REINTJES
POWERTRAIN SOLUTIONS

REINTJES ADS
Active Speed Control System
for electronically controlled trolling operation

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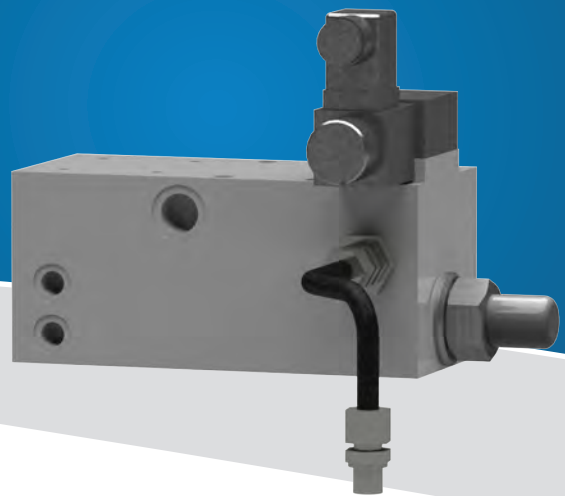
ADS
for electronically controlled trolling operation

The Task

Reaching very low speeds with a ship can be problematic, for example:

- when maneuvering in the harbour, locks or other restricted spaces.
- when hauling in the nets on fishing vessels.
- when positioning special-purpose vessels like fire-fighting boats, police launches, or buoy-tenders.
- when matching speeds with other vessels, e. g. police, customs and pilot boats, where slower ship speeds are needed but impossible to achieve due to a high engine idling speed.

This results in frequent gearbox disengagement / engagement operations, which exposes the gearbox and the complete propulsion system to high levels of strain.

The Solution: Active Speed Control (ADS)

ADS is electronically-controlled trolling propulsion system used for travelling at low propeller speeds. Speed is controlled by means of the oil pressure in the disc clutch.

ADS can be engaged for travel directions ahead and astern. Reversing during ADS operation is also possible at low vessel speeds.

The minimum output shaft speed with the clutch engaged in normal operation is usually engine idle speed divided by reduction ratio of the gearbox.

In trolling propulsion mode, the engine speed may reach 40 % of the nominal engine speed, but it must not exceed 1000 min^{-1}. If this speed is exceeded, the control system reverts automatically to the standard system.
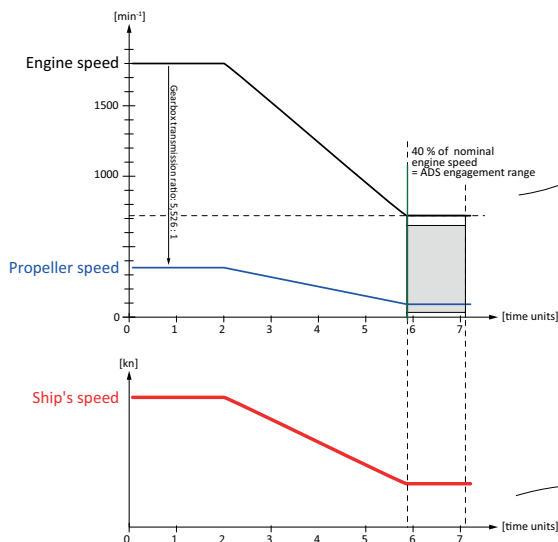
When ADS is engaged, the propeller speed is infinitely variable between approximately 20 % and 80 % of the admissible ADS speed range.
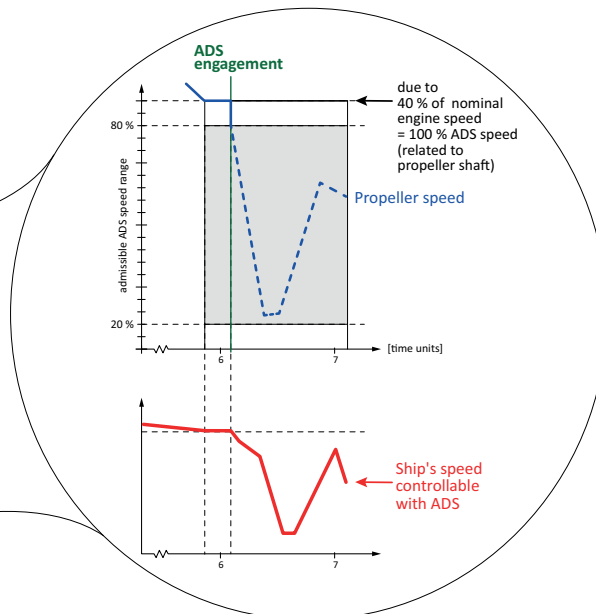
Available ADS systems

- controlled V-ADS
- closed-loop controlled G-ADS

Engine/propeller/ship without ADS

Propeller and ship speeds during ADS operation

V-ADS

V-ADS

V-ADS has a universal interface to an external remote control. The remote control is not included in REINTJES scope of supply.

V-ADS is a controlled system in which the clutch pressure is adjusted with the shift lever of the remote control. The transmissible torque of the slipping disc clutch is directly proportional to the clutch pressure. The shift lever controls the transmissible clutch torque.

Oil temperature and inflow from the propeller have an influence on the propeller speed. Due to these external influences, deviating propeller speeds may occur even without moving the shift lever. The propeller speed is not linked to the position of the shift lever.

The remote control must include the following interlockings:

- Engagement interlocking:
  V-ADS engagement must only be possible with the shift lever in the NEUTRAL position at the permissible ADS engine speed

- Disengagement interlocking:
  Disengagement of trolling propulsion mode must only be possible with the shift lever in the NEUTRAL position
- Engine speed interlocking
- Interlocking for multi-engine systems

The remote control must provide the following interfaces:

- Potential-free switch "V-ADS On-Off"
- ADS control signal 4-20 mA.
  Lower and upper limit must be adjustable separately. The settings must be easily adjustable during trial run.

REINTJES scope of supply V-ADS

- hydraulic gearbox control unit with proportional valve
- control unit with valve controller (integrated in the terminal box of the gearbox*) and relays to suppress pressure alarms in trolling propulsion mode and to generate the current pulse when the trolling propulsion mode is engaged. The valve controller in the control unit amplifies the control signal of the remote control to the current required by the proportional valve.

- potential-free contact for feedback "V-ADS On" (to indicate the trolling propulsion mode and/or for control purposes)
- temperature switch for oil temperature
- differential pressure switch(es) for filter contamination

* for some small gearboxes the terminal box will be supplied separately to be mounted next to the gearbox.

Shipyard's scope of supply

- V-ADS interface
- switch "V-ADS On-Off"
- indication "V-ADS On"
- shift lever
- redundant power supply

M-ADS

M-ADS is a special V-ADS execution with an interface to the Rexroth Marex OS II remote control.

ADS operation is integrated in the shift lever of the remote control. This allows for an ADS operation from all control cabins on the ship.

The Marex OS II operates the governor of the main engine and the gearbox. This means that the speed setting of the engine can either be controlled mechanically by an actuator or electronically. Gear shifting and trolling is realised electronically. The components of

the remote control system, consisting of control head including buttons for command take-over and a control unit called MPC, are connected by CANbus. The signals for ahead, stop, astern, and engine speed are set by means of the control head on the station.

G-ADS

G-ADS

G-ADS has a universal interface to an external remote control. The remote control is not included in REINTJES scope of supply.

G-ADS is a closed-loop controlled system where the propeller speed is adjusted with the shift lever of the remote control. The selected propeller speed will be kept by the G-ADS control unit. Oil temperature and inflow from the propeller have no influence on the propeller speed.

The remote control must include the following interlockings:

- Engagement interlocking:
  G-ADS engagement must only be possible with the shift lever in the NEUTRAL position at the permissible engine speed for ADS operation

- Disengagement interlocking:
  Disengagement of trolling propulsion mode must only be possible with the shift lever in the NEUTRAL position
- Interlocking for multi-engine systems

The remote control must provide the following interfaces:
- Potential-free switch "G-ADS On -Off"
- ADS control signal 0-10 V

REINTJES scope of supply G-ADS

- hydraulic gearbox control unit with proportional valve
- control unit with engine and propeller speed interlocking and relays to suppress pressure alarms in trolling propulsion mode. The control unit keeps the selected propeller speed at a constant speed
- potential-free contact for G-ADS available" (to indicate the trolling propulsion mode can be engaged)
- potential-free contact for feedback "G-ADS On" (to indicate the trolling propulsion mode and/or for control purposes)
- speed pick-ups for engine and propeller speed
- temperature switch for oil tempera-ture
- differential pressure switch(es) for filter contamination

Optional:
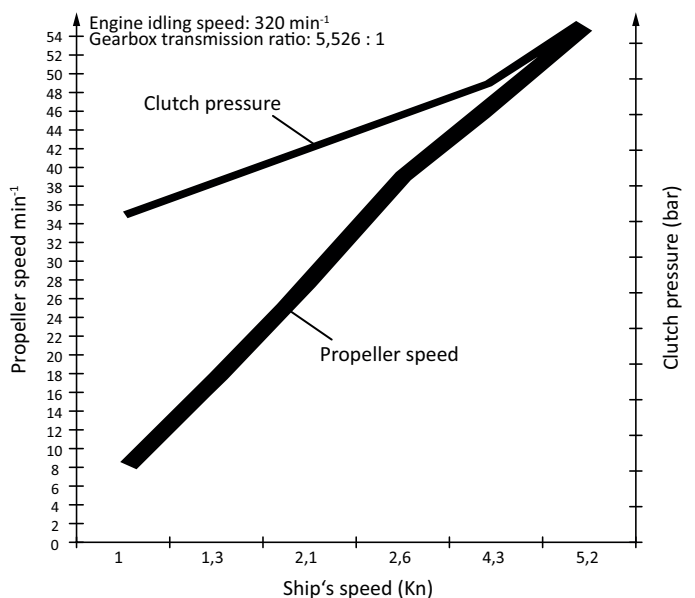- propeller speed indicator
- operating hour meter

Shipyard's scope of supply

- G-ADS interface
- switch "G-ADS On-Off"
- indication "G-ADS On"
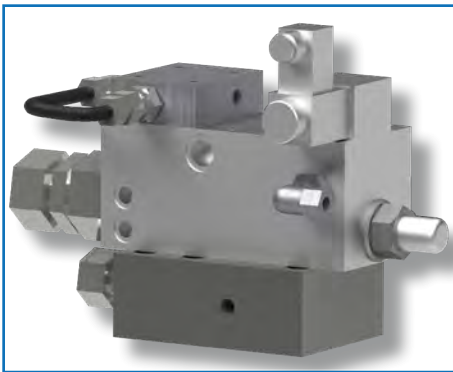- shift lever
- redundant power supply

Figure: Application example

The propeller speed is determined as a function of the torque transmission capability and the propeller curve.
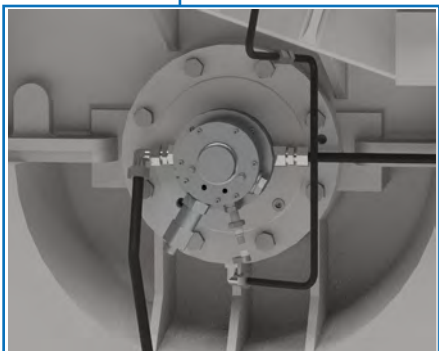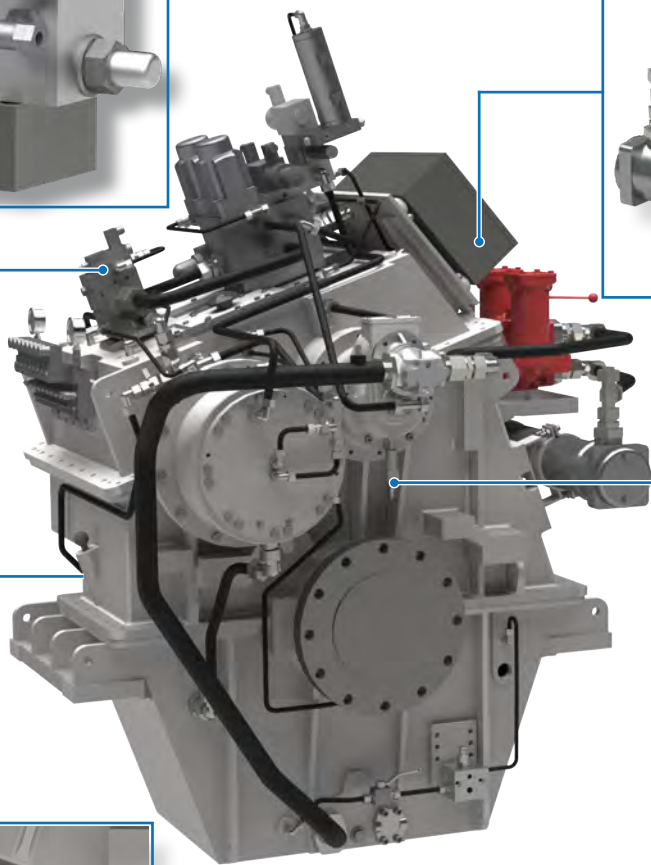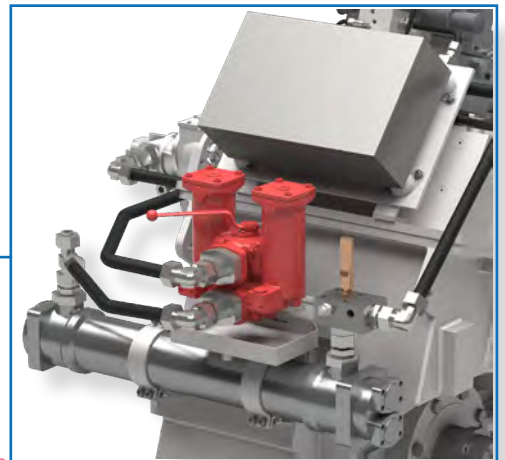
As the operational pressure increases (in accordance with the propulsion control lever setting), the torque transmitted, and in consequence the propeller speed, also increases:
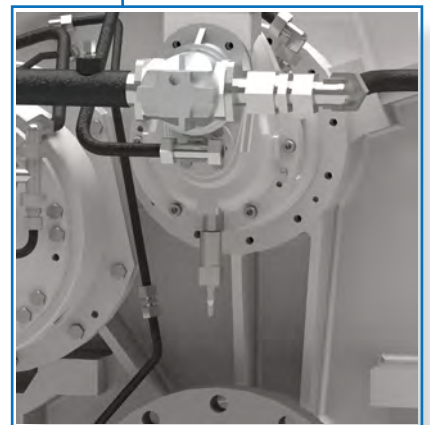

Engine idling speed: 320 min^{-1}
Gearbox transmission ratio: 5,526 : 1
Clutch pressure
Propeller speed
Propeller speed min^{-1}
Clutch pressure (bar)
Ship's speed (Kn)

Proportional valve on control block

Terminal box

Speed pick-up for propeller speed

Speed pick-up for engine speed

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