Autotech Controls
Rotary Position Transducers
SAC-RL220-G010x
Instruction & Operation Manual

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Rotary Position Transducers

Geared Single Turn Resolver
SAC-RL220-G010x

Instruction Manual

Resolvers

Rugged and Reliable

The resolver is a highly accurate and highly dependable device for absolute position shaft encoding. Resolvers have a reliable track record of applications in aerospace, military, and industry, where they have been used for decades for position sensing. Some of the common applications are radar antenna position sensing, missile guidance systems, NC machine position feedback, automotive stamping presses, 2 piece can-manufacturing presses and packaging machines. The resolver is designed to operate reliably under extremely hostile environments such as continuous mechanical shock, vibration, extreme temperature and humidity changes, oil mist, coolants and solvents.

The resolver is a passive transducer. It is a brushless rotary transformer with one rotor and two stator windings. The stator windings are electrically 90 degrees out of phase with each other. As the shaft rotates, the relative position of the rotor and the stator windings change. Either the rotor or the two stator windings together can be used as the primary of the rotary transformer and the secondary will then produce an analog voltage corresponding to the shaft position.

RL220 Resolver

Autotech's Model RL220 resolver is the most rugged resolver in the industry today. These resolvers operate with extreme reliability in highly demanding applications in automotive, can-manufacturing and packing industries. Rugged industrial housing, heavy duty double row ball bearing, and an internal flexible coupling lend to an extremely reliable design.

Built-in gear train for multi-turn application

Various resolver models from Autotech are available with a built-in precision gear train. The resolver makes 1 turn for many turns of the input shaft. (Contact the factory for special gear ratios.)

Electrical Specifications:
Frequency: 2250 Hz
Input voltage: 1.88 V
Input current: 6 mA
Input power: 6.5 mW watts
Rotor impedence with stator
open circuit Z_{ro}: 180 + j256 ohms

DC resistance (Rotor): 18.3 ohms
Output voltage (Stator): 2.63 V± 5%
Transformation ratio: 1.400

Mechanical:			
Specification	Condition	SAC-RL220	Unit
Housing Size		Size 40 (4.0" dia)	
Max. StartingTorque	@ 25° C	8	oz-in
Moment of Inertia		45	gm/cm²
Max. Slew Speed		5,000	RPM
Shaft Size		5/8	inch
Max. Shaft Loading	*Axial* *Radial*	50 100	lbs lbs
Bearing life	@Max. Mfr. Spec	$2x10^9$	Revolutions
Approx. Weight		6	lbs
Environmental			
Shock:	for 11 mSec	200	g
Vibrations		20 g to 2.000 Hz	g to Hz
Operating Temperature:		– 67° to 248°	F
Storage Temperature		–85° to 302°	F
Enclosure:		NEMA 13	

Mounting

Autotech resolvers are designed to operate reliably under extremely hostile environments such as continuous mechanical shock, vibration, extreme temperature and humidity changes, oil mist, coolant and solvents. Still ordinary precautions to prevent damage to bearings of any rotation device should be followed to prolong their life.

1. It is recommended that the Autotech encoder mounting bracket (MMB-EN359-010) be used, wherever possible, for size 40 resolvers.

2. If the resolver is to be axially shaft driven, be sure that the shafts are aligned. Misaligned shafts can destroy resolver bearings.

3. If a pulley, coupling or sprocket is mounted to the resolver shaft, DO NOT hammer or press on the shaft. DO NOT force fit anything onto or off from the resolver shaft.

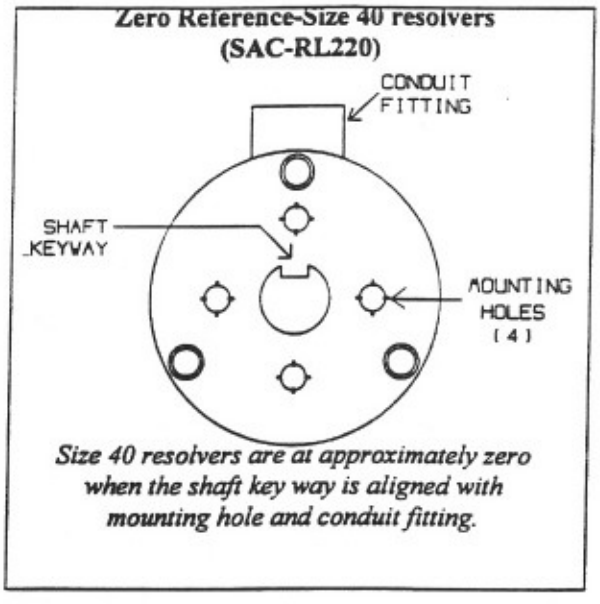
4. If the resolver is belt-driven or chain-driven, do not overtighten the drive belt or chain. Too much side loading (Radial) can destroy the resolver bearings.

5.To maintain the NEMA 13 rating of the resolver, the following precautions must be taken:

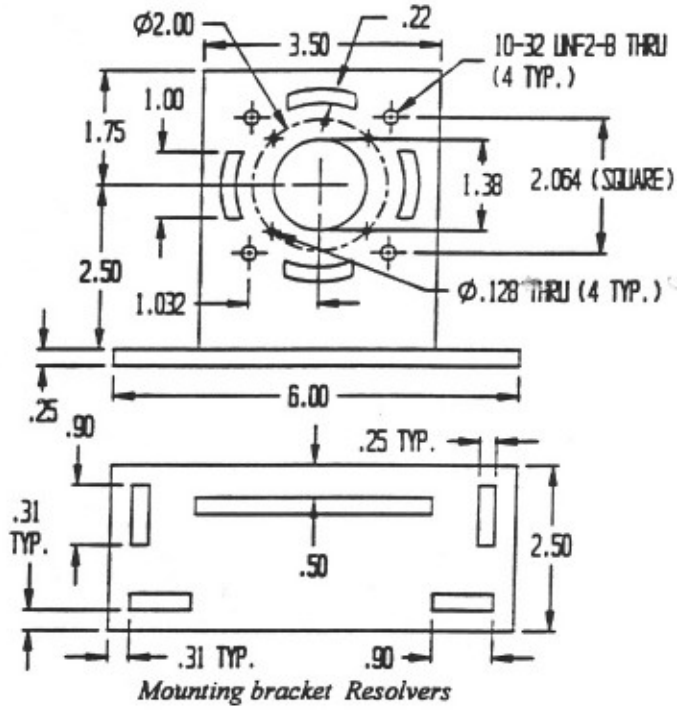
a) Sealing compound must be used when fitting the conduit pipe.

b)The bearing seal must be checked once every six months and replaced if necessary. Lubricating the bearing seal periodically prolongs its life.

6. Zero Reference: For most resolver types, the approximately zero reference may be located by aligning the shafts as shown in the figures below:



Size 40 resolvers are at approximately zero when the shaft key way is aligned with mounting hole and conduit fitting.



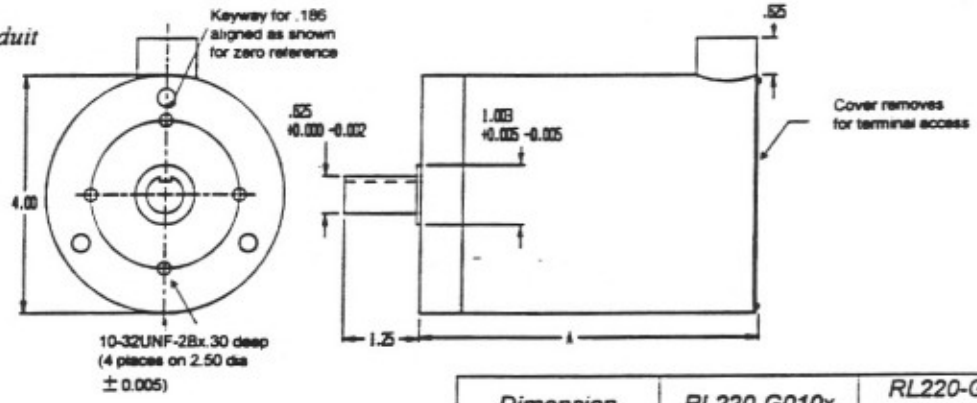
Mounting bracket Resolvers

Outline Dimensions

The outline dimensions of the resolvers are shown in the following diagrams.

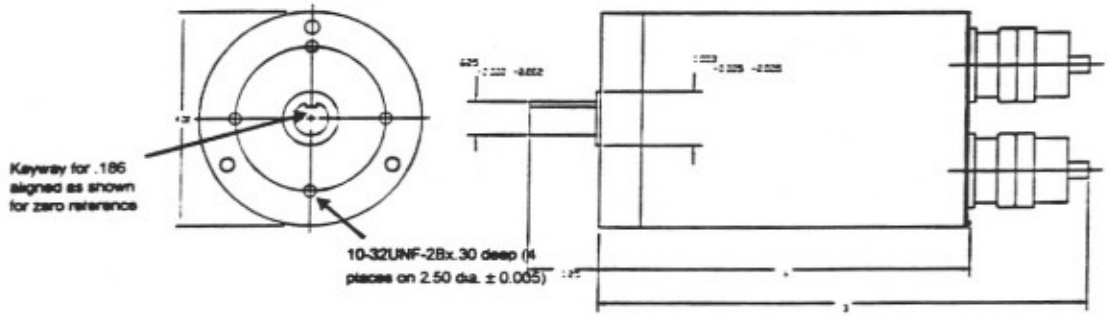
Size 40 *Resolvers* SAC-RL220

Resolver with conduit



Dimension	RL220-G010x	RL220-G036 /G1:2/G1:4
A	6.50"	8.91"
B	8.60"	11.01"

Resolver with end connector



Wiring

Grounding and Shielding

1. Resolver wiring must be done using twisted pairs in cable with an overall foil shield. The twisted pairs must be wired as per wiring instructions. See "How to Order" section for suitable cable offered by Autotech.
2. It is recommended that the shielded resolver cable be routed in its own conduit or cable tray.
3. All shielded resolver cable must be kept at a minimum distance of 2 inches from all high voltage or inductive wiring.
4. All shielded resolver cable must be kept at a minimum distance of 12 inches from all motor wiring controlled by AC or DC drives.
5. All ground planes (chassis grounds) in the total system must be held to the same RF potential, by good metallic connections to building frames, conduit or wiring trays.
6. **The shield drain** wires may be terminated in one of two ways.
   a) Connect to chassis ground at each end and not connected to signal reference at any point in the system.
   b) Connect to signal reference at the decoder only. The shield drain should remain unconnected at the resolver end and the shield should not touch earth ground at any point in its run.

NOTE: Resolvers with MS connectors have shield drain wire pre-terminated for method a).

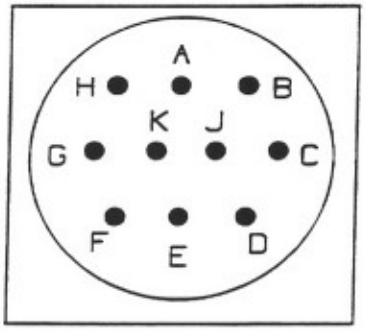
Method a) is recommended for all Autotech products. In certain circumstances, in unusual EMI conditions, method b) may be necessary after consulting factory.

Wiring Table for SAC-RL220-Gxxxx Resolvers						
CBL-10T22-xxxx Wire Colors		Function	Resolver with Terminials SAC-RL220-GxxxC		Resolver with 2MS Connector SAC-RL220-GxxxM	
					Conn. A Pin #	Conn. B Pin #
Black/Green	*Twisted*	R1 Rotor	1	7	F	F
Green	*Pair*	R2 Rotor	2	8	E	E
Black/Yellow	*Twisted*	S1 Stator	3	9	D	D
Yellow	*Pair*	S3 Stator	5	11	C	C
Black/Blue	*Twisted*	S2 Stator	4	10	B	B
Blue	*Pair*	S4 Stator	6	12	A	A
Shield		Case Ground	GND (Green Screw)	GND (Green Screw)	G	G

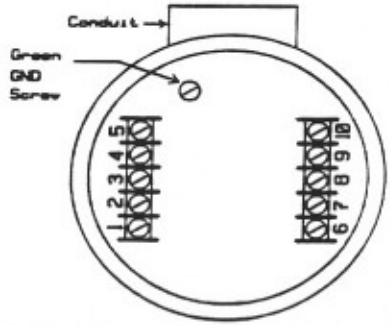
Notes:
1. Black/Green indicates a black wire with green stripes
2. An overall foil shielded cable with twisted pairs (such as Autotech's cable CBL-10T22-xxx) must be used for wiring the unit. The pairs must be formed as follows: S1 & S3, S2 & S4, R1 & R2
3. MS connector: MS3112E-12-10P: Mating connector: MS3116F-12-10S (Autotech part number: ECM-10REC-ITT)
4. MS connector is not available with E8R series

For **SAC-RL220-G010S**, wiring table on following page.

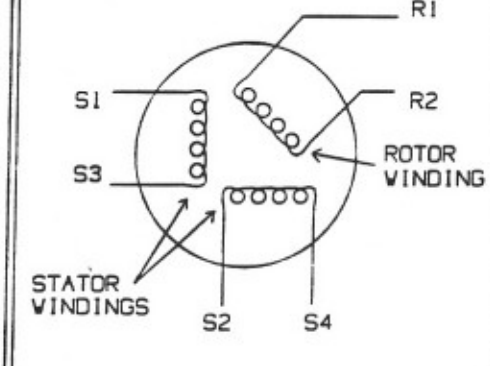
MS connector on a single turn resolver



Terminal Block on a Geared Single Turn Resolver

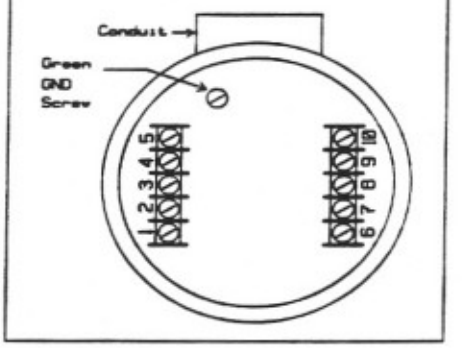


Resolver Windings

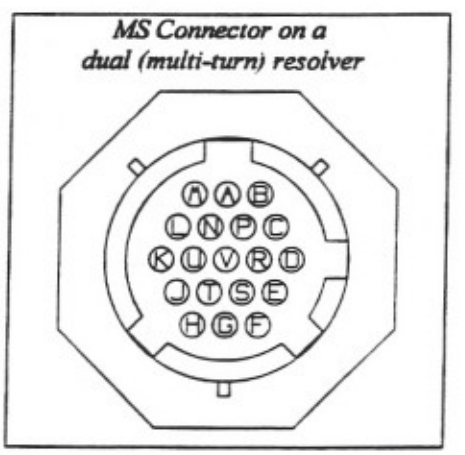


Wiring Table for SAC-RL220-GxxxS Resolver		
Function	Resolver Terminal	Resolver Pin Number SAC-RL220-G010S
CR1 Rotor	1	A
CR2 Rotor	2	B
CS1 Stator	3	C
CS3 Stator	5	E
CS2 Stator	4	D
CS4 Stator	6	F
FS1 Stator	9	H
FS3 Stator	11	L
FS2 Stator	10	K
FS4 Stator	12	M
FR1 Rotor	7	N
FR2 Rotor	8	P
Case Ground	GND (Green Screw)	S

Terminal Block on a dual (multi-turn) resolver



MS Connector on a dual (multi-turn) resolver



How to Order

Geared Single-Turn Resolver

Size 40, NEMA 13 Resolvers

SAC-RL220-G010M	Dual resolver package with 1:1 gear train built in, size 40 housing, 5/8" shaft diameter, heavy duty bearing, and two separate 10-pin military connectors on the end.**(Requires two cables with 10-pin connector)**
SAC-RL220-G010C	Dual resolver package with 1:1 gear train built in, size 40 housing, 5/8" shaft diameter, heavy duty bearing, and terminal block connections through conduit and removable back plate (to access terminal blocks)**(Requires two cables without connector)**
SAC-RL220-G010S	Dual resolver package with 1:1 gear train built-in, size 40 housing, 5/8" shaft diameter, heavy duty bearing, and one 19-pin military connector on the side (through conduit) **(Requires 6 twisted pairs, overall foil shielded cable — customer supplied)**
SAC-RL220-G036M	Dual resolver package with both resolvers geared down 36:1 (36 turns of shaft = 1 turn of resolver), size 40 housing, 5/8" shaft diameter, heavy duty bearing and two separate 20-pin military connectors on the end (requires two cables with 10-pin connectors)
SAC-RL220-G1:2M	Dual resolver package with both resolvers geared up 2:1 (turn of shaft = 2 turns of resolver), size 40 housing, 5/8" shaft diameter, heavy duty bearing and two separate 10-pin military connectors on the end (requires two cables with 10-pin connectors)
SAC-RL220-G1:4M	Dual resolver package with both resolvers geared up 4:1 (turn of shaft = 4 turns of resolver), size 40 housing, 5/8" shaft diameter, heavy duty bearing and two separate 10-pin military connectors on the end (requires two cables with 10-pin connectors)

Accessories

Cables

CBL-10T22-x xxx — 22 AWG, 10 conductor (5 twisted pairs) overall foil shielded cable

Length in feet

Standard lengths are 010, 020, 050 feet and increments of 50 ft (Ex. 100,150, 200, etc.)

Connector

C: Without connector

M: With 10 pin MS connector (ECM-10REC-ITT) on one end

Couplings

CPL-005/8-5/8	5/8" to 5/8" flexible coupling

Mating Connector

ECM-10REC-ITT	10 pin Mating MS connector for single turn resolvers with MS connector (MS 3116F-12-10S)
ECM-19REC-ITT	19 pin Mating MS connector for single-turn resolvers with MS connector (MS3112E-14-19P)

Mounting Bracket

MMB-EN359-010	Mounting bracket for **size 25 & 40** resolvers

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Autotech Controls warrant their products to be free from defects in materials or workmanship for a period of one year from the date of shipment, provided the products have been installed and used under proper conditions. The defective products must be returned to the factory freight prepaid and must be accompanied by a Return Material Authorization (RMA) number. The Company's liability under this limited warranty shall extend only to the repair or replacement of a defective product, at The Company's option. The Company disclaims all liability for any affirmation, promise or representation with respect to the products.

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