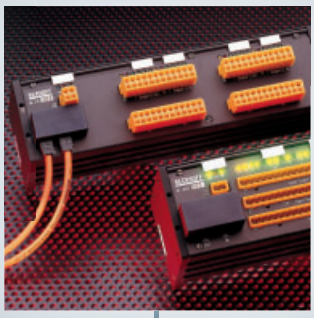
25 years of PC Control – from the idea to the world standard



µC-based Control

PC-based Control

1980 1981 1982 1983 1984 1985 1987

1986

First PC-based machine controller was delivered by Beckhoff

1988

S1000: Software PLC/NC on PC (DOS)

1989

Lightbus: Fibre-optic fieldbus for fast I/O coupling

1990

C2000: All-in-one Motherboard

Intel® 386™ microprocessor

- 32 bit
- 275,000 transistors

MS DOS 3.3

- 3½-inch, 1.44 MB HD floppy disk
- hard disk partitioning possible

Intel® 486™ microprocessor

- 1.2 million transistors
- built-in math coprocessor

PC-based Control

1991 1992 1994 1997

1993
S2000: Software PLC/NC/CNC on PC (DOS)

1995
Bus Terminals: Fine granular I/Os

1996
TwinCAT: Standard real-time automation software running on Windows

1998
CP-Link: Remote Control Panels up to 100 m from IPC

MS DOS 5.0
- additionally available RAM: HMA, EMS, XMS
- larger hard disk partitions: 2 GB instead of 32 MB

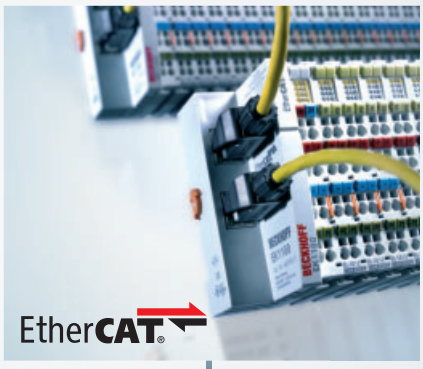
Intel® Pentium® processor
- 3.1 million transistors
- integrated floating-point unit

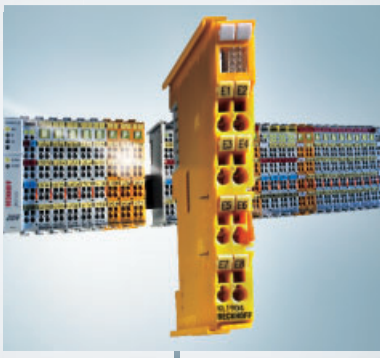
MS DOS 6.22
- DrvSpace data storage device compression

Windows 95
- 16/32 bit operating system
- modern Graphical User Interface

Windows NT 4.0 Workstation
- Graphical User Interface similar to Windows 95
- purely 32 bit operating system
- memory protection through separate address spaces
- modern NTFS file system
- multi-CPU support

Intel® Celeron® processor
- 7.5 million transistors





PC-based Control

2000 2001 2004

1999

Fieldbus Box: The compact IP 67 modules

2002

CX1000: Embedded PC – Modular DIN rail Industrial PCs

2003

EtherCAT: Real-time Ethernet for automation

2005

TwinSAFE: The compact safety solution

AX5000: EtherCAT Servo Drive

Intel® Pentium® III processor
- 28 million transistors

Intel® Pentium® 4 processor
- 42 million transistors

Windows 2000
- USB support
- plug-and-play for PCI and USB

Windows Embedded CE 3.0
- real-time support

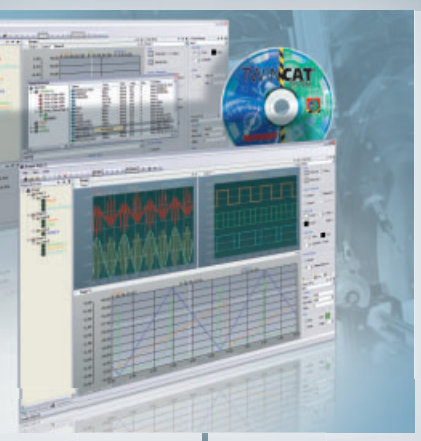
Windows XP
- improved plug-and-play
- new user interface design
- firewall
- fast change of user

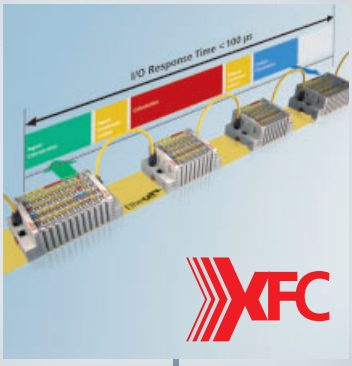
Windows Embedded CE 4.2
- Graphical User Interface
- real-time operating system with 256 thread priorities, 32 processes, 32 MB address space per process
- scalable memory requirement, minimum 400 KB

Intel® Pentium® 4-M processor
- 55 million transistors

Intel® IXP420 network processor
- single-chip integrated processor

Windows Embedded CE 5.0
- improved hardware support
- transaction-based, non-volatile TFAT file system





PC-based Control

2007 2009 2011

2006

Scientific Automation: Measurement technology and engineering science as a control component

Intel® Core™2 Duo processor
- multi-core CPU
- 291 million transistors

Intel® Core™2 Quad processor
- multi-core CPU
- 582 million transistors

Windows Embedded CE 6.0
- number of available processes increased to 65,535
- virtual address space increased to 2 GB per process

2008

XFC: eXtreme Fast Control for efficient machines and plants

Intel® Celeron® processor
- 105 million transistors

Intel® Atom™ processor
- energy-efficient, low-cost design
- 47 million transistors

Windows 7
- improved safety functions against attacks by harmful software
- new user interface design
- convenient user guidance
- 64 bit version

2010

TwinCAT 3: Engineering tool for object-oriented and modular automation

Intel® Xeon® processor
- 8-core CPU

Windows Embedded Standard 7
- scalable system
- smaller footprint
- installable language support
- embedded features e.g. EWF (Enhanced Write Filter)

Windows Embedded Compact 7
- multi-CPU support
- Silverlight for Windows Embedded