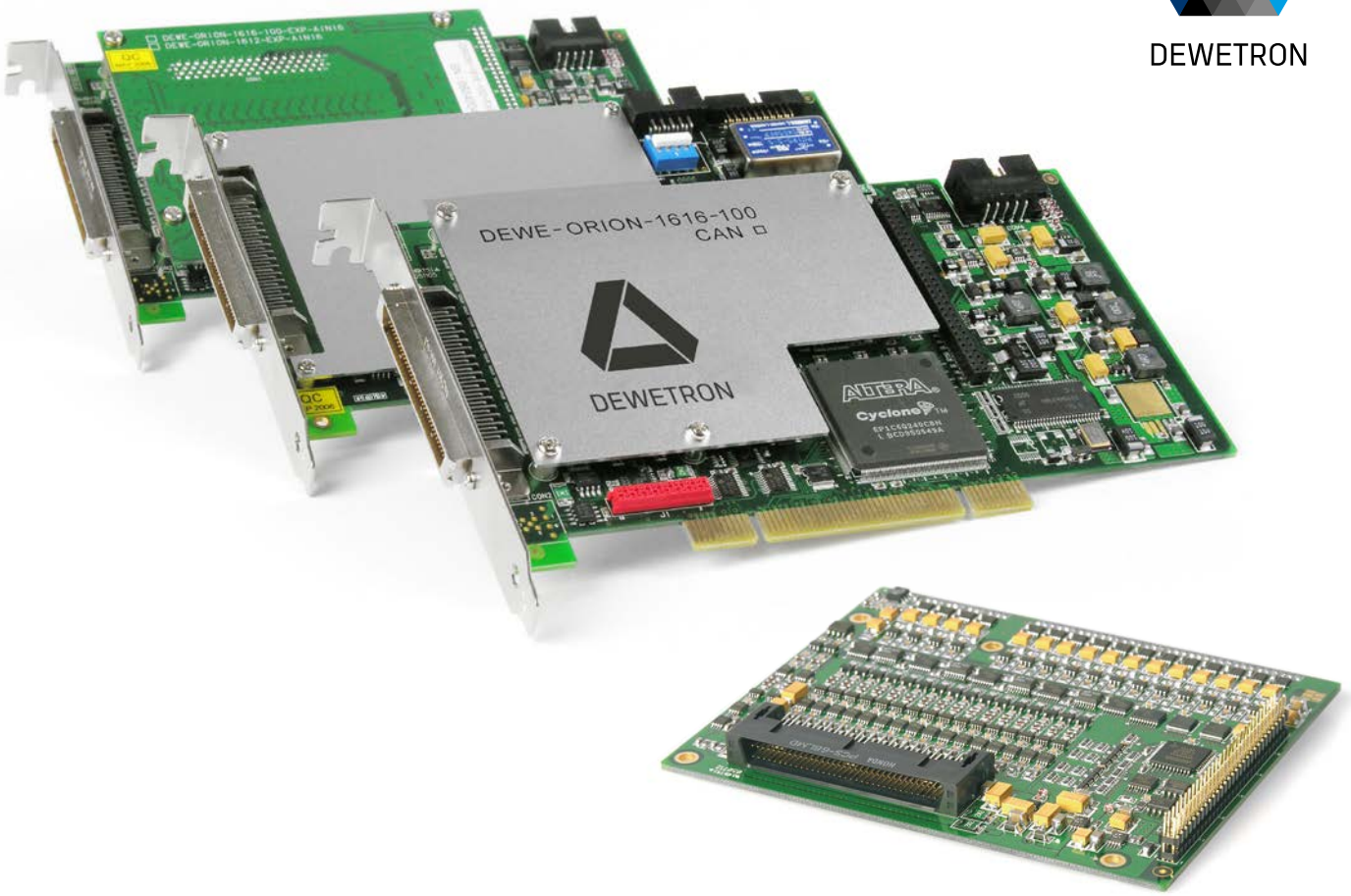
DEWETRON



DEWE-ORION

A/D Boards

DEWE-ORION A/D boards define a new Standard in Data Acquisition!

Simultaneous sampling of all analog input channels is guaranteed by using a separate A/D converter for each channel. But more than this all digital I/Os, counters, encoders and the onboard CAN interfaces are acquired synchronized, too.

To reach multi-channel instruments several cards can be installed within a single unit. All cards are synchronized via the internal sync-bus to ensure absolute simultaneous sampling of all channels.

Key Features

- *Simultaneous sampling*
- *Separate A/D converter channel*
- *Synchronized analog, digital, counter and CAN inputs*
- *Clock output for synchronizing external devices, e.g. video cameras*
- *Sync option for synchronizing multiple systems or synchronize to IRIG or GPS*

For high channel count or distributed systems multiple instruments can be synchronized using the ORION-SYNC option. Depending on distance and local preconditions there are several choices how to use this option.

The easiest way is to simply daisy-chain all instruments by sync-cables. Standard CAT6 cables with RJ45 connectors can be used for short distances. The maximum length depends on the sampling rate and the A/D technology and ranges between 30 m to 200 m.

For large distances which do not allow physical connection of the instruments a DEWETRON sync-interface using GPS or IRIG time is connected to the ORION-SYNC input.

The ingenious driver design enables total continuous gap-free disk storing rates of more than 100 MB/s.

Of course each DEWE-ORION card always comes with a calibration certificate.

There is no compromise in quality.

A/D Knowledge

Analog to Digital Conversion Technologies

Delta-Sigma Converter

This technique is used in the DEWE-ORION-0424, DEWE-ORION-0824, DEWE-ORION-1624 and DEWE-ORION-1622 /-3222 series boards. The 24 bit converters offer highest dynamic range (up to 120 dB).

Whenever you choose a sampling rate, the used internal sampling rate is 512 times higher. Using this oversampling technique full anti aliasing protection is guaranteed. These boards can not be external clocked, but synchronized from board to board and also synchronized to GPS or to IRIG time using DEWE-CLOCK.

Flash Converter

This technique is used in the DEWE-ORION-1616, DEWE-ORION-0816, MI and AD series boards.

Flash converters offer fastest sampling rate (up to 1 MS/s @ 16 bit) as well as the possibility for external clocking. This is required for external clocked applications like distance related A/D conversion, combustion analysis as well as order tracking applications (using hardware order tracking clocked by an encoder).

Simultaneous, Synchronized and Multiplexed Acquisitions

Multiplexed Acquisition

This was the common technology in the past. The advantage: you need only one A/D converter, which makes the board cheaper. The multiplexer in front of the A/D converter scans the signal from channel to channel. This is also the big disadvantage: the signal needs some settling time which results in a delay between sampling of each channel. An A/D converter with 100 kS/s could sample every 10 µs. Imagine you have to acquire just 10 channels. This will lead to a time delay between channel 1 and 10 of 90 µs. This old technology is not used on any DEWE-ORION series board.

Simultaneous Acquisition

In multichannel applications it is always the best way to sample all input channels simultaneously (at the same time). This avoids errors related to time delays between sampling of each channel. In former days this was done via sample and hold functions - which caused worse signal quality. For best signal quality DEWETRON uses an own A/D converter for each channel on all DEWE-ORION boards.

Synchronized Acquisition

Synchronized acquisition means that you acquire signals from different sources. They can have the same or different speeds. But at any time you know the time relation between these sources. As an example, two A/D boards each with 200 kS/s per channel can be synchronized, maybe together with one video camera (100 frames per second), CAN-bus data (50 values/second) and EPAD modules (5 values/second). Wherever you look into the acquired data, you are able to show the exactly related information of all sources - even after hours of measurement!

Accuracy, Precision and Resolution

Accuracy is the degree of veracity while precision is the degree of reproducibility. The resolution defines the smallest step between two values. It's very important to know the difference to get good measurement results.

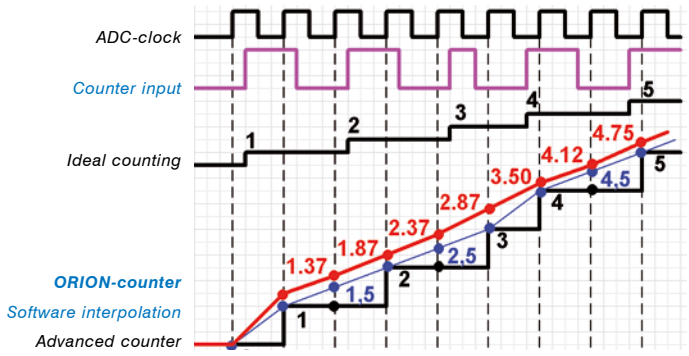
***The accuracy** is very important for measurement of absolute values. Let's take a weight measurement as an example. When you put several parts on the scale, you want to know their weight as accurate as possible (e.g. you want to know the weight as accurate as 0.5 kg).*

***The precision** is important for repetitive and comparison measurements. When you put the same part on the scale - maybe after some days or weeks - you want to see the same result. Or how much it changed in this time. In this cases the precision has to be higher than the accuracy (as an example 0.1 kg).*

***The resolution** is normally not important to be known, but has to be much better than precision and accuracy. The resolution in the digital world represents the smallest value which can be measured. In our example above it makes no sense to have a resolution of 1 kg, because then you couldn't measure smaller values than 1 kg. It has to be at least 0.05 kg or smaller to be efficient.*

Counters of DEWE-ORION Boards

DEWETRON has advanced the state-of-the-art in counter / encoder input and all DEWE-ORION series boards are equipped with synchronous 32-bit counters. The key advancement is that all counters are phase synchronized.
Refering to the diagram, you can see that a standard counter is always a sample behind. With software interpolation you can get closer, but only DEWETRONs advanced technology are both fully phase and amplitude corrected.



DEWETRON distinguishes between two different stages of extension (all of them are fully phase synchronized)

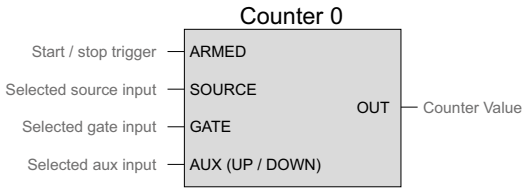
- *ORION standard counters*
- *ORION advanced counters*

In which way are they different?
All counter inputs provide felxible signal routing enabling easy signal connection and the usage of the same input pin for all counter input functions and for digital inputs. Some pins even can be used for digital output.
In addition to the basic counter functions like simple event counting, up/down counting and gated event counting also period time, pulse width, two pulse edge separation, frequency and duty cycle measurements are supported. Of course all encoder, tacho and geartooth sensors can be used.

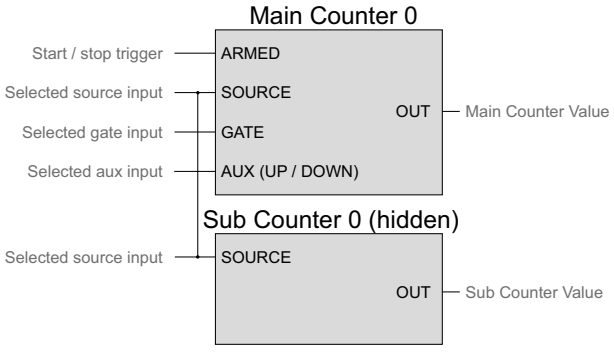
Measuring the duty cycle of an input signal needs the information of the period time and the pulse width for the calculation. Thus two counter inputs are needed. Also for precise frequency measurement of a signal synchronized to analog samples two counters are required.

Using "standard counters" these advanced applications can be done but two counter inputs are needed for e.g. one precise synchronized frequency measurement. Only one input is physically connected, the second one is "connected" by the internal signal routing.
Every "advanced counter"consists of two counters in truth, a main counter and an invisible "sub counter". This architecture enables you performing even the advanced measurements like duty cycle with a single counter input.

Standard counter



Advanced counter

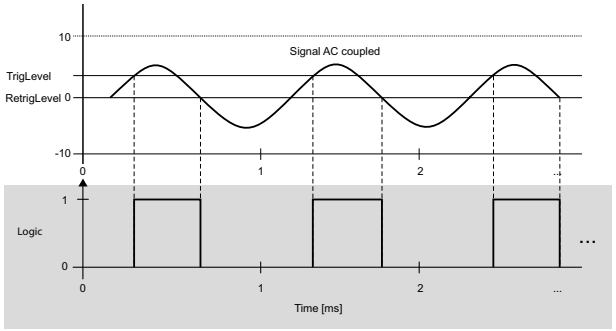


Example in practice, torsional vibration:
We only need two encoders but using an ORION-1616-100 card which has two "standard" counters is not possible as two counter inputs are required per encoder for the calculation of results like torsion angle. Note: The application still can be done with ORION-1616 series boards but at least four counters are needed, e.g. ORION-1616-102. In comparison using an ORION-1624-200 card which has two "advanced counters" (incl. two hidden sub-counters) is sufficient for this application.

Besides the different functional range we further distinguish between different input signal ranges

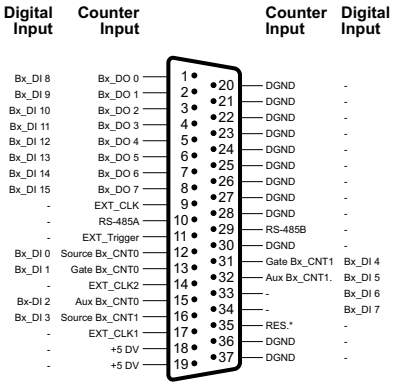
- *TTL input (TTL)*
- *Differential adjustable input (ADJ)*

The difference between these is the electrical input circuit. The differential adjustable counter inputs offer an input voltage range from -35 to 60 V (protected up to 100 V_{peak}) with AC/DC coupling and there are programmable trigger and re-trigger levels from 0 to 40 V (with 40 mV resolution) to support any signal waveform.



Counter Options of DEWE-ORION Boards with 2 Counters (-xx0 & -xx1 cards)

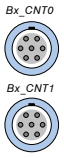
Without any option the two counters and 8 digital I/Os of the first DEWE-ORION board in a system are wired to a D-Sub-37 socket on DEWETRON instruments. The two counters can be switched to eight digital inputs per software. The figure on the right side shows the pin out of the D-Sub-37 socket labeled "Bx_Digital I/O".



Bx_Digital I/O

ORION-CNT2-LEMO

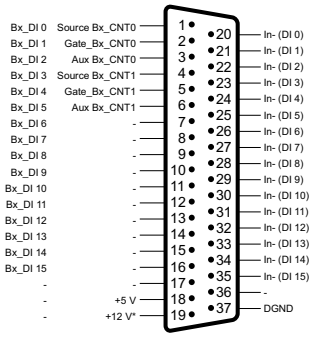
As an option (ORION-CNT2-LEMO) the two counters can be wired to female 7-pin LEMO sockets in parallel for direct connection of encoders or any other counter channel sources.



ORION-BASE-DI-ISO

Some applications require isolated digital lines. This can be achieved with the option ORION-BASE-DI-ISO which isolates all digital inputs from the ORION board but also between each other.

When this option is installed the eight digital I/Os only can be used as inputs!

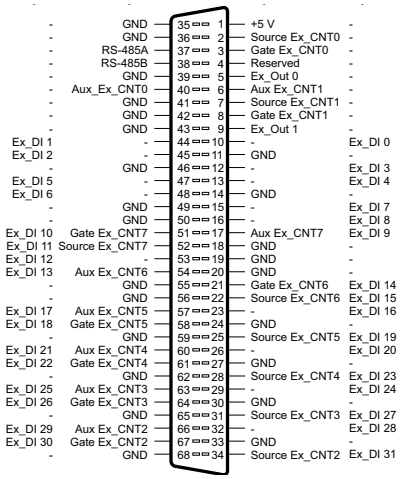


Bx_Digital I/O
Galvanically isolated

Additional Counter Options of DEWE-ORION Boards with 10 Counters (-xx2, -xx3, -xx4 and -xx5 cards)

To reach a total of ten counters these cards include an expansion for another eight counters. Without any option these extra counters are available on a D-Sub-68 jack.

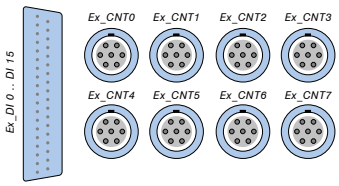
For instruments which are too small for adding extra connectors, e.g. DEWE-211, there is an external connection box ORION-CB-CNT8 available.



Counter Expansion

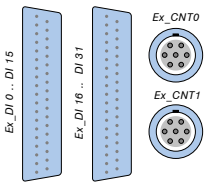
Most instruments accept one of the following options to enable direct sensor connection.

ORION-DIO-PANEL-1



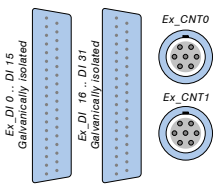
This panel should be used if mainly counter/encoder signals will be measured. All eight counters are wired to 7-pin Lemo connectors and Digital inputs 0 .. 15 are connected to a D-Sub-37 socket.

ORION-DIO-PANEL-2



All 32 digital inputs are wired to two D-Sub-37 sockets. CNT 0 and CNT 1 are connected to 7-pin Lemo sockets. Therefore this panel is suitable if multiple digital TTL inputs are requested.

ORION-DIO-PANEL-3



This option is similar to PANEL-2 except the digital inputs are galvanically isolated. The two counter inputs are not isolated.

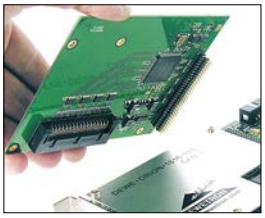
DEWE-ORION Series

- *Simultaneous sampling*
- *Separate A/D converter channel*
- *35 different models*
- *Synchronized analog, digital, counter and CAN inputs*
- *Clock output for synchronizing external devices, e.g. video cameras*
- *Sync option for synchronizing multiple systems or synchronize to IRIG or GPS*

Selection Guide

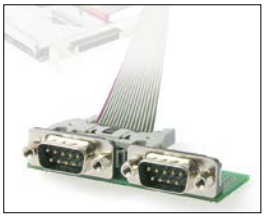
Model overview	Analog input channels	Input ranges	Resolution	Max. sampling rate / channel	Type of ADC	Digital input channels	Digital I/O	Counter / Encoder	CAN
DEWE-ORION-0824-20x series	8	Voltage: ±0.1 V, ±0.5 V, ±2 V, ±10 V IEPE®: 4 mA / 8 mA excitation	24 bit	204.8 kS/s	delta-sigma with antialising filter	up to 40	8	up to 10 (advanced)	up to 2
DEWE-ORION-0816-100x series	8	Voltage: ±1.25 V, ±2.5 V, ±5 V, ±10 V	16 bit	1 MS/s	successive approximation (SAR)	up to 40	8	up to 10	up to 2
DEWE-ORION-0816-5Mx series	8	Voltage: ±5 V	16 bit	5 MS/s	successive approximation (SAR)	up to 8	8	2 (advanced)	up to 2
DEWE-ORION-0816-10Mx series	8	Voltage: ±5 V	16 bit	10 MS/s	successive approximation (SAR)	up to 8	8	2 (advanced)	up to 2
DEWE-ORION-1624-20x series	16	Voltage: ±10 V	24 bit	204.8 kS/s	delta-sigma with antialising filter	up to 40	8	up to 10 (advanced)	up to 2
DEWE-ORION-1622-10x series	16	Voltage: ±10 V	22 bit	102.4 kS/s	delta-sigma with antialising filter	up to 40	8	up to 10 (advanced)	up to 2
DEWE-ORION-1616-10x series	16	Voltage: ±1.25 V, ±2.5 V, ±5 V, ±10 V	16 bit	100 kS/s	successive approximation (SAR)	up to 40	8	up to 10	up to 2
DEWE-ORION-1616-100x series	16	Voltage: ±1.25 V, ±2.5 V, ±5 V, ±10 V	16 bit	1 MS/s	successive approximation (SAR)	up to 40	8	up to 10	up to 2
DEWE-ORION-3222-10x series	32	Voltage: ±10 V	22 bit	102.4 kS/s	delta-sigma with antialising filter	up to 24	8	2 (advanced)	up to 2
DEWE-ORION-3216-10x series	32	Voltage: ±1.25 V, ±2.5 V, ±5 V, ±10 V	16 bit	100 kS/s	successive approximation (SAR)	up to 24	8	2	up to 2

Options and Accessories

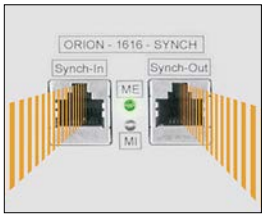


DEWE-ORION-xxxx with additional digital inputs

DEWE-CAN-CAB2 option Connects the built in Lemo conn. with your D-Subs



ORION-CAN-PANEL 9-pin D-Sub connectors for CAN channel 0 and 1



ORION-xxxx-SYNC option Synchronization with PC based instruments

Built-in digital I/O and counter/encoder connectors (option)

DEWE-ORION-0824-20X

- *8 simultaneous sampled channels*
- *Voltage or IEPE® mode (4 mA or 8 mA source)*
- *204.8 kS/s per channel*
- *24 bit resolution*
- *4 input ranges (from ±1.25 V to ±10 V)*
- *Synchronous digital inputs*
- *8 digital I/Os, e.g. alarm output*
- *32 bit synchronous counter/encoder*
- *2 synchronous CAN interfaces*

Model Overview

Model	Analog input channels	Max. sampling rate / channel	Digital input channels	Digital I/O	Ext. Clock	Ext. Trigger	Counter Encoder TTL	Counter Encoder ADJ	CAN
DEWE-ORION-0824-200	8	204.8 kS/s	2 (8*)	8	-	1	-	2	-
DEWE-ORION-0824-201	8	204.8 kS/s	2 (8*)	8	-	1	-	2	2
DEWE-ORION-0824-202	8	204.8 kS/s	10 (40*)	8	-	1	8	2	-
DEWE-ORION-0824-203	8	204.8 kS/s	10 (40*)	8	-	1	8	2	2
DEWE-ORION-0824-204	8	204.8 kS/s	10 (40*)	8	-	1	-	2+8	-
DEWE-ORION-0824-205	8	204.8 kS/s	10 (40*)	8	-	1	-	2+8	2

* Without using counter inputs

Analog Input Specifications

Analog input			
Channel characteristics			
Number of channels		8, simultaneously sampled	
Input configuration		Symmetric, differential or single ended	
Resolution		24 bit, nominal	
Type of ADC		Delta-sigma	
Sampling rate		204.8 kS/s per channel	
Data throughput		1.6 MS/s	
Oversampling, for sample rate (fs)			
	Frequency accuracy	±35 ppm	
	1 kS/s ≤ f_s ≤ 51.2 kS/s	256 f_s	
	51.2 kS/s < f_s ≤ 102.4 kS/s	128 f_s	
	102.4 kS/s < f_s ≤ 204.8 kS/s	64 f_s	
Input signal range		±10 V, ±2 V, ±0.5 V, ±0.1 V peak	
FIFO buffer size		4096 samples	
Data transfers		DMA	
Transfer characteristics			
DC accuracy		% of reading	% of range
Range	±10 V	±0.05 %	± 0.01 %
	±2 V	±0.05 %	± 0.012 %
	±0.5 V	±0.05 %	± 0.02 %
	±0.1 V	±0.05 %	± 0.06 %
Gain drift		±15 ppm/K	
Amplifier characteristics			
Input impedance (ground referenced)			
	Positive input to negative input	1 MΩ each with 60 pF to GND	
	Positive input to GND	7.8 MΩ in parallel with 60 pF	
	Negative input to GND	10 MΩ in parallel with 60 pF	
Overvoltage protection			
	Positive input	±30 V	
	Negative input	±30 V	

Common mode rejection (CMR)				
Range	±10 V	±2 V	±0.5V	±0.1 V
f_{in} < 1 kHz	> 60 dB, typ.	> 74 dB, typ.	> 86 dB, typ.	> 100 dB, typ.
Flatness digital filter				
1 kS/s ≤ f_s ≤ 51.2 kS/s	-0.035 dB to +0.01 dB, DC to 0.475 f_s			
51.2 kS/s < f_s ≤ 102.4 kS/s	-0.035 dB to +0.01 dB, DC to 0.45 f_s			
102.4 kS/s < f_s ≤ 204.8 kS/s	-0.035 dB to +0.01 dB, DC to 0.246 f_s			
-3 dB bandwidth digital filter				
1 kS/s ≤ f_s ≤ 51.2 kS/s	0.494 f_s			
51.2 kS/s < f_s ≤ 102.4 kS/s	0.49 f_s			
102.4 kS/s < f_s ≤ 204.8 kS/s	0.38 f_s			
Analog bandwidth				
Range	±10 V	±2 V	±0.5V	±0.1 V
-1 dB Bandwidth	225 kHz	225 kHz	200 kHz	80 kHz
-3 dB Bandwidth	360 kHz	360 kHz	320 kHz	150 kHz
Maximum working voltage				
Channel-to-ground, channel-to-channel	10 V, installation category I			
Max. working voltage refers to the signal voltage plus common-mode voltage.				

Dynamic Characteristics

Dynamic characteristics				
Alias-free bandwidth (passband)				
1 kS/s ≤ f_s ≤ 51.2 kS/s	DC (0 Hz) to 0.42 f_s			
51.2 kS/s < f_s ≤ 102.4 kS/s	DC (0 Hz) to 0.32 f_s			
102.4 kS/s < f_s ≤ 200 kS/s	DC (0 Hz) to 0.22 f_s			
Alias rejection				
1 kS/s ≤ f_s ≤ 51.2 kS/s	-95 dB			
51.2 kS/s < f_s ≤ 102.4 kS/s	-92 dB			
102.4 kS/s < f_s ≤ 200 kS/s	-97 dB			
Signal to noise				
Range	±10 V	±2 V	±0.5 V	±0.1 V
1 kS/s ≤ f_s ≤ 51.2 kS/s	108 dB	107 dB	104 dB	93 dB
51.2 kS/s < f_s ≤ 102.4 kS/s	105 dB	104 dB	101 dB	90 dB
102.4 kS/s < f_s ≤ 200 kS/s	78 dB	78 dB	78 dB	78 dB
Spurious free dynamic range				
Range	±10 V	±2 V	±0.5 V	±0.1 V
1kS to 51.2 kS/s	140 dB	140 dB	138 dB	125 dB
51.2kS to 102.4 kS/s	137 dB	133 dB	132 dB	122 dB
102.4kS to 200 kS/s	103 dB*	103 dB*	103 dB**	103 dB***
THD (1kS/s <= f_s <= 102.4 kS/s)				
Range	±10 V	±2 V	±0.5 V	±0.1 V
0 dB_{FS} input	< -92 dB	< -96 dB	< -96 dB	< -88 dB
-20 dB_{FS} input	< -100 dB	< - 97 dB	< - 88 dB	< - 78 dB
-60 dB_{FS} input	< -60 dB	< -60 dB	< -60 dB	< -55 dB
Crosstalk (channel separation)				
f_{in} 0 to 10 kHz	120 dB			
f_{in} 10 to 50 kHz	105 dB			
Typical Interchannel gain mismatch	±0.002 dB			
Typical filter delay through ADC				
1 kS/s ≤ f_s ≤ 51.2 kS/s	12 / f_s			
51.2 kS/s < f_s ≤ 102.4 kS/s	9 / f_s			
102.4 kS/s < f_s ≤ 200 kS/s	5 / f_s			
Inter channel phase mismatch	0.02° * f_{in} (kHz) + 0.08°			

* *133 dB below 0.22*f_s*
** *132 dB below 0.22*f_s*
*** *119 dB below 0.22*f_s*

Digital and Counter Input

Digital and Counter input	
Counter resolution	32 bit
Counter time base	80 MHz
Time base accuracy	35 ppm
Maximum input frequency	40 MHz
Input signal characteristic main board	
Compatibility	TTL/CMOS
Configuration	Pull-up with 100 kOhm
Input low level	-0.7 V to 0.8 V
Input high level	2 V to 5 V
Input low current	< -50 µA
Input high current	< 10 µA
Input capacitance	< 5 pF
Overvoltage protection (DI 0 to DI 7)	±25 V continuous
Overvoltage protection (DI 8 to DI 15)	-1 to 6 V
Input signal characteristic CLK and Trigger	
Compatibility	TTL Schmitt trigger
Configuration	Pull-up with 100 kOhm
Input low level	-0.7 V to 2 V
Input high level	3 V to 5 V
Input low current	< -50 µA
Input high current	< 10 µA
Input capacitance	< 5 pF
Overvoltage protection	-1 to 6 V
Input signal characteristic expansion board with TTL input (used on ORION-0824-202 and -203)	
Compatibility	TTL/CMOS
Configuration	Pull-up with 100 kOhm
Input low level	-0.7 V to 0.8 V
Input high level	2 V to 5 V
Input low current	< -50 µA
Input high current	< 10 µA
Input capacitance	< 5 pF
Overvoltage protection	±25 V continuous
Input signal characteristic expansion board with adjustable input (used on ORION-0824-204 and -205)	
Compatibility	Adjustable trigger levels
Configuration	Symmetric differential
Input coupling	DC / AC (1 Hz)
Input impedance (ground referenced)	1 MOhm / 5 pF
Bandwith (-3dB)	5 MHz
Trigger adjustment range	0 to 40 V
Trigger resolution	40 mV
Trigger level accuracy	±100 mV ±1% of trigger level
Common voltage range	-35 to 50V
Common mode rejection ratio	>40 dB
Overvoltage protection	±100 V continuous
Max. DC level @AC coupling	±50 V continuous
Input signal characteristic with isolated inputs (optional external cards)	
Compatibility	CMOS
Configuration	Isolated input
Input low level	U_{IN} < 1.8 V
Input high level	U_{IN} > 3.2 V
Input high current @ 5 V U_{IN}	< 3.5 mA
Input high current @ 30 V U_{IN}	< 7 mA
Propagation delay	< 160 nsec
Bandwidth	3 MHz
Overvoltage protection	35 V continuous (65 V peak)
Isolation voltage (channel to channel)	100 V
Isolation voltage (input to output)	250 V

Digital and Clock Divider Output

Digital and clock divider out	
Compatibility	TTL/CMOS
Characteristic	
Low voltage level	< 0.4 V @ 4 mA load
High voltage level	> 3 V @ 4 mA load
Output current	
Sink (low level)	-20 mA
Source (high level)	20 mA
Output impedance	50 Ohm

CAN Interface

CAN interface	
Specification	CAN 2.0B
Physical layer	High speed
Listen only mode	Supported
Galvanic isolation	Not isolated
Bus pin fault protection	±36 V
ESD protection	12 kV (HBM)
CAN tranceiver	SNHVD235
PCI data transfere mode	DMA with SW pooling

Power Requirements

ORION Type	I_{12V} [mA]	I_{5V} [mA]	$I_{3.3V}$ [mA]	$P_{tot.}$ [Watt]
ORION-0824-200	225	1010	---	7.8
ORION-0824-201	225	1080	---	8.1
ORION-0824-202	225	1130	---	8.4
ORION-0824-203	225	1200	---	8.7
ORION-0824-204	225	1330	---	9.4
ORION-0824-205	225	1400	---	9.7

General Specifications

General Specifications	
Environmental	
Operating temperature	0 to 50 °C
Storage temperature	-20 to 70 °C
Relative humidity	10 to 90%, non condensing
Maximum altitude	2000 m
Pollution degree (indoor use only)	2
Physical	
Dimensions (not including connectors)	17.5 x 10.7 cm (6.9 x 4.2 in.)
Analog input connector (main board)	68-pin SCSI male (AMP 174341-5)
Counter input connector (expansion)	68-pin SCSI male (Honda PCS-68LMD)
CAN input connector SUBD Lemo	 2 x D-Sub 9-pin male 7-pin Lemo connector female (Type: EPG.0B.307.HLN)

DEWE-ORION-0816-100X

- *8 simultaneous sampled channels*
- *1 MS/s per channel*
- *16 bit resolution*
- *4 input ranges (from ±1.25 V to ±10 V)*
- *Synchronous digital inputs*
- *8 digital I/Os, e.g. alarm output*
- *32 bit synchronous counter/encoder*
- *2 synchronous CAN interfaces*

Model Overview

Model	Analog input channels	Max. sampling rate / channel	Digital input channels	Digital I/O	Ext. Clock	Ext. Trigger	Counter Encoder	CAN
DEWE-ORION-0816-1000	8	1000 kHz	2 (8)*	8	1	1	2	-
DEWE-ORION-0816-1001	8	1000 kHz	2 (8)*	8	1	1	2	2
DEWE-ORION-0816-1002	8	1000 kHz	10 (40)*	8	1	1	10	-
DEWE-ORION-0816-1003	8	1000 kHz	10 (40)*	8	1	1	10	2
DEWE-ORION-0816-1004	8	1000 kHz	10 (40)	8	1	1	10	-
DEWE-ORION-0816-1005	8	1000 kHz	10 (40)	8	1	1	10	2

* Without using counter inputs

Analog Input Specifications

Analog input		
Channel characteristics		
Number of channels	8 simultaneously sampled	
Input configuration	single ended with remote sense	
Resolution	16 bit	
Effectiv number of bits	14.3	
Type of ADC	Successive approximation (SAR)	
Sampling rate	1 S/sec to 1 MS/sec per channel	
Sampling rate accuracy	35 ppm	
Input amplifier characteristics		
Input ranges	±1.25, ±2.5, ±5 or ±10 V	
Typical analog bandwidth (-3 dB)	900 kHz	
Input impedance	10 MΩ parallel (3.9 kΩ + 10 pF)	
Overvoltage protection	±30 V	
Common mode rejection ratio (CMRR) of AISense	> 54 dB, f_{in} < 1kHz	
Channel separation (cross talk)	> 90 dB @ f_{in} 1 kHz	
Transfer characteristics		
DC accuracy		
Range	% of reading	% of range
±10 V	±0.02 %	±0.0115 %
±5 V	±0.02 %	±0.013 %
±2.5 V	±0.02 %	±0.016 %
±1.25 V	±0.02 %	±0.022 %
Gain drift (typ)	±8 ppm/K	
Offset drift (typ)	±5 ppm/K of Range	
Dynamic characteristics		
Signal to noise	89 dB	
THD (f_{in} = 1kHz) 0 dB_{FS} input	< -90 dB	
THD (f_{in} = 1kHz) -20 dB_{FS} input	< -93 dB	
Typical interchannel gain mismatch	±0.015 %	
Inter channel phase mismatch (f_{in} < 500kHz)	0.006° * f_{in} (kHz) + 0.08°	
Maximum working voltage		
Channel-to-ground	10 V, installation category I	
Channel-to-channel	10 V, installation category I	

Digital and Counter Input

Digital and Counter input	
Counter resolution	32 bit
Counter time base	80 MHz
Time base accuracy	35 ppm
Maximum input frequency	40 MHz
Input signal characteristic main board	
Compatibility	TTL/CMOS
Configuration	Pull-up with 100 kOhm
Input low level	-0.7 V to 0.8 V
Input high level	2 V to 5 V
Input low current	< -50 µA
Input high current	< 10 µA
Input capacitance	< 5 pF
Overvoltage protection (DI 0 to DI 15)	-1 to 6 V
Input signal characteristic CLK and Trigger	
Compatibility	TTL Schmitt trigger
Configuration	Pull-up with 100 kOhm
Input low level	-0.7 V to 2 V
Input high level	3 V to 5 V
Input low current	< -50 µA
Input high current	< 10 µA
Input capacitance	< 5 pF
Overvoltage protection	-1 to 6 V
Input signal characteristic expansion board with TTL input (used on ORION-0816-1002 and -1003)	
Compatibility	TTL/CMOS
Configuration	Pull-up with 100 kOhm
Input low level	-0.7 V to 0.8 V
Input high level	2 V to 5 V
Input low current	< -50 µA
Input high current	< 10 µA
Input capacitance	< 5 pF
Overvoltage protection	±25 V continuous
Input signal characteristic expansion board with adjustable input (used on ORION-0816-1004 and -1005)	
Compatibility	Adjustable trigger levels
Configuration	Symmetric differential
Input coupling	DC / AC (1 Hz)
Input impedance (ground referenced)	1 MOhm / 5 pF
Bandwith (-3dB)	5 MHz
Trigger adjustment range	0 to 40 V
Trigger resolution	40 mV
Trigger level accuracy	±100 mV ±1% of trigger level
Common voltage range	-35 to 50V
Common mode rejection ratio	>40 dB
Overvoltage protection	±100 V continuous
Max. DC level @AC coupling	±50 V continuous
Input signal characteristic with isolated inputs (optional external cards)	
Compatibility	CMOS
Configuration	Isolated input
Input low level	U_{IN} < 1.8 V
Input high level	U_{IN} > 3.2 V
Input high current @ 5 V U_{IN}	< 3.5 mA
Input high current @ 30 V U_{IN}	< 7 mA
Propagation delay	< 160 nsec
Bandwidth	3 MHz
Overvoltage protection	35 V continuous (65 V peak)
Isolation voltage (channel to channel)	100 V
Isolation voltage (input to output)	250 V

Digital and Clock Divider Output

Digital and clock divider out	
Compatibility	TTL/CMOS
Characteristic	
Low voltage level	< 0.4 V @ 4 mA load
High voltage level	> 3 V @ 4 mA load
Output current	
Sink (low level)	-20 mA
Source (high level)	20 mA
Output impedance	50 Ohm

CAN Interface

CAN interface	
Specification	CAN 2.0B
Physical layer	High speed
Listen only mode	Supported
Galvanic isolation	Not isolated
Bus pin fault protection	±36 V
ESD protection	12 kV (HBM)
CAN tranceiver	SNHVD235
PCI data transfere mode	DMA with SW pooling

Power Requirements

ORION Type	I_{12V} [mA]	I_{5V} [mA]	$I_{3.3V}$ [mA]	$P_{tot.}$ [Watt]
ORION-0816-1000	---	710	240	4,3
ORION-0816-1001	---	780	240	4,7
ORION-0816-1002	---	730	340	4,8
ORION-0816-1003	---	800	340	5,1
ORION-0816-1004	---	840	430	5,6
ORION-0816-1005	---	910	430	6

General Specifications

General Specifications	
Interface	
PCI	Rev. 3.0
Transfer Mode	DMA/Scatter-Gather
Transfer Speed	40 Mbyte/sec max.
Environmental	
Operating temperature	0 to 50 °C
Storage temperature	-20 to 70 °C
Relative humidity	10 to 90%, non condensing
Maximum altitude	2000 m
Pollution degree (indoor use only)	2
Physical	
Dimensions (not including connectors)	17.5 x 10.7 cm (6.9 x 4.2 in.)
Analog input connector (main board)	68-pin SCSI male (AMP 174341-5)
Analog input connector (expansion)	68-pin SCSI male (Honda PCS-68LMD)
Counter input connector (expansion)	68-pin SCSI male (Honda PCS-68LMD)
CAN input connector SUBD Lemo	 2 x D-Sub 9-pin male 7-pin Lemo connector female (Type: EPG.0B.307.HLN)

DEWE-ORION-0816-5Mx and DEWE-ORION-0816-10Mx

- *8 simultaneous sampled channels*
- *5 MS/s or 10 MS/s per channel*
- *16 bit resolution*
- *Synchronous digital inputs*
- *8 digital I/Os, e.g. alarm output*
- *32 bit synchronous counter/encoder*
- *2 synchronous CAN interfaces*

Model Overview

Model	Analog input channels	Max. sampling rate / channel	Digital input channels	Digital I/O	Ext. Clock	Ext. Trigger	Counter Encoder	CAN
DEWE-ORION-0816-5M0	8	5000 kHz	2 (8)*	8	1	1	2	-
DEWE-ORION-0816-5M1	8	5000 kHz	2 (8)*	8	1	1	2	2
DEWE-ORION-0816-10M0	8	10000 kHz**	2 (8)*	8	1	1	2	-
DEWE-ORION-0816-10M1	8	10000 kHz**	2 (8)*	8	1	1	2	2

* Without using counter inputs **requires DEWE-2600

Analog Input Specifications

Analog input		
Channel characteristics		
Number of channels		8 simultaneously sampled
Input configuration		differential
Resolution		16 bit
Effectiv number of bits		14.3
Type of ADC		Successive approximation (SAR)
Sampling rate		100 S/sec to 5 MS/sec or 10 MS/sec per channel
Sampling rate accuracy		35 ppm
Input amplifier characteristics		
Input range		±5 V
Maximum common mode range		±5 V
Typical analog bandwidth (-3 dB)		>6 MHz
Input impedance		10 MΩ parallel (1 kΩ + 15 pF)
Overvoltage protection		±30 V
Common mode rejection ratio (CMRR) of AISense		typically 70 dB @ 100 kHz
Channel separation (cross talk)		>80 dB @ 100 kHz; >70 dB @ 1 MHz
Transfer characteristics		
Accuracy	DC to 10 kHz	±0.02 % of reading ±0.01 % of range
	>10 kHz to 100 kHz	±0.1 % of reading ±0.01 % of range
	>100 kHz to 300 kHz	±0.3 % of reading ±0.01 % of range
Linearity		<0.005 %
Gain drift (typ)		±8 ppm/K
Offset drift (typ)		±5 ppm/K of Range
Dynamic characteristics		
Signal to noise		88 dB
THD (f_{in} = 20kHz) 0 dB_{FS} input		100 dB
THD (f_{in} = 1kHz) -20 dB_{FS} input		90 dB
Spuriouse free dynamic range (SFDR)		100 dB
Typical interchannel gain mismatch		<0.005 %
Inter channel phase mismatch		<1 ns (0.04° @ 100 kHz) between channels on one board <5 ns (0.2° @ 100 kHz) between two boards in one system
Maximum working voltage		
Channel-to-ground		5 V
Channel-to-channel		5 V

Digital and Counter Input

Digital and Counter input	
Counter resolution	32 bit
Counter time base	80 MHz
Time base accuracy	35 ppm
Maximum input frequency	40 MHz
Input signal characteristic DIO 0 .. 7 (counter input)	
Compatibility	Adjustable trigger levels
Configuration	Symmetric differential
Input coupling	DC / AC (1 Hz)
Input impedance (ground referenced)	1 MOhm / 5 pF
Bandwith (-3 dB)	5 MHz
Trigger adjustment range	0 to 40 V
Trigger resolution	40 mV
Trigger level accuracy	±100 mV ±1% of trigger level
Common voltage range	-35 to 50V
Common mode rejection ratio	>40 dB
Overvoltage protection	±100 V continuous
Max. DC level @AC coupling	±50 V continuous
Input signal characteristic DIO 8 .. 15	
Compatibility	TTL/CMOS
Configuration	Pull-up with 100 kOhm
Input low level	-0.7 V to 0.8 V
Input high level	2 V to 5 V
Input low current	< -50 µA
Input high current	< 10 µA
Input capacitance	< 5 pF
Overvoltage protection (DI 0 to DI 15)	-1 to 6 V
Input signal characteristic CLK and Trigger	
Compatibility	TTL Schmitt trigger
Configuration	Pull-up with 100 kOhm
Input low level	-0.7 V to 2 V
Input high level	3 V to 5 V
Input low current	< -50 µA
Input high current	< 10 µA
Input capacitance	< 5 pF
Overvoltage protection	-1 to 6 V
Input signal characteristic with isolated inputs (optional external cards)	
Compatibility	CMOS
Configuration	Isolated input
Input low level	U_{IN} < 1.8 V
Input high level	U_{IN} > 3.2 V
Input high current @ 5 V U_{IN}	< 3.5 mA
Input high current @ 30 V U_{IN}	< 7 mA
Propagation delay	< 160 nsec
Bandwidth	3 MHz
Overvoltage protection	35 V continuous (65 V peak)
Isolation voltage (channel to channel)	100 V
Isolation voltage (input to output)	250 V

Digital and Clock Divider Output

Digital and clock divider out	
Compatibility	TTL/CMOS
Characteristic	
Low voltage level	< 0.4 V @ 4 mA load
High voltage level	> 3 V @ 4 mA load
Output current	
Sink (low level)	-20 mA
Source (high level)	20 mA
Output impedance	50 Ohm

CAN Interface

CAN interface	
Specification	CAN 2.0B
Physical layer	High speed
Listen only mode	Supported
Galvanic isolation	Not isolated
Bus pin fault protection	±36 V
ESD protection	12 kV (HBM)
CAN tranceiver	SNHVD235
PCI data transfere mode	DMA with SW pooling

Power Requirements

I_{12V} [mA]	I_{5V} [mA]	$I_{3.3V}$ [mA]	$P_{tot.}$ [Watt]
---	750	1400	8.4
---	750	1400	8.4

General Specifications

General Specifications	
Interface	
PCI	Rev. 3.0
Transfer Mode	DMA/Scatter-Gather
Transfer Speed	80 MB/sec @ 33 MHz PCI bus 160 MB/sec @ 66 MHz PCI bus
Environmental	
Operating temperature	0 to 50 °C
Storage temperature	-20 to 70 °C
Relative humidity	10 to 90%, non condensing
Maximum altitude	2000 m
Pollution degree (indoor use only)	2
Physical	
Dimensions (not including connectors)	17.5 x 10.7 cm (6.9 x 4.2 in.)
Analog input connector (main board)	68-pin SCSI male (AMP 174341-5)
Analog input connector (expansion)	68-pin SCSI male (Honda PCS-68LMD)
Counter input connector (expansion)	68-pin SCSI male (Honda PCS-68LMD)
CAN input connector SUBD Lemo	 2 x D-Sub 9-pin male 7-pin Lemo connector female (Type: EPG.0B.307.HLN)

DEWE-ORION-1624-20X

- *16 simultaneous sampled channels*
- *204.8 kS/s per channel*
- *24 bit resolution*
- *4 input ranges (from ±1.25 V to ±10 V)*
- *Synchronous digital inputs*
- *8 digital I/Os, e.g. alarm output*
- *32 bit synchronous counter/encoder*
- *2 synchronous CAN interfaces*

Model Overview

Model	Analog input channels	Max. sampling rate / channel	Digital input channels	Digital I/O	Ext. Clock	Ext. Trigger	Counter Encoder TTL	Counter Encoder ADJ	CAN
DEWE-ORION-1624-200	16	204.8 kS/s	2 (8*)	8	-	1	2	-	-
DEWE-ORION-1624-201	16	204.8 kS/s	2 (8*)	8	-	1	2	-	2
DEWE-ORION-1624-202	16	204.8 kS/s	10 (40*)	8	-	1	2 + 8	-	-
DEWE-ORION-1624-203	16	204.8 kS/s	10 (40*)	8	-	1	2 + 8	-	2
DEWE-ORION-1624-204	16	204.8 kS/s	10 (40*)	8	-	1	2	8	-
DEWE-ORION-1624-205	16	204.8 kS/s	10 (40*)	8	-	1	2	8	2

* Without using counter inputs

Analog Input Specifications

Analog input		
Channel characteristics		
Number of channels	16, simultaneously sampled	
Input configuration	Symmetric, differential	
Resolution	24 bit, nominal	
Type of ADC	Delta-sigma	
Sampling rate	204.8 kS/s per channel	
Data throughput	3.2 MS/s	
Oversampling, for sample rate (fs)		
Frequency accuracy	±35 ppm	
1 kS/s ≤ f_s ≤ 51.2 kS/s	256 f_s	
51.2 kS/s < f_s ≤ 102.4 kS/s	128 f_s	
102.4 kS/s < f_s ≤ 204.8 kS/s	64 f_s	
Input signal range	±10 V peak	
FIFO buffer size	4096 samples	
Data transfers	DMA	
Transfer characteristics		
DC accuracy; range ±10 V	% of reading	% of range
1 kS/s ≤ f_s ≤ 51.2 kS/s	±0.058 %	± 0.005 %
51.2 kS/s < f_s ≤ 102.4 kS/s	±0.058 %	± 0.007 %
102.4 kS/s < f_s ≤ 204.8 kS/s	±0.058 %	± 0.015 %
Gain drift	±15 ppm/K	
Amplifier characteristics		
Input impedance (ground referenced)		
Positive input	10 MΩ in parallel with 60 pF	
Negative input	10 MΩ in parallel with 60 pF	
Overvoltage protection		
Positive input	±30 V	
Negative input	±30 V	

Common mode rejection ratio (CMRR)	
f_{in} < 1 kHz	> 60 dB, typ.
Flatness digital filter	
1 kS/s ≤ f_s ≤ 51.2 kS/s	-0.035 dB to +0.01 dB, DC to 0.475 f_s
51.2 kS/s < f_s ≤ 102.4 kS/s	-0.035 dB to +0.01 dB, DC to 0.45 f_s
102.4 kS/s < f_s ≤ 204.8 kS/s	-0.035 dB to +0.01 dB, DC to 0.246 f_s
-3 dB bandwidth digital filter	
1 kS/s ≤ f_s ≤ 51.2 kS/s	0.494 f_s
51.2 kS/s < f_s ≤ 102.4 kS/s	0.49 f_s
102.4 kS/s < f_s ≤ 204.8 kS/s	0.38 f_s
Analog bandwidth	
-1 dB bandwidth	200 kHz
-3 dB bandwidth	320 kHz
Maximum working voltage	
Channel-to-ground, channel-to-channel	10 V, installation category I
Max. working voltage refers to the signal voltage plus common-mode voltage.	

Dynamic Characteristics

Dynamic characteristics	
Alias-free bandwidth (passband)	
1 kS/s ≤ f_s ≤ 51.2 kS/s	DC (0 Hz) to 0.42 f_s
51.2 kS/s < f_s ≤ 102.4 kS/s	DC (0 Hz) to 0.32 f_s
102.4 kS/s < f_s ≤ 200 kS/s	DC (0 Hz) to 0.22 f_s
Alias rejection	
1 kS/s ≤ f_s ≤ 51.2 kS/s	-95 dB
51.2 kS/s < f_s ≤ 102.4 kS/s	-92 dB
102.4 kS/s < f_s ≤ 200 kS/s	-97 dB
Signal to noise	
1 kS/s ≤ f_s ≤ 51.2 kS/s	108 dB
51.2 kS/s < f_s ≤ 102.4 kS/s	105 dB
102.4 kS/s < f_s ≤ 200 kS/s	80 dB
Spurious free dynamic range	
1kS to 51.2 kS/s	140 dB
51.2kS to 102.4 kS/s	137 dB
102.4kS to 200 kS/s	106 dB
THD (1kS/s <= f_s <= 102.4 kS/s)	0 dB_{FS} input < -90 dB -20 dB_{FS} input < -100 dB -60 dB_{FS} input < -60 dB
Crosstalk (channel separation)	
f_{in} 0 to 10 kHz	120 dB
f_{in} 10 to 50 kHz	105 dB
Typical interchannel gain mismatch	±0.002 dB
Filter delay through ADC	
1 kS/s ≤ f_s ≤ 51.2 kS/s	12 / f_s
51.2 kS/s < f_s ≤ 102.4 kS/s	9 / f_s
102.4 kS/s < f_s ≤ 200 kS/s	5 / f_s
Inter channel phase mismatch	0.01° * f_{in} (kHz)

Digital and Counter Input

Digital and Counter input	
Counter resolution	32 bit
Counter time base	80 MHz
Time base accuracy	35 ppm
Maximum input frequency	40 MHz
Input signal characteristic main board	
Compatibility	TTL/CMOS
Configuration	Pull-up with 100 kOhm
Input low level	-0.7 V to 0.8 V
Input high level	2 V to 5 V
Input low current	< -50 µA
Input high current	< 10 µA
Input capacitance	< 5 pF
Overvoltage protection (DI 0 to DI 7)	±25 V continuous
Overvoltage protection (DI 8 to DI 15)	-1 to 6 V
Input signal characteristic CLK and Trigger	
Compatibility	TTL Schmitt trigger
Configuration	Pull-up with 100 kOhm
Input low level	-0.7 V to 2 V
Input high level	3 V to 5 V
Input low current	< -50 µA
Input high current	< 10 µA
Input capacitance	< 5 pF
Overvoltage protection	-1 to 6 V
Input signal characteristic expansion board with TTL input (used on ORION-1624-202 and -203)	
Compatibility	TTL/CMOS
Configuration	Pull-up with 100 kOhm
Input low level	-0.7 V to 0.8 V
Input high level	2 V to 5 V
Input low current	< -50 µA
Input high current	< 10 µA
Input capacitance	< 5 pF
Overvoltage protection	±25 V continuous
Input signal characteristic expansion board with adjustable input (used on ORION-1624-204 and -205)	
Compatibility	Adjustable trigger levels
Configuration	Symmetric differential
Input coupling	DC / AC (1 Hz)
Input impedance (ground referenced)	1 MOhm / 5 pF
Bandwith (-3dB)	5 MHz
Trigger adjustment range	0 to 40 V
Trigger resolution	40 mV
Trigger level accuracy	±100 mV ±1% of trigger level
Common voltage range	-35 to 50V
Common mode rejection ratio	>40 dB
Overvoltage protection	±100 V continuous
Max. DC level @AC coupling	±50 V continuous
Input signal characteristic with isolated inputs (optional external cards)	
Compatibility	CMOS
Configuration	Isolated input
Input low level	U_{IN} < 1.8 V
Input high level	U_{IN} > 3.2 V
Input high current @ 5 V U_{IN}	< 3.5 mA
Input high current @ 30 V U_{IN}	< 7 mA
Propagation delay	< 160 nsec
Bandwidth	3 MHz
Overvoltage protection	35 V continuous (65 V peak)
Isolation voltage (channel to channel)	100 V
Isolation voltage (input to output)	250 V

Digital and Clock Divider Output

Digital and clock divider out	
Compatibility	TTL/CMOS
Characteristic	
Low voltage level	< 0.4 V @ 4 mA load
High voltage level	> 3 V @ 4 mA load
Output current	
Sink (low level)	-20 mA
Source (high level)	20 mA
Output impedance	50 Ohm

CAN Interface

CAN interface	
Specification	CAN 2.0B
Physical layer	High speed
Listen only mode	Supported
Galvanic isolation	Not isolated
Bus pin fault protection	±36 V
ESD protection	12 kV (HBM)
CAN tranceiver	SNHVD235
PCI data transfere mode	DMA with SW pooling

Power Requirements

ORION Type	I_{12V} [mA]	I_{5V} [mA]	$I_{3.3V}$ [mA]	$P_{tot.}$ [Watt]
ORION-1624-200	---	1300	---	6.5
ORION-1624-201	---	1370	---	6.9
ORION-1624-202	---	1420	---	7.1
ORION-1624-203	---	1490	---	7.5
ORION-1624-204	---	1620	---	8.1
ORION-1624-205	---	1690	---	8.5

General Specifications

General Specifications	
Environmental	
Operating temperature	0 to 50 °C
Storage temperature	-20 to 70 °C
Relative humidity	10 to 90%, non condensing
Maximum altitude	2000 m
Pollution degree (indoor use only)	2
Physical	
Dimensions (not including connectors)	17.5 x 10.7 cm (6.9 x 4.2 in.)
Analog input connector (main board)	68-pin SCSI male (AMP 174341-5)
Counter input connector (expansion)	68-pin SCSI male (Honda PCS-68LMD)
CAN input connector SUBD Lemo	 2 x D-Sub 9-pin male 7-pin Lemo connector female (Type: EPG.0B.307.HLN)

DEWE-ORION-1622-10X

DEWE-ORION-3222-10x

- *16 simultaneous sampled channels*
- *102.4 kS/s per channel*
- *22 bit resolution*
- *Input range ±10 V*
- *Synchronous digital inputs*
- *8 digital I/Os, e.g. alarm output*
- *32 bit synchronous counter/encoder*
- *2 synchronous CAN interfaces*

Model Overview

Model	Analog input channels	Max. sampling rate / channel	Digital input channels	Digital I/O	Ext. Clock	Ext. Trigger	Counter Encoder TTL	Counter Encoder ADJ	CAN
DEWE-ORION-1622-100	16	102.4 kS/s	2 (8*)	8	-	1	2	-	-
DEWE-ORION-1622-101	16	102.4 kS/s	2 (8*)	8	-	1	2	-	2
DEWE-ORION-1622-102	16	102.4 kS/s	10 (40*)	8	-	1	2 + 8	-	-
DEWE-ORION-1622-103	16	102.4 kS/s	10 (40*)	8	-	1	2 + 8	-	2
DEWE-ORION-1622-104	16	102.4 kS/s	10 (40*)	8	-	1	2	8	-
DEWE-ORION-1622-105	16	102.4 kS/s	10 (40*)	8	-	1	2	8	2
DEWE-ORION-3222-100	32	102.4 kS/s	18 (24*)	8	1	1	2	-	-
DEWE-ORION-3222-101	32	102.4 kS/s	18 (24*)	8	1	1	2	-	2

* Without using counter inputs

Analog Input Specifications

Analog input		
Channel characteristics		
Number of channels	16, simultaneously sampled	
Input configuration	Single ended with remote sense	
Resolution	22 bit, nominal	
Type of ADC	Delta-sigma	
Sampling rate	102.4 kS/s per channel	
Data throughput	1.6 MS/s max.	
Oversampling, for sample rate (fs)		
Frequency accuracy	±35 ppm	
100 S/s ≤ f_s ≤ 51.2 kS/s	256 f_s	
51.2 kS/s < f_s ≤ 102.4 kS/s	128 f_s	
Input signal range	±10 Vpeak	
FIFO buffer size	4096 samples	
Data transfers	DMA	
Transfer characteristics		
DC accuracy	% of reading	% of range
±10 V	0.05 %	0.01 %
Gain drift	±15 ppm/K	
Amplifier characteristics		
Input impedance (ground referenced)	10 MΩ in parallel with 60 pF	
Overvoltage protection	±30 V	
Common mode rejection (CMR) with AISense		
f_{in} < 1 kHz	> 60 dB, typ.	

Flatness digital filter	
1 kS/s ≤ f_s ≤ 51.2 kS/s	-0.035 dB to +0.01 dB, DC to 0.475 f_s
51.2 kS/s < f_s ≤ 102.4 kS/s	-0.035 dB to +0.01 dB, DC to 0.45 f_s
-3 dB bandwidth digital filter	
1 kS/s ≤ f_s ≤ 51.2 kS/s	0.494 f_s
51.2 kS/s < f_s ≤ 102.4 kS/s	0.49 f_s
Analog bandwidth	
-1 dB Bandwidth	90 kHz
-3 dB Bandwidth	160 kHz
Maximum working voltage	
Channel-to-ground, channel-to-channel	10 V, installation category I
Max. working voltage refers to the signal voltage plus common-mode voltage.	

Dynamic Characteristics

Dynamic characteristics	
Alias-free bandwidth (passband)	
1 kS/s ≤ f_s ≤ 51.2 kS/s	DC (0 Hz) to 0.42 f_s
51.2 kS/s < f_s ≤ 102.4 kS/s	DC (0 Hz) to 0.32 f_s
Alias rejection	
1 kS/s ≤ f_s ≤ 51.2 kS/s	-95 dB
51.2 kS/s < f_s ≤ 102.4 kS/s	-92 dB
Signal to noise	
1 kS/s ≤ f_s ≤ 51.2 kS/s	102 dB
51.2 kS/s < f_s ≤ 102.4 kS/s	99 dB
Spurious free dynamic range	
1kS to 51.2 kS/s	126 dB
51.2kS to 102.4 kS/s	121 dB
THD (1kS/s <= f_s <= 102.4 kS/s)	0 dB_{FS} input < -90 dB -20 dB_{FS} input < -100 dB -60 dB_{FS} input < -60 dB
Crosstalk (channel separation)	
f_{in} 0 to 10 kHz	105 dB
f_{in} 10 to 50 kHz	90 dB
Typical interchannel gain mismatch	±0.002 dB
Filter delay through ADC	
1 kS/s ≤ f_s ≤ 51.2 kS/s	12 / f_s
51.2 kS/s < f_s ≤ 102.4 kS/s	9 / f_s
Inter channel phase mismatch	0.02° * f_{in} (kHz) + 0.08°

Digital and Counter Input

Digital and Counter input	
Counter resolution	32 bit
Counter time base	80 MHz
Time base accuracy	35 ppm
Maximum input frequency	40 MHz
Input signal characteristic main board	
Compatibility	TTL/CMOS
Configuration	Pull-up with 100 kOhm
Input low level	-0.7 V to 0.8 V
Input high level	2 V to 5 V
Input low current	< -50 µA
Input high current	< 10 µA
Input capacitance	< 5 pF
Overvoltage protection (DI 0 to DI 7)	±25 V continuous
Overvoltage protection (DI 8 to DI 15)	-1 to 6 V
Input signal characteristic CLK and Trigger	
Compatibility	TTL Schmitt trigger
Configuration	Pull-up with 100 kOhm
Input low level	-0.7 V to 2 V
Input high level	3 V to 5 V
Input low current	< -50 µA
Input high current	< 10 µA
Input capacitance	< 5 pF
Overvoltage protection	-1 to 6 V
Input signal characteristic expansion board with TTL input (used on ORION-1622-102 and -103)	
Compatibility	TTL/CMOS
Configuration	Pull-up with 100 kOhm
Input low level	-0.7 V to 0.8 V
Input high level	2 V to 5 V
Input low current	< -50 µA
Input high current	< 10 µA
Input capacitance	< 5 pF
Overvoltage protection	±25 V continuous
Input signal characteristic expansion board with adjustable input (used on ORION-1622.104 and -105)	
Compatibility	Adjustable trigger levels
Configuration	Symmetric differential
Input coupling	DC / AC (1 Hz)
Input impedance (ground referenced)	1 MOhm / 5 pF
Bandwith (-3dB)	5 MHz
Trigger adjustment range	0 to 40 V
Trigger resolution	40 mV
Trigger level accuracy	±100 mV ±1% of trigger level
Common voltage range	-35 to 50V
Common mode rejection ratio	>40 dB
Overvoltage protection	±100 V continuous
Max. DC level @AC coupling	±50 V continuous
Input signal characteristic with isolated inputs (optional external cards)	
Compatibility	CMOS
Configuration	Isolated input
Input low level	U_{IN} < 1.8 V
Input high level	U_{IN} > 3.2 V
Input high current @ 5 V U_{IN}	< 3.5 mA
Input high current @ 30 V U_{IN}	< 7 mA
Propagation delay	< 160 nsec
Bandwidth	3 MHz
Overvoltage protection	35 V continuous (65 V peak)
Isolation voltage (channel to channel)	100 V
Isolation voltage (input to output)	250 V

Digital and Clock Divider Output

Digital and clock divider out	
Compatibility	TTL/CMOS
Characteristic	
Low voltage level	< 0.4 V @ 4 mA load
High voltage level	> 3 V @ 4 mA load
Output current	
Sink (low level)	-20 mA
Source (high level)	20 mA
Output impedance	50 Ohm

CAN Interface

CAN interface	
Specification	CAN 2.0B
Physical layer	High speed
Listen only mode	Supported
Galvanic isolation	Not isolated
Bus pin fault protection	±36 V
ESD protection	12 kV (HBM)
CAN tranceiver	SNHVD235
PCI data transfere mode	DMA with SW pooling

Power Requirements

ORION Type	I_{12V} [mA]	I_{5V} [mA]	$I_{3.3V}$ [mA]	$P_{tot.}$ [Watt]
ORION-1622-100	---	1240	---	6,2
ORION-1622-101	---	1310	---	6,6
ORION-1622-102	---	1360	---	6,8
ORION-1622-103	---	1430	---	7,2
ORION-1622-104	---	1560	---	7,8
ORION-1622-105	---	1630	---	8,2
ORION-3222-100	---	2230	---	11,2
ORION-3222-101	---	2300	---	11,5

General Specifications

General Specifications	
Environmental	
Operating temperature	0 to 50 °C
Storage temperature	-20 to 70 °C
Relative humidity	10 to 90%, non condensing
Maximum altitude	2000 m
Pollution degree (indoor use only)	2
Physical	
Dimensions (not including connectors)	17.5 x 10.7 cm (6.9 x 4.2 in.)
Analog input connector (main board)	68-pin SCSI male (AMP 174341-5)
Analog input connector (expansion)	68-pin SCSI male (Honda PCS-68LMD)
Counter input connector (expansion)	68-pin SCSI male (Honda PCS-68LMD)
CAN input connector SUBD Lemo	 2 x D-Sub 9-pin male 7-pin Lemo connector female (Type: EPG.0B.307.HLN)

DEWE-ORION-1616-10X
DEWE-ORION-3216-10X

- *16 simultaneous sampled channels*
- *100 kS/s per channel*
- *16 bit resolution*
- *4 input ranges (from ±1.25 V to ±10 V)*
- *Synchronous digital inputs*
- *8 digital I/Os, e.g. alarm output*
- *32 bit synchronous counter/encoder*
- *2 synchronous CAN interfaces*

Model Overview

Model	Analog input channels	Max. sampling rate / channel	Digital input channels	Digital I/O	Ext. Clock	Ext. Trigger	Counter Encoder TTL	Counter Encoder ADJ	CAN
DEWE-ORION-1616-100	16	100 kS/s	2 (8*)	8	1	1	2	-	-
DEWE-ORION-1616-101	16	100 kS/s	2 (8*)	8	1	1	2	-	2
DEWE-ORION-1616-102	16	100 kS/s	10 (40*)	8	1	1	2 + 8	-	-
DEWE-ORION-1616-103	16	100 kS/s	10 (40*)	8	1	1	2 + 8	-	2
DEWE-ORION-1616-104	16	100 kS/s	10 (40*)	8	1	1	2	8	-
DEWE-ORION-1616-105	16	100 kS/s	10 (40*)	8	1	1	2	8	2
DEWE-ORION-3216-100	32	100 kS/s	18 (24*)	8	1	1	2	-	-
DEWE-ORION-3216-101	32	100 kS/s	18 (24*)	8	1	1	2	-	2

* Without using counter inputs

Analog Input Specifications

Analog input		
Channel characteristics		
Number of channels	16 (or 32) simultaneously sampled	
Input configuration	Single ended with remote sense	
Resolution	16 bit	
Effectiv number of bits	14.7	
Type of ADC	Successive approximation (SAR)	
Sampling rate	1 to 100 kS/s per channel	
Sampling rate accuracy	35 ppm	
Input amplifier characteristics		
Input ranges	±1.25, ±2.5, ±5 or ±10 V	
Typical analog bandwidth (-3 dB)	100 kHz	
Input impedance	10 MΩ parallel (5.1 kΩ + 30 pF)	
Overvoltage protection	±30 V	
Common mode rejection ratio (CMRR) of AISense	> 54 dB, f_{in} < 1kHz	
Channel separation (cross talk)	> 90 dB @ f_{in} 1 kHz	
Transfer characteristics		
DC accuracy		
Range	% of reading	% of range
±10 V	±0.02 %	±0.0115 %
±5 V	±0.02 %	±0.013 %
±2.5 V	±0.02 %	±0.016 %
±1.25 V	±0.02 %	±0.022 %
Gain drift (typ)	±8 ppm/K	
Offset drift (typ)	±5 ppm/K of range	
Dynamic characteristics		
Signal to noise	89 dB	
THD (f_{in} = 1kHz) 0 dB_{FS} input	< -86 dB	
THD (f_{in} = 1kHz) -20 dB_{FS} input	< -93 dB	
Interchannel gain mismatch	±0.015 %	
Inter channel phase mismatch (f_{in} < 50kHz)	0.02° * f_{in} (kHz) + 0.08°	
Maximum working voltage		
Channel-to-ground	10 V, installation category I	
Channel-to-channel	10 V, installation category I	

Digital and Counter Input

Digital and Counter input	
Counter resolution	32 bit
Counter time base	80 MHz
Time base accuracy	35 ppm
Maximum input frequency	40 MHz
Input signal characteristic main board	
Compatibility	TTL/CMOS
Configuration	Pull-up with 100 kOhm
Input low level	-0.7 V to 0.8 V
Input high level	2 V to 5 V
Input low current	< -50 µA
Input high current	< 10 µA
Input capacitance	< 5 pF
Overvoltage protection (DI 0 to DI 15)	-1 to 6 V
Input signal characteristic CLK and Trigger	
Compatibility	TTL Schmitt trigger
Configuration	Pull-up with 100 kOhm
Input low level	-0.7 V to 2 V
Input high level	3 V to 5 V
Input low current	< -50 µA
Input high current	< 10 µA
Input capacitance	< 5 pF
Overvoltage protection	-1 to 6 V
Input signal characteristic expansion board with TTL input (used on ORION-1616-102 and -103)	
Compatibility	TTL/CMOS
Configuration	Pull-up with 100 kOhm
Input low level	-0.7 V to 0.8 V
Input high level	2 V to 5 V
Input low current	< -50 µA
Input high current	< 10 µA
Input capacitance	< 5 pF
Overvoltage protection	±25 V
Input signal characteristic expansion board with adjustable input (used on ORION-1616-104 and -105)	
Compatibility	Adjustable trigger levels
Configuration	Symmetric differential
Input coupling	DC / AC (1Hz)
Input impedance (ground referenced)	1 MOhm / 5 pF
Bandwith (-3dB)	5 MHz
Trigger adjustment range	0 to 40 V
Trigger resolution	40 mV
Trigger level accuracy	±100 mV ±1% of trigger level
Common voltage range	-35 to 50V
Common mode rejection ratio	>40 dB
Overvoltage protection	±100 V continuous
Max. DC level @AC coupling	±50 V continuous
Input signal characteristic with isolated inputs (optional external cards)	
Compatibility	CMOS
Configuration	Isolated input
Input low level	U_{IN} < 1.8 V
Input high level	U_{IN} > 3.2 V
Input high current @ 5 V U_{IN}	< 3.5 mA
Input high current @ 30 V U_{IN}	< 7 mA
Propagation delay	< 160 nsec
Bandwidth	3 MHz
Overvoltage protection	35 V continuous (65 V peak)
Isolation voltage (channel to channel)	100 V
Isolation voltage (input to output)	250 V

Digital and Clock Divider Output

Digital and clock divider out	
Compatibility	TTL/CMOS
Characteristic	
Low voltage level	< 0.4 V @ 4 mA load
High voltage level	> 3 V @ 4 mA load
Output current	
Sink (low level)	-20 mA
Source (high level)	20 mA
Output impedance	50 Ohm

CAN Interface

CAN interface	
Specification	CAN 2.0B
Physical layer	High speed
Listen only mode	Supported
Galvanic isolation	Not isolated
Bus pin fault protection	±36 V
ESD protection	12 kV (HBM)
CAN tranceiver	SNHVD235
PCI data transfere mode	DMA with SW pooling

Power Requirements

ORION Type	I_{12V} [mA]	I_{5V} [mA]	$I_{3.3V}$ [mA]	$P_{tot.}$ [Watt]
ORION-1616-100	---	580	240	3,7
ORION-1616-101	---	650	240	4,0
ORION-1616-102	---	600	340	4,1
ORION-1616-103	---	670	340	4,5
ORION-1616-104	---	710	430	5,0
ORION-1616-105	---	780	430	5,3
ORION-3216-100	---	1200	270	6,9
ORION-3216-101	---	1270	270	7,2

General Specifications

General Specifications	
Environmental	
Operating temperature	0 to 50 °C
Storage temperature	-20 to 70 °C
Relative humidity	10 to 90%, non condensing
Maximum altitude	2000 m
Pollution degree (indoor use only)	2
Physical	
Dimensions (not including connectors)	17.5 x 10.7 cm (6.9 x 4.2 in.)
Analog input connector (main board)	68-pin SCSI male (AMP 174341-5)
Analog input connector (expansion)	68-pin SCSI male (Honda PCS-68LMD)
Counter input connector (expansion)	68-pin SCSI male (Honda PCS-68LMD)
CAN input connector SUBD Lemo	 2 x D-Sub 9-pin male 7-pin Lemo connector female (Type: EPG.0B.307.HLN)

DEWE-ORION-1616-100X

- *16 simultaneous sampled channels*
- *1 MS/s per channel*
- *16 bit resolution*
- *4 input ranges (from ±1.25 V to ±10 V)*
- *Synchronous digital inputs*
- *8 digital I/Os, e.g. alarm output*
- *32 bit synchronous counter/encoder*
- *2 synchronous CAN interfaces*

Model Overview

Model	Analog input channels	Max. sampling rate / channel	Digital input channels	Digital I/O	Ext. Clock	Ext. Trigger	Counter Encoder TTL	Counter Encoder ADJ	CAN
DEWE-ORION-1616-1000	16	1 MS/s	2 (8*)	8	1	1	2	-	-
DEWE-ORION-1616-1001	16	1 MS/s	2 (8*)	8	1	1	2	-	2
DEWE-ORION-1616-1002**	16	1 MS/s	10 (40*)	8	1	1	2 + 8	-	-
DEWE-ORION-1616-1003**	16	1 MS/s	10 (40*)	8	1	1	2 + 8	-	2
DEWE-ORION-1616-1004**	16	1 MS/s	10 (40*)	8	1	1	2	8	-
DEWE-ORION-1616-1005**	16	1 MS/s	10 (40*)	8	1	1	2	8	2

* Without using counter inputs
** Max. data transfer speed per card is 40 MB/s. More information see 'Calculation of data rate'.

Analog Input Specifications

Analog input		
Channel characteristics		
Number of channels	16 simultaneously sampled	
Input configuration	Single ended with remote sense	
Resolution	16 bit	
Effectiv number of bits	14.7	
Type of ADC	Successive approximation (SAR)	
Sampling rate	10 S/sec to 1 MS/sec per channel	
Sampling rate accuracy	35 ppm	
Input amplifier characteristics		
Input ranges	±1.25, ±2.5, ±5 or ±10 V	
Typical analog bandwidth (-3 dB)	900 kHz	
Input impedance	10 MΩ parallel (3.9 kΩ + 14 pF)	
Overvoltage protection	±30 V	
Common mode rejection ratio (CMRR) of AISense	> 54 dB, f_{in} < 1kHz	
Channel separation (cross talk)	> 90 dB @ f_{in} 1 kHz	
Transfer characteristics		
DC accuracy		
Range	% of reading	% of range
±10 V	±0.02 %	±0.0115 %
±5 V	±0.02 %	±0.013 %
±2.5 V	±0.02 %	±0.016 %
±1.25 V	±0.02 %	±0.022 %
Gain drift (typ)	±8 ppm/K	
Offset drift (typ)	±5 ppm/K of range	
Dynamic characteristics		
Signal to noise [Range = ±1.25 V]	89 dB [86 dB]	
THD (f_{in} = 1kHz) 0 dB_{FS} input	< -86 dB	
THD (f_{in} = 1kHz) -20 dB_{FS} input	< -93 dB	
Interchannel gain mismatch	±0.015 %	
Inter channel phase mismatch (f_{in} < 50kHz)	0.02° * f_{in} (kHz) + 0.08°	
Maximum working voltage		
Channel-to-ground	10 V, installation category I	
Channel-to-channel	10 V, installation category I	

Digital and Counter Input

Digital and Counter input	
Counter resolution	32 bit
Counter time base	80 MHz
Time base accuracy	35 ppm
Maximum input frequency	40 MHz
Input signal characteristic main board	
Compatibility	TTL/CMOS
Configuration	Pull-up with 100 kOhm
Input low level	-0.7 V to 0.8 V
Input high level	2 V to 5 V
Input low current	< -50 µA
Input high current	< 10 µA
Input capacitance	< 5 pF
Overvoltage protection (DI 0 to DI 15)	-1 to 6 V
Input signal characteristic CLK and Trigger	
Compatibility	TTL Schmitt trigger
Configuration	Pull-up with 100 kOhm
Input low level	-0.7 V to 2 V
Input high level	3 V to 5 V
Input low current	< -50 µA
Input high current	< 10 µA
Input capacitance	< 5 pF
Overvoltage protection	-1 to 6 V
Input signal characteristic expansion board with TTL input (used on ORION-1616-1002 and -1003)	
Compatibility	TTL/CMOS
Configuration	Pull-up with 100 kOhm
Input low level	-0.7 V to 0.8 V
Input high level	2 V to 5 V
Input low current	< -50 µA
Input high current	< 10 µA
Input capacitance	< 5 pF
Overvoltage protection	±25 V
Input signal characteristic expansion board with adjustable input (used on ORION-1616-1004 and -1005)	
Compatibility	Adjustable trigger levels
Configuration	Symmetric differential
Input coupling	DC / AC (1Hz)
Input impedance (ground referenced)	1 MOhm / 5 pF
Bandwith (-3dB)	5 MHz
Trigger adjustment range	0 to 40 V
Trigger resolution	40 mV
Trigger level accuracy	±100 mV ±1% of trigger level
Common voltage range	-35 to 50V
Common mode rejection ratio	>40 dB
Overvoltage protection	±100 V continuous
Max. DC level @AC coupling	±50 V continuous
Input signal characteristic with isolated inputs (optional external cards)	
Compatibility	CMOS
Configuration	Isolated input
Input low level	U_{IN} < 1.8 V
Input high level	U_{IN} > 3.2 V
Input high current @ 5 V U_{IN}	< 3.5 mA
Input high current @ 30 V U_{IN}	< 7 mA
Propagation delay	< 160 nsec
Bandwidth	3 MHz
Overvoltage protection	35 V continuous (65 V peak)
Isolation voltage (channel to channel)	100 V
Isolation voltage (input to output)	250 V

Digital and Clock Divider Output

Digital and clock divider out	
Compatibility	TTL/CMOS
Characteristic Low voltage level High voltage level	 < 0.4 V @ 4 mA load > 3 V @ 4 mA load
Output current Sink (low level) Source (high level)	 -20 mA 20 mA
Output impedance	50 Ohm

CAN Interface

CAN interface	
Specification	CAN 2.0B
Physical layer	High speed
Listen only mode	Supported
Galvanic isolation	Not isolated
Bus pin fault protection	±36 V
ESD protection	12 kV (HBM)
CAN tranceiver	SNHVD235
PCI data transfere mode	DMA with SW pooling

Power Requirements

ORION Type	I_{12V} [mA]	I_{5V} [mA]	$I_{3.3V}$ [mA]	$P_{tot.}$ [Watt]
ORION-1616-1000	---	580	240	3,7
ORION-1616-1001	---	650	240	4,0
ORION-1616-1002	---	600	340	4,1
ORION-1616-1003	---	670	340	4,5
ORION-1616-1004	---	710	430	5,0
ORION-1616-1005	---	780	430	5,3

General Specifications

General Specifications	
Environmental	
Operating temperature	0 to 50 °C
Storage temperature	-20 to 70 °C
Relative humidity	10 to 90%, non condensing
Maximum altitude	2000 m
Pollution degree (indoor use only)	2
Physical	
Dimensions (not including connectors)	17.5 x 10.7 cm (6.9 x 4.2 in.)
Analog input connector (main board)	68-pin SCSI male (AMP 174341-5)
Analog input connector (expansion)	68-pin SCSI male (Honda PCS-68LMD)
Counter input connector (expansion)	68-pin SCSI male (Honda PCS-68LMD)
CAN input connector SUBD Lemo	 2 x D-Sub 9-pin male 7-pin Lemo connector female (Type: EPG.0B.307.HLN)

Calculation of data rate

Calculation of data rate	
For AIN	
f_s [1/s] * no. of active channels * 2 [Byte]	1 000 000 1/s * 8 * 2 Byte = 16 MB/s
For CTR	
f_s [1/s]* no. of active channels * 4 [Byte]	1 000 000 1/s * 8 * 4 Byte = 32 MB/s
Example	
ORION-1616-1000 (1 MS/s, 16 AIN, 2 CTR) ==> (1 * 16 * 2 = 32 MB/s) + (1 * 2 * 4 = 8 MB/s) = 40 MB/s [OK] ORION-1616-1002 (1 MS/s, 16 AIN, 4 CTR) ==> (1 * 16 * 2 = 32 MB/s) + (1 * 4 * 4 =16 MB/s) = 48 MB/s [too much] Reduce sampling rate to 833 kS/s: (0.833 * 16 * 2 = 26.6 MB/s) + (0.833 * 4 * 4 = 13.3 MB/s) = 39.9 MB/s [OK]	