# Absolute Shaft Encoders Type AC 58

# ACURO industry BiSS / SSI

Synchro flange

- Compact design: 50mm length for single or multiturn
- Aids for start up and operation: diagnostic LED, preset key with optical response, status information
- Use of sine/ cosine signals for fast control task possible
- Control input: Direction
- Resolution up to 29 Bit

Hub shaft

## TECHNICAL DATA mechanical

| | |
|---|---|
| Housing diameter | 58 mm |
| Protection class shaft input | IP 64 or IP 67 |
| Protection class housing | IP 64 (IP 67 optional) |
| Flange | Synchro flange, clamping flange, hubshaft with tether, square flange |
| Shaft diameter | Solid shaft 6 mm, 10 mm; Hub shaft 10 mm, 12 mm |
| Max. speed | Continuous 10 000 $min^{-1}$, short term 12 000 $min^{-1}$ |
| Starting torque | ≤ 0.01 Nm |
| Moment of inertia | 3.8 x $10^{-6}$ $kgm^2$ |
| Spring tether (hollow shaft) | |
| Tolerance axial | ±1.5 mm |
| Tolerance radial | ±0.2 mm |
| Max. shaft load | axial 40 N / radial 60 N |
| Shock resistance DIN EN 60068-2-27 | 1 000 $m/s^2$ (6ms) |
| Vibration resistance DIN EN 60068-2-6 | 100 $m/s^2$ (10 ... 2.000 Hz) |
| Operating temperature | -40 ... 100 °C |
| Storage temperature | -25 ... 85 °C (because of packing) |
| Weight approx. ST/MT | 260 g / 310 g |

## TECHNICAL DATA electrical

| | |
|---|---|
| Supply voltage | DC 5 V, -5 % / +10 % or DC 10–30 V |
| Max. current w/o load ST/MT | 50 mA / 100 mA |
| Interface | Standard SSI or BiSS |
| Lines / drives | Clock and Data / RS422 |
| Output code | Binary or Gray parameterization with ACURO soft |
| Linearity | ± ½ LSB (± 1 LSB for resolution > 13 Bit) |
| Resolution singleturn | 10–17 Bit , Gray Excess: 360, 720 increments |
| Resolution multiturn | 12 Bit |
| Incremental signals optional | Sinus – Cosinus 1 Vss |
| Number of pulses | 2048 |
| 3dB limiting frequency | 500 kHz |
| Absolute accuracy | ±35´´ |
| Repeatability | ±7´´ |
| Parameterization with Acuro soft | Code type, direction, warning, alarm |
| Control input | $\overline{\text{Direction}}$ |
| Reset key | Disable via parameterization |
| Alarm output | Alarm bit (SSI Option), warning bit and alarm bit (BiSS) |
| Status LED | Green = ok.; red = alarm |
| Connection | Cable or conin, axial or radial |

## DIMENSIONAL DRAWINGS

see chapter “Dimensional drawings ACURO industry”, starting page 142

## RECOMMENDED DATA TRANSFER RATE WITH SSI

The max. data transfer rate depends on the cable length.
For Clock/ $\overline{\text{Clock}}$ and Data/ $\overline{\text{Data}}$ please use twisted pairs. Use shielded cable.

| Leitungslänge | Taktrate |
|---|---|
| < 50 m | < 400 kHz |
| < 100 m | < 300 kHz |
| < 200 m | < 200 kHz |
| < 400 m | < 100 kHz |

## DATA FORMAT singleturn

| **Resolution** | **Data bits** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | T1 ... T9 | T10 | T11 | T12 | T13 | T14 | T15 | T16 | T17 | T18 | T19 |
| 9 Bit [1] | S8 ... S0 | 0 | 0 | 0 | 0 | 0 | W [2] | | | | |
| 10 Bit [1] | S9 ... S1 | S0 | 0 | 0 | 0 | 0 | W [2] | | | | |
| 11 Bit [1] | S10 ... S2 | S1 | S0 | 0 | 0 | 0 | W [2] | | | | |
| 12 Bit [1] | S11 ... S3 | S2 | S1 | S0 | 0 | 0 | W [2] | | | | |
| 13 Bit [1] | S12 ... S4 | S3 | S2 | S1 | S0 | 0 | W [2] | | | | |
| 14 Bit [1] | S13 ... S5 | S4 | S3 | SS2 | S1 | S0 | 0 | W [2] | | | |
| 15 Bit [1] | S14 ... S6 | S5 | S4 | S3 | S2 | S1 | S0 | 0 | W [2] | | |
| 16 Bit [1] | S15 ... S7 | S6 | S5 | S4 | S3 | S2 | S1 | S0 | 0 | W [2] | |
| 17 Bit [1] | S16 ... S8 | S7 | S6 | S5 | S4 | S3 | S2 | S1 | S0 | 0 | W [2] |

Examples for data format 9 Bit and 13 Bit with the optional bits alarm und parity

| **Resolution** | **Data bits** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | T1 ... T9 | T10 | T11 | T12 | T13 | T14 | T15 | T16 | T17 | T18 | T19 |
| 9 Bit + P [3] | S8 ... S0 | 0 | 0 | 0 | P | 0 | W [2] | | | | |
| 9 Bit + A [4] | S8 ... S0 | 0 | 0 | 0 | A | 0 | W [2] | | | | |
| 9 Bit + P [3] + A [4] | S8 ... S0 | 0 | 0 | 0 | A | P | 0 | W [2] | | | |
| | | | | | | | | | | | |
| 13 Bit + P [3] | S12 ... S4 | S3 | S2 | S1 | S0 | P | 0 | W [2] | | | |
| 13 Bit + A [4] | S12 ... S4 | S3 | S2 | S1 | S0 | A | 0 | W [2] | | | |
| 13 Bit + P [3] + A [4] | S12 ... S4 | S3 | S2 | S1 | S0 | A | P | 0 | W [2] | | |

## DATA FORMAT Multiturn

| **Resolution** | **Takte** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | T1 ... T12 | T13 ... T21 | T22 | T23 | T24 | T25 | | | | | |
| 24 Bit [1] | M11 ... M0 | S11 ... S2 | S1 | S0 | 0 | W [2] | | | | | |
| 25 Bit [1] | M11 ... M0 | S11 ... S3 | S2 | S1 | S0 | 0 | W [2] | | | | |
| 26 Bit [1] | M11 ... M0 | S11 ... S4 | S3 | S2 | S1 | S0 | 0 | W [2] | | | |

Example for data format 24 Bit with the optional bits alarm und parity

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 24 Bit + P [3] | M11 ... M0 | S11 ... S2 | S1 | S0 | P | 0 | W [2] | | | | |
| 24 Bit + A [4] | M11 ... M0 | S11 ... S2 | S1 | S0 | A | 0 | W [2] | | | | |
| 24 Bit + P [3] + A [4] | M11 ... M0 | S11 ... S2 | S1 | S0 | P | A | 0 | W [2] | | | |

S0 ... S16 Data bits for resolution per revolution
M0 ... M11 Data bits for number of revelutions (only for multiturn)
[1] Options (Parity bit, alarm and parity bit, zero bit) on request
[2] W: from this data bit on the data iteration for multiplex starts
[3] Parity bit : Even Parity (The parity bit expands the data bits to an even nummber of 1-bits). (Option)
[4] Alarm bit: is set to "1" when over temperature, under temperature, disc breakage and defect LED

# ACURO industry BiSS / SSI

## SYNCHRONOUS-SERIAL TRANSFER (SSI)

Synchronous readout of the encoder data is according to the clock rate given by the SSI-counterpart.
The number of clock rates is determined by the type of encoder (singleturn resp. multiturn) and the configuration of the special Bits as defined.
For multiple transactions (the stored value is readout several times successively) a fixed clock rate per transaction must be kept (for singleturn 13 resp. 14 clocks, for multiturn 25 resp. 26 clocks).

- In the rest position, when the last clock brush has passed by more than 30µs, the data output is logically at "1".
- With the first descending clock edge the encoder data and the special bits are loaded in the shift register of the encoder interface.
- With each ascending clock edge the data bits are serially readout, beginning with the MSB.
- At the end of the data transfer the data output is set to logically "0" for approx. 20µs.
  If within these 20µs a further clock brush reaches the encoder interface, the already transferred data is readout once again.
  This multiple transfer of the same data makes it possible to recognize transfer errors.
- After the 20µs the data output goes to its rest position, logically "1". Subsequently new encoder data can be readout.

## PIN ASSIGNMENT Conin & Cable

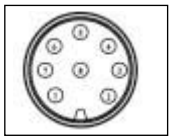
| Cable | Flange connector | Signal |
|---|---|---|
| brown [3] | 1 | 0 V (supply voltage) |
| pink | 2 | Data |
| yellow | 3 | Clock |
| | 4 | N.C. |
| blue | 5 | $\overline{\text{Direction}}$ [1] |
| red | 6 | N.C. |
| violet | 7 | N.C. |
| white [3] | 8 | DC 5/10 - 30 V |
| | 9 | N.C. |
| grey | 10 | $\overline{\text{Data}}$ |
| green | 11 | $\overline{\text{Clock}}$ |
| black | 12 | 0 V-signal output [2] |

[1] $\overline{\text{Direction}}$: + $U_B$ or unconnected = ascending code values with rotation cw
0 V = descending code values with rotation cw
[2] Connected with 0 V in the encoder. Use this output to lay Direction on logical "0" if required.
[3] use only the thin wires (∅ = 0.14 mm)

## PIN ASSIGNMENT M12

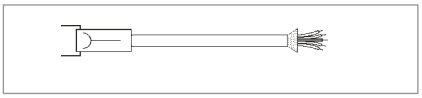
| **M12 Plug-in connector 8 pole** | | |
|---|---|---|
| Colour | Pin | Signal |
| white | 1 | DC 10 - 30 V |
| brown | 2 | 0 V |
| | 3 | N.C. |
| green | 4 | $\overline{\text{Clock}}$ |
| pink | 5 | Data |
| yellow | 6 | Clock |
| blue | 7 | $\overline{\text{Direction}}$ [1] |
| grey | 8 | $\overline{\text{Data}}$ |

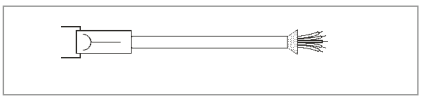
[1] $\overline{\text{Direction}}$: + $U_B$ or unconnected = ascending code values with rotation cw
0 V = descending code values with rotation cw



View on connector

## ACCESSORIES





| | | Ordering code |
|---|---|---|
| **M12 plug** | | 3 539 597 |

| **Extension cable with M12 plug** | **Ordering code** |
|---|---|
| 3 m | 1 565 329 |
| 5 m | 1 565 330 |
| 10 m | 1 565 331 |

| **Mating connector: 12 pin Conin** | **Cable** | |
|---|---|---|
| | **Ordering code** | **Ordering code** |
| turning right | 3 539 202 | 3 280 220 |
| turning left | 3 539 229 | |

| **Extension cable with plug** | | **Ordering code** |
|---|---|---|
| turning right | 3 m | 1 542 003 |
| | 5 m | 1 542 004 |
| | 10 m | 1 542 005 |
| turning left | 3 m | 1 542 010 |
| | 5 m | 1 542 011 |
| | 10 m | 1 542 012 |

| | **Ordering code** |
|---|---|
| ACURO soft, PC connecting cable, incl. power pack 230 VA, for CONIN 12 pole, CCW (suited for supply voltage E and connection G or H) | on request |

| | **Ordering code** |
|---|---|
| Position indicationsigno-SSI | see chapter “Accessories” (page 228) |
| Mounting eccentric for synchronous flange | 0 070 655 |
| Diaphragm coupling (hub 6/6 mm) | 3 520 081 |
| Diaphragm coupling (hub 10/10 mm) | 3 520 088 |

## ORDERING INFORMATION
## ACURO industry BiSS

| Type | Resolution | Supply voltage | Flange, Protection, Shaft | Interface | Connection |
|---|---|---|---|---|---|
| | | | | | |
| **AC58** | **0010** 10 Bit ST<br>**0012** 12 Bit ST<br>**0013** 13 Bit ST<br>**0014** 14 Bit ST<br>**0017** 17 Bit ST<br>**0360** 360 increments ST [1]<br>**0720** 720 increments ST [2]<br>**1212** 12 Bit MT+12 Bit ST<br>**1213** 12 Bit MT+13 Bit ST<br>**1214** 12 Bit MT+14 Bit ST<br>**1217** 12 Bit MT+17 Bit ST<br>higher resolutions<br>on request | **A** DC 5 V *<br>**E** DC<br>10 - 30 V | **S.41 Synchro, IP64, 6x10mm**<br>**S.71 Synchro, IP67 [3], 6x10mm**<br>**K.42 Clamping, IP64, 10x19.5mm**<br>**K.72 Clamping, IP67 [3], 10x19.5mm**<br>**K.46** Clamping, IP64, 9.52x19.5mm<br>**K.76** Clamping, IP67 [3], 9.52x19.5mm<br>**F.42 Hubshaft with tether, IP64, 10x19.5mm hollow shaft**<br>**F.47 Hubshaft with tether, IP64, 12x19.5mm hollow shaft**<br>**F.46** Hubshaft with tether, IP64, 9.52x19.5mm hollow shaft<br>**Q.42** Square, IP64, 10x19.5mm<br>**Q.72** Square, IP67 [3], 10x19.5mm<br>**Q.46** Square, IP64, 9.52x19.5mm<br>**Q.76** Square, IP67 [3], 9.52x19.5mm | **BI** BiSS (Digital)<br>**BC** BiSS (+SinCos 1Vss) [4] | **A** Cable axial<br>**B** Cable radial<br>**C** Conin 12 pole axial cw<br>**D** Conin 12 pole radial cw<br>**G** Conin 12 pole axial ccw<br>**H** Conin 12 pole radial ccw<br>**7** M 12, 8 pole axial<br>**8** M 12, 8 pole radial |

[1] with Offset 76 (value range 76...435)
[2] with Offset 152 (value range 152...871)
[3] Protection class IP67 not available in combination with preset key and LED display
[4] not with connection "7" and "8"
* max. cable length: 40 m
**Preferably available versions are printed in bold type.**

## ORDERING INFORMATION
## ACURO industry SSI

| Type | Resolution | Supply voltage | Flange, Protection, Shaft | Interface | Connection |
|---|---|---|---|---|---|
| | | | | | |
| **AC58** | **0010** 10 Bit ST<br>**0012** 12 Bit ST<br>**0013** 13 Bit ST<br>**0014** 14 Bit ST<br>**0017** 17 Bit ST<br>**0360** 360 increments ST [1]<br>**0720** 720 increments ST [2]<br>**1212** 12 Bit MT+12 Bit ST<br>**1213** 12 Bit MT+13 Bit ST<br>higher resolutions<br>on request | **A** DC 5 V *<br>**E** DC 10 - 30 V | **S.41 Synchro, IP64, 6x10mm**<br>**S.71 Synchro, IP67 [3], 6x10mm**<br>**K.42 Clamping, IP64, 10x19.5mm**<br>**K.72 Clamping, IP67 [3], 10x19.5mm**<br>**K.46** Clamping, IP64, 9.52x19.5mm<br>**K.76** Clamping, IP67 [3], 9.52x19.5mm<br>**F.42 Hubshaft with tether, IP64, 10x19.5mm hollow shaft**<br>**F.47 Hubshaft with tether, IP64, 12x19.5mm hollow shaft**<br>**F.46** Hubshaft with tether, IP64, 9.52x19.5mm hollow shaft<br>**Q.42** Square, IP64, 10x19.5mm<br>**Q.72** Square, IP67 [3], 10x19.5mm<br>**Q.46** Square, IP64, 9.52x19.5mm<br>**Q.76** Square, IP67 [3], 9.52x19.5mm | **SB** SSI Binary<br>**SG** SSI Gray<br>**SC** SSI Gray (+SinCos 1Vss) [4] | **A** Cable axial<br>**B** Cable radial<br>**C** Conin 12 pole axial cw<br>**D** Conin 12 pole radial cw<br>**G** Conin 12 pole axial ccw<br>**H** Conin 12 pole radial ccw<br>**7** M 12, 8 pole, axial<br>**8** M 12, 8 pole, radial |

[1] with Offset 76 (value range 76...435)
[2] with Offset 152 (value range 152...871)
[3] Protection class IP67 not available in combination with preset key and LED display for flange connector
[4] not with connection "7" and "8"
* max. cable length: 40 m
**Preferably available versions are printed in bold type.**