A black square with white text

Description automatically generated

PILOT SBW2 EPS

Drive-by-wire electric power steering (EPS) system

A close-up of a car part

Description automatically generated

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1. **General description**

Steering by Wire System SBW2 is a product customized and developed for intelligent driving vehicles.

The system has multiple working modes (mechanical working mode, power-assisted working mode and wire-controlled working mode).

Electric power assist mode: During manual steering, the torque (steering) sensor will "feel" the torque of the steering wheel and the intended rotation reliability.

The turning moment is converted into a horizontal movement, and then the steering wheel tracks the desired turning angle.

1. **Description of working principles**

This product has the characteristics of high intelligence and integration and can meet the application and layout forms of different customer scenarios.

Intelligent driving mode (angle control mode): controller responds to VCU or host computer at desired angle.

1. **Product components**

A drawing of a fishing rod

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1. **Product parameters**

|  |  |  |  |
| --- | --- | --- | --- |
| **#** | **Description** | **Unit** | **Value** |
|  |  |  |  |
| 1. | Motor rated voltage | V | 12V |
| 2. | Motor rated power | W | 450 |
| 3. | Motor rated torque | Nm | 3.6 ± 10% |
| 4. | Steering angle range | deg | ± 500 |
| 5. | Steering rod lateral travel | mm | ± 65 |
| 6. | Rack lateral thrust | N | 8500 |
| 7. | Controller working voltage | V | DC12V |
| 8. | Transmission reduction ratio |  | 20,5:1 |
| 9. | Operating temperature range | C | -40-+85 |
| 10. | Dielectric withstand voltage | V | 240 |
| 11. | Insulation temperature | C | 500 |
| 12. | Protection class |  | IP67 |

1. **Size parameters (unit: mm)**

**Drawing of a car steering wheel

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1. **Mounting and connection parameters (unit: mm)**
2. **Electrical interface**

This section defines the connection of the standard wiring harness of the system:

The red thin wire is connected to the ignition gear

The thick red wire is connected to the positive pole (12v+) (diameter of 8 square millimeters) The thick black wire is connected to the negative pole (12v-) (diameter of 8 square millimeters) There is a matching plug on the wire harness, and the pin definition as follows:

**A diagram of a car wiring

Description automatically generated with medium confidence**

|  |  |  |
| --- | --- | --- |
| **1** | **2** | **3** |
|  |  |  |
| Red wire to the ignition | Green wire to CAN low | Yellow wire to CAN high |

1. **Controller communication protocol**

The communication protocol of the wire controlled steering system adopts the CAN 2.0B standard, with a communication baud rate of 500kbs.

According to feedback/transmission frequency of 20ms, the message adopts Motorola format, standard frame, and can be sent through external CAN bus interface.

The controller CAN bus does not have a 120 ohm resistor at both ends.

|  |  |  |
| --- | --- | --- |
| **Message ID** | **Signal name** | **Signal Description** |
|  |  |  |
| 219 (send) | VCU\_Req\_SBW2\_Target\_Angle | Rotation angle request: speed request |
|  | VCU\_Request\_SBW2\_Angle\_Speed | of plus or minus 500 degrees, unit (deg/s) (accuracy) |
|  | VCU\_Required\_SBW2\_AngleModeOn | 0x0:disable  0x1:enbale |
| 225 (feedback) | SBW2\_Work\_Mode\_Status | 0x0: invalid angle  0x1: assist mode  0x2: angle control mode  0x3: failure mode |
|  | SBW2\_Steering\_Wheel\_Torque\_Value | Steering real-time torque (-10~10N.m) |
|  | SBW2\_Angle\_Speed | Real-time speed feedback (deg/s) (accuracy 4) |
|  | SBW2\_Angle | Real-time angle feedback (deg) |

1. **Midpoint angle alignment**

Before using the wire controlled steering system, Midpoint angle alignment is required to function properly;

When the vehicle is driving straight with a steering wheel angle of 0 degrees, there is a deviation in the angle alignment, indicating that there is a deviation.

Under certain circumstances, alignment can be carried out;

Send ID: 0x680

CAN Data content: 55 AA 00 00 00 00 00 00 00 00 00

Note: After successful angle alignment, the feedback angle of 0x225 should be 0 degrees.

1. **Common problems and solutions**

Q1: During vehicle operation, the upper computer sends a steering request but the steering does not respond?

A: Firstly, please check if the wiring is connected correctly, confirm if the controller power supply is normal (12V), and if the controller can be powered on normally (controlled during power on)

The controller relay will sound once); Check if the fuse is blown, confirm if the controller's message can be received normally, and if the message is normal; If

The message is normal, check if the angle is aligned.

Q2: After the system installation is completed, it was found that the steering system is not aligned. How can I perform angle alignment?

A: Please refer to the angle alignment instructions in this manual for angle alignment operations.

Q3: After the system installation is completed, during the test, did the vehicle experience deviation while maintaining a steering wheel angle of 0 degrees and driving straight?

A: Check if there is any deviation in the angle alignment. If there is any deviation, please refer to the angle alignment instructions in this manual and perform the angle alignment operation; If the angle is right

Correct, it is possible to perform four-wheel alignment on the wheels. Please consult a professional engineer.