

Linear Encoders

Angle Encoders

Rotary Encoders

3-D Touch Probes

Position Display Units

Numerical Controls

IBV 100/EXE 100 Interpolation and Digitizing Electronics

HEIDENHAIN linear, rotary and angle encoders operate on the principle of photoelectrically scanning very fine gratings. These encoders normally produce sinusoidal scanning signals with levels of approximately $11 \mu\text{A}_{\text{PP}}$ (current signal) or approx. 1 V_{PP} (voltage signals). The subsequent electronics first interpolate the scanning signals and then

convert them into square-wave pulses (digitizing). This interpolation and digitizing circuitry is either integrated in the NC control (e.g. a HEIDENHAIN TNC), in the numerical display (e.g. ND or POSITIP from HEIDENHAIN) or is available as a separate unit of the **IBV** type (for voltage signals A, B and R) or **EXE** type (for current signals I_1 , I_2 and I_0).

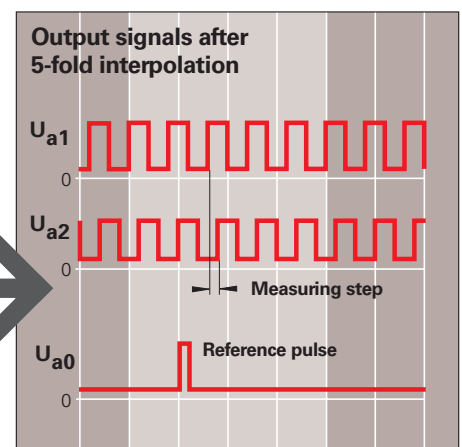
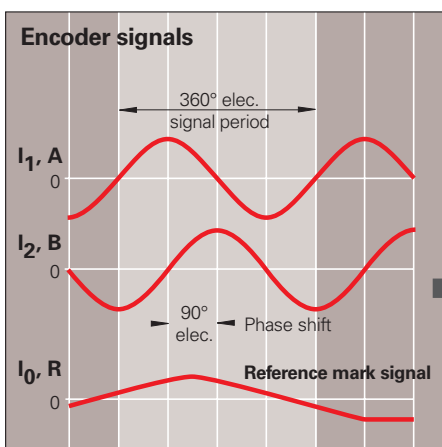
The new IBV 100/EXE 100 interpolation and digitizing electronics from HEIDENHAIN are smaller in dimension than the IBV/EXE 600 series, making them particularly well designed for easy and immediate mounting on machine elements.

The EXE and IBV provide two square-wave pulse trains U_{a1} and U_{a2} as well as a reference pulse U_{a0} . Within one signal period, each of the four signal edges of U_{a1} and U_{a2} can serve as a counting pulse. The distance between two subsequent edges of U_{a1} and U_{a2} is one measuring step.

After 5-fold interpolation, for example, this distance is 1/20th of a grating period.

The adjustment to the subsequent electronics is quite easy. The interpolation, edge separation and reference pulse width are adjusted using PCB switches. Failure indication consists of a separate fault detection signal, or in addition, a switch to high impedance in the outputs U_{a1} and U_{a2} .

Optimum functionality and compact size are the essential attributes of the IBV 100/EXE 100 series.



Specifications

IBV 100 series

IBV Interpolation and Digitizing Electronics

Input:  1 V_{PP}
 Output:  TTL

The IBV 100 series features one input for incremental linear or angle encoders with sinusoidal output signals and a signal level of 1 V_{PP}. IBVs provide output signals over a TTL compatible flange socket.

The 5 V ± 5 % power supply of the IBV 100 series must be provided by the subsequent electronics.

Interpolation and minimum edge separation *a* of the output signals or the resulting maximum input frequency are adjustable in the IBV. The hysteresis of the incremental output signals of the IBV 101 is fixed at "no hysteresis"; the IBV 102 is fixed at "with hysteresis."



IBV 101	Possible settings		Minimum edge separation <i>a</i>
	5-fold	10-fold	
Input frequency	200 kHz	200 kHz	0.125 μs
	200 kHz	100 kHz	0.25 μs
	133 kHz	66 kHz	0.375 μs
	100 kHz	50 kHz	0.5 μs
	80 kHz	40 kHz	0.625 μs
	50 kHz	25 kHz	1.0 μs
	25 kHz	12.5 kHz	2.0 μs
	Reference pulse width	90° elec. or 270° elec.	
Fault indication	Via fault detection signal U_{AS} , or additionally U _{a1} /U _{a2} high-impedance		

Default version printed bold!

IBV 102	Possible settings				Minimum edge separation <i>a</i>
	20-fold	25-fold	50-fold	100-fold	
Input frequency	100 kHz	80 kHz	40 kHz	20 kHz	0.125 μs
	50 kHz	40 kHz	20 kHz	10 kHz	0.25 μs
	33 kHz	26 kHz	13 kHz	6.6 kHz	0.375 μs
	25 kHz	20 kHz	10 kHz	5 kHz	0,5 μs
	20 kHz	16 kHz	8 kHz	4 kHz	0.625 μs
	12.5 kHz	10 kHz	5 kHz	2.5 kHz	1.0 μs
	6.25 kHz	5 kHz	2.5 kHz	1.25 kHz	2.0 μs
	Reference pulse width	90° elec. or 270° elec.			
Fault indication	Via fault detection signal U_{AS} , or additionally U _{a1} /U _{a2} high-impedance				

Default version printed bold!

Specifications

EXE 100 series

EXE Interpolation and Digitizing Electronics

Input:  11 μA_{PP}
Output: 

The EXE 100 series features one input for linear or angle encoders with sinusoidal output signals and a signal level of 11 μA_{PP} . These EXEs provide output signals over a TTL compatible flange socket.

The 5 V \pm 5 % power supply of the EXE 100 series must be provided by the subsequent electronics.

Interpolation and minimum edge separation *a* of the output signals or the resulting maximum input frequency are adjustable in the EXE. The hysteresis of the incremental output signals of the EXE 101 is fixed at "no hysteresis"; the EXE 102 is fixed at "with hysteresis."



EXE 101	Possible settings		Minimum edge separation <i>a</i>
	Interpolation*		
Input frequency	5-fold	10-fold	0.125 μs
	100 kHz	100 kHz	0.25 μs
	100 kHz	100 kHz	0.375 μs
	100 kHz	66 kHz	0.5 μs
	100 kHz	50 kHz	0.625 μs
	80 kHz	40 kHz	1.0 μs
	50 kHz	25 kHz	2.0 μs
25 kHz	12.5 kHz		
Reference pulse width	90° elec. or 270° elec.		
Fault indication	Via fault detection signal U_{AS} , or additionally U _{a1} /U _{a2} high-impedance		

* Default versions printed bold! Please indicate when ordering.

EXE 102	Possible settings				Minimum edge separation <i>a</i>
	Interpolation*	20-fold	25-fold	50-fold	
Input frequency	20-fold	25-fold	50-fold	100-fold	0.125 μs
	60 kHz	60 kHz	40 kHz	20 kHz	0.25 μs
	50 kHz	40 kHz	20 kHz	10 kHz	0.375 μs
	33 kHz	26 kHz	13 kHz	6.6 kHz	0.5 μs
	25 kHz	20 kHz	10 kHz	5 kHz	0.625 μs
	20 kHz	16 kHz	8 kHz	4 kHz	1.0 μs
	12.5 kHz	10 kHz	5 kHz	2.5 kHz	2.0 μs
6.25 kHz	5 kHz	2.5 kHz	1.25 kHz		
Reference pulse width	90° elec. or 270° elec.				
Fault indication	Via fault detection signal U_{AS} , or additionally U _{a1} /U _{a2} high-impedance				

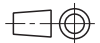
* Default versions printed bold! Please indicate when ordering.

Specifications – Dimensions

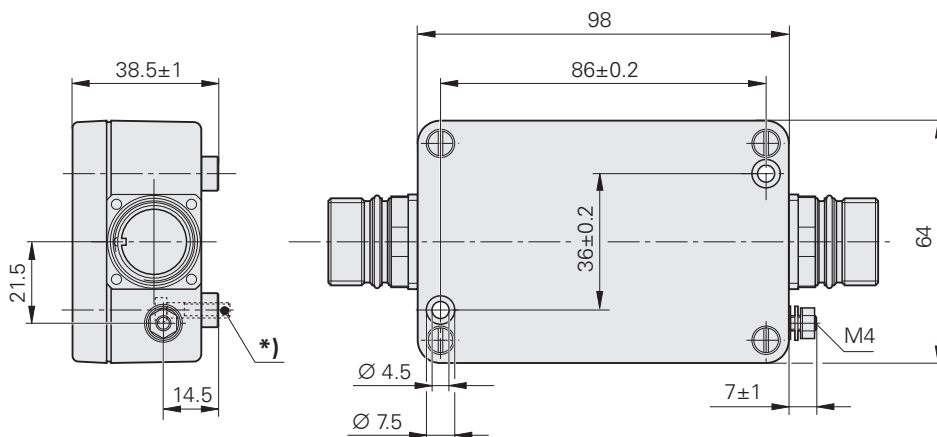
General specifications	
Weight	Approx. 0.3 kg
Protection IEC 60529	IP 65
Operating temperature Storage temperature	0 to 70 °C -30 to 80° C
Vibration 50 to 2000 Hz Shock 11 ms	$\leq 100 \text{ m/s}^2$ $\leq 300 \text{ m/s}^2$
Power Supply	$U_P = 5 \text{ V} \pm 5 \%$
Current consumption Without current consumption by the encoder and without output load	Max. 100 mA Subsequent electronics with the recommended input circuitry increase current consumption by approx. 80 mA.

Dimensions

in mm



Tolerancing ISO 8015
ISO 2768 - m H



*) Two mounting screws
M4 x 16 ISO 4762/DIN 912

Electrical Connection

Connecting Elements—General Information

The pins on connectors are **numbered** in the direction opposite to those on couplings or flange socket, regardless of whether the contacts are

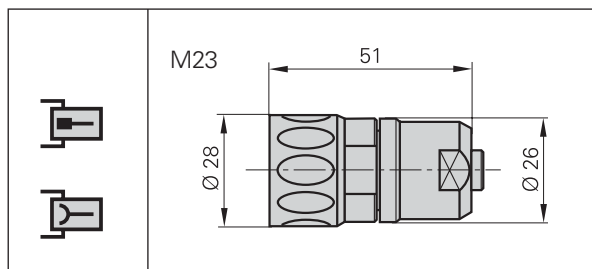
male or

female contacts.



When engaged, the connections provide **protection** to IP 67 (D-sub connector: IP 50; IEC 60529). When not engaged, there is no protection.

Connector: Connecting element with coupling ring. Available with male or female contacts.



Connecting elements and cables M23

Input of IBV

Cable and connector 12-pin
See HEIDENHAIN catalogs
Rotary Encoders
Angle Encoders
Exposed Linear Encoders
Sealed Linear Encoders

Cable lengths:

Max. 30 m*
Max. 60 m with $U_P > 4.9V$

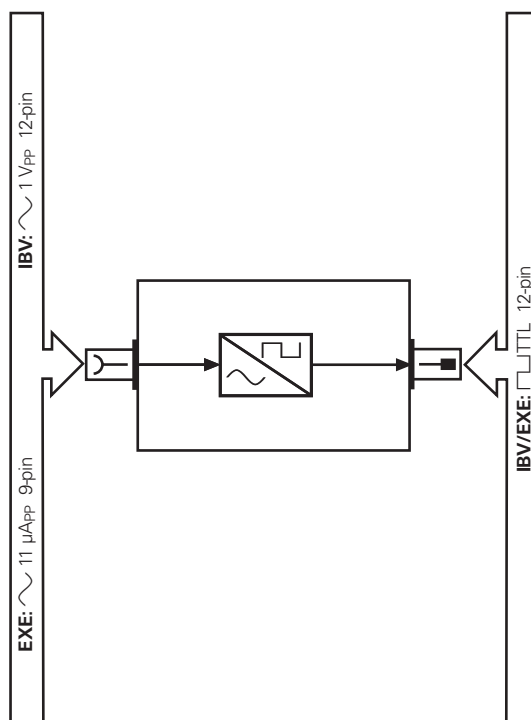
Input of EXE

Cable and connector 9-pin
See the HEIDENHAIN catalog
Digital Readouts and the Product Information documents of the respective encoders

Cable lengths:

Max. 30 m*

* At $I_{\text{encoder}} \leq 120 \text{ mA}$



Output of IBV / EXE

Cable 12-pin
Complete with connector (female) and coupling (pin)
Id. Nr. 298399-xx



With one connector (female)
Id. Nr. 309777-xx



Cable only
PUR [4(2 x 0.14 mm²) + (4 x 0.5 mm²)]
Id. Nr. 244957-01






Connector (female) 12-pin
Id. Nr. 291697-05



Electrical Connection




Input of IBV

12-pin flange socket M23													
  													
Power Supply				Incremental Signals						Other signals			
12	2	10	11	5	6	8	1	3	4	7	9	/	
U_P	Sensor U_P	0V	Sensor 0V	A+	A-	B+	B-	R+	R-	Vacant	Vacant	Vacant	
Brown/ Green	Blue	White/ Green	White	Brown	Green	Gray	Pink	Red	Black	Violet	/	Yellow	

U_P = power supply; **shield** on housing

Sensor: The sensor line is connected internally with the corresponding power line.

Input of EXE

9-pin flange socket M23										
  										
Power Supply				Incremental Signals						
3	4	Housing	9	1	2	5	6	7	8	
U_P	0V	External shield	Inside shield	$I_1 +$	$I_1 -$	$I_2 +$	$I_2 -$	$I_0 +$	$I_0 -$	
Brown	White	–	White/ Brown	Green	Yellow	Blue	Red	Gray	Pink	



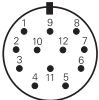
U_P = power supply

Vacant pins or wires must not be used!

Shield on housing

Color assignment applies only to extension cable.

Output of IBV and EXE

12-pin flange socket M23													
  													
Power Supply				Incremental Signals						Other signals			
12	2	10	11	5	6	8	1	3	4	7	9	/	
U_P	Sensor U_P	0V	Sensor 0V	U_{a1}	\overline{U}_{a1}	U_{a2}	\overline{U}_{a2}	U_{a0}	\overline{U}_{a0}	\overline{U}_{aS}	PWT test pin	Vacant	
Brown/ Green	Blue	White/ Green	White	Brown	Green	Gray	Pink	Red	Black	Violet	Yellow	/	

U_P = power supply; **shield** on housing

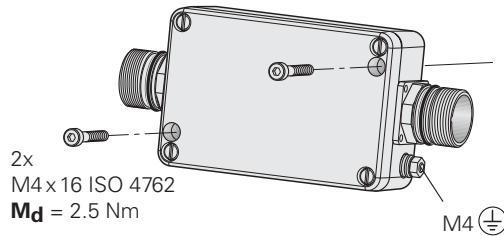
Sensor: The sensor line is connected internally with the corresponding power line.

Mounting

The IBV/EXE100 are fastened by two M4 screws.

Remark:

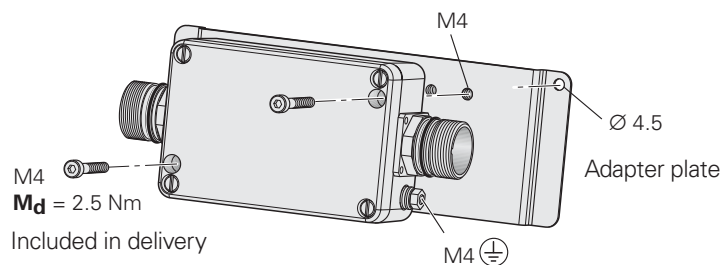
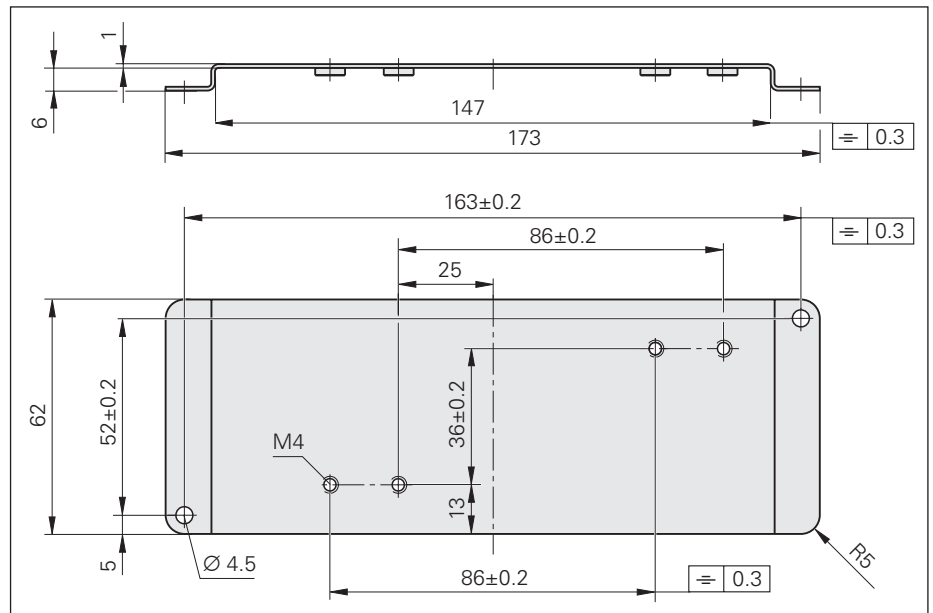
The housing must share the same electrical potential as the encoder and subsequent electronics. This is ensured by connecting the grounding screw with a potential compensating line (Cu; cross section > 6 mm²) to the main signal ground of the machine.



Accessories

An adapter plate is available for mounting on existing holes for the IBV 6xx/EXE 6xx:

Adapter plate: Id. Nr. 536452-01



HEIDENHAIN Measuring and Test Equipment

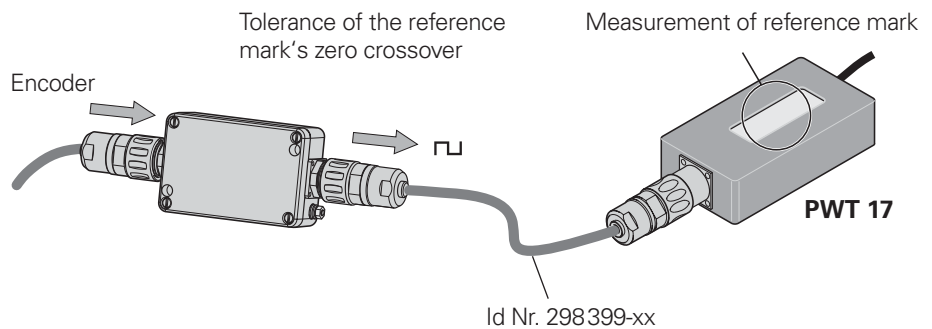
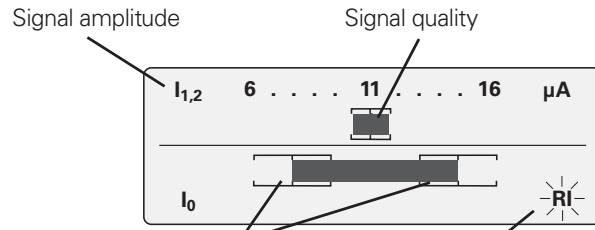
The **PWT** is a simple adjusting aid for HEIDENHAIN incremental encoders. In a small LCD window the signals are shown as bar charts with reference to their tolerance limits.



If the PWT test pin is connected with + 5 V, the TTL signals are switched off and the analog signals of the connected encoder are available at the output as 11 μA_{PP} signals.

The IBV 100 or EXE 100 series require the PWT 17. The connecting cable (Id. Nr. 298399-xx) must be ordered separately.

	PWT 10	PWT 17	PWT 18
Encoder input	11 μA_{PP}	TTL	1 V _{PP}
Features	Measurement of signal amplitude Wave-form tolerance Amplitude and position of the reference mark signal		
Power Supply	Via power supply unit (included)		
Dimensions	114 mm x 64 mm x 29 mm		



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For more information

- Brochure: EXE