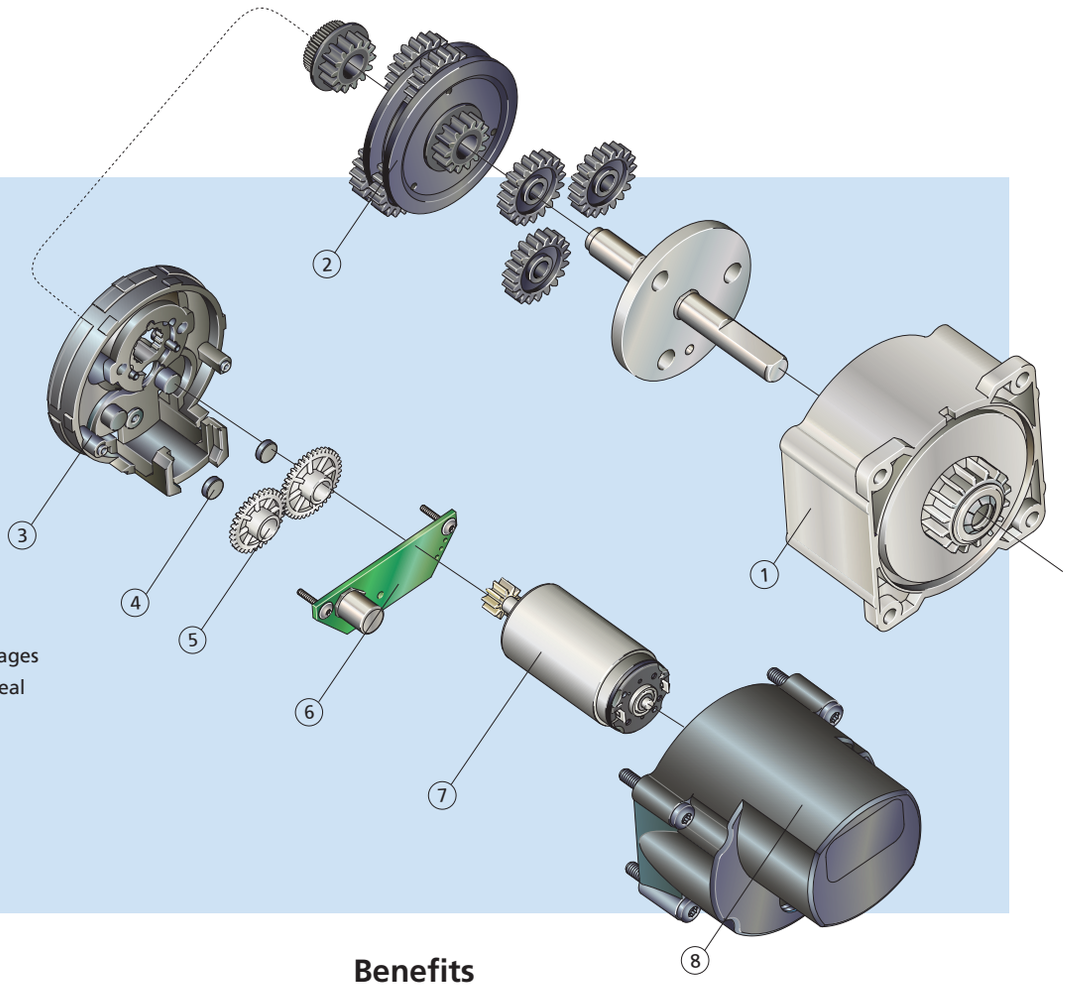
Industrial Actuator

Technical Information



Industrial drive

① Housing zinc diecast
② Planetary gearhead, three stages
③ Motor flange with housing seal
④ Encoder magnet
⑤ Encoder wheels
⑥ Encoder PCB with sensors
⑦ DC-Micromotor
⑧ Rear cover

Features

Engineered in a compact design, the 6091 industrial actuator combines FAULHABER's innovative Motion Control solutions consisting of powerful DC-Micromotors, robust planetary gearheads and high-precision feedback components.

Due to its robust, industry-compatible design with protection class IP 65, its oil-tight seal and its versatility, the 6091 actuator is the perfect choice for a wide range of applications in an industrial environment.

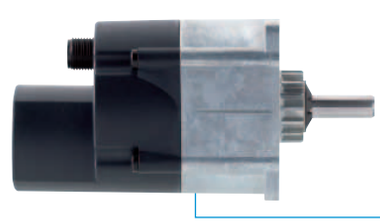
Various gear reduction ratios provide the basis for an extensive range of actuator speeds.

The premium-class system solution for positioning tasks to be performed in sophisticated applications is complemented by highly accurate, integrated multi-turn absolute encoders.

Benefits

- Industrial actuator of modular system design
- Fast and easy configuration of actuator combinations
- Convenient adaptation to industrial applications with regard to torque, speed and feedback system
- Electrical connection using DIN EN 61076-2-101 standard circular connectors

Product Code



60 91 Q

60	Motor diameter [mm]
91	Motor length [mm]
Q	Output shaft type
024	Nominal voltage [V]
DC01	Motor version
MA/MD	Multi-turn absolute encoder, analog/digital

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General information

Mounting:
The actuator must be force closure mounted, e.g. with screws. The permissible pressure on the screw straps must not exceed 120 N/mm². When mounting, care must be taken to ensure that the surfaces of the materials being joined are dry and free from grease. An axially preloaded screw connection (e.g. spring washer) is essential.

Mounting recommendation:
4 cylinder head screws ISO 4762 – M4 x 12 – 10.9
with spring washer DIN 6796-4-FSt.
Tightening torque: 3 Nm – 3.3 Nm

Notes on technical data

Shaft bearing
Describes the type of bearing for the output shaft. Selection of bearing type depends on the maximum permissible shaft loads.

Shaft load
Maximum load that is allowed to act on the output shaft in the radial and axial directions. An axial shaft load in operation must be decoupled in an appropriate manner.

Shaft play
Dimensionally permissible displacement at the output shaft in a no-load condition.

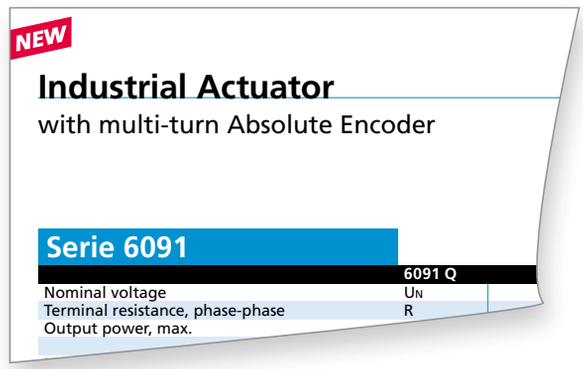
Protection classification
Describes the DIN EN 60529 requirement met by the actuator. The actuator is of oil-tight design in accordance with the same requirements profile.

Weight
The total weight of the actuator.

Operating temperature range
Describes the maximum temperature range in the actuator within which the drive as a whole meets its specification. Operating temperature is reached in the steady-state condition. It depends on ambient temperature and the load profile during operation.

Reduction ratio
The figures listed in the table are nominal and rounded. The exact reduction ratio is available on request.

Torque
Torque information does not depend on the motor; it relates to the integrated planetary gearhead.



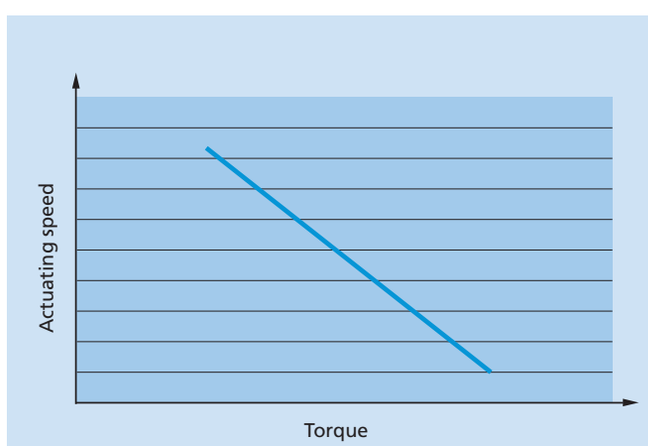
Continuous operation
Continuous torque represents the continuously permissible load on the gearhead. Exceeding this figure shortens lifetime.

Short-time operation
Short-time torque can only be maintained for a short period of time. Intervals should not exceed 5% of the continuous operation cycle.

Direction of rotation
Direction of rotation when viewing the output shaft. Motor connection as per connector pin assignment.

Torque/actuator speed diagram
The diagram shows actuator speed against shaft torque. Friction and efficiency have been taken into account. It thus indicates the real mechanical performance capability of the actuator.

The characteristics were plotted at an operating temperature, i.e. ambient temperature, of 22°C and at a nominal voltage of 24 V DC.



Integrated absolute encoder, analog

Rotational speed
Indicates the number of revolutions of the output shaft in which an absolute encoder value is available.

Outside this range the output signal remains at the minimum or maximum output value for a certain number of revolutions before there is an abrupt change.

Output signal
Depending on the type, the encoder provides either an analog output signal or a digital one. An analog output signal is ratiometric, i.e. the change in output voltage is proportional to the supply voltage of the encoder. The ratio of supply voltage to output voltage remains the same.

Operating voltage
Supply voltage range of the encoder.

Current consumption
Maximum and typical current consumption of the encoder. This figure may deviate from the data sheet figures if the output is subject to a resistive load.

Output resistor
The analog encoder includes an output resistor (see circuit diagram). Together with the analog input resistor on a measuring board the latter forms a voltage divider. To prevent falsification of the output signal, care must be taken to ensure that the measurement resistor has a high resistance.

Electrical angle of rotation
Equals the maximum electrical angle of rotation within which an absolute encoder value is available. This figure is equivalent to rotational speed.

Total number of increments
Number of increments across the entire electrical angle of rotation.

Angular resolution, rounded

$$\text{Angular resolution} = \frac{\text{Electrical angle of rotation}}{\text{Total number of increments}}$$

Linearity deviation, max.
This is the maximum deviation of the output signal from an ideal straight line. The gradient and axis intercept of this straight line may be such that deviation is minimized.

The figure is the percentage deviation of the output signal in relation to supply voltage, or in the case of a digital system, in relation to the total number of increments.

Example:
Analog absolute encoder with 5.0 V supply voltage and 0.25% linearity deviation. This is equivalent to a maximum deviation of 0.25 %* 5.00 V = 0.0125 V.

Lower limit of the linear range
Below this limit the output signal can be non-linear. The linearity deviation is determined within these limiting values.

Upper limit of the linear range
Above this limit the output signal can be non-linear. The linearity deviation is determined within these limiting values.

Integrated digital absolute encoder

Physical interface
The interface is configured with an RS485 driver.
The encoder shares a transmission channel with the control (half duplex). The interface cannot be switched off; when the encoder is not transmitting it is always on receive.

Topology
Only a point-to-point connection is possible between an encoder and a control; network operation is not available. It is not possible to issue a node number.

Terminating resistor, integrated
The network terminating resistor is already integrated.

Transfer speed rate
The transfer speed rate, i.e. the data rate, cannot be adjusted.

Scanning rate, max.
The maximum scanning rate indicates at what intervals the control is allowed to scan the encoder.

Protocol of the digital absolute encoder

On a command from the control to scan the current position the actuator immediately determines the position of the output shaft. It then activates its output drivers and places the result on the bus. When all the data has been sent, it switches back to receive and thus releases the bus for more actuation commands.

Time response
115.2 kbaud, one start bit, one stop bit, no parity, no flow control.

Serial command to scan the position

Hex code	ASCII character	Description of the reply
43 h	C	The position is sent to the RS485 interface in the form of a binary value. Its length is 4 bytes; the most significant byte comes first (little endian = Intel format). The position is output in the increments unit, while the connection with the angular position of the output shaft can be obtained by referring to the data sheet.