SED2100
SPEED CONTROL OF FHP SYNCHRONOUS MOTOR USING THREE PHASE VSI INVERTER

INTRODUCTION:

The variable frequency drive for synchronous motor, has advantage over variable voltage such as, (1) to vary speed in stepless manner (2) to maintain constant torque/power (3) to run motor on slower/ higher speed than rated. The V.S.I. (voltage source inverter) drive is one method to obtain the variable frequency voltage to control speed/torque of Synchronous motor. In a salient pole synchronous motor, the permeance offered to a mmf wave is highest when it is adjusted with the field pole axis, called direct or, d - axis, and is lowest when it is oriented at quadrature (90^0 to the field), called q - axis angle. The field winding in a salient pole motor is of concentrated type, the b wave produced by it is nearly sinusoidal because of the dumbbell shape. The power - angle 'Pe' characteristics of a salient pole synchronous motor

Features:

Motor : Salient pole three phase FHP (60W/100V/phase) synchronous motor fitted on insulated frame with speed sensor

Bridge : Three phase full bridge inverter comprising 6VMOS fets (600V8A) with polarized snubber

Transformer : One transformers(fractional KVA) for isolation

Frequency Control : Variable potentiometer (10-100hz)approx.

Control Circuitry : Digital to generate three 120 degree displaced signal for power circuit.

Voltage source : Variable using controlled chopping for constant V/F ratio.

Display : Digital display for speed

Observation : Sockets provided for reference wave, output voltage & current for study on CRO(isolated & attenuated).

Circuit Diagram : Screen printed

EXPERIMENT COVERED

Speed control of FHP synchronous motor using three phase VSI Inverter.
To observe current and voltage waveform at different frequency.

Photographs are for reference only final product may vary from it

MANFACTURED BY:
SATISH BROTHERS
#4309/20,Marble house,Punjabi Mohalla,
Ambala Cantt -133001(hry.)
Tel: 0171-2642617,4008617
E-mail: info@sibaindia.com

AUTH. DEALER

SED2101

SPEED TORQUE CHARACTERISTICSOF DC SERIES MOTOR IN OPEN/CLOSE LOOP USING IGBT/MOSFET

INTRODUCTION:

System employed for motion control in industrial or domestic applications like transportation, rolling mills, textile mills, pumps, fans etc are called drives. Such drives employing electric motors are known as electrical drives. The electrical drives has advantage of control over wide range of speed- torque characteristics and can be designed to meet wide range of power. Due to use of power semiconductors such as thyristors, IGBTs, power mosfets,GTOs these have high efficiency and can be employed in any environment. In present electrical drive, speed of a dc series motor is controlled by chopper .

Features:

Motor : DC series motor mounted upon iron frame with brake & pulley arrangement (1H.P.)

Drive circuit : Chopper (quad A)with duty cycle 10-90% drive based upon mosfet (600V/80A) or same rated IGBT with snubber circuit.

Switch : One to convert Open/Close loop drive (δ 0.4 to 0.6)

Free wheeling Diode : One 1200V/16A

DC source : DC source having power rectifier with smoothing filter, capacitor(high ripple rated)

Display : Digital display for volt & current

Short circuit Protection : In built

Observation : Sockets provided for gate pulse, load output voltage & current study on CRO.(isolated & attenuated).

Indicator Circuit : Overload, current limit & line

Diagram : Screen printed

Patch cords : Necessary to perform expt. Supplied along with

EXPERIMENT COVERED

To obtain speed torque characteristics of 1 H.P DC series motor in Open/close loop using IGBT/MOSFET(Chopper)

To observe current and voltage waveform at different duty factors

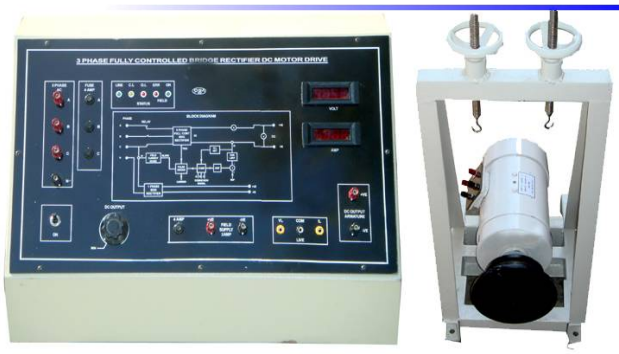
Photographs are for reference only final product may vary from it

AUTH. DEALER

MANFACTURED BY:
SATISH BROTHERS
#4309/20,Marble house,Punjabi Mohalla,
Ambala Cantt -133001(hry.)
Tel: 0171-2642617,4008617
E-mail: info@sibaindia.com

SED2102

SPEED-TORQUE CHARACTERISTICS OF THREE PHASE FULLY CONTROLLED RECTIFIER FED SEPARATELY EXCITED DC MOTOR



INTRODUCTION:

System employed for motion control in industrial or domestic applications like transportation, rolling mills, textile mills, pumps, fans etc are called drives. Such drives employing electric motors are known as electrical drives. The electrical drives has advantage of control over wide range of speed- torque characteristics and can be designed to meet wide range of power. Due to use of power semiconductors such as thyristors, IGBTs, power mosfets, GTOs these have high efficiency and can be employed in any environment. In present electrical drive, speed of a dc separately excited motor is controlled by full controlled 3 phase thyristor bridge converter controlled thyristor bridge converter.

Features:

Motor : DC separately excited motor mounted upon iron frame with brake & pulley arrangement (1H.P.)

Drive circuit : Three phase full wave fully controlled bridge rectifier (1600V/16A),

Power Supply: Separate field supply with field failure protection & indication.

Firing angle Control : Cosine firing angle control scheme with comparators and flip flops.

Isolation : Pulse isolation using high frequency carrier pulse transformers.

Display : Digital display for volt & current

Short circuit Protection : In built

Observation : Sockets provided for clock & flip flop , load output voltage & current on CRO(isolated & attenuated).

Indicator Circuit : Overload, current limit & line

Diagram : Screen printed

Patch cords : Necessary to perform expt. Supplied along with main power cord

EXPERIMENT COVERED

To draw speed-torque char. of Three phase Fully controlled rectifier fed 1 H.P separately excited DC motor at different firing angle

To observe current & voltage waveform at different firing angles

Photographs are for reference only final product may vary from it

MANFACTURED BY:

SATISH BROTHERS

#4309/20,Marble house,Punjabi Mohalla,
Ambala Cantt -133001(hry.)
Tel: 0171-2642617,4008617
E-mail: info@sibaindia.com

AUTH. DEALER

SED2103

SPEED TORQUE CHARACTERISTICS OF DC SERIES MOTOR IN OPEN/CLOSE LOOP USING SINGLE PHASE CONVERTER

INTRODUCTION:

System employed for motion control in industrial or domestic applications like transportation, rolling mills, textile mills, pumps, fans etc are called drives. Such drives employing electric motors are known as electrical drives. The electrical drives has advantage of control over wide range of speed- torque characteristics and can be designed to meet wide range of power. Due to use of power semiconductors such as thyristors, IGBTs, power mosfets, GTOs these have high efficiency and can be employed in any environment. In present electrical drive, speed of a dc series motor is controlled by full controlled thyristor bridge converter.

Features:

Motor : DC series motor mounted upon iron frame with brake & pulley arrangement (1H.P.)

Drive circuit : Single phase full wave fully controlled bridge converter comprising of SCR (1600V/16A),

Firing scheme : Ramp & comparator firing angle control scheme

Isolation : Pulse isolation using high frequency carrier pulse transformers.

Switch : One to convert Open/Close loop drive Cos a(90 to 60 degree)

Free wheeling Diode : One 1200V/16A

Display : Digital display for volt & current

Short circuit Protection : In built

Observation : Sockets provided for control circuit (min. 3 observation points), load output voltage & current CRO (isolated & attenuated).

Indicator : Overload, current limit & line

Circuit Diagram : Screen printed

Patch cords : Necessary to perform expt. Supplied along with main power cord.

EXPERIMENT COVERED

To obtain speed torque characteristics of 1 H.P DC series motor in open/close loop using single phase converter

To observe current & voltage waveform at different firing angles.

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AUTH. DEALER

MANFACTURED BY:

SATISH BROTHERS

#4309/20,Marble house,Punjabi Mohalla,
Ambala Cantt -133001(hry.)
Tel: 0171-2642617,4008617
E-mail: info@sibaindia.com

SED2104

SPEED TORQUE CHARACTERISTICS OF THREE PHASE VSI INVERTER FED FHP INDUCTION MOTOR DRIVE

INTRODUCTION:

The V.S.I. (voltage source inverter) drive is one method to obtain the variable frequency voltage to control speed/torque of induction motor The three phase 'cage induction motor' of fraction HP, is used in this application. In these motors to set up the air gap flux, magnetic current must flow, as lagging the voltage by 120^0. The movement of the rotation flux across the conductors induces a voltage in the 'short circuited closed cage' rotor winding, hence causing current flow. The interaction of the rotor currents and flux is to produce torque in the same direction as the rotating field. The rotor always rotate at a different speed, r', from the 'synchronous speed' for a given voltage, hence current and torque to be induced in the rotor.

Features:

Motor : Squirrel cage three phase fractional H.P. (60W/230V/phase) induction motor mounted upon insulated frame with brake & pulley arrangement fitted on insulated board with speed sensor.

Drive circuit : Three phase VSI inverter comprising 6 VMOS fets (600V/8A), with polarized snubbers.

Frequency Control : Variable potentiometer (10-100hz) .

Control Circuitry : Digital to generate three 120 degree displaced reference signals for power circuit

Voltage source : Variable using controlled rectification for constant V/F ratio.

Display : Digital display for speed & voltage .

Observation : Sockets provided for reference signals, drive signal, output voltage & current for study on CRO (isolated & attenuated)

Diagram : Screen printed

Patch cords : Necessary to perform expt. Supplied along with main power cord

EXPERIMENT COVERED

Speed torque char. of Three phase VSI inverter fed FHP induction motor drive and to observe current and voltage waveform at different frequency.

Photographs are for reference only final product may vary from it

MANFACTURED BY:
SATISH BROTHERS
#4309/20,Marble house,Punjabi Mohalla,
Ambala Cantt -133001(hry.)
Tel: 0171-2642617,4008617
E-mail: info@sibaindia.com

AUTH. DEALER

SED2105

SPEED TORQUE CHARACTERISTICS OF THREE PHASE CSI INVERTER FED FHP INDUCTION MOTOR DRIVE

INTRODUCTION:

The C.S.I. (Current source inverter) drive is one method to obtain the variable frequency voltage to control speed/torque of induction motor The three phase 'cage induction motor' of fraction HP, is used in this application. In these motors to set up the air gap flux, magnetic current must flow, as lagging the voltage by 120^0. The movement of the rotation flux across the conductors induces a voltage in the 'short circuited closed cage' rotor winding, hence causing current flow. The interaction of the rotor currents and flux is to produce torque in the same direction as the rotating field. The rotor always rotate at a different speed, r', from the 'synchronous speed' for a given voltage, hence current and torque to be induced in the rotor.

Features:

Motor : Squirrel cage three phase fractional H.P. (60W/230V/phase) induction motor mounted upon insulated frame with brake & pulley arrangement fitted on insulated board with speed sensor.

Drive circuit : Three phase CSI inverter comprising six VMOS fets (600V/8A), with polarized snubbers.

Frequency Control : Variable potentiometer (10-100hz) .

Control Circuitry : Digital to generate three 120 degree displaced reference signals for power circuit

Current source : Variable chopper controlled with inductor

Display : Digital display for speed

Observation : Sockets provided for reference signals, clock signal, output voltage & current for study on CRO (isolated & attenuated)

Diagram : Screen printed

Patch cords : Necessary to perform expt. Supplied along with main power cord

EXPERIMENT COVERED

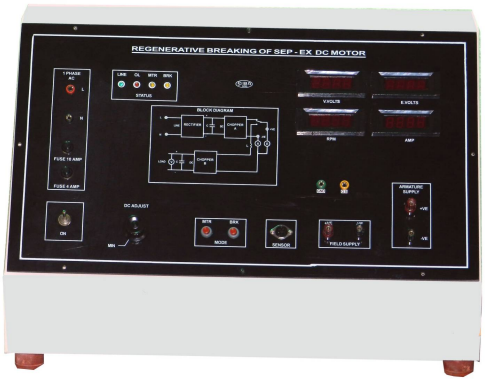
Speed torque char. of Three phase CSI inverter fed FHP induction motor drive and to observe current and voltage waveform at different frequency.

Photographs are for reference only final product may vary from it

AUTH. DEALER

MANFACTURED BY:
SATISH BROTHERS
#4309/20,Marble house,Punjabi Mohalla,
Ambala Cantt -133001(hry.)
Tel: 0171-2642617,4008617
E-mail: info@sibaindia.com

SED2106
REGENERATING AND BREAKING OF DC MOTOR USING TWO QUADRANT CHOPPER



INTRODUCTION:

Acceleration / deacceleration of dc motor required to meet the speed / torque demand or steady - state operation. The acceleration demand is fulfilled with controlled drives (in most case close - loop), and deacceleration complied with electrical or mechanical breaking. The breaking produce a torque in a direction to oppose the motion. The steady - state operation is obtained at a speed for which breaking torque equals the load torque. The mechanical breaking has a number of dis-advantages , frequent maintenance and replace-ment of breaking shoes, lower life and energy wasted in heat. These disadvantages overcome by the use of electrical breaking in which motor is made to work as a generator, converting mechanical power into electrical energy, producing counter torque in a direction oppose the motion. This type of breaking called 'regenerative breaking'.

Features:

Motor : DC separately excited motor mounted upon iron frame with active load in form of fly wheel (1H.P.)

DC source : DC source having power rectifier with smoothing filter, capacitor(high ripple rated)

Drive circuit : Chopper (quad A) drive based upon mosfet (600V/80A) and Second chopper (quad B) drive based upon mosfet (600V/80A) or same rated IGBT with snubber circuit.

Duty cycle : One chopper at 10-90% and other having proportional to speed to regenerate constant power(close loop)

Switches : Two to operate motoring (mode A) or breaking (mode B)

Free wheeling Diode : Two 1200V/16A

Indicator : Overload protection

Load : Lamp 3x100W

Display : Four separate for volt (V),current (I) ,RPM(N), regenerated voltage (E)

Diagram : Screen printed

Patch cords : Necessary to perform expt. Supplied along with main power cord

EXPERIMENT COVERED

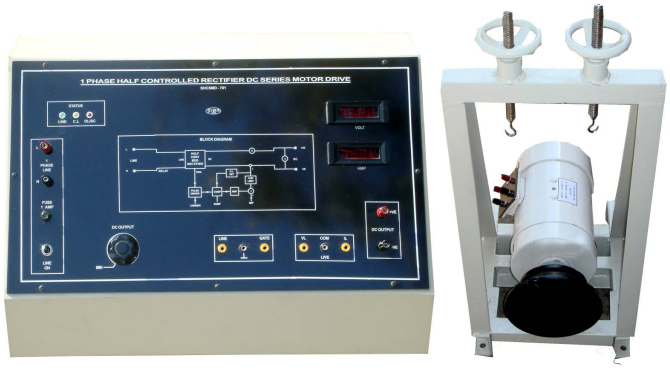
Regenerating and Breaking of DC motor using two Quadrant chopper with active load and to draw negative speed torque curve

Photographs are for reference only final product may vary from it

MANFACTURED BY:
SATISH BROTHERS
#4309/20,Marble house,Punjabi Mohalla,
Ambala Cantt -133001(hry.)
Tel: 0171-2642617,4008617
E-mail: info@sibaindia.com

AUTH. DEALER

SED2107
SINGLE PHASE HALF CONTROLLED BRIDGE RECTIFIER FED DC SERIES MOTOR



INTRODUCTION:

System employed for motion control in industrial or domestic applications like transportation, rolling mills, textile mills, pumps, fans etc are called drives. Such drives employing electric motors are known as electrical drives. The electrical drives has advantage of control over wide range of speed- torque characteristics and can be designed to meet wide range of power. Due to use of power semiconductors such as thyristors, IGBTs, power mosfets, GTOs these have high efficiency and can be employed in any environment. In present electrical drive, speed of a dc series motor is controlled by full controlled thyristor bridge converter.

Features:

Motor : DC series motor mounted upon iron frame with brake & pulley arrangement (1H.P.)

Drive circuit : Single phase half controlled bridge converter comprising of SCR (1600V/16A),

Firing scheme : Ramp & comparator firing angle control scheme

Isolation : Pulse isolation using high frequency carrier pulse transformers.

Switch : One to convert Open/Close loop drive Cos α(90 to 60 degree)

Free wheeling Diode : One 1200V/16A

Display : Digital display for volt & current

Short circuit Protection : In built

Observation : Sockets provided for control circuit (min. 3 observation points), load output voltage & current CRO

Indicator : Overload ,current limit & line

Circuit Diagram : Screen printed

Patch cords : Necessary to perform expt. Supplied along with main power cord.

EXPERIMENT COVERED

To obtain speed torque characteristics of 1 H.P DC series motor in open/close loop using single phase half controlled bridge rectifier

To observe current & voltage waveform at different firing angles.

Photographs are for reference only final product may vary from it

AUTH. DEALER

MANFACTURED BY:

SATISH BROTHERS

#4309/20,Marble house,Punjabi Mohalla,
Ambala Cantt -133001(hry.)
Tel: 0171-2642617,4008617
E-mail: info@sibaindia.com

SED2108

TO CONTROL SPEED OF FHP SYNCHRONOUS MOTOR USING 3 PHASE CYCLOCONVERTER

INTRODUCTION:

The given drive works upon live ac source which provide ac supplies to the fractional H.P synchronous motor through converters configurrated as half bridge cycloconverter. The complete system is block printed upon the panel. The frequency control is made continuously variable from > 25Hz down to 6 Hz approx to understand drive principle.Here an oscillator generates three low frequency reference signals A,B,C which are 120^0 displaced from each other. These reference signal are compared with cosine modulating signals derived from three step down transformers. Each comparator gives an output which has position modulated with reference input.

Features:

Motor : Salient pole three phase fractional H.P. (60W/100V/phase) synchronous motor fitted on insulated frame with speed sensor

Bridge : Three phase half bridge cylcoconverter comprising 18 SCR's (600V/12A) ,

Transformers : Three step down transformers(fractional KVA) in star-delta formation.

Frequency Control : Variable potentiometer 6-16hz(< 6 to >16Hz)

Modulation Control : Cosine wave

Circuitry : Based on precision comparators.

Pulse Gating : High frequency carrier gated pulse isolation for thyristors.

Reference Signal : Three low frequency reference signals (sine) generator.

Display : Digital display for speed

Observation : Sockets provided for reference wave, output voltage & current for study on CRO(isolated & attenuated)

Circuit Diagram : Screen printed

Patch cords : Necessary to perform expt. Supplied along with main power cord

EXPERIMENT COVERED

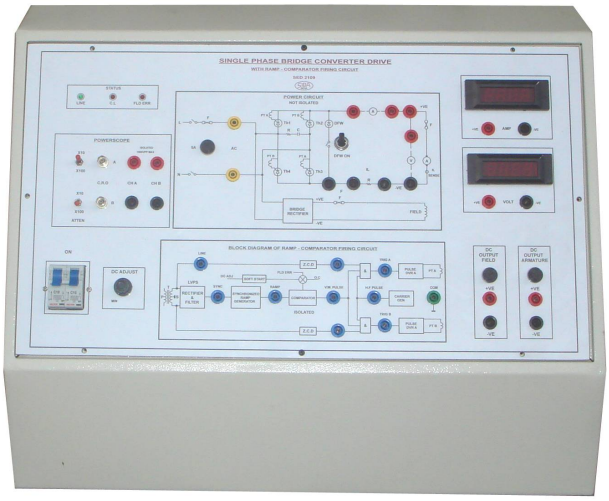
To control speed of FHP synchronous motor using 3 phase cycloconverter
To observe voltage & current waveforms of three phase cylcoconverter.

Photographs are for reference only final product may vary from it

MANFACTURED BY:
SATISH BROTHERS
#4309/20,Marble house,Punjabi Mohalla,
Ambala Cantt -133001(hry.)
Tel: 0171-2642617,4008617
E-mail: info@sibaindia.com

AUTH. DEALER

SED2109
SINGLE PHASE BRIDGE CONVERTER DRIVE



TECHNICAL SPECIFICATION:

Motor Specification

Type	:DC separately excited motor
Rating	: 1HP
RPM	:1500
SCR Rating	:SCR TYN616, 600V/16A
Diode Rating	:6A10, 1000V/6A
Firing Angle Control	:30° to 180°

Meters Used

DC Voltmeter	:300VDC digital
Ammeter	:5A digital
Single Phase MCB	: DP 32A

FEATURES:

Provided with DC Motor

Single Phase low voltage Supply for gate circuit

Single Phase Firing Circuit provided with pulse isolation

Test terminals provided to analyze the waveforms

Designed by considering all the safety precautions

Diagrammatic representation of circuits

Fully isolated & Attenuated observation points for observation on conventional CRO.

Ramp comparator firing circuit with observation points at each block output

EXPERIMENT COVERED

Study of Ramp Comparator firing circuit for drive

Study of single phase bridge converter drive

Photographs are for reference only final product may vary from it

MANFACTURED BY:

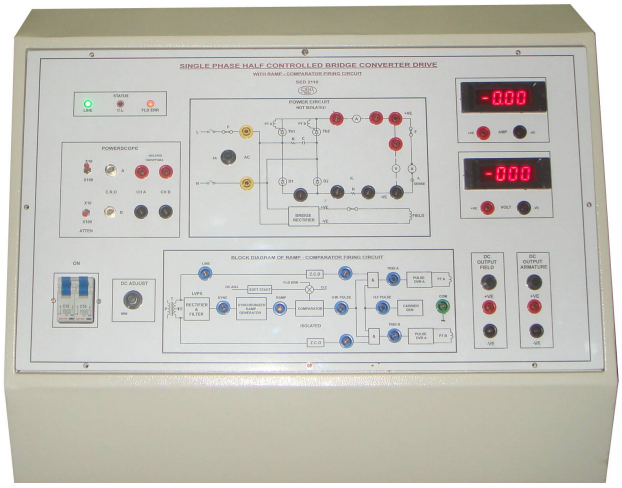
SATISH BROTHERS

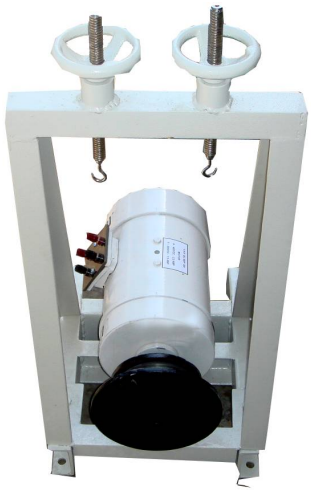
#4309/20,Marble house,Punjabi Mohalla,
Ambala Cantt -133001(hry.)
Tel: 0171-2642617,4008617
E-mail: info@sibaindia.com

AUTH. DEALER

SED2110

SINGLE PHASE HALF CONTROLLED BRIDGE CONVERTER DRIVE





TECHNICAL SPECIFICATION:

Motor Specification

Type	:DC Shunt Motor
Rating	: 1HP
RPM	:1500
SCR Rating	:SCR TYN616, 600V 16A
Diode Rating	:6A10, 1000V/6A
Firing Angle	
Control	:30° to 180°

Meter Used

DC Voltmeter	:300VDC
Ammeter	: 5ASingle Phase
MCB	:2A (SPN)

FEATURES:

Provided with DC Motor

Single Phase low voltage Supply for gate circuit

Single Phase Firing Circuit provided with pulse isolation

Test terminals provided to analyze the waveforms

Designed by considering all the safety precautions

Diagrammatic representation of circuits

Fully isolated & Attenuated observation points for observation on conventional CRO.

Ramp comparator firing circuit with observation points at each block output

EXPERIMENT COVERED

Study of Ramp Comparator firing circuit for drive

Study of single phase half converter drive

Photographs are for reference only final product may vary from it

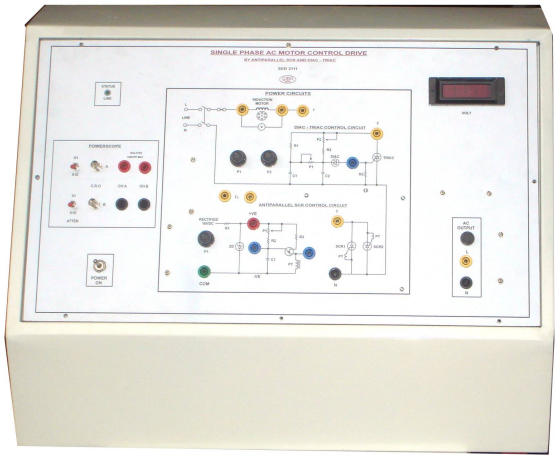
AUTH. DEALER

MANFACTURED BY:

SATISH BROTHERS

#4309/20,Marble house,Punjabi Mohalla,
Ambala Cantt -133001(hry.)
Tel: 0171-2642617,4008617
E-mail: info@sibaindia.com

SED2111
SINGLE PHASE AC MOTOR CONTROL DRIVE BY ANTI PARALLEL SCR & DIAC TRIAC



TECHNICAL SPECIFICATION:

Machine Type	:Single phase Squirrel Cage Induction Motor
Rated Power	:0.25HP
Rated Voltage	: 220V AC
MachineType	:Single phase induction capacitor run motor
SCR Rating	:SCR TYN616, 600V/16A
TRIAC Rating	:BT139, 600V/10A
DIAC Rating	:Db3
Firing Angle Control	:30° to 150°
Meters Used	
AC Voltmeter	:Digital
MCB	:DP 32A

FEATURES:

Test terminals provided to analyze the waveforms

Designed by considering all the safety precautions

Diagrammatic representation of circuits

Isolated UJT trigger circuit with pulse transformer to trigger anti-parallel thyristors.

DIAC-TRIAC phase control circuit with potentiometers

Fully isolated & Attenuated observation points for observation on conventional CRO.

Ramp comparator firing circuit with observation points at each block output

EXPERIMENT COVERED

Study of 1 phase AC motor control drive by antiparallel SCR

Study of 1 phase AC motor control drive by DIAC-TRIAC configuration.

Photographs are for reference only final product may vary from it

MANFACTURED BY:

SATISH BROTHERS

#4309/20,Marble house,Punjabi Mohalla,
Ambala Cantt -133001(hry.)
Tel: 0171-2642617,4008617
E-mail: info@sibaindia.com

AUTH. DEALER

SED2113

SPEED TORQUE CHARACTERISTICS OF SEPARATELY EXCITED DC SERIES MOTOR USING CHOPPER

INTRODUCTION:

System employed for motion control in industrial or domestic applications like transportation, rolling mills, textile mills, pumps, fans etc are called drives. Such drives employing electric motors are known as electrical drives. The electrical drives has advantage of control over wide range of speed- torque characteristics and can be designed to meet wide range of power. Due to use of power semiconductors such as thyristors, IGBTs, power mosfets,GTOs these have high efficiency and can be employed in any environment. In present electrical drive, speed of a dc series motor is controlled by chopper .

Features:

Motor : DC separately excited motor mounted upon iron frame with brake & pulley arrangement (1H.P.)

Drive circuit : Chopper (quad A)with duty cycle 10-90% drive based upon mosfet (600V/80A) or same rated IGBT with snubber circuit.

Field supply : Unregulated 200V DC

Free wheeling Diode : One 1200V/16A

DC source : DC source having power rectifier with smoothing filter, capacitor(high ripple rated)

Display : Digital display for volt & current

Short circuit Protection : In built

Observation : Sockets provided for gate pulse, load output voltage & current study on CRO.

Indicator : Overload, current limit, field fail & line

Circuit Diagram : Screen printed

Patch cords : Necessary to perform expt. Supplied along with

EXPERIMENT COVERED

To obtain speed torque characteristics of 1 H.P separately DC motor using IGBT/MOSFET(Chopper)

To observe current and voltage waveform at different duty factors

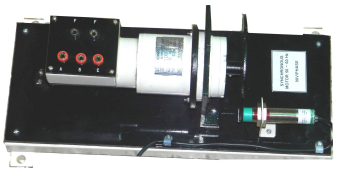
Photographs are for reference only final product may vary from it

MANFACTURED BY:
SATISH BROTHERS
#4309/20,Marble house,Punjabi Mohalla,
Ambala Cantt -133001(hry.)
Tel: 0171-2642617,4008617
E-mail: info@sibaindia.com

AUTH. DEALER

SED2114

SINGLE PHASE VSI INVERTER FED FHP INDUCTION MOTOR DRIVE



INTRODUCTION:

The V.S.I. (voltage source inverter) drive is one method to obtain the variable frequency voltage to control speed/torque of induction motor. The single phase 'cage induction motor' of fraction HP, is used in this application. In these motors to set up the air gap flux, magnetic current must flow, as lagging the voltage by 90^{0}. The movement of the rotation flux across the conductors induces a voltage in the 'short circuited closed cage' rotor winding, hence causing current flow. The interaction of the rotor currents and flux is to produce torque in the same direction as the rotating field. The rotor always rotate at a different speed, r', from the 'synchronous speed' for a given voltage, hence current and torque to be induced in the rotor.

Features:

Motor	: Squirrel cage single phase fractional H.P. (60W/230V) induction motor mounted upon insulated frame
Drive circuit	: Single phase VSI inverter comprising four VMOS fets (600V/8A), with polarized snubbers.
Isolation transformers	: One
Frequency Control	: Variable potentiometer (10-100hz) approx.
Control Circuitry	: Digital to generate control signals for power circuit
Voltage Source	: Variable using controlled rectification for constant V/F ratio.
Display	: Digital display for speed & voltage .
Observation	: Sockets provided for reference signals, drive signal, output voltage & current for study on CRO.
Diagram	: Screen printed
Patch cords	: Necessary to perform expt. Supplied along with main power cord

EXPERIMENT COVERED

Speed control characteristics of Single phase VSI inverter fed FHP induction motor drive and to observe current and voltage waveform at different frequency.

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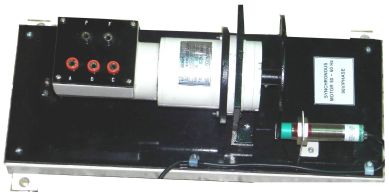
MANFACTURED BY:
SATISH BROTHERS
#4309/20,Marble house,Punjabi Mohalla,
Ambala Cantt -133001(hry.)
Tel: 0171-2642617,4008617
E-mail: info@sibaindia.com

AUTH. DEALER

SED2115

SINGLE PHASE CSI INVERTER FED FHP INDUCTION MOTOR DRIVE



INTRODUCTION:

The C.S.I. (current source inverter) drive is one method to obtain the variable frequency voltage to control speed/torque of induction motor The single phase 'cage induction motor' of fraction HP, is used in this application. In these motors to set up the air gap flux, magnetic current must flow, as lagging the voltage by 90^0. The movement of the rotation flux across the conductors induces a voltage in the 'short circuited closed cage' rotor winding, hence causing current flow. The interaction of the rotor currents and flux is to produce torque in the same direction as the rotating field. The rotor always rotate at a different speed, r', from the 'synchronous speed' for a given voltage, hence current and torque to be induced in the rotor.

Features:

Motor : Squirrel cage single phase fractional H.P. (60W/230V) induction motor mounted upon insulated frame

Drive circuit : Single phase CSI inverter comprising four VMOS fets (600V/8A), with polarized snubbers.

Isolation transformers : One

Frequency Control : Variable potentiometer (10-100hz) approx.

Control Circuitry : Digital to generate control signals for power circuit

Current source : Variable chopper controlled with inductor

Display : Digital display for speed & current .

Observation : Sockets provided for reference signals, drive signal, output voltage & current for study on CRO.

Diagram : Screen printed

Patch cords : Necessary to perform expt. Supplied along with main power cord

EXPERIMENT COVERED

Speed control characteristics of Single phase CSI inverter fed FHP induction motor drive and to observe current and voltage waveform at different frequency.

Photographs are for reference only final product may vary from it

MANFACTURED BY:
SATISH BROTHERS
#4309/20,Marble house,Punjabi Mohalla,
Ambala Cantt -133001(hry.)
Tel: 0171-2642617,4008617
E-mail: info@sibaindia.com

AUTH. DEALER

SED2116

HALF WAVE CYCLCOCONVERTER FED THREE PHASE INDUCTION MOTOR

INTRODUCTION:

The given drive works upon live ac source which provide ac supplies to the fractional H.P synchronous motor through converters configurated as half bridge cycloconverter. The complete system is block printed upon the panel. The frequency control is made continuously variable from > 16Hz down to 6 Hz approx to understand drive principle. Here an oscillator generates three low frequency reference signals A,B,C which are 120^0 displaced from each other. These reference signal are compared with cosine modulating signals derived from three step down transformers. Each comparator gives an output which has position modulated with reference input.

Features:

Motor : Squirrel cage three phase fractional H.P. (60W/230V) induction motor mounted upon insulated frame with brake & pulley arrangement fitted on insulated board with speed sensor.

Bridge : Three phase half bridge cylcoconverter comprising 18 SCR's (600V/12A) ,

Transformers : Three step down transformers(fractional KVA) in star-delta formation.

Frequency Control : Variable potentiometer (6-16hz)approx.

Modulation Control : Cosine wave

Circuitry : Based on precision comparators.

Pulse Gating : High frequency carrier gated pulse isolation for thyristors.

Reference Signal : Three low frequency reference signals (sine) generator.

Display : Digital display for speed

Observation : Sockets provided for reference wave, output voltage & current for study on CRO(isolated & attenuated).

Circuit Diagram : Screen printed

Patch cords : Necessary to perform expt. Supplied along with main power cord

EXPERIMENT COVERED

To study speed torque characteristics of FHP three phase induction motor using 3 phase half wave cycloconverter.

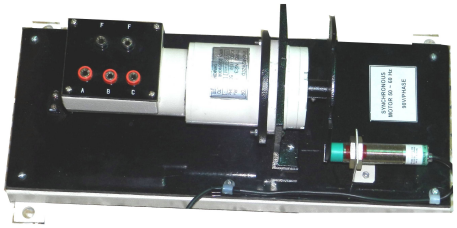
Photographs are for reference only final product may vary from it

MANFACTURED BY:
SATISH BROTHERS
#4309/20,Marble house,Punjabi Mohalla,
Ambala Cantt -133001(hry.)
Tel: 0171-2642617,4008617
E-mail: info@sibaindia.com

AUTH. DEALER

SED2118

THREE PHASE CSI INVERTER FED FHP SYNCHRONOUS MOTOR DRIVE



INTRODUCTION:

The C.S.I. (voltage source inverter) drive is one method to obtain the variable frequency voltage to control speed/torque of induction motor The three phase 'cage induction motor' of fraction HP, is used in this application. In these motors to set up the air gap flux, magnetic current must flow, as lagging the voltage by 120^0. The movement of the rotation flux across the conductors induces a voltage in the 'short circuited closed cage' rotor winding, hence causing current flow. The interaction of the rotor currents and flux is to produce torque in the same direction as the rotating field. The rotor always rotate at a different speed, r', from the 'synchronous speed' for a given voltage, hence current and torque to be induced in the rotor.

Features:

Motor	: Salient pole three phase FHP (60W/100V/phase) synchronous motor fitted on insulated frame
Drive circuit	: Three phase CSI inverter comprising 6 VMOS fets (600V/8A), with polarized snubbers.
Inductor	: One 600mH/3A
Transformers	: One (fractional KVA) for dc supply
Frequency Control	: Variable potentiometer (10-100hz) approx .
Control Circuitry	: Digital to generate three 120 degree displaced reference signals for power circuit
Current source	: Variable using controlled rectification for constant current
Display	: Digital display for speed
Observation	: Sockets provided for reference signals, drive signal, output voltage & current for study on CRO.
Diagram	: Screen printed
Patch cords	: Necessary to perform expt. Supplied along with main power cord

EXPERIMENT COVERED

Speed control characteristics of Three phase CSI inverter fed FHP synchronous motor drive and to observe current and voltage waveform at different frequency.

Photographs are for reference only final product may vary from it

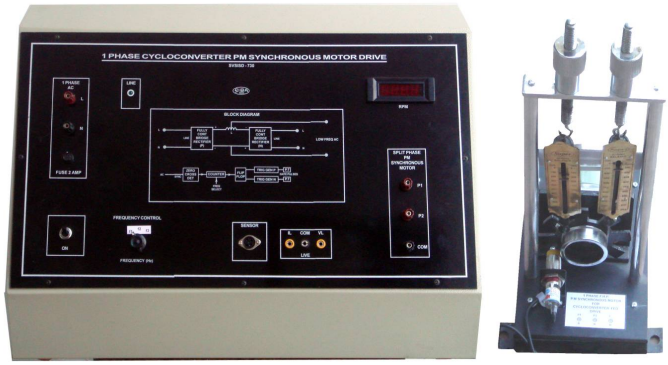
AUTH. DEALER

MANFACTURED BY:
SATISH BROTHERS
#4309/20,Marble house,Punjabi Mohalla,
Ambala Cantt -133001(hry.)
Tel: 0171-2642617,4008617
E-mail: info@sibaindia.com

SED2119

SINGLE PHASE CYLCOCONVERTER PM SYNCHRONOUS MOTOR

(SELF CONTORLLED SYNCHRONOUS MOTOR DRIVE)



INTRODUCTION:

The given drive works upon live ac source which provide ac supplies to the fractional H.P PM synchronous motor through dual converter configurated as bridge cycloconverter. The complete system is block printed upon the panel. The mode control selector which select the frequency f1, f2 and f3, as fundamental, half of it f/2 and half of f/2 equal to f/4. This way a comparison can be made between freq and torque.A cycloconverter oftenly called as 'cycle converter' changes the frequency of a single (or three phase) alternating power source without an intermediate ac to dc conversion stage. A cycloconverter require multiple control device of a single or three phase excitation, and are limited to low output frequency only.

Features:

Motor : Single phase fractional H.P. permanent magnet (60W/220V/60RPM/50Hz) synchronous motor fitted on insulated frame with brake & pulley arrangement fitted with speed sensor.

Bridge : Single phase full bridge cylcoconverter comprising 8 SCR's (600V/12A) ,

Transformers : Step down transformer (fractional KVA)

Frequency Control : 1/2,1/3,1/4

Control Circuitry : Based on microcontroller

Pulse Gating : High frequency carrier gated pulse isolation for thyristors.

Display : Digital display for speed

Observation : Sockets provided for reference wave, output voltage & current for study on CRO.

Circuit Diagram : Screen printed

Patch cords : Necessary to perform expt. Supplied along with main power cord

EXPERIMENT COVERED

To study speed torque characteristics of FHP single phase PM type synchronous motor using single phase full wave bridge cycloconverter.

Photographs are for reference only final product may vary from it

MANFACTURED BY:

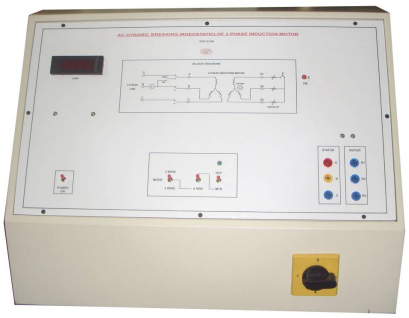
SATISH BROTHERS

#4309/20,Marble house,Punjabi Mohalla,
Ambala Cantt -133001(hry.)
Tel: 0171-2642617,4008617
E-mail: info@sibaindia.com

AUTH. DEALER

SED2120

AC DYNAMIC BRAKING(RHEOSTATIC) of 3-PHASE INDUCTION MOTOR



INTRODUCTION:

Acceleration / deacceleration of dc motor required to meet the speed / torque demand or steady - state operation. The acceleration demand is fulfilled with controlled drives (in most case close - loop), and deacceleration complied with electrical or mechanical breaking. The breaking produce a torque in a direction to oppose the motion. The steady - state operation is obtained at a speed for which breaking torque equals the load torque. The mechanical breaking has a number of dis-advantages , frequent maintenance and replace-ment of breaking shoes, lower life and energy wasted in heat. These disadvantages overcome by the use of electrical breaking in which motor is made to work as a generator, converting mechanical power into electrical energy, producing counter torque in a direction oppose the motion. This type of breaking called 'regenerative breaking'.

Features:

Motor : Three phase slip ring induction motor fitted upon channel with flywheel

Motoring & Breaking : Using two keys ,six relays

Breaking in single & two wire system

Starter : Rheostatic (4 steps) to run & breaking of motor

Display : one for current

Circuit Diagram : Screen printed

Patch cords : Necessary to perform expt. Supplied along with main power cord

EXPERIMENT COVERED

AC DYNAMIC BRAKING(RHEOTSTAIC) of 3-PHASE INDUCTION MOTOR
One wire breaking system
Two wire breaking system

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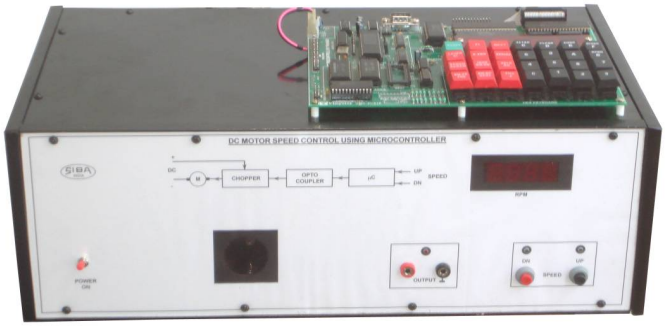
AUTH. DEALER

MANFACTURED BY:
SATISH BROTHERS
#4309/20,Marble house,Punjabi Mohalla,
Ambala Cantt -133001(hry.)
Tel: 0171-2642617,4008617
E-mail: info@sibaindia.com

SED2121

SPEED CONTROL OF UNIVRESAL MOTOR USING MICROCONTROLLER



INTRODUCTION:

The power control circuitry is given upon the front (top) panel and sockets are given to observe the motor voltage and current waveforms. Since it is a line operated unit thus isolation is provided by small transformer at the observation points. This demonstration unit use the small universal motor 220V, rated 60W .

Features:

Motor : Universal motor fractional HP(60W)

Triac : One in power circuit to control motor voltage

Interface : Through Microcontroller kit via FRC (connected with port of mC kit) and 9 pin din socket with kit.

Speed Control : Through up-down keys

Triggering : In synchronism of input frequency.

Pulse transformer : One (1:1) for isolation

Display : LCD for speed & voltage

Power supply: Short circuit & overload protected

Mains : 230V/50Hz AC

Instruction manual : One

Observation : Sockets provided for sync & gate pulse(B)

Patch cords : Necessary to perform expt. Supplied along with main power cord

EXPERIMENT COVERED

Speed control of Universal Motor using Microcontroller

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MANFACTURED BY:
SATISH BROTHERS
#4309/20,Marble house,Punjabi Mohalla,
Ambala Cantt -133001(hry.)
Tel: 0171-2642617,4008617
E-mail: info@sibaindia.com

AUTH. DEALER