HORN

Sensors · Monitoring · Systems

Cylinder Liner Diameter Measurement

CLDM-System

Flexible - Precise - Economical

Dr. E. Horn presents the measuring tool CLDM for the engine crew to measure the liner wear of two-stroke engines independently and at any time. Without removing the cylinder head, through the scavenge ports.

The CLDM is based on Horn's high precision eddy current sensors. Thousands of these sensors have been proving their reliability for many years in the well-known HORN bearing monitoring system.

The CLDM has a bore-specific calibration and is specially designed for “ease to use” by the crew. The recorded data is automatically analysed and a report is generated by a provided software.

Application fields

- Wear measurement of 2-stroke liners with bore up from ø350

Benefits

- Cost saving
- Liner wear can be measured at any harbour
- Measurement can be done by the crew
- Easy to operate without mishandling
- Calibration checks by the operator at any time
- Very robust (no optics, no moving parts, IP65)

Working principle

TASK

Liner wear is an important parameter in assessing the condition of a two-stroke engine. This wear must be determined according to the engine maintenance manual.

Currently the diameter is measured manually at defined heights in two directions: “Forward ⇔ Aft” and “Port ⇔ Starboard”. From this data relevant wear values are calculated.

PROBLEM

These measurements are currently done manually with an inside micrometre, what is potentially inaccurate. In addition, the cylinder-top has to be removed.

This is only possible when the piston is drawn for maintenance, which only happens every 3-4 years. For an economical and optimised engine operations, it is essential to measure the liner wear more frequently. Preferably at any scavenge port inspection.

POSSIBILITY

A service provider is ordered to carry out the wear measurement through the scavenge air ports by using a sophisticated technology. But this has disadvantages:

1. High costs due to the hourly rates and travelling of a specialist + equipment
2. Systematically status analyses are not possible because measurements are taken too seldom.
3. Cause-related measurements are not possible

THE BETTER SOLUTION

With the Horn CLDM, the crew themselves can measure the wear of two stroke liners.

At any time, independently from shore service and without removing the cylinder head.

COST SAVING

The Horn CLDM amortises in less than 18 months, because no land-based service is required and the condition of the liners can now be determined at any time.

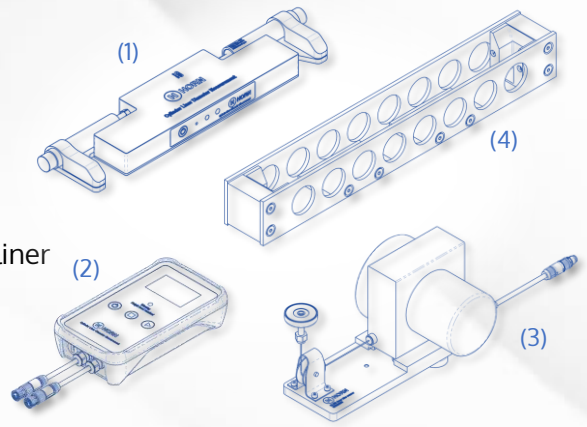
Technical data sensor CLDM

Version	CLDM
Liner diameter size	350 mm…980 mm
Accuracy	< 10 µm
Operating temperature	40…75°C
Protection class	IP65
Battery capacity	> 10 hours (rechargeable)

Scope of supply

The CLDM system consists of 5 components:

1. CLDM as described above
2. Operator device, communicating with the CLDM via infrared
3. Draw-wire encoder to record the position of the CLDM inside the liner
4. Calibration tool and case packaging
5. Evaluation software on USB-pendrive



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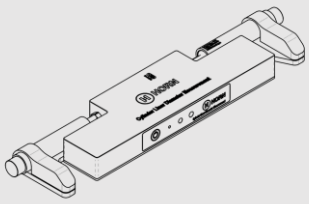
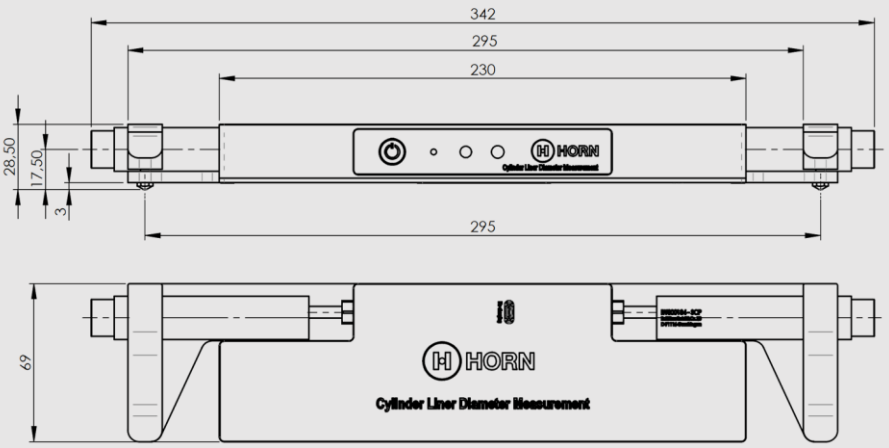
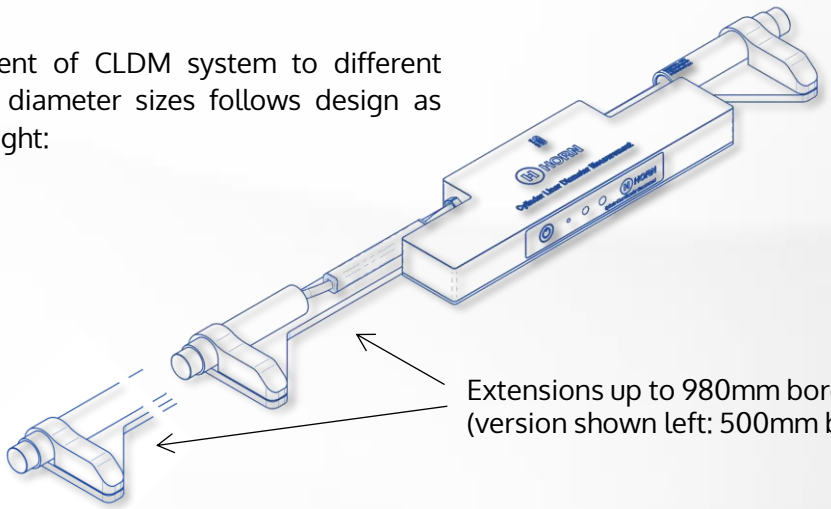
CLDM drawings

Image	Drawing (CLDM version for 350mm liner diameter)
	

Options

Adjustment of CLDM system to different cylinder diameter sizes follows design as shown right:



Extensions up to 980mm bore
(version shown left: 500mm bore size)

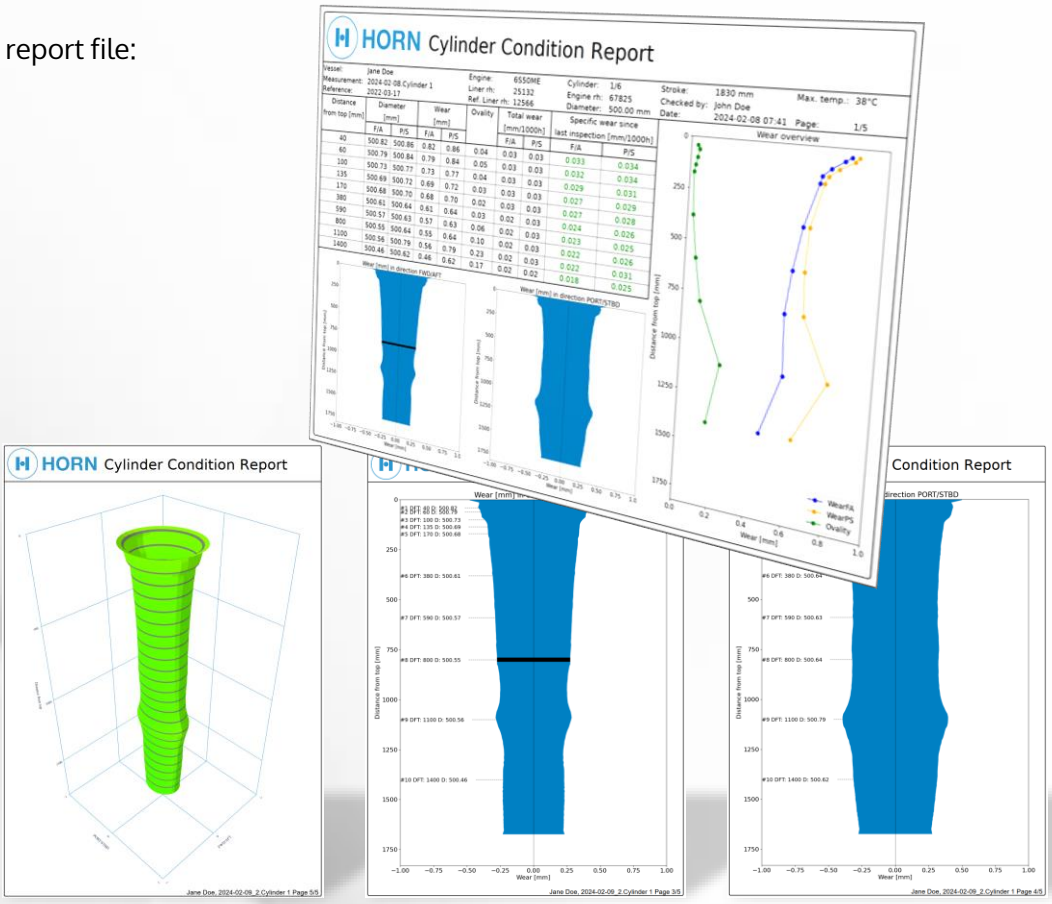
Procedure of measurement with the CLDM

1. Place CLDM through scavenge port on the piston (in BDC).
2. Place the draw-wire encoder under piston and connect the wire to piston skirt (with its magnet).
3. Follow the instruction on the operator device for best alignment when positioning the CLDM in direction Forward ⇔ Aft.
4. Start the CLDM from the operator device and turn the piston Forward in direction TDC.
5. When CLDM reaches the cylinder top a signal is triggered to return piston back to BDC.
6. Repeat from 1 to 5 for the second measurement. Now in direction Port ⇔ Starboard.
7. Remove the CLDM and transfer the data to the computer by using the USB-cable.
8. The computer with CLDM software automatically analyses the data and generates a report in PDF format.

Results of the CLDM measurement available as PDF

All wear results are documented in accordance with the vendor's maintenance manual and are visualized additionally in 2D and 3D over the entire stroke.

Data report file:



3D animation

Ordering structures

CLDM systems are specifically designed for each cylinder bore size. Therefore each system is manufactured and calibrated for one specific diameter and is labelled with a single code number.

CLDM – XXX – YYY

- YYY: Options
- XXX: Cylinder bore [mm]
- CLDM: Basic type information

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