

# ABSOLUTE ENCODER

## NO NEED TO BE RESET

Absolute encoders are capable to provide the correct data after a power-down event without needing to be reset to the zero point.

Thanks to these specifications and the possibility to transfer data over a field

bus, absolute encoders are nowadays used more frequently in various application fields.

**Max singleturn resolution**  
25 bit (33'554'432 ppr)

**Max number of turns**  
40 bit (1'099'511'627'776 turns)

**Supported output interfaces are:**  
Bit parallel, Analogue, SSI, Profibus, Profinet and Ethercat.

# EAR 58 B / C - 63 A / D / E BIT PARALLEL - SSI SOLID SHAFT SINGLETURN ABSOLUTE ENCODER



## MAIN FEATURES

Industry standard singleturn absolute encoder for factory automation applications.

- Optical sensor technology (proprietary OptoASIC)
- Resolution up to 25 bit
- Power supply up to +30 VDC with Bit Parallel or SSI as electrical interface
- Cable or connector output
- Solid shaft diameter up to 10 mm
- Mounting by synchronous, clamping or centering 2,5" square flange

## ORDERING CODE BIT PARALLEL EAR 63A 12 G 8/30 P P X 10 X MA R .162 +XXX

<b>SERIES</b> singleturn absolute encoder <b>EAR</b>	<b>MODEL</b> synchronous flange ø 31.75 mm <b>63A</b> synchronous flange ø 50 mm <b>58B</b> clamping flange ø 36 mm <b>58C</b> centering square flange ø 31.75 mm <b>63D</b> centering square flange ø 50 mm <b>63E</b>	<b>RESOLUTION</b> bit from 1 to 13 (multiples and submultiples of 360) ppr from 90 to 3600	<b>CODE TYPE</b> binary <b>B</b> gray <b>G</b> (no powers of 2) binary offset code (0-XXX) <b>BC</b> (no powers of 2) gray offset code (0-XXX) <b>GC</b>	<b>POWER SUPPLY</b> 8 ... 30 V DC <b>8/30</b>	<b>ELECTRICAL INTERFACE</b> push-pull <b>P</b>	<b>LOGIC</b> negative <b>N</b> positive <b>P</b>	<b>OPTIONS</b> to be reported if not used <b>X</b> latch with external input <b>L</b> (with binary code) strobe <b>S</b> reset with external input <b>ZE</b> latch / reset with external inputs <b>LZE</b> (with binary code) strobe / reset with external input <b>SZE</b>	<b>SHAFT DIAMETER</b> (mod. 58 B) mm <b>6</b> (mod. 63 A / D) 3/8" - mm <b>9,52</b> (mod. 58 C - 63 A / D / E) mm <b>10</b>	<b>ENCLOSURE RATING</b> IP 65 shaft side / IP67 cover side <b>X</b> IP 67 <b>S</b>	<b>OUTPUT TYPE</b> (without options) cable (standard length 1,5 m) <b>PD</b> cable (standard length 1,5 m) <b>PE</b> preferred cable lengths 2 / 3 / 5 / 10 m, to be added after DIRECTION TYPE (eg. PDR5) (without reset option) 19 pin MIL plug connector <b>MA</b>	<b>DIRECTION TYPE</b> radial <b>R</b>	<b>SOCKET</b> socket not included <b>.162</b>	<b>VARIANT</b> custom version <b>XXX</b>
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to be reported only with connector output (eg. MAR.162), for socket see Accessories

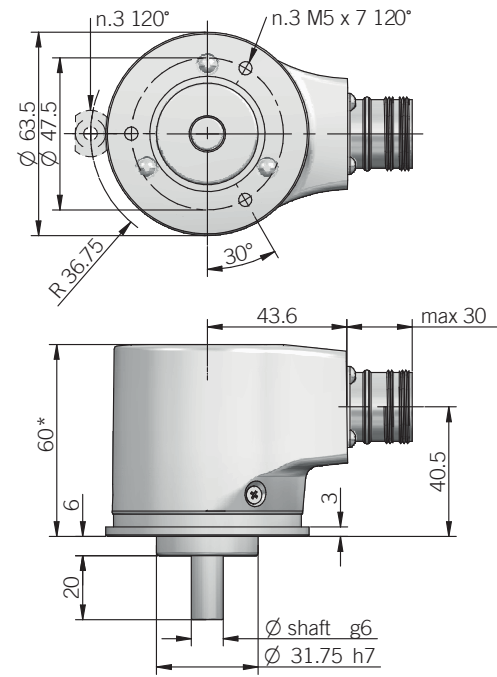
## SSI ORDERING CODE EAR 63A 13 G 8/30 S X 2048 RS 10 X HA R .162 +XXX

<b>SERIES</b> singleturn absolute encoder <b>EAR</b>	<b>MODEL</b> synchronous flange ø 31.75 mm <b>63A</b> synchronous flange ø 50 mm <b>58B</b> clamping flange ø 36 mm <b>58C</b> centering square flange ø 31.75 mm <b>63D</b> centering square flange ø 50 mm <b>63E</b>	<b>RESOLUTION</b> bit 13 / 16 / 17 / 18 / 21 / 25 ppr 360 / 720 / 1440 / 2880 / 3600	<b>CODE TYPE</b> binary <b>B</b> gray <b>G</b> (no powers of 2) binary offset code (0-XXX) <b>BC</b> (no powers of 2) gray offset code (0-XXX) <b>GC</b>	<b>POWER SUPPLY</b> 8 ... 30 V DC <b>8/30</b>	<b>ELECTRICAL INTERFACE</b> Serial Synchronous Interface - SSI <b>S</b>	<b>OPTION</b> to be reported if not used <b>X</b> reset with external input <b>ZE</b> reset on cover or with external input <b>ZP</b>	<b>INCREMENTAL RESOLUTION</b> (powers of 2) ppr from 128 to 8192	<b>INCREMENTAL ELECTRICAL INTERFACE</b> available with PD or HA output type line driver HTL <b>L</b> push pull <b>P</b> line driver RS-422 <b>RS</b>	<b>SHAFT DIAMETER</b> (mod. 58 B) mm <b>6</b> (mod. 63 A / D) 3/8" - mm <b>9,52</b> (mod. 58 C - 63 A / D / E) mm <b>10</b>	<b>ENCLOSURE RATING</b> IP 65 shaft side / IP67 cover side <b>X</b> IP 67 <b>S</b>	<b>OUTPUT TYPE</b> cable (standard length 1,5 m) <b>PC</b> preferred cable lengths 2 / 3 / 5 / 10 m, to be added after DIRECTION TYPE (eg. PCR5) cable (standard length 1,5 m) <b>PD</b> preferred cable lengths 2 / 3 / 5 / 10 m, to be added after DIRECTION TYPE (eg. PCR5) (without reset option) 7 pin MIL plug connector <b>MC</b> (with reset option) 10 pin MIL plug connector <b>MD</b> 12 pin M23 plug connector <b>HA</b> 8 pin M12 plug connector <b>M12</b>	<b>DIRECTION TYPE</b> radial <b>R</b>	<b>SOCKET</b> socket not included <b>.162</b>	<b>VARIANT</b> custom version <b>XXX</b>
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to be added with incremental output

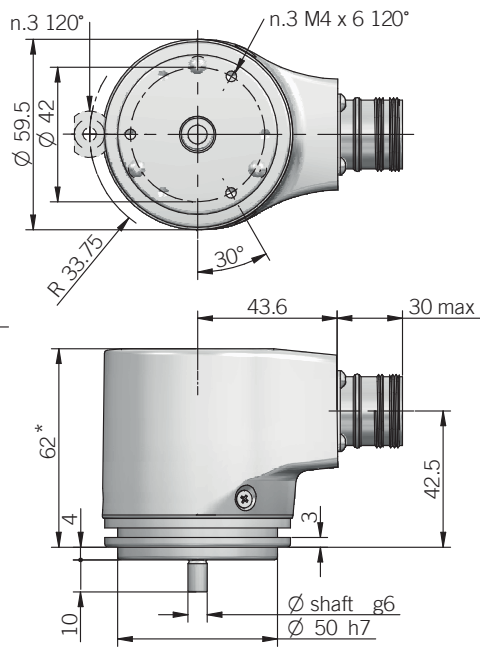
to be reported only with connector output (eg. HAR.162), for socket see Accessories

63A



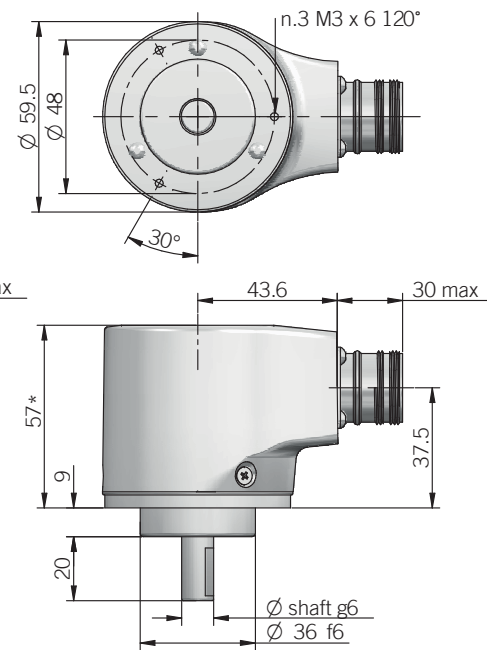
fixing clamps not included, please refer to Accessories

58B

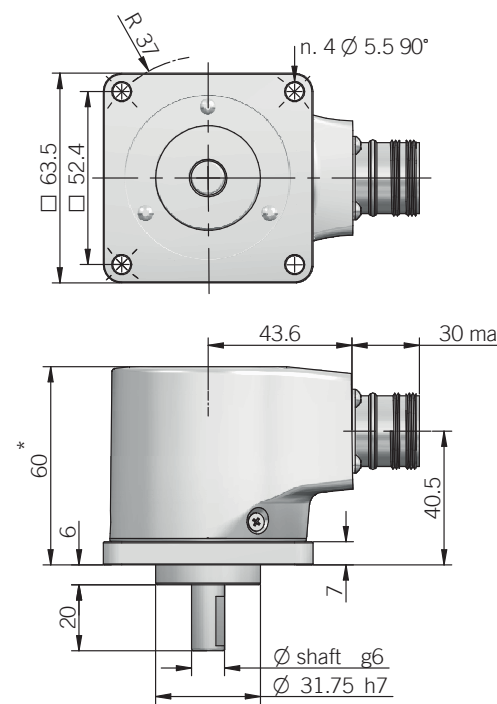


fixing clamps not included, please refer to Accessories

58C

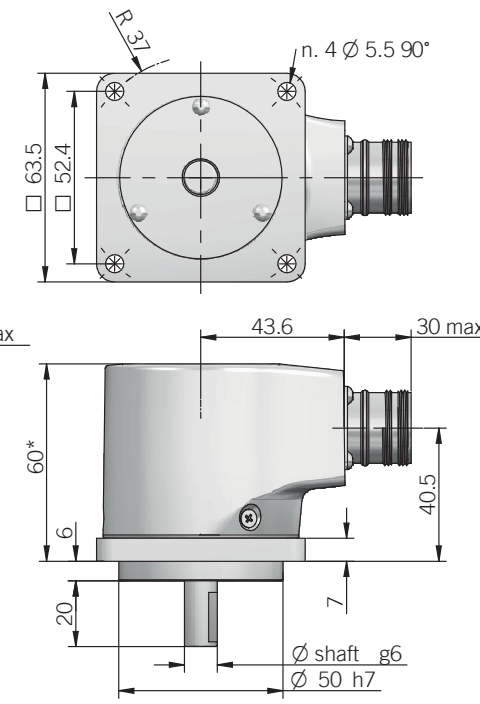


63D



\* with option ZP +1,5 mm  
recommended mating shaft tolerance H7  
dimensions in mm

63E



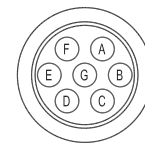
BIT PARALLEL CONNECTIONS

Function	Binary / Gray	Cable PD	Cable PE	19 pin MA
bit 1 (LSB)	B <sup>0</sup> / G <sup>0</sup>	green	green	A
bit 2	B <sup>1</sup> / G <sup>1</sup>	yellow	yellow	B
bit 3	B <sup>2</sup> / G <sup>2</sup>	blue	blue	C
bit 4	B <sup>3</sup> / G <sup>3</sup>	brown	brown	D
bit 5	B <sup>4</sup> / G <sup>4</sup>	orange or pink	orange or pink	E
bit 6	B <sup>5</sup> / G <sup>5</sup>	white	white	F
bit 7	B <sup>6</sup> / G <sup>6</sup>	grey	grey	G
bit 8	B <sup>7</sup> / G <sup>7</sup>	purple	purple	H
bit 9	B <sup>8</sup> / G <sup>8</sup>	grey / pink	grey / pink	J
bit 10	B <sup>9</sup> / G <sup>9</sup>	white / green	white / green	K
bit 11	B <sup>10</sup> / G <sup>10</sup>	brown / green	brown / green	L
bit 12	B <sup>11</sup> / G <sup>11</sup>	white / yellow	white / yellow	M
bit 13	B <sup>12</sup> / G <sup>12</sup>	yellow / brown	yellow / brown	N
STROBE	/	/	green / blue	P
LATCH	/	/	yellow / grey	R
0 V	/	black	black	T
U / D	/	red / blue	red / blue	U
RESET	/	/	pink / green	/
+ V DC	/	red	red	V
⊥	/	shield	shield	S

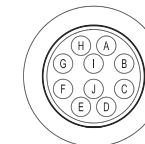
SSI CONNECTIONS

Function	Cable PC	Cable PD	7 pin MC	10 pin MD	12 pin HA	12 pin HA	8 pin M12
+ V DC	red	red	G	G	8	8	8
0 V	black	black	F	F	1	1	5
DATA +	green	green	C	C	2	2	3
DATA -	brown	brown	D	D	10	10	2
CLOCK +	yellow	yellow	A	A	3	3	4
CLOCK -	orange or pink	orange or pink	B	B	11	11	6
A+	/	grey	/	/	/	6	/
A-	/	blue	/	/	/	7	/
B+	/	purple	/	/	/	9	/
B-	/	white / green	/	/	/	12	/
U / D	red / blue	red / blue	E	E	5	5	7
RESET	white	white	/	H	4	4	1
⊥	shield	shield	housing	housing	9	housing	housing

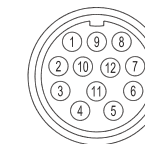
MC connector (7 pin)  
Amphenol MS3102-E-16-S  
front view



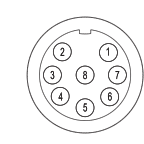
MD connector (10 pin)  
Amphenol MS3102-E-18-1P  
front view



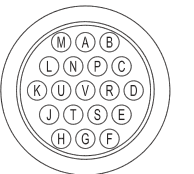
HA connector (12 pin) - M23 CCW  
Hummel 7.410.000000 - 7.002.912.603  
front view



M12 connector (8 pin)  
M12 A coded  
front view



MA connector (19 pin)  
Amphenol 62IN 12E 14-19 P  
front view



**ELECTRICAL SPECIFICATIONS**

<b>Resolution</b>	P = from 90 ppr to 13 bit S = from 360 ppr to 25 bit
<b>Power supply<sup>1</sup></b>	7,6 ... 30 V DC (reverse polarity protection)
<b>Power draw without load</b>	< 1 W
<b>Max load current</b>	20 mA / channel
<b>Absolute electrical interface<sup>2</sup></b>	P = push pull (iC-DL) S = RS-422 (THVD1451 or similar)
<b>Incremental electrical interface<sup>2</sup></b>	L = HTL differential (AEIC-7272 or similar) P = Push-Pull (AEIC-7272 or similar) RS = RS-422 (AELT-5000 or similar)
<b>Max incremental output frequency</b>	128 kHz
<b>Auxiliary inputs (U/D - RESET - LATCH)</b>	active high (+V DC) connect to 0 V if not used / RESET - LATCH t <sub>min</sub> 150 ms
<b>Max frequency</b>	50 kHz LSB (Bit Parallel) clock input 100 kHz ... 1 MHz (SSI)
<b>Code type</b>	binary or gray
<b>Logic</b>	SSI = positive Bit parallel = positive or negative
<b>SSI monostable time (T<sub>m</sub>)</b>	20 μs
<b>SSI pause time (T<sub>p</sub>)</b>	> 35 μs
<b>SSI frame</b>	left aligned format MSB ... LSB up to 13 bit = length 13 bit from 14 to 21 bit = length 21 bit from 22 to 25 bit = length 25 bit
<b>SSI status and parity bit</b>	on request
<b>Counting direction</b>	decreasing clockwise (shaft view)
<b>Start-up time</b>	700 ms
<b>Accuracy</b>	± 0,069°
<b>Mean time to dangerous failure (MTTF<sub>d</sub>)<sup>3</sup> according to EN ISO 13849-1</b>	173 years with BIT PARALLEL output 214 years with SSI/INCREMENTAL output
<b>Mission time (T<sub>m</sub>)<sup>3</sup></b>	20 years
<b>Diagnostic coverage (DC)<sup>3</sup></b>	0%
<b>Cable type PC</b>	shielded - fixed installation conductors section 0,22 mm <sup>2</sup> / AWG 24 bending radius min 60 mm
<b>Cable type PD</b>	shielded - fixed installation conductors section 0,14 mm <sup>2</sup> / AWG 26 bending radius min 50 mm
<b>Cable type PE</b>	shielded - fixed installation conductors section 0,14 mm <sup>2</sup> / AWG 26 bending radius min 50 mm
<b>Electromagnetic compatibility</b>	according to 2014/30/EU directive
<b>RoHS</b>	according to 2011/65/EU directive
<b>UL / CSA</b>	file n. E212495

**MECHANICAL SPECIFICATIONS**

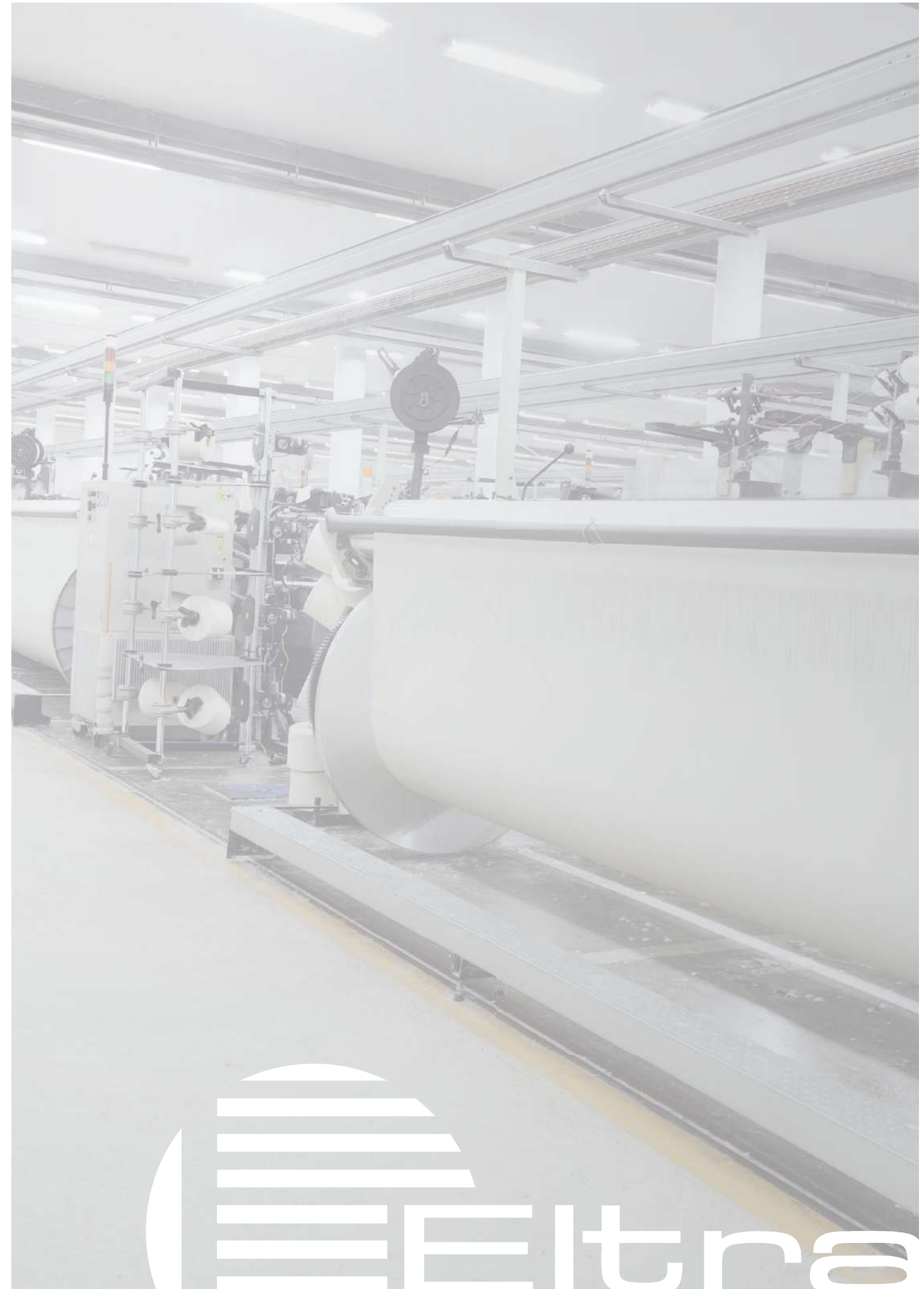
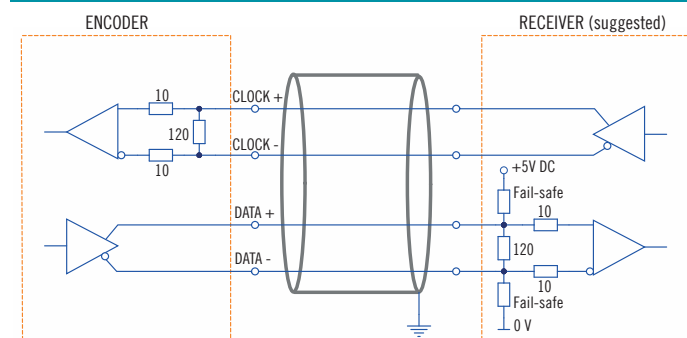
<b>Shaft diameter</b>	ø 6 / 9,52 (3/8") / 10 mm
<b>Enclosure rating IEC 60529</b>	X = IP 65 shaft side / IP67 cover side S = IP 67
<b>Max rotation speed</b>	see table
<b>Max shaft load<sup>4</sup></b>	200 N (45 lbs) axial / 70 N (15,74 lbs) radial
<b>Shock</b>	50 G, 11 ms (IEC 60068-2-27)
<b>Vibration</b>	10 G, 10 ... 2000 Hz (IEC 60068-2-6)
<b>Moment of inertia</b>	1,5 x 10 <sup>-6</sup> kgm <sup>2</sup> (36 x 10 <sup>-6</sup> lbf <sup>2</sup> )
<b>Starting torque (at +20°C / +68°F)</b>	< 0,03 Nm (4,25 Ozin)
<b>Bearing stage material</b>	aluminium
<b>Shaft material</b>	stainless steel
<b>Housing material</b>	painting aluminium
<b>Bearings</b>	n.2 ball bearings
<b>Bearings life</b>	10 <sup>9</sup> revolutions
<b>Operating temperature Bit parallel<sup>5,6</sup></b>	-20° ... +85°C (-4 ... +185°F)
<b>Operating temperature SSI<sup>5,6</sup></b>	-40° ... +100°C (-40° ... +212°F) -20° ... +100°C (-4° ... +212°F) with PC cable output -20° ... +85°C (-4° ... +185°F) with PD cable output -25° ... +85°C (-13° ... +185°F) with M12 connector
<b>Storage temperature<sup>6</sup></b>	-20° ... +85°C (-4° ... +185°F)
<b>Weight</b>	approx 300 g (10,58 oz)

<sup>1</sup> as measured at the transducer without cable influences  
<sup>2</sup> for further details refer to OUTPUT LEVELS on TECHNICAL BASICS section  
<sup>3</sup> this product is not a safety component, for further details refer to TECHNICAL BASICS section  
<sup>4</sup> maximum load for static usage  
<sup>5</sup> measured on the transducer flange  
<sup>6</sup> condensation not allowed

**ROTATION SPEED DERATING TABLE**

Temperature °C (°F)	Max speed (rpm)	Max continuous speed (rpm)
up to +70 (+158)	10000	8000
+70 ... +85 (+158 ... +185)	8000	5000
+85 ... +100 (+185 ... +212)	5000	3000

**SSI SCHEMATICS**



# EAR 58 F - 63 F / G BIT PARALLEL - SSI

## BLIND HOLLOW SHAFT SINGLETURN ABSOLUTE ENCODER



### MAIN FEATURES

Industry standard singleturn absolute encoder for factory automation applications.

- Optical sensor technology (proprietary OptoASIC)
- Resolution up to 25 bit
- Power supply up to +30 VDC with Bit Parallel or SSI as electrical interface
- Cable or connector output
- Blind hollow shaft up to 15 mm
- Mounting by stator coupling, torque stop slot or torque pin

### ORDERING CODE BIT PARALLEL

EAR	58F	12	G	8/30	P	P	X	15	X	MA	R	.162	+XXX
<b>SERIES</b> singleturn absolute encoder EAR													
<b>MODEL</b> blind hollow shaft with stator coupling 58F blind hollow shaft with torque stop slot 63F blind hollow shaft with torque pin 63G													
<b>RESOLUTION</b> bit from 1 to 13 (multiples and submultiples of 360) ppr from 90 to 3600													
<b>CODE TYPE</b> binary B gray G (no powers of 2) binary offset code (0-XXX) BC (no powers of 2) gray offset code (0-XXX) GC													
<b>POWER SUPPLY</b> 8 ... 30 V DC 8/30													
<b>ELECTRICAL INTERFACE</b> push-pull P													
<b>LOGIC</b> negative N positive P													
<b>OPTIONS</b> to be reported if not used X latch with external input L (with binary code) strobe S reset with external input ZE latch / reset with external inputs LZE (with binary code) strobe / reset with external input SZE													
<b>BORE DIAMETER</b> mm 14 mm 15 diameters 6 / 8 / 9,52 (3/8") / 10 / 11 / 12 mm with optional shaft adapter, see Accessories													
<b>ENCLOSURE RATING</b> IP 65 shaft side / IP67 cover side X IP 67 S													
<b>OUTPUT TYPE</b> (without options) cable (standard length 1,5 m) PD cable (standard length 1,5 m) PE preferred cable lengths 2 / 3 / 5 / 10 m, to be added after DIRECTION TYPE (eg. PDR5) (without reset option) 19 pin MIL plug connector MA													
<b>DIRECTION TYPE</b> radial R													
<b>SOCKET</b> socket not included .162 to be reported only with connector output (eg. MAR.162), for socket see Accessories													
<b>VARIANT</b> custom version XXX													

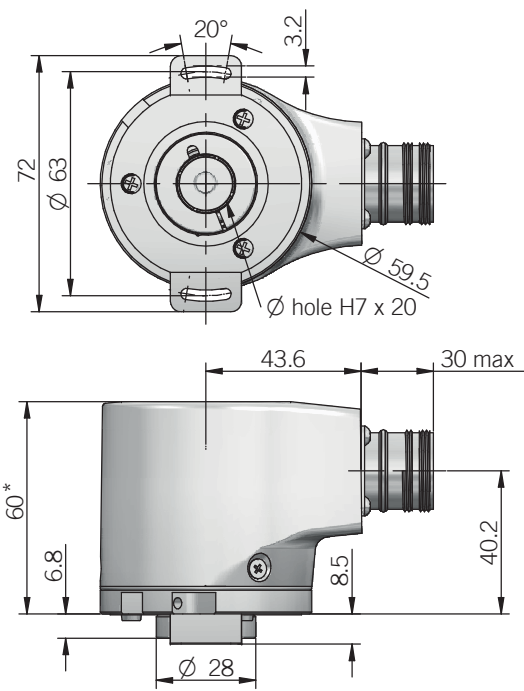
### ORDERING CODE SSI

EAR	58F	13	G	8/30	S	X	2048	RS	15	X	HA	R	.162	+XXX
<b>SERIES</b> singleturn absolute encoder EAR														
<b>MODEL</b> blind hollow shaft with stator coupling 58F blind hollow shaft with torque stop slot 63F blind hollow shaft with torque pin 63G														
<b>RESOLUTION</b> bit 13 / 16 / 17 / 18 / 21 / 25 ppr 360 / 720 / 1440 / 2880 / 3600														
<b>CODE TYPE</b> binary B gray G (no powers of 2) binary offset code (0-XXX) BC (no powers of 2) gray offset code (0-XXX) GC														
<b>POWER SUPPLY</b> 8 ... 30 V DC 8/30														
<b>ELECTRICAL INTERFACE</b> Serial Synchronous Interface - SSI S														
<b>OPTION</b> to be reported if not used X reset with external input ZE reset on cover or with external input ZP														
<b>INCREMENTAL RESOLUTION</b> (powers of 2) ppr from 128 to 8192														
<b>INCREMENTAL ELECTRICAL INTERFACE</b> available with PD or HA output type line driver HTL L push pull P line driver RS-422 RS														
<b>BORE DIAMETER</b> mm 14 mm 15 diameters 6 / 8 / 9,52 (3/8") / 10 / 11 / 12 mm with optional shaft adapter, see Accessories														
<b>ENCLOSURE RATING</b> IP 65 shaft side / IP67 cover side X IP 67 S														
<b>OUTPUT TYPE</b> cable (standard length 1,5 m) PC preferred cable lengths 2 / 3 / 5 / 10 m, to be added after DIRECTION TYPE (eg. PCR5) cable (standard length 1,5 m) PD preferred cable lengths 2 / 3 / 5 / 10 m, to be added after DIRECTION TYPE (eg. PCR5) (without reset option) 7 pin MIL plug connector MC (with reset option) 10 pin MIL plug connector MD 12 pin M23 plug connector HA 8 pin M12 plug connector M12														
<b>DIRECTION TYPE</b> radial R														
<b>SOCKET</b> socket not included .162 to be reported only with connector output (eg. HAR.162), for socket see Accessories														
<b>VARIANT</b> custom version XXX														

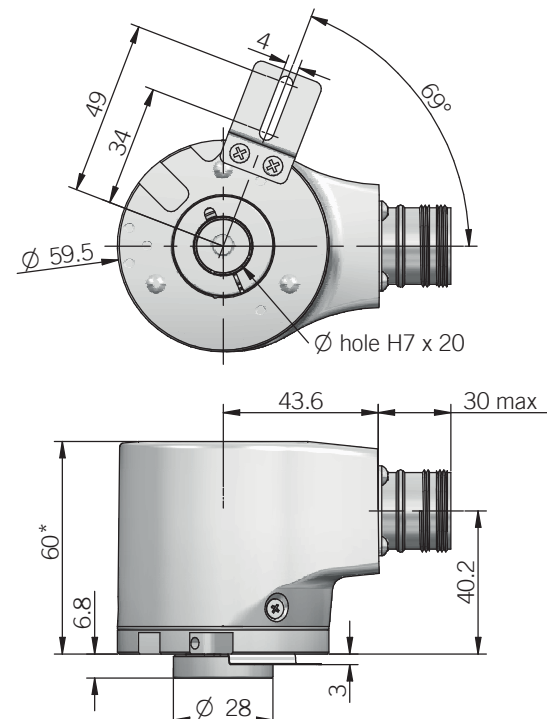
to be added with incremental output

to be reported only with connector output (eg. HAR.162), for socket see Accessories

58F

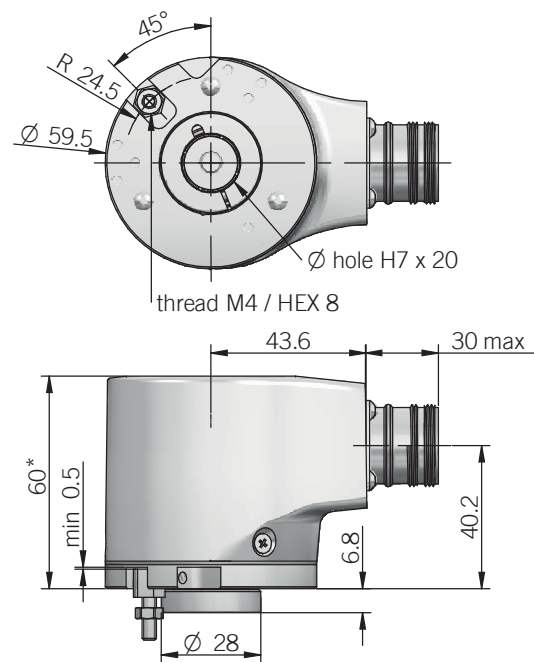


63F



for torque pin please refer to Accessories

63G



torque pin is included

\* with option ZP +1,5 mm  
recommended mating shaft tolerance g6  
dimensions in mm

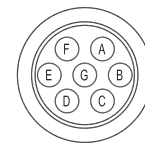
BIT PARALLEL CONNECTIONS

Function	Binary / Gray	Cable PD	Cable PE	19 pin MA
bit 1 (LSB)	B <sup>0</sup> / G <sup>0</sup>	green	green	A
bit 2	B <sup>1</sup> / G <sup>1</sup>	yellow	yellow	B
bit 3	B <sup>2</sup> / G <sup>2</sup>	blue	blue	C
bit 4	B <sup>3</sup> / G <sup>3</sup>	brown	brown	D
bit 5	B <sup>4</sup> / G <sup>4</sup>	orange or pink	orange or pink	E
bit 6	B <sup>5</sup> / G <sup>5</sup>	white	white	F
bit 7	B <sup>6</sup> / G <sup>6</sup>	grey	grey	G
bit 8	B <sup>7</sup> / G <sup>7</sup>	purple	purple	H
bit 9	B <sup>8</sup> / G <sup>8</sup>	grey / pink	grey / pink	J
bit 10	B <sup>9</sup> / G <sup>9</sup>	white / green	white / green	K
bit 11	B <sup>10</sup> / G <sup>10</sup>	brown / green	brown / green	L
bit 12	B <sup>11</sup> / G <sup>11</sup>	white / yellow	white / yellow	M
bit 13	B <sup>12</sup> / G <sup>12</sup>	yellow / brown	yellow / brown	N
STROBE	/	/	green / blue	P
LATCH	/	/	yellow / grey	R
0 V	/	black	black	T
U / D	/	red / blue	red / blue	U
RESET	/	/	pink / green	/
+ V DC	/	red	red	V
⊥	/	shield	shield	S

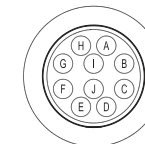
SSI CONNECTIONS

Function	Cable PC	Cable PD	7 pin MC	10 pin MD	12 pin HA	12 pin HA	8 pin M12
+ V DC	red	red	G	G	8	8	8
0 V	black	black	F	F	1	1	5
DATA +	green	green	C	C	2	2	3
DATA -	brown	brown	D	D	10	10	2
CLOCK +	yellow	yellow	A	A	3	3	4
CLOCK -	orange or pink	orange or pink	B	B	11	11	6
A+	/	grey	/	/	/	6	/
A-	/	blue	/	/	/	7	/
B+	/	purple	/	/	/	9	/
B-	/	white / green	/	/	/	12	/
U / D	red / blue	red / blue	E	E	5	5	7
RESET	white	white	/	H	4	4	1
⊥	shield	shield	housing	housing	9	housing	housing

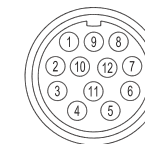
MC connector (7 pin)  
Amphenol MS3102-E-16-S  
front view



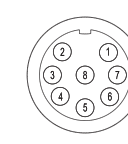
MD connector (10 pin)  
Amphenol MS3102-E-18-1P  
front view



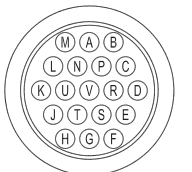
HA connector (12 pin) - M23 CCW  
Hummel 7.410.000000 - 7.002.912.603  
front view



M12 connector (8 pin)  
M12 A coded  
front view



MA connector (19 pin)  
Amphenol 62IN 12E 14-19 P  
front view



**ELECTRICAL SPECIFICATIONS**

<b>Resolution</b>	P = from 90 ppr to 13 bit S = from 360 ppr to 25 bit
<b>Power supply<sup>1</sup></b>	7,6 ... 30 V DC (reverse polarity protection)
<b>Power draw without load</b>	< 1 W
<b>Max load current</b>	20 mA / channel
<b>Absolute electrical interface<sup>2</sup></b>	P = push pull (iC-DL) S = RS-422 (THVD1451 or similar)
<b>Incremental electrical interface<sup>2</sup></b>	L = HTL differential (AEIC-7272 or similar) P = Push-Pull (AEIC-7272 or similar) RS = RS-422 (AELT-5000 or similar)
<b>Max incremental output frequency</b>	128 kHz
<b>Auxiliary inputs (U/D - RESET - LATCH)</b>	active high (+V DC) connect to 0 V if not used / RESET - LATCH t <sub>min</sub> 150 ms
<b>Max frequency</b>	50 kHz LSB (Bit Parallel) clock input 100 kHz ... 1 MHz (SSI)
<b>Code type</b>	binary or gray
<b>Logic</b>	SSI = positive Bit parallel = positive or negative
<b>SSI monostable time (T<sub>m</sub>)</b>	20 μs
<b>SSI pause time (T<sub>p</sub>)</b>	> 35 μs
<b>SSI frame</b>	left aligned format MSB ... LSB up to 13 bit = length 13 bit from 14 to 21 bit = length 21 bit from 22 to 25 bit = length 25 bit
<b>SSI status and parity bit</b>	on request
<b>Counting direction</b>	decreasing clockwise (shaft view)
<b>Start-up time</b>	700 ms
<b>Accuracy</b>	± 0,069°
<b>Mean time to dangerous failure (MTTF<sub>d</sub>)<sup>3</sup> according to EN ISO 13849-1</b>	173 years with BIT PARALLEL output 214 years with SSI/INCREMENTAL output
<b>Mission time (T<sub>m</sub>)<sup>3</sup></b>	20 years
<b>Diagnostic coverage (DC)<sup>3</sup></b>	0%
<b>Cable type PC</b>	shielded - fixed installation conductors section 0,22 mm <sup>2</sup> / AWG 24 bending radius min 60 mm
<b>Cable type PD</b>	shielded - fixed installation conductors section 0,14 mm <sup>2</sup> / AWG 26 bending radius min 50 mm
<b>Cable type PE</b>	shielded - fixed installation conductors section 0,14 mm <sup>2</sup> / AWG 26 bending radius min 50 mm
<b>Electromagnetic compatibility</b>	according to 2014/30/EU directive
<b>RoHS</b>	according to 2011/65/EU directive
<b>UL / CSA</b>	file n. E212495

**MECHANICAL SPECIFICATIONS**

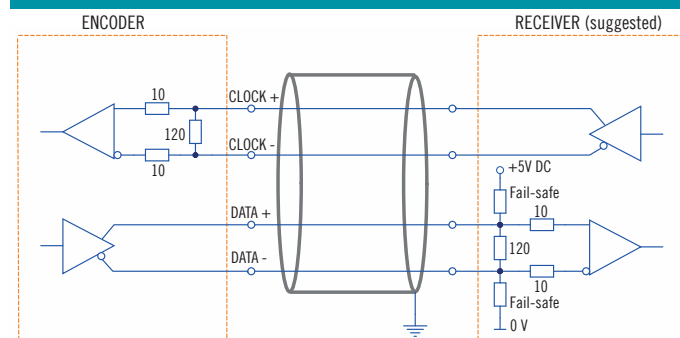
<b>Bore diameter</b>	ø 14 / 15 mm ø 6* / 8* / 9,52 (3/8")* / 10* / 11* / 12* * with optional shaft adapter, please refer to Accessories
<b>Enclosure rating IEC 60529</b>	X = IP 65 shaft side / IP67 cover side S = IP 67
<b>Max rotation speed</b>	see table
<b>Max shaft load<sup>4</sup></b>	200 N (45 lbs) axial / 60 N (13,49 lbs) radial
<b>Shock</b>	50 G, 11 ms (IEC 60068-2-27)
<b>Vibration</b>	10 G, 10 ... 2000 Hz (IEC 60068-2-6)
<b>Moment of inertia</b>	5 x 10 <sup>-6</sup> kgm <sup>2</sup> (119 x 10 <sup>-6</sup> lbft <sup>2</sup> )
<b>Starting torque (at +20°C / +68°F)</b>	< 0,03 Nm (4,25 Ozin)
<b>Bearing stage material</b>	aluminum
<b>Shaft material</b>	stainless steel
<b>Housing material</b>	painted aluminium
<b>Bearings</b>	n.2 ball bearings
<b>Bearings life</b>	10 <sup>9</sup> revolutions
<b>Operating temperature Bit parallel<sup>5,6</sup></b>	-20° ... +85°C (-4 ... +185°F)
<b>Operating temperature SSI<sup>5,6</sup></b>	-40° ... +85°C (-40° ... +185°F) -20° ... +85°C (-4° ... +185°F) with cable output -25° ... +85°C (-13° ... +185°F) with M12 connector
<b>Storage temperature<sup>6</sup></b>	-20° ... +85°C (-4° ... +185°F)
<b>Weight</b>	approx 300 g (10,58 oz)

<sup>1</sup> as measured at the transducer without cable influences  
<sup>2</sup> for further details refer to OUTPUT LEVELS on TECHNICAL BASICS section  
<sup>3</sup> this product is not a safety component, for further details refer to TECHNICAL BASICS section  
<sup>4</sup> maximum load for static usage  
<sup>5</sup> measured on the transducer flange  
<sup>6</sup> condensation not allowed

**ROTATION SPEED DERATING TABLE**

	Temperature °C (°F)	Max speed (rpm)	Max continuous speed (rpm)
<b>IP65</b>	up to +70 (+158)	9000	6000
	+70 ... 85 (+158 ... +185)	6000	3000
<b>IP67</b>	up to +70 (+158)	8000	6000
	+70 ... 85 (+158 ... +185)	4000	2000

**SSI SCHEMATICS**



# EAR 90 - 115 A BIT PARALLEL - SSI SOLID SHAFT SINGLETURN ABSOLUTE ENCODER



## MAIN FEATURES

Industry standard singleturn absolute encoder for factory automation applications.

- Optical sensor technology (proprietary OptoASIC)
- Resolution up to 25 bit
- Power supply up to +30 VDC with Bit Parallel or SSI as electrical interface
- Cable or connector output
- Solid shaft diameter up to 11 mm
- Mounting by synchronous or REO-444 flange

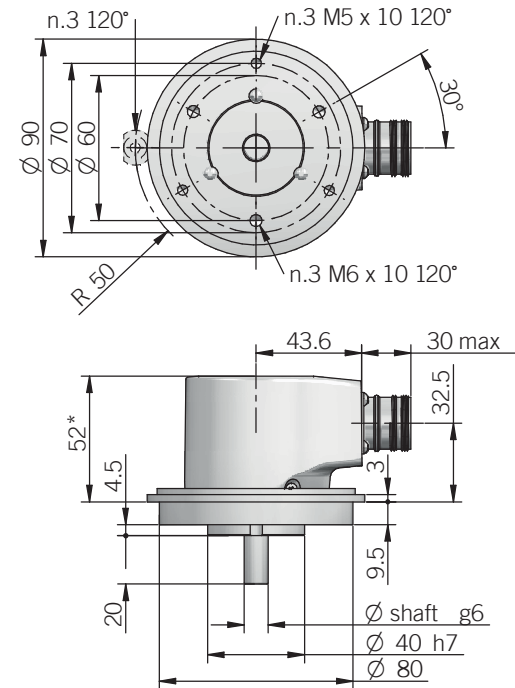
ORDERING CODE BIT PARALLEL	EAR	90A	12	G	8/30	P	P	X	10	X	MA	R	.162	+XXX
<b>SERIES</b> singleturn absolute encoder <b>EAR</b>														
<b>MODEL</b> synchronous flange ø 40 mm <b>90A</b> REO-444 flange <b>115A</b>														
<b>RESOLUTION</b> bit from <b>1</b> to <b>13</b> (multiples and submultiples of 360) ppr from <b>90</b> to <b>3600</b>														
<b>CODE TYPE</b> binary <b>B</b> gray <b>G</b> (no powers of 2) binary offset code (0-XXX) <b>BC</b> (no powers of 2) gray offset code (0-XXX) <b>GC</b>														
<b>POWER SUPPLY</b> <b>8 ... 30 V DC 8/30</b>														
<b>ELECTRICAL INTERFACE</b> push-pull <b>P</b>														
<b>LOGIC</b> negative <b>N</b> positive <b>P</b>														
<b>OPTIONS</b> to be reported if not used <b>X</b> latch with external input <b>L</b> (with binary code) strobe <b>S</b> reset with external input <b>ZE</b> latch / reset with external inputs <b>LZE</b> (with binary code) strobe / reset with external input <b>SZE</b>														
<b>SHAFT DIAMETER</b> (mod. 90) 3/8" - mm <b>9,52</b> mm <b>10</b> (mod. 115) mm <b>11</b>														
<b>ENCLOSURE RATING</b> IP 65 shaft side / IP67 cover side <b>X</b> IP 67 <b>S</b>														
<b>OUTPUT TYPE</b> (without options) cable (standard length 1,5 m) <b>PD</b> cable (standard length 1,5 m) <b>PE</b> preferred cable lengths 2 / 3 / 5 / 10 m, to be added after DIRECTION TYPE (eg. PDR5) (without reset option) 19 pin MIL plug connector <b>MA</b>														
<b>DIRECTION TYPE</b> radial <b>R</b>														
<b>SOCKET</b> socket not included <b>.162</b> to be reported only with connector output (eg. MAR.162), for socket see Accessories														
<b>VARIANT</b> custom version <b>XXX</b>														

ORDERING CODE SSI	EAR	90A	13	G	8/30	S	X	2048	RS	10	X	HA	R	.162	+XXX
<b>SERIES</b> singleturn absolute encoder <b>EAR</b>															
<b>MODEL</b> synchronous flange ø 40 mm <b>90A</b> REO-444 flange <b>115A</b>															
<b>RESOLUTION</b> bit <b>13 / 16 / 17 / 18 / 21 / 25</b> ppr <b>360 / 720 / 1440 / 2880 / 3600</b>															
<b>CODE TYPE</b> binary <b>B</b> gray <b>G</b> (no powers of 2) binary offset code (0-XXX) <b>BC</b> (no powers of 2) gray offset code (0-XXX) <b>GC</b>															
<b>POWER SUPPLY</b> <b>8 ... 30 V DC 8/30</b>															
<b>ELECTRICAL INTERFACE</b> Serial Synchronous Interface - SSI <b>S</b>															
<b>OPTION</b> to be reported if not used <b>X</b> reset with external input <b>ZE</b> reset on cover or with external input <b>ZP</b>															
<b>INCREMENTAL RESOLUTION</b> (powers of 2) ppr from <b>128</b> to <b>8192</b>															
<b>INCREMENTAL ELECTRICAL INTERFACE</b> available with PC or HA output type line driver HTL <b>L</b> push pull <b>P</b> line driver RS-422 <b>RS</b>															
<b>SHAFT DIAMETER</b> (mod. 90) 3/8" - mm <b>9,52</b> mm <b>10</b> (mod. 115) mm <b>11</b>															
<b>ENCLOSURE RATING</b> IP 65 shaft side / IP67 cover side <b>X</b> IP 67 <b>S</b>															
<b>OUTPUT TYPE</b> cable (standard length 1,5 m) <b>PC</b> preferred cable lengths 2 / 3 / 5 / 10 m, to be added after DIRECTION TYPE (eg. PCR5) cable (standard length 1,5 m) <b>PD</b> preferred cable lengths 2 / 3 / 5 / 10 m, to be added after DIRECTION TYPE (eg. PCR5) (without reset option) 7 pin MIL plug connector <b>MC</b> (with reset option) 10 pin MIL plug connector <b>MD</b> 12 pin M23 plug connector <b>HA</b> 8 pin M12 plug connector <b>M12</b>															
<b>DIRECTION TYPE</b> radial <b>R</b>															
<b>SOCKET</b> socket not included <b>.162</b> to be reported only with connector output (eg. HAR.162), for socket see Accessories															
<b>VARIANT</b> custom version <b>XXX</b>															

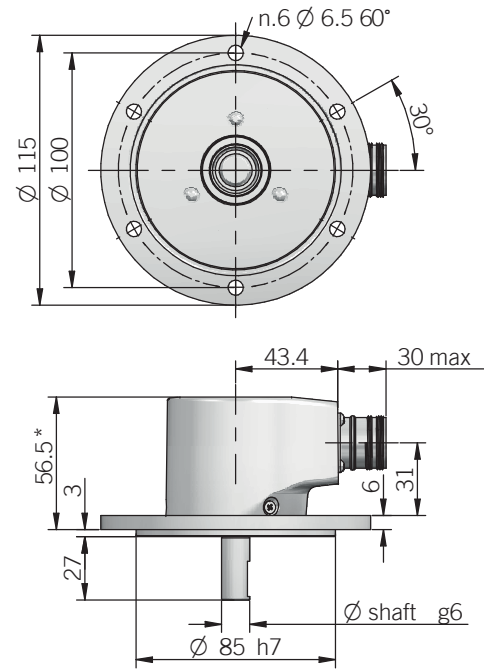
   to be added with incremental output



90A



115A



for fixing clamps please refer to Accessories  
 \* with option ZP +1,5 mm  
 recommended mating shaft tolerance H7  
 dimensions in mm



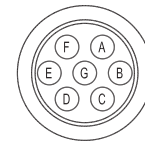
BIT PARALLEL CONNECTIONS

Function	Binary / Gray	Cable PD	Cable PE	19 pin MA
bit 1 (LSB)	B <sup>0</sup> / G <sup>0</sup>	green	green	A
bit 2	B <sup>1</sup> / G <sup>1</sup>	yellow	yellow	B
bit 3	B <sup>2</sup> / G <sup>2</sup>	blue	blue	C
bit 4	B <sup>3</sup> / G <sup>3</sup>	brown	brown	D
bit 5	B <sup>4</sup> / G <sup>4</sup>	orange or pink	orange or pink	E
bit 6	B <sup>5</sup> / G <sup>5</sup>	white	white	F
bit 7	B <sup>6</sup> / G <sup>6</sup>	grey	grey	G
bit 8	B <sup>7</sup> / G <sup>7</sup>	purple	purple	H
bit 9	B <sup>8</sup> / G <sup>8</sup>	grey / pink	grey / pink	J
bit 10	B <sup>9</sup> / G <sup>9</sup>	white / green	white / green	K
bit 11	B <sup>10</sup> / G <sup>10</sup>	brown / green	brown / green	L
bit 12	B <sup>11</sup> / G <sup>11</sup>	white / yellow	white / yellow	M
bit 13	B <sup>12</sup> / G <sup>12</sup>	yellow / brown	yellow / brown	N
STROBE	/	/	green / blue	P
LATCH	/	/	yellow / grey	R
0 V	/	black	black	T
U / D	/	red / blue	red / blue	U
RESET	/	/	pink / green	/
+ V DC	/	red	red	V
⊥	/	shield	shield	S

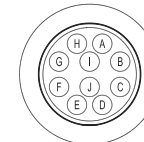
SSI CONNECTIONS

Function	Cable PC	Cable PD	7 pin MC	10 pin MD	12 pin HA	12 pin HA	8 pin M12
+ V DC	red	red	G	G	8	8	8
0 V	black	black	F	F	1	1	5
DATA +	green	green	C	C	2	2	3
DATA -	brown	brown	D	D	10	10	2
CLOCK +	yellow	yellow	A	A	3	3	4
CLOCK -	orange or pink	orange or pink	B	B	11	11	6
A+	/	grey	/	/	/	6	/
A-	/	blue	/	/	/	7	/
B+	/	purple	/	/	/	9	/
B-	/	white / green	/	/	/	12	/
U / D	red / blue	red / blue	E	E	5	5	7
RESET	white	white	/	H	4	4	1
⊥	shield	shield	housing	housing	9	housing	housing

MC connector (7 pin)  
Amphenol MS3102-E-16-S  
front view



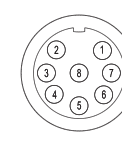
MD connector (10 pin)  
Amphenol MS3102-E-18-1P  
front view



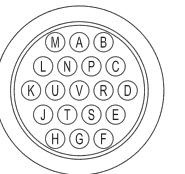
HA connector (12 pin) - M23 CCW  
Hummel 7.410.000000 - 7.002.912.603  
front view



M12 connector (8 pin)  
M12 A coded  
front view



MA connector (19 pin)  
Amphenol 62IN 12E 14-19 P  
front view



ELECTRICAL SPECIFICATIONS

<b>Resolution</b>	P = from 90 ppr to 13 bit S = from 360 ppr to 25 bit
<b>Power supply<sup>1</sup></b>	7,6 ... 30 V DC (reverse polarity protection)
<b>Power draw without load</b>	< 1 W
<b>Max load current</b>	20 mA / channel
<b>Absolute electrical interface<sup>2</sup></b>	P = push pull (iC-DL) S = RS-422 (THVD1451 or similar)
<b>Incremental electrical interface<sup>2</sup></b>	L = HTL differential (AEIC-7272 or similar) P = Push-Pull (AEIC-7272 or similar) RS = RS-422 (AELT-5000 or similar)
<b>Max incremental output frequency</b>	128 kHz
<b>Auxiliary inputs (U/D - RESET - LATCH)</b>	active high (+V DC) connect to 0 V if not used / RESET - LATCH t <sub>min</sub> 150 ms
<b>Max frequency</b>	50 kHz LSB (Bit Parallel) clock input 100 kHz ... 1 MHz (SSI)
<b>Code type</b>	binary or gray
<b>Logic</b>	SSI = positive Bit parallel = positive or negative
<b>SSI monostable time (Tm)</b>	20 μs
<b>SSI pause time (Tp)</b>	> 35 μs
<b>SSI frame</b>	left aligned format MSB ... LSB up to 13 bit = length 13 bit from 14 to 21 bit = length 21 bit from 22 to 25 bit = length 25 bit
<b>SSI status and parity bit</b>	on request
<b>Counting direction</b>	decreasing clockwise (shaft view)
<b>Start-up time</b>	700 ms
<b>Accuracy</b>	± 0,069°
<b>Mean time to dangerous failure (MTTF<sub>d</sub>)<sup>3</sup> according to EN ISO 13849-1</b>	173 years with BIT PARALLEL output 214 years with SSI/INCREMENTAL output
<b>Mission time (Tm)<sup>3</sup></b>	20 years
<b>Diagnostic coverage (DC)<sup>3</sup></b>	0%
<b>Cable type PC</b>	shielded - fixed installation conductors section 0,22 mm <sup>2</sup> / AWG 24 bending radius min 60 mm
<b>Cable type PD</b>	shielded - fixed installation conductors section 0,14 mm <sup>2</sup> / AWG 26 bending radius min 50 mm
<b>Cable type PE</b>	shielded - fixed installation conductors section 0,14 mm <sup>2</sup> / AWG 26 bending radius min 50 mm
<b>Electromagnetic compatibility</b>	according to 2014/30/EU directive
<b>RoHS</b>	according to 2011/65/EU directive
<b>UL / CSA</b>	file n. E212495

MECHANICAL SPECIFICATIONS

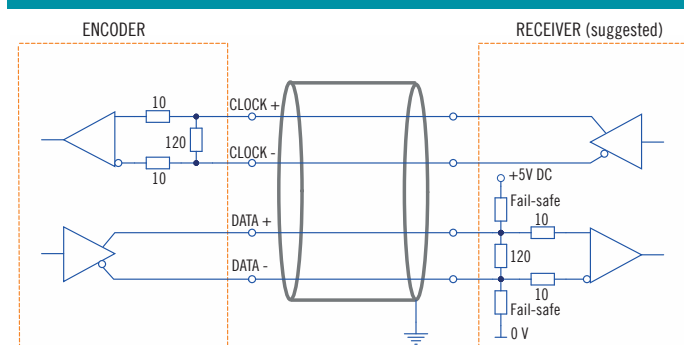
<b>Shaft diameter</b>	ø 9,52 (3/8") / 10 / 11 mm
<b>Enclosure rating IEC 60529</b>	X = IP 65 shaft side / IP67 cover side S = IP 67
<b>Max rotation speed</b>	see table
<b>Max shaft load<sup>4</sup></b>	200 N (45 lbs) axial / 70 N (15,74 lbs) radial
<b>Shock</b>	50 G, 11 ms (IEC 60068-2-27)
<b>Vibration</b>	10 G, 10 ... 2000 Hz (IEC 60068-2-6)
<b>Moment of inertia</b>	1,5 x 10 <sup>-6</sup> kgm <sup>2</sup> (36 x 10 <sup>-6</sup> lbf <sup>2</sup> )
<b>Starting torque (at +20°C / +68°F)</b>	< 0,03 Nm (4,25 Ozin)
<b>Bearing stage material</b>	aluminum
<b>Shaft material</b>	stainless steel
<b>Housing material</b>	painted aluminium
<b>Bearings</b>	n.2 ball bearings
<b>Bearings life</b>	10 <sup>9</sup> revolutions
<b>Operating temperature Bit parallel<sup>5,6</sup></b>	-20° ... +85°C (-4 ... +185°F)
<b>Operating temperature SSI<sup>5,6</sup></b>	-40° ... +100°C (-40° ... +212°F) -20° ... +100°C (-4° ... +212°F) with PC cable output -20° ... +85°C (-4° ... +185°F) with PD cable output -25° ... +85°C (-13° ... +185°F) with M12 connector
<b>Storage temperature<sup>6</sup></b>	-20° ... +85°C (-4° ... +185°F)
<b>Weight</b>	approx 300 g (10,58 oz)

<sup>1</sup> as measured at the transducer without cable influences  
<sup>2</sup> for further details refer to OUTPUT LEVELS on TECHNICAL BASICS section  
<sup>3</sup> this product is not a safety component, for further details refer to TECHNICAL BASICS section  
<sup>4</sup> maximum load for static usage  
<sup>5</sup> measured on the transducer flange  
<sup>6</sup> condensation not allowed

ROTATION SPEED DERATING TABLE

Temperature °C (°F)	Max speed (rpm)	Max continuous speed (rpm)
up to +70 (+158)	10000	8000
+70 ... +85 (+158 ... +185)	8000	5000
+85 ... +100 (+185 ... +212)	5000	3000

SSI SCHEMATICS



MAIN FEATURES

Industry standard singleturn absolute encoder for factory automation applications.

- Optical sensor technology (OptoASIC)
- Programmable measuring range via teach-in function (external inputs or cover button)
- Power supply up to +30 VDC with analogue (voltage or current) electrical interface
- Cable or M12 connector output
- Solid shaft diameter up to 10 mm
- Mounting by synchronous, clamping or centering 2,5" square flange

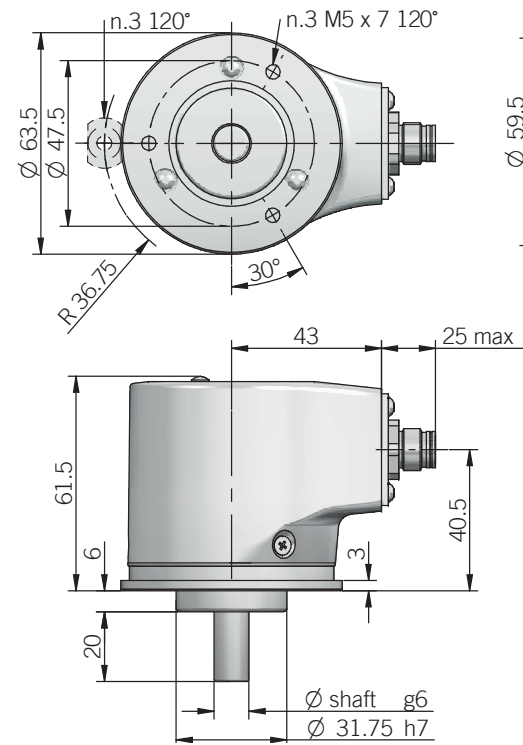


ORDERING CODE

EAL 63A 16B 12/30 V 05 X 10 X M12 R .162 +XXX

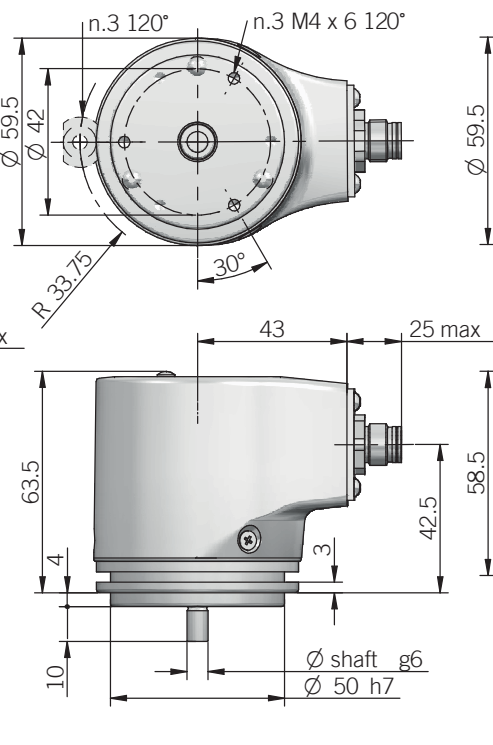
<b>SERIES</b>	analogue singleturn absolute encoder EAL
<b>MODEL</b>	synchronous flange ø 31.75 mm 63A synchronous flange ø 50 mm 58B clamping flange ø 36 mm 58C centering square flange ø 31.75 mm 63D centering square flange ø 50 mm 63E
<b>OUTPUT DAC RESOLUTION</b>	16 bit 16B
<b>POWER SUPPLY</b>	12 ... 30 V DC 12/30
<b>ELECTRICAL INTERFACE</b>	voltage V current I
<b>OUTPUT RANGE</b>	0 ... 5 V 05 0 ... 10 V 010 0 ... 20 mA 020 4 ... 20 mA 420
<b>OPTIONS</b>	to be reported with voltage output / 3 wires current output X 4 wires current output Q
<b>SHAFT DIAMETER</b>	(mod. 58 B) mm 6 (mod. 63 A / D) 3/8" - mm 9,52 (mod. 58 C - 63 A / D / E) mm 10
<b>ENCLOSURE RATING</b>	IP 65 shaft side / IP67 cover side X IP 67 S
<b>OUTPUT TYPE</b>	cable (standard length 1,5 m) P preferred cable lengths 2 / 3 / 5 / 10 m, to be added after DIRECTION TYPE (eg. PR5) M12 plug connector M12
<b>DIRECTION TYPE</b>	radial R
<b>SOCKET</b>	socket not included .162 to be reported only with connector output (eg. M12R.162), for socket see Accessories
<b>VARIANT</b>	custom version XXX

63A



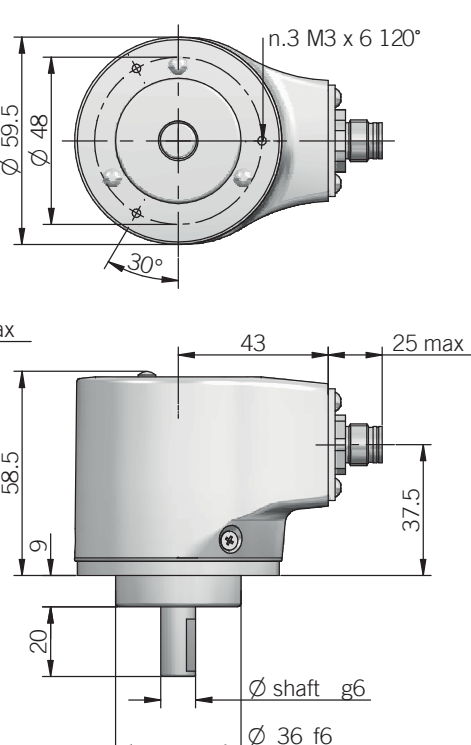
for fixing clamps please refer to Accessories

58B

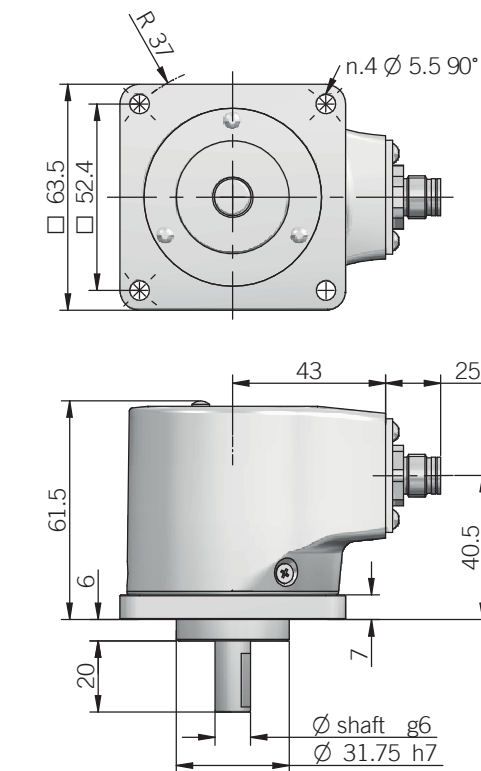


for fixing clamps please refer to Accessories

58C

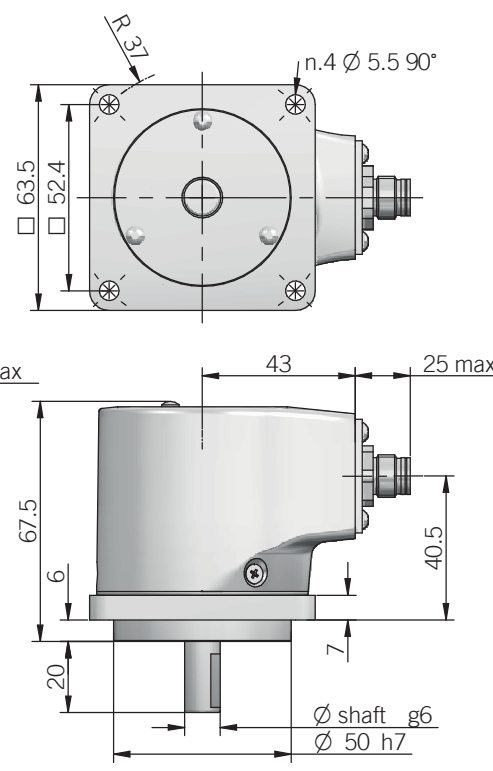


63D



recommended mating shaft tolerance H7  
dimensions in mm

63E

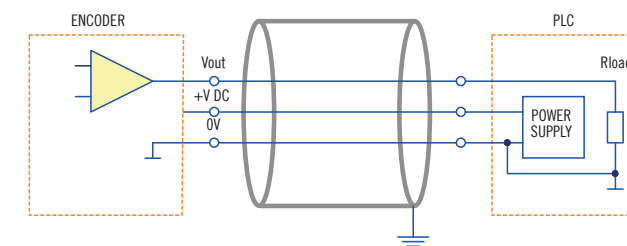


ELECTRICAL SPECIFICATIONS

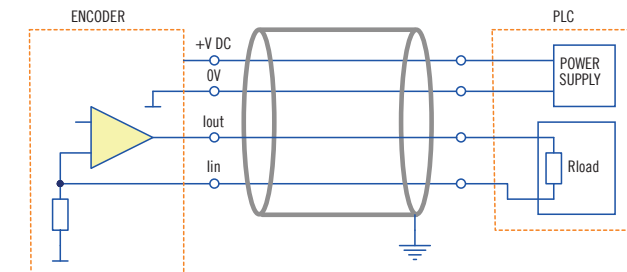
Resolution	16 bit
Output DAC resolution	16 bit
Minimum angle	22,5°
Power supply <sup>1</sup>	11,4 ... 30 V DC (reverse polarity protection)
Power draw without load	< 1 W
Electrical interface <sup>2</sup>	voltage (0 ... 5 V / 0 ... 10 V) current (0 ... 20 mA / 4 ... 20 mA)
Auxiliary inputs (BEGIN - END)	active high (+V DC) connect to 0 V if not used / t <sub>min</sub> 150 ms
Load	R <sub>min</sub> = 1 kΩ (voltage output) R <sub>max</sub> = (V DC - 2) / 0,02 (current output)
Output update frequency	16 kHz
Signal pattern	auto teaching according to commissioning
Start-up time	700 ms
Linearity error	± 0,069°
Mean time to dangerous failure (MTTF <sub>d</sub> ) <sup>3</sup> according to EN ISO 13849-1	215 years
Mission time (T <sub>m</sub> ) <sup>3</sup>	20 years
Diagnostic coverage (DC) <sup>3</sup>	0%
Cable type	shielded - fixed installation conductors section 0,22 mm <sup>2</sup> / AWG 24 bending radius min 60 mm
Electromagnetic compatibility	according to 2014/30/EU directive
RoHS	according to 2011/65/EU directive
UL / CSA	file n. E212495

ELECTRICAL INTERFACE

VOLTAGE OUTPUT



CURRENT OUTPUT



3 / 4 wire source  
with 3 wires interface lin is internally connected to 0V

MECHANICAL SPECIFICATIONS

Shaft diameter	Ø 6 / 9,52 (3/8") / 10 mm
Enclosure rating IEC 60529	X = IP 65 shaft side / IP67 cover side S = IP 67
Max rotation speed	see table
Max shaft load <sup>4</sup>	200 N (45 lbs) axial / 70 N (15,74 lbs) radial
Shock	50 G, 11 ms (IEC 60068-2-27)
Vibration	10 G, 10 ... 2000 Hz (IEC 60068-2-6)
Moment of inertia	1,5 x 10 <sup>-6</sup> kgm <sup>2</sup> (36 x 10 <sup>-6</sup> lbfm <sup>2</sup> )
Starting torque (at +20°C / +68°F)	< 0,03 Nm (4,25 Ozin)
Bearing stage material	aluminum
Shaft material	stainless steel
Housing material	painted aluminium
Bearings	n.2 ball bearings
Bearings life	10 <sup>9</sup> revolutions
Operating temperature <sup>5,6</sup>	-20° ... +85°C (-4° ... +185°F)
Storage temperature <sup>6</sup>	-20° ... +85°C (-4° ... +185°F)
Weight	approx 350 g (12,35 oz)

<sup>1</sup> as measured at the transducer without cable influences

<sup>2</sup> for further details refer to OUTPUT LEVELS on TECHNICAL BASICS section

<sup>3</sup> this product is not a safety component, for further details refer to TECHNICAL BASICS section

<sup>4</sup> maximum load for static usage

<sup>5</sup> measured on the transducer flange

<sup>6</sup> condensation not allowed

ROTATION SPEED / TEMPERATURE TABLE

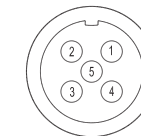
Temperature °C (°F)	Max speed (rpm)	Max continuous speed (rpm)
up to +70 (+158)	10000	8000
+70 ... +85 (+158 ... +185)	8000	5000

CONNECTIONS

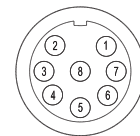
Function	Cable	5 pin M12	8 pin M12*
+ V DC	red	2	2
0 V	black	3	3
Vout / Iout	green	1	1
lin	yellow	/	6
BEGIN	white	4	4
END	brown or grey	5	5
Shield	shield	housing	housing

\* with Q current output

M12 connector (5 pin)  
M12 A coded front view



M12 connector (8 pin)  
M12 A coded front view



# EAL 58 F - 63 F / G ANALOGUE

## BLIND HOLLOW SHAFT SINGLETURN ABSOLUTE ENCODER



### MAIN FEATURES

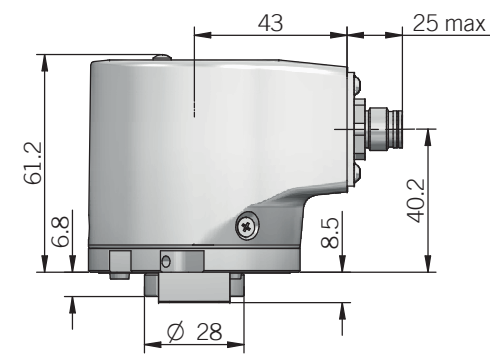
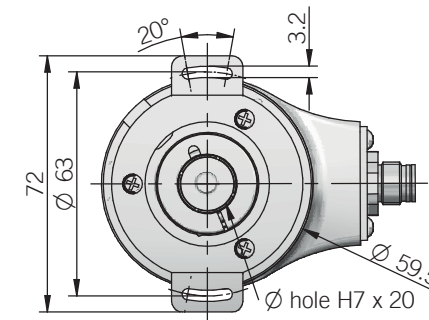
Industry standard singleturn absolute encoder for factory automation applications.

- Optical sensor technology (OptoASIC)
- Programmable measuring range via teach-in function (external inputs or cover button)
- Power supply up to +30 VDC with analogue (voltage or current) electrical interface
- Cable or M12 connector output
- Blind hollow shaft up to 15 mm
- Mounting by stator coupling, torque stop slot or torque pin

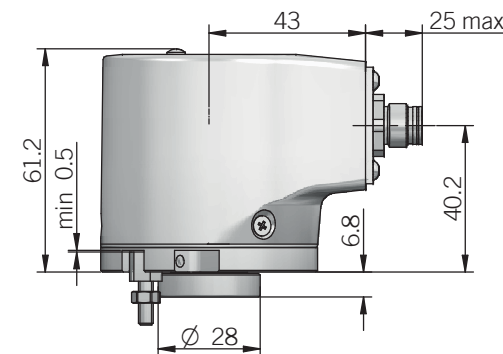
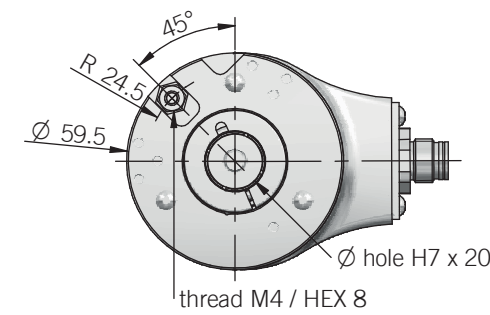


ORDERING CODE	EAL	58F	16B	12/30	V	05	X	15	X	M12	R	.162	+XXX
<b>SERIES</b> analogue singleturn absolute encoder	EAL												
<b>MODEL</b> blind hollow shaft with stator coupling blind hollow shaft with torque stop slot blind hollow shaft with torque pin		58F 63F 63G											
<b>OUTPUT DAC RESOLUTION</b> 16 bit		16B											
<b>POWER SUPPLY</b> 12 ... 30 V DC			12/30										
<b>ELECTRICAL INTERFACE</b> voltage current				V I									
<b>OUTPUT RANGE</b> 0 ... 5 V 0 ... 10 V 0 ... 20 mA 4 ... 20 mA				05 010 020 420									
<b>OPTIONS</b> to be reported with voltage output / 3 wires current output 4 wires current output						X Q							
<b>BORE DIAMETER</b> mm mm				14 15									
diameters 6 / 8 / 9,52 (3/8") / 10 / 11 / 12 mm with optional shaft adapter, see Accessories													
<b>ENCLOSURE RATING</b> IP 65 shaft side / IP67 cover side IP 67				X S									
<b>OUTPUT TYPE</b> cable (standard length 1.5 m) preferred cable lengths 2 / 3 / 5 / 10 m, to be added after DIRECTION TYPE (eg. PR5) M12 plug connector				P M12									
<b>DIRECTION TYPE</b> radial				R									
<b>SOCKET</b> socket not included to be reported only with connector output (eg. M12R.162), for socket see Accessories				.162									
<b>VARIANT</b> custom version				XXX									

58F

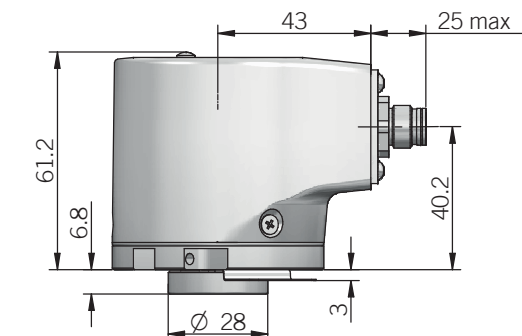
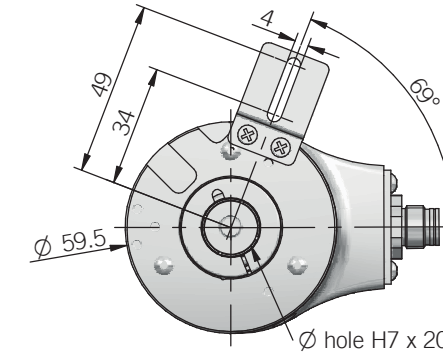


63 G



torque pin is included  
recommended mating shaft tolerance g6  
dimensions in mm

63F



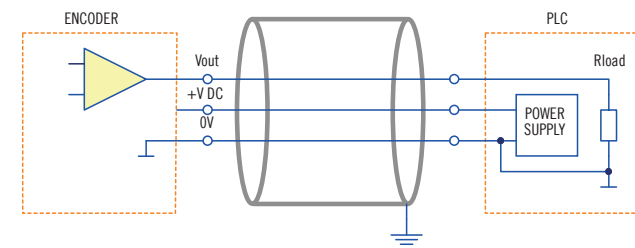
for torque pin please refer to Accessories

**ELECTRICAL SPECIFICATIONS**

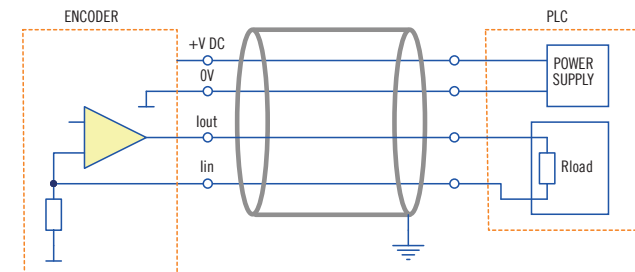
Resolution	16 bit
Output DAC resolution	16 bit
Minimum angle	22,5°
Power supply <sup>1</sup>	11,4 ... 30 V DC (reverse polarity protection)
Power draw without load	< 1 W
Electrical interface <sup>2</sup>	voltage (0 ... 5 V / 0 ... 10 V) current (0 ... 20 mA / 4 ... 20 mA)
Auxiliary inputs (BEGIN - END)	active high (+V DC) connect to 0 V if not used / t <sub>min</sub> 150 ms
Load	R <sub>min</sub> = 1 kΩ (voltage output) R <sub>max</sub> = (V DC - 2) / 0,02 (current output)
Output update frequency	16 kHz
Signal pattern	auto teaching according to commissioning
Start-up time	700 ms
Linearity error	± 0,069°
Mean time to dangerous failure (MTTF) <sub>d</sub> <sup>3</sup> according to EN ISO 13849-1	215 years
Mission time (T <sub>m</sub> ) <sup>3</sup>	20 years
Diagnostic coverage (DC) <sup>3</sup>	0%
Cable type	shielded - fixed installation conductors section 0,22 mm <sup>2</sup> / AWG 24 bending radius min 60 mm
Electromagnetic compatibility	according to 2014/30/EU directive
RoHS	according to 2011/65/EU directive
UL / CSA	file n. E212495

**ELECTRICAL INTERFACE**

**VOLTAGE OUTPUT**



**CURRENT OUTPUT**



3 / 4 wire source  
with 3 wires interface lin is internally connected to 0V

**MECHANICAL SPECIFICATIONS**

Bore diameter	∅ 14 / 15 mm ∅ 6* / 8* / 9,52 (3/8")* / 10* / 11* / 12* mm * with optional shaft adapter, please refer to Accessories
Enclosure rating IEC 60529	X = IP 65 shaft side / IP67 cover side S = IP 67
Max rotation speed	see table
Max shaft load <sup>4</sup>	200 N (45 lbs) axial / 60 N (13,49 lbs) radial
Shock	50 G, 11 ms (IEC 60068-2-27)
Vibration	10 G, 10 ... 2000 Hz (IEC 60068-2-6)
Moment of inertia	5 x 10 <sup>-6</sup> kgm <sup>2</sup> (119 x 10 <sup>-6</sup> lbfm <sup>2</sup> )
Starting torque (at +20°C / +68°F)	< 0,03 Nm (4,25 Ozin)
Bearing stage material	aluminum
Shaft material	stainless steel
Housing material	painting aluminium
Bearings	n.2 ball bearings
Bearings life	10 <sup>9</sup> revolutions
Operating temperature <sup>5,6</sup>	-20° ... +85°C (-4° ... +185°F)
Storage temperature <sup>6</sup>	-20° ... +85°C (-4° ... +185°F)
Weight	approx 350 g (12,35 oz)

<sup>1</sup> as measured at the transducer without cable influences  
<sup>2</sup> for further details refer to OUTPUT LEVELS on TECHNICAL BASICS section  
<sup>3</sup> this product is not a safety component, for further details refer to TECHNICAL BASICS section  
<sup>4</sup> maximum load for static usage  
<sup>5</sup> measured on the transducer flange  
<sup>6</sup> condensation not allowed

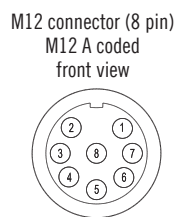
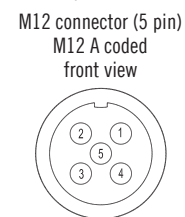
**ROTATION SPEED / TEMPERATURE TABLE**

	Temperature °C (°F)	Max speed (rpm)	Max continuous speed (rpm)
IP65	up to +70 (+158)	9000	6000
	+70 ... +85 (+158 ... +185)	6000	3000
IP67	up to +70 (+158)	8000	4000
	+70 ... +85 (+158 ... +185)	4000	2000

**CONNECTIONS**

Function	Cable	5 pin M12	8 pin M12*
+ V DC	red	2	2
0 V	black	3	3
Vout / lout	green	1	1
lin	yellow	/	6
BEGIN	white	4	4
END	brown or grey	5	5
Shield	shield	housing	housing

\* with Q current output



**MAIN FEATURES**

Industry standard singleturn absolute encoder for factory automation applications.

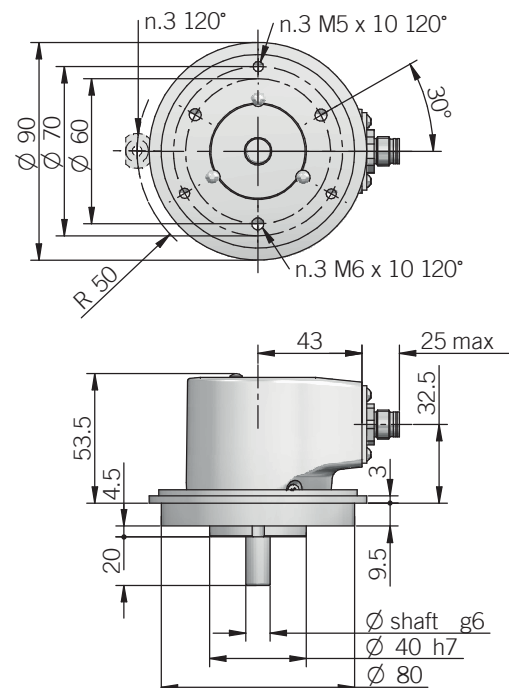
- Optical sensor technology (OptoASIC)
- Programmable measuring range via teach-in function (external inputs or cover button)
- Power supply up to +30 VDC with analogue (voltage or current) electrical interface
- Cable or M12 connector output
- Solid shaft diameter up to 11 mm
- Mounting by synchronous or RE0-444 flange



**ORDERING CODE** EAL 90A 16B 12/30 V 05 X 10 X M12 R .162 +XXX

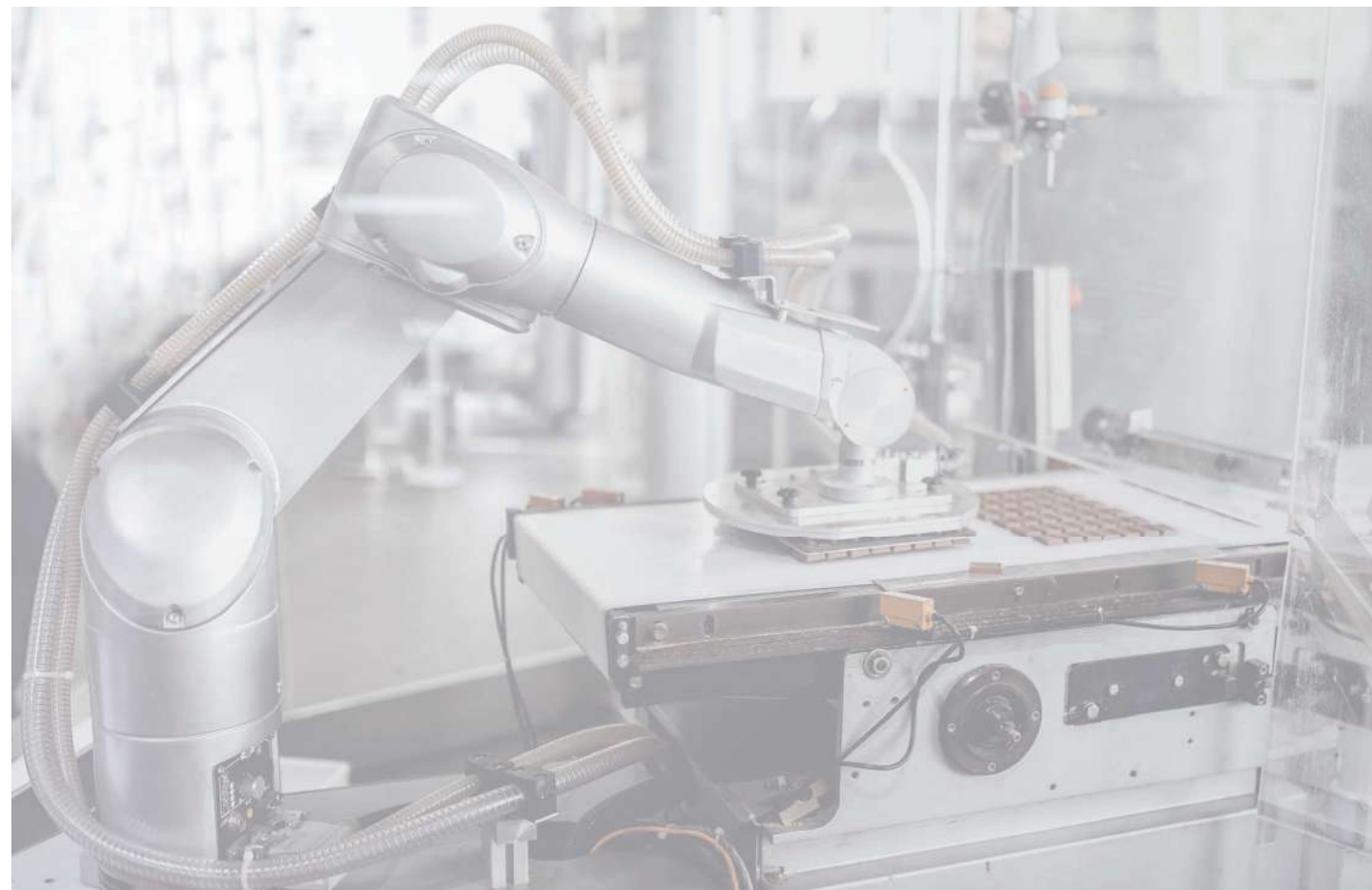
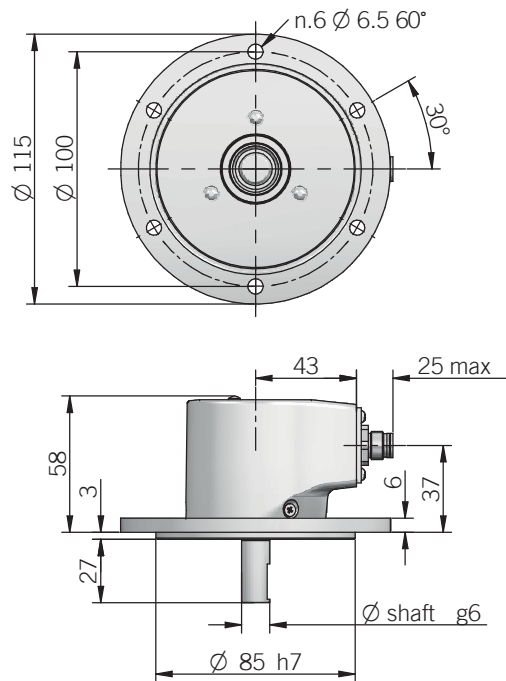
<b>SERIES</b> analogue singleturn absolute encoder EAL	<b>MODEL</b> synchronous flange ∅ 40 mm 90A RE0-444 flange 115A	<b>OUTPUT DAC RESOLUTION</b> 16 bit 16B	<b>POWER SUPPLY</b> 12 ... 30 V DC 12/30	<b>ELECTRICAL INTERFACE</b> voltage V current I	<b>OUTPUT RANGE</b> 0 ... 5 V 05 0 ... 10 V 010 0 ... 20 mA 020 4 ... 20 mA 420	<b>OPTIONS</b> to be reported with voltage output / 3 wires current output X 4 wires current output Q	<b>SHAFT DIAMETER</b> (mod. 90) 3/8" - mm 9,52 mm 10 (mod. 115) mm 11	<b>ENCLOSURE RATING</b> IP 65 shaft side / IP67 cover side X IP 67 S	<b>OUTPUT TYPE</b> cable (standard length 1,5 m) P preferred cable lengths 2 / 3 / 5 / 10 m, to be added after DIRECTION TYPE (eg. PR5) M12 plug connector M12 socket connector included, without socket please add 162 as variant code	<b>DIRECTION TYPE</b> radial R	<b>SOCKET</b> socket not included .162 to be reported only with connector output (eg. M12R.162), for socket see Accessories	<b>VARIANT</b> custom version XXX
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90A



for fixing clamps please refer to Accessories  
recommended mating shaft tolerance H7  
dimensions in mm

115A

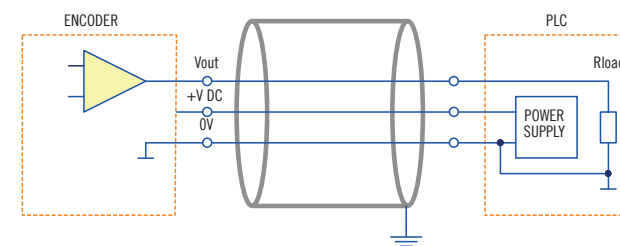


ELECTRICAL SPECIFICATIONS

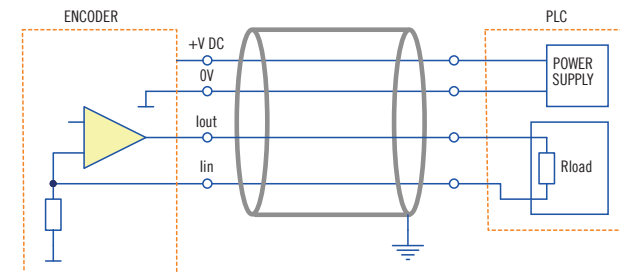
Resolution	16 bit
Output DAC resolution	16 bit
Minimum angle	22,5°
Power supply <sup>1</sup>	11,4 ... 30 V DC (reverse polarity protection)
Power draw without load	< 1 W
Electrical interface <sup>2</sup>	voltage (0 ... 5 V / 0 ... 10 V) current (0 ... 20 mA / 4 ... 20 mA)
Auxiliary inputs (BEGIN - END)	active high (+V DC) connect to 0 V if not used / t <sub>min</sub> 150 ms
Load	R <sub>min</sub> = 1 kΩ (voltage output) R <sub>max</sub> = (V DC - 2) / 0,02 (current output)
Output update frequency	16 kHz
Signal pattern	auto teaching according to commissioning
Start-up time	700 ms
Linearity error	± 0,069°
Mean time to dangerous failure (MTTF <sub>d</sub> ) <sup>3</sup> according to EN ISO 13849-1	215 years
Mission time (T <sub>m</sub> ) <sup>3</sup>	20 years
Diagnostic coverage (DC) <sup>3</sup>	0%
Cable type	shielded - fixed installation conductors section 0,22 mm <sup>2</sup> / AWG 24 bending radius min 60 mm
Electromagnetic compatibility	according to 2014/30/EU directive
RoHS	according to 2011/65/EU directive
UL / CSA	file n. E212495

ELECTRICAL INTERFACE

VOLTAGE OUTPUT



CURRENT OUTPUT



3 / 4 wire source  
with 3 wires interface Iin is internally connected to 0V

MECHANICAL SPECIFICATIONS

Shaft diameter	ø 6 / 9,52 (3/8") / 10 / 11 mm
Enclosure rating IEC 60529	X = IP 65 shaft side / IP67 cover side S = IP 67
Max rotation speed	see table
Max shaft load <sup>4</sup>	200 N (45 lbs) axial / 70 N (15,74 lbs) radial
Shock	50 G, 11 ms (IEC 60068-2-27)
Vibration	10 G, 10 ... 2000 Hz (IEC 60068-2-6)
Moment of inertia	1,5 x 10 <sup>-6</sup> kgm <sup>2</sup> (36 x 10 <sup>-6</sup> lbfm <sup>2</sup> )
Starting torque (at +20°C / +68°F)	< 0,03 Nm (4,25 Ozin)
Bearing stage material	aluminum
Shaft material	stainless steel
Housing material	painted aluminium
Bearings	n.2 ball bearings
Bearings life	10 <sup>9</sup> revolutions
Operating temperature <sup>5,6</sup>	-20° ... +85°C (-4° ... +185°F)
Storage temperature <sup>6</sup>	-20° ... +85°C (-4° ... +185°F)
Weight	approx 350 g (12,35 oz)

<sup>1</sup> as measured at the transducer without cable influences  
<sup>2</sup> for further details refer to OUTPUT LEVELS on TECHNICAL BASICS section  
<sup>3</sup> this product is not a safety component, for further details refer to TECHNICAL BASICS section  
<sup>4</sup> maximum load for static usage  
<sup>5</sup> measured on the transducer flange  
<sup>6</sup> condensation not allowed

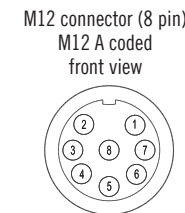
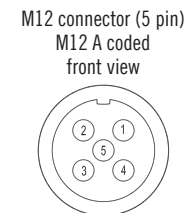
ROTATION SPEED / TEMPERATURE TABLE

Temperature °C (°F)	Max speed (rpm)	Max continuous speed (rpm)
up to +70 (+158)	10000	8000
+70 ... +85 (+158 ... +185)	8000	5000

CONNECTIONS

Function	Cable	5 pin M12	8 pin M12*
+ V DC	red	2	2
0 V	black	3	3
Vout / Iout	green	1	1
Iin	yellow	/	6
BEGIN	white	4	4
END	brown or grey	5	5
Shield	shield	housing	housing

\* with Q current output



**MAIN FEATURES**

Explosion proof encoder for applications within hazardous areas.

- Optical sensor technology (OptoASIC)
- Resolution up to 13 bit (8192 ppr)
- Power supply up +28 V DC with SSI as electrical interface
- Code reset for easy setup
- 10mm solid shaft diameter
- Cable output
- Mounting by synchronous or centering square flange

**EX CLASSIFICATION**

It has been assured with EC-TYPE Examination Certificate CESI 04 ATEX 082 that the EAX 80 is compliant with essential health and safety requirements according to

- EN IEC 60079-0:2018
- EN 60079-1:2014
- EN 60079-31:2014

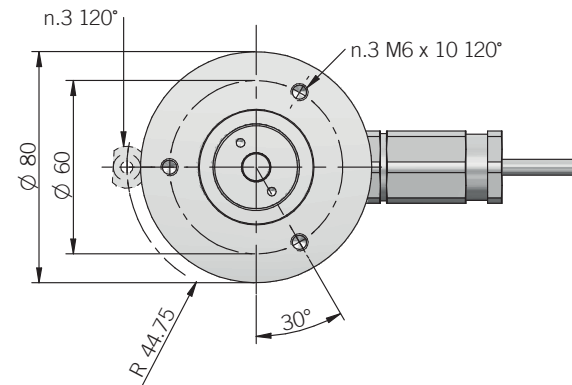
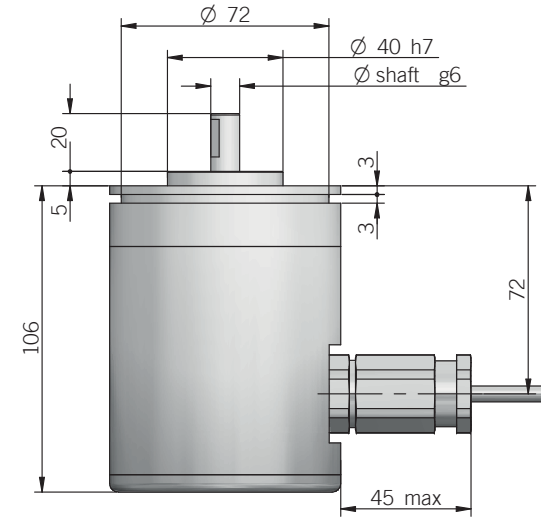
The UE declaration is available on [www.eltra.it](http://www.eltra.it)



**ORDERING CODE** EAX 80A 256 G 8/28 S X X 10 X 3 PR .XXX

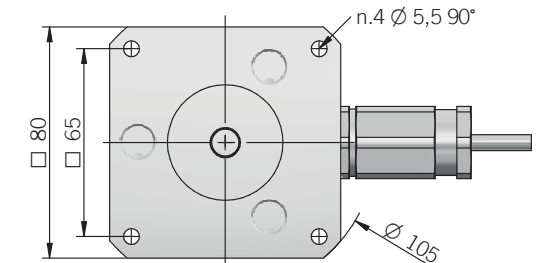
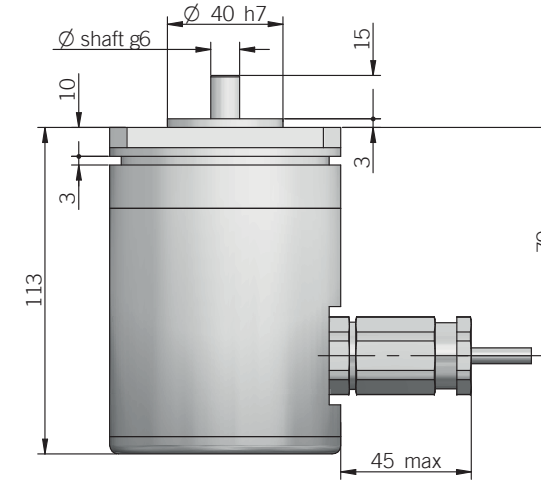
<b>SERIES</b> singleturn absolute flameproof encoder <b>EAX</b>	<b>MODEL</b> synchronous flange ø 40 mm <b>80A</b> centering square flange ø 40 mm <b>80D</b>	<b>RESOLUTION</b> ppr <b>360 / 720 / 1440 / 2880 / 3600 / 4096 / 8192</b> please directly contact our offices for other pulses	<b>CODE TYPE</b> binary <b>B</b> gray <b>G</b> (no powers of 2) binary offset code (0-XXX) <b>BC</b> (no powers of 2) gray offset code (0-XXX) <b>GC</b>	<b>POWER SUPPLY</b> 8 ... 28 V DC <b>8/28</b>	<b>ELECTRICAL INTERFACE</b> Serial Synchronous Interface - SSI <b>S</b>	<b>LOGIC</b> to be reported <b>X</b>	<b>OPTIONS</b> to be reported if not used <b>X</b> reset with external input <b>ZE</b>	<b>SHAFT DIAMETER</b> mm <b>10</b>	<b>ENCLOSURE RATING</b> IP 65 <b>X</b>	<b>MAX ROTATION SPEED</b> 3000 rpm <b>3</b>	<b>OUTPUT TYPE</b> radial cable (standard length 1,5 m) <b>PR</b> preferred cable lengths 2 / 3 / 5 / 10 m, to be added after OUTPUT TYPE (eg. PDR5)	<b>VARIANT</b> custom version <b>XXX</b>
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**80A**



fixing clamps not included, please refer to the Accessories

**80D**



recommended mating shaft tolerance H7  
dimensions in mm

**ELECTRICAL SPECIFICATIONS**

<b>Resolution</b>	from 360 to 8192 ppr
<b>Power supply<sup>1</sup></b>	7,6 ... 29,4 V DC (reverse polarity protection)
<b>Current consumption without load</b>	100 mA
<b>Electrical interface<sup>2</sup></b>	RS-422 compatible
<b>Auxiliary inputs (U/D - RESET)</b>	active high (+V DC) connect to 0 V if not used / RESET tmin 150 ms
<b>Clock frequency</b>	100 kHz ... 1 MHz
<b>SSI monostable time (Tm)</b>	18 µs
<b>SSI pause time (Tp)</b>	> 35 µs
<b>SSI frame</b>	MSB ... LSB 13 bit data length
<b>Counting direction</b>	decreasing clockwise (shaft view)
<b>Start-up time</b>	700 ms
<b>Accuracy</b>	± 1/2 LSB
<b>Mean time to dangerous failure (MTTF<sub>d</sub>)<sup>3</sup> according to EN ISO 13849-1</b>	54 years
<b>Mission time (Tm)<sup>3</sup></b>	20 years
<b>Diagnostic coverage (DC)<sup>3</sup></b>	0%
<b>Cable type</b>	shielded - fixed or flexible installation conductors section min 0,14 mm <sup>2</sup> / AWG 26 bending radius min 35 mm (fixed) / min 60 mm (flexible)
<b>Electromagnetic compatibility</b>	according to 2014/30/EU directive
<b>RoHS</b>	according to 2011/65/EU directive
<b>UL / CSA</b>	file n. E212495

**MECHANICAL SPECIFICATIONS**

<b>Shaft diameter</b>	ø 10 mm
<b>Enclosure rating</b>	IP 65 (IEC 60529)
<b>Max rotation speed</b>	3000 rpm
<b>Max shaft load<sup>4</sup></b>	200 N (45 lbs) axial / radial
<b>Shock</b>	50 G, 11 ms (IEC 60068-2-27)
<b>Vibration</b>	10 G, 10 ... 2000 Hz (IEC 60068-2-6)
<b>Moment of inertia</b>	1,5 x 10 <sup>-6</sup> kgm <sup>2</sup> (36 x 10 <sup>-6</sup> lbf <sup>2</sup> )
<b>Starting torque (at +20°C / +68°F)</b>	< 0,06 Nm (8,50 Ozin)
<b>Bearing stage material</b>	anodized aluminum
<b>Shaft material</b>	stainless steel
<b>Housing material</b>	anodized aluminum
<b>Bearings</b>	n.2 ball bearings
<b>Bearings life</b>	10 <sup>9</sup> revolutions
<b>Operating temperature<sup>5,6</sup></b>	0° ... +50°C (+32° ... +122°F)
<b>Storage temperature<sup>6</sup></b>	-15° ... +70°C (+5° ... +158°F)
<b>Weight</b>	1200 g (42,33 oz)

<sup>1</sup> as measured at the transducer without cable influences  
<sup>2</sup> for further details refer to OUTPUT LEVELS on TECHNICAL BASICS section  
<sup>3</sup> this product is not a safety component, for further details refer to TECHNICAL BASICS section  
<sup>4</sup> maximum load for static usage  
<sup>5</sup> measured on the transducer flange  
<sup>6</sup> condensation not allowed

EPL MARKING

**II 2GD**  
**Ex db IIC T6 Gb**  
**Ex tb IIIC T85°C Db**  
**IP 65**

**II 2GD**

II: group II: different than mines  
 2: category 2: high level of protection  
 GD: areas containing gas (G) and dust (D)

**Ex db IIC T6 Gb**

Ex db: flameproof enclosure for explosive atmospheres with gases, vapours and mists  
 IIC: group of gas IIC

T6: max surface temperature +85°C of the device for atmospheres with gas

Gb: product with a high level of protection

**Ex tb IIIC T85°C Db**

Ex tb: flameproof enclosure safety type

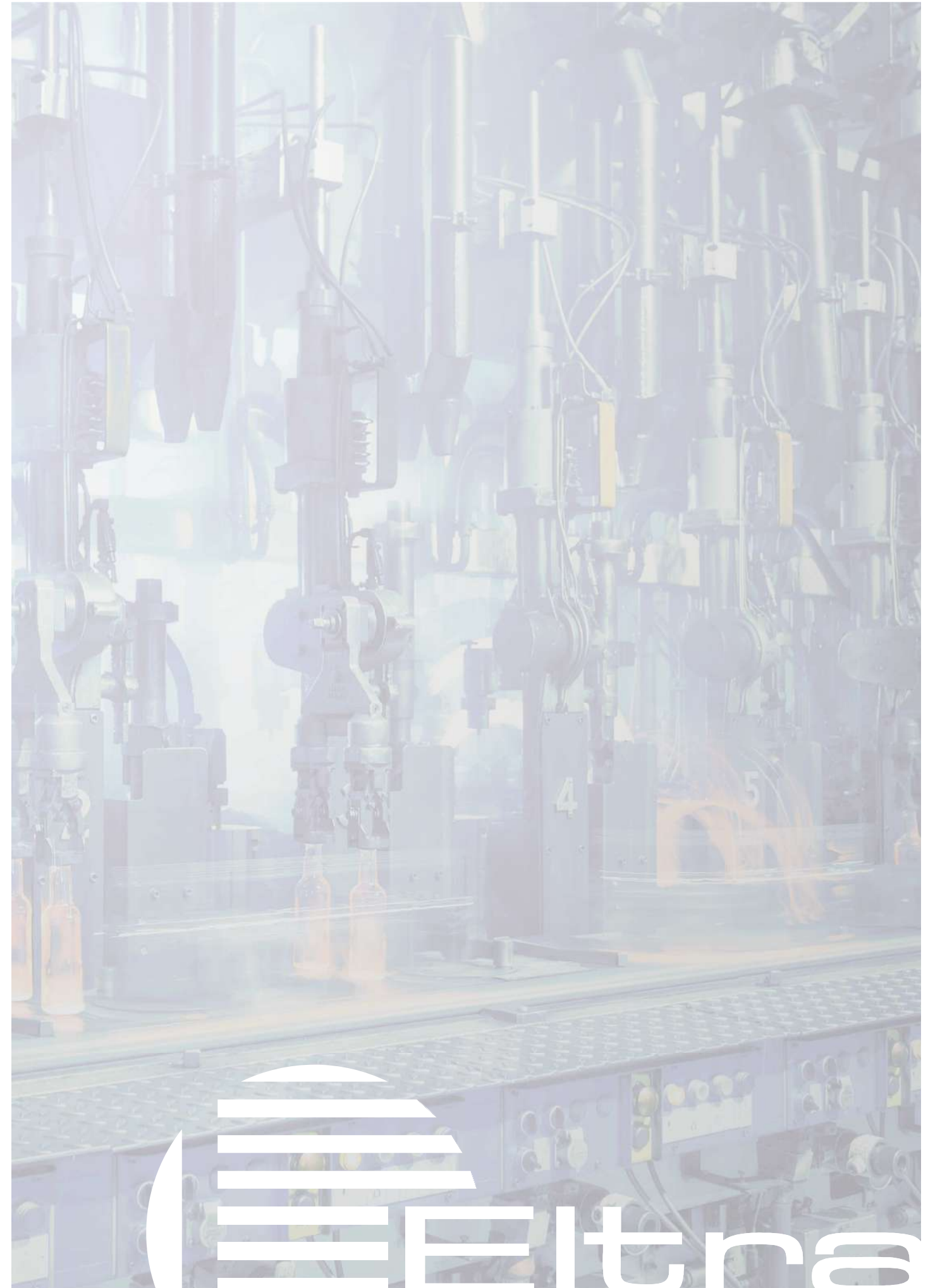
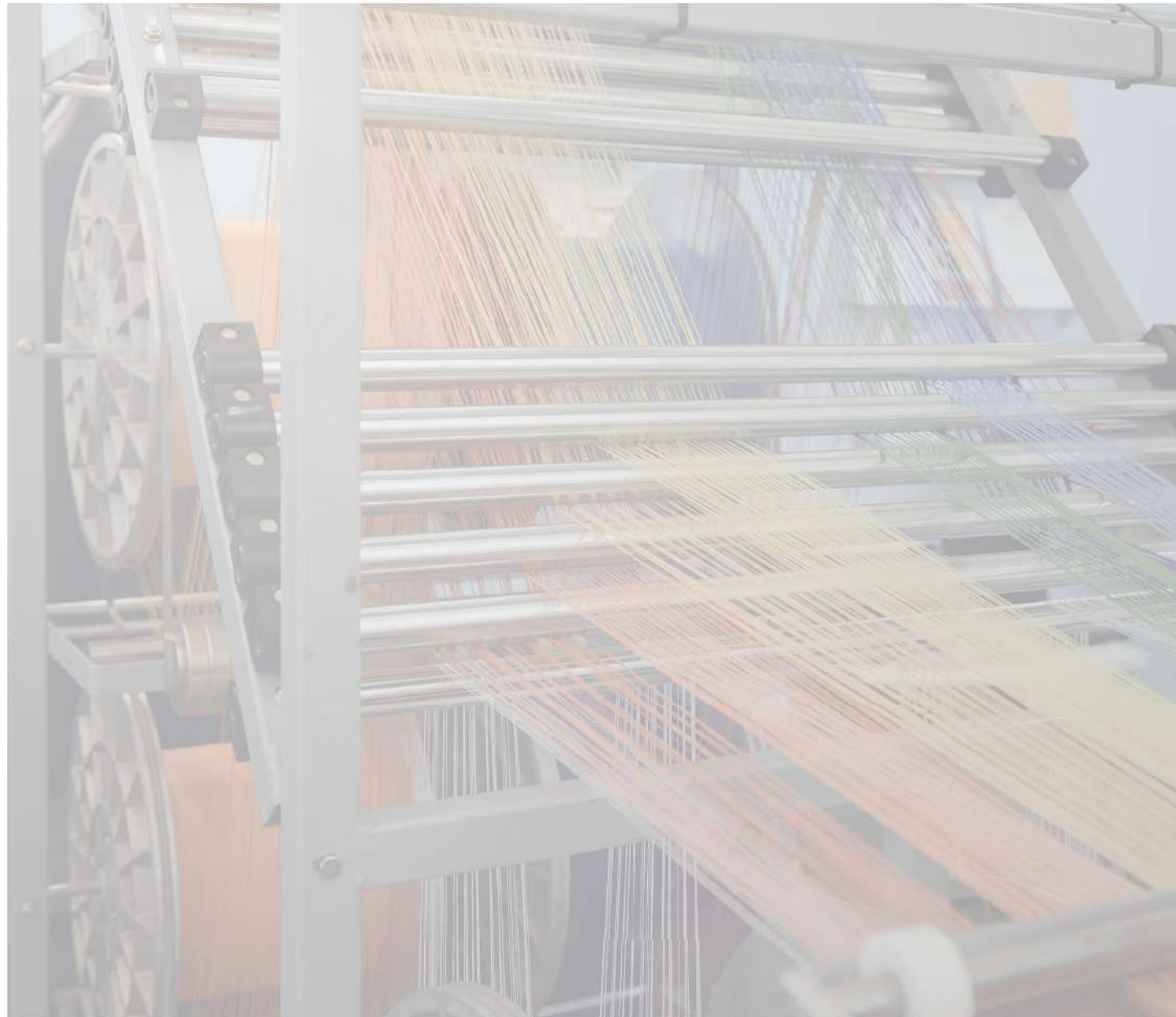
IIIC: group of dust combustibles IIIC

T85°C: max surface temperature +85°C of the device in the presence of dust

Db: product with a high level of protection

CONNECTIONS

Function	Cable
+ V DC	red
0 V	grey
DATA +	green
DATA -	brown
CLOCK +	yellow
CLOCK -	pink
U / D	blue
⏏	shield





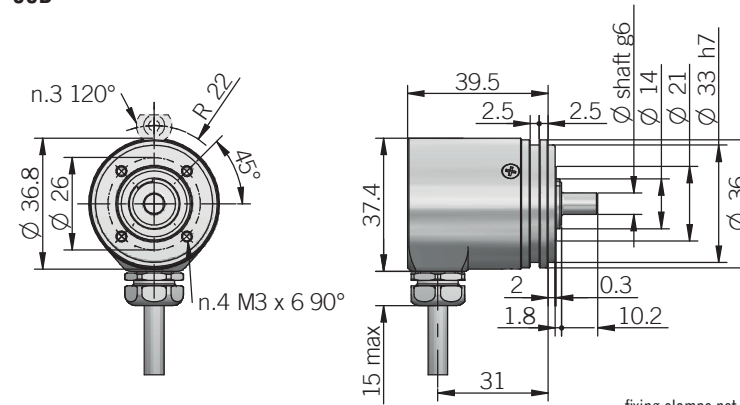
**MAIN FEATURES**

Miniaturized singleturn absolute encoder for limited size applications.

- Magnetic sensor technology without contact (Magnetic ASIC)
- Up to 15 bit as singleturn resolution
- Power supply up to +30 V DC with SSI as electrical interface
- Code reset for easy setup
- Cable or M12 output, other connectors available on cable end
- 6 mm diameter solid shaft
- Mounting by synchronous flange



**36B**



recommended mating shaft tolerance H7  
dimensions in mm

fixing clamps not included, please refer to Accessories

**ELECTRICAL SPECIFICATIONS**

<b>Resolution</b>	from 1 to 15 bit
<b>Power supply<sup>1</sup></b>	5 = 4,75 ... 5,25 V DC 8/30 = 7,6 ... 30 V DC (reverse polarity protection)
<b>Power draw without load</b>	< 400 mW
<b>Electrical interface<sup>2</sup></b>	RS-422 (THVD1451 or similar)
<b>Auxiliary inputs (U/D - RESET)</b>	active high (+V DC) connect to 0 V if not used / RESET t <sub>min</sub> 150 ms
<b>Clock frequency</b>	100 kHz ... 1 MHz
<b>Code type</b>	binary or gray
<b>SSI monostable time (T<sub>m</sub>)</b>	20 µs
<b>SSI pause time (T<sub>p</sub>)</b>	> 35 µs
<b>SSI frame</b>	MSB ... LSB up to 13 bit = length 13 bit 14 to 15 bit = length 15 bit
<b>SSI status and parity bit</b>	on request
<b>Counting direction</b>	decreasing clockwise (shaft view)
<b>Start-up time</b>	150 ms
<b>Accuracy</b>	± 0,35° max
<b>Mean time to dangerous failure (MTTF)<sup>3</sup> according to EN ISO 13849-1</b>	317 years
<b>Mission time (T<sub>m</sub>)<sup>3</sup></b>	20 years
<b>Diagnostic coverage (DC)<sup>3</sup></b>	0%
<b>Cable type</b>	shielded - fixed installation conductors section 0,14 mm <sup>2</sup> / AWG 26 bending radius min 60 mm
<b>Electromagnetic compatibility</b>	according to 2014/30/EU directive
<b>RoHS</b>	according to 2011/65/EU directive
<b>UL / CSA</b>	file n. E212495

**CONNECTIONS**

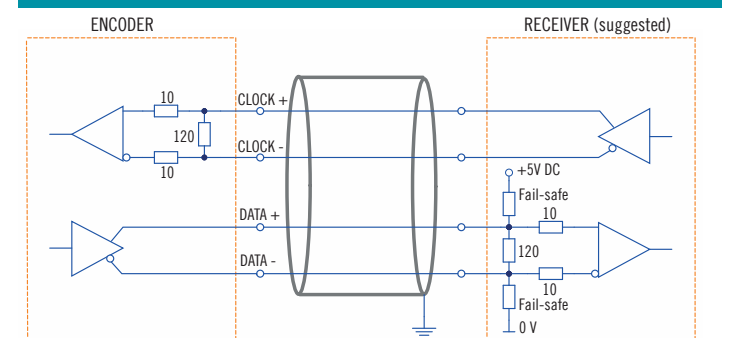
Function	Cable	8 pin M12
+ V DC	red	8
0 V	black	5
DATA +	green	3
DATA -	brown or grey	2
CLOCK +	yellow	4
CLOCK -	orange	6
U / D	red / blue	7
RESET	white	1
⊥	shield	housing

**MECHANICAL SPECIFICATIONS**

<b>Shaft diameter</b>	Ø 6 mm
<b>Enclosure rating</b>	IP 67 cover side / IP 65 shaft side (IEC 60529)
<b>Rotation speed</b>	8000 rpm continuous / 10000 rpm max
<b>Max shaft load<sup>4</sup></b>	20 N (4,5 lbs) axial / radial
<b>Shock</b>	50 G, 11 ms (IEC 60068-2-27)
<b>Vibration</b>	20 G, 10 ... 2000 Hz (IEC 60068-2-6)
<b>Moment of inertia</b>	0,001 x 10 <sup>-6</sup> kgm <sup>2</sup> (0,02 x 10 <sup>-6</sup> lbft <sup>2</sup> )
<b>Starting torque (at +20°C / +68°F)</b>	< 0,01 Nm (1,42 Ozin)
<b>Bearing stage material</b>	aluminum
<b>Shaft material</b>	stainless steel
<b>Housing material</b>	chrome plated steel
<b>Bearings</b>	n.2 ball bearings
<b>Bearings life</b>	10 <sup>9</sup> revolutions
<b>Operating temperature<sup>5,6</sup></b>	-30° ... +100°C (-22° ... +212°F) -25° ... +85°C (-13° ... +185°F) with M12 connector
<b>Storage temperature<sup>6</sup></b>	-25° ... +85°C (-13° ... +185°F)
<b>Weight</b>	150 g (5,29 oz)

<sup>1</sup> as measured at the transducer without cable influences  
<sup>2</sup> for further details refer to OUTPUT LEVELS on TECHNICAL BASICS section  
<sup>3</sup> this product is not a safety component, for further details refer to TECHNICAL BASICS section  
<sup>4</sup> maximum load for static usage  
<sup>5</sup> measured on the transducer flange  
<sup>6</sup> condensation not allowed

**SSI SCHEMATICS**



M12 connector (8 pin)  
M12 A coded  
front view



ORDERING CODE	EMA	36B	13	G	8/30	S	P	X	6	X	8	M12R	.162	+XXX
<b>SERIES</b> magnetic singleturn absolute encoder <b>EMA</b>														
<b>MODEL</b> synchronous flange Ø 33 mm <b>36B</b>														
<b>RESOLUTION</b> from 1 to 15 bit please directly contact our offices for other pulses														
<b>CODE TYPE</b> binary <b>B</b> gray <b>G</b>														
<b>POWER SUPPLY</b> 5 V DC <b>5</b> 8 ... 30 V DC <b>8/30</b>														
<b>ELECTRICAL INTERFACE</b> Serial Synchronous Interface - SSI <b>S</b>														
<b>LOGIC</b> positive <b>P</b>														
<b>OPTIONS</b> to be reported if not used <b>X</b> reset with external input <b>ZE</b>														
<b>SHAFT DIAMETER</b> mm <b>6</b>														
<b>ENCLOSURE RATING</b> IP 67 cover side / IP 65 shaft side <b>X</b>														
<b>MAX ROTATION SPEED</b> 8000 rpm <b>8</b>														
<b>OUTPUT TYPE</b> radial cable (standard length 0,5 m) <b>PR</b> preferred cable lengths 1,5 / 2 / 3 / 5 / 10 m, to be added after OUTPUT TYPE (eg. PR5) 8 pin M12 radial plug connector <b>M12R</b>														
<b>SOCKET</b> socket not included <b>.162</b> to be reported only with connector output (eg. M12R.162), for socket see Accessories														
<b>VARIANT</b> custom version <b>XXX</b>														

**MAIN FEATURES**

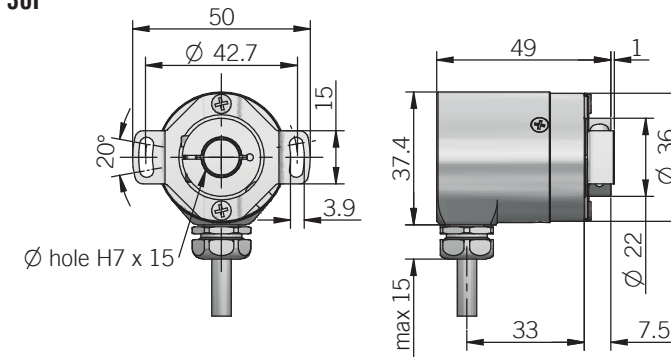
Miniaturized singleturn absolute encoder for limited size applications.

- Magnetic sensor technology without contact (Magnetic ASIC)
- Up to 15 bit as singleturn resolution
- Power supply up to +30 V DC with SSI as electrical interface
- Code reset for easy setup
- Cable or M12 output, other connectors available on cable end
- Blind hollow shaft up to 10 mm diameter
- Mounting by stator coupling or torque pin



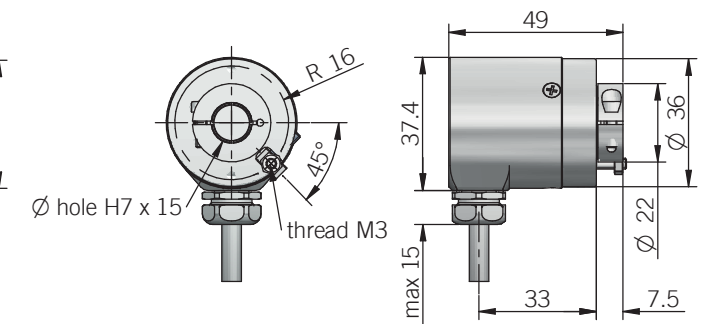
ORDERING CODE	EMA	36F	13	G	8/30	S	P	X	10	X	8	M12R	.162	+XXX
<b>SERIES</b> magnetic singleturn absolute encoder <b>EMA</b>														
<b>MODEL</b> blind hollow shaft with stator coupling <b>36F</b> blind hollow shaft with torque pin <b>36G</b>														
<b>RESOLUTION</b> from 1 to 15 bit please directly contact our offices for other pulses														
<b>CODE TYPE</b> binary <b>B</b> gray <b>G</b>														
<b>POWER SUPPLY</b> 5 V DC <b>5</b> 8 ... 30 V DC <b>8/30</b>														
<b>ELECTRICAL INTERFACE</b> Serial Synchronous Interface - SSI <b>S</b>														
<b>LOGIC</b> positive <b>P</b>														
<b>OPTIONS</b> to be reported if not used <b>X</b> reset with external input <b>ZE</b>														
<b>BORE DIAMETER</b> (3/8") mm <b>9,52</b> mm <b>10</b> diameters 4 / 5 / 6 / 6,35 (1/4") / 8 mm with optional shaft adapter, see Accessories														
<b>ENCLOSURE RATING</b> IP 67 cover side / IP 66 shaft side <b>X</b>														
<b>MAX ROTATION SPEED</b> 8000 rpm <b>8</b>														
<b>OUTPUT TYPE</b> radial cable (standard length 0,5 m) <b>PR</b> preferred cable lengths 1,5 / 2 / 3 / 5 / 10 m, to be added after OUTPUT TYPE (eg. PDR5) 8 pin M12 radial plug connector <b>M12R</b>														
<b>SOCKET</b> socket not included <b>.162</b> to be reported only with connector output (eg. M12R.162), for socket see Accessories														
<b>VARIANT</b> custom version <b>XXX</b>														

**36F**



recommended mating shaft tolerance g6  
dimensions in mm

**36G**



torque pin is included, for mounting instruction please refer to product installation notes

**ELECTRICAL SPECIFICATIONS**

<b>Resolution</b>	from 1 to 15 bit
<b>Power supply<sup>1</sup></b>	5 = 4,75 ... 5,25 V DC 8/30 = 7,6 ... 30 V DC (reverse polarity protection)
<b>Power draw without load</b>	< 400 mW
<b>Electrical interface<sup>2</sup></b>	RS-422 (THVD1451 or similar)
<b>Auxiliary inputs (U/D - RESET)</b>	active high (+V DC) connect to 0 V if not used / RESET t <sub>min</sub> 150 ms
<b>Clock frequency</b>	100 kHz ... 1 MHz
<b>Code type</b>	binary or gray
<b>SSI monostable time (T<sub>m</sub>)</b>	20 μs
<b>SSI pause time (T<sub>p</sub>)</b>	> 35 μs
<b>SSI frame</b>	MSB ... LSB up to 13 bit = length 13 bit 14 to 15 bit = length 15 bit
<b>SSI status and parity bit</b>	on request
<b>Counting direction</b>	decreasing clockwise (shaft view)
<b>Start-up time</b>	150 ms
<b>Accuracy</b>	± 0,35° max
<b>Mean time to dangerous failure (MTTF<sub>d</sub>)<sup>3</sup></b> according to EN ISO 13849-1	317 years
<b>Mission time (T<sub>m</sub>)<sup>3</sup></b>	20 years
<b>Diagnostic coverage (DC)<sup>3</sup></b>	0%
<b>Cable type</b>	shielded - fixed installation conductors section 0,14 mm <sup>2</sup> / AWG 26 bending radius min 60 mm
<b>Electromagnetic compatibility</b>	according to 2014/30/EU directive
<b>RoHS</b>	according to 2011/65/EU directive
<b>UL / CSA</b>	file n. E212495

**CONNECTIONS**

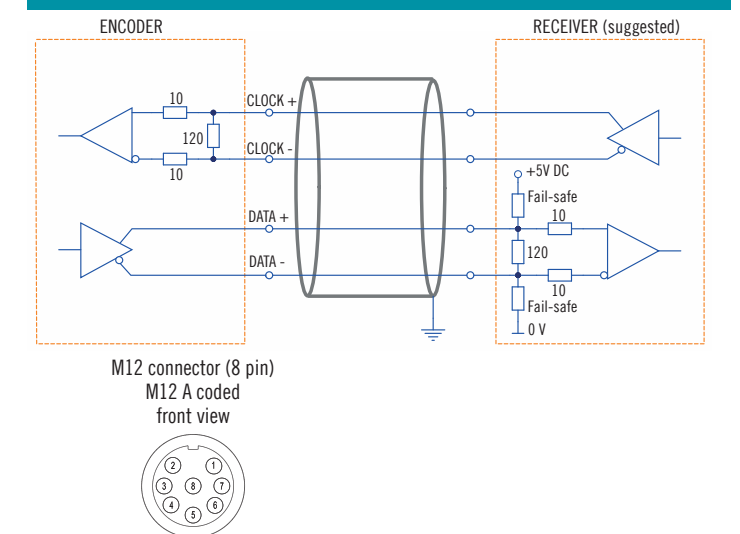
Function	Cable	8 pin M12
+ V DC	red	8
0 V	black	5
DATA +	green	3
DATA -	brown or grey	2
CLOCK +	yellow	4
CLOCK -	orange	6
U / D	red / blue	7
RESET	white	1
⊥	shield	housing

**MECHANICAL SPECIFICATIONS**

<b>Bore diameter</b>	∅ 9,52 (3/8") / 10 mm ∅ 4* / 5* / 6* / 6,35 (1/4")* / 8* mm * with optional shaft adapter, please refer to Accessories
<b>Enclosure rating</b>	IP 67 cover side / IP 66 shaft side (IEC 60529)
<b>Rotation speed</b>	8000 rpm continuous / 10000 rpm max
<b>Max shaft load<sup>4</sup></b>	20 N (4,5 lbs) axial / radial
<b>Shock</b>	50 G, 11 ms (IEC 60068-2-27)
<b>Vibration</b>	20 G, 10 ... 2000 Hz (IEC 60068-2-6)
<b>Moment of inertia</b>	0,001 x 10 <sup>-6</sup> kgm <sup>2</sup> (0,02 x 10 <sup>-6</sup> lbf <sup>2</sup> )
<b>Starting torque (at +20°C / +68°F)</b>	< 0,01 Nm (1,42 Ozin)
<b>Bearing stage material</b>	aluminum
<b>Shaft material</b>	stainless steel
<b>Housing material</b>	chrome plated steel
<b>Bearings</b>	n.2 ball bearings
<b>Bearings life</b>	10 <sup>9</sup> revolutions
<b>Operating temperature<sup>5,6</sup></b>	-30° ... +100°C (-22° ... +212°F) -25° ... +85°C (-13° ... +185°F) with M12 connector
<b>Storage temperature<sup>6</sup></b>	-25° ... +85°C (-13° ... +185°F)
<b>Weight</b>	150 g (5,29 oz)

<sup>1</sup> as measured at the transducer without cable influences  
<sup>2</sup> for further details refer to OUTPUT LEVELS on TECHNICAL BASICS section  
<sup>3</sup> this product is not a safety component, for further details refer to TECHNICAL BASICS section  
<sup>4</sup> maximum load for static usage  
<sup>5</sup> measured on the transducer flange  
<sup>6</sup> condensation not allowed

**SSI SCHEMATICS**



# EMA 50 A / B BIT PARALLEL - SSI SOLID SHAFT MAGNETIC SINGLETURN ABSOLUTE ENCODER

## MAIN FEATURES

Singleturn absolute magnetic encoder size 50 mm with solid shaft

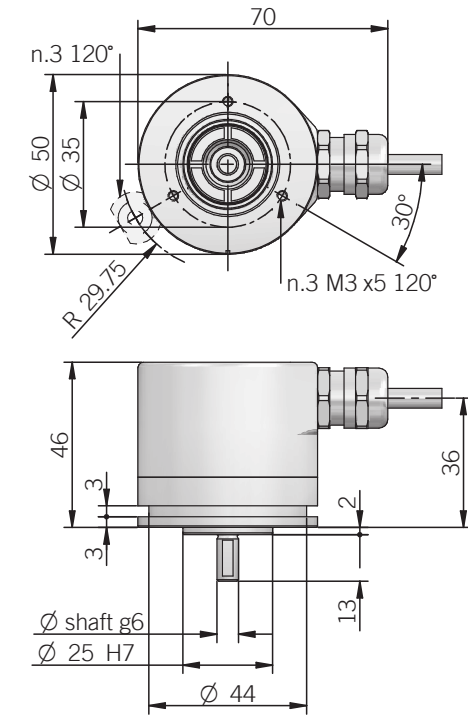
- Resolution up to 13 bit (8192 ppr)
- Power supply up to +30 V DC with SSI or Bit Parallel as electrical interface
- Code reset for easy setup
- Cable or M12 output, other connectors available on cable end
- Sturdy construction
- Solid shaft diameter up to 10 mm
- IP 67 enclosure rating
- Mounting by synchronous flange



**ORDERING CODE**    EMA   50B   1024   G   8/30   N   N   X   6   X   3   M12   R   .162   +XXX

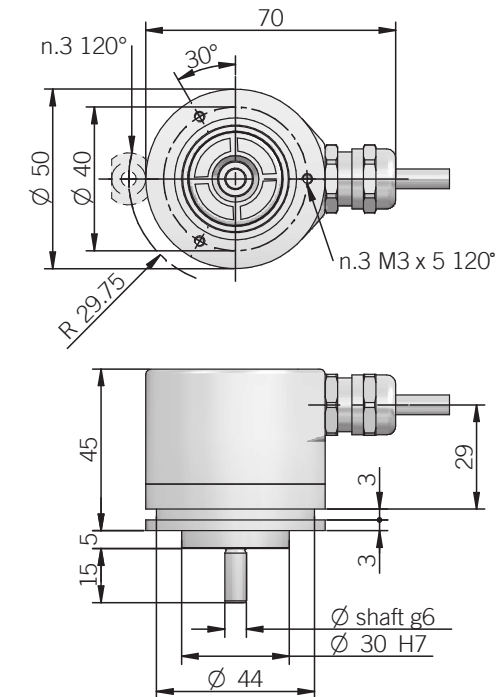
<b>SERIES</b> magnetic singleturn absolute encoder <b>EMA</b>	<b>MODEL</b> synchronous flange $\varnothing$ 25 mm <b>50A</b> synchronous flange $\varnothing$ 30 mm <b>50B</b> for anodized version please directly contact our offices	<b>RESOLUTION</b> (N / C / R / U / P interface) ppr from 2 to 4096 (S interface) ppr from 2 to 8192	<b>CODE TYPE</b> binary <b>B</b> gray <b>G</b> (no powers of 2) binary offset code (0-XXX) <b>BC</b> (no powers of 2) gray offset code (0-XXX) <b>GC</b>	<b>POWER SUPPLY</b> 5 V DC <b>5</b> 8 ... 30 V DC <b>8/30</b>	<b>ELECTRICAL INTERFACE</b> NPN <b>N</b> NPN open collector <b>C</b> PNP <b>R</b> PNP open collector <b>U</b> push pull <b>P</b> Serial Synchronous Interface - SSI <b>S</b>	<b>LOGIC</b> negative <b>N</b> positive <b>P</b>	<b>OPTIONS</b> to be reported if not used <b>X</b> reset with external input <b>ZE</b> (with binary code) strobe <b>S</b> (with binary code) strobe and reset with external input <b>SIZE</b>	<b>SHAFT DIAMETER</b> (mod. 50A) mm <b>6</b> (mod. 50B) mm <b>8</b> (mod. 50B) mm <b>10</b>	<b>ENCLOSURE RATING</b> IP 65 <b>X</b> IP 67 <b>S</b>	<b>MAX ROTATION SPEED</b> 3000 rpm <b>3</b>	<b>OUTPUT TYPE</b> cable (standard length 0,5 m) <b>P</b> preferred cable lengths 1,5 / 2 / 3 / 5 / 10 m, to be added after DIRECTION TYPE (eg. PR5) (S interface) M12 plug connector <b>M12</b>	<b>DIRECTION TYPE</b> axial <b>A</b> radial <b>R</b>	<b>SOCKET</b> socket not included <b>.162</b> to be reported only with connector output (eg. M12R.162), for socket see Accessories	<b>VARIANT</b> custom version <b>XXX</b>
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## 50A WITH RADIAL CABLE OUTPUT



fixing clamps not included, please refer to Accessories

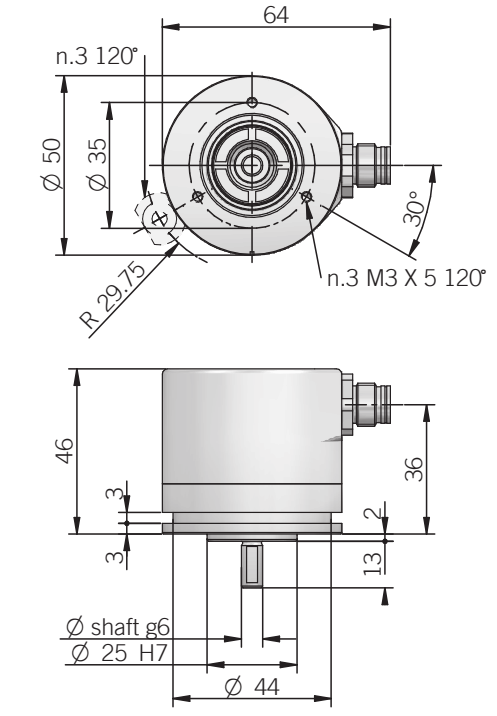
## 50B WITH RADIAL CABLE OUTPUT



fixing clamps not included, please refer to Accessories

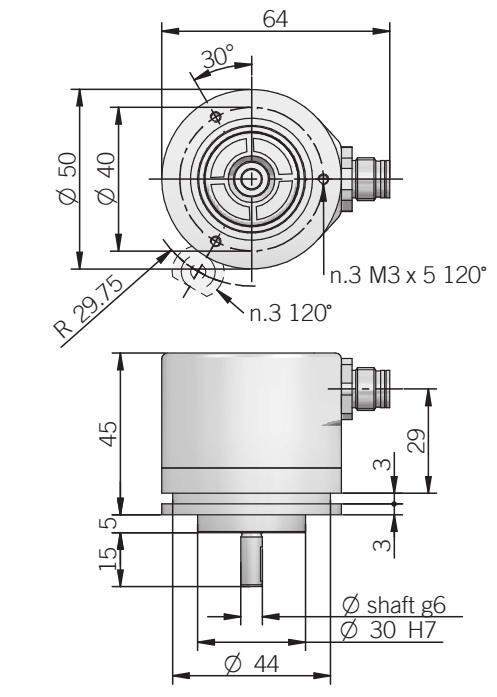
recommended mating shaft tolerance H7  
dimensions in mm

## 50A WITH RADIAL M12 OUTPUT



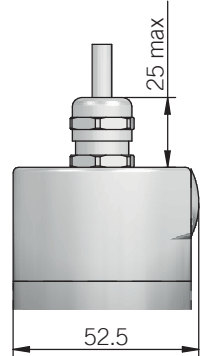
fixing clamps not included, please refer to Accessories

## 50B WITH RADIAL M12 OUTPUT



fixing clamps not included, please refer to Accessories

## DIMENSIONS WITH AXIAL OUTPUT



ELECTRICAL SPECIFICATIONS

<b>Resolution</b>	from 2 to 4096 ppr (N / C / P / R / U interface) from 2 to 8192 ppr (S interface)
<b>Power supply<sup>1</sup></b>	5 = 4,5 ... 5,5 V DC 8/30 = 7,6 ... 31,5 V DC (reverse polarity protection)
<b>Current consumption without load</b>	< 100 mA
<b>Max load current</b>	P = 20 mA / channel N / C / R / U = 40 mA / channel
<b>Electrical interface<sup>2</sup></b>	NPN / NPN open collector (ULN2003A) PNP / PNP open collector (TD62783) push pull (iC-DL) RS-422 (LTC1690 or similar)
<b>Auxiliary inputs (U/D - RESET)</b>	active high (+V DC) connect to 0 V if not used / RESET tmin 150 ms
<b>Max frequency</b>	output 25 kHz LSB (Bit parallel) clock input 100 kHz ... 1 MHz (SSI)
<b>Code type</b>	binary or gray
<b>SSI monostable time (Tm)</b>	20 µs
<b>SSI pause time (Tp)</b>	> 35 µs
<b>Strobe time</b>	20 µs
<b>SSI frame</b>	MSB ... LSB 13 bit data length
<b>Counting direction</b>	decreasing clockwise (shaft view)
<b>Start-up time</b>	150 ms
<b>Accuracy</b>	± 0,35° typical
<b>Mean time to dangerous failure (MTTF<sub>d</sub>)<sup>3</sup></b>	149 years with BIT PARALLEL output 160 years with SSI output
<b>Mission time (Tm)<sup>3</sup></b>	20 years
<b>Diagnostic coverage (DC)<sup>3</sup></b>	0%
<b>Cable type SSI</b>	shielded - fixed installation conductors section 0,22 mm <sup>2</sup> / AWG 24 bending radius min 60 mm
<b>Cable type Bit Parallel</b>	shielded - fixed installation conductors section 0,14 mm <sup>2</sup> / AWG 26 bending radius min 50 mm
<b>Electromagnetic compatibility</b>	according to 2014/30/EU directive
<b>RoHS</b>	according to 2011/65/EU directive
<b>UL / CSA</b>	file n. E212495

BIT PARALLEL CONNECTIONS

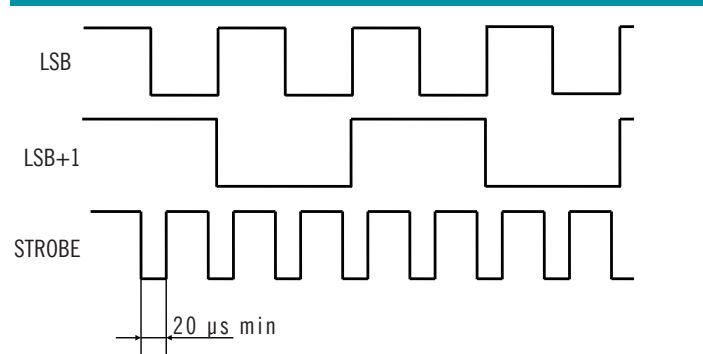
Function	Gray / Binary	Cable
bit 1 (LSB)	G <sup>0</sup> / B <sup>0</sup>	green
bit 2	G <sup>1</sup> / B <sup>1</sup>	yellow
bit 3	G <sup>2</sup> / B <sup>2</sup>	blue
bit 4	G <sup>3</sup> / B <sup>3</sup>	brown
bit 5	G <sup>4</sup> / B <sup>4</sup>	orange or pink
bit 6	G <sup>5</sup> / B <sup>5</sup>	white
bit 7	G <sup>6</sup> / B <sup>6</sup>	grey
bit 8	G <sup>7</sup> / B <sup>7</sup>	violet
bit 9	G <sup>8</sup> / B <sup>8</sup>	grey / pink
bit 10	G <sup>9</sup> / B <sup>9</sup>	white / green
bit 11	G <sup>10</sup> / B <sup>10</sup>	brown / green
bit 12	G <sup>11</sup> / B <sup>11</sup>	white / yellow
0 V	/	black
+ V DC	/	red
U / D	/	red / blue
RESET	/	yellow / brown
STROBE	/	white / grey
⊕	/	shield

MECHANICAL SPECIFICATIONS

<b>Shaft diameter</b>	ø 6 / 8 / 10 mm
<b>Enclosure rating IEC 60529</b>	X = IP 65 S = IP 67
<b>Max rotation speed</b>	3000 rpm continuous / 5000 rpm instantaneous
<b>Max shaft load<sup>4</sup></b>	30 N (6,74 lbs) axial / 50 N (11,24 lbs) radial
<b>Shock</b>	50 G, 11 ms (IEC 60068-2-27)
<b>Vibration</b>	20 G, 10 ... 2000 Hz (IEC 60068-2-6)
<b>Moment of inertia</b>	0,5 x 10 <sup>-6</sup> kgm <sup>2</sup> (12 x 10 <sup>-6</sup> lbf <sup>2</sup> )
<b>Starting torque (at +20°C / +68°F)</b>	< 0,03 Nm (4,25 Ozin)
<b>Bearing stage material</b>	aluminum
<b>Shaft material</b>	stainless steel
<b>Housing material</b>	painted aluminum
<b>Bearings</b>	n.2 ball bearings
<b>Bearings life</b>	10 <sup>9</sup> revolutions
<b>Operating temperature<sup>5,6</sup></b>	-25° ... +85°C (-13° ... +185°F)
<b>Storage temperature<sup>6</sup></b>	-25° ... +85°C (-13° ... +185°F)
<b>Weight</b>	200 g (7,05 oz)

<sup>1</sup> as measured at the transducer without cable influences  
<sup>2</sup> for further details refer to OUTPUT LEVELS on TECHNICAL BASICS section  
<sup>3</sup> this product is not a safety component, for further details refer to TECHNICAL BASICS section  
<sup>4</sup> maximum load for static usage  
<sup>5</sup> measured on the transducer flange  
<sup>6</sup> condensation not allowed

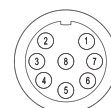
STROBE TIMING



SSI CONNECTIONS

Function	Cable	8 pin M12
+ V DC	red	8
0 V	black	5
DATA +	green	3
DATA -	brown or grey	2
CLOCK +	yellow	4
CLOCK -	orange or pink	6
U / D	red / blue	7
RESET	white	1
⊕	shield	housing

M12 connector (8 pin)  
M12 A coded  
front view



MAIN FEATURES

Singleturn absolute magnetic encoder size 50 mm with blind hollow shaft

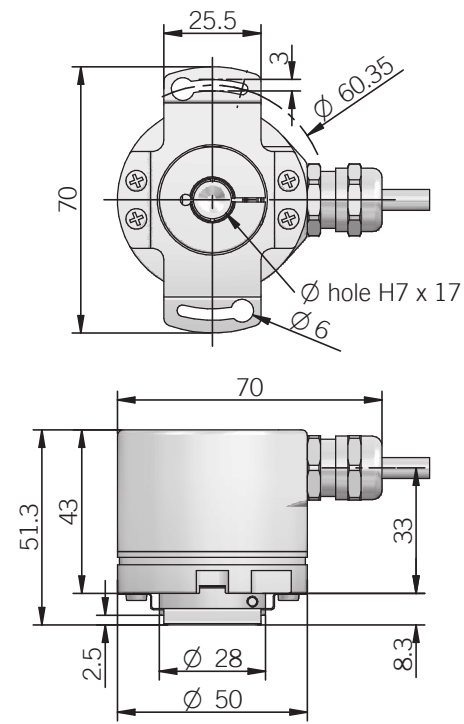
- Resolution up to 13 bit (8192 ppr)
- Power supply up to +30 V DC with SSI or Bit Parallel as electrical interface
- Code reset for easy setup
- Cable or M12 output, other connectors available on cable end
- Sturdy construction
- Blind hollow shaft diameter up to 15 mm
- IP 67 enclosure rating
- Mounting by stator coupling or torque pin



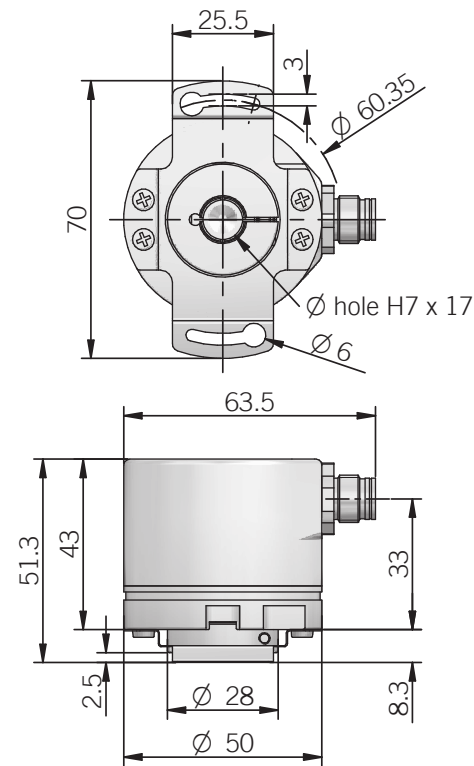
ORDERING CODE

EMA	50F	1024	G	8/30	N	N	X	15	X	3	M12	R	.162	+XXX
<p><b>SERIES</b> magnetic singleturn absolute encoder <b>EMA</b></p> <p><b>MODEL</b> blind hollow shaft with stator coupling <b>50F</b> blind hollow shaft with torque pin <b>50G</b></p> <p><b>RESOLUTION</b> (N / C / R / U / P interface) ppr from 2 to 4096 (S interface) ppr from 2 to 8192</p> <p><b>CODE TYPE</b> binary <b>B</b> gray <b>G</b> (no powers of 2) binary offset code (0-XXX) <b>BC</b> (no powers of 2) gray offset code (0-XXX) <b>GC</b></p> <p><b>POWER SUPPLY</b> 5 V DC <b>5</b> 8 ... 30 V DC <b>8/30</b></p> <p><b>ELECTRICAL INTERFACE</b> NPN <b>N</b> NPN open collector <b>C</b> PNP <b>R</b> PNP open collector <b>U</b> push pull <b>P</b> Serial Synchronous Interface - SSI <b>S</b></p> <p><b>LOGIC</b> negative <b>N</b> positive <b>P</b></p> <p><b>OPTIONS</b> to be reported if not used <b>X</b> reset with external input <b>ZE</b> (with binary code) strobe <b>S</b> (with binary code) strobe and reset with external input <b>SZE</b></p> <p><b>BORE DIAMETER</b> mm <b>14</b> mm <b>15</b> diameters 5 / 6 / 8 / 10 / 12 mm with optional shaft adapter, see Accessories</p> <p><b>ENCLOSURE RATING</b> IP 65 <b>X</b> IP 67 <b>S</b></p> <p><b>MAX ROTATION SPEED</b> 3000 rpm <b>3</b></p> <p><b>OUTPUT TYPE</b> cable (standard length 0,5 m) <b>P</b> preferred cable lengths 1,5 / 2 / 3 / 5 / 10 m, to be added after DIRECTION TYPE (eg. PR5) (S interface) M12 plug connector <b>M12</b></p> <p><b>DIRECTION TYPE</b> axial <b>A</b> radial <b>R</b></p> <p><b>SOCKET</b> socket not included <b>.162</b> to be reported only with connector output (eg. M12R.162), for socket see Accessories</p> <p><b>VARIANT</b> custom version <b>XXX</b></p>														

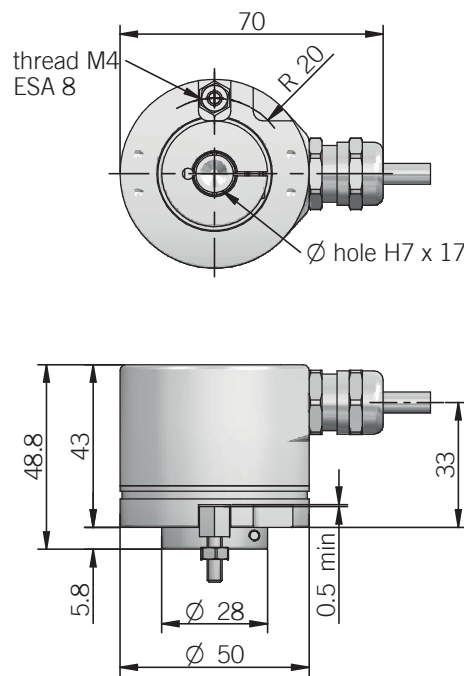
50F WITH RADIAL CABLE OUTPUT



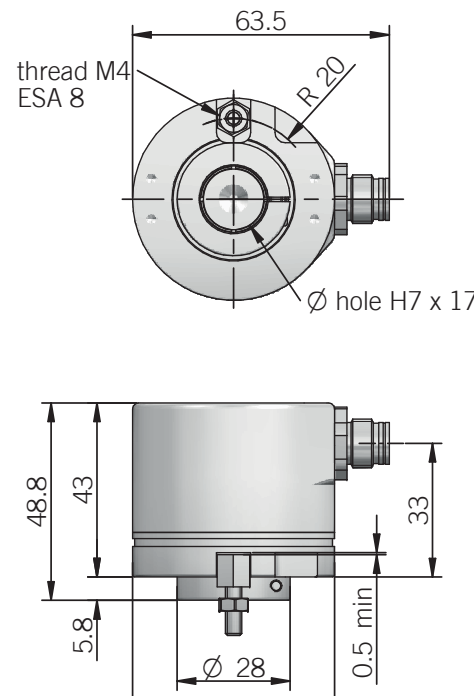
50F WITH RADIAL M12 OUTPUT



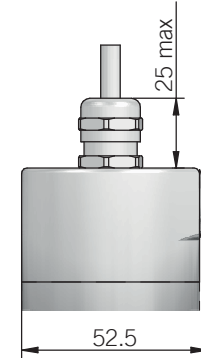
50G WITH RADIAL CABLE OUTPUT



50G WITH RADIAL M12 OUTPUT



DIMENSIONS WITH AXIAL OUTPUT



torque pin is included in model G, for mounting instruction please refer to product installation notes

recommended mating shaft tolerance g6  
dimensions in mm

ELECTRICAL SPECIFICATIONS

<b>Resolution</b>	from 2 to 4096 ppr (N / C / P / R / U interface) from 2 to 8192 ppr (S interface)
<b>Power supply<sup>1</sup></b>	5 = 4,5 ... 5,5 V DC 8/30 = 7,6 ... 31,5 V DC (reverse polarity protection)
<b>Current consumption without load</b>	< 100 mA
<b>Max load current</b>	P = 20 mA / channel N / C / R / U = 40 mA / channel
<b>Electrical interface<sup>2</sup></b>	NPN / NPN open collector (ULN2003A) PNP / PNP open collector (TD62783) push pull (iC-DL) RS-422 (LTC1690 or similar)
<b>Auxiliary inputs (U/D - RESET)</b>	active high (+V DC) connect to 0 V if not used / RESET tmin 150 ms
<b>Max frequency</b>	output 25 kHz LSB (Bit parallel) clock input 100 kHz ... 1 MHz (SSI)
<b>Code type</b>	binary or gray
<b>SSI monostable time (Tm)</b>	20 μs
<b>SSI pause time (Tp)</b>	> 35 μs
<b>Strobe time</b>	20 μs
<b>SSI frame</b>	MSB ... LSB 13 bit data length
<b>Counting direction</b>	decreasing clockwise (shaft view)
<b>Start-up time</b>	150 ms
<b>Accuracy</b>	± 0,35° typical
<b>Mean time to dangerous failure (MTTF)<sub>d</sub><sup>3</sup> according to EN ISO 13849-1</b>	149 years with BIT PARALLEL output 160 years with SSI output
<b>Mission time (Tm)<sup>3</sup></b>	20 years
<b>Diagnostic coverage (DC)<sup>3</sup></b>	0%
<b>Cable type SSI</b>	shielded - fixed installation conductors section 0,22 mm <sup>2</sup> / AWG 24 bending radius min 60 mm
<b>Cable type Bit Parallel</b>	shielded - fixed installation conductors section 0,14 mm <sup>2</sup> / AWG 26 bending radius min 50 mm
<b>Electromagnetic compatibility</b>	according to 2014/30/EU directive
<b>RoHS</b>	according to 2011/65/EU directive
<b>UL / CSA</b>	file n. E212495

BIT PARALLEL CONNECTIONS

Function	Gray / Binary	Cable
bit 1 (LSB)	G <sup>0</sup> / B <sup>0</sup>	green
bit 2	G <sup>1</sup> / B <sup>1</sup>	yellow
bit 3	G <sup>2</sup> / B <sup>2</sup>	blue
bit 4	G <sup>3</sup> / B <sup>3</sup>	brown
bit 5	G <sup>4</sup> / B <sup>4</sup>	orange or pink
bit 6	G <sup>5</sup> / B <sup>5</sup>	white
bit 7	G <sup>6</sup> / B <sup>6</sup>	grey
bit 8	G <sup>7</sup> / B <sup>7</sup>	violet
bit 9	G <sup>8</sup> / B <sup>8</sup>	grey / pink
bit 10	G <sup>9</sup> / B <sup>9</sup>	white / green
bit 11	G <sup>10</sup> / B <sup>10</sup>	brown / green
bit 12	G <sup>11</sup> / B <sup>11</sup>	white / yellow
0 V	/	black
+ V DC	/	red
U / D	/	red / blue
RESET	/	yellow / brown
STROBE	/	white / grey
≡	/	shield

MECHANICAL SPECIFICATIONS

<b>Bore diameter</b>	ø 14 / 15 mm ø 5 / 6* / 8* / 10* / 12* mm * with optional shaft adapter, please refer to Accessories
<b>Enclosure rating IEC 60529</b>	X = IP 65 S = IP 67
<b>Max rotation speed</b>	3000 rpm continuous
<b>Max shaft load<sup>4</sup></b>	30 N (6,74 lbs) axial / 50 N (11,24 lbs) radial
<b>Shock</b>	50 G, 11 ms (IEC 60068-2-27)
<b>Vibration</b>	20 G, 10 ... 2000 Hz (IEC 60068-2-6)
<b>Moment of inertia</b>	4 x 10 <sup>-6</sup> kgm <sup>2</sup> (95 x 10 <sup>-6</sup> lbfm <sup>2</sup> )
<b>Starting torque (at +20°C / +68°F)</b>	< 0,03 Nm (4,25 Ozin)
<b>Bearing stage material</b>	aluminum
<b>Shaft material</b>	stainless steel
<b>Housing material</b>	painted aluminum
<b>Bearings</b>	n.2 ball bearings
<b>Bearings life</b>	10 <sup>9</sup> revolutions
<b>Operating temperature<sup>5,6</sup></b>	-25° ... +85°C (-13° ... +185°F)
<b>Storage temperature<sup>6</sup></b>	-25° ... +85°C (-13° ... +185°F)
<b>Weight</b>	200 g (7,05 oz)

<sup>1</sup> as measured at the transducer without cable influences

<sup>2</sup> for further details refer to OUTPUT LEVELS on TECHNICAL BASICS section

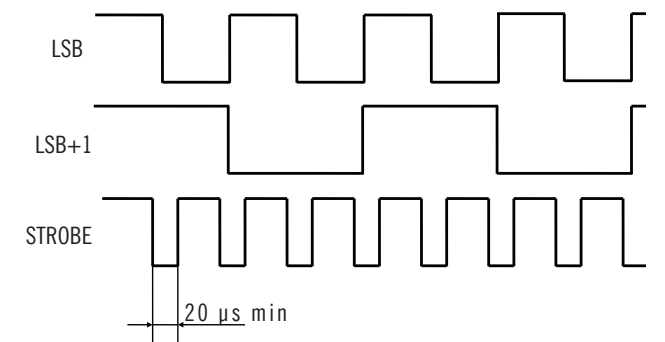
<sup>3</sup> this product is not a safety component, for further details refer to TECHNICAL BASICS section

<sup>4</sup> maximum load for static usage

<sup>5</sup> measured on the transducer flange

<sup>6</sup> condensation not allowed

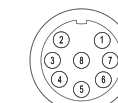
STROBE TIMING



SSI CONNECTIONS

Function	Cable	8 pin M12
+ V DC	red	8
0 V	black	5
DATA +	green	3
DATA -	brown or grey	2
CLOCK +	yellow	4
CLOCK -	orange or pink	6
U / D	red / blue	7
RESET	white	1
≡	shield	housing

M12 connector (8 pin)  
M12 A coded  
front view



# EML 50 A / B ANALOGUE

## SOLID SHAFT MAGNETIC SINGLETURN ABSOLUTE ENCODER



### MAIN FEATURES

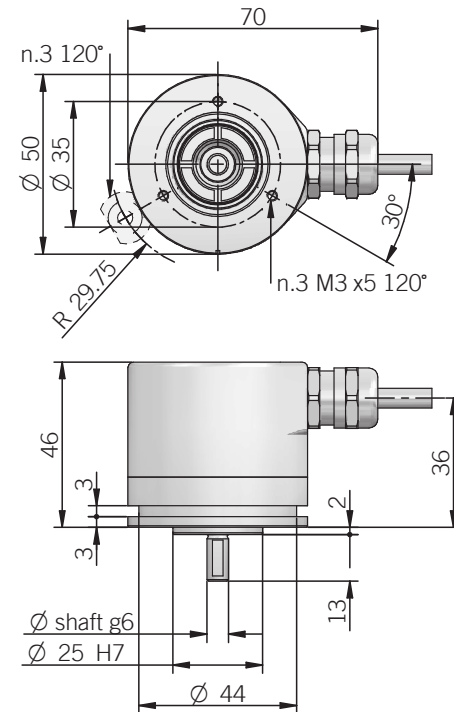
Singleturn absolute magnetic encoder size 50 mm with solid shaft

- Resolution 12 bit
- Power supply up to +28 V DC with analogue (voltage or current) electrical interface
- Code reset for easy setup
- Cable or M12 output, other connectors available on cable end
- Sturdy construction
- Solid shaft diameter up to 10 mm
- IP 67 enclosure rating
- Mounting by synchronous flange

**ORDERING CODE** EML 50A 360 X 12/28 V 05 X 6 X 3 M12 R .162 +XXX

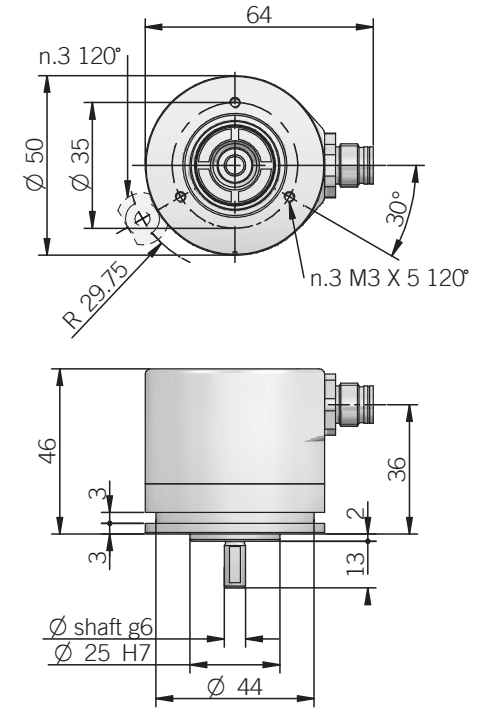
<b>SERIES</b> magnetic singleturn absolute encoder EML	<b>MODEL</b> synchronous flange $\varnothing$ 25 mm 50A synchronous flange $\varnothing$ 30 mm 50B for anodized version please directly contact our offices	<b>ACTIVE ANGLE</b> degrees 360 degrees 270 degrees 180 degrees 90	<b>OPTION</b> to be reported if not used X reset with external input ZE	<b>POWER SUPPLY</b> 12 ... 28 V DC 12/28	<b>ELECTRICAL INTERFACE</b> voltage V current I	<b>OUTPUT RANGE</b> 0 ... 5 V 05 0 ... 10 V 010 0 ... 20 mA 020 4 ... 20 mA 420	<b>OPTIONS</b> to be reported with voltage output / 3 wires current output X 4 wires current output Q	<b>SHAFT DIAMETER</b> (mod. 50A) mm 6 (mod. 50B) mm 8 (mod. 50B) mm 10	<b>ENCLOSURE RATING</b> IP 65 X IP 67 S	<b>MAX ROTATION SPEED</b> 3000 rpm 3	<b>OUTPUT TYPE</b> cable (standard length 0,5 m) P preferred cable lengths 1,5 / 2 / 3 / 5 / 10 m, to be added after DIRECTION TYPE (eg. PR5) M12 plug connector M12	<b>DIRECTION TYPE</b> axial A radial R	<b>SOCKET</b> socket not included .162 to be reported only with connector output (eg. M12R.162), for socket see Accessories	<b>VARIANT</b> custom version XXX
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### 50A WITH RADIAL CABLE OUTPUT



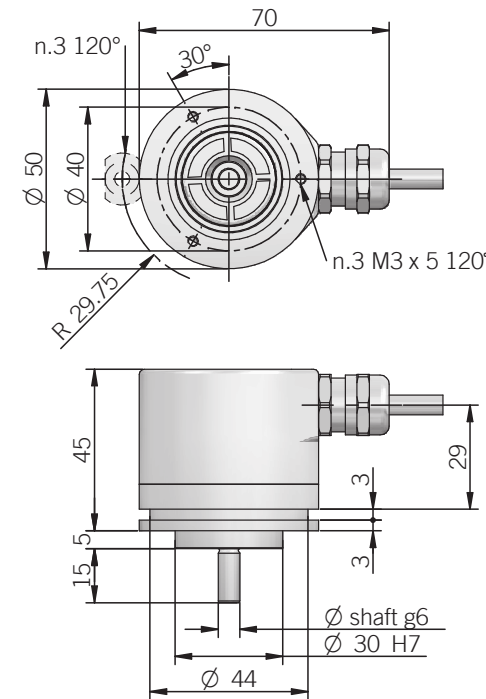
fixing clamps not included, please refer to Accessories

### 50A WITH RADIAL M12 OUTPUT



fixing clamps not included, please refer to Accessories

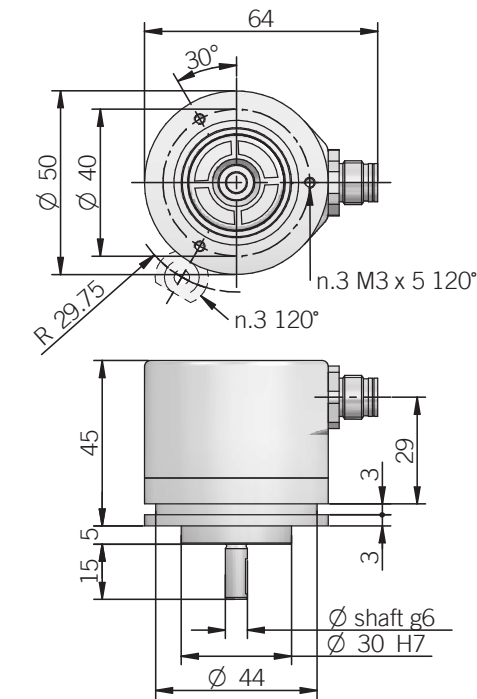
### 50B WITH RADIAL CABLE OUTPUT



fixing clamps not included, please refer to Accessories

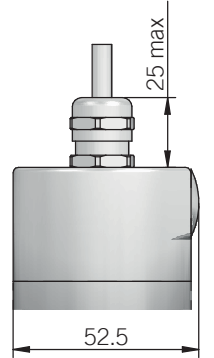
recommended mating shaft tolerance H7  
dimensions in mm

### 50B WITH RADIAL M12 OUTPUT



fixing clamps not included, please refer to Accessories

### DIMENSIONS WITH AXIAL OUTPUT



**ELECTRICAL SPECIFICATIONS**

<b>Resolution</b>	12 bit
<b>Output DAC resolution</b>	12 bit
<b>Active angle</b>	90 ... 360 mechanical degrees
<b>Power supply<sup>1</sup></b>	11,4 ... 29,4 V DC (reverse polarity protection)
<b>Current consumption without load</b>	40 mA max
<b>Electrical interface<sup>2</sup></b>	voltage (0 ... 5 V / 0 ... 10 V) current (0 ... 20 mA / 4 ... 20 mA)
<b>Auxiliary inputs (U/D - RESET)</b>	active high (+V DC) connect to 0 V if not used / RESET tmin 150 ms
<b>Load</b>	$R_{min} = 1 \text{ k}\Omega$ (voltage output) $R_{max} = (V_{DC} - 2) / 0,02$ (current output)
<b>Output update frequency</b>	100 kHz
<b>Signal pattern</b>	decreasing clockwise (shaft view)
<b>Start-up time</b>	150 ms
<b>Linearity error</b>	< 1 %
<b>Mean time to dangerous failure (MTTF)<sup>3</sup> according to EN ISO 13849-1</b>	153 years
<b>Mission time (Tm)<sup>3</sup></b>	20 years
<b>Diagnostic coverage (DC)<sup>3</sup></b>	0%
<b>Cable type</b>	shielded - fixed installation conductors section 0,22 mm <sup>2</sup> / AWG 24 bending radius min 60 mm
<b>Electromagnetic compatibility</b>	according to 2014/30/EU directive
<b>RoHS</b>	according to 2011/65/EU directive
<b>UL / CSA</b>	file n. E212495

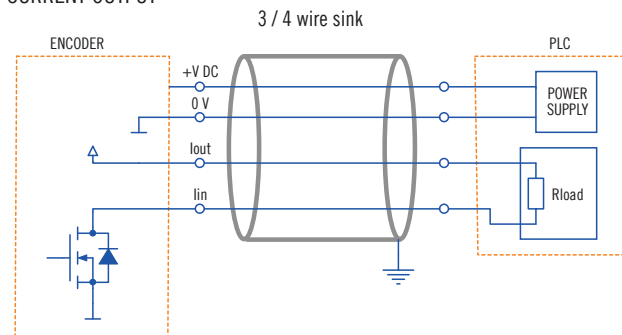
**MECHANICAL SPECIFICATIONS**

<b>Shaft diameter</b>	ø 6 / 8 / 10 mm
<b>Enclosure rating IEC 60529</b>	X = IP 65 S = IP 67
<b>Max rotation speed</b>	3000 rpm continuous / 5000 rpm instantaneous
<b>Max shaft load<sup>4</sup></b>	30 N (6,74 lbs) axial / 50 N (11,24 lbs) radial
<b>Shock</b>	50 G, 11 ms (IEC 60068-2-27)
<b>Vibration</b>	20 G, 10 ... 2000 Hz (IEC 60068-2-6)
<b>Moment of inertia</b>	0,5 x 10 <sup>-6</sup> kgm <sup>2</sup> (12 x 10 <sup>-6</sup> lbfm <sup>2</sup> )
<b>Starting torque (at +20°C / +68°F)</b>	< 0,03 Nm (4,25 Ozin)
<b>Bearing stage material</b>	aluminum
<b>Shaft material</b>	stainless steel
<b>Housing material</b>	painting aluminum
<b>Bearings</b>	n.2 ball bearings
<b>Bearings life</b>	10 <sup>9</sup> revolutions
<b>Operating temperature<sup>5,6</sup></b>	-25° ... +85°C (-13° ... +185°F)
<b>Storage temperature<sup>6</sup></b>	-25° ... +85°C (-13° ... +185°F)
<b>Weight</b>	200 g (7,05 oz)

<sup>1</sup> as measured at the transducer without cable influences  
<sup>2</sup> for further details refer to OUTPUT LEVELS on TECHNICAL BASICS section  
<sup>3</sup> this product is not a safety component, for further details refer to TECHNICAL BASICS section  
<sup>4</sup> maximum load for static usage  
<sup>5</sup> measured on the transducer flange  
<sup>6</sup> condensation not allowed

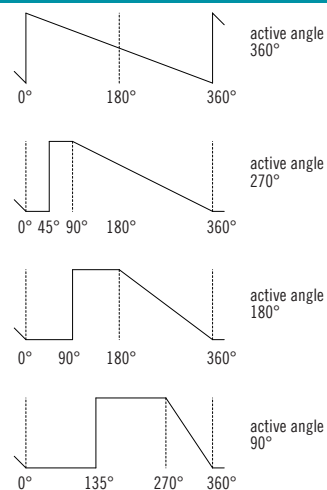
**ELECTRICAL INTERFACE**

**CURRENT OUTPUT**

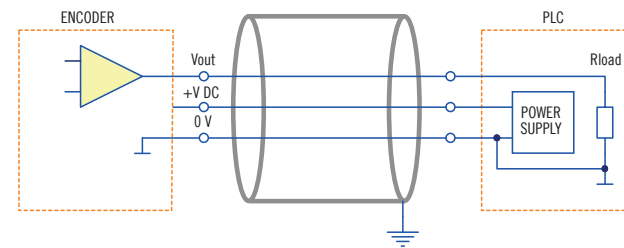


with 3 wires interface  $I_{out}$  is internally connected to +V DC  
 where  $R_{LOADmax} = (V_{DC} - 2) / 0,02$

**SIGNAL PATTERN (decreasing CW)**



**VOLTAGE OUTPUT**



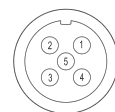
where  $R_{LOADmin} = 1 \text{ k}\Omega$

**CONNECTIONS**

Function	Cable (voltage)	Cable (current)	5 pin M12	8 pin M12*
+ V DC	red	red	2	8
0 V	black	black	4	5
V <sub>out</sub>	green	/	3	/
I <sub>in</sub>	/	yellow	3	3
I <sub>out</sub>	/	green	/	2
U / D	blue	blue	5	7
RESET	white	white	1	1
Shield	shield	shield	housing	housing

\* with Q current output

M12 connector (5 pin)  
M12 A coded front view



M12 connector (8 pin)  
M12 A coded front view



**MAIN FEATURES**

Singleturn absolute magnetic encoder size 50 mm with blind hollow shaft

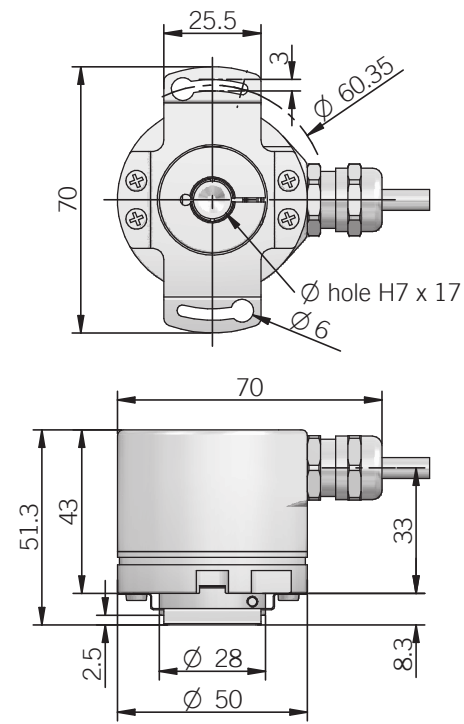
- Resolution 12 bit
- Power supply up to +28 V DC with analogue (voltage or current) electrical interface
- Code reset for easy setup
- Cable or M12 output, other connectors available on cable end
- Sturdy construction
- Blind hollow shaft diameter up to 15 mm
- IP 67 enclosure rating
- Mounting by stator coupling or torque pin



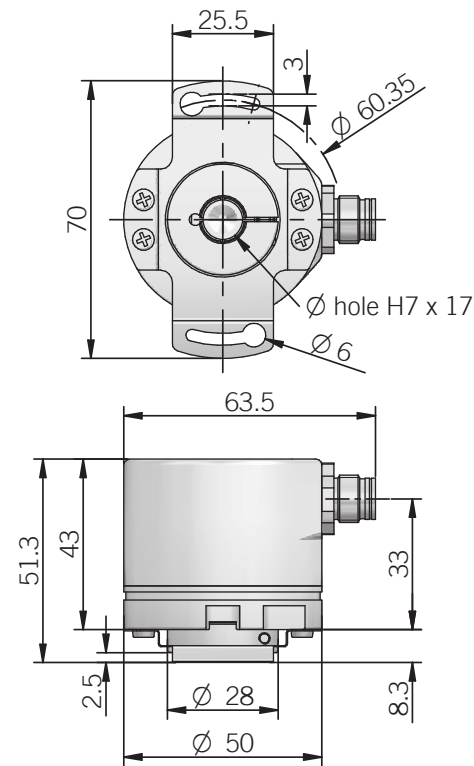
**ORDERING CODE** EML 50F 360 X 12/28 V 05 X 15 X 3 M12 R .162 +XXX

<b>SERIES</b> magnetic singleturn absolute encoder EML	<b>MODEL</b> blind hollow shaft with stator coupling 50F blind hollow shaft with torque pin 50G	<b>ACTIVE ANGLE</b> degrees 360 degrees 270 degrees 180 degrees 90	<b>OPTION</b> to be reported if not used X reset with external input ZE	<b>POWER SUPPLY</b> 12 ... 28 V DC 12/28	<b>ELECTRICAL INTERFACE</b> voltage V current I	<b>OUTPUT RANGE</b> 0 ... 5 V 05 0 ... 10 V 010 0 ... 20 mA 020 4 ... 20 mA 420	<b>OPTIONS</b> to be reported with voltage output / 3 wires current output X 4 wires current output Q	<b>BORE DIAMETER</b> mm 14 mm 15 diameters 5 / 6 / 8 / 10 / 12 mm with optional shaft adapter, see Accessories	<b>ENCLOSURE RATING</b> IP 65 X IP 67 S	<b>MAX ROTATION SPEED</b> 3000 rpm 3	<b>OUTPUT TYPE</b> cable (standard length 0,5 m) P preferred cable lengths 1,5 / 2 / 3 / 5 / 10 m, to be added after DIRECTION TYPE (eg. PR5) M12 plug connector M12	<b>DIRECTION TYPE</b> axial A radial R	<b>SOCKET</b> socket not included .162 to be reported only with connector output (eg. M12R.162), for socket see Accessories	<b>VARIANT</b> custom version XXX
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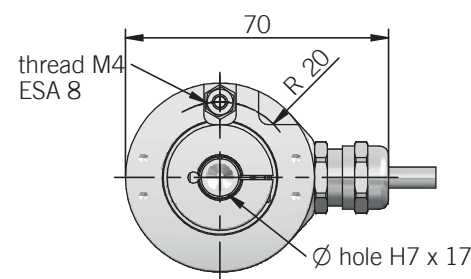
50F WITH RADIAL CABLE OUTPUT



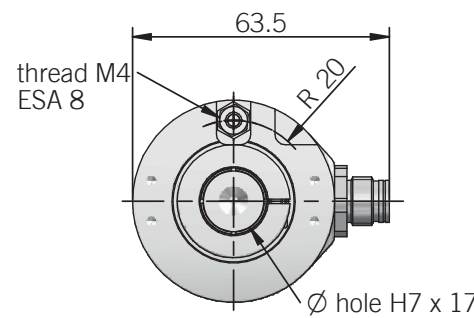
50F WITH RADIAL M12 OUTPUT



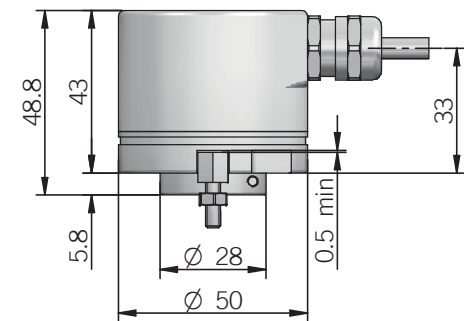
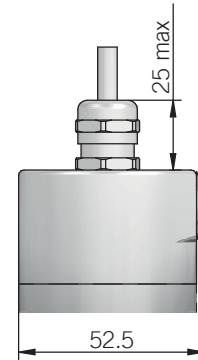
50G WITH RADIAL CABLE OUTPUT



50G WITH RADIAL M12 OUTPUT

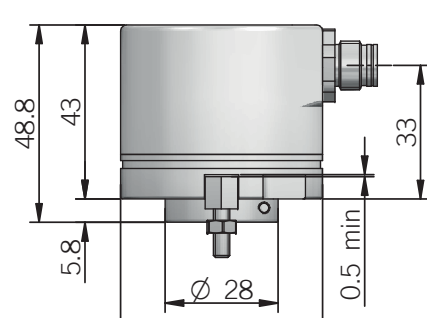


DIMENSIONS WITH AXIAL OUTPUT



torque pin is included in model G, for mounting instruction please refer to product installation notes

recommended mating shaft tolerance g6  
dimensions in mm



ELECTRICAL SPECIFICATIONS

Resolution	12 bit
Output DAC resolution	12 bit
Active angle	90 ... 360 mechanical degrees
Power supply <sup>1</sup>	11,4 ... 29,4 V DC (reverse polarity protection)
Current consumption without load	40 mA max
Electrical interface <sup>2</sup>	voltage (0 ... 5 V / 0 ... 10 V) current (0 ... 20 mA / 4 ... 20 mA)
Auxiliary inputs (U/D - RESET)	active high (+V DC) connect to 0 V if not used / RESET t <sub>min</sub> 150 ms
Load	R <sub>min</sub> = 1 kΩ (voltage output) R <sub>max</sub> = (V <sub>DC</sub> - 2) / 0,02 (current output)
Output update frequency	100 kHz
Signal pattern	decreasing clockwise (shaft view)
Start-up time	150 ms
Linearity error	< 1 %
Mean time to dangerous failure (MTTF) <sup>3</sup> according to EN ISO 13849-1	153 years
Mission time (T <sub>m</sub> ) <sup>3</sup>	20 years
Diagnostic coverage (DC) <sup>3</sup>	0%
Cable type	shielded - fixed installation conductors section 0,22 mm <sup>2</sup> / AWG 24 bending radius min 60 mm
Electromagnetic compatibility	according to 2014/30/EU directive
RoHS	according to 2011/65/EU directive
UL / CSA	file n. E212495

MECHANICAL SPECIFICATIONS

Bore diameter	ø 14 / 15 mm ø 5 / 6* / 8* / 10* / 12* mm * with optional shaft adapter, please refer to Accessories
Enclosure rating IEC 60529	X = IP 65 S = IP 67
Max rotation speed	3000 rpm continuous
Max shaft load <sup>4</sup>	30 N (6,74 lbs) axial / 50 N (11,24 lbs) radial
Shock	50 G, 11 ms (IEC 60068-2-27)
Vibration	20 G, 10 ... 2000 Hz (IEC 60068-2-6)
Moment of inertia	4 x 10 <sup>-6</sup> kgm <sup>2</sup> (95 x 10 <sup>-6</sup> lbfm <sup>2</sup> )
Starting torque (at +20°C / +68°F)	< 0,03 Nm (4,25 Ozin)
Bearing stage material	aluminum
Shaft material	stainless steel
Housing material	painted aluminum
Bearings	n.2 ball bearings
Bearings life	10 <sup>9</sup> revolutions
Operating temperature <sup>5,6</sup>	-25° ... +85°C (-13° ... +185°F)
Storage temperature <sup>6</sup>	-25° ... +85°C (-13° ... +185°F)
Weight	200 g (7,05 oz)

<sup>1</sup> as measured at the transducer without cable influences

<sup>2</sup> for further details refer to OUTPUT LEVELS on TECHNICAL BASICS section

<sup>3</sup> this product is not a safety component, for further details refer to TECHNICAL BASICS section

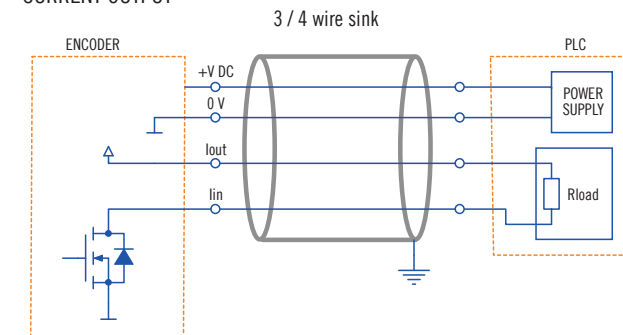
<sup>4</sup> maximum load for static usage

<sup>5</sup> measured on the transducer flange

<sup>6</sup> condensation not allowed

ELECTRICAL INTERFACE

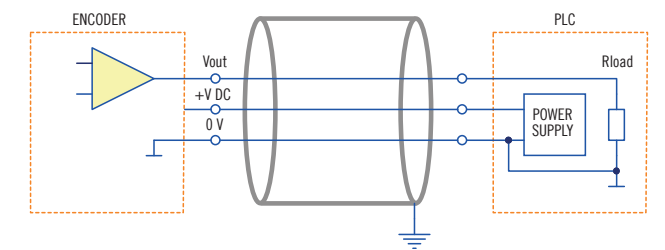
CURRENT OUTPUT



with 3 wires interface I<sub>out</sub> is internally connected to +V DC

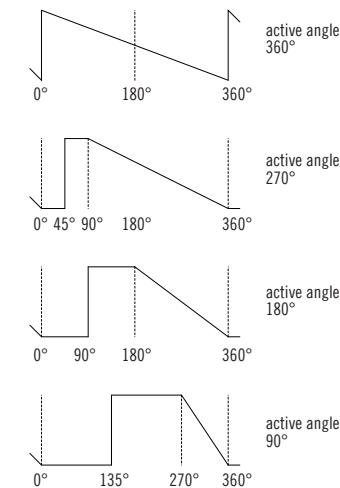
where R<sub>LOAD</sub> max = (V<sub>DC</sub> - 2) / 0,02

VOLTAGE OUTPUT



where R<sub>LOAD</sub> min = 1 kΩ

SIGNAL PATTERN (decreasing CW)

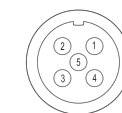


CONNECTIONS

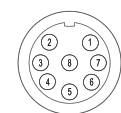
Function	Cable (voltage)	Cable (current)	5 pin M12	8 pin M12*
+ V DC	red	red	2	8
0 V	black	black	4	5
V <sub>out</sub>	green	/	3	/
I <sub>in</sub>	/	yellow	3	3
I <sub>out</sub>	/	green	/	2
U / D	blue	blue	5	7
RESET	white	white	1	1
Shield	shield	shield	housing	housing

\* with Q current output

M12 connector (5 pin)  
M12 A coded front view



M12 connector (8 pin)  
M12 A coded front view





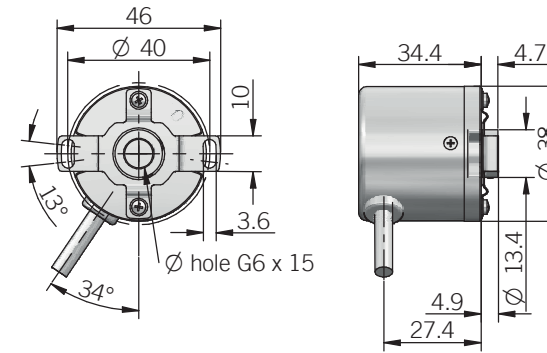
**MAIN FEATURES**

Miniaturized optical multiturn absolute encoder for high end application. Thanks to BiSS-C interface and high resolution it can be used in robotics, motor feedback and CNC machines.

- Optical sensor technology (OptoASIC + Energy Harvesting)
- 39 bit total resolution (23 bit single turn + 16 bit multiturn)
- Power supply +5 VDC with BiSS-C as electrical interface
- Cable output
- Blind hollow shaft diameter up to 8 mm
- Mounting by stator coupling
- Operating temperature -20° ... +105°C (-4° ... +221°F)

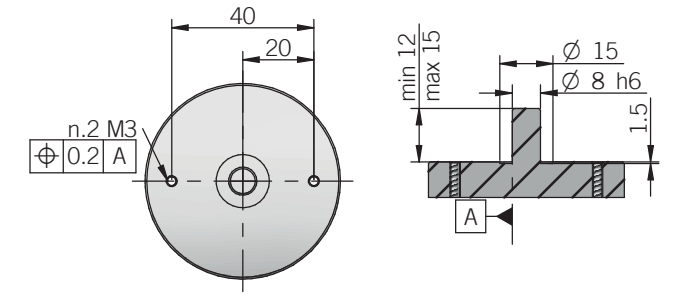


**AAM 38F**



dimensions in mm

**RECOMMENDED INTERFACE FLANGE DESIGN**



**ORDERING CODE**      AAM 38F 16 / 23 B 5 B 8 X X PR .XXX

<b>SERIES</b> absolute multiturn encoder AAM	<b>MODEL</b> blind hollow shaft with stator coupling 38F	<b>MULTITURN RESOLUTION</b> bit 16	<b>SINGLETURN RESOLUTION</b> bit 23	<b>CODE TYPE</b> binary B	<b>POWER SUPPLY</b> 5 V DC 5	<b>ELECTRICAL INTERFACE</b> BiSS-C B	<b>BORE DIAMETER</b> mm 6 (1/4") mm 6,35 mm 8	<b>ENCLOSURE RATING</b> IP 50 X	<b>OPTIONS</b> to be reported X	<b>OUTPUT TYPE</b> radial cable (standard length 0,2m) PR	<b>VARIANT</b> custom version XXX
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**ELECTRICAL SPECIFICATIONS**

<b>Multiturn resolution</b>	16 bit
<b>Singleturn resolution</b>	23 bit
<b>Fault status</b>	8 bit
<b>CRC</b>	8 bit
<b>Power supply<sup>1</sup></b>	4,75 ... 5,25 V DC
<b>Current consumption without load</b>	< 120 mA
<b>Output type<sup>2</sup></b>	BiSS-C (SN65LBC179Q or similar)
<b>Code type</b>	binary
<b>Clock frequency (MA)</b>	80 kHz ... 10 MHz
<b>Position calculation Time</b>	Refer to BiSS-C T <sub>busy time</sub>
<b>Counting direction</b>	decreasing clockwise (shaft view)
<b>Start-up time</b>	500 ms
<b>Accuracy</b>	± 80 arc-sec
<b>Mean time to dangerous failure (MTTF<sub>d</sub>)<sup>3</sup></b> according to EN ISO 13849-1	481 years
<b>Mission time (Tm)<sup>3</sup></b>	20 years
<b>Diagnostic coverage (DC)<sup>3</sup></b>	0%
<b>Electromagnetic compatibility</b>	according to 2014/30/EU directive
<b>RoHS</b>	according to 2011/65/EU directive

**MECHANICAL SPECIFICATIONS**

<b>Shaft diameter</b>	ø 6 / 6,35 (1/4") / 8 mm
<b>Enclosure rating</b>	IP 50 (IEC 60529)
<b>Max rotation speed</b>	6000 rpm continuous
<b>Shock</b>	200 G, 6 ms (IEC 60068-2-27)
<b>Vibration</b>	10 G, 10 ... 2000 Hz (IEC 60068-2-6)
<b>Shaft material</b>	brass
<b>Housing material</b>	steel
<b>Bearing stage material</b>	aluminum
<b>Bearings</b>	n.2 ball bearings
<b>Bearings life</b>	10 <sup>9</sup> revolutions
<b>Operating temperature<sup>4,5</sup></b>	-20° ... +105°C (-4° ... +221°F)
<b>Storage temperature<sup>5</sup></b>	-20° ... +105°C (-4° ... +221°F)
<b>Shaft radial play allowed</b>	± 0,05 mm
<b>Shaft axial play allowed</b>	± 0,1 mm
<b>Fixing torque for shaft grains</b>	1 Nm (142 Ozin) recommended
<b>Fixing torque for spring screws</b>	0,35 Nm (49,5 Ozin) recommended for M3 screws (not provided)
<b>Weight</b>	150 g (5,29 oz)

<sup>1</sup> as measured at the transducer without cable influences  
<sup>2</sup> for further details refer to OUTPUT LEVELS on TECHNICAL BASICS section  
<sup>3</sup> this product is not a safety component, for further details refer to TECHNICAL BASICS section  
<sup>4</sup> measured on the transducer flange  
<sup>5</sup> condensation not allowed

**CONNECTIONS**

Function	Cable
+ V DC	red
GROUND	black
SERIAL DATA (SLO) +	orange
SERIAL DATA (SLO) -	blue
SERIAL CLOCK (MA)+	brown
SERIAL CLOCK (MA) -	white

# EAMR 58 B / C - 63 A / D / E BIT PARALLEL - SSI SOLID SHAFT MULTITURN ABSOLUTE ENCODER



## MAIN FEATURES

Industry standard multiturn absolute encoder for factory automation applications.

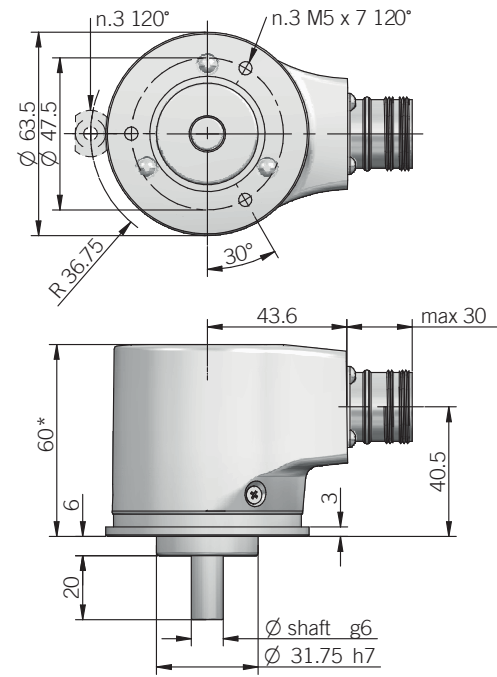
- Optical sensor technology (proprietary OptoASIC + Energy Harvesting)
- Resolution up to 65 bit (25 bit single turn + 40 bit multiturn)
- Power supply up to +30 VDC with Bit Parallel or SSI as electrical interface
- Cable or connector output
- Solid shaft diameter up to 10 mm
- Mounting by synchronous, clamping or centering 2,5" square flange

ORDERING CODE	EAMR	63A	12 / 12	G	8/30	P	P	X	10	X	MA	R	.162	+XXX
<b>SERIES</b>	multiturn absolute encoder <b>EAMR</b>													
<b>MODEL</b>	synchronous flange ø 31.75 mm <b>63A</b> synchronous flange ø 50 mm <b>58B</b> clamping flange ø 36 mm <b>58C</b> centering square flange ø 31.75 mm <b>63D</b> centering square flange ø 50 mm <b>63E</b>													
<b>MULTITURN RESOLUTION</b>	bit from 1 to 12													
<b>SINGLETURN RESOLUTION</b>	bit from 1 to 13													
<b>CODE TYPE</b>	binary <b>B</b> gray <b>G</b>													
<b>POWER SUPPLY</b>	8 ... 30 V DC <b>8/30</b>													
<b>ELECTRICAL INTERFACE</b>	push-pull <b>P</b>													
<b>LOGIC</b>	negative <b>N</b> positive <b>P</b>													
<b>OPTIONS</b>	to be reported if not used <b>X</b> latch <b>L</b> reset with external input <b>ZE</b> latch / reset with external inputs <b>LZE</b>													
<b>SHAFT DIAMETER</b>	(mod. 58 B) mm <b>6</b> (mod. 63 A / D) 3/8" - mm <b>9,52</b> (mod. 58 C - 63 A / D / E) mm <b>10</b>													
<b>ENCLOSURE RATING</b>	IP 65 shaft side / IP67 cover side <b>X</b> IP 67 <b>S</b>													
<b>OUTPUT TYPE</b>	(up to 13 bit as total resolution, without reset option) 16 cores cable (standard length 1,5 m) <b>PD</b> (from 14 to 25 bit as total resolution or options) 32 cores cable (standard length 1,5 m) <b>PE</b> preferred cable lengths 2 / 3 / 5 / 10 m, to be added after DIRECTION TYPE (eg. PDR5) (up to 13 bit as total resolution, without reset option) 19 pin MIL plug connector <b>MA</b> (from 14 to 25 bit as total resolution) 32 pin MIL plug connector <b>ME</b>													
<b>DIRECTION TYPE</b>	radial <b>R</b>													
<b>SOCKET</b>	socket not included <b>.162</b> to be reported only with connector output (eg. MAR.162), for socket see Accessories													
<b>VARIANT</b>	custom version <b>XXX</b>													

ORDERING CODE	EAMR	63A	12 / 13	G	8/30	S	X	2048	RS	10	X	HA	R	.162	+XXX
<b>SERIES</b>	multiturn absolute encoder <b>EAMR</b>														
<b>MODEL</b>	synchronous flange ø 31.75 mm <b>63A</b> synchronous flange ø 50 mm <b>58B</b> clamping flange ø 36 mm <b>58C</b> centering square flange ø 31.75 mm <b>63D</b> centering square flange ø 50 mm <b>63E</b>														
<b>MULTITURN RESOLUTION</b>	bit 12 / 14 / 15 see table for preferred combinations														
<b>SINGLETURN RESOLUTION</b>	bit 13 / 18 / 25 see table for preferred combinations														
<b>CODE TYPE</b>	binary <b>B</b> gray <b>G</b>														
<b>POWER SUPPLY</b>	8 ... 30 V DC <b>8/30</b>														
<b>ELECTRICAL INTERFACE</b>	Serial Synchronous Interface - SSI <b>S</b>														
<b>OPTION</b>	to be reported if not used <b>X</b> reset with external input <b>ZE</b> reset on cover or with external input <b>ZP</b>														
<b>INCREMENTAL RESOLUTION</b>	(powers of 2) ppr from 128 to 8192														
<b>INCREMENTAL ELECTRICAL INTERFACE</b>	available with PD or HA output type line driver HTL <b>L</b> push pull <b>P</b> line driver RS-422 <b>RS</b>														
<b>SHAFT DIAMETER</b>	(mod. 58 B) mm <b>6</b> (mod. 63 A / D) 3/8" - mm <b>9,52</b> (mod. 58 C - 63 A / D / E) mm <b>10</b>														
<b>ENCLOSURE RATING</b>	IP 65 shaft side / IP67 cover side <b>X</b> IP 67 <b>S</b>														
<b>OUTPUT TYPE</b>	cable (standard length 1,5 m) <b>PC</b> preferred cable lengths 2 / 3 / 5 / 10 m, to be added after DIRECTION TYPE (eg. PCR5) cable (standard length 1,5 m) <b>PD</b> preferred cable lengths 2 / 3 / 5 / 10 m, to be added after DIRECTION TYPE (eg. PCR5) (without reset option) 7 pin MIL plug connector <b>MC</b> (with reset option) 10 pin MIL plug connector <b>MD</b> 12 pin M23 plug connector <b>HA</b> 8 pin M12 plug connector <b>M12</b>														
<b>DIRECTION TYPE</b>	radial <b>R</b>														
<b>SOCKET</b>	socket not included <b>.162</b> to be reported only with connector output (eg. HAR.162), for socket see Accessories														
<b>VARIANT</b>	custom version <b>XXX</b>														

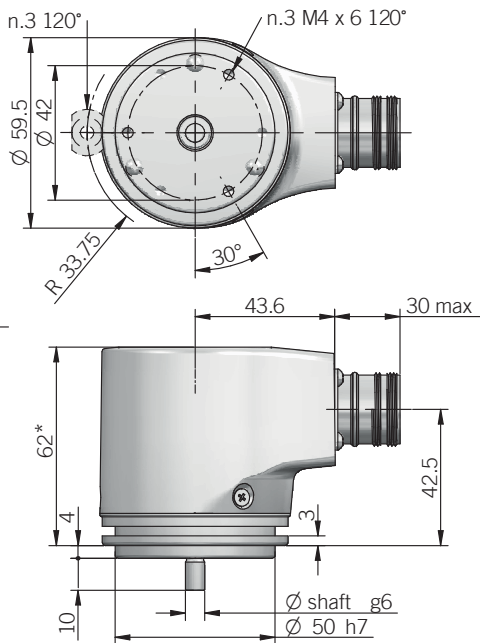
  only with additional incremental output

63A



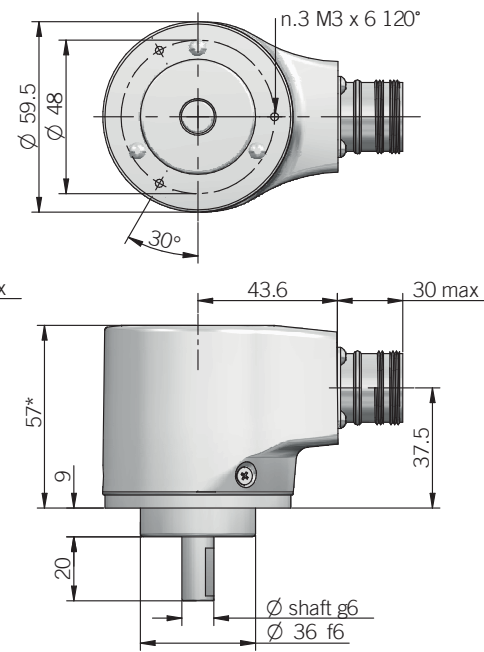
for fixing clamps please refer to Accessories

58B

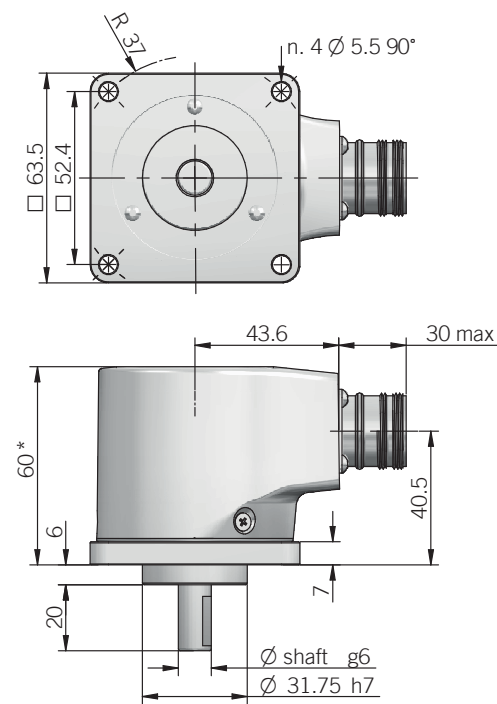


for fixing clamps please refer to Accessories

58C

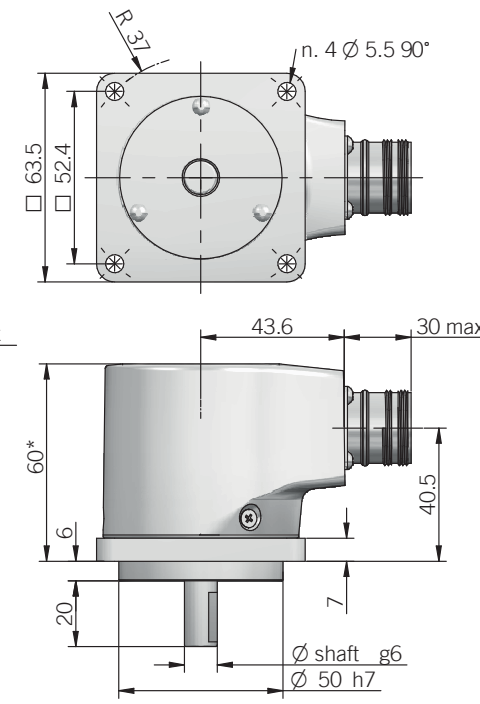


63D



\* with option ZP +1,5 mm  
recommended mating shaft tolerance H7  
dimensions in mm

63E



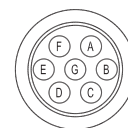
BIT PARALLEL CONNECTIONS

Function	Binary / Gray	Cable PD	Cable PE	19 pin MA	32 pin ME
bit 1 (LSB)	B <sup>0</sup> / G <sup>0</sup>	green	green	A	A
bit 2	B <sup>1</sup> / G <sup>1</sup>	yellow	yellow	B	B
bit 3	B <sup>2</sup> / G <sup>2</sup>	blue	blue	C	C
bit 4	B <sup>3</sup> / G <sup>3</sup>	brown	brown	D	D
bit 5	B <sup>4</sup> / G <sup>4</sup>	orange or pink	orange or pink	E	E
bit 6	B <sup>5</sup> / G <sup>5</sup>	white	white	F	F
bit 7	B <sup>6</sup> / G <sup>6</sup>	grey	grey	G	G
bit 8	B <sup>7</sup> / G <sup>7</sup>	purple	purple	H	H
bit 9	B <sup>8</sup> / G <sup>8</sup>	grey / pink	grey / pink	J	J
bit 10	B <sup>9</sup> / G <sup>9</sup>	white / green	white / green	K	K
bit 11	B <sup>10</sup> / G <sup>10</sup>	brown / green	brown / green	L	L
bit 12	B <sup>11</sup> / G <sup>11</sup>	white / yellow	white / yellow	M	M
bit 13	B <sup>12</sup> / G <sup>12</sup>	yellow / brown	yellow / brown	N	N
bit 14	B <sup>13</sup> / G <sup>13</sup>	/	white / grey	/	P
bit 15	B <sup>14</sup> / G <sup>14</sup>	/	grey / brown	/	R
bit 16	B <sup>15</sup> / G <sup>15</sup>	/	white / pink	/	S
bit 17	B <sup>16</sup> / G <sup>16</sup>	/	pink / brown	/	T
bit 18	B <sup>17</sup> / G <sup>17</sup>	/	white / blue	/	U
bit 19	B <sup>18</sup> / G <sup>18</sup>	/	brown / blue	/	V
bit 20	B <sup>19</sup> / G <sup>19</sup>	/	white / red	/	W
bit 21	B <sup>20</sup> / G <sup>20</sup>	/	brown / red	/	X
bit 22	B <sup>21</sup> / G <sup>21</sup>	/	white / black	/	Y
bit 23	B <sup>22</sup> / G <sup>22</sup>	/	brown / black	/	Z
bit 24	B <sup>23</sup> / G <sup>23</sup>	/	grey / green	/	a
bit 25	B <sup>24</sup> / G <sup>24</sup>	/	yellow / pink	/	b
LATCH	/	/	yellow / grey	R	e
0 V	/	black	black	T	j
U / D	/	red / blue	red / blue	U	g
RESET	/	/	pink / green	/	f
+ V DC	/	red	red	V	h
⏏	/	shield	shield	S	housing

SSI CONNECTIONS

Function	Cable PC	Cable PD	7 pin MC	10 pin MD	12 pin HA	12 pin HA	8 pin M12
+ V DC	red	red	G	G	8	8	8
0 V	black	black	F	F	1	1	5
DATA +	green	green	C	C	2	2	3
DATA -	brown	brown	D	D	10	10	2
CLOCK +	yellow	yellow	A	A	3	3	4
CLOCK -	orange or pink	orange or pink	B	B	11	11	6
A+	/	grey	/	/	/	6	/
A-	/	blue	/	/	/	7	/
B+	/	purple	/	/	/	9	/
B-	/	white / green	/	/	/	12	/
U / D	red / blue	red / blue	E	E	5	5	7
RESET	white	white	/	H	4	4	1
⏏	shield	shield	housing	housing	9	housing	housing

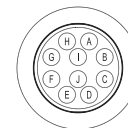
MC connector (7 pin)  
Amphenol MS3102-E-16-S  
front view



M12 connector (8 pin)  
M12 A coded  
front view



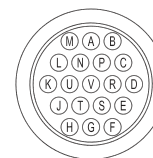
MD connector (10 pin)  
Amphenol MS3102-E-18-1P  
front view



HA connector (12 pin) - M23 CCW  
Hummel 7.410.000000 - 7.002.912.603  
front view



MA connector (19 pin)  
Amphenol 62IN 12E 14-19 P  
front view



ME connector (32 pin)  
Glenair IPT 02 A 18-32 P F6  
front view



**ELECTRICAL SPECIFICATIONS**

<b>Multiturn resolution</b>	12 / 14 / 15 bit please directly contact our offices for other pulses
<b>Singleturn resolution</b>	P = from 1 to 13 bit S = preferred combinations 12 multiturn / 13 singleturn 14 multiturn / 18 singleturn 15 multiturn / 25 singleturn please directly contact our offices for other pulses
<b>Power supply<sup>1</sup></b>	7,6 ... 30 V DC (reverse polarity protection)
<b>Power draw without load</b>	< 1 W
<b>Max load current</b>	20 mA / channel
<b>Absolute electrical interface<sup>2</sup></b>	P = push pull (iC-DL) S = RS-422 (THVD1451 or similar)
<b>Incremental electrical interface<sup>2</sup></b>	L = HTL differential (AEIC-7272 or similar) P = Push-Pull (AEIC-7272 or similar) RS = RS-422 (AELT-5000 or similar)
<b>Max incremental output frequency</b>	128 kHz
<b>Auxiliary inputs (U/D - RESET - LATCH)</b>	active high (+V DC) connect to 0 V if not used / RESET - LATCH t <sub>min</sub> 150 ms
<b>Max frequency</b>	50 kHz LSB (Bit Parallel) clock input 100 kHz ... 1 MHz (SSI)
<b>Code type</b>	binary or gray
<b>Logic</b>	SSI = positive Bit parallel = positive or negative
<b>SSI monostable time (T<sub>m</sub>)</b>	20 μs
<b>SSI pause time (T<sub>p</sub>)</b>	> 35 μs
<b>SSI frame</b>	tree format MSB ... LSB up to 12 bit multiturn = length 25 bit (12MT + 13ST) 14 bit multiturn = length 32 bit (14MT + 18ST) 15 bit multiturn = length 40 bit (15MT + 25ST)
<b>SSI status and parity bit</b>	on request
<b>Counting direction</b>	decreasing clockwise (shaft view)
<b>Start-up time</b>	700 ms
<b>Accuracy</b>	± 0,069°
<b>Mean time to dangerous failure (MTF<sub>d</sub>)<sup>3</sup> according to EN ISO 13849-1</b>	156 years with BIT PARALLEL output 186 years with SSI/INCREMENTAL output
<b>Mission time (T<sub>m</sub>)<sup>3</sup></b>	20 years
<b>Diagnostic coverage (DC)<sup>3</sup></b>	0%
<b>Cable type PC</b>	shielded - fixed installation conductors section 0,22 mm <sup>2</sup> / AWG 24 bending radius min 60 mm
<b>Cable type PD</b>	shielded - fixed installation conductors section 0,14 mm <sup>2</sup> / AWG 26 bending radius min 50 mm
<b>Cable type PE</b>	shielded - fixed installation conductors section 0,14 mm <sup>2</sup> / AWG 26 bending radius min 50 mm
<b>Electromagnetic compatibility</b>	according to 2014/30/EU directive
<b>RoHS</b>	according to 2011/65/EU directive
<b>UL / CSA</b>	file n. E212495

**ROTATION SPEED DERATING TABLE**

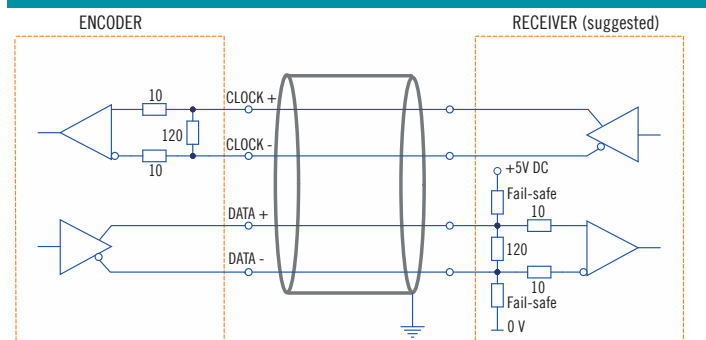
Temperature °C (°F)	Max speed (rpm)	Max continuous speed (rpm)
up to +70 (+158)	10000	8000
+70 ... +85 (+158 ... +185)	8000	5000
+85 ... +100 (+185 ... 212)	5000	3000

**MECHANICAL SPECIFICATIONS**

<b>Shaft diameter</b>	ø 6 / 9,52 (3/8") / 10 mm
<b>Enclosure rating IEC 60529</b>	X = IP 65 shaft side / IP67 cover side S = IP 67
<b>Max rotation speed</b>	see table
<b>Max shaft load<sup>4</sup></b>	200 N (45 lbs) axial / 70 N (15,74 lbs) radial
<b>Shock</b>	50 G, 11 ms (IEC 60068-2-27)
<b>Vibration</b>	10 G, 10 ... 2000 Hz (IEC 60068-2-6)
<b>Moment of inertia</b>	1,5 x 10 <sup>-6</sup> kgm <sup>2</sup> (36 x 10 <sup>-6</sup> lbf <sup>2</sup> )
<b>Starting torque (at +20°C / +68°F)</b>	< 0,03 Nm (4,25 Ozin)
<b>Bearing stage material</b>	aluminium
<b>Shaft material</b>	stainless steel
<b>Housing material</b>	painting aluminium
<b>Bearings</b>	n.2 ball bearings
<b>Bearings life</b>	10 <sup>9</sup> revolutions
<b>Operating temperature Bit parallel<sup>5, 6</sup></b>	-20° ... +85°C (-4 ... +185°F)
<b>Operating temperature SSI<sup>5, 6</sup></b>	-40° ... +100°C (-40° ... +212°F) -20° ... +100°C (-4° ... +212°F) with PC cable output -20° ... +85°C (-4° ... +185°F) with PD cable output -25° ... +85°C (-13° ... +185°F) with M12 connector
<b>Storage temperature<sup>6</sup></b>	-20° ... +85°C (-4° ... +185°F)
<b>Weight</b>	approx 300 g (10,58 oz)

<sup>1</sup> as measured at the transducer without cable influences  
<sup>2</sup> for further details refer to OUTPUT LEVELS on TECHNICAL BASICS section  
<sup>3</sup> this product is not a safety component, for further details refer to TECHNICAL BASICS section  
<sup>4</sup> maximum load for static usage  
<sup>5</sup> measured on the transducer flange  
<sup>6</sup> condensation not allowed

**SSI SCHEMATICS**



**BIT PARALLEL CONNECTOR OR CABLE CHOICE**

According to the resolution and the chosen number of turns is possible to calculate the connections required by the connector or the cable.  
See below examples:

<b>EXAMPLE 1</b> Singleturn = 8 bit = 8 connections Multiturn = 5 bit = 5 connections Total connections 13	<b>EXAMPLE 2</b> Singleturn = 12 bit = 12 connections Multiturn = 12 bit = 12 connections Total connections 24
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From 1 to 13 connections a 16 cores cable (PD) or a 19 pin connector (MA) is required.  
From 14 to 25 connections a 32 cores cable (PE) or a 32 pin connector (ME) is required.

With LATCH option a 32 cores cable (PE) or a 19 pin connector (MA) or a 32 pin connector (ME) is required.  
With RESET option a 32 cores cable (PE) or a 32 pin connector (ME) is required.



# EAMR 58 F - 63 F / G BIT PARALLEL - SSI

## BLIND HOLLOW SHAFT MULTITURN ABSOLUTE ENCODER



### MAIN FEATURES

Industry standard multiturn absolute encoder for factory automation applications.

- Optical sensor technology (proprietary OptoASIC + Energy Harvesting)
- Resolution up to 65 bit (25 bit single turn + 40 bit multiturn)
- Power supply up to +30 VDC with Bit Parallel or SSI as electrical interface
- Cable or connector output
- Blind hollow shaft up to 15 mm
- Mounting by stator coupling, torque stop slot or torque pin

### ORDERING CODE BIT PARALLEL

ORDERING CODE	EAMR	58F	12 / 12	G	8/30	P	P	X	15	X	MA	R	.162	+XXX
<b>SERIES</b>	multiturn absolute encoder <b>EAMR</b>													
<b>MODEL</b>	blind hollow shaft with stator coupling <b>58F</b> blind hollow shaft with torque stop slot <b>63F</b> blind hollow shaft with torque pin <b>63G</b>													
<b>MULTITURN RESOLUTION</b>	bit from 1 to 12													
<b>SINGLETURN RESOLUTION</b>	bit from 1 to 13													
<b>CODE TYPE</b>	binary <b>B</b> gray <b>G</b>													
<b>POWER SUPPLY</b>	8 ... 30 V DC <b>8/30</b>													
<b>ELECTRICAL INTERFACE</b>	push-pull <b>P</b>													
<b>LOGIC</b>	negative <b>N</b> positive <b>P</b>													
<b>OPTIONS</b>	to be reported if not used <b>X</b> latch with external input <b>L</b> reset with external input <b>ZE</b> latch / reset with external inputs <b>LZE</b>													
<b>BORE DIAMETER</b>	mm <b>14</b> mm <b>15</b> diameters (6 / 8 / 9,52 (3/8") / 10 / 11 / 12 mm) with optional shaft adapter, see Accessories													
<b>ENCLOSURE RATING</b>	IP 65 shaft side / IP67 cover side <b>X</b> IP 67 <b>S</b>													
<b>OUTPUT TYPE</b>	(up to 13 bit as total resolution, without reset option) 16 cores cable (standard length 1,5 m) <b>PD</b> (from 14 to 25 bit as total resolution or options) 32 cores cable (standard length 1,5 m) <b>PE</b> preferred cable lengths 2 / 3 / 5 / 10 m, to be added after DIRECTION TYPE (eg. PDR5) (up to 13 bit as total resolution, without reset option) 19 pin MIL plug connector <b>MA</b> (from 14 to 25 bit as total resolution) 32 pin MIL plug connector <b>ME</b>													
<b>DIRECTION TYPE</b>	radial <b>R</b>													
<b>SOCKET</b>	socket not included <b>.162</b> to be reported only with connector output (eg. MAR.162), for socket see Accessories													
<b>VARIANT</b>	custom version <b>+XXX</b>													

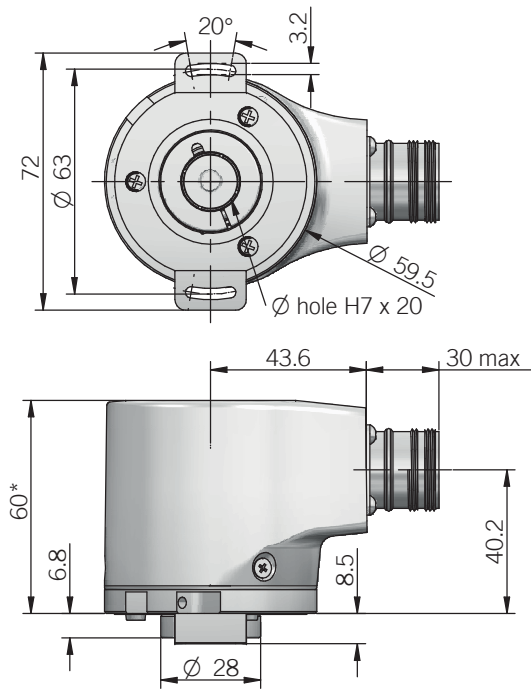
### ORDERING CODE SSI

ORDERING CODE	EAMR	58F	12 / 12	G	8/30	S	X	2048	RS	15	X	HA	R	.162	+XXX
<b>SERIES</b>	multiturn absolute encoder <b>EAMR</b>														
<b>MODEL</b>	blind hollow shaft with stator coupling <b>58F</b> blind hollow shaft with torque stop slot <b>63F</b> blind hollow shaft with torque pin <b>63G</b>														
<b>MULTITURN RESOLUTION</b>	bit 12 / 14 / 15 see table for preferred combinations														
<b>SINGLETURN RESOLUTION</b>	bit 13 / 18 / 25 see table for preferred combinations														
<b>CODE TYPE</b>	binary <b>B</b> gray <b>G</b>														
<b>POWER SUPPLY</b>	8 ... 30 V DC <b>8/30</b>														
<b>ELECTRICAL INTERFACE</b>	Serial Synchronous Interface - SSI <b>S</b>														
<b>OPTION</b>	to be reported if not used <b>X</b> reset with external input <b>ZE</b> reset on cover or with external input <b>ZP</b>														
<b>INCREMENTAL RESOLUTION</b>	(powers of 2) ppr from 128 to 8192														
<b>INCREMENTAL ELECTRICAL INTERFACE</b>	available with PD or HA output type line driver HTL <b>L</b> push pull <b>P</b> line driver RS-422 <b>RS</b>														
<b>BORE DIAMETER</b>	mm <b>14</b> mm <b>15</b> diameters 6 / 8 / 9,52 (3/8") / 10 / 11 / 12 mm with optional shaft adapter, see Accessories														
<b>ENCLOSURE RATING</b>	IP 65 shaft side / IP67 cover side <b>X</b> IP 67 <b>S</b>														
<b>OUTPUT TYPE</b>	cable (standard length 1,5 m) <b>PC</b> preferred cable lengths 2 / 3 / 5 / 10 m, to be added after DIRECTION TYPE (eg. PCR5) cable (standard length 1,5 m) <b>PD</b> preferred cable lengths 2 / 3 / 5 / 10 m, to be added after DIRECTION TYPE (eg. PCR5) (without reset option) 7 pin MIL plug connector <b>MC</b> (with reset option) 10 pin MIL plug connector <b>MD</b> 12 pin M23 plug connector <b>HA</b> 8 pin M12 plug connector <b>M12</b>														
<b>DIRECTION TYPE</b>	radial <b>R</b>														
<b>SOCKET</b>	socket not included <b>.162</b> to be reported only with connector output (eg. HAR.162), for socket see Accessories														
<b>VARIANT</b>	custom version <b>XXX</b>														

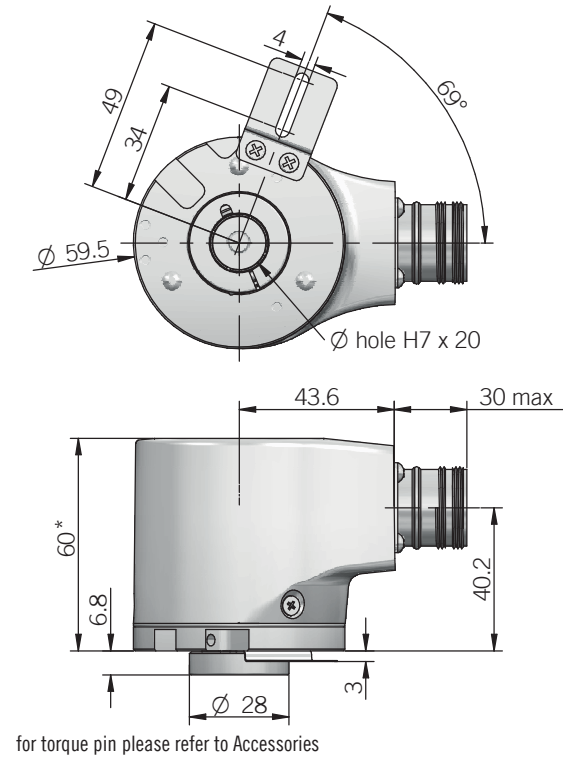
**2048** to be added with incremental output

**RS** to be reported only with connector output (eg. HAR.162), for socket see Accessories

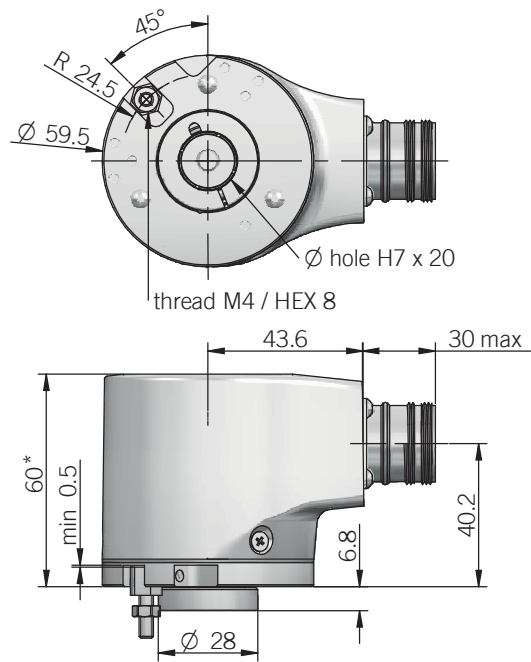
58F



63F



63G



torque pin is included  
\* with option ZP +1,5 mm  
recommended mating shaft tolerance g6  
dimensions in mm

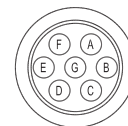
BIT PARALLEL CONNECTIONS

Function	Binary / Gray	Cable PD	Cable PE	19 pin MA	32 pin ME
bit 1 (LSB)	B <sup>0</sup> / G <sup>0</sup>	green	green	A	A
bit 2	B <sup>1</sup> / G <sup>1</sup>	yellow	yellow	B	B
bit 3	B <sup>2</sup> / G <sup>2</sup>	blue	blue	C	C
bit 4	B <sup>3</sup> / G <sup>3</sup>	brown	brown	D	D
bit 5	B <sup>4</sup> / G <sup>4</sup>	orange or pink	orange or pink	E	E
bit 6	B <sup>5</sup> / G <sup>5</sup>	white	white	F	F
bit 7	B <sup>6</sup> / G <sup>6</sup>	grey	grey	G	G
bit 8	B <sup>7</sup> / G <sup>7</sup>	purple	purple	H	H
bit 9	B <sup>8</sup> / G <sup>8</sup>	grey / pink	grey / pink	J	J
bit 10	B <sup>9</sup> / G <sup>9</sup>	white / green	white / green	K	K
bit 11	B <sup>10</sup> / G <sup>10</sup>	brown / green	brown / green	L	L
bit 12	B <sup>11</sup> / G <sup>11</sup>	white / yellow	white / yellow	M	M
bit 13	B <sup>12</sup> / G <sup>12</sup>	yellow / brown	yellow / brown	N	N
bit 14	B <sup>13</sup> / G <sup>13</sup>	/	white / grey	/	P
bit 15	B <sup>14</sup> / G <sup>14</sup>	/	grey / brown	/	R
bit 16	B <sup>15</sup> / G <sup>15</sup>	/	white / pink	/	S
bit 17	B <sup>16</sup> / G <sup>16</sup>	/	pink / brown	/	T
bit 18	B <sup>17</sup> / G <sup>17</sup>	/	white / blue	/	U
bit 19	B <sup>18</sup> / G <sup>18</sup>	/	brown / blue	/	V
bit 20	B <sup>19</sup> / G <sup>19</sup>	/	white / red	/	W
bit 21	B <sup>20</sup> / G <sup>20</sup>	/	brown / red	/	X
bit 22	B <sup>21</sup> / G <sup>21</sup>	/	white / black	/	Y
bit 23	B <sup>22</sup> / G <sup>22</sup>	/	brown / black	/	Z
bit 24	B <sup>23</sup> / G <sup>23</sup>	/	grey / green	/	a
bit 25	B <sup>24</sup> / G <sup>24</sup>	/	yellow / pink	/	b
LATCH	/	/	yellow / grey	R	e
0 V	/	black	black	T	j
U / D	/	red / blue	red / blue	U	g
RESET	/	/	pink / green	/	f
+ V DC	/	red	red	V	h
⏏	/	shield	shield	S	housing

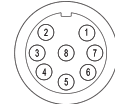
SSI CONNECTIONS

Function	Cable PC	Cable PD	7 pin MC	10 pin MD	12 pin HA	12 pin HA	8 pin M12
+ V DC	red	red	G	G	8	8	8
0 V	black	black	F	F	1	1	5
DATA +	green	green	C	C	2	2	3
DATA -	brown	brown	D	D	10	10	2
CLOCK +	yellow	yellow	A	A	3	3	4
CLOCK -	orange or pink	orange or pink	B	B	11	11	6
A+	/	grey	/	/	/	6	/
A-	/	blue	/	/	/	7	/
B+	/	purple	/	/	/	9	/
B-	/	white / green	/	/	/	12	/
U / D	red / blue	red / blue	E	E	5	5	7
RESET	white	white	/	H	4	4	1
⏏	shield	shield	housing	housing	9	housing	housing

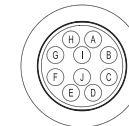
MC connector (7 pin)  
Amphenol MS3102-E-16-S  
front view



M12 connector (8 pin)  
M12 A coded  
front view



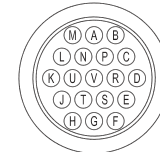
MD connector (10 pin)  
Amphenol MS3102-E-18-1P  
front view



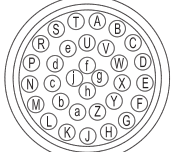
HA connector (12 pin) - M23 CCW  
Hummel 7.410.000000 - 7.002.912.603  
front view



MA connector (19 pin)  
Amphenol 62IN 12E 14-19 P  
front view



ME connector (32 pin)  
Glennair IPT 02 A 18-32 P F6  
front view



**ELECTRICAL SPECIFICATIONS**

<b>Multiturn resolution</b>	12 / 14 / 15 bit please directly contact our offices for other pulses
<b>Singleturn resolution</b>	P = from 1 to 13 bit S = preferred combinations 12 multiturn / 13 singleturn 14 multiturn / 18 singleturn 15 multiturn / 25 singleturn please directly contact our offices for other pulses
<b>Power supply<sup>1</sup></b>	7,6 ... 30 V DC (reverse polarity protection)
<b>Power draw without load</b>	< 1 W
<b>Max load current</b>	20 mA / channel
<b>Absolute electrical interface<sup>2</sup></b>	P = push pull (iC-DL) S = RS-422 (THVD1451 or similar)
<b>Incremental electrical interface<sup>2</sup></b>	L = HTL differential (AEIC-7272 or similar) P = Push-Pull (AEIC-7272 or similar) RS = RS-422 (AELT-5000 or similar)
<b>Max incremental output frequency</b>	128 kHz
<b>Auxiliary inputs (U/D - RESET - LATCH)</b>	active high (+V DC) connect to 0 V if not used / RESET - LATCH t <sub>min</sub> 150 ms
<b>Max frequency</b>	50 kHz LSB (Bit Parallel) clock input 100 kHz ... 1 MHz (SSI)
<b>Code type</b>	binary or gray
<b>Logic</b>	SSI = positive Bit parallel = positive or negative
<b>SSI monostable time (Tm)</b>	20 μs
<b>SSI pause time (Tp)</b>	> 35 μs
<b>SSI frame</b>	tree format MSB ... LSB up to 12 bit multiturn = length 25 bit (12MT + 13ST) 14 bit multiturn = length 32 bit (14MT + 18ST) 15 bit multiturn = length 40 bit (15MT + 25ST)
<b>SSI status and parity bit</b>	on request
<b>Counting direction</b>	decreasing clockwise (shaft view)
<b>Start-up time</b>	700 ms
<b>Accuracy</b>	± 0,069°
<b>Mean time to dangerous failure (MTTF<sub>d</sub>)<sup>3</sup> according to EN ISO 13849-1</b>	156 years with BIT PARALLEL output 186 years with SSI/INCREMENTAL output
<b>Mission time (Tm)<sup>3</sup></b>	20 years
<b>Diagnostic coverage (DC)<sup>3</sup></b>	0%
<b>Cable type PC</b>	shielded - fixed installation conductors section 0,22 mm <sup>2</sup> / AWG 24 bending radius min 60 mm
<b>Cable type PD</b>	shielded - fixed installation conductors section 0,14 mm <sup>2</sup> / AWG 26 bending radius min 50 mm
<b>Cable type PE</b>	shielded - fixed installation conductors section 0,14 mm <sup>2</sup> / AWG 26 bending radius min 50 mm
<b>Electromagnetic compatibility</b>	according to 2014/30/EU directive
<b>RoHS</b>	according to 2011/65/EU directive
<b>UL / CSA</b>	file n. E212495

**ROTATION SPEED DERATING TABLE**

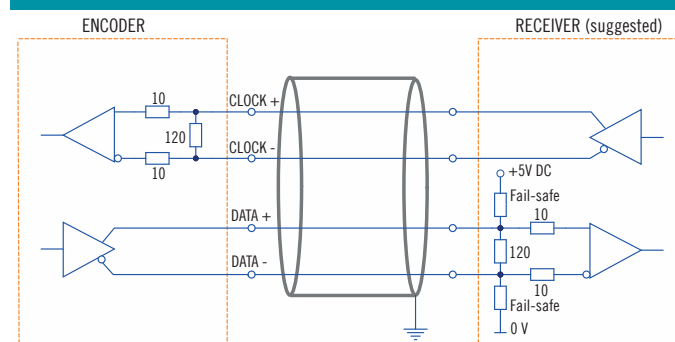
	Temperature °C (°F)	Max speed (rpm)	Max continuous speed (rpm)
IP65	up to +70 (+158)	9000	6000
	+70 ... 85 (+158 ... +185)	6000	3000
IP67	up to +70 (+158)	8000	6000
	+70 ... 85 (+158 ... +185)	4000	2000

**MECHANICAL SPECIFICATIONS**

<b>Bore diameter</b>	ø 14 / 15 mm ø 6 / 8* / 9,52 (3/8")* / 10* / 11* / 12* mm * with optional shaft adapter, please refer to Accessories
<b>Enclosure rating IEC 60529</b>	X = IP 65 shaft side / IP67 cover side S = IP 67
<b>Max rotation speed</b>	see table
<b>Max shaft load<sup>4</sup></b>	200 N (45 lbs) axial / 60 N (13,49 lbs) radial
<b>Shock</b>	50 G, 11 ms (IEC 60068-2-27)
<b>Vibration</b>	10 G, 10 ... 2000 Hz (IEC 60068-2-6)
<b>Moment of inertia</b>	5 x 10 <sup>-6</sup> kgm <sup>2</sup> (119 x 10 <sup>-6</sup> lbft <sup>2</sup> )
<b>Starting torque (at +20°C / +68°F)</b>	< 0,03 Nm (4,25 Ozin)
<b>Bearing stage material</b>	aluminum
<b>Shaft material</b>	stainless steel
<b>Housing material</b>	painted aluminium
<b>Bearings</b>	n.2 ball bearings
<b>Bearings life</b>	10 <sup>9</sup> revolutions
<b>Operating temperature Bit parallel<sup>5,6</sup></b>	-20° ... +85°C (-4° ... +185°F)
<b>Operating temperature SSI<sup>5,6</sup></b>	-40° ... +85°C (-40° ... +185°F) -20° ... +85°C (-4° ... +185°F) with cable output -25° ... +85°C (-13° ... +185°F) with M12 connector
<b>Storage temperature<sup>6</sup></b>	-20° ... +85°C (-4° ... +185°F)
<b>Weight</b>	approx 350 g (12,35 oz)

<sup>1</sup> as measured at the transducer without cable influences  
<sup>2</sup> for further details refer to OUTPUT LEVELS on TECHNICAL BASICS section  
<sup>3</sup> this product is not a safety component, for further details refer to TECHNICAL BASICS section  
<sup>4</sup> maximum load for static usage  
<sup>5</sup> measured on the transducer flange  
<sup>6</sup> condensation not allowed

**SSI SCHEMATICS**



**BIT PARALLEL CONNECTOR OR CABLE CHOICE**

According to the resolution and the chosen number of turns is possible to calculate the connections required by the connector or the cable. See below examples:

**EXAMPLE 1**  
 Singleturn = 8 bit = 8 connections  
 Multiturn = 5 bit = 5 connections  
 Total connections 13

**EXAMPLE 2**  
 Singleturn = 12 bit = 12 connections  
 Multiturn = 12 bit = 12 connections  
 Total connections 24

From 1 to 13 connections a 16 cores cable (PD) or a 19 pin connector (MA) is required.  
 From 14 to 25 connections a 32 cores cable (PE) or a 32 pin connector (ME) is required.

With LATCH option a 32 cores cable (PE) or a 19 pin connector (MA) or a 32 pin connector (ME) is required.  
 With RESET option a 32 cores cable (PE) or a 32 pin connector (ME) is required.



# EAMR 90 - 115 A BIT PARALLEL - SSI SOLID SHAFT MULTITURN ABSOLUTE ENCODER



## MAIN FEATURES

Industry standard multiturn absolute encoder for factory automation applications.

- Optical sensor technology (proprietary OptoASIC + Energy Harvesting)
- Resolution up to 65 bit (25 bit single turn + 40 bit multiturn)
- Power supply up to +30 VDC with Bit Parallel or SSI as electrical interface
- Cable or connector output
- Solid shaft diameter up to 11 mm
- Mounting by synchronous or REO-444 flange

EAMR	90A	12 / 12	G	8/30	P	P	X	10	X	MA	R	.162	+XXX
<p><b>SERIES</b> multiturn absolute encoder <b>EAMR</b></p> <p><b>MODEL</b> synchronous flange ø 40 mm <b>90A</b> REO-444 flange <b>115A</b></p> <p><b>MULTITURN RESOLUTION</b> bit from 1 to 12</p> <p><b>SINGLETURN RESOLUTION</b> bit from 1 to 13</p> <p><b>CODE TYPE</b> binary <b>B</b> gray <b>G</b></p> <p><b>POWER SUPPLY</b> 8 ... 30 V DC <b>8/30</b></p> <p><b>ELECTRICAL INTERFACE</b> push-pull <b>P</b></p> <p><b>LOGIC</b> negative <b>N</b> positive <b>P</b></p> <p><b>OPTIONS</b> to be reported if not used <b>X</b> latch with external input <b>L</b> reset with external input <b>ZE</b> latch / reset with external inputs <b>LZE</b></p> <p><b>SHAFT DIAMETER</b> (mod. 90) 3/8" - mm <b>9,52</b> mm <b>10</b> (mod. 115) mm <b>11</b></p> <p><b>ENCLOSURE RATING</b> IP 65 shaft side / IP67 cover side <b>X</b> IP 67 <b>S</b></p> <p><b>OUTPUT TYPE</b> (up to 13 bit as total resolution, without reset option) 16 cores cable (standard length 1,5 m) <b>PD</b> (from 14 to 25 bit as total resolution or options) 32 cores cable (standard length 1,5 m) <b>PE</b> preferred cable lengths 2 / 3 / 5 / 10 m, to be added after DIRECTION TYPE (eg. PDR5)</p> <p>(up to 13 bit as total resolution, without reset option) 19 pin MIL plug connector <b>MA</b> (from 14 to 25 bit as total resolution) 32 pin MIL plug connector <b>ME</b></p> <p><b>DIRECTION TYPE</b> radial <b>R</b></p> <p><b>SOCKET</b> socket not included <b>.162</b> to be reported only with connector output (eg. MAR.162), for socket see Accessories</p> <p><b>VARIANT</b> custom version <b>XXX</b></p>													

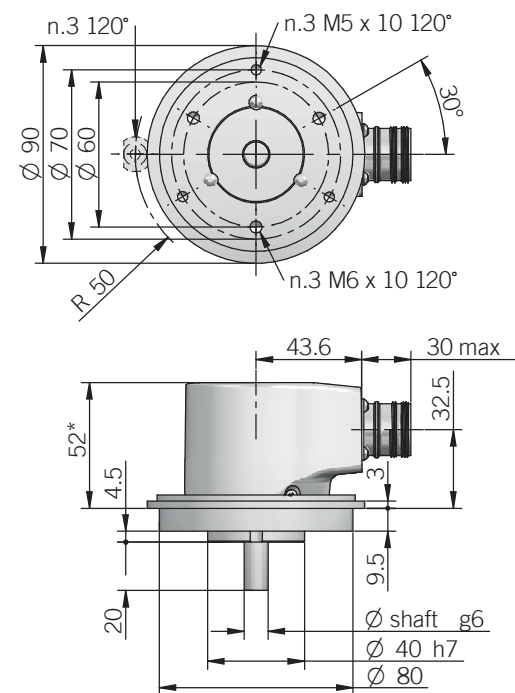
ORDERING CODE SSI	EAMR	90A	12 / 13	G	8/30	S	X	2048	RS	10	X	HA	R	.162	+XXX
<p><b>SERIES</b> multiturn absolute encoder <b>EAMR</b></p> <p><b>MODEL</b> synchronous flange ø 40 mm <b>90A</b> REO-444 flange <b>115A</b></p> <p><b>MULTITURN RESOLUTION</b> bit 12 / 14 / 15 see table for preferred combinations</p> <p><b>SINGLETURN RESOLUTION</b> bit 13 / 18 / 25 see table for preferred combinations</p> <p><b>CODE TYPE</b> binary <b>B</b> gray <b>G</b></p> <p><b>POWER SUPPLY</b> 8 ... 30 V DC <b>8/30</b></p> <p><b>ELECTRICAL INTERFACE</b> Serial Synchronous Interface - SSI <b>S</b></p> <p><b>OPTION</b> to be reported if not used <b>X</b> reset with external input <b>ZE</b> reset on cover or with external input <b>ZP</b></p> <p><b>INCREMENTAL RESOLUTION</b> (powers of 2) ppr from 128 to 8192</p> <p><b>INCREMENTAL ELECTRICAL INTERFACE</b> available with PD or HA output type line driver HTL <b>L</b> push pull <b>P</b> line driver RS-422 <b>RS</b></p> <p><b>SHAFT DIAMETER</b> (mod. 90) 3/8" - mm <b>9,52</b> mm <b>10</b> (mod. 115) mm <b>11</b></p> <p><b>ENCLOSURE RATING</b> IP 65 shaft side / IP67 cover side <b>X</b> IP 67 <b>S</b></p> <p><b>OUTPUT TYPE</b> cable (standard length 1,5 m) <b>PC</b> preferred cable lengths 2 / 3 / 5 / 10 m, to be added after DIRECTION TYPE (eg. PCR5)</p> <p>(without reset option) 7 pin MIL plug connector <b>MC</b> (with reset option) 10 pin MIL plug connector <b>MD</b> 12 pin M23 plug connector <b>HA</b> 8 pin M12 plug connector <b>M12</b></p> <p><b>DIRECTION TYPE</b> radial <b>R</b></p> <p><b>SOCKET</b> socket not included <b>.162</b> to be reported only with connector output (eg. HAR.162), for socket see Accessories</p> <p><b>VARIANT</b> custom version <b>XXX</b></p>															

to be added with incremental output

to be reported only with connector output (eg. HAR.162), for socket see Accessories

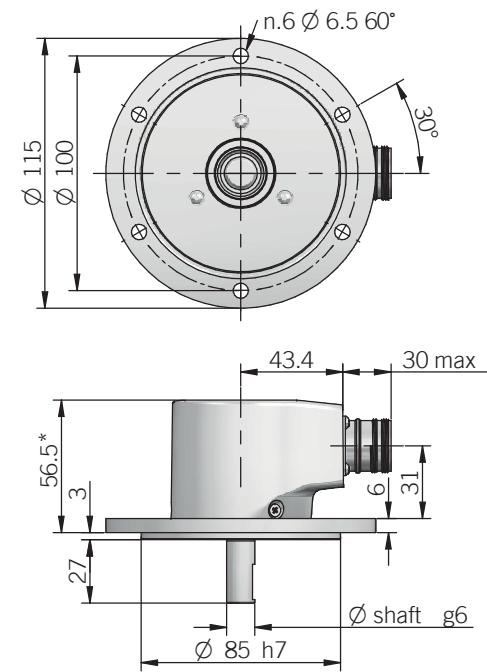


90A



for fixing clamps please refer to Accessories  
\* with option ZP +1,5 mm  
recommended mating shaft tolerance H7  
dimensions in mm

115A



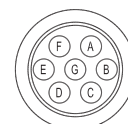
BIT PARALLEL CONNECTIONS

Function	Binary / Gray	Cable PD	Cable PE	19 pin MA	32 pin ME
bit 1 (LSB)	B <sup>0</sup> / G <sup>0</sup>	green	green	A	A
bit 2	B <sup>1</sup> / G <sup>1</sup>	yellow	yellow	B	B
bit 3	B <sup>2</sup> / G <sup>2</sup>	blue	blue	C	C
bit 4	B <sup>3</sup> / G <sup>3</sup>	brown	brown	D	D
bit 5	B <sup>4</sup> / G <sup>4</sup>	orange or pink	orange or pink	E	E
bit 6	B <sup>5</sup> / G <sup>5</sup>	white	white	F	F
bit 7	B <sup>6</sup> / G <sup>6</sup>	grey	grey	G	G
bit 8	B <sup>7</sup> / G <sup>7</sup>	purple	purple	H	H
bit 9	B <sup>8</sup> / G <sup>8</sup>	grey / pink	grey / pink	J	J
bit 10	B <sup>9</sup> / G <sup>9</sup>	white / green	white / green	K	K
bit 11	B <sup>10</sup> / G <sup>10</sup>	brown / green	brown / green	L	L
bit 12	B <sup>11</sup> / G <sup>11</sup>	white / yellow	white / yellow	M	M
bit 13	B <sup>12</sup> / G <sup>12</sup>	yellow / brown	yellow / brown	N	N
bit 14	B <sup>13</sup> / G <sup>13</sup>	/	white / grey	/	P
bit 15	B <sup>14</sup> / G <sup>14</sup>	/	grey / brown	/	R
bit 16	B <sup>15</sup> / G <sup>15</sup>	/	white / pink	/	S
bit 17	B <sup>16</sup> / G <sup>16</sup>	/	pink / brown	/	T
bit 18	B <sup>17</sup> / G <sup>17</sup>	/	white / blue	/	U
bit 19	B <sup>18</sup> / G <sup>18</sup>	/	brown / blue	/	V
bit 20	B <sup>19</sup> / G <sup>19</sup>	/	white / red	/	W
bit 21	B <sup>20</sup> / G <sup>20</sup>	/	brown / red	/	X
bit 22	B <sup>21</sup> / G <sup>21</sup>	/	white / black	/	Y
bit 23	B <sup>22</sup> / G <sup>22</sup>	/	brown / black	/	Z
bit 24	B <sup>23</sup> / G <sup>23</sup>	/	grey / green	/	a
bit 25	B <sup>24</sup> / G <sup>24</sup>	/	yellow / pink	/	b
LATCH	/	/	yellow / grey	R	e
0 V	/	black	black	T	j
U / D	/	red / blue	red / blue	U	g
RESET	/	/	pink / green	/	f
+ V DC	/	red	red	V	h
⏏	/	shield	shield	S	housing

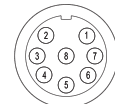
SSI CONNECTIONS

Function	Cable PC	Cable PD	7 pin MC	10 pin MD	12 pin HA	12 pin HA	8 pin M12
+ V DC	red	red	G	G	8	8	8
0 V	black	black	F	F	1	1	5
DATA +	green	green	C	C	2	2	3
DATA -	brown	brown	D	D	10	10	2
CLOCK +	yellow	yellow	A	A	3	3	4
CLOCK -	orange or pink	orange or pink	B	B	11	11	6
A+	/	grey	/	/	/	6	/
A-	/	blue	/	/	/	7	/
B+	/	purple	/	/	/	9	/
B-	/	white / green	/	/	/	12	/
U / D	red / blue	red / blue	E	E	5	5	7
RESET	white	white	/	H	4	4	1
⏏	shield	shield	housing	housing	9	housing	housing

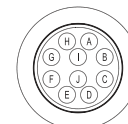
MC connector (7 pin)  
Amphenol MS3102-E-16-S  
front view



M12 connector (8 pin)  
M12 A coded  
front view



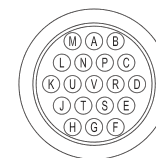
MD connector (10 pin)  
Amphenol MS3102-E-18-1P  
front view



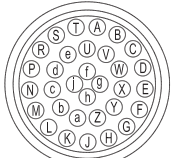
HA connector (12 pin) - M23 CCW  
Hummel 7.410.000000 - 7.002.912.603  
front view



MA connector (19 pin)  
Amphenol 62IN 12E 14-19 P  
front view



ME connector (32 pin)  
Glenair IPT 02 A 18-32 P F6  
front view



**ELECTRICAL SPECIFICATIONS**

<b>Multiturn resolution</b>	12 / 14 / 15 bit please directly contact our offices for other pulses
<b>Singleturn resolution</b>	P = from 1 to 13 bit S = preferred combinations 12 multiturn / 13 singleturn 14 multiturn / 18 singleturn 15 multiturn / 25 singleturn please directly contact our offices for other pulses
<b>Power supply<sup>1</sup></b>	7,6 ... 30 V DC (reverse polarity protection)
<b>Power draw without load</b>	< 1 W
<b>Max load current</b>	20 mA / channel
<b>Absolute electrical interface<sup>2</sup></b>	P = push pull (iC-DL) S = RS-422 (THVD1451 or similar)
<b>Incremental electrical interface<sup>2</sup></b>	L = HTL differential (AEIC-7272 or similar) P = Push-Pull (AEIC-7272 or similar) RS = RS-422 (AELT-5000 or similar)
<b>Max incremental output frequency</b>	128 kHz
<b>Auxiliary inputs (U/D - RESET - LATCH)</b>	active high (+V DC) connect to 0 V if not used / RESET - LATCH t <sub>min</sub> 150 ms
<b>Max frequency</b>	50 kHz LSB (Bit Parallel) clock input 100 kHz ... 1 MHz (SSI)
<b>Code type</b>	binary or gray
<b>Logic</b>	SSI = positive Bit parallel = positive or negative
<b>SSI monostable time (Tm)</b>	20 μs
<b>SSI pause time (Tp)</b>	> 35 μs
<b>SSI frame</b>	tree format MSB ... LSB up to 12 bit multiturn = length 25 bit (12MT + 13ST) 14 bit multiturn = length 32 bit (14MT + 18ST) 15 bit multiturn = length 40 bit (15MT + 25ST)
<b>SSI status and parity bit</b>	on request
<b>Counting direction</b>	decreasing clockwise (shaft view)
<b>Start-up time</b>	700 ms
<b>Accuracy</b>	± 0,069°
<b>Mean time to dangerous failure (MTTF<sub>a</sub>)<sup>3</sup> according to EN ISO 13849-1</b>	156 years with BIT PARALLEL output 186 years with SSI/INCREMENTAL output
<b>Mission time (Tm)<sup>3</sup></b>	20 years
<b>Diagnostic coverage (DC)<sup>3</sup></b>	0%
<b>Cable type PC</b>	shielded - fixed installation conductors section 0,22 mm <sup>2</sup> / AWG 24 bending radius min 60 mm
<b>Cable type PD</b>	shielded - fixed installation conductors section 0,14 mm <sup>2</sup> / AWG 26 bending radius min 50 mm
<b>Cable type PE</b>	shielded - fixed installation conductors section 0,14 mm <sup>2</sup> / AWG 26 bending radius min 50 mm
<b>Electromagnetic compatibility</b>	according to 2014/30/EU directive
<b>RoHS</b>	according to 2011/65/EU directive
<b>UL / CSA</b>	file n. E212495

**ROTATION SPEED DERATING TABLE**

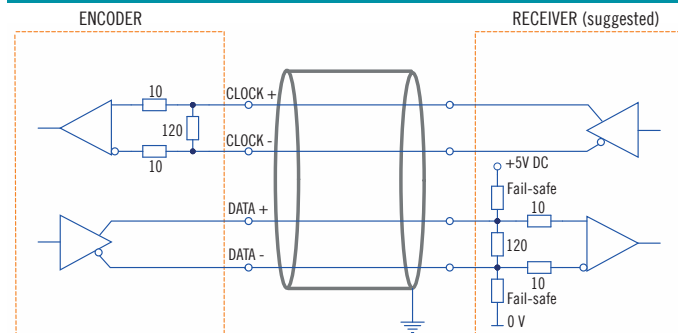
Temperature °C (°F)	Max speed (rpm)	Max continuous speed (rpm)
up to +70 (+158)	10000	8000
+70 ... +85 (+158 ... +185)	8000	5000
+85 ... +100 (+185 ... 212)	5000	3000

**MECHANICAL SPECIFICATIONS**

<b>Shaft diameter</b>	ø 9,52 (3/8") / 10 / 11 mm
<b>Enclosure rating IEC 60529</b>	X = IP 65 shaft side / IP67 cover side S = IP 67
<b>Max rotation speed</b>	see table
<b>Max shaft load<sup>4</sup></b>	200 N (45 lbs) axial / 70 N (15,74 lbs) radial
<b>Shock</b>	50 G, 11 ms (IEC 60068-2-27)
<b>Vibration</b>	10 G, 10 ... 2000 Hz (IEC 60068-2-6)
<b>Moment of inertia</b>	1,5 x 10 <sup>-6</sup> kgm <sup>2</sup> (36 x 10 <sup>-6</sup> lbf <sup>2</sup> )
<b>Starting torque (at +20°C / +68°F)</b>	< 0,03 Nm (4,25 Ozin)
<b>Bearing stage material</b>	aluminium
<b>Shaft material</b>	stainless steel
<b>Housing material</b>	painted aluminium
<b>Bearings</b>	n.2 ball bearings
<b>Bearings life</b>	10 <sup>9</sup> revolutions
<b>Operating temperature Bit parallel<sup>5,6</sup></b>	-20° ... +85°C (-4 ... +185°F)
<b>Operating temperature SSI<sup>5,6</sup></b>	-40° ... +100°C (-40° ... +212°F) -20° ... +100°C (-4° ... +212°F) with PC cable output -20° ... +85°C (-4° ... +185°F) with PD cable output -25° ... +85°C (-13° ... +185°F) with M12 connector
<b>Storage temperature<sup>6</sup></b>	-20° ... +85°C (-4° ... +185°F)
<b>Weight</b>	approx 350 g (12,35 oz)

<sup>1</sup> as measured at the transducer without cable influences  
<sup>2</sup> for further details refer to OUTPUT LEVELS on TECHNICAL BASICS section  
<sup>3</sup> this product is not a safety component, for further details refer to TECHNICAL BASICS section  
<sup>4</sup> maximum load for static usage  
<sup>5</sup> measured on the transducer flange  
<sup>6</sup> condensation not allowed

**SSI SCHEMATICS**



**BIT PARALLEL CONNECTOR OR CABLE CHOICE**

According to the resolution and the chosen number of turns is possible to calculate the connections required by the connector or the cable. See below examples:

<b>EXAMPLE 1</b> Singleturn = 8 bit = 8 connections Multiturn = 5 bit = 5 connections Total connections 13	<b>EXAMPLE 2</b> Singleturn = 12 bit = 12 connections Multiturn = 12 bit = 12 connections Total connections 24
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From 1 to 13 connections a 16 cores cable (PD) or a 19 pin connector (MA) is required.  
From 14 to 25 connections a 32 cores cable (PE) or a 32 pin connector (ME) is required.

With LATCH option a 32 cores cable (PE) or a 19 pin connector (MA) or a 32 pin connector (ME) is required.  
With RESET option a 32 cores cable (PE) or a 32 pin connector (ME) is required.

**MAIN FEATURES**

Industry standard multiturn absolute encoder for factory automation applications.

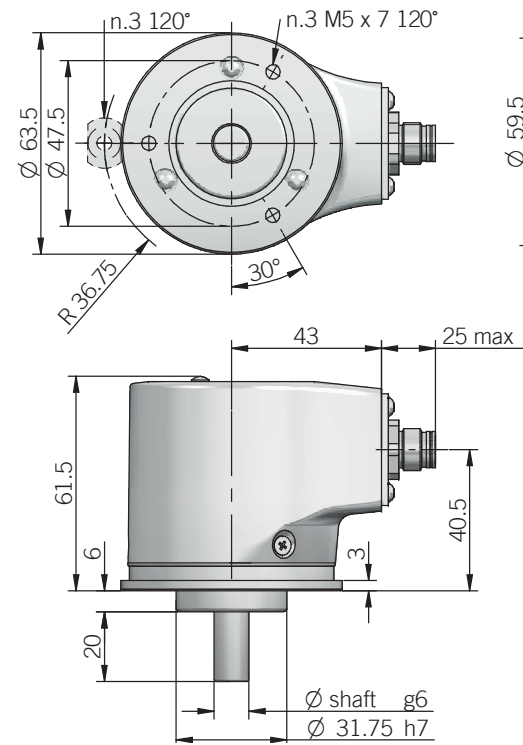
- Optical sensor technology (OptoASIC + Energy Harvesting)
- Programmable measuring range via teach-in function (external inputs or cover button)
- Power supply up to +30 VDC with analogue (voltage or current) electrical interface
- Cable or M12 connector output
- Solid shaft diameter up to 10 mm
- Mounting by synchronous, clamping or centering 2,5" square flange



**ORDERING CODE** EAML 63A 16B 12/30 V 05 X 10 X M12 R .162 +XXX

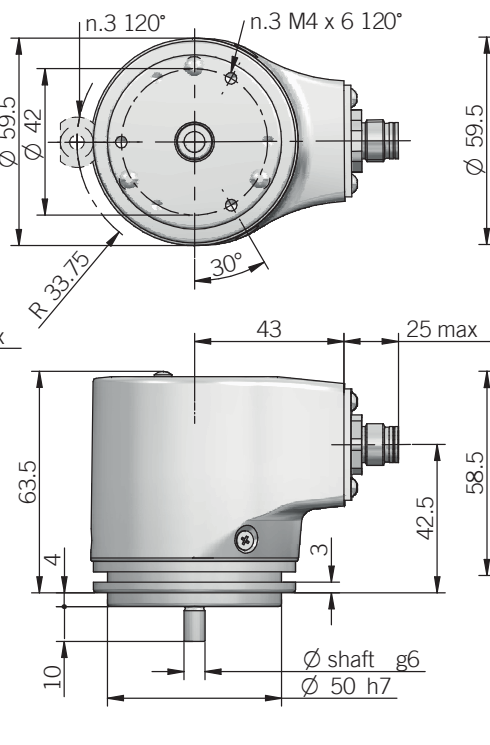
<b>SERIES</b> analogue multiturn absolute encoder EAML	<b>MODEL</b> synchronous flange ø 31.75 mm 63A synchronous flange ø 50 mm 58B clamping flange ø 36 mm 58C centering square flange ø 31.75 mm 63D centering square flange ø 50 mm 63E	<b>OUTPUT DAC RESOLUTION</b> 16 bit 16B	<b>POWER SUPPLY</b> 12 ... 30 V DC 12/30	<b>ELECTRICAL INTERFACE</b> voltage V current I	<b>OUTPUT RANGE</b> 0 ... 5 V 05 0 ... 10 V 010 0 ... 20 mA 020 4 ... 20 mA 420	<b>OPTIONS</b> to be reported with voltage output / 3 wires current output X 4 wires current output Q	<b>SHAFT DIAMETER</b> (mod. 58 B) mm 6 (mod. 63 A / D) 3/8" - mm 9,52 (mod. 58 C - 63 A / D / E) mm 10	<b>ENCLOSURE RATING</b> IP 65 shaft side / IP67 cover side X IP 67 S	<b>OUTPUT TYPE</b> cable (standard length 1,5 m) P preferred cable lengths 2 / 3 / 5 / 10 m, to be added after DIRECTION TYPE (eg. PR5) M12 plug connector M12	<b>DIRECTION TYPE</b> radial R	<b>SOCKET</b> socket not included .162 to be reported only with connector output (eg. M12R.162), for socket see Accessories	<b>VARIANT</b> custom version XXX
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63A



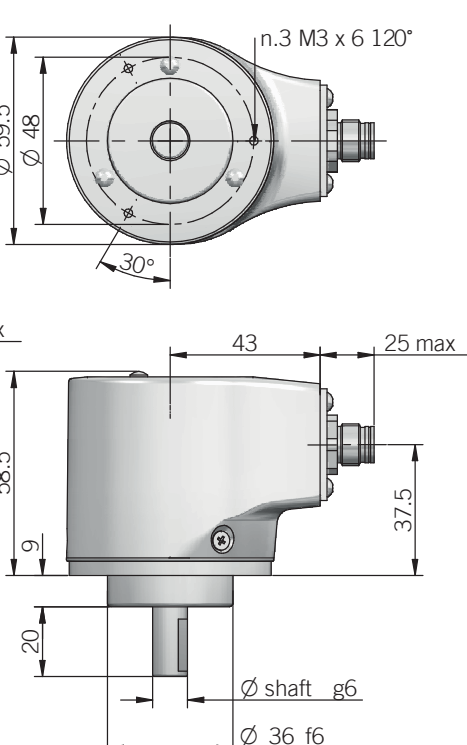
for fixing clamps please refer to Accessories

58B

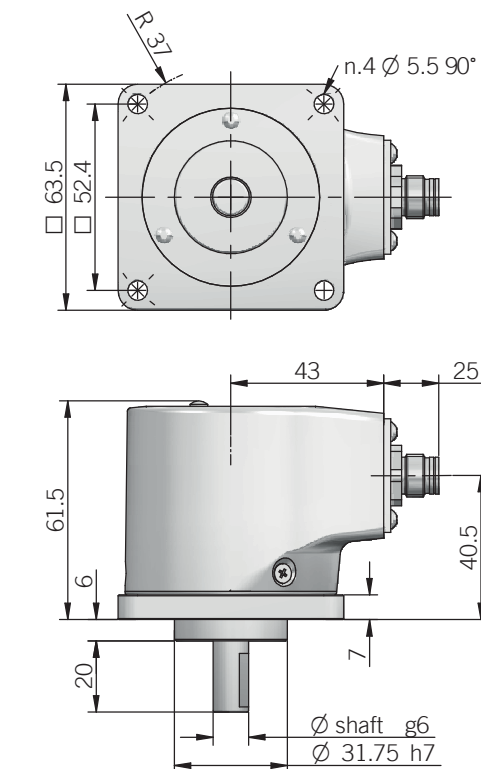


for fixing clamps please refer to Accessories

58C

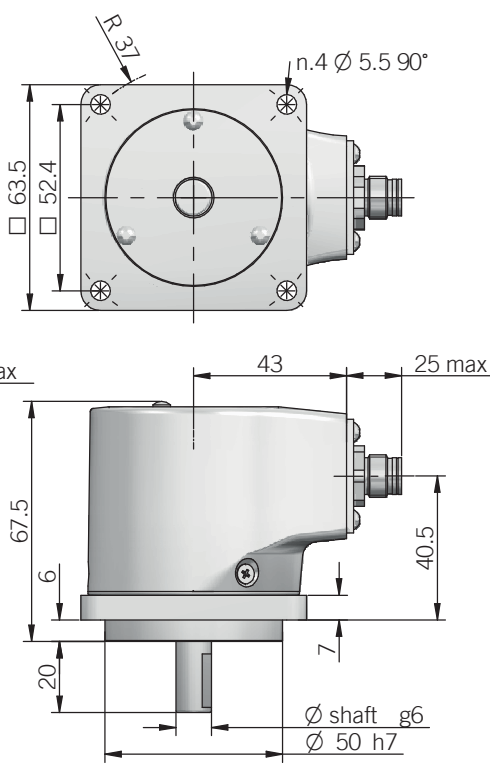


63D



recommended mating shaft tolerance H7  
dimensions in mm

63E

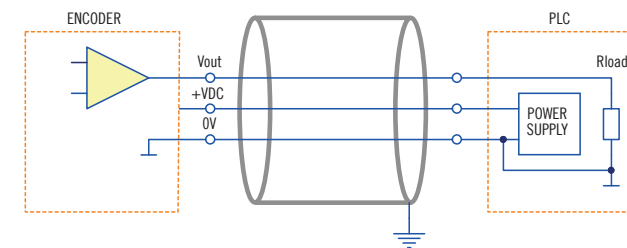


ELECTRICAL SPECIFICATIONS

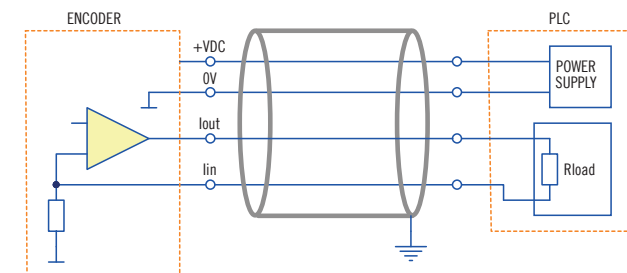
Multiturn resolution	16 bit max
Singleturn resolution	16 bit max
Output DAC resolution	16 bit
Minimum angle	22,5°
Power supply <sup>1</sup>	11,4 ... 30 V DC (reverse polarity protection)
Power draw without load	< 1 W
Electrical interface <sup>2</sup>	voltage (0 ... 5 V / 0 ... 10 V) current (0 ... 20 mA / 4 ... 20 mA)
Auxiliary inputs (BEGIN - END)	active high (+V DC) connect to 0 V if not used / t <sub>min</sub> 150 ms
Load	R <sub>min</sub> = 1 kΩ (voltage output) R <sub>max</sub> = (V DC - 2) / 0,02 (current output)
Output update frequency	16 kHz
Signal pattern	auto teaching according to commissioning
Start-up time	700 ms
Linearity error	± 0,069°
Mean time to dangerous failure (MTTF <sub>d</sub> ) <sup>3</sup> according to EN ISO 13849-1	186 years
Mission time (Tm) <sup>3</sup>	20 years
Diagnostic coverage (DC) <sup>3</sup>	0%
Cable type	shielded - fixed installation conductors section 0,22 mm <sup>2</sup> / AWG 24 bending radius min 60 mm
Electromagnetic compatibility	according to 2014/30/EU directive
RoHS	according to 2011/65/EU directive
UL / CSA	file n. E212495

ELECTRICAL INTERFACE

VOLTAGE OUTPUT



CURRENT OUTPUT



3 / 4 wire source  
with 3 wires interface Iin is internally connected to 0V

MECHANICAL SPECIFICATIONS

Shaft diameter	∅ 6 / 9,52 (3/8") / 10 mm
Enclosure rating IEC 60529	X = IP 65 shaft side / IP67 cover side S = IP 67
Max rotation speed	see table
Max shaft load <sup>4</sup>	200 N (45 lbs) axial / 70 N (15,74 lbs) radial
Shock	50 G, 11 ms (IEC 60068-2-27)
Vibration	10 G, 10 ... 2000 Hz (IEC 60068-2-6)
Moment of inertia	1,5 x 10 <sup>-6</sup> kgm <sup>2</sup> (36 x 10 <sup>-6</sup> lbf <sup>2</sup> )
Starting torque (at +20°C / +68°F)	< 0,03 Nm (4,25 Ozin)
Bearing stage material	aluminum
Shaft material	stainless steel
Housing material	painted aluminium
Bearings	n.2 ball bearings
Bearings life	10 <sup>9</sup> revolutions
Operating temperature <sup>5,6</sup>	-20° ... +85°C (-4 ... +185°F)
Storage temperature <sup>6</sup>	-20° ... +85°C (-4 ... +185°F)
Weight	approx 350 g (12,35 oz)

<sup>1</sup> as measured at the transducer without cable influences  
<sup>2</sup> for further details refer to OUTPUT LEVELS on TECHNICAL BASICS section  
<sup>3</sup> this product is not a safety component, for further details refer to TECHNICAL BASICS section  
<sup>4</sup> maximum load for static usage  
<sup>5</sup> measured on the transducer flange  
<sup>6</sup> condensation not allowed

ROTATION SPEED / TEMPERATURE TABLE

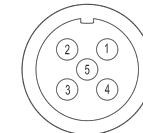
Temperature °C (°F)	Max speed (rpm)	Max continuous speed (rpm)
up to +70 (+158)	10000	8000
+70 ... +85 (+158 ... +185)	8000	5000

CONNECTIONS

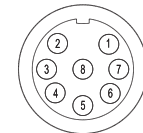
Function	Cable	5 pin M12	8 pin M12*
+ V DC	red	2	2
0 V	black	3	3
V <sub>out</sub> / I <sub>out</sub>	green	1	1
I <sub>in</sub>	yellow	/	6
BEGIN	white	4	4
END	brown or grey	5	5
≡	shield	housing	housing

\* with Q current output

M12 connector (5 pin)  
M12 A coded  
front view



M12 connector (8 pin)  
M12 A coded  
front view



# EAML 58 F - 63 F / G ANALOGUE

## BLIND HOLLOW SHAFT MULTITURN ABSOLUTE ENCODER



### MAIN FEATURES

Industry standard multiturn absolute encoder for factory automation applications.

- Optical sensor technology (OptoASIC + Energy Harvesting)
- Programmable measuring range via teach-in function (external inputs or cover button)
- Power supply up to +30 VDC with analogue (voltage or current) electrical interface
- Cable or M12 connector output
- Blind hollow shaft up to 15 mm
- Mounting by stator coupling, torque stop slot or torque pin

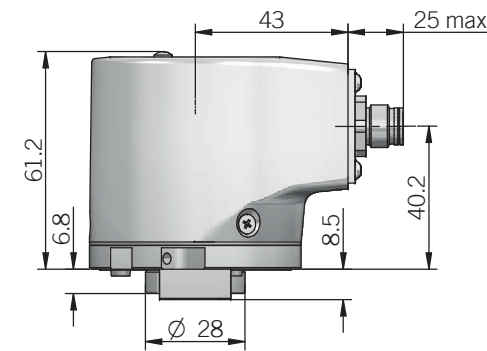
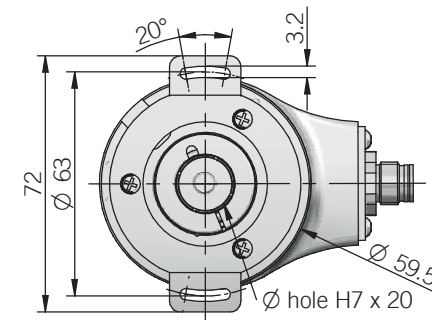


### ORDERING CODE

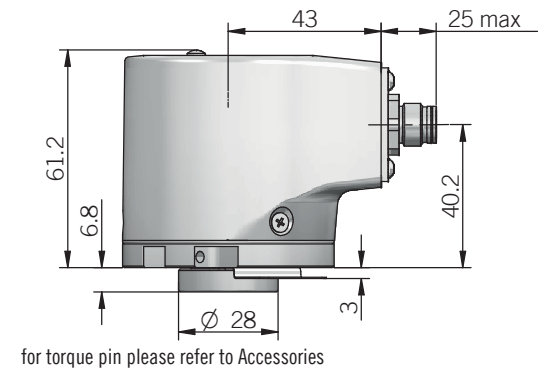
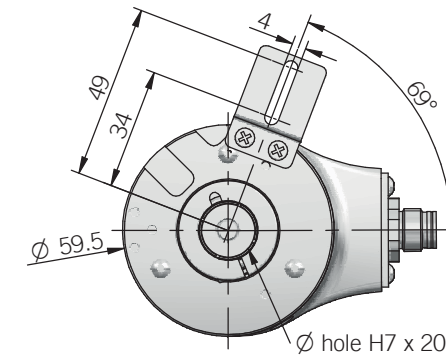
ORDERING CODE	EAML	58F	16B	12/30	V	05	X	15	X	M12	R	.162	+XXX
<b>SERIES</b>	analogue multiturn absolute encoder <b>EAML</b>												
<b>MODEL</b>	blind hollow shaft with stator coupling <b>58F</b> blind hollow shaft with torque stop slot <b>63F</b> blind hollow shaft with torque pin <b>63G</b>												
<b>OUTPUT DAC RESOLUTION</b>	16 bit <b>16B</b>												
<b>POWER SUPPLY</b>	12 ... 30 V DC <b>12/30</b>												
<b>ELECTRICAL INTERFACE</b>	voltage <b>V</b> current <b>I</b>												
<b>OUTPUT RANGE</b>	0 ... 5 V <b>05</b> 0 ... 10 V <b>010</b> 0 ... 20 mA <b>020</b> 4 ... 20 mA <b>420</b>												
<b>OPTIONS</b>	to be reported with voltage output / 3 wires current output <b>X</b> 4 wires current output <b>Q</b>												
<b>BORE DIAMETER</b>	mm <b>14</b> mm <b>15</b> diameters 6 / 8 / 9,52 (3/8") / 10 / 11 / 12 mm with optional shaft adapter, see Accessories												
<b>ENCLOSURE RATING</b>	IP 65 shaft side / IP67 cover side <b>X</b> IP 67 <b>S</b>												
<b>OUTPUT TYPE</b>	cable (standard length 1,5 m) <b>P</b> preferred cable lengths 2 / 3 / 5 / 10 m, to be added after DIRECTION TYPE (eg. PR5) M12 plug connector <b>M12</b>												
<b>DIRECTION TYPE</b>	radial <b>R</b>												
<b>SOCKET</b>	socket not included <b>.162</b> to be reported only with connector output (eg. M12R.162), for socket see Accessories												
<b>VARIANT</b>	custom version <b>XXX</b>												

## OPTICAL MULTITURN ABSOLUTE ENCODERS | EAML 58 F - 63 F / G ANALOGUE

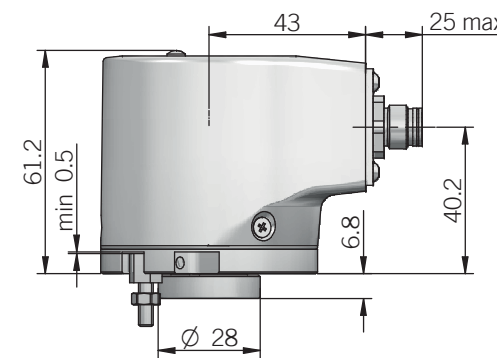
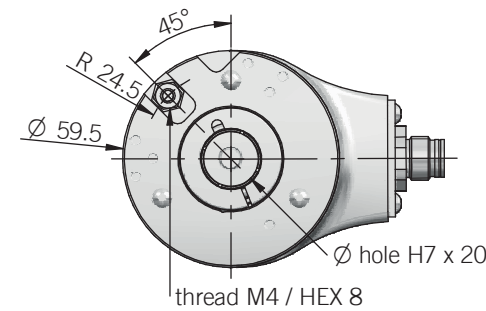
58F



63F



63G

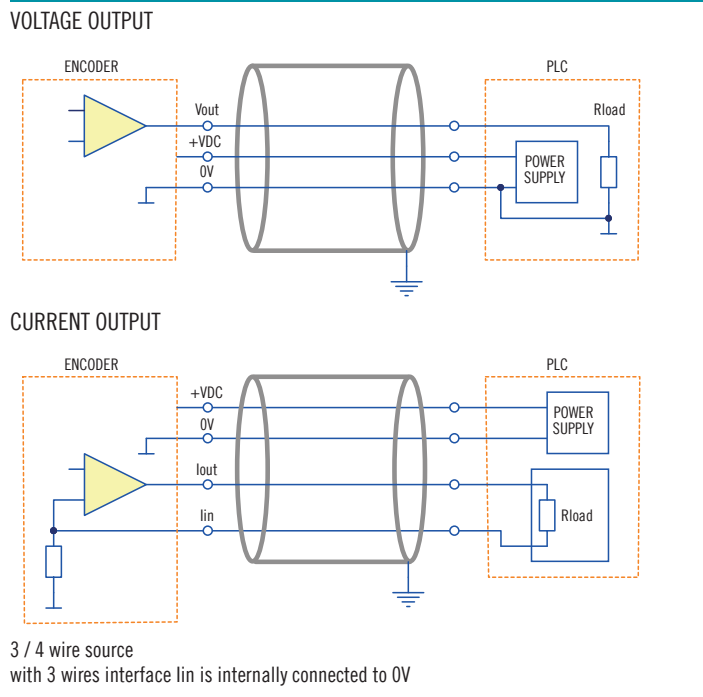


torque pin is included  
recommended mating shaft tolerance g6  
dimensions in mm

**ELECTRICAL SPECIFICATIONS**

<b>Multiturn resolution</b>	16 bit max
<b>Singleturn resolution</b>	16 bit max
<b>Output DAC resolution</b>	16 bit
<b>Minimum angle</b>	22,5°
<b>Power supply<sup>1</sup></b>	11,4 ... 30 V DC (reverse polarity protection)
<b>Power draw without load</b>	< 1 W
<b>Electrical interface<sup>2</sup></b>	voltage (0 ... 5 V / 0 ... 10 V) current (0 ... 20 mA / 4 ... 20 mA)
<b>Auxiliary inputs (BEGIN - END)</b>	active high (+V DC) connect to 0 V if not used / t <sub>min</sub> 150 ms
<b>Load</b>	R <sub>min</sub> = 1 kΩ (voltage output) R <sub>max</sub> = (V DC - 2) / 0,02 (current output)
<b>Output update frequency</b>	16 kHz
<b>Signal pattern</b>	auto teaching according to commissioning
<b>Start-up time</b>	700 ms
<b>Linearity error</b>	± 0,069°
<b>Mean time to dangerous failure (MTTF<sub>d</sub>)<sup>3</sup> according to EN ISO 13849-1</b>	186 years
<b>Mission time (Tm)<sup>3</sup></b>	20 years
<b>Diagnostic coverage (DC)<sup>3</sup></b>	0%
<b>Cable type</b>	shielded - fixed installation conductors section 0,22 mm <sup>2</sup> / AWG 24 bending radius min 60 mm
<b>Electromagnetic compatibility</b>	according to 2014/30/EU directive
<b>RoHS</b>	according to 2011/65/EU directive
<b>UL / CSA</b>	file n. E212495

**ELECTRICAL INTERFACE**



**MECHANICAL SPECIFICATIONS**

<b>Bore diameter</b>	∅ 14 / 15 mm ∅ 6 / 8* / 9,52 (3/8")* / 10* / 11* / 12* mm * with optional shaft adapter, please refer to Accessories
<b>Enclosure rating IEC 60529</b>	X = IP 65 shaft side / IP67 cover side S = IP 67
<b>Max rotation speed</b>	see table
<b>Max shaft load<sup>4</sup></b>	200 N (45 lbs) axial / 60 N (13,49 lbs) radial
<b>Shock</b>	50 G, 11 ms (IEC 60068-2-27)
<b>Vibration</b>	10 G, 10 ... 2000 Hz (IEC 60068-2-6)
<b>Moment of inertia</b>	5 x 10 <sup>-6</sup> kgm <sup>2</sup> (119 x 10 <sup>-6</sup> lbft <sup>2</sup> )
<b>Starting torque (at +20°C / +68°F)</b>	< 0,03 Nm (4,25 Ozin)
<b>Bearing stage material</b>	aluminum
<b>Shaft material</b>	stainless steel
<b>Housing material</b>	painting aluminium
<b>Bearings</b>	n.2 ball bearings
<b>Bearings life</b>	10 <sup>9</sup> revolutions
<b>Operating temperature<sup>5,6</sup></b>	-20° ... +85°C (-4° ... +185°F)
<b>Storage temperature<sup>6</sup></b>	-20° ... +85°C (-4° ... +185°F)
<b>Weight</b>	approx 350 g (12,35 oz)

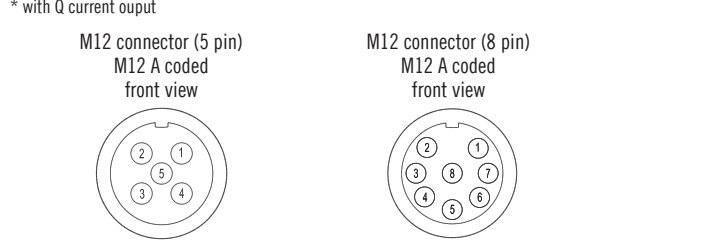
<sup>1</sup> as measured at the transducer without cable influences  
<sup>2</sup> for further details refer to OUTPUT LEVELS on TECHNICAL BASICS section  
<sup>3</sup> this product is not a safety component, for further details refer to TECHNICAL BASICS section  
<sup>4</sup> maximum load for static usage  
<sup>5</sup> measured on the transducer flange  
<sup>6</sup> condensation not allowed

**ROTATION SPEED / TEMPERATURE TABLE**

Temperature °C (°F)	Max speed (rpm)	Max continuous speed (rpm)
up to +70 (+158)	10000	8000
+70 ... +85 (+158 ... +185)	8000	5000

**CONNECTIONS**

Function	Cable	5 pin M12	8 pin M12*
+ V DC	red	2	2
0 V	black	3	3
V <sub>out</sub> / I <sub>out</sub>	green	1	1
I <sub>in</sub>	yellow	/	6
BEGIN	white	4	4
END	brown or grey	5	5
⊥	shield	housing	housing



**MAIN FEATURES**

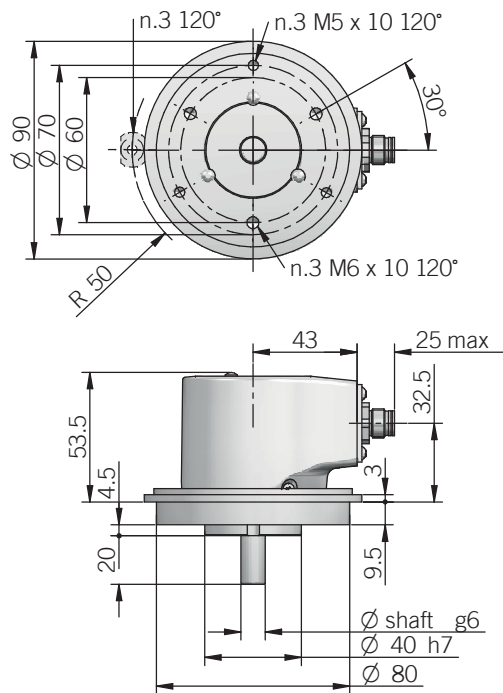
- Industry standard multiturn absolute encoder for factory automation applications.
- Optical sensor technology (OptoASIC + Energy Harvesting)
- Programmable measuring range via teach-in function (external inputs or cover button)
- Power supply up to +30 VDC with analogue (voltage or current) electrical interface
- Cable or M12 connector output
- Solid shaft diameter up to 11 mm
- Mounting by synchronous or REO-444 flange



**ORDERING CODE** EAML 90A 16B 12/30 V 05 X 10 X M12 R .162 +XXX

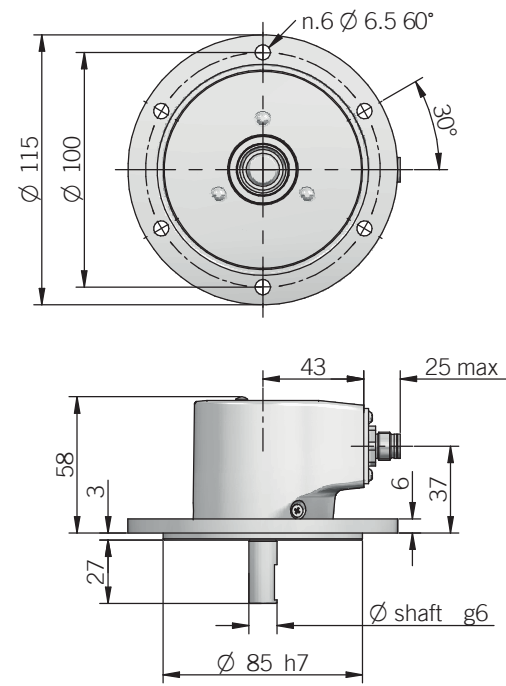
<b>SERIES</b>	analogue multiturn absolute encoder EAML
<b>MODEL</b>	synchronous flange ∅ 40 mm 90A REO-444 flange 115A
<b>OUTPUT DAC RESOLUTION</b>	16 bit 16B
<b>POWER SUPPLY</b>	12 ... 30 V DC 12/30
<b>ELECTRICAL INTERFACE</b>	voltage V current I
<b>OUTPUT RANGE</b>	0 ... 5 V 05 0 ... 10 V 010 0 ... 20 mA 020 4 ... 20 mA 420
<b>OPTIONS</b>	to be reported with voltage output / 3 wires current output X 4 wires current output Q
<b>SHAFT DIAMETER</b>	(mod. 90) 3/8" - mm 9,52 mm 10 (mod. 115) mm 11
<b>ENCLOSURE RATING</b>	IP 65 shaft side / IP67 cover side X IP 67 S
<b>OUTPUT TYPE</b>	cable (standard length 1,5 m) P preferred cable lengths 2 / 3 / 5 / 10 m, to be added after DIRECTION TYPE (eg. PR5) M12 plug connector M12
<b>DIRECTION TYPE</b>	radial R
<b>SOCKET</b>	socket not included .162
<b>VARIANT</b>	to be reported only with connector output (eg. M12R.162), for socket see Accessories custom version XXX

90A



for fixing clamps please refer to Accessories  
recommended mating shaft tolerance H7  
dimensions in mm

115A

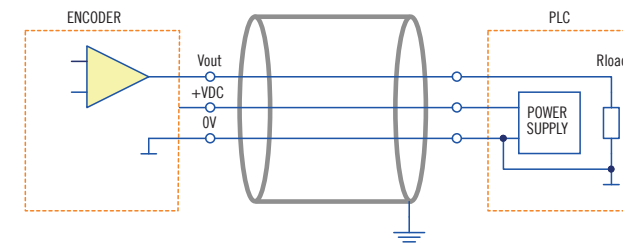


ELECTRICAL SPECIFICATIONS

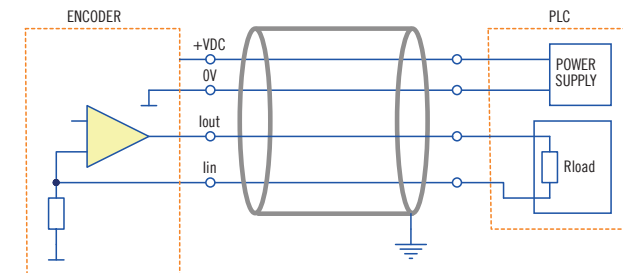
Multiturn resolution	16 bit max
Singleturn resolution	16 bit max
Output DAC resolution	16 bit
Minimum angle	22,5°
Power supply <sup>1</sup>	11,4 ... 30 V DC (reverse polarity protection)
Power draw without load	< 1 W
Electrical interface <sup>2</sup>	voltage (0 ... 5 V / 0 ... 10 V) current (0 ... 20 mA / 4 ... 20 mA)
Auxiliary inputs (BEGIN - END)	active high (+V DC) connect to 0 V if not used / t <sub>min</sub> 150 ms
Load	R <sub>min</sub> = 1 kΩ (voltage output) R <sub>max</sub> = (V DC - 2) / 0,02 (current output)
Output update frequency	16 kHz
Signal pattern	auto teaching according to commissioning
Start-up time	700 ms
Linearity error	± 0,069°
Mean time to dangerous failure (MTTF <sub>d</sub> ) <sup>3</sup> according to EN ISO 13849-1	186 years
Mission time (Tm) <sup>3</sup>	20 years
Diagnostic coverage (DC) <sup>3</sup>	0%
Cable type	shielded - fixed installation conductors section 0,22 mm <sup>2</sup> / AWG 24 bending radius min 60 mm
Electromagnetic compatibility	according to 2014/30/EU directive
RoHS	according to 2011/65/EU directive
UL / CSA	file n. E212495

ELECTRICAL INTERFACE

VOLTAGE OUTPUT



CURRENT OUTPUT



3 / 4 wire source  
with 3 wires interface I<sub>in</sub> is internally connected to 0V

MECHANICAL SPECIFICATIONS

Shaft diameter	∅ 9,52 (3/8") / 10 / 11 mm
Enclosure rating IEC 60529	X = IP 65 shaft side / IP67 cover side S = IP 67
Max rotation speed	see table
Max shaft load <sup>4</sup>	200 N (45 lbs) axial / 70 N (15,74 lbs) radial
Shock	50 G, 11 ms (IEC 60068-2-27)
Vibration	10 G, 10 ... 2000 Hz (IEC 60068-2-6)
Moment of inertia	1,5 x 10 <sup>-6</sup> kgm <sup>2</sup> (36 x 10 <sup>-6</sup> lbf <sup>2</sup> )
Starting torque (at +20°C / +68°F)	< 0,03 Nm (4,25 Ozin)
Bearing stage material	aluminum
Shaft material	stainless steel
Housing material	painted aluminium
Bearings	n.2 ball bearings
Bearings life	10 <sup>9</sup> revolutions
Operating temperature <sup>5,6</sup>	-20° ... +85°C (-4 ... +185°F)
Storage temperature <sup>6</sup>	-20° ... +85°C (-4 ... +185°F)
Weight	approx 350 g (12,35 oz)

<sup>1</sup> as measured at the transducer without cable influences  
<sup>2</sup> for further details refer to OUTPUT LEVELS on TECHNICAL BASICS section  
<sup>3</sup> this product is not a safety component, for further details refer to TECHNICAL BASICS section  
<sup>4</sup> maximum load for static usage  
<sup>5</sup> measured on the transducer flange  
<sup>6</sup> condensation not allowed

ROTATION SPEED / TEMPERATURE TABLE

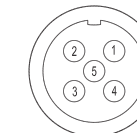
Temperature °C (°F)	Max speed (rpm)	Max continuous speed (rpm)
up to +70 (+158)	10000	8000
+70 ... +85 (+158 ... +185)	8000	5000

CONNECTIONS

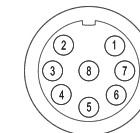
Function	Cable	5 pin M12	8 pin M12*
+ V DC	red	2	2
0 V	black	3	3
V <sub>out</sub> / I <sub>out</sub>	green	1	1
I <sub>in</sub>	yellow	/	6
BEGIN	white	4	4
END	brown or grey	5	5
⊥	shield	housing	housing

\* with Q current output

M12 connector (5 pin)  
M12 A coded front view



M12 connector (8 pin)  
M12 A coded front view



# EAM 58 B / C - 63 A / D / E PROFIBUS

## SOLID SHAFT MULTITURN ABSOLUTE ENCODER



### MAIN FEATURES

Industry standard multiturn absolute encoder for factory automation applications.

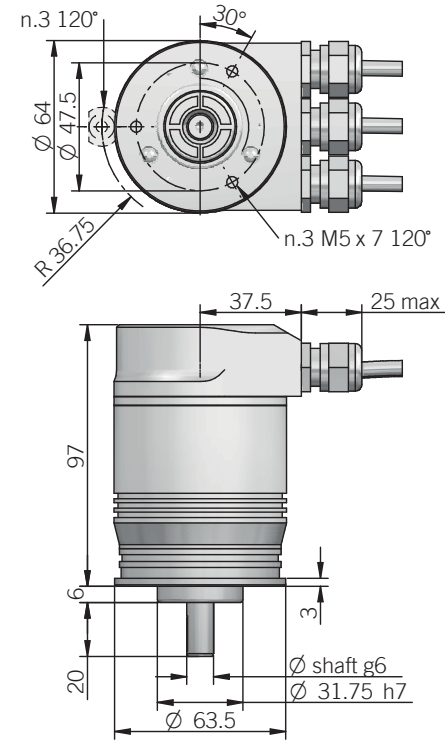
- Optical sensor technology (OptoASIC + gears)
- 25 bit total resolution (13 bit single turn (8192 ppr) + 12 bit multiturn (4096 turns))
- Power supply up to +28 V DC with Profibus DP as electrical interface
- Intelligent status leds
- Terminal box or M12 connector for fast setup
- Solid shaft diameter up to 10 mm
- Mounting by synchronous, clamping or centering 2,5" square flange



**ORDERING CODE**      **EAM**    **63A**    **R**    **4096 / 4096**    **B**    **12/28**    **FXX**    **10**    **X**    **6**    **M12R**    **.162**    **+XXX**

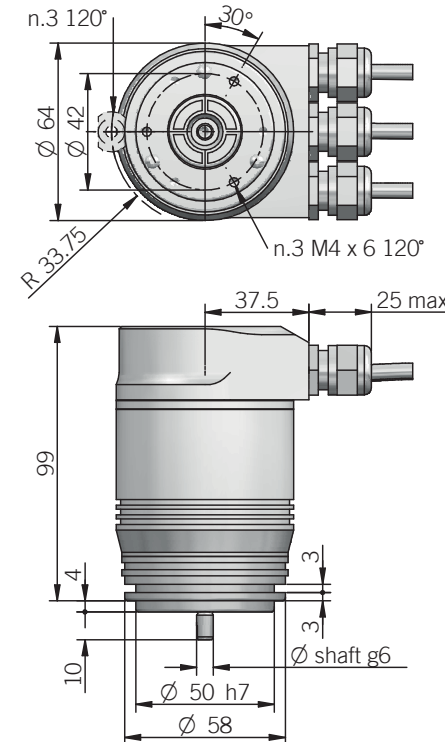
<b>SERIES</b> multiturn absolute encoder <b>EAM</b>	<b>MODEL</b> synchronous flange $\varnothing$ 31.75 mm <b>63A</b> synchronous flange $\varnothing$ 50 mm <b>58B</b> clamping flange $\varnothing$ 36 mm <b>58C</b> centering square flange $\varnothing$ 31.75 mm <b>63D</b> centering square flange $\varnothing$ 50 mm <b>63E</b>	<b>rev. 2.0 R</b>	<b>MULTITURN RESOLUTION</b> turns <b>4096</b>	<b>SINGLETURN RESOLUTION</b> ppr <b>4096 / 8192</b>	<b>CODE TYPE</b> binary <b>B</b>	<b>POWER SUPPLY</b> 12 ... 28 V DC <b>12/28</b>	<b>ELECTRICAL INTERFACE</b> PROFIBUS DP V0 CLASS 2 <b>FXX</b>	<b>SHAFT DIAMETER</b> (mod. 58 B) mm <b>6</b> (mod. 63 A / D) (3/8") 9,52 mm <b>9</b> (mod. 58 C - 63 A / D / E) mm <b>10</b>	<b>ENCLOSURE RATING</b> IP 54 <b>X</b> IP 66 <b>S</b>	<b>MAX ROTATION SPEED</b> (IP 66) 3000 rpm <b>3</b> (IP 54) 6000 rpm <b>6</b>	<b>OUTPUT TYPE</b> terminal box - radial cable glands <b>P3R</b> radial M12 connectors <b>M12R</b>	<b>SOCKETS</b> sockets not included <b>.162</b> to be reported only with connectors output (eg. M12R.162), for sockets see Accessories	<b>VARIANT</b> custom version <b>XXX</b>
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**63A**



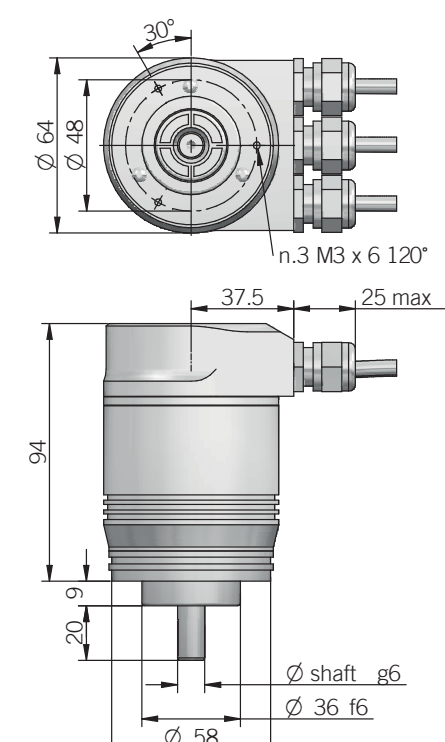
fixing clamps not included, please refer to Accessories

**58B**

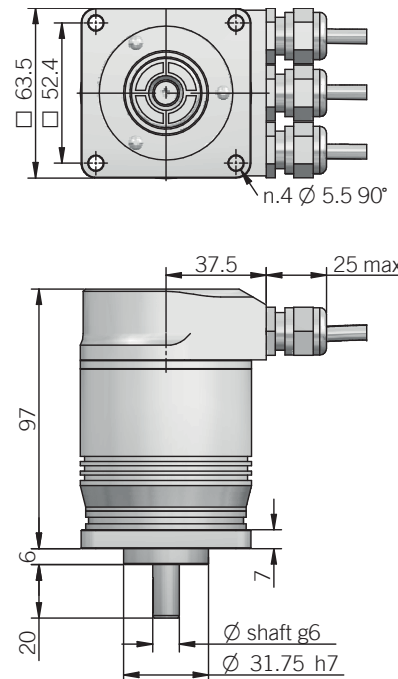


fixing clamps not included, please refer to Accessories

**58C**

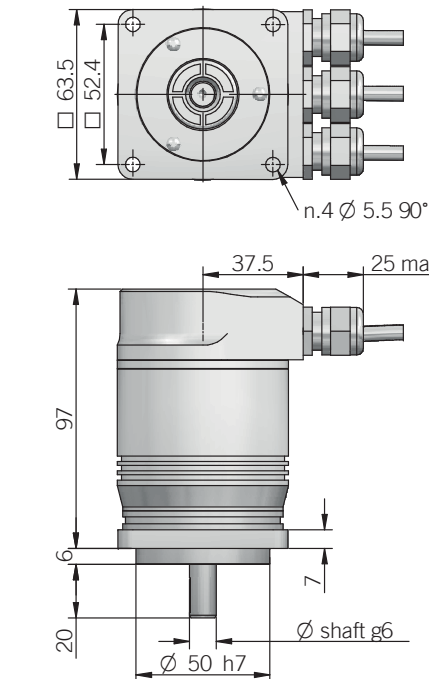


**63D**



recommended mating shaft tolerance H7  
dimensions in mm

**63E**



**ELECTRICAL SPECIFICATIONS**

<b>Multiturn resolution</b>	1 ... 4096 turns programmable during commissioning
<b>Singleturn resolution</b>	2 ... 4096 / 2 ... 8192 ppr programmable during commissioning
<b>Power supply<sup>1</sup></b>	11,4 ... 29,4 V DC (reverse polarity protection)
<b>Current consumption without load</b>	300 mA
<b>Electrical interface<sup>2</sup></b>	RS 485 galvanically isolated
<b>Max bus frequency</b>	12 Mbaud
<b>Diagnostic features</b>	frequency warning position warning / alarm please refer to installation manual for more informations
<b>Max frequency</b>	max 25 kHz LSB
<b>Code type</b>	binary
<b>Counting direction</b>	programmable during commissioning
<b>Start-up time</b>	500 ms
<b>Accuracy</b>	± 1/2 LSB
<b>Mean time to dangerous failure (MTTF<sub>d</sub>)<sup>3</sup> according to EN ISO 13849-1</b>	years
<b>Mission time (Tm)<sup>3</sup></b>	20 years
<b>Diagnostic coverage (DC)<sup>3</sup></b>	0%
<b>Electromagnetic compatibility</b>	according to 2014/30/EU directive
<b>RoHS</b>	according to 2011/65/EU directive
<b>UL / CSA</b>	file n. E212495

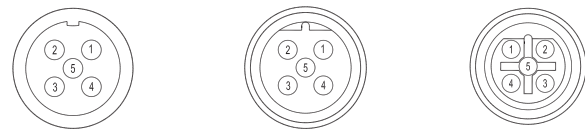
**CONNECTIONS**

Function	POWER	BUS OUT	BUS IN
+ V DC	2		
0 V	4		
A		2	
B		4	
A			2
B			4

POWER connector (5 pin) M12 A coded view solder side FV

BUS OUT - socket (5 pin) M12 B coded front view

BUS IN - plug (5 pin) M12 B coded solder side view MV



**MECHANICAL SPECIFICATIONS**

<b>Shaft diameter</b>	ø 6 / 9,52 (3/8") / 10 mm
<b>Enclosure rating IEC 60529</b>	X = IP 54 S = IP 66
<b>Max rotation speed</b>	6000 rpm with X enclosure rating 3000 rpm with S enclosure rating
<b>Max shaft load<sup>4</sup></b>	10 N (2,25 lbs) axial with ø 6 mm shaft 20 N (4,45 lbs) radial with ø 6 mm shaft 100 N (22,48 lbs) axial / radial
<b>Shock</b>	50 G, 11 ms (IEC 60068-2-27)
<b>Vibration</b>	10 G, 10 ... 2000 Hz (IEC 60068-2-6)
<b>Moment of inertia</b>	1,5 x 10 <sup>-6</sup> kgm <sup>2</sup> (36 x 10 <sup>-6</sup> lbf <sup>2</sup> )
<b>Starting torque (at +20°C / +68°F)</b>	< 0,02 Nm (2,83 Ozin) with X enclosure rating < 0,06 Nm (8,50 Ozin) with S enclosure rating
<b>Bearing stage material</b>	aluminium
<b>Shaft material</b>	stainless steel
<b>Housing material</b>	painted aluminium
<b>Bearings</b>	n.2 ball bearings
<b>Bearings life</b>	10 <sup>9</sup> revolutions
<b>Operating temperature<sup>5,6</sup></b>	0° ... +60°C (+32° ... +140°F)
<b>Storage temperature<sup>6</sup></b>	-15° ... +70°C (+5° ... +158°F)
<b>Weight</b>	650 g (22,93 oz)

<sup>1</sup> as measured at the transducer without cable influences  
<sup>2</sup> for further details refer to OUTPUT LEVELS on TECHNICAL BASICS section  
<sup>3</sup> this product is not a safety component, for further details refer to TECHNICAL BASICS section  
<sup>4</sup> maximum load for static usage  
<sup>5</sup> measured on the transducer flange  
<sup>6</sup> condensation not allowed

**MAIN FEATURES**

Industry standard multiturn absolute encoder for factory automation applications.

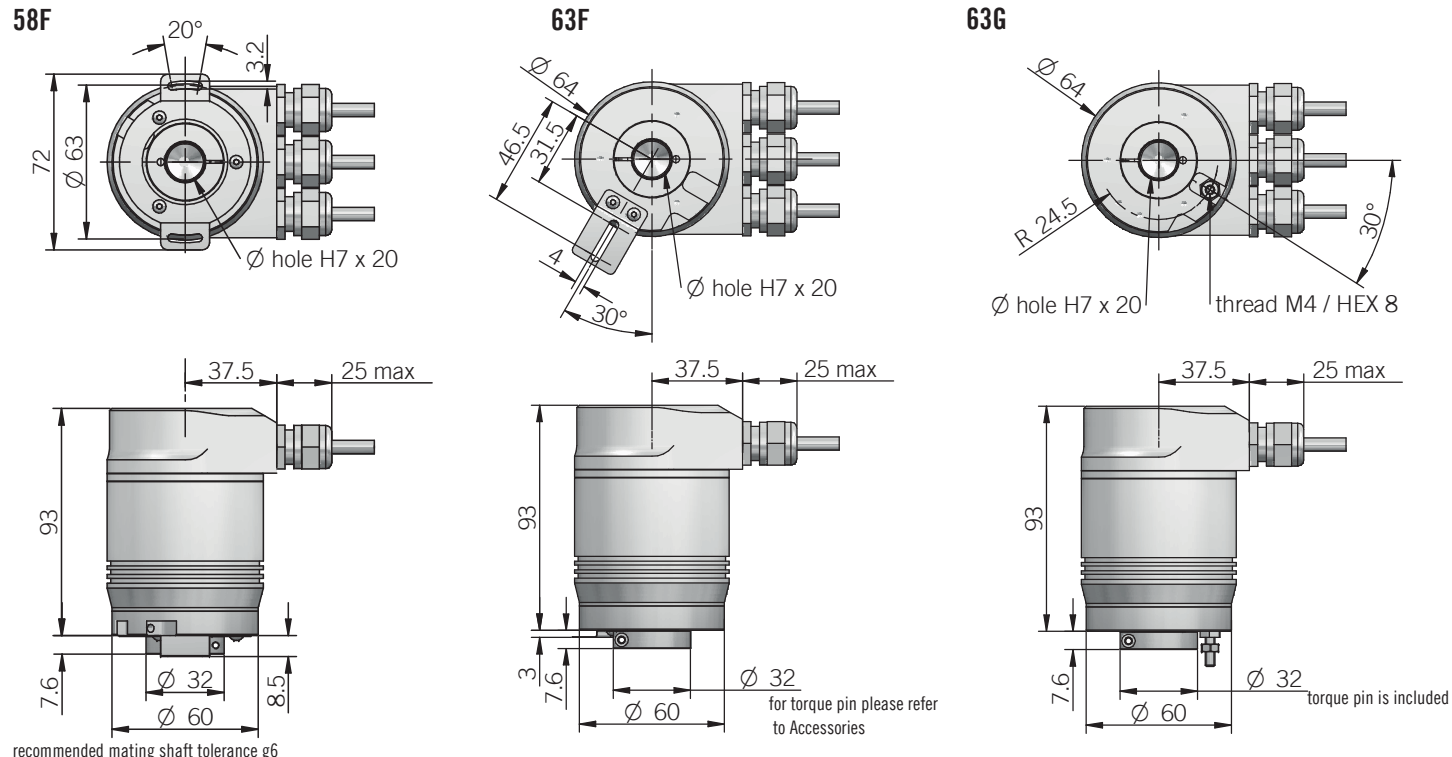
- Optical sensor technology (OptoASIC + gears)
- 25 bit total resolution (13 bit single turn (8192 ppr) + 12 bit multiturn (4096 turns))
- Power supply up to +28 V DC with Profibus DP as electrical interface
- Intelligent status leds
- Terminal box or M12 connector for fast setup
- Blind hollow shaft up to 15 mm diameter
- Mounting by stator coupling, torque stop slot or torque pin



**ORDERING CODE** EAM 63F R 4096 / 4096 B 12/28 FXX 15 X 3 M12R .162 +XXX

<b>SERIES</b> multiturn absolute encoder EAM	<b>MODEL</b> blind hollow shaft with stator coupling 58F blind hollow shaft with torque stop slot 63F blind hollow shaft with torque pin 63G	rev. 2.0 R	<b>MULTITURN RESOLUTION</b> turns 4096	<b>SINGLETURN RESOLUTION</b> ppr 4096 / 8192	<b>CODE TYPE</b> binary B	<b>POWER SUPPLY</b> 12 ... 28 V DC 12/28	<b>ELECTRICAL INTERFACE</b> PROFIBUS DP V0 CLASS 2 FXX	<b>BORE DIAMETER</b> mm 14 mm 15 diameters 6 / 8 / 9,52 (3/8") / 10 / 11 / 12 mm with optional shaft adapter, see Accessories	<b>ENCLOSURE RATING</b> IP 54 X	<b>MAX ROTATION SPEED</b> 3000 rpm 3	<b>OUTPUT TYPE</b> terminal box - radial cable glands P3R radial M12 connectors M12R	<b>SOCKETS</b> sockets not included .162 to be reported only with connectors output (eg. M12R.162), for sockets see Accessories	<b>VARIANT</b> custom version XXX
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recommended mating shaft tolerance g6

**ELECTRICAL SPECIFICATIONS**

<b>Multiturn resolution</b>	2 ... 4096 turns programmable during commissioning
<b>Singleturn resolution</b>	2 ... 4096 / 2 ... 8192 ppr programmable during commissioning
<b>Power supply<sup>1</sup></b>	11,4 ... 29,4 V DC (reverse polarity protection)
<b>Current consumption without load</b>	300 mA
<b>Electrical interface<sup>2</sup></b>	RS 485 galvanically isolated
<b>Max bus frequency</b>	12 Mbaud
<b>Diagnostic features</b>	frequency warning position warning / alarm please refer to installation manual for more informations
<b>Max frequency</b>	max 25 kHz LSB
<b>Code type</b>	binary
<b>Counting direction</b>	programmable during commissioning
<b>Start-up time</b>	500 ms
<b>Accuracy</b>	± 1/2 LSB
<b>Mean time to dangerous failure (MTTF<sub>d</sub>)<sup>3</sup></b>	years according to EN ISO 13849-1
<b>Mission time (Tm)<sup>3</sup></b>	20 years
<b>Diagnostic coverage (DC)<sup>3</sup></b>	0%
<b>Electromagnetic compatibility</b>	according to 2014/30/EU directive
<b>RoHS</b>	according to 2011/65/EU directive
<b>UL / CSA</b>	file n. E212495

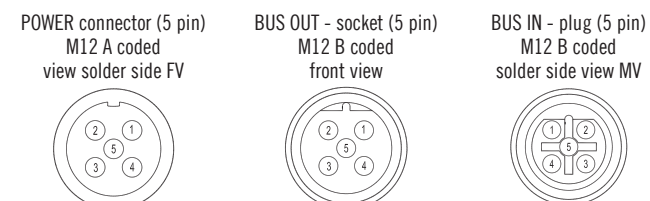
**CONNECTIONS**

Function	POWER	BUS OUT	BUS IN
+ V DC	2		
0 V	4		
A		2	
B		4	
A			2
B			4

**MECHANICAL SPECIFICATIONS**

<b>Bore diameter</b>	ø 14 / 15 mm ø 6* / 8* / 9,52 (3/8")* / 10* / 11* / 12* * with optional shaft adapter, please refer to Accessories
<b>Enclosure rating</b>	IP 54 (IEC 60529)
<b>Max rotation speed</b>	3000 rpm
<b>Shock</b>	50 G, 11 ms (IEC 60068-2-27)
<b>Vibration</b>	10 G, 10 ... 2000 Hz (IEC 60068-2-6)
<b>Moment of inertia</b>	5 x 10 <sup>-6</sup> kgm <sup>2</sup> (119 x 10 <sup>-6</sup> lbf <sup>2</sup> )
<b>Starting torque (at +20°C / +68°F)</b>	< 0,02 Nm (2,83 Ozin)
<b>Bearing stage material</b>	aluminum
<b>Shaft material</b>	stainless steel
<b>Shaft adapter material</b>	bronze
<b>Housing material</b>	painted aluminium
<b>Bearings</b>	n.2 ball bearings
<b>Bearings life</b>	10 <sup>9</sup> revolutions
<b>Operating temperature<sup>4,5</sup></b>	0° ... +60°C (+32° ... +140°F)
<b>Storage temperature<sup>5</sup></b>	-15° ... +70°C (+5° ... +158°F)
<b>Weight</b>	650 g (22,93 oz)

<sup>1</sup> as measured at the transducer without cable influences  
<sup>2</sup> for further details refer to OUTPUT LEVELS on TECHNICAL BASICS section  
<sup>3</sup> this product is not a safety component, for further details refer to TECHNICAL BASICS section  
<sup>4</sup> measured on the transducer flange  
<sup>5</sup> condensation not allowed



**MAIN FEATURES**

Industry standard multiturn absolute encoder for factory automation applications.

- Optical sensor technology (OptoASIC + gears)
- 25 bit total resolution (13 bit single turn (8192 ppr) + 12 bit multiturn (4096 turns))
- Power supply up to +28 V DC with Profibus DP as electrical interface
- Intelligent status leds
- Terminal box or M12 connector for fast setup
- Solid shaft diameter up to 11 mm
- Mounting by synchronous or REO-444 flange

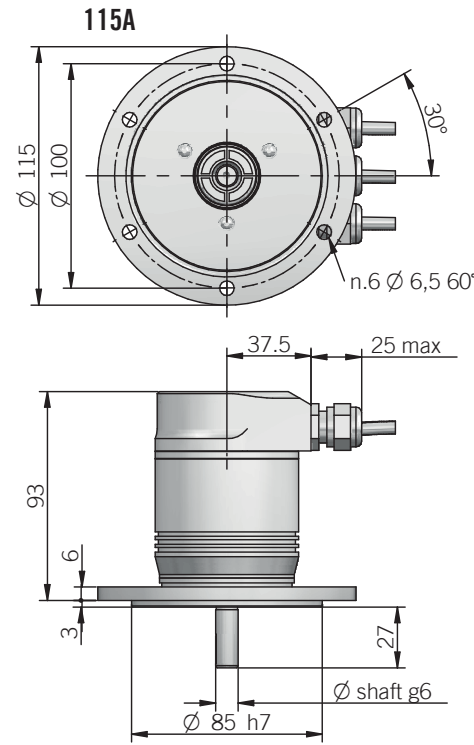
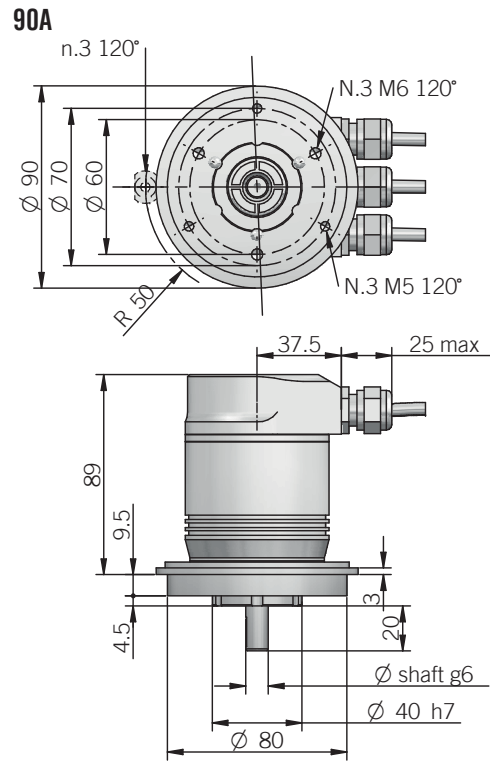


**ORDERING CODE** EAM 90A R 4096 / 4096 B 12/28 FXX 10 X 6 M12R .162 +XXX

<b>SERIES</b> multiturn absolute encoder EAM	<b>MODEL</b> synchronous flange ø 40 mm 90A REO444 flange 115A	rev. 2.0 R	<b>MULTITURN RESOLUTION</b> turns 4096	<b>SINGLETURN RESOLUTION</b> ppr 4096 / 8192	<b>CODE TYPE</b> binary B	<b>POWER SUPPLY</b> 12 ... 28 V DC 12/28	<b>ELECTRICAL INTERFACE</b> PROFIBUS DP V0 CLASS 2 FXX	<b>SHAFT DIAMETER</b> (mod. 90) (3/8") 9,52 mm 9 mm 10 (mod. 115) mm 11	<b>ENCLOSURE RATING</b> IP 54 X (mod. 90) IP 66 S	<b>MAX ROTATION SPEED</b> (IP 66) 3000 rpm 3 (IP 54) 6000 rpm 6	<b>OUTPUT TYPE</b> terminal box - radial cable glands P3R radial M12 connectors M12R	<b>SOCKETS</b> sockets not included .162
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to be reported only with connectors output (eg. M12R.162), for sockets see Accessories

**VARIANT**  
custom version XXX



fixing clamps not included, please refer to Accessories

recommended mating shaft tolerance H7  
dimensions in mm

**ELECTRICAL SPECIFICATIONS**

<b>Resolution</b>	2 ... 4096 / 2 ... 8192 ppr programmable during commissioning
<b>Power supply<sup>1</sup></b>	11,4 ... 29,4 V DC (reverse polarity protection)
<b>Current consumption without load</b>	300 mA
<b>Electrical interface<sup>2</sup></b>	RS 485 galvanically isolated
<b>Max bus frequency</b>	12 Mbaud
<b>Diagnostic features</b>	frequency warning position warning / alarm please refer to installation manual for more informations
<b>Max frequency</b>	max 25 kHz LSB
<b>Code type</b>	binary
<b>Counting direction</b>	programmable during commissioning
<b>Start-up time</b>	500 ms
<b>Accuracy</b>	± 1/2 LSB
<b>Mean time to dangerous failure (MTTF)<sub>d</sub><sup>3</sup></b> according to EN ISO 13849-1	years
<b>Mission time (Tm)<sup>3</sup></b>	20 years
<b>Diagnostic coverage (DC)<sup>3</sup></b>	0%
<b>Electromagnetic compatibility</b>	according to 2014/30/EU directive
<b>RoHS</b>	according to 2011/65/EU directive
<b>UL / CSA</b>	file n. E212495

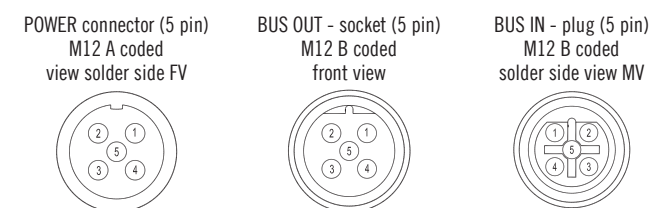
**MECHANICAL SPECIFICATIONS**

<b>Shaft diameter</b>	Ø 9,52 (3/8") / 10 / 11 mm
<b>Enclosure rating IEC 60529</b>	X = IP 54 S = IP 66
<b>Max rotation speed</b>	6000 rpm with X enclosure rating 3000 rpm with S enclosure rating
<b>Max shaft load<sup>4</sup></b>	100 N (22,48 lbs) axial / radial
<b>Shock</b>	50 G, 11 ms (IEC 60068-2-27)
<b>Vibration</b>	10 G, 10 ... 2000 Hz (IEC 60068-2-6)
<b>Moment of inertia</b>	1,5 x 10 <sup>-6</sup> kgm <sup>2</sup> (36 x 10 <sup>-6</sup> lbf <sup>2</sup> )
<b>Starting torque (at +20°C / +68°F)</b>	< 0,02 Nm (2,83 Ozin) with X enclosure rating < 0,06 Nm (8,50 Ozin) with S enclosure rating
<b>Bearing stage material</b>	aluminium
<b>Shaft material</b>	stainless steel
<b>Housing material</b>	painting aluminium
<b>Bearings</b>	n.2 ball bearings
<b>Bearings life</b>	10 <sup>9</sup> revolutions
<b>Operating temperature<sup>5,6</sup></b>	0° ... +60°C (+32° ... +140°F)
<b>Storage temperature</b>	-15° ... +70°C (+5° ... +158°F)
<b>Weight</b>	750 g (26,46 oz)

<sup>1</sup> as measured at the transducer without cable influences  
<sup>2</sup> for further details refer to OUTPUT LEVELS on TECHNICAL BASICS section  
<sup>3</sup> this product is not a safety component, for further details refer to TECHNICAL BASICS section  
<sup>4</sup> maximum load for static usage  
<sup>5</sup> measured on the transducer flange  
<sup>6</sup> condensation not allowed

**CONNECTIONS**

Function	POWER	BUS OUT	BUS IN
+ V DC	2		
0 V	4		
A		2	
B		4	
A			2
B			4



**MAIN FEATURES**

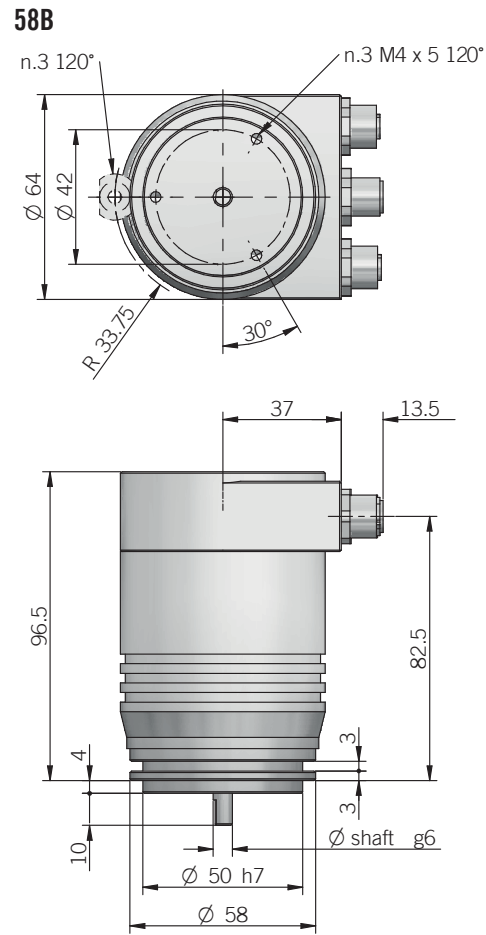
Industry standard multiturn absolute encoder for factory automation applications.

- Optical sensor technology (OptoASIC + gears)
- 25 bit total resolution (13 bit single turn + 12 bit multiturn )
- Power supply up to +30 V DC with Profinet IO as electrical interface
- Intelligent status leds
- M12 connector for fast setup
- Solid shaft diameter up to 10 mm
- Mounting by synchronous or clamping flange
- Operating temperature -40° ... +80°C (-40° ... +176°F)

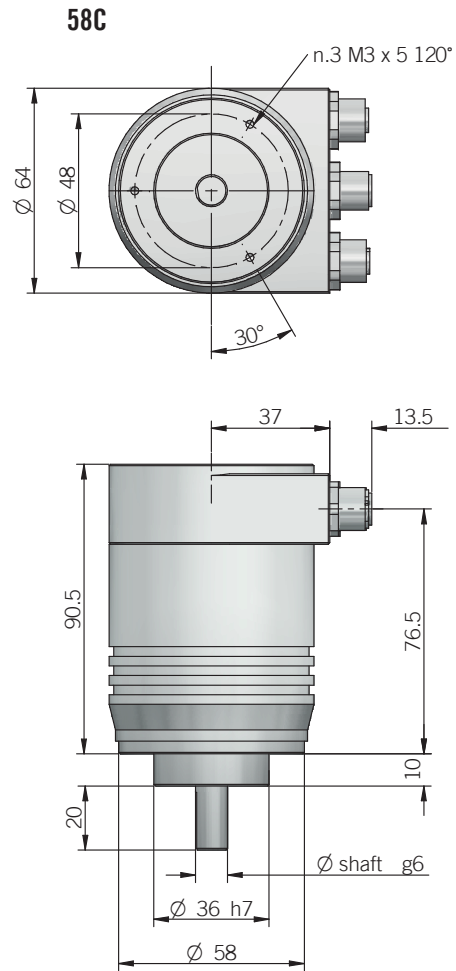


**ORDERING CODE**

<b>SERIES</b>	AAM	<b>58B</b>	<b>12 / 13</b>	<b>B 10/30</b>	<b>PFN</b>	<b>6</b>	<b>X</b>	<b>X</b>	<b>M12R</b>	<b>.162</b>
<b>absolute multiturn encoder</b>										
<b>MODEL</b>										
<b>synchronous flange Ø 50 mm</b>		58B								
<b>clamping flange Ø 36 mm</b>		58C								
<b>MULTITURN RESOLUTION</b>			bit 12							
<b>SINGLETURN RESOLUTION</b>			bit 13							
<b>CODE TYPE</b>				binary	B					
<b>POWER SUPPLY</b>				10 ... 30 V DC	10/30					
<b>ELECTRICAL INTERFACE</b>				PROFINET IO	PFN					
<b>SHAFT DIAMETER</b>		(mod. 58B) mm	6							
		(mod. 58C) mm	10							
<b>ENCLOSURE RATING</b>				IP 65	X					
<b>OPTIONS</b>								to be reported	X	
<b>OUTPUT TYPE</b>								radial M12 connectors	M12R	
<b>SOCKETS</b>								sockets not included	.162	
								for sockets see Accessories		



fixing clamps not included, please refer to Accessories  
recommended mating shaft tolerance H7  
dimensions in mm



**ELECTRICAL SPECIFICATIONS**

<b>Multiturn resolution</b>	1 ... 12 bit programmabile during commissioning
<b>Singleturn resolution</b>	1 ... 13 bit programmabile during commissioning
<b>Power supply<sup>1</sup></b>	10 ... 30 V DC (reverse polarity protection)
<b>Current consumption without load</b>	< 200 mA
<b>Electrical interface<sup>2</sup></b>	PROFINET IO RT Class 1 / Conformance Class B
<b>Hardware features</b>	Ertec 200 auto-negotiation auto-polarity auto-crossover diagnostic LEDs
<b>Code type</b>	binary
<b>Max bus frequency</b>	100 Mbit/s
<b>Cycle time</b>	≤ 1 ms
<b>Accuracy</b>	± 0,04°
<b>Start-up time</b>	500 ms
<b>Electromagnetic compatibility</b>	according to 2014/30/EU directive
<b>RoHs</b>	according to 2011/65/EU directive

**MECHANICAL SPECIFICATIONS**

<b>Shaft diameter</b>	ø 6 mm (mod. 58B) ø 10 mm (mod. 58C)
<b>Enclosure rating</b>	IP 65 (IEC 60529)
<b>Max rotation speed</b>	6000 rpm
<b>Max shaft load<sup>3</sup></b>	80 N (17,98 lbs) radial / 40 N (9 lbs) axial
<b>Starting torque (at +20°C / +68°F)</b>	< 0,05 Nm (7 Ozin)
<b>Moment of inertia</b>	approx 1,8 x 10 <sup>-6</sup> kgm <sup>2</sup>
<b>Shock</b>	50 G, 11 ms (IEC 60068-2-27)
<b>Vibrations</b>	10 G, 10 ... 2000 Hz (IEC 60068-2-6)
<b>Bearings life</b>	10 <sup>9</sup> revolutions
<b>Bearings</b>	n.2 ball bearings
<b>Shaft material</b>	stainless steel
<b>Bearing stage / cover material</b>	aluminium
<b>Housing material</b>	painting aluminium
<b>Operating temperature<sup>4,5</sup></b>	-40° ... +80°C (-40° ... +176°F)
<b>Storage temperature<sup>5</sup></b>	-40° ... +85°C (-40° ... +185°F)
<b>Weight</b>	600 g (21 oz)

**CONNECTIONS**

	Pin	Function
PORT 1 Connector	1	Tx D+
	2	Rx D+
	3	Tx D-
	4	Rx D-
POWER connector	1	+V DC
	2	/
	3	0 V
	4	/
PORT 2 Connector	1	Tx D+
	2	Rx D+
	3	Tx D-
	4	Rx D-

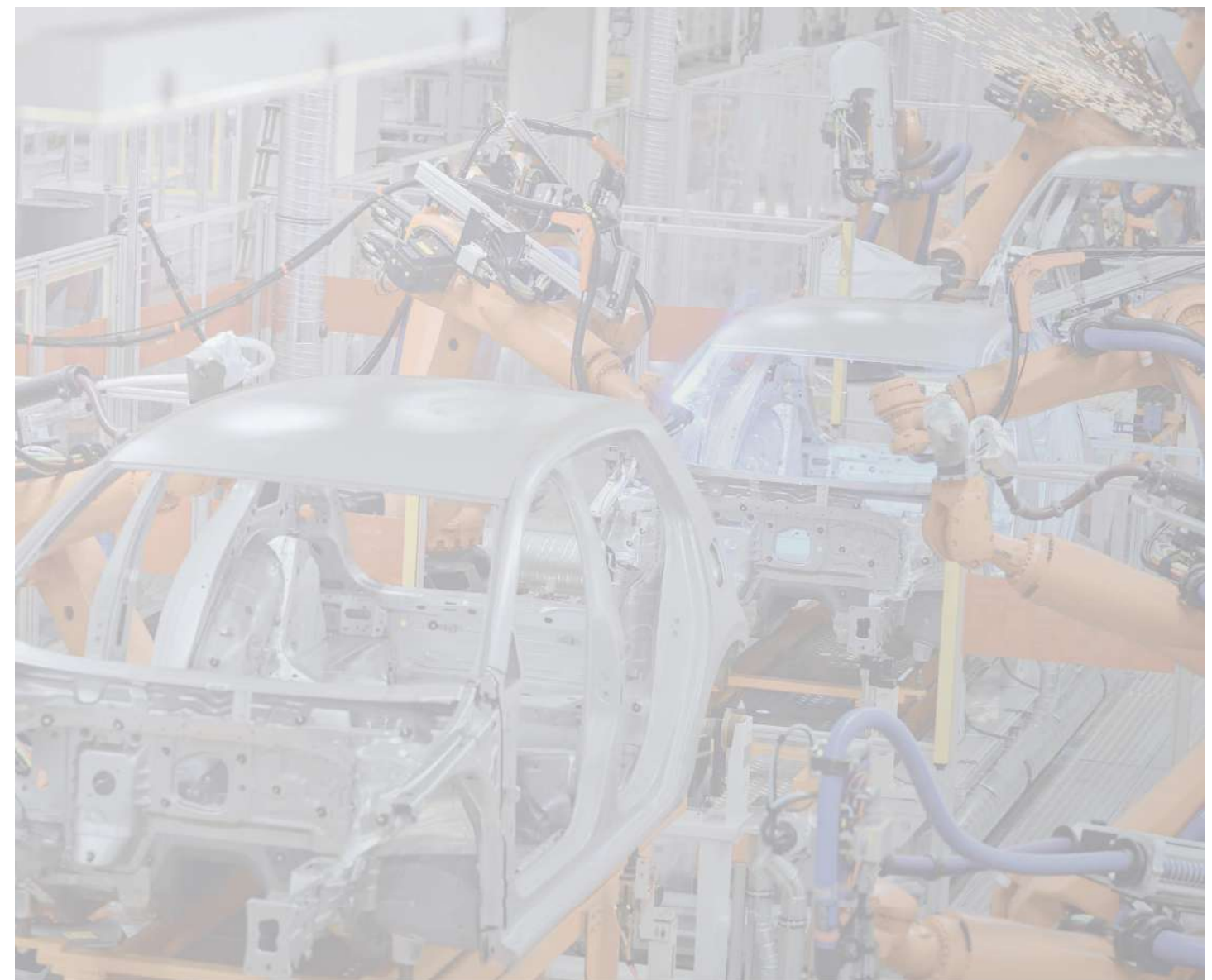
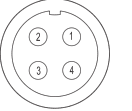
socket connectors not included, please refer to Accessories



PORT 1 / 2 connector (4 pin) M12 D coded front view



POWER connector (4 pin) M12 A coded front view



# AAM 58 F PROFINET

## BLIND HOLLOW SHAFT MULTITURN ABSOLUTE ENCODER

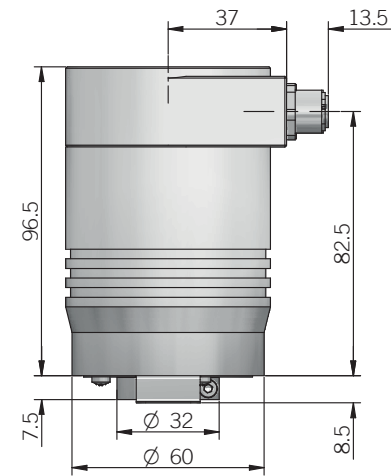
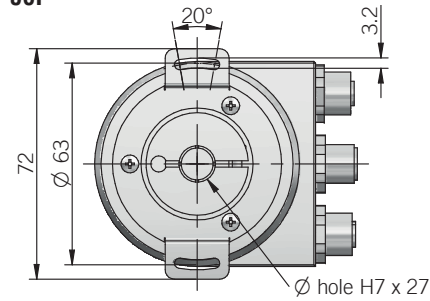
### MAIN FEATURES

Industry standard multitrans absolute encoder for factory automation applications.

- Optical sensor technology (OptoASIC + gears)
- 25 bit total resolution (13 bit single turn + 12 bit multitrans )
- Power supply up to +30 V DC with Profinet IO as electrical interface
- Intelligent status leds
- M12 connector for fast setup
- Blind hollow shaft diameter up to 15 mm
- Mounting by stator coupling
- Operating temperature -40° ... +80°C (-40° ... +176°F)



58F



recommended mating shaft tolerance g6  
dimensions in mm

### CONNECTIONS

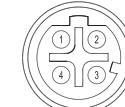
	Pin	Function
PORT 1 Connector	1	Tx D+
	2	Rx D+
	3	Tx D-
	4	Rx D-
POWER connector	1	+V DC
	2	/
	3	0 V
	4	/
PORT 2 Connector	1	Tx D+
	2	Rx D+
	3	Tx D-
	4	Rx D-

socket connectors not included, please refer to Accessories

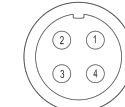


socket connectors not included, please refer to Accessories

PORT 1 / 2 connector (4 pin)  
M12 D coded  
front view



POWER connector (4 pin)  
M12 A coded  
front view



### ELECTRICAL SPECIFICATIONS

<b>Multitrans resolution</b>	1 ... 12 bit programmable during commissioning
<b>Singleturn resolution</b>	1 ... 13 bit programmable during commissioning
<b>Power supply<sup>1</sup></b>	10 ... 30 V DC (reverse polarity protection)
<b>Current consumption without load</b>	< 200 mA
<b>Electrical interface<sup>2</sup></b>	PROFINET IO RT Class 1 / Conformance Class B
<b>Hardware features</b>	Ertec 200 auto-negotiation auto-polarity auto-crossover diagnostic LEDs
<b>Code type</b>	binary
<b>Max bus frequency</b>	100 Mbit/s
<b>Cycle time</b>	≤ 1 ms
<b>Accuracy</b>	± 0,04°
<b>Start-up time</b>	500 ms
<b>Electromagnetic compatibility</b>	according to 2014/30/EU directive
<b>RoHS</b>	according to 2011/65/EU directive

### MECHANICAL SPECIFICATIONS

<b>Bore diameter</b>	ø 15 mm ø 12* / 10* mm * with optional shaft adapter, please refer to Accessories
<b>Enclosure rating</b>	IP 65 (IEC 60529)
<b>Max rotation speed</b>	6000 rpm
<b>Max shaft load<sup>3</sup></b>	80 N (17,98 lbs) radial / 40 N (9 lbs) axial
<b>Starting torque (at +20°C / +68°F)</b>	< 0,05 Nm (7 Ozin)
<b>Moment of inertia</b>	approx 1,8 x 10 <sup>-6</sup> kgm <sup>2</sup>
<b>Shock</b>	50 G, 11 ms (IEC 60068-2-27)
<b>Vibrations</b>	10 G, 10 ... 2000 Hz (IEC 60068-2-6)
<b>Bearings life</b>	10 <sup>9</sup> revolutions
<b>Bearings</b>	n.2 ball bearings
<b>Shaft material</b>	stainless steel
<b>Bearing stage / cover material</b>	aluminium
<b>Housing material</b>	painted aluminium
<b>Operating temperature<sup>4,5</sup></b>	-40° ... +80°C (-40° ... +176°F)
<b>Storage temperature<sup>5</sup></b>	-40° ... +85°C (-40° ... +185°F)
<b>Weight</b>	600 g (21 oz)

<sup>1</sup> as measured at the transducer without cable influences

<sup>2</sup> for further details refer to OUTPUT LEVELS on TECHNICAL BASICS section

<sup>3</sup> maximum load for static usage

<sup>4</sup> measured on the transducer flange

<sup>5</sup> condensation not allowed

### ORDERING CODE

ORDERING CODE	AAM	58F	12 / 13	B	10/30	PFN	15	X	X	M12R	.162
<b>SERIES</b>	absolute multitrans encoder AAM										
<b>MODEL</b>	blind hollow shaft with stator coupling 58F										
<b>MULTITRANS RESOLUTION</b>	bit 12										
<b>SINGLETURN RESOLUTION</b>	bit 13										
<b>CODE TYPE</b>	binary B										
<b>POWER SUPPLY</b>	10 ... 30 V DC 10/30										
<b>ELECTRICAL INTERFACE</b>	PROFINET IO PFN										
<b>BORE DIAMETER</b>	mm 15 diameters 10 / 12 mm with optional shaft adapter, see Accessories										
<b>ENCLOSURE RATING</b>	IP 65 X										
<b>OPTIONS</b>	to be reported X										
<b>OUTPUT TYPE</b>	radial M12 connectors M12R										
<b>SOCKETS</b>	sockets not included .162 for sockets see Accessories										

# AAM 58 B / C ETHERCAT

## SOLID SHAFT MULTITURN ABSOLUTE ENCODER



### MAIN FEATURES

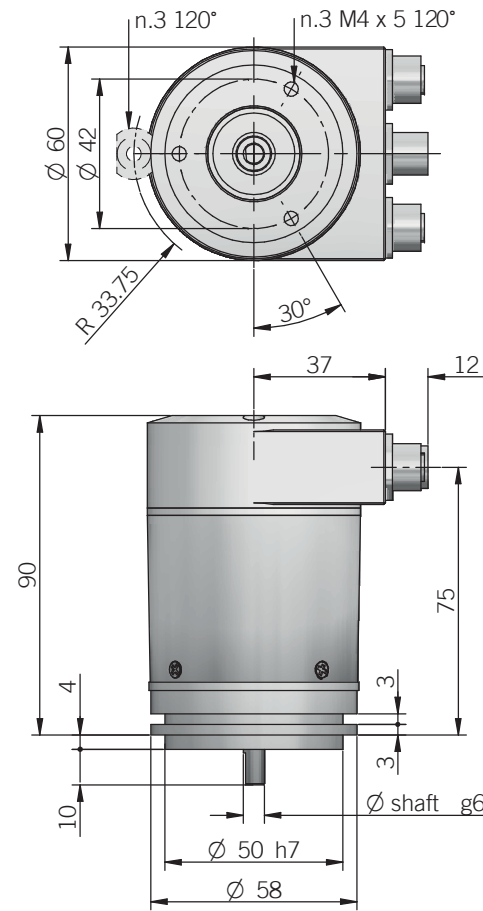
Industry standard multiturn absolute encoder for factory automation applications.

- Optical sensor technology (OptoASIC + gears)
- 25 bit total resolution (13 bit single turn + 12 bit multiturn )
- Power supply up to +30 V DC with EtherCAT as electrical interface
- Intelligent status leds
- M12 connector for fast setup
- Solid shaft diameter up to 10 mm
- Mounting by synchronous or clamping flange
- Operating temperature -40° ... +80°C (-40° ... +176°F)

### ORDERING CODE

SERIES	MODEL	REVISION	MULTITURN RESOLUTION	SINGLETURN RESOLUTION	CODE TYPE	POWER SUPPLY	ELECTRICAL INTERFACE	SHAFT DIAMETER	ENCLOSURE RATING	OPTIONS	OUTPUT TYPE	SOCKETS
absolute multiurn encoder AAM	synchronous flange ø 50 mm 58B clamping flange ø 36 mm 58C	to be reported R	bit 12	bit 13	binary B	10 ... 30 V DC 10/30	ETHERCAT ETC	(mod. 58B) mm 6 (mod. 58C) mm 10	IP 65 X	to be reported X	radial M12 connectors M12R	sockets not included .162 for sockets see Accessories

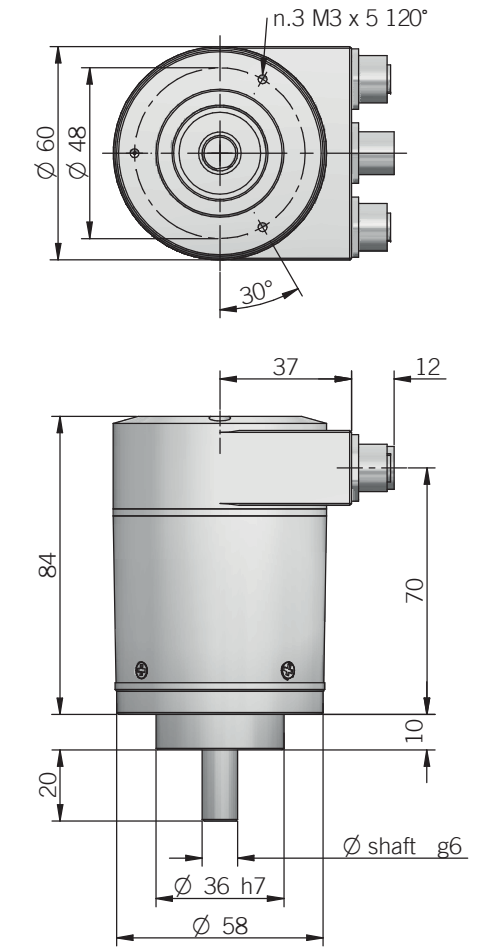
58B



for fixing clamps please refer to Accessories

recommended mating shaft tolerance H7  
dimensions in mm

58C



### ELECTRICAL SPECIFICATIONS

<b>Multiturn resolution</b>	1 ... 12 bit programmabile during commissioning
<b>Singleturn resolution</b>	1 ... 13 bit programmabile during commissioning
<b>Power supply<sup>1</sup></b>	10 ... 30 V DC (reverse polarity protection)
<b>Current consumption without load</b>	< 200 mA
<b>Electrical interface<sup>2</sup></b>	Ethercat
<b>Profile</b>	CoE (CANopen over EtherCAT, DS-301+DS-406)
<b>Programming functions</b>	Resolution Preset Counting direction
<b>Code type</b>	binary
<b>Max bus frequency</b>	100 Mbit/s
<b>Cycle time</b>	≥ 62,5 µs
<b>Accuracy</b>	± 0,044°
<b>Start-up time</b>	500 ms
<b>Electromagnetic compatibility</b>	according to 2014/30/EU directive
<b>RoHs</b>	according to 2011/65/EU directive

### MECHANICAL SPECIFICATIONS

<b>Shaft diameter</b>	ø 6 mm (mod. 58B) ø 10 mm (mod. 58C)
<b>Enclosure rating</b>	IP 65 (IEC 60529)
<b>Max rotation speed</b>	6000 rpm
<b>Max shaft load<sup>3</sup></b>	80 N (17,98 lbs) radial / 40 N (9 lbs) axial
<b>Starting torque (at +20°C / +68°F)</b>	< 0,05 Nm (7 Ozin)
<b>Moment of inertia</b>	approx 1,8 x 10 <sup>-6</sup> kgm <sup>2</sup>
<b>Shock</b>	50 G, 11 ms (IEC 60068-2-27)
<b>Vibrations</b>	10 G, 10 ... 2000 Hz (IEC 60068-2-6)
<b>Bearings life</b>	10 <sup>9</sup> revolutions
<b>Bearings</b>	2 ball bearings
<b>Shaft material</b>	stainless steel
<b>Bearing stage / cover material</b>	aluminium
<b>Housing material</b>	aluminium
<b>Operating temperature<sup>4,5</sup></b>	-40° ... +80°C (-40° ... +176°F)
<b>Storage temperature<sup>5</sup></b>	-40° ... +85°C (-40° ... +185°F)
<b>Weight</b>	600 g (21 oz)

<sup>1</sup> as measured at the encoder without cable influences

<sup>2</sup> for further details refer to TECHNICAL BASICS section

<sup>3</sup> maximum load for static usage

<sup>4</sup> measured on encoder flange

<sup>5</sup> condensation not allowed

CONNECTIONS

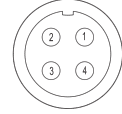
	Pin	Function
ECAT IN connector	1	Tx D+
	2	Rx D+
	3	Tx D-
	4	Rx D-
POWER connector	1	+V DC
	2	/
	3	0 V
	4	/
ECAT OUT connector	1	Tx D+
	2	Rx D+
	3	Tx D-
	4	Rx D-



ECAT IN / OUT connector (4 pin)  
M12 D coded  
front view



POWER connector (4 pin)  
M12 A coded  
front view



ECAT IN POWER ECAT OUT

socket connectors not included, please refer to Accessories

EtherCAT® is a registered trademark and patented technology, licensed by Beckhoff Automation GmbH, Germany.



MAIN FEATURES

Industry standard multiturn absolute encoder for factory automation applications.

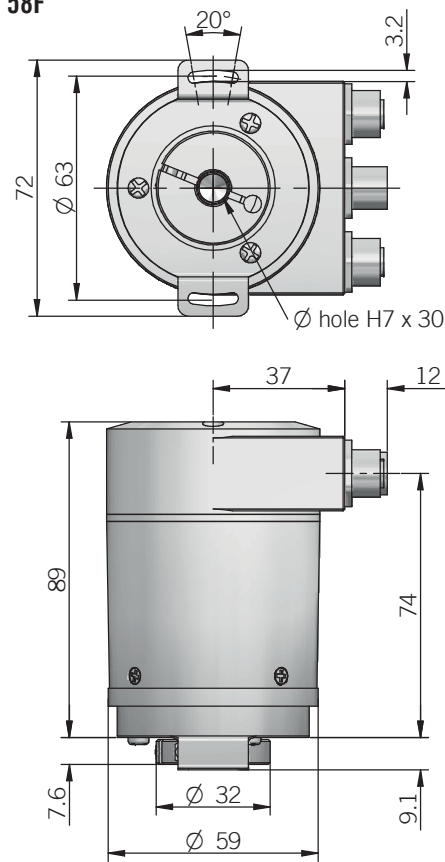
- Optical sensor technology (OptoASIC + gears)
- 25 bit total resolution (13 bit single turn + 12 bit multiturn )
- Power supply up to +30 V DC with EtherCAT as electrical interface
- Intelligent status leds
- M12 connector for fast setup
- Blind hollow shaft diameter up to 15 mm
- Mounting by stator coupling
- Operating temperature -40° ... +80°C (-40° ... +176°F)



ORDERING CODE      AAM   58F   R   12 / 13   B   10/30   ETC   15   X   X   M12R   .162

SERIES absolute multiurn encoder <b>AAM</b>	MODEL blind hollow shaft with stator couplings <b>58F</b>	REVISION to be reported <b>R</b>	MULTITURN RESOLUTION bit <b>12</b>	SINGLETURN RESOLUTION bit <b>13</b>	CODE TYPE binary <b>B</b>	POWER SUPPLY 10 ... 30 V DC <b>10/30</b>	ELECTRICAL INTERFACE ETHERCAT <b>ETC</b>	BORE DIAMETER mm <b>15</b> diameters 10 / 12 mm with optional shaft adapter, see Accessories	ENCLOSURE RATING IP <b>65 X</b>	OPTIONS to be reported <b>X</b>	OUTPUT TYPE radial M12 connectors <b>M12R</b>	SOCKETS sockets not included <b>.162</b> for sockets see Accessories
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58F



recommended mating shaft tolerance g6  
dimensions in mm

CONNECTIONS

	Pin	Function
ECAT IN connector	1	Tx D+
	2	Rx D+
	3	Tx D-
	4	Rx D-
POWER connector	1	+V DC
	2	/
	3	0 V
	4	/
ECAT OUT connector	1	Tx D+
	2	Rx D+
	3	Tx D-
	4	Rx D-

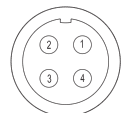
socket connectors not included, please refer to Accessories



ECAT IN / OUT connector (4 pin)  
M12 D coded  
front view



POWER connector (4 pin)  
M12 A coded  
front view



ELECTRICAL SPECIFICATIONS

Multiturn resolution	1 ... 12 bit programmabile during commissioning
Singleturn resolution	1 ... 13 bit programmabile during commissioning
Power supply <sup>1</sup>	10 ... 30 V DC (reverse polarity protection)
Current consumption without load	< 200 mA
Electrical interface <sup>2</sup>	Ethercat
Profile	CoE (CANOpen over EtherCAT, DS-301+DS-406)
Programming functions	Resolution Preset Counting direction
Code type	binary
Max bus frequency	100 Mbit/s
Cycle time	≥ 62,5 μs
Accuracy	± 0,044°
Start-up time	500 ms
Electromagnetic compatibility	according to 2014/30/EU directive
RoHs	according to 2011/65/EU directive

MECHANICAL SPECIFICATIONS

Bore diameter	∅ 15 mm ∅ 12* / 10* mm * with optional shaft adapter, please refer to Accessories
Enclosure rating	IP 65 (IEC 60529)
Max rotation speed	6000 rpm
Max shaft load <sup>3</sup>	80 N (17,98 lbs) radial / 40 N (9 lbs) axial
Starting torque (at +20°C / +68°F)	< 0,05 Nm (7 Ozin)
Moment of inertia	approx 1,8 x 10 <sup>-6</sup> kgm <sup>2</sup>
Shock	50 G, 11 ms (IEC 60068-2-27)
Vibrations	10 G, 10 ... 2000 Hz (IEC 60068-2-6)
Bearings life	10 <sup>9</sup> revolutions
Bearings	n° 2 ball bearings
Shaft material	stainless steel
Bearing stage / cover material	aluminium
Housing material	aluminium
Operating temperature <sup>4,5</sup>	-40° ... +80°C (-40° ... +176°F)
Storage temperature <sup>5</sup>	-40° ... +85°C (-40° ... +185°F)
Fixing torque for collar clamping	1,5 Nm (212 Ozin) recommended
Weight	600 g (21 oz)

<sup>1</sup> as measured at the encoder without cable influences

<sup>2</sup> for further details refer to TECHNICAL BASICS section

<sup>3</sup> maximum load for static usage

<sup>4</sup> measured on encoder flange

<sup>5</sup> condensation not allowed

MAIN FEATURES

Explosion proof encoder for applications within hazardous areas.

- Optical sensor technology (OptoASIC + gears)
- Resolution up to 27 bit (13 bit single turn (8192 ppr) + 14 bit multiturn (16384 turns))
- Power supply up to +28 V DC with SSI as electrical interface
- Cable output
- Solid shaft diameter up to 10 mm
- Mounting with synchronous or centering square flange

EX CLASSIFICATION

It has been assured with EC-TYPE Examination Certificate CESI 04 ATEX 082 that the EAMX 80 is compliant with essential health and safety requirements according to

- EN IEC 60079-0:2018
- EN 60079-1:2014
- EN 60079-31:2014

The UE declaration is available on [www.eltra.it](http://www.eltra.it)



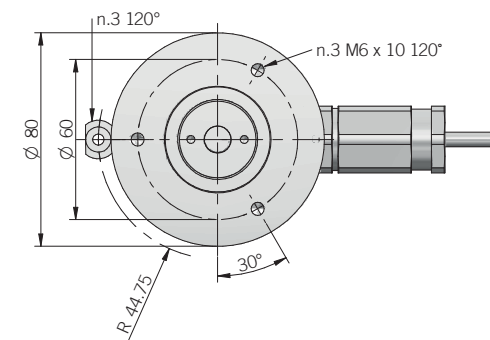
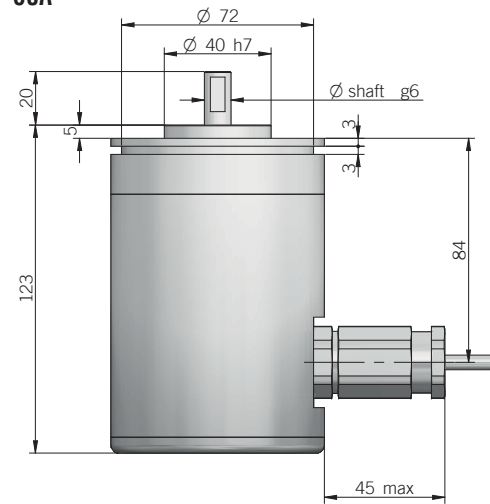
ORDERING CODE EAMX 80A 4096 / 4096 G 8/28 S X X 10 X 3 PR .XXX

SERIES	multiturn absolute explosion proof encoder EAMX
MODEL	synchronous flange ∅ 40 mm 80A centering square flange ∅ 40 mm 80D
MULTITURN RESOLUTION	(powers of 2) turns from 2 to 16384
SINGLETURN RESOLUTION	ppr 4096 / 8192
CODE TYPE	binary B gray G
POWER SUPPLY	8 ... 28 V DC 8/28
ELECTRICAL INTERFACE	Serial Synchronous Interface - SSI S
LOGIC	to be reported X
OPTION	to be reported X
SHAFT DIAMETER	mm 10
ENCLOSURE RATING	IP 65 X
MAX ROTATION SPEED	3000 rpm 3
OUTPUT TYPE	radial cable (standard length 1,5 m) PR preferred cable lengths 2 / 3 / 5 / 10 m, to be added after OUTPUT TYPE (eg. PR5)

VARIANT  
custom version XXX

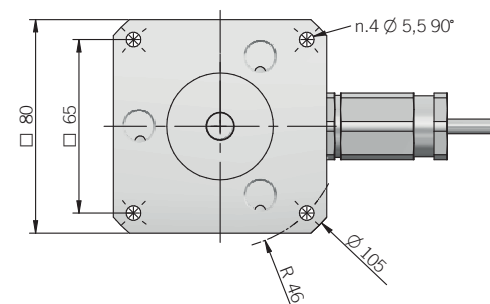
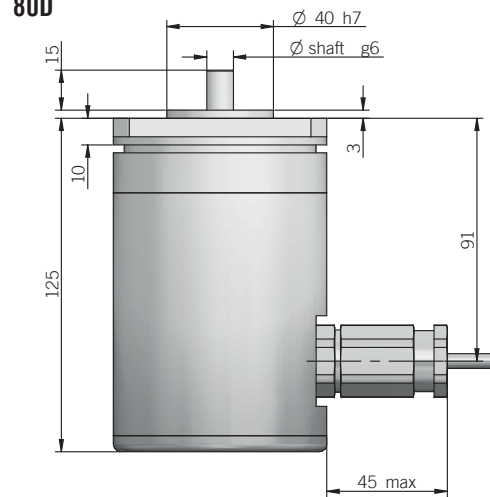
EtherCAT® is a registered trademark and patented technology, licensed by Beckhoff Automation GmbH, Germany.

80A



fixing clamps not included, please refer to Accessories

80D



recommended mating shaft tolerance H7  
dimensions in mm

**ELECTRICAL SPECIFICATIONS**

Multiturn resolution	from 2 to 16384 turns
Singleturn resolution	4096 / 8192 ppr
Power supply <sup>1</sup>	7,6 ... 29,4 V DC (reverse polarity protection)
Current consumption without load	100 mA
Electrical interface <sup>2</sup>	RS-422 compatible
Auxiliary inputs (U/D - RESET)	active high (+V DC) connect to 0 V if not used / RESET tmin 150 ms
Clock frequency	100 kHz ... 1 MHz
SSI monostable time (Tm)	18 μs
SSI pause time (Tp)	> 35 μs
SSI frame	MSB ... LSB 13 bit data length
Counting direction	decreasing clockwise (shaft view)
Start-up time	700 ms
Accuracy	± 1/2 LSB
Mean time to dangerous failure (MTTF <sub>d</sub> ) <sup>3</sup> according to EN ISO 13849-1	71 years
Mission time (Tm) <sup>3</sup>	20 years
Diagnostic coverage (DC) <sup>3</sup>	0%
Cable type	shielded - fixed or flexible installation conductors section min 0,14 mm <sup>2</sup> / AWG 26 bending radius min 35 mm (fixed) / min 60 mm (flexible)
Electromagnetic compatibility	according to 2014/30/EU directive
RoHS	according to 2011/65/EU directive
UL / CSA	file n. E212495

**MECHANICAL SPECIFICATIONS**

Shaft diameter	ø 10 mm
Enclosure rating	IP 65 (IEC 60529)
Max rotation speed	3000 rpm
Max shaft load <sup>4</sup>	200 N (45 lbs) axial / radial
Shock	50 G, 11 ms (IEC 60068-2-27)
Vibration	10 G, 10 ... 2000 Hz (IEC 60068-2-6)
Moment of inertia	1,5 x 10 <sup>-6</sup> kgm <sup>2</sup> (36 x 10 <sup>-6</sup> lbf <sup>2</sup> )
Starting torque (at +20°C / +68°F)	< 0,06 Nm (8,50 Ozin)
Bearing stage material	anodized aluminum
Shaft material	stainless steel
Housing material	anodized aluminum
Bearings	n.2 ball bearings
Bearings life	10 <sup>9</sup> revolutions
Operating temperature <sup>5,6</sup>	0° ... +50°C (+32° ... +122°F)
Storage temperature <sup>6</sup>	-15° ... +70°C (+5° ... +158°F)
Weight	1200 g (42,33 oz)

<sup>1</sup> as measured at the transducer without cable influences  
<sup>2</sup> for further details refer to OUTPUT LEVELS on TECHNICAL BASICS section  
<sup>3</sup> this product is not a safety component, for further details refer to TECHNICAL BASICS section  
<sup>4</sup> maximum load for static usage  
<sup>5</sup> measured on the transducer flange  
<sup>6</sup> condensation not allowed

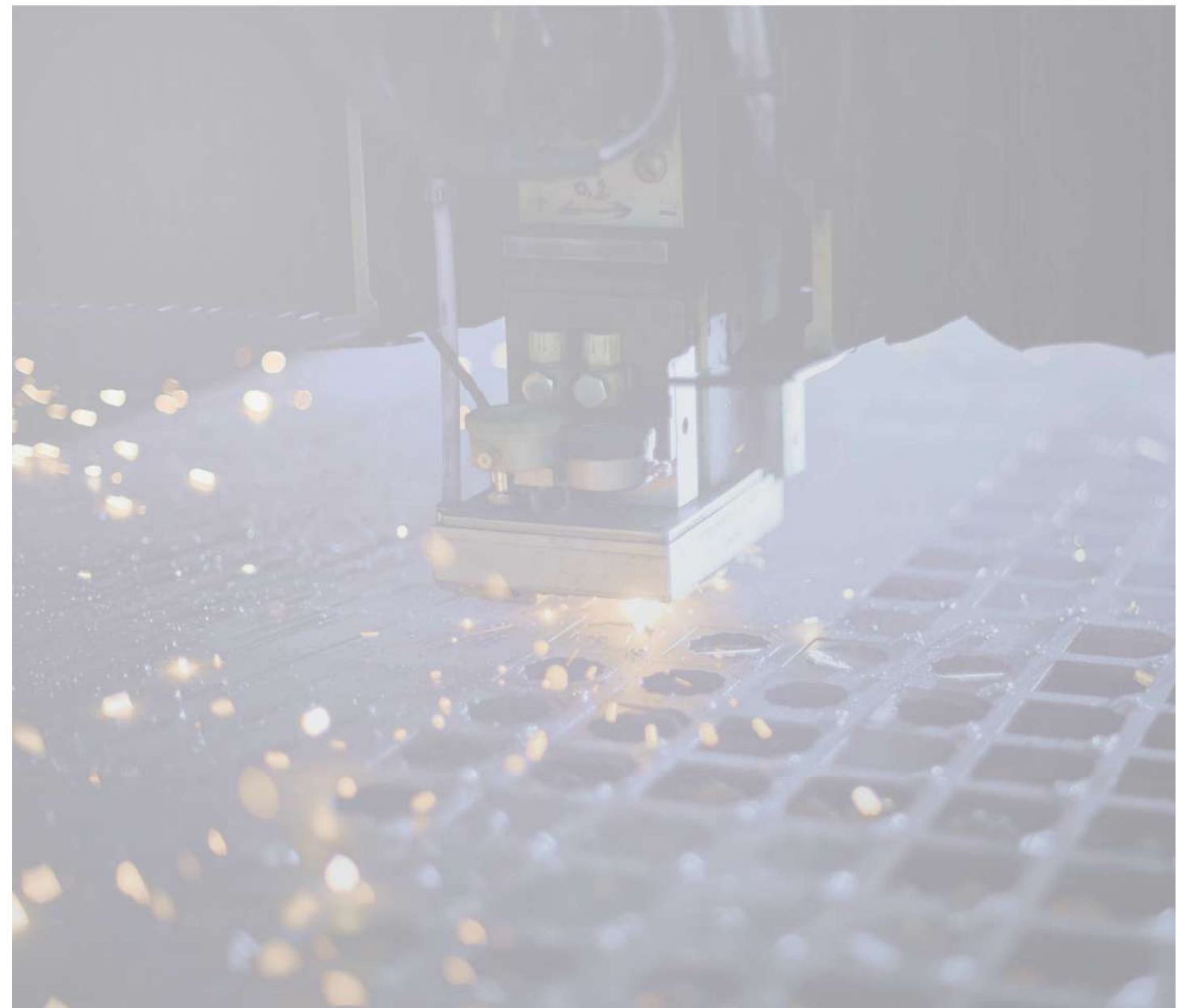
**EPL MARKING**

**Ex**  
**II 2GD**  
**Ex db IIC T6 Gb**  
**Ex tb IIIC T85°C Db**  
**IP 65**

**II 2GD**  
 II: group II: different than mines  
 2: category 2: high level of protection  
 GD: areas containing gas (G) and dust (D)  
**Ex db IIC T6 Gb**  
 Ex db: flameproof enclosure for explosive atmospheres with gases, vapours and mists  
 IIC: group of gas IIC  
 T6: max surface temperature +85°C of the device for atmospheres with gas  
 Gb: product with a high level of protection  
**Ex tb IIIC T85°C Db**  
 Ex tb: flameproof enclosure safety type  
 IIIC: group of dust combustibles IIIC  
 T85°C: max surface temperature +85°C of the device in the presence of dust  
 Db: product with a high level of protection

**CONNECTIONS**

Function	Cable
+ V DC	red
0 V	grey
DATA +	green
DATA -	brown
CLOCK +	yellow
CLOCK -	pink
U / D	blue
⏏	shield





**MAIN FEATURES**

Miniaturized multiturn absolute encoder for limited size applications.

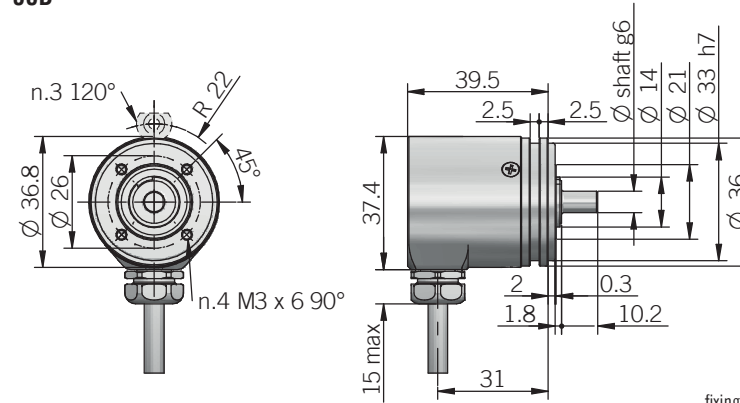
- Magnetic sensor technology without contact (Magnetic ASIC + Patented Energy Harvesting)
- Up to 55 bit as total resolution (15 bit single turn + 40 bit multiturn)
- Power supply up to +30 V DC with SSI as electrical interface
- Code reset for easy setup
- Cable or M12 output, other connectors available on cable end
- 6 mm diameter solid shaft
- Mounting by synchronous flange



**ORDERING CODE** EAM 36B 12 / 13 G 8/30 S P X 6 X 8 M12R .162 +XXX

<b>SERIES</b> magnetic multiturn absolute encoder EAM	<b>MODEL</b> synchronous flange ø 33 mm 36B	<b>MULTITURN RESOLUTION</b> turns from 1 to 17 bit	<b>SINGLETURN RESOLUTION</b> from 1 to 15 bit	<b>CODE TYPE</b> binary B gray G	<b>POWER SUPPLY</b> 5 V DC 5 8 ... 30 V DC 8/30	<b>ELECTRICAL INTERFACE</b> Serial Synchronous Interface - SSI S	<b>LOGIC</b> positive P	<b>OPTIONS</b> to be reported if not used X reset with external input ZE	<b>SHAFT DIAMETER</b> mm 6	<b>ENCLOSURE RATING</b> IP 67 cover side / IP 65 shaft side X	<b>MAX ROTATION SPEED</b> 8000 rpm 8	<b>OUTPUT TYPE</b> radial cable (standard length 0,5 m) PR preferred cable lengths 1,5 / 2 / 3 / 5 / 10 m, to be added after OUTPUT TYPE (eg. PR5) 8 pin M12 radial plug connector M12R	<b>SOCKET</b> socket not included .162 to be reported only with connector output (eg. M12R.162), for socket see Accessories	<b>VARIANT</b> custom version XXX
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**36B**



recommended mating shaft tolerance H7  
dimensions in mm

fixing clamps not included, please refer to Accessories

**ELECTRICAL SPECIFICATIONS**

<b>Multiturn resolution</b>	1 to 17 bit for multiturn resolution > 17 bit please contact our offices
<b>Singleturn resolution</b>	1 to 15 bit
<b>Power supply<sup>1</sup></b>	5 = 4,75 ... 5,25 V DC 8/30 = 7,6 ... 30 V DC (reverse polarity protection)
<b>Power draw without load</b>	< 400 mW
<b>Electrical interface<sup>2</sup></b>	RS-422 (THVD1451 or similar)
<b>Auxiliary inputs (U/D - RESET)</b>	active high (+V DC) connect to 0 V if not used / RESET t <sub>min</sub> 150 ms
<b>Clock frequency</b>	100 kHz ... 1 MHz
<b>Code type</b>	binary or gray
<b>SSI monostable time (T<sub>m</sub>)</b>	20 µs
<b>SSI pause time (T<sub>p</sub>)</b>	> 35 µs
<b>SSI frame</b>	tree format MSB ... LSB up to 12 bit multiturn = length 25 bit (12MT + 13ST) 13 to 14 bit multiturn = length 27 bit (14MT + 13ST) 15 to 17 bit multiturn = length 32 bit (17MT + 15ST)
<b>SSI status and parity bit</b>	on request
<b>Counting direction</b>	decreasing clockwise (shaft view)
<b>Start-up time</b>	150 ms
<b>Accuracy</b>	± 0,35° max
<b>Mean time to dangerous failure (MTTF)<sub>d</sub><sup>3</sup></b> according to EN ISO 13849-1	271 years
<b>Mission time (T<sub>m</sub>)<sup>3</sup></b>	20 years
<b>Diagnostic coverage (DC)<sup>3</sup></b>	0%
<b>Cable type</b>	shielded - fixed installation conductors section 0,14 mm <sup>2</sup> / AWG 26 bending radius min 60 mm
<b>Electromagnetic compatibility</b>	according to 2014/30/EU directive
<b>RoHS</b>	according to 2011/65/EU directive
<b>UL / CSA</b>	file n. E212495

**CONNECTIONS**

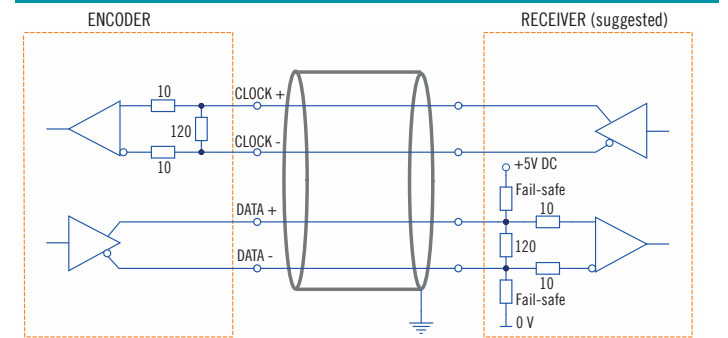
Function	Cable	8 pin M12
+ V DC	red	8
0 V	black	5
DATA +	green	3
DATA -	brown or grey	2
CLOCK +	yellow	4
CLOCK -	orange	6
U / D	red / blue	7
RESET	white	1
≡	shield	housing

**MECHANICAL SPECIFICATIONS**

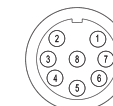
<b>Shaft diameter</b>	ø 6 mm
<b>Enclosure rating</b>	IP 67 cover side / IP 65 shaft side (IEC 60529)
<b>Rotation speed</b>	8000 rpm continuous / 10000 rpm max
<b>Max shaft load<sup>4</sup></b>	20 N (4,5 lbs) axial / radial
<b>Shock</b>	50 G, 11 ms (IEC 60068-2-27)
<b>Vibration</b>	20 G, 10 ... 2000 Hz (IEC 60068-2-6)
<b>Moment of inertia</b>	0,001 x 10 <sup>-6</sup> kgm <sup>2</sup> (0,02 x 10 <sup>-6</sup> lbft <sup>2</sup> )
<b>Starting torque (at +20°C / +68°F)</b>	< 0,01 Nm (1,42 Ozin)
<b>Bearing stage material</b>	aluminum
<b>Shaft material</b>	stainless steel
<b>Housing material</b>	chrome plated steel
<b>Bearings</b>	n.2 ball bearings
<b>Bearings life</b>	10 <sup>9</sup> revolutions
<b>Operating temperature<sup>5,6</sup></b>	-30° ... +100°C (-22° ... +212°F) -25° ... +85°C (-13° ... +185°F) with M12 connector
<b>Storage temperature<sup>6</sup></b>	-25° ... +85°C (-13° ... +185°F)
<b>Weight</b>	150 g (5,29 oz)

<sup>1</sup> as measured at the transducer without cable influences  
<sup>2</sup> for further details refer to OUTPUT LEVELS on TECHNICAL BASICS section  
<sup>3</sup> this product is not a safety component, for further details refer to TECHNICAL BASICS section  
<sup>4</sup> maximum load for static usage  
<sup>5</sup> measured on the transducer flange  
<sup>6</sup> condensation not allowed

**SSI SCHEMATICS**



M12 connector (8 pin)  
M12 A coded  
front view



**MAIN FEATURES**

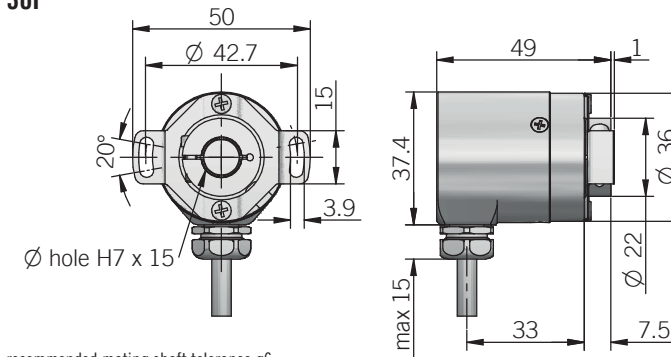
Miniaturized multiturn absolute encoder for limited size applications.

- Magnetic sensor technology without contact (Magnetic ASIC + Patented Energy Harvesting)
- Up to 55 bit as total resolution (15 bit single turn + 40 bit multiturn)
- Power supply up to +30 V DC with SSI as electrical interface
- Code reset for easy setup
- Cable or M12 output, other connectors available on cable end
- Blind hollow shaft up to 10 mm diameter
- Mounting by stator coupling or torque pin



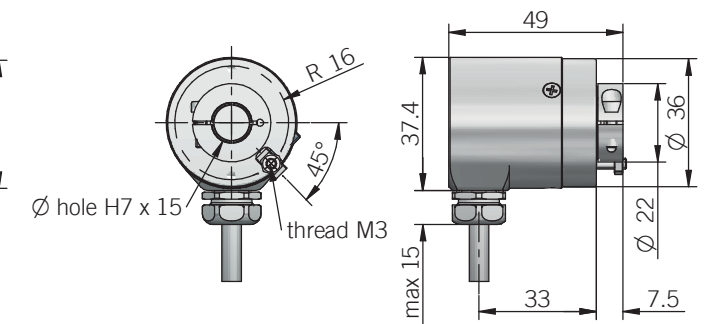
ORDERING CODE	EAM	36F	12 / 13	G	8/30	S	P	X	10	X	8	M12R	.162	+XXX
<b>SERIES</b> magnetic multiturn absolute encoder <b>EAM</b>														
<b>MODEL</b> blind hollow shaft with stator coupling <b>36F</b> blind hollow shaft with torque pin <b>36G</b>														
<b>MULTITURN RESOLUTION</b> turns from 1 to 17 bit														
<b>SINGLETURN RESOLUTION</b> from 1 to 15 bit														
<b>CODE TYPE</b> binary <b>B</b> gray <b>G</b>														
<b>POWER SUPPLY</b> 5 V DC <b>5</b> 8 ... 30 V DC <b>8/30</b>														
<b>ELECTRICAL INTERFACE</b> Serial Synchronous Interface - SSI <b>S</b>														
<b>LOGIC</b> positive <b>P</b>														
<b>OPTIONS</b> to be reported if not used <b>X</b> reset with external input <b>ZE</b>														
<b>BORE DIAMETER</b> (3/8") mm <b>9,52</b> mm <b>10</b> diameters 4 / 5 / 6 / 6,35 (1/4") / 8 mm with optional shaft adapter, see Accessories														
<b>ENCLOSURE RATING</b> IP 67 cover side / IP 66 shaft side <b>X</b>														
<b>MAX ROTATION SPEED</b> 8000 rpm <b>8</b>														
<b>OUTPUT TYPE</b> radial cable (standard length 0,5 m) <b>PR</b> preferred cable lengths 1,5 / 2 / 3 / 5 / 10 m, to be added after OUTPUT TYPE (eg. PCR5) 8 pin M12 radial plug connector <b>M12R</b>														
<b>SOCKET</b> socket not included <b>.162</b> to be reported only with connector output (eg. M12R.162), for socket see Accessories														
<b>VARIANT</b> custom version <b>XXX</b>														

**36F**



recommended mating shaft tolerance g6  
dimensions in mm

**36G**



torque pin is included, for mounting instruction please refer to product installation notes

**ELECTRICAL SPECIFICATIONS**

<b>Multiturn resolution</b>	1 to 17 bit for multiturn resolution > 17 bit please contact our offices
<b>Singleturn resolution</b>	1 to 15 bit
<b>Power supply<sup>1</sup></b>	5 = 4,75 ... 5,25 V DC 8/30 = 7,6 ... 30 V DC (reverse polarity protection)
<b>Power draw without load</b>	< 400 mW
<b>Electrical interface<sup>2</sup></b>	RS-422 (THVD1451 or similar)
<b>Auxiliary inputs (U/D - RESET)</b>	active high (+V DC) connect to 0 V if not used / RESET t <sub>min</sub> 150 ms
<b>Clock frequency</b>	100 kHz ... 1 MHz
<b>Code type</b>	binary or gray
<b>SSI monostable time (T<sub>m</sub>)</b>	20 μs
<b>SSI pause time (T<sub>p</sub>)</b>	> 35 μs
<b>SSI frame</b>	tree format MSB ... LSB up to 12 bit multiturn = length 25 bit (12MT + 13ST) 13 to 14 bit multiturn = length 27 bit (14MT + 13ST) 15 to 17 bit multiturn = length 32 bit (17MT + 15ST)
<b>SSI status and parity bit</b>	on request
<b>Counting direction</b>	decreasing clockwise (shaft view)
<b>Start-up time</b>	150 ms
<b>Accuracy</b>	± 0,35° max
<b>Mean time to dangerous failure (MTF<sub>d</sub>)<sup>3</sup></b> according to EN ISO 13849-1	271 years
<b>Mission time (T<sub>m</sub>)<sup>3</sup></b>	20 years
<b>Diagnostic coverage (DC)<sup>3</sup></b>	0%
<b>Cable type</b>	shielded - fixed installation conductors section 0,14 mm <sup>2</sup> / AWG 26 bending radius min 60 mm
<b>Electromagnetic compatibility</b>	according to 2014/30/EU directive
<b>RoHS</b>	according to 2011/65/EU directive
<b>UL / CSA</b>	file n. E212495

**CONNECTIONS**

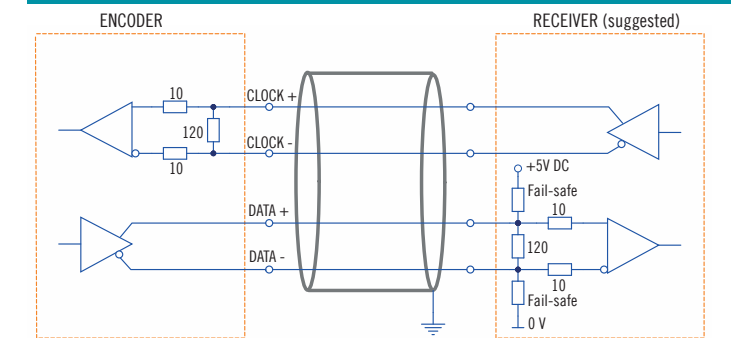
Function	Cable	8 pin M12
+ V DC	red	8
0 V	black	5
DATA +	green	3
DATA -	brown or grey	2
CLOCK +	yellow	4
CLOCK -	orange	6
U / D	red / blue	7
RESET	white	1
⊥	shield	housing

**MECHANICAL SPECIFICATIONS**

<b>Bore diameter</b>	∅ 9,52 (3/8") / 10 mm ∅ 4* / 5* / 6* / 6,35 (1/4")* / 8* mm * with optional shaft adapter, please refer to Accessories
<b>Enclosure rating</b>	IP 67 cover side / IP 66 shaft side (IEC 60529)
<b>Rotation speed</b>	8000 rpm continuous / 10000 rpm max
<b>Max shaft load<sup>4</sup></b>	20 N (4,5 lbs) axial / radial
<b>Shock</b>	50 G, 11 ms (IEC 60068-2-27)
<b>Vibration</b>	20 G, 10 ... 2000 Hz (IEC 60068-2-6)
<b>Moment of inertia</b>	0,001 x 10 <sup>-6</sup> kgm <sup>2</sup> (0,02 x 10 <sup>-6</sup> lbf <sup>2</sup> )
<b>Starting torque (at +20°C / +68°F)</b>	< 0,01 Nm (1,42 Ozin)
<b>Bearing stage material</b>	aluminum
<b>Shaft material</b>	stainless steel
<b>Housing material</b>	chrome plated steel
<b>Bearings</b>	n.2 ball bearings
<b>Bearings life</b>	10 <sup>9</sup> revolutions
<b>Operating temperature<sup>5,6</sup></b>	-30° ... +100°C (-22° ... +212°F) -25° ... +85°C (-13° ... +185°F) with M12 connector
<b>Storage temperature<sup>6</sup></b>	-25° ... +85°C (-13° ... +185°F)
<b>Weight</b>	150 g (5,29 oz)

<sup>1</sup> as measured at the transducer without cable influences  
<sup>2</sup> for further details refer to OUTPUT LEVELS on TECHNICAL BASICS section  
<sup>3</sup> this product is not a safety component, for further details refer to TECHNICAL BASICS section  
<sup>4</sup> maximum load for static usage  
<sup>5</sup> measured on the transducer flange  
<sup>6</sup> condensation not allowed

**SSI SCHEMATICS**



M12 connector (8 pin)  
M12 A coded  
front view



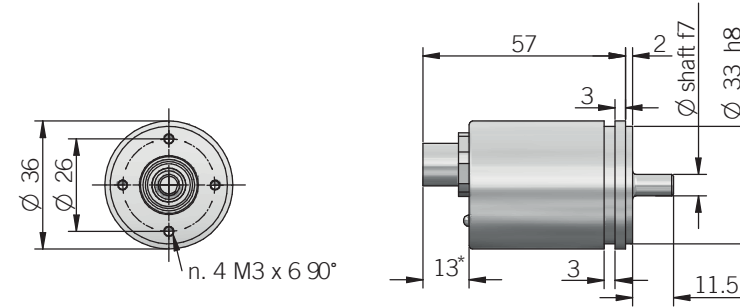
**MAIN FEATURES**

Industry standard multiturn absolute encoder for factory automation applications.

- Magnetic sensor technology without contact (magnetic ASIC + Energy Harvesting)
- Sturdy construction thanks to separated chambers
- Power supply up to +32 VDC with CANopen interface
- Cable or M12 connector axial output
- 6 mm diameter solid shaft
- Mounting by synchronous flange



**36B**



recommended mating shaft tolerance H7  
dimensions in mm

\* with cable output + 7mm

**ORDERING CODE**      **AAM 36B 24 / 14 B 10/30 CNP 6 X X M12A .162 +XXX**

<b>SERIES</b> magnetic multiturn absolute encoder series <b>AAM</b>	<b>MODEL</b> synchronous flange ø 33 mm <b>36B</b>	<b>MULTITURN RESOLUTION</b> bit <b>24</b>	<b>SINGLETURN RESOLUTION</b> bit <b>14</b>	<b>CODE TYPE</b> binary <b>B</b>	<b>POWER SUPPLY</b> 10 ... 30 V DC <b>10/30</b>	<b>ELECTRICAL INTERFACE</b> CANopen <b>CNP</b>	<b>SHAFT DIAMETER</b> mm <b>6</b>	<b>ENCLOSURE RATING</b> IP67 cover side / IP 65 shaft side <b>X</b>	<b>OPTIONS</b> to be reported <b>X</b>	<b>OUTPUT TYPE</b> axial cable (standard length 2 m) <b>PA2</b> 5 pin M12 axial plug connector <b>M12A</b>	<b>SOCKET</b> socket not included <b>.162</b>	<b>VARIANT</b> custom version <b>XXX</b>
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**ELECTRICAL SPECIFICATIONS**

<b>Multiturn resolution</b>	24 bit programmable during commissioning
<b>Singleturn resolution</b>	14 bit programmable during commissioning
<b>Power supply<sup>1</sup></b>	10 ... 32 V DC (reverse polarity protection)
<b>Power draw without load</b>	0,5 W
<b>Electrical interface<sup>2</sup></b>	CAN
<b>Protocol</b>	CANopen Communication profile CiA 301 Encoder profile CiA 406 V3.2 class C2
<b>Node number</b>	1 ... 127 (default 127) programmable during commissioning
<b>Baud rate</b>	10 kBaud ... 1 Mbaud with automatic bit rate detection
<b>LSS protocol</b>	according to CiA 305
<b>CAN transmission modes</b>	programmable (Synchronous and Asynchronous)
<b>LED error messages</b>	according to CiA 303-3
<b>Code type</b>	binary
<b>Position update rate</b>	≤ 600 µs
<b>Start-up time</b>	< 1,5 s
<b>Accuracy</b>	± 0,35°
<b>Mean time to dangerous failure (MTTF)<sup>3</sup></b> according to EN ISO 13849-1	1000 years
<b>Mission time (Tm)<sup>3</sup></b>	20 years
<b>Diagnostic coverage (DC)<sup>3</sup></b>	0%
<b>Cable type</b>	shielded - fixed or flexible installation conductors section 0,25 mm <sup>2</sup> / AWG 24 bending radius min 35 mm (fixed installation) bending radius min 95 mm (flexible installation)
<b>Electromagnetic compatibility</b>	according to 2014/30/EU directive
<b>RoHS</b>	according to 2011/65/EU directive

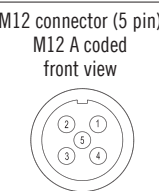
<sup>1</sup> as measured at the transducer without cable influences  
<sup>2</sup> for further details refer to OUTPUT LEVELS on TECHNICAL BASICS section  
<sup>3</sup> this product is not a safety component, for further details refer to TECHNICAL BASICS section  
<sup>4</sup> maximum load for static usage  
<sup>5</sup> measured on the transducer flange  
<sup>6</sup> condensation not allowed

**MECHANICAL SPECIFICATION**

<b>Shaft diameter</b>	ø 6 mm
<b>Enclosure rating IEC 60529</b>	IP 67 cover side / IP65 shaft side
<b>Max rotation speed</b>	12000 rpm
<b>Max shaft load<sup>3</sup></b>	80 N (17,98 lbs) radial / 50 N (11,24 lbs) axial
<b>Shock</b>	100 G, 6 ms (IEC 60068-2-27)
<b>Vibrations</b>	30 G, 10 ... 2000 Hz (IEC 60068-2-6)
<b>Starting torque (at +20°C / +68°F)</b>	< 0,002 Nm (0,28 Ozin)
<b>Bearing stage material</b>	aluminium
<b>Shaft material</b>	stainless steel
<b>Housing material</b>	chromium plated steel
<b>Bearings</b>	2 ball bearings
<b>Bearings life</b>	10 <sup>9</sup> revolutions
<b>Operating temperature<sup>4,5</sup></b>	-40° ... +85°C (-40° ... +185°F)
<b>Storage temperature<sup>5</sup></b>	-40° ... +100°C (-40 ... +212°F)
<b>Weight</b>	110 g (3,88 oz) approx

**CONNECTIONS**

Function	5 pin M12
+ V DC	2
0 V	3
CAN_H	4
CAN_L	5
CAN_GND (shield)	1
shield connected to encoder housing	



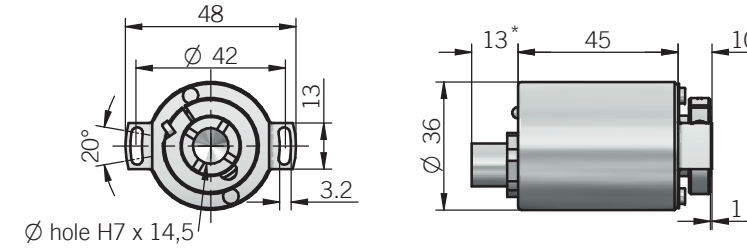
**MAIN FEATURES**

Industry standard multiturn absolute encoder for factory automation applications.

- Magnetic sensor technology without contact (magnetic ASIC + Energy Harvesting)
- Sturdy construction thanks to separated chambers
- Power supply up to +32 VDC with CANopen interface
- Cable or M12 connector axial output
- 8 or 10 mm blind hollow shaft
- Mounting by stator coupling



**AAM 36F**



recommended mating shaft tolerance g6  
dimensions in mm

\* with cable output + 7mm

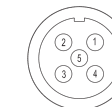
ORDERING CODE	AAM	36F	24 / 14	B	10/30	CNP	10	X	X	M12A	.162	+XXX
<b>SERIES</b> magnetic multiturn absolute encoder series <b>AAM</b>												
<b>MODEL</b> blind hollow shaft with stator coupling <b>36F</b>												
<b>MULTITURN RESOLUTION</b> bit <b>24</b>												
<b>SINGLETURN RESOLUTION</b> bit <b>14</b>												
<b>CODE TYPE</b> binary <b>B</b>												
<b>POWER SUPPLY</b> 10 ... 30 V DC <b>10/30</b>												
<b>ELECTRICAL INTERFACE</b> CANopen <b>CNP</b>												
<b>BORE DIAMETER</b> mm <b>8</b> mm <b>10</b>												
<b>ENCLOSURE RATING</b> IP67 cover side / IP65 shaft side <b>X</b>												
<b>OPTIONS</b> to be reported <b>X</b>												
<b>OUTPUT TYPE</b> axial cable (standard length 2 m) <b>PA2</b> 5 pin M12 axial plug connector <b>M12A</b>												
<b>SOCKET</b> socket not included <b>.162</b>												
<b>VARIANT</b> custom version <b>XXX</b>												

ELECTRICAL SPECIFICATIONS	
<b>Multiturn resolution</b>	24 bit programmable during commissioning
<b>Singleturn resolution</b>	14 bit programmable during commissioning
<b>Power supply<sup>1</sup></b>	10 ... 32 V DC (reverse polarity protection)
<b>Power draw without load</b>	0,5 W
<b>Electrical interface<sup>2</sup></b>	CAN
<b>Protocol</b>	CANopen Communication profile CiA 301 Encoder profile CiA 406 V3.2 class C2
<b>Node number</b>	1 ... 127 (default 127) programmable during commissioning
<b>Baud rate</b>	10 kBaud ... 1 Mbaud with automatic bit rate detection
<b>LSS protocol</b>	according to CiA 305
<b>CAN transmission modes</b>	programmable (Synchronous and Asynchronous)
<b>LED error messages</b>	according to CiA 303-3
<b>Code type</b>	binary
<b>Position update rate</b>	≤ 600 μs
<b>Start-up time</b>	< 1,5 s
<b>Accuracy</b>	± 0,35°
<b>Mean time to dangerous failure (MTTF)<sup>3</sup></b> according to EN ISO 13849-1	1000 years
<b>Mission time (Tm)<sup>3</sup></b>	20 years
<b>Diagnostic coverage (DC)<sup>3</sup></b>	0%
<b>Cable type</b>	shielded - fixed or flexible installation conductors section 0,25 mm <sup>2</sup> / AWG 24 bending radius min 35 mm (fixed installation) bending radius min 95 mm (flexible installation)
<b>Electromagnetic compatibility</b>	according to 2014/30/EU directive
<b>RoHS</b>	according to 2011/65/EU directive

MECHANICAL SPECIFICATION	
<b>Bore diameter</b>	ø 8 / 10 mm
<b>Enclosure rating IEC 60529</b>	IP 67 cover side / IP65 shaft side
<b>Max rotation speed</b>	6000 rpm
<b>Max shaft load<sup>3</sup></b>	80 N (17,98 lbs) radial / 50 N (11,24 lbs) axial
<b>Shock</b>	100 G, 6 ms (IEC 60068-2-27)
<b>Vibrations</b>	30 G, 10 ... 2000 Hz (IEC 60068-2-6)
<b>Starting torque (at +20°C / +68°F)</b>	< 0,002 Nm (0,28 Ozin)
<b>Bearing stage material</b>	aluminium
<b>Shaft material</b>	stainless steel
<b>Housing material</b>	chromium plated steel
<b>Bearings</b>	2 ball bearings
<b>Bearings life</b>	10 <sup>9</sup> revolutions
<b>Operating temperature<sup>4,5</sup></b>	-40° ... +85°C (-40° ... +185°F)
<b>Storage temperature<sup>5</sup></b>	-40° ... +100°C (-40° ... +212°F)
<b>Weight</b>	110 g (3,88 oz) approx

CONNECTIONS	
<b>Function</b>	<b>5 pin M12</b>
+ V DC	2
0 V	3
CAN_H	4
CAN_L	5
CAN_GND (shield)	1
shield connected to encoder housing	

M12 connector (5 pin)  
M12 A coded front view



<sup>1</sup> as measured at the transducer without cable influences  
<sup>2</sup> for further details refer to OUTPUT LEVELS on TECHNICAL BASICS section  
<sup>3</sup> this product is not a safety component, for further details refer to TECHNICAL BASICS section  
<sup>4</sup> maximum load for static usage  
<sup>5</sup> measured on the transducer flange  
<sup>6</sup> condensation not allowed