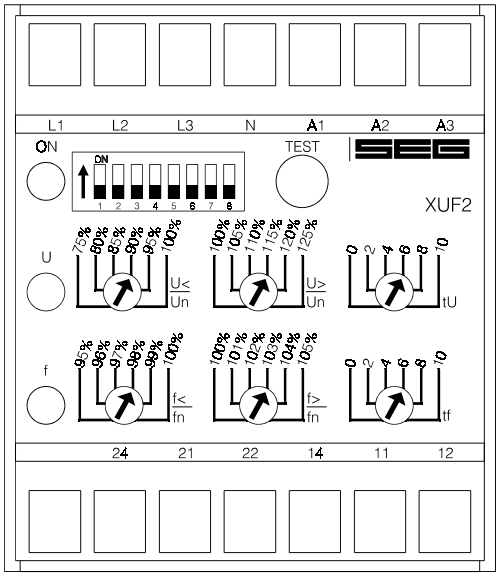
PROFESSIONAL LINE

XUf2-400 - AC voltage and frequency relay



Contents

1. Applications and features

Relay *XUF2-400* of the *PROFESSIONAL LINE* is a digital relay for voltage and frequency supervision of 1-phase or 3-phase systems and provides protection for electrical power generators and general equipment against inadmissible undervoltage or overvoltage as well as against frequency changes.

When compared to conventional protection equipment all relays of the *PROFESSIONAL LINE* reflect the superiority of digital protection technique with the following features:

- High measuring accuracy by digital processing
- Fault indication via LEDs
- Extremely wide operating ranges of the supply voltage by universal wide range power supply unit
- Fine graded wide setting ranges
- Data exchange with process management system by serial interface adapter XRS1 which can be retrofitted
- RMS measurement
- Extremely short response time
- Compact design by SMD-technology

In addition to this relay *XUF2-400* has the following special features:
- Different switching hysteresis for frequency adjustable
- Tripping times for supervision of frequency and voltage individually adjustable
- Measurement phase-to-neutral or phase-to-phase voltage possible

2. Design

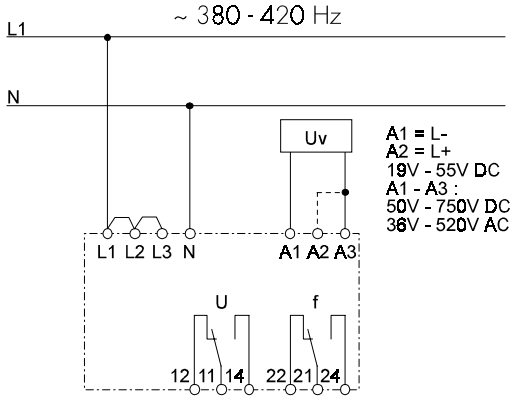


Fig. 2.1: Connection two wire system

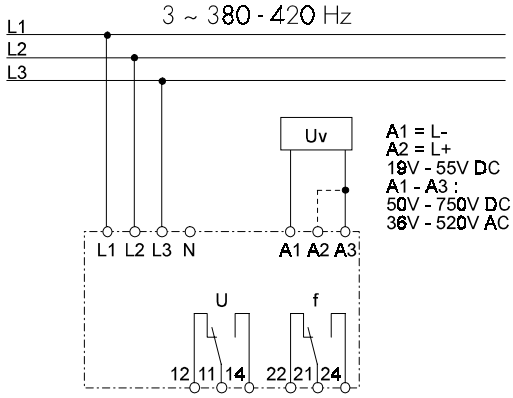


Fig. 2.2: Connection three wire system

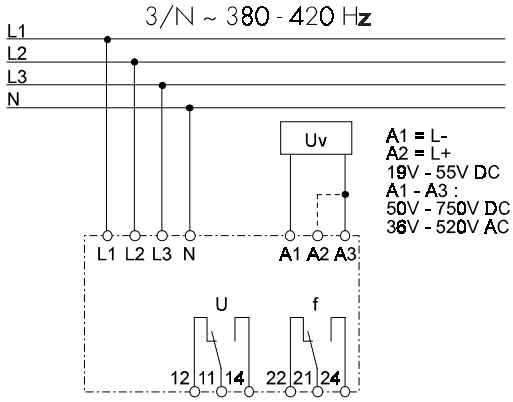


Fig. 2.3: Connection four wire system

Analog inputs

The analog voltage input signals are connected to the protection relay via terminals L1-L3 and N.

Auxiliary voltage supply

Unit ***XUF2-400*** can be supplied directly from the measuring quantity itself or by a secured auxiliary supply. Therefore a DC or AC voltage must be used.

Unit ***XUF2-400*** has integrated wide range power supply. Voltages in the range from 19 - 55 V DC can be applied at connection terminals A1(L-) and A2(L+). Terminals A1/A3 are to be used for voltages from 50 - 750 V DC or from 36 - 520 V AC (f = 100 - 480 Hz).

Contact Positions

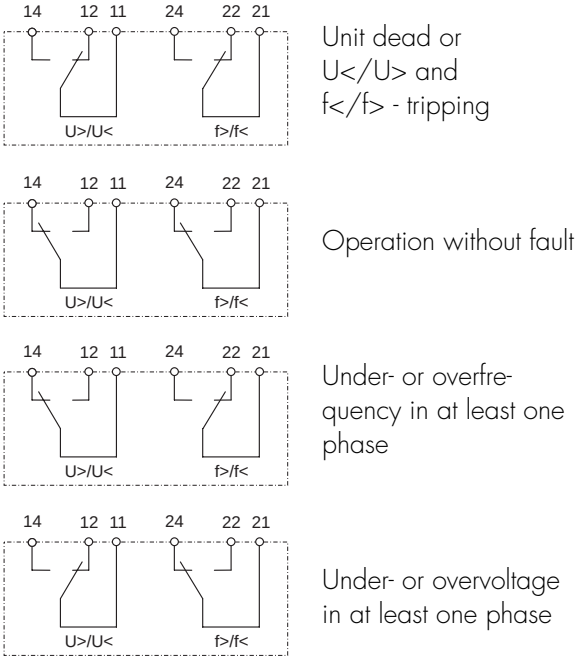


Fig. 2.4: Contact positions of the output relays

3. Function

3.1 Voltage supervision

The *XUF2-400* has an independent under- and overvoltage supervision. Either 1-phase or 3-phase of the voltage are measured (RMS-measurement). During 3-phase measuring the voltage is permanently compared with the set reference values.

For overvoltage supervision always the highest value is evaluated, for undervoltage supervision always the lowest value.

Tripping/pickup at undervoltage is indicated by flashing LED U, whereas at overvoltage LED U is steady lit.

3.2. Frequency supervision

For frequency supervision the cycle duration is evaluated and so measuring is virtually independent on harmonic influences. To avoid tripping during normal operation due to voltages transients and phase transients a fixed measuring repetition is used.
Each of the phases is individually monitored. Pickup or tripping only after the set reference value in at least one phase is exceeded or not reached.
Tripping/pickup at underfrequency is indicated by flashing LED f, whereas at overfrequency LED f is steady lit. If the measuring voltage drops below 70 % Un, supervision of the frequency is blocked.

4. Operation and settings

All operating elements needed for setting parameters are located on the front plate of the *XUF2-400* as well as all display elements.
Because of this all adjustments of the relay can be made or changed without disconnecting the unit from the DIN-rail.

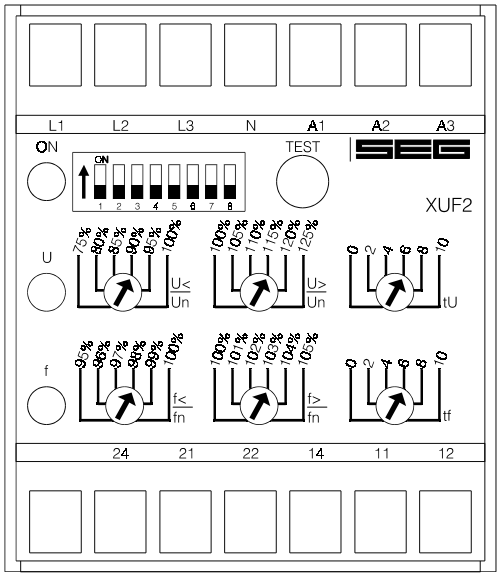


Fig. 4.1: Front plate

For adjustment of the relay please open the transparent cover as illustrated. Do not use force! The transparent cover has two inserts for labels.

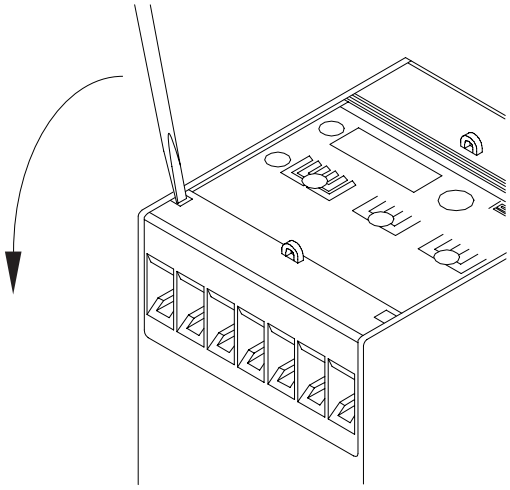


Fig. 4.2: How to open the transparent cover

LEDs

LED "ON" is used for display of the readiness for service (at applied auxiliary voltage Uv). LED U indicates tripping/pickup due to undervoltage by a flashing light, at overvoltage this LED is steady lit. Underfrequency is indicated by flashing of LED f, at overfrequency LED f is steady lit.

Test push button

This push button is used for test tripping of the unit and when pressed for 5 s a check-up of the hardware takes place. Both output relays are tripped and all tripping LEDs light up.

4.1 Setting of DIP-switches

The DIP-switch block on the front plate of unit *XUF2-400* is used for adjustment of the nominal values and setting of function parameters:

DIP-switch	OFF	ON	Function
1*	Un = 100 V	Un = 110 V	setting of rated voltage
2*	Un = 100 V	Un = 230 V	
3*	Un = 100 V	Un = 400 V	
4			
5	Y	Δ	measuring phase-to-neutral/phase-to-phase voltage
6			
7	0.25 %	0.5 %	switching hysteresis of the frequency protection
8	x 0.1 s	x 1 s	time multiplier tU/tf

Table 4.1: Function of DIP-switches

* Only one of the DIP-switches 1 - 3 shall be in "ON" position at a time

Rated voltage

The required rated voltage (phase-to-phase voltage) can be set with the aid of DIP-switch 1 - 3 to 100, 110, 230 or 400 V AC. It has to be ensured that only one of the three DIP-switches is switched on.

The following DIP-switch configurations for adjustment of the rated voltage are allowed:

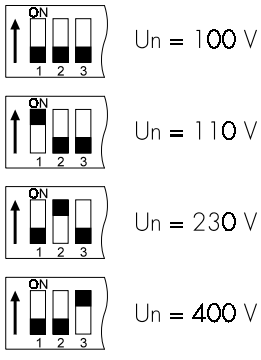


Fig. 4.3: Adjustment of rated voltage

Rated voltage chosen too low, does not cause destruction of the unit, but leads to wrong measuring results which may lead to false tripping.

Measurement over phase-to-neutral voltage / phase-to-phase voltage

The phase-to-neutral (position "OFF") or phase-to-phase voltage (position "ON") can be adjusted by means of switching over the DIP-switch 5.
By measuring phase-to-neutral voltage a displacement of the neutral point will be detected.
If the phase-to-phase voltage is measured, a dispacement of the neutral point will not be detected. Instead of it the values of the three phase-to-phase voltages in the phase triangle will be detected.
The kind of connection Y or Δ is dependent on the item to be protected, i.e. a three phase motor (without neutral) in a four wire system => select Δ.

Switching hysteresis of the frequency protection

Switching hysteresis of the frequency protection can be set to 0.25 % or 0.5 % of the tripping value by using DIP-switch 7.

Supervision of single-phase AC voltages

For supervision of single-phase AC voltages, terminals L1 - L3 must be short-circuited. DIP-switch 5 must be in position "OFF".

4.2 Setting of potentiometers

Undervoltage element

The undervoltage element can be adjusted in the range from 75 % to 100 % Un by using potentiometer U</Un.

Overvoltage element

The overvoltage element can be adjusted in the range from 100 % to 125 % Un by using potentiometer U>/Un.

Underfrequency element

The underfrequency element can be adjusted in the range from 95 % to 100 % fn by using potentiometer f</fn.

Overfrequency element

The overfrequency element can be adjusted in the range from 100 % to 105 % fn by using potentiometer f>/fn.

Time delays

Time delays tf and tU can be adjusted continously variably in the range from 0 - 1 s (DIP-switch 8 = OFF) or 0 - 10 s (DIP-switch 8 = ON).

4.3 Communication via serial interface adapter XRS1

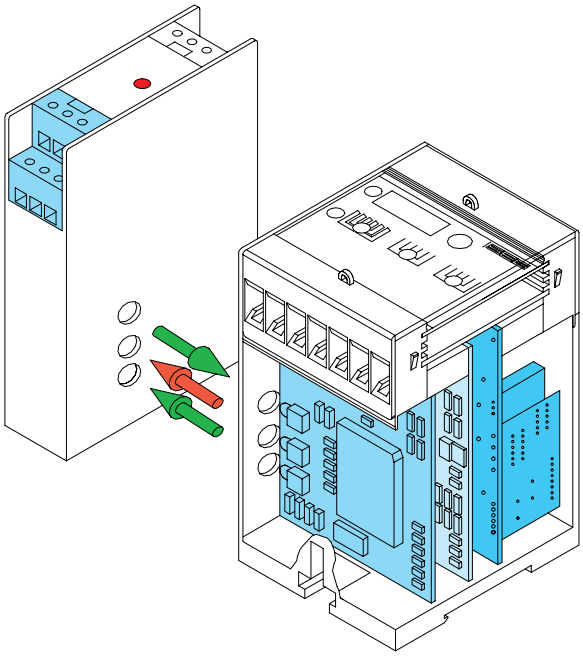


Fig. 4.4: Communication principle

For communication of the units with a superior management system, the interface adapter XRS1 is available for data transmission, including operating software for our relays. This adapter can easily be retrofitted at the side of the relay. Screw terminals simplify its installation. Optical transmission of this adapter makes galvanic isolation of the relay possible. Aided by the software, actual measured values can be processed, relay parameters set and protection functions programmed at the output relays. Information about unit XRS1 in detail can be taken from the description of this unit.

5. Relay case and technical data

5.1 Relay case

Relay *XUF2-400* is designed to be fastened onto a DIN-rail acc. to DIN EN 50022, the same as all units of the *PROFESSIONAL LINE*.

The front plate of the relay is protected with a sealable transparent cover (IP40).

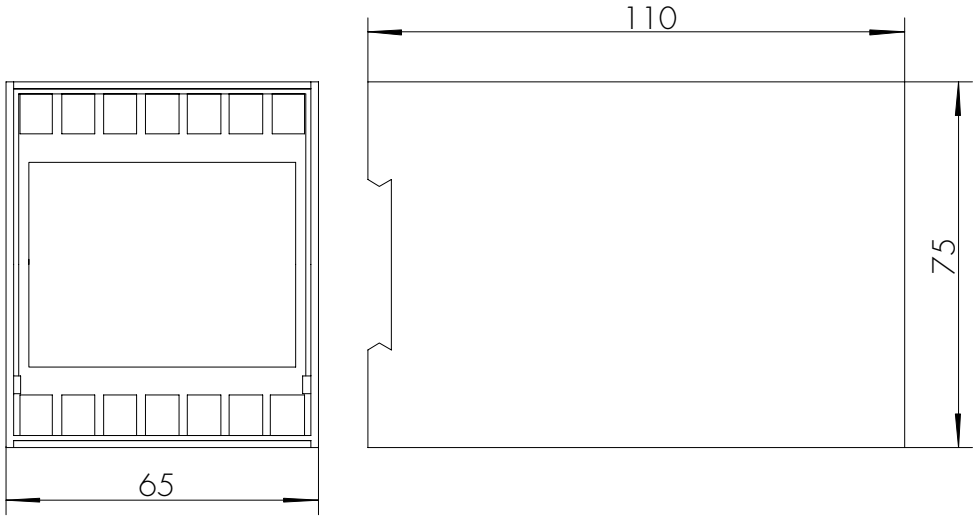


Fig. 5.1: Dimensional drawings

Connection terminals

The connection of up to a maximum of 2 x 2.5 mm^2 cross-section conductors is possible. For this the transparent cover of the unit has to be removed (see para. 4).

5.2 Technical data

Connection possibilities:

System voltage	Setting Un	Connection	Setting	Connection	Setting	Connection	Setting
100 / 60 V	100 V	60 V single-phase	Y	100 V 3-phase	Δ	100/60 V four wire	Y
110 / 63 V	110 V	63 V single-phase	Y	110 V 3-phase	Δ	110/63 V four wire	Y
230 / 130 V	230 V	130 V single-phase	Y	230 V 3-phase	Δ	230/130 V four wire	Y
400 / 230 V	400 V	230 V single-phase	Y	400 V 3-phase	Δ	400/230 V four wire	Y
690 / 400 V		not possible		not possible		not possible	

Table 5.1: Connection possibilities

Measuring input circuits

Rated voltage Un:	100, 110, 230, 400 V AC (phase-to-phase voltage)
Rated frequency	400 Hz
Rated frequency range:	380 - 420 Hz (100 - 480 Hz at communication via serial interface)
Power consumption in voltage circuit:	1 VA per phase at Un = 400 V
Thermal capacity of the voltage circuit:	continuously 520 V AC

Auxiliary voltage

Rated auxiliary voltage Uv/	36 - 520 V AC (f = 100 - 480 Hz) or 50 - 750 V DC / 4 W (terminals A1-A3)
Power consumption:	19 - 55 V DC / 3 W (terminals A1 (L-) and A2 (L+))

Common data

Dropout to pickup ratio:	depending on the adjusted hysteresis
Resetting time from pickup:	< 20 ms
Returning time from trip:	500 ms
Minimum initialization time after supply voltage has applied:	80 ms
Minimum response time when the supply voltage is available and measuring voltage has applied:	30 ms ±10 ms

Output relay

Number of relays:	2
Contacts:	1 changeover contact for each trip relay
Maximum breaking capacity:	ohmic 1250 VA/AC resp. 120 W/DC inductive 500 VA/AC resp. 75 W/DC
Max. rated voltage:	250 V AC 220 V DC ohmic load Imax. = 0,2 A inductive load Imax. = 0,1 A at L/R ≤ 50 ms 24 V DC inductive load Imax. = 5 A
Minimum load:	1 W / 1 VA at Umin ≥ 10 V
Maximum rated current:	5 A
Making current (16 ms):	20 A
Contact life span:	10^5 operations at max. breaking capacity

System data

Design standard:	VDE 0435 T303; IEC 0801 part 1-4, VDE 0160; IEC 255-4; BS 142; VDE 0871
Temperature range at storage and operation:	- 25 °C to + 70 °C
Constant climate class F acc. to DIN 40040 and DIN IEC 68, T.2-3:	more than 56 days at 40 °C and 95 % relative humidity

High voltage test
acc. to VDE 0435, part 303
Voltage test: 2,5 kV (eff) /50 Hz; 1 min
Surge voltage test: 5 kV; 1.2/50 µs, 0.5 J
High frequency test: 2,5 kV / 1 MHz
Electrostatic discharge (ESD)
acc. to IEC 0801, part 2: 8 kV

Radiated electromagnetic field test
acc. to IEC 0801, part 3: 10 V/m

Electrical fast transient (burst)
acc. to IEC 801, part 4: 4 kV/2.5 kHz, 15 ms

Radio interference suppression test
acc. to DIN 57871 and VDE 0871: limit value class A

Repeat accuracy: 0.5 % for U / 0.15 % for f
Basic time delay accuracy: 0.5 % or ±20 ms

Accuracy of the specific rated values: for U: Un = 100 V / 110 V / 230 V / 400 V 1 % $U_{phase\text{-}to\text{-}neutral}$
1 % $U_{phase\text{-}to\text{-}phase}$
for f: 0.06 %

Temperature effect: 0.02 % per K for voltage measuring
0.002 % per K for frequency measuring

Frequency effect: for voltage measuring
320 - 480 Hz no tolerance
100 - 320 Hz 1.5 %

Mechanical test
Shock: class 1 acc. to DIN IEC 255-21-2
Vibration: class 1 acc. to DIN IEC 255-21-1

Degree of protection:
Front plate: IP40 at closed front cover
Weight: approx. 0.5 kg
Mounting position: any

Parameter	Setting range	Graduation
U<	75 - 100 % Un	continuously variable
U>	100 - 125 % Un	continuously variable
f<	95 - 100 % fn	continuously variable
f>	100 - 105 % fn	continuously variable
tU/tf	0 - 1 s / 0 - 10 s	continuously variable
Hysteresis for f> and f<	0.25 or 0.5 %	

Table 5.2: Setting ranges and graduation

Technical data subject to change without notice!

Setting-list *XUF2-400*

Project: _____ SEG job.-no.: _____

Function group: = _____ Location: + _____ Relay code: - _____

Relay functions: _____ Date: _____

Setting of parameters

Function		Unit	Default settings	Actual settings
U<	Undervoltage	% Un	75*	
U>	Overvoltage	% Un	100*	
f<	Underfrequency	% fn	95*	
f>	Overfrequency	% fn	100*	
tU</tU>	Time delay for U< / U>	s	0	

* at Un = 100 V

Schaltanlagen-Elektronik-Geräte GmbH & Co. KG
Abteilung Gerätevertrieb / Electronic Devices Sales Department
Krefelder Weg 47 · D - 47906 Kempen (Germany)
Postfach 10 07 67 (P.O.B.) · D - 47884 Kempen (Germany)
Tel.: +49 (0)21 52 1 45-1 · Fax.: +49 (0)21 52 1 45-3 54
e-mail: electronics@avkseg.com