DANEO 400

Technical Data

This technical data was extracted from the following manual: ENU 1040 05 08

1 DANEO 400 technical data

1.1 Guaranteed values

The values are valid for the period of one year after factory calibration, within 23 °C ±5 °C at nominal value and after a warm-up time greater than 25 min.

The given input/output accuracy values relate to the range limit value (% of range limit value).

1.2 Power supply

Main power supply	
Connection	Connector according to IEC 60320-1/ C14
Voltage, single phase Nominal voltage Operational range	 100 V AC ... 240 V AC 85 V AC ... 264 V AC
Power fuse	T 12.5 AH 250 V (5 x 20 mm) "Schurter", order number 0001.2515
Nominal current	10 A
Frequency Nominal frequency Operational range	 50/60 Hz 45 Hz ... 65 Hz
Overvoltage category	II

1.3 Analog measurement inputs

Analog inputs: ANALOG INPUT 1 ... 10	
Number of analog measurement inputs	10
Measurement ranges (RMS value of the sinusoidal shaped input signal)	10 mV, 100 mV, 1 V, 10 V, 100 V, 600 V
Crest factor	1.75
Sampling frequency	10 kHz 40 kHz
Input impedance	(1 MΩ ±2 %) || (170 pF ±50 pF)
Measurement category	CAT II / 600 V CAT III / 300 V CAT IV / 150 V
Temperature drift	< 25 ppm/K

1.3.1 Magnitude accuracy

The maximum measurement error is specified in percent (%) unit. The error is composed by two parts, the first one referring to the actual reading and the second one referring to the measurement range.

Maximum error				
Sampling frequency	**10 kHz / 40 kHz**	**10 kHz / 40 kHz**	**10 kHz**	**40 kHz**
Frequency range	**DC**	**10 Hz ... 1 kHz**	**1 kHz ... 4 kHz**	**1 kHz ... 10 kHz**
10 mV	0.08 + 0.50	0.20 + 0.30	0.20 + 0.30	0.20 + 0.30
100 mV	0.08 + 0.07	0.08 + 0.05	0.16 + 0.04	0.16 + 0.04
1 V	0.08 + 0.02	0.08 + 0.02	0.16 + 0.04	0.16 + 0.04
10 V	0.08 + 0.02	0.08 + 0.02	0.16 + 0.04	0.16 + 0.04
100 V	0.08 + 0.02	0.08 + 0.02	0.16 + 0.04	0.16 + 0.04
600 V	0.08 + 0.02	0.08 + 0.02	0.16 + 0.04	0.16 + 0.04

1.3.2 Phase and frequency accuracy

Phase and frequency accuracy are specified for signal levels above 10% of range and sinusoidal signals. Phase and frequency accuracy are not guaranteed for the 10 mV range.

Accuracy of frequency and phase measurements			
Sample frequency	**Frequency range**	**Maximum error**	
		Frequency measurement	**Phase measurement**
10 kHz	15 Hz ... 70 Hz	0.01 %	0.1 °
40 kHz	15 Hz ... 70 Hz		

1.3.3 Power accuracy

The power measurement is specified for signal frequencies between 15 Hz and 70 Hz only. Errors are relative to actual measured values and specifications do not apply when one or both quantities are measured on the 10 mV or the 100 mV range.

Power measurement error			
Calculated quantity	**Error**	**Relative magnitudes of measured quantities with respect to measurement range**	**Power factor limits**
Apparent power *S*	0.24 %	≥ 50 %	n. a.
	0.36 %	≥ 20 %	
Active power *P*	0.30 %	≥ 50 %	$\lvert cos(\varphi)\rvert \geq 0.5$ ($\lvert\varphi\rvert \leq 60°$, $120° \leq \lvert\varphi\rvert \leq 180°$)
	0.42 %	≥ 20 %	
Reactive power *Q*	0.30 %	≥ 50 %	$\lvert cos(\varphi)\rvert \leq 0.866$ ($30° \leq \lvert\varphi\rvert \leq 150°$)
	0.42 %	≥ 20 %	

1.4 Harmonics

The first order harmonic (order 1, designated as f_1) is the fundamental component. Higher harmonic orders are 2 to 25.

There are two THD figures available, THDf and THDr, which are relative to the fundamental component and to the RMS value, respectively. The THDf calculation conforms to the definitions in IEEE P1495, IEEE 519, and IEC 61000. The THDf may exceed 100 %. V_i and I_i are the magnitudes (RMS values) of the individual spectral components.

$$\mathrm{THDf} = \frac{\sqrt{\sum_{i=2}^{N} V_i^2}}{V_1} \cdot 100\% \quad \text{or} \quad \mathrm{THDf} = \frac{\sqrt{\sum_{i=2}^{N} I_i^2}}{I_1} \cdot 100\%$$

The THDr does not exceed 100 %. V_{rms} and I_{rms} are the “fast RMS” values of the harmonic calculation.

or

$$\cdots \sqrt{\sum^{N} V^{2}}$$

$$V_{rms} = \sqrt{\sum_{i=1}^{N} V_i^2} \quad \text{and} \quad I_{rms} = \sqrt{\sum_{i=1}^{N} I_i^2}$$

The maximum order (N) used in the calculations depends on several parameters such as nominal frequency and is always higher than the maximum order i=25 offered for acquisition and analysis.

The following table enumerates the harmonics accuracy where the error is derived from the harmonic calculation only. The measurement error for processed quantities such as voltages and currents, chapter 1.3 "Analog measurement inputs" on page 3, is added to the harmonic accuracy error.

Harmonics accuracy		
Calculated quantity	**Error**	**Conditions**
Magnitudes (Order 1 ... 25)	0.1 % (of fundamental)	$f_1 = f_{nom}$ 15 Hz ≤ f_{nom} ≤ 70 Hz THDf < 100 %
THD	0.2 %	
Magnitudes (Order 1 ... 9)	2.5 % (of fundamental)	f_{nom} - 0.6 Hz < f_1 < f_{nom} + 0.6 Hz 50 Hz ≤ f_{nom} ≤ 60 Hz THDf < 50 %
THD	2.5 %	

1.5 Binary inputs

Binary inputs: BINARY INPUT 1 ... 10	
Number of binary inputs	10
Number of potential groups	10
Trigger criteria	Potential-free (16 V even when device is not in run mode) or DC-voltage compared to threshold voltage
Input ranges	10 V (-10 V ... 10 V); 100 V (-100 V ... 100 V); 600 V (-600 V ... 600 V) default: 600 V
Sampling frequency	10 kHz
Time resolution	100 µs
Threshold	
Range	Same as selected input range; default: 18 V
Resolution (input range)	100 mV (600 V); 10 mV (100 V); 1 mV (10 V)
Error	Refer to 1.3 "Analog measurement inputs" on page 3.
Hysteresis	10 % of absolute value of threshold or 1 % of input range, whichever is higher; Pick-up value is threshold; Drop-off value is threshold minus hysteresis
Deglitch time	
Range	0 … 500 ms (refer to “Deglitching input signals” below); default: 0.5 ms
Resolution	100 µs
Debounce time	
Range	0 … 500 ms (refer to “Debouncing input signals” below); default: 1 ms
Resolution	100 µs
Connectors	4 mm/0.16 " banana sockets on the front panel
Insulation	10 galvanic insulated binary inputs. Functional isolation with 4 mm creepage between channels. Reinforced insulation from all SELV interfaces and from power supply.

Data for potential-free operation	
Trigger criteria	Logical 0: R > 80 kΩ Logical 1: R < 20 kΩ
Input impedance	(125 kΩ ± 20 %) || (170 pF ±50 pF)

Deglitching input signals

In order to suppress short spurious pulses a deglitching algorithm could be configured. The deglitch process results in an additional dead time and introduces a signal delay. In order to be detected as a valid signal level, the level of an input signal must have a constant value at least during the deglitch time. Figure 1-1 illustrates the deglitch function.

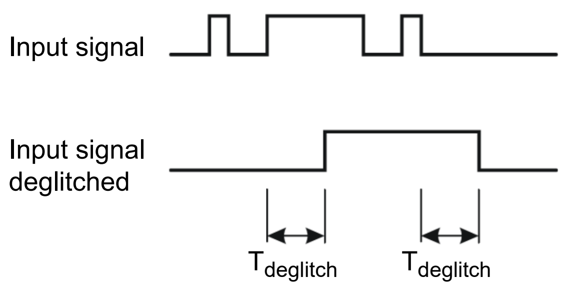

Figure 1-1: Signal curve, deglitching input signals

Debouncing input signals

For input signals with a bouncing characteristic, a debounce function can be configured. This means that the first change of the input signal causes the debounced input signal to be changed and then be kept on this signal value for the duration of the debounce time.

The debounce function is placed after the deglitch function described above and both are realized by the firmware of *DANEO 400* and are calculated in real time.

Figure 1-2 illustrates the debounce function. On the right-hand side of the figure, the debounce time is too short. As a result, the debounced signal rises to “high” once again, even while the input signal is still bouncing and does not drop to low level until the expiry of another period $T_{debounce}$.

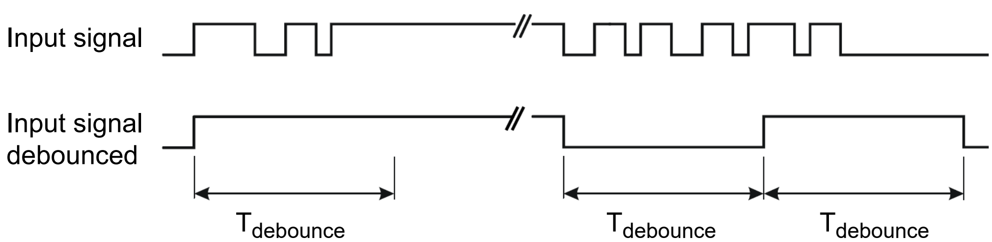

Figure 1-2: Signal curve, debouncing input signals

1.6 Binary outputs

Binary output relays: BINARY OUTPUT 1 ... 4	
Number of binary outputs	4
AC loading	$V_{max} = 300\ V\ AC\ ;\ I_{max} = 8\ A\ ;\ S_{max} = 2000\ VA$
DC loading	$V_{max} = 300\ V\ DC\ ;\ I_{max} = 8\ A\ ;\ P_{max} = 50\ W$ (refer to load limit curve)
Switch-on current	15 A (max. 4 s at 10 % duty-cycle)
Electrical lifetime	100000 switching cycles at 230 V AC / 8 A and ohmic load
Pickup time	Approx. 6 ms
Fall back time	Approx. 3 ms
Bounce time	Approx. 0.5 ms
Connectors	4 mm/0.16 " banana sockets
Insulation	Reinforced insulation from all SELV interfaces and from power supply.

The diagram on Figure 1-3 shows the load limit curve for DC voltages. For AC voltages, a maximum power of 2000 VA is achieved.

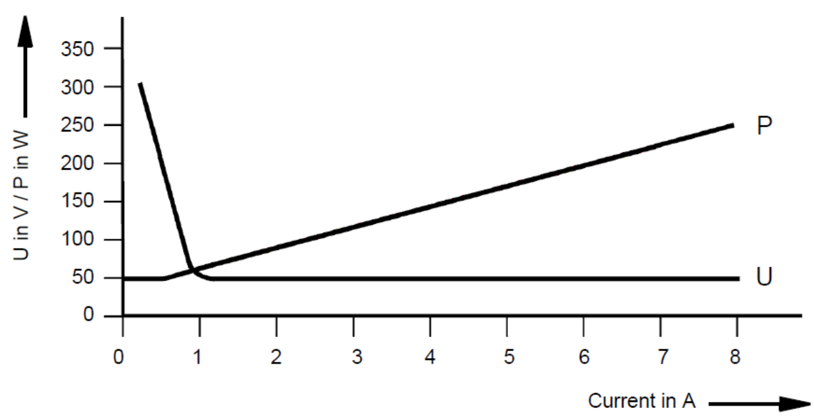

Figure 1-3: Load limit curve for relays on the binary outputs with DC voltages

1.7 Ethernet ports

All Ethernet ports support Power over Ethernet (PoE) according to IEEE 802.3af and IEEE 802.3at. The accumulated output power of all PoE ports is limited to 75 W.

1.7.1 Control and network ports

Ethernet ports A, B, and ETH	
Type	10/100/1000Base-TX
Connector	RJ45
Cable type	LAN cable of category 5 (CAT5) or better
Status indication	Green LED: physical link present Yellow LED: traffic on interface
Power over Ethernet (PoE)	IEEE 802.3af (PoE) and IEEE 802.3at (PoE+) compliant

1.7.2 Extension ports

Extension ports OUT 1 and OUT 2	
Type	100Base-TX
Connector	RJ45
Cable type	LAN cable of category 5 (CAT5) or better
Status indication	Green LED: physical link present Yellow LED: traffic on interface
Power over Ethernet (PoE)	IEEE 802.3af (PoE) and IEEE 802.3at (PoE+) compliant

1.8 USB

1.8.1 Control port

Control port	
Type	USB 2.0 high speed (480 Mbit/s) USB 1.1 compatible (12 Mbit/s)
Power	4.5 W (5 V @ 900 mA)
Connector	USB type B
Cable	< 5 m USB 2.0 high speed type A-B

1.8.2 Storage port

Storage port	
Type	USB 3.0 ultra speed (5 Gbit/s)
Connector	USB type A
Cable	Up to 900 mA

1.9 Environmental conditions

Climate	
Operating temperature[1]	0 °C ... +50 °C
Storage and transportation	-25 °C ... +70 °C
Maximum altitude	
Operating	4000 m
Non-operating	15000 m
Humidity	5 % ... 95 % relative humidity; no condensation

1. In case of overtemperature, *DANEO 400* turns-off automatically. *DANEO Control* informs you that overtemperature has occurred (**Notification** bar and **Message** board) and what actions you can take to turn-on *DANEO 400*.

1.10 Mechanical data

Size, weight, and protection	
Mass	Approx. 7.0 kg
Dimensions W x H x D without handle	345 mm x 140 mm x 390 mm
Ingress protection	IP20 according to EN 60529

1.11 Cleaning

To clean *DANEO 400*, use a cloth dampened with isopropanol alcohol. Prior to cleaning, always unplug the power cord from power supply and unplug all connectors so that all hazardous life parts are disconnected and the device is switched off.

1.12 Electromagnetic compatibility and certified safety standards

EMC	
Emission	
Europe	EN 61326-1; EN 61000-6-4; EN 61000-3-2/3
International	IEC 61326-1; IEC 61000-6-4; IEC 61000-3-2/3
USA	FCC Subpart B of Part 15 Class A
Immunity	
Europe	EN 61326-1; EN 61000-6-2; EN 61000-4-2/3/4/5/6/11
International	IEC 61326-1; IEC 61000-6-2; IEC 61000-4-2/3/4/5/6/11
Certified safety standards	
Europe	EN 61010-1; EN 61010-2-030
International	IEC 61010-1; IEC 61010-2-030
USA	UL 61010-1; UL 61010-2-030
Canada	CAN/CSA-C22.2 No 61010-1; CAN/CSA-C22.2 No 61010-2-030
Certificates	