AC-THOR®
AC-THOR 9s

Photovoltaic-Power-Manager for hotwater and spaceheating

Documentation of Controls

⚠ This document may only be distributed to third parties with written permission of my-PV!

⚠ To do a firmware update, the device must first be enabled for this. To do this, send us the 16-digit serial number to **support@my-pv.com**

Modbus TCP control

⚠ Control type of AC-THOR has to be set to Modbus TCP to accept power commands!

⚠ Mentioned register addresses are „real" addresses. Depending on your data retrieval system it might be required to add 1 to the register addresses (e.g. 1001 instead of 1000)!

Address	R/W	Parameter		Value Unit	Comment
1000	R/W	Power		W	unlimited range of value
			AC-THOR:	0-3.000 M1, 0-6.000 M3	
			AC-THOR 9s:	0-9.000 M1	
				0-18.000 M3	since a0020500
		In Multi-Mode this is the power sum of all devices. The value range can then also be larger depending on the number of devices			
1001	R	Temp1		1/10°C	
1002	R/W	HW 1 max (hot water)		1/10°C	
1003	R	Status			
1004	R/W	Power timout		10-600 sec	
1005	R/W	Boost mode		0: off, 1: on, 3: relay boost on	
1006	R/W	HW 1 min (hot water)		1/10°C	
1007	R/W	Boost time 1 start		0-23 hrs	
1008	R/W	Boost time 1 stop		0-24 hrs	
1009	R/W	Hour		0-23	
1010	R/W	Minute		0-59	
1011	R/W	Second		0-59	
1012	R/W	Boost activate			
1013	R/W	AC-THOR Number			
1014	R/W	max Power		500-3000 W for AC-THOR, 1500-9000 W for AC-THOR 9s	
1015	R	tempchip		1/10°C	
1016	R	Control Firmware Version			
1017	R	PS firmware version			

1018	R	AC-THOR serial number	2xCHAR	
1019	R	AC-THOR serial number	2xCHAR	
1020	R	AC-THOR serial number	2xCHAR	
1021	R	AC-THOR serial number	2xCHAR	
1022	R	AC-THOR serial number	2xCHAR	
1023	R	AC-THOR serial number	2xCHAR	
1024	R	AC-THOR serial number	2xCHAR	
1025	R	AC-THOR serial number	2xCHAR	
1026	R/W	Boost time 2 start	0-23	
1027	R/W	Boost time 2 stop	0-24	
1028	R	Control Firmware sub Version	Ushort	
1029	R	Control Firmware Update Available	see Footnote 1	
1030	R	Temp 2	1/10°C	
1031	R	Temp 3	1/10°C	
1032	R	Temp 4	1/10°C	
1033	R	Temp 5	1/10°C	not available
1034	R	Temp 6	1/10°C	not available
1035	R	Temp 7	1/10°C	not available
1036	R	Temp 8	1/10°C	not available
1037	R/W	HW 2 max (hot water)	1/10°C	not available
1038	R/W	HW 3 max (hot water)	1/10°C	not available
1039	R/W	HW 2 min (hot water)	1/10°C	not available
1040	R/W	HW 3 min (hot water)	1/10°C	not available
1041	R/W	RH 1 max (room heating)	1/10°C	
1042	R/W	RH 2 max (room heating)	1/10°C	
1043	R/W	RH 3 max (room heating)	1/10°C	
1044	R/W	RH 1 day min (room heating)	1/10°C	
1045	R/W	RH 2 day min (room heating)	1/10°C	
1046	R/W	RH 3 day min (room heating)	1/10°C	
1047	R/W	RH 1 night min (room heating)	1/10°C	
1048	R/W	RH 2 night min (room heating)	1/10°C	
1049	R/W	RH 3 night min (room heating)	1/10°C	
1050	R	Night flag	0 day 1 night	
1051	R/W	UTC correction	0..37	
1052	R/W	DST correction	0,1	
1053	R/W	Legionella interval	days	
1054	R/W	Legionella start	hrs	
1055	R/W	Legionella temp	°C	
1056	R/W	Legionella mode	0,1	
1057	R	Stratification flag	0,1	
1058	R	Relay 1 status	0,1	
1059	R	load state	0,1 Bit1 ... Out1, 9s only, since version a0020201 Bit2 ... Out2, 9s only, since version a0020201 Bit3 ... Out3, 9s only, since version a0020201	
1060	R	load nominal power	W	
1061	R	U L1	V	
1062	R	I L1	1/10A	
1063	R	U Out	V	
1064	R	Freq	mHz	
1065	R/W	Operation mode	1-7	since version a0020410
1066	R	9s state		since version a0021200
1066 (old)	R/W	Access Level 1-3	was only used up to firmware version a0010103	
1067	R	U L2	V, 9s only, ACTHOR replies 0	
1068	R	I L2	1/10A, 9s only, ACTHOR replies 0	
1069	R	Meter Power	integer, negative is feed in	

1070	R/W	Control type	see Footnote 2	
1071	R	Pmax_abs; Max. power currently possible. Also includes power of slaves.	W, since version 00102.05	
1072	R	U L3	V, 9s only, ACTHOR replies 0	
1073	R	I L3	1/10A, 9s only, ACTHOR replies 0	
1074	R	P out1	W, 9s only, ACTHOR replies 0	
1075	R	P out2	W, 9s only, ACTHOR replies 0	
1076	R	P out3	W, 9s only, ACTHOR replies 0	
1077	R	operation state	see Footnote 3	
1078	R/W	Power high word	W	see Footnote 4
1079	R/W	Power low word	W	see Footnote 4
1080	R/W	Power + relays	W	9s only, see Footnote 5
1081	R/W	Device state	0 / 1	
1082	R	Power of the queried device In Multi-Mode this is the power of the single device that is queried	W	since version a0020303 1082=1083+1084
1083	R	Solar part of device power	W	since version a0020303
1084	R	Grid part of device power	W	since version a0020303
1085	R	PWM-out	0-100	since version a0020500
1087	R	Meter measurement value high word (negative = feed-in)	W	since version a0021002 see Footnote 6
1088	R	Meter measurement value low word (negative = feed-in)	W	since version a0021002 see Footnote 6

Registers can be read by Modbus command 0x03 (read holding registers) and written by Modbus commands 0x06 (write single register) or 0x10 (write multiple registers).

From Ethernet firmware a0010004, multiple devices can also be controlled via UDP broadcast.

⚠ **All writable registers ("W") must not be written more than once a day except register 1000 ("power")! This is due to protect the lifespan of the non-volatile memory.**

Discover in Network

The devices can be found in the network by an UDP Broadcast command.
Data format UDP Discover (broadcast to 255.255.255.255):

Search-Algorithms my-PV Devices	AC•THOR 9s	AC•THOR	my-PV Meter	AC ELWA 2	AC ELWA-E
Protocol: UDP Broadcast					
Port Number:	16124	16124	16124	16124	16124
Block length:	32bytes	32bytes	32bytes	32bytes	32bytes
Data block:					
2bytes crc modbus type, high byte first, over following 30 bytes	0x84db	0xcb7a	0x401e	0xa4d9	0x86d9
2bytes identification	0x4f4c	0x4e84	0x4e8e	0x3f16	0x3efc
16bytes string, fill the rest with 0x00	AC-THOR 9s	AC-THOR	my-PV Meter	AC ELWA 2	AC ELWA-E
rest reserved 0x00					
reply:					
Block length	64 byte	64 byte	64 byte	64 byte	64 byte
Port Number	16124	16124	16124	16124	16124
Data block:					

0-1 2 bytes crc modbus type, high byte first, over 62 bytes					
2-3 2 bytes identification	0x4f4c	0x4e84	0x4e8e	0x3f16	0x3efc
4-7 4 bytes IP address					
8-23 16 bytes serial number string					
24-25 2 bytes firmware version comm high byte first					
26 byte ELWA number					
rest internally used					

Status codes

0..... Off
1-8... device start-up
9... operation
>=200 Error states power stage

Footnote 1:

0: no new afw available,
1: new afw available (download not started, fw-version in variable Fwup_actual_version)
2: download started (ini-file download)
3: download started (afw.bin-file download)
4: downloading other files
5: download interrupted
10: download finished, waiting for installation

Footnote 2:

These control modes are possible from version a0020410 onwards, additionally all of them can also be set via the display.

HTTP	1
Modbus TCP	2
Fronius Auto	3
Fronius Manual	4
SMA Home Manager	5
Steca Auto	6
Varta Auto	7
Varta Manual	8
my-PV Power Meter Auto	9
my-PV Power Meter Manual	10
my-PV Power Meter Direct	11
RCT Power Manual	14
SMA Direct meter communication Auto	17
SMA Direct meter communication Manual	18
Digital Meter P1	19
Frequency	20
Fronius Sunspec Manual	100
KACO TL1 + TL3 Manual	101
Kostal PIKO IQ Plenticore plus Manual	102
Kostal Smart Energy Meter Manual	103
MEC electronics Manual	104
SolarEdge Manual	105
Victron Energy 1ph Manual	106

Victron Energy 3ph Manual	107	
Huawei (Modbus TCP) Manual	108	
Carlo Gavazzi EM24 Manual	109	
Sungrow Manual	111	
Fronius Gen24 Manual	112	
GoodWe Manual	113	since version a0020500
Huawei (Modbus RTU)	200	
Growatt (Modbus RTU)	201	since version a0020500
Solax (Modbus RTU)	202	
Qcells (Modbus RTU)	203	
IME Conto D4 Modbus MID (Modbus RTU)	204	

Footnote 3: operation states (screen icon):

0 green tick flashes
1 yellow wave is on
2 yellow wave flashes
3 green tick and yellow wave is on
4 red cross is on
5 red cross flashes

Lights up = set temperature reached (since version a0020806)

Flashes = stand-by, waits for excess

Lights up = heats with PV excess. Flashes = boost backup mode

Lights up = no control signal

Lights up = physical connection to the RJ45 network connection is intact

Lights up = no intact physical connection to the RJ45 network connection

Block active

Footnote 4:

Only for large systems with several units (multi-mode) and output specifications greater than 65,535 watts. Power below this value is entered in register 1000.
1078 and 1079 form a 32-bit unsigned integer. Always write this registers consecutively.

Footnote 5:

This register allows direct access to the AC-THOR 9s power stage and the relays in Modbus TCP mode.

bit 15:	relay Out-3
bit 14:	relay Out-2
bit 13 and 12:	0 ... power stage off
	1 ... power stage to Out-1
	2 ... power stage to Out-2
	3 ... power stage to Out-3
bit 11 – 0:	power stage power 0 – 3.000 (watt)

Footnote 6:

For meter values below -32768 W and above 32767 W.
Power within this range can be read in register 1069.
1087 and 1088 form a 32-bit signed integer. Always read this registers consecutively.

http control

In the Web interface the kind of control has to be set to http.

The control happens via the sub-page /control.html

/control.html?power=n	n ... Set power on the power stage, unlimited range of value The regulation is carried out by a higher-level control system. AC-THOR: 0-3.000 M1, 0-6.000 M3 AC-THOR 9s: 0-9.000 M1, 0-18.000 M3 (since a0020500)
/control.html?pid_power=n	The regulation is carried out by the pid-controller of AC-THOR (since a0020500)
/control.html?boost=1	activate Boost-Backup manually

NOTE:
For firmware versions following version a0010107, the xml query is replaced by json (data.jsn)!

Status info is queried via [IP]/data.jsn

device:	"ACTHOR"
acthor9s:	2
fwversion:	"a0020410"
psversion:	108
p9sversion:	100
screen_mode_flag:	3
power_act:	null
power_solar_act:	null
power_grid_act:	null
power_ac9:	0
power_solar_ac9:	0
power_grid_ac9:	0
power1_solar:	0
power1_grid:	0
power2_solar:	0
power2_grid:	0
power3_solar:	0
power3_grid:	0
load_state:	" 1:0 2:0 3:0"
load_nom:	0
rel1_out:	"0000"
temp1:	201
temp2:	null
temp3:	null
temp4:	null
boostactive:	0
legboostnext:	"null"
date:	"23.04.21"
loctime:	"07:27:54"
unixtime:	1619108874
wp_flag:	0
wp_time1_ctr:	0
wp_time2_ctr:	0
wp_time3_ctr:	0
pump_pwm:	0

schicht_flag:	0
act_night_flag:	0
ctrlstate:	"Conn. to Power Meter. P=1"
blockactive:	0
error_state:	0
meter1_id:	1438514
meter1_ip:	"192.168.2.5"
meter2_id:	null
meter2_ip:	"null"
meter3_id:	null
meter3_ip:	"null"
meter4_id:	null
meter4_ip:	"null"
meter5_id:	null
meter5_ip:	"null"
meter6_id:	null
meter6_ip:	"null"
surplus:	-1
m0sum:	-1
m0l1:	null
m0l2:	null
m0l3:	null
m0bat:	null
m1sum:	null
m1l1:	null
m1l2:	null
m1l3:	null
m1devstate:	null
m2sum:	null
m2l1:	null
m2l2:	null
m2l3:	null
m2soc:	null
m2state:	null
m2devstate:	null

m3sum:	null
m3l1:	null
m3l2:	null
m3l3:	null
m3soc:	null
m3devstate:	null
m4sum:	null
m4l1:	null
m4l2:	null
m4l3:	null
m4devstate:	null
ecarstate:	"null"
ecarboostctr:	null
mss2:	"null"
mss3:	"null"
mss4:	"null"
mss5:	"null"
mss6:	"null"
mss7:	"null"
mss8:	"null"
mss9:	"null"
mss10:	"null"
mss11:	"null"
volt_mains:	241
curr_mains:	0
volt_L2:	5
curr_L2:	0
volt_L3:	5
curr_L3:	0
volt_out:	0
freq:	50000
temp_ps:	195
fan_speed:	0
ps_state:	1
cur_ip:	"192.168.2.22"
cur_sn:	"255.255.0.0"
cur_gw:	"192.168.2.1"
cur_dns:	"192.168.2.1"
fwversionlatest:	"a0020410"
psversionlatest:	108
p9sversionlatest:	100
upd_state:	0
upd_files_left:	0
ps_upd_state:	0
p9s_upd_state:	0
cloudstate:	4
debug_ip:	"0.0.0.0"

my-PV GmbH
Betriebsstrasse 12, A-4523 Neuzeug
www.my-pv.com

Subject to change.