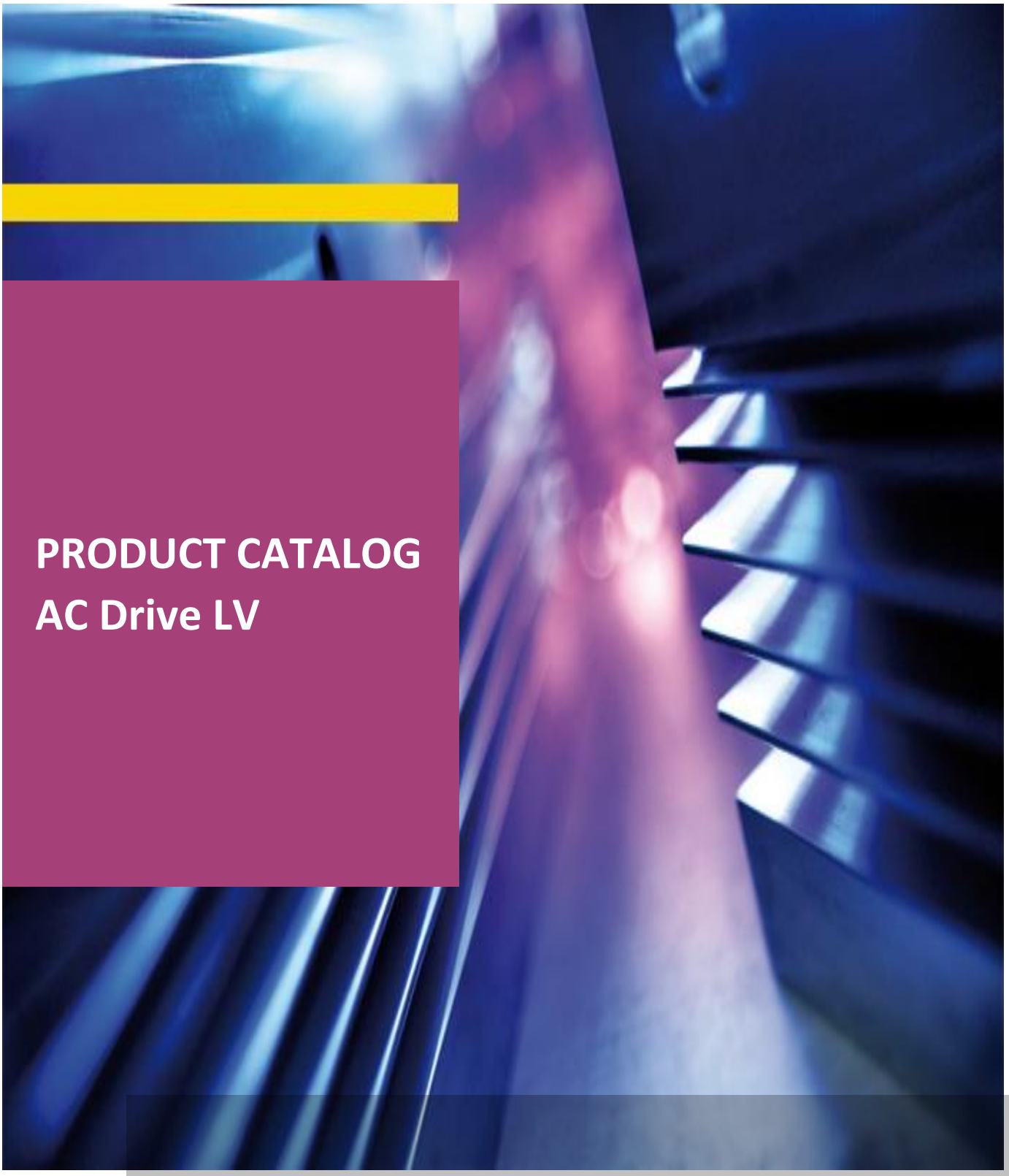
SECOM



PRODUCT CATALOG
AC Drive LV

SECOM DRIVE AND CONVERTER SOLUTION

INDEX

1. OVERVIEW SECOM DRIVE LINE

1.1 LOW VOLTAGE PRODUCT LINE

F3E	AFE	INVERTER	SDS
			
Converter type: Foudamental Front End (Regenerative no control)	Converter type: Active Front End	Converter type: 2 Level IGBT drive AC/DC	Converter type: Inverter stand alone AC/AC
Voltage Range: 380÷480V, 500÷690V	Voltage Range: 380÷480V, 500÷690V	Voltage Range: 380÷480V, 500÷690V	Voltage Range: 380÷480V, 500÷690V
Current Range: 200 ÷ 1020 A (400V) 200 ÷ 1020 A (690V)	Current Range: 141 ÷ 553 A (400V) 141 ÷ 553 A (690V)	Current Range: 159 ÷ 835 A (400V) 155 ÷ 835 A (690V)	Current Range: 159 ÷ 790 A (400V) 159 ÷ 790 A (690V)
Coolyng system: Forced Air (Water cooled on request)	Coolyng system: Forced Air (Water cooled on request)	Coolyng system: Forced Air (Water cooled on request)	Coolyng system: Forced Air (Water cooled on request)
Dimension (WxHxD): F2: 245*1398*650mm F3: 245*830*500mm	Dimension (WxHxD): F2: 245*1398*650mm F3: 245*830*500mm	Dimension (WxHxD): F2: 245*1398*650mm F3: 245*830*500mm	Dimension (WxHxD): F2: 245*1398*650mm F3: 245*830*500mm
Installation type: Inside cabinet	Installation type: Inside cabinet	Installation type: Inside cabinet	Installation type: Inside cabinet

1.2 SYSTEM CONFIGURATION

Secom drive modular system are designed to permit the maximum flexibility and a wide range of configuration.
Secom drive's SD line is composed of a series of converters topologies available in a range of power ratings.
The inverters can combined with DC-link AC/DC Rectifiers according to applications.

GR UNITS:

Secom has developed several converters for AC to DC power conversion:
o Three Phase Diode rectifier
o Three Phase Thyristor Rectifier
o Three Phase Half Bridge Rectifier
o Three Phase Regenerative Converter

The topology of converters differs from wall mounting, withdrawable, IP20 case, open frame, etc.
Each of the above products is available in a wide range of current and voltages ratings that covers the diverse applications of our customers.
In multi drive applications the AC/DC Converter can be used to feed a common DC bus; naturally the Secom drive range is compatible with the classic transformer arrangements to achieve 6 pulses, 12 pulses, 18 or 24 pulses. Where several converters are used on a single transformer winding, line reactors must be used upstream of every converter.
A common DC bus reduces the size and cost of the drive system by using a single set of line components. Furthermore, the rectifier can be sized on the maximum current draw of the system not on the summation of the individual motors; this efficient design has the major results where motoring and generating loads are sharing energy across the DC bus.

F3E unit:

Fundamental frequency front end regenerative unit - SDF
It's a regenerative power module where the AC/DC converter uses diodes inside the IGBT modules, while the IGBTs are used in the regenerative operation.
The rectifier does not permit to control the DC voltage on the DC bus, the line filter is sized on the line frequency with a cost reduction compared with a filter for AFE converter. One more advantage is the reduction of the losses due to the switching of the IGBTs, the THD and the power factor is that of a standard diode bridge. The control unit can control up to 8 parallel modules with the same SD-MCU.

AFE unit:

Active Front End regenerative unit - SDA
In Active Front End (AFE) converters the diode bridge rectifier is replaced by a self-commutated, pulsed rectifier, The rectifier that controls the DC line, operates as an intelligent converter and is controlled and filtered to draw an undistorted sine-shaped current from the mains. The power factor is normally kept equal one. However, the Active Front End rectifier may be used as a phase compensator thus allowing generators to be run at PF=1 (cos ϕ=1) even with a high degree of inductive/capacitive loads connected. This means that a variable frequency converter with Active Front End is supplying the reactive power required in the mains instead of the generator. Active Front End permit a low stressing of the line supply, i.e. extremely low harmonics are fed back into the line supply; the current drawn from the line supply is in the form of sinusoidal current. The voltage distortion from Active Front End is actually below 1 %, which means that the distortion is not visible in the oscilloscope picture, and shows that the AFE is an ideal solution for power users that have to fulfil tough specifications regarding the line supply. The control unit can control up to 8 parallel AFE modules with the same SD-MCU.

Inverter unit:

Inverter unit - SDI

Inverter unit as the F3E and AFE modules have a modular design the sizes are designed with up to 8 base units in parallel connection;

This solution minimized spare parts number and permit an easy maintenance and modules replacement.

Stand alone Inverter unit:

Stand alone unit - SDS

It's an AC/AC converter where the AC/DC converter uses Thyristor/diode modules inside the stack, while the IGBTs are used for motor operation (DC/AC converter).

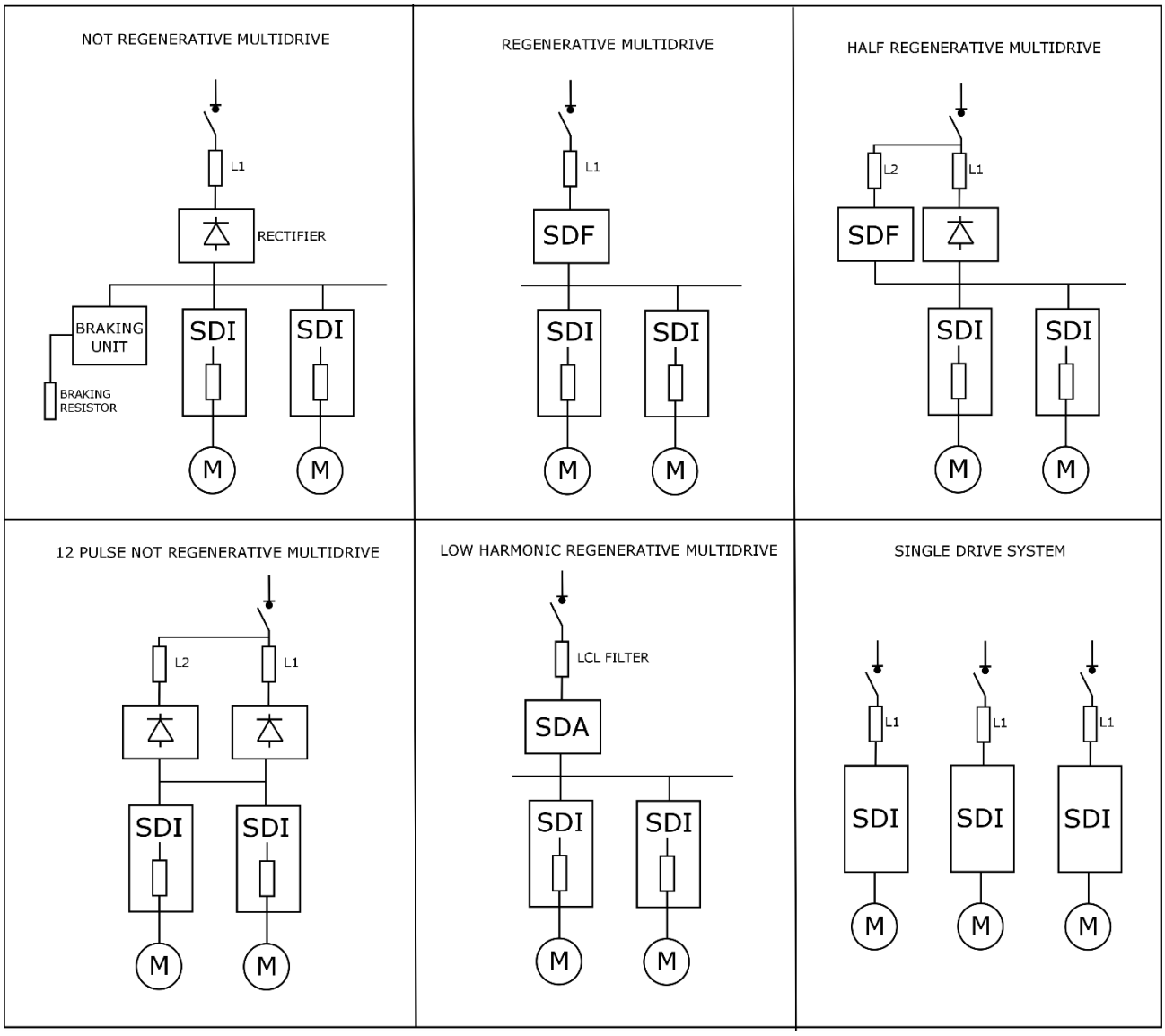
The AC/DC converter is an half controlled bridge in order to control the precharge operation and avoid the external precharge circuit.

It's a compact bookshelf design that can be used for single motor application where a common DC bus is not convenient.

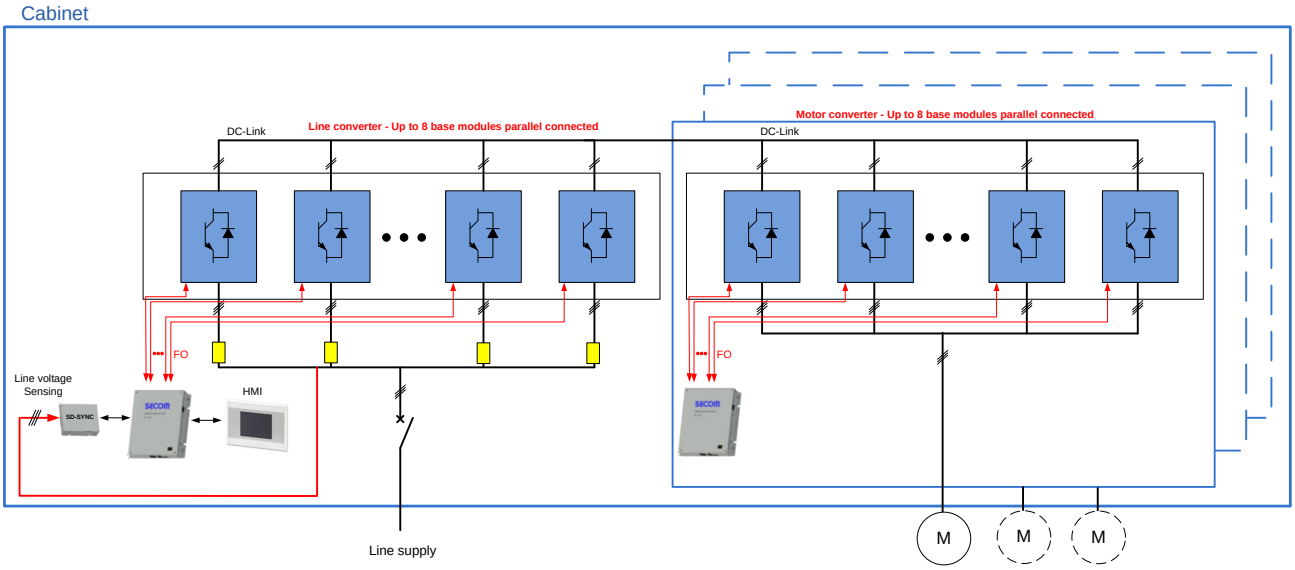
Switching Frequency

Switching frequency available 1,25kHz (rated value), 2,5kHz (AFE), 3,5kHz, 5kHz.

Example of configuration:



1.3 CONTROL SYSTEM ARCHITECTURE



An example of drive configuration is shown here below.

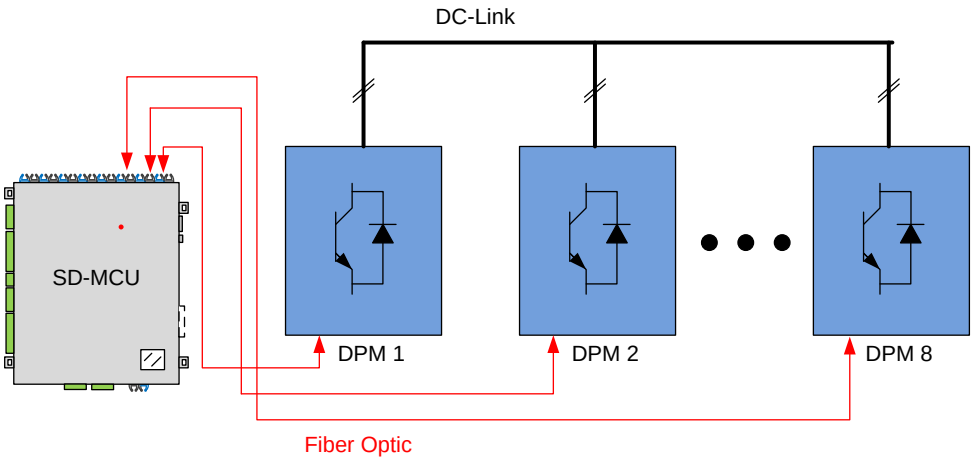
The complete control system is composed by:

SD-MCU: the heart of the system where it is located all the control loops and the interface with other devices.

SD-RMU: this board is located inside the power module and represents the interface between the power module and the SD-MCU.

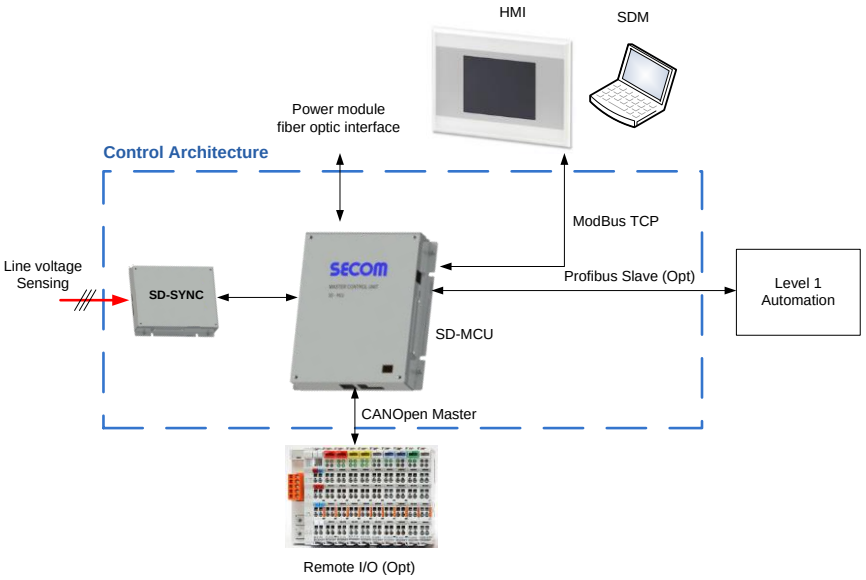
Optional Boards: plugged on the SD-MCU or connected through CANOpen or Modbus-TCP protocols.

SD-MCU communicates with the DPM by means a fiber optic couple (TX and RX) and not drive directly the IGBT commands. The analog and digital signals inside the power module are sent to the SD-MCU.



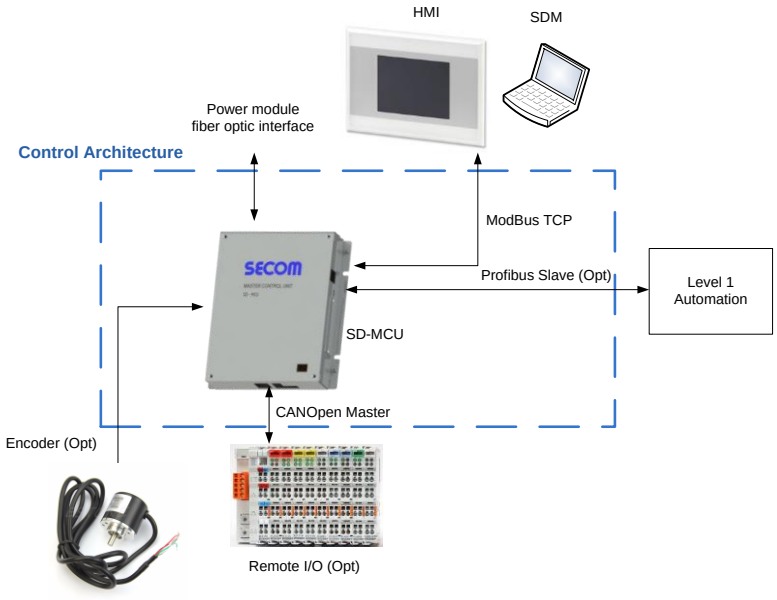
1.4 F3E, AFE ARCHITECTURE:

- SD-MCU
- SD-SYNC
- SD-OP (Opt)
- Profibus slave module (Opt)
- Remote I/O (Opt)



1.5 INVERTER ARCHITECTURE:

- SD-MCU
- Encoder Module (opt)
- SD-OP (Opt)
- Profibus slave module (opt)
- Remote I/O (opt)



2. INVERTER, F3E, AFE POWER MODULES

Electrical Data	**SDI / SDA / SDF**	**SDS**
AC Line input voltage (Vin)	380V ÷ 480V ± 10% 500V ÷ 690V ± 10%	
AC Line ouput voltage (Vout) - first harmonic -	0 ÷ $Vdc_p/\sqrt{2}$ standard mod. (SDI) 0 ÷ $Vdc_p \cdot 0.86$ overmod. (SDI)	0 ÷ Vin standard mod. 0 ÷ Vin·1.2 overmodulation
DC voltage Trip threshold (Vdc_{Trip})	820V for SD*x.x.x.x*.400 1200V for SD*x.x.x.x*.690	
Input frequency range	45 ÷ 65 Hz (SDF, SDA)	45 ÷ 65 Hz
Output frequency range	For motor application: 0 ÷ 500 Hz (@5kHz of switching frequency)	
Interface DPM Power Supply	24Vdc (21V ÷ 27V) @ 2.5 A	
SD-MCU power supply	24Vdc @ 1A without analog supply	
STO	N.2 Channel 24Vdc – 20mA for each channel	
Fan Power Supply	400V ~3AC 50Hz-60Hz	
Mechanical Data	**SDI / SDA / SDF**	**SDS**
Vibration stress	EN 60721-3-3 Class 3M1 compliant, EN 60068-2-6	
Shock	EN 60068-2-27 compliant	
Cooling system	Forced air with internal Fan (water cooled on request)	
Weight	SDI/SDF/SDA/SDS.2 up to 178kg SDI/SDF/SDA/SDS.3 up to 100kg	
Environment Conditions	**SDI / SDA / SDF**	**SDS**
Pollution degree	2	
Relative humidity	Max 95% in normal conditions	
Ambient temperature	0°C ÷ 40°C without derating (40°C ÷ 60°C with derating)	
Altitude installation	Up to 2000m above sea level with no derating (>2000m with derating)	
Safety Function	**SDI / SDA / SDF**	**SDS**
STO	SIL 3 PL e, Category 3	

2.1 SD DESCRIPTION

The SDI range of drives can reach a maximum power of about 8MVA. To reach this power, DC/AC drives must be parallelized and controlled by only one SD-MCU control unit; a parallel converter is a combination of up to eight identical stack modules.
The main features of an SECOM DRIVE are:

- Designed for simple maintenance and use.
- Modular solution to reduce the number of spare parts.
- “Roll out design" to reduce maintenance intervention times for the big stack.
- Compact dimensions with high power density.
- Customizable solutions for any customer need.
- Simple to install and commission.
- Separated control unit with optical fibers interface, coated electronics.
- Tools and the interface software free.
- Operator panel and PC interfaces intuitive and easy to use.
- High quality maintaining a low cost.

Main Control Application

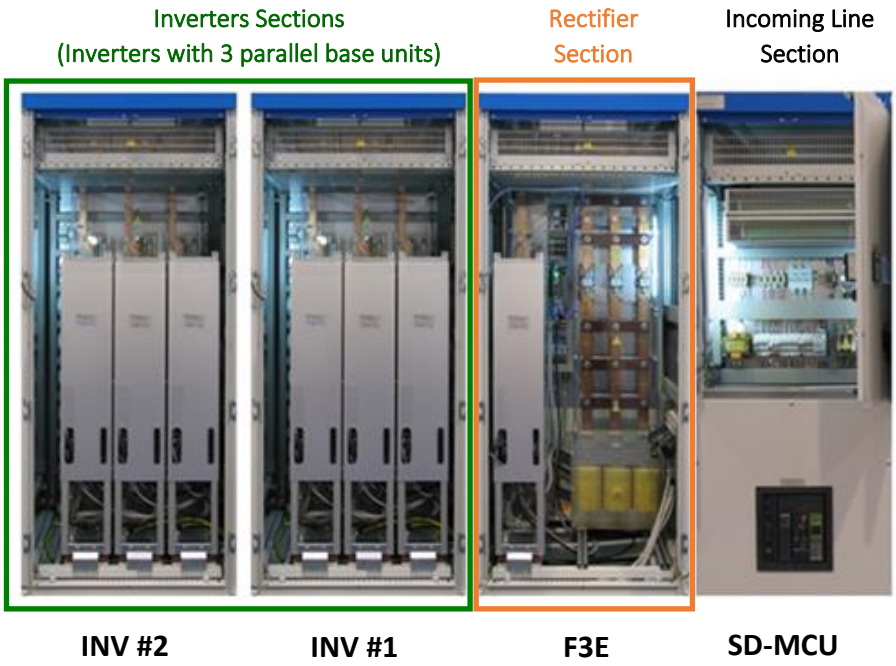
SECOM Drive is design to cover various market such as oil and gas, energy, metals, etc, which means application for pumps, fans, rolling mills, shear, and much more.
Control applications are divided by Motor control and Grid control. For Grid control, the main control strategy and feature are:

- AFE: control the Vdc with at desired cosϕ at PPC
- F3E: regenerative control cosϕ=1 during regeneration
- Vac Generator: stand alone generator with short-circuit management

For Motor Control, only induction motor is managed. The control strategy proposed are:

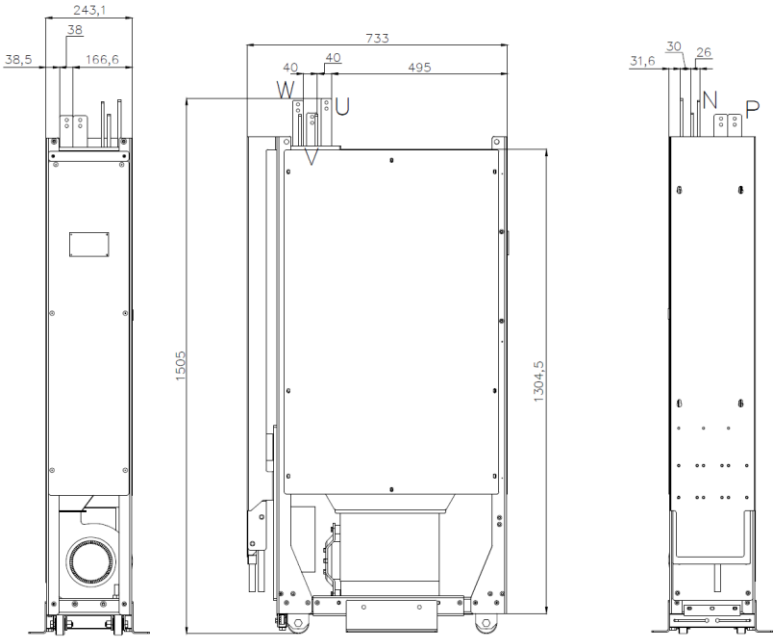
- V/Hz: can be open or closed loop and with performances very close to vector sensorless control
- FOC: Field Oriented Control. It needs an encoder but is the best choice in performance

All the motor control strategy have many MACRO function selectable and configurable per-application, such as braking function (Vdc Rollback, Current Rollback), energy saving, Master/Helper, and so on. For all the information regarding Control and Macro application and configuration please refer to SOFTWARE MANUAL.

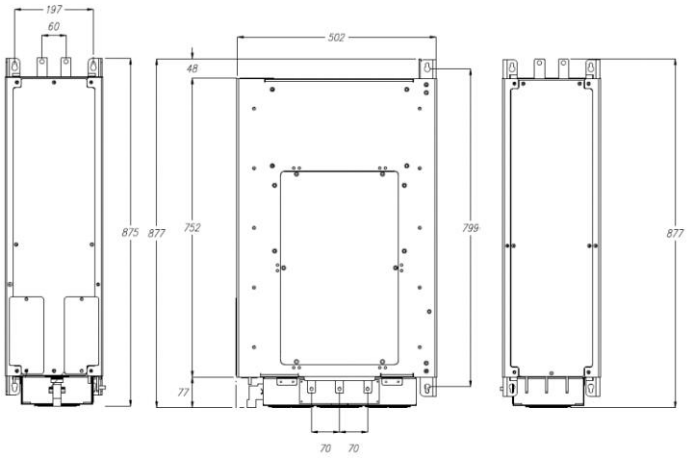


2.2 DIMENSIONS

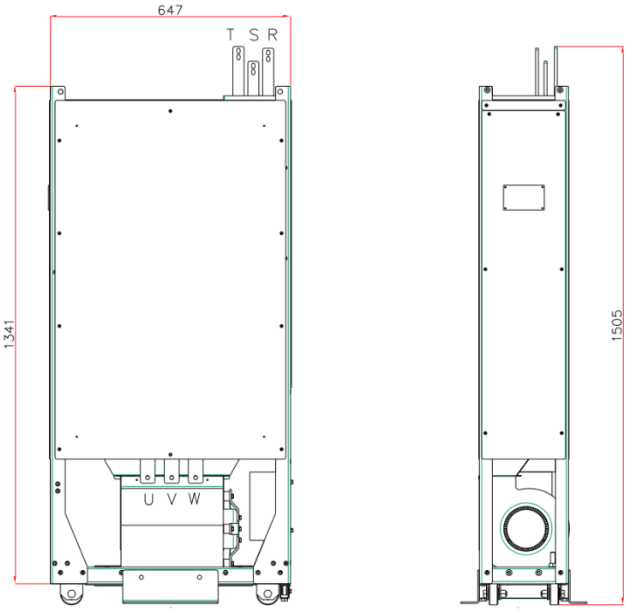
SDF.2, SDA.2, SDI.2
FRAME 2



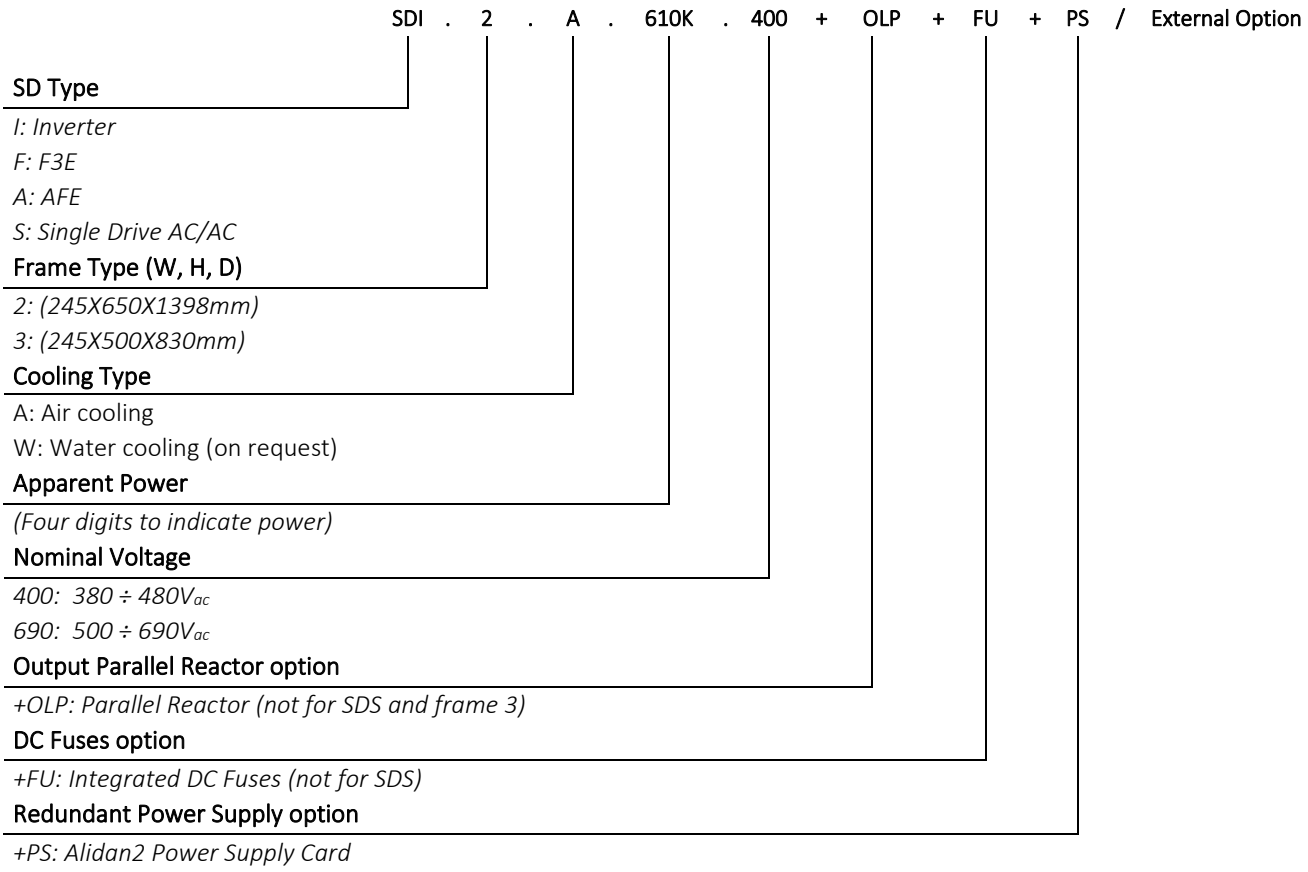
SDF.3, SDA.3, SDI.3, SDS.3
FRAME 3



SDS.2
FRAME 2



2.3 SD TYPE CODING



2.4 EXTERNAL OPTION CODES

The external options can be ordered separately or within the main product code, if the customer order the product code followed by the symbol "/" and the code described below, the product will be equipped with the option chosen.

Option Code	Description
/KB1	AC bus bar option for each DPM for ΔT ≤ 50°C (default)
/KB2	AC bus bar option for each DPM for ΔT ≤ 30°C
/KFO	Optical Fiber Kit – 4.5m. Ask to SECOM for different lengths
/FUD	External DC Bus Fuses. It depends on the drive size (see Tab. 5-25)
/OLDV†	Output dV/dt reactor
/ILF†	Input filter for F3E
/LCL†	Input filter for AFE
/SIN†	Output sinusoidal filter for inverter
/EMI†	EMI Filter
/FUA	External AC Fuses

† Designed on request

2.5 INVERTER 400V TECHNICAL DATA – SDI

CODE Vn: 380÷480 V	SN [kVA]	IN [A]	ILD [A]	IHD [A]	PN [kW]	PLD [kW]	PHD [kW]	HEAT LOSS [kW]	AIR FLOW [m³/h]	CP
SDI.3.A.110K.400	110	159	145	115	95	90	75	1,6	700	1
SDI.3.A.166K.400	166	240	220	170	145	136	110	2,4	800	1
SDI.3.A.230K.400	229	330	310	230	200	192	145	3,3	1100	1
SDI.2.A.290K.400	291	420	410	330	260	254	205	4,2	1750	1
SDI.2.A.350K.400	353	510	500	410	315	309	255	5,1	1750	1
SDI.2.A.450K.400	450	650	620	520	400	384	325	6,5	1750	1
SDI.2.A.520K.400	520	750	710	570	460	440	355	7,5	1750	1
SDI.2.A.575K.400	579	835	780	600	515	483	375	8,4	1750	1
SDI.2.A.874K.400	874	1261	1203	1009	780	745	625	12,6	3500	2
SDI.2.A.1M00.400	1008	1455	1377	1106	900	853	685	14,6	3500	2
SDI.2.A.1M12.400	1122	1620	1513	1164	1000	937	725	16,2	3500	2
SDI.2.A.1M50.400	1512	2183	2066	1659	1350	1279	1030	21,8	5250	3
SDI.2.A.1M68.400	1683	2430	2270	1746	1500	1405	1085	24,3	5250	3
SDI.2.A.2M24.400	2245	3240	3026	2328	2005	1874	1445	32,4	7000	4
SDI.2.A.2M80.400	2806	4050	3783	2910	2505	2342	1805	40,5	8750	5
SDI.2.A.3M35.400	3367	4860	4540	3492	3005	2811	2165	48,6	10500	6
SDI.2.A.3M90.400	3928	5670	5296	4074	3510	3279	2525	56,7	12250	7
SDI.2.A.4M45.400	4489	6480	6053	4656	4010	3747	2885	64,8	14000	8

Note:
LD: 110% 1min. every 5min.
IHD: 150% 1min. every 5min.
CP: converter parallels (e.g. 2 x SDI.2.A.350K.400)

2.6 INVERTER 690V TECHNICAL DATA – SDI

CODE Vn: 500÷690 V	SN [kVA]	IN [A]	ILD [A]	IHD [A]	PN [kW]	PLD [kW]	PHD [kW]	HEAT LOSS [kW]	AIR FLOW [m³/h]	CP
SDI.3.A.190K.690	185	159	145	115	165	155	125	2,1	700	1
SDI.3.A.280K.690	280	240	220	170	250	235	180	3,1	800	1
SDI.3.A.310K.690	310	260	245	202	275	265	220	3,4	1100	1
SDI.2.A.460K.690	460	390	365	290	410	390	310	5,1	1750	1
SDI.2.A.560K.690	560	470	440	370	505	475	400	6,1	1750	1
SDI.2.A.710K.690	710	590	550	440	640	600	480	7,7	1750	1
SDI.2.A.825K.690	825	690	650	515	740	705	560	9,0	1750	1
SDI.2.A.1M00.690	1000	835	780	590	900	845	640	10,9	1750	1
SDI.2.A.1M36.690	1368	1145	1067	854	1230	1155	925	14,9	3500	2
SDI.2.A.1M60.690	1600	1339	1261	999	1440	1360	1080	17,4	3500	2
SDI.2.A.1M93.690	1936	1620	1513	1145	1745	1635	1235	21,1	3500	2
SDI.2.A.2M40.690	2400	2008	1892	1499	2160	2040	1620	26,1	5250	3
SDI.2.A.2M90.690	2904	2430	2270	1717	2615	2450	1855	31,6	5250	3
SDI.2.A.3M85.690	3872	3240	3026	2289	3490	3265	2470	42,1	7000	4
SDI.2.A.4M85.690	4840	4050	3783	2862	4360	4080	3085	52,6	8750	5
SDI.2.A.5M80.690	5808	4860	4540	3434	5235	4895	3705	63,2	10500	6
SDI.2.A.6M75.690	6776	5670	5296	4006	6110	5710	4320	73,7	12250	7
SDI.2.A.7M70.690	7744	6480	6053	4578	6980	6525	4935	84,2	14000	8

Note:

LD: 110% 1min. every 5min.

IHD: 150% 1min. every 5min.

CP: converter parallels (e.g. 2 x SDI.2.A.350K.400)

2.7 F3E 400V TECHNICAL DATA - SDF

Not controlled DC Bus Power supply and regenerative power unit.

Power supply by diode jumper / line-commutaded regenerative mode by IGBTs.

CODE Vn: 380÷480 V	SN [kVA]	IN [A]	ILD [A]	IHD [A]	IDCN [A]	IDC LD [A]	IDC HD [A]	PDCN [kW]	PDC LD [kW]	PDC HD [kW]	HEAT LOSS [kW]	AIR FLOW [m³/h]	CP
SDF.3.A.140K.400	140	200	196	154	249	244	192	136	132	103	1,8	700	1
SDF.3.A.210K.400	210	305	299	235	380	372	292	204	201	158	2,7	800	1
SDF.3.A.270K.400	270	390	382	300	485	475	373	262	257	202	3,5	1100	1
SDF.2.A.312K.400	312	450	441	346	560	549	431	303	296	233	4,1	1750	1
SDF.2.A.400K.400	402	580	568	446	722	707	555	390	382	300	5,2	1750	1
SDF.2.A.485K.400	485	700	686	538	871	853	670	470	461	362	6,3	1750	1
SDF.2.A.590K.400	590	850	833	654	1058	1036	814	572	560	440	7,7	1750	1
SDF.2.A.710K.400	710	1020	999	785	1269	1244	977	689	672	528	9,2	1750	1
SDF.2.A.970K.400	970	1400	1371	1076	1742	1707	1339	941	922	723	12,6	3500	2
SDF.2.A.1M18.400	1180	1700	1665	1308	2116	2073	1628	1145	1119	879	15,3	3500	2
SDF.2.A.1M42.400	1420	2040	1998	1570	2539	2487	1954	1377	1343	1055	18,4	3500	2
SDF.2.A.1M77.400	1770	2550	2498	1962	3174	3109	2442	1717	1679	1319	23,0	5250	3
SDF.2.A.2M13.400	2130	3060	2998	2355	3808	3731	2931	2066	2015	1583	27,5	5250	3
SDF.2.A.2M84.400	2840	4080	3997	3140	5078	4974	3908	2755	2686	2110	36,7	7000	4
SDF.2.A.3M55.400	3550	5100	4996	3925	6347	6218	4885	3444	3358	2638	45,9	8750	5
SDF.2.A.4M26.400	4260	6120	5995	4710	7616	7461	5862	4132	4029	3165	55,1	10500	6
SDF.2.A.4M97.400	4970	7140	6995	5495	8886	8705	6839	4821	4701	3693	64,3	12250	7
SDF.2.A.5M68.400	5680	8160	7994	6280	10155	9948	7816	5510	5372	4220	73,4	14000	8

Note:

LD: 110% 1min. every 5min.

IHD: 150% 1min. every 5min.

CP: converter parallels (e.g. 2 x SDI.2.A.350K.400)

2.8 F3E 690V TECHNICAL DATA - SDF

Not controlled DC Bus Power supply and regenerative power unit.

Power supply by diode jumper / line-commutaded regenerative mode by IGBTs.

CODE Vn: 500÷690 V	SN [kVA]	IN [A]	ILD [A]	IHD [A]	IDCN [A]	IDC LD [A]	IDC HD [A]	PDCN [kW]	PDC LD [kW]	PDC HD [kW]	HEAT LOSS [kW]	AIR FLOW [m³/h]	CP
SDF.3.A.240K.690	235	200	196	154	249	244	192	228	227	179	2,0	700	1
SDF.3.A.350K.690	379	330	323	235	411	402	292	368	375	272	3,3	800	1
SDF.3.A.460K.690	472	400	392	300	498	488	373	458	454	348	4,0	1100	1
SDF.2.A.540K.690	540	450	441	346	560	549	431	524	511	401	4,5	1750	1
SDF.2.A.695K.690	695	580	568	446	722	707	555	674	659	517	5,8	1750	1
SDF.2.A.840K.690	840	700	686	538	871	853	670	815	795	624	7,0	1750	1
SDF.2.A.1M02.690	1020	850	833	654	1058	1036	814	989	965	758	8,5	1750	1
SDF.2.A.1M22.690	1220	1020	999	785	1269	1244	977	1183	1158	910	10,2	1750	1
SDF.2.A.1M68.690	1680	1400	1371	1076	1742	1707	1339	1630	1590	1247	14,0	3500	2
SDF.2.A.2M04.690	2040	1700	1665	1308	2116	2073	1628	1979	1931	1516	17,0	3500	2
SDF.2.A.2M44.690	2440	2040	1998	1570	2539	2487	1954	2367	2317	1820	20,4	3500	2
SDF.2.A.3M06.690	3060	2550	2498	1962	3174	3109	2442	2968	2896	2274	25,5	5250	3
SDF.2.A.3M66.690	3660	3060	2998	2355	3808	3731	2931	3550	3475	2730	30,6	5250	3
SDF.2.A.4M88.690	4880	4080	3997	3140	5078	4974	3908	4734	4633	3640	40,8	7000	4
SDF.2.A.6M10.690	6100	5100	4996	3925	6347	6218	4885	5917	5792	4550	51,0	8750	5
SDF.2.A.7M32.690	7320	6120	5995	4710	7616	7461	5862	7100	6950	5460	61,2	10500	6
SDF.2.A.8M54.690	8540	7140	6995	5495	8886	8705	6839	8284	8109	6370	71,4	12250	7
SDF.2.A.9M76.690	9760	8160	7994	6280	10155	9948	7816	9467	9267	7280	81,6	14000	8

Note:

LD: 110% 1min. every 5min.

IHD: 150% 1min. every 5min.

CP: converter parallels (e.g. 2 x SDI.2.A.350K.400)

2.9 AFE 400V TECHNICAL DATA - SDA

DC Bus Power supply and regenerative power unit.

Power supply by diode jumper / line-commutaded regenerative mode by IGBTs

CODE Vn: 380÷480 V	SN [kVA]	IN [A]	ILD [A]	IHD [A]	IDCN [A]	IDC LD [A]	IDC HD [A]	PDCN [kW]	PDC LD [kW]	PDC HD [kW]	HEAT LOSS [kW]	AIR FLOW [m³/h]	CP
SDA.3.A.098K.400	98	141	129	102	159	145	115	96	87	69	1,4	700	1
SDA.3.A.148K.400	148	213	195	151	241	221	171	145	132	102	2,1	800	1
SDA.3.A.200K.400	200	286	268	199	323	304	225	196	182	135	2,9	1100	1
SDA.2.A.264K.400	264	380	370	298	429	419	337	259	252	202	4,2	1750	1
SDA.2.A.320K.400	320	461	452	370	522	511	419	314	307	252	5,1	1750	1
SDA.2.A.408K.400	408	587	560	470	665	634	532	400	380	319	6,5	1750	1
SDA.2.A.470K.400	470	678	642	515	767	726	583	461	436	350	7,5	1750	1
SDA.2.A.524K.400	524	755	705	542	854	798	614	514	479	368	8,4	1750	1
SDA.2.A.790K.400	790	1139	1087	912	1329	1268	1063	774	761	638	11,4	3500	2
SDA.2.A.911K.400	911	1315	1245	999	1534	1452	1166	893	871	699	13,1	3500	2
SDA.2.A.1M01.400	1014	1464	1367	1052	1708	1595	1227	994	957	736	14,6	3500	2
SDA.2.A.1M37.400	1367	1972	1867	1499	2301	2178	1749	1340	1307	1049	19,7	5250	3
SDA.2.A.1M52.400	1521	2196	2051	1578	2562	2393	1841	1491	1436	1104	22,0	5250	3
SDA.2.A.2M03.400	2029	2928	2735	2104	3415	3190	2454	1988	1914	1472	29,3	7000	4
SDA.2.A.2M54.400	2536	3659	3418	2630	4269	3988	3068	2485	2393	1841	36,6	8750	5
SDA.2.A.3M04.400	3043	4391	4102	3155	5123	4786	3681	2982	2871	2209	43,9	10500	6
SDA.2.A.3M55.400	3550	5123	4786	3681	5977	5583	4295	3479	3350	2577	51,2	12250	7
SDA.2.A.4M06.400	4057	5855	5469	4207	6831	6381	4908	3976	3828	2945	58,6	14000	8

Note:

LD: 110% 1min. every 5min.

IHD: 150% 1min. every 5min.

CP: converter parallels (e.g. 2 x SDI.2.A.350K.400)

2.10 AFE 690V TECHNICAL DATA – SDA

CODE Vn: 500÷690 V	SN [kVA]	IN [A]	ILD [A]	IHD [A]	IDCN [A]	IDC LD [A]	IDC HD [A]	PDCN [kW]	PDC LD [kW]	PDC HD [kW]	HEAT LOSS [kW]	AIR FLOW [m³/h]	CP
SDA.3.A.164K.690	164	141	129	102	159	145	115	161	151	119	2,1	700	1
SDA.3.A.250K.690	250	213	195	151	241	221	171	245	228	176	3,1	800	1
SDA.3.A.270K.690	270	225	212	175	255	240	198	265	248	205	3,4	1100	1
SDA.2.A.328K.690	328	278	260	206	314	294	234	321	304	242	5,1	1750	1
SDA.2.A.400K.690	400	335	313	263	379	354	298	392	367	308	6,1	1750	1
SDA.2.A.506K.690	506	420	391	313	475	443	354	496	459	367	7,7	1750	1
SDA.2.A.548K.690	548	457	431	341	517	487	386	537	504	400	9,0	1750	1
SDA.2.A.664K.690	664	553	517	391	626	585	442	651	605	458	10,9	1750	1
SDA.2.A.0M97.690	974	815	759	608	950	886	709	955	917	734	14,9	3500	2
SDA.2.A.1M06.690	1061	887	836	662	1035	975	772	1040	1009	799	17,4	3500	2
SDA.2.A.1M28.690	1283	1073	1003	758	1252	1170	885	1257	1211	916	21,1	3500	2
SDA.2.A.1M59.690	1591	1331	1253	993	1552	1462	1159	1559	1513	1199	26,1	5250	3
SDA.2.A.1M93.690	1925	1610	1504	1138	1878	1755	1327	1887	1816	1374	31,6	5250	3
SDA.2.A.2M57.690	2566	2147	2005	1517	2505	2340	1770	2515	2422	1832	42,1	7000	4
SDA.2.A.3M21.690	3208	2684	2507	1896	3131	2925	2212	3144	3027	2290	52,6	8750	5
SDA.2.A.3M85.690	3849	3220	3008	2275	3757	3509	2655	3772	3632	2747	63,2	10500	6
SDA.2.A.4M49.690	4491	3757	3510	2655	4383	4094	3097	4401	4238	3205	73,7	12250	7
SDA.2.A.5M13.690	5132	4294	4011	3034	5009	4679	3539	5029	4843	3663	84,2	14000	8

Note:
LD: 110% 1min. every 5min.
IHD: 150% 1min. every 5min.
CP: converter parallels (e.g. 2 x SDI.2.A.350K.400)

2.11 SDS TECHNICAL DATA – SDS

CODE Vn: 380÷480 V	SN [kVA]	IN [A]	ILD [A]	IHD [A]	PN [kW]	PLD [kW]	PHD [kW]	HEAT LOSS [kW]	AIR FLOW [m³/h]	FSW [kHz]
SDS.3.A.110K.400	111	159	145	115	100	95	75	1,0	700	2
SDS.3.A.166K.400	167	240	220	170	150	140	110	1,5	800	2
SDS.3.A.230K.400	229	330	310	230	205	200	145	2,1	1100	2
SDS.2.A.260K.400	291	420	410	330	260	260	210	2,6	1750	2
SDS.2.A.315K.400	353	510	500	410	315	315	260	3,2	1750	2
SDS.2.A.405K.400	450	650	620	520	405	390	330	4,1	1750	2
SDS.2.A.495K.400	499	720	680	540	450	430	340	4,5	1750	2
SDS.2.A.545K.400	547	790	740	560	495	465	355	4,9	1750	2

CODE Vn: 500÷690 V	SN [kVA]	IN [A]	ILD [A]	IHD [A]	PN [kW]	PLD [kW]	PHD [kW]	HEAT LOSS [kW]	AIR FLOW [m³/h]	FSW [kHz]
SDS.3.A.190K.690	190	159	145	120	170	160	132	1,7	190	2
SDS.3.A.285K.690	287	240	220	170	260	240	185	2,6	287	2
SDS.3.A.310K.690	311	260	245	202	280	270	220	2,8	311	2
SDS.2.A.375K.690	466	390	365	290	420	400	315	4,2	466	1,25
SDS.2.A.560K.690	562	470	440	370	510	480	405	5,1	562	1,25
SDS.2.A.705K.690	705	590	550	440	635	600	480	6,3	705	1,25
SDS.2.A.825K.690	825	690	650	515	745	710	560	7,4	825	1,25
SDS.2.A.930K.690	932	780	733	555	845	800	605	8,4	932	1,25

Note:
LD: 110% 1min. every 5min.
IHD: 150% 1min. every 5min.
CP: converter parallels (e.g. 2 x SDI.2.A.350K.400)

3. POWER MODULE OPTIONS

3.1 INTERNAL OPTIONS

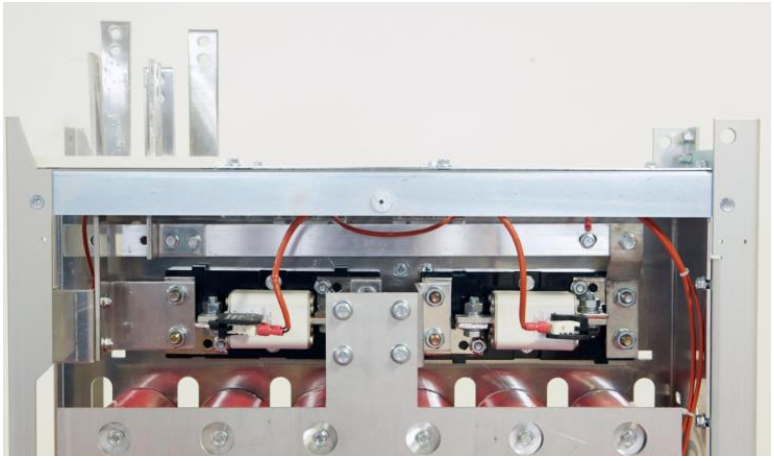
PARALLEL REACTORS

For the parallel connection of more power module is mandatory to use a coupling inductors.
Secom provides as option the parallel reactor for the parallel connection.

Code	Description	Material
+OLP	Parallel Reactor kit	Cu

INTERNAL DC FUSES

For the parallel connection of more power module is mandatory to use DC Fuses for the protection agaist fault.
Secom provides as option internal DC fuses.



Code	Description	Manufacturer	TYPE
+FU	Internal DC fuses	Eaton Bussmann	Fuse for drive size

For more information see HW Manual 210450P003

DC POWER SUPPLY

A redundant power supply can be added internally to each power module. The power supply card (ALIDAN) is a powerful switching power supply for back up purpose of the +24Vdc voltage used in all the electronic cards present in SD drives.

Code	Description	Voltage input	Voltage output
+PS	DC Power supply	400Vdc – 1250Vdc	24V

For more information see HW Manual 210450P003

3.2 EXTERNAL OPTIONS

KIT BUS BAR

Default configuration of power modules DC/AC has both DC and AC on the upper side. To let the user able to connect the motor cable from the lower side, a rear kit bar is provided by SECOM as option. There are two kind of kit bars: the former has single bars while the second has double bars.

Code	Bus Bar	Material	Section	In (ΔT 30°)	In (ΔT 50°)
/KB1	Single bar	Al	1x (60x6)	512A	717A
/KB1	Single bar	Cu	1x (60x6)	806A	1128A
/KB2	Double bar	Al	2x (60x6)	950A	1331A
/KB2	Double bar	Cu	2x (60x6)	1132A	1585A

KIT OPTICAL FIBER

Communication between control unit SD-MCU and each inverter stack operates through fiber optics.
Secom provides a fiber optic kit with the right connector terminals.

Code	Lenght	FO Q.ty	FO Type	Connector1	Connector2
/FO	4,5m	2	HFBR EUS	HFBR4533	HFBR4535

EXTERNAL DC FUSES

For the parallel connection of more power module is mandatory to use DC Fuses for the protection agaist fault.
Secom provides as option external DC fuses, is responsibility of customer defines the right installation.

Code	Description	Manufacturer	TYPE
/FUD	External DC fuses	Eaton Bussmann	Fuse for drive size

For more information see HW Manual 210450P003

EXTERNAL AC FUSES

Secom provides as option external AC fuses, for the protection against the power module fault.

Code	Description	Manufacturer	TYPE
/FUA	External AC fuses	Eaton Bussmann	Fuse for drive size

For more information see HW Manual 210450P003

OUTPUT dV/dT REACTOR /OLDV

The dv/dt filters with Voltage Peak Limiter must be used for motors for which the voltage strength of the insulation system is unknown or insufficient.
For the selection of the filter contact Secom.

INPUT FILTER FOR F3E /ILF

The line reactors used for F3E power supply modules limits lower-frequency harmonics that are fed back into the line supply. They are used to smooth voltage spikes (line supply faults) or to bridge voltage dips/interruptions when commutating. This is the reason that we recommend line reactors in conjunction with Secom drives.
For the selection of the filter contact Secom.

INPUT FILTER FOR AFE /LCL

The line filter composed by two reactance and a capacitor bank (delivered as loose parts) is used for AFE power supply module to limit lower-frequency harmonics that are fed back into the line supply. They are used to smooth voltage spikes and voltage dips/interruptions when commutating, and limit the THD on the net. This is the reason that we recommend line filter in conjunction with Secom drives.
For the selection of the filter contact Secom.

OUTPUT SINUSOIDAL FILTER /SIN

The sinusoidal filter at the output of the Power Module supplies voltages that are almost sinusoidal at the motor, thereby enabling standard motors to be used.
For the selection of the filter contact Secom.

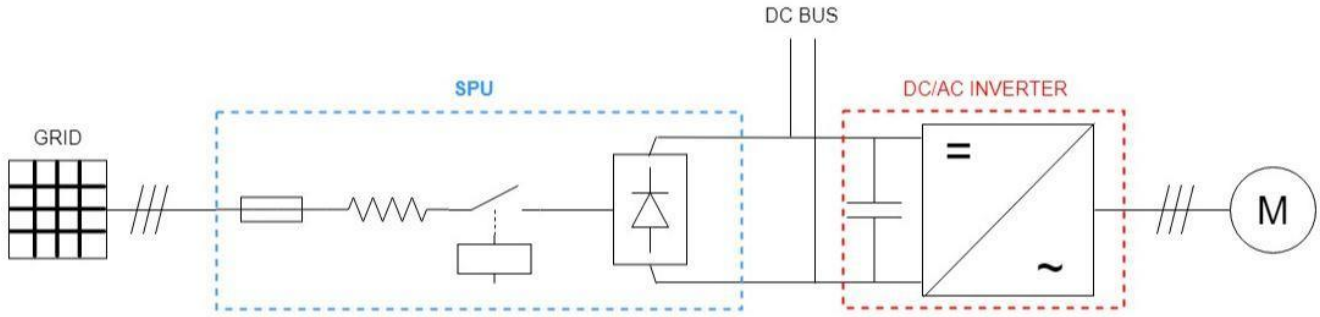
EMI FILTER /EMI

In conjunction with line reactors and the plant/system configuration EMI filters limit the cable-borne noise and disturbances emitted from Power Modules to permissible values for the industrial environment at the installation location.
For the selection of the filter contact Secom.

3.3 PRECHARGE SYSTEM

For correct operation of SECOM Drive inverters, it is mandatory that a precharge system is used; i.e. the DC voltage must be increased gradually to the nominal value, in order to avoid damage to the internal capacitors.
A different precharge system have to be selected based on the drive configuration and the capacitance installed.

Example of precharge kit when the drive uses AFE and F3E DC bus power supply.



Type	Total Capacitance
SPU-xxx-45	45mF
SPU-xxx-85	85mF
SPU-xxx-210	210mF

xxx is the nominal voltage of the internal power contactor's coil:

- 024 (for 24 Vdc)
- 230 (for 230 Vac)

Options:
+RT Rectifer for feed the DC Bus directly
+TH Temperature protection

For more information see SECOM PRECHARGE UNIT MANUAL 210450P018

4. CONTROL UNIT SD-MCU

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.
For more information about control board, please refer to Software Manual (210450P004).

4.1 MAIN GENERAL DATA

MAIN GENERAL DATA	
Main supply Voltage	24Vcc
Consumption	300mA
Protection Degree	IP20
Installation	Wall Mounting
I/O	16 Input, 10 Output (6 relay 125Vac - 4 Output collector)
Communication	Ethernet, CanOpen, Modbus TCP/IP, (Profibus DP slave or Profinet as option)
Internal device	Real time PLC
Dimesions	165*45*230 (WxHxD)
Weight	0,5Kg
Control Type	Grid control type and Motor control type
Motor Control System	V/Hz, Field Oriented, Sensorless FOC
Grid Control System	AFE, F3E, VAC

AMBIENT CONDITIONS	
Altitude	1000 m. a.s.l.
Climate	Temperate
Min/Max operatin temperature	0 ÷ 40°C
Storage Temperature	-40 ÷ +70°C
Relative humidity	-10÷ 90 % (from 0 to 40°C)

4.2 CONTROL UNIT FEATURES

The control unit permit to select the most suitable control method according to needs of use.
The SD-MCU allows F3E, AFE, Inverter control strategies and much more.

MOTOR CONTROL HIGHLIGHTS										
		Encoder	Output Voltage sensor	Output LC filter	DC Voltage accuracy	Vdc Response	Transient current Response	1° Harmonic Current Accuracy	Transient Speed response	Speed Accuracy
V/Hz	Scalar	Option	Option	Option	-	-	Slow	< 1%	Slow	1%
	Open loop	Option	Option	Option	High	slow	Fast	< 1%	Fast	< 1%
	Closed loop	Option	Option	Option	High	slow	Fast	< 1%	Fast	< 1%
Field Oriented (FOC)		Yes	Option	Option	High	fast	Very Fast	< 1%	Very fast	< 0.01%
Sensorless (FOC)		No	Option	Option	High	fast	Very Fast	< 1%	Very fast	< 0.3%

GRID CONTROL HIGHLIGHTS									
	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	Yes	Option	-	Very Fast	-	-	-	No	Yes
VAC	Option	Option	-	-	Very Fast	< 1%	-	-	no

4.3 CONTROL UNIT FUNCTIONS

The SD-MCU unit come with built in control function that the user can select according to the application need.

CONTROL FUNCTIONS:	
Flying Restart	To estimate the motor speed before start with demagnetized motor
Fast Flying Restart	To estimate the motor speed before start in any condition (it requires SD-SYNC)
2 Digital Potentiometer	To generate a reference with configurable steps
2 JOG	A pulse to reach a certain speed reference with a certain ramp time
Cold Bypass (Starter)	To start the motor up to the grid voltage and frequency and afterwards the motor will be connected to the grid and the inverter will be bypassed
Hot Bypass	Bring the motor on line to the grid and vice versa.
Helper (Master-Follower)	A master drive can control other slave drive with a reference of torque (for motor control) or current (for AFE)
Ride Through (kinetic regeneration)	If the DC voltage goes down, the DC bus vale is substained by keeping the kinetic energy of motor and load
Grid Waiting	If the DC goes down, power module switch off the pulses till the DC voltage be back
Current Brake and/or Vdc Rollback	To speed up the actual ramp stop time
Energy Saver	To reduce as much as possible the motor power loss
Safe Torque Off	SIL 3 – safety function to avoid torque transfer
Speed Droop	To share the load when more motors are mechanically coupled

OTHER CONTROL FEATURE:	
Commissioning/ID Test	A usefull set of function to detect the motor parameters from plate data, or at standstill or in run for magnetization curve detection
Short Circuit Management	For VAC generator, it is possible control the short circuit current for protection selectivity with various strategy
Regulators Auto-tuning	Main regulator coefficients are autodetected
Configurable I/O	Almost all the digital I/Os are configurable; for example an output can be connected to a bit of a command or status word.
Various mechanical reference	Up to 4 ramps time with various way to select them, 4 skip frequency, torque reference, upt to 2 reference source, etc
Allarms Configuration	All the software alarm are configurable. The drive can perform even an OFF1/2/3 before switch to fault state.
Internal custom PLC	Users can progam a custom PLC to add functionalities, espand I/O, etc

4.4 DIGITAL AND ANALOG SIGNAL INTERFACE

SD-MCU Control card manages analog and digital signals coming from system and general alarms.

Digital output signals –X3		
X3-1	OUT1	Digital output signal 1
X3-2	GND	0V reference for signals
X3-3	OUT2	Digital output signal 2
X3-4	GND	0V reference for signals
X3-5	OUT3	Digital output signal 3
X3-6	GND	0V reference for signals
X3-7	OUT4	Digital output signal 4
X3-8	GND	0V reference for signals
Digital output relays –JP2		
JP2-1,2,3	NO, C, NC	Output Relay 1 (MCB close CMD)
JP2-4,5,6	NO, C, NC	Output Relay 2 (Precharge close CMD)
JP2-7,8,9	NO, C, NC	Output Relay 3
JP2-10,11,12	NO, C, NC	Output Relay 4
JP2-13,14,15	NO, C, NC	Output Relay 5 (Inverter Fan start CMD)
JP2-16,17,18	NO, C, NC	Output Relay 6 (Fault Active)

Analog signals JP3		
	JP3-2	0V analog inputs
	JP3-3	Analog input 1 (4-20mA/ ±5V)
	JP3-6	0V analog inputs
	JP3-7	Analog input 2 (4-20mA/ ±5V)
	JP3-10	0V analog inputs
	JP3-11	Analog input 3 (4-20mA/ ±5V)
	JP3-14	0V analog inputs
	JP3-15	Analog input 4 (±10V)
	JP3-18	0V analog inputs
	JP3-19	Analog input 5 (±10V)
	JP3-22	0V analog inputs
	JP3-23	Analog input 6 (±10V)

Digital Input signals 24V X1		
X1-1	Digital IN 1	Input for the digital input 1
X1-2	Digital IN 2	Input for the digital input 2
X1-3	Digital IN 3	Input for the digital input 3
X1-4	Digital IN 4	Input for the digital input 4
X1-5	Digital IN 5	Input for the digital input 5
X1-6	Digital IN 6	Input for the digital input 6
X1-7	Digital IN 7	Input for the digital input 7
X1-8	Digital IN 8	Input for the digital input 8
X1-9	GND	0V reference for signals
X1-10	Digital IN 9	Input for the digital input 9
X1-11	Digital IN 10	Input for the digital input 10
X1-12	Digital IN 11	Input for the digital input 11
X1-13	Digital IN 12	Input for the digital input 12
X1-14	Digital IN 13	Input for the digital input 13
X1-15	Digital IN 14	Input for the digital input 14
X1-16	Digital IN 15	Input for the digital input 15
X1-17	Digital IN 16	Input for the digital input 16
X1-18	GND	0V reference for signals

For more information about control board, please refer to SOFTWARE MANUAL (210450P004).

4.5 FIELDBUS COMMUNICATION INTERFACE

The Secom Drive has several fieldbus interfaces useful to interconnect many objects in the network.

Fieldbus Name	Equipment	Example use
CAN Open Master	Standard	Remote I/O expansion Master/Follower application (Master side)
CAN Open Slave	Standard	Automation Level 1 Slave
Modbus TCP Master	Standard	Remote I/O expansion
Modbus TCP Slave	Standard	Automation Level 1 Slave SDM interface
Profibus Slave	Optional	Level 1 Slave

4.6 SAFETY INTEGRATED

Secom Drives have integrated safety functions that prevent the requirement of many external electromechanical components that should be normally used to ensure the safety standards.

Safe Torque Off (STO)

"Safe Torque Off" ensures that torque is no longer output at the motor shaft.

Certificate Number	20161227_4787333343-
Report Reference	20161227_4787333343_Functional Safety Report
Issue Date	2016-December-27th
Additional Information:	Safety function «Safe Torque Off (STO)» as defined by IEC 61800-5-2, complies with the requirements for the following functional safety ratings: • SIL Capability 3, as defined by IEC 61800-5-2:2007 • SIL 3, as defined by IEC 61508:2010 • PL e, Category 3 as defined by ISO 13849-1:2006 • SIL Claim Limit 3 as defined by IEC 62061 Further safety-related data : • PFH (as defined in IEC 61508:2010): 3.372E-08/h • MTTFd (as defined in ISO 13849-1:2006): 3385 years The product must be installed, operated, and maintained, in accordance with the instructions for use.

4.7 SD CONTROL UNIT CODING

The control unit SD-MCU is identified by a unique code described as follow:

	SD-MCU CODE			External Options
	Control	***Internal Options***		
	SD-MCU	+ENC24	+COMX10	
Board Name ***SD-MCU*** *standard*				
Encoder ***.ENC5***: *5V power supply* ***.ENC24****:* *24V power supply*				**/…**
Fieldbus Option ***.COMX10***: *Profibus-DP* ***.COMX51****: ProfiNet slave*				

External option codes:

Option Code	Description
/OP	Operator Panel with USB cable (3m) and Ferrite
/SYNC	Synchronization board (SD-SYNC)

4.8 CONTROL UNIT AND OPTIONS

SD-MCU-Control Unit

SECOM provides a new 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.

COMX-Profibus–DP Interface SD-COMX10

The SD-COMX10 communication module has been designed to be integrated into directly to the motor controller SD-MCU to add a network Profibus interface. All communication tasks are executed autonomously within the module - irrespective of the processor of the target device.
Process data is exchanged via a Dual-Port-Memory which is accessed either by an 8-/16-bit bus interface or a fast 50 MHz SPI interface.

COMX-Profinet Interface SD-COMX51

The SD-COMX51 communication module has been designed to be integrated into directly to the motor controller SD-MCU to add a network Profinet interface. All communication tasks are executed autonomously within the module - irrespective of the processor of the target device.
Process data is exchanged via a Dual-Port-Memory which is accessed either by an 8-/16-bit bus interface or a fast 50 MHz SPI interface.

ENC-Encoder card SD-ENC

The Encoder Receiver Option allows incremental encoders to be connected directly to the motor controller SD-MCU to provide highly accurate speed feedback measurement. It mounts directly to the Main Control Board.
It used for Flux Vector Control operation with sensor it therefore improves drive performance of the motor control.

SYNC-Synchronization card SD-SYNC

The synchronization card is used in all the application where a line synchronization is required. Then SD-SYNC card is present in all the AFE/F3E configuration and can be placed inside the power stack or alternatively directly on the main line.
As standard the card is supplied with aluminum case IP20.

OP-Keypad SD-OP

LCD Graphic display with buttons for drive operating commands
The Keypad is a simple and fast way to program and communicate with the drive, a power platform with a menu structure permit a rapid interpretation of parameters and functions.

Cable

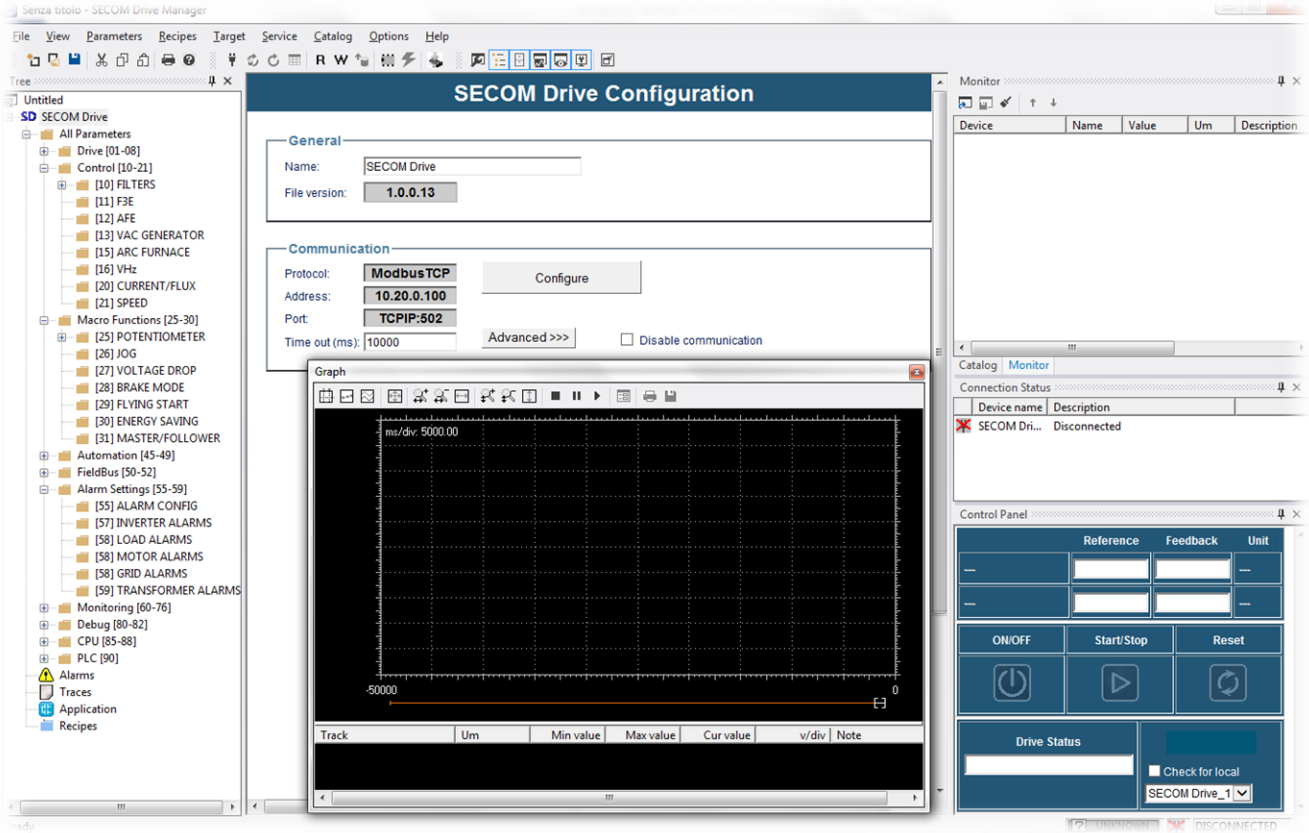
Keypad cables to connect the control unit SD-MCU to the keypad

Code	Lenght
OP_CBL3	3m

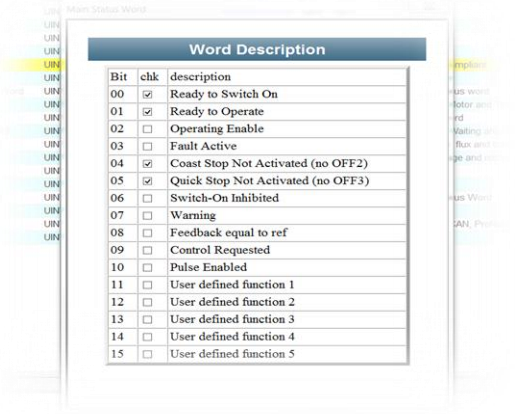
5. SECOM DRIVE MANAGER

SDM (SECOM Drive Manager) permit to configure the drive by RJ45 port (Ethernet cable)
The main features are:

- Set parameters configuration and password to lock modification
- Save up to 3 parameters default configuration
- Keep the control (manual control) completely bypassing the reference configuration
- Commissioning the drive quickly and autotune some regulators
- Grouping the parameters in recipies to customize (and simplify) the use of the drive manager
- Compare parameters with other drives
- Check and configure the active faults and alarms and action to perform
- Check the parameter log with the time table
- Check the alarm history log with time table and configure the alarms behaviour
- Download and upgrade the control software (via USB key too)
- Download the Data Log (trace) and see what happened before and a little after a fault
- Download a custom PLC Application (or a PLC provided by SECOM or other partners)
- Monitoring the actual quantity of the drive an plot it with realtime or non-realtime graph



Each Status word can be monitored bit-by-bit to better understand the meaning

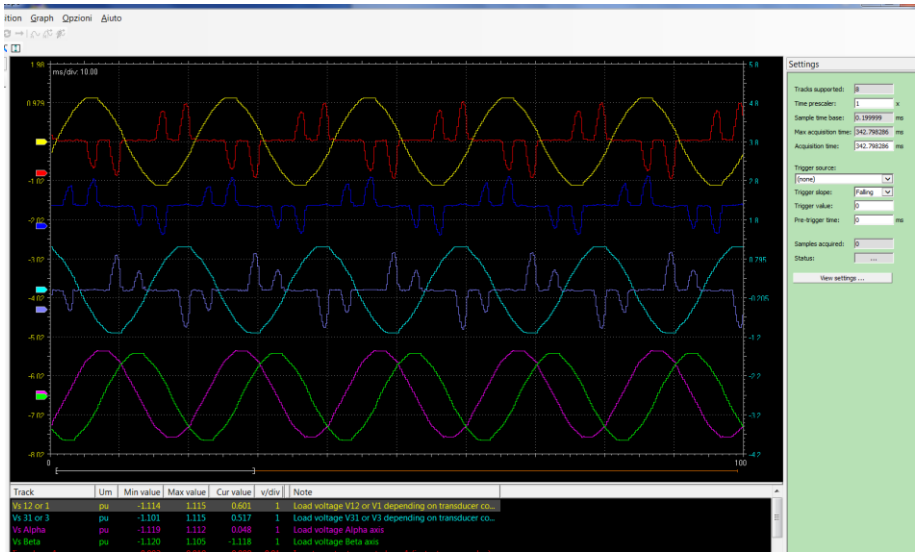


Word Description

Bit	chk	description
00	☑	Ready to Switch On
01	☑	Ready to Operate
02	☐	Operating Enable
03	☐	Fault Active
04	☑	Coast Stop Not Activated (no OFF2)
05	☑	Quick Stop Not Activated (no OFF3)
06	☐	Switch-On Inhibited
07	☐	Warning
08	☐	Feedback equal to ref
09	☐	Control Requested
10	☐	Pulse Enabled
11	☐	User defined function 1
12	☐	User defined function 2
13	☐	User defined function 3
14	☐	User defined function 4
15	☐	User defined function 5

5.1 SOFT SCOPE TOOL

The SOFT SCOPE TOOL provided with Secom drive manager allows viewing, saving and opening control analog signal with cycle time synchronous with control frequency (real time).

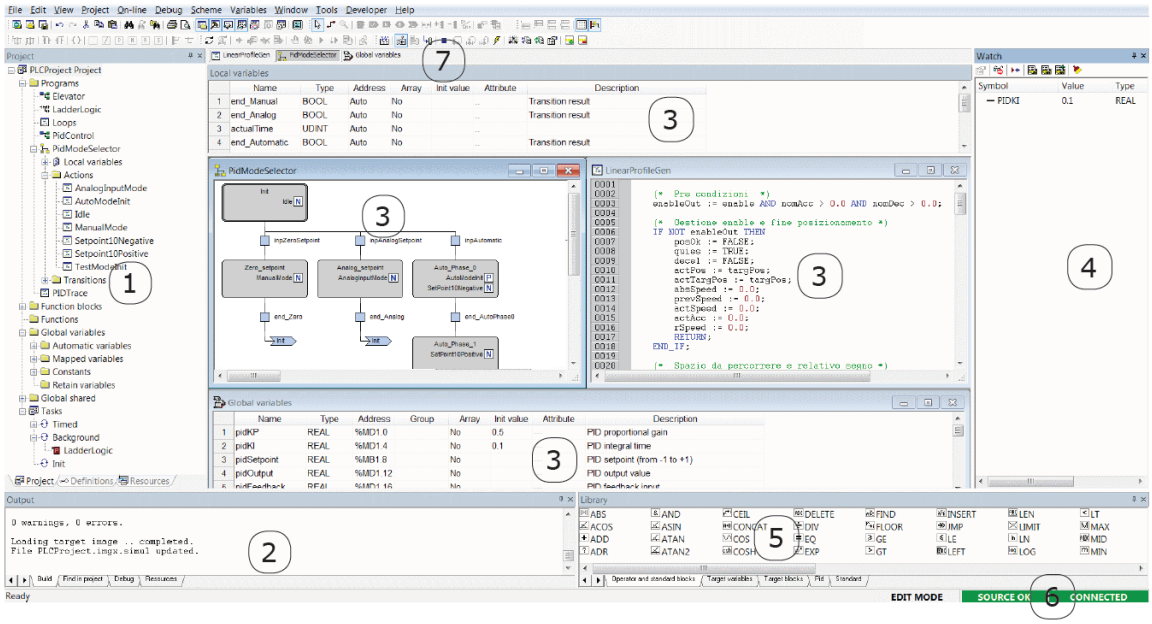


5.2 SD LOGIC ENVIRONMENT – PLC

Secom Drive logic Environment permit to program a logic function inside the control unit SD-MCU. The software support the standard programming languages (IL, ST, LD, FDB, SFC).

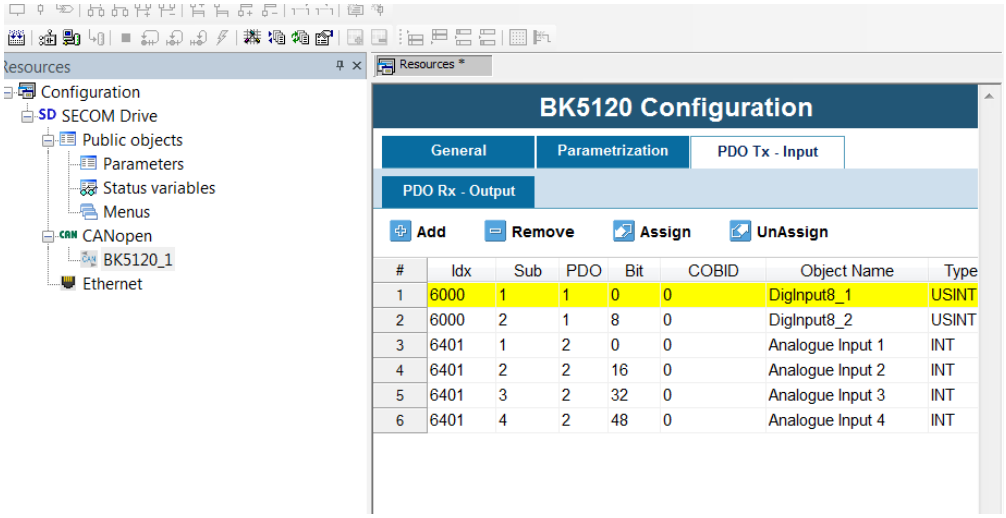
PLC Function can be used for:

- Command fans, contactors, relays.
- Create new functions
- Create new signal interface
- Create new alarms



5.3 FURTHER SDM FEATURES

- Parameter change history log
- Fault/Warning history log
- Firmware download
- Control parameter lock code feature
- Different parameters set load/save
- Trace on event
- Upload / Download via USB or Ethernet



#	Idx	Sub	PDO	Bit	COBID	Object Name	Type
1	6000	1	1	0	0	DigInput8_1	USINT
2	6000	2	1	8	0	DigInput8_2	USINT
3	6401	1	2	0	0	Analogue Input 1	INT
4	6401	2	2	16	0	Analogue Input 2	INT
5	6401	3	2	32	0	Analogue Input 3	INT
6	6401	4	2	48	0	Analogue Input 4	INT

5.4 SD DRIVE COMMISSIONING

- Parameter calculation
- Motor identification at stand still (under development)
- Magnetization curve detection
- Trouble shooting tool analysis

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