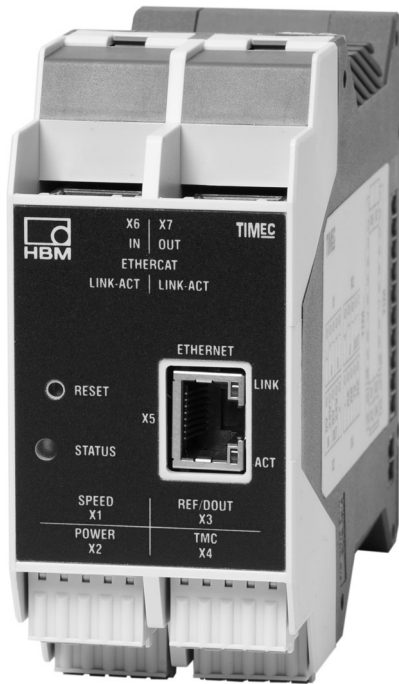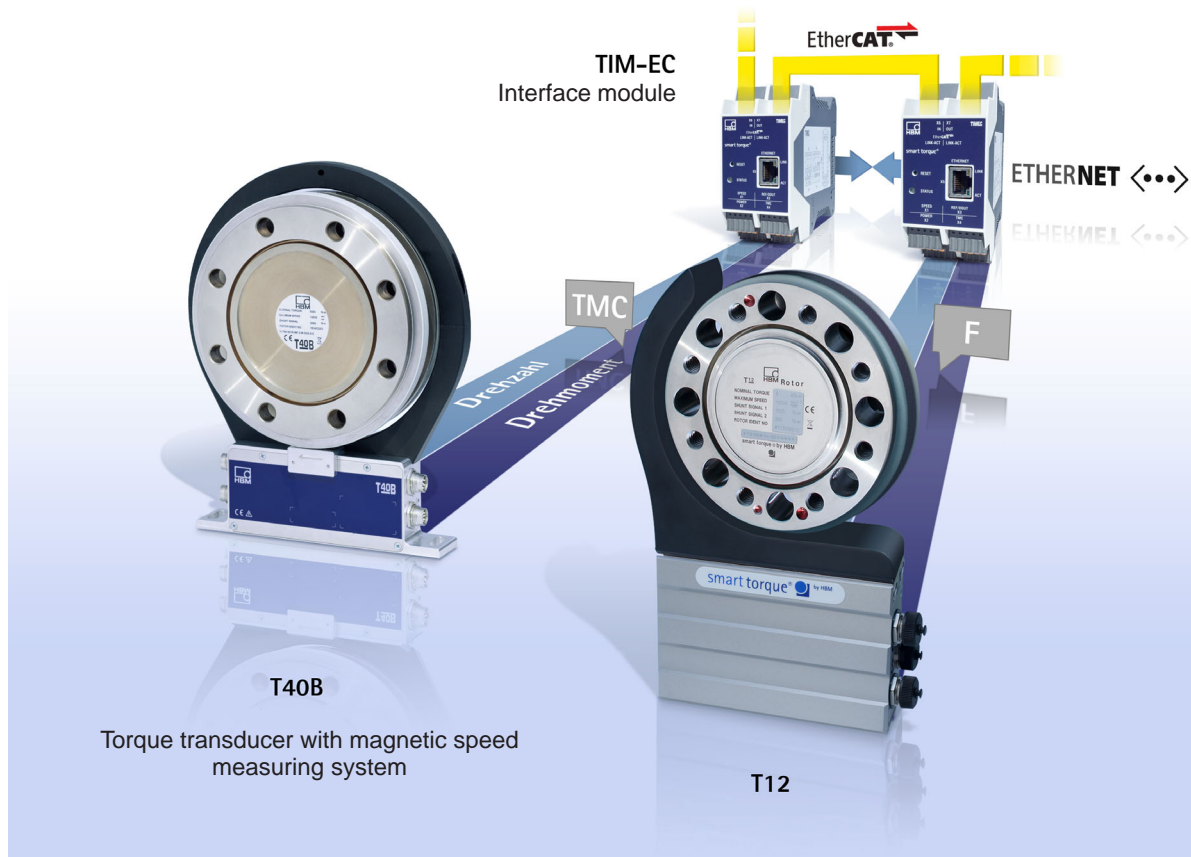# TIM-EC

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

TIM-EC Interface module

T40B

Torque transducer with magnetic speed measuring system

T12

Specifications

Type		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 ≤ 100 Cat-5, shielded ≤ 100 ≤ 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		
Material		Polyamide PA 6.6
Dimensions (W x H x D), without connections	mm	45 x 99 x 107
Weight, approx.	g	230
Mechanical stress capability Vibration test based on IEC/DIN EN 60 068, Part 2-6 (30 min in each direction) Impact test based on IEC/DIN EN 60 068, Part 2-27 (3 times in each direction, impact duration 11 ms)	m/s^2 m/s^2 m/s^2	10 (5 … 8 Hz) 25 (10 … 65 Hz) 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

Specifications (continued)

Torque		
TMC connector input		
Signal type		TMC (digital serial data)
Data rate	Hz	38000 … 39000
Resolution	bits	16
Signal type		FM (frequency modulation via TMC connection)
Data rate	Hz	approx. 39000
Resolution	bits	25
Frequency measurement resolution, min.		
10 +/- 5kHz		1
60 +/-30kHz	mHz	8
240 +/- 120kHz		16
Accuracy		
Frequency measurement rel. to act. value	%	<=0.01
Temperature effect per 10K, rel. to act. value	%	<=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	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
Linearization for full range 1:1 and partial range 1:5 or 1:10 (right, left, up to 11 points)		Calibration coefficients can be entered directly
Maximum cable length for TIM-EC/torque transducer	m	50
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 20kHz		1
Measuring range 200kHz	mHz	10
Measuring range 1000 kHz		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		
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
Max. cable length of TIM-EC/torque transducer/speed encoder	m	50

Specifications (continued)

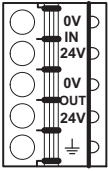| Angle of rotation		
Resolution		1x / 2x / 4x with interpolation
Zero balance		360° / 720° / 1440° EtherCAT® / manual / zero index
Power		
Low pass filter, 4th order	Hz	0.1 / 1 / 10 / 100
Runtimes, filter 1		360° / 720° / 1440° EtherCAT® / manual / zero index
Filter off	µs	0.944
100 Hz	ms	2.6
10 Hz	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 power 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
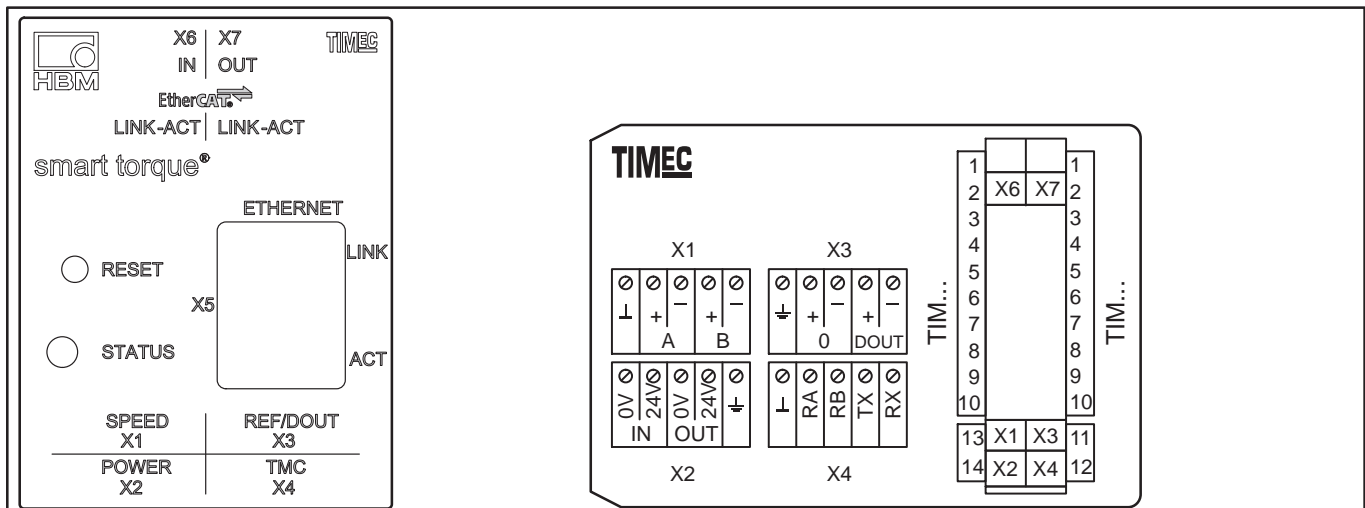
Terminal X1, speed encoder

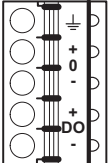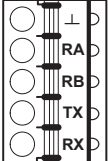|	Pin	Assignment
	1	DGND (digital GND), color code black[1] / brown[2]
	2	A + F1 rotational speed measurement signal, pulse sequence, 5V, 0°, color code red
	3	A - F1 rotational speed measurement signal, pulse sequence, 5V, 0°, color code white
	4	B + F2 rotational speed measurement signal, pulse sequence,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

[1] Speed cable type KAB153
[2] Speed cable type KAB164

Terminal X2, voltage supply

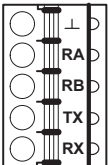|	Pin	Assignment
		Connection for energy supply, input
	1	GND (TIM-EC and stator supply)
	2	+24 V ±10% supply (TIM-EC and stator)
		Output for the supply voltage of the torque transducer
	3	GND (looped through from X2-1): color code black
	4	+24V (looped through from X2-2): color code blue
	5	Shield (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
	2	RA, torque measurement signal 5V, color code red
	3	RB, torque measurement signal 5V, color code white
	4	Not in use
	5	Not in use

Terminal X4, torque transducer - TMC

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

Supplementary technical information

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

measure and predict with confidence

B03727_05_E00_00 19.02.2021 HBM: public

HBM