

Multi Channel Over Speed Protection and Monitoring System



Maximum Security Without Sacrificing System Availability

Features

- High integrity redundant system concept
- Fast 10ms reaction time to over speed
- Acceleration measurement with set point control
- 3 status & 4 limit relays per channel
- Internal relay voting e.g. 1oo3, 2oo3
- Isolated analogue outputs with scale able ranges
- Voted /averaged and max speed values
- Clear front panel displays of unit status
- Control functions via binary inputs or PC
- 3 level password protection

The FT 3000 Advantage

- IEC 61508 SIL 3 certified & API 670 compliant
- Up to 3 shafts monitored in one rack
- Trip Chain Control Card - brings temperature and other trips into the IEC 61508 SIL 3 regime
- Multiple set points and status outputs
- On line self testing via internal generators
- Channel cross checking
- Hot module exchange
- Direction sensing
- Configuration and status monitoring via PC
- Sensor, power & system watchdogs
- MTBF measured in 100's of years

Applications

- Single and dual shaft steam turbine protection
- Multi shaft aero derivative gas turbines
- Common solution for combined gas / steam turbine solutions
- Compressor over speed protection in chemical plants
- Pump monitoring and control
- Hydro electric power stations
- Demanding marine applications

The FT 3000 comprises of modules that are configured in a 19" rack to suit the particular application. Please refer to the enclosed CD for detailed technical specifications, configuration tools & example software, together with specimen system drawings, references and presentations.

Module Overview

A measurement channel may be just a FTFU 3024 motherboard or a combination of motherboard + FTV 3090 relay card + FTW 3013 analogue card



FTFU 3024 Motherboard

Overview:	One per channel (sensor). Performs measurement and watchdog functions. 3 hardware speed limit monitors for fast over speed detection plus one comparator for acceleration limit. 3 single contact change over relays for status or limits. 3 test generators for on line testing. Max speed memory. Direction sensing. Front panel LED's for system status.
Measuring range:	Lowest: 0...0.9990 Hz Highest: 0... 35 kHz
Accuracy:	0.1% of the set point
Set points:	Range: see above. Values in rpm once number of gear teeth entered. Hysteresis: individually programmable High switching and Low reset values for each limit. Configurable number of teeth used for limit control.
Response time	Over speed typically signalled via relay output in 10ms
Sensor input:	Isolated. Input voltage: 50 mV . . .80 Vrms. Optional integral zener barriers (Exi version) Input impedance: 100 kOhms, suitable for passive or active sensors; Adjustable trigger level 0...+3.5 V.
Sensor supply:	12 V, 25mA max. Short circuit proof.
Sensor monitoring:	Static: Low & High consumption values selectable in the range 0.5...30mA. Sensors with consumption < I min. or > I max. are signalled as defective. Dynamic: Programmable channel cross check values. Sensor fault may be assigned to a relay.
Binary inputs:	May be assigned to control functions e.g. on line testing, trip reset, lamp test. Nr. 1 & 2. Not isolated. + 5 V level with pull up resistor Low, active = 0...+1V High = + 3,5...+33V or open Nr. 3 to 6: Isolated. Low = 0...+5 V or open; High = +10...+33 V.
Frequency outputs:	Sensor signal repeat with insignificant time delay. Nr. 1: Push-pull square wave o/p; not isolated. Amplitude +10 Vpk Nr. 2: Push-pull square wave o/p. Isolated. Amplitude 15 Vpp Source impedance: 100 Ohms for both.

FTV 3090 Relay card

Overview:	Added to motherboard as required. 4 relays, each having 4 change over contacts. May be assigned to any limit or status function. Used for voting control e.g. 2oo3 trip outputs. Front panel status LED's.
Relays:	Potential free, selectable normal/inverse mode, max 250V, 0.3A, 60W UL / CSA rating: 0.6A 110Vdc / 125Vac, 2A 30Vdc. Programmable non latching, mono-stable or latch modes.

FTW 3013 Analogue card

Overview: Added to motherboard, as required, with or without relay card. 3 isolated and independently scaleable ranges. May be assigned to any measured, calculated or stored value e.g. max speed.

Analogue outputs: 3 x 0/4... 20mA, configurable for narrow or wide speed ranges.
 Programmable rising or falling characteristic.
 Resolution: 12 bit corresponding to 1:4096.
 Maximum linearity error: 0.1 %

FTBU 3034 Trip chain control card

Overview: Combines 6 different trip commands to provide global shutdown control within IEC 61508 SIL 3 regime. 6 potential free change-over relay contacts (K1-6) are created from 6 opto-coupled inputs (IN1-6) in a 1:1 relationship. An additional output (OUT) comprises of two relays that each provide a change-over contact. These contacts allow 2 out of 3 voting in a three FTBU 3034 card system. The OUT output is driven by a logical combination of six inputs: OUT is active (de-energized) when the following equation is true.

$$IN1.IN2 + IN3.IN4 + IN5 + IN6 \quad - \text{ where } IN_i \text{ means an active input (low level).}$$

This function allows the FTBU card to provide optimum combination of commands in the trip chain and simplify system wiring.

On board self-diagnostics for PSU & logic function. Trip chain self test facility.

INPUT: IN1 - IN6 Potential free, 20-50 V, active level is OV. Isink: Min 10 mA, Max 15 mA

OUTPUT: K1 - K6 Relay Ki is energized when INi is high.
 Potential free change over contact.

AC	Umax 250 V	I _{max} 5 A	Pmax 1250 VA
DC	Umax 30 V	I _{max} 5 A	Pmax 150 VA

RELAY OUT: 2 potential change over contacts

AC	Umax 250V	I _{max} 2A	Pmax 125 VA
DC	Umax 220V	I _{max} 2A	Pmax 60W

Reaction time
 INi to K1 & OUT: < 8 ms

TEST input: 5-48V, input active level is high. No test mode is at TEST = Ov. Isink < 15 mA for the whole voltage range.

FTK 3072 Communications card

Overview: Communications card; one per rack; used with FT 3000 Windows software supplied with each unit.

Data I/O: Serial RS 232 interface, 9 pole sub D plug. 1:1 serial cable required

Power supply modules

Overview: 1 or any combination of 2 per rack. Motherboards diode decouple 2 PSU lines for redundancy and monitor supply status. Supply status is available for relay control.

FTZ 3061 115 or 230Vac, -20, +15%, 50 / 60 Hz

FTZ 3062 24 or 48Vac, -20, +15%, 50 / 60 Hz

FTZ 3064 14...70Vdc

FTZ 3065 88...372Vdc / 85...264Vac

FTZ 3069 Filter only. 18...33Vdc (rack bus supply voltage)

Environmental: Operating temp 0...+60°C, (+70°C for max 2 hours)

Storage temp -25...+85°C
 rH 75% yearly average, max 90% over 30 days

Full technical details can be seen in the detailed specification. All FT 3000's are supplied with a 3.5" disk providing full documentation and the FT 3000 Windows Software. The Software allows:

- Quick and easy configuration of all operating parameters
- Unit interrogation of identity and parameters
- PC display of current measurement and relay status
- Archiving and printing of the configuration



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