PACEline

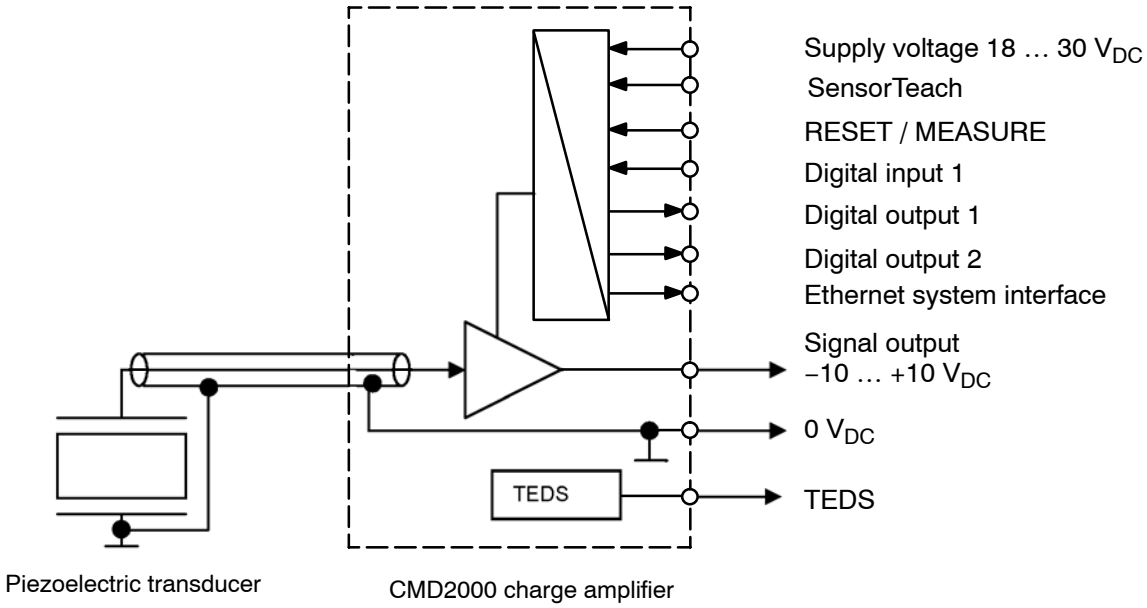
CMD2000

Data sheet

Special features

- **Digital charge amplifier for piezoelectric sensors**
- **Two separate parameter sets (measurement programs)**
- **Measuring range adjustable as required or via SensorTeach**
- **TEDS sensor detection**
- **Signal output ±10 V**
- **Fast and configurable digital inputs/outputs**
- **All signal inputs and outputs electrically isolated**
- **Ethernet system interface**
- **Compact, robust design, IP60**
- **User-friendly parameterization software, LabView drivers and Siemens S7 operation blocks**

CMD2000 block diagram



Specifications (data per VDI/VDE/DKD 2638 standards)

Charge amplifier		**CMD2000**
Transducers that can be connected		Piezoelectric sensors
Charge inputs		1
Measuring range adjustable as required or via SensorTeach for fast teach-in processes	pC	±200 … ±2 000 000
Calibrated measuring ranges	% F_{nom}	100
Signal output, analog		
Output voltage	V	–10 …+10
Signal source		current measured value, min./max. value, peak-to-peak value
Output voltage limiting	V	±11
Output current, max., short-circuit proof	mA	10
Output resistance	Ω	< 5
Interference suppression between input and output (GND) (0 … 1000 Hz)	dB	> 60
Output interference signal (0.1 Hz … 1 MHz, peak-to-peak) over the full measuring range ±200 … ±2 000 000 pC up to 30 kHz filter frequency	mV	< 30
Time from switch-on to stable output values	ms	375
TEDS as per IEEE1451.4		1-wire
Measurement accuracy		
Accuracy class (at 25°C)	%	< ±0.5
Repeat accuracy (at 25°C)	%FS	< ±0.05
Reset/Measure (operate) step	pC	< ±2 (typ. < 1)
Drift (at 20°C)	pC/s	< ±0.05
Analog signal output frequency response		
Measurement frequency range (–3dB)		
Measuring range 200 pC to 400 000 pC	kHz	50
Measuring range 400 000 pC to 600 000 pC	kHz	33
Measuring range 600 000 pC to 1 000 000 pC	kHz	20
Measuring range 1 000 000 pC to 2 000 000 pC	kHz	10
Low-pass filter, selectable up to 20 kHz	Hz	1 … 20000; 50 000
Runtime at 50 kHz cut-off frequency	µs	5
Runtime at 20 kHz cut-off frequency	µs	28
Runtime at 10 kHz cut-off frequency	µs	46
Runtime at 1 kHz cut-off frequency	µs	400
Runtime at 100 Hz cut-off frequency	ms	4
Runtime at 10 Hz cut-off frequency	ms	40
Filter characteristics (except 50 kHz)		Fifth-order Bessel
High-pass filter, selectable	Hz	0.15; 1.5; Off
Offset		
Output voltage offset for current measurement signal	V	±10
Resolution	mV	10
Signal output, digital		
Resolution	bits	14
Accuracy	%FS	< ±1
Sampling rate for peak value acquisition	kHz	10
Control signals (electrically isolated)		
Input voltage range		
High	V	12 … 30
Low	V	0 … 5 or open input

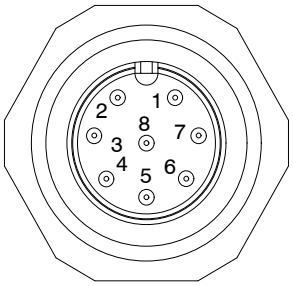
Specifications (continued)

Input current	mA	4, at 24 V Supply
Reset time (5 x RC)		
Measuring range < 20000 pC	ms	3
Measuring range > 20000 pC (adaptive reset from firmware 3.61)		
Output voltage		
> 2V	ms	80
1 … 2 V	ms	60
0.1 … 1 V	ms	40
50 mV … 0.1 V	ms	20
0 … 50 mV	ms	13
Peak-value memories		
Number		3
Function		Min., max., peak-to-peak value
Update rate	ms	0.1
Peak-value memory clearing	ms	2
Limit value switches		
Number		2
Functions		Switching threshold, hysteresis (2-point control)
Signal source		Current measured value
Hysteresis		Adjustable as required
Update	ms	0.1
LED displays		
IP address not configured		Flashing green-blue
Connection via Ethernet		Constant blue
Measure		Constant green
Reset		Constant red
Overload		Flashing red-blue or red-green
SensorTeach function in the 2000000 pC range		Flashing yellow, 1 Hz
SensorTeach function in the 20000 pC range		Flashing yellow, 2 Hz
Ready for firmware update		Flashing white, 2 Hz
Bootloader mode		Flashing red, 1 Hz
Device identification		Blue, yellow, red and green in succession, 2 Hz
Device signals		
System input/output		M12 plug, pin-compatible with CMA amplifier, 8 pins
Ethernet input		M12 socket, 4 pins, with protective cap
Digital input/output		M12 plug, 5 pins, with protective cap
Sensor input		CMD2000: BNC socket;
Ethernet communications interface		
System interface for amplifier parameterization and transmission of measured values at max. 1 kHz transfer rate		
Transmission protocol	Mbit/s	TCP/IP, can be networked per IEEE802
Transfer rate, max.	Mbit/s	10
Topology (twisted pairs)		2
Connector socket		M12, socket with protective cap
Cable type		UTP category 5 or shielded twisted pair (STP)
Digital control signals		
System input/output		Voltage supply; Reset/Measure; SensorTeach; TEDS; analog output signal
Ethernet input		PC/PLC connection, measured value streaming
Digital input		
Number		1
Switching actions, selectable		One-off, peak-value memory clearing (min./max.), RUN/HOLD analog output signal hold
Response time	ms	0.1
Input voltage range	V	0 … 30
Active input level can also be selected inverted	V	0 or 24

Switching voltages Logical High level Logical Low level	 V V	 12 … 30 0 … 5 or open input
Input current at 24 V, typical	mA	4
One-way fitting	V	–30 … 0
Digital input latency times	ms	2
Digital output		
Number		2
Switching actions, selectable		Limit value switch 1 or 2, overload, manual actuation, device error, parameter set selection (digital output 2 only)
Response times	ms	0.1
Active voltage level can also be selected inverted, separately for each output	V	0 or 24
Output voltage (like supply voltage), nom.	V	24
Voltage drop with load, max.	V	1
Output current at operating temperature	mA	350
Short-circuit current, typical	A	0.7
Short-circuit period		unlimited
Latency times of digital outputs	ms	2
General data		
Supply voltage overvoltage and one-way fitting	V_{DC}	24 (18 … 30)
Voltage supply buffer capacitor	µF	220
Electrical isolation		Electrical isolation of signal input and signal output from the voltage supply. Electrical isolation of signal input/signal output from the digital I/Os including the control inputs (Reset/Operate, SensorTeach). No electrical isolation of the digital I/Os and control inputs (Reset/operate, SensorTeach) from the voltage supply. The CMD2000 housing must be grounded.
Supply current (24 V), without digital outputs	mA	160
Number of parameter sets/measurement programs in the device		2 plus factory settings, saved in EEPROM
Typical switching times between parameter sets, in the measuring range < 6000 pC without range selection in all other cases	 ms ms	 5 160
Vibration resistance 20 … 2000 Hz, duration 16 min., cycle 2 min. **Impact;** duration 1 ms	 m/s^2 m/s^2	 100 2000
Nominal (rated) temperature range, non-condensing	°C	0 … 60
Operating temperature range, non-condensing	°C	–40 … +80
Relative humidity (maximum), non-condensing	%	93, at +40°C ± 2°C
Dimensions (L x W x H)	mm	115 x 64 x 35
Weight	g	350
Housing material		Die-cast aluminum
Degree of protection, with connected cable or with protective caps		CMD2000: IP60
EMC conformity		
in accordance with EN 61326–1: 2007, EN 61326–2–3: 2007		in an industrial environment

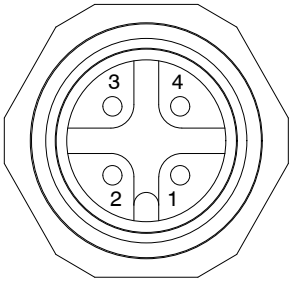
Connector pin assignment

SYSTEM input/output connector plug (view of pins in CMD2000)



PIN no.	Signal name	Description	Values	Color code KAB 168...
1	Supply ground	–	–	wh
2	SensorTeach	Digital input, active High	+12 … +30 V	br
3	RESET/MEASURE	Digital input, active High	+12 … +30 V	gn
4	TEDS	–	–	ye
5	Charge out	Output signal	± 10 V	gy
6	Ground output	Ground output signal	–	pk
7	no function	no function	–	bu
8	Voltage supply	Voltage supply between pins 8 and 1	+18 … +30 V	rd

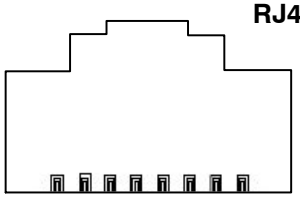
ETHERNET connector socket (view of pins in CMD2000)



PIN no.	Signal name
1	TX +
2	RX +
3	TX –
4	RX –

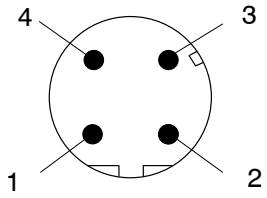
CMD2000 Ethernet cable pin assignment to PC

RJ45



View of PIN side

M12



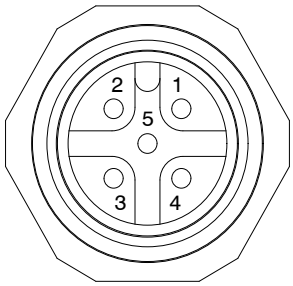
Patch cable

RJ45	M12
1	1
2	3
3	2
6	4

Crossover cable (1–KAB284–2)

RJ45	M12
1	2
2	4
3	1
6	3

DIGITAL I/O connector socket (digital input/digital outputs**,** view of pins in CMD2000)

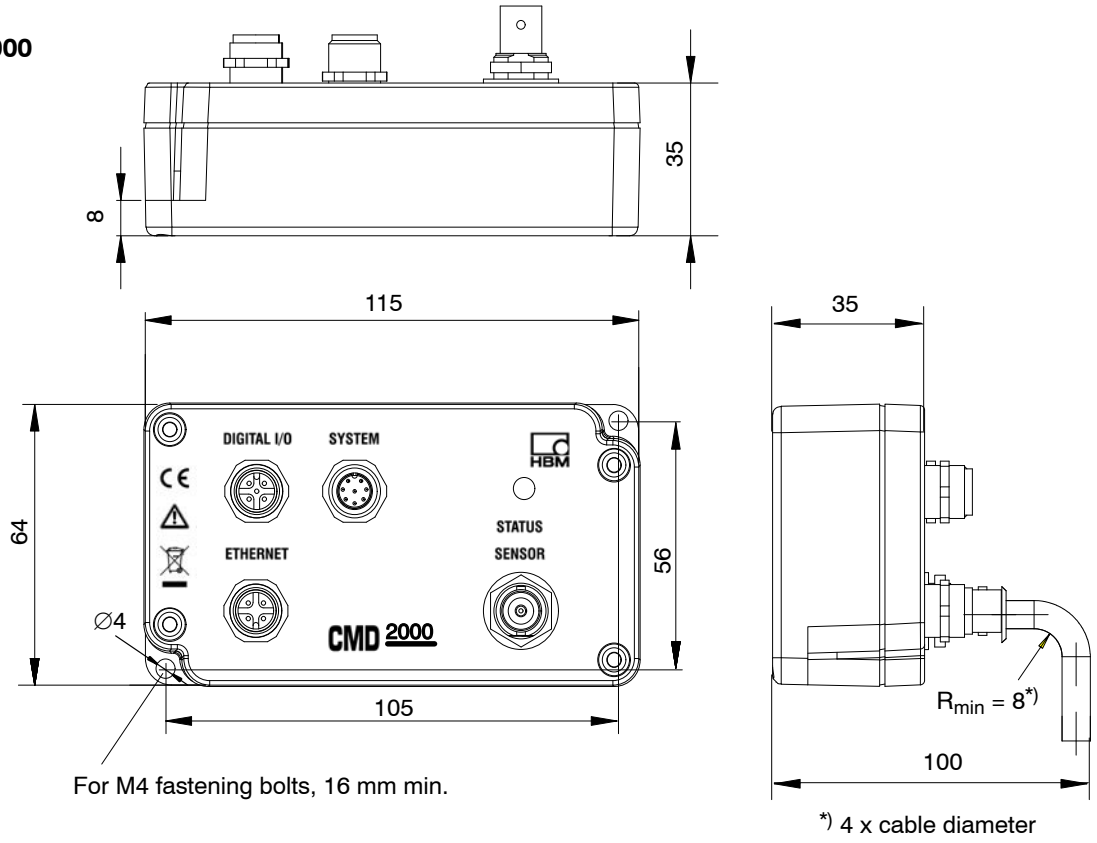


PIN no.	Signal name	Description	Values
1	Digital Out	Digital output 1	VCC/ 350 mA max.
2	VCC	Supply for digital output 1/2	+18 … +30 V
3	Digital Out	Digital output 2	VCC/ 350 mA max.
4	Digital In	Digital input 1	+12 … +30 V
5	Supply ground	–	–

Dimensions

Dimensions in mm (1 mm = 0.03937 inches)

CMD2000



Scope of supply

Ordering number	
1–CMD2000	Single-channel charge amplifier for piezoelectric sensors, measuring range 200…2000 000 pC; includes protective caps, protection class IP60, transducer connection with BNC
	CD-ROM with operating manual, CMD command set, CMD Assistant parameterization software [1]

[1] You can obtain the latest version of the CMD Assistant free of charge from http://www.hbm.com/support

Accessories

Ordering number	
1–KAB168–5	8-wire cable for voltage supply and processing electronics, M12 x 1 cable plug, 5 m long, free ends
1–KAB168–20	8-wire cable for voltage supply and processing electronics, M12 x 1 cable plug, 20 m long, free ends
1–KAB143–x	Sensor connection cable, coaxial, 10–32 UNF plug at both ends, available in 2 m, 3 m and 7 m lengths
1–KAB145–x	Sensor connection cable, coaxial, 10–32 UNF plug at both ends, robust design, available in 0.2 m and 3 m lengths
1–KAB176–x	Sensor connection cable, with 10–32 UNF plug and BNC connector plug, coaxial, available in 2 m and 3 m lengths
1–CON–P3001	BNC to 10–32 UNF sensor adapter
1–KAB284–2	CMD to PC ethernet cable, M12 to RJ45, 2 m long
1–CON–S1002	Connector socket for digital I/O, M12 x 1, 5-pin, straight

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