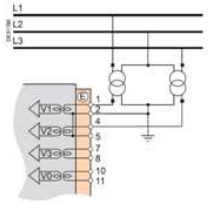
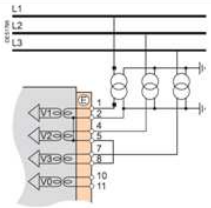
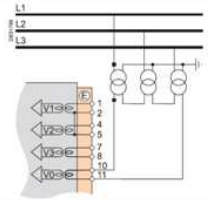
What does it mean V0 residual voltage External VT Uns/ √ 3 and External VT Uns/3 in Sepam series 20, 40,60 and 80?

We have got three types of VT:

22000 / 100: This kind of VT is used to measure phase-to-phase voltages. It is impossible to measure a residual voltage with such VT.

22000:√3 / 100:√3: This kind of VT is used to measure phase-to-neutral voltages or residual voltage Vo with open delta wiring.

22000:√3 / 100:√3 / 100:3: This kind of VT with two secondary windings allows measurement of phase to neutral voltages and residual voltage Vo with open delta wiring.

Variant	Type of VT availabe in MV market	Method	Connecting Diagram	Availabe parameters depend on Measurment	parameters not availabe	Comments
1	22000/100	2 phase-to-phase voltages transformer(2U)		U21,U32,U13	∑V0,V0	it is possible to measure the V0,By adding star/ open (Delat) method and connect it to V0 input.
2	22000:√3 / 100:√3	3 phase-to-neutral voltages transformer (3V , standard connection)		U21,U32,U13 V1,V2,V3 ∑V0	V0	On some Sepam models (Sereis 20,80) it is possible to measure the V0, by adding star/ open (Delat) method and connect it to V0 input.
3	22000:√3 / 100:√3	Measurment of residual V0		V0	U21,U32,U13 V1,V2,V3 ∑V0	
4	22000:√3 / 100:√3 / 100:3	(3V , standard connection) + V0	It is combination of Variant 2 and 3 (By considering the ratio and value)	U21,U32,U13 V1,V2,V3 V0,∑V0	-	

I grab your attention into these important notices:

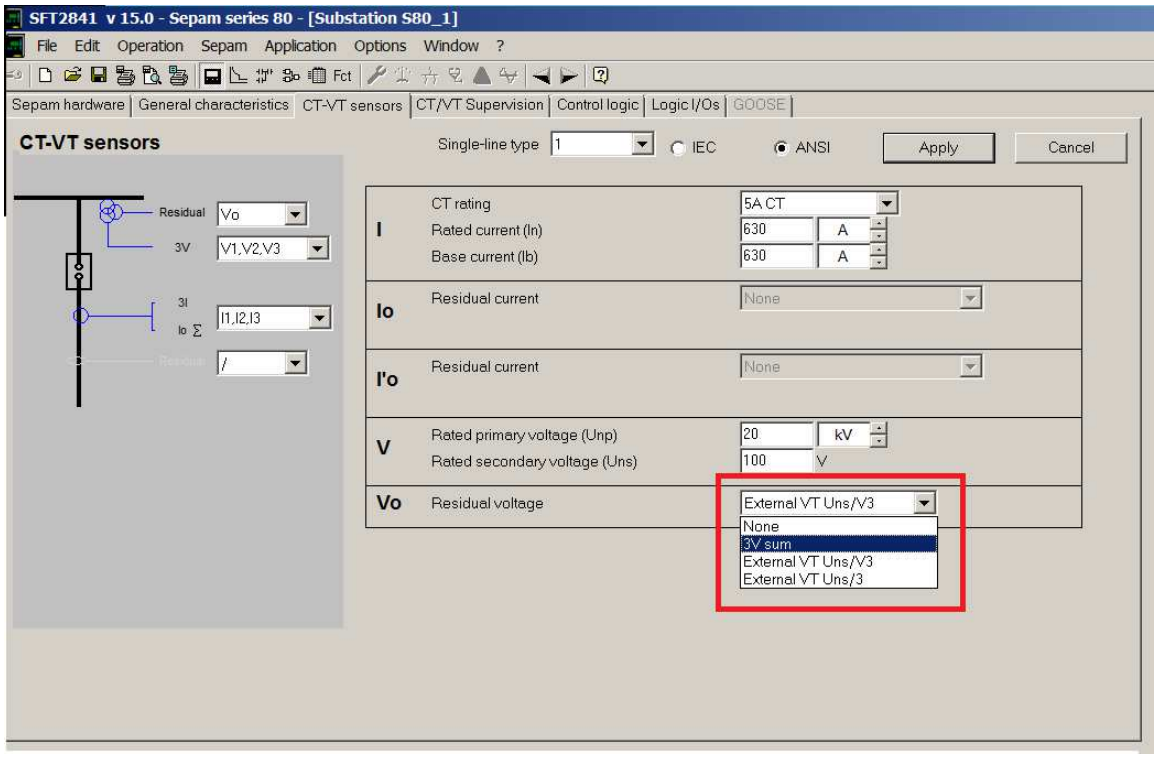
1) For Vo measurement you can combine variant 3 with variant 1 and 2:

Variant 1 + variant 3 = phase-to-phase voltages (U) + Vo (Residual measurement)

Variant 2 + variant 3 = phase-to-neutral voltages (V) + Vo (Residual measurement)

2) Variant 4, is because of special type of VT available in market to reduce voltage level (security reasons) in case of fault occurrence in Isolated earthing system. In this situation, last winding as Uns:3 is used for V0 measurement.

But back to main question about Sepam setting:



For Variant 3 **22000:√3 / 100:√3**→ we set to Uns/√3

For Variant 4 **22000:√3 / 100:√3 / 100:3**→ we set to Uns/3

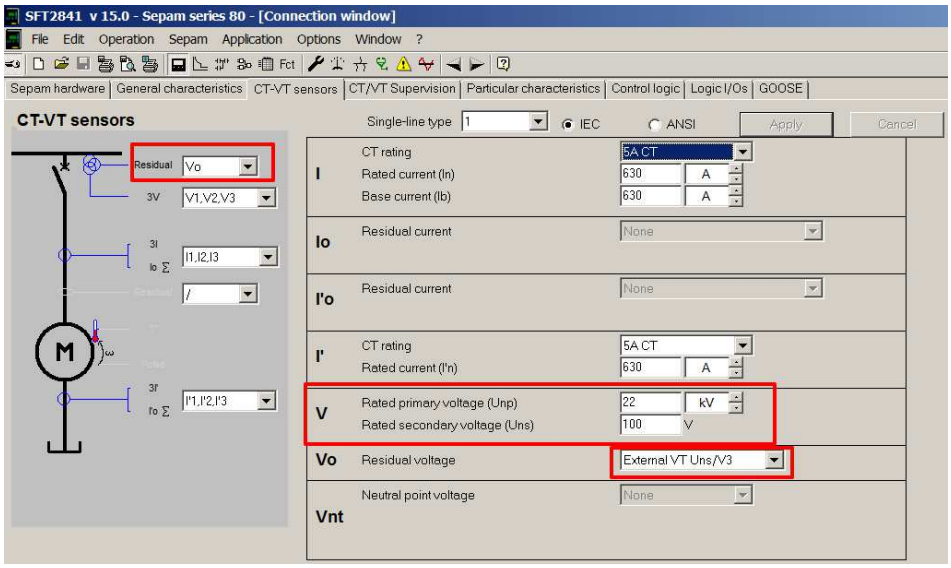
There are some important points to be reminded for doing test and calculations:

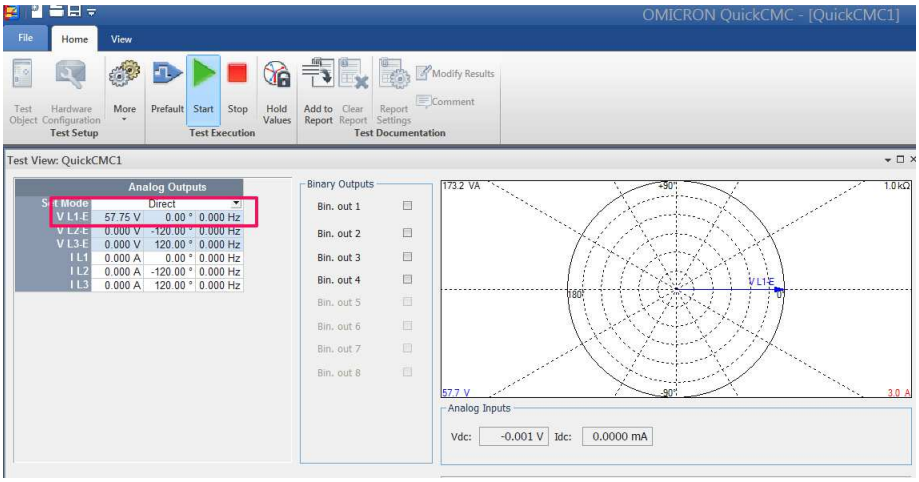
- **Voltage injection levels**

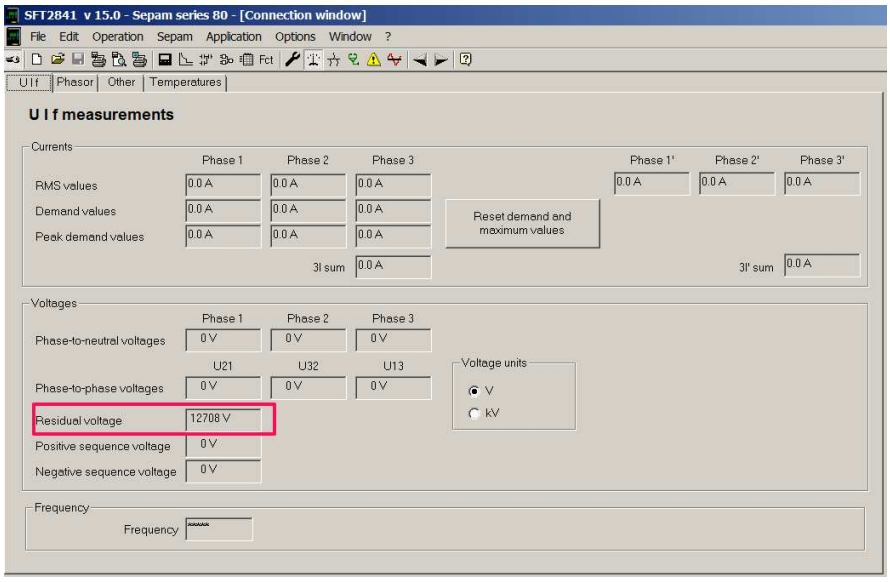
For testing Uns/3 and Uns/√3 these values should be injected to relay.

VT setting	Relay setting for Vo	Injection in V0(volt.)	Residual Voltage Meas.(Volt.)
22000/100	Uns/3	100:3= 33.34	12708
22000/100	Uns/√3	100:1.732=57.75	12708

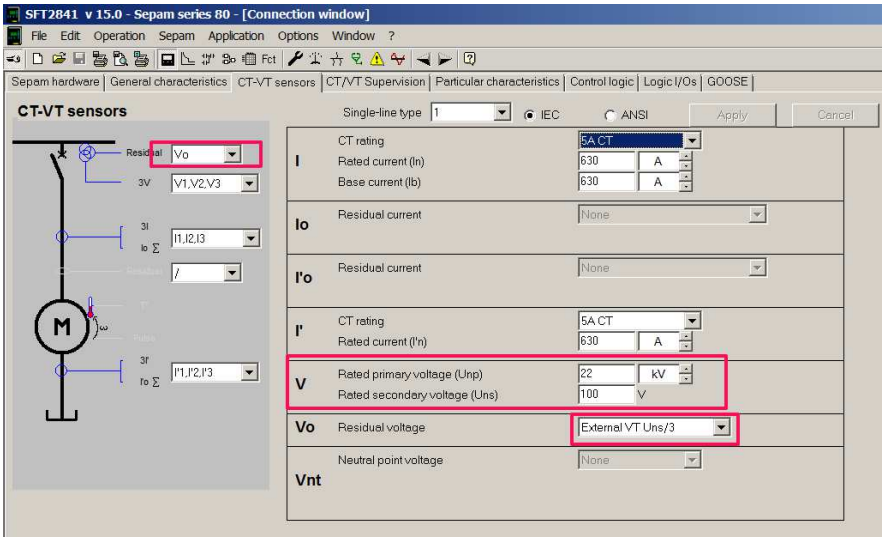
Here are the results for both tests: Test for Uns/√3

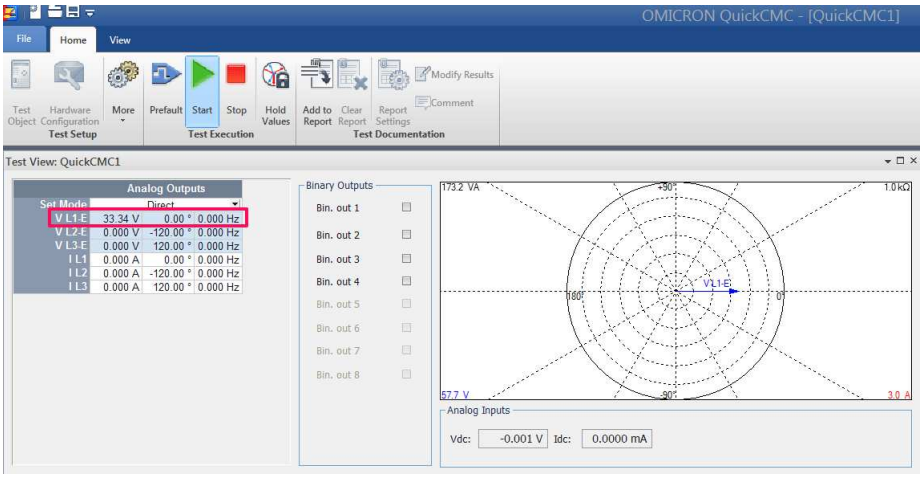

SFT2841 v 15.0 - Sepam series 80 - [Connection window]
File Edit Operation Sepam Application Options Window ?
Sepam hardware | General characteristics | CT-VT sensors | CT/VT Supervision | Particular characteristics | Control logic | Logic I/Os | GOOSE
CT-VT sensors
Single-line type 1
IEC
ANSI
Apply
Cancel
Residual
Vo
3V
V1,V2,V3
3I
Io Σ
I1,I2,I3
M
3I'
Io Σ
I'1,I'2,I'3
I
CT rating
5A CT
Rated current (In)
630
A
Base current (Ib)
630
A
Io
Residual current
None
I'o
Residual current
None
I'
CT rating
5A CT
Rated current (I'n)
630
A
V
Rated primary voltage (Unp)
22
kV
Rated secondary voltage (Uns)
100
V
Vo
Residual voltage
External VT Uns/V3
Vnt
Neutral point voltage
None

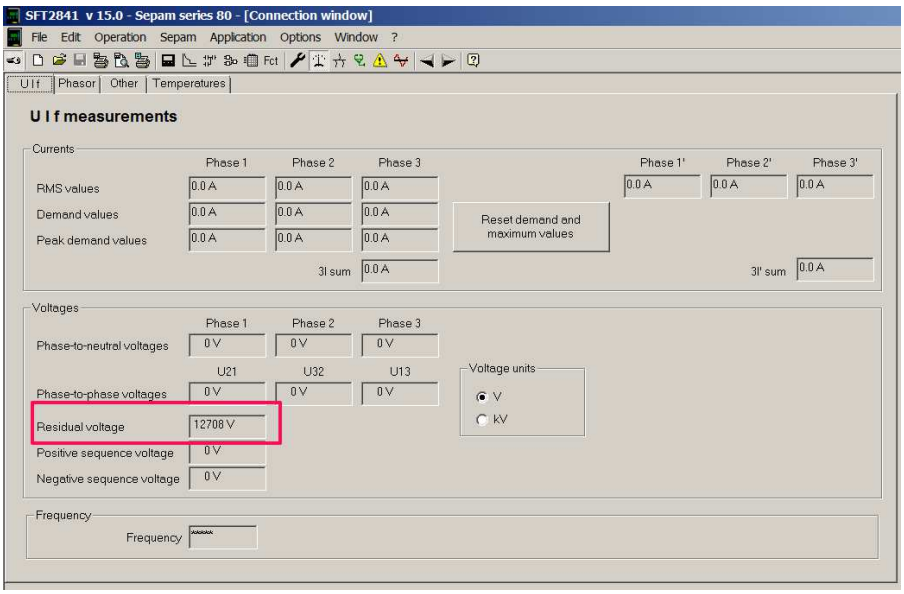

OMICRON QuickCMC - [QuickCMC1]
File
Home
View
Test Object
Hardware Configuration
Test Setup
More
Prefault
Start
Stop
Hold Values
Test Execution
Add to Report
Clear Report
Report Settings
Test Documentation
Modify Results
Comment
Test View: QuickCMC1
Analog Outputs
Set Mode
Direct
V L1-E 57.75 V 0.00 ° 0.000 Hz
V L2-E 0.000 V -120.00 ° 0.000 Hz
V L3-E 0.000 V 120.00 ° 0.000 Hz
I L1 0.000 A 0.00 ° 0.000 Hz
I L2 0.000 A -120.00 ° 0.000 Hz
I L3 0.000 A 120.00 ° 0.000 Hz
Binary Outputs
Bin. out 1
Bin. out 2
Bin. out 3
Bin. out 4
Bin. out 5
Bin. out 6
Bin. out 7
Bin. out 8
173.2 VA
1.0 kΩ
+90°
180°
V L1-E
57.7 V
-90°
3.0 A
Analog Inputs
Vdc: -0.001 V
Idc: 0.0000 mA


SFT2841 v 15.0 - Sepam series 80 - [Connection window]
File Edit Operation Sepam Application Options Window ?
U I f
Phasor
Other
Temperatures
U I f measurements
Currents
Phase 1
Phase 2
Phase 3
RMS values
0.0 A
Demand values
0.0 A
Peak demand values
0.0 A
3I sum
0.0 A
Phase 1'
Phase 2'
Phase 3'
Reset demand and maximum values
3I' sum
Voltages
Phase-to-neutral voltages
0 V
U21
U32
U13
Phase-to-phase voltages
Voltage units
V
kV
Residual voltage
12708 V
Positive sequence voltage
0 V
Negative sequence voltage
0 V
Frequency
Frequency

Test for Uns/3:







The residual voltage for both tests is same.

We remind you that in variant 2, we have Unp:√3 / Uns:√3 VTs, so when we're injecting 100:√3= 57.75V then the result is 22000:√3=12708V.

We remind you that in variant 4, we have Unp:√3 / Uns:√3/ Uns:3 VTs, so when we're injecting 100: 3= 33.34V then the result is 22000:√3=12708V.

This is why in Sepam we have got both Uns:√3 AND Uns:3 which is referring to standard methods of V0 measurement and available VT in market.

AEDL3