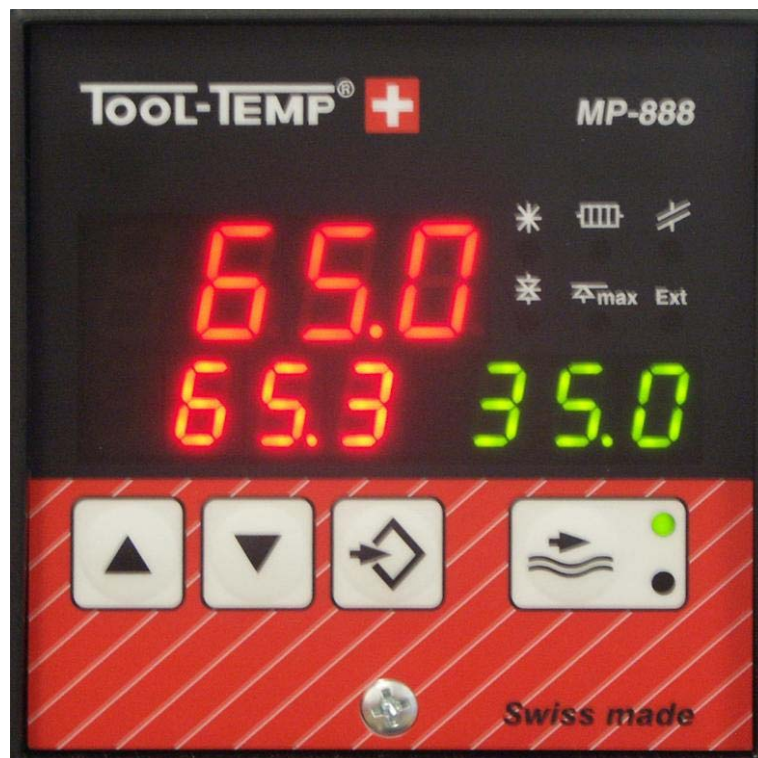


Guidance - Supplement to the manual of instructions

# Microprocessor Temperature Controller MP-888



software-version C30

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Version: 14

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In case of inconsistencies in the English translation, the German version shall prevail.

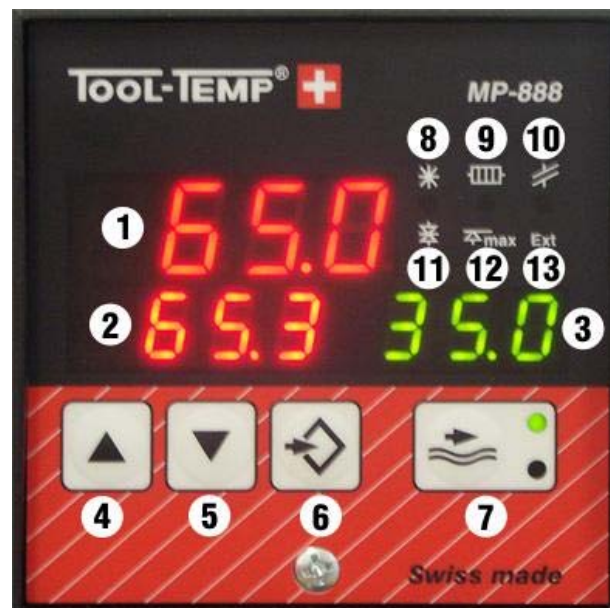
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<b>HINWEIS</b>	
	<p><b>This guidance provides specific information to the temperature controller.</b></p> <p><b>Observe the General Safety Information in the manual of instructions to the TOOL-TEMP machine!</b></p>

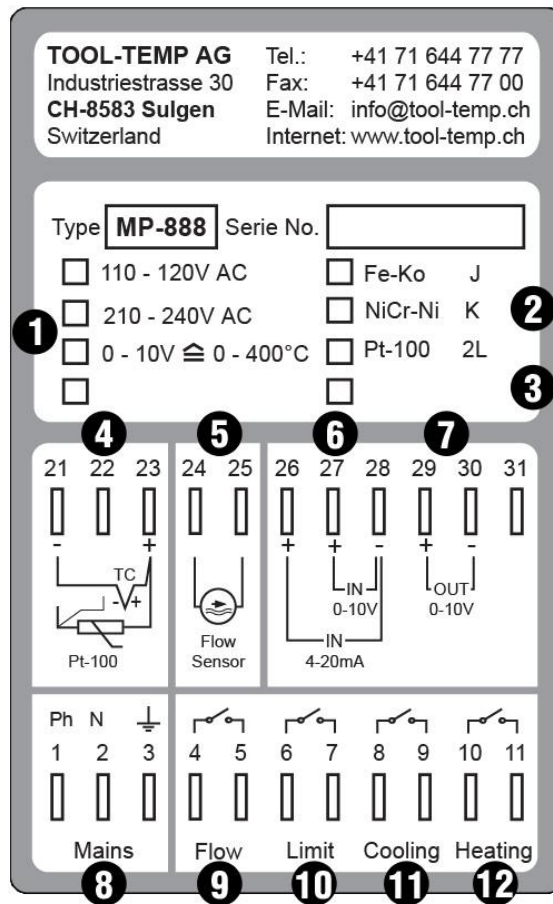
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## 1. Overview MP-888



1	<b>Display of set value</b>	
2	<b>Display of actual value</b>	
3	<b>Flow control</b> Display of the current flow in litres/min, English or American gallons/min.	
4	<b>Up arrow</b>	Raise of set value
5	<b>Down arrow</b>	Reduction of set value
6	<b>Program button</b>	
7	<b>Flow control</b> Flow control active Alarm flow control	LED green LED red
8	<b>LED Cooling</b> Lights up when the cooling relay is activated	
9	<b>LED Heating</b> Lights up when the heating relay is activated	
10	<b>LED Sensor failure</b> Lights up when the sensor is intermitted	
11	<b>LED Temperature deviation control</b> Lights up when the difference between set and actual temperature is too high	
12	<b>LED Maximum temperature</b> Lights up when the maximum temperature has been reached	
13	<b>LED External temperature control</b> Lights up when the set value is applied from extern	



1	<b>Possible supply voltages</b> (factory adjusted)
2	<b>Possible temperature sensor</b> (factory adjusted)
3	<b>Version of the controller</b>
4	<b>Temperature sensor connection</b> 21+23 Temperature sensor – note + / - 22 Pt-100 compensation
5	<b>Flow control – encoder signal</b>
6	<b>Connection external set point</b> 26+28 Analog input 4- 20mA 27+28 Analog input 0 - 10 V
7	<b>Connection actual value - output</b> 29+30 Analog output 0 - 10V
8	<b>Power supply</b> 1 230V AC 2 Neutral 3 PE
9	<b>Flow control (alarm)</b>
10	<b>Temperature monitoring, temperature deviation alarm</b>
11	<b>Cooling (command)</b>
12	<b>Heating (command)</b>

## 2. Overview controller programmes

Once the „US-programs“ are set, the corresponding parameters are adjusted automatically on US-Gallons per minute and degree Fahrenheit.

Temperature Control Units without flow control			
Programme		New models	Old models
P 41	P US 41	TT-180, TT-181	TT-155, TT-156, TT-157 E, TT-162 E, TT-162H
P 42	P US 42	TT-170 L, TT-100 K-E, TT-100 KB-E	TT-162 E/PHE, TT-162 H/PHE, TT-162 E/A, TT-162 H/A, TT-154 E, TT-113 K, TT-103 K FeKo
P 43	P US 43		TT-130, TT-131, TT-132, TT-133, TT-134, TT-139
P 44	P US 44		TT-220, TT-230, TT-240, TT-245
P 45	P US 45		TT-260, TT-270, TT-280, TT-280/2
P 46	P US 46		TT-360, TT-370, TT-380, TT-380/2, TT-380 / 48 kW
P 47	P US 47		TT-300, TT-301, TT-302, TT-303, TT-304, TT-305, TT-500, TT-700

Temperature Control Units with flow control			
Programme		New models	Old models
P 72	P US 72	TT-DW160 9kW	
P 73	P US 73	TT-1358	
P 74	P US 74	TT-1398	TT-148
P 75	P US 75	TT-108 E / 6 - 18 kW / Pt-100	
P 76	P US 76	TT-108 K / 18 - 45 kW / Pt-100	
P 77	P US 77	TT-1000	
P 78	P US 78	TT-137 B/BP, TT-138 B/BP	
P 79	P US 79	TT-188, TT-168 E special unit 1,5 – 35 l/min	
P 80	P US 80	TT-188, TT-168 E, TT-168 H	
P 81	P US 81	TT-168 E/A, TT-168 H/A, TT-168 E/PHE, TT-168 H/PHE, TT-168 E/A/PHE, TT-168 H/A/PHE	
P 82	P US 82	TT-118 K, TT-1038 K, TT-108 K FeKo	
P 83	P US 83	TT-1548 E	
P 84	P US 84	TT-137 N-B, TT-138 N-B, TT-142 N-B, TT-142 B/BP	TT-143
P 85	P US 85	TT-288, TT-288/2	
P 86	P US 86	TT-1368	
P 87	P US 87	TT-388, TT-388/2, TT-390, TT-390/2	

<b>P 88</b>	<b>P US 88</b>	TT-388 / 48 kW, TT-608 Z	TT-380 / 48 kW with flow control
<b>P 89</b>	<b>P US 89</b>	TT-508 X, TT-510 X	TT-500 with flow control
<b>P 90</b>	<b>P US 90</b>	TT-708 Y	TT-700 with flow control
<b>P 91</b>	<b>P US 91</b>	TT-248	
<b>P 92</b>	<b>P US 92</b>	TT-407 Z, TT-409 Z	TT-408
<b>P 93</b>	<b>P US 93</b>	TT-410 X	
<b>P 94</b>	<b>P US 94</b>	TT-30/160	

**Heating- and cooling unit:**

Programme		New models	Old models
<b>P 09</b>	<b>P US 09</b>	TT-13'502 10 - 90°C	
<b>P 10</b>	<b>P US 10</b>	TT-13'502 10 - 40°C	

**Water chillers without flow control**

Programme		New models	Old models
<b>P 11</b>	<b>P US 11</b>	TT-29'000, TT-54'000, TT-54'000 WK, TT-54'000 OT, TT-108'000, TT-108'000 WK, TT-108'000 OT, TT-216'000, TT-216'000 WK, TT-216'000 OT, TT-14'000 E/LC	TT-4'500, TT-5'000, TT-9'500, TT-11'000, TT-11'000 WK, TT-12'000, TT-12'000 WK, TT-14'000, TT-14'000 WK, TT-20'000, TT-23'000, TT-23'000 WK, TT-25'000, TT-28'000, TT-28'000 WK, TT-29'000 WK, TT-40'000, TT-41'000, TT-57'000, TT-57'000 WK, TT-70'000, TT-80'000, TT-80'000 WK, TT-95'000, TT-95'000 WK, TT-110'000, TT-110'000 WK, TT-160'000, TT-160'000 WK
<b>P 12</b>	<b>P US 12</b>	TT-5'000 H, TT-14'000 H, TT-28'000 H, TT-5'000 E/LC	TT-4'500 H, TT-9'500 H, TT-11'000 H, TT-12'000 H, TT-14'000 H, TT-20'000 H, TT-23'000 H, TT-25'000 H

**Water chillers with flow control**

Programme		New models	Old models
<b>P 13</b>	<b>P US 13</b>	TT-5'500 E, TT-14'500 H, TT-14'500 H/WK	
<b>P 14</b>	<b>P US 14</b>	TT-28'500, TT-28'500 WK, TT-28'500 OT, TT-29'500 WK, TT-54'500, TT-54'500 WK, TT-54'500 OT, TT-58'500 WK	

**For all units with a special programming**

Programme		New models	Old models
<b>P 100</b>		Special programming	

### 3. Selection of the controller programme

By starting the controller, the software-version is first shown (C-30) and afterwards the programme number (P80).

Each temperature control unit or water chiller requires a different programming of the parameters. The different parameters adjustments are saved in each program.



Start the unit, on the display follows...

- up: Software-version (C30)
- down left: Temperature unit in °C
- down right: Flow unit in liters per minute



- P80 Software-version



Press button twice



With the arrow buttons choose the required programme (see overview controller programmes)



Press button once to save



### 4. Navigation in the controller

**Enter into the controller and navigate to the different parameter:**

- To enter into the programme of the controller, the programme button has to be pressed for 3 seconds.
- To move from parameter to parameter, press the programme button.



**Setting the parameter value:**

With the two arrow buttons the value of the parameters can be adjusted.



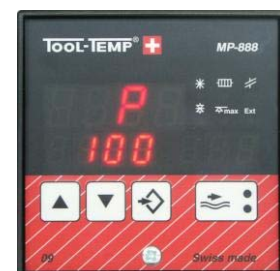
**Save the parameter settings:**

- To save the parameter settings and get back to the control function, the flow button must be pressed.
- To save the parameter settings and move to the next parameter, the programme button must be pressed.



**For all units with special programming P100:**

If a parameter will be changed the controller shows P100. Controllers with a special programming have a written the parameters on a label on the controller and in the manual of the model.



## 5. Parameter – Overview

	Function	Factory adjusted	User	Agent	TOOL-TEMP	Description
<b>P1</b>	Maximum temperature	<b>Setting depends on model</b> (0.0...400.0°C) (32.0...752.0°F)				If the maximum temperature exceeds, the heating and cooling are inactive and the maximum temperature LED lights up on the controller.
<b>P2</b>	Temperature deviation control (Deviation between set and actual temperature)	<b>5.0°C / 9.0°F</b> (0...20.0°C) (0...36.0°F)				The limit determines the maximum deviation from the nominal value, which is still tolerated. If the actual temperature outside the set point window the alarm will sound and the Temperature deviation control LED lights. If the restart lock (P24) is turned on, the temperature deviation control is active only when it reaches the set temperature. A set point changes the start-up lock again.
<b>P3</b>	Flow measurement function	0: Manuel <b>1: Automatic</b>				If the automatic flow measurement is enabled, after 20s the measured flow is stored and monitoring is enabled. The green LED lights up.
<b>P4</b>	Alarm value flow	<b>8.0 L</b> (0.1...999.9 L)				(P3) set to manual Alarm is triggered when the set value is exceeded.
<b>P20</b>	Temperature unit	<b>1: °C</b> 2: °F				Change the temperature unit: When the unit started the selected unit will be indicated for a short time.
<b>P21</b>	Temperature sensor	<b>Setting depends on model</b> 1: Fe-Ko J 2: NiCr-Ni K 3: Pt 100 2-Draht 4: Pt 100 3-Draht				Selection of temperature sensor
<b>P22</b>	Temperature adjustment on Pt 100	<b>0.7°C / 33.3°F</b> (0.0...130.0°C) (0.0...234.0°F)				When using very long sensor lines (Pt 100) the resistor of the line can be compensated. A compare measurement is needed. For example: measured temperature: 100°C indicated temperature: 108°C. -> set 8°C (difference)
<b>P23</b>	Analog input	<b>1: Voltage 0-10V</b> 2: Current 0-20 mA 3: Current 4-20 mA				Analog input for setpoint selection. 0-10 V (switching threshold <0.1V) 0-20 mA (switching threshold <0.5mA) 4-20 mA (switching threshold <0.1mA)
<b>P24</b>	Starting interlock for temperature deviation control	0: OFF <b>1: ON</b>				see P2



<b>P25</b>	Setting range FROM	<b>Setting depends on model</b> (-50.0...399.0°C) (-58.0...750.2°F)		This temperature value limits the lowest temperature that can be adjusted.
<b>P26</b>	Setting range TO	<b>Setting depends on model</b> (-49.9...400.0°C) (-57.8...752.0°F)		This temperature value limits the highest temperature that can be adjusted.
<b>P27</b>	Temperature at 0 V INPUT	<b>0.0°C / 32°F</b> (-50.0...399.9°C) (-58.0...751.8°F)		Lower scaling point of the voltage analog input 0 V corresponds to 0°C
<b>P28</b>	Temperature at 0 V INPUT	<b>400.0°C / 752°F</b> (-49.9...400.0°C) (-57.8...752.0°F)		Upper scaling point of the voltage analog input 10 V corresponds to 400°C
<b>P29</b>	Temperature at 0/4 mA INPUT	<b>0.0°C / 32°F</b> (-50.0...399.9°C) (-58.0...751.8°F)		Lower scaling point of the voltage analog input 4 mA corresponds to 0°C
<b>P30</b>	Temperature at 20 mA INPUT	<b>400.0°C / 752°F</b> (-49.9...400.0°C) (-57.8...752.0°F)		Upper scaling point of the voltage analog input 20 mA corresponds to 400°C
<b>P31</b>	Temperature at 0 V OUTPUT	<b>0.0°C / 32.0°F</b> (-50.0...399.9°C) (-58.0...751.8°F)		Lower scaling point of the voltage analog output 0 V corresponds to 0°C
<b>P32</b>	Temperature at 10 V OUTPUT	<b>400.0°C / 752°F</b> (-49.9...400.0°C) (-57.8...752.0°F)		Upper scaling point of the voltage analog output 10 V corresponds to 400°C
<b>P33</b>	Output function	<b>0: P31,P32</b> 1: 10V=100% 2: 5V=0% 3: Durchfluss		voltage analog output 0 : actual value P31...P32 -> 0...10V 1 : variable 0...100% -> 0...10V 2 : variable -100...0...100% -> 0...5...10V 3 : flow 0...P65 -> 0...10V
<b>P38</b>	Amplification factor I-proportion ( $K_I$ ), controller parameter	<b>Setting depends on model</b> (1...100%)		Constant of integration of the PID control controls the sensitivity / reactivity of the controller
<b>P39</b>	Integration speed-limiting band, controller parameter	<b>Setting depends on model</b> (0.0...5.0°C) (0.0...9.0°F)		Prevents overshooting of the temperature
<b>P41</b>	P-Band heating, controller parameter	<b>Setting depends on model</b> (1.0...35.0°C) (1.8...63.0°F)		Within the proportional band controlling is accomplished by PID-Algorithm
<b>P42</b>	Delta-W – Cooling	<b>Setting depends on model</b> (-9.9...9.9°C) (-17.8...17.8°F)		Starting point of cooling: If the actual temperature is higher by this value as the set temperature, cooling starts

<b>P43</b>	Hysteresis cooling	<b>Setting depends on model</b> (0.2...25.0°C) (0.4...45.0°F)			Period between ON and OFF of cooling. This value has to be adjusted correctly according to the controller adjustment tables for temperature control units and chillers.
<b>P44</b>	Differential portion heating and cooling, controller parameter	<b>Setting depends on model</b> (0...100%)			Differential portion of the PID control. Controls the max. speed of the controller
<b>P45</b>	Relation between cooling- and heating capacity	<b>0</b> (1...50)			Adjusting of the cooling capacity 0: 2-point cooling (Standard) 1: cooling = heating capacity 50: cooling > heating capacity
<b>P47</b>	Minimal switching time cooling, controller parameter	<b>1s</b> (0.5...9s)			Minimal switching time for cooling relay. Only active if P45 is higher than 0
<b>P48</b>	Minimal switching time heating, controller parameter	<b>2s</b> (1...9s)			Minimal switching time for heating relay. If P45 = 0, so also relevant for the cooling relay
<b>P49</b>	Cycle time, controller parameter	<b>15s</b> (6...255s)			Controller time base of PWM-outputs Time of the analyse of the control system to define the variable
<b>P53</b>	Flow unit	0: Flow OFF 1: Impulse (Hz) 2: litres/min 3: US gallons/min 4: Imperial gal./min			Flow unit to display 1 US gallon = 3.785 litres 1 Imperial gallon = 4.546 litres
<b>P60</b>	Flow measurement Calibration table	0 = Manual 1 = Small units 1 2 = Medium units 3 = Large units 4 = Reserved 5 = Small units 2 6 = Reserve			Selection of the calibration table for flow measurement
<b>P61</b>	Flow measurement point 1	x Hz	y l/min		Relevant calibration curve for flow measurement depending on P60
<b>P62</b>	Flow measurement point 2	x Hz	y l/min		Relevant calibration curve for flow measurement depending on P60
<b>P63</b>	Flow measurement point 3	x Hz	y l/min		Relevant calibration curve for flow measurement depending on P60
<b>P64</b>	Flow measurement point 4	x Hz	y l/min		Relevant calibration curve for flow measurement depending on P60
<b>P65</b>	Flow measurement point 5	x Hz	y l/min		Relevant calibration curve for flow measurement depending on P60
<b>P66</b>	Lower alarm limit (P61)	<b>30%</b>			Only valid for automatic node (P3=1) to calculate the alarm point
<b>P67</b>	Upper alarm limit (P65)	<b>10%</b>			Only valid for automatic mode (P3=1) to calculate the alarm point