Flexium systems

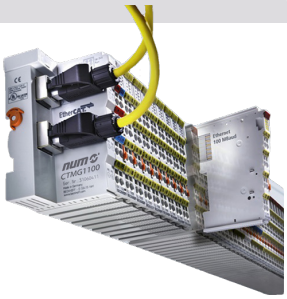
Installation manual

M00009EN-07

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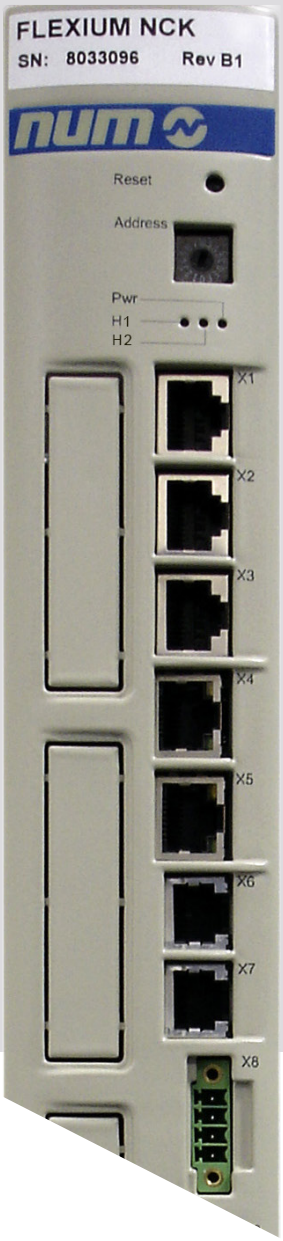












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1 Foreword

1.1 Use of the manual

This manual is for use by qualified personnel only.
To reduce the risk due to an improper use of the product, do not perform any servicing other than that contained in this manual unless you are qualified to do so.

To ensure proper use of these products, please always read this User's manual carefully and retain for future reference. Should the unit require maintenance, please contact a NUM authorized service center only.

This description is only intended for the use of trained specialists in control and automation technology who are familiar with the applicable national standards. It is essential that the following notes and explanations are followed when installing and commissioning these components.

The responsible staff must ensure that the application or use of the products described satisfy all the requirements for safety, including all the relevant laws, regulations, guidelines and standards.

1.1.1 Disclaimer

The documentation has been prepared with care. The products described are, however, constantly under development. For that reason the documentation is not in every case checked for consistency with performance data, standards or other characteristics.

In the event that it contains technical or editorial errors, we retain the right to make alterations at any time and without warning.
No claims for the modification of products that have already been supplied may be made on the basis of the data, diagrams and descriptions in this documentation.

1.2 Use of symbols in the manual

Symbol	Meaning of the symbol
	Important notes on product use.
	You may find this symbol whenever a wrong operation may damage the product.

1.3 Document revisions

Date	Index	Reason for revision	See chapter
11 - 2008	00	Document creation	-
01 - 2009	01	General update due to internal summary links.	-
03 - 2009	02	DPLC, FS152i, FS152 descriptions and connections	-
06 - 2013	03	All-in-one Flexium installation manual creation, moreover this manual introduces the new nPad Mobile Operator Panel, new Industrial Box PC P1 and P2. This manual cover the installation and connections of all Flexium system devices as for Flexium NCK, FS152i PC panels, FS152 Passive panels, Industrial Box PC P1 and P2, MP04 Machine panels, nPad Mobile Operator Panel, Portable Handwheel HBA-X. Therefore some manuals as M00011, M00014, M00015 have not to be used anymore. Please also refer to the next page for the main contents of the manual.	-
xx - 2014	04	Internal use revision.	-
05 - 2016	05	All-in-one Flexium and Flexium+ installation manual. Moreover this manual introduces the following sections: - New FS122 panel. - New FS153i panel. - New FS153 panel. - New FS192i panel. - New FS192L panel. - New USB QWERTY keyboard (Horizontal and Vertical external keyboard). - New MP05 Panel. - New MP06 panel. - New MP08 panel. - New NUM Industrial Box PC. - New Handwheel connection diagrams. **- FS152 and FS152i panels "removed".** **Please refer to Flexium Installation manual M00009EN-04**	-
07 - 2017	06	- New FS153i, FS154i and FS192i Warning for Machine builder and end user - New section FS154i panel. - New MP05 (new configurable buttons) - New MP06/MP08 EtherCAT LEDs RUN and ERROR description - New MP06 / 8 Potentiometer Tuning procedure - New Box PC Warning for Machine builder and end user - New Box PC P1 G4. - New nPad Wireless Mobile Operator terminal presentation. - New Watchdog diagram . - New CAN LEDs status.. - New nPad Wireless Mobile Operator panel connections. - New section NUMSmartBackup.	4 4.2 5.2 5.3.6 5.3.8 6.1 6.2 8 9.4.6 9.5.10 9.6.7 9.18 10
08 - 2023	07	- System component update - Removed the FS153i operator panel with integrated iPC - Replacement of the FS154i ordering code table - Replacement of the general characteristics table - New chapter FS184i display - New chapter FS194i Operator panels with integrated iPC - Update of the FXPC194CN2Hxx00 table - New chapter FS244i P2 operator panels with integrated iPC - New chapter How to calibrate the touch screen in Windows 10, 8.1, 8 or 7 - Update image MP05 with MP05-H - New chapter MP07 Panel connection	2.2 4.1.1 4.1.1 4.2 4.3 4.3.2 4.4 4.8 9.13 9.15

1.4 How to read the manual

This manual is structured and divided into 11 main sections as indicated here below. We suggest to follow these indicated manual sections.

1	**Foreword** This section introduces the use of the manual.
2	**Flexium and Flexium+ CNC System** This section introduces the Flexium and Flexium+ CNC System components with a short descriptions and general layout of the CNC System.
3	**Flexium NCK system** This section introduces the NCK description, NCK characteristics, the general connectors layout and the led status signalling and the mounting instructions.
4	**Flexium Panels FS - Operators panel** This section introduces the FS153i, FS154i, FS192i, FS122, FS153, FS192L panels and USB QWERTY keyboard (Horizontal and Vertical external keyboard) description, characteristics, the general connectors layout, the mounting instructions.
5	**Flexium MP Panels - Machine panel** This section introduces the MP04, MP05, MP06 and MP08 panel description, characteristics, the general connectors layout, the installing button labels procedure and the mounting instruction.
6	**NUM Industrial Box PC** This section introduces the NUM Industrial Box PC P1 / P2 description, characteristics, the general connectors layout and the mounting instructions.
7	**Portable Handwheel HBA-X** This section introduces the HBA-X description, characteristics.
8	**nPad Mobile Operator Panel** This section introduces the nPad description, characteristics, the safety related information, the general safety guidelines over the Emergency Stop push-button, Enabling Device, Enabling Device positions and State selector.
9	**Flexium connections** This section introduces all system connections of the Flexium components.
10	**NUMSmartBackup** This section introduces the NUMSmartBackup system is an own developed tool to backup or restore all Flexium iPCs.
11	**Available accessories** This section introduces all the available accessories around Flexium (Cable, plugs, connector kit....)

1.5 NUM Agency

The list of NUM agencies is given on http://www.num.com

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2 Flexium and Flexium+ CNC Systems

2.1 Flexium Systems

Available in three configurations: 6, 8 and 68, Flexium and Flexium+ are key elements of NUM's high-end applications systems. The compact dimensions are the result of a design aimed at limiting energy requirements. The PLC, programmed according to IEC 61131-3, as well as the powerful and user friendly development environment provides efficient tools for development, commissioning and servicing of your machines.

Flexium and Flexium+ use standardized interfaces such as Ethernet - real-time Ethernet when required EtherCAT and CANopen for I/Os, as well as a dedicated and efficient digital bus for connection to the servo drives.

The CNC units (NCK for NC Kernel) can be linked together in a global configuration, whereby, for example, large transfer systems with more than 200 interpolating axes can be easily implemented. Integrating machine control panels, inputs and outputs, handwheels, positioning axes and more is easy, thanks to the versatility of the field bus interfaces.

For very specific requirements like particular coordinate conversion, Flexium offers the machine manufacturer secure and real time access to the system interpolator's data; integration of CAD/CAM systems is also facilitated.

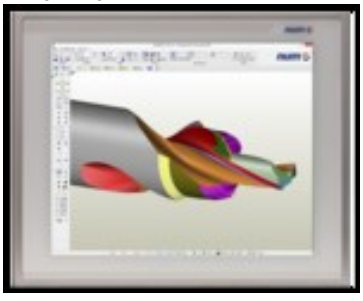
Flexium and Flexium+ are a complete, user-friendly and versatile range of CNC systems consiting of:

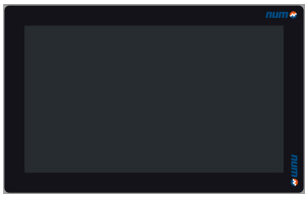
- CNC Kernel: Flexium NCK
- Operator panels with integrated PC
- Human Machine Interface: Flexium HMI
- PLC software
- Machine panel
- Remote inputs/outputs: NUM EtherCAT modules CTMxxx
- Servo drives: NUMDrive X or NUMDrive C
- NUM Motors: various ranges.



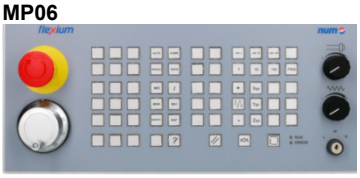
Please refer to NUM Catalog for more detailed information upon the NUM CNC System configurations.

2.2 System components

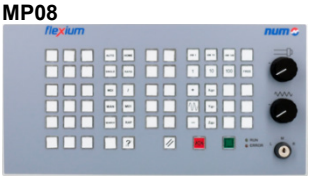
Flexium NCK 	**Flexium NCK** is the heart of a system. In a compact design compatible in size with the NUMDrive C components it packs a powerful engine, up to 40MB of user's memory, the connectivity for up to 32 digital axes each and the PLC link, all this delivered on standard RJ45 ports. Additional Ethernet and clock synchronization ports for multi NCK operation, two analog axes ports, two probing inputs as well as sixteen / sixteen direct part program access digital IOs, four analog inputs and two analog outputs complete this unit.
Passive panels (without integrated PC)	
FS122 12" 	**FS122 12"** panels designed for use with an external PC or NUM Industrial Box PC P1/P2 or for multi HMI systems. FS122 panels are available with and without touch screen. Both versions provide 22 function keys.
FS153 15" 	**FS153 15"** panels designed for use with an external PC or NUM Industrial Box PC P1/P2 or for multi HMI systems. FS153 panels provide 22 function keys and are available with or without Qwerty keyboard (dimension varies)
FS194L 19" 	**FS194L 19"** panels designed for use with an external PC or NUM Industrial Box PC P1/P2 or for multi HMI systems. FS194L panels are landscape oriented capacitive touch panel. The touch sensor supports dual-touch gestures.

Active panels (with integrated PC)	
FS154i P1 and FS154i P2 15“ 	**FS154i P1 and FS154i P2 15“** panels provide the Human Machine interface and can provide the PLC function. FS153i and FS154i are similar in design. They all provide 22 function keys and are proposed with or without keyboard, with or without touch screen. FS154i P1 is getting discontinued during 2024
FS184i 18.5” 	**FS184i 18.5”** is a landscape oriented panel equipped with a multi touch capacitive feature. Therefore, it does not provide keyboard nor function keys. As the other PC panels it provides the HMI and can handle the PLC function. It is available with performance level P2.
FS194i 19” 	**FS194i 19”** is a panel is a portrait-oriented panel equipped with a multi touch capacitive feature. Therefore, it does not provide keyboard nor function keys. In portrait orientation the lower part of the display can be used for a virtual keyboard/machine panel As the other PC panels it provides the HMI and can handle the PLC function. It is available with performance level P2.
FS244i 24” 	**FS244i 24”** is a portrait or landscape oriented panel equipped with a multi touch capacitive feature. Therefore, it does not provide keyboard nor function keys. As the other PC panels it provides the HMI and can handle the PLC function. It is available with performance level P2.
Machine Panels	
MP04 	MP04 panel interfaced on CANOpen is used to control the machining functions and is available with / without handwheel. This configurable machine panel includes 63 keys with LEDs, 2 potentiometers, an emergency stop pushbutton, a three position key-switch and an optional hand-wheel. Interfaced on CANopen this panel also includes on the back 10 digital inputs and 12 digital outputs. Design fit with the FS153 family.
MP05 	MP05 panel is used accompany the new FS192i touch panel. MP05 complements the FS192i’s virtual machine panel by adding physical interfaces for functions that need tactile feedback. MP05 provides E-Stop button, 6 luminous push buttons, USB 2 interface, 2 step key switch, 2 Overrides potentiometers and Handwheel are available.

MP06



MP08



MP06 and MP08 interfaced on EtherCAT panel are used for control of manual movements, production initiation and intervention during machining.

Four versions are available for MP06 and two version for MP08, with analog potentiometer or 25 positions selectors for axis and spindle overrides, with or without handwheel for MP06.

These panels also includes on the back 12 digital inputs and 12 digital outputs. This configurable machine panel includes 63 keys with LEDs, 2 potentiometers or 2 selector switches (multi-switches), an emergency stop pushbutton (1), a three position key-switch and an optional hand-wheel (1).

MP06 is designed fit with the FS153 / FS154 family.
MP08 is designed fit with the FS122 family.

(1) Not available on MP08.

MP07



MP07 is identical to MP06 but designed to fit the FS184 panel. In addition to MP06 it provides an USB port (not wired) andf the location for two additional push buttons.

Box PC P1 G4 - Box PC P2



Box PC P1 G4 Box PC P2

Industrial box PC are an alternative to FS154i / FS194i operator panels. Two performance levels P1 and P2 are available.

The required PLC functions are handled by the external Box PC (with dedicated PLC) linked by Ethernet to the external PC.

Portable Handwheel HBA-X



The portable handwheel HBA-X for Flexium provides a number of operation function like Axis selection, Hand mode and speed selection, movements forward/backward and speed override.

nPad - Mobile Operator Panel



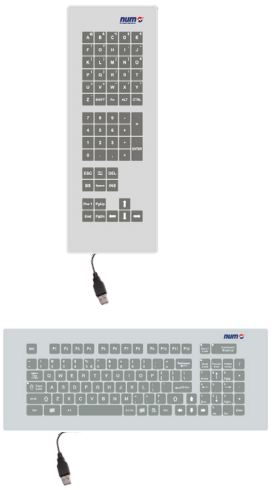
Please refer to chaper 8 for more detailed information.

nPad Mobile Operator Panel with integrated 5” TFT touch screen monitor provides 19 soft-keys, 2 override potentiometers, handwheel, a 16 positions selector as well as E-Stop and Enabling Device button.

The nPad is equipped with WinCE 6 and CoDeSys HMI runtime environment.

nPad Mobile Operator Panel is available with Wireless version mantaining the same functionnality.

nPad is discontinued

USB QWERTY keyboard 	The external USB QWERTY keyboard are adapted to FS153 panels. The keyboard is available for horizontal or vertical mounting.
NUM EtherCAT terminal CTMG, CTMT 	The EtherCAT terminals are common I/O components based on EtherCAT technology. Each I/O group begins with a CTMG Gateway which receives the EtherCAT field bus and propagate the message to the different devices by means of internal E-bus. Up to 65535 devices can be connected with a distance between gateways of up to 100m. For more detailed informations on the NUM EtherCAT terminals please refer to NUM EtherCAT terminals CTMG and CTMT Operating manual M00032.
NUMSmartBackup  Please refer to chaper 10 for more detailed information.	The NUMSmartBackup system is an own developed tool to backup or restore all Flexium iPCs.

FS152 and FS152i please refer to Flexium Installation manual **M0009EN-04**.

2.3 Flexium 6, Flexium 8 and Flexium 68 systems overview

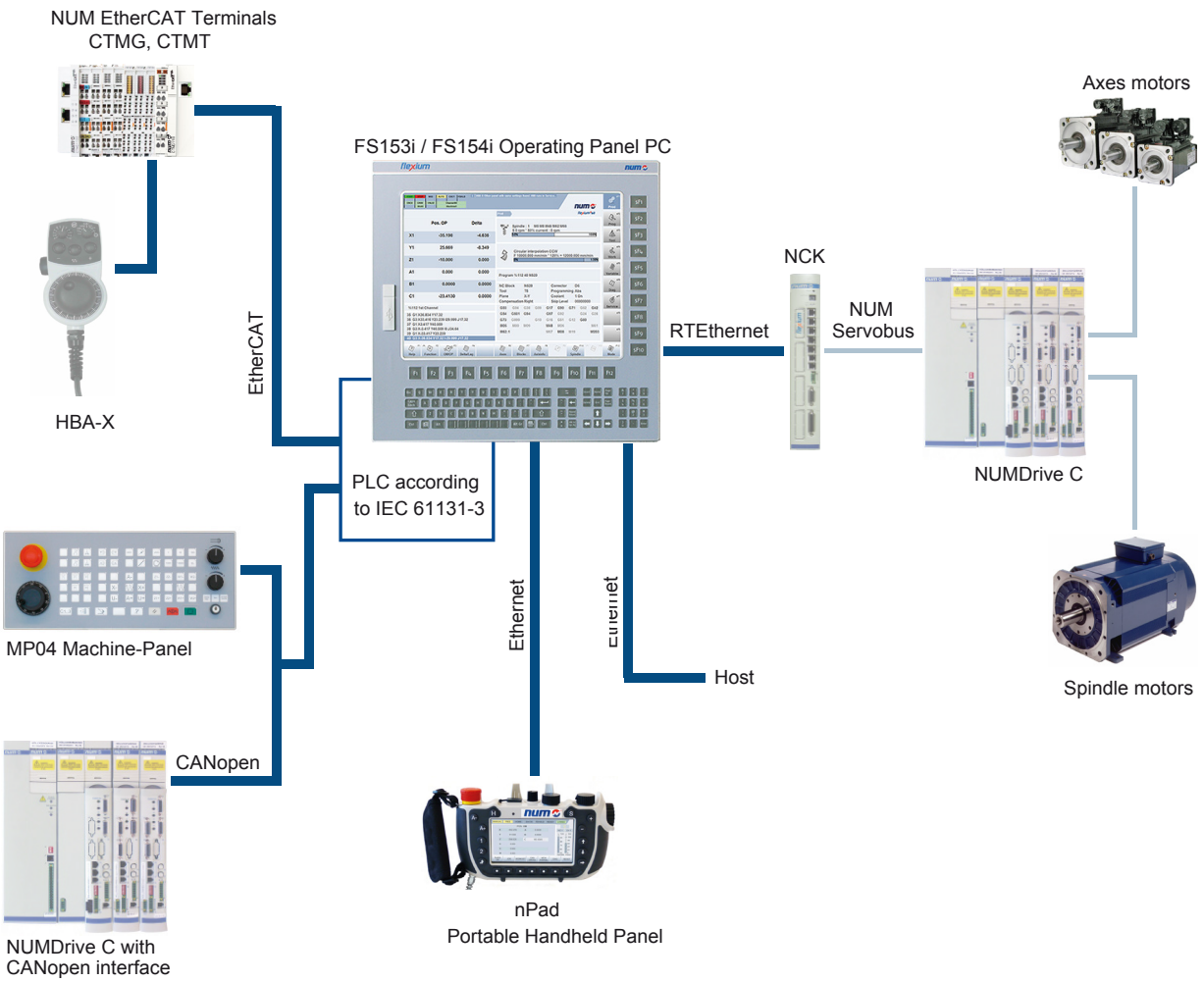
2.3.1 Flexium 6

- CNC with choice of kinematic structure: milling or turning.
- For CNC for up to 4 axes and 1 spindle.
- One CNC channel.
- Interpolates up to 4 axes simultaneously (more complex interpolations such as Spline or NURBS require Flexium 8 or Flexium 68).
- Options packages available: Milling: M0 or Turning: T.

2.3.2 Flexium 8

- For CNC for up to 5 axes or 4 axes and 1 spindle.
- One channel is standard, a second is optionnaly available.
- Interpolates up to 4 axes simultaneously.
- Various options and technology packages are available.

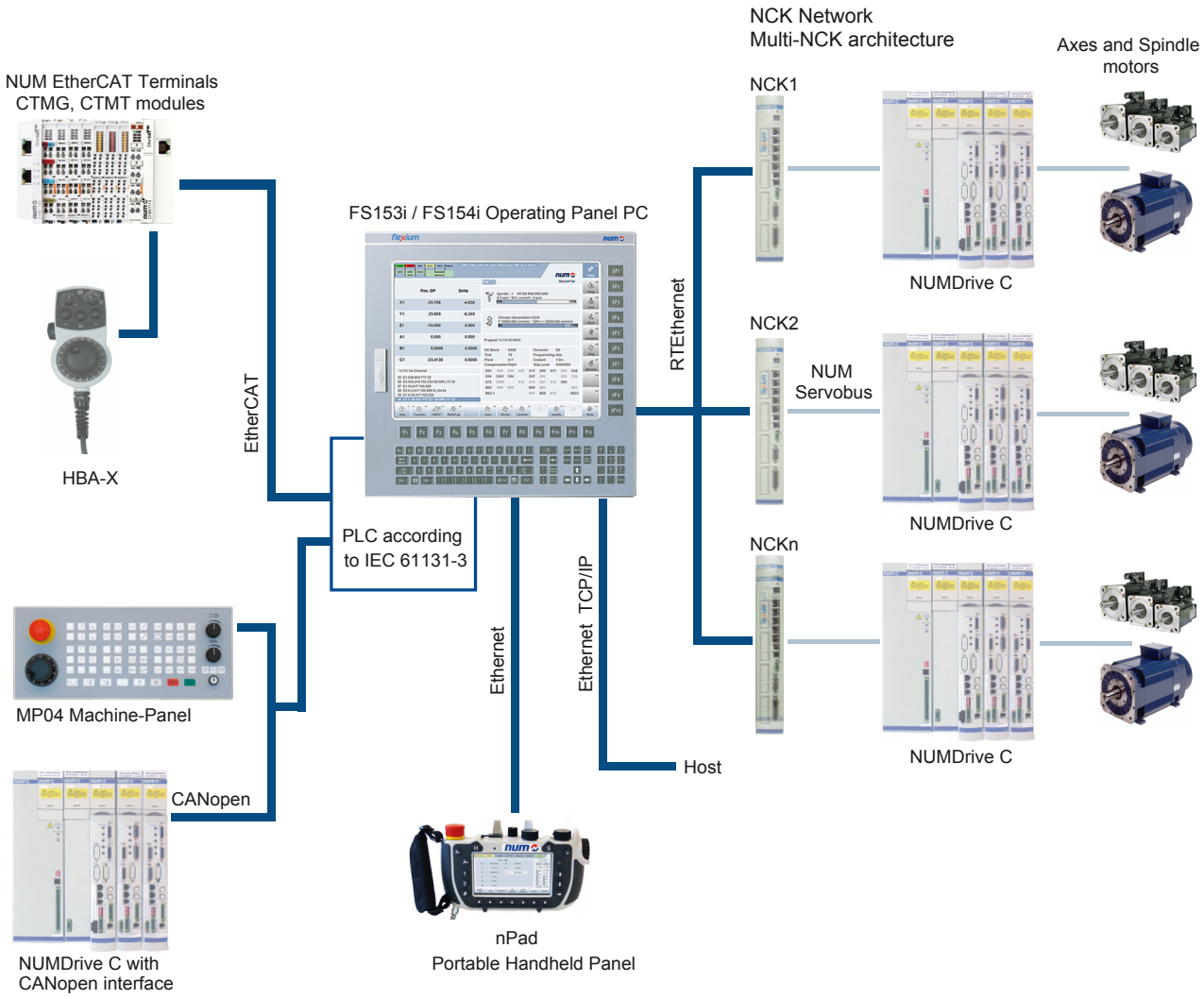
Flexium 6 and Flexium 8 systems



2.3.3 Flexium 68 fully scalable system

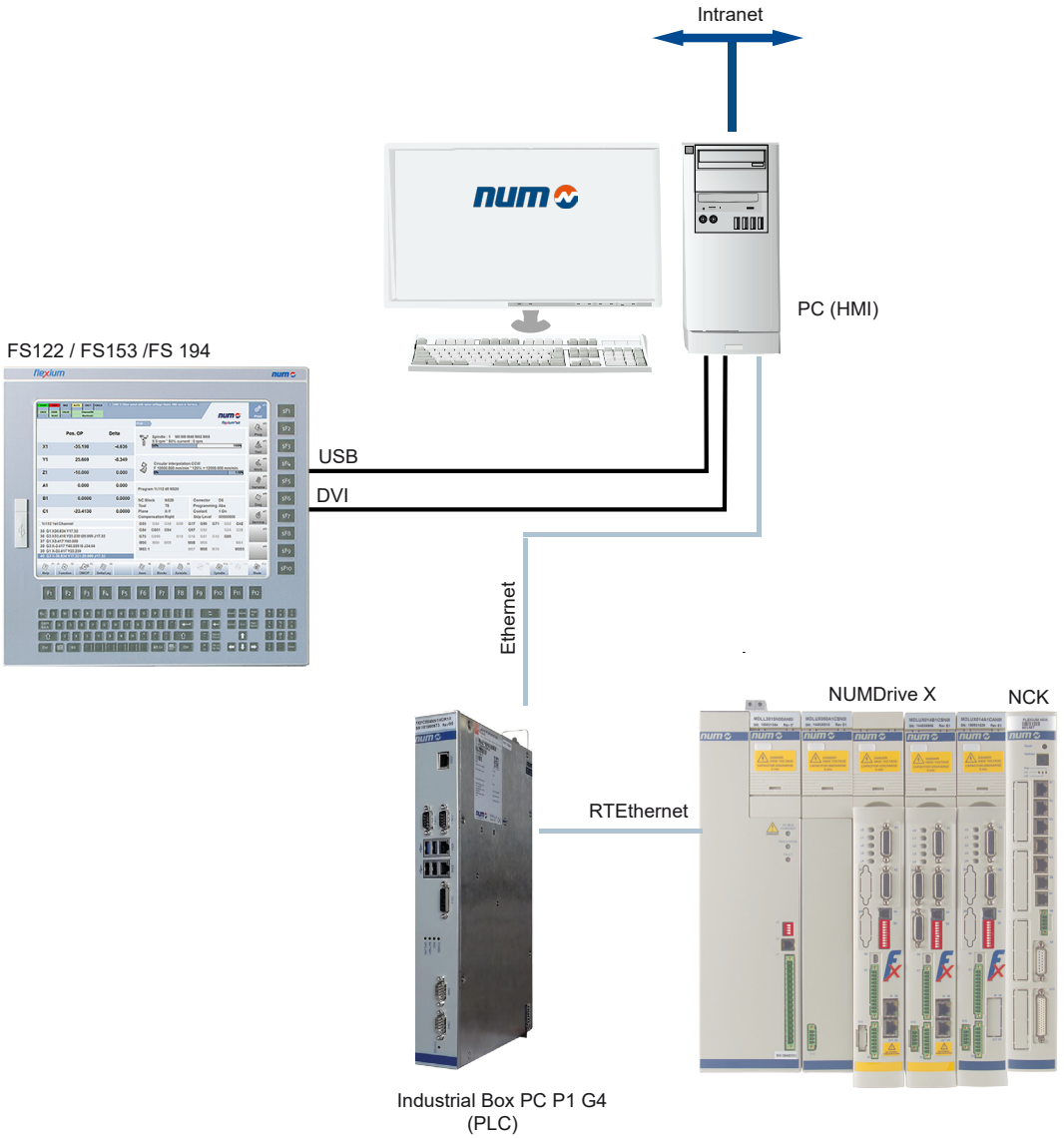
- CNC for 5 axes + spindles in standard version, up to 32 axes/spindles as an option (with a max of two analog).
- Up to 4 spindles may be parameterized.
- One channel is standard, 2, 4, 6 or 8 channels as an option.
- Interpolates 4 axes par channel as standard, up to 9 interpolated axes per channel as an option (more complex interpolations such as Spline or NURBS available as options)
- All technology packages are available as options.

Flexium 68 system

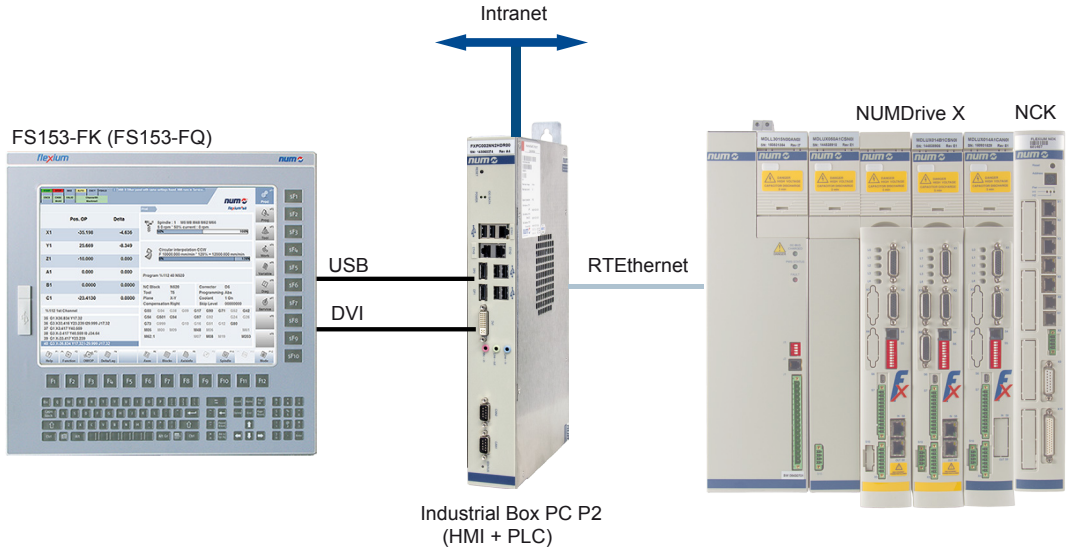


2.3.4 Configuration with Industrial PC

Industrial Box PC as PLC



Industrial Box PC as PC and PLC



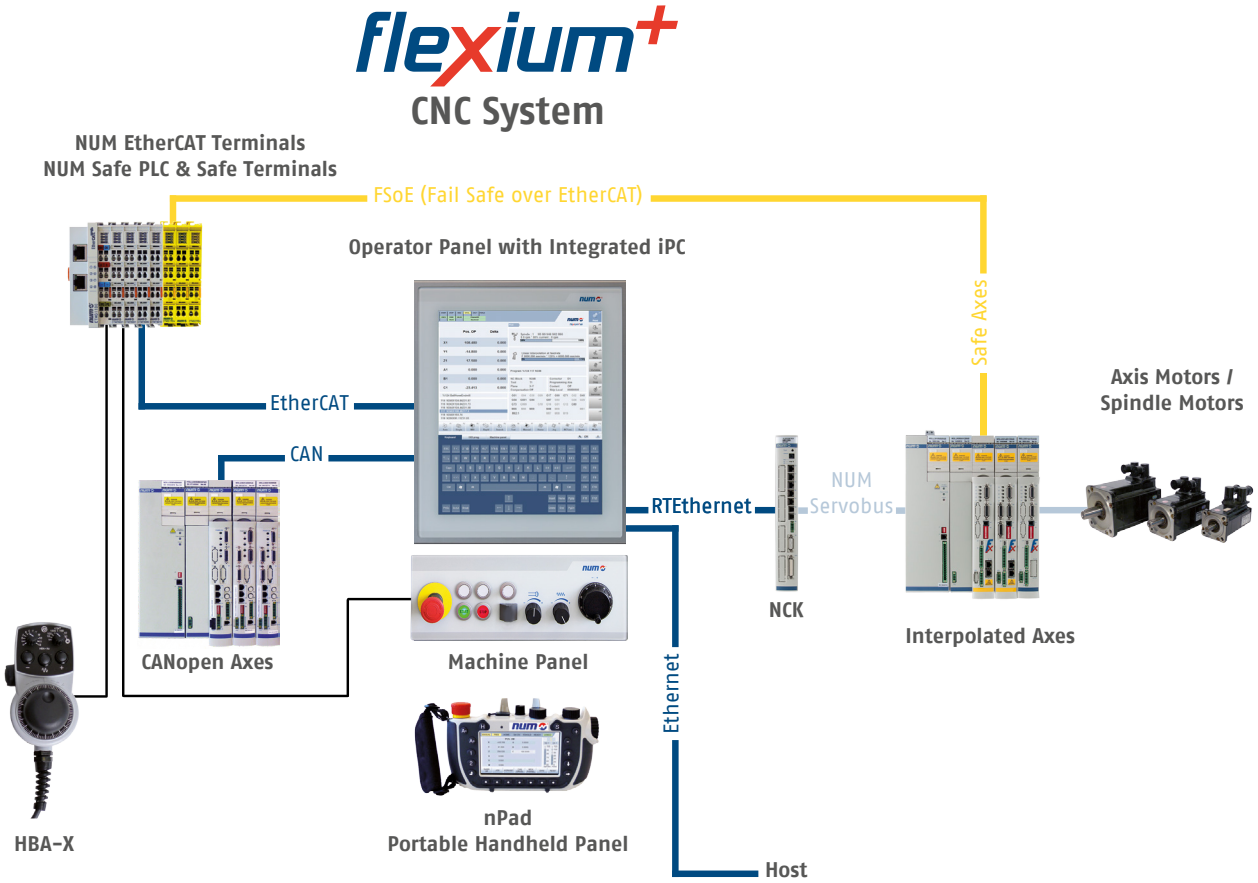
2.4 Flexium⁺ 6, Flexium⁺ 8 and Flexium⁺ 68 systems overview

2.4.1 Flexium⁺ 6

- CNC with choice of kinematic structure: milling or turning.
- For CNC for up to 4 axes and 1 spindle.
- One CNC channel.
- Interpolates up to 4 axes simultaneously (more complex interpolations such as Spline or NURBS require Flexium 8 or Flexium 68).
- Options packages available: Milling: M0 or Turning: T.

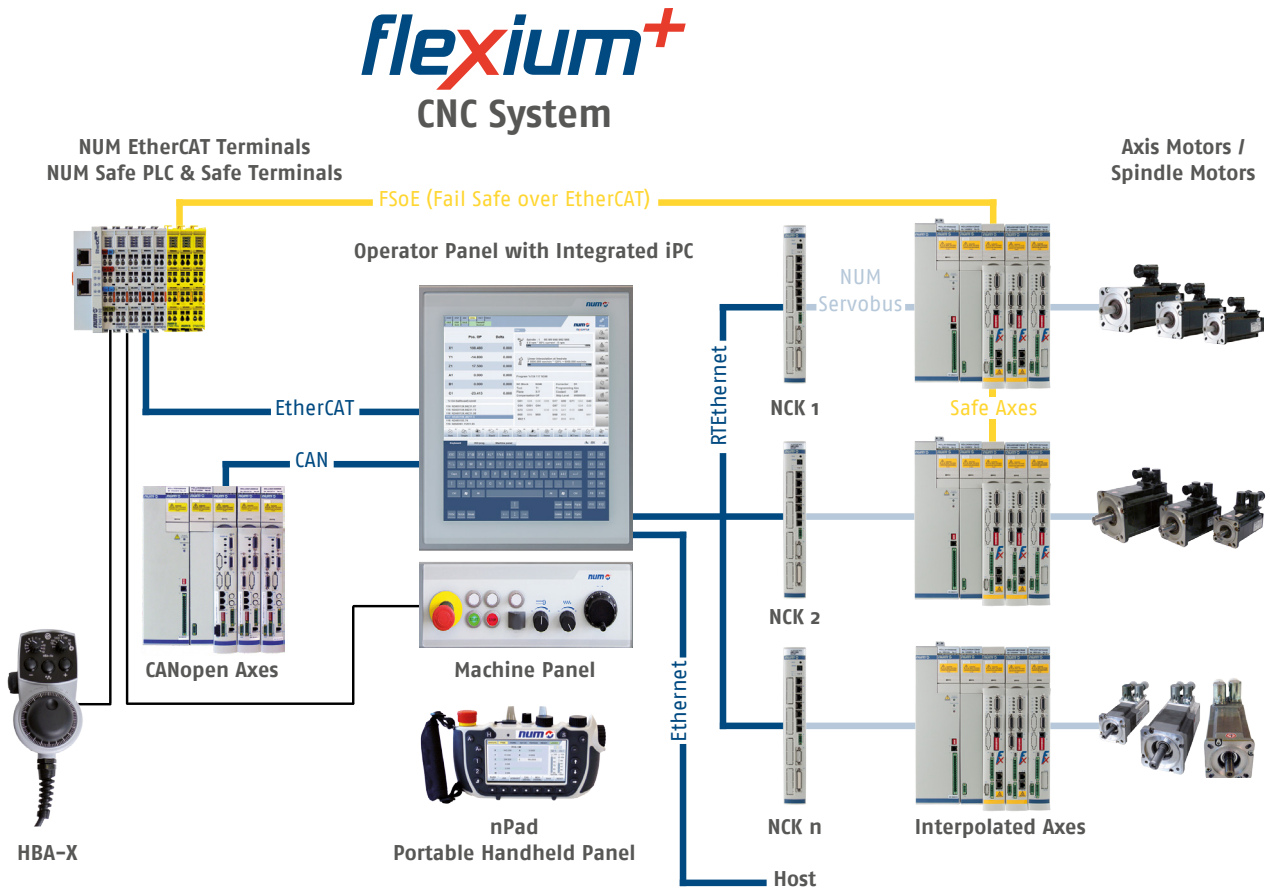
2.4.2 Flexium⁺ 8

- For CNC for up to 5 axes or 4 axes and 1 spindle.
- One channel is standard, a second is optionnaly available.
- Interpolates up to 4 axes simultaneously.
- Various options and technology packages are available.



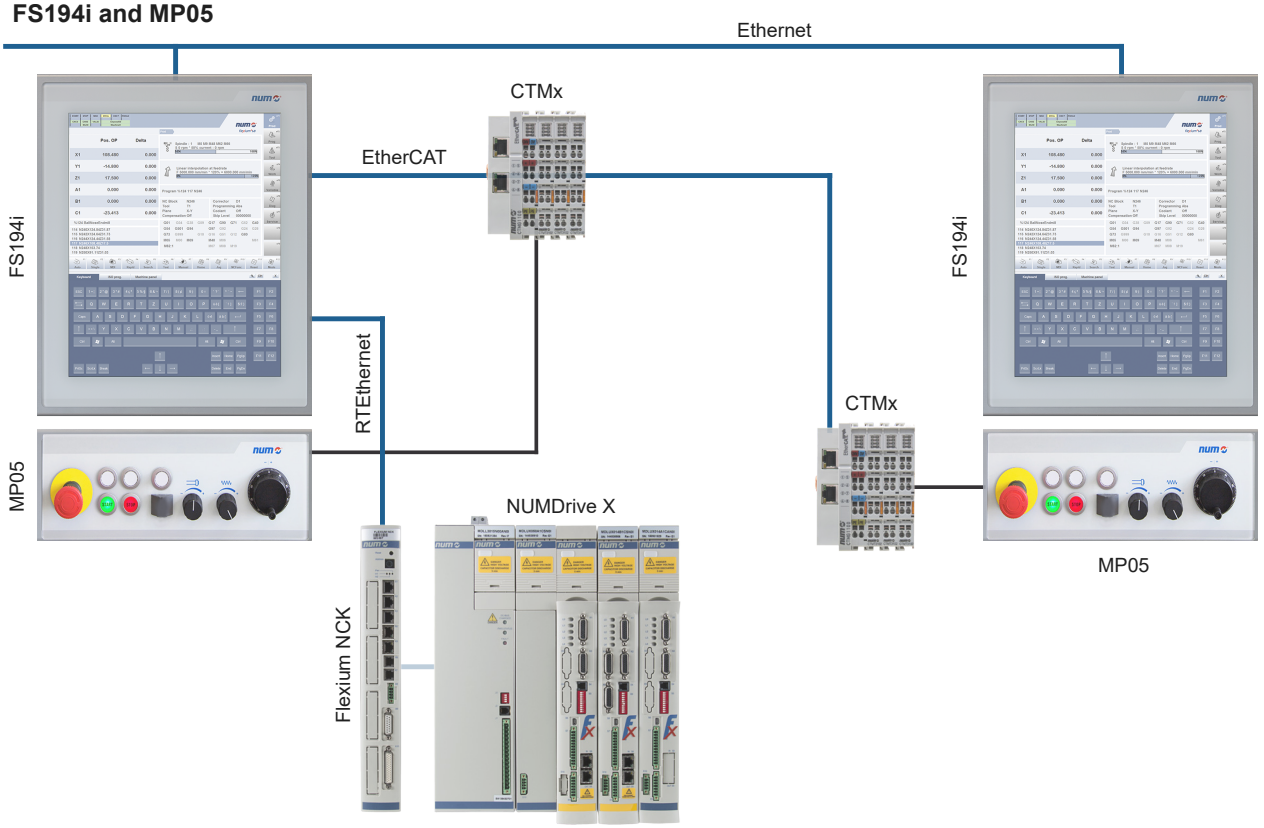
2.4.3 Flexium+ 68 fully scalable system

- CNC for 5 axes + spindles in standard version, up to 32 axes/spindles as an option (with a max of two analog).
- One channel is standard, 2, 4, 6 or 8 channels as an option.
- Interpolates 4 axes per channel as standard, up to 9 interpolated axes per channel as an option (more complex interpolations such as Spline or NURBS available as options)
- All technology packages are available as options.

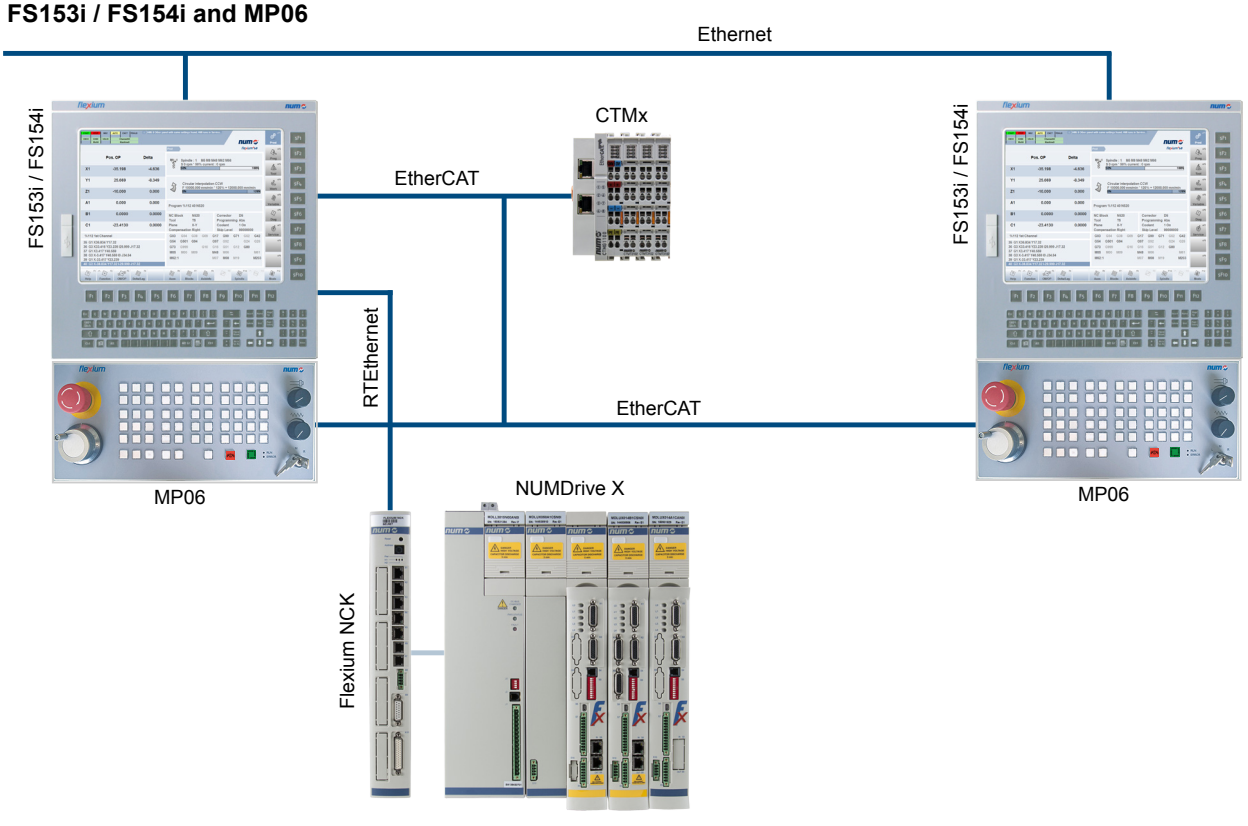


2.4.4 Multi Panel configuration

FS194i and MP05

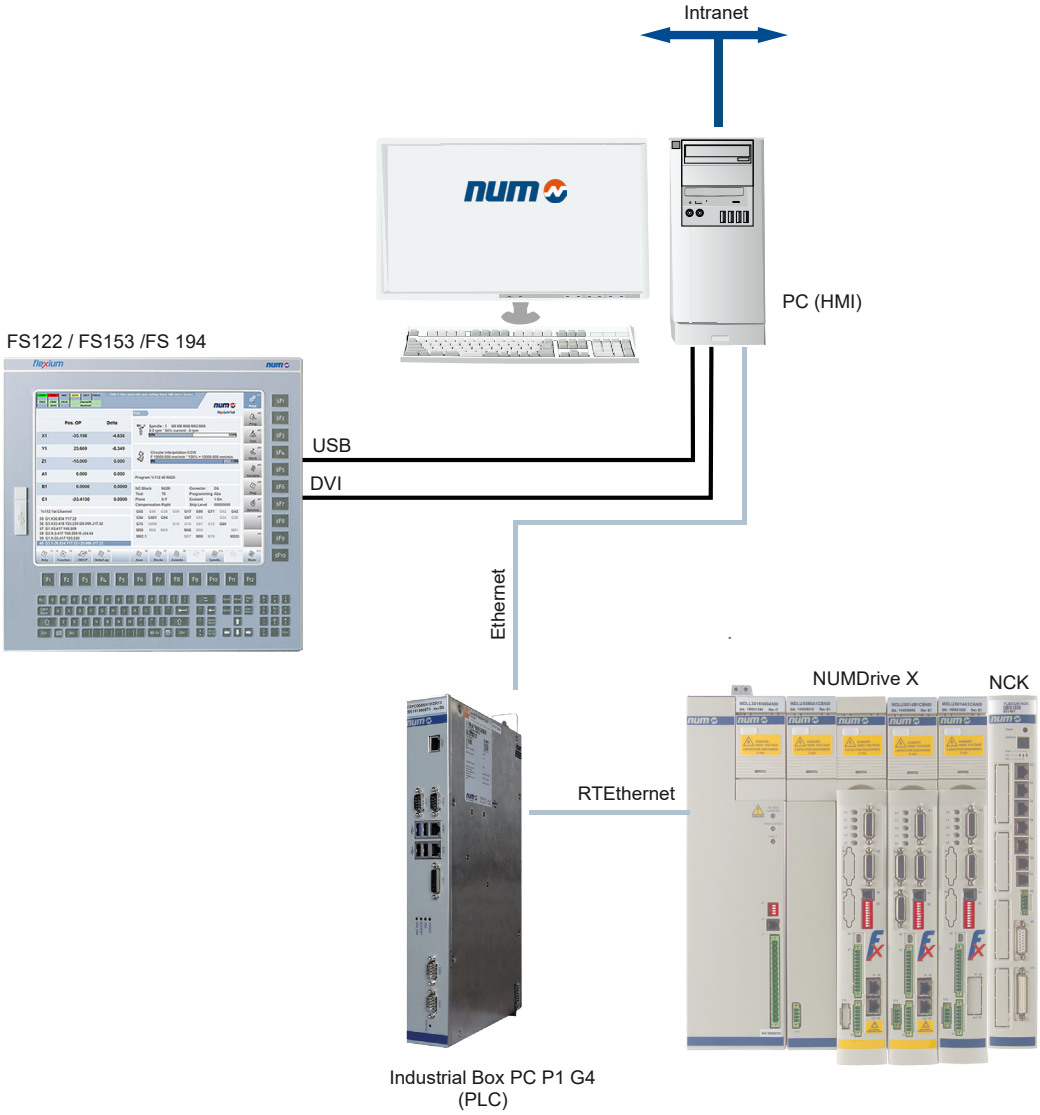


FS153i / FS154i and MP06

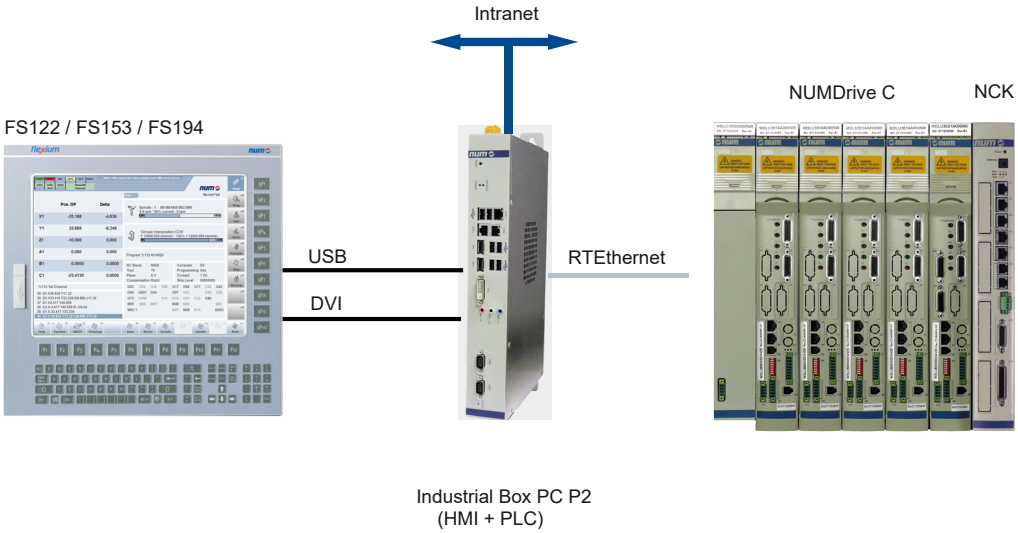


2.4.5 Configuration with Industrial PC

Industrial Box PC as PLC



Industrial Box PC as PC and PLC



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3 Flexium NCK

3.1 General

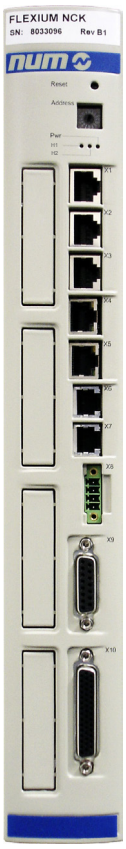
Flexium NCK is the heart of a system. In a compact design compatible in size with the NUMDrive C or NUMDrive X components it packs a powerful engine, up to 40MB of user's memory, the connectivity for up to 32 digital axes and the PLC link, all this delivered on standard RJ45 ports.

Additional Ethernet and clock synchronization ports for multi NCK operation, two analog axes ports, two probing inputs as well as sixteen digital input and sixteen digital output all with direct part program access, four analog inputs and two analog outputs complete this unit.

Flexium NCK is the CNC platform where the CNC software to manage part programs and machining data, to compute paths and speeds and to monitor axis movements is loaded at power up.
CNC units can be linked together in a global configuration, whereby, for example, large transfer systems with more than 200 interpolating axes can be easily implemented.

Integrating machine control panels, inputs and outputs, handwheels, positioning axes and more is easy, thanks to the versatility of the field bus interfaces. The NCK hardware is identical between Flexium 6, Flexium 8 and Flexium 68 and Flexium+ 6, Flexium+ 8 and Flexium+ 68.

Some features such as analog axes configurations and handwheels require a software option.



NCK front view

NCK Top view



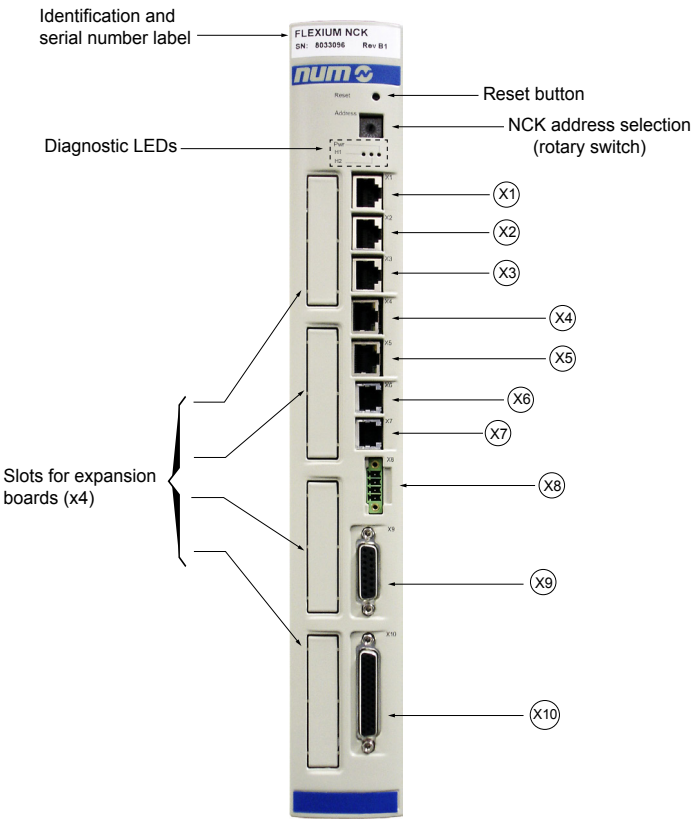
NCK Bottom view



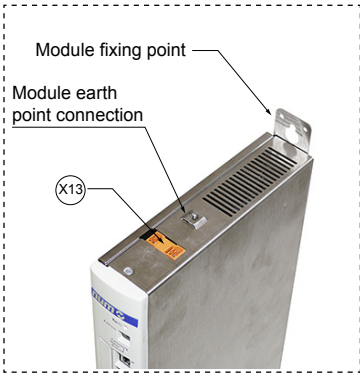
3.2 General characteristics

	Flexium NCK	
Power supply	Rated voltage	24 VDC SELV, safety extra low voltage protection class III / 1A
	Voltage range	24VDC +20% -15% supplied by the customer
	Power consumption using Flexium NCK without I/Os	24VDC, 12W
	The system power consumption is obtained by summing the power consumptions of the system components.	
Analog inputs	4 analog input available	
	Input impedance	40kΩ
	Resolution	12 bits
	Input voltage range	0 / +10V
Analog outputs	2 analog output available	
	Output voltage range	- 10V / +10V
	Minimum load	2kΩ
	Resolution	16 bits
Digital inputs	16 digital input available: Discrete inputs complying with IEC 1131 type 1	
	Rated voltage	24VDC
	Voltage limits	0 to 35 V
	Maximum current	6mA per input
	Operating voltage ranges	- Low-level: 0-5 V (current < 1mA) - High-level: 15-30 V (2.8mA < current < 4.3mA)
	Reverse voltage withstand	30VDC permanent
	Response time	100µs
	Sampling period	2ms
	Logic	Positive (current sink)
	Protection	Complying with: IEC 62000-4-5, IEC 61000-4-4, IEC 61000-4-6
Digital outputs	16 digital output available: Discrete inputs Semiconductors	
	Rated voltage	24VDC (external power supply)
	Voltage range	15 - 35VDC
	Maximum internal consumption current	30mA
	Rated current	250mA per output
	Maximum current (at 40°C maximum)	0.5A per output
	Maximum consumption current	8A for all outputs (protection by fuse)
	Delay on the resistance load (I=0.5 A)	250µs
	Protection per output	Overload and short-circuit (thermal circuit-breaker)
	Protection	by Poly Switch fuse
Digital inputs for probing	2 digital inputs available	
	Maximum operational current	2mA
	Minimum current required	1mA
	Input on 24V	- Low-level voltage: between 0 and 4.7V. - High-level voltage: between 18 and 27V
Analogue Axes	Maximum 2. Please refer to chaper 7.9.8 for more detailed informations.	
Watchdog	2 NO independant contacts	
Ambient conditions	Operating temperature range	0°C to 40°C
	Climatic conditions storage	-25°C to 70°C
	Relative humidity, noncondensing	max 75%
Protection class		IP 20
Weight		ca. 2.2kg
Dimensions	W x H x D:	50 x 355 x 206mm (see also chapter 3.4)

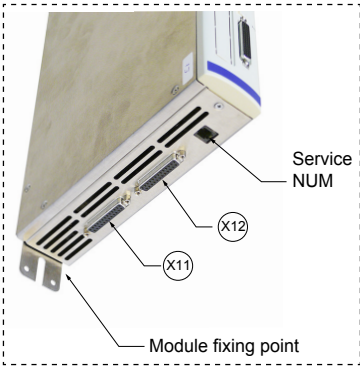
3.3 Overall layout and connectors



NCK Top view



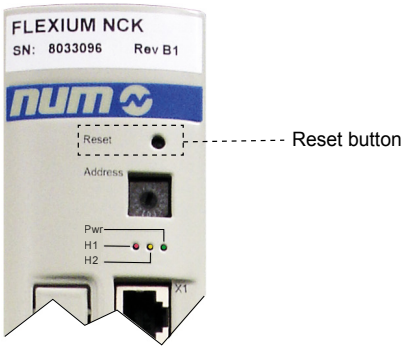
NCK Bottom view



Connector	Type	Description
X1, X2, X3	RJ45 (8P/8C)	3 DISC NT rings (NCK to NUMDrive connection)
X4	RJ45 (8P/8C)	Do not use.
X5	RJ45 (8P/8C)	Ethernet port for Operator Panel FSxxx or Box PC connection
X6	RJ11 (6P/6C)	NCK clock input
X7	RJ11 (6P/6C)	NCK clock output
X8	4 screws pins	Watchdog interface connections: - ≥12VDC/100mA ÷ 30VDC/1A - 250VAC/350mA$_{rms}$
X9	Sub D 15 pins F	Analog I/Os: • 2 outputs 16bits +/-10VDC • 4 inputs 12bits - 0 …10VDC • 2 Probing inputs 24VDC
X10	Sub HD 44 pins F	Digital I/Os:16 inputs 24VDC, 16 outputs 24VDC / 1A
X11	Sub D 25 pins F	1 Analog axis or Handwheel connections: • Reference: ±10VDC 16bits. • Measure: quadrature complemented incremental encoder with zero pulse.
X12	Sub D 25 pins F	
X13	4 screws pins	Power supply connections: • 24VDC 1A

3.3.1 Reset button

Do not use. Internal NUM use only.



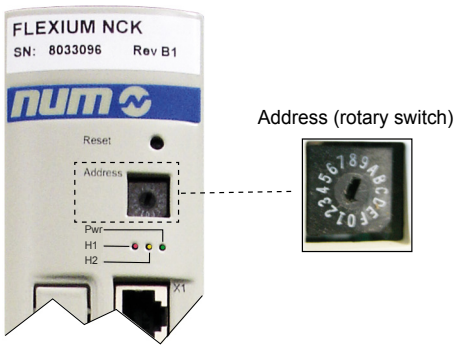
3.3.2 Address rotary switch

The rotary switch allows to assigning an address to NCK. Each NCK module must receive a unique address. This address is assigned with the aid of the 16-position rotary switch located on the NCK front panel as indicated here under.
Please rotate the switch using an adequate screwdriver.

As the application is directly linked to this address make sure the rotary switch is set properly.
The machine parameter P99 N1 defines the master NCK.

In standard configuration (one NCK module) P99 N1 must correspond to the physical address of the NCK module. In Multi-NCK configurations each module should have its own physical address but its P99 N1 must contain the address of the master NCK module. Default address is 0.

For more detailed information on P99 please refer to the Flexium Parameters manual M00021 or Flexium⁺ Parameters manual M00041.

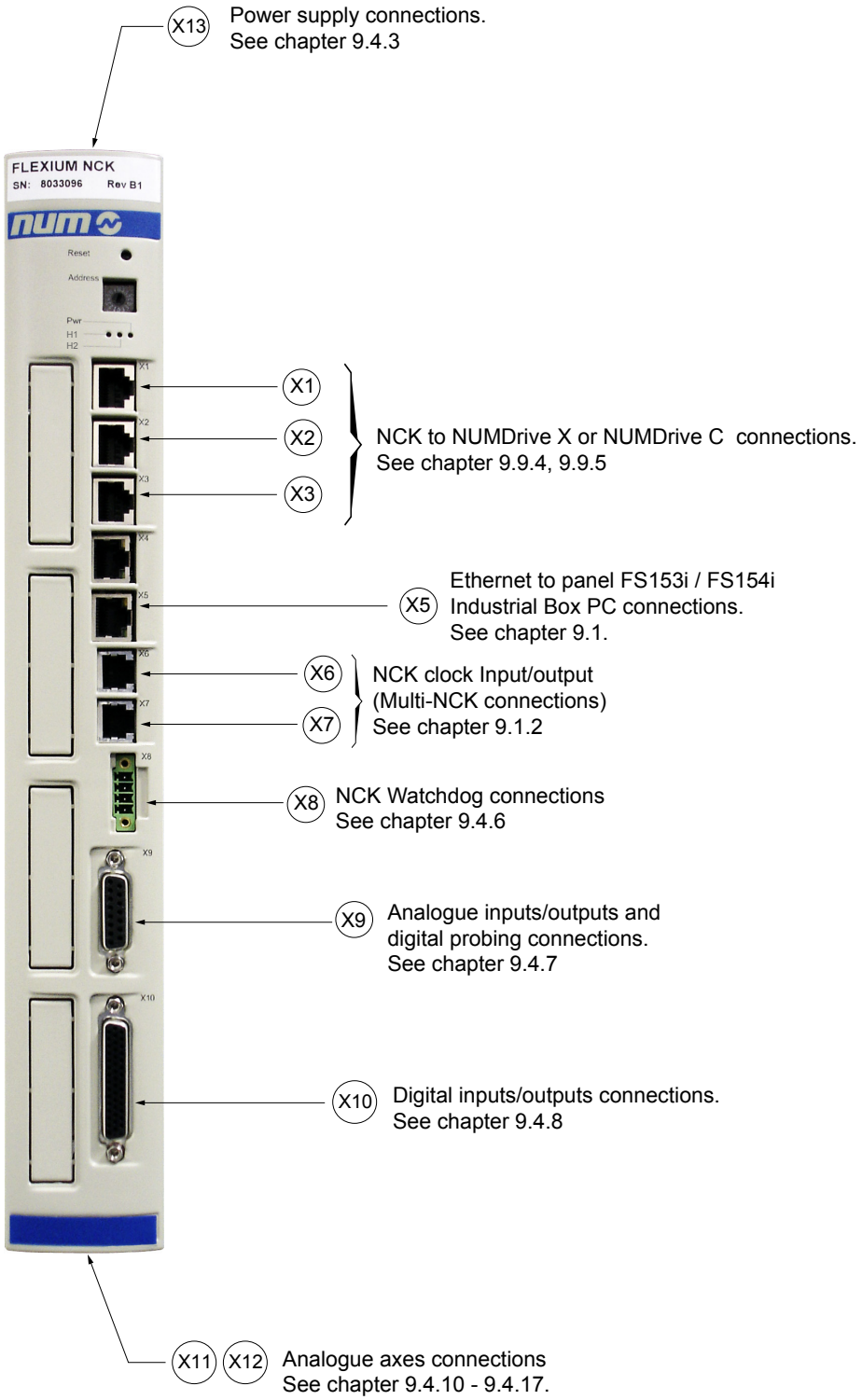


3.3.3 System configuration and options

The system configuration is stored on a dedicated component of the NCK. The configuration is delivered on a flash drive and must be stored during the initial startup. This operation is detailed in the Flexium + Commissioning manual M00044EN

3.3.4 NCK connectors

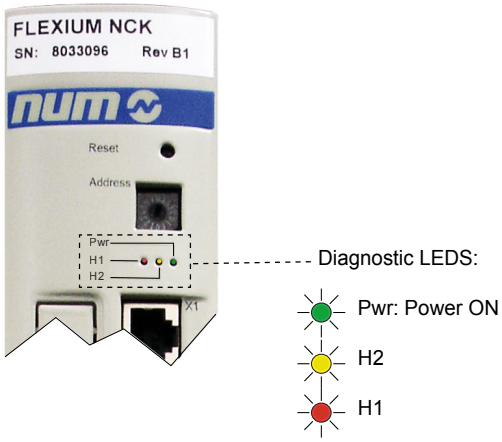
Please refer to the here indicated chapter to connecting all the NCK connectors.



3.3.5 LED status signalling

Three status LEDs are located on the front panel of the NCK. When powering up is complete, the green LED should be on steady. If other LEDs are lit, then there is an error in the system.

A LED can be OFF, ON or Blinking. There are several different possible LED blinking variants. They are described here below.



3.3.5.1 LED status signalling

LED status	Meaning	Status timing
	LED ON	
	Blink 1	
	Blink 2	
	Blink 3	
	Blink 4	
	Blink 5 : two LEDs alternately blinking	
	LED OFF	

Legend : LED ON
LED blink
LED OFF

3.3.5.2 LED error signalling

The different errors and their associated LED states are described in the table below.

Led Status			
H1	**H2**	**Pwr**	**Cause**
			Power OFF
			System OK
			• Waiting for firmware upload. • FSxxxi or Industrial Box PC not fully started
			Firmware upload in progress.
			Firmware upload aborted.
			• Machine error (e.g. excess following error). • CNC_Ready flag will be OFF. • RAZ procedure under way, CNC not ready.
			• Communication error between CNC and PLC. • CNC_Ready flag and Watchdog will be OFF.
			• Too many DISC NT errors. • Wiring – Perturbations or Drive fault.
			• DISC NT overload. • Check the configuration.
			• Processor exception. • Firmware error – Reboot system.
			• Processor in Halt. • Hardware error.

Legend :  LED ON

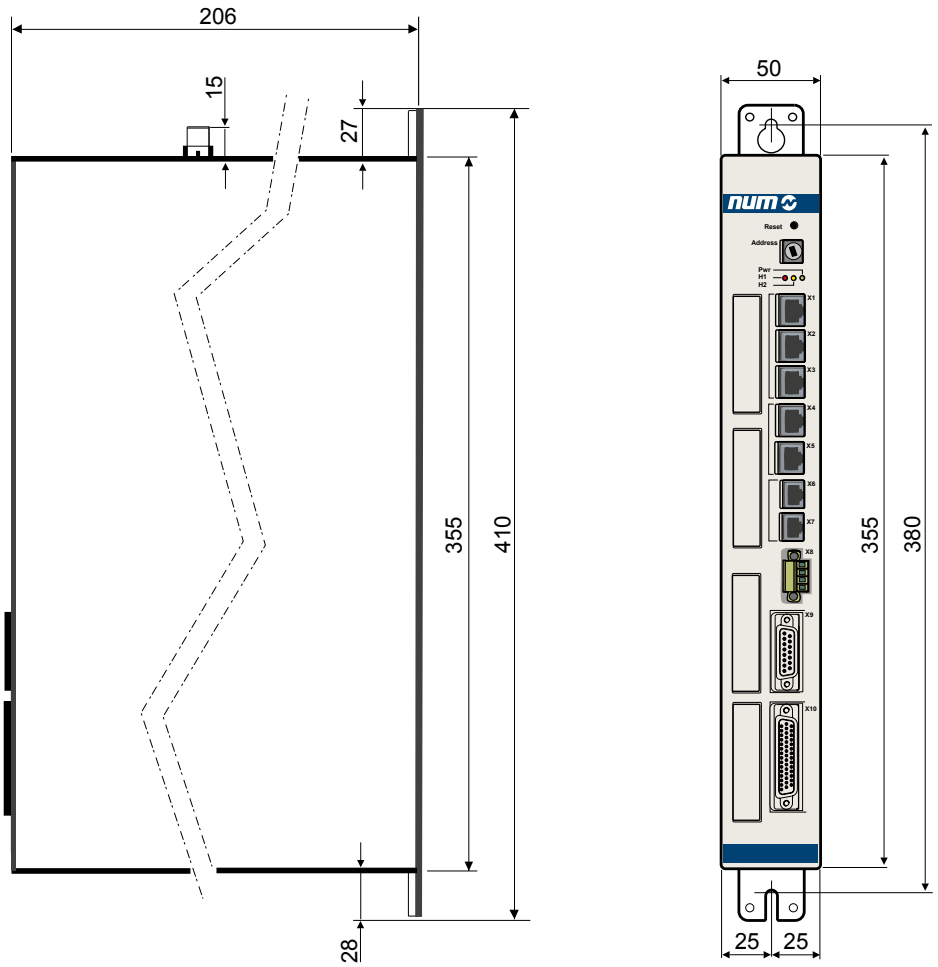
 LED blink

 LED OFF

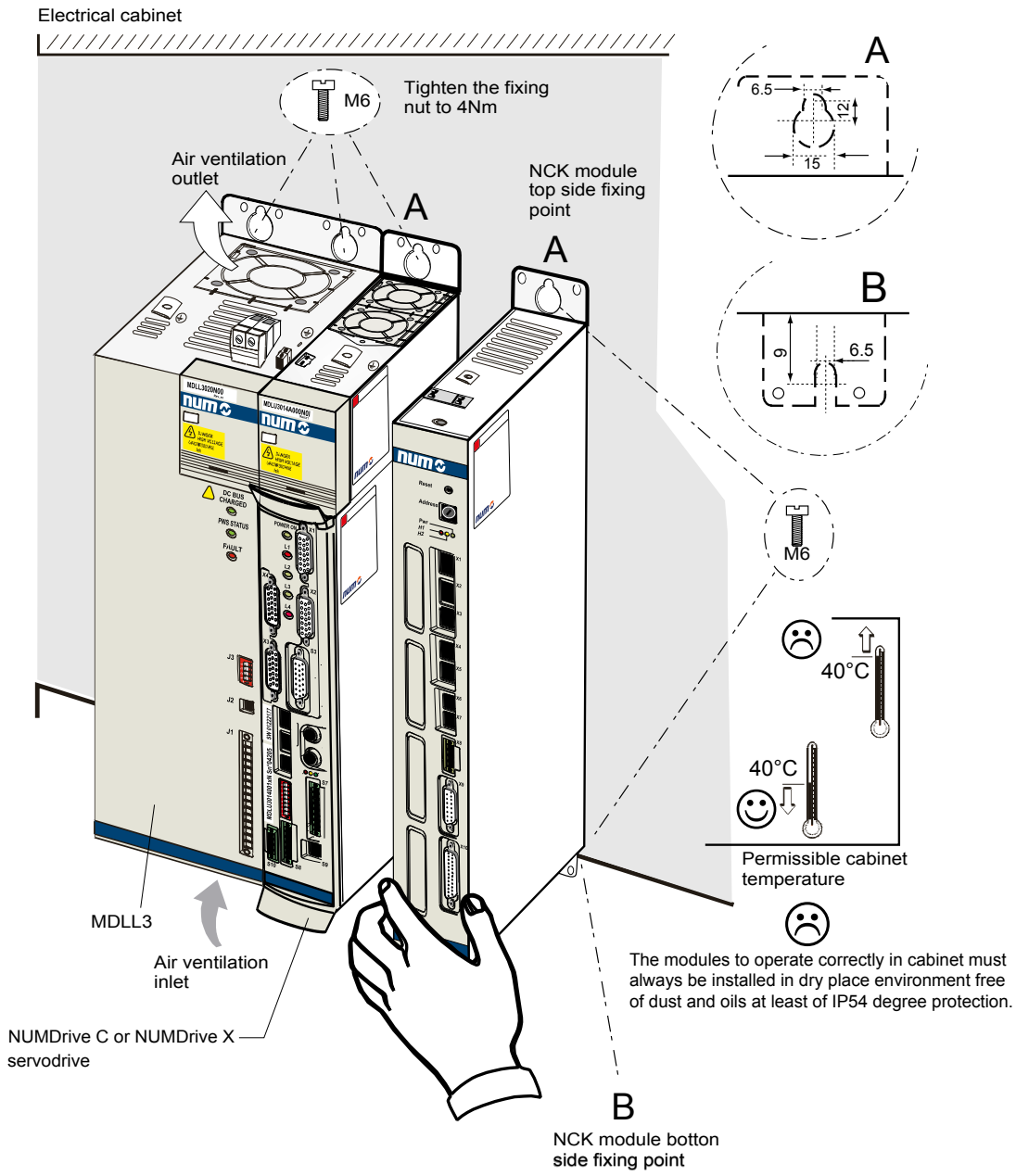


In case of system malfunction, it may be necessary to restart the full system (NCK and PC). Each NCK unit is personalized with an unique identifier. In the unlikely case of failure get in touch with the NUM Service before returning the defective component.

3.4 NCK overall dimensions



3.5 Assembly NCK in electrical cabinet



STOP

The NCK and the other modules must be installed in the electrical cabinet using the fixing points as shown in the figure. They must always be mounted vertically. The NCK module must always be installed on the rightmost side of the drives unit.

To facilitate sufficient air circulation and ensure an adequate heat exchange in the system it is recommended that a minimum clearance of 100mm is left at top and bottom when installing the modules in the electrical cabinet. Do not cover the ventilation grilles with cables or anything else, this may cause the rise temperature inside the modules.
Please also refer to the M00027 manual Cabinet layout and EMC Guide for more detailed information.

3.6 NCK installation and connections



Please refer to chaper 9 Connections for more detailed information upon the NCK installation and connections.

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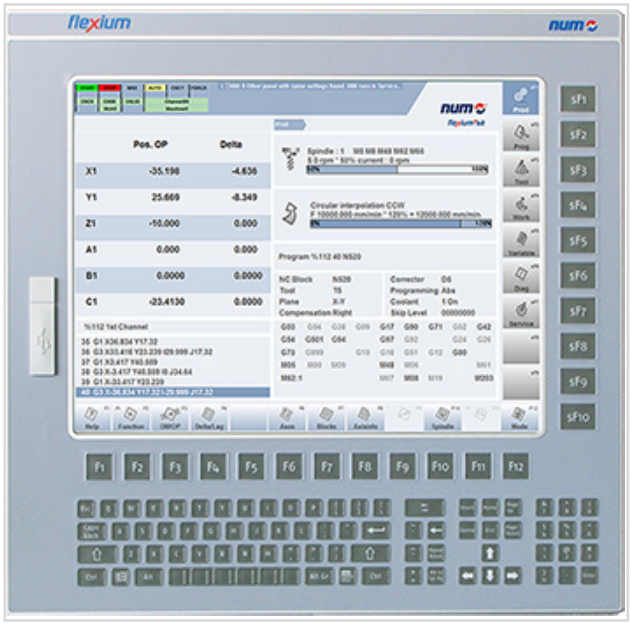
4 Flexium Panels FS - Operators panels

4.1 FS154i Operator panel with Integrated iPC

FS154i PC panels provide a powerful and ergonomic platform for Flexium+ HMI, enabling you to interact with the machine in a simple and logical manner. The integrated PCs use modern dual-core processors.

Depending on the application, you can choose one of three physical user interfaces:
- With 22 large function keys (keyboard option F)
- With 22 large function keys and an expanded QWERTY keyboard (keyboard option Q).
- With Touch screen available as option.

The display quality of their 15.1“ screen makes them very legible even in poorly-lit environments. Compact, they are also very rugged are sealed (IP 65) for compatibility with the most severe industrial environments.





Machine builders and end users are not allowed to install on this NUM industrial PC, software which performs “Desktop Functions” other than through, in support of, and operating as a part of, the Embedded Application. “Desktop Functions” means consumer or business tasks or processes performed by a computer or computing device. This includes email, word processing, spreadsheets, database, network/Internet browsing, scheduling, and personal finance. Desktop Functions may include features and functions derived from the MS Binaries or the Company Binaries.

4.1.1 FS154i Operator Panel with Integrated iPC

Ordering code Operator Panel FS154i Available Versions

FS154i Version	Ordering Codes
FS154i-FK P1 HD RT	FXPC154NF1HNR10
FS154i-FQ P1 HD RT	FXPC154NQ1HNR10
FS154i-FK P1 HD RT CAN NVRAM	FXPC154NF1HDR10
FS154i-FQ P1 HD RT CAN NVRAM	FXPC154NQ1HDR10
FS154i-FK TS P1 HD RT	FXPC154RF1HNR10
FS154i-FQ TS P1 HD RT	FXPC154RQ1HNR10
FS154i-FK TS P1 HD RT CAN NVRAM	FXPC154RF1HDR10
FS154i-FQ TS P1 HD RT CAN NVRAM	FXPC154RQ1HDR10
FS154i-FK P2 SSD RT	FXPC154NF2SNR20
FS154i-FQ P2 SSD RT	FXPC154NQ2SNR20
FS154i-FK TS P2 SSD RT	FXPC154RF2SNR20
FS154i-FQ TS P2 SSD RT	FXPC154RQ2SNR20
FS154i-FK P2 SSD RT CAN NVRAM	FXPC154NF2SDR20
FS154i-FQ P2 SSD RT CAN NVRAM	FXPC154NQ2SDR20
FS154i-FK TS P2 SSD RT CAN NVRAM	FXPC154RF2SDR20
FS154i-FQ TS P2 SSD RT CAN NVRAM	FXPC154RQ2SDR20

FXPC	15	4	N	F	1	H	D	R	1	0
Display Unit										
• LCD 15”	15									
Panel/Mechanical Variant										
• Fourth Generation		4								
Display Sensor										
• Touch screen resistive			R							
• No Sensor			N							
Keyboard Type										
• 22 Function keys				F						
• 22 Function keys + Qwerty Keyboard				Q						
IPC Mother Board, Processor										
• Performance level P1					1					
• Performance level P2					2					
Mass Memory Type										
• HD (Hard Disk) [1]						H				
• SSD (Solid State Disc) [2]						S				
Option Board										
• No fieldbus							N			
• CAN + NVRAM							D			
Flexium RTS										
• Real time								R		
Operating System										
• Windows 8 kernel [1]									1	
• Windows 10 kernel 64 bits [2]									2	
Spare Number										0

[1] For performance level P1 only
[2] For performance level P2 only

		FXPC154xx1HxR10 (FS154 P1)	FXPC154xx2HxR20 (FS154 P2)
Screen	User interface options	Active panel with integrated PC with: • 22 Function Keys • 22 Function Keys and Qwerty Keyboard • Touch Screen (resistive)	
	Technology	15“ TFT LCD (16.9 million colors)	
	Resolution	1024 x 768 from 60Hz to 75Hz	
	Size	304 x 228 mm (12 x 9 inch)	
	Backlight	LED, Contr. 700:1 (Type)	
Main PC Features	CPU	Intel® Celeron™ CPU J1900 @ 2GHz Quad Core	Intel® i5-6500TE 2.3GHz Quad Core 6th generation
	RAM	2 GB	8 GB
	Mass storage	250 GB Hard Disk	SSD 64 GB
	Operating system	Win. Embedded 8 .1 Industry Pro	Windows 10 IoT Enterprise LTSB 64 bits
Communication Interfaces	Ethernet (ETH)	3 x Gigabit LAN / RTE	
	USB front	1 x USB 2.0 Type A	
	USB rear	1 x USB 3.0 Type A / 3 x USB 2.0 Type A	2 x USB 2.0 Type A / 4 x USB 3.0 Type A
	Serial interface	2 x COM	
	Dual CAN + NVRAM	optional	
	DVI	Yes	
	CRT monitor	No	
	HDMI	No	Yes
Power Supply	Rated voltage	24 VDC (+15%/-15%) SELV	
	Protection against reverse polarity	Yes	
	Protection against over voltage	Yes	
	Potential insulation	No, the 0V pin is connected to the digital GND	
	Power consumption	typ. 25 W max. 50 W (2.1A)	typ. 48 W max. 96 W (4A)
Ambient Conditions	Climatic conditions operation	0..45°C, 70% rel. air humidity, non-condensing	
	Climatic storage conditions	-20...60°C, 70% rel. air humidity, non-condensing	
	Climatic conditions transport	-20...60°C, 90% rel. air humidity, non-condensing	
Degree of Protection	Front	IP 65	
	Rear	IP 20	
	Pollution degree	2	
Weight		ca. 6.1 kg Function Key version ca. 6.5 kg Full Qwerty version	
Dimensions	W x H x D	410 x 330 (400) x 72.3mm	
Fan	Type	Fan-less	With fan

4.1.2 FS154i User interface options



Panel with 22 Function Keys
Reference with PC Panel coding «F»)

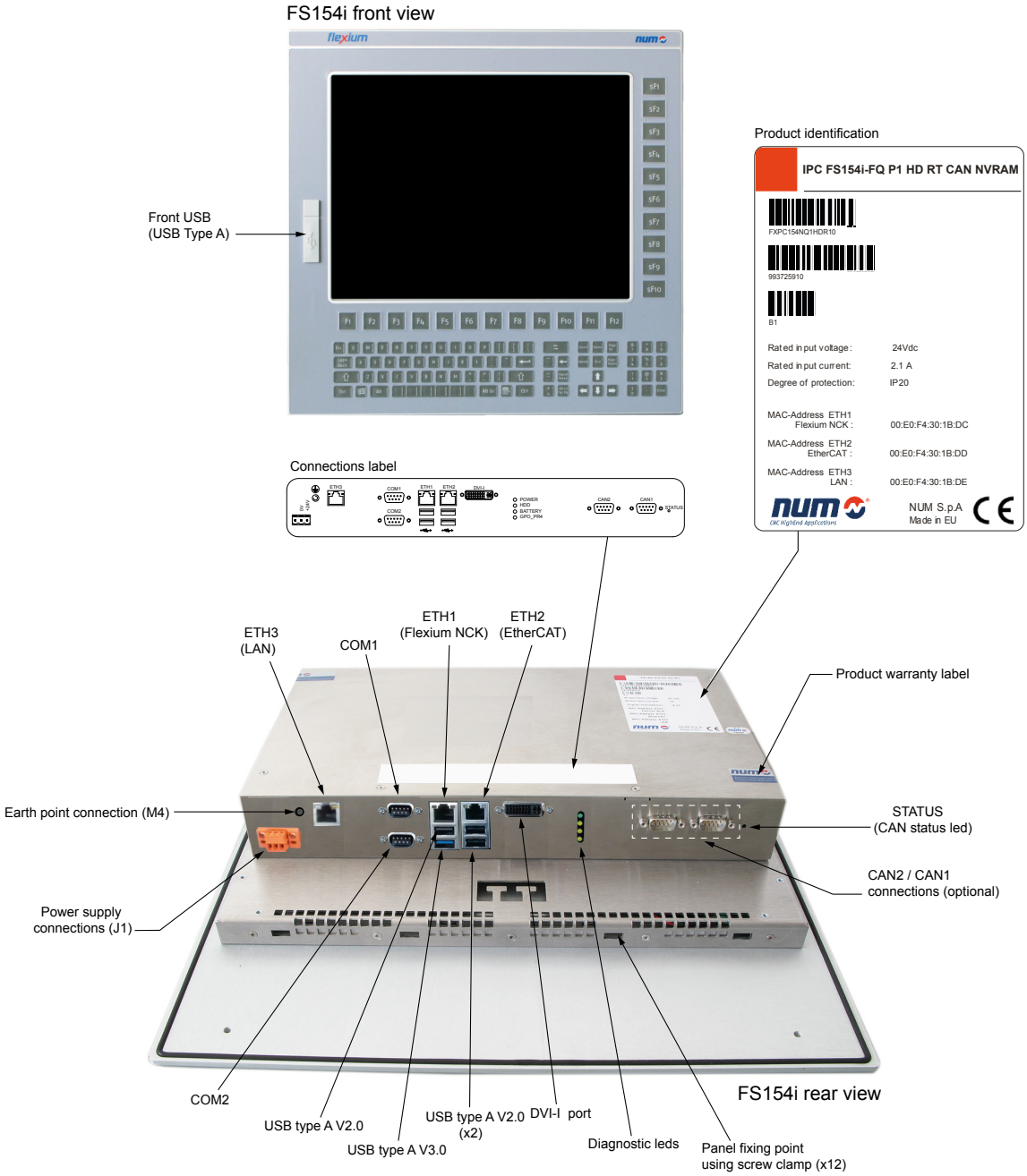


Panel with 22 Function Keys and QWERTY-Keyboard
Reference with PC Panel coding «Q»)

Both configurations are available with touch screen coding “R”.

4.1.3 FS154i (with integrated iPC) module description

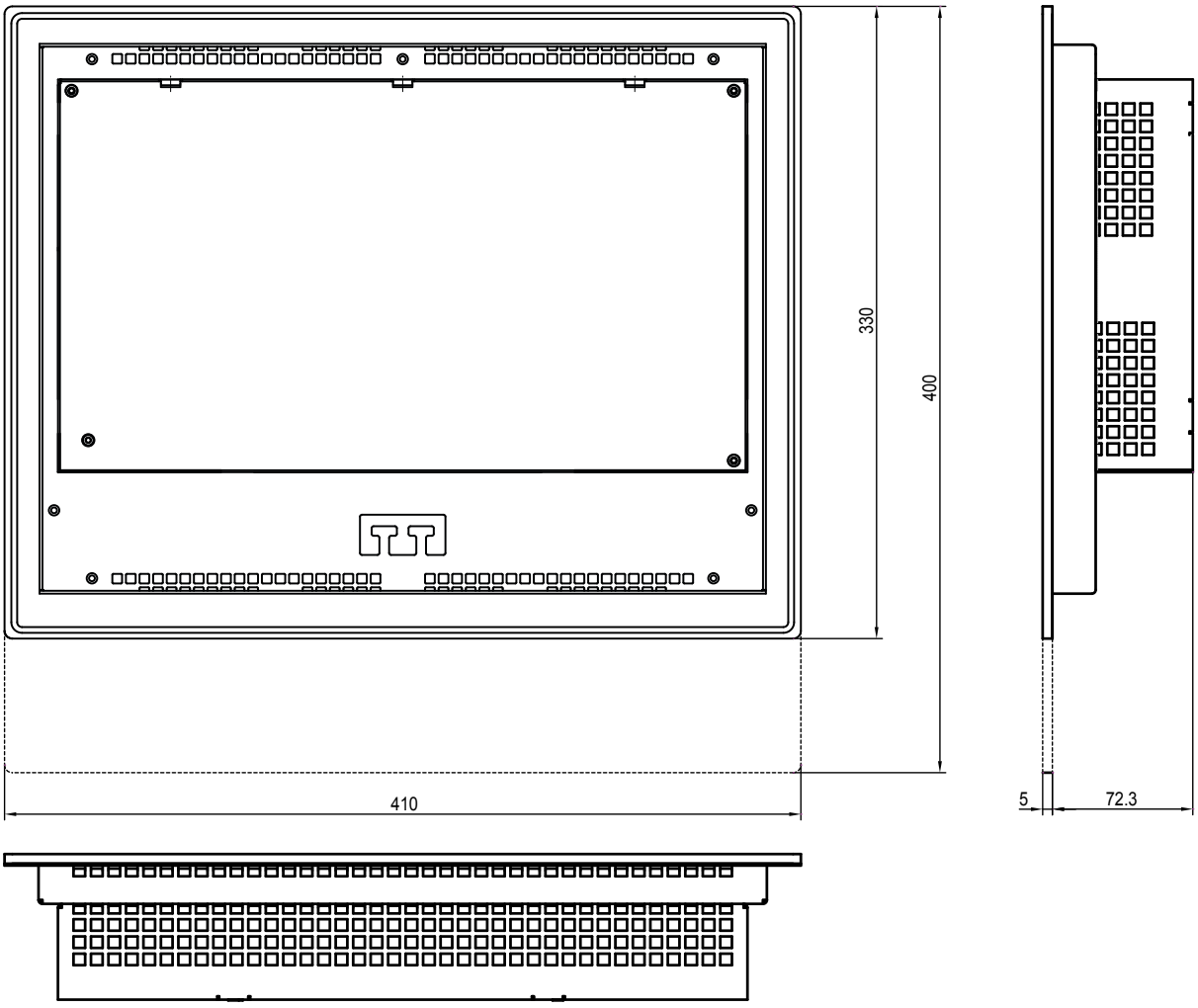
4.1.3.1 Example with the CAN option



Connector	Type	Description
Power supply	3 screws pins F	FS154i power supply connections
COM1	RS232 Sub D 9 pins M	Serial interface. General user purpose
COM2		
ETH1	RJ45 (8P/8C)	Flexium NCK Ethernet connections
ETH2	RJ45 (8P/8C)	EtherCAT port connections
ETH3	RJ45 (8P/8C)	Company LAN
CAN1 / CAN2	Sub D 9 pins M	Dual CAN + NVRAM interface (optional)
DVI-I	Standard DVI	Digital Video interface connection
USB (Front)	-	General user purpose. (Mouse and all USB devices)
USB x4 (Rear)		

4.1.4 Installation of Panels FS154i

4.1.4.1 Detailed dimensions



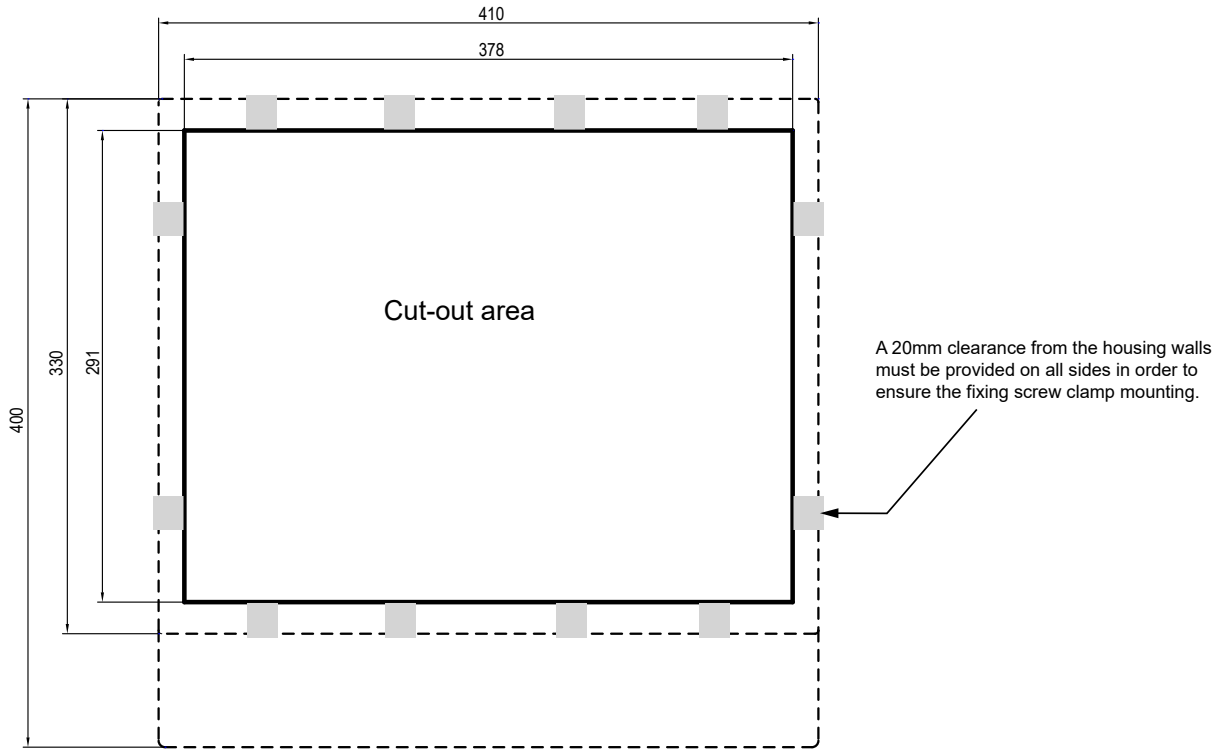
Dashed line FS154xQ version only.

The FS154i can be operated at a maximum ambient temperature of 45°C. The ambient temperature is based on the temperature of the area 5 cm above the panel with the device mounted vertically at a height of 2000 m above sea level.

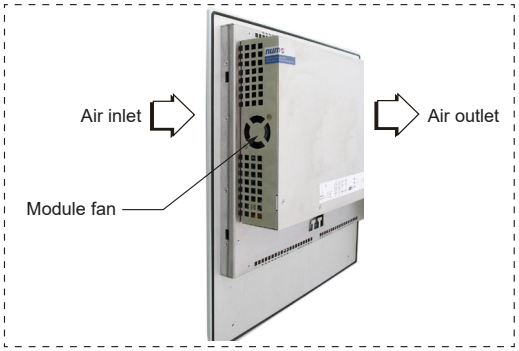
The device can be mounted in a completely closed housing, provided that the ambient temperature (in the case) is taken into account. A 20mm clearance from the housing walls must be provided on all sides in order to ensure sufficient air circulation and the fixing screw clamp mounting.

A minimum clearance of 75mm must be provided to active elements such as power supplies, transformers etc.

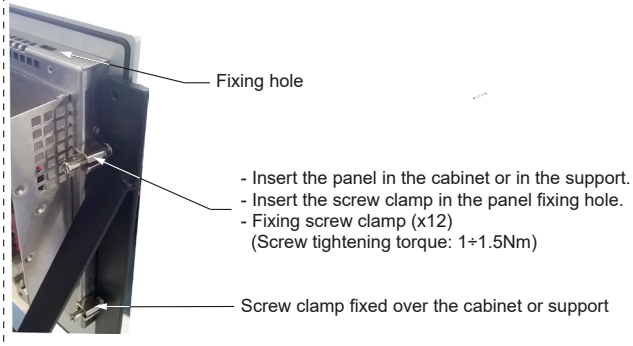
4.1.4.2 Panel FS154i cut-out, hole pattern and panel mounting



Panel ventilation



Panel mounting and fixing (example with support)



The maximum thickness allowed of cabinet or support is 5mm.

4.1.5 Power up and shutdown

FS154i starts automatically when Power up is applied. There is no Power up button.

To Power up the system after a shut down it is necessary to switch the power off and on again. Such OFF/ON sequence should be separated by a minimum dealy of 20seconds.

Shut Down: To keep the system safe and running never switch off the power directly but use a shut down procedure. A shutdown can be initilaized by the PLC program or by windows itself.

4.1.6 Diagnostics

Leds	**Meaning**
Power (Green) ON	- Power supply OK.
HDD (Yellow - First led) ON	- HDD access OK
Battery (Yellow - Second led) ON	- Change BIOS Battery
GPO_PR4 (Yellow - Third led)	Not used

Symptom	**Possible cause and remedy**
Dark screen during power-up	- Check power supply. - Loss of setup data. - Connect an external video display for diagnosis.
White screen after switch off and re-switch on again	- The ATX-power supply doesn't switch on properly because the switch off time was shorter than 20s.
Date/time not correct	Replace battery (see next page)
Ethernet connection missing	- Incorrect Ethernet cable fitted (crosslink/direct) - LINK-LED is lit if the connection is correct - ACT LED if the data transfer is correct (flashes during the transfer) - Incorrect/invalid IP address set.

4.1.7 Disposal

FS154i no longer in use must be properly disposed of or must be returned to the manufacturer for disposal. (Manufacturer address see list of NUM agencies on chapter 1)

4.1.8 Maintenance and Repair

4.1.8.1 Battery

The battery is used to back up the clock. The battery should be changed every 5 years in order to prevent any date/time loss. Please refer to chapter 9.6.8.



Only trained personnel are allowed to replace the battery.
For replacing, the back cover has to be removed.
Caution : Breaking the warranty label or removing the cover voids the warranty.



Pay attention to ESD safety protections when changing the battery.

4.1.8.2 Transport

Only the original packaging must be used for transporting the device.
The climatic conditions (see previous pages) must be observed.

4.1.8.3 Storage

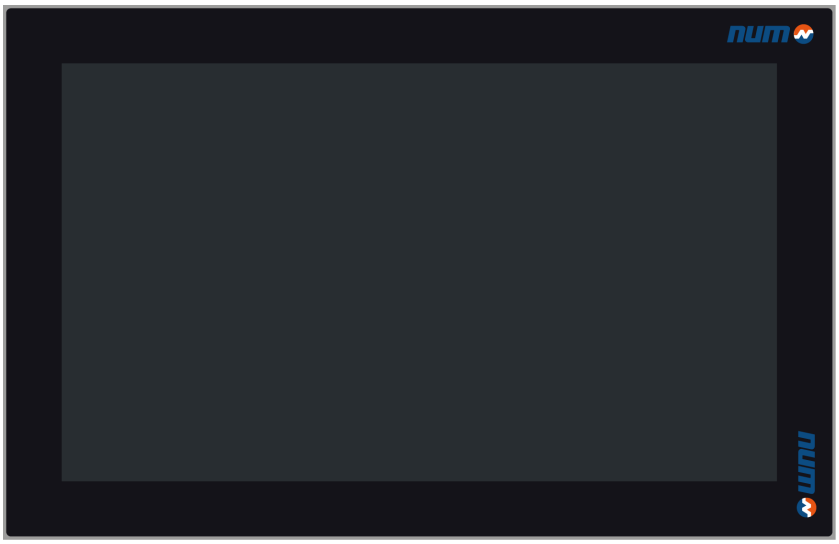
The device must only be stored in the climatic conditions described in the previous pages.
It should be remembered that a high storage temperature reduces the lifespan of the real time clock battery. It is recommended to store the device at room temperature.

4.1.9 FS154i Panels connections



Please refer to chaper 9 Flexium connections for more detailed information upon the FS154i Panels connections.

4.2 FS184i Operator Panel with Integrated PC



FS184i is a 18.5” display, glass protected, fitted with a capacitive multi-touch screen system. It includes an i5-6500TE 2.3GHz Quad Core 6th generation processor and an SSD mass memory

Durable, modern front end for machine control.it features an IP65 degree of protection at the front, and IP20 at the rear.

It can be landscape or portrait mounted.

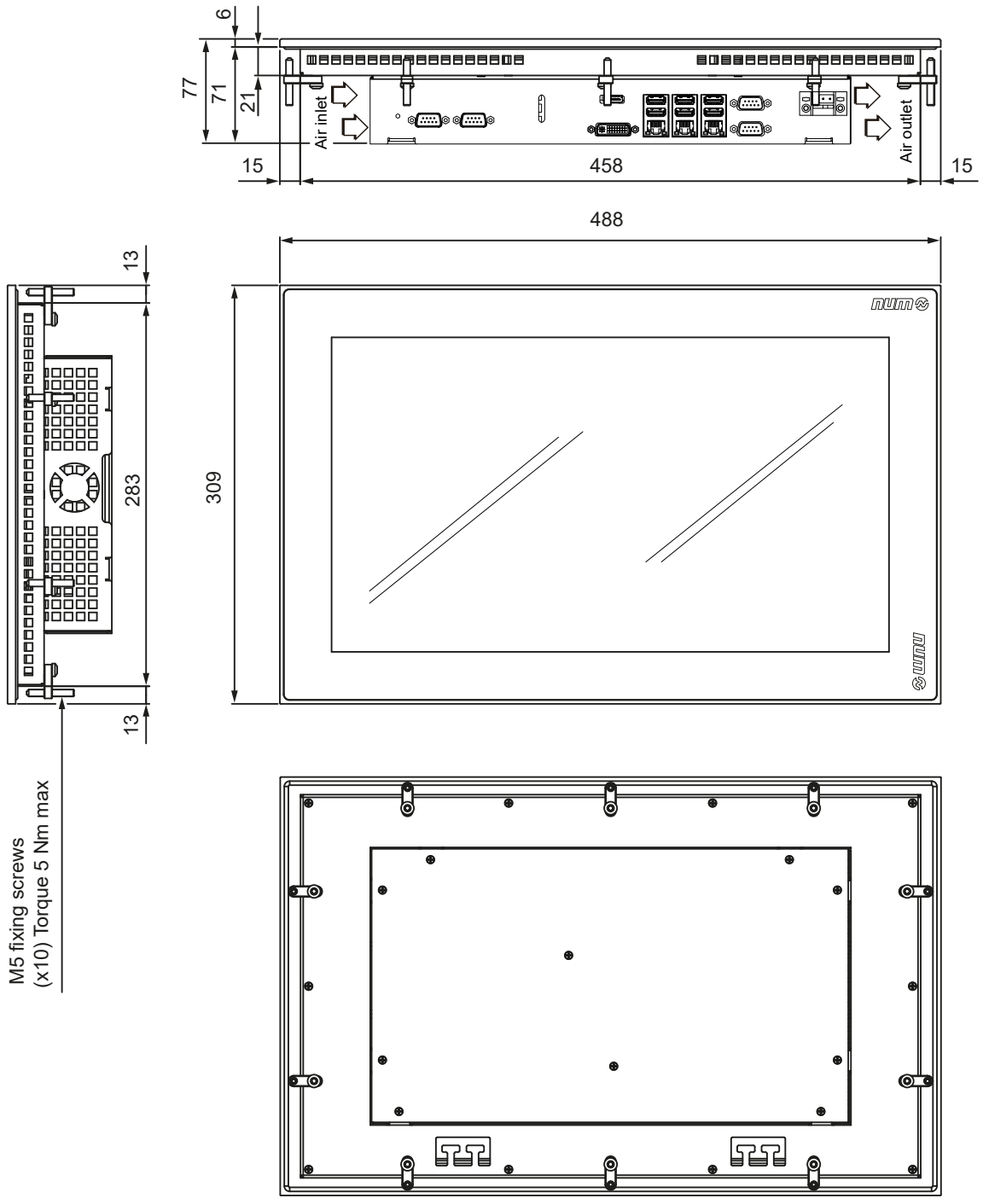


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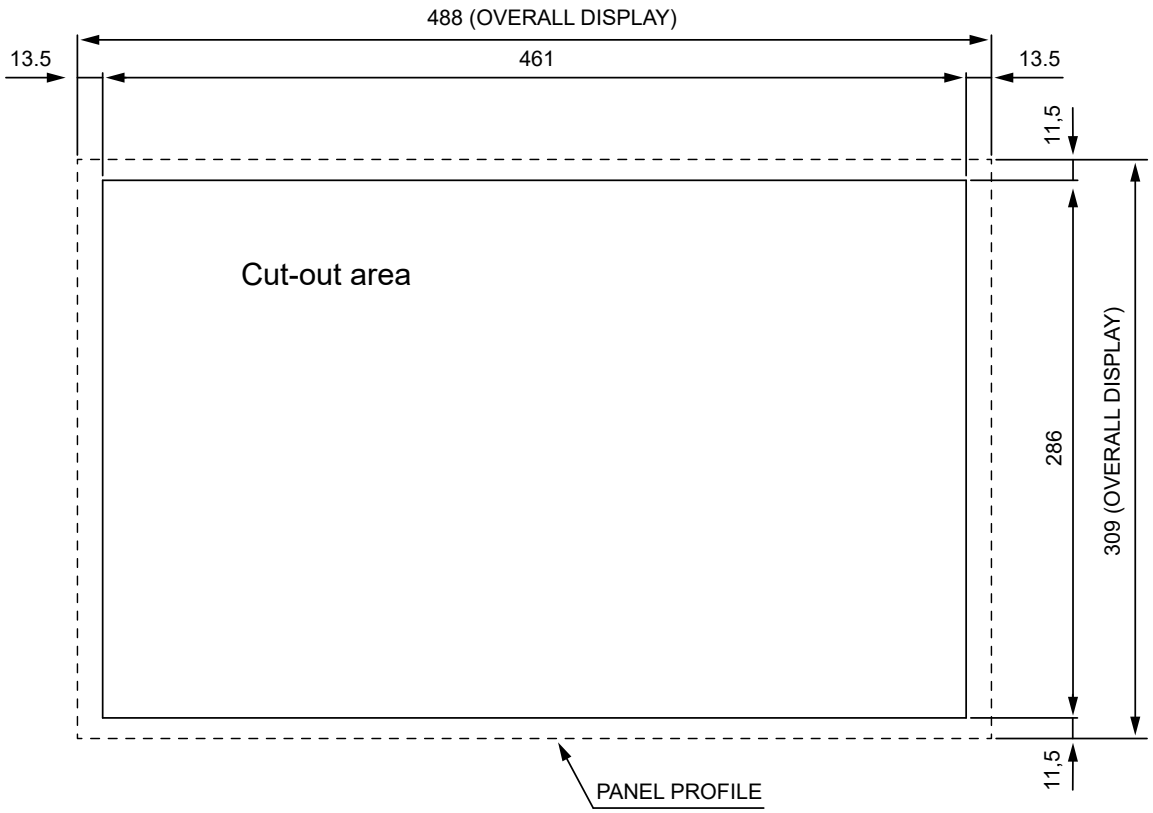
4.2.9.1 NUM Operator panel FS184i with integrated iPC P2 G4

		FXPC184CN2SxR20
Screen	User interface options	Projected capacitive touch screen with glass protection
	Technology	18.5“ TFT LCD (16.9 million colors)
	Resolution	1366 x 768
	Size	409.8 x 230.4mm
	Backlight	LED, Contr. 1000:1
Main PC Features	CPU	i5-6500TE 2.3GHz Quad Core 6th generation
	RAM	8 GB
	Mass storage	SSD 64 GB
	Operating system	Windows 10 IoT Enterprise LTSB 64 bits
Communication Interfaces	Ethernet (ETH)	3 x Gigabit LAN / RTE
	USB	2 x USB 2.0 Type A / 4 x USB 3.0 Type A (rear)
	Serial interface	2 x COM
	Dual CAN + NVRAM	optional
	DVI-D	1
	CRT monitor	No
	HDMI	1
Power Supply	Rated voltage	24VDC (+15%/-15%) SELV
	Protection against reverse polarity	Yes
	Protection against over voltage	Yes
	Potential isolation	No. (The 0V-pin of the PS is connected to the digital GND)
	Power consumption	55 W typ., max. 120 W (5A)
Ambient Conditions	Climatic conditions operation	5..45°C, 70% rel. air humidity, non-condensing
	Climatic storage conditions	-20...60°C, 70% rel. air humidity, non-condensing
	Climatic conditions transport	-20...60°C, 90% rel. air humidity, non-condensing
Degree of Protection	Front	IP 65
	Rear	IP 20
Weight		6.7 kg
Dimensions	W x H x D	488 x 309 x 77 mm
Cooling		With fan

4.2.9.2 FS184i outline



4.2.9.3 FS184i cutout area



4.2.1 Power up and shutdown

FS184i starts automatically when Power up is applied. There is no Power up button.

To Power up the system after a shut down it is necessary to switch the power off and on again.

Such OFF/ON sequence should be separated by a minimum delay of 20seconds.

Shut Down: To keep the system safe and running never switch off the power directly but use a shut-down procedure. A shutdown can be initialised by the PLC program or by windows itself.

4.2.1.1 Disposal

FS184i no longer in use must be properly disposed of or must be returned to the manufacturer for disposal. (Manufacturer address see list of NUM agencies on chapter 1)

4.2.1.2 Battery

The battery is used to back up the clock. The battery should be changed every 5 years in order to prevent any date/time loss.

Only trained personnel are allowed to replace the battery.

Caution : Breaking the warranty label or removing the cover voids the warranty.

Pay attention to ESD safety protections when changing the battery.

4.2.1.3 Transport

Only the original packaging must be used for transporting the device.

The climatic conditions must be observed.

4.2.1.4 Storage

The device must only be stored in the climatic conditions described in the previous pages.

It should be remembered that a high storage temperature reduces the lifespan of the real time clock battery. It is recommended to store the device at room temperature.

4.2.1.5 FS184i Panels connections

Please refer to chaper 9 Flexium connections for more detailed information upon the FS184i Panels connections.

4.3 FS194i Operator panel with integrated iPC

FS194i with integrated industrial PC, with the latest portrait oriented 19-inch capacitive touch screen system NUM has set a new standard for operating panels in the machine tool industry.

A compact and scalable panel PC with Intel's i5 allows entry to multi-processor technology with Windows 8 operating system.

FS194i function as a powerful platform for the HMI and enable you to operate it simply and logically.

The FS194i operator panel provides a durable, modern front end for machine control. It has an IP65 degree of protection at the front, and IP20 at the rear.

High-quality 4 mm hardened safety glass protects the front, without introducing any disturbing reflection.

A narrow brushed aluminum frame with rounded edges provides complete side protection for the glass and multi-touch sensor.



STOP

Machine builders and end users are not allowed to install on this NUM industrial PC, software which performs "Desktop Functions" other than through, in support of, and operating as a part of, the Embedded Application. "Desktop Functions" means consumer or business tasks or processes performed by a computer or computing device. This includes email, word processing, spreadsheets, database, network/Internet browsing, scheduling, and personal finance. Desktop Functions may include features and functions derived from the MS Binaries or the Company Binaries.

FS194i available versions

FS194i version	Ordering code
FS194i-TS P2 HD NR	**FXPC194CN2HNN00**
FS194i-TS P2 HD RT	**FXPC194CN2HNR00**
FS194i-TS P2 HD RT CAN	**FXPC194CN2HCR00**
FS194i-TS P2 HD RT CAN NVRAM	**FXPC194CN2HDR00**

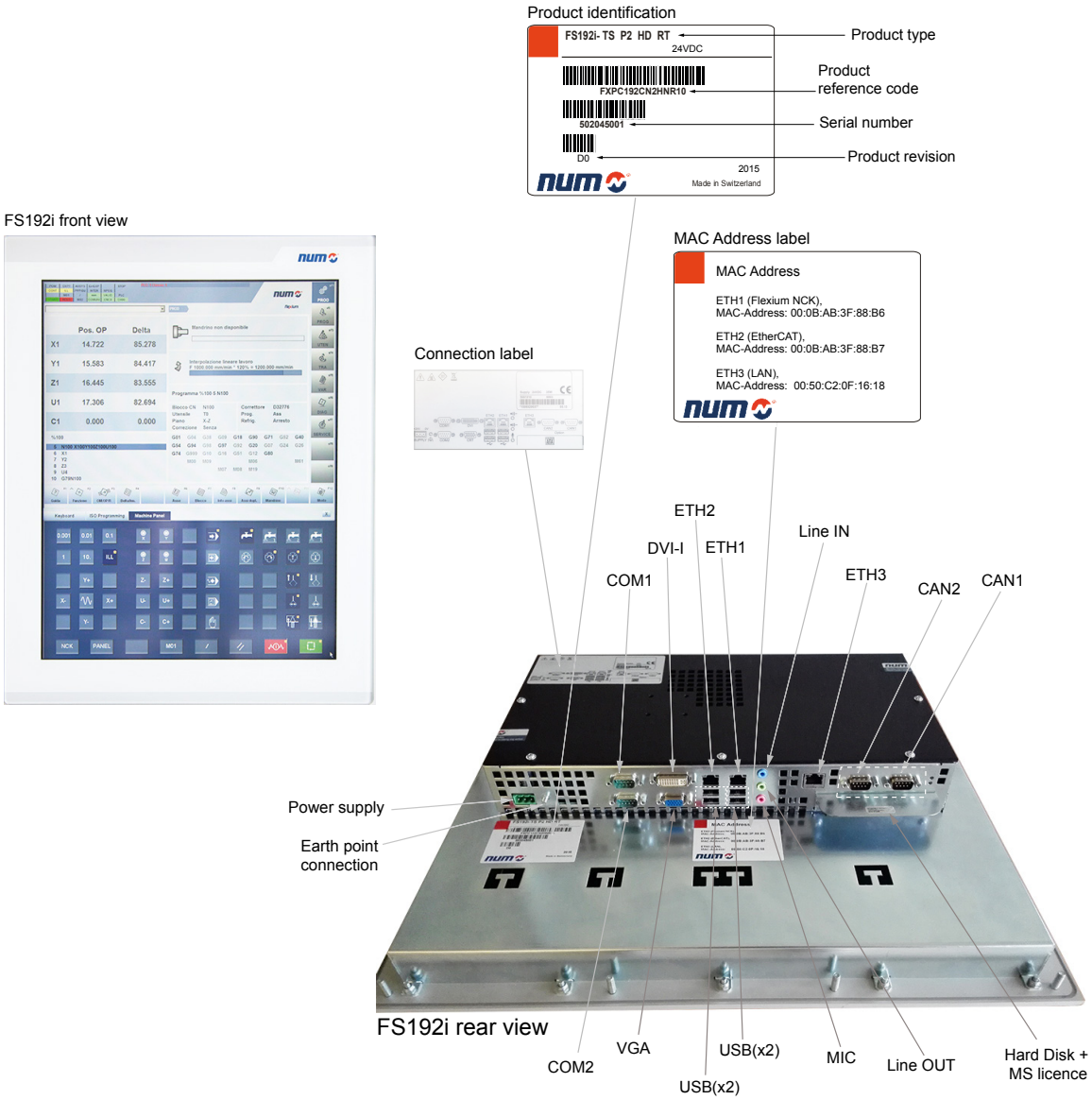
4.3.1 FS194i ordering code

	FXPC	19	4	C	N	2	H	D	R	1	0
Display Unit											
• LCD 19”		19									
Panel/Mechanical Variant											
• Fourth Generation			4								
Display Sensor											
• Touch screen (proj.) capacitive				C							
Keyboard Type											
• No keyboard, no function keys					N						
IPC Mother Board, Processor											
• Performance level P2						2					
Mass Memory Type											
• HD (Hard Disk)							H				
Option Board											
• No fieldbus								N			
• CAN								C			
• CAN + NVRAM								D			
Flexium RTS											
• Real time									R		
Operating System											
• Windows 8 kernel [1]										1	
Spare Number											0

4.3.2 General characteristics

FXPC194CN2Hxx00		
Screen	User interface options	Projected capacitive touch screen with hardened glass protection
	Technology	19“ TFT LCD (16.9 million colours)
	Resolution:	1024 x 1280 from 60Hz to 75Hz (vertical orientation)
	Size:	304 x 379mm
	Backlight:	Contr. 400:1 (Typ)
Main PC features	CPU	i5 M520 2.4GHz Dua lCore
	RAM	SATA DDR3 2 GB
	Mass storage	SATA Hard disk ≥ 260 GB
	Operating system	Windows Embedded 8.1 Industry Pro
	Graphic card	Intel® HD Graphics
Communication Interfaces	Ethernet (ETH)	2 x GbE LAN / RTE, 1 USB to LAN
	USB rear	4 x Type A V2.0
	Serial interface	COM1, COM2, (x2), RS232 D-Sub 9 pole male
	Dual CAN1 / CAN2 (optional)	max. 500kBaud (isolated); 1MBaud non isolated
	Dual CAN + NVRAM (optional)	max. 500kBaud (isolated); 1MBaud non isolated.
	DVI-I interface	1
	VGA interface	1
	Line IN/Line OUT MIC	Yes
Power supply	Rated voltage	24 VDC SELV, safety extra low voltage. Protection class III / 4A.
	Voltage range	24VDC +20% -15% supplied by the customer.
	Protection against reverse polarity	Yes
	Protection against overvoltage	Yes
	Potential isolation	No. (The 0V-pin of the PS is connected to the digital GND)
	Power consumption	ca. 50W As point of reference, the 24V-power supply should be rated for 4A continuous load.
Ambient conditions	Climatic conditions operation	5..45 °C with vertical mounting with Hard disk. 5..35 °C with mounting up to max. 35° with Hard disk. 10...90% rel. air humidity, non-condensing. The measuring point is defined 5cm over the top of the PC case in the middle of the vent holes. It is recommended to ensure enough air circulation.
	Climatic storage conditions	-20...60°C, 10...90% rel. air humidity, non-condensing
	Climatic conditions, transport	Class 2K3 EN50178 (reduced) -20...60 °C, 10...90 % rel. Air humidity, non-condensing.
EMC	EMC immunity	Industry EN 61000-6-2
	EMC emission	Residential area EN 61000-6-3
Degree of Protection	Front	IP 65
	Rear	IP 20
Weight		11.2 kg
Dimensions	W x H x D	Please refer to the following pages
Fan	Type	The Smart Fan control system supports Thermal® and Speed® cruise.
Noise		<70dB

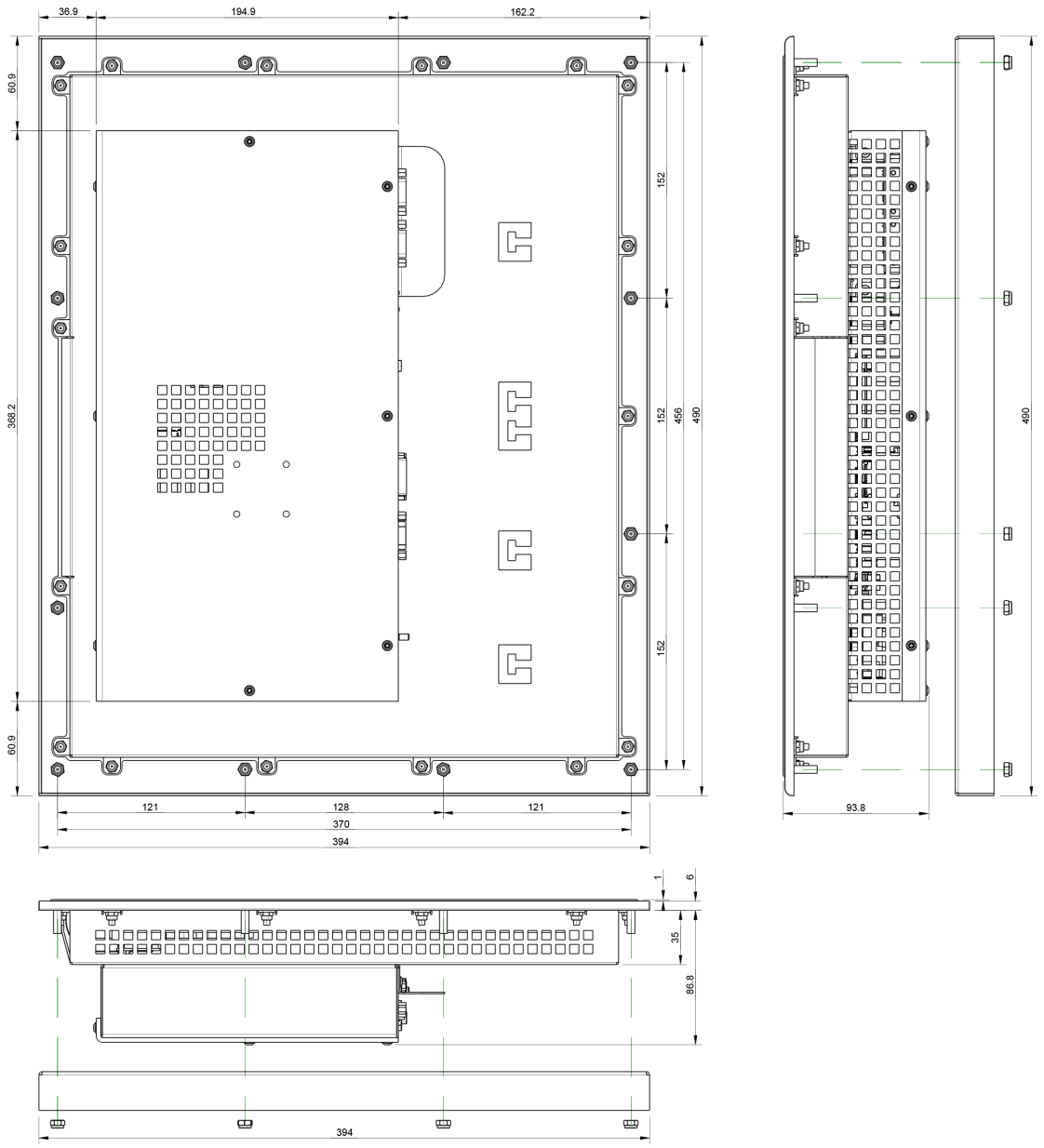
4.3.3 FS194i (with integrated PC) module description



Connector	Type	Description
Power supply	3 screws pins F	FS194i power supply connections
COM1	RS232 Sub D 9 pins M	Serial interface. General user purpose
COM2		
ETH1	RJ45 (8P/8C)	Flexium NCK Ethernet connections
ETH2	RJ45 (8P/8C)	EtherCAT port connections
ETH3	RJ45 (8P/8C)	Company LAN
CAN1 /CAN2	Sub D 9 pins M	Standard CAN interface (optional)
USB x4	Type A V2.0	General user purpose. (Mouse and all USB devices)
VGA	Sub D HD 15 pins F	Video interface PC compatible connection
DVI-I	Standard DVI	Digital Video interface connection

4.3.4 Installation of Panels FS194i

4.3.4.1 Detailed dimensions

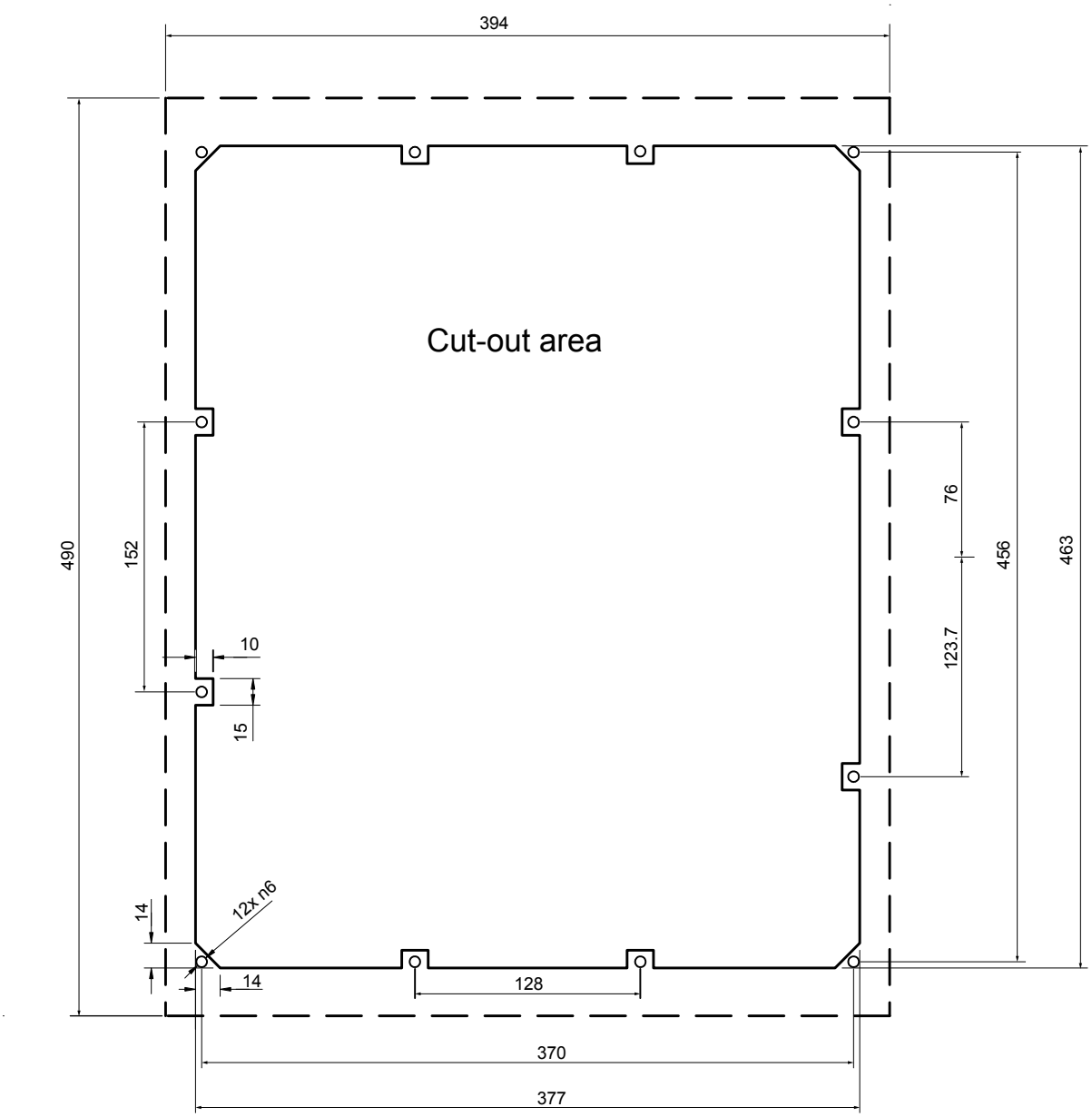


The FS194i can be operated at a maximum ambient temperature of 45°C. The ambient temperature is based on the temperature of the area 5 cm above the panel with the device mounted vertically at a height of 2000 m above sea level.

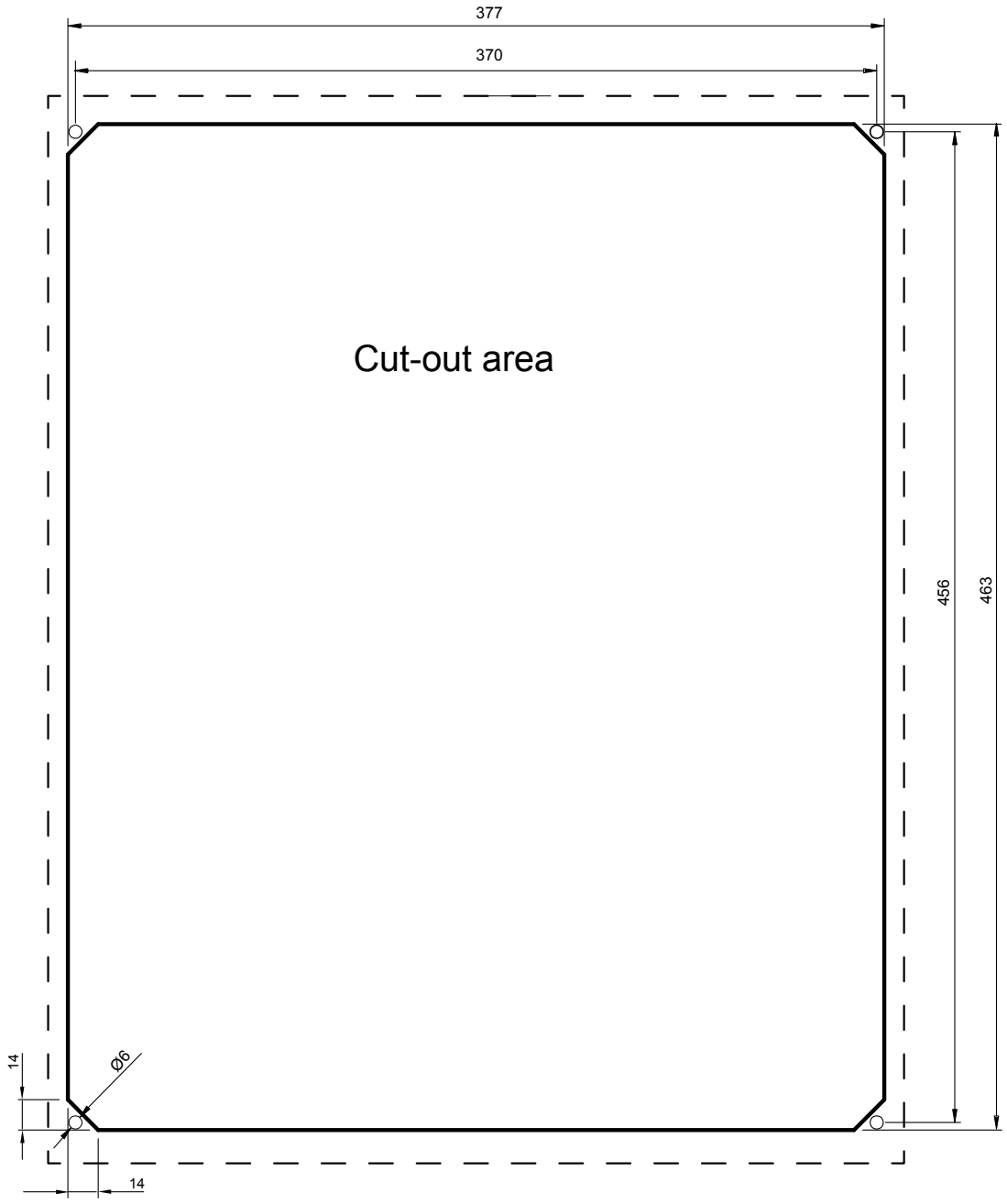
The device can be mounted in a completely closed housing, provided that the ambient temperature (in the case) is taken into account. A 10mm clearance from the housing walls must be provided on all sides in order to ensure sufficient air circulation.

A minimum clearance of 75mm must be provided to active elements such as power supplies, transformers etc.

4.3.4.2 Panel FS194i cut-out and hole pattern



4.3.4.3 Panel FS194i cut-out using Back Side Mounting Plate



4.3.4.4 FS194i (with Integrated iPC) Technical Characteristics

FXPC194CN2SxR20		
Screen	User interface options	Projected capacitive touch screen with hardened glass protection
	Technology	19“ TFT LCD (16.9 million colours)
	Resolution	1024 x 1280 from 60 Hz to 75 Hz (vertical orientation)
	Size	304 x 379 mm
	Backlight	LED, Contr. 400:1 (Type)
Main PC Features	CPU	i5-6500TE 2.3GHz Quad Core 6th generation
	RAM	8 GB
	Mass storage	SSD 64 GB
	Operating system	Windows 10 IoT Enterprise LTSB 64 bits
Communication Interfaces	Ethernet (ETH)	3 x Gigabit LAN / RTE
	USB	2 x USB 2.0 Type A / 4 x USB 3.0 Type A
	Serial interface	2 x COM
	Dual CAN + NVRAM	optional
	DVI-D	1
	CRT monitor	No
	HDMI	1
Power Supply	Rated voltage	24VDC (+15%/-15%) SELV
	Protection against reverse polarity	Yes
	Protection against over voltage	Yes
	Potential isolation	No. (The 0V-pin of the PS is connected to the digital GND)
	Power consumption	70 W, max. 120 W (5A)
Ambient Conditions	Climatic conditions operation	5..45°C, 70% rel. air humidity, non-condensing
	Climatic storage conditions	-20...60°C, 70% rel. air humidity, non-condensing
	Climatic conditions transport	-20...60°C, 90% rel. air humidity, non-condensing
Degree of Protection	Front	IP 65
	Rear	IP 20
Weight		9.8 kg
Dimensions	W x H x D	394 x 490 x 92 mm
Fan	Type	With fan

4.3.5 Power up and shutdown

FS194i starts automatically when Power up is applied. There is no Power up button.

To Power up the system after a shut down it is necessary to switch the power off and on again. Such OFF/ON sequence should be separated by a minimum dealy of 20seconds.

Shut Down: To keep the system safe and running never switch off the power directly but use a shut down procedure. A shutdown can be initilaized by the PLC program or by windows itself.

4.3.6 Disposal

FS194i no longer in use must be properly disposed of or must be returned to the manufacturer for disposal. (Manufacturer address see list of NUM agencies on chapter 1)

4.3.6.1 Battery

The battery is used to back up the clock. The battery should be changed every 5 years in order to prevent any date/time loss. Please refer to chapter 9.7.9.



Only trained personnel are allowed to replace the battery.
For replacing, the back cover has to be removed.
Caution : Breaking the warranty label or removing the cover voids the warranty.



Pay attention to ESD safety protections when changing the battery.

4.3.6.2 Transport

Only the original packaging must be used for transporting the device.
The climatic conditions (see previous pages) must be observed.

4.3.6.3 Storage

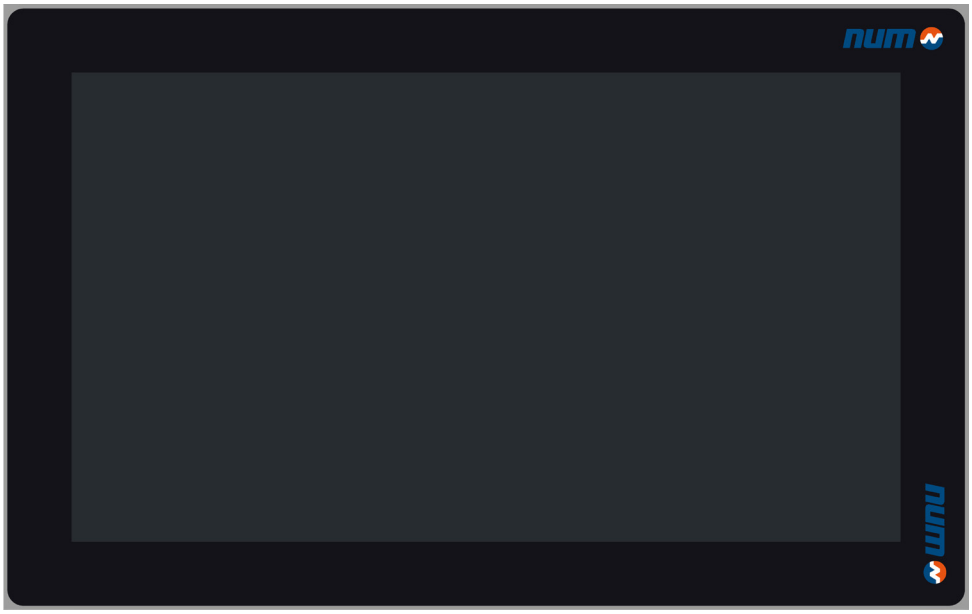
The device must only be stored in the climatic conditions described in the previous pages.
It should be remembered that a high storage temperature reduces the lifespan of the real time clock battery. It is recommended to store the device at room temperature.

4.3.7 FS194i Panels connections



Please refer to chaper 9 Flexium connections for more detailed information upon the FS194i Panels connections.

4.4 FS244i P2 operator panels with integrated iPC;



FS244i is a 24” display, glass protected, fitted with a capacitive multi-touch screen system. It includes an i5-6500TE 2.3GHz Quad Core 6th generation processor and an SSD mass memory

Durable, modern front end for machine control.it features an IP65 degree of protection at the front, and IP20 at the rear.

It can be landscape or portrait mounted.

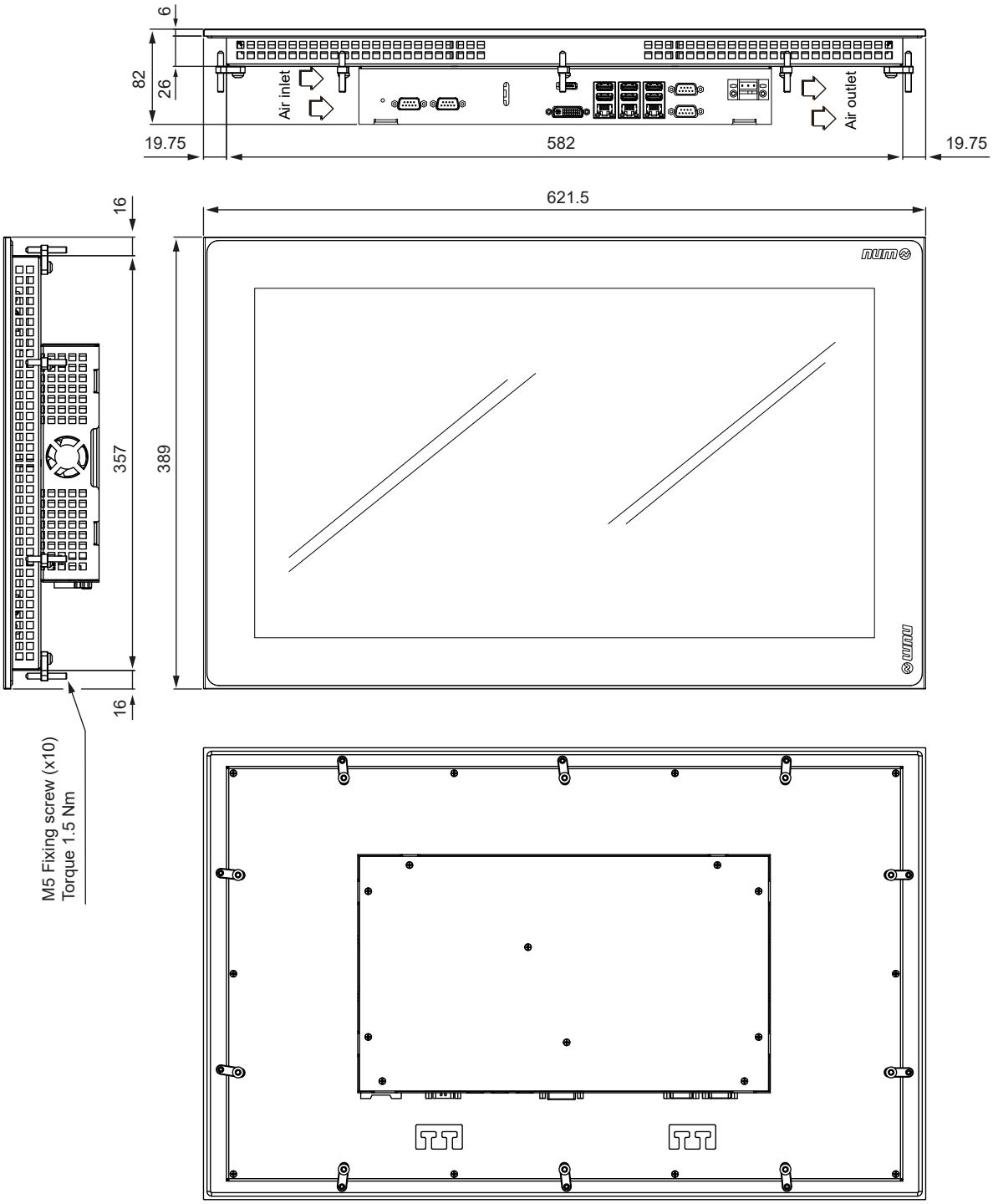


Machine builders and end users are not allowed to install on this NUM industrial PC, software which performs “Desktop Functions” other than through, in support of, and operating as a part of, the Embedded Application. “Desktop Functions” means consumer or business tasks or processes performed by a computer or computing device. This includes email, word processing, spreadsheets, database, network/Internet browsing, scheduling, and personal finance. Desktop Functions may include features and functions derived from the MS Binaries or the Company Binaries.

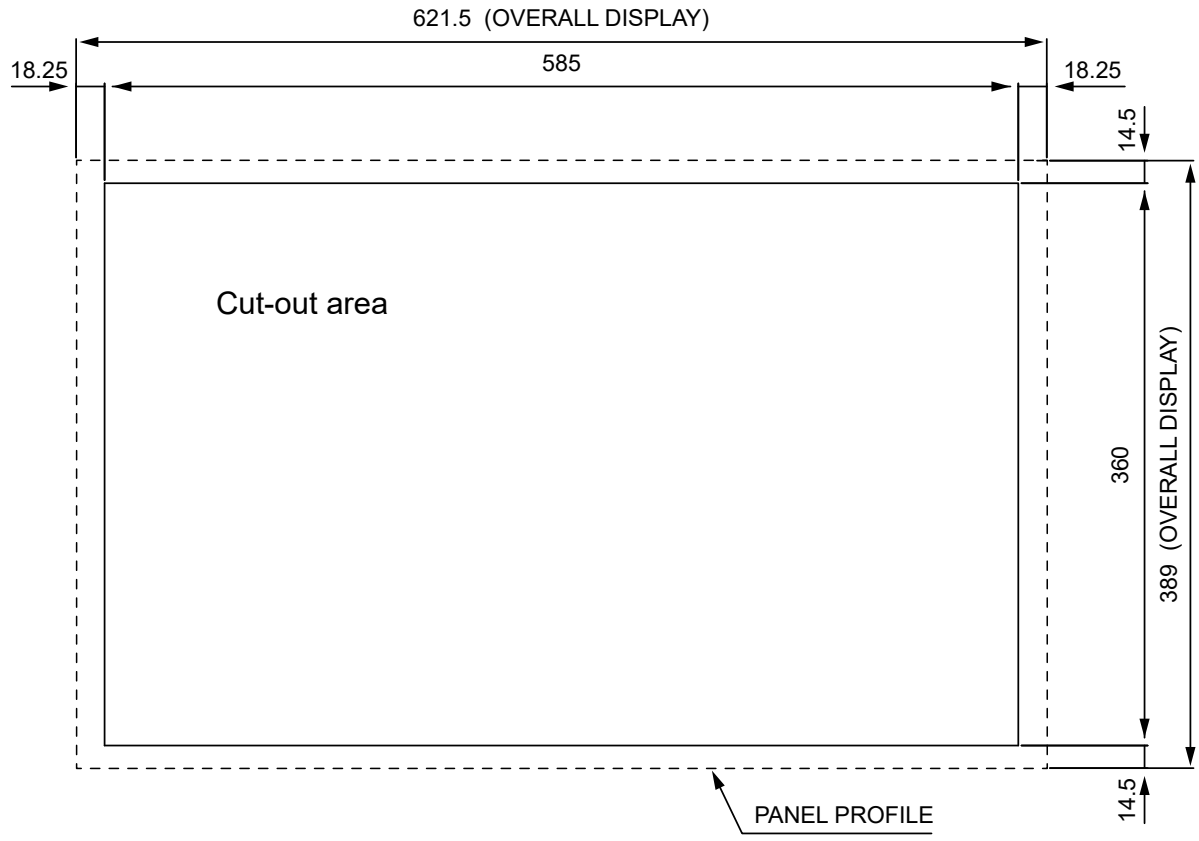
4.4.1 NUM Operator panel FS244i vs FS184i with integrated iPC P2 G4

		FXPC184CN2SxR20	FXPC244CN2SxR20
Screen	User interface options	Projected capacitive touch screen with glass protection	
	Technology	18.5“ TFT LCD (16.9 million colors)	24“ TFT LCD (16.9 million colors)
	Resolution	1366 x 768	1920 x 1080
	Size	409.8 x 230.4mm	531.3 x 298.8mm
	Backlight	LED, Contr. 1000:1	LED, Contr. 5000:1
Main PC Features	CPU	i5-6500TE 2.3GHz Quad Core 6th generation	
	RAM	8 GB	
	Mass storage	SSD 64 GB	
	Operating system	Windows 10 IoT Enterprise LTSB 64 bits	
Communication Interfaces	Ethernet (ETH)	3 x Gigabit LAN / RTE	
	USB	2 x USB 2.0 Type A / 4 x USB 3.0 Type A (rear)	
	Serial interface	2 x COM	
	Dual CAN + NVRAM	optional	
	DVI-D	1	
	CRT monitor	No	
	HDMI	1	
Power Supply	Rated voltage	24VDC (+15%/-15%) SELV	
	Protection against reverse polarity	Yes	
	Protection against over voltage	Yes	
	Potential isolation	No. (The 0V-pin of the PS is connected to the digital GND)	
	Power consumption	55 W typ., max. 120 W (5A)	63 W typ., max. 120 W (5A)
Ambient Conditions	Climatic conditions operation	5..45°C, 70% rel. air humidity, non-condensing	
	Climatic storage conditions	-20...60°C, 70% rel. air humidity, non-condensing	
	Climatic conditions transport	-20...60°C, 90% rel. air humidity, non-condensing	
Degree of Protection	Front	IP 65	
	Rear	IP 20	
Weight		6.7 kg	8.9 kg
Dimensions	W x H x D	488 x 309 x 77 mm	621.5 x 389 x 82 mm
Cooling		With fan	

4.4.2 FS244i outline



4.4.3 FS244i Cutout area



4.4.3.1 Power up and shutdown

FS244i starts automatically when Power up is applied. There is no Power up button.

To Power up the system after a shut down it is necessary to switch the power off and on again.

Such OFF/ON sequence should be separated by a minimum delay of 20seconds.

Shut Down: To keep the system safe and running never switch off the power directly but use a shut-down procedure. A shutdown can be initialised by the PLC program or by windows itself.

4.4.3.2 Disposal

FS244i no longer in use must be properly disposed of or must be returned to the manufacturer for disposal. (Manufacturer address see list of NUM agencies on chapter 1)

4.4.3.3 Battery

The battery is used to back up the clock. The battery should be changed every 5 years in order to prevent any date/time loss.

Only trained personnel are allowed to replace the battery.

Caution : Breaking the warranty label or removing the cover voids the warranty.

Pay attention to ESD safety protections when changing the battery.

4.4.3.4 Transport

Only the original packaging must be used for transporting the device.

The climatic conditions must be observed.

4.4.3.5 Storage

The device must only be stored in the climatic conditions described in the previous pages.

It should be remembered that a high storage temperature reduces the lifespan of the real time clock battery. It is recommended to store the device at room temperature.

4.4.3.6 FS244i Panels connections

Please refer to chaper 9 Flexium connections for more detailed information upon the FS192i Panels connections.



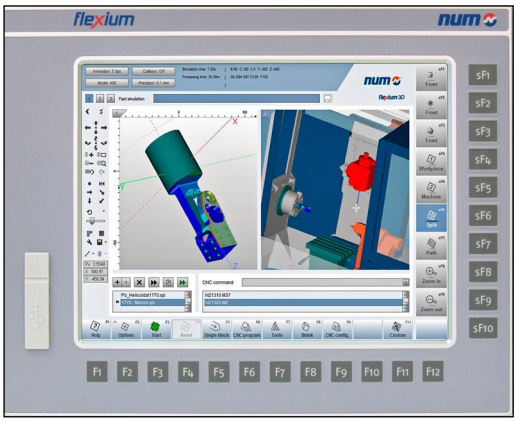
Machine builders and end users are not allowed to install on this NUM industrial PC, software which performs “Desktop Functions” other than through, in support of, and operating as a part of, the Embedded Application. “Desktop Functions” means consumer or business tasks or processes performed by a computer or computing device. This includes email, word processing, spreadsheets, database, network/Internet browsing, scheduling, and personal finance. Desktop Functions may include features and functions derived from the MS Binaries or the Company Binaries.

4.5 FS122 Operator Panel (without integrated iPC)

FS122 Operator Panel is a 12-inch passive control panels for Flexium that are designed for use with an external PC or NUM Industrial Box PC P1 / P2.
Please refer to chapter 6 to give more detailed information on Box PC P1 / P2.

The passive panels FS122 are available with and without touch screen. Both versions have got 22 functional keys.

The display quality makes the panels very legible, even in poorly-lit environments. Compact and very rugged, the panels are sealed (IP65) and suitable for use in severe industrial environments.



4.5.1 FS122 Panel options



Panel with 22 Function Keys



Panel with 22 Function Keys

Resistive Touch Screen

4.5.2 FS122 available version

FS122 version	Ordering code
FS122-FK-TS	**FXPC122RFNNNN00**
FS122-FK	**FXPC122NFNNNN00**

4.5.3 FS122 ordering code

FXPC	12	2	R	F	N	N	N	N	0	0
Display Unit										
- LCD 12”	12									
Panel/Mechanical Variant										
- Second generation		2								
Display Sensor										
- Touch screen resistive			R							
- No touch Sensor			N							
Keyboard Type										
- 22 Function keys				F						
IPC Mother Board, Processor										
- No IPC, just operator panel					N					
Mass Memory Type										
- No IPC, just operator panel						N				
Option Board										
- No fieldbus, just operator panel							N			
Flexium RTS										
- No RTS, just operator panel								N		
Operating System										
- No IPC, just operator panel									0	
Spare Number										0

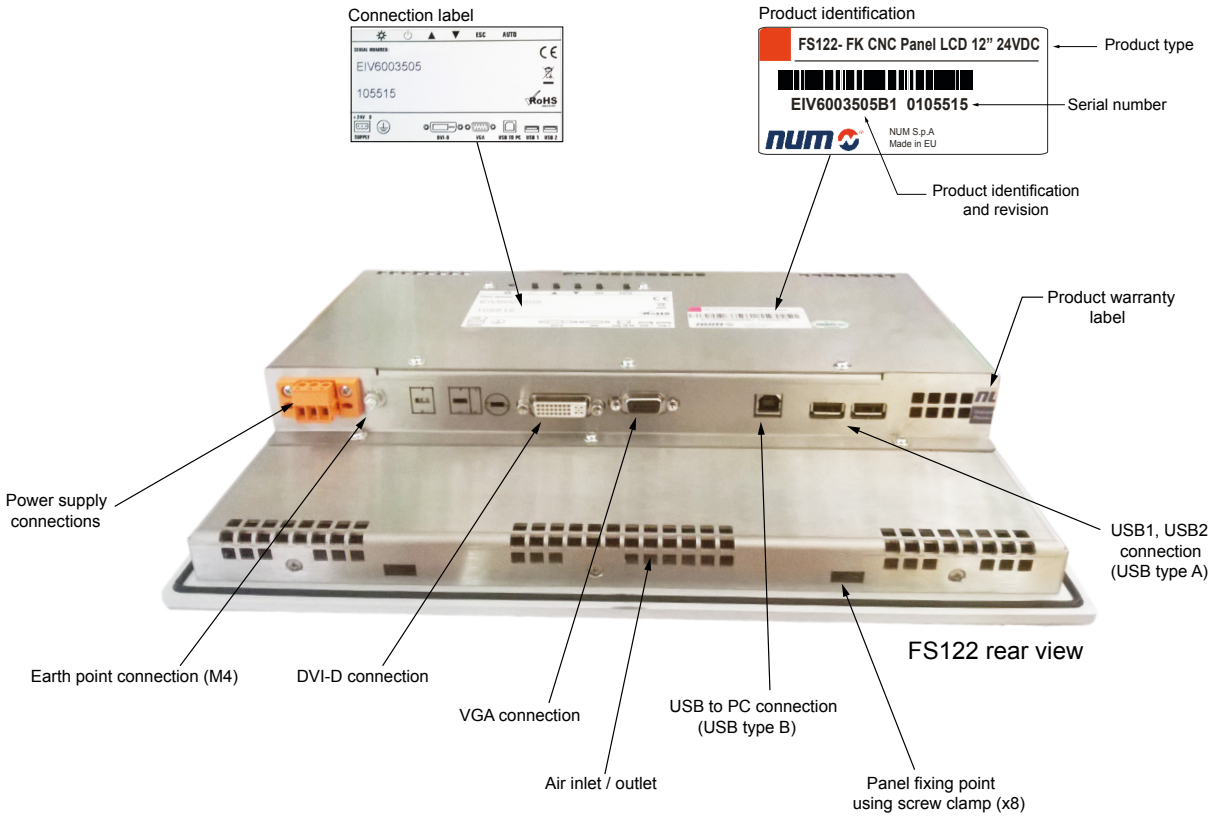
4.5.4 General characteristics

FXPC122xFNNNN00		
Screen	User interface	Operator panel without integrated PC: - 22 Function Keys - Resistive touch screen available as option
	Technology	12.1“ LED
	Resolution	1024 x 768 on 60 Hz till 75Hz
	Size	Diagonal 307 mm
	Backlight	Contr. 700:1
	Brightness	600cd/m²
Main PC features	CPU	External PC required
	RAM	
	Mass storage	
	Operating system	
	Graphic card	
Communication Interfaces	USB front	1 x Type A V2.0
	USB rear	2 x Type A V2.0 and 1 x Type B V2.0 (USB to PC)
	DVI-D interface	1
	VGA interface	1
Power supply	Rated voltage	24 VDC SELV, safety extra low voltage. Protection class III / 4A.
	Voltage range	24VDC +20% -15% supplied by the customer.
	Protection against reverse polarity	Yes
	Protection against over voltage	Yes
	Potential isolation	No. (The 0V-pin of the PS is connected to the digital GND)
	Power consumption	ca. 25W As point of reference, the 24V-power supply should be rated for 4A continuous load.
Ambient conditions	Climatic conditions operation	0..50°C 10...90% rel. air humidity, non-condensing. The measuring point is defined 5cm over the top of the PC case in the middle of the vent holes. It is recommended to ensure enough air circulation.
	Climatic conditions storage	-20...60°C, 10...90% rel. air humidity, non-condensing
	Climatic conditions, transport	Class 2K3 EN50178 (reduced) -20...60°C, 10...90% rel. air humidity, non-condensing.
EMC	EMC immunity	Industry EN 61000-6-2
	EMC emission	Residential area EN 61000-6-3
Degree of protection	Front	IP 65
	Rear	IP 20
Weight		ca. 3.45 kg
Dimensions	W x H x D:	347 x 276 x 63mm

4.5.5 FS122 panel description

FS122 front view



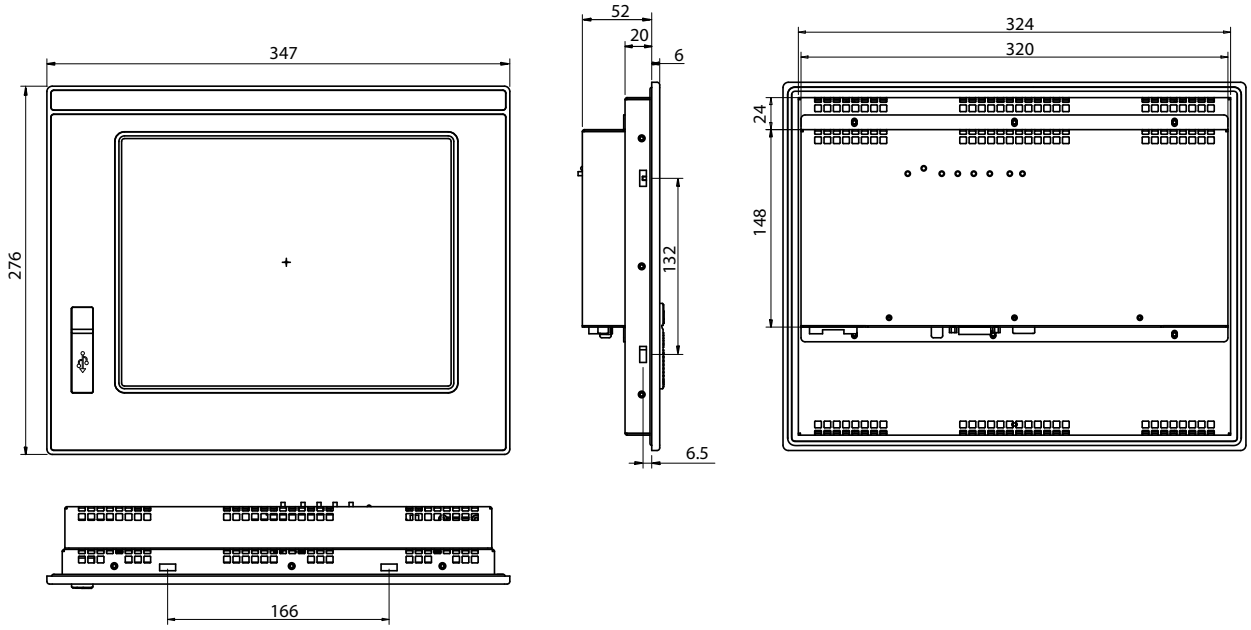


FS122 rear view

Connector	Type	Description
Power supply	3 screws pins F	FS122 power supply connections
USB (Front)	Type A V2.0	General user purpose. (Memory stick, Mouse and all USB devices)
USB x2 (Rear)		
USB (to PC)	Type B V2.0	Interface for FS122 to PC connections
DVI-D	Standard DVI	Video interface PC compatible connection
VGA	VGA interface	Standard VGA interface

4.5.6 Installation of FS122 Panels

4.5.6.1 Detailed dimensions



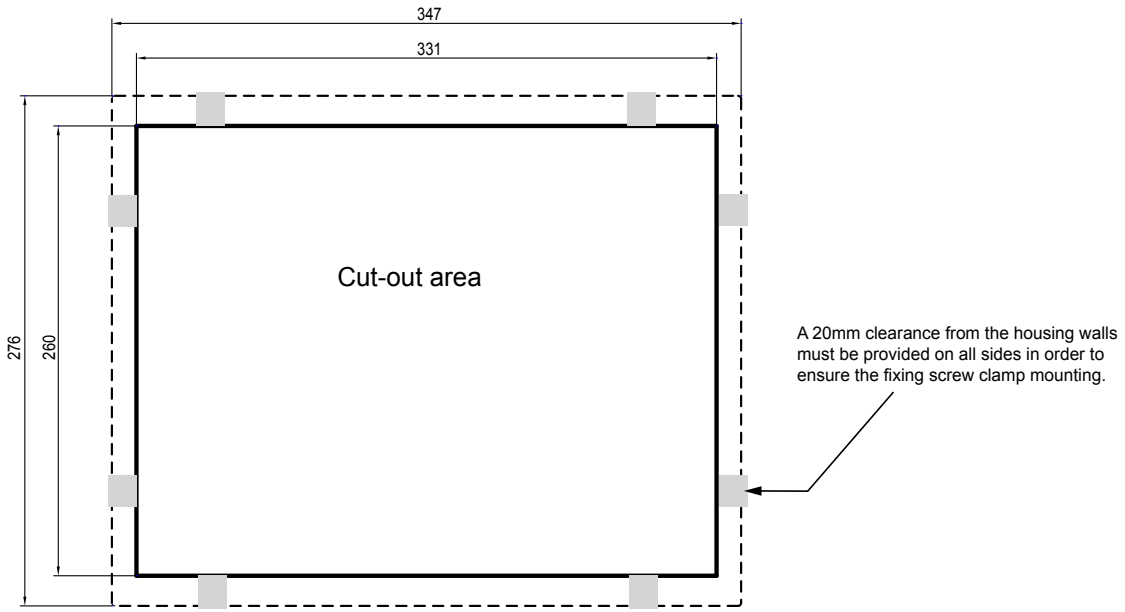
The FS122 can be operated at a maximum ambient temperature of 50°C. The ambient temperature is based on the temperature of the area 5 cm above the panel with the device mounted vertically at a height of 2000 m above sea level.

The device can be mounted in a completely closed housing, provided that the ambient temperature (in the case) is taken into account. A 20mm clearance from the housing walls must be provided on all sides in order to ensure sufficient air circulation and the fixing screw clamp mounting.

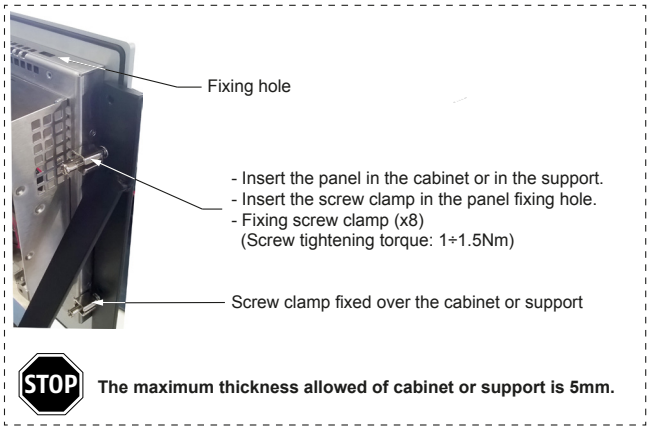
A minimum clearance of 75mm must be provided to active elements such as power supplies, transformers etc.

4.5.6.2 Panel FS122 cut-out, hole pattern and panel mounting

Cut-out and hole pattern



Panel mounting and fixing (example with support)



4.5.7 Disposal

FS122 no longer in use must be properly disposed of or must be returned to the manufacturer for disposal. (Manufacturer address see list of NUM agencies on chapter 1)

4.5.7.1 Transport

Only the original packaging must be used for transporting the device.
The climatic conditions (see previous pages) must be observed.

4.5.7.2 Storage

The device must only be stored in the climatic conditions described in the previous pages.
It should be remembered that a high storage temperature reduces the lifespan of the real time clock battery. It is recommended to store the device at room temperature.

4.5.8 FS122 Panels connections



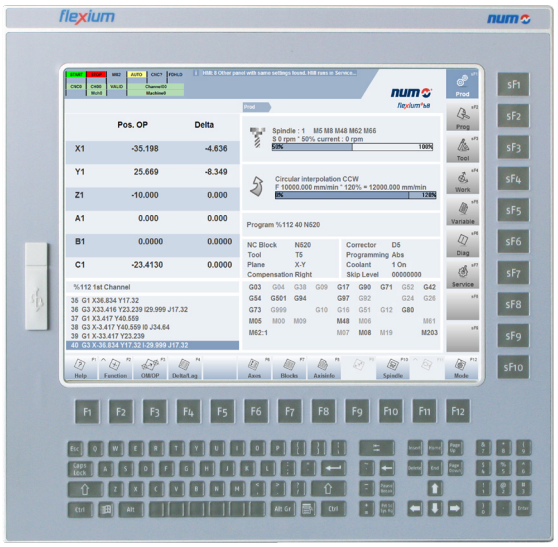
Please refer to chaper 9 Flexium connections for more detailed information upon the FS122 Panels connections.

4.6 FS153 Operator Panel (without integrated iPC)

FS153 Operator Panel is a 15-inch passive control panels for Flexium that are designed for use with an external PC or NUM Industrial Box PC P1 / P2.
Please refer to chapter 6 to give more detailed information on Box PC P1 / P2.

The FS153 panels FS153-FK (keyboard option F) and FS153-FQ (keyboard option Q) share the physical dimensions with the above panels but have no integrated PC.

The display quality of their 15-inch screen makes them very legible even in poorly-lit environments. Compact, they are also very rugged are sealed (IP 65) for compatibility with the most severe industrial environments.



4.6.1 FS153 Panel options



Panel with 22 Function Keys

Reference with PC Panel coding «F»)



Panel with 22 Function Keys and

QWERTY-Keyboard
Reference with PC Panel coding «Q»)

4.6.2 FS153 available versions

The FS153 panels can be provided in two different version and with two different fronts (function keys and function keys with QWERTY keybord) :

- FS153-FK : 15” Screen for PC-Panel with function keys
- FS153-FQ : 15” Screen for PC-Panel with function keys and QWERTY keyboard.

FS153 version	Ordering code
FS153-FK	**FXPC153NFNNNN00**
FS153-FK TS	**FXPC153RFNNNN00**
FS153-FQ	**FXPC153NQNNNN00**

4.6.3 Ordering code

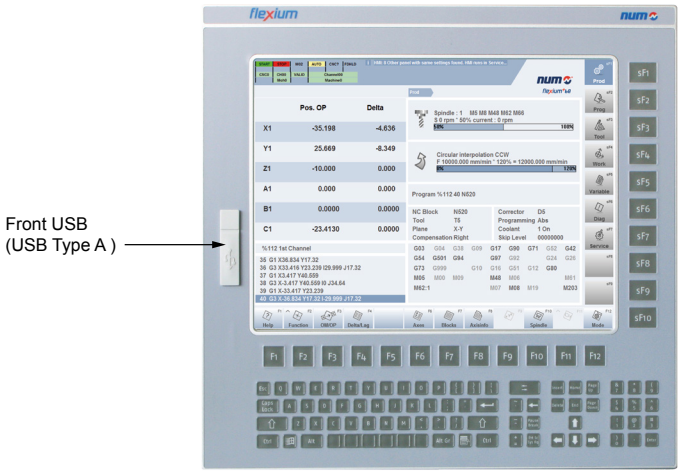
FXPC	15	3	R	F	N	N	N	N	0	0
Display Unit										
- LCD 15”	15									
Panel/Mechanical Variant - Third generation 1		3								
Display Sensor										
- Touch screen resistive			R							
- No touch Sensor			N							
Keyboard Type										
- 22 Function keys				F						
- 22 Function keys + Qwerty keyboard				Q						
IPC Mother Board, Processor										
- No IPC, just operator panel					N					
Mass Memory Type										
- No IPC, just operator panel						N				
Option Board										
- No fieldbus, just operator panel							N			
Flexium RTS										
- No RTS, just operator panel								N		
Operating System										
- No IPC, just operator panel									0	
Spare Number										0

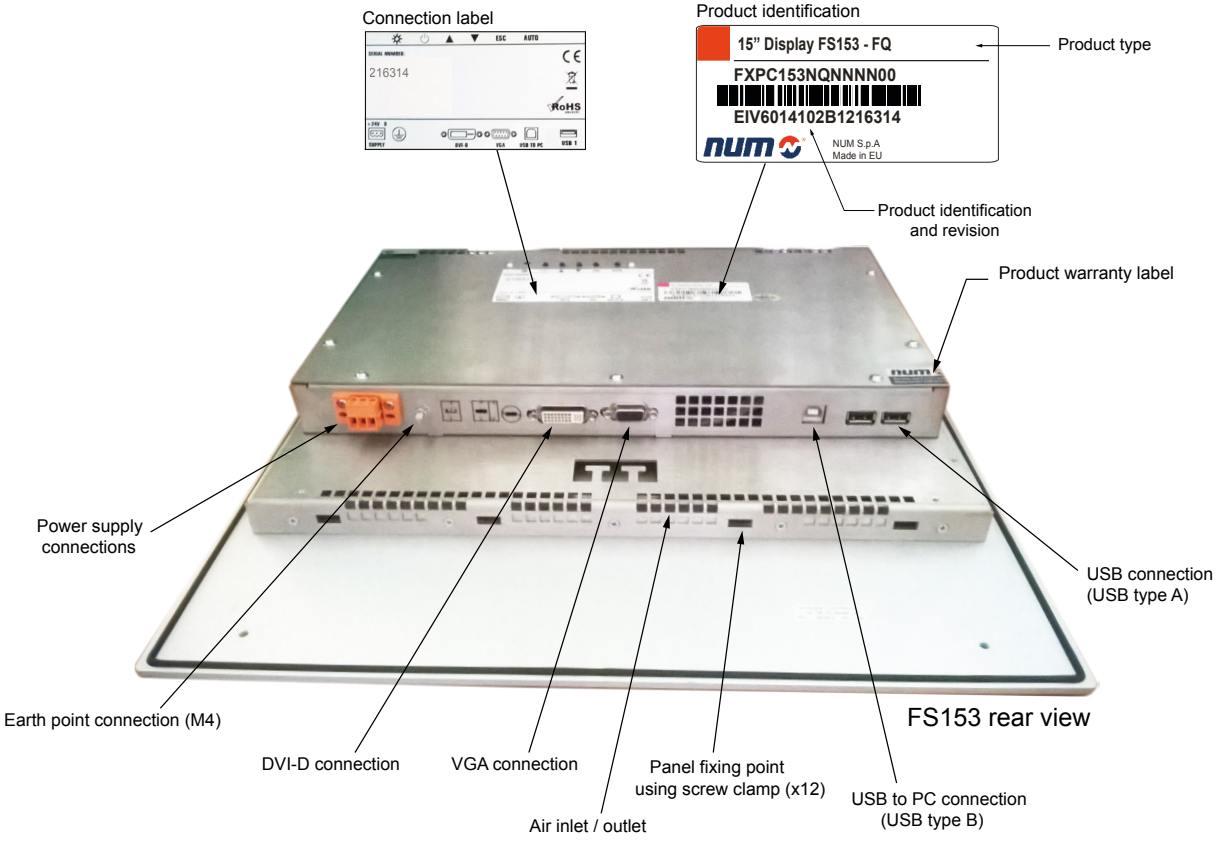
4.6.4 General characteristics

		FXPC153NFNNNN00, FXPC153RFNNNN00 FXPC153NQNNNN00
Screen	User interface	Operator panel without integrated PC: - 22 Function Keys (version FXPC153NFNNNN00) - 22 Function Keys and Qwerty Keyboard (version FXPC153NQNNNN00) - Resistive touch screen available as option (version FXPC153RFNNNN00)
	Technology	15“ TFT LCD (16.9 million colors)
	Resolution	1024 x 768 from 60Hz to 75Hz
	Size	304 x 228 mm (12 x 9 inch)
	Backlight	LED, Contr. 700:1 (Typ)
Main PC features	CPU	External PC required
	RAM	
	Mass storage	
	Operating system	
	Graphic card	
Communication Interfaces	USB front	1 x Type A V2.0
	USB rear	2 x Type A V2.0 and 1 xType B V2.0 (USB to PC) (only 1 x Type A V2.0 in case of touch version)
	DVI-D interface	1
	VGA interface	1
Power supply	Rated voltage	24 VDC SELV, safety extra low voltage. Protection class III / 4A.
	Voltage range	24VDC +20% -15% supplied by the customer.
	Protection against reverse polarity	Yes
	Protection against over voltage	Yes
	Potential isolation	No. (The 0V-pin of the PS is connected to the digital GND)
	Power consumption	ca. 25W As point of reference, the 24V-power supply should be rated for 4A continuous load.
Ambient conditions	Climatic conditions operation	0..50°C 70% relative air humidity, non-condensing.
	Climatic conditions storage	-20...60°C, 10...70% rel. air humidity, non-condensing
	Climatic conditions, transport	-20...60°C, 90% relative air humidity, non-condensing
EMC	EMC immunity	Industry EN 61000-6-2
	EMC emission	Residential area EN 61000-6-3
Degree of protection	Front	IP 65
	Rear	IP 20
	Pollution degree	2
Weight		ca. 5.3 kg Function Key version ca. 5.7 kg Full Qwerty version
Dimensions	W x H x D:	410 x 330 (400) x 52.3 mm
Cooling Type		Fanless

4.6.5 FS153 panels description

FS153 front view





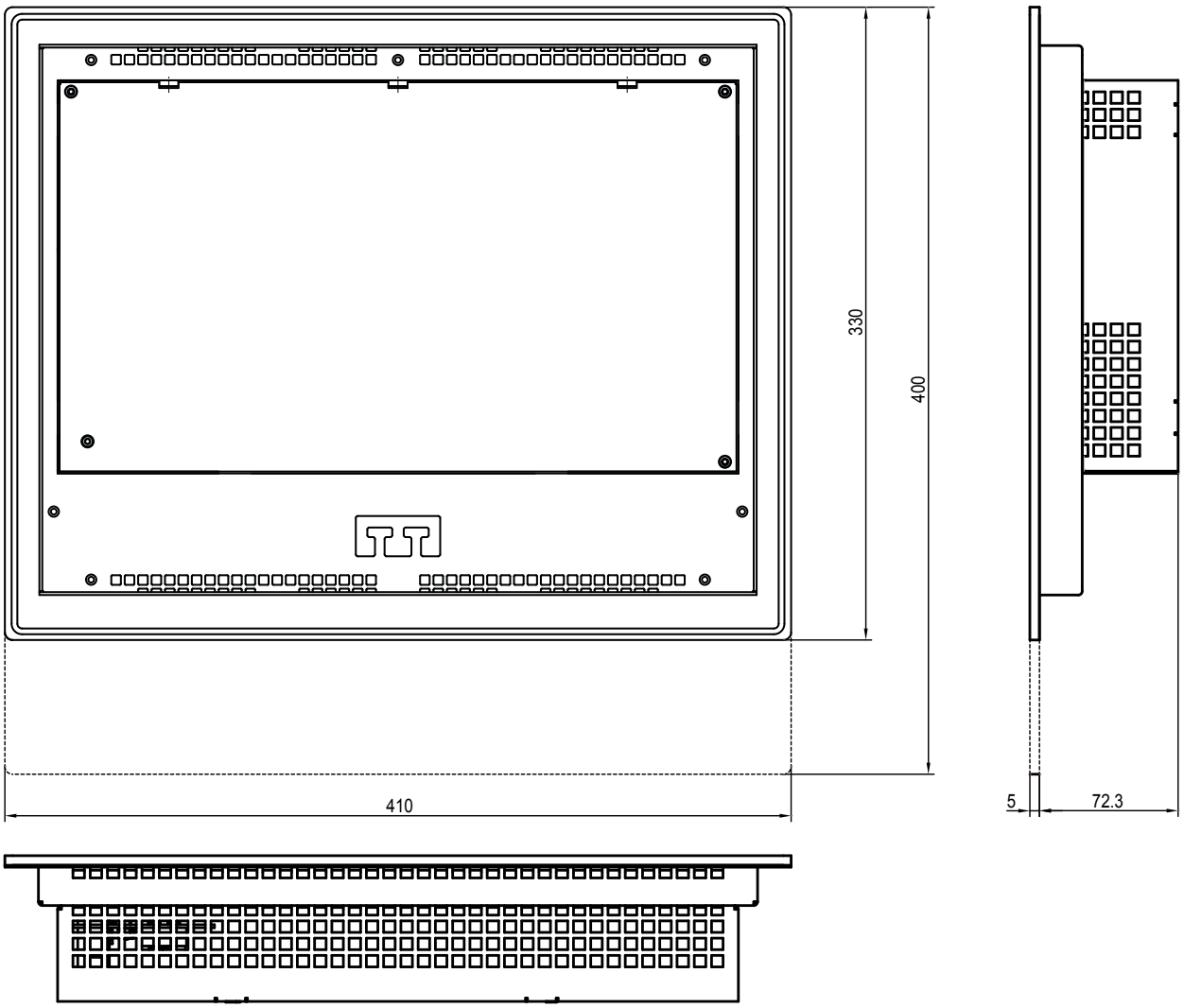
FS153 rear view

Connector	Type	Description
Power supply	3 screws pins F	FS153 power supply connections
USB (Front)	USB port type A	General user purpose. (Memory stick, Mouse and all USB devices)
USB x2 (Rear)		
USB (to PC)	USB port type B	Interface for FS153 to PC connections
DVI-D	Standard DVI	Video interface PC compatible connection
VGA	VGA interface	Standard VGA interface

The FS153 panels rear side layout is identical on both version.
(Power supply connection, USB, DVI...)

4.6.6 Installation of Panels FS153

4.6.6.1 Detailed dimensions



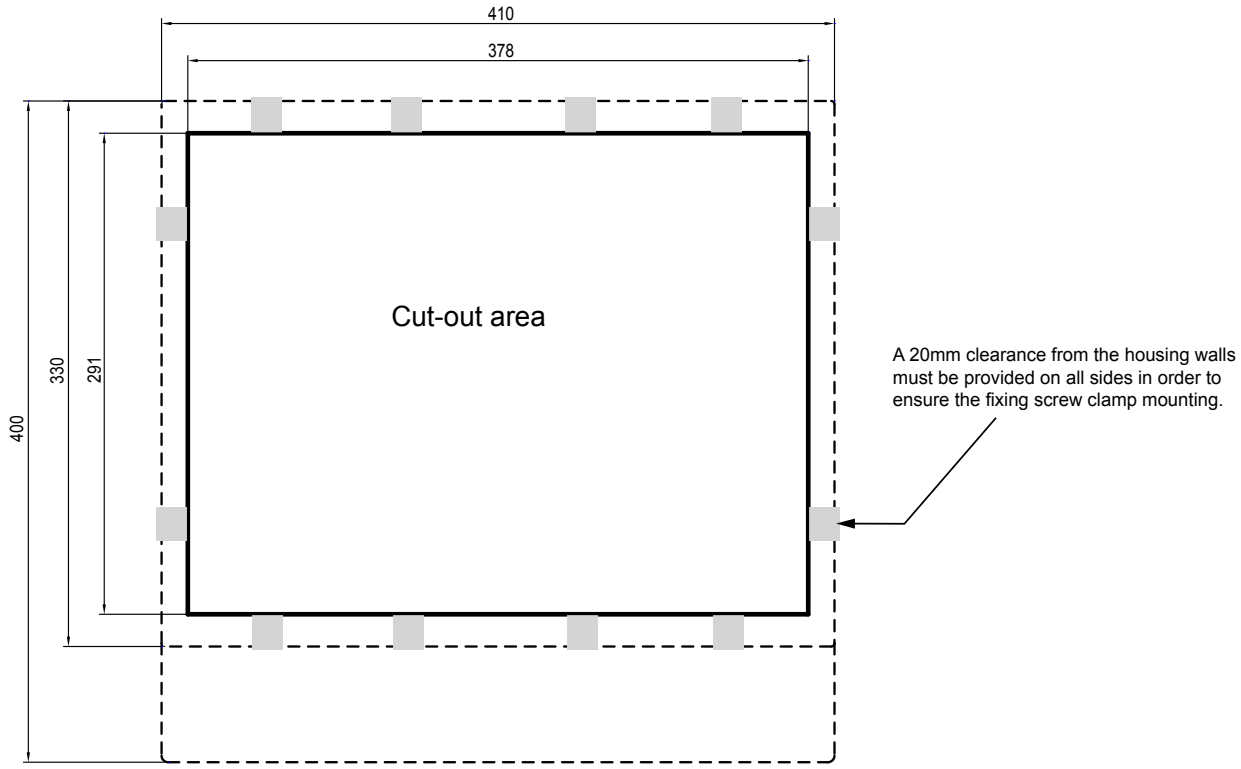
The FS153 can be operated at a maximum ambient temperature of 50°C. The ambient temperature is based on the temperature of the area 5 cm above the panel with the device mounted vertically at a height of 2000 m above sea level.

The device can be mounted in a completely closed housing, provided that the ambient temperature (in the case) is taken into account. A 20mm clearance from the housing walls must be provided on all sides in order to ensure sufficient air circulation and the fixing screw clamp mounting.

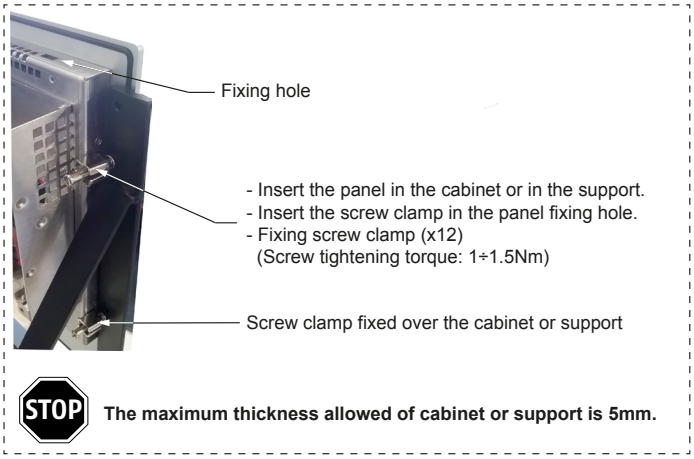
A minimum clearance of 75mm must be provided to active elements such as power supplies, transformers etc.

4.6.6.2 Panels FS153 cut-out, hole pattern and panel mounting

Cut-out and hole pattern



Panel mounting and fixing (example with support)



4.6.7 Diagnostics

Symptom	Possible cause and remedy
Dark screen during power-up	- Check power supply. - Check diagnostics LEDs; all three power must be lit. - No video data present; the DVI Panel switches to a safe mode.
Faults on the screen	- Rotary switch not optimally set for cable length compensation. - Check DVI cable.
Reset of the DVI Panel during operation	- Voltage drop in the power supply / touch cable too large; feed local 24V.
Sticking Image on screen	- Use a screen-saver.

4.6.8 Image Sticking

If a static pattern is displayed for a long time, image retention can occur. To prevent this behavior, it is recommended to change the pattern at least every 12 hours for a short period.

Image sticking is mostly reversible, but can be very annoying.



It is recommended to use a screen-saver.

4.6.9 Backlight

The brightness of the backlight can be adjusted via potentiometer at the back side.

4.6.9.1 Fuse

The device is protected internally by means of a self-healing fuse.
If this fuse is tripped, the FS153 Panel must be disconnected from the power supply, all faults must be rectified and the reset time (approx. 1min) must be allowed to elapse.

4.6.10 Disposal

FS153 no longer in use must be properly disposed of or must be returned to the manufacturer for disposal. (Manufacturer address see list of NUM agencies on chapter 1)

4.6.10.1 Transport

Only the original packaging must be used for transporting the device.
The climatic conditions (see previous pages) must be observed.

4.6.10.2 Storage

The device must only be stored in the climatic conditions described in the previous pages.
It should be remembered that a high storage temperature reduces the lifespan of the real time clock battery. It is recommended to store the device at room temperature.

4.6.11 FS153 Panels connections



Please refer to chaper 9 Flexium connections for more detailed information upon the FS153 Panels connections.

4.7 FS194L Operator panel without integrated iPC

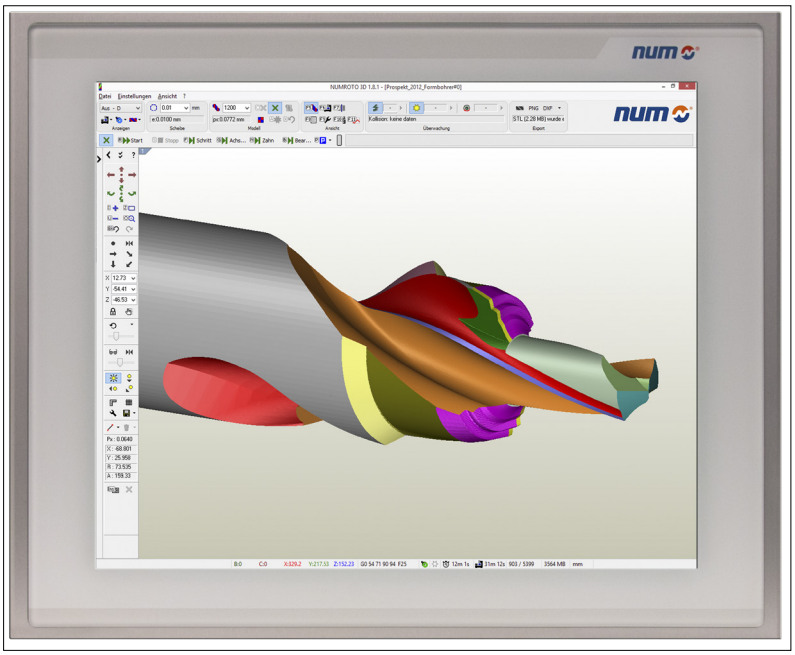
The passive panel FS194L is 19-inch landscape oriented projected capacitive touch screen panel.

The touch sensor supports dual-touch gestures.

The FS194L operator panel provides a durable, modern front end for machine control. It has an IP65 degree of protection at the front, and IP20 at the rear.

High-quality 4 mm hardened safety glass protects the front, without introducing any disturbing reflections.

A narrow brushed aluminum frame with rounded edges provides complete side protection for the glass and multi-touch sensor.



4.7.1 FS194L ordering code

The FS194L panels are recommended with NUM Industrial BoxPC P1/P2.
Please refer to chapter 6 for more detailed information.

FS194L version	**Ordering code**
FXPC194L-TS	**FXPC19LCNNNNN00**

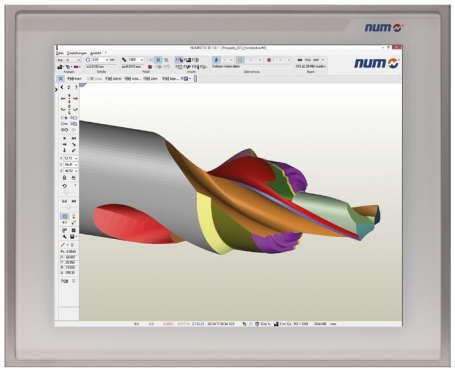
FXPC	19	L	C	N	N	N	N	N	**0**	**0**
Display Unit										
- LCD 19”	19									
Panel/Mechanical Variant										
- Landscape		L								
Display Sensor										
- Touch screen (proj.) capacitive			C							
Keyboard Type										
- No keyboard, no function keys				N						
IPC Mother Board, Processor										
- No IPC, just operator panel					N					
Mass Memory Type										
- No IPC, just operator panel						N				
Option Board										
- No fieldbus, just operator panel							N			
Flexium RTS										
- No RTS, just operator panel								N		
Operating System										
- No IPC, just operator panel									0	
Spare Number										0

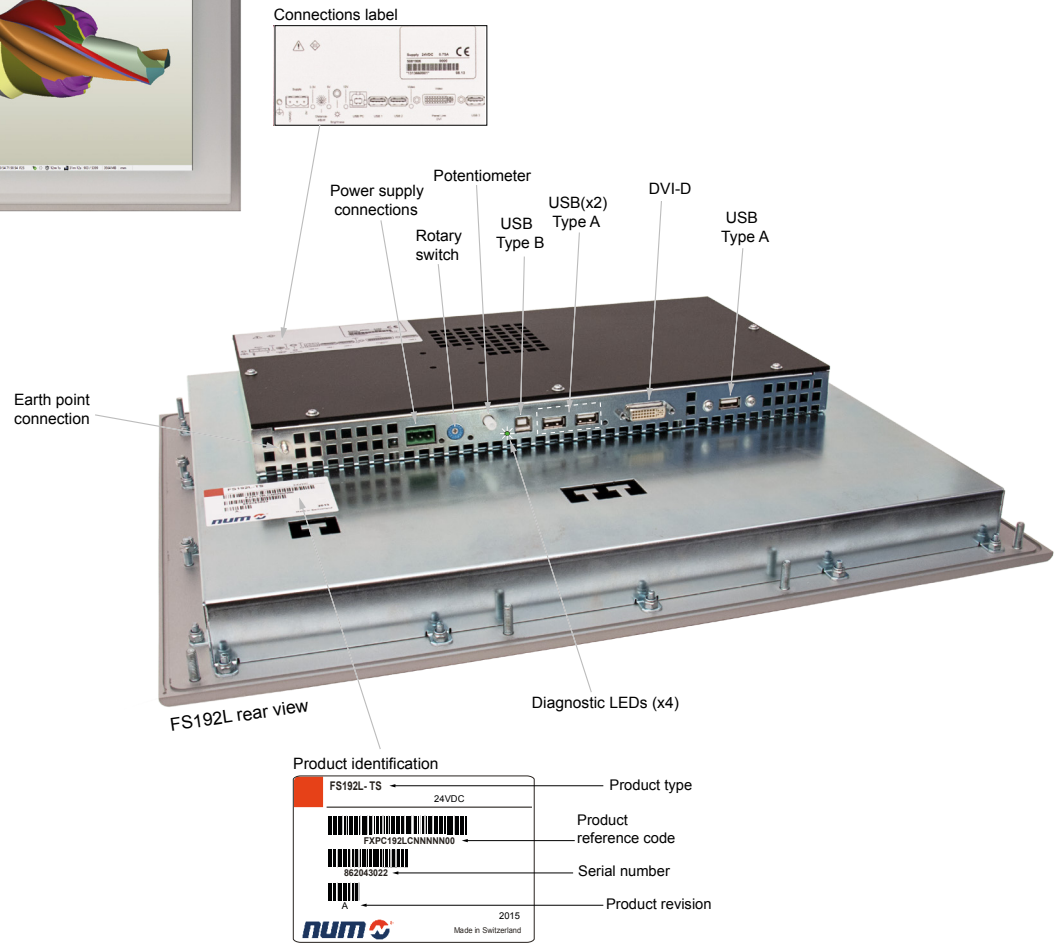
4.7.2 General characteristics

		FXPC19LCNNNNN00
Screen	User interface options	Projected capacitive touch screen with hardened glass protection
	Technology	19“ TFT LCD (16.9 million colours)
	Resolution:	1024 x 1280 from 60Hz to 75Hz (horizontal/landscape orientation)
	Size:	374 x 304mm
	Backlight:	Contr. 400:1 (Typ)
Main PC features	CPU	External PC required
	RAM	
	Mass storage	
	Operating system	
	Graphic card	
Communication Interfaces	Ethernet (ETH)	2 x GbE LAN / RTE, 1 USB to LAN
	USB front	1 x Type A V2.0
	USB rear	3 x Type A V2.0 and 1 x Type B V2.0 (USB to PC)
	DVI-D interface	1
Power supply	Rated voltage	24 VDC SELV, safety extra low voltage. Protection class III / 4A.
	Voltage range	24VDC +20% -15% supplied by the customer.
	Protection against reverse polarity	Yes
	Protection against overvoltage	Yes
	Potential isolation	No. (The 0V-pin of the PS is connected to the digital GND)
	Power consumption	ca. 50W As point of reference, the 24V-power supply should be rated for 4A continuous load.
Ambient conditions	Climatic conditions operation	5..45 °C with horizontal mounting. 10...90% rel. air humidity, non-condensing. The measuring point is defined 5cm over the top of the PC case in the middle of the vent holes. It is recommended to ensure enough air circulation.
	Climatic storage conditions	-20...60°C, 10...90% rel. air humidity, non-condensing
	Climatic conditions, transport	Class 2K3 EN50178 (reduced) -20...60 °C, 10...90 % rel. Air humidity, non-condensing.
EMC	EMC immunity	Industry EN 61000-6-2
	EMC emission	Residential area EN 61000-6-3
Degree of Protection	Front	IP 65
	Rear	IP 20
Weight		8.5 kg
Dimensions	W x H x D	Please refer to the following pages
Fan	Type	The Smart Fan control system supports Thermal® and Speed® cruise.
Noise		<70dB

4.7.3 FS194L (without integrated PC) module description

FS192L front view

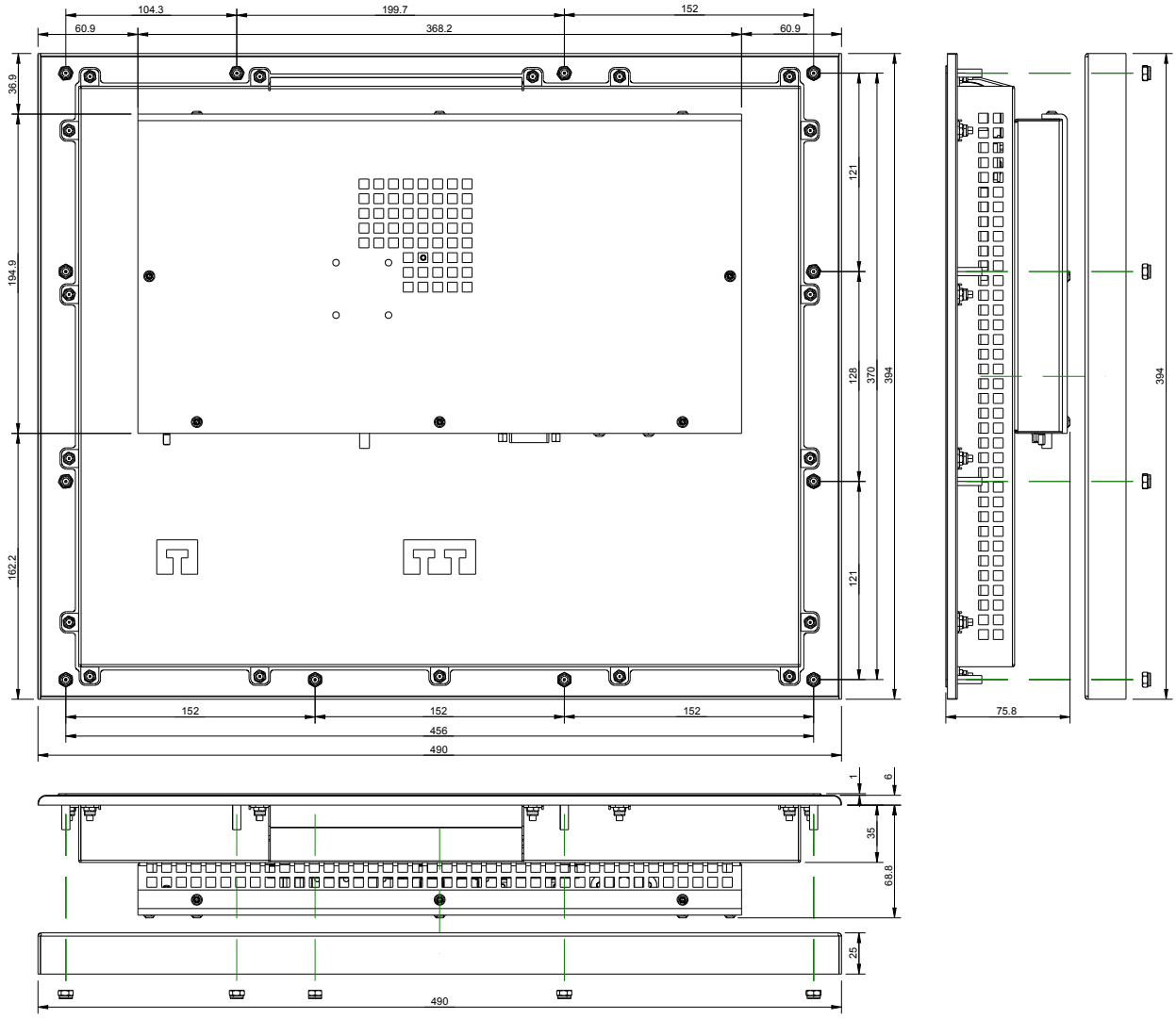




Connector	Type	Description
Power supply	3 screws pins F	FS194L power supply connections
Rotary switch	-	Rotary switch to adapt DVI cable length
Potentiometer	-	Potentiometer to adjust the screen brightness
USB (to PC)	USB port Type B	Interface for FS194L to PC connections
USB x3	USB port Type A	General user purpose. (Mouse and all USB devices)
DVI-D	Standard DVI	Digital Video interface connection
LEDs x4	Green LEDs	Power supply and DVI signal diagnostics LEDs

4.7.4 Installation of Panels FS194L

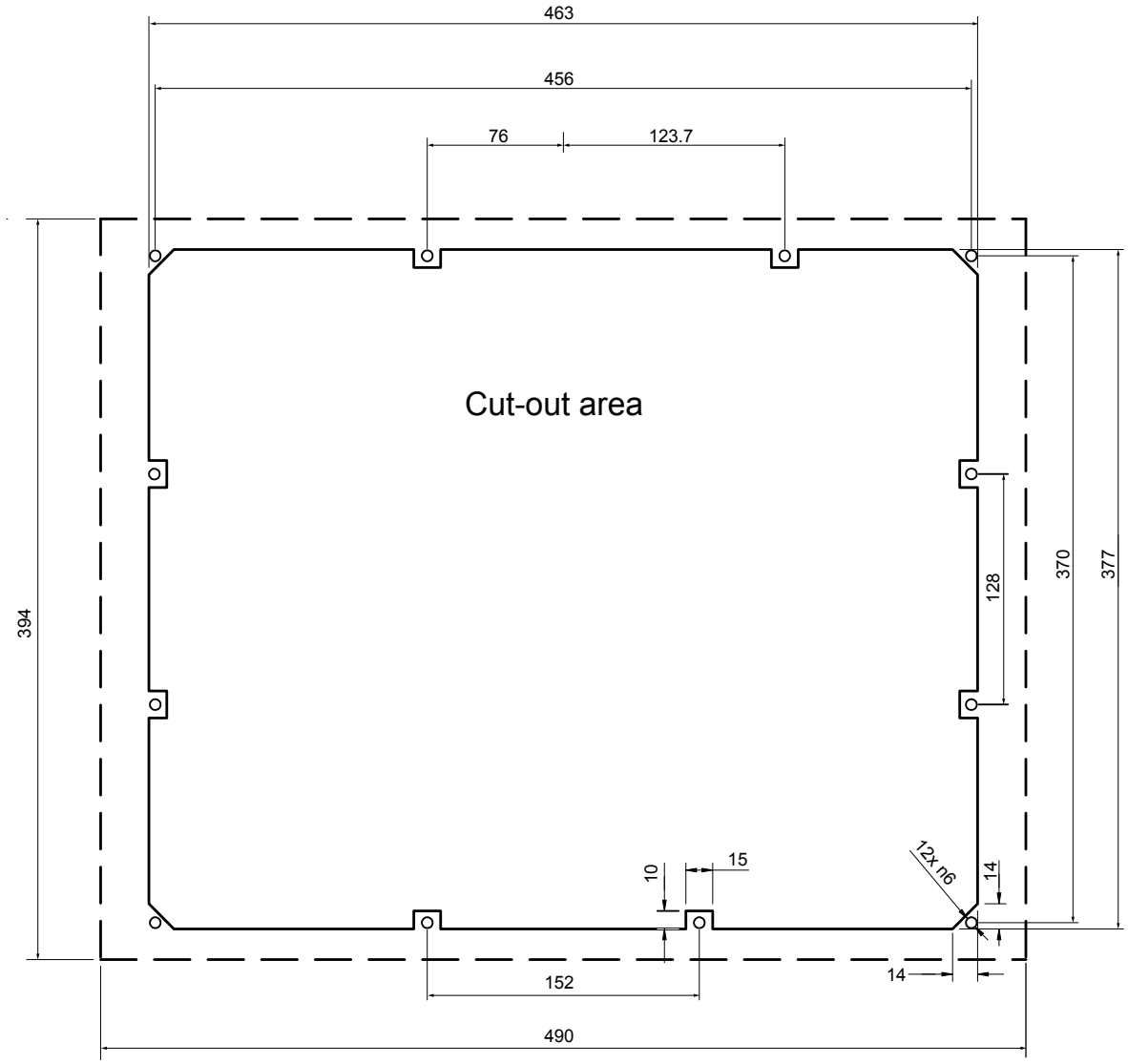
4.7.4.1 Detailed dimensions



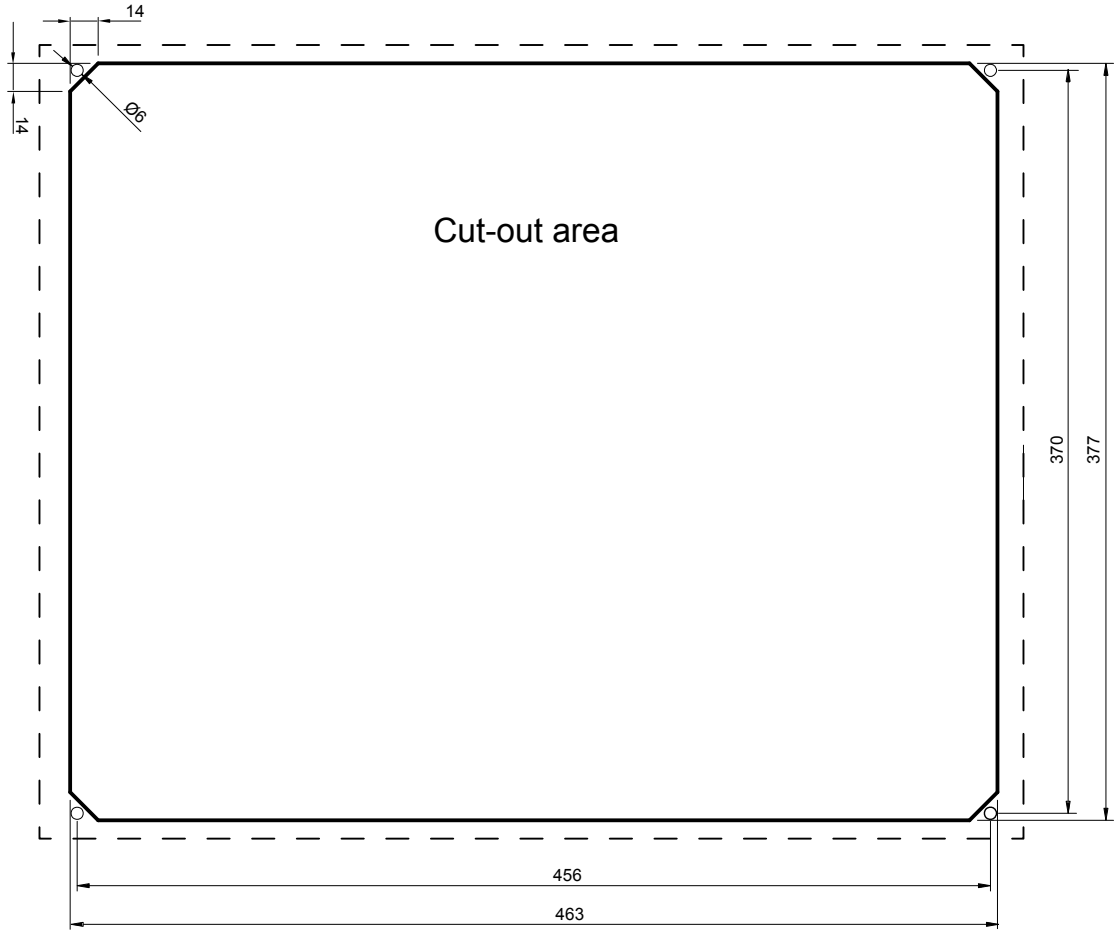
The FS194L can be operated at a maximum ambient temperature of 45°C. The ambient temperature is based on the temperature of the area 5 cm above the panel with the device horizontal mounting at a height of 2000 m above sea level.

The device can be mounted in a completely closed housing, provided that the ambient temperature (in the case) is taken into account. A 10mm clearance from the housing walls must be provided on all sides in order to ensure sufficient air circulation.
A minimum clearance of 75mm must be provided to active elements such as power supplies, transformers etc.

4.7.4.2 Panel FS194L cut-out and hole pattern



4.7.4.3 Panel FS194L cut-out using back side mounting plate



4.7.5 Disposal

FS194L no longer in use must be properly disposed of or must be returned to the manufacturer for disposal. (Manufacturer address see list of NUM agencies on chapter 1)

4.7.5.1 Transport

Only the original packaging must be used for transporting the device.
The climatic conditions must be observed (see previous pages).

4.7.5.2 Storage

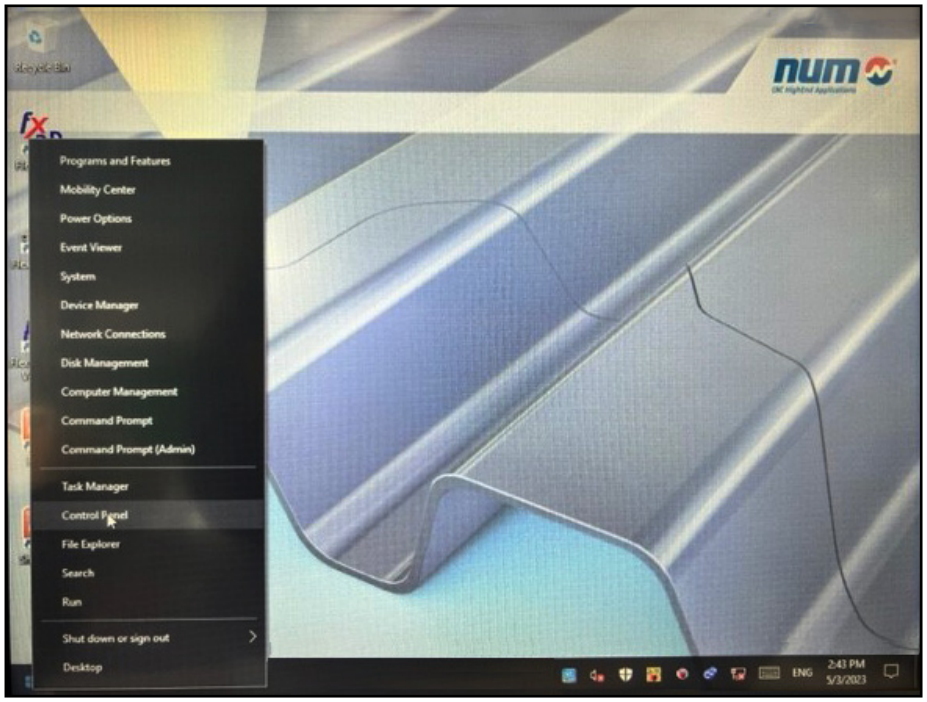
The device must only be stored in the climatic conditions described in the previous pages.
It should be remembered that a high storage temperature reduces the lifespan of the real time clock battery. It is recommended to store the device at room temperature.

4.7.6 FS194L Panels connections

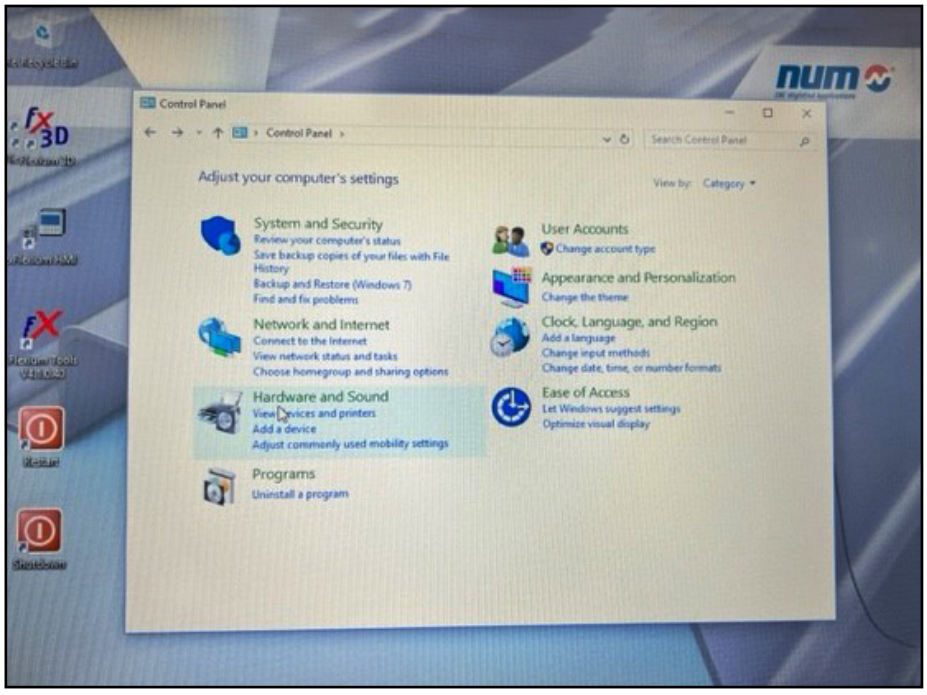
Please refer to chaper 9 Flexium connections for more detailed information upon the FS194L Panels connections.

4.8 How to calibrate the touch screen in Windows 10, 8.1, 8 or 7

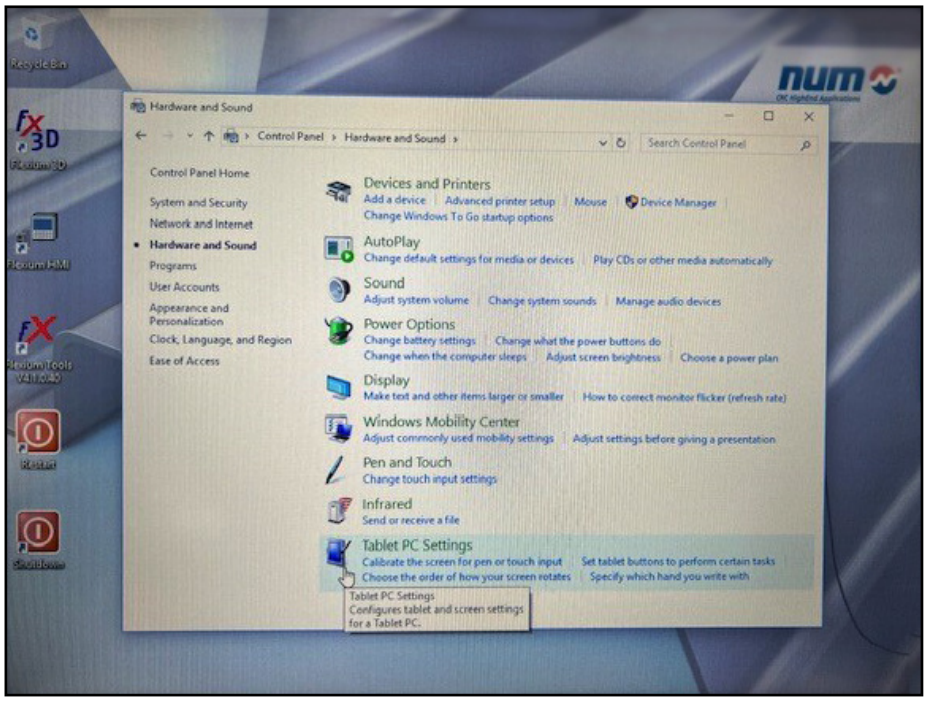
1. Open **Control Panel**



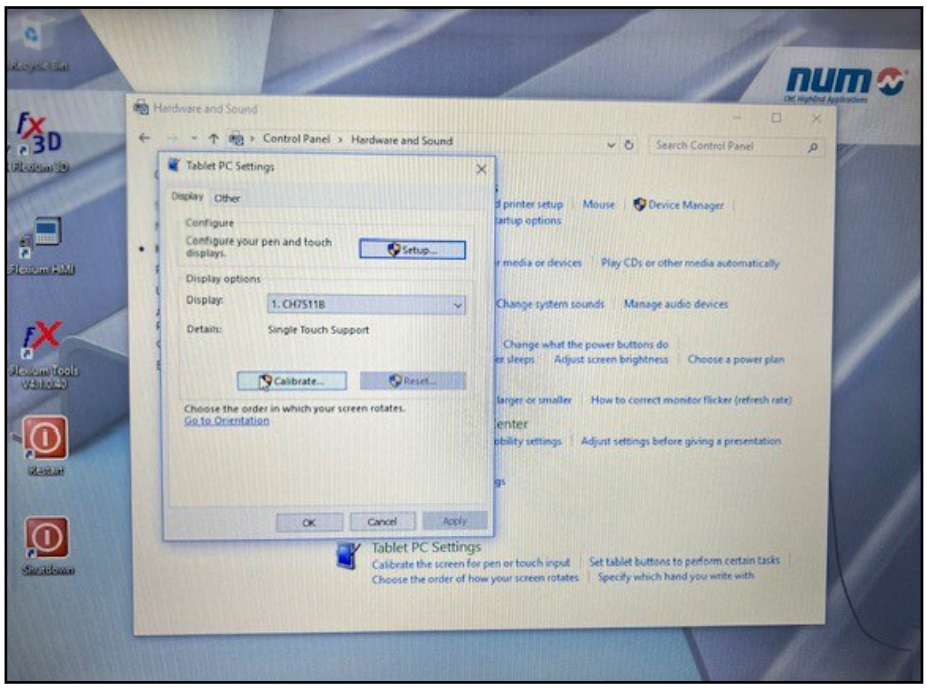
2. Click **Hardware and Sound**.



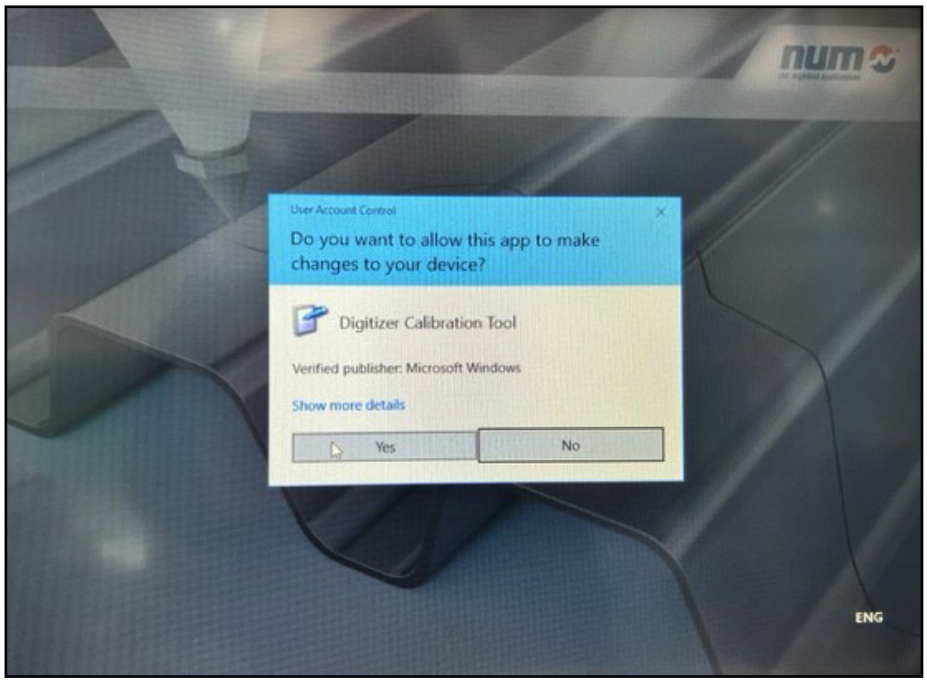
3. Under **Tablet PC Settings**, click the **Calibrate the screen for pen or touch input**.



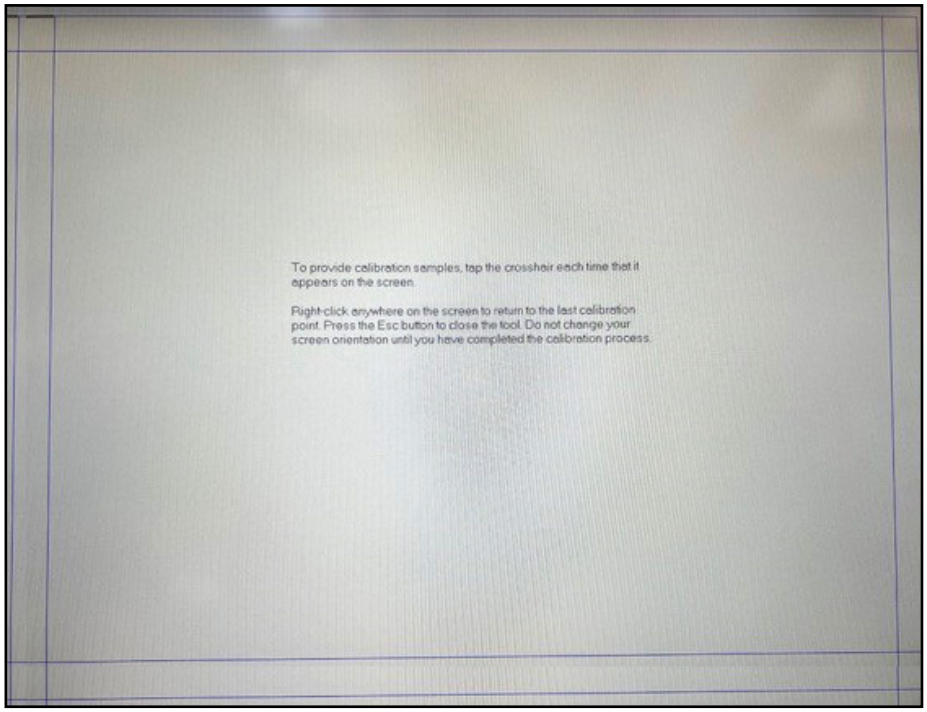
4. In the **Tablet PC Settings** windows, click the **Calibrate**.



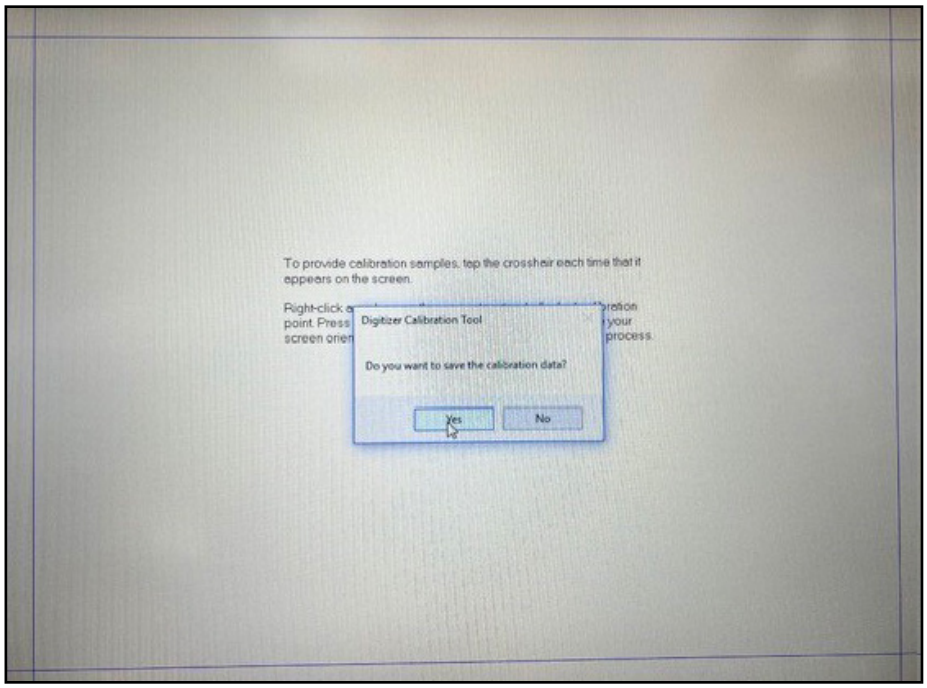
5. Select **Touch input** and **Calibrate**



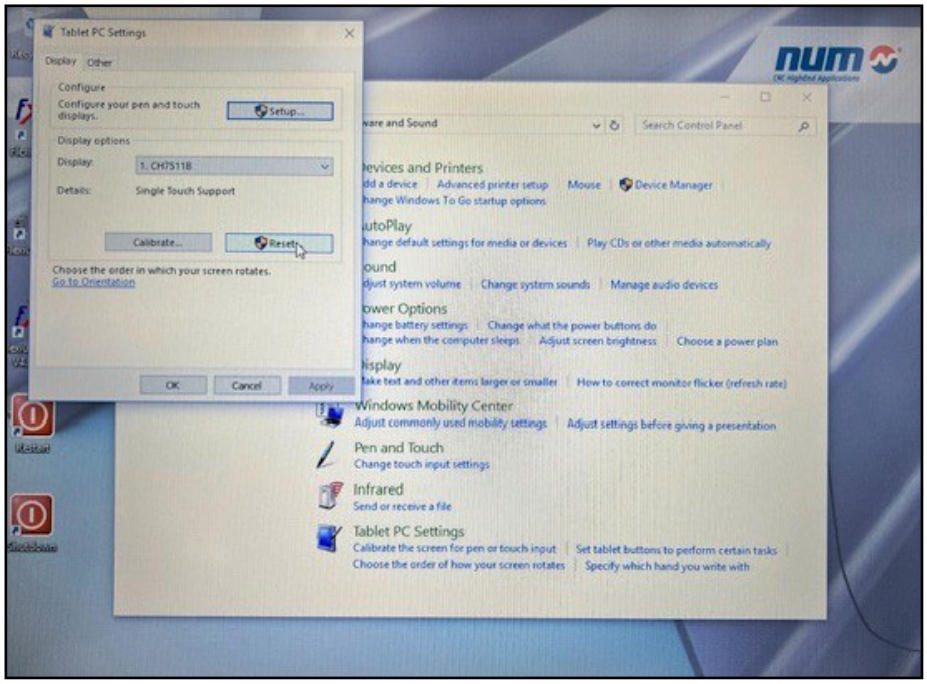
6. In the white screen, tap the crosshair each time it appears on the screen, and do not change the resolution during this process.



7. Click **Yes** when you are prompted to save the calibration data.



8. Click **OK** to confirm. If you want repeat the complete procedure, please push **Reset**



4.9 USB QWERTY keyboard (Horizontal and Vertical external keyboard)

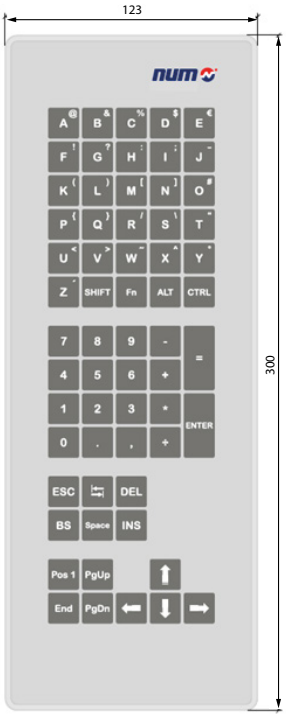
4.9.1 General characteristics

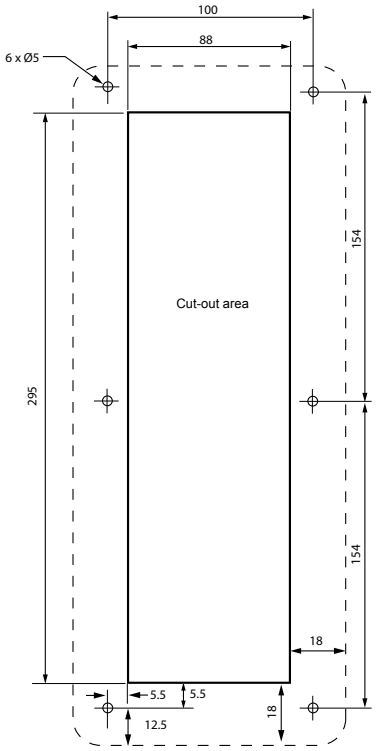
	FXHE000248 (Vertical keyboard)	FXHE000249 (Horizontal keyboard)
Main keyboard features	62 keys with mechanic key under membrane	100 keys with mechanic key under membrane
	1 USB interface type A - V2.0 - 1.5/12/480 MBit/s	1 USB interface type A - V2.0 - 1.5/12/480 MBit/s
	Front keyboard in polyester - IP65	Front keyboard in polyester - IP65
	Outer Dimensions : 123mm x 300mm	Outer Dimensions : 410mm x 160mm
	Fixing nr. 6 pins M4x18	Fixing nr. 8 pins M4x18
	Weight with blind plate: 0.8kg	Weight: 1.3kg
	Design adapted for FS153 panels and MP04 or MP06 machine panels (410mm x 330mm). See next pages.	
		

The vertical keyboard is always completed by a blind plate with location for 11 push buttons under membrane.

4.9.2 Installation of the keyboards

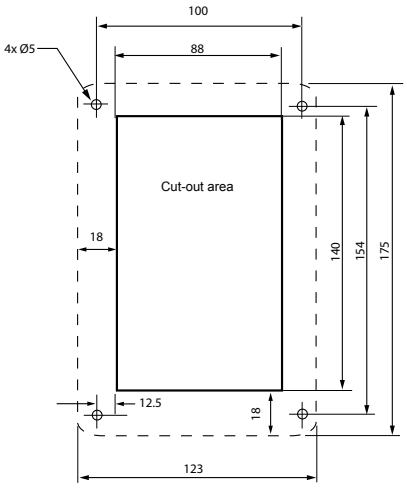
4.9.2.1 Vertical keyboard detailed dimensions and cut-out





Blind plate (rear view)



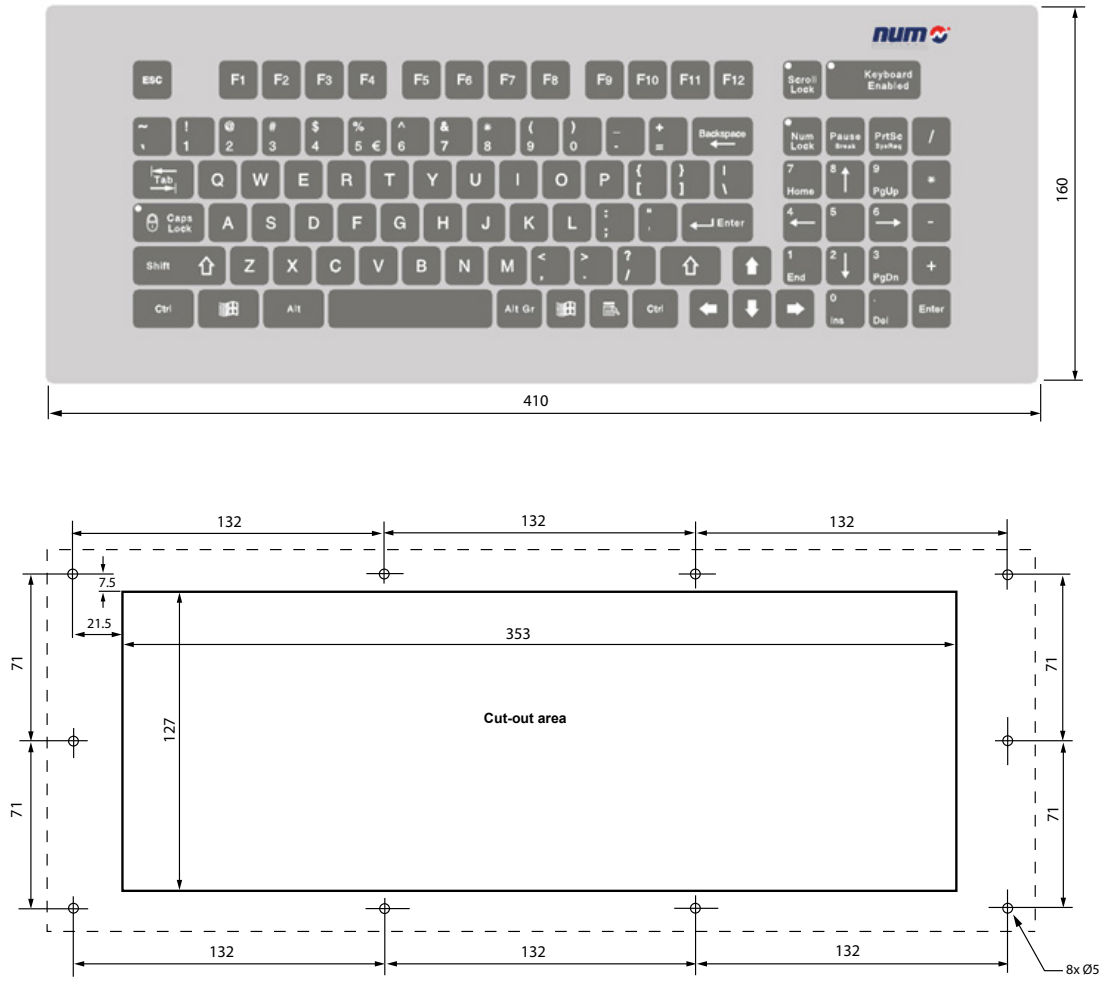




The USB keyboard can be operated at a maximum ambient temperature of 45°C. The ambient temperature is based on the temperature of the area 5 cm above the panel with the device vertical mounting at a height of 2000 m above sea level.

The device can be mounted in a completely closed housing, provided that the ambient temperature (in the case) is taken into account. A 10mm clearance from the housing walls must be provided on all sides in order to ensure sufficient air circulation. A minimum clearance of 75mm must be provided to active elements such as power supplies, transformers etc.

4.9.2.2 Horizontal keyboard detailed dimensions and cut-out



The USB keyboard can be operated at a maximum ambient temperature of 45°C. The ambient temperature is based on the temperature of the area 5 cm above the panel with the device horizontal mounting at a height of 2000 m above sea level.

The device can be mounted in a completely closed housing, provided that the ambient temperature (in the case) is taken into account. A 10mm clearance from the housing walls must be provided on all sides in order to ensure sufficient air circulation.
A minimum clearance of 75mm must be provided to active elements such as power supplies, transformers etc.

4.9.3 Disposal

USB keyboards no longer in use must be properly disposed of or must be returned to the manufacturer for disposal. (Manufacturer address see list of NUM agencies on chapter 1)

4.9.4 USB keyboards connections



Please refer to chaper 9 Flexium connections for more detailed information upon the USB keyboards connections.

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5 Flexium MP Panels - Machine panel

5.1 MP04 Machine panel

5.1.1 General

MP04 Machine panel is used for control of manual movements, production initiation and intervention during machining.

Two versions are available:
- Machine Panel MP04–W, without handwheel (reference FXHE558110)
- Machine Panel MP04–H, with handwheel (reference FXHE558120)

MP04 includes:
- 55 configurable buttons with LEDs
- 2 Overrides potentiometers for spindle speed and feed rate
- 1 handwheel (FXHE 558 120 only)
- 1 emergency stop button
- 1 three-position key switch
- 3 controls: Cycle start, Cycle stop and Reset
- 5 keys for additional functions with LEDs.

The MP04 has to be connected via CAN. For the handwheel, which is mounted on MP04 machine panel, exists two connection possibilities. Either connected via CAN or directly hooked up at CNC.



5.1.1.1 Machine Panel MP04

Machine Panels MP04



Machine Panel MP04-H (with handwheel)

- CAN interface
- 63 free programmable function buttons
- Same width as FS153i
- Handwheel



Machine Panel MP04-W (without handwheel)

- CAN interface
- 63 free programmable function buttons
- Same width as FS153i

5.1.2 MP04 available versions and ordering code

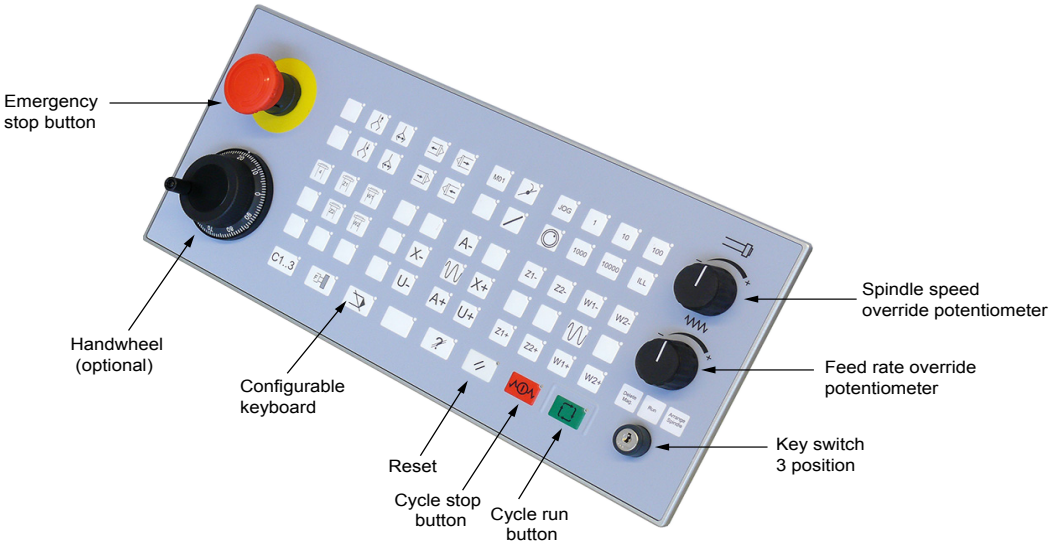
MP04 version	Ordering code
Machine Panel MP04–W without handwheel	**FXHE558110**
Machine Panel MP04–H with handwheel	**FXHE558120**

5.1.3 General characteristics

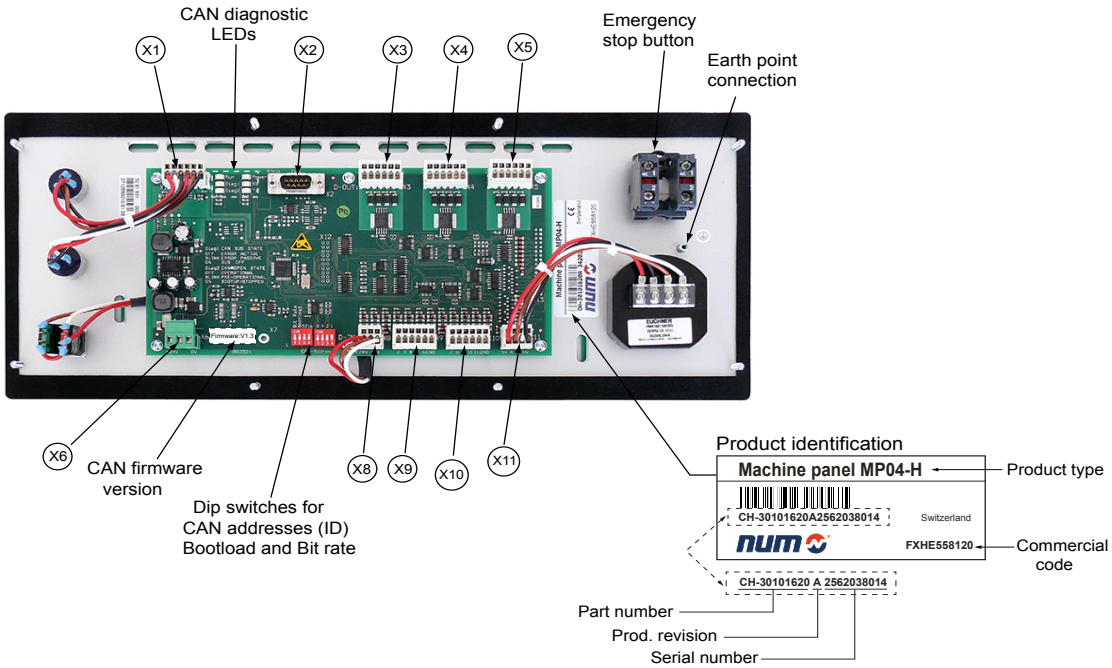
		FXHE558110	FXHE558120
MP04 panel	User interface	63 free programmable keys	63 free programmble keys
	Handwheel	Not present	Yes (100 Pulses per revolution)
	CAN interface	Yes (9 Pins Sub-D)	
On board sensor	Key switch	3 positions	
	Potentiometer	For spindle speed override (10kOhm potentiometers, 2.5 VDC,10Bit resolution)	
	Potentiometer	For feed rate override (10kOhm potentiometers, 2.5 VDC,10Bit resolution)	
	1 input for handwheel	For a 5VDC handwheel with A & B push-pull signal, max. 100mA	
	Emergency stop	1	1
Press buttons	55 softkeys with LED	Free configurable	
	3 controls with LED	Cycle start, cycle stop and reset	
	5 softkeys with LED	Free configurable for additional functions with LED	
Digital inputs	10 digital inputs	Organisation: 3 groups of terminals type Semiconductor	
	Operating voltage	24V –15% / +10%	
	Logic 0	0 to 5VDC	
	Logic 1	6 to 26.4VDC	
	In current	4mA typical at 24VDC	
	Reaction time	8ms typical (debounced)	
Digital outputs	12 digital outputs	Organisation: 3 groups of terminals type Semiconductor	
	Operating voltage	24V –15% / +10%	
	Rated current	100 mA maximum per output	
	Outputs simultaneously active	100%	
	Protection	Short-circuit and permanent overloads (trip device)	
Power supply	Rated voltage	24 VDC SELV, safety extra low voltage. Protection class III / 1A	
	Voltage range	24VDC +20% -15% supplied by the customer	
	Protection against reverse polarity	Yes	
	Protection against over voltage	Yes	
	Fuse protection	Yes, self resettable	
	Potential isolation	No. (The 0V-pin of the PS is connected to the digital GND)	
	Power consumption	15W max	
Ambient conditions	Climatic conditions operation	0..45°C, 70% rel. air humidity, non-condensing	
	Climatic conditions storage	-40...60°C, 70% rel. air humidity, non-condensing	
	Climatic conditions, transport	-20...60°C, 70% rel. air humidity, non-condensing	
EMC	EMC immunity	Industry EN 61000-6-2	
	EMC emission	Residential area EN 61000-6-3	
	Electrical safety	EN 60950 and EN 50178	
	Conformity	MP04-W and MP04-H meets the requirements specified by the EU Council Directives for harmonizing the regulations of EU member states relating to electromagnetic compatibility (89/336/EEC).	
Degree of protection	Front	IP 65, EN 60068-2-68	
	Rear	IP 00	
Weight		1.2 kg	1.3 kg
Dimensions	W x H x D:	410 x 175 x 55 mm	

5.1.4 Machine panel description

MP04 Machine Panels front view



MP04 Machine Panels rear view



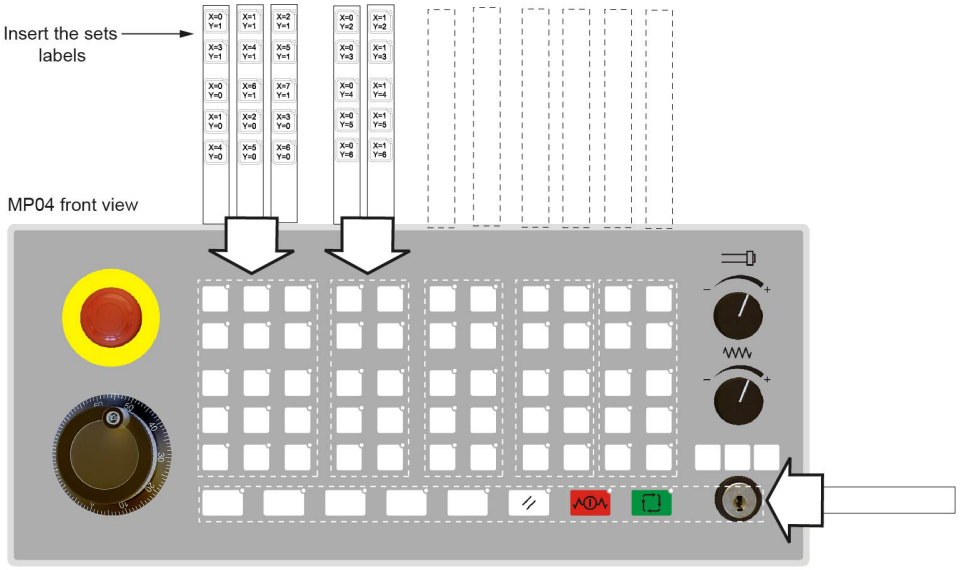
Connector	Type	Description
X1	6 pins spring-loaded terminal	Potentiomenters connection
X2	Sub D 9 pins M	CAN interface connection
X3, X4, X5	6 pins spring-loaded terminal	12 Digital outputs connection
X6	3 screws pins F	MP04 power supply connection
X8	3 pins spring-loaded termina	Key switch (2 digital input connection)
X9, X10	6 pins spring-loaded terminal	10 Digital inputs connection
X11	3 pins spring-loaded terminal	Handwheel connection

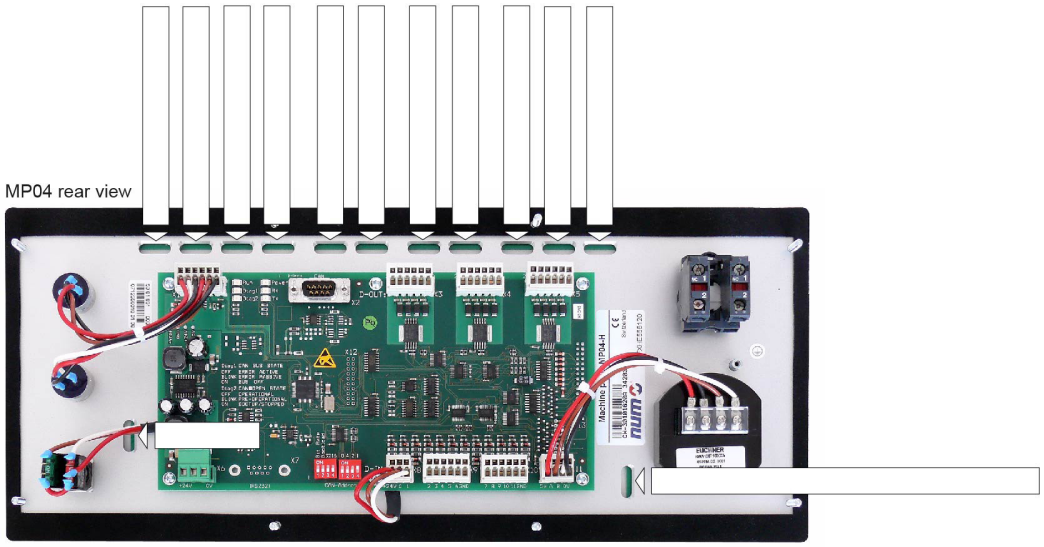
5.1.5 Installing the button labels

The buttons on the machine panel are not engraved. Their assignment is specified by installing a set of labels at the rear of the panel.
Supplied with the panel:

- a file to define and print the key labels:
  https://flexium.num.com folder 01 Examples and Files You can get Id and password from your NUM local contact.
- a blank sheet of A4 paper to be printed on a laser printer (Type Folex BG-72 WO thickness 0.1 mm)

5.1.5.1 Installing the key labels at the rear of the MP04 Machine Panel



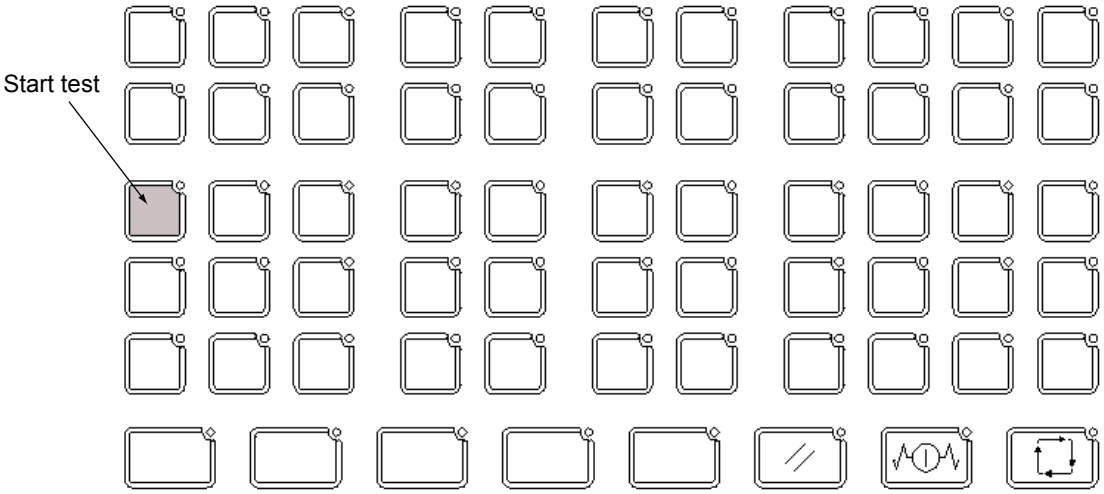


5.1.6 Test program

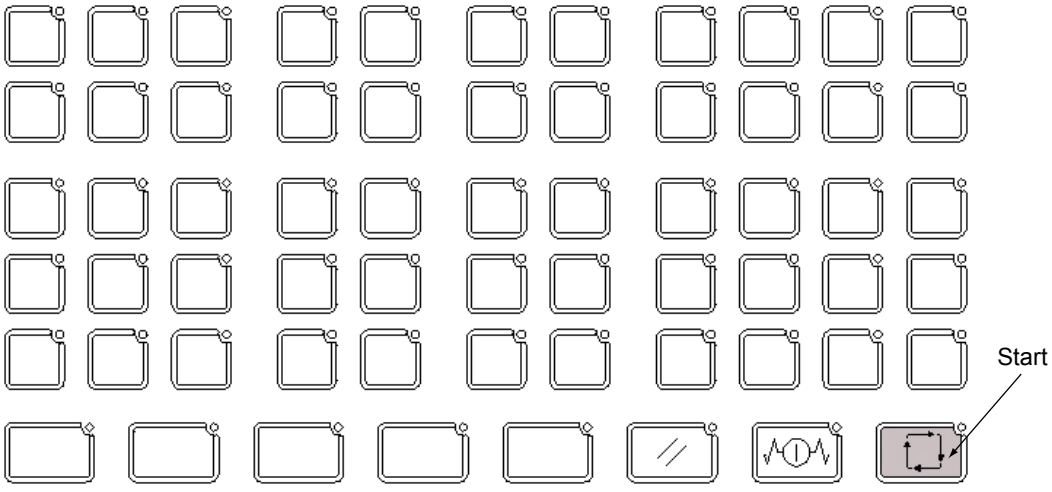
The MP04 has an integrated test program to test the LEDs, the buttons, the potentiometers, the handwheel, the IOs, the DIP switches of the address and the firmware.

1. Switch off the power of the MP04.

2. Press the button *"Start test"*, hold it depressed and switch power on.
   The *"Start test"* button may now be released.



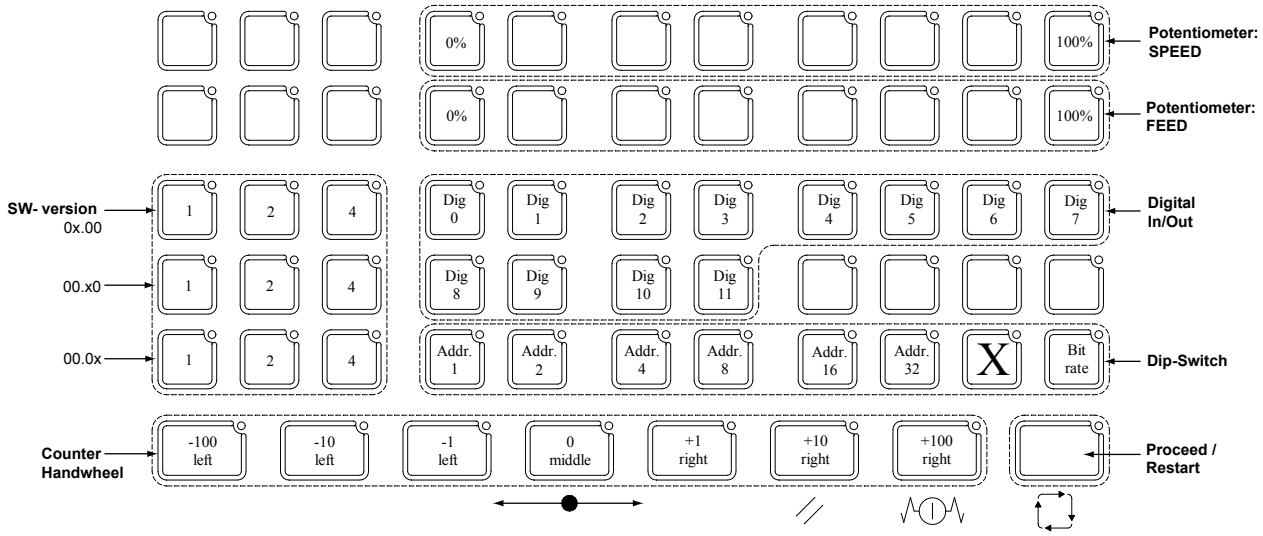
3. All LEDs will light up for 250ms one after another. So the function of the LEDs can be checked. After completion of this test, the LED of the *"Start"* button will flash.



4. Now the buttons can be tested by pressing them. If the key is working properly the LED of the button lights up.

5. To select the next test, press the green *"Start"* button.

6. The areas shown below display the states and values of the hardware.



The values displayed are:

- *"SW-version"* : (software version) — Software version of the panel. The version is displayed in binary.
- *"Counter handwheel"*: By turning the handwheel clockwise the LEDs will light up one after the other from left to right. (anticlockwise = right to left).
- *"Potentiometer SPEED"*: By turning the potentiometer the LEDs will light up from 0% to 100%.
- *"Potentiometer FEED"*: By turning the potentiometer the LEDs will light up from 0% to 100%.
- *"Digital In/Output"*: By pressing a button the relevant digital output will be forced. The LEDs shows the state of the digital inputs.
- *"Dip-Switch"*: Shows the positions of the DIP switches on the rear side of the MP04.

7. To restart the test, press the *"Start"* button with the flashing LED again.

8. To exit the test mode, switch off the power of the MP04.

5.1.7 Mounting instructions

5.1.7.1 General Mounting instructions

The MP04 are installed from the front, for example, into a control cabinet. They are fixed at the rear with embedded threaded bolts.

The MP04 can be operated at a maximum ambient temperature of 45°C. The ambient temperature is based on the temperature of the area 5cm above the panel with the device mounted vertically at a height of 2000m above sea level.

The device can be mounted in a completely closed housing, provided that the ambient temperature (in the HOUSING) is taken into account. A 10mm clearance from the housing walls must be provided on all sides in order to ensure sufficient air circulation



Prevention of overheating during operation:
- A forced airflow increases the overall reliability.

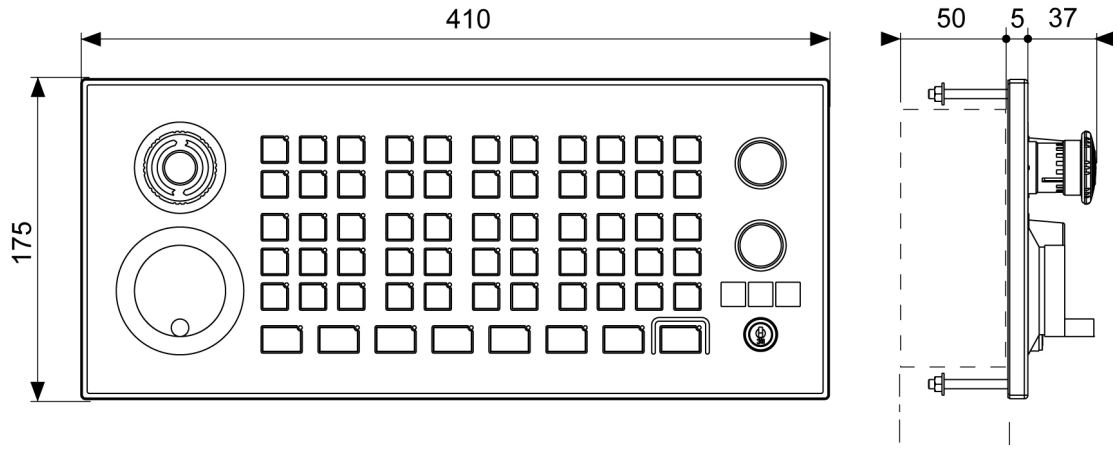
5.1.7.2 Flush mounting in front plate

- Insert the MP04 from the front into the panel cut-out.
- The front seal must be flat and evenly positioned between the front plate and the front panel.
- Fasten the rear of the device to the supplied fixing frame using the 8 M4 locking nuts (Thereby is to observe that the seal bar gets constricted only slightly, on maximal half size of its original thickness).

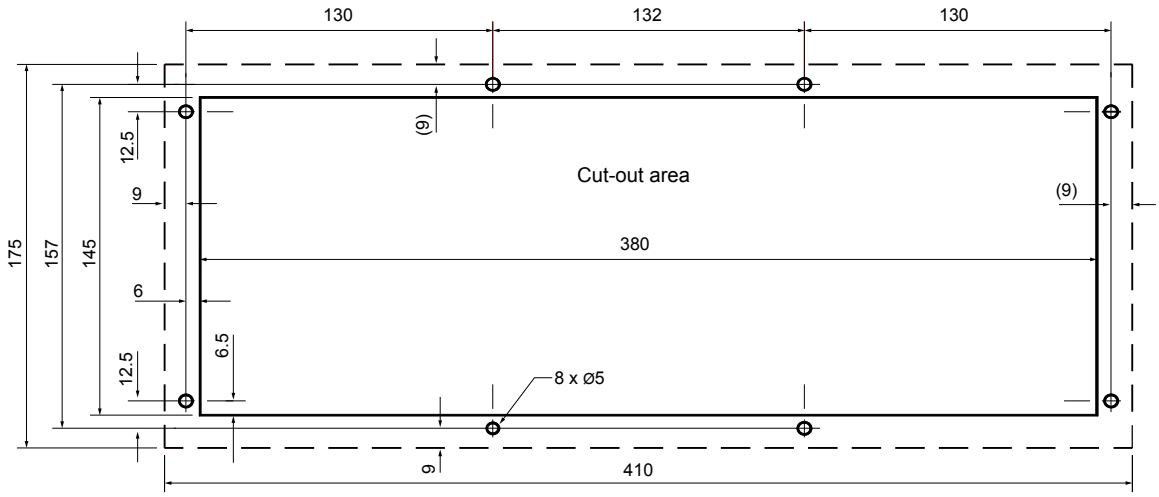


Ensure that the seal is seated correctly on the front panel.
Avoid torques higher than 0.5Nm, as this may damage the device.
The thickness of the cabinet must not exceed 7mm.

5.1.8 Detailed dimensions of the MP04-W and MP04-H



5.1.9 Cut-out and hole pattern





The MP04 can be operated at a maximum ambient temperature of 45°C. The ambient temperature is based on the temperature of the area 5cm above the panel with the device horizontal mounting at a height of 2000m above sea level.

The device can be mounted in a completely closed housing, provided that the ambient temperature (in the HOUSING) is taken into account.

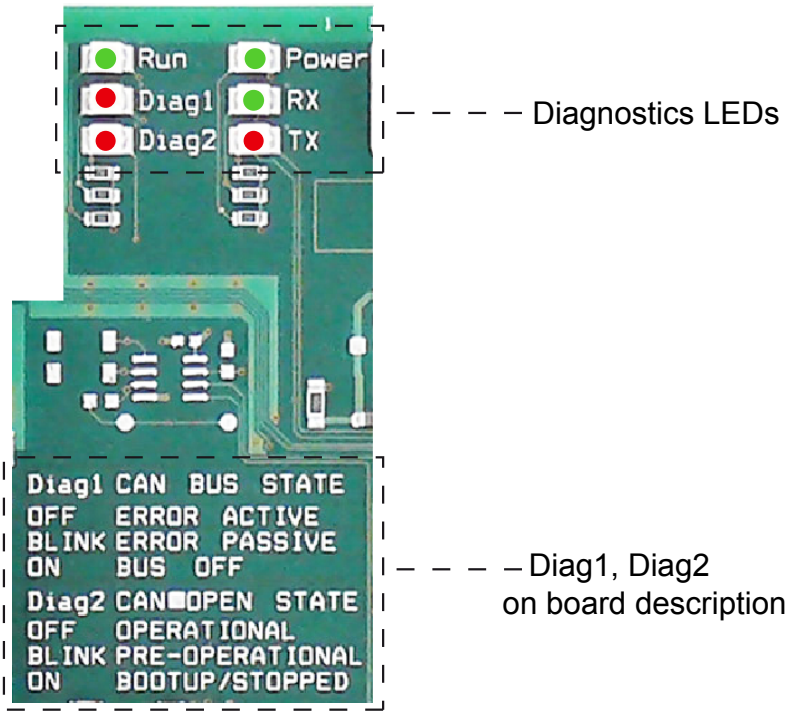
A 10mm clearance from the housing walls must be provided on all sides in order to ensure sufficient air circulation. The thickness of the cabinet must not exceed 7mm.

5.1.10 Diagnostic LEDs on board

For diagnostic there are 6 LEDs on the electronic board of the MP04.

For the explanation of the LEDs please refer to the table below.

The two diagnosis LEDs Diag1 and Diag1 are also described on the electronic board as indicated in the picture.



LED	Colour	Status	Possible cause and remedy
Run	Green	OFF	• The module is in bootload state • No firmware loaded
		Blinking	• The firmware is working properly
Diag1	Red	OFF	• CAN-Bus-State = Error active (error free)
		Blinking	• CAN-Bus-State = Error passive (disturbed, but working)
		ON	• CAN-Bus-State = Bus OFF (node disconnected)
Diag2	Red	OFF	• CAN-Bus-State = operational
		Blinking	• CAN-Bus-State = Pre operational
		ON	• CAN-Bus-State = Stopped or during Boot up • MP04 is in boot load mode
Power	Green	OFF	• The MP04 is switched off • The internal +5V power supply is malfunctioning
		ON	• The MP04 is switched on and the internal +5V power supply is functioning properly
RX	Green		• Receive CAN data (1)
TX	Red		• Transmit CAN data (1)
(1) The light intensity is proportional to the bus traffic.			

5.1.11 MP04 to PLC configuration



For MP04 to PLC configuration please refer to Flexium Commissioning manual M00010.

5.1.12 Disposal

MP04 no longer in use must be properly disposed of or must be returned to the manufacturer for disposal. (Manufacturer address see list of NUM agencies on chapter 1)

Materials

- Frontplate : Aluminium
- Board : Lead free
- Front : plastic frame.

5.1.13 Maintenance and Repair

5.1.13.1 Repairs

Repairs to MP04 devices must only be carried out by the manufacturer.
(Manufacturer address see list of NUM agencies on chapter 1)

5.1.13.2 Transport

Only the original packaging must be used for transporting the device.
The climatic conditions (see previous pages) must be observed.

5.1.13.3 Storage

The device must only be stored in the climatic conditions described in the previous pages.
It should be remembered that a high storage temperature reduces the lifespan of the product.
It is recommended to store the device at room temperature (see previous pages).

5.1.14 MP04 connections



Please refer to chaper 9 Flexium connections for more detailed information upon the MP04 Panels connections.

5.2 MP05 Machine panel

5.2.1 General

MP05 Machine panel is associated to FS192i touch panel. This uses the same 4mm hardened safety glass as the FS192i and has the same IP65 protection level at the front. A solid aluminum frame with back plate ensures correct stiffness.

MP05 complements the FS192i's virtual machine panel adding specific interfaces which need tactile feedback. The combination provides OEMs with a powerful competitive advantage.

The panel configuration and connections is supplied by the customer.

MP05 includes:

- E-Stop button
- 2 Overrides potentiometers 10kΩ for spindle speed and feed rate
- 1 handwheel (100 Impulses/rev., 5V - A, B)
- 5 luminous customizable push buttons (e.g. NC-Start, NC-Stop, JOG+ direction, JOG- direction, Rapid)
- 1 USB 2.0 interface

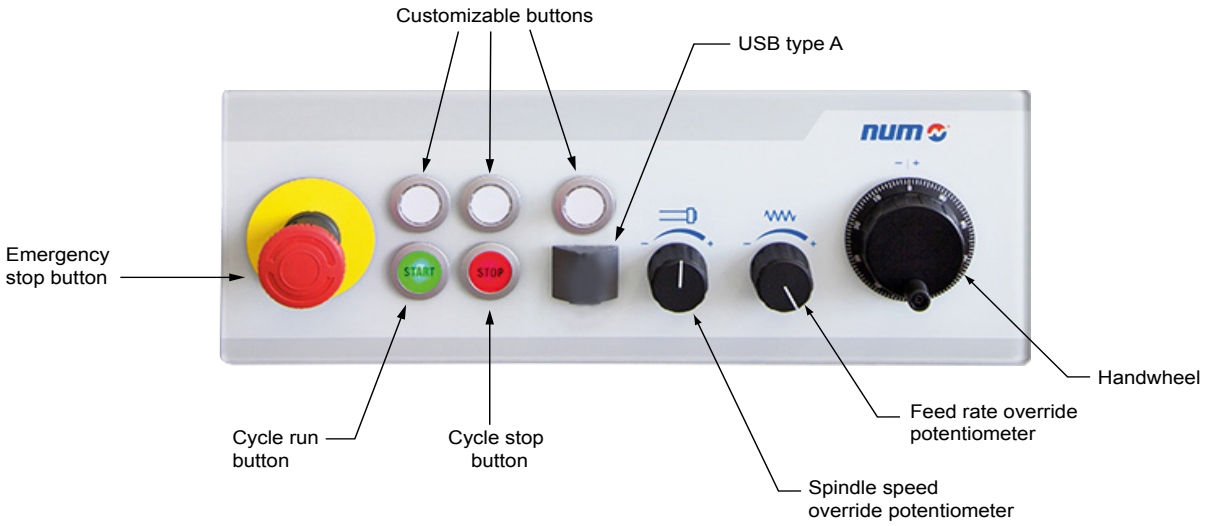


5.2.2 MP05 available versions and ordering code

MP05 version	Ordering code
Machine Panel MP05-H	**FXHE558520**

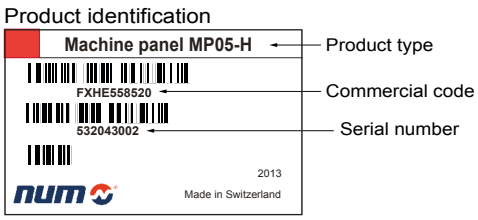
5.2.3 MP05 Machine panel description

MP05 Machine Panel front view

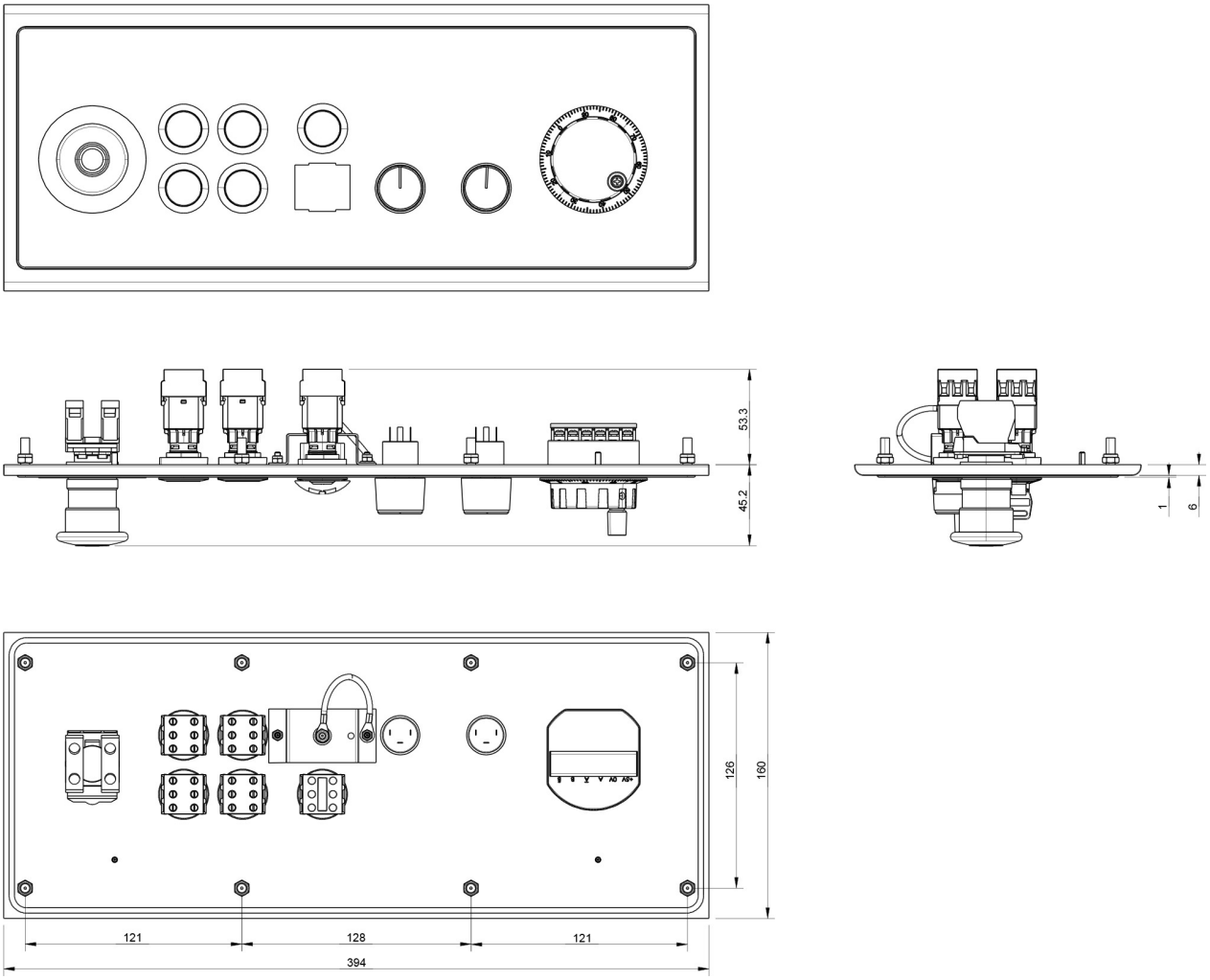


MP05 Machine Panel rear view

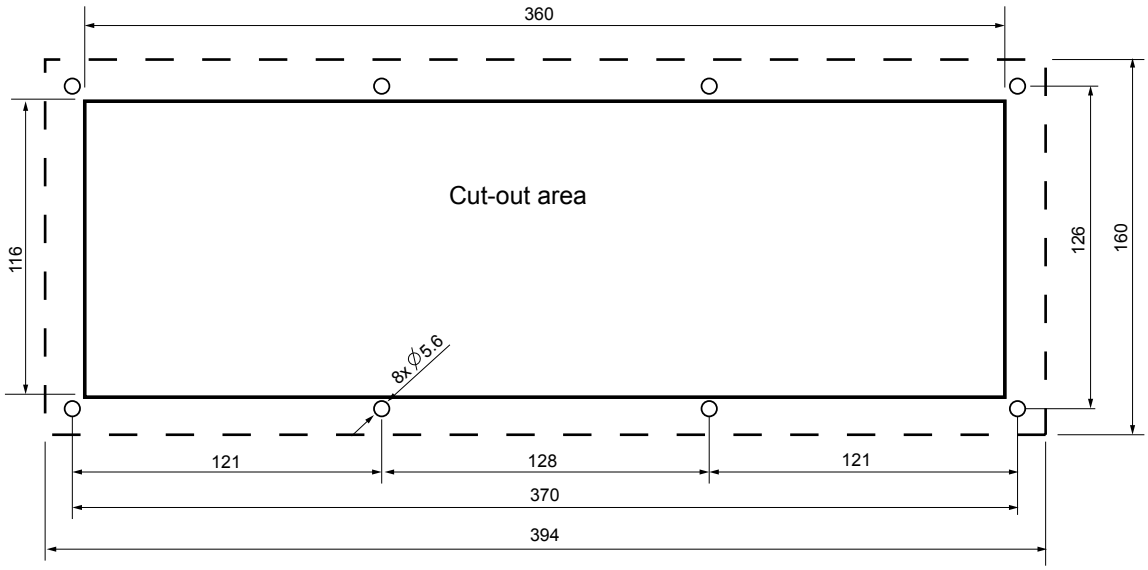




5.2.4 Detailed dimensions



5.2.5 Cut-out and hole pattern



The MP05 can be operated at a maximum ambient temperature of 45°C.
The ambient temperature is based on the temperature of the area 5cm above the panel with the device horizontal mounting at a height of 2000m above sea level.

The device can be mounted in a completely closed housing, provided that the ambient temperature (in the HOUSING) is taken into account.

A 10mm clearance from the housing walls must be provided on all sides in order to ensure sufficient air circulation. The thickness of the cabinet must not exceed 7mm.

5.2.6 MP05 to PLC configuration

For MP05 to PLC configuration please refer to Flexium+ Commissioning manual M00044.

5.2.7 Disposal

MP05 no longer in use must be properly disposed of or must be returned to the manufacturer for disposal. (Manufacturer address see list of NUM agencies on chapter 1)

5.2.8 Maintenance and Repair

5.2.8.1 Repairs

Repairs to MP05 Panel must only be carried out by the manufacturer.
(Manufacturer address see list of NUM agencies on chapter 1)

5.2.8.2 Transport

Only the original packaging must be used for transporting the device.

5.2.8.3 Storage

The device must only be stored in the climatic conditions described for MP04 and MP06 Panels.
It should be remembered that a high storage temperature reduces the lifespan of the product.
It is recommended to store the device at room temperature.

5.2.9 MP05 connections

MP05 connections and button configurations are supplied by the customer.
Please refer to chapter 9 for the MP05 connections.

5.3 MP06 Machine panel

5.3.1 General

MP06 Machine panel is used for control of manual movements, production initiation and intervention during machining and is available with / without handwheel.

For the handwheel, which is mounted on MP06 machine panel, exists two connection possibilities, either connected via EtherCAT or directly hooked up at NCK.

Four versions are available as indicated in the following sections. This panel also includes on the back 12 digital inputs and 12 digital outputs. Design fit with the FS153 family.

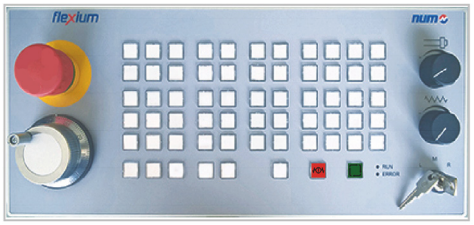
MP06 includes:

- 60 configurable buttons with blue LEDs
- 2 Overrides potentiometers or selectors for spindle speed and feed rate
- 1 Handwheel (as optional)
- 1 Emergency stop button
- 1 Three-position key switch
- 3 Dedicated buttons: Reset (white LED) Cycle Stop (Red LED), Cycle Start (green LED)
- 2 Dedicated LEDs for EtherCAT state: RUN and ERROR.



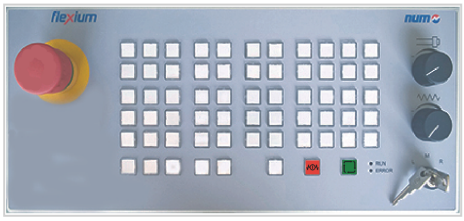
5.3.1.1 Machine Panel MP06

MP06 Machine Panels



Machine Panel MP06-H (with handwheel)

- EtherCAT interface
- 63 free configurable buttons with LEDs
- With potentiometers or selectors
- Handwheel
- Same width as FS153i



Machine Panel MP06-W (without handwheel)

- EtherCAT interface
- 63 free configurable buttons with LEDs
- With potentiometers or selectors
- Same width as FS153i

5.3.2 MP06 available versions and ordering code

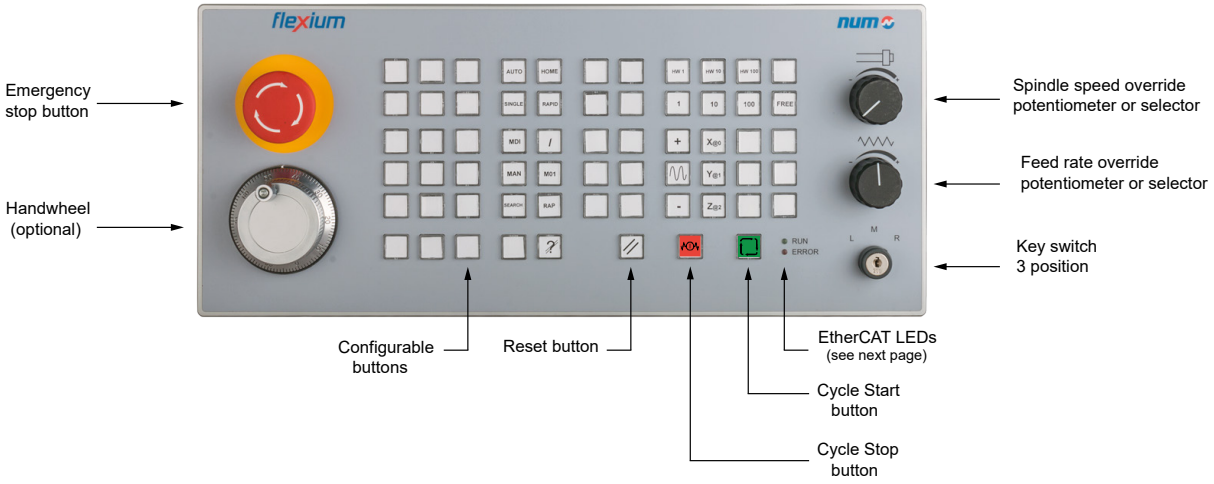
MP06 version	Ordering code
Machine Panel MP06–W without handwheel and potentiometers	**FXHE02ARE1WE000**
Machine Panel MP06–H with handwheel and potentiometers	**FXHE02ARE1HE000**
Machine Panel MP06–W without handwheel and selectors	**FXHE02ARE2WE000**
Machine Panel MP06–H with handwheel and selectors	**FXHE02ARE2HE000**

5.3.3 General characteristics

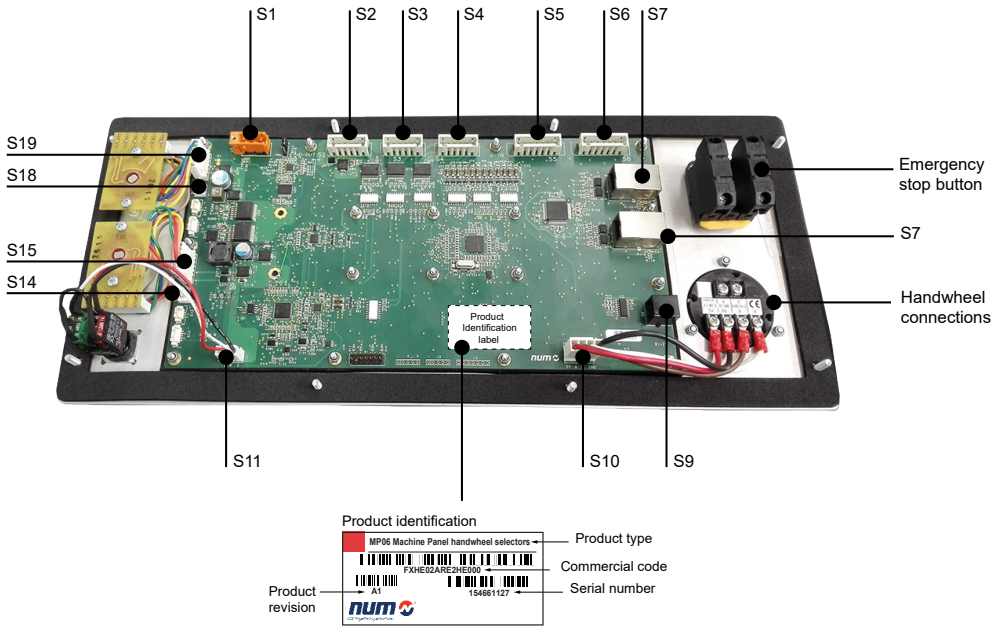
		FXHE02ARE1WE000	FXHE02ARE1HE000	FXHE02ARE2WE000	FXHE02ARE2HE000
MP06 panel	User interface	63 free programmable keys			
	Handwheel	Not present	Yes (100 Puls. per rev.)	Not present	Yes (100 Puls. per rev.)
	Comm. interface	Standard EtherCAT 2xRj45			
On board sensor	Key switch	3 positions			
	Potentiometers	For spindle speed and feed rate override (10kOhm potentiometers, 8Bit resolution)		Not present	
	Selectors	Not present		25 positions switch selector	
	1 input for handwheel	For a 5VDC handwheel with A & B push-pull signal, max. 100mA			
	Emergency stop	1			
Press buttons	55 softkeys with LED	Free configurable			
	3 controls with LED	Cycle start, cycle stop and reset			
	5 softkeys with LED	Free configurable for additional functions with LED			
Digital inputs	12 digital inputs	Organisation: 2 groups of terminals			
	Operating voltage	24V –15% / +10%			
	Logic 0 / Logic 1	0 to 5VDC / 6 to 26.4VDC			
	In current	4mA typical at 24VDC			
	Reaction time	8ms typical (debounced)			
Digital outputs	12 digital outputs	Organisation: 3 groups of terminals			
	Operating voltage	24V –15% / +10%			
	Rated current	500 mA maximum per output			
	Outputs simultuneously active	100%			
	Protection	Short-circuit and permanent overloads (trip device)			
Power supply	Rated voltage	24VDC SELV, safety extra low voltage. Protection class III /1A			
	Voltage range	24VDC +20% -15% supplied by the customer.			
	Protection against reverse polarity	Yes			
	Protection against over voltage	Yes			
	Potential isolation	No. (The 0V-pin of the PS is connected to the digital GND)			
	Power consumption	15W max			
Ambient conditions	Climatic conditions operation	0..45°C, 70% rel. air humidity, non-condensing			
	Climatic conditions storage	-40...60°C, 70% rel. air humidity, non-condensing			
	Climatic conditions, transport	-20...60°C, 70% rel. air humidity, non-condensing			
EMC	EMC immunity	Industry EN 61000-6-2			
	EMC emission	Residential area EN 61000-6-3			
	Electrical safety	EN 60950 and EN 50178			
	Conformity	MP06-W and MP06-H meets the requirements specified by the EU Council Directives for harmonizing the regulations of EU member states relating to electromagnetic compatibility (89/336/EEC).			
Degree of protection	Front	IP 65, EN 60068-2-68			
	Rear	IP 00			
Weight		1.2 kg	1.4 kg	1.2 kg	1.4 kg
Dimensions	W x H x D:	410 x 175 x 55 mm			

5.3.4 Machine panel description

MP06 Machine Panels front view



MP06 Machine Panels rear view



Connector	Type	Description
S1	3 screws pins F	MP06 power supply connection
S2, S3, S4	6 pins spring-loaded terminal	12 Digital outputs connection
S5, S6	7 pins spring-loaded terminal	12 Digital inputs connection
S7, S8	Rj45 connector	EtherCAT IN / OUT connection
S9	Rj11 connector	Service NUM only
S10	4 pins terminal	Handwheel connection
S11	4 pins terminal	Key switch connection
S14, S18	3 pin spring-loaded terminal	Potentiomenters connection
S15, S19	7 pin spring-loaded terminal	Rotary switches connection

5.3.5 EtherCAT LEDs RUN and ERROR description

RUN indicator state

Indicator state	Slave State	Description
OFF	INITIALISATION	The device is in state INIT
Blinking	PRE-OPERATIONAL	The device is in state PRE-OPERATIONAL
Single flash	SAFE-OPERATIONAL	The device is in state SAFE-OPERATIONAL
ON	OPERATIONAL	The device is in state OPERATIONAL

ERROR indicator state

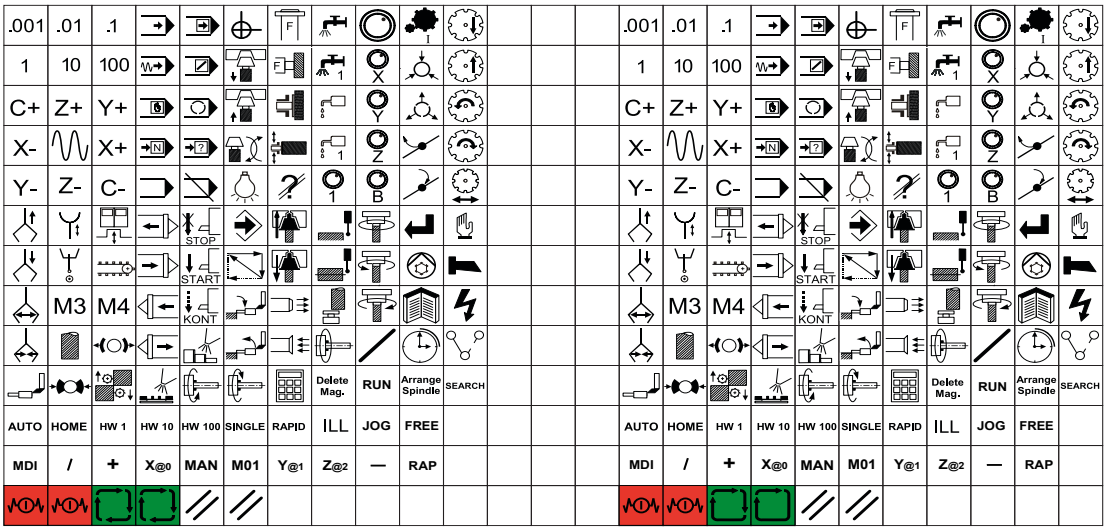
Indicator state	ERROR Name	Description	Example
ON	Application controller failure	An critical communication or application controller error has occurred.	Application controller is not responding any more (PDI Watchdog Timeout detected by ESC)
n Flashes	Reserved	Reserved for future use	-
Triple Flash	Reserved	Reserved for future use	-
Double Flash	Processor Data Watchdog Timeout / EtherCAT Watchdog Timeout	An application watchdog timeout has occurred	Sync Manager Watchdog timeout
Single Flash	Local Error	Slave device application has changed the EtherCAT state autonomously, due to local error (see ETG.1000 part 6 EtherCAT State Machine). Error indicator bit is set to 1 in AL Status register.	Device changes its EtherCAT state from Op to SafeOpError due to a synchronization error.
Blinking	Invalid configuration	General Configuration Error.	State change commanded by master is impossible due to register or object settings, or invalid hardware configuration (pin sharing violation detected by ESC).
Flickering	Booting Error	Bootin Error was detected. INIT state reached, but Error indicator bit setto 1 in AL Status register.	Checksum error in Application controller flash memory.
OFF	No Error	The EtherCAT communication of the device is in working condition.	

5.3.6 Installing the personalization button labels

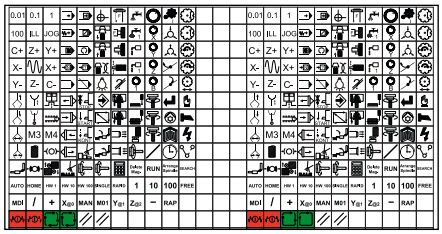
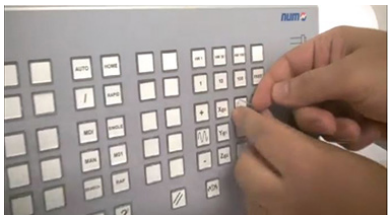
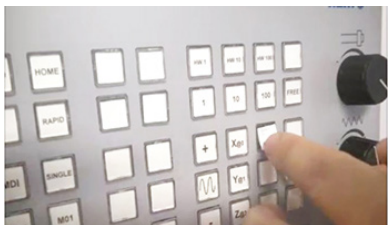
MP06 buttons on the machine panel are not engraved, therefore they must be personalized by the customer.

MP06 is supplied with covers button and their assignment is specified by installing a set of personalization label sheet supplied with the machine panel as indicated here under.

If you need printout more own labels please download the label file from:
https://flexium.num.com (Identifier and password will be provided by your usual num contact)



5.3.6.1 Installing / change the key labels and cover in the MP06 Machine Panel

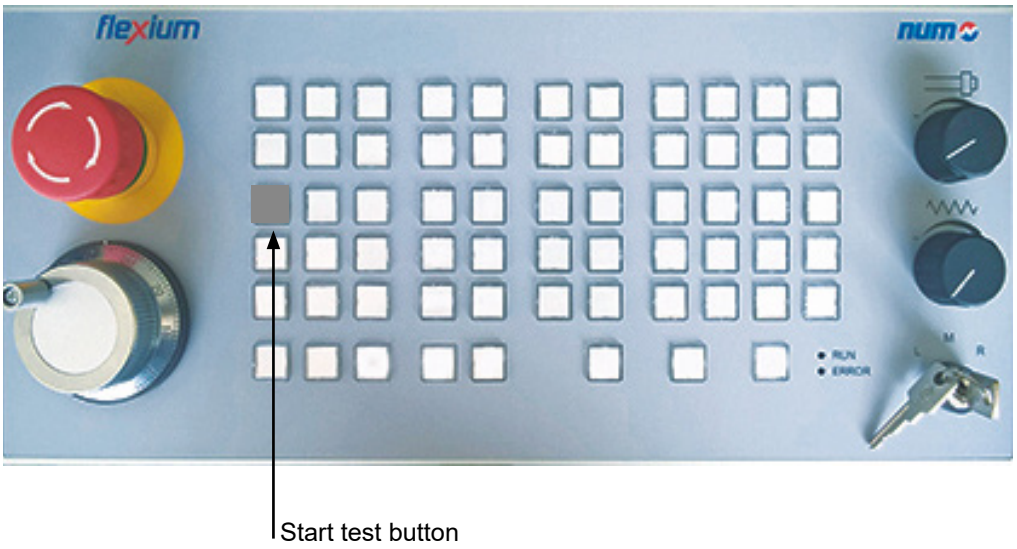
Installing a new key label	
- Take your personalization label. - Place the label into the button cavity. - Place the plastic button cover	
Change key label	
Remove the plastic button cover using small pincers or by mean a small screwdriver.	 
Grasp the label.	
Remove the label.	
Place the new label.	
Replace the plastic button cover.	

5.3.7 Test program

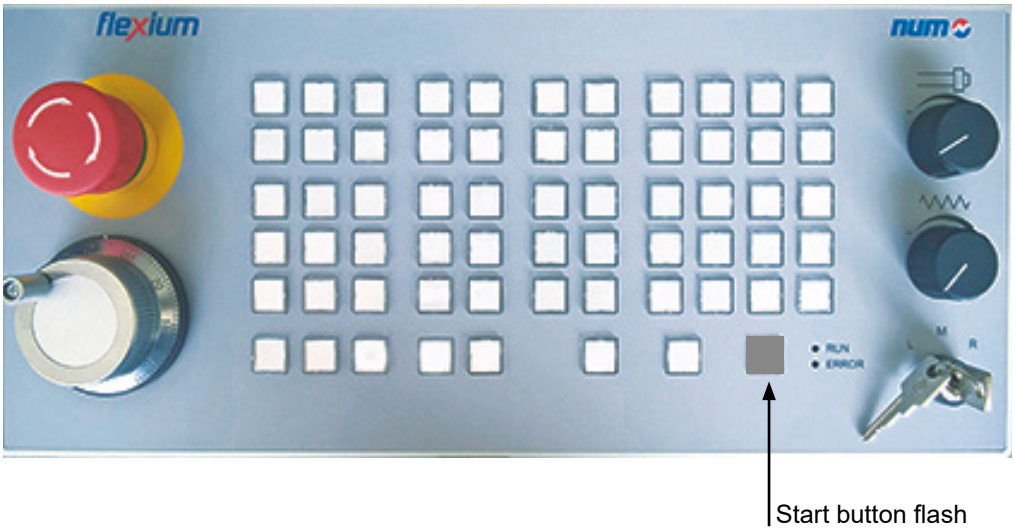
The MP06 has an integrated test program to test the LEDs, the keys, the potentiometers, the handwheel, the IOs and the firmware.

1. Switch off the power of the MP06.

2. Press the button *"Start test"*, hold it depressed and switch power on.
   After 250ms the test procedure starts. The *"Start test"* button may now be released.

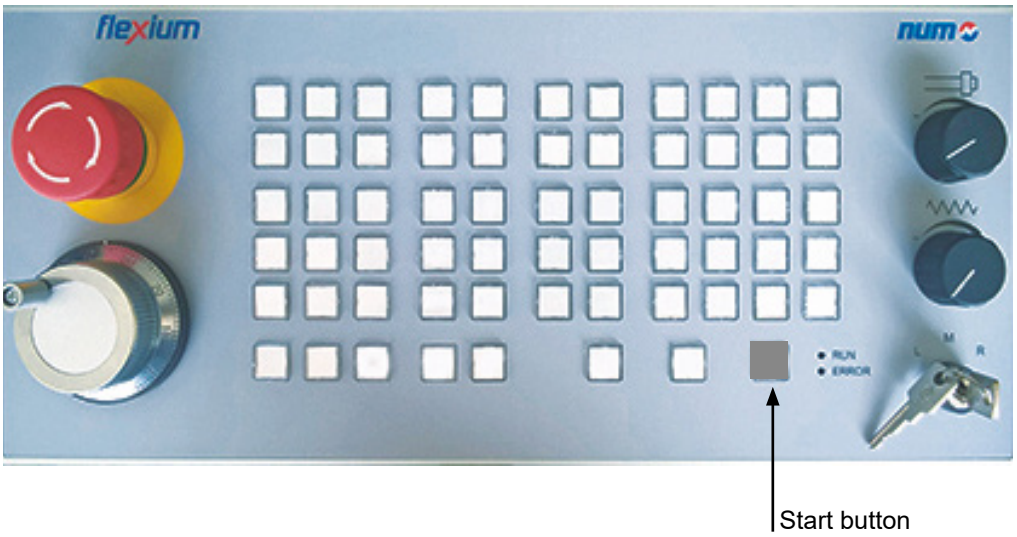


3. All LEDs will light up for 250ms one after another. So the function of the LEDs can be checked.
   After completion of this test, the LED of the *"Start"* button will flash.

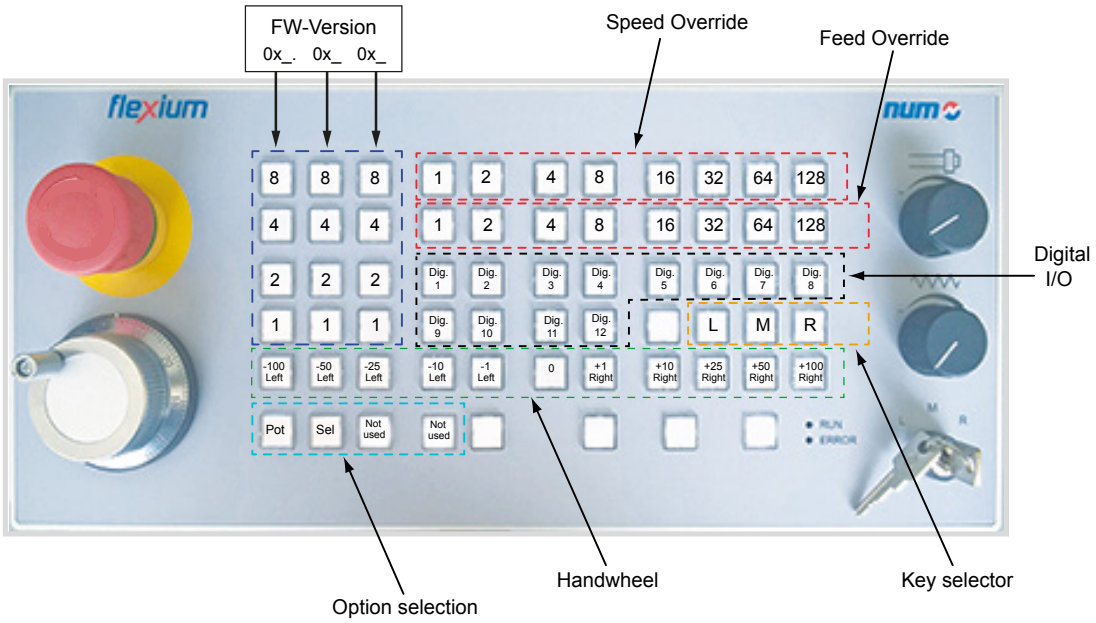


4. Now the buttons can be tested by pressing them.
   If the button is working properly the LED of the key lights up.

5. To select the next test, press the *"Start"* button.



6. The areas shown below display the states and values of the hardware.



The values displayed are:

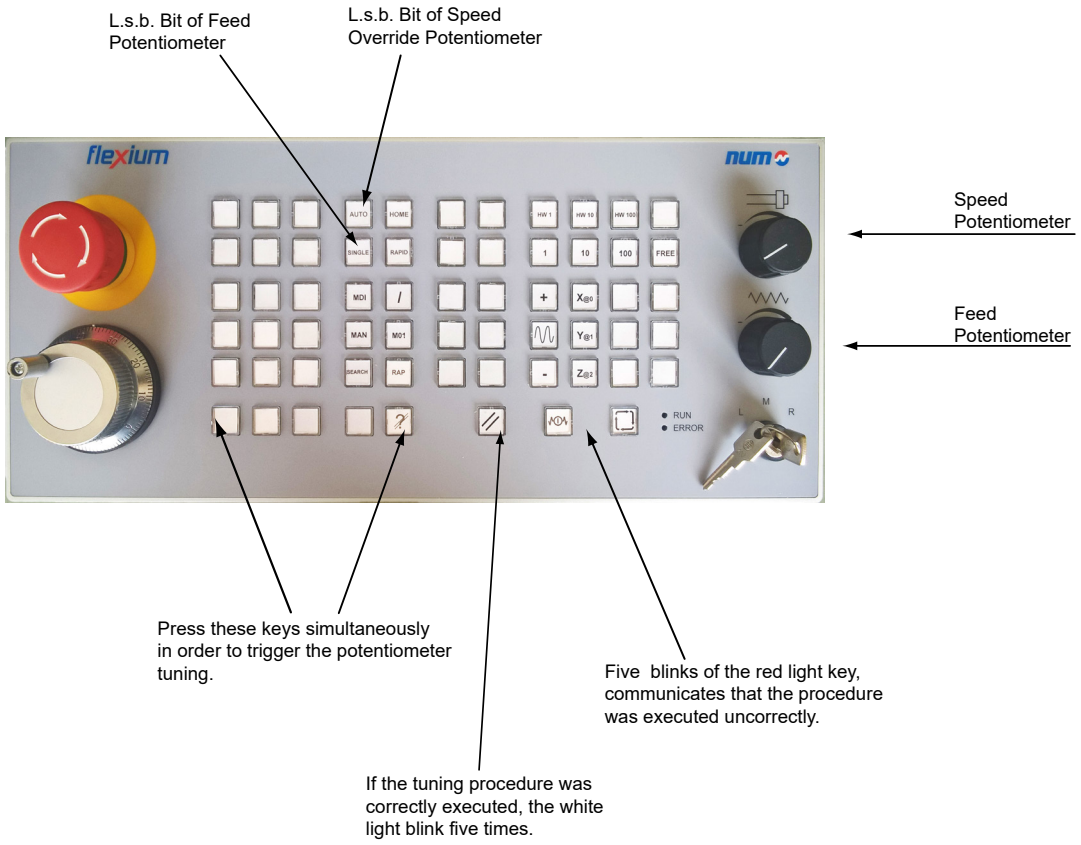
FW-Version (software version) *(see Blue area)*	Firmware version of the MP06 panel. The version is displayed in Hexadecimal code. (0.00)
Handwheel *(see Green area)*	By turning the handwheel clockwise the LEDs will light up one after the other from left to right as indicated in the picture above. (anticlockwise = right to left)
SPEED Override **FEED Override** *(see Red area)*	By turning the corresponding knob the LEDs will light in binary code: - Potentiometers version: 0 ÷ 255 values displayed. - Selectors version: 0 ÷ 24 values displayed.
Digital I/O (1) *(see Black area)*	By pressing a key the relevant digital output will be forced. The LEDs shows the state of the digital inputs.
Key Selector (1) *(see Orange area)*	Shows the 3 switches positions of the key as indicated in the picture above. (L, M, R key positions)
Options Selection *(see Blue azure area)*	By pressing this keys we can change the "override option", under test. "*Pot*" for override potentiometer, *"Sel"* for override selectors. The values are displayed in override areas (see Speed and Feed override for details).
(1) This test can be performed just with EtherCAT in OP-state, the RUN led in front panel is light on.	

7. To restart the test, press the *"Start"* button with the flashing LED again.

8. To exit the test mode, switch off the power of the MP06.

9. **Potentiometers Tuning** (Starting from the SW version 3.06)

Starting from the SW version 3.06 the MP0x offers the feature to set the max value reach by Spindle and Feed potentiometers.
It's possible to set the biggest dynamic of the potentiometers when the MP06 runs in Test Program.



9.1 Procedure

1. When the test procedure enter in the step of visualization of Fw version and inputs status (see step 6 of previously paragraph), if the L.s.b keys blink, then the corresponding potentiometer is not tune and the current full scale is set to default value.

2. Set the potentiometers in the position corresponding to the full scale (clockwise end travel).

3. Press simultaneously the fist key and fifth key of last key row.

4. The tuning was execute:
    a. If the procedure was correct the key with white light blink five times.
    b. If the value of the potentiometer was too low, then the procedure is deemed not correct and the key with red light, blink five times. After this you can see the lsb of the corresponding knob to blink, in order to signal what potentiometer was uncorrecttly positioned.

5.3.8 Mounting instructions

5.3.8.1 General Mounting instructions

MP06 are installed from the front, for example, into a control cabinet. They are fixed at the rear with embedded threaded bolts.

MP06 can be operated at a maximum ambient temperature of 45°C. The ambient temperature is based on the temperature of the area 5cm above the panel with the device mounted vertically at a height of 2000m above sea level.

The device can be mounted in a completely closed housing, provided that the ambient temperature (in the HOUSING) is taken into account. A 10mm clearance from the housing walls must be provided on all sides in order to ensure sufficient air circulation



Prevention of overheating during operation:
- A forced airflow increases the overall reliability.

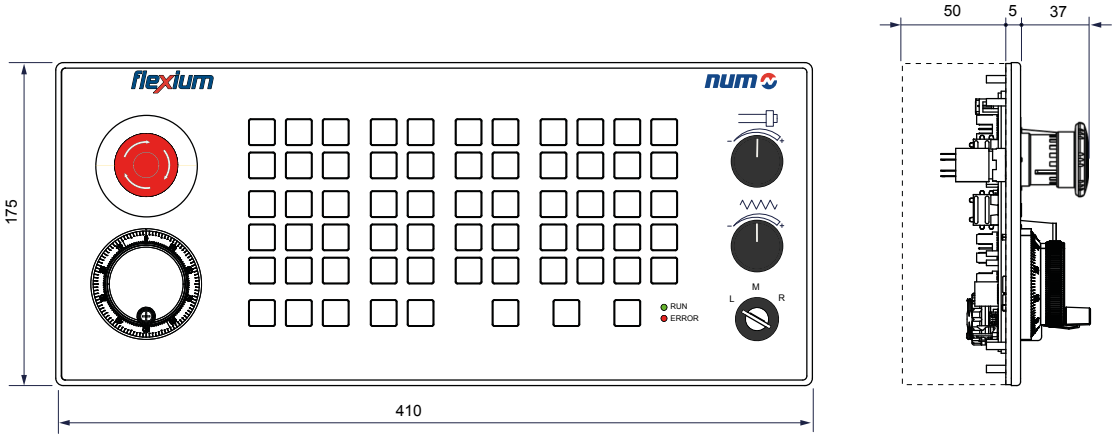
5.3.8.2 Flush mounting in front plate

- Insert the MP06 from the front into the panel cut-out.
- The front seal must be flat and evenly positioned between the front plate and the front panel.
- Fasten the rear of the device to the supplied fixing frame using the 8 M4 locking nuts (Thereby is to observe that the seal bar gets constricted only slightly, on maximal half size of its original thickness).

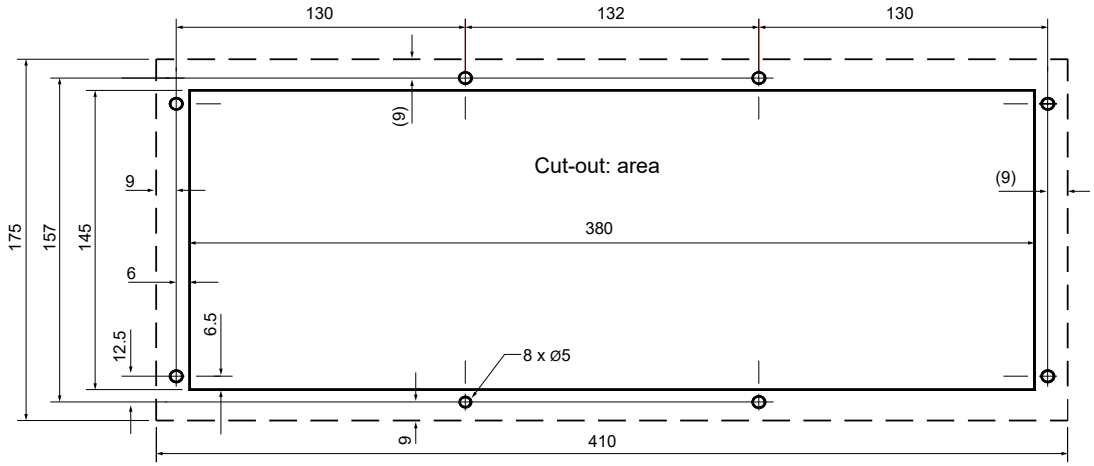


Ensure that the seal is seated correctly on the front panel.
Avoid torques higher than 0.5Nm, as this may damage the device.
The thickness of the cabinet must not exceed 7mm.

5.3.9 Detailed dimensions



5.3.10 Cut-out and hole pattern



Tolerance of the cut-out: +0/-1mm

MP06 can be operated at a maximum ambient temperature of 45°C.
The ambient temperature is based on the temperature of the area 5cm above the panel with the device horizontal mounting at a height of 2000m above sea level.

The device can be mounted in a completely closed housing, provided that the ambient temperature (in the HOUSING) is taken into account.

A 10mm clearance from the housing walls must be provided on all sides in order to ensure sufficient air circulation. The thickness of the cabinet must not exceed 7mm.

5.3.11 MP06 to PLC configuration



For MP06 to PLC configuration please refer to Flexium+ Commissioning manual M00044.

5.3.12 Disposal

MP06 no longer in use must be properly disposed of or must be returned to the manufacturer for disposal. (Manufacturer address see list of NUM agencies on chapter 1)

5.3.13 Maintenance and Repair

5.3.13.1 Repairs

Repairs to MP06 Panels must only be carried out by the manufacturer.
(Manufacturer address see list of NUM agencies on chapter 1)

5.3.13.2 Transport

Only the original packaging must be used for transporting the device.
The climatic conditions (see previous pages) must be observed.

5.3.13.3 Storage

The device must only be stored in the climatic conditions described in the previous pages.
It should be remembered that a high storage temperature reduces the lifespan of the product.
It is recommended to store the device at room temperature.

5.3.14 MP06 connections



Please refer to chaper 9 Flexium connections for more detailed information upon the MP06 Panels connections.

5.4 MP07 Machine panel

5.4.1 General

MP07 is identical to MP06 but designed to be compatible wth the FS184i panel.

In addition to the MP06 it provides an USB connector and the provision for two standard buttons.



MP07 is available in four versions

With handwheel and override potentiometers

With handwheel and override selectors

Without hanwheel and with override potentiometers

Without handwheel and with override selectors

5.4.2 MP07 available versions and ordering code

MP07 version	Ordering code
Machine Panel MP07–W without handwheel and potentiometers	**FXHE04ARE1WE100**
Machine Panel MP07–H with handwheel and potentiometers	**FXHE04ARE1HE100**
Machine Panel MP07–W without handwheel and selectors	**FXHE04ARE2WE100**
Machine Panel MP07–H with handwheel and selectors	**FXHE04ARE2HE100**

5.4.3 General characteristics



Please refer to “5.3.3 General characteristics”.

5.4.4 Machine panel description



Please refer to “5.3.4 Machine panel description”.
In addition to the MP06 it provides an USB connector and the provision for two standard buttons.

5.4.5 EtherCAT LEDs RUN and ERROR description



Please refer to “5.3.5 EtherCAT LEDs RUN and ERROR description”

5.4.6 Installing the personalization button labels



Please refer to “5.3.6 Installing the personalization button labels”

5.4.7 Test program



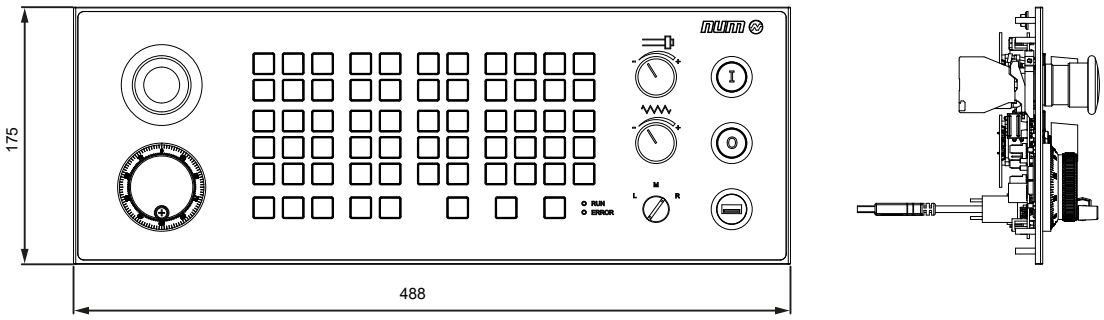
Please refer to “5.3.7 Test program”.

5.4.8 Mounting instructions

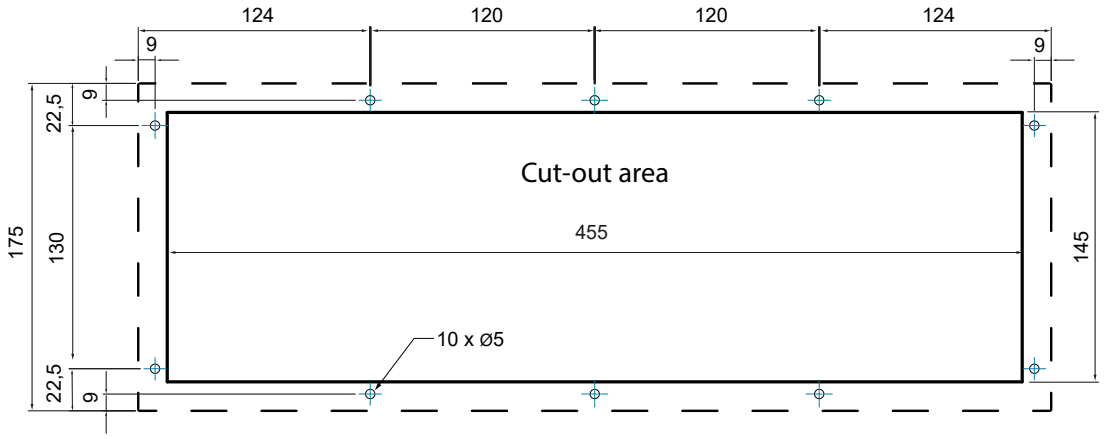


Please refer to “5.3.8 Mounting instructions”

5.4.9 Detailed dimensions



5.4.10 Cut-out and hole pattern



Tolerance of the cut-out: +0/-1mm

STOP

MP07 can be operated at a maximum ambient temperature of 45°C.
The ambient temperature is based on the temperature of the area 5cm above the panel with the device horizontal mounting at a height of 2000m above sea level.

The device can be mounted in a completely closed housing, provided that the ambient temperature (in the HOUSING) is taken into account.

A 10mm clearance from the housing walls must be provided on all sides in order to ensure sufficient air circulation. The thickness of the cabinet must not exceed 7mm.

5.4.11 MP07 to PLC configuration



For MP07 to PLC configuration please refer to Flexium+ Commissioning manual M00044 “MP06” configuration.

5.4.12 Disposal

MP08 no longer in use must be properly disposed of or must be returned to the manufacturer for disposal. (Manufacturer address see list of NUM agencies on chapter 1)

5.4.13 Maintenance and Repair

5.4.13.1 Repairs

Repairs to MP08 Panels must only be carried out by the manufacturer.
(Manufacturer address see list of NUM agencies on chapter 1)

5.4.13.2 Transport

Only the original packaging must be used for transporting the device.
The climatic conditions (see previous pages) must be observed.

5.4.13.3 Storage

The device must only be stored in the climatic conditions described in the previous pages.
It should be remembered that a high storage temperature reduces the lifespan of the product.
It is recommended to store the device at room temperature.

5.4.14 MP07 connections



Please refer to chaper 9 Flexium MP06 connections for more detailed information upon the panel connections.

5.5 MP08 Machine panel

5.5.1 General

MP08 Machine panel is used for control of manual movements, production initiation and intervention during machining.

Two versions are available as indicated in the following sections. This panel also includes on the back 12 digital inputs and 12 digital outputs. Design fit with the FS122 Panel family.

MP08 includes:

- 60 configurable buttons with blue LEDs
- 2 Overrides potentiometers or selectors for spindle speed and feed rate
- 1 Three-position key switch
- 3 Dedicated buttons: Reset (white LED) Cycle Stop (Red LED), Cycle Start (green LED)
- 2 Dedicated LEDs for EtherCAT state: RUN and ERROR.



5.5.2 MP08 available versions and ordering code

MP06 version	Ordering code
Machine Panel MP08 with potentiometers	**FXHE01ARE1WE000**
Machine Panel MP08 with selectors	**FXHE01ARE2WE000**

5.5.3 General characteristics



Please refer to “5.3.3 General characteristics”.

5.5.4 Machine panel description



Please refer “5.3.4 Machine panel description”.
(Handwheel and stop pushbutton not available).

5.5.5 EtherCAT LEDs RUN and ERROR description



Please refer to “5.3.5 EtherCAT LEDs RUN and ERROR description”

5.5.6 Installing the personalization button labels



Please refer to “5.3.6 Installing the personalization button labels”
.

5.5.7 Test program



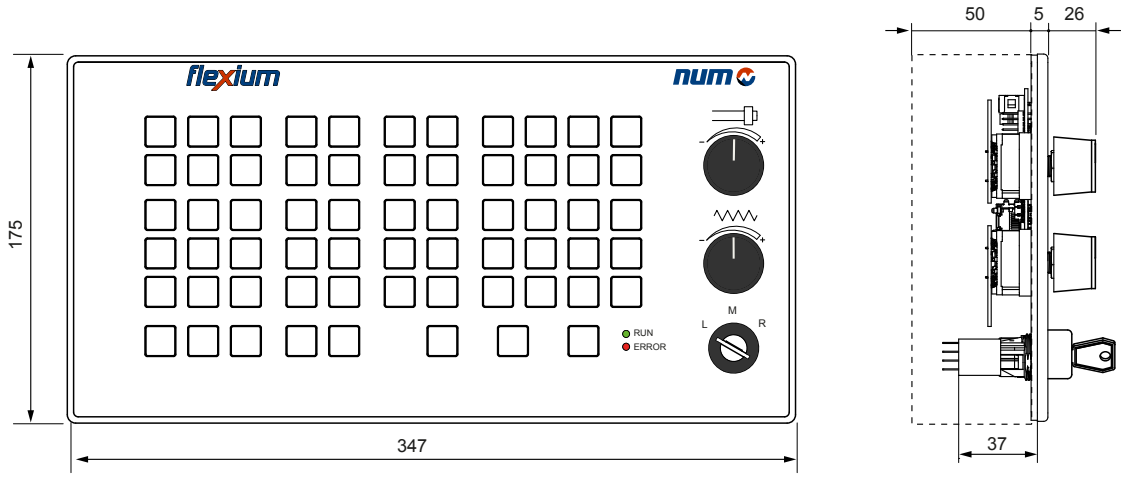
Please refer to “5.3.7 Test program”.

5.5.8 Mounting instructions

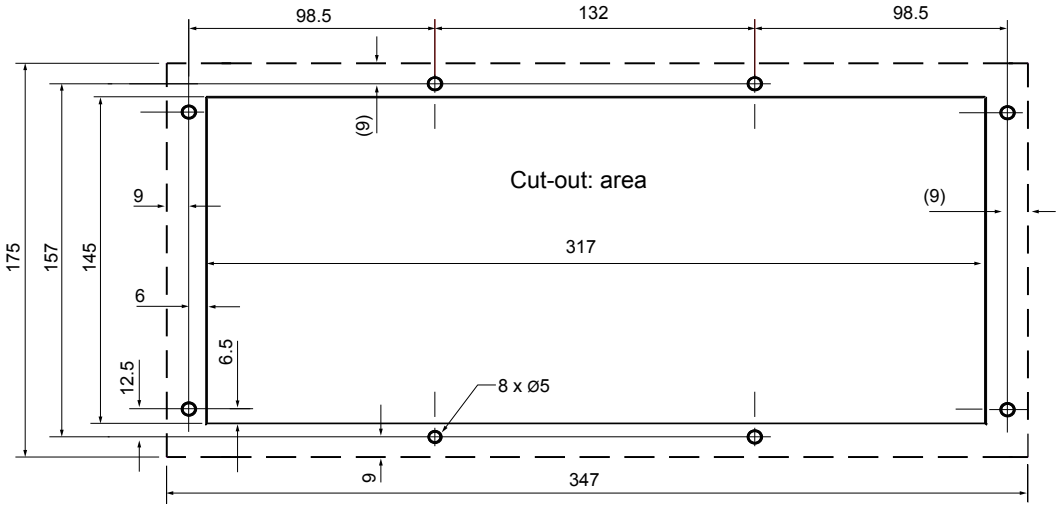


Please refer to “5.3.8 Mounting instructions”

5.5.9 Detailed dimensions



5.5.10 Cut-out and hole pattern



Tolerance of the cut-out: +0/-1mm

STOP

MP08 can be operated at a maximum ambient temperature of 45°C.
The ambient temperature is based on the temperature of the area 5cm above the panel with the device horizontal mounting at a height of 2000m above sea level.

The device can be mounted in a completely closed housing, provided that the ambient temperature (in the HOUSING) is taken into account.

A 10mm clearance from the housing walls must be provided on all sides in order to ensure sufficient air circulation. The thickness of the cabinet must not exceed 7mm.

5.5.11 MP08 to PLC configuration



For MP08 to PLC configuration please refer to Flexium+ Commissioning manual M00044 “MP06” configuration.

5.5.12 Disposal

MP08 no longer in use must be properly disposed of or must be returned to the manufacturer for disposal. (Manufacturer address see list of NUM agencies on chapter 1)

5.5.13 Maintenance and Repair

5.5.13.1 Repairs

Repairs to MP08 Panels must only be carried out by the manufacturer.
(Manufacturer address see list of NUM agencies on chapter 1)

5.5.13.2 Transport

Only the original packaging must be used for transporting the device.
The climatic conditions (see previous pages) must be observed.

5.5.13.3 Storage

The device must only be stored in the climatic conditions described in the previous pages.
It should be remembered that a high storage temperature reduces the lifespan of the product.
It is recommended to store the device at room temperature.

5.5.14 MP08 connections



Please refer to chaper 9 Flexium MP06 connections for more detailed information upon the panel connections.

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6 NUM Industrial Box PC

6.1 Industrial Box PC

NUM Industrial Box PC can be used in two different ways:

- In case of very demanding application where a powerfull workstation is needed (e.g. when CAD/CAM are used), Industrial Box PC acts as a PLC only.
- Industrial Box PC P2 can also deal as Flexium HMI as well as Flexium PLC platform together with a FS122, FS153 or FS192L passive panels.



Box PC P1 G4 Box PC P2



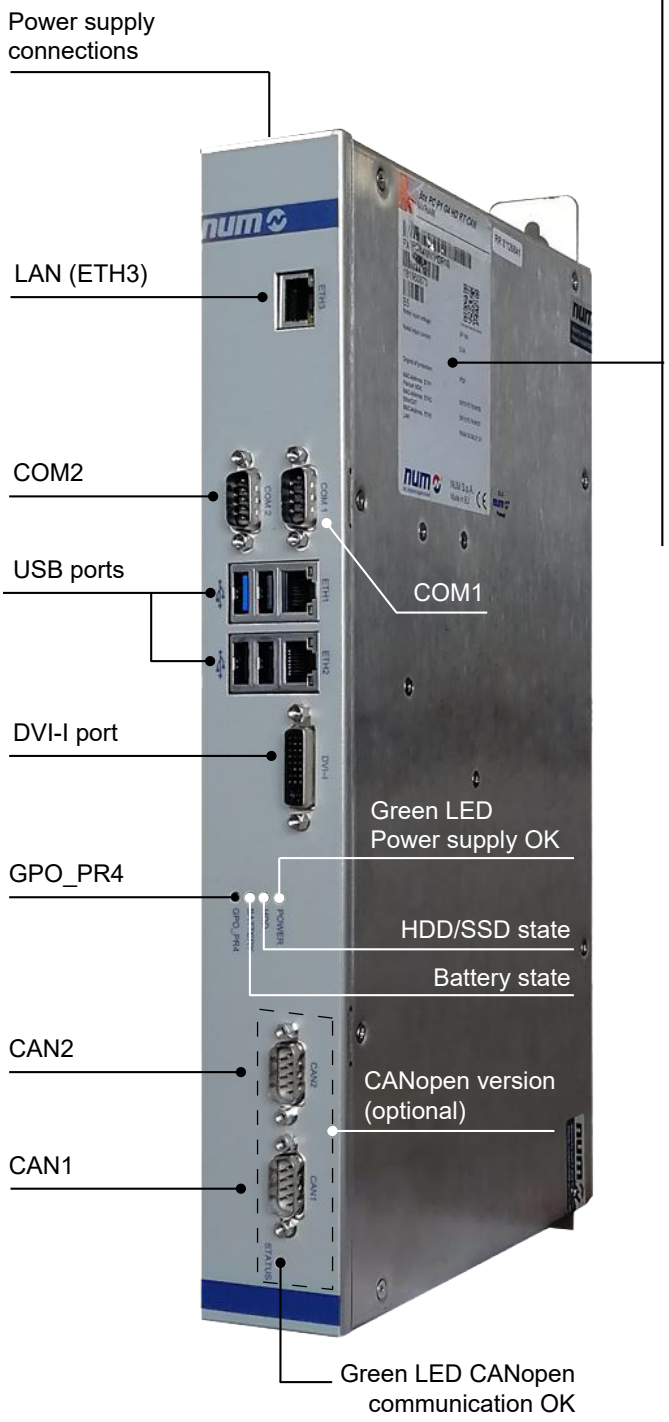
Machine builders and end users are not allowed to install on this NUM industrial PC, software which performs “Desktop Functions” other than through, in support of, and operating as a part of, the Embedded Application. “Desktop Functions” means consumer or business tasks or processes performed by a computer or computing device. This includes email, word processing, spreadsheets, database, network/Internet browsing, scheduling,
and personal finance. Desktop Functions may include features and functions derived from the MS Binaries or the Company Binaries.

6.1.1 General characteristics

		FXPC004NN1HxR10 (PC P1 G4)
Main PC features	CPU	Intel ® Celeron™ CPU J1900 @ 2GHz Quad Core
	RAM	2GB
	Mass storage	>250 GB Hard Disk
	Operating system	Windows Embedded 8.1 Industry Pro
Communication Interfaces	Ethernet (ETH)	3x Gigabit LAN / RTE
	CAN	2 - CAN1 / CAN2 (as option)
	USB	3 Type A V2.0 - 1.5/12/480 MBit/s and 1 Type A V3.0
	COM	2
	PS2	No
	Mic-In / Line Out	No
	VGA interface	No
	DVI-I interface	1
	DisplayPort	No
Power supply	Rated voltage	24 VDC SELV, safety extra low voltage. Protection class III / 1A
	Voltage range	24VDC +20% -15% supplied by the customer
	Protection fuse	Yes. Internal fuse 2A/250V - ø5mm x 20mm
	Power consumption	typ. 21W max. 50W (2.1A)
Ambient conditions	Climatic conditions operation	0..40°C, 70% rel. air humidity, non-condensing
	Climatic conditions storage	-40...80°C, 70% rel. air humidity, non-condensing
	Environmental installation conditions	Requires protection to at least IP54
	Climatic conditions, transport	Class 2K3 EN50178 (reduced) -20...60°C, 10...90% rel. Air humidity, non-condensing.
Degree of protection		IP20
Pollution degree		2
Cooling type		Fan-less
Weight		ca. 2.4kg
Dimensions	W x H x D:	50 x 355 (410) x 206 mm (Please refer to the next pages)

6.2 Industrial Box PC P1 G4 (FXPC004NN1HxR00)

6.2.1 Box PC P1 G4 layout and connectors

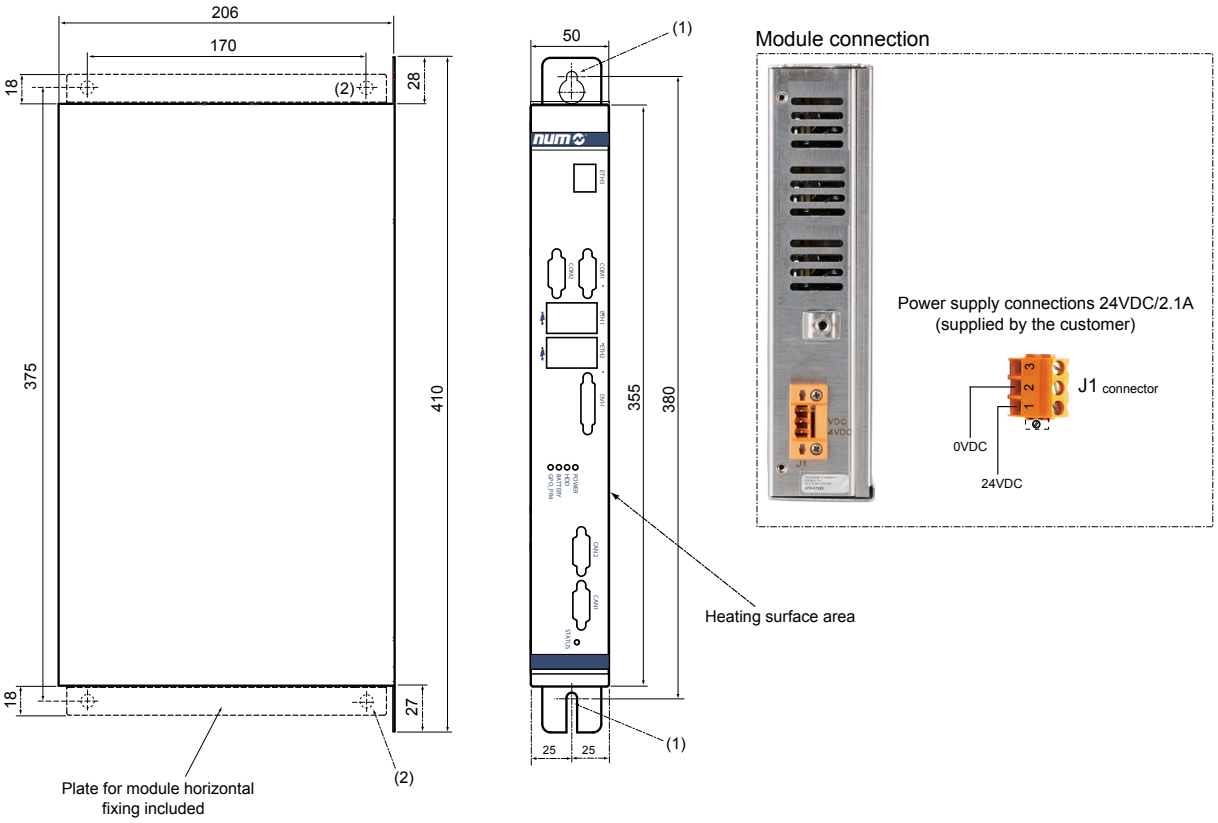


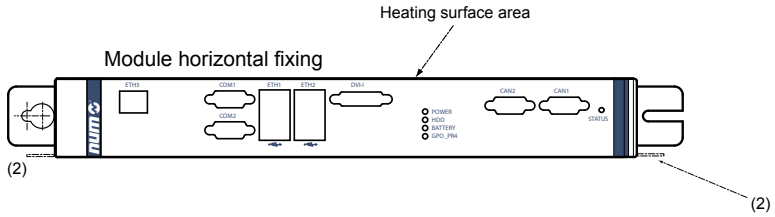


FXPC004NN1HxR10	Description
CPU	Intel ® Celeron™ CPU J1900 @ 2GHz Quad Core
Mass Storage	SSD
RAM	> = 2GB
Operating System	Windows 10 IoT Enterprise 2019 64 bit
Ethernet (ETH)	3x Gigabit LAN / RTE
Field bus CAN / EtherCAT	Max 2 / 1
USB external	1 x USB3.0 and 3 x USB2.0
COM / PS2	2 / 0
VGA / DVI	0 / 1
Power supply	24VDC (+15%/-15%)
Power consumption	typ. 21W max. 50W (2.1 A)
Cooling type	Without fan
Degree of protection	IP20
Pollution degree	2
Climatic conditions: operation	0..45°C, 70% rel. air humidity, non-condensing.
Climatic conditions: storage	-40...60°C, 70% rel. air humidity, non-condensing
Climatic conditions: transport	-20...60°C, 70% rel. air humidity, non-condensing
Overall dimensions W x H x D	50 x 355 (410) x 206 mm
Weight approx.	2.4kg

6.2.2 Box PC P1 G4 installation and power supply connections

Dimensions in mm.





(1) Provide 2 x M6 fixing screws.
(2) Provide 4 x M4 fixing screws.

To facilitate sufficient air circulation and so ensure an adequate heat exchange in the system, it is recommended that a minimum ventilation clearance of 100mm is left in the fan area and at top and bottom side when installing the modules in the electrical cabinet.
Do not cover the ventilation grilles with cables or anything else, this may cause the rise temperature inside the drives. Please also refer to the M00027 manual for more detailed information.

6.2.3 Power up and shutdown

The PC starts automatically when Power up is applied. There is no Power up button.

To Power up the system after a shut down it is necessary to switch the power off and on again. Such OFF/ON sequence should be separated by a minimum dealy of 20seconds.

Shut Down: To keep the system safe and running never switch off the power directly but use a shut down procedure. A shutdown can be initilaized by the PLC program or by windows itself.

6.2.4 Diagnostics

Symptom	Possible cause and remedy
Dark screen during power-up	- Check power supply. - Loss of setup data. - Connect an external video display for diagnosis.
White screen after switch off and re-switch on again	- The ATX-power supply doesn't switch on properly because the switch off time was shorter than 20s.
Date/time not correct	Replace battery (see next page)
Ethernet connection missing	- Incorrect Ethernet cable fitted (crosslink/direct) - LINK-LED is lit if the connection is correct - ACT LED if the data transfer is correct (flashes during the transfer) - Incorrect/invalid IP address set.

6.2.5 Battery replacement

Box PC P1 is provided with a battery-powered real-time clock circuit Exchangeable code EIV6003971. There is a danger of explosion if battery is incorrectly replaced.



Replace only with the same type recommended by NUM.
Attention: Opening the back cover or breaking the warranty labels voids the warranty.



Pay attention to ESD safety protections when changing the battery.

6.2.6 Maintenance and Repair

6.2.6.1 Repairs

Repairs to Box PC devices must only be carried out by the manufacturer.
(Manufacturer address see list of NUM agencies on chapter 1)

6.2.6.2 Transport

Only the original packaging must be used for transporting the device.
The climatic conditions (see previous pages) must be observed.

6.2.6.3 Storage

The device must only be stored in the climatic conditions described in the previous pages.
It should be remembered that a high storage temperature reduces the lifespan of the product.
It is recommended to store the device at room temperature (see previous pages).

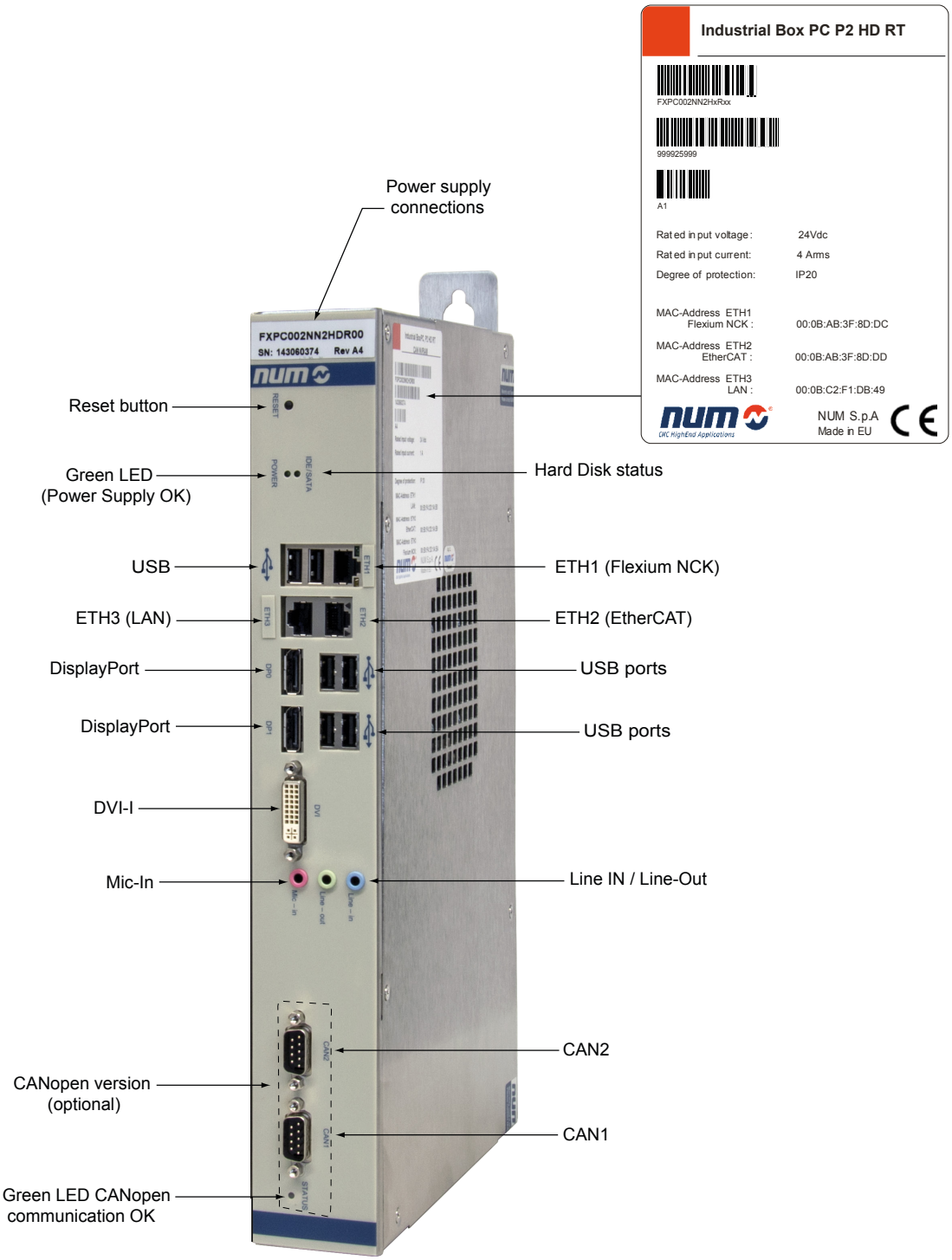
6.2.7 Industrial Box PC to NCK general connections



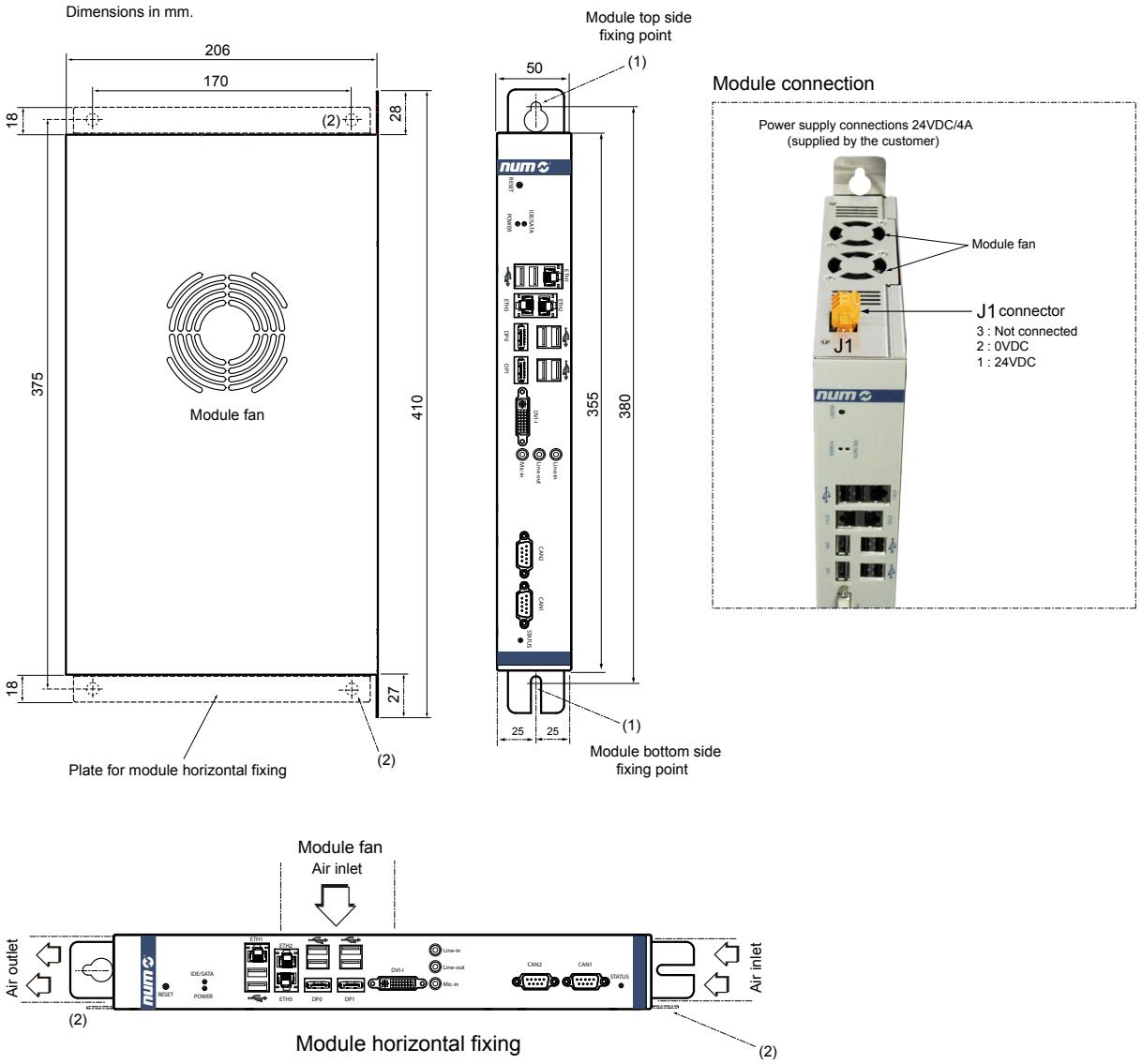
Please refer to chaper 9 Flexium connections for more detailed information upon the Industrial Box PC connections.

6.3 Industrial Box PC P2 (FXPC002NN1HxR00)

6.3.1 Box PC P2 layout and connectors



6.3.2 Box PC P2 installation and power supply connections



(1) Provide 2 x M6 fixing screws.
(2) Provide 4 x M4 fixing screws.

To facilitate sufficient air circulation and so ensure an adequate heat exchange in the system, it is recommended that a minimum ventilation clearance of 100mm is left in the fan area and at top and bottom side when installing the modules in the electrical cabinet.
Do not cover the ventilation grilles with cables or anything else, this may cause the rise temperature inside the drives. Please also refer to the M00027 manual for more detailed information.

6.3.3 Power up and shutdown

The PC starts automatically when Power up is applied. There is no Power up button.

To Power up the system after a shut down it is necessary to switch the power off and on again. Such OFF/ON sequence should be separated by a minimum dealy of 20seconds.

Shut Down: To keep the system safe and running, never switch off the power directly but use a shut down procedure. A shutdown can be initilaized by the PLC program or by windows itself.

6.3.4 Diagnostics

Symptom	Possible cause and remedy
Dark screen during power-up	- Check power supply. - Loss of setup data. - Connect an external video display for diagnosis.
White screen after switch off and re-switch on again	- The ATX-power supply doesn't switch on properly because the switch off time was shorter than 20s.
Date/time not correct	Replace battery (see next page)
Ethernet connection missing	- Incorrect Ethernet cable fitted (crosslink/direct) - LINK-LED is lit if the connection is correct - ACT LED if the data transfer is correct (flashes during the transfer) - Incorrect/invalid IP address set.

6.3.5 Battery replacement

Box PC P2 is provided with a battery-powered real-time clock circuit Exchangeable 3.0V Lithium battery for Real Time Clock CMOS RAM type CR-2032L/BN, CR-2032N/BN or CR2032L/BE. There is a danger of explosion if battery is incorrectly replaced.



Replace only with the same or equivalent type recommended by NUM. Discard used batteries according to the manufacturer's instructions.

Attention: Opening the back cover or breaking the warranty labels voids the warranty.



Pay attention to ESD safety protections when changing the battery.

6.3.6 Maintenance and Repair

6.3.6.1 Repairs

Repairs to Box PC devices must only be carried out by the manufacturer.
(Manufacturer address see list of NUM agencies on chapter 1)

6.3.6.2 Transport

Only the original packaging must be used for transporting the device.
The climatic conditions (see previous pages) must be observed.

6.3.6.3 Storage

The device must only be stored in the climatic conditions described in the previous pages.
It should be remembered that a high storage temperature reduces the lifespan of the product.
It is recommended to store the device at room temperature (see previous pages).

6.3.7 Industrial Box PC to NCK general connections



Please refer to chaper 9 Flexium connections for more detailed information upon the Industrial Box PC connections.

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7 Portable Handwheel HBA-X

7.1 General

The portable handwheel HBA-X for Flexium / Flexium+ provides a number of operation functions:

- Axis selection
- Hand mode and speed selection
- Movements forward/backward and speed override
- Handwheel
- 3 step acknowledge button (Enabling Device “dead-man’s button”)
- Connection to the system for Flexium / Flexium+ 6, 8 and 68 via cable and IO modules.
- Buttons and switches: via I/Os
- Handwheel: directly to the Flexium NCK
- Enabling Device (Dead-man’s) button: into the safety circle.

Reference Code

- FXHE181121 for HBA-Xc (5V)
- FXHE181122 for HBA-Xd (24V)

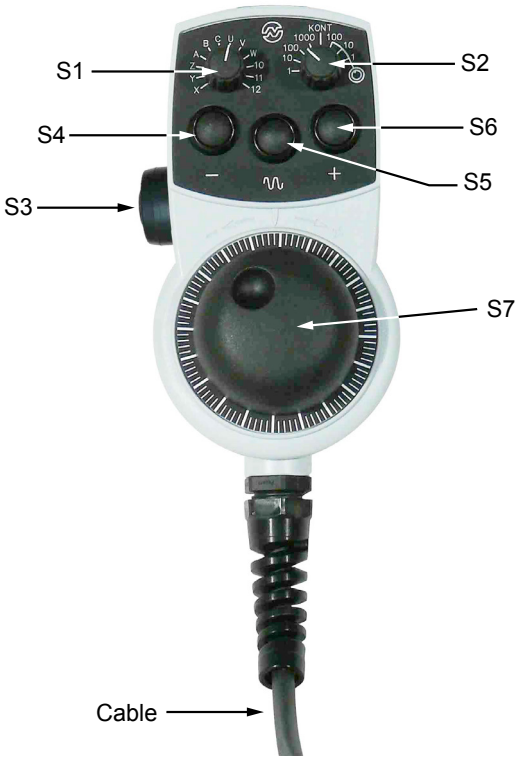
CAN

Connection to the Flexium / Flexium+ 68 system can also be made using CAN.
This requires one or more CAN connection devices (including a counter module CTMT as indicated on chapter 9.15) and allows hot-plugging of the HBA-X without affecting the machine.

For CAN connectivity the Portable Handwheel HBA-Xd FXHE181122 is recommended.



7.2 Portable Handwheel HBA-X description



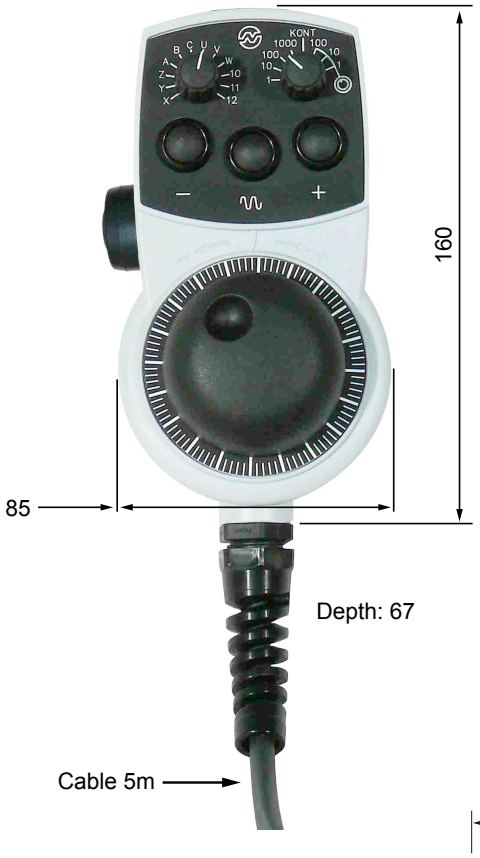
S1	Selector switch (12 positions axis selection)
S2	Selector switch (8 position incremental selection and rate multiplier)
S3	3 stage acknowledge button Enabling Device (dead-man's button)
S4	Push button (negative)
S5	Push button (fast)
S6	Push button (positive)
S7	Handwheel
Cable	HBA-X cable + plug connector (23 pins M) Moreover one socket 23 pins F connector.

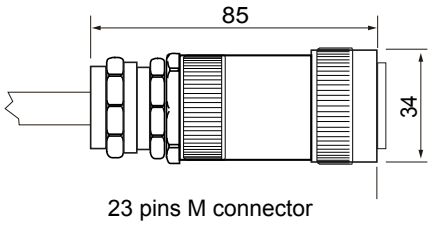
7.3 Technical characteristics

Handwheel	• Impulse per revolution : 100 • Supply voltage : 5VDC ± 5% for HBA-Xc / 24VDC ± 5% for HBA-Xd • Output circuit : 5VDC or 24VDC
Push Button	• Control element : 3 single closure • Switching voltage max : 30VDC • Switching current max : 100mA • Switching power max : 1W
Acknowledge button 3-step	• Control element : 1 double closure • Switching voltage max : 30VDC • Switching current max : 1mA • Switching power max : 0.25W
Connection (1) (2)	• 23-pins connector • Cable 5m
Housing	• Material : Plastic (polycarbonate) • Colour : Grey RAL 7040 • Starting current: 250mA @ 24V • Power consumption: 3.12W (typ) = 130mA @ 24V • Electrical insulation: No
Overall dimensions (L, H, W) in mm	160 x 85 x 67
Weight	Approx. 1.3kg
Temperature	• Operating temperature: 0 to +50°C • Transport and storage temperature: -20° to +50°C
Relative humidity	• Operating: Max 95% non-condensing • Transport: Max 95% non-condensing
Operating Altitude	Max 3000m
Degree of protection	IP 65

(1) For different OEM handwheel places connections it is possible to required an additional socket FXHE181310. Please also refer to chapter 8.
(2) Standard cable length is:
- 5m for straight cable
- 2m for spiral cable
Maximum distance from CNC is 40m.

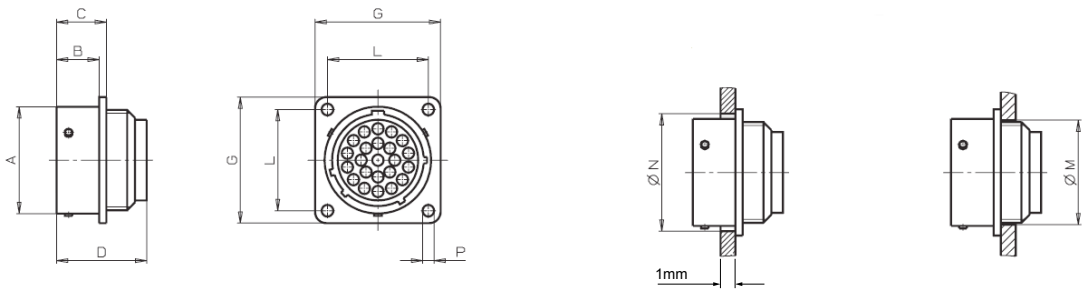
7.4 Overall Dimensions





23 pins M connector

7.5 Cut out for socket FXHE181310



	A	B	C	D	G	L	M	N	P
[mm]	28.5	11.4	13.3	24.1	33.6	27	27.8	31.3	3.1

7.6 Connections



Please refer to chaper 9 Flexium connections for more detailed information upon the Portable Handwheel HBA-X connections.

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8 nPad Mobile Operator Panel

8.1 General

The NUM nPad Mobile Operator Panel is a small, light and comfortable remote system controller which, appositely configured and connected to a machine control logic and safety, guarantees machine control and configuration and the implementation of safety related functions.

The mobile operator panel nPad is equipped with WinCE and CoDeSys HMI runtime environment. A communication library permits the access to nPad Hardware for handwheel, touch buttons, selector, overrides and other signals.

For graphical editor and programming, design patterns and system integration only one tool is needed: Flexium Tools, the same used for NCK/Drive configuration and PLC programming.
Subsequently advanced features such as multi-language support in visualization are present.

Simulation of the graphical supported touch panel software could be done even without nPad hardware.

The safety related devices available on the nPad Mobile Operator Panel are:
- Emergency Stop push-button
- Enabling Device and State Selector.

The nPad Mobile Operator Panel is a robust panel featuring a powerful processor widely used in industrial products, a high reliability solid state disc, a comfortable 5” TFT LCD color touch display and a USB 2.0 port. The processor runs Windows CE operating system.

nPad provides also 19 soft-keys, 2 override potentiometers, handwheel, BCD selector as well as E-Stop and dead man button.

All configuration and control commands selected through the keyboard or the touch screen display, the Handwheel and the potentiometers status are sent to the machine control logic through Ethernet. The safety related signals Emergency Stop push-button, Enabling Device and State Selector outputs are cable connected to the machine control logic.

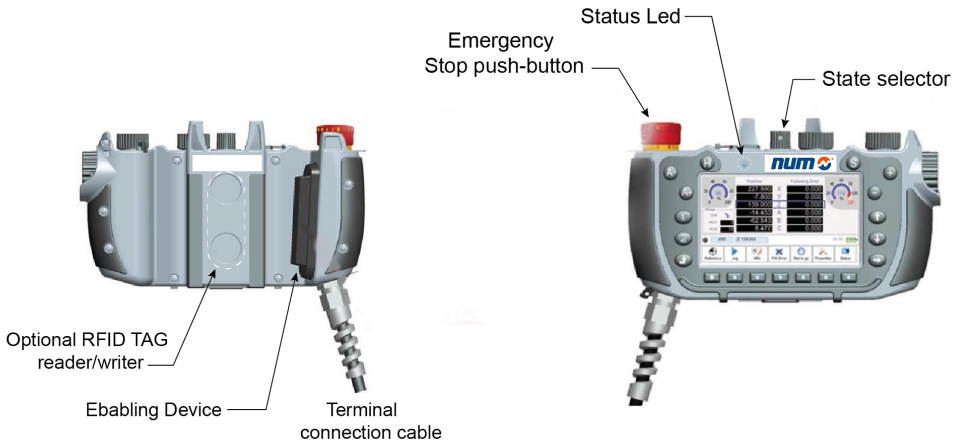
nPad Mobile Operator Panel has been designed, developed, and manufactured for conventional use in industry.

nPad Mobile Operator Panel is even available with Wireless version mantaining the same functionnality. In this case please refer to nPad Wireless Mobile Operator terminal Operating manual M00053EN-00.

8.2 Product overview







8.3 Technical characteristics

Emergency Stop Button	2 N.C contacts
Enabling Device	3 positions switches, 2 N.O. contacts
State selector	16 state BCD coded
Handwheel	40 detents per turn
Override Potentiometer	2 linear potentiometers
CPU and electronics	CPU: • 600MHz ARM Cortex-A8 core. • 16kB instruction Cache. • 256kB L2 Cache. • Embedded Graphic engine.
Flash Memory	128MB Flash NOR Solid State Disc (SSD)
RAM Memory	128MB DRR2 SDRAM
Ethernet Interface	• 10/100Mbps Fast Ethernet • Fulfils standards: IEEE 802.3, IEEE 802.3u 100BASE-TX • Supports auto cross-over function (AUTO-MDI) • Connection: 2 shielded twisted pairs
USB interface	• USB 2.0 HOST • max 500mA • USB type-A
Keyboard	The mobile panel has a rubber keypad containing 19 keys: • 6 keys are command keys, useful for a direct machine control. • The remaining 13 keys are function keys, useful for navigating and operating through the panels of the software application. • The letter or the symbol printed on the keys reminds the function.
Display	TFT LCD: • Diagonal 5” (12.7cm) • Colours: 16 millions • Resolution: RGB 480x272 pixels • Contrast ratio: 500:1 • Viewing angle: - Horizontal: Direction Right / Direction Left = 70° - Vertical: Direction Up = 50° / Direction Down = 70° • Brightness: 300cd/m^2 • Half-brightness time: at least 20000 hours. • Touch screen technology: Resistive sensor technology.
Status LED	Bicolor LED: Red / Green. • 2 LED’s: - RED color: indicates hardware failures, - GREEN color: may be fixed or blinking and is controlled by OS. • Touch screen TFT LCD Display.
Power supply	• Rated voltage : 24VDC +/-25% • Max interruption of the supply : 10ms • Starting current: 250mA @ 24V • Power consumption: 3.12W (typ) = 130mA @ 24V • Electrical insulation: No
Overall dimensions (L, H, W) in mm	220 x 50 x 130
Weight	730g (without cable with handhwheel)
Temperature	• Operating temperature: +5° to +45°C • Transport and storage temperature: -20° to +70°C
Relative humidity	• Operating: Max 95% non-condensing • Transport: Max 95% non-condensing
Vibration and shock during operation	Fulfils EN 60204/A1:2009 (par. 4.4.8), EN 61131-2:2007 (par. 4.2.2), EN 60068-2-31:2008.
Operating Altitude	Max 3000m

Degree of protection	IP64
Housing and chemical resistance	Vibration and shock resistant according to EN 60204/A1:2009 (par. 4.4.8).
	Non-flammable material housing (fulfils UL 94-5VA)
	Extremely robust housing. Drop-tested according to EN 60068-2-31:2008.
	Body structure: RAL 7035
	Rubber part: RAL7016
	Degree of Protection IP6 : nPad has been designed to withdstand to agrresive fluids such as: Denathured Ethhyl Alcohol, Diesel, Gasoline, Silicon, Acetone and various fluids used for cooling.
Directives	Machinery Directive 2006/42/EC.
	Electromagnetic Compatibility (EMC) Directive 2004/108/EC.
Safety Standards	EN 60204-1:2006 Safety of Machinery – Electrical Equipment of Machines. Part 1: General Requirements.
	IEC 61000 (1-2-3) Electromagnetic Compatibility (EMC).
	EN 61000-6-2:2005 Electromagnetic Compatibility (EMC) Part 6-2: Generic Standards – Immunity for Industrial Environments.
	EN 61000-6-4:2007 Electromagnetic Compatibility (EMC) Part 6-4: Generic Standards – Emission Standard for Industrial Environments.
	EN ISO 13849-1:2008 “Safety of Machinery – Safety related parts of control systems- Part 1: General principles for design” (see detailed information).
	EN 62061:2005 “2008 “Safety of Machinery – Functional safety of safety related electrical, electronic and programmable electronic control systems” (see detailed information).
	Emergency stop button conforming to standards : IEC 60947-5-5, 6.2 (Safety Lock Mechanism) ; IEC 60947-5-5, 5.2, IEC60947-5-1, Annex K (Direct opening action mechanism); EN ISO13850, 4.2, 4.3, 4.4)
	3 positions Enabling device conforming to standards : IEC60947-5-1, EN60947-5-1, JIS C8201-5-1, UL508, CSA C22.2 No 14, IEC 60947-5-8 (2006) Low-voltage switchgear and controlgear.

8.4 Safety-related devices

8.4.1 Performance Level and Safety Integrity Level summary

Emergency Stop button

Characteristics	Value
Performance **L**evel (PL) as defined in EN ISO 13849-1:2008	e
Safety **I**ntegrity **L**evel (SIL) as defined in EN 62061:2005	3
Switchable nominal voltage	24VDC +/-25%
Switchable nominal current	2A (DC-12 resistive load) 1A (DC-13 resistive load)
Reliability	• Mechanical life: 250000 operation minimum • Electrical life: 250000 operation minimum • Maximum operating frequency: 900 operations/hour

State selector

Characteristics	Value
Performance Level PL as defined in EN ISO 13849-1:2008	c
Safety Integrity Level (SIL) as defined in EN 62061:2005	1
Switchable nominal voltage	24VDC +/-25%
Switchable nominal current	200mA
Reliability	250000 operation minimum

Enabling device

Characteristics	Value
Performance Level PL as defined in EN ISO 13849-1:2008	e
Safety Integrity Level (SIL) as defined in EN 62061:2005	3
Switchable nominal voltage	24VDC +/-25%
Switchable nominal current	1A (DC-12 resistive load) 0.7A (DC-13 resistive load)
Reliability: • Mechanical life • Electrical life • Maximum operating frequency	 Position 1 → 2: 1000000 operations minimum Position 1 → 2 → 3 → 1: 100000 operations minimum 100000 operations minimum 1200 operations / hour

8.4.2 Details on the PL

In the following tables we will detail PL and SIL values, the parameters useful for their calculation and the assumptions we made.

	PL	$MTTF_d$ (year)	DC	Category
Emergency Stop Push-button	e	Note 2	100%	4
Enabling Device	e	Note 2	100%	4
State Selector	c	347	60%	1

8.4.3 Details on the SIL (EN62061:2005)

	SIL	PFH_d (1 hour)	SFF	HFT
Emergency Stop Push-button	3	Note 2	100%	2
Enabling Device	3	Note 2	100%	2
State Selector	1	$3.29\ 10^{-7}$	60%	1

8.4.4 Parameters useful for PL (EN ISO 13849-1:2008) and SIL (EN 62061:2005) calculation

Parameter	Description	Stop Push button	Enabling Device	State Selector
D_{op}	Average number of annual operating days of safety function	240	240	240
h_{op}	Average number of daily hours of operation of the safety function	16	16	16
t_{cycle}	Average elapse time (seconds) between two uses of the safety function	1152	288	19200
n_{op}	Average number of annual operations	12000	4800	720
b_{10}	Number of cycles that determines a failure of 10% of the components	250000	1000000	25000
MTTF	**M**ean **T**ime **T**o **F**ailure (years)	208	208	347
b_{10d}	Number of cycles that determines a dangerous failure of 10% of the components	Note 2	Note 2	25000
$MTTF_d$	**M**ean **T**ime **T**o **D**angerous **F**ailure (years)	Note 2	Note 2	347

Note 1
The safety devices (Emergency Stop Push-button, Enebling Device, State Selector) on board of nPad handheld terminal are directly hardware-connected to the output connector pins.
For this reason, the numerical values shown in the table above consider the highest performances of these devices if used in the conditions described here above.
The numerical values of MTTFd, PFHd, SFF and DC were obtained through the assumptions shown in the table here above and are related to each safety function frequency of use. The values for the overall safety functions of the machine depend on how the output safety signals are managed inside the machine controller.

Note 2
The E-Stop button and Enabling Device are compliant with IEC60947-5-1.
Considering that and referring to paragraph D.5.3 (table D.8) of ISO 13849-2, it is not possible to relate dangerous failures to these components and, so, the values of “b10d”, MTTFd and PFHd for the E-Stop button and Enabling Device does not have any relevance (from a mathematical point of view: “b10d”, MTTFd = infinite and PFHd = 0).

8.5 Product code

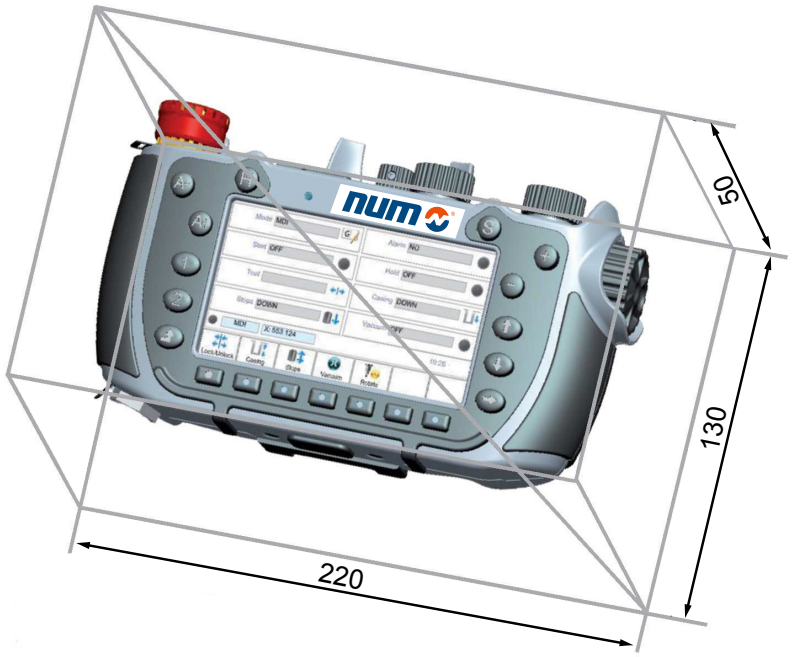
Note.

The nPad terminal connection NPADA001 is not present in package.
Therefore must be ordered separately.

	NPAD	05	2	R	E	1	S	H	0	D	1
Display Unit											
• LCD 05”		05									
Panel/Mechanical Variant											
• Variant			2								
Display Sensor											
• Touch screen resistive				R							
Connection technology											
• Wired (Ethernet + wires)					E						
• Wireless (Wi-Fi +BlueTooth)					W						
Processor performance											
• Performance level P1						1					
Safety Functions											
• E-Stop, Enabling Device and State selector							S				
Handwheel											
• Handwheel								H			
Options											
• Standard									0		
Cable length											
• Wireless version										0	
• 10m cable										D	
Cable termination											
• Wireless version											0
• Cable gland and free wires											1

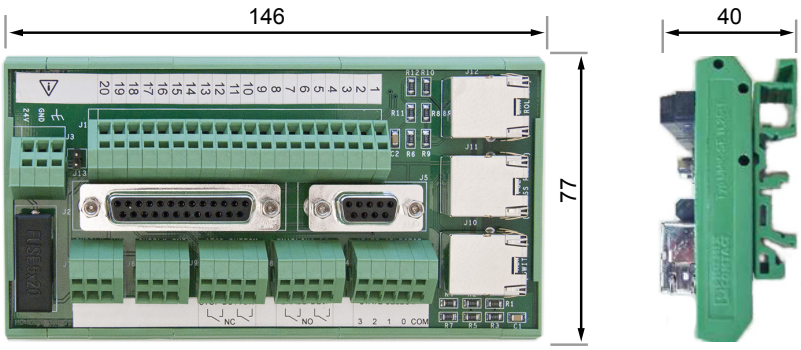
8.6 Overall dimensions

nPad Mobile Operator Panel



Approx. weigth: 0.73kg (without cable)

nPad terminal connection NPADA001



Approx. weigth: 0.2kg

8.7 Installation and connections

8.7.1 Safety guidelines



- The implementation of the safety related functions must comply with the application safety level determined in a previous risk analysis.
- During machine control logic implementation, always take into consideration all conditions related to the machine operations:

  a) checking the Emergency Stop push-button, Enabling Device and State Selector status;
  b) checking all possible further safety devices available on board of the machine: safety fences, optical barriers and so on.

- User is responsible for considering all further safety and accident prevention guidelines related to the particular working environment in addition and independently from this document.
- Observe all safety precautions applying to industrial control systems in accordance with national and international regulations.
- The installation, commissioning and maintenance tasks must be carried out only by qualified personnel. Furthermore it is suggested to follow all national accident prevention guidelines.
- All safety guidelines, cabling schemes, mechanical and electrical limit values listed in the technical data must be read before installation and commissioning and strictly respected.
- All instructions contained in this manual ensuring user safety must be taken in consideration. Each non-conformity could cause the safety functions integrated in the handheld terminal not to work properly.

8.7.2 Installation

- Installation must take place according to the documentation and using suitable equipment and tools.
- Electrical installation must follow the fundamental guidelines (line cross section, protective ground connection, the electrical limits explained in the technical data etc.).
- Take care not to squeeze and thus damage the cable with any object.
- Make sure that nobody can fall over the cable to avoid that the device falls to ground.
- Do not lay the cable over sharp edges to avoid damaging the cable sheat.
- Always operate the touch screen with the proper touch-pen. Never use sharp objects that could damage the touch screen.

8.7.3 Supply voltage



The supply circuit must be protected using a 0.25A slow-blow fuse.

8.7.4 Emergency Stop push-button

The Emergency Stop push-button provides two redundant switching N.C. (Normally Closed) contacts.

User should directly connect the Emergency Stop push-button outputs to the machine cabinet and monitoring devices. For further information about the handheld terminal cable pin-out please refer the following pages.

The Emergency Stop push-button provided by nPad Mobile Operator Panel allows the user to fulfill high PL (according to EN ISO 13849-1:2008) and SIL (according to EN 62061:2005) for the related safety function once it is interfaced with the machine control logic (please refer to chaper 8.4).



- The interfacing of the Emergency Stop push-button to the machine control logic and implementing the Emergency Stop function, must be realized according to the safety level determined in a previous risk analysis.
- In case of drop or other possible damages of the device, the stop function operation must always be checked by the operator.
- Releasing the Emergency Stop push-button must never cause an uncontrolled restart. User is responsible for implementing this controls on the machine control logic.
- The Emergency Stop push-button on the handheld terminal is not a substitute for the Emergency Stop push-button located on the machine.
- For further and more detailed information about the Emergency Stop push-button, as the electrical and mechanical life please refer to chapter 8.4.

8.7.5 Enabling Device

The Enabling Device is a three positions enable switch providing two redundant switching N.O. (Normally Open) contacts.

User should directly connect the Enabling Device outputs to the machine cabinet and monitoring devices. For further information about the handheld terminal cable pin-out please refer to chapter 9.

Respecting the standard EN60204-1, two positions, “Null” and “Panic”, represent off condition while only the “Enable” position allows activation.

The Enabling Device provided by nPad Mobile Operator Panel handheld terminal allows the user to fulfil high PL (according to EN ISO 13849-1:2008) and SIL (according to EN 62061:2005) for the related safety function once it is interfaced with the machine control logic (please refer to chapter 8.4).



- The interfacing of the Enabling Device to the machine control logic and implementing the enabling function must be realized according to the safety level determined in a previous risk analysis.
- The enable switch fulfils its protective function only if the operator can recognize the danger in time.
- In case of dangerous states the logic controller must provide that, additionally to the enable switch, another conscious start command should be required to allow activation.
- The only person permitted in the dangerous area is the person activating the enable switch.
- For further and more detailed information about the enable switch, as the electrical and mechanical life please refer to the next pages.

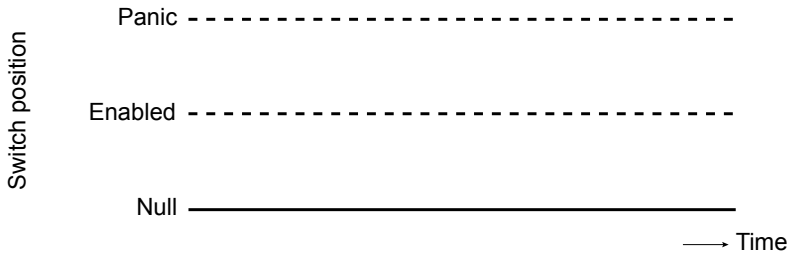
8.7.6 Enabling Device positions

The Enabling Device can have three different positions:

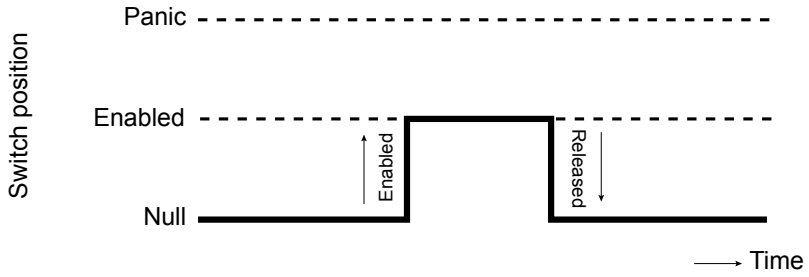
Switch position	Function	Enable switch	Switching contact
1	Zero position	Not pressed	OFF (opened)
2	Enabled	Pressed	ON (engaged)
3	Panic	Pushed all the way in	OFF (opened)

The positions null and panic must be cabled and controlled by the machine logic in order to guarantee a stop category 0 or 1 according to EN 60204:2006.

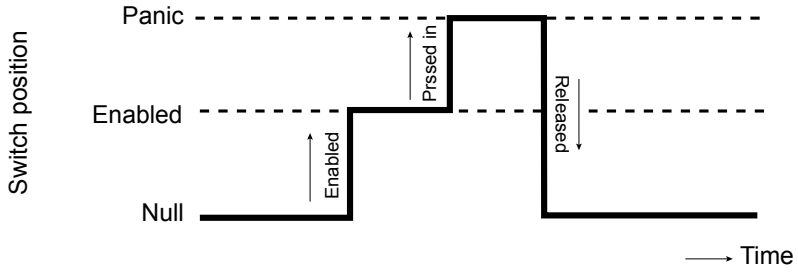
Zero position
When not pressed the Enabling Device returns to the zero position.



Enable position
When pressed the Enabling Device goes into the enabling position. This condition is often associated to machine movement activation. When released it goes back to the null position.



Panic position
When the Enabling Device is pushed all the way in it goes to the panic position which corresponds to the same contact condition as the zero state.



If the switch is pushed all the way in and then released it goes directly to the null state skipping the enable position.

8.7.7 State Selector

The State Selector is a 16 states BCD coded rotary switch with four non-redundant outputs and a common contact.

User should directly connect the State selector outputs and common contact to the machine cabinet and monitoring devices. For further information about the handheld terminal cable pin-out please refer to the next pages.

The State selector provided by nPad Mobile Operator Panel handheld terminal allows the user to fulfil high PL (according to EN ISO 13849-1:2008) and SIL (according to EN 62061:2005) for the related safety function once it is interfaced with the machine control logic plaese refer to chapter 8.4.

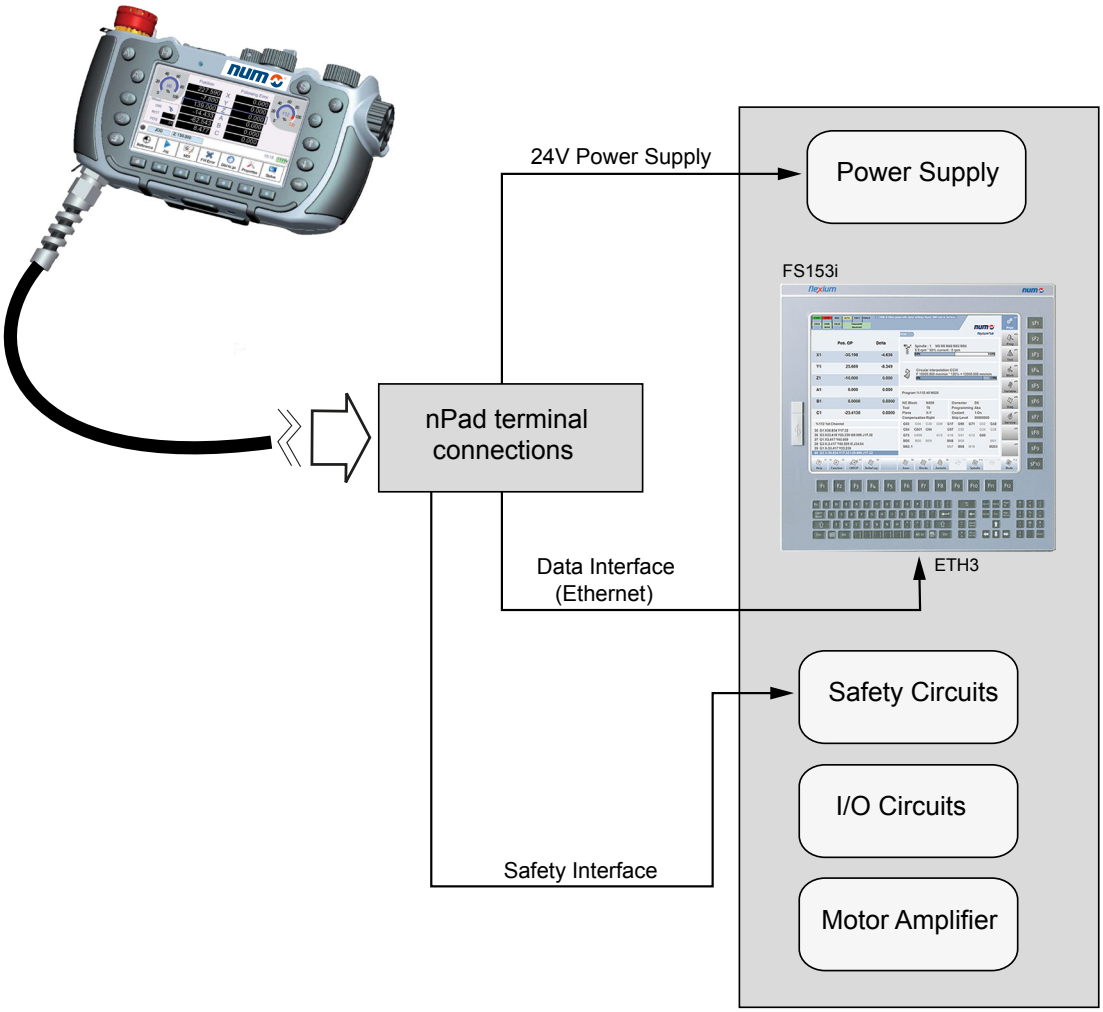


- User is responsible for interfacing the State selector to the machine control logic and implementing the state selecting function according to the safety level determined in a previous risk analysis.
- The State Selector function should be only related to the selection of the various working modes available on the machine by the logic controller.
- For further and more detailed information about the State Selector, as the electrical life, please refer to chapter 9.

8.8 Connections

8.8.1 Connections overview

All of the components related to the nPad Mobile Operator Panel and the interface to the machine control logic are hereunder schematically presented.



8.8.2 General connections

Please refer to chaper 9 Flexium connections for more detailed information upon the nPad Mobile Operator Panel connections.

8.9 nPad configuration and commissioning



Please refer to Flexium Commissioning manual M00010 or M00044.

8.10 Maintenance and Repair

8.10.1 Repairs

Repairs to nPad Mobile Operator Panel devices must only be carried out by the manufacturer. (Manufacturer address see list of NUM agencies on chapter 1)

8.10.2 Transport and storage

All kind of environmental (temperature, aggressive atmospheres, humidity) and mechanical stresses over the accepted limits explained in the previous pages must be avoided during transport and storage of the devices.

Two main considerations must be done in order to prevent damages during transport:



- Always use the original packaging.
- Always keep the right environmental conditions as explained in the technical data on previous pages.

8.11 nPad Wireless Mobile Operator Panel



Please refer to nPad Wireless MobileOperator terminal Operating manual M00053EN-00.

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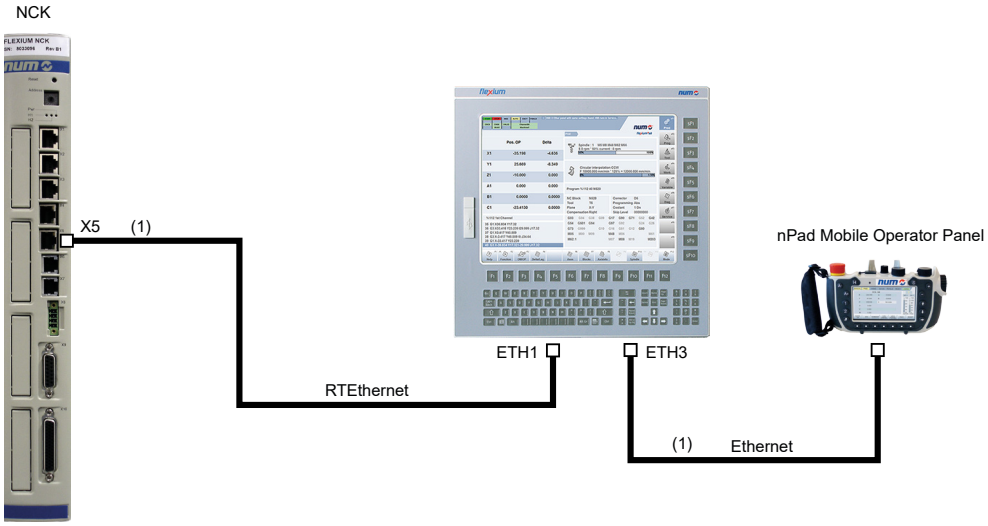
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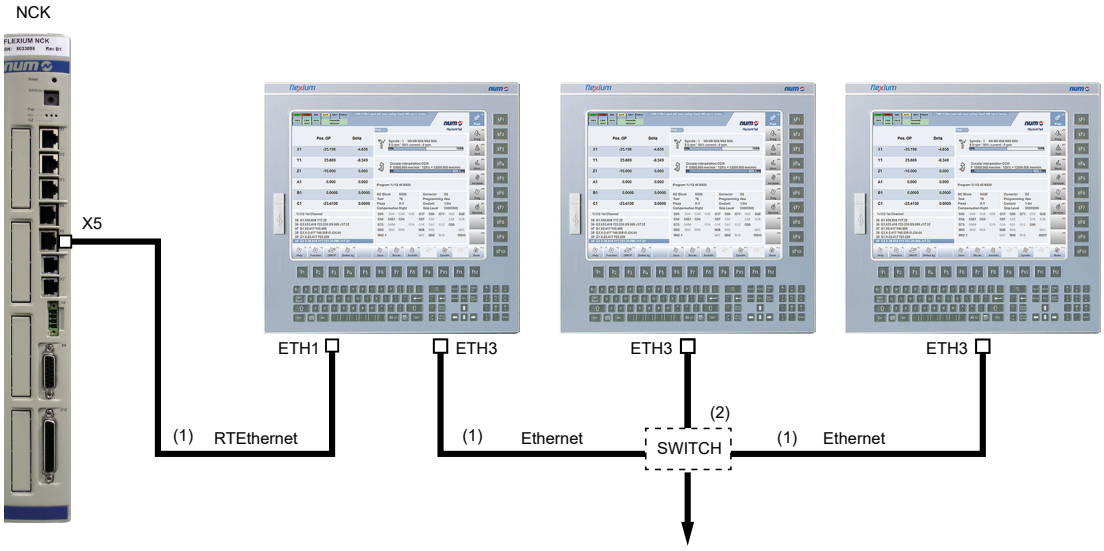
9 Flexium connections

9.1 NCK general connections

9.1.1 NCK to Operator's panels general connections



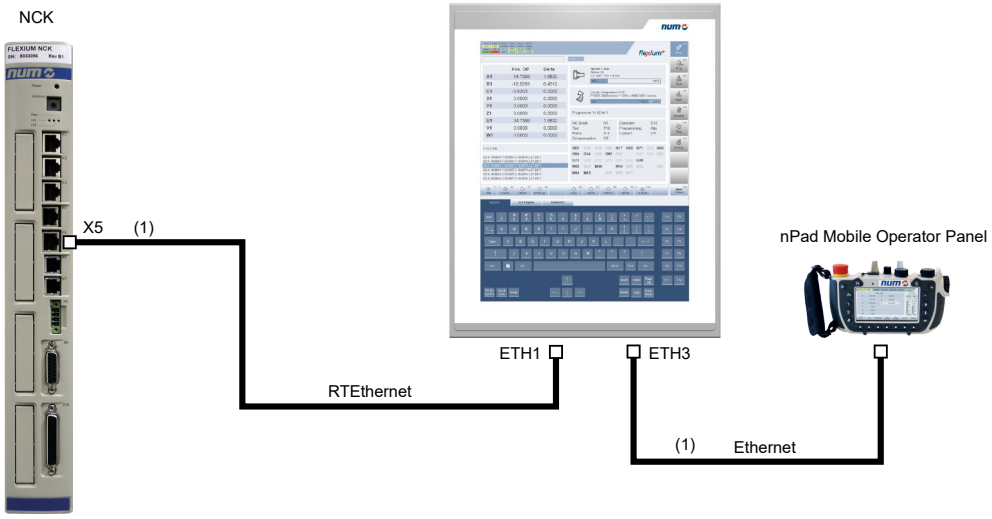
Multipanel configuration



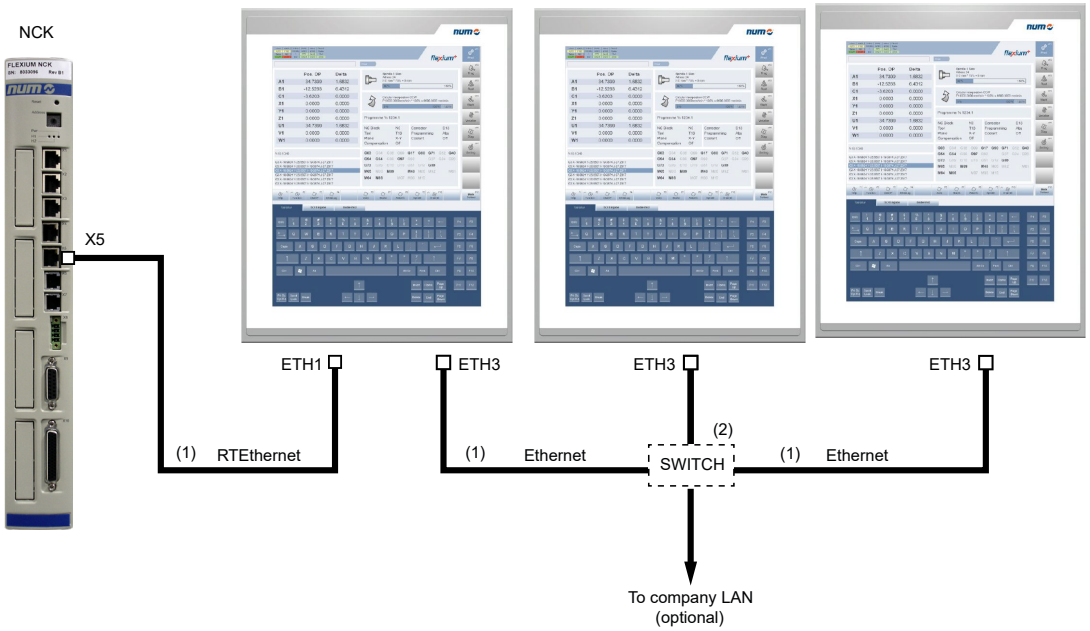
1	Ethernet cable connections FXHC18104x. (RJ45, Cat 5e SF/UTP) For the cable length please refer to the chapter 11.
2	Switch module supplied by the customer (100/10 Mbit sec).
ETH1 ETH3	Please refer to chapter 9.5 or 9.6.
X5	Please refer to chapter 3.

If only two panels are used a Switch module is not necessary. The connection between the two panels can be made with a crossed Ethernet cable.
The Switch module is not supplied by NUM.

9.1.2 NCK to portrait oriented operator's panels general connections



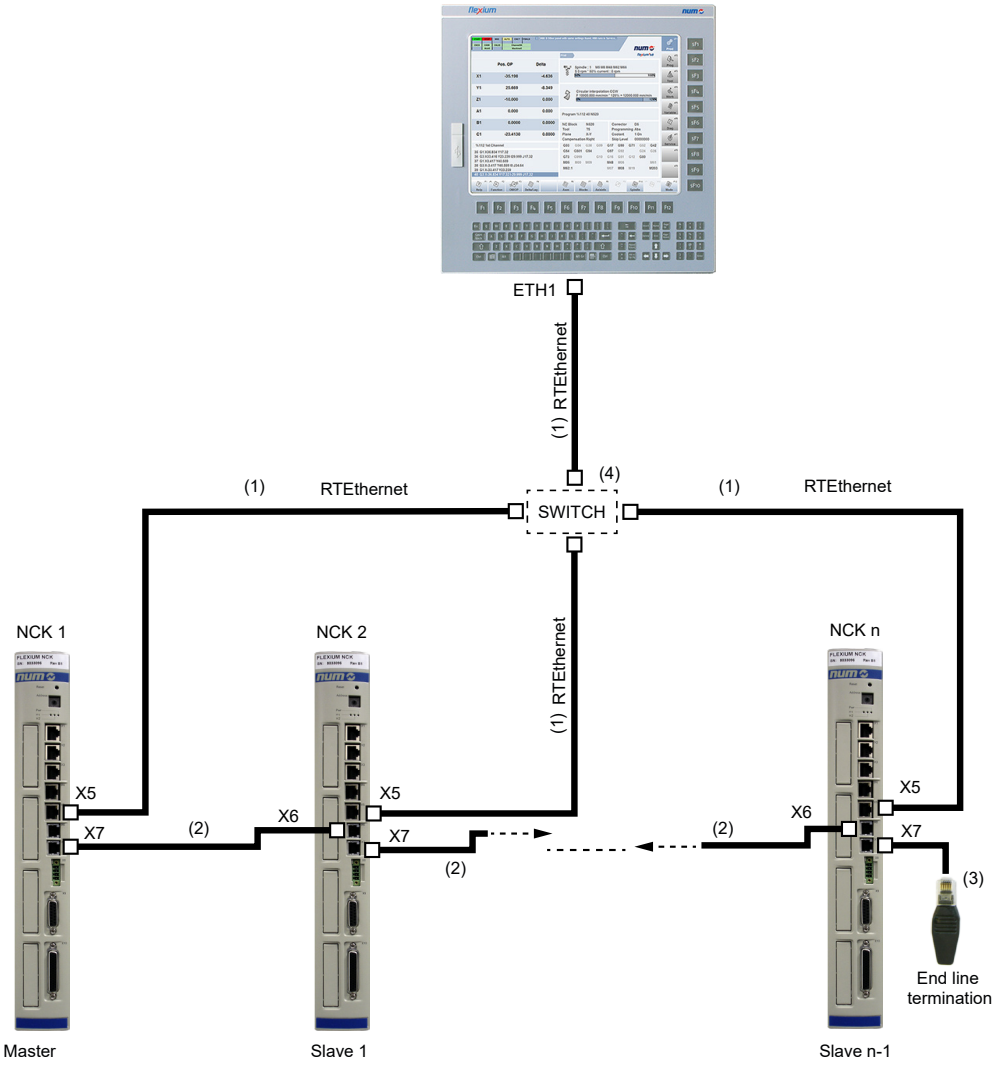
Multipanel configuration



1	Ethernet cable connections FXHC18104x. (RJ45, Cat 5e SF/UTP) For the cable length please refer to the chapter 11.
2	Switch module is not supplied by NUM (100/10 Mbit sec).
ETH1, ETH3	Please refer to chapter 9.7.
X5	Please refer to chapter 3.

If only two FS194i panels are used a Switch module is not necessary. The connection between the two FS194i can be made with a crossed Ethernet cable. The Switch module is not supplied by NUM.

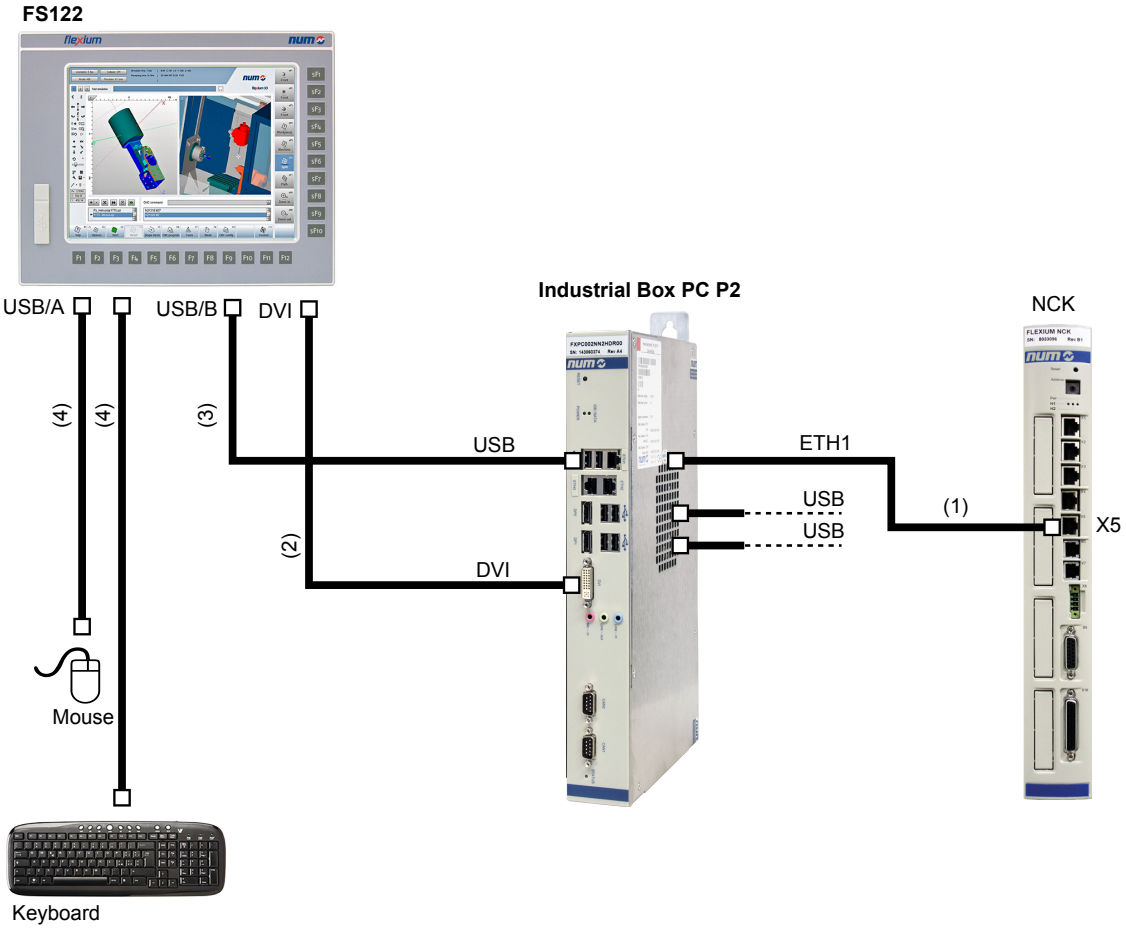
9.1.3 Multi-NCK configuration general connections



FS153i = Connections related to FXPC152... (see chapter 3.1.5)

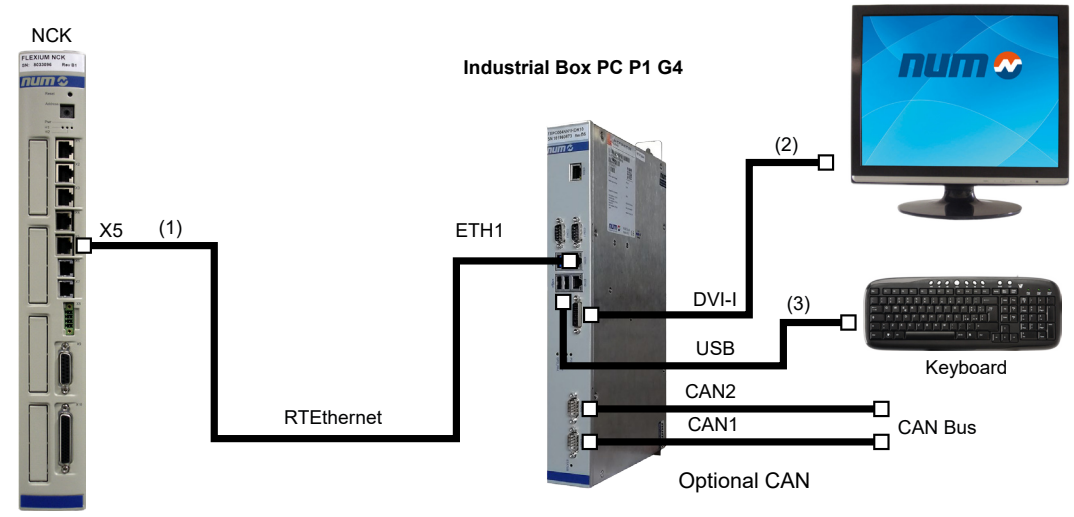
1	Ethernet cable connections FXHC18104x. (RJ45, Cat 5e SF/UTP) For the cable length please refer to the chapter 11.
2	Clock/Synchro cable connections FXHC08153x for Multi-NCK configuration. For the cable length please refer to chapter 11.
3	End of line termination FXHC081540.
4	Switch module is not supplied by NUM (100/10 Mbit sec).
ETH1	Please refer to chapter 9.5 or 9.6.
X5, X7	Please refer to chapter 3.

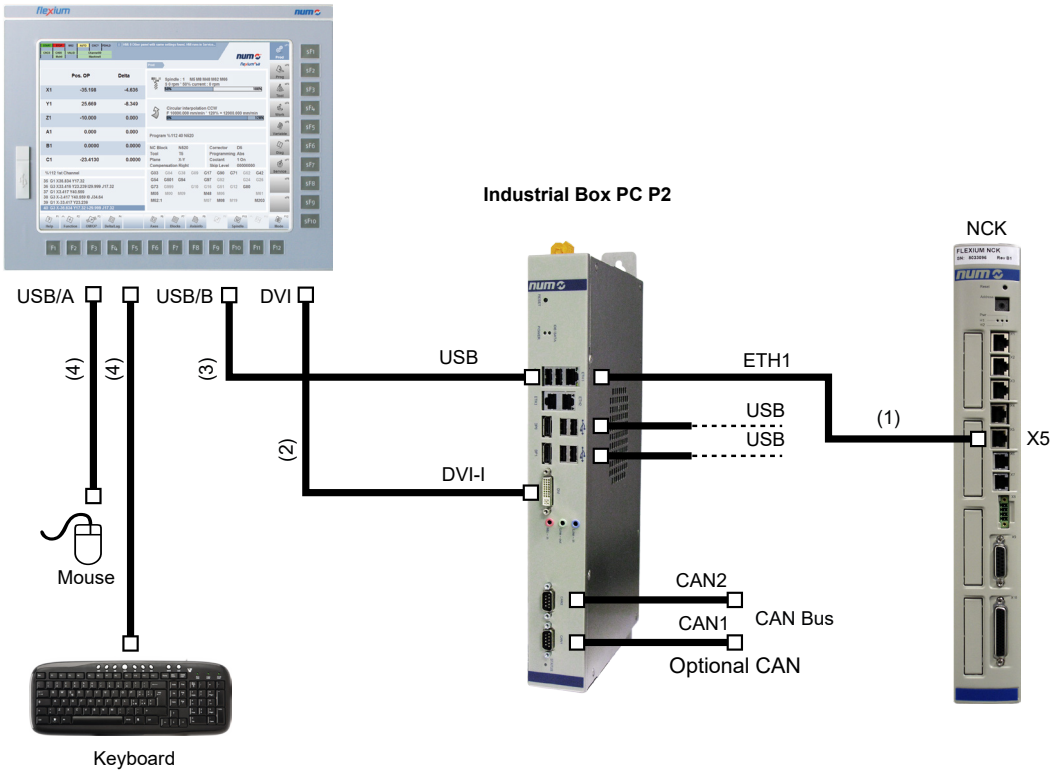
9.1.4 NCK to passive panels general connections



1	Ethernet cable connections FXHC18104x. (RJ45, Cat 5e SF/UTP) For the cable length please refer to the chapter 11.
2	Cable supplied by the customer. Please refer to chaper 9.7 “DVI interface connections”
3	Cable supplied by the customer. Please refer to chaper 9.7 “USB connections”
4	Cable supplied by the customer. Please refer to chaper 9.7 “USB connections”

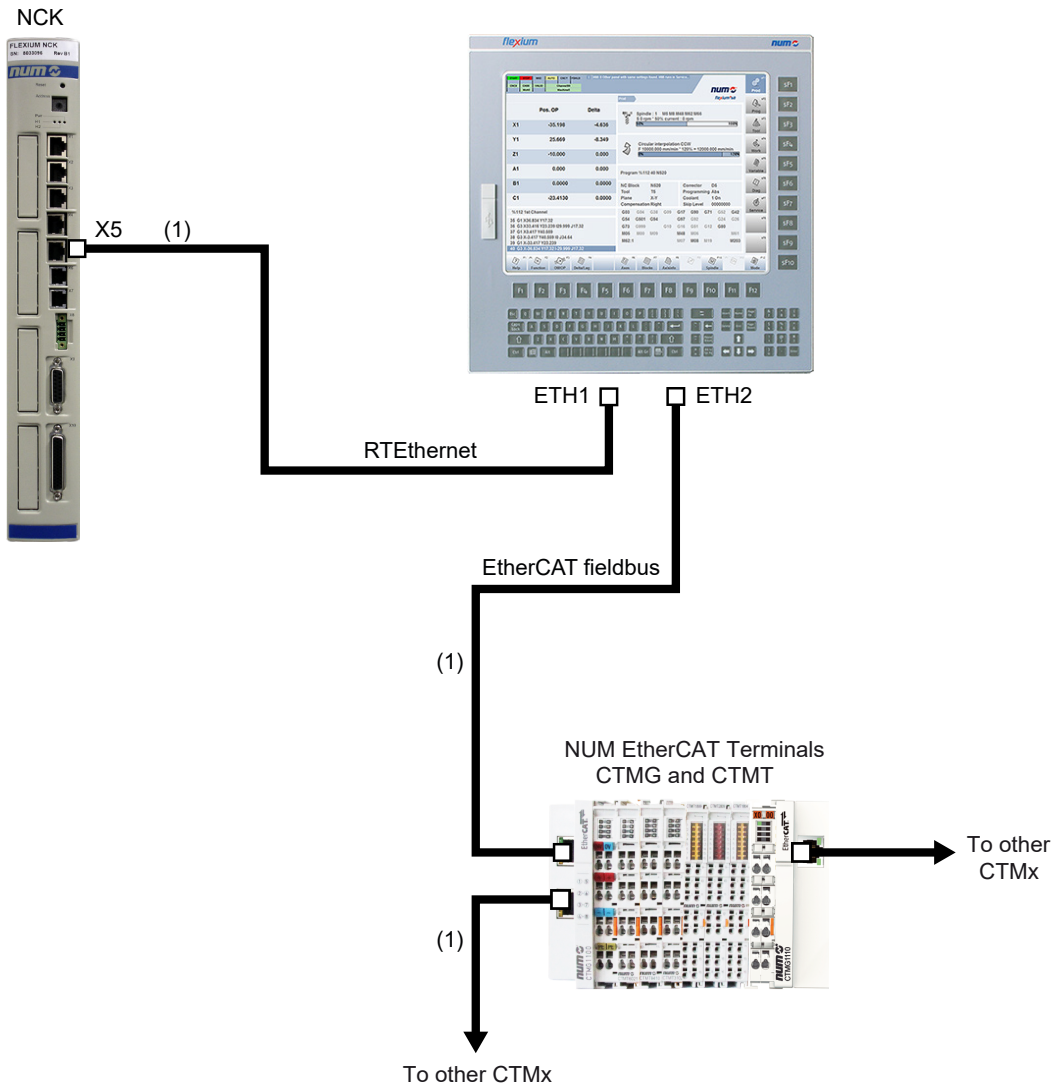
9.1.5 NCK to Industrial Box PC and passive panel general connections





1	Ethernet cable connections FXHC18104x. (RJ45, Cat 5e SF/UTP) For the cable length please refer to the chapter 11.
2	Cable supplied by the customer. Please refer to chaper 9.8 “DVI-I interface connections”
3	Cable supplied by the customer. Please refer to chaper 9.8 “USB connections”
4	Cable supplied by the customer. Please refer to chaper 9.8 “USB connections”

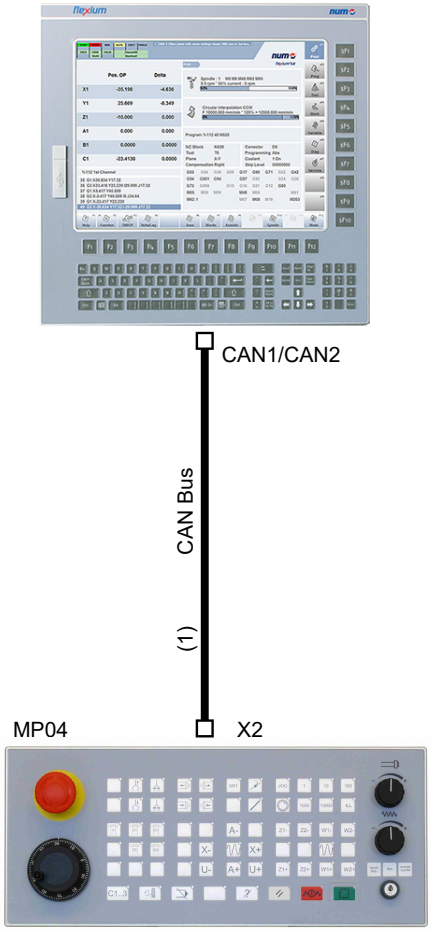
9.1.6 NCK to operator's panel with EtherCAT terminals general connections



1	Ethernet cable connections FXHC18104x. (RJ45, Cat 5e SF/UTP) For the cable length please refer to the chapter 11.
ETH1 ETH2	Please refer to chapter 9.5 or 9.6
X5	Please refer to chapter 3.
For more detailed information on the NUM EtherCAT Terminals please refer to manual M00032.	

9.2 PLC to Machine panel general connections

9.2.1 PLC to CAN controlled Machine panel general connections



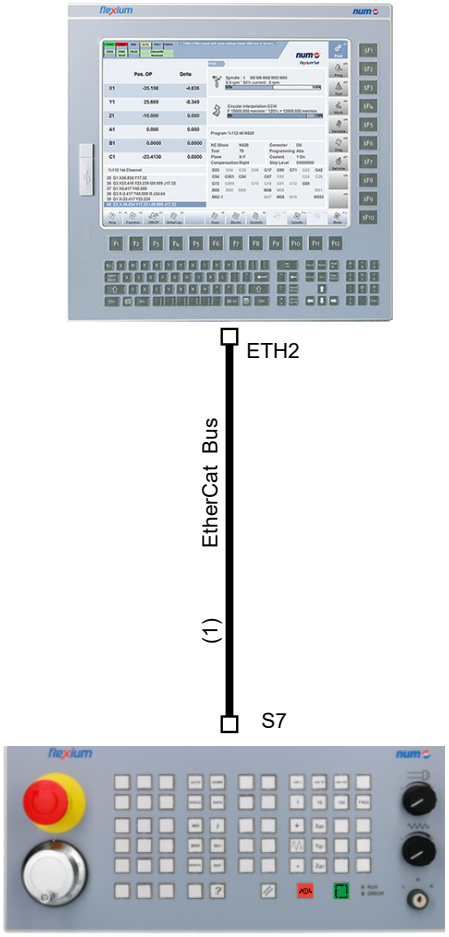
1	CANbus cable connections FXHC181060. For the cable length please refer to the chapter 11.
X2	Please refer to chapter 9.11.
CAN1 CAN2	Please refer to chapter 9.5.

9.2.2 PLC to MP05 Machine panel general connections



MP05 connections and button configurations are supplied by the customer and it is not connected by bus but directly to the I/Os terminals.

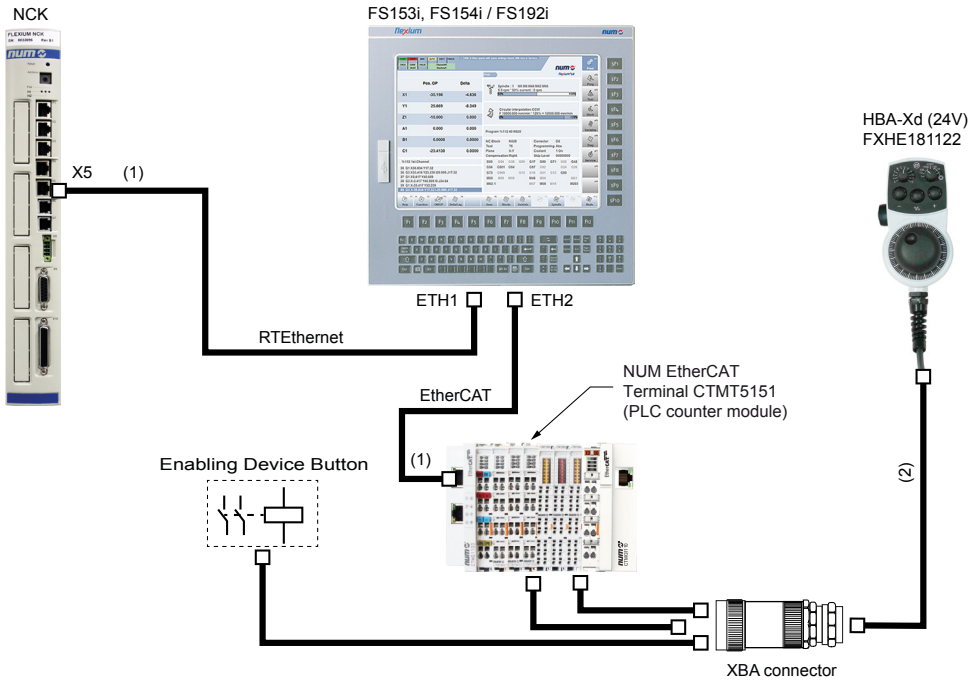
9.2.3 PLC to EtherCAT controlled Machine panel general connections



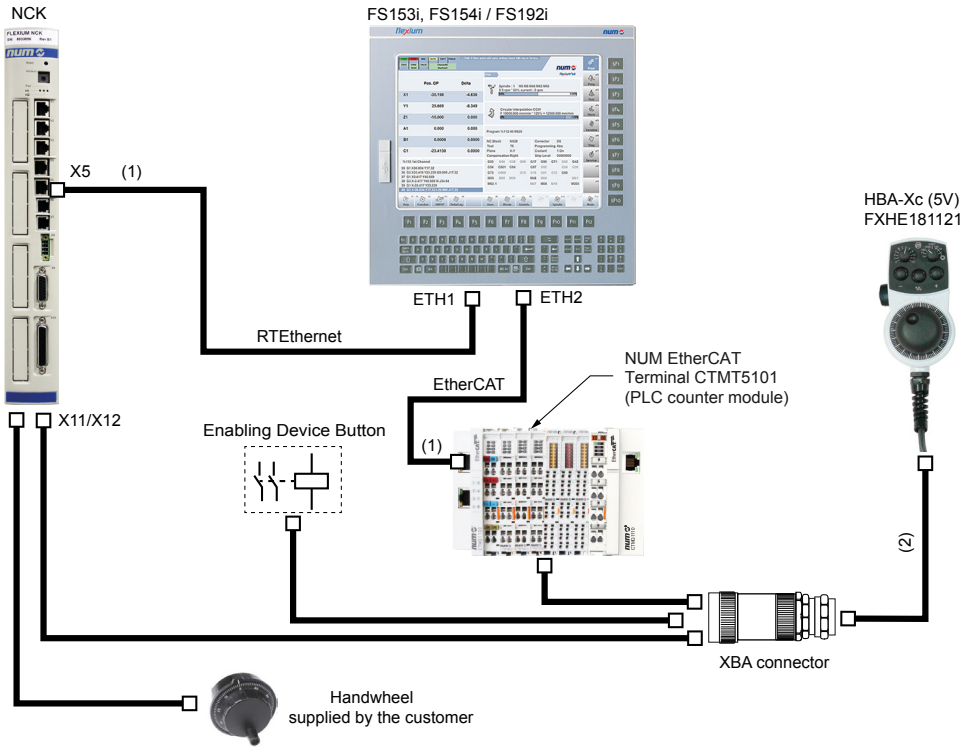
1	Ethernet cable connections FXHC18104x. (RJ45, Cat 5e SF/UTP) For the cable length please refer to the chapter 11.
ETH2	Please refer to chapter 9.13.

9.3 XBA-X Handwheels general connections

FXHE181122 (HBA-Xd 24V) connections



FXHE181121 (HBA-Xc 5V) and standard handwheel connections



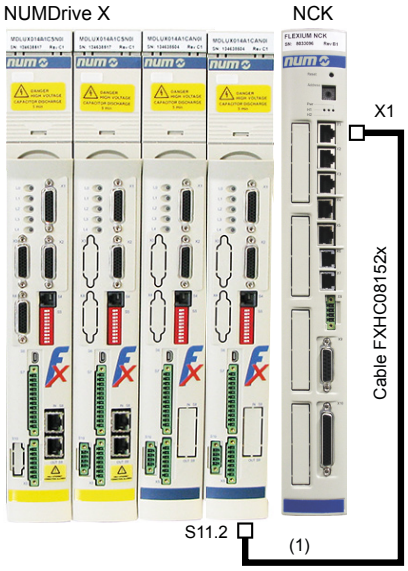
1	Ethernet cable connections FXHC18104x. (RJ45, Cat 5e SF/UTP) For the cable length please refer to the chapter 11.
2	XBA-X connections cable see chapter 9.15.
ETH1/2	Please refer to chapter 9.5 or 9.6.
X5	Please refer to chapter 3.

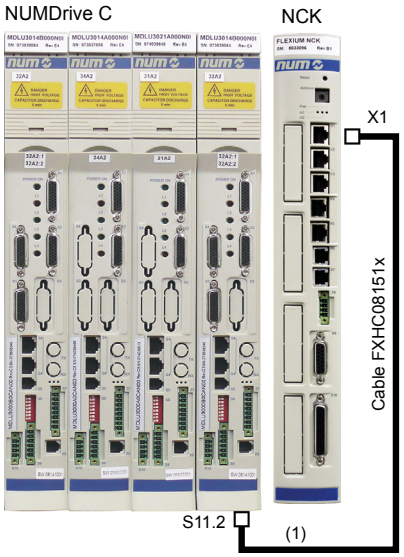
9.4 Flexium NCK connections

9.4.1 Flexium NCK to NUMDrive X or NUMDrive C general connections

The NCK to NUMDrive X or NUMDrive C connections is possible using the connectors X1, X2, X3 on the front of the NCK panel. The Flexium NCK can control up to 32 digital axes. It is recommended to distribute the axes between these three connectors.

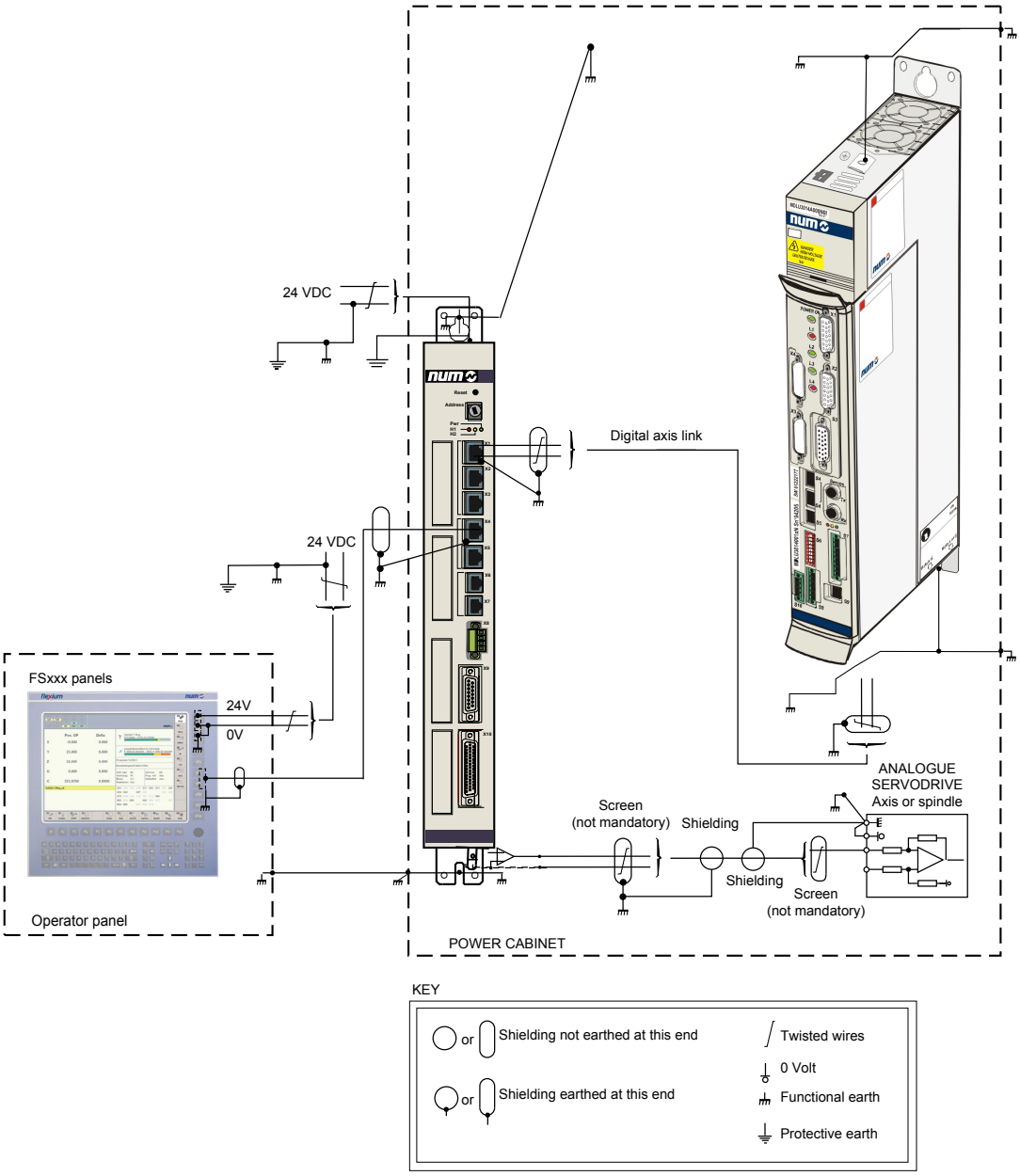
For other type of connections due to a different applications for instance DISC NT mixed solution with CAN bus, Dual ring solution, Dual Rows please refer to NUMDrive X Installation manual M00030 or NUMDrive C Installation manual AMOMAN012.





1	NCK (X1 connector) to NUMDrive C or NUMDrive X (S11.2 connector) connecting cable. Please refer to the following pages for more detailed information. Refer to chapter 11 for the cable length.
S11.2	Module / Module interconnections. Please refer to the NUMDrive X Installation manual M00030 or NUMDrive C Installation manual AMOMAN012.

9.4.2 Diagram of the 0V, Protective Earth and Functional Earth



STOP

The 0V lines of the 24VDC power supplies must be connected to the functional earth. For more detailed information please refer to Cabinet layout and EMC Guide manual M00027.

9.4.3 NCK Power Supply connections

The NCK must be powered connecting 24VDC. (supplied by the customer)
The power supply connector is located on top of the NCK module as indicated below.

Power Supply Voltage	Pin Number	Description	Maximum Power
24VDC nominal (+20% -15%)	1 or 3 2 or 4	VIN+ VIN-	48W

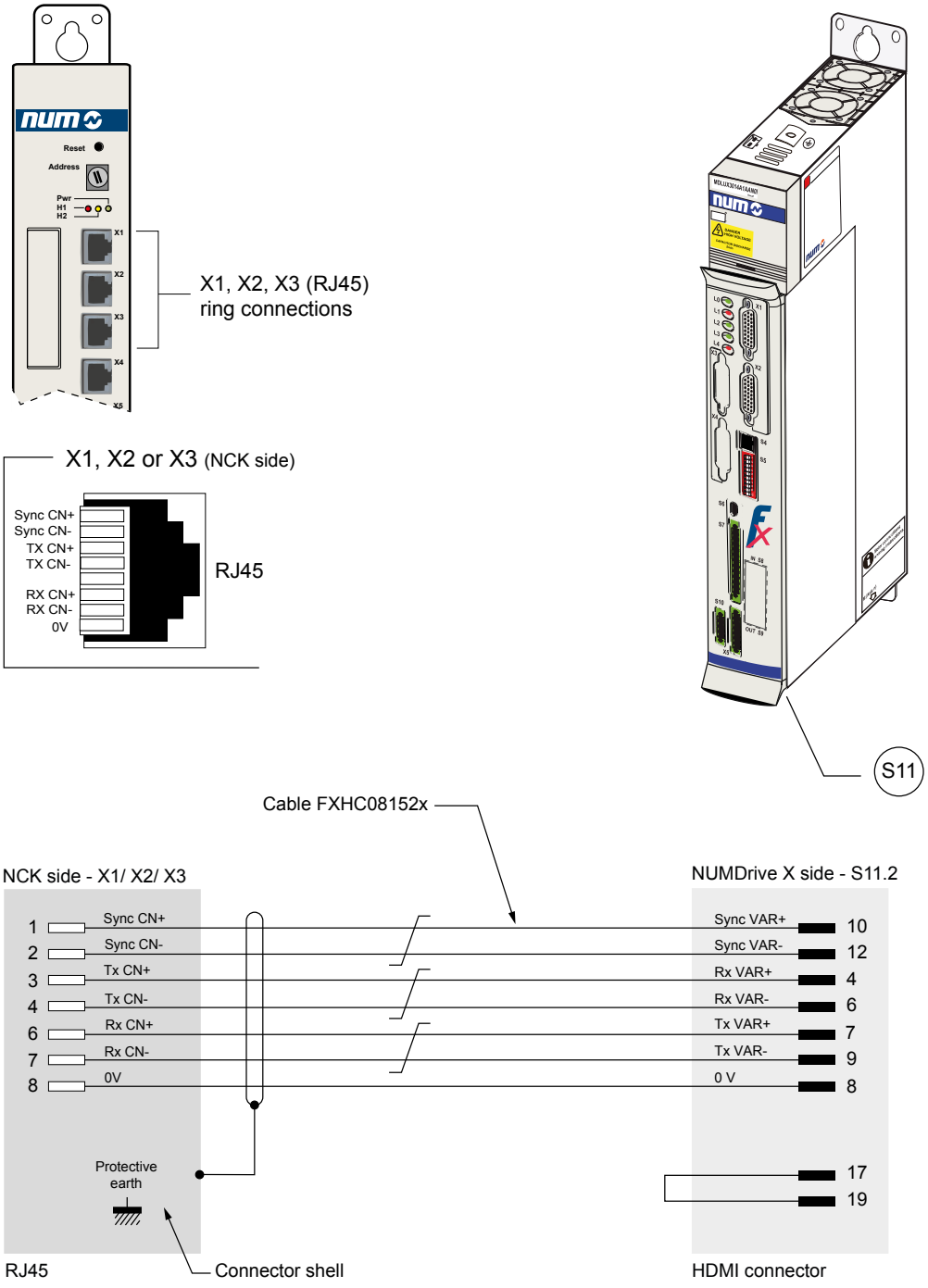
Power supply connector (X13)





It is absolutely necessary to insert a fast-blow 2A fuse in the NCK powering line.

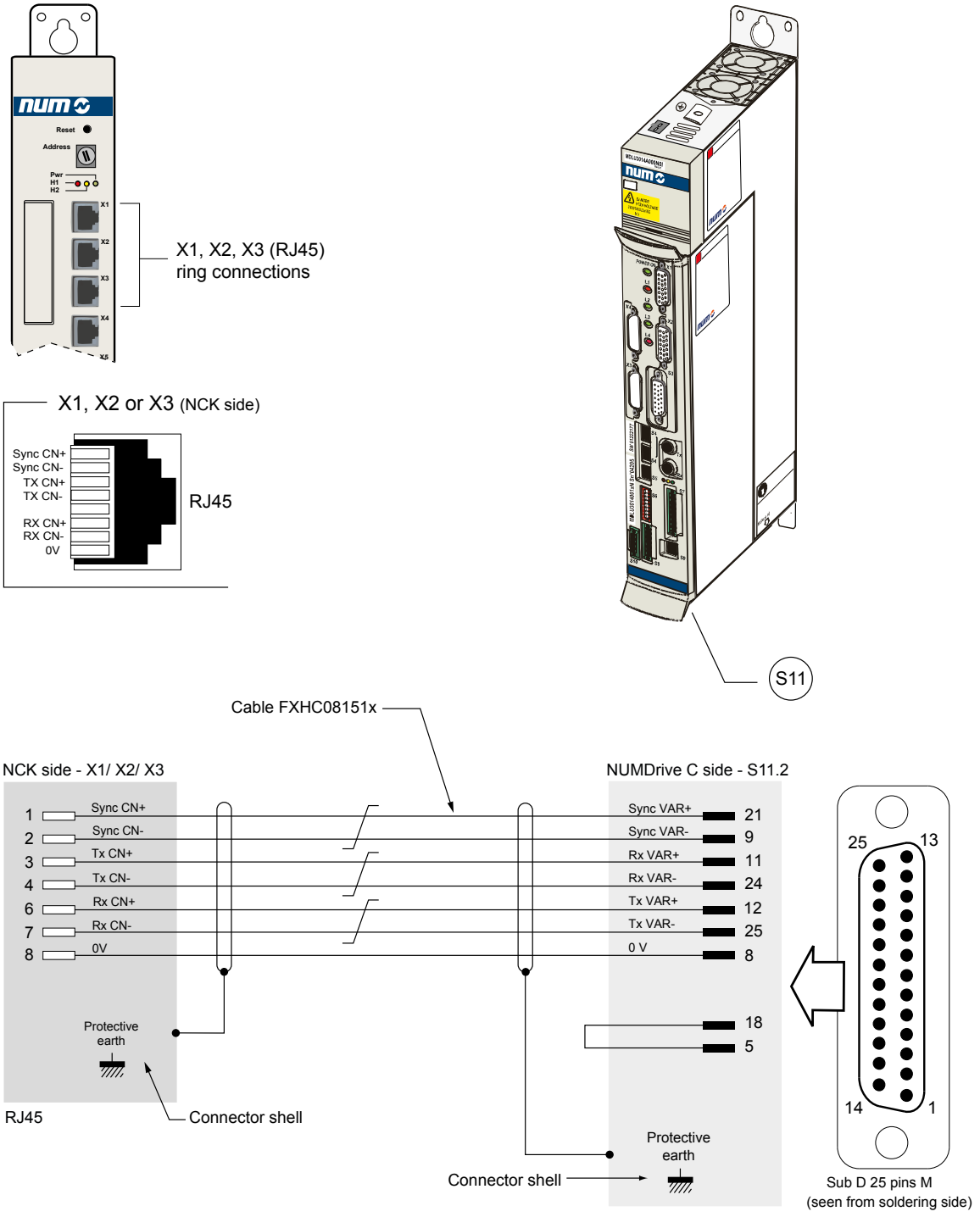
9.4.4 NCK to NUMDrive X connections



STOP

For correct interference suppression in the system, the cable shielding must be earthed in accordance with Cabinet layout and EMC Guide manual M00027.

9.4.5 NCK to NUMDrive C connections

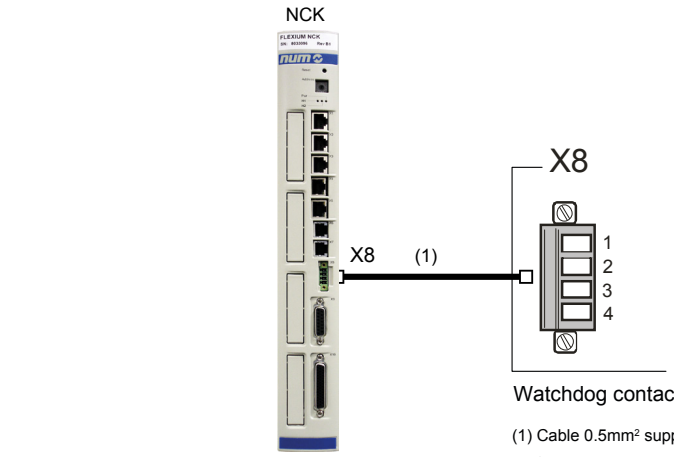


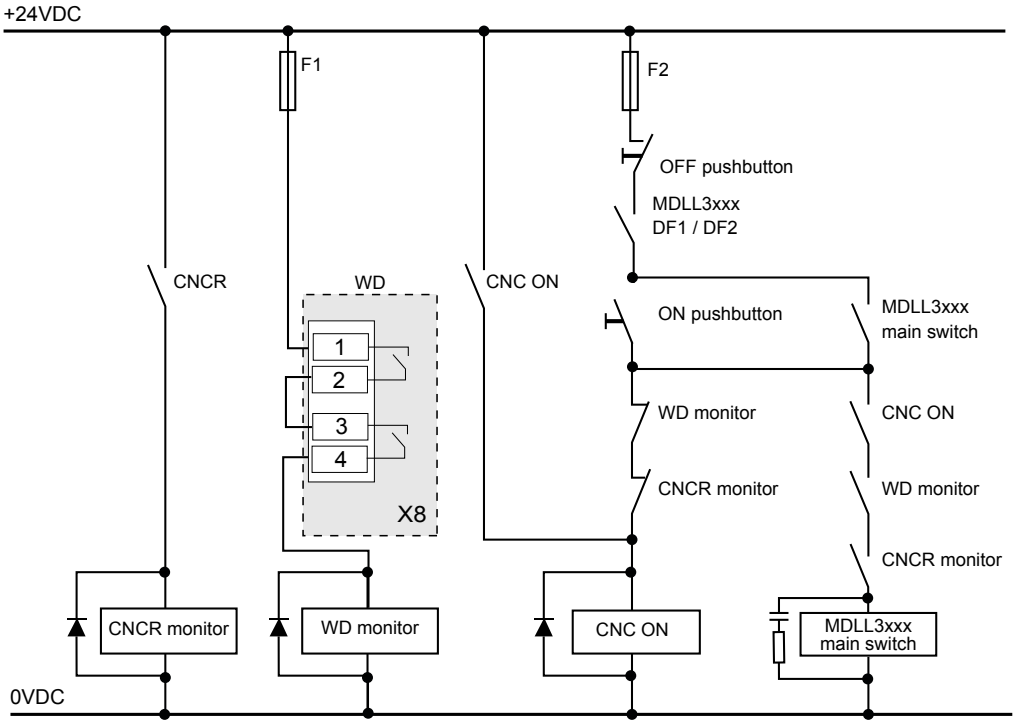
STOP

For correct interference suppression in the system, the cable shielding must be earthed in accordance with Cabinet layout and EMC Guide manual M00027.

9.4.6 NCK Watchdog connections

Recommended safety daisy chain





F1: Protection fuse 250V/1A gL, gG type
F2: Protection fuse 250V/4A gL, gG type
WD: Watchdog
CNC: Computer Numerical Control
CNCR: CNC Ready signal = Flexium_NCK.RCNC.General.CncReady

This diagram ensures that the WD and CNCR relays are in the required state to allow the powering up of the system. No delay is used.

- Powering up of the NCK is not allowed unless WD and CNCR relays are closed.
- When the NCK is on, the PLC program closes the CNCR relay.
- Powering up of the NCK is determined by the states of WD and CNCR.



To prevent and avoid overcurrent a protection fuse must be placed in the circuit as indicated in the diagram above.
Contacts 2 and 3 of the X8 connector must be connected externally.

9.4.6.1 Wiring of the watchdog - Safety Daisy Chain

The watchdog (WD) is a relay on each NCK module which reports the status of the control system.

There is a severe fault in the system if the watchdog's contacts are open as indicated in the Flexium Commissioning manual reference M00010 or Flexium+ Commissioning manual reference M00044.



The NCK may continue sending commands to the drives when the WD is open, which could cause problems (collisions, etc.).
The contacts of watchdog relays must therefore be wired in the safety chain so that when the watchdog triggers, power supply to the drives is cut off.

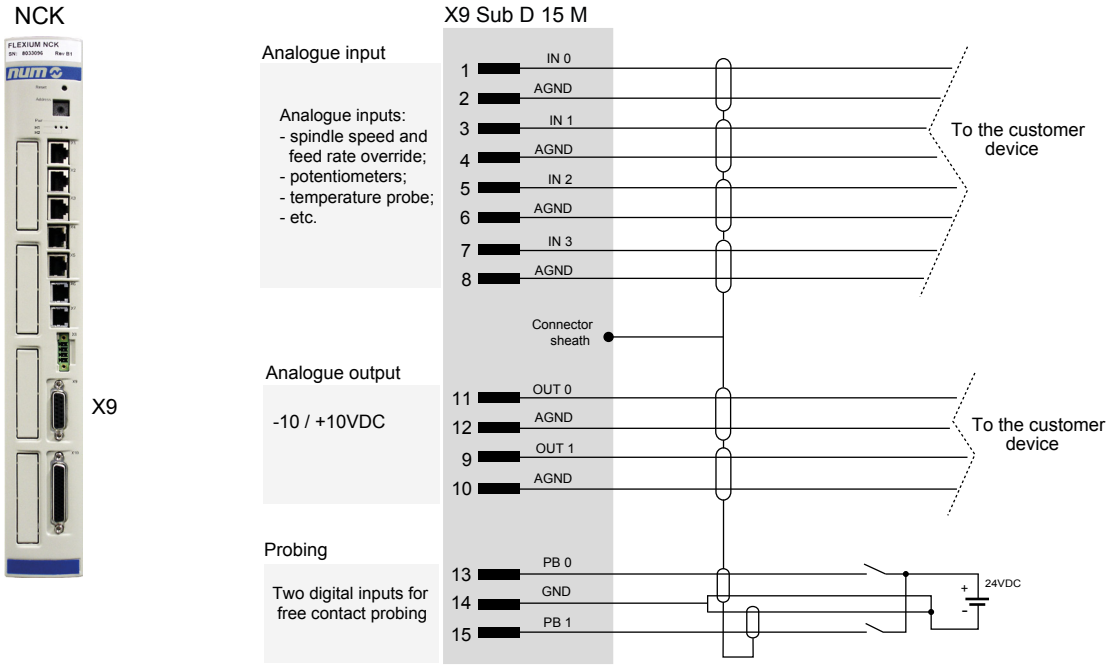
The control system should remain powered to allow troubleshooting and setting of certain logic inputs (which are not the only possible causes of system failure).

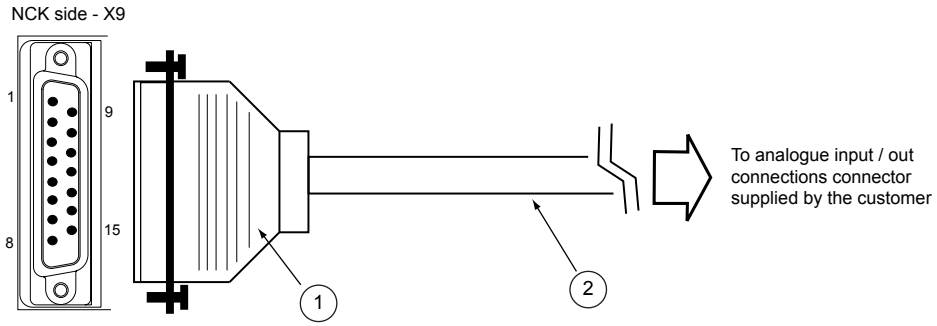


To avoid unsafe movements, take all due precautions in case of deactivation of the power contactor (e.g. loss of NCK ready signal, watchdog trigger, or emergency stop):

- Immediately stop the axes at maximum torque if this option is available on the drive, otherwise deassert speed and torque enable signals.
- In case of unbalanced axis, immediately stop and activate the holding brake motors.

9.4.7 Analogue inputs/outputs and digital probing connections (embedded)





1	Connector X9 is a part of analog / digital IOs connections kit code FXHE181301 The kit consists of X9, X10 alone connectors NCK side. - 1 DB 15 SubD male connector for analogue IOs (X9) The others user's connections and connectors are supplied by the customer.
2	- Cable for analogue input / output : 1 pair double shielding cable (2 x 0.22 mm^2) - Cable for probing : 2 wires shielded cable (2 x 0.22 mm^2) The cable are supplied by the customer.

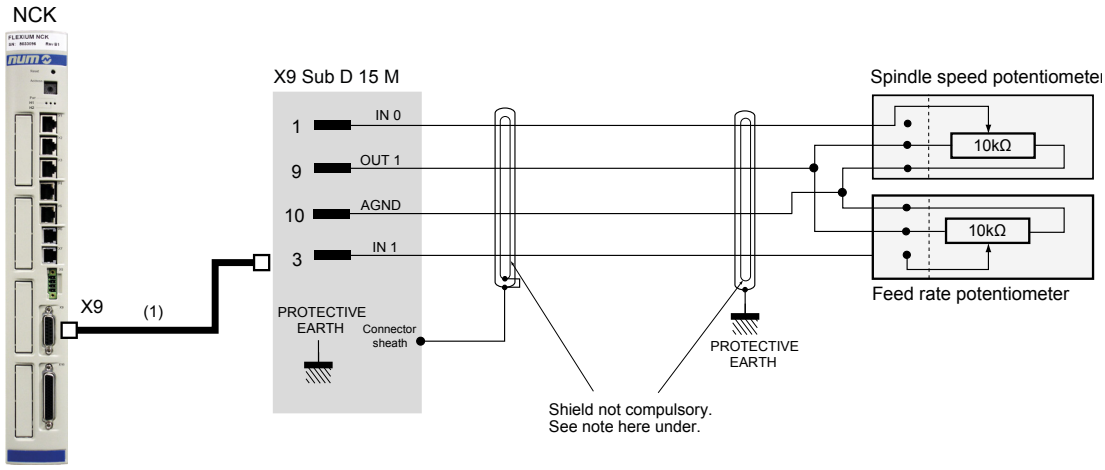


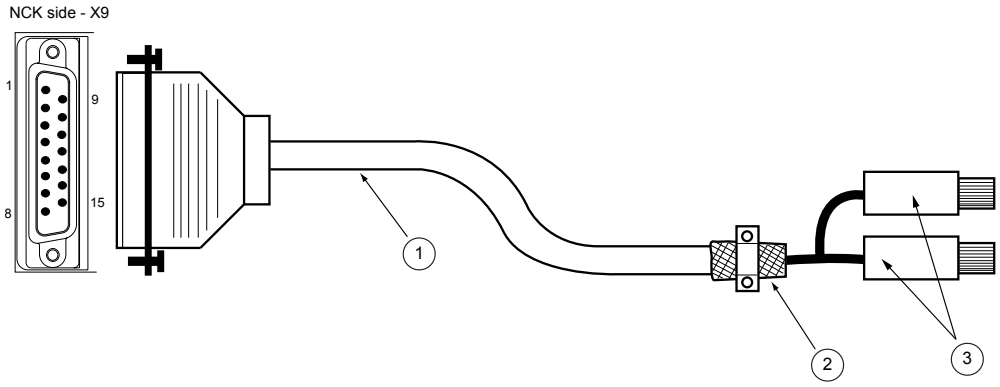
For correct interference suppression in the system, the cable shielding must be earthed in accordance with Cabinet layout and EMC Guide manual M00027.

9.4.7.1 Speed and Feed Override potentiometers connections

This section describes an example of the analogue input wiring use and the relevant override potentiometers connections. The reference voltage is given by an analogue output.

- The analoque output has to be set to 10V by PLC programming.
- Recommended potentiometer value is 10kΩ. (Minimum permissible value is 5kΩ)
- The cable and all the components are supplied by the customer.





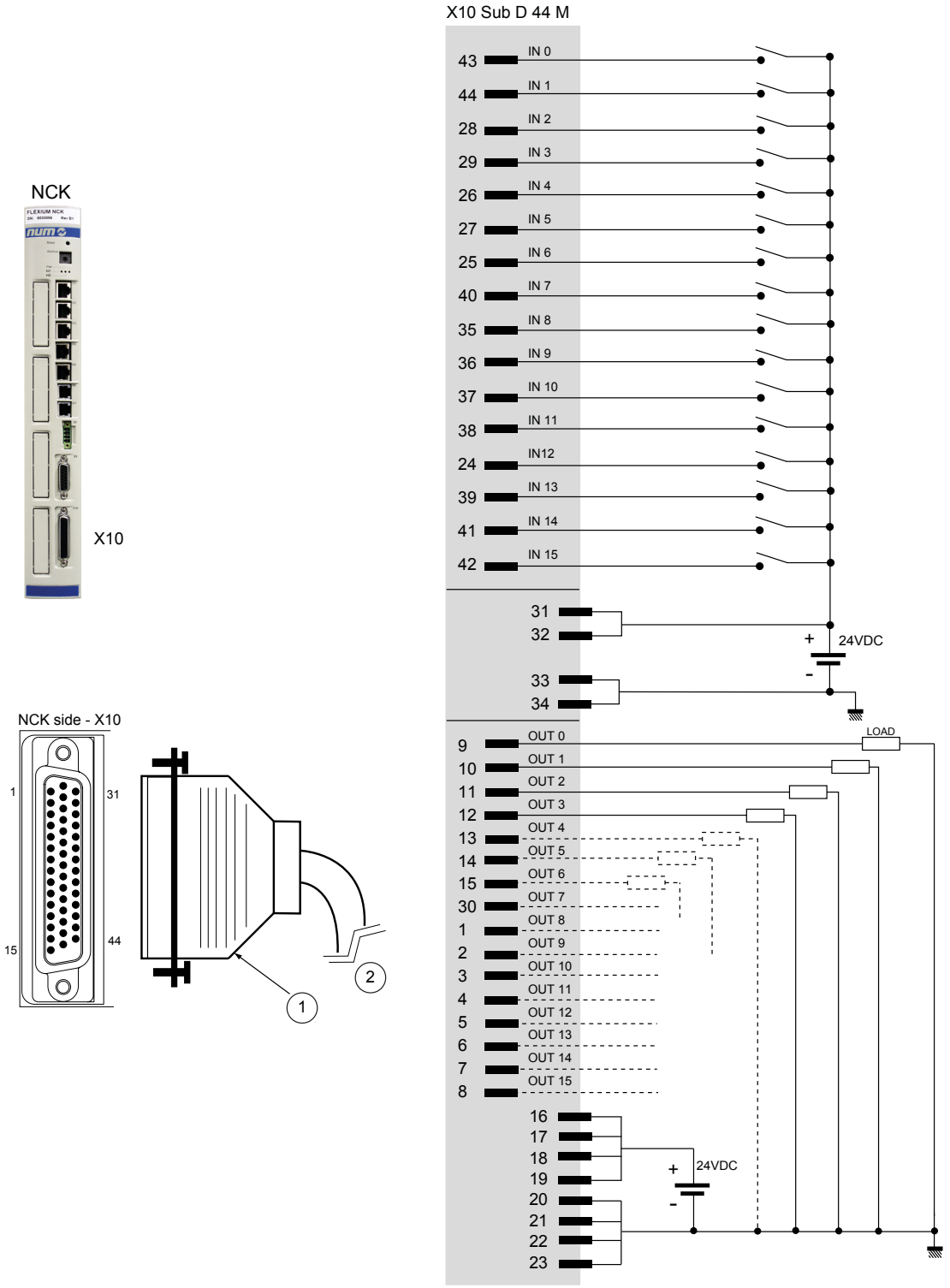
1	4 wires cable with double shielding (4 x 0.22 mm²) supplied by the customer.
2	Bonding braid connected to machine frame
3	Spindle speed and feed rate override potentiometers



If the interference level is low, the analogue output cable with double shielding can be replaced by a cable with single shielding connected at both ends to the protective earth.

9.4.8 Digital inputs/outputs connections (embedded)

The Flexium NCK module receives input signals and sends output signals via the front panel input / output connector (X10). 16 inputs and 16 outputs are available on the NCK module.
They have to be wired directly to the connector as indicated in the diagram below.



1	Connector X10 is a part of analog / digital IOs connections kit code FXHE181301. The kit consists of X9, X10 alone connectors NCK side. - 1 DB 44 High density male connector for digital IOs (X10).
2	The cable section 0.22 mm^2 each is supplied by the customer.

9.4.9 Analogue axes connections

The analogue axis connections allow the NCK module to control the servodrives, process the sensor data and read handwheels. The two connectors (X11, X12) are placed on the bottom side of the NCK as indicated in the next page.

The axes measurement system must be an incremental sensor.

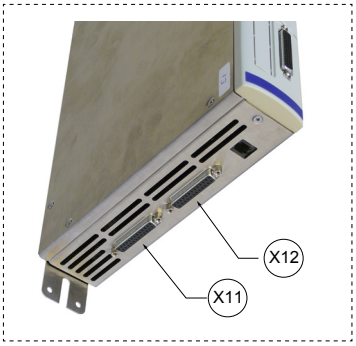
Requirements concerning sensors and their Power Supply

- The installation of a sensor is subject to several requirements:
- minimum sensor power supply voltage (see next pages),
- maximum frequency above which the signals provided by the sensor are no longer measured with accuracy by the system (incremental channels, (see next pages),
- maximum available current for the sensor supply (see next pages).

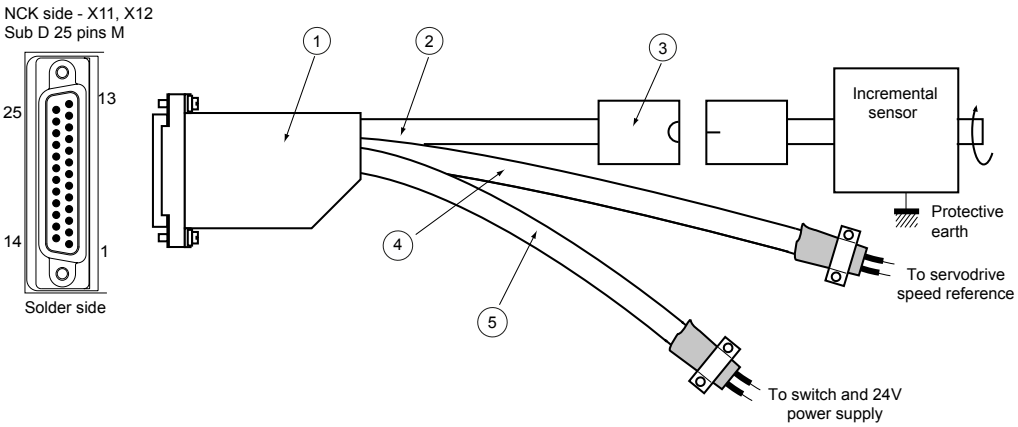
These requirements determine:
- the minimum power cable cross-section area,
- the maximum cable lengths,
- the eventual need of an external power supply.

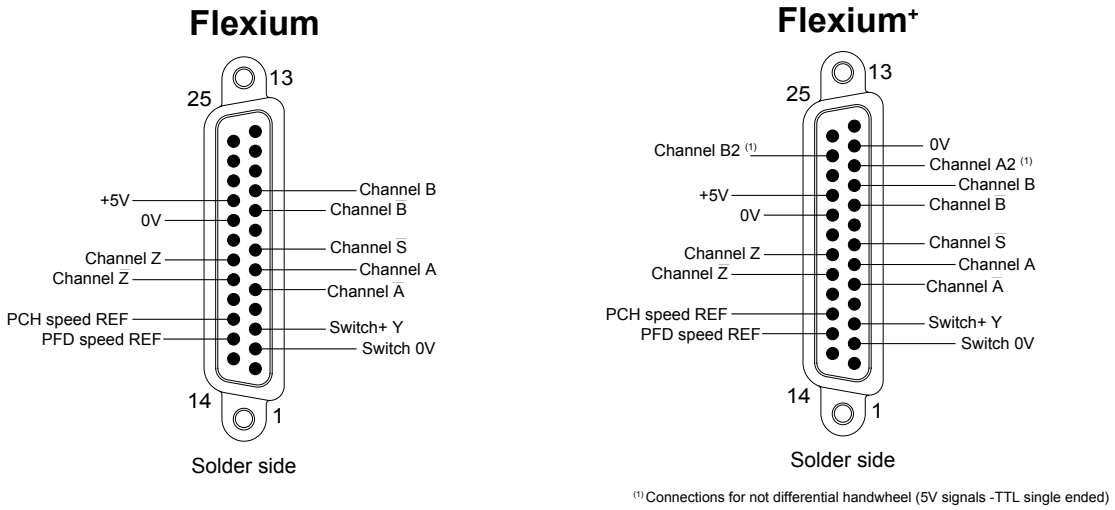
The origin switch must be set after installation.

9.4.10 Incremental axis encoder connections cable for Flexium and Flexium+



NCK Bottom view





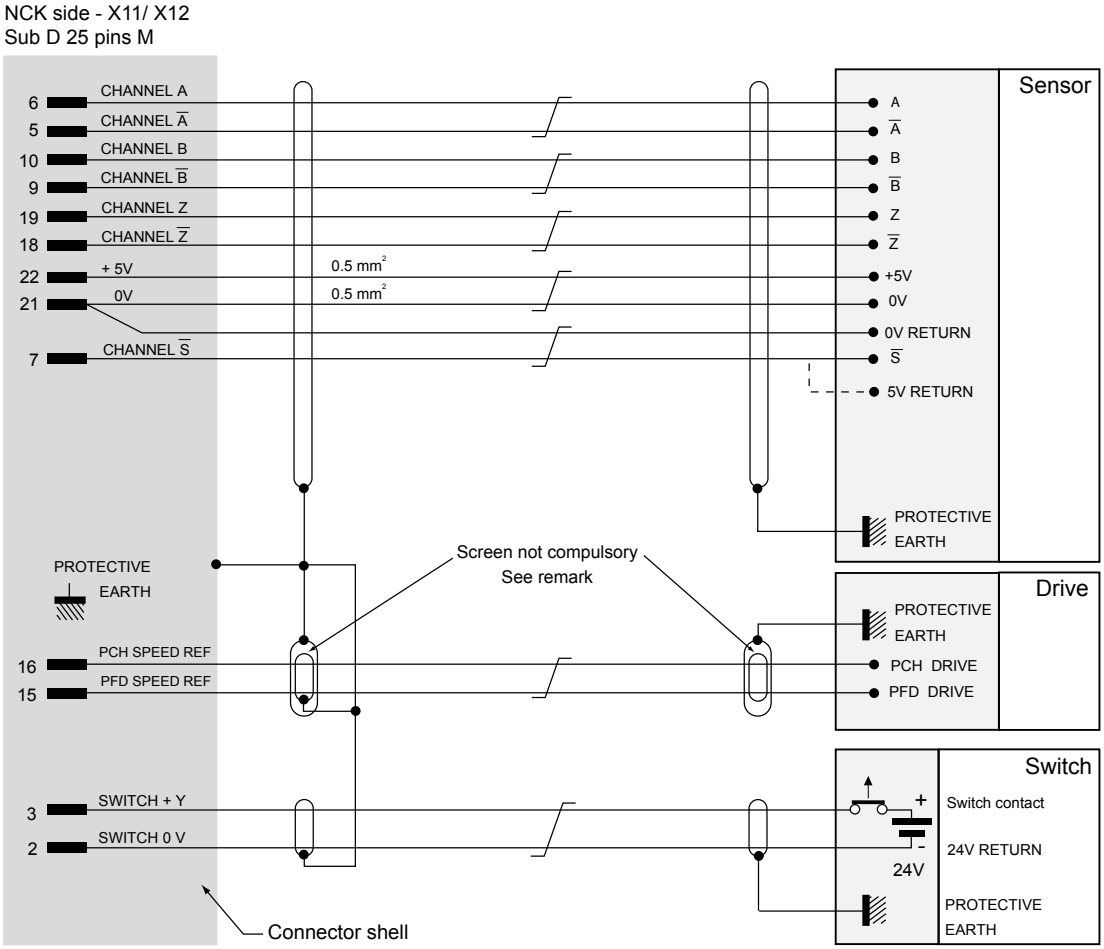
(1) Connections for not differential handwheel (5V signals -TTL single ended)

1	25-contact male Sub.D connector plug.
2	Shielded cable [4 x (2 x 0.14mm²) + 2 x 0.5mm²] supplied by the customer
3	Connector
4	1 twisted pair cable with double shielding (2 x 0.22mm²) supplied by the customer
5	1 twisted pair shielded cable (2 x 0.22mm²) supplied by the customer



For correct interference suppression in the system, the cable shielding must be earthed in accordance with Cabinet layout and EMC Guide manual M00027.

9.4.11 Incremental TTL encoder connections



The wiring of channels A,A/,B,B/,Z,Z/ or S/ allows the detection of a wiring or encoder fault.

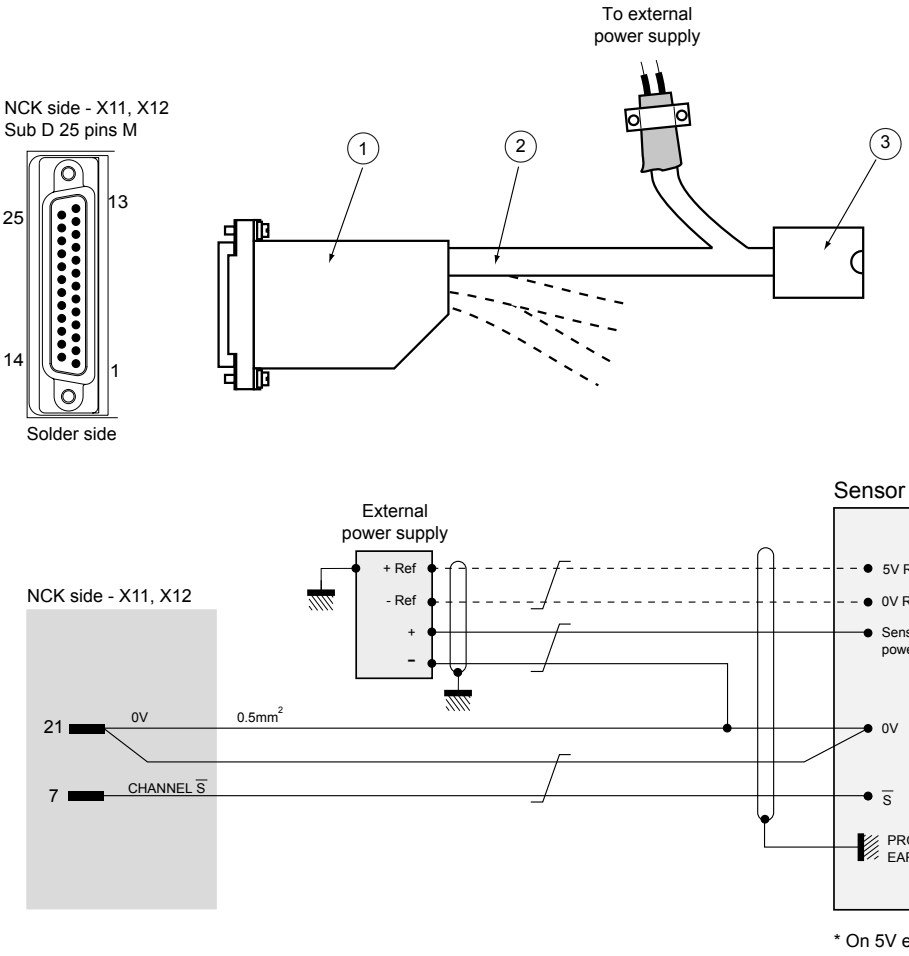
This requires enabling the poor signal and/or encoder channel complementarity check.
(for Flexium parameters P25 and P26 refer to the Flexium Parameter Manual M00021, for Flexium⁺ parameter P70 N1 and N5 refer to the Flexium⁺ Parameter Manual M00041).

If the interference level is low, the cable with double shielding (servodrive cable) can be replaced by a cable with single shielding connected at both ends to the functional earth.
Contact S/ is present on sensors with poor signal errors. When the sensor does not include this signal, contact 7 on the NCK side must be connected to the sensor 5V return.

9.4.12 Axis with external power supply

When an external power supply is used (case of sensors > 5V or 5V sensors for which the axis interface cannot supply sufficient voltage because of the distance, for instance), the cables must be adapted to take this power supply into account.

Only the differences relating to cables for encoders supplied by the axis interface are described below.



1	25-contact male Sub.D connector plug.
2	Shielded cable [4 x (2 x 0.14mm²) + 2 x 0.5mm²] supplied by the customer
3	Connector

STOP

For correct interference suppression in the system, the cable shielding must be earthed in accordance with Cabinet layout and EMC Guide manual M00027.

9.4.13 Voltage across the sensor

When installing a position sensor, it is necessary to provide the minimum power supply voltage related to the type of sensor used.

5VDC Sensors
When the NUM power supply is used, the voltage across the sensor is given by the equation:
Vs = 4.95 - (0.45 + 36.8 x 10-3 x L/S) x I
where:
- Vs (in V) is the voltage across the sensor,
- L (in m) is the cable length (one way only),
- S (in mm²) is the power conductor cross-sectional area,
- I (in A) is the current through the sensor.

The minimum wire size of the power supply conductors is calculated from the maximum current through the sensor, the minimum voltage across the sensor and the required wire length.

It is recommended not to use wires with a cross-sectional area above 2.624mm². If a larger size is required, the use of an external power supply located near the sensor can reduce the required wire size.

Example of a 5V ± 5% sensor, current 220mA
The computed voltage (Vs) must not be less than 4.75V.
The table below gives the calculation results obtained for different cable lengths using the NUM power supply:

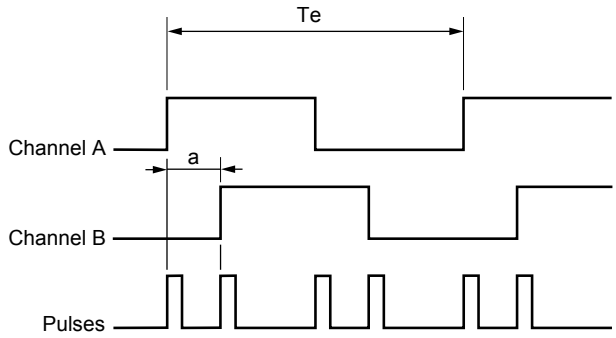
Cable length	Minimum cross-sectional area	Voltage across the sensor
20m	1.65mm²	4.753V
30m	2.624mm²	4.758V

Above 30m, the wire size required would be above 2.624mm². In this case, use an external power supply whose characteristics provide a minimum voltage of 4.75V across the sensor while preserving a reasonable wire size.

Sensors requiring a power supply voltage above 5VDC
The use of an external power supply is mandatory.

9.4.14 Maximum incremental sensor channel output frequency

The diagram below shows the waveform of the signal on sensor channels A and B:



T_e: signal period on one of the channels
a: time shift between two fronts

The sensor channel output frequency is fe = 1 / Te .

Extreme values allowing correct signal detection by the system:
- Maximum frequency: fe max = 1.8MHz
- Minimum time shift between two fronts: amin = 138ns.

The minimum time shift between two fronts allowing correct signal detection by the system depends on the length and type of cable used.

The table below gives the results of tests conducted with shielded cables [4 x (2 x 0.14 mm²)] connecting the sensor to the axis encoder card and using an external power supply:

Cable length	**Minimum time between two fronts**
10m	147ns
20m	156ns
50m	250ns

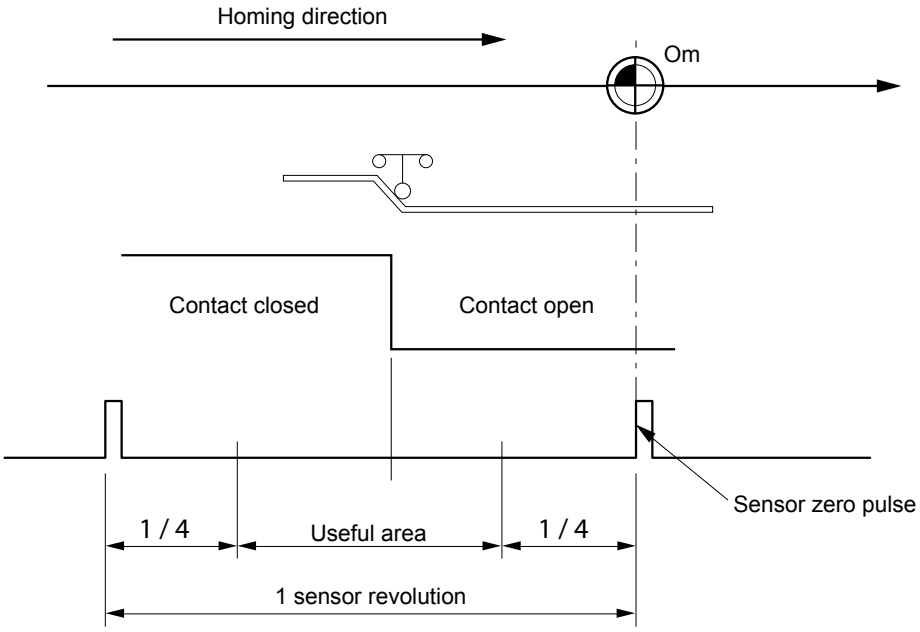
9.4.15 Maximum available current per axis

Each axis interface can supply a maximum current of 350mA.

The consumption current of all connected sensors cannot exceed 1.5A.
Above these values, an external power supply should be used.

9.4.16 Setting the Origin Switch

Homing is carried out on the zero pulse following the opening of the origin switch:

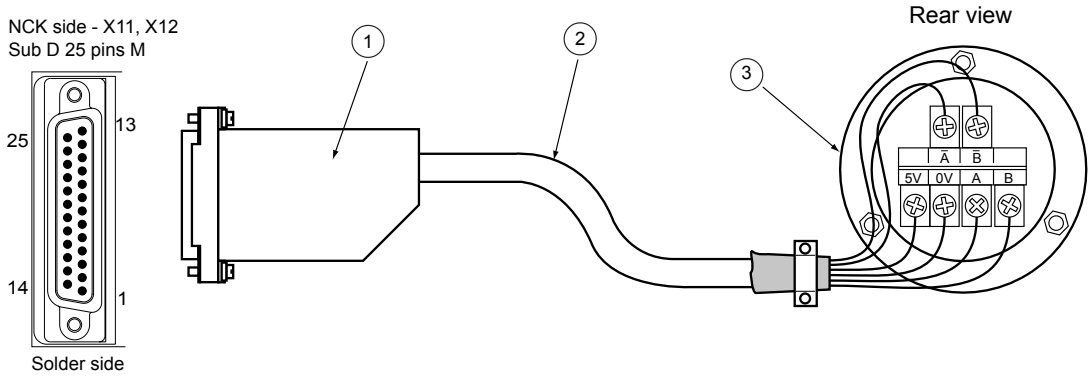


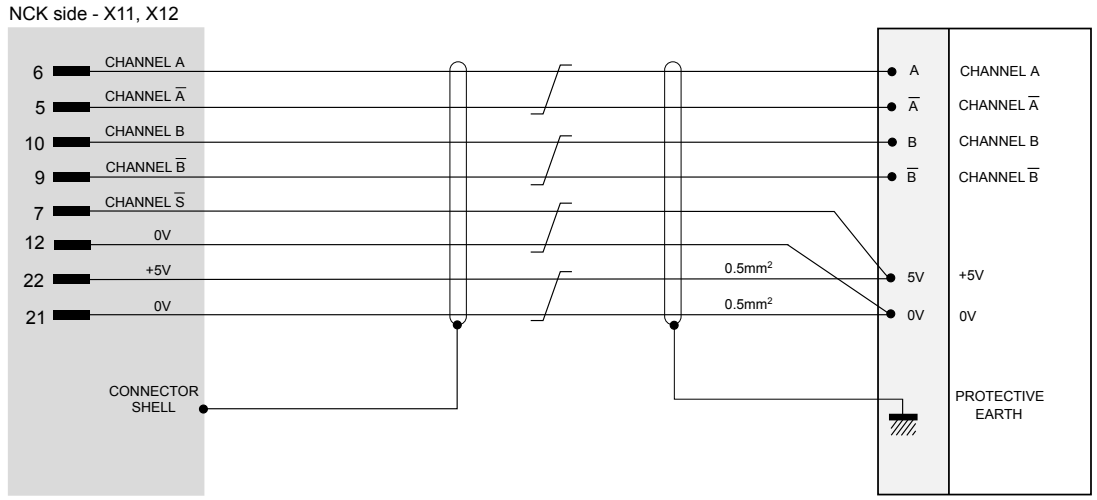
The switch must be set so that the contact opens between one-quarter and three-quarters of the interval separating two zero pulses. This is to avoid coincidence between switch operation and the zero pulse, which could cause a random shift by a distance equal to that separating two zero pulses.

The switch size should be such that the contact which was opened before detection of the sensor zero pulse remains open until the axis stops after detection of the zero pulse.

9.4.17 Handwheels connections

9.4.17.1 Handwheels with Differential outputs connections for Flexium





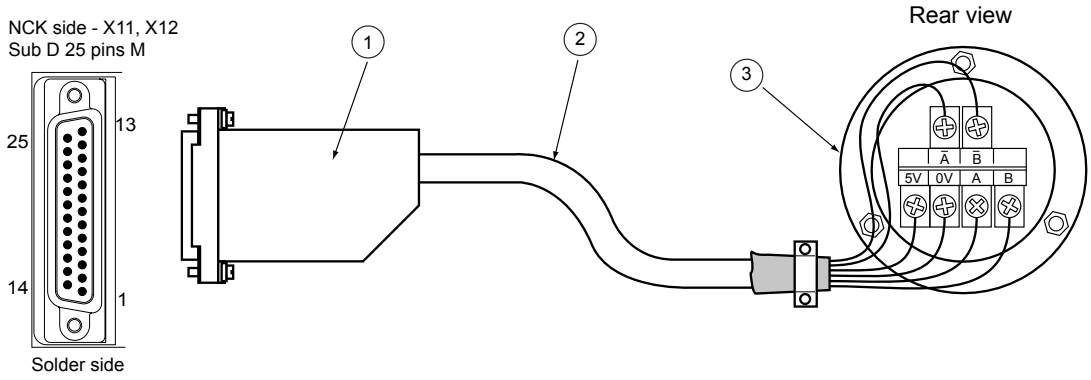
1	25-contact male Sub D connector plug.
2	Shielded cable with three twisted pairs wrapped around one pair [3 x (2 x 0.14 mm²) + (2 x 0.5 mm²)] supplied by the customer
3	Handwheel with differential outputs

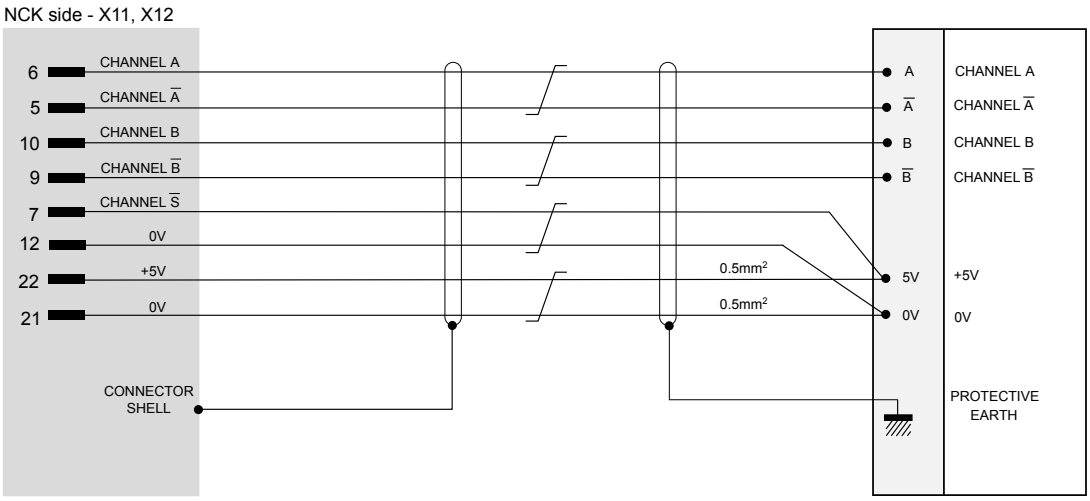
Flexium Handwheel connected to full coupler input configuration (Max 2 handwheel without analogue axis)			
X11	**Handwheel**	**Analogue axes (Axis/Spindle)**	Handwheel and analogue axis use the same input, therefore they cannot connected in the same connector (X11 or X12). Moreover, it is not possible to declare an handwheel and an analogue axes with the same physical @. I.e: If we have an analoque axis @1 it is not possible to declare an handwheel with @1.
	Yes	No	
	No	Yes	
X12	Yes	No	
	No	Yes	



For correct interference suppression in the system, the cable shielding must be earthed in accordance with Cabinet layout and EMC Guide manual M00027.

9.4.17.2 Handwheels with Differential outputs connections for Flexium+





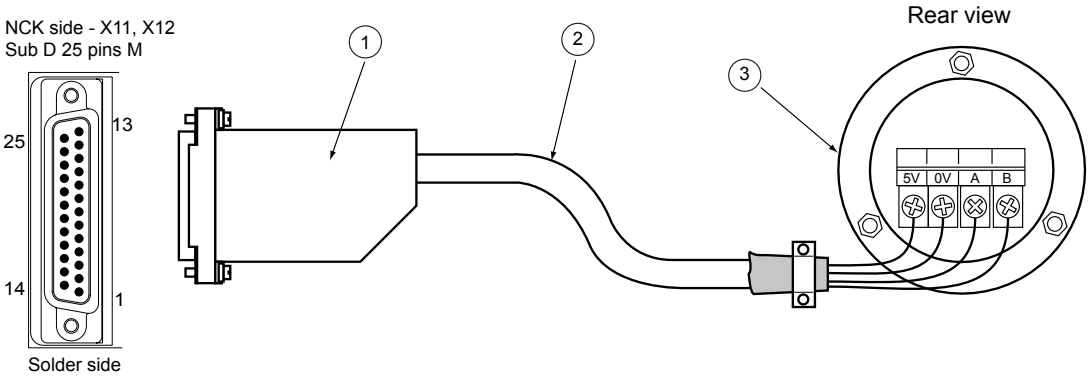
1	25-contact male Sub D connector plug.
2	Shielded cable with three twisted pairs wrapped around one pair [3 x (2 x 0.14 mm²) + (2 x 0.5 mm²)] supplied by the customer
3	Handwheel with differential outputs

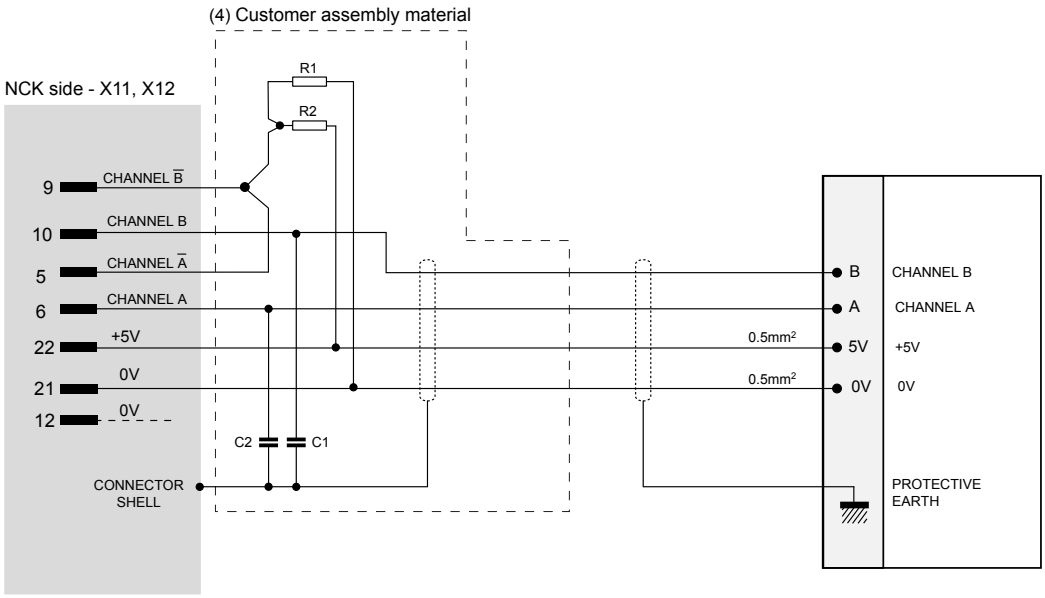
Flexium+ Handwheel connected to full coupler input configuration (Max 2 handwheel without analogue axis)			
X11	**Handwheel**	**Analogue axes (Axis/Spindle)**	Handwheel and analogue axis use the same input, therefore they cannot connected in the same connector (X11 or X12).
	Yes	No	
	No	Yes	
X12	Yes	No	
	No	Yes	



For correct interference suppression in the system, the cable shielding must be earthed in accordance with Cabinet layout and EMC Guide manual M00027.

9.4.17.3 Handwheels with Non-Differential outputs connected to full coupler of Flexium



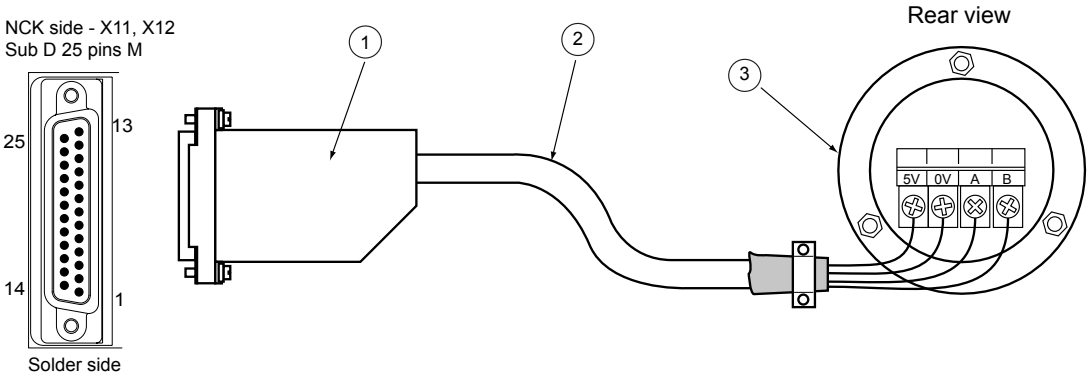


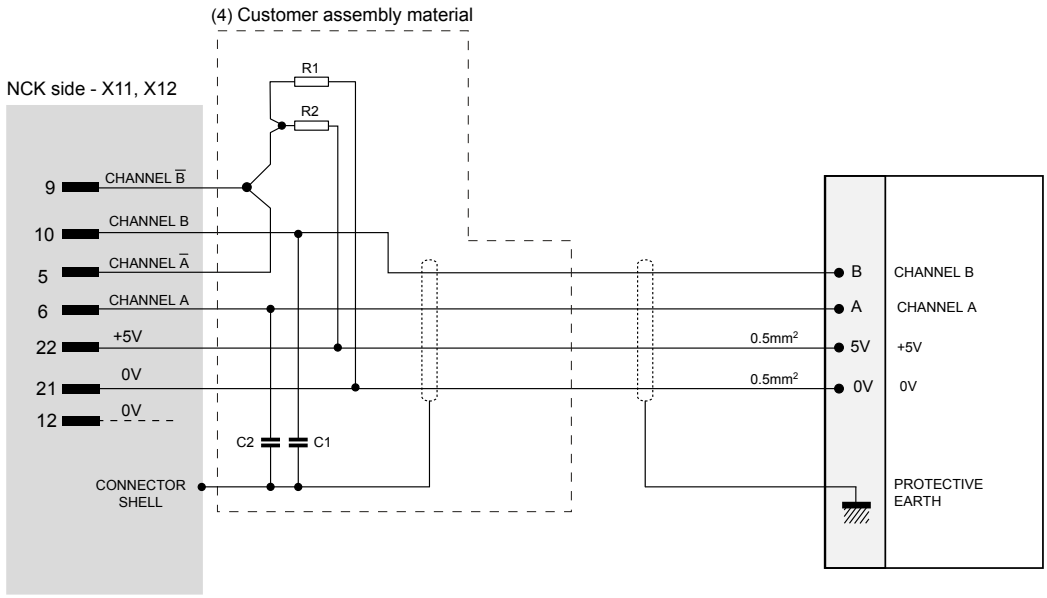
Please also refer to chapter 9.15 for more detailed information of the handwheels connections.
For correct interference suppression in the system please refer the advise on previous pages.

1	25-contact male Sub.D connector plug.
2	Shielded cable with three twisted pairs wrapped around one pair [1 x (2 x 0.14 mm²) + (2 x 0.5 mm²)] supplied by the customer
3	Handwheel
4	Customer assembly material: - R1 = 120Ω 1/4W - R2 = 100Ω 1/4W - C1, C2 = 33nF - Cable type 2x0.14mm² + 2x0.15mm²

Flexium Handwheel connected to full coupler input configuration (Max 2 handwheel without analogue axis)			
X11	**Handwheel**	**Analogue axes (Axis/Spindle)**	Handwheel and analogue axis use the same input, therefore they cannot connected in the same connector (X11 or X12). Moreover, it is not possible to declare an handwheel and an analogue axes with the same physical @. I.e: If we have an analoque axis @1 it is not possible to declare an handwheel with @1.
	Yes	No	
	No	Yes	
X12	Yes	No	
	No	Yes	

9.4.17.4 Handwheels with Non-Differential outputs connected to full coupler of Flexium+



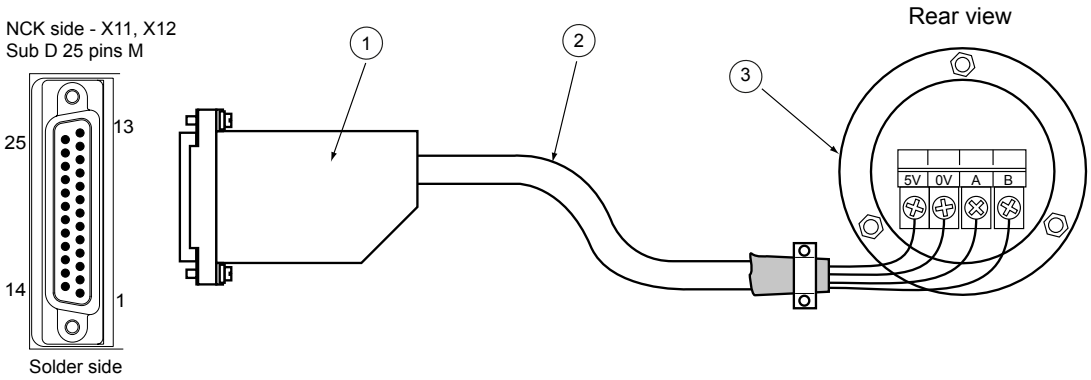


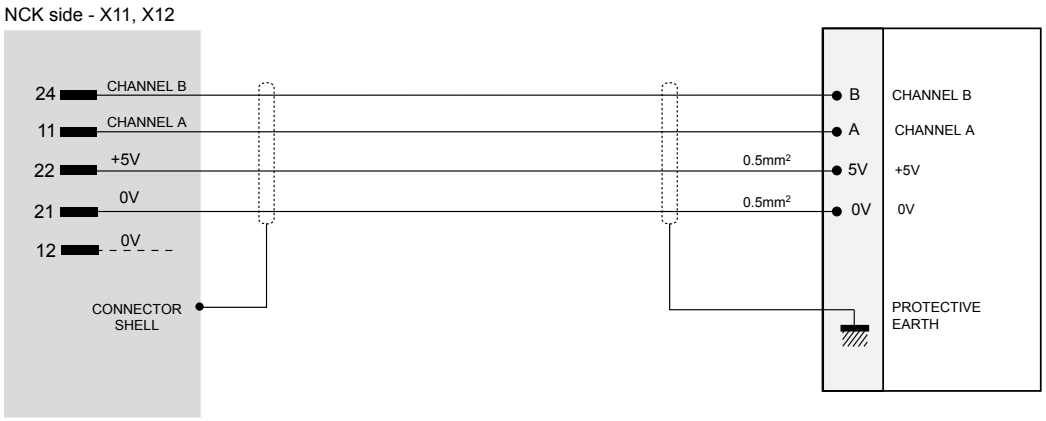
Please also refer to chapter 9.15 for more detailed information of the handwheels connections. For correct interference suppression in the system please refer the advise on previous pages.

1	25-contact male Sub.D connector plug.
2	Shielded cable with three twisted pairs wrapped around one pair [1 x (2 x 0.14 mm²) + (2 x 0.5 mm²)] supplied by the customer
3	Handwheel
4	Customer assembly material: - R1 = 120Ω 1/4W - R2 = 100Ω 1/4W - C1, C2 = 33nF - Cable type 2x0.14mm² + 2x0.15mm²

Flexium+ Handwheel connected to full coupler input configuration (Max 2 handwheel without analogue axis)			
X11	**Handwheel**	**Analogue axes (Axis/Spindle)**	Handwheel and analogue axis use the same input, therefore they cannot connected in the same connector (X11 or X12).
	Yes	No	
	No	Yes	
X12	Yes	No	
	No	Yes	

9.4.17.5 Handwheels with Non-Differential outputs connected to reduced coupler of Flexium+





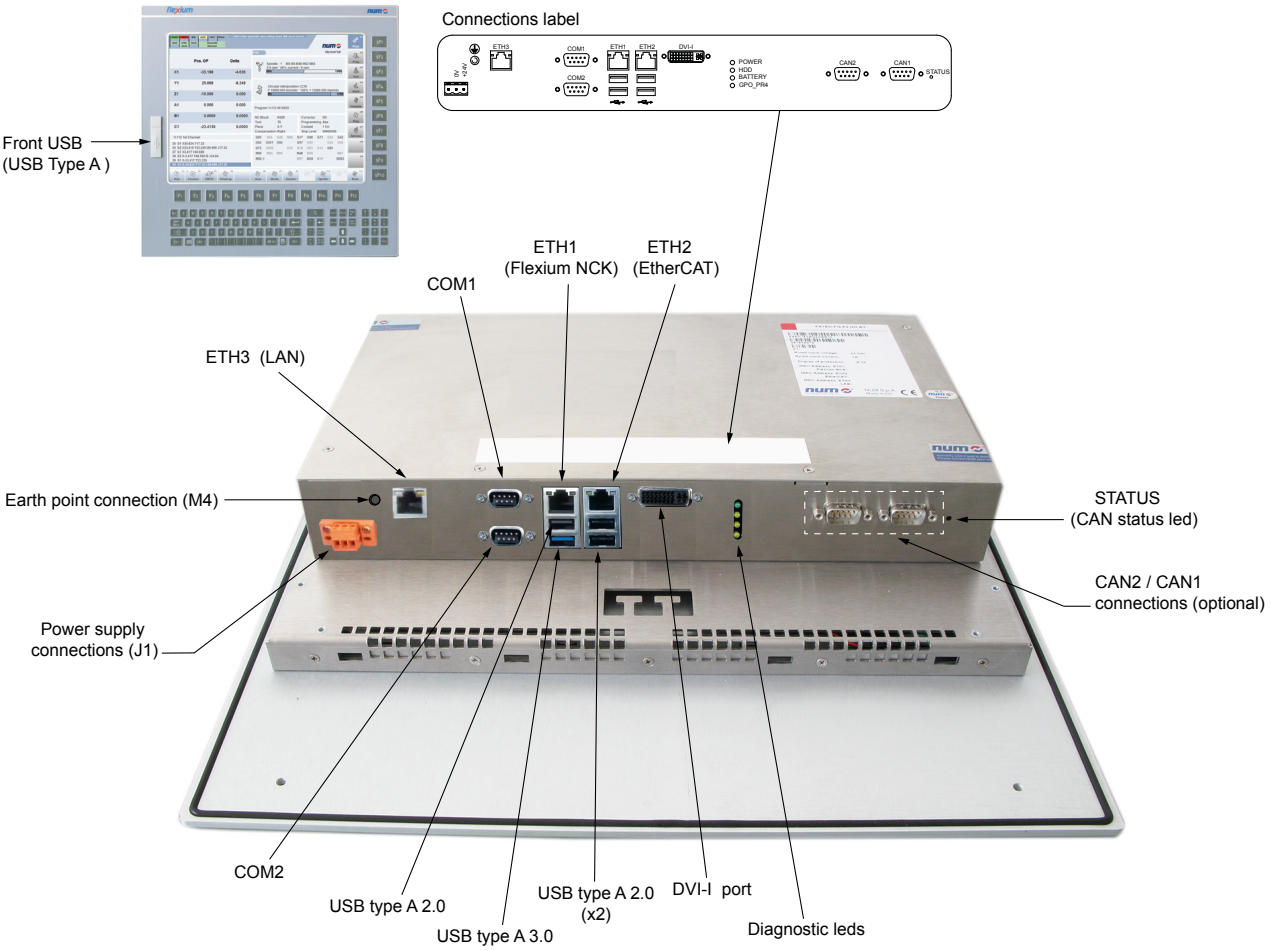
Please also refer to chapter 9.15 for more detailed information of the handwheels connections.

1	25-contact male Sub.D connector plug.
2	Shielded cable with three twisted pairs wrapped around one pair [1 x (2 x 0.14 mm²) + (2 x 0.5 mm²)] supplied by the customer
3	Handwheel

Flexium+ Handwheel connected to reduced coupler input configuration (Max 2 handwheel)			
X11	**Handwheel** (Reduced coupler)	**Analogue axes** (Axis/Spindle)	Handwheel and analogue axis do not use the same inputs, therefore is possible to connect both Handwheel and Analoque axes over the same X11 or X12 connector.
	Yes	Yes	
X12	Yes	Yes	

9.5 FS154i Panels connections

9.5.1 FS154i PC P1 G4 General connectors lay-out



The panel connections are available as indicated in the following pages.

9.5.2 Connecting the power supply

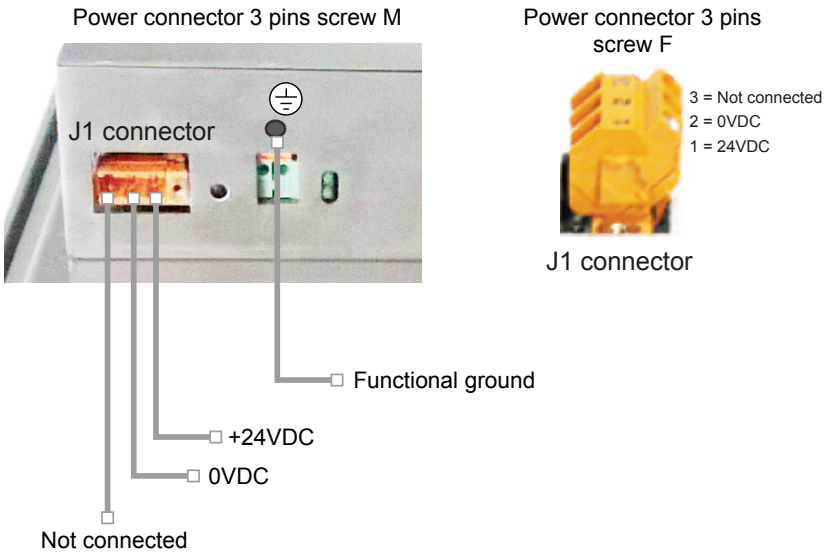
The FS154i PC P1 G4 is a device compliant with protection class 3.
The system must be fed with an SELV 24VDC (safety extra-low voltage) supply by the customer.
The power supply is not electrically isolated and the 0V terminal is directly connected to the housing potential.

The power supply is protected by a self resettable fuse.
The relevant national regulations must be observed when connecting the FS154i.

The connection should be made as follows:
- The cross-section of the power supply cable must be between 0.75mm² and 1.5mm².
- The current consumption must be taken into account for the power supply (see chapter 4).
- The functional ground is not compulsory for operation. It may help to prevent interference and potential differences.
- The 0V pin is directly connected to the housing potential.
- The two connection cables must be attached to each other close to the plug in order to ensure a safe connection. (see below)

The plug connector (socket strip with screw terminals) for the terminal is supplied with the device.

Designation	Function
+24VDC	24VDC SELV, safety extra low voltage. Protection class III / 4A.
0V	0V power supply
-	Reserved
Voltage range	24VDC +20% -15% supplied by the customer.



STOP

If the polarity is reversed and a 0V connection is added at the same time, e.g. GND connection of the COM1 interface, the leakage current will flow across this 0V connection.
The two connection cables must be attached to each other close to the plug in order to ensure a safe connection.

9.5.3 COM connections

The serial interfaces COM1 to COM2 are PC compatible.

Cables connected to the RS232 interface must be routed separately from low-voltage cables.

Connector	Type	Description
COM1	RS232 Sub D 9 pins M	Serial interface. General user purpose
COM2		
Note. It is mandatory to use a shielded cable for interference-free operation.		



Windows XP embedded devices will not support this interface.

9.5.4 DVI-I Digital Video connection

Cables connected to the video interface must be routed separately from low-voltage cables.

Connector	Type	Description
DVI-I	Standard DVI	Supplementary video connection
Note. It is mandatory to use a shielded cable for interference-free operation.		

9.5.5 ETH1, ETH2 and ETH3 Ethernet connections

The connection to a HUB is implemented using a cable Cat 5 cable with RJ45 (8P/8C) connections.
A crossed cable is required for direct connection to another PC.
For ETHx connectors two diagnostics LEDs are provided:

- Green: LINK (Connection to HUB or other device)
- Orange: ACT (Send or Receive)

Cables connected to the Ethernet interface must be routed separately from low-voltage cables.

Connector	Type	Description
ETH1	RJ45 (8P/8C)	To NCK X5 connector - NCK - Network connections
ETH2	RJ45 (8P/8C)	To EtherCAT connection (i.e. NUM Gateway CTMG1100)
ETH3	RJ45 (8P/8C)	Company - Network



It is mandatory to use a STP cable for interference- free operation.

9.5.6 USB connections type A

The FS154i PC P1 G4 provides 5 USB interfaces PC compatible:
- 3 USB port type A 2.0 on the rear side of the panel
- 1 USB port type A 3.0 on the rear side of the panel
- 1 USB port type A 2.0 into the front keyboard panel.

Cables connected to the USB interface must be routed separately from low-voltage cables.

Connector	Type	Description
USB	USB port type A	General user purpose. (Mouse, keyboards and all USB devices)
Note. It is mandatory to use a shielded cable for interference-free operation.		

9.5.7 CAN1 and CAN2 connections (optional)

The CAN1 and CAN2 connectors allow a standard CAN interface connections. To connect the CAN cable it is mandatory to use a special CAN plug with bus termination resistance included.
The bus termination must only be activated at both ends of the CAN bus.

- CAN cable PVC, purple, shielded in pairs: FXHC181060.
- CAN Plug axial, with integrated bus termination: FXHE181200.
  Please also refer to chapter 10.

To activate the second CAN interface (CAN2 connector) the option FXSO000432 “additional 2nd CAN interface for FS154i” must be required.

The green Led “STATUS” indicates:

- Blinking state indicates the CAN communication active.
- OFF state indicates power supply not present.
- ON state indicated shutdown of the system and power supply present.

Connector	Type	Description
CAN1	Sub D 9 pins M	CAN interface to MP04 Machine panel or IOs connections.
CAN2	Sub D 9 pins M	CAN interface to NUMDrive CAN rings or other CAN application connections.
Note. It is mandatory to use a shielded cable for interference-free operation.		

The pin assignment is as followed:

Pin	**Description**
1	-
2	CAN_L (Low)
3	CAN_GND
4	-
5	SHIELD
6	CAN_GND
7	CAN_H (High)
8	-
9	-



It is mandatory to use a special CAN cable (Device Net cable) and CAN plugs for interference- free operation. The cable and different plugs are available as indicated in the chapter 11.

9.5.8 Battery replacement

FS154i is provided with a battery-powered real-time clock circuit Exchangeable code EIV6003971.
There is a danger of explosion if battery is incorrectly replaced.



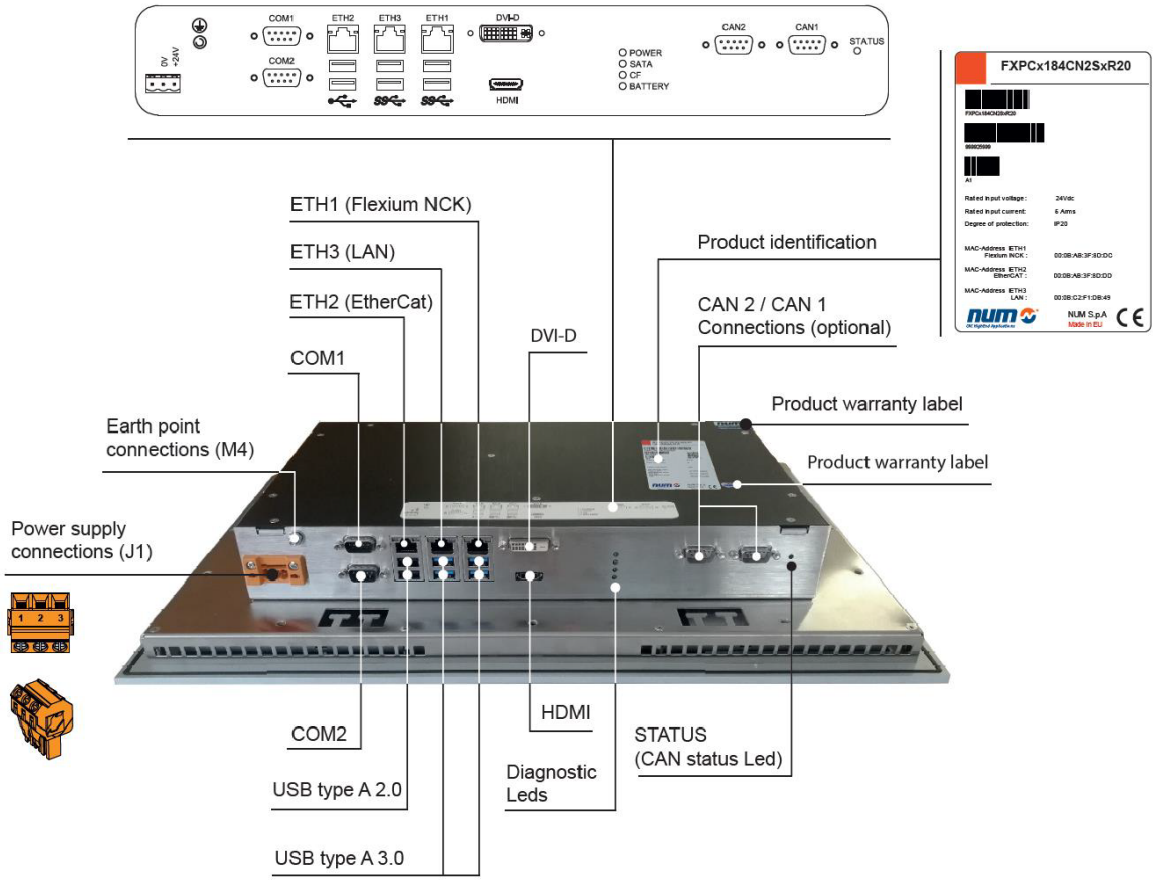
Replace only with the same type recommended by NUM.
Attention: Opening the back cover or breaking the warranty labels voids the warranty.



Pay attention to ESD safety protections when changing the battery.

9.6 FS184i and FS 244i connections

9.6.1 General connectors lay-out

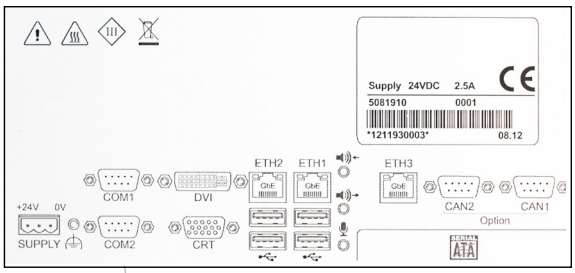


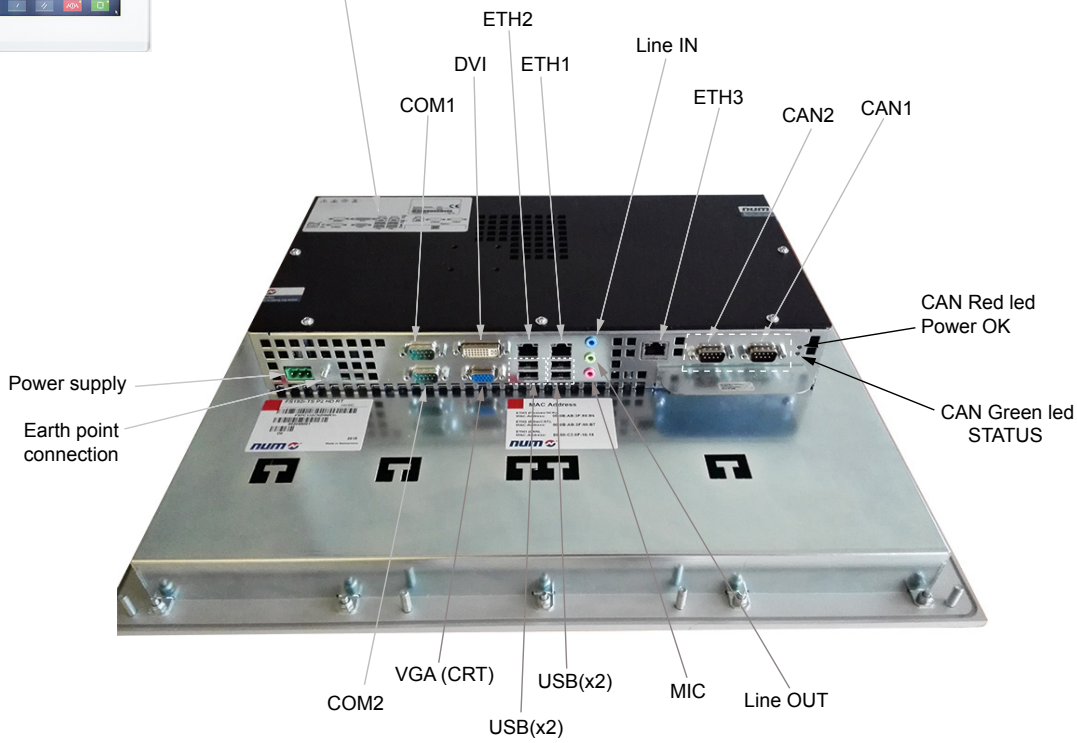
9.7 FS194i Panels connections

9.7.1 FS194i General connectors lay-out



Connection label





The panel connections are available as indicated in the following pages.

9.7.2 Connecting the power supply

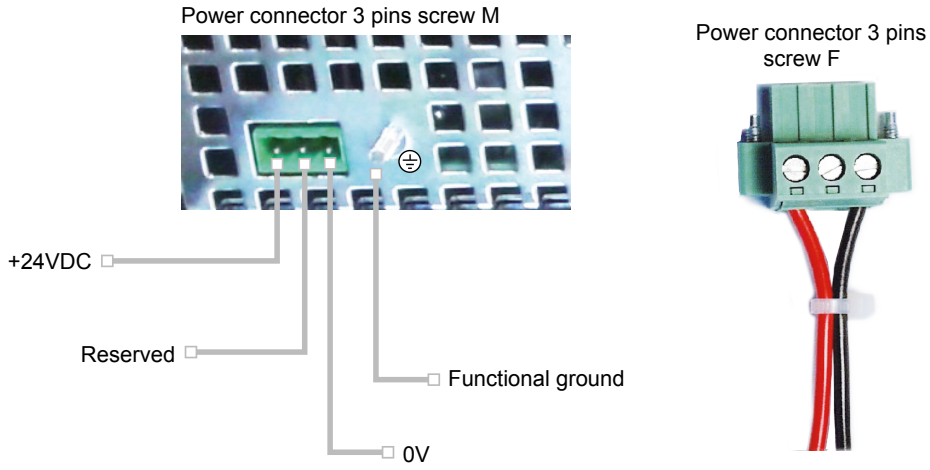
The FS194i Panel is a device compliant with protection class 3.
The system must be fed with an SELV 24VDC (safety extra-low voltage) supply by the customer.
The maximum breaking capacity of the fuse must be observed.

The power supply is not electrically isolated. The 0V terminal is directly connected to the housing potential. The power supply is fuse protected.
The device is protected against reverse polarity, however, operation is only possible when the device is connected correctly.

The connection should be made as follows:
- The cross-section of the power supply cable must be between 0.75mm² and 1.5mm².
- A lead or wire can be used for the connection
- The current consumption must be taken into account for the power supply. (See chapter 4)
- The functional ground is not compulsory for operation. It may help to prevent interference and potential differences.
- The two connection cables must be attached to each other close to the plug in order to ensure a safe connection. (see below)

The plug connector (socket strip with screw terminals) for the terminal is supplied with the device.
We recommend that the FS194i Panel is grounded in order to prevent interference. This can either be implemented with the shield for the power supply or by using a ground connection on the grounding bolt.

Designation	Function
+24VDC	24VDC SELV, safety extra low voltage. Protection class III / 4A.
-	Reserved
0V	0V power supply
Voltage range	24VDC +20% -15% supplied by the customer.





If the polarity is reversed and a 0V connection is added at the same time, the leakage current will flow across this 0V connection. The FS194i Panel or external components may be destroyed if the housing is not properly connected to the 0V potential.
The two connection cables must be attached to each other close to the plug in order to ensure a safe connection.The relevant national regulations must be observed when connecting the FS194i Panel.

9.7.3 COM connections

The serial interfaces COM1 and COM2 are PC compatible. The serial interface COM2 is used internally.

Cables connected to the RS232 interface must be routed separately from low-voltage cables.

Connector	Type	Description
COM1	RS232 Sub D 9 pins M	Serial interface. General user purpose
COM2		
Note. It is mandatory to use a shielded cable for interference-free operation.		

9.7.4 VGA Video connection

Cables connected to the video interface must be routed separately from low-voltage cables.

Connector	Type	Description
VGA	Sub D HD 15 pins F	Video interface PC compatible
Note. It is mandatory to use a shielded cable for interference-free operation.		

9.7.5 DVI-I Digital Video connection

Cables connected to the video interface must be routed separately from low-voltage cables.

Connector	Type	Description
DVI-I	Standard DVI	Supplementary video connection
Note. It is mandatory to use a shielded cable for interference-free operation.		

9.7.6 ETH1, ETH2 and ETH3 Ethernet connections

The connection to a HUB is implemented using a cable Cat 5 cable with RJ45 (8P/8C) connections.
A crossed cable is required for direct connection to another PC.
For ETHx connectors two diagnostics LEDs are provided:

- Green: LINK (Connection to HUB or other device)
- Orange: ACT (Send or Receive)

Cables connected to the Ethernet interface must be routed separately from low-voltage cables.

Connector	Type	Description
ETH1	RJ45 (8P/8C)	To NCK X5 connector - NCK - Network connections
ETH2	RJ45 (8P/8C)	To EtherCAT connection (i.e. NUM Gateway CTMG1100)
ETH3	RJ45 (8P/8C)	Company - Network



It is mandatory to use a STP cable for interference- free operation.

9.7.7 USB connections

The FS194i provides 4 USB type A interfaces PC compatible in the rear side of the panel.
Cables connected to the USB interface must be routed separately from low-voltage cables.

Connector	Type	Description
USB	USB port type A	General user purpose. (Mouse, keyboards and all USB devices)
Note. It is mandatory to use a shielded cable for interference-free operation.		

9.7.8 CAN1 and CAN2 connections (optional)

The CAN1 and CAN2 connectors allow a standard CAN interface connections. To connect the CAN cable it is mandatory to use a special CAN plug with bus termination resistance included.
The bus termination must only be activated at both ends of the CAN bus.

- CAN cable PVC, purple, shielded in pairs: FXHC181060.
- CAN Plug axial, with integrated bus termination: FXHE181200.
  Please also refer to chapter 11.

To activate the second CAN interface (CAN2 connector) the option FXSO000432 “additional 2nd CAN interface for FS194i” must be required.

The green Led “STATUS” blinking indicates the CAN communication active.

Connector	Type	Description
CAN1	Sub D 9 pins M	CAN interface to MP04 Machine panel or IOs connections or other systems.
CAN2	Sub D 9 pins M	CAN interface to NUMDrive CAN rings or other CAN application connections.
Note. It is mandatory to use a shielded cable for interference-free operation.		

The pin assignment is as followed:

Pin	**Description**
1	-
2	CAN_L (Low)
3	CAN_GND
4	-
5	SHIELD
6	CAN_GND
7	CAN_H (High)
8	-
9	-



It is mandatory to use a special CAN cable (Device Net cable) and CAN plugs for interference- free operation. The cable and different plugs are available as indicated in the chapter 11.

9.7.9 Battery replacement

FS194i is provided with a battery-powered real-time clock circuit Exchangeable type Panasonic, BR2032. There is a danger of explosion if battery is incorrectly replaced.



Replace only with the same or equivalent type recommended by the NUM. Discard used batteries according to the manufacturer's instructions.

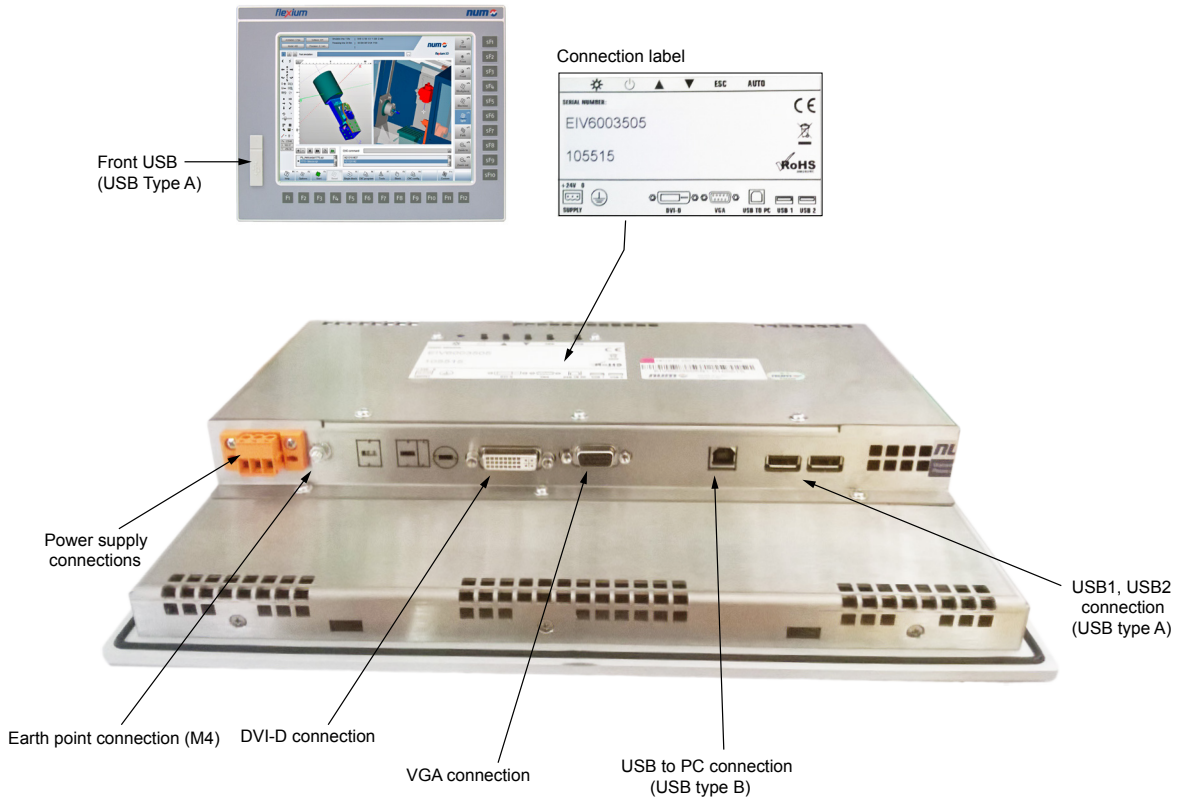
Attention: Opening the back cover or breaking the warranty labels voids the warranty.



Pay attention to ESD safety protections when changing the battery.

9.8 FS122 Passive panels connections

9.8.1 FS122 general lay-out connectors



The panel connections are available as indicated in the following pages.

9.8.2 Connecting the power supply

The FS122 Panel is a device compliant with protection class 3.
The system must be fed with an SELV 24VDC (safety extra-low voltage) supply by the customer.
The maximum breaking capacity of the fuse must be observed.

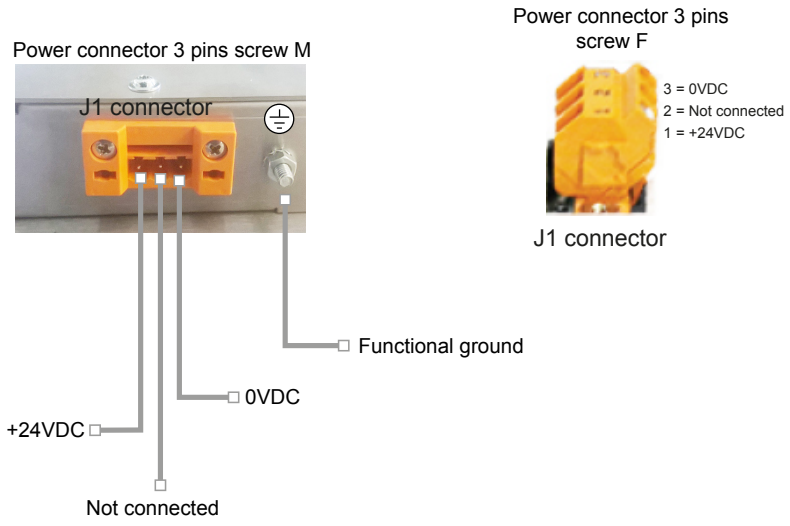
The power supply is not electrically isolated. The 0V terminal is directly connected to the housing potential. The power supply is fusezprotected.
The device is protected against reverse polarity, however, operation is only possible when the device is connected correctly.

The connection should be made as follows:

- The cross-section of the power supply cable must be between 0.75mm² and 1.5mm².
- A lead or wire can be used for the connection
- The current consumption must be taken into account for the power supply. (See chapter 4)
- The functional ground is not compulsory for operation. It may help to prevent interference and potential differences.
- The two connection cables must be attached to each other close to the plug in order to ensure a safe connection. (see below)

The plug connector (socket strip with screw terminals) for the terminal is supplied with the device.
We recommend that the FS122 Panel is grounded in order to prevent interference. This can either be implemented with the shield for the power supply or by using a ground connection on the grounding bolt.

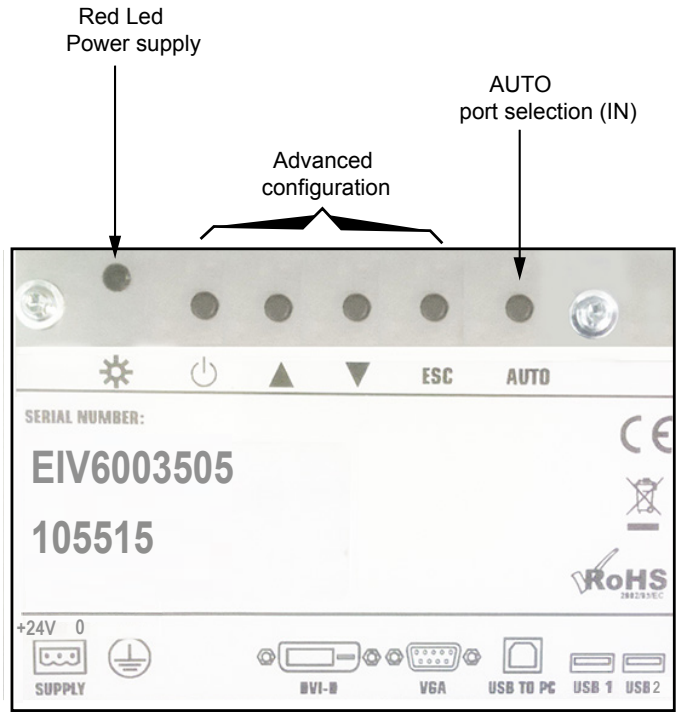
Designation	Function
+24VDC	24VDC SELV, safety extra low voltage. Protection class III / 4A.
-	Not connected
0V	0V power supply
Voltage range	24VDC +20% -15% supplied by the customer.





If the polarity is reversed and a 0V connection is added at the same time, the leakage current will flow across this 0V connection. The FS122 Panel or external components may be destroyed if the housing is not properly connected to the 0V potential.
The two connection cables must be attached to each other close to the plug in order to ensure a safe connection.The relevant national regulations must be observed when connecting the FS122 Panel.

9.8.3 FS122 configuration



9.8.4 USB connections type A

The FS122 provides 3 USB type A interfaces PC compatible two in the rear side of the panel and 1 more into the front keyboard panel side
Cables connected to the USB interface must be routed separately from low-voltage cables.

Connector	Type	Description
USB x1 (Front)	USB port	The USB Type A front connection can be used to connect additional peripherie as keyboard, mouse, memorystick etc.
USB x2 (Rear)		The USB Type A connection are for peripherie (keyboard, mouse Memorystick etc.).
Note. It is mandatory to use a shielded cable for interference-free operation.		

9.8.5 USB connections type B

The FS122 provides 1 USB tye B interface in the rear side of the panel and one more into the front keyboard panel side and is used to connect the panel to the PC.
Cables connected to the USB interface must be routed separately from low-voltage cables.

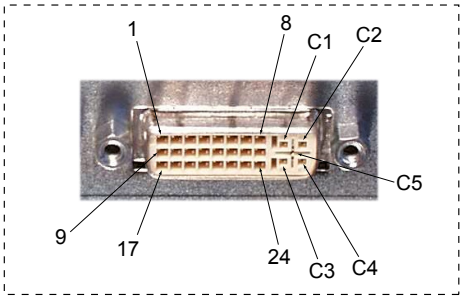
Take care by elongating the USB connection from the panel to the PC. The maxiumum permissible cable connection length is 5m.
The panel contains a four port USB-Hub (front USB, front keyboard and the two at the rear side. Only a few KVM (Keyboard/Video/Mouse) switch units are able to transfer USB signals from a hub.

9.8.6 DVI-D interface connections

A standard DVI cable is used to connect the DVI interface of the FS122 Panel to a Compact PC or the DVI interface of a standard PC.

The video transfer is carried out differentially in (Transition Minimized Digital Signalling).
The video interface is compliant with the Single Link DVI-D Standard.

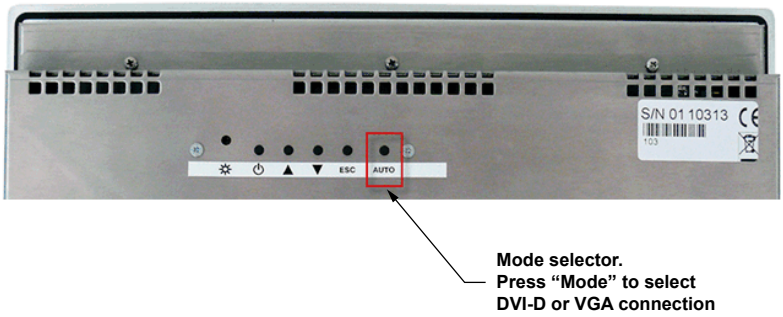
DVI connector



Pin No	Signal	Description
1, 2	RX2- / RX2+	TMDS Data 2- Input / TMDS Data 2+ Input
3	RX2/RX4 shield	TMDS shield for Data 2 & 4
4, 5	RX4- / RX4+	Not connected internally
6, 7	DDC Clock / DDC Data	Digital Data Channel Clock Input / Digital Data Channel Data I/O
8	Analog Vsync	Not connected internally
9, 10	RX1- / RX1+	TMDS Data 1- Input / TMDS Data 1+ Input
11	RX1/RX3 shield	TMDS shield for Data 1 & 3
12, 13	RX3- / RX3+	Not connected internally
14	+5 V	+5V for DDC
15	TTL Ground	-
16	HPD	Hot Plug Detect
17, 18	RX0- / RX0+	TMDS receive 0- / TMDS receive 0+
19	RX0/RX5 shield	TMDS shield for Data 0 & 5
20, 21	RX5- / RX5+	Not connected internally
22	Clock shield	TMDS shield for Clock
23, 24	Clock+ / Clock-	TMDS Clock+ Input / TMDS Clock- Input
C1	Analog Red	Not internally connected
C2	Analog Green	
C3	Analog Blue	
C4	Analog Hsync	
C5	Analog Ground	

The DVI cables recommended for NUM must be used in order to ensure trouble-free operation.

9.8.6.1 DVI-D interface configuration



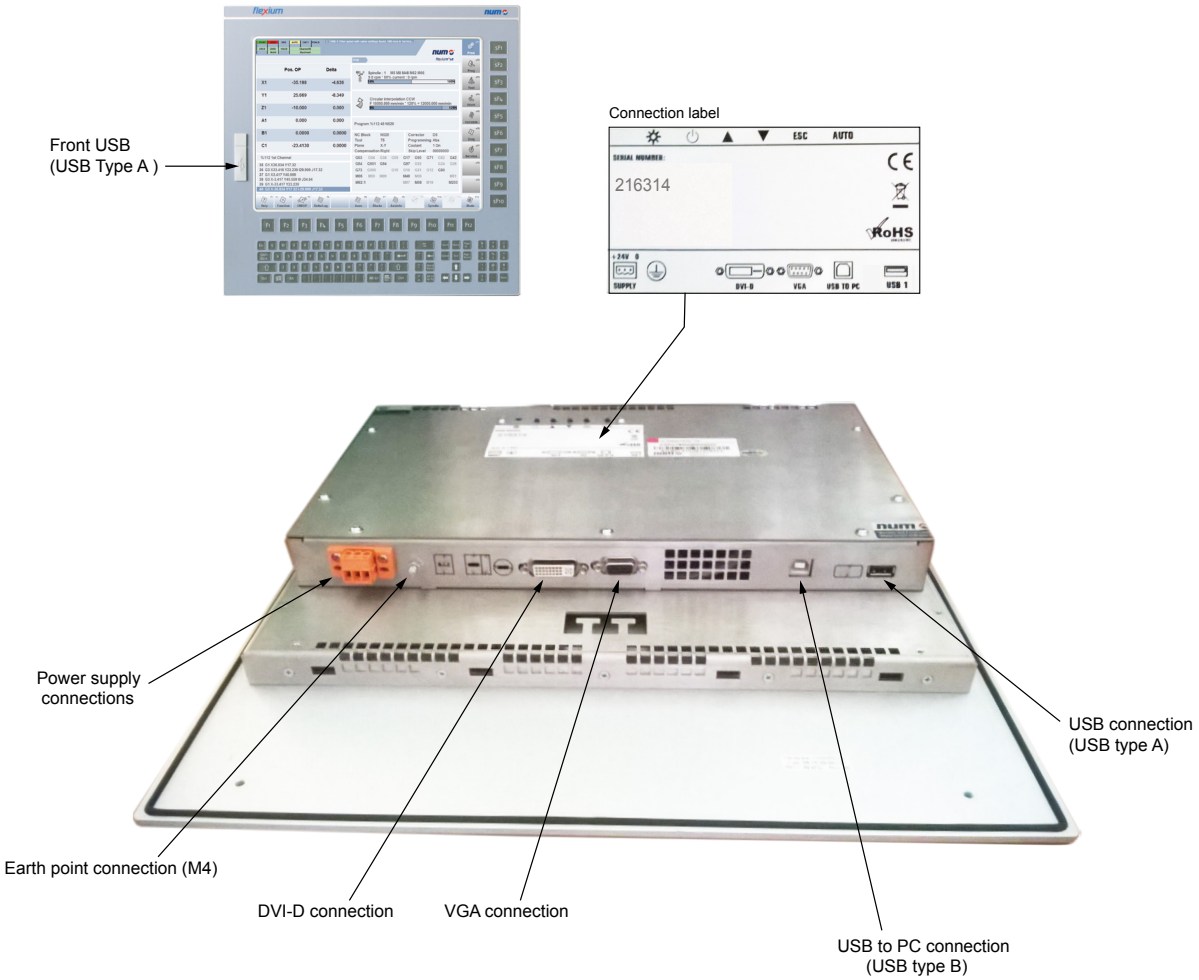
9.8.7 VGA Video connection

The video interface is PC compatible.
Cables connected to the video interface must be routed separately from low-voltage cables.

Connector	Type	Description
VGA	Sub D HD 15 pins F	Video interface PC compatible
Note. It is mandatory to use a shielded cable for interference-free operation.		

9.9 FS153 Passive panels connections

9.9.1 FS153 general lay-out connectors



The panel connections are available as indicated in the following pages.

9.9.2 Connecting the power supply

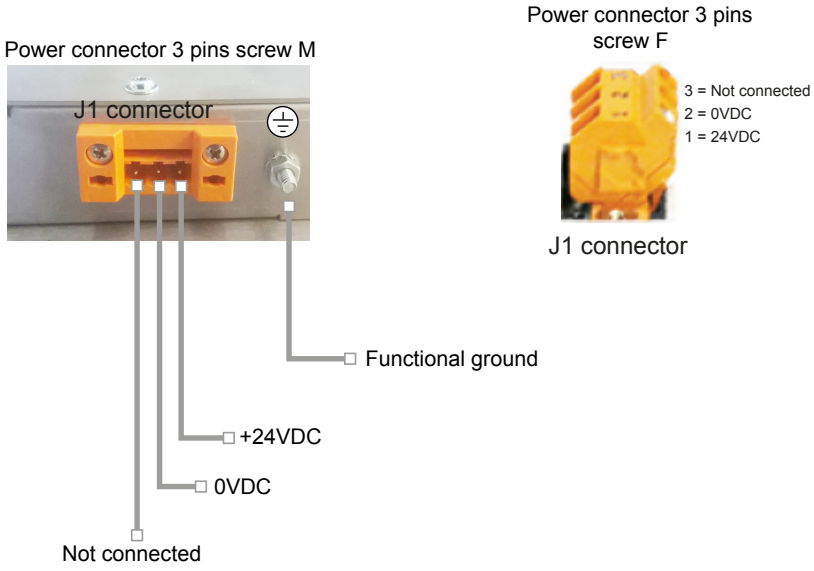
The FS153 Panel is a device compliant with protection class 3.
The system must be fed with an SELV 24VDC (safety extra-low voltage) supply by the customer.
The maximum breaking capacity of the fuse must be observed.

The power supply is not electrically isolated. The 0V terminal is directly connected to the housing potential. The power supply is fuse protected.
The device is protected against reverse polarity, however, operation is only possible when the device is connected correctly.

The connection should be made as follows:
- The cross-section of the power supply cable must be between 0.75mm² and 1.5mm².
- A lead or wire can be used for the connection
- The current consumption must be taken into account for the power supply. (See chapter 4)
- The functional ground is not compulsory for operation. It may help to prevent interference and potential differences.
- The two connection cables must be attached to each other close to the plug in order to ensure a safe connection. (see below)

The plug connector (socket strip with screw terminals) for the terminal is supplied with the device.
We recommend that the FS153 Panel is grounded in order to prevent interference. This can either be implemented with the shield for the power supply or by using a ground connection on the grounding bolt.

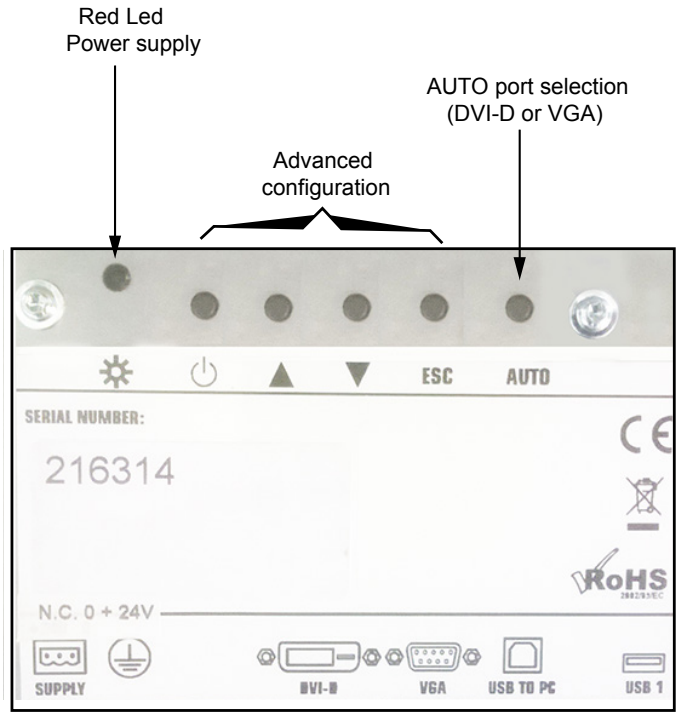
Designation	Function
+24VDC	24VDC SELV, safety extra low voltage. Protection class III / 4A.
-	Reserved
0V	0V power supply
Voltage range	24VDC +20% -15% supplied by the customer.



STOP

If the polarity is reversed and a 0V connection is added at the same time, the leakage current will flow across this 0V connection. The FS153 Panel or external components may be destroyed if the housing is not properly connected to the 0V potential.
The two connection cables must be attached to each other close to the plug in order to ensure a safe connection.The relevant national regulations must be observed when connecting the FS153 Panel.

9.9.3 FS153 configuration



9.9.4 USB connections type A

The FS153 provides 2 USB interfaces PC compatible one in the rear side of the panel and one more into the front keyboard panel side. Pay attention USB are 2 if the panel has no touch screen option. Cables connected to the USB interface must be routed separately from low-voltage cables.

Connector	Type	Description
USB x1 (Front)	USB port	The USB Type A front connection can be used to connect additional peripherie as keyboard, mouse, memorystick etc.
USB x1 or 2 (Rear)		The USB Type A connection are for peripherie (keyboard, mouse Memorystick etc.). 1 x USB Type A in case of touch version.
Note. It is mandatory to use a shielded cable for interference-free operation.		

9.9.5 USB connections type B

The FS153 provides 1 USB tye B interface in the rear side of the panel and one more into the front keyboard panel side and is used to connect the panel to the PC.
Cables connected to the USB interface must be routed separately from low-voltage cables.

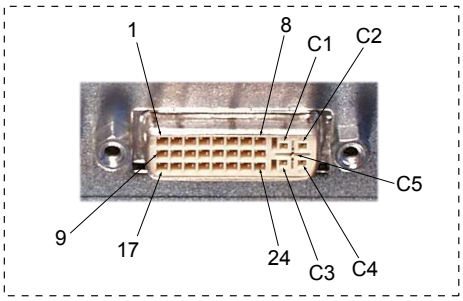
Take care by elongating the USB connection from the panel to the PC.
The maxiumum permissible cable connection length is 5m.
The panel contains a four port USB-Hub (front USB, front keyboard and the two at the rear side. Only a few KVM (Keyboard/Video/Mouse) switch units are able to transfer USB signals from a hub.

9.9.6 DVI-D interface connections

A standard DVI cable is used to connect the DVI interface of the FS153 Panel to a Compact PC or the DVI interface of a standard PC.

The video transfer is carried out differentially in (Transition Minimized Digital Signalling).
The video interface is compliant with the Single Link DVI-D Standard. For practical reasons, a DVI-I connector was fitted, however, the analog inputs do not have any function.

DVI connector



Pin No	Signal	Description
1, 2	RX2- / RX2+	TMDS Data 2- Input / TMDS Data 2+ Input
3	RX2/RX4 shield	TMDS shield for Data 2 & 4
4, 5	RX4- / RX4+	Not connected internally
6, 7	DDC Clock / DDC Data	Digital Data Channel Clock Input / Digital Data Channel Data I/O
8	Analog Vsync	Not connected internally
9, 10	RX1- / RX1+	TMDS Data 1- Input / TMDS Data 1+ Input
11	RX1/RX3 shield	TMDS shield for Data 1 & 3
12, 13	RX3- / RX3+	Not connected internally
14	+5 V	+5V for DDC
15	TTL Ground	-
16	HPD	Hot Plug Detect
17, 18	RX0- / RX0+	TMDS receive 0- / TMDS receive 0+
19	RX0/RX5 shield	TMDS shield for Data 0 & 5
20, 21	RX5- / RX5+	Not connected internally
22	Clock shield	TMDS shield for Clock
23, 24	Clock+ / Clock-	TMDS Clock+ Input / TMDS Clock- Input
C1	Analog Red	Not internally connected
C2	Analog Green	
C3	Analog Blue	
C4	Analog Hsync	
C5	Analog Ground	

The DVI cables recommended for NUM must be used in order to ensure trouble-free operation.

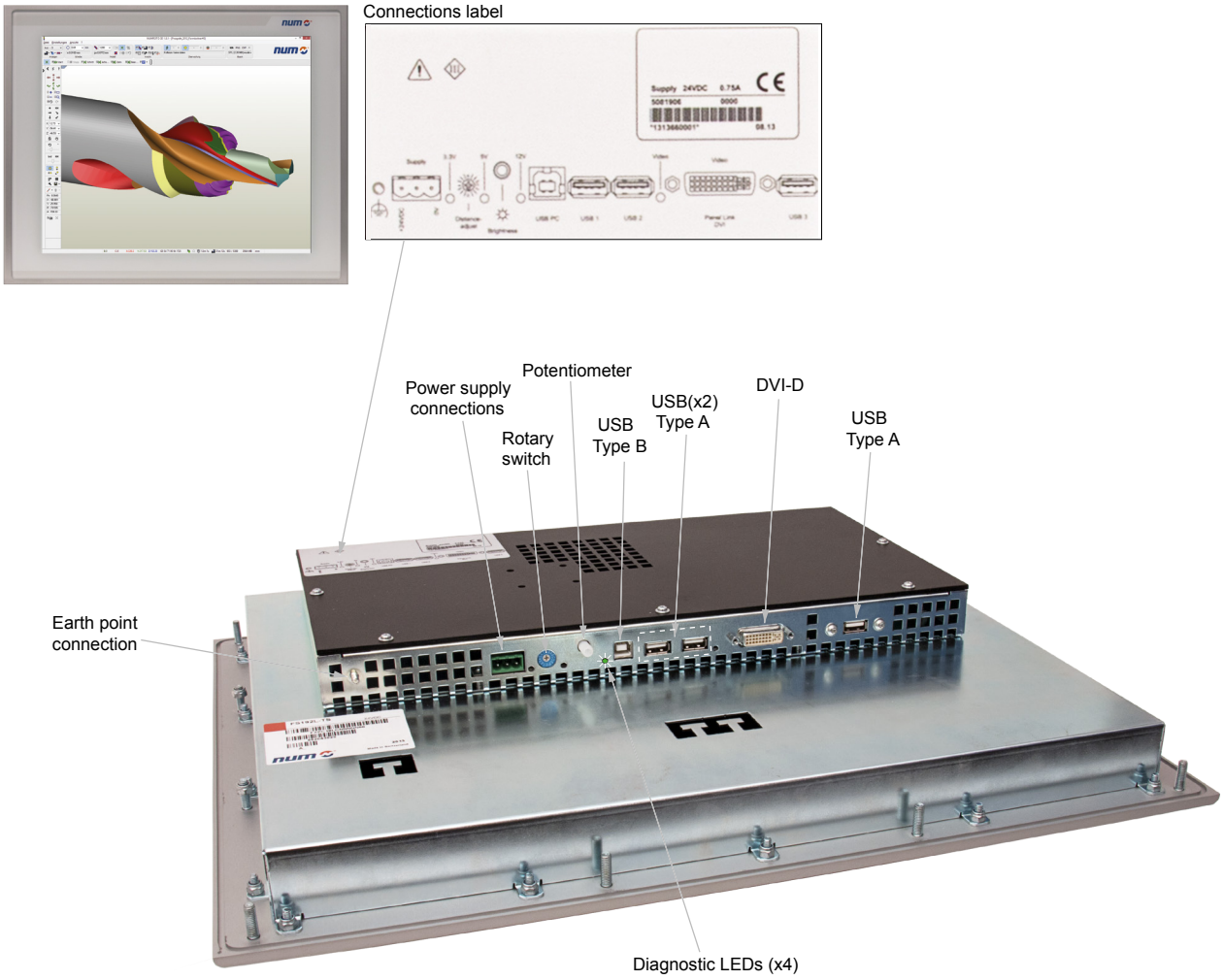
9.9.7 VGA Video connection

The video interface is PC compatible.
Cables connected to the video interface must be routed separately from low-voltage cables.

Connector	Type	Description
VGA	Sub D HD 15 pins F	Video interface PC compatible
Note. It is mandatory to use a shielded cable for interference-free operation.		

9.10 FS194L Passive panels connections

9.10.1 FS194L general lay-out connectors



The panel connections are available as indicated in the following pages.

9.10.2 Connecting the power supply

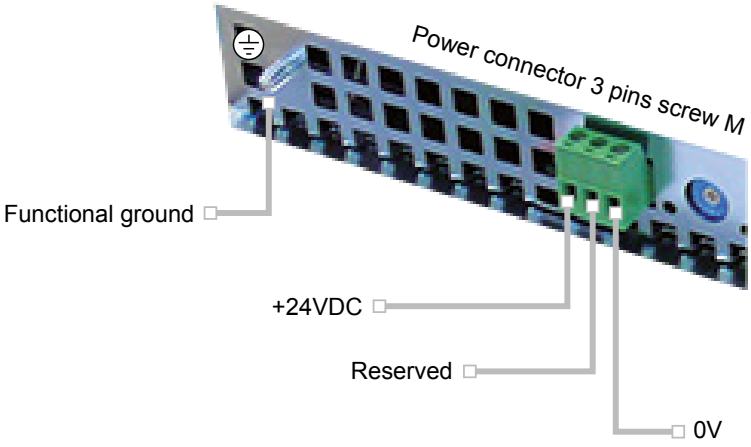
The FS194L Panel is a device compliant with protection class 3.
The system must be fed with an SELV 24VDC (safety extra-low voltage) supply by the customer.
The maximum breaking capacity of the fuse must be observed.

The power supply is not electrically isolated. The 0V terminal is directly connected to the housing potential. The power supply is fuse protected.
The device is protected against reverse polarity, however, operation is only possible when the device is connected correctly.

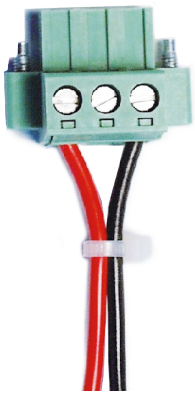
The connection should be made as follows:
- The cross-section of the power supply cable must be between 0.75mm² and 1.5mm².
- A lead or wire can be used for the connection
- The current consumption must be taken into account for the power supply. (See chapter 4)
- The functional ground is not compulsory for operation. It may help to prevent interference and potential differences.
- The two connection cables must be attached to each other close to the plug in order to ensure a safe connection. (see below)

The plug connector (socket strip with screw terminals) for the terminal is supplied with the device.
We recommend that the FS194L Panel is grounded in order to prevent interference. This can either be implemented with the shield for the power supply or by using a ground connection on the grounding bolt.

Designation	Function
+24VDC	24VDC SELV, safety extra low voltage. Protection class III / 4A.
-	Reserved
0V	0V power supply
Voltage range	24VDC +20% -15% supplied by the customer.



Power connector 3 pins screw F





If the polarity is reversed and a 0V connection is added at the same time, the leakage current will flow across this 0V connection. The FS194L Panel or external components may be destroyed if the housing is not properly connected to the 0V potential.
The two connection cables must be attached to each other close to the plug in order to ensure a safe connection.The relevant national regulations must be observed when connecting the FS194L Panel.

9.10.3 Rotary switch

The rotary switch can be used to adapt the FS194L Panel for operation with long or short cables in order to prevent quality losses due to the DVI cable being too long or too short.

Normally no faults occur when the switch is set to the factory setting (0).

However, cable that is too short may cause flickering. This can be eliminated by turning the rotary switch backwards.



- 0 corresponds to long cable (factory setting).
- F corresponds to short cable.

9.10.4 Potentiometer for backlight adjustment

The backlight of the display can be adjusted via potentiometer at the back side.

9.10.5 USB connections type A

The FS194L provides 3 USB interfaces PC compatible.
Cables connected to the USB interface must be routed separately from low-voltage cables.

Connector	Type	Description
USB x3 (Rear)	USB type A	The USB Type A connection can be used to connect additional peripherie as keyboard, mouse, memorystick etc.
Note. It is mandatory to use a shielded cable for interference-free operation.		

9.10.6 USB connections type B

The FS194L provides 1 USB tye B interface in the rear side of the panel and it is used to connect the panel to the PC.
Cables connected to the USB interface must be routed separately from low-voltage cables.



Take care by elongating the USB connection from the panel to the PC. The maxiumum permissible cable connection length is 5m.
The panel contains a four port USB-Hub (front USB, front keyboard and the two at the rear side. Only a few KVM (Keyboard/Video/Mouse) switch units are able to transfer USB signals from a hub.

9.10.7 Diagnostic LEDs

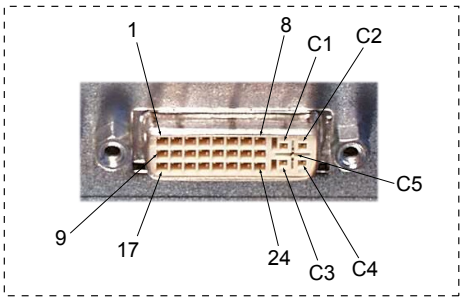
Four diagnostic LEDs show the correct panel voltage and video control.

9.10.8 DVI-D interface connections

A standard DVI cable is used to connect the DVI interface of the FS122 Panel to a Compact PC or the DVI interface of a standard PC.

The video transfer is carried out differentially in (Transition Minimized Digital Signalling).
The video interface is compliant with the Single Link DVI-D Standard. For practical reasons, a DVI-I connector was fitted, however, the analog inputs do not have any function.

DVI connector

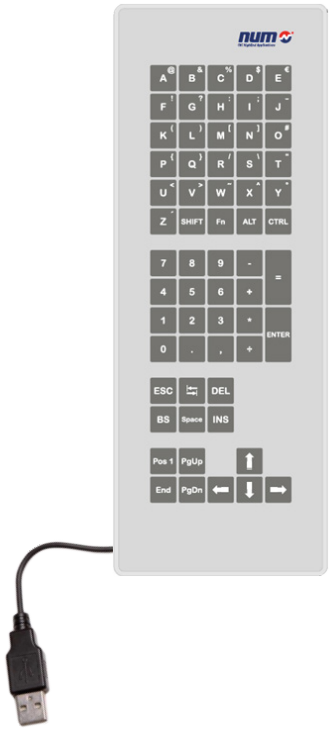


Pin No	Signal	Description
1, 2	RX2- / RX2+	TMDS Data 2- Input / TMDS Data 2+ Input
3	RX2/RX4 shield	TMDS shield for Data 2 & 4
4, 5	RX4- / RX4+	Not connected internally
6, 7	DDC Clock / DDC Data	Digital Data Channel Clock Input / Digital Data Channel Data I/O
8	Analog Vsync	Not connected internally
9, 10	RX1- / RX1+	TMDS Data 1- Input / TMDS Data 1+ Input
11	RX1/RX3 shield	TMDS shield for Data 1 & 3
12, 13	RX3- / RX3+	Not connected internally
14	+5 V	+5V for DDC
15	TTL Ground	-
16	HPD	Hot Plug Detect
17, 18	RX0- / RX0+	TMDS receive 0- / TMDS receive 0+
19	RX0/RX5 shield	TMDS shield for Data 0 & 5
20, 21	RX5- / RX5+	Not connected internally
22	Clock shield	TMDS shield for Clock
23, 24	Clock+ / Clock-	TMDS Clock+ Input / TMDS Clock- Input
C1	Analog Red	Not internally connected
C2	Analog Green	
C3	Analog Blue	
C4	Analog Hsync	
C5	Analog Ground	

The DVI cables recommended for NUM must be used in order to ensure trouble-free operation.

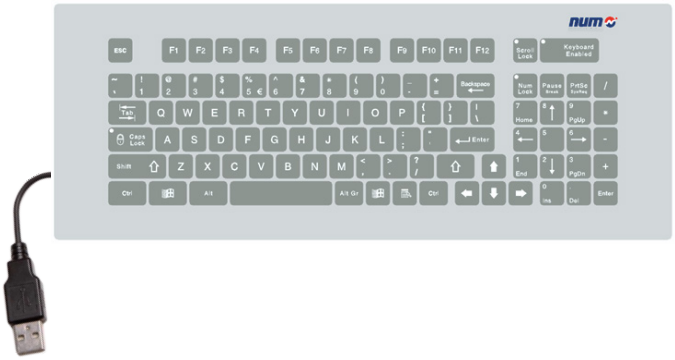
9.11 USB QWERTY keyboards connections

Verical USB QWERTY keyboard FXHE000248



Connect to USB port type A

Horizontal USB QWERTY keyboard FXHE000249

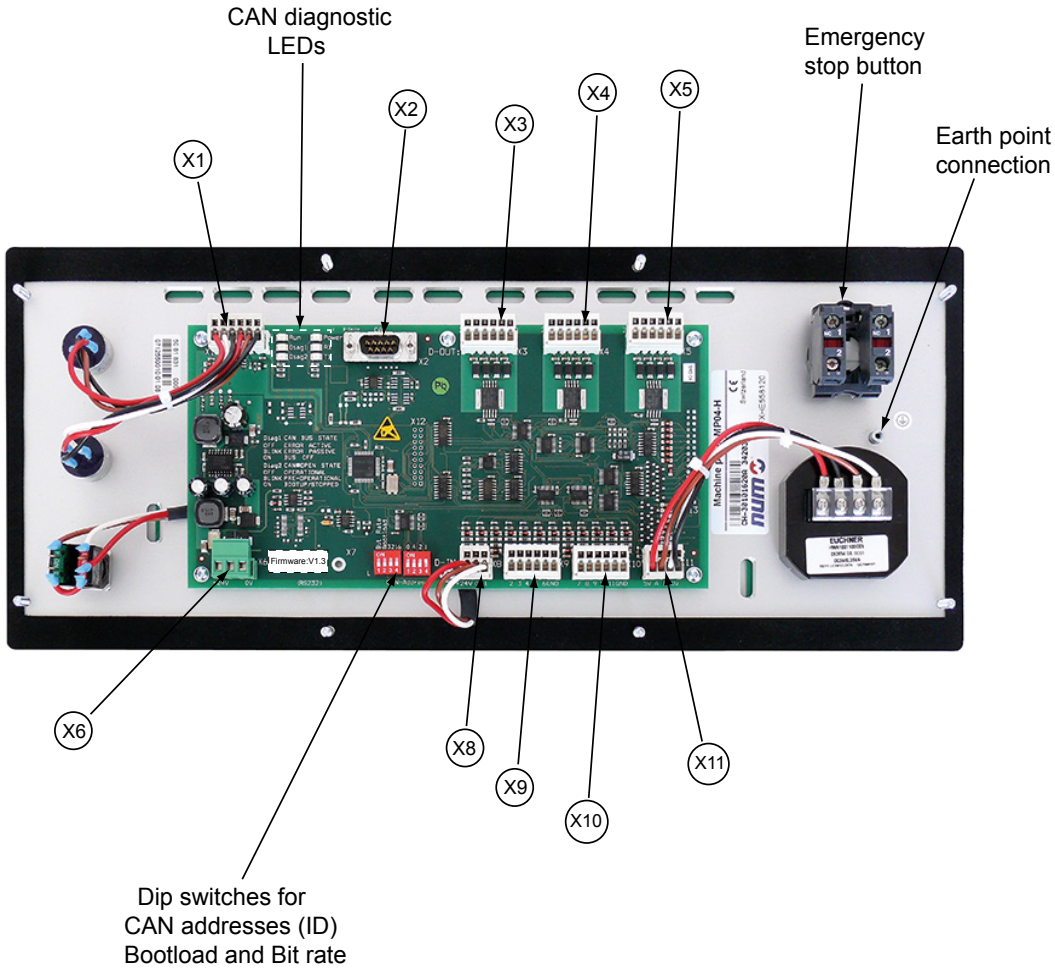


Connect to USB port type A

The keyboards must be connected directly to the USB type A port.

9.12 MP04 Machine panel connections

9.12.1 MP04 general lay-out connectors



The panel connections are available as indicated in the following pages.

9.12.2 Connecting the power supply (X6)

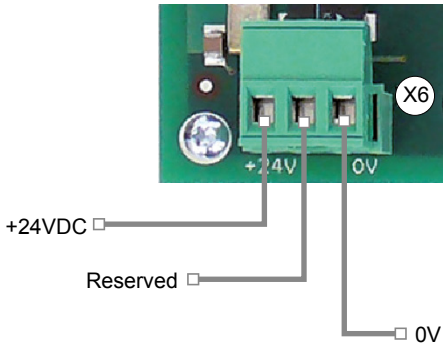
The MP04-W / MP04-H is a device compliant with protection class 3.
The system must be fed with an SELV 24VDC (safety extra-low voltage) supply.

The power supply is not electrically isolated. The 0V terminal is directly connected to the housing potential. A self-resettable fuse and a safety diode protects the power supply.

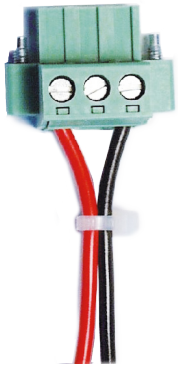
The relevant national regulations must be observed when connecting the MP04.

The connection should be made as follows:
- The cross-section of the power supply cable must be between 0.75mm² and 1.5mm².
- The current consumption must be taken into account for the power supply. (See chapter 5)
- The 0V pin is directly connected to the housing potential.
- The two connection cables must be attached to each other close to the plug in order to ensure a safe connection. (see below)

Power connector 3 pins screw M



Power connector 3 pins screw F



The plug connector (socket strip with screw terminals) for the terminal is supplied with the device. The two connection cables must be attached to each other close to the plug in order to ensure a safe connection.

Designation	Function
+24VDC	+24VDC power supply
-	reserved
0V	0V power supply

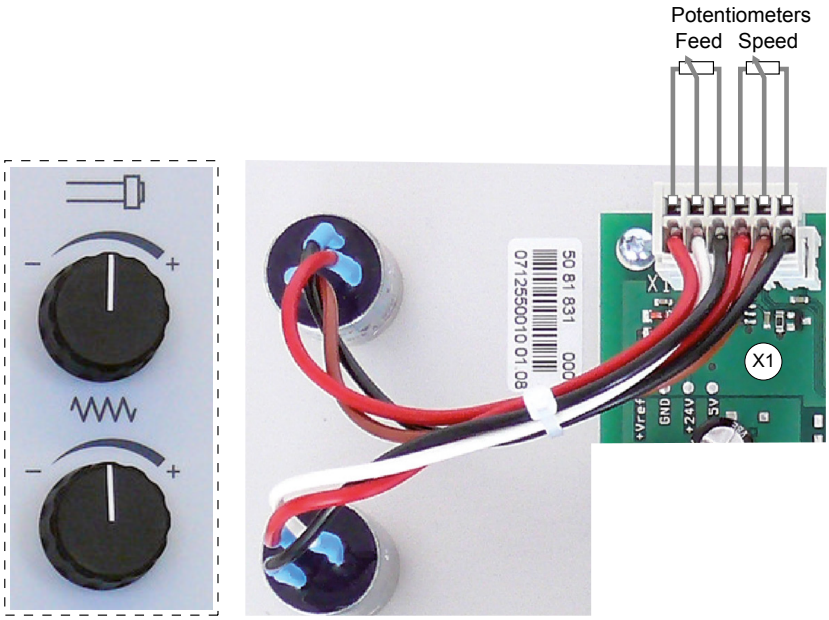


A self-resetting fuse provides short-circuit protection. After waiting a few minutes to cool the fuse, it will be reset and the MP04 is again ready to run.

If the polarity is reversed a safety diode in the power supply prevents a damage to the power supply.

9.12.3 Spindle speed and feed rate override potentiometer connections (X1)

This interface is for 10kOhm potentiometers. The voltage is 2.5VDC, the resolution 10Bit.

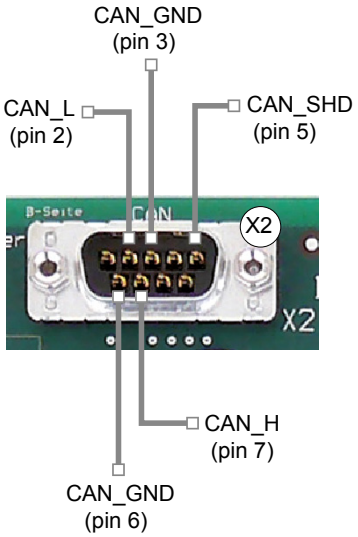


STOP It's not allowed to connect other than 10kOhm potentiometers on this interface. For more detailed information upon the Potentiometers to PLC configuration please refer to Flexium Commissioning manual M00010.

9.12.4 CAN interface (X2)

This is a standard CAN interface. To connect the CAN cable it is mandatory to use a special CAN plug with bus termination resistance included. The bus termination must only be activated at both ends of the CAN bus. The pin assignment is as followed:

Pin	Function
1	-
2	CAN_L (Low)
3	CAN_GND
4	-
5	CAN_SHD (SHIELD)
6	CAN_GND
7	CAN_H (High)
8	-
9	-



STOP It is mandatory to use a special CAN cable (Device Net cable) and CAN plugs for interference - free operation. The cable and different plugs are available at NUM.

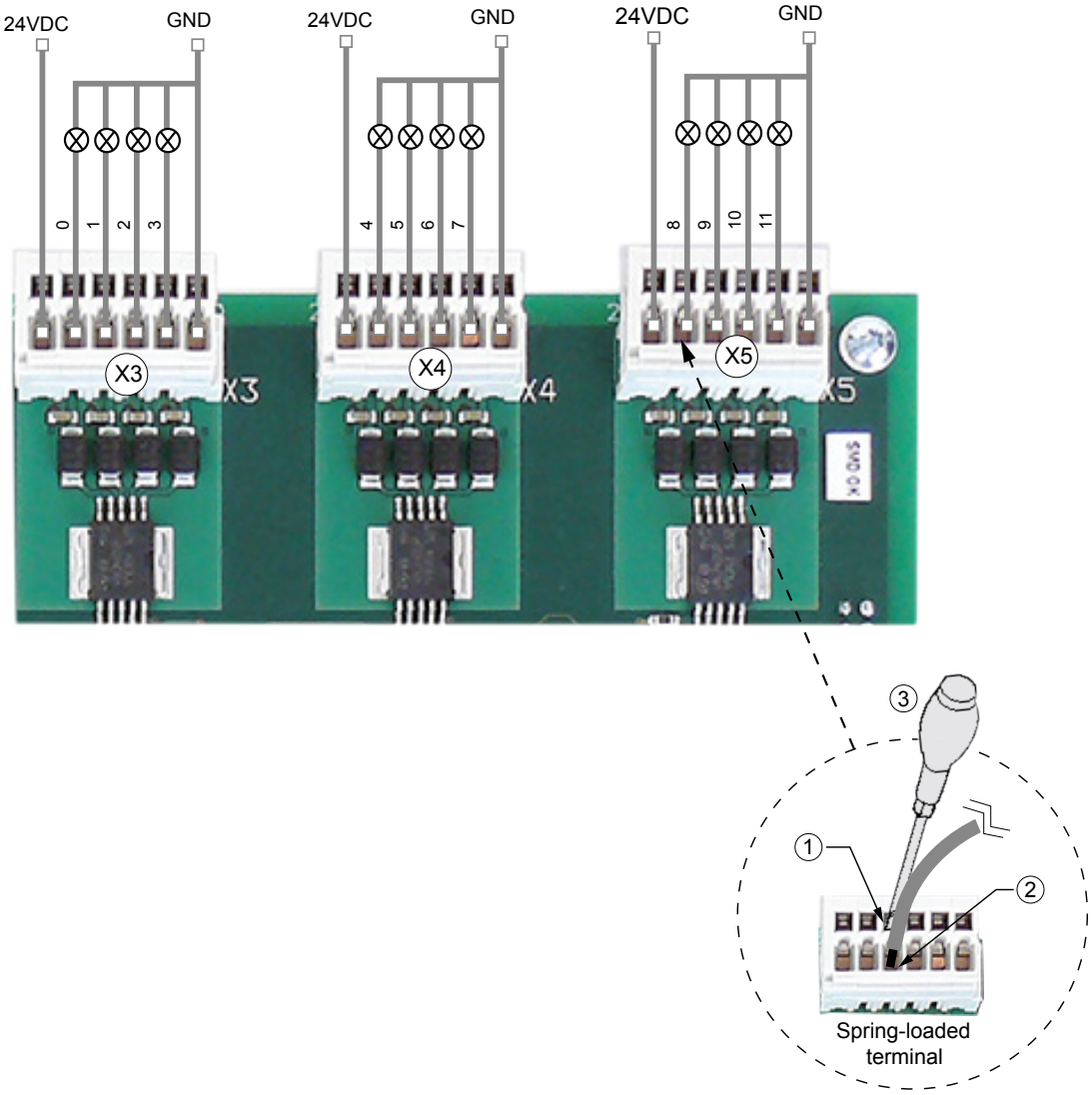
9.12.5 Digital outputs connections (X3, X4, X5)

12 digital outputs are available. Each group needs a separate infeed (24VDC) and return path (GND)

Cable connection

1. Open a spring-loaded terminal by slightly pushing with a screwdriver or a rod into the square opening above the terminal.
2. The wire can now be inserted into the round terminal opening without any force.
3. The terminal closes automatically when the pressure is released, holding the wire safely and permanently.

Cable supplied by the customer	
Wire cross section	0.08 ... 1.5mm²
Strip length	8 ...9mm



STOP

Take care that only 100mA are used per output.
For more detailed information upon the Digital outputs to PLC configuration please refer to Flexium Commissioning manual M00010.

9.12.6 Emergency stop button

You need to connect the emergency stop directly into the two channel emergency circuit.
The two contacts are normally closed.

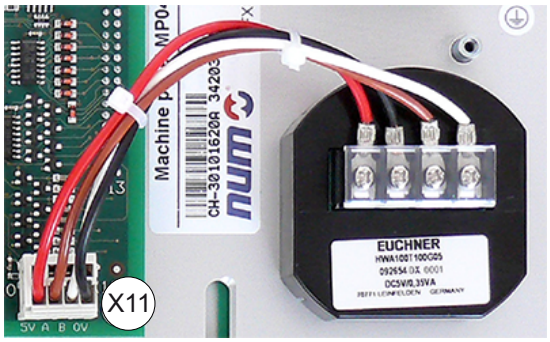




9.12.7 Handwheel connections (X11)

This interface is for a 5VDC handwheel with A & B push-pull scanning signal.
The max allowed power is 100mA.





STOP

Take care that only 5VDC and 100mA are used for the handwheel.
For more detailed information upon the Handwheel to PLC configuration please refer to Flexium Commissioning manual M00010.

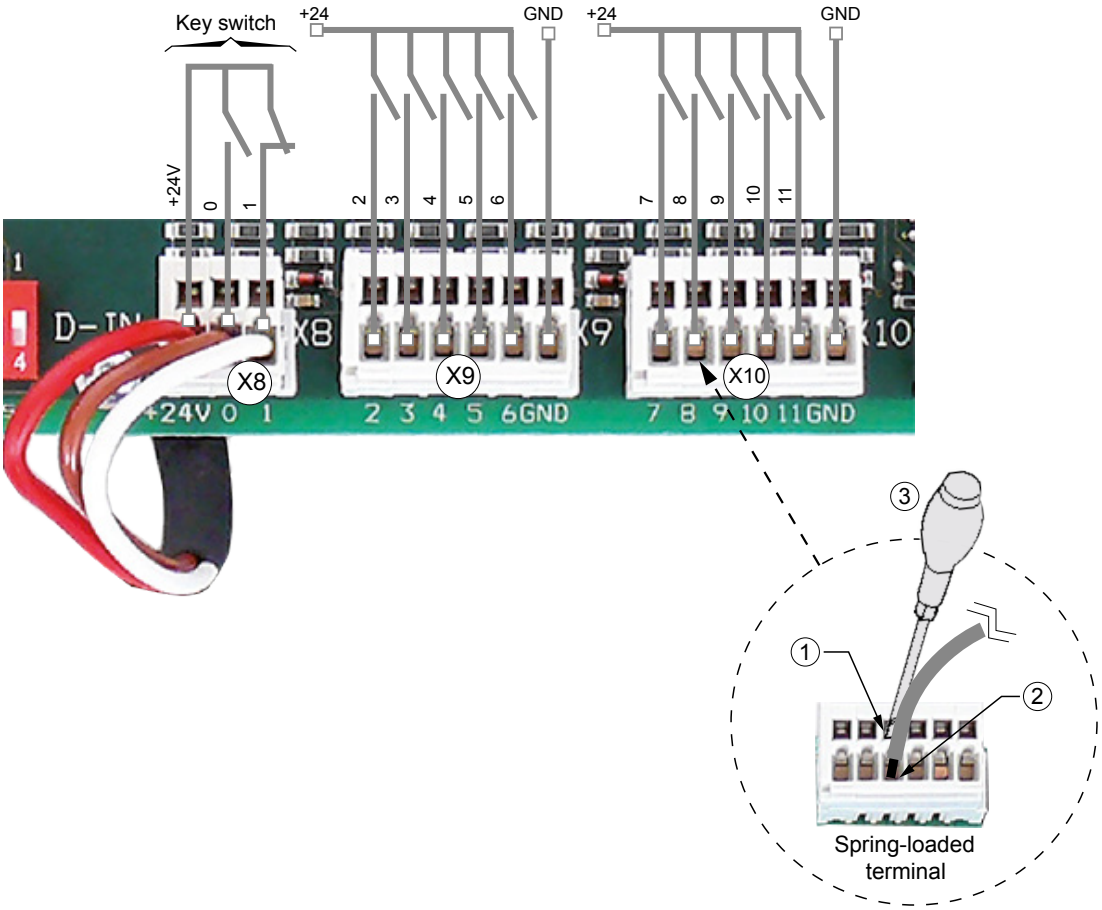
9.12.8 Digital inputs connections (X9, X10) and Key switch connections

12 digital inputs are available. Each group needs a separate infeed (24VDC) and return path (GND).

Cable connection

1. Open a spring-loaded terminal by slightly pushing with a screwdriver or a rod into the square opening above the terminal.
2. The wire can now be inserted into the round terminal opening without any force.
3. The terminal closes automatically when the pressure is released, holding the wire safely and permanently.

Cable supplied by the customer	
Wire cross section	0.08 ... 1.5mm²
Strip length	8 ...9mm



STOP

The inputs DI0 and DI1 are reserved for the key switch.
For more detailed information upon the Digital input to PLC configuration please refer to Flexium Commissioning manual M00010.

9.12.9 Dip Switches setting (CAN address)

The explanation from the left to the right:

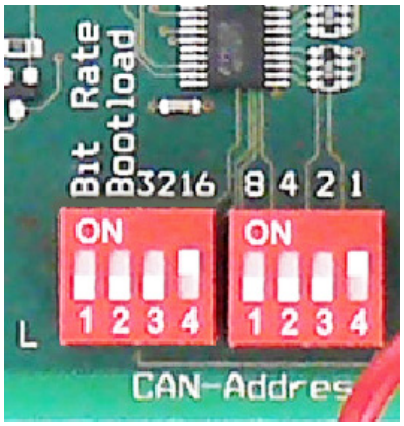
Block	Description	Position down (OFF)	Position up (ON)
Left	Bit rate	125 kBit	500 kBit
Left	Bootload	OFF	ON
Left	Address 32	OFF	ON
Left	Address 16	OFF	ON
Right	Address 8	OFF	ON
Right	Address 4	OFF	ON
Right	Address 2	OFF	ON
Right	Address 1	OFF	ON

Two bit rates are possible with the MP04 (125k and 500k Bit). The switch “Bootload” is to load a new firmware. It must be on position down (OFF) during normal operation.

The CAN address can be set between 1 and 64 (Pos 0 = CAN address 64).

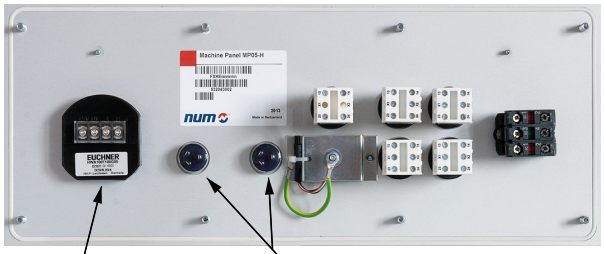
Example: Bus addresse 36

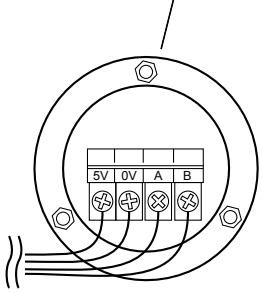
Bit rate	Bootload	32	16	8	4	2	1
X	OFF	ON	OFF	OFF	ON	OFF	OFF



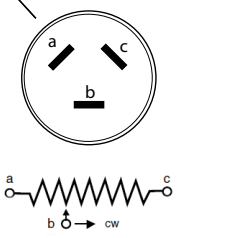
9.13 MP05 Machine panel connections







Handwheel connections



Potentiometers connections

Emergency stop button



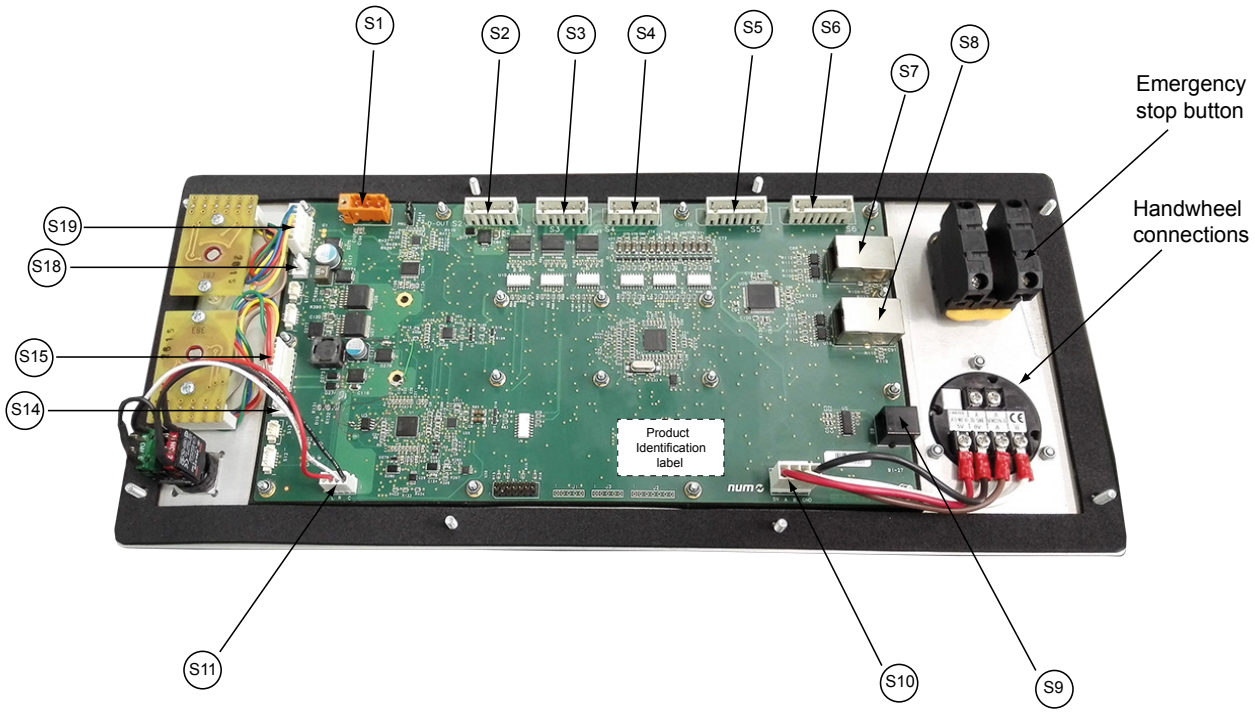


Connect the emergency stop directly into the two channel emergency circuit. The two contacts are normally closed.

MP05 connections and button configurations are supplied by the customer. The panel is not connected by a bus. All contacts and potentiometers terminals must be linked to PLC I/Os.

9.14 MP06 Machine panel connections

9.14.1 MP06 general lay-out connectors



The panel connections are available as indicated in the following pages.

9.14.2 Connecting the power supply (S1)

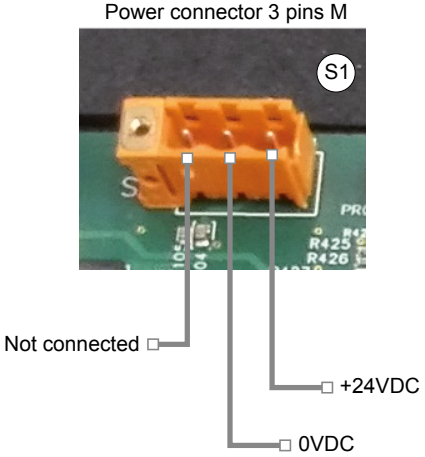
The MP06 is a device compliant with protection class 3.
The system must be fed with an SELV 24VDC (safety extra-low voltage) supply.

The power supply is not electrically isolated. The GND terminal is directly connected to the housing potential. A self-resettable fuse and a safety diode protects the power supply.

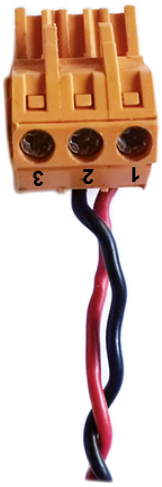
The relevant national regulations must be observed when connecting the MP06.

The connection should be made as follows:
- The cross-section of the power supply cable must be between 0.75mm² and 1.5mm².
- The current consumption must be taken into account for the power supply. (See chapter 5)
- The 0V pin is directly connected to the housing potential.
- The two connection cables must be attached to each other close to the plug in order to ensure a safe connection. (see below)

Power connector 3 pins M



Power connector 3 pins screw F





A self-resetting fuse provides short-circuit protection. After waiting a few minutes to cool the fuse, it will be reset and the MP06 is again ready to run.

If the polarity is reversed a safety diode in the power supply prevents a damage to the power supply.

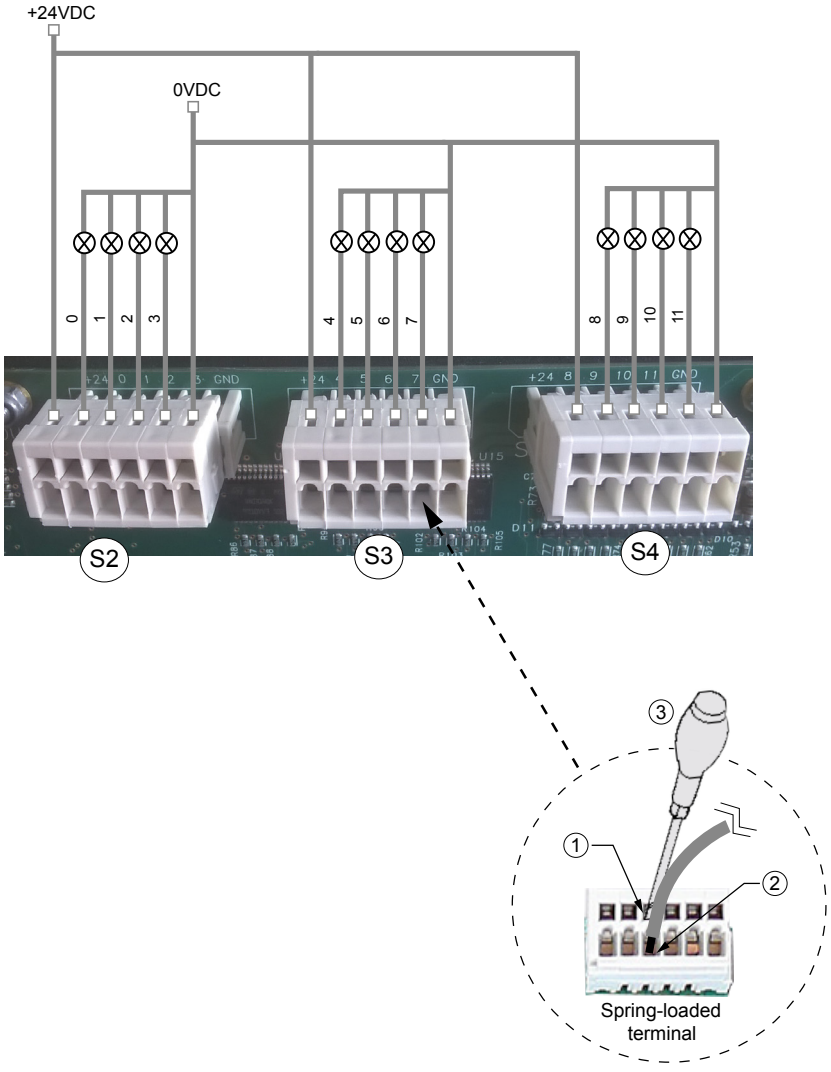
9.14.3 Digital outputs connections (S2, S3, S4)

12 digital outputs are available. Each group needs a separate infeed (+24VDC) and return path (0VDC).

Cable connection

1. Open a spring-loaded terminal by slightly pushing with a screwdriver or a rod into the square opening above the terminal.
2. The wire can now be inserted into the round terminal opening without any force.
3. The terminal closes automatically when the pressure is released, holding the wire safely and permanently.

Cable supplied by the customer	
Wire cross section	0.08 ... 1.5mm²
Strip length	8 ...9mm



STOP Each output cannot provide more than 500mA.

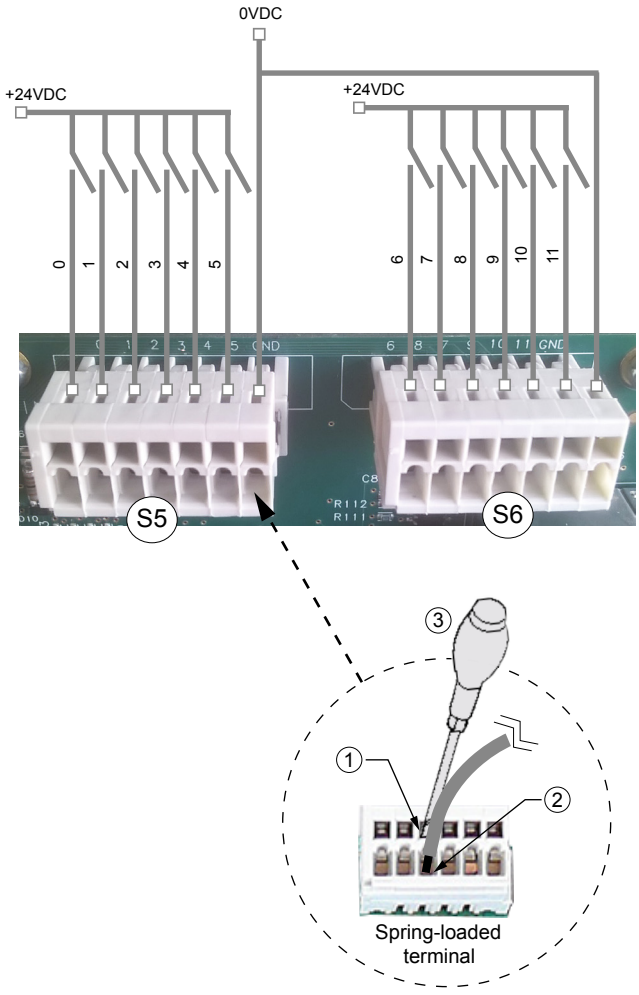
9.14.4 Digital inputs connections (S5, S6) connections

12 digital inputs are available. Each group needs a separate infeed (+24VDC) and return path (0VDC).

Cable connection

1. Open a spring-loaded terminal by slightly pushing with a screwdriver or a rod into the square opening above the terminal.
2. The wire can now be inserted into the round terminal opening without any force.
3. The terminal closes automatically when the pressure is released, holding the wire safely and permanently.

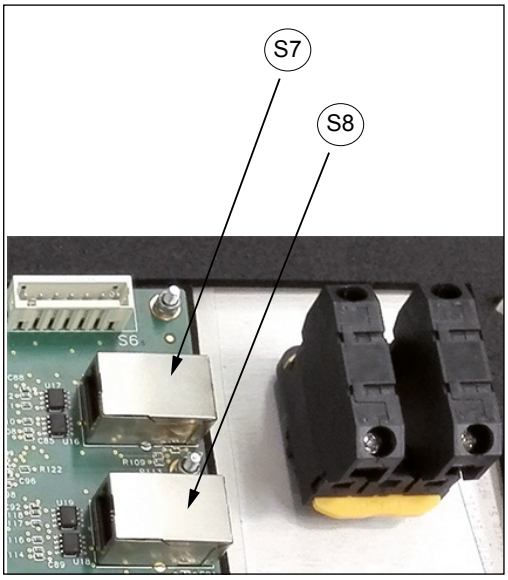
Cable supplied by the customer	
Wire cross section	0.08 ... 1.5mm^2
Strip length	8 ...9mm



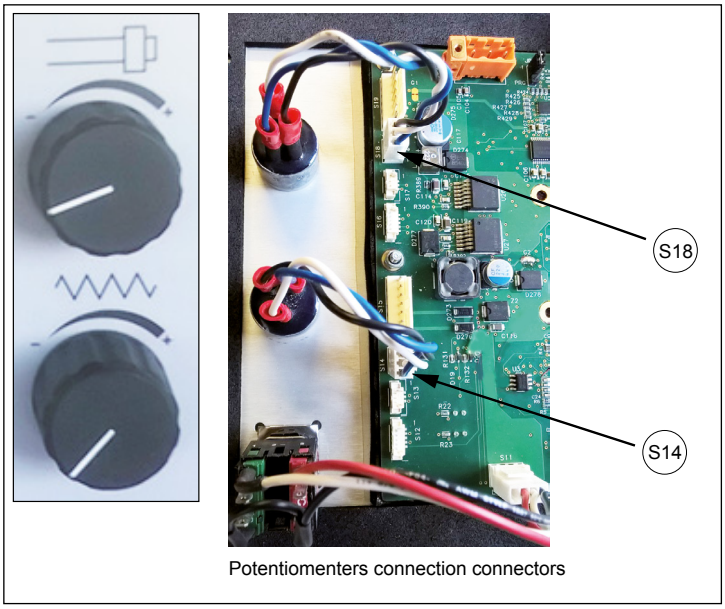
9.14.5 EtherCAT connection (S7 IN / S8 OUT)

This is a standard EtherCAT interface.
To connect the EtherCAT cable it is mandatory to use the NUM cable FXHC18104x .

S7 / S8 Diagnostic LEDs	
Green LED: LinkAct Led	
OFF	No link
Blinking	Link and activity
ON	Link without activity
Orange LED PERR(x) port error	
Port receive error indicators PERR(x), displays physical layer RX errors. The PERR(x) LEDs flash once if a physical layer RX error occurs.	

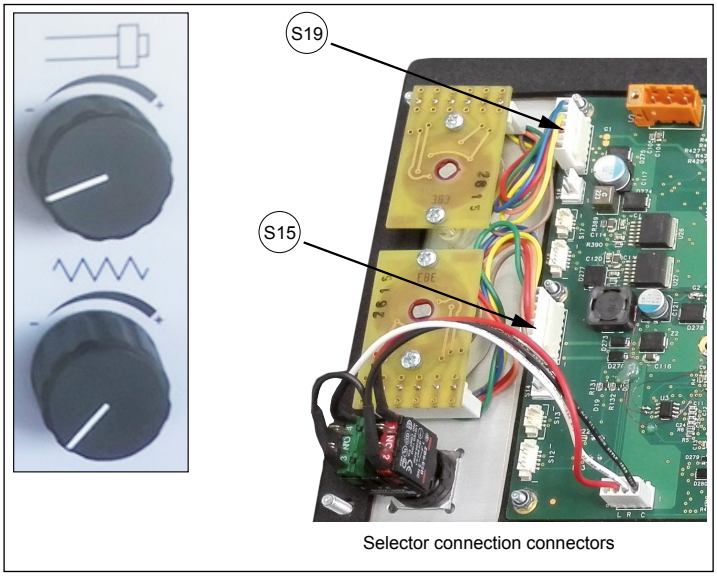


9.14.6 Spindle speed and feed rate override potentiometer connections (S14 / S18)



Potentiomenters connection connectors

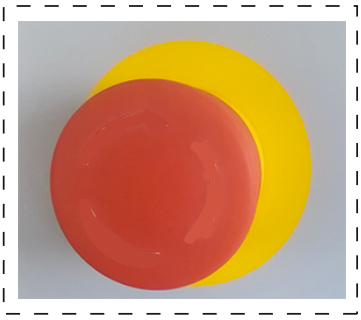
9.14.7 Spindle speed and feed rate override selector connections (S15 / S19)

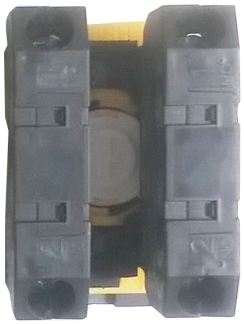


Selector connection connectors

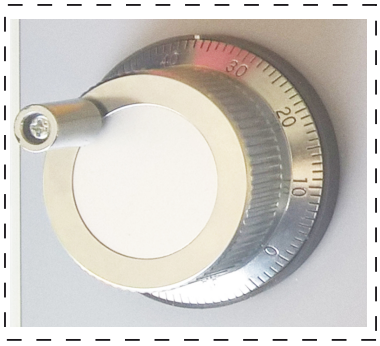
9.14.8 Emergency stop button

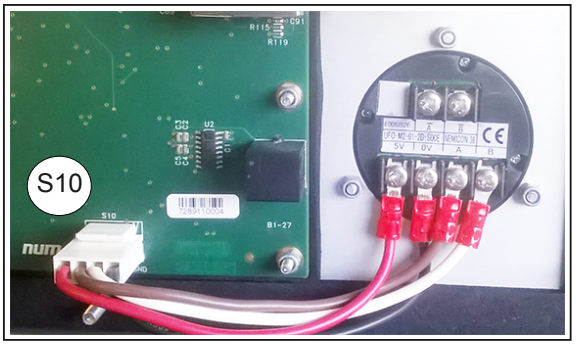
You need to connect the emergency stop directly into the two channel emergency circuit. The two contacts are normally closed. (24V/8A resistive load or 24V/4A inductive load)





9.14.9 Handwheel connections (S10)





9.14.10 MP06 to PLC configuration



For MP06 to PLC configuration please refer to Flexium+ Commissioning manual M00044.

9.14.11 Disposal

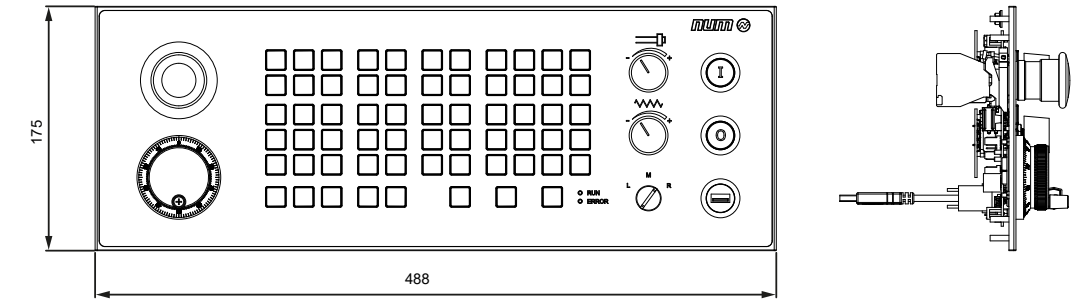
MP06 no longer in use must be properly disposed of or must be returned to the manufacturer for disposal. (Manufacturer address see list of NUM agencies on chapter 1)

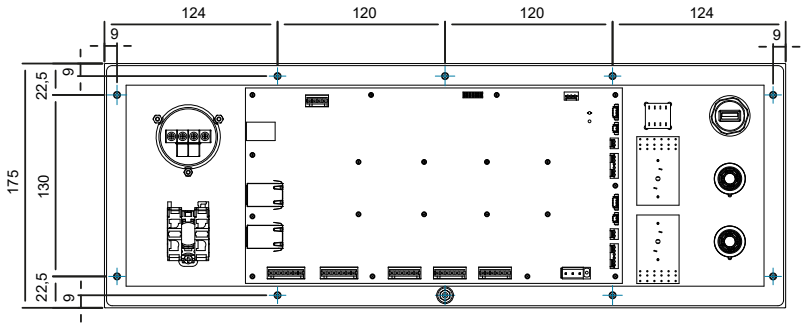
9.15 MP07 Panel connections

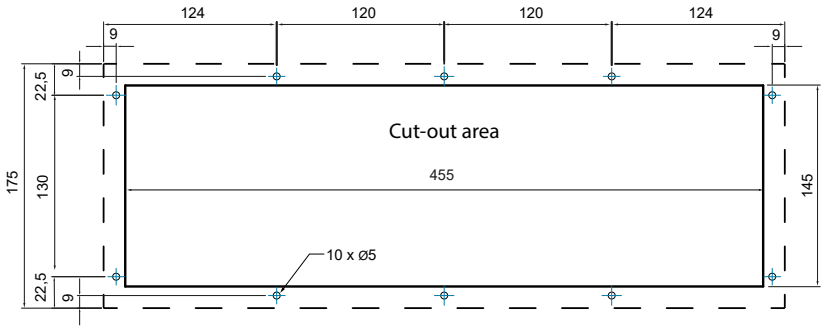
MP07 connections are identical to those of MP06. The dimensions are adapted to the FS184i operator's panel.

Relative to MP06, MP07 provides an USB extender plug and two cap mounted homes where standard pushbuttons can be fitted

9.15.1 Outlines and cut out







Tolerance of the cut-out: +0/-1mm

9.16 MP08 Machine panel connections



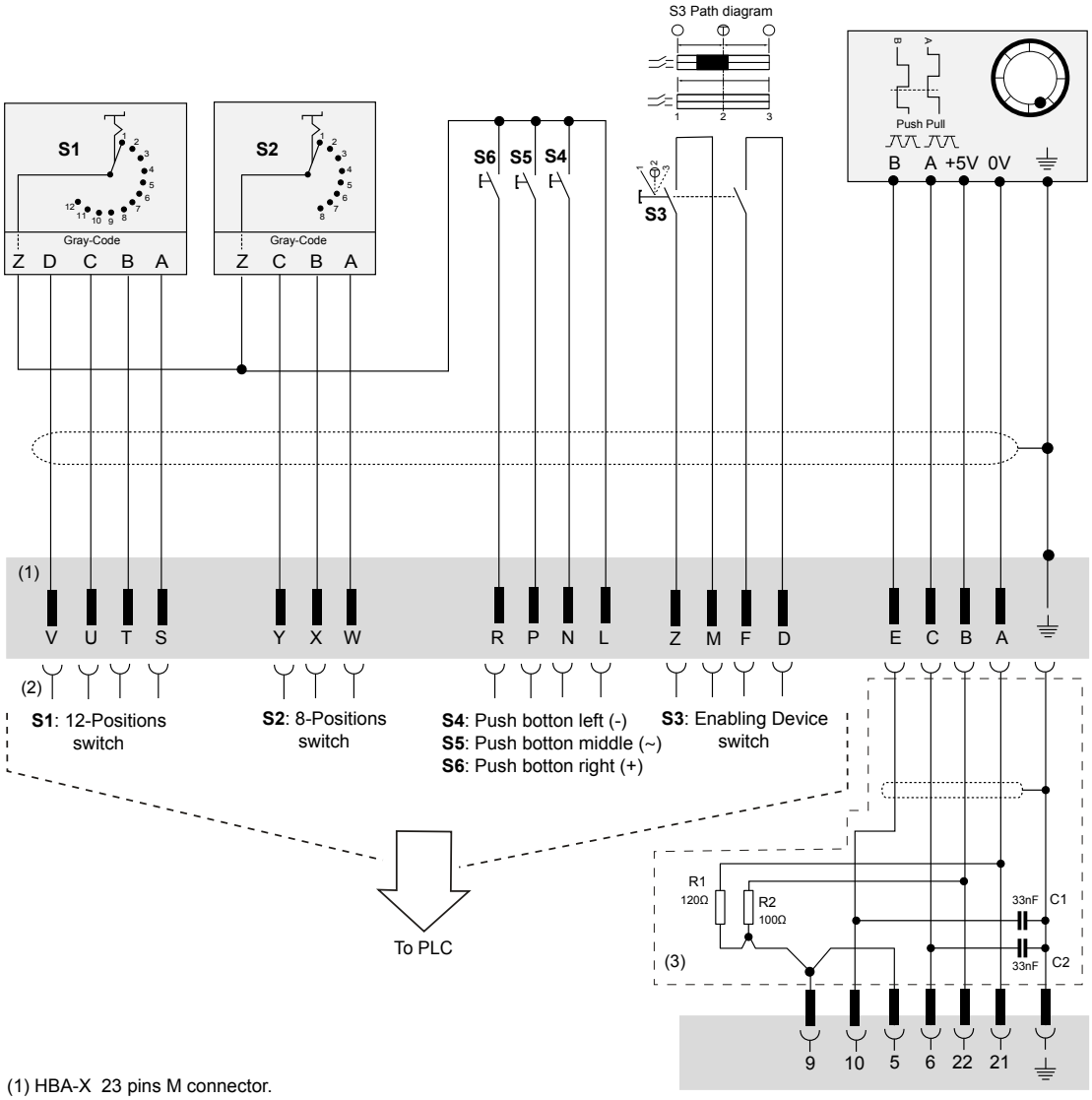
MP08 and MP06 connections are identical except that MP08 does not feature Handwhell nor Emergency stop buttons Please refer previous pages “MP06 connections” for detailed information upon the panel connections. (Handwheel and Emergency stop button not present in the panel)

9.17 HBA-X handwheel connections

9.17.1 HBA-Xc (5V) handwheel connections

The HBA-Xc portable handwheel can be connected directly to the NCK using X11 or X12 connector as indicated in the diagram below or can be connected to a PLC counter module CTMT5101 via EtherCAT fieldbus.

The Enabling Device button has to be wired directly into the security circuit of the manual mode as indicated in the connection diagram on chapter 9.3.



(1) HBA-X 23 pins M connector.
(2) Socket for HBA-X 23 pins F connector code FXHE181310.
(3) Customer assembly material:
- Cable type 2x0.14mm² + 2x0.15mm²
- 2 Resistances: R1, R2 (1/4W)
- 2 Capacitor: C1, C2.

For the Gray-Code table selection and CTMT informations please refer to the next page.

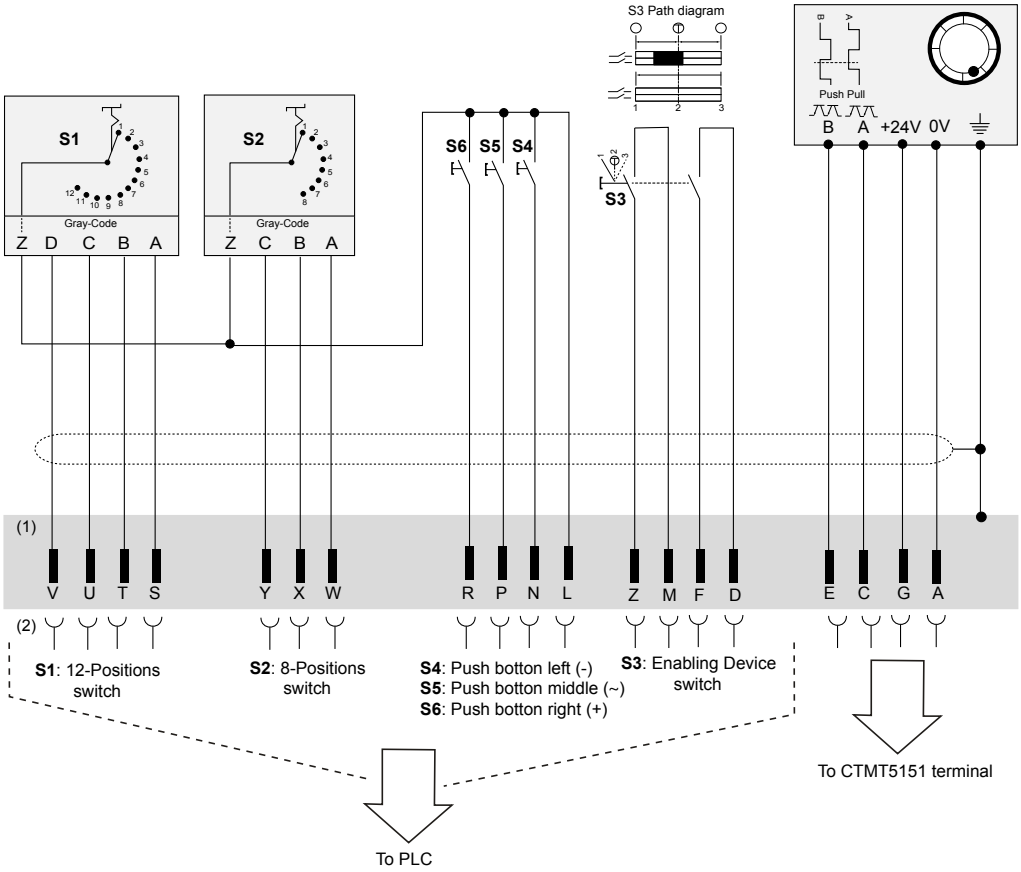
For the second handwheel connection over the NCK X11/X12 connectors see the table here under and also refer to chapter 9.3.

XBA-X connector	NCK X11/X12 connector
Pin C	Pin 13 Channel A2
Pin E	Pin 25 Channel B2

9.17.2 HBA-Xd (24V) handwheel connections

The HBA-Xd portable handwheel must to be connected only to a PLC counter module CTMT5151 via EtherCAT fieldbus. The modules send the pulses to NCK for the execution.

The push buttons and selector switches are directly connected to digital IOs using its own cable 5m lenght supplied with the handwheel. The Enabling Device button has to be wired directly into the security circuit of the manual mode as indicated in the connection diagram on chapter 9.3.



(1) HBA-X 23 pins M connector
(2) Socket for HBA-X 23 pins F connector code FXHE181310

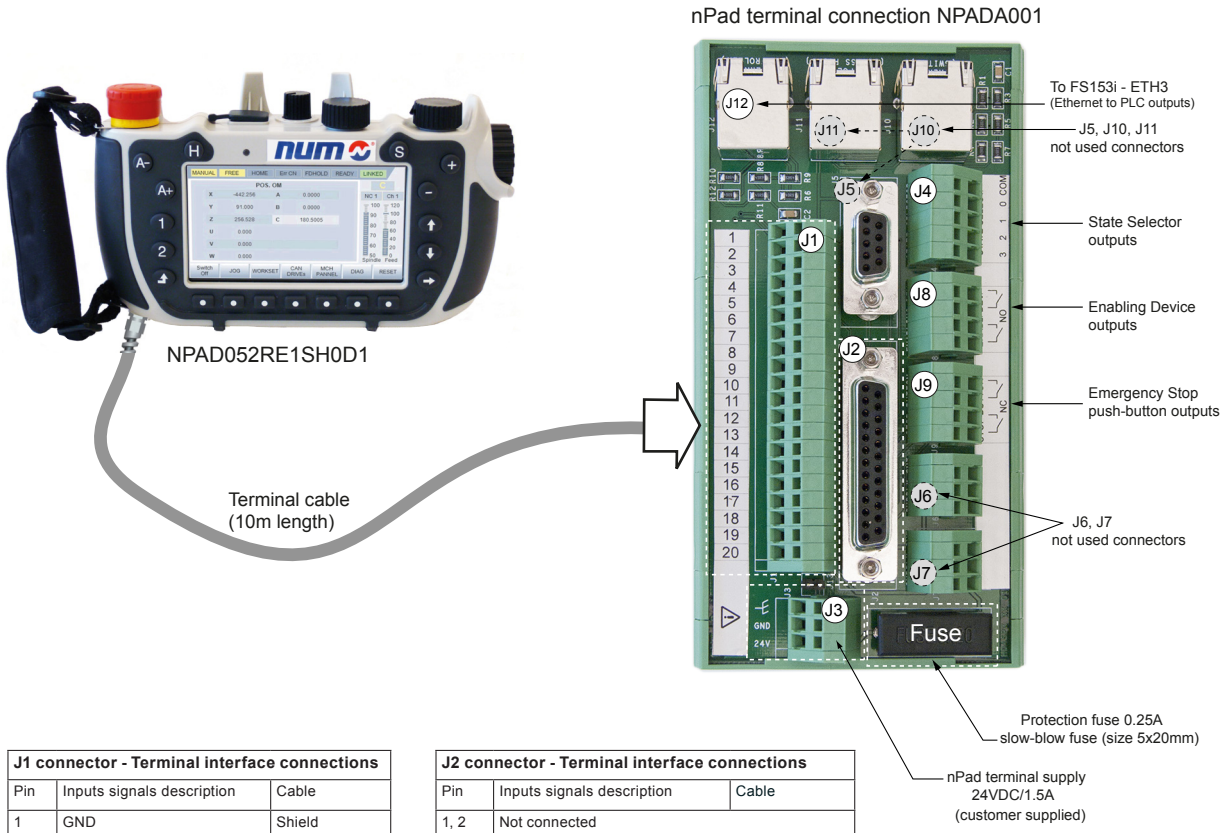
Gray-Code table				
Position	**D**	**C**	**B**	**A**
1	0	0	0	0
2	0	0	0	1
3	0	0	1	1
4	0	0	1	0
5	0	1	1	0
6	0	1	1	1
7	0	1	0	1
8	0	1	0	0
9	1	1	0	0
10	1	1	0	1
11	1	1	1	1
12	1	1	1	0

For more detailed informations upon the CTMT terminals please refer to M00032 manual.

9.18 nPad Mobile Operator Panel connections

The nPad terminal interface connections may be carried out in two different mode:

- By J1 screws terminal sockets connections (see pin-to-pin J1 table here under).
- By J2 Sub D25 M pins connector (see pin-to-pin J2 table here under). The connector is supplied by the customer.

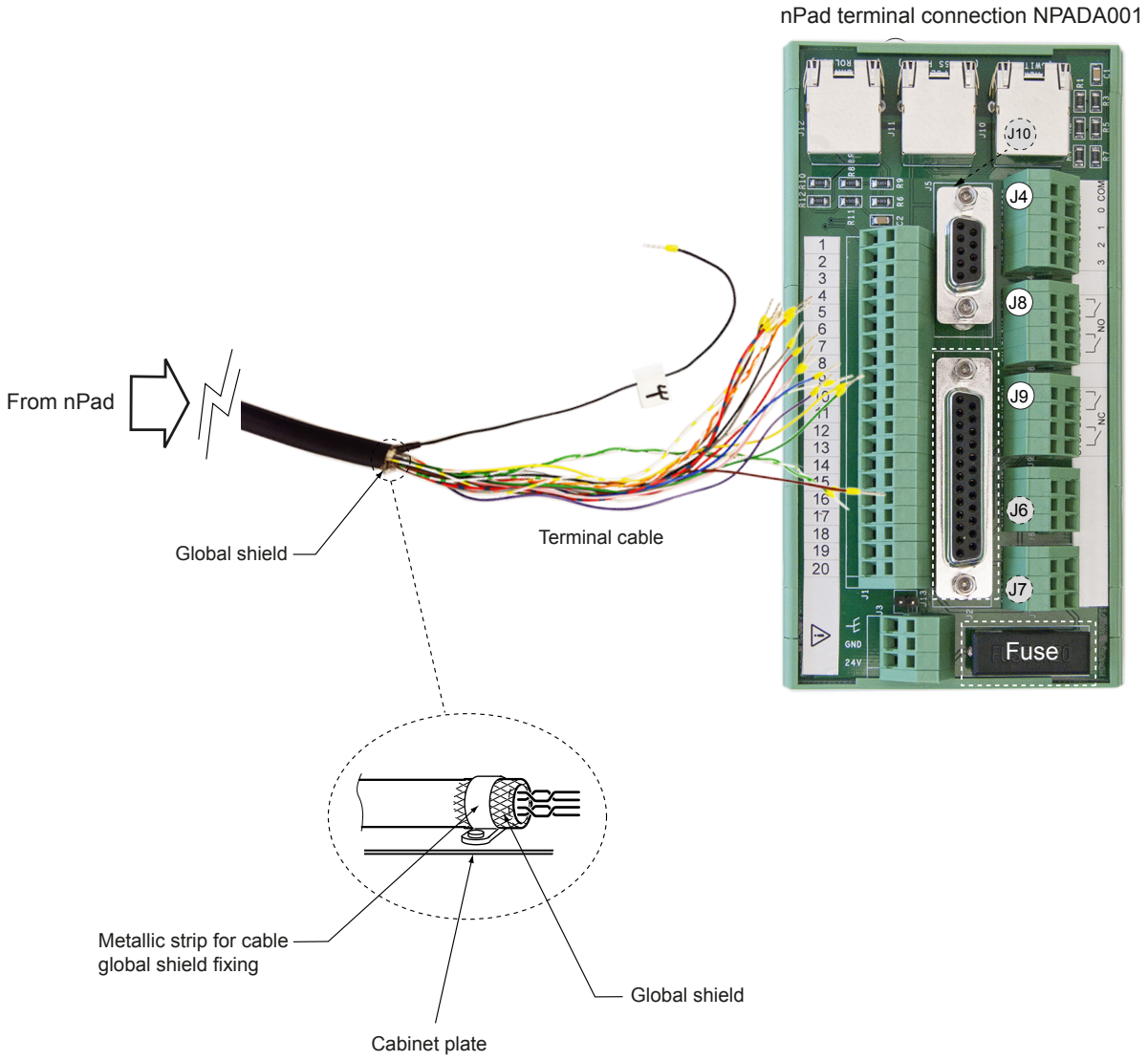


J1 connector - Terminal interface connections		
Pin	Inputs signals description	Cable
1	GND	Shield
2	Ethernet TX+	White/Green
3	Ethernet TX-	Green
4	Ethernet RX-	Orange
5	Ethernet RX+	White/Orange
6	State Selector (com)	Red/Blue
7	State Selector (bit 0)	Gray/Pink
8	State Selector (bit 1)	Yellow/White
9	State Selector (bit 2)	White/Green
10	State Selector (bit 3)	Brown/Green
11	Enabling Device (C1)	Green
12	Enabling Device (C1-NO)	Yellow
13	Enabling Device (C2)	Brown
14	Enabling Device (C2-NO)	White
15	Emerg. Stop push-button (C1a)	Black
16	Emerg. Stop push-button (C1b)	Pink
17	Emerg. Stop push-button (C2a)	Violet
18	Emerg. Stop push-button (C2b)	Gray
19	Power supply +24VDC (fused)	Red
20	Power supply 0VDC (GND)	Blue

J3 connector - Power supply connections	
Pin	Description
1	Ground
2	Power supply 0VDC (GND)
3	Power supply +24VDC (fused)

J2 connector - Terminal interface connections		
Pin	Inputs signals description	Cable
1, 2	Not connected	
3	Ethernet TX+	White/Green
4	Ethernet TX-	Green
5	Ethernet RX-	Orange
6	Ethernet RX+	White/Orange
7	State Selector (com)	Red/Blue
8	State Selector (bit 0)	Gray/Pink
9	State Selector (bit 1)	Yellow/White
10	State Selector (bit 2)	White/Green
11	State Selector (bit 3)	Brown/Green
12	Enabling Device (C1)	Green
13	Enabling Device (C1-NO)	Yellow
14	Enabling Device (C2)	Brown
15	Enabling Device (C2-NO)	White
16, 18	Not connected	
17	GND	
19	Power supply 0VDC (GND)	Blue
20	Power supply +24VDC (fused)	Red
21	Not connected	
22	Emerg. Stop push-button (C1a)	Black
23	Emerg. Stop push-button (C1b)	Pink
24	Emerg. Stop push-button (C2a)	Violet
25	Emerg. Stop push-button (C2b)	Gray

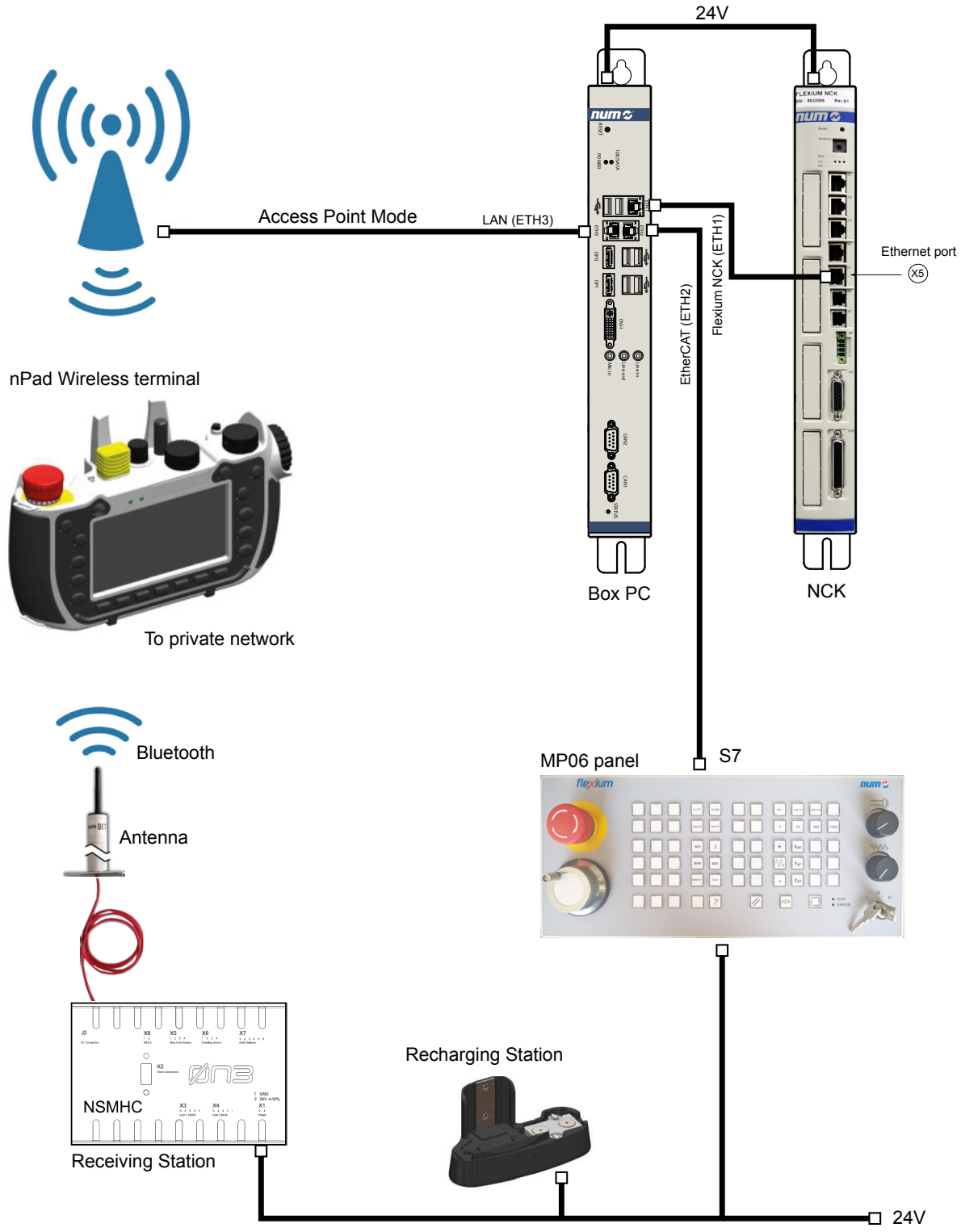
9.18.1 Wiring the nPAD terminal cable



To prevent eventual disturbances on the nPad we suggest to connect the cable global shield as indicated in the picture above.
An inadequate global shield or earthing connection may generate distrurbance on nPad terminal. For more detailed information please refer to Cabinet layout and EMC Guide M00027.

9.19 nPad Wireless Mobile Operator Panel connections

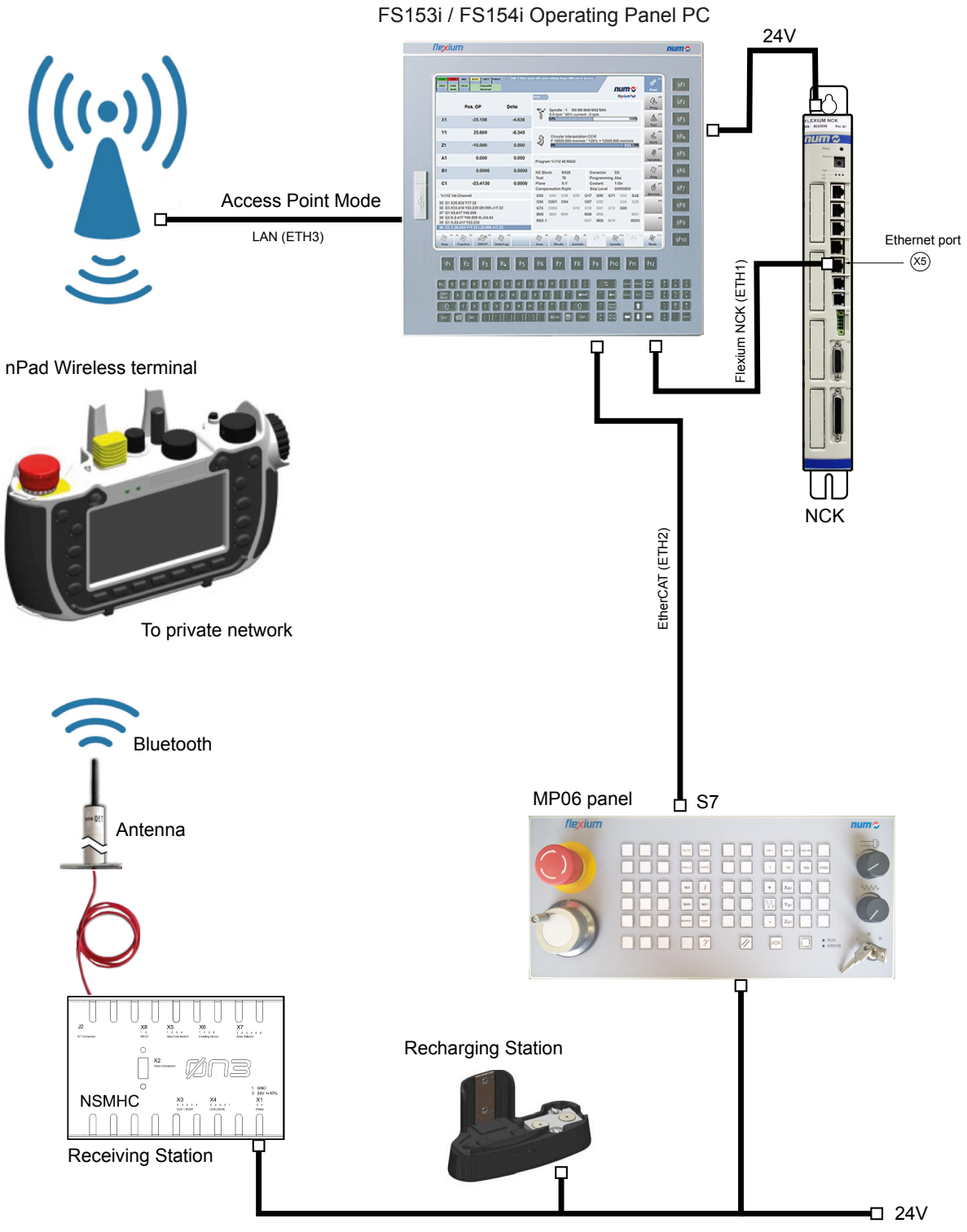
9.19.1 nPad Wiless Mobile Operator Panel with Box PC



STOP

Please refer to nPad Wireless Mobile Operator terminal Operating manual M00053EN-00 and Flexium Commissioning manual M00044 for more detailed information.

9.19.2 nPad Wiless Mobile Operator Panel with FS 153i or FS154i



Please refer to nPad Wireless Mobile Operator terminal Operating manual M00053EN-00 and Flexium Commissioning manual M00044 for more detailed information.

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Summary

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10 NUMSafe devices

Due to certification requirements, the Safety components instructions are given in dedicated manuals. Please refer to the following list

M00033	NUMSafe CTMP6900 Operating manual
M00034	NUMSafe CTMS 1904 Digital inputs terminal Operating manual
M00035	NUMsafe CTMS 2904 Digital outputs terminal Operating manual
M00036	NUM SAMX Safety module Instruction manual
M00037	NUMsafe CTMP 6900 Logical terminal Programming manual
M00038	NUMSafe Application Guide
M00060	NUMSafe CTMP 1960-2600 Compact controller Operating manual
M00061	NUMSafe CTMS 2912 Digital outputs terminal Operating manual

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Summary

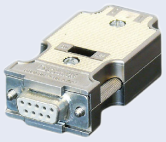
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11.2.2.3 Plug 90° angled with connection for programmable unit FXHE181202 296

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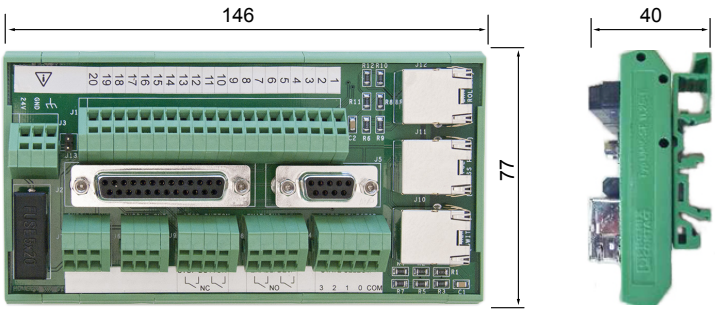
11 Available accessories

11.1 Flexium accessories list

Accessories	Order code	Description	
NCK to NUMDrive X cable	**FXHC081520** **FXHC081521** **FXHC081522** **FXHC081523** **FXHC081524**	0.6m length 1m length 2.5m length 5m length 10m length	
NCK to NUMDrive C cable	**FXHC081510** **FXHC081511** **FXHC081512** **FXHC081513** **FXHC081514**	0.6m length 1m length 2.5m length 5m length 10m length	
NCK to FS153i or 192i cable	**FXHC181040** **FXHC181041** **FXHC181042** **FXHC181043** **FXHC181044** **FXHC181045** **FXHC181046**	0.5m length 1m length 2m length 5m length 10m length 20m length 30m length	
NCK Clock-Synchro cable	**FXHC081530** **FXHC081531** **FXHC081532**	0.2m length 2.5m length 5m length	
CAN Cable PVC, purple, shielded in pairs	**FXHC181060**	Alone cable. Cable length must be declared in the order.	
End of line termination	**FXHC081540**	End terminal RJ45 for Multi-NCK Clock-Synchro version	

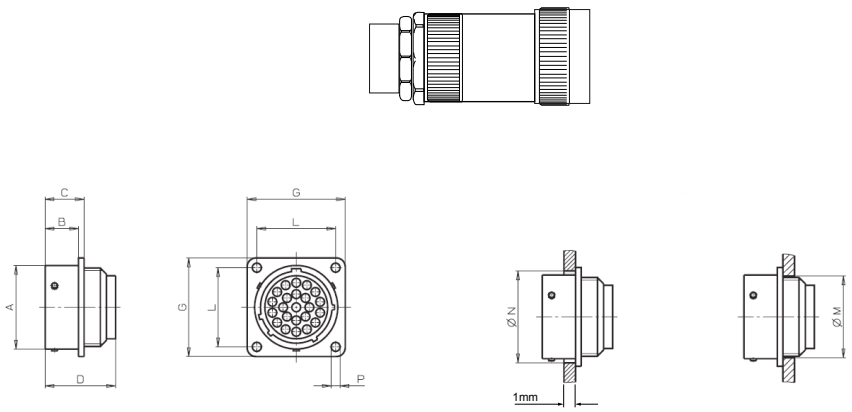
Accessories	Order code	Description	
Connector kit for Flexium+ : - X9 Analogue IOs - X10 Digital IOs	**FXHE181301**	X9 sub D 15 pins male connector X10 sub HD 44 pins male connector	
CAN connector	**FXHE181200**	CAN Female connector axial	
CAN connector	**FXHE181201**	CAN Female connector 90°	
CAN connector	**FXHE181202**	CAN Male / Female connector 90° with prog. unit	

Accessories	Order code	Description
Terminal connection	**NPADA001**	Terminal connectionc for nPad Mobile Operator Panel. See figure.



Approx. weigth: 0.2kg

Accessories	Order code	Description
Socket for portable HBA-X	**FXHE181310**	XBA-X connector. The socket FXHE181310 is an OEM additional 23 pins F connector to connected the handwheel on different places on the machine.



11.2 CAN Cable and CAN connectors connection

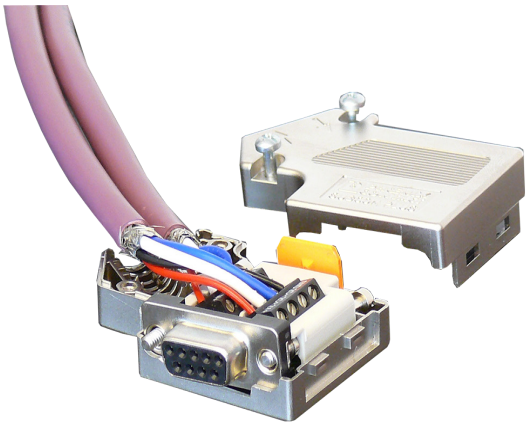
11.2.1 CAN cable FXHC181060



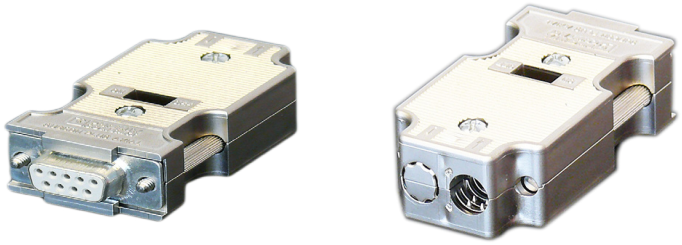
Wire colour	CAN connections
Blank	Shield
Red	V+
Black	V-
White	CAN-H
Blue	CAN-L

11.2.2 CAN plugs

With the following plugs the end resistor is included (ON/OFF switchable) and the cable connections are screw terminated.



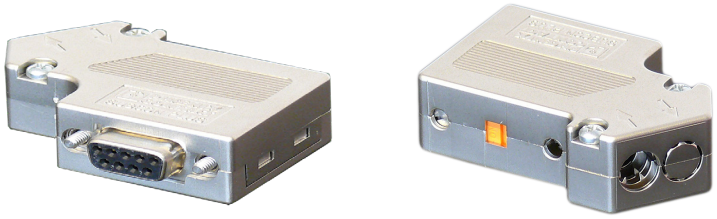
11.2.2.1 Plug axial connector FXHE181200



Wire colour	BUS IN connections	BUS OUT connections
Blank	Shield	Shield
Black	GND	GND
White	1C+	2C+
Blue	1C-	2C-

Always connect the incoming bus cable (BUS IN) to the connection points GND/1C-/1C+ (also at the starting point of the bus system).
The outgoing bus cable (BUS OUT) is always connected to the terminals GND/2C-/2C+/2V+ .

11.2.2.2 Plug 90° angled without connection for programmable unit FXHE181201



Wire colour	BUS IN connections	BUS OUT connections
Blank	Shield	Shield
Red	1V+	2V+
Black	GND	GND
White	1C+	2C+
Blue	1C-	2C-

Always connect the incoming bus cable (BUS IN) to the connection points GND/1C-/1C+/1V+ (also at the starting point of the bus system).
The outgoing bus cable (BUS OUT) is always connected to the terminals GND/2C-/2C+/2V+ .

11.2.2.3 Plug 90° angled with connection for programmable unit FXHE181202



Wire colour	BUS IN connection	BUS OUT connection
Blank	Shield	Shield
Red	1V+	2V+
Black	GND	GND
White	1C+	2C+
Blue	1C-	2C-

Always connect the incoming bus cable (BUS IN) to the connection points GND/1C-/1C+/1V+ (also at the starting point of the bus system).
The outgoing bus cable (BUS OUT) is always connected to the terminals GND/2C-/2C+/2V+ .

Selector configuration:
- selector in ON = 1 cable IN bus IN use only.
- selector OFF = If IN /OUT used

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