Gurley Series VL18 Virtual Absolute Encoder

Motion Type:

Linear

Usage Grade:

Industrial

Output:

*Virtual Absolute

Max Resolution:

*1.0 um or 1/4 um

*With appropriate electronics

Built in Testing - Absolute Output

The **Model VL18** combines the opto-mechanical simplicity and ruggedness of an incremental encoder with the interfacing ease of an absolute encoder. Utilizing Gurley's unique *Virtual Absolute* technology, the **VL18** system is less expensive and more reliable than any conventional absolute encoder of comparable resolution and accuracy. Compared with an incremental encoder, the **VL18** system provides greater system reliability and minimizes homing time.

- 1-µm resolution over 1 meter of travel, or ¼-µm resolution over 250 mm.

- Three accuracy grades available

- LED illumination for long life (>100,000 hours)

- Differential photo-detectors for stable signals

- Small number of wires from the encoder

- Differential output for noise immunity

ingenuity@work®

GPI

	See Note	Option 1	Option 2
Scale pitch, µm	1	32	64
Initialization distance, mm (in)		0.480 (0.019)	0.768 (0.030)
Code length, bits		15	12
Final resolution, µm	1	1	0.25
Max. measuring length, mm		1038	252
Interpolating Decoder to use		**VB**	**VF**
Maximum operating speed, mm/s (in/s)	3	1000 (40)	600 (24)
Accuracy (at 20°C), µm (µin)	2	Grade A: ±3 (±120) Grade B: ±5 (±200) Grade C: ±10 (±400)	
Weight, kg (lb)		0.4 + 0.6/m (0.9 + .03/in)	
Driving force, N (oz)		1.5 (6)	
Operating temperature, °C (°F)		0 to 50 (32 to 122)	
Humidity, % rh, non-condensing		98	
Shock		50 g, 11 ms	
Vibration		15 g, 0-2000 Hz	
Sealing		IP54	
Read Head support		precision ball bearings	

NOTES:

1. These line counts provides 1 µm resolution after interpolation in the **Model VB** Interpolating Decoder, or ¼ µm with the **VF**. By using other line counts, the system can provide resolutions such as 50 µinches. Consult factory for details.

2. This is the total encoder error from all sources. Error is defined at the signal transitions and therefore does not include quantization error, which is ±1/2 quantum. ("Quantum" is the final resolution of the encoder.) Accuracy is guaranteed at 20°C.

3. This is the maximum speed for full accuracy.

As part of our continuing product improvement program, all specifications are subject to change without notice.

GPI

iNPUT POWER
+5Vdc @180 mA max, available from **VB** or **VF** interpolating decoder. Separate power supply is not required. See **VB** or **VF** data sheet.

OUTPUT WAVEFORMS
Differential buffered sinusoids, 750 mV p-p.

THEORY OF OPERATION- SHORT VERSION
Virtual Absolute (VA) discs and scales are similar to incremental discs and scales in that they contain a cyclic track and an index track. In an incremental encoder, the index occurs at one place in the full travel, but in a *VA* encoder, the index track is a continuous serial code (similar in appearance to a bar code). You don't know position immediately upon start-up, as you do in a conventional absolute, but after a very short travel*, in either direction and starting from anywhere*, you know exactly where you are. In the **VL18**, this initialization distance is 1.93°. From then on, the encoder is truly absolute. (There are ways to build a pseudorandom encoder so that absolute information is available on power-up without initializing, but these techniques require far more complex sensing hardware; they often impose slower operation as well. And none of them offers the sophisticated built-in testing of GPI's *Virtual Absolute* technology.)

To complete the system, the **VL18** is used with one of Gurley's **Interpolating Decoders**. The size of a credit card, it contains patented high-speed circuitry to decode the special serial index track and interpolation to increase the final resolution. In addition to the natural binary position output, a *Status* bit is provided to tell you when the encoder is initialized. This bit is at a logic high whenever the initializing motion is not yet complete, or when some other problem such as supply voltage interruption, electrical noise, damage, or fouling of the disc interferes with the proper code sequence from the index track. When these self-tests are all satisfied, the status bit is low, indicating the position data output is valid.

Final resolution depends on which version of interpolating decoder is used. With the Model **VB**, final resolution is 16 bits (65,536) measuring steps/rev. With the Model **VF**, final resolution is 19 bits (524,288) measuring steps/rev, but the max speed is lower. Please refer to the **Model VB** or **VF** data sheet for complete details.

ELECTRICAL CONNECTIONS

| Output Functions	Wire Colors Conn. Code **P**	Pin #, DA-15P Conn. Code **Q**	Pin #, DE-15P Conn. Code **R**	Pin #, AMP 102387-1 Conn. Code **V**
SIN	Yellow	8	8	4
/ SIN	Brown	7	7	3
COS	Green	5	5	2
/ COS	Orange	4	4	1
IND	Blue	2	2	5
/ IND	White	1	1	6
+V	Red	10	10	7
COMMON	Black	13	13	8
CASE	Bare (shield) *	9	9	10

* The bare wire (shield) is connected to the encoder case.

Use connector code **V** if the encoder will be connected to a **VB** or **VF** interpolating decoder.

Use connector code **R** if there will be a **CAX###** extension cable between the encoder and the **VB** or **VF** interpolating decoder.

Use connector code **Q** if the encoder will be connected to a Model **DVL** display unit. (The **VB** or **VF** interpolating decoder is inside the DVL.)

GPI
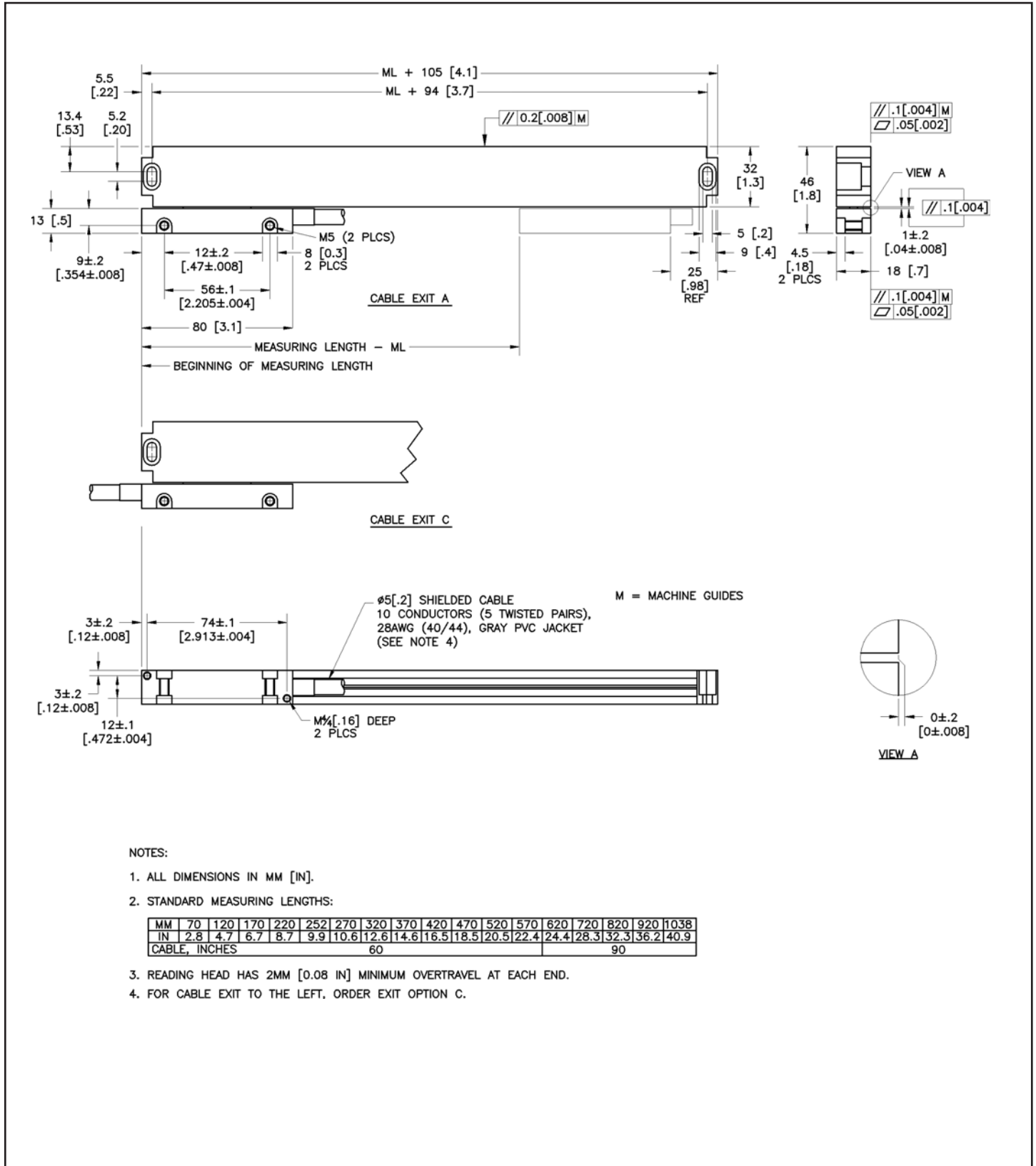
NOTES:

1. ALL DIMENSIONS IN MM [IN].

2. STANDARD MEASURING LENGTHS:

MM	70	120	170	220	252	270	320	370	420	470	520	570	620	720	820	920	1038
IN	2.8	4.7	6.7	8.7	9.9	10.6	12.6	14.6	16.5	18.5	20.5	22.4	24.4	28.3	32.3	36.2	40.9
CABLE, INCHES						60									90		

3. READING HEAD HAS 2MM [0.08 IN] MINIMUM OVERTRAVEL AT EACH END.

4. FOR CABLE EXIT TO THE LEFT, ORDER EXIT OPTION C.

VL18H
Page 4 of 5
V3.1

GPI

VL18   ACC   SCALE   CODE   FORMAT   MEAS   EXIT   TYPE   CAB   CONN   SPEC

☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

ACC	A	±3 µm
	B	±5 µm
	C	±10 µm
SCALE	**0032M**	32-µm pitch (use with CODE = 15; order **VB** electronics)
	0064M	64-µm pitch (use with CODE = 12; order **VF** electronics)
CODE	**15**	Code length = 2^{15} (use with SCALE = 0032M)
	12	Code length = 2^{12} (use with SCALE = 0064M)
FORMAT	**M**	Differential analog output
MEAS	**####**	Measuring length, mm (see drawing note 2)
EXIT	**A**	Right cable exit (standard)
	C	Left cable exit
TYPE	**S**	Shielded cable (standard)
	A	Armored cable
CAB	**##**	Cable length, inches
	60	Standard for MEAS ≤ 0570
	90	Standard for MEAS > 0570
CONN	**V**	Amp 102387-1; use to connect encoder cable to **VB** or **VF** Interpolating Decoder
	R	DE-15P; use if there will be a **CAX###** extension cable between the **VL18** and **VB** or **VF**
	Q	DA-15P; use with Model **DVL** Display Unit
	P	Pigtails; no connector
SPEC	**#**	Issued at time of order to cover special customer requirements
	N	No special features

ACCESSORIES (order separately)

VB	Interpolating decoder; use with **VL18x0032M…** See separate data sheet
VF	Interpolating decoder; use with **VL18x0064M…** See separate data sheet
CAX###	Extension cable assembly, ### inches long. (enc. cable + ext. cable = 600 max)

SPECIAL CAPABILITIES

For special situations, we can optimize catalog encoders to provide higher frequency response, greater accuracy, wider temperature range, reduced torque, non-standard line counts, or other modified parameters. In addition, we regularly design and manufacture custom encoders for user-specific requirements. These range from high-volume, low-cost, limited-performance commercial applications to encoders for military, aerospace and similar high-performance, high-reliability conditions. We would welcome the opportunity to help you with your encoder needs.

WARRANTY

Gurley Precision Instruments offers a limited warranty against defects in material and workmanship for a period of one year from the date of shipment.

Gurley Precision Instruments
514 Fulton Street
Troy, NY 12180 U.S.A.
(800) 759-1844, (518) 272-6300, fax (518) 274-0336,
Online at www.gurley.com, e-mail: info@gurley.com

GPI