Rapid speed changes express themselves in a rapid change in real-time of the tachogenerator voltage (*Delay time* on page 11). The "tachogenerator limiting frequency" therefore depends only on the **mechanical drive limiting frequency** which is negligible in comparison to the electrical limiting frequency of sinewave encoders and particularly Digital-Tachos (incremental encoders). However, attention should be paid to transmission of the tachogenerator voltage to the speed controller and several rules of telecommunication engineering practice should be observed:

- **Twisted pair signal cables** with an overall screen, e.g. Ölflex-Servo®-720 (manufactured by LAPP) $4 \times 2 \times 0.25 + 2 \times 1$ CY, should be used.
- The **cable screen** should be connected to the housing and protective earth of the line receiver using a large area connection. In some cases, a single-ended cable screen connection can provide better results, since balancing currents (equipotential bonding) are suppressed flowing via the cable screen.
- **Earthing** of the tachogenerator or combination via the flange and driving machine or via the special **earth connection** of the device according to VDE specifications.
- **Star point layout** of all earth connections to a common earthing point (equipotential bonding) to avoid earth loops with voltage differences between the devices.
- The **distance of the signal cable** from motor cables with pulsed currents must be kept as large as possible.
- **Line Receivers** with differential input (Display in figure 33) are characterized by high **interference signal common mode rejection**: Interference signals that reach the cable cores despite screening and twisting, are reliably suppressed. This differential amplifier technology is to be given preference over the earlier used tachogenerator voltage transmission with a cable core connected to earth ("single-ended").
- **High tachogenerator voltage** should be used so that parasitic interference remains small in comparison to the tachogenerator voltage (high signal-to-noise ratio). The high tachogenerator voltage is an essential advantage compared with Digital-Tachos (incremental encoders) with TTL signals (+5 V) and sinewave encoders with $1\ V_{pp}$.

  For the tachogenerator voltage, the following rule of thumb applies:

  Tachogenerators with own bearings with 60 V/1,000 rpm (or more) are used for large machines and plants with long tachogenerator voltage transmission path subject to interference.

  Hollow-shaft tachogenerators with 20 V/1,000 rpm (also slight more or less) are used for high dynamic drives with short tachogenerator voltage transmission path.

Figure 33: Uniform tracking of this radio telescope in Effelsberg in all weathers and for long-distance signal transmission – HÜBNER LongLife® tachogenerators mounted on the wheel drives ensure optimal results.

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