CONCEPT

A torque applied on a shaft naturally generates a torsion deformation of the shaft. The CTS is designed to measure this torsion. This measurement is performed by 2 sub systems:
• The torsion converter: it is an elastic body fixed on the shaft. The converter transforms torsion deformation into linear displacement detected by a proximity sensor (Fig.3). In another terms, the converter (Fig.4) transforms angular shift into significant axial shifts of two targets in a direction along the shaft axis. The torsion converter can include a shaft (Fig.1) or be located onto an existing shaft (Fig.2). The shaft can be a stationary axle or a rotating shaft.

• A proximity sensor: located in front of the targets, the proximity sensor detect the target linear motions and provide a signal image of the applied torque. Several types of proximity sensors can be used. Nominal solution proposed by CEDRAT TECHNOLOGIES consists in new cost effective PCB-based ECS probes combined with the ECS75 electronics card designed by CEDRAT TECHNOLOGIES (Fig.5).

The speed and angle can also be proposed as options without any additional components.

<table>
<thead>
<tr>
<th>Reference</th>
<th>Unit</th>
<th>CTS1</th>
<th>CTS10</th>
<th>CTS500</th>
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<tbody>
<tr>
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<td>0 ... 1</td>
<td>0 ... 10</td>
<td>0 ... 500</td>
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<tr>
<td>Speed</td>
<td>Rpm</td>
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<td>3000</td>
<td>3000</td>
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<td>Resolution</td>
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<td>0.1 % Full scale</td>
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<tr>
<td>Accuracy</td>
<td>%</td>
<td>2 %</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Repeatability</td>
<td>%</td>
<td>2 %</td>
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</tr>
<tr>
<td>Bandwidth</td>
<td>Hz</td>
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<tr>
<td>Operating temperature</td>
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<tr>
<td>Output</td>
<td>V (DC)</td>
<td>±10 V</td>
<td></td>
<td></td>
</tr>
<tr>
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<td>Ø30x30mm</td>
<td>Ø65x50mm</td>
<td>Ø130x100mm</td>
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<tr>
<td>Nominal shaft diameter</td>
<td>mm</td>
<td>Ø 5mm</td>
<td>Ø 15mm</td>
<td>Ø 40mm</td>
</tr>
</tbody>
</table>

Table 1: Preliminary characteristics of the Contactless Torque Sensor

COLLABORATION

CEDRAT TECHNOLOGIES has developed the initial CTS sensor for PSA Peugeot Citroën for automotive applications. New developments of CTS are performed for high precision compact robot joints in for the MANUMET Smart Joint project, which is an European Union Co-funded project and in the COTS project with CETIM and UTC.