

Nmark AGV-HP(O)

High Accuracy, Thermally Stable Galvo Scanner

Highest accuracy scanner available attains single-digit, micron-level accuracy over the field of view

Optical feedback technology significantly improves thermal stability

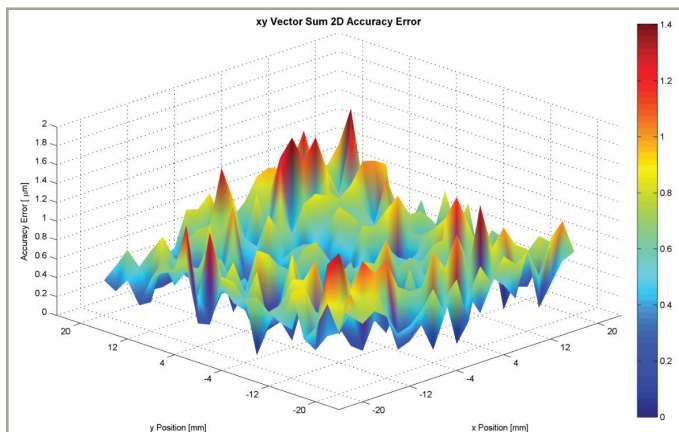
Industry-best resolution of >24 bits when used with Aerotech's Nmark GCL controller

Wide range of apertures and focal lengths

Many choices of mirror surface treatments for a variety of laser wavelengths

The Ultimate in Accuracy and Stability

The highly repeatable and thermally stable feedback sensors used on the AGV-HP(O) scanner systems can be calibrated down to single-digit, micron-level accuracy over the field of view (see figure below). With the extremely low thermal gain drift performance of the position transducers, complex, high-density laser machining applications that take long periods of time to complete will maintain consistent micron-level feature placement accuracy over the lifetime of the process. Likewise, high throughput applications will maintain consistent part-to-part quality without having to re-calibrate between parts. For the highest level of thermal stability, the AGV-HP(O) scanners can be equipped with water cooling to stabilize the operating temperature of the



Nmark AGV-HP(O) provides industry-best micron-level 2D accuracy over the entire field of view.



AGV-HP(O) galvo scanners offer micron-level accuracy over the field of view.

device under varying loads, changes in ambient temperature or beam clipping on the input aperture.

Real-Time Process Visibility

The location of the AGV-HP(O) mirrors can be captured and analyzed in real time. With direct access to the positions of the scanner the user no longer has to program delay parameters to compensate for lag and tracking errors in the servo system. The process can be optimized prior to marking the part, saving time and reducing material waste. The state of the laser can also be controlled based on in-position and velocity criteria, further reducing programming complexity.

Advanced Programming Features

The AGV-HP(O) utilizes all of Aerotech's advanced motion and PSO (Position Synchronized Output) capabilities that have been developed for traditional servo-based laser processing applications. Contouring functions such as Acceleration Limiting can be used to automatically reduce speeds in tight corners or small radii to minimize overshoot. The laser can be triggered based on the position feedback of the mirrors with PSO to ensure consistent spot overlap as the scanner changes speed. Aerotech's Infinite Field of View (IFOV) function seamlessly combines servo and scanner motion to extend the marking capability of the scanner across the entire travel of the servo stages, eliminating stitching errors that can occur in a more traditional move-expose-repeat process.

Design Choices

The AGV-HP(O) family is available with 10, 14, 20, and 30 mm input apertures and can be equipped with an F-Theta or telecentric lens directly from Aerotech. Users can also acquire the focusing optic directly from a trusted supplier with Aerotech supplying a spacer ring to ensure that back reflections through the optic do not damage the scanner mirrors. Mirror coatings for a wide range of UV, visible, IR and CO₂ wavelengths are supported. Coatings optimized for ultra-fast lasers are also available.

Nmark AGV-HP(O) SPECIFICATIONS

Mechanical Specifications	AGV10HP(O)	AGV14HP(O)	AGV20HP(O)	AGV30HP(O)
Optical Performance				
Beam Aperture	10 mm	14 mm	20 mm	30 mm
Maximum Scan Angle	±20°			
Beam Displacement	13.0 mm	18.0 mm	25.1 mm	35.7 mm
Feedback Resolution	0.007 μrad (26 bit)			
Dither (Min. Incremental Motion) ⁽²⁾	0.2 μrad _{rms}			
Accuracy	50 μrad pk-pk			
Repeatability ⁽³⁾	0.4 μrad _{rms}			
Gain Error	0.05 mrad			
Non-Linearity	0.005%			
Dynamic Performance				
Tracking Error	0 μsec			
Peak Acceleration ^(4,5)	288,000 m/s ²	224,000 m/s ²	80,000 m/s ²	56,000 m/s ²
Continuous Acceleration ^(4,6)	75,200 m/s ²	56,000 m/s ²	20,800 m/s ²	19,200 m/s ²
Positioning Speed ⁽⁴⁾	75 m/s	75 m/s	50 m/s	20 m/s
Marking Speed ^(4,7,8)	5 m/s	5 m/s	5 m/s	5 m/s
Jump & Settle Time, 1 mm Move ^(4,9)	270 μsec	270 μsec	450 μsec	700 μsec
Stability				
Long-Term Drift ⁽⁹⁾	Offset	10 μrad/12 hrs		
	Gain	15 μrad/24 hrs		
Thermal Drift	Offset	10 ppm/24 hrs		
	Gain	10 μrad/°C		
Mechanical Specifications				
Weight	4.0 kg	4.3 kg	5.0 kg	5.8 kg
Material	Aluminum (Black Anodize and Blue Paint)			
MTBF (Mean Time Between Failure)	20,000 Hours			

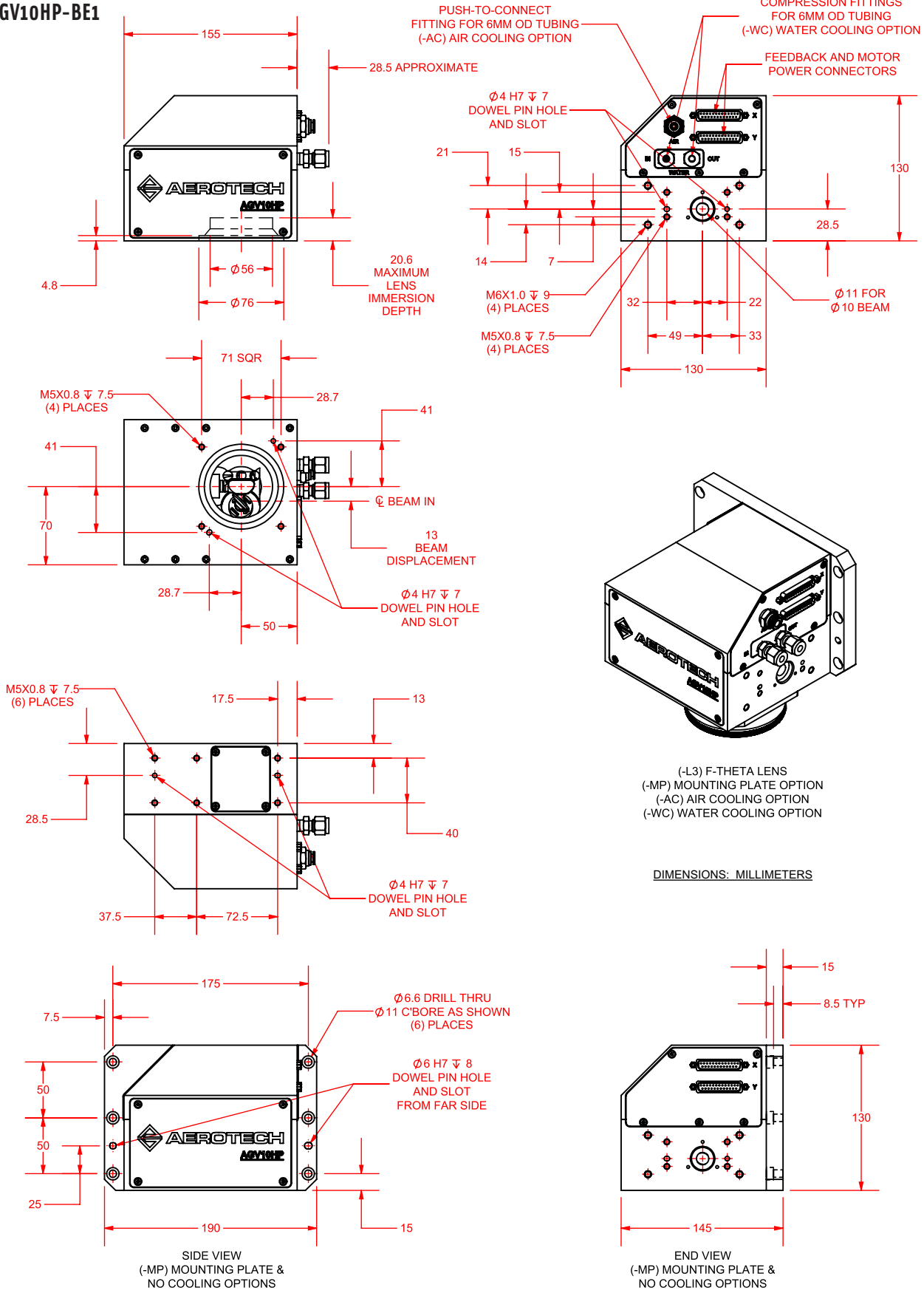
Notes:

1. All angles are optical unless otherwise specified
2. Without -AC air cooling option
3. After initial 3 hour warm-up, ambient temperature variation <±0.5 deg C
4. Typical performance with f = 160mm F-Theta objective
5. Based on maximum rated current of the motor
6. Based on rated rms current of the motor with -WC water cooling option; maximum continuous acceleration is 70% of this value without water cooling
7. Achievable with < 1% velocity error over continuous velocity portion of move
8. Marking speed is dependent on allowable tracking error
9. Settled to within 1% of move distance
10. All specifications are per axis unless otherwise noted

Electrical Specifications	AGV10HP(O)	AGV14HP(O)	AGV20HP(O)	AGV30HP(O)
Drive System	Brushless Direct-Drive Galvano Motor			
Feedback	Noncontact Rotary Encoder			
Maximum Bus Voltage	±40 VDC			
Limit Switches	Software Limits Only			
Home Switch	At Center			

Nmark AGV10HP(O) DIMENSIONS

AGV10HP-BE1



Nmark AGV10HP(O) DIMENSIONS

Galvanometer

Nmark AGV-HP(O)

AGV10HP-BE2

PUSH-TO-CONNECT FITTING FOR 6MM OD TUBING (-AC) AIR COOLING OPTION

COMPRESSION FITTING FOR 6MM OD TUBING (-WC) WATER COOLING OPTION

FEEDBACK AND MOTOR POWER CONNECTORS

Ø4 H7 ∇ 7 DOWEL PIN HOLE AND SLOT

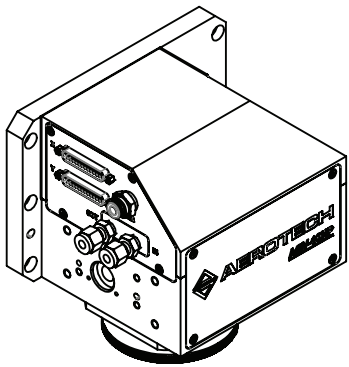
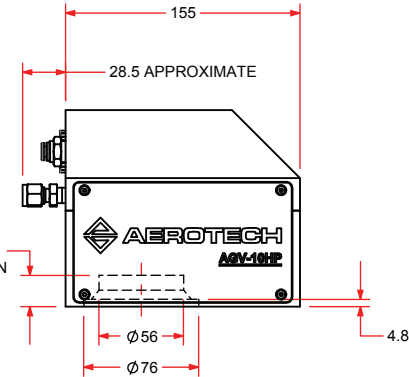
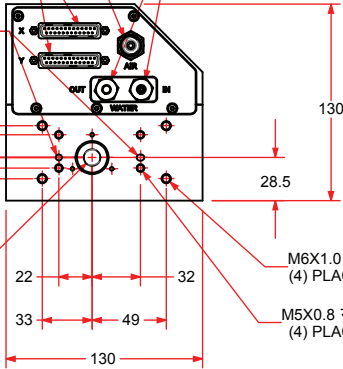
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14

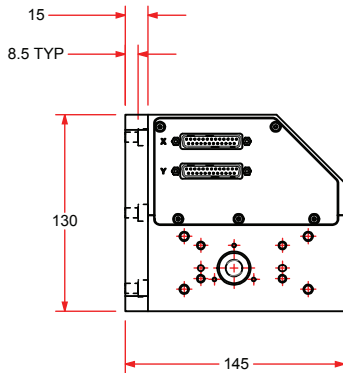
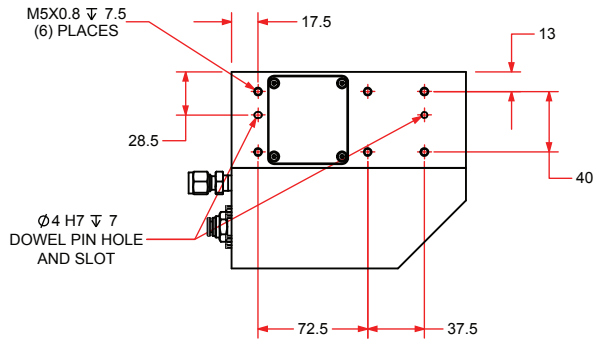
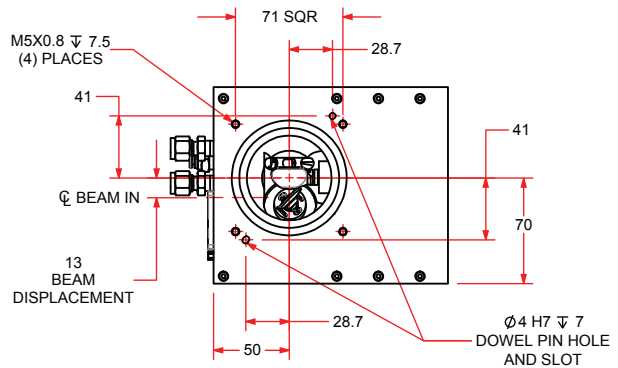
7

Ø11 FOR Ø10 BEAM



(-1064-100) OPTICS CONFIGURATION (-MP) MOUNTING PLATE OPTION (-AC-WC) COOLING OPTION

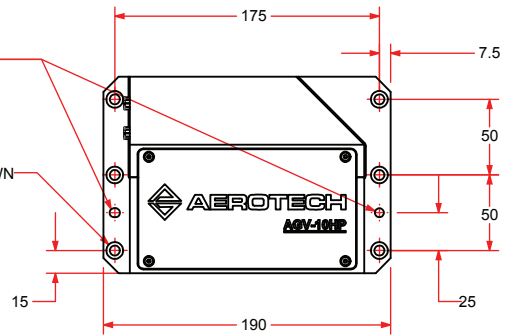
DIMENSIONS: MILLIMETERS



END VIEW (-MP) MOUNTING PLATE & (-NC) NO COOLING OPTIONS

Ø6 H7 ∇ 8 DOWEL PIN HOLE AND SLOT FROM FAR SIDE

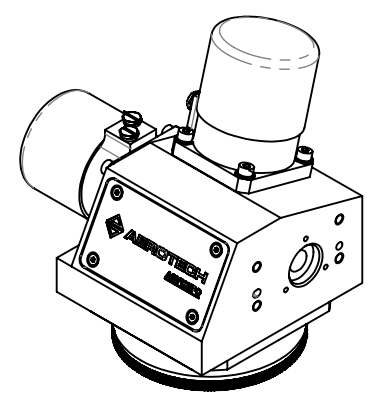
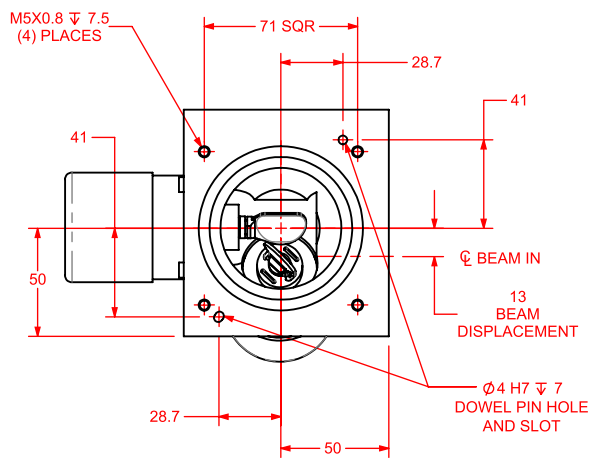
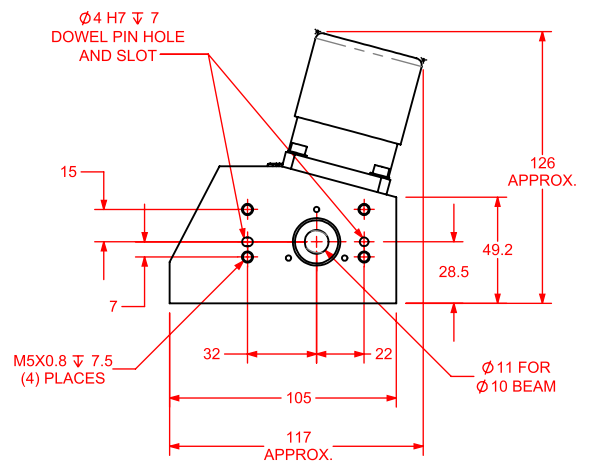
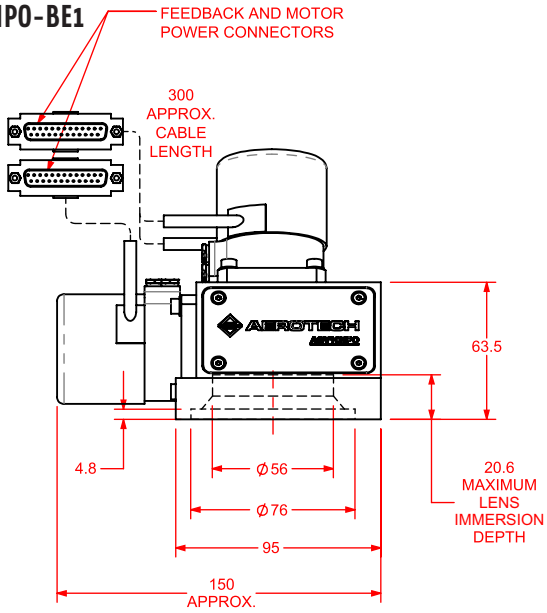
Ø6.6 DRILL THRU Ø11 C'BORE AS SHOWN (6) PLACES



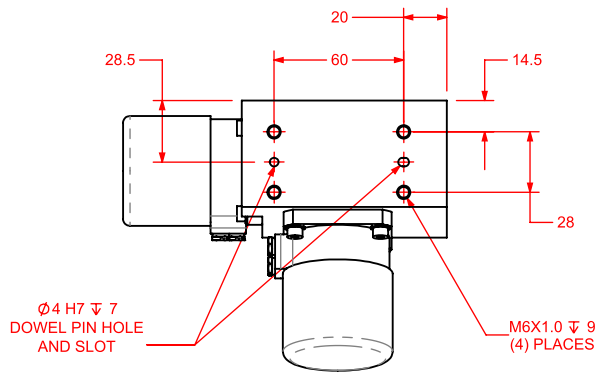
SIDE VIEW (-MP) MOUNTING PLATE & (-NC) NO COOLING OPTIONS

Nmark AGV10HP(0) DIMENSIONS

AGV10HP0-BE1



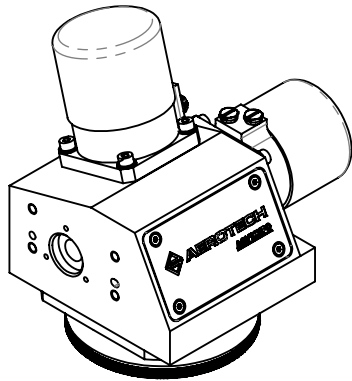
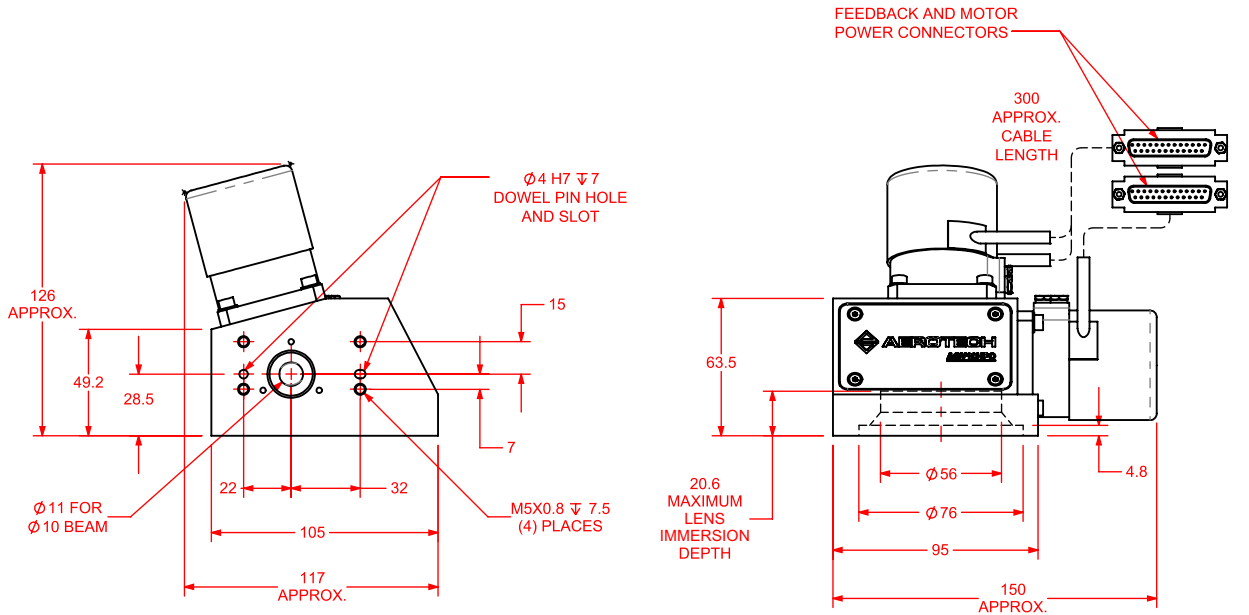
(-L3) F-THETA LENS



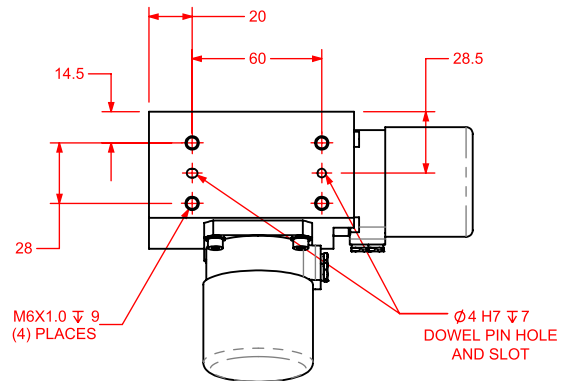
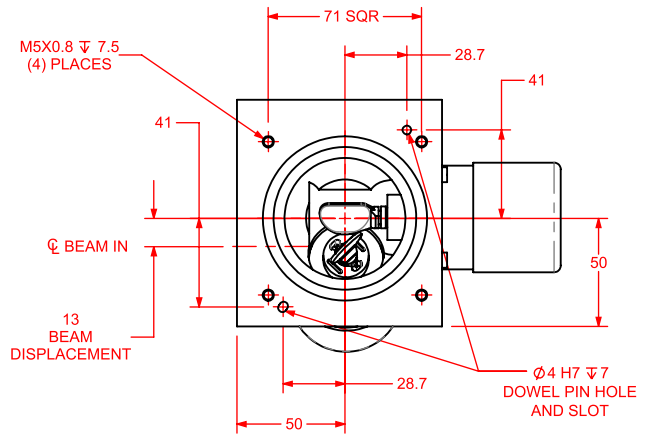
DIMENSIONS: MILLIMETERS

Nmark AGV10HP(0) DIMENSIONS

AGV10HP0-BE2

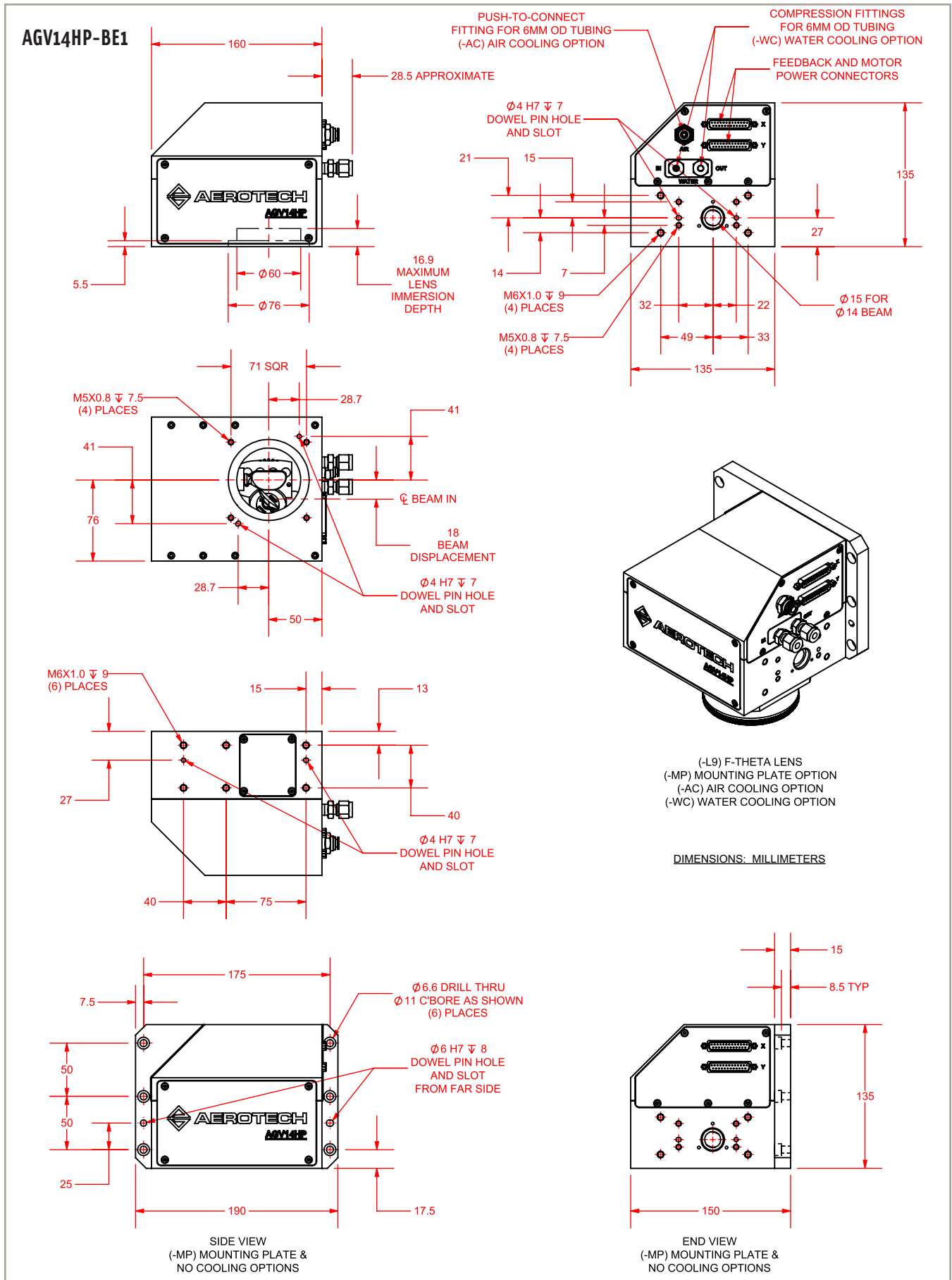


(-L3) F-THETA LENS



DIMENSIONS: MILLIMETERS

Nmark AGV14HP(0) DIMENSIONS



Nmark AGV14HP(0) DIMENSIONS

AGV14HP-BE2

PUSH-TO-CONNECT FITTING FOR 6MM OD TUBING (-AC) AIR COOLING OPTION

FEEDBACK AND MOTOR POWER CONNECTORS

Ø 4 H7 ∇ 7 DOWEL PIN HOLE AND SLOT

21

15

14

7

Ø 15 FOR Ø 14 BEAM

22

32

33

49

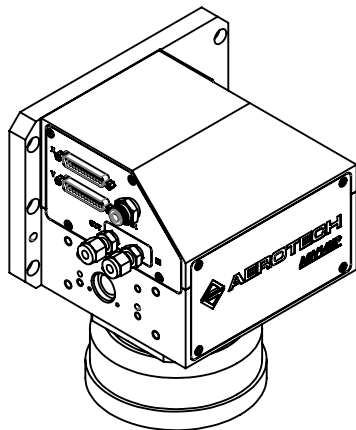
COMPRESSION FITTINGS FOR 6MM OD TUBING (-WC) WATER COOLING OPTION

135

27

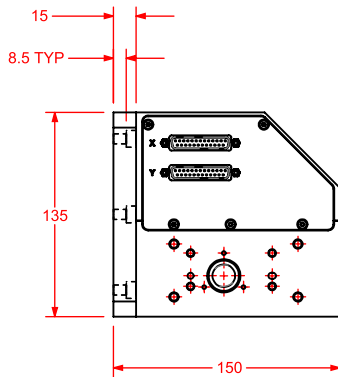
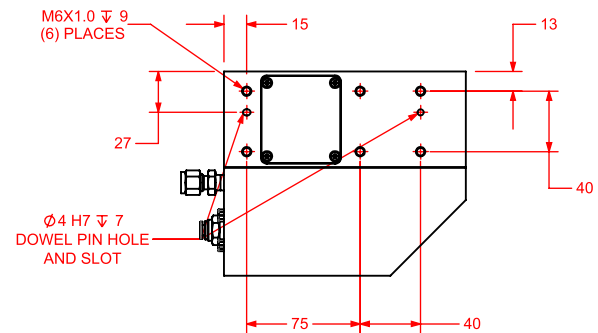
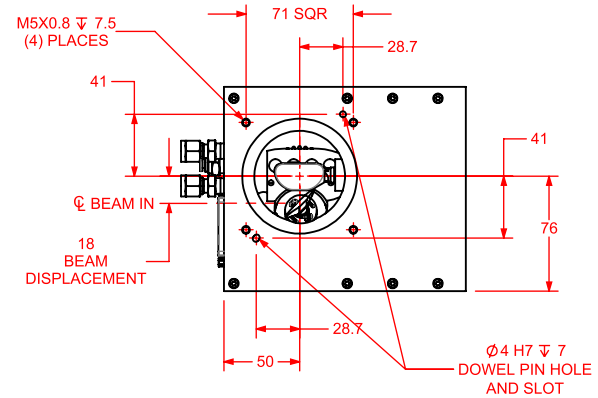
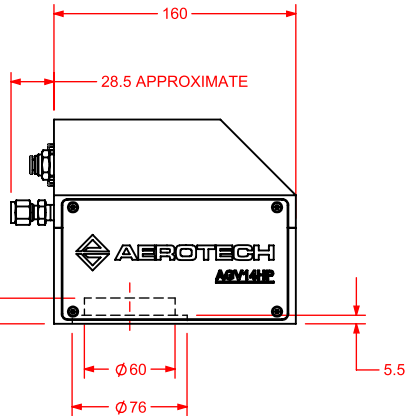
M6X1.0 ∇ 9 (4) PLACES

M5X0.8 ∇ 7.5 (4) PLACES

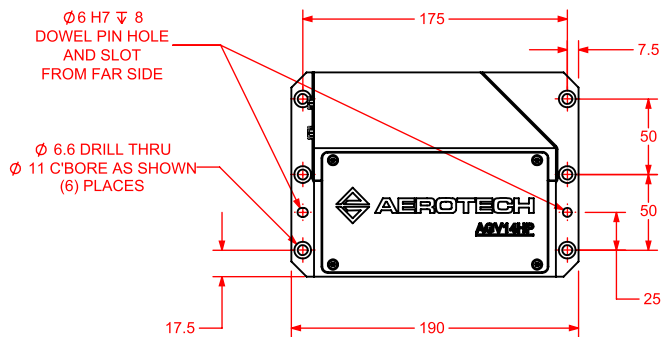


(-L9) F-THETA LENS
(-MP) MOUNTING PLATE OPTION
(-AC) AIR COOLING OPTION
(-WC) WATER COOLING OPTION

DIMENSIONS: MILLIMETERS



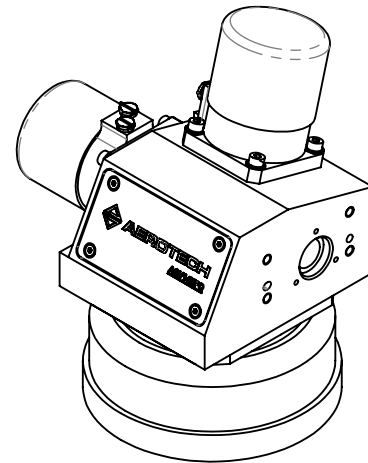
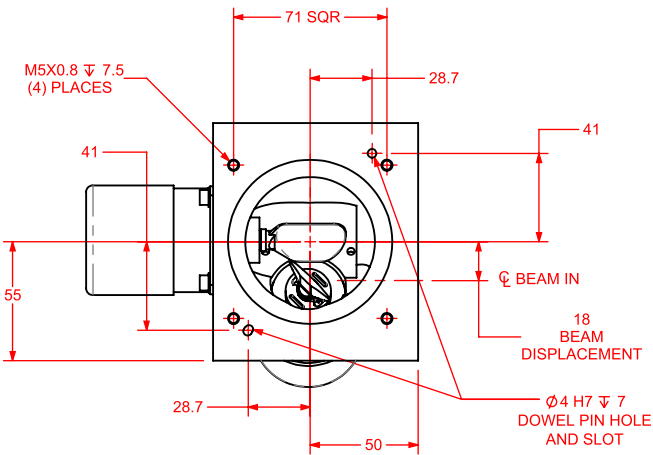
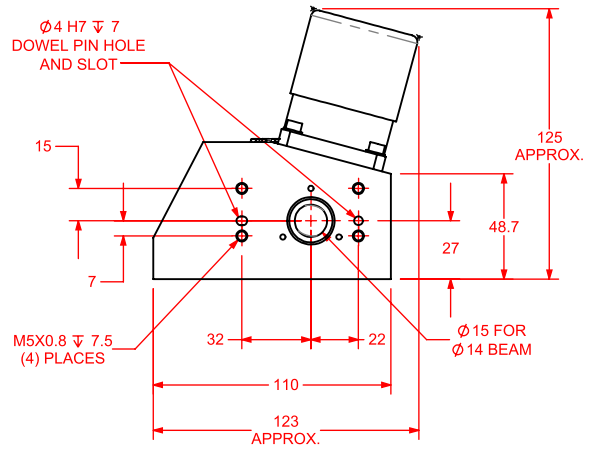
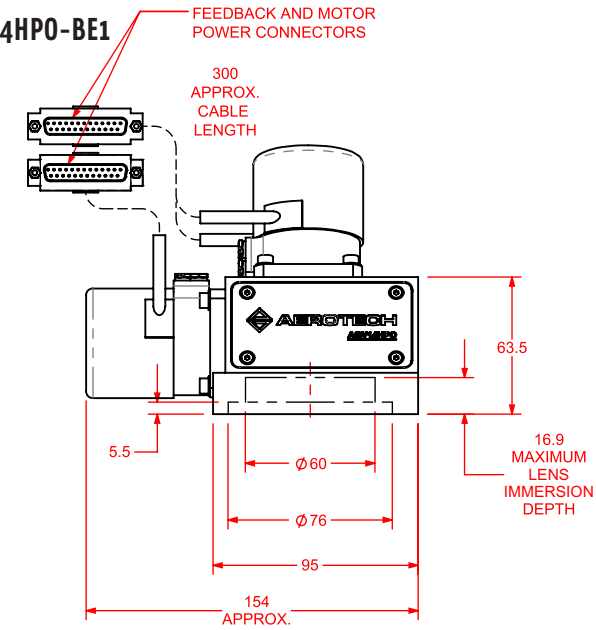
END VIEW
(-MP) MOUNTING PLATE &
NO COOLING OPTIONS



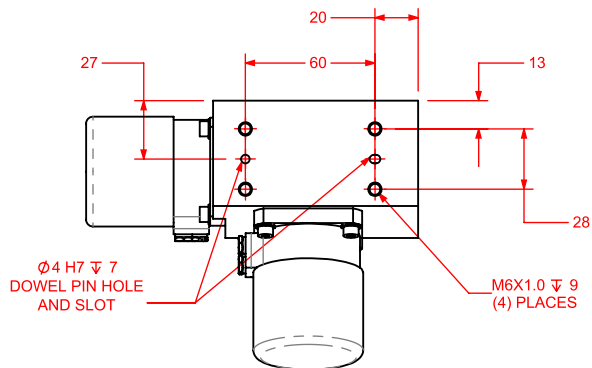
SIDE VIEW
(-MP) MOUNTING PLATE &
NO COOLING OPTIONS

Nmark AGV14HP(0) DIMENSIONS

AGV14HP0-BE1



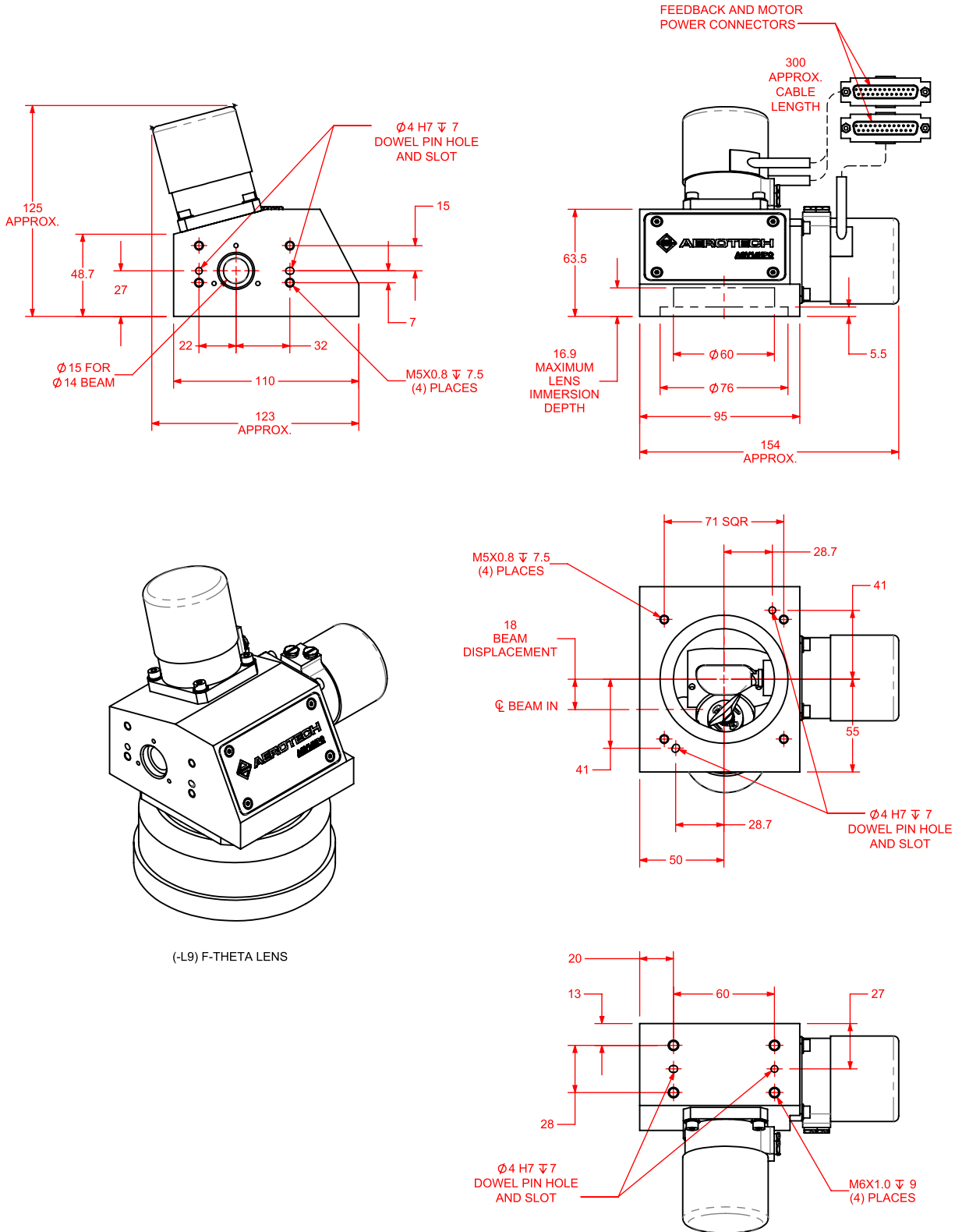
(-L9) F-THETA LENS



DIMENSIONS: MILLIMETERS

Nmark AGV14HP(O) DIMENSIONS

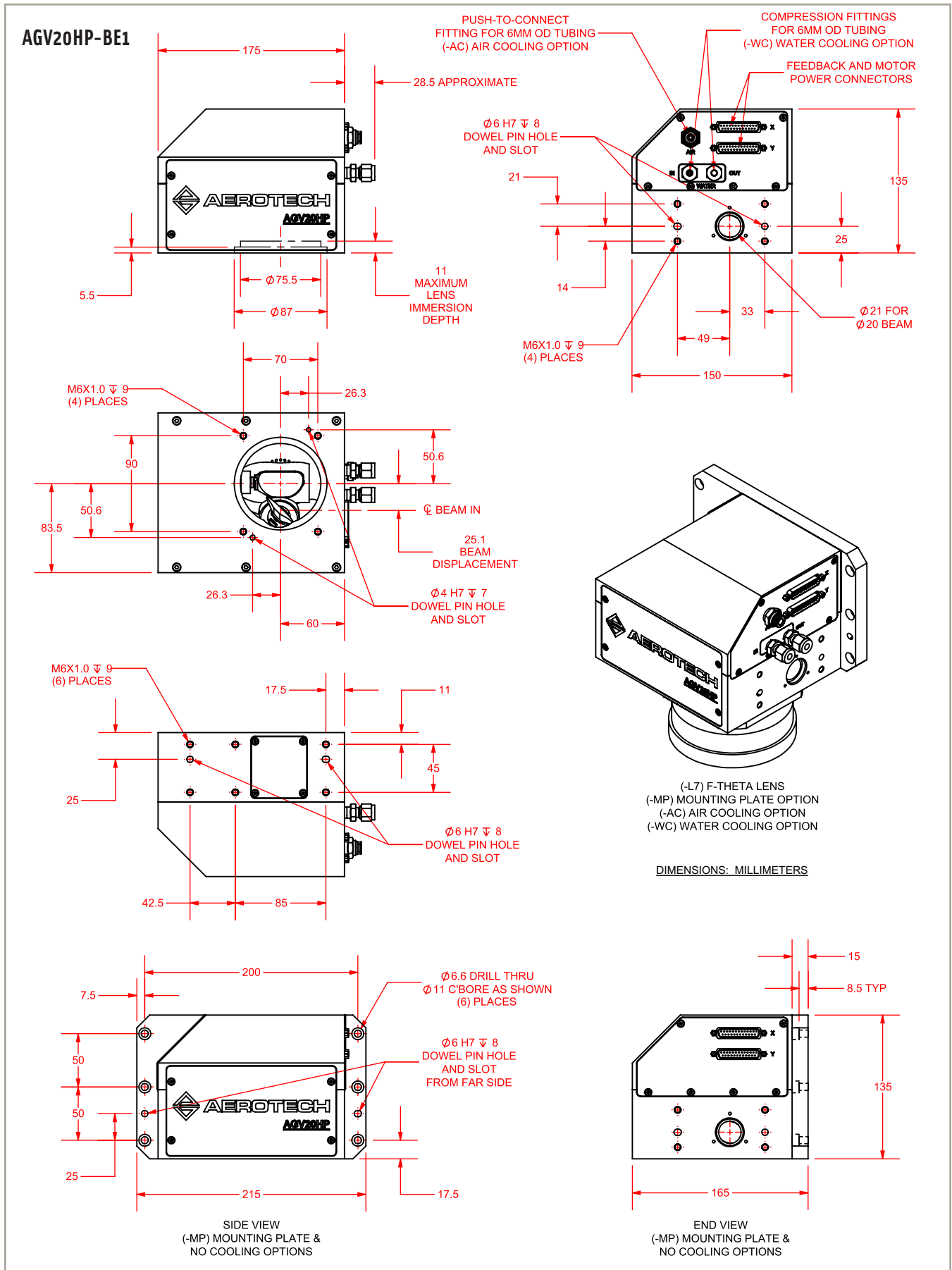
AGV14HP0-BE2



(-L9) F-THETA LENS

DIMENSIONS: MILLIMETERS

Nmark AGV20HP(O) DIMENSIONS



Nmark AGV20HP(O) DIMENSIONS

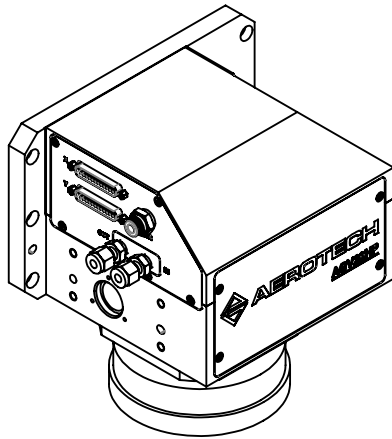
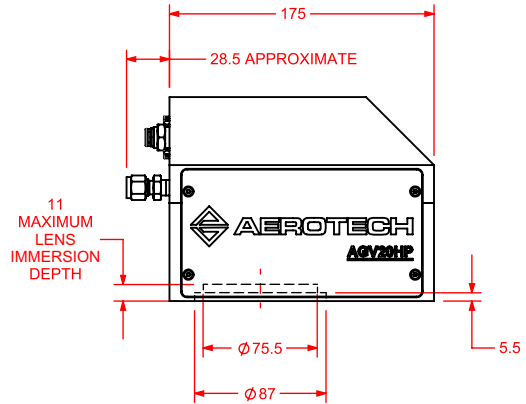
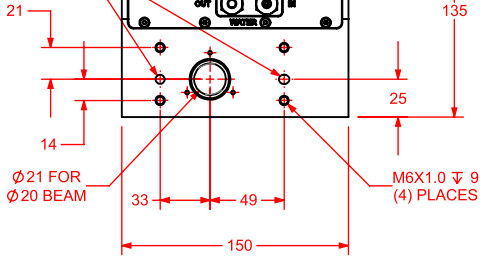
AGV20HP-BE2

PUSH-TO-CONNECT FITTING FOR 6MM OD TUBING (-AC) AIR COOLING OPTION

FEEDBACK AND MOTOR POWER CONNECTORS

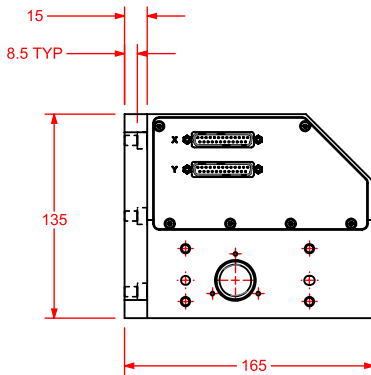
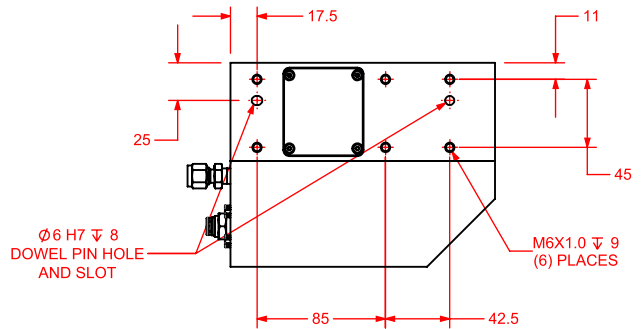
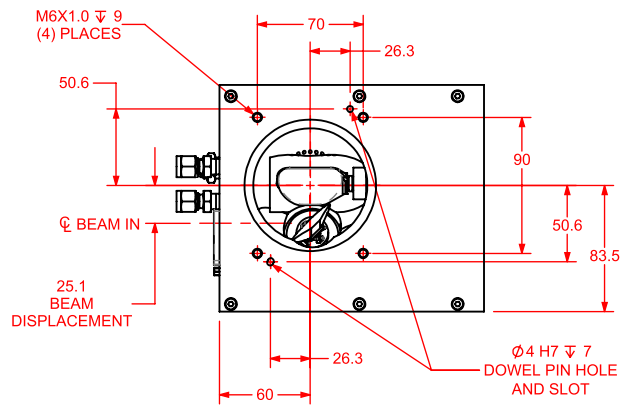
COMPRESSION FITTINGS FOR 6MM OD TUBING (-WC) WATER COOLING OPTION

Ø6 H7 ∇ 8 DOWEL PIN HOLE AND SLOT

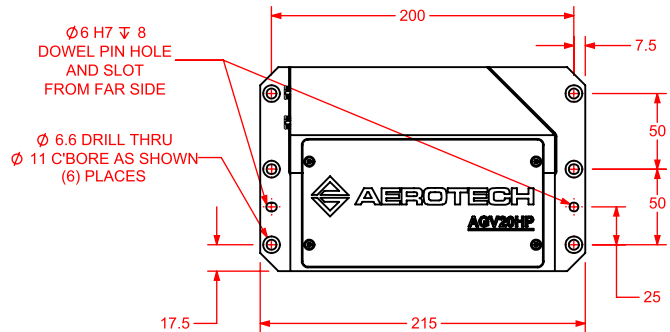


(-L7) F-THETA LENS
(-MP) MOUNTING PLATE OPTION
(-AC) AIR COOLING OPTION
(-WC) WATER COOLING OPTION

DIMENSIONS: MILLIMETERS



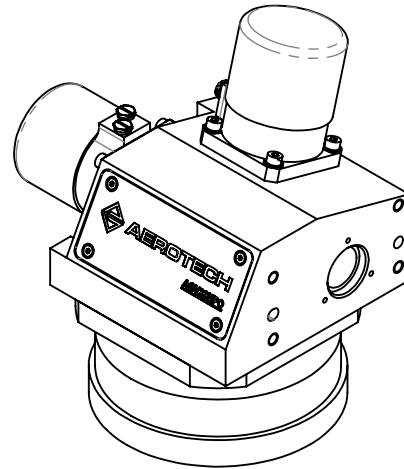
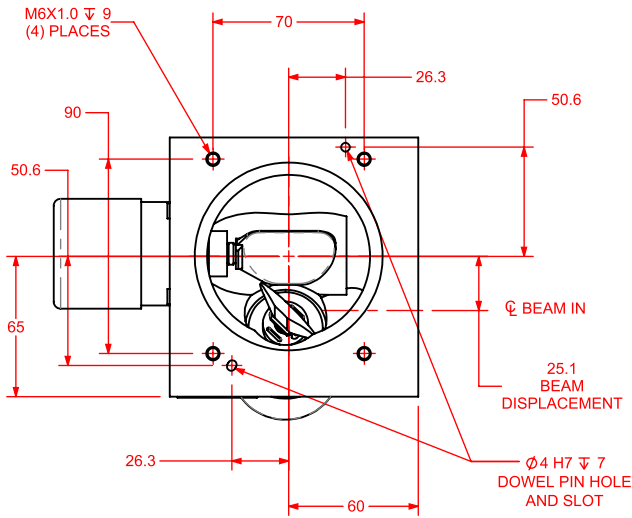
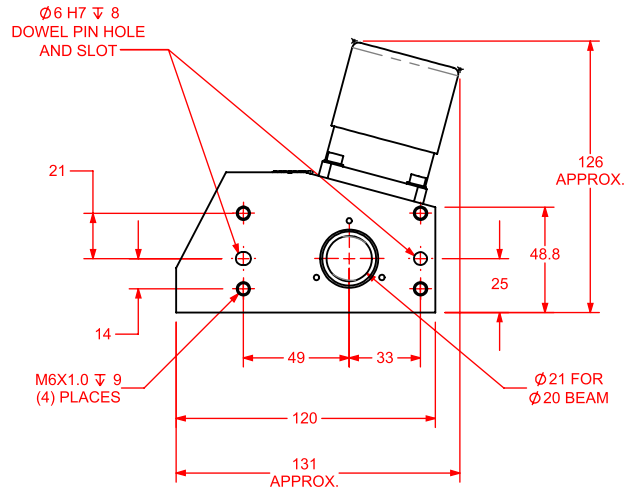
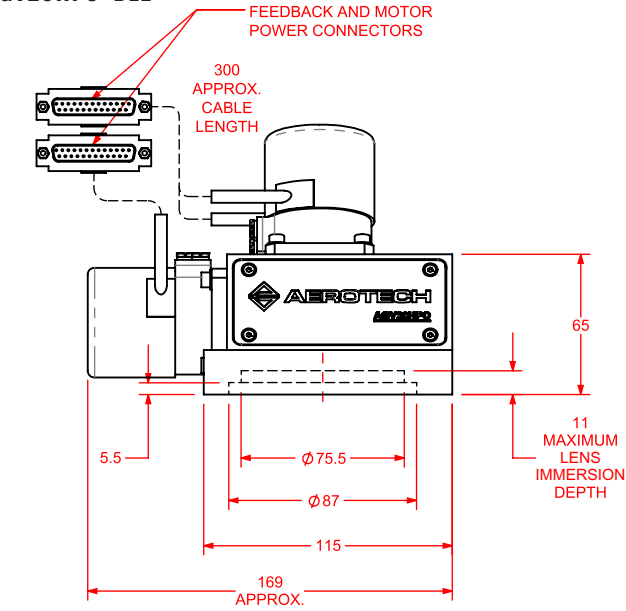
END VIEW
(-MP) MOUNTING PLATE &
NO COOLING OPTIONS



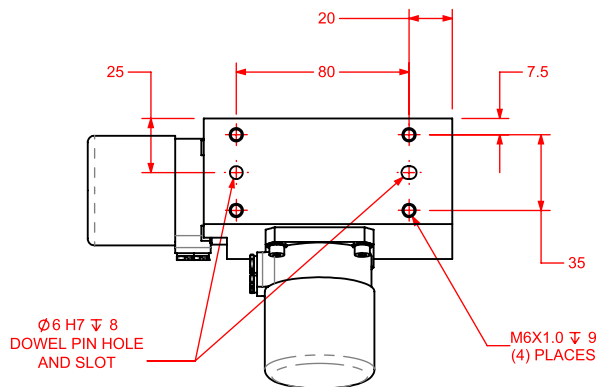
SIDE VIEW
(-MP) MOUNTING PLATE &
NO COOLING OPTIONS

Nmark AGV20HP(O) DIMENSIONS

AGV20HPO-BE1



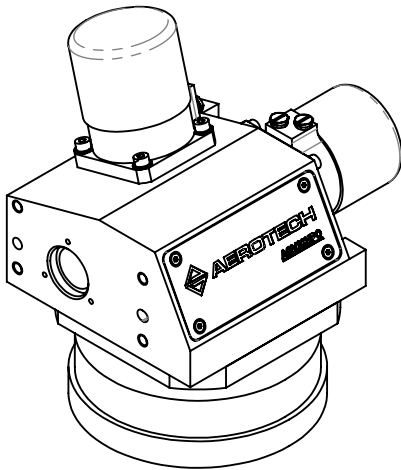
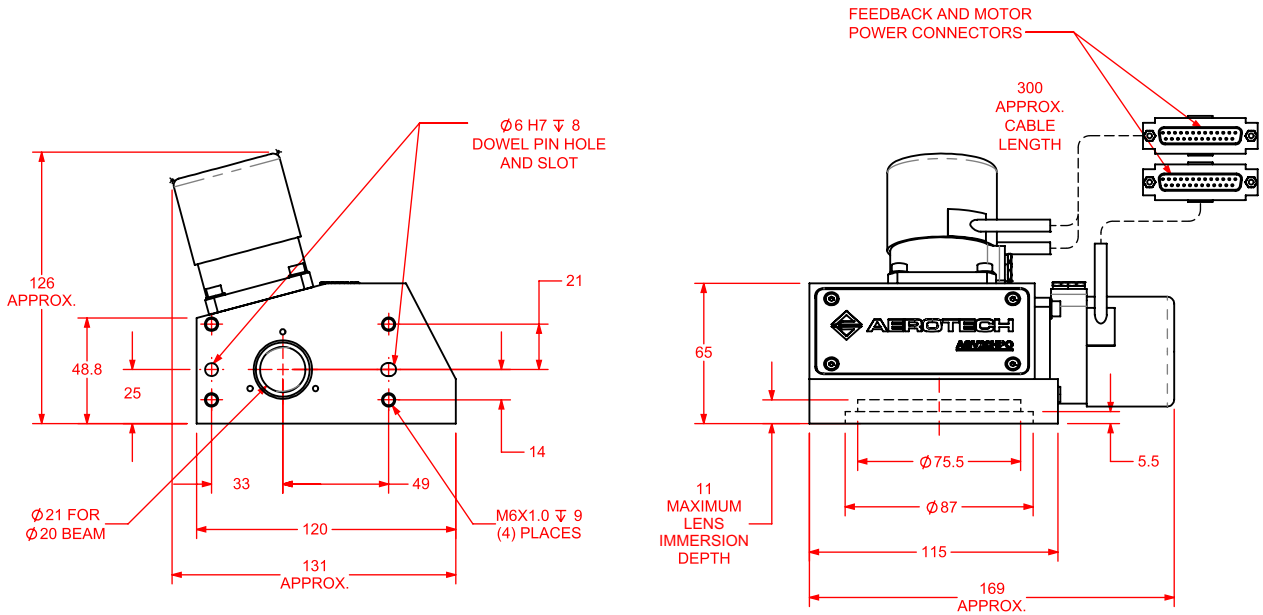
(-L7) F-THETA LENS



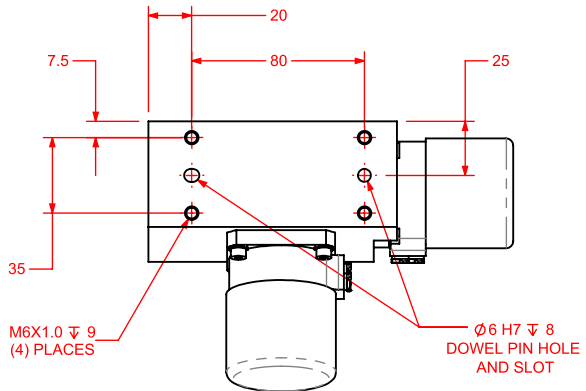
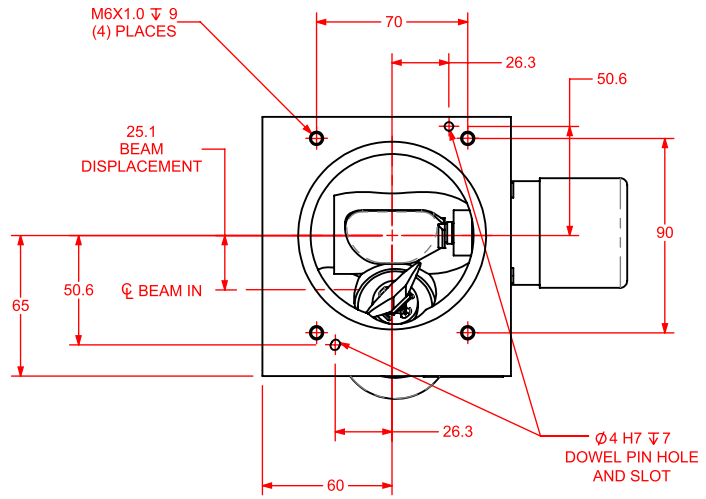
DIMENSIONS: MILLIMETERS

Nmark AGV20HP(O) DIMENSIONS

AGV20HP0-BE2



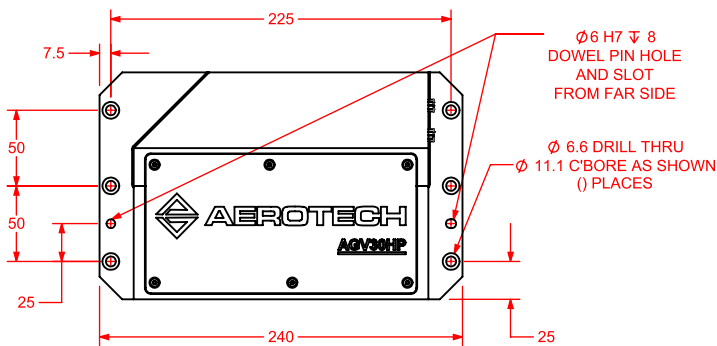
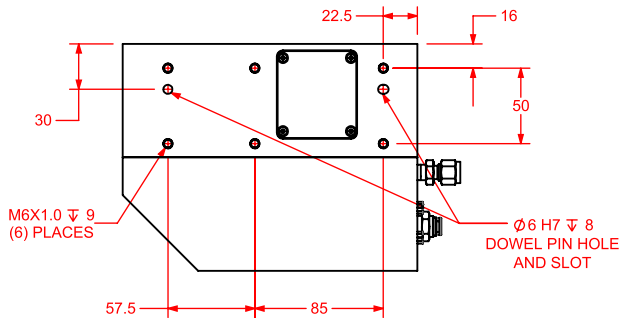
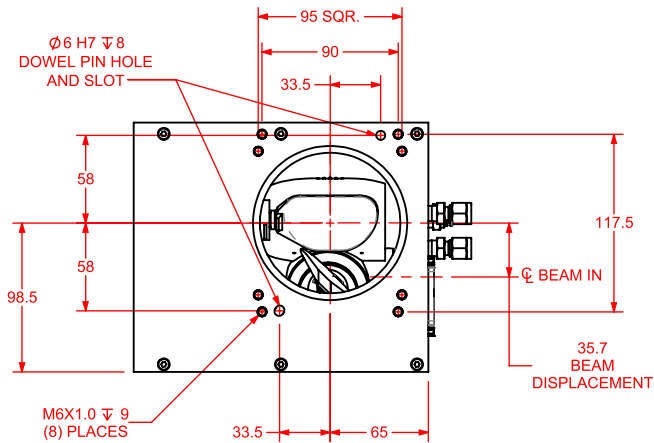
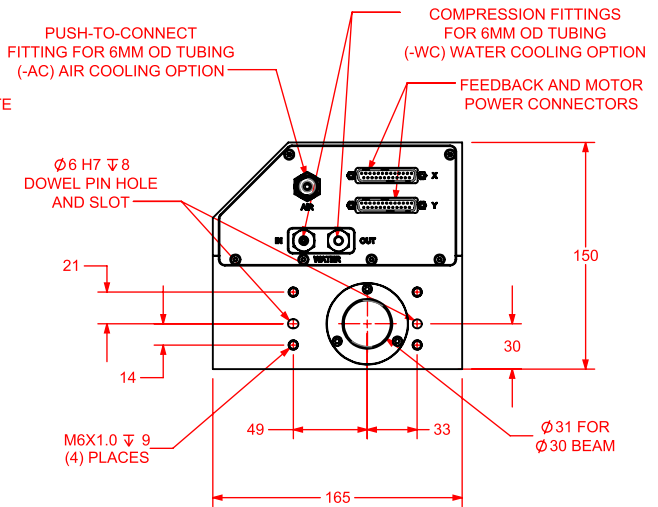
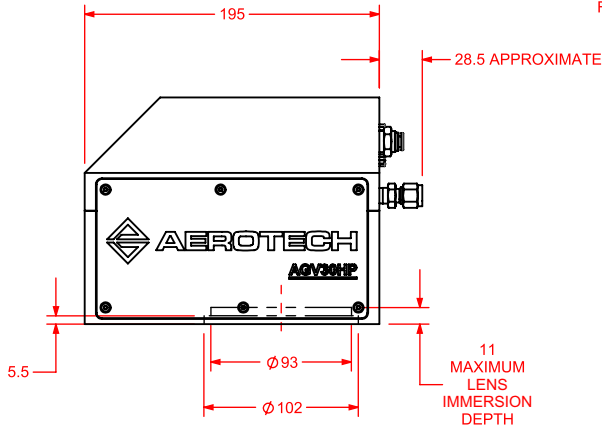
(-L7) F-THETA LENS



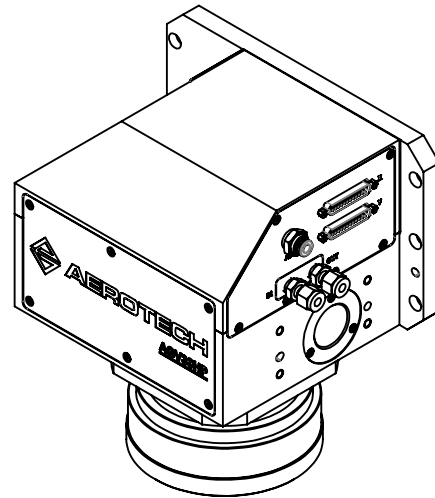
DIMENSIONS: MILLIMETERS

Nmark AGV30HP(O) DIMENSIONS

AGV30HP-BE1

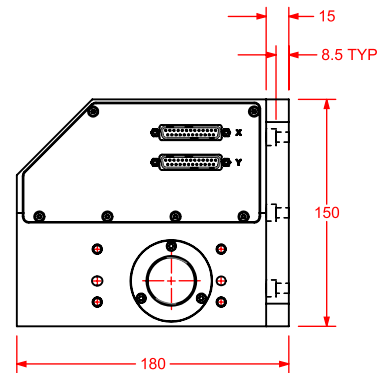


END VIEW
(-MP) MOUNTING PLATE &
NO COOLING OPTIONS



(-L3) F-THETA LENS
(-MP) MOUNTING PLATE OPTION
(-AC) AIR COOLING OPTION
(-WC) WATER COOLING OPTION

DIMENSIONS: MILLIMETERS



END VIEW
(-MP) MOUNTING PLATE &
NO COOLING OPTIONS

Nmark AGV30HP(O) DIMENSIONS

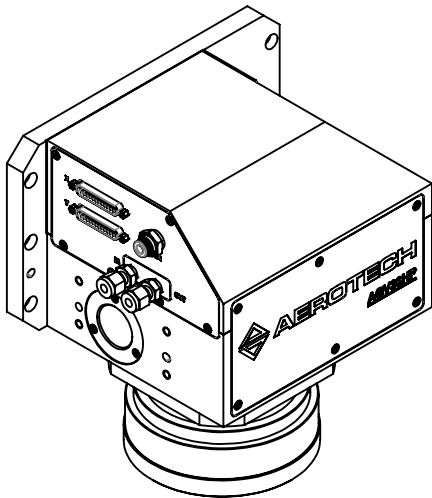
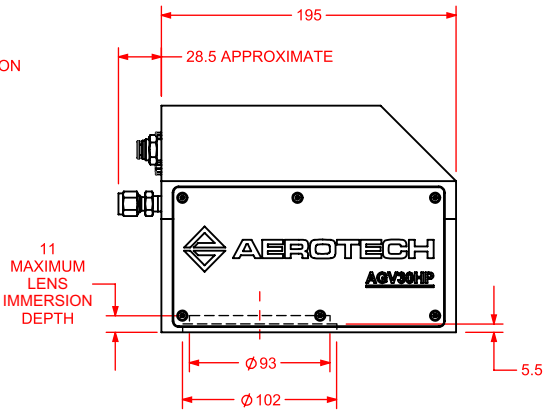
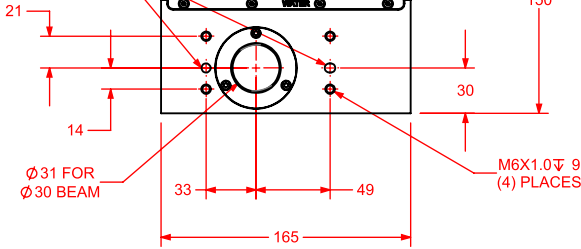
AGV30HP-BE2

PUSH-TO-CONNECT FITTING FOR 6MM OD TUBING (-AC) AIR COOLING OPTION

COMPRESSION FITTINGS FOR 6MM OD TUBING (-WC) WATER COOLING OPTION

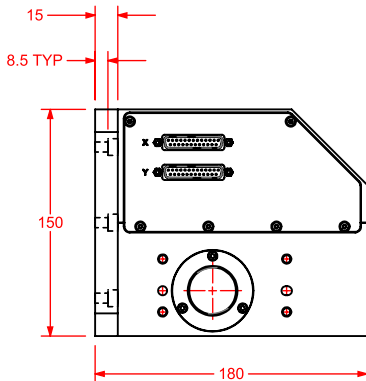
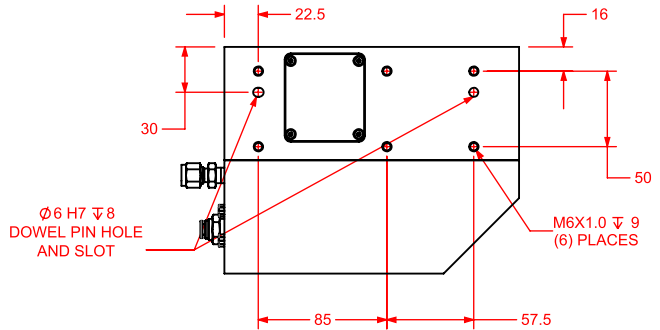
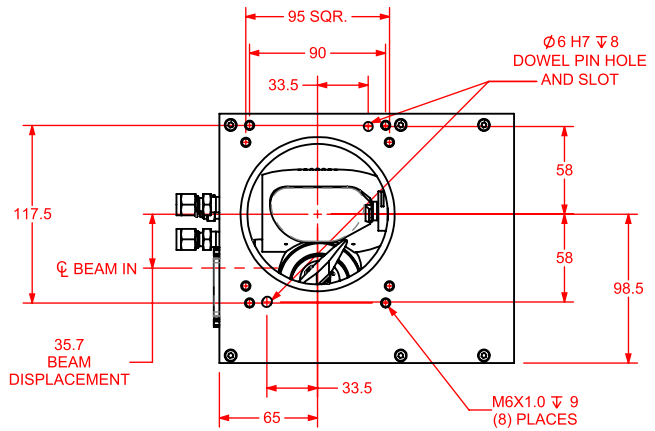
FEEDBACK AND MOTOR POWER CONNECTORS

Ø6 H7 ∇ 8 DOWEL PIN HOLE AND SLOT



(-L3) F-THETA LENS
 (-MP) MOUNTING PLATE OPTION
 (-AC) AIR COOLING OPTION
 (-WC) WATER COOLING OPTION

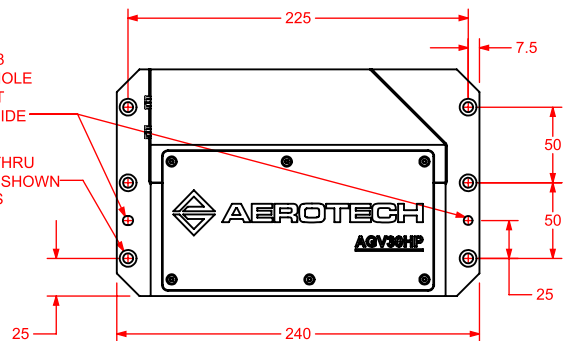
DIMENSIONS: MILLIMETERS



END VIEW
 (-MP) MOUNTING PLATE &
 NO COOLING OPTIONS

Ø6 H7 ∇ 8 DOWEL PIN HOLE AND SLOT FROM FAR SIDE

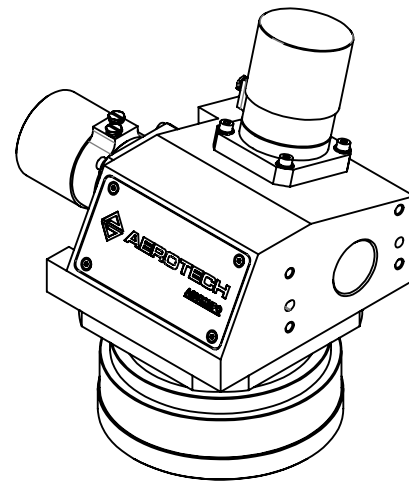
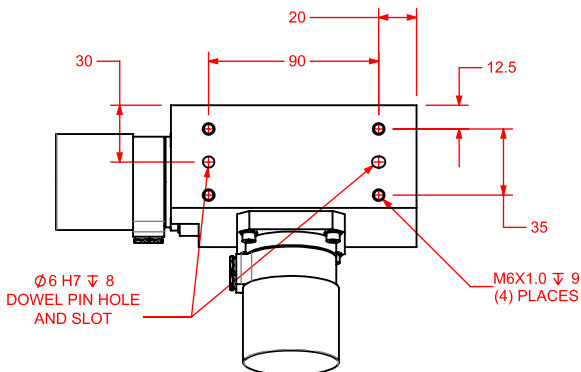
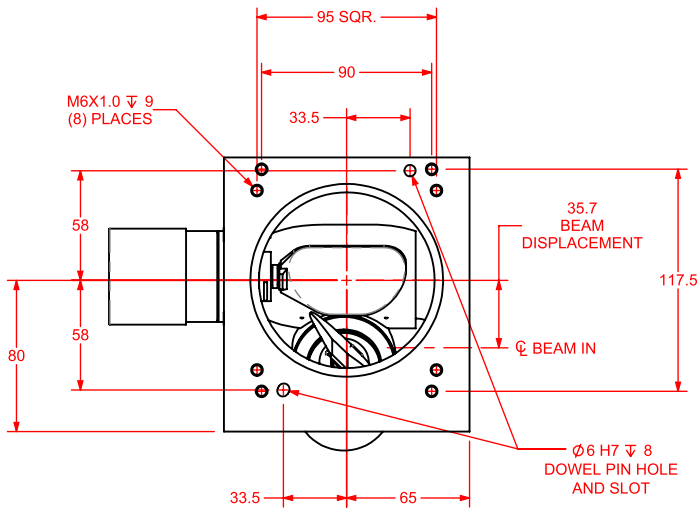
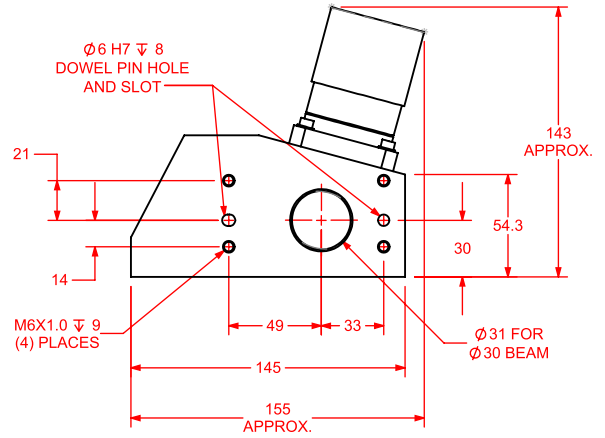
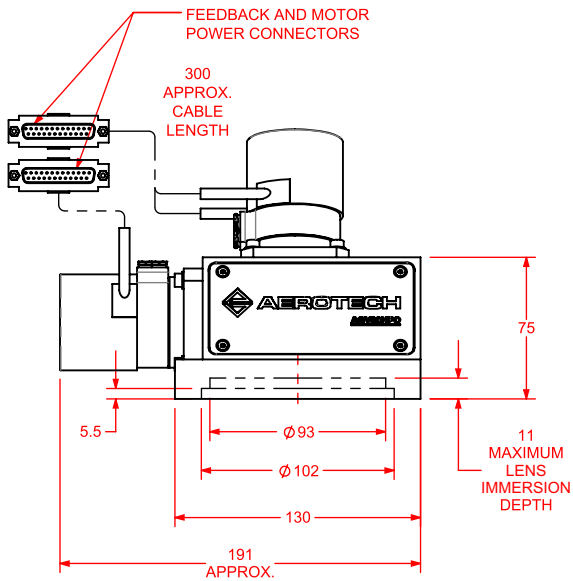
Ø 6.6 DRILL THRU Ø 11 C'BORE AS SHOWN () PLACES



SIDE VIEW
 (-MP) MOUNTING PLATE &
 NO COOLING OPTIONS

Nmark AGV30HP(0) DIMENSIONS

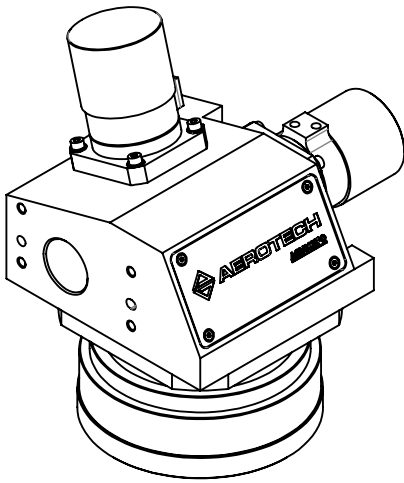
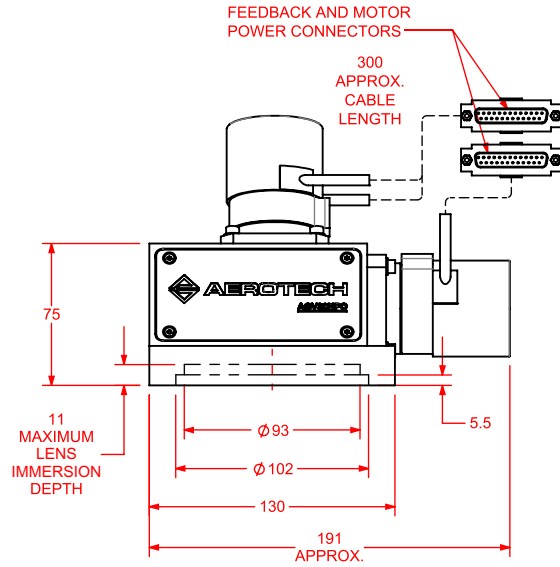
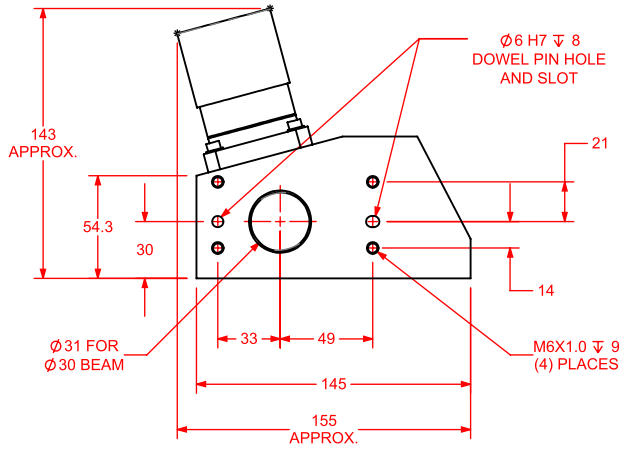
AGV30HP0-BE1



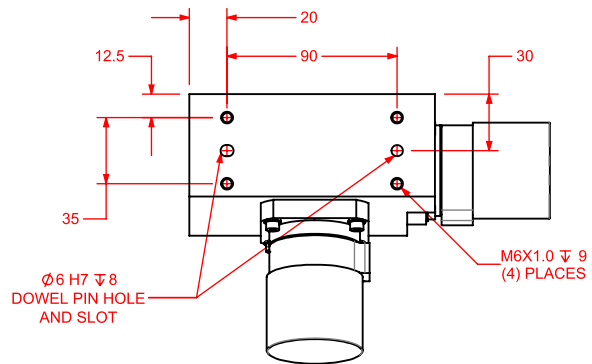
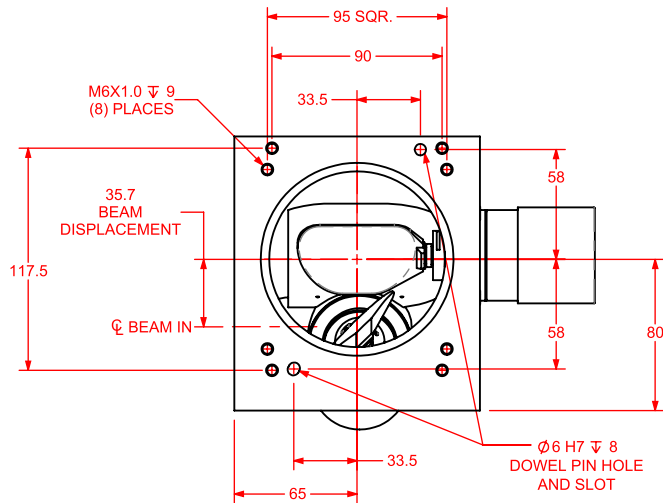
(-L3) F-THETA LENS

Nmark AGV30HP(O) DIMENSIONS

AGV30HP0-BE2



(-L3) F-THETA LENS



DIMENSIONS: MILLIMETERS

Nmark AGV-HP(O) ORDERING INFORMATION

AGV-HP(O) Series Galvanometer Scanner

AGV10HP(O)	2-axis galvanometer scanner with 10 mm diameter beam aperture and integral high-precision feed back
AGV14HP(O)	2-axis galvanometer scanner with 14 mm diameter beam aperture and integral high-precision feed back
AGV20HP(O)	2-axis galvanometer scanner with 20 mm diameter beam aperture and integral high-precision feed back
AGV30HP(O)	2-axis galvanometer scanner with 30 mm diameter beam aperture and integral high-precision feed back

Housing Type (Required)

-	Closed scanner housing (AGVxxHP)
O	Open scanner housing (AGVxxHPO)

Beam Entry (Required)

-BE1	Right-side laser beam entry (standard)
-BE2	Left-side laser beam entry

Wavelength of Mirror Coating (Required)

Option	AGV10HP(O)	AGV14HP(O)	AGV20HP(O)	AGV30HP(O)
-W1	-	-	10.6 μ m Wavelength Coating	
-W2 ⁶	Durable-Silver Coated Mirrors, 450 nm - 10.6 μ m	-	-	-
-W3		1552 nm Wavelength Coating		-
-W4		1064 nm Wavelength Coating		-
-W5		1030 nm Wavelength Coating		-
-W6		532 nm Wavelength Coating		-
-W7		515 nm Wavelength Coating		-
-W8		355 nm Wavelength Coating		-
-W9	-	343 nm Wavelength Coating		-
-W10		1064, 532, and 355 nm Tri-Band Wavelength Coating		-
-W11	1030, 515, and 343 nm Tri-Band Wavelength Coating		-	-

Notes:

1. Custom coatings available. Contact factory for details.
2. -W2 (Durable-Silver) option only available with AGV10HP(O)-BE1.
3. -W4 (1064 nm) option not available with AGV30HP(O)-BE2.
4. -W9 (343 nm) and -W11 (1030/515/343 nm) options not available with -BE2.
5. AGV20HP(O)-BE2 only available with -W1 (CO2), -W4 (1064 nm), and -W6 (532 nm) options.
6. Limited operating power.

Nmark AGV-HP(O) ORDERING INFORMATION

F-Theta Lenses Available (Optional)^(1, 2)

-Lxx See Table 1: F-Theta Lenses Available

Mounting Plate (Optional)

-MP Mounting plate

Note: -MP option is only available with closed scanner housing (AGVxxHP) models.

Air Cooling (Optional)

-AC Air cooling

Note: Air cooling only available on closed housing models.

Water Cooling (Optional)

-WC Water cooling

Note: Water cooling only available on closed housing models.

Performance Grade (Required)

-PL0 Standard performance grade

-PL9 Ultra performance grade

Integration (Required)

Aerotech offers both standard and custom integration services to help you get your system fully operational as quickly as possible. The following standard integration options are available for this system. Please consult Aerotech if you are unsure what level of integration is required, or if you desire custom integration support with your system.

-TAS Integration - Test as system
Testing, integration, and documentation of a group of components as a complete system that will be used together (ex: drive, controller, and stage). This includes parameter file generation, system tuning, and documentation of the system configuration.

-TAC Integration - Test as components
Testing and integration of individual items as discrete components that ship together. This is typically used for spare parts, replacement parts, or items that will not be used together. These components may or may not be part of a larger system.

Lens Mounting Adapters (to be ordered as separate line item)

LM10HP-XXX Lens mount adapter for AGV10HP(O); standard versions support the lens configurations offered by Aerotech; custom versions available on request

LM14HP-XXX Lens mount adapter for AGV14HP(O); standard versions support the lens configurations offered by Aerotech; custom versions available on request

LM20HP-XXX Lens mount adapter for AGV20HP(O); standard versions support the lens configurations offered by Aerotech; custom versions available on request

LM30HP-XXX Lens mount adapter for AGV30HP(O); standard versions support the lens configurations offered by Aerotech; custom versions available on request

Nmark AGV-HP(O) ORDERING INFORMATION

Table 1: F-Theta Lenses Available (Optional)^(1, 2)

Wavelength	Focal Length	AGV10HP(O)	AGV14HP(O)	AGV20HP(O)	AGV30HP(O)
10.6 μm	100 mm Telecentric	-	-	10.6 μm Wavelength 100 mm Focal Length 38.6 x 38.6 mm FOV Telecentric (-L1)	-
	160 mm	-	-	10.6 μm Wavelength 160 mm Focal Length 76.0 x 76.0 mm FOV Non-Telecentric (-L2)	-
	255 mm	-	-	10.6 μm Wavelength 255 mm Focal Length 163.8 x 163.8 mm FOV Non-Telecentric (-L3)	10.6 μm Wavelength 255 mm Focal Length 104.4 x 104.4 mm FOV Non-Telecentric (-L1)
1552 nm	100 mm Telecentric	1552 nm Wavelength 100 mm Focal Length 55.2 x 55.2 mm FOV Telecentric (-L1)	1552 nm Wavelength 100 mm Focal Length 49.4 x 49.4 mm FOV Telecentric (-L3)	-	-
	163 mm Telecentric	1552 nm Wavelength 163 mm Focal Length 93.8 x 93.8 mm FOV Telecentric (-L2)	1552 nm Wavelength 163 mm Focal Length 93.8 x 93.8 mm FOV Telecentric (-L4)	-	-
1064 nm	100 mm	1064 nm Wavelength 100 mm Focal Length 66.9 x 66.9 mm FOV Non-Telecentric (-L3) [3]	1064 nm Wavelength 100 mm Focal Length 37.0 x 37.0 mm FOV Non-Telecentric (-L5) [3]	-	-
	100 mm Telecentric	1064 nm Wavelength 100 mm Focal Length 69.8 x 69.8 mm FOV Telecentric (-L4) [3]	1064 nm Wavelength 100 mm Focal Length 61.6 x 61.6 mm FOV Telecentric (-L6) [3]	1064 nm Wavelength 100 mm Focal Length 44.0 x 44.0 mm FOV Telecentric (-L4)	-
	160 mm	1064 nm Wavelength 160 mm Focal Length 107.6 x 107.6 mm FOV Non-Telecentric (-L5) [3]	1064 nm Wavelength 160 mm Focal Length 78.4 x 78.4 mm FOV Non-Telecentric (-L7) [3]	-	-
	163 mm	-	-	1064 nm Wavelength 163 mm Focal Length 72.4 x 72.4 mm FOV Non-Telecentric (-L5) [3]	-
	163 mm Telecentric	1064 nm Wavelength 163 mm Focal Length 92.0 x 92.0 mm FOV Telecentric (-L6)	1064 nm Wavelength 163 mm Focal Length 85.2 x 85.2 mm FOV Telecentric (-L8)	1064 nm Wavelength 163 mm Focal Length 71.6 x 71.6 mm FOV Telecentric (-L6)	-
	170 mm	-	1064 nm Wavelength 170 mm Focal Length 110.8 x 110.8 mm FOV Non-Telecentric (-L9) [3]	-	-
	200 mm	-	-	-	1064 nm Wavelength 200 mm Focal Length 68.0 x 68.0 mm FOV Non-Telecentric (-L2) [3]
	255 mm	-	-	1064 nm Wavelength 255 mm Focal Length 154.2 x 154.2 mm FOV Non-Telecentric (-L7) [3]	1064 nm Wavelength 255 mm Focal Length 91.6 x 91.6 mm FOV Non-Telecentric (-L3) [3]
	500 mm	-	-	-	1064 nm Wavelength 500 mm Focal Length 233.2 x 233.2 mm FOV Non-Telecentric (-L4)
1030 nm	100 mm Telecentric	1030 nm Wavelength 100 mm Focal Length 41.6 x 41.6 mm FOV Telecentric (-L7)	1030 nm Wavelength 100 mm Focal Length 34.8 x 34.8 mm FOV Telecentric (-L10)	-	-
	163 mm Telecentric	1030 nm Wavelength 163 mm Focal Length 92.0 x 92.0 mm FOV Telecentric (-L8)	1030 nm Wavelength 163 mm Focal Length 85.0 x 85.0 mm FOV Telecentric (-L11)	-	-

Nmark AGV-HP(O) ORDERING INFORMATION

Table 1: F-Theta Lenses Available (Optional)^(1, 2)

Wavelength	Focal Length	AGV10HP(O)	AGV14HP(O)	AGV20HP(O)	AGV30HP(O)
532 nm	100 mm	532 nm Wavelength 100 mm Focal Length 57.2 x 57.2 mm FOV Non-Telecentric (-L9) [3]	-	-	-
	100 mm Telecentric	532 nm Wavelength 100 mm Focal Length 64.6 x 64.6 mm FOV Telecentric (-L10) [3]	532 nm Wavelength 100 mm Focal Length 57.0 x 57.0 mm FOV Telecentric (-L12) [3]	-	-
	160 mm	532 nm Wavelength 160 mm Focal Length 107.0 x 107.0 mm FOV Non-Telecentric (-L11) [3]	532 nm Wavelength 160 mm Focal Length 77.2 x 77.2 mm FOV Non-Telecentric (-L13) [3]	-	-
	163 mm Telecentric	532 nm Wavelength 163 mm Focal Length 79.6 x 79.6 mm FOV Telecentric (-L12)	532 nm Wavelength 163 mm Focal Length 66.0 x 66.0 mm FOV Telecentric (-L14)	-	-
	170 mm	-	532 nm Wavelength 170 mm Focal Length 103.8 x 103.8 mm FOV Non-Telecentric (-L15) [3]	-	-
	255 mm	-	-	532 nm Wavelength 255 mm Focal Length 148.0 x 148.0 mm FOV Non-Telecentric (-L8) [3]	-
515 nm	100 mm Telecentric	515 nm Wavelength 100 mm Focal Length 41.4 x 41.4 mm FOV Telecentric (-L13)	515 nm Wavelength 100 mm Focal Length 34.6 x 34.6 mm FOV Telecentric (-L16)	-	-
	163 mm Telecentric	515 nm Wavelength 163 mm Focal Length 79.2 x 79.2 mm FOV Telecentric (-L14)	515 nm Wavelength 163 mm Focal Length 65.8 x 65.8 mm FOV Telecentric (-L17)	-	-
355 nm	53 mm Telecentric	355 nm Wavelength 53 mm Focal Length 17.2 x 17.2 mm FOV Telecentric (-L15)	355 nm Wavelength 53 mm Focal Length 8.2 x 8.2 mm FOV Telecentric (-L18)	-	-
	100 mm Telecentric	355 nm Wavelength 100 mm Focal Length 51.6 x 51.6 mm FOV Telecentric (-L16)	-	-	-
	160 mm	355 nm Wavelength 160 mm Focal Length 92.4 x 92.4 mm FOV Non-Telecentric (-L17)	-	-	-
	163 mm Telecentric	355 nm Wavelength 163 mm Focal Length 80.8 x 80.8 mm FOV Telecentric (-L18)	355 nm Wavelength 163 mm Focal Length 74.6 x 74.6 mm FOV Telecentric (-L19)	-	-
	255 mm	355 nm Wavelength 255 mm Focal Length 143.0 x 143.0 mm FOV Non-Telecentric (-L19)	355 nm Wavelength 255 mm Focal Length 119.4 x 119.4 mm FOV Non-Telecentric (-L20)	-	-
343 nm	53 mm Telecentric	-	343 nm Wavelength 53 mm Focal Length 8.0 x 8.0 mm FOV Telecentric (-L21)	-	-
	163 mm Telecentric	-	343 nm Wavelength 163 mm Focal Length 74.0 x 74.0 mm FOV Telecentric (-L22)	-	-
	255 mm	-	343 nm Wavelength 255 mm Focal Length 118.4 x 118.4 mm FOV Non-Telecentric (-L23)	-	-

Notes:

1. Input beam diameter is assumed to be equal to scan head entrance aperture at 1/e² Gaussian profile.
2. Reported field size is minimum achievable based on zero beam vignetting.
3. F-Theta lens is not recommended for use with short pulse lasers (ps and fs pulse durations). Please consult factory for lens options that are compatible with short pulse lasers.
4. Custom coatings available. Contact factory for details.