Robox RMC motor with integrated drive


The drive is mechanically and thermally integrated in the motor.
The core of the system is the servo drive SPIMD20 designed in co-operation with STMicroelectronics.
The designers had to pay the utmost attention to the temperature and vibrations.

![ROBOX] www.robox.it

The idea of integrating the servodrive on the motor was in principle to save money.

- money is saved by reducing the wiring

- money is saved by eliminating the cabinet

- money is saved in the technical office

- money is saved by a quick, error free commissioning

ROBOX www.robox.it
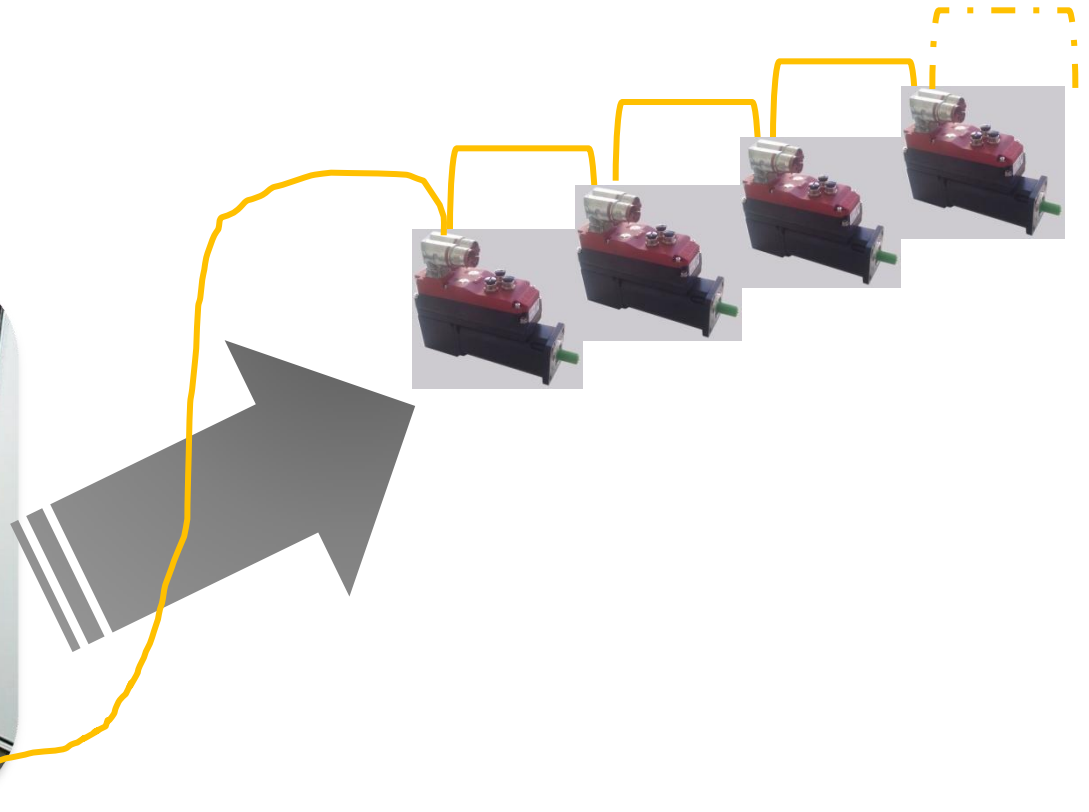
✓**Wiring minimization**
✓**Electrical cabinet suppression**

Of course it was necessary to develop hybrid cables and connectors.

Hybrid cables/connectors must be able to deliver the motors:
- the power supply, typically up to 800DC Volt
- an auxiliary supply, typically from 18 to 48Volt
- the ethernet connection
- auxiliary signals like for instance the hardware torque off handling
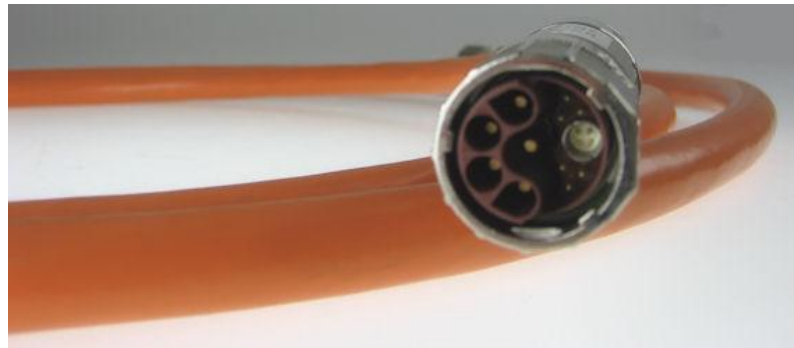
The idea to develop the integrated servo drive was a winning one, thanks to the wide band of the Ethernet real-time buses.

- a big number of integrated servo drives can be connected using just one ethernet cable

-high updating frequency (up to 1 / 2 KHz and even more) can be easily obtained, thus improving the dynamic performance and reducing undesired latencies

- multiple axes can be synchronized at PWM level (less than 100µs)

- a lot of diagnostic information is available allowing remote failure analysis and remote servicing

- the operating software can be upgraded whenever needed

- etc…

But other important advantages resulted from the integrated servo drive technology:
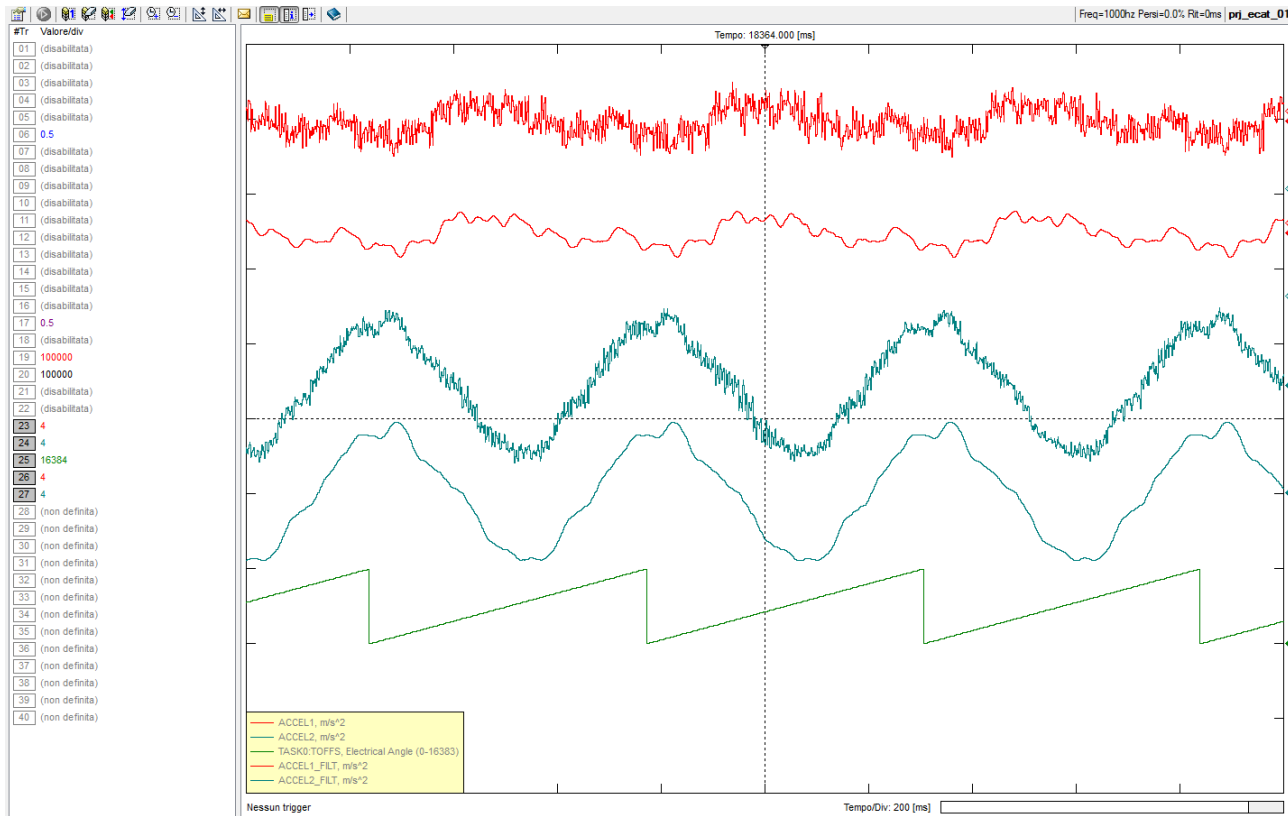
As already pointed out vibrations and temperature are the most challenging design aspects in an integrated servo drive.
#4 thermometers were installed in the SPIMD20 (plus the capability to read the thermal probe inside the motors)
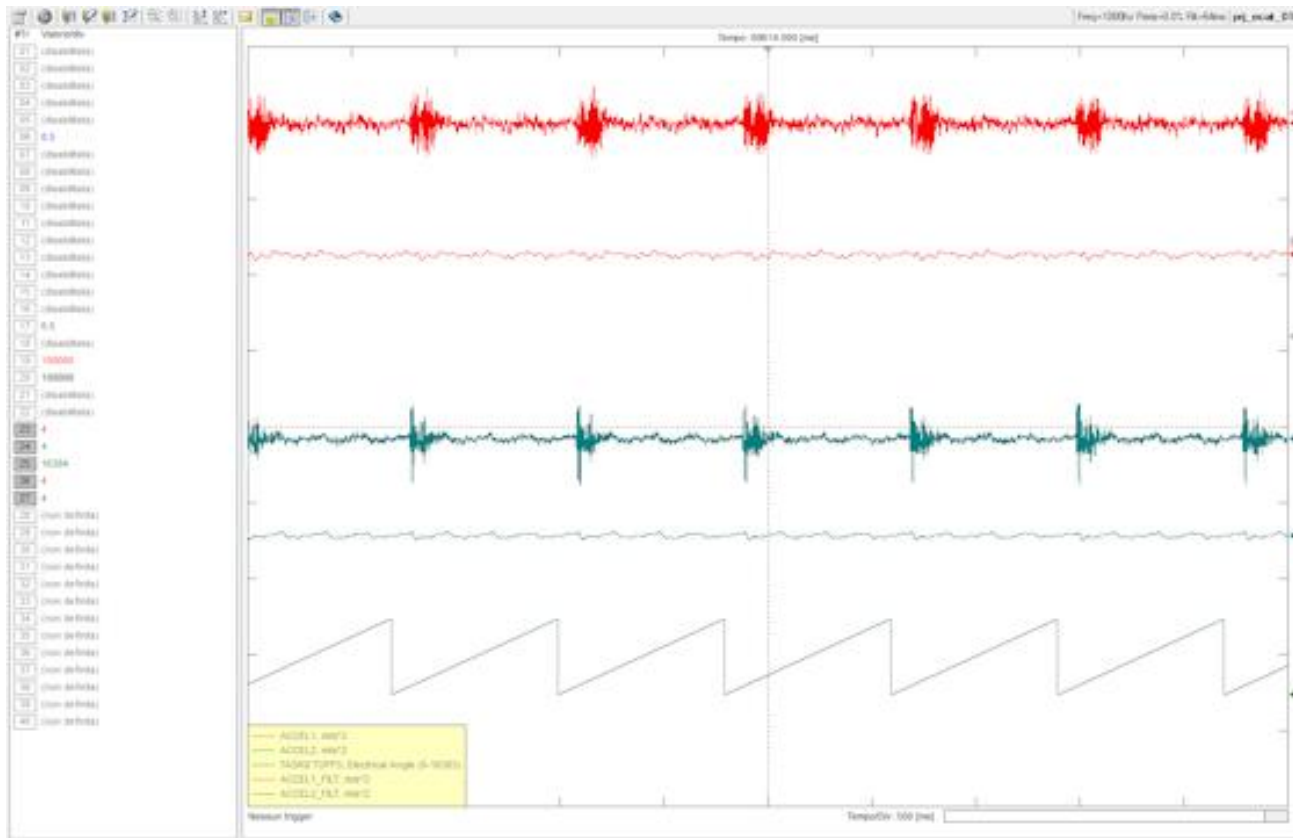#1 2-axis Mems accelerometer ST LIS2L06AL was installed (+/-6g; 1500Hz)

These sensors were installed to protect the SPIMD20 itself, but suddendly it appeared that they are even more useful :
- to perform preventive service on the motor and related mechanical
   stuff (gearboxes, for instance)
- to deeply investigate abnormal working conditions related for instance
  to the speed range or other particular working conditions

Unfiltered acceleration Cross axis

Filtered acceleration Cross axis - 200 Hz

Unfiltered acceleration Longitudinal axis - 200 Hz

Filtered acceleration Longitudinal axis - 200 Hz

Motor revolutions

One time division = 25ms

Abnormal vibrations caused by unbalanced load

Unfiltered acceleration
Cross axis

Filtered acceleration
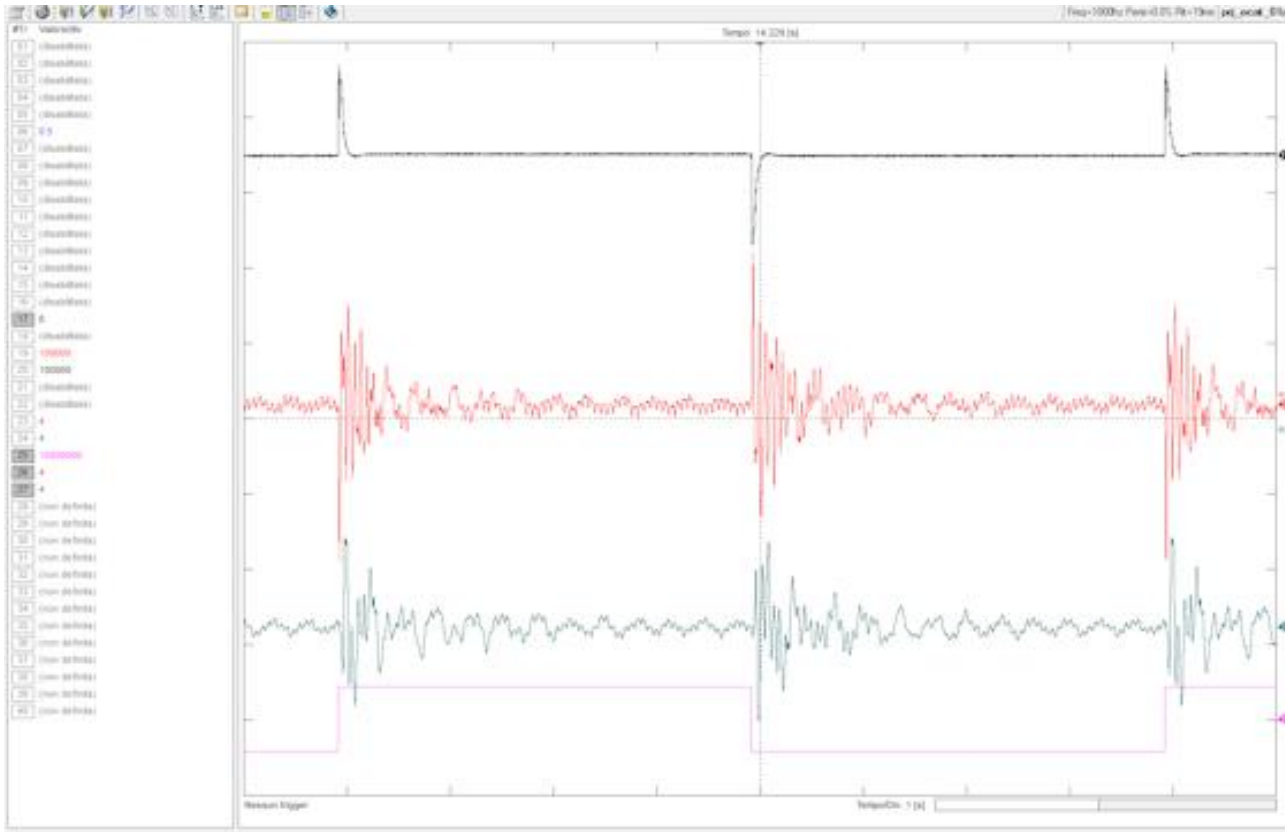Cross axis - 200 Hz

Unfiltered acceleration
Longitudinal axis - 200 Hz

Filtered acceleration
Longitudinal axis - 200 Hz

Motor revolutions

One time division = 62,5ms

Abnormal vibrations caused by a defective gearbox
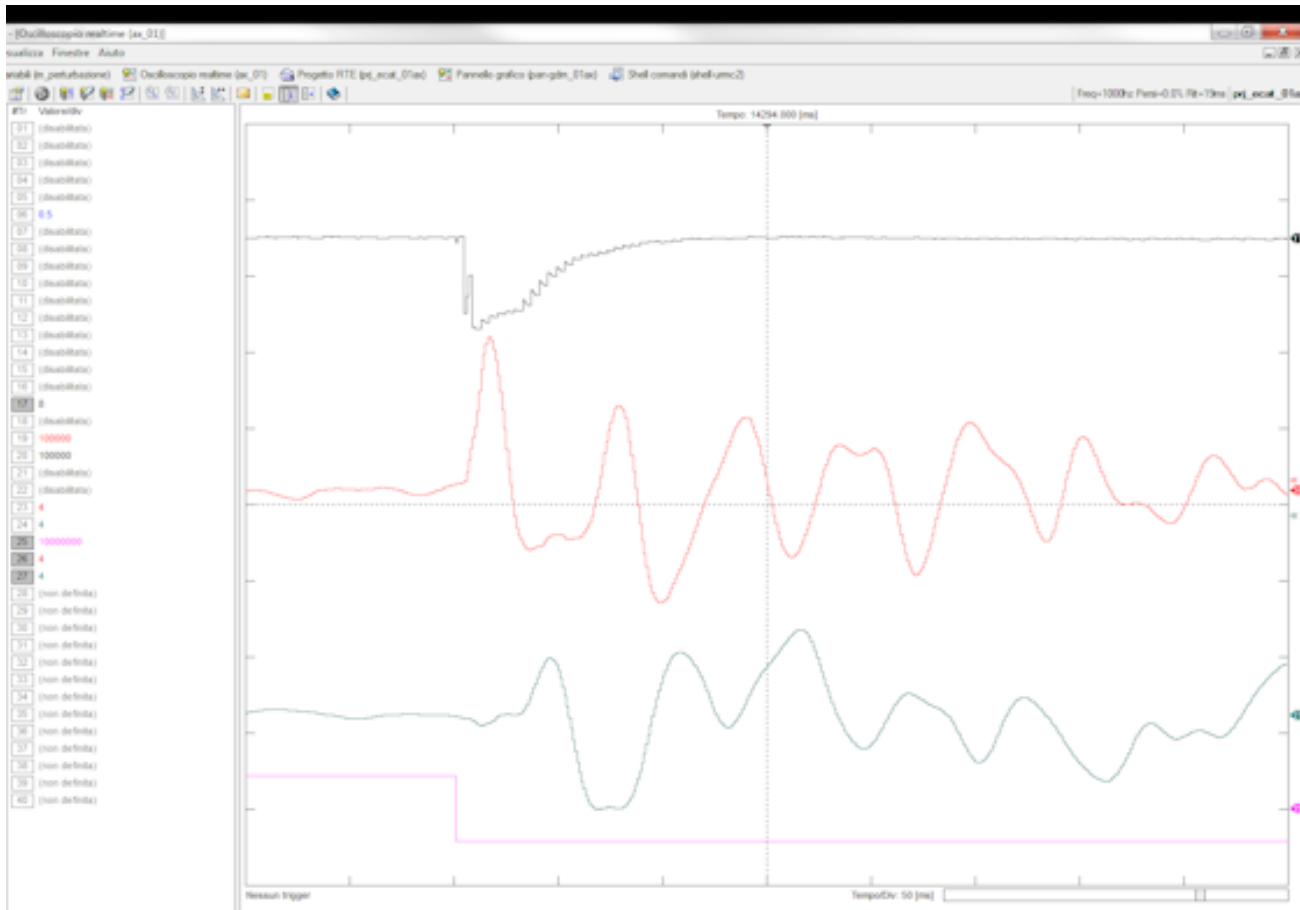
Iq current

Filtered acceleration
Cross axis 200 Hz

Filtered acceleration
Longitudinal axis - 200 Hz

Motor revolutions

One time division = 125ms

Vibrations caused by a velocity step +/-1000 rpm

Iq current

Filtered acceleration
Cross axis 200 Hz

Filtered acceleration
Longitudinal axis - 200 Hz

Motor revolutions

One time division = 6.25ms

Vibrations caused by a velocity step +/-1000 rpm