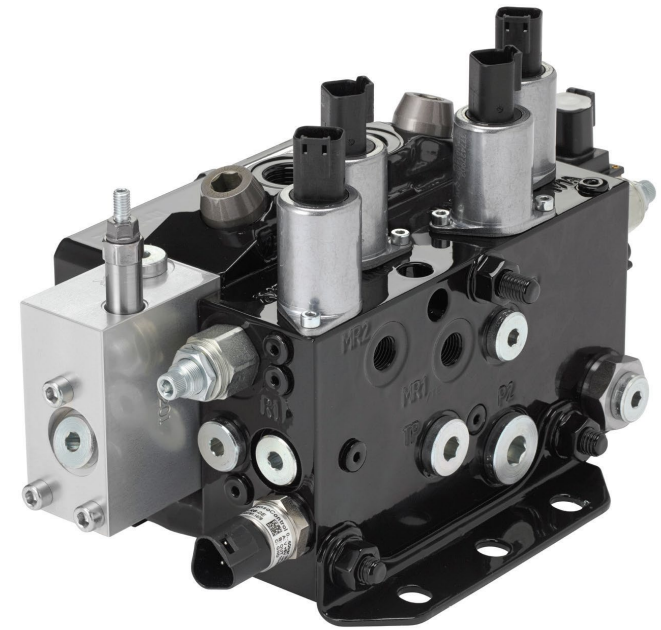


SBW110 Training

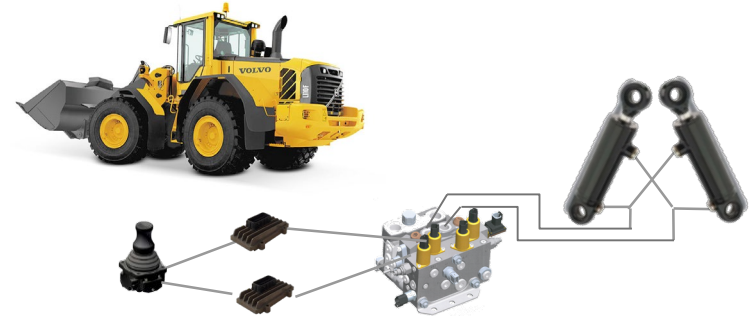
Next generation Steering Systems

- *Steer-by-Wire Value*
- *Steer-by-Wire Functionality*



ENGINEERING YOUR SUCCESS.

Steer-by-Wire Value



OEM Value

- No hydraulic in cabin – Reduced assembly time
- No orbitrol – Less components
- Enabler for autonomous functionality – Improved machine productivity
- Enabler for active safety – Safer machine

End User Value

- Less noise, oil and heat in cabin – Improved operator environment
- Improved steering controllability and performance – Increased productivity
- Less steering wheel turning – Less operator fatigue

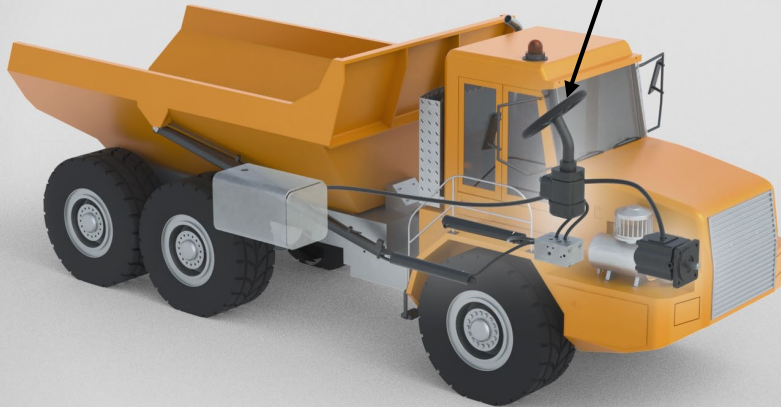
Steering Function

Since mobile machinery is often heavy vehicles, some steering force- or torque amplifying system is needed.

The cabin interface differs between orbitrol and Steer-by-Wire solution:

Conventional Orbitrol System

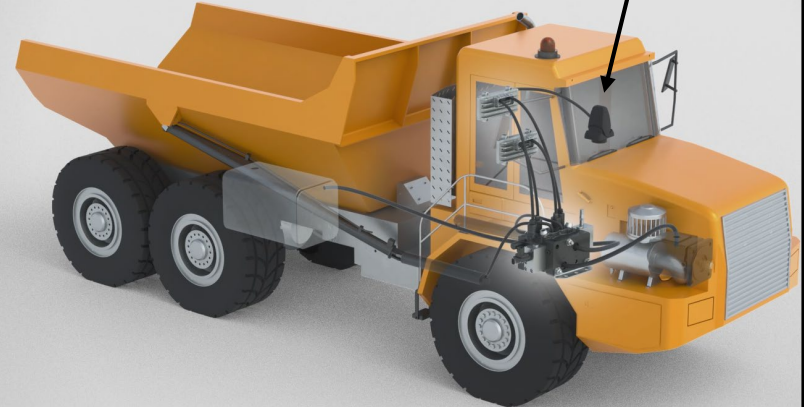
Steering column and steering wheel



Most machines use a hydraulic orbitrol unit with steering column and steering wheel for controlling the steering.

Steer by Wire

E.g joystick



A Steer-by-Wire system with electric joystick.

Steer-by-Wire, System Structure

Example of Steer-by-Wire system with PL d, see Figure 2, and related components from Parker is can be used that requires single fault tolerance.

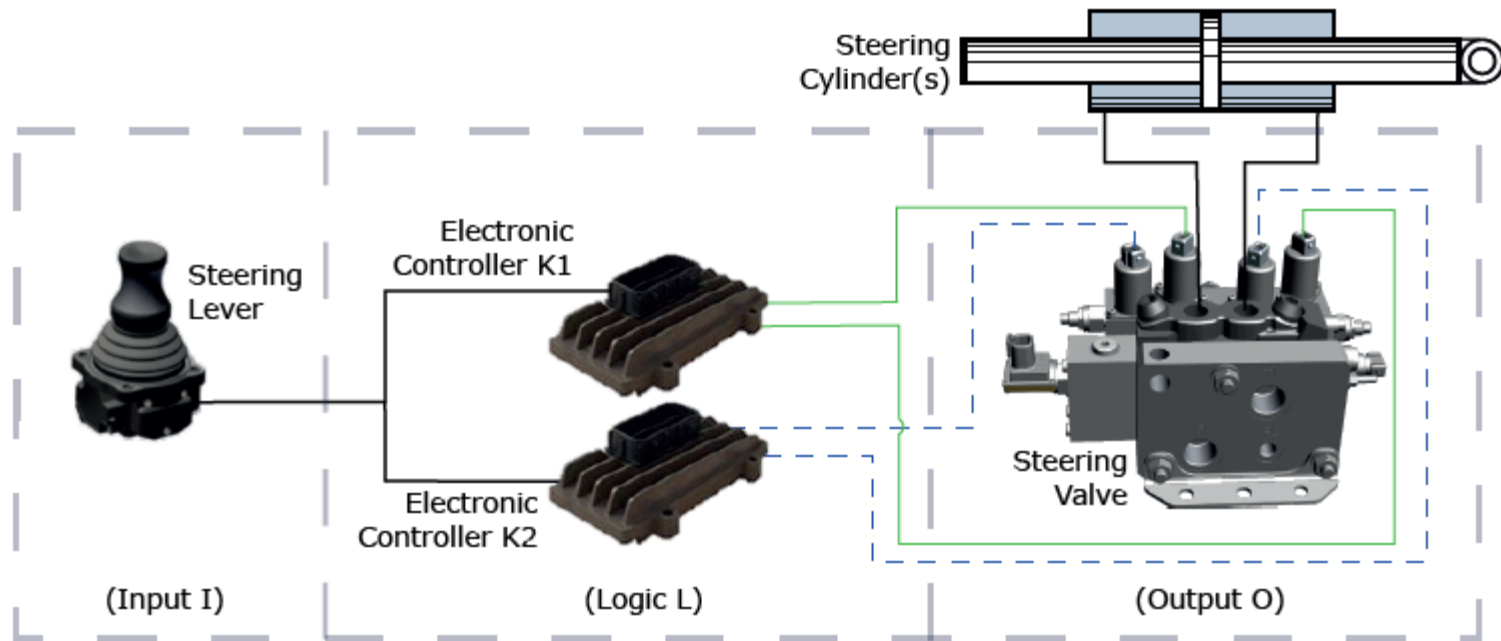


Figure 2 Overview of the Parker steer-by-wire system

On request

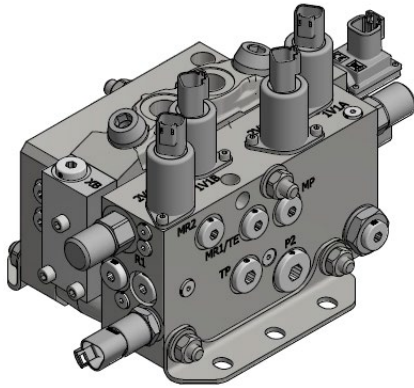
IQAN MC4xFS

SBW110

Steer-by-Wire Valve Solutions

SBW110

Safety function: Maintained steering
No unintended steering



Why:

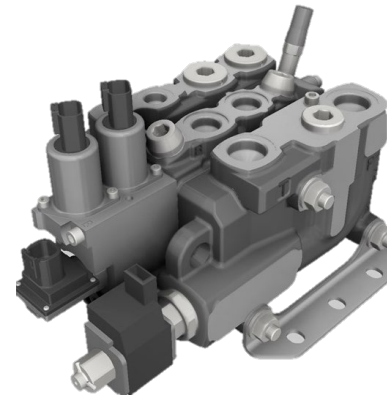
- Can be used with both safety functions: “Maintained steering” and “No unintended steering”
- In many cases allows machine speed >20 km/h

OEM requirements:

- ISO 13849 category 3 / 4
- Up to PL d
- Up to PL e (extra pressure sensor required)

L90LS section with EC3 and BEN inlet

Safety function: No unintended steering



Why:

- In many cases enough if safety function is no unintended steering and machine speed <20 km/h

OEM requirements:

- ISO 13849 category 2
- Up to PL d

Summary

- Steer-by-Wire enables new modern steering features
- Steer-by-Wire improves the operator environment
- Steer-by-Wire valve alternatives available (SBW110 or L90LS)
- Parker have components for Steer-by-Wire solutions:
 - Valves
 - Joystick
 - Steering wheel
 - Safe controllers (SIL2)