



Request for Interpretation No. 36

of

**AC Class Rule** Version 1.4: December 8<sup>th</sup> 2015

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**Rule References:**

- 15.1 The management of power used to adjust **control surfaces** on an **AC Class Yacht** shall only be controlled by:
- (a) **manual** input;
  - (b) Electrical or electronic systems, operated in compliance with the **AC Class Rule** and initiated by **manual** input;
  - (c) passive devices that limit power transmission or flow to one direction (check valves, relief valves, cams or ratchets, etc); and/or
  - (d) relief valves including counter balance valves that release hydraulic oil into a low pressure return.
- 15.2 Control Systems in General
- (a) Except as provided in Rule 15.2(c) and 15.3, systems and devices used to adjust the **control surfaces** may only use direct **manual** input and/ or an internally generated timing signal initiated by **manual** input. Any input or feedback used by the control systems to adjust the **control surfaces** is not permitted unless specifically allowed by the **AC Class Rule**.
  - (b) Except as provided in Rule 15.2(c) and 15.3, control systems used to adjust **control surfaces** shall not use positional information of the **control surface** or any part of the control system, whether that positional information is measured, inferred or indicated by any method, including electronic counting, indexing or pulsing (e.g. stepper motors and indexing actuators are not permitted).
  - (c) A system controlling a hydraulic valve or drive clutch may use feedback from the internal state of that valve or drive clutch (e.g. to drive a cam or spool to a target position), providing that the feedback provides no information or indication as to the state of the control system outside that valve, drive clutch, or drive clutch actuator.
- 15.5 Hydraulic valves, drive clutches, and electrical actuators shall be available to all **Competitors** on a reasonable commercial basis. **Competitors** may seek a confidential determination from the **Measurement Committee** as to the components complying with this Rule 15.5. The list of hydraulic valves, drive clutches and electrical actuators approved under this Rule 15.5 shall be made public 150 days prior to the first scheduled race of the **America's Cup Qualifiers** and updated as **Competitors** seek further determinations after this date.
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**Background:**

Hydraulic systems contain a number of components which function semi-autonomously, without direct manual, electrical, or electronic input. Rules 15.1(c) and (d) permit passive devices within hydraulic systems, including relief valves and counterbalance valves.

In Interpretation No. 6, in response to the question of whether or not a hydraulic control valve can be operated by electrical input from a pressure sensor to function as a gear selector, answer (a) states:

(a) If the manually driven pump is used to adjust a control surface the control of the pump including gear selection must be initiated by manual input as required by Rules 15.1 (a) and 15.1 (b). Passive devices listed in Rule 15.1 (c) and (d) may always be used.

Internal components of hydraulic pumps may function passively, that is, without explicit operator input other than the manually-generated flow of hydraulic fluid. Every pump valve opens to allow high pressure oil out to the supply side, then closes and the reservoir valve opens to allow oil into the pump chamber. These valves open and close in response to pressure within the pump, without user input, other than the manual work input to the pump which generates oil pressure.

In the case of a manually-powered variable-displacement hydraulic pump, the angle of the swash plate is self-adjusting in response to the internal pressure of the pump. The swash plate reacts passively to pump pressure, in a manner similar to other permitted components of the hydraulic systems, such as pressure relief valves, counterbalance valves, and pump port valves. There are no sensors or signals, nor any control over the internal operation of the pump's mechanism.

**Questions:**

Does a manually-powered variable-displacement pump which functions in this manner comply with the AC Class Rule?

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**Interpretation:**

The above described manually-powered variable-displacement pump complies with AC Class Rule 15.1 c) and 15.2 c), provided the pump only senses its internal pressure.

END

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