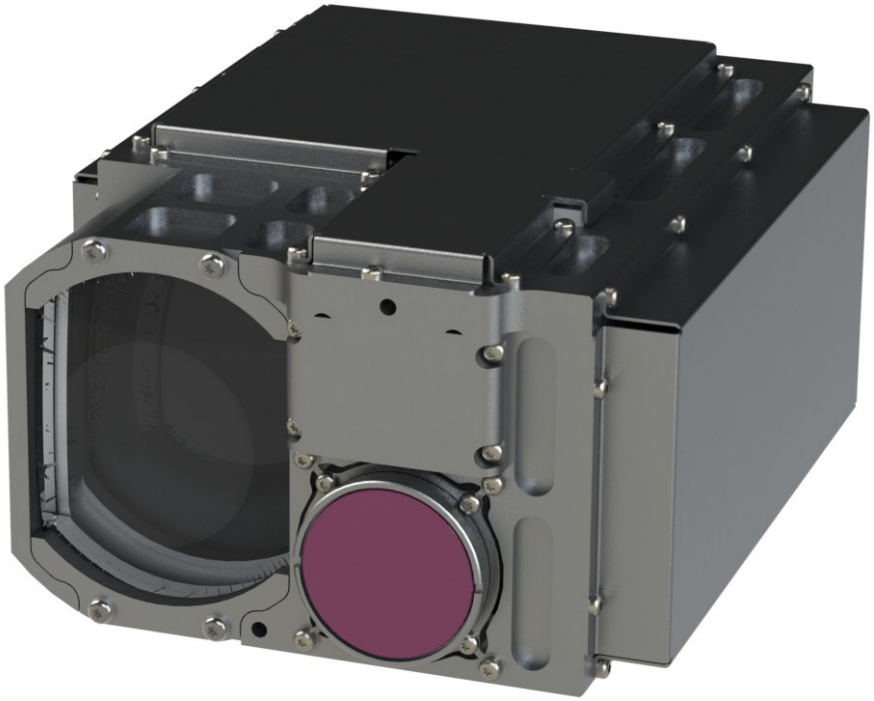
RangePRO Model HPCL-20K0 Laser Rangefinder Module



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$$P_R = \frac{P_L \times \mathbb{Z}^2 \times \delta \times D_L^2 \times A_t \times \cos\beta}{4 \times R^2 \times A_L}$$

RangePRO Model HPCL-20KO Laser Rangefinder Module

1 DESCRIPTION

The RangePRO Model HPCL-20KO is a compact OEM laser rangefinder module providing an advanced digital rangefinding capability for military, paramilitary and commercial applications. All assemblies are integrated onto a precision bore-sighted platform. It offers higher performance than the smaller HPCL-10KO model, while remaining a spatially economic package.

It integrates with host systems such as weapon, sensing, or surveillance and tracking stations, and thermal imaging cameras. It requires power and control command input, and provides range-to-target and self-diagnostic data output.

The HPCL-20KO ranges 30km at low repetition rates off a large target (at normal incidence) with albedo 0.6 under standard clear atmospheric conditions (extinction coefficient 0.038km^{-1}). Typical maximum range for a vehicle type target is 12km.

The transmitter is a collimated eye-safe laser system. It can provide ranging rates from single shot up to 1Hz with a duty cycle depending on ambient temperature.

The receiver incorporates an APD detector for maximum sensitivity.

The unit is an open frame construction type, unsealed for environmental purposes but enclosed for EM shielding.

Advanced digital signal processing techniques are employed to provide accurate, reliable ranging. Signals from the detector are digitally sampled. The samples are examined to determine all potential real target returns. If a valid target is detected within the user-set range gate it's range data is output, if more than one target is detected within the range gate the nearest or farthest may be selected for data output.

All signal and range computation is done "on the fly". Using this philosophy, the only task remaining after the sampling has expired is to transfer the range data through the serial port. Effectively the speed of the signal processing is limited only by the data output rate.

The system employs an adaptive range threshold to compensate for changing noise levels. The worst case for noise is when the system electronics are being operated at the high end of their temperature specification and when ranging is being performed in strong sunlight. The best case is the reverse situation. The adaptive range threshold feature results in more reliable ranging (fewer false alarms) when noise is elevated, and higher sensitivity (further ranging) when noise is reduced, thus maximising the system capability under varying conditions. The threshold is calculated on a "shot-by-shot" basis.

RangePRO laser rangefinder software is easily upgradeable, upgrades can be downloaded in the field via a PC.

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2 SYSTEM SPECIFICATIONS

Notation - use of brackets in tables: [*notes & qualifications*] (*units*).

2.1 System Performance

PARAMETER		SPECIFICATION
Control		
Control Functions		all control functions and range data via comms port
Ranging		
Laser Type		Nd:YAG/OPO
Wavelength (nm)		1,565 to 1,575 [1,570 nominal]
Output Energy [per pulse] (mJ)		nominally 8[1]
Beam Divergence [full angle; typical] (mrad)		<1
Beam Diameter [at exit] (mm)		23
Receiver Aperture [main] (mm)		equivalent 50mm
Detector [main]		APD with time variant gain
Range Read-out Limits (m) [factory selectable]	**min.**	100
	max.	30,000
Ranging Performance[2] [Std. Clear[3]; max.] (m)	**man [0.45x1.8m]**	> 7,500
	vehicle [2.3x2.3m]	12,000
	building [large]	26,000
Extinction Ratio[4] (dB)		45
Range Accuracy [typical] (m)		± 2 [4 rms over 10 shots]
Target Dis-crimination (m)	**Lateral [1m^2 targets @ 5,000m]**	≤ 10
	Axial [between 500 & 5,000m]	≤ 20
Ranging Rate (per minute)	**typical**	10
	max.[5]	1Hz for 15min with 5min cool down period

[1] Not exceeding allowable output to maintain laser Class 1M.
[2] Target albedo 0.3 @ 1,570nm.
[3] Standard clear atmosphere; extinction coefficient 0.038 km^{-1} @ 1,570nm (Beta Spec); sea level visibility = 23.5km.
[4] Target range 1000m; target albedo 100%; target size large; standard clear atmosphere; probability of detection 90%.
[5] At room temperature. An extended cool down period (TBD) will be required at high temperature.

$$P_R = \frac{P_L \times \mathbb{Z}^2 \times \delta \times D_L^2 \times A_t \times \cos\beta}{4 \times R^2 \times A_L}$$

PARAMETER	SPECIFICATION
Safety & Protection	
Laser Classification[6]	Class 1M
Visible Emission Filter	blocking
Visible Emission [@ ≥ 5m]	n/a [open frame]
Audible Emission [@ ≥ 5m]	n/a [open frame]
Support	
MTBF [ground mobile] (shots)	> 150,000
Operational Life (years)	10

2.2 Communications

PARAMETER	SPECIFICATION
Port(s)	one serial port [shared with power input]
Type	RS-422
Data Rate	19,200 or 9,600

2.3 Physical Characteristics

PARAMETER		SPECIFICATION
Mass [approx.] (g)		860
Dimensions (mm)	**length**	131
	width	107.75
	height	66.9
Mounting	**rear**	3-point rear mount, M4 heli-coil inserts (7.5mm deep); 2 x 3mm dia. holes for guide pins[7, 8]
	front	2 x tapped M3 holes (5.0mm deep)

[6] Australian/New Zealand Standard AS/NZS IEC 60825.1:2011 *Safety of Laser Products - Equipment classification and requirements*
[7] Some kinematic isolation is recommended to be provided by the installer.
[8] Tapped mounting holes and mechanical interface surfaces are electrically conductive.

2.4 Electrical Requirements

PARAMETER			SPECIFICATION
Supply Voltage [external] (Vdc)			9 to 36[9]
Current Drain @ 12VDc (A) [average]	**standby mode**		< 0.2
	firing	**at 0.2Hz**	< 0.6
		at 1Hz	< 1.5
	low power mode		< 0.02

2.5 Environmental

PARAMETER			SPECIFICATION
Temperature (°C)	**Operate[10]**	**min.[11]**	-32
		max.[12,13]	+65
	Survive	**min.[11]**	-40
		max.[12]	+85
Vibration and Shock[14]			MIL-STD-810F, ground mobile
EMI/EMC[14]			unit is enclosed in EM shield/cover
Altitude [operational] (ft)			25,000[15]

2.6 Connector/Pin Details

PARAMETER		SPECIFICATION
Power & Comms Connection: D-Sub Connector, Panel, Plug, 9 Way		
Pins	**1**	RS-422 Rx+ (LRF input)
	2	RS-422 Rx- (LRF input)
	3	[not used]
	4	RS-422 Tx+ (LRF output)
	5	RS-422 Tx- (LRF output)
	6	[not used]
	7	V in (+) (DC power)
	8	V in (-) (GND / 0V)
	9	[not used][16]

[9] Operation at 6 to 9Vdc may be supported but at reduced performance levels. Refer to manufacturer for details.
[10] With some performance degradation at temperature extremes. Refer to manufacturer for details.
[11] Without wind chill.
[12] Without solar radiation.
[13] Limited operation at higher temperature with further degradation of performance.
[14] Refer to manufacturer for details.
[15] Limited operation at altitudes >5,000ft. Refer to manufacturer for details.
[16] Optional signal provided on customer request. Refer to manufacturer for details.

3 OUTLINE DRAWING

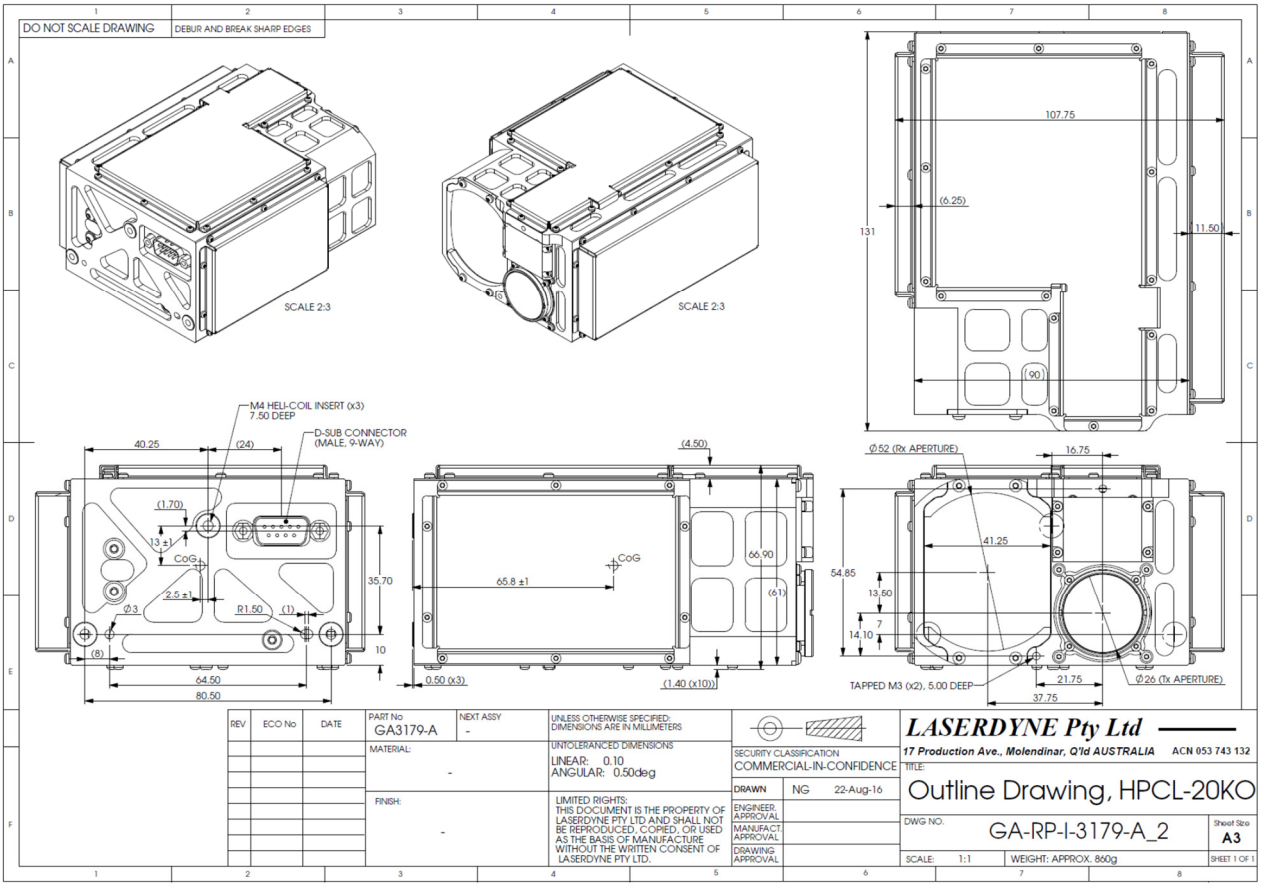

Figure 3-1: Outline Drawing

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