P-IRIS CONTROLLER

Control unit for lenses with stepper motors

Datasheet

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FOCUSED ON DETAIL

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DOCUMENT INFORMATION

Revision No.	Author	Revision date	Description
0	Dohnal J.	18 January 2018	Document creation
1	Navrátil J.	9 March 2018	Description and key features
2	Navrátil J.	24 May 2018	Drawings and order information
3	Dohnal J.	19 June 2018	Photographs added
4	Dohnal J.	20 June 2018	Description of connectors
5	Navrátil J.	18 September 2018	Change of lens limits for FW 1.52 and later
6	Navrátil J.	23 January 2019	FW 1.7.2 – reading of motors state (running/idle)
7	Navrátil J.	11 June 2019	Connection variants

Appendixes

Notes

Firmware version 1.7.2 is supported by the PC control application 1.1.0 and above. With version 1.0.0 does not work properly.

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1 KEY FEATURES

- Aperture, zoom, and focus control of lenses with stepper motors.
- IR filter switching – possibility of both day and night use.
- Primarily intended for acA2040-35gc/uc camera.
    - Can be used with Basler ace Classic and ace U product series with a sensor size up to 1/1.7“, CS-mount and resolution up to 12 Mpx.
- Delivered with Theia TL1250P lens:
    - Resolution 12 Mpx with max. optical format of 1/1.7“.
    - Focal length 12 – 50 mm.
    - Working distance from 2 m to infinity.
    - Minimum aperture F1.8 (at 12 mm focal length).
- Communication interface:
    - RS232 – standard version, galvanically isolated.
    - UART – designed for Basler ace with a special firmware, which will allow to use the digital output of the camera as UART.
- Supply voltage 12 – 24 V DC with galvanic isolation.
- Aluminium holder for easy installation.
- Application especially in transport systems (ITS), such as toll systems, red light running violations or section speed control.
- Simple text communication protocol.
- C++ SDK and LabVIEW device driver available for download.

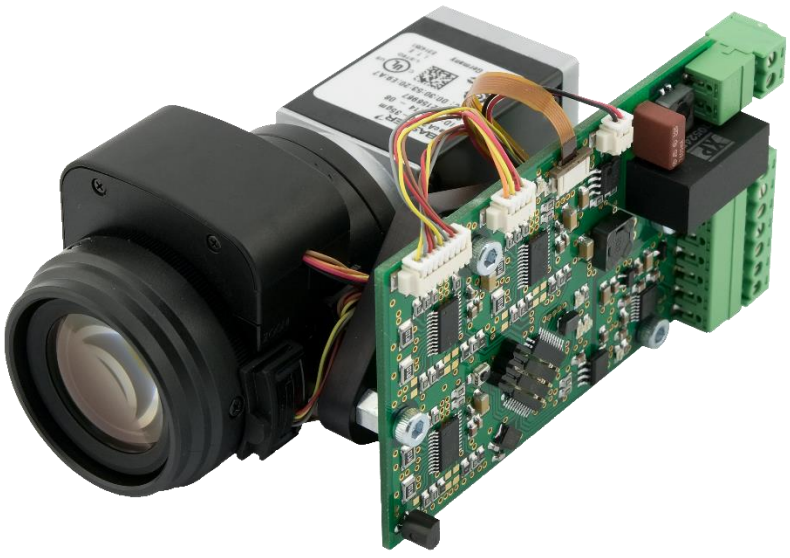


Fig. 1 – Control unit in the set with camera and lens

2 PRODUCT DESCRIPTION

The P-Iris controller for lenses with a stepper motor is an intermediate designed for the functional connection of motorized lenses and Basler ace cameras. It allows to electronically control focus, zoom, aperture and IR filter. Standard RS232 interface with a text protocol is used for its control. Another option is the Basler ace camera with a modified firmware that simulates the UART communication interface on its digital output. In this case, there is only one cable for image data transmission and lens control, because Ethernet is used for transmission of control commands from PC. The camera acts as an Ethernet - UART converter. (Detailed description in chap. 4)

The controller is delivered in a set with Theia TL1250P lens. The combination of these two components allows to cover almost all ITS applications, both in terms of optical properties and image resolution and quality. With the ability to control the zoom in 12-50 mm focal length range, focus and aperture, this solution is designed for small detail applications (such as vehicle registration plate) or to capture a large field of view (such as multiple lanes) under different lighting conditions. The IR filter can be also used with infrared light at night. This illumination can be synchronized very precisely with the camera via its digital output. Thanks to the new generation of Basler cameras, resolution of up to 12 Mpx can be used.

The hardware is adapted to the dimensions of Basler Ace cameras. It is a compact unit designed to be embedded in a device or installed in a camera housing. Aluminium holder includes mounting holes with 1/4“ tripod thread and M8 thread.

Parameter	Value
Supply voltage	12 - 24 V DC
Current consumption with TL1250P lens	12 V DC - 230 mA max. 24 V DC - 130 mA max.
Minimum recommended power source	3 W (TL1250P)
Baud rate	9600 Bd
Dimensions of electronics	82 x 50 x 15 mm
Dimensions of the set (max.)	107 x 71 x 52 mm

Tab. 1 – System parameters

Information: *In the RS232 version, it is necessary to switch on the PC DTR and RST lines, which supply the circuit for serial communication and galvanic isolation.*

3 CONNECTORS AND INDICATORS

The device includes 2 input connectors:

- The XC1 connector is used to connect the supply voltage.
- The XC2 connector is used to connect the RS232 communication interface or the UART (depending on the version of the controller), it is also possible to power the camera from it.

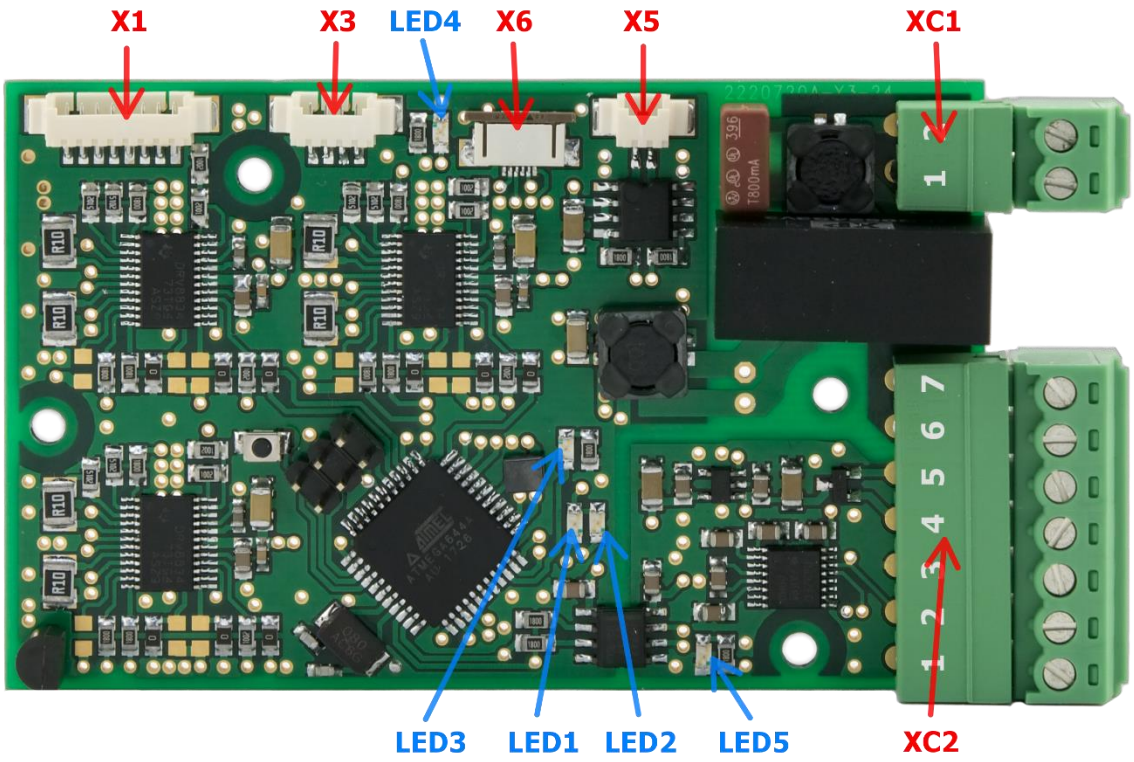


Fig. 2 – PCB top view

LED	Value
LED1	Serial communication - RX
LED2	Serial communication - TX
LED3	Steady light – the device is OK, ready to execute the movement command Flashing – the device performs motion, the motors are running Off – the device is in an error state, it is not possible to move the lens
LED4	Indicates that power supply is connected
LED5	Indicates the supply of communication circuits, galvanic isolation of RS232

Tab. 2 – Meaning of LED indication

Caution: *If the camera is powered via the XC2 connector, the camera must be compatible with used voltage level!*

Pin	Description
1	Supply voltage 12 – 24 V DC
2	GND

Tab. 3 – Power supply connector XC1

Pin	Description
1	TX (PC)
2	RX (PC)
3	GND (communication)
4	RTS
5	DTR
6	GND for camera (power supply)
7	Power supply for camera (**corresponds to the supply voltage of the control unit,** protected by 800 mA fuse)

Tab. 4 – Communication connector XC2

Connector	Description
X1	Zoom and focus stepper motors
X3	Aperture stepper motor (P-Iris)
X5	Coil for IR filter on/off switching
X6	End switches (photo interrupter)

Tab. 5 – Lens connectors

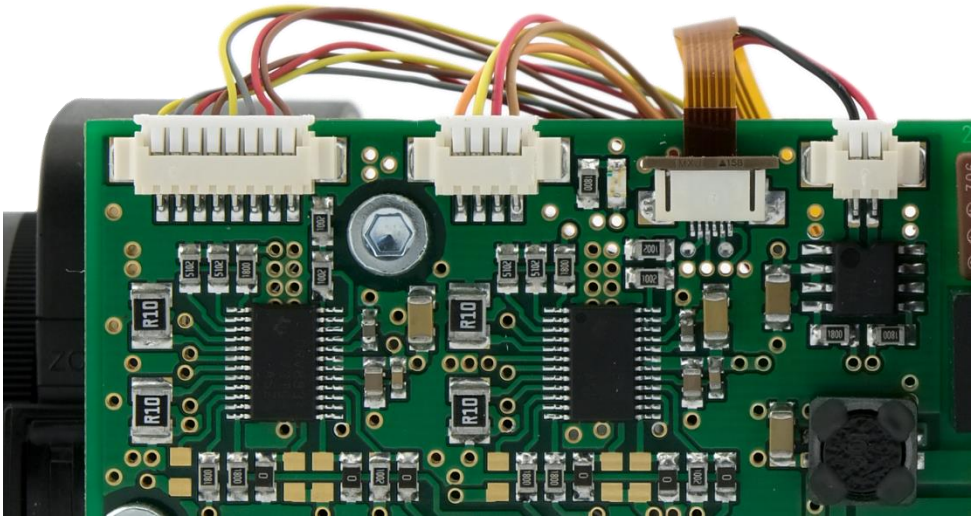


Fig. 3 – Detail of lens connectors

4 CONNECTION VARIANTS

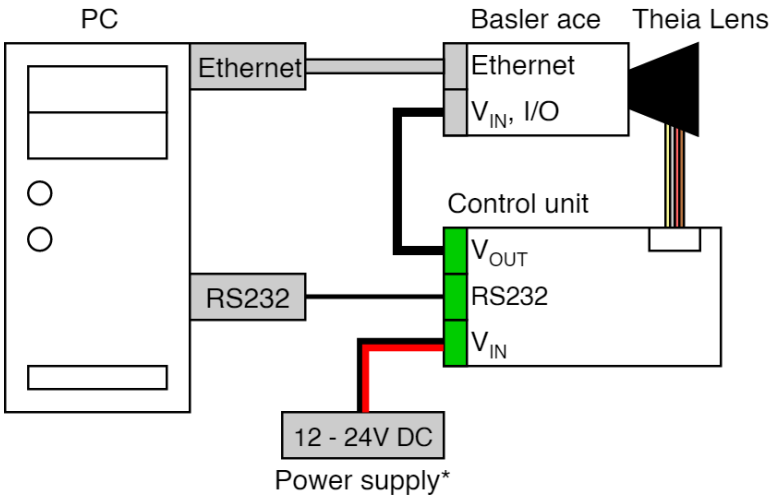


Fig. 4 – Connection diagram – RS232 version

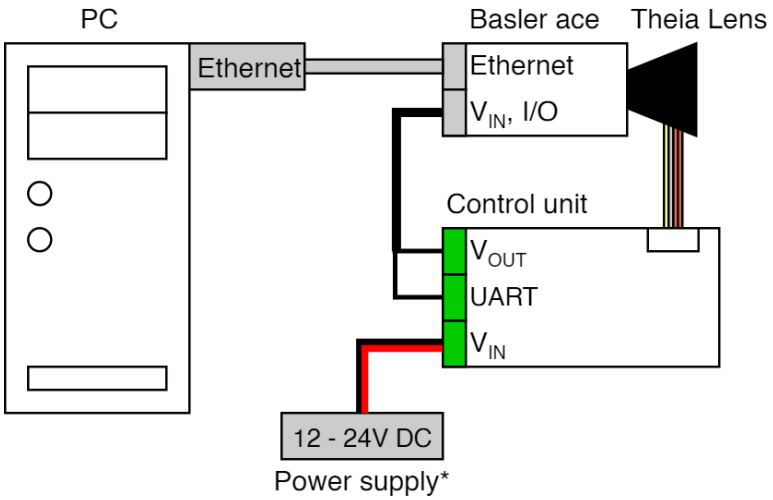


Fig. 5 – Connection diagram – Ethernet version

** Voltage level of power supply must be compatible with the used camera (applicable for both diagrams above).*

RS232 version requires 2 cables between the camera and the PC – Ethernet cable to transmit image data, RS232 cable to transmit commands for the lens control unit. The cable between the camera and the control unit is used only for camera power supply.

The Ethernet version is connected to the PC using only one Ethernet cable, which transmits both image data and control commands. Camera serves as an Ethernet – UART converter. To control the Ethernet version, it is not possible to use the supplied graphical control application for PC, C++ SDK must be used instead (includes a demonstration console application). Documentation is part of the development package, which can be found at the website of ATEsystem s.r.o.

5 COMMUNICATION PROTOCOL

Every command must always be terminated with ASCII characters: *carriage return* <CR> and *line feed* <LF>. Control unit responses also contain the same pair of termination characters. Absolute/relative movement commands are responded immediately, control unit does not wait for finishing movement. If motors are still running can be detected with status check command.

Command	Syntax (example -> response)	Meaning
Identification	IDN IDN->OK; P_IRIS;version:1.7.2	Device identification, lists name and SW version
Initialization	INI INI->OK	Adjusting focus and zoom to the initialization position, setting the aperture to fully open, IR filter on
Getting the position	GP GP->OK;F100;Z200;P10;I0	Getting the focus, zoom, aperture, and IR filter position
Absolute movement	SETA:FX;ZX;PX;IX SETA:F1000;Z500;P10;I0->OK	Setting focus, zoom, and aperture to the specified position. X for I (IR filter) is 1 or 0, the other X = the number of steps from the beginning **Example:** Moving the focus to 1000 steps (from the beginning), zoom to 500 steps, aperture to 10 steps, switching the IR filter off
Relative movement	SETR:FX;ZX;PX SETR: F-100;Z500;P-10->OK	Moves the focus, zoom, and aperture for the specified number of steps (limit for TL1250: F 2025, Z 800, P 19) **Example:** Moving focus by -100 steps, zoom 500 steps, aperture -10 steps
Reading the type of lens and limits	GT GT-> OK;TL1250P;F2025;Z800; P19;I1;D1	Detects lens type and limits. It also reads the presence of IR filter and end switches **Example:** TL1250P lens type, focus limit 2025 steps, zoom limit 800 steps, aperture limit 19 steps, IR filter present, end switch present
Status check	GS GS->ERR3;S110;M0	Returns OK, or the appropriate error code, state of each motor driver (1 = OK, 0 = ERR) and state of motors: M0 = idle, M1 = running **Example:** Driver error, focus OK, zoom OK, aperture ERR, motors idle
Reset	RST RST->OK	When the command is sent, the device responds with OK and then performs the reset of the MCU

Tab. 6 – Communication protocol

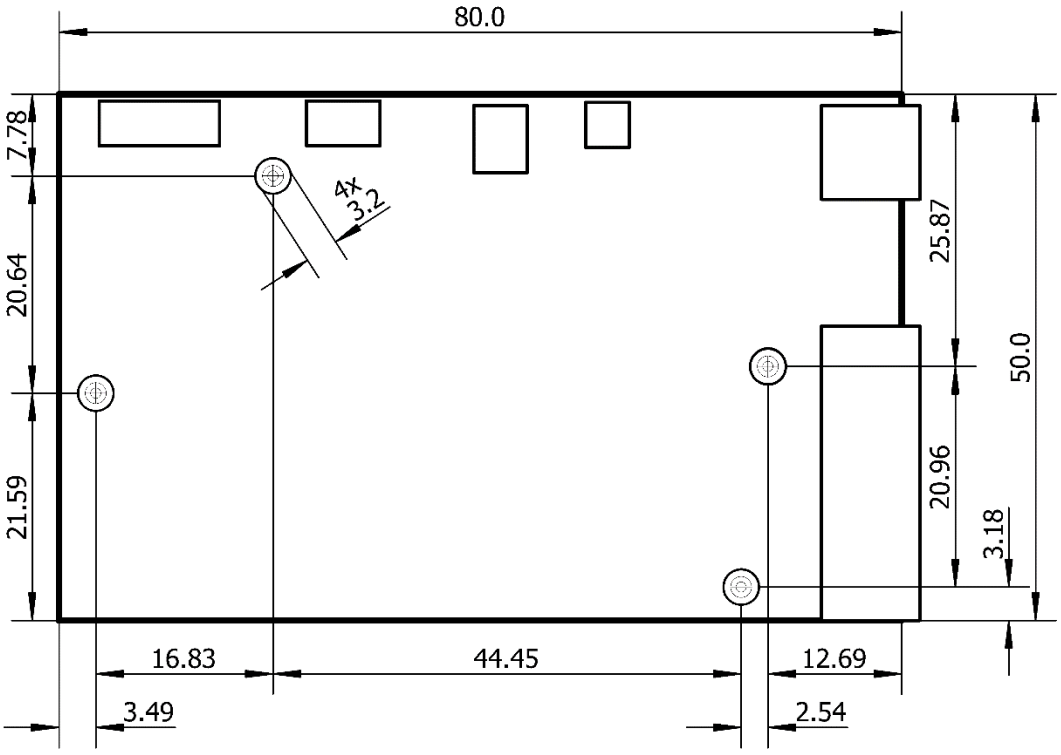
Error code	Meaning
ERR0	Unrecognized command
ERR1	Incorrectly entered / exceeded input parameter value
ERR2	Initialization was not performed
ERR3	One of the motor drivers is in error (overheating, short circuit / overcurrent on output, undervoltage)
ERR4	Incorrectly specified lens type
ERR5	Absent/damaged end switch
ERR6	Exceeded timeout for step generation (timer error)
ERR7	Motors are busy (running)

Tab. 7 – Error codes

6 DIMENSIONS AND MOUNTING HOLES

6.1 Electronics

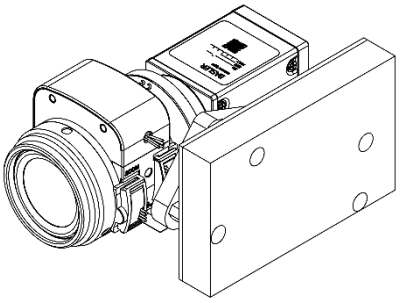
A PCB with control electronics can be attached using four holes of 3.2 mm in diameter.

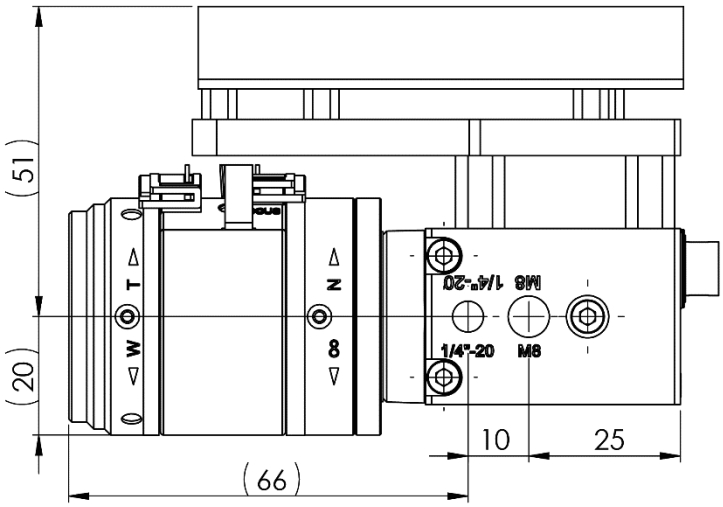


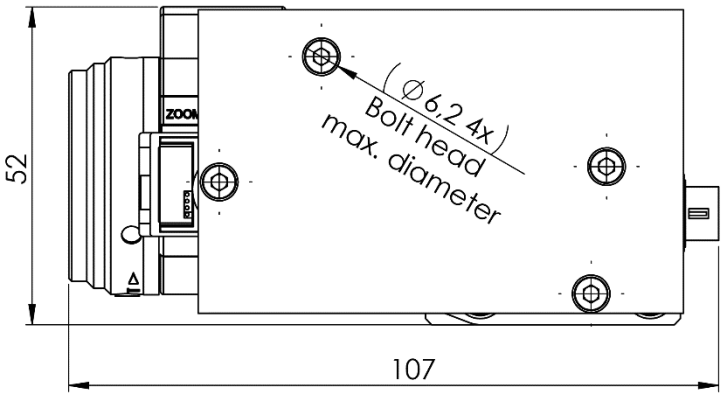
Caution: *The product contains a freely accessible printed circuit board with electronic components. It is designed exclusively for installation into a device or a housing to prevent external influences such as humidity/water or dirt. It is also necessary to observe the electrostatic discharge (ESD) precautions when handling the product. Damage caused by non-observance of the above instructions is not covered by the warranty.*

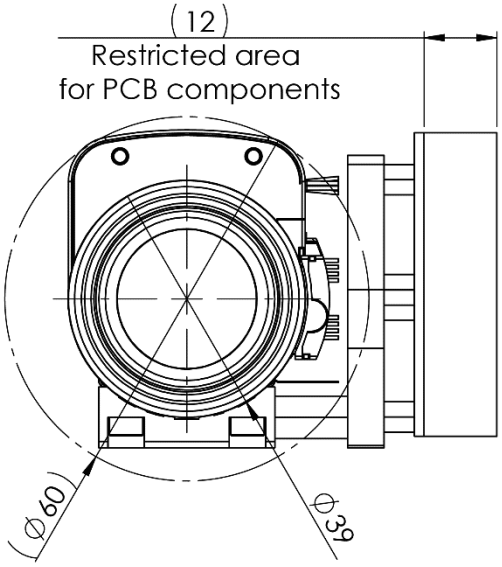
6.2 The complete assembly

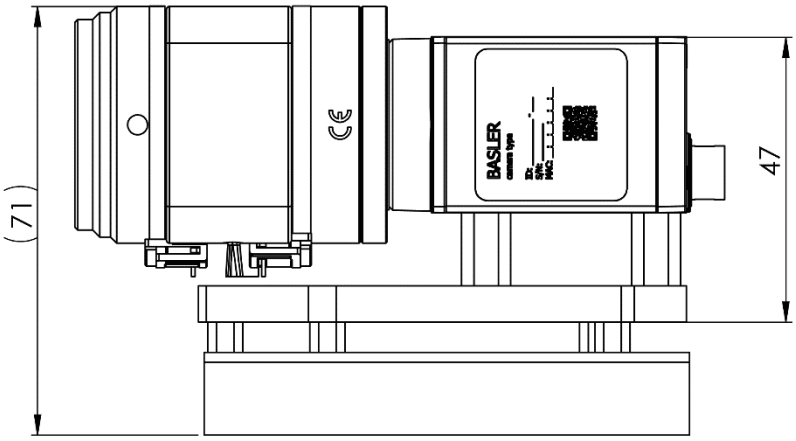
Includes the following components: Camera, lens, electronics, mechanical holder. Mounting holes M8 and 1/4 " tripod thread.











7 ORDERING INFORMATION

Order number	Name
11350000	P-Iris Controller - electronics
10980007	Theia TL1250P Lens
69982000	P-Iris Controller - mechanics

The minimum functional set is the lens 10980007 along with the electronics 11350000. The camera is always selected to fit the particular application; for consultation and help with component selection contact ATEsystem s.r.o. Individual components (camera, electronics, lens) can be mounted separately or by means of mechanics 69982000, which is designed for this purpose. The dimensions of the resulting assembly are listed in 6.2.

Fig. 1 – Mechanics for P-Iris Controller (69982000)