



## Motor feedback systems rotary incremental with commutation CFS50

CFS50-AEV04X09



**Model Name** > CFS50-AEV04X09  
**Part No.** > -\*



*Illustration may differ*

\* When ordering for the first time, please use the information in "Model Name" instead of "Part No."

#### At a glance

- Output driver for incremental and commutation signals as per EIA 422
- Resolution of up to 65,536 lines per revolution
- Commutation signals up to 32 pole pairs
- Temperature range from -20 °C to +115 °C
- Various mechanical interfaces

#### Your benefits

- High level of flexibility due to mechanics already proven in other motor feedback systems
- High level of compatibility thanks to standard interface
- Time-saving due to electrical zero adjustment

#### Performance

|                                 |                                         |
|---------------------------------|-----------------------------------------|
| Number of lines per revolution: | 4,000 <sup>1)</sup>                     |
| Measuring step:                 | 90 ° /number of lines                   |
| Commutation signals:            | 9 pole pairs                            |
| Reference signal, number:       | 1                                       |
| Reference signal, position:     | 90 ° electronically, gated with A and B |
| Operating speed:                | 6,000 /min                              |

<sup>1)</sup> Number of lines from 1 ... 1.000 and > 4.096 ... 65.536 on request

#### Mechanical data

|                                              |                            |
|----------------------------------------------|----------------------------|
| Shaft version:                               | Tapered shaft              |
| Flange type/stator coupling:                 | Rubber support             |
| Dimensions:                                  | See dimensional drawing    |
| Mass:                                        | 0.1 kg                     |
| Moment of inertia of the rotor:              | 10 gcm <sup>2</sup>        |
| Maximum operating speed:                     | 12,000 /min                |
| Maximum angular acceleration:                | 200,000 rad/s <sup>2</sup> |
| Operating torque:                            | 0.2 Ncm                    |
| Start up torque:                             | 0.4 Ncm                    |
| Permissible shaft movement, radial, static:  | ± 0.5 mm                   |
| Permissible shaft movement, radial, dynamic: | ± 0.1 mm                   |
| Permissible shaft movement, axial, static:   | ± 0.75 mm                  |

|                                                               |                                   |
|---------------------------------------------------------------|-----------------------------------|
| Permissible shaft movement, axial, dynamic:                   | ± 0.2 mm                          |
| Life of ball bearings:                                        | 3.6 x 10 <sup>9</sup> revolutions |
| Connection type:                                              | Stranded cable, 15-pin, radial    |
| Angular motion perpendicular to the rotational axis, static:  | ± 0.005 mm/mm                     |
| Angular motion perpendicular to the rotational axis, dynamic: | ± 0.002 mm/mm                     |

#### Electrical data

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|                                         |                       |
|-----------------------------------------|-----------------------|
| Electrical interface:                   | TTL/RS422             |
| Operating voltage range/supply Voltage: | 4.5 V DC ... 5.5 V DC |
| Maximum output frequency:               | 820 kHz               |
| Operating power consumption (no load):  | 60 mA <sup>1)</sup>   |

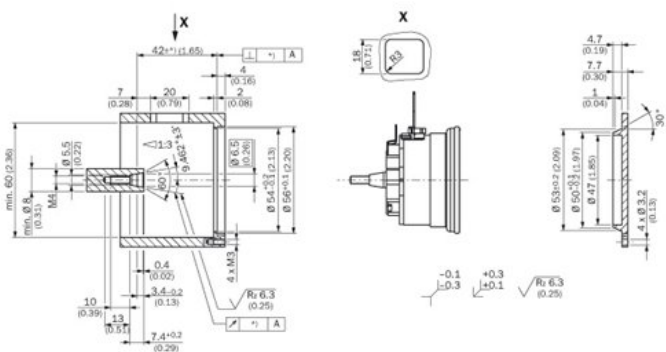
<sup>1)</sup> Without load

#### Ambient data

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|                                 |                                                            |
|---------------------------------|------------------------------------------------------------|
| Working temperature range:      | -20 °C ... 115 °C                                          |
| Storage temperature range:      | -40 °C ... 125 °C, without package                         |
| Relative humidity/Condensation: | 90 %, Condensation not permitted                           |
| Resistance to shocks:           | 100 g, 10 ms (according to EN 60068-2-27)                  |
| Resistance to vibration:        | 20 g, 10 Hz ... 2,000 Hz (according to EN 60068-2-6)       |
| EMC:                            | (according to EN 61000-6-2 and EN 61000-6-3) <sup>1)</sup> |
| Enclosure rating:               | IP 40 (according to IEC 60529)                             |

<sup>1)</sup> The EMC according to the standards quoted is achieved when the motor feedback system is mounted in an electrically conductive housing, which is connected to the central earthing point of the motor controller via a cable screen. This is also where the GND (0 V) connection of the power supply voltage is linked to earth. Users must perform their own tests when other screen designs are used.



<sup>\*)</sup> Size of tolerance reduce the allowed movement of the shaft, see data sheet

All dimensions in mm (inch)

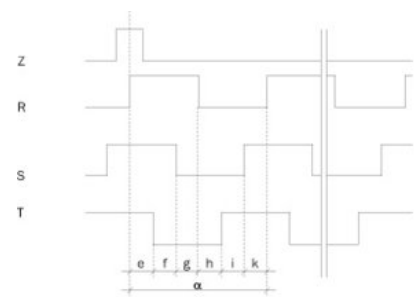
The diagram illustrates the timing of a carry signal in a ripple-carry adder. It shows the propagation of a carry signal from the least significant bit (A<sub>0</sub> + B<sub>0</sub>) through the carry chain (Z, B, A) over time. The diagram is divided into four time intervals:  $t_{x1}$ ,  $t_{x2}$ ,  $t_{x3}$ , and  $t_{x4}$ , with a total time  $T$ . The carry signal starts at 10% and propagates through the stages, with the final carry output reaching 90%.

By connecting the two signals A and B, an output signal arises whose period durations  $t_{x1} \dots t_{x4}$  have varying lengths. The differences are determined:

- by the pulse/pause ratio tolerance of the individual channels
- by the tolerance in the 90° phase shift between A and B
- by the frequency

The times  $t_1 \dots t_4$  ideally have to amount to  $1/4$  of the particular period duration  $T$ . The typical output frequency of the encoder is defined so that the max. time  $t_x$  is smaller than  $1.5 \times T/4$ .

Pulse time diagram



| Polpairs | Number of poles | e, f, g, h, i, k | α    |
|----------|-----------------|------------------|------|
| 2        | 4               | 30°              | 180° |
| 3        | 6               | 20°              | 120° |
| 4        | 8               | 15°              | 90°  |
| 6        | 12              | 10°              | 60°  |
| 8        | 16              | 7.5°             | 45°  |

The angle information is related to a mechanical shaft rotation. Flank precision of the signals R, S, T ±1°.

Wire allocation

| PIN | Color        | Signal                                               |
|-----|--------------|------------------------------------------------------|
| 1   | Blue         | Ground connection (GND)                              |
| 2   | Red          | Supply voltage 5 V ± 10 % (U <sub>0</sub> )          |
| 3   | Yellow       | Reference signal inverted ( $\bar{Z}$ )              |
| 4   | Purple       | Reference signal (Z)                                 |
| 5   | Brown        | Increment signal inverted ( $\bar{A}$ )              |
| 6   | White        | Increment signal (A)                                 |
| 7   | Black        | Increment signal inverted ( $\bar{B}$ )              |
| 8   | Pink         | Increment signal (B)                                 |
| 9   | White/Red    | Commutation signal inverted ( $\bar{T}$ )            |
| 10  | White/Gray   | Commutation signal (T)                               |
| 11  | White/Blue   | Commutation signal inverted ( $\bar{S}$ )            |
| 12  | White/Yellow | Commutation signal (S)                               |
| 13  | White/Pink   | Commutation signal inverted ( $\bar{R}$ )            |
| 14  | White/Green  | Commutation signal (R)                               |
| 15  | Gray         | Electronic setting of the commutation signals (SET0) |

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