SIGNAL CONDITIONING Introduction







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- **2** SENECA solution
- 3 Analog conversion
- **4** Temperature conversion
- **5** Serial conversion
- **6** Digital / Frequency conversion
- 7 Load cell conversion
- 8 Electric parameter conversion

9 Multiplexing

10 Market & Sales





General concepts

- What is signal conditioning
- What is galvanic isolation
- Galvanic isolation benefits
- Galvanic isolation circuit layout
- Ground loop effect
- Signal conditioning industrial solutions
- Signal conversion types





What is signal conditioning

- **Signal conditioning** is an electronic technology conceived to solve integration problems between field sensors / actuators and data acquisition / control units, whenever output signals of field units are not homogeneous in electric mode (current, voltage, resistance, etc.), signal level and kind (continuous, alternate, pulsed voltage, etc.).
- **Signal conditioning interface** include all electronic circuits that convert output signals into a normalized electric signals
- Main **signal conditioning techniques** are: galvanic isolation, signal amplification, signal attenuation, signal filtering, multiplexing, signal activation, cold joint compensation, linearization, loop power supply etc.







What is galvanic isolation

- Galvanic isolation is a signal conditioning technique that lets the electric signal flow from source to measurement device by a transformers or capacitive / optical coupler.
- Beside interrupt ground loops, isolation interrupts high voltage peaks and removes common mode high voltage, protecting operators / measurement / control devices.
- 2-way isolation separates galvanically signals each other and decouples measurement circuits. 3way isolation decouples power supply voltage from the input/output circuit and allows the operating functions with a unique operating voltage.
- Passive isolation is an isolation mode that does not need any auxiliary *power supply*. Isolator module
 power supply is made by an input circuit and transmitted to the output. This loop power supply has a
 low power consumption







Why use galvanic isolation

There are at least 8 technical reasons to introduce a galvanic isolation interface earlier than control and acquisition system

- Total isolation between signal and power supply circuits, and as a result the protection against the mutual influence.
- Separation of several ground potentials, to avoid unwanted ground loop currents
- Reliability in data transmission, assured by limited presence of errors and interferences
- Security of transmission, as the high isolation protect the electronic circuits
- Coverage of distance between field and control device over 20 meters, assured by signal conversion into µA standard (less critical for interferences)
- Protection against high ground potentials
- Immunity against electromagnetic interferences
- Proximity of signal & power cables, in order to reduce magnetic field effects





Galvanic isolation insertion

Between a transmitter (i.e. Sensor) and a receiver to:

- Isolate galvanically the signals
- Cut the field noises
- Provide the power supply to the sensor
- Solve the conflict of more supply sources in the same loop

Between the PLC output and the inverter that has to be drived (the inverter generates several noises)



To separe the analog inputs of a PLC (avoiding the ground loop effects). Normally the PLC isolated cards are more expensive than the solution "separators + not isolated cards"







Ground loop effects

- A single ground causes no problem but multiple grounds cause ground loops.
- In a ground loop, each ground is tied to a different earth potential. This allows current to flow between the grounds, interfering the actual signal.
- A galvanic isolator prevents unwanted currents by breaking ground loops. This eliminates noise problems and DC offsets.







Signal conditionig industrial solutions

PLC I/O INTEGRATED	CUSTOM BOARD	DIN RAIL MODULES
Benefits	Benefits	Benefits
 Compact solution 	Real-time performancePC based solution	Easy installationLow-cost solutionHigh performance hardware
Costs / Risks	Costs / Risks	•Wide range of instruments and applications
•Complete hardware replacement and re- configuration in case of fault or damage	 Not much industry-oriented Difficult engineering and programming 	•Easy to change in case of fault







Main signal conversions

Sensor / Signal	Туре	Output signal	Application
Thermocouple	B, C, E, J, K, N, R, S, T	Millivolt DC	Temperature measurement & control
RTD	Pt100, Pt500, Pt1000, Ni100	Resistance (DC current)	Temperature measurement & control
DC current	4-20 mA, 1-5 A, 0-100 μA, 0-1 mA, 1-5 mA	DC current (24 VDC)	Standard control signals, sensors output signals
DC voltage	1-5V, 0-10V, +/-5V, +/-10V, 0-100V, 0-500V	DC voltage	Standard control signals, sensors output signals
Extensimeter	0-10mV, 0-20mV, 0-30mV, +/-10mV, +/-50mV	DC millivolt (5-10Vdc)	Weight, pressure, extension, compression
Potentiometer	0-100 Ohm, 0-500 Ohm, 0-1000 Ohm, 0-10 KOhm	Resistance (DC voltage)	Setpoint, position, tank level control
Frequency/Pulse	Sine wave, square wave, triangular wave, pulse peak	mV o V DC (5V, 12V, 24V DC)	Proximity sensors (speed, flow, counting)
AC current	0-100mA, 0-1A, 0-5A	AC current	Electric power, load measurement
AC voltage	0-500mV, 0-24V, 0-120 V AC	AC voltage	Electric power, load measurement





2 SENECA solutions

- Z LINE
- K LINE
- S LINE / Serie T LINE
- Connections









17,5 mm multistandard modular isolators converters



6,2 mm high performance compact isolators converters





Modular isolators

- converters





SENECA SOLUTION (1)







SENECA SOLUTION (2)









S LINE



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20a

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SU

DIN SHAPE Converters, isolators, processer 2, 3, 6, 9 DIN modules	NETWORK POWER SUPPLY 115 / 230 Vac
OPERATING TEMPERATURE -10+60℃	GALVANIC ISOLATION Up to 4.500 Vac
WIDE RANGE Analog & digital converters isolators Control relays & current transformers Overvoltage protections	POWER TRANSDUCERS Min 18 V



COCCOCCA I











2/4 WIRE CONNECTIONS

4 wire

- INPUT: 0/4..20 mA (active & passive)
- OUTPUT 0/4..20 mA (active & passive)
- POWER SUPPLY: auxiliary 24 V
 Cod. Z109S, K109S, K109UI



2 wire

- INPUT: 4..20mA (passive)
- OUTPUT: 4..20mA (active)
- POWER SUPPLY: self powered by the input circuit
 - Cod: Z110S, Z110D (double channel)







Current loop schemes







The current will flow if the voltage will be higher than V.

CURRENT LOOP 0..20 / 4..20 mA WITH MORE DEVICES IN THE SAME LOOP

The total circuit impedance will be equal to the impedance addition of single impedances. The voltage must be higher than V

CURRENT LOOP 0..20 / 4..20 mA WITH MORE DEVICES IN THE SAME LOOP AND TRANSDUCER

In this case the supply voltage shall be increased of Vt (usually between 12 and 18 Vdc),







Signal outgoing from active transducer



The transducer is "active" if it's able to generate itself the current loop. Usually the power and signal connectors are separated. The most important parameter is the max load impedance (Ohm) that the transducer is able to drives.









In this situation the transducer is powered from the 4..20mA. It has not an auxiliary power supply terminals





3 Analog conversion

- Applications & benefits
- Signal types
- Product range
- Application schemes
- Commercial information





ANALOG CONVERTERS PRODUCT RANGE







K110 – Application note

Isolation and Analog re-transmission + Hart Signal







K109LV – T201DC Application Note

String current measurement and transmission in photovoltaic plant







K109LV – Application note

Battery charging / discharging monitoring for naval equipment







UNIVERSAL CONVERTER WHEN PROPOSE IT



- If it's necessary to have an extreme flexibility of programming about input type (TC, RTD, NTC, PTC, mA, V, Ohm), measurement range (totally configurable), output type (mA and V programmable)
- If you want a complete settings by dip-switches, software and handheld device
- If you need a analog output as well as a relay alarm
- If you need to read more signals (with different standard too) using just an analog PLC input (exploiting the STROBE input)
 - If the customer wants a unique converter for any application

If you want to save in the stock expenses

		SW1: INPU	L	IYPE	
	INPUT TYPE			11	NPUT TYPE
	1234	V		1234	Tc K
		Ω / Rheostat			Tc R
		mA			Tc S
-		NI100			Tc T
		PT100			Tc B
		PT500			Tc E
		PT1000			Tc N
		Tc J			Potentiometer

Order code Z109REG, Z109REG2, Z109REG2-H







UNIVERSAL CONVERTER ANY USE



The most flexible converter in the market

Maximum configurability, scalability of input and output, relay alarm, strobe input (multiplexing function). Settable by dip-switches, self-learning buttons, software and handheld device.





Z109REG2 - STRENGHTS



Several input type



Fast response time (35ms)







- High accuracy class (0,1%) and A/D resolution (16 bit)
- *****
- Wide Operating temperature range -10°C..60°C)



- UL UR CSA certification
- Alarm trip relay Strobe for Multiplexing applications





Z109REG2 - Application Note strobe multiplexer

The strobe functionality of Z109REG2 allows to acquire several signals through just 1 AI of the PLC







Z109REG2. Application Note. Alarm trip relay

The alarm functionality of Z109REG2 allows to handle an alarm signal as well the analog output











With these features Z109REG2 is the most complete interface-driven "universal converter" on the market





Z109S - Application Note (1)

Isolation, power for transducer and PLC re-transmission of 4..20 mA analog signal







Z109S - Application Note (2)

Inverter driven from a PLC – loop isolation







Z102 - Application note

Nr 2 channels output: signal re-transmission to inverters & display







Z110 - Application Note

Isolation of double loop from field transducers







Z170 - Application Note

Isolation and simultaneous (and independent) transmission to a PLC and an indicator / controller






Z190 - Application Note

Temperature control (average value) based on 2 Pt100 probes







Temperature conversion

• Product range

4

• Head mounting transmitters













K109TC - Application Note

TC conversion / displaying through S315 and alarm management as well







T LINE Temperature transmitters

NEW

- **T120** 2 wire loop powered transmitter for Pt100 and Ni100 probes
- **T121** Isolated loop powered universal transmitter (Pt100, Ni100, Pt500, Pt1000, TC, Ohm, mV)

Power supply range: 5..30 Vdc / 7..30 Vdc

<u>Output</u>: 4..20, 20..4 mA

Programming: By software

Accuracy class: 0,1% Max resolution: 16 bit Isolation: 1,5 KV Operating temperature: -40..+85°C Clamp connection: push wire



<u>Input</u>: Pt100, Ni100, Pt500, Pt1000, TC, Ω, V





SENECA / PHOENIX CONTACT: Pt100 CONVERTERS BENCHMARKING

	EDECKREAKE	SENECA Ingeneria e struinentazone	
	MINI MCR-SL-PT100-UI	К109РТ	
Max load output voltage	≥ 10 kΩ	≥ 2,5 kΩ	
Max current	25 mA (24 Vdc)	22 mA (24 Vdc)	
Max current not connected at 25 °C	10,3 mA	7,5 mA	
Transmission error (max range)	0,2 %	0,1 %	
Transmission error (measuring range)	100 K / ∆temp + 0,1%	40 K / ∆temp + 0,1%	
Isolation technique	Analog (transformer)	Digital (optocoupler)	
Conversion	12 bit	14 bit	
Rejection 50 Hz	no	yes	
Components number	Approx 190	160	
Max current limitation	no	yes	
Filter	no	yes	





5 Serial conversion

- Connections
- Products range
- Application cases





Serial conversion product range







K107A - Application Note (1)

Isolated RS485 (ModBUS) serial retransmission







K107A - Application Note (2)

Isolated data transmission with between devices with RS485 interface







K107A - Application Note (3)

Isolated RS485 (ModBUS) multiple connection









Bi-directional RS232 / RS485 transmission (in order to extend the communication distance)







K107B - Application Note (2)

RS232 / RS485 conversion and isolation



HMI / Panel PC





K107B - Application Note (3)

Bidirectional RS232 / RS485 transmission with isolation up to 32 nodes



Configurable nodes





K107B - Application Note (4)

RS232 / RS485 conversion with isolation up to 32 nodes







K107USB - Application Note (1)

USB / RS485 conversion and isolation







K107USB - Application Note (2)

Multiple connection and data transmission with USB / RS485 converters isolators







K107USB - Application Note (3)

USB / RS485 conversion with isolation up to 32 nodes







S107USB RS485/USB serial converter, portable version

On-site electrical panel diagnostic









6 Digital / Frequency conversion

- Signals
- Application notes





SIGNALS RANGE



Digital / Frequency conversion involves signals controlled by devices getting frequency measurement, pulse acquisition, lap, speed, batch, loss counting/timing

Data acquistion and transmission are made by period or frequency measurement outgoing from sensors: photocells, proximity switch, one direction incremental encoder, reed contact.





PRODUCT RANGE

Z111 Z104 DC current/voltage to frequency isolator / converter K112 K111 Universal digital coupler/isolator

Z111 Frequency to DC current/voltage isolator / converter









Z104 - Application Note

Conversion of analog flow meter signal into pulses



Reed relay output (< 40 Hz) or npn open collector transistor (< 10 kHz)







Conversion of pulse flow meter signals into analog standard







K111 Limit alarm unit for rotative speed control (on max and min speed)







K112 - Application Note

Isolated digital signal between Namur sensor and acquisition system / PLC







Load cell Amplification

- Measurement principle
- Products range
- Calibration

7

- Application notes
- Accessories









Load cells are transducers that convert forces of compression, tension, torsion, pressure or rotation into an electrical signal.

They are used for the measurement of forces and weight (from micrograms to tons). Usually generate an output analog signal.

- Factory features: a single point, tension / compression
- Applications: industrial electronic weighning systems, weighning of trucks, rail cars, ships, cranes, hoppers and tanks, dosing of food.
- Models: analog, digital, miniature, special automotive, robotics, metrology, areas with risk of explosion.





Load cell – Measurent Principle

LVDT (Linear Variable Differential Transformer)



Load Cells based on movement trasducers indutive. The applied force to the platform compress the spring and move the mobile LVDT equipment. This last supply an output proportional to the movement, so to the force. Suitable for **precision measurements**.



Wheatstone bridge

The load cell includes four strain gauges placed along the ring of the cell. The applied force causes an extension of R2 and R4 strain and a compression R1 and R3 strain. This configuration of the bridge is for giving the maximum voltage change due to the application of the load, while the loss of balance due to temperature variation is minimal. Used in stationary measures.

Piezoelectric crystal

Applying a force on the surface of a piezoelectric crystal generates an accumulation of proportional charge to the same force. The surfaces of the piezoelectric material behave like the faces of a condenser. Piezoelectric load cells have a high response speed, however, due to leakage current, the charging voltage supplied from the amplifier tends to decrease. This makes them suitable for vibration measurements.





Load cell – Industry applications

Flow Measurement of solid materials



Measurement of liquid quantity in the tanks







INDUSTRY WEIGHNING SYSTEM

	GOODS IN	PRODUCTION	STORES	QUALITY ASSURANCE / IN-HOUSE TRANSPORT	GOODS OUT
Application	Weight recording when unloading bulk materials, liquids and also weight units such as sacks, pallets, crates.	Various weighing processes in Proportioning, mixing and batch processes – but also force measurement	Static weight monitoring for example of stored bulk material, barrels, sacks, pallets, crates etc.	 Control of material flow Weight checks for quality assurance Purposes Completeness check of packaging units Weight value for in-house calculations. 	Weight recording/ checking •When filling or bagging bulk goods and liquids, for example, into sacks or tanks •For units such as pallets or crates
Type of scale	 Truck scale Weighbridges Emptying scales 	 Batch system Loss-in- weight feeders 	 Hopper weighing Weighbridges 	 Conveyor scales Dynamic and static control scales 	 Sacking scales Filling machine Truck scale Weighbridges Loading scales





Source Siemens

Z-SG / ZC-SG - Strain gauge converters

	Z-SG	ZC-SG		
	Modbus	CRNopen		
Power supply	1040 Vdc, 1928 Vac			
Max consumption	1 W			
Isolation	1,5 kVac (3 way)			
Analog input	1 ch. for input (and power supply) up to 4 (350 Ω) or 8 (700 Ω) cells, connection to 4 or 6 wires, impedence equivalent to the minimum 87 Ω			
Sensitivity	From 1 to 64 mV/V			
Analog output	1 analog channel net weight retrasmission in current (020, 420 mA) or voltage (05, 010 V)			
Digital input / output	Input: reset remote tara, side calibration button Output: alarm, stabled weight			
Accuracy	0,01%			
Resolution	24 bit (settable by user)			
Response time	5 ms (on bus – analog output)	1 ms		
Connections	Back Bus IDC10 for DIN rail, RS485, 2.400115k baud Jack frontal communication RS232, 2.400 baud	Back Connector IDC10 for DIN rail, CANopen interface up to 1 Mbps Jack frontal communication RS232, 2.400 baud		
Programmable functions (DIP-switch or software)	SW: Cell calibration, stable weight warning, tare remote writing, alarm threshold misure stabilized DIP: Communication parameters			
Operating temperature	-10+65°C			
Dimensions	35 x 100 x 112 mm			







ACCURACY	SENSITIVITY	CALIBRATION	EASY CABLING
0,01%	From 1 to 64 mV/V	4 methods (with or without software / known weight value)	Power supply and communication interface by backplane bus mounted on DIN rail
SAMPLING FREQUENCY	INTERFACES	SETTINGS	ADVANCED FUNCTIONS
From 2,53 to 151,71 Hz	ModBUS RTU RS485/RS232 CANopen	DIP switches Software	Trip alarm Tare settings Stable weight





Z-SG - Application note (1)

Temporary tare







Z-SG - Application note (2)

Weights Control on conveyor belt – digital output for stable weight







Z-SG - Application note (3)

Weight Measure and signal amplification (input with 4 load cells)



RS485, ModBUS RTU




Z-SG – Application note (4)

RS485 Data trasmission of tanks weights



RS485, ModBUS RTU





SETTINGS PC CONNECTION









EASY Z-SG / EASY ZC-SG. Plug&play software downloadable by www.seneca.it





- Automatic Research of the connected devices
- Configuration Reading from file or module
- Load cell Configuration (sensibility, endscale, known weight)
- Input Configuration
- Resolution Settings
- Input/output settings, linearization, stable weight, communication protocol
- Measure Stabilization
- Configuration test
- On-line load configuration





WHERE PROPOSE SG CONVERTERS







Competitors Comparison

BENEFITS

- High class accuracy
- Very fast response time (up to 10ms)
- Easy wiring
- High level galvanic isolation
- Multiple calibration methods
- Multiple use: converter, acquisition module, stand-alone device, integrated device with other manufacturer systems



Equalization and connection card up to 4 load cells in parallel cod. **SG-EQ4**





Electric measurement conversion

• Products range

8

- Application areas
- Current transformers
- Application notes





Electric measuring devices

Z202LP

Z201 / Z201-H



Z202 / Z202-H



AC Current Converter

- INPUT: 0..5 / 0..10 A
- OUTPUT: 0/4..20 mA; 0..5 /10 V
- ACCURACY: 0,3 %
- POWER SUPPLY: 9..40
 Vdc / 19..28 Vac (Z201)
 85..265 Vac/dc (Z201-H)
- ISOLATION: 3.750 Vac

AC Voltage Converter

- INPUT: 0..500 Vac
- OUTPUT: 0/4..20 mA; 0..5/10V
- ACCURACY: 0.3 %
- POWER SUPPLY: 9..40
 Vdc / 19..28 Vac (Z202)
 85..265 Vac/dc (Z202-H)
- ISOLATION: 3.750 Vac

AC/DC Voltage converter

- INPUT: AC Voltage 0..500
 V and DC Voltage
 0..540Vdc
- OUTPUT: 4..20 mA
- ACCURACY: 0,3 %(0,4%)
- POWER SUPPLY: Loop-Powered
- ISOLATION: 3.750 Vac



Z203

- network analyzer
- INPUT: 0..500 Vac, 0..5 A
- OUTPUT: programmable* 0/4..20 mA, 0..5 /10 V
- Seriale RS485 PORT
- ACCURACY: 0.5%
- POWER SUPPLY: 9..40
 Vdc / 19..28 Vac
- ISOLATION: 3.750 Vac

(*) Analog Retransmission of 1 of 5 electrical measurement (Vrms, Irms, Active power, Reactive power, Cosfi)





Electric measuring devices

S203T



3 phases network analyzer (input from dedicated CT's)

- INPUT: 0..600 Vac, 0..100mA (CT15,25,100A)
- OUTPUT: programmable* 0/4..20 mA, 0..5 /10 V
- Seriale RS485 PORT
- ACCURACY: 0.1%
- POWER SUPPLY: 10–40
 Vdc, 19–28 Vac 50-60 Hz

(*) Measurement in TRMS: Analog Retransmission of 1 of the electrical

bidirectional power (available only on Modbus port)

measurements (Vrms, Irms, Watt (bidirectional), Var, VA, Coso,

S203TA

ROHS CE

T201





T201DC

AC Current transmitter

- INPUT: Alternate Current
- RANGE: from 5A to 40A (8 configurable scale by Dip-Switch)
- OUTPUT: 4..20 mA,
- ACCURACY: 0.2%
- POWER SUPPLY: 5-28Vdc 2-wires
- TEMPERATURE: -40..+85°C
- CONNECTION: free or on
 35mm DIN rail guide
- CABLE DIAMETER : 12,5mm

DC Current transmitter

- INPUT: Direct Current
 - RANGE: from 5A to 40A (8 configurable scales by Dip-Switch)
- OUTPUT: 4..20 mA,

-

- ACCURACY: 0.2%
- POWER SUPPLY: 5-28Vdc 2-wires
 - TEMPERATURE: -40..+85°C
 - CONNECTION: free or on 35mm DIN rail guide
 - CABLE DIAMETER: 12,5mm





3-phase network analyzer (input 5A)

- INPUT: 0..600 Vac, 0..5A
- OUTPUT: programmable* 0/4..20 mA, 0..5 /10 V
- Seriale RS485 PORT
- ACCURACY: 0.5%
- POWER SUPPLY: 10–40
 Vdc, 19–28 Vac 50-60 Hz

ELECTRIC MEASURING DEVICES APPLICATIONS

Isolation Test and Faults Research











Test-bed and motor controls



Energy quality Control



String current Measure – Photovoltaic



Diagnostic





Electric measures instrumentation Typical customers

- End User
- Project design office
- Photovoltaic System Integrator
- Naval manufacturer / eletrical engineer
- Machine builders: test benches, electric furnaces, threephase and polyphase motors, welding machines, etc.; bio-gas plants, refrigeration machines, climatic rooms etc.;
- Instrumentation manufacturers / supplier
- Electric material distributor
- Utilities





T201 – Application note Power consumption control







T201DC - Application Note

Current Consumption monitoring







T201 - Layout connections







Z201 - Application Note







Z202 - Application Note









0..500 Vac





9 Multiplexing

- General concepts
- Application notes





MULTIPLEXING

- Multiplexing technology is applied when a device (multiplexer) support the control of many signals incoming from many transducers.
- A multiplexer selects one of many analog or digital input signals and forwards the selected input into a single line.
- An electronic multiplexer makes it possible for several signals to share one device or resource, for example one A/D converter or one communication line, instead of having one device per input signal





Z-4TC-D (4 thermocouple A/D converter) Application Note







10 Market & Sales

- Applications
- Sales channel
- Customer approach
- Competitors arena





APPLICATIONS (1)

CEMENT INDUSTRY



Italcementi, Colacem, Buzzi, Moccia, Vassiliko Cement Works, Buzzi Unicem, Calme Cementi, Devnya Cement, Cementizillo, Vulkan Cement Plant, Les Cements Artificiel Tunisienne, Touran Portland cement Company,

METAL INDUSTRY

Steel, aluminium, pipes production, plants



Riva Acciaio, Ilva, Acciaierie Venete, Fonderia Anselmi, Tenaris-Dalmine, Ori Martin, Alcoa Laminazione Sottile, Acciaierie Valbruna, Tubificio di Terni,Lucchini, Alfa Acciai, Tenova, Techint, VA TECH, Tenova, Concast, Danieli, Tecoelettra, Moditech, Prisma, Imel, Elti

PAPER INDUSTRY



Fedrigoni, Cartiere Saci, Cartiera di Carmignano, Cartiera di Carbonera Carterie Cariollaro, Burgo Group, Cartiere Ermolli, Cartiere Milani Fabriano, ICO, Gruppo Marchi, Comer

WOOD MACHINE



IMAL

PLANTS FOR BRICKS PRODUCTION

RAIL APPLICATIONS

GLASS PRODUCTION

FOURNACES PRODUCTION



Laterlite, Gruppo Sacmi, Tecnoforni, Omega Automation



RFI, Trenitalia



Zignago Vetro, Ardagh Glass, Pilkington



Cieffe Forni industriali, ELTE; Termomacchine, Gruppo Sacmi, Riello, Ici Caldaie, Energy bruciatori industriali





APPLICATIONS (2)

WATER TREATMENT, **PROCESS AUTOMATION ENVIRONMENT MONITORING** NAVAL APPLICATIONS **TELECONROL Public Utilities / Plants** AQP, Acea, Hera, Multiservizi, Aceagag-APS, Aimag, ASSM, Etra, Nuove Acque, CPL Concordia. ABB Process **General Impianti** Fincantieri, B&B System, CCLG, Veritas, Cadf, CAFC, Astea, Gaia, Centro Automation Division Cantalupi, Naviop Veneto Servizi, AGAP, AGSM, CPL CEIF. Concordia, Acmo-ATI, Tecnoelettra Acque, General Impianti **ENERGY COMBUSTION PLANTS COGENERATION PLANTS REFRIGERATION / CHILLER** STC, Sogliano Ambiente, Berica Enel, Edison, Tirreno Power. Frigoriferi Emerson, Industriali; Endesa, Alstom Power, Eusebio impianti Electrolux, Industrial Frigo, Frigoriferi Energia, Edipower, Terna, T&T Bava; Hiross, Aermec Sistemi, Sices, Sideridraulic, Ansaldo Energia





APPLICATIONS (3) ELECTRIC MOTORS FOOD & BEVERAGE, WINE **UPS PRODUCTION FOOD & BEVERAGE, DAIRY** PRODUCTION PRODUCTION and a CEG, Gruppo Riello, PK Electronics Cantina di Soave **SUGAR PRODUCTION TESTING ROOMS BEER PRODUCTION** FOOD MACHINE PRODUCTION Birra Peroni SpA Pavan Cate Eridania, Sadam, Italia Zuccheri





APPLICATIONS (4)

CHEMICAL, POLYURETHAN PRODUCTION



Saip

CHEMICAL, GLUE PRODUCTION



Vinavil

PHARMACEUTICAL



Fidia, Zambon Group, Glaxo Welcome, Sandoz

DOSING PLANTS



CEPI, Sacmi Beverage, Sacmi Filling, Logic,



HEAT TREATMENT

Tentori

GAS PLANTS



Sol, Sapio, Linde, Air Liquide, Airgas, Pietro Fiorentini, CPL Concordia





SALES CHANNELS





GENERAL INSTRUMENTATION MANUFACTURERS

Endress + Hauser, Grundfos, Maddalena, Ghibson, Baggi, Elster Contatori, Honeywell, Asco Pompe, Samson, Hach lange, Vega, Prominent, Contrel Elettronica, Spirax Sarco, Siemens, Greiner, Khrone...





HOW TO APPROACH CUSTOMERS

- 1. Direct contact electrical design & enginnering offices to promote products knowledge.
- 2. Direct promotion to the end-users. The first purchase order probably will be not so big but, after the first test, the customer hardly will change the supplier.
- 3. Ask the end user some clear questions: which industrial signals do you treat? Digital, analog...; Wich control system do you use: PLC, PC, DCS, local controller, etc.)?
- 4. If end user don't use signal conditioners, ask him if he's interested to analyze solutions in order to avoid machine / plant stop and optimize data acquisition system.
- 5. If customer use other manufacturer converters, ask which product they use and for which application. Show SENECA as alternative marking the benefits.
- 6. In this way the resellers and system integrators will receive constantly the requests just by the final customers



