

USER'S MANUAL DC-SERVO-DRIVER TFMxx0-STANDARD

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0 PRECAUTIONS ON SAFETY (DEFINITIONS)

DANGER *immediately and imminent DANGER for life and limb
(possibly including the PRECAUTIONS ON SAFETY WARNING
and NOTICE)*

WARNING *possibility of a dangerous situation for life and limb
(possibly including the PRECAUTION ON SAFETY NOTICE)*

NOTICE *possibility of a dangerous situation for the TFMxx0 or
an object in its area*

DANGER: *Possibility of an electric shock. The nonobservance of the instructions and the precautions on safety written down in this manual (including the additional manuals) shall produce immediately and imminent danger for life and limb or for the TFMxx0 or an object in its area. The handling including mounting, installation and operating has to be carried out by instructed and well trained personal..*

1 INTRODUCTION

WARNING: *To ward off accidents given by electric shock or destruction of TFMxx0 or an object in its area the instructions and the precautions on safety written down in this manual (including the additional manuals) have to be read and fulfilled before mounting, installation and operating the TFMxx0.*

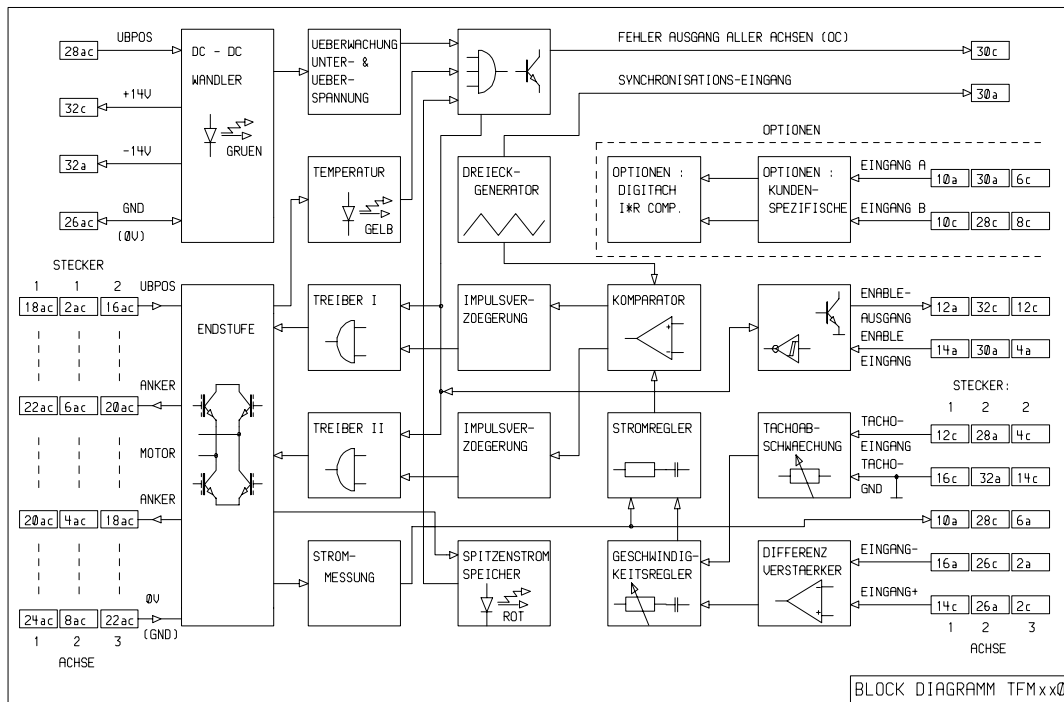
1.1 Performances of TFMxx0-Standard

The **DC-Servo-Dirver TFMxx0** is constructed as transistorised 4-quadrant switching amplifier. The outstanding characteristics are **the high power range in relation to the size, the high efficiency and the simple maintainability**. The general specifications are:

-power range	50 bis 400 W
-power supply	24 bis 150 Volt
-variations	1 single board 100x160mm (for 1axle) 2 single board 100x233mm (for 2 axles) 3 single board 100x233mm (for 3 axles)
- connection	DIN41612 BAUFORM D (plug in)
- output	short current protected (also to the ground)
- EMC	there are no influences between two or more TFMxx0 which are mounted in the same case (e.g. a rack or the like)

The whole construction is well done for a wide range of applications and also for layouts with small sizes.

1.2 Circuitry



1.2.1 Common Parts

All versions of the TFMxx0 have a **Built-in Power Supply** which converts the intermediate circuit voltage to an **internal power supply voltage**. Therefore the controller and the options **never need an external power supply**. The function of the internal power supply **includes also checking an monitoring (LED)** the whole functions of each TFMxx0. **Faults are monitored** by an **Common Fault Monitor Output** (transistor) and several **LEDs**.

1.2.2 Servomodul (Axle)

Basically the servomodul (per axle) consists of:

- A) Controller
- B) Power Amplifier
- C) Options

A) The Controller consists as well of the input circuits and the circuits for the pulse with modulation (PWM) as of:

- the Speed Controller
- the Current Controller

The **Speed Controller** relates the actual value to the rated value. The **current controller** relates the output of the **Speed Controller** to the current signal. The **output of the Current Controller** controls the circuits for the **Pulse With Modulation (PWM)**. This control of **the motor torque** ensures that an **exactly regulation of the motor speed without influences caused by the load** is given.

The adjustment for different applications is given by several marked and well available potentiometers and parts for compensation.

B) The Power Unit is constructed as an transistorised 4-quadrant switching amplifier and **supplies the motor**. The output is short current protected (also to the ground). **Special circuits protect** the Power Unit in the **case of faulty operation**.

C) Several standard options and **special options** at customers request are available. Both are easily to install. For the handling including mounting, installation and operating consult the **additional manuals**.

1.3 Mechanical Construction

axles	printed wiring board	connector
1	100x160mm	1 x DIN41612 BAUFORM D (plug in)
2	100x233mm	2 x DIN41612 BAUFORM D (plug in)
3	100x233mm	2 x DIN41612 BAUFORM D (plug in)

The wide of each unit is **12TE**. For the **connection in applications** different standard **back planes** are available. The back planes are compatible with the **DIN41612 BAUFORM D**. The internal **potentiometers** are adjustable at the **front** of each unit. **WARNING: Possibility of an electric shock. To protect the operator the potentiometers has to be adjustet with an isolated screwdriver (blade and shank).**

To connect the options each axle is equipped with an special connector. The mechanical fixing is given by a screw in a hole on the main board.

2 POSSIBILITIES OF ADJUSTMENT

WARNING: To ward off accidents given by electric shock or destruction of TFMxx0 or an object in its area the instructions and the precautions on safety written down in this manual (including the additional manuals) have to be read and fulfilled before mounting, installation and operating the TFMxx0.

The elements for adjustment are described in the additional manuals.

3 MOUNTING AND INSTALLATION

WARNING: To ward off accidents given by electric shock or destruction of TFMxx0 or an object in its area the instructions and the precautions on safety written down in this manual (including the additional manuals) have to be read and fulfilled before mounting, installation and operating the TFMxx0.

3.1 Principles

There are no influences (EMC) between two or more TFMxx0 which are mounted in the same case (e.g. a Rack or the like).

To protect the operator and to reduce the emission of electromagnetic radiation (EMC) the case (e.g. a Rack or the like) has to fulfil the following requirements:

- each part and each part to the other electrically conducting
- preferably FE-alloy
- connected to earth
- protection against electric shock

Before mounting, installation and operating all units have to be in compliance with the international and the national standards. **DANGER:** To ward off accidents given by electric shock or destruction of TFMxx0 or an object in its area all units have to have protection against electric shock.

3.2 Mounting

DANGER: Possibility of an electric shock. Mounting and disassembly have to be carried out without electric power. To discharge the condensers the operator has to wait 2 minutes after switch off the power before disassembly (e.g. a TFMxx0 unit).

Preferably use a rack system to integrate the TFMxx0 (see also 3.1). Take into account that the **TFMxx0-Standard with the option TFZ05 produces emissions of electromagnetic radiation on the free side of the printed wiring board.** For the optimal **connection in applications** different standard **back planes** are available. The back planes are compatible with the **DIN41612 BAUFORM D.**

DANGER: To ward off accidents given by electric shock or destruction of TFMxx0 or an object in its area all units have to have protection against electric shock. Before mounting, installation and operating all units have to be in compliance with the international and the national standards.

3.3 Installation

DANGER: Possibility of an electric shock. Mounting and disassembly have to be carried out without electric power. To discharge the condensers the operator has to wait 2 minutes after switch off the power before disassembly (e.g. a TFMxx0 unit).

For the optimal **connection in applications preferably use the standard back planes.** The back planes are compatible with the **DIN41612 BAUFORM D.** To ensure that the TFMxx0 operates correct and to reduce the emission of electromagnetic radiation (EMC) the **following installation requirements have to be fulfilled:**

connector	requirement
Motor	motor windings without connection to earth. Always use an electrical shielded cable. The electrical shield has to be connected at one end to the earth. An inductivity (EMI-filter) has to be connected between the TFMxx0 and the motor windings inside the case (e.g. rack or the like).
Tacho Input actual value	tacho (sensor) without connection to earth. Connect the sensor GND to the Tacho Input GND. Always use an electrical shielded cable. The electrical shield has to be connected at one end to the earth.



intermediate
circuit voltage

connect the **transformator without connection to earth.**
Always use an electrical shielded cable. The electrical shield has to be connected **at one end** to the **earth. Inside of the case** (e.g. rack or the like) an inductivity (EMI-filter) and if required X and Y condensators have to be connected to the primary side of the transformator.

Control Input,
Enable Input,
Failure Output and
Synchronisation
Input

If required use electrical shielded cables. **WARNING:** *The connectors are **not** protected against electric shock. If protection against electric shock is required a special module is available.*
DANGER: *To ward off accidents given by electric shock or destruction of TFMxx0 or an object in its area **never** use only the Control Input or the Enable Input in security loops.*

4 OPERATING OF TFMxx0

DANGER: *Possibility of an electric shock. The nonobservance of the instructions and the precautions on safety written down in this manual shall produce immediately and imminent danger for life and limb or for the TFMxx0 or an object in its area. The handling including mounting, installation and operating has to be carried out by well trained and instructed personal. Measuring instruments has to be connected without electric power. To discharge the condensators the operator has to wait 2 minutes after switch off the power before any manipulation is carried out. To protect the operator the potentiometers has to be adjusted with a isolated screw driver (blade and shank).*

WARNING: *To ward off accidents given by electric shock or destruction of TFMxx0 or an object in its area the instructions and the precautions on safety written down in this manual have to be red and fulfilled before mounting, installation and operating the TFMxx0. The TFMxx0 are delivered in defined adjustment. It is not allowed to change specific adjustments given by customer requirements. Variations (e.g. to fulfil customer requirements) of TFMxx0 have different identification numbers.*

The operating of TFMxx0 is described in the additional manuals.



5 TROUBLESHOOTING

Monitoring / Symptom	Status (LED)	Failure	Cause/Removing
OVERTEMPERATURE LED (yellow) heatsink temperature check	activated	yes	-insufficient cooling -short current by having a high inductivity between the TFMxx0 and the motor (is not detected as overcurrent) -reset by cooling down the heatsink
	inactive	no	
POWER ON LED (green) intermediate circuit voltage and built in power supply	inactive	yes	-intermediate circuit voltage to small or missing -incorrect connected TFMxx0 -fuse on TFMxx0 is blown -to high during load -destroyed power unit
	activated	no	
OVERCURRENT (red per axle) monitoring of overcurrent (power unit)	activated	yes	-destroyed power transistor LED -short circuit (output or output to earth or motor windings) -reset by set off and set on the intermediate circuit voltage
	inactive	no	
All LED's	inactive	yes	POWER ON
Motor the rotor rotates with highest speed	-----	yes	-see chapter 3.2 of the additional manuals -tacho signal is missing -tacho signal (+/-) changed

Each failure monitored by one of the LED's activates the Common Fault Monitor Output (transistor). See also chapters 2.1 and 2.2 of the additional manuals.

6 DECLARATION

DESIGN : **Integrated transistor servo amplifier to operate in machines and controls**

TYPE : **TFMxx0**

SERIAL-NO. : **No. 110000 and higher**

DESCRIPTION : **In this manual**

MANUFACTURER : **LEAG Antriebsstechnik AG, CH-8200 SCHAFFHAUSEN, SWITZERLAND**

The construction of the TFMxx0 and its mounting, installation, adjustment and operating written down in this manual fulfil not only the requirements for a world-wide operation but also the legal compliances in the EC (EWG-Richtlinien):

Niederspannungsrichtlinie

-73/23/EWG vom 19.02.1973 (ABl. EG Nr. L 11/29 vom 26.03.1973)

geändert durch:

-93/68/EWG vom 22.07.1993 (ABl. EG Nr. L 220/1 vom 30.08.1993)

Elektromagnetische Verträglichkeit

-89/336/EWG vom 03.05.1989 (ABl. EG L Nr. 139/19 vom 23.05.1989)

geändert durch:

-91/263/EWG vom 29.04.1991 (ABl. EG Nr. L 128/1 vom 23.05.1991)

-92/31/EWG vom 28.04.1992 (ABl. EG Nr. L 126/11 vom 12.05.1992)

-93/68/EWG vom 22.07.1993 (ABl. EG Nr. L 220/1 vom 30.08.1993)

Use the integrated transistor servo amplifier TFMxx0 only to operate in machines and controls. It is absolutely not allowed to put the TFMxx0 into operation before it is noticed that the machine or the control are in compliance with the international and the national standards, requirements and law. The enduser has to be informed of the instructions written down in this manual, this declaration and the specific product documents given by customer specific changes. The manuals DC-SERVO-DRIVER TFMxx0 and the additional manuals are a part of this declaration and the TFMxx0.

CH-8200 Schaffhausen
the 26th of January 1998
the Manager of the Staff

CH-8200 Schaffhausen
the 26th of January 1998
the General Manager

Monika Egloff

Lucas Egloff



APPENDIX 1 LIST OF ADDITIONAL MANUALS (STANDARD):

- A** USER'S MANUAL DC-SERVO-DRIVER TFMxx0 USING AS **CURRENT CONTROLLER** (NON OPTIONAL EQUIPMENT REQUIRED ON BOARD)
- B** USER'S MANUAL DC-SERVO-DRIVER TFMxx0 BY USING THE OPTIONAL EQUIPMENT **DIGITACH TFZ05** (ON BOARD)
- C** USER'S MANUAL DC-SERVO-DRIVER TFMxx0 BY USING THE OPTIONAL EQUIPMENT **IxR-COMPENSATION TFZ06** (ON BOARD)
- D** USER'S MANUAL DC-SERVO-DRIVER TFMxx0 Using AS **SPEED CONTROLLER**