

Extended temperature range of AXIS TU8003 90 W Connectivity Midspan

Operating temperatures of the midspan when placed
inside AXIS T91G61 Wall Mount or similar mounts

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Summary

The specified operating temperature range of AXIS TU8003 90 W Connectivity Midspan is extended when you place the midspan inside AXIS T91G61 Wall Mount or a similar mount.

Product	Operating temperature range
AXIS TU8003	-25 °C to 60 °C (-13 °F to 140 °F)
AXIS TU8003 placed in AXIS T91G61	-50 °C to 50 °C (-58 °F to 122 °F)

The range is extended to the same range as that of most Axis outdoor-ready PTZ cameras.

Our temperature tests show that the temperature inside the mount stays within levels that are acceptable for the midspan, both at the lower and upper limits.

In very low ambient temperatures (-50 °C), the midspan is kept warm enough inside the mount because the camera's power draw creates enough thermal output in the midspan.

In very high ambient temperatures (50 °C), the camera does not need as much power from the midspan as when it is using its heaters. Therefore the thermal output from the midspan is lower than at low temperatures. The metal in AXIS T91G61 Wall Mount helps the heat transfer to the outside air.

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1 Introduction

Security cameras are used all over the world. They are exposed to great variations in temperature – from the searing heat of the Middle East to the icy cold of Alaska. Because they are frequently placed on top of poles or buildings, they must also endure strong winds and sunlight.

A camera is often installed together with a mount and a midspan. Both the camera and the midspan come with a specified operating temperature range.

This white paper shows why the operating temperature range of AXIS TU8003 90 W Connectivity Midspan is extended when the midspan is placed inside AXIS T91G61 Wall Mount.

2 Background

A midspan is a power injector that makes it possible to use PoE (Power over Ethernet) cameras in an existing Ethernet infrastructure. AXIS TU8003 90 W Connectivity Midspan supports Axis PTZ cameras using up to 90 W and provides seemingly camera-integrated audio and I/O connectivity.

AXIS T91G61 Wall Mount is made of impact-resistant and outdoor-proven (IP66) material, and specially designed to accommodate a device, such as a midspan, inside it to protect the midspan against water ingress. The mount comes with a pre-mounted Ethernet cable and connector for easy connectivity of power and data to most Axis PTZ cameras.

3 Operating temperatures of the midspan

The midspan's datasheet specifies the operating temperatures to be -25 °C to 60 °C (-13 °F to 140 °F).

The lower limit refers to the internal temperature of the midspan. A lower ambient temperature could be allowed as long as the internal temperature of the midspan stays above -25 °C.

The upper limit is defined by the ambient temperature. The midspan's internal temperature is always higher (in operation) than the ambient temperature. This is due to the midspan's thermal energy output.

The midspan is compliant with NEMA TS 2 (2.2.7), where it was tested standalone (not inside AXIS T91G61 Wall Mount) in a maximum temperature of 74 °C (165 °F).

4 Operating temperatures of the midspan in the mount

When you place the midspan inside AXIS T91G61 Wall Mount or a similar mount, the midspan's operating temperature range is extended because the midspan is more protected.

The range is extended to the same range as that of most Axis outdoor-ready PTZ cameras (AXIS Q60-E, Q61-E, and Q63-E Series). This is -50 °C to 50 °C (-58 °F to 122 °F).

Product	Operating temperature range
AXIS TU8003	-25 °C to 60 °C (-13 °F to 140 °F)
AXIS TU8003 placed in AXIS T91G61	-50 °C to 50 °C (-58 °F to 122 °F)

The extended range defines the lower and upper limits for the constant ambient temperature surrounding the camera and mount. It does not refer to the temperature inside the mount. Our temperature tests show that the temperature inside the mount stays within levels that are acceptable for the midspan, both at the lower and upper limits.

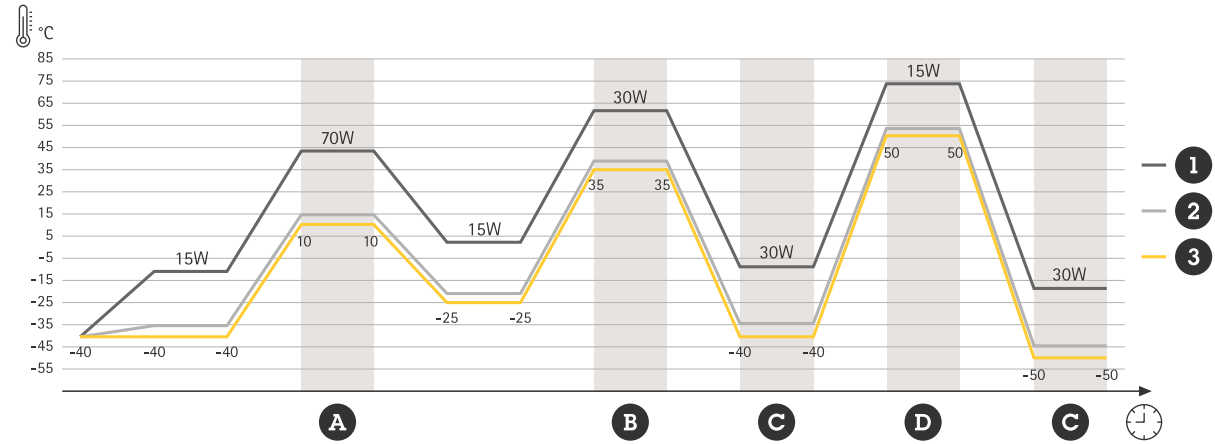
In very low ambient temperatures (-50 °C), the thermal energy output of the midspan will be relatively high because the camera draws extra power for heating. This warms up the midspan. When the midspan is protected inside the mount, the effect of this internal heating is even larger. This way the midspan is constantly kept above its lower limit (-25 °C), even when the temperature inside the mount (that is, the ambient temperature of the midspan) is much lower.

In very high ambient temperatures (50 °C), the midspan's power output is always reduced (to max 34 W, see power draw estimations later in this document) because the camera is not using power for its heaters. This contributes to keeping the midspan's internal temperature down. Also, the metal of AXIS T91G61 Wall Mount helps the heat transfer to the outside air, which keeps the temperature down inside the mount and, thereby, prevents the midspan from becoming too warm.

5 Temperature tests

To make sure that the midspan can handle the extended operating temperature range, we have performed extensive climate testing in a lab environment.

Tests were performed with an example camera in a climate chamber with constant ambient temperatures without any wind. The temperature inside the mount and the internal temperature of the midspan were monitored. The midspan's power output was varied with the ambient temperature. The typical power draw of the camera varies with the ambient temperature and affects the thermal energy output (resulting in internal heating) of the midspan. Note that in practicality the midspan's power output never exceeds 30 W in high ambient temperatures.



Temperature measurements, along with typical power draw, at varying ambient temperature.

- 1 Internal temperature of the midspan
- 2 Temperature inside the mount
- 3 Ambient temperature (outdoor)

The shaded areas A, B, C, and D correspond to scenarios detailed in the next section.

The diagram shows that the temperature inside the mount is not much different from the temperature surrounding the mount, neither in high nor low temperatures. It is less than 10 °C warmer inside the

mount, and even in warm environments, the temperature inside AXIS T91G61 is within the midspan's allowed operating temperature range.

The diagram also shows that the internal temperature of the midspan stays well above $-25\text{ }^{\circ}\text{C}$ ($-13\text{ }^{\circ}\text{F}$) even when the temperature inside the mount is much lower. The only exception is when the midspan has been powered off for some time and started in $-40\text{ }^{\circ}\text{C}$ ($-40\text{ }^{\circ}\text{F}$). In that case, the temperature reaches $-25\text{ }^{\circ}\text{C}$ ($-13\text{ }^{\circ}\text{F}$) within a short period of time. If this happens occasionally, it does not affect the functionality or life expectancy of the midspan.

6 Estimated power draw of example camera

We can break down the total power draw to the camera's main power-using features. The power draw depends on which features the camera is using, and this depends partly on the temperature (heater use depends on temperature) and light conditions (IR LEDs are on mainly at night). The estimated power draw for each of the marked scenarios in the diagram is explained below.

Table 6.1 Scenario A: cold day or night, $-10\text{ to }10\text{ }^{\circ}\text{C}$ ($14\text{ to }50\text{ }^{\circ}\text{F}$).

Camera feature	Power draw	Why this power draw?
Heaters	39 W 0 W in low power mode	Intense heating to prevent ice formation around $0\text{ }^{\circ}\text{C}$ All heaters off when in low power mode
IR LEDs	Up to 18 W	IR LEDs may be activated
Fans	0 W	Fans deactivated below $20\text{ }^{\circ}\text{C}$ ($68\text{ }^{\circ}\text{F}$).
PTZ motors	Up to 18 W/6 W	When in operation/when not in operation
Wiper	4 W/0 W	When in use/when not in use
AXIS OS	10 W	One H.264 stream recording to SD card
Total	Up to $>71\text{ W}^1$, typically $55\text{ W}/>71\text{ W}^1$ (without/with IR) In low power mode: up to $32\text{ W}/50\text{ W}$, typically $16\text{ W}/34\text{ W}$ (without/with IR)	

1. Scenario A is the scenario where the power draw is at its maximum. If not enough power is available, the pan and tilt ring heaters will run on reduced power.

If *low power mode* is activated (supported above $-5\text{ }^{\circ}\text{C}$ ($23\text{ }^{\circ}\text{F}$)), all heaters remain off and typical power draw is only $16\text{ W}/34\text{ W}$ without/with IR (maximum $32\text{ W}/50\text{ W}$).

Table 6.2 Scenario B: hot night, $35\text{ }^{\circ}\text{C}$ ($95\text{ }^{\circ}\text{F}$)².

Camera feature	Power draw	Why this power draw?
Heaters	0 W	Heaters deactivated above $20\text{ }^{\circ}\text{C}$ ($68\text{ }^{\circ}\text{F}$)
IR LEDs	Up to 18 W	IR LEDs may be activated at night
Fans	3 W/2 W	Above $30\text{ }^{\circ}\text{C}$ ($86\text{ }^{\circ}\text{F}$) and IR LEDs activated/deactivated
PTZ motors	Up to 18 W/6 W	When in operation/when not in operation
Wiper	4 W/0 W	When in use/when not in use

Table 6.2. Scenario B: hot night, 35 °C (95 °F)². (Continued)

Camera feature	Power draw	Why this power draw?
AXIS OS	10 W	One H.264 stream recording to SD card
Total	Up to 53 W, typically 37 W with IR LEDs activated	

2. Temperatures up to 35 °C (95 °F) are typical for a hot night. To see temperatures at possible camera sites, check the color-coded graphs of average hourly temperatures around the world at weatherspark.com

Table 6.3 Scenario C: frigid night, -40 °C (-40 °F) and below.

Camera feature	Power draw	Why this power draw?
Heaters	13 W	Some heaters activated
IR LEDs	Up to 18 W	IR LEDs may be activated at night
Fans	0 W	Fans deactivated below 20 °C (68 °F).
PTZ motors	Up to 18 W/6 W	When in operation/when not in operation
Wiper	4 W/0 W	When in use/when not in use
AXIS OS	10 W	One H.264 stream recording to SD card
Total	Up to 63 W, typically 47 W with IR LEDs activated	

Table 6.4 Scenario D: hot day, 50 °C (122 °F)

Camera feature	Power draw	Why this power draw?
Heaters	0 W	Heaters deactivated above 20 °C (68 °F)
IR LEDs	0 W	IR LEDs most likely deactivated in daylight
Fans	2 W	Above 30 °C (86 °F) and IR LEDs deactivated
PTZ motors	Up to 18 W/6 W	When in operation/when not in operation
Wiper	4 W/0 W	When in use/when not in use
AXIS OS	10 W	One H.264 stream recording to SD card
Total	Up to 34 W, typically 18 W	

About Axis Communications

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Axis has around 4,000 dedicated employees in over 50 countries and collaborates with technology and system integration partners worldwide to deliver customer solutions. Axis was founded in 1984, and the headquarters are in Lund, Sweden