# i300/i200 MEMS INERTIAL MEASUREMENT UNIT.

Installation and Environmental Manual


Honeywell

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# PRODUCT OVERVIEW

**The HGuide i300/i200 is a high performance Micro-Electro-Mechanical System (MEMS) based Inertial Measurement Unit (IMU) designed to meet the needs of applications across various markets including agriculture, AUVs, industrial equipment, robotics, survey/mapping, stabilized platforms, transportation, UAVs, and UGVs. With industry standard communication interfaces and a wide input voltage range the HGuide i300/i200 is easily integrated into a variety of architectures. The extremely small size, lightweight, and low power make the HGuide i300/i200 ideal for many applications.**

The HGuide i300/i200 includes MEMS gyroscopes and accelerometers. In addition, the HGuide i300/i200 employs an internal environmental isolation system to attenuate unwanted inputs commonly encountered in real world applications. The internal isolation and other proprietary design features ensure the HGuide i300/i200 is rugged enough to meet the needs of the most demanding users.

The HGuide i300/i200 is both hardware and software compatible with the HG4930 IMU. It is also software compatible with the HG1120 IMU with their message descriptions contained in those device manuals.

The HGuide i300/i200 is not ITAR controlled. Its Export Control Classification Number (ECCN) is 7A994.

For more information, email hguide.sales@honey well.com or contact us on our website aerospace.honeywell.com/I300

# HGUIDE DATA READER/ INTEGRATION

The Honeywell HGUIDE DATA READER is a web deployed software integration tool which can configure the i300/i200 for message types and baud rate. The software tool also provides real time and “Off Device” integration support.

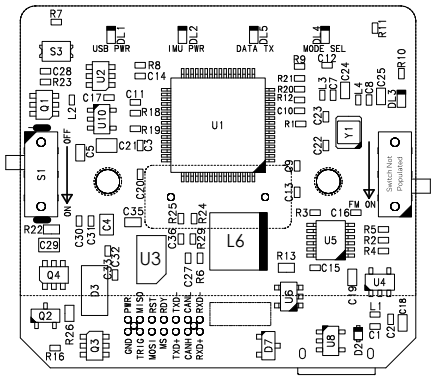
The software integration tool will display and record data, generates supporting message documentation, and includes an example Windows executable which will parse and log data. The program will also export data to CSV format for easy plotting.

The Honeywell HGuide Data reader provides a software development kit (SDK) including C/C++ source code, header files, DLL, and essential functions. See “Bit Stream” window to produce the SDK.

An evaluation kit is also available for separate purchase. Connect the evaluation board to the IMU being careful to align the pins to the connector.

Connect a micro-USB cable. Make sure the switch is on. Verify that both green LEDs power on. Once data transmission starts the orange LED will turn on. Data can be monitored using any terminal program or the data reader program. The Windows Device Manager should show a new port.

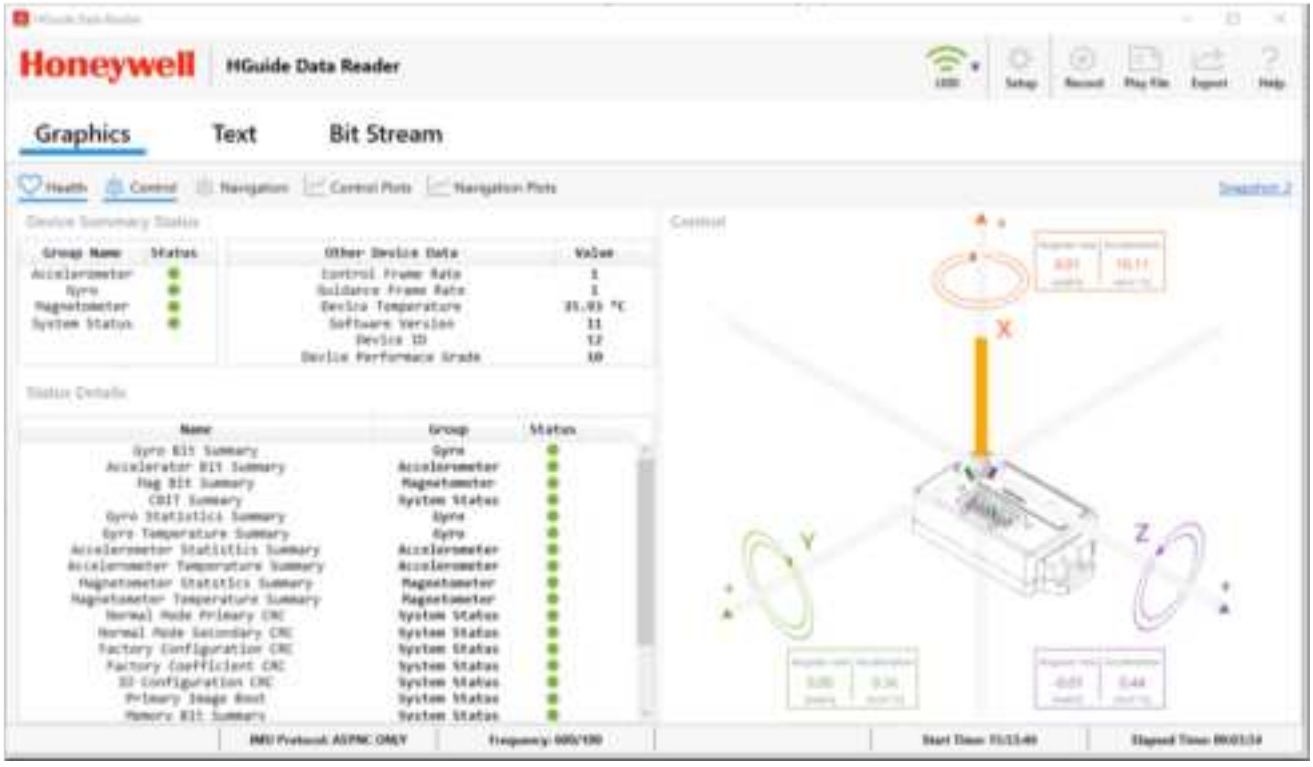
If using the Honeywell Data reader, be sure to press the “scan/hunt” button on the introductory screen. The program will automatically do an initial search but will time out if device not connected.



CAN ONLY
Replace 120 Ohm Resistor Between CANH and CANL.

*Evaluation kit (68009732-003) with shown board is available for purchase.*

| EVAL KIT BOARD MOUNTING TO i300/i200 |
| --- |
| Use two 2-56 x 3/16” SHCS |
| Grainger part number 1GU11. Driver size is 5/64” |
| **RECOMMENDED i300 MOUNTING** |
| Use two 4-40 x 3/8” SHCS (M3.0 x 0.5) screws. |
| Grainger part number 5UGX4. Driver size is 3/32” |



# PIN OUTS/POWER SIGNAL LIST

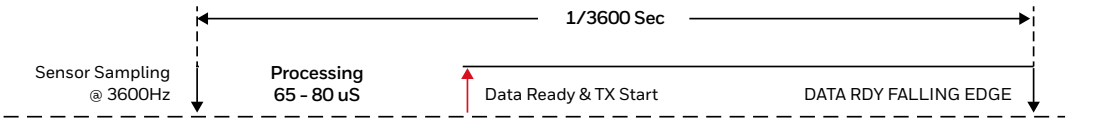
Typical power draw is 500 mW. The i300/i200 will work with most PC USB ports; however, Honeywell recommends a non-PC power supply for permanent installations.

This device has been designed to meet stringent EMI and EMC requirements, and as such, the user should shield the I/O cabling and provide chassis ground connection to the IMU housing.

| i300 14 PIN CONNECTOR J1 | | | |
|---|---|---|---|
| Pin# | Signal Name | Input/Output & Signal type | Signal Function |
| 1 | Ground | Ground | Ground |
| 2 | Power | Power | +4.75 to 36 VDC |
| 3 | SCLK[1] | Input, +3.3 to 5.5 VDC | Serial Clock Output from Master |
| 4 | COM1 TX / MISO[1] | Output, +5 Volt TTL | Asynchronous or SPI Output |
| 5 | COM1 RX / MOSI[1] | Input - +3.3 to 5.5 VDC | Asynchronous or SPI Input |
| 6 | RESET | Input - +3.3 to 5.5 VDC | Device reset input discrete. CMOS Compatible. Device will remain in reset while at logic 0. |
| 7 | Slave Select[1] | Input, +3.3 to 5.5 VDC | Slave Select (Active Low) |
| 8 | System TOV Mark | Output - 5 Volt BiCMOS | Data Ready on Rising Edge to 5 VDC. Rise and Fall Time < 50 Nanoseconds. |
| 9 | COM3_TX_H | Output RS-422 | Asynchronous High |
| 10 | COM1_TX_L | | Asynchronous Low |
| 11 | COM2 / CAN_H | Bi-directional ISO 11898-2 120 Ohm Termination Resistor Required | Asynchronous High |
| 12 | COM2 / CAN_L | | Asynchronous Low |
| 13 | COM3_RX_H | Input RS-422 | Asynchronous High |
| 14 | COM1_RX_L | | Asynchronous Low |

1 Contact Honeywell for future SPI product availability.

# DATA READY SIGNAL DESCRIPTION




Data Ready Rising and Falling at Message Frame Rate. Data transmission will continue across additional 3600 Hz frames dependent upon selected bit rate.

The Data Ready falling edge can be used to provide a time mark to a data recording system which will provide time of validity for recorded IMU data. This is often GPS time. Some customers also need to know when Honeywell data transmission starts so that the data can be immediately processed or manage a data bus.

# HGUIDE i300/i200 PERFORMANCE

| GYRO ROOM TEMPERATURE TYPICAL PERFORMANCE | | | | | |
|---|---|---|---|---|---|
| Distributor Ordering Part Number | Performance Class | Bias Repeatability (°/hr 1σ) | Bias In-run Stability (°/hr 1σ) | ARW (°/√hr) | Scale Factor Repeatability (ppm 1σ) |
| i300 | "B" | 65 | 3 | 0.15 | 1400 |
| i300 | "A" | 90 | 5 | 0.25 | 1400 |
| i200 | "C" | 260 | 10 | 0.30 | 2500 |

| ACCELEROMETER ROOM TEMPERATURE TYPICAL PERFORMANCE | | | | | |
|---|---|---|---|---|---|
| Distributor Ordering Part Number | Performance Class | Bias Repeatability (mg 1σ) | Bias In-run Stability (mg 1σ) | VRW (m/s/√hr) | Scale Factor Repeatability (ppm 1σ)[1] |
| i300 | "B' | 1 | 0.02 | 0.02 | 250[1] |
| i300 | "A" | 2 | 0.03 | 0.03 | 500[1] |
| i200 | "C" | 5 | 0.06 | 0.04 | 1000[1] |

1 Model as a +1500 PPM offset with the one sigma value as shown.

| GYRO AND ACCELEROMETER ROOM TEMPERATURE TYPICAL NOISE @ 400 HZ BW | | | | | |
|---|---|---|---|---|---|
| Distributor Ordering Part Number | Axes | Control Data (1σ) @ 1800 Hz Data Rate | | Control Data (1σ) @ 1800 Hz Data Rate | |
| | | Gyro (Deg/s) | Accel (mg) | Gyro (Deg) | Accel (mm/s) |
| i300 | X | 0.15 | 5 | 0.0005 | 0.12 |
| i300 | Y / Z | 0.15 | 2.5 | 0.0005 | 0.06 |
| i200 | All Axes | 0.15 | 8 | 0.05 | 0.30 |

# USING HONEYWELL DATA

**Controlling (Messages 0xA1 or 0xAC)**
Honeywell provides high bandwidth (400 Hz information) at 1800 Hz. General "rule of thumb" is that sensor control bandwidth should be 5 times the structure being controlled – allowing control of an 80 Hz device. If you are controlling lower frequency platforms (like a car) – filter the 1800 Hz data to the desired bandwidth.

**Navigation (Messages 0xA3 & 0xAE)**
Navigating requires that single integration of angular rates to attitude and the double integration of acceleration into position. This navigation format provides data relative to the prior frame and often referred to as Delta Velocity / Theta or Incremental Velocity / Angles. The data is directly integrable in that the data is not "per second" but rather per the length of the navigation frame (100 Hz, 200 Hz or 300 Hz).

**Interleaved (Multiple Messages & CAN)**
Get both Control and Navigation data by selecting a message which sends out data on multiple frame rates. This is the default data for the i300/i200 because it demonstrates all sensor types.  If you are one of the few who need this – study carefully the right columns on the Interleave table. For the rest – use the Honeywell HGuide Data Reader to send out just Control or Navigation data.

# PRODUCT DEFAULT MESSAGE

The HGuide i300 / i200 Inertial Measurement Units (IMUs) are factory configured with 0xA1/0xA2 Interleaved Messages at 921.6 KBaud. Use the HGuide Data Reader (HGDR) to change the default message to alternates.

**DEFAULT i300 / i200 MESSAGE**
**DEFAULT BAUD RATE FROM FACTORY IS 921.6 KBAUD**

| Message Name | Message Information | | Data Rates (Hz) | | Available KBaud Rates | | |
|---|---|---|---|---|---|---|---|
| | Control | Nav | Control | Nav | 460.8 | 921.6 | 1000 |
| 0xA1 & A2 Interleaved | X | | 600 | 100 | X | X | X |
| | | X | 1200 | 200 | | X | X |
| | | | 1800 | 300 | | X | X |

**DEFAULT i300/i200 MESSAGE INTERLEAVE TABLE**

| Message Name | Message | | Data Rates (Hz) | | Interleave Transmission Sequence | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Control | Nav | Control | Nav | 1 | 2 | 3 | 4 | 5 | 6 |
| 0xA1 & 0xA2 Interleaved | | | 600 | 100 | | | | | | |
| | X | X | 1200 | 200 | 0xA2 | 0xA1 | 0xA1 | 0xA1 | 0xA1 | 0xA1 |
| | | | 1800 | 300 | | | | | | |

# ALTERNATE MESSAGE SELECTION

| ALTERNATE MESSAGES. USE THE HGUIDE DATA READER TO SELECT MESSAGES AND BAUD RATES | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Allowed Messages | Message Information | | | | Data Rates (Hz) | | Available KBaud Rates | | | | |
| | Control | Mag | Nav | Descrip-tion | Control | Nav | 115.2 | 230.4 | 460.8 | 921.6 | 1000 |
| CAN | X | X | X | ALL | 600 | 100 | | X | X | X | X |
| 0x01 | X | | | HG4930 | 600 | NA | | | X | X | X |
| 0x01 & 0x02 Interleaved | X | | X | HG4930 | 600 | 100 | | | X | X | X |
| 0x04 | X | | | HG1120 | 1800 | NA | | | X | X | X |
| 0x04 & 0x05 Interleaved | X | | X | HG1120 | 1800 | 300 | | | X | X | X |
| 0x0C | X | | | HG1120 | 600 | NA | | | X | X | X |
| 0x0C & 0x0D Interleaved | X | | X | HG1120 | 600 | 100 | | | | X | X |
| 0xA1 | X | | | i300/i200 | 600 | | | | X | X | X |
| | | | | | 1200 | NA | | | X | X | X |
| | | | | | 1800 | | | | X | X | X |
| 0xA3 | | | X | i300/i200 | NA | 100 | X | | X | X | X |
| | | | | | | 200 | X | | X | X | X |
| | | | | | | 300 | | | X | X | X |
| 0xAC | X | X | | i300/i200 | 600 | NA | | | X | X | X |
| | | | | | 1200 | | | | X | X | X |
| | | | | | 1800 | | | | | X | X |
| 0xAC & 0xAD Interleaved | X | X | X | i300/i200 | 600 | 100 | | | X | X | X |
| | | | | | 1200 | 200 | | | | X | X |
| | | | | | 1800 | 300 | | | | X | X |
| 0xAE | | X | X | i300/i200 | NA | 100 | X | | X | X | X |
| | | | | | | 200 | X | | X | X | X |
| | | | | | | 300 | X | | X | X | X |

For Legacy HG1120 and HG4930 messages, consult their respective manuals for message definitions.

**Use the HGuide Data Reader (HGDR) to configure messages and baud rates. CAN messages may be enabled via the HGDR but require configuration upon each power cycle.**

# INTERLEAVE TABLE
# ALTERNATE MESSAGES

| INTERLEAVE TABLE. TRANSMISSION SEQUENCE IS AT THE CONTROL RATE | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Allowed Messages | Message Information | | | | Data Rates (Hz) | | Interleave Transmission Sequence @Control Rate | | | | | |
| | Control | Mag | Nav | Device | Control | Nav | 1 | 2 | 3 | 4 | 5 | 6 |
| CAN | X | X | X | ALL | 600 | 100 | C1 C2 M1 I1 I2 I3 | C1 C2 M1 | C1 C2 M1 | C1 C2 M1 | C1 C2 M1 | C1 C2 M1 |
| 0x01 & 0x02 Interleaved | X | | X | HG4930 | 600 | 100 | 0x02 | 0x01 | 0x01 | 0x01 | 0x01 | 0x01 |
| 0x04 & 0x05 Interleaved | X | | X | HG1120 | 1800 | 300 | 0x05 | 0x04 | 0x04 | 0x04 | 0x04 | 0x04 |
| 0x0C & 0x0D Interleaved | X | | X | HG1120 | 600 | 100 | 0x0D | 0x0C | 0x0C | 0x0C | 0x0C | 0x0C |
| 0xA1 & 0xA2 Interleaved | X | | X | i300/ i200 | 600 | 100 | 0xA2 | 0xA1 | 0xA1 | 0xA1 | 0xA1 | 0xA1 |
| | | | | | 1200 | 200 | | | | | | |
| | | | | | 1800 | 300 | | | | | | |
| 0xAC & 0xAD Interleaved | X | X | X | i300/ i200 | 600 | 100 | 0xAD | 0xAC | 0xAC | 0xAC | 0xAC | 0xAC |
| | | | | | 1200 | 200 | | | | | | |
| | | | | | 1800 | 300 | | | | | | |

# ASYNCHRONOUS MESSAGE EXAMPLE

| ASYNCHRONOUS MESSAGE | | | | | |
|---|---|---|---|---|---|
| Message Detail Template<br>0xAD Control, Mag, Status & Delta Data<br>Apply the LSB, Byte, and Units information to all other message ID's | | | | | |
| Position | Parameter | Description | Bytes | LSB Weight | Units/LSB |
| 1 | Address | 0x0E | 1 | NA | |
| 2 | Message ID | 0xAD | 1 | NA | |
| 3 | Control | Angular Rate X | 2 | $2^{-11}$ | rad/sec |
| 4 | | Angular Rate Y | 2 | | |
| 5 | | Angular Rate Z | 2 | | |
| 6 | | Linear Acceleration X | 2 | $0.3048*2^{-5}$ | $m/sec^2$ |
| 7 | | Linear Acceleration Y | 2 | | |
| 8 | | Linear Acceleration Z | 2 | | |
| 9 | Mag | Mag Field X | 2 | 0.438404 | Milli-Gauss |
| 10 | | Mag Field Y | 2 | | |
| 11 | | Mag Field Z | 2 | | |
| 12 | Status | Status Word 1 | 2 | See Table | See Table |
| 13 | | Status Word 2 | 2 | NA | Reserved |
| 14 | Navigation | Delta Angle X | 4 | $2^{-33}$ | radians<br>or equivalently,<br>radians/second/Hz |
| 15 | | Delta Angle Y | 4 | | |
| 16 | | Delta Angle Z | 4 | | |
| 17 | | Delta Velocity X | 4 | $0.3048*2^{-27}$ | m/sec<br>or equivalently,<br>$m/sec^2/Hz$ |
| 18 | | Delta Velocity Y | 4 | | |
| 19 | | Delta Velocity Z | 4 | | |
| 20 | Checksum | Checksum | 2 | NA | Total of 50 Bytes |

**All messages are a subset of this message set.**
**Apply the LSB, Byte, and Units information to all other Message ID's.**
**The LS byte and 16-bit word are first (little endian).**
**Asynchronous Communications are 8 Bits, One Start Bit, One Stop Bit.**

See HGDR SDK (in BIT STREAM tab)

# STATUS AND CHECKSUM DESCRIPTIONS

| i300/i200 STATUS WORD | | |
|---|---|---|
| Bit | Definition | Values |
| 0–3 | 4-bit Counter | 0-15 |
| 4–7 | Control Data Output | 0 (No Active Output) |
| | | 1 (600 Hz) |
| | | 2 (1200 Hz) |
| | | 3 (1800 Hz) |
| 8–11 | Navigation Data Output | 0 (No Active Output) |
| | | 1 (100 Hz) |
| | | 2 (200 Hz) |
| | | 3 (300 Hz) |
| 12–15 | BIT (Gyro/Accel/Mag/Summary) | Logic 0 is Pass |

The Checksum is the sum of all message data (positions 1 ... 19 of example message), taken as 16 bit words, and summed without regard for rollover.

**This pseudo code illustrates the checksum algorithm for the 0xA1 message:**

```
u16sum = 0;
for (i=0; i<9; i++) // (20-2)/2=9
{ u16sum += u16_msg_array[i]; }
Checksum = u16_msg_array[9];
if (Checksum != u16sum) {checksum error}
```

The HGuide Data Reader with its associated software development tools provide real time examples of checksum calculations.

# ASYNCHRONOUS MESSAGES ABBREVIATED

| 0XA1 CONTROL DATA | | |
|---|---|---|
| Position | Parameter Description | Bytes |
| 1 | IMU Address - 0x0E | 1 |
| 2 | Message ID - 0xA1 | 1 |
| 3-8 | Control Data | 12 |
| 9-10 | Status | 4 |
| 11 | Checksum | 2 |
| | Total Bytes | 20 |

| 0XAC CONTROL & MAG DATA | | |
|---|---|---|
| Position | Parameter Description | Bytes |
| 1 | IMU Address - 0x0E | 1 |
| 2 | Message ID - 0xAC | 1 |
| 3-8 | Control Data | 12 |
| 9-11 | Mag Data | 6 |
| 12-13 | Status | 4 |
| 14 | Checksum | 2 |
| | Total Bytes | 26 |

| 0XA2 CONTROL & NAVIGATION DATA | | |
|---|---|---|
| Position | Parameter Description | Bytes |
| 1 | IMU Address - 0x0E | 1 |
| 2 | Message ID - 0xA2 | 1 |
| 3-8 | Control Data | 12 |
| 9-10 | Status | 4 |
| 11-16 | Navigation Data | 24 |
| 17 | Checksum | 2 |
| | Total Bytes | 44 |

| 0XAD CONTROL, NAVIGATION & MAG DATA | | |
|---|---|---|
| Position | Parameter Description | Bytes |
| 1 | IMU Address - 0x0E | 1 |
| 2 | Message ID - 0xAD | 1 |
| 3-8 | Control Data | 12 |
| 9-11 | Mag Data | 6 |
| 12-13 | Status Word | 4 |
| 14-19 | Navigation Data | 24 |
| 20 | Checksum | 2 |
| | Total Bytes | 50 |

| 0XA3 NAVIGATION DATA | | |
|---|---|---|
| Position | Parameter Description | Bytes |
| 1 | IMU Address - 0x0E | 1 |
| 2 | Message ID - 0xA3 | 1 |
| 3-8 | Navigation Data | 24 |
| 9-10 | Status | 4 |
| 11 | Checksum | 2 |
| | Total Bytes | 32 |

| 0XAE NAVIGATION & MAG DATA | | |
|---|---|---|
| Position | Parameter Description | Bytes |
| 1 | IMU Address - 0x0E | 1 |
| 2 | Message ID - 0xAE | 1 |
| 3-8 | Navigation Data | 24 |
| 9-11 | Mag Data | 6 |
| 12-13 | Status | 4 |
| 14 | Checksum | 2 |
| | Total Bytes | 38 |

See 0xAD Combined Control & Inertial for detailed contents.

See example 0xAD Combined Control & Inertial Message Table in this document or the HGDR SDK (in BIT STREAM tab).

# CAN MESSAGES ABBREVIATED

| C1 CONTROL DATA | | |
|---|---|---|
| # | Parameter | Bytes |
| NA | Arbitration ID | NA |
| 1 | Angular Rate X | 2 |
| 2 | Angular Rate Y | 2 |
| 3 | Angular Rate Z | 2 |
| 4 | Status Word | 2 |

| C2 CONTROL DATA | | |
|---|---|---|
| # | Parameter | Bytes |
| NA | Arbitration ID | NA |
| 1 | Linear Acceleration X | 2 |
| 2 | Linear Acceleration Y | 2 |
| 3 | Linear Acceleration Z | 2 |
| 4 | Reserved | 2 |

| C3 MAGNETIC DATA | | |
|---|---|---|
| # | Parameter | Bytes |
| NA | Arbitration ID | NA |
| 1 | Mag X | 2 |
| 2 | Mag Y | 2 |
| 3 | Mag Z | 2 |

| I1 NAVIGATION DATA | | |
|---|---|---|
| # | Parameter | Bytes |
| NA | Arbitration ID | NA |
| 1 | Delta Angle X | 4 |
| 2 | Delta Velocity X | 4 |

| I2 NAVIGATION DATA | | |
|---|---|---|
| # | Parameter | Bytes |
| NA | Arbitration ID | NA |
| 1 | Delta Angle Y | 4 |
| 2 | Delta Velocity Y | 4 |

| I3 NAVIGATION DATA | | |
|---|---|---|
| # | Parameter | Bytes |
| NA | Arbitration ID | NA |
| 1 | Delta Angle Z | 4 |
| 2 | Delta Velocity Z | 4 |

See 0xAD Combined Control & Inertial for LSB weights and units.

# CAN ID'S

| CAN ID TABLE | | | |
|---|---|---|---|
| (0xC, 0xD, 0xA1, 0xA2) | | | |
| Message | Packet | CAN-11 | CAN-29 |
| 0xC | C1 | 0x121 | 0x04924921 |
| 0xC | C2 | 0x122 | 0x04924922 |
| 0xC | C3 | 0x126 | 0x04924926 |
| 0xD | I1 | 0x123 | 0x04924923 |
| 0xD | I2 | 0x124 | 0x04924924 |
| 0xD | I3 | 0x125 | 0x04924925 |
| 0xA1 | C1 | 0x141 | 0x04924941 |
| 0xA1 | C2 | 0x142 | 0x04924942 |
| 0xA1 | C3 | 0x146 | 0x04924946 |
| 0xA2 | I1 | 0x143 | 0x04924943 |
| 0xA2 | I2 | 0x144 | 0x04924944 |
| 0xA2 | I3 | 0x145 | 0x04924945 |

| CAN ID TABLE | | | |
|---|---|---|---|
| (0x01,0x02,0xAC,0xAD) | | | |
| 0x01 | C1 | 0x131 | 0x04924931 |
| 0x01 | C2 | 0x132 | 0x04924932 |
| 0x02 | I1 | 0x133 | 0x04924933 |
| 0x02 | I2 | 0x134 | 0x04924934 |
| 0x02 | I3 | 0x135 | 0x04924935 |
| 0xAC | C1 | 0x151 | 0x04924951 |
| 0xAC | C1 | 0x152 | 0x04924952 |
| 0xAC | C3 | 0x156 | 0x04924956 |
| 0xAD | I1 | 0x153 | 0x04924953 |
| 0xAD | I2 | 0x154 | 0x04924954 |
| 0xAD | I3 | 0x155 | 0x04924955 |

**Use CAN ID's to design DBC Files.**

# SPI PROTOCOL

## The SPI PROTOCOL will be available in future product releases. Contact Honeywell for availability.

The messages are identical in content to the asynchronous Control/Inertial messages except that Position 0 will be added and contain a 1 byte field containing the number of bytes of data (not including spare bytes) in the message.

**The External SPI device will be coming in asynchronous to the Control/Inertial message sequence. Each SPI message in the Control/Inertial set will be a constant length. The Control message will have spare bytes at the end, NOT included in the checksum, to match the length of the Inertial Message.**

The SPI clock frequency must be at least 2 MHz or no faster than 9 Mhz.
The SPI clock polarity and phase are set to one (1).
SPI data order is MSB first.
A 4-wire SPI implementation is used.

The DATA_RDY signal must be used to synchronize your application to the data being produced to ensure a consistent data set. The DATA_RDY signal must trigger an SPI fetch, and the clock rate must be fast enough to fetch an entire message within the Control data rate (either 1800 or 600 Hz).

The SPI_SS signal should be set, then the application should clock 408 (51*8) SPI bits beforeresetting the SPI_SS signal.

# ENVIRONMENTAL/ COMPLIANCE

| ENVIRONMENTAL AND COMPLIANCE INFORMATION | | | |
|---|---|---|---|
| Item | Operating | Non-Operating | Units |
| Temperature | -54 to +85<br>-40 to +85 (Full Performance) | -55 to +95 | °C |
| Temperature Shock | ±3 Operating<br>±0.8 Full Performance | -40 to + 85 in 15 Minutes<br>Measure on Top of Device with Thermocouple | °C/minute |
| Random Vibration | 5 g's RMS | 12 g's RMS | NA |
| Shock | 15 g bump half-sine, 6 ms duration, both polarities, each axis, per IEC 60068-2-27 | 40 g Shock at 11 msec duration per MIL-STD-810G Method 516.7 Procedure I 500 g's 0.5 mSec, Half Sine | NA |
| Static Acceleration | > 250 g's of static acceleration in all directions and recover within 25 milliseconds | | NA |
| Altitude | 0 to 12000, Mean Sea Level | | Meters |
| Magnetic Field | ±10 | No Known Sensitivity | Gauss |
| Acoustic Rectification | 147 dB, SPL, 20 - 8000 Hz | No Known Sensitivity | NA |
| Regulatory | DS/EN 13309:2010 & ISO 13766-1:2018 (Construction Machinery), EN ISO 14982:2009 (Agricultural and Forestry Machinery) | | NA |
| Materials | RoHS Compliant and RoHS Process Compatible | | NA |
| WEEE Compliance | Classified as electrical and electronic equipment.<br>Must be sent to separate collection facilities for recovery and recycling. | |  |
| Packaging | IP68 Compliant | | |

# EMC TEST CONDITIONS

| i300/I200 COMPLIANT TO LISTED EMC TEST CONDITIONS | | |
|---|---|---|
| Environment | Test Method Standard | Test Parameters |
| Radiated Emissions | ISO 13309:2010 | 30 MHz to 1000 MHz |
| | ISO 13766:2006 | BB and NB Scans |
| | ISO 14982:1998 | Ambient Baseline Before & After |
| Bulk Current Injection (BCI) | ISO 11452-4:2011 | 20 MHz to 400 MHz |
| | | 100 mA, 80% AM at 1kHz |
| Radiated Immunity | ISO 11452-2:2004 | 400 MHz to 2000 MHz |
| | | 100 V/m, 80% AM at 1kHz and PM |
| Conducted Transients | ISO 7637-2:2011 | Pulses 1, 2a, 2b, 3a, 3b at Test Level IV |
| | ISO 7637-2:2004 | Pulse 4 at Test Level IV |

# MOUNTING/ INSTALLATION

Do not place this device in an environment with Helium concentrations greater than the normal atmosphere. The helium will permeate the housing and affect sensors. The housing seal allows Helium to enter/leave so that helium does not accumulate. The IMU should not be subjected to contact with any fuels, lubricants, solvents, or their vapors.

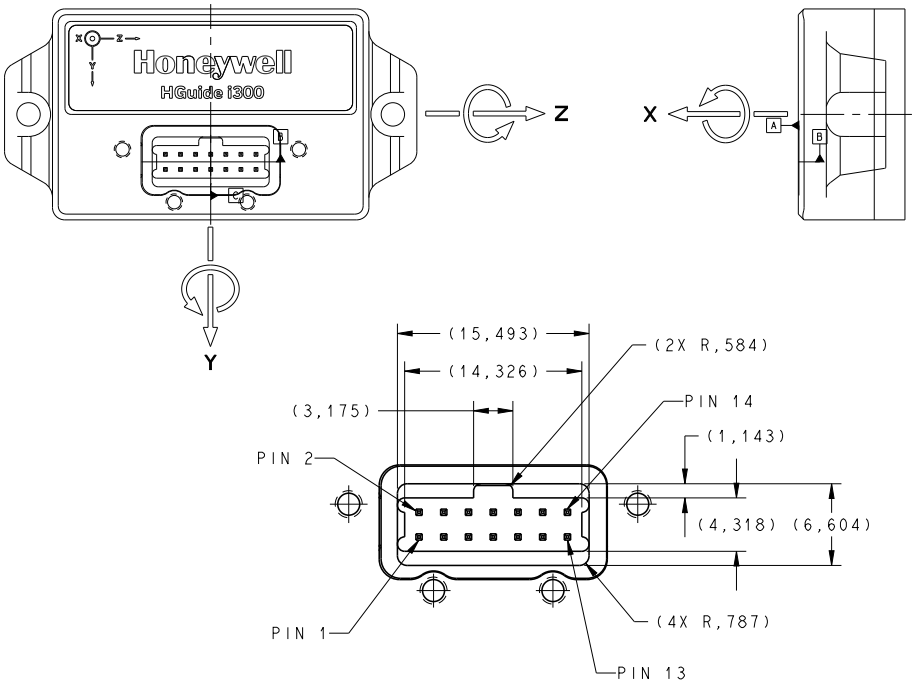
The accelerometer and gyro sensors are mounted in a normally aligned, right-handed axis configuration that is nominally aligned with the IMU axes as shown in the figure below. If the X axis is pointed up away from the Earth's surface, the accelerometer reading will be positive.

The i300/i200 nominally weighs 35 grams. The packaging is compliant to IP68; however, do not intentionally submerse device under water.

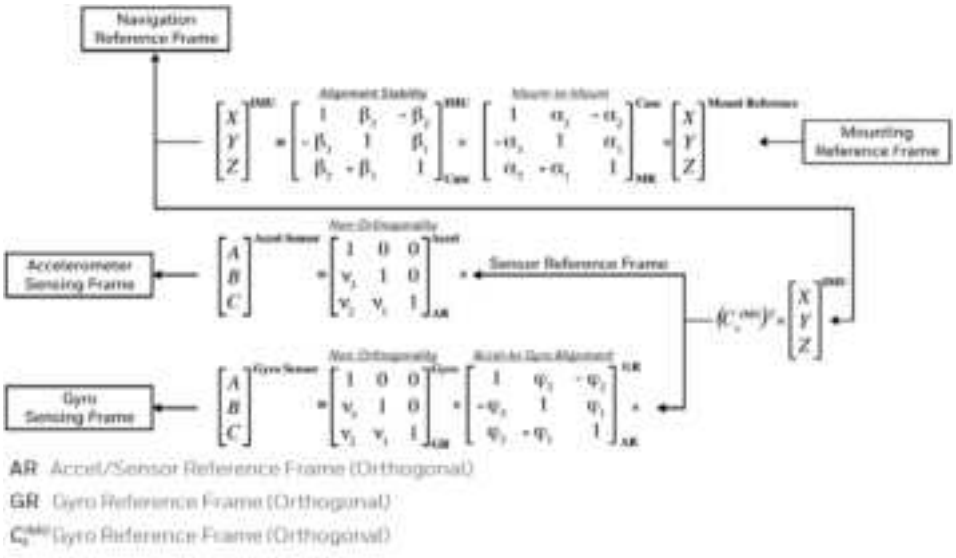
Recommended mating connectors are SAMTECH Part Numbers CLT-107-02-L-D-BE or CLT-107-02-F-D-A or equivalent.

The center of gravity and center of navigation are located at the approximate geometric center. A CAD compatible STP file is available from Honeywell upon request.

**ATTENTION:**
IMUs are precision instruments which measure angular rate and linear acceleration across a broad temperature range. Because of their precision, users often interpret real motion (both angular and linear) as sensor noise. This noise can often be coupled mechanically through the mounting plate. Installation on a thin structure is generally not desirable. Placement at anti-nodes will minimize angular rotation and maximize linear displacement. Placement at nodes will maximize angular rotation and minimize linear displacement.



# ALIGNMENT AND ORTHOGONALITY




| ALIGNMENT AND ORTHOGONALITY | | |
|---|---|---|
| Parameter | Requirement | Units |
| Mount to Mount with Pins | 3500 | µrad max |
| Sensor Frame Alignment Stability | <375 | µrad 1σ |
| Accelerometer Non-orthogonality | <375 | µrad 1σ |
| Accelerometer to Gyro Alignment | <375 | µrad 1σ |
| Gyro Non-Orthogonality | <375 | µrad 1σ |

**Alignment / Orthogonality Note**

Honeywell navigation system equations implement alignment / orthogonality as shown. These equations are provided to customers for understanding of the parameters provided. Customers may optionally choose to implement these equations into their own navigation equations. Values shown in above table are "as delivered" and include Honeywell factory calibration.

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**Honeywell Aerospace**
1944 East Sky Harbor Circle
Phoenix, AZ 85034
aerospace.honeywell.com

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