

Leonardo's Space exploration drills

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Leonardo is one of the world's leading companies in space robotics, from complex drills with space sampling systems to advanced robotic arms.

At the **Italian Pavilion at Expo 2020 – Dubai**, it will be possible to see a reproduction of the drill made by Leonardo for *ExoMars 2022*, an ESA and Roscosmos mission, with the support of the Italian Space Agency (ASI) and industrial guide of Thales Alenia Space (a joint venture between Thales 67% and Leonardo 33%). The drill will look for traces of present and past life by digging down 2 metres into the soil of the Red Planet.

With a power of 80 watts (one fifth compared to the drills we use at home), the drill is ready to work in extreme conditions: through 60 rotations per minute with a constant thrust equal to 40-50 kilos, it will dig into the ground with a polycrystalline diamond tip which will generate holes of 25 mm in diameter. During this delicate task of drilling the soil and collecting samples, the drill will be assisted by another tool developed by Leonardo, with the scientific supervision of INAF-IASP and the funding and coordination of ASI: the **Ma_Miss**, a miniaturised infrared spectrometer, which inside the drill, will provide information on the environment around the collected samples.

In addition to the ExoMars2022's drill, Leonardo produced the drill for the ESA **Rosetta** mission, which, for the first time in history, operated on a comet trying to pierce its surface. Leonardo is now developing **PROSPECT**, the drill with an integrated mini-laboratory for Luna-27, an ESA and Roscosmos mission, with the support of ASI and the UK Space Agency. PROSPECT will search for ice, volatiles and chemicals under the surface of the Moon, and these precious resources could pave the way for future lunar exploration missions.

Leonardo's space drills are real **technological jewels** capable of making their way into the soil of celestial bodies and taking samples to be analysed *in situ* using special scientific methods. The drill is a symbol of Italian know-how, and feature in the documentary "*Saper Fare*" filmed by the Oscar-winning director Gabriele Salvatores for the Italian Pavilion.

In fact, designing and producing similar devices pose important technological challenges, since they must be able to operate in unknown environments: soil, temperature and pressure are very different to those on Earth. There is no room for error in the construction of space drills: once they arrive at their destination, they must be able to operate independently, without being managed from the ground. Therefore, elements such as the materials used, sophisticated electronics and advanced software are fundamental to allow a high degree of intelligence for space robotics.

Leonardo, a global high-technology company, is among the top world players in Aerospace, Defence and Security and Italy's main industrial company. Organized into five business divisions, Leonardo has a significant industrial presence in Italy, the United Kingdom, Poland and the USA, where it also operates through subsidiaries that include Leonardo DRS (defense electronics), and joint ventures and partnerships: ATR, MBDA, Telespazio, Thales Alenia Space and Avio. Leonardo competes in the most important international markets by leveraging its areas of technological and product leadership (Helicopters, Aircraft, Aerostructures, Electronics, Cyber Security and Space). Listed on the Milan Stock Exchange (LDO), in 2020 Leonardo recorded consolidated revenues of €13.4 billion and invested €1.6 billion in Research and Development. The company has been part of the Dow Jones Sustainability Index (DJSI) since 2010 and has been named as sustainability global leader in the Aerospace & Defence sector for the second year in a row of DJSI in 2020.