

# HIGH-RESOLUTION, PROGRAMMABLE MEASURING WHEEL INCREMENTAL ENCODER



## Product description

The DFV60 high-resolution measuring wheel encoder is an extremely rugged solution for determining position and speed directly on the conveyor belt, even in applications where the measuring surface is subject to high levels of vibrations. The DFV60 consists of an

incremental encoder with a mounting arm and two measuring wheels. The spring arm is available as an accessory. Extensive programmability of output signal, zero pulse and line numbers from 1 to 65,536 enable customer-specific adaptations.

## At a glance

- Rotating spring arm for universal use
- 300 mm wheel circumference with O ring made from NBR70
- Mounting arm and measuring wheels made from aluminum
- Programmable output voltage, zero pulse position, zero pulse width and number of pulses
- Connection: radial M12 connector outlet or radial/axial cable outlet
- Electrical interfaces: 5 V & 24 V TTL/RS-422, 24 V HTL/Push Pull
- Remote zero set possible

## Your benefits

- Universal-use spring arm ensures fast and simple mounting
- The high level of spring tension enables use in harsh ambient conditions
- Reduction of storage costs and downtimes due to programmability
- Option to insert cable outlet in radial or axial direction enables customer-specific cable solutions
- Excellent concentricity, even at high speeds
- Long-term and reliable operation thanks to a high enclosure rating, temperature resistance and bearing lifetime
- The ability to program using the PGT-08 programming software and the PGT-10-Pro display programming device enables fast and flexible adaptation of the encoder to customer requirements
- Programmable zero pulse position simplifies installation



## Additional information

Fields of application . . . . .	F-211
Detailed technical data . . . . .	F-211
Type code . . . . .	F-212
Ordering information . . . . .	F-212
Dimensional drawings . . . . .	F-213
PIN assignment . . . . .	F-214
Signal outputs . . . . .	F-215
Zero pulse width . . . . .	F-216
Recommended accessories . . . . .	F-216

F

## Fields of application

- Measurement of position and speed directly on conveyor belts in wood processing machines, steel and metal processing machines, storage and conveyors, sorting systems and conveyor belts, textile machines, printing and paper machines

## Detailed technical data

### Performance

<b>Pulses per revolution</b>	1 ... 65,536, programmable
<b>Error limits O-ring surface</b>	± 0.03 mm
<b>Measuring step deviation at non-binary number of lines</b>	
Pulses 1 ... 99	± 0.04°
Pulses 100 ... 10,000	± 0.008°
Pulses > 10,000	± 0.002°
<b>Measuring step deviation at binary number of lines</b>	
Pulses 1 ... 64	± 0.008°
Pulses 128 ... 8,192	± 0.03°
Pulses 16,384 ... 65,536	± 0.0015°
<b>Initialization time</b>	30 ms

### Mechanical data

<b>Mechanical design</b>	2 measuring wheels, O ring surface
<b>Mass</b>	0.5 kg
<b>Maximum operating speed</b>	3,000 rpm <sup>1)</sup>
<b>Bearing lifetime</b>	3 x 10 <sup>9</sup> revolutions
<b>Spring deflection spring arm</b>	40 mm
<b>Preload spring arm</b>	20 mm

<sup>1)</sup> Take into account self-warming of 3.3 K per 1,000 rpm when designing operating temperature range

### Electrical data

<b>Electrical interface</b>	4.5 V ... 32 V TTL/HTL programmable, (factory setting: TTL)
<b>Connection type</b>	Male connector, M12, 8-pin, radial Cable, universal, 1.5 m Cable, universal, 3 m Cable, universal, 5 m
<b>Operating current without load</b>	40 mA
<b>Supply voltage</b>	4.5 V ... 32 V
<b>Load current</b>	≤ 30 mA
<b>Power consumption</b>	0.7 W (without load)
<b>Maximum output frequency</b>	≤ 820 kHz
<b>Reference signal, number</b>	1
<b>Reference signal, position</b>	90° electric, logically gated with A and B (programmable, see zero pulse width)
<b>MTTFd: mean time to dangerous failure</b>	300 years (EN ISO 13849-1) <sup>1)</sup>

<sup>1)</sup> This product is a standard product and does not constitute a safety component as defined in the Machinery Directive. Calculation based on nominal load of devices, average ambient temperature 40 °C, frequency of use 8760 h/a. All electronic failures are considered hazardous. For more information, see document no. 8015532.

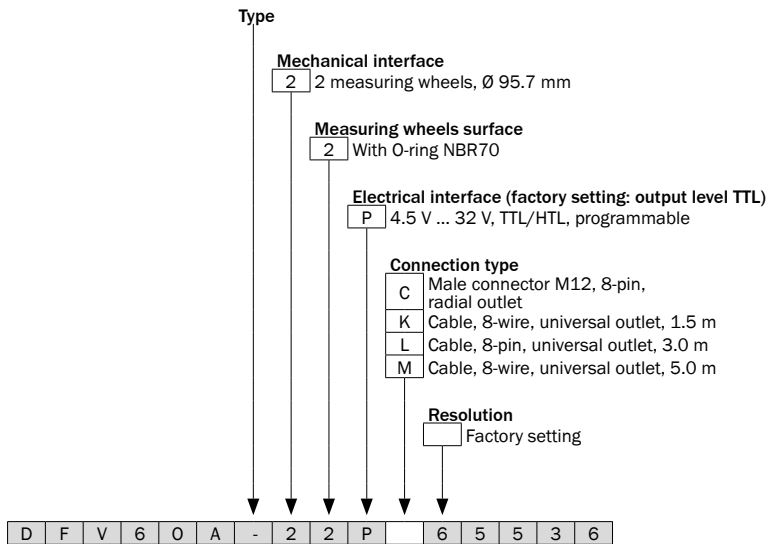
## Ambient data

<b>EMC</b>	EN 61000-6-3, EN 61000-6-2
<b>Enclosure rating (IEC 60529)</b>	IP 65
<b>Air humidity</b>	90% <sup>1)</sup>
<b>Operating temperature range</b>	-20 °C ... +100 °C
<b>Storage temperature range</b>	-40 °C ... +100 °C, without packaging
<b>Resistance to shocks</b>	70 g/ 6 ms (EN 60068-2-27)
<b>Resistance to vibrations</b>	30 g/ 2,000 Hz ... 10 Hz (EN 60068-2-6)

<sup>1)</sup> Condensation of optical surfaces not permitted.

## Type code

F



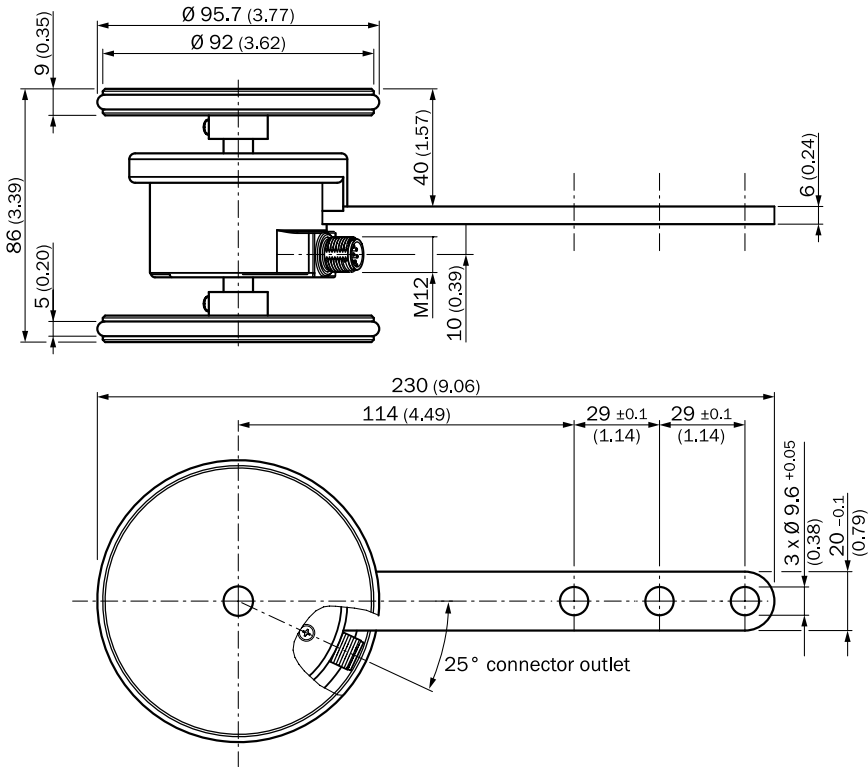
## Ordering information

### 2 measuring wheels, O ring surface

Electrical interface	Connection type	Range of pulses per revolution	Type	Part no.
TTL/HTL programmable	Cable, universal, 1.5 m	65,536	DFV60A-22PK65536	1051331
	Cable, universal, 3 m	65,536	DFV60A-22PL65536	1051334
	Cable, universal, 5 m	65,536	DFV60A-22PM65536	1051337
	Plug connector, M12, 8-pin, radial	65,536	DFV60A-22PC65536	1051309

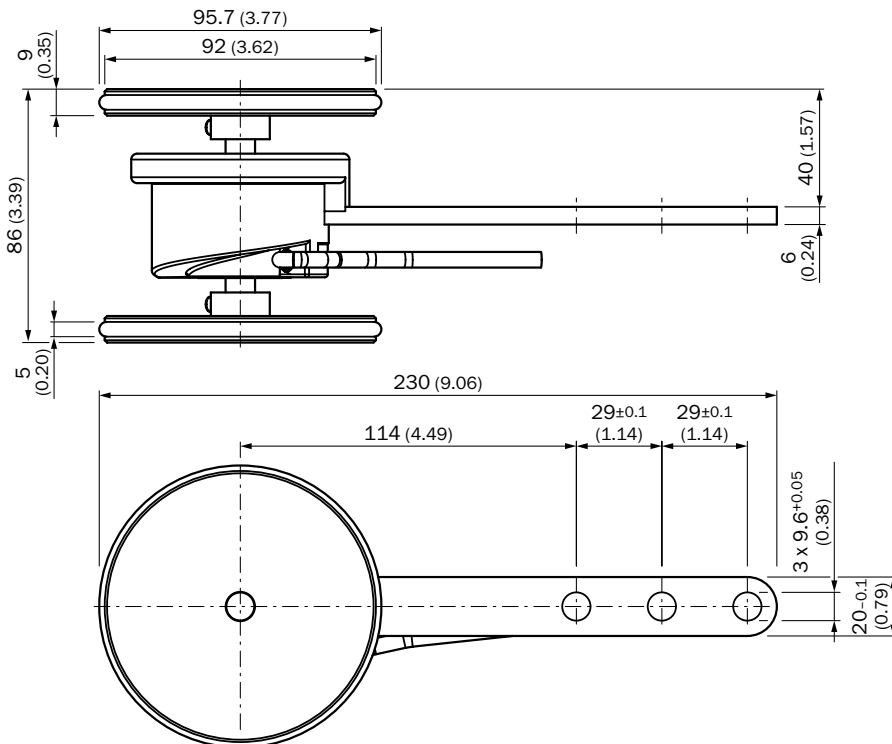
Dimensional drawings (dimensions in mm)

Connector outlet



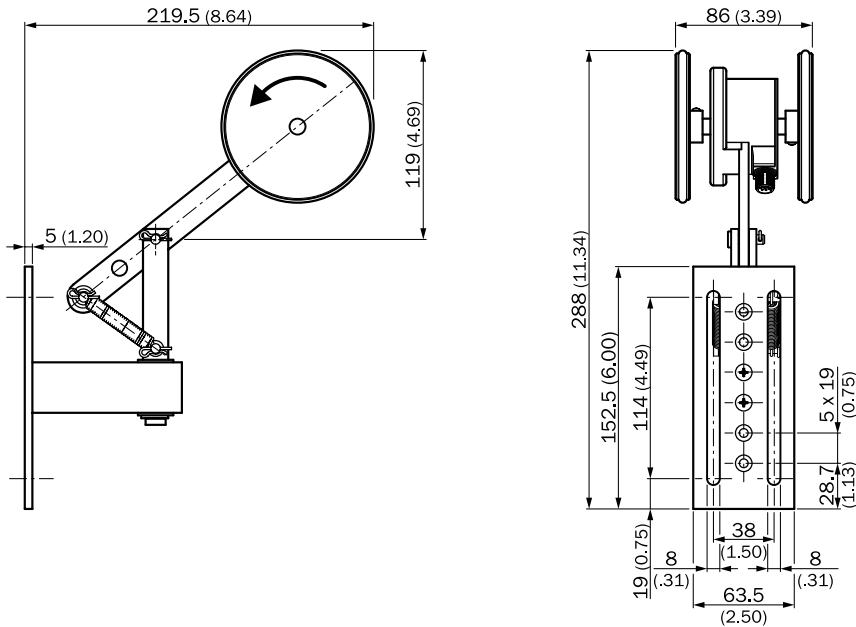
General tolerances according to ISO 2768-mk

Cable outlet



General tolerances according to ISO 2768-mk

DFV60 with 2056155 mounted spring arm (available as an accessory)

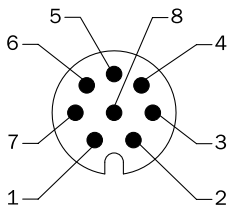


General tolerances according to ISO 2768-mk

## PIN assignment

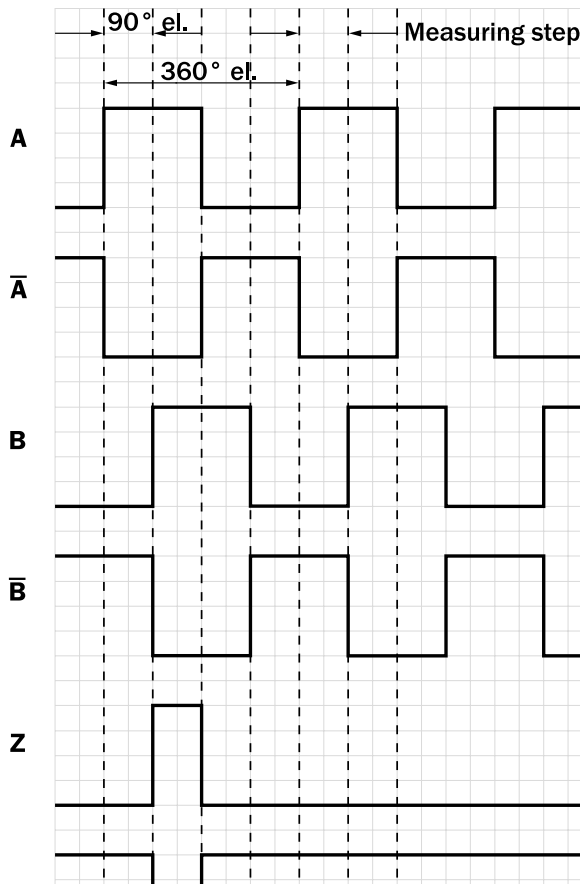
### Cable, 8-wire

View of M12 male device connector on encoder



PIN, 8-pin, M12 male connector	Color of the wires for encoders with cable outlet	TTL/HTL signal	Explanation
1	Brown	$\bar{A}$	Signal wire
2	White	A	Signal wire
3	Black	$\bar{B}$	Signal wire
4	Pink	B	Signal wire
5	Yellow	$\bar{Z}$	Signal wire
6	Violet	Z	Signal wire
7	Blue	GND	Ground connection of the encoder
8	Red	+U <sub>s</sub>	Supply voltage (volt-free to housing)
Screen	Screen	Screen	Screen connected to housing on encoder side. Connected to ground on control side.

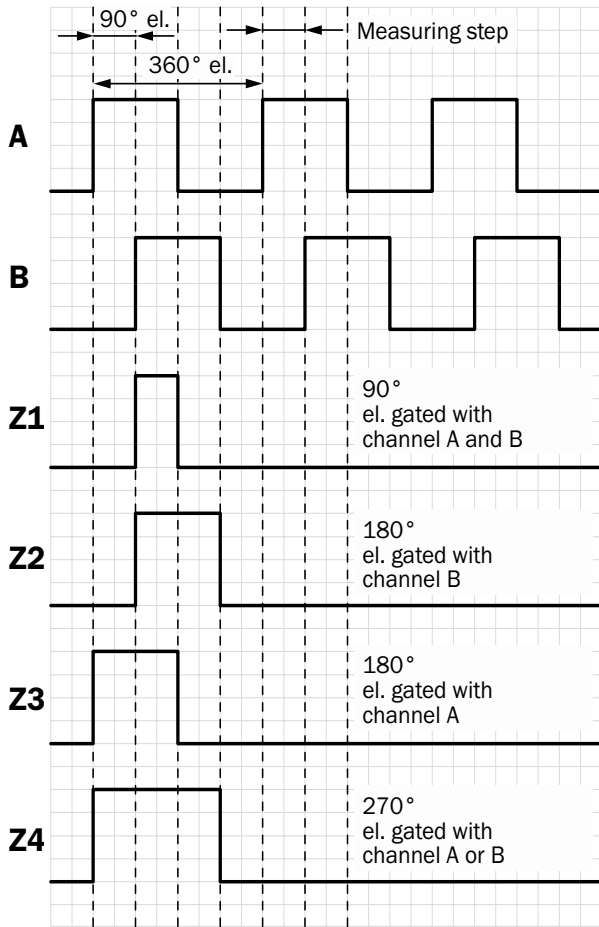
Signal outputs



CCW with view on the measuring wheel, see dimensional drawing.

**F**

Zero pulse width 90 m, 180° or 270°, programmable




CCW with view on the measuring wheel, see dimensional drawing.

Recommended accessories

Mounting systems

Other mounting accessories

Measuring wheels and measuring wheel systems

Figure	Brief description	Type	Part no.
	Measuring wheel with O-ring (NBR70) for 10 mm solid shaft, circumference 300 mm	BEF-MR010030R	2049278

Miscellaneous


Figure	Brief description	Type	Part no.
	Spring arm / mounting arm for DFV60	DFV60 sprung arm	2056155

F




## Connectivity

### Plug connectors and cables





#### Connecting cables with female connector

Figure	Brief description	Length of cable	Type	Part no.
	Head A: female connector, M12, 8-pin, straight Head B: cable Cable: suitable for drag chain, PVC, shielded, 4 x 2 x 0.25 mm <sup>2</sup> , Ø 7.0 mm	2 m	DOL-1208-G02MAC1	6032866
		5 m	DOL-1208-G05MAC1	6032867
		10 m	DOL-1208-G10MAC1	6032868
		20 m	DOL-1208-G20MAC1	6032869




#### Female connector (ready to assemble)

Figure	Brief description	Type	Part no.
	Head A: female connector, M12, 8-pin, straight, A encoded, shielded, for cable diameter 4 mm ... 8 mm Head B: - Operating temperature: -40 °C ... +85 °C	DOS-1208-GA01	6045001
	Head A: female connector, M23, 12-pin, straight, shielded, for cable diameter 5.5 mm ... 10.5 mm Head B: - Operating temperature: -20 °C ... +130 °C	DOS-2312-G	6027538
	Head A: female connector, M23, 12-pin, angled, shielded, for cable diameter 4.2 mm ... 6.6 mm Head B: - Operating temperature: -20 °C ... +130 °C	DOS-2312-W01	2072580
	Head A: female connector, M23, 12-pin, straight, shielded, for cable diameter 5.5 mm ... 10.5 mm Head B: - Operating temperature: -40 °C ... +125 °C	DOS-2312-G02	2077057




#### Cables (ready to assemble)

Figure	Brief description	Length of cable	Type	Part no.
	Head A: cable Head B: cable Cable: suitable for drag chain, PUR, halogen-free, shielded, 4 x 2 x 0.15 mm <sup>2</sup> , Ø 5.6 mm	By the meter	LTG-2308-MWENC	6027529
	Head A: cable Head B: cable Cable: PUR, shielded, 4 x 2 x 0.25 mm <sup>2</sup> + 2 x 0.5 mm <sup>2</sup> + 1 x 0.14 mm <sup>2</sup> , Ø 7.5 mm		LTG-2411-MW	6027530
	Head A: cable Head B: cable Cable: suitable for drag chain, PUR, halogen-free, shielded, 4 x 2 x 0.25 mm <sup>2</sup> + 2 x 0.5 mm <sup>2</sup> + 2 x 0.14 mm <sup>2</sup> , Ø 7.8 mm		LTG-2512-MW	6027531
	Head A: cable Head B: cable Cable: suitable for drag chain, PUR, halogen-free, shielded, UV and saltwater resistant, 4 x 2 x 0.25 mm <sup>2</sup> + 2 x 0.5 mm <sup>2</sup> + 2 x 0.14 mm <sup>2</sup> , Ø 7.8 mm		LTG-2612-MW	6028516

## Male connector (ready to assemble)

Figure	Brief description	Type	Part no.
	Head A: male connector, M12, 8-pin, straight, A encoded, shielded, for cable diameter 4 mm ... 8 mm Head B: - Operating temperature: -40 °C ... +85 °C	STE-1208-GA01	6044892
	Head A: male connector, M23, 12-pin, straight, shielded, for cable diameter 5.5 mm ... 10.5 mm Head B: - Operating temperature: -20 °C ... +130 °C	STE-2312-G	6027537
	Head A: male connector, M23, 12-pin, straight, for cable diameter 5.5 mm ... 10.5 mm Head B: - Operating temperature: -40 °C ... +125 °C	STE-2312-G01	2077273



## Connection cables with female and male connector

Figure	Brief description	Length of cable	Type	Part no.
	Head A: female connector, connector system, 8-pin, straight Head B: male connector, D-Sub, 9-pin, straight Cable: PVC, shielded, can be used for encoders with cable outlet in conjunction with PGT-10-Pro	0.5 m	DSL-0D08-G0M5AC3	2061739
	Head A: female connector, M12, 8-pin, straight Head B: male connector, D-Sub, 9-pin, straight Cable: shielded, 4 x 2 x 0.08 mm <sup>2</sup>	0.5 m	DSL-2D08-G0M5AC3	2046579
	Head A: female connector, M23, 12-pin, straight Head B: male connector, D-Sub, 9-pin, straight Cable: shielded, 4 x 2 x 0.08 mm <sup>2</sup>	0.5 m	DSL-3D08-G0M5AC3	2046580

F

## Other accessories

### Programming and configuration tools

Figure	Brief description	Type	Part no.
	Programming unit USB, for programmable SICK Encoders AFS60, AFM60, DFS60, VFS60, DFV60 and wire draw encoders with programmable encoder.	PGT-08-S	1036616
	Programming unit display for programmable SICK DFS60, VFS60, DFV60, AFS/AFM60, AHS/AHM36 encoders, and wire draw encoders with DFS60, AFS/AFM60, and AHS/AHM36. Compact dimensions, low weight, and intuitive operation.	PGT-10-Pro	1072254

→ For additional accessories, please see page K-668 onwards