

Data Sheet for Angle Sensors

Hall-Effect Absolute Rotary Encoders FHB58, FHS58

Family FHx58

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Quick overview FHx58 series - magnetic absolute rotary encoders

1	Series	FHB58 CANopen (this data sheet)	FHB58 CAN SAE J1939 (this data sheet)	FHB58 SSI (this data sheet)
2	Technology	Magnetic, gradient-based signal capturing with μ Processor-controlled digital signal processing Multiturn: battery- and gear-less, energy harvesting		
3	Electronics not redundant / redundant	Not redundant	Not redundant	Not redundant
4	Output signal	1 x CANopen Communication profile CiA 301	1 x CAN SAE J1939 ISO11898 (High Speed CAN)	SSI Gray or SSI Binary
5	Bearing	Ball bearing		
6	Shaft material	Stainless steel solid shaft		
7	Shaft diameter	Standard: \varnothing 10 mm		
8	Max. operational shaft speed	3600 rpm		
9	Lifetime	100% shaft load 1x10E9 shaft revolutions 80% shaft load 1x10E10 shaft revolutions 20% shaft load 1x10E11 shaft revolutions		
10	Operating temperature range	-20..+80 °C		
11	Protection grade	Shaft bearing IP67 Housing IP69k		
12	Effective electrical angle of rotation, resolution	Singleturn 360°, resolution 1 up to 16 Bit (programmable ex works) Multiturn 1 up to 43 Bit (programmable ex works)		
13	Accuracy	Singleturn $\pm 0,0878^\circ$ (≤ 12 Bit), repeatability $\pm 0,0878^\circ$ (≤ 12 Bit)		
14	Supply voltage	VSUP = 10 V..32 V		
15	Electrical connection	Cable gland (TPE), axial or radial cable output, Shielded roundcable, 2 m, AWG24 or AWG26, cable endings tinned		
16	MTTF	1000a	1000a	1000a
17	Programmable ex works	Yes	Yes	Yes
18	Detailed information about the series see pages	11-14		15-17

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Quick overview FHx58 series - optical incremental rotary encoder

1	Series	FHI58 Incremental (Please see separate data sheet)
2	Technology	Optical signal capturing
3	Electronics not redundant / redundant	Not redundant
4	Output signal	Incremental, HTL, TTL
5	Bearing	Ball bearing
6	Shaft material	Stainless steel solid shaft
7	Shaft diameter	Standard: Ø10 mm
8	Max. operational shaft speed	3600 rpm
9	Lifetime	100% shaft load 1x10E9 shaft revolutions 80% shaft load 1x10E10 shaft revolutions 20% shaft load 1x10E11 shaft revolutions
10	Operating temperature range	-20..+80 °C
11	Protection grade	Shaft bearing IP67 Housing IP69k
12	Effective electrical angle of rotation, resolution	Singleturn 360°, resolution 1 up to 16 Bit (programmable ex works) Multiturn 1 up to 43 Bit (programmable ex works)
13	Pulse frequency	TTL, HTL up to 5000 rpm max. 200 kHz TTL HF up to 1200 rpm max. 2 MHz HTL HF up to 1200 rpm max. 600 kHz
14	Supply voltage	VSUP = 10 V..32 V
15	Electrical connection	Cable gland (TPE), axial or radial cable output, shielded roundcable, 2 m, AWG24 or AWG26, cable endings tinned
16	MTTF	200a
17	Detailed information about the series see pages	Please see separate data sheet

Data Sheet for Angle Sensors

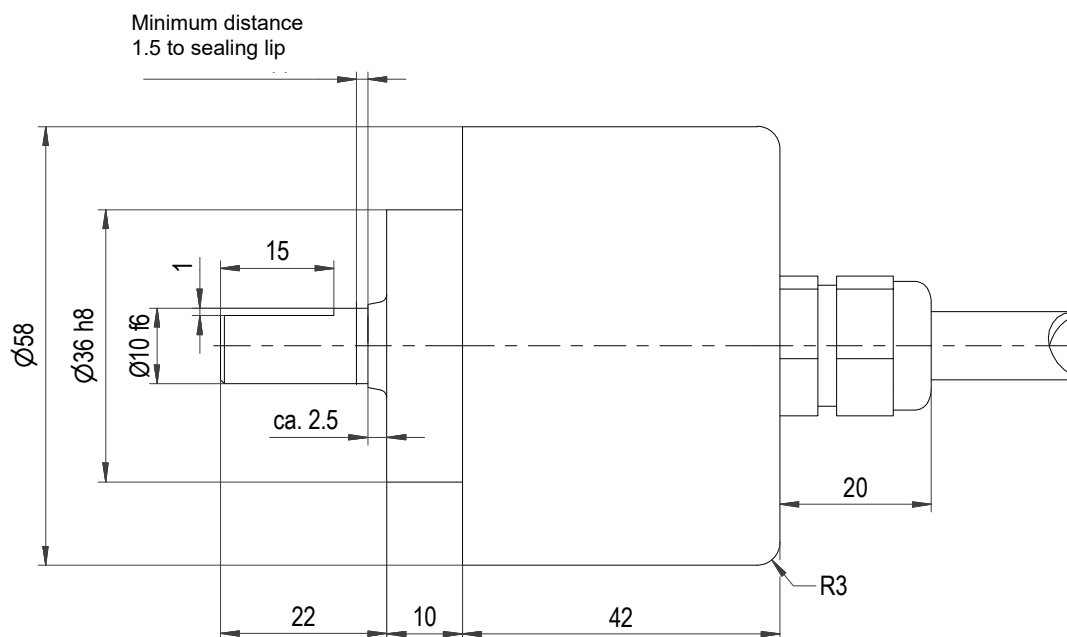
Hall-Effect Absolute Rotary Encoders FHB58, FHS58

Family FHx58

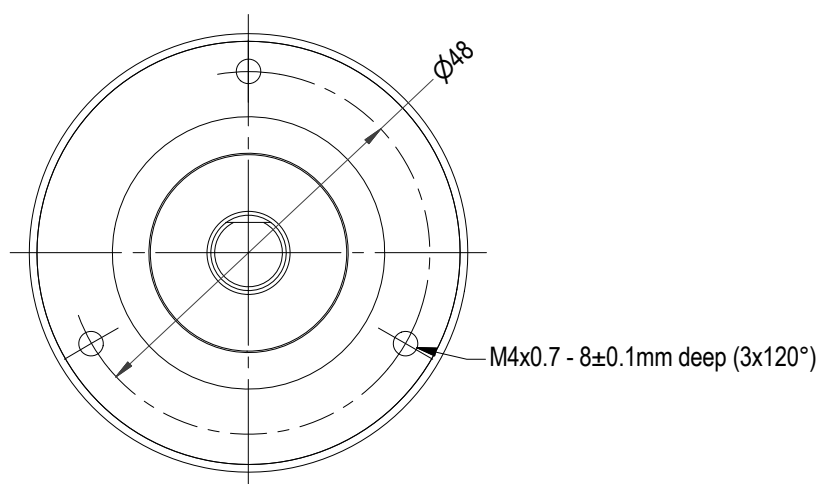
Drawings FHx58

Option **PG** - cable gland, axial orientation

Side view:



Front view:



Data Sheet for Angle Sensors

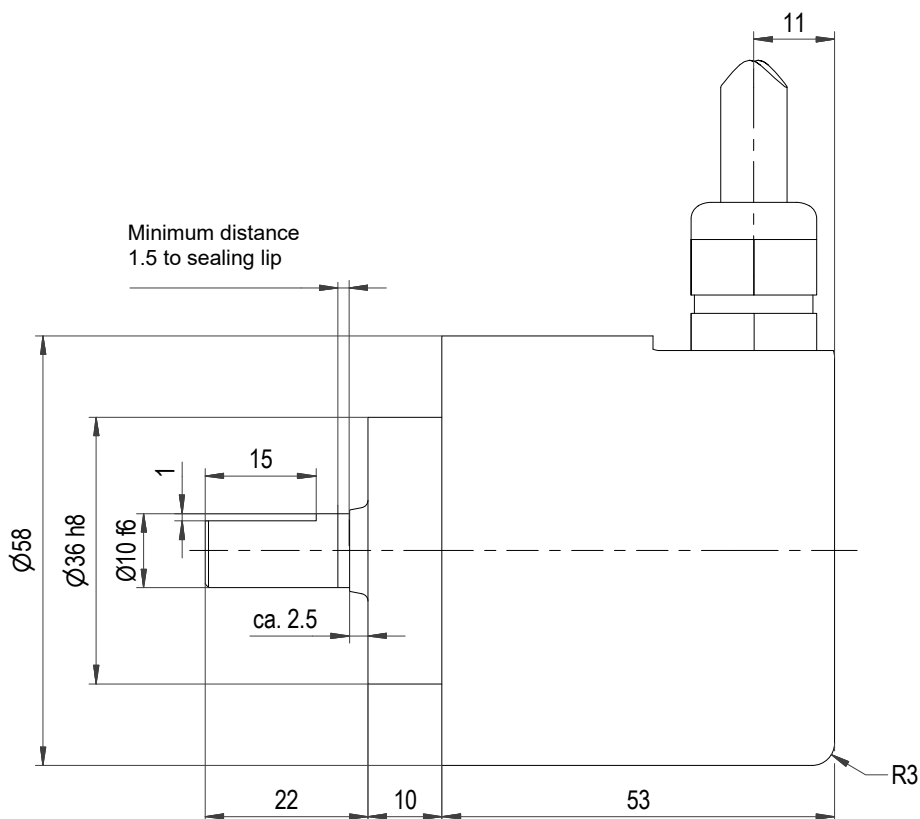
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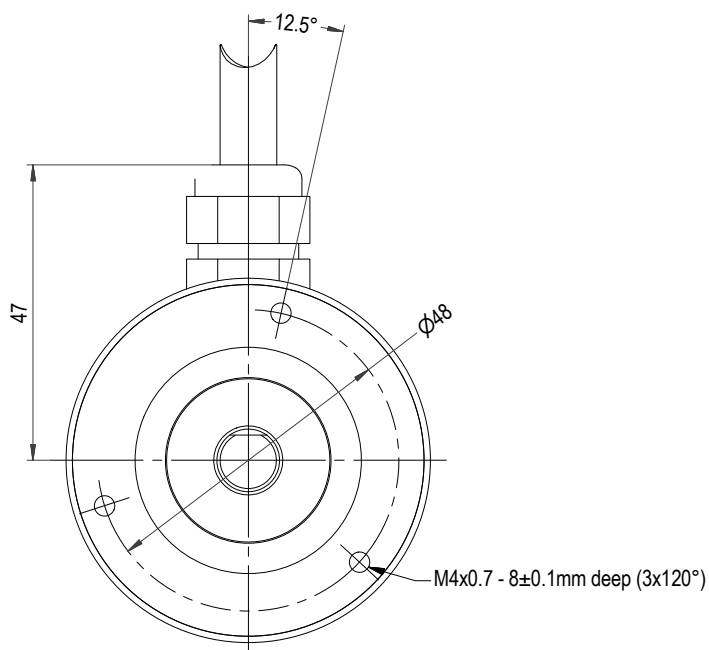
Drawings FHx58

Option **PGR** - cable gland, radial orientation

Side view:



Front view:



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Information about the standard signal cable which is included in the option PG, PGR

Option	Standard Cable Length L	Cable sheath \varnothing	Single Strands Cross Section	Allowed Tolerance (L)	Minimum Bend Radius
PG, PGR	2000 mm	8,3 mm	VSUP AWG 22 Signal cables AWG 26	-30...+50 mm	6 x D \varnothing (D= cable sheath diameter \varnothing)
Shielded signal cable (=standard)					

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Mechanical and Environmental Data, Miscellaneous - FHx58 family

Shaft type	Solid shaft
Mechanical angle of rotation 1.)	Endless
Lifetime 2.)	@100 % from max. permissible radial load >1x10E9 shaft revolutions @80 % from max. permissible radial load >1x10E10 shaft revolution @20 % from max. permissible radial load >1x10E11 shaft revolutions
Bearing	2 pcs. precision ball bearings
Max. operational speed (with shaft sealing)	3600 rpm
Operational torque: (@ room temperature and 10 rev/min)	≥ 2 Ncm
Operating temperature range	-20..+80 °C
Storage temperature range	-20..+80 °C
Protection grade (IEC 60529) front side	From shaft side: IP67
Protection grade (IEC 60529) rear side	IP69k
Vibration (DIN EN 60068-2-6)	30 g / 10 bis 2000 Hz
Shock (DIN EN 60068-2-27)	100 g / 6 ms
Housing diameter	Ø58 mm
Housing depth	Wit electrical connection position (in dependency to the shaft): ▪ axial 42 mm ▪ radial 53 mm
Shaft diameter	Ø10 mm Other shaft diameters on request
Max. radial load (HTx36E S)	100 N (load point 80% - in dependency to the visible shaft length)
Max. axial load	100 N (axial force initiation at the shaft end)
Mass	app. 600 g
Connection type	▪ Cable glands, axial or radial ▪ Shielded round cable 2 m, VSUP AWG22, signal cable AWG26, TPE cable sheath, cable endings tinned
Connection position	Axial or radial
Sensor mounting	3 pcs. screws M4x0,7
Fastening parts included in delivery	None
Fastening torque per screw to fastening the rotary encoder	2 Nm
Material shaft	Stainless steel
Material flange	Stainless steel
Material housing lid	Stainless steel
Material cable gland	TPE

1.) According IEC 60393

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

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Compliance - FHx58 Family

Immunity

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

Electrostatic Discharge

EN 61000-4-2 ESD	Class B
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REACH

REACH Regulation (EC) 1907/2006 including the SVHC list

RoHS

RoHS Directive 2011/65/EU

Salt mist resistance

EN60068-2-11

ECOLAB certified - material resistance test against detergents and disinfectants

According to testing method F&E/P3-E Nr. 40-1, rev. 3

EHEDG certified hygienic design

Verified cleanability according to EHEDG recommendations - "Hygienic Design"



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Possible Options - FHx58 Family

Options for project business (higher quantities) - FHx58 Family

Cable assembly	<ul style="list-style-type: none"> ▪ Special cable style ▪ Cable with plug
Shaft	<ul style="list-style-type: none"> ▪ Other shaft diameter ▪ Other shaft length ▪ Special shaft flattening ▪ Screwdriver slot
Mounting	<ul style="list-style-type: none"> ▪ Other rotary encoder fixation
Miscellaneous	<ul style="list-style-type: none"> ▪ Application-specific parameterization of PDOs, scaling, heartbeat, node ID, baud rate, etc. (CAN-open) ▪ Commissioning support
Everything else	<ul style="list-style-type: none"> ▪ On request

MEGATRON support

Department	Request:	E-Mail:	Phone:
Sales	<ul style="list-style-type: none"> ▪ Technical support ▪ Application support ▪ Prices ▪ Delivery time 	sales@megatron.de	+49 89 46094-520
Order processing	<ul style="list-style-type: none"> ▪ Order ▪ Delivery time ▪ Return (RMA) 	order@megatron.de	+49 89 46094-100
Further information material / accessories:	<p>Available on the MEGATRON homepage https://www.megatron.de/</p> <ul style="list-style-type: none"> ▪ Free 3D-models in STEP format ▪ EDS file for encoders with CAN interface ▪ Instruction manual for FHx58 series with CAN interface <p>Accessories:</p> <ul style="list-style-type: none"> ▪ Counter ICs for incremental rotary encoder FHI58 ▪ Shaft coupling for all FHx58 rotary encoders 		

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Hall-Effect Absolute Rotary Encoders FHB58, FHS58

Family FHx58

Series FHB58 - Single- /Multiturn rotary encoder with CAN interface

Key-features FHB58:

- 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)
- Singleturn accuracy $\pm 0,0878^\circ$ (≤ 12 Bit), repeatability $\pm 0,0878^\circ$ (≤ 12 Bit)
- Supply voltage: 10..32 VDC

Electrical Data FHB58 - Single- /Multiturn rotary encoder with CAN interface

Output signal	CANopen	CAN SAE J1939
Effective electrical angle of rotation 1.)	Singleturn 360° Multiturn up to 43 Bit	Singleturn 360° Multiturn up to 32 Bit
Singleturn accuracy	$\pm 0,0878^\circ$ (≤ 12 Bit)	
Singleturn repeatability	$\pm 0,0878^\circ$ (≤ 12 Bit)	
Resolution	1 up to 16 Bit singleturn 1 up to 43 Bit multiturn	1 up to 16 Bit singleturn 1 bis 32 Bit multiturn
Update rate	$\leq 600 \mu\text{s}$	
Supply voltage	10..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)

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Order Code FHB58 - single- /multiturn rotary encoder with CAN interface

Selection: standard=black/bold, possible options=grey/cursive

Series FHB58	FHB58									
Shaft type: Solid shaft		S								
Single- or Multiturn: Singleturn (If 0 Bit is selected as multiturn resolution) Multiturn (If ≥ 1 Bit is selected as multiturn resolution)			- PM							
Shaft diameter: Shaft diameter Ø6 mm Option: user defined shaft diameter [mm] (*)				10 XX						
Multiplication symbol [x]:					x					
Shaft length of the rotary encoder: Shaft length 22 mm Option: user defined shaft length for Option S [mm] (*)						22 - XX				
Supply voltage / output signal: VSUP=24 V (10...32 V) / CANopen VSUP=24 V (10...32 V) / CAN SAE J1939							24CA 24CJ			
Terminating resistor: Without terminating resistor Option: integrated 120 Ohm terminating resistor (Integrated in the rotary encoder)								- T		
Singleturn resolution: Singleturn resolution 12 Bit Option: singleturn resolution 1 up to 16 Bit								12 XX		
Multiturn resolution: Resolution 12 Bit (=4096 turns) Option: resolution 0 Bit (=singleturn rotary encoder) Option: resolution ≥ 1 Bit (=Multiturn rotary encoder) (Maximum multiturn resolution 43 Bit for CANopen, 32 Bit for CAN SAE J1939)									12 0 XX	
Electrical connection, cable length, position: 2 m round cable, cable gland, axial 2 m round cable, cable gland, radial Option: customer specific cable length, cable gland, axial (*) Option: Customer specific cable length, cable gland, radial (*)										PG PGR <i>PG X,XX</i> <i>PGR X,XX</i>

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

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Hall-Effect Absolute Rotary Encoders FHB58, FHS58

Family FHx58

Order example 1: FHB58 - singleturn-rotary encoder with CANopen interface

Requirement:

Solid shaft Ø10 mm, shaft length 22 mm, VSUP=24 V / OUT=CANopen, without integrated 120 Ohm termination resistor, singleturn resolution 12 Bit (=resolution per turn, 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:

FHB58 S 10x22 S 24CA 12 0 PG

Order example 2: FHB58 PM - multiturn-rotary encoder with CANopen interface

Requirement:

Solid shaft Ø10 mm, shaft length 22 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:

FHB58 S PM 10x22 24CA 12 12 PG

Cable- and pin-assignment FHB58 single- /multiturn rotary encoder with CANopen or CAN SAE J1939 interface, not redundant

Function:	Option PG(R), CVR
VSUP	brown
GND	orange
CANHigh	green
CANLow	yellow
CANGND / Shield (*)	shield

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

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Hall-Effect Absolute Rotary Encoders FHB58, FHS58
Family FHx58
Series FHS58 - single- /multiturn rotary encoder with SSI interface
Key-features FHS58 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 $\pm 0,0878^\circ$ (≤ 12 Bit), repeatability $\pm 0,0878^\circ$ (≤ 12 Bit)
- Supply voltage: 10..32 VDC or 4.75 V..5.5 VDC

Electrical data FHS58 single- /multiturn rotary encoder with SSI output

Effective electrical angle of rotation 1.)	Singleturn 360°, multiturn up to 43 Bit	
Singleturn accuracy	$\pm 0,0878^\circ$ (≤ 12 Bit)	
Singleturn repeatability	$\pm 0,0878^\circ$ (≤ 12 Bit)	
Output signal	SSI binary or SSI Gray	
Resolution	1 up to 16 Bit singleturn, 1 up to 43 Bit multiturn	
Update rate	$\leq 600 \mu\text{s}$	
Supply voltage	10..32 V	4.75..5.5 V
Current consumption (no load)	typ. 50 mA	typ. 80 mA
Power consumption	max. 0.44 W	max. 0.5 W
MTTF	1000a	

1.) According IEC 60393

SSI specifications

Clock input	Via opto-coupler
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



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Family FHx58

Order code FHS58 - single- /multiturn rotary encoder with SSI interface

Description		Selection: standard=black/bold, possible options=grey/cursive									
Series FHS58	FHS58										
Shaft type: Solid shaft	S										
Single- or Multiturn: Singleturn (If 0 Bit is selected as multiturn resolution) Multiturn (If ≥ 1 Bit is selected as multiturn resolution)	- PM										
Shaft diameter: Shaft diameter Ø10 mm Option: user defined shaft diameter [mm] (*)	10 XX										
Multiplication symbol [x]:	x										
Visible shaft length of the rotary encoder: Shaft length 22 mm Option: user defined shaft length for Option S [mm] (*)	22 XX										
Supply voltage / output signal: VSUP=24 V (10...32 V) / SSI Option: VSUP=5 V (4.75...5.5 V) / SSI	24SSI <i>05SSI</i>										
Code: Binary Gray	B G										
Singleturn resolution: Singleturn resolution 12 Bit Option: singleturn resolution 1 up to 16 Bit	12 XX										
Multiturn resolution: Resolution 12 Bit (=4096 turns) Option: resolution 0 Bit (=singleturn rotary encoder) Option: resolution ≥ 1 Bit (=Multiturn rotary encoder) (Maximum multiturn resolution 43 Bit)	12 0 XX										
Electrical connection, cable length, position: 2 m round cable, cable gland, axial 2 m round cable, cable gland, radial Option: customer specific cable length, cable gland, axial (*) Option: Customer specific cable length, cable gland, radial (*)	PG PGR <i>PG X,XX</i> <i>PGR X,XX</i>										

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

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Order example 1: FHS58 - singleturn rotary encoder with SSI interface

Requirement:

Solid shaft \varnothing 10 mm, shaft length 22 mm, VSUP=24 V / OUT=SSI binary, singleturn resolution 12 Bit (=resolution per turn, 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:

FHS58 S 10x22 24SSI B 12 0 PG

Order example 2: FHS58 PM - multiturn rotary encoder with SSI interface

Requirement:

Solid shaft \varnothing 10 mm, shaft length 22 mm, VSUP=24 V / OUT=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:

FHS58 S PM 10x22 24SSI B 12 12 PG

Cable- and pin assignment FHS58 - single-/multiturn rotary encoder with SSI interface, not redundant

Function:	Option PG(R)
GND	white
VSUP	brown
CLK+	green
CLK-	yellow
DATA+	grey
DATA-	pink
PRESET	blue
DIR	red
Shield	housing

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Accessory for FHI58 rotary encoders

Shaft couplings for FHx58:

- 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



TDS Precision Products GmbH
Industriestrasse 1a
CH-8157 Dielsdorf

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