

Magnetic Rotary Encoders with Solid or Hollow Shaft

T + 41 44 885 30 80
info@tds-pp.com
www.tds-pp.com

Family HTx36E

Key Features



HTx36E S
Solid Shaft



HTx36E H
Hollow Shaft

- 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 $< 0.0878^\circ$ (< 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

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"> ▪ Resolution up to 16 bit ▪ CANopen, CAN SAE J1939, SSI ▪ Patented technology for a system accuracy $< 0.0878^\circ$ 	<ul style="list-style-type: none"> ▪ Analogue voltage or current loop output, up to 12 bit resolution ▪ 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 ▪ Absolute Linearity up to 0.6%
Multiturn encoders	<ul style="list-style-type: none"> ▪ CANopen, CAN SAE J1939, SSI ▪ Patented battery and gear-less true-power-on multiturn technology (energy harvesting) ▪ up to 43 bit multturn resolution 	<ul style="list-style-type: none"> ▪ Analogue voltage or current loop output ▪ Resolution 12 bit ▪ Not True-Power-On, max. 200 revolutions (72000°)
Incremental encoders	<ul style="list-style-type: none"> ▪ 1 to 16384 Impulses per revolution (ppr.) ▪ Outputs TTL or HTL ▪ Optional user-parameterizable index pulse (Z) position 	<ul style="list-style-type: none"> ▪ 1 to 1024 Impulses per revolution (ppr.) ▪ Outputs TTL, Push-Pull, Open Collector or Linedriver, optional with UVW up to 16 pole pairs

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.

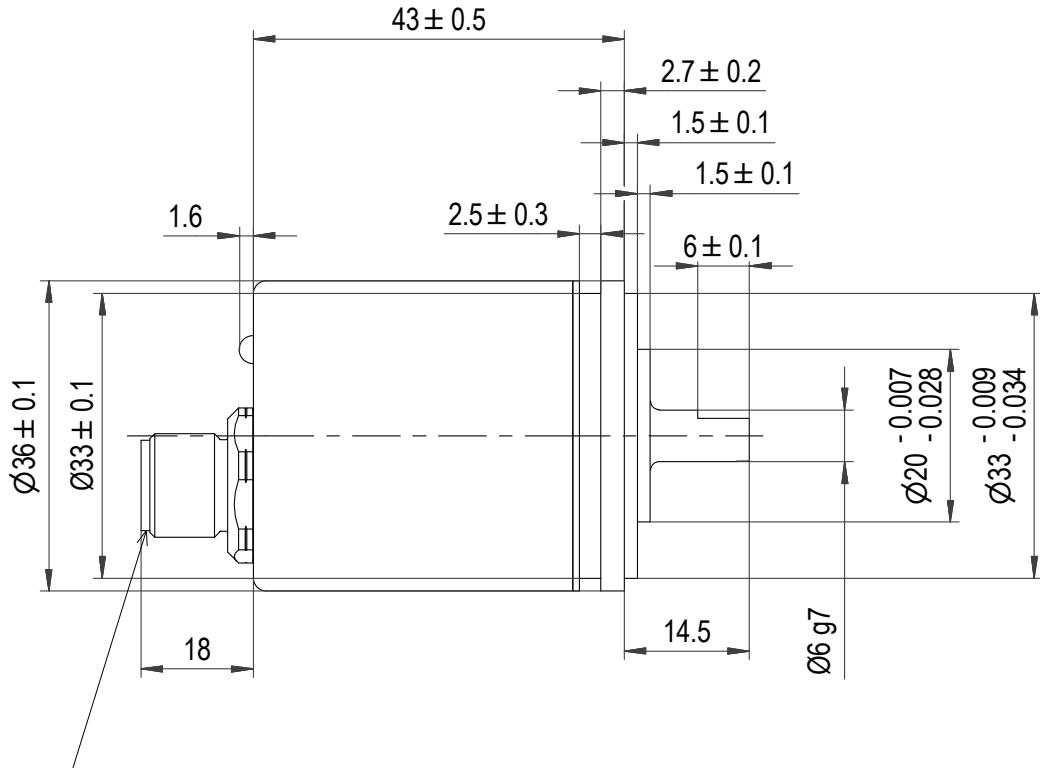
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Drawings HTx36E S - solid shaft

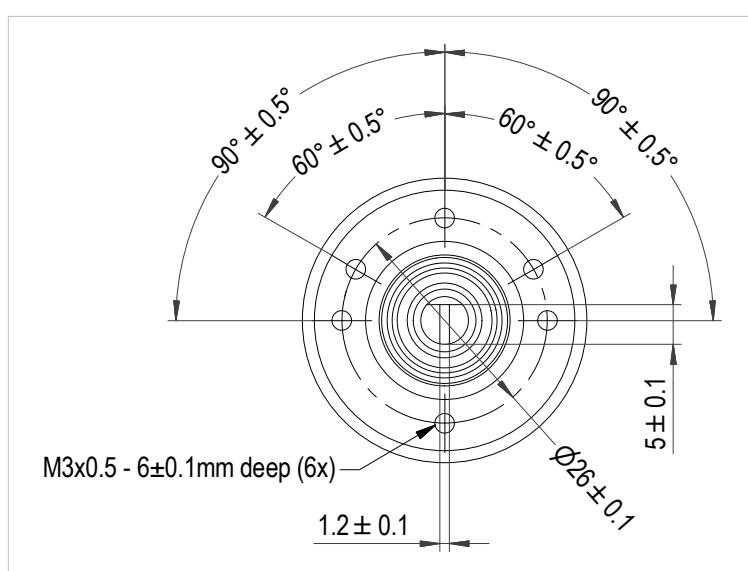
HTx36E S (solid shaft), option M12 - M12 plug, axial orientation

Side view:



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

Front view:



(*) Tolerances according IPC Association

Standard shaft dimensions:

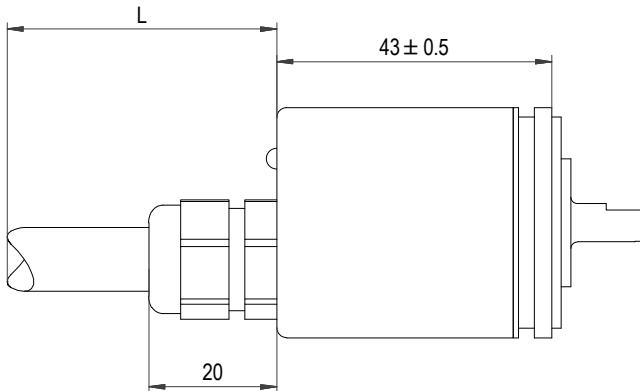
Shaft length	14.5 mm
Shaft diameter	6 mm or 8 mm

Drawings HTx36E S - solid shaft

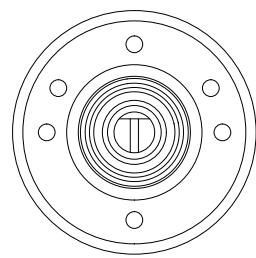
HTx36E S (solid shaft), option PG - cable gland, axial orientation

Side view:

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

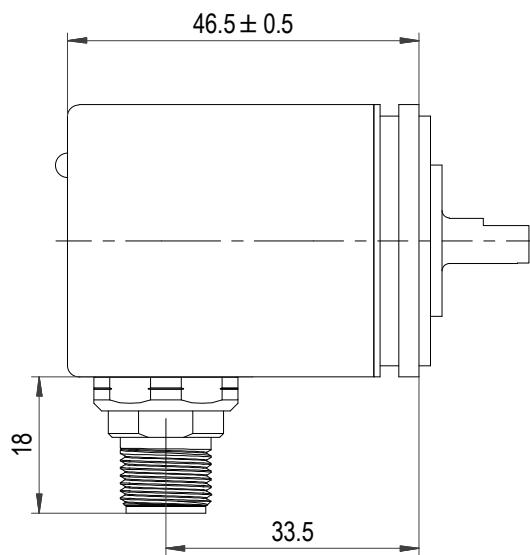


Front view:

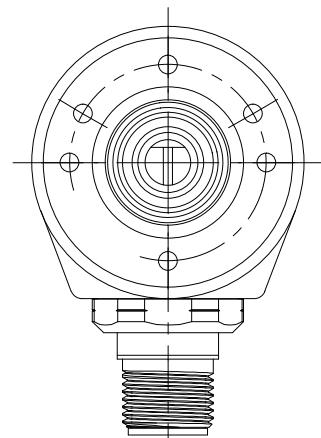


HTx36E S (solid shaft), option M12R - M12 plug, radial orientation

Side view:



Front view:

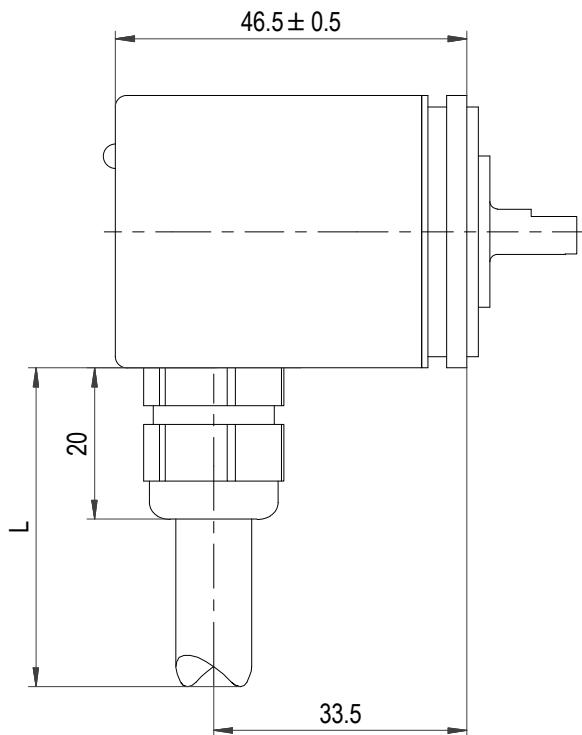


General	Contents	Drawings	Solid Shaft	Hollow Shaft	Mechanical Data	CAN Bus (HTx36E)	Serial/SSI (HTx36E)	Incremental (HTx36E)	Accessories
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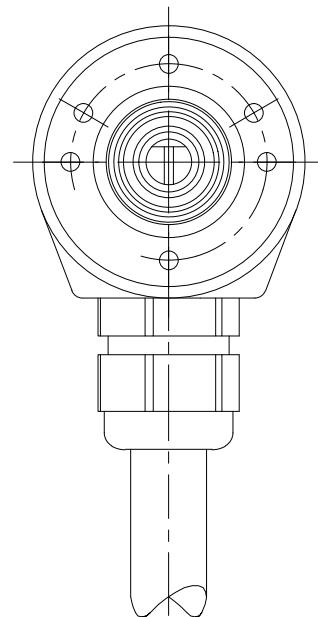
Drawings HTx36E S - solid shaft

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

Side view:

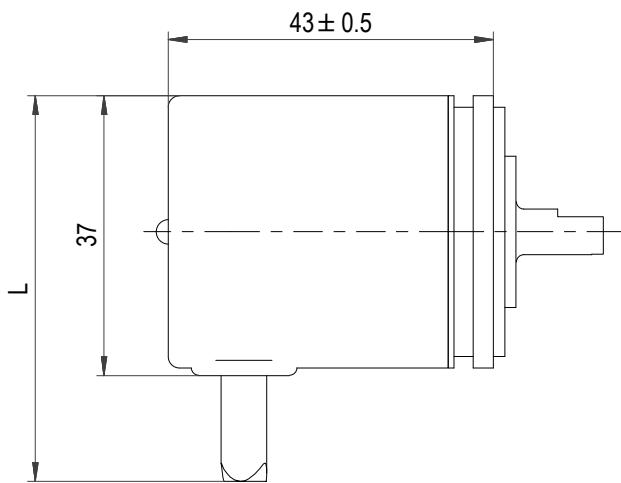


Front view:

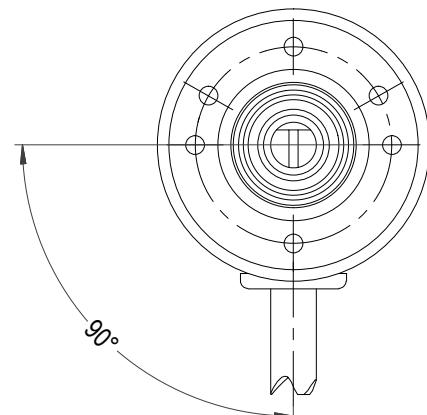


HTx36E S (solid shaft), option CVR - cable sleeve, radial orientation incl. signal cable

Side view:



Front view:



Drawing HTx36E S - solid shaft

CAN Interface:

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)						

SSI Interface:

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)						

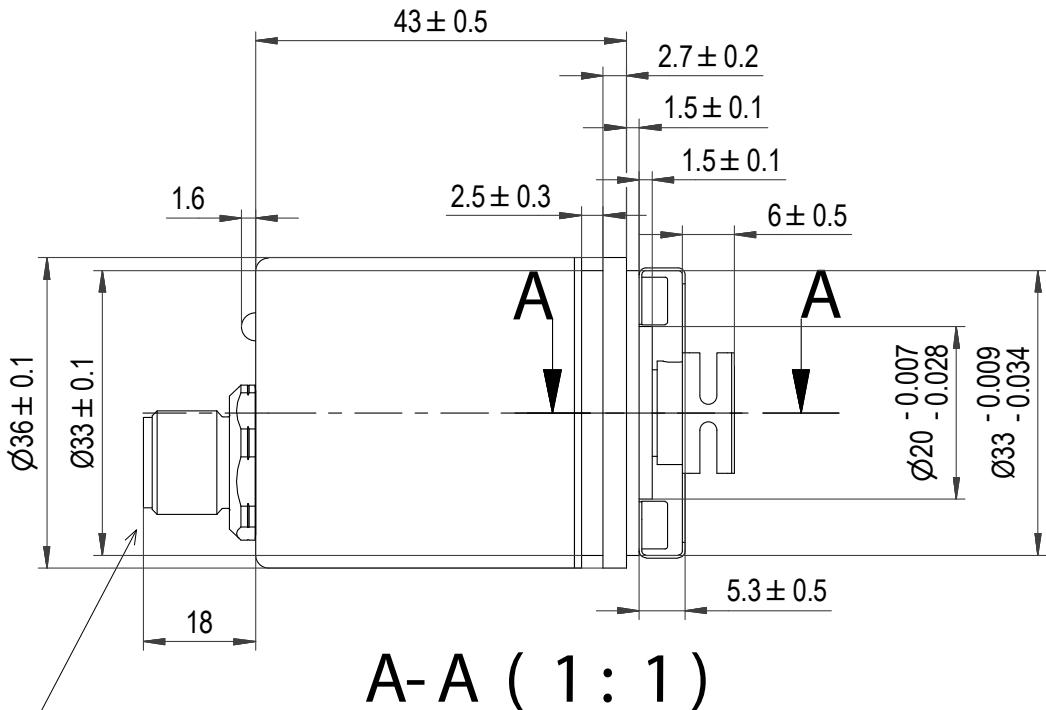
Incremental Interface:

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)						

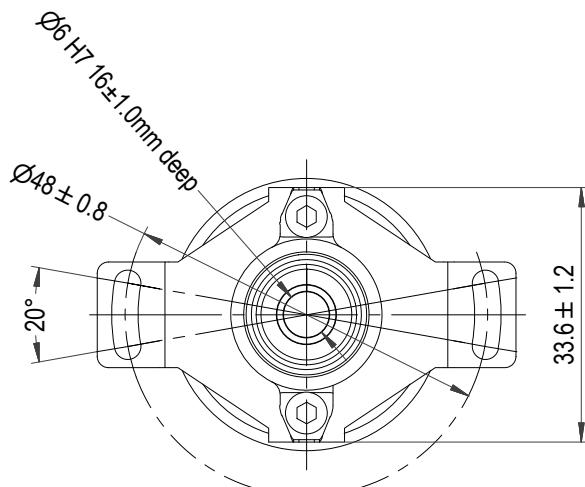
Drawings HTx36E H - hollow shaft (screw fixation)

Side view:



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

Front view:



Accessories	Incremental (HT36E)	Serial/SSI (HT36E)	CAN Bus (HT36E)	Mechanical Data	Hollow Shaft Drawings	Solid Shaft Drawings	General
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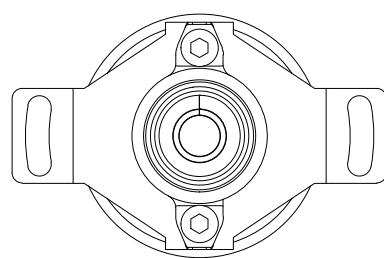
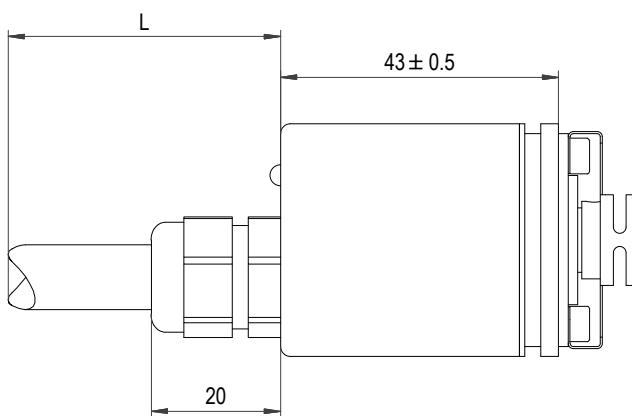
Drawings HTx36E H - hollow shaft (screw fixation)

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

Side view:

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

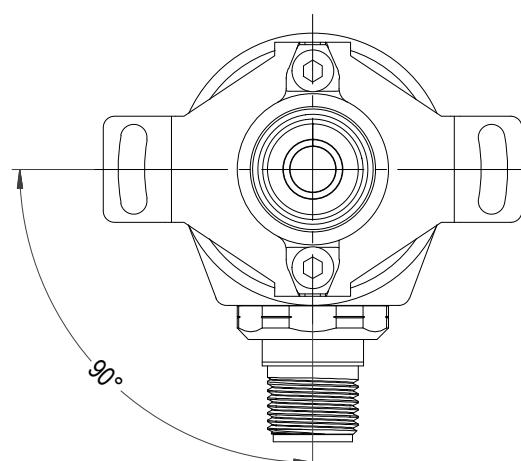
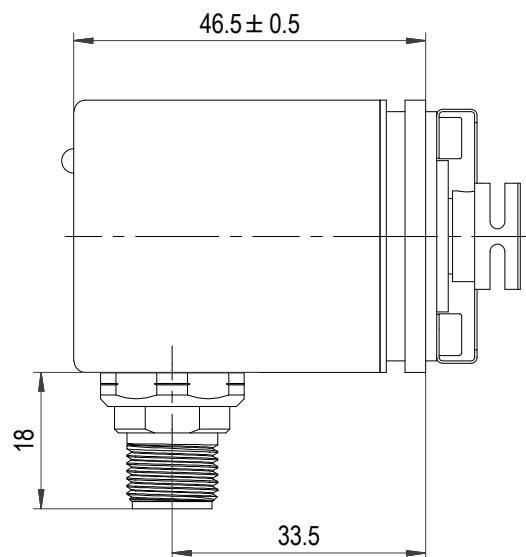
Front view:



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

Side view:

Front view:

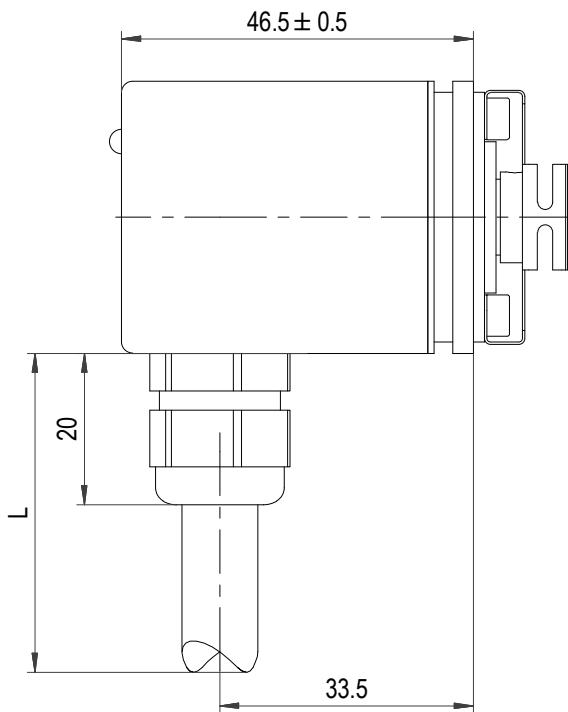


General	Contents	Drawings	Solid Shaft	Hollow Shaft	Mechanical Data	CAN Bus (HTx36E)	Serial/SSI (HTx36E)	Incremental (HTx36E)	Accessories
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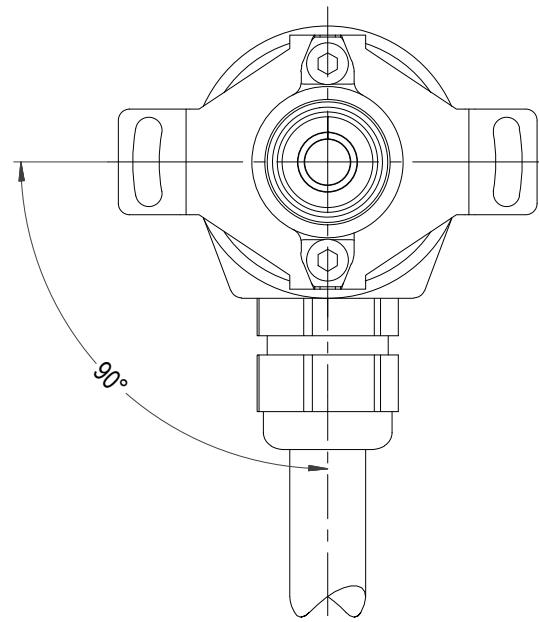
Drawings HTx36E H - hollow shaft (screw fixation)

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

Side view:

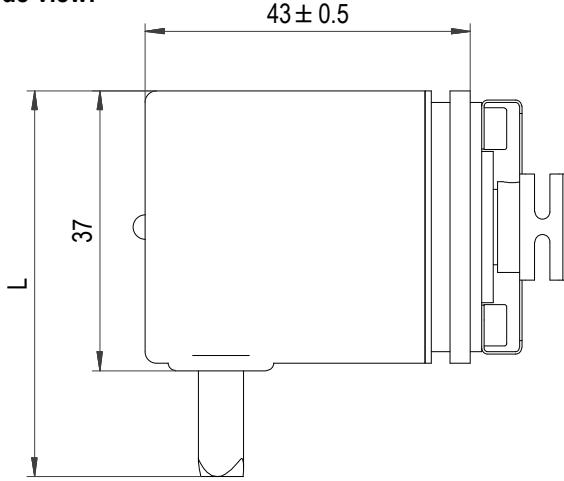


Front view:

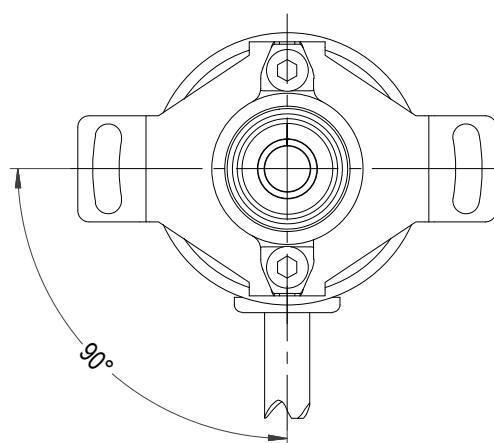


HTx36E S (solid shaft), option CVR - cable sleeve, radial orientation incl. signal cable

Side view:



Front view:



Drawing HTx36E H - hollow shaft

CAN Interface:

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)						

SSI Interface:

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)						

Incremental Interface:

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)						

Mechanical and Environmental Data, Miscellaneous - HTx36E		General	Contents	Drawings	Mechanical Data	CAN Bus (HTB36E)	Serial/SSI (HTS36E)	Incremental (HTI36E)	Accessories
Shaft type	Solid shaft (HTx36E S) or hollow shaft (HTx36E H)								
Mechanical angle of rotation 1.)	Endless								
Lifetime 2.)	<ul style="list-style-type: none"> @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)	<p>Solid shaft:</p> <ul style="list-style-type: none"> Standard IP65: ≤ 0.3 Ncm <p>Hollow shaft:</p> <ul style="list-style-type: none"> Standard IP65: ≤ 0.5 Ncm 								
Operating temperature range	<p>With option M12 (plug)</p> <ul style="list-style-type: none"> -40 to +85 °C <p>With option PG (cable gland or sleeve)</p> <ul style="list-style-type: none"> -40 to +85 °C (HTB36E CAN, HTS36E SSI) -20 to +80 °C (HTI36E Incremental) 								
Storage temperature range	<p>With option M12 (plug)</p> <ul style="list-style-type: none"> -40 to +100 °C <p>With option PG (cable gland or sleeve)</p> <ul style="list-style-type: none"> -40 to +100°C (HTB36 CAN, HTS36 SSI) -30 to +80 °C (HTI36E Incremental output) 								
Protection grade (IEC 60529) front side	From shaft side: <ul style="list-style-type: none"> 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): <ul style="list-style-type: none"> axial 43 mm radial 46.5 mm 								
Shaft diameter	<p>Solid shaft: Ø6 mm, Ø8 mm</p> <p>Hollow shaft: Ø6 mm, Ø6.35 mm</p> <p>Other shaft diameters on request</p>								
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 Data

Family HTx36E

Mechanical and Environmental Data, Miscellaneous - HTx36E		General
Connection type	<ul style="list-style-type: none"> ▪ Cable gland stainless steel M12, axial, radial ▪ Plug M12, axial or radial ▪ CVR, cable feed through via sleeve, radial <p>Options PG(R), CVR: Shielded round cable, 2 m, AWG24 or AWG26, PVC sheath, cable endings tinned</p>	
Connection position	Axial or radial	
Sensor mounting	<p>Sensor mounting possibilities for solid shaft rotary encoders HTx36 S:</p> <ul style="list-style-type: none"> ▪ 1. Via threaded holes integrated in the sensors head ▪ Stainless steel screws M3x0.5 ▪ 2. Via synchro flange: <p>With optional available servomount fixing nails SFN1 incl. screws M3 x 0,5 from MEGATRON.</p> <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>Sensor mounting for hollow shaft rotary encoders HTx36E H:</p> <p>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	<p>None</p> <p>Solid shaft:</p> <ul style="list-style-type: none"> ▪ For fastening the rotary encoder by means of servomount fixing nails SFN1 - available from MEGATRON as accessories <p>Solid- and hollow shaft:</p> <ul style="list-style-type: none"> ▪ 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 	
Fastening torque per screw or nut	<p>≤ 0.6 Nm (screw M3)</p> <p>For screw securing, the use of a medium-strength thread securing adhesive is recommended</p>	
Maximum tightening torque for grub screw for fixation of the shaft, only HTx36 H	≤ 0.5 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 (Singletur)	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.)	Singletur part: 1 to 16 bit Multiturn part (optional): CAN J1939: 1 to 32 bit CANopen: 1 to 43 bit	Singletur 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, parameteriza- tion 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 "singletur resolution" and "multiturn resolution" for CAN/SSI variants

The resolution values for singletur and multiturn are independent of each other. In case of a multiturn version, the encoders have a memory for the values within one revolution (singletur 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 singletur 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, multturn up to 43 Bit
- Single- or multturn rotary encoder
- Battery and gear-less multturn 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"> ▪ Communication profile CiA 301 ▪ Device profile for encoder CiA 406 V3.2 class C2
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	Synchronous mode: When receiving a synchronization telegram (SYNC) from another bus participant PDOs will be sent out autonomous Asynchronous mode: An internal event triggers a PDO message (e.g. change of measured value, internal timer or similar)

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

Single- / Multiturn Absolute Encoder with CAN Output

Series HTB36E

Order Code HTB36E - multturn/singleturn rotary encoder with CAN interface, not redundant	
Description	Selection: standard=black/bold, possible options=grey/italic
Series HTB36E	HTB36E
Single- or Multiturn:	-
Singleturn (If 0 Bit is selected as multturn resolution)	PM
Multiturn (If ≥ 1 Bit is selected as multturn resolution)	
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
Supply voltage / output signal:	
VSUP=24 V (4.75 to 32 V) / CANopen	24CA
VSUP=24 V (4.75 to 32 V) / CAN SAE J1939	24CJ
Terminating resistor:	
Without terminating resistor	-
<i>Option: integrated 120 Ohm terminating resistor (Integrated in the rotary encoder)</i>	T
Singleturn resolution:	
Singleturn resolution 12 Bit	12
<i>Option: singleturn resolution 1 up to 16 Bit</i>	XX
Multiturn resolution:	
Resolution 12 Bit (4096 turns)	12
<i>Option: resolution 0 Bit (singleturn rotary encoder)</i>	0
<i>Option: resolution ≥ 1 Bit (Multiturn rotary encoder)</i>	XX
<i>(Maximum multturn resolution 43 Bit for CANopen, 32 Bit for CAN SAE J1939)</i>	
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

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

Single- / Multiturn Absolute Encoder with CAN Output

Series HTB36E

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

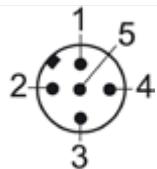
Cable and pin assignment HTB36E multiturn/singleturn rotary encoder with CANopen or CAN SAE J1939 interface, not redundant

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 / Schield (*)	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 multturn rotary encoder
- Battery and gear-less multturn technology (energy harvesting)
- Singleturn accuracy $< 0.0878^\circ$ (< 12 bit)
- Supply voltage: 4,75 to 32 VDC
- Status LED

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

Singleturn Resolution*	1 to 16 bit
Multiturn resolution/memory size*	1 to 43 bit
Singleturn accuracy	$\pm 0.0878^\circ$ (≤ 12 bit)
Singleturn repeatability	$\pm 0.0878^\circ$ (≤ 12 bit)
Output signal	SSI binary or gray code
Update rate	≤ 600 μ s
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 page Seite 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
Positive direction of counting (view on shaft)	DIR = VSUP => CCW
Set to zero	Set: preset = VSUP for 2 sec Deactivate: preset = GND

(*) Up to 2 MHz clock frequency on request

Single-/Multiturn Absolute Encoders with Serial Output (SSI)

Series HTS36E

Order code HTS36 - multiturn/singleturn rotary encoder with SSI interface, not redundant	
Description	Selection: standard=black/bold , possible <i>options=grey/italic</i>
Series HTS36E	HTB36E
Singleturn or Multiturn:	
Singleturn (If 0 Bit is selected as multturn resolution)	-
Multiturn (If ≥ 1 Bit is selected as multturn resolution)	PM
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>	<i>X</i>
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>	<i>XX</i>
Supply voltage / output signal:	
VSUP=4,75 to 32 V / SSI	SSI
Code:	
Binary	B
Gray	G
Singleturn resolution:	
Singleturn resolution 12 Bit	12
<i>Option: singleturn resolution 1 up to 16 Bit</i>	<i>XX</i>
Multiturn resolution:	
Resolution 12 Bit (4096 turns)	12
<i>Option: resolution 0 Bit (singleturn rotary encoder)</i>	<i>0</i>
<i>Option: resolution ≥ 1 Bit (multiturn rotary encoder)</i> (Maximum multiturn resolution 43 Bit)	<i>XX</i>
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>	<i>PG X,XX</i>
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>	<i>PGR X,XX</i>

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

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 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:

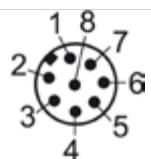
HTS36E PM S 6x14,5 SSI B 12 12 PG

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

Order Code HTI36E - singleturn rotary encoder with incremental signal interface, not redundant																			
Description		Selection: standard=black/bold , possible <i>options=grey/italic</i>																	
Series HTI36E		HTI36E																	
Shaft type:		S																	
Solid shaft		H																	
Hollow shaft with screw fastening																			
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															BZ TTL P				
<i>(not available in combination with option M12(R))</i>																			
A, B, Z, HTL, index pulse position parameterizable															BZ HTL P				
<i>(not available in combination with the option M12(R))</i>																			
<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				

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

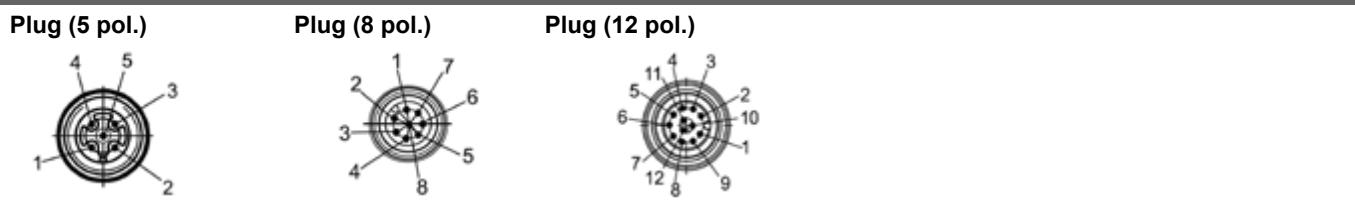
Function:	For Options: BZ TTL BZ HTL	For Options: BZ TTL P BZ HTL P	For Options: BZ N TTL BZ N HTL	For Options: BZ N TTL P BZ N HTL P
VSUP	brown	brown	brown	brown
GND	white	white	white	white
A	green	green	green	green
B	yellow	yellow	yellow	yellow
Z	grey	grey	grey	grey
SET	-	rosa	-	pink
A/	-	-	red	red
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 and pin assignments, HTI36E Option M12(R) - singleturn, incremental output, not redundant

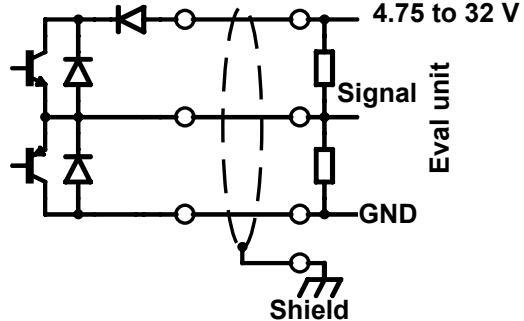
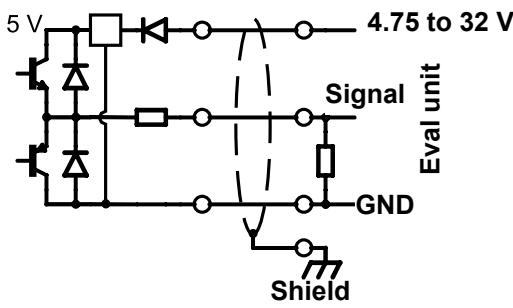
Function:	Plug 5 pol. for options: BZ TTL BZ HTL	Plug 8 pol. for options: BZ N TTI BZ N HTLI	Plug 12 pol. for options: BZ N TTI P BZ N HTLI P
VSUP	3	1	3
GND	1	2	1
A	4	3	4
B	2	4	6
Z	5	5	8
SET	-	-	5
A/	-	6	9
B/	-	7	7
Z/	-	8	10
n/c	-	-	2, 11, 12
Shield	-	-	-

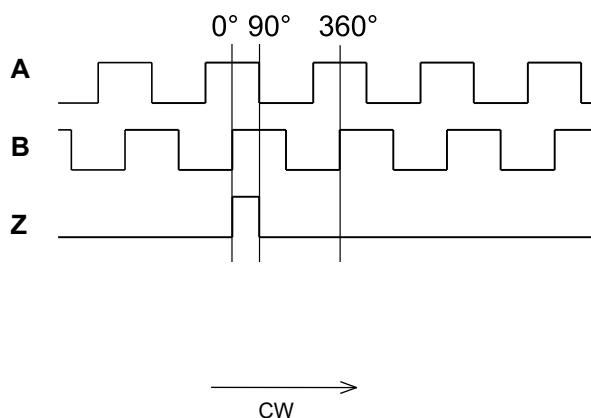
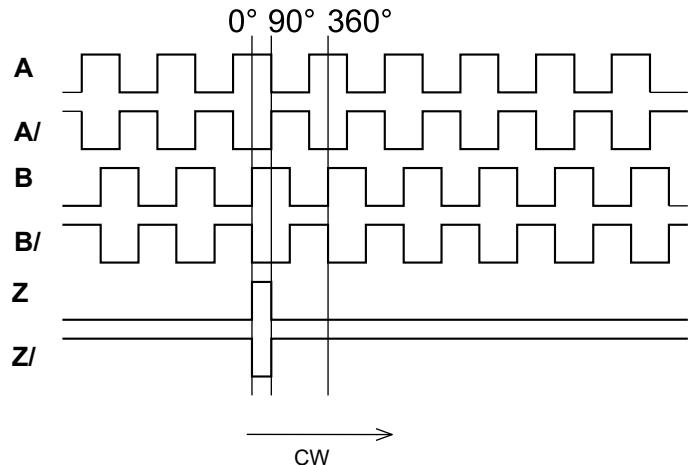
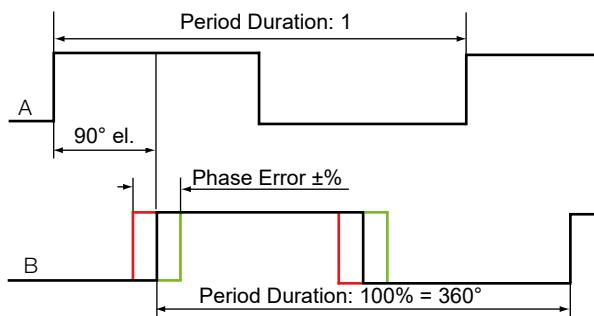
Note: Options BZ TTL P and BZ HTL P are not available in combination with options M12 and M12R

Output Circuits:

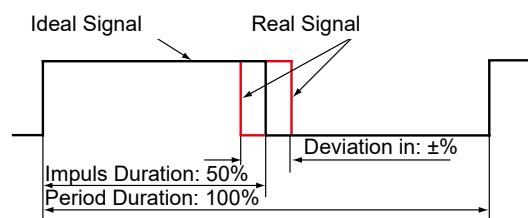
TTL(I):

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. $\pm 7\%$

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