

### Key Features

- Ø36 metal housing (flange material aluminium, cover stainless steel)
- CANopen, CAN SAE J1939 or SSI output
- Maximum lifetime
- High continuous actuation speeds
- High shaft loads
- Absolute encoder:
  - Singleturn resolution selectable from 1 to 16 bit
  - Multiturn resolution selectable from 1 to 43 bit
  - Accuracy < 0.0878° (< 12 bit)
  - Battery and gearless true-power-on multiturn encoders
- Incremental encoder:
  - 1 to 16384 ppr programmable ex works in steps of 1 increment
  - Signal outputs A, B, Z (index) also differential
- Magnetic, gradient-based measured value acquisition
- µProcessor-supported digital signal processing
- Double ball bearing
- Shaft bearing IP65, housing up to IP67
- Operating temperature -40 to +85°C
- Electrical connection as M12 plug or round cable
- Cable/plug outlet radial or axial



HTx36E S  
Solid Shaft



HTx36E H  
Hollow Shaft

### Applications

- Plant engineering
- Operating machines
- Elevators
- Wind energy, photovoltaic
- Industrial robots
- Marking systems
- Mechanical engineering

	HTx36E (this data sheet):	HTx36 (separate data sheet):
Singleturn absolute encoders	<ul style="list-style-type: none"> <li>▪ Resolution up to 16 bit</li> <li>▪ CANopen, CAN SAE J1939, SSI</li> <li>▪ Patented technology for a system accuracy &lt; 0.0878°</li> </ul>	<ul style="list-style-type: none"> <li>▪ Analogue voltage or current loop output, up to 12 bit resolution</li> <li>▪ Digital outputs PWM, SPI (also redundant), SER or SSI (optional with UVW up to 16 pole pairs), SER, SPI or SSI, up to 14 bit resolution</li> <li>▪ Absolute Linearity up to 0.6%</li> </ul>
Multiturn encoders	<ul style="list-style-type: none"> <li>▪ CANopen, CAN SAE J1939, SSI</li> <li>▪ Patented battery and gear-less true-power-on multiturn technology (energy harvesting)</li> <li>▪ up to 43 bit multiturn resolution</li> </ul>	<ul style="list-style-type: none"> <li>▪ Analogue voltage or current loop output</li> <li>▪ Resolution 12 bit</li> <li>▪ Not True-Power-On, max. 200 revolutions (72000°)</li> </ul>
Incremental encoders	<ul style="list-style-type: none"> <li>▪ 1 to 16384 Impulses per revolution (ppr.)</li> <li>▪ Outputs TTL or HTL</li> <li>▪ Optional user-parameterizable index pulse (Z) position</li> </ul>	<ul style="list-style-type: none"> <li>▪ 1 to 1024 Impulses per revolution (ppr.)</li> <li>▪ Outputs TTL, Push-Pull, Open Collector or Linedriver, optional with UVW up to 16 pole pairs</li> </ul>

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**HTx36E Encoder - robust, ball-bearing, sealed, with solid or hollow shaft, as multiturn encoder with energy harvesting technology**

The HTx36E family of rotary encoders stand for what is technically feasible today in the field of contactless angle sensors with gradient-based magnetic data acquisition. They offer maximum resolution and accuracy when measuring angles.

**Absolute encoders HTB36E/HTS36E:**

- Battery- and gearless Energy-Harvesting / True-Power-On multiturn measurement acquisition method
- High single- and multiturn resolution
- High system accuracy for the most precise measurement results possible
- Outputs CANopen, CAN SAE J1939 or SSI

The digital communication interfaces CANopen, SAE J1939 and SSI ensure reliable digital transmission of the measured values. They also ensure smooth integration and monitoring of the encoder in the application. In addition, each encoder is automatically calibrated to a standard before leaving the factory. In the battery- and gearless energy harvesting version, the encoders also record the number of revolutions made in a de-energised state.

**Incremental encoders HTI36E:**

- Resolution from 1 to 16,384 ppr
- ppr. value can be selected in steps of 1 increment
- The option to set the index pulse to any position

HTx36E rotary encoders are the high-end encoders with magnetic sensor technology in the MEGATRON product range. They feature state-of-the-art electronics, a metal housing, a high IP protection class and a double ball bearing stainless steel shaft that can withstand high axle loads and allow high actuation speeds. Signal processing is digital, based on magnetic recording of the measured values and uses the patented Energy-Harvesting technology needed for battery-less multi turn encoders, even when the power is turned off during rotation. The gradient-based evaluation ensures high interference immunity, e.g. B. against temperature fluctuations and EMC influences. This technology leaves the disadvantages of conventional Hall sensors far behind. HTx36E rotary encoders are designed for maximum durability and even outperform the robust optical data acquisition.

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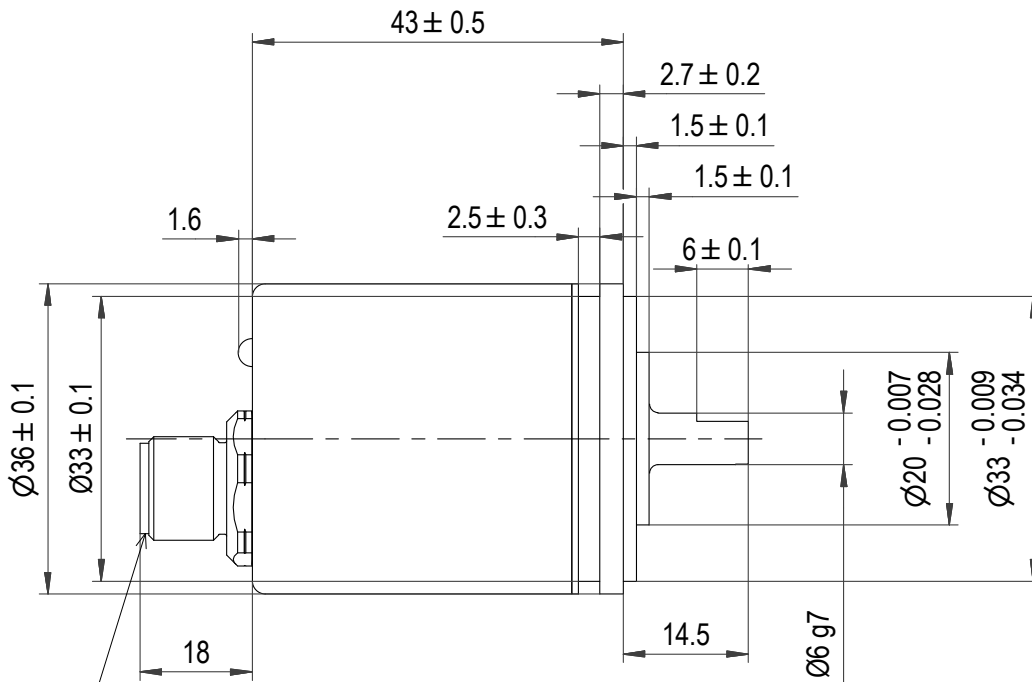
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Drawings HTx36E S - solid shaft

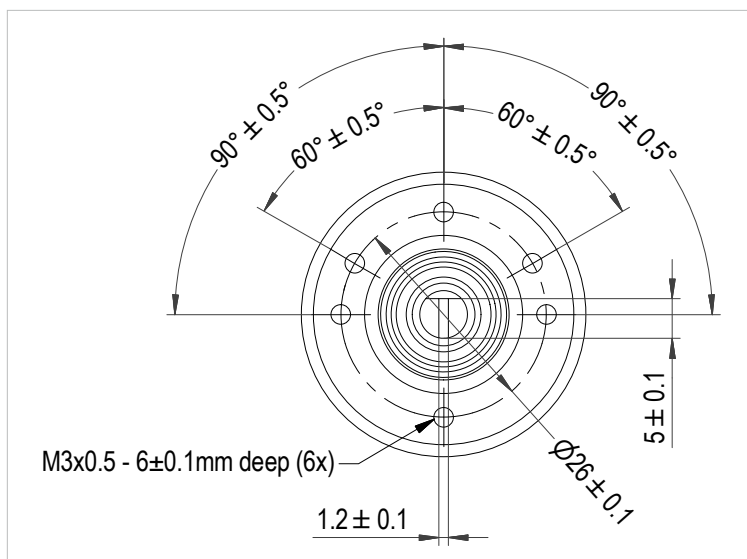
HTx36E S (solid shaft), option M12 - M12 plug, axial orientation

Side view:



BINDER male panel mount connector, range M12-A, series 713

Front view:



Standard shaft dimensions:	
Shaft length	14.5 mm
Shaft diameter	6 mm or 8 mm

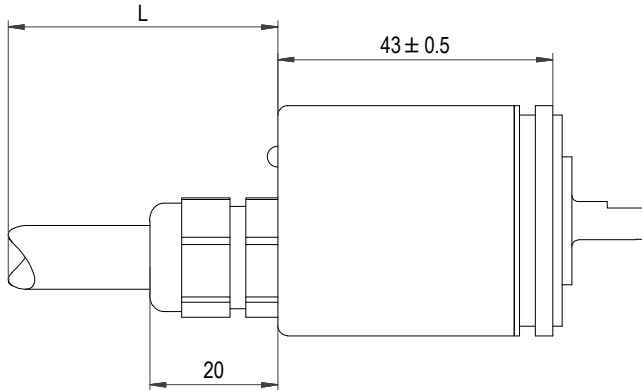
(\*) Tolerances according IPC Association

Drawings HTx36E S - solid shaft

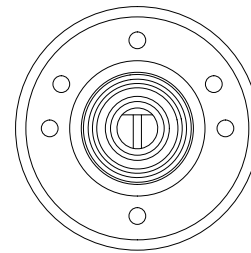
**HTx36E S (solid shaft), option PG - cable gland, axial orientation**

Side view:

Option PG with cable gland is the standard electrical connection for HTx36 series

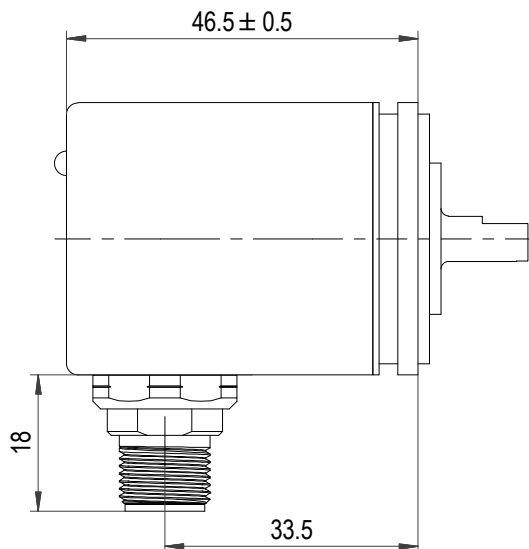


Front view:

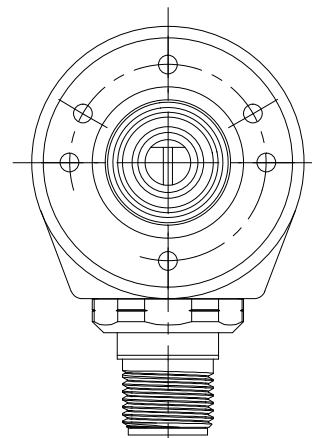


**HTx36E S (solid shaft), option M12R - M12 plug, radial orientation**

Side view:



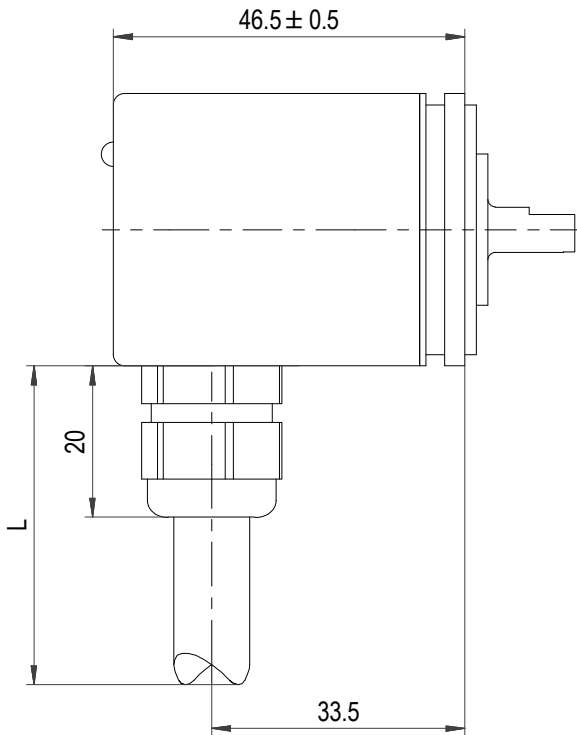
Front view:



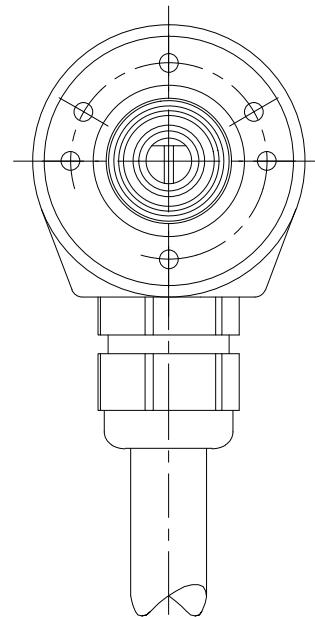
Drawings HTx36E S - solid shaft

HTx36E S (solid shaft), option PG cable gland, radial orientation incl. signal cable

Side view:

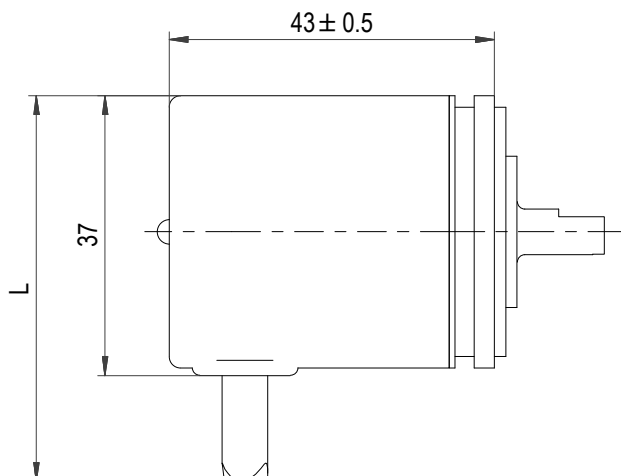


Front view:

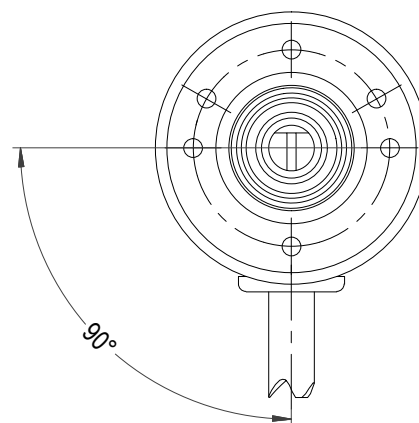


HTx36E S (solid shaft), option CVR - cable sleeve, radial orientation incl. signal cable

Side view:



Front view:



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**Drawing HTx36E S - solid shaft**

<b>CAN Interface:</b>						
Information about the standard signal cable which is included in the option PG, CVR for Absolute Rotary Encoder HTB36E						
Option	Standard Cable Length L	Number of Single Strands (depends on electronics)	Cable sheath Ø	Single Strands Cross Section	Allowed Tolerance (L)	Minimum Bend Radius
PG, CVR	2000 mm	5	6.3 mm	AWG24	-30 to +50 mm	6 x D Ø (D= cable sheath diameter Ø)
Shielded signal cable (standard)						

<b>SSI Interface:</b>						
Information about the standard signal cable which is included in the option PG, CVR for Absolute Rotary Encoder HTS36E						
Option	Standard Cable Length L	Number of Single Strands (depends on electronics)	Cable sheath Ø	Single Strands Cross Section	Allowed Tolerance (L)	Minimum Bend Radius
PG, CVR	2000 mm	8	5,3 mm	AWG26	-30 to +50 mm	6 x D Ø (D= cable sheath diameter Ø)
Shielded signal cable (standard)						

<b>Incremental Interface:</b>						
Information about the standard signal cable which is included in the option PG, CVR for Incremental Encoder HTI36E						
Option	Standard Cable Length L	Number of Single Strands (depends on electronics)	Cable sheath Ø	Single Strands Cross Section	Allowed Tolerance (L)	Minimum Bend Radius
PG, CVR	2000 mm	9	7 mm	AWG26	-30 to +50 mm	6 x D Ø (D= cable sheath diameter Ø)
		8				
		6				
		5				
Shielded signal cable (standard)						

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CAN Bus (HTB36E)

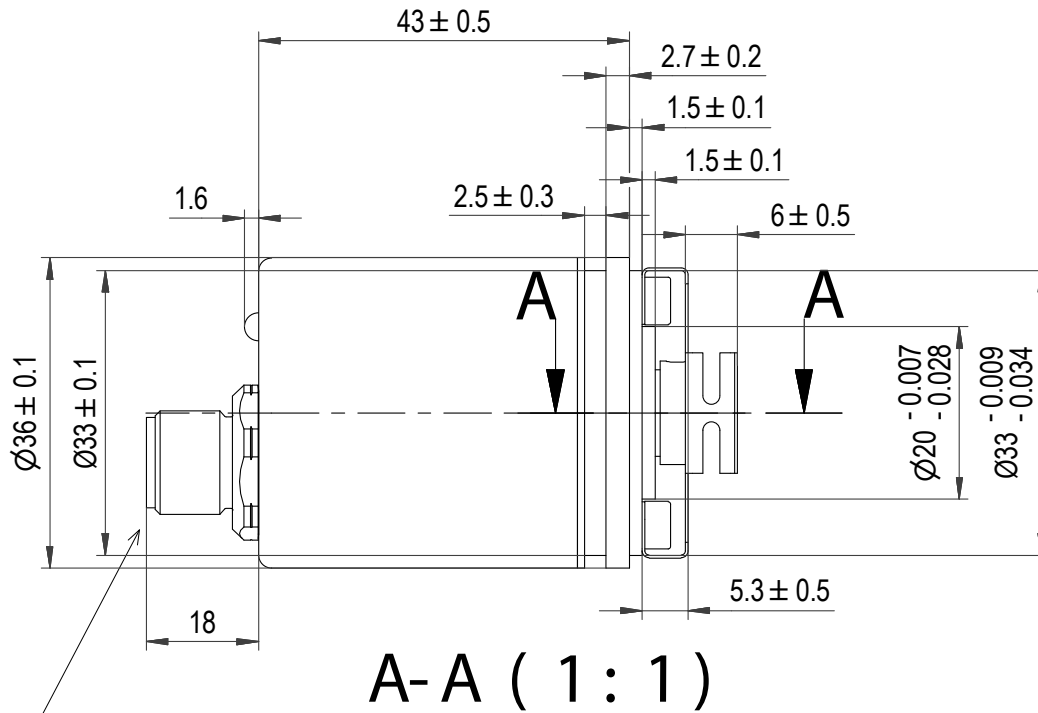
Serial/SSI (HTS36E)

Incremental (HTI36E)

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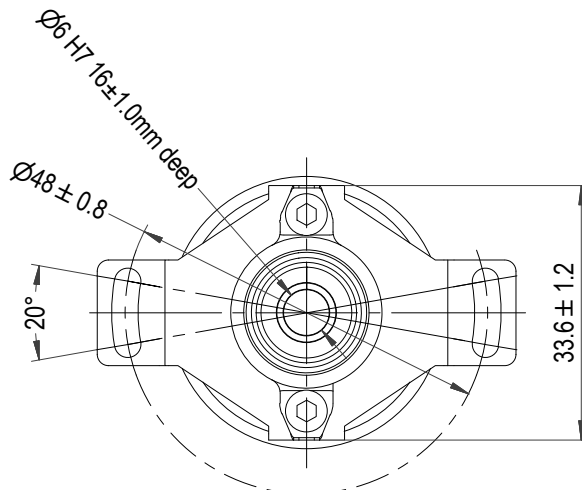
Drawings HTx36E H - hollow shaft (screw fixation)

Side view:



BINDER male panel mount connector, range M12-A, series 713

Front view:



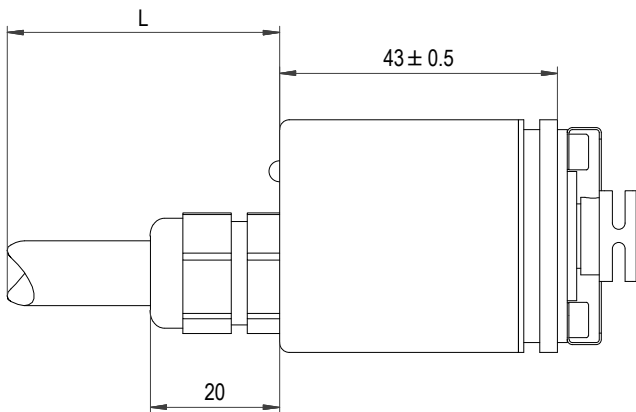


Drawings HTx36E H - hollow shaft (screw fixation)

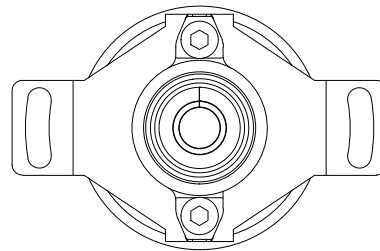
HTx36E H (hollow shaft), option PG - cable gland, axial orientation

Option PG with cable gland is the standard electrical connection for HTx36 series

Side view:

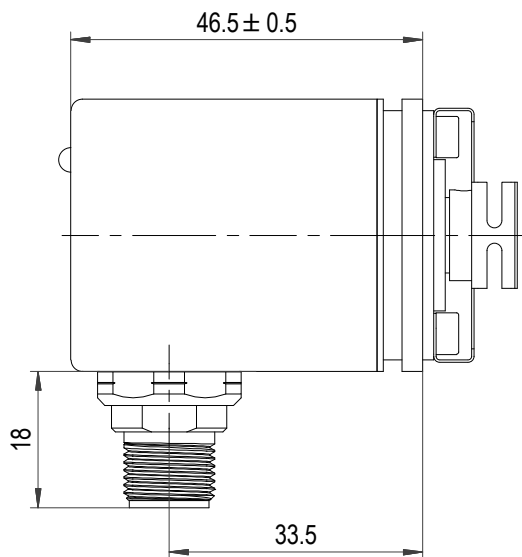


Front view:

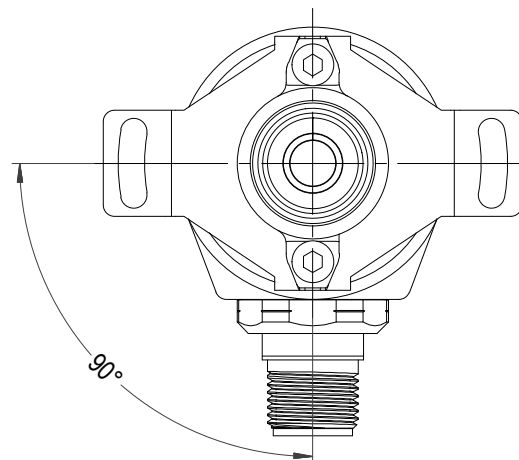


HTx36E H (hollow shaft), option M12R - M12 plug, radial orientation

Side view:



Front view:

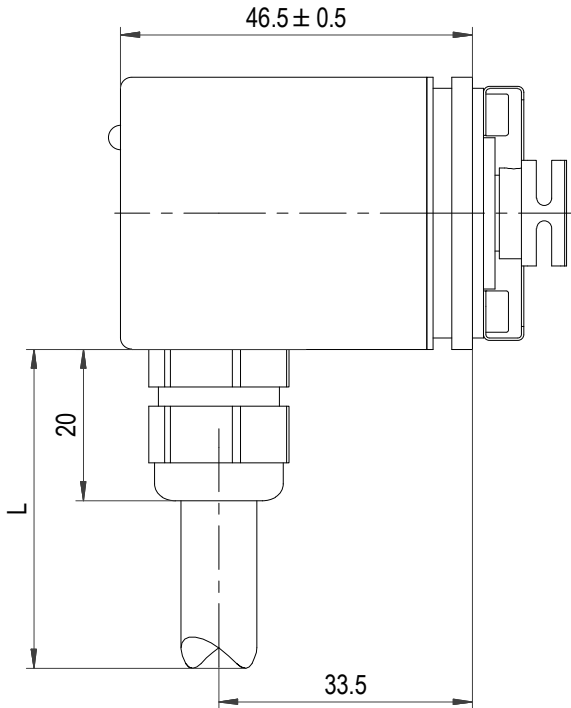


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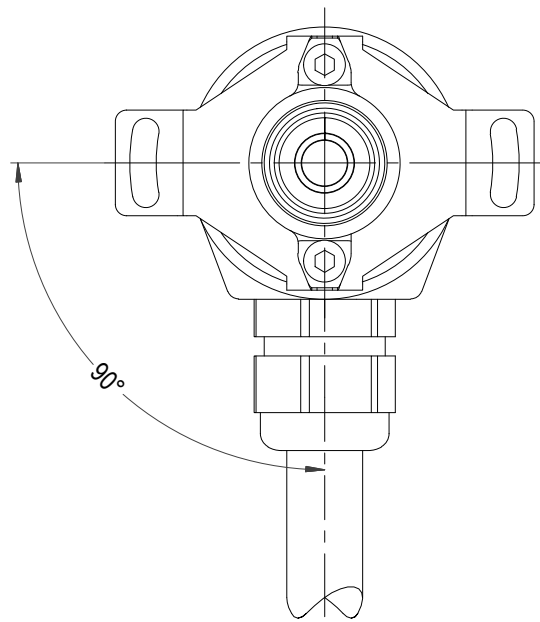
Drawings HTx36E H - hollow shaft (screw fixation)

**HTx36E H (hollow shaft), option PG - cable gland, radial orientation incl. signal cable**

Side view:

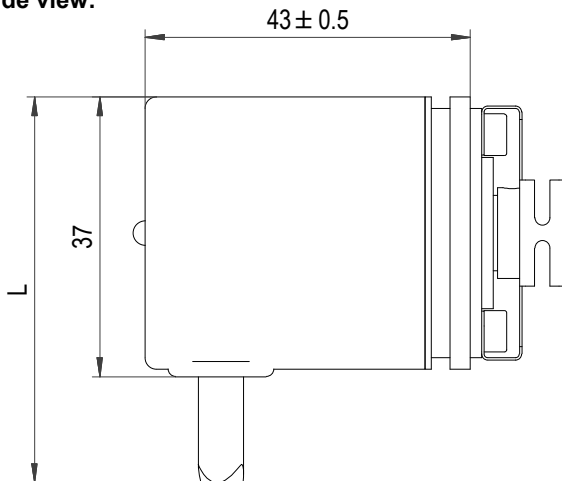


Front view:

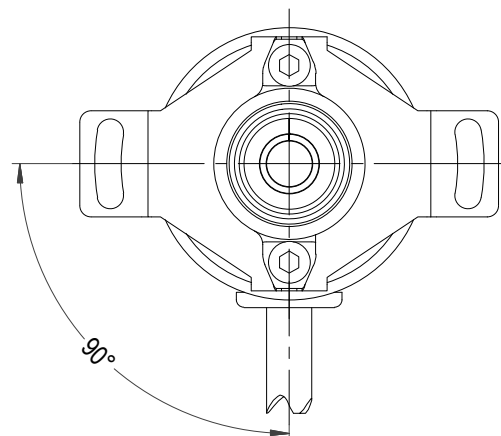


**HTx36E S (solid shaft), option CVR - cable sleeve, radial orientation incl. signal cable**

Side view:



Front view:



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**Drawing HTx36E H - hollow shaft**

<b>CAN Interface:</b> Information about the standard signal cable which is included in the option PG, CVR for Absolute Rotary Encoder HTB36E						
Option	Standard Cable Length L	Number of Single Strands (depends on electronics)	Cable sheath Ø	Single Strands Cross Section	Allowed Tolerance (L)	Minimum Bend Radius
PG, CVR	2000 mm	5	6.3 mm	AWG24	-30 to +50 mm	6 x D Ø (D= cable sheath diameter Ø)
Shielded signal cable (standard)						

<b>SSI Interface:</b> Information about the standard signal cable which is included in the option PG, CVR for Absolute Rotary Encoder HTS36E						
Option	Standard Cable Length L	Number of Single Strands (depends on electronics)	Cable sheath Ø	Single Strands Cross Section	Allowed Tolerance (L)	Minimum Bend Radius
PG, CVR	2000 mm	8	5.3 mm	AWG26	-30 to +50 mm	6 x D Ø (D= cable sheath diameter Ø)
Shielded signal cable (standard)						

<b>Incremental Interface:</b> Information about the standard signal cable which is included in the option PG, CVR for Incremental Encoder HTI36E						
Option	Standard Cable Length L	Number of Single Strands (depends on electronics)	Cable sheath Ø	Single Strands Cross Section	Allowed Tolerance (L)	Minimum Bend Radius
PG, CVR	2000 mm	9	7 mm	AWG26	-30 to +50 mm	6 x D Ø (D= cable sheath diameter Ø)
		8				
		6				
		5				
Shielded signal cable (standard)						

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Mechanical and Environmental Data, Miscellaneous - HTx36E	
Shaft type	Solid shaft (HTx36E S) or hollow shaft (HTx36E H)
Mechanical angle of rotation 1.)	Endless
Lifetime 2.)	@100 % from max. permissible radial load >1.4x10E8 shaft revolutions @80 % from max. permissible radial load >2x10E9 shaft revolution @20 % from max. permissible radial load >1.7x10E10 shaft revolutions
Bearing	2 pcs. grooved ball bearings type 2RS
Max. operational speed (with shaft sealing)	12.000 rpm
Operational torque: (@ room temperature and 10 rev/min)	Solid shaft: ▪ Standard IP65: ≤ 0.3 Ncm Hollow shaft: ▪ Standard IP65: ≤ 0.5 Ncm
Operating temperature range	With option M12 (plug) ▪ -40 to +85 °C With option PG (cable gland or sleeve) ▪ -40 to +85 °C (HTB36E CAN, HTS36E SSI) ▪ -20 to +80 °C (HTI36E Incremental)
Storage temperature range	With option M12 (plug) ▪ -40 to +100 °C With option PG (cable gland or sleeve) ▪ -40 to +100°C (HTB36E CAN, HTS36E SSI) ▪ -30 to +80 °C (HTI36E Increment output)
Protection grade (IEC 60529) front side	From shaft side: ▪ IP65
Protection grade (IEC 60529) rear side	Electrical connections M12(R), PG(R) IP67 Electrical connection CVR IP40
Vibration (DIN EN 60068-2-6)	30 g / 10 bis 2000 Hz
Shock (DIN EN 60068-2-27)	100 g / 6 ms
Housing diameter	Ø 36 mm
Housing depth	With electrical connection position (in dependency to the shaft): ▪ axial 43 mm ▪ radial 46.5 mm
Shaft diameter	Solid shaft: Ø6 mm, Ø8 mm Hollow shaft: Ø6 mm, Ø6.35 mm  Other shaft diameters on request
Max. radial load (HTx36E S)	80 N (load point 80% - in dependency to the visible shaft length)
Max. axial load	50 N (axial force initiation at the shaft end)
Mass	ca. 110 g (CAN, SSI) ca. 130 g (Incremental)

1.) According IEC 60393

2.) Determined by climatic conditions according to IEC 68-1, para. 5.3.1 without load collectives

**Mechanical and Environmental Data, Miscellaneous - HTx36E**

Connection type	<ul style="list-style-type: none"> <li>▪ Cable gland stainless steel M12, axial, radial</li> <li>▪ Plug M12, axial or radial</li> <li>▪ CVR, cable feed through via sleeve, radial</li> </ul> Options PG(R), CVR: Shielded round cable, 2 m, AWG24 or AWG26, PVC sheath, cable endings tinned
Connection position	Axial or radial
Sensor mounting	<p><b>Sensor mounting possibilities for solid shaft rotary encoders HTx36 S:</b></p> <ul style="list-style-type: none"> <li>▪ 1. Via threaded holes integrated in the sensors head Stainless steel screws M3x0.5</li> <li>▪ 2. Via synchro flange: With optional available servomount fixing nails SFN1 incl. screws M3 x 0,5 from MEGATRON.</li> </ul> <p>For sensor mounting it is recommended to use 3 pcs screws or servomount fixing nails in a hole circle distance of 120°</p> <p><b>Sensor mounting for hollow shaft rotary encoders HTx36E H:</b> Using the ex work mounted torque bracket on the rotary encoder (spring plate) by means of 2 pcs of M3 screws</p>
Fastening parts included in delivery	None <p><b>Solid shaft:</b></p> <ul style="list-style-type: none"> <li>▪ For fastening the rotary encoder by means of servomount fixing nails SFN1 - available from MEGATRON as accessories</li> </ul> <p><b>Solid- and hollow shaft:</b></p> <ul style="list-style-type: none"> <li>▪ For options M12 (R), the M12 plug is not part of the scope of delivery. M12 plugs also with cables are available as accessory from MEGATRON</li> </ul>
Fastening torque per screw or nut	$\leq 0.6 \text{ Nm}$ (screw M3) For screw securing, the use of a medium-strength thread securing adhesive is recommended
Maximum tightening torque for grub screw for fixation of the shaft, only HTx36 H	$\leq 0.5 \text{ Nm}$ (M2.5 grub screw)
Material shaft	Stainless steel
Material flange	Front aluminium, rear stainless steel
Material housing lid	Non-rusting steel
Material cable gland M12	Stainless steel

**Immunity / Electrostatic Discharge / REACH / RoHS**

EN 61000-4-3 RF sine wave	Class A
EN 61000-4-6 Conducted sine wave	Class A
EN 61000-4-8 Power frequency magnetic fields	Class A
EN 61000-4-2 ESD	Class B
REACH Regulation (EC) 1907/2006 including the SVHC list	
RoHS Directive 2011/65/EU	

### Series Overview with electrical Data

	Incremental Encoder (Singleturn)	Absolute Encoder Single-/Multiturn	
Series	HTI36E	HTB36E	HTS36E
Electronics redundant	NO		
Output signal(s)	Incremental A, B, Z Optional: A, A/, B, B/, Z, Z/	CANopen Communication profile CiA 301  or CAN SAE J1939 ISO11898 (High Speed CAN)	SSI, binary- or gray code
Resolution	(pulsed 1 to 16384 ppr.)	Singleturn part: 1 to 16 bit  Multiturn part (optional): CAN J1939: 1 to 32 bit CANopen: 1 to 43 bit	Singleturn part: 1 to 16 bit  Multiturn part (optional): 1 to 43 bit
Supply voltage(s)	4,75 to 30 V	4,75 to 32 V	4,75 to 32 V
Programmable by customer	ppr. value NO, parameterization of index pulse position Z or Z, Z/ with selected option P	Resolution values NO, The standard settings as well as customer-specific adjustments in the software can be changed via LSS (CiA 305) and the SDO protocol, e.g. PDOs, scaling, heartbeat, node ID, baud rate, etc.	Resolution values NO, Setting zero and changing the counting direction done via configuration inputs DIR and PRESET
Programmable ex works	YES	YES	YES
MTTF	1200a	1000a	1000a

#### About the terms "singleturn resolution" and "multiturn resolution" for CAN/SSI variants

The resolution values for singleturn and multiturn are independent of each other. In case of a multiturn version, the encoders have a memory for the values within one revolution (singleturn resolution) and a separate memory area for the number of complete revolutions performed (multiturn resolution). The value range can therefore be configured independently of each other and the value for multiturn resolution does not include the value for singleturn resolution.

**Series HTB36E - multiturn/singleturn rotary encoder with CAN interface, not redundant**

**Key-features HTB36E:**

- Interface: CANopen, CAN SAE J 1939
- Resolution singleturn up to 16 Bit, multiturn up to 43 Bit
- Single- or multiturn rotary encoder
- Battery and gear-less multiturn technology (energy harvesting)
- Supply voltage: 4.75 to 32 VDC
- Status LED

**Electrical Data HTB36E - multiturn/singleturn rotary encoder with CAN interface, not redundant**

Output signal	CANopen	CAN SAE J1939
Singleturn resolution*	1 bis 16 bit	
Resolution / Memory size multiturn*	1 bis 43 bit	
Accuracy	± 0,0878° (≤ 12 Bit)	
Singleturn repeatability	± 0,0878° (≤ 12 Bit)	
Update rate	≤ 600 µs	
Supply voltage	4.75 to 32 VDC	
Power consumption (no load)	max. 0.5 W	
MTTF	1000a	

1.) According IEC 60393

**CANopen Specifications**

Protocol	CANopen <ul style="list-style-type: none"> <li>▪ Communication profile CiA 301</li> <li>▪ Device profile for encoder CiA 406 V3.2 class C2</li> </ul>
Node number	1 up to 127 (default 127)
Baud rate	10 kBaud up to 1 MBaud with automatic bit rate detection
Ex works parameters / adaptations	The default settings as well as the customer-specific adaptation in the software can be changed via LSS (CiA 305) and the SDO protocol, e.g. PDOs, scaling, heartbeat, node ID, baud rate, etc.
Programmable CAN transfer modes	<p><b>Synchronous mode:</b> When receiving a synchronization telegram (SYNC) from another bus participant PDOs will be sent out autonomous</p> <p><b>Asynchronous mode:</b> An internal event triggers a PDO message (e.g. change of measured value, internal timer or similar)</p>

CAN SAE J1939 specifications	
CAN physical layer	ISO 11898 (High Speed CAN)
Protocol	ISO 11898 (High Speed CAN)
Baud rate	Auto-Baud-Detection
Standard factory programming: (*)	
Direction of counting	View on the shaft side, CCW (counter clockwise)
ECU-address	0x 0A
Process data identifier	0x18FF000A
PGN	0xFF00
Process data mapping	Byte 0-3 32 Bit position value Byte 4 8 Bit error register PDU timer and position preset can be set by PGN configuration 0xEF00 (Prop. A)
PDU-Time	50 ms (default)
Configurations-PGN	0x EF 00 (prop. A)
Byte 0	0x 01
Byte 1	0x FF
Byte 2	PDU Time LSB
Byte 3	PDU Time MSB
Byte 4	Preset LSB
Byte 5, 6	Preset

(\*) Other programmings on request

Further information/manual for HTB36E series with CAN interface are available in the download area of the HTB36 product site <https://www.megatron.de/>  
 - CAN-Manual for HTB36E series  
 - Manual: HTB36E CANopen setting Node ID  
 - Startup instruction manuals

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Order Code HTB36E - multiturn/singleturn rotary encoder with CAN interface, not redundant									
Description	Selection: <b>standard=black/bold</b> , possible <i>options=grey/italic</i>								
Series HTB36E	HTB36E								
<b>Single- or Multiturn:</b>									
<b>Singleturn</b> (If 0 Bit is selected as multiturn resolution)		-							
<b>Multiturn</b> (If ≥ 1 Bit is selected as multiturn resolution)		PM							
<b>Shaft type:</b>									
<b>Solid shaft</b>		S							
<b>Hollow shaft with screw fastening</b>		H							
<b>Shaft diameter:</b>									
<b>Shaft diameter Ø6 mm</b> (Available in combination with options S and H)				6					
<b>Shaft diameter Ø6.35 mm</b> (Available only in combination with option H)				6,35					
<b>Shaft diameter Ø8 mm</b> (Available in combination with option S)				8					
<i>Option: user defined shaft diameter [mm] (*)</i>				X					
<b>Multiplication symbol [x]:</b>					x				
<b>Visible shaft length of the rotary encoder:</b>									
<b>Shaft length 14.5 mm for option S</b>					14,5				
<b>Shaft length 5.3 mm for option H</b> (blindhole depth 16 mm)					-				
<i>Option: user defined shaft length for Option S [mm] (*)</i>					XX				
<b>Supply voltage / output signal:</b>									
<b>VSUP=24 V (4.75 to 32 V) / CANopen</b>						24CA			
<b>VSUP=24 V (4.75 to 32 V) / CAN SAE J1939</b>						24CJ			
<b>Terminating resistor:</b>									
<b>Without terminating resistor</b>							-		
<i>Option: integrated 120 Ohm terminating resistor (Integrated in the rotary encoder)</i>							T		
<b>Singleturn resolution:</b>									
<b>Singleturn resolution 12 Bit</b>							12		
<i>Option: singleturn resolution 1 up to 16 Bit</i>							XX		
<b>Multiturn resolution:</b>									
<b>Resolution 12 Bit (4096 turns)</b>								12	
<i>Option: resolution 0 Bit (singleturn rotary encoder)</i>								0	
<i>Option: resolution ≥ 1 Bit (Multiturn rotary encoder)</i>								XX	
<i>(Maximum multiturn resolution 43 Bit for CANopen, 32 Bit for CAN SAE J1939)</i>									
<b>Electrical connection, cable length, position:</b>									
<b>2 m round cable, cable gland, axial (IP67)</b>									PG
<b>Plug M12, axial (IP67)</b>									M12
<b>2 m round cable, cable sleeve, radial (IP40)</b>									CVR
<i>Option: customer specific cable length, cable gland, axial (IP67) (*)</i>									PG X,XX
<b>2 m round cable, cable gland, radial (IP67)</b>									PGR
<b>Plug M12, radial (IP67)</b>									M12R
<i>Option: Customer specific cable length, cable gland, radial (IP67) (*)</i>									PGR X,XX

(\*) This option is linked to a minimum order quantity

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**Order example HTB36E - singleturn rotary encoder with CANopen interface, not redundant**

**Requirement:**

Solid shaft Ø6.00 mm, shaft length 14.5 mm, VSUP=24 V / OUT=CANopen, without integrated 120 Ohm termination resistor, singleturn resolution 12 Bit (resolution, thus  $360^\circ/4096=0.088^\circ$ ), multiturn resolution 0 Bit (0 Bit stands for singleturn rotary encoder), round cable 2 m, cable outlet position axial (in dependency to the shaft)

**Example for order code:**

HTB36E S 6x14,5 24CA 12 0 PG

**Order example HTB36E PM - multiturn rotary encoder with CANopen interface, not redundant**

**Requirement:**

Solid shaft Ø6.00 mm, shaft length 14.5 mm, VSUP=24 V / OUT=CANopen, without integrated 120 Ohm termination resistor, singleturn resolution 12 Bit (resolution per turn, thus for  $360^\circ \Rightarrow 360^\circ/4096=0.088^\circ$ ), multiturn resolution 12 Bit ( $4096 \text{ turns} \times 360^\circ = 1.474.560^\circ$  effective electrical angle), round cable 2 m, cable outlet position axial (in dependency to the shaft)

**Example for order code:**

HTB36E PM S 6x14,5 24CA 12 12 PG

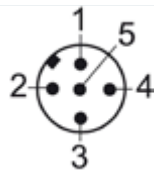
**Cable and pin assignment HTB36E multiturn/singleturn rotary encoder with CANopen or CAN SAE J1939 interface, not redundant**

Function:	Option PG(R), CVR	Option M12(R)
VSUP	brown	PIN 2
GND	white	PIN 3
CANHigh	green	PIN 4
CANLow	yellow	PIN 5
CANGND / Shield (*)	shield	PIN 1

(\*) The cable shield is conductively connected to the rotary encoder housing

**Plug type M12 (R) HTB36E - pin assignment: position of the plug pins in the rotary encoder housing in the top view**

Plug (5 pol.)



**Series HTS36E - multiturn/singleturn rotary encoder with SSI interface, not redundant**

**Key-features HTS36E with SSI interface:**

- Signal output: SSI, binary- or Gray- code
- Resolution singleturn up to 16 Bit, Multiturn up to 43 Bit
- Single- or multiturn rotary encoder
- Battery and gear-less multiturn technology (energy harvesting)
- Singleturn accuracy < 0.0878° (< 12 bit)
- Supply voltage: 4,75 to 32 VDC
- Status LED

**Electrical data HTS36E multiturn/singleturn rotary encoder with SSI output, not redundant**

Singleturn Resolution*	1 to 16 bit
Multiturn resolution/memory size*	1 to 43 bit
Singleturn accuracy	±0,0878° (≤ 12 bit)
Singleturn repeatability	±0,0878° (≤ 12 bit)
Output signal	SSI binary or gray code
Update rate	≤ 600 µs
Supply voltage	4.75 to 32 V
Current consumption (no load)	typ. 50 mA
Power consumption	max. 0.5 W
MTTF	1000a

\*For the terms "singleturn resolution" and "multiturn resolution", please refer to the note on pageSeite 14.

**SSI specifications**

Clock input	Via opto-coupler, min. 1.6 mA (CLK difference min. 2.2 V), input not RS485/RS422 compatible
Clock frequency	100 kHz up to 500 kHz (*)
Data output	RS485/RS422 compatible
Output code	Binary or Gray
SSI output	Angular-/position value
Parity bit	Optional (even/odd)
Error bit	Optional
Turn on time	< 1.5 s
Configuration inputs	DIR = GND => CW DIR = VSUP => CCW
Set to zero	Set: preset = VSUP for 2 sec Deactivate: preset = GND

(\*) Up to 2 MHz clock frequency on request

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Order code HTS36 - multiturn/singleturn rotary encoder with SSI interface, not redundant									
Description	Selection: <b>standard=black/bold</b> , possible <i>options=grey/italic</i>								
<b>Series HTS36E</b>	<b>HTB36E</b>								
<b>Single- or Multiturn:</b>									
<b>Singleturn</b> (If 0 Bit is selected as multiturn resolution)		-							
<b>Multiturn</b> (If ≥ 1 Bit is selected as multiturn resolution)		<b>PM</b>							
<b>Shaft type:</b>									
<b>Solid shaft</b>			<b>S</b>						
<b>Hollow shaft with screw fastening</b>			<b>H</b>						
<b>Shaft diameter:</b>									
<b>Shaft diameter Ø6 mm</b> (Available in combination with options S and H)				<b>6</b>					
<b>Shaft diameter Ø6.35 mm</b> (Available only in combination with option H)				<b>6,35</b>					
<b>Shaft diameter Ø8 mm</b> (Available in combination with option S)				<b>8</b>					
<i>Option: user defined shaft diameter [mm] (*)</i>				<i>X</i>					
<b>Multiplication symbol [x]:</b>					<b>x</b>				
<b>Visible shaft length of the rotary encoder:</b>									
<b>Shaft length 14.5 mm for option S</b>						<b>14,5</b>			
<b>Shaft length 5.3 mm for option H</b> (blindhole depth 16 mm)						-			
<i>Option: user defined shaft length for Option S [mm] (*)</i>						<i>XX</i>			
<b>Supply voltage / output signal:</b>									
<b>VSUP=4,75 to 32 V / SSI</b>							<b>SSI</b>		
<b>Code:</b>									
<b>Binary</b>								<b>B</b>	
<b>Gray</b>								<b>G</b>	
<b>Singleturn resolution:</b>									
<b>Singleturn resolution 12 Bit</b>								<b>12</b>	
<i>Option: singleturn resolution 1 up to 16 Bit</i>								<i>XX</i>	
<b>Multiturn resolution:</b>									
<b>Resolution 12 Bit (4096 turns)</b>								<b>12</b>	
<i>Option: resolution 0 Bit (singleturn rotary encoder)</i>								<i>0</i>	
<i>Option: resolution ≥ 1 Bit (multiturn rotary encoder)</i>								<i>XX</i>	
(Maximum multiturn resolution 43 Bit)									
<b>Electrical connection, cable length, position:</b>									
<b>2 m round cable, cable gland, axial (IP67)</b>									<b>PG</b>
<b>Plug M12, axial (IP67)</b>									<b>M12</b>
<b>2 m round cable, cable sleeve, radial (IP40)</b>									<b>CVR</b>
<i>Option: customer specific cable length, cable gland, axial (IP67) (*)</i>									<i>PG X,XX</i>
<b>2 m round cable, cable gland, radial (IP67)</b>									<b>PGR</b>
<b>Plug M12, radial (IP67)</b>									<b>M12R</b>
<i>Option: Customer specific cable length, cable gland, radial (IP67) (*)</i>									<i>PGR X,XX</i>

(\*) This option is linked to a minimum order quantity

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**Order example HTS36E - singleturn rotary encoder with SSI interface, not redundant**
**Requirement:**

Solid shaft Ø6.00 mm, shaft length 14.5 mm, SSI binary, singleturn resolution 12 Bit (resolution, thus  $360^\circ/4096=0.088^\circ$ ), multiturn resolution 0 bit (0 bit stands for for singleturn rotary encoder), round cable 2 m, cable outlet position axial (in dependency to the shaft)

**Example for order code:**

HTS36E S 6x14,5 SSI B 12 0 PG

**Order example HTS36E PM - multiturn rotary encoder with SSI interface, not redundant**
**Requirement:**

Solid shaft Ø6.00 mm, shaft length 14.5 mm, SSI binary code, singleturn resolution 12 Bit (resolution per turn, thus for  $360^\circ \Rightarrow 360^\circ/4096=0.088^\circ$ ), multiturn resolution 12 Bit ( $4096 \text{ (turns)} \times 360^\circ = 1.474.560^\circ$  effective electrical angle), round cable 2 m, cable outlet position axial (in dependency to the shaft)

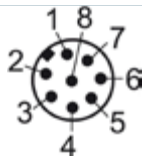
**Example for order code:**

HTS36E PM S 6x14,5 SSI B 12 12 PG

**Cable- and pin assignment HTS36E - multiturn/singleturn rotary encoder with SSI interface, not redundant**

Function:	Option PG(R), CVR	Option M12(R)
GND	white	PIN 1
VSUP	brown	PIN 2
CLK+	green	PIN 3
CLK-	yellow	PIN 4
DATA+	grey	PIN 5
DATA-	pink	PIN 6
PRESET	blue	PIN 7
DIR	red	PIN 8
Shield	housing, [not CVR (*)]	housing

(\*) With the options PG(R) and M12(R), the cable shield is connected to the rotary encoder housing. With the CVR option, the cable shield is open.

**Plug type M12(R) HTS36E with SSI interface - pin assignment: position of the plug pins in the rotary encoder housing in the top view**
**Plug (8 pol.)**

**Status LED - indication modes**

At the start / boot-up	Red light < 2.3 s
Error	Constant red light >2.3 s
Normal operation	Constant green light
No supply voltage	LED is off (no light)

**Series HTI36E - singleturn, incremental output, not redundant**

**Key-features HTI36E with incremental signal output:**

- From customer free to chose: 1 to 16384 pulses per revolution (ppr) in 1 increment step-width
- Standard: Channel A, B and Z (index pulse). Option: Differential signal output A, A/, B, B/, Z, Z/
- Option: Position of the index pulse Z or Z/ freely parameterizable by the customer
- TTL level, option HTL level
- Limit frequency TTL 1 MHz, HTL 600 kHz
- 100% magnetic based sensor technology - in comparison to optical incremental encoders no wear of optical components such as LEDs, contaminated code wheels, etc.
- For a magnetic incremental rotary encoder very low signal jitter - When choosing the number of increments in 1 bit steps-width the output signal has only app. 1% higher signal jitter in comparison to a conventional optical incremental encoder. E.g. 1 bit = 2 increments, 2 bit = 4 increments, 3 bit = 8 increments,  $n$  bit = 2 high  $n$  increments
- Status LED

**Electrical data HTI36E - singleturn, incremental output, not redundant**

Output signals (A, B, Z)	TTL	HTL
Number of pulses	1 bis 16384 ppr	
Differential signal outputs (A, A/, B, B/, Z, Z/)	Optional	
Parameterizable index impulse position Z respectively Z, Z/ by the customer	Optional	
Limit frequency	1 MHz	600 kHz
Supply voltage	4.75 to 32 V	
Power consumption (without load)	≤ 80 mA	
Output load	max. 40 mA / channel	
MTTF	1200a	

1.) According IEC 60393

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Order Code HTI36E - singleturn rotary encoder with incremental signal interface, not redundant							
Description	Selection: <b>standard=black/bold</b> , possible <i>options=grey/italic</i>						
Series HTI36E	HTI36E						
Shaft type: Solid shaft	S						
Hollow shaft with screw fastening	H						
Shaft diameter:							
Shaft diameter Ø6 mm (Available in combination with options S and H)	6						
Shaft diameter Ø6.35 mm (Available only in combination with option H)	6,35						
Shaft diameter Ø8 mm (Available in combination with option S)	8						
<i>Option: user defined shaft diameter [mm] (*)</i>	X						
Multiplication symbol [x]:			x				
Visible shaft length of the rotary encoder:							
Shaft length 14.5 mm for option S				14,5			
Shaft length 5.3 mm for option H (blindhole depth 16 mm)				-			
<i>Option: user defined shaft length for Option S [mm] (*)</i>				XX			
Number of pulses per revolution:							
1 to 16384 ppr (in 1 increment stepwidth selectable)					XXXXX		
Supply voltage:							
VSUP=24 V (4,75 to 32 V)						24	
Output signal, output circuit, index pulse position parameterizable from customer:							
A, B, Z, TTL							BZ TTL
A, B, Z, HTL							BZ HTL
A, B, Z, TTL, index pulse position parameterizable by the customer <i>(not available in combination with option M12(R))</i>							BZ TTL P
A, B, Z, HTL, index pulse position parameterizable <i>(not available in combination with the option M12(R))</i>							BZ HTL P
<i>Option: A, A/, B, B/, Z, Z/, TTL, differential</i>							BZ N TTL
<i>Option: A, A/, B, B/, Z, Z, HTL, differential</i>							BZ N HTL
<i>Option: A, A/, B, B/, Z, Z/, TTL, differential, index pulse position parameterizable</i>							BZ N TTL P
<i>Option: A, A/, B, B/, Z, Z/, HTL, differential, index pulse position parameterizable</i>							BZ N HTL P
Electrical connection, cable length, position:							
2 m round cable, cable gland, axial (IP67)							PG
Plug M12, axial (IP67)							M12
2 m round cable, cable sleeve, radial (IP40)							CVR
<i>Option: customer specific cable length, cable gland, axial (IP67) (*)</i>							PG X,XX
2 m round cable, cable gland, radial (IP67)							PGR
Plug M12, radial (IP67)							M12R
<i>Option: Customer specific cable length, cable gland, radial (IP67) (*)</i>							PGR X,XX

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**Order example 1: HTI36E - singleturn, incremental signal outputs not differential, signal output electronics TTL, index pulse position parameterizable from customer, not redundant**

**Requirement:**

Solid shaft Ø6.00 mm, shaft length 14.5 mm, 4096 ppr, VSUP=24 V, output signals A, B, Z, output circuit TTL, no differential (not inverted) signal outputs, position of the index pulse Z or Z, Z/ parameterizable from the customer, round cable 2 m, cable outlet position axial (in dependency to the shaft)

**Example for order code:**

HTI36E S 6x14,5 04096 24 BZ TTL P PG

**Order example 2: HTI36E - singleturn, differential incremental signal outputs, signal output electronics HTL, fixed index position - not parameterizable from customer, not redundant**

**Requirement:**

Solid shaft Ø6.00 mm, shaft length 14.5 mm, 8135 ppr, VSUP=24 V, differential output signals A, A/, B, B/, Z, Z/, output circuit HTL, index pulse position Z or Z, Z/ not parameterizable from customer, round cable 2 m, cable outlet position axial (in dependency to the shaft)

**Example for order code:**

HTB36E S 6x14,5 08135 24 BZ N HTL PG

**Cable assignment, HTI36E - option PG(R), incremental output, not redundant**

Function:	For Options: BZ TTL BZ HTL	For Options: BZ TTL P BZ HTL P	For Options: BZ N TTL BZ N HTL	For Options: BZ N TTL P BZ N HTL P
VSUP	brown	brown	brown	brown
GND	white	white	white	white
A	green	green	green	green
B	yellow	yellow	yellow	yellow
Z	grey	grey	grey	grey
SET	-	rosa	-	pink
A/	-	-	red	red
B/	-	-	black	black
Z/	-	-	purple	purple
Shield	strand	strand	strand	strand

(\*) For the options PG(R), the cable shield is connected to the rotary encoder housing. For option CVR shield is open

**HTI36E - parameterization of the index pulse position Z or Z, Z/ if option P is chosen**

1. Move the rotary encoder shaft to the desired position  
(where the index pulse (Z) shall be given out in future at each full shaft revolution)
2. Set index pulse position: connect VSUP with SET input for 2 seconds
3. Delete index pulse position: connect SET to ground (GND)

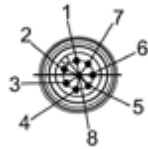


Plug types M12(R) HTI36E - pin assignment: position of the plug pins in the rotary encoder housing in the top view

Plug (5 pol.)



Plug (8 pol.)



Plug (12 pol.)



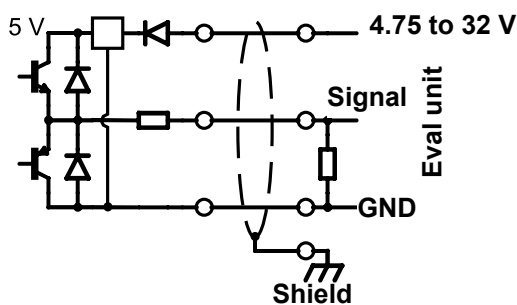
Plug and pin assignments, HTI36E Option M12(R) - singleturn, incremental output, not redundant

Function:	Plug 5 pol. for options: BZ TTL BZ HTL	Plug 8 pol. for options: BZ N TTI BZ N HTLI	Plug 12 pol. for options: BZ N TTI P BZ N HTLI P
VSUP	3	1	3
GND	1	2	1
A	4	3	4
B	2	4	6
Z	5	5	8
SET	-	-	5
A/	-	6	9
B/	-	7	7
Z/	-	8	10
n/c	-	-	2, 11, 12
Shield	-	-	-

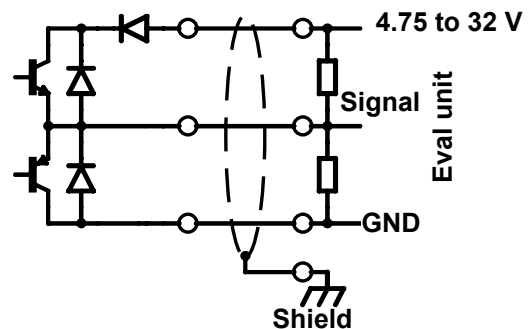
Note: Options BZ TTL P and BZ HTL P are not available in combination with options M12 and M12R

Output Circuits:

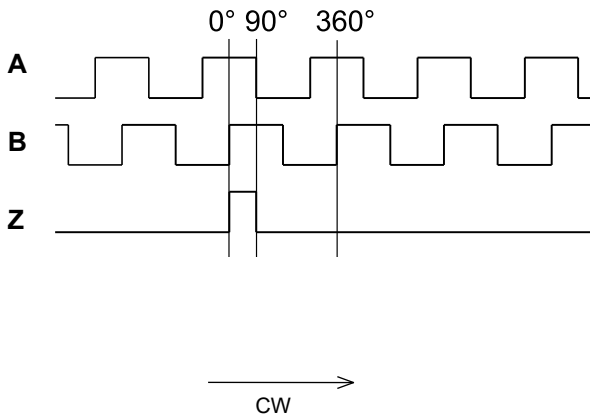
TTL(I):



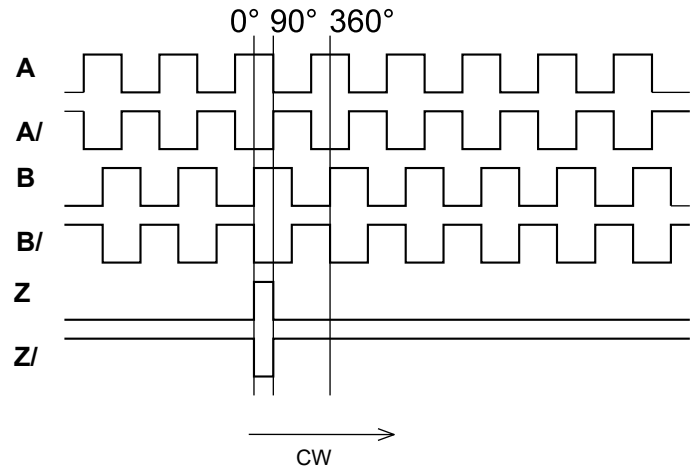
HTL(I):



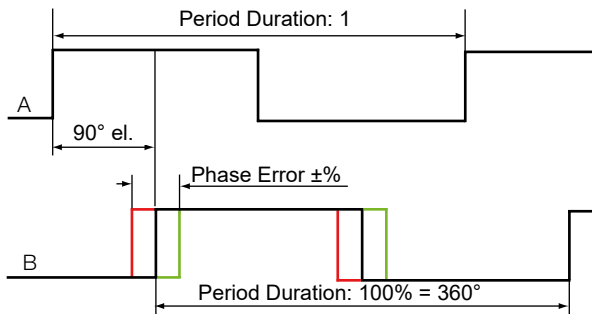
**Output Signals A, B, Z:**



**Output Signals A, A/, B, B/, Z, Z/:**

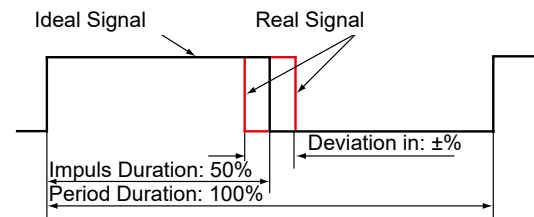


**Phase Shift:**



Phase shift (electric): 90° max. phase error  $\pm 8.5\%$  of a period duration

**Pulse-/Pause Ratio:**



Pulse-/Pause Ratio: 50 % max.  $\pm 7\%$

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### Servomount fixing nails SFN for encoders with solid shaft

- Required for mounting the rotary encoder when using synchro flange
- Fastening the rotary encoder requires at least 3 pcs.
- Ideal for panel mounting of the rotary encoder so that no holes have to be drilled through the panel
- By rotating the rotary encoder housing around its own axis, synchro clamps allow a zero point alignment with an application-side shaft that is already coupled to the rotary encoder (0° position)
- Material: stainless steel



### M12 plugs without or with cable for option M12(R)

- plugs without cable (STE)
- plug with cable (STK)



STE



STK

### Shaft couplings for encoders with solid shaft

- Connect two shafts, even with different diameters
- Absorb larger angular and radial deviations
- Have a low inertia
- Do not cause a change in the transmission speed
- Damp torsional vibrations
- Serves as mechanical protection against oversized pairs of forces
- Made of plastic (also with metal hubs) act electrically and heat insulating



### Counter ICs for HTI36 (incremental encoders)

- LS7083 in DIP or SOIC form factor, generates from incremental-signals quadrature-signals
- LS7166 24-Bit counter IC



LS7083/4N-S



LS7166



LS7083/4N



### CAN-Network accessories "CANZUB", CANopen Starter Kit

- Plugs, cables, T-/Y-pieces, terminators with M12 connections to build a stable CAN network structure in a short time
- CANopen starter kit, includes all necessary components to:
  - Enable beginners an easy entry into the world of CANopen encoders
  - Parameterize the rotary encoder to the needs of the application before installing
  - Check the encoder separated from the application

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