

Standardization with Rexroth

Automation Concepts for the Solar Industry





Document ID

Project name	
Area of application	Production and Assembly Lines
Type of document	Project Manual
Release version	3.0
Release date	01/2010
Organization unit	
Customer plant	
Production area	
Supplier plant	Bosch Rexroth Electric Drives and Controls GmbH
File format	DOC Microsoft Word 03, Photoshop CS, EPS Freehand MX
Output format	PDF Acrobat Reader 6.0



Document Approval and Responsibility

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Revision History

Version	Date	Page/ Chapter	Revisions
2.0	11.11.2009		Update DCL
3.0	27.11.2009		Update DCP
3.0	19.08.2011		Layout, Easy Handling, CSS/F



Typographical conventions



Main chapter



Subchapter



Topic



Topic in subchapter



Remarks, Note



In development, technical clarification/ Initial modification or revision

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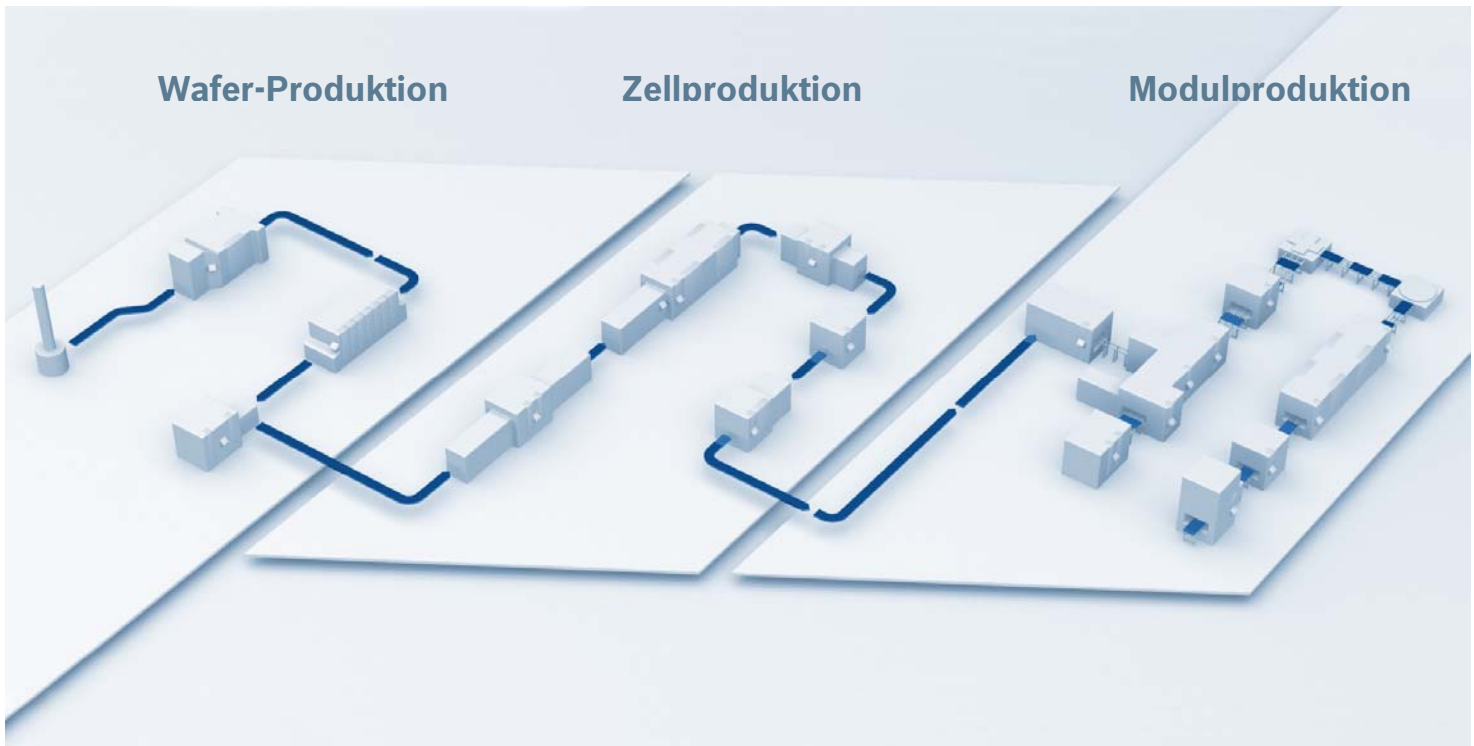
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Introduction and Objective

This project manual describes all the elements of control architecture that have been adapted to the requirements of the Solar Industry. As a systems supplier, Bosch Rexroth offers hardware and software, engineering services, replacement parts, training and support.



Among the products and services offered are selected components that have been especially designed for the needs of production such as:

- PLC controls
- CNC controls
- operating and visualisation devices
- Industrial PC
- open interfaces
- I/O components
- drives
- software packages

The components are used in all divisions of the photovoltaics industry
e.g.:

- handling
- transport in vacuum
- laminator
- as well as related applications

 Project Management

The project manager is responsible for project-specific coordination of the technical and commercial projects between Bosch Rexroth, machine manufacturer and the end customer.

Bosch Rexroth

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All the necessary decisions concerning deadlines, special approvals, range of functions, etc. are made between the project manager and the project planning department of the original equipment manufacturer (OEM).

The automated series production tool has been designed to:

- reduce costs for storing replacements parts, startup, and maintenance by offering an optimized selection of components.
- ensure high availability using standard software structures and a standardized operating concept that includes diagnostics.
- allow you to connect third-party and additional components using standard interfaces.

The specified components for the control and drive equipment should always be used by the machine engineers. This will provide the highest productivity and availability for the entire service life of the production equipment.



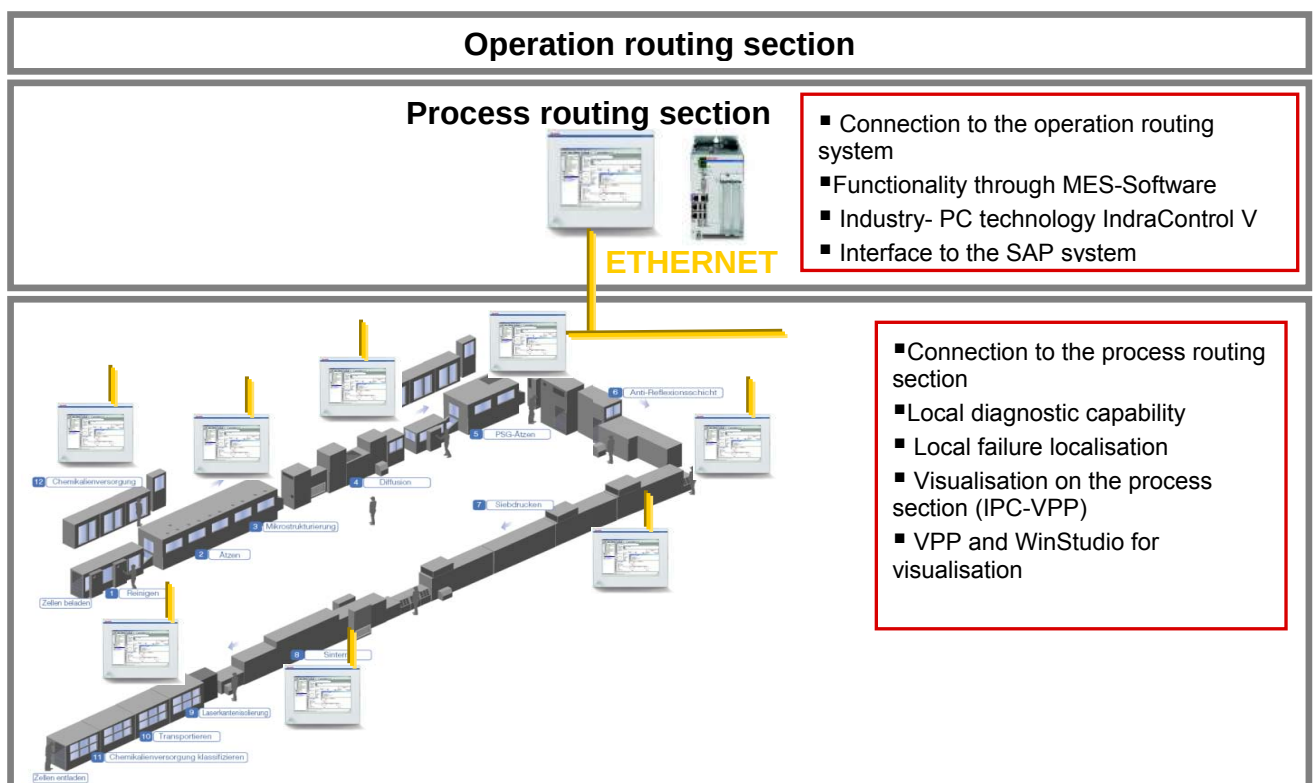
Points not covered in detail in the project book are to be arranged with the OEM project manager in charge.

This does not exempt the system supplier of his responsibility to supply systems that have been properly constructed and meet the local regulations in effect. This also applies to the accompanying documentation.

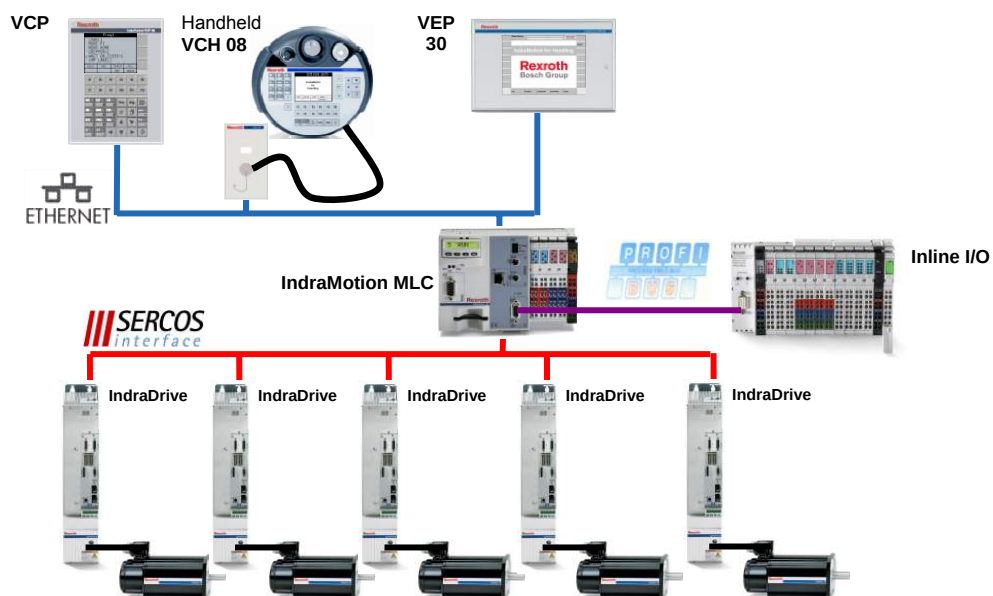
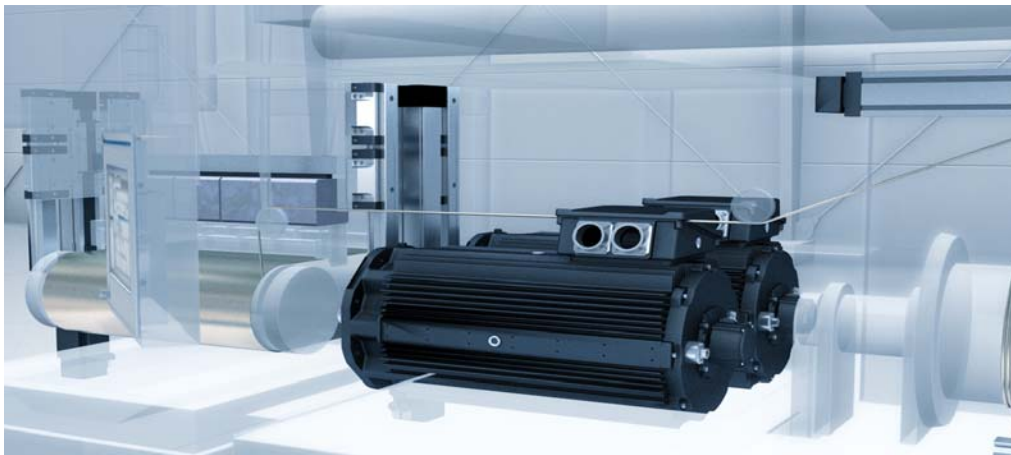
1.0 Automation Concepts

1.1 Example „Process- and operation routing section“

- technical control connection to the process routing section
- local diagnostic capability
- local breakdown localisation
- technical control connection to the operation routing section
- functionality through MES-software
- interface to the SAP system
- visualisation on the process section (IPC-VPP) Page 37
- VPP with WinStudio for visualisation Page 91
- Industry PC technology IndraControl V from Bosch Rexroth Page 35



1.2 📁 Example: „Ingot – Saw“

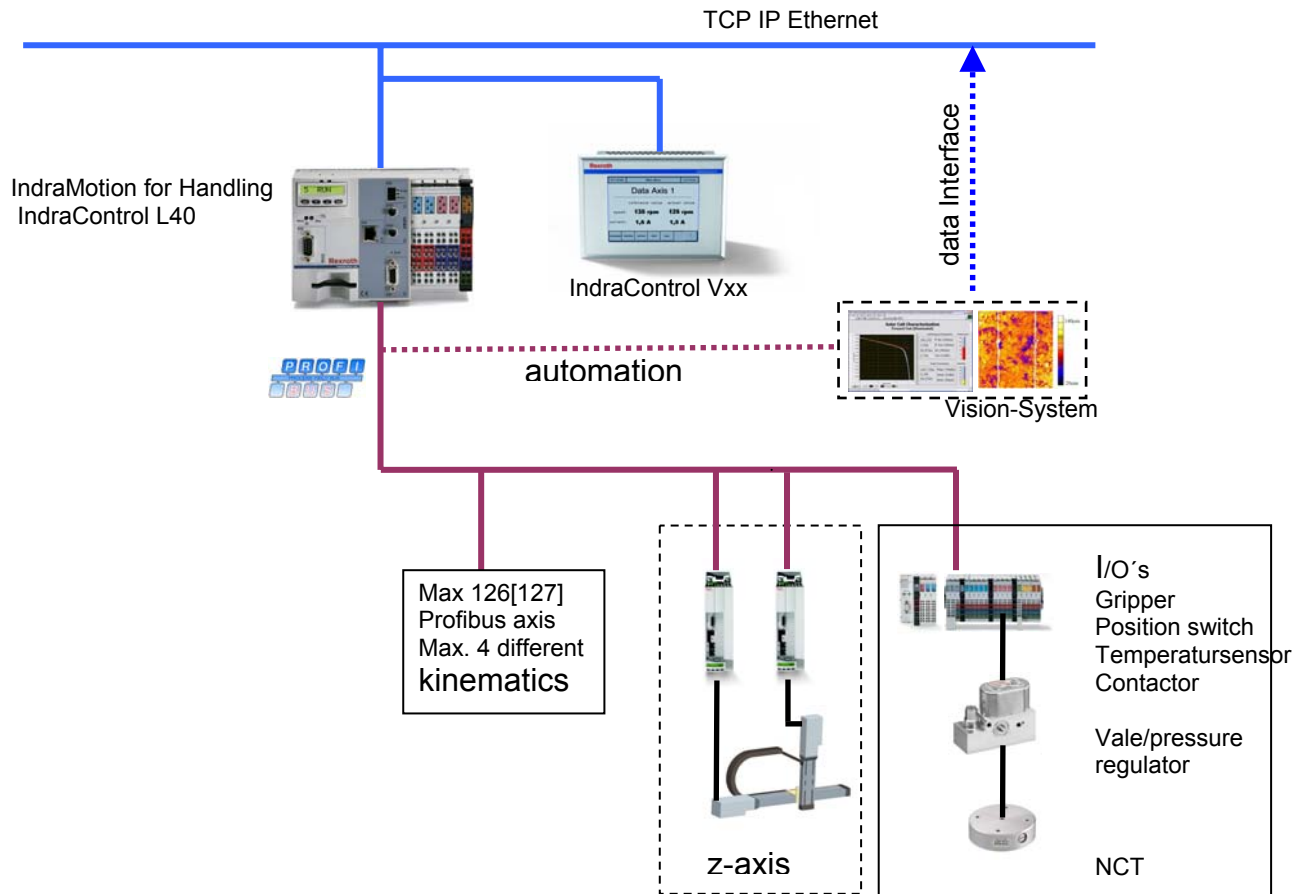


Component Overview:

- | | |
|--|---------|
| • Motion Logic-System IndraMotion MLC | Page 24 |
| • HMI - IndraControl V | Page 35 |
| • I/O technology Rexroth – Inline | Page 58 |
| • electrical drive technology IndraDrive C + IndraDrive Cs | Page 67 |
| • drives – IndraDyn | Page 61 |

1.3. Handling for cell production

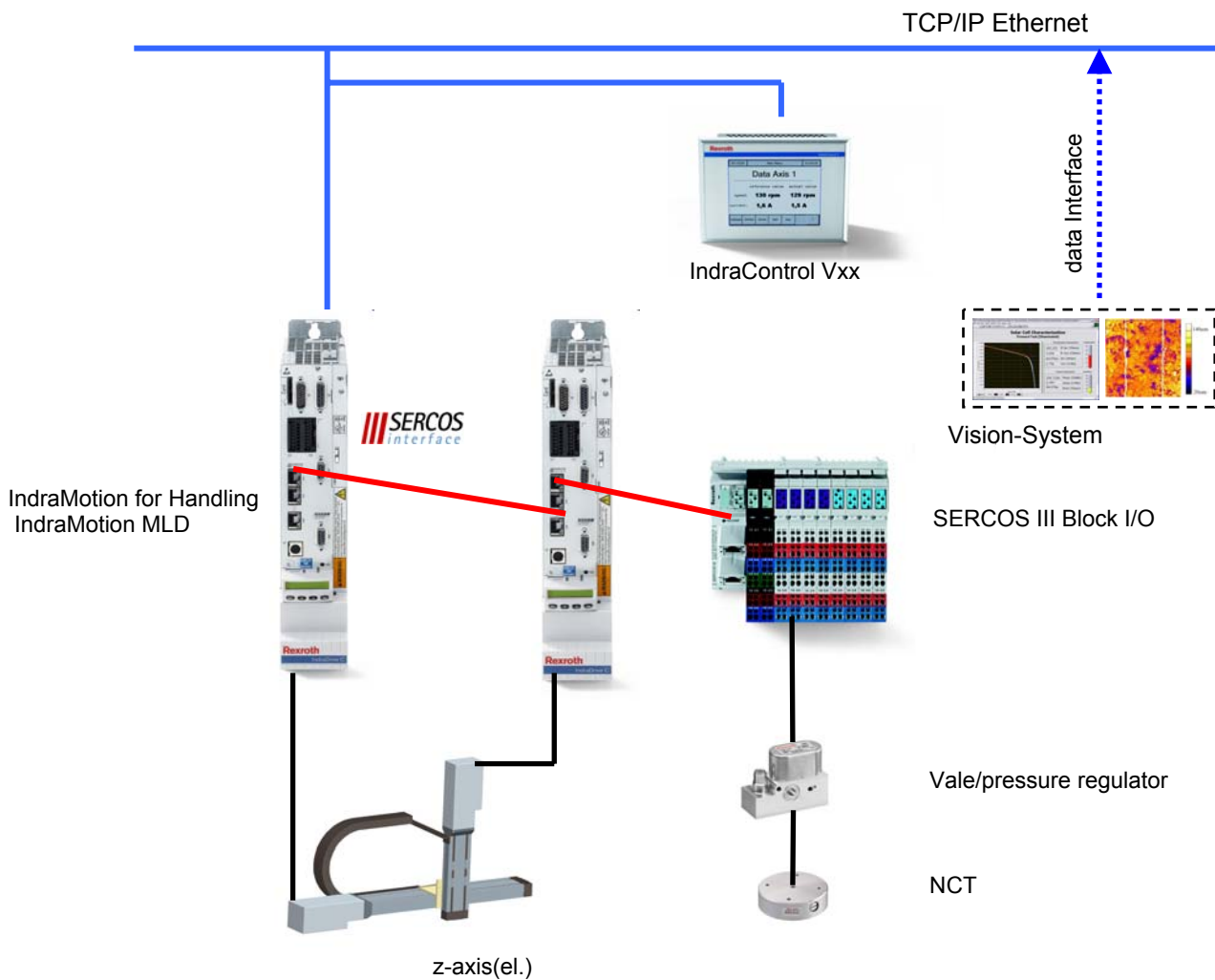
1.3.1 Example: „Conversion“: 2 axes Cartesian – controller-based



Component Overview:

- | | |
|---|---------|
| • Turn Key solution for automation IndraMotion for handling | Page 23 |
| • HMI - IndraControl V | Page 35 |
| • I/O technology Rexroth – Inline | Page 58 |
| • electrical drive technology IndraDrive C + IndraDrive Cs | Page 67 |
| • drives – IndraDyn | Page 61 |
| • construction kit for handling-systems - CamoLine | Page 85 |
| • gripper technology NCT | Page 80 |
| • Vale/pressure regulator | Page 80 |

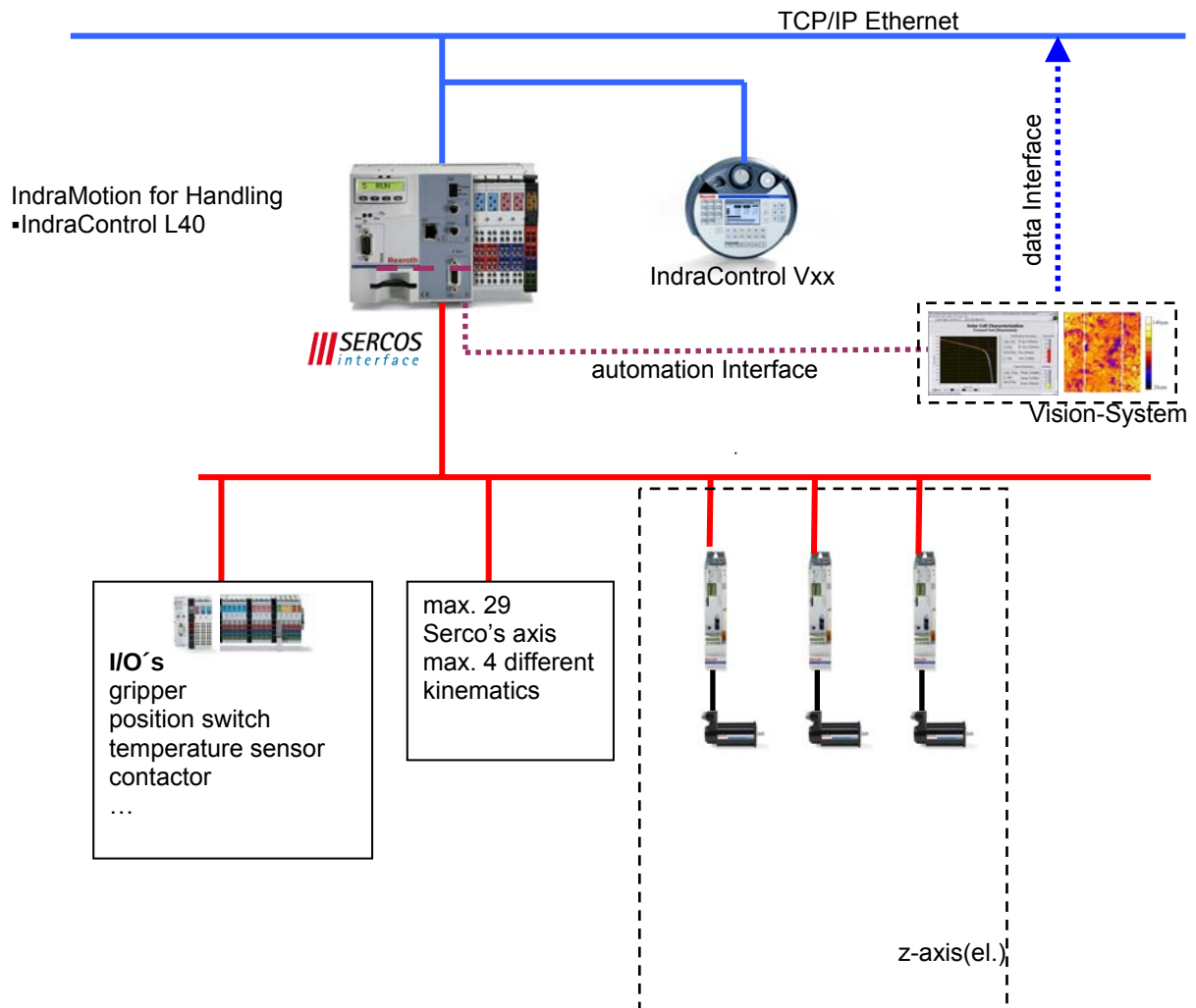
1.3.2 Example: „Conversion“: 2 axes Cartesian – drive-based



Component Overview:

• IndraMotion MLD drive-based Motion-Logic.System	Page 26
• HMI - IndraControl V	Page 35
• I/O technology Rexroth – Inline	Page 58
• electrical drive technology IndraDrive C + IndraDrive Cs	Page 67
• drives – IndraDyn	Page 61
• construction kit system Camoline	Page 85
• gripper technology NCT	Page 80
• Vale/pressure regulator	Page 80

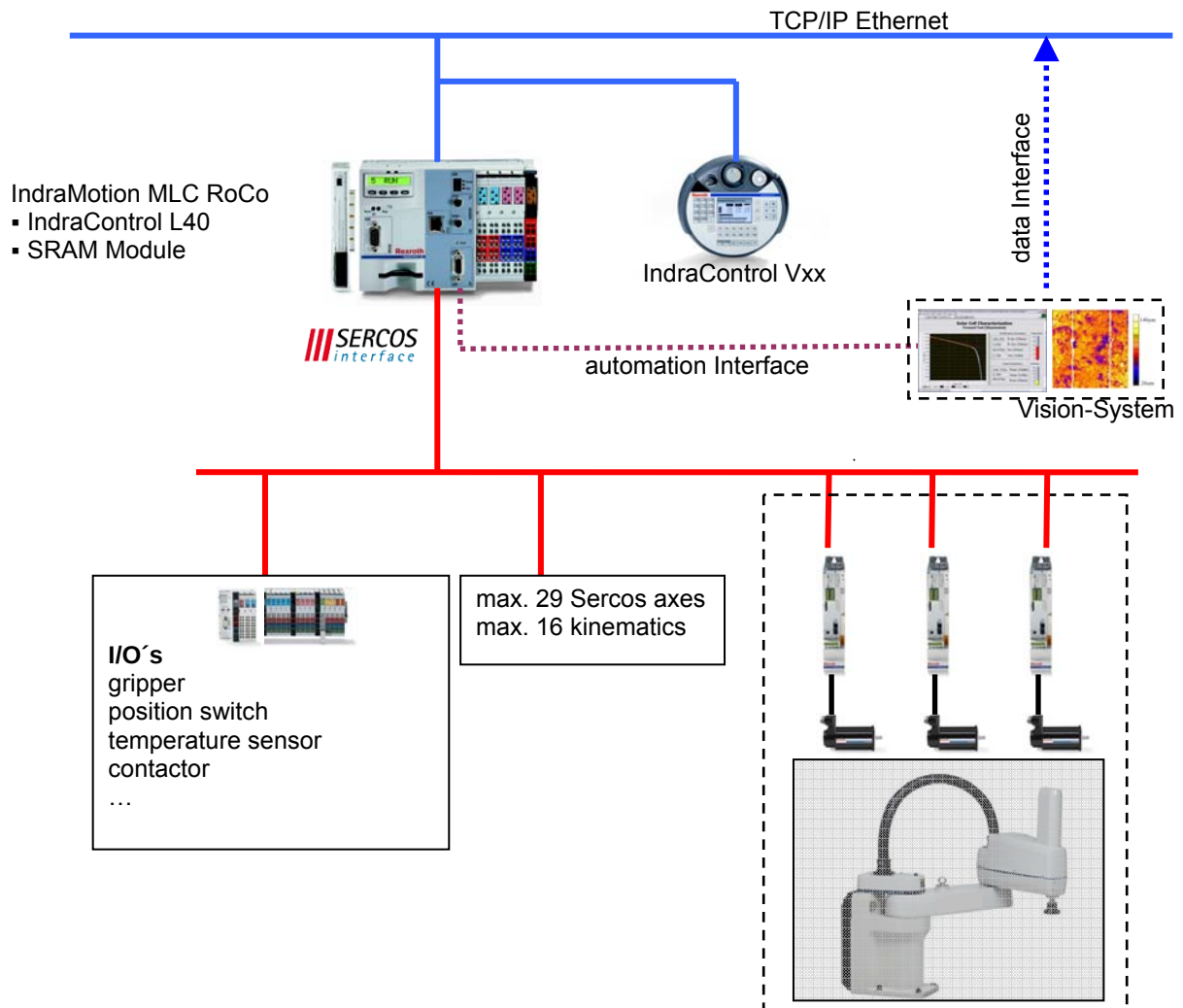
1.3.3 Example: „Sorting“: 3 axes Cartesian



Component Overview:

- | | |
|--|---------|
| • Turn Key solution for automatisaton IndraMotion for handling | Page 23 |
| • HMI/Handheld - IndraControl V | Page 35 |
| • I/O technology Rexroth – Inline | Page 58 |
| • electrical drive technology IndraDrive C + IndraDrive Cs | Page 67 |
| • drives – IndraDyn | Page 61 |
| • construction kit system Camoline | Page 85 |
| • gripper technology NCT | Page 80 |

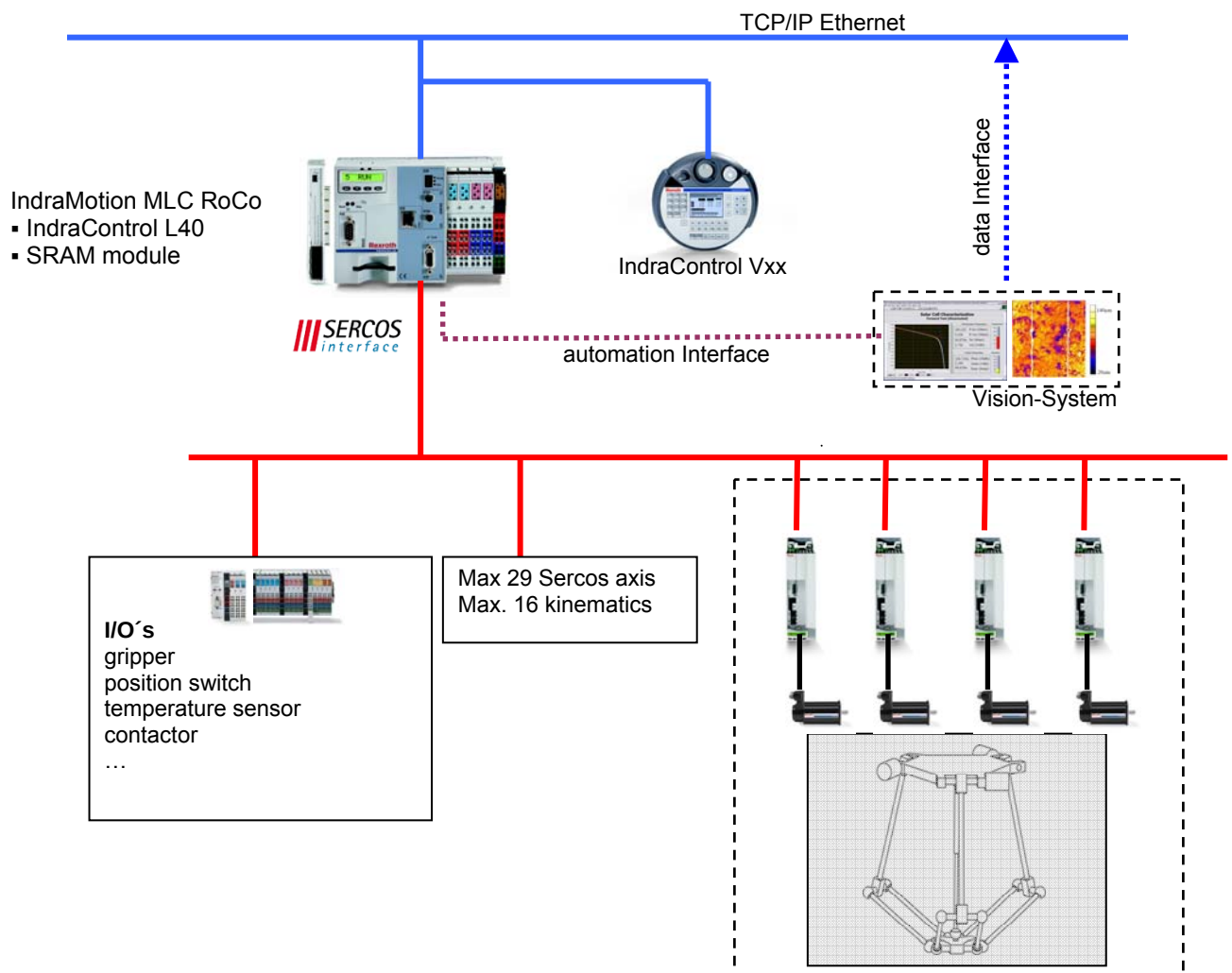
1.3.4 Example: „Conversion“: SCARA Robot



Component Overview:

- | | |
|--|---------|
| • robot control IndraMotion MLC -RobotControl | Page 25 |
| • HMI/Handheld - IndraControl V | Page 35 |
| • I/O technology Rexroth – Inline | Page 58 |
| • electrical drive technology IndraDrive C + IndraDrive Cs | Page 67 |
| • drives – IndraDyn | Page 61 |

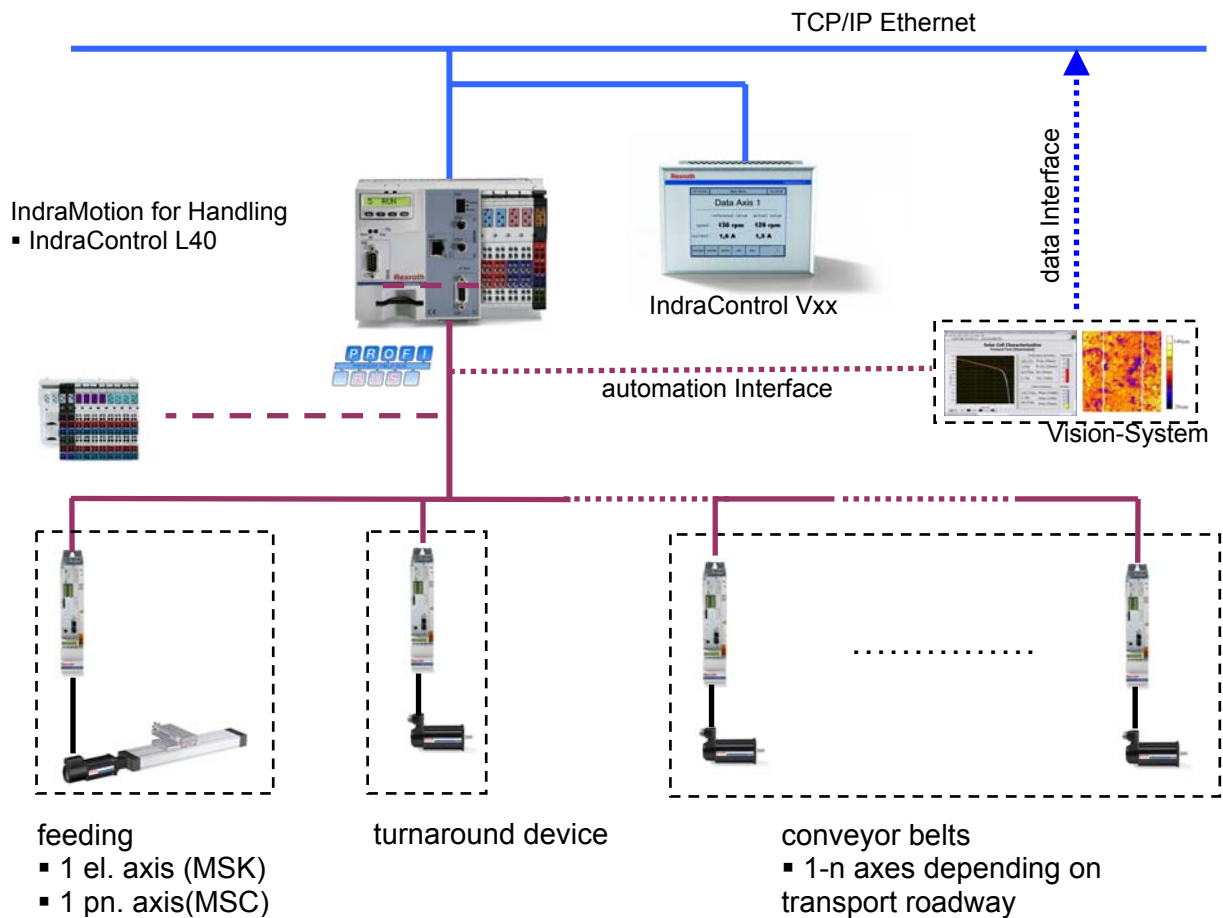
1.3.5 Example: „Sorting“: Delta Robot



Component Overview:

- | | |
|--|---------|
| • robot control IndraMotion MLC -RobotControl | Page 25 |
| • HMI/Handheld - IndraControl V | Page 35 |
| • I/O technology Rexroth – Inline | Page 58 |
| • electrical drive technology IndraDrive C + IndraDrive Cs | Page 67 |
| • drives – IndraDyn | Page 61 |

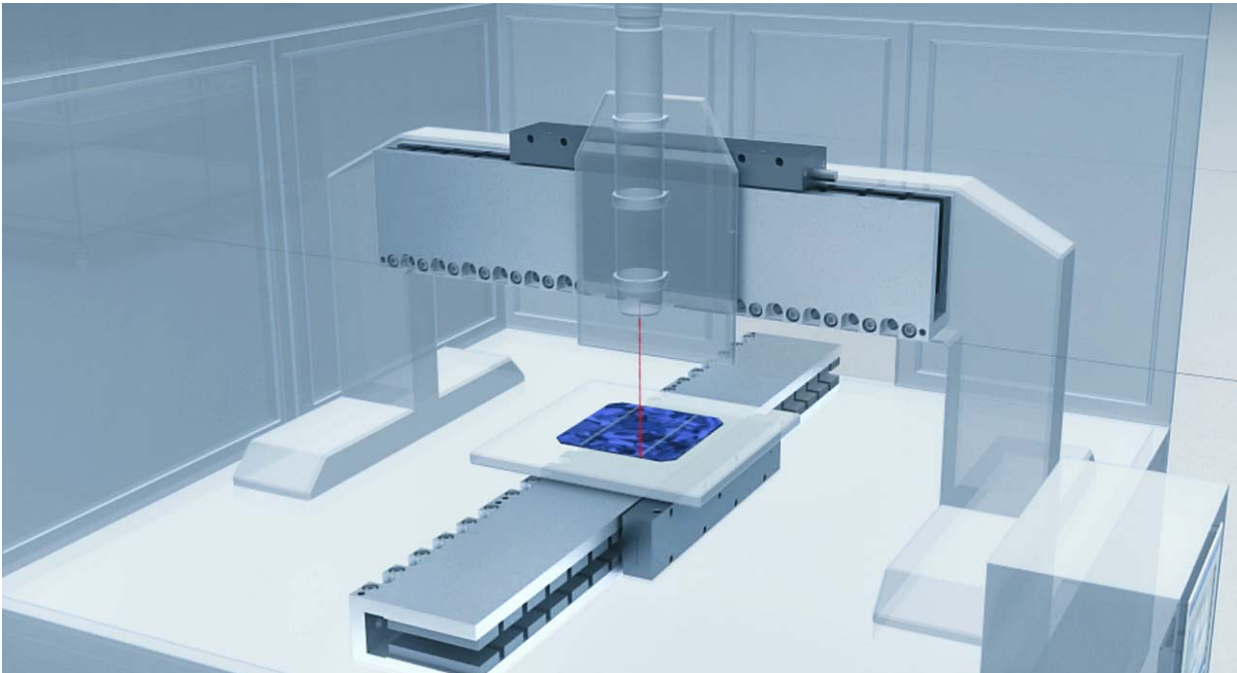
1.4 Example: „feeding screen-printing and turnaround device“



Component Overview:

- | | |
|--|---------|
| • Turn Key solution for automation IndraMotion for Handling | Page 23 |
| • controller-based small operation terminal IndraControl VCP | Page 46 |
| • I/O technology Rexroth – Inline | Page 58 |
| • electrical drive technology IndraDrive C + IndraDrive Cs | Page 67 |
| • drives – IndraDyn | Page 61 |

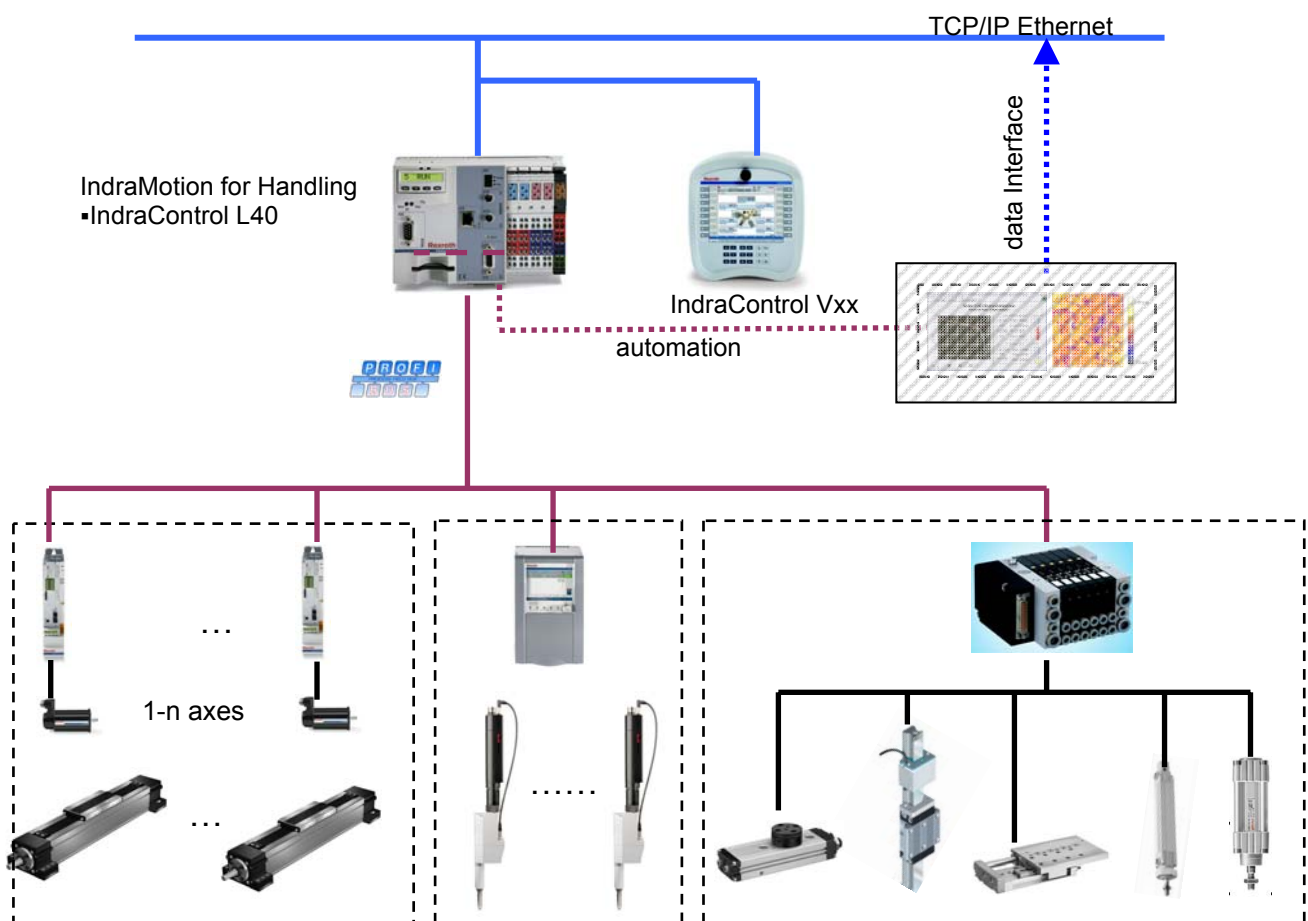
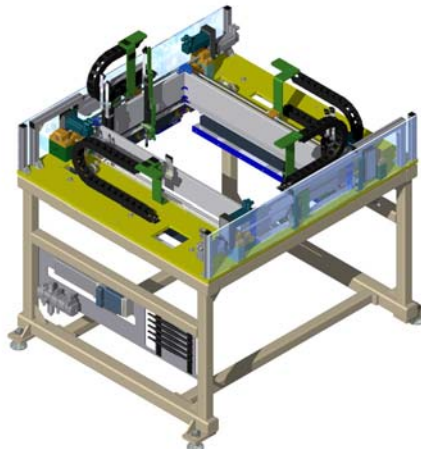
1.5 Example: “Laser - structuring“ and “Laser edge-cutting“



Component Overview:

- | | |
|--|---------|
| • automatisisation solution IndraMotion MTX | Page 31 |
| • automatisisation solution NYCe 4000 | Page 33 |
| • electrical drive technology IndraDrive C + IndraDrive Cs | Page 67 |
| • drives - IndraDyn | Page 61 |

1.6 Example: „Screw technology“



Component Overview:

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Version 1.0 [Änderungen vorbehalten]

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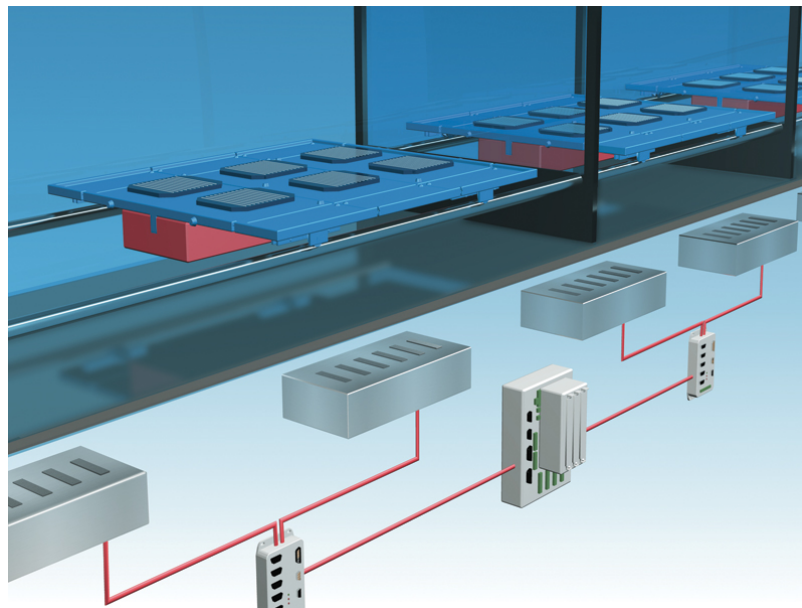
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• Turn Key solution for automation IndraMotion for handling	Page 23
• controller-based small operation terminal IndraControl Vxx	Page 44
• electrical drive technology IndraDrive C + IndraDrive Cs	Page 67
• drives – IndraDyn	Page 61
• screw technology	Page 88
• Rexroth Pneumatics:	Page 79
compact-cylinder CCI series	
mini-cylinder OCT series	
turnaround-module	
valve-carrier-system HF03-LG series	
• construction kit for handling systems - CamoLine	Page 85

1.7 Example: „Transport of components in clean-room and vacuum“

Transport of materials and components under process conditions, e.g.:

- clean-room
- vacuum
- rare gas
- at higher temperatures
- in chemical sector



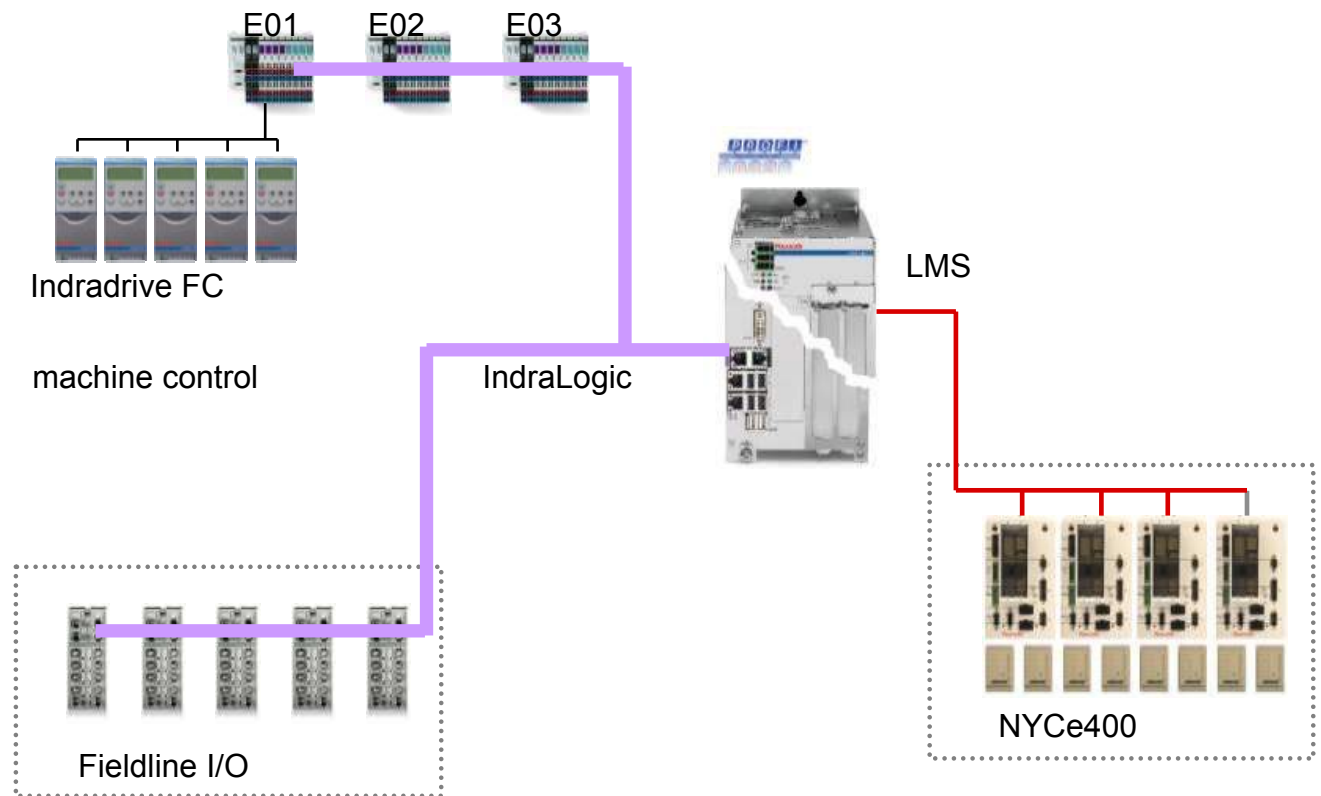
Benefits:

- no lead-through for motor-shafts and wires necessary
- less abrasion, with it low maintenance effort
- easy access to the components – because outside of the processing room

Function Overview:

- freely programmable in C and C++
- up to 28 inductors in one configuration
- detailed startup tools
- high precise positioning (repeat accuracy <50 µm)
- independent move of carrier allows complex automation operations
- speed up to 5 m/s

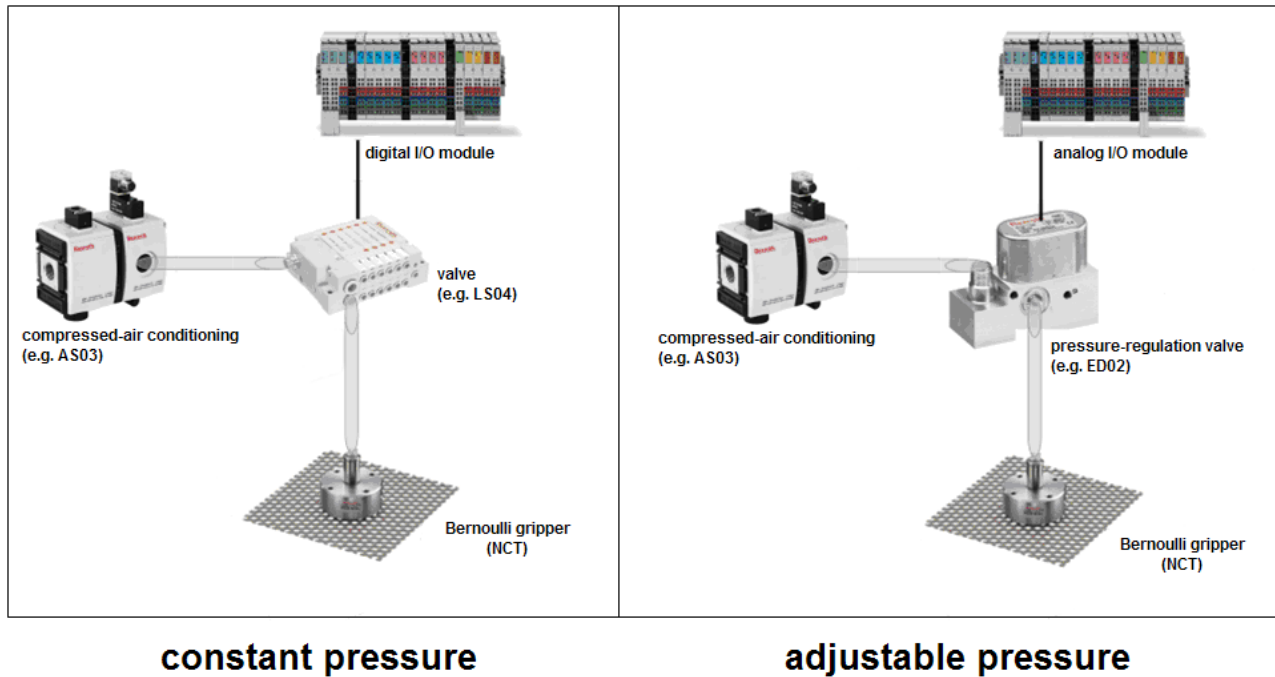
Topology „Transport of components into clean-room and vacuum“:



Component Overview:

- | | |
|-----------------|---------|
| • IndraLogic | Page 53 |
| • IndraDrive FC | Page 75 |
| • Fieldline | Page 59 |
| • Inline | Page 58 |
| • NYCe 4000 | Page 33 |

1.8 📁 Example: „Technical control connection of the Bernoulli gripper“

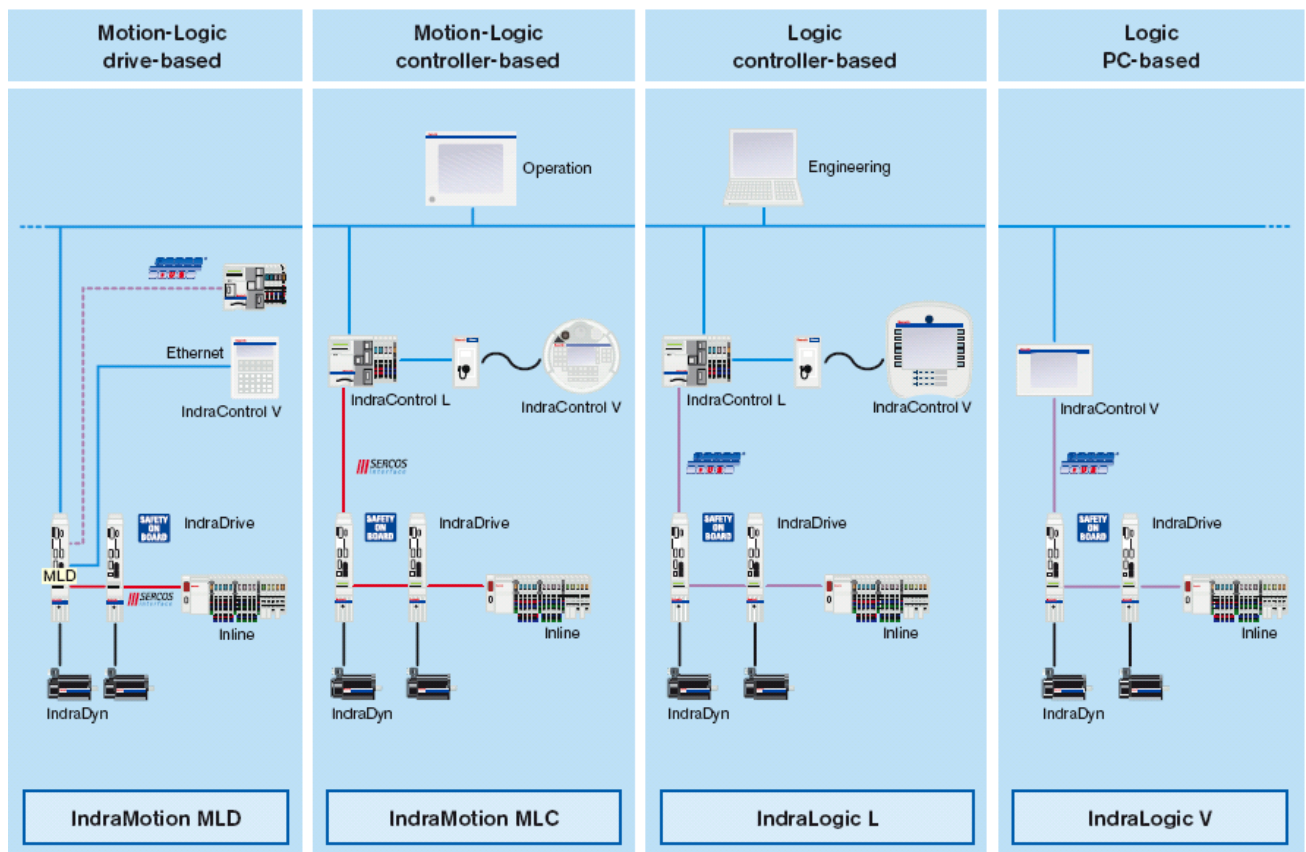


Component Overview:

- | | |
|-----------------------------------|---------|
| • I/O technology Rexroth – Inline | Page 58 |
| • gripper NCT | Page 81 |
| • pressure preparation | Page 81 |
| • valve / pressure regulator | Page 81 |

2.0. IndraMotion for Handling - Turn Key solution for automation

IndraMotion for Handling is the system solution for efficient coordination of axes movement in the fully automated production. The intelligent concept is based on a unitary drive and control platform as well as international software standards. Those coordinated components establish you all freedoms for the realisation of your handling applications.



IndraMotion for Handling provides all degrees of freedom for centralized and distributed automation, with numerous options for control and visualization devices.

Function Overview:

- free PLC - functionality (IEC 61131-3)
- complete PLC-library und PLCopen-logic arrays
- easy teaching, defining and programming of motion sequences via HMI,PC or PLC
- Cartesian kinematics
- moving in machine coordinates without coordinate-transformation
- up to 4 kinematics in one control
- up to 6 axes per kinematic
- sluring motions

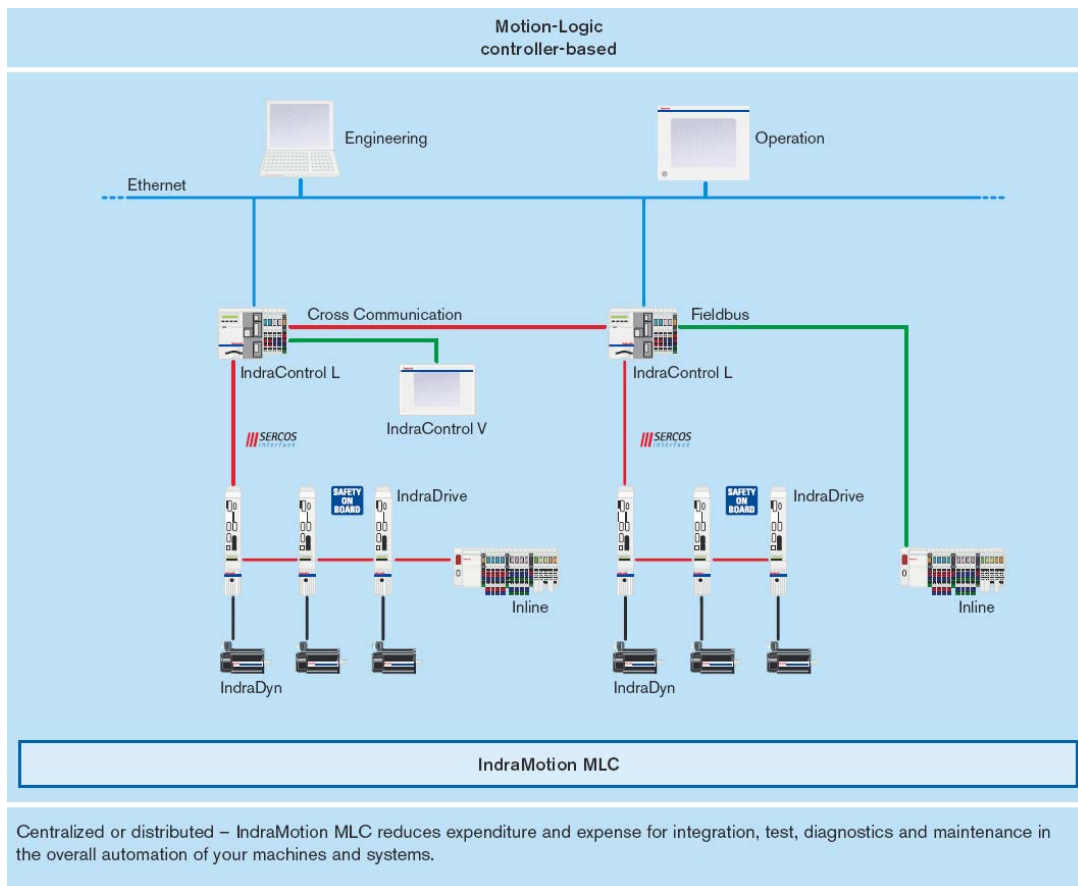
2.1 IndraMotion MLC – controller-based Motion Logic System

Motion - Logic

The compact Rexroth IndraMotion MLC motion-logic system gives you any freedom you wish for your consistent and modern machine automation. Innovative software and firmware functions, easy engineering and open system interfaces ensure maximum flexibility in all motion applications.



IndraMotion MLC is the integrated controller-based system solution from the Rexroth Automation House. Ready-to-use technology functions accelerate engineering.



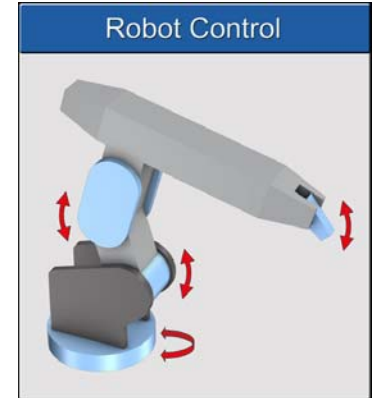
Motion - Robotic

General:

- overall maximum 32/64 axes
- up to 16 kinematics
- overall 16 axes per kinematic (position, orientation, band)
- coordination transformation enabled for:

Kinematic types:

- Cartesian robots
- Scara-robot and
- Delta-robot
- about 90 further transformations are available



Multi-kinematic:

- different kinematic-types are mixable (Scara, Delta, Cartesian, ...)
- up to 4 band axes per kinematic
- several robots can work synchronously on one band (band-axes can multiply be assigned to a kinematic)
- operating mode per kinematic selectable (automatic, manual)
- every kinematic has a data-interface between RCL-programm and PLC KinData → Array comparable with AxisData

Programming:

- programming with Robot Control Language
- c.f. BAPS
- PTP-, LINEAR- and CIRCULAR-motion with
 - conditional interruption,
 - setting of digital output position- or time-dependent
 - time-controlled motion ($v = s/t$)
 - programmable speed and acceleration (A, V, AFACTOR, DFACTOR, AFIX, V_PTP)
- modularisation possible through RCL-subroutines
- debugger for RCL available

Miscellaneous:

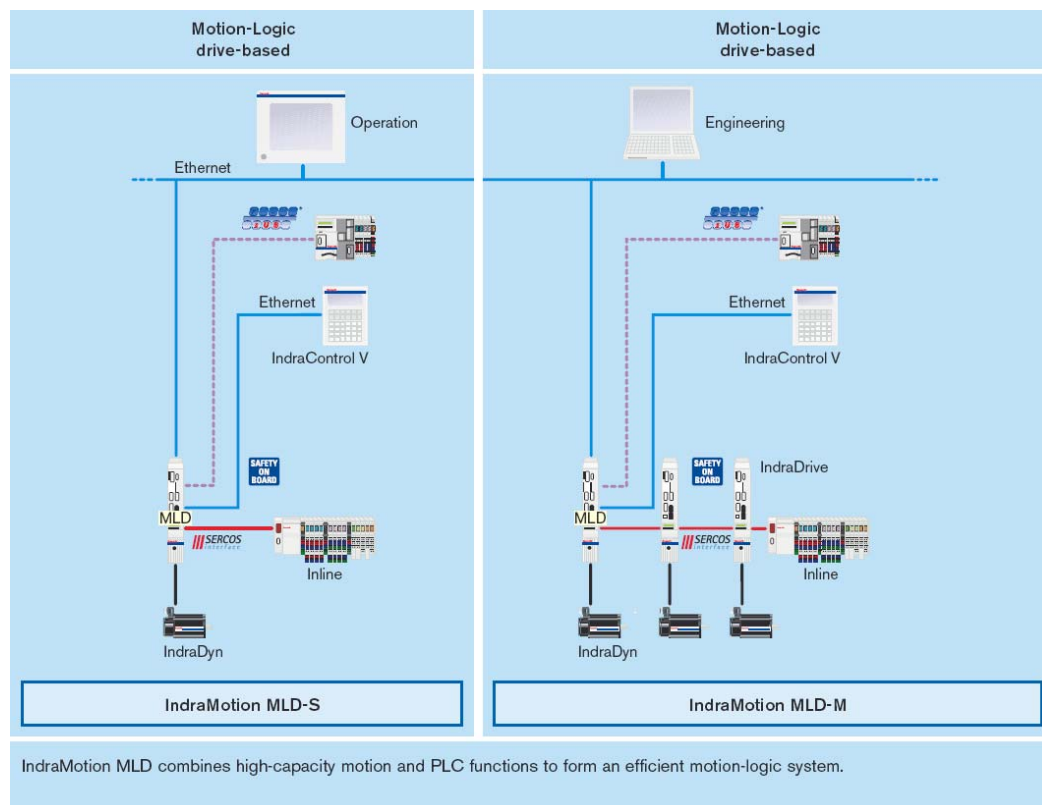
- band-synchronisation (with up to 4 bands)
- set-slope and program-slope
- override
- teach pendant as AWP available

2.2 IndraMotion MLD – drive-based Motion Logic System

IndraMotion MLD combines motion and PLC functions to form a modern open automation platform for modular machine designs. The distributed control architecture establishes a compact motion-logic system, based on the scalable IndraDrive platform, so that higher-order controls are no longer necessary.



This drive-based solution is available as a single-axis control for simple applications as well as multi-axis control for applications with a maximum of 8 axes. Ready-to-use function libraries simplify the use of intelligent drive functions of our IndraDrives. In addition, PLCopen-conforming function blocks provide access to standardized motion-control functions. The open technology and communication interfaces facilitate integration of IndraMotion MLD in your automation design.



Project Book

1	IndraMotion MLD control		MLD-S	MLD-M
1.1	Interfaces			
1.1.1	SERCOS III-Master	On board	●	●
1.1.2	SERCOS III-Slave	Option S3	○	○
1.1.3	SERCOS 2-Slave	Option SE	○	○
1.1.4	PROFIBUS DP-Slave	Option PB	○	○
1.1.5	DeviceNet-Slave	Option CO	○	○
1.1.6	PROFINET IO-Slave	Option ET	○	○
1.1.7	EtherNet/IP-Slave	Option CCD	○	○
1.1.8	CANopen-Slave	Option CO	○	○
1.1.9	RS232	On board	●	●
1.1.10	Ethernet TCP/IP	Option CCD or option S3	○	●
1.2	On board diagnosis and settings			
1.2.1	Status display (boot, SERCOS, test)	Display or parameter	●	●
1.2.2	Errors, warnings, messages, system reset	Display or parameter	●	●
1.2.3	Ethernet settings (IP address)	Display or parameter	●	●
1.2.4	Voltage monitoring, watchdog		●	●
1.2.5	Relay output (ready for operation)		●	●
2	Inputs and outputs		MLD-S	MLD-M
2.1	On board			
2.1.1	Digital inputs		7 I	Depending on the number and type of control units and options used
2.1.2	Digital inputs/outputs, any adjustment		4 I or O	
2.1.3	Analog inputs and outputs		1 I/2 O	
2.2	Local			
2.2.1	Option MD1, digital I/O extension		12 I/8 O	
2.2.2	Option MD2, digital I/O extension		16 I/16 O	
2.2.3	Parallel interface, digital inputs/outputs		16 I/16 O	
2.2.4	Option MA1, analog I/O extension		2 I/2 O	
2.3	Distributed via fieldbus			
2.3.1	Inline (IP20)			
2.3.1.1	SERCOS III	On board	○	●
3	HMI		MLD-S	MLD-M
3.1	IndraControl VCP, VCH (controller-based)		●	●
3.1.1	Ethernet TCP/IP		●	●
3.2	IndraControl VEP (embedded PC)		●	●
3.3	IndraControl VSP, VPP, VDP (Industrial PC)		●	●

- Default
 ○ Optional
 ▼ In preparation

4	Communication interfaces		MLD-S	MLD-M
4.1	SERCOS 2		○	○
4.2	SERCOS III-Master		○	●
4.3	SERCOS III-Slave		○	○
4.4	Master axis grouping			
4.4.1	SERCOS III (C2C)		○	○
4.5	Control grouping	Network variables through VDP	●	●
4.6	PROFIBUS DP-V1-Slave		○	○
4.7	DeviceNet-Slave		○	○
4.8	Ethernet TCP/IP	(e.g. HMI, Engineering)	○	○
4.9	PROFINET IO-Slave		▼	▼
4.10	EtherNet/IP-Adapter (Slave)		○	●
4.11	EtherCAT-Slave		▼	▼
5	Firmware functions		MLD-S	MLD-M
5.1	General information			
5.1.1	Runtime system	Integrated motion-logic systems	●	●
5.2	Logic control			
5.2.1	IndraLogic V1 kernel	Conforming with IEC 61131-3	●	●
5.2.2	Freely configurable tasks	Cyclic, free-running, event-controlled	4	4
		Synchronous with SERCOS cycle	●	●
5.2.3	External event tasks	Synchronous with master communication (FKM-synchronous task)	●	●
		System-specific (task acc. to position controller cycle)	●	●
5.2.4	Status/setting of cycle times	e.g. SERCOS cycle (1/2/4/8 ms)	●	●
5.2.5	Program organization	According to IEC 61131-3	●	●
		MC_MoveAbsolute	●	●
		MC_MoveRelative	●	●
5.2.6	Motion commands according to PLCopen (choice)	MC_TorqueControl	●	●
		MC_MoveVelocity	●	●
		MC_Home	●	●
		MC_CamIn, MC_CamOut	●	●
		MC_GearIn, MC_GearOut	●	●
		MB_ReadListParameter	●	●
		MB_WriteListParameter	●	●
5.2.7	Extended motion commands (choice)	MB_GearInPos	●	●
		MB_PhasingSlave	●	●
		MC_Reset	●	●

- Default
- Optional
- ▼ In preparation

5	Firmware-Funktionen		MLD-S	MLD-M
5.3	Motion-Control			
5.3.1	Anzahl Achsen	reale/virtuelle	1/1	8/1
5.3.2	Synchronisation (ELS – Electronic Line Shaft)	Multiachs	●	●
5.3.2.1	virtuelle Achsen	virtuelle Master	●	●
5.3.2.2	Geber-Achsen	reale Master	●	●
5.3.2.3	Verbundachsen	Querkommunikation	●	●
5.3.2.4	dynamische Synchronisation		●	●
5.3.2.5	Leitachverbund		●	●
5.3.2.6	Leitachskaskadierung		●	●
5.3.3	Positionierung	Einzelachs	●	●
5.3.4	elektronische Getriebe		●	●
5.3.5	elektronische Kurvenscheiben		●	●
5.3.5.1	Stützpunkttabellen (antriebsintern)	max. 1024 Stützpunkte	●	●
5.3.5.2	Electronic Motion Profile (antriebsintern)	2 Bewegungsprofile mit je 8 Schritten	●	●
5.3.6	Drehmomentregelung		●	●
5.3.7	Geschwindigkeitsregelung		●	●
5.3.8	Diagnosen	Status, Warnungen, Fehler		
5.3.8.1	Funktionsbausteine		●	●
5.3.8.2	Parameterzugriff Diagnosespeicher		●	●
5.3.8.3	lokal über Display		●	●
5.3.8.4	Achsüberwachung		●	●
5.3.8.5	Diagnosespeicher		●	●
5.4	Technologiefunktionen (Auswahl)	Druckmarkenregler	●	●
		fliegende Säge	●	●
		Messrad	●	●
		Messtaster	●	●
		Nockenschaltwerk	●	●
		Querschneider	●	●
		Schlaufenregler	●	●
		Wickler	●	●
		Zugspannungsregler	●	●

● Standard

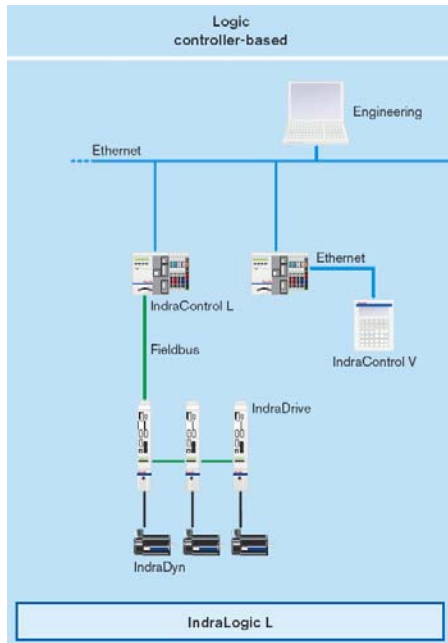
○ optional

▼ in Vorbereitung

2.3 IndraLogic - open PLC-system

The required in-/outputs as well as drives and visualisations can be connected to the PLC-controller via Profibus. Applications in carcass and assembly can be realised with IndraLogic. IndraLogic is offered in following stages of expansion:

IndraLogic – controller-based



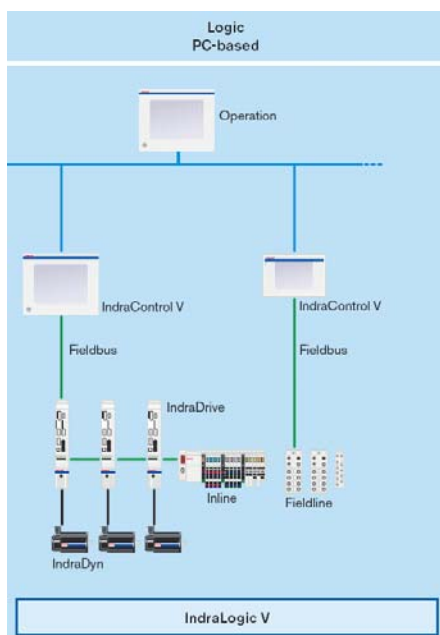
Components of a controller-based IndraLogic configuration:

- control hardware CML xx
- operation terminal: IndraControl V
- powered fieldbus-subscriber (e.g.: I/O modules)
- drives (if existing, connected via Profibus)

optional:

- machine control panel VAM xx

IndraLogic – PC-based



Components of a PC-based IndraLogic configuration:

- control panel: IndraControl V
- powered fieldbus-subscriber (e.g.: I/O modules)
- drives (if existing, connected via Profibus)

optional:

- machine control panel VAM xx / keyboard

2.4 CNC – automation solution IndraMotion MTX

IndraMotion MTX is the innovative complete solution for CNC-, motion control and PLC-functionality combined in one system. Through the software scaling, up to 64 digital drives (thereof up to max. 32 shafts) can be coordinated. Therefore 12 independent NC-channels are available and a Laser power control for applications like laser- structuring or laser edge-cutting.



The control family "IndraMotion MTX" is offered in different characteristics.

MTX performance

- control-hardware for CNC and PLC: CMP 60
- operation and display system: IndraControl V
- machine control panel VAM xx
- powered fieldbus-subscribers (e.g.: I/O-modules)
- drives via SERCOS 2

optional:

- keyboard VAK xx
- VxH xx handheld or Euchner handwheel



features:

- | | |
|---------------------------------|----------------------------|
| • max. number of channels: | 12 |
| • min. block-cyclic time: | 250 μ s |
| • min. Sercos 2 -cyclic time: | 250 μ s (bei 8 Achsen) |
| • max. operable axes: | 64 |
| • max. possible shafts: | 32 |
| • interpolate axes per channel: | 8 |

software package: universal deployable

MTX standard

The realisation MTX standard is based on the hardware components VSP xx and CMP 40

- control-hardware for CNC and PLC: CMP 40
- operation and display system: IndraControl V
- machine control panel VAM xx
- powered fieldbus-subscriber (e.g.: I/O-modules)
- drives via SERCOS 2

optional:

- keyboard VAK xx
- VxH xx handheld or Euchner handwheel

features:

- max. number of channels: 2
- min. block-cyclic time: 6 ms
- min. SERCOS 2 -cyclic time: 6 ms
- max. operable axes: 8
- max. possible shafts: 2
- interpolate axes per channel: 4

software package: universal deployable



MTX compact

The realisation MTX compact is based on the hardware component CML 40

- control-hardware for CNC and PLC: CML 40
- operation and display system: IndraControl V
- machine control panel VAM xx
- powered fieldbus-subscriber (e.g.: I/O-modules)
- drives via SERCOS 2
-

optional:

- keyboard VAK xx



features:

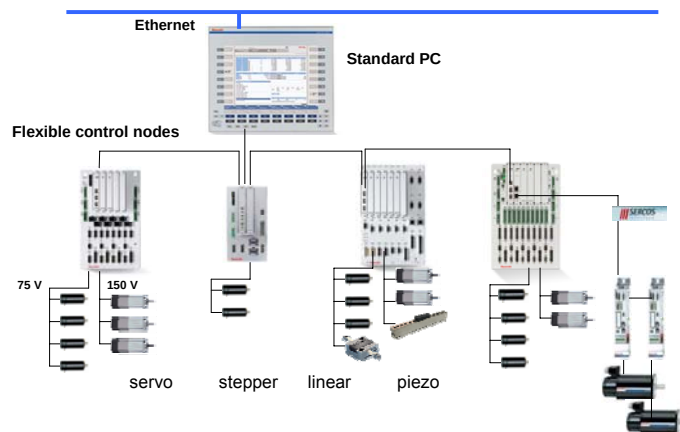
- max. number of channels: 2
- min. block cyclic time: 6 ms
- min. SERCOS 2 -cyclic time: 6 ms
- max. operable axes: 8
- max. possible shafts: 2
- interpolate axes per channel: 4

software package: universal deployable

2.5 NYCe 4000 - Motion control for precision-small-drives

The NYCe4000 motion control is especially suitable if a variety of different small drives with different transmitter types is required.

The compact controller is freely programmable and also meets the customer requirements for highest speed and maximum programming freedom.



Sample configuration of a NYCe4000 with different motor types

Function Overview:

- freely programmable in C und C++
- up to 10 drives,
- 100 digital and 20 analog I/Os in one controller
- up to 60 controls within one configuration possible
- easy startup of different drive and encoder types
- very suitable for high precision tasks
- feed-back position control clock: 32 kHz.
- variety of standard and customer specific housings

In- / Outputs: (max. per controller)

- fast digital inputs (typ. 2 μ s): 10
- standard digital inputs (typ. 100 μ s): 40
- fast digital outputs (50 mA, typ. 2 μ s): 10
- standard digital outputs (1 A, typ. 50 μ s): 20
- analog inputs (12 Bit): 10
- analog outputs (16 Bit): 10

motors/encoder:

Maximum of 10 per control, 256 per configuration built on max. of 60 controls. Range of performance reaches from 1 Watt up to 100 Watt (15 VDC – 150VDC), higher power with IndraDrive via SERCOS III interface.

motor types:

- DC Servo
- AC Servo
- EC Servo
- stepper
- linear motor
- plunger coil (voice-coil)
- piezo-motor

encoder types:

- incremental up to 40 MHz
- analog 10V
- SinCos
- EnDat 2.1
- EnDat 2.2
- Hiperface
- Panasonic
- Yaskawa

startup-tools:

- configuration-tool for system parameterisation
- tuning-tool for fine-tuning the position control
- scopetool to visualize the system data in real-time

simulation:

- complete simulation environment for Windows
- simulation without control hardware possible
- setting and reading of the I/Os

applications software: for the superior PC or the control

3.0 Control Technology

3.1. IndraControl V

With a clearly higher performance and more compact dimensions, Rexroth improves and expands his wide industry PC programm IndraControl V. The revised panel-PCs and box-PCs with the control units base exclusively on long-term available components and meet the requirements even in extreme difficult environment conditions.



PC-based handling and visualisation

The PC-based devices are offered in two versions: Once as reduced visualisation device VDP combined with a control cabinet industry PC (VxB). Alternatively a panel PC is offered. In this version, the PC is mounted on the display. The devices integrate in each case the complete CNC and PLC for your machine.



Via Ethernet network all devices can be linked in a horizontal and even vertical machine combination. Therefore all data can be easily exchanged between the controls and even to the superior control centre level.

The connection of local operation and display systems allow the design of complex production lines. An extern alpha-numeric keyboard is connectable for programming.

Industry PC

PC device VPB 40

The industry PCs VxB 40 is used together with the reduced operator system and is offered in 4 versions. In each case, the devices integrate the complete CNC and PLC for your machine. The data between VDP and VxB 40 can be transmitted over a range up to 80m.

Frontal view VPB 40:



Technical Data VPB 40

General:	
Operating System:	Windows XP
Processor:	CoreDuo L2400 1,66 GHz or Core2Duo T7400 2,1 GHz
Working memory:	1 GB up to 4 GB possible
Hard disk:	Hard Disk 80 GB SSD solid state Disk 8 up to 32 GB optional
Power supply:	24 VDC
Interfaces:	
serial and parallel:	not available
Ethernet connection:	2x GBit LAN
DVI-connection:	available
Connection VDP-display unit:	CDI
USB 2.0:	6x
Floppy disc drive:	DVD-ROM or DVD-Burner
Slot:	1 up to 4 slot PCI
Additional keyboard/mouse connection:	not available
Protection class:	IP20
Physical dimensions:	
Dimension:	
1slot	205 x 84 x 181 mm (W x H x D)
2slot	205 x 110 x 181 mm (W x H x D)
4slot	321 x 92 x 181 mm (W x H x D)

Operation and Visualisation System VPP 40

The PC-based operator terminals VPP 40 are matched for the use in automated series production, in which the continuity of communication and cost-saving standardisation stand in the foreground. It integrates the complete CNC and PLC for your machine.

Via Ethernet networks all devices can be linked in a horizontal and even vertical machine combination. Therefore all data can be easily exchanged between the controls and even to the superior control centre level.

Frontal view VPP 40:



Technical Data VPP 40

General:	
Operating System:	Windows XP
Processor:	CoreDuo L2400 1,66 GHz oder Core2Duo T7400 mit 2,1 GHz
Working memory:	1 GB bis 4 GB möglich
Hard drive:	Hard Disk 80 GB SSD solid state disk 8 bis 32 GB optional
Power Supply:	24 VDC
Interfaces:	
serial and parallel:	available
Ethernet connection:	2x GBit LAN
DVI-connection:	available
USB 2.0:	6x (on PC-Box)
Floppy disc drive:	DVD-Burner in PC-Box
Slots:	1 up to 4 slot PCI
Additional keyboard/mouse connection:	available
Display unit:	
large basic version	15"
VPP 40.1DG (touch-screen device)	17"
Resolution:	1024 x 768 Pixel
Colors:	65000
Type:	TFT color display
Automatic screen saver:	available

Machine- and operating keyboard divided into right/left keys, navigation keys:	available (optional touch-screen version)
16 operating - and function keys:	available (optional touch-screen version)
Protection class:	front panel IP65; housing IP20
Physical dimensions:	
Front panel (WxH):	407 mm x 370 mm
Installation depth 1 slot	109 mm
Installation depth 4 slot	117 mm
Dimension PC-Box:	
1 slot	205 x 84 x 181 mm (W x H x D)
4 slot	321 x 92 x 181 mm (W x H x D)

Operation and Visualisation Device VPP 16

The PC-based operator terminals VPP 16 are matched for the use in automated series production, in which the continuity of communication and cost-saving standardisation are in the foreground. It integrates the complete CNC and PLC for your machine.

Via Ethernet networks all devices can be linked in a horizontal and even vertical machine combination. Therefore all data can be easily exchanged between the controls and even to the superior control centre level.

The connection of local operation and display systems allow the design of complex production lines. An extern alpha-numeric keyboard is suitable for connection for programming.

Frontal view VPP 16:



Technical Data VPP 16

General:	
Operating System:	Windows XP
Processor:	CoreDuo L2400 1,66 GHz or Core2Duo T7400 2,1 GHz
Working memory:	1 GB up to 4 GB
Hard drive:	Hard Disk 80 GB SSD solid state disk 8 up to 32 GB optional
Power Supply:	24 VDC

Interfaces:	
serial and parallel:	available
Ethernet connection:	2x GBit LAN
DVI-connection:	available
USB 2.0:	6x (an PC-Box)
Floppy disc drive:	DVD-Burner in PC-Box
Slots:	1 up to 4 slot PCI
Additonal keyboard/mouse connection:	available
Display unit:	
Size:	12"
Resolution:	800 x 600 Pixel
Colors:	65000
Type:	TFT color display
Automatic screen saver:	available
Machine- and operating keyboard devided into right/left keys, navigation keys:	available (optional touch-screen version)
16 operating - and function keys:	available (optional touch-screen version)
Protection class:	Front panel IP65; housing IP20
Physical dimensions:	
Front panel (WxH):	350 mm x 290 mm
Installation depth 1 slot	109 mm
Installation depth 4 slot	117 mm
Dimension PC-Box:	
1slot	205 x 84 x 181 mm (W x H x D)
4slot	321 x 92 x 181 mm (W x H x D)

HMI Control Element

Operation and Visualisation Device VDP

The reduced visualisation device VDP is used together with the control cabinet industry PC VxB40. This combination is matched for the use in automated series production, in which the reduced front of the VPDs allows a small installation depth. The data between VDP and VxB 40 can be transmitted over a range up to 80m.

Furthermore the reduced version allows to connect four VDP operator panels on one VxB 40. So the application of Thin-Client-solutions is possible.

Following manufactured sizes and versions of the VPD are available:

Frontal view of VDP devices:



Technical Data VDP 40

General:	
Size:	15" (1024 x 768 Pixel) 17" (only touchversion with 1280x 1024 Pixel)
Colors:	65000
Type:	TFT color display
Automatic screen saver:	available
Machine- and operating keyboard devided into right/left keys, navigation keys:	available (optional as touch- and touch-key version available)
16 operating - and function keys:	available (optional as touch- and touch-key version available)
USB 2.0:	1x face, 4x back
Protection class:	front panel IP65
Power supply:	24 V DC
Physical dimensions:	
Front panel (WxHxD)	407 mm x 370 mm x 46 mm

Technical Data VDP 16

General:	
Size:	12" (800 x 600 Pixel)
Colors:	65000
Type:	TFT color display
Automatic screen saver:	available
Machine- and operating keyboard devided into right/left keys, navigation keys:	available (optional as touch-screen version available)
16 operating - and function keys:	available (optional as touch-screen version available)
USB 2.0	1x face, 4x back
Protection class:	front panel IP65
Power supply:	24 V DC
Physical dimensions:	
Front panel (WxHxD)	350 mm x 290 mm x 46 mm

Technical Data VDP 08

General:	
Size:	8,4" (800 x 600 Pixel)
Colors:	65000
Type:	TFT color display
Automatic screen saver:	available
Machine- and operating keyboard divided into right/left keys, navigation keys:	not available, only touch-screen version available
16 operating - and function keys:	not available, only touch-screen version available
USB 2.0	1x face, 4x back
Protection class:	front panel IP65
Power supply:	24 VDC
Physical dimensions:	
Front panel (WxHxD)	300 mm x 200 mm x 46 mm

Operation Terminal VDP40.3 CG

The operation terminal VDP40.3 CG from Rexroth is designed as complete device and is provided as touch version with 5 keys. It is used in combination with the control cabinet industry PC VxB 40 and has besides his VESA-mounting a closed housing. Therefore the CG-devices can be installed on stations easily. The data between VDP and VxB 40 can be transmitted over a range up to 80m.



Features:

- VDP40.3 CG
- 15" TFT-display (1024*768)
- Touchscreen
- 3 keys + emergency-off

Connectors:

- 1 x USB on the face
- 4 x USB in box
- 24 VDC power supply
- CDI-Interface for IndraControl VxB

Operation Terminal VEP 50 Embedded

The embedded operation device VEP 50 is designed as economic HMI terminal. The operating system WinXP Embedded allows a flexible application as platform of a Soft-PLC as well as pure HMI terminal, e.g. in combination with the compact CML. The connectability of the terminals via Ethernet and/or field bus module allows the construction of complex systems.

The project development of the terminals is realized with IndraWorks on a notebook and respectively industry PC. A Runtime-version is generated there, which can be easily transmitted to the VEP and started via Ethernet connection. Inputs can be done via touch, a virtual or external keyboard.

Frontal view VEP 50



Technical Data VEP 50

General:	
Operating System:	Windows XP Embedded
Processor:	Ultra Low Volt Celeron 1 GHz
Working memory:	512 MB RAM, 1 GB Compact Flash Card
Power supply:	24 VDC
Interfaces:	
Fieldbus:	available, optional
Ethernet connections:	2x 10/100 Base-T Fast Ethernet
USB 2.0:	2x
Sercos III:	available
Display unit:	
Size:	15" touch-screen
Resolution:	1024 x 768 Pixel XVGA
Colors:	65000
Type:	TFT color display
Protection class:	front panel IP65; housing IP20
Physical dimensions:	
(WxHxD)	407 x 370 x 70 mm

Operation Terminal VEP 40 Embedded

The embedded operation device VEP 40 is designed as economic HMI terminal. The operating system WinXP Embedded allows a flexible application as platform of a Soft-PLC as well as pure HMI terminal, e.g. in combination with the compact CML. The connectability of the terminals via Ethernet and/or field bus module allows the construction of complex systems.

The project development of the terminals is realised with IndraWorks on a notebook and respectively industry PC. A Runtime-version is generated there, which can be easily transmitted to the VEP and started via Ethernet connection. Inputs can be done via touch, a virtual or external keyboard.

Additionally the VEP 40 is now offered in the version 40.4 as key-touch version.

Frontal view VEP 40



Technical Data VEP 40

General:	
Operating System:	Windows XP Embedded
Processor:	Ultra Low Volt Celeron 1 GHz
Working memory:	512 MB RAM, 1 GB Compact Flash Card
Power supply:	24 VDC
Interfaces:	
Fieldbus:	available, optional
Ethernet connection:	2x 10/100 Base-T Fast Ethernet
USB 2.0:	2x
Sercos III:	available

Display unit:	
Size:	12"
Resolution:	800 x 600 Pixel; SVGA
Colors:	65000
Type:	TFT color display
Machine- and operating keyboard devided into right/left keys, navigation keys:	available (optional as touch- and touch-key version available)
16 operating - and function keys:	available (optional as touch- and touch-key version available)
Protection class:	front panel IP65; housing IP20
Physical dimensions:	
(WxHxD)	350 x 300 x 70 mm

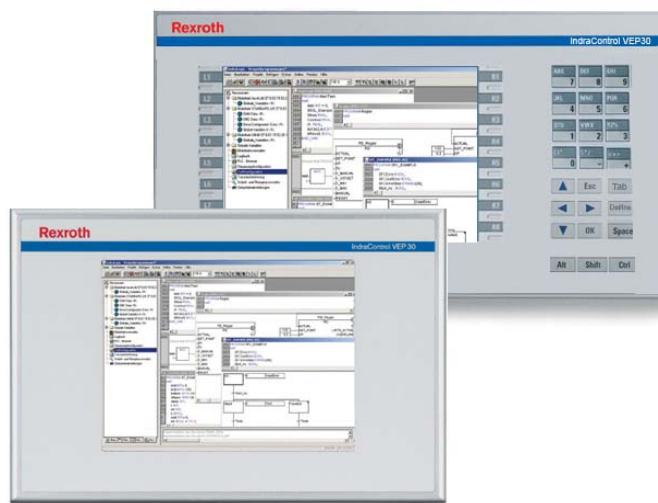
Operation Terminal VEP 30 Embedded

The embedded operation device VEP 30 is designed as economic HMI terminal. The operating system WinXP Embedded allows a flexible application as platform of a Soft-PLC as well as pure HMI terminal, e.g. in combination with the compact CML. The connectability of the terminals via Ethernet and/or field bus module allows the construction of complex systems.

The project development of the terminals is realized with IndraWorks on a notebook and respectively industry PC. A Runtime-version is generated there, which can be easily transmitted to the VEP and started via Ethernet connection. Inputs can be done via touch, a virtual or extern keyboard.

Additionally the VEP 30 is now offered in the version 30.4 as key-touch version with a 350mm front panel (matched for combination with VAM 1x operation device).

Frontal view VEP 30



Technical Data VEP 30

General:	
Operating System:	Windows XP Embedded
Processor:	Ultra Low Volt Celeron 1 GHz
Working memory:	512 MB RAM, 1 GB Compact Flash Card
Power supply:	24 VDC
Interfaces:	
Fieldbus:	available, optional
Ethernet connection:	2x 10/100 Base-T Fast Ethernet
USB 2.0:	2x
Sercos III:	available
Anzeigeeinheit:	
Size:	8,4"
Resolution:	800 x 600 Pixel; SVGA
Colors:	65.000
Type:	TFT color display
Machine- and operating keyboard devided into right/left keys, navigation keys:	available (optional as touch and touch-key version available)
16 operating - and function keys:	available (optional as touch and touch-key version available)
Protection class:	front panel IP65; housing IP20 or IP40
Physical dimensions:	
	VEP 30.3 Touch (WxHxD) 300 x 200 x 70 mm
	VEP 30 CG (WxHxD) 306 x 242 x 93 mm version as unit in IP40-housing; mounting: via stud bolt for suspension over a gibbet or as table device possible. optional with VAS 2.1 module (2 keys and emergency-stop-casing)

Operation Terminal VCP

The touch-terminal VCP 11 can be optionally linked via Fieldbus or Ethernet and is used as display for diagnoses and operating states.

The operation terminals can be used as adequate ANSI-terminals. Every touch produces a pressure- and release-code which can be transmitted over the interface. The triggering of the display is effected by ESC-sequences.

The easy projection of the terminals is implemented by the software VI-Composer via notebook or industry PC and the serial interface.

Frontal view VCP 11



Technical Data VCP 11

General:	
Operating System:	Windows CE.NET 5.0
Processor:	200 MHz, RISC ARM9
Working memory:	3 MB application-memory, 16 MB Flash, 32 MB SDRAM
Current input:	Max. 200 mA
Power supply:	24 VDC
Interfaces:	
Fieldbus:	Profibus DP or DeviceNet
Ethernet connection:	1x 10/100 Base-T Fast Ethernet
USB 2.0:	2x
Serial:	RS232, RS485
Display unit:	
Size:	
version 1	3,8" FSTN-module, 5 levels of grey
version 2	3,5" TFT graphics display with 256 colors
Resolution:	320 x 240 Pixel
Protection class:	front panel IP65; housing IP20
Physical dimensions:	
(WxHxD)	96 x 130 x 45 mm

Frontal view VCP 35


 Technical Data VCP 35

General:	
Operating System:	Windows CE.NET 5.0
Processor:	200 MHz, RISC ARM9
Working memory:	3 MB application memory, 16 MB Flash, 32 MB SDRAM
Current input:	Max. 350 mA
Power supply:	24 VDC
Interfaces:	
Fieldbus:	Profibus DP or DeviceNet
Ethernet connection:	1x 10/100 Base-T Fast Ethernet
USB 2.0:	2x
Serial:	RS232, RS485
Display unit:	
Size:	10,4" Touch
Resolution:	640 x 480 Pixel
Colors:	65.000
Type:	TFT color display
Protection class:	front panel IP65; housing IP20
Physical dimensions:	
(WxHxD)	328 x 249 x 60 mm

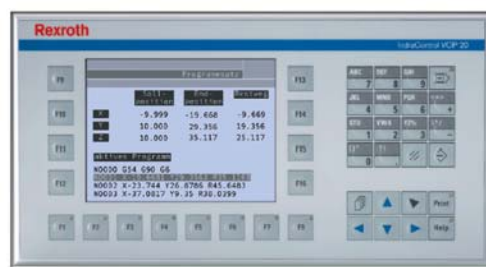
Frontal view VCP 25



Technical Data VCP 25

General:	
Operating System:	Windows CE.NET 5.0
Processor:	200 MHz, RISC ARM9
Working memory:	3 MB application memory, 16 MB Flash, 32 MB SDRAM
Current input:	Max. 350 mA
Power supply:	24 VDC
Interfaces:	
Fieldbus:	Profibus DP or DeviceNet
Ethernet connection:	1x 10/100 Base-T Fast Ethernet
USB 2.0:	2x
Serial:	RS232, RS485
Display unit:	
Size:	5,7" Touch
Resolution:	320 x 240 Pixel
Colors:	65.000
Type:	STN color display display options: extended ASCII character set, rows: (font normal): 20 signs/row (font normal): 40 visible area 86 x 115 mm
Protection class:	front panel IP65; housing IP20
Physical dimensions:	
(WxHxD)	203 x 147 x 66 mm

Frontal view VCP 20



Technical Data VCP 20

General:	
Operating System:	Windows CE.NET 5.0
Processor:	200 MHz, RISC ARM9
Working memory:	3 MB application memory, 16 MB Flash, 32 MB SDRAM
Current input:	max. 200 mA
Power supply:	24 VDC

Interfaces:	
Fieldbus:	Profibus DP oder DeviceNet
Ethernet connection:	1x 10/100 Base-T Fast Ethernet
USB 2.0:	2x
Serial:	RS232, RS485
Display Unit:	
Size:	5,7"
Resolution:	320 x 240 Pixel
Colors:	5 levels of grey
Type:	FSTN-module temperature compensated visible area 57 x 77 mm
Keyboard:	16 function-, 24 system-keys
Protection class:	front panel IP65; housing IP20
Physical dimensions:	
(WxHxD)	300 x 160 x 55 mm

Frontal view VCP 08



Technical Data VCP 08

General:	
Operating System:	Windows CE.NET 5.0
Processor:	200 MHz, RISC ARM9
Working memory:	3 MB application memory, 16 MB Flash, 32 MB SDRAM
Current input:	Max. 200 mA
Power supply:	24 VDC
Interfaces:	
Fieldbus:	Profibus DP or DeviceNet
Ethernet connection:	1x 10/100 Base-T Fast Ethernet
USB 2.0:	2x
Serial:	RS232, RS485

Display unit:	
Size:	3,8"
Resolution:	320 x 240 Pixel
Colors:	5 levels of grey
Type:	FSTN-module temperature compensated visible area 57 x 77 mm
Keyboard:	15 function-, 24 system-keys
Protection class:	front panel IP65; housing IP20
Physical dimensions:	
(WxHxD)	205 x 155 x 55 mm

Frontal view VCP 05



Technical Data VCP 05

General:	
Operating System:	Windows CE.NET 5.0
Processor:	200 MHz, RISC ARM9
Working memory:	3 MB application memory, 16 MB Flash, 32 MB SDRAM
Current input:	Max. 200 mA
Power supply:	24 VDC
Interfaces:	
Fieldbus:	Profibus DP or DeviceNet
Ethernet connection:	1x 10/100 Base-T Fast Ethernet
USB 2.0:	2x
Serial:	RS232, RS485
Display unit:	
Size:	3"
Resolution:	160 x 80 Pixel
Colors:	5 levels of grey
Type:	FSTN-module temperature compensated visible area 33 x 67 mm
Keyboard:	6 function-, 24 system-keys
Protection class:	front panel IP65; housing IP20
Physical dimensions:	
(WxHxD)	168 x 120 x 55 mm

Frontal view VCP 02



Technical Data VCP 02

General:	
Operating System:	Windows CE.NET 5.0
Processor:	200 MHz, RISC ARM9
Working memory:	3 MB application memory, 16 MB Flash, 32 MB SDRAM
Current input:	Max. 200 mA
Power supply:	24 VDC
Interfaces:	
Fieldbus:	Profibus DP or DeviceNet
Ethernet connection:	1x 10/100 Base-T Fast Ethernet
USB 2.0:	2x
Serial:	RS232, RS485
Display unit:	
Size:	3"
Resolution:	160 x 80 Pixel
Colors:	5 levels of grey
Type:	FSTN-module temperature compensated visible area 33 x 67 mm
Keyboard:	4 function-, 7 system-keys
Protection class:	front panel IP65; housing IP20
Physical dimensions:	
(WxHxD)	96 x 144 x 59 mm

Manual Control Unit VEH 30

The manual control unit VEH 30 from Rexroth can be connected to the control with a VAM xx or a VAC 30. It allows the operation of machines in unclear areas such as loading gates. It can also be used as station handling in low-cost applications together with the L 40.

The web-enabled manual control unit sets new standards in the communication and visualisation.

Operating and observing via Ethernet as well as its ergonomic design with touch-screen characterise this handheld. An electronic hand wheel and override-switch are optionally available.

Frontal view VEH 30



Technical Data VEH 30

General:	
Operating System:	Windows CE
Processor:	300 MHz, NS-Geode
Working memory:	128 MB RAM
Power supply:	24 VDC
Interfaces:	
Ethernet connection:	10/100 Base-T Fast Ethernet
Display unit:	
Size:	8,4" TFT grafic display SVGA
Resolution:	800 x 600 Pixel, MTBF-backlight
Colors:	32.000
Stop-key:	2-circled
Accept-keys:	2 x, 2-circled, 3-leveled
Foil keys:	30 keys for navigation, teach-in, enter, confirm
Protection class :	IP65
Physical dimensions:	
(WxHxD)	240 x 250 x 80 mm
Mass:	circa 1.6 kg

Manual Control Unit VCH 08

The manual control unit VEH 30 from Rexroth can be connected to the control with the VAC 30. It allows the operation of machines in unclear areas such as loading gates. In assembling applications, it is used in low-cost applications as station handling together with the CML xx.

The web-enabled manual control unit sets new standards in the communication and visualisation. Operating and observing via Ethernet as well as its ergonomic design with touch-screen characterise this handheld. An electronic hand wheel and override-switch are optionally available.

Frontal view VCH 08



Technical Data VCH 08

General:	
Operating System:	Windows CE
Processor:	400 MHz, PXA270
Working memory:	64 MB application memory (Flash)
Current input:	Max. 200 mA
Power supply:	24 VDC
Interfaces:	
Ethernet connection:	1x 10/100 Base-T Fast Ethernet
Display unit:	
Size:	3,8" FSTN-module, 5 levels of grey
Resolution:	320 x 240 Pixel
Stop-key:	2-circled
Accept-key:	2 x, 2-circled, 3-leveled
Foil key:	12 (+9) function-, 19 system-keys
Protection class:	IP65
Physical dimensions:	
(WxHxD)	252 x 240 x 55 (+37) mm
Mass:	circa 1,2 kg

3.2. IndraControl L

Automate easily and continuous with the controller-based control-platform from Rexroth for all central and distributed architectures. This technical and economic optimised control concept offers a multitude of benefits, both for machine manufacturers and end users.

The control hardware of the CML-series is, for example the basic model with Profibus as possible base of the stand-alone PLC“ IndraLogic usable.



Function Modules

With the function modules (fieldbus interfaces and technology modules), the IndraControl L can be optimally integrated in heterogeneous control landscapes and functionally to your requirements. The modules communicate over the fast system bus with the control processor, thereby the high requirements relating to speed and functionality are met.

available modules:

- PROFIBUS DP-Master
- SERCOS III
- DeviceNet-Master
- cross communication
- routing axis sensor
- fast I/O
- cam-controller
- SRAM-module



With the additional SRAM-technology-module „CFL01.1-Y1“, the Sercos-version of the CML builds the hardware base of the IndraMotion **MTX compact** and **MLC RobotControl**.



CML 65

The IndraControl L65 is an extremely compact, modular and scaleable control. The high-performance processor allows the use in Motion- and Logic- Control applications with very high requirements. It combines the advantages of an embedded-PC-Architecture with a standardised I/O-system on clip-technology. Additional modules expand the Rexroth IndraControl L65 with more function modules like additional fieldbus-interfaces.

An expansion of the local I/Os is possible with the inline I/O-system through easy adding of the components. The complete application programmes including Runtime are stored on an easy accessible standardised Compact-Flash-Medium.



Technical Data CML 65

General data:	
CPU:	x86 kompatibel / 1000 MHz
Working memory:	512 MB
Remanent storage:	256 KB (RDS)
Removable storage:	CF-Card / min. 128 MB, max. 1 GB (depends on firmware version)
Real-time clock:	integrated

Display:	1 row, 4 control keys
Protection class:	IP 20
Physical dimension : (W x B x D)	120 x 175 x 97,5 mm
Interfaces:	
to function-modules:	ja
to I/O-modules:	Inline-interface
Communication interfaces:	1 x Ethernet TCP/IP (RJ45, 10/100 Base-T)
	1 x single-pole Ready-Kontakt
Optional:	1 x SERCOS III - Interface (2 x RJ45)
	1 x PROFINET IO Master (2 x RJ45)
	1 x PROFIBUS DP-Master/Slave-Interface
	1 x EtherNet/IP Master (2 x RJ45)
	1 x DeviceNet Master
In-/Outputs:	8 galvanically isolated Inputs (interrupt-able), 8 galvanically isolated Outputs
I/O-expansions:	up to 63 Inline I/O-modules with up to 512 I/O (64 Byte)
Function-modules:	up to 4

CML 40

The CML 40 is a compact controller-based platform for central and distributed PLC- and Motion-applications. It is available in different versions and vary in the types of technology-modules. The handling and programming takes place via Ethernet connected operation and visualisation devices.

The CML 40 joins the Rexroth Inline Construction Kit and is therefore outstanding economic and easy in installation and handling. Additionally 8 interrupt-able in/outputs are already available in the basic version. The CML 40 can be expanded with up to 63 Inline-modules (512 I/Os).



Technical Data CML 40

General:	
Processor:	Intel Low Voltage Celeron 500 MHz
Working memory:	min. 64 MByte DRAM and min. 128 KByte NvRAM
Current input:	max. 2,6 A
Protection class:	IP20
Power supply:	24 VDC

Interfaces:	
Ethernet connection:	1x 10/100 Base-T Fast Ethernet
Fieldbus:	Profibus DP
Serial:	RS232
I/Os:	8 local I/Os for direct, fast access
Display unit:	
Type:	LCD-display with 8 signs
Physical dimension:	
(WxBxD)	175 mm x 120 mm x 76 mm

CML 20

The CML 20 is a compact and controller-based platform of the **IndraLogic L20** PLC-control for distributed machine concepts. It is a light-performance version of the L40 and is not configurable with technology-modules. The handling takes place via Ethernet connected operation and visualisation devices.

The CML 20 joins the Rexroth Inline Construction Kit and is therefore outstanding economic and simple in installation and handling. Additionally 8 interrupt-able in/outputs are already available in the basic version. The CML 20 can be expanded with up to 63 Inline-modules (256 I/Os).

Together with the IndraLogic-software the CML 20 is usable as stand-alone-PLC "IndraLogic L20"



Technical Data CML 20

General:	
Processor:	ST Microelectronics ST40 with min.192 MHz
Working memory:	min. 16 MByte DRAM and min. 64 KByte NvRAM
Current input:	max. 1,5 A
Protection class:	IP20
Power supply:	24 VDC

Interfaces:	
Ethernet connection:	1x 10/100 Base-T Fast Ethernet
Fieldbus:	Profibus DP
Serial:	RS232
I/Os:	8 local I/Os for direct fast access
Display unit:	
Type:	LCD-display with 8 signs
Physical dimension:	
(WxBxD)	175 mm x 120 mm x 76 mm

CML 10

The CML 10 is a controller-based platform for the PLC-control system **IndraLogic**. There it is used as a component for distributed machine concepts. It rounds down the performance range of the CML-series and is not configurable with technology-modules. The handling takes place via Ethernet connected operation and visualisation devices.

The CML 10 joins the Rexroth Inline Construction Kit and is therefore outstanding economic and easy in installation and handling. Additionally 8 interrupt-able in/outputs are already available in the basic version. The CML 10 can be expanded with up to 63 Inline-modules (256 I/Os).

Together with the IndraLogic-software the CML 10 is usable as stand-alone-PLC "IndraLogic L10"



Technical Data CML 10

General:	
Processor:	STMicroelectronics ST40 with min. 192 MHz
Working memory:	32 MB SRAM +Flash
Current input:	max. 1,25 A
Protection class:	IP20
Power supply:	24 VDC
Interfaces:	
Ethernet connection:	1x 10/100 Base-T Fast Ethernet, RJ45 connector
I/Os:	8 local I/Os for direct fast access
Physical dimension:	
(WxBxD):	121 mm x 123 mm x 71 mm

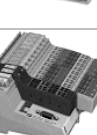
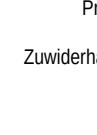
I/O - Periphery

active IP-20 module Rexroth Inline

The I/O-modules of the Rexroth Inline-series are completed in special compact housing-formats. The modular system allows an optimal adaption to the particular control tasks. The communications with the PLC takes place via Fieldbus.

The order of the in- and output-modules or rather the function-modules do not play a role. The connection of the switching voltage takes place over feeding-terminals or segment-terminals with integrated fuse. All power supplies and reference potentials are automatically looped through over the sideways attached contacts to the next modules.

Components:

Picture:	Module-ID:	Description:
	R-IL PB BK DP/V1	Profibus-DP fieldbus coupler
	R-IB IL SCN-PWR IN-CP	plug for feeding- and segment-terminal
	R-IL PB BK DI8 DO4-PAC	Profibus-DP fieldbus coupler with local I/Os
	R-IL S3 BK DI8 DO4-PAC	fieldbus coupler for SERCOS 2, Interbus-S and DeviceNet also available, Sercos III bus coupler in preparation
	R-IB IL 24 PWR IN	feeding terminal without fuse
	R-IB IL 24 SEG/F-PAC	segment-terminal with elec. fuse; incl. plug for feeding- and segment-terminal
	R-IB IL 24 DI 8-PAC	digital-input-terminal, 8 inputs
	R-IB IL 24 DO 2-2A-PAC	digital-output-terminal, 2 outputs, 2A
	R-IB IL 24 DO 8-PAC	digital-output-terminal, 8 outputs; 0,5A; incl. printed plug for digital terminals
	R-IB IL AI 2/SF-PAC	analog-input-terminal, 2 inputs
	R-IB IL AI 8/SF-PAC	analog-input-terminal, 8 inputs
	R-IB IL AO 1/SF-PAC	analog-output-terminal, 1 output
	R-IB IL AO 2 AF-PAC	analog-output-terminal, 2 outputs
	R-IB IL TEMP 2 RTD-PAC	temperature-input-terminal, 2 inputs;
	R-IB IL TEMP 4/8 RTD-PAC	temperature-measure-terminal, 8 inputs incl. shield terminal for analog terminals
	R-ILB PB 24 DI16/DO16	digital in- /output-terminal, 16 in- 16 outputs, 500mA, 3-conductor-connector Profibus incl. plug
	R-IB IL 24 DO 32/HD-PAC	digital in- output-terminal, 32 outputs
	R-IB IL RS485/422-PRO-PAC	RS-485/422 function-unit for serial data
	R-IB IL RS232-PRO-PAC	transmitter, 1 serial in-/output-channel with RS-232, for process-data communication
	R-IB IL INC-IN-PAC	incremental-encoder-input-module
	R-IB IL DDL	DDL Master for Rexroth Pneumatics
	R-IB IL 24 FLM-PAC	branch terminal to fieldline M8-coupling

IP67 module Rexroth Fieldline

The new Rexroth Fieldline I/O-modules are offered in the versions “stand-alone” and “modular”. All connectors (bus and I/O) are realised in M12. This makes the handling at the startup easier, compared to other I/O-modules, because assembled standard M12 wires can be used. Furthermore T-pieces and Y-pieces are not necessary anymore. This reduces wiring costs for the field bus connection.

The modular technology furthermore allows the setup of I/O-clusters with up to 16 module-subscribers at one fieldbus-connector.



more **benefits** are the integrated monitoring functions like:

- undervoltage sensor supply
- overcurrent sensor supply
- short-circuit/overload
- monitoring of the module supply

Rexroth Fieldline I/Os are available for the field busses: Interbus, Profibus and DeviceNet.

Stand-alone components:

Picture:	Module-ID:	Description:
	Interbus	
	RF-FLS IB M12 DI 16 M12	16 distributed digital inputs
	RF-FLS IB M12 DI 8 M12	8 distributed digital inputs
	RF-FLS IB M12 DO 8 M12-2A	8 distributed digital outputs
	RF-FLS IB M12 DIO 4/4 M12-2A	4 inputs and 4 outputs
	assembled cable:	
	IKB0045/010,0 (here: cable length 10 m)	bus connection, start
	IKB0047/0xx,x (cable length 0,5; 2; 5 ;10m)	bus connection, bridge
	IKB0046/010,0 (here: cable length 10 m)	bus connection, end
	Profibus	
	RF-FLS PB M12 DI 8 M12	8 distributed digital inputs
	RF-FLS PB M12 DI 16 M12	16 distributed digital inputs
	RF-FLS PB M12 DO 8 M12-2A	8 distributed digital outputs
	RF-FLS PB M12 DIO 4/4 M12-2A	4 inputs and 4 outputs
	RF-FLS PB M12 DIO 8/8 M12	8 inputs and 8 outputs
	assembled cable	
	IKB0048/010,0 (here: cable length 10 m)	bus connection, start
	IKB0050/0xx,x (cable length 0,5; 2; 5; 10)	bus connection, bridge
	IKB0049/010,0 (here: cable length 10 m)	bus connection, end
	DeviceNet	
	RF-FLS DN M12 DI 8 M12	8 distributed digital inputs
	RF-FLS DN M12 DO 8 M12-2A	8 distributed digital outputs
	RF-FLS DN M12 DIO 4/4 M12-2A	4 inputs and 4 outputs
	assembled cable	
	IKB0042/010,0 (here: cable length 10 m)	bus connection, start
	IKB0044/0xx,x (cable length 0,5; 2; 5; 10m)	bus connection, bridge
	IKB0043/010,0 (here: cable length 10 m)	bus connection, end
General:	power supply	
	IKL0267/0xx,0 (cable length 5; 10; 15m)	supply, start
	IKL0268/0xx,x (cable length 0,5; 2; 5; 10m)	supply, bridge
	terminal resistor	directly available for order
	power rating of the modules:	UL max. 4A, US max. 4A

Components Modular:

Picture:	Module-ID:	Description:
	Profibus	
	RF-FLM PB M12 DI 8 M12	8 distributed digital inputs M12
	RF-FLM PB M12 DI 8 M8	8 distributed digital inputs M8
	RF-FLM PB M12 DIO 8/4 M8	8 inputs and 4 outputs M8
	RF-FLM ADAP M12/M8	adaptor for M12/M8
	assembled cable	
	NEW! Speed-con technology	on request
	IKB0045/010,0 (here: cable length 10 m)	bus connection, start
	IKB0047/0xx,x (cable length 0,5; 2; 5; 10m)	bus connection, bridge
	IKB0046/010,0 (here: cable length 10 m)	bus connection, end

4.0 Drive Technology

With the drive systems from Bosch Rexroth, we open a new era in the assembly automation. Outstanding performance data, sector-specific functions and appliance optimised scalability are the outstanding characteristics of the innovative drive solutions.



4.1. General Features

Extensive Functions

The drive technology offers a large number of functions like positioning set operation, angle- and speed-synchronisation, cam disc-, cam-switch-function or a integrated routing axis generator.

Different motor-encoder systems allow absolute or relative position acquisition. If necessary, all conventional encoder-types can be used as separate position-encoder through a second encoder input.

Comfortable and time-saving startup

The graphical startup-tool IW-Drives guides you at the control terminal or PC faster and unerring through all set-up steps of the startup. Though, every current drive-intern state variable is displayed. Further manuals support you in every action.

4.2. Servo drive with IndraDyn S

Synchronous Motor MSK

MSK motors are suitable for all application areas in the assembly and production automation up to 448Nm, in which highest demands on position accuracy, machining quality and machining rate are made. Standard implemented protection class IP65 and with a single-turn-encoder for relative position acquisition.

If desired all motors will be supplied with a multi-turn-absolute-value encoder, holding brake or feather key groove.



Motor		Maximum speed ¹⁾	Cont. torque at standstill	Maximum torque	Cont. current at standstill	Maximum current	Moment of inertia	Dimensions								Mass ²⁾		
		n _{max} [rpm]	M ₀ [Nm]	M _{Max} [Nm]	I ₀ [A]	I _{Max} [A]	J _R [kgm²]	A [mm]	B [mm]	C [mm]	Ø D [mm]	Ø E [mm]	Ø F [mm]	Ø G [mm]	H [mm]	m [kg]		
MSK030	B-0900	9,000	0.4	1.8	1.5	6.8	0.000013	54	152.5	20	9	40	63	4.5	98.5	1.3/1.6		
	C-0900	9,000	0.8	4	1.5	6.8	0.00003		188							1.9/2.1		
MSK040	B-0450	6,000	1.7	5.1	1.5	6	0.0001	82	155.5	30	14	50	95	6.6	124.5	2.8/3.1		
	B-0600	7,500			2	8			3.6/3.9									
	C-0450	6,000	2.7	8.1	2.4	9.6	0.00014									185.5		
	C-0600	7,500	3.1	12.4														
MSK050	B-0300	4,300	3	9	1.8	7.2	0.00028	98	173	40	19	115	9	134.5	4/4.9			
	B-0450	6,000			2.8	11.2			5.4/6.3									
	B-0600	6,000			3.7	14.8												
	C-0300	4,700	5	15	3.1	12.4	0.00033								203			
	C-0450	6,000			4.7	18.8												
	C-0600	6,000			6.2	24.8												
MSK060	B-0300	4,800	5	15	3	12	0.00048	116	181	50	24	95	130	9	156	5.7/6.4		
	B-0600	6,000			6.1	24.4			0.0008							226	8.4/9.2	
	C-0300	4,900	8	24	4.8	19.2	223									40	19	5.7/6.4
	C-0600	6,000			9.5	38												
MSK061	B-0300	4,200	3.5	14	1.9	8.6	0.00044		264	40	19				130	11	202	23.5/25.1
	C-0200	3,100	8	32	3.2	14.4	0.000752											
	C-0300	4,200			4.3	19.4												
	C-0600	6,000			7.7	34.7												
MSK070	C-0150	2,500	13	33	4.1	16.4	0.00291	140	238	58	32	130	165	11	202	11.7/13.2		
	C-0300	5,500			8.2	32.8			14/15.6									
	C-0450	6,000			12.3	36.9												
	D-0150	2,700	17.5	52.5	6.2	24.8	0.00375									268		
	D-0300	4,900			11	33												
	D-0450	6,000			16.6	49.8												
	E-0150	2,200	23	70	6.4	25.6	0.00458		298							16.2/17.8		
	E-0300	5,300		65	15.4	49.3												
	E-0450	6,000		60	19.3	57.9												
MSK071	C-0200	3,500	12	44	5.2	23.4	0.00173	140	272	58	32	130	165	11	202	13.9/15.8		
	C-0300	5,000			7.3	32.9												
	C-0450	5,800			8.9	40.1												
	D-0200	3,200	17.5	66	7.3	32.8	0.00255		312							18/19.6		
	D-0300	3,800			9.1	40.5												
	D-0450	6,000			15.4	69.3												
	E-0200	3,400	23	84	10.1	45.5	0.0029		352							23.5/25.1		
	E-0300	4,200			12.5	56.3												
E-0450	6,000	20			90.1													
MSK075	C-0200	4,000	12	44	5.9	26.4	0.00352	140	272	58	32	130	165	11	202	14.8/16.4		
	C-0300	5,000			8.4	37.8												
	C-0450	6,000			12.6	56.7												
	D-0200	3,800	17	64	8.3	37.4	0.0049		312							19/20.1		
	D-0300	3,800		66	11.7	52.7												
	D-0450	6,000		64	16.5	74.3												

Motor		Maximum speed ¹⁾	Cont. torque at standstill	Maximum torque	Cont. current at standstill	Maximum current	Moment of inertia	Dimensions								Mass ²⁾		
		n _{Max} [rpm]		M ₀ [Nm]		M _{Max} [Nm]		I ₀ [A]	I _{Max} [A]	J _R [kgm²]	A [mm]	B [mm]	C [mm]	Ø D [mm]	Ø E [mm]	Ø F [mm]	Ø G [mm]	H [mm]
MSK075	E-0200	3,850	21	88	10.2	45.9	0.00613	140	352	58	32	130	165	11	202	22.5/23.6		
	E-0300	5,200			14.2	63.9												
	E-0450	6,000			18.6	86												
MSK076	C-0300	4,700	12	43.5	7.2	32.4	0.0043	292.5	50	24	110	165	180	13.8/14.9				
	C-0450	5,000			12.2	54.9												
MSK100	A-0200	4,400	15	54	9.2	41.4	0.011	192	302	60	32	130	215	14	211.5	23/25.4		
	A-0300	5,200			10.2	45.9												
	A-0450	6,000			12	54												
	B-0200	4,100	28	102	14.7	66.2	0.0192		368							434	502	45.1/48.9
	B-0300	4,500			17.4	78.3												
	B-0400	4,500			23.7	106.7												
	B-0450	4,500	38	148	28.5	110.7	0.0273		502							56/59.8		
	C-0200	3,500			17.7	79.7												
	C-0300	4,500			21.9	98.6												
	C-0450	4,000	48	187	35.4	159.3	0.035		502							56/59.8		
	D-0200	2,000			13	58.5												
	D-0300	3,000			20.7	93.2												
	D-0350	3,000	29.9	135														
MSK101	C-0200	3,300	32	110	14.9	67.1	0.0065	192	350	80	38	180	262	28.3/32.1				
	C-0300	4,500			18.7	84.2												
	C-0450	5,800			25.1	113												
	D-0200	3,400	50	160	22.2	99.9	0.00932		410					40/43.8				
	D-0300	4,600			30.6	137.7												
	D-0450	6,000			41.7	187.7												
	E-0200	3,500	70	231	32.1	144.5	0.0138		501					53.5/57.3				
	E-0300	4,600			41.6	187.4												
E-0450	6,000	58.3			262.4													
MSK103	A-0300	5,200	21	54	12.5	40	0.00442	260	186	110	48	250	300	18	337	18/21.5		
	B-0300	4,700	28	85	17	63	0.00594		211							22.5/26		
	D-0300	4,600	46	138	26.3	94.7	0.00894		265							31.6/36.1		
MSK131	B-0200	3,200	85	250	36.7	165	0.0232	260	470	110	48	250	300	18	337	84/89.4		
	D-0200	3,000	160	495	65.2	293.4	0.0382		610							116/121.4		

Synchronous Motor MSM



The maintenance-free motors MSM are available in 5 different overall sizes up to a mechanical continuous power rating of 750 Watt. The motors of the protection class IP54 are equipped with an absolute value encoder and optionally with or without holding brake shippable. Operating on a control unit with 3 AC 230V supply. At higher supply voltages and continuous power ratings up to 3,5kW choose from the IndraDyn motor programm.

Technical data MSM motors

Technical Data	Symbol	Unit	MSM019A	MSM019B	MSM031B	MSM031C	MSM041B
Continuous power	P	W	50	100	200	400	750
Continuous torque	M _{rated}	Nm	0,16	0,32	0,64	1,3	2,4
Maximum torque	M _{pk}	Nm	0,48	0,95	1,91	3,8	7,1
Rated current	I _{rated}	A _(eff)	1,1	1,1	1,6	2,6	4,0
Maximum current	I _{peak}	A _(peak)	4,7	4,7	6,9	11,0	17,0
Rated speed	n _{rated}	min ⁻¹	3000	3000	3000	3000	3000
Maximum speed	n _{max}	min ⁻¹	5000	5000	5000	5000	4500
Rotor inertia without brake	J _{Rotor}	kgcm ²	0,025	0,051	0,14	0,26	0,87
Rotor inertia with brake			0,027	0,054	0,16	0,28	0,97
Mass without brake	m	kg	0,32	0,47	0,82	1,2	2,3
Mass with brake	m	kg	0,53	0,68	1,3	1,7	3,1

Dimensions	Symbol	Unit	MSM019A	MSM019B	MSM031B	MSM031C	MSM041B
Motor length without brake	l _M	mm	72	92	79	98,5	112
Motor length with brake			102	122	115,5	135	149
Flange	□	mm	38	38	60	60	80
Bolt circle	d _B	mm	45	45	70	70	90
Center diameter	d _C	mm	30	30	50	50	70
Shaft diameter	d _S	mm	8	8	11	14	19
Shaft length	l _S	mm	25	25	30	30	35

General features:

Protection category IP54 (shaft IP40)
 Multiturn absolute encoder 17bit (serial transmission)
 Absolute encoder function with battery buffer (battery-box in encoder cable)
 Cable with BRC connector, cable length 220 / 250 mm (encoder / power)
 Plain shaft, no oil seal
 Holding brake (with clearance) optional

 New or changed compared to MSM020/030/040

2008-06-16

4.3. AC-Main Spindle Drives

IndraDyn A – Asynchronous motors MAD/MAF

MAD-motors (surface aerated) and MAF-motors (liquid-cooled) are particularly used as main spindle and partially as servo drives. Therefore different overall sizes with power ratings up to 120 kW are available. Characteristics of these motors are the outstanding high dynamic, the high speed control range and the excellent concentricity quality. The motors can be optionally provided with a holding brake.



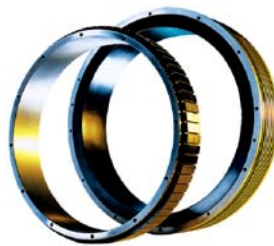
4.4. Linear Drive Technology IndraDyn L

Linear drives do not need any mechanical transmission elements, therefore its use in high-speed chipping, grinding and laser processing is especially beneficial. Furthermore this drive-series opens up new machine concepts with different benefits. Clearly higher speed, at higher precision and peak forces from 800 N up to 21,500 N are the outstanding characteristics of the drive technology. The capsuled version of the primary part relieves the motor mounting and protects the motor from environmental influences.



4.4. Rotary table drives with IndraDyn T

Torque motors MBT from Rexroth are used in rotary tables or swivelling axis of machining centres and results drastic competitive advantages. With these direct-drive motors, attrition afflicted mechanical transmission elements are inapplicable. At the same time dynamic and precision are clearly increased. With the MTB motors, torques of 15 Nm up to 13,800 Nm, are possible.



4.5. Servo-gears GTE and GTM

GTE

Servo-planetary gears for standard applications

The single- or double-staged gears can be obtained with plane shaft or feather key groove.



GTM

Servo-planetary gears for highest requirements.

The single- or double-staged gears can be obtained with plane shaft or feather key groove and optionally with twisted torsional stiffness.



4.6. Drive-Control Unit IndraDrive

More flexibility, productivity and precision is offered by the new modular drive-system IndraDrive from Rexroth. IndraDrive covers a range of performance from 0.1 up to 132 kW. All popular control communications like SERCOS 2 Interface, SERCOS III Interface, PROFIBUS, CANopen, DeviceNet, INTERBUS, analog and parallel interface are supported.

The IndraDrive Family

IndraDrive C – Converter

Range of performance from 1 up to 630kW with peak currents up to 1300 A

- compact setup even for single-axis solutions
- direct power supply up to 500V
- high overload capability



IndraDrive Cs– Compact Converter (system compatible from MTXV10)

Range of performance from 0.1 up to 3 kW

- compact setup in protection classes IP20 and IP54
- integrated safety technology (optional)
- Multi-Ethernet-connection



IndraDrive Fc – Frequency Converter

Range of performance from 0.25 up to 7.5 kW

- compact setup for open-loop-applications
- most simple installation and startup
- Fieldbus-modules for Profibus, CANopen und DeviceNet available



IndraDrive M – Inverter

Range of performance from 1 up to 132 kW with peak currents up to 350 A

- double-axes-inverter with peak currents from 12 A bis 36 A
- space-saving setup for multi-axis-solutions
- feeding via converter or supply module possible
- energy-efficient, feed-back-able supply modules



IndraDrive Mi – Combined module (motor + control)

Range of performance from 9.4 up to 35 Nm

- minimal place requirement (e.g. for gate applications)
- compatible to IndraDrive-drive-family
- integrated Motion-Logic according to IEC 61131-3



IndraDrive C and M



The modular series IndraDrive C and M are specially intended specially for the use in machine tool field and general automation. Besides the drive integrated PLC according to IEC 61131-3, the IndraDrive comes with a large function package which is optimised for following main application areas.

Firmware Function Package:

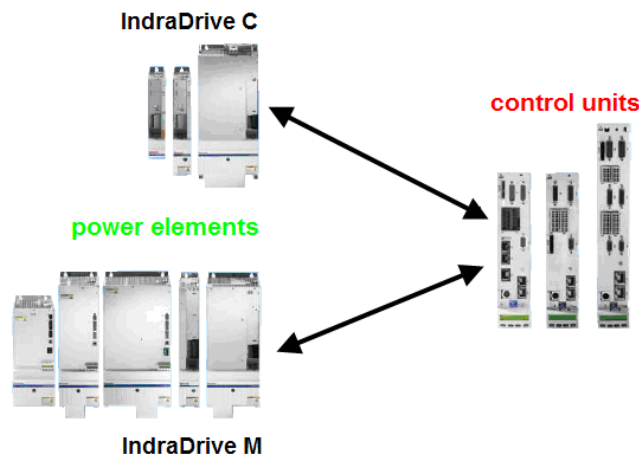
- FWA-....-MPB-... single-axis basic, standard servo application, automation
- FWA-....-MPH-... single-axis advanced, servo application, main-drive application, machine tool high-end
- FWA-....-MPD-... double-axes basic, servo application, WZM

The software basic package e.g. for the servo-operation includes already all necessary basic functions like position alternate operation, position control, speed control and torque control.

Rexroth furthermore offers with expansion packages an economic scaling of the functionality like:

- axis error correction
- main-spindle function
- synchronisation of axes
- electronic cam controller
- technology packages based on the integrated PLC
- safety technology

Modular setup:



The IndraDrive series can be combined among each other. The control units are scalable and configurable and fit for IndraDrive C and M.

Overview of the safety functions:

The safe braking- and deceleration system as safety function in the IndraDrive was certified after IEC61508. It protects the operator in the special operation from uncontrolled system crashes of gravity loaded axes. The IndraDrive safety technology enables the compliance of the Europe-wide safety regulations without any additional hardware or the detour over the control. Following functions are available amongst others:

Safe-Stop

The safe-stop forms a backup against unintentional startup of a machine axis. With the safe-stop the power supply to the drive is interrupted safely.

**SAFETY
ON
BOARD**

Safe Operation-Stop

As well as the safe-stop the safe operation-stop forms a protection against unintentional startup of machine axes. For it, the drive-system is stopped at a point in the production process. All regulation functions between the control and the drive motor will not be lost. Through intelligent safety technology all unintended and dangerous motions owing to errors will be safely prevented.

Safe Reduced Speed

The intelligent safety technology safely prevents that a drive will transcend the parameterised speed threshold.

Safe Limited Absolute Position

Safety procedures in CNC-controls and drives prevent that a axis leaves the parameterised traversing range.

Safe Brake-Management



Further safety-functions:

safe drive interlock, safe maximum speed, safe limited pace-dimension, safe rotation directionung, safe monitored disengagement, safe safety-door-locking

Function overview control units (IndraDrive C/M)



Project Book

Overview	Single-axis BASIC OPEN LOOP	Single-axis BASIC ANALOG	Single-axis BASIC PROFIBUS	Single-axis BASIC SERCOS	Single-axis BASIC UNIVERSAL	Double-axis BASIC ⁵⁾ UNIVERSAL	Single-axis ADVANCED
Control communication							
Analog/digital for Open Loop operation	●	–	–	–	–	–	–
Analog interface	–	●	–	–	–	–	○ ¹⁾
Parallel interface	–	–	–	–	○	○	○
PROFIBUS	–	–	●	–	○	○	○
SERCOS 2	–	–	–	●	○	○	○
SERCOS III	–	–	–	–	○	○	○
Multi-Ethernet	–	–	–	–	○	○	○
CANopen	–	–	–	–	○	–	○
DeviceNet	–	–	–	–	○	–	○
Configurations							
Option 1	–	● ²⁾	● ²⁾	● ²⁾	● ²⁾	●/●	●
Option 2	–	–	–	–	●	●/●	●
Option 3	–	–	–	–	–	–	●
Safety option	–	●	●	●	●	●/●	●
Slot for MultiMediaCard	–	–	–	–	●	●	●
Encoder interfaces							
IndraDyn motors MSK, MKE, MAD and MAF, Hiperface®, 1 V _{pp} and 5 V TTL ³⁾	–	●	●	●	●	○	○
MHD and MKD motors	–	–	–	–	○	○	○
EnDat 2.1, 1 V _{pp} and 5 V TTL ⁴⁾	–	–	–	–	○	○	○
Safety options compliant with EN 954-1							
Starting lockout compliant with EN 954-1, Cat. 3 for the prevention of unintentional restart	–	○	○	○	○	○	○
Safety technology conforming to EN 954-1, Cat. 3	–	–	–	–	–	○	○
Expansions							
Encoder emulation	–	●	–	–	○	○	○
Analog I/O extension	–	–	–	–	○	○	○
Digital I/O extension	–	–	–	–	–	–	○
Digital I/O with SSI interface	–	–	–	–	–	–	○
Cross communication	–	–	–	–	–	–	○
Software module							
MultiMediaCard	–	–	–	–	○	○	○

● Standard ○ Optional

¹⁾ in conjunction with additional options ²⁾ encoder interface for IndraDyn motors ³⁾ supply voltage 12 V ⁴⁾ supply voltage 5 V ⁵⁾ only in connection with power unit HMD

IndraDrive M Power Elements

HMS01.1N-W0020-A-07-*	20A maximum current
HMS01.1N-W0036-A-07-*	36A maximum current
HMS01.1N-W0054-A-07-*	54A maximum current
HMS01.1N-W0070-A-07-*	70A maximum current
HMS01.1N-W0110-A-07-*	110A maximum current
HMS01.1N-W0150-A-07-*	150A maximum current
HMS01.1N-W0210-A-07-*	210A maximum current
HMS01.1N-W0350-A-07-*	350A maximum current

Volume-optimised IndraDrive M Power Elements

HMS02.1N-W0028-A-07-*	28A maximum current
HMS02.1N-W0054-A-07-*	54A maximum current

Power Elements Double-Axis-Devices

HMD01.1N-W0020-A-07-*	20A maximum current
HMD01.1N-W0036-A-07-*	36A maximum current

Supply-Devices:

HMV01.1E-W0030-A-07-*	30A continuous output with inductor (without feed back)
HMV01.1E-W0075-A-07-*	75A continuous output with inductor (without feed back)
HMV01.1E-W0120-A-07-*	120A cont. output with inductor (without feed back)
HMV01.1R-W0018-A-07-*	18A continuous output with inductor (with feed back)
HMV01.1R-W0045-A-07-*	45A continuous output with inductor (with feed back)
HMV01.1R-W0065-A-07-*	65A continuous output with inductor (with feed back)
HMV01.1R-W0120-A-07-*	120A continuous output with inductor (with feed back)

Volume-optimised Supply-Devices

HMV02.1R-W0015-A-07-NNNN	15A continuous output with inductor (with feed back)
--------------------------	--

 IndraDrive C Power Elements (automatisation, single-axis-solution)

HCS02.1E-W0012-A-03-*	12A maximum current
HCS02.1E-W0028-A-03-*	28A maximum current
HCS02.1E-W0054-A-03-*	54A maximum current
HCS02.1E-W0070-A-03-+	70A maximum current
HCS03.1E-W0070-A-05-*	70A maximum current
HCS03.1E-W0100-A-05-*	100A maximum current
HCS03.1E-W0150-A-05-*	150A maximum current
HCS03.1E-W0210-A-05-*	210A maximum current
HCS04.1E-W0350-N 04-*	350A maximum current
HCS04.1E-W0420-N-04-*	420A maximum current
HCS04.1E-W0520-N-04-*	520A maximum current
HCS04.1E-W0640-N-04-*	640A maximum current
HCS04.1E-W0790-N 04-*	790A maximum current
HCS04.1E-W1010-N-04-*	1010A maximum current
HCS04.1E-W1240-N-04-*	1240A maximum current
HCS04.1E-W1540-N-04-*	1540A maximum current

 IndraDrive Cs

The IndraDrive Cs is characterised by the space-saving construction and outstanding performance data exchange.

The new multi-protocol-able communication interface allows the universal operation of IndraDrive Cs with different Ethernet-based communication protocols without changing the hardware.

In combination with the new multi-encoder interface for interpretation, all popular encoder-types as well as an additional options-space, even total special drive requirements can be solved.

Technical Characteristics:

- 2 series for direct power supply on 110 -230 V AC or 200 -500 V AC
- suitable for motors from 0.05 up to 3.5 kW continuous power output
- complete, scaleable drive programm
- compatible to IndraDrive-drive-family
- digital in-/outputs and analog input on board
- intelligent operation control with programming module function
- multi-Ethernet

IndraDrive Cs supports following protocols:

- SERCOS III
- PROFINET IO
- EtherNET/IP
- EtherCat
- Multi-Encoder

IndraDrive Cs supports following encoder-types:

- absolute encoder EnDat 2.1 and EndDat 2.2
- absolute encoder Hiperface
- absolute encoder from Rexroth MSM-motors
- incremental signals 1Vss
- incremental signals 5V TTL
- resolver

Converter	Size 1						Size 2	
Models	HCS01.1E-W0003	HCS01.1E-W0006	HCS01.1E-W0009	HCS01.1E-W0013	HCS01.1E-W0005	HCS01.1E-W0008	HCS01.1E-W0018	HCS01.1E-W0028
Performance data								
Mains voltage	V	3 AC 110 ... 230 V				3 AC 200 ... 500 V ¹⁾		
Continuous current	A _{eff}	1.1	2	3	4.4	1.7	2.7	11.5
Maximum current	A _{eff}	3.3	6	9	13	5	8	28
Continuous mechanical output	W	100	200	400	750	400	750	3,500
Mechanical data								
Width W	mm	50				70		
Height H ²⁾	mm	160/215				213/268		
Depth D ³⁾	mm	196/220						
Mass	kg	1.1				1.6		

IndraDrive Fc

Rexroth IndraDrive Fc is a standard converter for open-loop-applications.

IndraDrive Fc converters cover completely the range of performance from 0.25 up to 7.5 kW. Instead 4 overall sizes and two mains input voltages (1/3 x AC 230 V and 3 x AC 400 V) are available. Through, the extensive functions as well as the easy installation, startup and operating sets new standards in its class.



Type	FCS01.1E-W ...								FCS01.1E-W ...								
	0003-A-02- NNBV	0005-A-02- NNBV	0006-A-02- NNBV	0008-A-02- NNBV	0011-A-02- NNBV	0015-A-02- NNBV	0019-A-02- NNBV	0003-A-04- NNBV	0005-A-04- NNBV	0006-A-04- NNBV	0008-A-04- NNBV	0011-A-04- NNBV	0015-A-04- NNBV	0019-A-04- NNBV	0025-A-04- NNBV	0032-A-04- NNBV	
Power data																	
Mains input voltage	V	1 AC 200 ... 240 V 3 AC 200 ... 240 V (± 10 %) 47 ... 63 Hz							3 AC 380 ... 480 V (± 10 %/± 20 %) 47 ... 63 Hz								
Rated motor power	kW	0.25	0.37	0.55	0.75	1.1	1.5	2.2	0.55	0.75	1.1	1.5	2.2	3	4	5.5	7.5
Continuous current	A	1.7	2.2	3	4	5.5	7	9	1.7	2.3	3.1	4.0	5.5	7.5	9.5	12.5	16.0
Maximum current	A	3.4	4.4	6	8	11	14	18	3.4	4.6	6.2	8	11	15	19	25	32
Continuous input mains current 1 AC 230 V	A	3.7	4.8	6.5	8.7	12	15.2	19.6	–	–	–	–	–	–	–	–	–
Continuous input mains current 3 AC 230 V	A	2.4	3.1	4.2	5.6	7.7	9.8	13.3	–	–	–	–	–	–	–	–	–
Continuous input mains current 3 AC 400 V	A	–	–	–	–	–	–	–	2.4	3.2	4.3	5.6	7.7	10.5	13.3	17.5	22.4
Reference between output and mains voltage		if $U_{in} < 230$ V: 2 % power reduction per 5 V if $U_{in} > 230$ V: no power gain							if $U_{in} < 400$ V: 1 % power reduction per 4 V if $U_{in} > 400$ V: no power gain								
DC bus connection ¹⁾		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
DC bus capacity	mF	300	300	600	600	900	1200	1500	120	120	175	210	305	420	500	630	920
Output voltage	V	0 ... power supply voltage															
Brake resistor																	
Brake resistor		external															
Continuous braking power	kW	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.4	0.4	0.6	0.6
Maximum braking power	kW	0.7	0.7	0.7	0.7	2.2	2.2	2.2	1.3	1.3	1.3	2.6	2.6	5.2	5.2	8.6	8.6
Control voltage data																	
Control voltage		internal															
Mechanical data																	
Size		A				B			A		B			C		D	
Width	mm	76							76				98				
Height	mm	186				226			186		226			241		286	
Depth	mm	151							151				178				
Installation dimensions L1	mm	220				260			220		260			275		320	
Weight	kg	1.4				1.8			1.4		1.8			2.7		3.1	

All data apply to rated operation from 4 Hz rotational frequency. Derating from 6 kHz switching frequency

¹⁾For DC coupling of several frequency converters

The maximum braking power of the brake resistors is based on a rated DC link voltage of 400 V at FCS01.1E-Wxxx-A-02 and 720 V at FCS01.1E-Wxxx-A-04

IndraDrive Mi

The IndraDrive Mi combines control electronics and servo motor in one compact unit. Therewith the IndraDrive Mi is the ideal solution for all applications which depend on a minimal of required space at highest flexibility and maximum economy.



The compact control electronic of the IndraDrive Mi uses the lateral area of the servo motor as cooling element. This reduces the total construction volume by over 50% compared to classic servo-drive solutions and by up to 30% compared to other integrated solutions.

Another benefit of the IndraDrive Mi is the clearly reduced effort for installation – only one cable is enough to realise the power supply and the communication via SERCOS III interface.

Features:

- extensive reduction of control cabinet volume up to 70%
- drastic reduction of the wiring effort up to 85%
- extensive rising of the flexibility and modularity of machine and installation
- up to 20 IndraDrive Mi can be connected in series to one drive train

Motor-integrated drive KSM



Servo drive		Maximum speed	Continuous torque at standstill	Maximum torque	Continuous current at standstill	Maximum current	Moment of inertia	Dimensions								Mass ¹⁾
		n_{max} [rpm]	$M_{0.60K}$ [Nm]	M_{max} [Nm]	I_0 [A]	I_{max} [A]	J_R [kgm ²]	A [mm]	B [mm]	C [mm]	Ø D [mm]	Ø E [mm]	Ø F [mm]	Ø G [mm]	H [mm]	m [kg]
KSM01.2B-041	C-42	5,500	2.2	9.4	1.4	6.8	0.00017	82	252	30	14	50	95	6.6	201	5.5/6
KSM01.2B-061	C-35	4,300	6	25	3.3	14.9	0.00087	115	271	40	19	95	130	9	216	9.5/10.3
	C-61	6,000	5.5	18	5	17.7										
KSM01.2B-071	C-24	3,400	10.5	35	4.4	17.7	0.00173	140	307	58	32	130	165	11	248	14/15.1
	C-35	4,700	10	28	5.7	17.7										
KSM01.2B-076	C-35	4,700	8.7	29	5.7	17.7	0.0043	140	290	50	24	110	165	11	248	14.5/15.6

All data refer to the operation with 750 V DC bus voltage

¹⁾ values without/with holding brake

Close-to-motor control electronic KMS

The close to motor converter KMS allows the integration of most different motors.

Especially with cramped space conditions, MSK/MKE servo motors as well as 3rd party motors in open-loop-operation or with hyperface-encoder can be embedded with the KMS into an IndraDrive Mi drive train.



Servo drive	Continuous current	Maximum current	Dimensions				Mass
	I_0 [A]	I_{max} [A]	A [mm]	B [mm]	C [mm]	D [mm]	m [kg]
KMS01.2B	6	18	316	24	147	85	2.4

All data refer to the operation with 750 V DC bus voltage

5. Rexroth Pneumatics

Rexroth offers with the pneumatic electronic and electro-pneumatic components and systems for automation of machines and production facilities a broad range of standard products for application-specific solutions.



5.1 Gripping, Moving, Turning and Controlling

Non Contact Transfer NTC

Technical Data	
Operating type	Bernoulli principle
Working pressure	1–7 bar
Ambient temperature range	5 °C to +60 °C
Medium	Compressed air, non-lubricated
Material	Aluminium alloy (anodized)

Application areas

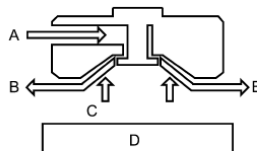
Suitable for all applications where grippers or suction cups not can be used.

- Rough surface
- Hot or cold objects
- Sensitive objects
- Dirty objects
- Leaky surfaces (up to 50% holes)
- Examples of objects
- Plastic bags
- Paper material
- CDs and DVDs
- Electronic circuit board



Technical information					
Symbol	Type	NCT20	NCT30	NCT40	NCT60
	Diameter [mm]	20	30	40	60
	Lifting force at 5 bar [N]	0,9	1,3	2,0	6,0
	Air consumption [l/min]	100	100	110	210
	Weight [kg]	0,02	0,03	0,054	0,124
	Port size	M5 x 0,8	M5 x 0,8	M5 x 0,8	M5 x 0,8

Operating principle



A: Pressure B: Air stream C: Lifting force D: Object

Code no.				
Type	NCT20	NCT30	NCT40	NCT60
Code no.	2 650 100 010	2 650 100 020	2 650 100 030	2 650 100 040

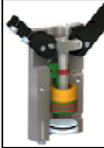
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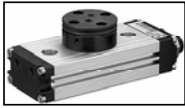
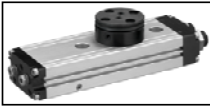
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 Grippers GSP

A	P	R	Z	
				
-Size	-10, 16, 25, 32 ,40	-8, 10, 16, 25, 32 ,40	-10, 16, 25, 32 ,40	-16, 32 ,50
-Gripping force	-0,22 up to 8,6 Nm	-26 up to 840 N	-0,3 up to 12 Nm	-144 up to 1320 N
-Recommended payload (friction)	-0,08 up to 0,85 kg	-0,13 up to 4,2 kp	-0,08 up to 1,15 kg	-0,6 up to 5,7 kg
-Stroke-Angle per finger	-40 °	-2 up to 13 mm	-180 °	-3 up to 7 mm
-Max. finger length	-25 up to 80 mm	-20 up to 64 mm	-25 up to 80 mm	-30 up to 80 mm
Benefits: -High gripping force in very small package -Easy-2-Combine interface -Centering sleeves at all grippers, jaws and body -Repeatability 0,02 mm -Sensor covered completely in the slot -Even Schunk started to sell our GSP-P, called LGP at Schunk				
Accessories: Centering sleeves, gripper switch				
Options: Normally open and normally closed				
Our strengths:				
Parallel ✓Centering sleeves at jaws ✓Strong mechanical design ✓Few mechanical parts ✓Jaws made by steel ✓Wedge hook design, stronger ✓Strong & precise T-slot guiding ✓Lot of sensor slots ✓Manufactured by Schunk	Angular ✓Centering sleeves at jaws ✓Few mechanical parts ✓Jaws made by steel ✓Very strong “nose-slot” gear ✓Lot of sensor slots ✓Manufactured by Schunk	Radial ✓Centering sleeves at jaws ✓5 different sizes ✓Few mechanical parts ✓Jaws made by steel ✓Lot of sensor slots ✓Manufactured by Schunk	Centric ✓Centering sleeves at jaws ✓Can be mounted from the top or bottom ✓High gripping force ✓Few mechanical parts ✓Jaws made by steel ✓Wedge hook design, stronger ✓Strong & precise T-slot guiding ✓Lot of sensor slots ✓Manufactured by Schunk	

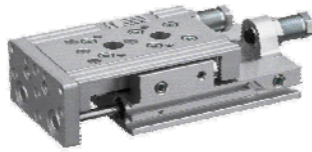
Rack & Pinion Rotary Drive RCM

		AP = Air duct	IP = Intermediate
SE = Elastic Cushioning SH = Hydraulic Cushioning			
-Size SE	-6, 8, 12, 16, 20, 25	-8, 12, 16, 20, 25	-12, 16, 20, 25
-Size SH	-12, 16, 20, 25	-12, 16, 20, 25	-12, 16, 20, 25
-Torque	-0,16 up to 6,5 Nm	-0,33 up to 6,5 Nm	-0,95 up to 6,5 Nm
-Max. moment of inertia SE	-0,08 up to 6,3 kgcm ²	-10 up to 450 kgcm ²	-10 up to 450 kgcm ²
-Max. moment of inertia SH	-10 up to 450 kgcm ²	-10 up to 450 kgcm ²	-10 up to 450 kgcm ²
General: Repetitive precision : SE = 0,2 ° och SH = 0,05 ° Angel adjustment: [0° pos. -6°→45°] [90° pos. 45°→145°] [180° pos. 135°→186°] Accessories: Centering sleeves, standard sensor ST-4 Options: Free to make combinations e.g. RCM-SH-AP-IP Benefits: •Higher capacity for moments of inertia than competitors •No back step with intermediate stop necessary •Easy-2-Combine interface •No rod is outside for our intermediate position •Change of shock absorbers without losing position			
Our strengths:			
<u>Standard SE and SH</u> ✓Centering sleeves in flange and body ✓Double ball bearing in top and bottom ✓Fast rotary time ✓High payload at axial and radial forces ✓Covered bearing, in house ✓Many sensor slots ✓Manufactured by Schunk	<u>AP-air duct + benefits as SH</u> ✓"A real" air Swivel ✓Air duct in top of swivel, 2-4 channels ✓Easy to combine grippers ✓No rotating tubing around grippers ✓Compact design ✓The best version compared with Festo and SMC	<u>IP-intermediate + benefits as SH-AP</u> ✓Simple installation to valves ✓Simple adjustment of intermediate position ✓Compact design ✓Fast rotary time against competitors ✓Easy to adjust	<u>Kombo SE/SH-AP-IP + Benefits as SH-AP-IP</u> ✓Very compact ✓Easy to order with standard modules ✓Few details inside that can broke down ✓Hard for competitors to meet our technical specification ✓The best module at the market of our main competitors

Rodless Cylinder RTC

	BV	CG	EG	HD
				
-Size	-16, 25, 32 ,40, 50, 63, -80	-16, 25, 32 ,40	-16, 25, 32	-16, 25, 32 , 40, 50, -63
-Max. stroke	-4800 up to 9900 mm	-1800 mm	-1800 mm	-1800 up to 4300 mm
-Max. speed	-3 up to 5,5 m/s	-2 m/s	-1 m/s	-2 m/s
-Guide rail	-Internal oval piston	-9/3 up to 15	-15 up to 25	-15 up to 30
Benefits: -Magnetic outer band removes bowing or warping -Flat design due to oval piston -Optimized for fast cycle times (pneumatic cushioning, optional shock absorbers and stroke adjusters) -Online configurator available for custom configurations -Comprehensive range of guide options -Calculation software available for sizing applications with minimum risk -Air connection from both ends -competitive pricing Accessories: standard sensor ST4, shock absorbers, end cover mounting, foot mounting, shuttle angle bracket, adjustable articulated mounting, T-groove nut Options: RTC-RR: Interchanges with RMC (Rexmover), RTC-RI: Interchanges with 170 series rodless				
Our strengths:				
<u>RTC-BV</u> ✓ Internally guided ✓ Compact dimensions ✓ Optimized internal air channels ✓ Proven sealing concept (from RMC) ✓ Both metric and inch versions available	<u>RTC- CG</u> ✓ Compact Mini Guide rail ✓ Adjustable stops available ✓ Change of shock absorbers without stroke adjustment ✓ Easy-2-Combine interface	<u>RTC-EG</u> ✓ Medium duty BRL E-line Guide for Less demanding applications ✓ Change of shock absorbers without stroke adjustment ✓ Easy-2-Combine interface	<u>RTC-HD</u> ✓ Heavy duty guide rail ✓ 15mm BRL rail even on smallest (16mm) bore size ✓ Change of shock absorbers without stroke adjustment ✓ Easy-2-Combine interface	

Mini Slide MSC



-Size	8, 12, 16, 20, 25
-Stroke	10 up to 200 mm
-Static Moments	7 up to 236 Nm
-Dynamic moments	1,1 up to 57,8 Nm
-Velocity	0,8 m/s
-Force	60 N up to 589 N

Benefits:

- Easy-2-Combine interface
- Repeatability 0,02 mm
- Slides can be mounted in parallel without a gap in between
- Calculation and CAD tools available
- Combinable with electric axes without adapting plates
- Change of shock absorber without loosening position adjustments

Accessories: Centering sleeves, stroke limitation bolts (10, 20 and 30 mm)

Options: Elastic or hydraulic shock absorbers

Our strengths:

- ✓ Strong mechanical design, In House expertise for guide
- ✓ High drive forces with smallest dimensions
- ✓ Intelligent stroke setting
- ✓ Air connection possible from 3 sides
- ✓ Air connection and sensor mounting at same side possible
- ✓ Integrated sensor grooves (both sides)
- ✓ Stable guide
- ✓ Symmetrical design
- ✓ Integrated stroke adjustment
- ✓ 2 shock absorbers for out stroke mountable
- ✓ Combination of elastic and hydraulic stroke adjustment possible

Valves Series LS04


XS



AF



VTS

	XS extra small	AF all functions	VTS LS04
Version	Inline - single valve	Inline - single valve	Modular valve terminal system
Nominal flow	200 l/min	330 l/min	320 l/min
Pneumatic function	Only 5/2 SR version	5/2 SR, 5/2 DS, 5/3CC, all 2 x 3/2 versions	5/2 SR, 5/2 DS, 5/3CC, all 2 x 3/2 versions
Pneumatic connection	Push-in connector for Ø 4 mm hose	Push-in connector for Ø 4 mm and Ø 6 mm hoses	Push-in connector in the VTS for Ø 4 mm and Ø 6 mm hoses can be freely configured
Switching time	9 ms/24 ms	12 ms/30 ms	13 ms/22 ms
Working pressure range	Internal: 3 to 8 bar	Internal: 2 to 8 bar	Internal: 3 to 8 bar External: -0.9 to 8 bar
Electrical connection	M8 3-pin or standard plug	M8 3-pin or standard plug	D-Sub 25-pin, rotatable
Dimensions	57.7 x 10.8 x 45	76.2 x 10.8 x 60	149 x 10.8 x 45*
Weight	30 g	51 g	630 g*

 Valve Terminal System LP04

- Modular valve terminal system
- 4-16 valves
- Expandable one time by 2 valve positions
- Temperature range: - 5°C to 50°C
- Operating pressure (external): -1 to 10 bar
- Operating pressure (internal): 3 to 8 bar
- Valve functions: 2x3/2, 5/2, and 5/3
- Valve width: 11.8 mm
- IP65
- Electrical connections:
 - o D-sub connection
 - o Profibus DB
 - o DeviceNet
 - o DDL
- Flow rate 300 l/min (all models)
- Valve models:
 - o 2x3/2 NC, 2x3/2 NO, 2x3/2 NC-NO
 - o 5/2 mono-stable, spring return
 - o 5/2 mono-stable, air-actuated return
 - o 5/2 bi-stable
 - o 5/3 bi-stable, closed center
 - o 5/3 pressurized or exhausted center (with 2x3/2 NC or 2x3/2 NO)
- Power consumption 0.35 watts (incl. LED and protective circuit)
- Voltage: 24 V DC (-10%/+10%)

 Valve Terminal Series HF04

- Modular valve terminal system
- 2-12 valves, expandable in 2 increments
- Temperature range: 0°C to 50°C
- Operating pressure (external): -1 to 10 bar
- Operating pressure (internal): 3 to 8 bar
- Valve functions: 2x3/2, 5/2, and 5/3
- Valve width: 11.8 mm
- IP65

- Electrical connections:
 - o D-sub connection
 - o Profibus DB
 - o AS-i

- Flow rate 400 l/min (all models)
- Valve models:
 - o 2x3/2 NC, 2x3/2 NO, 2x3/2 NC-NO
 - o 5/2 mono-stable, spring return
 - o 5/2 mono-stable, air-actuated return
 - o 5/2 bi-stable
 - o 5/3 bi-stable, closed center
 - o 5/3 pressurized or exhausted center (with 2x3/2 NC or 2x3/2 NO)
- Power consumption 0.35 watts (incl. LED and protective circuit)
- Voltage: 24 V DC (-10%/+10%)

Air Preparation Units

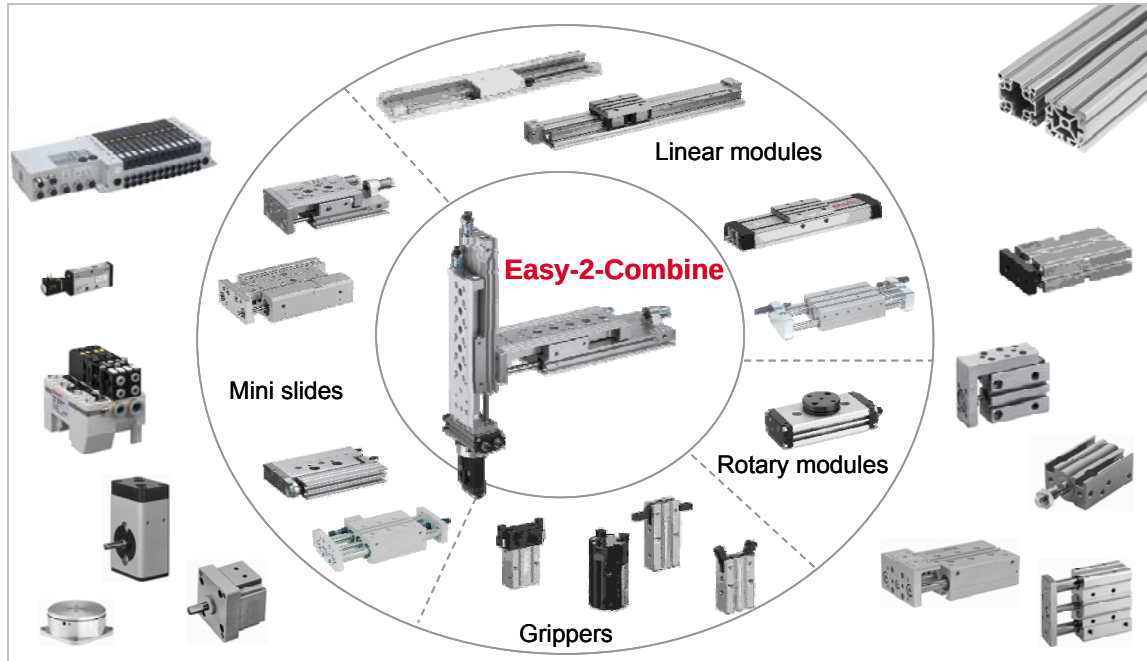


	AS2	AS3	AS5
▪ Nominal size:	1/4	3/8	3/4
▪ Air connection:	G1/4, G3/8 G3/8, G1/2 1/4" & 3/8" NPT	3/8" & 1/2" NPT	3/4
▪ Pressure gauge connection:	G1/4	G1/4	G1/4
▪ Maximum pressure range:	16 bar (232 psi)	16 bar (232 psi)	16 bar
▪ Permissible temp. range:	-10°C - +50°C (+14°C - +122°C) (with dried air)	-10°C - +50°C (+14°C - + 122°C) (with dried air)	-10°C- +50°C
▪ ATEX approval:	Zone 1 (category 2G) Zone 21 (category 2D)		
▪ Flow rate specifications:	Measured according to ISO 6953 (6,3 bar - 5,3, bar) (91-77 psi)		

Easy-2-Combine

The Easy-2-Combine automation system consists of both tried-and-tested and newly developed components including grippers, mini slides, rotary and linear modules with standardized mounting interfaces and interlocking connections. In this way, typical applications – whether pick & place, linear or area gantry – can be implemented with maximum versatility and minimum complexity.

Easy-2-Combine comprises pneumatic as well as electric drive modules, guaranteeing one-stop, cross-technology know-how.



- Standardized interfaces (uniform mounting dimensions, thread and centering sleeve sizes)
- Direct mounting (via connection plates, bolts and/or groove nuts)
- Comprehensive connection kits as accessories
- Interlocking, force-fit connection without extra work
- High-load and low-wear guides
- Universal mounting raster 20/40 mm with 0.01 mm accuracy

Application examples:



Pick and place



Linear gantry



Area gantry

Autor
Datei

DC-IA/SFS
Projektbuch_Solar_V04_11-08-19_GE_ENG

Version 1.0 [Änderungen vorbehalten]

88

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6. Rexroth TS Transfer Systems

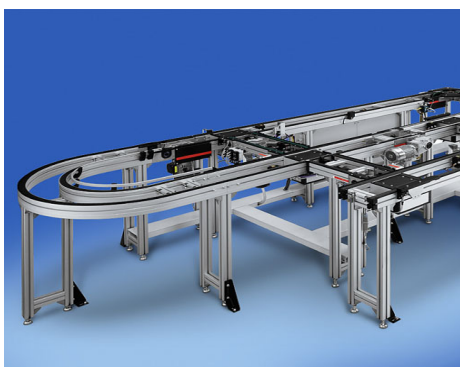
For the component transport Bosch offers transfer systems. The different overall size enables the transport of work-piece carrier from 3kg up to 250kg depending on the overall size.

Transfer System TS1



- Weights of up to 3 kg, speeds of up to 15 m/min
- Three workpiece pallet sizes
80 x 80, 120 x 120 and 160 x 160 mm
- Small dimensions for small products
- For all processes that have to be carried out with a high level of precision
- Fast change times for high quantities
- ESD compatible

Transfer System TS2



- Weights of up to 100 kg, speeds of up to 18 m/min
- Workpiece pallet dimensions from 160 x 160 mm to 800 x 1040 mm
- Also suitable for rough ambient conditions and clean rooms
- ESD compatible

 Transfer System Varioflow

- Weights of up to 20 kg, speeds of up to 60 m/min
- Simple planning and assembly with preassembled modules
- High chain tensile force of 1,250 N

VarioFlow chain conveyor system

- Two sizes 65 and 90 mm
- Workpiece pallet system

VarioFlow S chain conveyor system

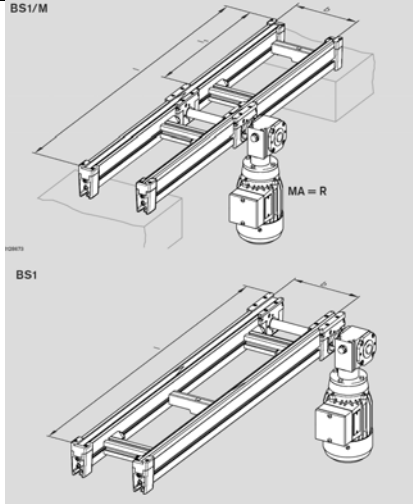
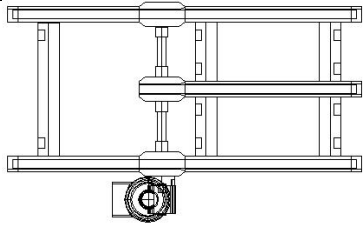
- Five sizes from 80 – 320 mm
- Stainless steel version with open system construction
- Fast and easy assembly

 Transfer System TS Solar

- haulways for the transport of hot glass modules up to 150°C
- absolute silicone-free, no open grease and oils
- 100% usable in ESD-environments
- suitable for class 6 clean-rooms (EN ISO 14644-1)
- on customer application balanced transport media
- available as 2-, 3-, 4- and 5-tracked solution
- optional continuous speed via frequency converter
- pre-assembled conveyor roads

Product Variants

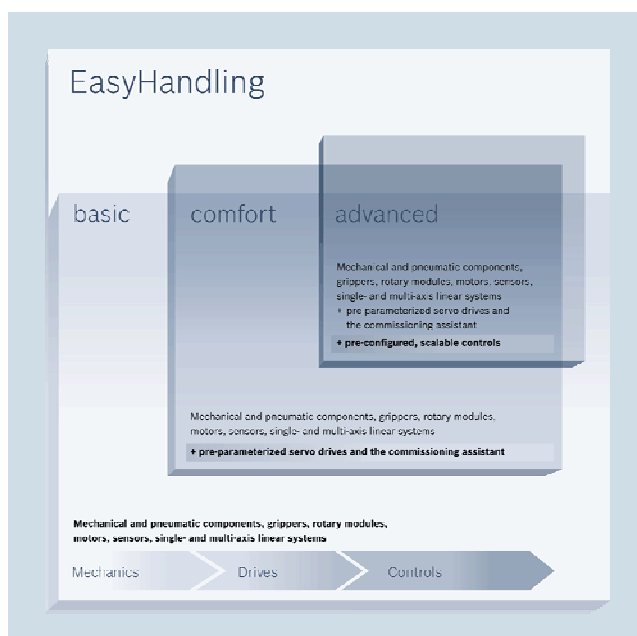
CSS/B & CSS/BM	CSS/F	CSS/NT Temperature
Transport of glass substrate panels, glass laminations and complete framed modules	Transport of glass substrate panels, glass laminations and complete framed modules	Application: transport of glass panels with a temperature up to 150°C
		
- transport medium gear belt with high density woven fabric plating - optimised, low-wear gear belt track - small deflection radius, closed direction change - stepless speed via optional frequency converter - opt. without lateral support - reversible version	- application specific gear belt for different environmental conditions 3mm polyurethane on gear belt webbing - good friction for high acceleration - PU-layer seamless applied - different colors available - return-bending-free - optimised, low-wear gear belt track - big deflection radius especially for transport of modules with tedlar-composite-foil suitable - open design for easy and fast gear belt swap - stepless speed via optional frequency converter - opt. without lateral support - reversible version	- especially for the attachment on laminator max. temperature up to 150°C cyclic operation - integrated gear belt tightener for high temperature operations - open, big deflection - stepless speed via optional frequency converter - opt. without lateral support - reversible version
- max. L: 6 m, max. W: 3 m - max. load: 120 kg	- max. L: 6 m, max. W: 3 m - max. load: 120 kg	- max. L: 6 m, max. W: 3 m - max. load: 120 kg
actuator: head-drive CSS/B, middle-drive CSS /BM	actuator: head-drive CSS/F	actuator: head-drive CSS/NT

CSS/B-cell and CSS/BM-cell	LTS cross-lift unit Solar	CSS/BM-32, CSS/BM-42, CSS/BM-52
Transport of silicon solar cells as delivery to the stringer	Direction change and transport of glass modules	Adaption of 3 to 2-lane solution for the extension to LTS
		
▪ base: BS1/M ▪ 2-lane version ▪ small deflection radius ▪ closed direction change ▪ stepless speed via optional frequency converter ▪ reversible version	▪ deflection within the solar conveyor ▪ optimised low-wear gear belt track ▪ transport roadway optionally with CSS/B or CSS/BM ▪ stepless speed via optional frequency converter ▪ up to 5-lane solutions ▪ length and width adjustable to the module size ▪ reversible version	▪ conveyor media gear belt with high density woven fabric plating ▪ routed deflection pulley ▪ optionally without lateral support ▪ stepless speed via optional frequency converter ▪ reversible version ▪
▪ max. L: 6m, max. B: 3m ▪ max. load: 30 kg	▪ max. load 120kg	▪ max. L: 6m, max. W: 3 m ▪ max. load: 120 kg
actuator: head-drive CSS/B-cell, centre-drive CSS /BM-cell		actuator: center-drive CSS /B-cell

7. Handling-Systems from Bosch Rexroth

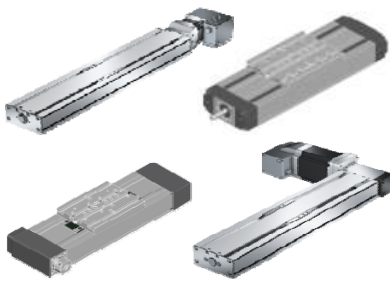


Mechatronic systemsolution



- **EasyHandling basic**
mechanical and pneumatic components, grippers, rotary modules, motors, sensors, single- and multi-axis linear systems
- **EasyHandling comfort**
 - EasyHandling basic
+ pre-parameterized servo drives and commissioning assistant
- **EasyHandling advanced**
 - EasyHandling comfort
+ pre-configured, scalable controls

Easy Handling components

Motor and Drives	Electrical axes	Pneumatic axes, rotary modules and grippers
		

Standard applications

pick-and-place		
	max. stroke (x):	600 mm
	max. stroke (z):	600 mm
	max. load capacity:	30 kg

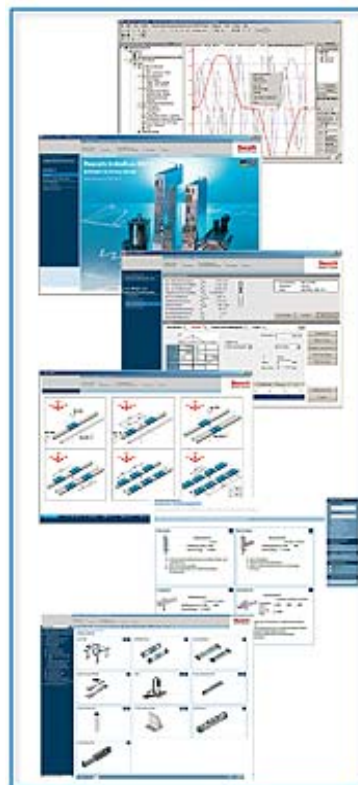
linear gantry		
	max. stroke (x):	1720 mm
	max. stroke (z):	1720 mm
	max. load capacity:	50 kg

cartesian system: arm		
	max. stroke (x):	1720 mm
	max. stroke (y):	520 mm
	max. stroke (z):	600 mm
	max. load capacity:	30 kg

cartesian system: gantry		
	max. stroke (x):	1720 mm
	max. stroke (y):	1520 mm
	max. stroke (z):	600 mm
	max. load capacity:	30 kg

Calculation- and Dimensioning-Tools

- **IndraWorks**
for startup of electrical control- and drive units
- **IndraSize**
for dimensioning of servo motors
- **LinSize**
for dimensioning and calculation of linear-axis and multi-axis systems
- **Linear Motion Designer**
for dimensioning of profile rail guiding
- **Easy-2-Combine**
for dimensioning of pneumatic components
- **CAD-Konfigurator**
for easy



8. Rexroth Tightening Systems

Tightening Systems from Rexroth are designed for the flexible market and his permanently changing requirements. The components are developed in the construction kit principle. The modular design of the systems ensures an easy installation.

Rexroth ErgoSpin and compact system CS351 - powerfull hand-screw-system in compact form

The ErgoSpin is formed after latest knowledge of ergonomics. Thanks to his optimal arranged operating elements and a 15 degree-step turnable and lockable crosshead, the ErgoSpin adjusts to every screw position.



Rexroth-Screw-Jacks – continuous modular concept for all-round applications

Rexroth-Screw-Jacks sets world-wide standards for system safety and process safety e.g. through digital data transfer and highest productivity in the control-cabinet-less screw-system for up to 40 channels.



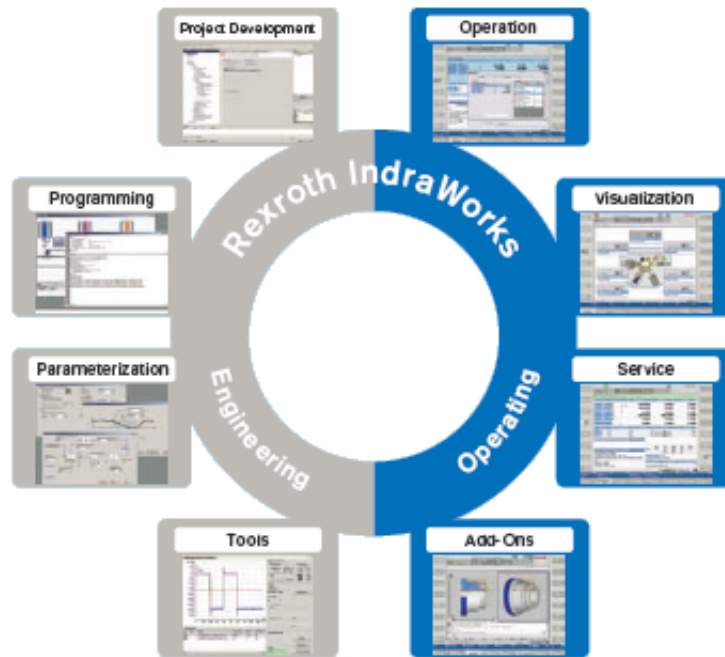
Features:

- The Rexroth operating system is used for parameterisation. The parameterisation is done by experts (maintenance and repairs)
- The programm is operated with SVGA resolution on a VxP in WinNT as task in VGA mode. This means, as the case may be, scrolling of an active screen. A mouse is absolute necessary for operation.
- Alternatively the Rexroth operating system can be operated on every notebook with suited screen resolution.
- Ethernet-based fieldbus for network connection as well as 24V-interfaces are available.

9. System software

9.1. IndraWorks

The IndraWorks Framework from Bosch Rexroth is a scalable frame for modular Engineering solutions. The following components are integrated in IndraWorks.

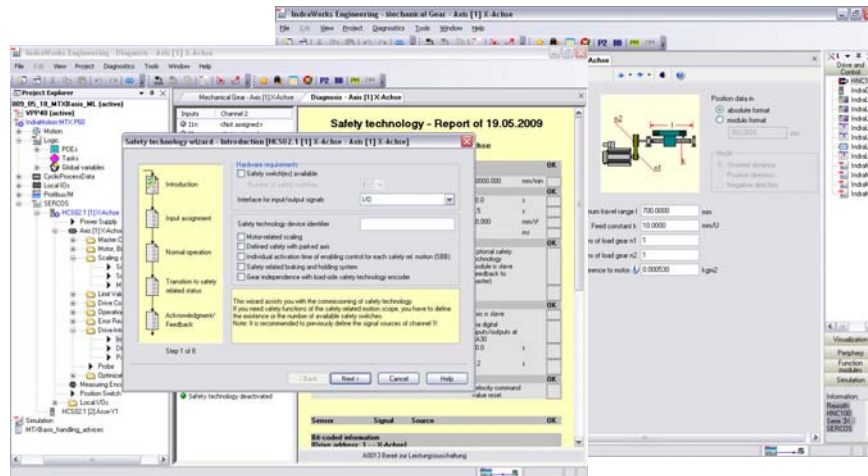


The specific Engineering Tools (Packages) of different technologies integrates themselves step by step as „plug-in“ into the collective framework. Framework and tools are independent and apart developable. This is the basic of our long-ranging openness.

IndraWorks-Drives

IW-Drives is the Rexroth Drive Technology setup tool. All required parameter settings are made in IW-Drives. The relevant function data such as mode selection (for example settings for positioning the drive) and current speed values are entered on the standard screen in the guided startup procedure. Predefined parameter sets, for example for linear axes or spindles, also simplify the startup procedure.

The software tool which is integrated in the IndraWorks also allows you to re-optimize individual parameters directly at the machine and provides diagnostic functions in the control. The extensive oscilloscope function facilitates the documentation and the checking of the control loops.

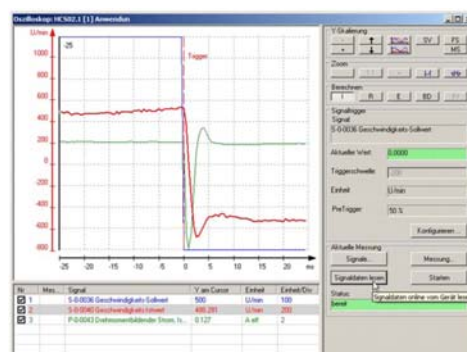


Advantages of IW-Drives

- guided startup procedure
- works with all types of firmware
- automatically detects the components (controller, motor, feedback)
- oscilloscope function

Oscilloscope-function

Using the Oscilloscope function you can do measurements and evaluate diagrams e.g. the transient response of a motor. The function is demanded therefore by start-up drives or while optimizing of machines axes in the project engineering phase.



HMI screen design with WinStudio

Besides the standard design elements (configurable NC- basic screens, diagnosis screen, F-, OP-keys, M-keys, header,...) and configurable operating screens for additional functional staged screen design, the HMI screen design is possible with WinStudio. Then they are for most different control systems available.



Single container but even full-screens can be realised with WinStudio.

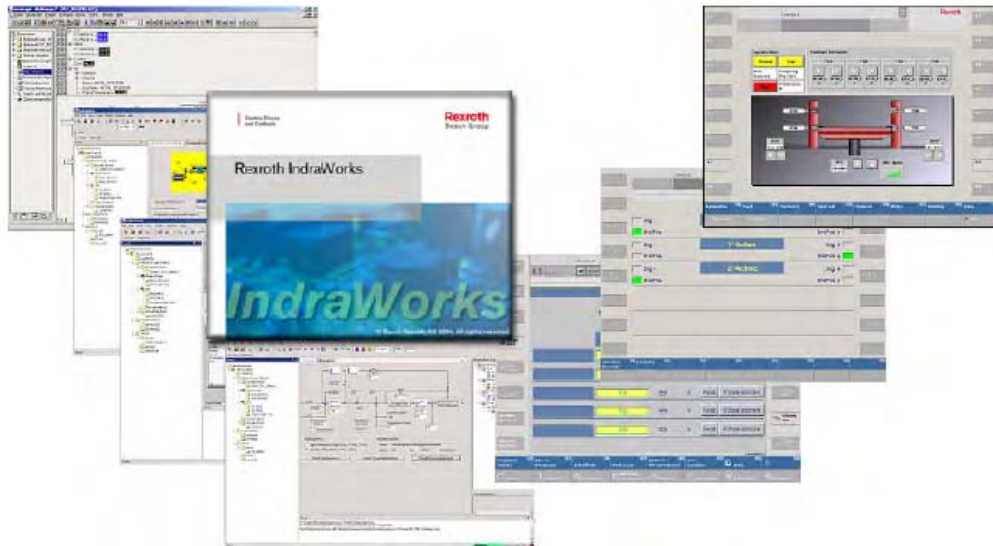


The functional stages in WinStudio refer to the number of available tags (process variables) which can be mapped. These stages have the following partitions:

- Basic License package (Lite Version) on board and free in every control unit
- Editor License package (scalable in the number of available tags, easy upgrade by activation codes without additional installation)

System software IndraLogic

The System Software IndraLogic comprised all necessary Software components to realize PLC machines for High Production and PLC controlled assembly applications. All components are integrated in the IndraWorks Framework into one Engineering tool.



Components of the basic installation:

Engineering Framework IndraWorks with:

- Fieldbus and I/O configurator
- IndraLogic (PLC programming system)
- IW criteria analysis and IndraStep
- IW linkage and network function
- WinStudio (to create user interface elements for production machines individual)
- common tools (logic analyzer, graphical NC programming, NC simulation...)
- IW-Drives (startup tool for drives)

System add-ons available for:

- IndraLogic applications (demos, libraries, information for end units...)

PLC programming system



The IndraLogic programming system is used to logically implement automation tasks.

IndraLogic is useable on different hardware platforms and forms the base programm system for the realisation of all PLC applications. For CNC applications with IndraMotion MTX, IndraLogic is also used for PLC programming and provides there the necessary interfaces to the communication.

The IndraLogic programming system is a universal and generic application programming system of programmable logic controllers and is also available as a soft PLC concept.

IndraLogic runs on the operating system Windows XP and thus is fully compatible to the entire system (clipboard functionality table import/export, complete, Excel mouse operation and/or keyboard etc.).

IndraLogic is integrated into the IndraWorks desktop of the Rexroth controls from where it can be invoked. Full functionality is then present within the Rexroth control, for example project planning in the engineering desktop mode. Together with WinStudio visualization elements you can create HMI pictures in IndraWorks for screening during the running machine.

The programming system can also be installed as an independent program on any PC without a PLC connection. This makes it possible to plan offline.

Basic Functions

The IndraLogic programming system has following basic functions:

Editors

Various editors form the interface between the programming system and the programmer. There is, for example, an editor for (logical) configuration of the various fieldbus systems, an editor for the (resources/program/...) declaration etc.

Compiler

The compiler translates the project (source code) into a code that can be read by the PLC processor.

Printing

Entire projects or selected sections (for example a list of cross-references) can be easily printed out on a printer that is connected to and installed on a Windows PC.

Help

The programming system has a context-sensitive help. Additional information (for example "Introduction to WinPCL programming" is also provided.

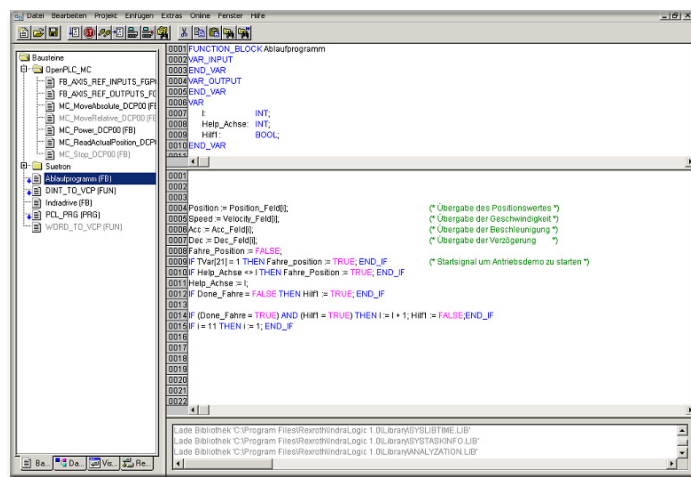
Structured programming

Resource, program, function block diagram, function, structure, array etc. form the foundation for a clear program structure. All structure elements can be used as modules after they have been defined (created). The system forms the foundation for creating a module library.

Programming via EN 61131-3 standard

The EN 61131-3 standard forms the foundation for IndraLogic programming.

Structured text ST



Standard keywords (VAR_INPUT, DECLARATION,...)

Keywords standardised in meaning and name. Is base for the system-independent publication. (see "Uniform text format (ASCII import/export)").

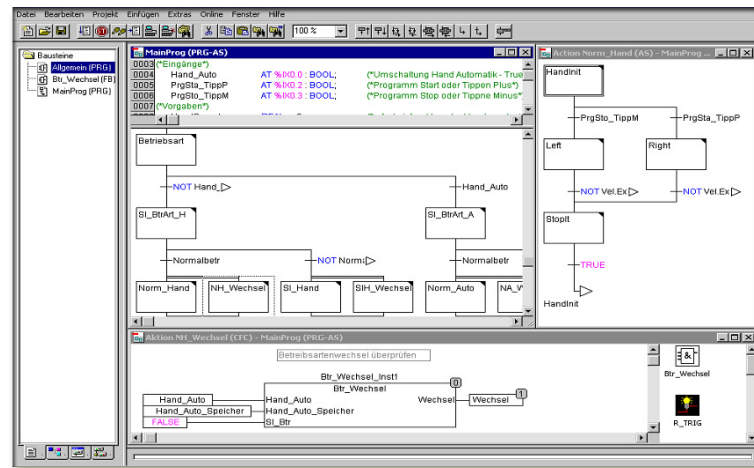
Standardized data types (BOOL, WORD, REAL,...)

Data types defined in terms of their meaning and possible values.

Symbolic identifiers

External data (I/Os) can be accessed by assigning symbolic names to the respective data segments. Thus it is only necessary to change the absolute address at one point in the program (declaration). The declaration displays the symbolic identifiers used, their addresses, data types and comments in an organized form.

Sequence language AS/SFC, function block language FUP/CFC



Predefined standard components (TON, TOFF, counter,...)

Components defined in terms of their meaning, possible values, and functionality.

Standard graphic representation

Standard representation of make contacts, break contacts, coils etc.

Text import/export function

Individual structure elements or entire projects can be published by exporting them as ASCII files. The ASCII export generates a text file that can be read and further edited with the text editor: The ASCII import option provides a way to read the data back into the programming system. As a consequence, configuration (declaration and implementation) that completely conforms to the EN 61131-3 standard is open for any system that itself supports this standard.

ProVi messages

Standard in IndraLogic for PLC diagnostic is the ProVi message. General malfunctions, messages and warnings as well as system error messages are displayed in the WinHMI.

PLCopen Function library

PLCopen is the first library for standardised Motion Control functions. Systems programmed under IEC 61131-3 can resort to this function library. IndraLogic supports PLCopen.



Common Tools

IndraStep – Step chain programming with IndraLogic

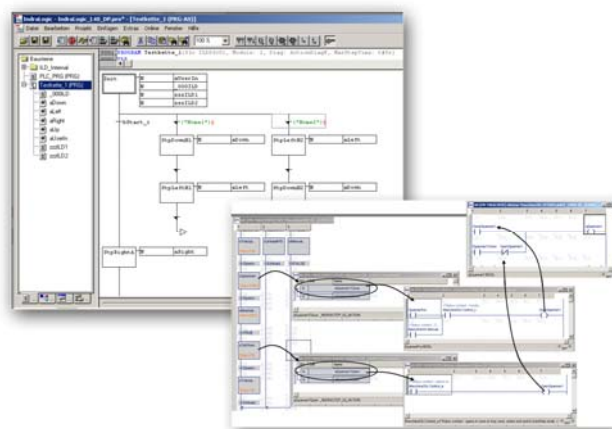
The general IndraStep programming relieved the PLC Programming of complex responsibilities while it makes possible the implementation of separate machine parts in module construction.

The Step chain programming with IndraLogic additional have the function:

- automatic identification and management of operation methods
- automatic diagnostics

That is, the IndraLogic step chain recognises and administers modes of operation like automatic, manual operation, jogging or semi automatic just like diagnosis messages themselves. So the programmer must not take care of the PLC implementation of the modes of operation and diagnoses, he only must put on the appropriate I/O-signals at the IndraStep chains.

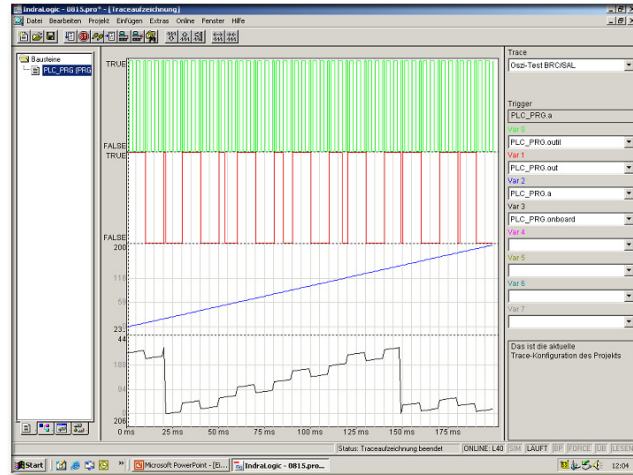
IndraStep automatically supports different diagnostics. Step chains errors, start conditions, missing basic positions and status messages belong to it. These messages are mostly automatically generated. Other messages can be released directly in the IndraStep program and be indicated on the HMI.



The criteria analysis is an add-on to the diagnostic messages of IndraWorks. No additional programme expenditure is necessary anymore.

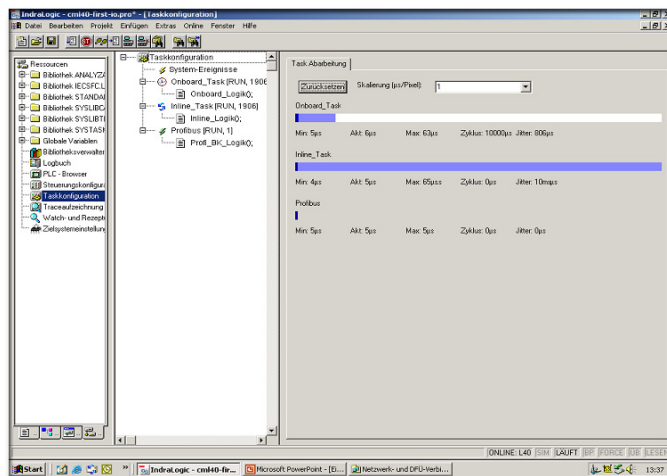
Logic Analyzer

The Logic Analyzer facilitates the implementation of the PLC programming. Here you can record trace screens directly with the IndraLogic function in 8 channels.



Visualisation of the task load

This function shows the task efficiency and helps during the project analysis in finding of weak spots in existing PLC projects.

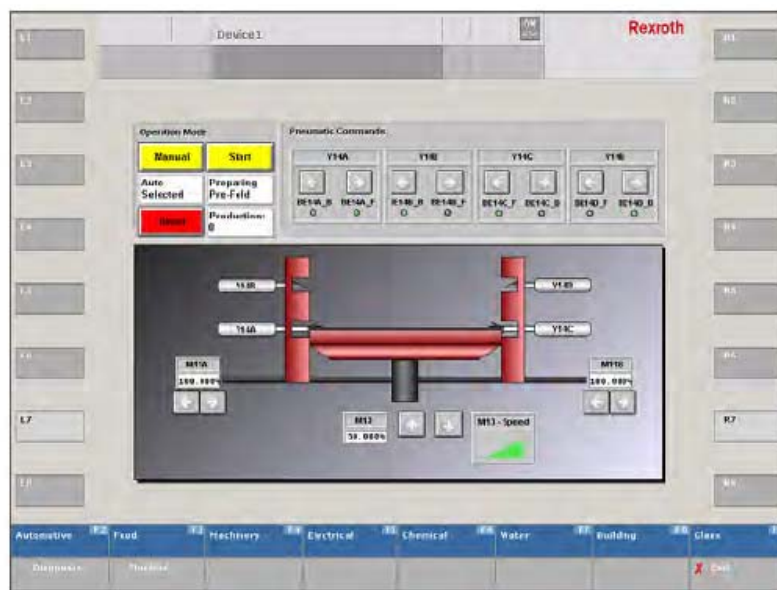


9. Software AddOns

9.1. WinStudio flexible and free HMI screen design

Using the add-on package WinStudio „Editor“, you can design the user interface without restrictions. The package includes a project planning version and a runtime component. The project planning version you must acquire for one-time but it is usable on multi-control units with Crypkey or USB / LPT –Dongle. The runtime component must acquire for each control unit separately.

The limit of 500 tags is reversed in opposition to the free MTX light version. The Versions are functional staged.

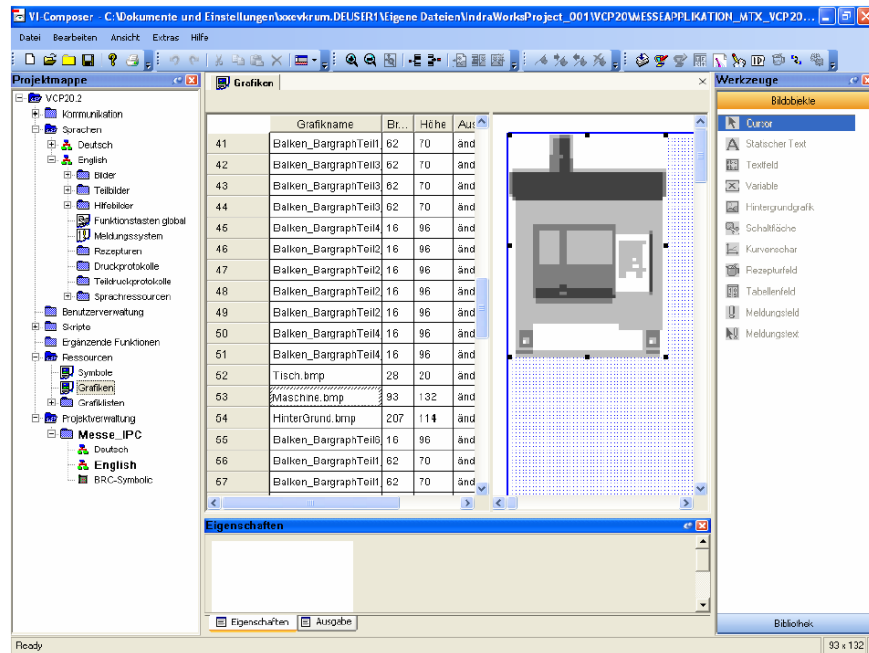


Normally screens created without high level language compose objects from the library database. Additionally the languages like Visual Studio 6 (VB6, C, C++) or Java get assisted.

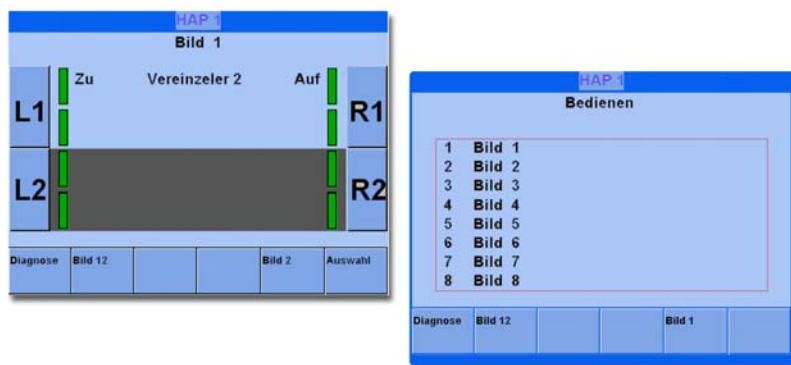
Furthermore there are additional functions integrated, like web-client-assistance (creating Web-Pages), client- functions via TCP/IP or an OPC server function to provide WinStudio-tags for third-party clients.

9.2. VI-Composer 2.0

The Software VI-Composer is for project planning the terminals VCP xx in a simple way. Programming knowledge is not necessary. VI-Composer can be started separately or via IndraWorks and included the programming surface and the download interface to transfer the data from PC to terminal. By using a VCP as a second operating terminal the VCP project data can be also indicated in the IndraWorks project tree. The archive function can be done with the whole IndraWorks project.



In the terminals you can call-up the projected masks and can be handled with menu functions during operation.



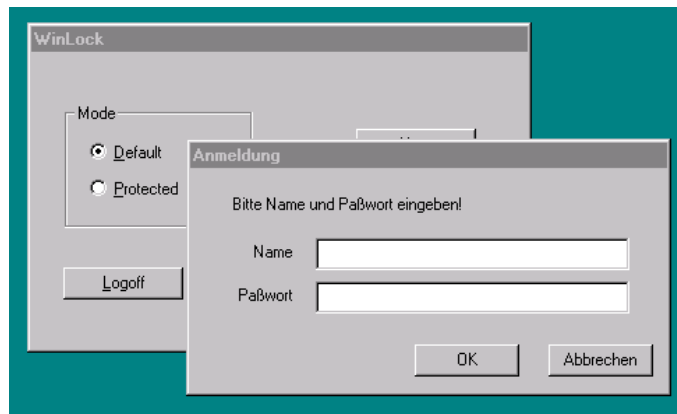
For the machine connection standard applications (components and documentation) are available. These can be made available if necessary.

more features:

- simple working with „drag & drop“
- direct writing and reading access to PLC variables
- integration of graphic and multilingual projects (asian marks)

9.3. WinLOC

WinLoc prohibits access of certain users to the Operating System. When activated it will limit access to only the programs that are called from the automatic "Startup" group. The Windows environment is inaccessible for unauthorised users. Special privileges are also required to end Windows.



If there are no user programs started i.e. when all programs are finished, the following possibilities are available to the user:

- switch from the 'protected' mode to the Windows Standard 'Default' mode.
- logon as a new Windows User i.e. 'Logoff'
- End Windows i.e. 'Shutdown'
- Re-start Windows "Restart"

To carry out any of the above functions the user must be authenticated. Thus with WinLOCK it is possible to have assigned defined Access Privilege for Users to respective machines.

9.4. I-Remote remote control software

With the open architecture and the I-Remote add-on Software you get a comfortable concept with fast reaction remote control during disturbance or machine start-up. Also simple problems as software updates are facilitated one more time. At last this leads to reduction in costs and productivity increase.

With the automation platform IndraWorks a system prepared for the far maintenance is delivered, on with low expenditure the Rexroth remote software I-Remote can be installed. All system components for data remote transmission as RAS or rather standard modem are already pre-installed on the system.



Performance:

- integrated WEB server on the control unit
- remote control via WEB browser per ActiveX Control (no client installation required!)
- high speed by means of data compression
- automatic screen updating
- Delta file transfer with split screen and drag-and-drop
- file synchronisation
- system snapshot
- audio support
- record/playback function for logging
- powerful script language for automated processes
- configurable security levels

Systems: MTX, IndraLogic



Service PC
 Windows XP
 Windows 2000
 Windows NT



PC- visualisation or PC-based
 control (Windows XP)

Systems: MTX, MLC, IndraLogic



VEP, VEH

visualisation or Embedded
 control(Windows CE)

Interfaces:

- connection possible via modem, network or serial line
- NetBEUI, TCP/IP and IPX support
- remote connection only required on the head control unit
- within the network the Ethernet connection can be used via TCP/IP

Hardware:

- tele-service is possible via VxP on PC control units
- choice of modem access (ISDN or analog) or direct Internet connection
- only one modem is required per network

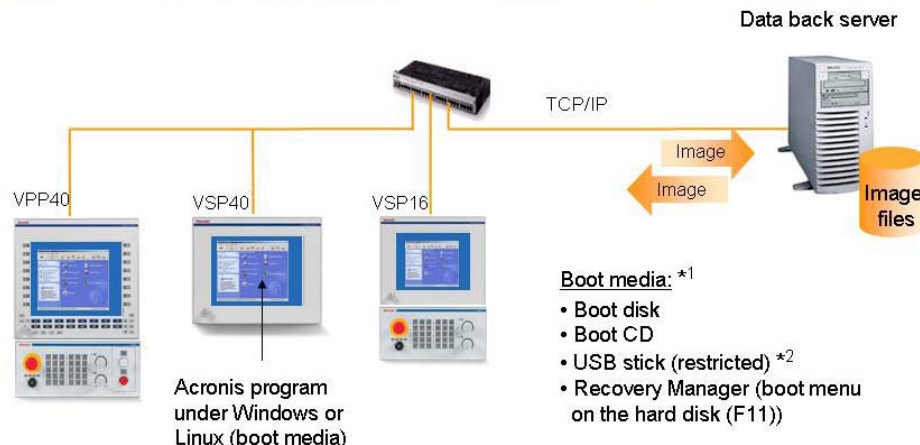
Software:

- modem access via Windows XP
- remote access via I-Remote Software

9.5. Rexroth data safety concept with Acronis

Acronis True Image is an add-on with backup functions for hard disk and partitions. It creates an accurate image of the hard disk or separate partitions for a complete Backup and allows the recovery of all contents, including the operating systems, all programs as well as the individual data and settings.

Image creation and hard-disk restoration with Acronis "True Image"



^{*1} External boot media are not included in the scope of delivery from Bosch Rexroth. Acronis (Windows program) provides an option for creating your own boot media.

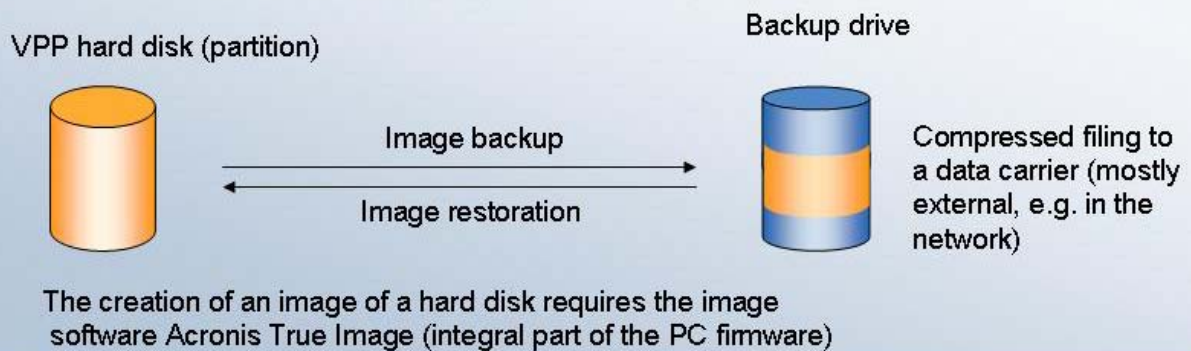
^{*2} Provided the USB stick can be booted (manufacturer-specific) and is detected by the PC bios.

In case of software or hardware problems Acronis True image reconstructs hard disks and partitions even if normal data saving software or even the operating system of the computer don't run any more.

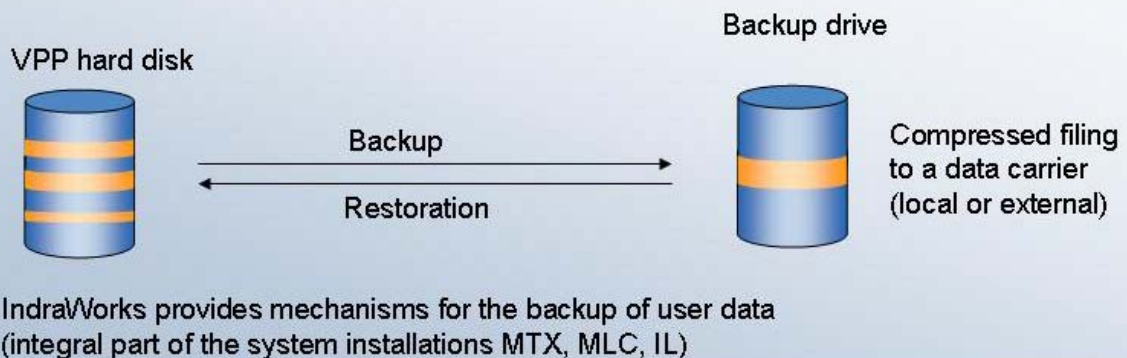
Protection of the user's data with net accessibility

Near the protection of complete hard disk partitions (images) you can also save only the user's data which are necessary for the operation of the control and are secured on the hard disk of the respective operating field. From there these can be secured with the Bosch Rexroth archiving tool about a parallel interface on an external disk drive or via Ethernet on a central Backup server. No additional interfaces or connections are necessary. This draft makes possible a uniform data saving for all components as well as a central data attitude and archiving.

Method 1: Creating an image (system backup)



Method 2: User data backup



10. Training

The training centre is located in Erbach, Germany. Training can as well be done globally around the world. Courses for maintenance personnel, machine operators, machine designers and engineers are conducted by our training personnel in special classrooms using the latest training equipment.



To better understand the Rexroth drive and control technology, the lessons are supplemented with practical exercises on the machines.

Please read on our latest training offers:

Info and announcement:

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