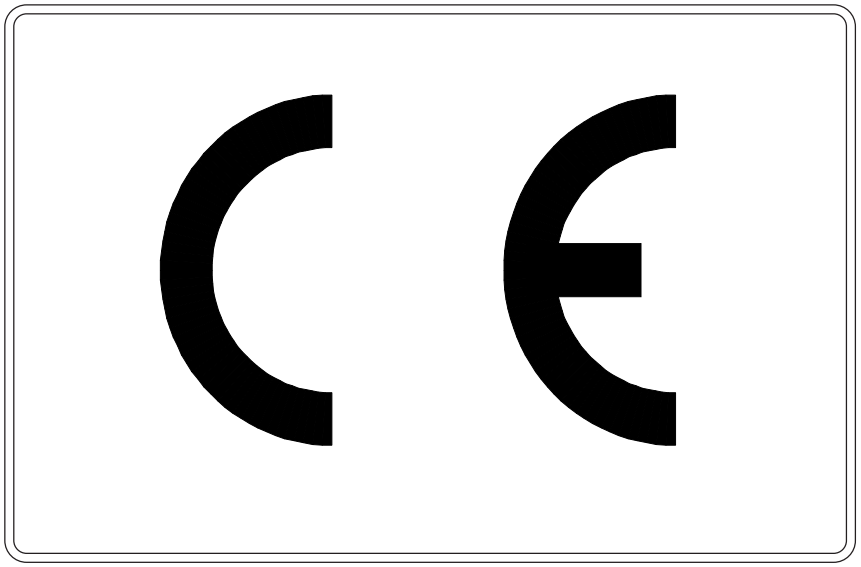
hohner Automazione

ENCODER HANDBOOK



MAN_GB 3/97 Rev 1.1

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1. Introduction

Hohner Automazione encoders are high precision position/speed transducers. They are used to sample these quantities on a revolving axle. The encoder converts the input analog signal to digital signal, so that it can be handled by a computer device. The conversion is carried out by a coded wheel, integral with the transducer shaft, read by a photoelectronical system.

2. Safety Rules

- Hohner encoders are manufactured according to quality standards in the electrical/electronic field.
- Leaving the manufacturing plant, they are safe for the operator; to mantain safety, please follow the rules described in this handbook.
- Take care when handling the encoder: as a metal device, it is a blunt instrument.
- The encoder must be employed as to be expected. Any alteration in employment could prevent the correct working.
- The encoder must be used within limit values stated in the specifications listed in this handbook.
- Our quality standards follow ISO9001 Certification.
- Our safety and environmental standards follow CEE directives. The CE marking of our encoders states this compliance.

3. Check-list at encoder receipt

Please immediately verify that:

- goods are those described in the delivery note (number of items, type of material).
- the encoder identification number is correct.
- there are no damages due to transport and/or defects.

4. Damages due to transport/defects

- If there are damages due to transport, please apply to the shipping agency.
- If there are defects, please apply directly to Hohner.
- In case of return of the goods, please use, if possible, the original package and enclose your name, address and a description of the defect/s.

5. Liability

Please refer to conditions as per contract.

6. Warnings

- Any alteration of the encoder, made by personnel not from Hohner or not authorized by Hohner, may prevent the correct working and the safety guaranteed by the device; it is understood that, in these circumstances, the guarantee ceases and Hohner cannot be held responsible for subsequent damages to anybody/anything.
- The mounting instructions here enclosed are necessary to guarantee the correct and safe working of the device. Any other operation or employment of coupling accessories not recommended by Hohner may reduce the perfect working order of the encoder.
- Encoders are high precision optoelectronic instruments, equipped with a precise mechanics to guarantee a linear conversion, so they must be handled with care.
- Prevent shocks on the assembly and especially on the encoder shaft. Do not apply an excessive load on the shaft.

7. Features of hohner encoders

- The electronic parts are produced in mixed SMT and Micro SMT technology (Surface Mounting Technology). This advanced technology guarantees a more precise construction and assembly of electronic components, improving reliability and durability.
- To prevent accidental failures, Hohner encoders are provided with electronic protection against short-circuits on signal lines and polarity inversion on the power supply.

8. Standard electrical connections

INCREMENTAL ENCODERS								
	-V	*+V*	*A*	*B*	*A neg.*	*B neg.*	*0*	*0 neg.*
CABLE 5 POLES	bn	mr	vr	gl	-	-	gr	-
CABLE 8 POLES	nr	bl	mr	bg	vr	gl	ra	vl
connector 9414	Pin1	Pin2	Pin3	Pin4	-	-	Pin5	-
conn. 9415 for PR	Pin1	Pin2	Pin3	Pin4	Pin5	Pin6	Pin7	Pin8
connector 9413/15(PR option H) /16/22	Pin1	Pin2	Pin3	Pin4	Pin5	Pin6	Pin7	Pin8
connector 9418/19	Pin A	Pin B	Pin C	Pin D	Pin E	Pin F	Pin G	Pin H (9419)

ABBREVIATIONS			
bn = white	bl = blue	mr = brown	vr = green
gl = yellow	gr = grey	ra = pink	ro = red
vl = violet	bg = beige	nr = black	ar = orange
nt = neutral	+ V = postive power supply	- V = 0 Volt reference	
A = A channel	B = B channel	0 = channel reference	
A inverted = complementary channel A	B inverted = complementary channel B	0 inverted = complementary reference channel	

ABSOLUTE ENCODERS															
	-V	*+V*	*1 bit*	*2 bit*	*3 bit*	*4 bit*	*5 bit*	*6 bit*	*7 bit*	*8 bit*	*9 bit*	*10 bit*	*11 bit*	*12 bit*	*latch / tristate / reset / preset*	*up - down*
CABLE 14 POLES	nr	bl	mr	bg	vr	gl	ra	vl	ar	nt	bn / ro	bn / bl	-	-	gl / vr	gl / bn
CABLE 16 POLES	nr	ro	mr	bg	gl	vr	ra	vl	gr	bl	ra / gr	ro / bl	vr / mr	mr / gl	bi / gl	bn / vr
connector 9416	Pin1	Pin2	Pin3	Pin4	Pin5	Pin6	Pin7	Pin8	Pin9	Pin10	Pin11	Pin12	-	-	-	-
connector 9413/26/ 28	Pin1	Pin2	Pin3	Pin4	Pin5	Pin6	Pin7	Pin8	Pin9	Pin10	Pin11	Pin12	Pin13	Pin14	Pin15	Pin16

ABSOLUTE MULTITOURN ENCODERS																	
	-V	*+V*	*1 bit*	*2 bit*	*3 bit*	*4 bit*	*5 bit*	*6 bit*	*7 bit*	*8 bit*	*9 bit*	*10 bit*	*11 bit*	*12 bit*	*13 bit*	*14 bit*	*15 bit*
connector 9444	Pin1	Pin2	Pin3	Pin4	Pin5	Pin6	Pin7	Pin8	Pin9	Pin10	Pin 11	Pin12	Pin13	Pin14	Pin15	Pin16	Pin17
	16 bit	*17 bit*	*18 bit*	*19 bit*	*20 bit*	*21 bit*	*22 bit*	*23 bit*	*24 bit*	*gray/ binary*	*up - down*	*parity even*	*parity odd*	*latch*	*tristate*	*strobe*	
	Pin18	Pin19	Pin20	Pin21	Pin22	Pin23	Pin24	Pin25	Pin26	Pin38	Pin39	Pin40	Pin41	Pin42	Pin43	Pin 44	

ATTENTION: FOR THE ELECTRICAL CONNECTION, ALWAYS REFER TO WHAT IS SPECIFIED ON THE ENCODER LABEL, SINCE THERE MAY BE OUT OF STANDARD CONNECTIONS.

9. Models / codes interpretations

9.1 Legenda of encoder tables

LEGGENDA BOARDS			
	= diameter	LATCH	= Input to freeze the output code of the encoder, also in motion, and read the correct position. The freeze lasts as long as the latch is active
LD	= line-driver circuit		
PP	= Push-Pull circuit	STROBE	= output to state when the code reading is correct. 1) Static strobe: it's related to the absolute position and lists the positions in wich the output code may not be correct. Dynamic strobe: at any code change states, with a determined duration pulse, that the code may not be correct.
OC	= open collector circuit		
A	= A channel		
B	= B channel	PARITY	= Check-sum output bit; it is calculated on the sum of 1-bits of the position. It can be even (check-sum even) or odd (check-sum odd).
0	= reference channel		
A inverted	= complementary channel A	TRISTATE	= Input used to temporarily disable the output, forcing it to high impedence state. It is used, for example, to read outputs from several encoders concurrently.
B inverted	= complementary channel B		
0 inverted	= complementary reference channel		

9.2 Series.21-24-25-28-29.

MODELS SERIES 21-24-25-28-29

_	_	-	2	1*	2*	3*	4*	/	*

SERIES	SHAFT	OUTPUTS	VARIATIONS	CONNECTIONS	PULSES
21	25 series : 5 = 6mm 8 = 7mm 9 = 5mm	0 = ABO 5/24V NPN	A = Open collector	0 = 5P AXIAL CABLE	
24		7 = AB 5/24V NPN		2 = 8P AXIAL CABLE	
25		5 = A 5/24V NPN	0 = None	1 = 9415 9P AXIAL	
28	21 series: 1 = 6mm	1B = AB0+AB0 inverted LD-PP 8/24V		3 = 9414 5P AXIAL	
29				4 = 9422 8P AXIAL	
	24 series: 4 = 6mm	2B = AB+AB inverted LD-PP 8/24V		R = 5P RADIAL CABLE	
				8 = 8P RADIAL CABLE	
	28 series: 8 = 6mm	3B = A+A inverted LD-PP 8/24V			
	29 series: 9 = 6mm	80 = AB0+AB0 inverted LD 5V			
		60 = AB+AB inverted LD 5V			
		40 = A+A inverted LD 5V			

9.3 Series BS-H-HC-K-M.

MODELS SERIES BS-H-HC-K-M

_	_	-	1*	2*	3*	4*	5*	/	*

SERIES	SHAFT	FLANGE	OUTPUTS	CONNECTIONS	VARIATIONS	PULSES
BS	1= 10mm	H series: 1, 2, 3, 4, 6 refer to drawing	1= A PP11/30V	0= 9414 Axial	0= None	
H	3= 6mm		2= AB PP11/30V	2= 9414 Radial	1= High zero pulse	
HC	4= 9,52mm		3= AB+0 inverted PP11/30V	3= Radial cable	A= Special connections	
K	6= 8mm	HC series= 1	4= A+A inverted LD5V	4= 9418 Radial	R= PULL-UP for A-B-C outputs	
M	BS series: 0= 10mm 1= 15mm 6= 6mm 7= 7mm	M series= 3	5= AB+AB inverted LD5V	5= 9416 Radial	Z= Syncronized zero pulse only for LD output.	
		BS series: this box is omitted	6= AB0+AB0 inverted LD5V	6= 9418 Axial		
			7= A+A inverted LD5/12V	7= 9419 Radial	5= 5V power supply for A,B,C + 1,2,3 outputs	
			8= AB+AB inverted LD5/12V	8= 9419 Axial		
			9= AB0+AB0 inverted LD5/12V	9= Axial cable		
			A= A OC11/30V	A= 9415 Axial		
			B= AB OC11/30V	B= 9415 Radial		
			C= AB0 OC11/30V	C= 9422 Radial		
			K=AB0+AB0 inverted LD11/30V(1)	E= 9416 Axial		
			M= A+A inverted PP11/30V	M= 9422 Axial		
			N= AB+AB inverted PP11/30V	N= 9413 Axial		
			P= AB0+AB0 inverted PP11/30V			
			R= A+A inverted LD15/24V (2)			
			S=AB+AB inverted LD15/24V (2)			
			T=AB0+AB0 inverted LD15/24V (2)			

NOTE
(1) The power supply varies from 11 to 30 Volt, however the output voltage level is fixed at 5Volt
(2) The power supply varies from 15 to 24 Volt, however the output voltage level is fixed at 12Volt

9.4 Series 27.

MODELS SERIES 27

2	7	-	1*	7	2*	3*	4*	/	*

2	7	-	1*	7	2*	3*	4*	/	*
SERIES			**SHAFT**		**OUTPUTS CONFIGURATIONS**	**VARIATIONS**	**CONNECTIONS**		**PULSES**
			2 = full, 4mm		0 = ABO NPN 5/24V	0= None	0 = Axial cable		
			P= semi-hollow, 4mm		7 = AB NPN 5/24V	A= Open collector (only for NPN outputs)	R = Radial cable		
					5 = A NPN 5/24V				
					1= AB0 LD-PP 8/24V				
					2= AB LD-PP 8/24V	N= Negative channels			
					3= A LD-PP 8/24V				
					8= AB0 LD 5V				
					6= AB LD 5V				
					4= A LD 5V				

9.5 Series 22-23.

MODELS SERIES 22-23

_	_	-	1*	1*	2*	3*	4*	/	*

_	_	-	1*	1*	2*	3*	4*	/	*
SERIES			**SHAFT**		**OUTPUTS**	**VARIATIONS**	**CONNECTIONS**		**PULSES**
22			22 series: 22= 6mm		0 = AB NPN 5/24V	0 = None	0 = 4P Axial cable		
23			23 series: 23= 4mm		5 = A NPN 5/24V	A = Open collector	2 = 6P Axial cable		
					3 = A+A inverted PUSH-PULL 5/12V				
					1 = AB+AB inverted PUSH-PULL 5/12V				

9.6 Series PA.

MODELS SERIES PA

P	A	-	0	1*	2*	3*	4*	/	*

P	A	-	0	1*	2*	3*	4*	/	*
SERIES				**CONNECTIONS**	**OUTPUT CIRCUITS**	**OUTPUTS**	**RESOLUTION**		**PULSES**
				2= 9416 radial	1= NPN 11/30V	5= A+A inverted	0= 1001-2500		
				4= radial cable	2= MM88C30 5/12V	7= AB+AB inverted	9= 1-1000		
					3= MM88C30 15/30V (1)	9= AB0+ AB0 inverted			
					5= PUSH-PULL 11/30V		(1)= power supply 15/30V, stabilized outpu 12V		
					6= PNP 11/30V				

9.7 Series 30.

MODELS SERIES 30

3	0	-	1*	1*	2*	3*	/	*

3	0	-	1*	1*	2*	3*	/	*
SERIES			**OUTPUTS**		**CONNECTIONS**	**OUTPUT CIRCUITS**		**PULSES**
			30 = A		0 = axial cable	0 = NPN 5/24V		
			32 = A0		9 = radial cable	1= PUSH-PULL 8/24V		
			40= AB		7 = 9414 axial	2= TTL LINE-DRIVER 5V		
			42= AB0		2 = 9414 radial	3= MM88C30 LD 15/30V (1)		
			34= A+A inverted		4 = 9416 axial	4= MM88C30 LD 5/12V		
			35= AB+AB inverted		5 = 9416 radial	6= OPEN COLLECTOR 5/24V		
			36= AB0+AB0 inverted		6 = 9418 axial			(1)= power supply 15/30V, stabilized output 12V
					8 = 9418 radial			
					1 = 9419 axial			
					3 = 9419 radial			

9.8 Series PM-PR.

MODELS SERIES PM-PR

_	_	-	1*	1*	2*	3*	4*	5*	/	*

_	_	-	1*	1*	2*	3*	4*	5*	/	*
SERIES			**SHAFT**		**FLANGE**	**OUTPUTS**	**CONNECTIONS**	**VARIATIONS**		**PULSES**
PM			PM series: 12= 12mm 14= 14mm 15= 15mm 16= 16mm 20= 20mm 24= 24mm 25= 25,4mm 30= 30mm		PR: 1,6 PM: 1,2 refer to drawings	1= A PP11/30V	1= 9415 Radial	0= None		
PR						2= AB PP11/30V	2= 9414 Radial	1= High zero pulse		
						3= AB+0 inverted PP11/30V	3= Radial cable	A= Special connections		
						4= A+A inverted LD5V	4= 9418 Radial (1)	R= PULL-UP for A-B-C outputs		
						5= AB+AB inverted LD5V	5= 9416 Radial (1)	Z= Syncronized zero pulse only for LD output		
						6= AB0+AB0 inverted LD5V	6= 9422 Radial			
						7= A+A inverted LD12V (2)		H= conector 9415 with pins compatible with other hohner models (2)		
			PR series (only 1 figure): 0= 10mm 6= 6mm 7= 7mm 8= 8mm			8= AB+AB inverted LD12V (2)				
						9= AB0+AB0 inverted LD12V (2)				
						A= A OC11/30V				
						B= AB OC11/30V				
						C= AB0 OC11/30V				
						M= A+A inverted PP11/30V				
						N= AB+AB inverted PP11/30V				
						P= AB0+AB0 inverted PP11/30V				

NOTES
(1) available only for PM series
(2) available only for PR series.

9.9 Series S-AS-MS.

MODELS SERIES S-AS-MS

_	_	-	1*	2*	3*	4*	5*	/	*

_ _ -	1*	2*	3*	4*	5*	/	*
SERIES	**SHAFT**	**FLANGE**	**OUTPUTS**	**MODIFICATION**	**CONNECTION**		**PULSES**
S	1= 10mm	S= 1, 3, 6 refer to drawings	1= GRAY <----> NPN	A= None	R= 9413 radial		
AS	3= 6mm		2= GRAY <----> PUSH-PULL	B= Open Collector	N= 9413 axial		
MS	6= 8mm		3= GRAY <----> TTL	D= Parity odd	2= 9416 axial		
	AS series: 1= 15mm 0= 10mm 7= 7mm		4= BIN. <----> NPN	E= Gray Exess	3= radial cable		
		MS= 3	5= BIN. <----> PUSH-PULL	P= Parity even	5= 9416 radial		
			6= BIN. <----> TTL		9= axial cable		
			7= BCD <----> NPN				
			8= BCD <----> PUSH-PULL				
			9= BCD <----> TTL				

DIR <--->: is the direction signal
Clockwise=Standard
Anti-Clockwise (connect pin to logical "0)

9.10 Series CS.

MODELS SERIES CS

C	S	-	1*	2*	3*	4*	5*	6*	/	*

C S -	1*	2*	3*	4*	5*	6*	/	*
SERIES	**SHAFT**	**INCREASE**	**OUTPUTS**	**CONNECTIONS**	**CODE**	**MODIFICATIONS (1)**		**PULSES**
	1= 10mm	1= clockwise	0= NPN 5/24V	0= axial cable	1= GRAY	A= NONE		
	2= 12mm	2= anti-clockwise	1= Push-Pull 8-24V	1= radial cable	2= BIN.	L= LATCH		
			2=TTL 5V	2= 9426 axial	3= BCD	P= PRESET		
		3= clockwise+ anti-clockwise	5= PNP 5/24	3= 9426 radial	4=GRAY EXESS	R= RESET		
			6= Open Collector 5/24V	4= 9413 axial		T= TRISTATE		
				5= 9413 radial				
				6= 9428 axial				
				7= 9428 radial				

DIR <--->: is the direction signal - Clockwise=Standard
Anti-Clockwise (connect pin to logical "0)

(1): The options listed in column "modifications" are combinable. RESET: shorting it briefly to +Vcc selects the zero on any position. PRESET: shorting it briefly to +Vcc selects any position.

9.11 Series MM.

MODELS SERIES MM

M	M	-	1*	2*	3*	4*	5*	6*	7*	/	*

M M -	1*	2*	3*	4*	5*	6*	7*	/	*
SERIES	**SHAFT**	**OUTPUTS**	**CONNECTIONS**	**OPTIONS**					**PULSES-REVOLUTION**
	1 = 10mm	1= Push-Pull 8/24V	1= 9444 Axial	0= None					
		2= TTL 5V		L= LATCH					
				P= PARITY (odd or even)					
				SD= DYNAMIC STROBE					
				SS= STATIC STROBE					
				T= TRISTATE (5V only)					

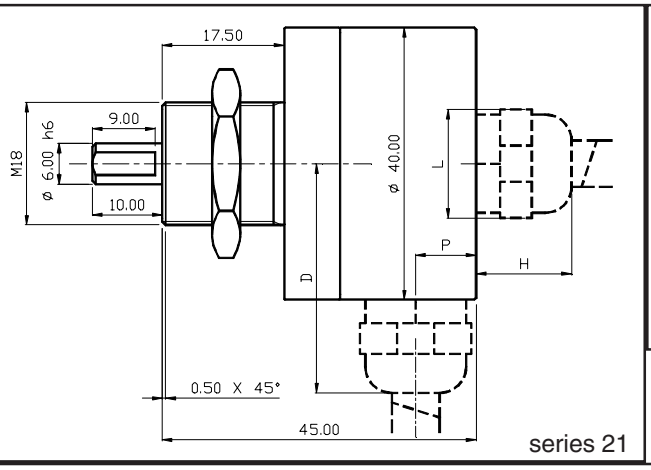
DIR <--->: is the direction signal - Clockwise=Standard
Anti-Clockwise (connect pin to logical "0)

N.B.: Encoder inputs are internally connected to logical"1", so the standard configuration is as follows: gray, clockwise increment (up), high impedence (active tri-state), latch disabled. Connecting input to logical"0", the configuration changes, output code: binary, anti-clockwise increment (up), true output (tri-state disabled), latch active.

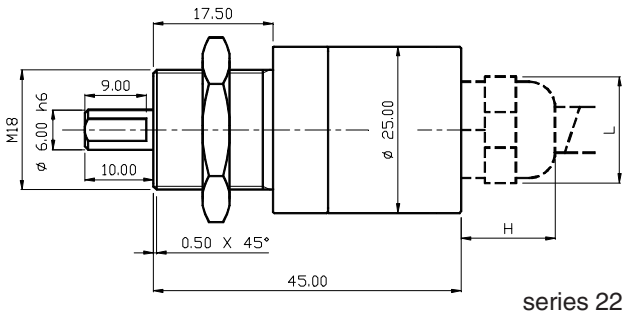
10. Dimensioned drawings

10.1 Assembly drawings

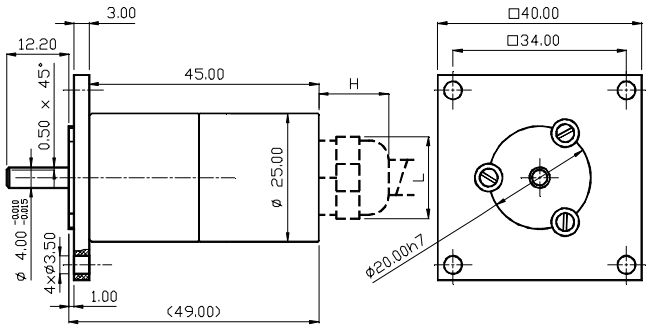
N.B. Connectors overall dimensions are listed in paragraph 10.2



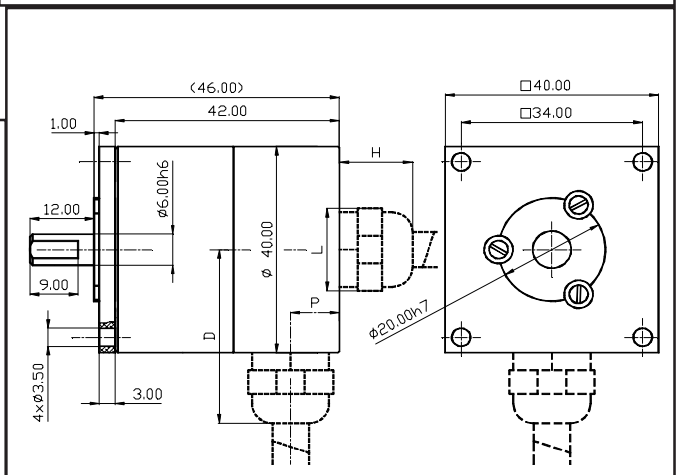
series 21



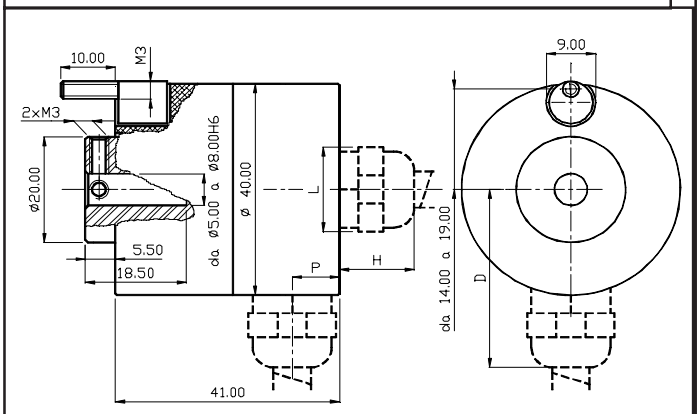
series 22



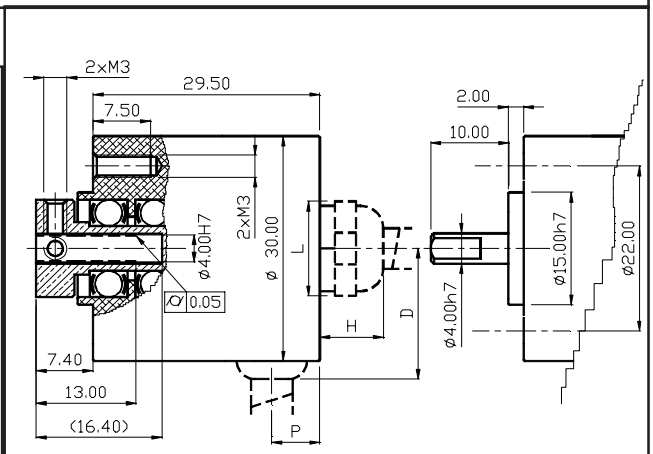
series 23



series 24

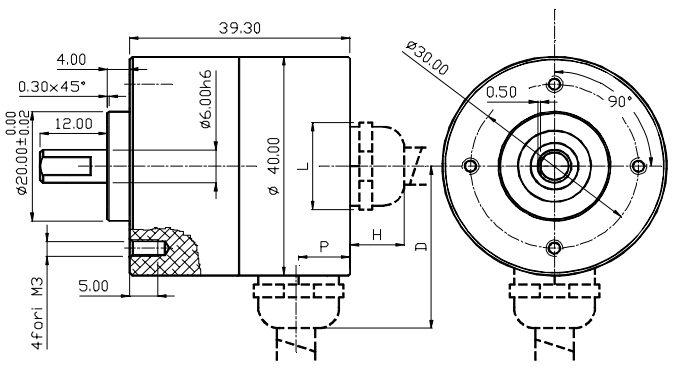


series 25

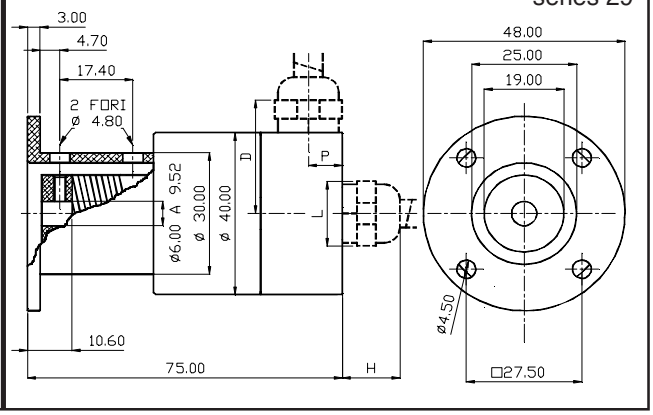


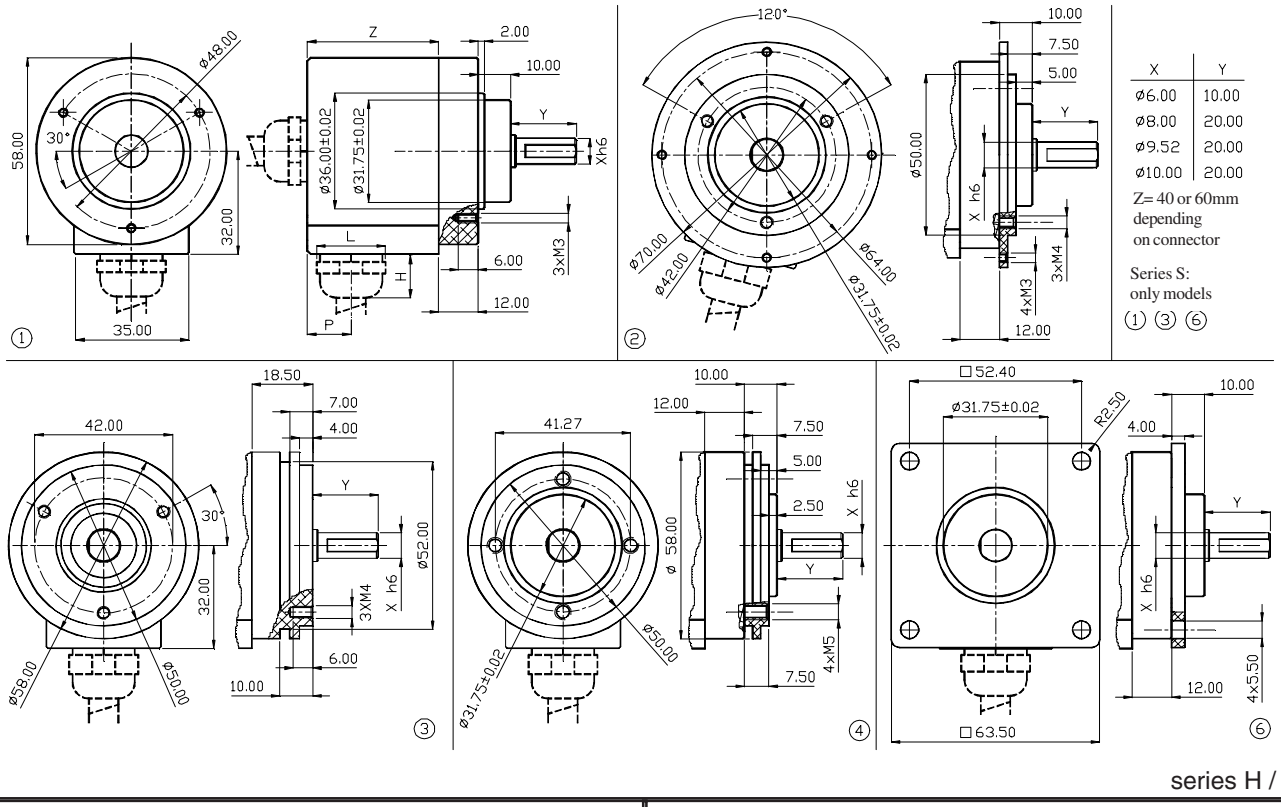
series 27

series 28

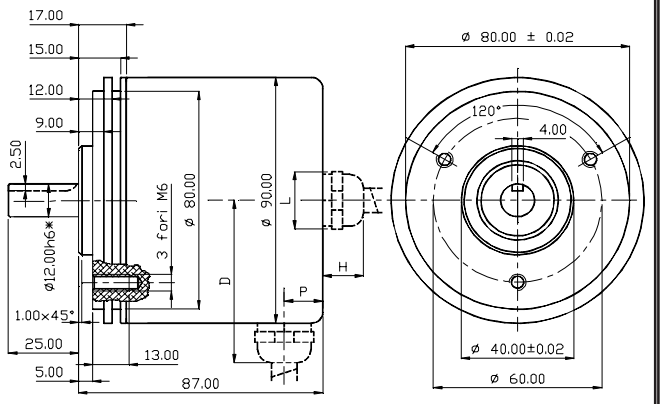


series 29

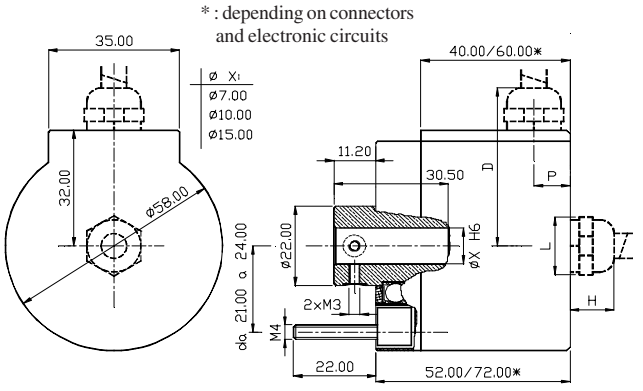




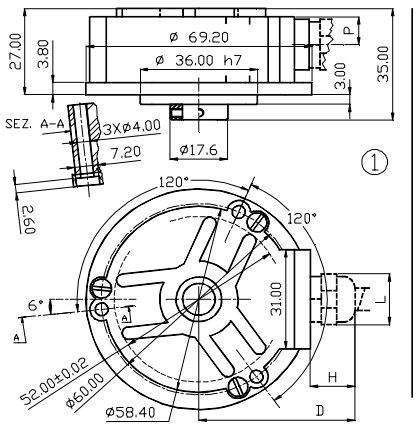
series H / S

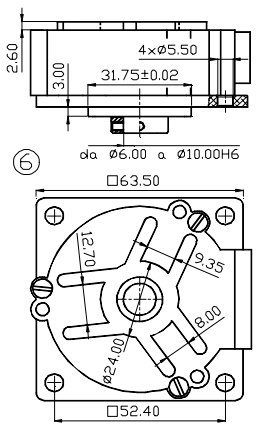


series 30 / CS

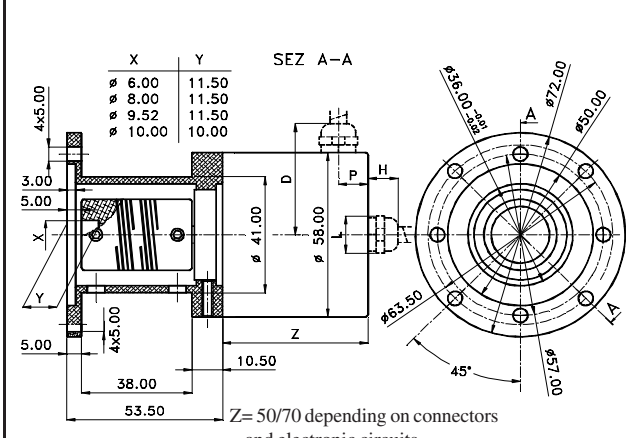


series BS / AS

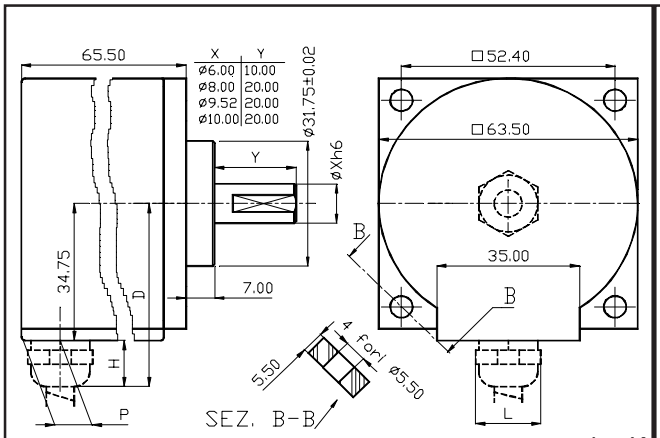




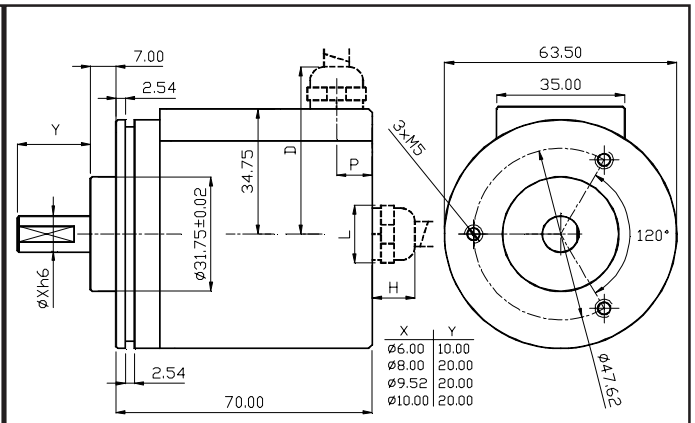
series PR



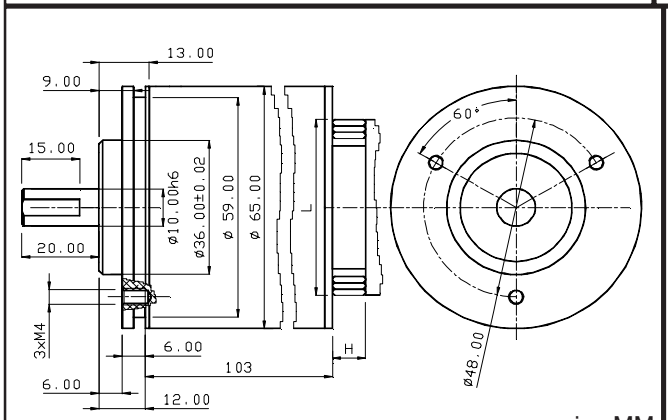
series HC



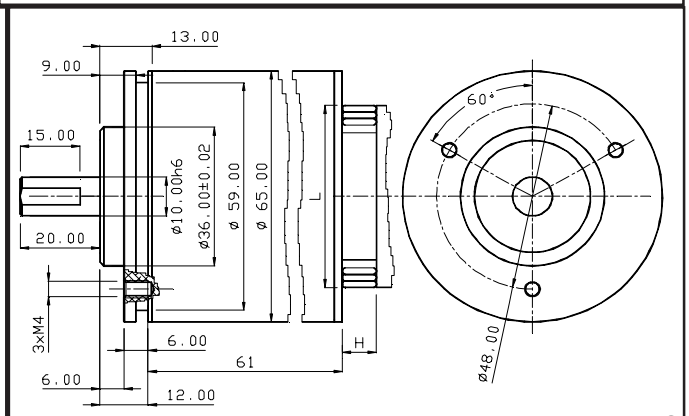
series K



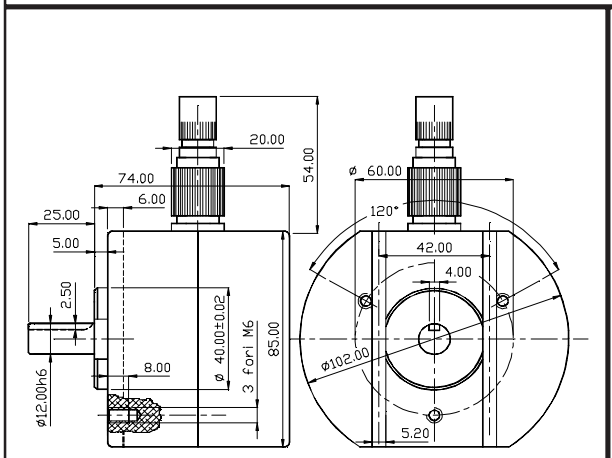
series M



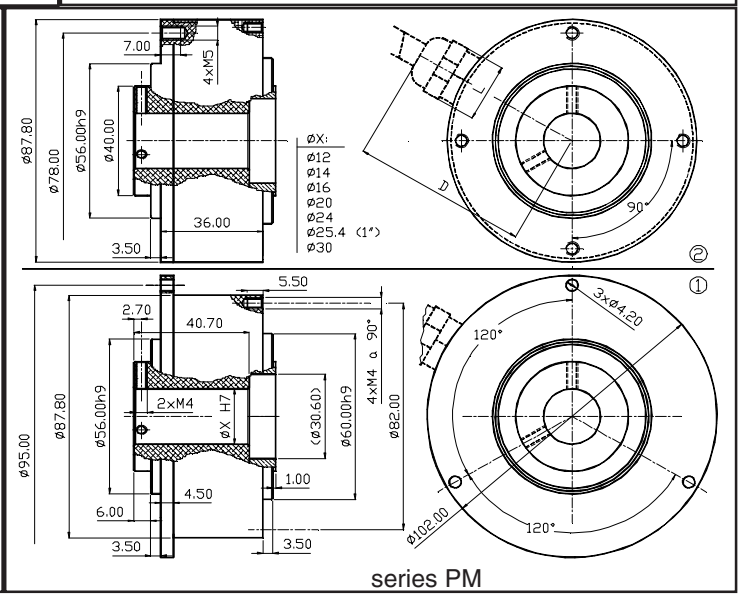
series MM



series MS



series PA



series PM

10.2 Connectors overall dimensions(MM)

SERIES	measurements (in mm)	9413	9414	9415	9416	9418	9419	9422	9423	9426	9444	PG5	PG7	PG7/9
For everything	L=	53	ł18	31	ł25	ł32	ł32	ł13	39	ł25	53	Ch11	Ch15	Ch19
	H=	50	67	46	51	63	76	35	42	51	50	13	22	22
	depth	16	-	16	-	-	-	-	16	-	16	-	-	-
21/ 24/ 25/ 28/ 29	P=	-	-	-	-	-	-	-	-	-	-	7,5	8,5	-
	D=	-	-	-	-	-	-	-	-	-	-	33	42	-
22/ 23/ 27	P=	-	-	-	-	-	-	-	-	-	-	-	-	-
	D=	-	-	-	-	-	-	-	-	-	-	-	-	-
BS/ H/ HC	P=	-	15	11	16	17	20	15	-	16	-	-	11	12
	D=	-	107	78	86	96	108	67	-	86	-	-	54	54
PR	P=	-	9	9	-	-	-	-	-	-	-	-	9	-
	D=	-	101	80	-	-	-	-	-	-	-	-	56	-
K	P=	-	15	-	-	17	20	15	-	-	-	-	11	12
	D=	-	110	-	-	99	111	70	-	-	-	-	57	57
M	P=	-	15	11	16	17	20	15	-	16	-	-	11	12
	D=	-	110	81	89	99	111	70	-	89	-	-	57	57
30	P=	-	27	-	27	27	27	-	-	27	-	-	-	27
	D=	-	120	91	99	109	121	-	-	99	-	-	-	67
PM	P=	-	18	8,5	-	18	-	18	-	-	-	-	-	18
	D=	-	127	96	-	123	-	95	-	-	-	-	-	82
S/ AS	P=	-	-	-	16	-	-	-	-	16	-	-	-	12
	D=	-	-	-	86	-	-	-	-	86	-	-	-	54
MS	P=	-	-	-	16	-	-	-	-	16	-	-	-	12
	D=	-	-	-	89	-	-	-	-	89	-	-	-	57
CS	P=	-	-	-	27	-	-	-	-	27	-	-	-	27
	D=	-	-	-	99	-	-	-	-	99	-	-	-	67

11. Device specification

11.1 Mechanical specifications

SERIES	21	22	23	24	25	27	28	29	PR	K	BS	H	HC	M	PA	30	PM	MM	S	AS	MS	CS
MOUNTING	refer to drawings																					
SHAFT DIAMETER	refer to drawings																					
SHAFT LOAD MAX. N axial / radial	5	5	5	5	5	5	5	5	30	30	10	30	30	30	10	30	50	30	30	10	30	30
SPEED rev/min	6000 (1)																3000 (1)		6000 (1)			
TORQUE N/cm	3	3	3	3	3	3	3	3	3	5	5	5	5	5	0,2	5	3,5	5	5	5	5	5
INERTIA g/cm^2	5	5	5	5	10	5	5	5	40	100	100	100	100	100	80	270	270	100	100	100	100	270
PROTECTION ip	65	65	55	55	55	54	65	65	65	65	54	65	65	65	55	65	54	65	65	54	65	65
OPERATION TEMPERATURE	from 0 to 60centigrades (C) degrees																					
WEIGHT g	150	150	90	130	130	130	130	230	150	250	300	300	600	300	1500	700	800	500	300	300	300	700
COVER MATERIAL	chromium plated brass or natural aluminium + abs, natural or chr. plated								compound material		aluminium				zama		aluminium					

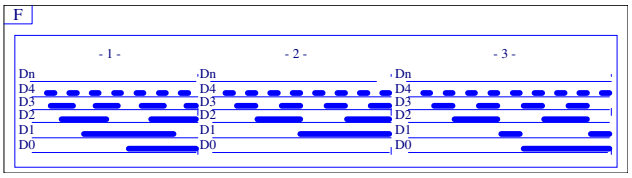
MAX. SPEED IS REFERRED TO MAXIMUM SPEED SUSTAINABLE BY MECHANICAL PARTS.
MAX. OPERATING SPEED, THE PARAMETER WITHIN WHICH THE INSTRUMENT WORKS CORRECTLY, DEPENDS ON TWO FACTORS: IN ANY SITUATION ONLY THE MOST RESTRICTIVE ONE MUST BE CONSIDERED.
THE FIRST FACTOR IS THE SPEED WITHIN WHICH MECHANICAL COMPONENTS DURABILITY IS GUARANTEED, THAT IS THE SPEED MARKED IN THE TABLE WITH “(1)”.

THE SECOND FACTOR IS THE MAXIMUM PULSE FREQUENCY THE ELECTRONIC CIRCUITS OF THE ENCODER CAN HANDLE.
THE FREQUENCY IS DESCRIBED BY THE FOLLOWING FORMULA:
f(Khz)= G *I/60000, where
f = frequency
G = revolutions per minute,
I = resolution (number of pulses/rotation).
f cannot exceed the limit value f_{max}, therefore G is limited by the maximum attainable value f_{max} :
G_{max}(revolutions/minute) = f_{max}(Khz)*60000/I

11.2 Electrical/electronic specifications

SERIES	21	22	23	24	25	27	28	29	BS	PR	K	H	HC	M	PA	30	PM	CS	S	AS	MS	MM
Power supply	5-30V depending on electronic circuit																					
Consumption without load	40-80mA																					150-300mA
Admitted load	40mA (RS422 Line Driver), 20mA (Push-Pull, NPN, Open collector)																					20 mA each channel
Max. Frequency	300Khz (RS422 eVDC, Push-Pull), 50Khz (NPN, Open Collector)																	50Khz in the least significant bit				
Outputs circuits	Refer to next chapter																					
Phases tolerance	Maximum. +/- 10%																					
Phase displacement	90																					
Output signals	A,B,0 / A,B,0 inverted / A,B,0 + A,B,0 inverted																	gray/gray exess /bcd/binary				bcd/binary
Commutation times	Below 100 ns (RS422), below 2 s (Push-Pull, NPN, Open Collector)																					
Pulse shape	Squadre																					
Resolution	Depending on version, refer to catalogue																					
Electronic protection	Against output short circuits								Against output short circuits , polarity invertion of power supply													

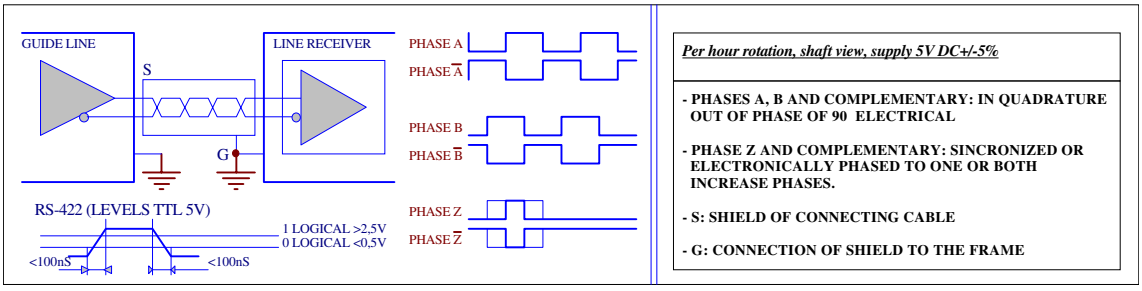
11.3 Absolute encoder code



LEGENDA	
1	= GRAY
2	= BINARY
3	= BCD

12. Output circuits

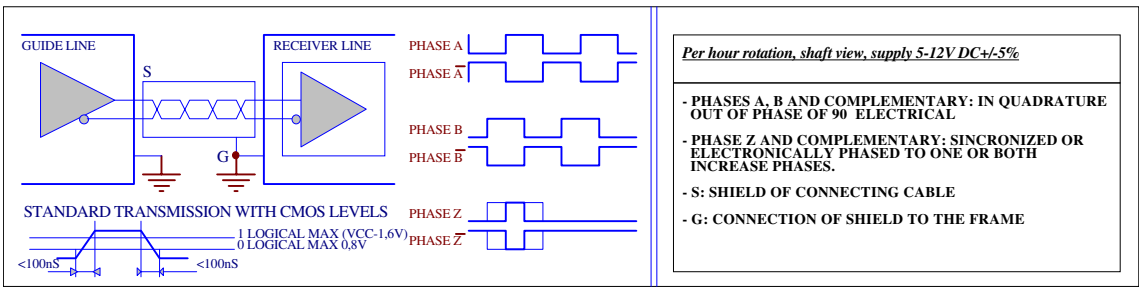
12.1 Line Driver TTL 5Volt configuration



Per hour rotation, shaft view, supply 5V DC+/-5%

- PHASES A, B AND COMPLEMENTARY: IN QUADRATURE OUT OF PHASE OF 90 ELECTRICAL
- PHASE Z AND COMPLEMENTARY: SINCRONIZED OR ELECTRONICALLY PHASED TO ONE OR BOTH INCREASE PHASES.
- S: SHIELD OF CONNECTING CABLE
- G: CONNECTION OF SHIELD TO THE FRAME

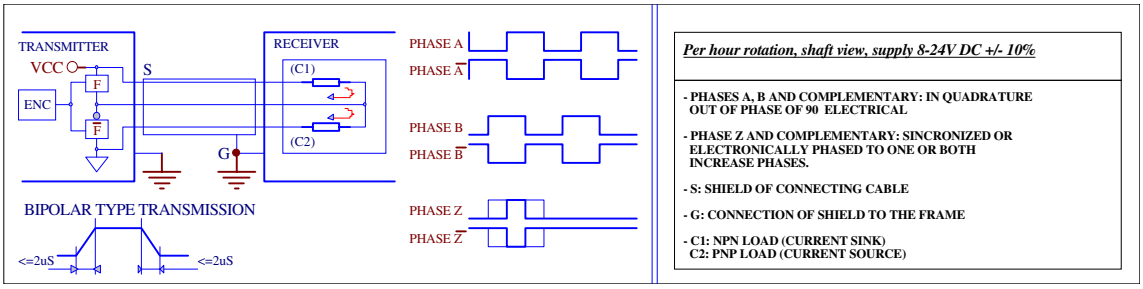
12.2 Line Driver CMOD 5-12 Volt configuration



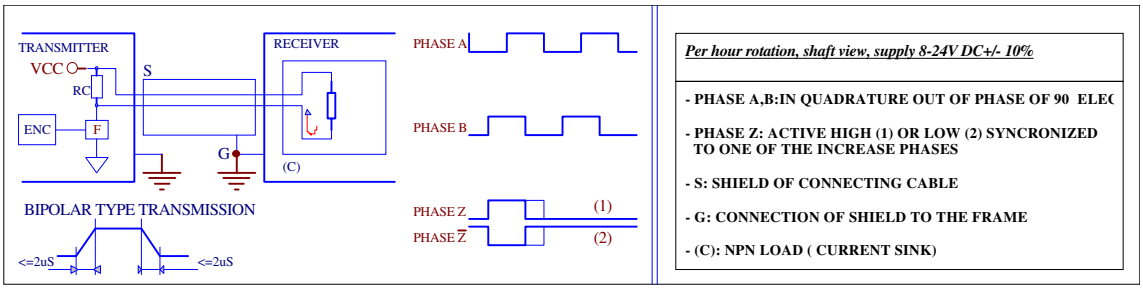
Per hour rotation, shaft view, supply 5-12V DC+/-5%

- PHASES A, B AND COMPLEMENTARY: IN QUADRATURE OUT OF PHASE OF 90 ELECTRICAL
- PHASE Z AND COMPLEMENTARY: SINCRONIZED OR ELECTRONICALLY PHASED TO ONE OR BOTH INCREASE PHASES.
- S: SHIELD OF CONNECTING CABLE
- G: CONNECTION OF SHIELD TO THE FRAME

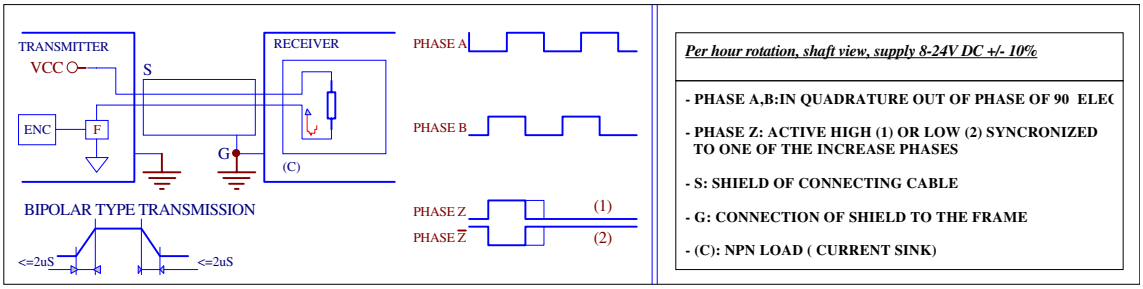
12.3 Push-Pull configuration



12.4 NPN configuration



12.5 Open Collector configuration



13. Mounting instruction

13.1 Mechanical assembly preparation

If you are employing adapters for the shafts (joints) and for the encoder (flange coupling), please verify on the enclosed drawings that they are suitable for the encoder series employed.
If the adapters are not Hohner products, please make sure that:

-the encoder can be mounted rigidly and reliably
-any dis-alignment and/or axis-error of the shafts to be coupled must be within the limits listed for the encoder and/or the eventual joint.

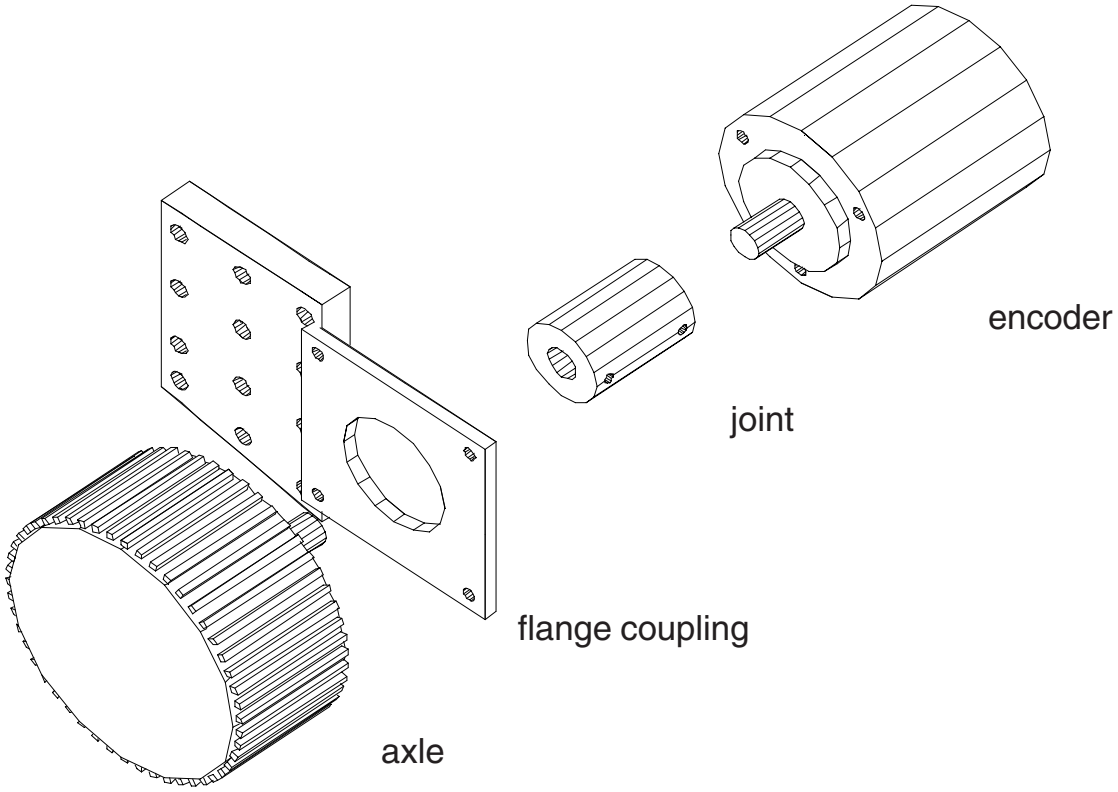
13.2 Mechanical mounting instructions

Please refer to the assembly drawing at the end of this paragraph.
Mount the eventual flange coupling on the encoder.
Mount the eventual joint to the axle you are installing the encoder on.
Connect the encoder shaft to the axle (eventually through the joint) positioning the encoder so that it can be later fixed on the machine.
Mount the body of the encoder on the machine (eventually through the flange coupling or in other way)
Verify that all screws are correctly tighten.

Attention:

the body of the encoder is usually made, due to lightness requirements, of aluminium or compsites (resins with short fibres), do not apply an excessive torque when tightening a screw in a thread on the encoder body.

- A rigid coupling of joints is not advisable (except in case of auto-aligning encoders): the use of an elastic joint is always preferrable.



13.3 Electrical connections preparation

If the encoder is equipped with an output cable, it already has tinned wires ready for connection.
If the encoder is supplied only with the connector, prepare the female connector referring to the label attached on the encoder.
Attention: if you are employing cables with more wires than needed, correctly terminate the ends not in use. In case of wires not carrying the signal, connect them to the shield or to 0V of the power supply (device connected to the encoder side); in case of wires carrying the signal, connect them to a fixed potential through a resistive load.

13.4 Electrical connections instructions

Attention:if you are not using all the outputs of the encoder, read the note in the previous paragraph.
The use of shielded cables is always advisable (for long distance or noisy employment, twisted cables are better)

- The ending of the shield must be carried out only on the device connected to the encoder side, leaving the wires un-shielded for no more than 20 mm. If this measure can not be respected, the use of connectors with a metal casing connected to the shield is advisable.
- The signal wires of the encoder must not installed together with power lines (e.g. inverters, motors, etc.) but must be separated in different metal ducts.
- Power devices must be provided with spikes-filters and cable shielding, to reduce radiated and trasmitted noise.
- The cables installation must be carried out very carefully to avoid any hindrance of machine motions (suspended cables) and any damages to the same cables. Do not over-bend the cable.
- Install the cable via the shortest path from the encoder to the control device and connect it to the latter.
- Power to the encoder must be supplied only after verifying that cabling is correct and connectors are reliably inserted or cables are secured in the junction boxes.
- Start the system and verify the correct assembly and working through an operation cycle.