

## Synchro/Stepper - NMEA converter S2N



### Technical Description

#### Brief Description

The serial point-to-point communication method described in NMEA 0183 and its international companion standards IEC 61162-1 and -2 will be in use for long times to come.

A consequence of that is that there is a strong need for efficient ways to transfer data from other electrical interfaces, such as the widely used synchro transformer format to complex systems, like integrated bridge systems, VDR and AIS.

The Synchro – NMEA converter unit described here is intended to fulfil this requirement by using efficient circuitry to solve the required task only.

The default setting converts from standard synchro format (any common voltage, including 115/90 and 26/11.5 V 50-500 Hz) to \$HEHDT transmitted each second or from  $1/6^\circ$  stepper.

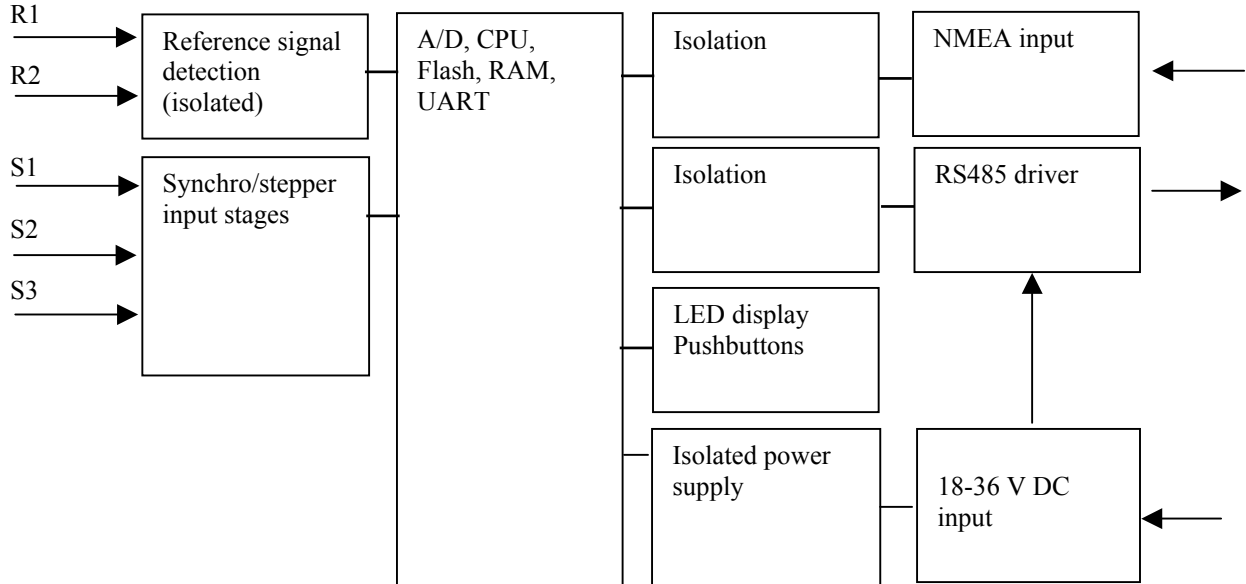
Conversion from more unusual formats with different geared ratios can be done using the NMEA input for set-up/calibration and alignment.

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## Block diagram



The internal electronics of the unit is in galvanic contact with inputs S1-S2-S3, but through a novel design all other connections from/to the unit are isolated from this potential.

The power supply for the internal circuitry is isolated from the power supply input, and the NMEA input for set-up/alignment (where needed) is opto-isolated.

The main NMEA output, based on a RS485 driver circuit, is fully compliant with the IEC 61162-2 specification and powered from the power intake supply (isolated from the internal supply), which shall be connected only to fully isolated NMEA/IEC compliant inputs, resulting in full isolation of input and output signals.

Even in the event of an erroneous grounding of the main NMEA output (for instance to a non-isolated serial input), there is still no electric connection to the input circuitry and the internal electronics.

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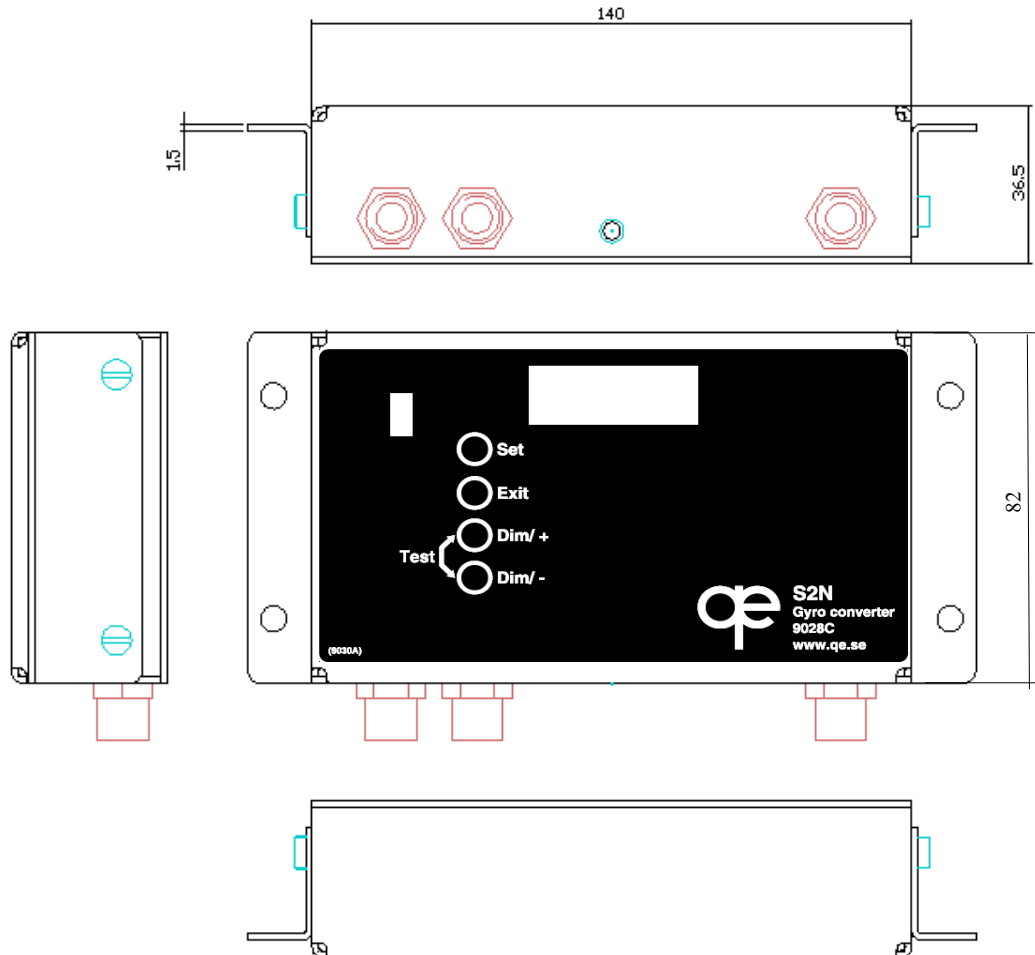
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## Technical data

### Mechanic:



### Dimensions:

Box (without mounting flanges and cable glands) 140 x 82 x 36 mm, mounting flanges adds 15 mm on each side and can be mounted for panel mount (shown) or for bulkhead mount.

### Mounting:

Front panel mounting in 145 x 82 mm panel opening.

Bulkhead mounting on any flat surface.

For bulkhead mounting in very tight spaces, it is possible to rotate the side flanges “inwards” to minimise bulkhead footprint.

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## Electronic:

### Synchro/Stepper inputs S1-S2-S3, R1-R2

Phase voltages: up to 60 V RMS from virtual common neutral (10% margin for nominal 115/90 V system) AC, DC up to 120 V  
Reference voltage: 10 to 120 V RMS AC or DC  
Frequency: 60 – 400 Hz AC or DC  
Gear ratio: Synchro 1:1, Synchro/Stepper 1:36, 1:45, 1:90, 1:180 and 1:360 values settable through proprietary NMEA set-up control or using internal key/display.

### NMEA 0183/IEC 61162-1 set-up/alignment input

Input circuit: Fully NMEA 0183/IEC 61162-1 compliant, optically isolated.  
Connections: Spring-loaded terminal block, accepting up to 2.5 mm<sup>2</sup> cable ends, marked “NMEA IN A” and “NMEA IN B”.  
Baud rate: 4800 b/s default, 1200 to 57600 settable.  
Message format: Proprietary “\$PQWE” messages for set-up and alignment, simple menu driven text terminal mode with JP7 set, see set-up section.

### NMEA 0183/IEC 61162-1 or -2 main output

Output driver: Based on RS485 driver, with differential signalling using 0 and +5 V, fully compliant to IEC 61162-1/-2 standard. Output driver is powered from regulated DC input and should be connected to isolated NMEA 0183/IEC 61162-1 or -2 receivers.  
Output current: 50 mA maximum  
Connections: Spring-loaded terminal block, accepting up to 2.5 mm<sup>2</sup> cable ends, marked “NMEA OUT A”, “NMEA OUT B” and “NMEA OUT C”.  
Polarity: “A” connection idles negative referred to “B”.  
“C” terminal: This is included for full IEC 61162-2 compliance, intended for inner screen or separate grounding wire and is internally connected to ground voltage of output driver. Common installation practice for standard NMEA 4 800 b/s operation is to use shielded, twisted pair cable and to connect shield in transmitting end only.  
Baud rate: 4 800 b/s  
Message formats: Standard “\$SHEHDT” with one decimal, transmitted at 1 Hz, which is appropriate for VDR/AIS installations. New “THD” (expected in next version of standard) or “HDM” sentence formatters, talker identifiers and transmission frequency and averaging properties can be tailored to suit any situation, see set-up section for this.  
Rat of turn: “ROT” rate of turn can be extracted from heading information, see set-up section.  
Other formats: Special functions, such as angle to speed or conversion from angular value to any other required serial format can be done on request.

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## Performance:

### Synchro operation

Inaccuracy: Better than 0.1°, typically 0.02-0.05° even at 20 Hz update rate using 1:1 synchro input and operating at phase voltages down to 50% of nominal voltage.

Update rate: Resulting resolution in 360:1 system down to 0.00003°  
1 Hz default, 2, 5, 10 and 20 Hz as required.

### Stepper operation

Inaccuracy: As defined by stepper format.

Update rate: 1 Hz default, 2, 5, 10 and 20 Hz as required.

Tracking rate: 100 steps/second for DC formats. Some restrictions apply for AC and/or rectified AC operation. Note: These limits are preliminary.

### Keys, indicators , jumpers

Keys: “Set”, “Exit“, “Dim/ +” and “Dim/ -” keys for alignment, setup and display dimming, all with backlit text.

LED indicators: Five seven-segment LED indicators for display of heading.

Jumpers: Three jumpers, P6, P7 and P8 are available.

### Power supply

Power requirement: 18 – 36 V DC, less than 2 W power consumption. Operation on 4.5-9 V DC or 9-18 V DC or AC on request.

Isolation: Internal circuitry is powered using an internal isolated DC/DC converter, main NMEA output driver is powered by 5 V DC, down-regulated from DC input. Pads on mounting screw holes or internal ground plane are not connected to DC intake.

### Environmental

Requirements: Unit is designed to fulfil all environmental requirements as defined by IEC 60945 when mounted in a metallic enclosure. Testing according to EN 50081-1 Emissions and EN 50082-2 Immunity has been performed and test report is available.

Type approval: “Wheelmark” is not possible or meaningful on a separate interface as this, since it will be a part of other and larger systems. Third party testing to verify IEC 60945 compliance is in progress.

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**Note!**

This unit is delivered with both possible mounting options, the standard, side flanges for panel or bulkhead mount and the trunnion mount.

To save space during shipping, the unit is shipped in the following configuration:

- Trunnion bracket mounted.
- Blind cable glands mounted in the unit case.
- Cable glands mounted in the rear panel, but panel mounted inside out during shipping.
- Panel/bulkhead supplied in box.

Please change configuration as required. Note that reversing the Trunnion bracket will allow table top mounting.

Dimensional drawing, showing mounting holes in trunnion bracket:

