

The armature being supported at both ends, the majority of two-pole tachogenerators with own bearings offer the possibility to integrate further devices. The combinations are characterized by a common housing (logo 1+1=1®) and commonly feature a **common shaft** to avoid a spring-mass system with a low resonant frequency. This offers decisive advantages for driving engineering applications:

- Tacho + Tacho (Twin tachogenerator) with two separate tachogenerator voltages
- Tacho/Twin Tacho + Incremental encoder
- Tacho/Twin Tacho + Overspeed switch.

Twin-Tachos

Twin-Tachos (twin-tachogenerators) are produced with two electrically isolated tachogenerator voltages, whereby the windings are located in the slots of a common armature. The commutators are arranged on both sides of the armature (↻ Figure 27). The tachogenerator voltages are available in the terminal box at terminals 1A1 and 1A2 (1st system) and 2A1 and 2A2 (2nd system) (↻ Figure 5); they can be different or identical for **function monitoring** (redundancy): if they should deviate, i.e. cable break, a safety function is activated.

Figure 27: Twin tachogenerator with two winding system (TDPZ 0,2) – here on a drive of a cold forming press.



Tacho/Twin-Tacho + Digital-Tacho (Incremental encoder)

Numerous drive applications require in addition to speed regulation also super-imposed position control (➔ Figure 1 on page 8). HÜBNER offers three variants of this combination, adapted to meet specific applications and requirements:

- The Tacho or Twin-tacho with bearings at both ends is the primary device with the Digital-Tacho (incremental encoder) attached:
- Example: **TDP 0,2 + OG 9** (➔ Figure 28).

Figure 28: This combination of Analog-Tacho + Digital-Tacho (TDP 0,2 + OG 9) is a classic: Introduced to the market in 1978, it is widely used today employing modern technology.



- The Digital-Tacho (incremental encoder) with bearings at both ends is the primary device with the Analog-Tacho attached:
- Example: **FOG 9 + GT 7** (➔ Figure 29).

Figure 29: The combination of Digital-Tacho + Analog-Tacho (FOG 9 + GT 7) harmonizes perfectly with the design of a hydraulic motor.



- The Tacho or Twin-Tacho has a non-drive end flange and a rear shaft on which the Digital-Tacho (or foreign encoder) with own bearings is mounted via a rear support housing and coupling:

- Example: **TDP 0,2 + OG 60** (➔ Figure 30).

Figure 30: The rear shaft of the Analog-Tacho drives via a coupling within a rear support housing the Digital-Tacho with own bearings (TDP 0,2 + OG 60 or separate encoder).



HÜBNER develops and produces **Digital-Tachos** in a wide range of variants which, based on decades of experience with rugged dc tachogenerators, are similarly characterized by high mechanical and electrical ruggedness:

- Solid light metal housing with high vibration and shock resistance.
- Push-pull scanning with optical semi-conductors, temperature and ageing compensation.
- Output signals with high-volt level HTL or 5 V level TTL according to RS-422.
- Output driver, depending on size, with short-circuit-proof power transistors or IC.

Detailed information with application examples are provided in our 48 pages publication

Information for the User

20 Years Competence in HeavyDuty:

Digital-Tachos (Incremental Encoders)
Sinus-Tachos (Sinewave Encoders),

which is available on our website www.huebner-berlin.de or can be sent to you on request.

Tacho/Twin-Tacho + Overspeed switch

The Tachos or Twin-Tachos (and several HÜBNER Digital-Tachos) are available as a combination with common shaft and integral mechanical or electronic overspeed switch, e.g.

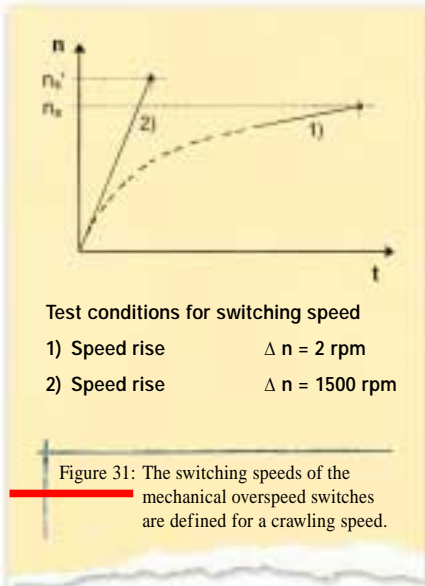
TDP 0,2 + FSL (mechanical with *one* switching speed) or

TDP 0,2 + ESL ... (electronic with *one* or *three* switching speeds)
(➔ *Technical Data*).

The overspeed switch is usually used for speed **safety monitoring**:

■ Mechanical overspeed switches (centrifugal switches)

They effect an *rapid* switching operation at a factory set switching speed without auxiliary electrical power. Centrifugal force actuate a switch with isolated make and break contacts. Resetting takes place automatically at an about 40 % lower speed (speed hysteresis). The **switching speed** n_s is defined for a **slow** speed change (➔ Figure 31). At high acceleration, the switching speed shifts to a higher value n_s' . The hysteresis between clockwise and counter-clockwise rotation is about 3 %.



The **operating speed** should be below 90 % of the switching speed in the case of heavily vibrating drives. The **maximum speed** specified in the data sheet must not be exceeded for safety reasons. A switching operation from high to low speeds is not available on the mechanical overspeed switches.

➤ Leaflet FS 90:

When combined with an Analog- or Digital-Tacho, the FS 90 has the designation **FSL**.

For lower switching speeds a **speed-up gear box** is available.

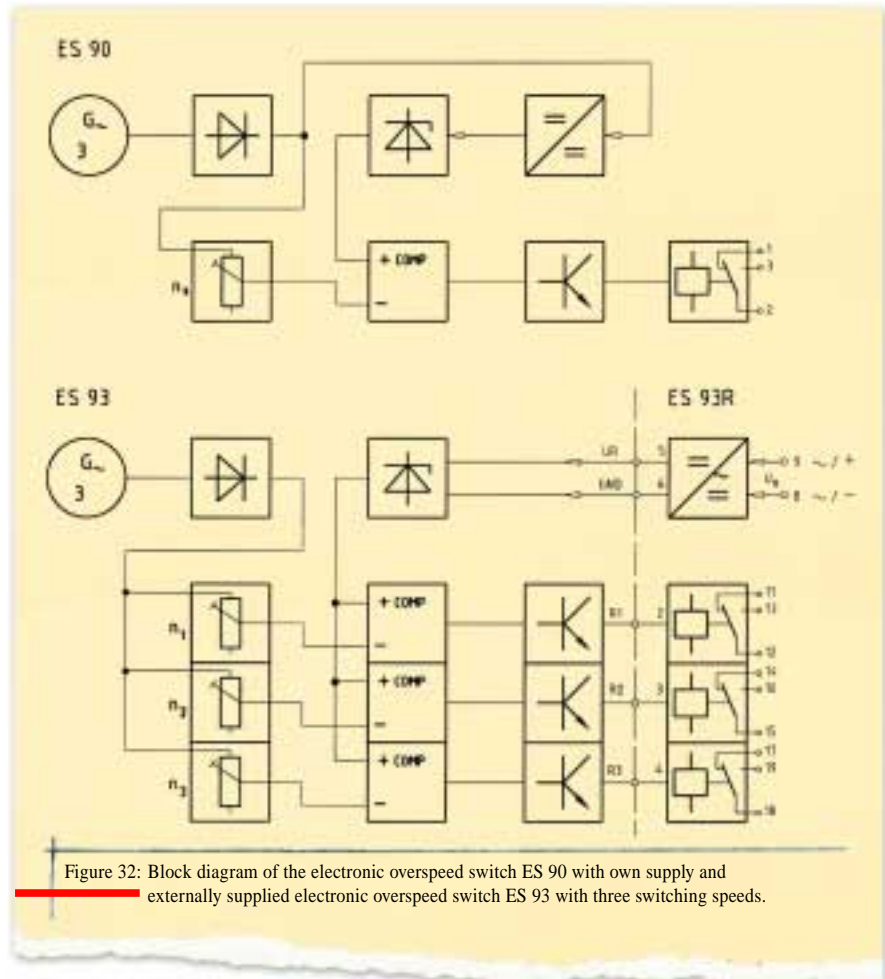
■ Electronic overspeed switches with one or three adjustable switching speeds

The factory set switching speeds can be readjusted with potentiometers in the terminal box.

The switching operation is effected **abruptly** in both directions of rotation. Switching back takes place **automatically** (speed hysteresis).

➤ Leaflet ES 90 · ES 93:

When combined with an Analog- or Digital-Tacho, the electronic overspeed switch with *one* switching speed has the designation **ESL 90** and with *three* switching speeds, the designation **ESL 93**.



The **ES 90** has one relay output with isolated changeover contact and is powered internally via an integral AC tachogenerator, so that an external voltage supply is unnecessary (➔ Figure 32 above).

The **ES 93** has three independent transistor outputs and in conjunction with the relay module **ES 93 R**, three floating relay contacts with changeover contact. The three relays are changed over upon interruption of the supply or signal cables.

The relay module ES 93 R supplied with direct or alternating voltage also supplies the ES 93 (➔ Figure 32 below).

As a supplement to the mentioned overspeed switches, HÜBNER has developed the electronic overspeed switch **ES 100** with particularly low switching speeds, provided with the EURO flange® B10 and shaft $\varnothing 11 \text{ mm}$ and is connected to the drive via a coupling (➔ Figure 2 on page 8).

The overspeed switches used in the combinations cover the following switching speed ranges:

FS 90 (FSL)	700 ... 4,900 rpm
ES 90 (ESL 90)	650 ... 6,000 rpm
ES 93 (ESL 93)	3 x 200 ... 5,000 rpm
ES 100	110 ... 500 rpm

For **safety-relevant** applications, combinations of mechanical and electronic overspeed switches are available.

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**The height of precision
in speed and position:
HÜBNER Technology.**

LongLife® DC Tachogenerators
with the patented silver track
embedded into the commutator.
We support this with a two year
guarantee.

Digital-Tachos (incremental
encoders) in **HeavyDuty®**
technology: rugged electrical
and mechanical construction.

LowHarmonics® Sinus-Tachos:
Sinewave signals with
significantly low harmonics –
a new level of precision.

Overspeed switches:
mechanically by centrifugal
actuator or electronically with
own or external voltage supply.

ExtendedSpeed® angular
and linear acceleration sensors
with no speed limit.

Combinations: Digital-Tachos,
dc tachogenerators or over-
speed switches in one single
housing with continuous shaft.



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