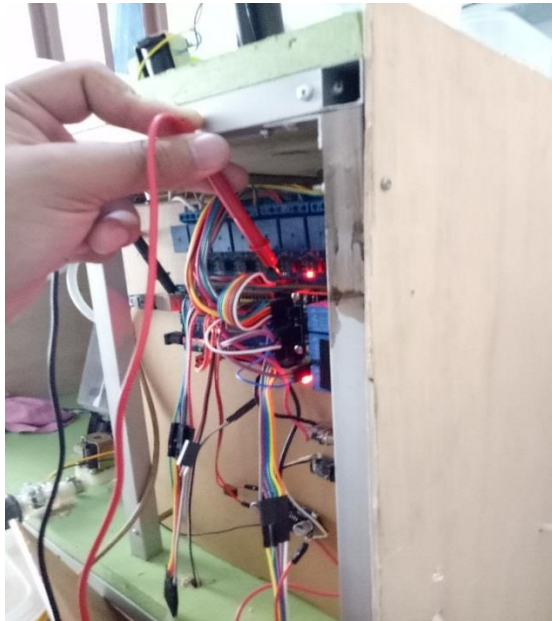


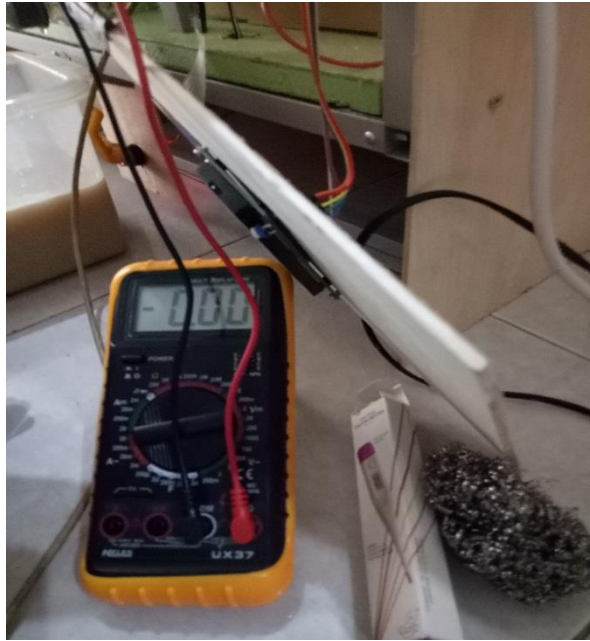
LAMPIRAN



Gambar Pengukuran Output Voltage Arduino



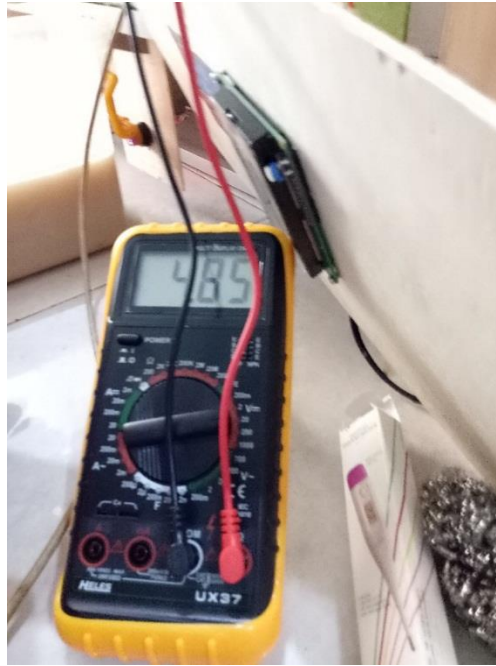
Gambar Pengukuran Tegangan Minuman Kopi, Pada Solenoid Valve Air



Gambar Pengukuran Tegangan Minuman Kopi, Pada Solenoid Valve Gula



Gambar Pengukuran Tegangan Minuman Kopi, Pada Solenoid Valve Kopi



Gambar Pengukuran Tegangan Minuman Kopi, Pada Solenoid Valve Teh



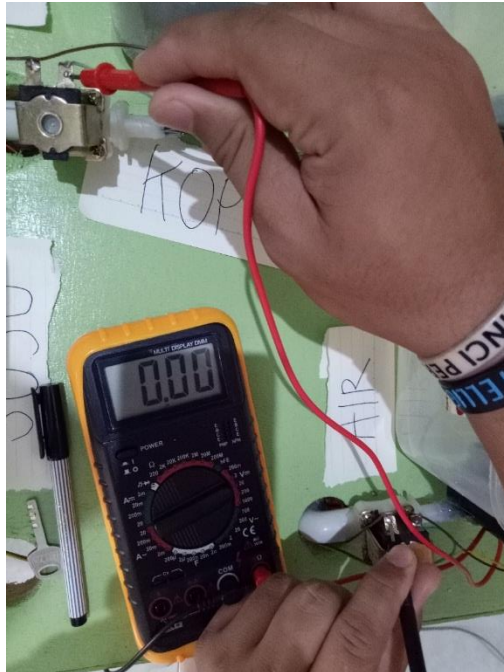
Gambar Pengukuran Tegangan Minuman Kopi, Pada Solenoid Valve Susu



**Gambar Pengukuran Tegangan Solenoid Valve Pada Minuman Teh Susu
Pada Solenoid Valve Air**



**Gambar Pengukuran Tegangan Solenoid Valve Pada Minuman Teh Susu
Pada Solenoid Valve Gula**



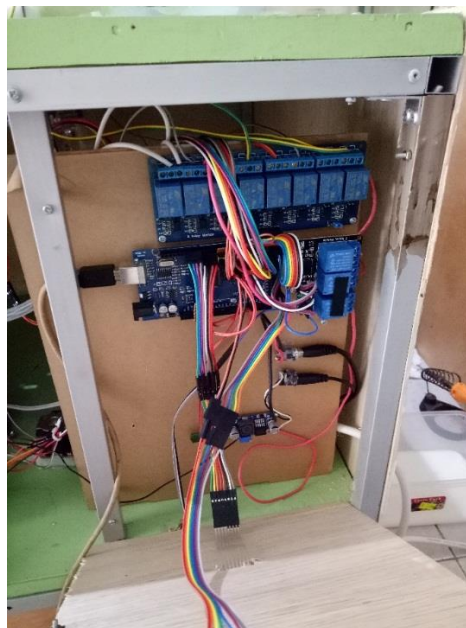
**Gambar Pengukuran Tegangan Solenoid Valve Pada Minuman Teh Susu
Pada Solenoid Valve Kopi**



**Gambar Pengukuran Tegangan Solenoid Valve Pada Minuman Teh Susu
Pada Solenoid Valve Teh**



**Gambar Pengukuran Tegangan Solenoid Valve Pada Minuman Teh Susu
Pada Solenoid Valve Susu**



Gambar Bagian Dalam pada Mesin Pembuat Minuman Otomatis



Gambar Pengaduk Minuman Heater/Peltier pada Mesin Pembuat Minuman Otomatis



Gambar Percobaan Wadah Air Minuman



Gambar Mesin Pembuat Minuman Otomatis



Gambar Pengeluaran Air dan Sensor Proximity



Gambar Tampilan LCD dan Keypad pada mesin pembuat minuman otomatis



Gambar tempat pengurasan air

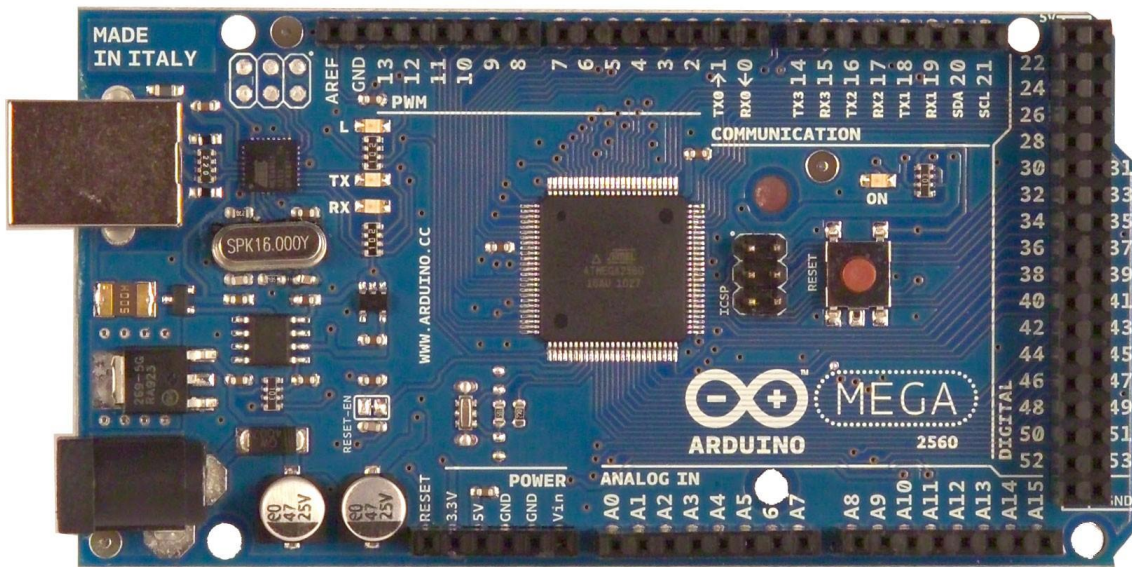


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Arduino Mega 2560 Datasheet

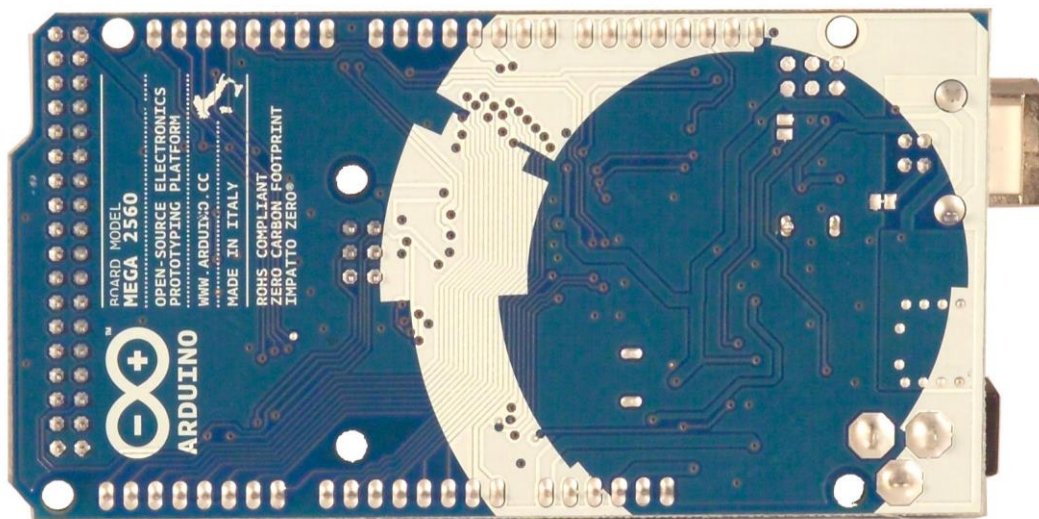




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Overview

The Arduino Mega 2560 is a microcontroller board based on the ATmega2560 ([datasheet](#)). It has 54 digital input/output pins (of which 14 can be used as PWM outputs), 16 analog inputs, 4 UARTs (hardware serial ports), a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. The Mega is compatible with most shields designed for the Arduino Duemilanove or Diecimila.

Schematic & Reference Design

EAGLE files: [arduino-mega2560-reference-design.zip](#)



Schematic: [arduino-mega2560-schematic.pdf](#)

Summary

Microcontroller	ATmega2560
Operating Voltage	5V
Input Voltage (recommended)	7-12V
Input Voltage (limits)	6-20V
Digital I/O Pins	54 (of which 14 provide PWM output)
Analog Input Pins	16
DC Current per I/O Pin	40 mA
DC Current for 3.3V Pin	50 mA
Flash Memory	256 KB of which 8 KB used by bootloader
SRAM	8 KB
EEPROM	4 KB
Clock Speed	16 MHz

Power

The Arduino Mega can be powered via the USB connection or with an external power supply. The power source is selected automatically.

External (non-USB) power can come either from an AC-to-DC adapter (wall-wart) or battery. The adapter can be connected by plugging a 2.1mm center-positive plug into the board's power jack. Leads from a battery can be inserted in the Gnd and Vin pin headers of the POWER connector.

The board can operate on an external supply of 6 to 20 volts. If supplied with less than 7V, however, the 5V pin may supply less than five volts and the board may be unstable. If using more than 12V, the voltage regulator may overheat and damage the board. The recommended range is 7 to 12 volts.

The Mega2560 differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the Atmega8U2 programmed as a USB-to-serial converter.



The power pins are as follows:

- **VIN.** The input voltage to the Arduino board when it's using an external power source (as opposed to 5 volts from the USB connection or other regulated power source). You can supply voltage through this pin, or, if supplying voltage via the power jack, access it through this pin.
- **5V.** The regulated power supply used to power the microcontroller and other components on the board. This can come either from VIN via an on-board regulator, or be supplied by USB or another regulated 5V supply.
- **3V3.** A 3.3 volt supply generated by the on-board regulator. Maximum current draw is 50 mA.
- **GND.** Ground pins.

Memory

The ATmega2560 has 256 KB of flash memory for storing code (of which 8 KB is used for the bootloader), 8 KB of SRAM and 4 KB of EEPROM (which can be read and written with the [EEPROM library](#)).

Input and Output

Each of the 54 digital pins on the Mega can be used as an input or output, using [pinMode\(\)](#), [digitalWrite\(\)](#), and [digitalRead\(\)](#) functions. They operate at 5 volts. Each pin can provide or receive a maximum of 40 mA and has an internal pull-up resistor (disconnected by default) of 20-50 kOhms. In addition, some pins have specialized functions:

- **Serial: 0 (RX) and 1 (TX); Serial 1: 19 (RX) and 18 (TX); Serial 2: 17 (RX) and 16 (TX); Serial 3: 15 (RX) and 14 (TX).** Used to receive (RX) and transmit (TX) TTL serial data. Pins 0 and 1 are also connected to the corresponding pins of the ATmega8U2 USB-to-TTL Serial chip.
- **External Interrupts: 2 (interrupt 0), 3 (interrupt 1), 18 (interrupt 5), 19 (interrupt 4), 20 (interrupt 3), and 21 (interrupt 2).** These pins can be configured to trigger an interrupt on a low value, a rising or falling edge, or a change in value. See the [attachInterrupt\(\)](#) function for details.
- **PWM: 0 to 13.** Provide 8-bit PWM output with the [analogWrite\(\)](#) function.
- **SPI: 50 (MISO), 51 (MOSI), 52 (SCK), 53 (SS).** These pins support SPI communication using the [SPI library](#). The SPI pins are also broken out on the ICSP header, which is physically compatible with the Uno, Duemilanove and Diecimila.
- **LED: 13.** There is a built-in LED connected to digital pin 13. When the pin is HIGH



value, the LED is on, when the pin is LOW, it's off.

- **I²C: 20 (SDA) and 21 (SCL).** Support I²C (TWI) communication using the [Wire library](#) (documentation on the Wiring website). Note that these pins are not in the same location as the I²C pins on the Duemilanove or Diecimila.

The Mega2560 has 16 analog inputs, each of which provide 10 bits of resolution (i.e. 1024 different values). By default they measure from ground to 5 volts, though it is possible to change the upper end of their range using the AREF pin and `analogReference()` function.

There are a couple of other pins on the board:

- **AREF.** Reference voltage for the analog inputs. Used with [analogReference\(\)](#).
- **Reset.** Bring this line LOW to reset the microcontroller. Typically used to add a reset button to shields which block the one on the board.

Communication

The Arduino Mega2560 has a number of facilities for communicating with a computer, another Arduino, or other microcontrollers. The ATmega2560 provides four hardware UARTs for TTL (5V) serial communication. An ATmega8U2 on the board channels one of these over USB and provides a virtual com port to software on the computer (Windows machines will need a .inf file, but OSX and Linux machines will recognize the board as a COM port automatically). The Arduino software includes a serial monitor which allows simple textual data to be sent to and from the board. The RX and TX LEDs on the board will flash when data is being transmitted via the ATmega8U2 chip and USB connection to the computer (but not for serial communication on pins 0 and 1).

A [SoftwareSerial library](#) allows for serial communication on any of the Mega2560's digital pins.

The ATmega2560 also supports I²C (TWI) and SPI communication. The Arduino software includes a Wire library to simplify use of the I²C bus; see the [documentation on the Wiring website](#) for details. For SPI communication, use the [SPI library](#).

Programming

The Arduino Mega can be programmed with the Arduino software ([download](#)). For details, see the [reference](#) and [tutorials](#).

The ATmega2560 on the Arduino Mega comes preburned with a [bootloader](#) that allows you to upload new code to it without the use of an external hardware programmer. It



communicates using the original STK500 protocol ([reference](#), [C header files](#)). You can also bypass the bootloader and program the microcontroller through the ICSP (In-Circuit Serial Programming) header; see [these instructions](#) for details.

Automatic (Software) Reset

Rather than requiring a physical press of the reset button before an upload, the Arduino Mega2560 is designed in a way that allows it to be reset by software running on a connected computer. One of the hardware flow control lines (DTR) of the ATmega8U2 is connected to the reset line of the ATmega2560 via a 100 nanofarad capacitor. When this line is asserted (taken low), the reset line drops long enough to reset the chip. The Arduino software uses this capability to allow you to upload code by simply pressing the upload button in the Arduino environment. This means that the bootloader can have a shorter timeout, as the lowering of DTR can be well-coordinated with the start of the upload. This setup has other implications. When the Mega2560 is connected to either a computer running Mac OS X or Linux, it resets each time a connection is made to it from software (via USB). For the following half-second or so, the bootloader is running on the Mega2560. While it is programmed to ignore malformed data (i.e. anything besides an upload of new code), it will intercept the first few bytes of data sent to the board after a connection is opened. If a sketch running on the board receives one-time configuration or other data when it first starts, make sure that the software with which it communicates waits a second after opening the connection and before sending this data. The Mega2560 contains a trace that can be cut to disable the auto-reset. The pads on either side of the trace can be soldered together to re-enable it. It's labeled "RESET-EN". You may also be able to disable the auto-reset by connecting a 110 ohm resistor from 5V to the reset line; see [this forum thread](#) for details.

USB Overcurrent Protection

The Arduino Mega2560 has a resettable polyfuse that protects your computer's USB ports from shorts and overcurrent. Although most computers provide their own internal protection, the fuse provides an extra layer of protection. If more than 500 mA is applied to the USB port, the fuse will automatically break the connection until the short or overload is removed.

Physical Characteristics and Shield Compatibility



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The maximum length and width of the Mega2560 PCB are 4 and 2.1 inches respectively, with the USB connector and power jack extending beyond the former dimension. Three screw holes allow the board to be attached to a surface or case. Note that the distance between digital pins 7 and 8 is 160 mil (0.16"), not an even multiple of the 100 mil spacing of the other pins.

The Mega2560 is designed to be compatible with most shields designed for the Uno, Diecimila or Duemilanove. Digital pins 0 to 13 (and the adjacent AREF and GND pins), analog inputs 0 to 5, the power header, and ICSP header are all in equivalent locations. Further the main UART (serial port) is located on the same pins (0 and 1), as are external interrupts 0 and 1 (pins 2 and 3 respectively). SPI is available through the ICSP header on both the Mega2560 and Duemilanove / Diecimila. *Please note that I²C is not located on the same pins on the Mega (20 and 21) as the Duemilanove / Diecimila (analog inputs 4 and 5).*

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Office: (916) 624-8333
Fax: (916) 624-8003
Sales: (888) 512-1024
Tech Support: (888) 997-8267

4x4 Matrix Membrane Keypad (#27899)

This 16-button keypad provides a useful human interface component for microcontroller projects. Convenient adhesive backing provides a simple way to mount the keypad in a variety of applications.

Features

- Ultra-thin design
- Adhesive backing
- Excellent price/performance ratio
- Easy interface to any microcontroller
- Example programs provided for the BASIC Stamp 2 and Propeller P8X32A microcontrollers

Key Specifications

- Maximum Rating: 24 VDC, 30 mA
- Interface: 8-pin access to 4x4 matrix
- Operating temperature: 32 to 122 °F (0 to 50°C)



- Dimensions:
Keypad, 2.7 x 3.0 in (6.9 x 7.6 cm)
Cable: 0.78 x 3.5 in (2.0 x 8.8 cm)

Application Ideas

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- Security systems
- Menu selection
- Data entry for embedded systems



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How it Works

Matrix keypads use a combination of four rows and four columns to provide button states to the host device, typically a microcontroller. Underneath each key is a pushbutton, with one end connected to one row, and the other end connected to one column. These connections are shown in Figure 1.

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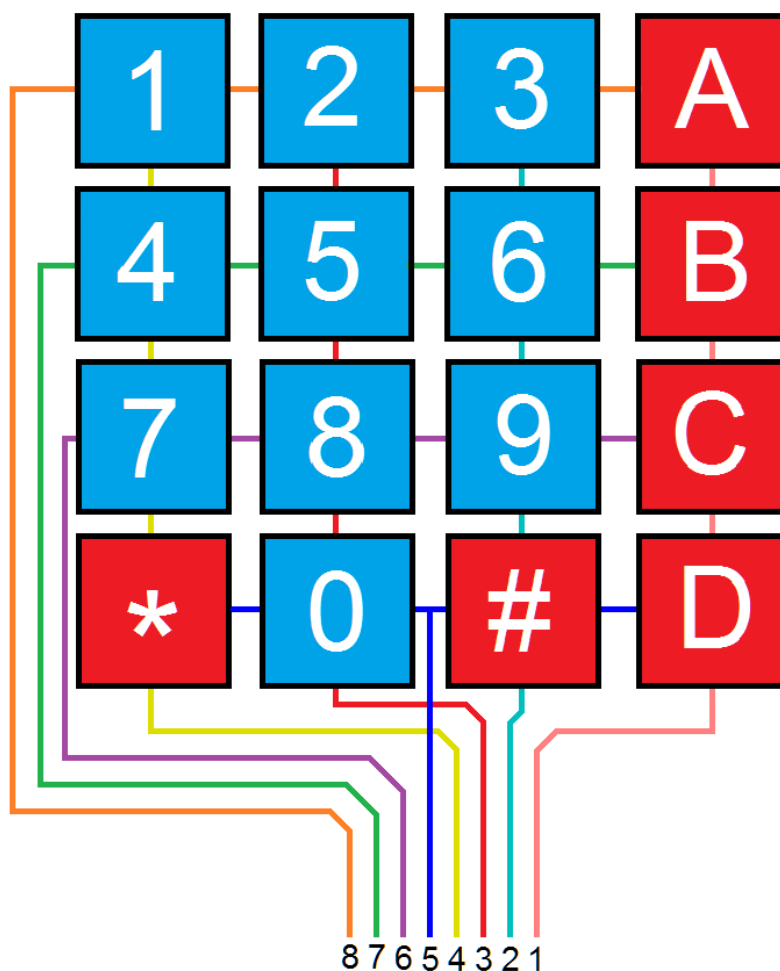
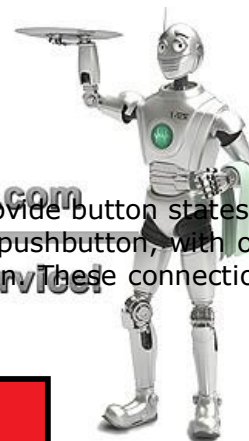


Figure 1: Matrix Keypad Connections

In order for the microcontroller to determine which button is pressed, it first needs to pull each of the four columns (pins 1-4) either low or high one at a time, and then poll the states of the four rows (pins 5-8). Depending on the states of the columns, the microcontroller can tell which button is pressed.

For example, say your program pulls all four columns low and then pulls the first row high. It then reads the input states of each column, and reads pin 1 high. This means that a contact has been made between column 4 and row 1, so button 'A' has been pressed.

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Connection Diagrams

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Figure 2

For use with the BASIC Stamp example program listed below.

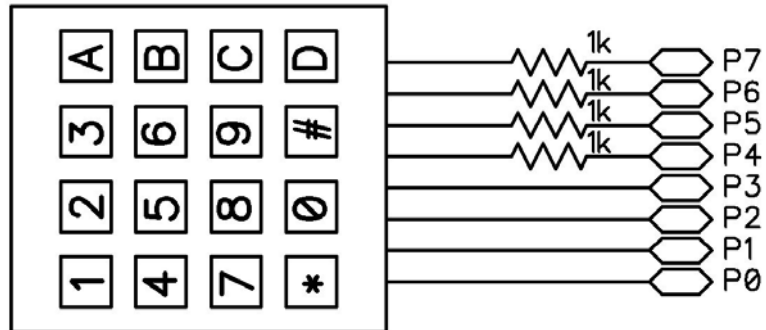
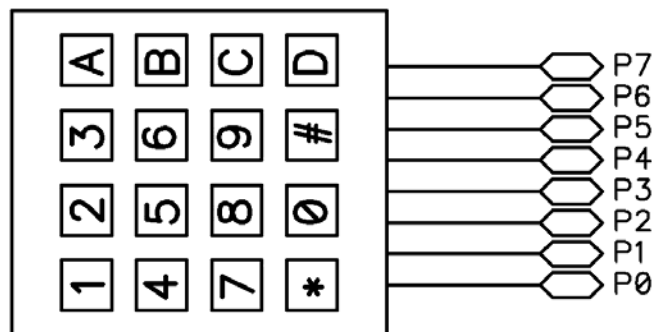


Figure 3

For use with the Propeller P8X32A example program listed below.



BASIC Stamp® Example Code

The example code below displays the button states of the 4x4 Matrix Membrane Keypad. It uses the Debug Terminal, which is built into the BASIC Stamp Editor software. The software is a free download from www.parallax.com/basicstampsoftware.

```
' 4x4MatrixKeypad_Demo.bs2
' Display buttons pressed on the 4x4 Matrix Membrane Keypad
' Author: Parallax HK Engineering

' {$STAMP BS2}
' {$PBASIC 2.5}

row          VAR  Nib
column       VAR  Nib
keypad       VAR  Word
keypadOld    VAR  Word
temp VAR  Nib

DEBUG CLS
GOSUB Update

DO
  GOSUB ReadKeypad
  DEBUG HOME, BIN16 keypad, CR, CR,
    BIN4 keypad >> 12, CR,
    BIN4 keypad >> 8, CR,
    BIN4 keypad >> 4, CR,
    BIN4 keypad
  ' Variable space for row counting
  ' Variable space for column counting
  ' Variable space to store keypad output
  ' Variable space to store old keypad output
  ' Variable space for polling column states

  ' Clear Debug Terminal
  ' Display keypad graphic

  ' Read keypad button states
  ' Display 16-bit keypad value
  ' Display 1st row 4-bit keypad value
  ' Display 2nd row 4-bit keypad value
  ' Display 3rd row 4-bit keypad value
  ' Display 4th row 4-bit keypad value
```



```
IF keypad <> keypadOld THEN      ' If different button is pressed, GOSUB
  Update                          ' update the keypad graphic to clear
ENDIF                             ' old display

IF keypad THEN                    ' Display button pressed in graphic
  GOSUB display
ENDIF

keypadOld = keypad                ' Store keypad value in variable keypadOld LOOP

' -----[ Subroutine - ReadKeypad ]-----
' Read keypad button states
ReadKeypad:
  keypad = 0
  OUTL  = %00000000              ' Initialize IO
  DIRL  = %00000000

  FOR row = 0 TO 3
    DIRB = %1111                  ' Set columns (P7-P4) as outputs
    OUTB = %0000                  ' Pull columns low (act as pull down)
    OUTA = 1 << row               ' Set rows high one by one
    DIRA = 1 << row

    temp = 0                      ' Reset temp variable to 0 FOR
    column = 0 TO 3
      INPUT (column + 4)           ' Set columns as inputs
      temp = temp | (INB & (1 << column)) ' Poll column state and store in temp NEXT

    keypad = keypad << 4 | (Temp REV 4) ' Store keypad value
  NEXT
RETURN

' -----[ Subroutine - Update ]-----
' Graphical depiction of keypad
Update:
  DEBUG CRSRXY,0,7,
    "+---+---+---+---+",CR,
    "|   |   |   |   |",CR,
    "+---+---+---+---+",CR,
    "|   |   |   |   |",CR,
    "+---+---+---+---+",CR,
    "|   |   |   |   |",CR,
    "+---+---+---+---+",CR,
    "|   |   |   |   |",CR,
    "+---+---+---+---+"
RETURN

' -----[ Subroutine - Display ]-----
' Display button pressed in keypad graphic
Display:
  IF KeyPad.BIT15 THEN DEBU CRSRXY, 02,08,"1"
                        G
  IF KeyPad.BIT14 THEN DEBU CRSRXY, 06,08,"2"
                        G
  IF KeyPad.BIT13 THEN DEBU CRSRXY, 10,08,"3"
                        G
  IF KeyPad.BIT12 THEN DEBU CRSRXY, 14,08,"A"
                        G
  IF KeyPad.BIT11 THEN DEBU CRSRXY, 02,10,"4"
                        G
  IF KeyPad.BIT10 THEN DEBU CRSRXY, 06,10,"5"
                        G
```




```
IF KeyPad.BIT9 THEN DEBU CRSRXY, 10,10,"6"  
G  
IF Keypad.BIT8 THEN DEBU CRSRXY, 14,10,"B"  
G  
IF KeyPad.BIT7 THEN DEBU CRSRXY, 02,12,"7"  
G  
IF Keypad.BIT6 THEN DEBU CRSRXY, 06,12,"8"  
G  
IF KeyPad.BIT5 THEN DEBU CRSRXY, 10,12,"9"  
G
```





```

IF Keypad.BIT4 THEN DEBUG CRSRXY, 14,12,"C"
IF Keypad.BIT3 THEN DEBUG CRSRXY, 02,14,"*"
IF Keypad.BIT2 THEN DEBUG CRSRXY, 06,14,"0"
IF Keypad.BIT1 THEN DEBUG CRSRXY, 10,14,"#"
IF Keypad.BIT0 THEN DEBUG CRSRXY, 14,14,"D"
RETURN

```

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Propeller™ P8X32A Example Code

The example code below displays the button states of the 4x4 Matrix Membrane Keypad, and is a modified version of the 4x4 Keypad Reader DEMO object by Beau Schwabe.

Note: This application uses the 4x4 Keypad Reader.spin object. It also uses the Parallax Serial Terminal to display the device output. Both objects and the Parallax Serial Terminal itself are included with the with the Propeller Tool v1.2.7 or higher, which is available from the Downloads link at www.parallax.com/Propeller.

```

{{ 4x4 Keypad Reader PST.spin
Returns the entire 4x4 keypad matrix into a single WORD variable indicating which buttons are
pressed. }}

CON

    _clkmode = xtall + pll16x
    _xinfreq = 5_000_000

OBJ
    text : "Parallax Serial Terminal"
    KP   : "4x4 Keypad Reader"

VAR
    word keypad

PUB start
    'start term
    text.start(115200)
    text.str(string(13,"4x4 Keypad Demo..."))
    text.position(1, 7)
    text.str(string(13,"RAW keypad value 'word'"))

    text.position(1, 13)
    text.str(string(13,"Note: Try pressing multiple keys"))

    repeat
        keypad := KP.ReadKeypad      '← One line command to read the 4x4 keypad
        text.position(5, 2)
        text.bin(keypad>>0, 4)      'Display 1st ROW
        text.position(5,3)
        text.bin(keypad>>4, 4)      'Display 2nd ROW
        text.position(5, 4)
        text.bin(keypad>>8, 4)      'Display 3rd ROW
        text.position(5, 5)
        text.bin(keypad>>12, 4)     'Display 4th ROW
        text.position(5, 9)
        text.bin(keypad, 16)        'Display RAW keypad value

```

Revision History

v1.0: original document

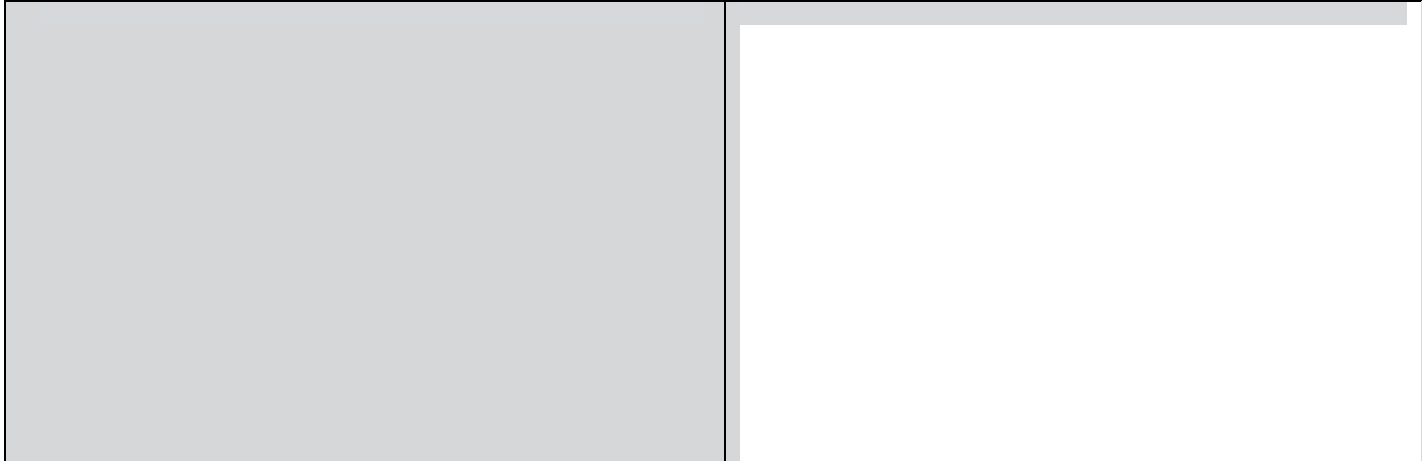
v1.1: Updated Figure 1 on page 2

v1.2: Updated Figure 1 on page 2 (again); updated BS2 comments

Aqua Tech Trading Corp. Ltd, located in Chongqing, China, which is focused on developing, manufacturing and distributing water valves and associated water used equipments.

We are a rapidly expanding company perceived as a growing force in the area of fluid control, we attribute our success to extensive product knowledge, our understanding of and responsiveness to market trends and customer needs.

Aqua Tech Trading Corp. Ltd is a leading manufacturer of water valves and associated water used equipments. Our products are widely used in various industries. The products are of high quality and reliable performance.



Model No.	AQT15S	Model No.	AQT15SC
Thread Size	1/2" BSP inlet and outlet	Thread Size	1/2" BSP inlet and outlet
Material	PET	Material	PET
Working Temp	0-40℃	Working Temp	0-40℃
Working Pressure	0.02~0.8MPa	Working Pressure	0.02~0.8MPa
Voltage	DC12V,DC24V,AC220V	Voltage	AC/DC 6/9/12/24/36110/220V
Voltage Range	15%	Voltage Range	15%
Style	Closed Valve	Style	Closed Valve
Working Environment	Water, Gas and Oil	Working Environment	Water, Gas and Oil
Lifespan	More than 200,000 times	Lifespan	More than 200,000 times
Certification	CQC/CE	Certification	CQC/CE

Usage:

Suit for many kinds of washing machine, drinking water machine, sanitary equipment, water heater, etc. Our products have passed CQC and CE. And it meets the requirement of WEEE and ROHS.



ation Limi



Model No.	AQT10S	Model No.	AQT15SL
Thread Size	1/2"10mm BSP inlet and outlet	Thread Size	1/2" BSP inlet and outlet
Material	Plastic and Brass	Material	Plastic and Brass
Working Temp	0~60/100℃	Working Temp	0~100℃
Working Pressure	0.02~0.8MPa, static pressure ≥ 2.0MPa	Working Pressure	400 millimeter water column
Voltage	DC12V,DC24V,AC220V	Voltage	AC/DC 6/9/12/24/36110/220V
Volta		Volta	
Style		Style	
Work		Work	
Lifes		Lifes	
Certi		Certif	
Usa		Usag	



Model No.	AQT12SL	Model No.	AQT12SLT
Thread Size	1/2"BSP inlet and 12mm outlet	Thread Size	1/2"BSP inlet and 12mm outlet
Material	Plastic and Brass	Material	Plastic and Brass
Working Temp	0~100℃	Working Temp	0~100℃
Working Pressure	400 millimeter water column	Working Pressure	400 millimeter water column
Voltage	DC12V,DC24V,AC220V	Voltage	AC/DC 6/9/12/24/36110/220V
Voltage Range	15% ax Inc. 4x4 Matrix Mem	Voltage Range	15% v1.2 12/16/2011 Page 9 of 5
Style	Opened Valve	Style	Opened Valve
Working Environment	Water, Gas and Oil	Working Environment	Water, Gas and Oil
Lifespan	More than 200,000 times	Lifespan	More than 200,000 times
Certification	CQC/CE	Certification	CQC/CE

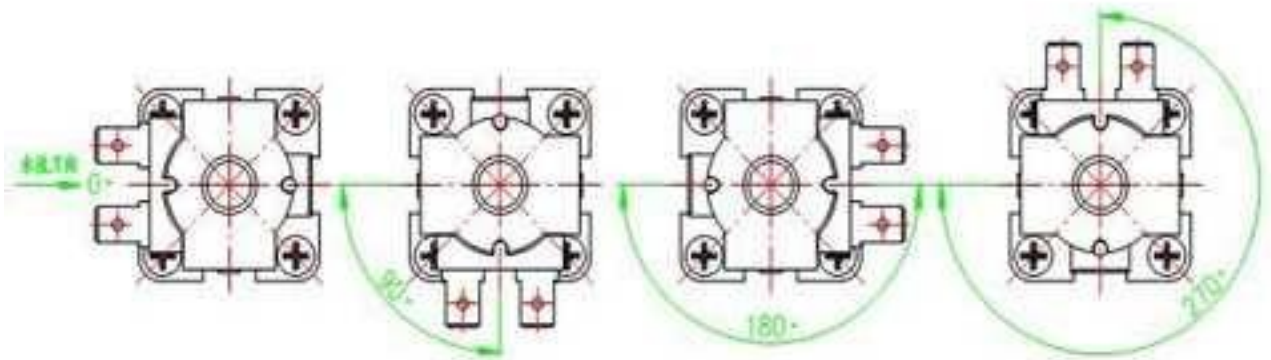


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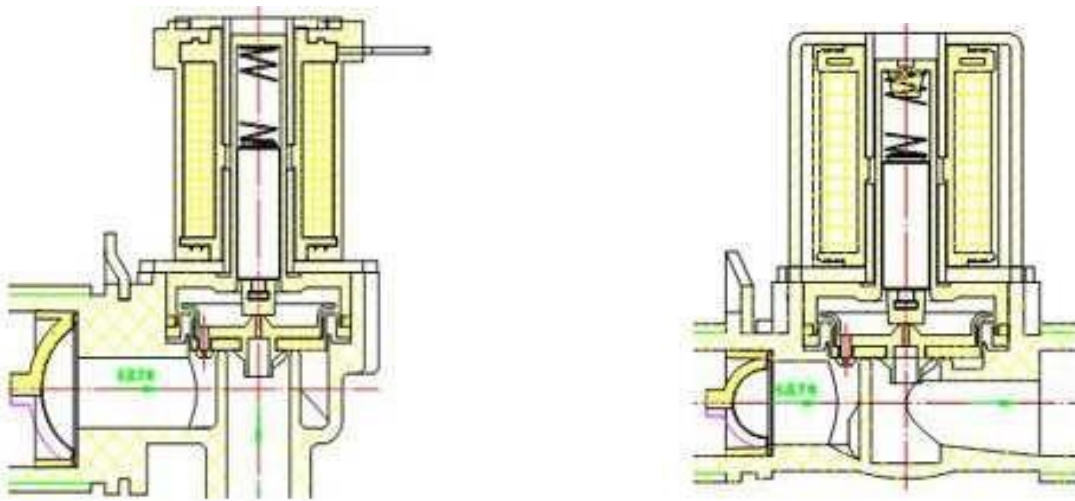
nt **Usage:** Specially working in low pressure environment



Model No.	AQT15SCB	Model No.	AQT15SP
Thread Size	1/2"BSP inlet and let	Thread Size	1/2"BSP inlet and 12mm outlet
Material	Brass	Material	Plastic
Working Temp	0~100℃	Working Temp	1℃-75℃
Working Pressure	0.02~0.8MPa	Flow rate	0.02Mpa≥3 L/min, 0.1Mpa≥12 L/min, 0.8Mpa≥35 L/min
Voltage	DC12V,DC24V,AC220V	Voltage	AC220V
Voltage Range	15%	Voltage Range	15%
Style	Closed Valve	Resistance Coil	4.75KΩ ±0.25KΩ (20℃)
Working Environment	Water, Gas and Oil	Working Environment	Water
Lifespan	More than 200,000 times	Lifespan	More than 1,000,000times
Certification	CQC/CE	Certification	0
Usage: Specially working in low pressure environment		Usage: Water used solenoid valve	



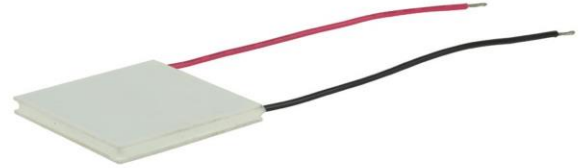
And the diagram picture of these valves as follows:



SERIES: CP85 | DESCRIPTION: PELTIER MODULE

FEATURES

- solid state device
- precise temperature control
- quiet operation



MODEL

MODEL	input voltage ¹ max (Vdc)	input current ² max (A)	output Qmax ³		output ΔTmax ⁴	
			T _h =27°C (W)	T _h =50°C (W)	T _h =27°C (°C)	T _h =50°C (°C)
CP85204035	7.6	8.5	37.4	41.8	68	75
CP85301535	4.2	8.5	20.0	22.3	68	75
CP85435	24.1	8.5	118	130	68	75
CP85138	2.1	8.5	10.0	11.1	68	75
CP85238	3.8	8.5	18.0	20.1	68	75
CP85338	8.6	8.5	42.0	46.9	68	75
CP85438	15.4	8.5	75.0	83.9	68	75

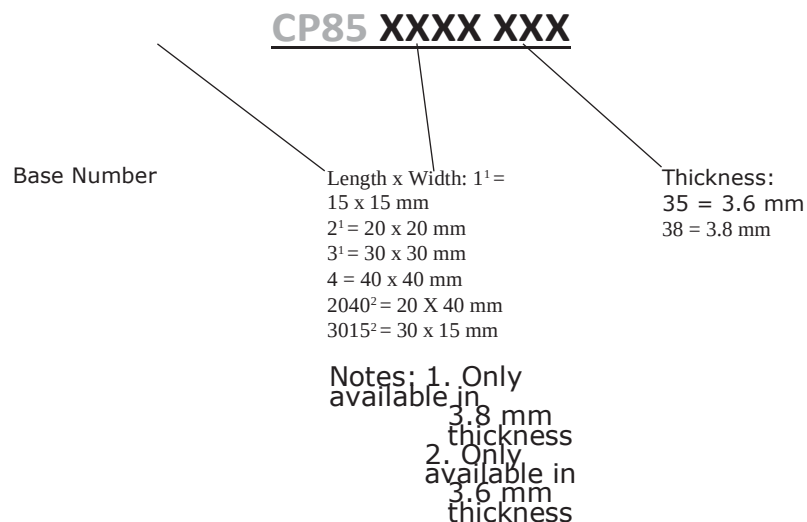
Notes: 1. Maximum voltage at ΔT max and T_h=27°C

2. Maximum current to achieve ΔT max

3. Maximum heat absorbed at cold side occurs at I_{max}, V_{max}, and ΔT=0°C

4. Maximum temperature difference occurs at I_{max}, V_{max}, and Q=0W (ΔT max measured in a vacuum at 1.3 Pa)

PART NUMBER KEY



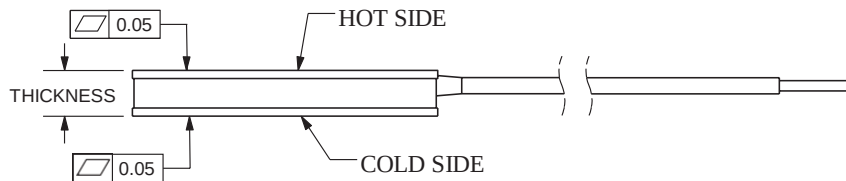
SPECIFICATIONS

parameter	conditions/description	min	typ	max	units
internal resistance ¹	CP85204035	0.675	0.75	0.825	Ω
	CP85301535	0.369	0.41	0.451	Ω
	CP85435	2.052	2.28	2.508	Ω
	CP85138	0.18	0.20	0.22	Ω
	CP85238	0.36	0.40	0.44	Ω
	CP85338	0.81	0.90	0.99	Ω
	CP85438	1.35	1.50	1.65	Ω
solder melting temperature	connection between thermoelectric pairs	138			°C
assembly compression	3.6 mm models			0.98	MPa
	3.6 mm models			1	MPa
hot side plate				80	°C
RoHS	2011/65/EU				

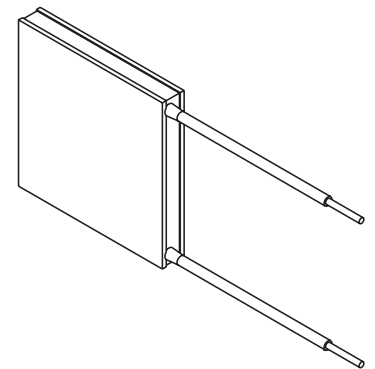
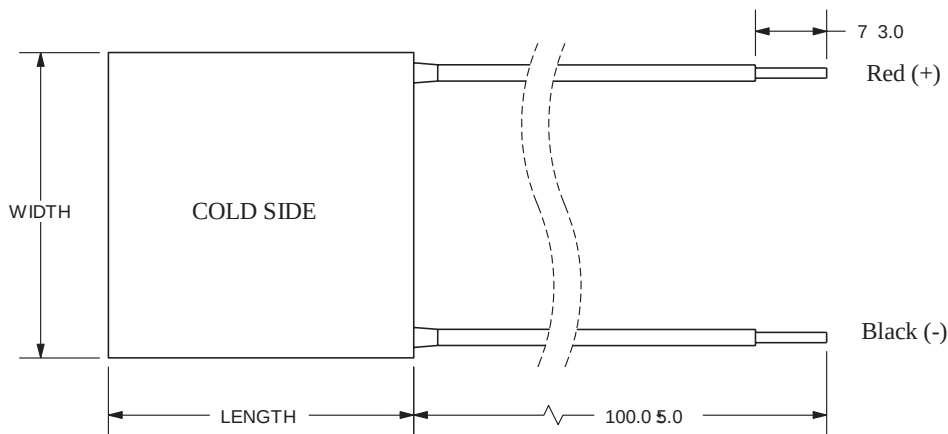
Note: 1. Measured by AC 4-terminal method at 25°C

MECHANICAL DRAWING

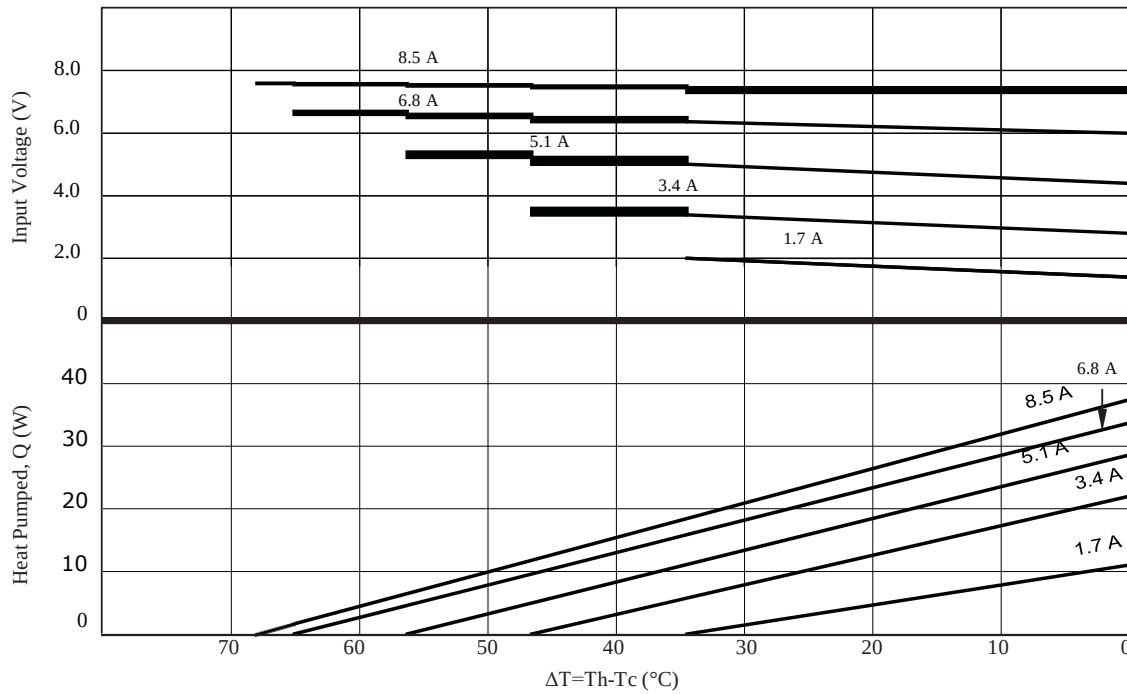
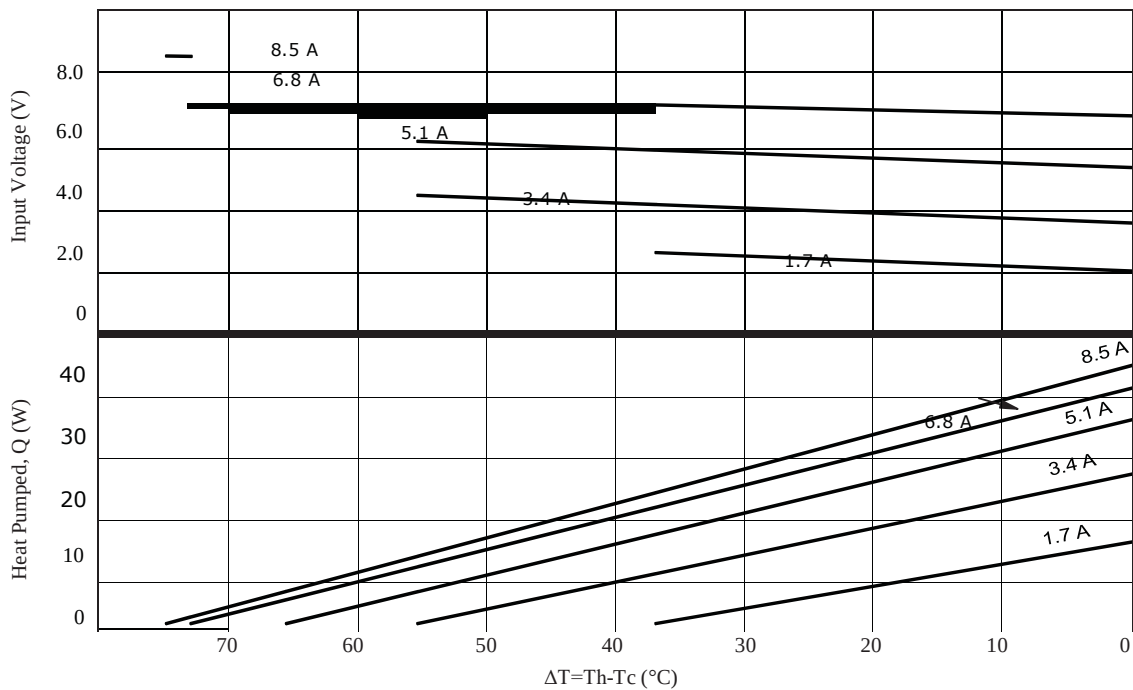
units: mm

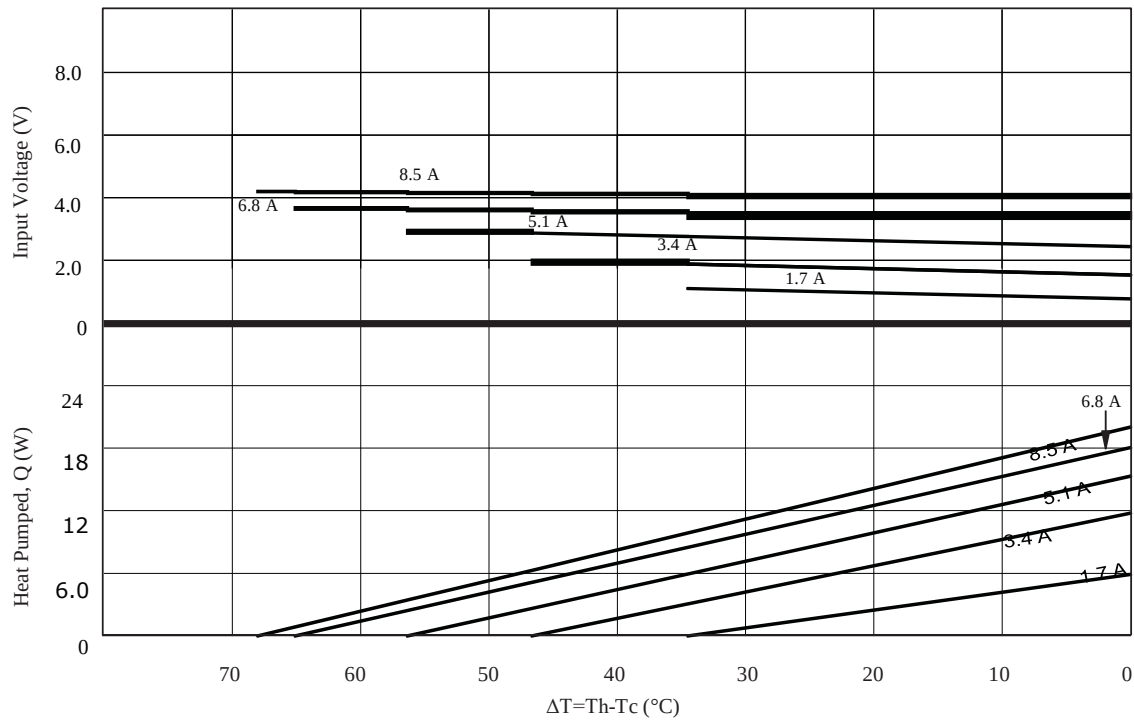
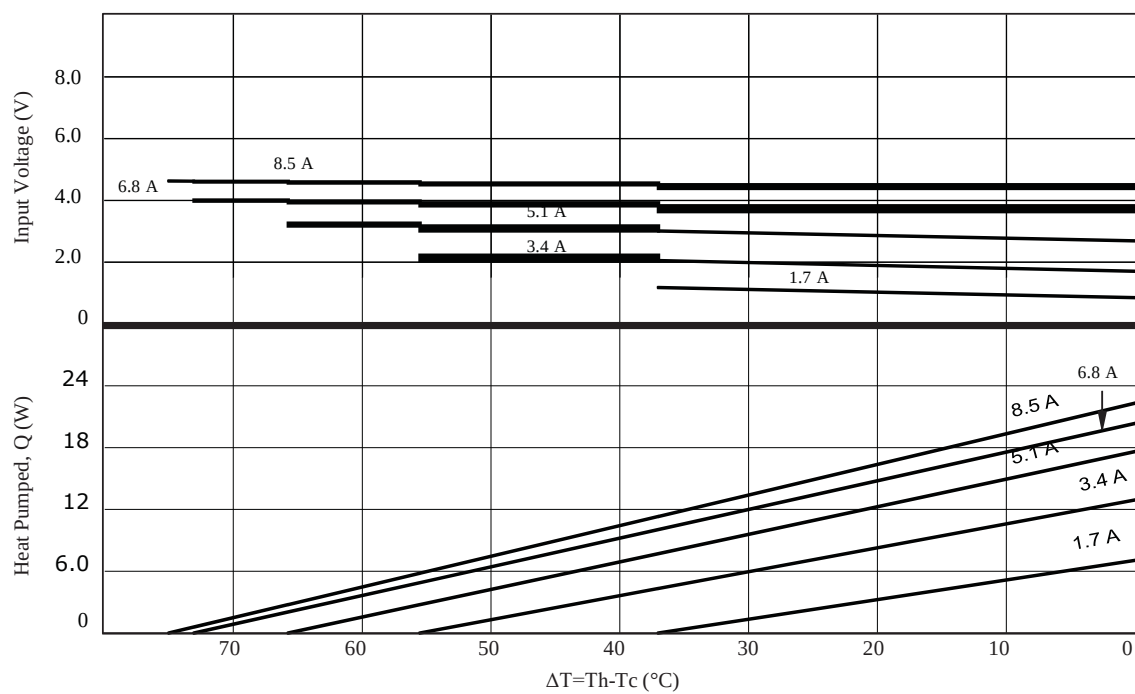


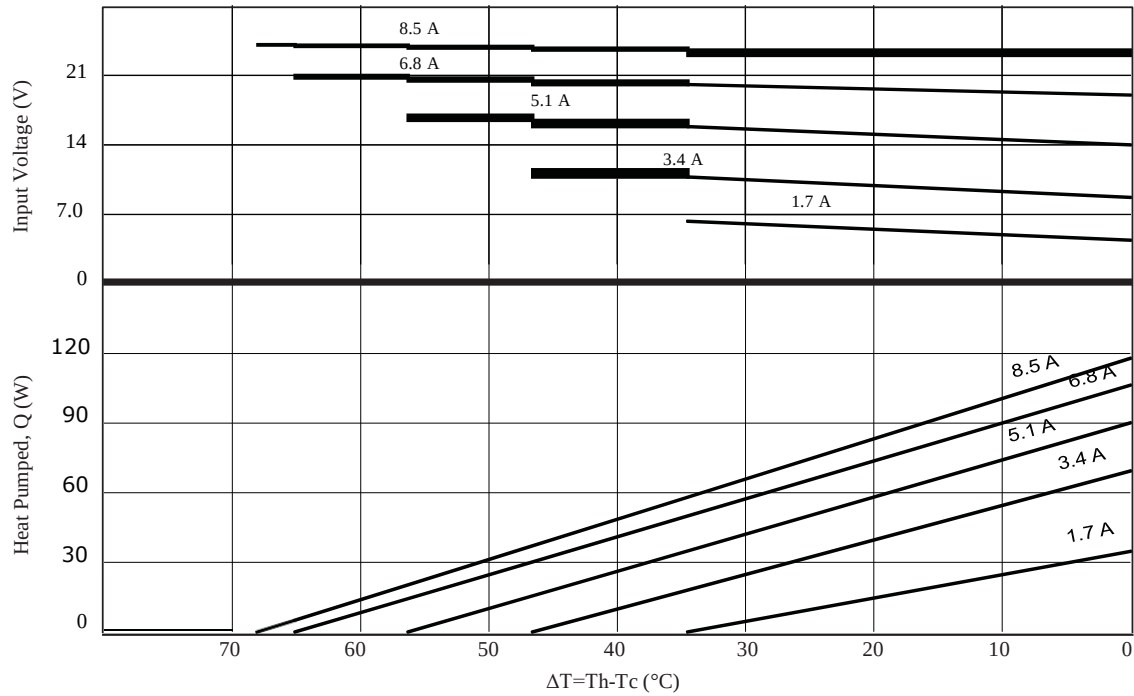
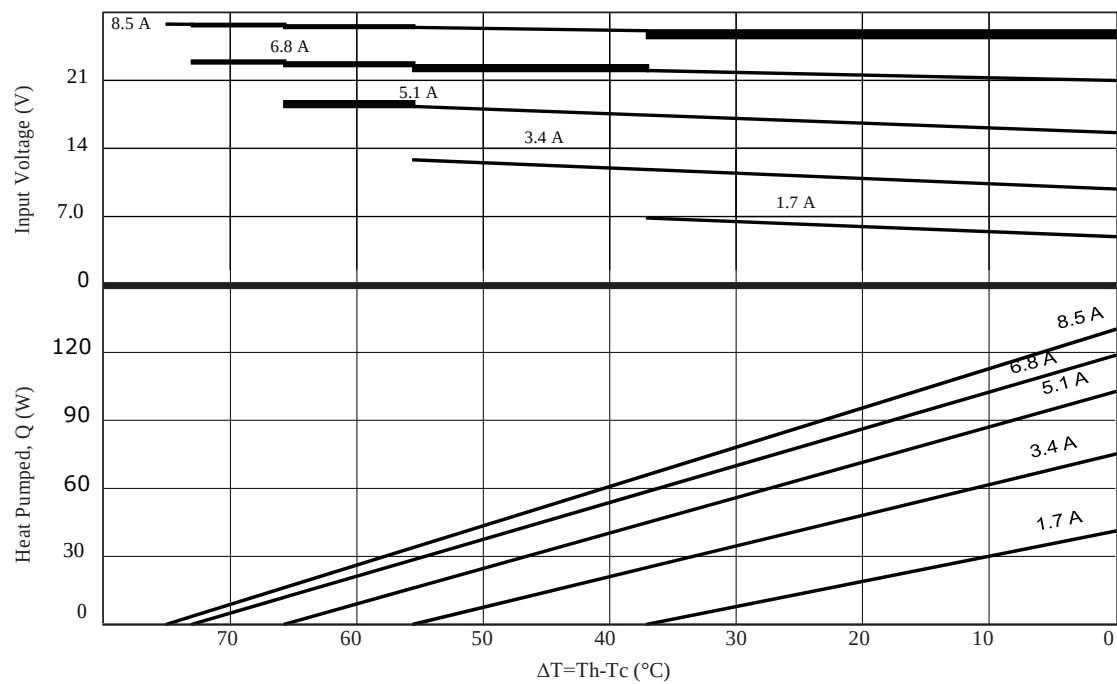
	MATERIAL	PLATING
ceramic plate	96% AL ₂ O ₃	
wire leads	20 AWG	tin
sealer	silicon rubber 703 RTV (between cold and hot side plates)	
joint cover	silicon rubber 703 RTV	
marking	P/N & S/N printed on cold side surface	

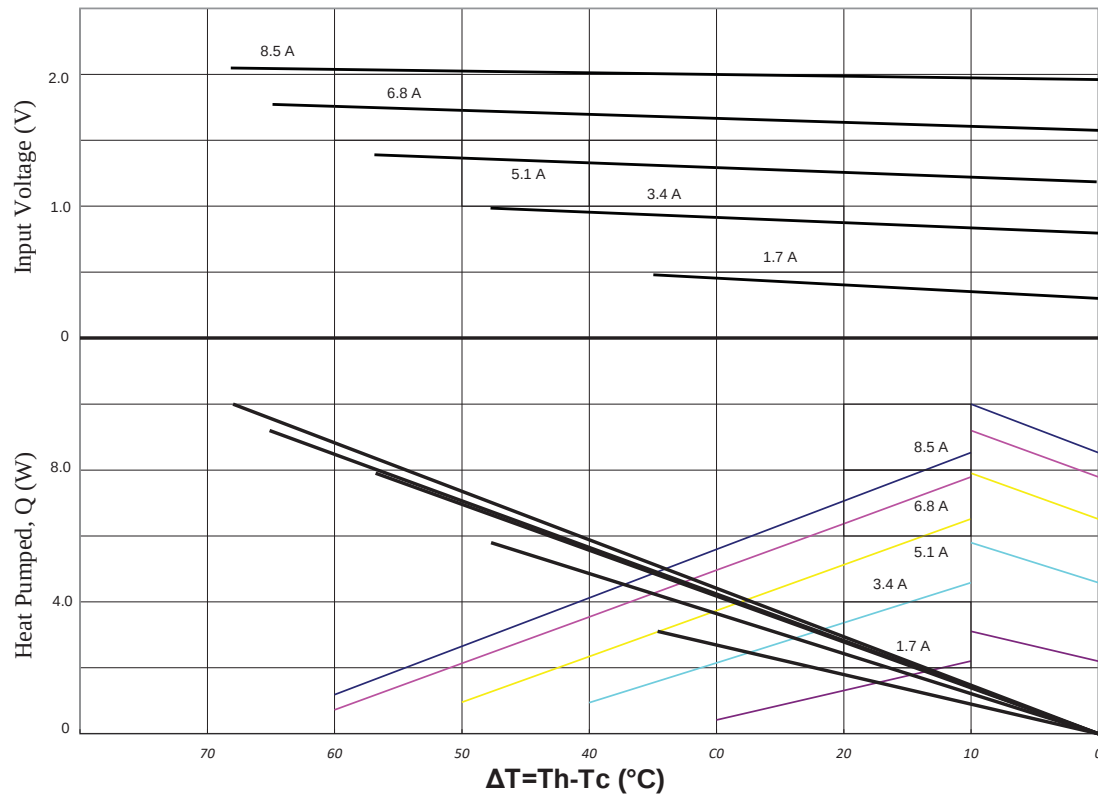
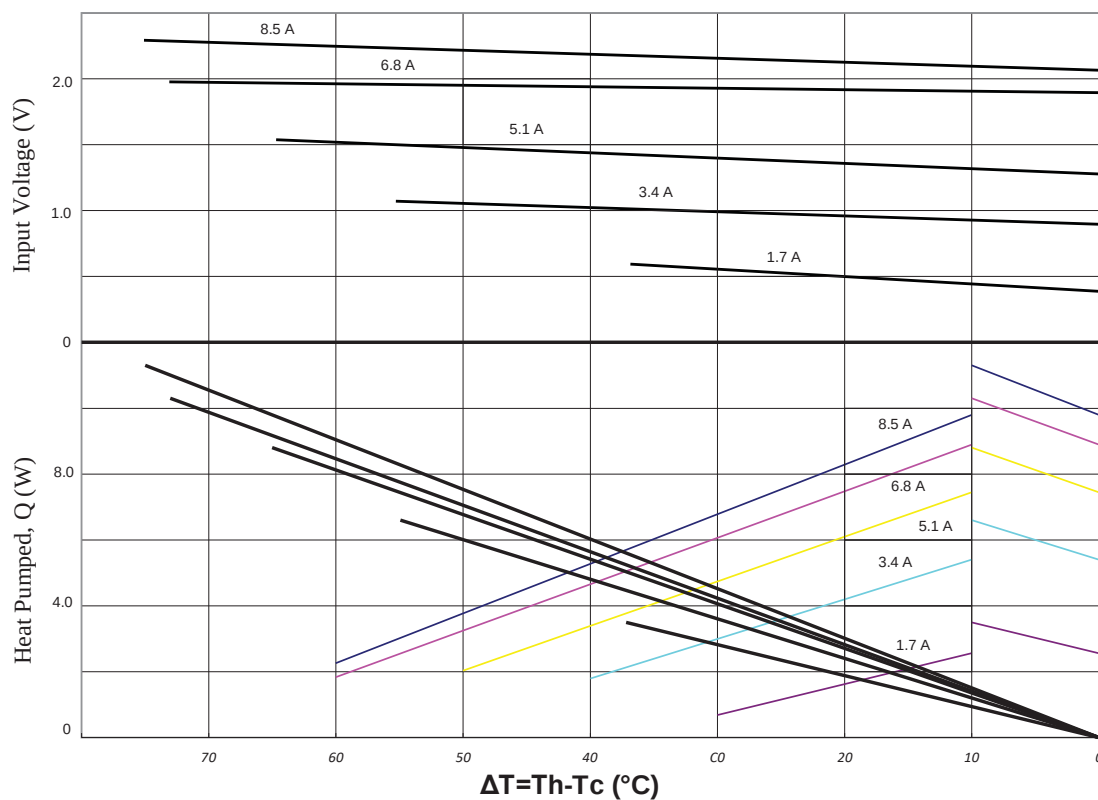


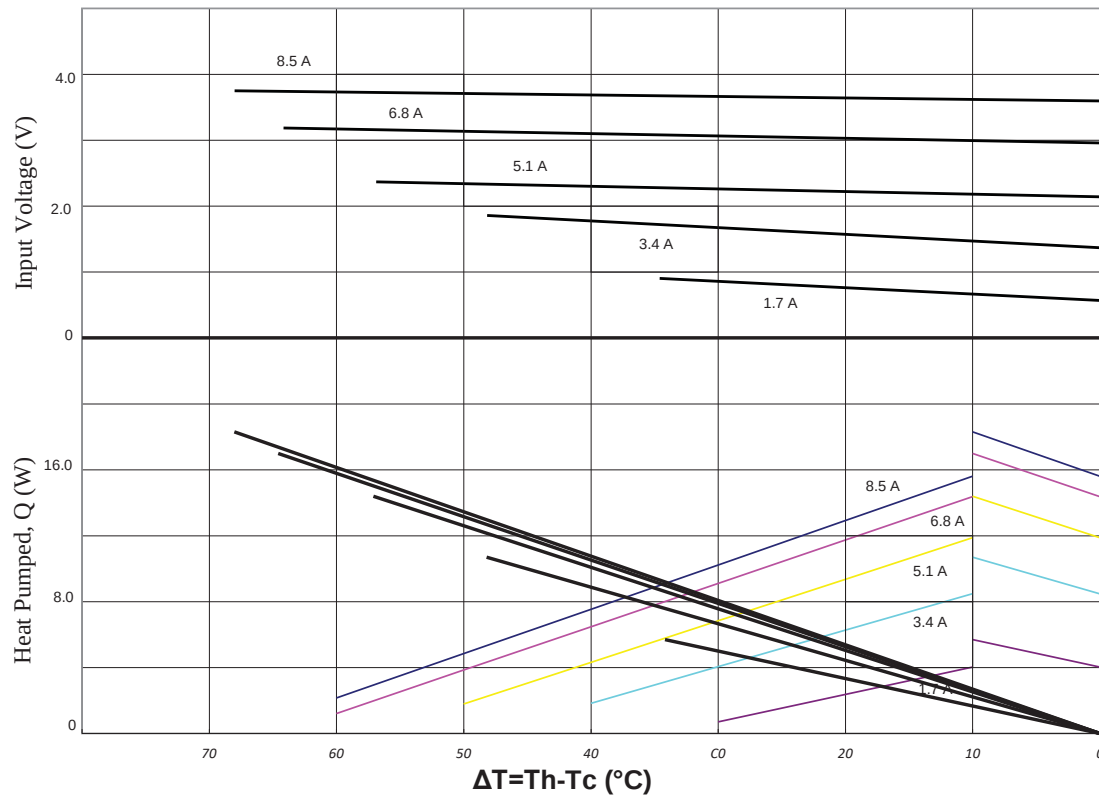
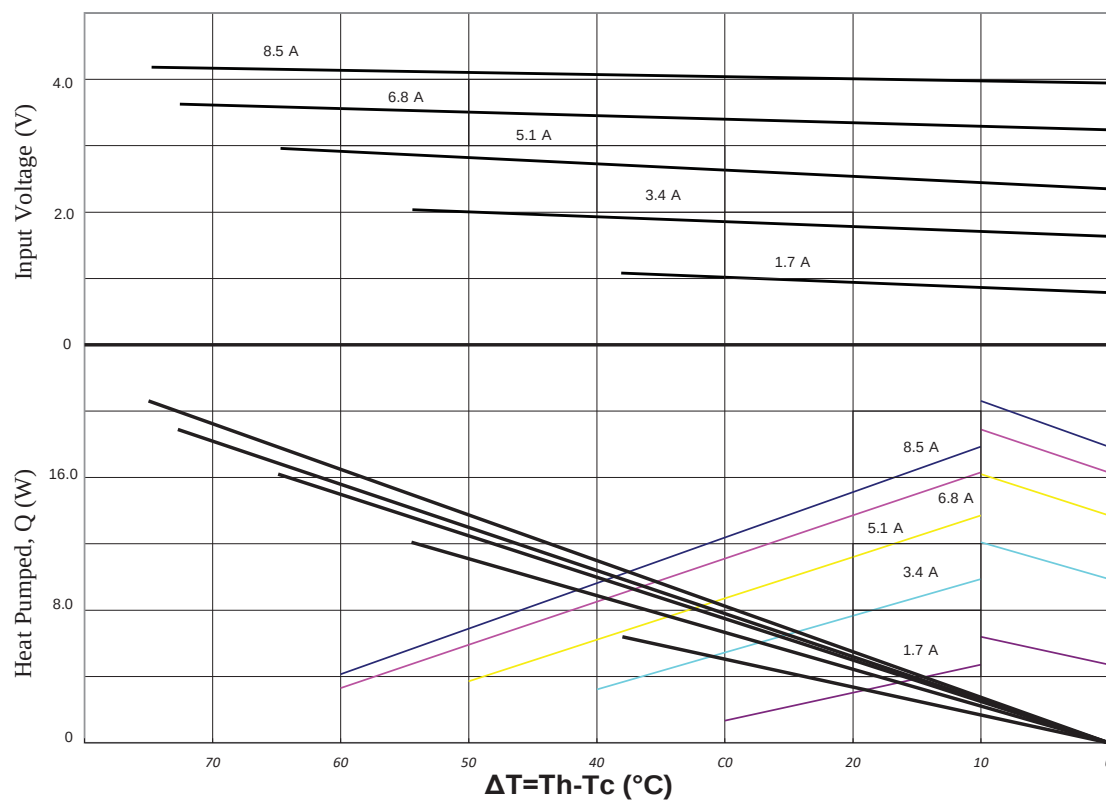
MODEL NO.	LENGTH (mm)	WIDTH (mm)	THICKNESS (mm)
CP85204035	20 ±0.3	40 ±0.3	3.6 ±0.1
CP85301535	30 ±0.3	15 ±0.3	3.6 ±0.1
CP85435	40 ±0.3	40 ±0.3	3.6 ±0.1
CP85138	15 ±0.3	15 ±0.3	3.8 ±0.1
CP85238	20 ±0.3	20 ±0.3	3.8 ±0.1
CP85338	30 ±0.3	30 ±0.3	3.8 ±0.1
CP85438	40 ±0.3	40 ±0.3	3.8 ±0.1

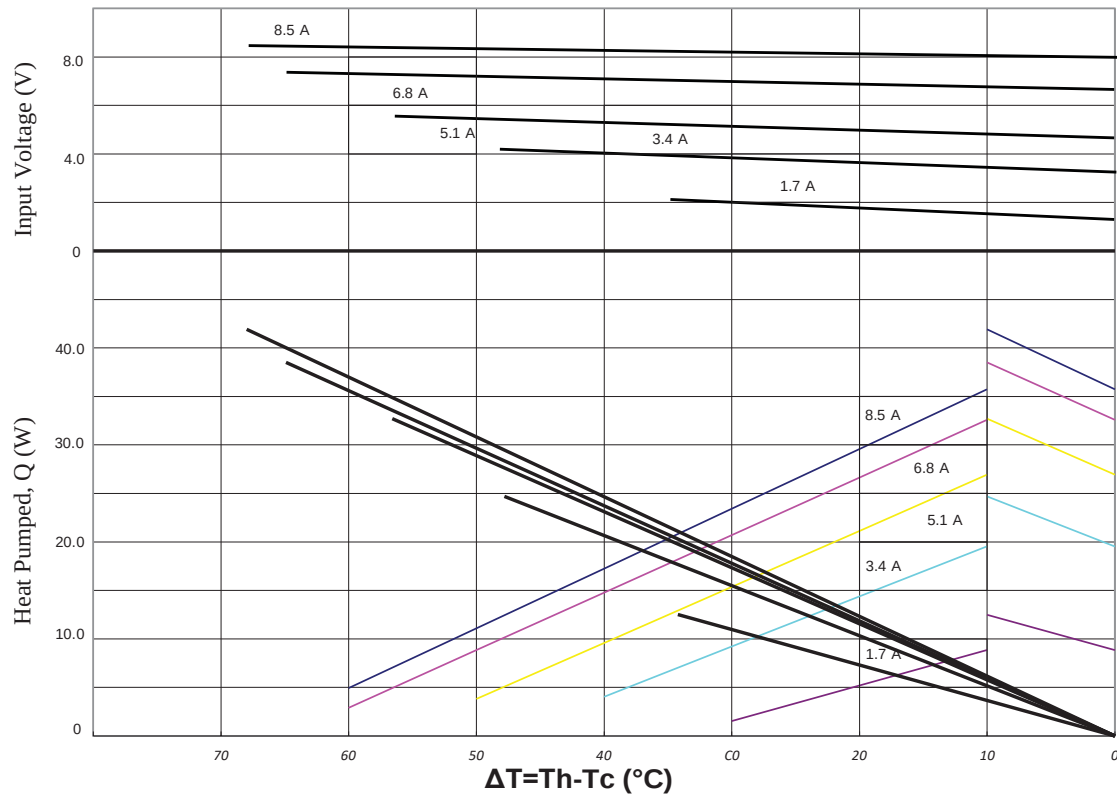
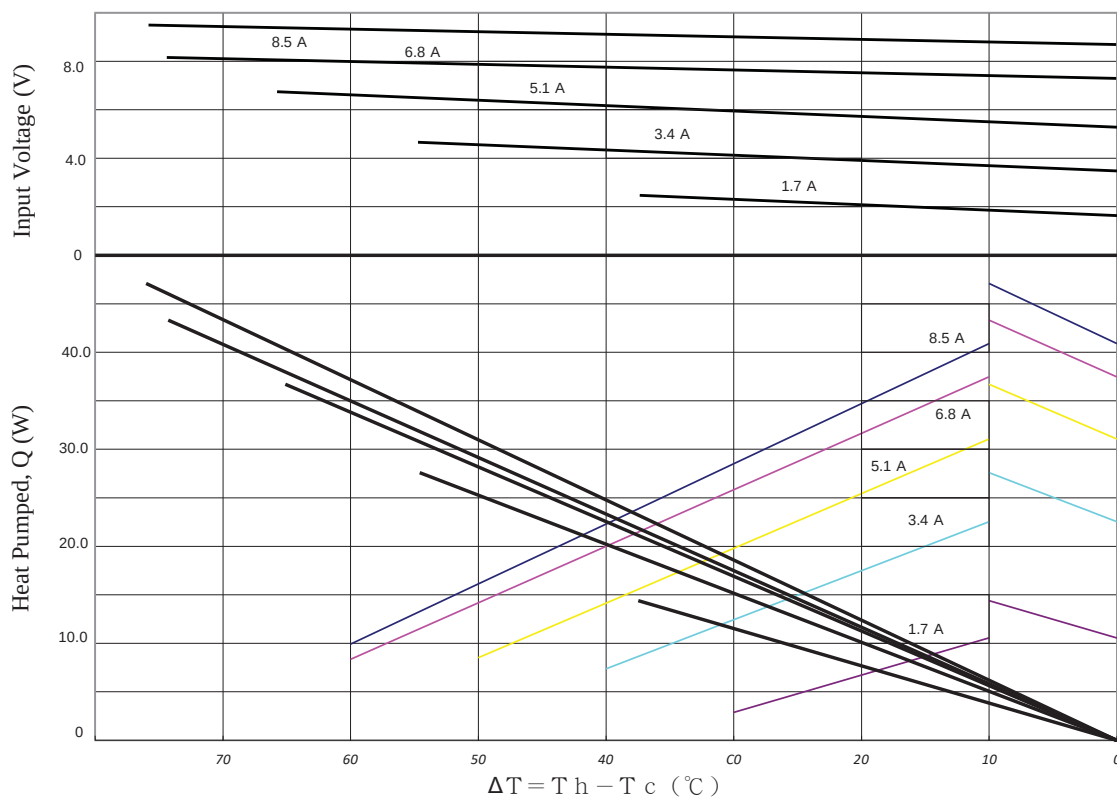
CP85204035 PERFORMANCE (Th=27°C)**CP85204035 PERFORMANCE (Th=50°C)**

CP85301535 PERFORMANCE (Th=27°C)**CP85301535 PERFORMANCE (Th=50°C)**

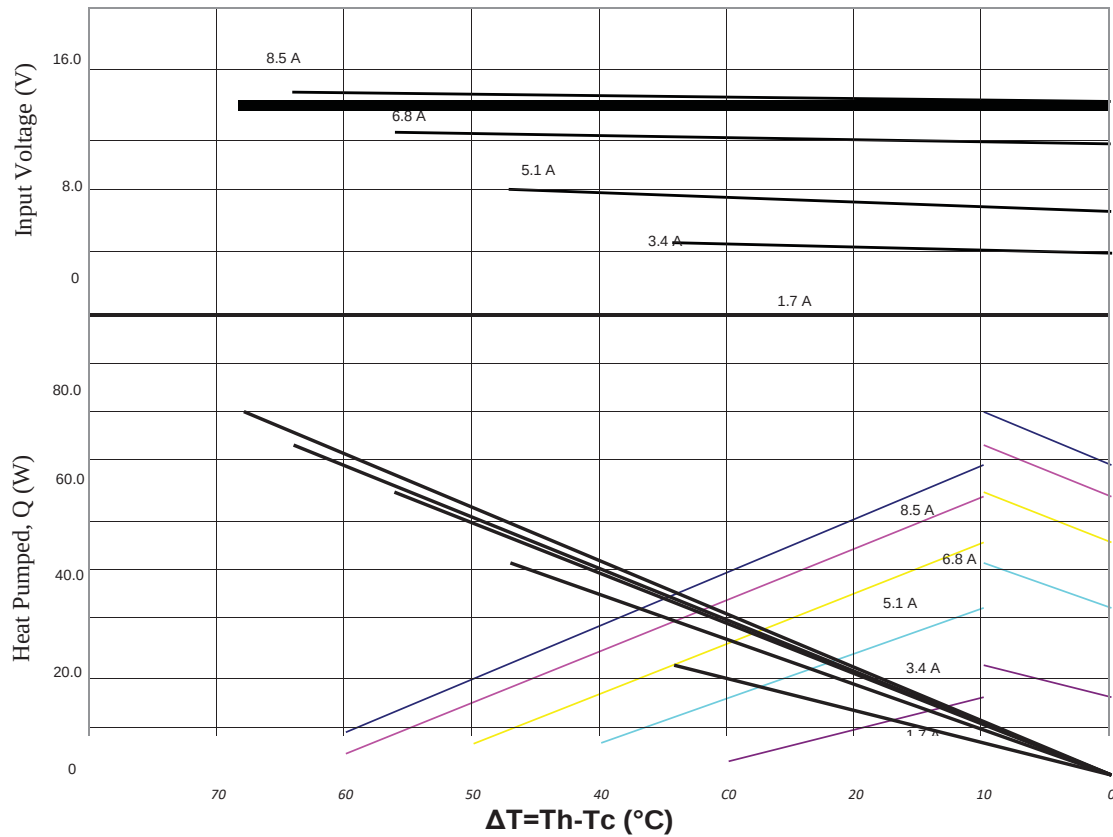
CP85435 PERFORMANCE (Th=27°C)**CP85435 PERFORMANCE (Th=50°C)**

CP85138 PERFORMANCE (Th=27°C)**CP85138 PERFORMANCE (Th=50°C)**

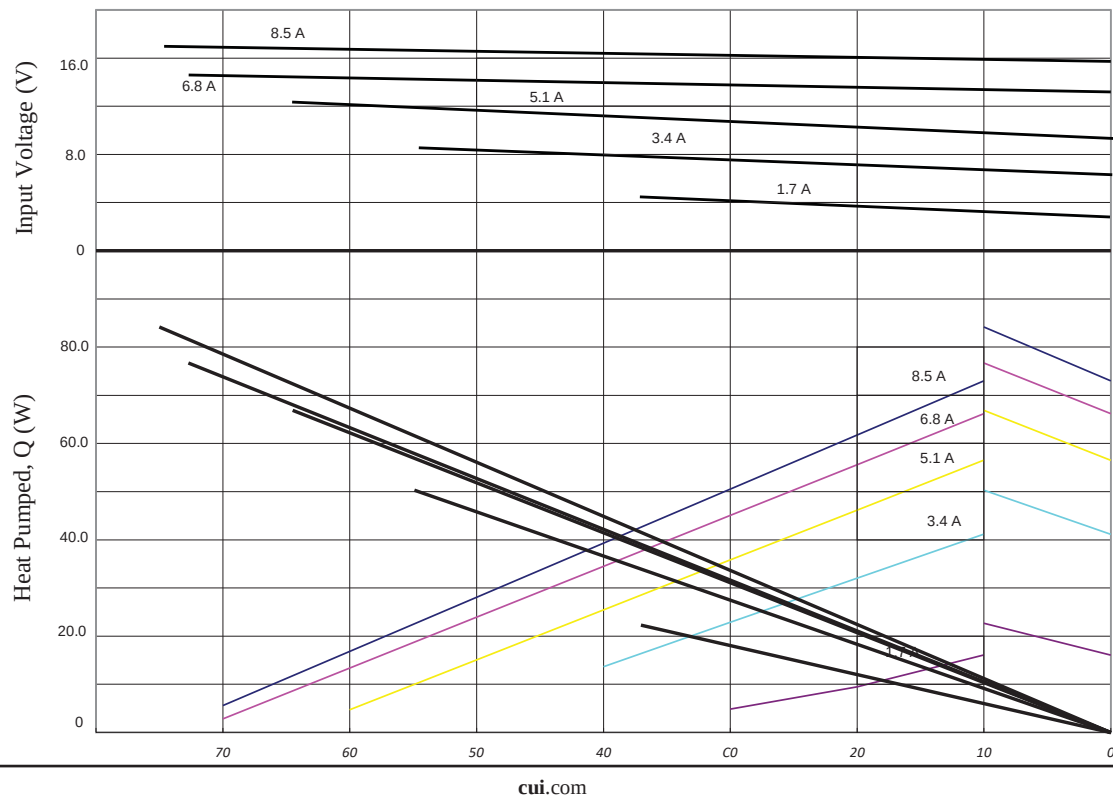
CP85238 PERFORMANCE (Th=27°C)**CP85238 PERFORMANCE (Th=50°C)**

CP85338 PERFORMANCE (Th=27°C)**CP85338 PERFORMANCE (Th=50°C)**

CP85438 PERFORMANCE (Th=27°C)



CP85438 PERFORMANCE (Th=50°C)



$\Delta T = T_h - T_c$ (°C)

REVISION HISTORY

rev.	description	date
1.0	initial release	09/03/2009
1.01	applied new template	05/08/2012
1.02	added new models	09/08/2016

The revision history provided is for informational purposes only and is believed to be accurate.



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CUI offers a one (1) year limited warranty. Complete warranty information is listed on our website.

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CUTIP SERIES CB85 | DESCRIPTION: FILTER MODULE
CUTIP products are not certified or warranted for use as critical components in equipment that requires an extremely high level of reliability. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.



Heating Elements overview



EHF Flanged Immersion Heater (ElektroHeizFlansche)

Type	Capacity (kW)	Voltage (50 Hz) (V)	Length (mm)	Flange	Art. No.
EHF 2,5 Incoloy 825	2,5	3 - 400	450	DN 110	18910
EHF 3 Incoloy 825	3,0	3 - 400	450	DN 110	18911
EHF 3,8 Incoloy 825	3,8	3 - 400	450	DN 110	18912
EHF 5 Incoloy 825	5,0	3 - 400	450	DN 110	18913
EHF 6 Incoloy 825	6,0	3 - 400	450	DN 110	18914
EHF 7,5 Incoloy 825	7,5	3 - 400	450	DN 110	18915
EHF 10 Incoloy 825	10,0	3 - 400	450	DN 110	18916
EHF 12 Incoloy 825	12,0	3 - 400	530	DN 110	18917
EHF 15 Incoloy 825	15,0	3 - 400	630	DN 110	17340
EHF 45 Incoloy 825	45,0	3 - 400	630	DN 165	17345

Datasheet

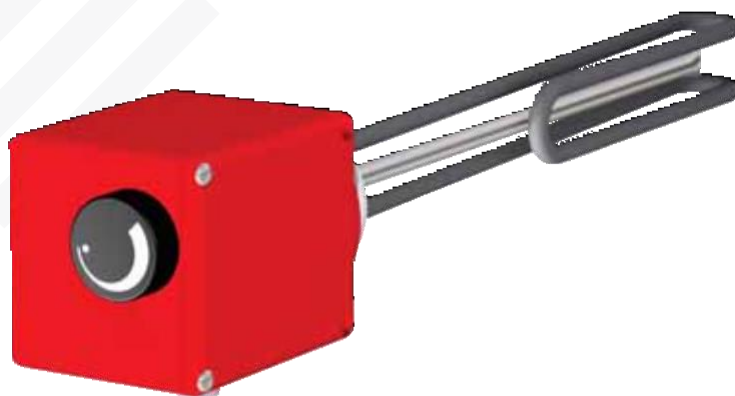
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Heating Elements overview



EHK Screwed Immersion Heater (EinschraubHeizKörper)

Type	Capacity (kW)	Voltage (50 Hz) (V)	Length (mm)	Installation Socket	Art. No.
EHK 2 Incoloy 825	2,0	230	320	1 ½"	18930
EHK3 Incoloy 825 fixed temp. 55 °	3,0	230	400	1 ½"	17334
EHK 3 Incoloy 825	3,0	3 - 400	390	1 ½"	18931
EHK 4,5 Incoloy 825	4,5	3 - 400	470	1 ½"	18932
EHK 6 Incoloy 825	6,0	3 - 400	620	1 ½"	18933
EHK 7,5 Incoloy 825	7,5	3 - 400	720	1 ½"	18934
EHK 9 Incoloy 825	9,0	3 - 400	780	1 ½"	18935
Old:					
EHK 2,5 Incoloy 825	2,5	230	345	1 ½"	17330
EHK 4,5 Incoloy 825	4,5	3 - 400	390	1 ½"	17331
EHK 6,0 Incoloy 825	6,0	3 - 400	490	1 ½"	17332
EHK 7,5 Incoloy 825	7,5	3 - 400	490	1 ½"	17333
EHK 2,5 Nickel-plated Copper	2,5	230	360	G 1 ½"	17335
EHK 4,5 Nickel-plated Copper	4,5	3 - 400	400	G 1 ½"	17336
EHK 6,0 Nickel-plated Copper	6,0	3 - 400	520	G 1 ½"	17337
EHK 3,0 Nickel-plated Copper	3,0	3 - 400	300	G 2"	17450

cancelled
use 18932
use 18933
use 18934
cancelled
cancelled
cancelled
use 17334

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RWT Finned Pipe Heat Exchanger (Rippenrohr Wärme Tauscher)

Type	Heating surface (m ²)	Length h (mm)	Installation thread	Art. No.
RWT 1	1,0	490	2 x 1/2"	18940
RWT 1,8	1,8	470	2 x 3/4"	18941
RWT 2,3	2,3	550	2 x 3/4"	18942
RWT 3	3,0	490	2 x 3/4"	18943
RWT 4,6	4,6	790	2 x 1"	18944

RWT-F Finned Pipe Heat Exchanger (Rippenrohr - WärmeTauscher-Flansche)

Type	Heating surface (m ²)	Length h (mm)	Installation flange	Installation thread	Art. No.
RWT 1	1,0	490	DN 110	2 x 1/2"	19941
RWT 1	1,0	490	DN 180	2 x 1/2"	19942
RWT 1	1,0	490	DN 205	2 x 1/2"	19943
RWT 1,8	1,8	470	DN 180	2 x 3/4"	19944
RWT 1,8	1,8	470	DN 205	2 x 3/4"	19945
RWT 2,3	2,3	550	DN 180	2 x 3/4"	19946
RWT 2,3	2,3	550	DN 205	2 x 3/4"	19947
RWT 3	3,0	490	DN 205	2 x 3/4"	19948
RWT 4,6	4,6	790	DN 205	2 x 1"	19949



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Datasheet

DUO/DUO Solar (EHF)

	EHF 2,5	EHF 3	EHF 3,8	EHF 5	EHF 6	EHF 7,5	EHF 10	EHF 12	EHF 15	EHF 45
150 liter										
200 liter										
300 liter										
400 liter	X	X	X	X	X	X	X			
500 liter	X	X	X	X	X	X	X			
750 liter	X ¹⁾	X ¹⁾	X ¹⁾	X ¹⁾	X ¹⁾	X ¹⁾	X ¹⁾	X ¹⁾	X ¹⁾	
1000 liter	X ¹⁾	X ¹⁾	X ¹⁾	X ¹⁾	X ¹⁾	X ¹⁾	X ¹⁾	X ¹⁾	X ¹⁾	
1500 liter	X ¹⁾	X ¹⁾	X ¹⁾	X ¹⁾	X ¹⁾	X ¹⁾	X ¹⁾	X ¹⁾	X ¹⁾	
2000 liter	X ¹⁾	X ¹⁾	X ¹⁾	X ¹⁾	X ¹⁾	X ¹⁾	X ¹⁾	X ¹⁾	X ¹⁾	

1) in combination with reduction flange DN 205/DN 110 - 18920



DUO/DUO Solar (EHK)

	EHK 2	EHK 3	EHK 4,5	EHK 6	EHK 7,5	EHK 9
150 liter	X ¹⁾	X ¹⁾	X ¹⁾			
200 liter	X ¹⁾	X ¹⁾	X ¹⁾			
300 liter	X ^{1),3)}	X ^{1),2)}	X ^{1),2)}			
400 liter	X ^{1),3)}	X ^{1),2)}	X ^{1),2)}	X ²⁾		
500 liter	X ^{1),3)}	X ^{1),2)}	X ^{1),2)}	X ²⁾		
750 liter	X ^{3),4)}	X ^{3),4)}	X ^{3),4)}	X ^{3),4)}	X ³⁾	
1000 liter	X ^{3),4)}	X ^{3),4)}	X ^{3),4)}	X ^{3),4)}	X ^{3),4)}	
1500 liter						
2000 liter						

1) in combination with blind flange DN 110 with socket G1½ - 18967

2) in socket G1½ above the bottom coil; from EHK 3 it is necessary to replace the Mg anode by an impressed anode

3) in socket G1½ above the bottom coil

4) in combination with blind flange DN 205 with socket G1½ - 18969



DUO/DUO Solar (RWT)

	RWT 1 DN 110	RWT 1 DN 180	RWT 1 DN 205	RWT 1,8 DN 180	RWT 1,8 DN 205	RWT 2,3 DN 180	RWT 2,3 DN 205	RWT 3 DN 205	RWT 4,6 DN205
150 liter									
200 liter									
300 liter									
400 liter	X								



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500 liter
750 liter
1000 liter
1500 liter
2000 liter

x									
x		x		x		x	x		
x		x		x		x	x		
x		x		x		x	x	x	
x		x		x		x	x	x	
IVS - G 1/2"		IVS - G 1/2"		IVS - G 3/4"		IVS - G 3/4"	IVS - G 3/4"	IVS - G 1"	



If RWT is used in combination with a glass-lined vessel then the isolating joints IVS have to be used.

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HLS Solar (EHF)

	EHF 2,5	EHF 3	EHF 3,8	EHF 5	EHF 6	EHF 7,5	EHF 10	EHF 12	EHF 15	EHF 45
400 liter	x	x	x	x	x	x	x			
500 liter	x	x	x	x	x	x	x			

HLS Solar (EHK)

	EHK 2	EHK 3	EHK 4,5	EHK 6	EHK 7,5	EHK 9
400 liter	x ¹⁾	x ^{1),2)}	x ^{1),2)}	x ^{1),2)}		
500 liter	x ¹⁾	x ^{1),2)}	x ^{1),2)}	x ^{1),2)}		

1) For mounting the EHK a blindflange DN110 with 1½" bushing has to be used (art.code 18967)

2) in socket G1½ above the bottom coil; from EHK 3 it is necessary to replace the Mg anode by an impressed anode



HLS Solar (RWT)

	RWT 1 DN 110	RWT 1 DN 180	RWT 1 DN 205	RWT 1,8 DN 180	RWT 1,8 DN 205	RWT 2,3 DN 180	RWT 2,3 DN 205	RWT 3 DN 205	RWT 4,6 DN20 5
400 liter	x								
500 liter	x								

IVS-G½"



If RWT is used in combination with a glass-lined vessel then the isolating joints IVS have to be used.



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LS (EHF)

	EHF 2,5	EHF 3	EHF 3,8	EHF 5	EHF 6	EHF 7,5	EHF 10	EHF 12	EHF 15	EHF 45
200 liter										
300 liter										
500 liter	X	X	X	X	X	X	X	X	X	
750 liter	X	X	X	X	X	X	X	X	X	
1000 liter	X	X	X	X	X	X	X	X	X	
1500 liter	X	X	X	X	X	X	X	X	X	
2000 liter	X	X	X	X	X	X	X	X	X	

LS (EHK)

	EHK 2	EHK 3	EHK 4,5	EHK 6	EHK 7,5	EHK 9
200 liter						
300 liter						
500 liter	X	X	X	X		
750 liter	X	X	X	X	X	
1000 liter	X	X	X	X	X	X
1500 liter	X	X	X	X	X	X
2000 liter	X	X	X	X	X	X

For mounting the EHK a blind flange DN110 with 1½" socket has to be used (art.code 18967)

LS (RWT)

	RWT 1 DN 110	RWT 1 DN 180	RWT 1 DN 205	RWT 1,8 DN 180	RWT 1,8 DN 205	RWT 2,3 DN 180	RWT 2,3 DN 205	RWT 3 DN 205	RWT 4,6 DN205
200 liter									
300 liter									
500 liter	X								
750 liter	X								
1000 liter	X								
1500 liter	X								
2000 liter	X								
	IVS - G ½"								



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If RWT is used in combination with a glass-lined vessel then the isolating joints IVS have to be used.



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Datasheet

Supastor DWH (EHK / EHF)

	EHK 2	EHK 3	EHK 4,5	EHK 6	EHK 7,5	EHK 9	EHF 2,5:15	EHF 45
120 liter	X	X	X					
150 liter	X	X	X					
180 liter	X	X	X					
210 liter	X	X	X					
250 liter	X	X	X					
300 liter	X	X	X					
500 liter ¹⁾	X	X	X	X			X	
750 liter ²⁾							X	
1000 liter ²⁾							X	
1500 liter ³⁾								X
2000 liter ³⁾								X
3000 liter ³⁾								X

Up to 500 liter 2 sockets 1½" available

1) 1 x DN 110

2) 2 x DN 110

3) 1 - 3 x DN 165 possible

Supastor Mono (EHK)

	EHK 2	EHK 3	EHK 4,5
120 liter	X	X	X
150 liter	X	X	X
180 liter	X	X	X
210 liter	X	X	X
250 liter	X	X	X
300 liter	X	X	X

1 socket 1½" available



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