Absolute encoders – multiturn

Large hollow shaft optical / magnetic	9081 (hollow shaft)	SSI

The multiturn encoder 9081, with SSI interface and combined optical / magnetic sensor technology, has a through hollow shaft with a diameter up to 28 mm and offers resolutions up to 25 bits.

High rotational speed	Temperature range -20°... +70°C	High protection level IP65	Shock / vibration resistant	Short-circuit proof	Reverse polarity protection

Optimized dimensions

- Hollow shaft up to max. 28 mm with an installation depth of just 47 mm.
- Outer diameter 90 mm.

Order code Hollow shaft

8.9081 . 3X22 . 2004
Type a b c d e

a *Flange*
3 = with spring element, long

b *Through hollow shaft*
3 = ø 20 mm [0.79"]
4 = ø 24 mm [0.94"]
5 = ø 28 mm [1.10"]
6 = ø 5/8"

c *Interface / power supply*
2 = SSI with 4 status outputs / 5 ... 30 V DC

d *Type of connection*
2 = radial M23 connector, 12-pin without mating connector

e *SSI interface*
2004 = 8192 x 4096 (25 bit), gray

Optional on request
- other hollow shaft diameters

Mounting accessory for hollow shaft encoders	Dimensions in mm [inch]	Order no.
Cylindrical pin, long for flange with spring element (flange type 3)	with fixing thread	**8.0010.4700.0003**

14 [0.55]
9 [0.35]
Ø6 [0.24]
10 [0.39]
Ø6 m6 [0.24]
SW10
M6
40 [1.57]
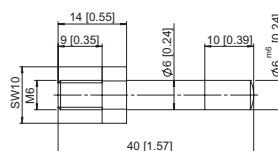
Connection technology		Order no.
Cordset, pre-assembled	M23 female connector with coupling nut, 12-pin 2 m [6.56'] PVC cable	**8.0000.6901.0002.0031**
Connector, self-assembly (straight)	M23 female connector with coupling nut, 12-pin	**8.0000.5012.0000**

Further accessories can be found in the accessories section or in the accessories area of our website at: www.kuebler.com/accessories.
Additional connectors can be found in the connection technology section or in the connection technology area of our website at: www.kuebler.com/connection_technology.

Absolute encoders multiturn

Kübler

Large hollow shaft optical / magnetic	9081 (hollow shaft)	SSI

Technical data

Mechanical characteristics

Maximum speed	6000 min^{-1}, 3000 min^{-1} (continuous)
Mass moment of inertia	approx. 65 x 10^{-6} kgm^2
Starting torque - at 20°C [68°F]	< 0.2 Nm
Weight	approx. 0.7 kg
Protection acc. to EN 60529	IP65
Working temperature range	-20°C ... +70°C [-4°F ... +158°F]
Materials hollow shaft	stainless steel H7
Shock resistance acc. to EN 60068-2-27	2500 m/s^2, 6 ms
Vibration resistance acc. to EN 60068-2-6	100 m/s^2, 10 ... 2000 Hz

Electrical characteristics

Power supply		5.0 ... 30 V DC [1]
Power consumption	typ.	89 mA
(no load)	max.	138 mA
Short circuit proof outputs [2]		yes [3]
Reverse polarity protection of the power supply		yes
Performance against magnetic influence acc. to		EN 61000-4-8, severity level 5
UL approval		file 224618
CE compliant acc. to		EMC guideline 2014/30/EU RoHS guideline 2011/65/EU

Control inputs (V/R, SET)

Voltage		5 ... 30 V DC = +V
Response time		10 ms
Switching level	LOW	max. 25% +V
	HIGH	min. 60% +V, max. +V
Max. current load		0.5 mA

SSI interface

Output driver		RS485
Permissible load / channel		max. +/- 20 mA
Update rate for position data		approx. 1600/s
SSI clock rate	min. / max.	100 kHz / 500 kHz
Signal level	HIGH	typ. 3.8 V
	LOW (I$_{Load}$ = 20 mA)	typ. 1.3 V
Resolution singleturn		1 ... 8192 (13 bit), scalable
Number of revolutions (multiturn)		1 ... 4096 (12 bit), scalable
Falling edge time t$_f$ (without cable)		max. 100 ns
Rising edge time t$_r$ (without cable)		max. 100 ns

Control outputs

Output driver		Push-Pull
Max. current output		± 10.0 mA
Signal level	HIGH	min. +V - 2.8 V
	LOW	max. 1.8 V
Falling edge time t$_f$ (without cable)		max. 1 µs
Rising edge time t$_r$ (without cable)		max. 1 µs

Control inputs

V/R input for change of direction

The encoder can output increasing code values when the shaft is rotated either clockwise or counter-clockwise (when looking from the shaft side).

The appropriate option can be selected via a hardware configuration of the V/R input BEFORE powering up the encoder.

The following table shows the function selection dependent on hardware and software settings:

Hardware configuration of the V/R input:	Function: increasing code value when the shaft is in the following direction
„LOW" (0V) on the V/R input (=cw)	cw
„HIGH" (+V) on the V/R input (= ccw)	ccw
„LOW" (0V) on the V/R input (=cw)	ccw
„HIGH" (+V) on the V/R input (= ccw)	ccw

Note:

- Any hardware configuration of the V/R input must take place BEFORE powering up the encoder!

- If the V/R input is not configured, then a 0 V configuration will apply (default condition)!

- If the direction of rotation is changed due to the V/R configuration, without activating the SET function again, and if the encoder is also then powered up again, a new position value may be outputted, even if the physical shaft position of the encoder has not moved! This is due to internal conversion processes.

- The start-up procedure for the encoder should therefore follow this sequence:
  1. Determine the count direction of the encoder either via the V/R input or via programming
  2. Apply power to the encoder
  3. Activate the SET function, if desired (see SET input below)

- If using a cable wire to configure the V/R input, then for EMC reasons the wire should not remain open but should be tied either to 0 V or +V!

- The response time of the V/R input with +V = 5 ... 30 V DC power supply is 10 ms.

---

1) The power supply at the encoder input must not be less than 4.75 V (5 V - 5%).
2) If power supply +V correctly applied.

3) Only one channel allowed to be shorted-out:
   at +V = 5 V DC short circuit to channel, 0 V, or +V is permitted.
   at +V ≥ 5 ... 30 V DC short circuit to channel or 0 V is permitted.

Kübler

Large hollow shaft optical / magnetic	9081 (hollow shaft)	SSI

SET input

This input is used for a one-time alignment (zeroing) of the encoder immediately after installation. A high control pulse (+V) applied to this input for a minimum of 10 ms will reset the current encoder position to the pre-programmed setpoint value. The default value is zero.

Notes:

- The SET function should only be implemented when the encoder shaft is at rest.
- For the duration of the SET pulse the SSI interface does not function and therefore does not output any valid position values! In order to avoid malfunctions, no SSI clock pulse should occur during the SET pulse.
- If a cable wire is used to configure the SET input, then for EMC reasons the wire should not remain open but should if at all possible be tied to 0 V, provided no SET pulse is triggered!
- The response time of the SET input with +V = 5 ... 30 V DC power supply is 10 ms.

Output

Output	Default-function
A1	battery control

Terminal assignment (SSI Synchronous Serial Interface with 12-pin connector)

Interface	Type of connection	Features	M23 connector, 12-pin									
2	2	SET Up/down input	Signal:	0 V	+V	C+	C-	D+	D-	ST	VR	A1	⏚
			Pin:	1	2	3	4	5	6	7	8	9	PH
			Core color:	WH	BN	GN	YE	GY	PK	BU	RD	BK	

+V: Encoder power supply +V DC
0 V: Encoder power supply ground GND (0 V)
C+, C-: Clock signal
D+, D-: Data signal
ST: Set input. The current position becomes defined as position zero.
VR: Up/down input. As long as this input (High-Level = +V) is active, decreasing code values are transmitted when shaft turning clockwise.
A1: Output battery monitoring
⏚PH: Plug connector housing (Shield)
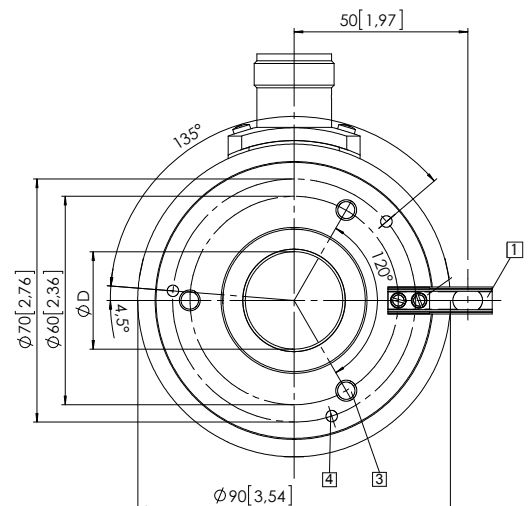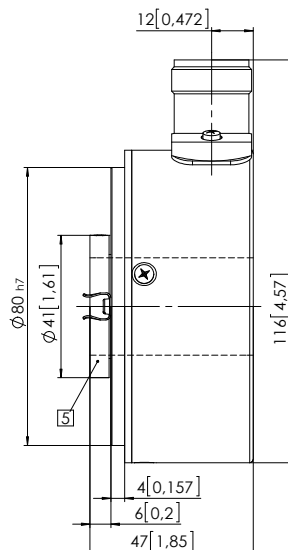
Top view of mating side, male contact base
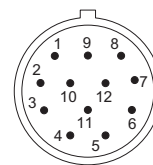
M23 connector, 12-pin

Dimensions

Dimensions in mm [inch]

1 Spring element, long (flange no. 3) cylindrical pin DIN 6325, ø 6 [0.24]

3 3 x M6, 10 [0.4] deep

4 3 x M4, 7 [0.28] deep

5 Recommended torque for the clamping ring 1.0 Nm

D	Fit
20 [0.79]	H7
24 [0.94]	H7
28 [1.10]	H7
5/8"	H7