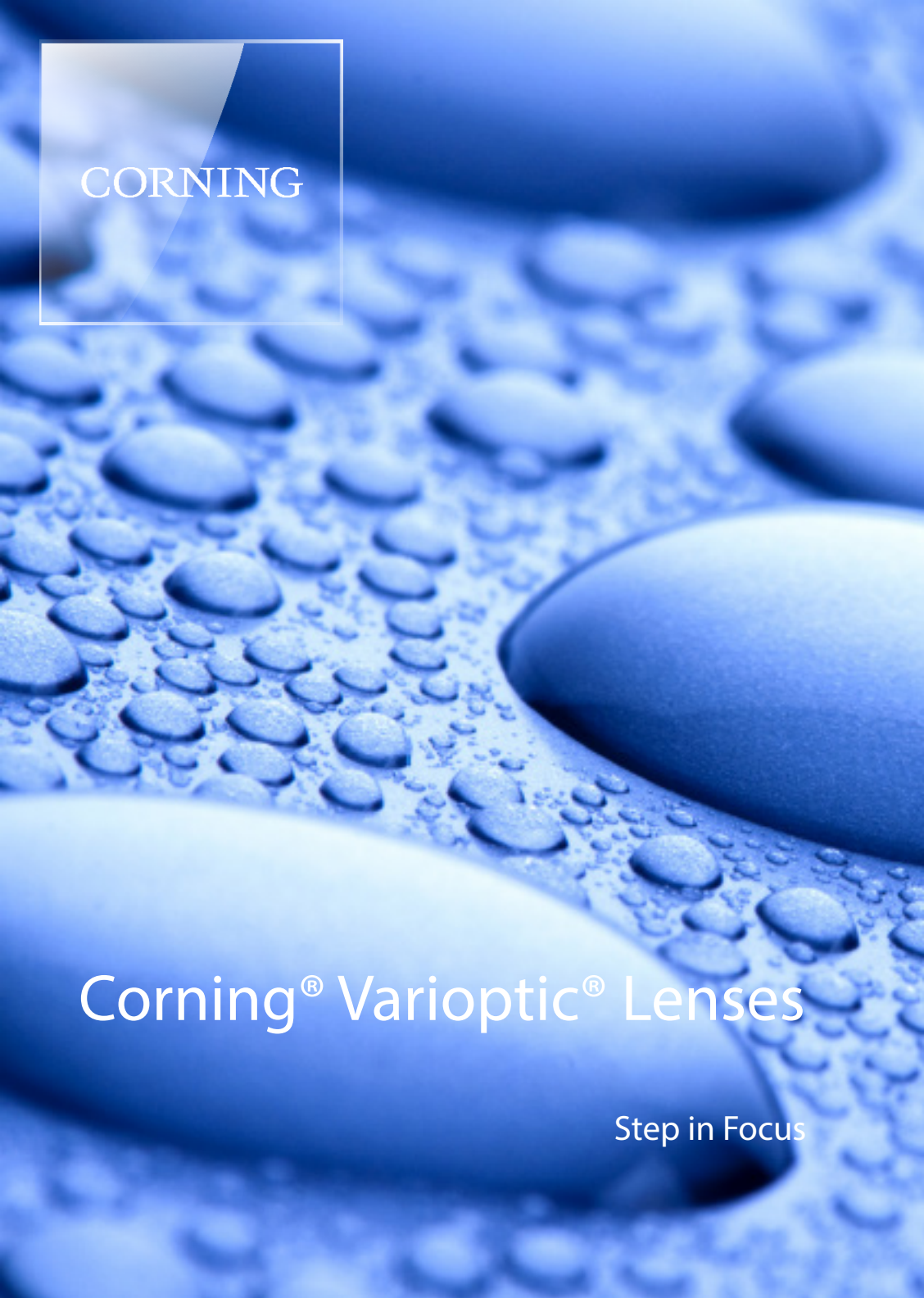
CORNING
Corning® Varioptic® Lenses
Step in Focus

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About Corning

Corning is one of the world's leading innovators in materials science. For more than 170 years, Corning has applied its unparalleled expertise in glass science, ceramic science, and optical physics to develop products that transform industries and enhance people's lives.

Corning succeeds through sustained investment in R&D, a unique combination of material and process innovation, and close collaboration with customers to solve tough technology challenges.

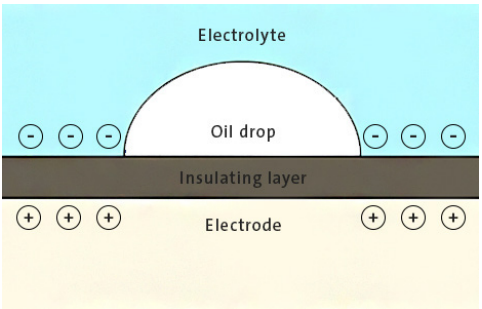
Corning's businesses and markets are constantly evolving. Today, Corning's products enable diverse markets such as mobile consumer electronics, display, optical communications, automotive, and life sciences vessels.

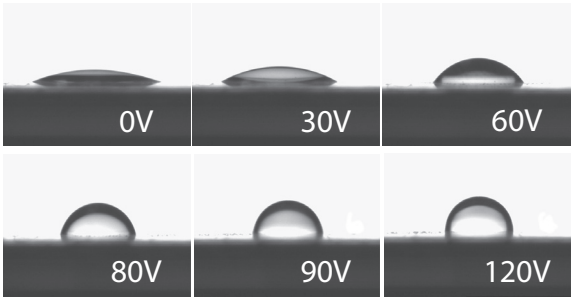
Corning® Varioptic® Lenses are optical devices that adjust voltage to change the shape of a liquid interface. This technology addresses demanding markets for industrial imaging applications. The technology was originally developed by Bruno Berge when he founded Varioptic in 2002, and Corning acquired the company in 2017.

Corning® Varioptic® Lenses is part of the Advanced Optics Division, a global leader in providing cutting-edge material and optical solutions that serve a variety of commercial markets including semiconductor manufacturing, microfabrication, consumer electronics, and more.

Electrowetting

Electrowetting occurs when a drop of insulating liquid (e.g. oil drop) is deposited on a flat surface, made of a conductive material covered with an insulating and hydrophobic layer, and then both the drop and surface are immersed in a conductive liquid (e.g. electrolyte). Voltage is then applied between the conductive substrate and the conductive liquid causing the liquid drop to change shape. This effect is known as electrowetting.





The shape of the drop then changes as voltage increases

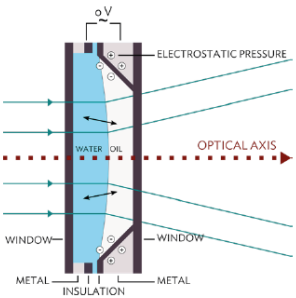
Lens Structure

The design of the adjustable lens structure ensures:

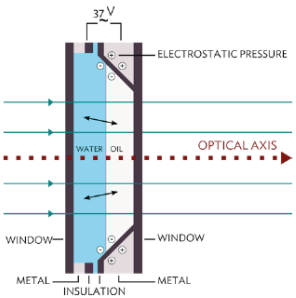
- Stable optical axis, by a conical centering of the drop
- Non sensitivity to orientation, by using two liquids of equal density
- High shock resistance, by a simple mechanical structure and equal density

Depending on the voltage applied, the lens can be a divergent lens, a flat lens, or a convergent lens.

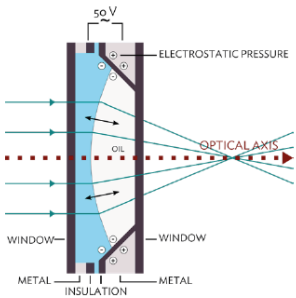
Divergent Lens



Flat Lens



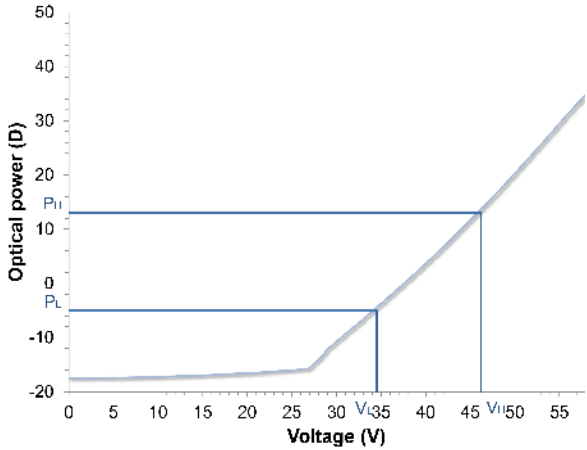
Convergent Lens



Key Performances

Optical Power vs. Voltage

The optical power of Corning® Varioptic® Lenses is a linear response versus voltage.

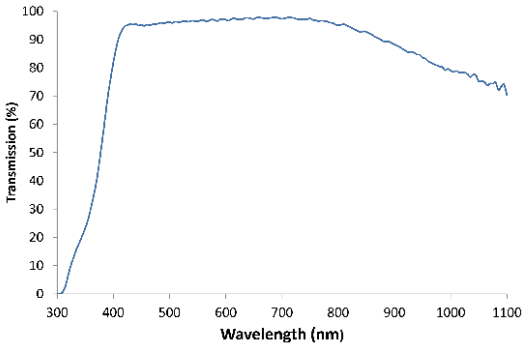


Optical Quality

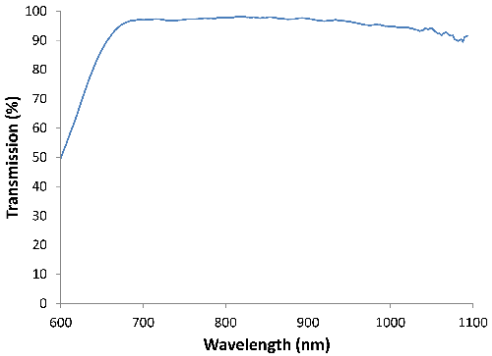
The optical quality of each adjustable lens is specified by the Wave Front Error (WFE). The WFE characterizes the deviation of the actual shape of the lens compared to a perfectly spherical lens – and measured in nanometers rms. The typical WFE of the lens is in the range of 50 nm rms, which is the equivalent of a lambda/10 lens.

Transmission

The standard version of each lens comes with an anti-reflective coating which is optimized in the visible range. Therefore, the transmission drops slightly in the near infrared. The loss of transmission below 400nm is linked both to the anti-reflective coating and to the glass that is used in the lenses, which is a standard borosilicate glass.



A-25H0 – AR coating optimized in the visible range



A-25H1 – AR coating optimized in the near-infrared range

With an anti-reflective coating optimized in the near infrared, the transmission curve flattens from 700nm to 1100 nm.

System Integration

Corning® Varioptic® Lenses can be used in several types of systems:

- Manual focus: the user adjusts the focus manually, with a knob for example
- Closed-loop: this is the standard auto focus method, where a processor runs a contrast optimization loop to maximize the sharpness of the image
- Open-loop: this is a mode where the focus command is directly sent to the lens, from an external distance measurement for instance
- Mixed mode: a combination of open loop for coarse search, and closed loop for fine tuning of the focus
- Sweep mode: this mode performs a continuous sweep of the full range of the optical power of the liquid lens

Closed-loop Auto Focus

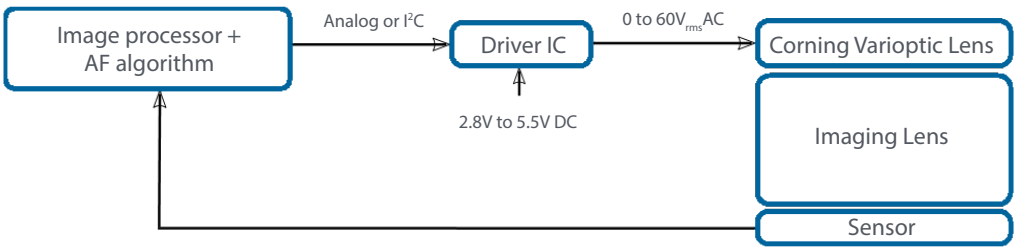
A closed-loop system consists of:

- An image sensor
- An optical lens consisting of fix-focus optics and an adjustable lens
- An adjustable lens driver IC
- A processor (ISP, FPGA...)

The processor performs the following tasks:

- Contrast measurement on the image output by the sensor
- Modification of the driver IC command to maximize this image contrast.

Corning Varioptic Lenses provides auto focus algorithms that have been optimized for the adjustable lens. The overall performance depends on many system parameters such as sensor frame rate and processing speed; typically, the complete auto focus loop can be completed in 8 to 12 frames.



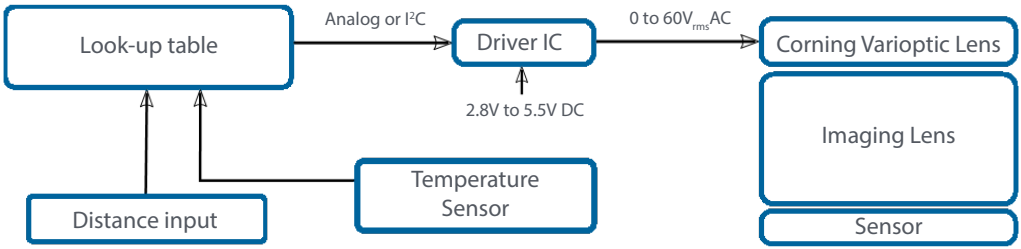
Open-loop Driving

Although the adjustable lens closed-loop is extremely fast, there are situations where it is not possible to acquire several frames to perform a focusing loop. In this case, the solution is to use open-loop focusing, where the sensor feedback is not used.

Open-loop focusing is based on a look-up table where the desired focusing distance is linked to the driver IC command. This look-up table is initially calibrated through an easy process since the lens response is linear and stable. Focusing is then triggered through an external device, for instance:

- A distance measurement device (telemeter) that measures object position in real time;
- A predetermined set of distances, etc.

Through the addition of this extra device, open-loop driving enables ultra-fast focusing where focus can be achieved within one frame only.



Closed-loop vs. Open-loop

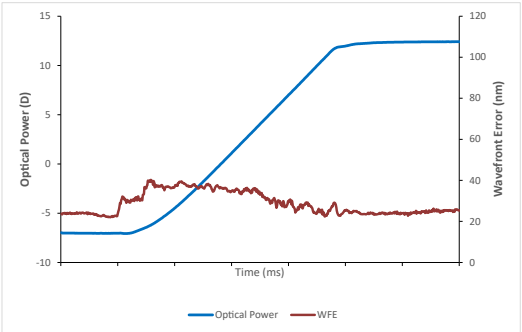
The main advantage of the closed-loop system is its simplicity of integration. Indeed, an open-loop system will need:

- A distance measurement device
- A temperature sensor
- A calibration of the device during production

Also, an open-loop system may be susceptible to any variation in the system. For optimum performances, open-loop and closed-loop should be combined: open-loop for coarse search and closed-loop for fine search.

Sweep mode

This mode is particularly suited for applications where the image does not need to remain in focus, typically like on the fly decoding applications. The focus ramp is a linear change of the optical power of the liquid lens with time, allowing acquiring images while the Liquid Lens is still moving, with virtually no settling time. The principle is to cover the full optical power range of the liquid lens such as having the focus moving between infinity and short distance making sure to have any targeted object focused at least on one image. The collected images can then be analyzed and decoded in parallel. This method can be extremely fast since it doesn't require any settling time between 2 focus positions relying on the unique property of the Liquid Lens which is, being able to provide high optical quality even while the optical power is being changed.



A-16F0 – Sweep example

Parameters can be tuned to meet application requirements (rise time, diopter range etc...).

Advantages of Corning® Varioptic® Lenses

The traditional way to perform the auto focus function is to mechanically move the lens module to adjust the back focal length (distance to the image sensor) depending on object distance. This method presents several drawbacks:

- Requires bulky and fragile motors
- Friction of small parts leading to damage and malfunction after a few hundreds of thousands of actuations
- Noise and high power consumption while moving the mass of the lens module

The unique characteristics of Corning Varioptic Lenses offer the following:

- No moving parts
- Hundreds of millions of cycles endurance
- Speed: much faster than mechanical actuators
- Robustness and unmatched mechanical shock resistance: tested at 2000g / 0.25ms / 100 times (x2 directions)
- Close focus ability: from infinity to below 5 cm
- Low power consumption: <1 mW (~20 mW with driver)
- Silent operation

Applications

- Consumer devices
- Barcode readers
- Biometrics
- Endoscopes
- Lasers
- Low vision devices
- Machine vision
- Medical imaging
- Ophthalmology equipment

Variable Focus Lenses (A-Series)

Corning® Varioptic® Lenses enable variable focus functionality when designed into imaging or beam shaping lenses. They offer a high degree of design freedom for mechanical, electrical, and optical integration.

A-16F

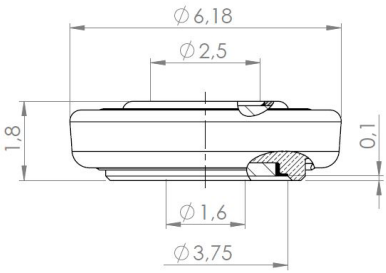
The latest and smallest member of the A-Series family, and the smallest lens currently available. It is specifically designed for ultra-compact cameras, such as barcode engines, industrial and medical endoscopes, etc.

Key Features:

- 6.2 mm outer diameter
- 1.85 mm thickness
- 1.6 mm clear aperture
- Excellent optical quality and fast response time
- Focus range from 5 cm to infinity
- Easy to integrate

Ordering Information:

- A-16F0: with an anti-reflective coating optimized in the visible range
- A-16F1: with an anti-reflective coating optimized in the near infrared
- A-16F9: with no anti-reflective coating



Specifications:

Typical performance at 25°C

Useful aperture at 0° field of view	1.6 mm
Low optical power	-5 diopters (m^{-1})
High optical power	+15 diopters (m^{-1})
Wave Front Error on 1.6mm aperture	20 nm (rms)
Transmission at 587nm (or 850nm for F1)	97%
Storage temperature	from -40 to 85°C
Operating temperature	from-20 to 60°C

A-25H

Designed for compact optical systems such as: barcode readers, industrial cameras, medical imaging and biometrics. The A-25H small size, large dynamic range, and low wave front error delivers outstanding performance.

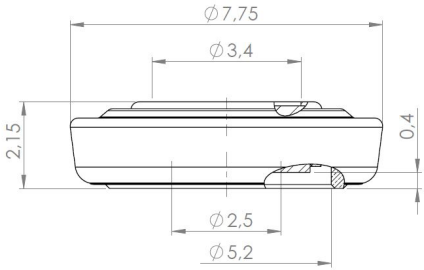
The A-25H lens is broadly suited for standard imaging applications. For very close distance imaging needs teh A-25H-D0 is specially designed with a high dynamic range.

Key Features:

- 7.75 mm outer diameter
- 2.15 mm thickness
- 2.5 mm clear aperture
- Silent
- Focus range from 5.5 cm to ∞ (<3 cm to ∞ for A-25H-D0)
- Easy to integrate

Ordering Information:

- A-25H0 / A-25H0-D0 : with an anti-reflective coating optimized in the visible range
- A-25H1 / A-25H1-D0 : with an anti-reflective coating optimized in the near infrared
- A-25H9 / A-25H9-D0 : with no anti-reflective coating



Specifications:

Typical performance at 25°C

	A-25H	A-25H-D0
Useful aperture	2.5 mm	
Low optical power	-5 diopters (m^{-1})	-35 diopters (m-1)
High optical power	+13 diopters (m^{-1})	+35 diopters (m-1)
Wave Front Error on 2.5mm aperture	30 nm (rms)	70 nm (rms)
Transmission at 587nm (or 850nm for H1)	97%	
Storage temperature	from -40 to 85°C	from -40 to 85°C
Operating temperature	from-30 to 85°C	from -20 to 60°C

A-39N

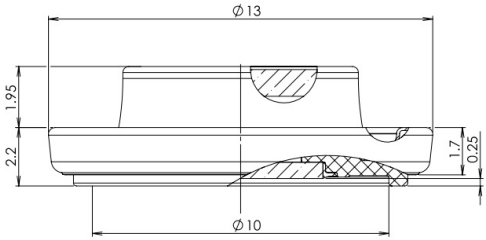
Designed specifically for variable focus products needing a large clear aperture: long focal objectives, large sensors, C-Mount objective lenses and laser beam shaping applications. The A-39N is perfectly suited for applications such as industrial vision, medical imaging cameras, optical equipment, biometric devices, etc.

Key Features:

- 13 mm outer diameter
- 4.0 mm thickness
- 3.9 mm clear aperture
- Silent
- Focus range from 5 cm to ∞
- Easy to integrate

Ordering Information:

- A-39N0: with an anti-reflective coating optimized in the visible range
- A-39N1: with an anti-reflective coating optimized in the near infrared
- A-39N9: with no anti-reflective coating



Specifications:

Typical performance at 25°C

Useful aperture at 0° field of view	3.9 mm
Useful aperture at 50° field of view	3.5 mm
Low optical power	-5 diopters (m^{-1})
High optical power	+15 diopters (m^{-1})
Wave Front Error on 3.5mm aperture	50 nm (rms)
Transmission at 587nm (or 850nm for N1)	97%
Storage temperature	from -40 to 85°C
Operating temperature	from-20 to 60°C

A-58N

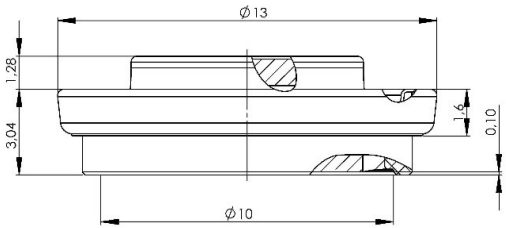
The A-58N lens is designed specifically for variable focus products needing a larger clear aperture than our A-39N and A-25H lenses. This lens is more specifically designed for optical instruments, like ophthalmology, scientific instrumentation, life sciences and microscopes.

Key Features:

- 13 mm outer diameter
- 4.3 mm thickness
- 5.8 mm clear aperture
- Compact & Low WFE
- Focus range from 7 cm to ∞
- Easy to integrate
- Without moving parts or internal heating

Ordering Information:

- A-58N0: with an anti-reflective coating optimized in the visible range
- A-58N1: with an anti-reflective coating optimized in the near infrared
- A-58N9: with no anti-reflective coating



Specifications:

Typical performance at 25°C

Useful aperture at 0° field of view	5.8 mm
Useful aperture at 50° field of view	3.5 mm
Low optical power	-5 diopters (m^{-1})
High optical power	+10 diopters (m^{-1})
Wave Front Error on 3.5mm aperture	80 nm (rms)
Transmission at 587nm (or 850nm for N1)	97%
Storage temperature	from -40 to 85°C
Operating temperature	from-20 to 50°C

A-P Series

Packaged A-Series lenses are designed to make integration easier. By avoiding the hassle of mechanical and electrical integration of the lens, the variable focus capability can be integrated much faster into customer's system. The lens is built-in with an FPC cable, and can be connected to a standard FPC connector.

Ordering Information:

- A-16F0-P31: Packaged A-16F0 with straight Flex Cable with thermistor (FPC-A-31)
- A-P-25H0-33 : Packaged A-25H0 with straight Flex Cable with thermistor (FPC-A-33)
- A-39N0-P37: Packaged A-39N0 with straight Flex Cable with thermistor (FPC-A-37)
- A-58N0-P37: Packaged A-58N0 with straight Flex Cable with thermistor (FPC-A-37)

Contact us for more information on FPC specifications.

Specifications:

	A-16F0-P31	A-P-25H0-33	A-39N0-P37	A-58N0-P37
External diameter	7.0 mm	8.8 mm	15.5 mm	15.5 mm
Thickness	3.0 mm	2.8 mm	5.2 mm 5.5 mm	6.3 mm

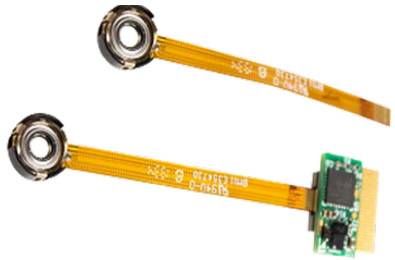
From left to right : A-16F0-P31 / A-P-25H0-33 / A-39N0-P37 / A-58N0-P37

A-PE-Series

A-PE-Series is a higher degree of integration of the Corning® Varioptic® liquid lens based on the combination of an A-P Series lens and a with dedicated driving board. This product has been designed such as reducing the integration and development effort on user side (comprehensive hardware, calibrated lens etc…) as well as to enhance the electro-optical performance of the lens embedding temperature compensation algorithm for better open loop operation and providing response time acceleration features to handle ever increasing sensor frame rates.
This platform will be rolled out across the A-Series portfolio, starting with the A-25H0 lens.

Key Features:

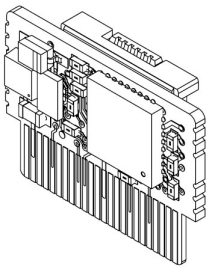
- A-P- Series lens & electronic board
- Multipoint calibration
- Temperature compensation algorithm (V-Temp)
- Response time accelaration algorithm (V-Speed)

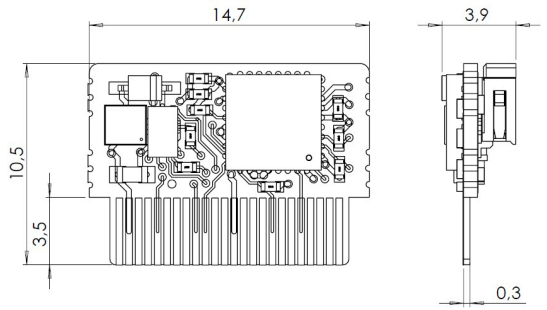


Ordering Information:

A-PE- 25H0-33: Packaged A-25H0 with electronics and FPC-A-33

Electronic board mechanical dimension :





Auto Focus Modules (C-Series)

Corning® Varioptic® Lenses enable auto focus functionality when a fixed lens module and a variable focus lens are integrated into a Corning Varioptic receptacle mount. Corning provides auto focus algorithms that are optimized for Corning Varioptic Lenses.

C-S-Series

Integrates a fixed lens module and an A-Series variable focus lens in an M12 receptacle (S-mount). It can be easily mounted into a standard M12 sensor board and driven by the same drivers as the A-Series lenses.

Key Features:

- M12x0.5 thread
- Flex Cable compatible with 1 mm pitch connector
- Compatible FPC connectors:
  - —SFW4S-2STE9LF from FCI
  - —04FMN-BTK-A (LF)(SN) from JST
- Built in auto focus actuator
- Built in IR cut filter for -IR version

Ordering Information:

- C-S-25H0-026-0X: includes A-25H0 and FPC-A-X (X=6 or 7), EFL = 2.6 mm
- C-S-25H0-036-0X: includes A-25H0, and FPC-A-X (X=3 or 7), EFL = 3.6 mm
- C-S-25H0-047-0X: includes A-25H0, and FPC-A-X (X=3), EFL = 4.7 mm
- C-S-25H0-075-0X: includes A-25H0, and FPC-A-X (X=3), EFL = 7.5 mm
- C-S-25H0-096-0X: includes A-25H0, and FPC-A-X (X=3 or 7), EFL = 9.6 mm
- C-S-39N0-158-0X: includes A-39N0, and FPC-A-X (X=4), EFL = 15.8 mm

For module with IR cut filter (650 nm cut-off wavelength), please add I to one of the above reference when ordering

From left to right : C-S-25H0-026-06 / C-S-39N0-158-04 / C-S-25H0-075-03 / C-S-25H0-096-03 / C-S-25H0-036-03

C-H-Series

Integrates a fixed lens module and an A-16F variable focus lens in an M8 receptacle. It can be easily mounted into a standard M8 sensor board and driven by the same drivers as the A-Series lenses. It is the smallest formfactor auto focus lens module available among Corning® Varioptic® Lenses.

Key Features:

- M8x0.5 thread
- Flex Cable compatible with 0.5 mm pitch connector
- Compatible FPC connectors:
  - 525590652 from Molex
  - 5034800600 from Molex
- Built in auto focus actuator
- Built in IR cut filter for -IR version

Ordering Information:

- C-H-16F0-036-31: includes A-16F0 and bent Flex Cable with thermistor (FPC-A-31), EFL = 3.6 mm

For module with IR cut filter (650nm cut-off wavelength), please add I to one of the above reference when ordering

Specifications:

Typical performance at 25°C

	C-S-25H0-026	C-H-16F0-036	C-S-25H0-036	C-S-25H0-047	C-S-25H0-075	C-S-25H0-096	C-S-39N0-158
Effective Focal Length	2.6 mm	3.6 mm	3.6 mm	4.7 mm	7.5 mm	9.6 mm	15.8 mm
Format	M12	M8	M12				
F-number	2.5	2.2	1.8	2	2.9	3.7	4
Chief Ray Angle (CRA)	17°	33.7°	33.7°	34.4°	16.5°	12.5°	5.5°
Focusing range	4 mm to ∞	5 cm to ∞					

FOV vs. Sensor Format	C-S-25H0-026	C-H-16F0-036	C-S-25H0-036	C-S-25H0-047	C-S-25H0-075	C-S-25H0-096	C-S-39N0-158
1/4″	86°	63°	63°	46°	33°	26°	16°
1/3″	134°	79°	79°	65°	44°	35°	22°
1/2.7″	152°	-	-	71°	48°	39°	-
1/2.5″	160°	-	-	75°	51°	41°	-
1/2″	-	-	-	-	-	45°	-
1/1.8″	-	-	-	-	-	50°	-

	C-S-25H0-026	C-H-16F0-036	C-S-25H0-036	C-S-25H0-047	C-S-25H0-075	C-S-25H0-096	C-S-39N0-158
Back Focal (no IR)	5.26 mm	0.53 mm	0.53 mm	0.83 mm	4.07 mm	6.12 mm	6.02 mm
Back Focal (IR filter)	5.36 mm	0.59 mm	0.59 mm	0.69 mm	4.26 mm	6.3 mm	6.2 mm
Image circle diameter	7.2 mm	5.9 mm	5.9 mm	7.5 mm	7.2 mm	9.1 mm	6 mm
Sensor compatibility	1/2.5″	1/3″	1/3″	1/2.4″	1/2.5″	1/1.8″	1/3″

Setting Procedure

For optimum performance of the module, please refer to the setting procedure detailed in the Technical Data Sheets of the C-H and C-S-Modules.

C-u-Series

Combined with the use of specific adapters, either for C-Mount or M12, an inexpensive Auto Focus microscope can be built. It uses the same FPC cable as the C-S series, and therefore requires the same FPC connectors.

Ordering Information:

- C-u-25H0-075-03: inverted C-S-25H0-075

Specifications:

Typical performance at 25°C

	Extension Ring		
Magnification	X2	X4	X5
Working distance	7 mm	6 mm	5 mm
Focusing range	±0.85 mm	± 0.7 mm	± 0.65 mm
Mechanical Back Focal	15 mm	22 mm	37 mm

C-u Microscopy Set

Allows customers to achieve various magnifications, both for M12 and C-Mount cameras. This set is delivered with the C-Microscopy development kit.

- 1 microscope spacer
- 1 set of M12 and C-Mount adapters allowing X2, X3 and X5 magnifications
- 1 locking nut for M12 adapters

C-C-Series

Electronically focused, controllable C-mount module based on the A-39N0 variable focus lenses. The C-C-Series incorporates all necessary electronic components to drive the lenses and only requires a DC power supply.

Key Features:

- Variable focus from 10 cm to ∞
- Silent
- Supports I²C Analog, RS232, and SPI interfaces
- Supports closed-loop operations

Ordering Information:

- C-C-39N0-XX0-I²C: I²C or Analog operation
- C-C-39N0-XX0-R33: RS232 with 3.3 V signal or analog operation
- C-C-39N0-XX0-R12: RS232 with 12 V signal or analog operation
- C-C-39N0-XX0-SPI: SPI operation only

XX = 16 or 25 for 16mm EFL or 25mm EFL

Specifications:

Typical performance at 25°C

	C-C-39N0-160	C-C-39N0-250
Effective Focal Length	16 mm	25 mm
Manual Iris	No	Yes
F-number	2.8	4 to 22
Image circle diameter	11 mm	
Sensor compatibility	2/3"	
DC power supply	3.3-24 VDC	
Current consumption	25 to 100 mA	
Connector	6 pin jST SHR-06V-S-B	

C-C-39N0-160

C-C-39N0-250

Driver

Maxim MAX14574

Corning has qualified the Maxim MAX14574 for the use with Corning® Varioptic® Lenses.

- Compatible with A-Series, C-S-Series and C-u-Series
- It is also possible to read the temperature of an external thermistor, through the I^2C interface

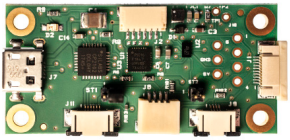
Corning is the exclusive worldwide reseller of the Maxim MAX14574, to purchase, please contact Corning Varioptic Lenses at varioptic@corning.com or an approved Corning Varioptic Lenses distributor.

Performance Summary:

	MAX14574
Maximum Voltage	70 V
Resolution	10 bits
Interface	I^2C
Size (mm)	1.6 x 2.6
External Components	5
Output Waveform	PWM
Maximum Power Consumption	40 mW
Package	15 bump WLP
Temperature Reading	Yes
Input Voltage Range	+ 2.7 V to +5.5 V

Driver Boards

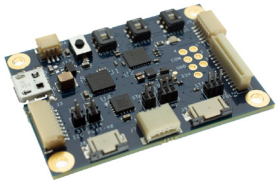
USB-M Flexiboard



This board includes a Maxim driver and various FPC connectors for the A-Series, C-S-Series and C-u-Series. Due to the Focuslab Software, it is easily driven through USB and delivered with the development kits. Its very small form factor enables use of this board directly with any PC-driven application with no extra hardware development.

Board size : 48 x 23 x 8 mm.

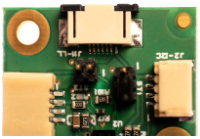
USB-M Universal



This board is an evolution of the USB-M Flexiboard and embeds dedicated connector to be able to control the A-PE-Series lenses, it is delivered with the A-PE-Series development kits.

Board size : 48 x 35 x 8 mm.

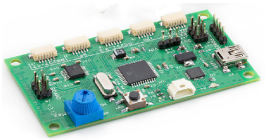
Maxim Drivboard



This board includes a Maxim driver and various FPC connectors for the A-Series, C-S-Series and C-u-Series. It has a 4 pin JST connector for DC power supply and for I^2C communication. It has been designed for fast driving of the adjustable lens directly from a microcontroller, an FPGA, a DSP, etc. A cabled JST connector is supplied with the board.

Board size : 23 x 18 x 8 mm.

C-C Com Board

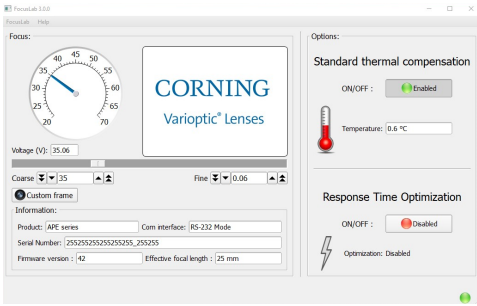


This board is a USB to RS232-12 V / RS232-3.3 V / I^2C / SPI converter. Connected to a PC with a USB cable on one hand, and to the C-C module on the other hand. It enables communication directly with any of the C-C versions using Focuslab. A potentiometer also allows direct control of the C-C voltage without a computer.

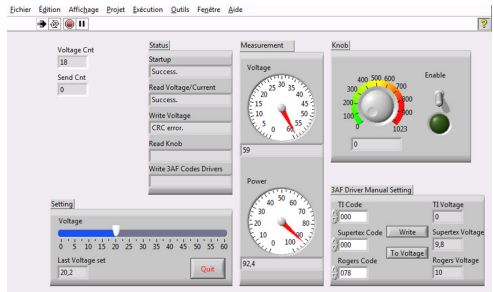
Board size : 42 x 75 x 16 mm.

FocusLab & AFLab Softwares

FocusLab allows customers to control the C-Mount lens through the C-C Com Board. The software controls the output voltage on the liquid lens. A specific dialog box allows for sending advanced commands to the C-Mount lens. A LabView VI is also provided to control the C-Mount lens through a LabView program. A specific documented DLL integrates this in a C-code program. FocusLab also allows the control of the USB-M Drivboard.

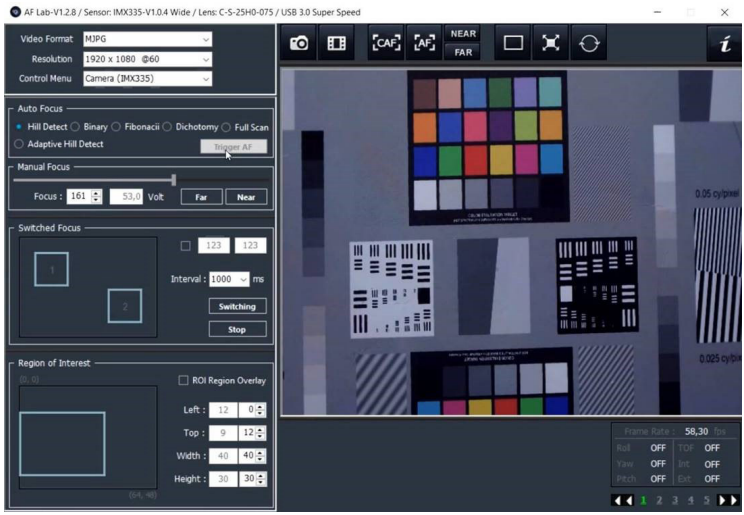


Focuslab windows interface



Focuslab LabView interface

AFLab Software is provided together with the Corning® Varioptic® AF Explorer Development Kit, it allows to select the various AF modes & algorithms, change the basic sensor settings, as well as image & video acquisition among others.



Development Kits

Development Kits for various A-Series lenses and C-Series modules are specially designed to speed up the evaluation and design process.

D-A-16F

Ordering code: D-A-16FX, X=0,1, or 9

- 1 A-16FX
- 1 A-16FX-P31
- 1 Maxim Drivboard
- 1 VHD-09
- 1 FPC-A-31
- 1 USB-M Flexiboard, USB cable
- Focuslab Software
- Documentation Package

D-A-25H-D0

Ordering code: D-A-25HX-D0, X=0,1, or 9

- 1 A-25HX-D0
- 1 A-25HX-D0-P33
- 1 Maxim Drivboard
- 1 VHD-07
- 1 FPC-A-3
- 1 USB-M Flexiboard, USB cable
- Focuslab Software
- Documentation Package

D-A-39N

Ordering code: D-A-39NX, X=0,1, or 9

- 1 A-39NX
- 1 A-39NX-P37
- 1 Maxim Drivboard
- 1 VHD-06
- 1 FPC-A-37
- 1 USB-M Flexiboard, USB cable
- Focuslab Software
- Documentation Package

D-A-58N

Ordering code: D-A-58NX, X=0,1, or 9

- 1 A-58NX
- 1 A-58NX-P37
- 1 Maxim Drivboard
- 1 VHD-10
- 1 FPC-A-37
- 1 USB-M Flexiboard, USB cable
- Focuslab Software
- Documentation Package

D-A-25H

Ordering code: D-A-25HX, X=0,1, or 9

- 1 A-PE-25H-33
- 1 Maxim Drivboard
- 1 USB-M Univeral, USB cable
- Focuslab Software
- Documentation Package

D-S Kits

Ordering code:

- D-S-25H0-XXX, XXX= 026/036/075/096, no filter
- D-S-25H0-XXXI, XXX= 026/036/075/096,with IR-Cut filter
- D-S-39N0-158, no filter

- 2 C-S Modules
- 1 Maxim Drivboard
- 1 USB-M Flexiboard, USB cable
- Focuslab Software
- Documentation Package

D-C-Series

Ordering code: D-C-39N0-XXX-YYY, XXX= 160 or 0250, YYY= R12, R33, SPI, I^2C

- 1 C-C-39N0-XXX-YYY
- 1 C-C Com board and cable
- Focuslab Software
- Documentation Package

D-u-25H0-075-03

Ordering code: D-u-25H0-075

- 1 C-u-25H0-075
- 1 Maxim Drivboard
- 1 C-Series Microscopy Set
- 1 USB-M Flexiboard, USB cable
- Focuslab Software
- Documentation Package

D-u-39N0-160

Ordering code: D-u-39N0-160

- 1 C-C-39N0-XXX-YYY
- 1 C-C Com board and cable
- 1 Adaptor ring
- 2 C-mount tubes (20 & 50 mm length)
- Focuslab Software
- Documentation Package

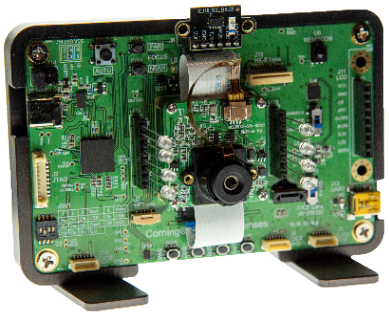
Corning® Varioptic® AF Explorer Development Kit

The Corning® Varioptic® AF Explorer is a comprehensive platform that produces fast and reliable auto focus based on Corning Varioptic liquid lens technology. The kit consists of several PCB boards with associated software and is provided in a ready-to-use format, including a USB camera system allowing straight-forward evaluation of Corning liquid lens products. The main structure is based on:

- an Image Signal Processor (ISP)
  can be purchased separately for use in other designs
- a Cypress EZ-USB® CX3 USB 3.0 chip
- an image sensor board
- an integrated Time of Flight (TOF) sensor
  for distance measurement
- different lighting options
  white, blue, and NIR LED's
- AF Lab Software that enables basic sensor settings,
  AF mode selection, AF algorithm, and more

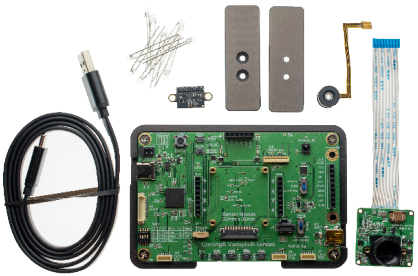
The kit is suited for camera developers wishing to study characteristics of the liquid lens. It offers various focus options, including manual focus, switched focus, closed-loop AF and open-loop AF - both triggered and continuous.

This kit can also be used as a reference design and a starting point for system deisgners, reducing time spent on development.



Default Configuration

D-AF-EXP-STD-075 is the default configuration of the Corning Varioptic AF Explorer kit. It is based on the Sony® IMX 335 sensor and Corning Varioptic C-S-25H0-075 Auto Focus Lens



- Main board
- Sensor board (Sony IMX 335 - 5MP 1/2.8")
- C-S-25H0-075 auto focus lense module
- TOF sensor
- Dedicated software
- Several options available
  (added sensors, TFT LCD, ...)

Additional Options

The standard configuration of the Varioptic AF Explorer can be modified with these

- Sensor board with Samsung® M3085 (8MP 1/3.2")
- Sensor board with Sony IMX307 (2MP 1/2.8")
- Sensor board with Sony IMX335 (5MP 1/2.8")
- Sensor board with Sony IMX219 (8MP 1/4")
- 2.8-inch LCD display to visualize live

These kit configurations can be used with C-C-series lenses and C-S- series lenses from Corning Varioptic Lenses. Select combinations are more compatible than others as listed in the chart below:

		Sensors			
		IMX307	IMX335	IMX219	M3085
	Resolution	2 Mpx	5 Mpx	8 Mpx	8 Mpx
	Pixel Size	2.9 µm	2 µm	1.2 µm	1.4 µm
	Format	1/2.8"	1/2.8"	1/4"	1/3.2"
C-Series Modules	C-S-25H0-026	102°	102°	86°	126°
	C-S-25H0-036			63°	
	C-S-25H0-047			52°	
	C-S-25H0-075	47°	47°	33°	41°
	C-S-25H0-096	37°	37°	26°	33°
	C-S-39N0-158			17°	20°
	C-C-39N0-160	23°	23°	16°	20°
	C-C-39N0-250	15°	15°	10°	13°

Documentation Package

With each Development Kit, Corning® Varioptic® Lenses deliver a complete set of application notes to assist the integration and development of the customer's product.

User Guides

- Focuslab user guide
- VHD user guide
- Board user guides (USB-M, Maxim DrivBoard, Microchip DrivBoard, C-Com board)
- Microscopy user guide
- Tutorial videos

Extended Details on Technology

- Marketing data sheet
- ZEMAX model: Focus configurations, n(λ) specifications
- IGES model: 3D design and opto-mechanical integration

Integration

- Mechanical and opto-electrical integration guide
- Design and assembly rules
- Driver implementation guide
- Closed loop auto focus implementation examples
- Overshooting and optimization overview
- Driver IC data sheets

General

- Measurement principles
- Optical Wave Front Error
- Cosmetic specification
- Laser Applications

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