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HEAVY DUTY ROTARY LIMIT SWITCHES

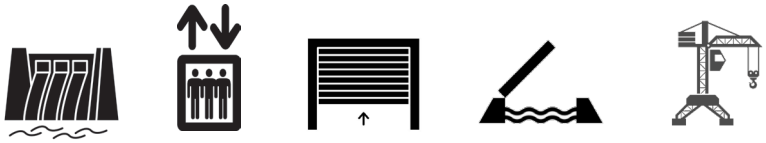
MR231 Geared Limit Switch with Encoder 4-20mA Feedback

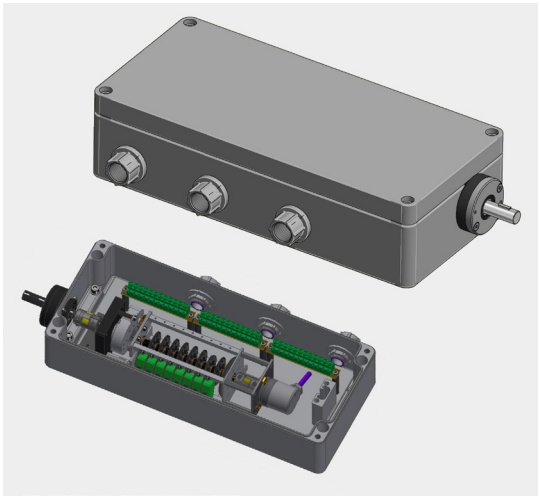
Questions?
Call +1-805-389-6600

MR220 SERIES

MICRONOR MR231 series Heavy Duty Geared Limit Switches are for use in the most demanding industrial control applications – dam gates, flood control channels, cranes, hoists, shields, bridges, etc. - where a limit switch with precision encoder-based 4-20mA position feedback is required.

The primary purpose of the switch is to control the intermediate or end limits of rotary or linear motion (when coupled to the shaft of a rope or wire drum). Each cam switch channel is independently programmable from 4°-356°. Wiring to the SPDT contacts and encoder output is easy via Phoenix COMBICON screw-down wiring blocks.





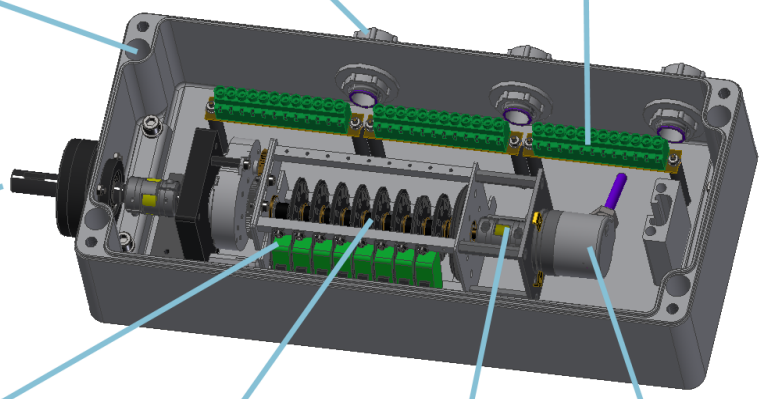
Features

- Compact design with heavy duty sealed bearings
- Precision 13-bit absolute encoder with programmable 4-20mA output
- Choice of 2, 4, 6 or 8 cam switch channels
- NEMA/UL 1/4/4X/IP66-rated die cast aluminum housing
- High torque Ø1/2" stainless steel shaft with #404 Woodruff Key
- Conduit hubs provided for direct use of ½" NPT conduit
- Modular, easy to replace, limit switches

Heavy Duty NEMA 1/4/4X corrosion resistant and watertight housing. Material is proprietary copper-free aluminum die cast housing with powder

3x Conduit Hubs and Sealing Plugs for use with standard 1/2" NPT conduit

Easy wiring to Phoenix COMBICON wiring blocks. Also supplied with pre-wired jumper.



High Strength Stainless Steel Shaft Ø1/2" with #404 Woodruff Key Slot. Woodruff Key supplied with unit.

UL approved micro switches are field replaceable using a slotted screwdrivver.

Double Cams are easily programmed with internally-stowed PSN cam programming tool.

0-360° Indicator Dial for ease of cam programming.

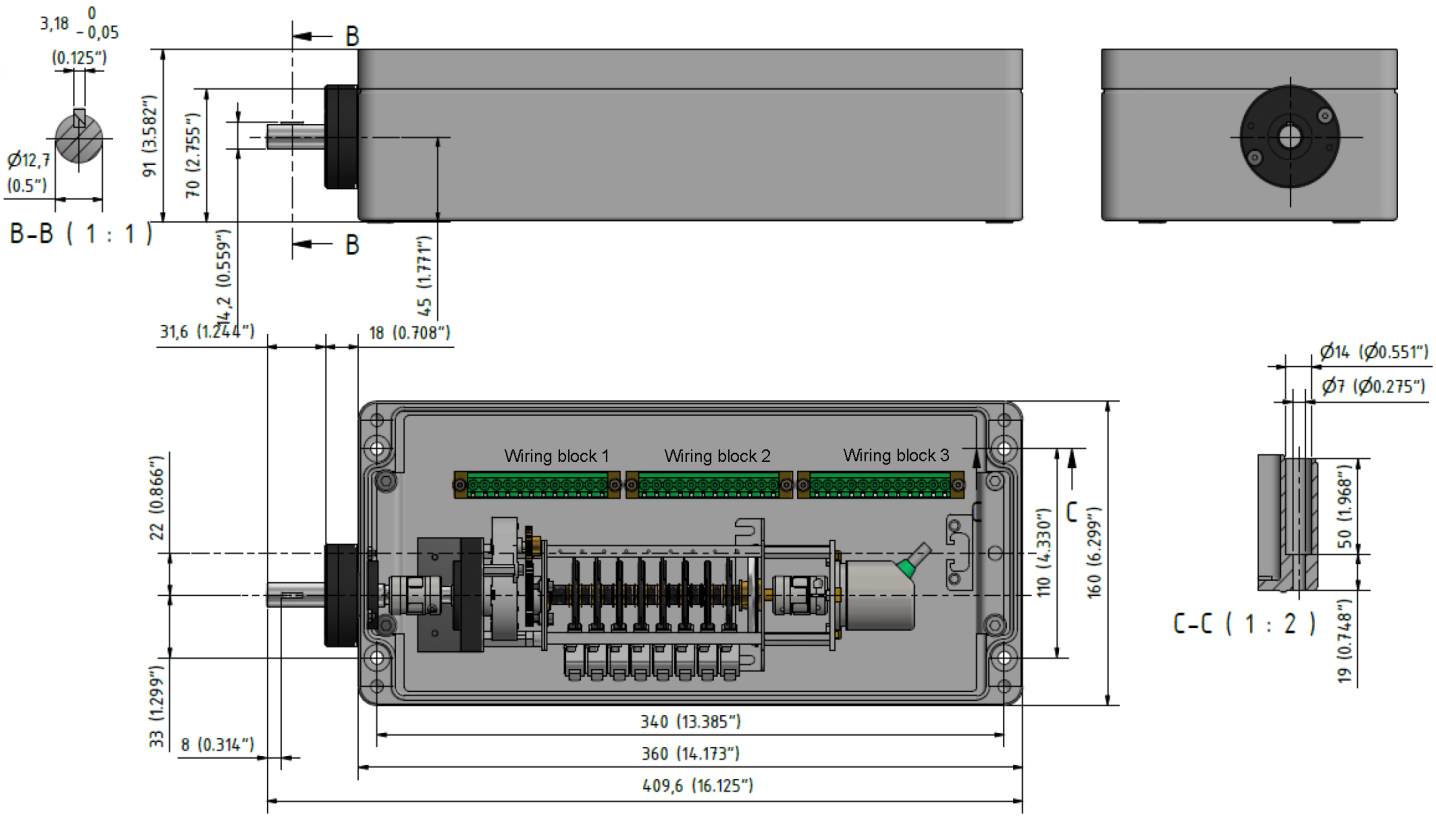
Precision 13-bit ST Absolute Encoder with 4-20mA Output

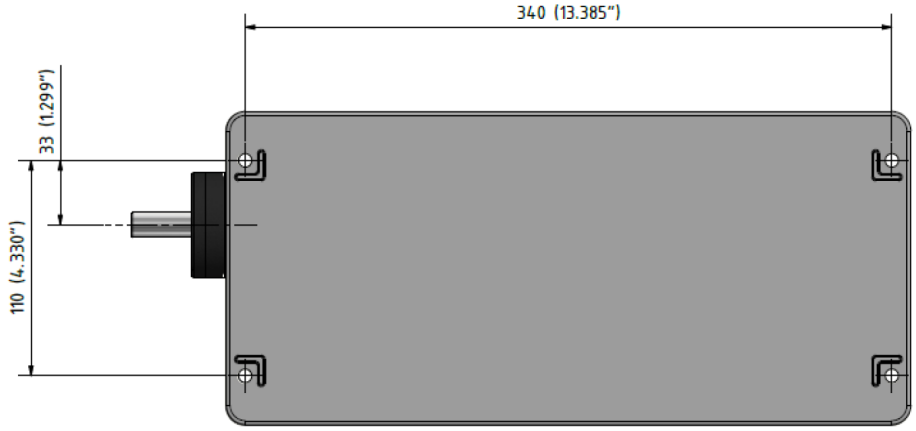
FIELD PROVEN DESIGN.

MICRONOR MR231 series used to upgrade gate control of Niagara-based NYPA Pumped-Storage Project, consisting of the Lewiston Pump-Generating Plant and downstream Robert Moses Power Plant.

MR231 Reference Drawing

Internal 8-Channel + Encoder Configuration Shown (KWG360)





4x Mounting Holes

Ø7.5mm [0.295 inch]

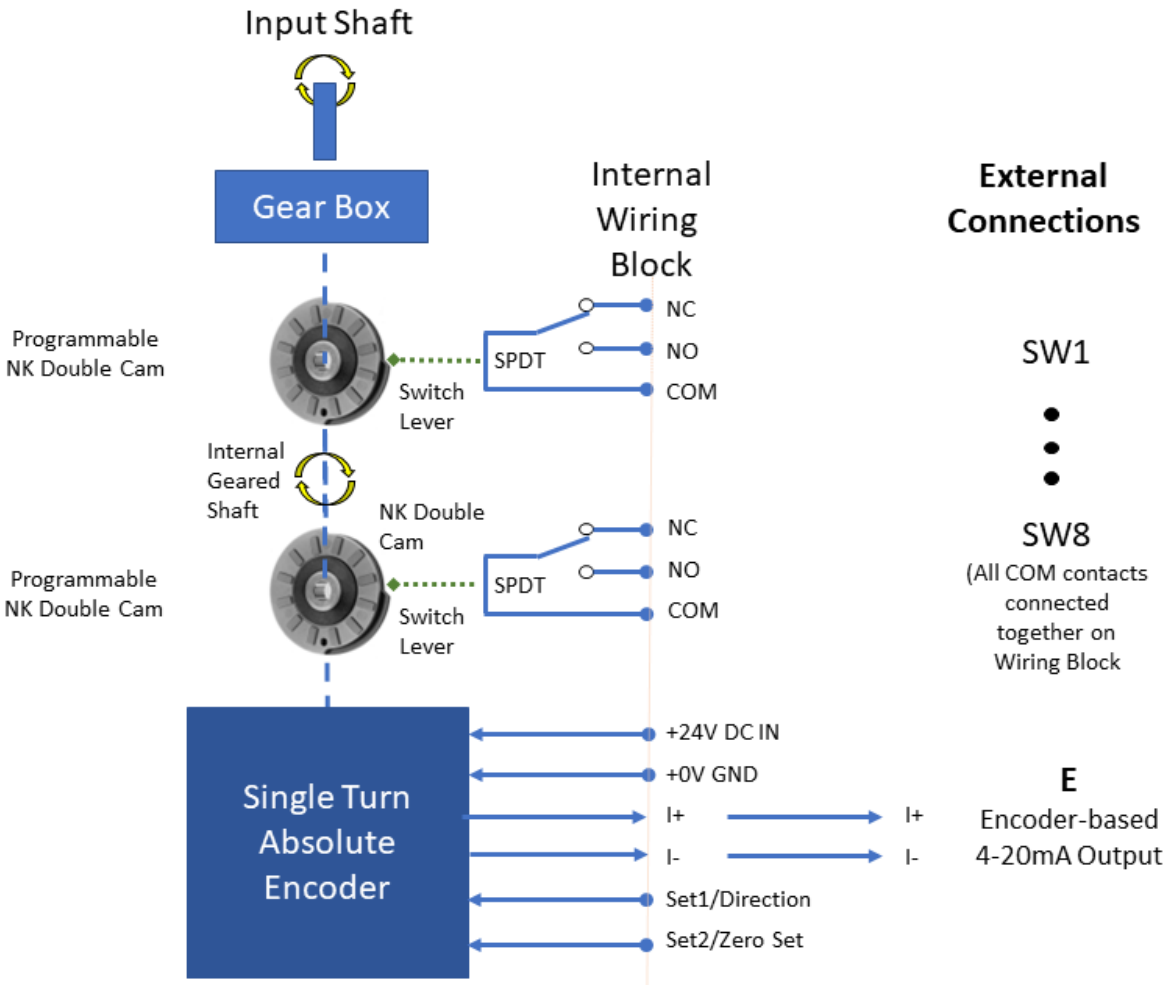
General Installation Instructions

- Use copper conductors rated at least 60°C
- TIghten terminal torque is 5-7 in-lbs
- Unused conduit ports must be properly sealed to prevent moisture and water leakage into the unit.

List of Contents

- One geared limit switch unit
- #404 Woodruff Keys (secured to shafts)
- One PSN Cam programming tool (stored in internal holder)
- One Wire Jumper (Installed across all COMMONS on terminal block)
- One copper grounding screw and slit washer (installed inside unit)
- Water proof plugs (installed on threaded conduit hole)
- MR220 User Guide (one per shipment)

Schematic Diagram



To program 4mA point, touch input Set2 to 24V DC IN and then release. The analog output will reset to 4.01mA. This should be done with the internal mechanical scale set to 360 (0) position.

Specifications

Enclosure Rating	NEMA/UL 1/4/4X	Watertight (IP66) Material: Copper free die cast aluminum housing with powder coat finish
Switch Rating	Mechanical Life Resistive Load Inductive Load Motor Load Temperature	10,000,000 cycles (typical) 230 VAC/6 A Continuous/10 A Momentary 24 VDC/6 A Continuous/10 A Momentary 230 VAC/Power Factor 0.7/3 A 125 VDC/0.5 A, 80 VDC /0.75 A, 40 VDC/1 A, 24 VDC/3 A 230 VAC/Power Factor 0.85/10A -40°C to +85°C
Cam Programming	1 - 2 (COM - NC) 1 - 3 (COM - NO) Repeatability	With Cam Valley Profile: 4°...180° (1...50%) With Cam Peak Profile: 4°...356° (1...99%) 1.8°
Encoder Rating	Type Max Load Resistance Supply Voltage Linearity / Accuracy	Single Turn Absolute Encoder with 4-20mA Output, Programmable (4mA) Zero Set 500Ω 8-32V DC (absolute max ratings), Typical 15mA @ 24V DC (no load) 0.15% / ±20µA @ 20mA / Internal Resolution=13 bits
Mechanical Rating	Max RPM Mechanical Life Max Side Load Max Axial (Thrust) Load Bearing Life	3000 rpm 10 x 106 Cycles (typical) 890 N (200 lbf) to 500 RPM, 445 N (100 lbf) to 1800 RPM 360 N (80 lbf) to 500 RPM, 185 N (40 lbf) to 1800 RPM 10 years (87,660 hours) continuous running with 350 N (78 ibf) side load at 1000 RPM
Wire Range	24-10 AWG	Via Phoenix MKDS 5/3-6,35 COMBICON modular wiring blocks with screw connection
Temperature	Storage Operating	-30°C to +70°C -15°C to +60°C NOTE: Extended Temperature models (to -40°C) are available.
Ingress Protection	IP	IP66 per EN60529 NOTE: IP rating only applies when unit installed, connected and torqued properly.
Mechanical Stress	Vibration Shock	50 m/s², 10-1000 Hz, per IEC 60068-2-6 1000 m/s², 3ms, per IEC 60068-2-27

CAM PROGRAMMING

The MR221-MR222 limit switches are pre-wired to PHOENIX Screw-Down Wiring Strips. Each limit switch has three connections which are pre-wired with AMP FASTON crimp-on receptacles and brought out to the wiring blocks:

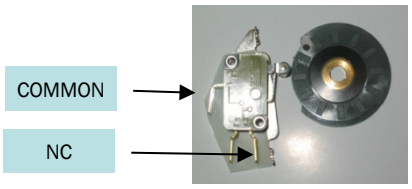
- COMMON (labeled 1 on the switch)
- NC (labeled 2 on the switch)
- NO (labeled 4 on the switch

The Micronor Programmable Cam Switches are designed to be both versatile and easy to operate. However, initial planning is required for cams to be programmed to function as desired. Due to the design of the cam, switches cannot be engaged for more than 180°. If the system requires that the switch does not make contact for more than 180°, the normally closed (NC) contact must be wired.

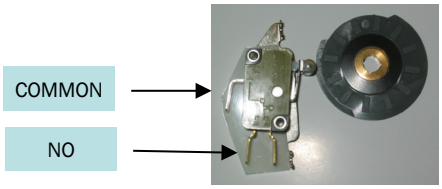
As shown in Example A, a system might require that the connection for a switch be made from 0° to 70° and there be no connection from 71° to 359°. To accomplish this, the switch must be wired in the normally closed position.

As shown in Example B, a system that requires a connection for 290°, the normally open contact must be wired so that a connection is made when the switch is engaged, and no connection is made when the switch is disengaged.

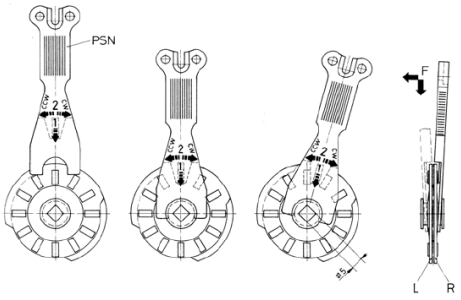
Example A



Example B



The following instructions may be used to program the start and stop times of each switch using the supplied PSN (black) cam programming tool.



Step 1 Turn external shaft to the desired START position via dial setting. Insert PSN key with the numbered side away from the cam and the notched side towards the cam.

Step 2 While gently applying pressure against the cam with the key; rotate the cam to the desired position.

Step 3 Turn external shaft to the desired STOP position, flip over the PSN key and repeat steps 1 and 2 on the other side of the cam.

Step 4 Test the unit to confirm that the switches engage (START) and disengage (STOP) at the appropriate positions.

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Ordering Info

Examples:

MR231-L8-M100 Single ended shaft model with ratio 100:1, 8 Channels, and 4-20mA output

Base Model

MR231 Large KWG360 Housing with One-Ended Shaft

No. of Switches (Channels)

L2 L4 L6 L8

Gear Ratio

Single Stage Step DOWN (Ux:1)

U1 U1.25 U2.0 U2.6
U2.75 U3.5 U4.0 U5.0

Multistage Step DOWN (Mx:1)

M12.5 M20 M25 M30
M37.5 M40 M50 M52.5
M75 M100 M200 M300
M420 M600 M750 M1600
M2250 M2500

Other gear ratios available upon request

Special options available:

- **125 VDC / 10A rated switches**
- **SSI Encoder**
- **Housing without conduit hubs or holes to allow for custom field installation by user**
- **Contact Micronor Sales with your special requirements**

Replacement Parts

6099.07.778	PSN (black) Cam Programming Key for NK Double Cams
6099.22.846	Microswitch mounted on bracket

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