DNV·GL

TECHNOLOGY CERTIFICATE

Certificate no.:	Initial date:	Valid until:
<2020-1141>	<28.01.2021>	<28.01.2021 + 4 yrs>

This is to certify that

Enhanced Kick Detection (EKD) system

as detailed in /1/ has been qualified in accordance with DNV-RP-A203 Technology Qualification /2/. DNV GL considers the EKD system to be qualified and able to detect and recognize gain or loss of 5 GPM while drilling provided that the conditions and requirements stated below and in /3/ are met.

Owner:	**Enhanced Drilling AS**
Name:	Enhanced Kick Detection (EKD) System as further detailed in /1/
Description:	The Enhanced Kick Detection (EKD) system enables rapid kick detection in drilling operations and gives the driller information regarding fluid gains and losses in operation as further detailed in /1/.
Use:	The EKD system comprises a pump system connected to the riser topside on a floating drilling unit. The pump reduces the level in the riser to below the bell nipple and pumps fluid returns from the riser to the flow line in a separate conduit, bypassing the bell nipple. A set of pressure sensors are installed on a flow spool located between the upper flex joint and the telescopic joint and a flow meter is installed in the mud return line, providing vital data to the EKD control system. The system can recognize gain or loss of 5 GPM while drilling, with reference to /3/ for precise specification.
Conditions:	The conditions of validity of this certificate are detailed in /3/, the main ones being: Rig movement: Up to 5m heave with 13 second period. Instrument error: Less than +/- 3 GPM Trend duration: Max 5 minutes to determine loss or gain Detect limit while static: 1GPM gain or loss Detect limit while drilling: 5GPM gain or loss
Involvement:	DNV GL has been involved in the qualification process as required according to /4/, and reviewed the acceptance criteria detailed in /3/.
Verification, certification:	Conformance with stated acceptance criteria and context requirements /3/ shall be verified for delivery and operation. Products can be subjected to certification according to /5/.

Reference documents:	/1/	INV1496-7000-T025 Rev.03, "Qualification Basis, EKD System"
	/2/	DNV-RP-A203, Technology Qualification, July 2019
	/3/	INV1519-7040-T007, Qualification Test report Rev.01, 2021-01-21
	/4/	DNVGL-SE-0160, Technology qualification management and verification, 2015
	/5/	DNVGL-OS-E101, 2018, Drilling Facilities

DNV GL shall not be held liable for undiscovered failure modes or causes or for missing qualification activities.

<Høvik 28.01.2021>
for DNV GL AS

Digitally Signed By: Uglane, Hallvard Thune
Location: DNV GL Høvik, Norway
Signing Date: 28.01.2021

Hallvard Thune Uglane
Engineer

Digitally Signed By: Moen, Jan Olav
Location: DNV GL Høvik, Norway
Signing Date: 29.01.2021

Jan Olav Moen
Project Manager