

# ATV950D45N4

Variable speed drive, Altivar Process ATV900, ATV950, 45 kW, 400/480 V, with braking unit, IP55



## Main

Device application	Industrial application
Device short name	ATV950
Product destination	Asynchronous motors Synchronous motors
EMC filter	Integrated with 50 m conforming to EN/IEC 61800-3 category C2 Integrated with 150 m conforming to EN/IEC 61800-3 category C3
IP degree of protection	IP55 conforming to IEC 61800-5-1 IP55 conforming to IEC 60529
Type of cooling	Forced convection
Supply frequency	50...60 Hz +/- 5 %
Network number of phases	3 phases
Motor power kW	45 kW (normal duty) 37 kW (heavy duty)
Motor power hp	60 hp normal duty 50 hp heavy duty
Line current	79.8 A at 380 V (normal duty) 69.1 A at 480 V (normal duty) 67.1 A at 380 V (heavy duty) 59 A at 480 V (heavy duty)
Continuous output current	88 A at 4 kHz for normal duty 74.5 A at 4 kHz for heavy duty
Maximum transient current	105.6 A during 60 s (normal duty) 111.8 A during 60 s (heavy duty)
Speed drive output frequency	0.1...599 Hz
Safety function	STO (safe torque off) SIL 3
Option module	Slot A: communication module for Profibus DP V1 Slot A: communication module for Profinet Slot A: communication module for DeviceNet Slot A: communication module for EtherCAT Slot A: communication module for CANopen daisy chain RJ45

Disclaimer: This documentation is not intended as a substitute for and is not to be used for determining suitability or reliability of these products for specific user applications.

Slot A: communication module for CANopen SUB-D 9  
 Slot A: communication module for CANopen screw terminals  
 Slot A/slot B/slot C: digital and analog I/O extension module  
 Slot A/slot B/slot C: output relay extension module  
 Slot B: 5/12 V digital encoder interface module  
 Slot B: analog encoder interface module  
 Slot B: resolver encoder interface module  
 communication module for Ethernet Powerlink

Range of product	Altivar Process ATV900
Product or component type	Variable speed drive
Variant	With braking chopper Standard version
Mounting mode	Wall mount
Communication port protocol	Modbus TCP EtherNet/IP Modbus serial
[Us] rated supply voltage	380...480 V - 15...10 %
IP degree of protection	IP55

## Complementary

Output voltage	<= power supply voltage
Frequency resolution	Display unit: 0.1 Hz Analog input: 0.012/50 Hz
Electrical connection	Control: screw terminal 0.5...1.5 mm <sup>2</sup> /AWG 20...AWG 16 Line side: screw terminal 35...50 mm <sup>2</sup> /AWG 3...AWG 1 DC bus: screw terminal 35...50 mm <sup>2</sup> /AWG 3...AWG 1 Motor: screw terminal 35...50 mm <sup>2</sup> /AWG 2...AWG 1
Connector type	2 RJ45 for Ethernet IP/Modbus TCP on the control block 1 RJ45 for Modbus serial on the control block
Physical interface	2-wire RS 485 for Modbus serial
Transmission frame	RTU for Modbus serial
Transmission rate	10/100 Mbit/s for Ethernet IP/Modbus TCP 4.8, 9.6, 19.2, 38.4 kbit/s for Modbus serial
Exchange mode	Half duplex, full duplex, autonegotiation Ethernet IP/Modbus TCP
Data format	8 bits, configurable odd, even or no parity for Modbus serial
Type of polarization	No impedance for Modbus serial
Number of addresses	1...247 for Modbus serial
Supply	External supply for digital inputs: 24 V DC (19...30 V), <1.25 mA, protection type: overload and short-circuit protection Internal supply for reference potentiometer (1 to 10 kOhm): 10.5 V DC +/- 5 %, <10 mA, protection type: overload and short-circuit protection Internal supply for digital inputs and STO: 24 V DC (21...27 V), <200 mA, protection type: overload and short-circuit protection
Local signalling	Local diagnostic: 3 LED (mono/dual colour) Embedded communication status: 5 LED (dual colour) Communication module status: 2 LED (dual colour) Presence of voltage: 1 LED (red)
Input compatibility	DI1...DI8: discrete input level 1 PLC conforming to EN/IEC 61131-2 DI7, DI8: pulse input level 1 PLC conforming to IEC 65A-68 STOA, STOB: discrete input level 1 PLC conforming to EN/IEC 61131-2
Discrete input logic	Positive logic (source) (DI1...DI8), < 5 V (state 0), > 11 V (state 1) Negative logic (sink) (DI1...DI8), > 16 V (state 0), < 10 V (state 1) Positive logic (source) (DI7, DI8), < 0.6 V (state 0), > 2.5 V (state 1) Positive logic (source) (STOA, STOB), < 5 V (state 0), > 11 V (state 1)
Sampling duration	2 ms +/- 0.5 ms (DI1...DI8) - discrete input 5 ms +/- 1 ms (DI7, DI8) - pulse input 1 ms +/- 1 ms (AI1, AI2, AI3) - analog input 5 ms +/- 1 ms (AQ1, AQ2) - analog output
Accuracy	+/- 0.6 % AI1, AI2, AI3 for a temperature variation 60 °C analog input +/- 1 % AQ1, AQ2 for a temperature variation 60 °C analog output
Linearity error	AI1, AI2, AI3: +/- 0.15 % of maximum value for analog input AQ1, AQ2: +/- 0.2 % for analog output
Refresh time	Relay output (R1, R2, R3): 5 ms (+/- 0.5 ms)

Isolation	Between power and control terminals
Variable speed drive application selection	Mixer Food and beverage processing Conveyor Food and beverage processing Shredder Food and beverage processing Process crane Hoisting Thruster Marine Winch Marine Press Material working (wood, ceramic, stone, pvc, metal) Extruder Material working (wood, ceramic, stone, pvc, metal) Other application Mining mineral and metal Drilling rig Oil and gas Progressive cavity pump Oil and gas Rod pump Oil and gas Swapping pump Oil and gas Compressor for regasification Oil and gas Separator Oil and gas Other application Oil and gas Separator Water and waste water
Power range	30...50 kW at 380...440 V 3 phases 30...50 kW at 480...500 V 3 phases
Discrete input number	10
Discrete input type	DI1...DI8 programmable, 24 V DC ( $\leq 30$ V), impedance: 3.5 kOhm DI7, DI8 programmable as pulse input: 0...30 kHz, 24 V DC ( $\leq 30$ V) STOA, STOB safe torque off, 24 V DC ( $\leq 30$ V), impedance: $> 2.2$ kOhm
Number of preset speeds	16 preset speeds
Discrete output number	2
Discrete output type	Logic output DQ+ 0...1 kHz $\leq 30$ V DC 100 mA Programmable as pulse output DQ+ 0...30 kHz $\leq 30$ V DC 20 mA Logic output DQ- 0...1 kHz $\leq 30$ V DC 100 mA
Analogue input number	3
Analogue input type	AI1, AI2, AI3 software-configurable voltage: 0...10 V DC, impedance: 30 kOhm, resolution 12 bits AI1, AI2, AI3 software-configurable current: 0...20 mA/4...20 mA, impedance: 250 Ohm, resolution 12 bits
Analogue output number	2
Analogue output type	Software-configurable voltage AQ1, AQ2: 0...10 V DC impedance 470 Ohm, resolution 10 bits Software-configurable current AQ1, AQ2: 0...20 mA impedance 500 Ohm, resolution 10 bits
Relay output number	3
Relay output type	Configurable relay logic R1: fault relay NO/NC electrical durability 100000 cycles Configurable relay logic R2: sequence relay NO electrical durability 1000000 cycles Configurable relay logic R3: sequence relay NO electrical durability 1000000 cycles
Maximum switching current	Relay output R1 on resistive load, $\cos \phi = 1$ : 3 A at 250 V AC Relay output R1 on resistive load, $\cos \phi = 1$ : 3 A at 30 V DC Relay output R1 on inductive load, $\cos \phi = 0.4$ and $L/R = 7$ ms: 2 A at 250 V AC Relay output R1 on inductive load, $\cos \phi = 0.4$ and $L/R = 7$ ms: 2 A at 30 V DC Relay output R2, R3 on resistive load, $\cos \phi = 1$ : 5 A at 250 V AC Relay output R2, R3 on resistive load, $\cos \phi = 1$ : 5 A at 30 V DC Relay output R2, R3 on inductive load, $\cos \phi = 0.4$ and $L/R = 7$ ms: 2 A at 250 V AC Relay output R2, R3 on inductive load, $\cos \phi = 0.4$ and $L/R = 7$ ms: 2 A at 30 V DC
Minimum switching current	Relay output R1, R2, R3: 5 mA at 24 V DC
Method of access	Slave Modbus TCP
Asynchronous motor control profile	Optimized torque mode Variable torque standard Constant torque standard
Synchronous motor control profile	Permanent magnet motor Synchronous reluctance motor
Acceleration and deceleration ramps	Linear adjustable separately from 0.01...9999 s
Motor slip compensation	Not available in permanent magnet motor law Adjustable Automatic whatever the load Can be suppressed
Switching frequency	2...16 kHz adjustable 4...16 kHz with derating factor
Nominal switching frequency	4 kHz
Braking to standstill	By DC injection
Apparent power	57.4 kVA at 480 V (normal duty)

	49.1 kVA at 480 V (heavy duty)
Prospective line I <sub>sc</sub>	50 kA
Protection type	Thermal protection: motor Safe torque off: motor Motor phase break: motor Thermal protection: drive Safe torque off: drive Overheating: drive Overcurrent between output phases and earth: drive Overload of output voltage: drive Short-circuit protection: drive Motor phase break: drive Overvoltages on the DC bus: drive Line supply overvoltage: drive Line supply undervoltage: drive Line supply phase loss: drive Overspeed: drive Break on the control circuit: drive
Width	290 mm
Height	910 mm
Depth	340 mm
Product weight	50 kg

## Environment


Insulation resistance	> 1 MOhm 500 V DC for 1 minute to earth
Noise level	69.7 dB conforming to 86/188/EEC
Vibration resistance	1.5 mm peak to peak (f= 2...13 Hz) conforming to IEC 60068-2-6 1 gn (f= 13...200 Hz) conforming to IEC 60068-2-6
Shock resistance	15 gn for 11 ms conforming to IEC 60068-2-27
Environmental characteristic	Chemical pollution resistance class 3C3 conforming to EN/IEC 60721-3-3 Dust pollution resistance class 3S3 conforming to EN/IEC 60721-3-3
Pollution degree	2 conforming to EN/IEC 61800-5-1
Relative humidity	5...95 % without condensation conforming to IEC 60068-2-3
Ambient air temperature for operation	-15...40 °C (without derating) 40...50 °C (with derating factor)
Standards	UL 508C EN/IEC 61800-3 Environment 1 category C2 EN/IEC 61800-3 Environment 2 category C3 EN/IEC 61800-3 EN/IEC 61800-5-1 IEC 61000-3-12 IEC 60721-3 IEC 61508 IEC 13849-1
Operating altitude	<= 1000 m without derating 1000...4800 m with current derating 1 % per 100 m
Operating position	Vertical +/- 10 degree
Product certifications	CSA UL TÜV
Marking	CE
Maximum THDI	<48 % from 80...100 % of load conforming to IEC 61000-3-12
Electromagnetic compatibility	Electrostatic discharge immunity test level 3 conforming to IEC 61000-4-2 Radiated radio-frequency electromagnetic field immunity test level 3 conforming to IEC 61000-4-3 Electrical fast transient/burst immunity test level 4 conforming to IEC 61000-4-4 1.2/50 µs - 8/20 µs surge immunity test level 3 conforming to IEC 61000-4-5 Conducted radio-frequency immunity test level 3 conforming to IEC 61000-4-6
Ambient air temperature for storage	-40...70 °C

## Packing Units

Unit Type of Package 1	PCE
Number of Units in Package 1	1

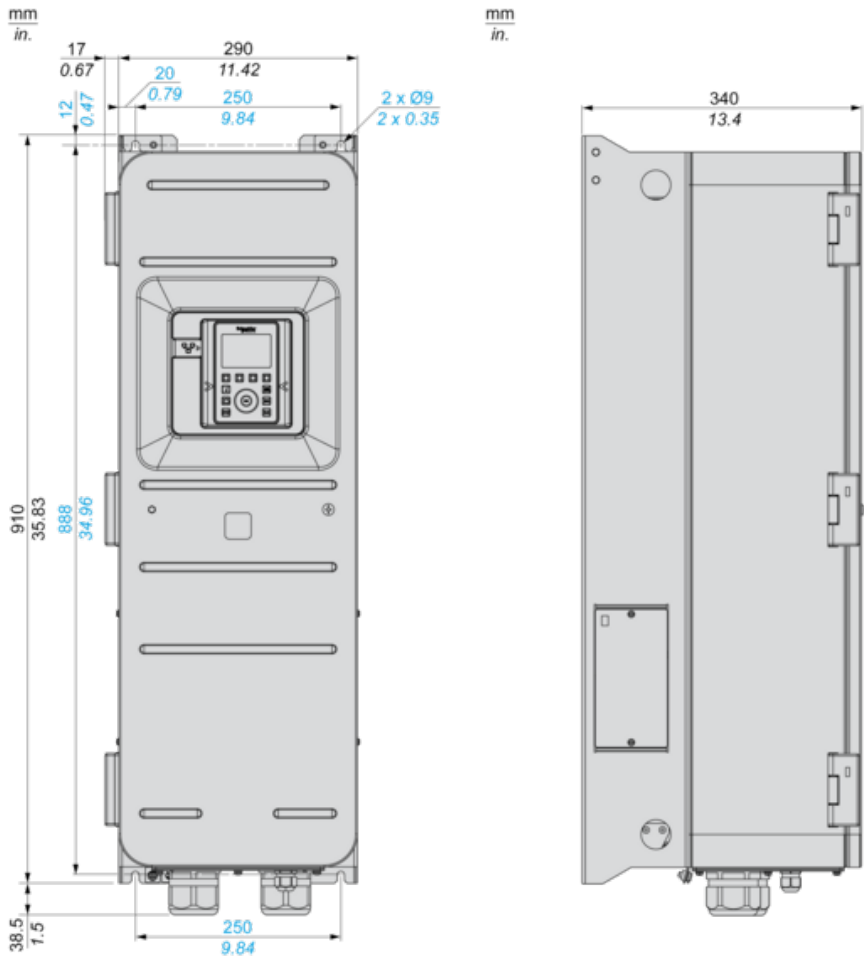
Package 1 Weight	40 kg
Package 1 Height	49.5 cm
Package 1 width	43.5 cm
Package 1 Length	111 cm

### Offer Sustainability

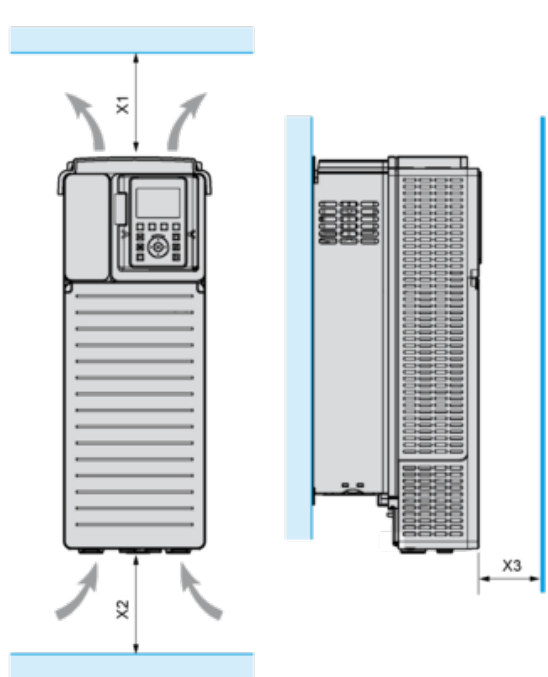
Sustainable offer status	Green Premium product
RECh Regulation	<a href="#">RECh Declaration</a>
EU RoHS Directive	Pro-active compliance (Product out of EU RoHS legal scope) <a href="#">EU RoHS Declaration</a>
Mercury free	Yes
RoHS exemption information	<a href="#">Yes</a>
China RoHS Regulation	<a href="#">China RoHS declaration</a>
Environmental Disclosure	<a href="#">Product Environmental Profile</a>
Circularity Profile	<a href="#">End of Life Information</a>
WEEE	The product must be disposed on European Union markets following specific waste collection and never end up in rubbish bins
California proposition 65	WARNING: This product can expose you to chemicals including: Lead and lead compounds, which is known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to <a href="http://www.P65Warnings.ca.gov">www.P65Warnings.ca.gov</a>
Upgradeability	<a href="#">Upgraded components available</a> 

Dimensions

Front and Left View



Clearances

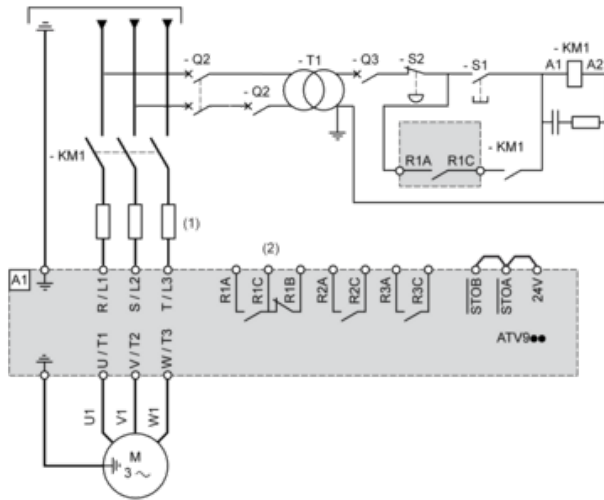


X1	X2	X3
≥ 100 mm (3.94 in.)	≥ 100 mm (3.94 in.)	≥ 10 mm (0.39 in.)

- Mount the device in a vertical position ( $\pm 10^\circ$ ). This is required for cooling the device.
- Do not mount the device close to heat sources.
- Leave sufficient free space so that the air required for cooling purposes can circulate from the bottom to the top of the drive.

## Three-Phase Power Supply with Upstream Breaking via Line Contactor

Connection diagrams conforming to standards EN 954-1 category 1 and IEC/EN 61508 capacity SIL1, stopping category 0 in accordance with standard IEC/EN 60204-1



(1) Line choke if used

(2) Use relay R1 set to operating state Fault to switch Off the product once an error is detected.

A1 : Drive

KM1 : Line Contactor

Q2, Q3 : Circuit breakers

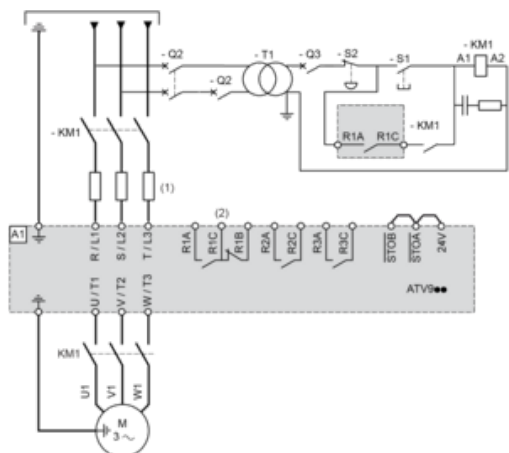
S1, S2 : Pushbuttons

T1 : Transformer for control part



## Three-Phase Power Supply with Downstream Breaking via Contactor

Connection diagrams conforming to standards EN 954-1 category 1 and IEC/EN 61508 capacity SIL1, stopping category 0 in accordance with standard IEC/EN 60204-1



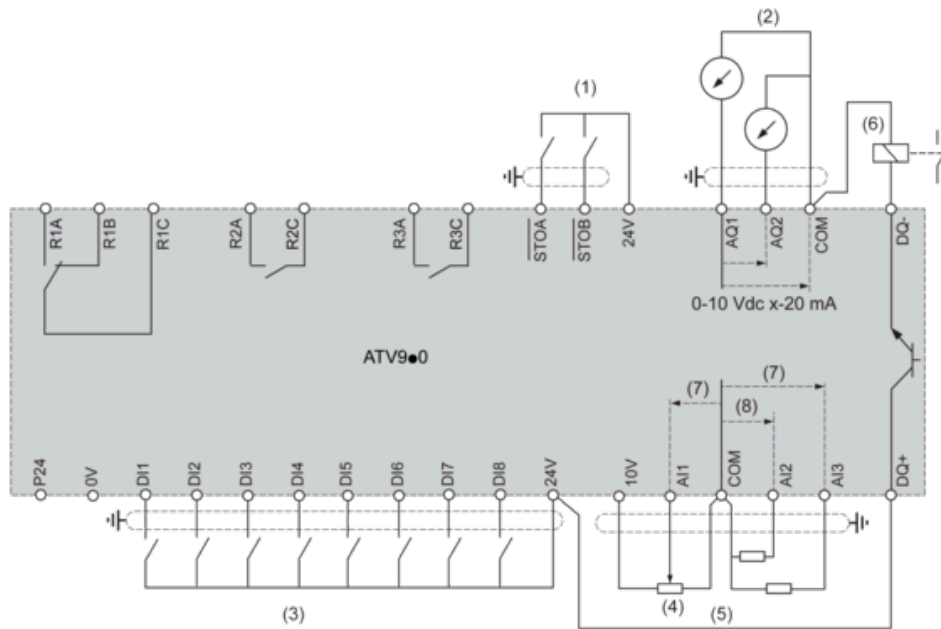
(1) Line choke if used

(2) Use relay R1 set to operating state Fault to switch Off the product once an error is detected.

A1 : Drive

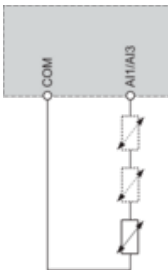
KM1 : Contactor

## Control Block Wiring Diagram



- (1) Safe Torque Off
  - (2) Analog Output
  - (3) Digital Input
  - (4) Reference potentiometer
  - (5) Analog Input
  - (6) Digital Output
  - (7) 0-10 Vdc, x-20 mA
  - (8) 0-10 Vdc, -10 Vdc...+10 Vdc
- R1A, R1B, R1C : Fault relay  
R2A, R2C : Sequence relay  
R3A, R3C : Sequence relay

## Sensor Connection



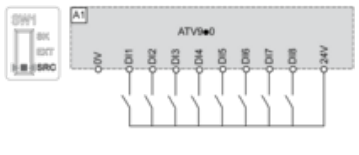
It is possible to connect either 1 or 3 sensors on terminals AI1 or AI3

## Sink / Source Switch Configuration

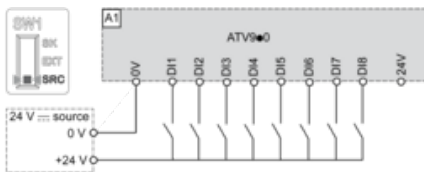
The switch is used to adapt the operation of the logic inputs to the technology of the programmable controller outputs.

- Set the switch to Source (factory setting) if using PLC outputs with PNP transistors.
- Set the switch to Ext if using PLC outputs with NPN transistors.

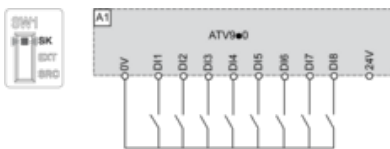
### Switch Set to SRC (Source) Position Using the Output Power Supply for the Digital Inputs



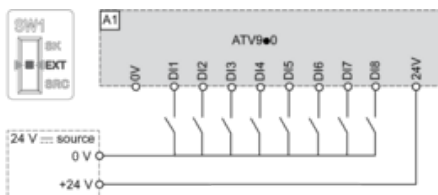
### Switch Set to SRC (Source) Position and Use of an External Power Supply for the DIs



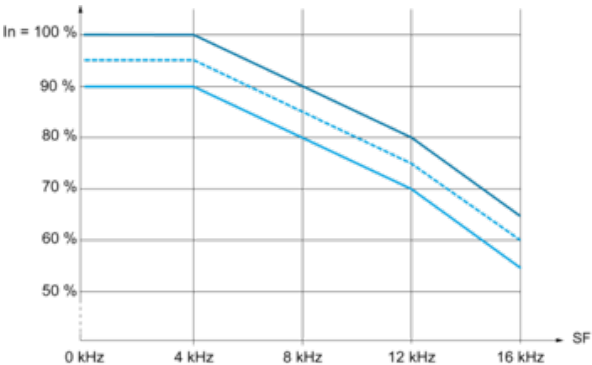
### Switch Set to SK (Sink) Position Using the Output Power Supply for the Digital Inputs



### Switch Set to EXT Position Using an External Power Supply for the DIs



Derating Curves



— 40 °C (104 °F)  
- - - 45 °C (113 °F)  
— 50 °C (122 °F)  
In : Nominal Drive Current  
SF : Switching Frequency