MULTI-COIL RESOLVER (MCR)

for the
Automotive Industry

SMARTER SENSORS FOR SMARTER VEHICLES

TE Connectivity‘s Sensor Solutions business unit is one of the leading suppliers of sensors and modules for automotive transmission applications.

The upgrade of existing transmissions to hybrid transmissions using power electric motors, mainly the synchronous type, leads to an increase of all requirements in terms of electric machines performance, which requires new technological developments.

The wide product and process portfolio of TE Sensor Solutions offers an ideal base for the development and production of such robust and reliable solutions.

The Multi-Coil Resolver (MCR) is designed to determine synchronous electric motor rotor position by scanning magnetic fields. This MCR can withstand rotation speeds above 20,000 RPM and operates in a temperature range within –40° C up to +150° C. Depending on the various specifications, specific adaptations may increase these values.

This innovative layout also guarantees a competitive cost and makes it possible to standardize the assembling process. As a result, it can be fitted to large diameter machines featuring numerous permanent magnets – being installed between the thermal engine and the gearbox, to separate electrical machines mounted parallel to the transmission or to another axle for instance.

TE Connectivity‘s Sensor Solutions developed the MCR technology as a product platform, capable to provide several ranges of speeds and shaft diameters in accordance with customer requirements.

APPLICATION

- Angular position sensor for electric motors for HEV- and EV cars

DESCRIPTION

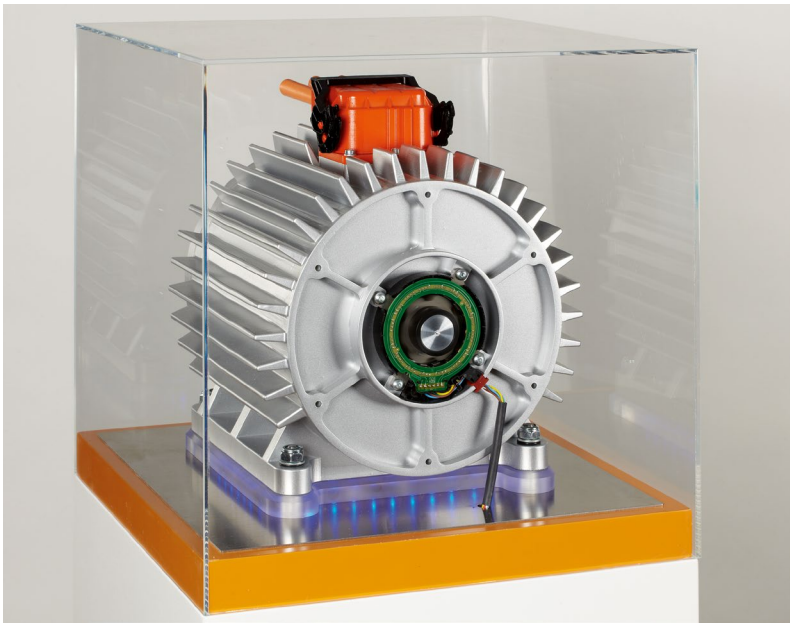
- Analoge Output Signal
- Plattform Product based on poolpairs of the e-motor (speed)
- Please see product specification 108-90819 for more details

PERFORMANCE

- Temperature range –40° C to +150° C
- High rotational speed
- Accurate measurement of angular rotor position and speed
- Shock and vibration robust
- Robust against eccentricity
- Very high signal-noise ratio
- High reliability (no active components)
- Customized cable assembly and connector interface

ADVANTAGES OF TE SOLUTION

- Fault-tolerant with excentriciy (static/dynamic) through patented winding scheme
- Fault-tolerant against external fields through patented winding scheme
- Flexible adaption of shaft diameter through smart tooling concept
- Different fixation designs of stator possible
- Different inner diameter of rotor possible



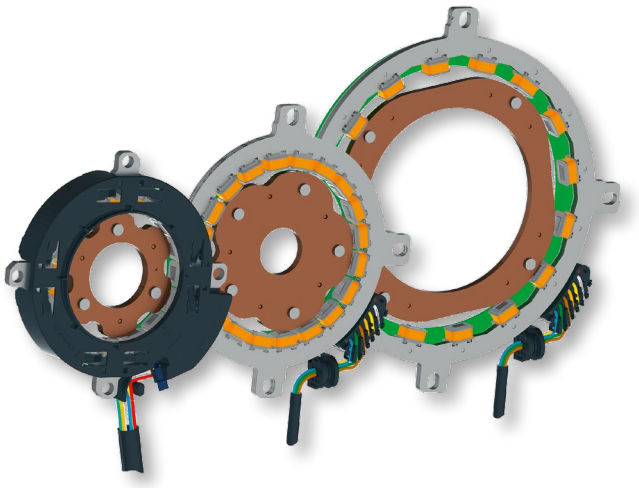
AVAILABLE SPEED NUMBERS

- 2-/ 3-/ 4-/ 5-/ 6-/ 8-/ 10-/ 12-speed

AVAILABLE PLATFORMS

- x05/ x07/ x11 platform*)

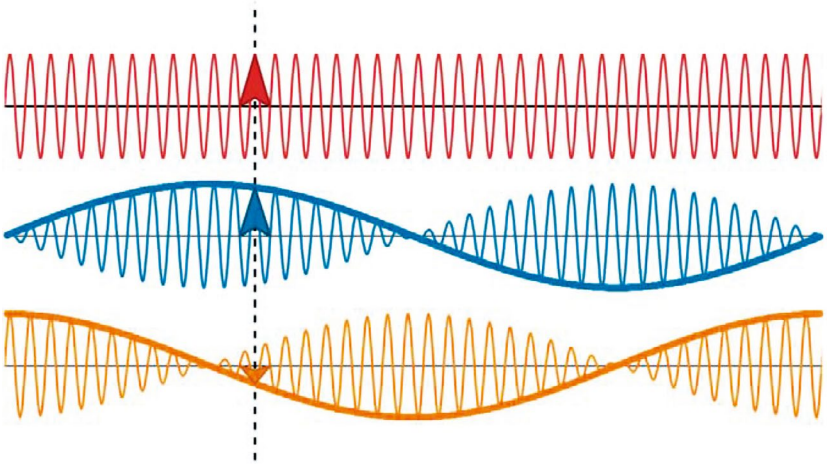
*) nomenclature

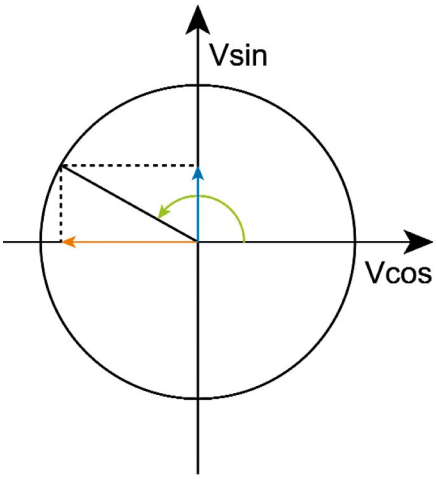


MCR XX YY - ZZ e.g. MCR605-11

- XX: Speed numbers, e.g. 4, 6, 10, ... (leading zero not displayed)
- YY: Inner diameter stator [mm/10]
- ZZ: Customer specific features

SIGNAL





RECOMMENDED OPERATION CONDITIONS

Parameter	Conditions	Symbol	Minimum	Typical	Maximum	Unit
Ambient Temperature	For lifetime = 600h	Ta	-40		140	°C
Storage Temperature		Ts	-40		80	°C
Excitation Voltage		$\hat{U}_{EXC}$		7		V_{rms}
Excitation Frequency		f		10		kHz

MAXIMUM RATING

Parameter	Conditions	Symbol	Minimum	Typical	Maximum	Unit
Peak Temperature*	<100h over lifetime	Ta_{peak}	-40		150	°C

* Peak temperature test need to be performed in application condition

ANALOG INPUT

Parameter	Conditions	Symbol	Minimum	Typical	Maximum	Unit
Input Impedance	@10kHz, 7V, with Rotor	$\|Z_{exc}\|$	96	(120)	144	Ω

ANALOG OUTPUT

Parameter	Conditions	Symbol	Minimum	Typical	Maximum	Unit
Sine Output Impedance	@10kHz, 7V, with Rotor	$\|Z_{sin}\|$	200	(250)	300	Ω
Cosine Output Impedance		$\|Z_{cos}\|$				

Values in all tables are typical values

Example: MCR 605 Performance

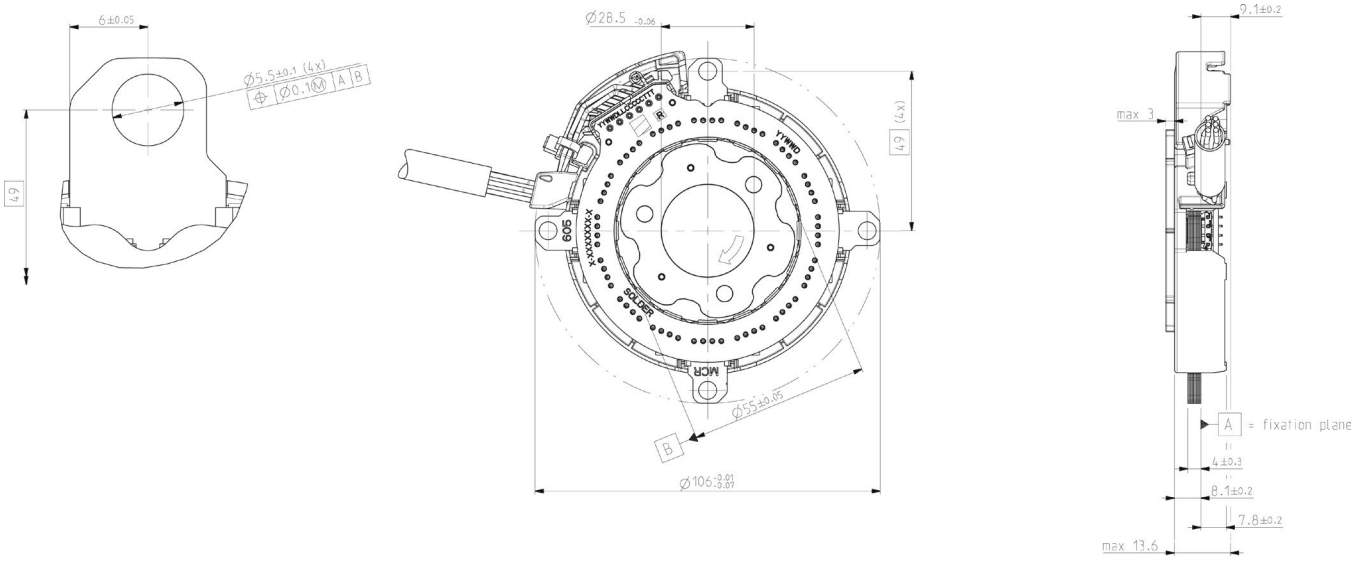
SIGNAL PERFORMANCE

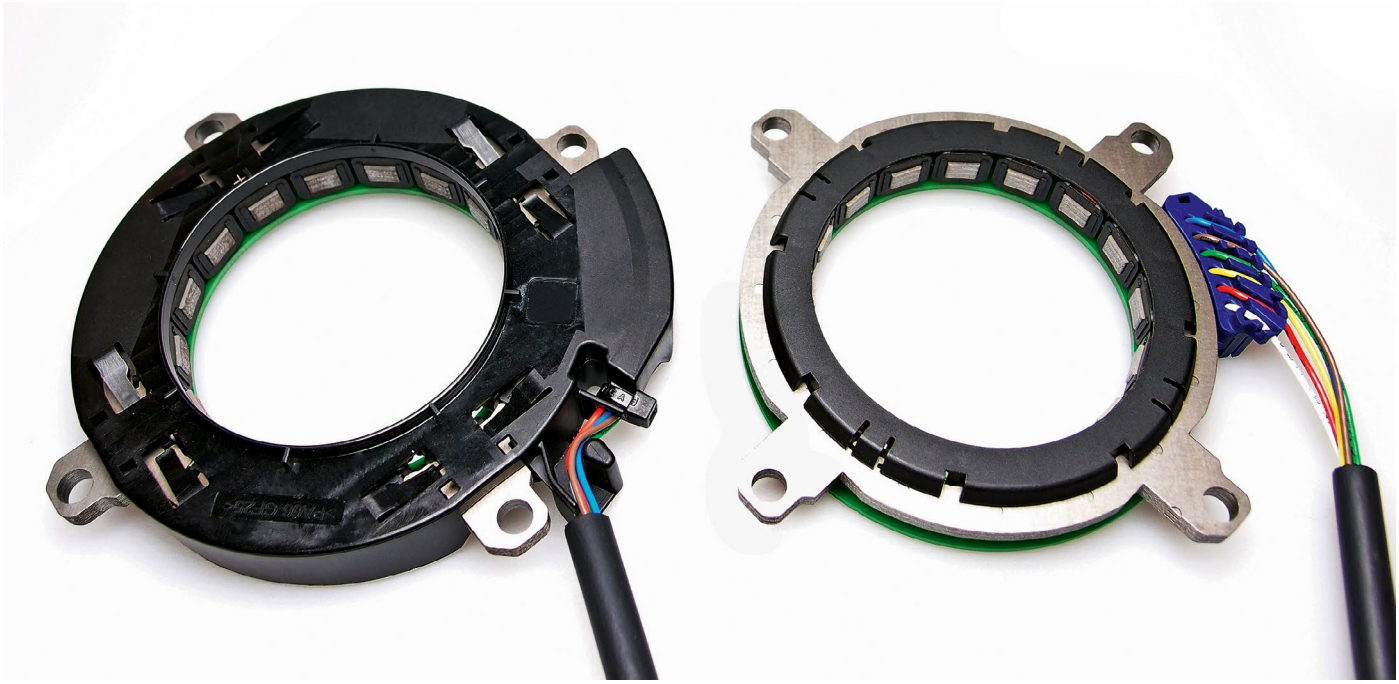
Parameter	Conditions	Symbol	Minimum	Typical	Maximum	Unit
Transformation Ratio	@10 kHz, 7 V	$\overline{TR'}$	0.2574	(0.286)	0.3146	–
Phase Shift		φ	-15°	(0)	15°	dag
Rotor Angle Offset	Reference Rotor	$\overline{\Delta\alpha'_{el}}$	-12°	(0)	12°	dag
Span of Angular Error		$\lvert\Delta\alpha'_{el}\rvert$		(80′) (1.33°)	180′ 2°	arc min dag

Values in all tables are typical values

$'_{el}$ means electrical minutes

Example: MCR 605 Diameters





YOUR ADVANTAGE

- Next level customer support
  - Design in support
  - Sensor function
  - Cable assembly
  - Connector definition
  - Manufacturing competence
- One Stop Shopping Solution
- TE Connectivity has a global footprint and customer support for every kind of question regarding to your products

CONTACT

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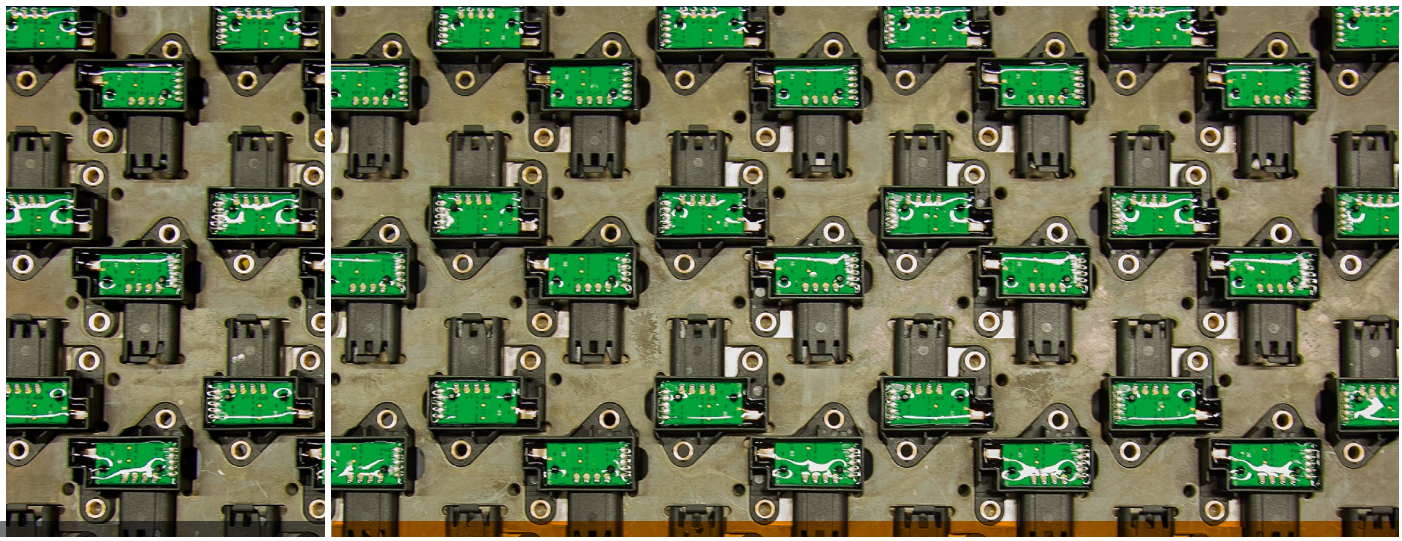

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