BDF DIGITAL

DRIVES | CNC | SYSTEMS | ENERGY

Products Applications and Main References

www.bdfdigital.com



Products Applications - Market reference : Sectors

AUTOMATION

Metal



Steel industry



Glass



Textile



HVAC



Packaging



Paper



Plastic



Wood



Power Cableway



Marine



Systems



ENERGY

Storage



Eolic



Water Turbines



Microgrid



Hydrogen



Cogeneration



Operating in the industrial automation sector, BDF Digital's reference market is aimed at manufacturers of machinery, industrial plants and the renewable energy sector.

The flexibility of the internally developed product and system means that today BDF Digital is present in various sectors.

- **AUTOMATION**
- **MACHINE TOOL**
- **ENERGY**

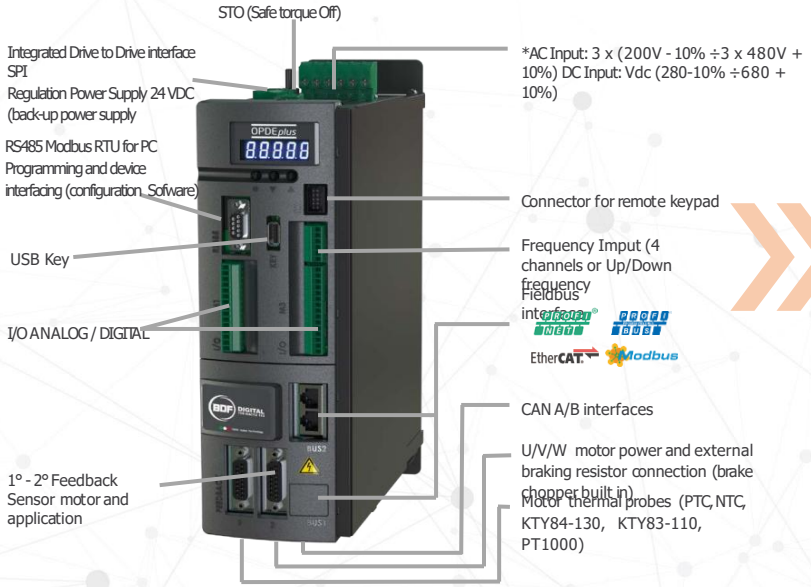
DRIVE DIVISION : Main References



Drive Division – Case history

BARUFFALDI SINCE 1927 Machine Tool Builders

BDF Digital has designed and manufactures the special drive for the control of machine tool turrets











BDF Digital standard drive

Customised drive

Dynamic Metal Process – Case history

OFFICINE MTM Spa – Welding wire tube machines

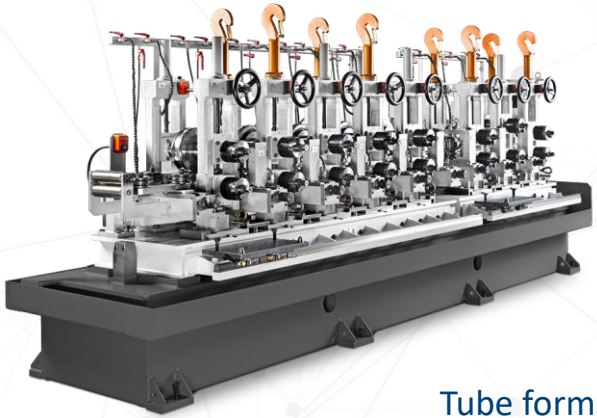
- **Strip entry lines**
- **Tube forming mills**
- **Cut-off machine**
- **Packing systems**

MTM CUTOFF MACHINES are well-known all around the world for their high precision and performance levels in terms of quality and reliability standards.



Cut off machine

MTM TUBE MILLS are recognized for their high level of automation and precision. They are equipped with advanced in-line control systems that guarantee the constant control of the production parameters as well the quality and reliability of the production.



Tube forming mills

Dynamic Metal Process – Case history

fives
Industry can do it

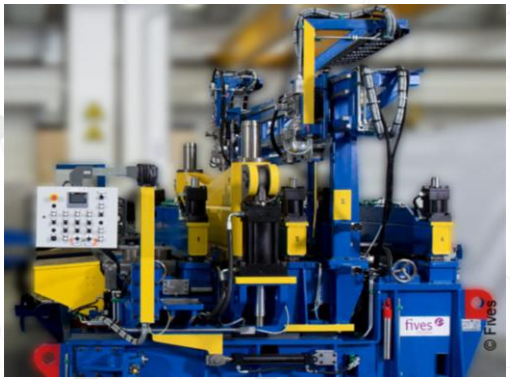
Tube mills

- Slitter
- Tape winder group
- Decoiler
- Accumulator
- Forming
- Cut-off









Dynamic Metal Process – Case history

Tube mills







Dynamic Metal Process – Case history

FIMI GROUP

Italy

Coil Processing Solutions

- Levelling and cut to length lines
- Slitting and trimming Lines
- Automatic packeging Lines
- Processing lines
- Special machines for aluminium
- Electro-welded tube production Lines







Dynamic Metal Process – Case history

OTOMILLS

Slitting lines

Servo positioning control on press feeding units and on cut-to-length lines





High precision feeding and cutting





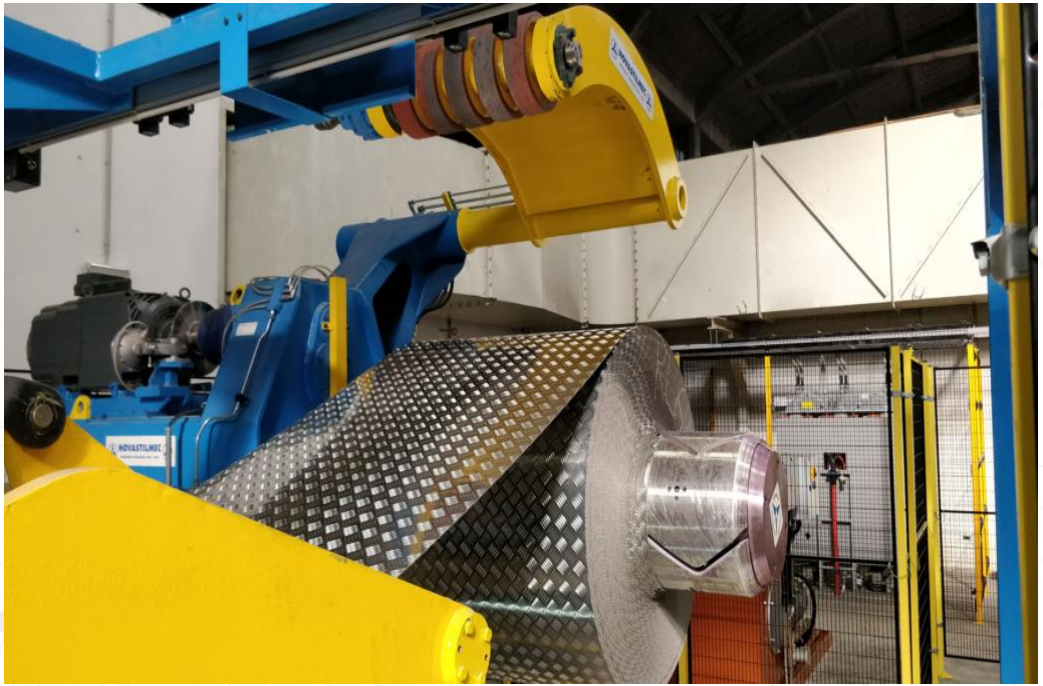
Cut-to-length machines, straighteners and slitting lines



Dynamic Metal Process – Case history

NOVASTILMEC COMPANY
QUALITY COIL LINES

Coil cutting lines







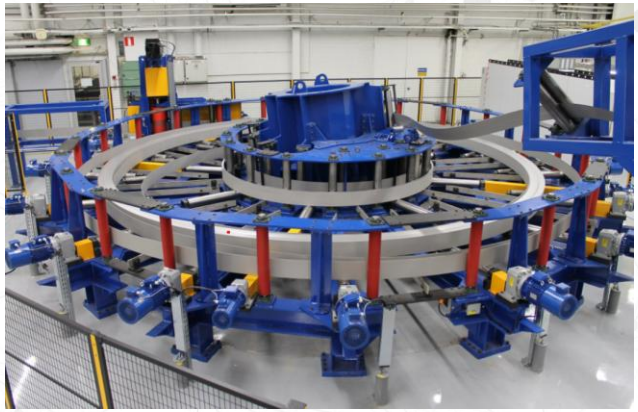
Dynamic Metal Process – Case history

olimpia80 TUBE MILLS
ITALIAN PASSION FOR TUBE TECHNOLOGY

Tube mills for stainless steel, titanium and non ferrous metals







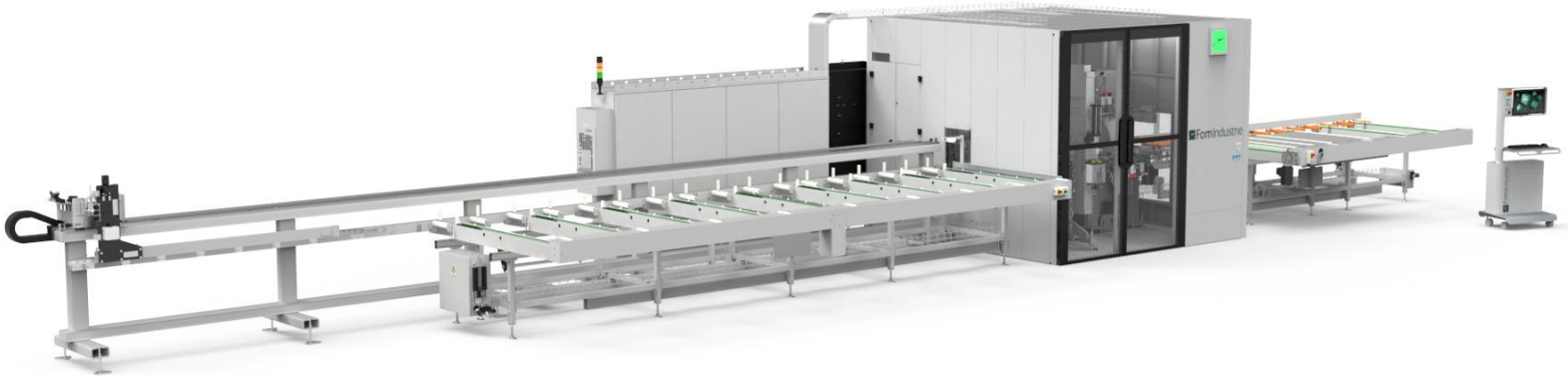


Dynamic Metal Process – Case history

FomIndustrie
Aluminium Working Machinery

Machining and cutting line with NC unit

Machining and cutting line with frontal Ø650 mm blade and bar passage 250x200 mm The machining unit tooled up with max 16 electrospindles and the cutting unit with 20° to 160° controlled blade tilt produce a continuous flow of machined and cut to measure elements. 20 different variants are available, which can be configured in terms of depth and length of material loading/unloading magazines and right or left feed direction

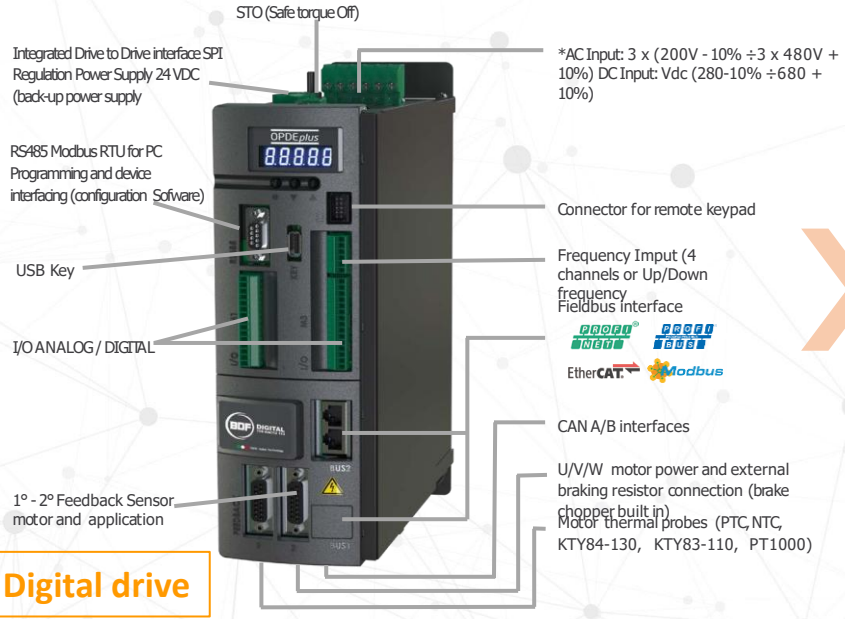


Dynamic Metal Process – Case history

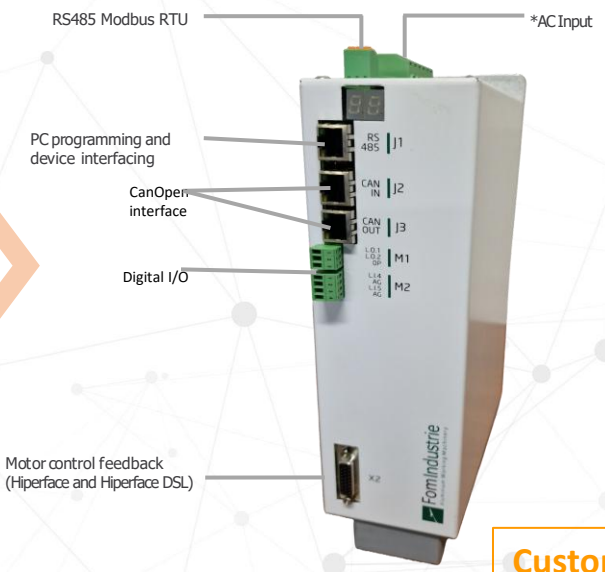
FomIndustrie
Aluminium Working Machinery

BDF DIGITAL

Servo spindle control (IM) + DS402 & analog	Axis movement
OPDEPlus std 22 - 32 - 60 [A]	OPDEPlus XS custom 4 [A] – 230 Vac



BDF Digital drive

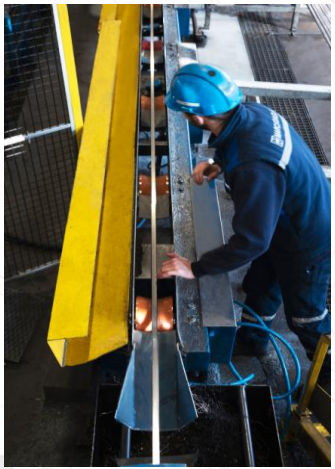


Customised drive

Dynamic Metal Process – Installations - Case history

MARCEGAGLIA is the leading industrial group worldwide in the steel processing sector

Worldwide







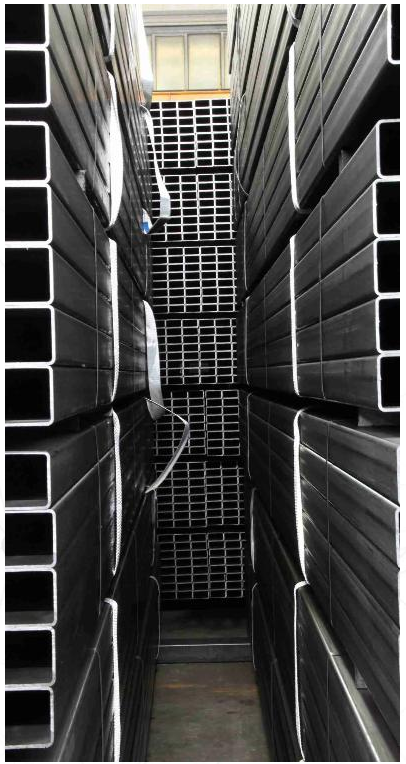
Dynamic Metal Process – Installations - Case history

PROFILTUBI
STEEL TUBE SPECIALISTS

Worldwide



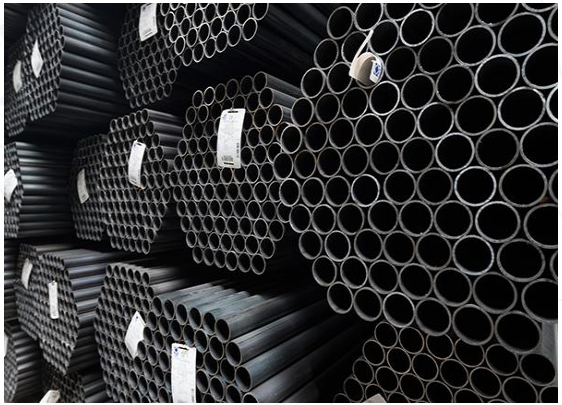


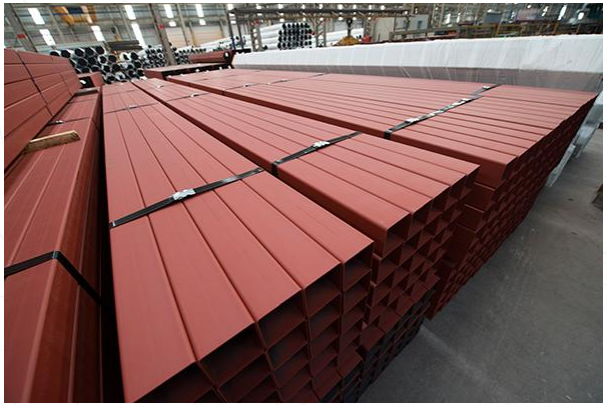


Dynamic Metal Process – Installations - Case history

YÜCEL boru is specialized in the manufacture of electro-welded carbon steel tubes







Injection – Plastic injection molding machines

BDF Digital has many years of experience in drive systems for the plastics sector, from extruders to injection moulding machines (hybrid and full electric) all the way to blow moulding machines..

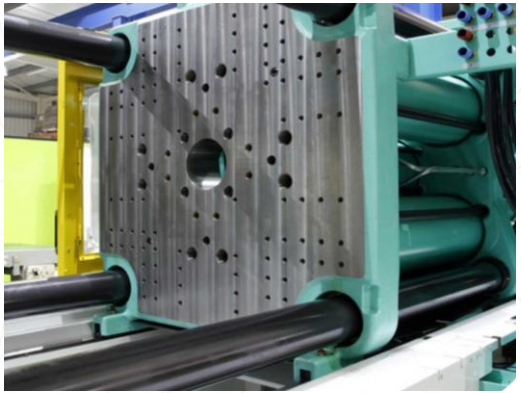
The OPDEplus drive integrated a P/Q control and directly manages the servo pump.

The digital connection between the servo pump, drives, and proportional valves ensures rapid communication with the press control.

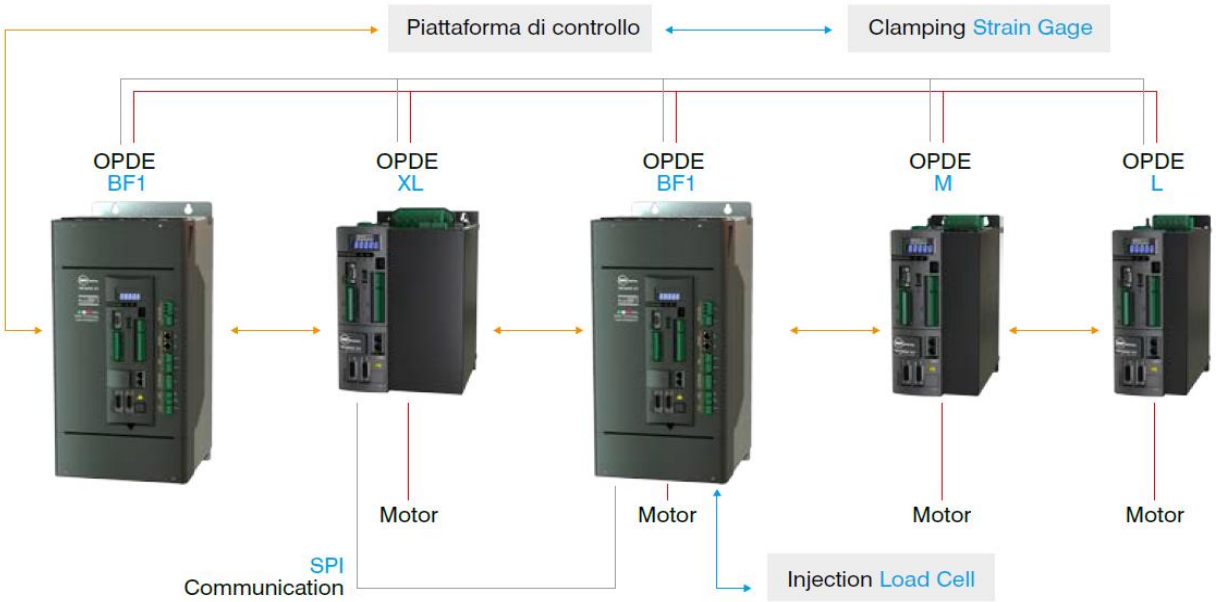
Software makes the difference

We develop **customized software**. BDF Digital incorporates data exchange via communication protocol, recipe setting, and data loading to ensure connectivity, mobility, and maximum productivity worldwide





Injection – Plastic injection molding machines

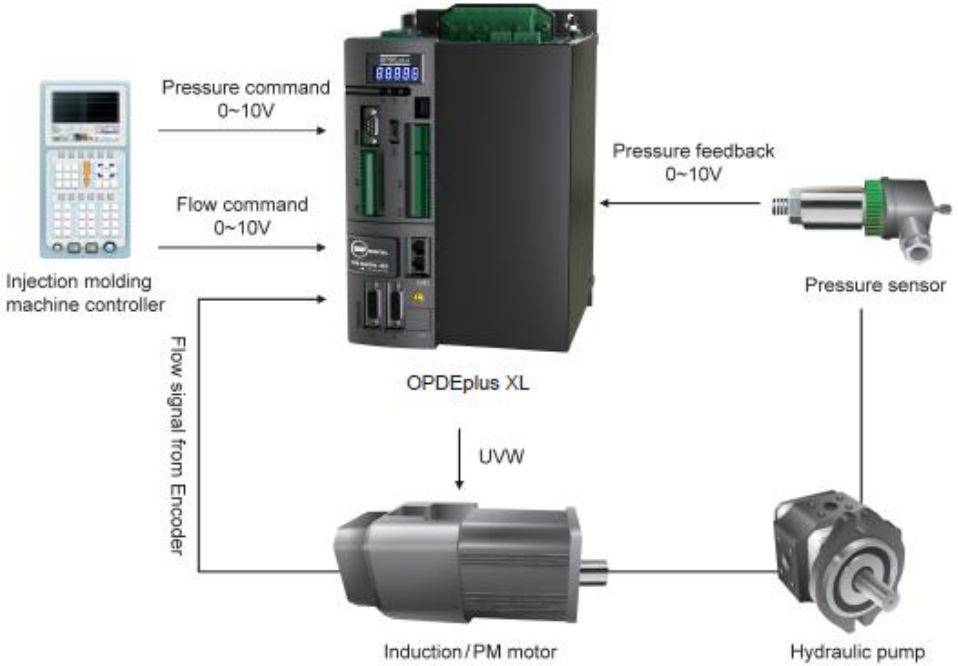




Injection – Plastic injection molding machines

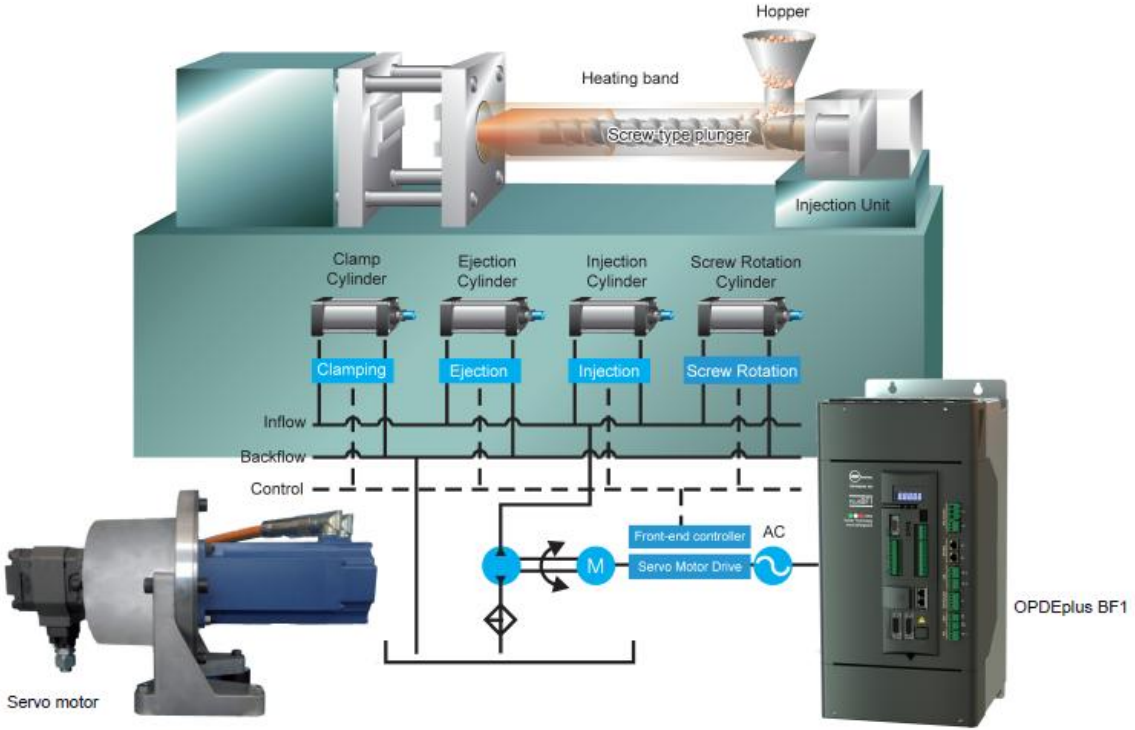
Structure of a Hybrid Servo system

After receiving pressure and flow commands from the injection molding machine controller, the OPDEplus performs PID calculations with actual pressure and speed feedback to drive the servo motor and hydraulic pump with a quick response time and high repeatability.



Injection – Plastic injection molding machines

Injection Molding Machine – Hydraulic System



Injection – Plastic injection molding machines

Integrated P/Q algorithm

The speed and torque control algorithm for axis positioning profiles is implemented in the motor drive fw.

- The pressure transducer is directly connected to the drive's 16-bit analog input, thereby closing the regulation loop directly on the drive.
- The control monitors the operation of each axis and awaits "work completed" signals from each one."



Consumption control per gram and per order

BDF Digital interfaces with network analyzers/energy meters dedicated to energy management: they are capable of providing information and tracking consumption trends. Observing the instantaneous and/or average power profile allows for load condition verification and definition of consumption per gram and per order.



Injection – Case history

Ripress Srl - Injection Presses for Thermoplastics

ECO HES is the servo-hydraulic machine with toggle clamping equipped with the celebrated HES system and therefore able to match all needs: the technical moulding, the furniture, the medicals or the high-production of packaging, indifferently. Designed to be the best cost effective and performing machine, offered with an unmatchable value for money, the IT HES from ripress is the best choice for all those looking for being more competitive without giving up their quality.







Special application

Injection – Case history

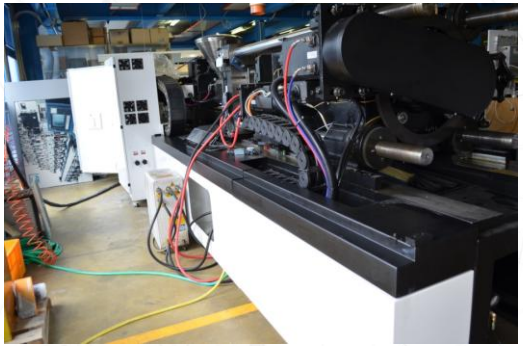
DONGSHIN

Injection Molding machines

- High performances at very low acceleration and deceleration time (0.2 sec) t
- High torque at zero speed and peak overload of 200%
- Easy set up and adjustment to any type of motor through auto tuning
- Energy Saving









Flexo Graphic

This application has been developed with servo drives to control **Torque Motors**.

Advantages in using a torque motor:

- Increase of the total efficiency: no mechanical gearbox
- Maintenance time reduction
- Regeneration control
- Flow control possible

High precision is obtained by using very precise sensors, like Endat 21/01/22/02 or MT absolute encoders.

Position, speed and Torque profiles are automatically calculated by the drive to obtain the **best dynamic response**





Flexo Graphic – Case History

FOSBER

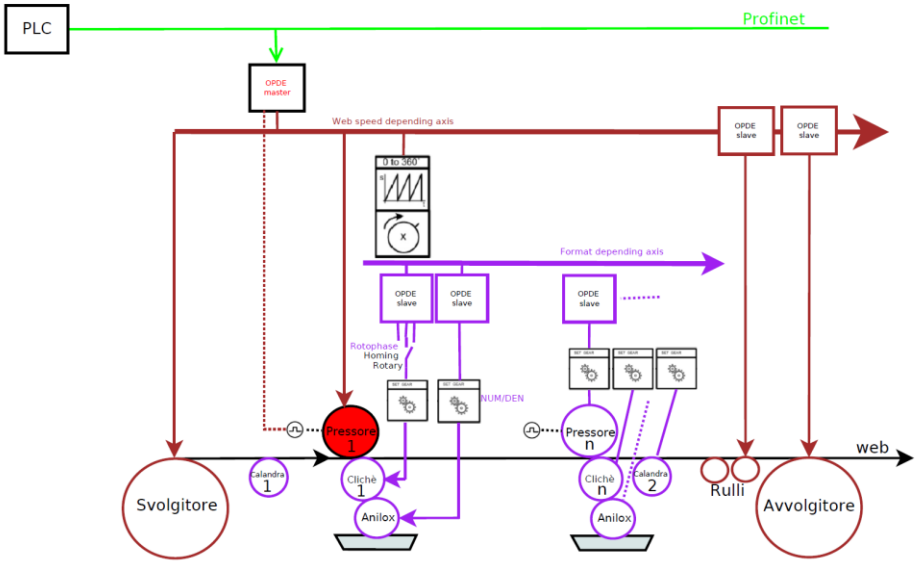
Custom Application - CORRUGATED BOARD





Flexo Graphic – Case History

Flexographic Presses







Textile – Custom solution

Weaving Machines, Rapier Looms and Air-jet Looms, Yarn Finishing & Spinning

BDF Digital has many years of experience in the field of textile machine automation.
The OPDEplus drive family offers a wide range of advantages for the production of textile machines; it allows for the devices to be equipped with various cooling systems, thus allowing them to be optimally cooled everywhere, even in the harshest environments.

We guarantee optimal solutions in the following areas of application:

- Rotor spinning machines
- Winding machines
- Twister spindles
- Winders and unwinders
- Frames

Benefits:

- Project optimization based on customer needs
- Enhanced performance
- Enhanced reliability
- Cost optimized
- Branding and labelling (Hw as well as Sw)





Textile – Custom solution

Command and control of the main motor on weaving loom:

Direct Frame Control

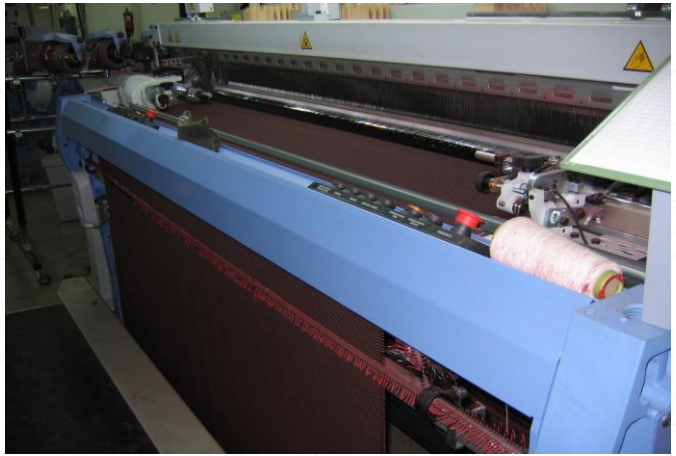
Implementation of a servo motor for direct frame control, replacing the electromagnetic flywheel and clutch-brake assembly.

Advantages:

- Elimination of significant mechanical parts (maintenance).
- More repetitive starts with improvement in the quality of the produced fabric.



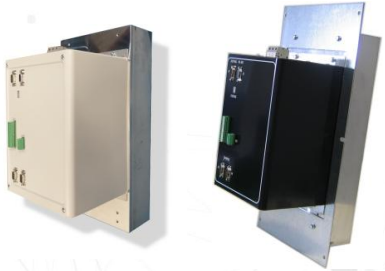




Textile – Custom solution – Case history

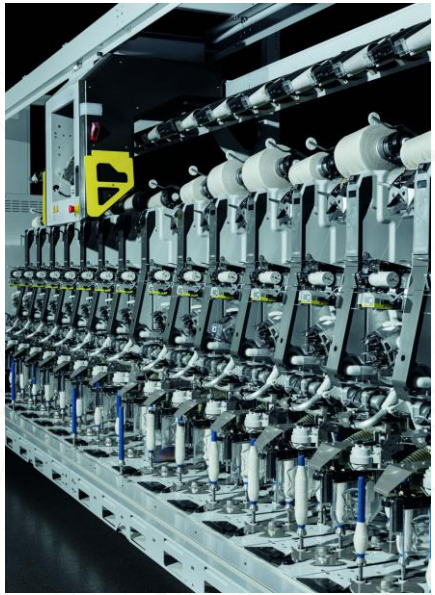
Savio Macchine Tessili S.p.A.

| TEXTILE SOLUTIONS TOGETHER | Leader in the textile machinery sector for the yarn finishing segment









Textile – Custom solution – Case history

bierrebi
italian cutting technologies

Italian cutting manufacturing company that operates in the industrial segment of machineries for textile and healthcare industries



Textile – Custom solution – Case history

SMIT

SANTEX RIMAR GROUP

https://www.santexrimar.com/

SMIT WEAVING MACHINES
SMIT is one of the leaders in design and manufacturing of dynamically controlled free flight tape rapier weaving machine



Inverter custom for weaving loom control

Free-flight rapier loom



Terry towel weaving machine



Weaving Machines : ONE



Textile – Custom solution – Case history

INDUSTRIAL WASHING MACHINES

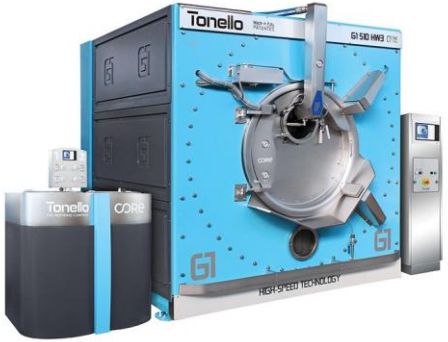
Tonello®
THE INSPIRING COMPANY

Italian company specialized in responsible technologies for denim and garment washing, dyeing and finishing.

Dyeing machines



Washing machines



Textile – Custom solution – Case history

MT COSTRUZIONE MACCHINE SRL

Design and construction of textile machinery :
Preparation Dyeing / Printing
Preparation Large Roll / Falda
Groups unwinding winding
Automatic Systems Audit
Complete Lines Control Packaging
Inspection for Technical Fabrics
Packers



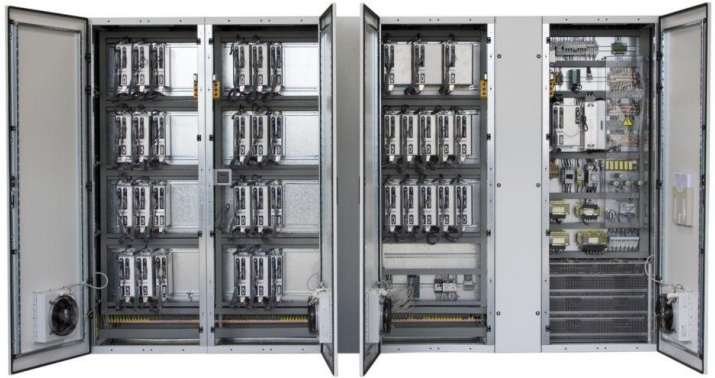
Glass – Glass Application with OPDEPlus

BDF Digital, grazie alla lunga esperienza, ha acquisito un know-how di prestigio che permette al reparto R&D di sviluppare soluzioni di altissimo livello per quanto riguarda le macchine per la produzione di articoli vetro cavo e pressato.

Dal Melting al Forming, forniamo un sistema avanzato in grado, non solo, di ottimizzare tempi e qualità di produzione, ma anche i consumi grazie alle nostre soluzioni rigenerative







Glass – Glass Application with OPDEPlus

- Hollow glass melting furnaces
- Forming process
- Flowtech: Cutting-edge technology









Glass – Flat Glass Application – Case History

SKILL GLASS
made for glass
VERTICAL CNC CENTERS

OVER 20 YEARS
Since 1999

Vertical Grinding and Arrissing

- Vertical Machining center
- Vertical Grinding and Arrissing
- CNC Grinding and Arrissing
- CNC Drilling and Milling





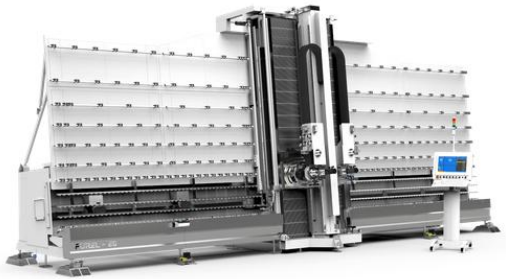
Double Edging machines for glass



Vertical CNC center



Drilling and Milling machine



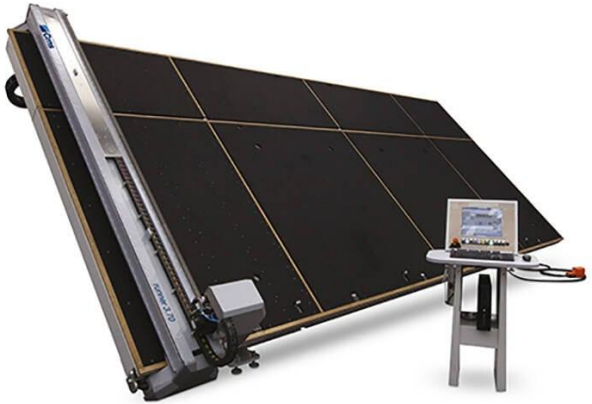
Glass – Flat Glass Application – Case History

Cms glass technology

Vertical Grinding and Arrissing

- Horizontal machining centers
- Vertical machining centers
- Cutting tables and cutting lines
- Loading systems
- Complete waterjet cutting systems
- Seaming Machines

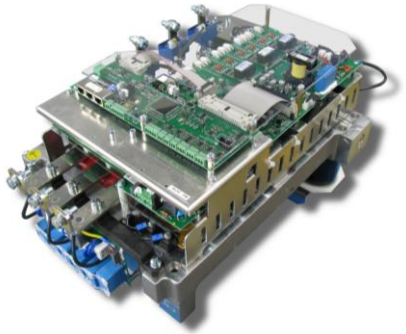


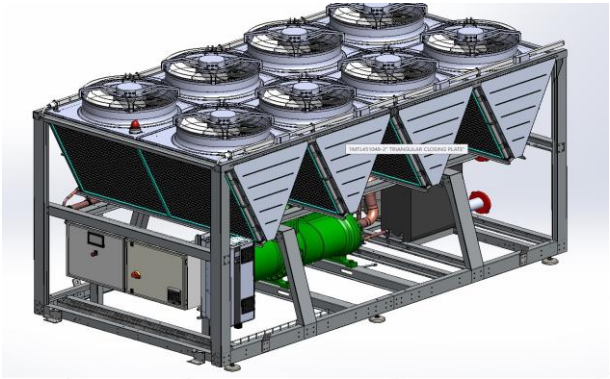


HVAC sector

The inverter controls Synchronous, Asynchronous and Reluctance motors.
It's composed of a semi-controlled bridge rectifier, a DC-link and IGBT power modules.
Low voltage electronic boards perform power module control and protections.

Control and status of the inverter can be done via digital and analog I/O, serial bus comunication alone or a combination.
The serial connection using Modbus (RTU) via RS485 or using OPDExplorer gives access to all system information.







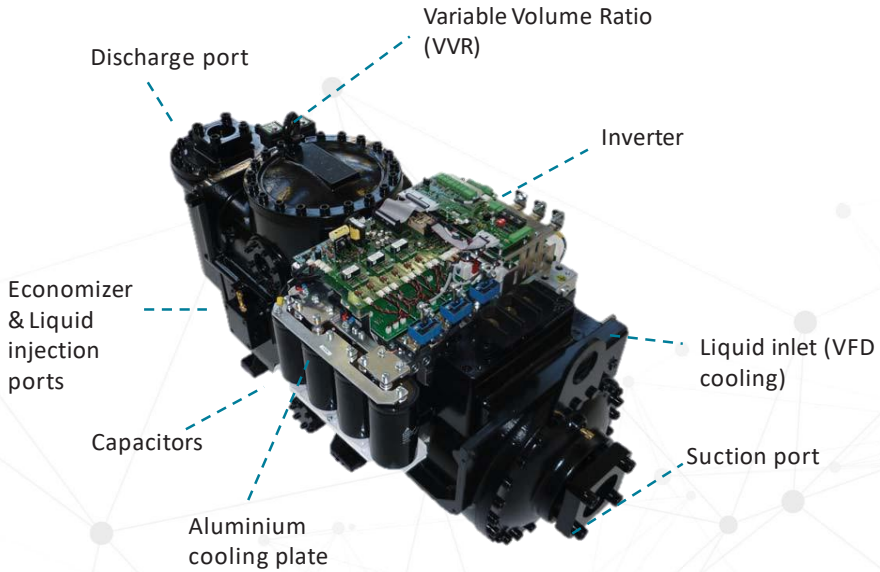
HVAC sector - Custom Application

DAIKIN



EWAD-TZ

Air cooled chiller with R-134a



HVAC sector - Custom Application

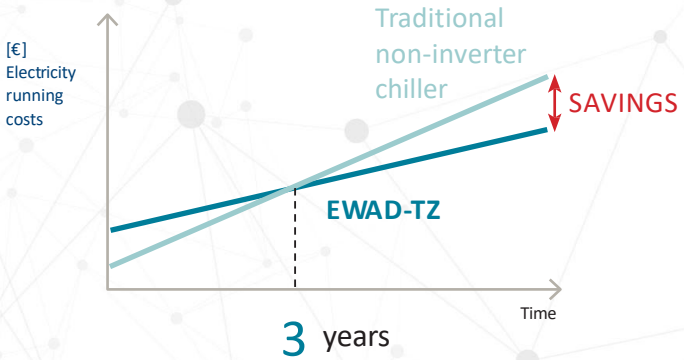
DAIKIN Rapid payback relative to traditional non-inverter chiller

High performance combined with unrivaled reliability

Chillers and compressors have been subject to intensive testing in Daikin factories and in selected job-sites even at extreme working conditions. Performances, acoustic, endurance and vibration tests ensuring the best technical solution and the most enjoyable chiller experience.

Comfort cooling application:

Return on investment within 3 years

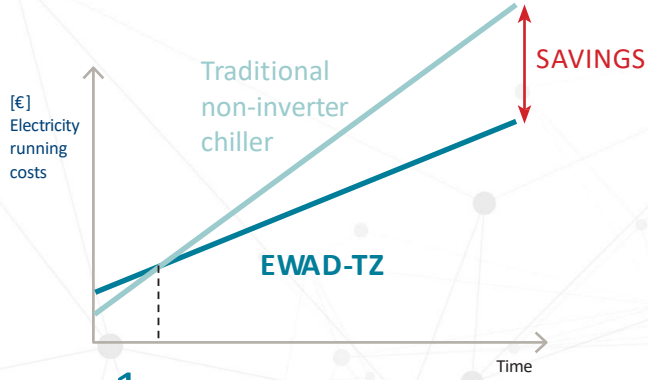


3 years

Based on:
1,500 working hours/year
industrial electricity price = 0.17€/kWh
design conditions 12/7°C evaporator and 35°C ambient

Process cooling application:

Return on investment within 1 year



1 year

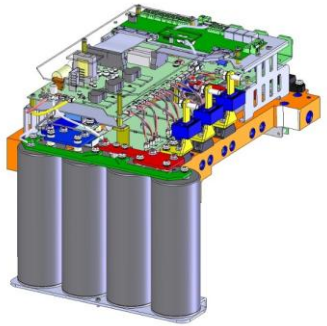
Based on:
5,000 working hours/year
industrial electricity price = 0.17€/kWh
design conditions 12/7°C evaporator and 35°C ambient

HVAC sector – Case History

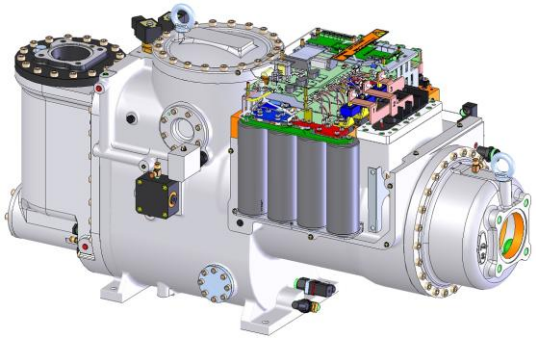
3D for inverter installation – Air cooled chiller with inverter driven screw compressor

Model	Dimensions [cm] AxBxC	Weight [kg]
90 KW	54x36x38	26
120 KW	54x36x38	26
200 KW	63x37x38	31

Inverter



Inverter installed on-board compressor



Final group compressor + inverter with plastic enclosure



Power Cableway

For over 10 years **BDF Digital** has been providing power electronics for the world major manufacturers of cableways.

- The same Power Stack and control unit is used for the AFE and the Inverter
- Minimize the stock problem
- The system is according to the standard S.T.O.

Typical installations:

- Chairlifts
- Automatic Hooks
- Ropeway
- Cableway
- Funifor

Powers from 30kW up to 2 MW





Power Cableway – Case history

FUNITEK

Cableway and Chairlift
Skyway-Mont Blanc
The plant, opened in June 2015

Doppelmayr (BolzenItaly): mechanical part
Funitek (Vicenza Italy): system integration
BDF Digital: drives OPDE

It connects Pontald'Entrèves (2.960 m) to Pointe Helbronner (3.466 m)

Europe's Highest Cableway



Power Cableway – Case history

Cableway and Chairlift
FuniforIdren - Rosa Mountain
The plant, opened in December 2009

Doppelmayr (BolzenItaly): mechanical part
Funitek (Vicenza Italy): system integration
BDF Digital: drives OPDE

It connects Area Passo dei Salati (2.960 m) to Idren's Area (3.275 m)
Rated Power Drives: 400 kW (690 Vac)



Power Cableway – Case history

Cableway and Chairlift
Merano, Italy
The plant, opened in 2022

8 OPDEplus BF1 150 A servo drives
8 Active Front End AFE OPDEplus 150 A
Driving of the 8 sectors of the DSD motor
Supervisory PLC
M&S control solution
Profinet interface





Power Cableway – Case history

Jafferau



Ravasceletto



Piani D'Erna



Power Cableway – Case history

Monesi Imperia



Les Saises (France)



Merano



Madonna di Campiglio



Motion Control – Marine

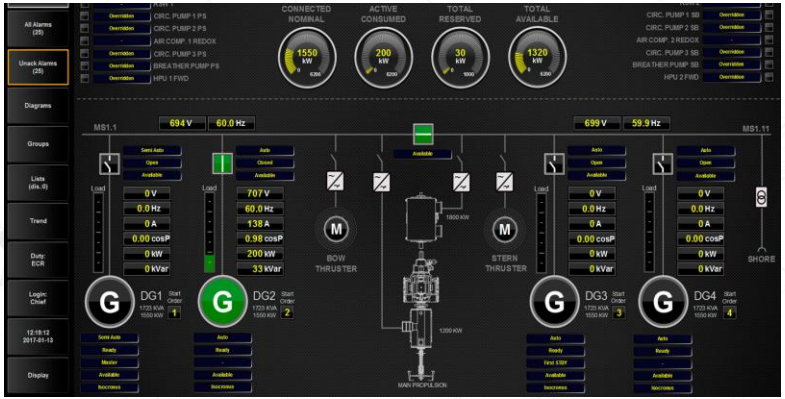
With BDF Digital Energy Marine solutions, your yacht always meets the highest standards requiring performance and ecological efficiency.

- **Shore to ship power converters**
- **Energy Management system**
- **Energy storage on Lithium and/or «Salt» batteries**



PMS (Power Management System)

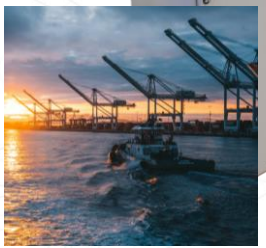


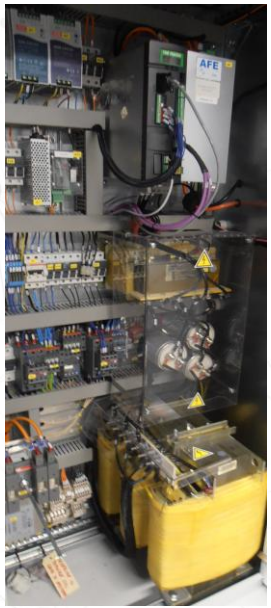


Motion Control – Marine

PCS - Power Conversion System with **AFE** and/or **DC/DC**







BATTERY TECHNOLOGY

Lithium
(CATL Li-ion/LifePo4)





Salt
(FZSoNick)



Motion Control – Marine - Case history

SMART GYRO

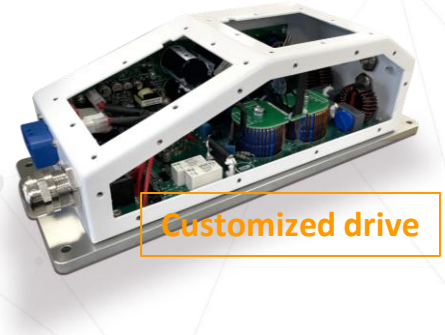
BDF DIGITAL

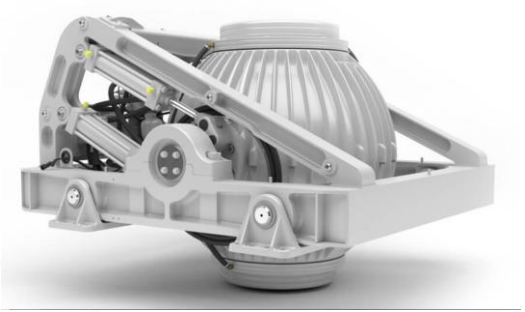
BDF Digital stands out for the design and production of energy conversion systems.

Power range: from 10 to 1000 kVA. Air and liquid cooled versions available.

The applications included:

- Converters for power supply on the dock
- PFC and AFE
- Line voltage regulators
- Isolation transformers
- Active filters
- Energy storage systems for peak shaving
- Custom automation solutions.





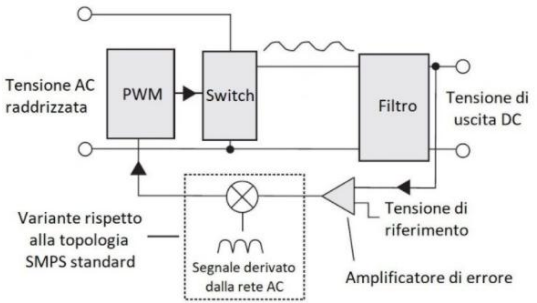


Figura 2: schema a blocchi di un circuito PFC

- Gyroscope Boat Stabilizzer
- Custom drive, PFC (power factor correction) integrated
- Fly Restart
- Power supply: 120 – 240 Vac 40..70Hz
- Synchronous motor 10.000 rpm, sensorless

Motion Control – Marine - Case history

CANTIERE DELLE MARCHE
explorer yachting starts here

Cantiere delle Marche

Explorer Yachts - Cantiere delle Marche - Shipyard in Italy

Ancona, Italy

Construction of long-range, luxury explorer yachts from 26 to 49 metres in length

SMART GYRO

Smartgyro

Smartgyro - Home Page

Spezia, Italy

Gyro stabilization technology company

ALIA
YACHT BUILDERS

Alia Yachts

Luxury Superyachts - Alia Yachts

Konyaalti, Antalya

Premium yacht builder

Motion Control – Marine - Case history

TEMA Group

Marine | tema.hr

Pula, Croatia

Complete electric propulsion systems for zero emission boats, serial hybrids and parallel hybrids

ISEL Srl

IS.EL Srl

Senigallia(AN), Italy

Electrical and automation systems

System Division – Case history

SPRAYTECH
WHAT LEATHER WANTS

Products dedicated to the tanning sector for the spraying of leather





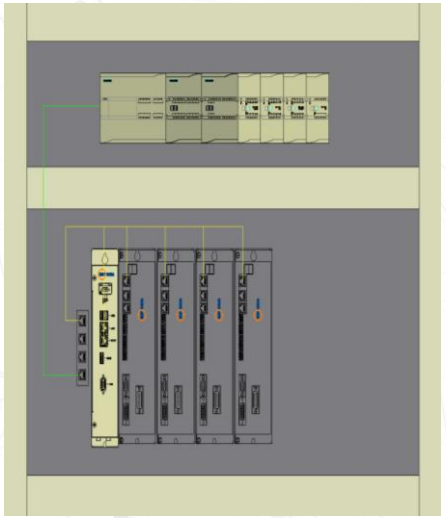
System Division – Case history

SPRAYTECH
WHAT LEATHER WANTS

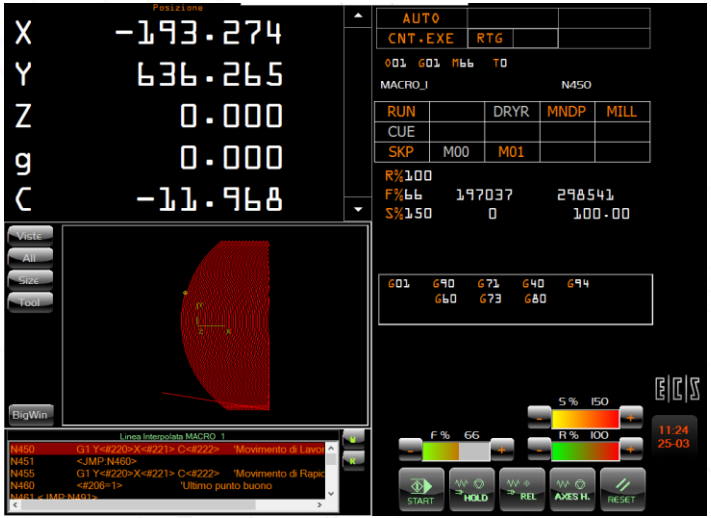
Interpolatore assi BDFd – Controllore S71200 SIEMENS

Sistema Motion interpolante **16 assi**, gestito da PLC Siemens S7 1200 in Profinet

Interpolazione **3 assi** + Gantry







CNC DIVISION : Main References



CNC – Case history

ROPER WHITNEY

The model CNC904 : bending is designed for the long folding machine

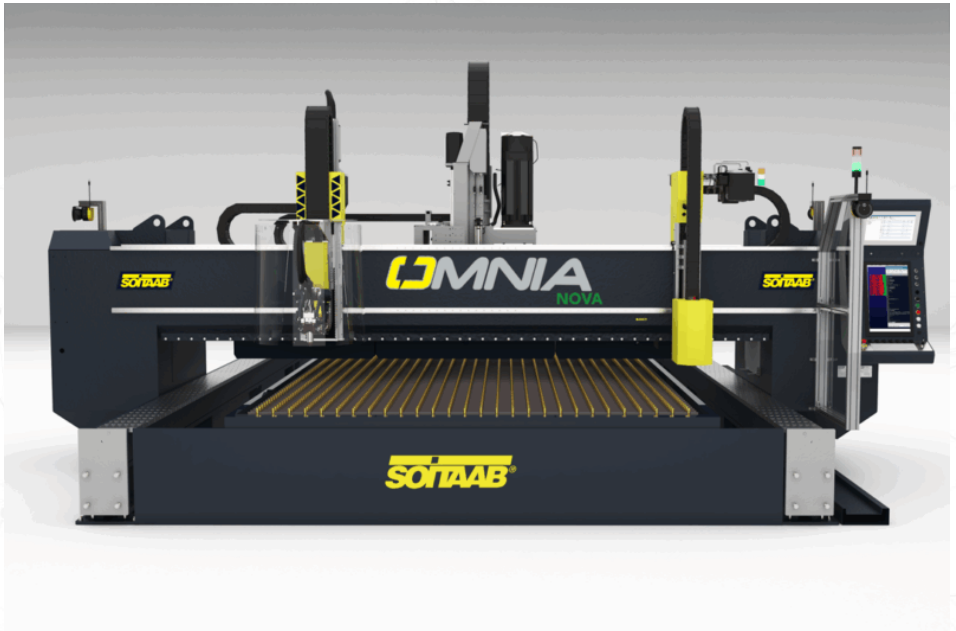




CNC – Case history

The model CNC905 : cutting machine (Plasma & Oxy-fuel cutting)





CNC – Case history

CYLASER®

The model CNC1015 : laser cutting machine





CNC – Case history

The model CNC901 : milling machines





CNC – Case history

TERZAGO MACCHINE
MACHINERY FOR STONE PROCESSING AND COMPLETE LINES

The model CNC1011: marble/stone bridge processing machines





ENERGY DIVISION : Application & References



Storage Solutions – TYPICAL APPLICATIONS

ENERGY RECOVERY FROM WATER PIPELINES





EOLIC GENERATION







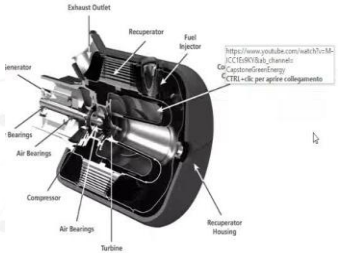
HYDROELECTRIC GENERATION

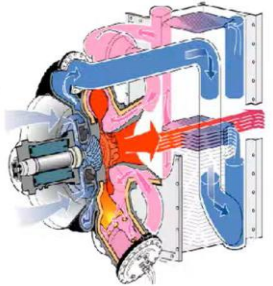






COGENERATION





Division TDE – ENERGY

50 years of technological excellence in automation, numerical control and **renewable energy**





Hydrodynamic Archimedean Screw

System made by 2 OPD Exp 90 kW with PLC on-board to realise the Active Front End and integrates the MPPT (Maximum Power Point Tracker) function to follow the maximum power point, varying the motor speed from 200 to 450 revs./min.







Hydrodynamic Archimedean Screw

The 90 kW OPDExp that controls the asynchronous motor without feedback (sensorless) is equipped with STARTER software that allows the motor to be connected directly to the line. So it is possible to recover the losses caused by the Active Front End drive and the inverter.





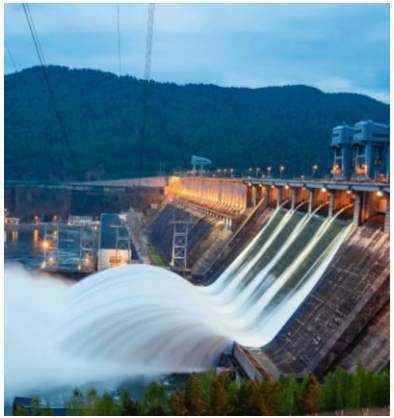
Water turbines

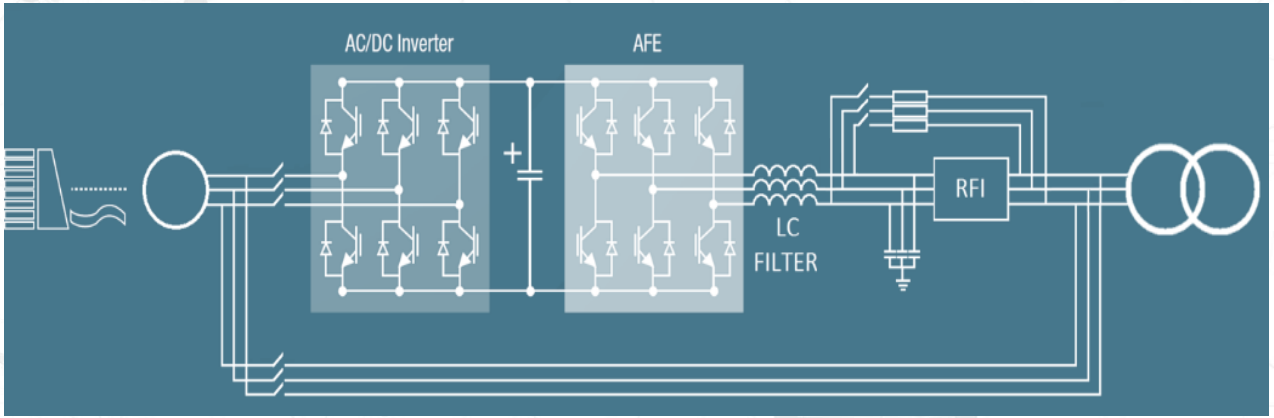
OPDE WATER INVERTER From 7 kW up to 2 MW

Main Features

Control of rotating machine

- Speed and torque control of the generator
- Flying restart of the rotating machine
- Function STARTER/BYPASS both in the asynchronous and in the synchronous as well and viceversa: back to the inverter control
- Automatic Cosphi rephasing with the AFE in run mode without the use of capacitor banks
- Management of the exceeding energy and of the plant out of control, thanks to electronic circuits and dissipative braking resistors
- Control of rotating machines in Sensorless Field Oriented Control (FOC) and defluxing modality





Water turbines – Case history

Client: C.G.M.

The biggest variable speed plant in Europe

Where	:River
Screw Number	:2
Generator's Nom. Power	:250 KW
Installation	:2010
Grid Connection	:Yes



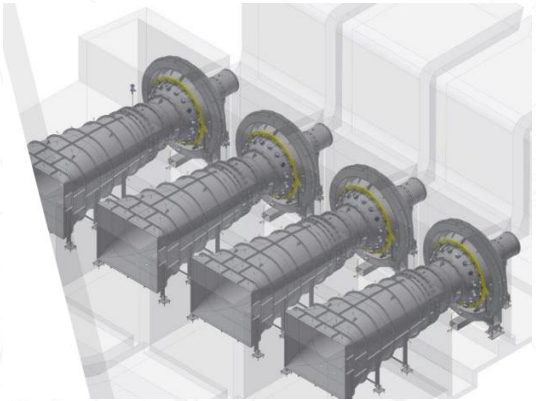
Client: ESEA

Where	:River
Screw Numbers	:2
Generator's Nom. Power	:160 KW
Installation	:2016
Grid Connection	:Yes



Client: B.M. SPA

Where	:River
Screw Number	:2
Generator's Nom. Power	:55 KW
Installation	:2014
Grid Connection	:Yes



E-Store

Storage + Solar System Microgrid

HQ 14 kVA Plant

In **Our Headquarter** in Vicenza, we realized a **14kVA Storage System** with 14kWh Lead-Acid Batteries.

The system works On-Grid and Off-Grid. It is a 4 quadrants system integrated with **9,5kW Solar Plant** installed on the roof of the company.

The **E-Store system** has as its main target the power peak-shaving and the backup function in order to ensure the energy to the Research Laboratory.



Storage Solutions – Case history

Ancillary Grid Service

2MVA – 2MWh

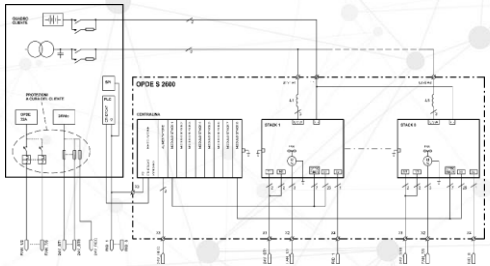
2 MVA system with 2 MW / 2 MWh Li-ion battery

On-Grid circular capability (4 quadrants)
Ancillary grid services: frequency/voltage regulation combined with 8 MVA wind farm.

Standard: CEI 0-16

- Virtual current generator (CSI)
- Virtual Voltage generator (VSI)
- CEI 0-16 storage functions
- Stack cabinet (inverter+filter)
- Design of the turn-key solution
- Algorithms' implementation for grid ancillary services (Grid frequency regulation / Grid Voltage regulation)





Microgrid 220 kW

Features

Implementation of 220 kW/kWh storage system, developed in partnership with Samsung SDI and smart management of the energy flows with the myLeaf system in the Loccioni microgrid.

- Virtual current generator (CSI)
- Possibility of Virtual Voltage generator (VSI)
- Possibility of Auto-consumption from renewable sources
  - Peak Shaving
  - Time shifting
  - Demand Response

- 3 PV with auto-consumption
- 1 micro hydroelectric unit



Storage Solutions – Case history

Features

10 kW/kWh lithium-battery system to test the integration of storage systems on distributed generation sources and on microgrids.

- Virtual power generator (CSI)
- Possibility of Virtual Voltage Generator (VSI)
- Design of the turn-key solution
- SCADA system implementation
- Best inverter/battery control development

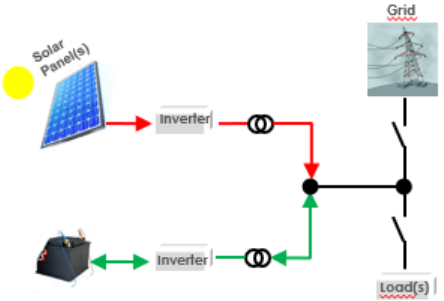


Storage Solutions – Case history

Features

10 kW System / 10 kWh Storage / Micro Grid
6 kWp Solar
15 kWh Lead Acid Battery

- AFE OPDE converter Solar Application
- AFE OPDE converter Storage / Island Function Mode
- Cable Design
- PLC management (Battery and Solar management / Peak shaving)





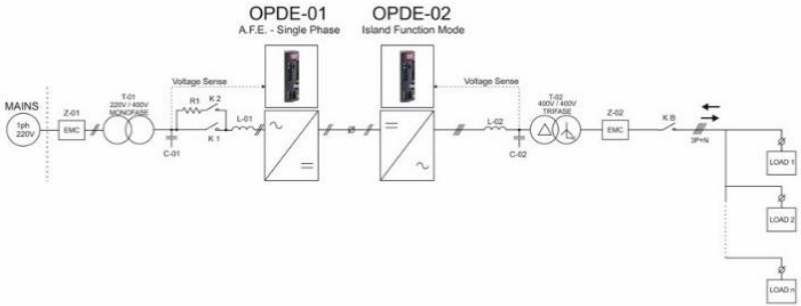
Storage Solutions – Case history

1- Phase Supply Islan System

Features

3 phase – 400V Micro Grid fed by 1-phase 220V grid
Single Phase OPDE-AFE
Three Phase OPDE -AFE (Micro Grid)

- AFE OPDE-01 converter standard (single Phase)
- AFE OPDE-02 converter with Island Function Mode





Storage Solutions – Case history

RSE System

Features

32 kVA system with 32 kW / 32 kWh Li-ion battery system integrated with Renewable Sources
(Virtual Power Plant)

Function: Micro-Grid test facility.

Virtual current generator
Virtual voltage generator
Black start
Design of the turn-key solution
SCADA system implementation
Best inverter/battery control development
Test on the control of the microgrid, connected and in island



Storage Solutions – Case history

Fruit and Vegetables

Features

20 kVA system with 20 kW / 20 kWh Li-ion Battery

On-Grid and Off-Grid, 4 quadrants integrated with 60 kWp PV.

Power Peak-Shaving
Self-Consumption

Standard: CEI 0-21



Storage Solutions – Case history

Terna Rete Elettrica Nazionale

SuperCap



Features

675 kW system with Supercapacitors.

Design of the turn-key solution

On-Grid and Off-Grid Black Start, 4 quadrants.
AFE + DC/DC buck converters.
VIN = 300 ÷ 1100 Vdc

Voltage Regulation
Primary Frequency Regulation
Secondary Frequency Regulation

Storage Solutions – Case history

ISPRA
Istituto Superiore per la Protezione e la Ricerca Ambientale

ISPRA Ambiente

Features

424 kVA system with 450 kWh Li-Ion Batteries

Design of the turn-key solution

On-Grid and Off-Grid, 4 quadrants.

Backup function
Island function

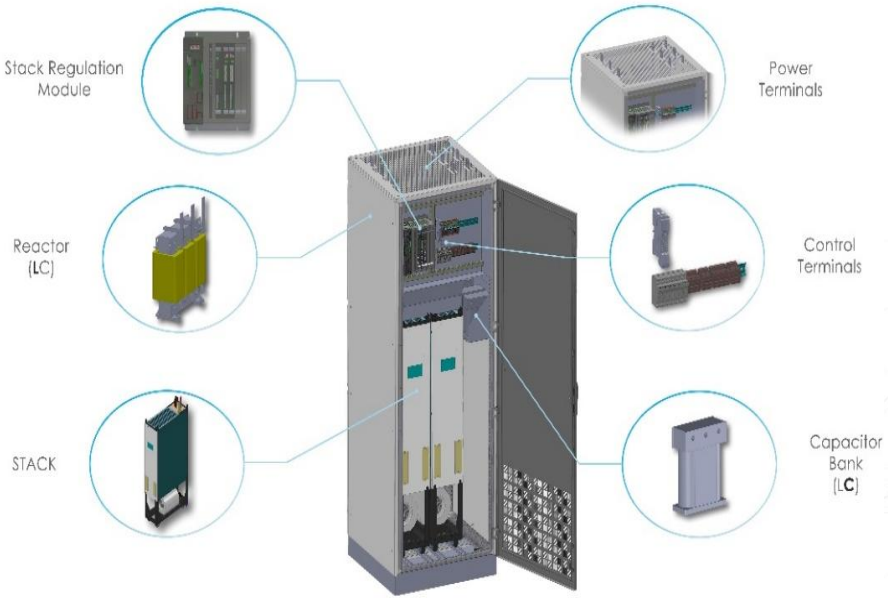
Standard: CEI 0-16



Fuel Cell System

Features

120 kVA system for use with Fuel Cell
Use: On-Grid and Off-grid, 2 quadrants (discharge only)
The use is for ancillary services and testing.
Standard: CEI 0-21

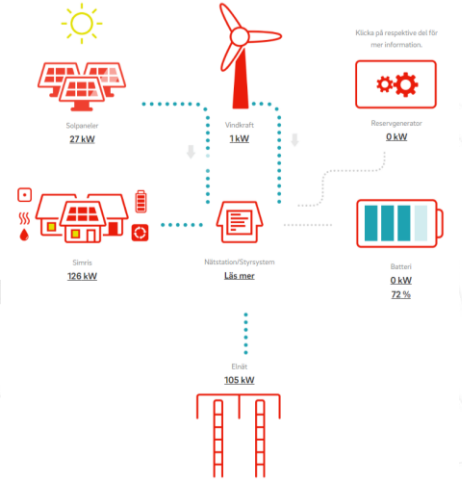


Storage Solutions – Case history

Micro Grid System

Features

850 kVA system with 850 kW / 850 kWh Li-ion Battery
Use: On-Grid and Off-Grid, 4 quadrants integrated with 650 kW wind turbine.
The use is to provide energy (both on-Grid and off-Grid) to a community.





Storage Solutions – Case history

Politechnical University
System

Features

200 kVA system integrated with renewable sources
Use: On-Grid and Off-Grid circular capability (4 quadrants).
The use is as MicroGrid test facility



Ship Application
Microgrid

Features

MicroGrid fed by 3-phase 480V 60Hz Diesel Generator
30 kW OPDE for Micro Grid application (VSI-Island application)

Thanks for the attention!

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