

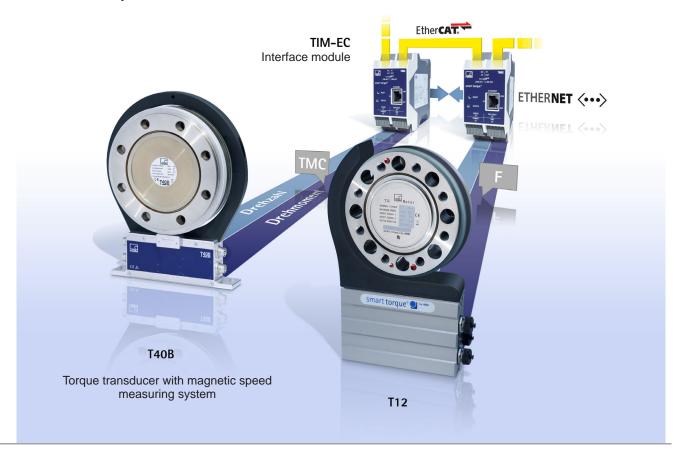
TIM-EC

EtherCAT® Interface Module

Special features

- Real-time EtherCAT® interface module
- Output of torque, speed, angle of rotation and power
- Very high dynamics (up to 20 kHz)
- Input resolution up to 25 bits
- Low latency time
- Diagnostic functions
- Integrated web server
- Flexible to use
- Modular design, expandable

Overall concept





Specifications

Туре		TIM-EC
Supply		
Supply voltage	V _{DC}	24 ±10%
Electrical isolation Torque, speed, EtherCAT [®] . Ethernet and supply voltage are electrically isolated from each other		
Isolation voltage	V	500
Voltage discontinuity Test based on PLC standard DIN EN 61 131-2: 24 V -10%	ms	10
Power consumption Without supply to transducers	W	<5
Communication interface	·	
Ethernet Data link Protocol/addressing Plug connection Line length Cable type (minimum requirements)	m	IEEE 802.3, 10Base-T / 100Base-TX TCP/IP (direct address or DHCP), HTTP, UDP RJ45, 8-pin ≤100 Cat-5, SFTP
EtherCAT® Function Data link Plug connection Line length Cable type (minimum requirements) Baud rate Update rate	m Mbit/s kHz	EtherCAT [®] slave IEEE 802.3, 100Base-TX RJ45 socket, shielded \leq 100 Cat-5, shielded \leq 100 \leq 20
Ambient conditions	'	
Nominal (rated) temperature range		+10 +60
Operating temperature range	°C	-10 +60
Storage temperature range		-20 +70
Permissible relative humidity, non-condensing	%	10 90
Cases		12 111 22
Material		Polyamide PA 6.6
Dimensions (W x H x D), without connections	mm	45 x 99 x 107
Weight, approx.		230
Mechanical stress capability Vibration test based on IEC/DIN EN 60 068, Part 2-6 (30 min in each direction)	m/s ² m/s ²	10 (5 8 Hz) 25 (10 65 Hz)
Impact test based on IEC/DIN EN 60 068, Part 2-27 (3 times in each direction, impact duration 11 ms)	m/s ²	200
Installation		Support rail DIN EN 60 715
Connector		Plug terminal
Degree of protection		IP20
EMC conformity		
Emission (EME)		EN 61326; 2013, Class A
Immunity from interference		EN 61326; 2013, industrial environment
	1	

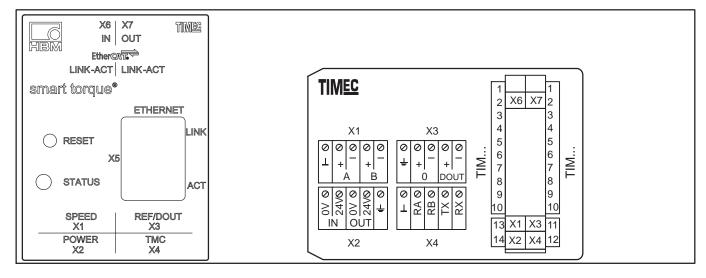
Specifications (continued)

TMC (digital serial data) Data rate Hz 3800 39000	Torque			
Data rate Hz 38000 39000 Resolution bits 16 Resolution bits 16 Resolution bits FM (frequency modulation via TMC connection) Data rate Hz approx. 39000 Resolution bits 25 Frequency measurement resolution, min. 10 +/ 5kHz 1 1 Resolution 16 Resolut	TMC connector input			
Data rate Hz 38000 39000 Resolution bits 16 Resolution bits 16 Resolution bits FM (frequency modulation via TMC connection) Data rate Hz approx. 39000 Resolution bits 25 Frequency measurement resolution, min. 10 +/ 5kHz 1 1 Resolution 16 Resolut	Signal type		TMC (digital serial data)	
FM (frequency modulation via TMC connection)	Data rate	Hz		
Data rate Hz approx. 39000	Resolution	bits	16	
Data rate Hz approx. 39000	Signal type	1	FM (frequency modulation via TMC connection)	
Prequency measurement resolution, min.	Data rate	Hz		
10 +/- Sichtz 60 +/-30kHz 10 -/- Sichtz 60 +/-30kHz 11 6 Accuracy Frequency measurement rel. to act. value ### Cand of the control of the	Resolution	bits		
10 +/- Sichtz 60 +/-30kHz 10 -/- Sichtz 60 +/-30kHz 11 6 Accuracy Frequency measurement rel. to act. value ### Cand of the control of the	Frequency measurement resolution, min.			
16 Accuracy Frequency measurement rel. to act. value % < =0.01			1	
Accuracy Frequency measurement rel. to act. value % <=0.01	60 +/-30kHz	mHz	8	
Accuracy Accuracy Frequency measurement rel. to act. value % <=0.01				
Frequency measurement rel. to act. value % <=0.01				
Temperature effect per 10K, rel. to act. value % c=0.01 Internal sampling rate mHz 125 Internal sampling rate Hz 0.1/1/10/100 / 1000 / 3000 / Off Internal sampling rate Hz 0.1/1/10/100 / 1000 / 3000 / Off Internal sampling rate Hz 0.1/1/10/100 / 1000 / 3000 / Off Internal sampling rate Hz 0.1/1/10/100 / 1000 / 3000 / Off Internal sampling rate Hz 0.1/1/10/100 / 1000 / 3000 / Off Internal sampling rate Hz 0.1/1/10/100 / 1000 / 3000 / Off Internal sampling rate Hz 0.1/1/10/100 / 1000 / 3000 / Off Internal sampling rate Hz 0.1/1/10/100 / 1000 / 3000 / Off Internal sampling rate Hz 0.1/1/10/100 / 1000 / 3000 / Off Internal sampling rate Hz 0.1/1/10/100 / 1000 / 3000 / Off Internal sampling rate Hz 0.1/1/10/100 / 1000 / 3000 / Off Internal sampling rate Hz 0.1/1/10/100 / 1000 / 3000 / Off Internal sampling rate Hz 0.1/1/10/100 / 1000 / Off Internal sampling rate Hz 0.1/1/10/100 / 1000 / Off Internal sampling rate Hz 0.1/1/10/100 / 1000 / Off Internal sampling rate MHz 0.1/1/10/100 / 1000 / Off Internal sampling rate MHz 0.1/1/10/100 / 1000 / Off Internal sampling rate MHz 0.1/1/10/100 / 1000 / Off Internal sampling rate MHz 0.1/1/10/100 / 1000 / Off Internal sampling rate MHz 0.1/1/10/100 / 1000 / Off Internal sampling rate MHz 0.1/1/10/100 / 1000 / Off Internal sampling rate MHz 0.1/1/10/100 / 1000 / Off Internal sampling rate MHz 0.1/1/10/100 / 1000 / Off Internal sampling rate MHz 0.1/1/10/100 / 1000 / Off Internal sampling rate MHz 0.1/1/10/100 / 1000 / Off Internal sampling rate MHz 0.1/1/10/100 / 1000 / Off Internal sampling rate MHz 0.1/1/10/100 / 1000 / Off Internal sampling rate MHz 0.1/1/10/100 / 1000 / Off Internal sampling rate MHz 0.1/1/10/100 / 1000 / Off Internal sampling rate MHz 0.1/1/10/100 / 1000 / Off Internal sampling rate MHz 0.1/1/10/100 / 1000 / Off Internal sampling rate MHz 0.1/1/10/100 /	·	%	<=0.01	
Internal sampling rate mHz 125 Termination resistor, internal ohms 120 Low pass filter, 4th order Hz 0.1 / 1 / 10 / 100 / 1000 / 3000 / Off Runtimes of filters 1 and 2 Filter off	· · ·			
Termination resistor, Internal				
Low pass filter, 4th order Hz 0.1/1/10/100/1000/3000/Off Runtimes of filters 1 and 2 ### \$ 0.944 Filter off ### \$ 0.944 3000 Hz ### \$ 54.4 1000 Hz ### \$ 26.8 10 Hz ms 2.68.8 1 Hz ms 2.68.8 1 Hz s 3.12 Linearization for full range 1:1 and partial range 1:5 or 1:10 Calibration coefficients can be entered directly fright, left, up to 11 points) Maximum cable length for TIM-EC/torque transducer m 50 Maximum cable length for TIM-EC/torque transducer m 50 Rotational speed Uput signal Quadrature / single / direct for T40 family Signal type RS422 RS422 Data rate Hz approx. 39000 Measuring range of pulse frequency measurement Determined automatily from max. speed and pulses/revolution of the transducer Resolution Frequency measurement resolution, min. Measuring range 20kHz mHz 1 Measuring range 20kHz mHz 1 Measuring range 20kHz mHz				
Runtimes of filters 1 and 2	·			
Filter off	Runtimes of filters 1 and 2		211. 12. 12. 100, 1000, 0000, 011	
3000 Hz		IIS	0.944	
1000 Hz				
100 Hz				
10 Hz				
1 Hz				
0.1 Hz				
Linearization for full range 1:1 and partial range 1:5 or 1:10 (right, left, up to 11 points) Maximum cable length for TIM-EC/torque transducer Rotational speed Input signal Signal type Date rate Measuring range of pulse frequency measurement Measuring range 20 pulse frequency measurement Measuring range 20 pulse frequency min. Measuring range 20 pulse frequency approx. Measurin				
(right, left, up to 11 points)		3	<u> </u>	
Rotational speed Input signal Quadrature / single / direct for T40 family Signal type RS422 Data rate Hz approx. 39000 Measuring range of pulse frequency measurement Determined automatically from max. speed and pulses/revolution of the transducer Resolution bits 25 Frequency measurement resolution, min. Measuring range 200kHz 1 1 Measuring range 200kHz mHz 1 Measuring range 200kHz mHz 10 Measuring range 200kHz mHz 1 Measuring range 200kHz <th colspa<="" th=""><th>(right, left, up to 11 points)</th><th></th><th>campiation decimalence can be entered unectly</th></th>	<th>(right, left, up to 11 points)</th> <th></th> <th>campiation decimalence can be entered unectly</th>	(right, left, up to 11 points)		campiation decimalence can be entered unectly
Quadrature / single / direct for T40 family RS422	Maximum cable length for TIM-EC/torque transducer	m	50	
Signal type RS422 Data rate Hz approx. 39000 Measuring range of pulse frequency measurement Determined automatically from max. speed and pulses/revolution of the transducer Resolution bits 25 Frequency measurement resolution, min. mHz 1 Measuring range 20kHz mHz 10 Measuring range 1000 kHz mHz 125 Accuracy Frequency measurement rel. to act. value % <=0.01	Rotational speed			
Data rate Hz approx. 39000 Measuring range of pulse frequency measurement Determined automatically from max. speed and pulses/revolution of the transducer Resolution bits 25 Frequency measurement resolution, min. Amount of the transducer Measuring range 20kHz 1 1 Measuring range 200kHz mHz 10 Measuring range 1000 kHz mHz 125 Accuracy ** ** Frequency measurement rel. to act. value % ** ** 0.01 Temperature effect per 10K, rel. to act. value % ** ** 0.01 Internal sampling rate mHz 125 1.00 1.	Input signal		Quadrature / single / direct for T40 family	
Measuring range of pulse frequency measurement Determined automatically from max. speed and pulses/revolution of the transducer Resolution bits 25 Frequency measurement resolution, min. The public publi	Signal type			
Pulses/revolution of the transducer	Data rate	Hz		
Frequency measurement resolution, min. Measuring range 20kHz Measuring range 20kHz Measuring range 200kHz Measuring range 1000 kHz 10	Measuring range of pulse frequency measurement			
Measuring range 20kHz 1 Measuring range 200kHz 10 Measuring range 1000 kHz 125 Accuracy ** Frequency measurement rel. to act. value % <=0.01	Resolution	bits	25	
Measuring range 200kHz Measuring range 1000 kHz mHz 10 125 Accuracy Frequency measurement rel. to act. value % <=0.01 Temperature effect per 10K, rel. to act. value % <=0.01 Internal sampling rate mHz 125 Input filter / glitch filter time constant (adjustable) 80ns, 800ns, 8ms, 80ms Low pass filter, 4th order Hz 0.1/1/10/100/1000/3000/Off Runtimes of filters 1 and 2 μs 0.944 3000 Hz μs 54.4 1000 Hz μs 212 100 Hz ms 2.6 10 Hz ms 26.8 1 Hz ms 230 0.1 Hz s 3.12		1 1	4	
Measuring range 1000 kHz 125 Accuracy Frequency measurement rel. to act. value % <=0.01 Temperature effect per 10K, rel. to act. value % <=0.01		mHz		
Accuracy Frequency measurement rel. to act. value % <=0.01 Temperature effect per 10K, rel. to act. value % <=0.01	* *	111112		
Frequency measurement rel. to act. value % <=0.01 Temperature effect per 10K, rel. to act. value % <=0.01 Internal sampling rate mHz 125 Input filter / glitch filter time constant (adjustable) 80ns, 80ns, 8ms, 80ms Low pass filter, 4th order Hz 0.1/1/10/100/1000/3000/Off Runtimes of filters 1 and 2 µs 0.944 3000 Hz µs 54.4 1000 Hz µs 212 100 Hz ms 2.6 10 Hz ms 26.8 1 Hz ms 230 0.1 Hz s 3.12	Accuracy	1		
Temperature effect per 10K, rel. to act. value % <=0.01 Internal sampling rate mHz 125 Input filter / glitch filter time constant (adjustable) 80ns, 800ns, 8ms, 80ms Low pass filter, 4th order Hz 0.1 / 1 / 10 / 1000 / 3000 / Off Runtimes of filters 1 and 2 Filter off μs 0.944 3000 Hz μs 54.4 1000 Hz μs 212 100 Hz ms 2.6 10 Hz ms 26.8 1 Hz ms 230 0.1 Hz s 3.12	Frequency measurement rel. to act. value	%	<=0.01	
Internal sampling rate mHz 125 Input filter / glitch filter time constant (adjustable) 80ns, 800ns, 8ms, 80ms Low pass filter, 4th order Hz 0.1 / 1 / 10 / 100 / 1000 / 3000 / Off Runtimes of filters 1 and 2 μs 0.944 3000 Hz μs 54.4 1000 Hz μs 212 100 Hz ms 2.6 10 Hz ms 26.8 1 Hz ms 230 0.1 Hz s 3.12	Temperature effect per 10K, rel. to act. value	%	<=0.01	
Low pass filter, 4th order Hz 0.1/1/10/100/1000/3000/Off Runtimes of filters 1 and 2 μs 0.944 Filter off μs 54.4 3000 Hz μs 212 1000 Hz ms 2.6 10 Hz ms 26.8 1 Hz ms 230 0.1 Hz s 3.12	Internal sampling rate	mHz	125	
Runtimes of filters 1 and 2 Filter off μs 0.944 3000 Hz μs 54.4 1000 Hz μs 212 100 Hz ms 2.6 10 Hz ms 26.8 1 Hz ms 230 0.1 Hz s 3.12	Input filter / glitch filter time constant (adjustable)		80ns, 800ns, 8ms, 80ms	
Filter off μs 0.944 3000 Hz μs 54.4 1000 Hz μs 212 100 Hz ms 2.6 10 Hz ms 26.8 1 Hz ms 230 0.1 Hz s 3.12	Low pass filter, 4th order	Hz	0.1 / 1 / 10 / 100 / 1000 / 3000 / Off	
3000 Hz μs 54.4 1000 Hz μs 212 100 Hz ms 2.6 10 Hz ms 26.8 1 Hz ms 230 0.1 Hz s 3.12	Runtimes of filters 1 and 2			
1000 Hz μs 212 100 Hz ms 2.6 10 Hz ms 26.8 1 Hz ms 230 0.1 Hz s 3.12	Filter off	μs	0.944	
100 Hz ms 2.6 10 Hz ms 26.8 1 Hz ms 230 0.1 Hz s 3.12	3000 Hz	μs	54.4	
10 Hz ms 26.8 1 Hz ms 230 0.1 Hz s 3.12	1000 Hz	μs	212	
1 Hz ms 230 0.1 Hz s 3.12	100 Hz	ms	2.6	
0.1 Hz s 3.12	10 Hz	ms	26.8	
	1 Hz	ms	230	
Max. cable length of TIM-EC/torque transducer/speed encoder m 50	0.1 Hz	s	3.12	
	Max. cable length of TIM-EC/torque transducer/speed encoder	m	50	

Specifications (continued)

Angle of rotation		
Resolution		1x / 2x / 4x with interpolation
Zero balance		360° / 720° / 1440° EtherCAT [®] / manual / zero index
Power		
Low pass filter, 4th order	Hz	0.1 / 1 / 10 / 100
Runtimes, filter 1		360° / 720° / 1440° EtherCAT [®] / manual / zero index
Filter off	μs	0.944
100 Hz	ms	2.6
10 Hz	ms	26.8
1 Hz	ms	230
0.1 Hz	s	3.12
If HBM torque transducers with integrated rotational speed measuring are	used, the po	wer calculation is runtime_corrected
EtherCAT [®]		
Control via EtherCAT [®]		Zero balance / shunt trigger / parameter set selection
Parameter set (saved in device and selectable via EtherCAT®)		32
Flags		
Torque transducer (via TMC), TIM-EC		Status (diagnosis)
Torque / speed / power		Status (diagnosis), measured values, overflow

Terminal assignment



Terminal X1, speed encoder

	Pin	Assignment
	1	DGND (digital GND), color code black ¹⁾ / brown ²⁾
A+ D	2	A + F1 rotational speed measurement signal, pulse sequence, 5V, 0°, color code red
	3	A - F1 rotational speed measurement signal, pulse sequence, 5V, 0°, color code white
□ B+ □	4	B + F2 rotational speed measurement signal, pulse sequence, 5V, phase_shifted 90°, color code gray
	5	B - F2 rotational speed measurement signal, pulse sequence, 5V, phase_shifted 90°, color code green

Speed cable type KAB153
 Speed cable type KAB164

Terminal X2, voltage supply

	Pin	Assignment
		Connection for energy supply, input
O TOV	1	GND (TIM-EC and stator supply)
IN 24V	2	+24 V ±10% supply (TIM-EC and stator)
		Output for the supply voltage of the torque transducer
0V DOUT 24V D	3	GND (looped through from X2-1): color code black
<u></u> ± >	4	+24V (looped through from X2-2): color code blue
	5	Shield (TMC), connected with ground

Terminal X3, speed encoder

Pin	Assignment
 1	Shield (speed), connected with ground
2	+, Reference signal (1 pulse/revolution), 5V, color code blue
3	-, Reference signal (1 pulse/revolution), 5V, color code black
4	Reserved
5	Reserved

Terminal X4, torque transducer - frequency

	Pin	Assignment
	1	Measurement signal 0V; symmetrical, color code gray
RAD	2	RA, torque measurement signal 5V, color code red
RBD	3	RB, torque measurement signal 5V, color code white
<u></u> πx⊳	4	Not in use
RXD	5	Not in use

Terminal X4, torque transducer - TMC

	Pin	Assignment
	1	DGND (digital GND), color code purple
RAD	2	RS-422 RA, color code red
RB	3	RS-422 RB, color code white
<u></u>	4	RS-232-TX, color code grey
RXD	5	RS-232-RX, color code green

Supplementary technical information



EtherCAT® is a registered trademark and patented technology, licensed by Beckhoff Automation GmbH, Germany.

