

## D.C. Hollow Shaft Tacho-Generator

Type TDP 439 H  
TDPL 439 H

Combined Units

JOHANNES  
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## General

The 4-pole TDP 439 H D.C. hollow shaft tachogenerators are measurement converters for measurement, control and regulation technology. The function of these permanently excited D.C. generators is to convert the speed at which they are driven into a **speed-proportional D.C. voltage**.

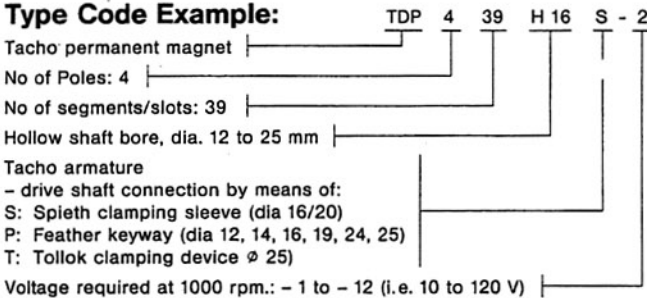
## Mechanical Design

- **low profile, short machine** in A4 construction (without own bearings), in a mechanically robust design.
- **torsionally-rigid connection** between tacho armature and drive machine, designed specially for **highly dynamic reversing**.
- **no coupling, no long intermediate flange, simple and cost-effective fitting** to the drive machine.
- **a wide selection of drive shaft diameters**  
– from 12 to 30 mm dia.
- **positive fitting to cylindrical shaft extensions to DIN 748 Part 3** with feather keyway.
- **interference fitting to cylindrical, plain shaft extensions** of 16, 20, 25 and 30 mm dia.
- **the possibility of passing the drive shaft through the tacho** so that an **additional shaft extension of up to 25 mm dia.** is available (e.g. for a crank handle).
- **high degree of protection – IP 56**  
– when fitting is carried out according to instructions.
- **large, sealed terminal box** with captive cover fixing screws for IP 55 and higher.
- **simple maintenance**, easily accessible brush area; **commutator contact surface** can be checked, cleaned and **refurbished without dismantling the armature**.
- **simple mounting and removal** of the machine; the stator housing is pushed on over the fixed armature.

## Electrical

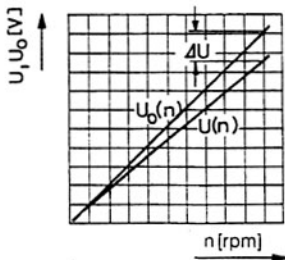
- **available voltages from 10 to 120 V at 1000 rpm.**
- **harmonic voltage content kept to a minimum** by the high number of segments/slots.
- **temperature compensation up to + 100°C** (optional/additional price)

### Type Code Example:



## Voltage

The standard voltages are given in the technical tables:



Speed/voltage curve

## Connections, Polarity

The tacho armature is connected via commutator/brushes to a 2-pole terminal board. When the machine is running clockwise (view from the mounting side), the A1 terminal is positive and the A2 terminal negative.

## Brushes

The sizing and quality of the silver-graphite brushes used, do guarantee long maintenance-free operation. Brush life is however extremely dependent on ambient conditions and speed. For normal operating conditions it is approx. 15.000 operating hours.

## Temperature coefficient Temperature compensation

The temperature coefficient of the permanent magnets used is dependent on the material used and is approx.  $\pm 0,3\%$  per 10 degrees K of temperature change. This value applies to a temperature range of approx.  $-40^\circ\text{C}$  up to  $+100^\circ\text{C}$  and is reversible.

If temperature compensation is required, this should be specified on ordering (extra cost). In the **temperature range 0 – 100°C** the temperature coefficient of the permanent magnets can be compensated up to a tolerance of  $\pm 0,05\%$  per 10 degrees K.

## Harmonics

An essential characteristic of a good tacho voltage is a low percentage of harmonic content in a large speed range. In general, the RMS value of the total harmonic mix is measured by a thermionic voltmeter and refers to the D.C. voltage value. The harmonic voltage is approx. 0,5 % at speeds between 100 and 3000 rpm. Machine harmonics result from the mechanical and electrical design and the electrical use, as well as the production tolerances of symmetry.

## Linearity and optimum load current

The suitability of a tacho-generator for different control functions is determined by the linearity of the output voltage relative to the speed. The max. permissible load current is given for each machine which should not be exceeded with respect to the linearity errors. (0,5 % at max. current.) However, for high precision requirements in the range of  $\pm 0,15\%$  speed deviation, we recommend to select the optimum load resistance.

## Brush contact voltage

**Silver-graphite brushes with very low contact voltage** are mainly used for D.C. tachogenerators.

The total voltage drop at the sliding contact is **affected by speed, current density under the brushes, brush pressure and the condition of the patina on the brush contact surface.**

## Insulation

Insulation class B. Additional protection against aggressive ambient conditions can be provided by special insulation (extra cost).

## Construction

The machine in **A4 construction** does not have own bearings. A torsionally-rigid connection results from pushing the tacho onto the drive shaft. Uncontrolled oscillations which are induced and amplified by couplings will thus be avoided. Mounting of the machine by means of two cheese-head screws, M 5 x 50 (included in scope of supply).

**Note: max. drive-in torque 200 Ncm.**

## Degrees of protection

DIN/VDE 0530 part 5 (for rotating electrical machines).

### IP 55

Fully enclosed. Protection against harmful dust deposits and against water spray from all directions.

### IP 56

Protection against flooding.

**Note: Mounting surface of tacho to be sealed.**

### IP 44

Protection against granular objects and water splashing (with plastic terminal box or connecting cable, no aluminium casting).

## Paint, surface protection

### IP 55/IP 56

Finish paint light grey RAL 7030.

### IP 44

Surface protection: galvanized and black chromed.

Tachos exposed to aggressive gases and fumes will be supplied, in addition to special insulation with an appropriate special coat of paint.

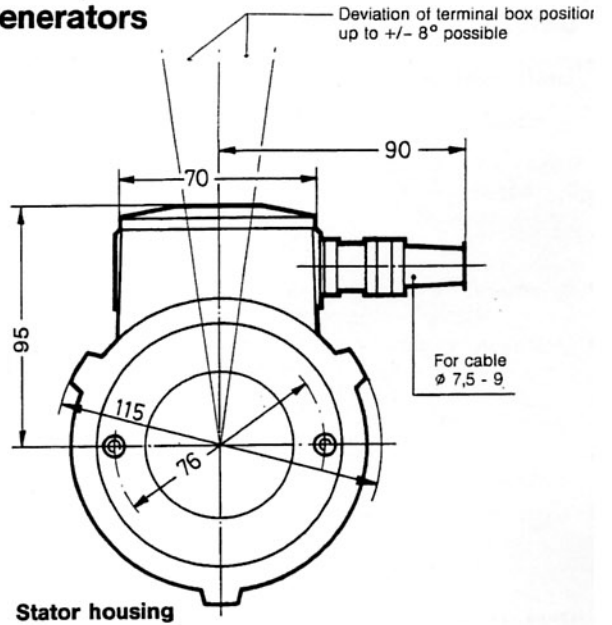
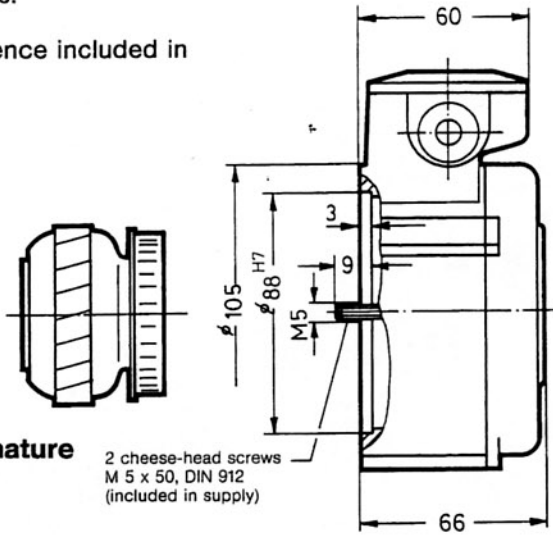
# Dimension Drawings for D.C. Hollow Shaft Tacho-Generators

## HM 80 M 51504 – A4 construction – protection: IP 55

For details of tacho bore diameter, see also type code.

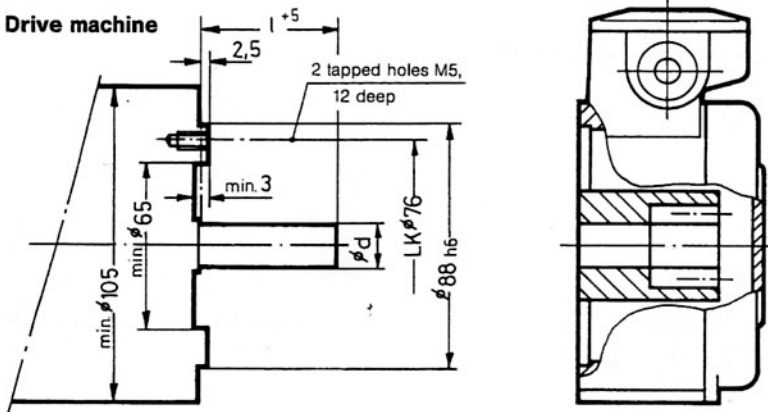
Bore fittings reference included in type code.

### Tacho – hollow shaft armature



Stator housing

### Drive machine

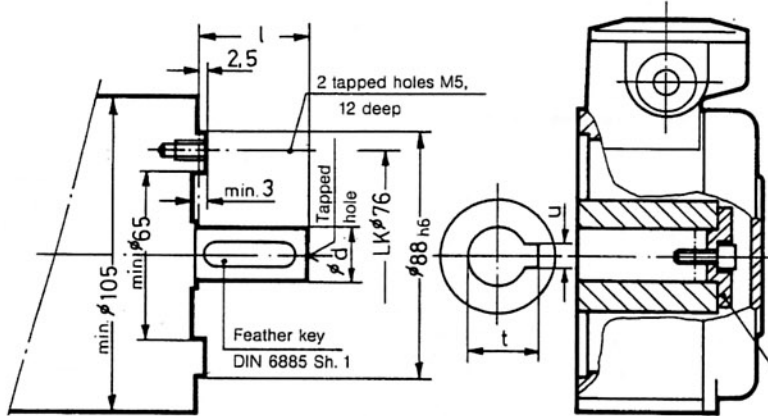


### Tacho armature – drive shaft connection using: Spieth clamping sleeve

Type	$\phi d \begin{smallmatrix} H7 \\ h5 \end{smallmatrix}$	l	Spieth clamping sleeve
TDP 439 H 16 S	16	45	DSK 16.28
TDP 439 H 20 S	20	50	DSK 20.32

### Tacho armature – drive shaft connection using: Tollok clamping device

Type	$\phi d \begin{smallmatrix} H7 \\ h6 \end{smallmatrix}$	l	Tollok clamping device
TDP 439 H 25 T	25	58	TLK 250



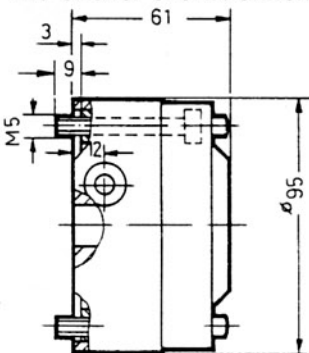
### Tacho armature – drive shaft connection using: Feather keyway and axial tensioning disc

Type	$\phi d \begin{smallmatrix} H7 \\ k6 \end{smallmatrix}$	l	t	u	Axial tensioning disc	Screw* DIN 912
TDP 439 H 12 P	12	30	13,7	4	D-51550-12	M 4 x 20
TDP 439 H 14 P	14	30	16,3	5	D-51550-14	M 4 x 20
TDP 439 H 16 P	16	40	18,3	5	D-51550-16	M 5 x 16
TDP 439 H 19 P	19	40	21,8	6	D-51550-19	M 6 x 18
TDP 439 H 24 P	24	50	27	8	D-51550-24	M 6 x 18

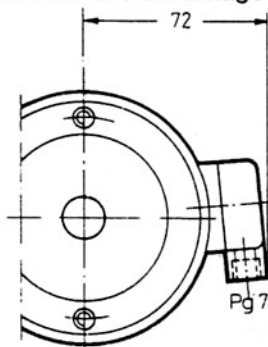
\* Micro-adhesive coated screw (reusable)  
Disc and screw for axial retaining (only on request)  
max. hollow shaft bore dia 30 on request

## A4 construction – protection: IP 44

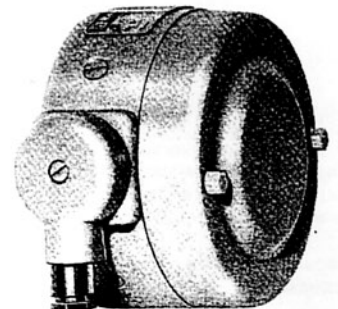
The smaller overall dimensions and the lower prices are the advantages.



HM 81 M 51922 with connecting cable approx. 500 mm long



Pg 7 HM 81 M 51923 with plastic terminal box



Drive machine and tacho armature shaft connection as described above.

# Selection table

## Technical Data

<b>Excitation:</b>	<b>Permanent</b>		
Rated voltage tolerance:	+/- 5 %	Reversing error:	+/- 0,2 %
Direction of rotation:	reversible	Insulation:	Class B
Polarity/connections:	dependent on direction of rotation	Temperature coefficient:	+/- 0,05 % per 10 degrees K, compensated magnet system +/- 0,3 % per 10 degrees K, uncompensated magnet system
No. of poles:	4		at a power consumption of approx. 0,04 W/1000 rpm
No. of slots:	39	Winding test:	2 x Umax. + 500 V, Repeat test max. 800 V
No. of segments:	39	Moment of inertia:	2,2 kgcm <sup>2</sup>
Brushes per machine:	4 quality AG 35 dimensions 3 x 5 x 10	Weight of complete machine:	approx. 2,3 kg in IP 55/IP 56 approx. 1,2 kg in IP 44 (TDPL: 2 kg)
Harmonic voltage:	$\Sigma U_{\sim}(\text{RMS}) \leq 0,5 \%$ (100 - 3000 rpm)		
Linearity error:	+/- 0,15 % (100 - 3000 rpm) +/- 1 % (10 - 100 rpm) at a power consumption of approx. 0,04 W/1000 rpm		

## Preferred voltages

Type	Rated Voltage at 1000 rpm [V]	Max. Speed [rpm]	Max. Permissible Current at 1000 rpm [mA]	Optimum Load [kΩ]	Armature Resistance at 20°C [Ω]
TDP 439-1	10	9000	40	2,5	28
TDP 439-2	20	9000	20	10	96
TDP 439-3	30	8000	13	23	227
TDP 439-4	40	6000	10	40	361
TDP 439-5	50	5000	8	62	545
TDP 439-6	60	4000	7	90	810

Voltages with 80 V, 100 V and 120 V are possible with Type TDPL 439.

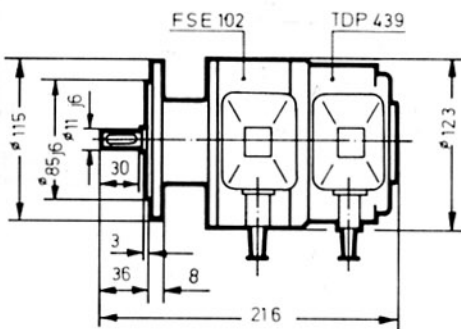
## Combined Units

The combined units (with own bearings) do comprise of the **tacho** described on the preceding pages plus an **incremental encoder** or **overspeed switch** mounted together on a single shaft. (Encoder + overspeed switch + tachometer on request). These totally enclosed machines are supplied in **B5 construction** with one free shaft extension having two terminal boxes.

The commutator and brush area of the D.C. tachometer are easily accessible from the back side.

The mounting dimensions are identical to those of the following single units in B5 construction: D.C. tachometer TDP 0,7/8 overspeed switch FSE 102 and incremental encoder FG 4.

### FSE 102 + TDP 439 H

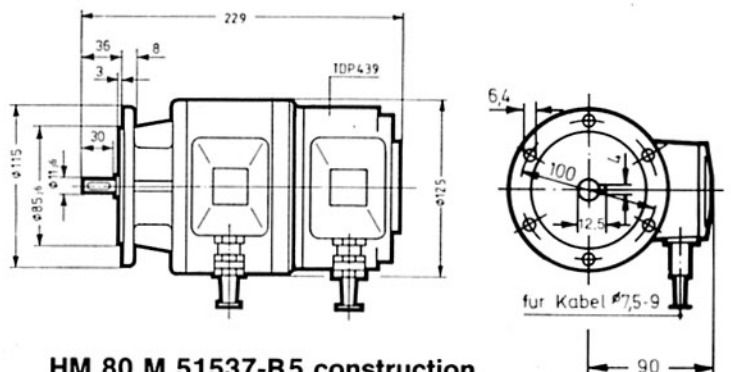


### HM 80 M 51536 - B5 construction

D.C. tachometer and overspeed switch type FSE 102. The overspeed switch type FSE 102 is a speed-dependent electro-mechanical switching device which releases a contact at a pre-set switching speed.

Separate data sheets of FG 4 and FSE 102 available on request.

### FG 4 + TDP 439 H



### HM 80 M 51537-B5 construction

D.C. tachometer and incremental encoder type FG 4. The incremental encoder type FG 4 is a robust unit for very extreme ambient and operational conditions, of high reliability and long life time. Its function is to convert the speed into a proportional frequency and to generate further digital signals.

Subject to modification!