IndraMotion MLC
Motion, robot and logic control in one innovative system solution

IndraMotion MLC – easy, open and flexible

Create your cost-optimized and future-proof automation concepts. On the basis of global software standards and a wide range of functions for motion control, robot control and logic control, Rexroth's IndraMotion MLC provides you with all the freedom you expect of state-of-the-art machine automation.

Higher productivity, greater flexibility, increased profitability – the requirements made of production automation are increasing all the time. And with them the features required of today's automation systems:

▶ easy to integrate and to handle
▶ open engineering and communication
▶ flexible and versatile for different applications and topologies

IndraMotion MLC offers an integrated runtime system for the IndraControl L scalable embedded control platform and with the innovative IndraWorks engineering framework it sets new standards for a uniform and consistent engineering.

The IndraMotion MLC system software is comprised of the following main components:

▶ logic control – powerful, IEC-compliant PLC core module
▶ motion control – high-performance motion core module for all motion controller functions
▶ robot control – unique motion core module for multi-axis interpolation with ready-made kinematics and transformations
▶ technology functions – extensive process functions in the form of ready-to-use function libraries

▲ **IndraMotion MLC is an integrated solution which combines motion control, robot control and logic control.**

Easy

▶ automation thanks to the combination of motion control, robot control and logic control in a single scalable complete system

▶ engineering using the IndraWorks framework

▶ implementation of complex processes using technology functions

▶ integration of centralized or distributed topologies using scalable control hardware

Open

▶ thanks to consistent support of international industry standards

▶ logic programming based on full IEC 61131-3 compatibility

▶ for all motion control applications based on the open sercos and PLCopen standards

▶ in terms of integration thanks to support for a wide range of communication interfaces

Flexible

▶ for a wide range of applications and processes

▶ for complete solutions using scalable system components

▶ for architecture with open hardware and software interfaces

▶ in terms of functionalities for all synchronized machinery and plants offering maximum precision

Open system solution

The open IndraMotion MLC system solution combines motion control, robot control and logic control to create control architecture which is both integrated and powerful. In combination with the compact IndraControl L control platform you therefore have all the functions you need for your automation requirements – economical, consistent and transparent.

In the integrated IndraMotion MLC runtime system the functions for motion control and logic control are called up via the application programs in accordance with the open PLC standard IEC 61131-3.

The IndraWorks engineering framework therefore provides extensive function libraries and transparent data structures which make it simpler to implement even the most complex applications.

For 3D motion control you can count on ready-to-use kinematics and transformations for numerous applications provided by the innovative robot control.

In addition, the high-performance motion core module also guarantees that the system functions in all synchronized multi-axis applications are processed in realtime.

▶ **IndraMotion MLC provides extensive function libraries with standard and technology functions and therefore simplifies your applications.**

Standard and technology functions (variety)
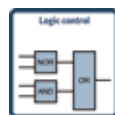
Logic control
in accordance with IEC 61131-3 with addition

Multi-axis synchronization
Electronic Line Shafting

Master axis link
Cross communication

GAT
Generic Application Template for modular machine software

Positioning

Cascading master axis

Electronic gear

Virtual master axes

Motion profile
Master axis based motion profiles

Electronic cams

Real master
Encoder axes

FlexProfile
Master axis based and time-based motion profiles

Benefits

▶ maximum performance thanks to open and integrated system architecture for motion control, logic control and robot control

▶ maximum synchronicity for drive functions thanks to the subordinate motion core module and sercos

▶ rapid implementation using extensive technology functions and function blocks

▶ increased productivity and reduced costs for automation with standardized interfaces

▶ investment certainty thanks to coordinated and maintenance-free system components

IndraMotion MLC is the complete and scalable automation system for all machines and plants synchronized with servo drives.

Extensive function libraries make it easier to use the wide range of system functions in the most diverse applications. Engineers now have at their disposal not just standardized PLCopen modules but extensive motion control and technology functions as well.

This makes the implementation of complex machine processes much simpler and also enables modular machine and control concepts to be developed. Being able to develop different alternatives for machines and plants more quickly gives you decisive market advantages.

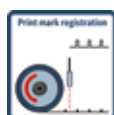|			
PLCopen Standardized functions for motion control	**Cross cutter**	**Coiler** Functions for dancer, diameter, tension	**Probe input Measuring wheel**
Robot control Editor and functions for 3D path movements	**Handling** Interpreter for PTP multi-axis coordination	**Flying shear**	**Two-point control**
Loop control	**Temperature control**	**Register control**	**PID control**
Tension control	**Programmable limit switches**	**Axis positioning** incremental, continuous	**CamLock** On-the-fly switching of cams
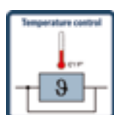
Easy engineering

With IndraMotion MLC and the engineering framework IndraWorks you can handle all your engineering tasks in a consistent software environment. IndraWorks is based on Microsoft.NET technology and includes all the tools you need for project planning, parameterization, programming, visualization and diagnostics.

Dialog-assisted agents with wide-ranging online assistance and tool tips accelerate the configuration and handling of the system's peripheral units. All types of axis are consistently parameterized by means of identical dialogs, with the project explorer providing the required overview and serving as the control center for all IndraMotion MLC devices and functions. The integrated CamBuilder tool provides the grafic generation of non-linear motional sequences. Thanks to the segmented profiles provided by the grafic editor for the innovative FlexProfile you will be able to enjoy undreamt of flexibility in your machine processes. Logic control conforms with PLC standards IEC 61131-3 and PLCopen offers more than 100 function blocks for programming your applications. To implement 3D motion control, robot control provides the user-oriented language RCL[1] in IndraWorks. All IndraMotion MLC system information is available in a clear overview at the press of a button for diagnostics purposes. The open support of FDT/DTM[2] enables you to parameterize devices from third-party manufacturers directly from IndraWorks.

Benefits
- ▶ consistent engineering for machines and plants
- ▶ all tools for project planning, commissioning and diagnostics are integrated and have central data storage
- ▶ intuitive servicing through dialog-assisted agents and wide-ranging online assistance
- ▶ PLC programming in conformity with standard IEC 61131-3
- ▶ extensive function libraries for all applications
- ▶ Generic Application Template for modular machine software
- ▶ RCL[1] for coordinated 3D motion
- ▶ openness thanks to standard FDT/DTM[2]

[1] Robot Control Language
[2] Field Device Tool/Device Type Manager

Functions

- ▶ multi-project management
- ▶ configuration Wizards
- ▶ motion control parameter set-up
- ▶ tools for logic control and robot control
- ▶ HMI project planning
- ▶ cam editor
- ▶ machine operation
- ▶ peripheral unit configurators
- ▶ communication
- ▶ diagnostics
- ▶ user management
- ▶ firmware management

▲ **Rexroth is an active member of the PLCopen organization.**

◀ **IndraWorks integrates all the tools for holistic engineering in a consistent software framework.**
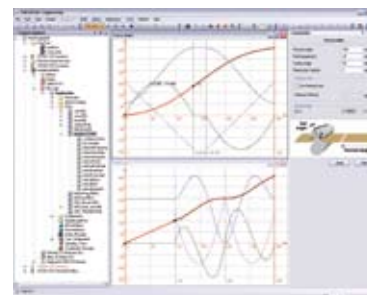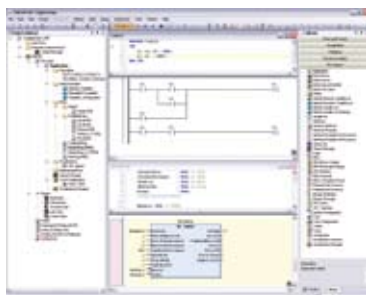
Flexible automation

IndraMotion MLC provides the guarantee of unique flexibility when it comes to integration in a wide diversity of machines, plants and processes. Thanks to its standardized hardware and software interfaces the scalable and compact IndraControl L hardware platform offers you a world of freedom for central or distributed automation topologies.

With sercos, the international standard in fieldbus communication, you can connect your controllers and drives transparently and consistently. Since you can expand larger plants and machines with flexibility by adding more controllers via Ethernet and the sercos master axes link, you have guaranteed investment protection and assurance for the future. In addition to sercos, open interfaces such as PROFIBUS, PROFINET and EtherNet/IP support integration into heterogeneous networks and provide connectivity to peripherals supplied by different manufacturers. This reduces the cost and effort you have to expend on integration, testing, troubleshooting and maintenance in the overall automation of your applications. Extensive and open software libraries with ready-to-use technology func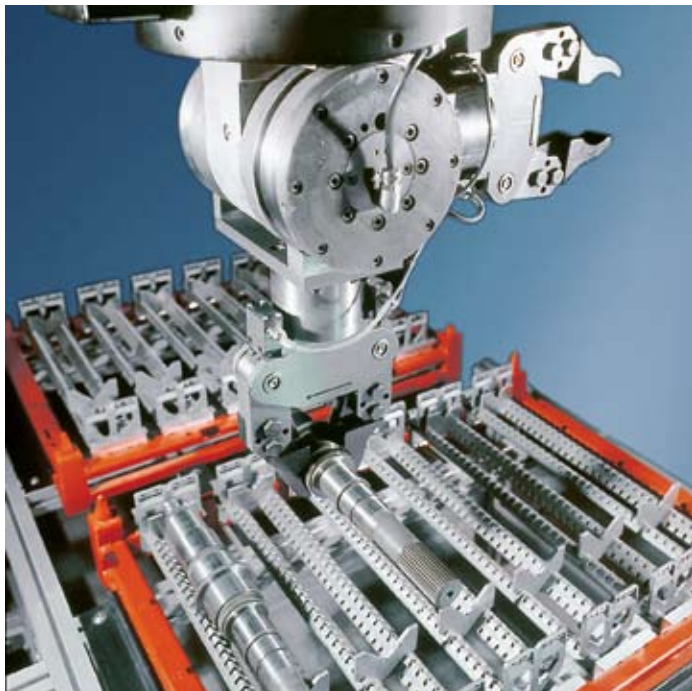tions and the innovative "Generic Application Template" enable the machine automation to be implemented and adapted to your specific requirements with ease. Thanks to its open system architecture, IndraMotion MLC is the ideal solution for all production machines in processes such as: Packaging, Printing, Processing, Metal Forming, Mounting and Handling.

Benefits
▶ flexible system software for all factory automation applications
▶ consistent control system architecture with scalable system components
▶ rapid implementation of a wide range of processes, machines and interlinked plants
▶ ready-to-use technology modules for demanding applications
▶ networking couldn't be easier with sercos and Industrial Ethernet
▶ open integration via extensive range of interfaces for communication and technologies

Control system, HMI, engineering

Ethernet-based communication between control systems, HMI and higher-level systems via Ethernet.

Control units

IndraControl L used as a central system component links up in a network with other automation units via Ethernet and fieldbus. I/O units are connected on a centralized basis.

HMI and I/O

Ideally, distributed I/O peripherals are connected via sercos. Ethernet TCP/IP or fieldbus are the preferred HMI connectivity solutions.

Drives

Drives synchronized via sercos offer maximum performance and dynamics.

The solution adapted for your application

User programs + Function libraries + Technology modules ▶ Rexroth Compact Flash

Using IndraMotion MLC, your application-specific solutions are created from the ideal combination of user programs, function libraries and ready-to-use technology functions. This simplifies your machine automation and reduces the overall costs in engineering.

▼ **The modular system architecture of IndraMotion MLC and the standardized interfaces provide guaranteed openness and maximum flexibility for a wide diversity of applications.**
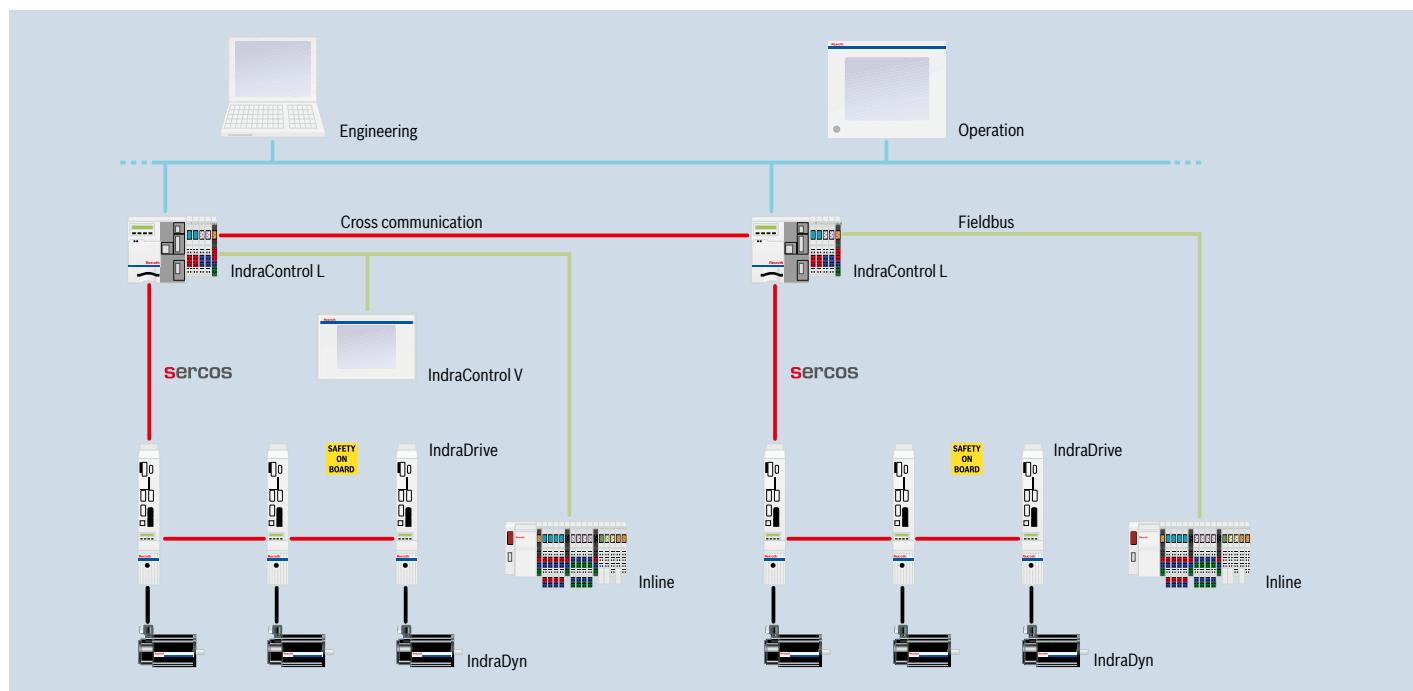
Scalable system components for flexible automation

IndraDrive and IndraDyn – scalable drive platform

▶ compact drive converters and modular inverters for all applications
▶ scalable power components with continuous ratings of up to 120 kW
▶ scalable control components for cost-effective complete solutions
▶ highest performance and precision for all multi-axis applications
▶ safety-on-board complying with EN ISO 13849-1, Category 3 PL d and EN 62061 SIL 2 for STO and SafeMotion
▶ integrated line contactor and braking resistor
▶ user-friendly servicing and maintenance

IndraControl L – controller-based control platform

▶ scalable hardware platform for central and distributed topologies
▶ highest performance in ultra-compact design
▶ maintenance-free design without fans, hard disk, battery
▶ large memory and Compact Flash for plug-in memory medium
▶ 8 rapid I/O on board
▶ integrated standard interfaces such as sercos III and Ethernet TCP/IP
▶ local connection of I/O Inline family modules without auxiliary couplers
▶ easy expansion using function modules for communication and technologies

Inline – flexible I/O system in IP20

▶ scalable I/O system for central or distributed connection
▶ maximum selectivity of the digital modules with 2, 3 or 4-wire technology
▶ cost-effective solutions with block I/O modules
▶ wide portfolio with analog, function, relay and feeder terminals
▶ toolless assembly and space-saving design
▶ flexible connection through permanent wiring and internal voltage supply
▶ fieldbus couplers for sercos III and more fielbusses

IndraDrive and IndraDyn

IndraControl L

Inline

IndraControl S67 – the versatile IP67 I/O system
▶ modular, ergonomic I/O system for distributed topologies
▶ broad portfolio of I/O and technology modules and field-bus couplers
▶ compact IP 67 enclosure
▶ latest hardware design supports maximum sensor and actuator signal processing speeds
▶ threaded or DIN rail mounting
▶ M8 and M12 signal line terminals
▶ prefabricated fieldbus, power and subbus cables

IndraControl S67

IndraControl VCP, VCH, VEP and VEH – convenient HMI
▶ economic HMI solutions for all applications
▶ controller-based IndraControl VCP user terminals – graphics-capable versions with keys and touch screen, with displays ranging from 7.6 to 26.4 cm (3" to 10.4") in size
▶ IndraControl VEP embedded PC terminals with touch screens, with displays ranging from 21.3 to 38.1 cm (8.4." to 15") in size
▶ IndraControl VCH and VEH handheld operator control units for mobile use
▶ open interfaces for Ethernet and fielbus (subject to type)
▶ ergonomic software tools for the rapid creation of screen masks

IndraControl VCP, VCH, VEP and VEH

IndraControl VPP, VSP, VSB, VPB und VDP – powerful industrial PC
▶ scalable solutions for IPC-based visualization
▶ standard and high-end versions with state-of-the-art processor technology
▶ wide range of panel PC and control cabinet PC with remote displays as well as complete PC HMI
▶ key or touch screen variants, with displays ranging up to 48.3 cm (19")
▶ extensive range of accessories such as terminals, membrane keyboards and UPS
▶ intuitive project planning using the IndraWorks engineering framework and integrated WinStudio tool

IndraControl VPP and VSP
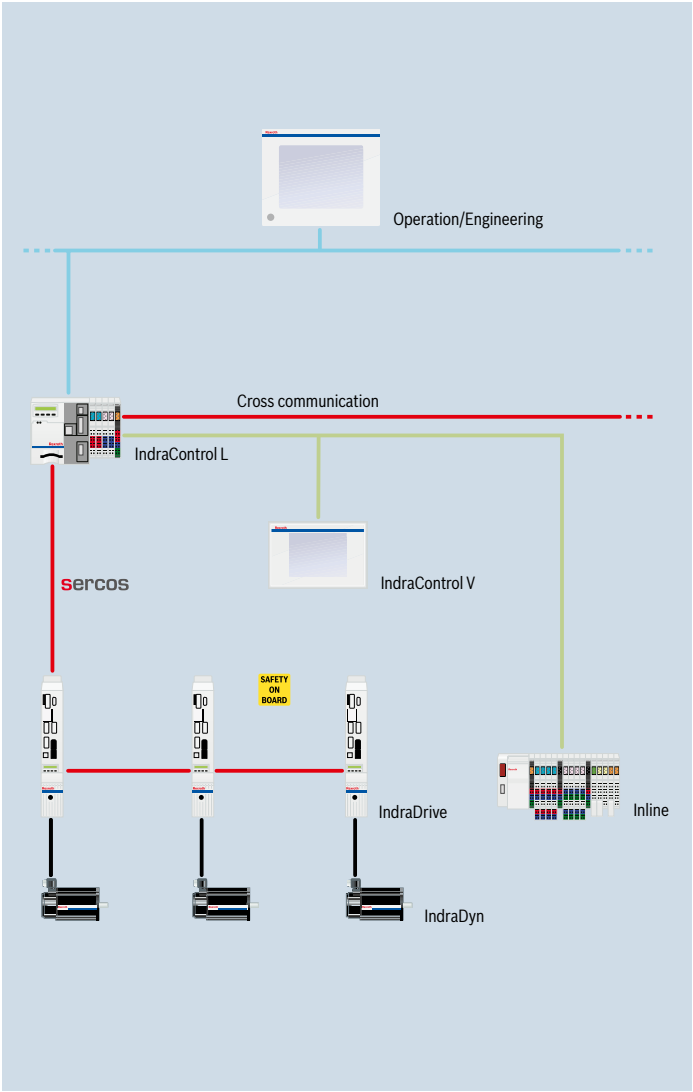
Software	
Engineering framework	IndraWorks
Control components	
Control hardware	IndraControl L25[2]
	IndraControl L40[1]
	IndraControl L45[2]
	IndraControl L65
Function modules	Cross communication/sercos II
	sercos III
	PROFIBUS master[1]
	DeviceNet master[1]
	Real-time Ethernet/PROFIBUS[2]
	Programmable limit switches
	Fast I/O
	SRAM
HMI/PC technology	
Visualization devices, controller-based	IndraControl VCP, VCH
Visualization devices, embedded PC	IndraControl VEP
Visualization devices, standard industrial PC	IndraControl VSP
Visualization devices high-end industrial PC	IndraControl VPP
Standard interfaces	Ethernet TCP/IP, PROFIBUS
I/O modules	
Centralized and distributed input/output modules in IP20	Inline
Distributed input/output modules in IP67	IndraControl S67
Standard interface	PROFIBUS, sercos III
Drives and motors	
Drive system	IndraDrive and IndraDyn
Standard interface	sercos II (IndraControl L40)
	sercos III (IndraControl L25, L45, L65)

[1] based on the PLC kernel of the 1st generation

[2] based on the PLC kernel of the 2nd generation

1	Drive system		1G[1]		2G[2]		
			L40	L65	L25	L45	L65
1.1	**IndraDrive**	BASIC and ADVANCED with MPB/MPH/MPC firmware, dual-axis control units with MPD firmware	●	●	●	●	●
1.2	**IndraDrive Mi**	With MPD firmware	●	●	●	●	●
1.3	**IndraDrive Cs**		–	–	●	●	●
1.4	**EcoDrive Cs**		●	●	●	●	●
1.5	**sercos Pack-Profile**		●	●	●	●	●
1.6	**HNC100.3**	Hydraulic drive	●	●	●	●	●
1.7	**Master communication**						
1.7.1	sercos III		○	●	●	●	●
1.7.2	sercos II		●	○	○	○	○
1.7.3	Min. sercos cycle time		1 ms	1 ms	1 ms	0,5 ms	0,25 ms
1.7.4	Min. motion cycle time		1 ms	1 ms	2 ms	1 ms	1 ms
2	**IndraControl L control**		1G[1]		2G[2]		
			L40	L65	L25	L45	L65
2.1	**Interfaces**						
2.1.1	sercos III	On board	–	●	●	●	●
2.1.2	sercos II	On board	●	–	–	–	–
2.1.3	PROFIBUS master	On board	●	●	–	●	●
2.1.4	PROFIBUS slave	On board	●	–	–	●	●
2.1.5	RS232	On board	●	–	–	–	–
2.1.6	Ethernet 10/100 MBit/s	On board	●	●	●	●	●
2.2	**On board diagnosis and settings**						
2.2.1	Status display (boot, sercos, test)	Display	●	●	●	●	●
2.2.2	Errors, warnings, messages, system reset	Display, keys	●	●	●	●	●
2.2.3	Ethernet settings (IP address)	Display, keys	●	●	●	●	●
2.2.4	Voltage monitoring, watchdog	LED	●	●	●	●	●
2.2.5	Relay output (ready for operation)	LED	●	●	●	●	●
2.3	**Function modules**						
2.3.1	Max. number		4	4	2	4	4
2.3.2	sercos III/cross communication of master axes (ELS)	Function module	○	○	○	○	○
2.3.3	sercos II/cross communication of master axes (ELS)	Function module	○	○	○	○	○
2.3.4	PROFIBUS master	Function module	○	○	–	–	–
2.3.5	Real-time Ethernet/PROFIBUS master/slave	Function module	–	–	●	●	●

● Default   ▼ In preparation   ○ Optional   – Not available

[1] based on the PLC kernel of the 1st generation

[2] based on the PLC kernel of the 2nd generation

2	**IndraControl L control**		1G[1]		2G[2]		
			L40	**L65**	**L25**	**L45**	**L65**
2.3.6	DeviceNet master	Function module	O	O	–	–	–
2.3.7	Programmable limit switch	Function module	O	O	O	O	O
2.3.8	SRAM	Function module for robot control	O	O	O	O	O
2.3.9	FAST I/O	Function module	O	O	O	O	O
3	**Inputs and outputs**		**1G[1]**		**2G[2]**		
			L40	**L65**	**L25**	**L45**	**L65**
3.1	**On board**						
3.1.1	High-speed digital inputs	Interrupt capability, typ. 50 μs	8	8	–	8	8
3.1.2	High-speed digital outputs	0.5 A, typ. 500 μs	8	8	–	8	8
3.2	**Local**						
3.2.1	Function module FAST I/O – high-speed digital inputs	Interrupt capability, typ. 40 μs	8/16	8/16	8/16	8/16	8/16
3.2.2	Function module FAST I/O – high-speed digital outputs	Max. 0,5 A, typ. 70 μs	8/16	8/16	8/16	8/16	8/16
3.2.3	Inline (digital, analog, relay, technology)	64 bytes, max. 512 I/O	O	O	O	O	O
3.3	**Distributed via fieldbus**						
3.3.1	Inline (IP20)						
3.3.1.1	sercos III	On board	–	–	●	●	●
3.3.1.2	PROFIBUS	On board/function module	O	O	O	●	●
3.3.1.3	DeviceNet	Function module	O	O	–	–	–
3.3.2	IndraControl S67 (IP67)						
3.3.2.1	sercos III	On board/function module	–	–	▼	▼	▼
3.3.2.2	PROFIBUS	On board/function module	O	O	O	▼	▼
4	**HMI**		**1G[1]**		**2G[2]**		
			L40	**L65**	**L25**	**L45**	**L65**
4.1	**IndraControl VCP (controller-based)**						
4.1.1	Ethernet		O	O	O	O	O
4.1.2	PROFIBUS		O	O	O	O	O
4.1.3	DeviceNet		O	O	–	–	–
4.2	**IndraControl VEP (embedded PC)**	Ethernet TCP/IP, OPC	O	O	O	O	O
4.3	**IndraControl VSP, VPP, VSB, VPB, VDP (industrial PC)**	Ethernet TCP/IP, OPC	O	O	O	O	O
5	**Communication interfaces**		**1G[1]**		**2G[2]**		
			L40	**L65**	**L25**	**L45**	**L65**
5.1	**sercos III (motion and peripherals)**	Real-time Ethernet bus	O	●	●	●	●
5.2	**sercos II**	Real-time motion bus	●	O	O	O	O
5.3	**Master axis grouping**						
5.3.1	sercos III	C2C, cross communication	O	O	O	O	O
5.3.2	sercos II		O	O	O	O	O
5.3.3	Number of controls in the group		64	64	64	64	64
5.4	**Control grouping**	Ethernet TCP/UDP/IP	●	●	●	●	●
5.5	**PROFIBUS-V1 master/slave**	E.g. peripherals, HMI	●/●	●/–	O/O	●/●	●/●
5.6	**DeviceNet master (explicit/implicit messaging)**	E.g. peripherals, HMI	O	O	–	–	–
5.7	**Ethernet TCP/IP**	E.g. HMI, engineering	●	●	●	●	●

● Default   ▼ In preparation   O Optional   – Not available

[1] based on the PLC kernel of the 1st generation

[2] based on the PLC kernel of the 2nd generation

5	Communication interfaces		1G[1]		2G[2]		
			L40	L65	L25	L45	L65
5.8	PROFINET IO controller/device		–/–	–/–	O/O	O/O	O/O
5.9	EtherNet/IP scanner/adapter		–/●	–/●	O/O	O/O	O/O

6	Firmware functions		1G[1]		2G[2]		
			L40	L65	L25	L45	L65
6.1	**Runtime system**	Integrated motion logic system	●	●	●	●	●
6.2	**Logic control**						
6.2.1	IndraLogic 1G kernel	Conforming with IEC 61131-3	●	●	–	–	–
6.2.2	IndraLogic 2G kernel	Conforming with IEC 61131-3 with extensions	–	–	●	●	●
6.2.3	Freely configurable tasks	Cyclic, free-running, event-controlled	8	8	8	8	8
6.2.4	External event tasks	Synchronous with sercos cycle	1	1	1	1	1
		System-specific (e.g. error reaction)	1	1	1	1	1
6.2.5	sercos communication cycle time setting						
6.2.5.1	sercos cycle		●	●	●	●	●
6.2.5.2	Motion cycle		–	–	●	●	●
6.2.6	Program organization	According to IEC 61131-3	●	●	●	●	●
6.2.7	Motion commands according to PLCopen (choice)	MC_MoveAbsolute	●	●	●	●	●
		MC_MoveRelative	●	●	●	●	●
		MC_MoveVelocity	●	●	●	●	●
		MC_Home	●	●	●	●	●
		MC_CamIn, MC_CamOut	●	●	●	●	●
		MC_GearIn, MC_GearOut	●	●	●	●	●
6.2.8	Extended motion commands (choice)	MB_ReadListParameter	●	●	●	●	●
		MB_WriteListParameter	●	●	●	●	●
		MB_GearInPos	●	●	●	●	●
		ML_PhasingSlave	●	●	●	●	●
		MB_ClearAxisError	●	●	●	●	●
		MB_ClearSystemError	●	●	●	●	●
6.3	**Motion control**						
6.3.1	Number of axes	Virtual, real, encoder, grouping	32	64	16	32	64
6.3.2	Synchronization (ELS – electronic line shaft)	Multi-axes					
6.3.2.1	Virtual axes	Virtual masters	●	●	●	●	●
6.3.2.2	Encoder axes	Real masters	●	●	●	●	●
6.3.2.3	Real axes	Servo drives	●	●	●	●	●
6.3.2.4	Grouped axes	Cross communication	●	●	●	●	●
6.3.2.5	Dynamic synchronization		●	●	●	●	●
6.3.2.6	Master axis grouping		●	●	●	●	●
6.3.2.7	Master axis cascading		●	●	●	●	●
6.3.3	Positioning	Single-axis	●	●	●	●	●
6.3.4	Electronic gears		●	●	●	●	●
6.3.5	Electronic cams						
6.3.5.1	Intermediate point tables (in the drive)	Max. 1,024 intermediate points	4	4	4	4	4
6.3.5.2	Electronic motion profile (in the control)	Motion profiles, max. 16 segments	2	2	2	2	2
6.3.5.3	FlexProfile (in the control)	Motion profiles, master-/time-based, max. 16 segments	4	4	4	4	4

● Default   ▼ In preparation   O Optional   – Not available

[1] based on the PLC kernel of the 1st generation

[2] based on the PLC kernel of the 2nd generation

6	**Firmware functions**		1G[1]		2G[2]		
			L40	L65	L25	L45	L65
6.3.6	Diagnostics	Status, warnings, errors					
6.3.6.1	Function blocks	Software	●	●	●	●	●
6.3.6.2	Parameter access to diagnostics memory	Software	●	●	●	●	●
6.3.6.3	Locally via display	Control hardware	●	●	●	●	●
6.3.6.4	Axis monitoring	E.g. capacity, encoders, limit values	●	●	●	●	●
6.3.6.5	Diagnostics memory	64 kB, max. 999 messages	●	●	●	●	●
6.4	**Robot control**						
6.4.1	Number of axes	Incl. auxiliary axes	16	16	16	16	16
6.4.2	Multi-axis kinematics		16	16	16	16	16
6.4.3	Kinematics transformations		●	●	●	●	●
6.4.4	LINEAR, CIRCULAR, PTP types of interpolation		●	●	●	●	●
6.4.5	Configurable block transitions		●	●	●	●	●
6.4.6	Override		●	●	●	●	●
6.4.7	Teach-in function		●	●	●	●	●
6.4.8	Approximate positioning		●	●	●	●	●
6.4.9	Late blending		–	–	●	●	●
6.4.10	Belt synchronization		●	●	●	●	●
6.4.11	Jogging/single step		–	–	●	●	●
6.4.12	Speed limitation	For path and axes	●	●	●	●	●
6.4.13	Acceleration limitation	For path and axes	●	●	●	●	●
6.4.14	Safety zones		●	●	●	●	●
6.5	**Technology (choice)**						
6.5.1	Register control		●	●	●	●	●
6.5.2	Flying cut-off		●	●	●	●	●
6.5.3	Measuring wheel		●	●	●	●	●
6.5.4	Probe		●	●	●	●	●
6.5.5	Programmable limit switch		●	●	●	●	●
6.5.6	Cross cutter		●	●	●	●	●
6.5.7	Sag control		●	●	●	●	●
6.5.8	Winder		●	●	●	●	●
6.5.9	Tension control		●	●	●	●	●
6.6	IndraMotion service tool	Web-based engineering	–	–	●	●	●

● Default ▼ In preparation ○ Optional – Not available

[1] based on the PLC kernel of the 1st generation

[2] based on the PLC kernel of the 2nd generation

7	Engineering framework IndraWorks		1G[1]		2G[2]		
			L40	L65	L25	L45	L65
7.1	**General information**						
7.1.1	Multilinguality of framework				●		
7.1.2	Multilinguality of projects				●		
7.1.3	Export/import of texts of the PLC projects				●		
7.1.4	Firmware management				●		
7.1.5	Deactivating/parking drives in the project				●		
7.1.6	Automatic detection of drives				●		
7.1.7	Switching between online and offline modes				●		
7.1.8	Automatic system monitoring	Display of messages and errors			●		
7.1.9	Project comparison				●		
7.1.10	Online change				●		
7.1.11	Search/replace				●		
7.1.12	Cross references				●		
7.1.13	Represents of the project as a tree structure				●		
7.1.14	Log file				●		
7.2	**Version control management (VCS)**						
7.2.1	Version management				●		
7.2.2	Multi-user interface				●		
7.3	**Configuration and project planning**						
7.3.1	System configurator				●		
7.3.2	Device library for controls, drives, visualization, peripherals				●		
7.3.3	Assistants for commissioning of controls and drives				●		
7.3.4	Project navigator				●		
7.3.5	I/O configurator				●		
7.3.6	Fieldbus configurator				●		
7.3.7	Project archiving				●		
7.3.8	Parameter monitor for controls and drives				●		
7.3.9	Offline parameterization of controls and drives				●		
7.3.10	FlexProfile configurator				●		
7.3.11	Cams editor						
7.3.11.1	Graphical creation of cams				●		
7.3.11.2	Kinematic laws according to VDI 2143				●		
7.3.11.3	Interpolation point calculation	Linear, square, sinusoidal, polynomial up to 8th degree, trapezoidal			●		
7.3.11.4	Analytic cams for motion profiles				●		
7.3.11.5	Wizards for specific applications				●		
7.3.11.6	Import/export				●		
7.3.11.7	Support of FlexProfile				●		
7.3.12	Cinematics (robot control)				●		
7.3.13	Extended project handling				●		
7.4	**Programming**						
7.4.1	Graphical editors						
7.4.1.1	SFC – Sequential Function Chart	Time monitoring per step			●		
		Error analysis			●		
		Control flags			●		

● Default   ▼ In preparation   O Optional   – Not available

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7	Engineering framework IndraWorks		1G[1]		2G[2]		
			L40	L65	L25	L45	L65
7.4	**Programming**						
7.4.1.2	LD – Ladder Diagram				●		
7.4.1.3	FBD – Function Block Diagram				●		
7.4.1.4	CFC – Continuous Function Chart	Auto-routing of the connections			●		
		Possibility of macros to structure large networks			●		
7.4.2	Textual editors						
7.4.2.1	IL – Instruction List				●		
7.4.2.2	ST – Structured Text				●		
7.4.2.3	RCL – Robot Control Language	Sequential motion programming			●		
7.4.3	Language elements						
7.4.3.1	Operators	According to IEC 61131-3			●		
7.4.3.2	Operands	Constants, variables, addresses, functions			●		
7.4.3.3	Bit access				●		
7.4.3.4	Typed pointers				●		
7.4.3.5	Object-oriented language extension				●		
7.4.4	Data types						
7.4.4.1	Standard according to IEC 61131-3	Incl. LREAL			●		
7.4.4.2	User-defined: arrays, structures, enumeration, alias, pointer				●		
7.4.4.3	Robot control	POINT, JC_POINT, BELT, TEXT, ARRAY, WC_FRAME, FILE			●		
7.4.5	Special editor features						
7.4.5.1	Syntax coloring				●		
7.4.5.2	Semantic coloring				●		
7.4.5.3	Multiple undo/redo				●		
7.4.5.4	Context-sensitive input help				●		
7.4.5.5	Context-sensitive menus				●		
7.4.5.6	Auto-declaration				●		
7.4.5.7	Auto-declaration with type identification				●		
7.4.5.8	Name spaces				●		
7.4.5.9	Auto-complete (IntelliSens)	Structures, functions, function blocks			●		
7.4.5.10	Pre compile for permanent syntax check				●		
7.4.5.11	Folding	In/out-fading of program blocks and structures			●		
7.4.5.12	Extended searching and replacing				●		
7.4.5.13	Smart coding	Auto-complete and auto-format			●		
7.4.6	Library management						
7.4.6.1	Managed libraries	Several library versions in one project			●		
7.4.6.2	License management				●		
7.4.7	Libraries (choice)						
7.4.7.1	System functions				●		
7.4.7.2	Communication				●		
7.4.7.3	GAT/GATcompact – Generic Application Template	Modular project template for machine control			●		
7.4.7.4	PLCopen (see Section 6.2)				●		
7.4.7.5	Robot control				●		
7.4.7.6	Technology (see Section 6.5)				●		

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7	**Engineering framework IndraWorks**		1G[1]		2G[2]		
			L40	L65	L25	L45	L65
7.4.8	Offline programming				●		
7.4.9	Automatic variable declaration of the system components				●		
7.4.10	Structure for access to control data				●		
7.4.11	Structure for access to axis data				●		
7.4.12	Structure for access to kinematic data				●		
7.4.13	Structure for access to programmable limit switch data				●		
7.4.14	Structure for access to probe data				●		
7.4.15	Structure for access to oscilloscope data				●		
7.5	**Online debugging and commissioning**						
7.5.1	Diagnostics						
7.5.1.1	Real-time logic analyzer				●		
7.5.1.2	Oscilloscope function	Graphical output with zoom function			●		
		Display of signal values of drives			●		
		Scaling			●		
		Measuring with/without trigger			●		
7.5.2	Debugging						
7.5.2.1	Monitoring of variables	Trace			●		
7.5.2.2	Forcing of variables and variable sets				●		
7.5.2.3	Project debugging	Incl. robot control			●		
7.5.2.4	Power flow	Sequential check			●		
7.5.2.5	Online exchange of function blocks				●		
7.5.2.6	Offline simulation of PLC variables				●		
7.5.2.7	Parameter monitor				●		
7.5.2.8	Writing of variables				●		
7.5.2.9	Breakpoint				●		
7.5.2.10	Single step operation				●		
7.5.2.11	Single cycle operation				●		
7.5.2.12	Sequence control				●		

● Default   ▼ In preparation   O Optional   – Not available

[1] based on the PLC kernel of the 1st generation

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