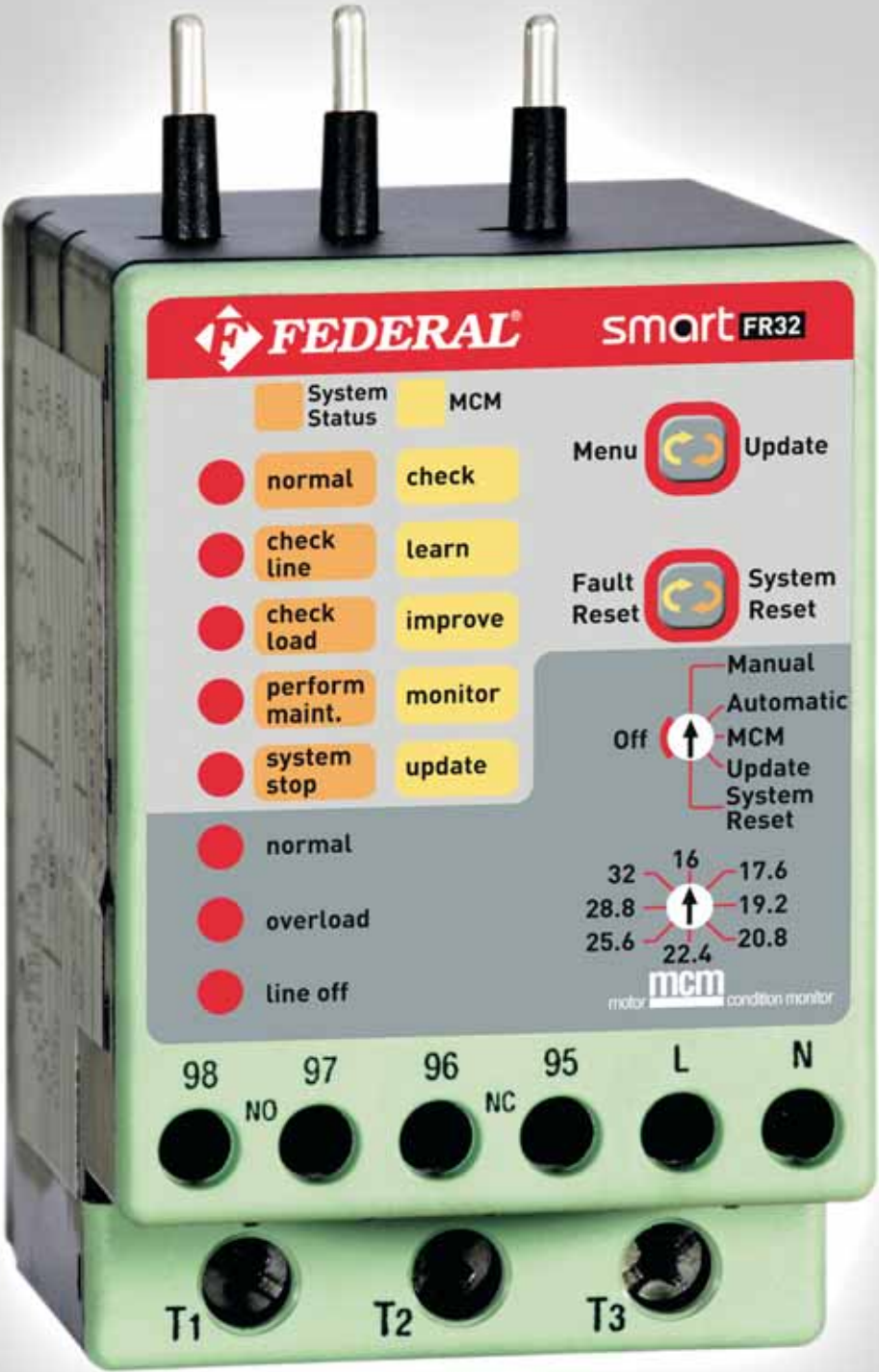
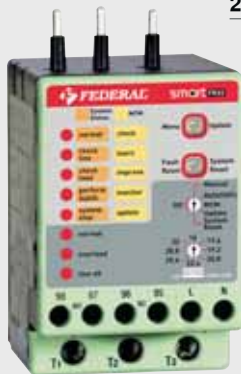


SMART RELAYS



Smart Relays

2A - 4A - 8A - 16A - 32A



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TS EN 60947-4-1
EN 60947-4-1
IEC 60947-4-1
C€

Altitude : 2000 m (max)
Relative Humidity : %50 (40°C) , %90 (20°C)
Ambient Temperature : between -25°C and +55°C
Pollution Degree : III

SMART RELAYS

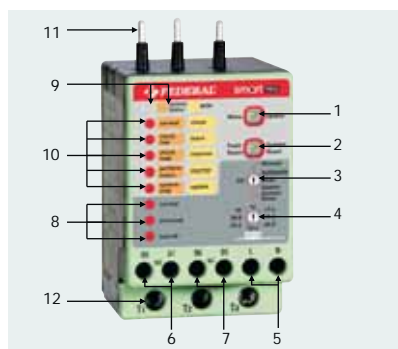
SmartFR has principally designed to fulfill two different functions. First function is to warn the user (Advanced Early Warning System) against failures, which are not sudden, which cannot be noticed by user but which grow up and stop the system in time. Second function is to protect the system against failures (over current, phase cut-off, phase imbalance etc.), which are sudden and which results in deformation of the system if not eliminated in a short time (Protection System). Whereas SmartFR only warns the user in its first function, it directly intervenes in the failure and stops the system in its second function. SmartFR is manufactured in accordance with IEC60947-4-1 standards and CE norms.

Advantages:

- It facilitates work of maintenance personnel.
- It reduces cost losses due to unplanned stops.
- It reduces maintenance-repair costs.
- It protects investments.
- It protects product quality.
- It increases productivity and effectiveness.
- It reduces time losses in fault detection.

Areas of Application:

- Pumps
- Fans
- Conveyor motors
- High pressure oil pumps
- Gas compressors
- Air compressors
- Press motors
- Hydraulic pumps
- Eccentric press motors
- Low pressure water pumps
- Milling motors
- Mixers
- Packaging machines



1. Update Button.
2. System Reset Button.
3. Delete Fault / MCM Mod & Motor Status Selection Button
4. Thermal Step Adjustment Switch.
5. L-N Relay Supply Input.
6. NO Auxiliary Contact.
7. NC Auxiliary Contact.
8. Protection System Indicator Leds.
9. MCM Mode & Motor Status Selection Leds.
10. MCM Mode & Motor Status Indicator Leds.
11. Pinned Busbar (Phase Input).

12. Phase Output Connector (Motor Connector). These elements are explained below in order.

1. "Update" Button: It sends the command required to have MCM learn the new conditions of operation. Use of "Update" button should be careful. It should never be used unless new condition of operation comes into existence.

Fonksiyon Switch: determinate operating mode of SmartFR and the authorization status of "Update", "System Delete". When Function switch position is "Off", operating mode of SmartFR is standby

2. "System Reset" Button:

It sends the command to delete all the conditions of operation learnt by MCM. It should be used only when you want to go back to factory settings. Memory is deleted by pressing and holding "System Reset" button. Smart FR starts learning from the beginning again after this command.

3. "Delete Fault / MCM Mod & Motor Status" Selection Button:

This button is used to fulfill two functions. First is to reset the relay in "phase faults" and "over current faults" and second is to select "MCM Mode" or "Motor Status" menus while system is operating normally. If the system has given "over current" or "phase fault" alarm, the relay is reset by pressing and holding button number "3" (delete fault operation of the button is active). If there is no fault in the system, you may navigate between MCM Mode and Motor Status menus by pressing and holding button number "3" (mode selection function of the button is active).

When Function switch position is "Manual", SmartFR can be reset for thermal errors by manual intervention. When Function switch position is "Auto", SmartFR can be reset automatically the occurred thermic errors with 15 seconds intervals. When Function switch position is "MCM", error protection feature of SmartFR is out of service. Only early warning system is running. When Function switch position is "Update, The necessary authorization is given for update. When Function switch position is "System Delete", The necessary authorization is given to clear the memory.

4. Thermal Adjustment Switch: It is used to adjust thermal area of SmartFR according to nominal current of the motor.

5. "L-N": This is the relay supply input. The relay operates with 220 V 50 Hz.

6. "NO" Contak: This is the contact, which is open in normal conditions and closed in "stop system", "over current" and "no phase" warnings and faults. When system gives an error, machine operators may be warned with a warning system (a flashing light or siren when NA contact is closed) to be controlled by "NA" contact.

7. "NC" Contak: This is the contact, which is closed when energy is supplied to the relay and which breaks energy by opening circuit of the contactor coil driving the motor only in cases of fault (e.g. "phase fault", "phase sequence fault", "over current").

8. Protection System Indicator Leds:

- System Normal Led: This is the led which indicates network conditions and motor operation are normal.
- Over Current Led: This is the led which indicates motor is in over current fault. If the system has given "over current" fault, the fault can be deleted by pressing and holding "Delete Fault" button.

- No Phase Led: This led is used to show three different statuses. First is used to indicate phase failures, second to indicate phase sequence faults and third to indicate relay's standby position.

I. Phase Failure: When at least one of the phases is broken off, "no phase led" flashes with 0.5 sec intervals to indicate phase failure.

II. Phase Sequence Fault: When phase sequence is changed, "no phase" led is continuously on to indicate change in phase sequence.

9. "MCM Mode & Motor Status" Selection Leds:

- Yellow Led: This is the MCM Mode led. When this led is on, this means yellow colored MCM steps on the indicator panel are being performed.
- Orange Led: This is the Motor Status led. When this led is on, this means orange colored motor status warnings on the indicator panel have occurred.

10. "MCM Mode & Motor Status" Indicator Leds:

- a. normal / check
- b. check the line / learning
- c. check the load / developing
- d. carry out maintenance / monitoring
- e. stop the system / updating



Fig-1: For MCM, Motor station "Make maintenance" warning.

SMART RELAYS

first ensure whether the load is changed as required by the process or not. If load change is due to the process, the user should use the Update button of MCM to have this new operating point learnt. However, if the load change does not arise from the process, the system should be checked to find source of the failure. After the failure is eliminated, Smart FR and connected system should be enabled.

IV) Carry out Maintenance: This is a first degree alarm. This is the indicator warning the user in cases of failures occurring in the system and reaching a particular level in time. When this warning is encountered, production flow should be taken into consideration and system should be taken to maintenance at an appropriate time.

Failures causing this warning are mechanical and/or electrical failures such as mechanical imbalance, bearing problems, bearing sleeve problems, motor shaft problems, crack or breaking in rotor bars, insulation problem in stator windings and line cables, over oiling or lack of oil, mechanical problems in driven system (gear box, compressor, fan, pump, press, conveyor etc.), friction or failure in fan knives, wearing in pump seal.

V) Stop the System: This is a second degree alarm. This is the indicator warning the user in cases of failures occurring in the system and reaching the peak in time. When this warning is encountered, the system should immediately be taken to maintenance. It is inevitable to have electrical and/or mechanical failure any time. When SmartFR gives "Stop the System" warning, "NO" contact is closed. In this way, machine operators can be warned by a warning system (A flashing light or siren when NO contact is closed) to be controlled by "NO" contact.

2. PROTECTION SYSTEM:

The protection system can be considered as a system containing both

phase protection relay and thermal relay. It has 3-led status indicator.

I) System Normal: This is the led flashing with 1 second intervals to show unproblematic operation of the system at normal operating point.

II) Over Current: If the system driven by ACA motor needs more power due to overloading or if there is a failure in mechanical part of the driven system, AC motor shall start drawing a higher current than the nominal current from the network. If no measure is taken against this over current drawn from the network, motor windings shall inevitably burn. Smart FR measures current of each phase, if the current passing through at least one phase is higher than 20% of the nominal current, motor is disabled for protection according to opening time curve.

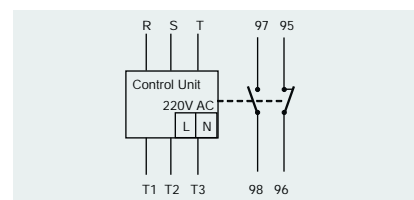
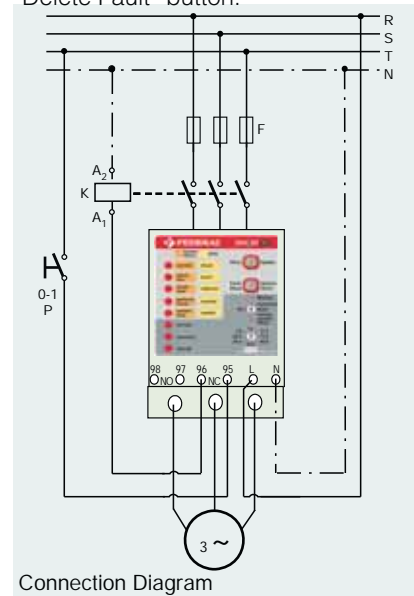
III) Phase Faults:

(1) Phase Failure: When at least one of the phases is broken off, AC motor cannot operate normally. Vibration is observed in the system, if the energy supplied to the motor is not cut off, motor windings burn and motor is deformed after a particular time. Smart FR checks all three phases against phase failure, if it determines that there is a failure in any phase, it protects the motor by breaking energy of the contactor coil driving the motor. After phase failure is eliminated, system can be enabled again by pressing and holding "Delete Fault" button.

(2) Phase Level: If voltage level goes down in at least one phase, motor starts to operate imbalanced. In such a case, if energy supplied to the motor is not broken, motor may be deformed. Smart FR checks voltage level of each phase, if voltage level of at least one phase goes below 20% of the nominal voltage, it protects the motor by breaking the energy. After phase level problem is eliminated, system can be enabled again by pressing and holding "Delete Fault" button.

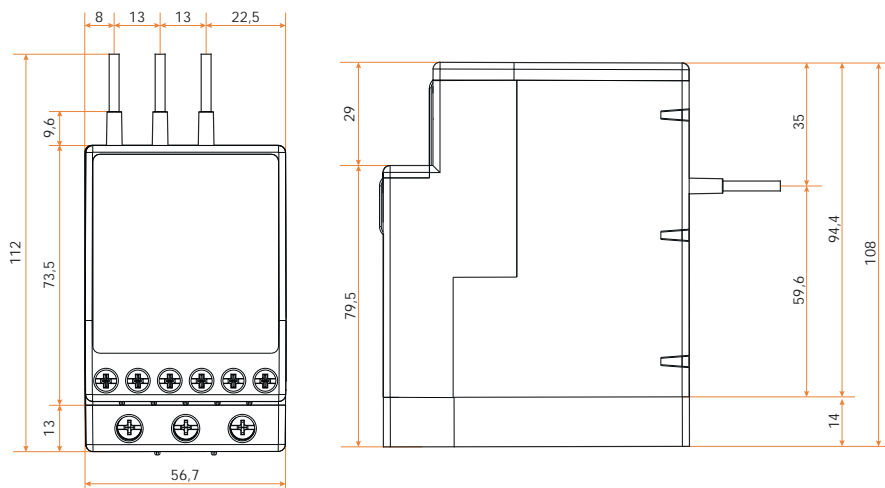
(3) Phase Sequence: In applications where motor rotating direction is

important, R, S, T phase sequence should be known. Smart FR instantly checks phase sequence of the line connected to busbars in first drive. If the sequence is right, system is enabled; if not, system is not enabled. At the same time, it periodically checks the phase sequence while the system is in operation and breaks energy to the motor if phase sequence has changed due to any reason. After phase sequence problem is eliminated, system can be enabled again by pressing and holding "Delete Fault" button.



Be careful not to connect Smart FR supply and contactor supply on the same phase.

Technical Dimension:



Technical Specifications:

Type	: SmartFR
Current Adjustment Area	: 2-32A
Opening Class	: AC - 15
Rated Impact	
Voltage (Uimp)	: 6000V
Operating Voltage	: 220V AC
Operating Frequency	: 50 Hz
Operating Temperature	: -25°C, +55°C
Auxiliary Contacts	: 1NO, 1NC
NO: 5A @ 250V AC, 3A @ 30V DC	
NC: 5A @ 250V AC, 3A @ 30V DC	