Q|TC

THERMOCOUPLE TEMPERATURE SWITCH

Q|TC is a configurable temperature switch supporting a wide range of thermocouple sensors, operating as a stand-alone controller or as a remote control.
The relay output can be controlled from fieldbus or configured to activate above / below setpoint.

Q|TC is available as a bare board to be installed within the enclosure of our Burner Control Units or as an independent unit with its own aluminum box.
Configuration from fieldbus interface or through on board jack by means of USB cable adapter.



CE

SAFETY INFORMATION

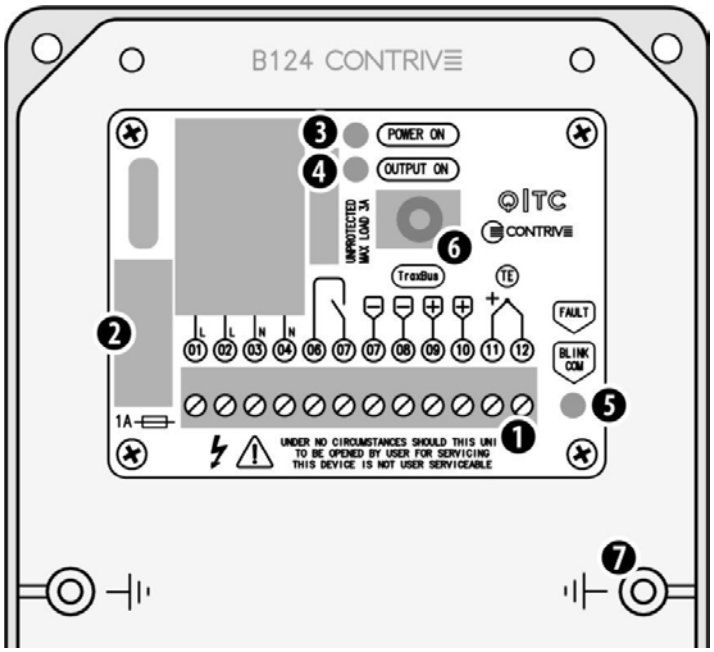
Read and understand this manual before installing, operating, or servicing this unit. This unit must be installed according to this manual and local regulations. The drawings may show units without covers or safety shields to illustrate details. Disconnect power supply and follow all usual safety precautions before carrying out any operation on the device. Be sure to reinstall covers or shields before operating any devices.
The device is not user serviceable, a faulty device must be put out of order and sent back for servicing.

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TraxBus

TraxBus features high electromagnetic noise immunity and great wiring simplicity, also using busbar trunkets. Possible application are in hostile industrial environments where other standard networks will not work.
Live connection and/or disconnection while the communication is running are allowed, though a short break in the data flow may result from this operation. TraxBus lines can be wired in any form: star, ring, straight or mixed but signal line must be wired separately from power lines.
Do not use shielded cables. Do not use multicore cables or limit the use to short stubs.
See TraxInterface literature for details.



1 TERMINAL BOARD
2 POWER SUPPLY FUSE
3 POWER ON GREEN INDICATOR
4 OUTPUT ON RED INDICATOR
5 COM / FAULT YELLOW INDICATOR
6 PROGRAMMING JACK
7 GROUND SCREW

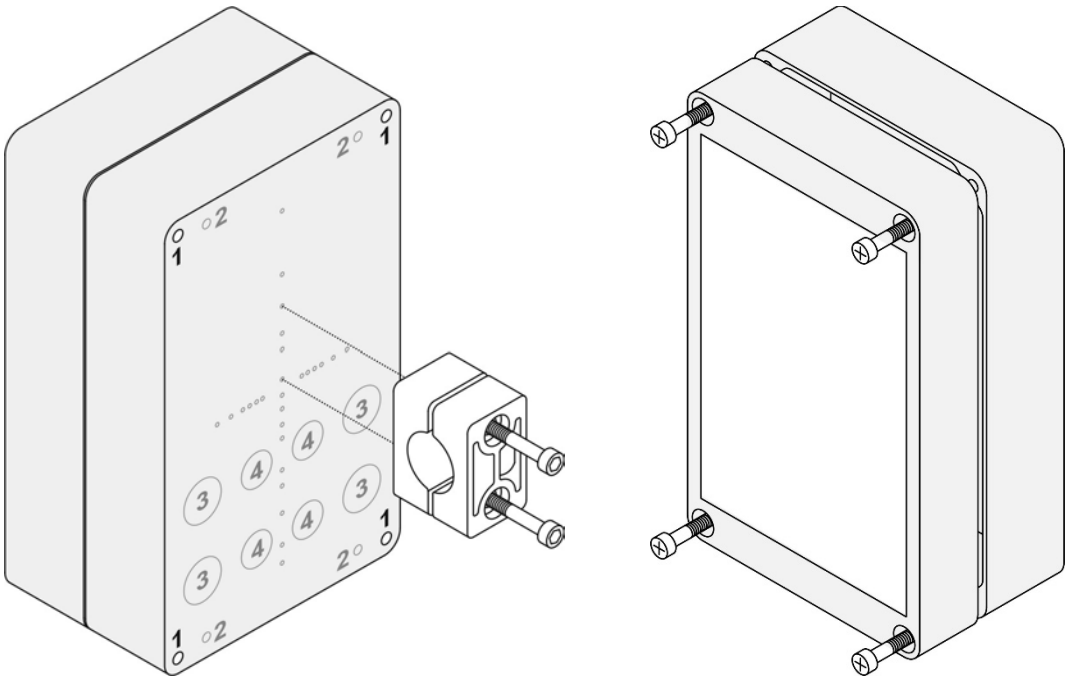
Please perform the following task after receiving the product:

- Inspect the unit for damage.
  If the product appears damaged upon receipt, contact the shipper immediately.
- If you have received the wrong model or the device does not function properly, contact your supplier.

ENCLOSURE

Q|TC can be installed into its own box or together with other devices. According to European Standard EN60529 a minimum protection degree IP40 must be guaranteed, raised to IP54 for open air application.

ALUMINUM ENCLOSURES MUST BE CONNECTED TO PROTECTIVE EARTH



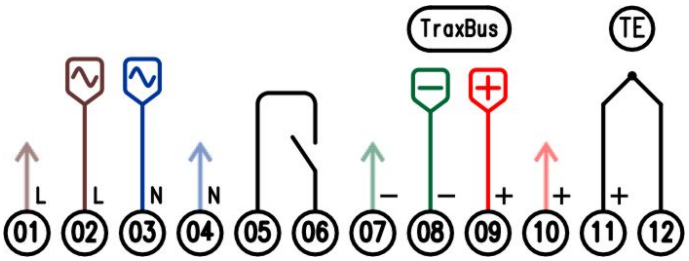
1	EXTERNAL FITTING HOLES (4) 4.2 mm SELF TAPPING OR M5 THREAD FORMING SCREW	106 x 186 mm
2	BREAKABLE FITTING HOLES (4) 4,0 mm DIAMETER	77 x 182 mm
3	BREAKABLE HOLES FOR WIRING (4) SUITABLE FOR PG11 CABLE GLAND	Ø 19,0 mm
4	BREAKABLE HOLES FOR WIRING (4) SUITABLE FOR PG9 CABLE GLANDS	Ø 15,5 mm

CAST ALUMINUM ALLOY EN AB 46100 IP64
OVERALL DIMENSION: 200 x 120 x 71 mm WEIGHT: 1150 g
ELECTROSTATIC POLYESTER POWDER COATING COLOR: GRAY

OPTIONAL FITTING CLAMPS FOR PIPES

VERTICAL MOUNTING	OUTSIDE DIAMETER 6 … 76 mm
HORIZONTAL MOUNTING	OUTSIDE DIAMETER 6 … 63 mm

WIRING DIAGRAM



GROUND CONNECTION
TO ENCLOSURE SCREW

01	POWER SUPPLY – PHASE	
02	POWER SUPPLY – PHASE	
03	POWER SUPPLY – NEUTRAL	N
04	POWER SUPPLY – NEUTRAL	N
05	OUTPUT CONTACT	
06	OUTPUT CONTACT	
07	COM INTERFACE – NEGATIVE	–
08	COM INTERFACE – NEGATIVE	–
09	COM INTERFACE – POSITIVE	+
10	COM INTERFACE – POSITIVE	+
11	THERMOCOUPLE – POSITIVE	+
12	THERMOCOUPLE – NEGATIVE	–

USE POWER, SIGNAL AND CONTROL CABLE SUITABLE FOR THE TYPE OF OPERATION AND COMPLYING WITH ALL REGULATIONS
DO NOT ROUTE CONNECTIONS TOGETHER WITH FREQUENCY CONVERTER CABLES OR CABLES EMITTING STRONG FIELDS
PROVIDE RELIABLE CONNECTION TO PE (PROTECTION EARTH)
ALL ELECTRONIC SYSTEMS MUST BE SUPPLIED BY A DEDICATED TRANSFORMER IN A TN-S EARTHING SYSTEM

ADDITIONAL TERMINALS PROVIDED FOR POWER SUPPLY AND COMMUNICATION BUS
FUSE PROTECTS THE ELECTRONIC CIRCUIT ONLY, MUST BE REPLACED WITH SAME TYPE AND VALUE: 1A QUICK-ACTING 5x20mm
OUTPUT CONTACT IS NOT PROTECTED

COM/FAULT INDICATOR

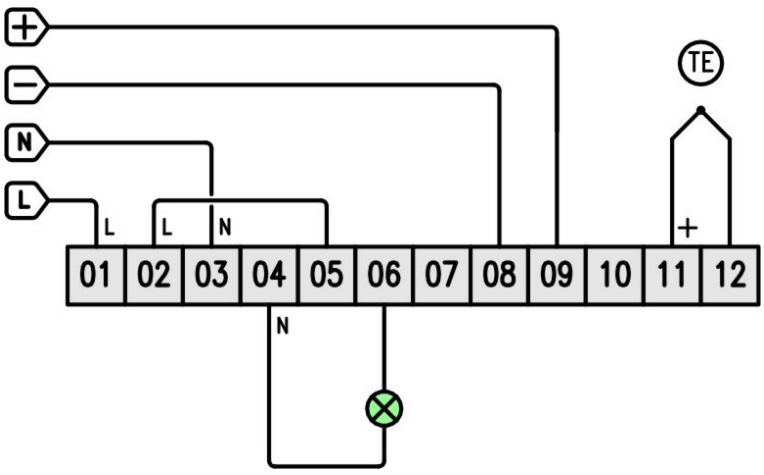
Once a valid command is received through the communication line this indicator [5] will blink yellow, slow flashing while in configuration mode. A failure occurred when this indicator remains permanently on.

APPLICATION

Q|TC can operate as a stand-alone temperature switch. Configure the output to switch above or below setpoint, select the thermocouple type and other relevant parameters.
Controlled load or device connected to relay contact output at terminals 05-06.

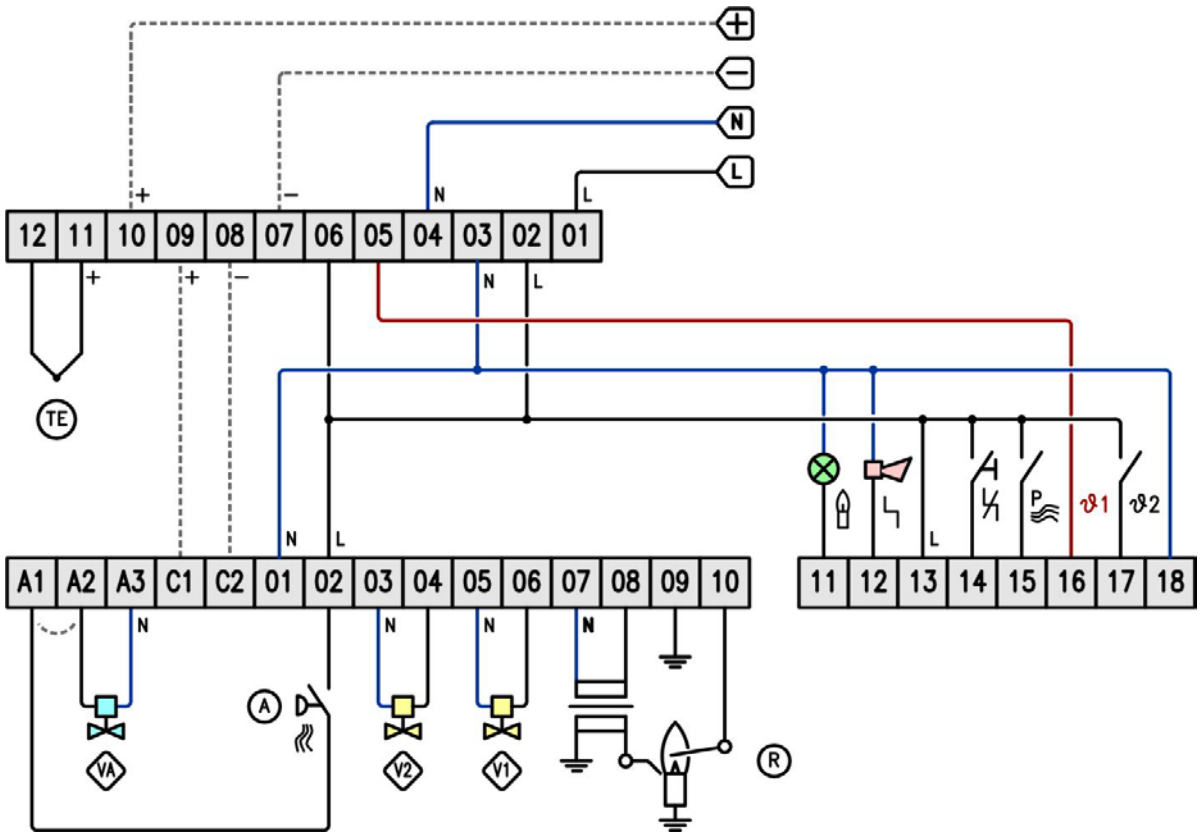
Measured temperature and output status can be read through the optional TraxBus connection.
Instead of working as an independent temperature switch, the output can be configured to operate from remote commands received through TraxBus.
Several units can be deployed on a single communication bus, specific address must be assigned to each unit.

Additional terminals provided for power supply and TraxBus, to simplify wiring.



THERMOSTAT FOR QBK BURNER CONTROL

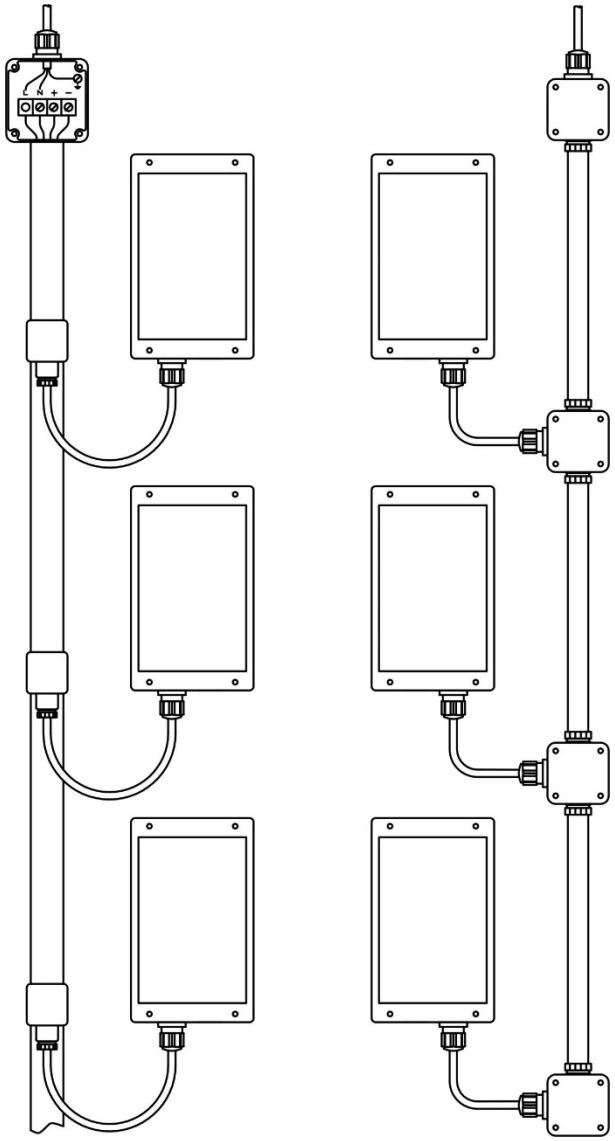
Q|TC can be used together with our Burner Control Unit QBK, installed into the base of same enclosure.
The burner is switched on/off controlled by temperature when Q|TC output relay is connected to thermostat 1 input (see figure below).
Connect the Q|TC output to thermostat 2 to control the 2nd stage of the burner.
Optional remote control and supervision through TraxBus.
A communication timeout is configurable to release the output when the remote supervisor does not send a valid message within the specified time.



TE	THERMOCOUPLE
A	LOW AIR PRESSURE SWITCH
VA	AIR VALVE
V1	PILOT GAS VALVE
V2	MAIN GAS VALVE
R	DUAL ROD CIRCUIT

	RESET INPUT
P	AIR CONTROL INPUT
ϑ1	ON/OFF THERMOSTAT INPUT
	BURNER ON
	BURNER LOCKOUT

FIELDBUS REMOTE CONTROL



TraxBus using busbars or single wire lines
Ref. to TraxInterface literature for wiring details

Complete remote control and supervision is possible through built-in serial communication interface using proprietary fieldbus, designed for reliable operation in harsh industrial environments with simplified wiring.
Communication protocol could be easily implemented into any programmable controller for great efficiency and low cost. Ready to use gateways are available to convert TraxBus into standard industry fieldbus systems.
See below for typical communication time at different baud rates.
Any supervisor takes some time for internal processing, real performance of the fieldbus should be computed adding such delay.

POLLING TIME FOR 1 UNIT [ms]

	4800	9600	19200	38400
COMMAND	15-23	8-12	4-6	2-3
QTC PROCESS	4	4	4	4
ANSWER	15-23	8-12	4-6	2-3
OVERALL	34-50	20-28	12-16	8-10

POLLING TIME FOR 10 UNITS [ms]

	4800	9600	19200	38400
COMMAND	150-230	80-120	40-60	20-30
QTC PROCESS	40	40	40	40
ANSWER	150-230	80-120	40-60	20-30
OVERALL	340-500	200-280	120-160	80-100

POLLING TIME FOR 100 UNITS [s]

	4800	9600	19200	38400
COMMAND	1,5-2,3	0,8-1,2	0,4-0,6	0,2-0,3
QTC PROCESS	0,4	0,4	0,4	0,4
ANSWER	1,5-2,3	0,8-1,2	0,4-0,6	0,2-0,3
OVERALL	3,4-5,0	2,0-2,8	1,2-1,6	0,8-1,0

Messages to/from remote host supervisor must be ASCII characters, 8 bits, no parity, 1 or 2 stop bits.

COMMAND FROM SUPERVISOR TO PERIPHERALS

Commands issued to peripherals within a single string terminated with Carriage Return.

[S N C KK <Cr>

[	Preamble (from master)
S	Segment, Zone identifier
N	Node, Unit identifier
C	Command (1 or 4 char)
KK	Checksum
<Cr>	Carriage return

STATUS FROM PERIPHERALS TO SUPERVISOR

Peripherals will acknowledge all valid command received from supervisor:

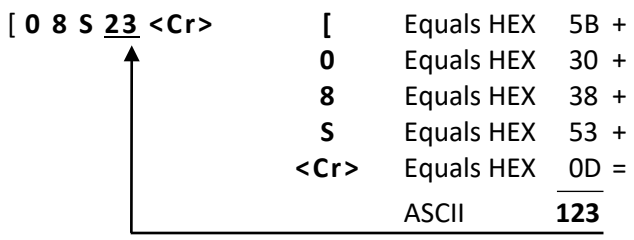
] S N T KK <Cr>

]	Preamble (to master)
S	Segment, Zone identifier
N	Node, Unit identifier
T	Status (1 or 4 char)
KK	Checksum
<Cr>	Carriage return

S and N can be any alphanumeric character and must match the settings of the peripheral to be addressed.
The special character * (star) can be used like wild card to send broadcast command: a star character instead of S will address all existing nodes, a star character instead of N will address the whole segment, two star characters will address all the connected units. No acknowledge answer sent back after broadcast commands.

CHECKSUM CALCULATION

Commands without valid checksum KK are ignored.
The answer includes a valid checksum that can be optionally evaluated by supervisor.
KK is the ASCII figure of the sum of all characters HEX values, including Carriage Return. See example and use only last two characters, ignoring leading ones (if any).



COMMAND LIST

H	OUTPUT OFF - HALT	SWITCH OFF OUTPUT	§ 1
R	OUTPUT ON - RUN	SWITCH ON OUTPUT	§ 1
O	OUTPUT STATUS	ASK FOR OUTPUT STATUS	
T	THERMOCOUPLE	ASK FOR TEMPERATURE MEASURED BY THERMOCOUPLE	
J	COLD JUNCTION	ASK FOR COLD JUNCTION TEMPERATURE	
S	SETPOINT	ASK FOR SETPOINT TEMPERATURE	
####	SETPOINT CHANGE	SET NEW VALUE FOR SETPOINT	§ 2
U	UP THRESHOLD	ASK FOR SETPOINT + HYSTERESIS	§ 3
D	DOWN THRESHOLD	ASK FOR SETPOINT – HYSTERESIS	§ 3
@	CONFIGURATION	ENTER CONFIGURATION MODE	§ 4

STATUS LIST

0	OUTPUT OFF	OUTPUT RELAY INACTIVE (RESPONSE TO COMMAND **O**)	
1	OUTPUT ON	OUTPUT RELAY ACTIVE (RESPONSE TO COMMAND **O**)	
####	CURRENT VALUE	THERMOCOUPLE TEMPERATURE COLD JUNCTION TEMPERATURE SETPOINT UP THRESHOLD DOWN THRESHOLD	§ 5
OPEN	ERROR / FAULT	THERMOCOUPLE NOT CONNECTED OR BROKEN	
OVUV	ERROR / FAULT	INPUT SIGNAL OVER/UNDERVOLTAGE	
TCOR	ERROR / FAULT	THERMOCOUPLE OUT OF RANGE	
CJOR	ERROR / FAULT	COLD JUNCTION OUT OF RANGE	

§1 AVAILABLE ONLY WHEN MODE IS CONFIGURED TO 'REMOTE'.
EXAMPLE: [01R1B
EXAMPLE: [01H11

§2 NUMERIC VALUE (-210 … 1820 °C). STORED INTO NON-VOLATILE MEMORY.
EXAMPLE: [01085096
EXAMPLE: [01-04088A

§3 OUTPUT SWITCHES WHEN MEASURED TEMPERATURE IS RISING ABOVE OR FALLING BELOW SETPOINT ± HYSTERESIS HYSTERESIS MUST BET ONCE DURING CONFIGURATION, CURRENT THRESHOLDS RETURNED ON REQUEST.

§4 SEE CONFIGURATION FOR DETAILS.

§5 CURRENT VALUE RETURNED TO SPECIFIC REQUEST (-210 … 1820 °C).
EXAMPLE:]01-01089
EXAMPLE:]01108094

CONFIGURATION

Configuration can take place through TraxBus or from local programming jack [6] by means of specific USB programming cable [1490.80.00] linked to PC running a terminal emulator.
Communication settings are the same of TraxBus: 8 bit data, 1 or 2 stop bits, no parity. Default baud rate 4800.
TraxBus will be disconnected when the jack is plugged.



Type @ to enter configuration mode, normal operation is suspended and relay output is released.
Yellow indicator [5] blinks slowly. The list of supported configuration commands and allowed values is printed out:

```
- Baud Rate
B=4800|9600|19200|38400|57600|115200

Zone/Segment
Z=0..1|a..z|A..Z

- Unit/Node
U=0..1|a..z|A..Z

- Setpoint temperature [°C]
S=-210..1820

- Setpoint Hysteresis [±°C]
H=01..99

- Cold Junction Offset Temperature [°C]
X=-8..08

- Thermocoouple Type
T=B|E|J|K|N|R|S|T

- Communication timeout [sec] 0=disabled
C=00..50

- Noise Rejection Filter [Hz]
F=50|60

- Output Mode A = On T Above Setpoint, B = On T Below Setpoint, C = Remote
M=A|B|C

- Leave the configuration
Exit

- Restore factory settings
Reset

- Get current settings
Settings

- Help
?
```

The command `Settings` returns current configuration (below the response with factory defaults values):

```
SW Version 1.0.7
Z=0    Zone/Segment
U=0    Unit/Node
S=-210 Setpoint °C
H=01   Hysteresis ±°C
X=00   CJ Offset °C
T=K    TC Type
F=50   Filter Noise Hz
M=C    Out Remote Control
B=4800 Baud Rate
C=00   Com Timeout Disabled
OK
```

EXAMPLES

`T=K`
SELECT CHROMEL/ALUMEL TYPE THERMOCOUPLE

`M=C`
OUTPUT CONTROLLED FROM REMOTE

`Z=A`
SET ZONE (COM ADDRESS) BELONGING THE Q|TC

`U=1`
SET UNIT (COM ADDRESS) BELONGING THE Q|TC

`F=50`
NOISE FILTER FOR MAIN POWER SUPPLY FREQUENCY 50HZ

`Exit`
LEAVE CONFIGURATION, RETURN TO NORMAL OPERATION

TECHNICAL DATA

POWER SUPPLY

VOLTAGE	80…264 Vac or 115…370 Vdc
FREQUENCY	50/60 Hz
LINE FUSE	1 A QUICK-ACTING - 5x20mm
POWER	0.5 W MAX
ISOLATION	3000 Vac

OVERVOLTAGE CATEGORY II PURSUANT TO EN 60730

ENVIRONMENT

OPERATING TEMPERATURE	(-4 … 140 °F) -20 … 60 °C
STORAGE TEMPERATURE	(-40 … 185 °F) -40 … 85 °C
RELATIVE HUMIDITY	NO CONDENSATION ALLOWED
WEIGHT	BOARD ONLY 90 g
WEIGHT	ALUMIMUM BOX 700 g
MOUNTING POSITION	ANY

THIS UNIT IS NOT INTENDED FOR EXPLOSIVE OR CORROSIVE ENVIRONMENTS

OUTPUTS

MAX RATED VOLTAGE	250 Vac
BREAKING CAPACITY	750 VA
MAX LOAD	2 A cosφ=1
MIN LOAD	1mA @ 5Vdc

THERMOCOUPLE INPUT

SENSOR TYPES	T, E, J, N, K, B, R, S
SENSOR SELECTION	COM INTERFACE
NOISE REJECTION	CONFIGURABLE 50/60 Hz
COLD JUNCTION ACCURACY	-20 … +85 °C ± 0.7 °C
MEASUREMENT ACCURACY	± 0.15 %
SAMPLE RATE	16/s
RESOLUTION	19 bit
RANGE	-210 … +1800 °C

TRAXBUS COMMUNICATION INTERFACE

VOLTAGE	30 Vdc MAX
BAUD RATE	4800, 9600, 19200, 38400, (57600, 115200) [1]

[1] TRAXBUS MAY NOT WORK FOR BAUD RATES ABOVE 38400

THERMOCOUPLES

TYPE	COMPOSITION	TEMP RANGE (°C) MIN	MAX
T	Copper – Constantan	-200	400
E	Chromel – Constantan	-200	1000
J	Iron – Constantan	-210	1200
N	Nicrosil – Nisil	-200	1300
K	Chromel – Alumel	-200	1372
B	Platinum – Platinum/Rhodium 30%	-250	1820
R	Platinum – Platinum/Rhodium 13%	-50	1768
S	Platinum – Platinum/Rhodium 10%	-50	1768

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