Digital Measurement Module



The Q.series has been designed for the demanding measurements found in today's industrial measuring and testing environments. Applications range from single, stand-alone solutions to networked, multi-channel systems in real-world areas such as component testing, engine testing, process performance testing, materials testing and structural monitoring.

The range and flexibility of the modules allows for an optimized solution for each and every measurement and control point:

- Dynamic signal acquisition up to 100 kHz per channel
- inputs and outputs for all types of signals and sensors
- Galvanic isolation (up to 1200V) of inputs and outputs
- Multi-channel, High-density packaging
- Intelligent signal conditioning on every channel.

All modules connect to a Q.series test controller (Q.gate, Q.pac, or Q.station) for synchronization and buffering, and data exchange between the test controller and automation system is handled via Ethernet TCP/IP, EtherCAT, Profibus-DP, CANopen, or through additional industrial fieldbus standards.

Key Features:

- 8 digital inputs and 8 digital outputs
 configurable as counter, frequency, PWM and time inputs,
 frequency or PWM output, state in or output
- State in and outputs process- and host controlled
- Frequency in and outputs
 frequency measurement up to 1 MHz (Chronos method),
 frequency output up to 1 / 10 kHz
- for/backward counter, quadrature counter with reference zero recognition (reset/enable), up to 1 MHz
- PWM in and outputs
 measurement of duty cycle and frequency, output with variable
 frequency and/or duty cycle
- Time measurement
- RS485 fieldbus-interface
 up to 48 Mbps: LocalBus
 up to 115.2 kbps: Modbus-RTU, ASCII
- Connectable to any Test Controller
 e.g. Q.station, Q.gate or Q.pac
- Galvanic isolation
 I/O-signals to power supply and to interface
 Isolation voltage 500 VDC
- Electromagnetic Compatibility according EN 61000-4 and EN 55011
- Power supply 10...30 VDC
- DIN rail mounting (EN 60715)



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Digital Measurement Module

Number Rank		Digital Model of Model
Input voltage Input current max. 2 mA Threshold (programmable) Signal voltage, 1° Signal voltage, 1° Itt. or high level Signal voltage, 1° Signal voltage, 1° Itt. or by level Signal voltage, 1° Itt. or by level Signal voltage, 1° Itt. or by level Sov VCC (EN81131-2, Type1) Sov VCC (EN81131-	Digital Inputs	
Input current Threshold (programmable) Signal voltage, 0° - 3 S VDC (EN81131-2, Type1) Signal voltage, 0° - 3 S VDC (EN81131-2, Type1) Isolation Voltage Sov VDC group/group and against power supply and interface ' Function State Reaction time 8-fold Bit-Set transmitted as a single variable. This functionality covers all 8 inputs even if they are already used by other functionalities such as counter or frequency measurement. In case of a conflict the Bit-Set is lower prior Frequency measurement Method Chronos podimized by combination of time measurement and pulse counting Recognition of the direction of rotation (0°, 90°) Frequency range 0.1 Hz up to 1 MHz Time base Counter frequency (reference) 48 MHz Resolution PWM measurement with recognition of the direction of rotation for the direction of rotation the phasing of both inputs is being used. PWM measurement Counter frequency 1 MHz Back/forward counter specification like counter but with an additional input for the direction of counting used. Counter tretence and reselvenable specification like counter but with an additional input for the direction of counting used. Fine measurement Function Measuring of time between two edges, measuring of high time, low time and high/low relation Time range 1 µs up to 32 s	Number	8
Threshold (programmable) Signal voltage .0" - 3 S VDC (EN81131-2, Type1) Signal voltage .1" - 11 30 VDC (EN81131-2, Type1) Isolation Voltage Function State Reaction time 8-fold Bit-Set transmitted as a single variable. This functionality covers all 8 inputs even if they are already used by other functionalities such as counter or frequency measurement. In case of a conflict the Bit-Set is lower prior Frequency measurement Method Chronos optimized by combination of time measurement and pulse counting Recognition of the direction of rotation of rotation (0", 90") Frequency measurement with recognition of the direction of rotation ike frequency measurement. For the recognition of the direction of rotation the phasing of both inputs is being used. Counter frequency Counter Counter frequency specification like counter but with an additional input for the direction of counting used. PWM measurement Function Measuring of time between two edges, measuring of high time, low time and high/low relation Time range 1 µs up to 32 s	Input voltage	max. 30 VDC
Signal voltage _0" 1 30 VDC (EN61131-2, Type1) 1 30 VDC (EN61131-2, Type1) 500 VDC group/group and against power supply and interface 500 VDC group/group and supply sovers all 8 inputs sever if they are already used by other functionality covers all 8 inputs eve	Input current	max. 2 mA
Signal voltage _ 1" 11 30 VDC (EN61131-2, Type1) 500 VDC group/group and against power supply and interface	Threshold (programmable)	TTL or high level
Function State Reaction time Reference Reaction State Septification such as simple state-input, but the binary coded information of 8 inputs can be transmitted as a single variable. This functionality covers all 8 inputs even if they are already used by other functionalities such as counter or frequency measurement. In case of a conflict the Bit-Set is lower prior Set is	Signal voltage "0"	-3 5 VDC (EN61131-2, Type1)
Function State Reaction time 8-fold Bit-Set B-fold Bit-Set 8-fold Bit-Set B-fold Bit-Set 8-fold Bit-Set Bit Bit Bit Bit Bit Bit Bit Bit Bit Bi	Signal voltage "1"	11 30 VDC (EN61131-2, Type1)
Reaction time 8-fold Bit-Set 9-for functionalities such as counter or frequency measurement. In case of a conflict the Bit-Set is lower prior Frequency measurement 8-for for functionalities on the function of the direction of rotation (0°, 90°) 8-frequency range 9-for fine base 9-for fine base 1-for fine base 1-for fine fine fine fine fine fine fine fine	Isolation Voltage	500 VDC group/group and against power supply and interface ¹
Reaction time 8-fold Bit-Set specification such as simple state-input, but the binary coded information of 8 inputs can be transmitted as a single variable. This functionality covers all 8 inputs even if they are already used by other functionalities such as counter or frequency measurement. In case of a conflict the Bit-Set is lower prior Frequency measurement Method Chronos Prequency range 0.1 Hz up to 1 MHz Time base 0.001 up to 10 s Counter frequency (reference) 48 MHz Resolution 0.002 % Frequency measurement with recognition of the direction like frequency measurement. For the recognition of the direction of rotation the phasing of both inputs is being used. PWM measurement Input frequency 0.1 Hz up to 1 MHz Resolution 2 In s Configuration of the measurement type Counter Counter Counter Counter Counter Counter Counter Counter frequency 1 MHz Back/forward counter Quadrature counter Quadrature counter with zero reference and reset/enable Time measurement Function Measuring of time between two edges, measuring of high time, low time and high/low relation Time range 1 µs up to 32 s	Function	
8-fold Bit-Set specification such as simple state-input, but the binary coded information of 8 inputs can be transmitted as a single variable. This functionality covers all 8 inputs even if they are already used by other functionalities such as counter or frequency measurement. In case of a conflict the Bit-Set is lower prior Frequency measurement Method Chronos optimized by combination of time measurement and pulse counting Recognition of the direction of rotation (0°, 90°) Frequency range O.1 Hz up to 1 MHz Time base O.001 up to 10 s Counter frequency (reference) 48 MHz Resolution PWM measurement Input frequency O.1 Hz up to 1 MHz Resolution PWM measurement Input frequency O.1 Hz up to 1 MHz Resolution Configuration of the measurement type Counter Counter Counter Counter frequency 1 MHz Back/forward counter Specification like counter but with an additional input for the direction of counting specification like quadrature counter but with an additional input for the phasing of both inputs is being used. Quadrature counter with zero reference and reset/enable Time measurement Function Measuring of time between two edges, measuring of high time, low time and high/low relation Time range 1 µs up to 32 s	State	
transmitted as a single variable. This functionality covers all 8 inputs even if they are already used by other functionalities such as counter or frequency measurement. In case of a conflict the Bit-Set is lower prior Frequency measurement	Reaction time	10 µs
Chronos optimized by combination of time measurement and pulse counting Recognition of the direction of rotation (0°, 90°) Frequency range 0.1 Hz up to 1 MHz Time base Counter frequency (reference) Resolution Frequency measurement with recognition of the direction of rotation like frequency measurement. For the recognition of the direction of rotation the phasing of both inputs is being used. PWM measurement Input frequency 0.1 Hz up to 1 MHz Resolution 21 ns Configuration of the measurement type Counter Counter Counter Counter Counter Guadrature counter Quadrature counter Specification like counter but with an additional input for the direction of counting specification like counter. For the recognition of the direction the phasing of both inputs is being used. Quadrature counter with zero reference and reset/enable Time measurement Function Time range 1 µs up to 32 s	8-fold Bit-Set	transmitted as a single variable. This functionality covers all 8 inputs even if they are already used by other functionalities such as counter or frequency measurement. In case of a conflict the Bit-
optimized by combination of time measurement and pulse counting Recognition of the direction of rotation (0°, 90°) Frequency range O.01 tz up to 1 MHz Time base O.001 up to 10 s Counter frequency (reference) Resolution Frequency measurement with recognition of the direction of rotation his being used. PWM measurement Input frequency O.1 Hz up to 1 MHz Resolution PWM measurement type Counter Counter Counter Counter Counter Counter Counter Guadrature counter Quadrature counter Specification like counter but with an additional input for the direction of counting specification like counter. For the recognition of the direction of counting specification like counter. For the recognition of the direction of counting Specification like counter but with an additional input for the direction of counting Specification like counter but with an additional input for the phasing of both inputs is being used. Quadrature counter with zero reference and reset/enable Time measurement Function Time range I µs up to 32 s	Frequency measurement	
Time base 0.001 up to 10 s Counter frequency (reference) 48 MHz Resolution 0.002 % Frequency measurement with recognition of the direction of rotation the phasing of both inputs is being used. PWM measurement 0.1 Hz up to 1 MHz Resolution 21 ns Configuration of the measurement type counter for duty cycle, frequency Counter Counter 32 bit (±31 bit) Counter frequency 1 MHz Back/forward counter Specification like counter but with an additional input for the direction of counting Quadrature counter with zero reference and reset/enable Time measurement Function Measuring of time between two edges, measuring of high time, low time and high/low relation 1 µs up to 32 s	Method	optimized by combination of time measurement and pulse counting
Counter frequency (reference) Resolution O.002 % Frequency measurement with recognition of the direction of rotation the phasing of both inputs is being used. PWM measurement Input frequency O.1 Hz up to 1 MHz Resolution Configuration of the measurement type Counter Counter Counter Counter for duty cycle, frequency 32 bit (±31 bit) Counter frequency Back/forward counter Quadrature counter Quadrature counter Quadrature counter with zero reference and reset/enable Time measurement Function Measuring of time between two edges, measuring of high time, low time and high/low relation 1 µs up to 32 s	Frequency range	0.1 Hz up to 1 MHz
Resolution Frequency measurement with specification like frequency measurement. For the recognition of the direction of rotation phasing of both inputs is being used. PWM measurement Input frequency O.1 Hz up to 1 MHz Resolution Configuration of the measurement type Counter Counter Counter Counter frequency 1 MHz Back/forward counter Quadrature counter Quadrature counter Quadrature counter Quadrature counter with zero reference and reset/enable Time measurement Function Time range Tunction Time range Tunction Time range Time measurement with pecification like requency measurement. For the recognition of the direction of rotation the phasing of both inputs is being used. Specification like counter. For the recognition of the direction the phasing of both inputs is being used. Specification like quadrature counter but with an additional input for the "0" reference recognition and an additional input to activate the counter functionality individually. Function Time range Time range Time range Time range Time rang	Time base	0.001 up to 10 s
Frequency measurement with recognition of the direction of rotation hasing of both inputs is being used. PWM measurement Input frequency O.1 Hz up to 1 MHz Resolution Configuration of the measurement type Counter Counter Counter 32 bit (±31 bit) Counter frequency Back/forward counter Quadrature counter Quadrature counter with zero reference and reset/enable Time measurement Function Time range Technical input for the recognition of the direction of rotation the phasing of both inputs is being used. Measuring of time between two edges, measuring of high time, low time and high/low relation Time range Time range PWM measurement with phasing of both inputs is being used. Specification like quadrature counter but with an additional input for the "0" reference recognition and an additional input to activate the counter functionality individually. Function Time range	Counter frequency (reference)	48 MHz
recognition of the direction of rotation PWM measurement Input frequency 0.1 Hz up to 1 MHz Resolution Configuration of the measurement type Counter Counter Counter for duty cycle, frequency 1 MHz Back/forward counter Quadrature counter Quadrature counter with zero reference and reset/enable Time measurement Function Measuring of time between two edges, measuring of high time, low time and high/low relation Time range 1 μs up to 32 s	Resolution	0.002 %
PWM measurement Input frequency 0.1 Hz up to 1 MHz Resolution 21 ns Configuration of the measurement type counter for duty cycle, frequency Counter Counter Counter frequency 1 MHz Back/forward counter specification like counter but with an additional input for the direction of counting specification like counter. For the recognition of the direction the phasing of both inputs is being used. Quadrature counter with zero reference and reset/enable Time measurement Function Measuring of time between two edges, measuring of high time, low time and high/low relation Time range 1 μs up to 32 s	Frequency measurement with	specification like frequency measurement. For the recognition of the direction of rotation the
Resolution 21 ns Configuration of the measurement type counter for duty cycle, frequency Counter Counter 32 bit (±31 bit) Counter frequency 1 MHz Back/forward counter specification like counter but with an additional input for the direction of counting specification like counter. For the recognition of the direction the phasing of both inputs is being used. Quadrature counter with zero reference and reset/enable Time measurement Function Measuring of time between two edges, measuring of high time, low time and high/low relation Time range 1 μs up to 32 s	recognition ot the direction of rotation	phasing of both inputs is being used.
Resolution 21 ns Configuration of the measurement type counter for duty cycle, frequency Counter Counter Counter 32 bit (±31 bit) Counter frequency 1 MHz Back/forward counter specification like counter but with an additional input for the direction of counting Quadrature counter specification like counter. For the recognition of the direction the phasing of both inputs is being used. Quadrature counter with zero reference and reset/enable Time measurement Function Measuring of time between two edges, measuring of high time, low time and high/low relation Time range 1 μs up to 32 s	PWM measurement	
Counter Counter Counter 32 bit (±31 bit) Counter frequency 1 MHz Back/forward counter specification like counter but with an additional input for the direction of counting specification like counter. For the recognition of the direction the phasing of both inputs is being used. Quadrature counter with zero reference and reset/enable reference and reset/enable Time measurement Function Measuring of time between two edges, measuring of high time, low time and high/low relation Time range 1 µs up to 32 s	Input frequency	0.1 Hz up to 1 MHz
Counter Counter 32 bit (±31 bit) Counter frequency 1 MHz Back/forward counter specification like counter but with an additional input for the direction of counting Quadrature counter specification like counter. For the recognition of the direction the phasing of both inputs is being used. Quadrature counter with zero reference and reset/enable and an additional input to activate the counter functionality individually. Time measurement Function Measuring of time between two edges, measuring of high time, low time and high/low relation Time range 1 µs up to 32 s	Resolution	21 ns
Counter frequency 1 MHz Back/forward counter specification like counter but with an additional input for the direction of counting Quadrature counter specification like counter. For the recognition of the direction the phasing of both inputs is being used. Quadrature counter with zero reference and reset/enable and an additional input to activate the counter functionality individually. Time measurement Function Measuring of time between two edges, measuring of high time, low time and high/low relation Time range 1 µs up to 32 s	Configuration of the measurement type	counter for duty cycle, frequency
Counter frequency Back/forward counter Specification like counter but with an additional input for the direction of counting Quadrature counter Specification like counter. For the recognition of the direction the phasing of both inputs is being used. Quadrature counter with zero Specification like quadrature counter but with an additional input for the "0" reference recognition and an additional input to activate the counter functionality individually. Time measurement Function Measuring of time between two edges, measuring of high time, low time and high/low relation Time range 1 µs up to 32 s	Counter	
Back/forward counter Quadrature counter Quadrature counter Quadrature counter Quadrature counter with zero reference and reset/enable Function Time range Time range Specification like counter but with an additional input for the direction the phasing of both inputs is being used. Specification like quadrature counter but with an additional input for the "0" reference recognition and an additional input to activate the counter functionality individually. Function Time range 1 µs up to 32 s	Counter	32 bit (±31 bit)
Quadrature counter specification like counter. For the recognition of the direction the phasing of both inputs is being used. Quadrature counter with zero specification like quadrature counter but with an additional input for the "0" reference recognition and an additional input to activate the counter functionality individually. Time measurement Function Measuring of time between two edges, measuring of high time, low time and high/low relation Time range 1 µs up to 32 s	Counter frequency	1 MHz
used. Quadrature counter with zero specification like quadrature counter but with an additional input for the "0" reference recognition and an additional input to activate the counter functionality individually. Time measurement Function Time range 1 μs up to 32 s	Back/forward counter	specification like counter but with an additional input for the direction of counting
reference and reset/enable and an additional input to activate the counter functionality individually. Time measurement Function Measuring of time between two edges, measuring of high time, low time and high/low relation Time range 1 µs up to 32 s	Quadrature counter	
Time measurement Function Measuring of time between two edges, measuring of high time, low time and high/low relation Time range 1 μs up to 32 s	Quadrature counter with zero	specification like quadrature counter but with an additional input for the "0" reference recognition
Function Measuring of time between two edges, measuring of high time, low time and high/low relation Time range 1 µs up to 32 s		and an additional input to activate the counter functionality individually.
Time range 1 μs up to 32 s	Time measurement	
The specific section of the section		Measuring of time between two edges, measuring of high time, low time and high/low relation
Resolution 21 ns	Time range	1 µs up to 32 s
	Resolution	21 ns

¹ Noise pulses up to 1000 VDC, permanent up to 250 VDC

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Digital Measurement Module

With a Q.bloxx D101 2 x 4 connectors for digital inputs are available. Those will accept all mentioned signals as it is required. The following combinations are possible

Connector 1				Connector 2			
Terminal 1.6	Terminal 1.7	Terminal 1.8	Terminal 1.9	Terminal 2.6	Terminal 2.7	Terminal 2.8	Terminal 2.9
State State State State		State	State	State	State		
State	State	State	State	State	State	2 channel signal 1)	
State	State	State	State	2 channel signal 1) 2 channel signal 1)		el signal 1)	
State	State	State	State	4 channel signal 2)			
State	State	2 channe	el signal 1)	2 channel signal 1) 2 channel signal 1)		el signal 1)	
State State 2 channel signal 1)		4 channel signal ²⁾					
2 channe	el signal 1)	2 channe	el signal 1)	4 channel signal ²⁾			
2 channel signal 1) 2 channel signal 1)		2 channel signal 1) 2 channel signal 1)		1)			
4 channel signal 2)			4 channel signal ²⁾				
¹⁾ all digital input functionalities except state and "quadrature counter with reference zero and reset/enable"		²⁾ Quadrature counter with reference zero and reset/enable					

Digital Outputs				
Number	8			
Contact	open drain p-channel MOSFET (short circuit proof)			
Output voltage	10 V up to 30 V, external supply required			
Load	30 VDC/500 mA (ohmic Load)			
Function				
State				
Reaction time (depending on load)	>0,5 A	>0,1 A	<0,1 A	
	10 µs	100 μs	1000 µs	
8-fold Bit-Set	Specification such as a simple state output but 8 outputs can be set with only one variable in binary coding. This functionality covers all 8 outputs even if they are used by other functionalities such as frequency or PWM output. In case of a conflict the Bit-Set is lower prior			
Frequency output				
Frequency range	0.1 Hz up to 1 kHz / 10 kHz deper	nding on load		
Accuracy	0.1 %			
Resolution	1 μs			
PWM output				
Frequency range	0.1 Hz up to 1 kHz / 10 kHz deper	nding on load		
Accuracy	0.1 %			
Resolution	1 μs			





Digital Measurement Module

Power Supply	
Power supply	10 up to 30 VDC, overvoltage and overload protection
Power consumption	approx. 2 W
Influence of the voltage	<0.001 %/V
Environmental	
Operating temperature	-20°C up to +60°C
Storage temperature	-40°C up to +85°C
Relative humidity	5 % up to 95 % at 50°C, non condensing
Communication Interface	
Standard	RS-485, 2-wire
Data format	8e1
Protocols	Local-Bus: 115200 bps up to 48 Mbps
	Modbus-RTU, ASCII: 19200 bps up to 115200 bps
Connectable devices	max. 32
Mechanical	
Case	Aluminum and ABS
Dimensions (W x H x D)	(27 x 120 x 105) mm
Weight	approx. 200 g
Mounting	DIN EN-rail

Warm Up Time

All declarations are valid after a warm up time of 45 minutes.

Valid from July 2015. Specification subject to change without notice gantner-q.bloxx-d101.pdf (Version 0616)