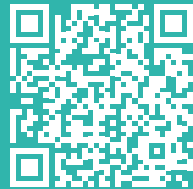




QI-50-V-485 | QI-300-V-485



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QI-50-V-485



QI-300-V-485

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SAFETY WARNINGS AND CAUTIONS

The following warnings and cautions must be observed to ensure personal safety and prevent damage.



Death or **serious injury** may result from failure to heed this warning.



Material damage or **serious personal injury** may result from failure to heed this warning.



The manufacturer **declines all responsibility** for electrical safety in the event of improper use of the equipment.



It is essential to read the entire contents of this manual before carrying out any work.

Installation and commissioning must be carried out by qualified personnel only.



Before commissioning, make sure that:

- the maximum values for all connections are not exceeded; refer to the product data sheet;
- the connection cables are not damaged or live during wiring;
- the direction of current flow and phase rotation are correct.

During installation, ensure that a switch or circuit-breaker is near the product and easily accessible.

The unit must be uninstalled if safe operation can no longer be guaranteed (e.g. visible damage). Disconnect all connections in this case. The unit should be returned to the manufacturer or to an authorised service centre for repair.



WARNING: High-intensity magnetic fields may alter the values measured by the transformer. Avoid installation near: permanent magnets, electromagnets, or iron masses. If irregularities are detected, reposition or move the unit to a more suitable location.



Failure to observe the warnings may result in damage to the equipment or failure to operate as intended.



Please note that the information on the nameplate must be observed.



It is necessary to comply with national regulations when installing and picking materials for power lines.



Repairs and modifications must be carried out only by the manufacturer. It is forbidden to open the case and make any changes to the device. Tampering with the device will invalidate the warranty.



The product described in this document may only be used for the specified application. The maximum performance data and environmental conditions specified in the product data sheet must be observed. Proper transport and storage, as well as professional assembly, installation, handling and maintenance are required for the correct and safe operation of the device.

Use under ambient conditions other than those specified, application of signals or voltages other than those specified, may cause significant deviations from the specified measurement tolerances, which may be irreversible.



Although the contents of this document have been checked for accuracy, it may contain errors or inconsistencies and we cannot guarantee its completeness or accuracy.



This document is subject to periodic revision and updating. QEED reserves the right to make changes to the product and/or its technical documentation at any time in the interests of continuous quality improvement. Always consult the latest version of the documentation available on the website:

www.qeed.it

If you find any errors or missing information in this document, please notify us by e-mail to:

technical@qeed.it



Disposal of waste electrical and electronic equipment (applicable in the European Union and other countries with separate collection). The symbol on the product or its packaging indicates that the product should not be treated as household waste. Instead, it will be handed over to an authorised collection point for the recycling of electrical and electronic waste. Ensuring that the product is disposed of properly will prevent potential negative effects on the environment and human health, which could otherwise be caused by inappropriate waste management of the product. Recycling materials helps to conserve natural resources. For further information, please contact your local authority, waste disposal service or the retailer from whom you purchased the product.





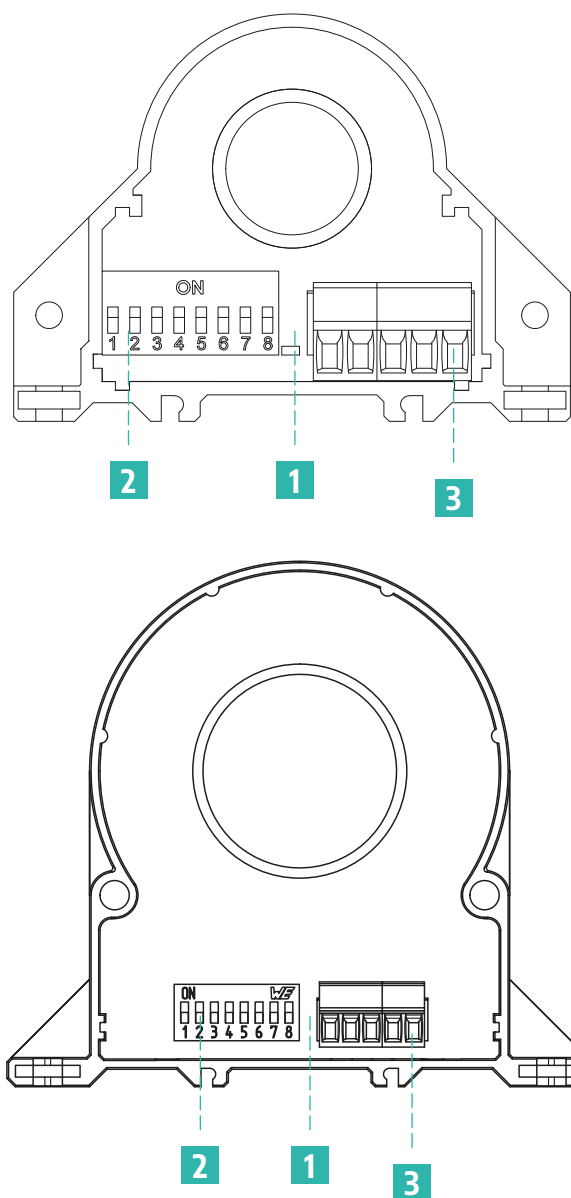
PRODUCT OVERVIEW

The QI-50-V-485 and QI-300-V-485 are 50A and 300A DC and AC current transformers that are galvanically isolated from the measurement circuit. They are similar in function and appearance to a standard active CT, but are capable of measuring both the DC and AC TRMS components.

The units are equipped with a 0-10V analogue output.

RS485 serial interface for communication with Modbus RTU protocol, either from the **Q-WIZARD configuration tool**, or with third party Modbus masters by acting on register map registers.

Mounting accessories supplied as standard for DIN rail mounting.



- 1** Status LED
 - OFF: product not powered
 - STEADY YELLOW: product powered
 - FLASHING YELLOW: communication in progress
- 2** DIP Switch
- 3** Power supply, V_{out} , RS485



TECHNICAL SPECIFICATIONS

Electrical characteristics

	QI-50-V-485	QI-300-V-485
Power supply	12÷30V _{DC} with reverse polarity and overtemperature protection	
Current consumption	20mA max	
Measurable AC/DC current range	0-50A	0-300A
0-10V analogue output range (values that can be set via DIP-switch)	50A RMS, ±50A DC, 25A RMS, ±25A DC	300A RMS, ±300A DC, 150A RMS, ±150A DC
Measurement type	TRMS(AC)/DC	
Accuracy class @25°C, 50Hz, PF = 1	<0,5% F.S.	
Measurement Hysteresis	0,15% F.S.	0,2% F.S.
Crest factor	2	1,4
Response delay	1000ms on analog port 30ms on serial port	
Passband (-3dB)	DC or 20÷2000Hz	
Isolation	3kV on bare cable for current measurement	
Overload	300A continuous, 2kA impulsive	
Output	0÷10V	
Communication interface	RS485 Modbus RTU	

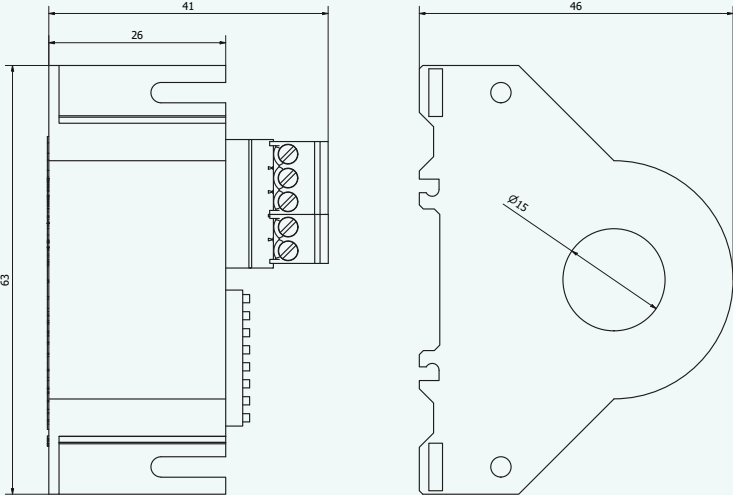
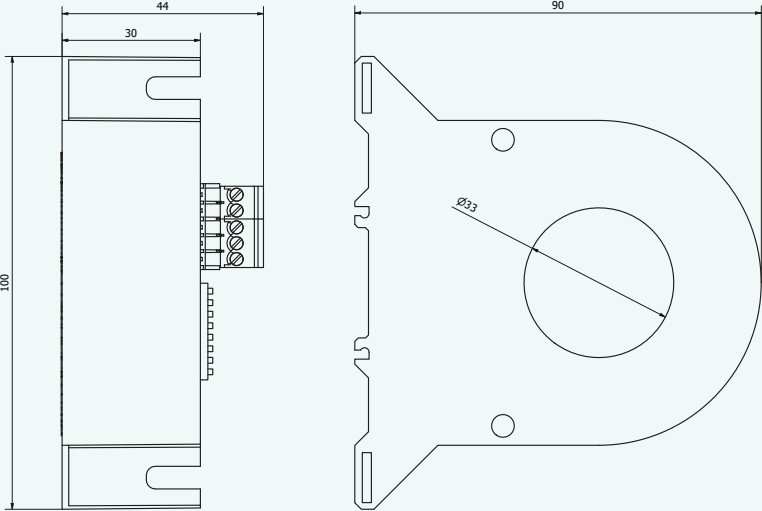
Communication characteristics

Protocol	Modbus RTU
Baudrate	1200÷115200 bps (default 9600)
Addresses	1÷247 (default 1)
Data format	1 bit di start, 8 bit dati, parità NO/ODD/EVEN (default NO parità)
Response delay	1÷1000ms
Connection	Via removable 5-pin terminal

General data

Working temperature	-15÷60° C
Storage temperature	-40÷85° C
Relative humidity	10÷90% not condensing
Elevation	Up to 2000m a.s.l.
Temperature coefficient	< 200ppm/°C
Protection degree	IP20



Measurements	QI-50-V-485 41x63x46 mm  QI-300-V-485 44x100x90 mm 
Weight	QI-50-V-485 72 g QI-300-V-485 370 g
Terminal cable cross-section	0.05÷1.5 mm ² (30÷14 AWG)
Appliance class	Cat. III (IEC 60664, EN60664)
Approvals and certifications	EN61000-6-4/2006 + A1 2011; EN61000-6-2; EN61010-1/2010 only QI-300-V-485    
Installation	Inside electrical panels and mounted on a DIN rail with attachment clips provided

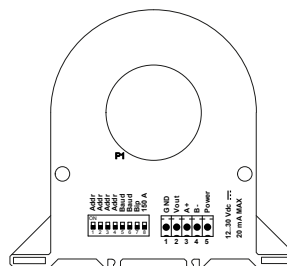
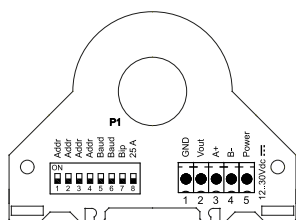
Order codes

50A version	QI-50-V-485
300A version	QI-300-V-485
Attachment clips (50A version)	900000009
Attachment clips (300A version)	900000012

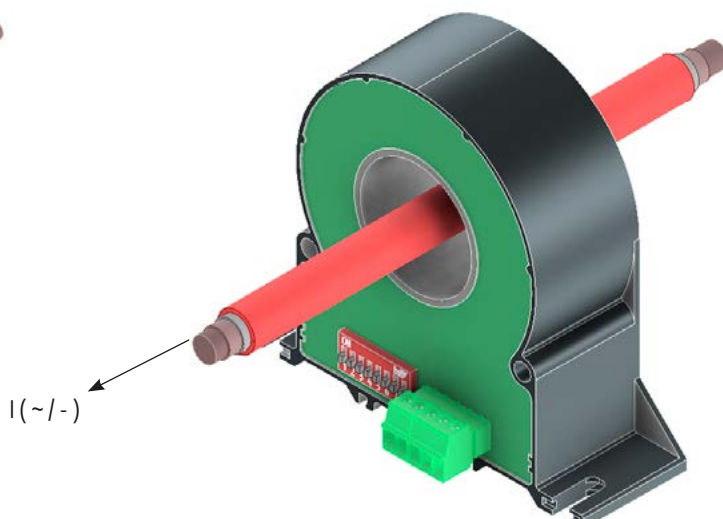
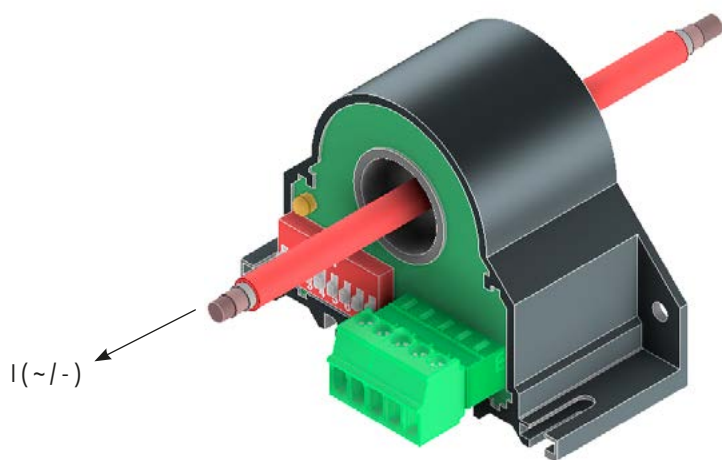


CONNECTION AND INSTALLATION

The instrument is designed to be installed inside electrical panels and mounted on a DIN rail in four different ways (DIN rail or panel mounting, vertical or horizontal). All connection terminals are shown on the pad print on the product and correspond to the figure below:



The system installation is as in the following image:



The conductor must be positioned as close to the product centre as possible to ensure correct current measurement.
The incoming direction of the current is represented by the nomenclature P1 pad-printed on the product.

WARNING: strong magnetic fields can alter the values measured by the instrument. Avoid installation near permanent magnets, electromagnets or ferrous masses that can significantly alter the magnetic field. In the event of anomalies, we recommend reorienting the instrument or moving it to a more suitable location.



The connection of the terminals is described below:

	Device power supply. Please note: Wiring must be protected against short circuits and/or accidental faults
	0÷10V output
	RS485 Modbus RTU connection: terminals 3 (A+), 4 (B-), 1 (GND)

AVAILABLE MEASUREMENTS

Depending on the product setting, both QI-50-V-485 and QI-300-V-485 can be used for both AC and DC measurements, with the ability to vary the measurement range for greater accuracy.

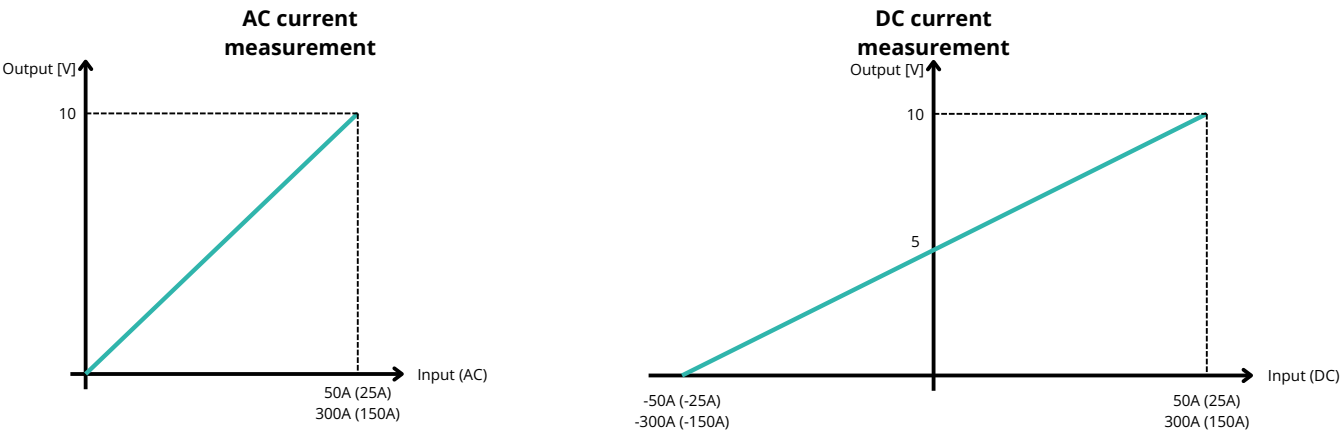


Figure 1: AC or DC measurement

Measurement and output intervals can also be set via configuration software or Modbus registers:

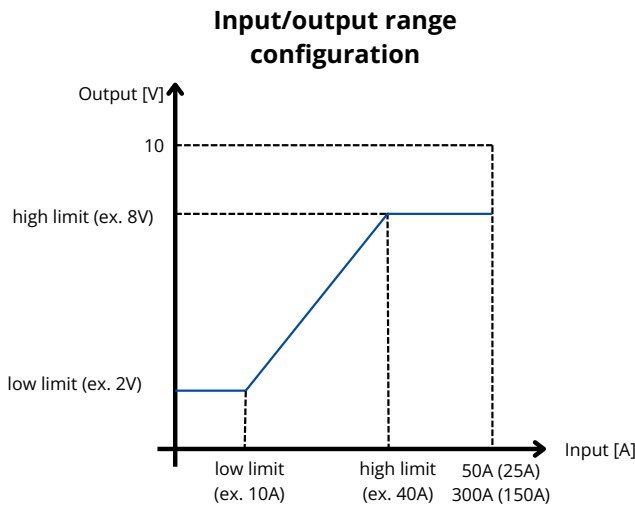


Figure 2: input/output range configuration



MEASUREMENT CONFIGURATION

By means of DIP switches 7 and 8, a different measuring range and type can be set according to the table below:

Product	Description	DIP 7	DIP 8
QI-300-V-485	TRMS	0	
QI-50-V-485	DC*	1	
QI-50-V-485	50A AC/DC		0
	25A AC/DC		1
QI-300-V-485	300A AC/DC		0
	150A AC/DC		1

* AC measurement would give an average value equal to 0A therefore the analogue output would be fixed to 5V.

In order for the above settings to take effect, DIP switches 1-4 must not be set to 0000, which would force the use of the configuration from the EEPROM.

PLEASE NOTE: DIP settings 7 and 8 only affect the analogue output and not the value stored in reg. 40037, which remains the RMS value with maximum full scale.

PRODUCT FEATURES

Using the configuration software or acting on the dedicated registers, the following functions can be configured:

Modbus

Address, baud rate, parity and response delay can be set.

Input/Output

- Possibility of rescaling the input measuring range [Reg. 40007 - 40009] and the output measuring range on the 0 ÷ 10V output [Reg. 40011 - 40012]
- 2 filtering levels for moving average and current ripple reduction [Reg. 40013 - 40014]
- Current display threshold [Reg. 40029]
- Ampere-hour setting [Reg. 40053]

DEVICE CONFIGURATION

Baudrate setting via DIP switch

Before connecting and powering up the product, the baud rate can be set by DIP switch.

Description	DIP 1	DIP 2	DIP 3	DIP 4	DIP 5	DIP 6
Settings from EEPROM	0	0	0	0		
Address = 1	0	0	0	1		
Address = 2	0	0	1	0		
...	...	...	...	...		
Address = 15	1	1	1	1		
Baudrate = 2400					0	0
Baudrate = 9600					0	1
Baudrate = 38400					1	0
Baudrate = 57600					1	1

Addresses greater than 15 and baud rate values other than those selectable by DIP-switch can be configured via the **Q-WIZARD configuration software** or with the Modbus RTU functions below by acting on the dedicated registers - see page 13.

If one of the DIP switches 1-4 is not set to zero, the default values are used to configure the input and output ranges (registers 40007 - 40012).

PLEASE NOTE: to make active all changes via DIP-switch, it is necessary to remove and restore power to the device.



Functionality configuration

Through an RS485 serial device such as our Q-USB485, it is possible to connect to the product using the Modbus RTU input terminals.

Configuration of the module can be done with our **Q-WIZARD configuration software** or with any third-party Modbus master by acting on the registers in the map - see page 13.

Q-WIZARD

Using the **Q-WIZARD configuration software**, it is possible to configure all device parameters by following the simple, self-explanatory steps. In addition to the configuration of various parameters, inputs and outputs, the **Q-WIZARD** also allows real-time monitoring of device variables.

Third-party Modbus Master

Alternatively, the product can communicate directly with a third-party Modbus RTU Master using the communication settings according to the DIP switch configuration (when using microUSB the DIP switch settings are irrelevant).

The communication protocol supported is Modbus RTU Slave:

- Modbus RTU connections: A+ and B- according to Modbus RTU standards
- Supported Modbus RTU functions: 03 hexadecimal (read multiple registers, max 100), 06 hexadecimal (write single), 10 hexadecimal (write multiple registers)
- Modbus RTU address numbering is by convention '1 BASED' (standard), but the physical register is base 0; the logical address, e.g. 40010, corresponds to the physical address #9, as required by Modbus RTU standards

PLEASE NOTE: A maximum of 5 logs can be read in one call, more than this will result in a timeout response.

PLEASE NOTE: All setting changes of calibration and configuration parameters must be followed by the flash save command 0xC1C0 = Flash settings save command in register 40040; changes of device communication parameters in addition must also be followed by the command 0xC1A0 = Reboot command in register 40040.

In this case, all device configurations are performed by accessing the Modbus RTU register map available in the last chapter of this document using the functions:

- Read holding registers (function 03 hexadecimal)
- Write single holding register (function 06 hexadecimal)
- Write multiple registers (function 10 hexadecimal)

**Function 03 Hexadecimal** (Read Holding Registers)

This function is used to read the contents of a contiguous block of holding registers (words). The request frame specifies the source register address and the number of registers to read. A maximum of 5 registers (words) can be read with a single request, unless otherwise specified. The register data in the response message is packaged as two bytes per register (word), with the binary contents right-justified within each byte. For each register, the first byte contains the most significant bits (MSB) and the second byte contains the least significant bits (LSB).

Request Frame			
Description	Lenght	Value	Comments
Physical address	1 byte	1 to F7 HEX (1 to 247)	
Function code	1 byte	03 HEX	
Starting address	2 bytes	0000 to FFFF HEX	Bytes order: MSB, LSB
Number of registers (N word)	2 bytes	1 to 10 HEX (1 to 16)	Bytes order: MSB, LSB
CRC	2 bytes		

Response frame (right action)			
Description	Lenght	Value	Comments
Physical address	1 byte	1 to F7 HEX (1 to 247)	
Function code	1 byte	03 HEX	
Required Number of bytes	1 byte	N word * 2	
Register value	N*2 bytes		Bytes order: MSB, LSB
CRC	2 bytes		

Response frame (wrong action)			
Description	Lenght	Value	Comments
Physical address	1 byte	1 to F7 HEX (1 to 247)	Possible exception: 01: illegal function 02: illegal data address 03: Illegal data value 04: Slave device failure
Function code	1 byte	83 HEX	
Exception code	1 byte	01, 02, 03, 04 (see note)	
CRC	2 bytes		



Function 06 Hexadecimal (Write Single Holding Register)

This function is used to write a single holding register. The request frame specifies the address of the register (word) to be written and its contents. The correct response is an echo of the request, returned after the contents of the register have been written.

Request frame			
Description	Lenght	Value	Comments
Physical address	1 byte	1 to F7 HEX (1 to 247)	
Function code	1 byte	06 HEX	
Starting address	2 bytes	0000h to FFFF HEX	Bytes order: MSB, LSB
Register value	2 bytes	0000h to FFFF HEX	Bytes order: MSB, LSB
CRC	2 bytes		

Response frame (right action)			
Description	Lenght	Value	Comments
Physical address	1 byte	1 to F7 HEX (1 to 247)	
Function code	1 byte	06 HEX	
Starting address	2 bytes	0000h to FFFF HEX	Bytes order: MSB, LSB
Register value	2 bytes	0000h to FFFF HEX	Bytes order: MSB, LSB
CRC	2 bytes		

Response frame (wrong action)			
Description	Lenght	Value	Comments
Physical address	1 byte	1 to F7 HEX (1 to 247)	Possible exception: 01: illegal function 02: illegal data address 03: Illegal data value 04: Slave device failure
Function code	1 byte	86 HEX	
Exception code	1 byte	01, 02, 03, 04 (see note)	
CRC	2 bytes		

**Function 10 Hexadecimal** (Write Multiple Registers)

This function is used to write a block of contiguous registers (maximum of 2). The required values to be written are specified in the data field of the request. The data is packed as two bytes per register.

A correct response returns the function code, the starting address and the number of registers written.

Request frame			
Description	Lenght	Value	Comments
Physical address	1 byte	1 to F7 HEX (1 to 247)	
Function code	1 byte	10 HEX	
Starting address	2 bytes	0000 to FFFF HEX	Bytes order: MSB, LSB
Number of registers (N word)	2 bytes	0001 to 0078 HEX	Bytes order: MSB, LSB
Byte counting	1 byte	N word * 2	
Register value	N * 2 bytes	value	Bytes order: MSB, LSB
CRC	2 bytes		

Response frame (right action)			
Description	Lenght	Value	Comments
Physical address	1 byte	1 to F7 HEX (1 to 247)	
Function code	1 byte	10 HEX	
Starting address	2 bytes	0000 to FFFF HEX	Bytes order: MSB, LSB
Number of registers (N word)	2 bytes	0001 to 0078 HEX	Bytes order: MSB, LSB
CRC	2 bytes		

Response frame (wrong action)			
Description	Lenght	Value	Comments
Physical address	1 byte	1 to F7 HEX (1 to 247)	Possible exception: 01: illegal function 02: illegal data address 03: Illegal data value 04: Slave device failure
Function code	1 byte	90 HEX	
Exception code	1 byte	01, 02, 03, 04 (see note)	
CRC	2 bytes		



REGISTER MAP

Default values are in **bold**.

Address Modbus	Description	Register Type	R/W	Default		Range	
				QI-50-V	QI-300-V	QI-50-V	QI-300-V
40001	Machine ID	UShort [16b]	R	4	16		
40002	Firmware version	UShort [16b]	R				
40003	Modbus Address	UShort [16b]	R/W	1		1...247	
40004	Answer Delay	UShort [16b]	R/W	1		1...255	1...1000
40005	Baudrate Value: 0 = 1200 1 = 2400 2 = 4800 3 = 9600 4 = 19200 5 = 38400 6 = 57600 7 = 115200	UShort [16b]	R/W	1		0...7	
40006	Type of parity: 0 = none 1 = ODD 2 = EVEN	UShort [16b]	R/W	0		0...2	
40007	Low limit of input range [A] Lower input value of current matched to low value of analogue output (reg. 40011)	Float [32b-LSW]	R/W	0		-50 ... +50	-300 ... +300
40009	High limit of input range [A] Higher input value of current matched to high value of analogue output (reg. 40012)	Float [32b-LSW]	R/W	50	300	-50 ... +50	-300 ... +300
40011	Low limit of output range [mV] Output value corresponding to corresponding to low input value set in reg. 40007	UShort [16b]	R/W	0		0 ...10000	
40012	High limit of output range [mV] Output value corresponding to corresponding to high input value set in reg. 40009	UShort [16b]	R/W	10000		0 ...10000	
40013	N° of samples for mobile average (1=100 ms)	UShort [16b]	R/W	1		132	
40014	Second level of filtering for ripple problems on AC measurement	UShort [16b]	R/W	4096		1000 ... 20000	
40029	Cutoff threshold – minimum level for current measurement [mA]	UShort [16b]	R/W	1500			
40037	RMS Current Value [A]	Float [32b-LSW]	R				
40040	Command: 0xC1C0 = Flash setting save command 0xD166 = Dip read command 0xC1A0 = Reboot command	UShort [16b]	R/W				
40048	Status Register: bit[0] = Error flash settings bit[1] = Error flash calibration bit[2] = Over Range bit[3] = Under Range	UShort [16b]	R				
40050	RMS Current value in hundred [A x 100]	Short [16b]	R				
40051	Swapped RMS Current [A]	Float [32b-MSW]	R				
40053	Ah counting (resettable)	Float [32b-LSW]	R/W				
40055	Max RMS current in hundred [A x 100] (resettable)	Short [16b]	R				
40056	min RMS current in hundred [A x 100] (resettable)	Short [16b]	R				

LEGEND:

Short [16b] = Signed Short (16 bit)
UShort [16b] = Unsigned Short (16 bit)

Long [32b-MSW] = Signed Long (32 bit - MSW First Register)
Long [32b-LWS] = Signed Long (32 bit - LSW First Register)
ULong [32b-LSW] = Unsigned Long (32 bit - LSW First Register)
ULong [32b] = Unsigned Long (32 bit)

Float [32b-MSW] = Float (32 bit - MSW First Register)
Float [32b-LSW] = Float (32 bit - LSW First Register)

UInt [16b] = Unsigned Integer (16 bit)
UInt [32b-MSW] = Unsigned Integer (32 bit - MSW First Register)
Int [64b-LSW] = Signed Long Long (64 bit - LSW First Register)



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As standards, specifications, and design change from time to time, please ask for confirmation of the information given in this publication.