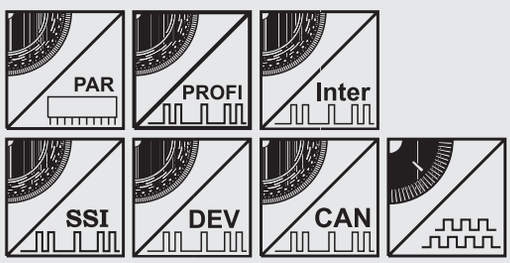
Model WS60
with absolute or incremental encoder output

Industrial position sensor for very long measurement ranges

- **Protection class IP52**
- **Measurement ranges:**
  0 … 15000 mm, 30000 mm, 60000 mm
- **With absolute or incremental encoder output**



Specifications

Outputs	Incremental encoder with TTL or HTL output			
	Absolute encoder (see order code)			
Resolution		15000 mm	30000 mm	60000 mm
	Pulses resp. steps per mm	16	10	8
Material	Aluminium and stainless steel. Cable: stainless steel			
Sensing device	Incremental encoder or absolute encoder			
Connector	Depending on the encoder type			
Linearity	±0.1 % full scale, optional ±0.025 % full scale			
Weight	15 kg max.			
Environmental				
EMC	Refer to output specification			
Temperature	Refer to output specification			

Order Code WS60 absolute/incremental

WS60 – □ – □ – ⬚ – □

Model Name

Measurement Range (in mm)
15000 / 30000 / 60000

Outputs (see pages 61 ff.)
IE58LI = Incremental encoder TTL compatible inverted
IE58HI = Incremental encoder HTL compatible inverted
HSSI = Absolute encoder with synchronous serial output (SSI)
HSSIP = Absolute encoder with synchronous serial output (SSI), programmable
HPROF = Absolute encoder with Profibus interface
HINT = Absolute encoder with Interbus interface
HCAN = Absolute encoder with CAN bus interface
HCANOP = Absolute encoder with CANopen bus interface
HDEV = Absolute encoder with DeviceNet interface
HPAR = Absolute encoder with parallel interface

Linearity (option)
L025 = ±0.025 %

Cable fixing
M4 = M4 cable fixing
SB0 = Cable clip

Order Code Mating Connector (see accessories page 82) **Incremental, SSI:** **CONN-CONIN-12F-G**

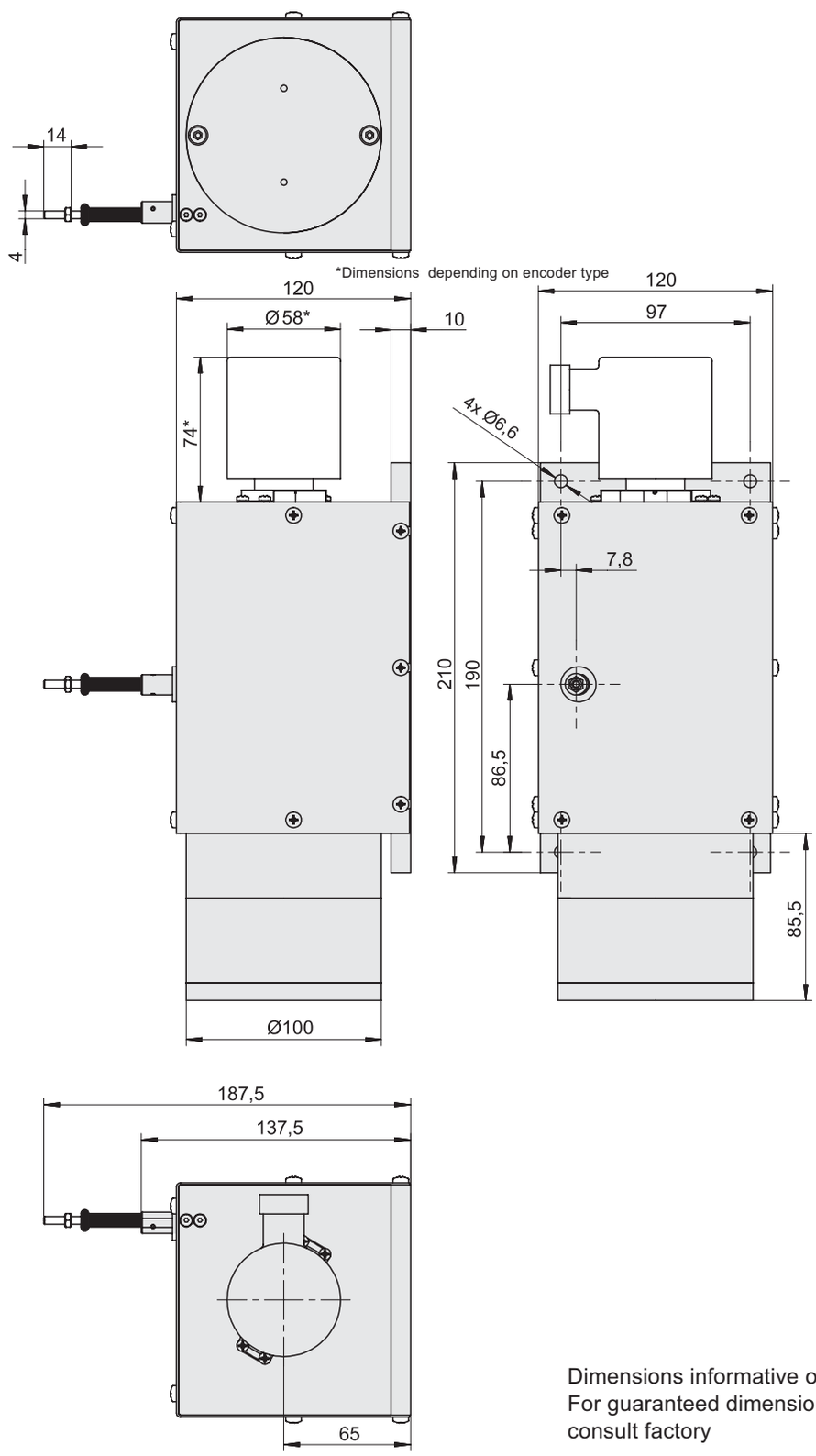
Order Example: WS60 - 60000 - HSSI - M4

Model WS60
with absolute or incremental encoder output

Cable Forces typical at 20 °C	Range	Maximum Pull-out Force	Minimum Pull-in Force
	[mm]	[N]	[N]
	15000	10.5	5.0
	30000	14.5	6.2
	60000	17.0	6.5

Outline drawing

(WS60-15000)

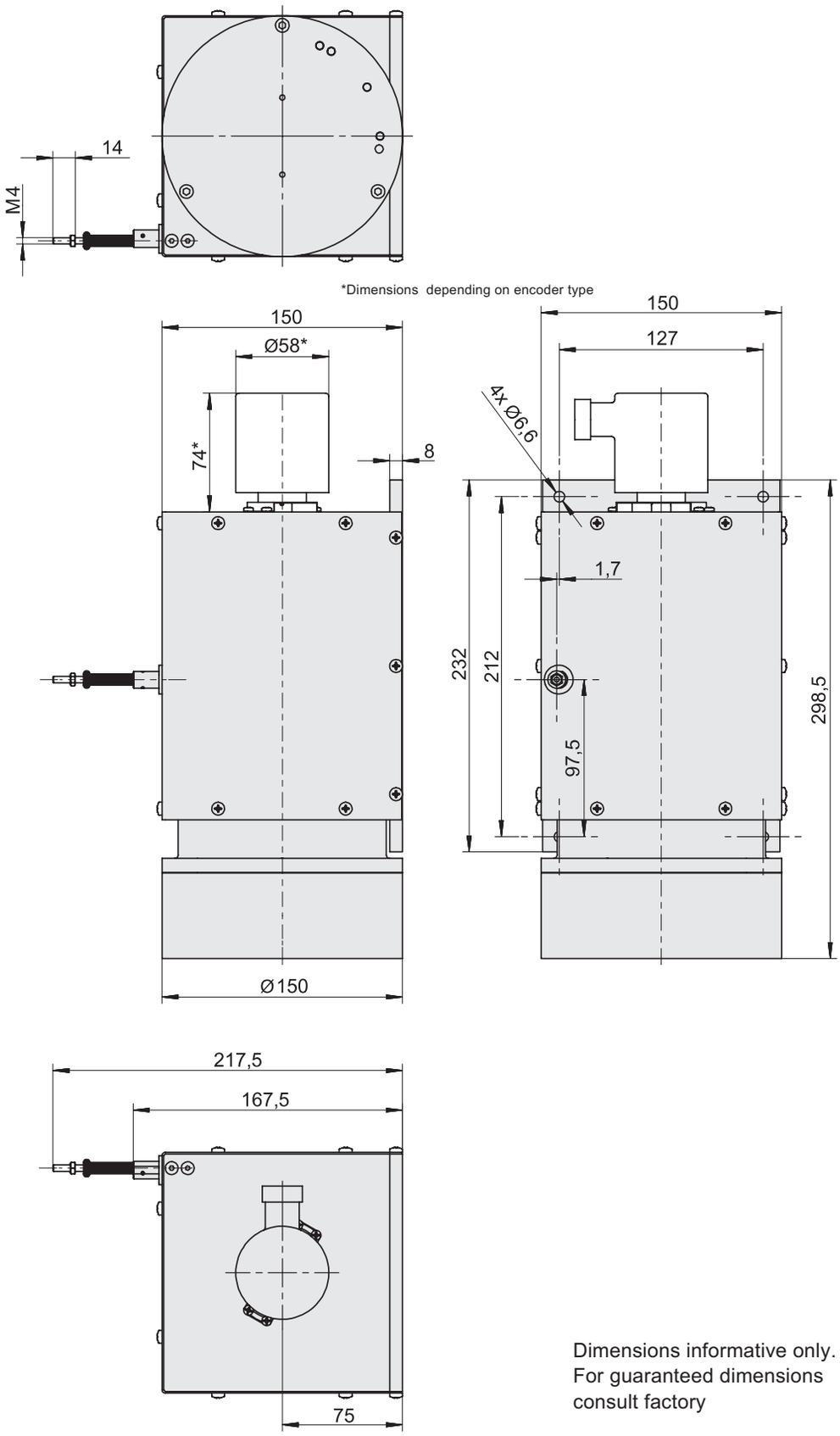


Dimensions informative only.
For guaranteed dimensions
consult factory

Model WS60
with absolute or incremental encoder output

Outline drawing

(WS60-30000)

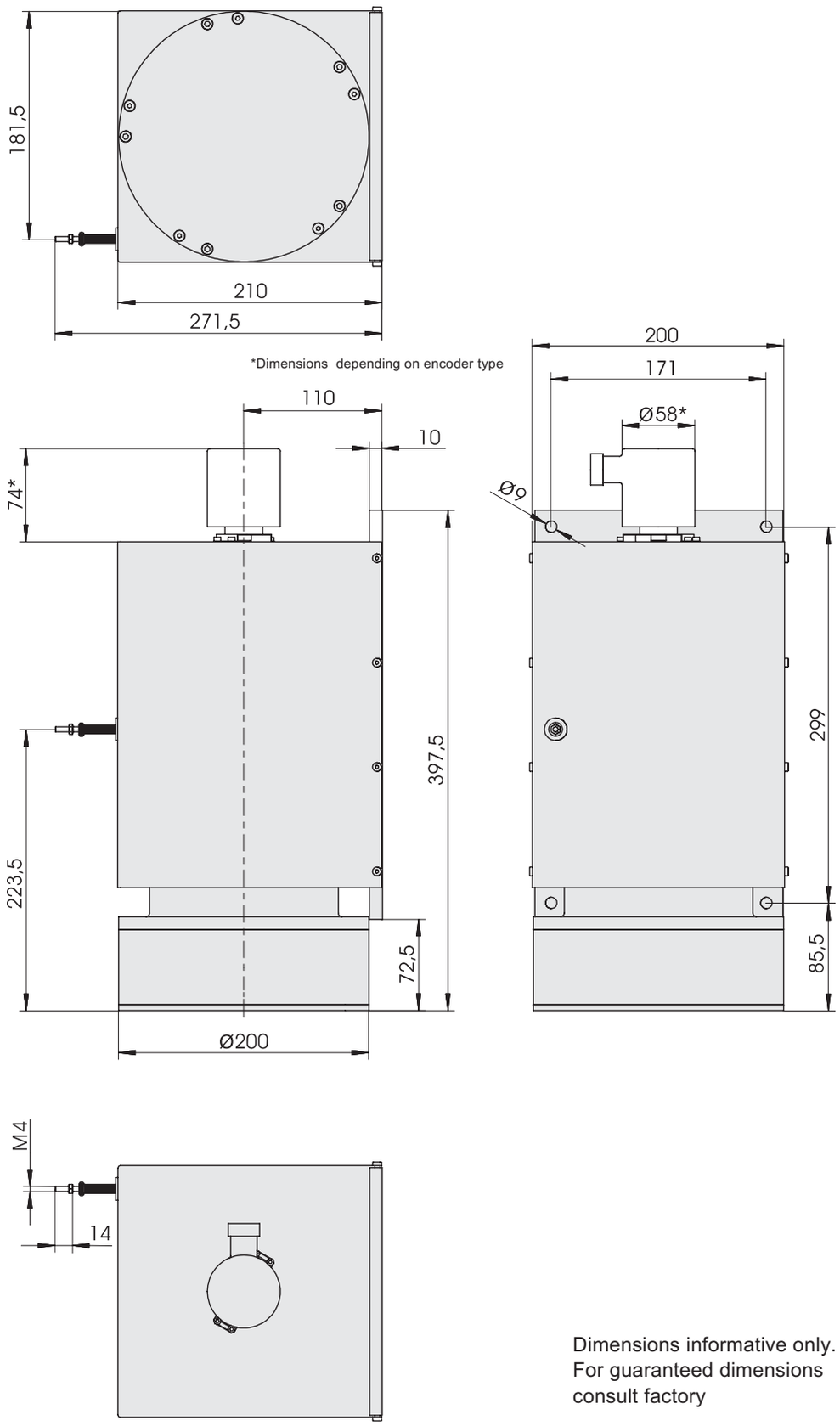


Dimensions informative only.
For guaranteed dimensions
consult factory

Model WS60
with absolute or incremental encoder output

Outline drawing

(WS60-60000)



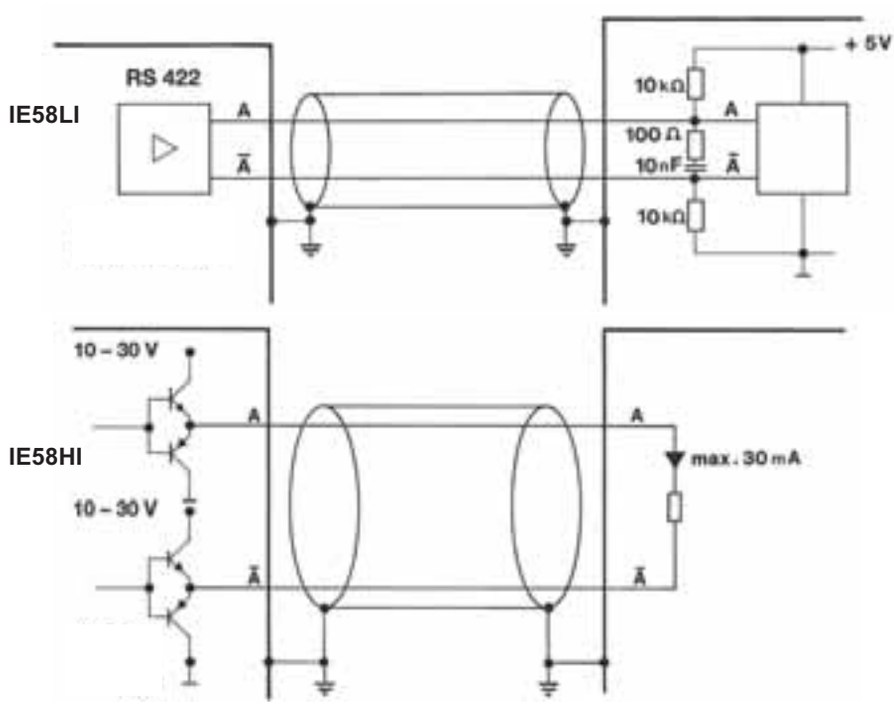
Dimensions informative only.
For guaranteed dimensions
consult factory

Output Specifications
IE58LI and IE58HI (IE41LI and IE41HI)
for WS position sensors

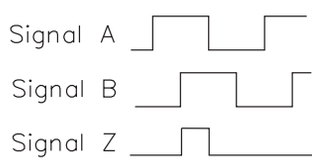
IE58LI and IE58HI
incremental

	IE58LI / IE41LI	IE58HI / IE41HI
Excitation voltage	5 V DC ±10 %	10 ... 30 V DC
Excitation current	120 mA max.	
Max. frequency	300 kHz	200 kHz
Output	RS422	Push-pull antivalent
Output current	±30 mA	30 mA
Output voltage	Depending on the excitation voltage	
Stability (temperature)	±20 x 10^{-6} / °C f.s. (sensor mechanism)	
Operation temperature	-10 … +70 °C	
Protection against short circuit	1 channel for 1 s max.	Yes
EMC	According to EN 61326:2004	

Output circuit and recommended processing input circuit



Output signals



Signal wiring

Output signals	Connector CONN-CONIN-12F
Excitation +	12
Excitation GND (0V)	10
Signal A	5
Signal $\overline{A}$	6
Signal B	8
Signal $\overline{B}$	1
Signal Z (reference pulse)	3
Signal $\overline{Z}$	4

Connection
Mating connector

CONN-CONIN-12F-G

Output Specification for absolute encoders with SSI interface

Signal Conditioner HSSI Absolute Encoder synchronous serial	Excitation voltage	10 … 30 V DC
	Excitation current	100 mA
	Interface	Standard SSI
	Lines / drivers	Clock and data / RS-422
	Code	Gray
	Resolution multiturn	12 + 12 bit
	3 dB cutoff frequency	500 kHz
	Control input	Direction
	Alarm output	Alarm bit (SSI option), warning bit
	Status LED	Green = OK, red = alarm
	Connection	Cable or male socket 12 pin

Data format

Resolution	**Clock**												
	T1	T2	T3	…	T12	T13	…	T21	T22	T23	T24	T25	T26
	Data bits												
24 bit	M11	M10	M9	…	M0	S11	…	S3	S2	S1	S0	0	

Mx = multiturn bits, Sx = single turn bits

Transmission rate

Cable length	**Baud rate**
< 50 m	< 400 kHz
< 100 m	< 300 kHz
< 200 m	< 200 kHz
< 400 m	< 100 kHz

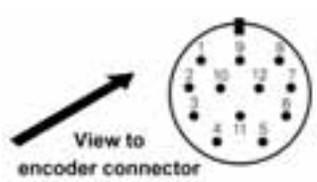
Note:
Extension of the cable length will reduce the maximum transmission rate.
The signals CLOCK/CLOCK and DATA/DATA must be connected in a twisted pair cable, shielded per pair and common.

Signal Wiring / Connection

Signal names	**Color**	**Connector pin no.**
Excitation +	white	8
Excitation GND (0V)	brown	1
CLOCK	yellow	3
CLOCK	green	11
DATA	pink	2
DATA	grey	10
Direction *	blue	5
0 V signal output	black	12

* Excitation + = cw increasing code, 0 V = cw decreasing code

Connection
Mating Connector



CONN-CONIN-12F-G

Output Specification for absolute encoders with programmable SSI interface

Programmable Signal Conditioner HSSIP Absolute Encoder synchronous serial	Excitation voltage	10 … 30 V DC
	Excitation current	250 mA
	Interface	SSI programmable
	Lines/drivers	Clock and data / RS-422
	Code	Binary or Gray, programmable
	Resolution	13 (9 … 20 bit) + 12 bit
	Format	MSB justified or fir tree
	Programmability	Resolution, code, rotating direction, format, warning, alarm
	Control input	Direction, Preset1, Preset2
	Reset button under housing cover	Lockable by programming
	Alarm output	Alarm bit (SSI option), warning bit
	Status LED	Green = ok, red = alarm
	Connection	Cable or male socket 12 pin

Transmission rate

Cable length	Baud rate
< 50 m	< 400 kHz
< 100 m	< 300 kHz
< 200 m	< 200 kHz
< 400 m	< 100 kHz

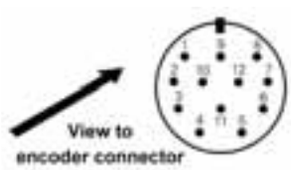
Note:
Extension of the cable length will reduce the maximum transmission rate.
The signals CLOCK/CLOCK and DATA/DATA must be connected in a twisted pair cable, shielded per pair and common.

Signal Wiring / Connection

Signal names	Color	CONN-CONIN-12F
Excitation +	white *	11
Excitation GND (0V)	brown *	12
CLOCK	yellow	2
CLOCK	green	1
DATA	pink	3
DATA	grey	4
Direction	blue	8
0 V signal output	black	7
RS-232 TxD	brown	5
RS-232 RxD	white	6
Preset 1	red	9
Preset 2	violet	10

* = larger width 0,5 mm^2

Connection
Mating Connector



CONN-CONIN-12F-G

Output Specification for absolute encoders with Profibus interface

Interface HPROF Absolute Encoder Profibus	Excitation voltage	10 … 30 V DC
	Excitation current	250 mA
	Interface	RS-485
	Protocol	Profibus DP with encoder profile class C2
	Resolution	12 (10 … 14) + 12 bit
	Output code	Binary
	Baudrate	Automatically selected between 9,6 kBaud and 12 MBaud
	Pragrammability	Resolution, preset, direction
	Integrated special functions	Velocity, acceleration, operating time
	Bus terminating resistor	Selectable via DIP switch
	Connection	Bus cover with T-manifold
	EMC	EN61326 : class A

	Signal name	**Cable terminal no. (bus cover)**
Signal Wiring / Connection	UB in	1
	0V in	2
	UB out	3
	0V out	4
	B in	5
	A in	6
	B out	7
	A out	8

Output Specification for absolute encoders with Parallel interface

Interface HPAR
Absolute Encoder
Parallel

Excitation voltage	10 ... 30 V DC
Excitation current	300 mA
Interface	Parallel
Output code	Binary, Gray, Gray Excess
Resolution	12 bit + 12 bit
Output current	30 mA per bit short circuit protected
Alarm output	NPN open collector 5 mA max.
Control inputs	$\overline{\text{Latch}}$, $\overline{\text{Direction}}$, Tristate
Connection	Cable 0.1 m with SUB-D 37 pin connector

Control inputs

Input name	Level (physical)	Function
$\overline{\text{Direction}}$	1 (+UB or open input) 0 (0 V)	CW increasing code values CW decreasing code values
$\overline{\text{Latch}}$	1 (+UB or open input) 0 (0 V)	Encoder data free running Encoder data stored (data hold)
Tristate	1 (+UB) 0 (0 V or open input)	Outputs in tristate condition Outputs active

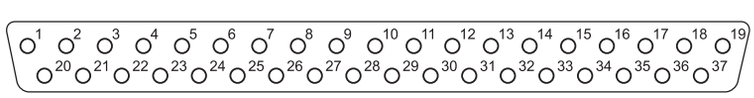
Switching delay 10 µs typ. for push-pull operation, for open collector signals an external pull-down resistor (1 kΩ) is necessary.

Signal Wiring / Connection

Signal names		Color	Connector SUB-D 37 pin
S0		brown	2
S1		green	21
S2		yellow	3
S3		grey	22
S4		pink	4
S5		violet	23
S6	Singleturn bits	grey/pink	5
S7		red/blue	24
S8		white/green	6
S9		brown/green	25
S10		white/yellow	7
S11		yellow/brown	26
M0		white/grey	8
M1		grey/brown	27
M2		white/pink	9
M3		pink/brown	28
M4		white/blue	14
M5		brown/blue	33
M6	Multiturn bits	white/red	15
M7		brown/red	34
M8		white/black	16
M9		brown/black	35
M10		grey/green	17
M11		yellow/grey	36
$\overline{\text{Alarm}}$		pink/green	18
$\overline{\text{Direction}}$		yellow/pink	10
$\overline{\text{Latch}}$		green/blue	30
Tristate		yellow/blue	12
10...30 V DC		red (0.5 mm2)	13
10...30 V DC		white (0.5 mm2)	31
0 V		blue (0.5 mm2)	1
0 V		black (0.5 mm2)	20

Connection
Mating Connector

View to encoder connector



CONN-SUBD-37F

Output Specification for absolute encoders with Interbus interface

Interface HINT Absolute Encoder Interbus 	Excitation voltage	10 … 30 V
	Excitation current	250 mA
	Interface	Interbus, ENCOM Profile K3 (progrmmable), K2
	Output code	Binary 32 bit
	Baud rate	500 kBaud
	Data refresh	Every 600 µs
	Resolution	12 (10 … 12) + 12 bit
	Programmability	Direction, preset, offset, resolution
	Connection	Bus cover with T-manifold
	EMC	EN 50081-2, 50082-2

Data format Interbus K2		Differential signals (RS485) ENCOM profile K3, K2, 32 bit, binary process data
	DT format	Sµpi address 0 1 2 3
	(according to the Phoenix company)	Byte no. 3 2 1 0
	ID code K2	36 H (= 54 dec.)
	ID code K3	37 H (= 55 dec.)

	Signal names	**Cable terminal no. (bus cover)**
Signal wiring / connection	UB +	1
	GND	2
	DI1	3
	$\overline{\text{DI1}}$	4
	DO1	5
	$\overline{\text{DO1}}$	6
	DO2	7
	$\overline{\text{DO2}}$	8
	DI2	9
	$\overline{\text{DI2}}$	10
	RBST	11
	GND	12

Output Specification for absolute encoders with DeviceNet interface

Interface HDEV Absolute Encoder DeviceNet 	Excitation voltage	10 ... 30 V DC
	Excitation Current	250 mA
	Interface	CAN highspeed according ISO/DIS 11898 CAN specification 2.0 A (11 bit identifier)
	Protocol	DeviceNet according to Rev. 2.0, programmable encoder
	Resolution	12 (10 … 14) + 12 bit
	Programmable	Resolution, preset, direction
	Output code	Binary
	MAC ID	Selectable via DIP switch
	Data refresh	Every 5 ms
	Baud rate	Selectable 125, 250, 500 kBaud, DIP switch
	Bus terminating resistor	Selectable via DIP switch
	Connection	Bus cover with T-manifold
	EMC	EN 50081-2, 50082-2

Recommanded transmission	Characteristic impedance	135 … 165 Ω (3...20 MHz)
	Operating capacity	< 30 pF
	Loop resistance	< 110 Ω/km
	Wire diameter	> 0.63 mm
	Wire width	> 0.34 mm^2

Transmission rate	**Segment length**	**Kbit/s**
	500 m	125
	250 m	250
	100 m	500

Signal Wiring / Connection	**Signal name**	**Cable terminal no. (bus cover)**
	UB in	1
	0V in	2
	CAN-L	3
	CAN-H	4
	Drain	5
	Drain	6
	CAN-H	7
	CAN-L	8

Output Specification for absolute encoders with CAN interface

Interface HCAN/HCANOP Absolute Encoder CANopen/CAN Layer 2 	Excitation voltage	10 … 30 V DC
	Excitation current	250 mA
	Interface	CAN highspeed according ISO/DIS 11898
	Protocol	CANopen according to DS301 with encoder profile DSP 406, programmable encoder according to class 2
	Resolution	12 (10 … 14) + 12 bit
	Programmable	CANopen: direction, resolution, preset, offset; CAN L2: direction, limit values
	Output code	Binary
	Data refresh	Every millsecond (adjustable), on request
	Baud rate	Selectable 10 to 1000 kBaud
	Base identifier	Selectable via DIP switches
	Integrated special functions	CANopen: speed, acceleration, limit values CAN L2: direction, limit values
	Connection	Bus cover with T-manifold
	EMC	EN 50081-2, EN50082-2

Signal wiring / connection	**Signal names**	**Cable terminal no. (bus cover)**
	UB in	1
	0V in	2
	CAN in – (dominant L)	3
	CAN in + (dominant H)	4
	CAN GND in	5
	CAN GND out	6
	CAN out + (dominant H)	7
	CAN out - (dominant L)	8
	0V out	9
	UB out	10