

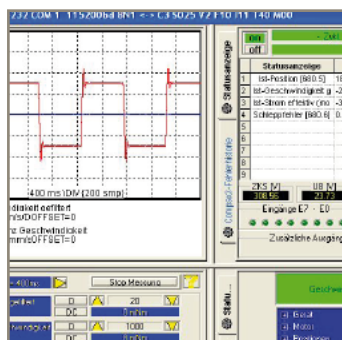
DeviceNet

PROFIBUS

CANopen

ETHERNET POWERLINK

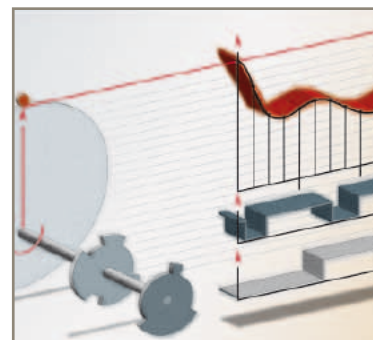
EtherCAT



aerospace
climate control
electromechanical
filtration
fluid & gas handling
hydraulics
pneumatics
process control
sealing & shielding



Integrator Servo Drive Compax3



ENGINEERING YOUR SUCCESS.

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Integrator Servo Drive Compax3

Description

Compax3 is Parker Hannifin's global servo drive. The drive series includes single axis as well as multi axis drives as well as hydraulics controllers. It features a power range from 1 to 110 kVA.

The servo drives are completely developed and manufactured in Germany. An additional Compax3 production site was established in the US. As a global servo drive controller, Compax3 is of course available all over the world. Service and support sites are located in the vicinity of all major industry locations - worldwide. The "Parker Automation Technology Centers" do play an important role in this context - well-trained and experienced application and support specialists will provide the necessary professional support in any situation.

Attributes

Hardware

- Power range from 1 to 110 kW
- 1 encoder output / 1 encoder input
- 8 digital inputs / 4 digital outputs
- 2 analog inputs (14 Bit)
- 2 analog outputs (8 Bit)
- Several fieldbusses
- Extensive safety technology

Technology Functions

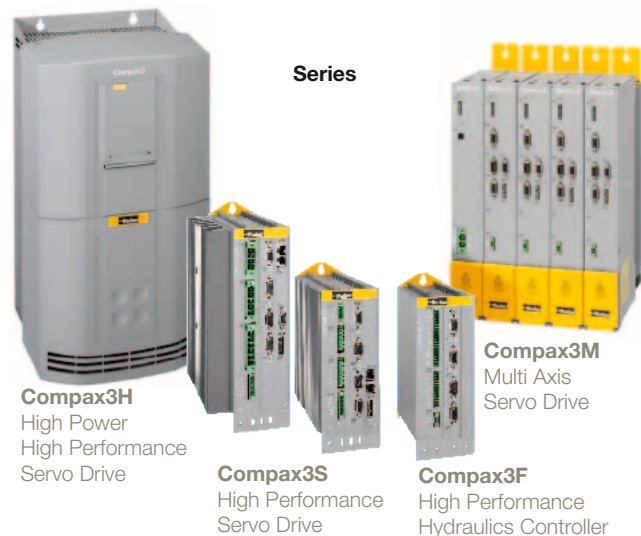
- I10T10: Drive control via velocity/torque control, step/direction input, encoder input
- I12T11: Positioning via digital I/Os, RS232/RS485, absolute/relative positioning, registration mark related positioning, electronic gearbox, dynamic positioning
- T30: Programming based on IEC61131-3 with CoDeSys
 - PLCOpen function modules
 - IEC61131-3 - standard modules
 - C3-specific function modules
- T40: T30 functionality + cam function

Motion Control

- Technology controller with integrate Motion PLC Compax3 *powerPLmC-C20*
- Standalone version - Motion PLC with technology functions C3 *powerPLmC-E30*

Software Tools

- Powerful - Parker Integrated Engineering Tool" Multi-axis tool with the "Compax3 ServoManager"
 - Guided configuration, setup support, integrated 4-channel oscilloscope function, ...
 - Diagnostics/Maintenance/Service
 - MotorManager, CamDesigner for the creation of cams, ...



Compax3H
High Power
High Performance
Servo Drive

Compax3S
High Performance
Servo Drive

Compax3F
High Performance
Hydraulics Controller

Compax3S & Compax3H Performance Data

Device:	Current [A_{rms}]		Supply voltage	Power [kVA]
Compax3	$I_{cont.}$	$I_{peak} (<5 s)$		
S025V2	2.5	5.5	1 *	1.0
S063V2	6.3	12.6	230/240 VAC	2.5
S100V2	10	20	3 *	4.0
S150V2	15	30	230/240 VAC	6.0
S015V4	1.5	4.5	3 * 400/480 VAC	1.25
S038V4	3.8	9.0		3.1
S075V4	7.5	15		6.2
S150V4	15	30		11.5
S300V4*	30	60		25.0
H050V4	50	75	3 * 400/480 VAC	35.0
H090V4	90	135		70.0
H125V4	125	187.5		91.0
H155V4	155	232.5		109.0

*Operation with C4 condenser module.

Compax3M Performance Data

Device:	Current [A_{rms}]		DC bus voltage
Compax3	$I_{cont.}$	$I_{peak} (<5 s)$	
M050D6	5	10	325 ... 679 VDC (Rated voltage 560 VDC)
M100D6	10	20	
M150D6	15	30	
M300D6	30	60	

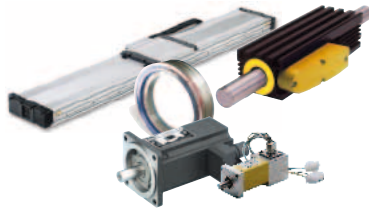
Innovative, flexible device technology

The development of Compax3 was focused on maximum openness and flexibility for a wide variety of applications.

Motors / Actuators

Today, motors and actuators are available in many different versions and technologies. The Compax3 servo drives support the most common motors. Among these are:

- Sine commutated synchronous and asynchronous motors
- Direct drives
 - Torque motors
 - Linear servo motors
 - Voice coil motors



Control Technology

The drive controller's modern control technology with automatic load identification / self control as well as an observer function which can be optionally activated is a guarantor of optimized motion control under all conditions.

Communication

The support of all common Fieldbus interfaces is an essential feature of open systems. Among these are PROFIBUS, PROFINET, CANopen, DeviceNet as well as the modern Ethernet based interfaces such as EtherCAT and Powerlink. The open OPC communication standard simplifies system integration considerably.

For dynamic, multi axis synchronized applications, a real-time drive bus is available for all drives from the Compax3 family.

Feedback Systems

In this context, the Compax3 servo drives support the following feedback systems:

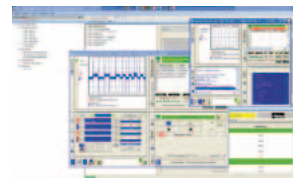
- Resolver
- Sine - Cosine Feedback (Single or Multiturn)
 - Hiperface interface
 - Optical and capacitive sensors
- EnDat Interface
- Analog and digital Hall sensors
- Rotary and Linear Encoders
 - Distance coded
 - Incremental and RS422
 - EnDat Interface



Software / Tools

Simple and efficient use of a modern and complex automation component offering high functionality such as Compax3 is guaranteed by an intuitively operable software tool, The specially designed "Parker Integrated Engineering Tool". Integral components of this software package are:

- Multi axis system management
- ServoManager
- MotorManager
- HydraulicsManager
- IEC 61131-3 / CoDeSys – programming environment
- IEC 61131-3 – Debugger



This software tool supports the user in the configuration, the setup and optimization, the programming as well as the maintenance of all Compax3 devices (see page 10).

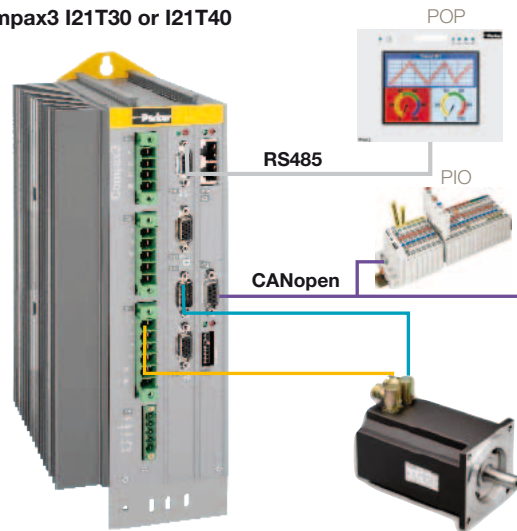
System Solutions

The Compax3 series servo drives represent an important component for the design of complete automation systems. The user can choose between additional components optimally suited for the use with Compax3.

Among those are:

- Operating and observing - Pop operator panels for all graphics and text applications
- Service and maintenance - BDM plug-in module
 - Change of parameters
 - Manual mode
 - Device exchange without PC
- PIO -Extension modules for the field level - external devices for digital and analog signal acquisition and control

Compax3 I21T30 or I21T40



Mechatronic system solutions

Mechatronic system solutions play a special role today. Parker Hannifin is not only the manufacturer of modern drive and control technology, but also of:

- Handling technology
- Precision Mechanics

As a special service we offer our customers complete, ready-to-mount mechatronic solutions, especially developed and manufactured for special industries or individual customers. In many cases, this reduces the development overhead on the user side considerably.

Thousands of systems installed prove Parker Hannifin's as well as their

partner's - the "Parker Automation Technology Centers" - high competence and long experience. Prefabricated integrated technology functions support the user's tasks. Furthermore, you can extend these functions by your own know-how at any time.



Quality

Our customer systems must meet the highest demands with respect to resilience. Compax3 by Parker Hannifin exceeds by far the high quality requirements for an automation component. Not only the quality characteristics but also our customers speak volumes.

Safety

With many applications in harsh and arduous environments such as presses and robot cells, Parker ensures that product and system reliability and quality are second to none. Drive integrated systems as implemented in Compax3 support the machine designer in realizing safe and cost-efficient solutions.

Compax3S & H - The Single Axis Variants

- Direct mains operation
- Integrated Safety Technology
Compax3S: Safe Torque off in accordance with EN ISO 13489-1 Category 3, PL d/e
- Remote maintenance

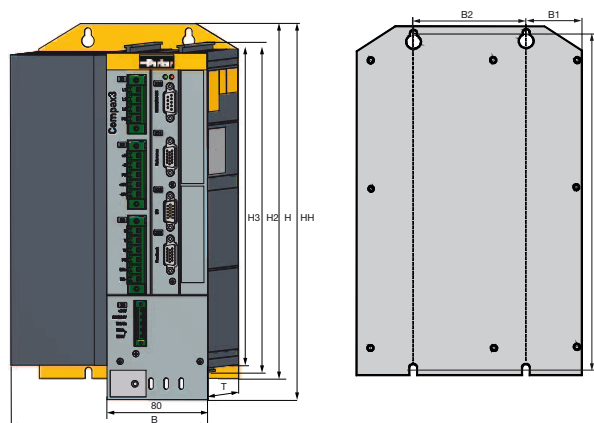
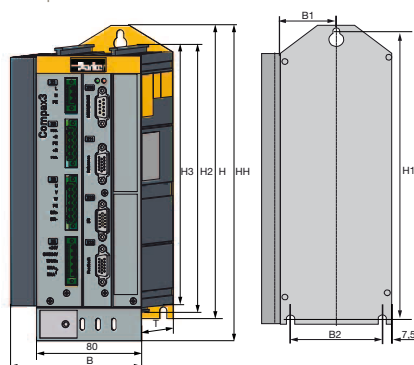


Performance Data

Device:	Current [A_{rms}]		Supply voltage	Power [kVA]
Compax3	$I_{cont.}$	$I_{peak} (<5 s)$		
S025V2	2.5	5.5	1 * 230/240 VAC	1.0
S063V2	6.3	12.6		2.5
S100V2	10	20	3 * 230/240 VAC	4.0
S150V2	15	30		6.0
S015V4	1.5	4.5	3 * 400/480 VAC	1.25
S038V4	3.8	9.0		3.1
S075V4	7.5	15		6.2
S150V4	15	30		11.5
S300V4*	30	60		25.0
H050V4	50	75	3 * 400/480 VAC	35.0
H090V4	90	135		70.0
H125V4	125	187.5		91.0
H155V4	155	232.5		109.0

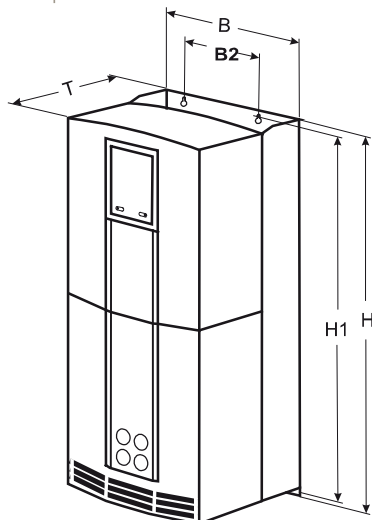
*Operation with C4 condenser module.

Compax3S



Size / Weight

Compax3H



Device:	Dimensions [mm]						Distances [mm]			Weight [kg]
Compax3	HH	H	B	T	H2	H3	B1	B2	H1	
S025V2	236	222	84	172	203	191	40	65	210	2.0
S063V2	236	222	100	172	203	191	40	65	210	2.5
S100V2	293	279	115	172	259	248	40	65	267	4.3
S150V2	293	279	158	172	259	248	39	80	267	6.8
S015V4	293	279	84	172	259	248	40	65	267	3.1
S038V4	293	279	100	172	259	248	40	65	267	3.5
S075V4	293	279	115	172	259	248	40	65	267	4.3
S150V4	293	279	158	172	259	248	39	80	267	6.8
S300V4	411	412	175	172	391	380	47.5	80	400	10.9
H050V4	-	453	252	245	-	-	-	150	440	17.4
H090V4	-	669	257	312	-	-	-	150	630	32.5
H125V4	-	720	257	355	-	-	-	150	700	41.0
H155V4	-	720	257	355	-	-	-	150	700	41.0

Compax3M - The Multi-Axis Variant

Cost optimization due to

- Reduction of the wiring overhead
- Central mains module
- Central braking resistor
- Central capacitor bank
- Central mains filter
- Central programming interface (USB)
- Small mounting dimensions
- Safety technology available as an option
 - S1 – Safe Torque Off, Safe Standstill
SS1 with PL = e
 - S3 - Extended Safety Technology



Performance Data

Device:	Current [A_{rms}]		Intermediate circuit voltage
Compax3	$I_{cont.}$	$I_{peak} (<5 s)$	
M050D6	5	10	325 ... 679 VDC (Rated voltage 560 VDC)
M100D6	10	20	
M150D6	15	30	
M300D6	30	60	

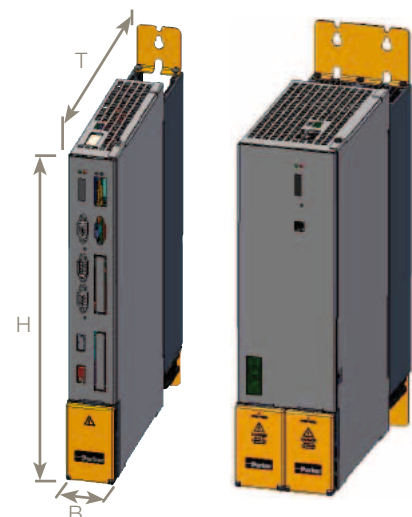
Power module:	Output power [kW]		Supply voltage
PSUP	$P_{cont.}$	$P_{peak} (<5 s)$	
PSUP10D6	6 @230 VAC	12 @230 VAC	50 ... 60 Hz 3 AC 230 V ... 480 V $\pm 10\%$ (Rated voltage 3 AC 400 V)
	10 @400 VAC	20 @400 VAC	
	10 @480 VAC	20 @480 VAC	
PSUP20D6	12 @230 VAC	24 @230 VAC	
	20 @400 VAC	40 @400 VAC	
	20 @480 VAC	40 @480 VAC	
PSUP30D6	17 @230 VAC	34 @230 VAC	
	30 @400 VAC	60 @400 VAC	
	30 @480 VAC	60 @480 VAC	

PSUP & Compax3M

Size / Weight

Device:	Dimensions [mm]			Weight [kg]
Compax3	H	B	T	
M050D6	360	50	263	3.5
M100D6	360	50	263	3.6
M150D6	360	50	263	3.6
M300D6	360	100	263	5.25
Power module				
PSUP10D6	360	50	263	3.95
PSUP20D6	360	100	263	6.3
PSUP30D6*	360	100	263	6.3

*Operation of the PSUP30 only with mains choke.

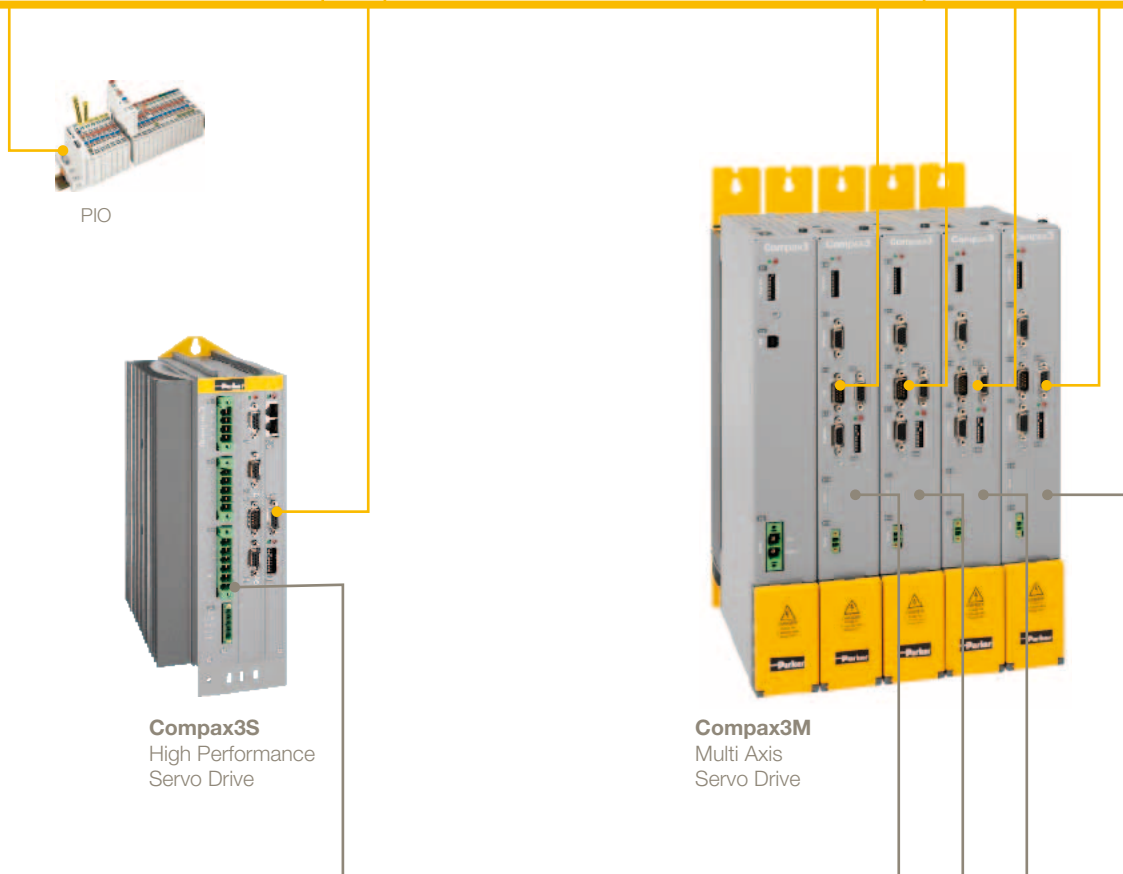


System layout

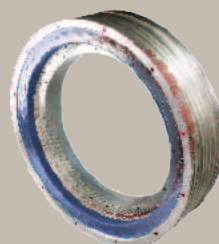
Ethernet



Communication channel



Synchronous Servo Motors



Direct drives



Handling Actuators

PIO

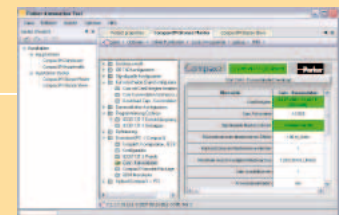


Compax3H
High Power
High Performance
Servo Drive

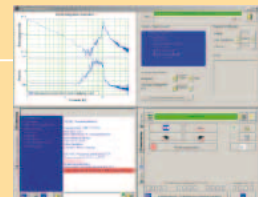


Compax3F
High Performance
Hydraulics Controller

IEC 61131-3
PLCopen
Data handling
Visualization
Communication (Process Control)
Access to all components
Project management



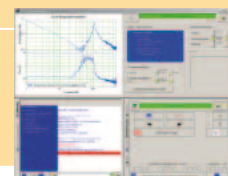
Communication
Multi-axis tool
C3 ServoManager
Drive Interface



IEC 61131-3
PLCopen
CamDesigner
Optimization
Setup
Diagnosis / Analysis / Maintenance
Oscilloscope



MotorManager
Motor library
HydraulicsManager
Valve library

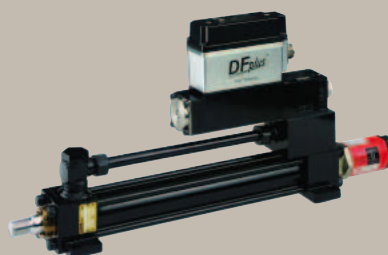


Dimensioning
Tool

PC Software



Precision Actuators



Hydraulics Components

Software

Parker Integrated Engineering Tool

Software Tool for Parker Motion Control Products

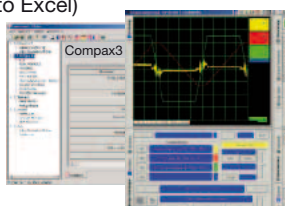
The software framework integrates the following functions:

- Configuration, setup, programming, visualization, maintenance / service / diagnostics and optimization
- Wizard based operation
- Support of different technologies for motion automation such as:
 - AC, DC converter, servo- and hydraulic drive technology
- IEC 611313 programming standard and PLCopen functionality
- Libraries for communication and different areas of application
- Access to all system components and data
- Users can profit from the tool entirely free of charge.



C3 ServoManager

- Guided configuration
 - Automatic querying of all necessary entries
 - Graphical support
- Setup mode
 - Manual motion of individual axes
 - Predefined profiles
 - Convenient operation
 - Storage of defined profiles
 - Automatic determination of the moment of inertia
- integrated 4-channel oscilloscope
 - Signal tracking directly on the PC
 - Various modes (single/normal/auto/roll)
 - Zoom function
 - Export as image or table (for example to Excel)



MotorManager

- Complete library for Parker motors
 - Integration of customer motors
 - Determination of motor characteristics and of the motor position feedback



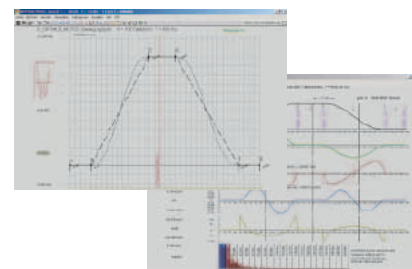
HydraulicsManager

- Valve library for Parker valves
 - Integration of customer valves

CamDesigner

Cam creation tool

- Standard and expert mode
- Evaluation of the motion profiles
- Verification of the drive selection
- Transition laws from the VDI directive 2143



Programming

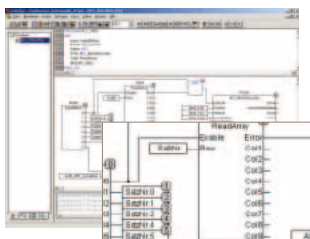
CoDeSys

CoDeSys is a development environment for programming that saves a significant amount of time as applications are created.

- Powerful developing environment, worldwide established
- Universal programming platform for various devices
- Complete offline simulation
- Visual elements
- Library management for user-defined applications
- Context-sensitive help wizard
- Data exchange between devices from different manufacturers
- Complete online functionality
- Sophisticated technological features
- Free of charge

Manage your own projects:

- Saving an entire project (source file) including symbols and comments to make service calls easier, because there is no need for any project data on the device.
- Archiving projects as ZIP files
- Creating user-specific libraries that can be reused as tested sections of programs
- These libraries can be protected
- E.g. winders, synchronization components, etc.
- Various user levels make it possible to lock sections of the program with passwords
- Depending on the task at hand, users can select from among 5 IEC languages plus CFC. These languages can also be mixed



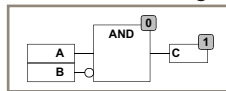
Program development in CFC

IEC 61131-3

IEC 61131-3 is the only company- and product independent programming language with world-wide support for industrial automation devices. IEC 61131-3 includes graphical and textual programming languages:

- Instruction list
- Structured text
- Ladder diagram
- Sequential function chart
- Function block diagram

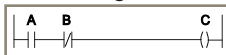
Function block diagram:



Structured text:

```
C := A AND NOT B
```

Ladder diagram:



IL (Instruction List):

LD	A
ANDN	B
ST	C

- Integrated standards offer:
 - a trusted programming environment
 - standardized programming
- Integrated standards reduce:
 - the overhead of development
 - maintenance costs
 - software upkeep
 - training overhead
- Integrated standards increase:
 - productivity
 - software quality
 - concentration on core competence

PLCopen

PLCopen is an organization that plays a significant role in supporting the IEC 61131-3 programming language. It is independent of individual companies or products. Its specific tasks also include defining basic processes relevant to motion. The PLCopen organization consists of both users and manufacturers of automation components.

Parker Hannifin is an active member



of the "Motion Control" task force. This represents a great advantage to users of Parker drive technology, since they are constantly able to profit directly from the latest developments in PLCopen.

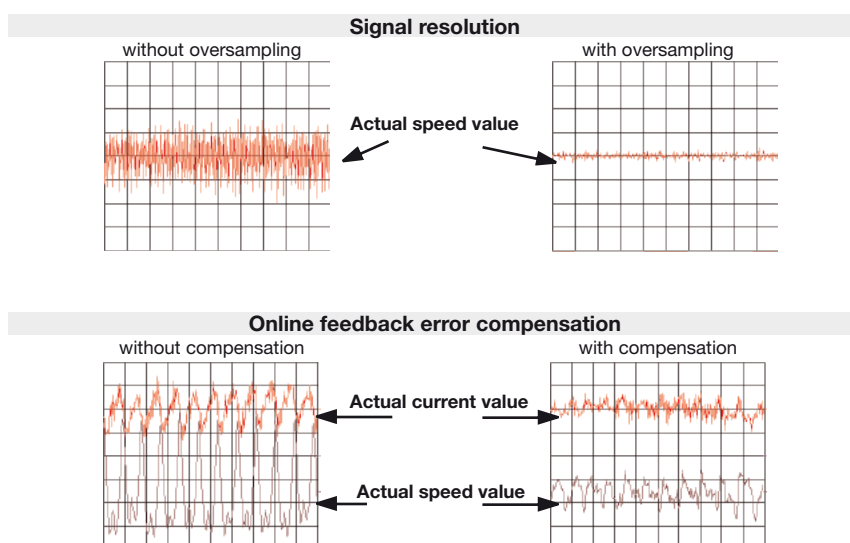
Parker is a member of the
"CoDeSys Automation Alliance"



Control technology

Real-time signal processing

- Reduction of the quantization noise
- Increase of the signal resolution
 - Due to oversampling of the speed and current signals
- Online feedback error compensation of offset and gain errors
- 14 Bit resolution increase
(Increase of the resolution of the scale graduation of up to 14 Bit)
 - By interpolation of sine-cosine feedback signals
- Determination of the speed by the observer technique
- Doubling of the controller bandwidth
 - By load torque observer principle



Jerk-limited setpoint generation, resulting in:

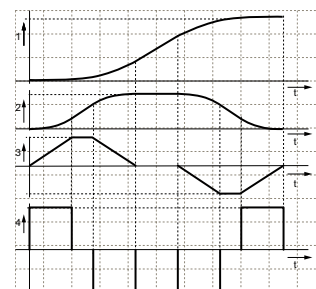
- Gentle handling of the moved goods
- Increased service life of mechanical components
- Overshoot free positioning
- Reduced excitation for mechanical resonance frequencies

1: Position

2: Speed

3: Acceleration

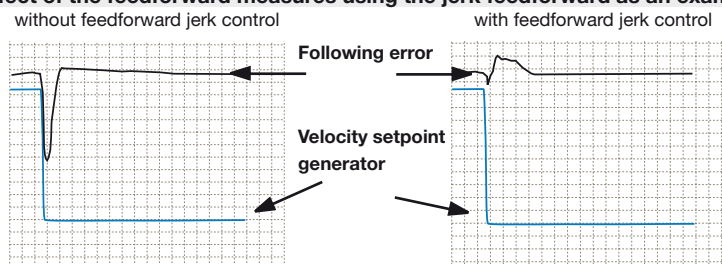
4: Jerk



Control:

- Controller in the feedback path helps avoid differentiating components in the numerator of the transmission function (which will result in a significant overshoot of the actual value)
- Automatic and robust controller design
 - User-oriented optimization parameters "damping" and "stiffness"
- Optimization of the response behavior
- Minimization of the following error
 - Due to feedforward of speed, acceleration, motor current and jerk
- Dual Loop Option
 - The load control can be activated via an additional feedback system for the acquisition of the actual position of the load.

Effect of the feedforward measures using the jerk feedforward as an example



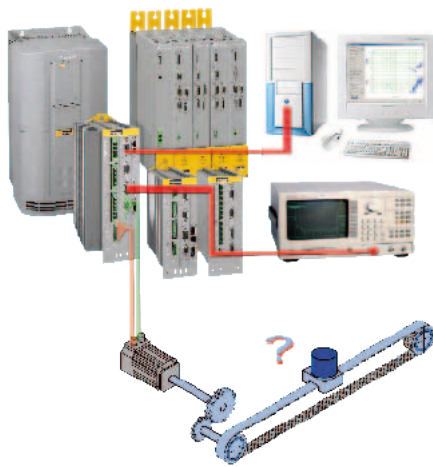
Commissioning / controller optimization

- Automatic determination of the load moment of inertia
- Compax3 MotorManager for determining the motor characteristics and the motor position feedback
- Optimization with integrated oscilloscope function



Signal analysis for the system identification

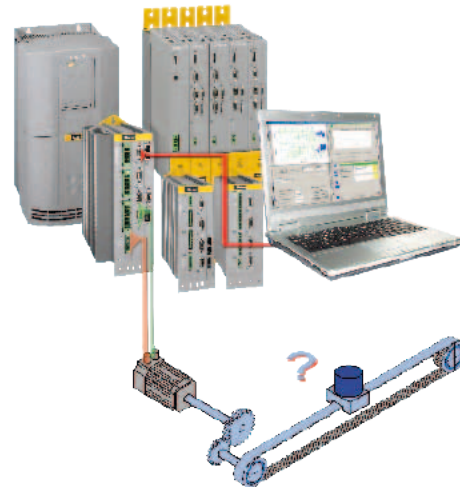
formerly



Implementation prerequisites:

- ✎ Expensive and complex measurement technology required
- ✎ Special knowledge required
- ✎ Implementation only possible in an open control loop (=dangerous)

today



Implementation prerequisites:

- ✎ Implementation with a common PC
- ✎ Simple and safe operation with the Compax3 ServoManager Software
- ✎ No special knowledge required
- ✎ The safety functions implemented in the servo drive ensure safe measurement in a closed position control loop

What purposes do the new functions serve?

Analysis and optimization of the mechanic system

Transmission behavior of the mechanic system

- Simple measurement of the mechanic dynamic behavior, therefore:
 - Possibilities to improve the mechanic construction can be spotted.
 - Increased stiffness and precision of the entire system. (improved mechanic system = improved controller performance)

Modal analysis

- Vibration analysis of the mechanic construction by specification of a sinusoidal motor force with a defined frequency.
- It is often possible to work without additional excitation by electrodynamic shakers or pulse hammers.

Analysis and optimization of the control

Transmission behavior of the mechanic system

- Better and faster controller optimization due to the knowledge of the transmission behavior of the control path.
- Specific suppression of disturbances at the mechanic resonance points with the aid of notch or low-pass filters.

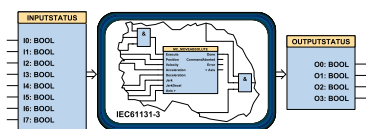
Transmission behavior of the control

- Quality assessment of the control with respect to the response behavior:
 - In the time range by step response
 - In the frequency range by frequency response
 - Optimization of the control by application of stability criteria from the control theory (e.g. Nyquist criterion or Hurwitz criterion)
- Quality assessment of the control with respect to the disturbance behavior:
 - In the time range by the disturbance current - step response¹
 - In the frequency range by measurement and analysis of the resilience - frequency response²

¹ Emulation of an external volatile change in the disturbance force.

² The compliance frequency response states the size of the control deviation caused by a disturbance force in dependence of its frequency.

Connection of Master Controllers



Compax3 I12T11 / I11T30 / I11T40: Digital Inputs/outputs

The digital I/Os can be optionally extended by 12 I/Os (M10 and M12 option)

Compax3 I20T11 / I20T30 / I20T40: PROFIBUS

Profibus ratings	
DP versions:	DPV0/DPV1
Baud rate:	up to 12 MHz
PROFIBUS ID:	C320

Compax3 I32T11 / I32T30 / I32T40: PROFINET

PROFINET Characteristics	
PROFINET Version:	PROFINET IO (RT)
Transmission mode:	100BASE-TX (Full Duplex)
PROFINET ID	C332

Compax3 I21T11 / I21T30 / I21T40: CANopen

CANopen ratings	
Baud rate [kBit/s]:	20 ... 1000
Service data object:	SDO1
Process data objects:	PDO1, ... PDO4

Compax3 I22T11 / I22T30 / I22T40: DeviceNet

DeviceNet - Characteristics	
I/O Data:	up to 32 bytes
Baud rate [kBit/s]:	125 ... 500
Nodes:	up to 63 slaves

Compax3 I30T11 / I30T30 / I30T40: Powerlink

Ethernet Powerlink - Characteristics	
Baud rate:	100 Mbits (FastEthernet)
Cycle time:	1 ms

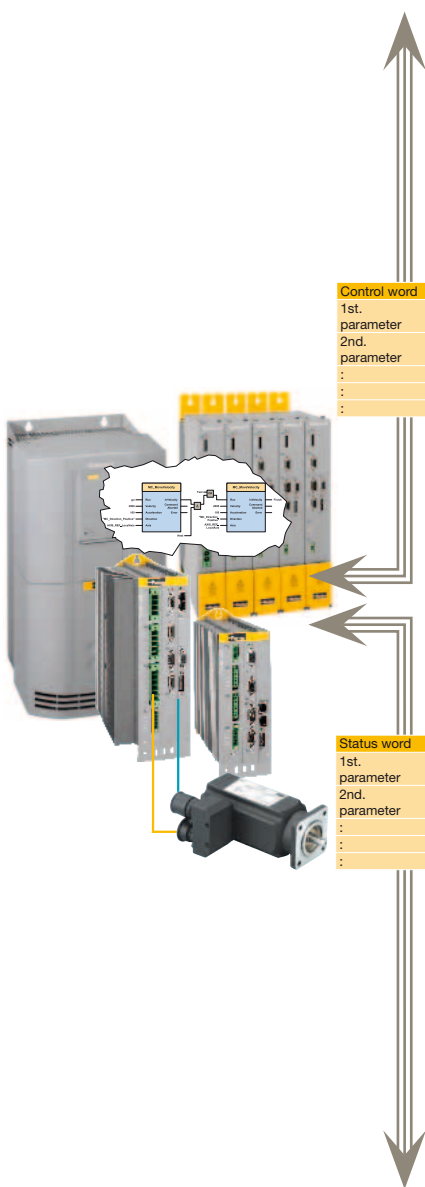
Compax3 I31T11 / I31T30 / I31T40: EtherCAT

EtherCAT - Characteristics	
Baud rate:	100 Mbits (FastEthernet)
Cycle time:	1 ms

Compax3 I21: PIO

Additional external digital and analog inputs and outputs can be integrated via the CANopen master function.
For this purpose we offer the Parker I/O system (PIO):

- CANopen fieldbus coupler
- Digital and analog input and output modules



Safety technology

The Compax3M and Compax3S drive controllers support the "safe torque off" (STO) safety function in the sense of the "Safe Stop", with protection against unexpected startup according to the requirements EN ISO 13849-1 Category 3, EN ISO 13849-1 PL=d/e (Compax3S), PL=e (Compax3M) and EN 1037.

Together with the external safety control device, the "safe stop 1" (SS1) safety function according to the requirements of EN ISO 13849-1 category 3 can be used.

Switching off the motor torque must be effected by the machine controller. According to a risk analysis which must be carried out according to the machine standard 89/392/EWG or EN 292; EN 954, EN ISO 13849-1 and EN 1050, the machine manufacturer must project the safety system for the entire machine including all integrated components. This does also include the electrical drives.

Compax3 with "Safe Torque Off" - STO

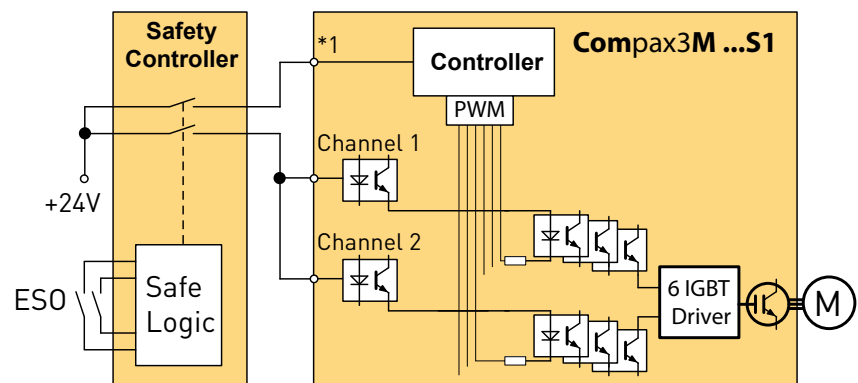
The STO or "safe torque off" safety function was differently implemented for the Compax3S and Compax3M families. In the Compax3S, the feedback paths of the 2 channel switch-off must be integrated into the external connection for monitoring. For the Compax3M, a protocol describing the orderly function of the safety function must be established upon setup and after defined maintenance intervals. The safety function in the Compax3M was implemented entirely without wear-prone relay technology. The Compax3H does not feature any safety function.

Safety functions with Compax3M

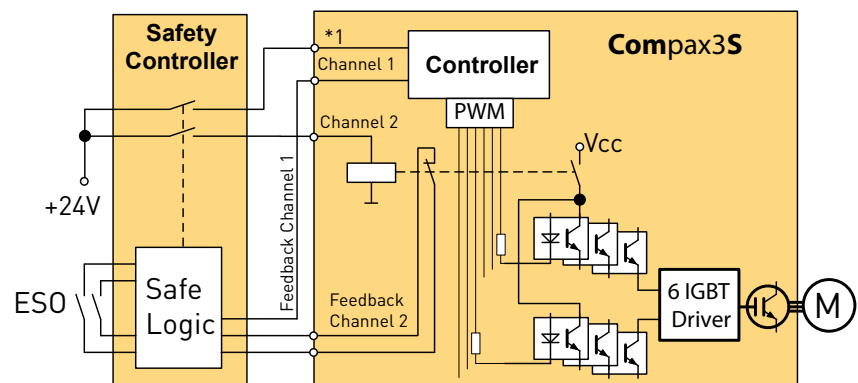
- SS1 - Safe Stop 1
- SS2 - Safe Stop 2
- SOS - safe operating stop
- SLS - Safely Limited Speed
- SLP - Safely Limited Position
- SLI - Safely Limited Increment
- SDI - Safe Direction
- SSM - Safe Speed Monitor (Diagnostics output for SLS)

The safety functions correspond to the standard in accordance with EN13849-1 PL=e.

STO function on the Compax3M



STO function on the Compax3S



ESO = Emergency switch off
*1 Deceleration Input

Device Technology

Compax3 I10T10: Step/Direction and Analog Command Input

I10T10 Scope of Functions

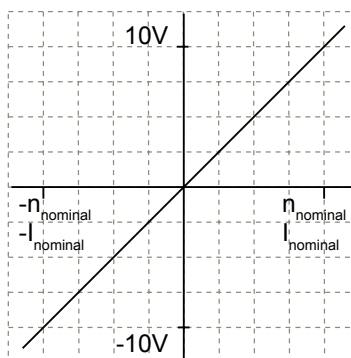
With its analogue interface or alternatively with step/direction or encoder step signals, the Compax3 I10T10 gives you easy and reasonably priced access to the world of servo-drive technology. Irrelevant of whether you have a PLC or PC central control unit, this remains unchanged.

The Compax3 I10T10 represents an ideal way of migrating from analog ± 10 V drives to digital, intelligent servo-drives.

You can choose between the different operating modes:

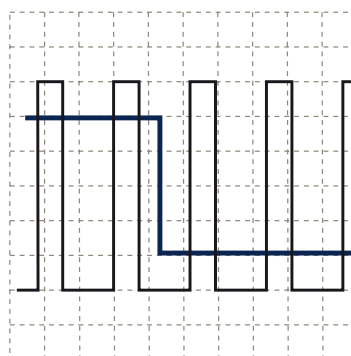
± 10 V Input

- ± 10 V predefined speed with encoder simulation as actual value feedback.
- ± 10 V predefined current setpoint with encoder emulation for actual position value feedback and configurable holding functions



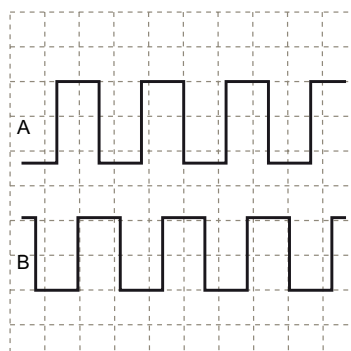
Step/Direction Command Input

- Step/direction signals as 24 V logic levels or
- With step/direction logic signals conforming to RS422



Encoder Input

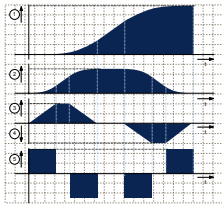
- RS422
- 24 V level



Compax3 T11: Positioning

T11 Scope of Functions

Due to its high functionality, the Positioning version of Compax3 forms an ideal basis for many applications in high-performance motion automation.

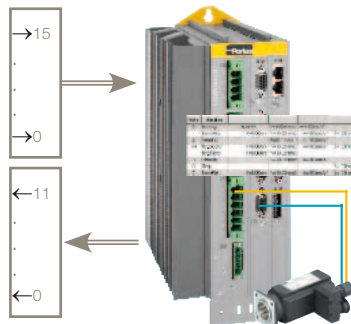


- Up to 31 motion profiles can be created with the help of the PC software:
 - Absolute or relative positioning
 - Electronic Gearbox (Gearing)
 - Reg-related positioning
 - Speed control
 - Stop - Set
- Dynamic positioning
- Movement profiles in non-volatile flash
- Motion profiles can be selected via field bus or digital inputs/outputs
- Wide choice of machine zero modes for your individual application
- Detection of the absolute position by distance-coded feedback
- Simple commissioning
 - Guided configuration with the Compax3 ServoManager
 - Flexible Optimization
- Adjustable jerk limitation
- Optional extension of the digital I/Os

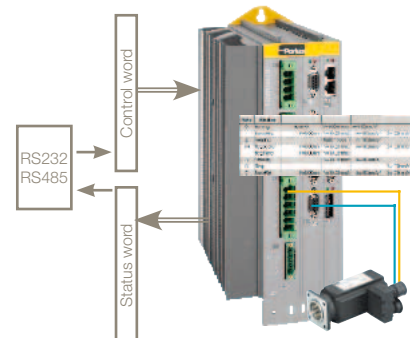
Compax3 I12T11 / Motion Control:

- Via digital I/Os
- Via RS232 / RS485 with the aid of control & status word
- Up to 31 motion functions via set table
- Status bits for each motion set

Access via Compax3 inputs and outputs:



Access via RS232 / RS485:

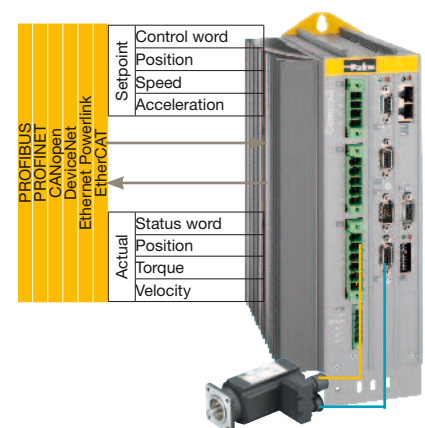


Compax3 I2xT11 / I3xT11 Motion Control:

- Standard profiles via PROFIBUS, CANopen, DeviceNet, Ethernet Powerlink and EtherCAT
- Direct set specification via fieldbus telegrams or
- Set selection (31 motion sets)
- Status bits for each motion set
- Operating modes:
 - Speed controller, direct positioning, positioning via set selection

Characteristics:

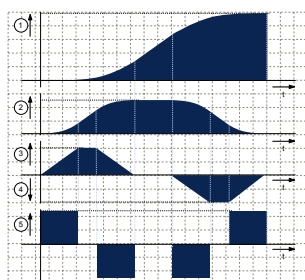
PROFIBUS	
Profile:	PROFIdrive Profile drive system V3
DP versions:	DPV0/DPV1
Baud rate:	up to 12 MHz
PROFINET	
Profile:	PROFIdrive profile drive technology V4.1
Version:	PROFINET IO (RT)
Transmission mode:	100BASE-TX (Full Duplex)
CANopen	
Profile:	MotionControl CiADS402
Baud rate:	20 ... 1000 kBit/s
DeviceNet	
I/O Data:	up to 32 bytes
Baud rate:	125 ... 500 kBit/s
Nodes:	up to 63 slaves
Ethernet Powerlink	
Profile:	MotionControl CiADS402
Baud rate:	100 Mbits (FastEthernet)
Cycle time:	1 ms
EtherCAT	
Profile:	MotionControl CiADS402
Baud rate:	100 Mbits (FastEthernet)
Cycle time:	1 ms



Motion Function:

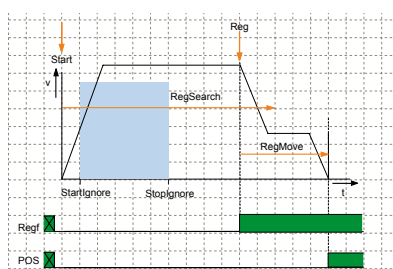
Absolute / Relative Positioning: MoveAbs and MoveRel

- A motion set defines a complete motion with all settable parameters.
 - (1) Target position
 - (2) Travel speed
 - (3) Maximum Acceleration
 - (4) Maximum deceleration
 - (5) Maximum Jerk



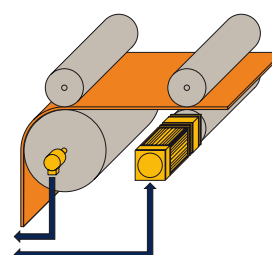
Reg-related positioning: RegSearch, RegMove

- For registration mark-related positioning, 2 motions are defined.
 - RegSearch: Search of an external signal - a reg; e.g. a mark on a product
 - RegMove: The external signal interrupts the search movement and the second movement by an offset follows without transition
- Accuracy of the reg detection: $<1 \mu s$



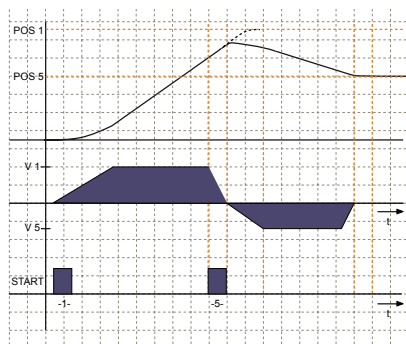
Electronic Gearbox: Gearing

- Synchronous motion to a leading axis with any transmission ratio. The position of a master axis can be detected via:
 - +/- 10 V analog input
 - Step / direction input
 - the encoder input or
 - HEDA, with Compax3 master



Dynamic positioning

- You can switch to a new motion profile during a positioning sequence - a dynamic transition takes place.



Speed control: Velocity

- Defined via speed and acceleration.

Stop movement: Stop

- The Stop set interrupts the current motion set.

2/3 Satztafel

Satz	Modus					
0	Waiting	M=0	V=10.00mm/s	A=100mm/s²		000
1	MoveAbs	P=10.00mm	V=10.00mm/s	A=100mm/s²	D=100mm/s²	J=10000.00mm/s³
2	Velocity		V=10.00mm/s	A=100mm/s²		X10
3	Gearing		Ratio=0.25 / 1	A=100mm/s²		X10
4	Stop				D=100mm/s²	J=10000.00mm/s³
56	RegSearch	P=50.00mm	V=10.00mm/s	A=100mm/s²	D=100mm/s²	J=10000.00mm/s³
57	RegMove	P=50.00mm	V=10.00mm/s	A=100mm/s²	D=100mm/s²	J=10000.00mm/s³
7	MoveRel	P=10.00mm	V=10.00mm/s	A=100mm/s²	D=100mm/s²	J=10000.00mm/s³
8	Gearing		Ratio=0.25 / 1	A=100mm/s²		X10
9	MoveAbs	P=20.00mm	V=10.00mm/s	A=100mm/s²	D=100mm/s²	J=10000.00mm/s³
10	Stop				D=100mm/s²	J=10000.00mm/s³
11	MoveAbs	P=40.00mm	V=10.00mm/s	A=100mm/s²	D=100mm/s²	J=10000.00mm/s³
12/13	RegSearch	P=10.00mm	V=10.00mm/s	A=100mm/s²	D=100mm/s²	J=10000.00mm/s³
14	MoveRel	P=40.00mm	V=10.00mm/s	A=100mm/s²	D=100mm/s²	J=10000.00mm/s³
15	Stop				D=100mm/s²	J=10000.00mm/s³
16	Velocity		V=25.00mm/s	A=100mm/s²		X10
17	Gearing		Ratio=1.00 / 1	A=100mm/s²		X10
18/19	RegSearch	P=20.00mm	V=10.00mm/s	A=100mm/s²	D=100mm/s²	J=10000.00mm/s³
20	MoveAbs	P=30.00mm	V=10.00mm/s	A=100mm/s²	D=100mm/s²	J=10000.00mm/s³
21	Gearing		Ratio=0.12 / 1	A=100mm/s²		X10
22	MoveAbs	P=8.00mm	V=10.00mm/s	A=100mm/s²	D=100mm/s²	J=10000.00mm/s³
23	Stop				D=100mm/s²	J=10000.00mm/s³
24	Search					min

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Entry of motion sets

Compax3 T30: IIEC 61131-3 Positioning with function modules based on PLCopen

T30 Scope of Functions

- Programming according to IEC 61131-3
- Programming system: CoDeSys
- up to 6000 instructions
- 650 16bit variables / 200 32bit variables
- Recipe table with 288 variables
- 3 16-bit retain variables / 3 32-bit retain variables
- Inputs/outputs:
 - 8 digital inputs (24 V level)
 - 4 digital outputs (24 V level)
 - 2 analog inputs (14 Bit)
 - Optional extension of 12 inputs/ outputs

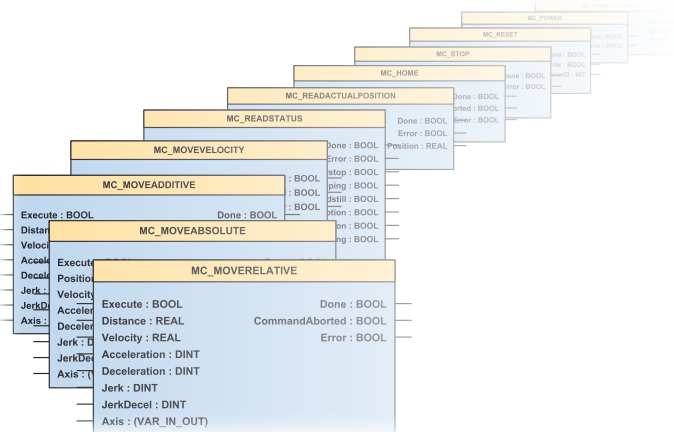
- IEC 61131-3 standard modules:
 - Up to 8 timers (TON, TOF, TP)
 - Triggers (R_TRIG, F_TRIG)
 - Flip-flops (RS, SR)
 - Counters (CTU, CTD, CTUD)
- Device-specific function modules:
 - C3_Input: Generates an input process image
 - C3_Output: Generates an output process image
 - C3_ReadArray: Access to recipe table

- PLCopen function modules:
 - Positioning: absolute, relative, additive, continuous
 - Machine Zero
 - Stop, energizing the power stage, Quit
 - Position, device status, reading axis error
 - Electronic gearbox (MC_GearIn)



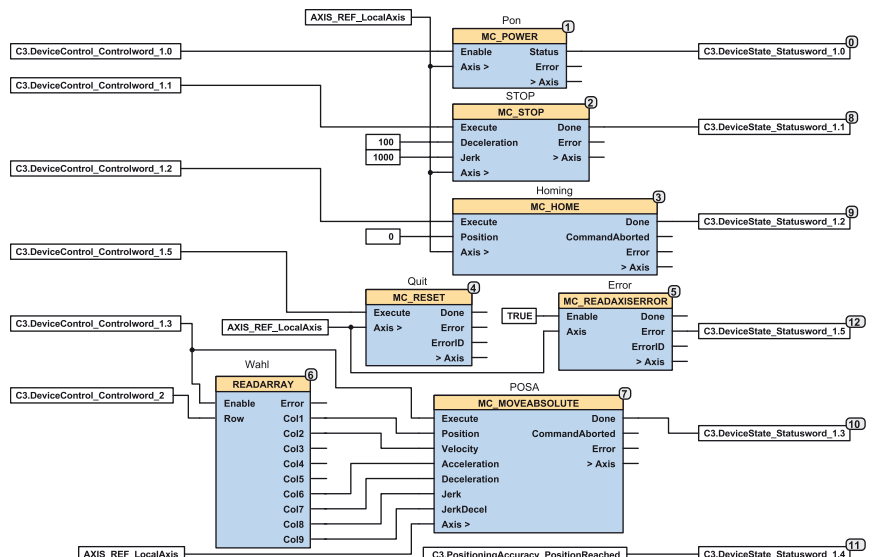
Compax3 Function Blocks

- Absolute Positioning
- Stop
- Reading axis error
- Relative Positioning
- Machine Zero
- Acknowledging errors
- Additive positioning
- Energizing the power stage
- Reading the current position
- Continuous positioning
- Reading device status
- Electronic Gearbox (Gearing)



Example of an IEC 61131 application controlled by means of a bus interface:

- 2 control words are placed on the cyclic channel of the bus.
- The position data records (position, speed, acceleration, ... are stored in a table (array).
- The desired position data record is selected with Controlword_2.
- The individual bits of Controlword_1 control positioning.
- A return message is given through a status word on the cyclic channel of the bus.



Compax3 T40: IEC 61131-3 positioning with cam function modules

T40 Scope of Functions:

Compax3 T40 is able to simulate mechanical cams and cam switching mechanisms electronically. The "Electronic Cam - T40" was especially optimized for

- Packaging Machinery,
- Printing Industry as well as
- all applications where a mechanical cam is to be replaced by a flexible, cyclic electronic solution.

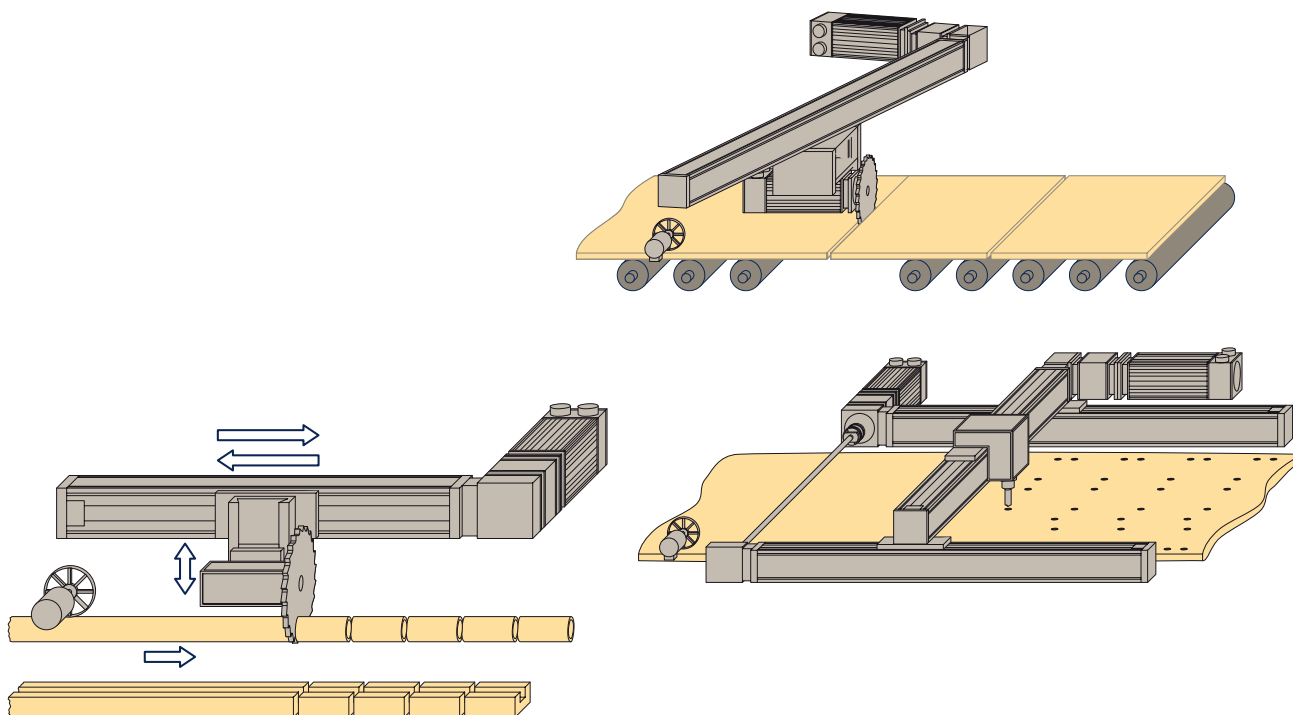
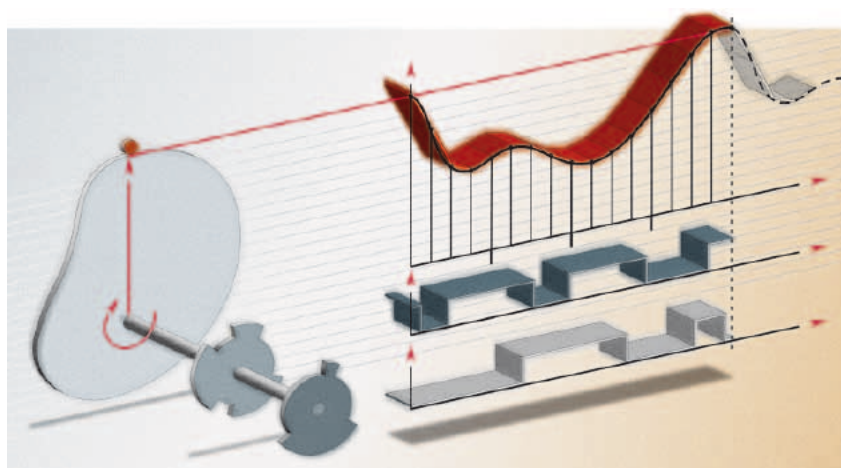
This helps to realize discontinuous material supply, flying knife and similar drive applications with distributed drive performance.

Compax3 T40 supports both real and virtual master movements. In addition, the user can switch to other cam profiles or cam segments on the fly. Programming is carried out in the IEC 61131-3 environment.

Cam applications can be easily implemented with the aid of the cam function modules and the CamDesigner.

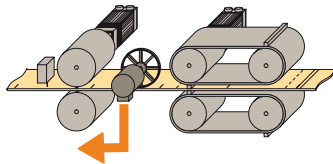
T40 Function Overview:

- T30 Technology Functions completely integrated and available
- Master position acquisition
- Reg synchronization
- Cam switching mechanism
- Coupling and decoupling functions
- Cam profiles
- Cam memory
- Cam creation with the CamDesigner



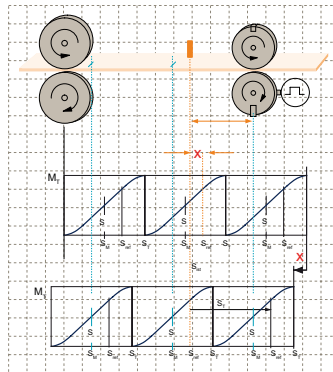
Master Position Acquisition

- Acquisition via SSI encoder or incremental encoder
- Acquisition by the HEDA real-time bus
- Virtual master:
 - A second axis in the IEC - program can be used to program a motion profile which serves as a master for one or several slaves.



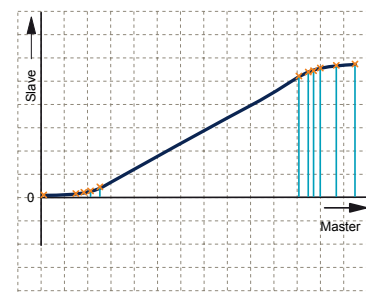
Reg Synchronization

- Master or slave oriented (simultaneous, cam-independent)
- Highly precise reg mark recognition (accuracy < 1 µs; Touchprobe)



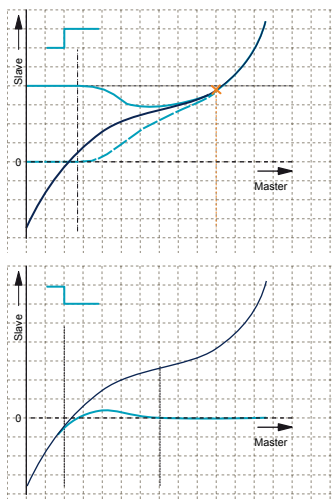
Cam Memory

- 10000 points (master / slave) in 24 bit format
- High-precision profile generation:
 - Non equidistant interpolation points of the master and slave coordinates (stored fail-safe)
 - Linear interpolation between interpolation points
- Cam memory for up to 20 curves



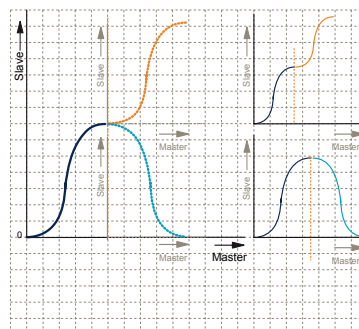
Coupling and Decoupling Functions

- By means of a setpoint generator
- By means of a change-over function
- Without overspeeding by coupling over several master cycles
- Virtually free set-up of the coupling and decoupling movement
- Master-guided coupling movement
- Random standstill position



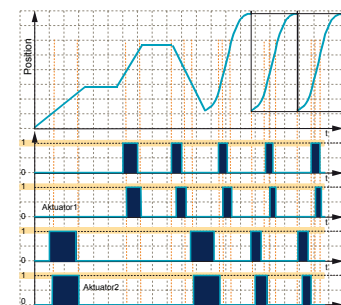
Cam Profiles

- Up to 20 cam segments can be produced by:
 - Virtually random cam links (forwards and backwards)
 - Freely programmable event-controlled cam branches
 - Scalable cam segments and complete cam profiles



Cam Controller

- 36 cams with individual profiles.
- 4 fast cams (125 µs per cam) standard: 500 µs.
- 32 serial cams, 16 ms/cam cycle (0.5ms/cam).
- Delay-time compensated cams: Compax3 can advance the cam to compensate for delays in switching elements.



Compax3F: Hydraulics Controller

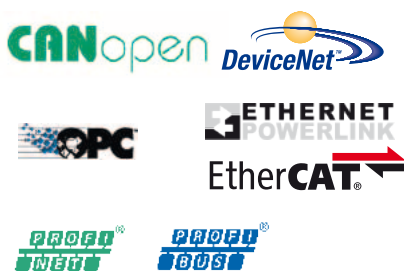
The Compax3F hydraulics controller is another member of the Compax3 family based on the well-known Compax3 digital drive.

Thus, all advantages offered by the Compax3 family are now also available in servo- and proportional hydraulics. The hydraulics controller is available with the following technologies:

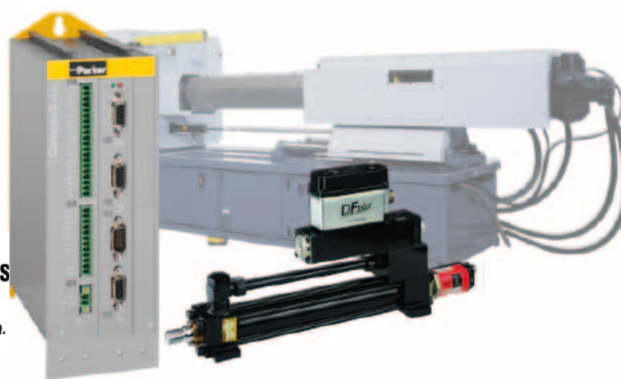
Technology Functions

- T11: Positioning
- T30: Motion control programmable in accordance with IEC 61131-3
- T40: Electronic cam

Communication



PROFIBUS and PROFINET are registered trademarks of PROFIBUS & PROFINET International (PI). EtherCAT® is a registered trademark and patented technology, licensed by Beckhoff Automation GmbH, Germany.



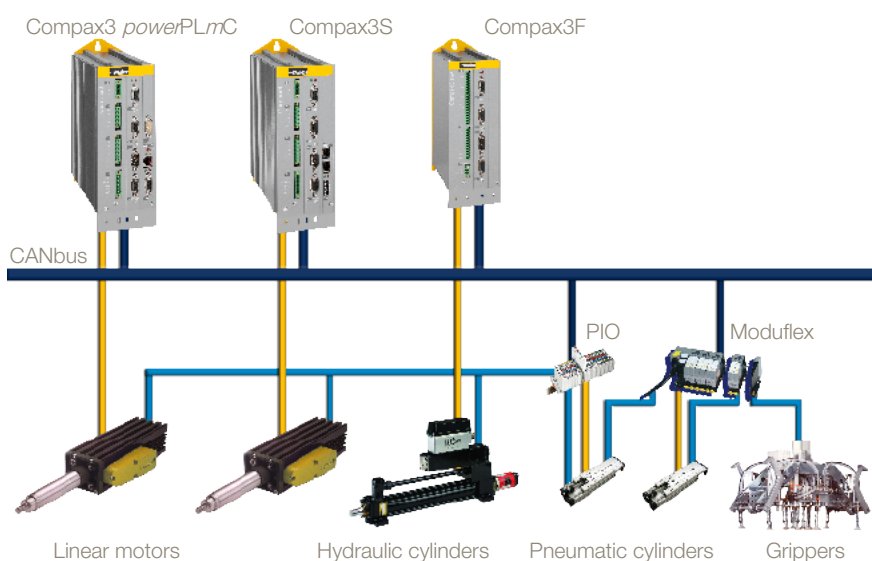
Device:	Compax3 F001 D2 F12 lxx Txx Mxx
Voltage supply	
Voltage range	21-27 VDC
Inputs and outputs	
8 control inputs	24 VDC / 10 kOhm
4 control outputs	Active HIGH / short-circuit proof / 24 V / 100 mA
4 analog current inputs	14 Bits
2 analog voltage inputs	14 Bits
4 analog outputs	16 Bits, current or voltage
2 analog monitor outputs	8 Bits
Communication	
RS232	115200 Bauds
RS485 (2 or 4-wire)	9600, 19200, 38400, 57600 or 115200 Bauds
...	
Feedback	
	1 V _{pp} SineCosine (max. 400 Hz) RS422 Encoder (max. 5 MHz, or Step/Direction) SSI (RS422) Start/Stop (Time of Flight, RS422) EnDat2.1
Size / Weight	
H x W x D [mm]	199 x 80 x 130
Weight [kg]	2.0
Housing / protection class	Enclosed metal housing, IP20

Your Advantage:

- It is no longer necessary to distinct between the motion of a hydraulic or an electromechanical axis on the control technology level .
- Common software tools for electromechanics and hydraulics supporting the design of hybrid machines.

Especially the combination with the highly dynamic DFplus valve can be used to efficiently increase your machine performance.

Example: System Layout



Compax3 - C3 *powerPLmC* Control Technology

C3 *powerPLmC*: Control of individual and multiple axes

Description

Modern machines feature high flexibility and productivity. Automation solutions from Parker Hannifin offer the basis for the implementation of state-of-the-art machine concepts. The consequent integration of international standards provides OEMs with the freedom to concentrate entirely on the technological process.

The motion control plays an increasingly central role in this development.



Compax3H *powerPLmC*-C20
Compax3S *powerPLmC*-C20
Compax3M *powerPLmC*-C20

- integrated -
into the Compax3 servo drive

The Parker control technology comes up to your greatest expectations...

Attributes

- Basis for the implementation of modular machine concepts
- Windows® based standard tools for programming, start-up and diagnostics
- Minimization of the wiring overhead by reduction of the interface diversity
- Maximum functionality and flexibility
- Optimized space requirements due to minimized components and state-of-the-art installation concept
- Realization of safe machine concepts
- Basis for the realization of hybrid machine concepts - electromechanics, hydraulics and pneumatics



C3 *powerPLmC*-E30

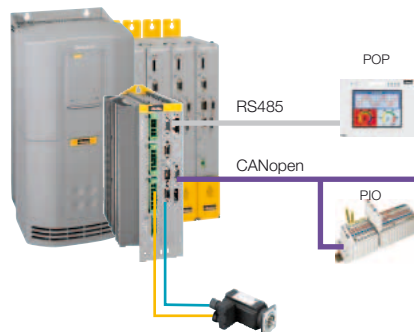
-standalone -
without servo drive

Compax3 T30 / T40 Technology Controller:

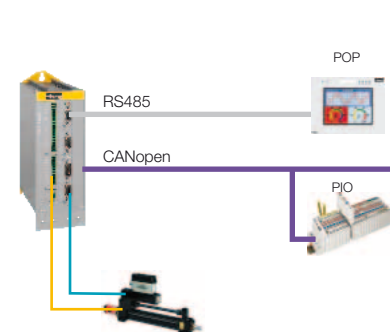
Main fields of application

- Machines or machine modules with one or two servo axes
- Applications requiring a high degree of flexibility with respect to sequence control
- Optional connection of upgrading devices for the operation and monitoring as well as external I/Os

C3S / C3H / C3M I21T30/T40 (CANopen)



Compax3 Fluid I21T30/T40 (CANopen)

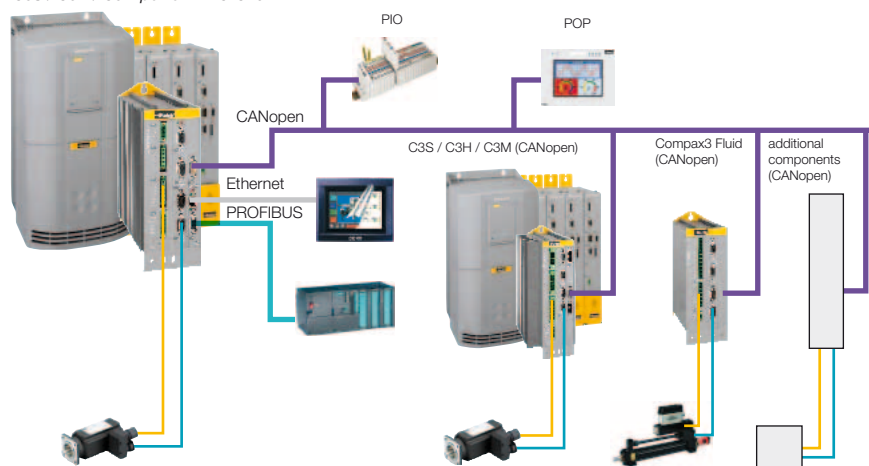


Technology controller with integrated Motion PLC - Compax3 *powerPLmC*-C20

Main fields of application

- More than two axes for motion automation
- High degree of system integration (e.g. via Ethernet)
- Integration of complex devices for machine visualization and operation
- Connection to a wide number of digital and analog inputs
- Integration of pneumatic and hydraulic automation devices

C3S / C3H / C3M *powerPLmC*-C20T11

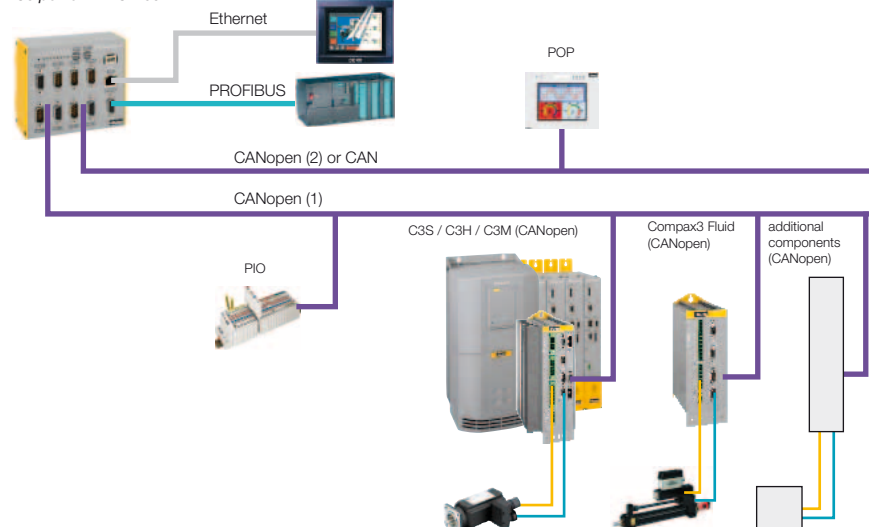


Motion PLC with Technology Functions - C3 *powerPLmC*-E30

Main fields of application

- Similar to Compax3 *powerPLmC*-C20
- High proportion of PLC typical tasks
- Integration of additional automation components via a second CAN bus.
- Basis for the realization of hybrid machine concepts electromechanics, hydraulics and pneumatics

C3 *powerPLmC*-E30



C3 powerPLmC - C20 integrated and C3 powerPLmC-E30 standalone

Compax3 powerPLmC is a control system for combined PLC, motion and visualization tasks. CANopen combines the bus components with the CANopen master „Compax3 powerPLmC“. The power range of commands based IEC 61131-3 is available for control tasks. Programming via "CoDeSys" high-power programming system via the Ethernet interface. The implementation of multi-axis motion tasks are supported by PLCopen function modules.



Compax3H powerPLmC-C20
Compax3S powerPLmC-C20
Compax3M powerPLmC-C20
- integrated -
into the Compax3 Servo Drive



C3 powerPLmC-E30
-standalone -
without servo drive

PLC Logic + Motion Control + Visualization = powerPLmC

- 32-bit RISC processor
 - <100 µs for 1000 IL commands
- CANopen
 - Multi-drive communication
- Drive interface
 - Simple integration of servo axes
- PROFIBUS DP Slave
 - as a connection with the control level
- Ethernet
 - Program interface
 - Remote diagnostics via Internet or Intranet
 - Process visualization
 - System integration
 - Network variables
- Programmable based on IEC 61131-3 / PLCopen
- CoDeSys development tool
- PLC functionality
 - 4 real-time task types: free-running, cyclical, event-triggered (internal or external events)
 - Online program change
 - Simulation, online trace, breakpoints
 - Watchdog Timer
 - Minimum IEC task time: 1ms
 - Debugging, single step, watch function, log
- PLC extensions offered by Parker:
 - POP: Parker Operator Panel (see page 29)
 - PIO: Parker digital and analog inputs/outputs modular extensions (see page 27)

Additional Features

Project Management

- Saving and archiving an entire project (source file) including symbols and comments to make service calls easier, because there is no need for any project data on the device itself.
- Creating and protecting user-specific libraries that can be reused as tested sections of programs
- Various user levels make it possible to lock sections of the program with passwords
- 5 IEC languages plus CFC can be selected
- Data import / export

File Handling

- The servo drive can generate files (e.g. for error protocols, recipes, machine parameters)
- Files are available via the FTP server on a drive in C3 powerPLmC and can be downloaded onto a PC.
- Error messages can be assigned to an error string by means of the error number and then stored together with the time of day (from an integrated clock)

Visualization

- Integrated into the local programming system (monitoring, debugging, diagnostics)
- With integrated access to web server via standard browser
- OPC interface for integrating Windows-based visualization programs such as InteractX, WinCC, Intouch, Protocol
- Remote diagnostics

Controller Characteristics



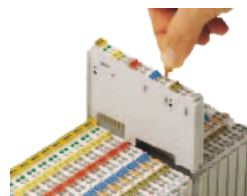
		Compax3 powerPLmC-C20	C3powerPLmC-E30	Compax3 T30 / T40
General information	Platform	32Bit RISC processor 200 MHz		24Bit Signal processor
	Boot FLASH / Program memory FLASH	1 Mbyte/4 Mbyte	64 MB compact flash	
	Data memory SDRAM / Data memory non volatile	16 MB / 32 kB (Retain)		64 kB / 18 Byte (Retain)
	Real time clock	Yes, battery backed		No
	Operating system / supply	Real-time multitasking / 24 V DC		Single tasking
Controller features	Processing time	<100 µs for 1000 IL rows		2 ms for 1000 AWL rows
	Real time tasks	Coasting Cyclical Event-controlled, internal / external events		Cyclical
	Minimal cycle time	Typical 1 ms		
	Online program change	Yes		No
	Watchdog Timer	Yes		Yes
	Data exchange in distributed systems (network variables)	Yes		No
Programming and debugging	Programming system	CoDeSys		
	Programming languages	IL, SFC, FBP, ST, LD, CFC		
	Protocol	IEC 61131-3		
	Import PLC programs	Siemens import		
	PLCopen - Motion control modules	Yes		
	Debug, single step, watch function	Yes		Yes (no single step)
	Simulation, online trace	Yes		Yes
	Breakpoints	Yes (source level debugging)		Yes
	Source code download	Yes		Yes
	Write, read, force variables	Yes		Yes (no forcing)
Visualization	Program administration	File System, FTP		No
	Programming interface	Fast Ethernet		RS232
	Locally on the programming system	Yes		No
	Web Server	Yes		No
	OPC Server	Yes		No
Interfaces	General	RS232/RS485	2x RS232 2x RS232/RS485	RS232/RS485
	Fieldbusses (standard)	CANopen Master Ethernet 10/100	2 x CANopen Master Ethernet 10/100	CANopen Master for the connection of PIOs (input/output modules)
	Fieldbusses (optional)	PROFIBUS DP Slave HEDA: Real-time data bus	PROFIBUS DP Slave	HEDA: Real-time data bus
	Digital and analog inputs/outputs Option	Any	Any (depending on the number of axes)	24 digital / 4 analog
	Encoder output	Yes, up to 16384/revolution	No	Yes, up to 16384/revolution

Peripheral modules for distributed automation

Parker I/O System - PIO

Parker's PIO modular bus terminal system uses the associated sensor system to record a wide variety of control signals from field devices. Connections to the field level can be implemented quickly and reliably with PIO.

- Fieldbus-independent layout via fieldbus coupler
- Easy to extend by replacing modules
- Especially compact design
- Safe contacting
- Maintenance-free
- Different voltages can be combined with each other
- Great flexibility ensures optimal adaptability to different applications



Digital Inputs	PIO 400	PIO 402	PIO 430
	2DI 24 V DC 3.0 ms 2-channel digital input terminal	4DI 24 V DC 3.0 ms 4-channel digital input terminal	8DI 24 V DC 3.0 ms 8-channel digital input terminal
Number of inputs	2	4	8
Data width of the process image	2 bits	4 bits	8 bits
Connection	2 - 4 wire, positive switching	2 - 3 wire, positive switching	1 wire, positive switching
Power contacts	3; DC 24 V (-15 % ... +20 %)	2; DC 24 V (-15 % ... +20 %)	2; DC 24 V (-15 % ... +20 %)
Internal current drain	3.7 mA at 5 V	7.5 mA at 5 V	17 mA at 5 V
Signal voltage (0)	DC -3 V to +5 V	DC -3 V to +5 V	DC -3 V to +5 V
Signal voltage (1)	DC 15 V to 30 V	DC 15 V to 30 V	DC 15 V to 30 V
Input current (typ.)	4.5 mA	4.5 mA	2.8 mA
Dimensions (mm) WxHxD	12 x 64 x 100	12 x 64 x 100	12 x 64 x 100



Analog Inputs	PIO 456	PIO 468	PIO 480
	2AI ± 10 V DC differential input 2-channel analog input terminal	4AI 0-10 V DC S.E. 4-channel analog input terminal	2AI 0-20 mA differential input 2-channel analog input terminal
Number of inputs	2	4	2 (opto-isolated)
Data width of the process image	2*2 bytes	4*2 bytes	2*2 bytes
Connection	Differential input	Single-ended	Differential input
Power contacts	none	none	none
Internal current drain	80 mA at 5 V	60 mA at 5 V	<100 mA at 5 V
Signal voltage	± 10 V	0...10 V	0...20 mA
Resolution	12 bits	12 bits	14 bits (A/D-converter) 13 bits (measurement value)
Dimensions (mm) WxHxD	12 x 64 x 100	12 x 64 x 100	12 x 64 x 100



Digital Outputs	PIO 501	PIO 504	PIO 530
	2DO 24V DC 0.5 A 2-channel digital output terminal	4DO 24V DC 0.5 A 4-channel digital output terminal	8DO 24V DC 0.5 A 8-channel digital output terminal
Number of outputs	2	2	4
Data width of the process image	2 bits	4 bits	8 bits
Connection	short-circuit proof, positive switching	short-circuit proof, positive switching	short-circuit proof, positive switching
Power contacts	3; DC 24 V (-15 % ... +20 %)	2; DC 24 V (-15 % ... +20 %)	2; DC 24 V (-15 % ... +20 %)
Internal current drain	3.5 mA at 5 V	7 mA at 5 V	25 mA at 5 V
Type of load	Resistive, inductive, lamp load	Resistive, inductive, lamp load	Resistive, inductive, lamp load
Output current	0.5 A	0.5 A	0.5 A
Switching frequency (max.)	5 kHz	5 kHz	1 kHz
Dimensions (mm) WxHxD	12 x 64 x 100	12 x 64 x 100	12 x 64 x 100



Analog Outputs	PIO 550	PIO 552	PIO 556
	2AO 0-10 VDC 2-channel analog output terminal	2AO 0-20 mA 2-channel analog output terminal	2AO DC ± 10 V 2-channel analog output terminal
Number of outputs	2	2	2
Data width of the process image	2*2 bytes	2*2 bytes	2*2 bytes
Power contacts	none	2; DC 24V (-15% ... +20%)	none
Signal voltage	0...10 V	0...20 mA	± 10 V
Internal current drain	65 mA at 5 V	60 mA at 5 V	65 mA at 5 V
Resolution	12 bits	12 bits	12 bits
Conversion time	approx. 2 ms	approx. 2 ms	approx. 2 ms
Load impedance	> 5 kOhm	< 500 Ohm	> 5 kOhm
Dimensions (mm) WxHxD	12 x 64 x 100	12 x 64 x 100	12 x 64 x 100



System integration using fieldbus couplers

Important features of the PIO bus terminal system:

- Integrated input filter
- Opto-isolated
- Suitable for copper cables with cross-sections from 0.08 mm² to 2.5 mm²
- Error and status display (LED)
- Access options for simple signal test
- Short-circuit-proof inputs
- Options for clear, unambiguous identification

CANopen standard coupler PIO 337

Process image 2x512 Byte



CANopen ECO coupler PIO 347

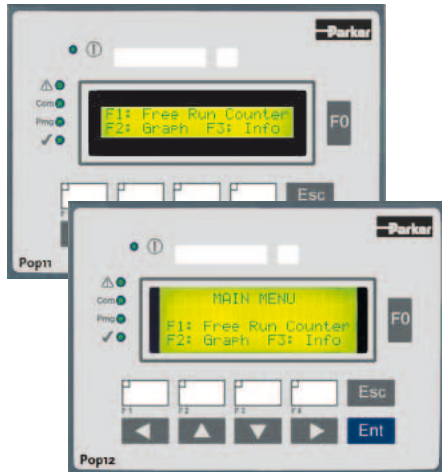
Process image 2x32 Byte



Automation Operation and Monitoring

Parker Operator Panel - Pop

Parker supplies operator panels for all text and graphical applications in industrial environments.

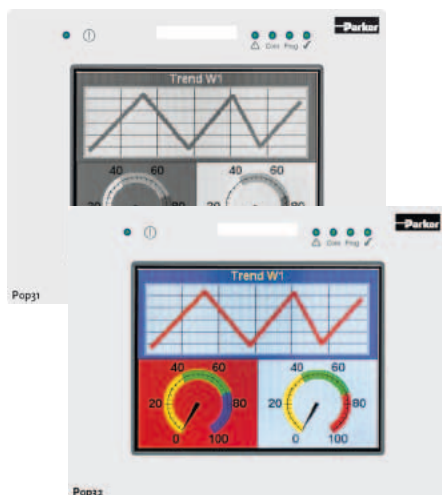
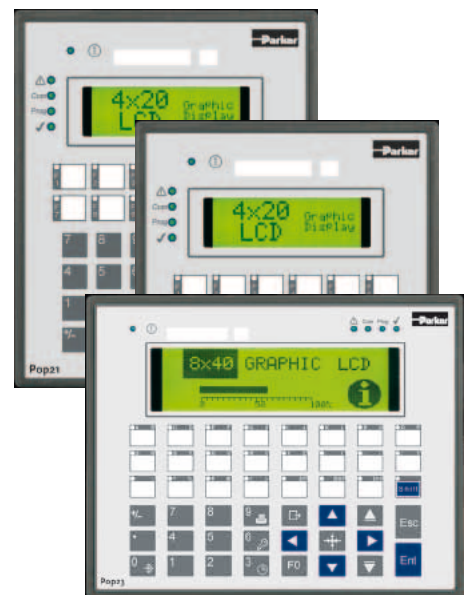


Text and graphics-oriented Operating Systems

- Pop11 / Pop12
 - 4 function keys with insertable labels
 - 5 user LEDs
 - Multi-lingual projects possible
 - Connection to various bus systems
 - RS232, RS422, RS485, CL20 mA, CANopen
 - 512 kB user program memory
- Pop11
 - Monochrome LCD display
 - 2 lines of 20 characters for text
- Pop12
 - Monochrome graphics display
 - 4 lines of 20 characters for text
 - Downloadable font
 - Scalable text

Operator panels with Graphics display

- Pop21 / Pop22
 - Monochrome graphics display
 - 4 lines of 20 characters for text
 - Downloadable font
 - 12 function keys with insertable labels
 - 13 user LEDs
 - Multi-lingual projects possible
 - RS232, RS422, RS485, CL20 mA, CANopen
 - 512 kB user program memory
 - 512 kB expanded memory
- Pop22
 - 32 kB recipe memory
 - Alarms, real-time clock, battery backup
- Pop23
 - 8 lines of 40 characters for text
 - 23 function keys
 - 24 user LEDs
 - Printer interface
 - 16 kB recipe memory
 - Alarms, real-time clock, battery backup



Visualisation with Touch-Screen

- Pop31 / Pop32
 - 1/4 VGA display (320x240 Pixel), 5.6" diagonal
 - 16 lines of 40 characters for text
 - Resistive touch screen
 - Can be connected to various bus systems
 - Multi-lingual projects possible
 - RS232, RS422, RS485, CL20 mA, CANopen
 - Printer interface
 - 32 kB recipe memory
 - Real-time clock, battery backup
 - Event list for alarms
 - Screensaver
- Pop31
 - Monochrome LCD display
 - 8 MB Flash memory
- Pop32
 - LCD-Display STN Colour
 - 8 MB Flash memory on memory card

Order code



Devices: Compax3

Ordering example:	C3	S	025	V2	F10	I10	T10	M00	
Device type: Compax3									
Single axis		S							✕
High power		H							✕
Hydraulics Controller		F	001	D2	F12				✕
Multi-axis device		M							✕
Device currents static/dynamic; supply voltage									
2.5 A / 5 A; 230 VAC (single phase)		S	025	V2					✕
6.3 A / 12.6 A; 230 VAC (single phase)		S	063	V2					✕
10 A / 20A; 230 VAC (3 phase)		S	100	V2					✕
15 A / 30 A; 230 VAC (3 phase)		S	150	V2					✕
1.5 A / 4.5 A; 400 VAC (3 phase)		S	015	V4					✕
3.8 A / 9 A; 400 VAC (3 phase)		S	038	V4					✕
7.5 A / 15.0 A; 400 VAC (3 phase)		S	075	V4					✕
15.0 A / 30.0 A; 400 VAC (3 phase)		S	150	V4					✕
30.0 A / 60.0 A; 400 VAC (3 phase)**		S	300	V4					✕
50 A / 75 A; 400 VAC (3 phase)		H	050	V4					✕
90 A / 135 A; 400 VAC (3 phase)		H	090	V4					✕
125 A / 187.5 A; 400 VAC (3 phase)*		H	125	V4					✕
155 A / 232.5 A; 400 VAC (3 phase)*		H	155	V4					✕
5.0 A / 10.0 A; 400 VAC (3 phase)		M	050	D6					✕
10 A / 20 A; 400 VAC (3 phase)		M	100	D6					✕
15 A / 30 A; 400 VAC (3 phase)		M	150	D6					✕
30 A / 60 A; 400 VAC (3 phase)		M	300	D6					✕
Feedback:									
Resolver					F10				
SinCos© (Hiperface)					F11				
Encoder, Sine-cosine with/without hall					F12				
Interface:									
Step/direction / analog input						I10	T10	M00	
Positioning via inputs/outputs						I11	T11	M00	
Positioning via I/Os or RS232 / RS485 / USB						I12			
PROFIBUS DP V0/V1/V2 (12 Mbaud)						I20			
CANopen						I21			
DeviceNet						I22			
Ethernet Powerlink						I30			
EtherCAT						I31			
PROFINET						I32			
C3 powerPLmC (Multi-axis control)						C20		M00	
Technology functions:									
Positioning							T11		
Motion control programmable in accordance with IEC 61131-3							T30		
Motion control programmable in accordance with IEC 61131-3 & electronic cam							T40		
Options:									
no additional supplement								M00	
Expansion 12 digital I/Os & HEDA (Motionbus)								M10	
HEDA (Motionbus)								M11	
Expansion, 12 digital I/Os								M12	
Safety technology as an option									
Safe torque off (furnished with the device)		M		D6					S1
Extended safety technology		M		D6					S3

* external voltage supply required for fan. Available in two versions for single phase feed.

Standard: 220/240 VAC: 140 W, on request: 110/120 VAC: 130 W

** Operation with condenser module C4.



Mains module: PSUP

Ordering example:	PSU	P	10	D6	USB	M00
Device type: PSU power module						
Power module		P				
Nominal power; supply voltage						
10 kW; 400 VAC (3 phase)			10	D6		
20 kW; 400 VAC (3 phase)			20	D6		
30 kW; 400 VAC (3 phase)*			30	D6		
Interface:						
USB connection					USB	
Options:						
no additional supplement						M00

* Operation of the PSUP30 only with mains choke.

Required mains choke for the PSUP30: 0.45 mH / 55 A

We offer the following mains chokes:

LCG-0055-0,45 mH (WxDxH: 180 mm x 140 mm x 157 mm; 10 kg)

LCG-0055-0,45 mH-UL (with UL certification) (WxDxH: 180 mm x 170 mm x 157 mm; 15 kg)

Accessories

Connection sets for fast and safe wiring

- Mating plug connector (furnished with the device)

Connection set for Compax3 and PSUP mains modules									
for C3S0xxV2	ZBH 02/01		ZBH	0	2	/	0	1	
for C3S0xxV4 / S150V4 / S1xxV2	ZBH 02/02		ZBH	0	2	/	0	2	
for C3S300V4	ZBH 02/03		ZBH	0	2	/	0	3	
for C3F00xD2	ZBH 02/04		ZBH	0	2	/	0	4	
for C3M050D6, C3M100D6, C3M150D6	ZBH 04/01		ZBH	0	4	/	0	1	
for C3M300D6	ZBH 04/02		ZBH	0	4	/	0	2	
for PSUP10	ZBH 04/03		ZBH	0	4	/	0	3	
for PSUP20/PSUP030	ZBH 04/04		ZBH	0	4	/	0	4	

Shielded cables

- Prefabricated with plug and cable eye.
- The plugs of the Parker motor and feedback cables contain a special surface area screening
- Cable plans, if you wish to make up your own cables



Feedback cable									
for resolver ⁽²⁾	for MH / SMH motors		REK	4	2	/	⁽¹⁾
for resolver ⁽²⁾	for MH / SMH motors	(cable chain compatible)	REK	4	1	/	⁽¹⁾
for SinCos© – feedback ⁽²⁾	for MH / SMH motors	(cable chain compatible)	GBK	2	4	/	⁽¹⁾
for EnDat 2.1 ⁽²⁾	for MH / SMH motors	(cable chain compatible)	GBK	3	8	/	⁽¹⁾
Encoder – Compax3			GBK	2	3	/	⁽¹⁾
for LXR linear motors		(cable chain compatible)	GBK	3	3	/	⁽¹⁾
for BLMA linear motors		(cable chain compatible)	GBK	3	2	/	⁽¹⁾

Motor cable ⁽²⁾									
for SMH / MH56 / MH70 / MH105 ⁽³⁾	(1.5 mm ² ; to 13.8 A)		MOK	5	5	/	⁽¹⁾
for SMH / MH56 / MH70 / MH105 ⁽³⁾	(1.5 mm ² ; to 13.8 A)	(cable chain compatible)	MOK	5	4	/	⁽¹⁾
for SMH / MH56 / MH70 / MH105 ⁽³⁾	(2.5 mm ² ; up to 18.9 A)		MOK	5	6	/	⁽¹⁾
for SMH / MH56 / MH70 / MH105 ⁽³⁾	(2.5 mm ² ; up to 18.9 A)	(cable chain compatible)	MOK	5	7	/	⁽¹⁾
for MH145 / MH205 ⁽⁴⁾	(1.5 mm ² ; to 13.8 A)		MOK	6	0	/	⁽¹⁾
for MH145 / MH205 ⁽⁴⁾	(1.5 mm ² ; to 13.8 A)	(cable chain compatible)	MOK	6	3	/	⁽¹⁾
for MH145 / MH205 ⁽⁴⁾	(2.5 mm ² ; up to 18.9 A)		MOK	5	9	/	⁽¹⁾
for MH145 / MH205 ⁽⁴⁾	(2.5 mm ² ; up to 18.9 A)	(cable chain compatible)	MOK	6	4	/	⁽¹⁾
for MH145 / MH205 ⁽⁴⁾	(6 mm ² ; up to 32.3 A)	(cable chain compatible)	MOK	6	1	/	⁽¹⁾
for MH145 / MH205 ⁽⁴⁾	(10 mm ² ; up to 47.3 A)	(cable chain compatible)	MOK	6	2	/	⁽¹⁾

MOK55 and MOK54 can also be used for linear motors LXR406, LXR412 and BLMA.

⁽¹⁾, ⁽²⁾ ... see cable length code page 32

Length code for cables

⁽¹⁾ length code 1 (Example: SSK01/09 = length 25 m)

Length [m]	1.0	2.5	5.0	7.5	10.0	12.5	15.0	20.0	25.0	30.0	35.0	40.0	45.0	50.0
Order code	01	02	03	04	05	06	07	08	09	10	11	12	13	14

⁽²⁾ Colors according to DESINA,

⁽³⁾ with motor connector,

⁽⁴⁾ with cable eye for motor terminal box,

⁽⁵⁾ length code 2 for SSK28

Length [m]	0.17	0.25	0.5	1.0	3.0	5.0	10.0
Order code	23	20	21	01	22	03	05

⁽⁶⁾ Order code: SSK27/nn/..

Length A (Pop - 1st. Compax3) variable (the last two numbers corresponding to the cable length code

for example SSK27/nn/01)

Length B (1st. Compax3 - 2nd. Compax3 - ... - n. Compax3) fixed 50 cm (only if there is more than 1 Compax3, i.e. nn greater than 01)

Number n (the last two digits)



Interface cable

-for configuration and communication and to the master controller

Configuration is made with a PC with the help of the "Compax3 ServoManager" software tool.

HEDA Bus:

- BUS07/01: Terminal connector (RJ45) for the first and last Compax3 in the HEDA Bus.
- SSK28/..(Crossover cable Cat5e): Preconfectioned cable in different lengths for HEDA bus wiring from Compax3 to Compax3 or PC to C3 powerPLmC.

DeviceNet

- A mating plug is included in the delivery. Additional information on DeviceNet wiring can be found under www.odva.org.

PROFIBUS

- BUS8/01: Plug with 2 cable inputs (1 arriving, 1 continuing PROFIBUS cable), as well as a switch for activating the terminal resistor.
- SSL01/...: Non confectioned cable. Special cable in any length for PROFIBUS wiring (colors according to DESINA).

PROFINET, EtherCAT, Ethernet Powerlink

SSK28/..(Crossover cable Cat5e): Cable prefabricated in different lengths.

CANbus

- BUS10/01: Plug with 2 cable inputs (1x arriving, 1x continuing CANbus cable), as well as a switch for activating the terminal resistor.
- SSL02/...: Non confectioned cable. Special cable in any length for CANbus wiring (colors according to DESINA).

Order code for interface cables and connectors									
PC – Compax3 (RS232)		SSK	0	1	/	...	...	(1)	
PC – PSUP (USB)		SSK	3	3	/	...	...
on X11 (Ref/Analog) and X13 with C3F001D2	with flying leads	SSK	2	1	/	...	...	(1)	
on X12 / X22 (digital I/Os)	with flying leads	SSK	2	2	/	...	...	(1)	
on X11 (Ref /Analog)	for I/O terminal block	SSK	2	3	/	...	...	(1)	
on X12 / X22 (digital I/Os)	for I/O terminal block	SSK	2	4	/	...	...	(1)	
PC ↔ POP (RS232)		SSK	2	5	/	...	...	(1)	
Compax3 ↔ POP (RS485) for several C3H on request		SSK	2	7	/	..	...	(6)	
Compax3 HEDA ↔ HEDA, PC ↔ C3powerPLmC, Compax3M ↔ Compax3M Communication, PROFINET, EtherCAT, Ethernet Powerlink		SSK	2	8	/	..	...	(5)	
Compax3 X11 ↔ Compax3 X11 (Encoder coupling of 2 axes)		SSK	2	9	/	...	...	(1)	
Compax3 X10 ↔ Modem		SSK	3	1	/	...	...
Compax3H adapter cable ↔ SSK01 (length 15 cm, delivered with the device)		SSK	3	2	/	2	0		
Compax3H X10 RS232 connection control ↔ Programming interface (delivered with the device)		VBK	1	7	/	0	1		
Bus terminal connector (for the 1st and last Compax3 in the HEDA Bus/or multi-axis system)		BUS	0	7	/	0	1		
Profibus cable ⁽²⁾	non prefabricated	SSL	0	1	/	...	...	(1)	
Profibus connector		BUS	0	8	/	0	1		
CAN bus cable ⁽²⁾	non prefabricated	SSL	0	2	/	...	...	(1)	
CAN bus connector		BUS	1	0	/	0	1		

(1), (2), ... see cable length code page 32

Inputs/Outputs:

Terminal block: EAM06/..

For additional wiring of the inputs/outputs:

- Can be mounted in the control cabinet via top hat rail
- Connection EAM06/.. via SSK23/.. to X11, SSK24/.. to X12



Terminal block									
for I/Os without luminous indicator	for X11, X12, X22	EAM	0	6	/	0	1		
for I/Os with luminous indicator	for X12, X22	EAM	0	6	/	0	2		

Display and diagnostics:

Operator control module BDM01/01

- Can be plugged in while in operation
- Supply via Compax3



Operating Module

Operating module (for Compax3S)	BDM	0	1	/	0	1
---------------------------------	-----	---	---	---	---	---

Reduction of disturbances and charges

Braking resistor: BRM../..

The energy generated during braking operation is initially absorbed by the Compax3 storage capacity. If this capacity is too small, the braking energy is drained via a braking resistor.

Mains filter: NFI../..

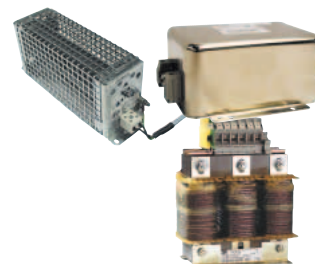
For radio interference suppression and compliance with the emission limit values for CE conform operation.

Mains chokes (on request)

Mains chokes for reducing the low-frequency interferences on the mains side.

Motor output filter MDR../..

For disturbance suppression when the motor connecting cables are long



Braking resistors

for C3S063V2, C3S075V4	56 Ω / 0.18 kW _{cont.}	BRM	0	5	/	0	1
for C3S075V4	56 Ω / 0.57 kW _{cont.}	BRM	0	5	/	0	2
for C3S025V2, C3S038V4	100 Ω / 60 W _{cont.}	BRM	0	8	/	0	1
for C3S150V4	47 Ω / 0.57 kW _{cont.}	BRM	1	0	/	0	1
for C3S150V2, C3S300V4	4/01:15 Ω / 0.57 kW _{cont.} 4/02:15 Ω / 0.74 kW _{cont.}	BRM	0	4	/	0	...
for C3S300V4	4/03:15 Ω / 1.5 kW _{cont.}						
for C3S100V2	22 Ω / 0.45 kW _{cont.}	BRM	0	9	/	0	1
for C3H0xxV4	27 Ω / 3.5 kW _{cont.}	BRM	1	1	/	0	1
for PSUP10D6							
for PSUP20D6 (2 x 30 Ω parallel)	30 Ω / 0.5 kW _{cont.}	BRM	1	3	/	0	1
for PSUP10D6 (2 x 15 Ω in series)							
for PSUP20, PSUP30	15 Ω / 0.5 kW _{cont.}	BRM	1	4	/	0	1
for C3H1xxV4, PSUP30	18 Ω / 4.5 kW _{cont.}	BRM	1	2	/	0	1

Condenser module

for C3S300V4	Module	C4
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Mains filter for Compax3S / Compax3H

for C3S025V2 or S063V2	NFI	0	1	/	0	1
for C3S0xxV4, S150V4 or S1xxV2	NFI	0	1	/	0	2
for C3S300V4	NFI	0	1	/	0	3
for C3H050V4	NFI	0	2	/	0	1
for C3H090V4	NFI	0	2	/	0	2
for C3H1xxV4	NFI	0	2	/	0	3

Mains filter for PSUP mains module

for PSUP10	Reference axis combination 3 x 480 V 25 A 6 x 10 m motor cable length	NFI	0	3	/	0	1
for PSUP10	Reference axis combination 3 x 480 V 25 A 6 x 50 m motor cable length	NFI	0	3	/	0	2
for PSUP20, PSUP30	Reference axis combination 3 x 480 V 50 A 6 x 50 m motor cable length	NFI	0	3	/	0	3

Mains choke for PSUP mains module

for PSUP30	Mains choke	LCG-0055-0.45 mH
for PSUP30	Mains choke with UL certification	LCG-0055-0.45 mH-UL

Motor output choke (for Compax3S, Compax3M >20 m motor cable)

up to 6.3 A rated motor current	MDR	0	1	/	0	4
up to 16 A rated motor current	MDR	0	1	/	0	1
up to 30 A rated motor current	MDR	0	1	/	0	2

With our devices you get:



The requested

Compax3 device

with the most important information in printed form

- Installation manual in German / English, French and
- Startup guide in German / English

+

Compax3 - DVD

with the latest software tools:

- C3 ServoManager (Software tool) for the configuration, setup and optimization...
- Parker Integrated Engineering Tool (Software tool) for the project management of several Parker Motion Control products.
- Software tool for supporting the software installation
- Bus Files
- C3M_USB_driver
- CamDesigner
- CoDeSys

+

- CAD Files
- Catalogs
- Detailed manuals (PDF) and help files (CHM)
 - an individual manual and help file version for each Compax3 technology function
 - in German, English and French
 - with over 80 manuals and help files containing more than 20000 pages
 - help files feature to some extent explanatory videos



Training portfolio:



Compax3 trainings

Our training portfolio ranges from an introduction into the Compax3 device technology to Compax3 powerPLmC control technology.

- Training seminars are held in German and English
- One-day or several-day seminars
- All training material included
- All training seminars can also be held at your premises, if desired.

Additional information on: www.parker-eme.com/seminar

Technical data

Technologies

- T10: Servo drive
- T11: Positioning
- T30: Motion control programmable in accordance with IEC 61131-3
- T40: Electronic cam

Supply voltage

- Compax3S
 - 1*230 / 240 VAC, 80-253 VAC / 50-60 Hz
 - 3*230 / 240 VAC, 80-253 VAC / 50-60 Hz
 - 3*400 / 480 VAC, 80-528 VAC / 50-60 Hz
- Mains module PSUP
 - 3*230 VAC $\pm 10\%$ 50-60 Hz
Output voltage: 325 VDC $\pm 10\%$
 - 3*400 VAC $\pm 10\%$ 50-60 Hz
Output voltage: 565 VDC $\pm 10\%$
 - 3*480 VAC $\pm 10\%$ 50-60 Hz
Output voltage: 680 VDC $\pm 10\%$
- Compax3H
 - 3*400 VAC/480 VAC, 350-528 VAC / 50-60 Hz

Control Voltage

- Compax3S / Compax3H
 - 24 VDC $\pm 10\%$, ripple $< 1 V_{pp}$
 - Current requirements: 0.8 A for the device
 - digital outputs 100 mA each
 - for motor holding brake (up to 1.6 A)
- PSUP / Compax3M
 - 24 VDC $\pm 10\%$, ripple $< 1 V_{pp}$
 - Current drain of the device:
PSUP10D6: 0.2 A
PSUP20D6: 0.3 A
PSUP30D6: 0.3 A
 - Total current drain:
C3M050D6: 0.85 A
C3M100D6: 0.85 A
C3M150D6: 0.85 A
C3M300D6: 1.0 A
+ Total load of the digital outputs + current for the motor holding brake
 - for motor holding brake (up to 1.6 A)

Output data of the devices

Compax3	$I_{cont.}$ [A]	I_{peak} (<5 s) [A]
S025V2:	2.5	5.5
S063V2:	6.3	12.6
S100V2:	10.0	20.0
S150V2:	15.0	30.0
S015V4:	1.5	4.5
S038V4:	3.8	9.0
S075V4:	7.5	15.0
S150V4:	15.0	30.0
S300V4:	30.0	60.0
H050V4	50.0	75.0
H090V4	90.0	135.0
H125V4	125.0	187.5
H155V4	155.0	232.5
M050D6	5	10
M100D6	10	20
M150D6	15	30
M300D6	30	60

Regenerative braking

Compax3	Capacity [μF]	storable energy [Ws]	
		@ 230 V	
S025V2	560	15	-
S063V2	1120	30	-
S100V2	780	21	-
S150V2	1170	31	-
		@ 400 V	@ 480 V
S015V4	235	37	21
S038V4	235	37	21
S075V4	470	75	42
S150V4	690	110	61
S300V4	1100	176	98
H050V4	2600	602	419
H090V4	3150	729	507
H125V4	5000	1158	806
H155V4	5000	1158	806
		@ 400 V	@ 480 V
M050D6	110	18	10
M100D6	220	37	21
M150D6	220	37	21
M300D6	440	74	42

Motor technologies supported

- Sinusoidally commutated synchronous motors
 - Maximum electrical turning frequency: 1000 Hz
 - Maximum velocity at 8 pole motors: 15000 rpm
 - Maximum speed: $60 \cdot 1000 / \text{number of pole pairs}$ in [rpm]
- Sinusoidal commutated asynchronous motors
 - Maximum electrical turning frequency: 1000 Hz
 - Maximum speed: $60 \cdot 1000 / \text{number of pole pairs} - \text{slip}$ in [rpm]
- 3 phase synchronous direct drives

Feedback systems supported

- Resolver (option F10)
 - Litton: JSSBH-15-E-5, JSSBH-21-P4, RE-21-1-A05, RE-15-1-B04
 - Tamagawa: 2018N321 E64
 - Siemens: 23401-T2509-C202
- Rotary SineCosine Single- or Multiturn encoder with Hiperface®- or EnDat 2.1 interface
 - SinCos® Singleturn (Stegmann)
 - SinCos® - Multiturn (Stegmann), Absolute position up to 4096 motor revolutions
 - Rotary feedback with HIPERFACE® interface: SRS50, SRM50, SKS36, SKM36, SEK52, SEL57
- Analog hall sensors
 - Sine-Cosine signal (max. 5 V_{pp} ; typical 1 V_{pp}) 90° offset
 - U-V signal (max. 5 V_{pp} ; typical 1 V_{pp}) 120° offset
- Encoder linear or rotary
 - Sine-Cosine (max. 5 V_{pp} ; typical 1 V_{pp}) (max. 400 kHz) or
 - TTL (RS422) (max. 5 MHz) with the following modes of commutation:
 - Automatic commutation or digital hall sensors
- Digital, bidirectional interface:
 - EnDat 2.1 or EnDat 2.2 feedback systems with incremental track (sine-cosine track)
 - linear or rotary
- Distance coded feedback systems
 - Distance coding with 1 V_{pp} interface
 - Distance coding with RS422 - Interface

Feedback error compensation

- Automatic feedback error compensation (offset & amplification) for analog hall sensors and sine-cosine encoder can be activated in the MotorManager

Positioning on the motor shaft:

- Resolver (option F10)
 - Resolution: 16 Bit (= 0.005°)
 - Absolute accuracy: +/-0.167°
- SinCos® (Option F11)
 - Position resolution: 13.5Bit/Encoder sine period
=> 0.03107°/encoder resolution
- Direct drives (F12)
 - Maximum position resolution
Linear: 24 Bits per motor magnet spacing
Rotary: 24 bits per motor revolution
 - For 1 V_{pp} sine-cosine encoders (e.g. EnDat): 13.5 bit / graduation of the scale of the encoder
With RS422-Encoders: 4xencoder resolution / encoder bypass possible. Accuracy of the feedback zero pulse acquisition = accuracy of the feedback resolution.
For analog hall sensors with 1 V_{pp} signal: 13.5 bits / motor magnet spacing

Accuracy

The accuracy of the position signal is above all determined by the type and accuracy of the feedback system used

Encoder simulation

- 4 - 16384 increments per revolution
- Limit frequency: 620 kHz

Setpoint generator

- Jerk-limited ramps
- Travel data in increments, mm, inch or variable by scale factor
- Specification of speed, acceleration, deceleration and jerk

Monitoring functions

- Power/Auxiliary supply range
- Motor power stage temperature/stall protection
- Following error monitoring

Inputs and outputs

- 8 control inputs: 24 VDC / 10 kOhm
- 4 control outputs: Active HIGH / short-circuit proof/ 24 V / 100 mA
- 2 analog inputs (14 Bit)
- 2 analog outputs (8 Bit)

COM ports

- RS232
 - 115200 Bauds
 - Word length 8 Bits, 1 start bit, 1 stop bit
 - Hardware handshake (XON, XOFF)
- RS485 (2 or 4-wire)
 - 9600, 19200, 38400, 57600 or 115200 Bauds
 - Word length 7/8 Bits, 1 start bit, 1 stop bit
 - Parity (can be switched off) even/odd
- USB (Compax3M)
 - USB 2.0 Full Speed compatible

Bus systems

- PROFIBUS DP V0-V2 (I20)
 - 12 MBaud
 - PROFIdrive profile drive technology
- CANopen (CiADS402) (I21)
- DeviceNet (I22)
- Ethernet Powerlink (I30)
- EtherCAT (I31)
- PROFINET (I32)

Housing

- Insulation: VDE 0160 / Protection class IP20 in accordance with EN 60529 (not for C3H1xxV4)

Insulation requirements

- Protection class I in accordance with EN 60664-1
- Protection against human contact with dangerous voltages: in accordance with EN 61800-5-1
- Overvoltage: Voltage category III in accordance with EN 60664-1
- Level of contamination 2 in accordance with EN 60664-1 and EN 61800-5-1

Ambient conditions

- Temperature range:
 - Compax3S & Compax3H 0...45 °C
 - PSUP / Compax3M 0...40 °C
- max. relative air humidity <=85% class 3K3; non-condensing

Safety technology

- Compax3S: STO (Safe torque off) according to EN ISO 13849:2008, category 3:PL=d/e approval: BG-PRÜFZERT
- Compax3M: Optional state-of-the-art safety technology (EN ISO 13849-1:2007, category 3, PL=e)

CE compliance

- EG low voltage directive 2006/95/EC
EN 61800-5-1, Standard for electric power drives with settable speed; requirements to electric safety
EN 60664-1, isolation coordinates for electrical equipment in low-voltage systems
EN 60204-1, Machinery norm, partly applied
- EC-EMC-directive 2004/108/EC
EN 61800-3, product standard for speed adjustable drives

UL certification

- UL conform according to UL508C
 - Compax3S
Recognized Component Mark for Canada and the US
 - PSUP / Compax3M & Compax3H
UL Listing

RoHS compliance

- Available for Compax3S, Compax3MP / M, Compax3F
Complies with European Union Directive 2002/95/EC - Restriction of Hazardous Substances (RoHS)

Dimensions

Compax3S & Compax3H (page 6)
Compax3M & PSUP (page 7)
Compax3F (page 22)





WARNING – USER RESPONSIBILITY

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