SECOM

Power Electronic Equipment & Components

: :

SECOMDrive
Low Voltage Drives

Index of contents

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Power Electronic Equipment & Components

Designed for industrial application System Overview

✓ Modular design and easy withdrawable wheeled modules, Rectifiers and Inverters sizes are designed with up to 8 base units in parallel connection;

✓ Minimized spare parts number;

✓ Easy maintenance and modules replacement;

✓ The inverters could be combined with DC-link AC/DC Rectifiers (capacity up to 9000Adc) according to applications:

- FULLY REGENERATIVE (AFE + F3E)

- PARTIALLY REGENERATIVE (DFE + F3E)

- UNIDIRECTIONAL (DFE)

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System Overview

- ✓ SECOM provides a new universal control system for its inverters completely developed in house.

- ✓ Focused on industrial application, SD CONTROL currently covers a wide range of control strategies for induction motors, regenerative frontend, grid application and much more.

- ✓ The fiber optic connection between SD CONTROL and power part simplifies cabling even in the parallelization of converters.

- ✓ The SD MANAGER configuration tool helps the customer to achieve a short commissioning time with a simple parametrization interface
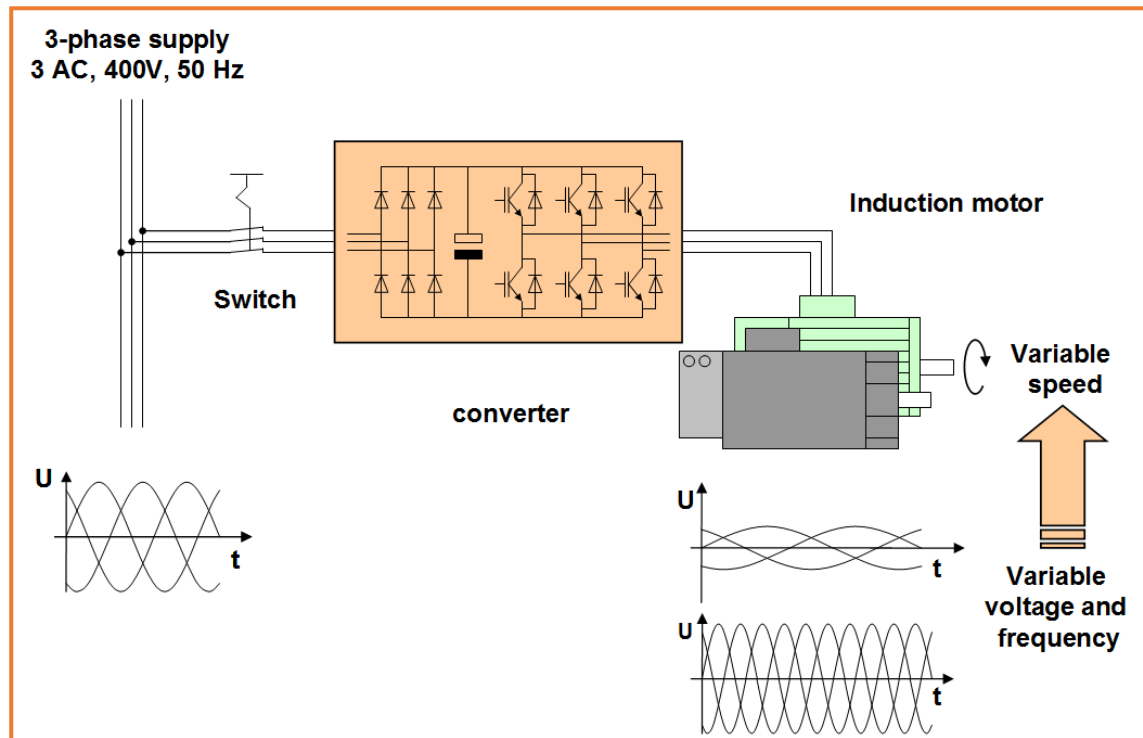

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System Overview

Fieldbus

DCS Automation

Drive

PROCESS
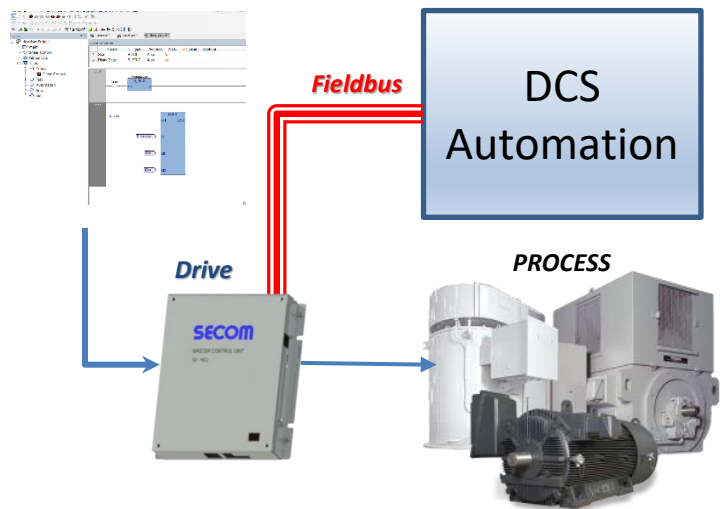
- ✓ Powerful integrated PLC functions in control logic for drive system protections handling, maximum flexibility and easy integration with overriding control system (Level 1 PLC);

- ✓ Different Fieldbus Interfaces CANopen, Modbus TCP and **Profibus slave up to 12Mbps(as option);**

- ✓ Just a fiber optic couple interface between SD-MCU and power modules (speed-up module unit connection);

- ✓ 16 integrated digital inputs and 6 relays outputs;

- ✓ Possibility of I/O terminals expansion thanks to CANOpen master interface;

- ✓ Advanced maintenance, parameterization, monitoring, troubleshooting and signal tracing functionalities;

- ✓ Possibility to use commercial HMIs thanks to Modbus TCP protocol;

- ✓ Remote Teleservice.

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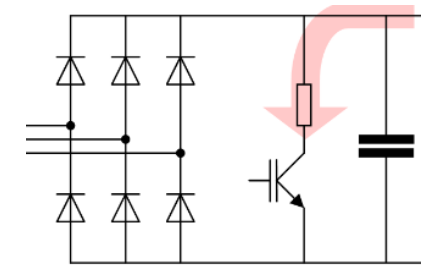Power Electronic Equipment & Components

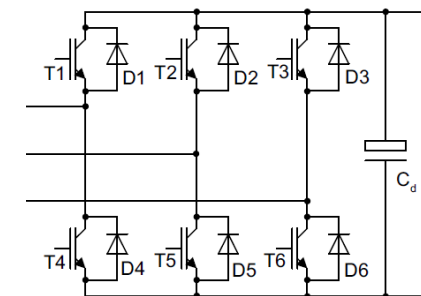# SECOMDrive LV - Solutions

Typical Single Line Diagram

Rectifier Solutions:

- DFE + Braking Chopper (without regeneration)

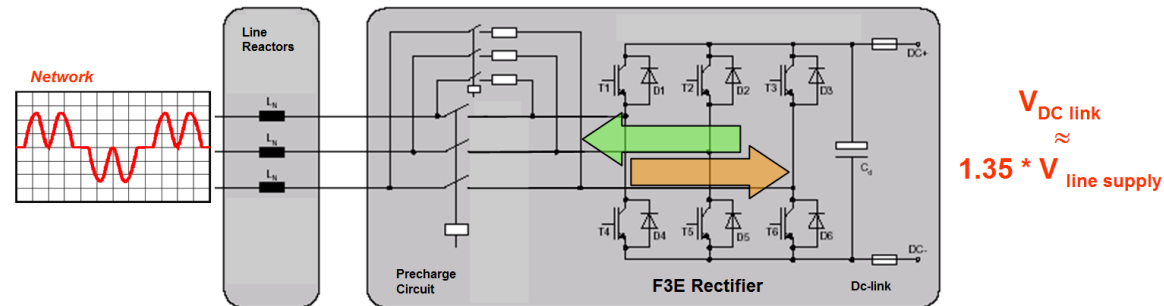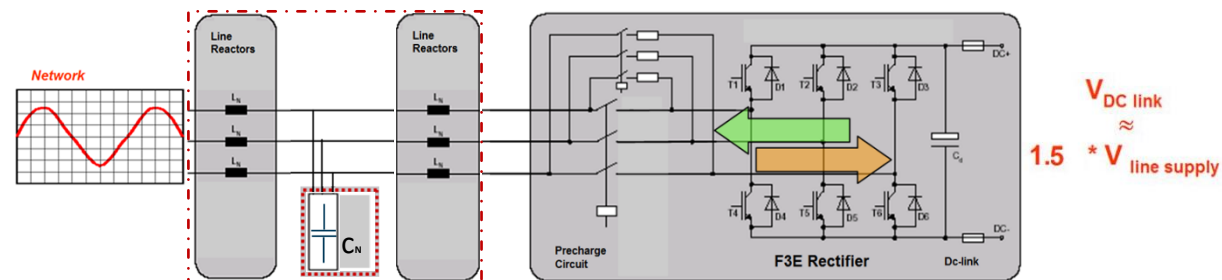- F3E / AFE Rectifier

SECOMDrive LV – DC Link Power Supply

F3E Rectifier Solution

$V_{DC\ link} \approx 1.35 * V_{line\ supply}$

AFE Rectifier + Input Filter Solution

$V_{DC\ link} \approx 1.5 * V_{line\ supply}$

SECOMDrive LV – F3E

Fundamental Frequency front End Converter (F3E)

The F3E is a simple, regulated rectifier / regenerative unit for four-quadrant operation.

It consists of an IGBT inverter, which operates as a line commutated 6-pulse bridge.

In rectifier operation (motor operation) the current flows via the diodes integrated into the IGBT modules from the line supply to the DC link. In regenerative operation the current flows via the IGBTs, which are synchronized at the line frequency, from the DC link to the line supply.

In regenerative operation, when the DC-link voltage reaches a certain value, the IGBTs start to conduct current with the F3E control unit that calculates their correct firing angles, synchronized with supply network voltages.

F3E CONVERTER

AC/DC CONVERTER   DC-LINK CAPACITORS
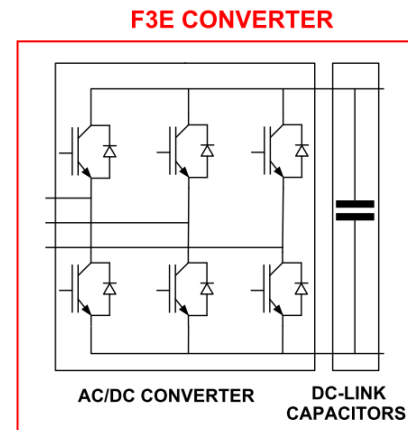
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SECOMDrive LV – Power modules features

DFE / F3E / AFE Rectifiers Solutions are used to supply DC-link

Inverter sections   F3E   Incoming line section
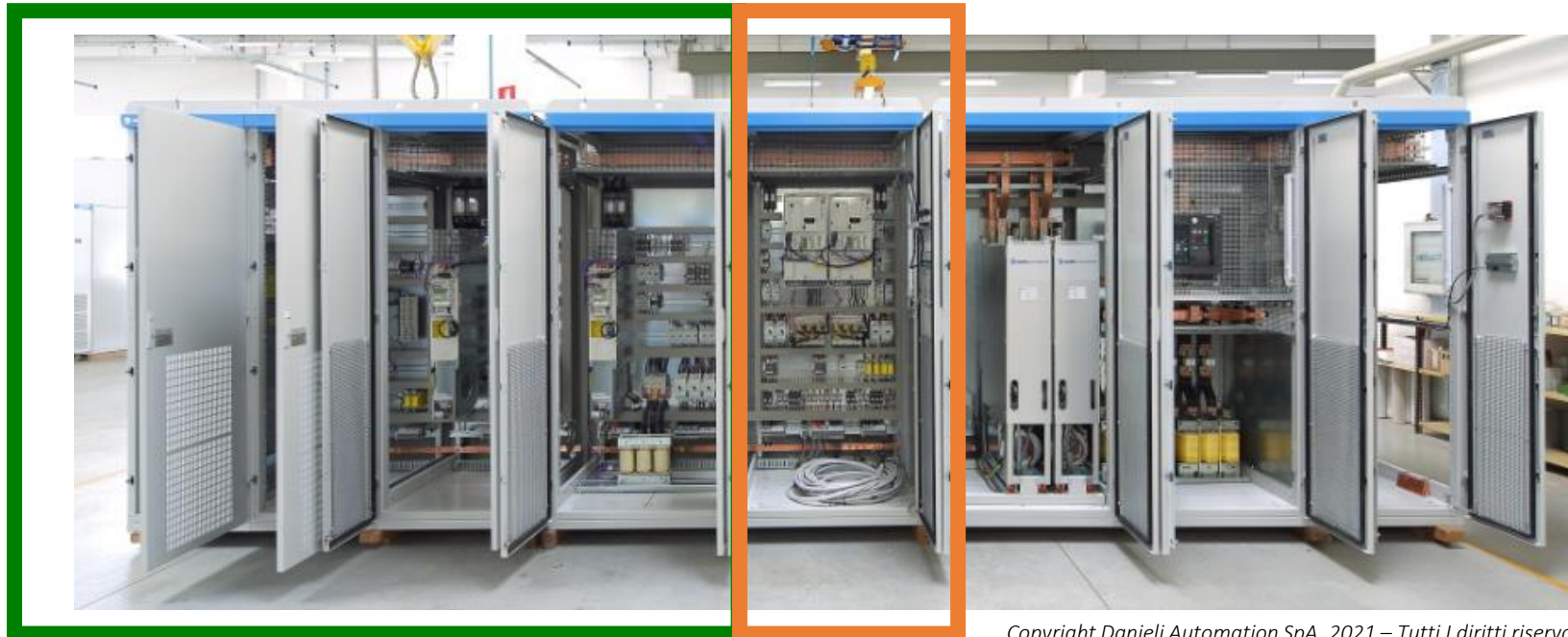
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SECOMDrive LV – Inverter

Inverter modules - Control

- Scalar Control

- Field Oriented Control Sensored

INVERTER

DC-LINK   DC/AC CONVERTER
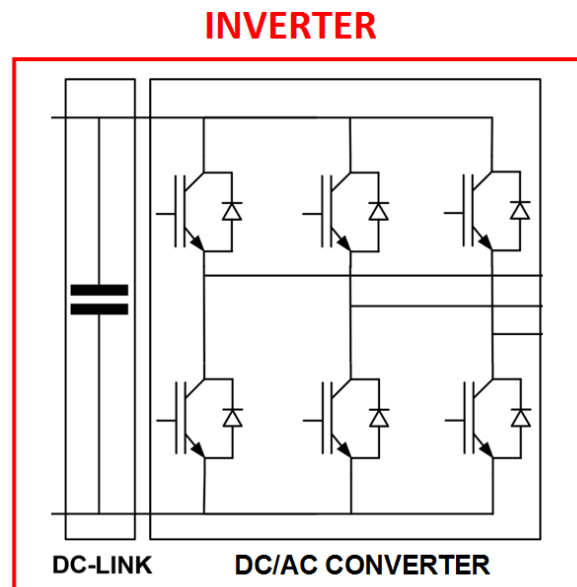
SECOMDrive LV – Wheeled power module Extraction operation
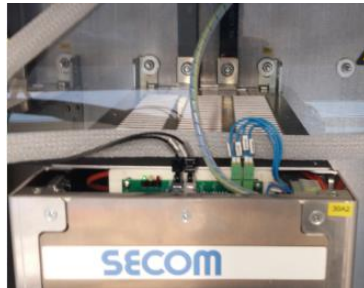
Simple and fast maintenance.

The design of power modules, realized with wheeled frames, allows a fast and easy replacement in about 30 minutes.

Moreover, special tools or lifting device are not necessary for modules substitution.

Minimized components and spare parts number.

SECOMDrive LV – Inverter rating and dimensions

380…690 Vac input voltage SECOMDrive F3E AC/DC Regenerative converters

CODE	A_N	I_N	I_{DC}	I_{HDC}	UNITS
RATED VOLTAGE 380 ÷ 480V	kVA	A	A	A	N.
SDF.2.A.312K.400	312	450	560	431	1
SDF.2.A.402K.400	402	580	722	555	1
SDF.2.A.485K.400	485	700	871	670	1
SDF.2.A.590K.400	590	850	1058	814	1
SDF.2.A.710K.400	710	1020	1269	977	1
SDF.2.A.970K.400	970	1400	1742	1339	2
SDF.2.A.1M18.400	1180	1700	2116	1628	2
SDF.2.A.1M42.400	1420	2040	2539	1954	2
SDF.2.A.1M77.400	1770	2550	3174	2442	3
SDF.2.A.2M13.400	2130	3060	3808	2931	3
SDF.2.A.2M84.400	2840	4080	5078	3908	4
SDF.2.A.3M55.400	3550	5100	6347	4885	5
SDF.2.A.4M26.400	4260	6120	7616	5862	6
SDF.2.A.4M97.400	4970	7140	8886	6839	7
SDF.2.A.5M68.400	5680	8160	10155	7816	8

CODE	A_N	I_N	I_{DC}	I_{HDC}	UNITS
RATED VOLTAGE 500 ÷ 690V	kVA	A	A	A	N.
SDF.2.A.540K.690	540	450	560	431	1
SDF.2.A.695K.690	695	580	722	555	1
SDF.2.A.840K.690	840	700	871	670	1
SDF.2.A.1020K.690	1020	850	1058	814	1
SDF.2.A.1220K.690	1220	1020	1269	977	1
SDF.2.A.1680K.690	1680	1400	1742	1339	2
SDF.2.A.2040K.690	2040	1700	2116	1628	2
SDF.2.A.2440K.690	2440	2040	2539	1954	2
SDF.2.A.3060K.690	3060	2550	3174	2442	3
SDF.2.A.3660K.690	3660	3060	3808	2931	3
SDF.2.A.4880K.690	4880	4080	5078	3908	4
SDF.2.A.6100K.690	6100	5100	6347	4885	5
SDF.2.A.7320K.690	7320	6120	7616	5862	6
SDF.2.A.8540K.690	8540	7140	8886	6839	7
SDF.2.A.9760K.690	9760	8160	10155	7816	8

Base units

Number of converter base units

SECOMDrive LV – Inverter rating and dimensions

380...690 Vac output voltage SECOMDrive DC/AC Inverters

CODE	A_N	I_N	I_{Ld}	I_{Hd}	UNITS
RATED VOLTAGE 380 ÷ 480V	kVA	A	A	A	N.
SDI.2.A.290K.400	290	420	410	330	1
SDI.2.A.350K.400	350	510	500	410	1
SDI.2.A.450K.400	450	650	620	520	1
SDI.2.A.540K.400	540	780	710	580	1
SDI.2.A.620K.400	620	890	865	685	1
SDI.2.A.900K.400	900	1300	1240	1040	2
SDI.2.A.1M08.400	1080	1560	1420	1160	2
SDI.2.A.1M24.400	1240	1780	1730	1370	2
SDI.2.A.1M62.400	1620	2340	2130	1740	3
SDI.2.A.1M86.400	1860	2670	2595	2055	3
SDI.2.A.2M48.400	2480	3560	3460	2740	4
SDI.2.A.3M10.400	3100	4450	4325	3425	5
SDI.2.A.3M72.400	3720	5340	5190	4110	6
SDI.2.A.4M34.400	4340	6230	6055	4795	7
SDI.2.A.4M96.400	4960	7120	6920	5480	8

CODE	A_N	I_N	I_{Ld}	I_{Hd}	UNITS
RATED VOLTAGE 500 ÷ 690V	kVA	A	A	A	N.
SDI.2.A.460K.690	460	390	365	290	1
SDI.2.A.560K.690	560	470	440	370	1
SDI.2.A.710K.690	710	590	550	440	1
SDI.2.A.825K.690	825	690	650	515	1
SDI.2.A.1M00.690	1000	830	780	600	1
SDI.2.A.1M42.690	1420	1180	1100	880	2
SDI.2.A.1M65.690	1650	1380	1300	1030	2
SDI.2.A.2M00.690	2000	1660	1560	1200	2
SDI.2.A.2M47.690	2475	2070	1950	1545	3
SDI.2.A.3M00.690	3000	2490	2340	1800	3
SDI.2.A.4M00.690	4000	3320	3120	2400	4
SDI.2.A.5M00.690	5000	4150	3900	3000	5
SDI.2.A.6M00.690	6000	4980	4680	3600	6
SDI.2.A.7M00.690	7000	5810	5460	4200	7
SDI.2.A.8M00.690	8000	6640	6240	4800	8

Base units

Number of converter base units

SECOMDrive LV – Inverter modularity

The inverter upper sizes are the simple arrangement of inverter base units (up to a maximum of 8 inverter base units in parallel).

The spare parts number is reduced to 10 inverter base units
(5 base units for 400V Inverter series and 5 base sizes for 690V Inverter series).
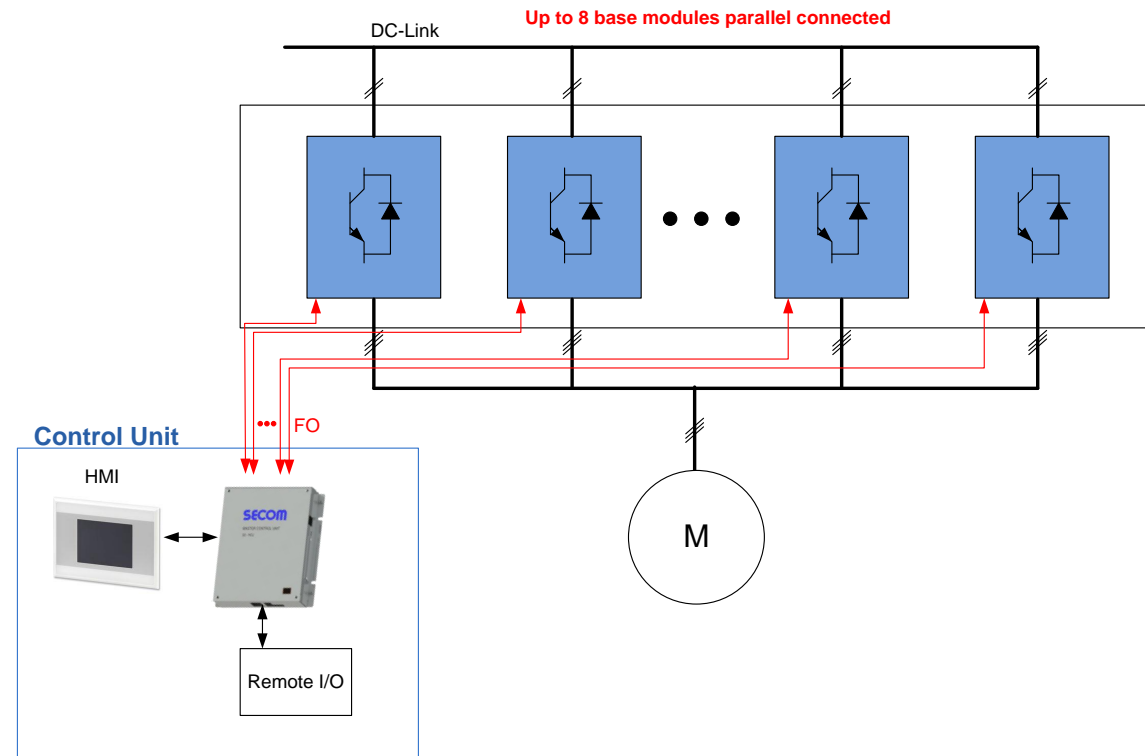
SECOMDrive LV – Switchboard layout

Inverter sections

(Example of Inverters composed of 3 parallel base power units)

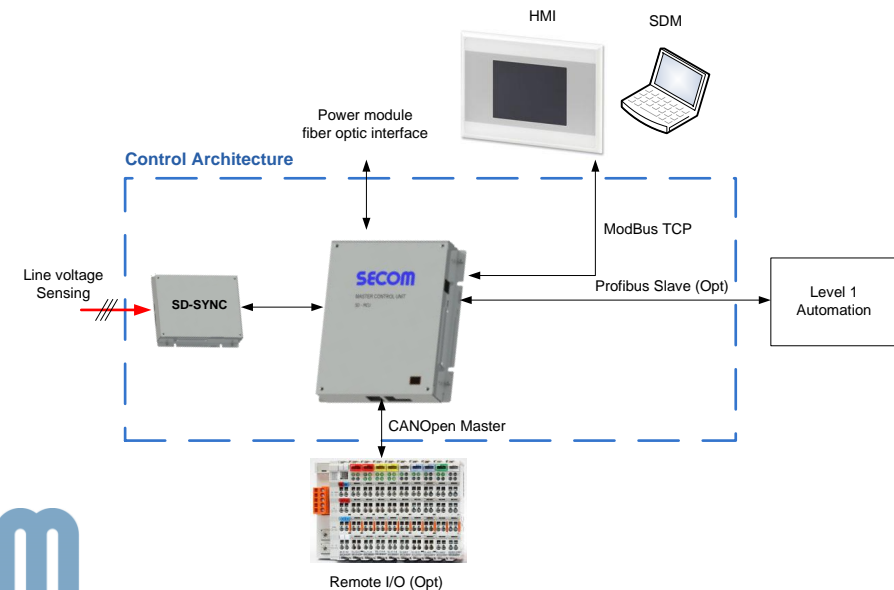Rectifier section   Incoming line section

SECOMDrive LV – Line control architecture and features

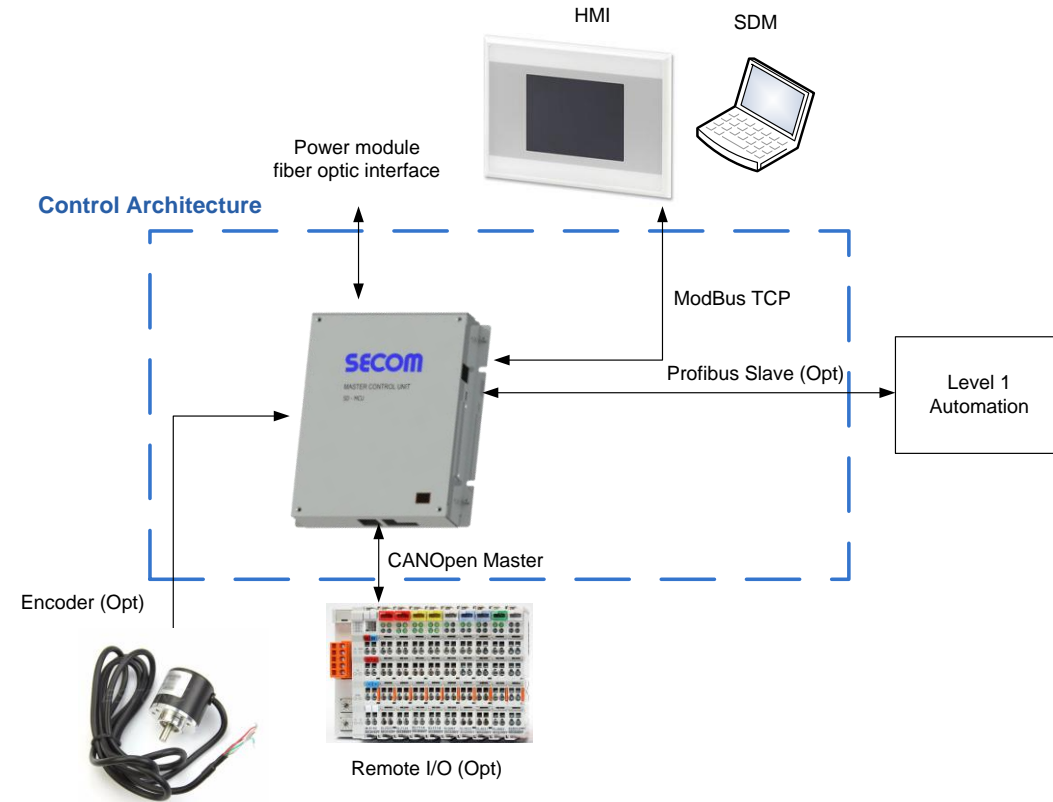| GRID CONTROL HIGHLIGHTS								
Device Options:	Output Voltage sensor	Output LC filter	DC Voltage accuracy	Transient DC Voltage Response	Transient current Response	1° Harmonic Current Accuracy	Active current control	Reactive current control	Grid parallel
AFE	Yes	Option	< 1%	Very fast	Very Fast	< 1%	Yes	Yes	Yes
F3E			-		-	-	-	No	
VAC	Option			-	Very Fast	< 1%	-	-	no

- The SD-MCU allows F3E and AFE control strategies and much more.
- The SD-SYNC (line synchronization board) is used to synchronized the control system to the line voltages.
- No other boards are needed.
- Up to 8 parallel modules can be controlled with the same SD-MCU.

Control Architecture

HMI SDM

Power module fiber optic interface

Line voltage Sensing → SD-SYNC → MASTER CONTROL UNIT SD-MCU

ModBus TCP
Profibus Slave (Opt)
Level 1 Automation

CANOpen Master

Remote I/O (Opt)

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SECOMDrive LV – Motor control architecture

- The SD-MCU also allows a high performance induction motor control.
- To achieve high closed loop control performance it is necessary to use also the encoder board.
- Up to 8 parallel modules can be controlled with the same SD-MCU.
- The maximum output frequency is 500 Hz*

*with a switching frequency of 5 kHz

HMI   SDM

Power module fiber optic interface

Control Architecture

ModBus TCP

Profibus Slave (Opt)

Level 1 Automation

CANOpen Master

Encoder (Opt)

Remote I/O (Opt)

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SECOMDrive LV – Motor control features

MOTOR CONTROL HIGHLIGHTS								
Device Options:		Encoder	Output Voltage sensor	Output LC filter	Transient current Response	1° Harmonic Current Accuracy	Transient Torque response	Speed Accuracy
V/Hz	Scalar	Option	Option	Option	Slow	<1%	Slow	≤1%
	Open Loop		Option					
	Closed Loop		Option		Fast		Fast	
Field Oriented		Yes	Option					< 0.01%

Some Macro Function Control Option												
Function		Flying Restart	Fast Flying Restart	Cold Bypass (Starter)	**Master-follower**	Hot Bypass	Helper (Master-Follower)	Ride Through (kinetic regeneration)	Grid Waiting	Regulator Auto-tuning	Current Brake and/or VdcRollback	Energy Saver
V/Hz	Scalar	Yes	Option (with Voltage out sensor)		No	With additional Voltage out and current sensor	No	No	Yes	Not needed	No	Yes
	Robust											
	Controlled											
Field Oriented					Yes		Yes	Yes	Yes	Yes		

COMMISSIONING - Motor Identification Tests performed				
With motor running	Motor parameter detection	Magnetic curve	No load current	Inertia (Motor + Load)

SECOMDrive LV –Control architecture Multi drive version
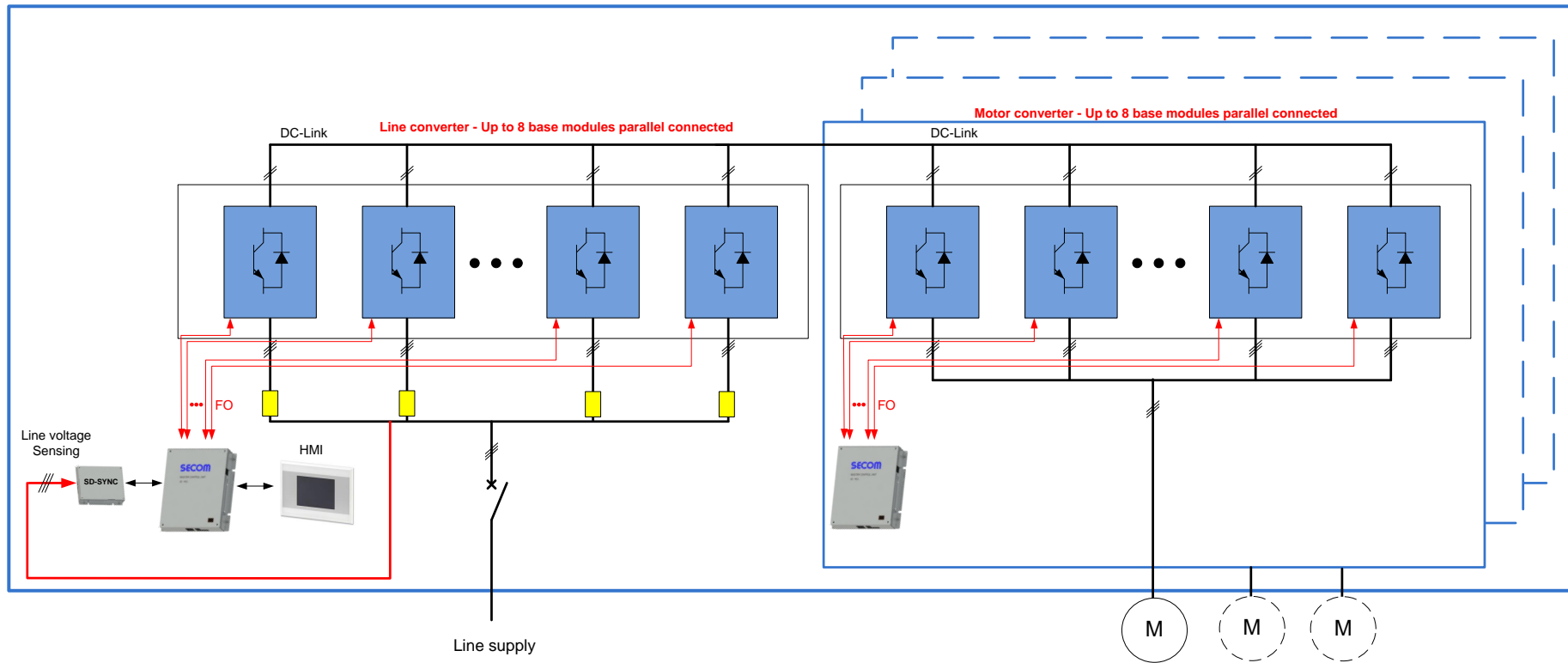
SECOMDrive LV –Commissioning tool

SECOMDrive Manager Tool (SDM)

Each drive control unit could be easily interfaced to a PC using RJ45 cable.

The **SECOMDrive Configurator Tool** is a software application that allows:

- Drive parameterization
- Tuning
- Accurate and fast signals tracing
  (triggering and visualization of
  up to 8 variables)
- Saving / retrieving of drive parameters
- Advanced troubleshooting

SECOMDrive LV –Commissioning tool

SECOMDrive Manager Tool (SDM)

SoftScope allows an accurate and fast signals tracing with triggering functions

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SECOMDrive LV –Commissioning tool

SECOMDrive Manager Tool (SDM)

Faults / Alarms Monitoring and detailed description
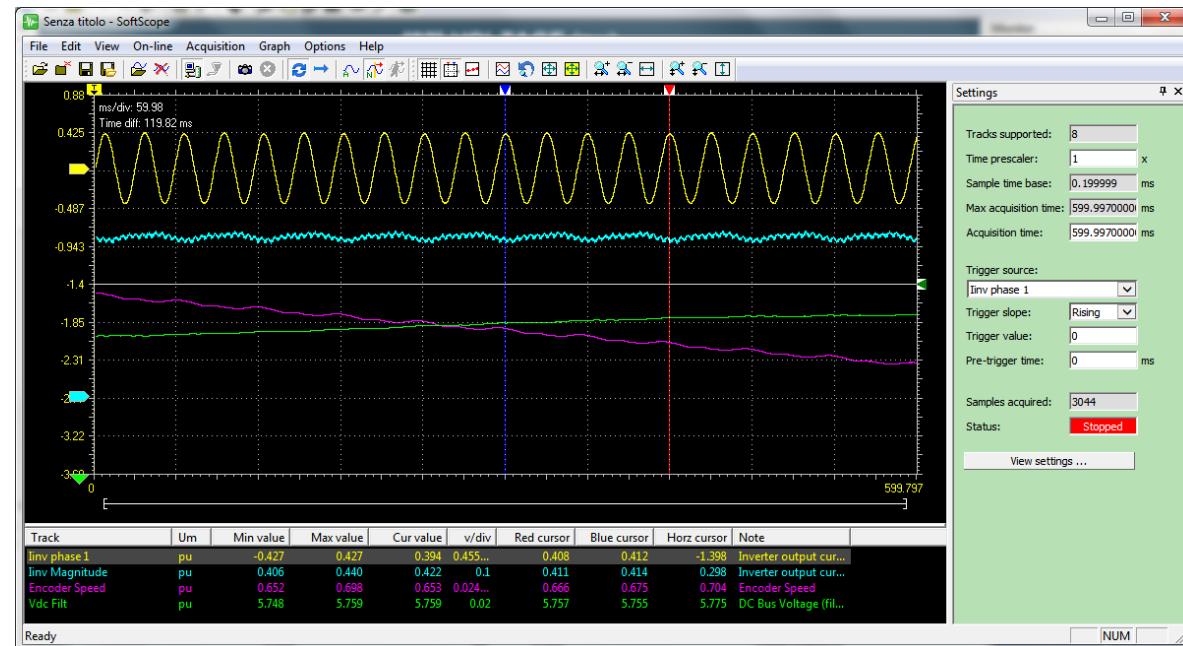
Alarms State

Total number of alarms: 7

Type	ID	Description
First Fault	[5073]	PLC Alarm 1: PLC Alarm actived (customizable)
First Fault	[5074]	PLC Alarm 2: PLC Alarm actived (customizable)
First Fault	[5082]	PLC Alarm 10: PLC Alarm actived (customizable)
Fault	[5058]	Configuration Timeout: Modulator board hasn't been configured on time
Fault	[5083]	PLC Alarm 11: PLC Alarm actived (customizable)
Fault	[5084]	PLC Alarm 12: PLC Alarm actived (customizable)
Fault	[5091]	PLC Alarm 19: PLC Alarm actived (customizable)

Further SDM features:

- Parameter change history log
- Fault/Warning history log
- Firmware download
- Control parameter lock code feature
- Different parameters set load/save

SECOM
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