

Temperature Controller 1893-FGA Installation and Adjustment Instructions



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Safety instructions

Always observe the attached safety instructions during installation and operation of the device!

Scope of delivery



Controller:
1893-FGA:
without alarm relay
1893/R-FGA:
with alarm relay (230 V),
normally closed
1893/A-FGA:
with alarm relay (230 V),
normally open
1893/L-FGA:
with secondary relay
(230 V/N), normally open



Temperature controller 1893-
FGA:
Installation and Adjustment
Instructions



Safety Instructions



Setpoint/Threshold value
control:
front plate



Setpoint/Alarm value
control:
front plate

Overview

The 1893-FGA temperature controller is designed for the use in the area of frost protection. It contains the following applications:

- Setpoint/Threshold value control for ice protection
- Setpoint/Alarm value control for trace heating

As a special feature the control is equipped with up to two relays for alarm and error messages:

- 1893-FGA:
without alarm relay, with signalling relay (SELV) as changeover relay
- 1893/R-FGA:
with alarm relay (230 V), normally closed; with signalling relay (SELV) as changeover relay
- 1893/A-FGA:
with alarm relay (230V), normally open; with signalling relay (SELV) as changeover relay
- 1893/L-FGA:
with with secondary relay (230 V/N), normally open; with signalling relay (SELV) as changeover relay

Features

- application can be chosen via the connection of the sensor
 - operation with the help of two rotary adjusters and signalling via two bicolour LEDs on the front
 - temperature sensors: tekmar Series 31 and 30, PT1000
 - load/main relay for a maximum of 4.6 kW (20 A) at 230 V *
 - possibly additional relay for a maximum of 1.38 kW (6 A) at 230 V *
 - signalling relay for SELV (changeover relay), optional: alarm relay 230 V (normally closed or open)
 - installation on mounting rail in subdistribution unit or surface-mounted housing (as accessory)
- * For restrictions of load refer to *Technical data* (page 19).

Documentation

Further relevant documentation:

- Safety Instructions

Application 1: Setpoint/Threshold value control

If the controller is used with an adjustable threshold value (dual thermostat), it is suitable, for example, for heating gutters and open areas without controlling the moisture at the same time.

The setpoint (the temperature to be reached) can be defined between $-5\text{ }^{\circ}\text{C}$ and $+10\text{ }^{\circ}\text{C}$. Additionally a lower temperature limit (the threshold value) is set for the heating operation. As long as the temperature is below this threshold value, the output remains switched off. Thus the threshold value allows for the heating to be switched off in case the temperature is very low and no new ice formation is to be expected. The threshold value can be set between -20 and $0\text{ }^{\circ}\text{C}$. The difference with regard to the setpoint value, however, must be at least 1 K plus hysteresis.

The controller's operating range therefore lies between $-20\text{ }^{\circ}\text{C}$ and $+10\text{ }^{\circ}\text{C}$. Within this temperature range the monitored medium or area can be heated..

If the temperature is set at an invalid value this will be indicated. The switching output will go into emergency operation and the alarm is active.

Errors in the temperature sensor and the controller can be indicated via one or two signalling/alarm relays.

Application 2: Setpoint/Alarm value control

If the controller is used with an adjustable alarm temperature, it is suitable, for example, for trace heating. The valid temperature ranges are 0 to $10\text{ }^{\circ}\text{C}$ for water-based fluids or 40 to $50\text{ }^{\circ}\text{C}$ for greasy media.

The alarm temperature (alarm value) can be set as a difference with regard to the setpoint value. An error message will be triggered in case the temperature falls below the alarm value (for example because the heating system fails).


Installation

Proper use

The device has been solely designed to control electric heating systems and must only be used for this purpose. It has to be installed in an electric distributor (fuse box or control cabinet) and connected to the existing electrical heating system. When doing so it is absolutely necessary to observe all *Technical data*.

Any different or improper use of the device may lead to defects and/or life-threatening states and situations. Additionally all guarantee claims are forfeited in such a case.

Installation procedure

 Only qualified personnel (electrician or similar qualification) may install the device. The relevant engineering practices and the enclosed safety instructions must be observed.

Disconnect the control cabinet before installation.

Glue the appropriate front plate onto the device before installation (in order to do so, remove the protective paper on the back).

Mount the device on a 35 mm mounting rail in a sub-distribution unit or another adequate housing. Wire it according to the illustrations.

The function of the sensor inputs and the relay outputs is defined by the configuration of the controller and the active application.

The way the temperature sensor is connected is decisive for the used application:

- Setpoint/Thresh. value control: T1 and \perp terminals
- Setpoint/Alarm value control: T2 and \perp terminals

Note: The application will only be automatically selected according to the sensor connection if the application 1 (factory setting) is set.

The P terminal is used to start the parameter setting mode in order to adjust further parameters. The \Leftrightarrow terminal is intended for future extensions and must not be connected. For details regarding parameter setting refer to section *Parameter setting* on page 12.

The power supply is connected to the L and N terminals, the heating unit to the SH and N terminals or else to SH1 and N1 or SH2 and N2. Conductor cross-sections and circuit breakers must be dimensioned in consistence with the performance of the heating unit according to good engineering practices.

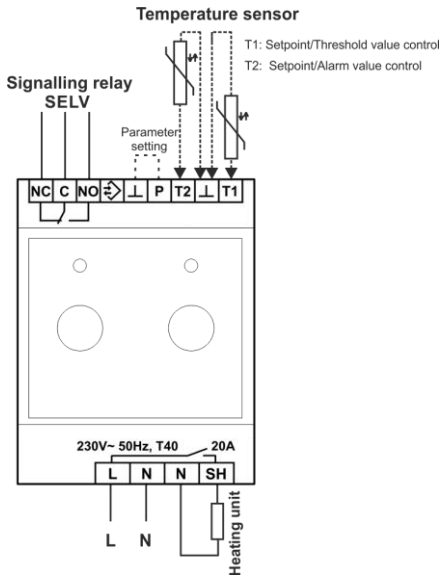
Depending on the type of device one or two signal outputs are available to report faults or alarms.

- signalling relay (relay 1): signalling circuit for SELV as changeover relay
- optional alarm/functional relay (relay 2): signalling circuit for low voltage (optional, normally closed or open)

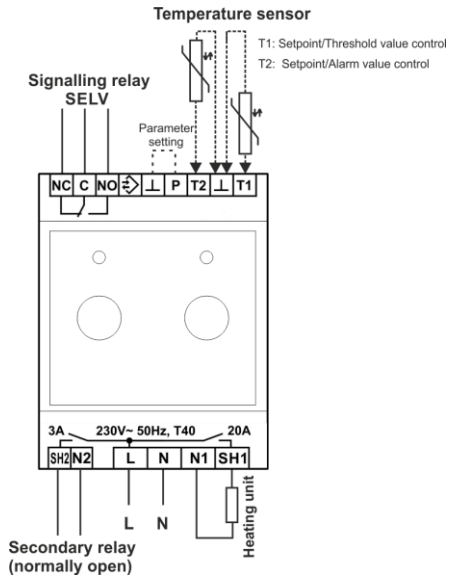
The following diagrams show examples of various connection alternatives for each of the four hardware variants.

Installation

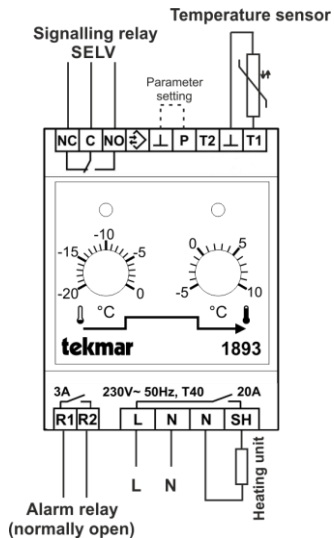
Connection 1893-FGA



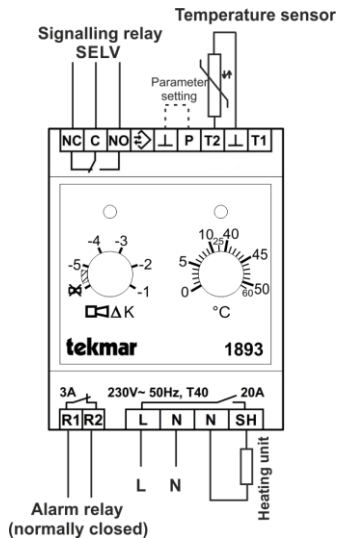
Connection 1893/L-FGA



Connection Setpoint/Threshold value control (example: 1893/A-FGA)



Connection Setpoint/Alarm value control (example: 1893/R-FGA)



Operation

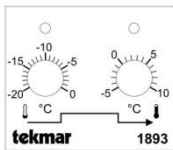
Setting parameters during operation

The operating values of the application can be modified during day-to-day operation using the rotary adjusters. Changes take effect immediately.

Setting the setpoint value and the threshold/ alarm value

The two rotary adjusters on the front of the device can be used to set the temperature values:

- right: setpoint value
- left: threshold value, alarm value



Front plate Setpoint/
Threshold value control

Display

Two bicolour LEDs are used to display the different operating states.

After initialisation the lefthand LED flashes in order to show the number of the active application. The number of flash pulses corresponds to the number of the application (for example one flash for the Setpoint/Threshold value control in the factory setting).

The following tables show the meanings of the LED displays of the controller, independent from the active application.

Displays of the system















L	R	Meaning
●	●	no supply voltage
●	●	hardware error
●	●	software initialisation
●	●	single flashing upon start-up = sensor installed correctly
●	●	software error ¹
●	●	error upon application start ²

¹ If this error message cannot be solved by resetting the device (power off/on), the device needs to be replaced.















² If this error message is displayed, the selected application, its parameters and the sensor type should be checked.

Status displays of the applications

LED displays Setpoint/Threshold value control

L	R	Meaning
		heating switched off
		heating switched on
	 	temperature below threshold value
 	 	sensor error, emergency operation
 		error in setting of setpoint/threshold value

LED displays Setpoint/Alarm value control

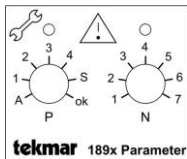
L	R	Meaning
		heating switched off
		heating switched on
	 	alarm temperature (heating off)
	 	alarm temperature (heating on)
 	 	sensor error, emergency operation

Setting parameters

Usually the preset parameters of the controller do not need to be changed. If, however, it should be necessary to adapt the device optimally to a special use case, the active application and its parameters as well as the type of the temperature sensor in use may be adjusted. These settings will be permanently saved in the controller.

The rotary adjusters and displays of the controller are used to set the parameters. No special tools are needed.

The parameter setting mode is started via the P input (bridge). In this mode the rotary adjusters have special functions with which the relevant parameters can be set. The stencil at the end of this document can serve as a help. It can be cut out and placed on the device when changing the parameters.



Start of parameter setting

- Disconnect the controller from the power supply.
- Set a bridge between the P and \perp terminals.

- Turn the left rotary adjuster to its left stop (position "A").
- Switch the power back on.

The controller is now in the parameter setting mode and displays its settings via the two LEDs.

Displays parameter setting mode

L	R	Meaning
● ● ●	● ●	application set
● ● ●	● ●	application changed
● ● ●	● ●	application inadmissible
● ●	● ●	parameter set
● ●	● ●	parameter changed
● ●	● ●	parameter inadmissible
● ● ●	● ●	sensor type set
● ● ●	● ●	sensor type changed
● ● ●	● ●	sensor type inadmissible
●	●	parameter setting saved
●	●	parameter setting not saved
		P and \perp connected, left rotary adjuster not in leftmost position or activity interval for parameter setting mode expired

Note: In the parameter setting mode the output relays are not activated.

Setting parameters

Process of parameter setting

In the parameter setting mode each rotary adjuster has seven positions equally distributed in the rotation angle with the following functions:

Rotary adjuster/lefthand LED

Position	Function	Display
A	Setting of application number	1x ●●●
1 ... 4 ¹	Setting of parameter number	1 ... 4x ●●●
S	Setting of sensor number	1x ●●●
ok	Save setting	●
	End	●

¹ Position 4: currently not in use

If the left rotary adjuster is set to "ok" the LED displays "Save setting" for 5 seconds. After that the settings are saved permanently. Before saving, the settings can be changed as often as desired.

Rotary adjuster/righthand LED

Position	Function	Display
1 ... 7	Setting of value	
	Value = current value	1 ... 7x ●●
	Value = changed value	1 ... 7x ●●
	Value = invalid value	1 ... 7x ●●
	Parameter not available	1 ... 4x ●● ¹
x	Save setting	●●
	End, ok not ok	● ●

¹ synchronous to lefthand LED

Note: When setting the parameters of an application, always set the application first and then adjust its parameters. This is important because in case the application is changed, its parameters are reset to the factory default settings.

If there is no activity for a duration of approximately 5 minutes, the parameter setting mode is ended without saving. Each time the rotary adjuster is moved, this time period starts again. If the power is

Setting parameters

disconnected in the parameter setting mode, the changes are not saved either.

Setting the application

In addition to the automatic selection due to the sensor connection, the application may be set in the parameter setting mode (lefthand rotary adjuster to "A", righthand rotary adjuster to application number).

Setting of application

Number	Application
1	Setpoint/Threshold value control (factory default)
2	Setpoint/Alarm value control

Setting the sensor type

To set the type of the connected sensor, turn the lefthand rotary adjuster to "S" and the righthand one to the number of the sensor type.

Setting of sensor type

Number	Sensor type
1	tekmar Series 31 (factory default)
2	tekmar Series 30
3	PT1000

Setting the application parameters

You can set the following parameters for the application (lefthand rotary adjuster):

Number	Parameter
1	Hysteresis
2	Alarm delay (signalling time)
3	Relay behaviour (signalling type)

Use the righthand rotary adjuster to set the values for the individual parameters.

Parameter setting Setpoint/Thresh. value control

Number	Parameter		
	Hyste- resis 1	Sign. time 2	Signalling type 1/2 ¹ 3
1	0,5 K	0 s	current/off
2	1,0 K ²	3 s	no current/off
3	1,5 K	5 s	current/current
4	2,0 K	10 s ²	no current ² /current
5	2,5 K	15 s	current/no current
6	-	20 s	no current/current
7	-	30 s	-

¹ also refer to *Explanation regarding the adjustment of signalling outputs* (page 15)

² Factory default

Setting parameters

Parameter setting Setpoint/Alarm value control

Number	Parameter		
	Hyste- resis 1	Sign. time 2	Signalling type 1/2 ¹ 3
1	1,0 K	0 s	current/off
2	1,5 K	3 s	no current/off
3	2,0 K	5 s	current/current
4	3,0 K ²	10 s ²	no current ² /current
5	5,0 K	15 s	current/ no current
6	7,0 K	20 s	no current/no current
7	10 K	30 s	-

¹ also refer to *Explanation regarding the adjustment of signalling outputs* (page 15)

² Factory default

Explanation regarding the adjustment of signalling outputs

Depending on the type of controller there are one or two signalling outputs for the alarm or error notification. For optimal use the activation of the signalling outputs can be adjusted. The parameter "Signalling type 1" (signalling relay SELV) and "Signalling type 2" (alarm relay 230 V) is used to set one of the following ways of operation:

- current: alarm activates relay
- no current: alarm deactivates relay
- off: relay is always deactivated

In many cases an alarm system works according to the closed-circuit principle. This means that the contact is closed when the operation runs without problem and the contact is opened if there is a problem. In order to directly activate a signalling device, however, a contact is needed which is closed in case of an alarm.

Depending on the desired way of operation, the relay contacts or the relay type must be selected and the signalling type must be set. When doing so, the following diagram may be useful.

Setting parameters

Configuration of signalling outputs

	Alarm in case of power failure?			
	Yes ↓		↓ No	
	Circuit closed in case of alarm?		Circuit closed in case of alarm?	
	Yes ↓	↓ No	Yes ↓	↓ No
Relay 1 (SELV)				
Setting:	no current	no current	current	current
Contacts:	C - NC	C - NO	C - NO	C - NC
Relay 2 (230 V)				
Setting:	no current	no current	current	current
Type:	normally closed	normally open	normally open	normally closed

Bold = Factory default

In order to avoid that a short-term disruption triggers an alarm, the transfer of the alarm to the signalling

outputs is delayed. This signalling time is an adjustable parameter (0 to 30 seconds). It starts when the fault occurs. An alarm will only be raised via the signalling relays if the fault persists after this delay time.

Troubleshooting

If the device does not react at all or does not function correctly, it often solves the problem to switch the power supply off and on. This reset can be done by switching the upstream circuit breaker off for approximately 10 seconds.

If the same error persists after the power has been switched on again, contact the tekmar Service.

If the controller identifies an internal error, this will be shown via the LEDs and the relay for the switching output and the two signalling relays will no longer be activated. If this error cannot be solved by resetting the device (power off/on), the device needs to be replaced.

The connected temperature sensor is monitored continuously. The active application defines the reaction to a sensor error. In case of a complete failure the emergency operation mode (30-minute sequence of load relay: 10 minutes on and 20 minutes off) is activated and an alarm is raised.

In case of a sensor error the sensor can be checked with the help of an ohmmeter. In order to do so, the sensor must be disconnected from the device. The

values in the following tables show the sensor's resistance at a particular temperature.

Sensor values Series 31

°C	Ω	°C	Ω	°C	Ω	°C	Ω
-30	24.532	+5	4.520	+40	1.154	+75	375
-25	18.851	+10	3.652	+45	970	+80	324
-20	14.616	+15	2.970	+50	819	+85	282
-15	11.383	+20	2.431	+55	695	+90	246
-10	8.941	+25	2.000	+60	592	+95	215
-5	7.070	+30	1.657	+65	506	+100	189
± 0	5.634	+35	1.379	+70	434	+105	167

Sensor values Series 30

°C	Ω	°C	Ω	°C	Ω	°C	Ω
-30	-	+5	866	+40	265	+75	100
-25	-	+10	714	+45	230	+80	89
-20	2.300	+15	590	+50	200	+85	81
-15	1.850	+20	500	+55	176	+90	72
-10	1.520	+25	423	+60	153	+95	63
-5	1.250	+30	358	+65	133	+100	56
± 0	1.040	+35	310	+70	116	+105	51

Troubleshooting

Sensor values PT1000

°C	Ω	°C	Ω	°C	Ω	°C	Ω
-40	843	± 0	1000	+40	1155	+80	1309
-30	882	+10	1039	+50	1194	+90	1347
-20	922	+20	1078	+60	1232	+100	1385
-10	961	+30	1117	+70	1271	+110	1423

Further information for troubleshooting can be found under: www.tekmar.de.

Technical data

Rated voltage:	230 V, 50 Hz
Acceptable voltage range:	207 V to 253 V
Power consumption:	approx. 1.5 VA
Measuring range:	-30 °C (-20 °C for Series 30) to +105 °C
Nominal switching capacity load output/ primary relay:	4,6 kW corresponding to 20 A for rated voltage *
Nominal switching capacity secondary relay:	1,38 kW corresponding to 6 A for rated voltage **
Signalling output 1 (SELV):	zero-potential changeover relay, 1 A for 30 V= potential separation from sensor inputs: 50 V~
Signalling output 2 (230 V, optional):	zero-potential normally open/closed relay, 3 A for 230 V~
Low-voltage connections:	cage clamp terminals for 2.5 mm ² (top)
Connecting terminals load circuit:	cage clamp terminals for 4 mm ² (bottom)
Connecting terminals second. circuit (opt.):	cage clamp terminals for 2.5 mm ² (bottom)
Sensor types:	NTC acc. to DIN EN 50350 (Ser. 31) , tekmar Ser. 30, PT1000
Enclosure:	rail-mounted device 3 HP (according to DIN 43880)
Degree of protection:	IP 20 (according to EN 60529)
Protection class:	II if installed properly
Operating temperature:	-15 °C to +40 °C, no condensation
Storage temperature:	-20 °C to +70 °C, no condensation
Mounting:	mounting rail TH-35 (according to DIN EN 60715)
Weight:	approx. 0.25 kg

* maximum of 10A / 2,3 kW in case of load on the secondary relay of more than 3A

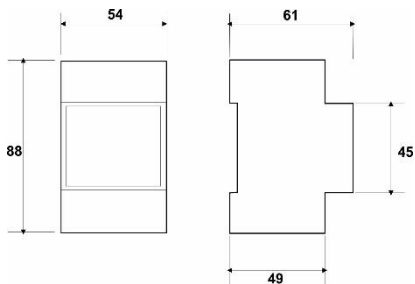
** maximum of 3A / 0,7 kW in case of load on the primary relay of more than 10A

Technical data

Further information according to DIN EN 60730-1:

Heat and fire resistance:	category B/D
Ball pressure test:	+125 °C
Rated surge voltage:	4 kV
Action type:	type 1B
Rated power and load for EMC emission test:	230 V~, load 0.5 A

Dimensions



Regulations

The product corresponds to the following rules and regulations:

EMC Directive

Radio Equipment Directive

Low-voltage Directive

RoHS Directive

WEEE-Reg.-No.: DE 75301302



Available accessories



Sensor Type 3154
degree of protection IP68, for
installation locations which are
mostly humid (e. g. gutter)



Sensor Type 3131
degree of protection IP65, typi-
cal sensor for trace heating, for
installation locations which
which are mostly dry



Application set Type 9637
for mounting the sensor 3131
on a pipe



Sensor Type 3115
degree of protection IP44,
mounting on vertical outer wall,
for capture of air temperaturer



Ground installation socket Type
3307 for installation of sensor
3154 in the ground



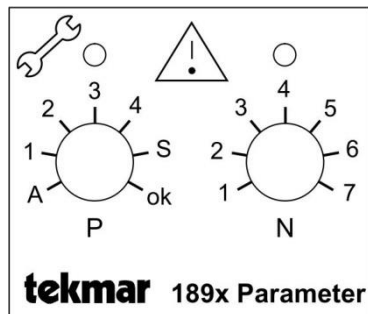
Surface-mounted housing
degree of protection IP65
(illustration similar)

	Own settings	Factory default
Application:	<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3	1 = Setpoint/Threshold value control
Sensor type:	<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3	1 = Series 31
1. Parameter Threshold value control		
Switching hysteresis	_____ K	1 K
Signalling delay	_____ s	10 s
Signalling type 1	<input type="checkbox"/> off <input type="checkbox"/> current <input type="checkbox"/> no current.	no current
Signalling type 2	<input type="checkbox"/> off <input type="checkbox"/> current <input type="checkbox"/> no current.	current
2. Parameter Alarm value control		
Switching hysteresis	_____ K	3 K
Signalling delay	_____ s	10 s
Signalling type 1	<input type="checkbox"/> off <input type="checkbox"/> current <input type="checkbox"/> no current.	no current
Signalling type 2	<input type="checkbox"/> off <input type="checkbox"/> current <input type="checkbox"/> no current.	current

Notes

Notes

Stencil for parameter setting



tekmar

tekmar Regelsysteme GmbH
Möllneyer Ufer 17
D-45257 Essen
mail@tekmar.de
www.tekmar.de

<ME-1893-FGA-EN>
Status 2017-07
Subject to change

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