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1.   Recommend Wiring

The interface has simply 3 signal wires for signal transmission.
- Use exclusively shielded twisted-pair cable to connect the device.
- Comply with the maximum permissible connection cables length.
- Preferably connect the shield on both sides with low impedance to the protective earth (PE), e.g.on the device and/or on the evaluation unit. In the event of potential differences, the shield must only be applied on one side.

Recommended input wiring
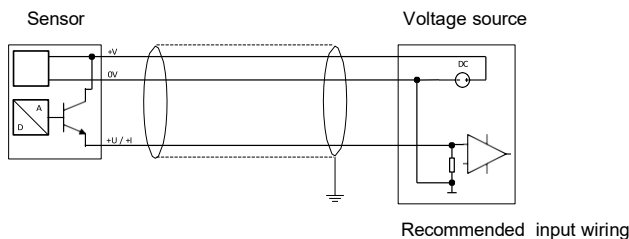
2.   Function and Status LED

The device is equipped with a two-color LED for display status and error messages:
- Green = status
- Red = error

| Display	LED	Meaning	Error cause	Note
No LED on	○	Encoder not in operation	Faulty supply voltage Encoder not operational	Check the voltage supply and the wiring.
Green LED flashes in 250ms cycles	🟢🟢	Service mode	The encoder is in Service mode.	Contact the Micronor Sensors support.
Green LED constantly on	🟢	Encoder in operation		
Red and green LEDs flash alternately in 250ms cycles	🔴🟢🔴	System error	Internal system error	Contact the Micronor Sensors support.
Red and green LEDs flash alternately in 500ms cycles	🔴🟢🔴	Wire break (only for current output)	Load at the output too low. Connection with the control interrupted.	Check the wiring
Green and red LED constantly on	🔴🟢	Reference point display		
Green LED flashes 1x	🟢○🟢	Activation of SET 1 input detected and confirmed.		
Green LED flashes 3x	🟢🟢🟢	Activation of SET 2 input detected. The new measuring range has taken over.		
Red LED flashes 3x	🔴🔴🔴	Error during the scaling operation. The new measuring range has not taken over.	Selected measuring range: < 22.5° or > 65536 revolutions	Scale another measuring range
Green / red / green sequence	🟢🔴🟢	Reset of the scaled measuring range. Default measuring range is loaded. Preset is carried out at the current position. Zero set function confirmed with singleturn devices.		

3. Default Settings

As a standard, the output signal (4 … 20 mA, 0 … 10 V, 0 … 5 V) is output scaled over the set measuring range.

Depending on the configuration, the measuring range can be as follows:
- For singleturn devices: 1 revolution
- For multiturn devices: 16 revolutions (factory setting)

If supported by the device, the measuring range can also be freely scaled.

Also the direction of rotation depends on the configuration of the used device. It affects the signal path.
The possible configurations are shown below.
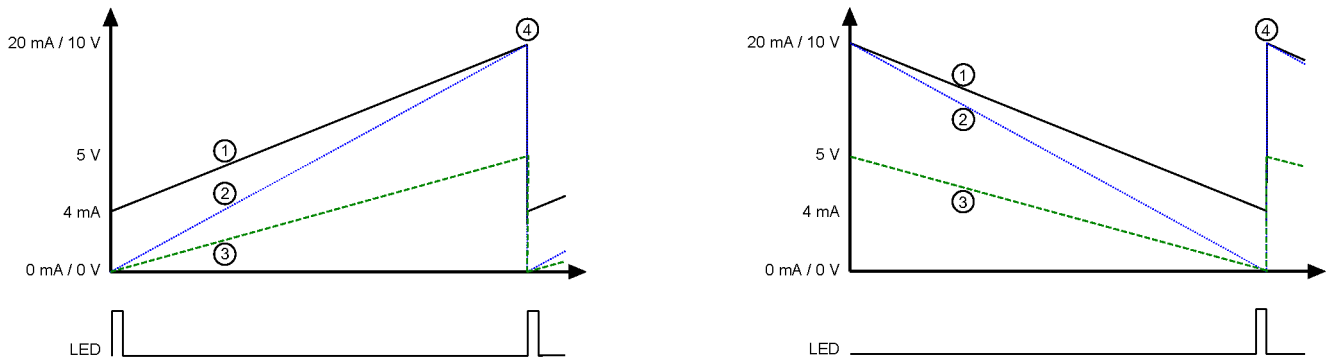
| 1 | Variant 4 … 20 mA | 3 | Variant 0 … 5 V |
| 2 | Variant 0 … 10 V | 4 | Rollover |

Singleturn devices

The measuring range of the singleturn devices varies according to the version. The pictures below can be used to represent the behavior of the measuring range.
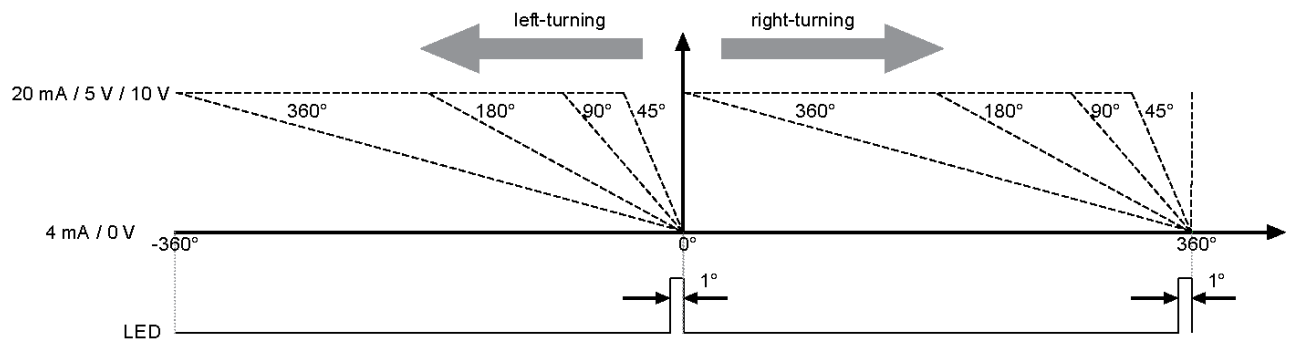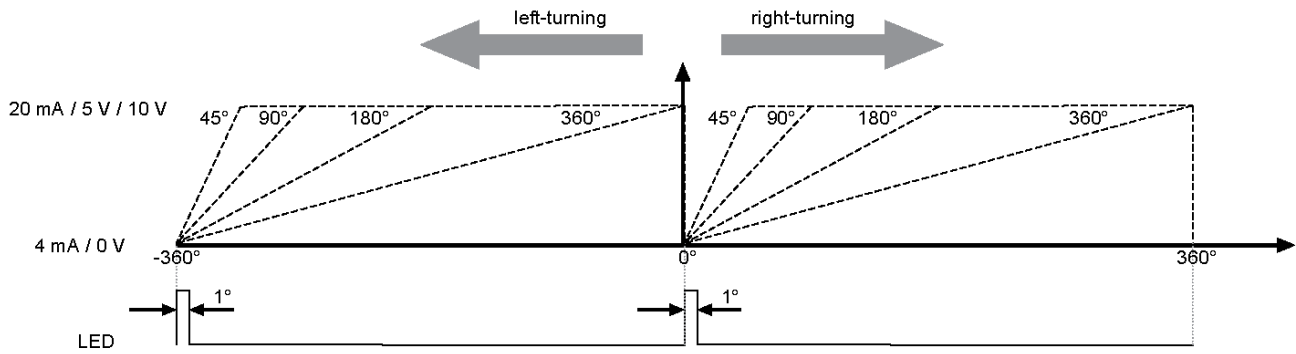
4. Programming

4.1 Scaling function (multiturn only)

Multiturn devices

The encoder is factory-set for a measuring range of 16 revolutions. Linear scaling is applied to the respective output signal.

The encoder is factory-set for a determined output range of 4 … 20 mA / 0 … 10 V / 0 … 5 V. It is scaled linearly over the desired measuring range.

The two scaling inputs SET 1 and SET 2 allow the user to set a measuring range himself. The desired measuring range must be > 22.5° and shall not exceed 65536 revolutions. To restore the default measuring range, apply + V to both SET inputs.

Important Notice:
- To trigger the scaling operation, apply the supply voltage + V to the corresponding scaling input at least 1 second.
- The scaling function is limited to 10,000 cycles. Beyond this limit, the error-free scaling of the output signal cannot be guaranteed.
- Actuate the SET inputs only once the shaft has stopped. Only this way will it be possible to take over properly the desired start and end position of the desired signal scaling.
- If the inputs are not used, they should be connected to 0V (encoder ground GND), to prevent interferences.

Scaling process for multiturn devices:
1) Turn the shaft to the desired start position.
2) Apply +V to input SET 1 for at least one second.
   ► The green LED flashes 1x
3) Turn the shaft to the desired end position.
4) Apply +V to input SET 2 for at least one second.
   ► The green LED flashes 3x. The new measuring range is active. The output signal jumps to the maximum value.

Resetting the scaled output signal for multiturn devices:
1) Make sure that the shaft stands still.
2) Apply +V to input SET 1 for at least one second.
   ► The green LED flashes 1x
3) Turn the shaft to the desired end position.
4) Apply +V to input SET 2 for at least one second.
   ► The green LED flashes 3x. The new measuring range is active. The output signal jumps to the maximum value.

If the inputs are not used, they must be connected to 0 V (encoder ground GND), to prevent in- terferences.

SET 1 input	SET 2 input	Function
0	0	Normal operating mode
1	0	Setting the start position
0	1	Setting the end position
1	1	Resetting to the default measuring range
0	0	Normal operating mode

Singleturn devices

For singleturn devices, the measuring range cannot be scaled. It is factory-preset and displayed by the reference point display. However, the measuring range can be shifted by the Zero set function.

Reference point display for singleturn devices:

With the factory-set "default" scaling, the LED displays the reference point of 0 ... 1°. The reference point display is no longer available if another measuring range is scaled using the scaling inputs.

4.2 Zero Set Function (singleturn only)

With singleturn devices, the Zero set function allows shifting the measuring range. For this purpose, the current position is set to 0. The size of the measuring range remains unchanged.

If this input is not used, it must be connected to 0V (encoder ground GND), to prevent interferences.

Zero set with singleturn devices:
1) Turn the shaft to the desired start position.
2) Apply +V to input SET 1 for at least one second.
   ► The green LED flashes 3x – green/red/green. The new measuring range is active

4.3   Direction of rotation change (multiturn only)

Multiturn devices

Fixed output levels are assigned to the scaling inputs.
- SET 1 = lowest output level (current variant = 4 mA / voltage variant = 0 V)
- SET 2 = highest output level (current variant = 20 mA / voltage variant = 5 or 10 V)

This means that the actuation order determines the logic of the direction of rotation. If input SET 2 is actuated first, followed by input Set 1, the new measuring range is defined with the reversed direction of rotation.

Order of the SET inputs	Absolute position	Sign
1 - 2	1 > 2 CCW	Positive
1 - 2	2 > 1 CW	Positive
2 - 1	1 > 2 CW	Negative
2 - 1	2 > 1 CCW	Negative

4.4   Limit switch function (multiturn only)

Multiturn devices

With the limit switch function, the output signal does not remain at the last final value, but it makes a defined jump. This signal jump can be used by a control as a limit switch. The output levels of the limit switches are factory-set. The output levels are represented below for a better illustration, once with and once without the limit switch function. The picture represents the factory-set total measuring range of 16 bits (NDR = 4 bits = 16 revolutions).
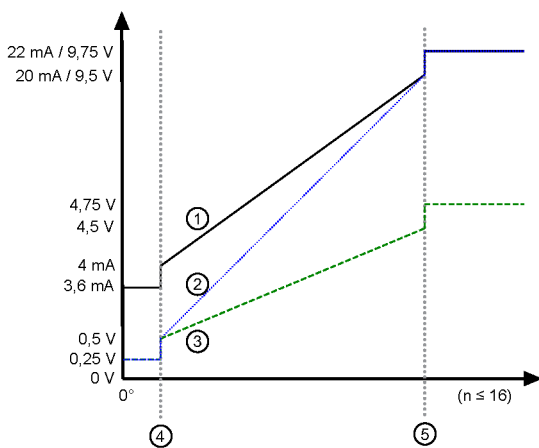
Measuring ranges with/without limit switch function
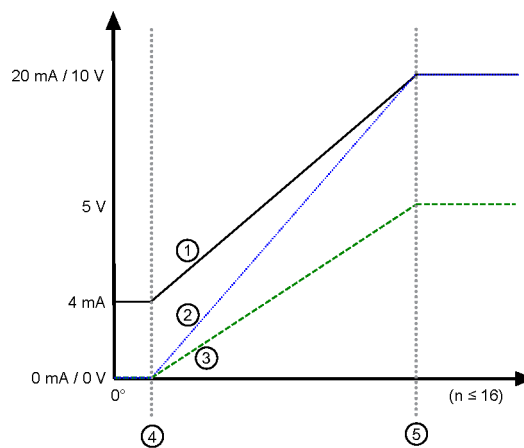
Fixed output levels are assigned to the
With singleturn devices, the Zero set function allows shifting the measuring range. For this purpose, the current position is set to 0. The size of the measuring range remains unchanged.

If this input is not used, it must be connected to 0V (encoder ground GND), to prevent interferences.

1	Variant 4 … 20 mA	4	Teach point 1
2	Variant 0 … 10 V	5	Teach point 2
3	Variant 0 … 5 V		

Measuring range in delivery (default) condition: NDR = 4 bits = 16 revolutions

Variant	4 … 20 mA	0 … 10 V	0 … 5 V
Limit switch low	3.6 mA	0.25 V	0.25 V
Limit switch high	22.0 mA	9.75 V	4.75 V