deviations. To maintain full lifetime and seamless operation the spark plug's temperature conducting capacity needs to be constantly ensured.

This capacity is affected by three fundamental factors listed below:

4.3.1 Correct positioning of the spark plug sealing-ring

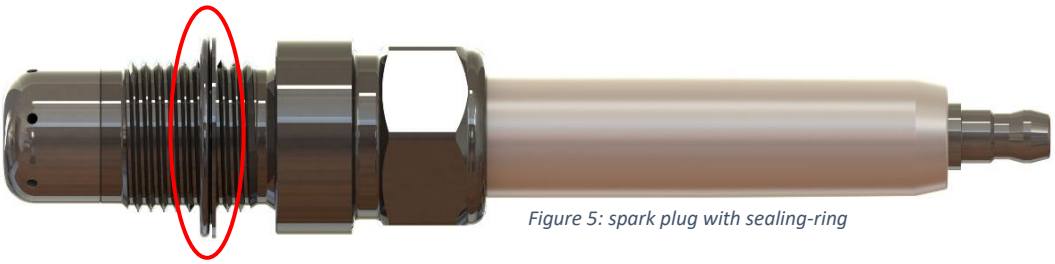

Figure 5: spark plug with sealing-ring

The sealing-ring is only functional when positioned correctly to the ERS spark plug! (figure 5 & 6)

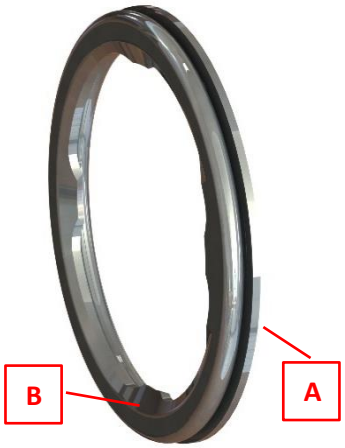

Figure6: sealing-ring

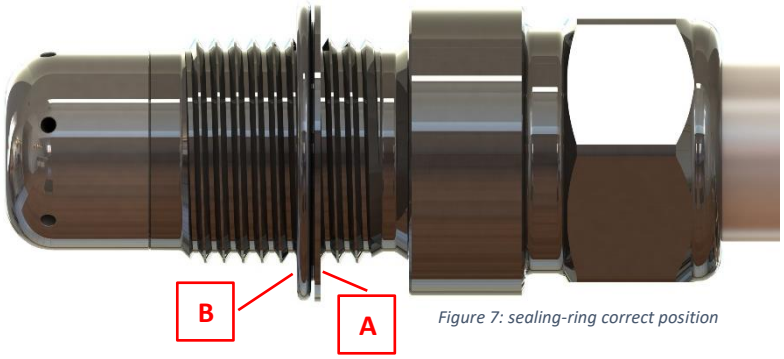

Figure 7: sealing-ring correct position

Each sealing-ring has got two sides. A flat one (A), which needs to be directed towards the spark plug's sealing surface. As well as a rounded one with claws (B) which needs to be directed towards the combustion Area.

The spark plug sealing-ring is very important for the spark plug's temperature conduction capacity and must be replaced as soon as the spark plug is unscrewed!

Sealing-rings are not reusable!

4.3.2 Correct fastening of the spark plug (torque)

To ensure the full thermal conductivity and sealing effect, the specified tightening torque must be observed when installing an ERS spark plug.

Before installing an ERS spark plug, please make sure that the cleaning measures listed above in the document have been properly carried out. Ensure that the threads in the cylinder head are free of any damages, contamination, and combustion residues such as oil-ash or siloxanes! These circumstances could cause the ERS spark plugs to block during installation and reach the recommended torque before the sealing surfaces are touching and/or are fully sealed off.

All ERS spark plugs must be fastened with a torque according to the instruction leaflet within each spark plug packaging.

Always check the information provided by the engine manufacturer. In case of deviations, please contact the engine manufacturer. ERS standard tightening torque is 55 +/- 5Nm.

4.3.3 Application of temperature-resistant lubricant

Make sure to apply a temperature-resistant lubricant to the spark plug thread before installation. This increases the temperature conductivity and prevents blocking when dismounting the spark plug.

Do not apply any temperature-resistant lubricant to the pre-chamber or electrodes as this will cause malfunctions such as misfire or knocking!

In addition, make sure that all ceramic parts of the spark plug are free of any lubricants, liquids, and other impurities since this may lead to misdirection of the spark.

The prescribed products are either "EURO-LOCK LOS 425 - Anti-Seize Copper Paste" or "Pulsar Smart Miedziany".

5.0 Maximum ignition voltages

In general, each ERS spark plug which reaches the maximum level of ignition voltage (figure6) the end of its lifetime is near. It is time to renew the spark plug.

Therefore, a regular measurement of the ignition voltage is necessary

If you use any other device (recommended by ERS is a Fluke 123) to measure ignition voltages, you must correlate its measurement results with the mentioned device.

type	max. ignition voltage [kV]
ERS spark plug	32-36

Figure 8: maximum ignition voltages for ERS spark plugs

6.0 Check of spark plug connectors and troubleshooting

If any misfires or abnormal ignition occurs during operation, please proceed as described.

First of all, you should check the spark plug connectors, they could carry a technical defect.
This issue can easily be checked by interchanging the spark plug connector, which is potentially affected, with the one to its left or right.

If the misbehaviour moves with the connector to the neighbouring cylinder, this is a clear sign that there is a problem with the spark plug connector itself and it needs to be replaced with a new one. If the misbehaviour stays, it is likely there is an issue with the spark plug and you should try to exchange the spark plug.

If your engine has not been operated for an extended period of time and the crankcase is cold, you should switch to start pre-heating for a while prior to engine start up.

The problem is that too much moisture could have collected within the cylinders. This would lead a condensation between the mass- & centre-electrode of the spark plug. This leads to a short circuit making it impossible to generate a spark and ultimately prevents ignition of the fuel gas.