

## 9 Encoders

### 9.1 Product description

#### 9.1.1 Description

The encoder types in the DR.. modular motor system were developed in such a way that the requirement has been met for both a fully integrated design and a design which is as short as possible.

For motor size	Design
DR.71 – 132	Integrated in the motor
	Mounting via spread shaft
DR.160 – 280	Mounting via plug-in shaft
DR.315	Mounting via hollow shaft
DR.71 – 280	Mounting via coupling and solid shaft

See project planning note (→ 438) and technical data (→ 441).

#### 9.1.2 Type designation

The type designation of the encoder or encoder mounting adapter is arranged in a four-digit, position coded structure.

The first position of the type designation defines the design of the encoder or encoder mounting adapter:

ID	Description
E	Incremental encoder
A	Absolute encoder
X	Encoders provided by the customer / encoder mounting adapter

The second position of the type designation states the mechanical design of the encoder mounting or the encoder mounting adapter:

ID	Description
I	Integrated in the motor
S	Spread shaft
G	Plug-in shaft with end thread
V	Solid shaft with coupling
H	Hollow shaft

The third position of the type designation shows the version of the encoder or encoder mounting adapter:

ID	Description
7	Series version of the motor
0 – 5	Identify of mounting adapter

The fourth position of the type designation states the electrical interface of the encoder or encoder mounting adapter:

ID	Brief description
S	Sin/Cos
R	TTL (RS422) for U = 9 – 30 V
C	HTL
W	RS485 (Multi-Turn) + Sin/Cos
Y	SSI (Multi-Turn) + Sin/Cos or TTL(RS422)
A	Mounting device
6, 2, 1	Frequency

### 9.1.3 Pin assignment

You find the pin assignment of the respective encoder in the "Prefabricated cables" (→ 562) chapter.

### 9.1.4 Standardized mounting device for encoder

#### Type designation

/ES7A, /EG7A, /EH7A, EV7A

#### Description

The encoder from SEW-EURODRIVE is not included in the scope of delivery. Only prepared for installation of an encoder. The motor shaft is predrilled and an additional protective cover is mounted.

*Principle of installation:*

DR.71 – 132 .../ES7A

The encoder is connected as non-positive connection with the motor shaft bore using a spread shaft. The torque arm is attached to the fan guard from outside.

Bore with Ø 10 mm.

DR.160 – 280 .../EG7A

The encoder with outer thread on the encoder shaft is fastened in the shaft bore (with internal thread). The torque arm is attached to the fan guard from inside.

Bore with Ø 14 mm, and additional end thread in M6.

DR.315 .../EH7A

The hollow shaft encoder is mounted on the B-side motor shaft end Ø 38 mm.

DR.71 – 280 .../EV7A

The encoder is attached using a coupling, encoder: EV7A, centering flange Ø 50 mm, coupling for shaft Ø 10 mm.

See technical data (→ 450).

### 9.1.5 Non-SEW encoder mounting

#### Type designation

/XV..

#### Description

This type of mounting allows the use of non-SEW encoders in motors from SEW-EURODRIVE. The encoder requested by the customer is installed by SEW.

A fan guard with encoder mount allows the encoder to be mounted on the motor shaft. The encoder shaft is connected to the motor shaft via spread shaft coupling.

The non-SEW encoder can also be mounted by the customer. In this case the mounting adapter /XV.A must also be ordered.

The part of the second shaft end which is still protruding following the encoder mounting must be secured with either an extended fan guard or with a cover.

See technical data (→ 450).

### 9.1.6 Mechanical interface for mounting non-SEW encoders by the customer

#### Type designation

Non-SEW encoder mounting devices

- /XV0A Any shaft diameter and centering
- /XV1A Shaft diameter 6 mm; centering 50 mm
- /XV1A Shaft diameter 10 mm; centering 50 mm
- /XV3A Shaft diameter 12 mm; centering 80 mm
- /XV3A Shaft diameter 11 mm; centering 85 mm
- /XV5A Shaft diameter 12 mm; centering 45 mm

#### Description

The non-SEW mounting adapter allows non-SEW encoders to be mounted to the motor via a shaft coupling.

The non-SEW encoder is not yet installed, only the mechanical interface is prepared for mounting the encoder.

The encoder shaft is connected to the motor shaft via a coupling.

See technical data (→ 450).

### 9.1.7 Built-in encoder

#### Type designation

/EI71, /EI72, /EI76, /EI7C

#### Description

Sensor scan of a magnetic pole ring which is integrated within the plastic fan.

Suitable for simple positioning and speed monitoring tasks.


The sensor unit is located directly behind the B-side endshield, when a brake motor is used, on two spacers behind the brake coil or behind the backstop for a motor with a backstop.

The E17 encoders can be evaluated as follows:

- MOVITRAC® in the technology version: Evaluation via "Simple positioning" application software
- MOVIFIT® FC with "technology" function level
- MOVIMOT® with fieldbus interfaces MQ (with EI71, 2 and 6) and MF (with EI71)
- MOVIPRO® with encoder option
- MOVIDRIVE®
- MOVIAxis®

The safety-rated encoder EI7C FS can be evaluated as follows:

- MOVIFIT® FC: Functional safety with safety option S12

See technical data (→  445).

Connection technology, see chapter "Built-in encoder cable" (→  591).

## 9.2 Designs

### 9.2.1 Encoders

The following designs are available:

#### Incremental encoder

These encoders provide an incremental resolution of a single motor revolution.

ID	Description
EI7	+ letter or number for the resolution of the electrical interface EI7C = 24 periods/revolution, EI71 = 1 periods/revolution, EI72 = 2 periods/revolution, EI76 = 6 periods/revolution
ES7	+ letter for the electrical interface (→ 431)
EG7	+ letter for the electrical interface (→ 431)
EV7	+ letter for the electrical interface (→ 431)

#### Absolute encoder

These encoders provide an incremental resolution of a single motor revolution and also count the number of motor revolutions, which is equivalent to absolute information regarding the position.

ID	Description
AS7	+ letter for the electrical interface (→ 431)
AG7	
AV7	

### 9.2.2 Encoder mounting adapters

A SEW encoder is prepared for mounting with the use of the encoder mounting adapter.

The following encoder mounting adapter designs are available for SEW encoders:

ID	Description
ES7A	for SEW spread-shaft encoders on DR.71 – 132
EG7A	for SEW Plug-in shaft encoders with end thread DR.160 – 280
EV7A	for SEW spread-shaft encoders on DR.71 – 225

### 9.2.3 Encoders provided by the customer

#### Encoders

The mounting adapters allow a customer encoder to be mounted on the DR..motor.

The following designs of customer encoders and encoder mounting adapters are available:

ID	Mounting device
XV0	+ letter for the electrical interface
XV1	
XV2	
XV3	
XV4	
XV5	

The encoder is supplied mounted on the motor if it

- is provided by the customer
- or
- is bought by SEW-EURODRIVE according to customer data.

### Electrical interfaces

The electrical interfaces in the chapter "Type designation" (→ 431) represent only some of the options for encoders provided by the customer. Customer encoders have already been mounted in DR..motors with the following interfaces:

ID	Brief description
B	HTL, without inverted signals
S	DeviceNet
E	EnDat
N	CAN bus
P	PROFIBUS
T	TTL (RS422) with U = 5 V and sensor lines

## INFORMATION



Encoders provided by the customer which are supplied fitted cannot undergo functional final inspection however.

### Encoder mounting adapters

The alternative to delivery with a fitted customer encoder is the mounting adapter.

ID	Mounting device
XV0A	for encoders shown in the chapter "Encoder mounting adapter – SEW encoders" (→ 450)
XV1A	
XV2A	
XV3A	
XV4A	
XV5A	



## INFORMATION

Addition mounting adapter for encoders provided by the customer can be requested from SEW-EURODRIVE. It is possible to combine hollow shaft encoders with the second shaft end of DR..motors.

### 9.3 General information on drive selection

#### 9.3.1 Speed sensors

Speed sensors, which can be mounted to the motors in series, can be combined with a range of motor designs and options, such as brakes and forced cooling fans.

If you have any questions, please contact SEW-EURODRIVE.

#### 9.3.2 Encoder connection

When connecting the encoders to the inverters, always follow the operating instructions for the inverter and the wiring diagrams supplied with the encoders.

- The maximum line length (inverter – encoder) is 100 m for the following cable capacitance:
  - < 83 nF/km (core / core) according to DIN VDE 0472 part 504
  - < 110 nF/km (core / shield)
- The potential clamped core cross section is 0.20 – 0.5 mm<sup>2</sup>
- Use shielded cables with twisted pair conductors and make sure they are grounded on both ends over a large surface area:
  - At the encoder in the cable gland or in the encoder plug
  - To the inverter on the electronics shield clamp and/or to the housing of the sub D plug
- Install the encoder cables separately from the power cables, maintaining a distance of at least 200 mm (7.87 in).
- Encoder with screw fitting: Observe the permitted diameter of the encoder cable to ensure that the cable gland functions correctly.

#### 9.3.3 Connection alternatives

Encoder types /ES7, /EG7, /EV7 and /AS7, /AG7, /AV7 can be delivered in three connection variations:

- with connection cover
- with connection cover, cable length 0.3 m and M23 connector
- without connection cable

SEW-EURODRIVE recommends to use prefabricated encoder cables (→ 562).

When using prefabricated cables from SEW-EURODRIVE, you can order the encoders without a connection cover because this cover is part of the cable.



## 9.4 Overview of the electrical interfaces

### 9.4.1 Overview of built-in encoders

#### Electrical interface HTL (push-pull)

Designation	To match the motor size	Encoder type	Mounting type	Specification Periods/revolution	Power supply V
EI7C	71 – 132	Built-in encoder	Integrated	24	DC 9 – 30
EI76				6	
EI72				2	
EI71				1	

### 9.4.2 Overview of incremental encoders

#### Electrical interface Sin / Cos with 1 V<sub>ss</sub>

Designation	To match the motor size	Encoder type	Mounting type	Specification Periods/revolution	Power supply V
ES7S	71 – 132	Add-on encoder	Shaft-centered	1024	DC 7 – 30
EG7S	160 – 280		Hollow shaft		DC 10 – 30
EH7S	315		Coupling		DC 7 – 30
EV7S	71 – 280				

#### Electrical interface HTL (push-pull)

Designation	To match the motor size	Encoder type	Mounting type	Specification Periods/revolution	Power supply V
ES7C	71 – 132	Add-on encoder	Shaft-centered	1024	DC 4.75 – 30
EG7C	160 – 280		Hollow shaft		DC 10 – 30
EH7C	315		Coupling		DC 4.75 – 30
EV7C	71 – 280				

**Electrical interface TTL (RS422)**

Designa- tion	To match the motor size	Encoder type	Mounting type	Specification Periods/revolution	Power supply V	
ES7R	71 – 132	Add-on en- coder	Shaft-centered	1024	DC 7 – 30	
EG7R	160 – 280				DC 4.75 – 5.25	
ES7C <sup>1)</sup>	71 – 132					
EG7C <sup>1)</sup>	160 – 280				DC 10 – 30	
EH7R	315		Hollow shaft			
EH7T	315		DC 5			
EV7R	71 – 280		Coupling		DC 7 – 30	

1) ES7C and EG7C can also be used as TTL (RS422) due to the wide range voltage supply

**9.4.3 Overview of absolute encoders****Electrical interface RS485 (Multi-Turn) + Sin / Cos with 1 V<sub>SS</sub>**

Designation	To match the motor size	Encoder type	Mounting type	Specification Periods/revolution	Power supply V
AS7W	71 – 132	Absolute encoder (Multi-Turn)	Shaft-centered	2048	DC 7 – 30
AG7W	160 – 280				
AV7W	71 – 280		Coupling		

**Electrical interface SSI (Multi-Turn) + Sin / Cos with 1 V<sub>SS</sub>**

Designation	To match the motor size	Encoder type	Mounting type	Specification Periods/revolution	Power supply V
AS7Y	71 – 132	Absolute encoder SSI® (Multi-Turn)	Shaft-centered	2048	DC 7 – 30
AG7Y	160 – 280				
AV7Y	71 – 280		Coupling		

**Electrical interface SSI (Multi-Turn) + TTL (RS422)**

Designation	To match the motor size	Encoder type	Mounting type	Specification Periods/revolution	Power supply V
AH7Y	315	Absolute encoder SSI® (Multi-Turn)	Hollow shaft	2048	DC 9 – 30

## 9.5 Encoder technical data

The following tabular overviews detail the encoders' technical data, sorted based on the electrical interfaces and sizes.

### 9.5.1 Sin/Cos encoder

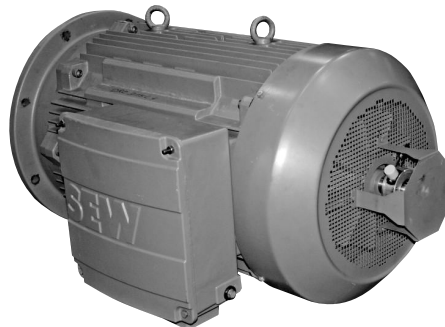


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Encoders		ES7S	EG7S
For motor size		DR.71 – 132	DR.160 – 280
Mounting type		Shaft-centered; spread shaft / plug-in shaft	
Supply voltage $U_B$	V	DC 7– 30	
Max. current consumption $I_{in}$	mA	140	
Output amplitude per track $U_{high}$ $U_{low}$	$V_{ss}$	1	
Signal output		Sine/cosine	
Output current per track $I_{out, RMS}$	mA	10	
Max. pulse frequency $f_{max}$	kHz	150	
Pulses (sine cycles) per A, B Revolution C		1024 1	
Phase angle A : B		$90^\circ \pm 3^\circ$	
Data memory		1920	
Vibration resistance at 10 Hz – 2 kHz	$m/s^2$	$\leq 100$ pursuant to EN 60068-2-6	
Shock resistance	$m/s^2$	$\leq 1000$ pursuant to EN 60068-2-27	$\leq 2000$ pursuant to EN 60068-2-27
Maximum speed $n_{max}$	rpm	6000	
Ambient temperature <sup>1)</sup>	$^\circ C$	-30 to +80 pursuant to EN 60721-3-3, class 3K3	
Degree of protection		IP66 (EN 60529)	
Connection		Terminal strip in pluggable connection cover	
Clamping range of the cable gland	mm	$\varnothing 5 - 10$	
Additional weight	kg	1.1	1.4

1) Ambient temperature for safety-rated encoders

See Product description (→ 431).



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Encoders		EH7S
For motor size		DR.315
Mounting type		Hollow shaft
Supply voltage $U_B$	V	DC 10 – 30
Max. current consumption $I_{in}$	mA	130
Output amplitude $U_{high}$ $U_{low}$	$V_{ss}$	1
Signal output		Sine / Cosine
Output current per track $I_{out, RMS}$	mA	10
Max. pulse frequency $f_{max}$	kHz	180
Periods per revolution A, B C		1024 1
Phase angle A : B		$90^\circ \pm 10^\circ$
Data memory		-
Vibration resistance at 10 Hz – 2 kHz	$m/s^2$	$\leq 100$ pursuant to EN 60068-2-6
Shock resistance	$m/s^2$	$\leq 2000$ pursuant to EN 60068-2-27
Maximum speed $n_{max}$	rpm	6000, 2500 at 60 °C
Ambient temperature	°C	-40 to +60 pursuant to EN 60721-3-3, Class 3K3
Degree of protection		IP65 according to EN 60529
Connection		12-pin plug connector
Additional weight	kg	2.85

See Product description (→ 431).

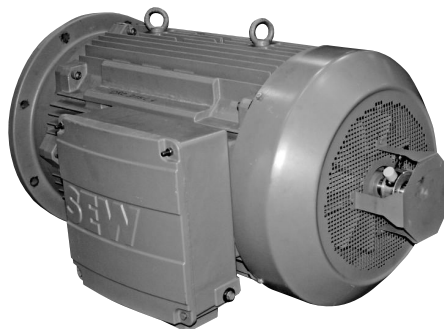
## 9.5.2 TTL (RS422)



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Encoders		ES7R	EG7R
For motor size		DR.71 – 132	DR.160 – 280
Mounting type		Shaft-centered; spread shaft / plug-in shaft	
Supply voltage $U_B$	V	DC 7 – 30	
Max. current consumption $I_{in}$	mA	160	
Output amplitude $U_{high}$ $U_{low}$ (for terminating resistance = 120 $\Omega$ )	V	$\geq 2.5$ $\leq 1.1$	
Signal output		TTL (RS422)	
Output current per track $I_{out, RMS}$	mA	25	
Max. pulse frequency $f_{max}$	kHz	120	
Periods per revolution A, B C		1024 1	
Pulse duty factor		1 : 1 $\pm$ 10 %	
Phase angle A : B		90° $\pm$ 20°	
Vibration resistance at 10 Hz – 2 kHz	m/s <sup>2</sup>	$\leq 100$ pursuant to EN 60068-2-6	$\leq 2000$ pursuant to EN 60068-2-6
Shock resistance	m/s <sup>2</sup>	$\leq 100$ pursuant to EN 60068-2-27	$\leq 2000$ pursuant to EN 60068-2-27
Maximum speed $n_{max}$	rpm	6000	
Ambient temperature	°C	-30 to +60 pursuant to EN 60721-3-3, Class 3K3	
Degree of protection		IP66 according to EN 60529	
Connection		Terminal strip in pluggable connection cover	
Clamping range of the cable gland	mm	Ø 5 – 10	
Additional weight	kg	1.1	1.4

See Product description (→ 431).

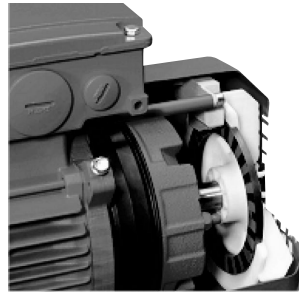


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Encoders		EH7R	EH7T
For motor size		DR.315	
Mounting type		Hollow shaft	
Supply voltage $U_B$	V	DC 10 – 30	DC 5
Max. current consumption $I_{in}$	mA	140	
Output amplitude $U_{high}$ $U_{low}$	V	$\geq 2.5$ $\leq 0.5$	
Signal output		TTL (RS422)	
Output current per track $I_{out, RMS}$	mA	20	
Max. pulse frequency $f_{max}$	kHz	300	
Periods per revolution A, B C		1024 1	
Pulse duty factor		1 : 1 $\pm$ 20 %	
Phase angle A : B		90° $\pm$ 20°	
Vibration resistance at 10 Hz – 2 kHz	m/s <sup>2</sup>	$\leq 100$ pursuant to EN 60068-2-6	
Shock resistance	m/s <sup>2</sup>	$\leq 2000$ pursuant to EN 60068-2-27	
Maximum speed $n_{max}$	rpm	6000, 2500 at 60 °C	
Ambient temperature	°C	-40 to +60 pursuant to EN 60721-3-3, Class 3K3	
Degree of protection		IP65 according to EN 60529	
Connection		12-pin plug connector	

See Product description (→ 431).

### 9.5.3 HTL sensor



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Encoders		EI7C	EI76	EI72	EI71
<b>For motor size</b>		<b>DR.71 – 132</b>			
Mounting type		integrated			
Supply voltage $U_B$	V	DC 9 – 30			
Max. current consumption $I_{in}$	mA	120			
Output amplitude $U_{high}$ $U_{low}$	V	$V_{cc} - 3.5$ to $V_{cc}$ 0 to 3			
Signal output		HTL (push-pull)			
Output current per track $I_{out}$	mA	$\pm 60$			
Max. pulse frequency $f_{max}$	kHz	1.44			
Periods per revolution A, B C		24 0	6 0	2 0	1 0
Pulse duty factor		1 : 1 $\pm 20$ %			
Phase angle A : B		$90^\circ \pm 20^\circ$			
Vibration resistance at 5 Hz – 2 kHz	m/s <sup>2</sup>	$\leq 10$ g (98.1 m/s <sup>2</sup> ) pursuant to EN 60068-2-6			
Shock resistance	m/s <sup>2</sup>	$\leq 100$ g (981 m/s <sup>2</sup> ) pursuant to EN 60068-2-27			
Maximum speed $n_{max}$	rpm	3600			
Ambient temperature	°C	Motor: -30 to +60 Encoders: -30 to +85			
Degree of protection		IP66			
Connection		Connection unit in the terminal box or M12 (8- or 4-pin)			

See Product description (→ 433).



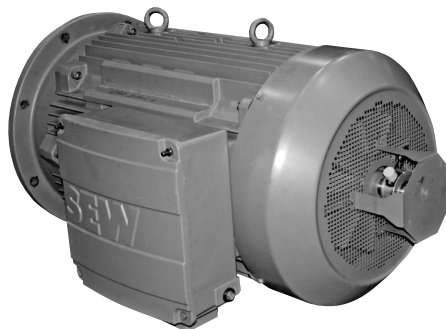
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Encoders		ES7C	EG7C
<b>For motor size</b>		<b>DR.71 – 132</b>	<b>DR.160 – 280</b>
Mounting type		Shaft-centered; spread shaft / plug-in shaft	
Supply voltage $U_B$	V	DC 4.75 – 30	
Max. current consumption $I_{in}$	mA	250	
Output amplitude per track $U_{high}$ $U_{low}$ $U_B = 4.75 - 6$ V, terminating resistance = 120 $\Omega$	$V_{ss}$	$\geq 2.5$ $\leq 1.1$	
Output amplitude per track $U_{high}$ $U_{low}$ $U_B = 6 - 30$ V, terminating resistance = 1 – 3 k $\Omega$	$V_{ss}$	$\geq U_B - 2.5$ $\leq 3$	
Signal output		Extended HTL <sup>1)</sup>	

Encoders		ES7C	EG7C
For motor size		DR.71 – 132	DR.160 – 280
Output current per track $I_{out, RMS}$	mA	60	
Max. pulse frequency $f_{max}$	kHz	120	
Pulses (sine periods) per A, B Revolution C		1024 1	
Pulse duty factor		1 : 1 ± 10 %	
Phase angle A : B		90° ± 20°	
Vibration resistance at 10 Hz – 2 kHz	m/s <sup>2</sup>	≤ 100 pursuant to EN 60068-2-6	
Shock resistance	m/s <sup>2</sup>	≤ 100 pursuant to EN 60068-2-27	≤ 2000 pursuant to EN 60068-2-27
Maximum speed $n_{max}$	rpm	6000	
Ambient temperature	°C	-30 to +60 pursuant to EN 60721-3-3, Class 3K3	
Degree of protection		IP66 according to EN 6052	
Connection		Terminal strip in pluggable connection cover	
Clamping range of the cable gland	mm	Ø 5 – 10	
Additional weight	kg	0.35	0.35

1) for  $U_b = 4.75 - 6$  V can be used as TTL (RS422) encoder

See Product description (→ 431).



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Encoders		EH7C
For motor size		DR.315
Mounting type		Hollow shaft
Supply voltage $U_b$	V	DC 10 – 30
Max. current consumption $I_{in}$	mA	225
Output amplitude per track $U_{high}$ $U_{low}$ $U_b = 10 - 30$ V, terminating resistance = 1 – 3 kΩ	$V_{ss}$	$\geq U_b - 2.5$ $\leq 3$
Signal output		HTL
Output current per track $I_{out, RMS}$	mA	30
Max. pulse frequency $f_{max}$	kHz	300
Pulses (sine cycles) per A, B Revolution C		1024 1
Pulse duty factor		1 : 1 ± 20 %
Phase angle A : B		90° ± 20°
Vibration resistance at 10 Hz – 2 kHz	m/s <sup>2</sup>	≤ 100 pursuant to EN 60068-2-6
Shock resistance	m/s <sup>2</sup>	≤ 2000 pursuant to EN 60068-2-27
Maximum speed $n_{max}$	rpm	6000, 2500 at 60 °C
Ambient temperature	°C	-40 to +60 pursuant to EN 60721-3-3, Class 3K3
Degree of protection		IP65 (EN 60529)
Connection		12-pin plug connector

See Product description (→ 431).



#### 9.5.4 RS485 (Multi-Turn) + Sin / Cos



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Encoders		AS7W	AG7W
For motor size		DR.71 – 132	DR.160 – 280
Mounting type		Shaft-centered: spread shaft / plug-in shaft	
Supply voltage $U_B$	V	DC 7 – 30	
Max. current consumption $I_{in}$	mA	140	
Output amplitude	V	1	
Signal output		Sine/cosine	
Output current per track $I_{out, RMS}$	mA	10	
Max. pulse frequency $f_{max}$	kHz	200	
Periods per revolution A, B C		2048 - -	
Phase angle A : B		$90^\circ \pm 3^\circ$	
Absolute encoder scanning code		Binary code	
Resolution • Single-turn • Multi-turn		8192 increments / revolution 65536 revolutions	
Data transmission of absolute value		Asynchronous, serial (RS485)	
Serial data output		Driver to EIA RS485	
Serial clock input		Optocoupler, recommended driver to EIA RS485	
Data memory		1920 Byte	
Vibration resistance at 10 Hz – 2 kHz	m/s <sup>2</sup>	$\leq 100$ pursuant to EN 60068-2-6	$\leq 2000$ pursuant to EN 60068-2-6
Shock resistance	m/s <sup>2</sup>	$\leq 100$ pursuant to EN 60068-2-27	$\leq 2000$ pursuant to EN 60068-2-27
Maximum speed $n_{max}$	rpm	6000	
Ambient temperature <sup>1)</sup>	°C	-30 to +60 pursuant to EN 60721-3-3, Class 3K3	
Degree of protection		IP66 according to EN 60529	
Connection		Terminal strip in pluggable connection cover	
Clamping range of the cable gland	mm	$\varnothing 5 - 10$	
Additional weight	kg	1.15	1.45

1) Ambient temperature for safety-rated encoders

See Product description (→ 431).

## 9.5.5 SSI (Multi-Turn) + Sin / Cos



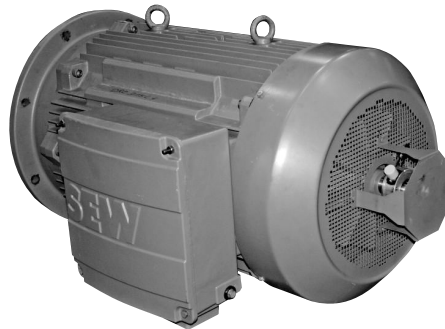
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Encoders		AS7Y	AG7Y
For motor size		DR.71 – 132	DR.160 – 280
Mounting type		Shaft-centered: spread shaft / plug-in shaft	
Supply voltage $U_B$	V	DC 7 – 30	
Max. current consumption $I_{in}$	mA	140	
Output amplitude	V	1	
Signal output		Sine/cosine	
Output current per track $I_{out, RMS}$	mA	10	
Max. pulse frequency $f_{max}$	kHz	200	
Periods per revolution A, B C		2048 - -	
Phase angle A : B		$90^\circ \pm 3^\circ$	
Absolute encoder scanning code		Gray Code	
Resolution • Single-turn • Multi-turn		4096 increments / revolution 4096 revolutions	
Data transmission of absolute value		Synchronous, serial (SSI)	
Serial data output		Driver to EIA RS485	
Serial clock input		Optocoupler, recommended driver to EIA RS485	
Clock rate	kHz	Permitted range: 100 – 2000 (max. 100 m cable length with 300 kHz)	
Clock-pulse space period	ms	12 – 30	
Vibration resistance at 10 Hz – 2 kHz	$m/s^2$	$\leq 100$ pursuant to EN 60068-2-6	$\leq 2000$ pursuant to EN 60068-2-6
Shock resistance in $m/s^2$	$m/s^2$	$\leq 100$ pursuant to EN 60068-2-27	$\leq 2000$ pursuant to EN 60068-2-27
Maximum speed $n_{max}$	rpm	6000	
Ambient temperature <sup>1)</sup>	$^\circ C$	-30 to +60 pursuant to EN 60721-3-3, Class 3K3	
Degree of protection		IP66 according to EN 60529	
Connection		Terminal strip in pluggable connection cover	
Clamping range of the cable gland	mm	$\varnothing 5 - 10$	
Additional weight	kg	1.15	1.45

1) Ambient temperature for safety-rated encoders

See Product description (→ 431).

### 9.5.6 SSI (Multi-Turn) Sin/Cos or TTL (RS422)



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Encoders		AH7Y
For motor size		DR.315
Mounting type		Hollow shaft
Supply voltage $U_B$	V	DC 9 – 30
Max. current consumption $I_{in}$	mA	160
Output amplitude $U_{high}$ $U_{low}$	$V_{ss}$	$\geq 2.5$ $\leq 0.5$
Signal output		TTL (RS422)
Output current per track $I_{out, RMS}$	mA	20
Max. pulse frequency $f_{max}$	kHz	120
Periods per revolution A, B C		2048 - -
Pulse duty factor		1 : 1 $\pm$ 20 %
Phase angle A : B		90° $\pm$ 20°
Absolute encoder scanning code		Gray Code
Resolution		
• Single-turn • Multi-turn		4096 increments / revolution 4096 revolutions
Data transmission of absolute value		Synchronous, serial (SSI)
Serial data output		Driver to EIA RS485
Serial clock input		Optocoupler, recommended driver to EIA RS485
Clock rate	kHz	Permitted range: 100 – 800 (max. 100 m cable length with 300 kHz)
Clock-pulse space period	ms	12 – 30
Data memory		-
Vibration resistance at 10 Hz – 2 kHz	m/s <sup>2</sup>	$\leq 100$ pursuant to EN 60068-2-6
Shock resistance	m/s <sup>2</sup>	$\leq 2000$ pursuant to EN 60068-2-27
Maximum speed $n_{max}$	rpm	3500
Ambient temperature	°C	-20 to +60 pursuant to EN 60721-3-3, Class 3K3
Degree of protection		IP56 according to EN 60529
Connection		Terminal strip on encoder
Clamping range of the cable gland	mm	Ø 5 – 10
Additional weight	kg	4.55

See Product description (→ 431).

## 9.6 Technical data for the encoder mounting adapters

### 9.6.1 Encoder mounting adapters – SEW encoders

To retrospectively mount SEW encoders, the DR.. series motors can be fitted with a corresponding encoder mounting adapter, if desired.

The dimensions of the SEW encoder mounting adapters are displayed in the "Motor dimension sheets" (→ 203) chapter.

Encoder mounting adapter	ES7A	EG7A	EH7A
For motor size	DR.71 – 132	DR.160 – 280 <sup>1)</sup>	DR.315
Mounting type of encoder	Shaft-centered		Hollow shaft
Motor shaft design	10 mm bore	14 mm bore with M6 threaded end	Shaft end 38 mm × 116 mm
Suitable for encoder	ES7S	EG7S	EH7S
	ES7R	EG7R	-
	AS7Y	AG7Y	AH7Y
	AS7W	AG7W	-

1) Brakemotor DR.250/280: EV7A

### INFORMATION



The DR.250/280 motor can be delivered with the EG7A encoder mounting adapter, while the DR.250/280.. BE brakemotor can be delivered with the EV7A encoder mounting adapter.

See Product description (→ 432).

See the "Motor dimension sheets" (→ 203) chapter.

### 9.6.2 Encoder mounting adapter – customer encoder

On request, DR.. series motors can be equipped with various encoder mounting adapters for mounting customer-specific encoders from different manufacturers.

These encoders are usually attached using three encoder clamps (bolts with eccentric disks). The encoder shaft is connected to the motor shaft via a coupling.

**The encoder is not included in the scope of delivery of SEW-EURODRIVE** but is purchased and installed by the customer itself.

The dimensions of the customized encoder mounting adapters are displayed in the "Motor dimension sheets" (→ 203) chapter. Please request the necessary dimension sheets from SEW-EURODRIVE, if required.

### INFORMATION



The combinations with forced cooling fan requires knowledge of the clearance lengths of the encoder to be mounted. Several forced cooling fan hoods with different lengths are available. Please contact SEW-EURODRIVE for more information.



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Encoder mounting adapter	XV0A	XV1A	XV2A	XV3A	XV4A	XV5A
For motor size	DR.71 – 225					
Mounting type of encoder	Flange centered with coupling					
Encoder shaft design	Any	6 mm	10 mm	12 mm	11 mm	12 mm
Centering	Any	50 mm	50 mm	80 mm	85 mm	45 mm
Suitable for encoder	Provided by the customer or by SEW-EURODRIVE on behalf of the customer.					

See Product description (→ 432).

## 9.7 Safety-rated encoder technical data

The following table displays the data that is valid for all safety-rated encoder types ES7S, EG7S, AS7W, AG7W, AS7Y and AG7Y.

Designation	Value
Ambient temperature of encoder	-30 °C to +85 °C
Ambient temperature of motor	-20 °C to +40 °C
Storage temperature	-15 °C to +70 °C
Maximum speed	6000 rpm
Vibration resistance according to EN 60068-2-6	$\leq 100 \text{ m/s}^2 \approx 10 \text{ g}$ (at 10 Hz to 2 kHz)
Maximum angular acceleration	$10^4 \text{ rad/s}^2$
Degree of protection according to EN 60529	IP66

### 9.7.1 Sin / Cos encoder data

The following table displays the data that is valid for all safety-rated encoder types ES7S and EG7S.

Designation	Value
Operating voltage	DC +7 to +30 V
Current consumption without load	100 mA
Resolution	sin/cos interface 1024 periods/revolution
Accuracy	$0.0194^\circ$ (70 angular seconds) <sup>1)</sup>
Shock resistance according to EN 60068-2-27	ES7S: $\leq 1000 \text{ m/s}^2 \approx 100 \text{ g}$ (6 ms) EG7S: $\leq 2000 \text{ m/s}^2 \approx 200 \text{ g}$ (6 ms)

1) Due to the stiffness of the torque arm, you have to take into account an automatically resetting  $\pm 0.6^\circ$  twist (depending on the direction of rotation) of the encoder housing compared to the encoder shaft.

### 9.7.2 HTL built-in encoder data

The following table displays the data that is valid for all safety-rated built-in encoder types EI7C FS.

Designation	Value
Operating voltage	DC +19.2 to +30 V
Current consumption without load	120 mA
Resolution of the incremental section	HTL interface 24 periods/revolution
Max. output current per track	± 30 mA
Signal period tolerance	± 4 m%
Vibration resistance according to EN 60068-2-6	10 g (98.1 m/s <sup>2</sup> ); 5 – 2000 Hz
Shock resistance according to EN 60068-2-27	100 g (981 m/s <sup>2</sup> ); 6 ms
Ambient temperature of motor	-30 to +60
Ambient temperature of encoder	-30 to +85

### 9.7.3 Data on the RS485 in connection with Sin / Cos encoders

The following table displays the data that is valid for all safety-rated encoder types AS7W and AG7W.

Designation	Value
Operating voltage	DC +7 to +30 V
Current consumption without load	100 mA
Resolution of the incremental section	sin/cos interface 2048 periods/revolution
Accuracy of the incremental section	0.0194° (70 angular seconds) <sup>1)</sup>
Resolution of the absolute section	SSI interface, gray-coded 12 bits = 4096 revolutions (single-turn) 12 bits = 4096 revolutions (multi-turn)
Accuracy of the absolute section	± 1 LSB (least significant bit)
Cycle frequency of the absolute section	100 kHz to 800 kHz
Shock resistance according to EN 60068-2-27	AS7Y: ≤ 1000 m/s <sup>2</sup> ≈ 100 g (6 ms) AG7Y: ≤ 2000 m/s <sup>2</sup> ≈ 200 g (6 ms)

1) Due to the stiffness of the torque arm, you have to take into account an automatically resetting ± 0.6 ° twist (depending on the direction of rotation) of the encoder housing compared to the encoder shaft.

### 9.7.4 Data on the multi-turn SSI in connection with Sin / Cos encoders

The following table displays the data that is valid for all safety-rated encoder types AS7Y and AG7Y.

Designation	value
Operating voltage	DC +7 to +30 V
Current consumption without load	100 mA
Resolution of the incremental section	sin/cos interface 2048 periods/revolution
Accuracy of the incremental section	0.0194° (70 angular seconds) <sup>1)</sup>
Resolution of the absolute section	RS485 interface 13 bits = 8192 revolutions (single-turn) 16 bits = 65536 revolutions (multi-turn)
Accuracy of the absolute section	± 1 LSB (least significant bit)
Shock resistance according to EN 60068-2-27	AS7W: ≤ 1000 m/s <sup>2</sup> ≈ 100 g (6 ms) AG7W: ≤ 2000 m/s <sup>2</sup> ≈ 200 g (6 ms)

1) Due to the stiffness of the torque arm, you have to take into account an automatically resetting ± 0.6 ° twist (depending on the direction of rotation) of the encoder housing compared to the encoder shaft.