

Flexium systems

Installation manual

M00009EN-08

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The programming examples described in this manual are intended for guidance only. They must be specially adapted before they can be used in programs with an industrial application, according to the automated system used and the safety levels required.

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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 Hazard and safety use instructions - Symbolology use in the manual

Symbol	Meaning of the symbol
	The information " i " icon indicates notes on product use.
	The STOP icon indicates a wrong operation which may damage the product or indicates important notes on product use .
	The TRIANGLE icon indicates hazard for human beings and this information is referring to personal damage! Whenever one of these icons appear, please beware, use and apply adequate precautions to avoid hazards or damage situations during the drive installation and commissioning operations! Please beware! Prevent and safety instruction against accidental contact with electrical components.

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 connections 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

Date	Index	Reason for revision	See chapter
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 connections - Removed section NUMSmartBackup and create dedicated manual "NUMSmartBackup Operator's manual" M00056	2.2 4.1.1 4.1.1 4.2 4.3 4.3.2 4.4 4.8 9.13 9.15
01 - 2026	08	Alignment layout with FlexiumPro installation manual M00070EN - Updating image - Updating tables - Reorganizing the sequence of paragraphs - Replaced cable FXHC18104x with AEOFU018Mxxxx	

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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 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 FS154i, FS184i, FS194i, FS244i, FS122, FS153, FS184, FS194L, FS244 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, MP07 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	NUMSafe devices Due to certification requirements, the Safety components instructions are given in dedicated manuals. Please refer the manuals list in the chapter.
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.

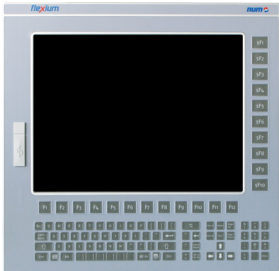
Flexium and Flexium⁺ are a complete, user-friendly and versatile range of CNC systems consisting of:

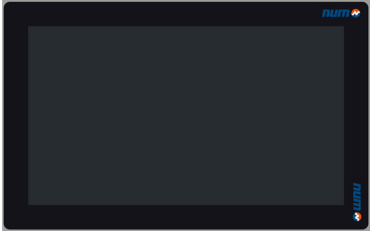
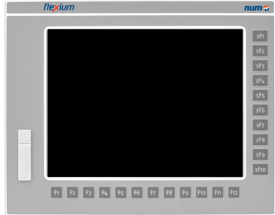
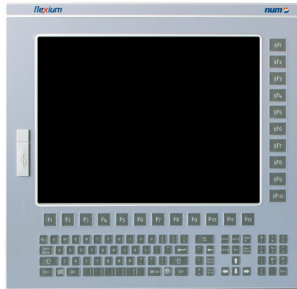
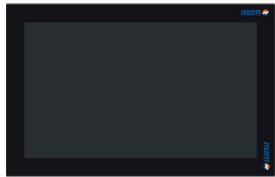
- CNC Kernel: Flexium NCK
- Operator panels with integrated PC
- Human Machine Interface: Flexium HMI
- PLC software
- Machine panel
- Remote inputs/outputs: NUM EtherCAT modules CTMxxx
- Servo drives: NUMDrive X or NUMDrive C
- NUM Motors: various ranges.

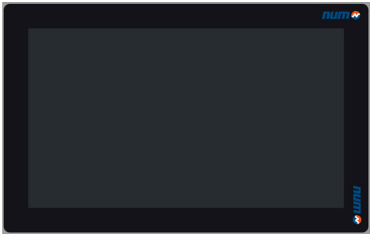
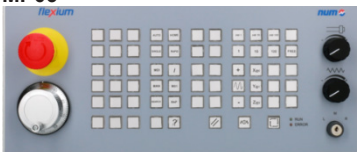


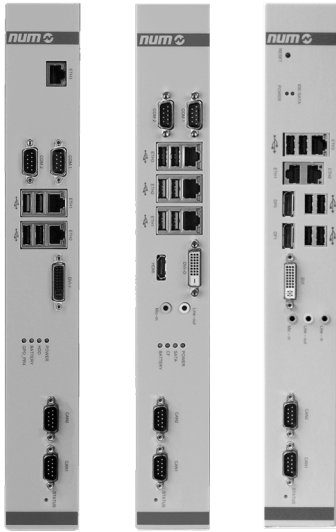
Please refer to NUM Catalog for more detailed information upon the NUM CNC System configurations.

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.
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. 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.

Active panels (with integrated PC)	
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.
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 (different dimensions) and with or without touch screen.
FS184 18.5" 	FS184 is a 18.5" display, glass protected, fitted with a capacitive multi-touch screen system. 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.
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.

Passive panels (without integrated PC)	
FS244 24" 	FS244 is a 24" display, glass protected, fitted with a capacitive multi-touch screen system. 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 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 	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.
MP08 	(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) and the location for two additional push buttons.

Box PC P1 G4 / G4A - Box PC P2 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 FlexiumPro 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 chapter 8 for more detailed information.

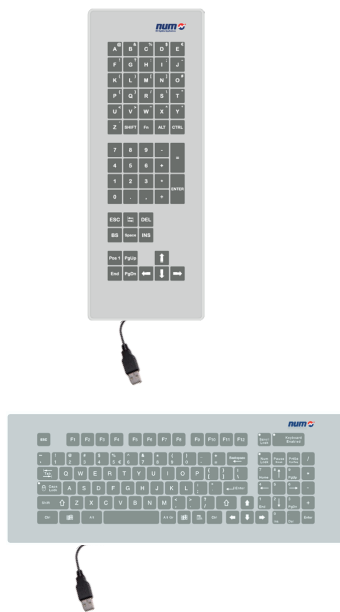
nPad Mobile Operator Panel with integrated 5" TFT touch screen monitor provides 19 soft-keys, 2 override potentiometers, handwheel, a 16 positions selector as well as E-Stop and Enabling Device button.

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

nPad Mobile Operator Panel is available with Wireless version maintaining the same functionality.

nPad is discontinued

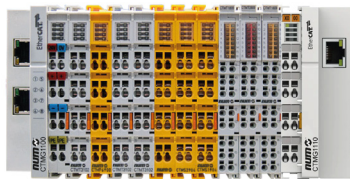
External keyboard



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.

For more detailed informations on the NUMSafe terminals please refer to chapter 10.

NUMSmartBackup



The NUMSmartBackup system is an own developed tool to backup or restore all NUM BoxPC.or Flexium Panel with iPC.

Please refer to dedicated manual "NUMSmartBackup Operator's manual" M00056 for more detailed information.

2.3 Flexium 6, Flexium 8 and Flexium 68 systems overview

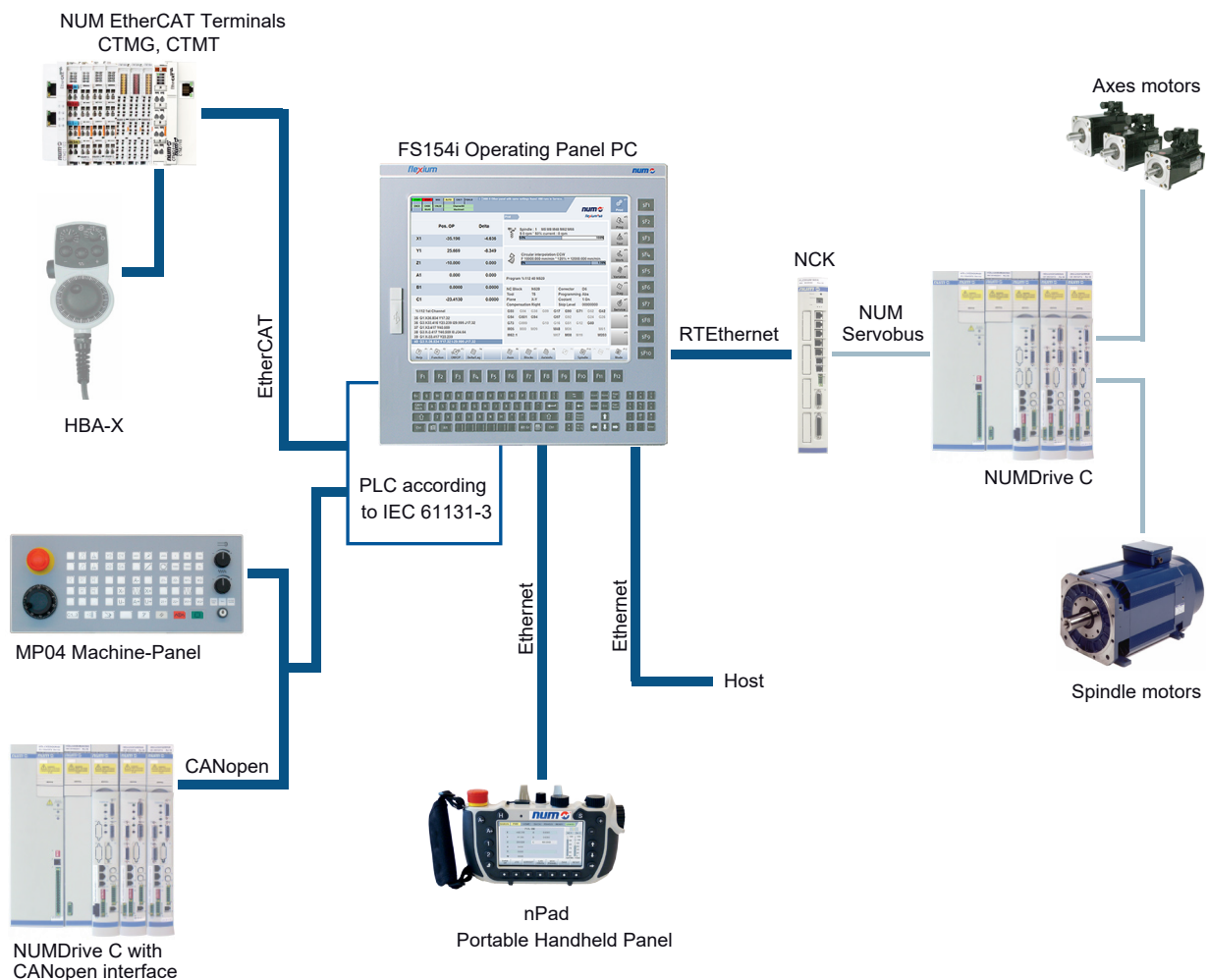
2.3.1 Flexium 6

- 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.

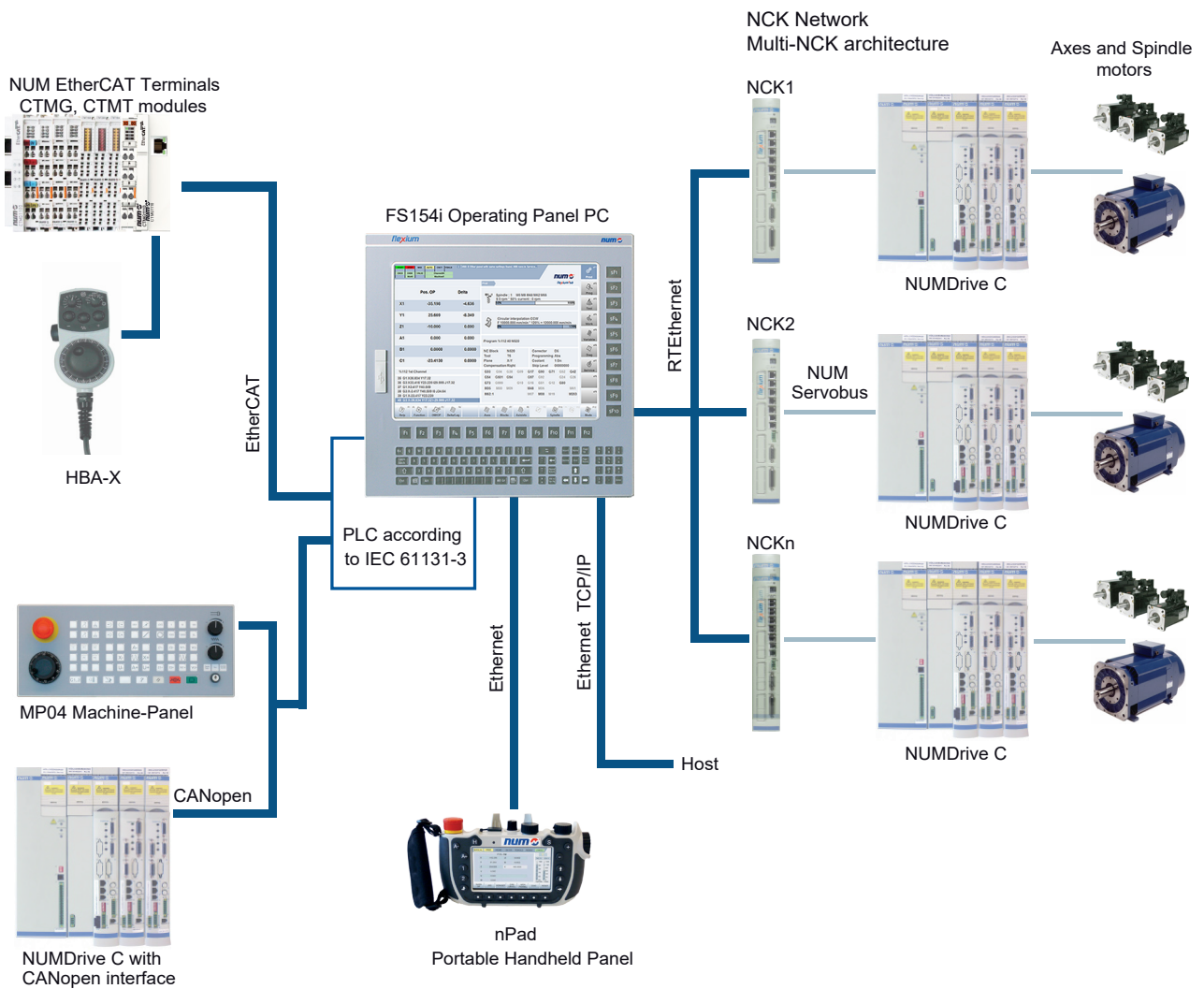
Flexium 6 and Flexium 8 systems



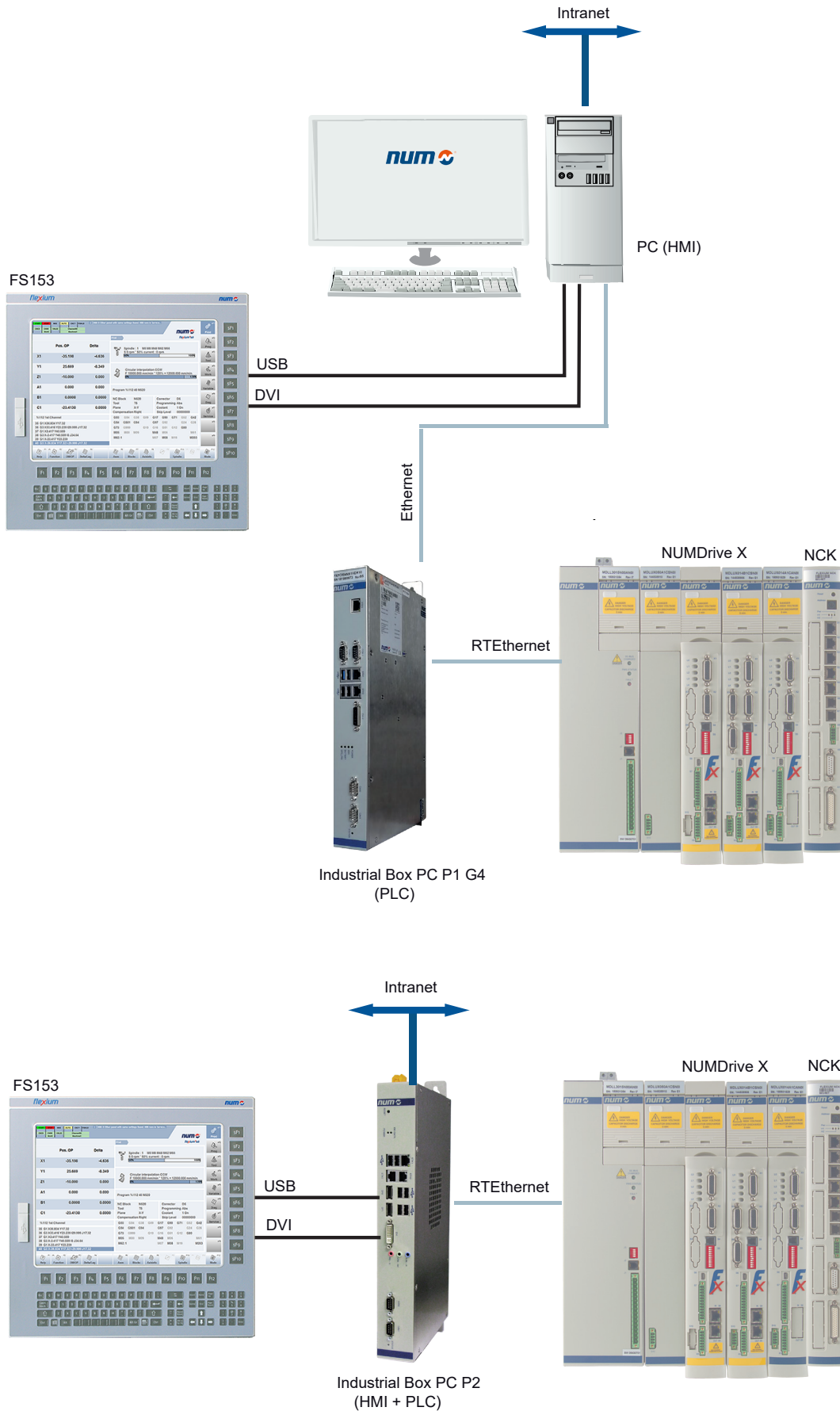
2.3.3 Flexium 68 fully scalable system

- 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



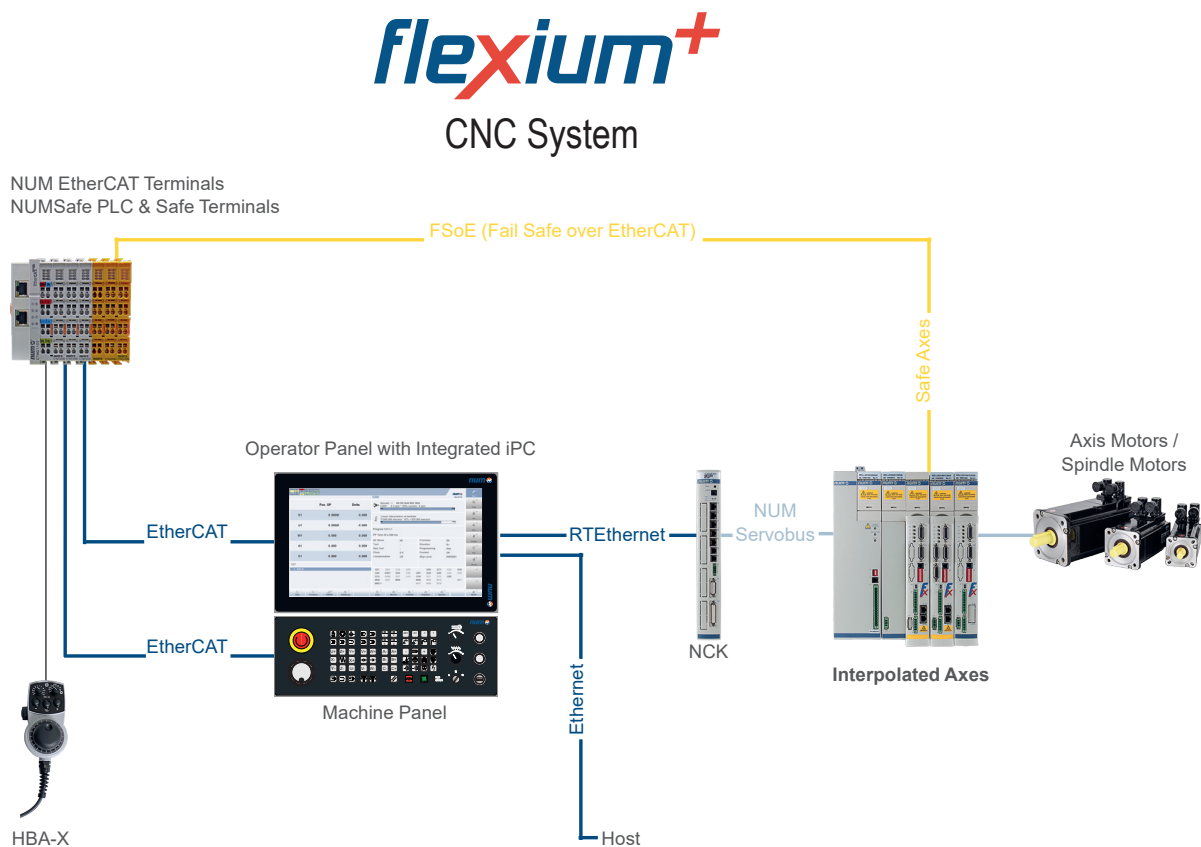
2.4 Flexium⁺ 6, Flexium⁺ 8 and Flexium⁺ 68 systems overview

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

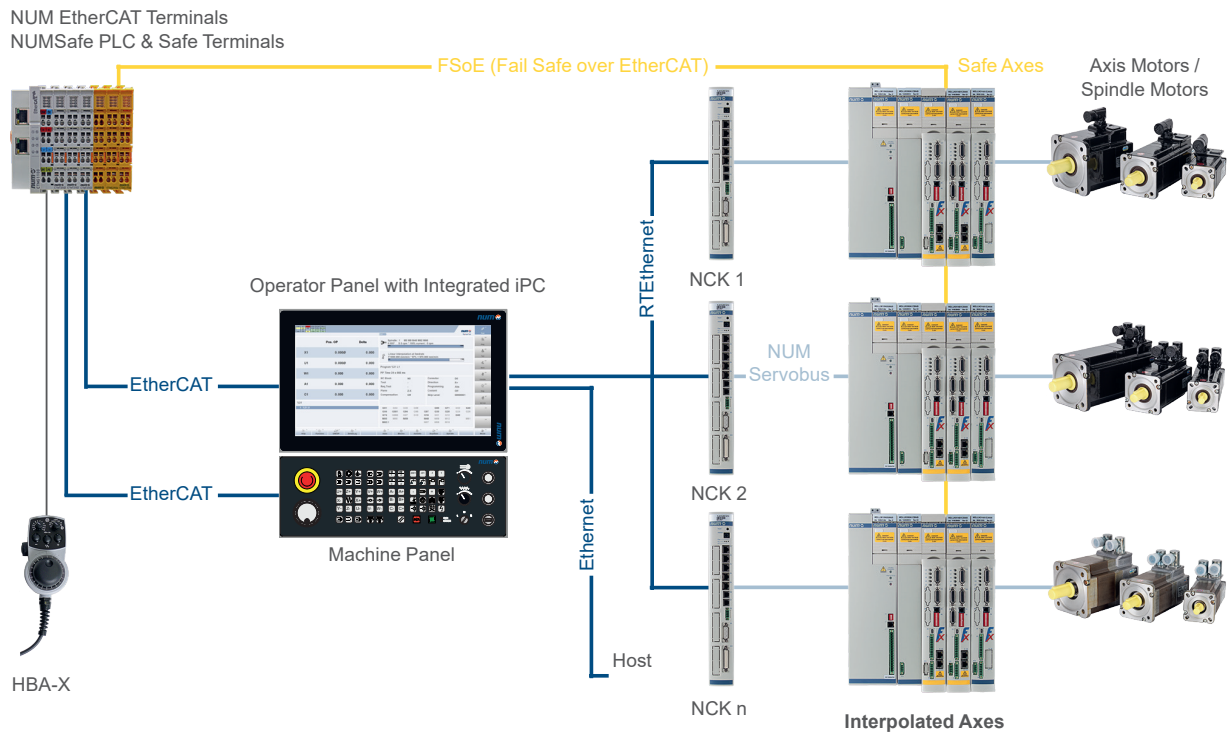
- For CNC for up to 5 axes or 4 axes and 1 spindle.
- One channel is standard, a second is optionnaly available.
- Interpolates up to 4 axes simultaneously.
- Various options and technology packages are available.



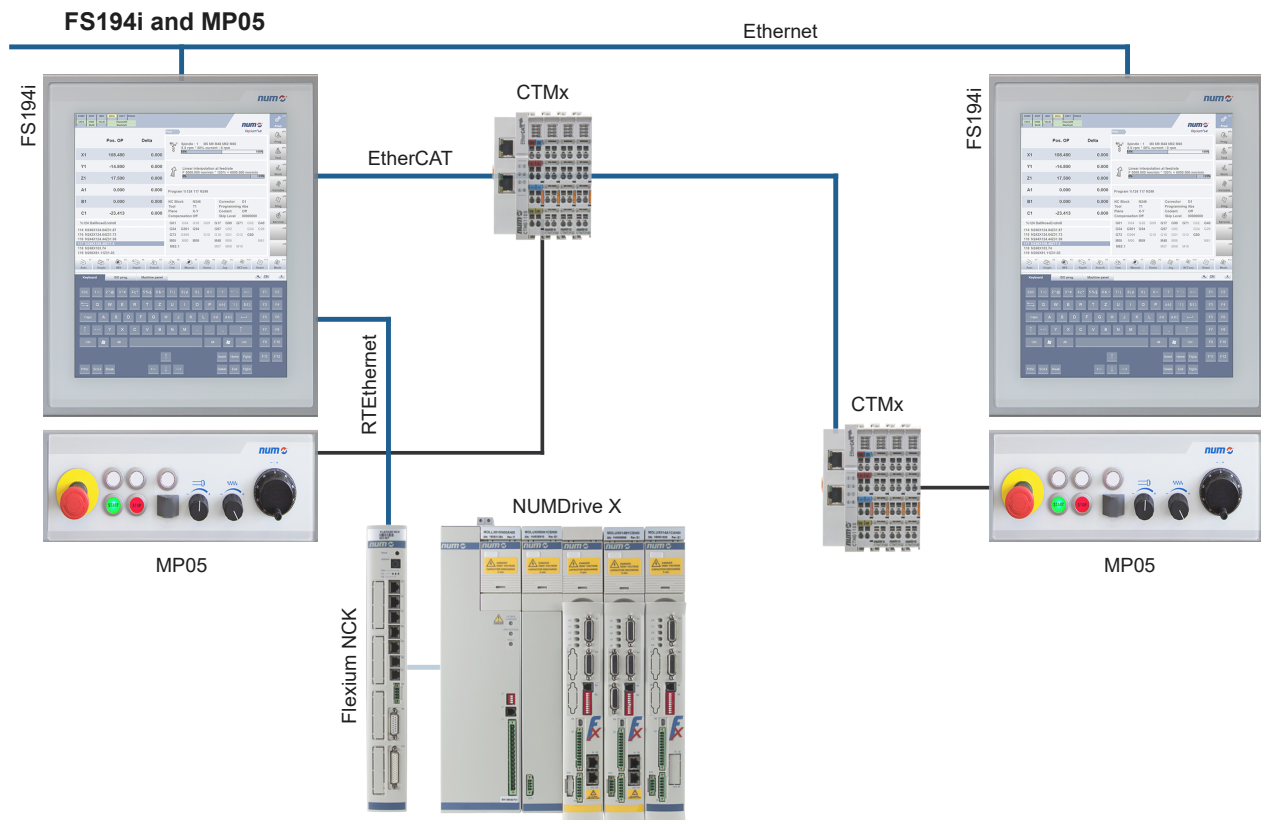
2.4.3 Flexium+ 68 fully scalable system

- 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.

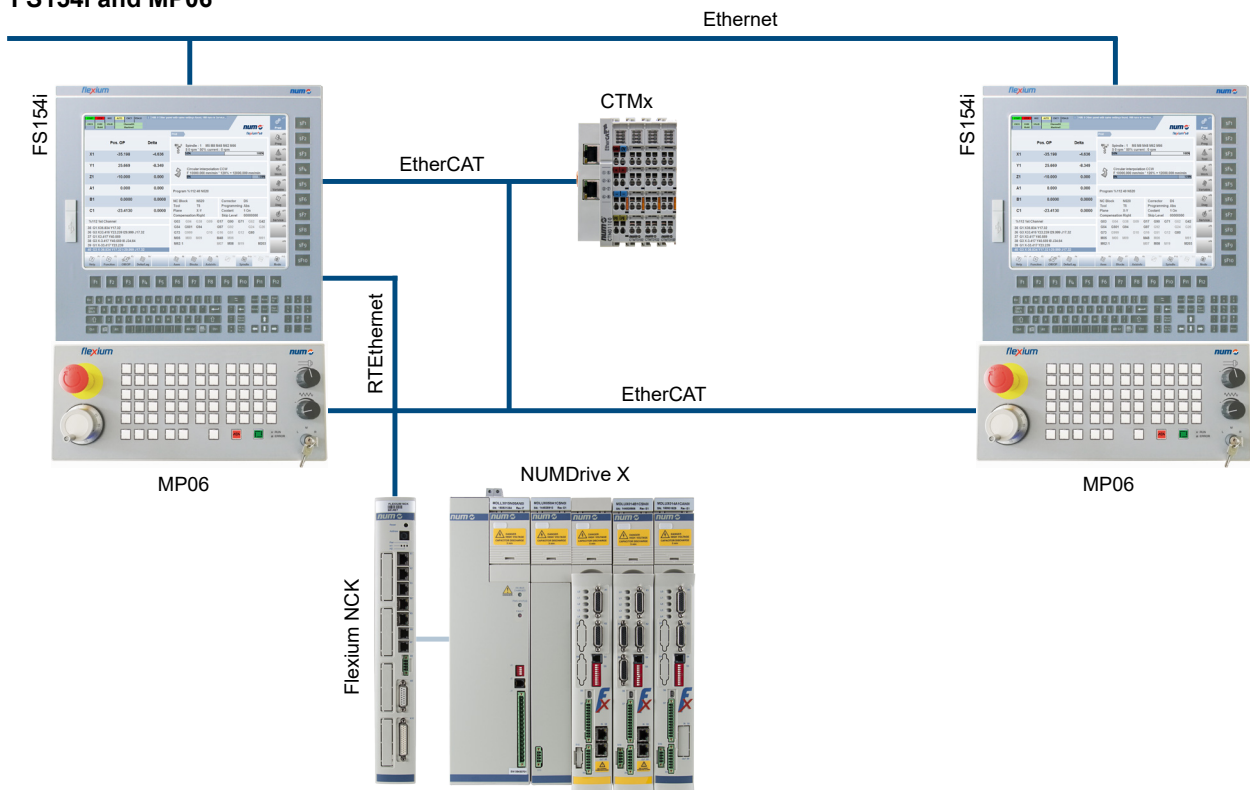
flexium+ CNC System



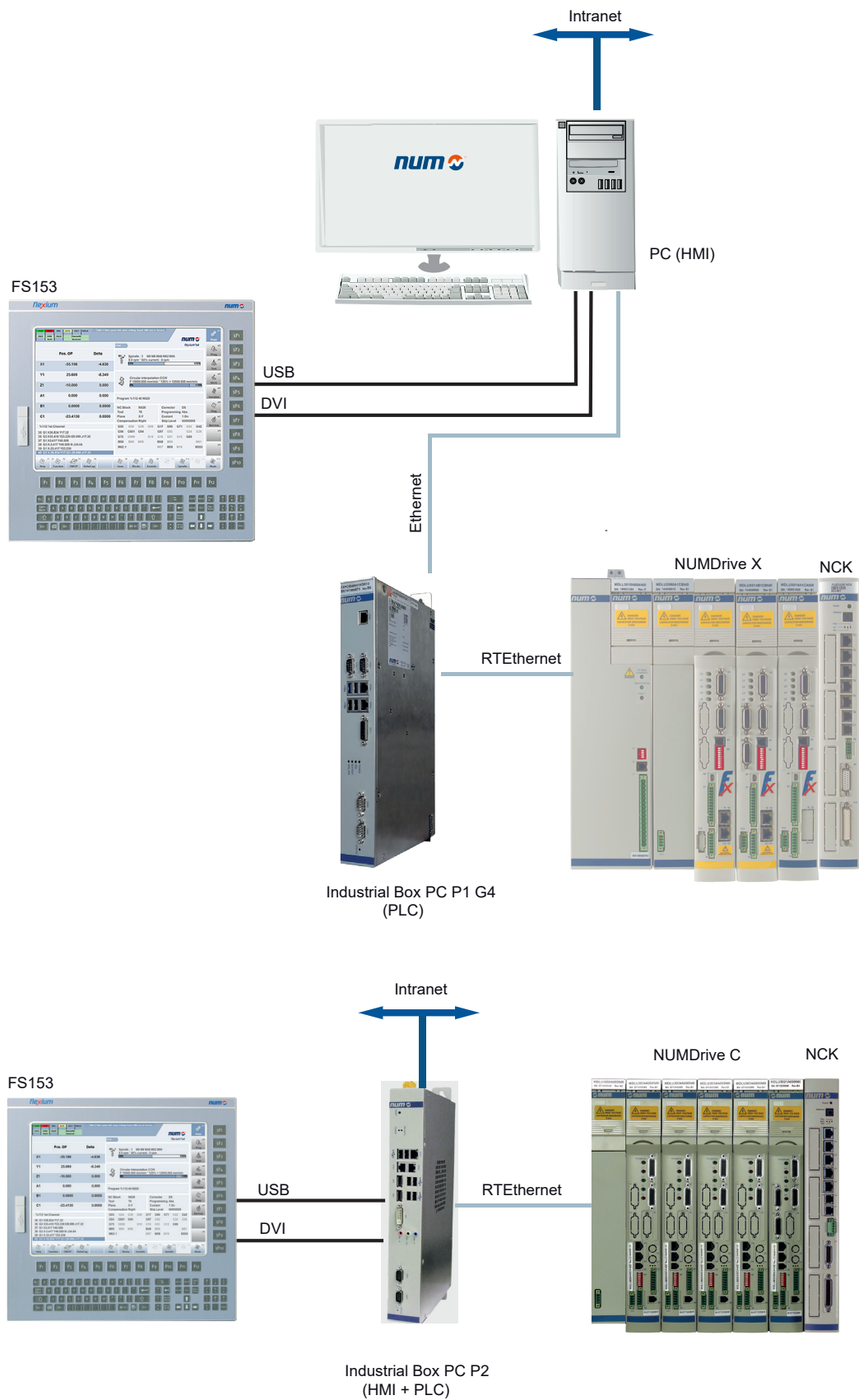
2.4.4 Multi Panel configuration



FS154i and MP06



2.4.5 Configuration with Industrial PC



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3 Flexium NCK

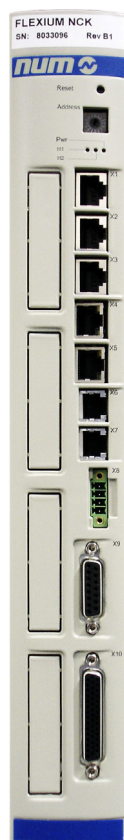
Flexium NCK is the heart of a system. In a compact design compatible in size with the NUMDrive C or NUMDrive X components it packs a powerful engine, up to 40MB of user's memory, the connectivity for up to 32 digital axes and the PLC link, all this delivered on standard RJ45 ports.

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



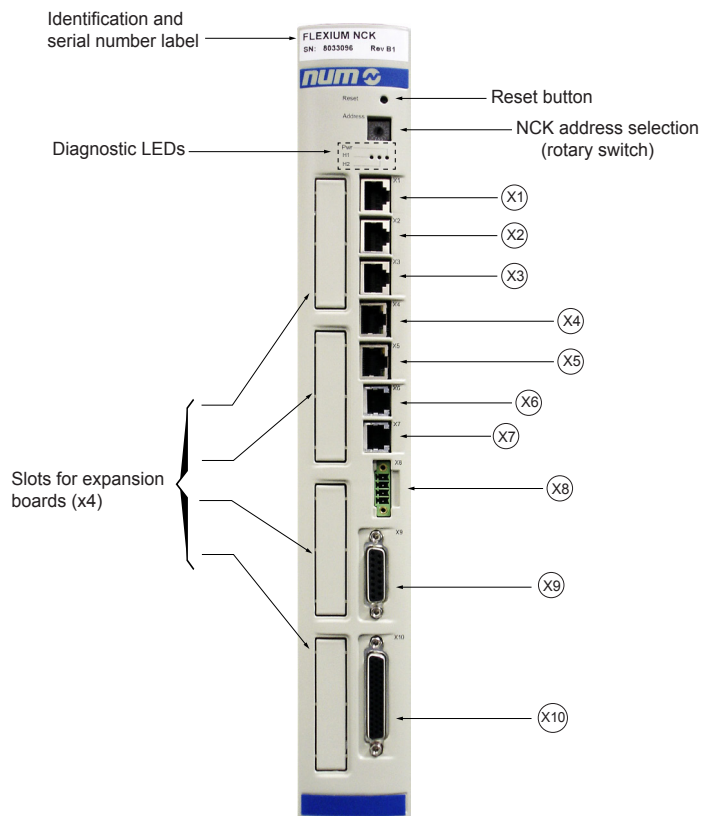
NCK Bottom view



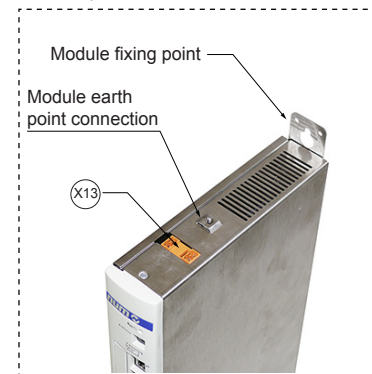
3.1 Characteristics

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 outputs 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 chapter 9.3.9 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 3.3)

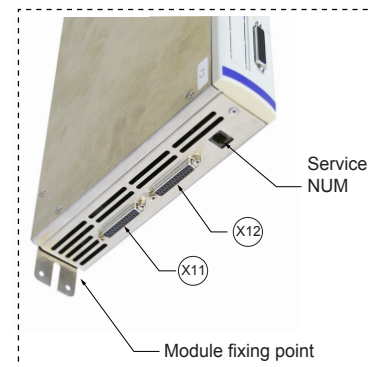
3.2 Module description



NCK Top view



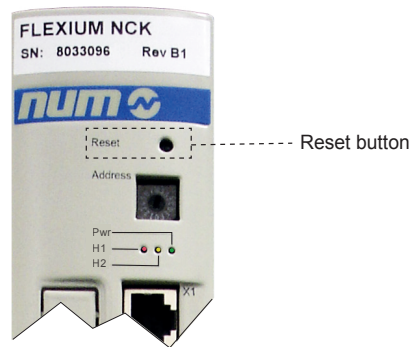
NCK Bottom view



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: - $\geq 12\text{VDC}/100\text{mA} \div 30\text{VDC}/1\text{A}$ - $250\text{VAC}/350\text{mA}_{\text{rms}}$
X9	Sub D 15 pins F	Analog I/Os: • 2 outputs 16bits $\pm 10\text{VDC}$ • 4 inputs 12bits - 0 ... 10VDC • 2 Probing inputs 24VDC
X10	Sub HD 44 pins F	Digital I/Os: 16 inputs 24VDC , 16 outputs $24\text{VDC} / 1\text{A}$
X11	Sub D 25 pins F	1 Analog axis or Handwheel connections: • Reference: $\pm 10\text{VDC}$ 16bits.
X12	Sub D 25 pins F	• Measure: quadrature complemented incremental encoder with zero pulse.
X13	4 screws pins	Power supply connections: • $24\text{VDC} 1\text{A}$

3.2.1 Reset button

Do not use. Internal NUM use only.



3.2.2 Address rotary switch

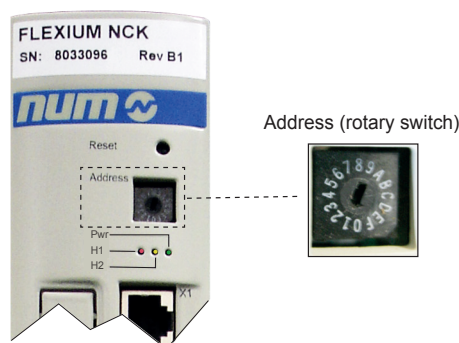
The rotary switch allows to assigning an address to NCK. Each NCK module must receive a unique address. This address is assigned with the aid of the 16-position rotary switch located on the NCK front panel as indicated here under.

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.



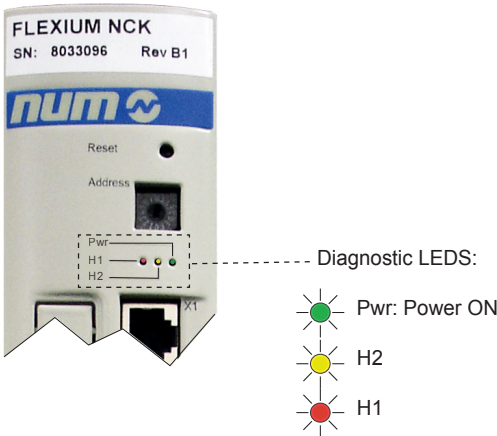
3.2.3 System configuration and options

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

3.2.4 Status LED

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.



3.2.4.1 Status LED 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

3.2.4.2 Error LED 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. - FSxxx 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 :

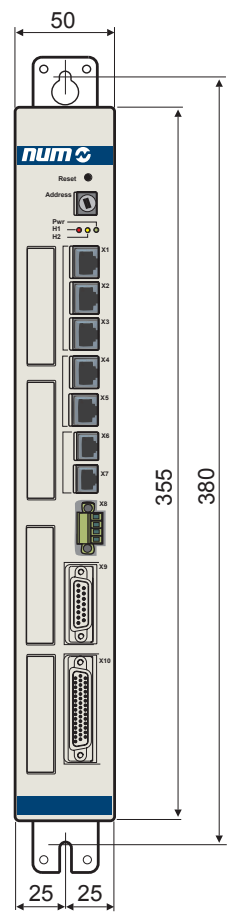
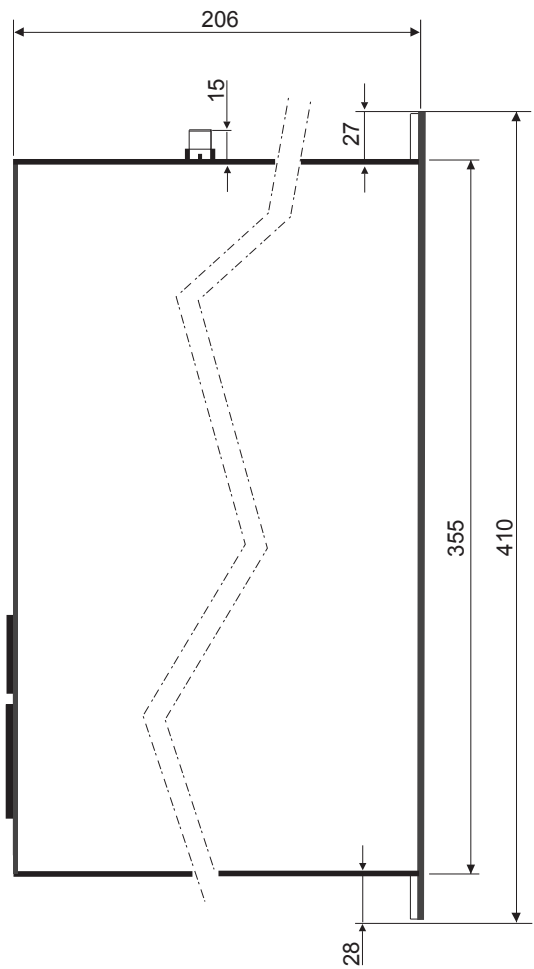
-  LED ON
-  LED blink
-  LED OFF



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.

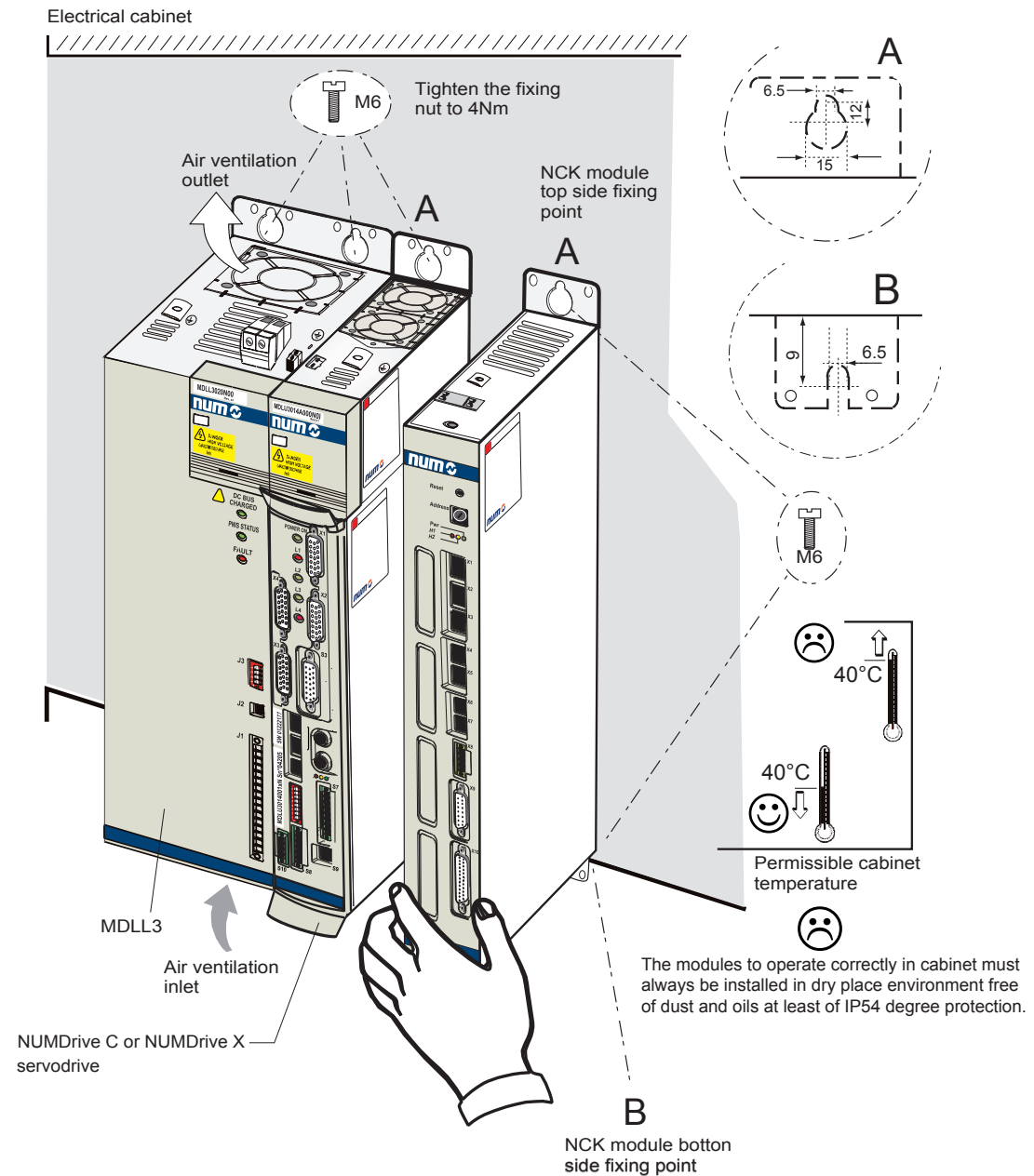
3.3 Overall dimensions

Dimensions in mm



3.4 Assembly NCK in electrical cabinet

Dimensions in mm

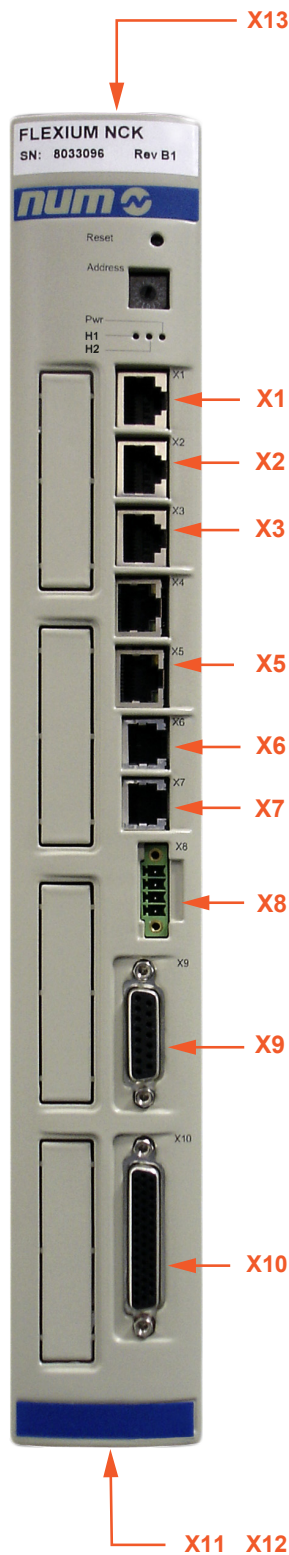


The NCK and the other modules must be installed in the electrical cabinet using the fixing points as shown in the figure. They must always be mounted vertically. The NCK module must always be installed on the rightmost side of the drives unit.

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.

3.5 Module connections

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



X13	Power supply connections. See chapter 9.3.3
X1 X2 X3	NCK to NUMDrive X or NUMDrive C connections. See chapter 9.3.4
X5	Ethernet to panel FS154i or FS184i or FS244i or Industrial BoxPC connections. See chapter 9.1
X6 X7	NCK clock Input/output (Multi-NCK connections)See chapter 9.1.3
X8	NCK Watchdog connections. See chapter 9.3.6
X9	Analogue inputs/outputs and digital probing connections. See chapter 9.3.7
X10	Digital inputs/outputs connections. See chapter 9.3.8
X11 X12	Analogue axes connections. See chapter 9.3.9

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4 Flexium Panels FS - Operators panels

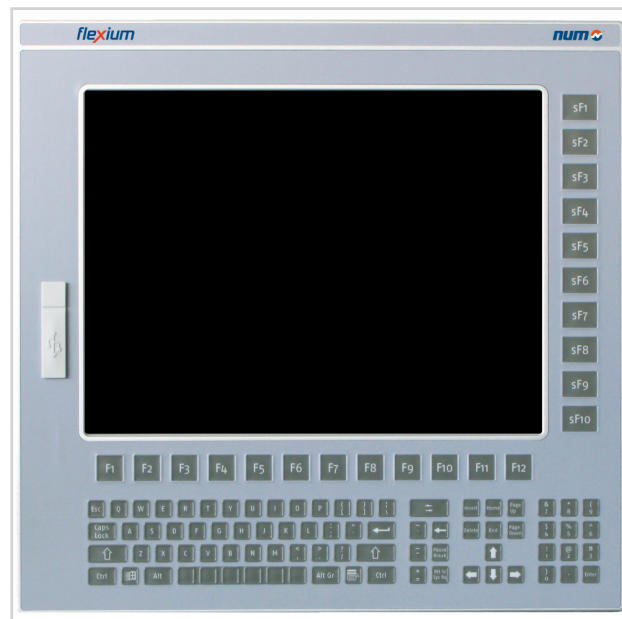
4.1 FS154i Operator panel with Integrated PC

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 and 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 Ordering code

FS154i Version	Ordering Codes
FS154i-FK P1 HD RT	FXPC154NF1HNR10
FS154i-FK P1 HD RT CAN NVRAM	FXPC154NF1HDR10
FS154i-FQ P1 HD RT	FXPC154NQ1HNR10
FS154i-FQ P1 HD RT CAN NVRAM	FXPC154NQ1HDR10
FS154i-FK TS P1 HD RT	FXPC154RF1HNR10
FS154i-FK TS P1 HD RT CAN NVRAM	FXPC154RF1HDR10
FS154i-FQ TS P1 HD RT	FXPC154RQ1HNR10
FS154i-FQ TS P1 HD RT CAN NVRAM	FXPC154RQ1HDR10
FS154i-FK TS P1 G4A SSD	FXPC154RF1SNR3A
FS154i-FK P2 SSD CAN NVRAM W10	FXPC154NF2SDR20
FS154i-FK P2 SSD CAN NVRAM W10 2021	FXPC154NF2SDR40
FS154i-FK P2 SSD W10	FXPC154NF2SNR20
FS154i-FK P2 SSD W10 2021	FXPC154NF2SNR40
FS154i-FQ P2 SSD CAN NVRAM W10	FXPC154NQ2SDR20
FS154i-FQ P2 SSD CAN NVRAM W10 2021	FXPC154NQ2SDR40
FS154i-FQ P2 SSD W10	FXPC154NQ2SNR20
FS154i-FQ P2 SSD W10 2021	FXPC154NQ2SNR40
FS154i-FK TS P2 SSD CAN NVRAM W10	FXPC154RF2SDR20
FS154i-FK TS P2 SSD CAN NVRAM W10 21	FXPC154RF2SDR40
FS154i-FK TS P2 SSD W10	FXPC154RF2SNR20
FS154i-FK TS P2 SSD W10 2021	FXPC154RF2SNR40
FS154i-FQ TS P2 SSD CAN NVRAM W10	FXPC154RQ2SDR20
FS154i-FQ TS P2 SSD CAN NVRAM W10 21	FXPC154RQ2SDR40
FS154i-FQ TS P2 SSD W10	FXPC154RQ2SNR20
FS154i-FQ TS P2 SSD W10 2021	FXPC154RQ2SNR40

	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)							H				
• SSD (Solid State Disc)							S				
Option Board											
• No fieldbus								N			
• CAN + NVRAM								D			
Fixed Value											
									R		
Operating System											
• Windows 8.1 Embedded Industry Pro										1	
• Windows 10 IoT Enterprise LTSB 2016 64 bits										2	
• Windows 10 IoT Enterprise LTSC 2019 64 bits										3	
• Windows 10 IoT Enterprise LTSC 2021 64 bits ⁽¹⁾										4	
Version											
• P1 G4A											A
• Other											0

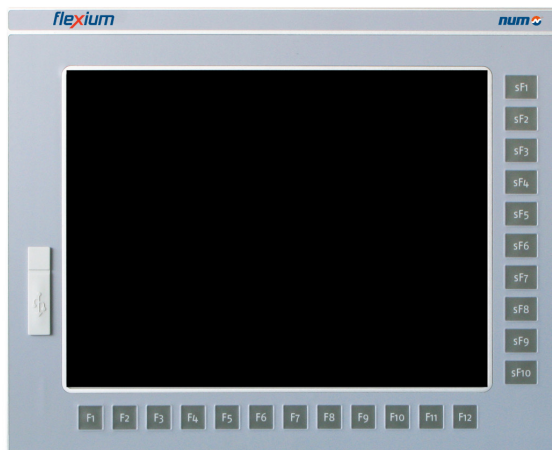
(1) Windows 10 IoT Enterprise LTSC 2021 64 bits supports only Flexium Tools starting from 4.2.00.00

4.1.2 Characteristics

		FXPC154xx1HxR10	FXPC154RF1SNR3A	FXPC154xx2SxR20 FXPC154xx2SxR40
Screen	User interface options	Active panel with integrated PC with: • Touch Screen (resistive) • 22 Function Keys • 22 Function Keys and Qwerty Keyboard	Active panel with integrated PC with: • Touch Screen (resistive) • 22 Function Keys	Active panel with integrated PC with: • Touch Screen (resistive) • 22 Function Keys • 22 Function Keys and Qwerty Keyboard
	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	Windows 8.1 Embedded Industry Pro	Windows 10 IoT Enterprise LTSC 2019 64 bits	...R20 Windows 10 IoT Enterprise LTSC 2016 64 bits ...R40 Windows 10 IoT Enterprise LTSC 2021 64 bits ⁽¹⁾
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	No option	No option
	DVI interface	DVI-I	DVI-I	DVI-D
	HDMI	No	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	ca. 6.1 kg	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	Fan-less	With fan

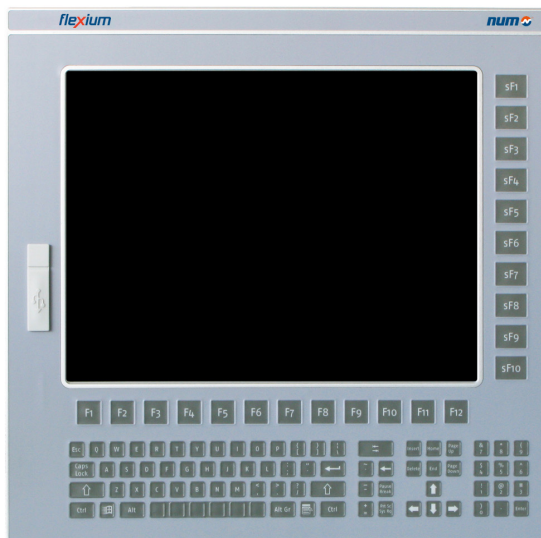
⁽¹⁾ Windows 10 IoT Enterprise LTSC 2021 64 bits supports only Flexium Tools starting from 4.2.00.00

4.1.3 Panel options



Panel with 22 Function Key

Reference with PC Panel coding «F»)



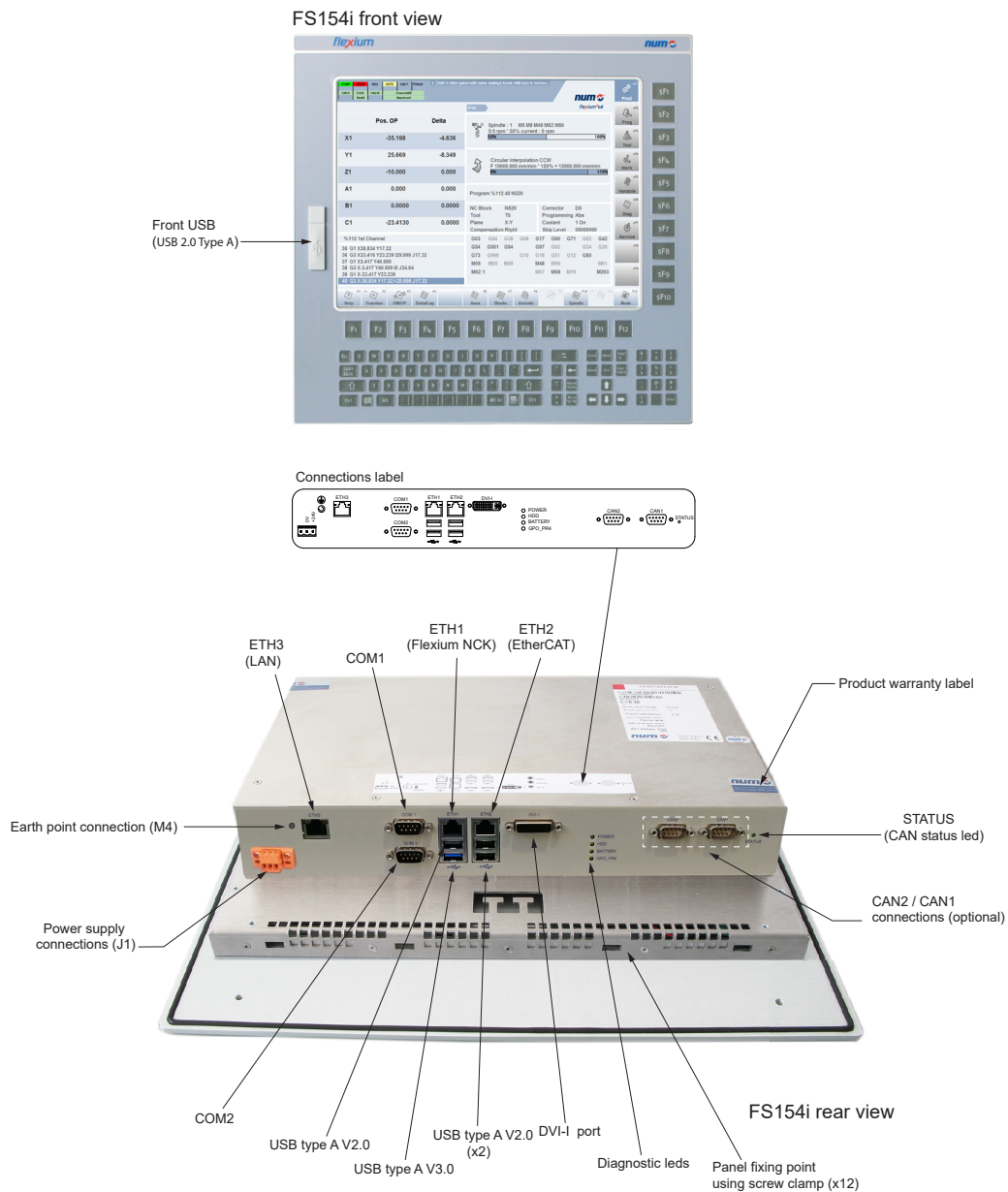
Panel with 22 Function Keys and QWERTY-Keyboard

Reference with PC Panel coding «Q»)

Both configurations are available with touch screen.

4.1.4 Module description

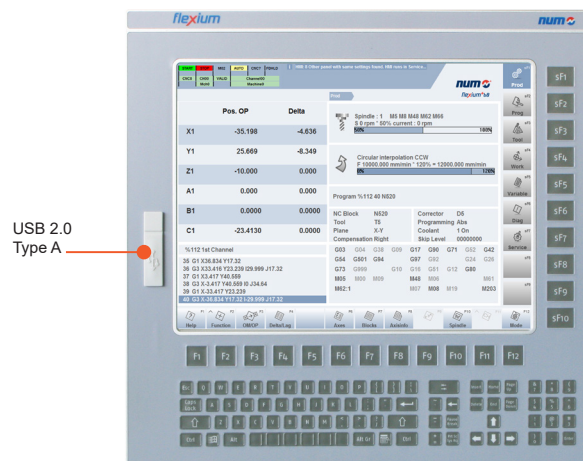
4.1.4.1 FS154i P1



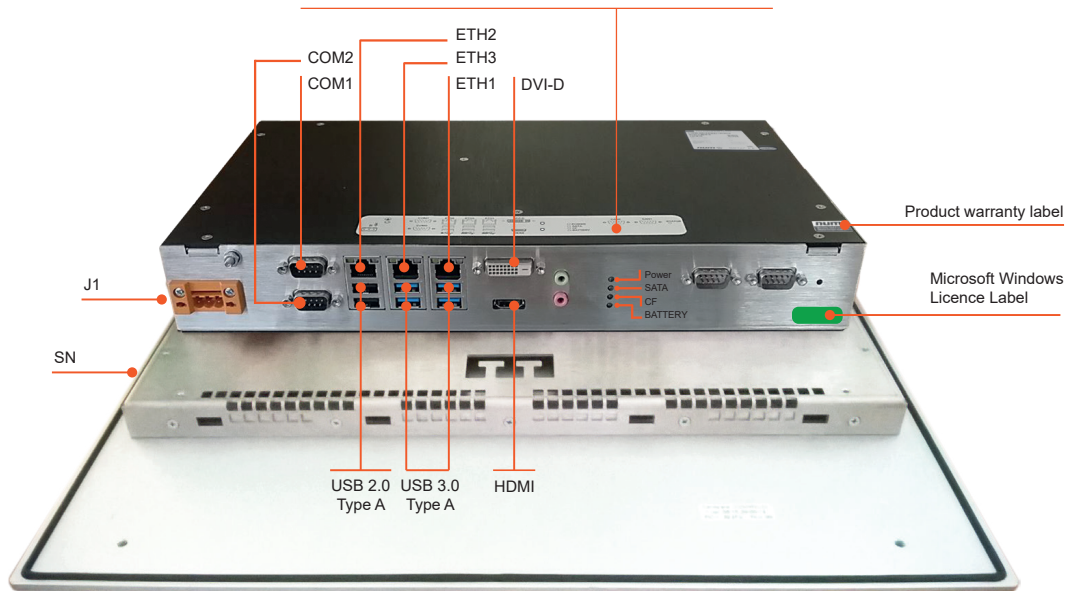
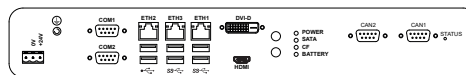
Connector	Type	Description
J1	3 screws pins F	Power supply connections
COM1 / COM2	RS232 Sub D 9 pins M	Serial interface. General user purpose
ETH1	RJ45 (8P/8C)	Flexium NCK Ethernet connections
ETH2	RJ45 (8P/8C)	PLC EtherCAT
ETH3	RJ45 (8P/8C)	Company LAN
DVI-D	Standard DVI	Digital Video interface connection
USB (Front)	1 x USB 2.0 Type A	General user purpose. (Mouse and all USB devices)
USB (Rear)	3 x USB 2.0 Type A, 1 x USB 3.0 Type A	
CAN1 / CAN2	Sub D 9 pins M	Dual CAN + NVRAM interface (optional)

4.1.4.2 FS154i P2

FS154i front view



Connections label



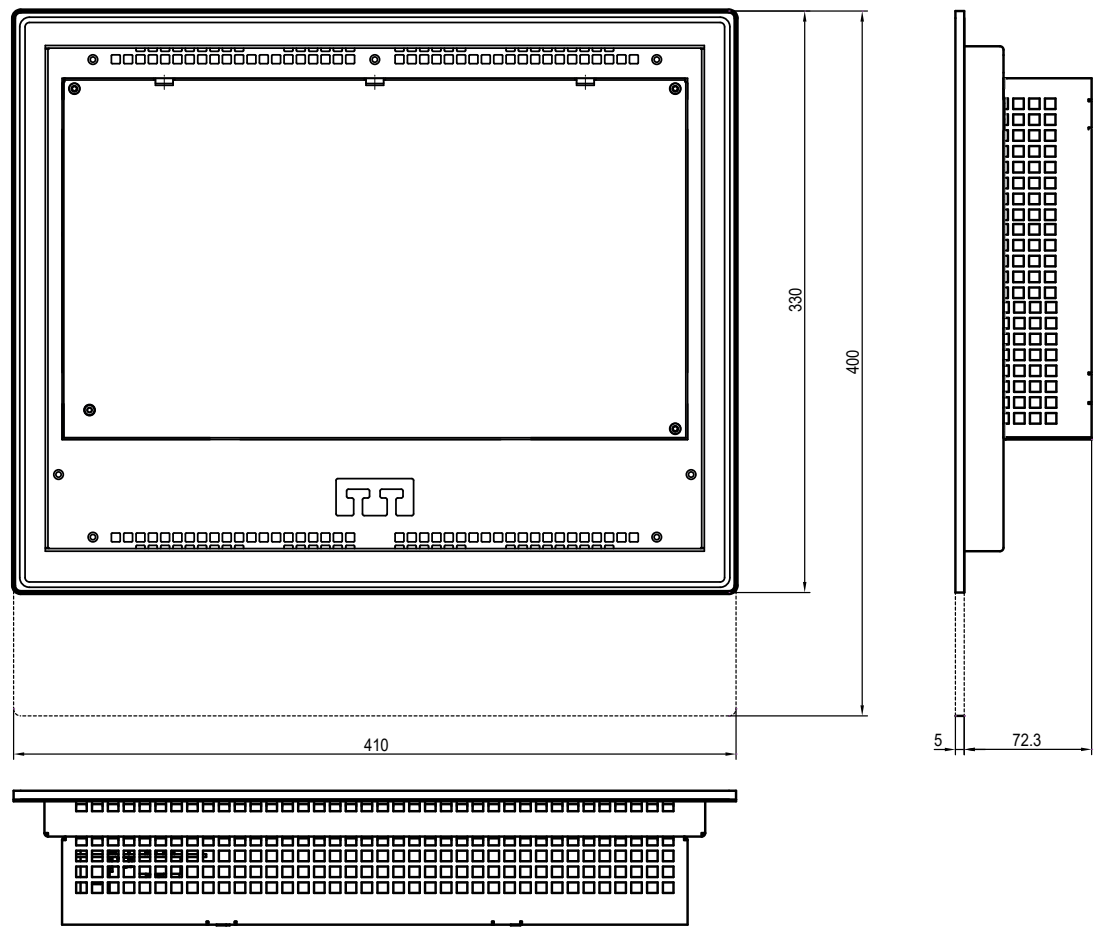
FS154i rear view

Connector	Type	Description
J1	3 screws pins F	Power supply connections
COM1 / COM2	RS232 Sub D 9 pins M	Serial interface. General user purpose
ETH1	RJ45 (8P/8C)	Flexium NCK Ethernet connections
ETH2	RJ45 (8P/8C)	PLC EtherCAT
ETH3	RJ45 (8P/8C)	Company LAN
DVI-D	Standard DVI	Digital Video interface connection
HDMI		High-Definition Multimedia Interface
USB (Front)	1 x USB 2.0 Type A	General user purpose. (Mouse and all USB devices)
USB (Rear)	2 x USB 2.0 Type A, 4 x USB 3.0 Type A	
CAN1 / CAN2	Sub D 9 pins M	Dual CAN + NVRAM interface (optional)
Mic-in		
Line-out		

4.1.5 Overall dimensions

4.1.5.1 FS154i P1

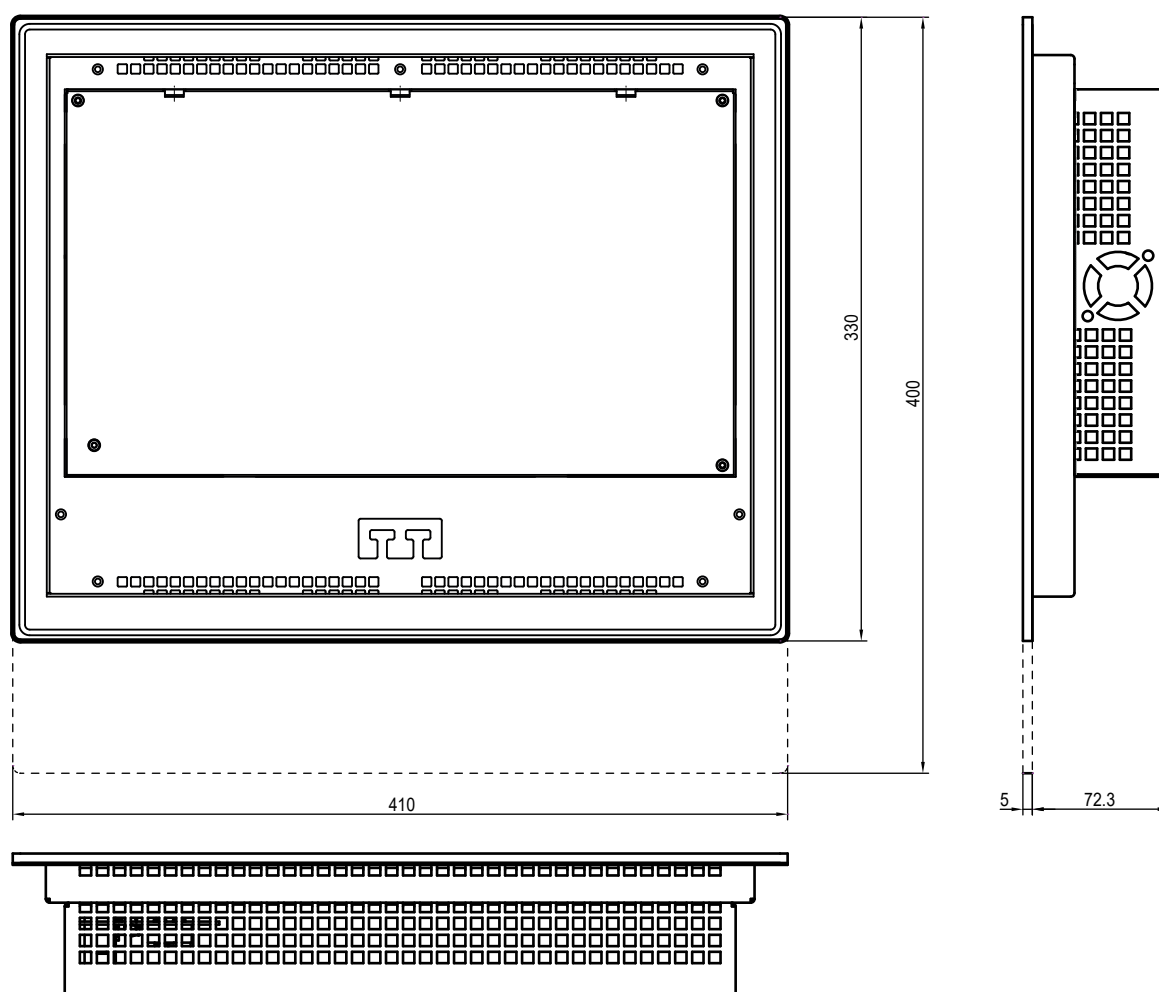
Dimensions in mm



Dashed line FS154xQ version only.

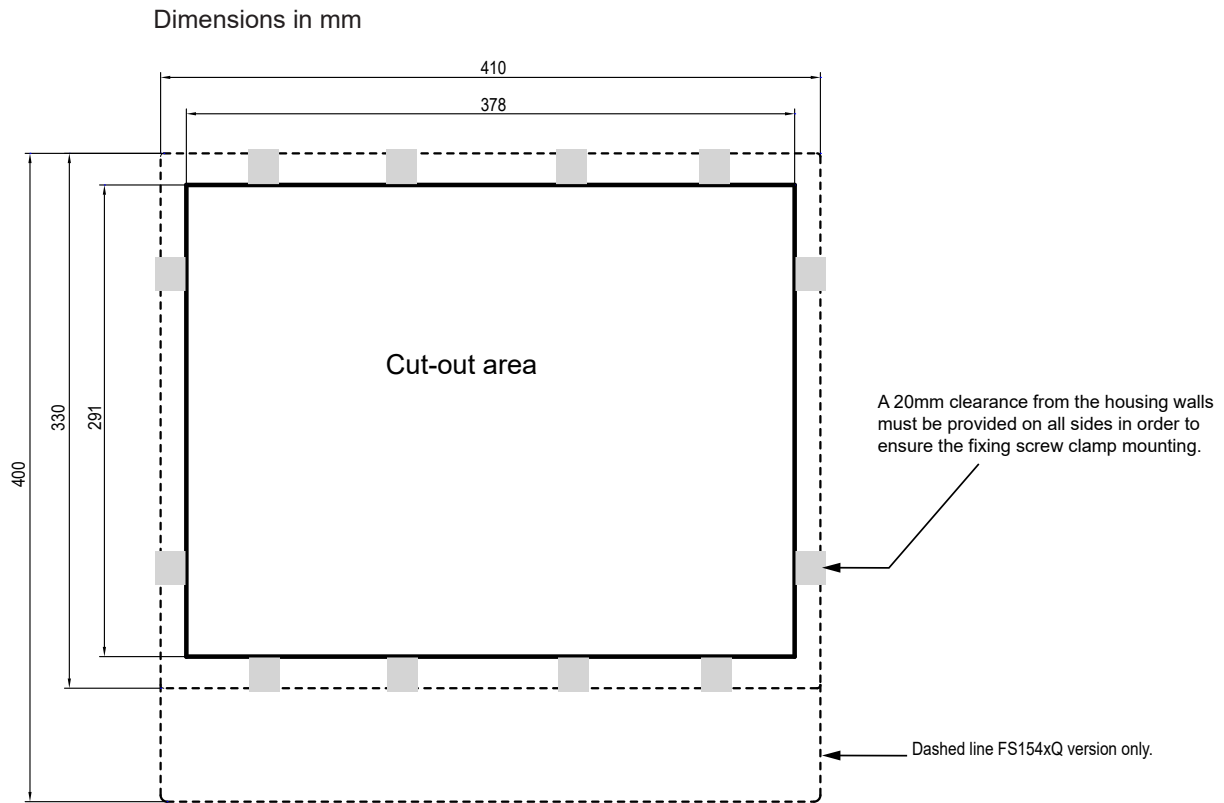
4.1.5.2 FS154i P2

Dimensions in mm



Dashed line FS154xQ version only.

4.1.6 Cut-out area



4.1.7 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 delay of 20seconds.

Shut Down:

To keep the system safe and running, never switch off the power directly but use a shut down procedure.

4.1.8 Diagnostics

Leds	Meaning
POWER	Power supply OK
SATA	HDD/SSD access
CF	Not used
BATTERY	Change battery

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 chapter 4.1.9.4)
Ethernet connection missing	- Incorrect Ethernet cable fitted (crossover/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.

4.1.9 Maintenance and Repair

4.1.9.1 Repairs

Repairs to FS154i Operator panels must only be carried out by the manufacturer.
(Manufacturer address see list of NUM agencies on chapter [1.5](#))

4.1.9.2 Transport

Only the original packaging must be used for transporting the device.
The climatic conditions must be observed. (see chapter [4.1.2](#))

4.1.9.3 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. (see chapter [4.1.2](#))

4.1.9.4 Battery replacement

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

Panel	Battery code
FS154i P1	EIV6003971
FS154i P2	EIV6003972

There is a danger of explosion if battery is incorrectly replaced.



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.

4.1.10 Panel connections

Please refer to chapter [9.4](#) for more detailed information upon the Panels connections.

4.1.11 Mounting instructions

The operator panel is installed from the front, for example, into a control cabinet. They are fixed at the rear with screw clamp.

The operator panel 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.

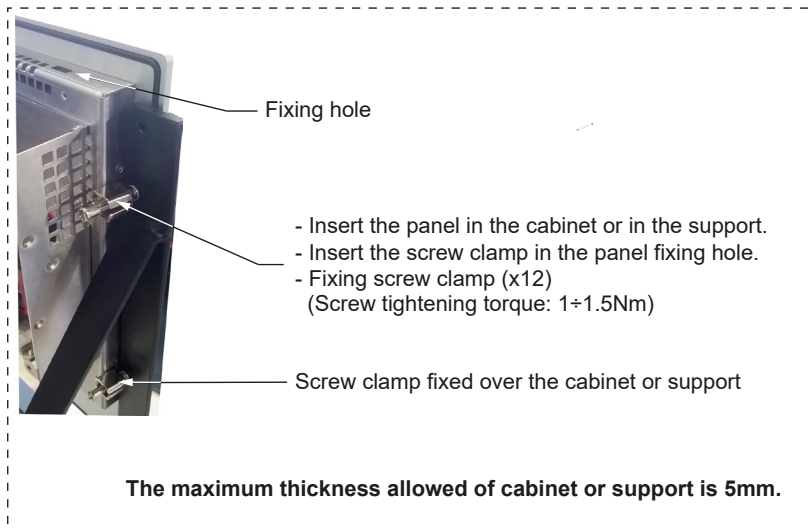
The operator panel can be mounted in a completely closed housing, provided that the ambient temperature (in the housing) is taken into account. A 20mm clearance from the housing walls must be provided on all sides in order to ensure sufficient air circulation.

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



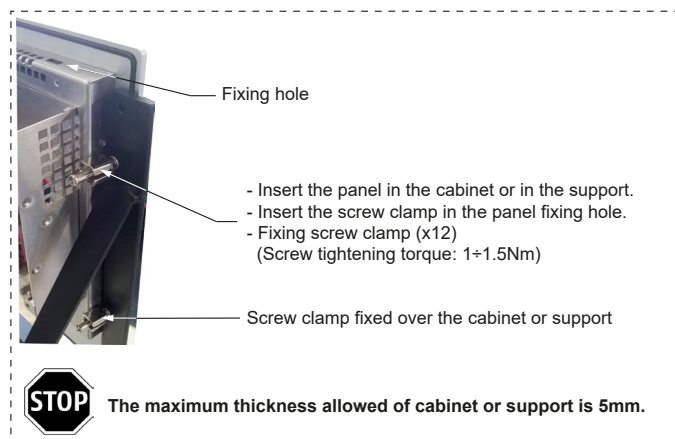
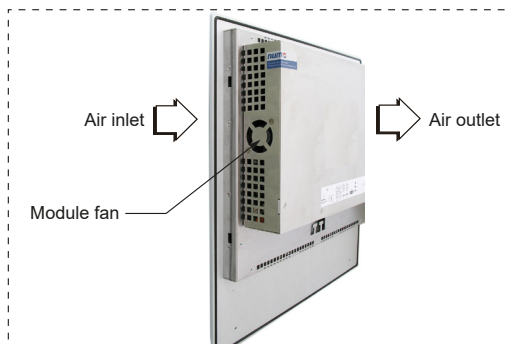
Prevention of overheating during operation:
- A forced airflow increases the overall reliability.

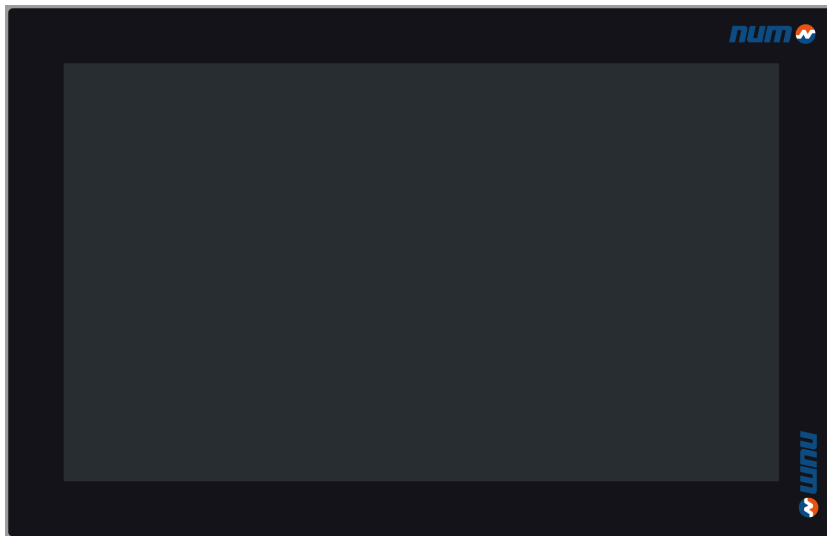
4.1.11.1 FS154i P1 mounting example



4.1.11.2 FS154i P2 mounting example

Panel ventilation





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.



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.

4.2.1 Ordering code

FS184i version	Ordering code
FS184i TS P2 SSD W10	FXPC184CN2SNR20
FS184i TS P2 SSD W10 2021	FXPC184CN2SNR40
FS184i TS P2 SSD CAN NVRAM W10	FXPC184CN2SDR20
FS184i TS P2 SSD CAN NVRAM W10 2021	FXPC184CN2SDR40

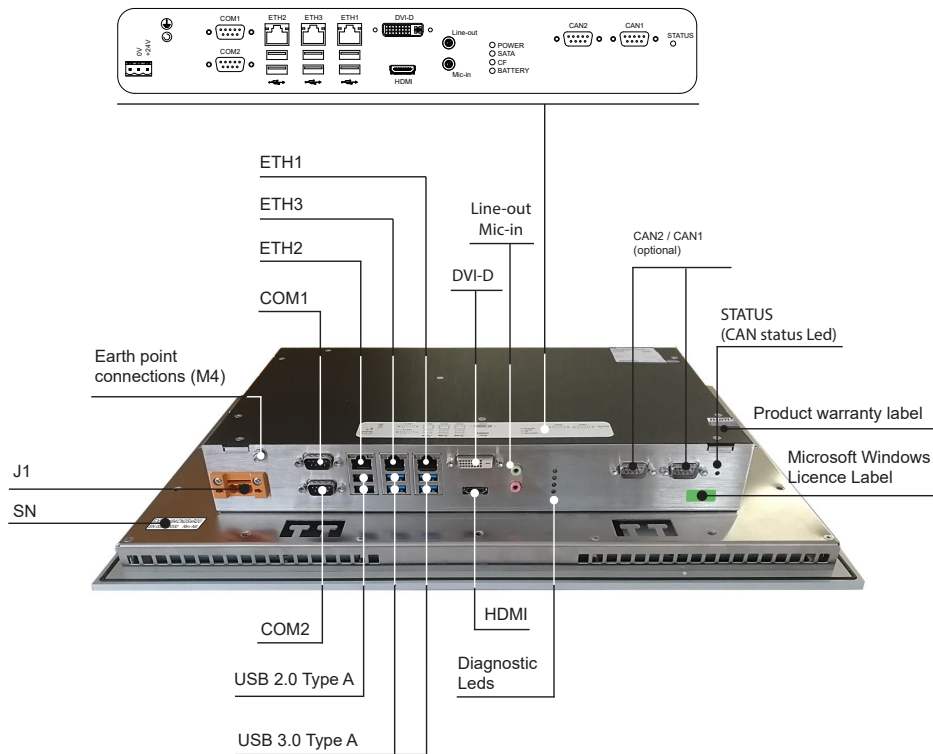
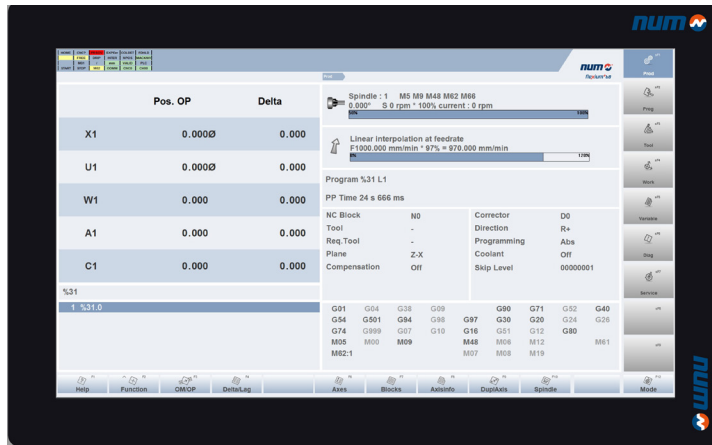
	FXPC	18	4	C	N	2	S	N	R	2	0
Display Unit											
• LCD 18.5"		18									
Panel/Mechanical Variant											
• Fourth Generation			4								
Display Sensor											
• Touch screen (proj.) capacitive				C							
Keyboard Type											
• No keyboard, no function keys					N						
IPC Mother Board, Processor											
• Performance level P2						2					
Mass Memory Type											
• SSD (Solid State Disc)							S				
Option Board											
• None								N			
• CAN + NVRAM								D			
Fixed Value									R		
Operating System											
• Windows 10 IoT Enterprise LTSC 2016 64 bits										2	
• Windows 10 IoT Enterprise LTSC 2021 64 bits ⁽¹⁾										4	
Spare Number											0

⁽¹⁾ Windows 10 IoT Enterprise LTSC 2021 64 bits supports only Flexium Tools starting from 4.2.00.00

4.2.2 Characteristics

		FXPC184CN2SxR20 FXPC184CN2SxR40
Screen	User interface	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	...R20 Windows 10 IoT Enterprise LTSC 2016 64 bits ...R40 Windows 10 IoT Enterprise LTSC 2021 64 bits ⁽¹⁾
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 interface	DVI-D
	HDMI	Yes
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 (5 A)
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
Weight		6.7 kg
Dimensions	W x H x D	488 x 309 x 71 mm
Cooling		With fan
⁽¹⁾ Windows 10 IoT Enterprise LTSC 2021 64 bits supports only Flexium Tools starting from 4.2.00.00		

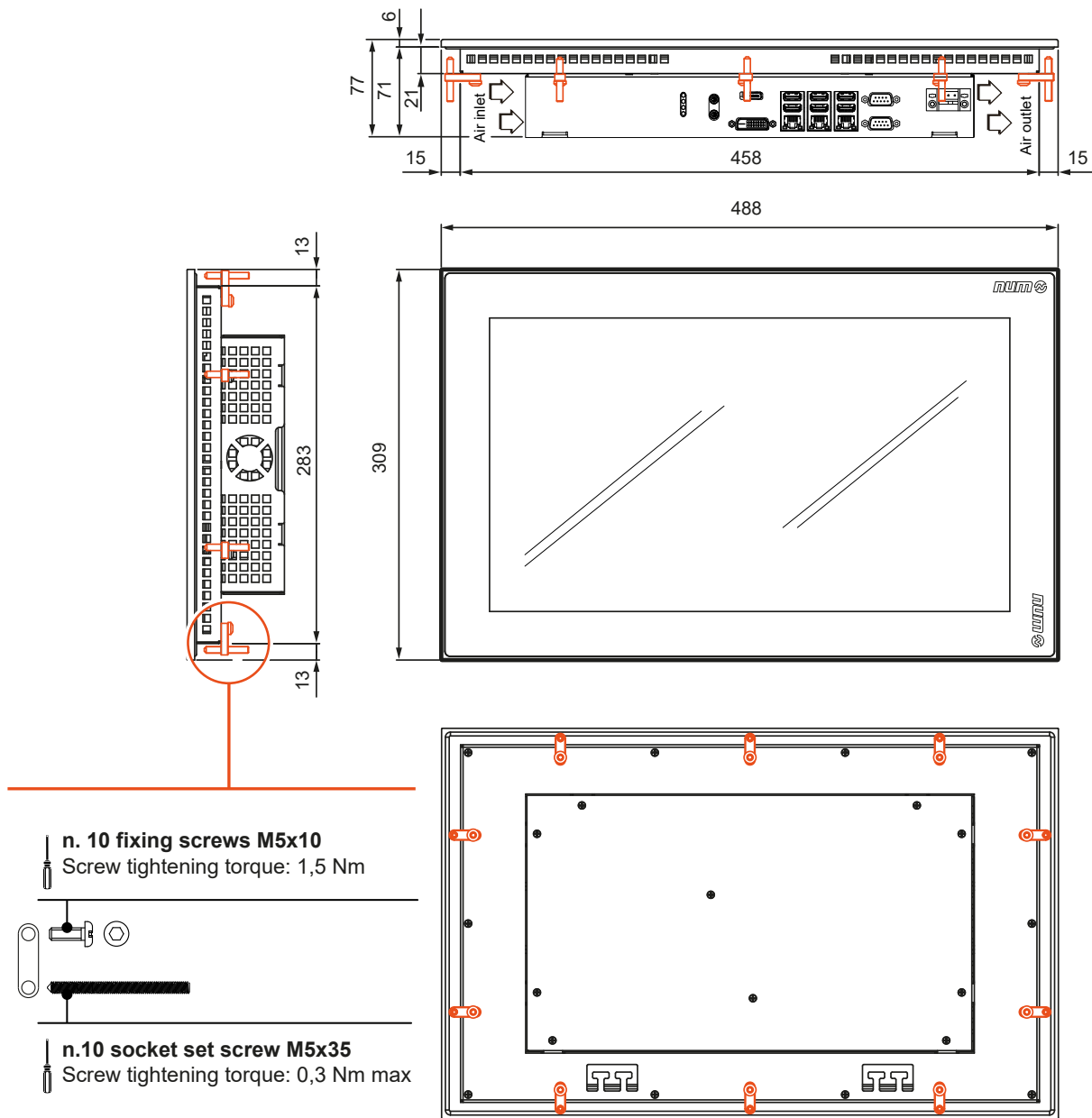
4.2.3 Module description



Connector	Type	Description
J1	3 screws pins F	Power supply connections
COM1 / COM2	RS232 Sub D 9 pins M	Serial interface. General user purpose
ETH1	RJ45 (8P/8C)	Flexium NCK Ethernet connections
ETH2	RJ45 (8P/8C)	PLC EtherCAT
ETH3	RJ45 (8P/8C)	Company LAN
DVI-D	Standard DVI	Digital Video interface connection
HDMI		High-Definition Multimedia Interface
USB	2 x USB 2.0 Type A, 4 x USB 3.0 Type A	General user purpose. (Mouse and all USB devices)
CAN1 / CAN2	Sub D 9 pins M	Dual CAN + NVRAM interface (optional)
Mic-in		
Line-out		

4.2.4 Overall dimensions

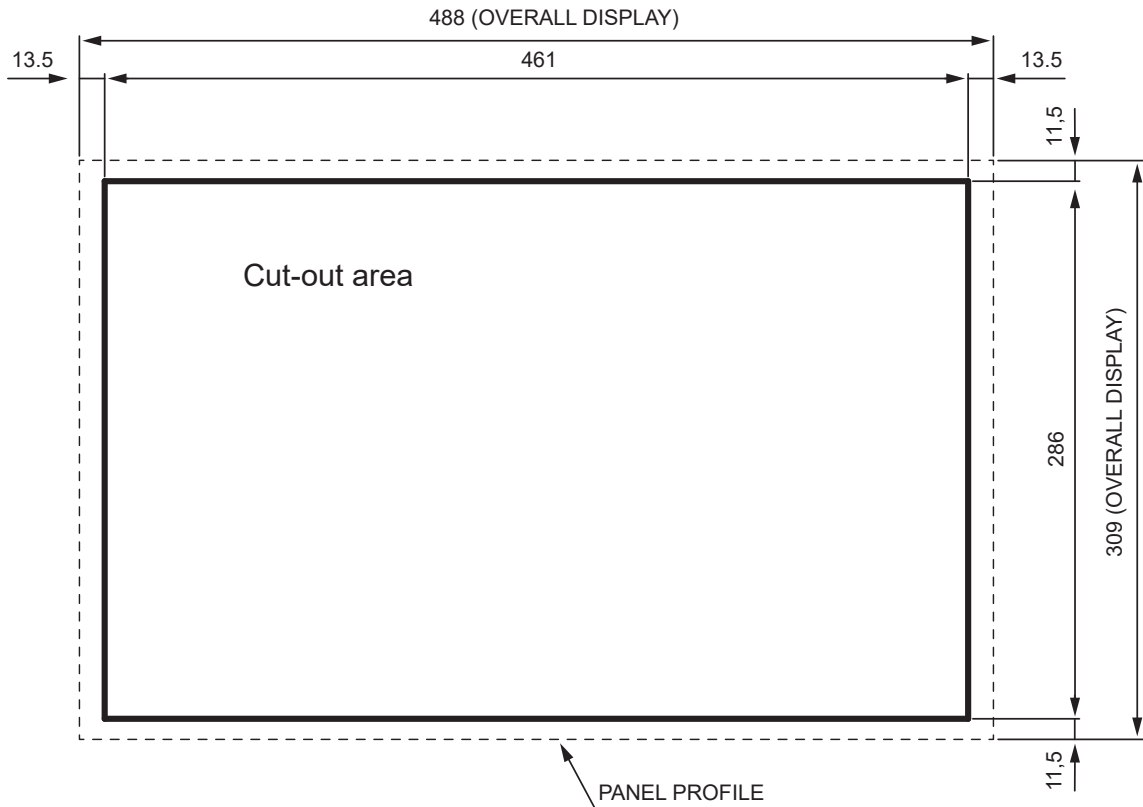
Dimensions in mm



Fixing kit, screws and brackets, for FS184i panel. Assembly to be carried out by the customer.

4.2.5 Cut-out area

Dimensions in mm



4.2.6 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.

4.2.7 Diagnostics

Leds	Meaning
POWER	Power supply OK
HDD	HDD/SSD access
BATTERY	Change battery
GPO_PR4	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 chapter 4.2.8.4)
Ethernet connection missing	- Incorrect Ethernet cable fitted (crossover/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.

4.2.8 Maintenance and Repair

4.2.8.1 Repairs

Repairs to FS184i Operator panels must only be carried out by the manufacturer.
(Manufacturer address see list of NUM agencies on chapter [1.5](#))

4.2.8.2 Transport

Only the original packaging must be used for transporting the device.
The climatic conditions must be observed (see chapter [4.2.2](#)).

4.2.8.3 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 (see chapter [4.2.2](#)).

4.2.8.4 Battery replacement

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

Panel	Battery code
FS184i P2	EIV6003972

There is a danger of explosion if battery is incorrectly replaced.



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.

4.2.9 Panel connections

Please refer to chapter [9.4](#) for more detailed information upon the panels connections.

4.2.10 Mounting instructions

The operator panel is installed from the front, for example, into a control cabinet. They are fixed at the rear with screw (see chapter [4.2.4](#))

The operator panel 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 operator panel can be mounted in a completely closed housing, provided that the ambient temperature (in the housing) is taken into account. A 20mm 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.



Prevention of overheating during operation:

- A forced airflow increases the overall reliability.

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.



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.

4.3.1 Ordering code

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

	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 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	
Spare Number											0

4.3.2 Characteristics

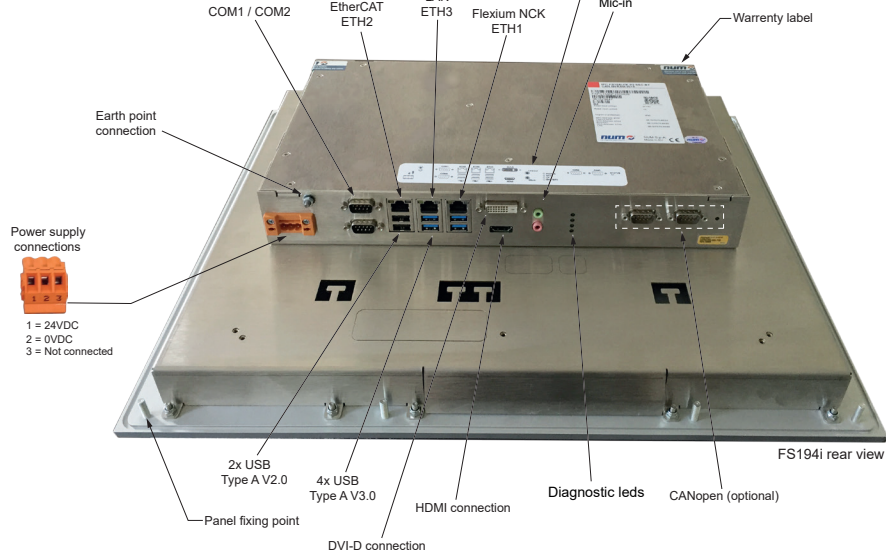
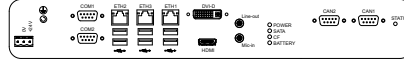
FXPC194CN2SxR20		
Screen	User interface options	Projected capacitive touch screen with hardened glass protection
	Technology	19" TFT LCD (16.9 million colours)
	Resolution	1024 x 1280 from 60 Hz to 75 Hz (vertical orientation)
	Size	304 x 379 mm
	Backlight	LED, Contr. 400:1 (Type)
Main PC Features	CPU	i5-6500TE 2.3GHz Quad Core 6th generation
	RAM	8 GB
	Mass storage	SSD 64 GB
	Operating system	Windows 10 IoT Enterprise LTSC 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

4.3.3 Module description

FS194i front view



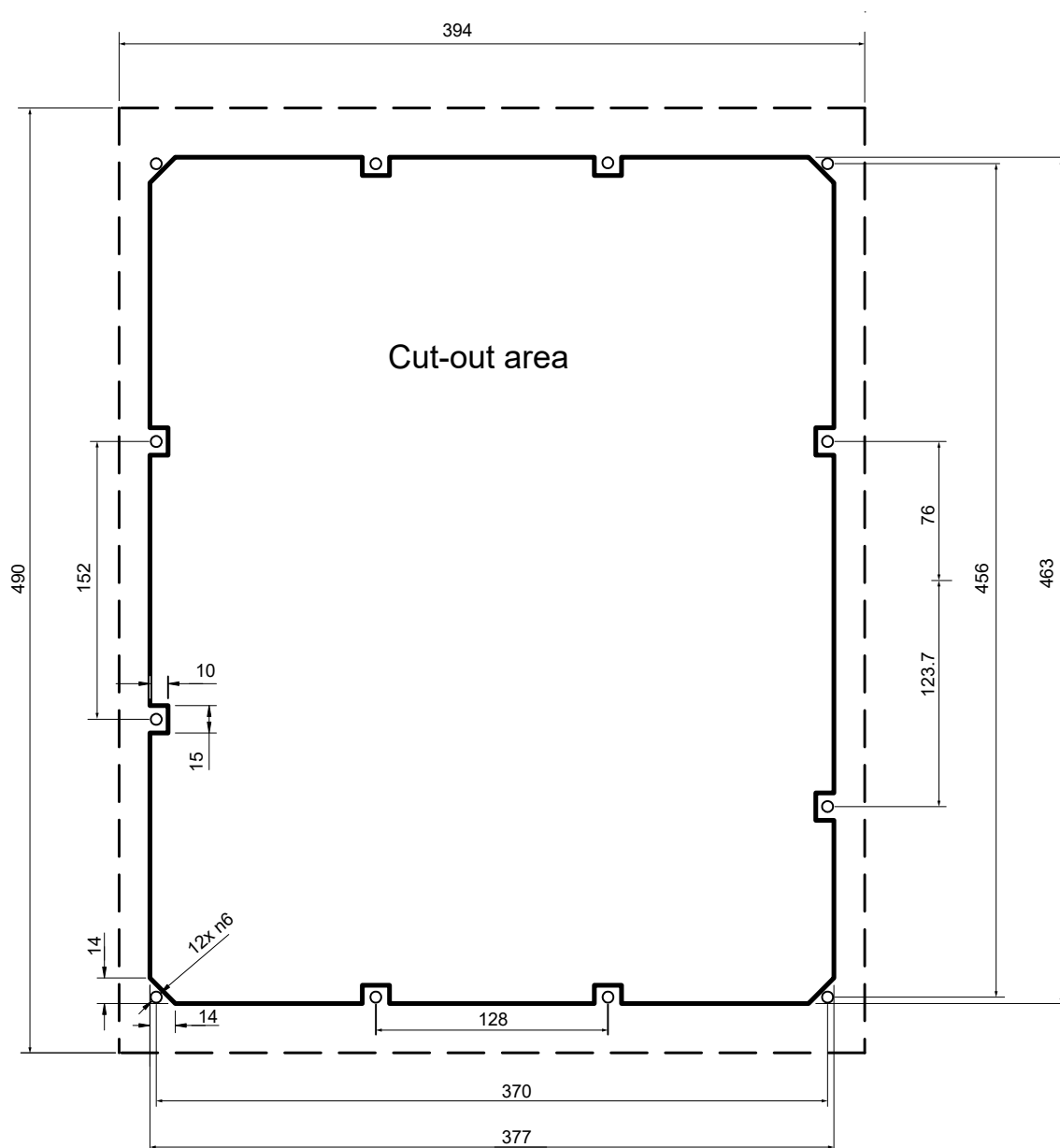
Connections label



Connector	Type	Description
Power supply	3 screws pins F	FS194i power supply connections
COM1 / COM2	RS232 Sub D 9 pins M	Serial interface. General user purpose
ETH1	RJ45 (8P/8C)	Flexium NCK Ethernet connections
ETH2	RJ45 (8P/8C)	PLC EtherCAT
ETH3	RJ45 (8P/8C)	Company LAN
CAN1 /CAN2	Sub D 9 pins M	Standard CAN interface (optional)
USB	2 x V2.0 Type A	General user purpose. (Mouse and all USB devices)
USB	4 x V3.0 Type A	General user purpose. (Mouse and all USB devices)
HDMI		High-Definition Multimedia Interface
DVI-D	Standard DVI	Digital Video interface connection
Mic-in		
Line-out		

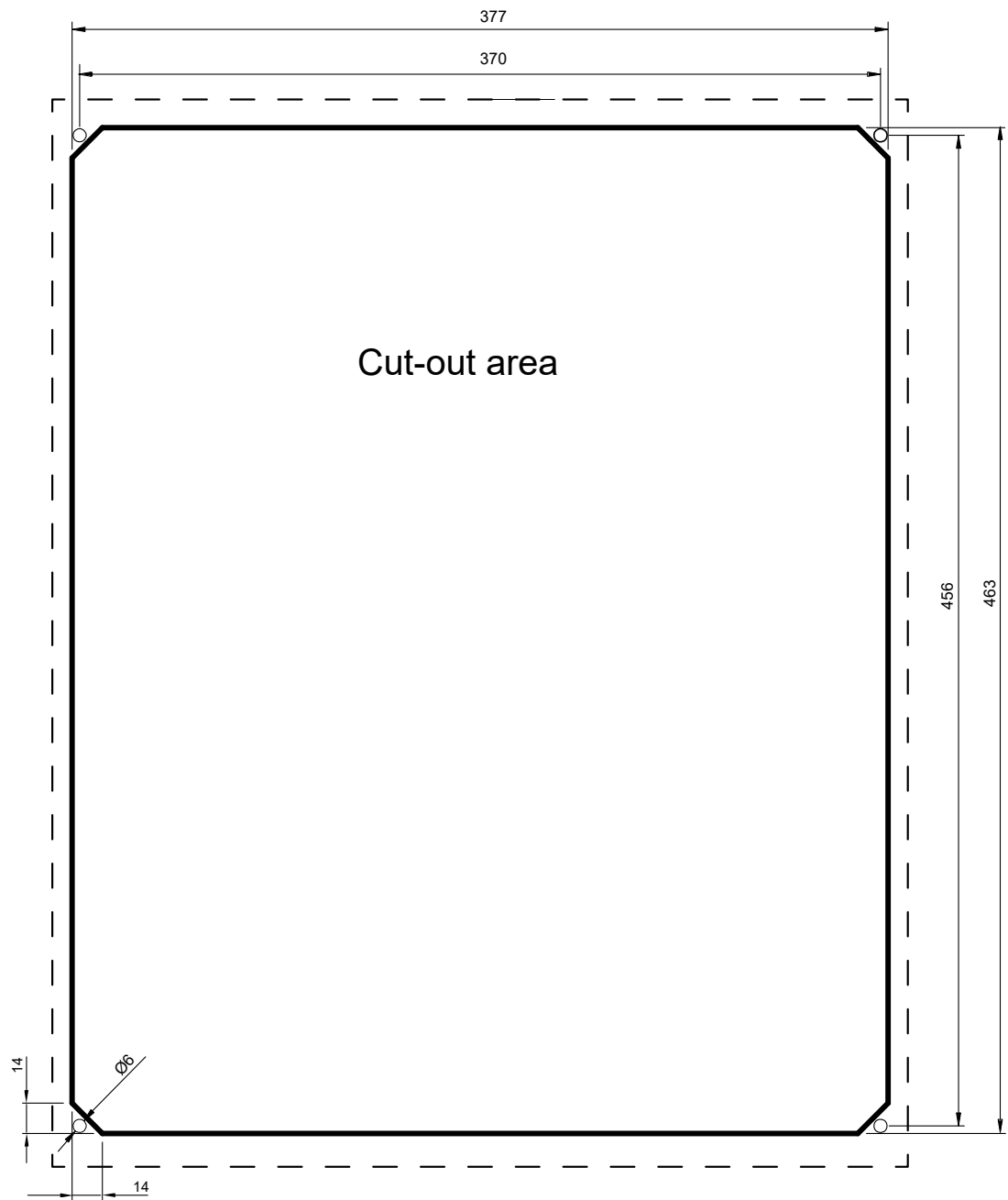
4.3.5 Cut-out area

Dimensions in mm



4.3.5.1 Panel cut-out using Back Side Mounting Plate

Dimensions in mm



4.3.6 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 delay of 20 seconds.

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

4.3.7 Diagnostics

Leds	Meaning
POWER	Power supply OK
HDD	HDD access
BATTERY	Change battery
GPO_PR4	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 chapter 4.3.8.4)
Ethernet connection missing	- Incorrect Ethernet cable fitted (crossover/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.

4.3.8 Maintenance and Repair

4.3.8.1 Repairs

Repairs to FS194i Operator panels must only be carried out by the manufacturer.
(Manufacturer address see list of NUM agencies on chapter [1.5](#))

4.3.8.2 Transport

Only the original packaging must be used for transporting the device.
The climatic conditions must be observed (see chapter [4.3.2](#)).

4.3.8.3 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 (see chapter [4.3.2](#)).

4.3.8.4 Battery replacement

The battery is used to back up the clock circuit. The battery should be changed every 5 years in order to prevent any date/time loss. The battery code is Panasonis BR2032.

There is a danger of explosion if battery is incorrectly replaced.



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.

4.3.9 Panel connections

Please refer to chapter [9.4](#) for more detailed information upon the panels connections.

4.3.10 Mounting instructions

The operator panel is installed from the front, for example, into a control cabinet. They are fixed at the rear with screw (see chapter [4.3.5](#))

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

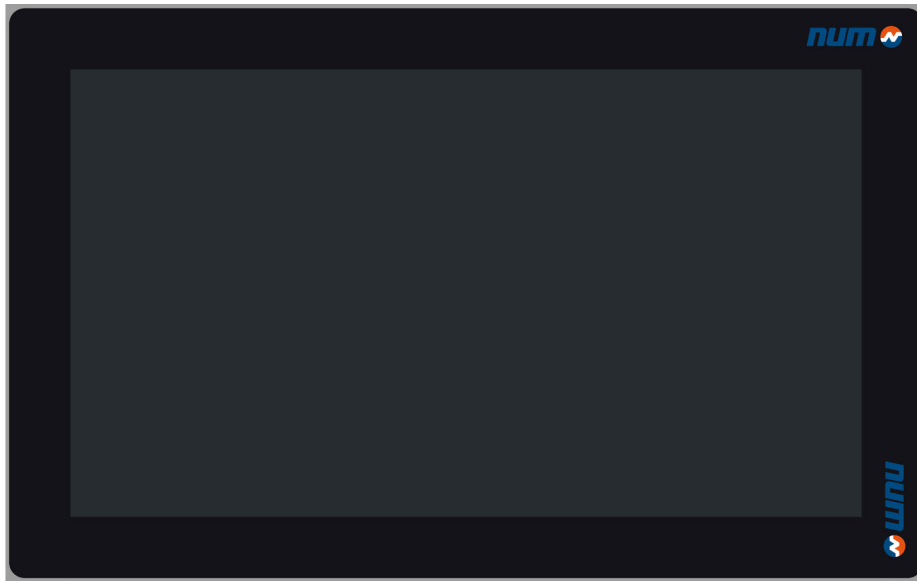
A minimum clearance of 75mm must be provided to active elements such as power supplies, transformers etc.



Prevention of overheating during operation:

- A forced airflow increases the overall reliability.

4.4 FS244i operator panels with Integrated PC



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 Ordering code

FS244i version	Ordering code
FS244i TS P2 SSD W10	FXPC244CN2SNR20
FS244i TS P2 SSD W10 2021	FXPC244CN2SNR40
FS244i TS P2 SSD CAN NVRAM W10	FXPC244CN2SDR20
FS244i TS P2 SSD CAN NVRAM W10 2021	FXPC244CN2SDR40

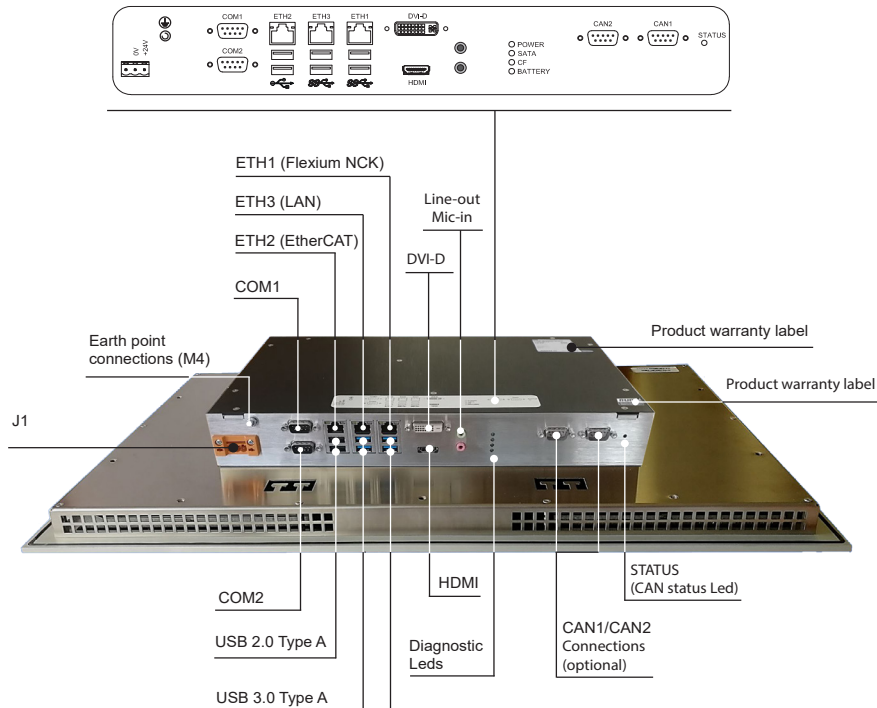
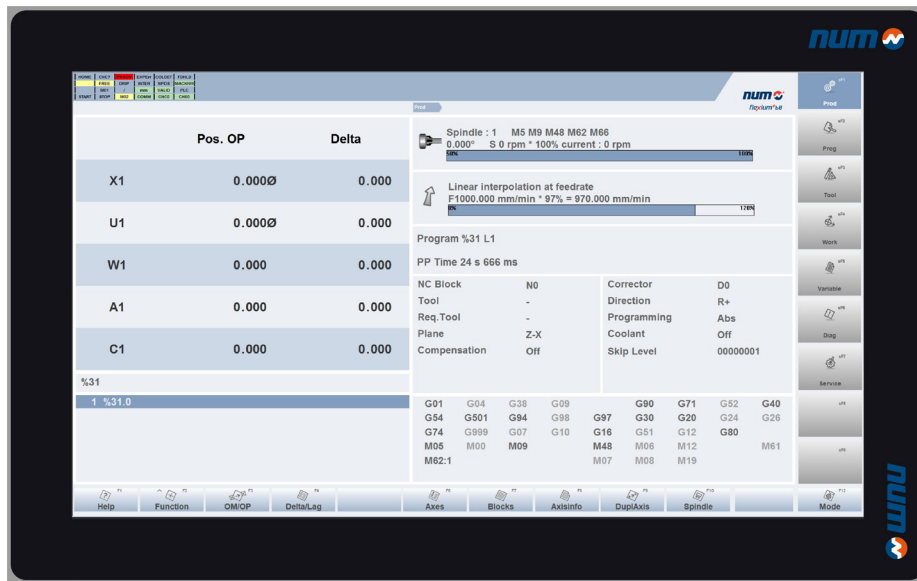
	FXPC	24	4	C	N	2	S	N	R	2	0
Display Unit											
• LCD 24"		24									
Panel/Mechanical Variant											
• Fourth Generation			4								
Display Sensor											
• Touch screen (proj.) capacitive				C							
Keyboard Type											
• No keyboard, no function keys					N						
IPC Mother Board, Processor											
• Performance level P2						2					
Mass Memory Type											
• SSD (Solid State Disc)							S				
Option Board											
• None								N			
• CAN + NVRAM								D			
Fixed Value									R		
Operating System											
• Windows 10 IoT Enterprise LTSC 2016 64 bits										2	
• Windows 10 IoT Enterprise LTSC 2021 64 bits ⁽¹⁾										4	
Spare Number											0

⁽¹⁾ Windows 10 IoT Enterprise LTSC 2021 64 bits supports only Flexium Tools starting from 4.2.00.00

4.4.2 Characteristics

		FXPC244CN2SxR20 FXPC244CN2SxR40
Screen	User interface	Projected capacitive touch screen with glass protection
	Technology	24" TFT LCD (16.9 million colors)
	Resolution	1920 x 1080
	Size	531.3 x 298.8mm
	Backlight	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	...R20 Windows 10 IoT Enterprise LTSC 2016 64 bits ...R40 Windows 10 IoT Enterprise LTSC 2021 64 bits ⁽¹⁾
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 interface	DVI-D
	HDMI	Yes
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	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		8.9 kg
Dimensions	W x H x D	621.5 x 389 x 76 mm
Cooling		With fan
⁽¹⁾ Windows 10 IoT Enterprise LTSC 2021 64 bits support only Flexium Tools starting from 4.2.00.00		

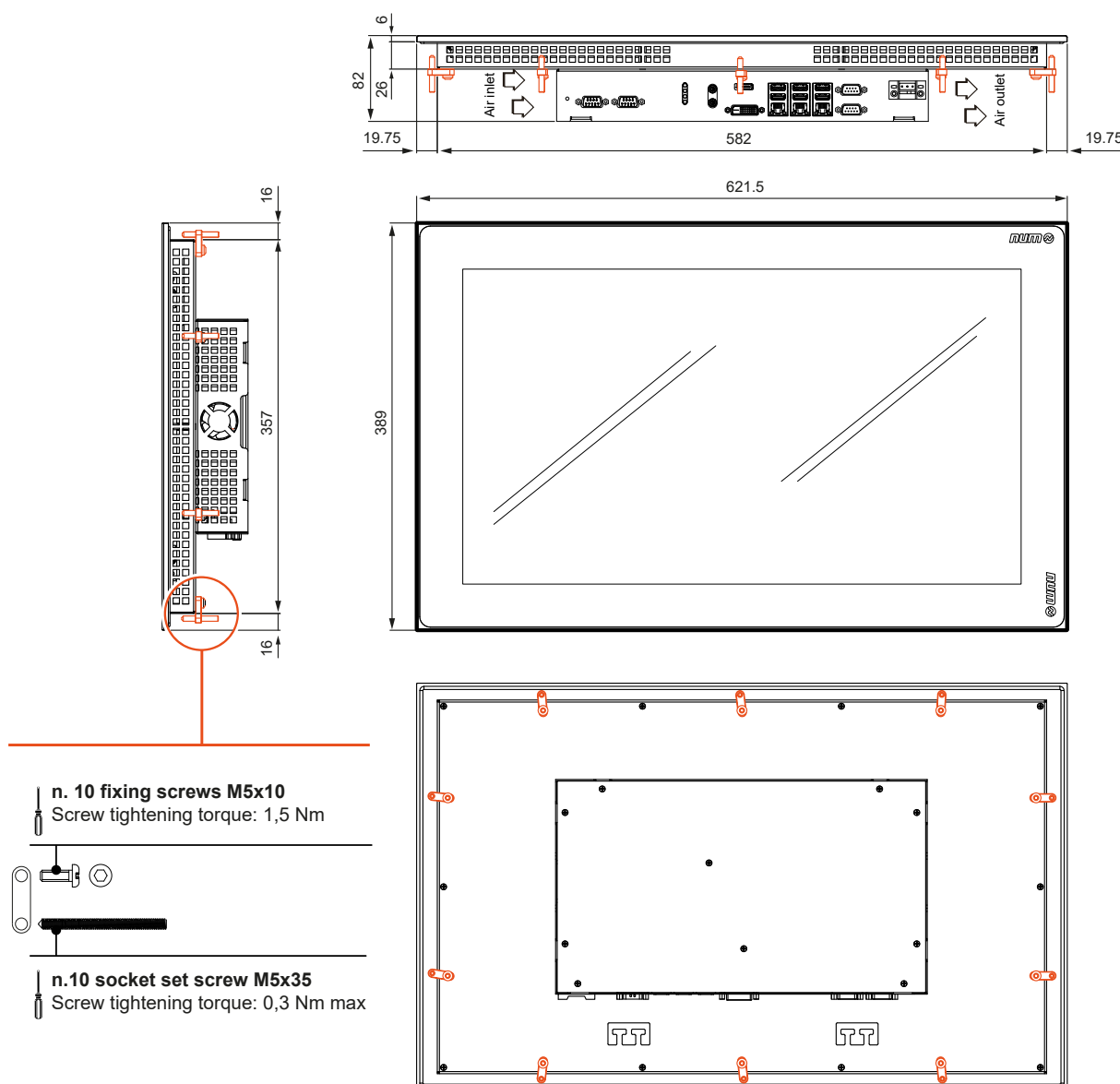
4.4.3 Module description



Connector	Type	Description
J1	3 screws pins F	Power supply connections
COM1 / COM2	RS232 Sub D 9 pins M	Serial interface. General user purpose
ETH1	RJ45 (8P/8C)	
ETH2	RJ45 (8P/8C)	PLC EtherCAT
ETH3	RJ45 (8P/8C)	Company LAN
DVI-D	Standard DVI	Digital Video interface connection
USB	2 x USB 2.0 Type A, 4 x USB 3.0 Type A	General user purpose. (Mouse and all USB devices)
HDMI		High-Definition Multimedia Interface
CAN1 / CAN2	Sub D 9 pins M	Standard CAN interface (optional)
Mic-in		
Line-out		

4.4.4 Overall dimensions

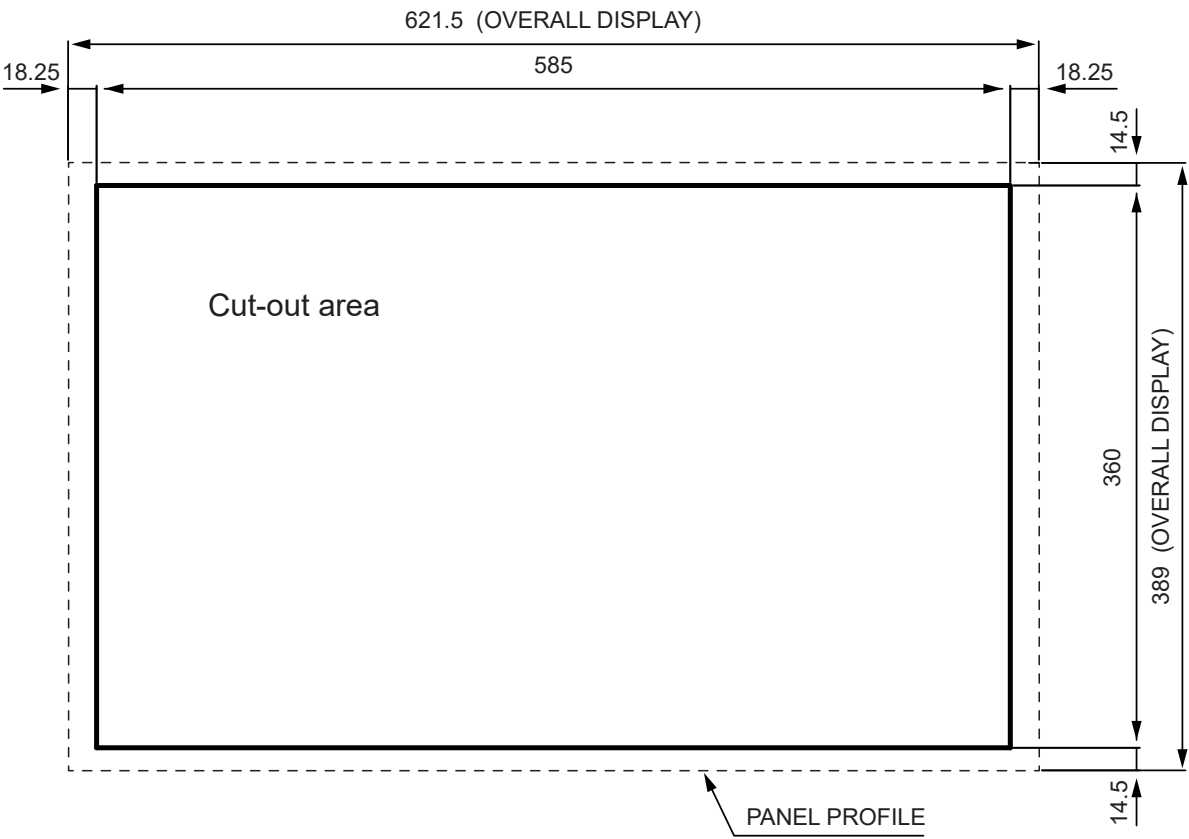
Dimensions in mm



Fixing kit, screws and brackets, for FS244i panel. Assembly to be carried out by the customer.

4.4.5 **Cut-out area**

Dimensions in mm



4.4.6 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 shutdown procedure. A shutdown can be initialised by the PLC program or by windows itself.

4.4.7 Diagnostics

Leds	Meaning
POWER	Power supply OK
SATA	SSD access
CF	Not used
BATTERY	Change battery

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 chapter 4.4.8.4)
Ethernet connection missing	- Incorrect Ethernet cable fitted (crossover/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.

4.4.8 Maintenance and Repair

4.4.8.1 Repairs

Repairs to FS244i Operator panels must only be carried out by the manufacturer.

(Manufacturer address see list of NUM agencies on chapter 1.5)

4.4.8.2 Transport

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

The climatic conditions must be observed (see chapter 4.4.2).

4.4.8.3 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 (see chapter 4.4.2).

4.4.8.4 Battery replacement

The battery is used to back up the clock circuit. The battery should be changed every 5 years in order to prevent any date/time loss. The battery code is EIV6003972.

There is a danger of explosion if battery is incorrectly replaced.



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.

4.4.9 Panel connections

Please refer to chapter [9.4](#) for more detailed information upon the panels connections.

4.4.10 Mounting instructions

The operator panel is installed from the front, for example, into a control cabinet. They are fixed at the rear with screw (see chapter [4.4.4](#))

The FS244i can be operated at a maximum ambient temperature of 45°C.

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.



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

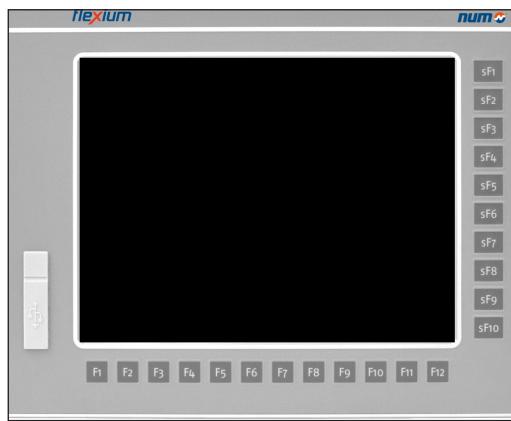
4.5 FS122 Operator Panel (without integrated PC)

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 Ordering code

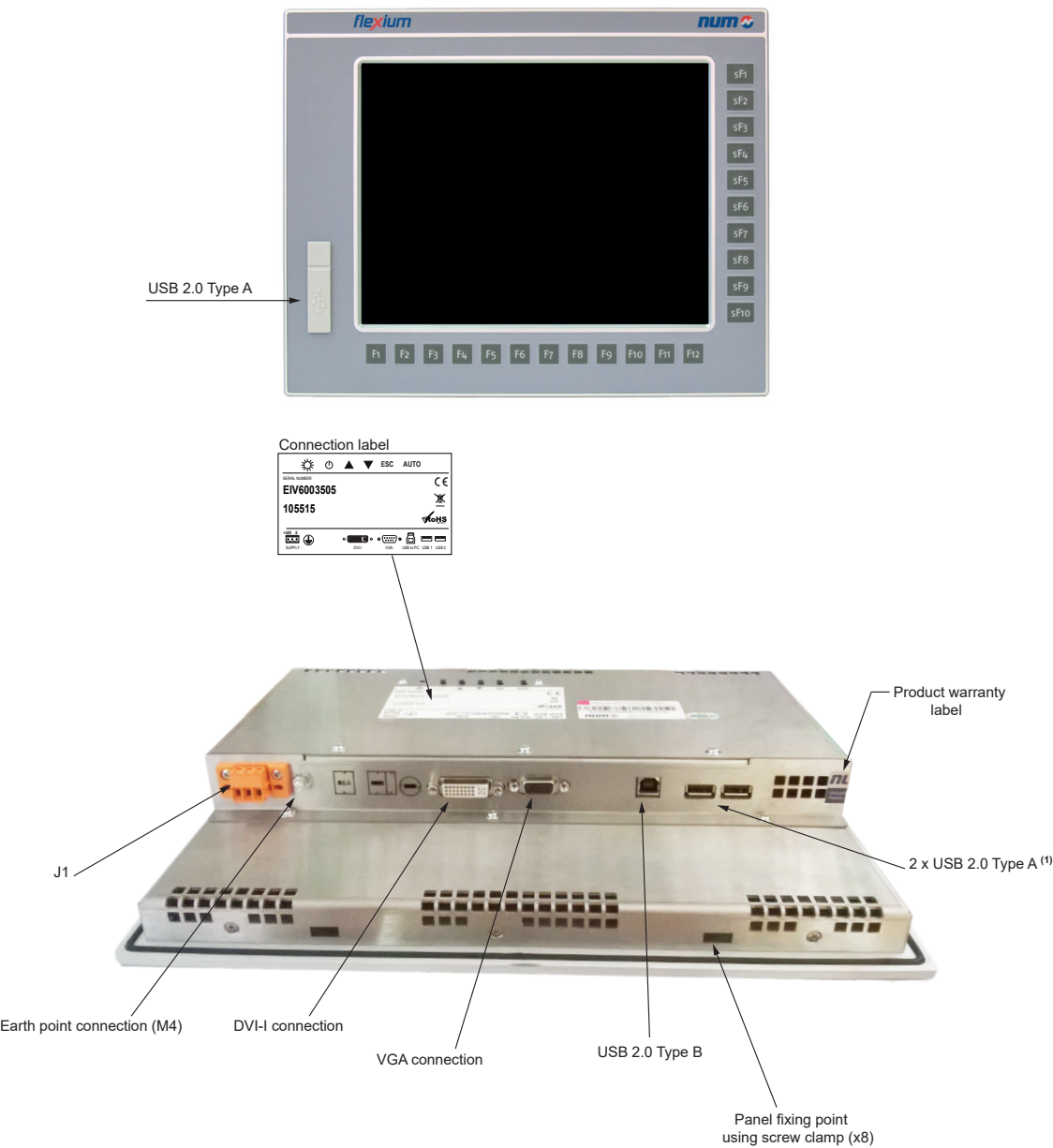
FS122 version	Ordering code
FS122-FK-TS	FXPC122RFNNNN00
FS122-FK	FXPC122NFNNNN00

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

4.5.2 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/m ²
Communication Interfaces	USB front	1 x USB 2.0 Type A
	USB rear	2 x USB 2.0 Type A (only 1 x USB 2.0 Type A in case of touch version) + 1 x USB 2.0 Type B
	DVI-I 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 52mm

4.5.3 Module description



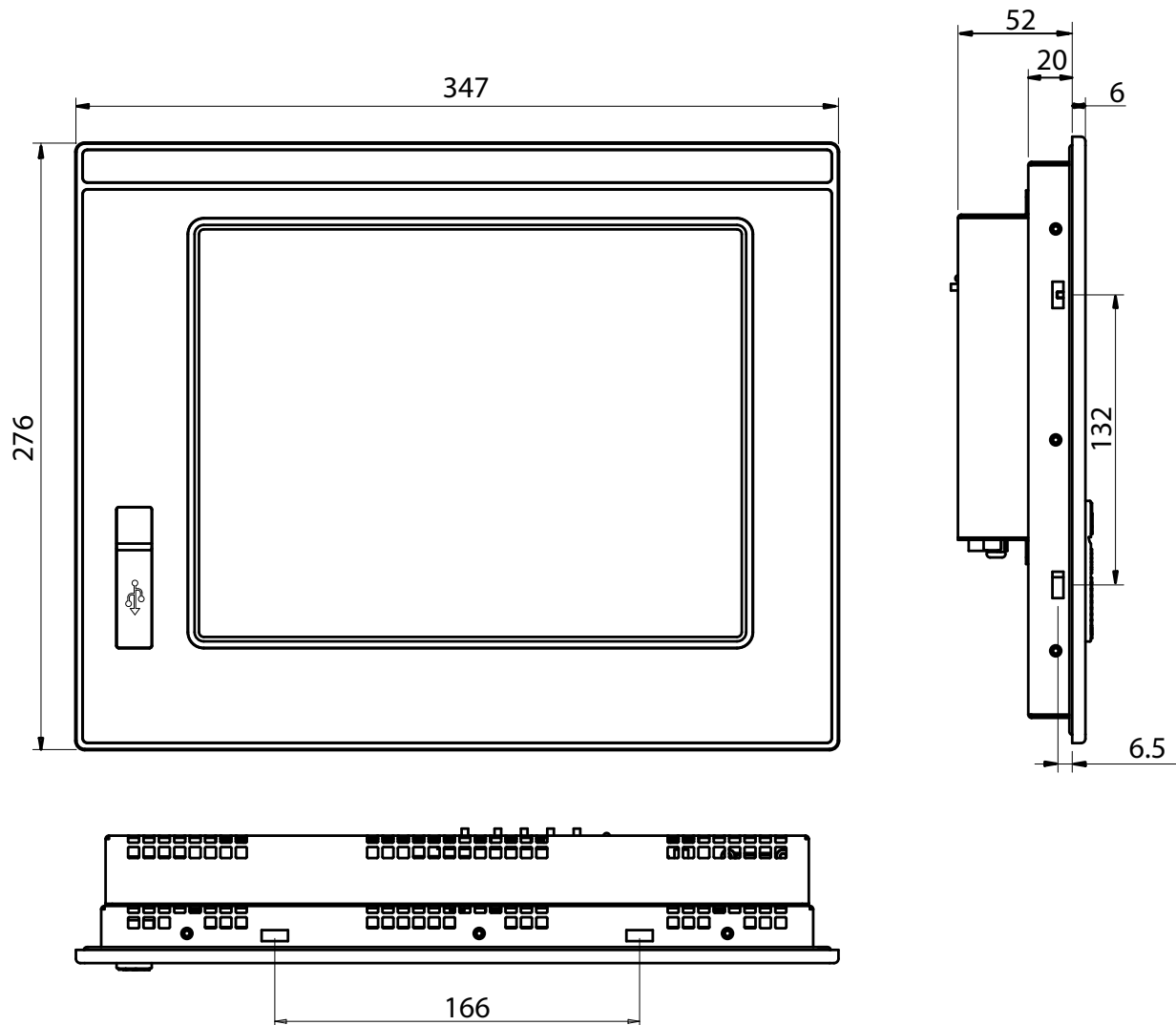
Connector	Type	Description
J1	3 screws pins F	Power supply connections
USB (Front)	USB 2.0 Type A	General user purpose. (Memory stick, Mouse and all USB devices)
USB (Rear)		
USB (to PC)	USB 2.0 Type B	Interface to PC connections
DVI-I	Standard DVI	Digital Video interface connection
VGA	VGA interface	Standard VGA interface



(1) Only 1 x USB 2.0 Type A in case of touch version.

4.5.4 Overall dimensions

Dimensions in mm



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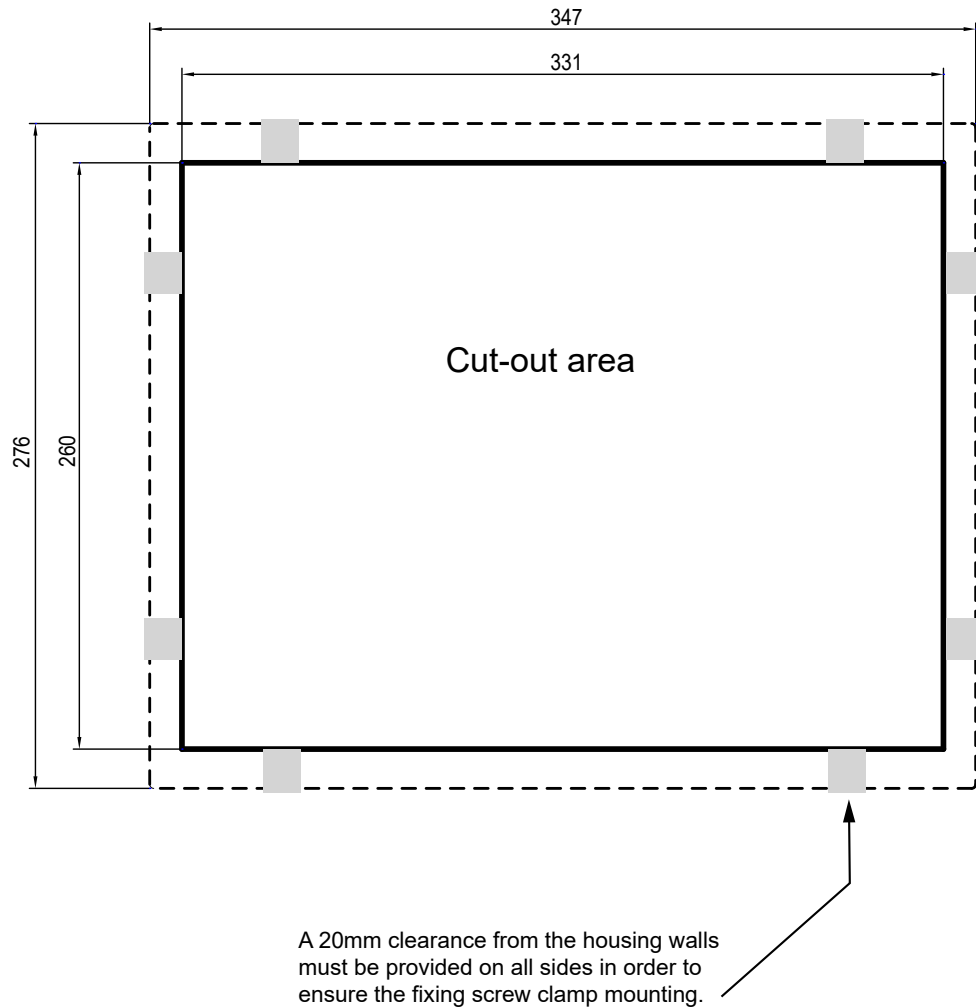
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4.5.5 Cut-out area

Dimensions in mm



4.5.6 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.

4.5.7 Maintenance and Repair

4.5.7.1 Repairs

Repairs to FS122 Operator panels must only be carried out by the manufacturer.
(Manufacturer address see list of NUM agencies on chapter [1.5](#))

4.5.7.2 Transport

Only the original packaging must be used for transporting the device.
The climatic conditions must be observed (see chapter [4.5.2](#)).

4.5.7.3 Storage

Only the original packaging must be used for transporting the device.
The climatic conditions must be observed (see chapter [4.5.2](#)).

4.5.8 Panel connections

Please refer to chapter [9.4](#) for more detailed information upon the panels connections.

4.5.9 Mounting instructions

The operator panel is installed from the front, for example, into a control cabinet. They are fixed at the rear with screw clamp.

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

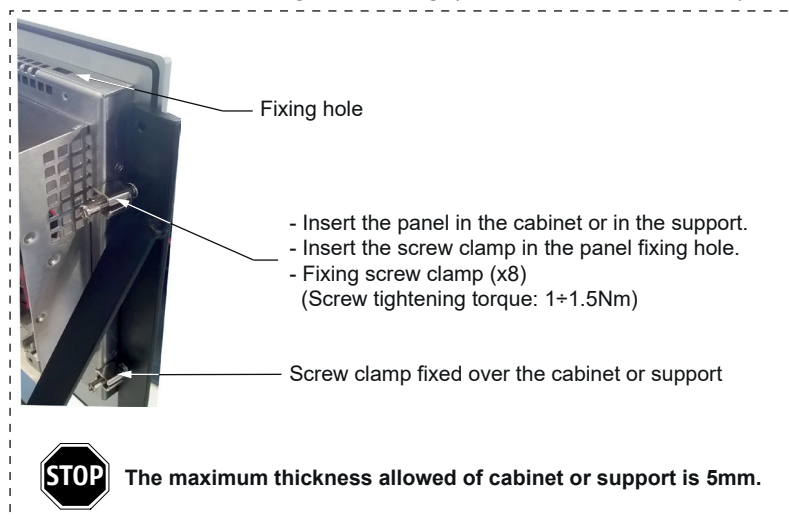
A minimum clearance of 75mm must be provided to active elements such as power supplies, transformers etc.



Prevention of overheating during operation:

- A forced airflow increases the overall reliability.

FS122 Panel mounting and fixing (example with support)



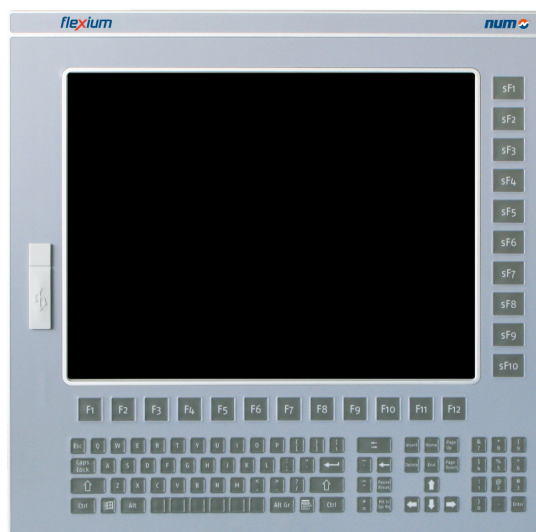
4.6 FS153 Operator Panel (without integrated PC)

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 Ordering code

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

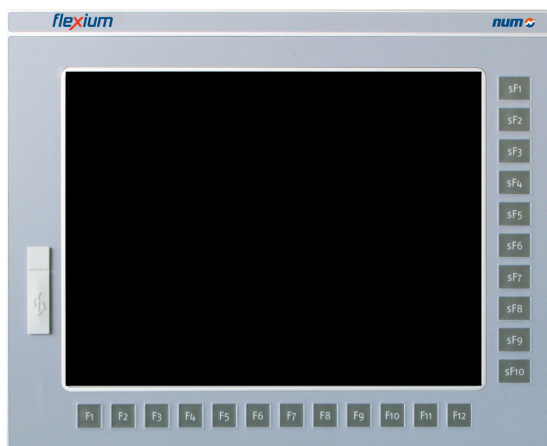
	FXPC	15	3	R	F	N	N	N	N	0	0
Display Unit											
- LCD 15"		15									
Panel/Mechanical Variant											
- Third generation 1			3								
Display Sensor											
- Touch screen resistive				R							
- No touch Sensor				N							
Keyboard Type											
- 22 Function keys					F						
- 22 Function 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

4.6.2 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)
Communication Interfaces	USB front	1 x USB 2.0 Type A
	USB rear	2 x USB 2.0 Type A (only 1 x USB 2.0 Type A in case of touch version) + 1 x USB 2.0 Type B
	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 mm

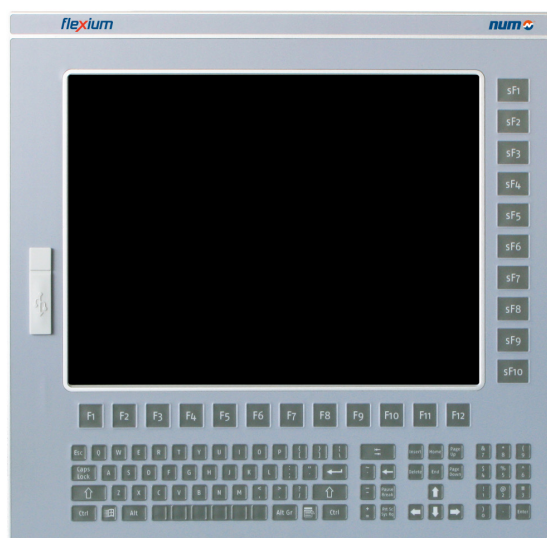
4.6.3 Panel options

Panel with 22 Function Keys



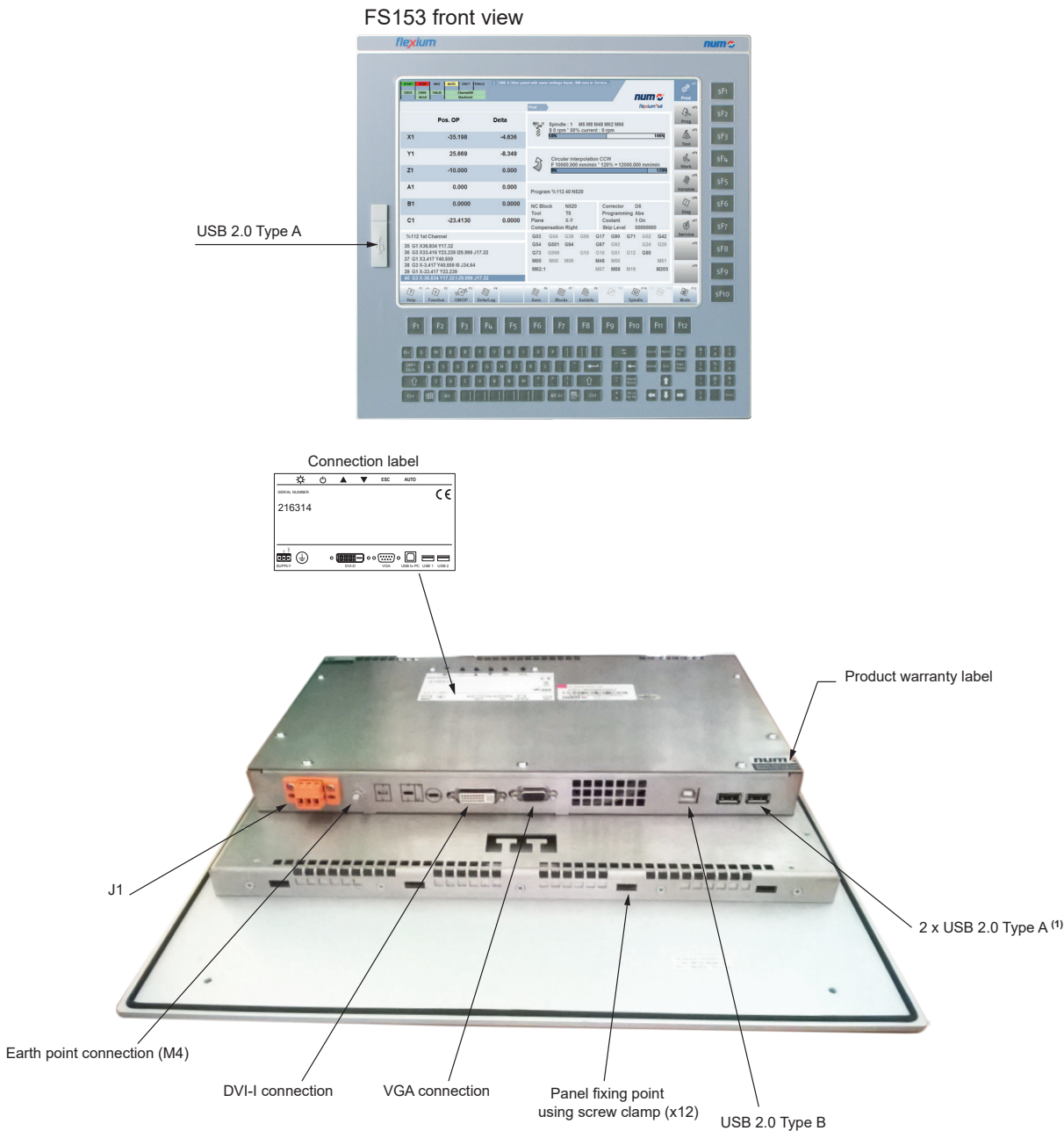
Reference with PC Panel coding «F»)

Panel with 22 Function Keys and



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

4.6.4 Module description



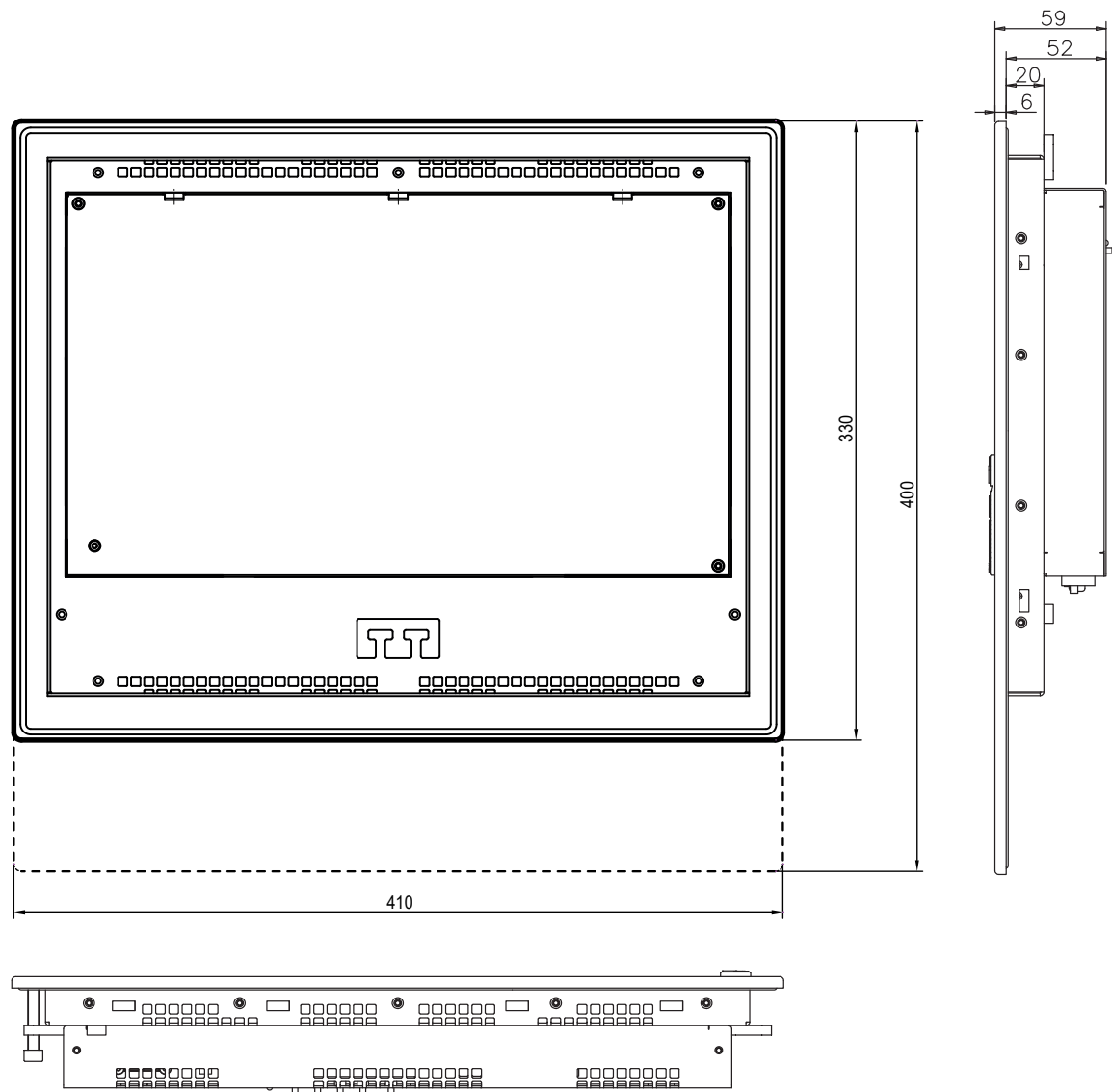
Connector	Type	Description
J1	3 screws pins F	Power supply connections
USB (Front)	USB 2.0 Type A	General user purpose. (Memory stick, Mouse and all USB devices)
USB (Rear)		
USB (to PC)	USB 2.0 Type B	Interface to PC connections
DVI-I	Standard DVI	Digital Video interface connection
VGA	VGA interface	Standard VGA interface



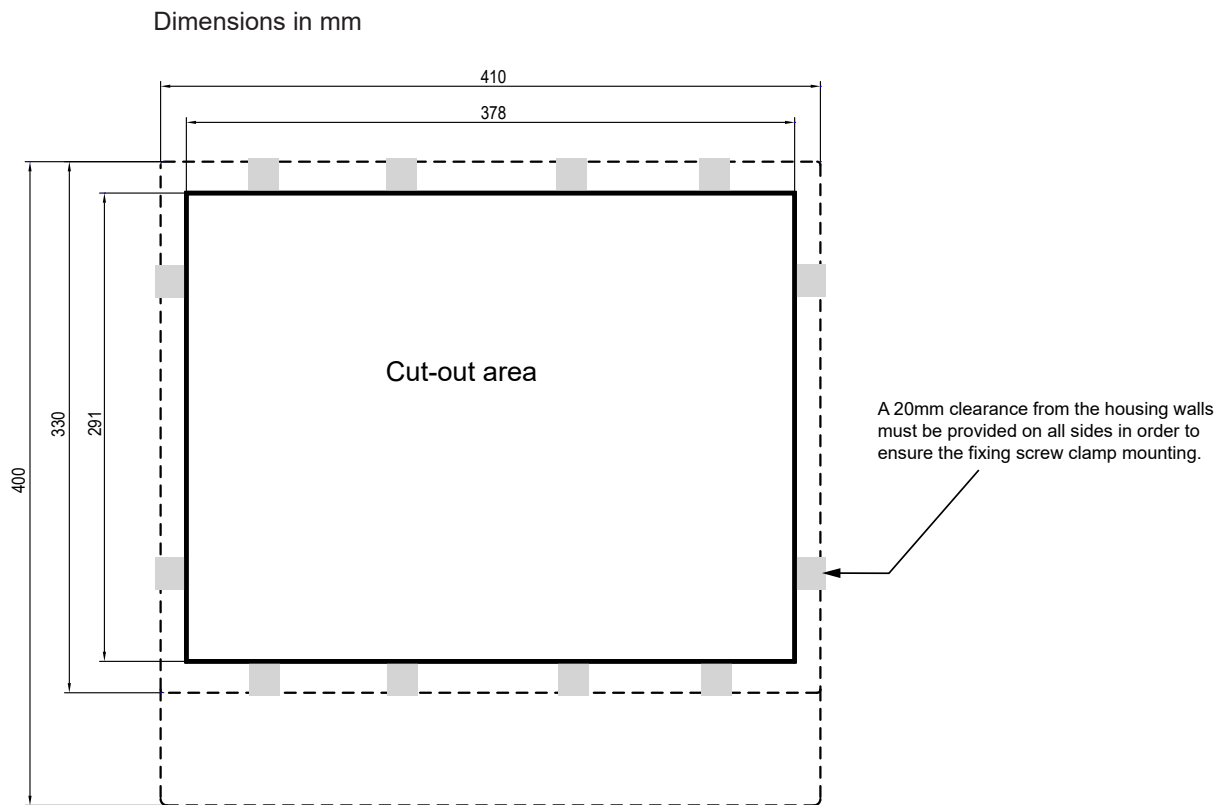
(1) Only 1 x USB 2.0 Type A in case of touch version.

4.6.5 Overall dimensions

Dimensions in mm



4.6.6 Cut-out area



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.

4.6.8 Backlight

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

4.6.8.1 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.

4.6.9 Maintenance and Repair

4.6.9.1 Repairs

Repairs to FS153 Operator panels must only be carried out by the manufacturer.
(Manufacturer address see list of NUM agencies on chapter [1.5](#))

4.6.9.2 Transport

Only the original packaging must be used for transporting the device.
The climatic conditions must be observed (see chapter [4.6.2](#)).

4.6.9.3 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 (see chapter [4.6.2](#)).

4.6.10 Panel connections

Please refer to chapter [9.4](#) for more detailed information upon the panels connections.

4.6.11 Mounting instructions

The operator panel is installed from the front, for example, into a control cabinet. They are fixed at the rear with screw clamp.

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.

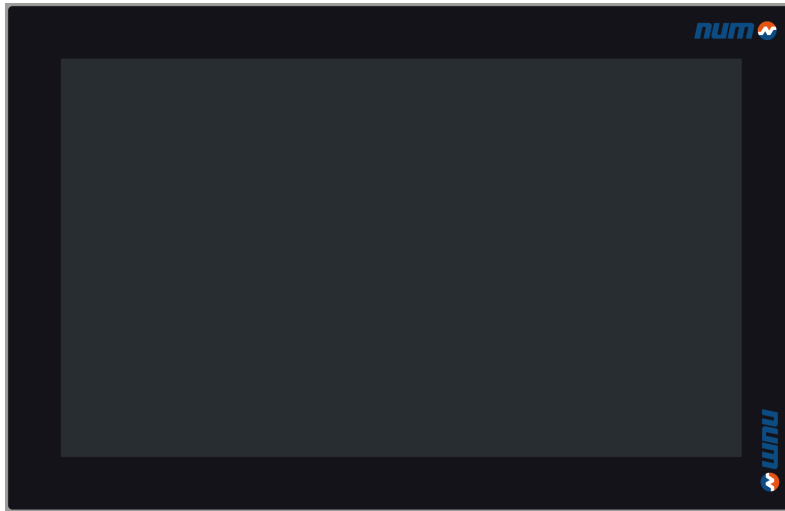
The device can be mounted in a completely closed housing, provided that the ambient temperature (in the case) is taken into account. A 20mm clearance from the housing walls must be provided on all sides in order to ensure sufficient air circulation and the fixing screw clamp mounting.

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



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

4.7 FS184 Operator panel (without integrated PC)



FS184 is a 18.5" display, glass protected, fitted with a capacitive multi-touch screen system.

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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4.7.1 Ordering code

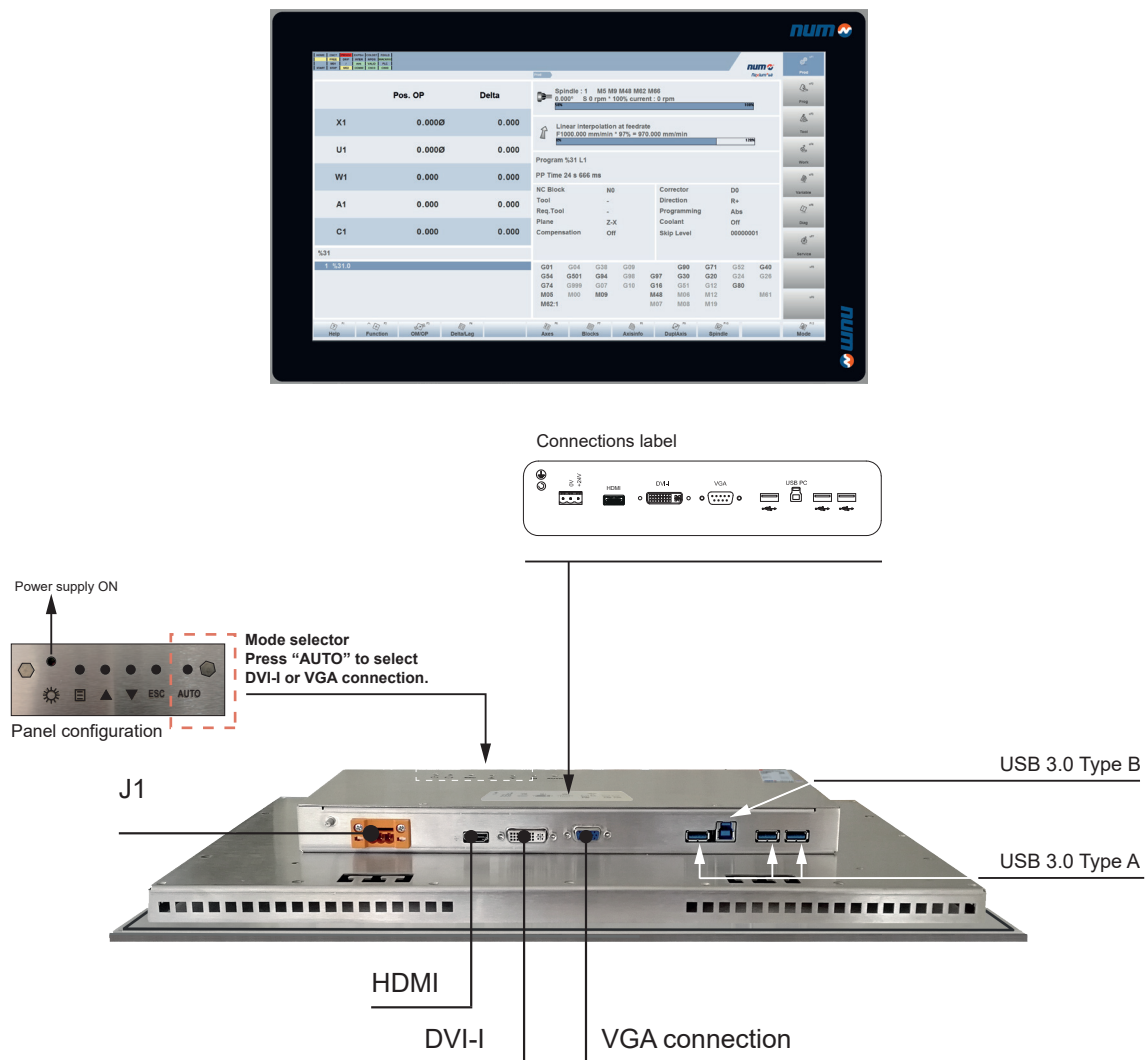
FS184 version	Ordering code
FS184 - TS	FXPC184CNNNNNN00

	FXPC	18	4	C	N	N	N	N	N	0	0
Display Unit											
• LCD 18.5"		18									
Panel/Mechanical Variant											
• Fourth Generation			4								
Display Use											
• Touch Screen projective 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											
• None								N			
Fixed Value									N		
Operating System											
• No iPC, just operator panel										0	
Spare Number											0

4.7.2 Characteristics

		FXPC184CNNNNN00
Screen	User interface	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
Communication Interfaces	USB	3 x USB 3.0 Type A / 1 x USB 3.0 Type B (rear)
	DVI-I	1
	VGA Connection	1
	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	24 W typ., max. 48 W (2 A)
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		5.3 kg
Dimensions	W x H x D	488 x 309 x 51 mm

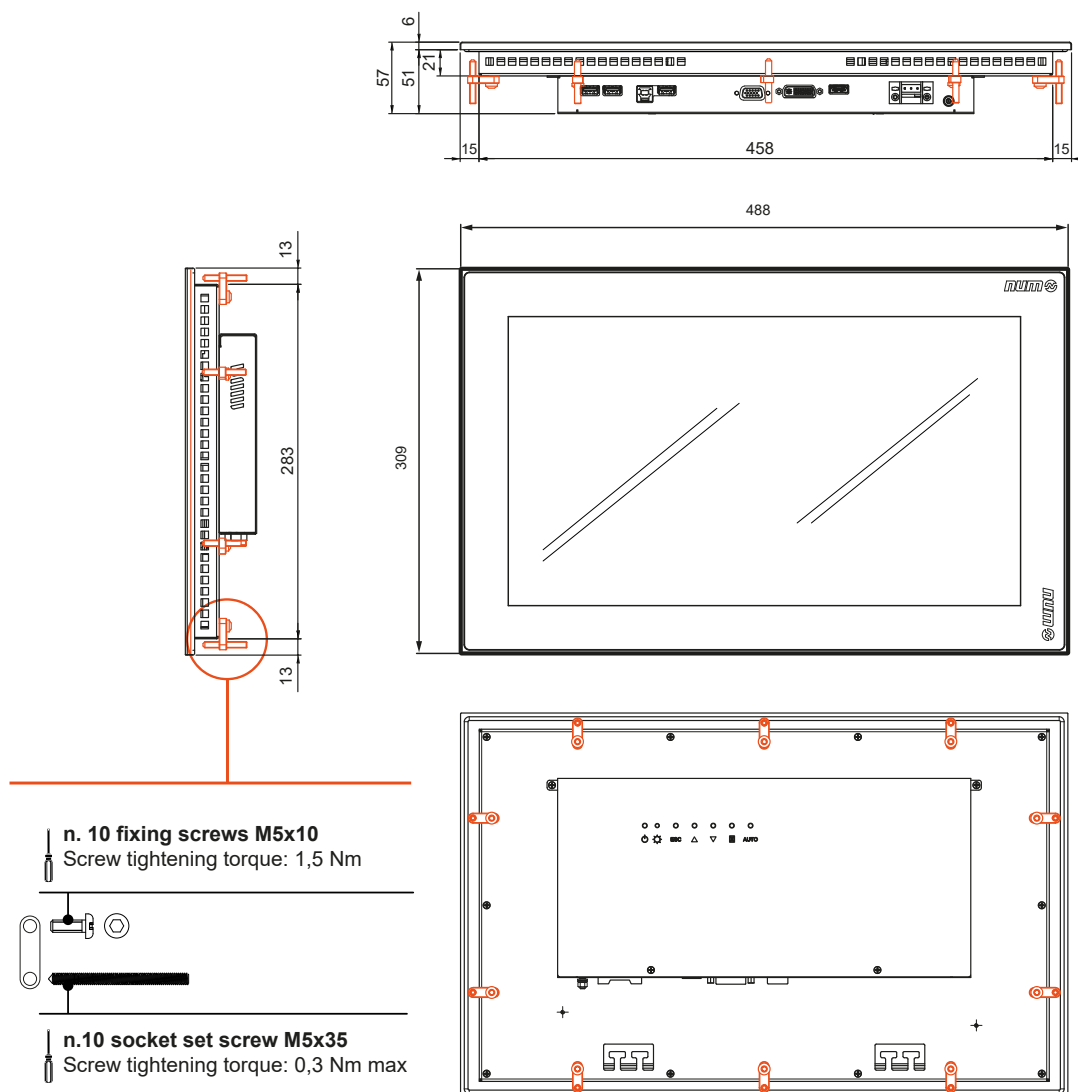
4.7.3 Module description



Connector	Type	Description
J1	3 screws pins F	Power supply connections
DVI-I	Standard DVI	Digital Video interface connection
VGA	VGA interface	Standard VGA interface connection
USB	3 x USB 3.0 Type A, 1 x USB 3.0 Type B	General user purpose. (Mouse and all USB devices) Interface to PC connections
HDMI		High-Definition Multimedia Interface

4.7.4 Overall dimensions

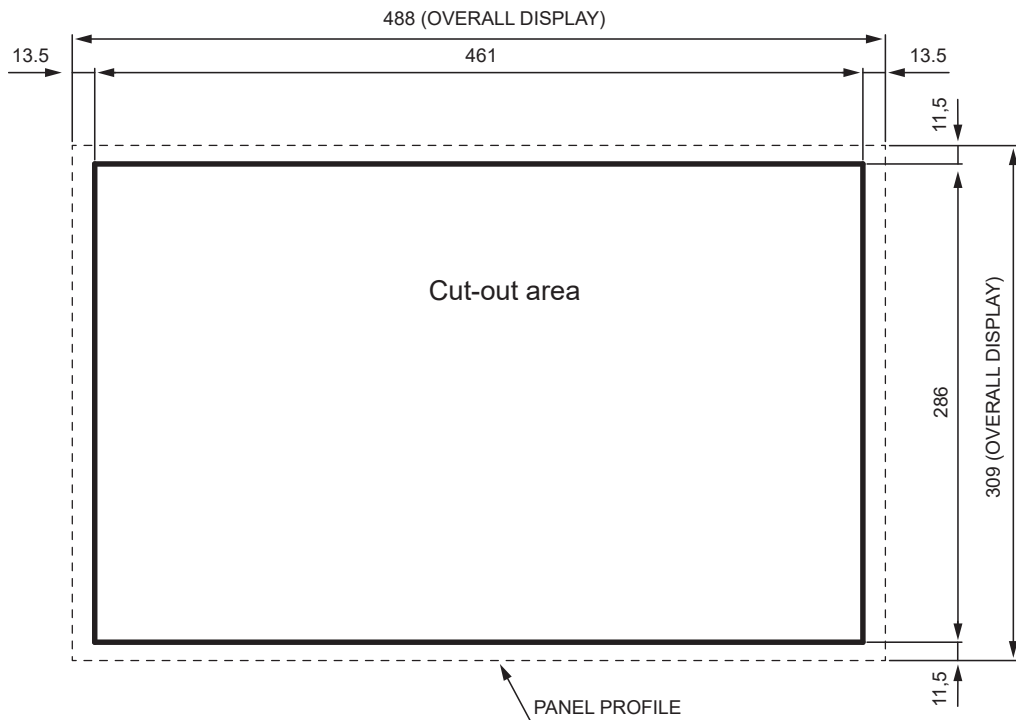
Dimensions in mm



Fixing kit, screws and brackets, for FS184 panel. Assembly to be carried out by the customer.

4.7.5 Cut-out area

Dimensions in mm



4.7.6 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.

4.7.7 Maintenance and Repair

4.7.7.1 Repairs

Repairs to FS184 Operator panels must only be carried out by the manufacturer.
(Manufacturer address see list of NUM agencies on chapter 1.5)

4.7.7.2 Transport

Only the original packaging must be used for transporting the device.
The climatic conditions must be observed (see chapter 4.7.2).

4.7.7.3 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 (see chapter 4.7.2).

4.7.8 Panel connections

Please refer to chapter 9.4 for more detailed information upon the panels connections.

4.7.9 Mounting instructions

The operator panel is installed from the front, for example, into a control cabinet. They are fixed at the rear with screw (see chapter 4.7.4)

The FS184 can be operated at a maximum ambient temperature of 45°C. The ambient temperature is based on the temperature of the area 5 cm.

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.

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



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

4.8 FS194L Operator panel (without integrated PC)

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.



4.8.1 Ordering code

FS194L version	Ordering code
FXPC194L-TS	FXPC194LNNNNN00

FXPC	19	4	L	N	N	N	N	N	0	0
Display Unit										
- LCD 19"	19									
Panel/Mechanical Variant										
- Fourth generation		4								
Display Use										
- Landscape			L							
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

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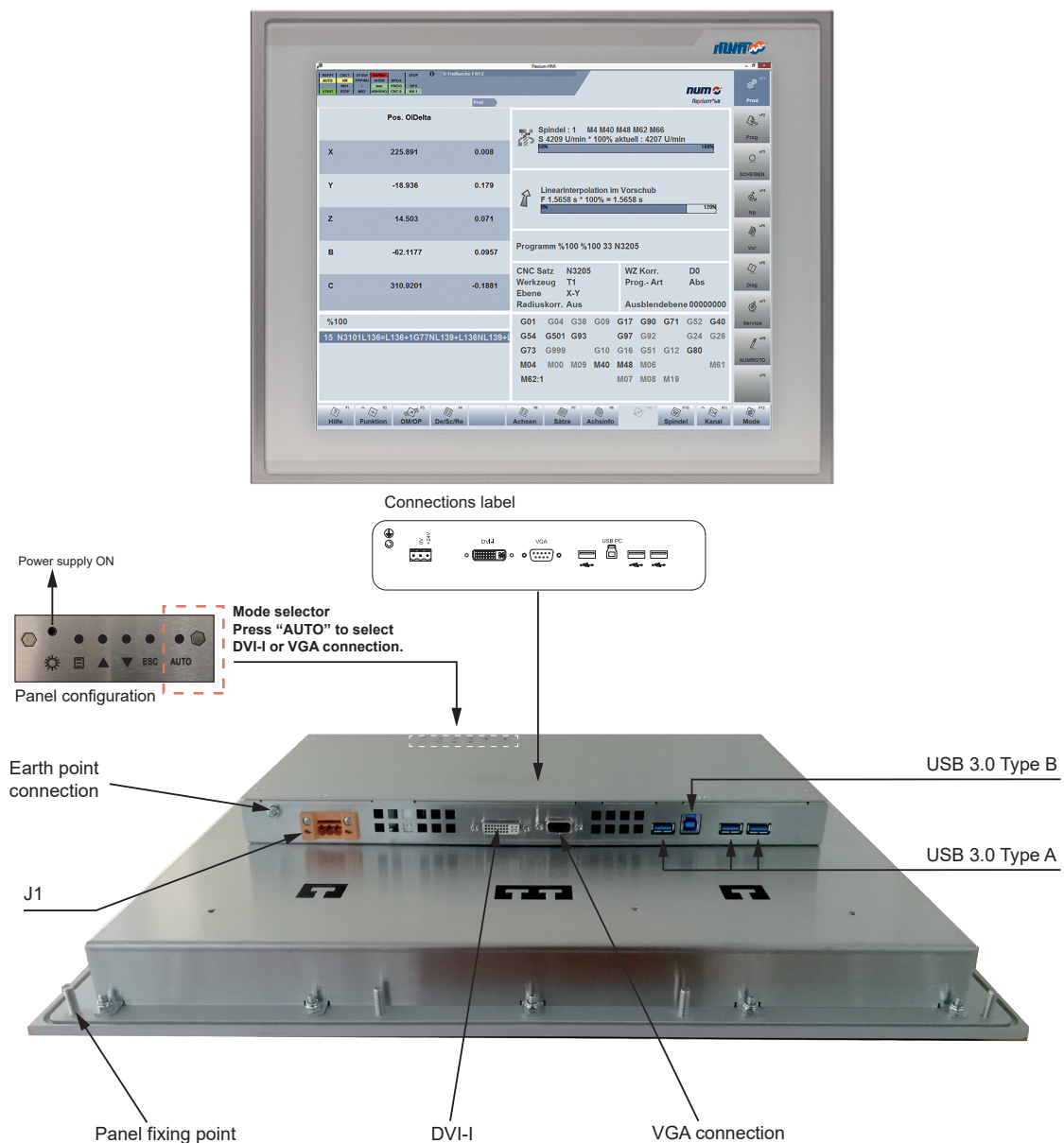
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4.8.2 Characteristics

		FXPC194LNNNNN00
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)
Communication Interfaces		
	USB	3 x USB 3.0 Type A + 1 x USB 3.0 Type B
	DVI-I	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 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		7.5 kg
Dimensions	W x H x D	490 x 394 x 65 mm

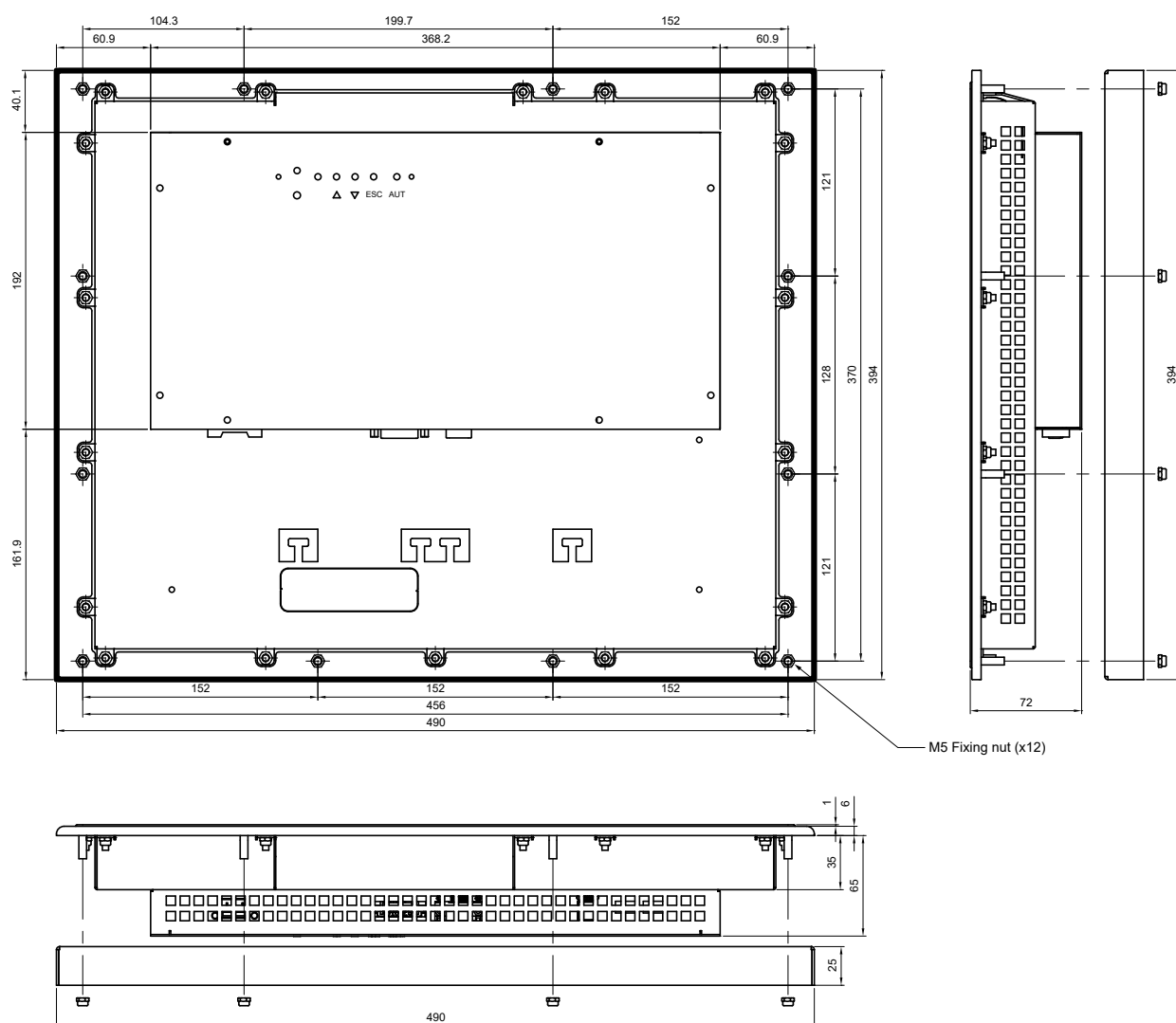
4.8.3 Module description



Connector	Type	Description
J1	3 screws pins F	Power supply connections
USB	3 x USB 3.0 Type A	General user purpose. (Mouse and all USB devices)
USB	1 x USB 3.0 Type B	Interface to PC connections
DVI-I	Standard DVI	Digital Video interface connection
VGA	VGA interface	Standard VGA interface connection

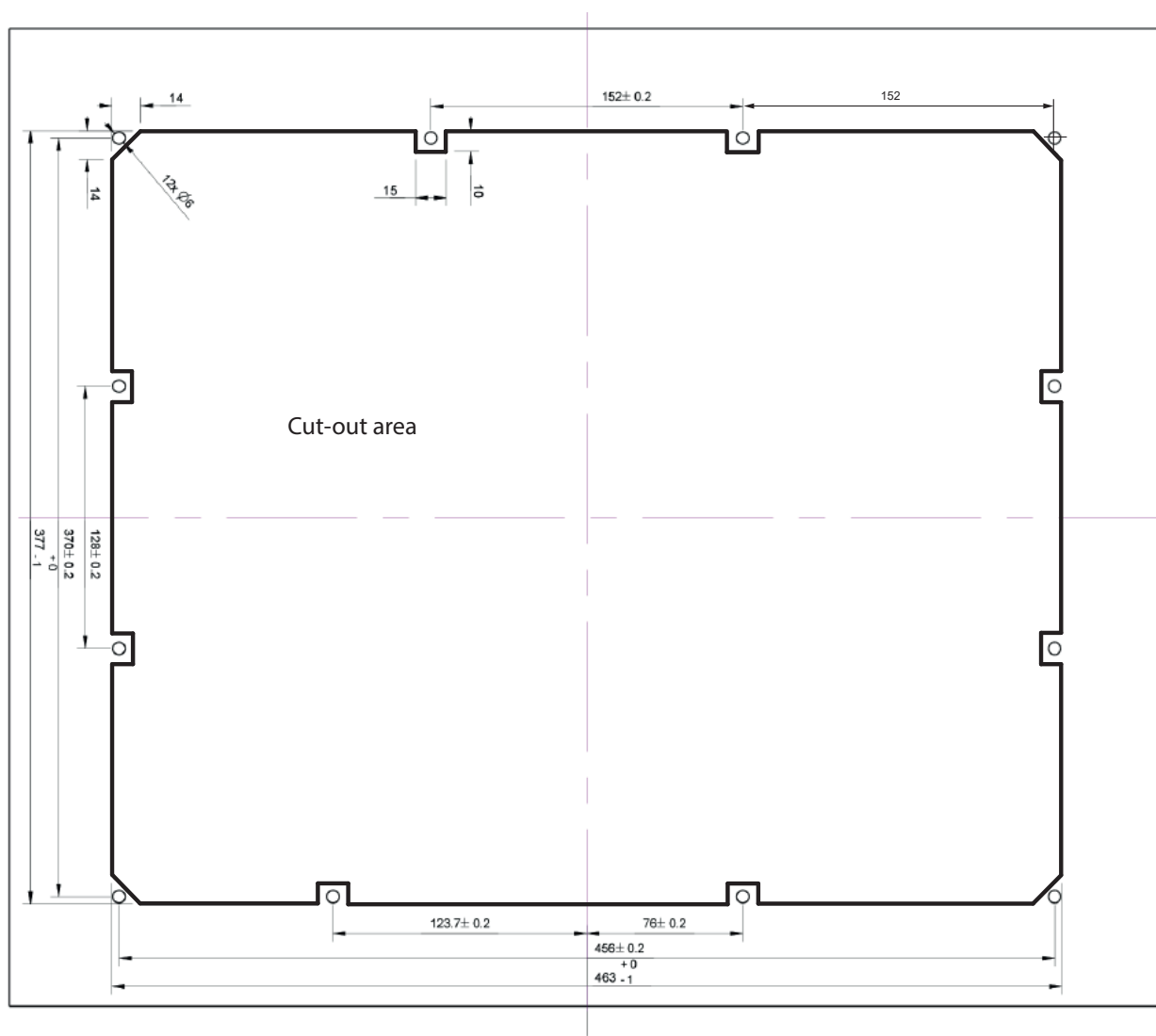
4.8.4 Overall dimensions

Dimensions in mm



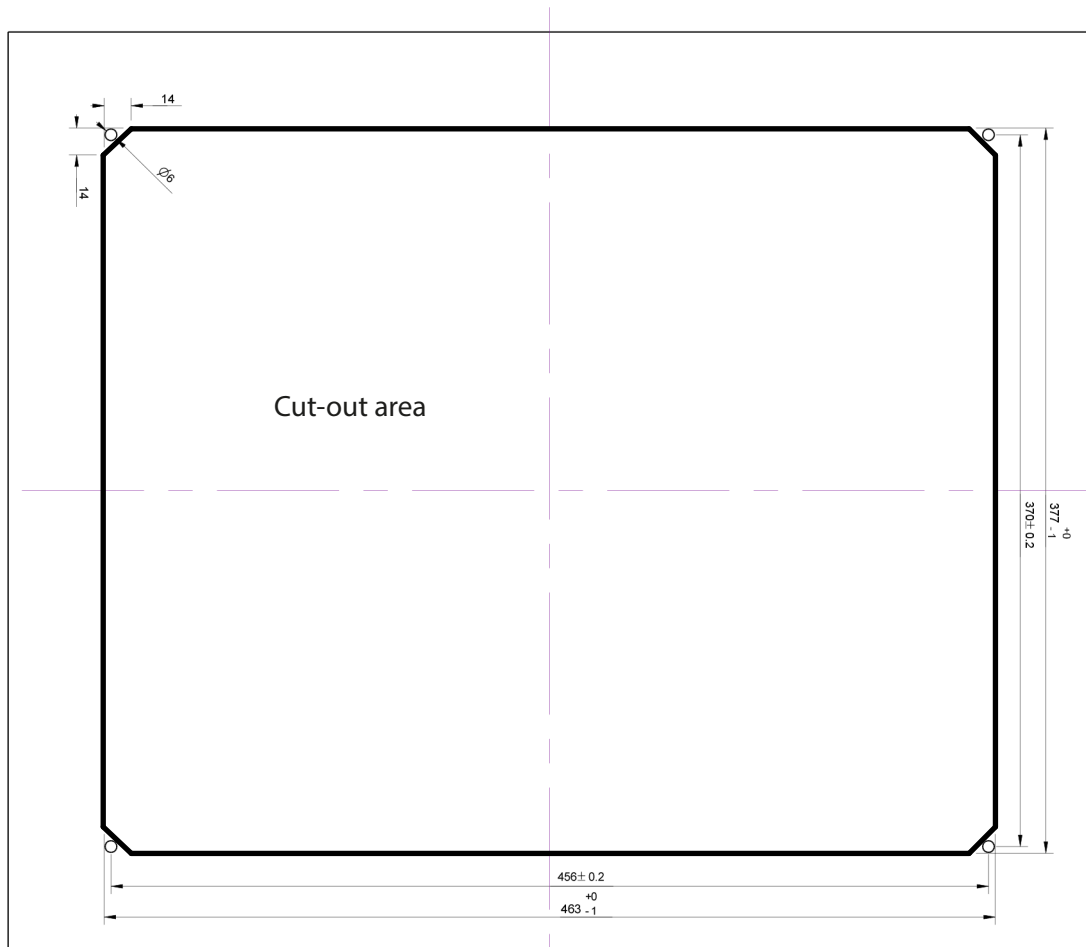
4.8.5 Cut-out area and hole pattern without back side mounting plate

Dimensions in mm



4.8.5.1 Cut-out area and hole pattern using back side mounting plate

Dimensions in mm



4.8.6 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.

4.8.7 Maintenance and Repair

4.8.7.1 Repairs

Repairs to FS194L Operator panels must only be carried out by the manufacturer.
(Manufacturer address see list of NUM agencies on chapter [1.5](#))

4.8.7.2 Transport

Only the original packaging must be used for transporting the device.
The climatic conditions must be observed (see chapter [4.8.2](#)).

4.8.7.3 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 (see chapter [4.8.2](#)).

4.8.8 Panel connections

Please refer to chapter [9.4](#) for more detailed information upon the panels connections.

4.8.9 Mounting instructions

The operator panel is installed from the front, for example, into a control cabinet. They are fixed at the rear with screw (see chapter [4.8.4](#))

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.

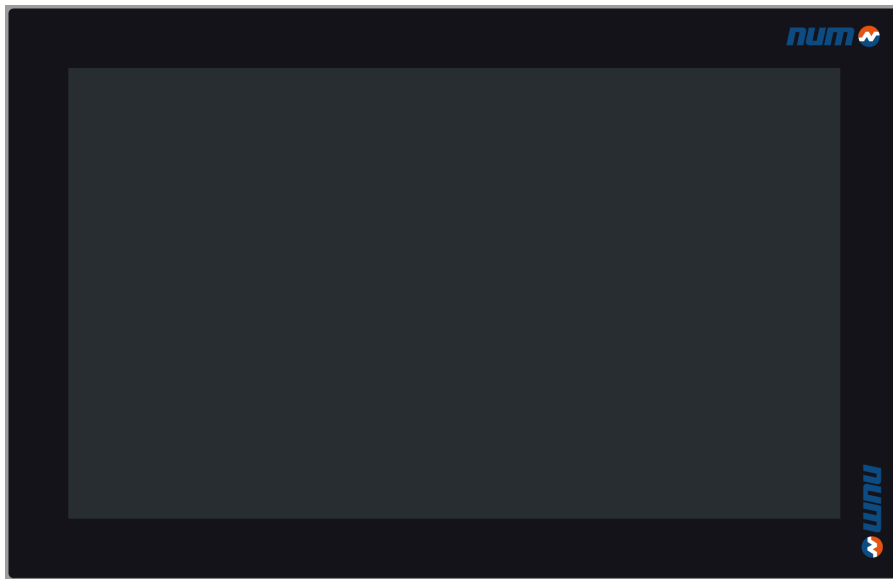
The device can be mounted in a completely closed housing, provided that the ambient temperature (in the case) is taken into account. A 10mm clearance from the housing walls must be provided on all sides in order to ensure sufficient air circulation.

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



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

4.9 FS244 Operator panel (without integrated PC)



FS244 is a 24" display, glass protected, fitted with a capacitive multi-touch screen system.

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.

4.9.1 Ordering code

FS244i version	Ordering code
FS244 - TS	FXPC244C>NNNNN00

	FXPC	24	4	C	N	N	N	N	N	0	0
Display Unit											
• LCD 24"		24									
Panel/Mechanical Variant											
• Fourth Generation			4								
Display Sensor											
• Touch Screen projective 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											
• None								N			
Fixed Value									N		
Operating System											
• No IPC, just operator panel										0	
Spare Number											0

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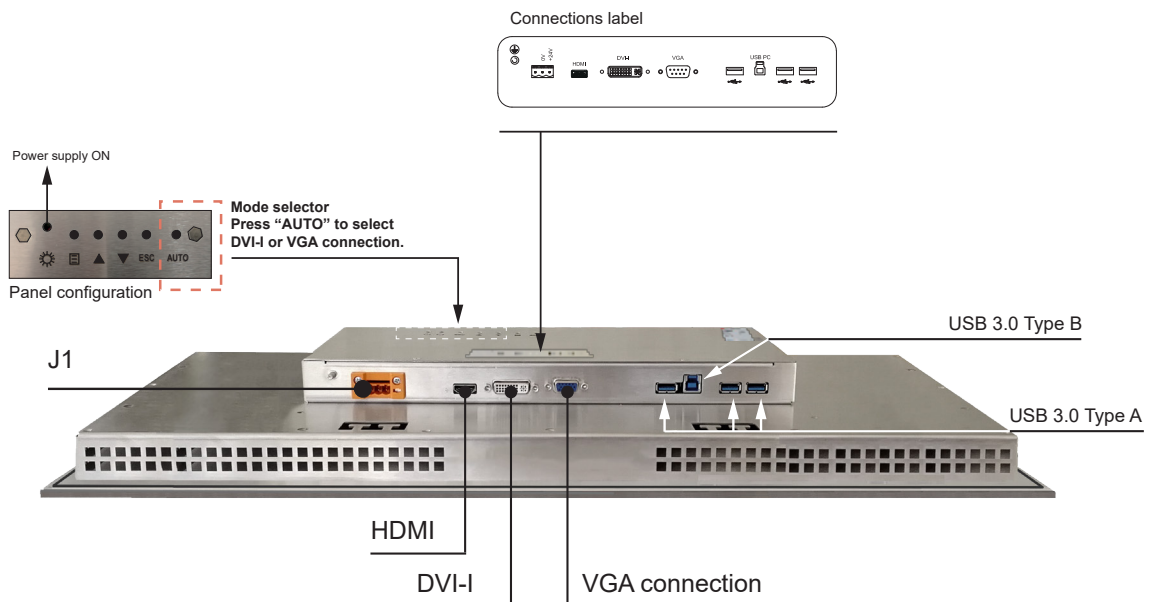
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4.9.2 Characteristics

		FXPC244CNNNNN00
Screen	User interface	Projected capacitive touch screen with glass protection
	Technology	24" TFT LCD (16.9 million colors)
	Resolution	1920 x 1080
	Size	531.3 x 298.8mm
	Backlight	LED, Contr. 5000:1
Communication Interfaces	Ethernet (ETH)	3 x Gigabit LAN / RTE
	USB	3 x USB 3.0 Type A / 1 x USB 3.0 Type B (rear)
	DVI-I	1
	VGA Connection	1
	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	28 W typ., max. 60 W (2.5 A)
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		7,5 kg
Dimensions	W x H x D	621.5 x 389 x 56 mm

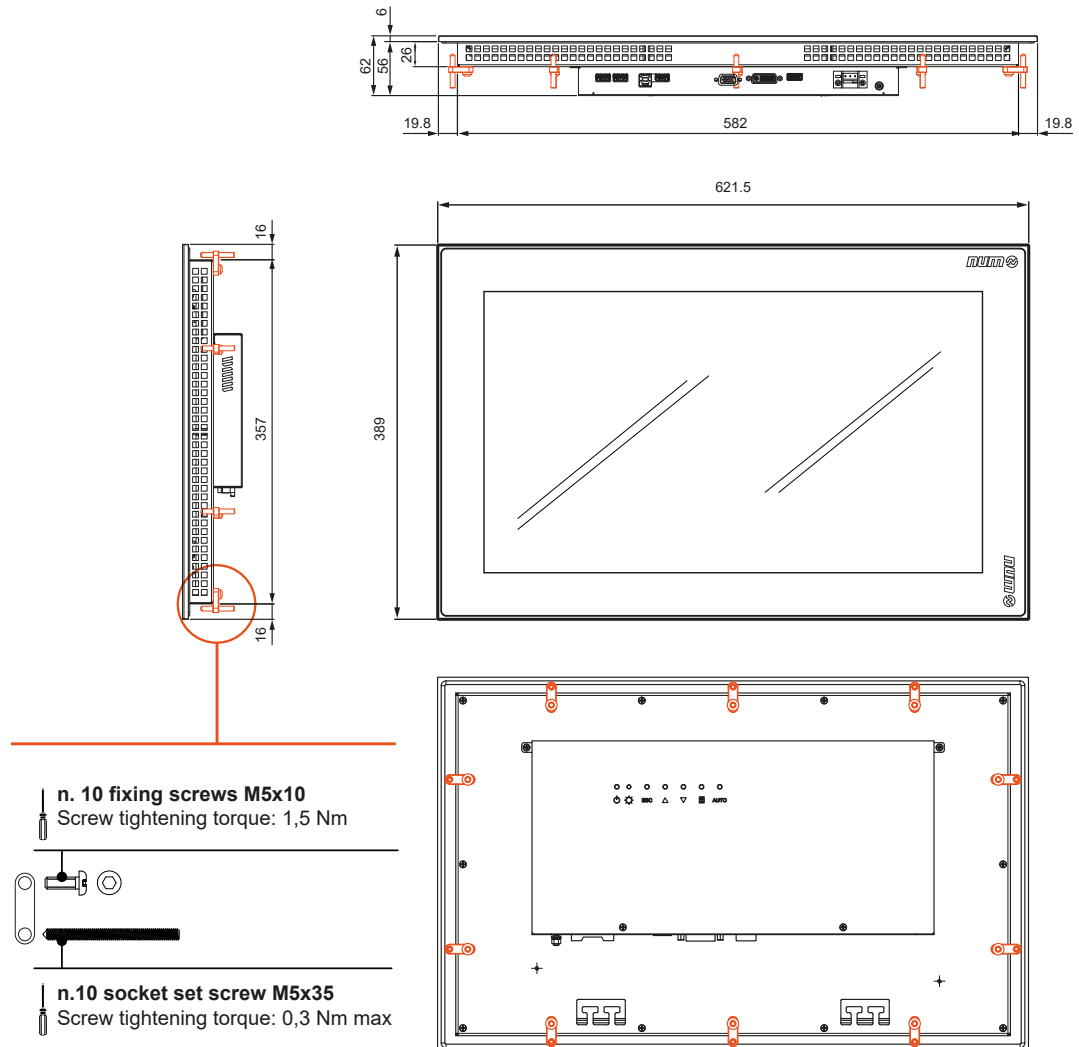
4.9.3 Module description



Connector	Type	Description
J1	3 screws pins F	Power supply connections
DVI-I	Standard DVI	Digital Video interface connection
VGA	VGA interface	Standard VGA interface connection
USB	3 x USB 3.0 Type A, 1 x USB 3.0 Type B	General user purpose. (Mouse and all USB devices) Interface to PC connections
HDMI		High-Definition Multimedia Interface

4.9.4 Overall dimensions

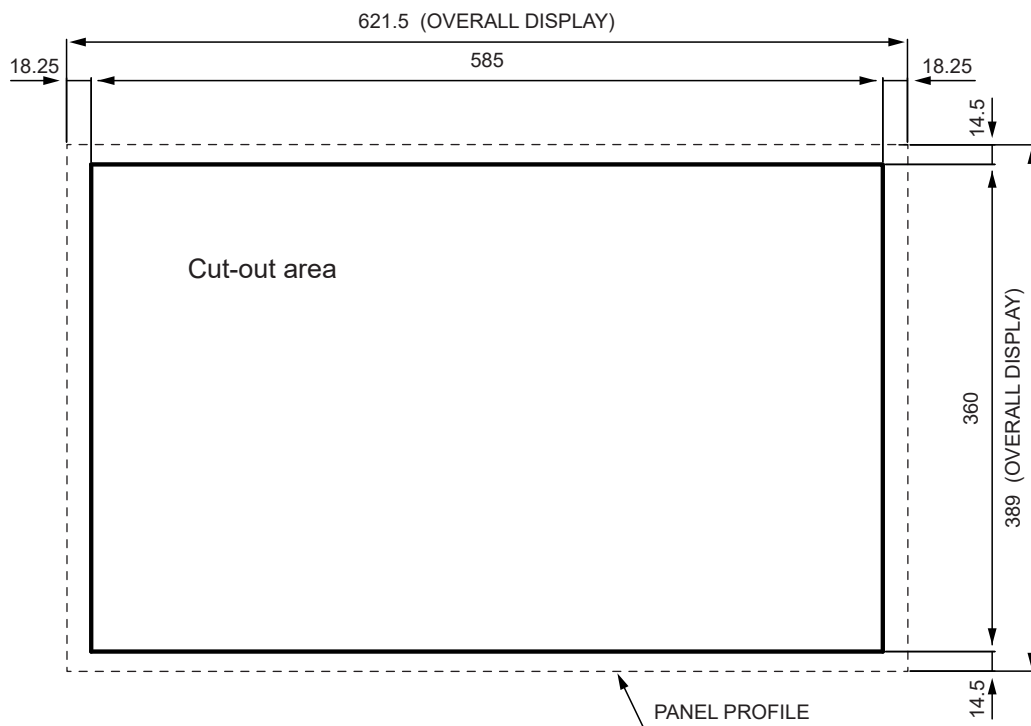
Dimensions in mm



Fixing kit, screws and brackets, for FS244 panel. Assembly to be carried out by the customer.

4.9.5 Cut-out area

Dimensions in mm



4.9.6 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.

4.9.7 Maintenance and Repair

4.9.7.1 Repairs

Repairs to FS244 Operator panels must only be carried out by the manufacturer.
(Manufacturer address see list of NUM agencies on chapter [1.5](#))

4.9.7.2 Transport

Only the original packaging must be used for transporting the device.
The climatic conditions must be observed (see chapter [4.9.2](#)).

4.9.7.3 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 (see chapter [4.9.2](#)).

4.9.8 Panel connections

Please refer to chapter [9.4](#) for more detailed information upon the panels connections.

4.9.9 Mounting instructions

The operator panel is installed from the front, for example, into a control cabinet. They are fixed at the rear with screw (see chapter [4.9.4](#))

The FS244 can be operated at a maximum ambient temperature of 45°C. The ambient temperature is based on the temperature of the area 5 cm.

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.

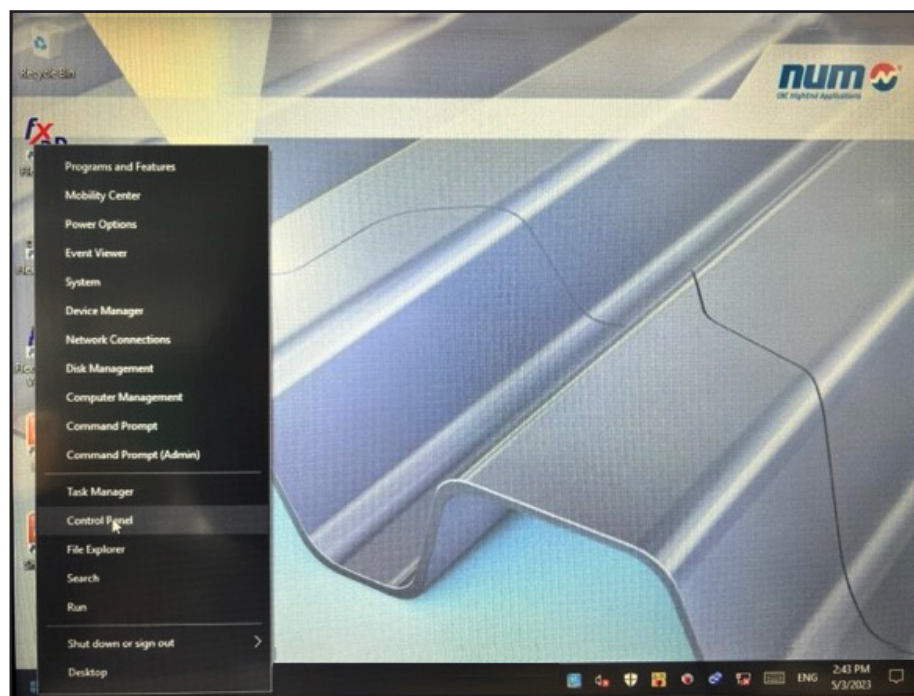
A minimum clearance of 75mm must be provided to active elements such as power supplies, transformers etc.



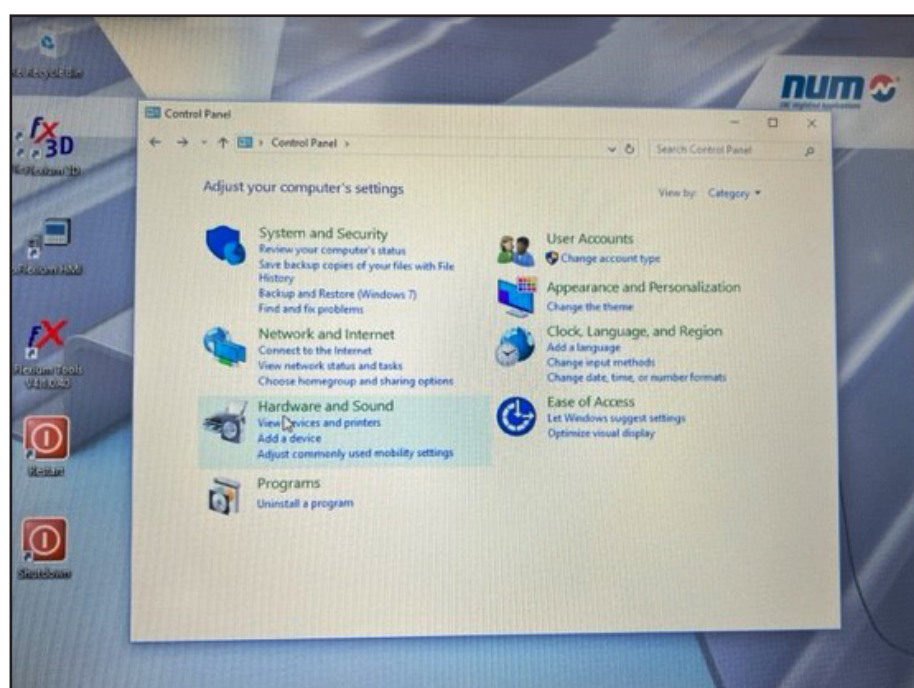
Prevention of overheating during operation:
- A forced airflow increases the overall reliability.

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

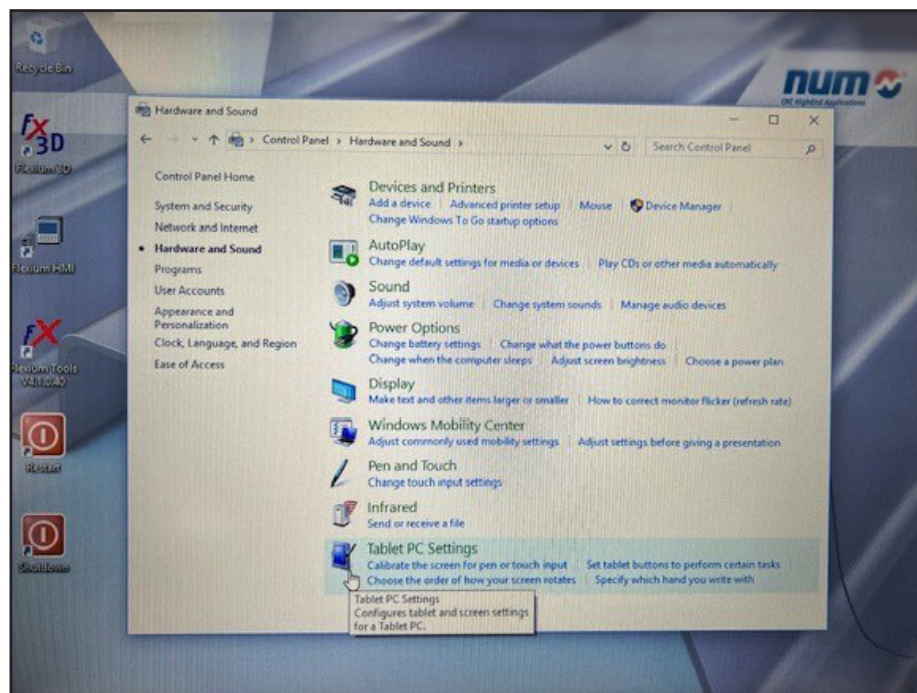
1. Open **Control Panel**



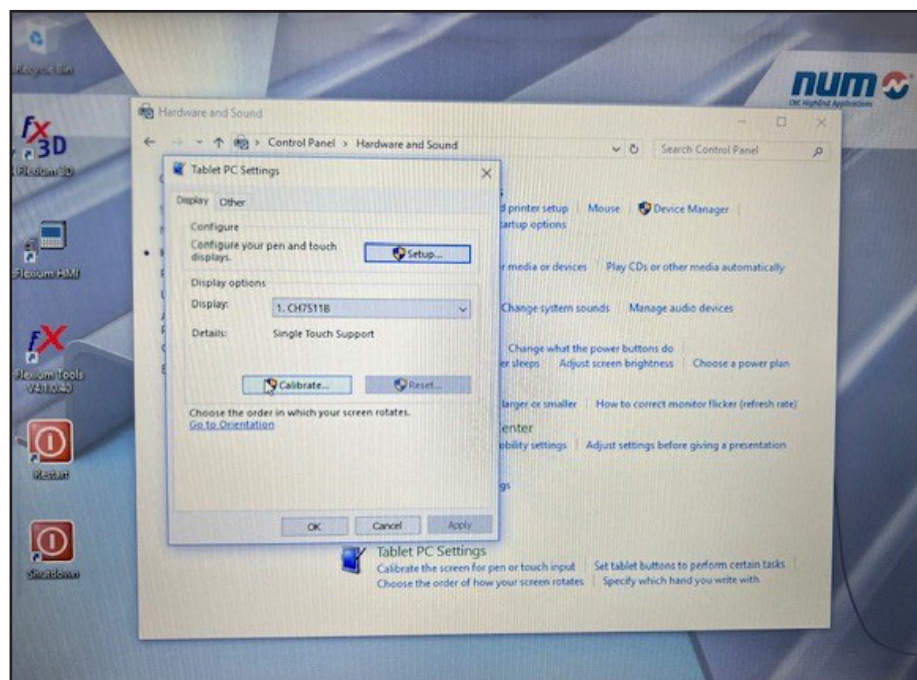
2. Click **Hardware and Sound**.

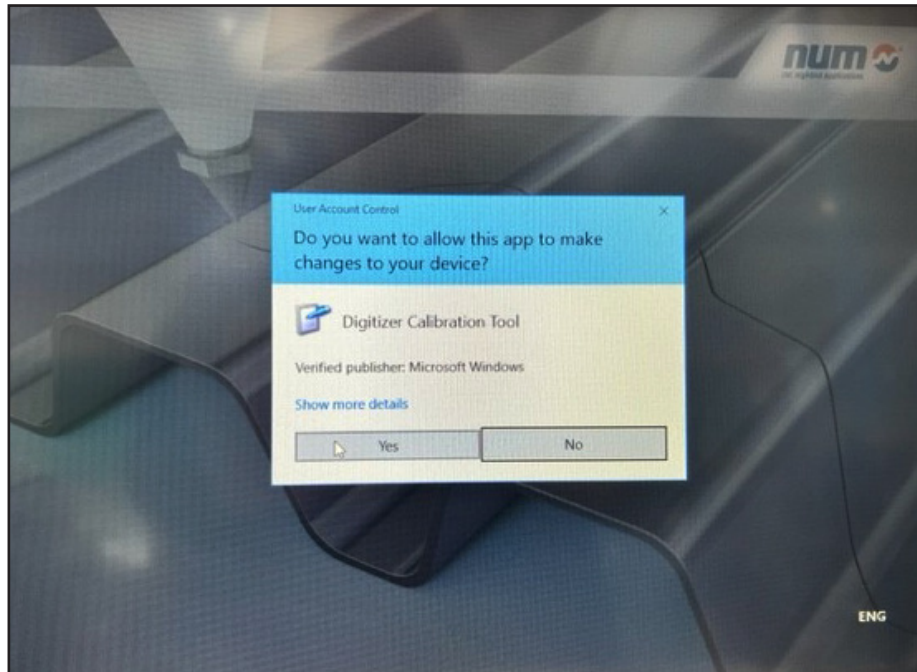


3. Under **Tablet PC Settings**, click the **Calibrate the screen for pen or touch input**.

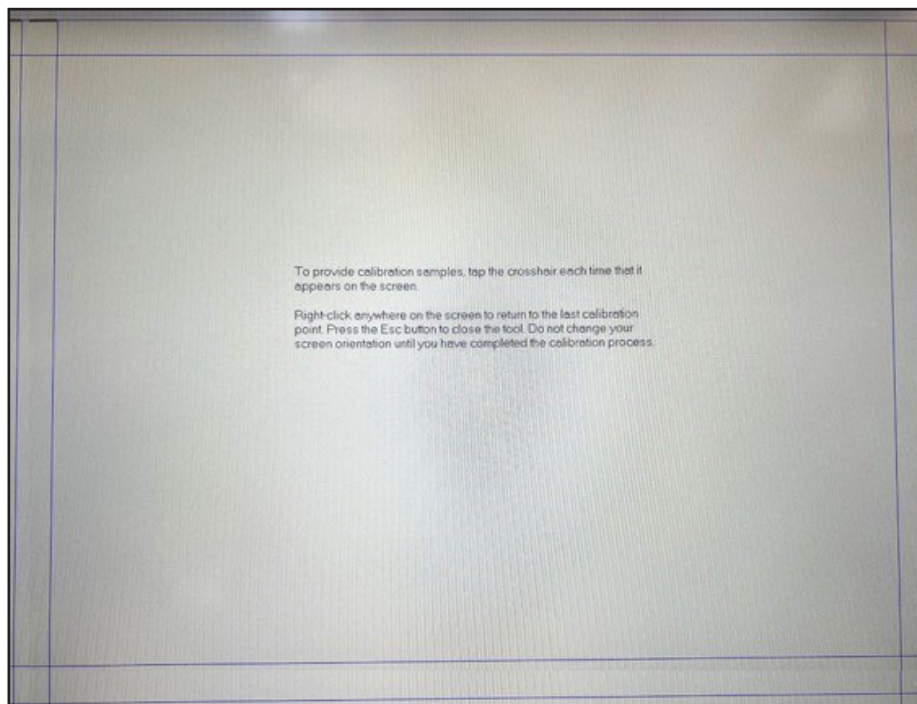


4. In the **Tablet PC Settings** windows, click the **Calibrate**.

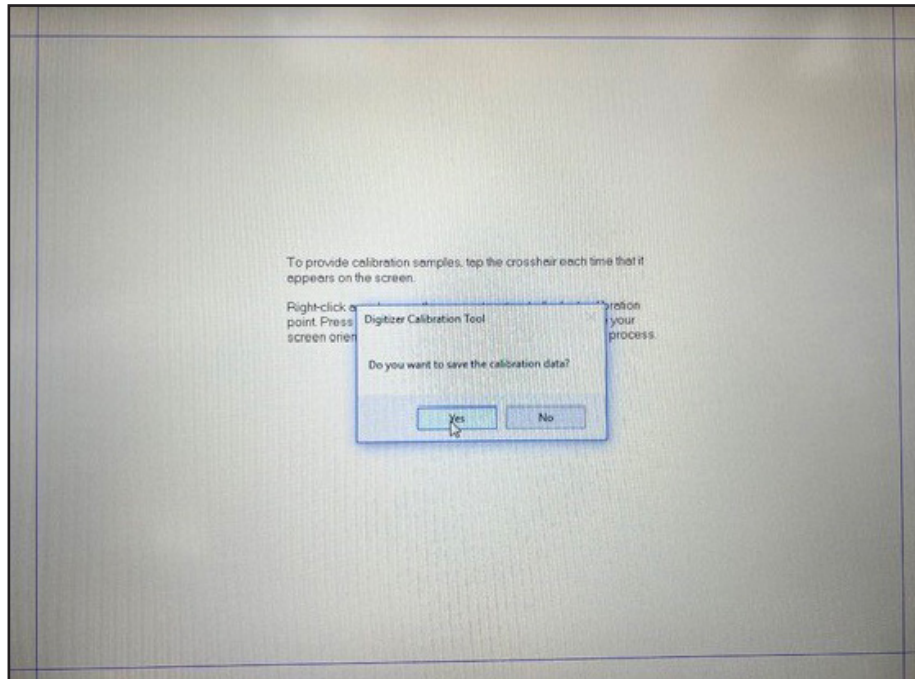


5. Select **Touch input** and **Calibrate**

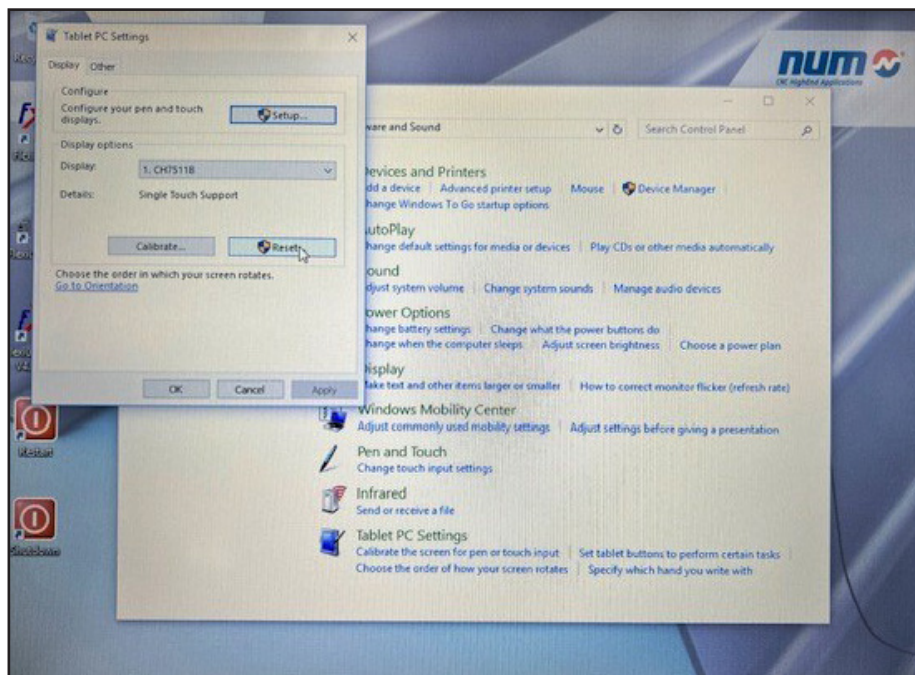
6. In the white screen, tap the crosshair each time it appears on the screen, and do not change the resolution during this process.



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

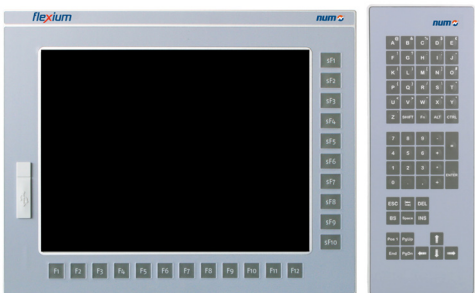
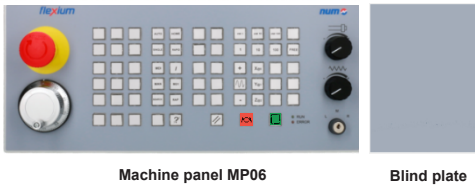


8. Click **OK** to confirm. If you want repeat the complete procedure, please push **Reset**



4.11 USB QWERTY keyboard (Horizontal and Vertical external keyboard)

4.11.1 General characteristics

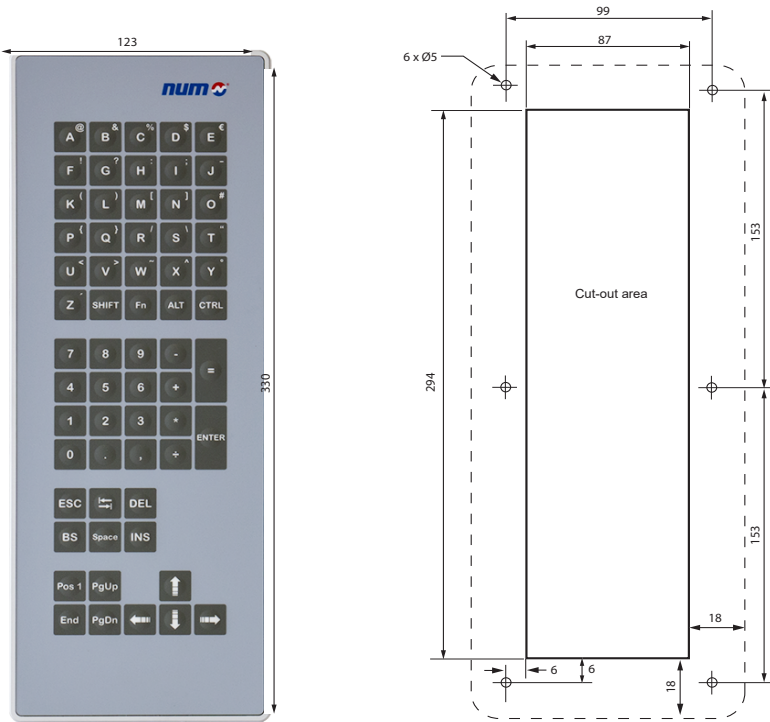
	FXHE000248 (Vertical keyboard)	FXHE000249 (Horizontal keyboard)
Main keyboard features	62 keys with mechanic key under membrane	100 keys with mechanic key under membrane
	1 USB interface type A - V2.0 - 1.5/12/480 MBit/s	1 USB interface type A - V2.0 - 1.5/12/480 MBit/s
	Front keyboard in polyester - 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.	
	FS153 Panels  Machine panel MP06  Blind plate	FS153 Panels  USB keyboard

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

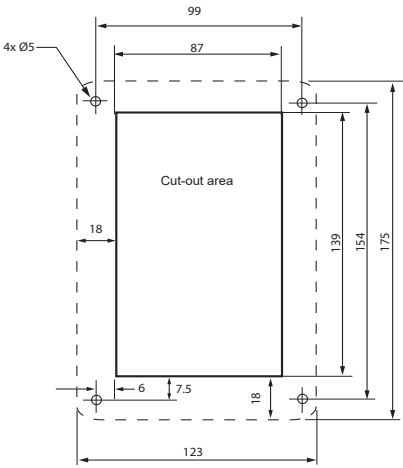
4.11.2 Installation of the keyboards

4.11.2.1 Vertical keyboard overall dimensions, hole pattern and cut-out area

Dimensions in mm

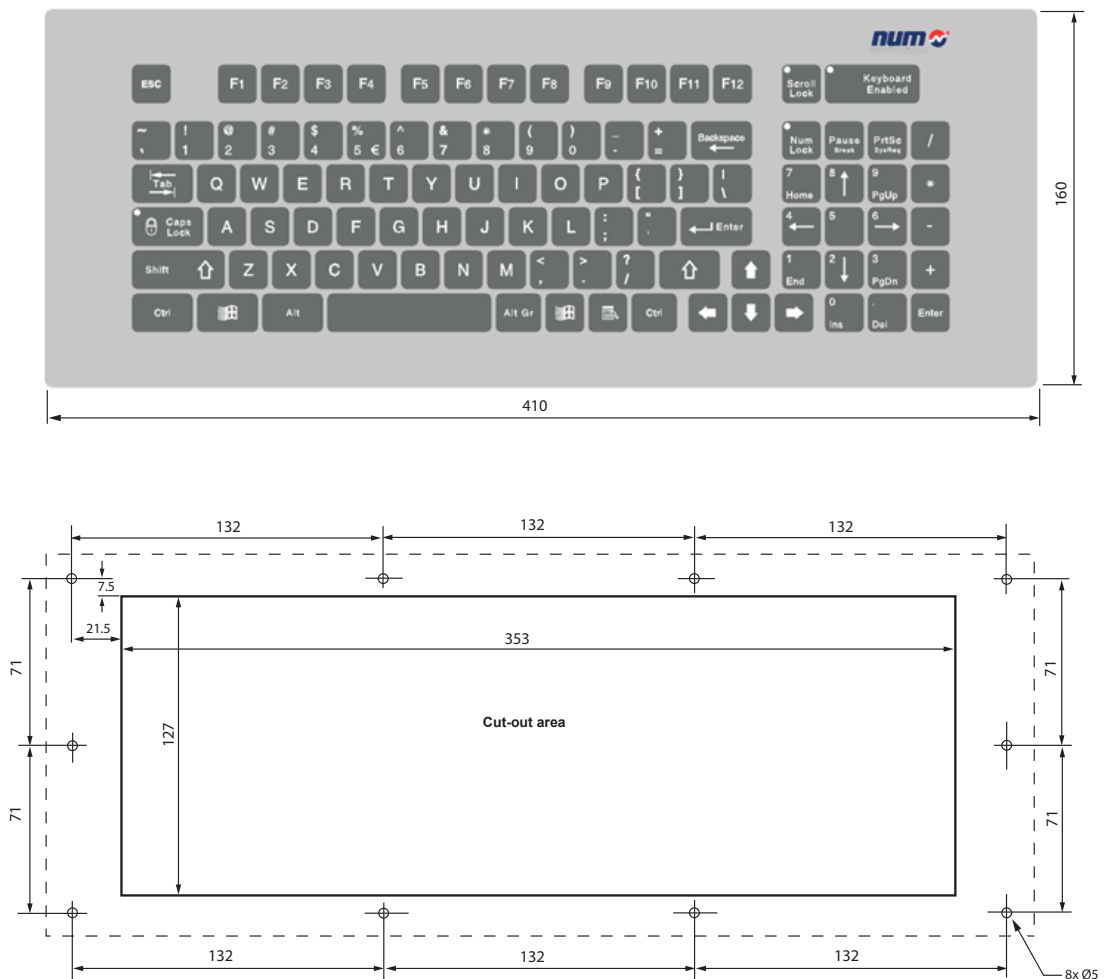


Blind plate (rear view)



4.11.2.2 Horizontal keyboard overall dimensions, hole pattern and cut-out area

Dimensions in mm



4.11.3 USB keyboards connections

Please refer to chapter [9.4.6](#) Flexium connections for more detailed information upon the USB keyboards connections.

4.11.4 Mounting instruction

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 20mm 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.

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5 Flexium MP Panels - Machine panel

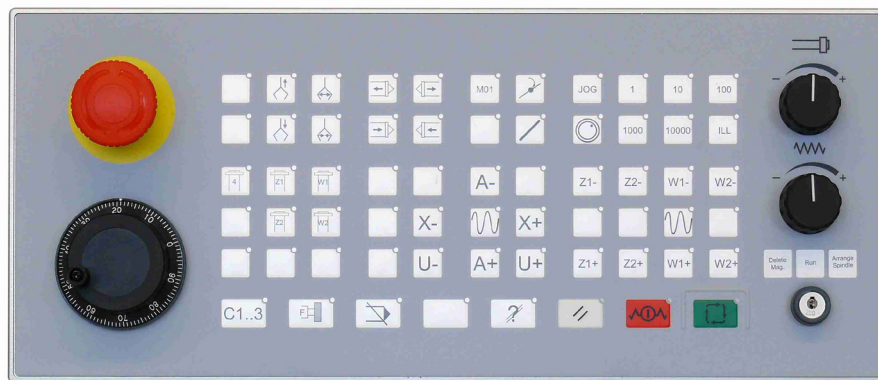
5.1 MP04 Machine panel

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

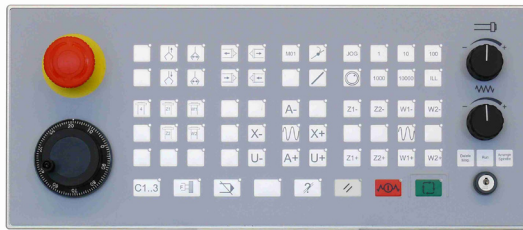
MP04 includes:

- 60 Configurable buttons with LEDs
- 2 Overrides potentiometers for spindle speed and feed rate
- 1 Handwheel (as optional)
- 1 Emergency stop button
- 1 three-position key switch
- 3 Dedicated buttons: Reset, Cycle Stop, Cycle Start
- 12 digital inputs and 12 digital outputs on the back.

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.

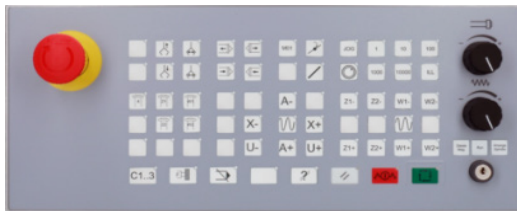


5.1.1 Machine panel option



Machine Panel MP04-H (with handwheel)

- CAN interface
- 60 free programmable function buttons
- Same width as FS154i
- Handwheel



Machine Panel MP04-W (without handwheel)

- CAN interface
- 60 free programmable function buttons
- Same width as FS154i

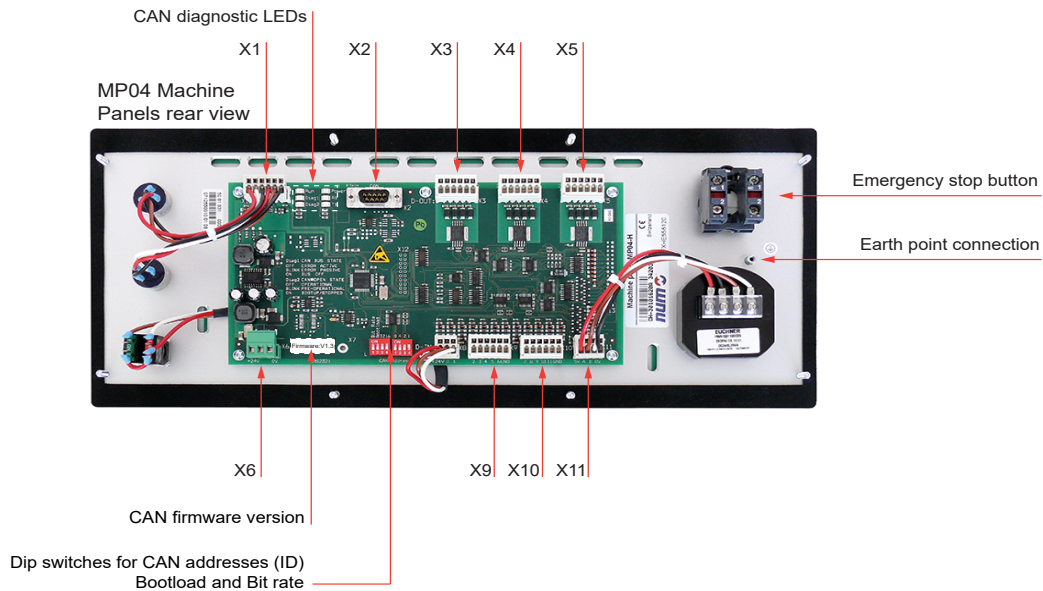
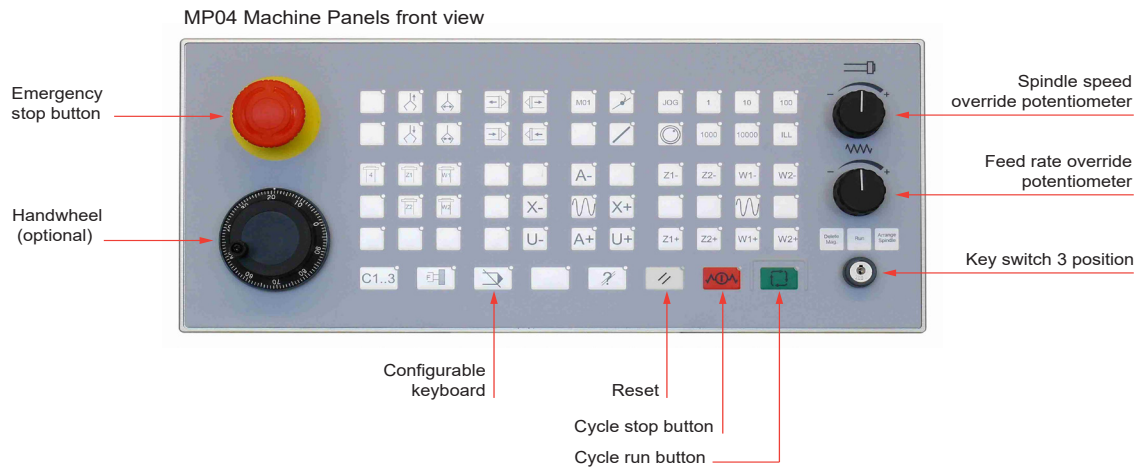
5.1.2 Ordering code

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

5.1.3 Characteristics

		FXHE558110	FXHE558120
MP04 panel	User interface	60 free programmable keys	60 free programmable 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	

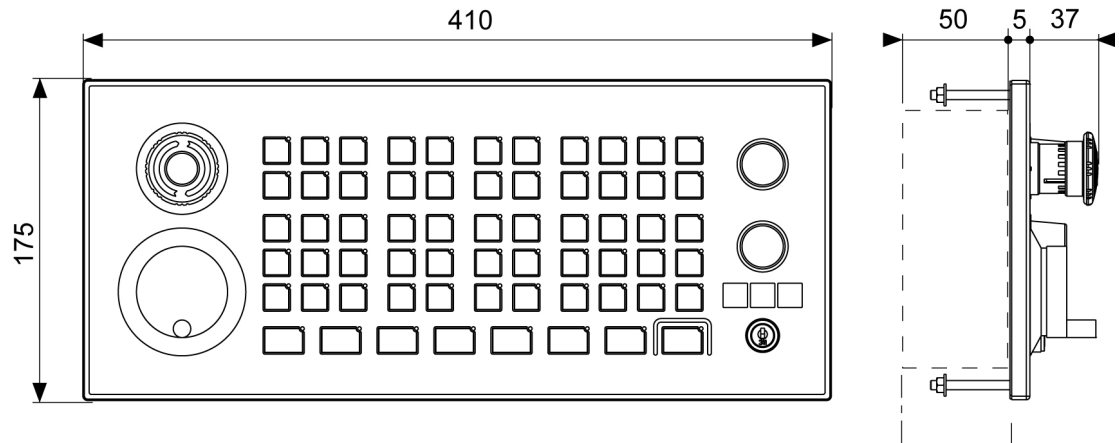
5.1.4 Machine panel description



Connector	Type	Description
X1	6 pins spring-loaded terminal	Potentiometers 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 terminal	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

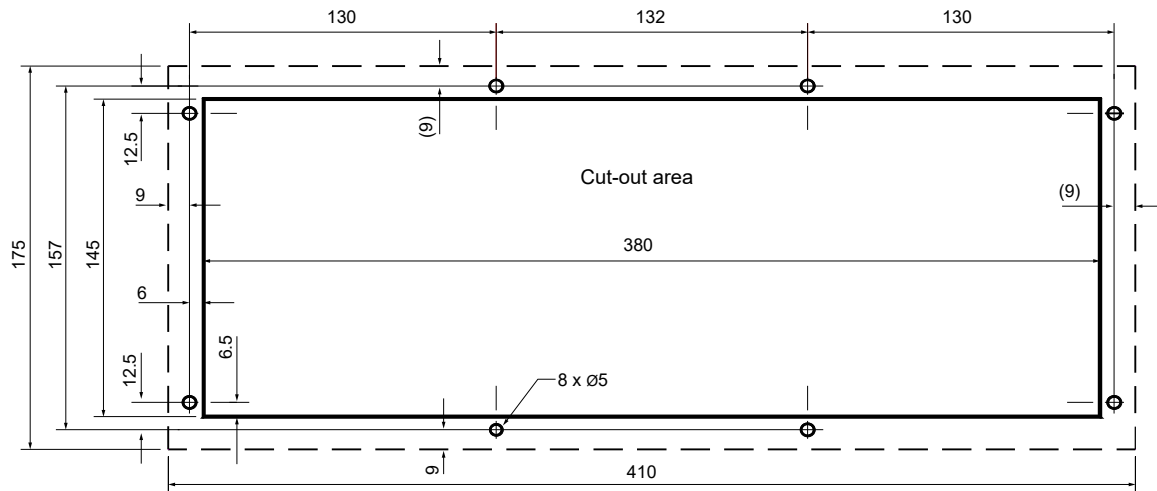
5.1.5 Overall dimensions

Dimensions in mm



5.1.6 Cut-out and hole pattern

Dimensions in mm



5.1.7 PLC configuration

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

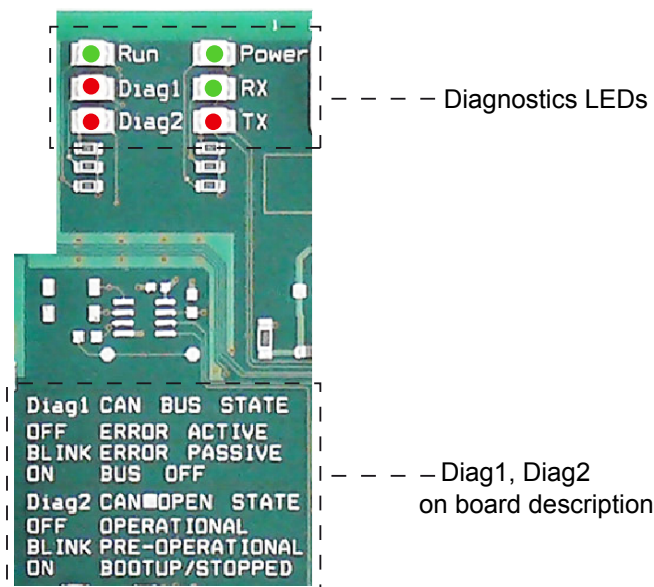
5.1.8 Diagnostic

5.1.8.1 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.



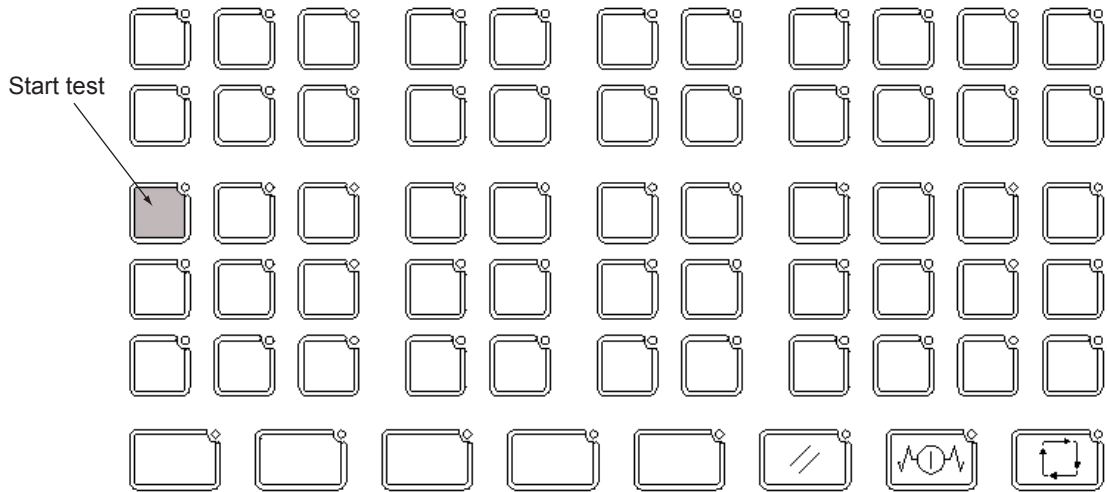
LED	Colour	Status	Possible cause and remedy
Run	Green	OFF	- The module is in bootload state - No firmware loaded
		Blinking	The firmware is working properly
Diag1	Red	OFF	CAN-Bus-State = Error active (error free)
		Blinking	CAN-Bus-State = Error passive (disturbed, but working)
		ON	CAN-Bus-State = Bus 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.

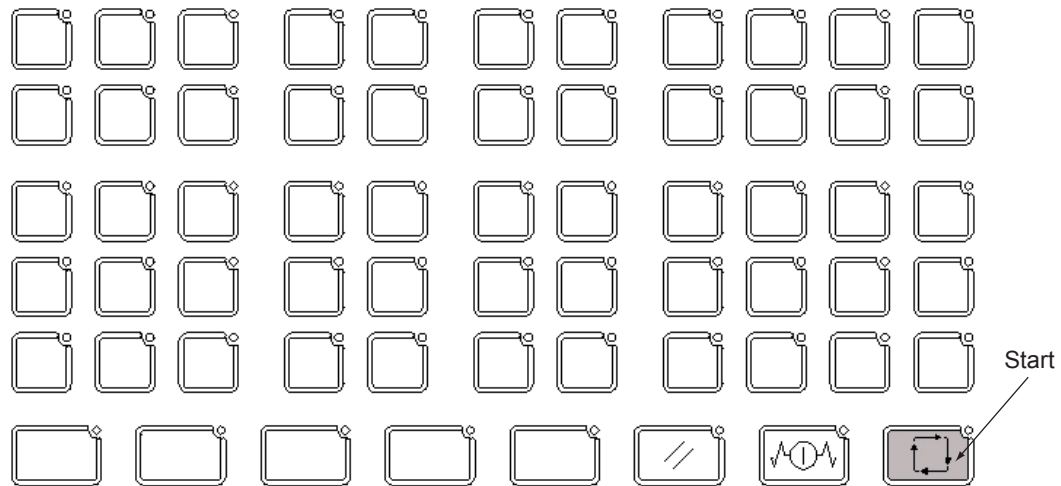
5.1.8.2 Test program

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.

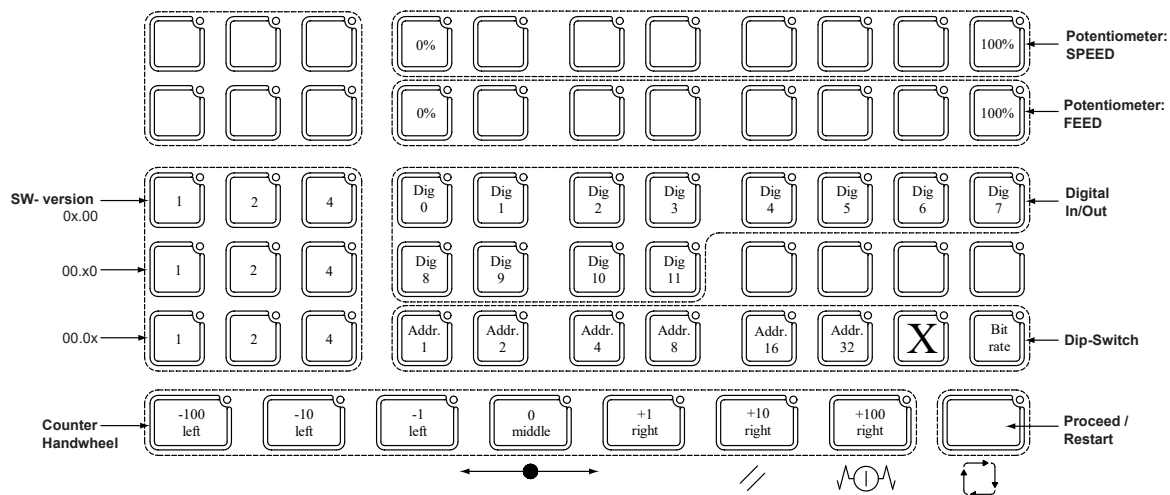
1. Switch off the power of the MP04.
2. Press the button “*Start test*”, hold it depressed and switch power on.
The “*Start test*” button may now be released.



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 of the panel.
(software version) 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.

5.1.9 Maintenance and Repair

5.1.9.1 Repairs

Repairs to MP04 devices must only be carried out by the manufacturer.
(Manufacturer address see list of NUM agencies on chapter 1.5)

5.1.9.2 Transport

Only the original packaging must be used for transporting the device.
The climatic conditions (see chapter 5.1.3) must be observed.

5.1.9.3 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 chapter 5.1.3).

5.1.10 Connections

Please refer to chapter 9.6 for more detailed information upon the panels connections.

5.1.11 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.

- 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.

5.1.12 Installing the personalization button labels

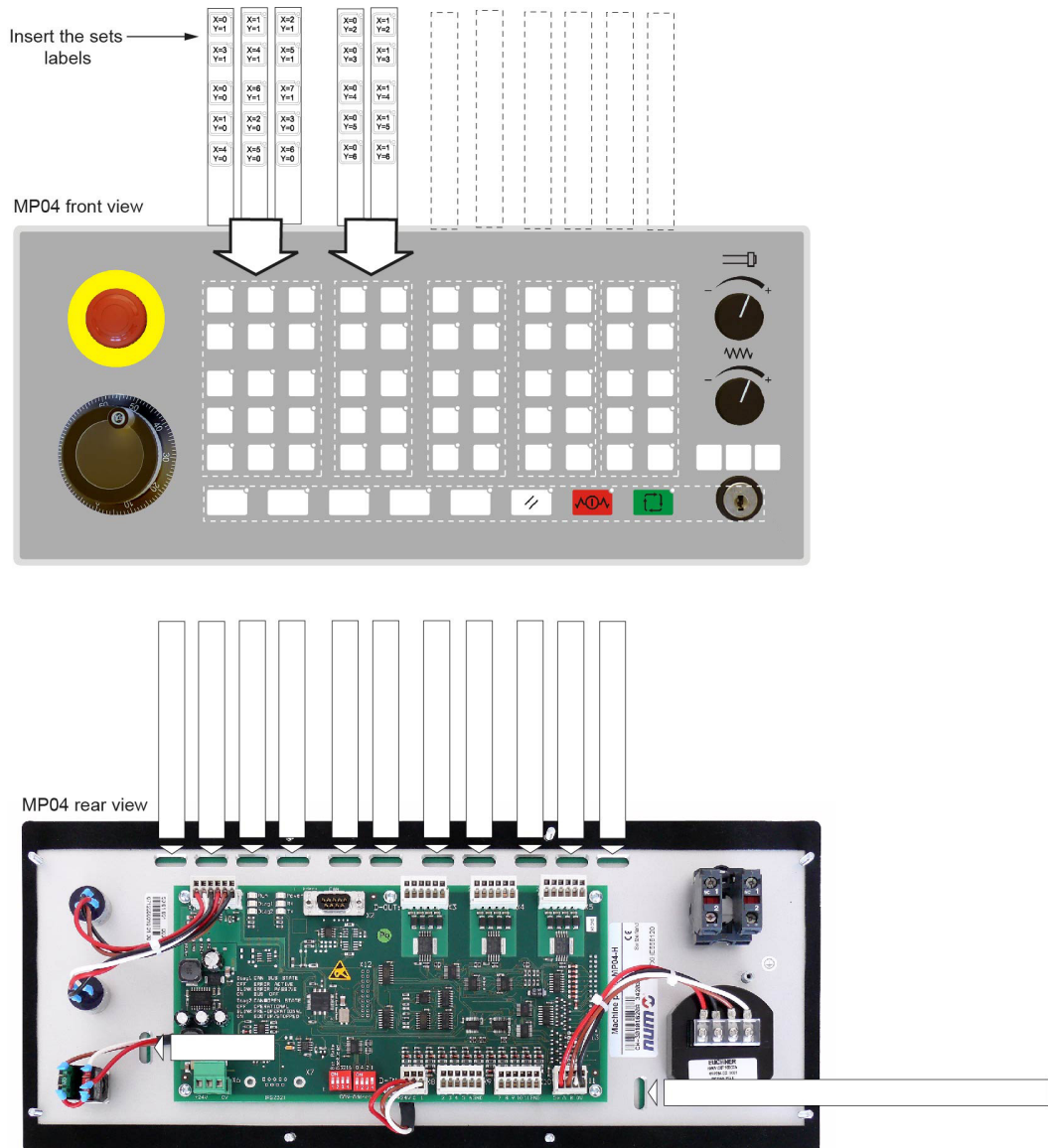
The buttons on the machine panel are not engraved. Their assignment is specified by installing a set of labels at the rear of the panel.

Supplied with the panel:

- a blank sheet of A4 paper to be printed on a laser printer (Type Folex BG-72 WO thickness 0.1 mm);

A file to define and print the key labels could be found at https://ftp.num.com/Web_Client/Customer_Support/Client_Common/TechnicalDocumentation/MachinePanelIMP/MP04_Labels

If you need printout more own labels please contact your local NUM customer service.



5.2 MP05 Machine panel

MP05 Machine panel is associated to FS194i touch panel. This uses the same 4mm hardened safety glass as the FS194i and has the same IP65 protection level at the front. A solid aluminum frame with back plate ensures correct stiffness.

MP05 complements the FS194i'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.

5.2.1 MP05-H G1

MP05-H G1 includes:

- E-Stop button
- 2 Overrides potentiometers 10k Ω 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-H G2

MP05-H G2 includes:

- E-Stop button;
- 2 Overrides potentiometers 10kW for spindle speed and feed rate adjustable via PLC;
- 1 handwheel (100 Impulses/rev., 5V - A, B);
- 3 step key switch;
- 6 luminous customizable push buttons (e.g. NC-Start, NC-Stop and 4 customizable push buttons, e.g. JOG+ direction, JOG- direction, Rapid);
- 1 USB 2.0 interface.

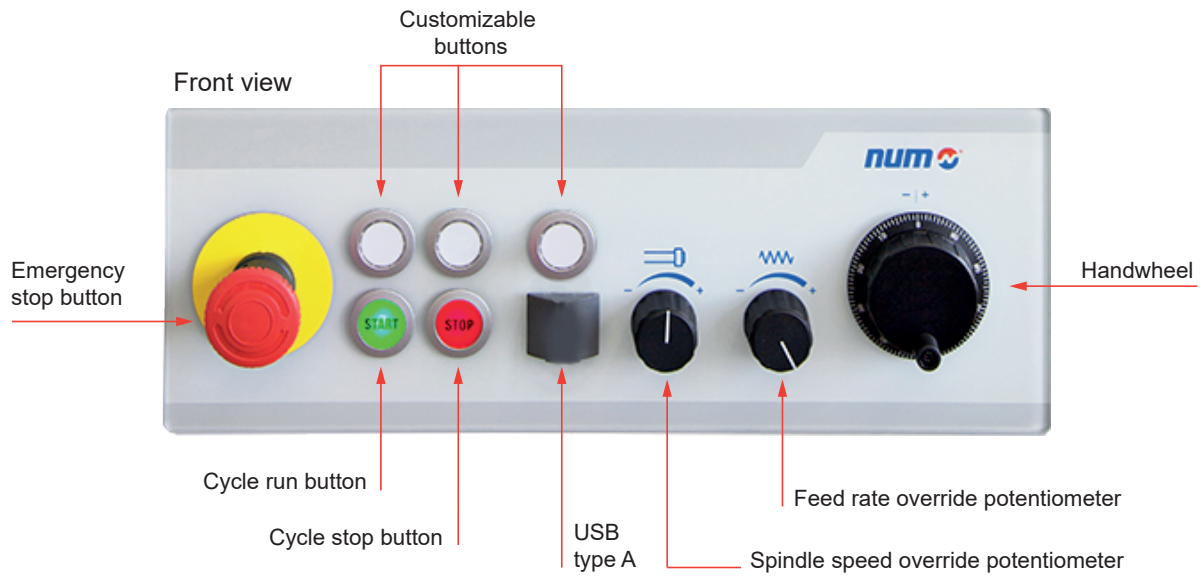


5.2.3 Ordering code

MP05 version	Ordering code
Machine Panel MP05-H G1 with handwheel	FXHE558520
Machine Panel MP05-H G2 with handwheel	FXHE03NBE1HN000

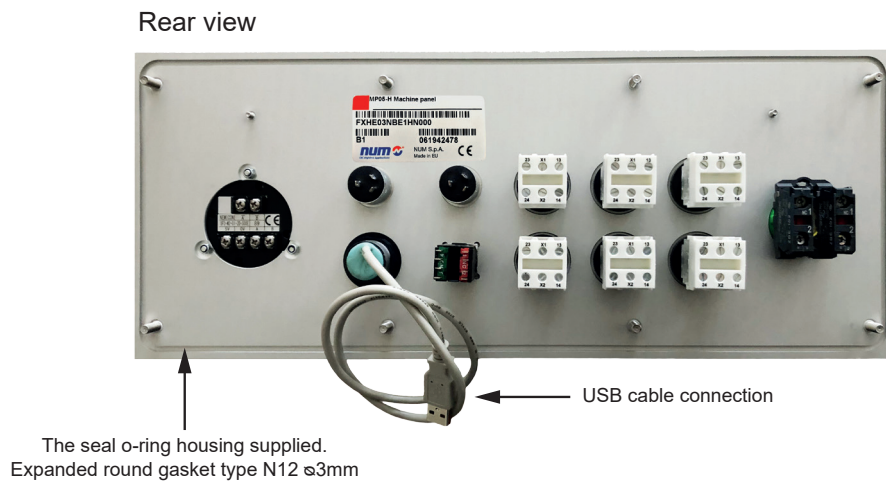
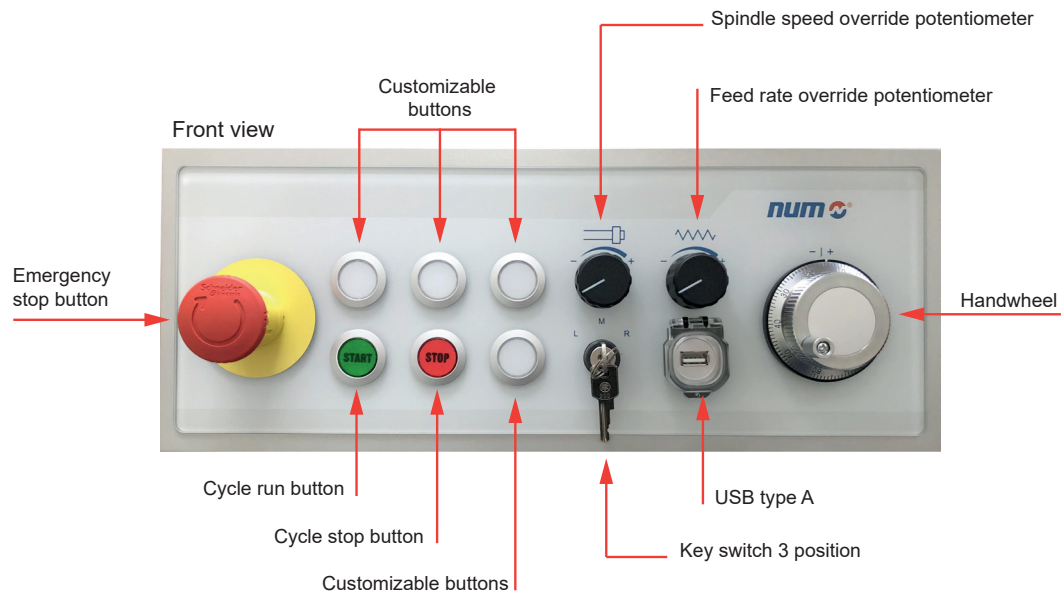
5.2.4 Machine panel description

5.2.4.1 MP05-H G1



Rear view

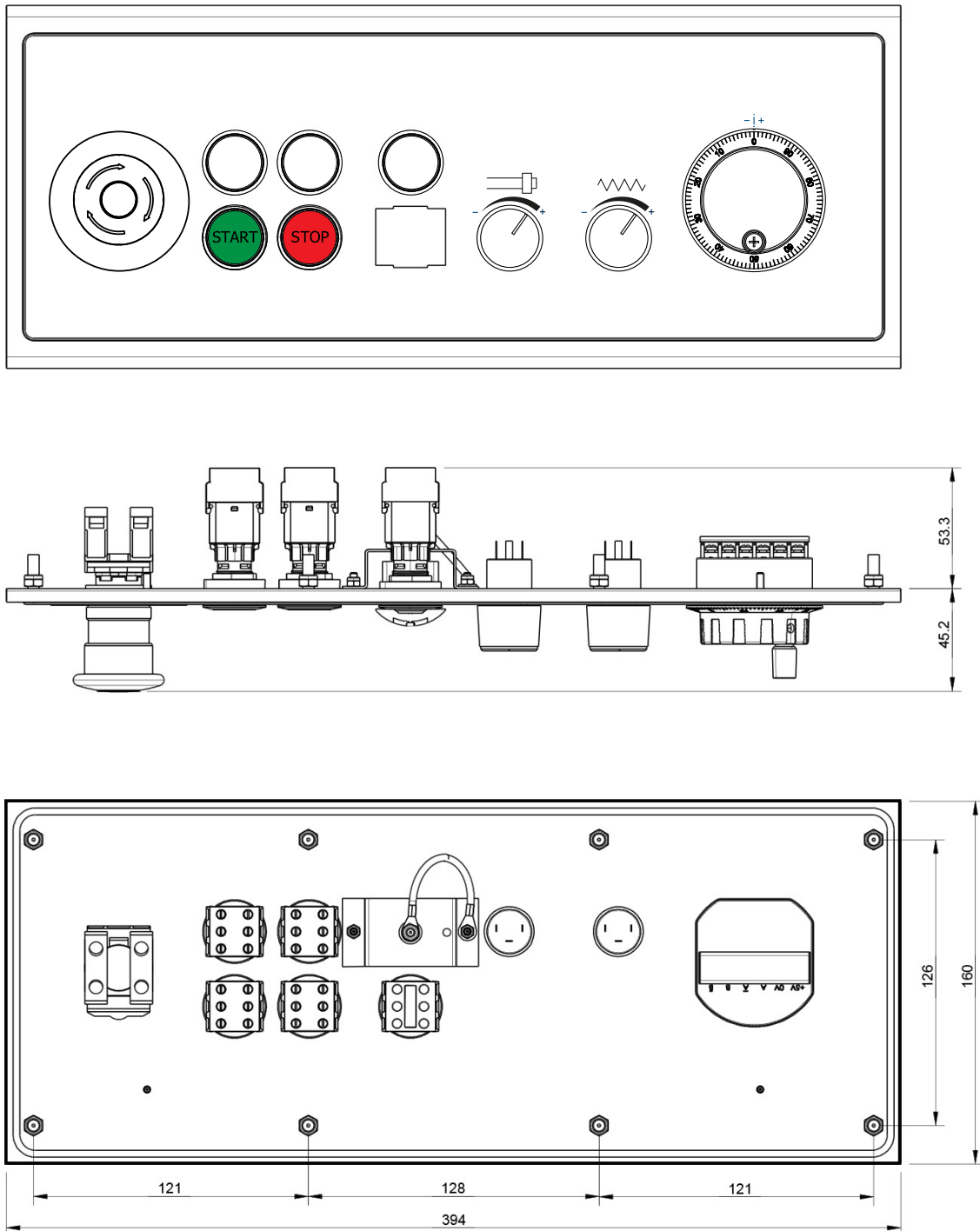




5.2.5 Overall dimensions

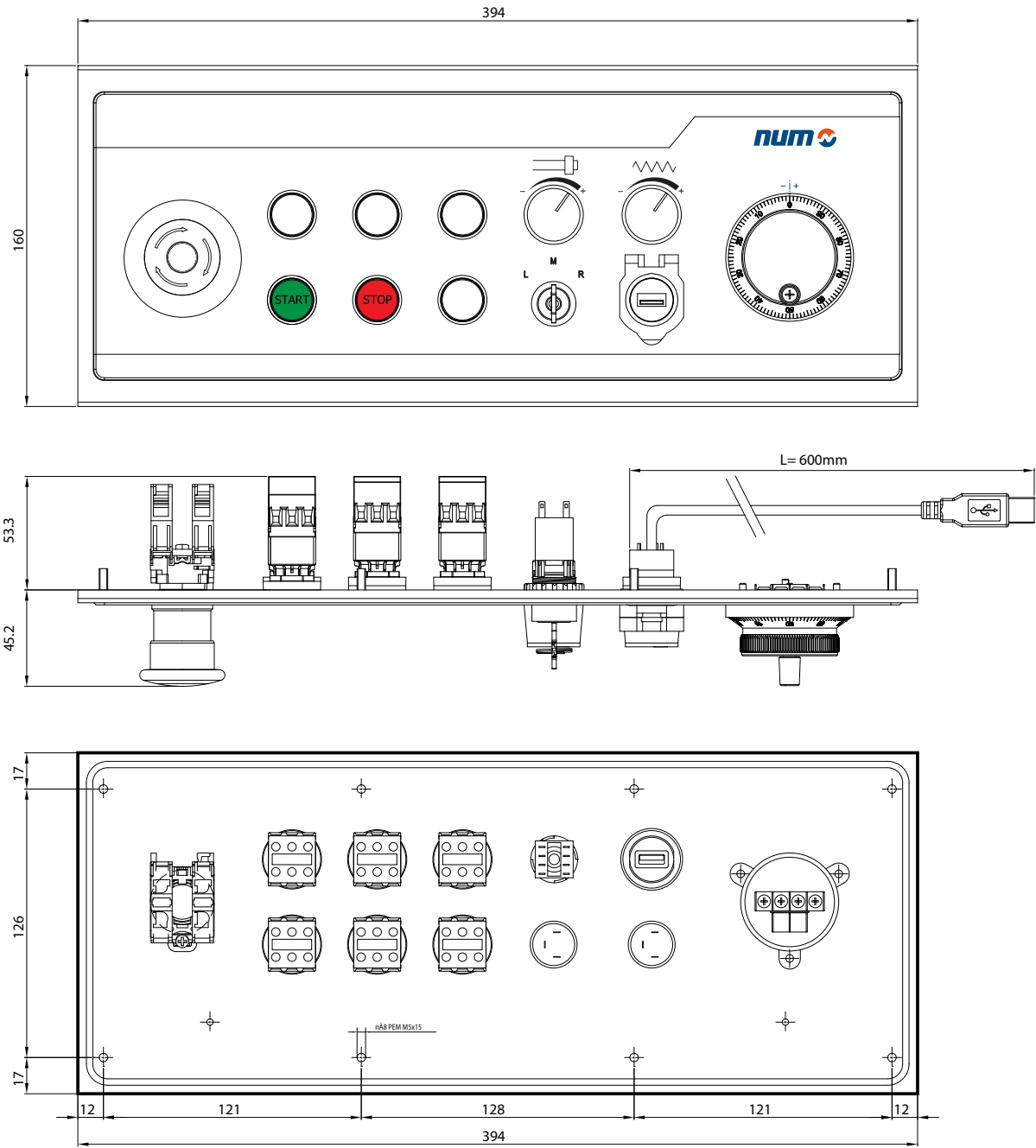
5.2.5.1 MP05-H G1

Dimensions in mm



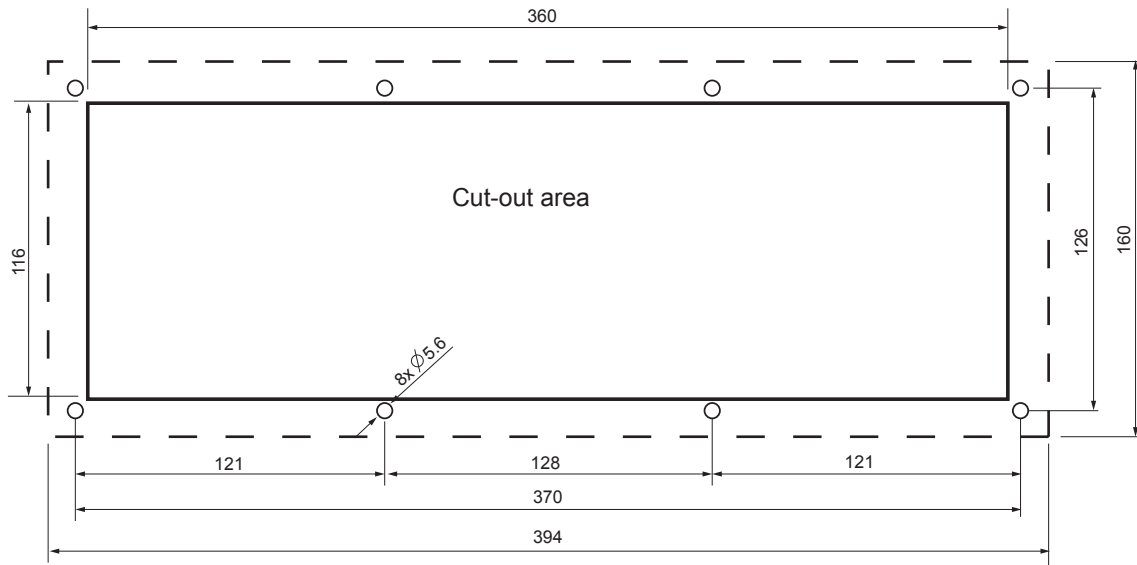
5.2.5.2 MP05-H G2

Dimensions in mm



5.2.6 Cut-out and hole pattern

Dimensions in mm



5.2.7 Maintenance and Repair

5.2.7.1 Repairs

Repairs to MP05 Panel must only be carried out by the manufacturer.
(Manufacturer address see list of NUM agencies on chapter 1.5)

5.2.7.2 Transport

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

5.2.7.3 Storage

The device must only be stored in the climatic conditions -40...60°C, 70% rel. air humidity, non-condensing.

5.2.8 Connections

Please refer to chapter 9.8 for more detailed information upon the panels connections.

5.2.9 Mounting instruction

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.

5.3 MP06 and MP06_M Machine panel

5.3.1 MP06 description

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

Four versions are available as indicated in the following sections.

MP06 is designed to fit FS154i / FS153 operator panel dimensions..

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
- 12 digital inputs and 12 digital outputs on the back



MP06 with key button caps

5.3.2 MP06_M description

MP06_M the button caps are substituted by a membrane that cover all the machine panel. The customization of the button icon is possible inserting them from the back.



MP06_M with with a membrane that covers all MP06

5.3.3 Machine panel options



Machine Panel MP06-H (with handwheel)

- EtherCAT interface
- 60 free configurable buttons with LEDs
- With potentiometers or selectors
- Handwheel
- Same width as FS154i/FS153



Machine Panel MP06-W (without handwheel)

- EtherCAT interface
- 60 free configurable buttons with LEDs
- With potentiometers or selectors
- Same width as FS154i/FS153

5.3.4 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

MP06_M version	
Machine Panel MP06–W without handwheel and potentiometers	FXHE02AME1WE000
Machine Panel MP06–H with handwheel and potentiometers	FXHE02AME1HE000
Machine Panel MP06–W without handwheel and selectors	FXHE02AME2WE000
Machine Panel MP06–H with handwheel and selectors	FXHE02AME2HE000

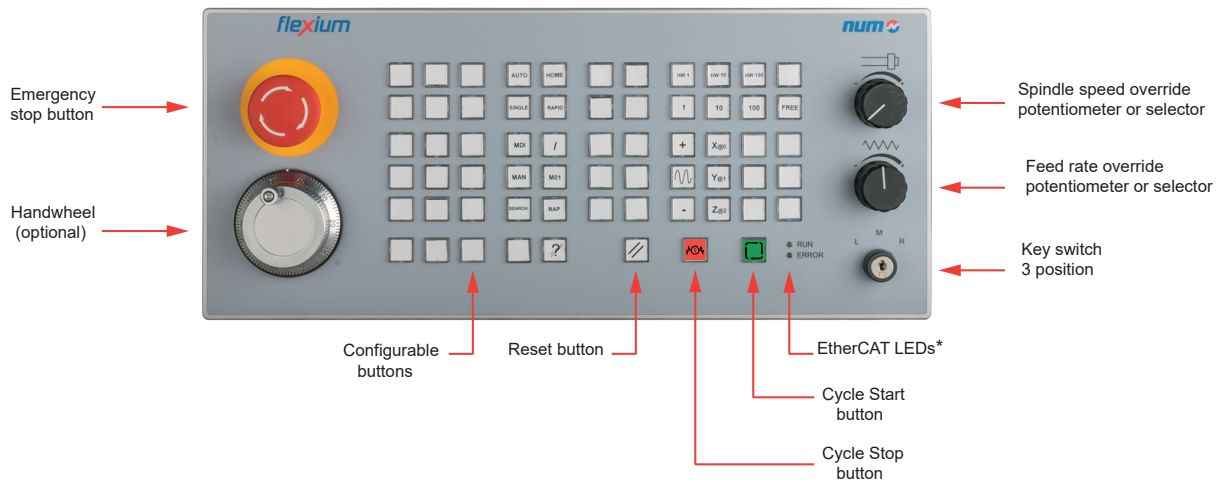
	FXHE	02	A	R	E	1	H	E	0	0	0
Index / Mechanical variant											
• MP06 (x FS154i / FS153)		02									
Integrated I/Os											
• 12 digital inputs and 12 digital outputs			A								
Keys number and technology											
• 63 x keys with real switches and button caps											
• 63 x keys with real switches and membrane											
Safety functions											
• E-STOP + 3 positions key switch					E						
Override feedrate and spindle											
• 2 potentiometers						1					
• 2 selectors with mechanical indexing						2					
Handwheel											
• None							W				
• Handwheel							H				
Connections Technology											
• EtherCAT								E			
Spare Number									0		
Spare Number										0	
Spare Number											0

5.3.5 Characteristics

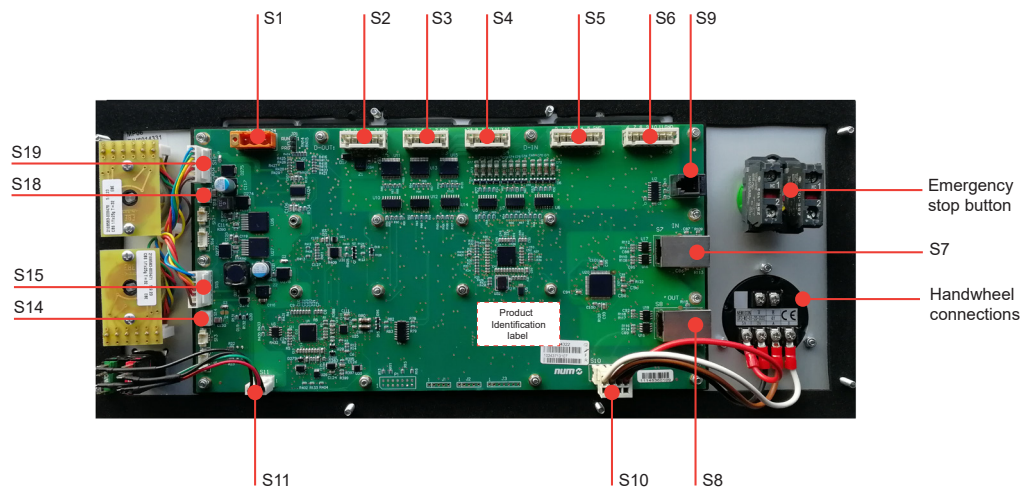
MP06 MP06_M		FXHE02ARE1WE000 FXHE02AME1WE000	FXHE02ARE1HE000 FXHE02AME1HE000	FXHE02ARE2WE000 FXHE02AME2WE000	FXHE02ARE2HE000 FXHE02AME2HE000
Interfaces	Communication interface	Standard EtherCAT 2xRj45			
	Handwheel input	1 input for 5 VDC handwheel with A & B push-pull signal connected to handwheel when present			
	Key switch	1 key switch with 3 positions			
	Potentiometers	2 potentiometers 10 kOhm, 8 Bit resolution (For spindle speed and feed rate override)		Not present	
	Selectors	Not present		2 switch selectors with 25 positions	
	Handwheel	Not present	Yes (100 Pulse per rev.)	Not present	Yes (100 Pulse per rev.)
	Emergency stop	1			
Push buttons	Free configurable	60 buttons with mechanical switches with LEDs			
	Cycle start, cycle stop and reset	3 buttons with mechanical switches with LEDs			
Digital inputs	Digital inputs	12 organized in 2 groups of terminals			
	Operating voltage	24V –15% / +10%			
	Logic 0 / Logic 1	0 < 6 VDC (<= 3mA) 1 > 10 VDC up to 30 VDC (5 mA up to 15 mA)			
	Reaction time	8ms typical (debounced)			
Digital outputs	Digital outputs	12 organized in 3 groups of terminals			
	Operating voltage	24V –15% / +10%			
	Rated current	500 mA maximum per output			
	Outputs simultaneously 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			
Degree of protection	Front	IP 65			
	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			

5.3.6 Machine panel description

MP06 Machine Panels front view



MP06 Machine Panels rear view

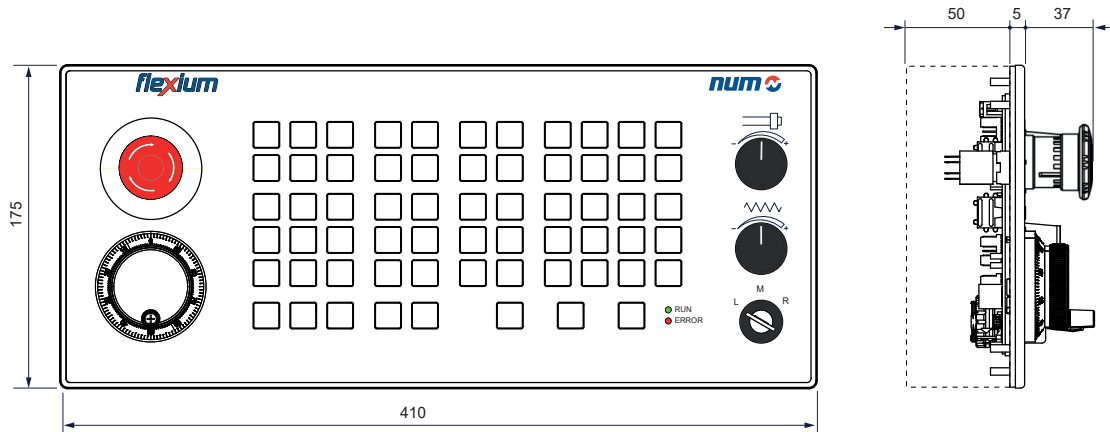


* see chapter 5.3.12

Connector	Type	Description
S1	3 screws pins F	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	Potentiometers connection
S15, S19	7 pin spring-loaded terminal	Rotary switches connection

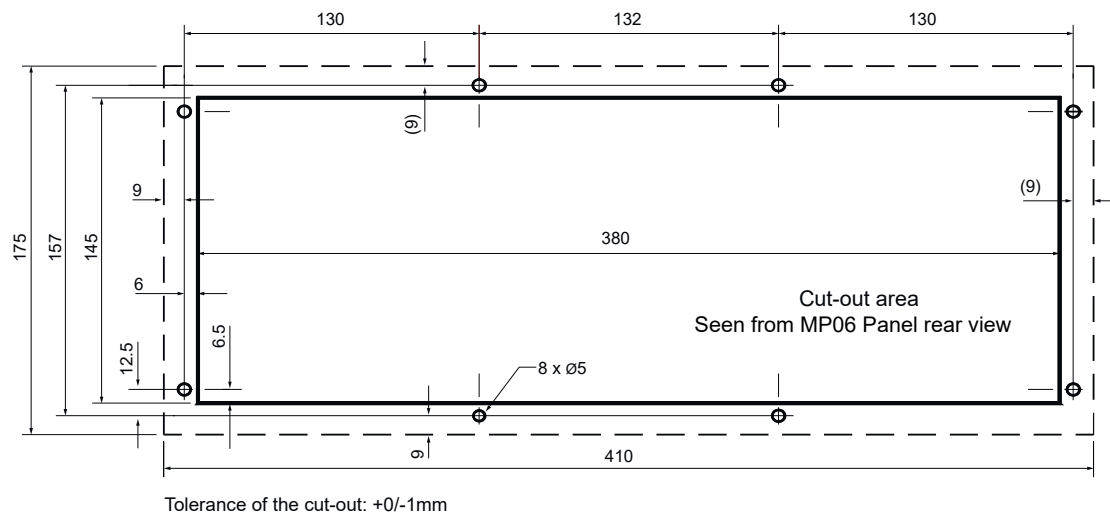
5.3.7 MP06 Overall dimensions

Dimensions in mm



5.3.8 MP06 Cut-out and hole pattern

Dimensions in mm



5.3.12 Diagnostics

5.3.12.1 EtherCAT 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

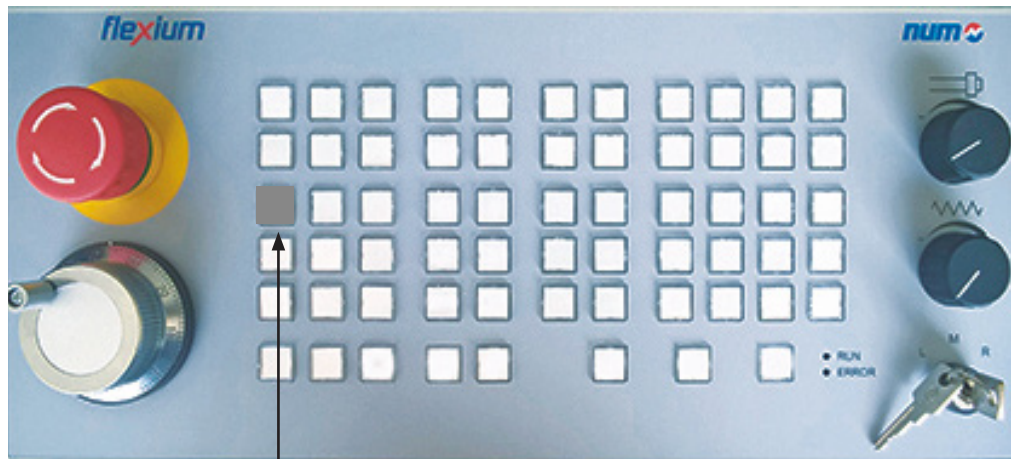
5.3.12.2 EtherCAT ERROR indicator state

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	Bootin Error	Bootin Error was detected. INIT state reached, but Error indicator bit set to 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.	

5.3.12.3 Test program

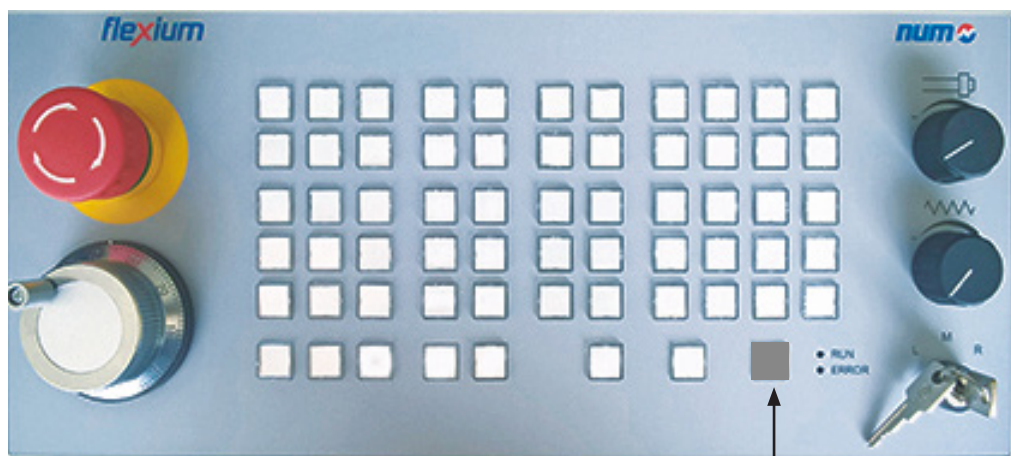
The MP06 has an integrated test program to test the LEDs, the keys, the potentiometers, the handwheel, the IOs and the firmware.

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.



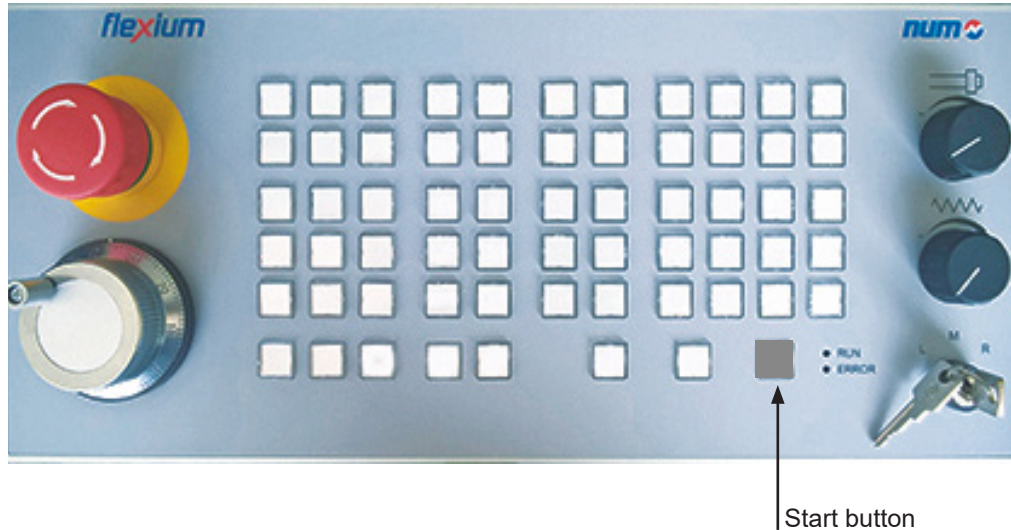
Start test button

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.

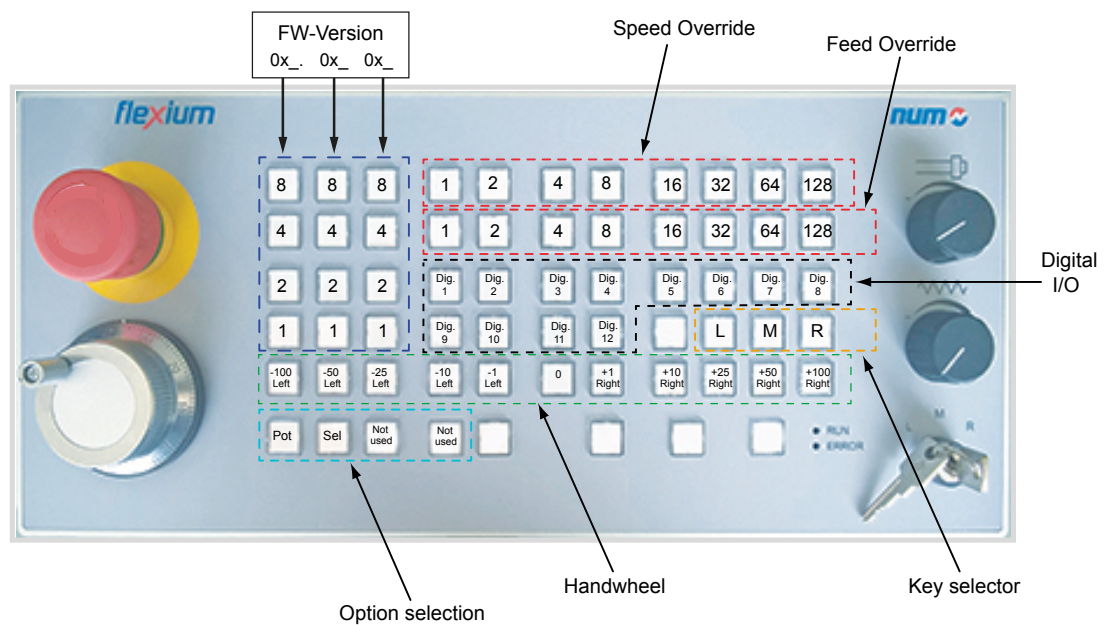


Start button flash

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.	

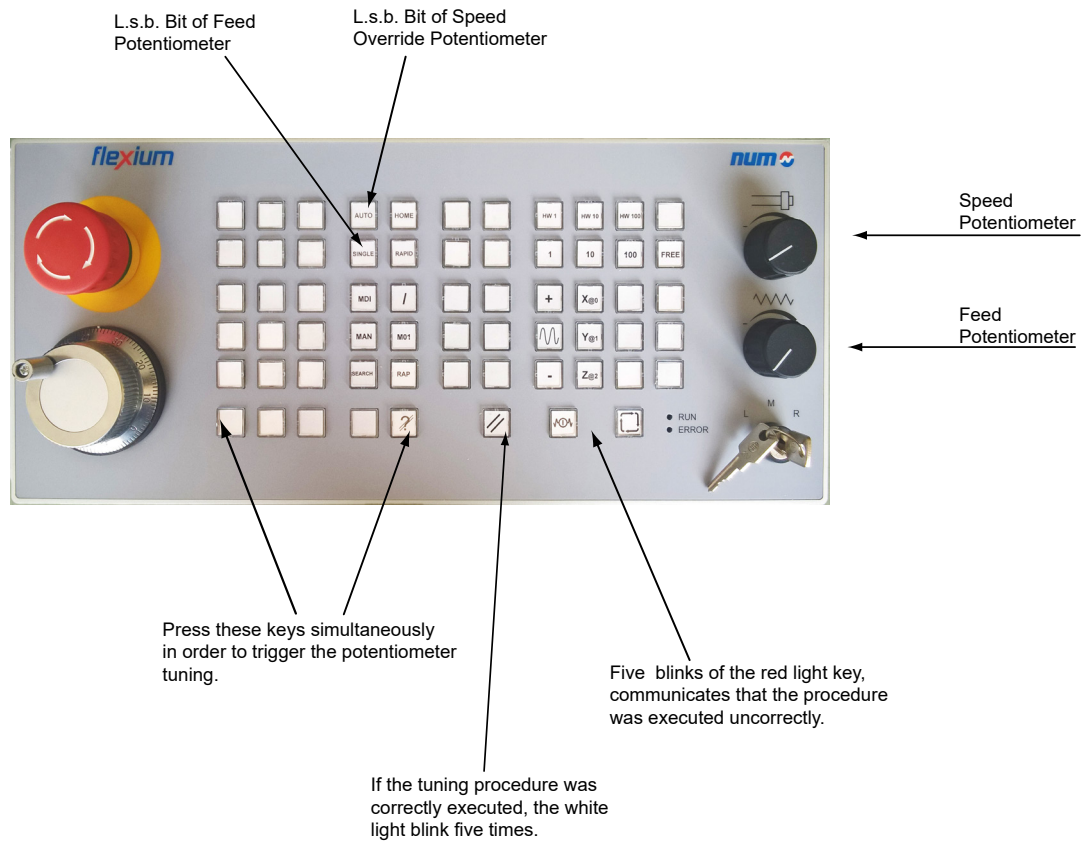
7. To restart the test, press the “Start” button with the flashing LED again.

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 L.s.b of the corresponding knob to blink, in order to signal what potentiometer was incorrectly positioned.

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](#))

5.3.13.2 Transport

Only the original packaging must be used for transporting the device.
The climatic conditions must be observed (see chapter [5.3.5](#)).

5.3.13.3 Storage

The device must only be stored in the climatic conditions (see chapter [5.3.5](#)).
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 Connections

Please refer to chapter [9.9](#) for more detailed information upon the panels connections.

5.3.15 Mounting instructions

MP06 and MP06_M are installed from the front, for example, into a control cabinet. They are fixed at the rear with embedded threaded bolts.

MP06 and MP06_M 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.

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.

- Insert the MP06 and MP06_M 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.

5.3.16 Protection for the MP06 keyboard with and without handwheel

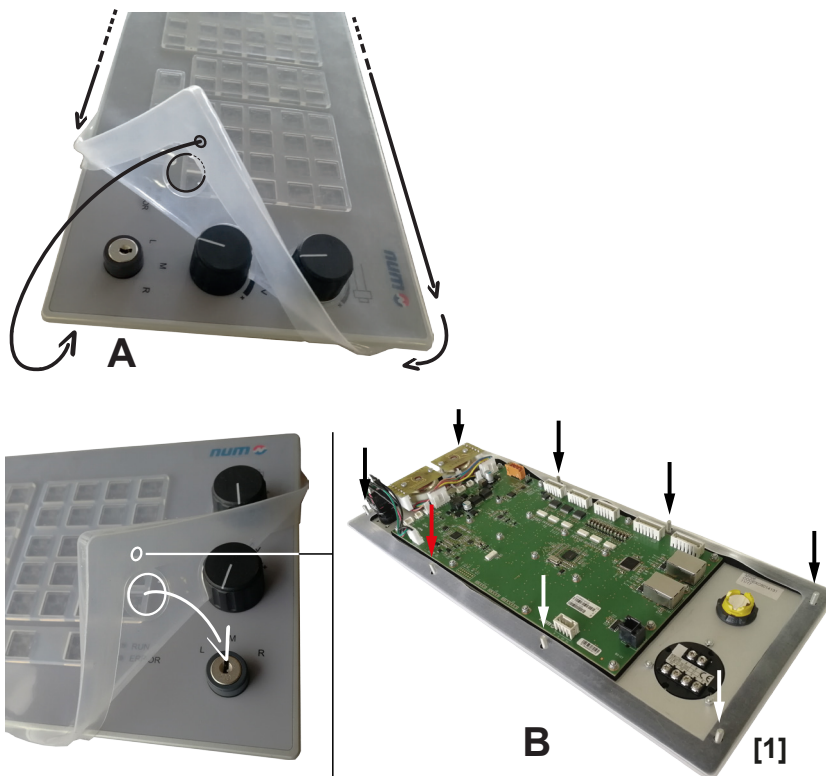
5.3.16.1 Assembly procedure:



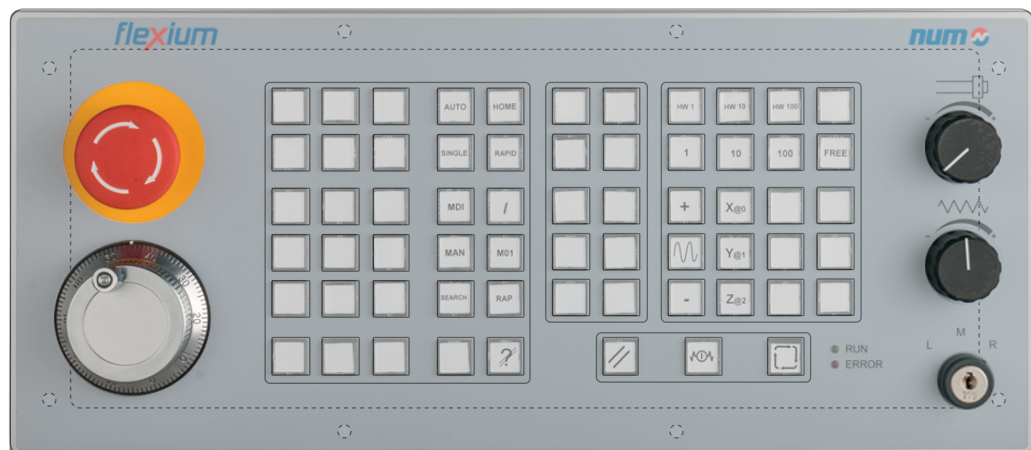
NOTE

The silicone protection used to cover the MP06 model keyboard is easy to apply thanks to the silicone properties which make it extensible, facilitating correct positioning on the keyboard **without removing any part mounted on it**.

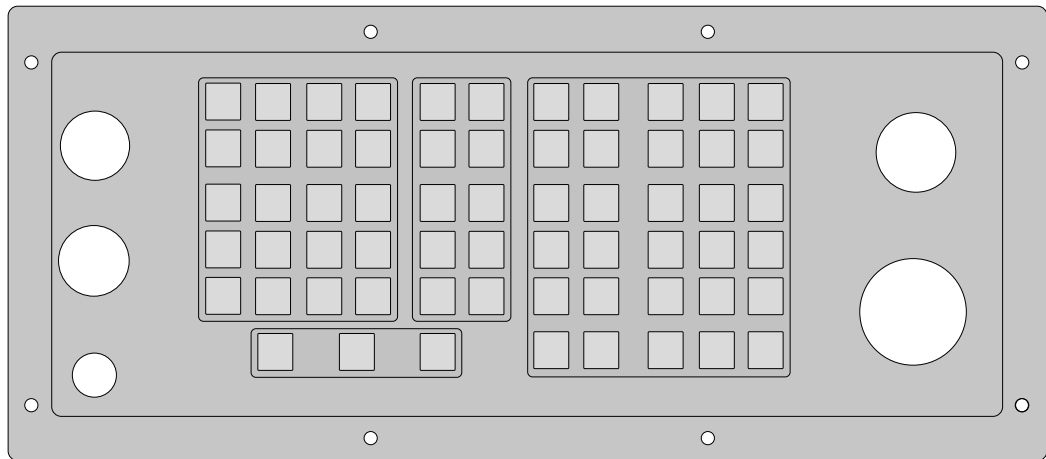
3. Apply the silicone protection starting from a corner of the keyboard and adjust the whole profile as shown in figure **A**;
4. On the back of the keyboard there are 8 threaded inserts **[1]** used for fixing the keyboard to the machine panel: the same inserts will be used to fix the protection to the keyboard as shown in figure **B**.



MP06 with protection mounting front view

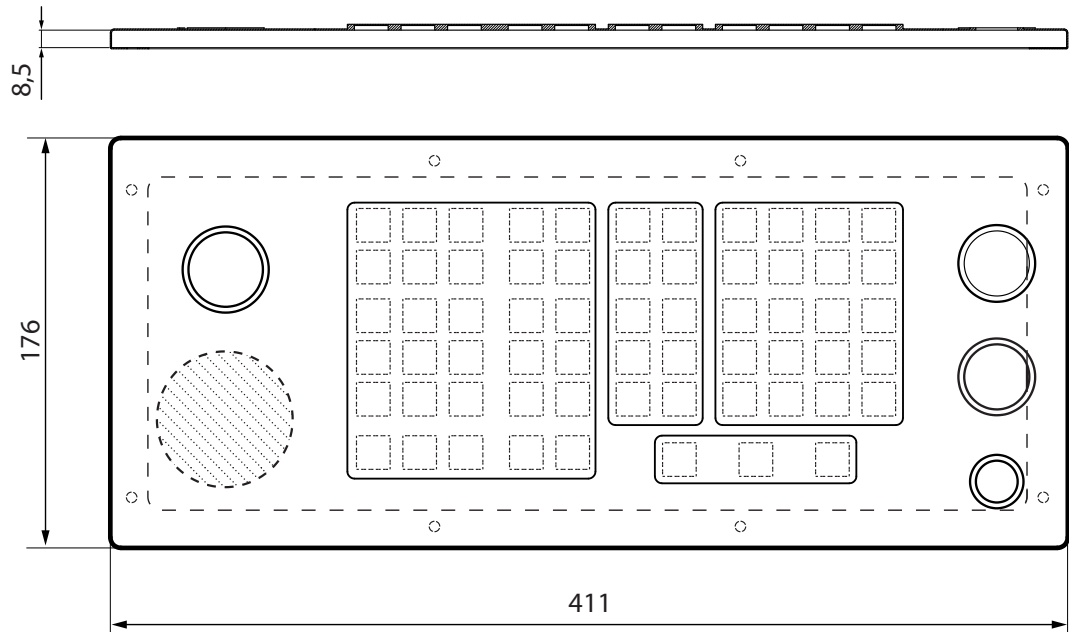


Backside view of the protection with handwheel opening



Front view of the MP06 protection and overall main dimensions

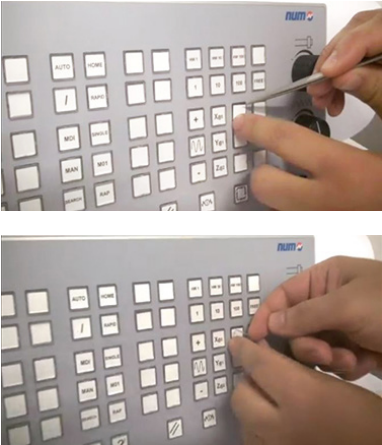
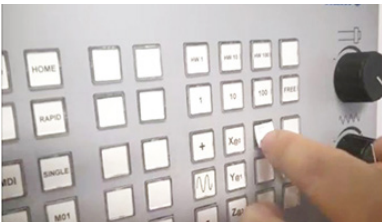
Dimensions in mm



The protection is also available as spare part with following part number:

Part number	Description
EIV6014400	Protection with Handwheel opening
EIV6014402	Protection without Handwheel opening

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.	

5.3.17.2 MP06_M

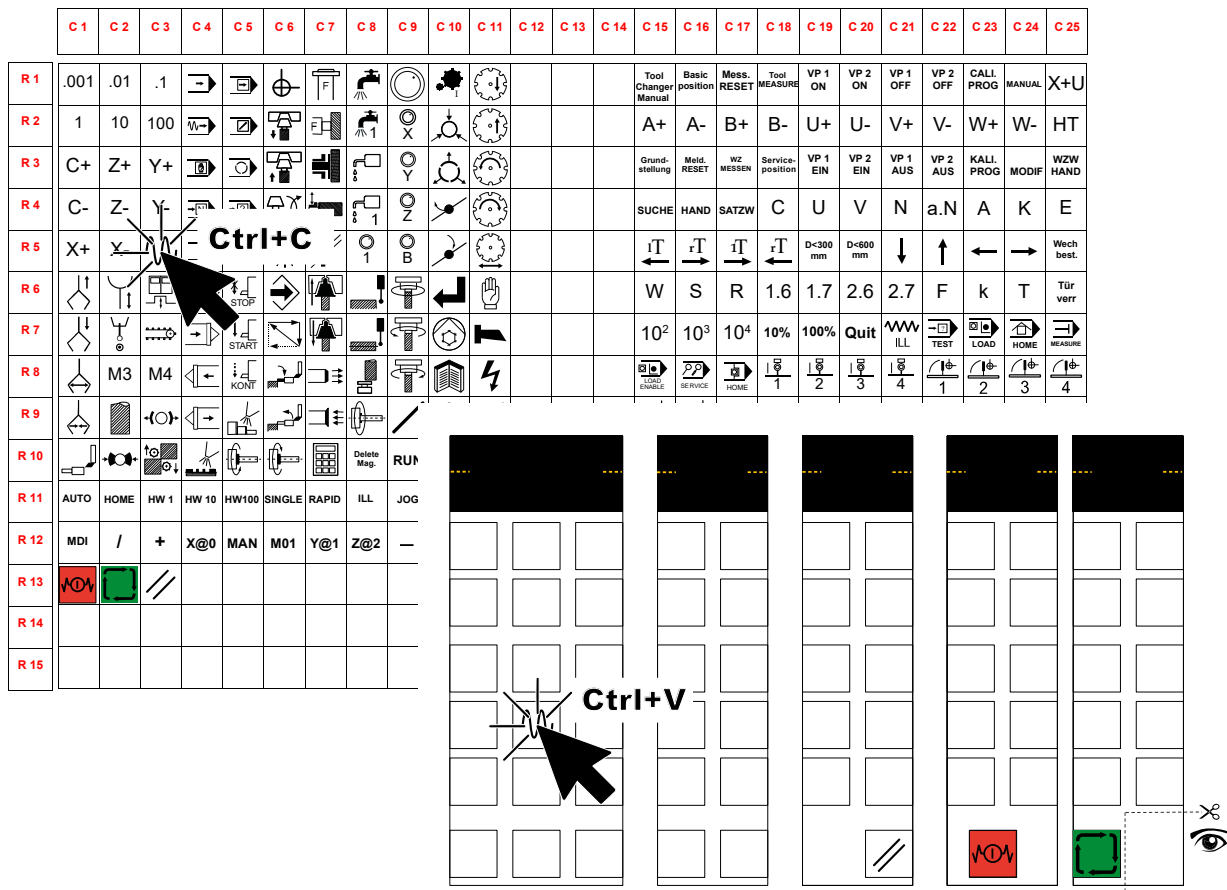
MP06 Machine Panels with keys option “M” compared to option “R” have the following specific differences:

The keys look like a membrane type, but the key switches are the same. Only the graphic configuration is new;



The MP06 machine panel is supplied with buttons not set, then icons have to be printed by the Customer.

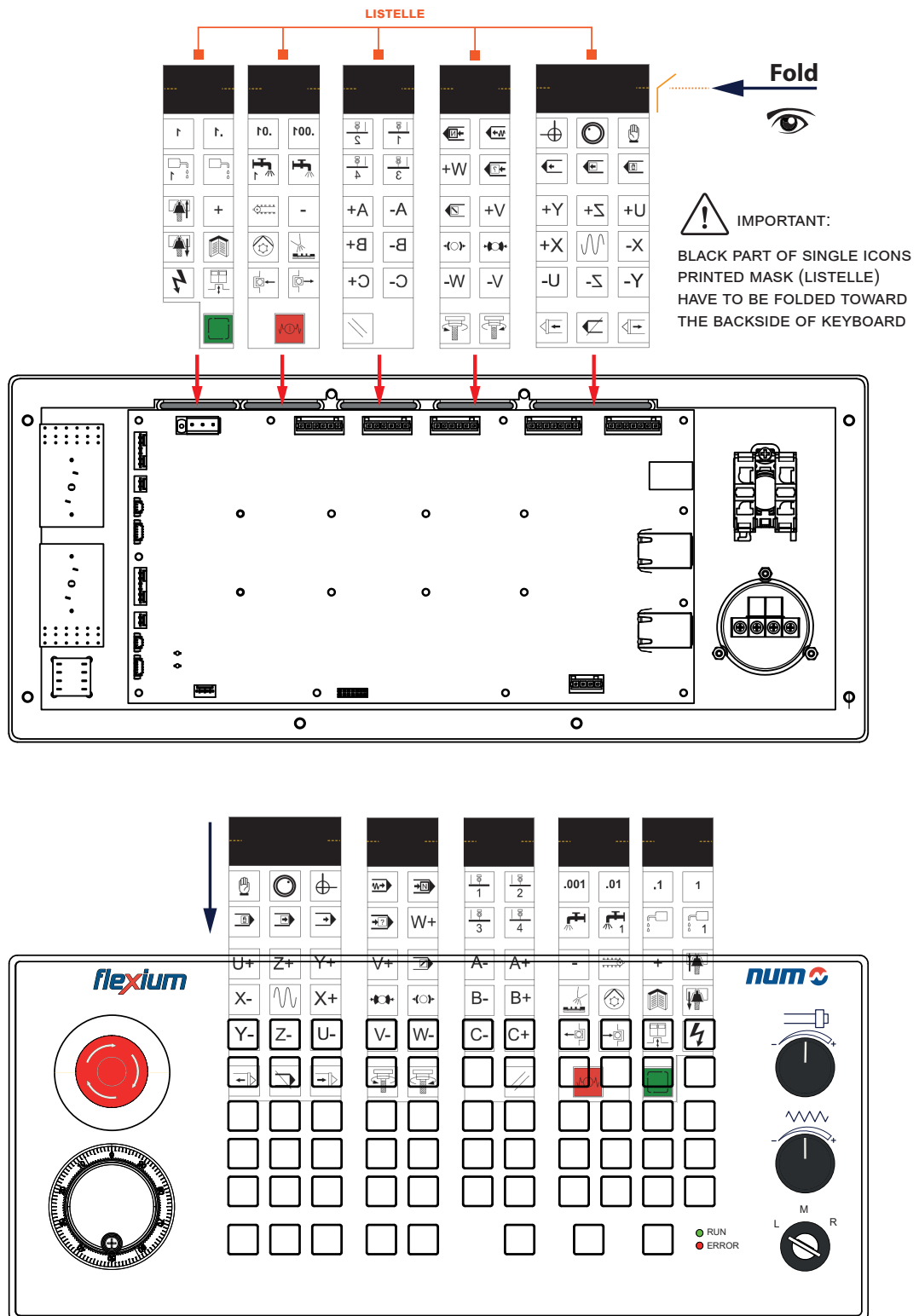
About that, it is available the package file "MP06 M option label template.zip" you can download https://ftp.num.com/Web_Client/Customer_Support/Client_Common/TechnicalDocumentation/MachinePanelMP/MP06_M_Labels. First file (A3 sheet.docx) shows a table with complete icons set; second file (A4 sheet.docx) shows the printing mask to be filled with the necessary icons by the Customer, picking them from first file.



File package "MP06_M option label template.zip" is available upon request to your local NUM Customer Service.

1. Open both files A3 sheet and A4 sheet (word format);
2. Copy the icons from complete table in A3 sheet (icons palette) and paste them in the mask in A4 sheet as shown above;
3. Once printing mask has been completely filled with all necessary icons, print it using a 0.1+0.125 mm thickness polyester sheet;
4. Carefully cut out each single box of labels (listelle) of the printable mask, also following the scissors icon (presence of LEDs in that area);
5. Once you've got listelle cut out, fold the black part following the dotted lines;
6. Insert each listella in its own slot on the backside of the keyboard as shown in the following page.

Insertion of masks in the prepared slots



5.4 MP07 Machine panel

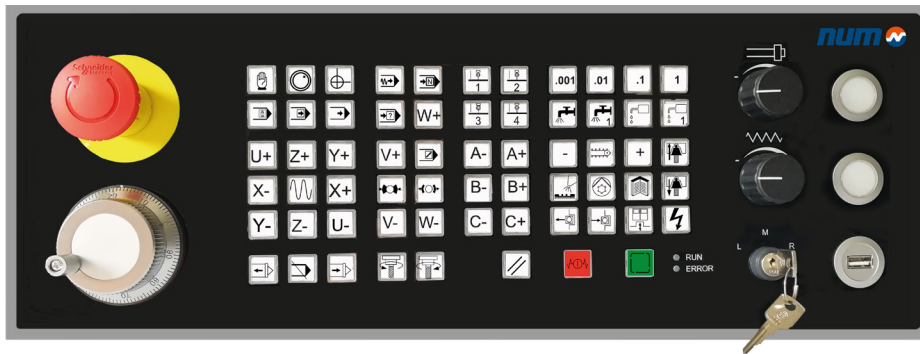
MP07 Machine panel is used for control of manual movements, production initiation and intervention during machining and is available with / without handwheel.

Four versions are available as indicated in the following sections.

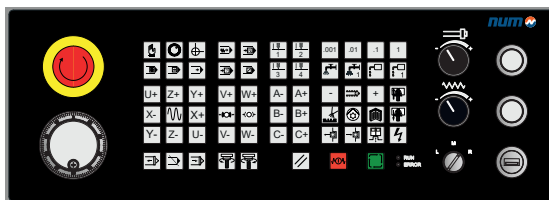
MP07 is designed to fit FS184i / FS184 operator panel dimension.

MP07 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) and Cycle Start (green LED)
- 2 Dedicated LEDs for EtherCAT state: RUN and ERROR
- 1 USB 2.0 Type A extender
- 2 holes Ø 22.3mm (with caps) where the standard button can be mounted
- 12 digital inputs and 12 digital outputs on the back.

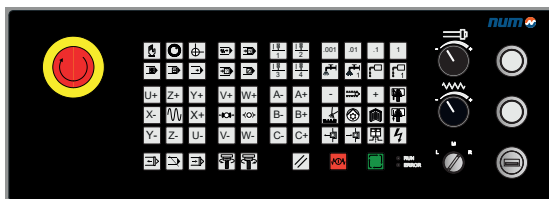


5.4.1 Machine panel options



Machine Panel MP07-H (with handwheel)

- EtherCAT interface
- 63 free configurable buttons with LEDs
- With potentiometers or selectors
- Handwheel
- Same width as FS184i / FS184



Machine Panel MP07-W (without handwheel)

- EtherCAT interface
- 63 free configurable buttons with LEDs
- With potentiometers or selectors
- Same width as FS184i / FS184

5.4.2 Ordering code

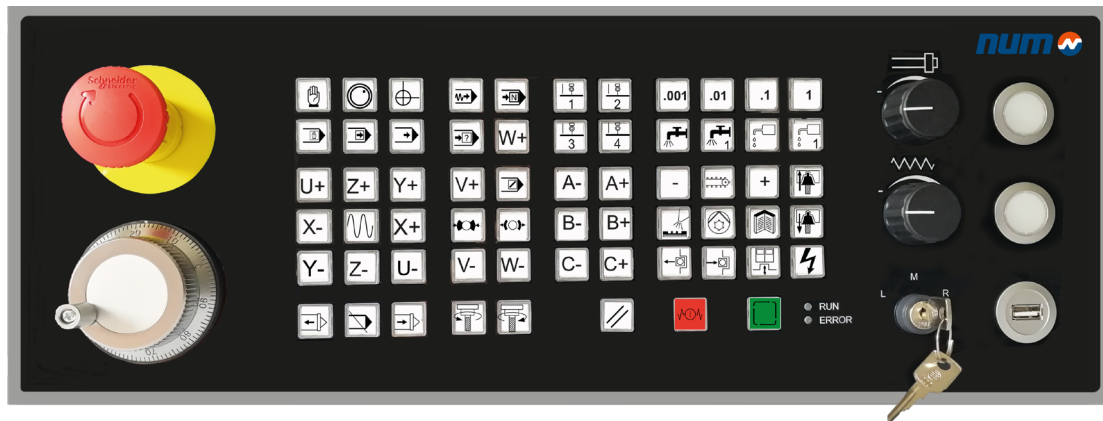
MP07 version	Ordering code
Machine Panel MP07–W without handwheel and potentiometers	FXHE04ARE1WE100
Machine Panel MP07–H with handwheel and potentiometers	FXHE04ARE1HE100
Machine Panel MP07–W without handwheel and selectors	FXHE04ARE2WE100
Machine Panel MP07–H with handwheel and selectors	FXHE04ARE2HE100

	FXHE	04	A	R	E	1	H	E	1	0	0
Index / Mechanical variant MP07 (x FS184i / FS184)		04									
Integrated I/Os • 12 digital inputs and 12 digital outputs			A								
Buttons number and technology • 63 x buttons with real switches				R							
Safety functions • E-STOP + 3 positions key switch					E						
Override feedrate and spindle • 2 potentiometers • 2 selectors with mechanical indexing						1 2					
Handwheel • None • Handwheel							W H				
Connections Technology EtherCAT								E			
USB 2.0 Type A extender									1		
Spare Number										0	
Spare Number											0

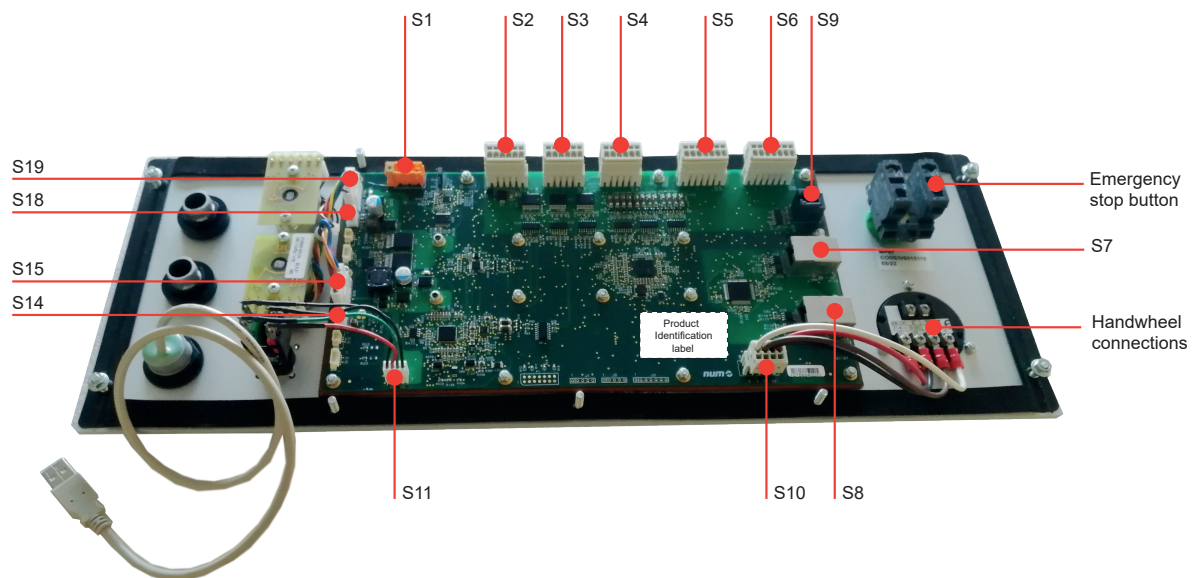
5.4.3 Characteristics

		FXHE04ARE1WE100	FXHE04ARE1HE100	FXHE04ARE2WE100	FXHE04ARE2HE100
Interfaces	Communication interface	Standar EtherCAT 2xRj45			
	Handwheel input	1 input for 5 VDC handwheel with A & B push-pull signal connected to handwheel when present			
	Key switch	1 key switch with 3 positions			
	Potentiometers	2 potentiometers 10 kOhm, 8 Bit resolution (For spindle speed and feed rate override)		Not present	
	Selectors	Not present		2 switch selectors with 25 positions	
	Handwheel	Not present	Yes (100 Pulse per rev.)	Not present	Yes (100 Pulse per rev.)
	Emergency stop	1			
Push buttons	Free configurable	60 buttons with mechanical switches with LEDs			
	Cycle start, cycle stop and reset	3 buttons with mechanical switches with LEDs			
Digital inputs	Digital inputs	12 organized in 2 groups of terminals			
	Operating voltage	24V –15% / +10%			
	Logic 0 / Logic 1	0 < 6 VDC (<= 3mA) 1 > 10 VDC up to 30 VDC (5 mA up to 15 mA)			
	Reaction time	8ms typical (debounced)			
Digital outputs	Digital outputs	12 organized in 3 groups of terminals			
	Operating voltage	24V –15% / +10%			
	Rated current	500 mA maximum per output			
	Outputs simultaneously 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			
Degree of protection	Front	IP 65			
	Rear	IP 00			
Weight		1.3 kg	1.5 kg	1.3 kg	1.5 kg
Dimensions	W x H x D:	488 x 175 x 55 mm			

5.4.4 Machine panel description



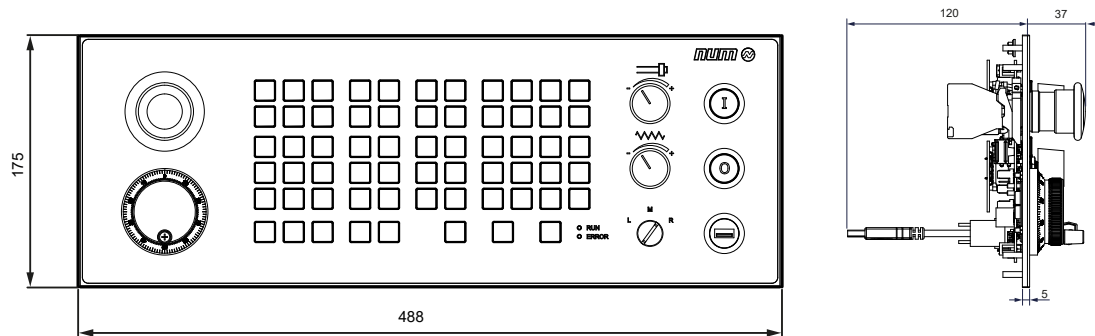
MP07 Machine Panels rear view



Connector	Type	Description
S1	3 screws pins F	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	Potentiometers connection
S15, S19	7 pin spring-loaded terminal	Rotary switches connection

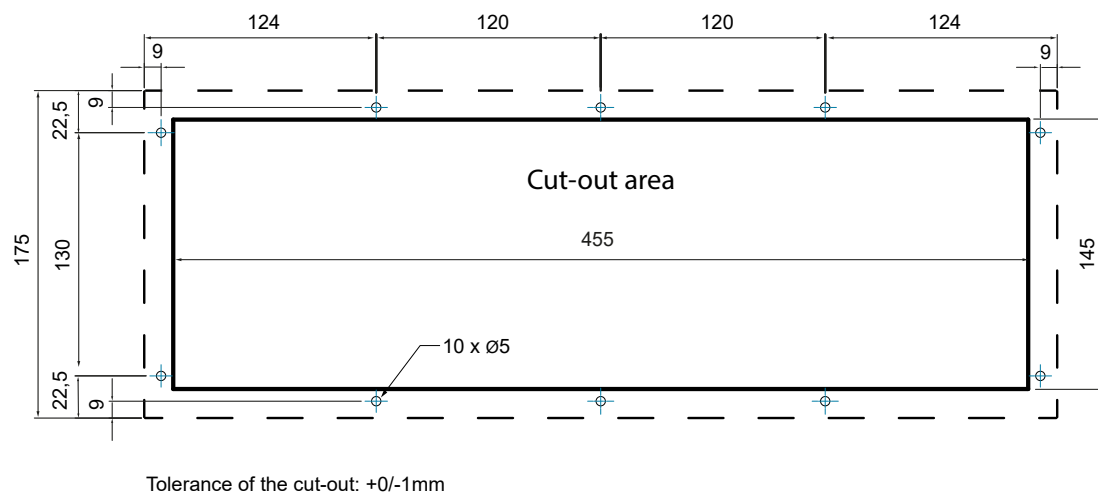
5.4.5 Overall dimensions

Dimensions in mm



5.4.6 Cut-out and hole pattern

Dimensions in mm



5.4.7 PLC configuration

For MP07 to PLC configuration please refer to Flexium⁺ Commissioning manual M00010.

5.4.8 Diagnostics

5.4.8.1 EtherCAT RUN indicator state
See chapter [5.3.12.1](#)

5.4.8.2 EtherCAT ERROR indicator state
See chapter [5.3.12.2](#)

5.4.8.3 Test program
See chapter [5.3.12.3](#)

5.4.9 Maintenance and Repair

5.4.9.1 Repairs
Repairs to MP07 Panels must only be carried out by the manufacturer.
(Manufacturer address see list of NUM agencies on chapter [1.5](#))

5.4.9.2 Transport
Only the original packaging must be used for transporting the device.
The climatic conditions must be observed (see chapter [5.4.3](#))

5.4.9.3 Storage
The device must only be stored in the climatic conditions (see chapter [5.4.3](#)).
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.

5.4.10 Connections

MP07 connections and button configurations are supplied by the customer. Please refer to chapter [9.9](#) for the connections.

5.4.11 Mounting instructions
See chapter [5.3.15](#)

5.4.12 Installing the personalization button labels
See chapter [5.3.17.1](#)

5.5 MP08 Machine panel

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.

MP08 is designed to fit FS122 operator panel dimensions.

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.
- 12 digital inputs and 12 digital outputs on the back.



5.5.1 Ordering code

Machine Panel	Ordering Codes
MP08 with potentiometers	FXHE01ARD1WE000
MP08 with selectors	FXHE01ARD2WE000

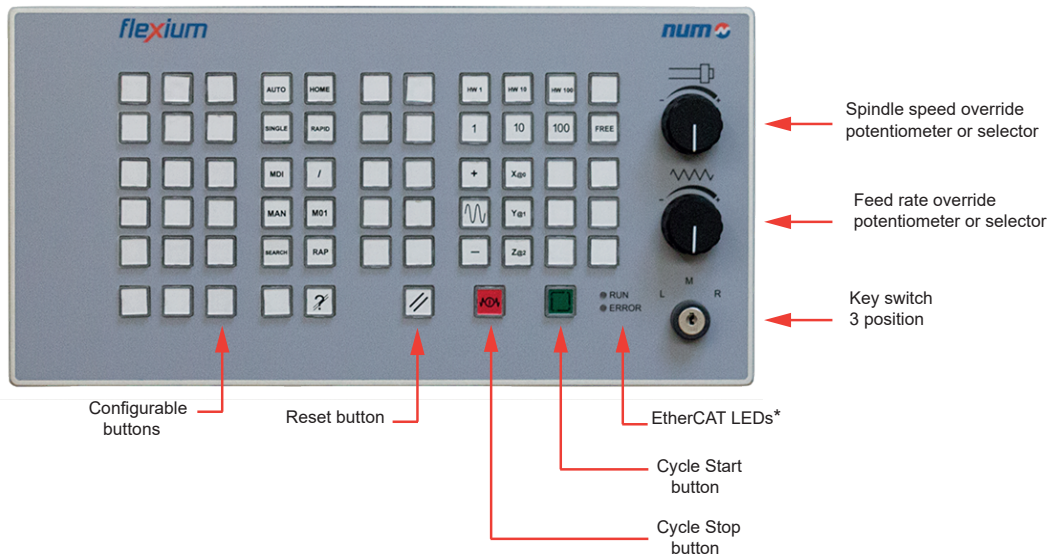
FXHE	01	A	R	D	1	W	E	0	0	0
Index / Mechanical variant										
• MP08 (x FS122)	01									
Integrated I/Os										
• 12 digital inputs and 12 digital outputs		A								
Buttons number and technology										
• 63 x buttons with real switches			R							
Safety functions										
3 positions key switch				D						
Override feedrate and spindle										
• 2 potentiometers					1					
• 2 selectors with mechanical indexing					2					
Handwheel										
None						W				
Connections Technology										
• EtherCAT							E			
Spare Number								0		
Spare Number									0	
Spare Number										0

5.5.2 Characteristics

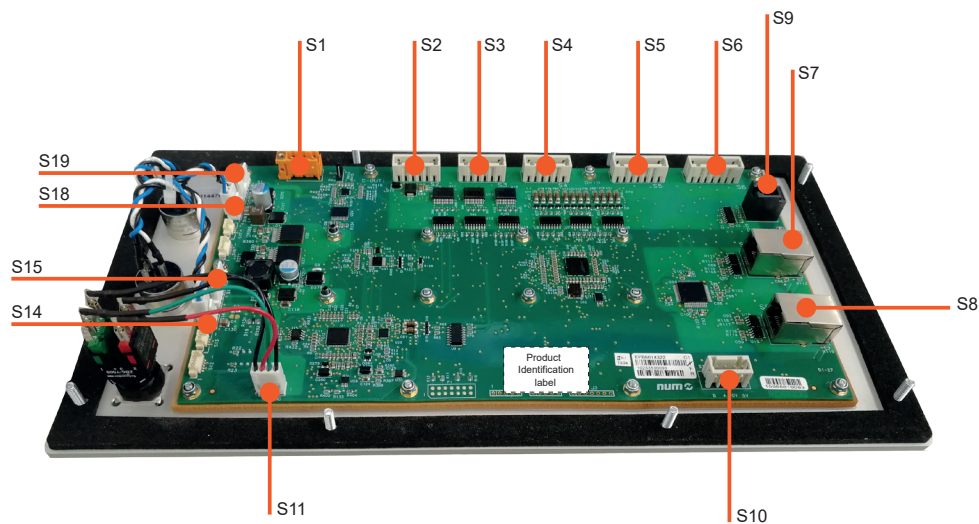
		FXHE01ARD1WE000	FXHE01ARD2WE000
Interfaces	Communication interface	Standard EtherCAT 2xRj45	
	Handwheel input	1 input for 5 VDC handwheel with A & B push-pull signal	
	Key switch	1 key switch with 3 positions	
	Potentiometers	2 potentiometers 10 kOhm, 8 Bit resolution (For spindle speed and feed rate override)	Not present
	Selectors	Not present	2 switch selectors with 25 positions
	Handwheel	Not present	
	Emergency stop	Not present	
Push buttons	Free configurable	60 buttons with mechanical switches with LEDs	
	Cycle start, cycle stop and reset	3 buttons with mechanical switches with LEDs	
Digital inputs	Digital inputs	12 organized in 2 groups of terminals	
	Operating voltage	24V –15% / +10%	
	Logic 0 / Logic 1	0 < 6 VDC (<= 3mA) 1 > 10 VDC up to 30 VDC (5 mA up to 15 mA)	
	Reaction time	8ms typical (debounced)	
Digital outputs	Digital outputs	12 organized in 3 groups of terminals	
	Operating voltage	24V –15% / +10%	
	Rated current	500 mA maximum per output	
	Outputs simultaneously 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	
Degree of protection	Front	IP 65	
	Rear	IP 00	
Weight		1.2 kg	
Dimensions	W x H x D:	347 x 175 x 55 mm	

5.5.3 Machine panel description

MP08 Machine Panels front view



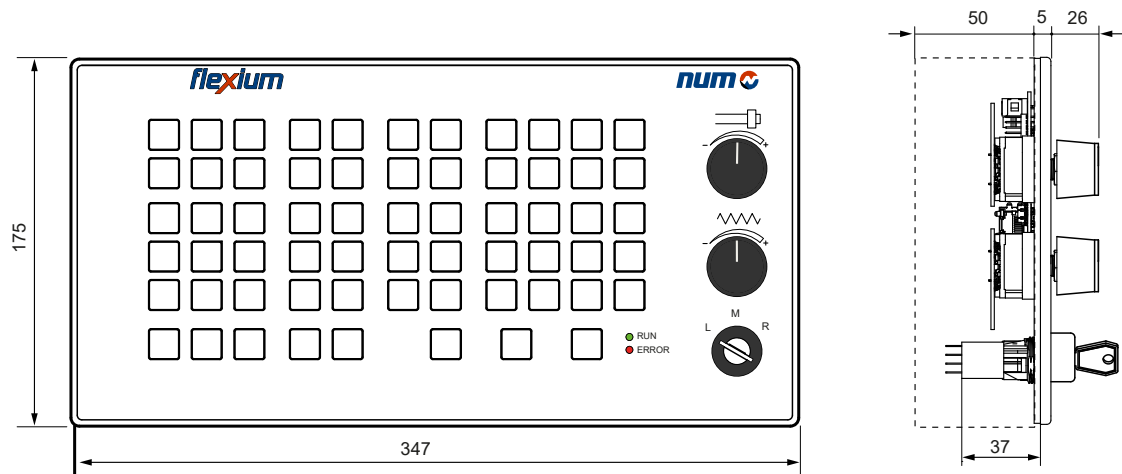
MP08 Machine Panels rear view



Connector	Type	Description
S1	3 screws pins F	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	Potentiometers connection
S15, S19	7 pin spring-loaded terminal	Rotary switches connection

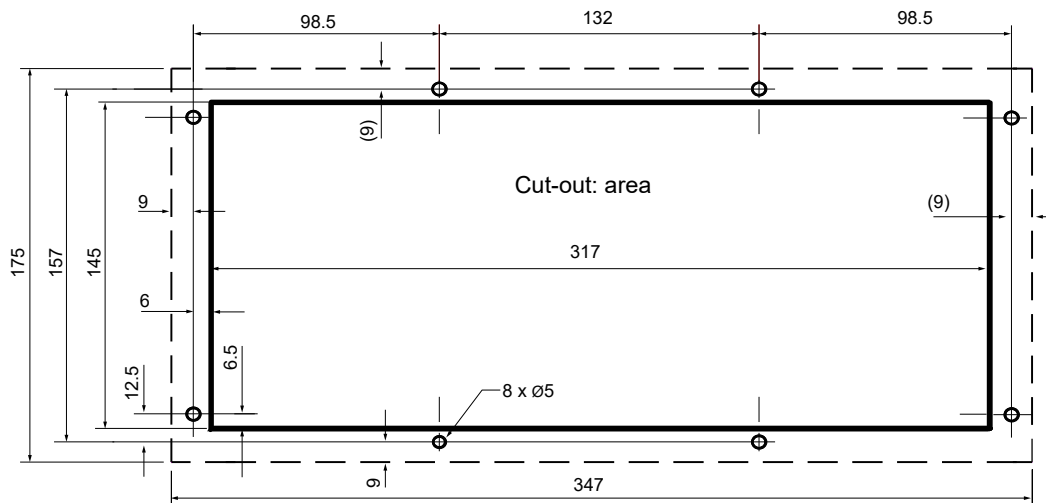
5.5.4 Overall dimensions

Dimensions in mm



5.5.5 Cut-out and hole pattern

Dimensions in mm



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

5.5.6 PLC configuration

For MP08 to PLC configuration please refer to Flexium Commissioning manual M00010.

5.5.7 Diagnostics

5.5.7.1 EtherCAT RUN indicator state
See chapter [5.3.12.1](#)

5.5.7.2 EtherCAT ERROR indicator state

See chapter [5.3.12.2](#)

5.5.7.3 Test program

See chapter [5.3.12.3](#)

5.5.8 Maintenance and Repair

5.5.8.1 Repairs

Repairs to MP08 Panels must only be carried out by the manufacturer.
(Manufacturer address see list of NUM agencies on chapter [1.5](#))

5.5.8.2 Transport

Only the original packaging must be used for transporting the device.
The climatic conditions must be observed (see chapter [5.5.2](#))

5.5.8.3 Storage

The device must only be stored in the climatic conditions described in chapter [5.5.2](#).
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.

5.5.9 Connections

Please refer to chapter [9.9](#) for more detailed information upon the panels connections.

5.5.10 Mounting instructions

See chapter [5.3.15](#)

5.5.11 Installing the personalization button labels

See chapter [5.3.17.1](#)

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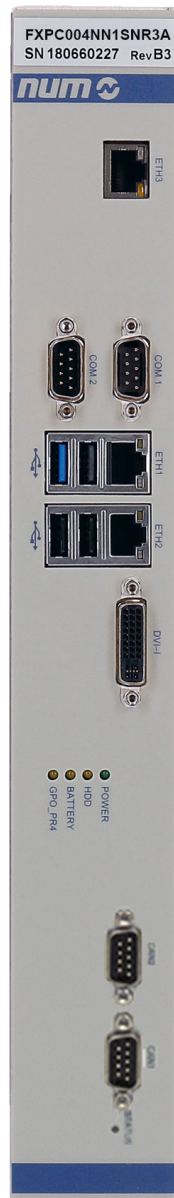
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6 NUM Industrial Box PC

6.1 Box PC P1 G4 and PC P1 G4A

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 P1 can also deal as Flexium HMI platform together with a FS122, FS153, FS184, FS194L or FS244 passive panels.



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 Ordering code

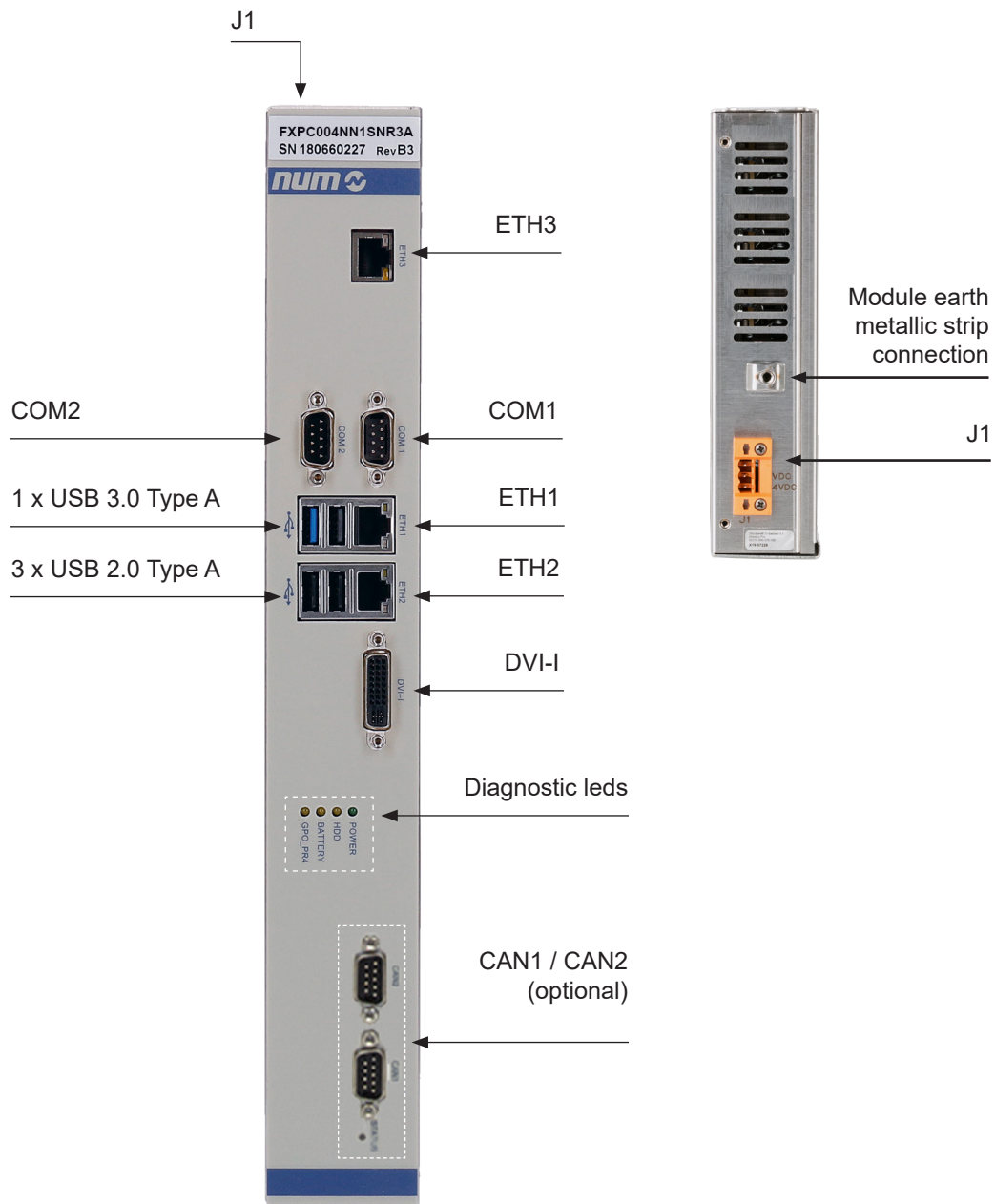
Box PC Version	Ordering Codes
Box PC P1 G4 HD	FXPC004NN1HNR10
Box PC P1 G4 HD CAN	FXPC004NN1HDR10
Box PC P1 G4A SSD	FXPC004NN1SNR3A
Box PC P1 G4A SSD CAN	FXPC004NN1SDR3A

	FXPC	00	4	N	N	1	S	N	R	3	A
Display Unit											
• Industrial Box PC		00									
Panel/Mechanical Variant											
• Fourth generation			4								
Display Sensor											
• No touch sensor, just Box PC				N							
Keyboard Type											
• No keyboard, just Box PC					N						
IPC Mother Board, Processor											
• Performance level P1						1					
Mass Memory Type											
• HD (Hard Disk)							H				
• SSD (Solid State Disc)							S				
Option Board											
• None								N			
• CAN + NVRAM								D			
Fixed value									R		
Operating System											
• Windows Embedded 8.1 Industry Pro										1	
• Windows 10 IoT Enterprise LTSC 2019 64 bits										3	
Versions											
• P1 G4											0
• P1 G4A											A

6.1.2 Characteristics

		FXPC004NN1HxR10 (P1 G4)	FXPC004NN1SxR3A (P1 G4A)
Main PC features	CPU	Intel ® Celeron™ CPU J1900 @ 2GHz Quad Core	
	RAM	2GB	
	Mass storage	>250 GB Hard Disk	Industrial SSD 64 GB
	Operating system	Windows Embedded 8.1 Industry Pro	Windows 10 IoT Enterprise LTSC 2019 64 bits
Communication Interfaces	Ethernet (ETH)	3x Gigabit LAN / RTE	
	CAN	2 - CAN1 / CAN2 (as option)	
	USB	3 x USB 2.0 Type A and 1 x USB 3.0 Type A	
	COM	2	
	DVI-I interface	1	
Power supply	Rated voltage	24 VDC (+15%/-15%)	
	Power consumption	typ. 21W max. 50W (2.1A)	
Ambient conditions	Climatic conditions operation	0...45°C, 70% rel. air humidity, non-condensing	
	Climatic conditions storage	-20...60°C, 70% rel. air humidity, non-condensing	
	Environmental installation conditions	Requires protection to at least IP54	
	Climatic conditions, transport	-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	

6.1.3 Module description



Connector	Type	Description
J1	3 screws pins F	Power supply connections
ETH1	RJ45 (8P/8C)	FlexiumPro RTK Ethernet connections
ETH2	RJ45 (8P/8C)	PLC EtherCAT
ETH3	RJ45 (8P/8C)	Company LAN
COM1 / COM2	RS232 Sub D 9 pins M	Serial interface. General user purpose
USB	3 x USB 2.0 Type A, 1 x USB 3.0 Type A	General user purpose. (Mouse and all USB devices)
USB		
DVI-I	Standard DVI	Digital Video interface connection
CAN1 / CAN2	Sub D 9 pins M	Dual CAN + NVRAM interface (optional)

6.1.5 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 delay of 20 seconds.

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

6.1.6 Diagnostics

Leds	Meanings
POWER	Power supply OK
HDD	HDD/SSD access
BATTERY	Change battery
GPO_PR4	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 chapter 6.1.7.4)
Ethernet connection missing	- Incorrect Ethernet cable fitted (crossover/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.

6.1.7 Maintenance and Repair

6.1.7.1 Repairs

Repairs to Box PC devices must only be carried out by the manufacturer.

(Manufacturer address see list of NUM agencies on chapter [1.5](#))

6.1.7.2 Transport

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

The climatic conditions must be observed (see chapter [6.1.2](#))

6.1.7.3 Storage

The device must only be stored in the climatic conditions described in chapter [6.1.2](#).

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.

6.1.7.4 Battery replacement

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

Box PC	Battery code
P1 G4	EIV6003971
P1 G4A	EIV6003971

There is a danger of explosion if battery is incorrectly replaced.



Only trained personnel are allowed to replace the battery.
Replace only with the same type recommended by NUM.
Caution: Opening the right cover or breaking the warranty labels voids the warranty.



Pay attention to ESD safety protections when changing the battery.

6.1.8 Box PC connections

Please refer to chapter [9.4](#)

6.1.9 Mounting instructions

The Box PC is installed from the front, for example, into a control cabinet. They are fixed at the rear with screw (see chapter [6.1.4](#))

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

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 Box PC.

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

6.2 Box PC P2 G2 and PC P2 G4

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 platform together with a FS122, FS153, FS184, FS194L or FS244 passive panels.

Box PC P2 G2	Box PC P2 G4
	



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.

6.2.1 Ordering code

Box PC Version	Ordering Codes
Box PC P2 G2 HD	FXPC002NN2HNR10
Box PC P2 G2 HD CAN	FXPC002NN2HDR10
Box PC P2 G4 SSD W10 2016	FXPC004NN2SNR20
Box PC P2 G4 SSD CAN W10 2016	FXPC004NN2SDR20
Box PC P2 G4 SSD W10 2021	FXPC004NN2SNR40
Box PC P2 G4 SSD CAN W10 2021	FXPC004NN2SDR40

	FXPC	00	4	N	N	2	S	N	R	4	0
Display Unit											
• Industrial Box PC		00									
Panel/Mechanical Variant											
• Second generation			2								
• Fourth generation			4								
Display Sensor				N							
• No touch sensor, just Box PC											
Keyboard Type					N						
• No keyboard, just Box PC											
IPC Mother Board, Processor						2					
• Performance level P2											
Mass Memory Type							H				
• HD (Hard Disk)							S				
• SSD (Solid State Disc)											
Option Board								N			
• None								D			
• CAN + NVRAM											
Fixed value									R		
Operating System											
• Windows Embedded 8.1 Industry Pro										1	
• Windows 10 IoT Enterprise LTSC 2016 64 bits										2	
• Windows 10 IoT Enterprise LTSC 2021 64 bits ⁽¹⁾										4	
Fixed value											0

⁽¹⁾ Windows 10 IoT Enterprise LTSC 2021 64 bits supports only Flexium Tools starting from 4.2.00.00

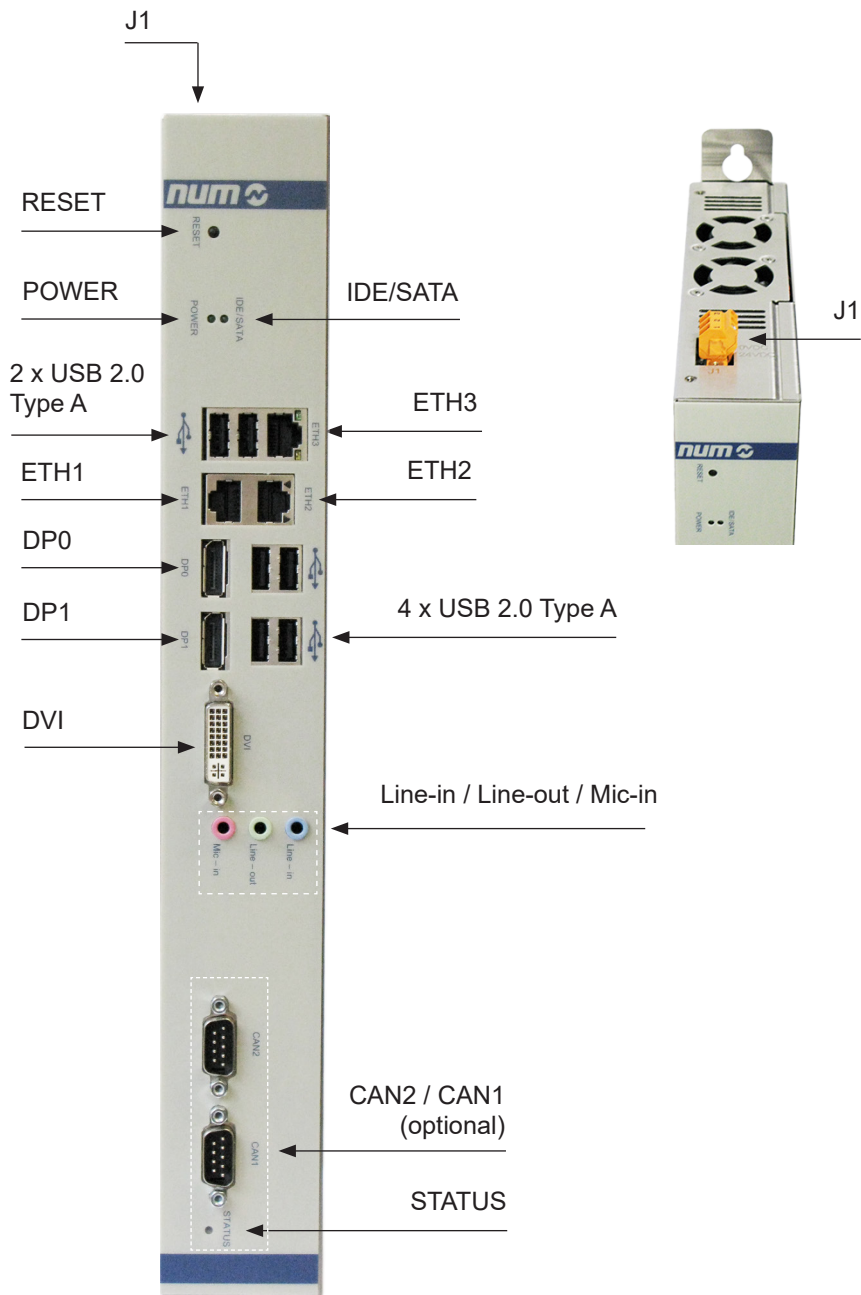
6.2.2 Characteristics

		FXPC002NN2HxR10 (P2 G2)	FXPC004NN2SxR20 (P2 G4) FXPC004NN2SxR40 (P2 G4)
Main PC features	CPU	Intel ® i5-2510E CPU @ 2.5GHz Dual Core	Intel ® Celeron™ CPU J1900 @ 2GHz Quad Core
	RAM	2GB	
	Mass storage	>250 GB Hard Disk	Industrial SSD 64 GB
	Operating system	Windows Embedded 8.1 Industry Pro	..R20 Windows 10 IoT Enterprise LTSC 2016 64 bits ..R40 Windows 10 IoT Enterprise LTSC 2021 64 bits ⁽¹⁾
Communication Interfaces	Ethernet (ETH)	3x Gigabit LAN / RTE	
	CAN	2 - CAN1 / CAN2 (as option)	
	USB	6 x USB 2.0 Type A	2 x USB 2.0 Type A and 4 x USB 3.0 Type A
	COM	2	
	Digital port interface	2	No
	DVI interface	DVI-I	DVI-D
Power supply	Rated voltage	24 VDC (+15%/-15%)	
	Power consumption	typ. 40W (4A)	typ. 21W max. 50W (2.1A)
Ambient conditions	Climatic conditions operation	0...45°C, 70% rel. air humidity, non-condensing	
	Climatic conditions storage	-20...60°C, 70% rel. air humidity, non-condensing	
	Environmental installation conditions	Requires protection to at least IP54	
	Climatic conditions, transport	-20...60°C, 10...90% rel. Air humidity, non-condensing	
Degree of protection		IP20	
Pollution degree		2	
Cooling type		With fan	
Weight		ca. 2.6kg	
Dimensions	W x H x D:	50 x 355 (410) x 206 mm	

⁽¹⁾ Windows 10 IoT Enterprise LTSC 2021 64 bits supports only Flexium Tools starting from 4.2.00.00

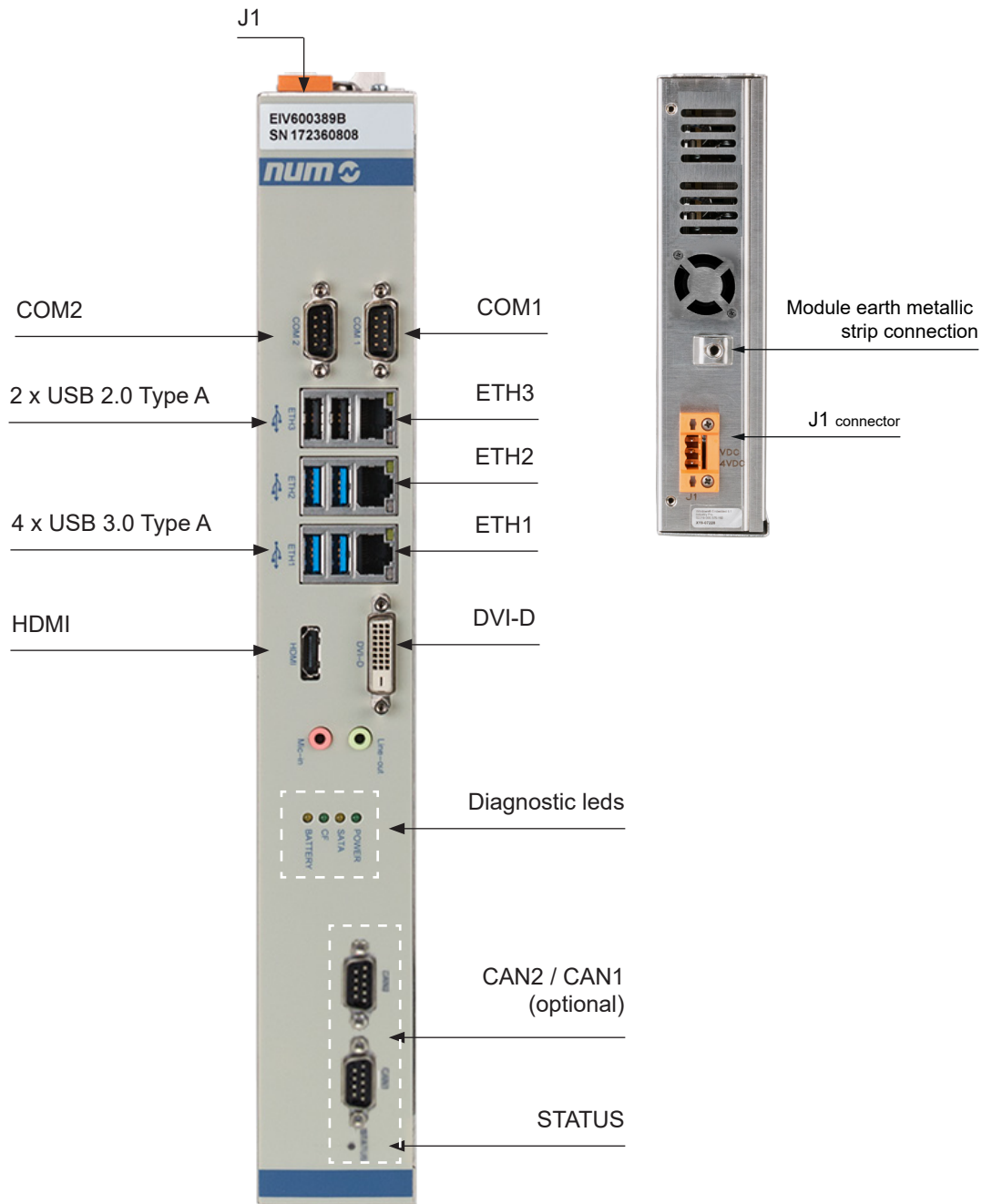
6.2.3 Module description

6.2.3.1 Box PC P2 G2



Connector	Type	Description
J1	3 screws pins F	Power supply connections
ETH1	RJ45 (8P/8C)	FlexiumPro RTK Ethernet connections
ETH2	RJ45 (8P/8C)	PLC EtherCAT
ETH3	RJ45 (8P/8C)	Company LAN
USB	6 x USB 2.0 Type A,	General user purpose. (Mouse and all USB devices)
DVI	Standard DVI-I	Digital Video interface connection
CAN1 / CAN2	Sub D 9 pins M	Dual CAN + NVRAM interface (optional)
STATUS		
Line-in		
Line-out		
Mic-in		
POWER		
IDE/SATA		
RESET		

6.2.3.2 Box PC P2 G4

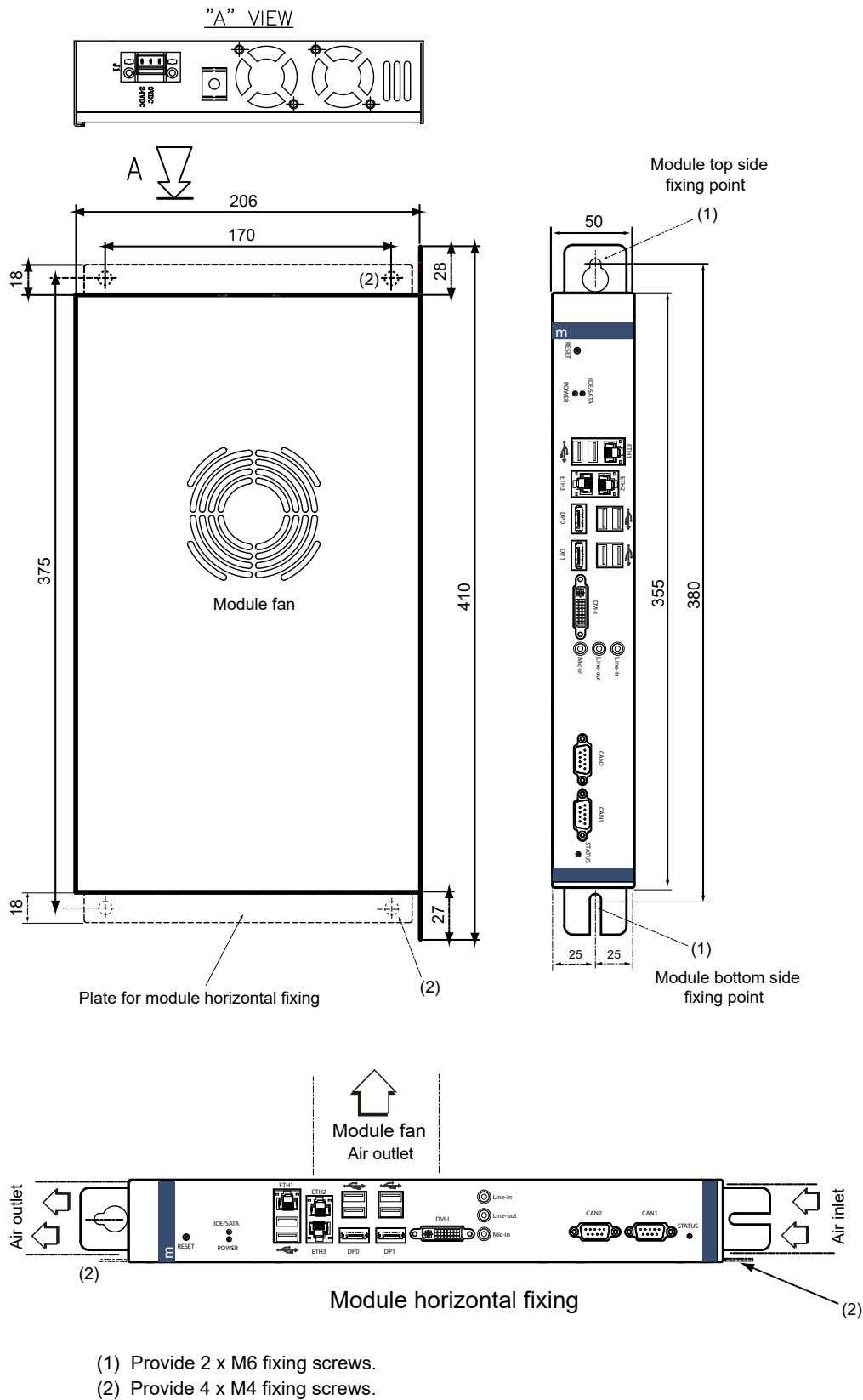


Connector	Type	Description
J1	3 screws pins F	Power supply connections
ETH1	RJ45 (8P/8C)	FlexiumPro RTK Ethernet connections
ETH2	RJ45 (8P/8C)	PLC EtherCAT
ETH3	RJ45 (8P/8C)	Company LAN
COM1 / COM2	RS232 Sub D 9 pins M	Serial interface. General user purpose
USB	4 x USB 3.0 Type A, 2 x USB 2.0 Type A	General user purpose. (Mouse and all USB devices)
HDMI		High-Definition Multimedia Interface
DVI	Standard DVI-D	Digital Video interface connection
CAN1 / CAN2	Sub D 9 pins M	Dual CAN + NVRAM interface (optional)

6.2.4 Overall dimensions

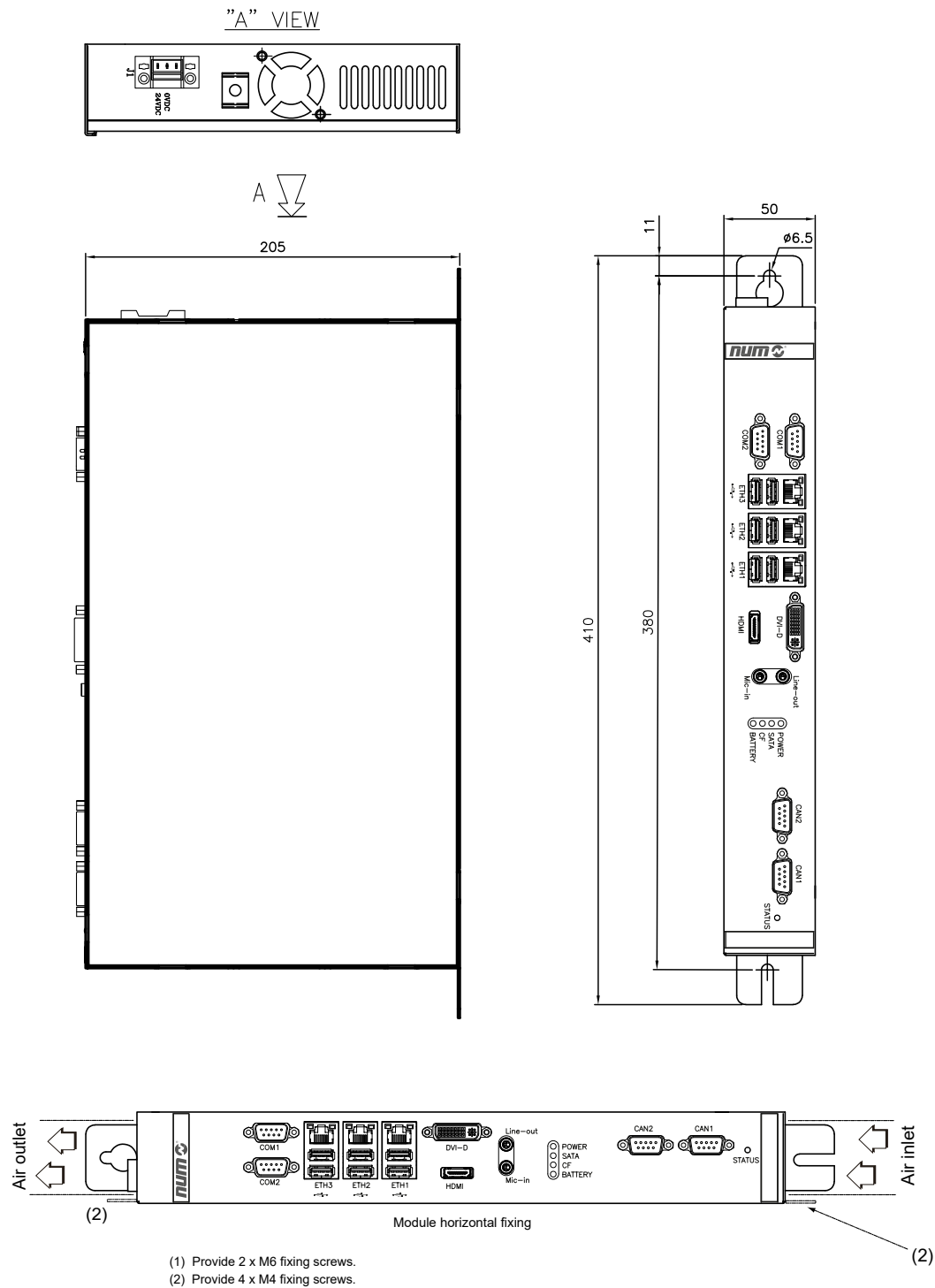
6.2.4.1 Box PC P2 G2

Dimensions in mm



6.2.4.2 Box PC P2 G4

Dimensions in mm



6.2.5 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 delay of 20 seconds.

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

6.2.6 Diagnostics

Leds	Meanings
POWER	Power supply OK
HDD	HDD/SSD access
BATTERY	Change battery
GPO_PR4	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 chapter 6.1.7.4)
Ethernet connection missing	- Incorrect Ethernet cable fitted (crossover/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.

6.2.7 Maintenance and Repair

6.2.7.1 Repairs

Repairs to Box PC devices must only be carried out by the manufacturer.

(Manufacturer address see list of NUM agencies on chapter [1.5](#))

6.2.7.2 Transport

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

The climatic conditions must be observed (see chapter [6.2.2](#))

6.2.7.3 Storage

The device must only be stored in the climatic conditions described in chapter [6.2.2](#).

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.

6.2.7.4 Battery replacement

The battery is used to back up the clock circuit. The battery should be changed every 5 years in order to prevent any date/time loss. The battery code is EIV6003972.

There is a danger of explosion if battery is incorrectly replaced.



Only trained personnel are allowed to replace the battery.
Replace only with the same type recommended by NUM.
Caution: Opening the right cover or breaking the warranty labels voids the warranty.



Pay attention to ESD safety protections when changing the battery.

6.2.8 Box PC connections

Please refer to chapter 9.4

6.2.9 Mounting instructions

The Box PC is installed from the front, for example, into a control cabinet. They are fixed at the rear with screw (see chapter 6.2.4)

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

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 Box PC.

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

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7 Portable Handwheel HBA-X

The portable handwheel HBA-X for FlexiumPro 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 FlexiumPro 6, 8 and 68 via cable and IO modules.
- Buttons and switches: via I/Os
- Handwheel: To be connected to Encoder counter using a PLC module
- Enabling Device (Dead-man’s) button: into the safety circuit.



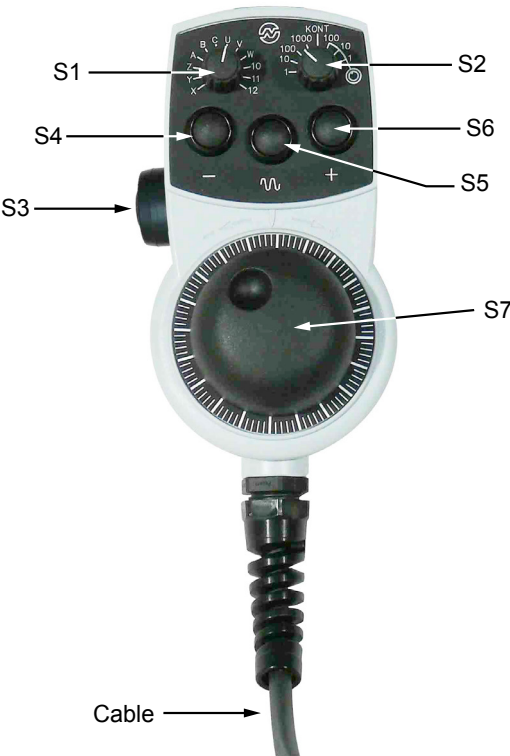
7.1 Ordering code

Portable Handwheel version	Ordering Codes
Portable Handwheel HBA-Xc (5V)	FXHE181121
Portable Handwheel HBA-Xd (24V)	FXHE181122

7.2 Characteristics

Handwheel	• Pulse per revolution : 100 • Supply voltage : 5VDC $\pm$ 5% for HBA-Xc / 24VDC $\pm$ 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. (2) Standard cable length is: - 5m for straight cable - 2m for spiral cable Maximum distance from PLC counter module is 40m.	

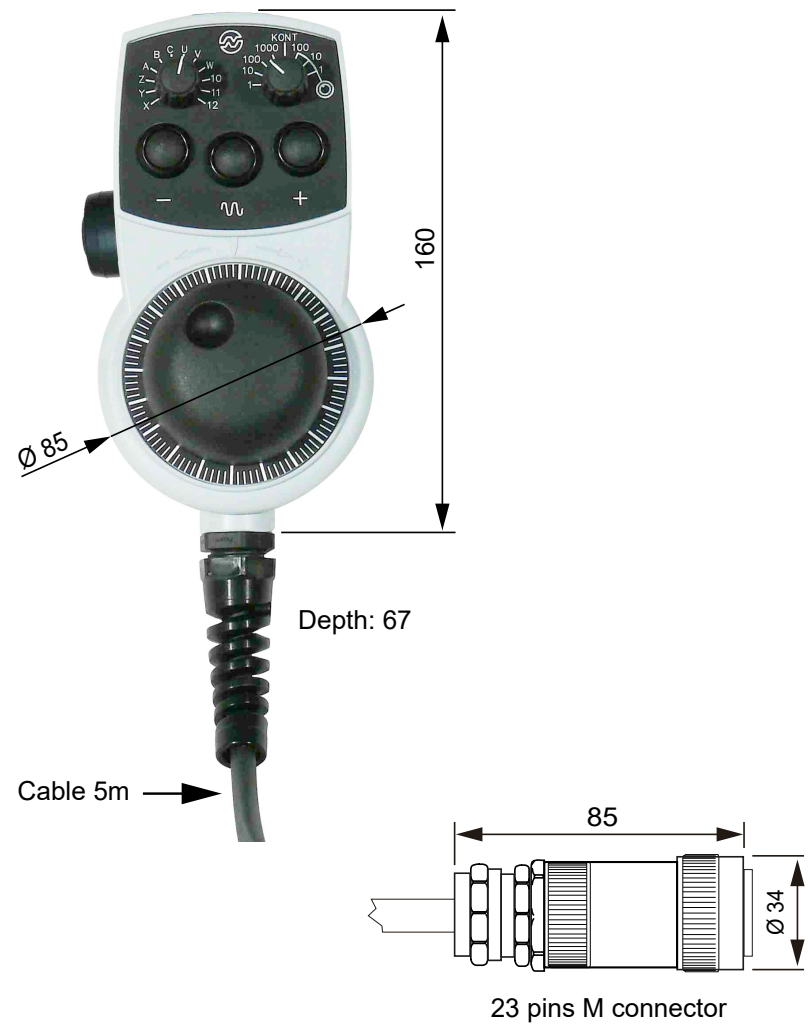
7.3 Portable Handwheel description



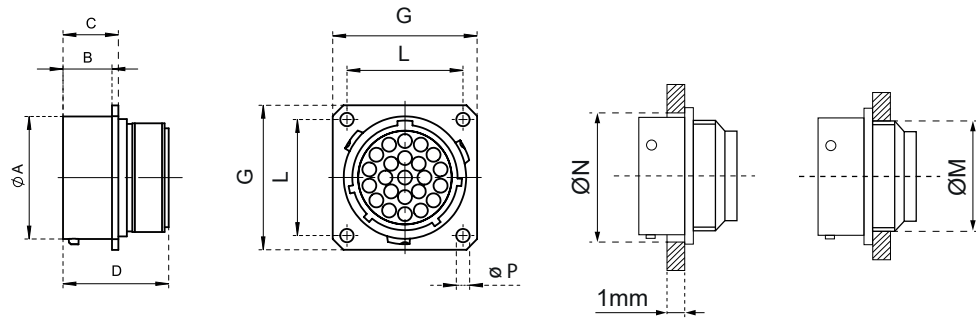
Ref	Description
S1	Selector switch (12 positions axis selection)
S2	Selector switch (8 position incremental selection and rate multiplier)
S3	3 stage acknowledge button Enabling Device (dead-man's button)
S4	Push button (negative)
S5	Push button (fast)
S6	Push button (positive)
S7	Handwheel
Cable	HBA-X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

7.4 Overall Dimensions

Dimensions in mm



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 Portable handwheel connections

Please refer to chapter [9.12](#) for more detailed information upon the Portable Handwheel HBA-X connections.

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8 nPad Mobile Operator Panel

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 maintaining the same functionality. In this case please refer to nPad Wireless Mobile Operator terminal Operating manual M00053EN-00.

8.1 Ordering code

nPad modules	Ordering Codes
nPad wired handheld terminal, cable 10m	NPAD052RE1SH0D1
nPad wireless handheld terminal KIT	NPAD052RW1SH000
nPad terminal connector	NPADA001

	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

Note:

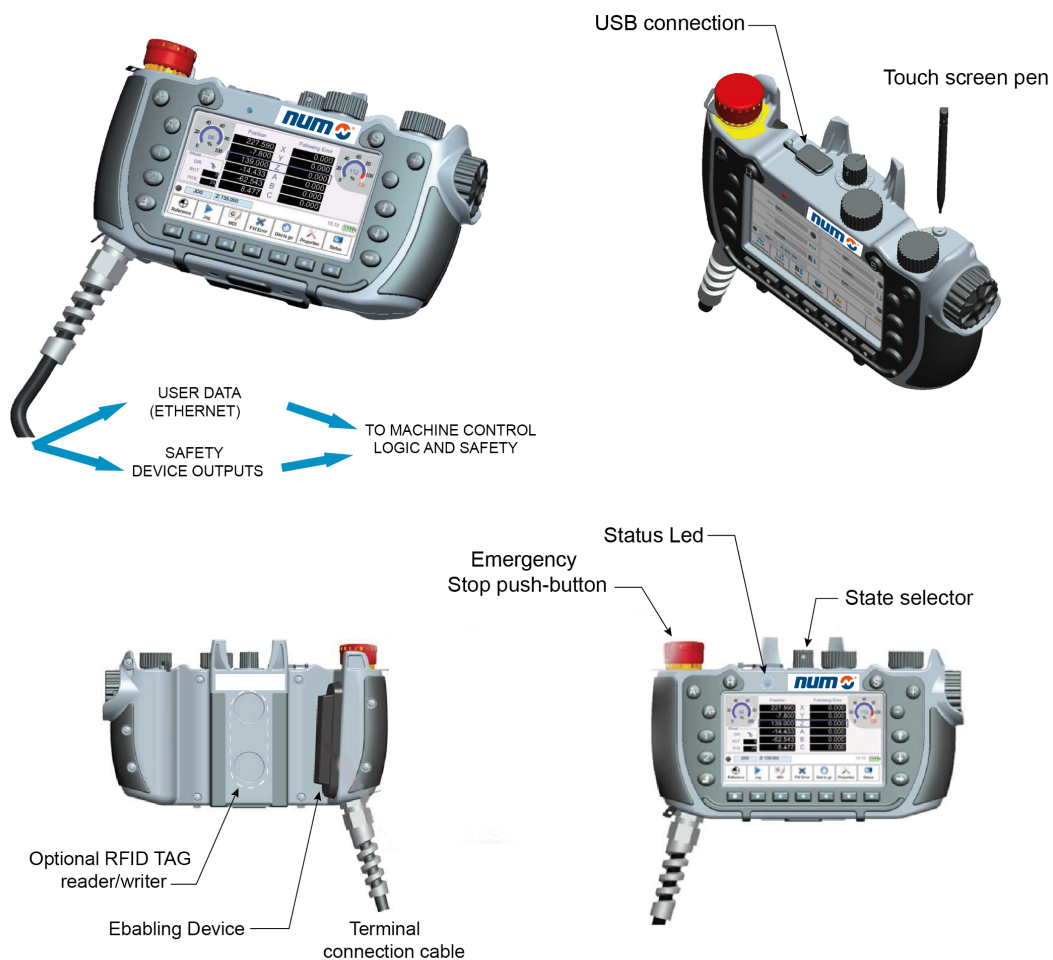
The nPad terminal connection NPADA001 is not present in package. Therefore must be ordered separately.

8.2 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/m² • 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 handwheel)
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 withstand to aggressive fluids such as: Denatured Ethyl 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.

8.3 nPad description



8.4 Safety-related devices

8.4.1 Performance Level and Safety Integrity Level summary

Emergency Stop button

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	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	Mean Time To Failure (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	Mean Time To Dangerous Failure (years)	Note 2	Note 2	347

Note 1

The safety devices (Emergency Stop Push-button, Enabling 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 MTTF_d, PFH_d, 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

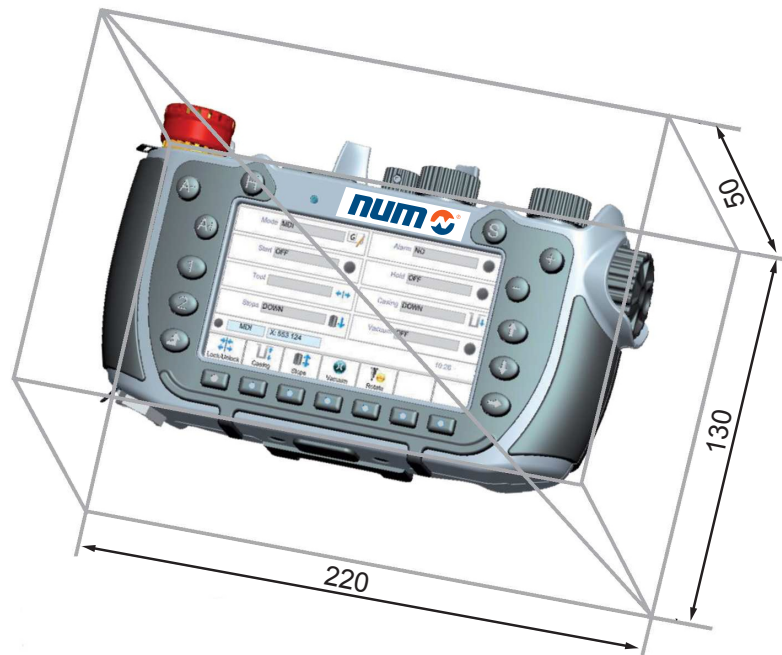
The E-Stop button and Enabling Device are compliant with IEC60947-5-1.

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 "b_{10d}", MTTF_d and PFH_d for the E-Stop button and Enabling Device does not have any relevance (from a mathematical point of view: "b_{10d}", MTTF_d = infinite and PFH_d = 0).

8.5 Overall dimensions

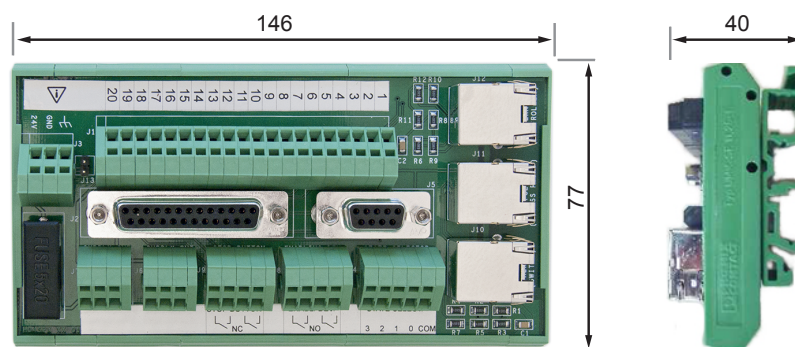
Dimensions in mm

nPad Mobile Operator Panel



Approx. weight: 0.73kg (without cable)

nPad terminal connection NPADA001



Approx. weight: 0.2kg

8.6 Mounting instruction

8.6.1 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.

8.6.2 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 sheath.
- Always operate the touch screen with the proper touch-pen. Never use sharp objects that could damage the touch screen.

8.6.3 Supply voltage



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

8.6.4 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 chapter [8.4.1](#)).



- 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 [8.4.1](#)

8.6.5 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 [9.13](#)

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 [8.4.1](#)).



- 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 chapter [8.4.1](#)

8.6.6 Enabling Device positions

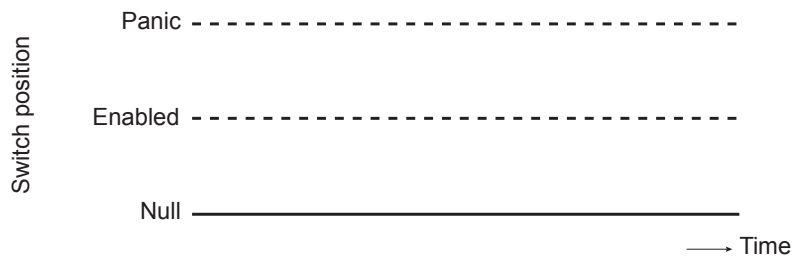
The Enabling Device can have three different positions:

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.

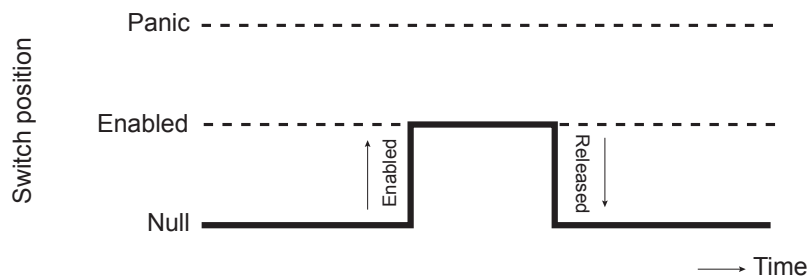
Zero position

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



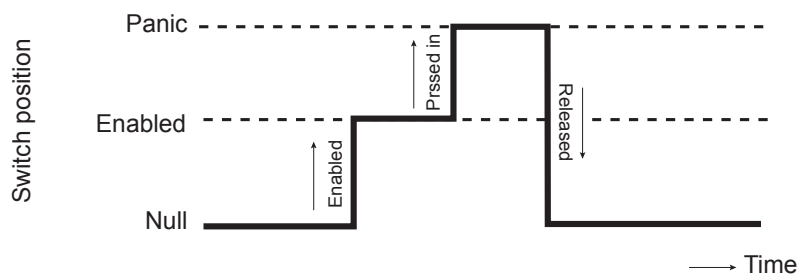
Enable position

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.

8.6.7 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 please refer to chapter [8.4.1](#)

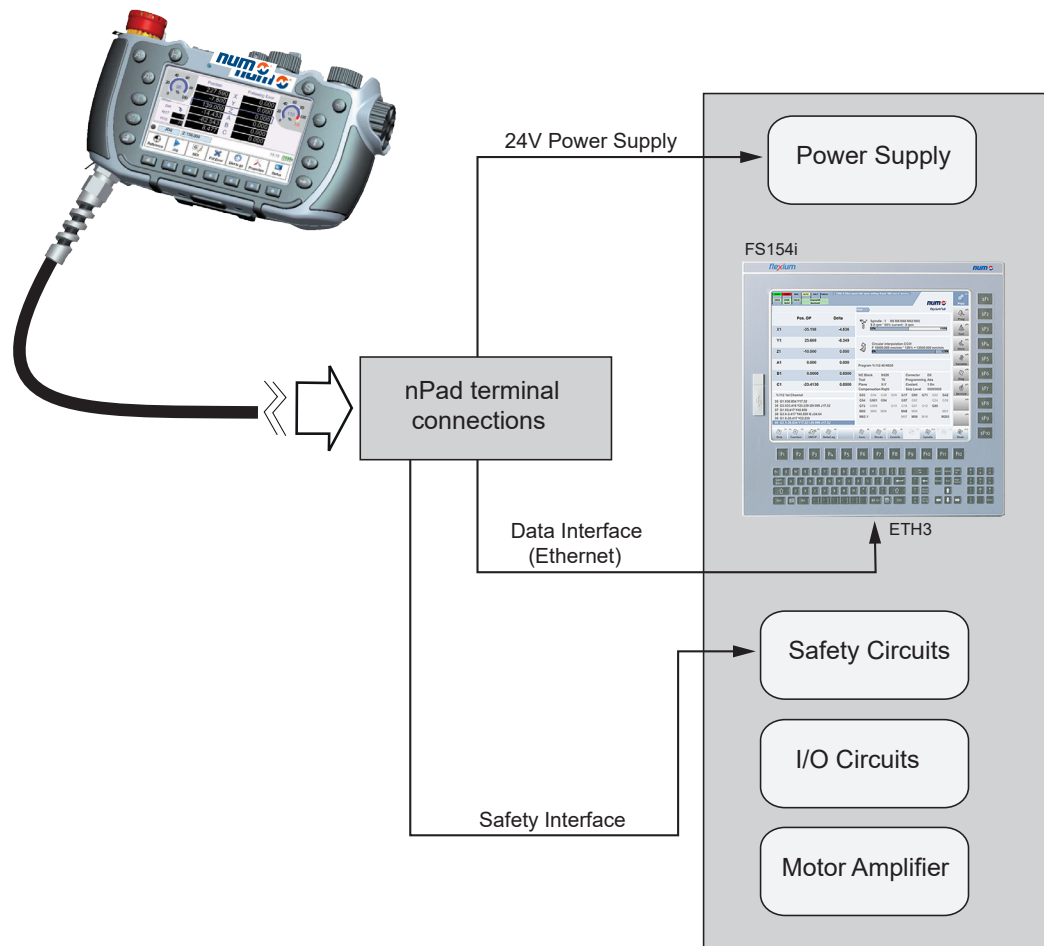


- User is responsible for interfacing the State selector to the machine control logic and implementing the state selecting function according to the safety level determined in a previous risk analysis.
- The State Selector function should be only related to the selection of the various working modes 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 [8.4.1](#)

8.7 nPad connections

8.7.1 Overview

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



8.7.2 Connections

Please refer to chapter [9.13](#) Flexium connections for more detailed information upon the nPad Mobile Operator Panel connections.

8.8 nPad configuration and commissioning

Please refer to Flexium Commissioning manual M00010 or M00044.

8.9 Maintenance and Repair

8.9.1 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 [1.5](#))

8.9.2 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.

8.10 nPad Wireless Mobile Operator Panel

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

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Summary

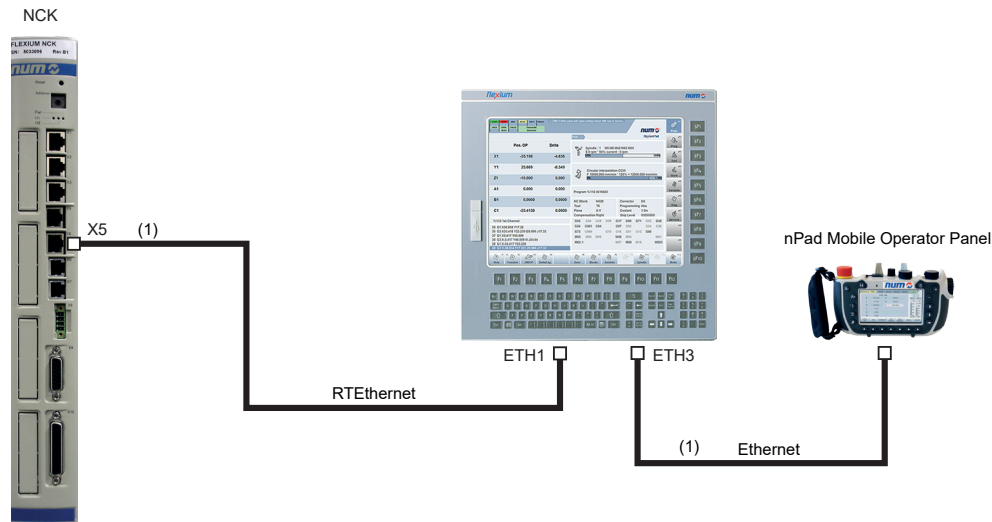
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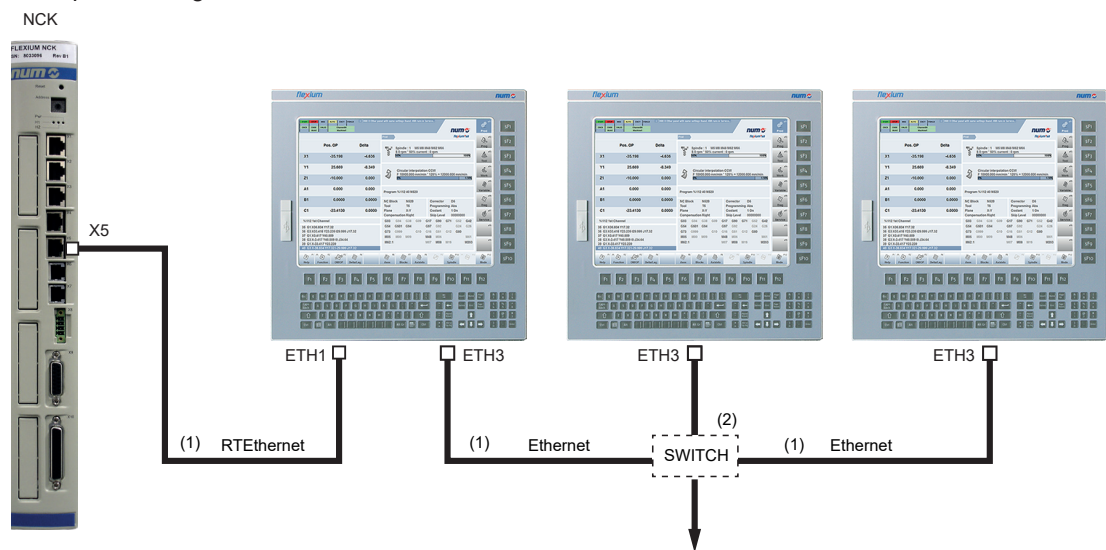
9 Flexium connections

9.1 NCK overview connections

9.1.1 NCK to Operator panels overview connections



Multipanel configuration



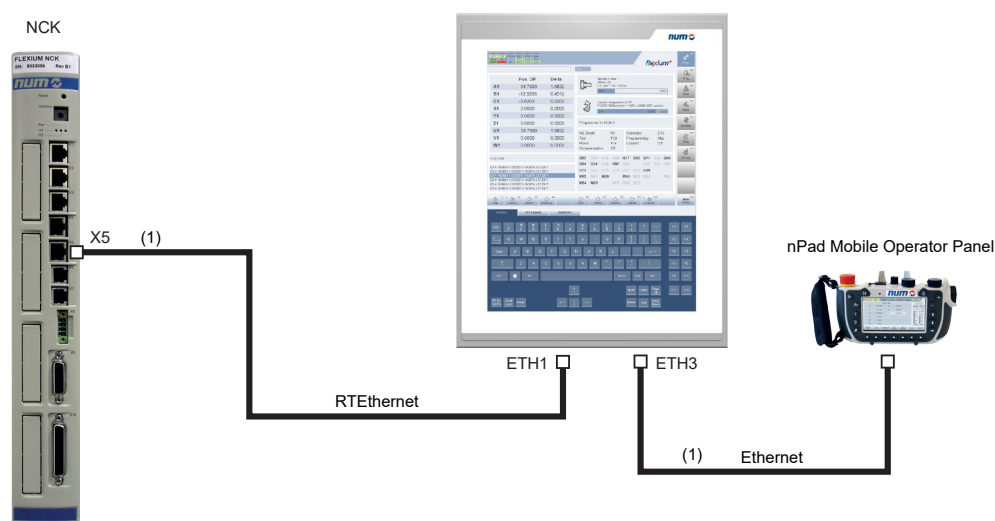
1	Ethernet cable connections AEOFU018Mxxxx (RJ45, Cat.5E) For the cable length please refer to the chapter 11.1
2	Switch module supplied by the customer (100/10 Mbit sec).
ETH1 ETH3	Please refer to chapter 9.4.5
X5	Please refer to chapter 3.5



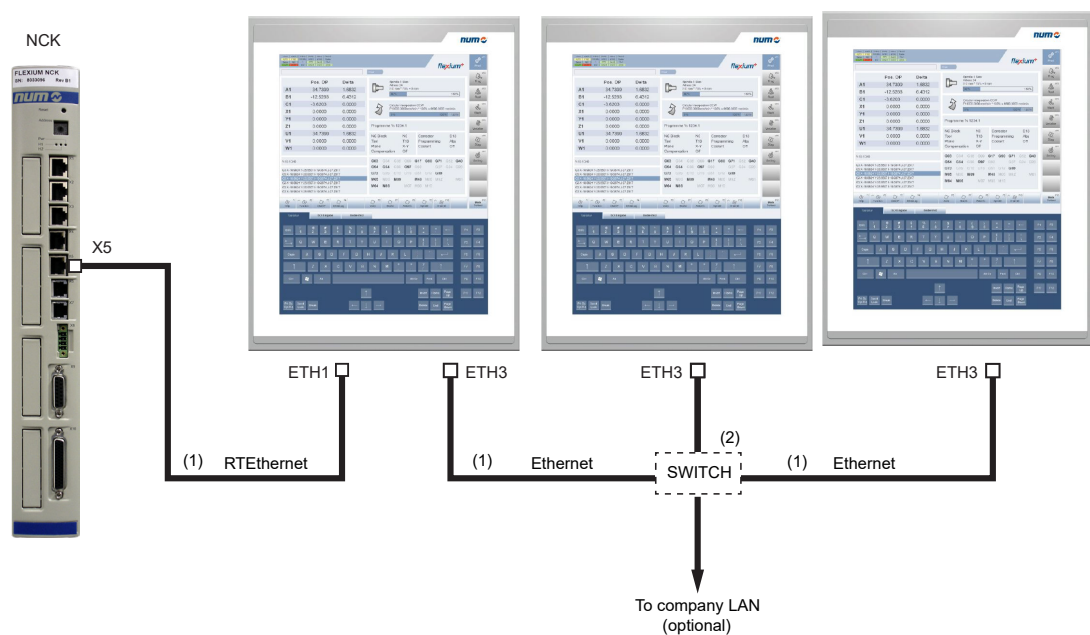
If only two panels are used a Switch module is not necessary. The connection between the two panels can be made with a crossed Ethernet cable.

The Switch module is not supplied by NUM.

9.1.2 NCK to portrait oriented operator's panels overview connections



Multipanel configuration

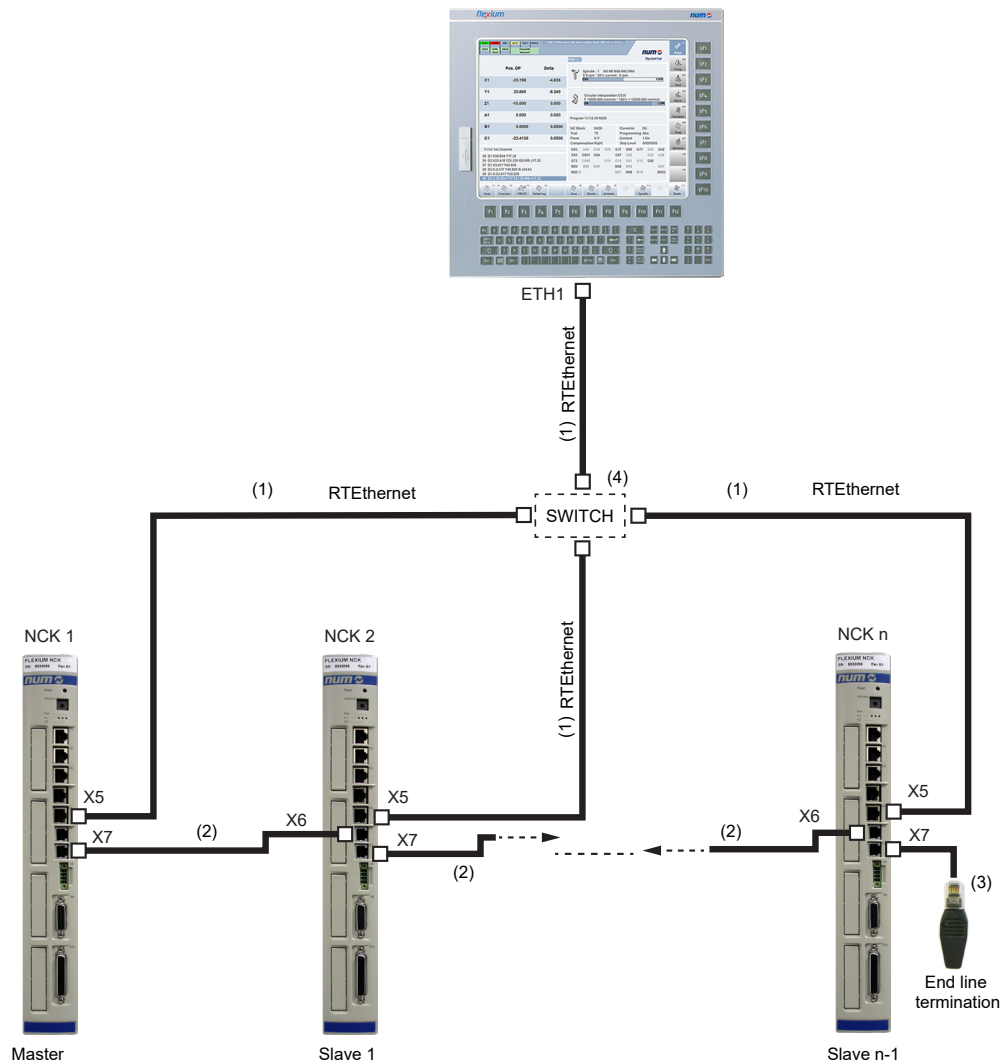


1	Ethernet cable connections AEOFU018Mxxxx (RJ45, Cat.5E) For the cable length please refer to the chapter 11.1
2	Switch module is not supplied by NUM (100/10 Mbit sec).
ETH1, ETH3	Please refer to chapter 9.4.5
X5	Please refer to chapter 3.5



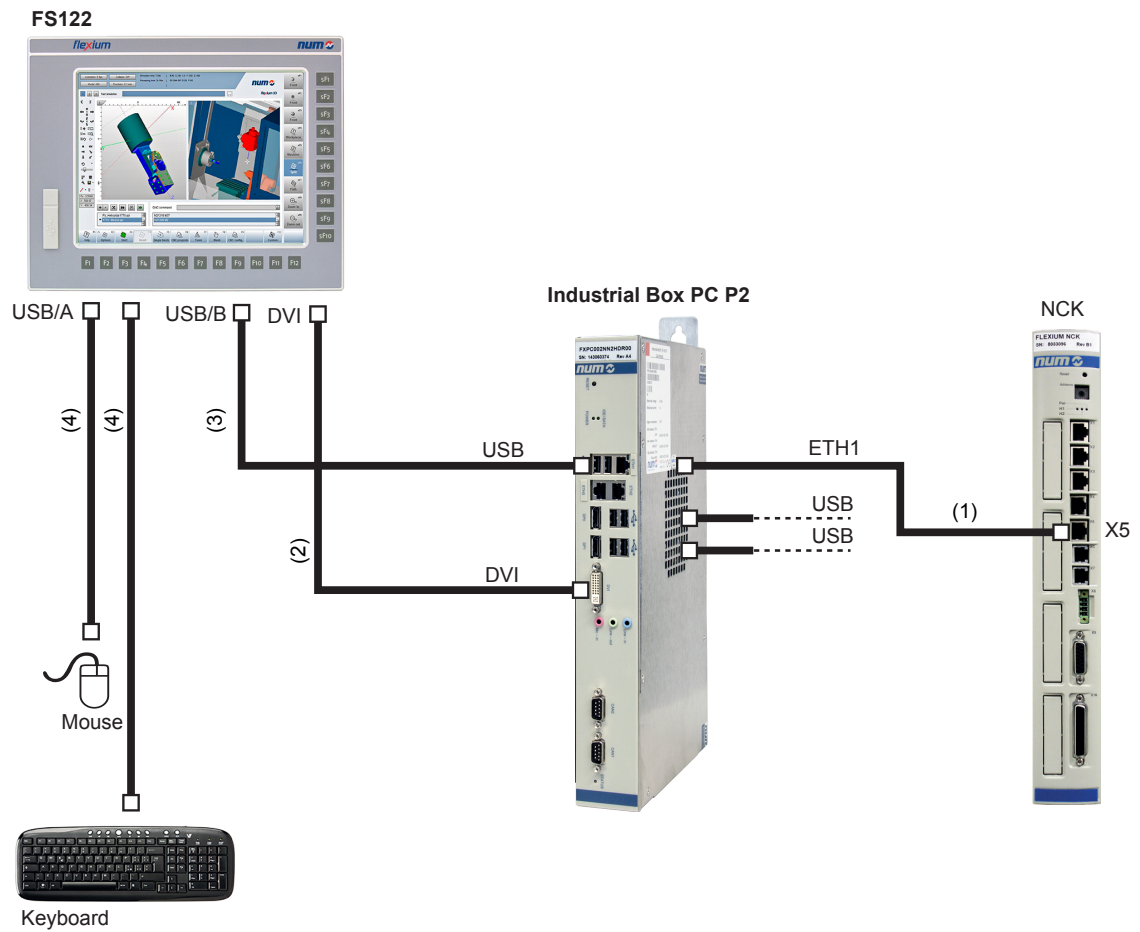
If only two FS194i panels are used a Switch module is not necessary. The connection between the two FS194i can be made with a crossed Ethernet cable. The Switch module is not supplied by NUM.

9.1.3 Multi-NCK configuration overview connections



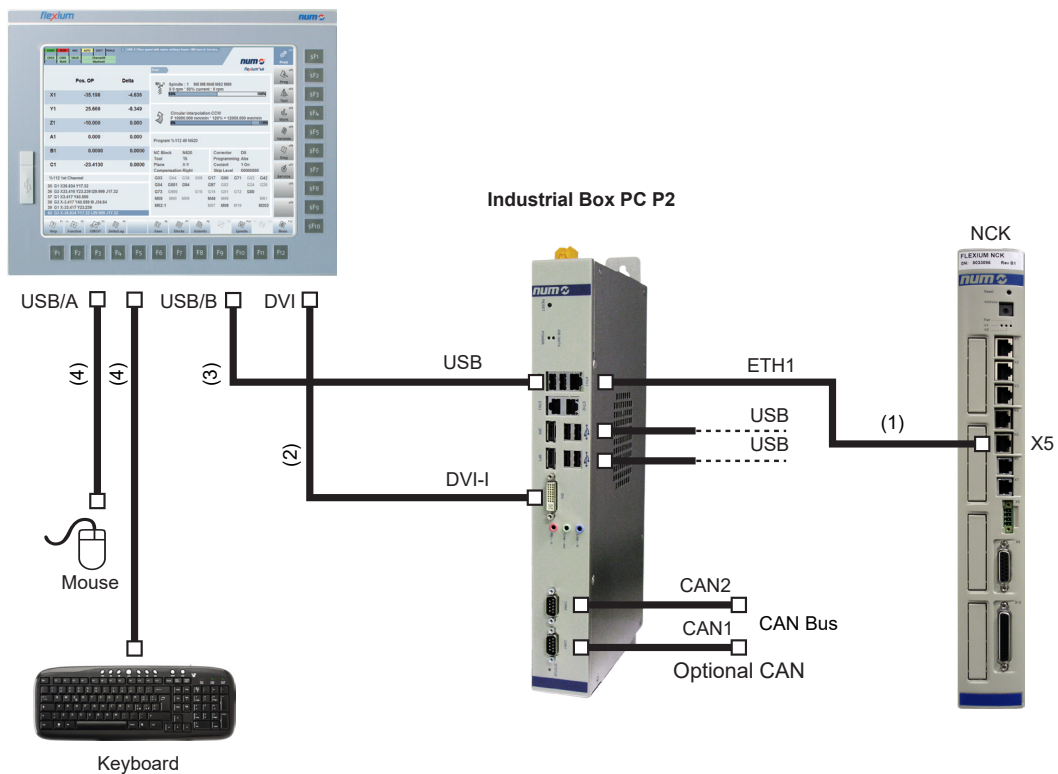
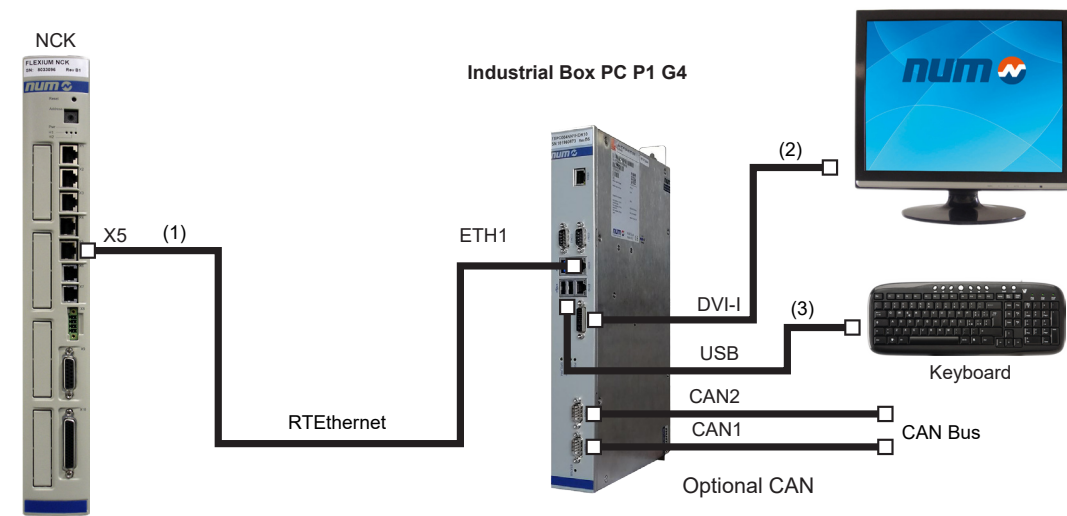
1	Ethernet cable connections AEOFU018Mxxxx (RJ45, Cat.5E) For the cable length please refer to the chapter 11.1
2	Clock/Synchro cable connections FXHC08153x for Multi-NCK configuration. For the cable length please refer to chapter 11.1
3	End of line termination FXHC081540.
4	Switch module is not supplied by NUM (100/10 Mbit sec).
ETH1	Please refer to chapter 9.4.5
X5, X7	Please refer to chapter 3.5

9.1.4 NCK to passive panels overview connections



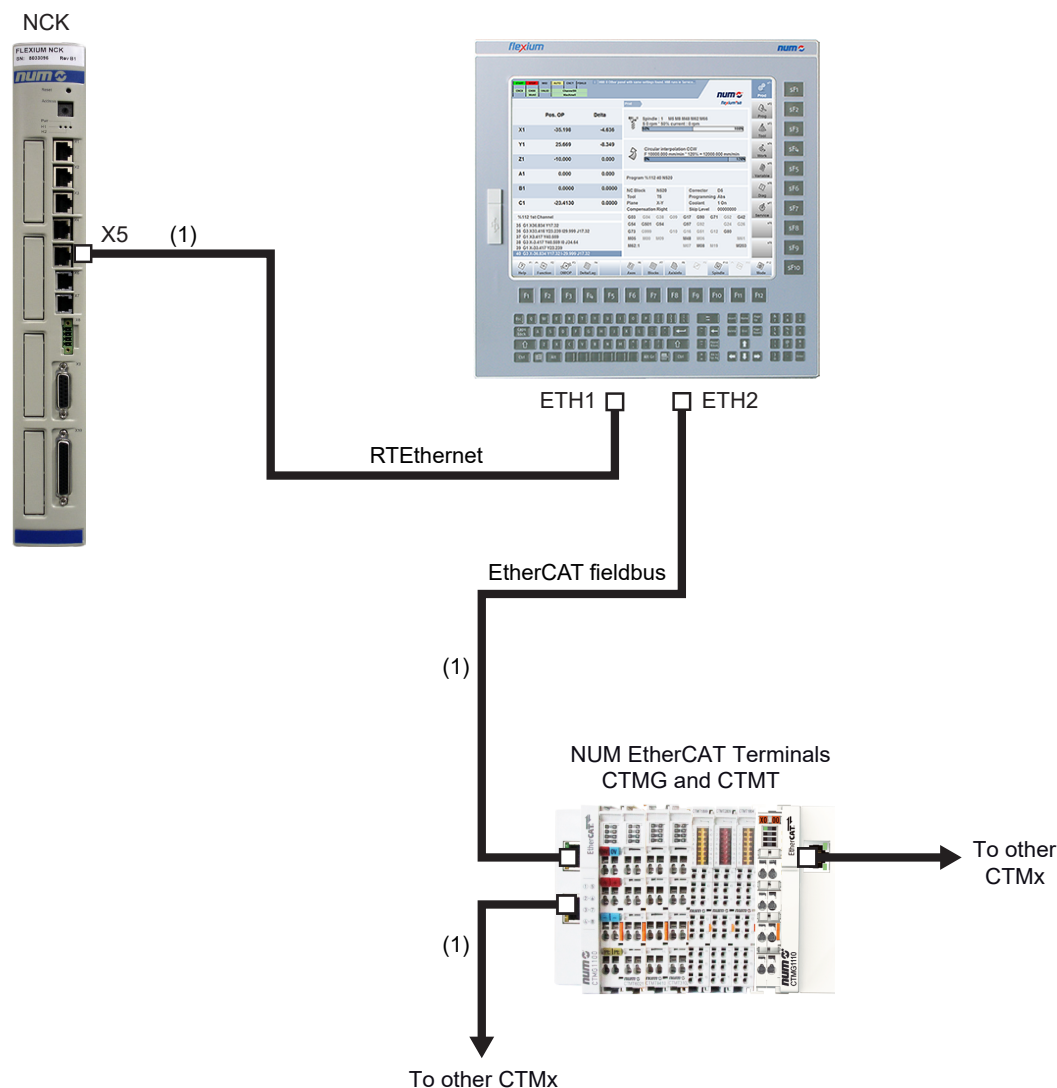
1	Ethernet cable connections AEOFU018Mxxxx (RJ45, Cat.5E) For the cable length please refer to the chapter 11.1
2	Cable supplied by the customer. Please refer to chapter 9.4.4 "DVI interface connections"
3	Cable supplied by the customer. Please refer to chapter 9.4.6 "USB connections"
4	Cable supplied by the customer. Please refer to chapter 9.4.6 "USB connections"

9.1.5 NCK to Industrial Box PC and passive panel overview connections



1	Ethernet cable connections AEOFU018Mxxxx (RJ45, Cat.5E) For the cable length please refer to the chapter 11.1
2	Cable supplied by the customer. Please refer to chapter 9.4.4 "DVI-I interface connections"
3	Cable supplied by the customer. Please refer to chapter 9.4.6 "USB connections"
4	Cable supplied by the customer. Please refer to chapter 9.4.68 "USB connections"

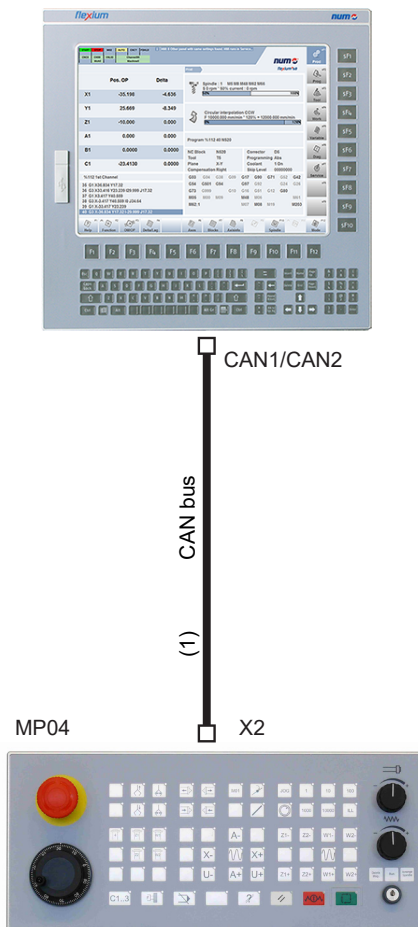
9.1.6 NCK to operator's panel with EtherCAT terminals overview connections



1	Ethernet cable connections AEOFRU018Mxxxx (RJ45, Cat.5E) For the cable length please refer to the chapter 11.1
ETH1 ETH2	Please refer to chapter 9.4.5
X5	Please refer to chapter 3.5
For more detailed information on the NUM EtherCAT Terminals please refer to manual M00032.	

9.2 PLC to Machine panel connections

9.2.1 PLC to MP04 Machine panel overview connections



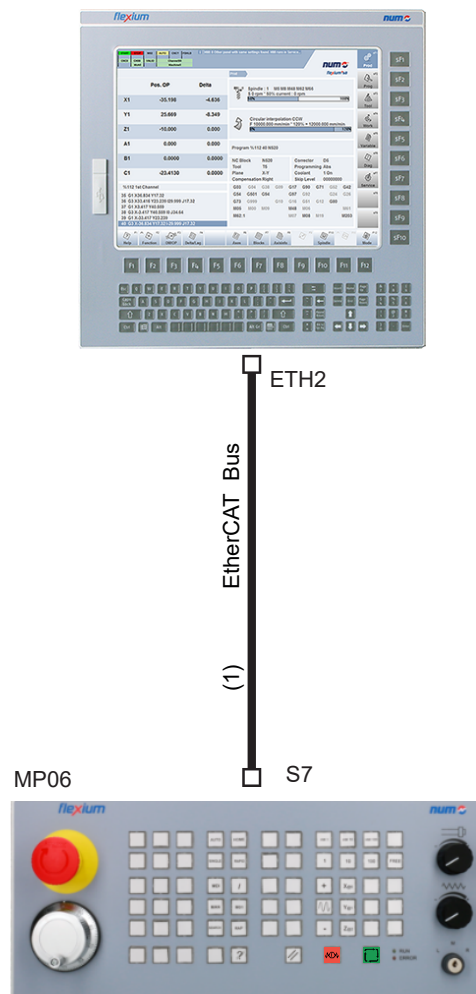
1	CANbus cable connections FXHC181060. For the cable length please refer to the chapter 11.2.1
X2	Please refer to chapter 9.7.5
CAN1 CAN2	Please refer to chapter 9.4.8

9.2.2 PLC to MP05 Machine panel 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 MP06 Machine panel overview connections



MP06 could be replaced by MP06_M, MP07, MP08

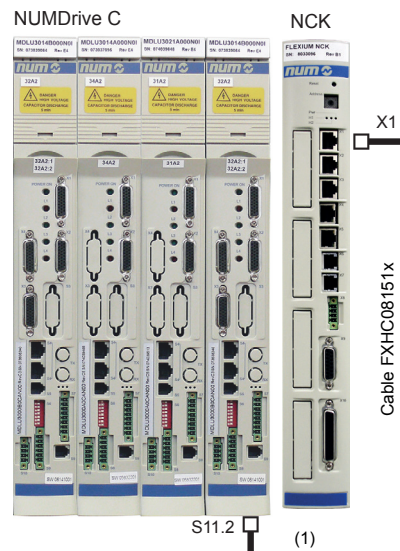
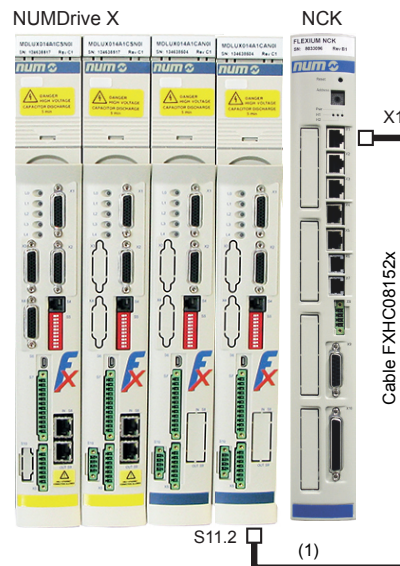
1	Ethernet cable connections AEOFU018Mxxxx (RJ45, Cat.5E) For the cable length please refer to the chapter 11.1
ETH2	Please refer to chapter 9.4.5

9.3 Flexium NCK connections

9.3.1 X1 X2 X3 Flexium NCK to NUMDrive X or NUMDrive C connections

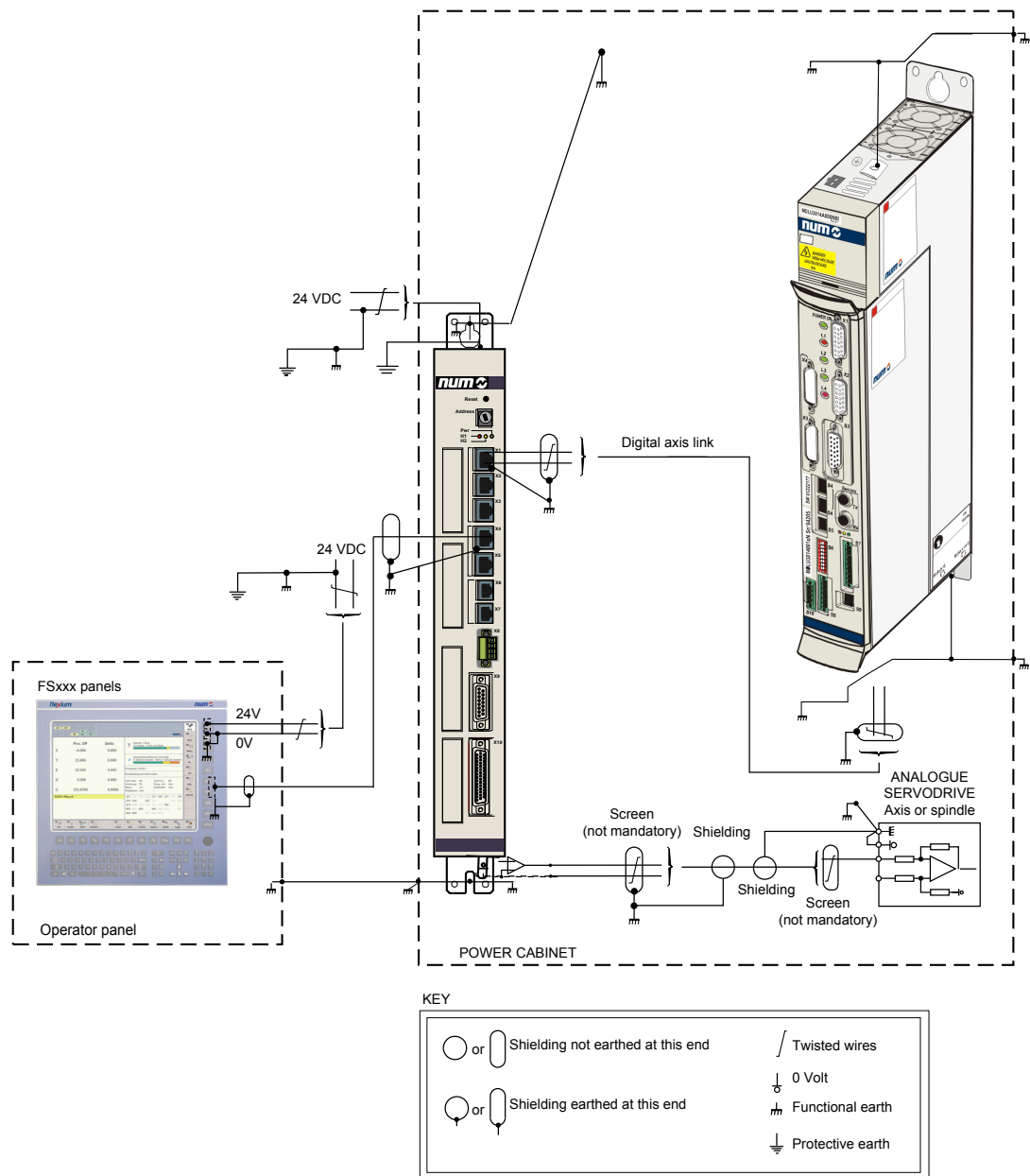
The NCK to NUMDrive X or NUMDrive C connections is possible using the connectors X1, X2, X3 on the front of the NCK panel. The Flexium NCK can control up to 32 digital axes. It is recommended to distribute the axes between these three connectors.

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 11.1 for the cable length.
S11.2	Module / Module interconnections. Please refer to the NUMDrive X Installation manual M00030 or NUMDrive C Installation manual AMOMAN012.

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



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.

9.3.3 X13 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.

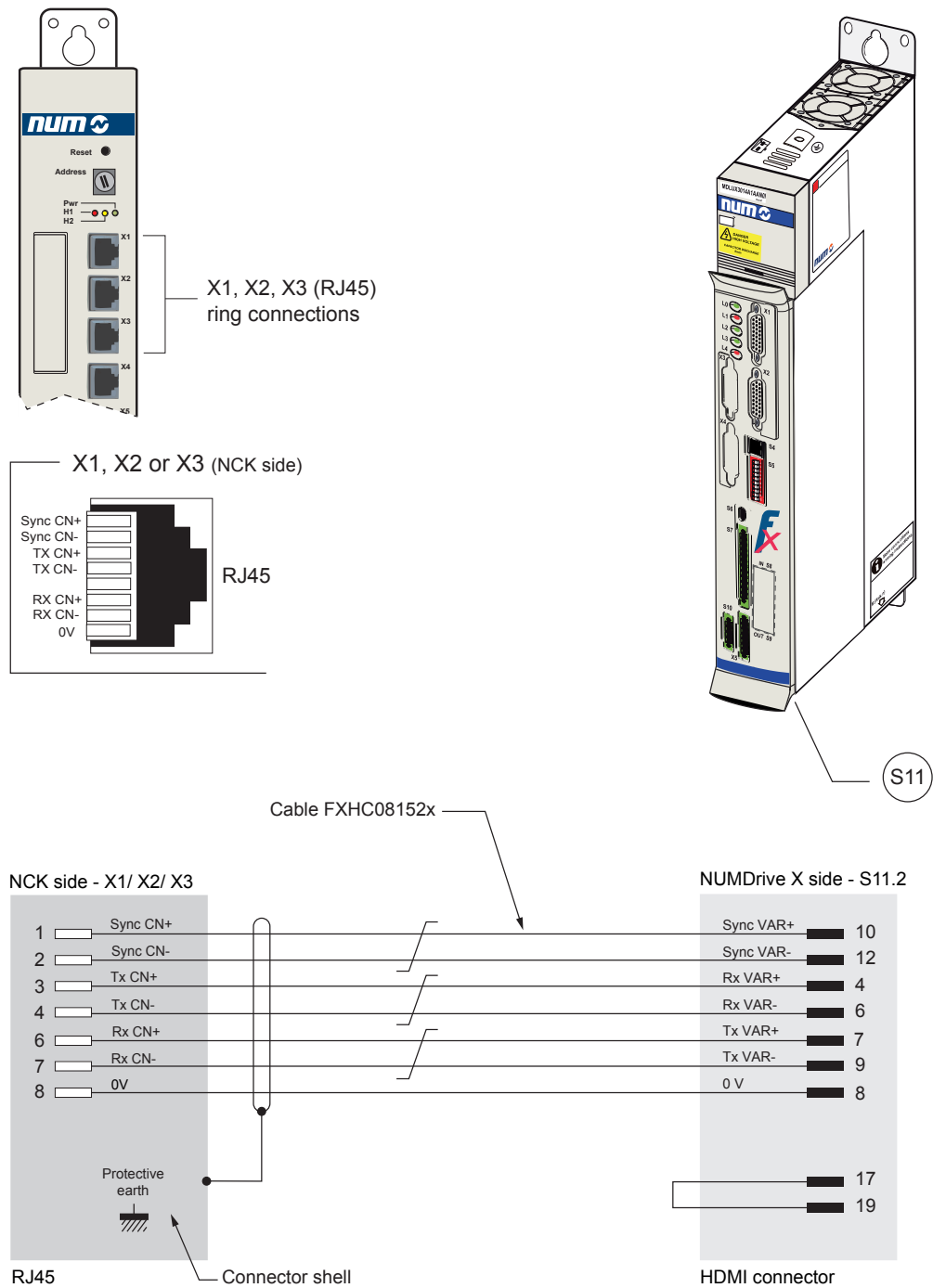
Power Supply Voltage	Pin Number	Description	Maximum Power
24VDC nominal (+20% -15%)	1 or 3 2 or 4	+24Vdc 0Vdc	48W

Power supply connector (X13)



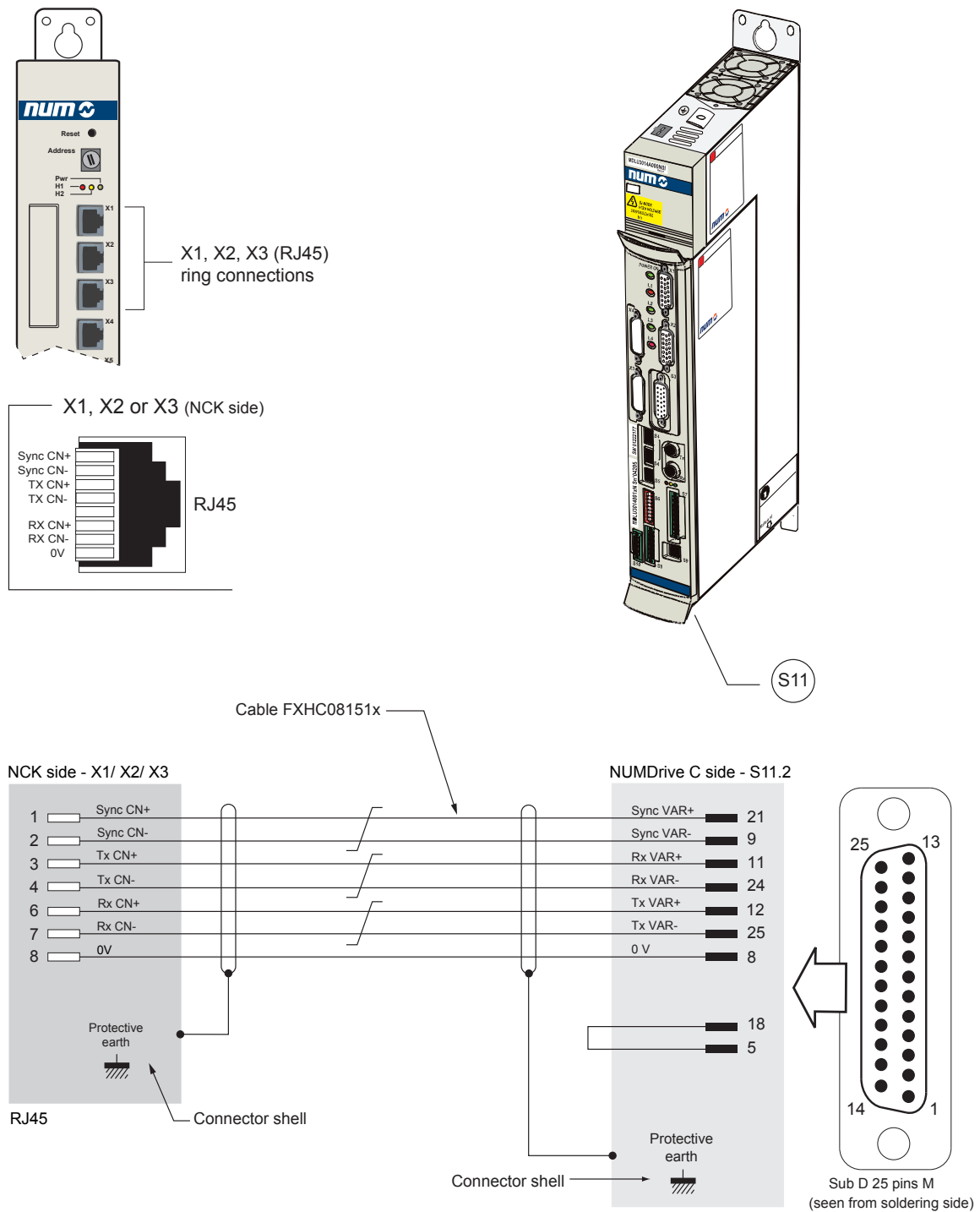
It is absolutely necessary to insert a fast-blow 2A fuse in the NCK powering line.

9.3.4 X1 X2 X3 NCK to NUMDrive X connections



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

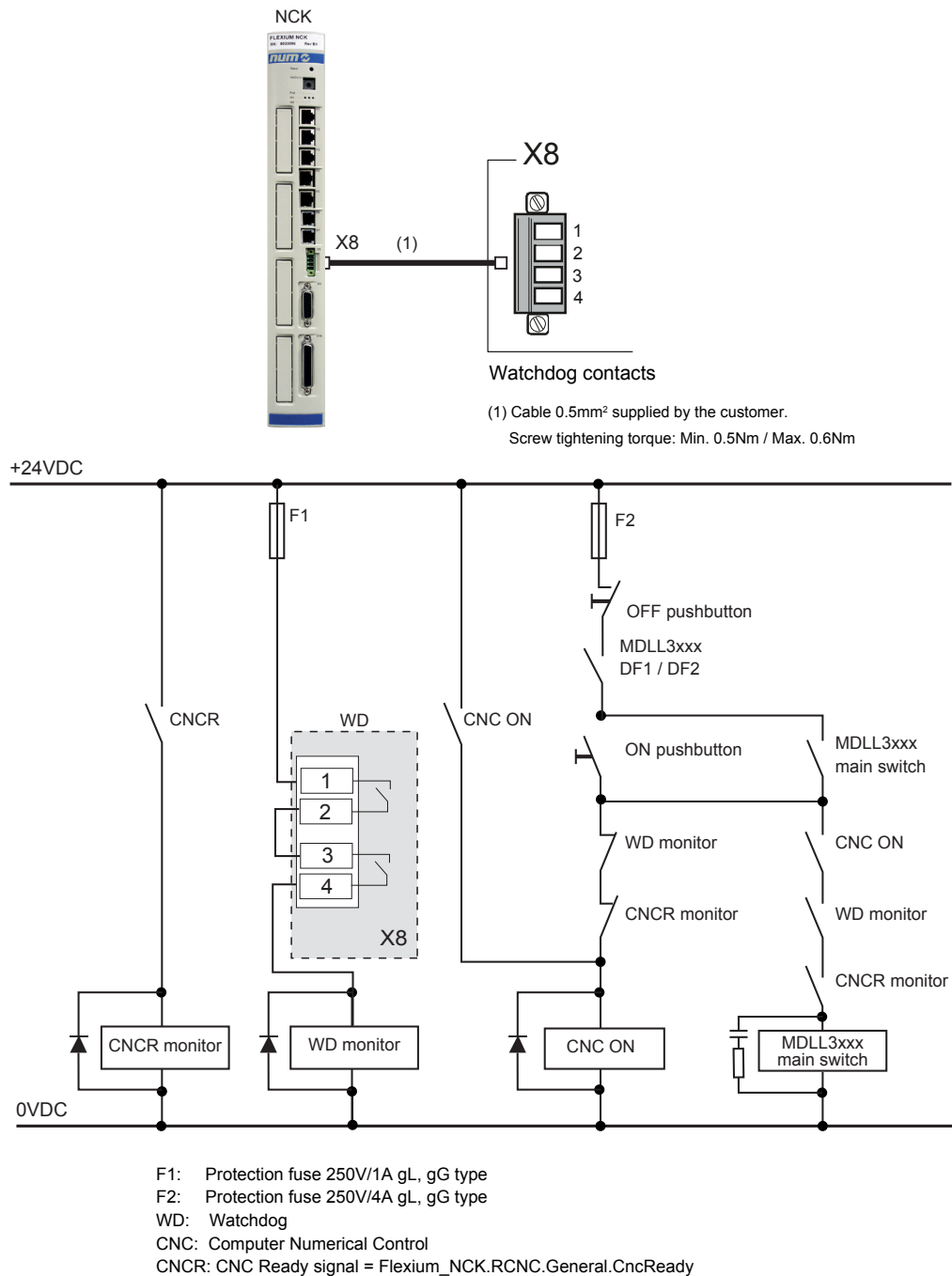
9.3.5 X1 X2 X3 NCK to NUMDrive C connections



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

9.3.6

Recommended safety daisy chain



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.

Pins 2 and 3 of the X8 connector must be connected externally.

9.3.6.1 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.

1

2

3

4

5

6

7

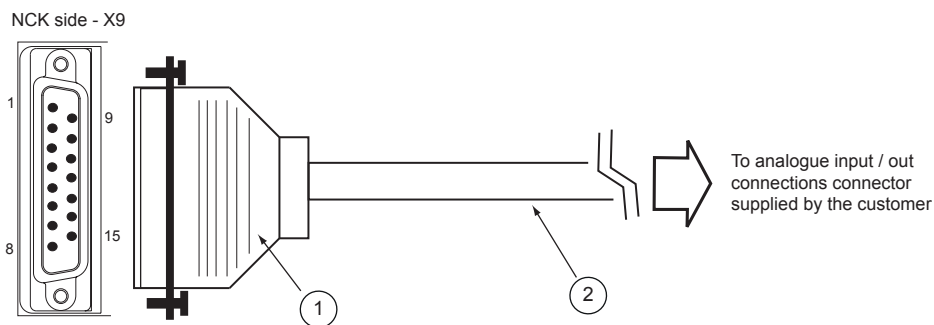
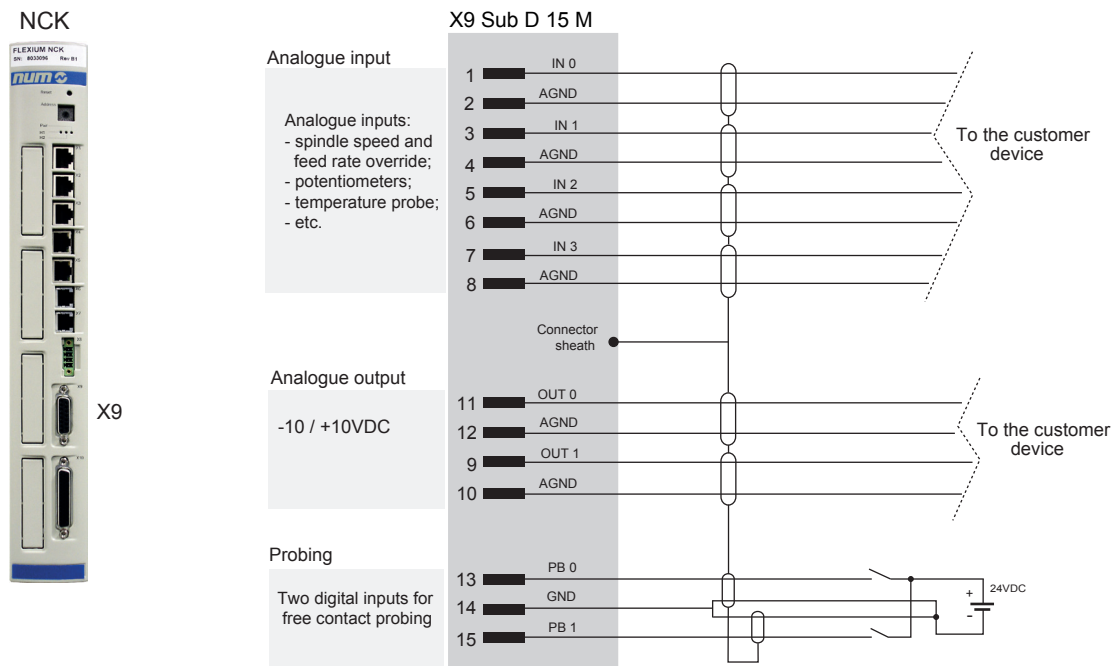
8

9

10

11

9.3.7 X9 NCK Analogue inputs/outputs and digital probing connections



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 mm²) - Cable for probing : 2 wires shielded cable (2 x 0.22 mm²) The cable are supplied by the customer.

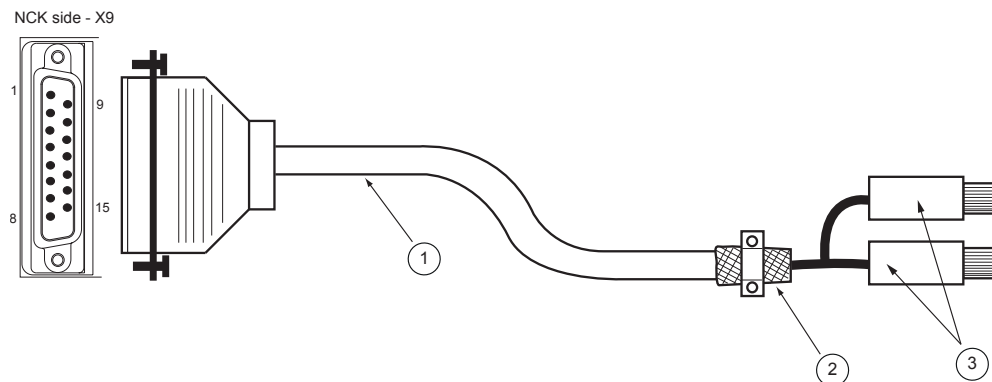
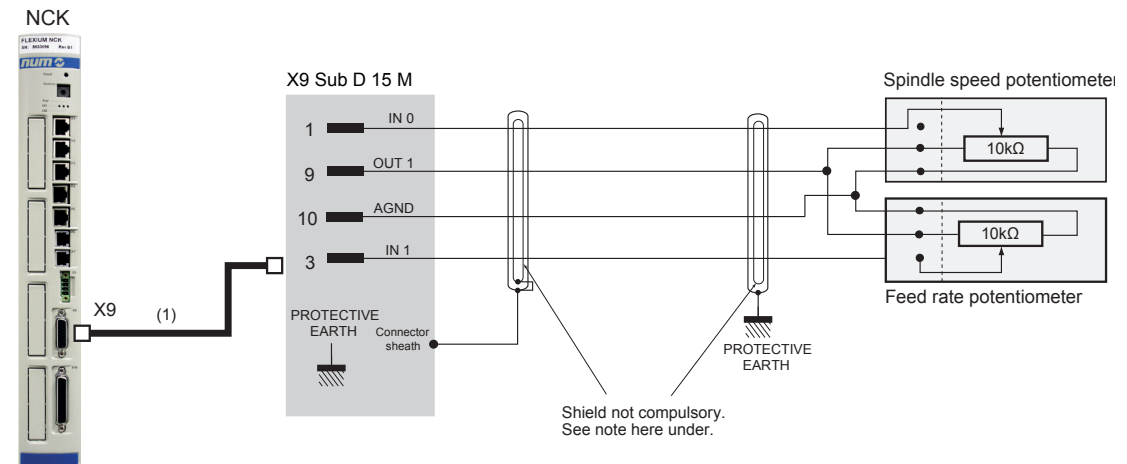


For correct interference suppression in the system, the cable shielding must be earthed in accordance with Cabinet layout and EMC Guide manual M00027.

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



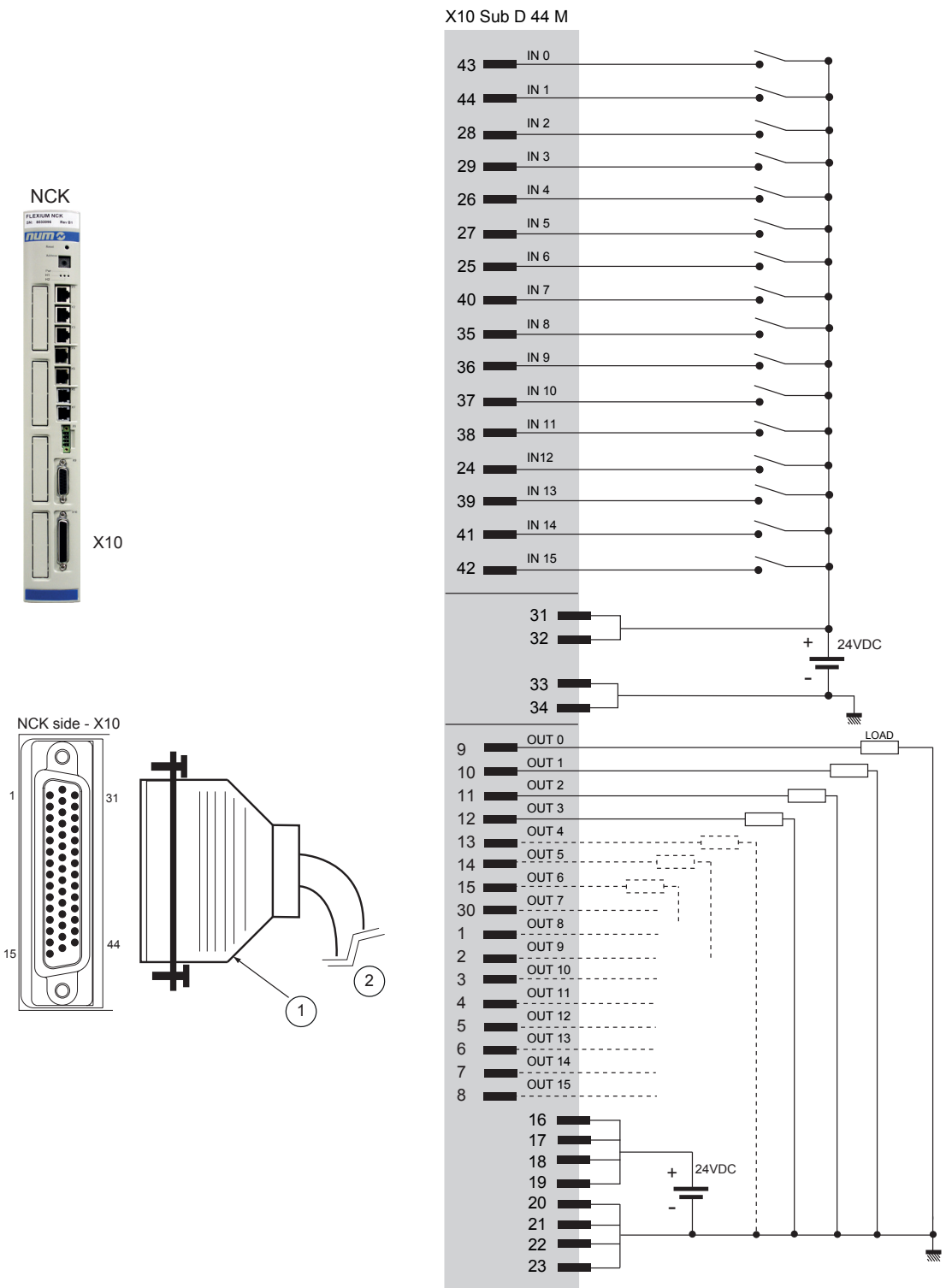
1	4 wires cable with double shielding (4 x 0.22 mm ²) supplied by the customer.
2	Bonding braid connected to machine frame
3	Spindle speed and feed rate override potentiometers



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.

9.3.8 X10 NCK Digital inputs/outputs connections

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.

9.3.9 X11 X12 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

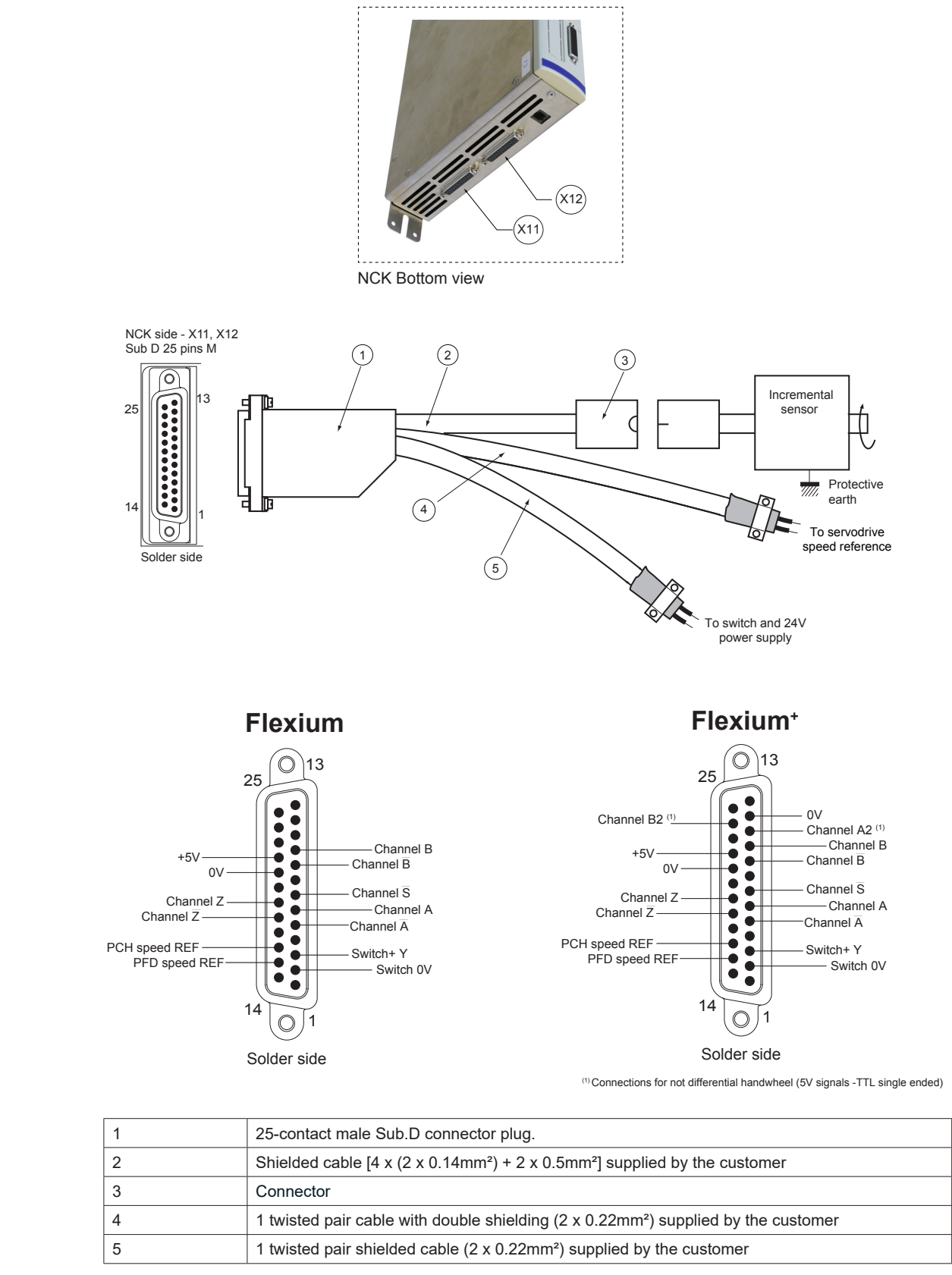
- The installation of a sensor is subject to several requirements:
- minimum sensor power supply voltage (see next pages),
- maximum frequency above which the signals provided by the sensor are no longer measured with accuracy by the system (incremental channels, (see next pages),
- maximum available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

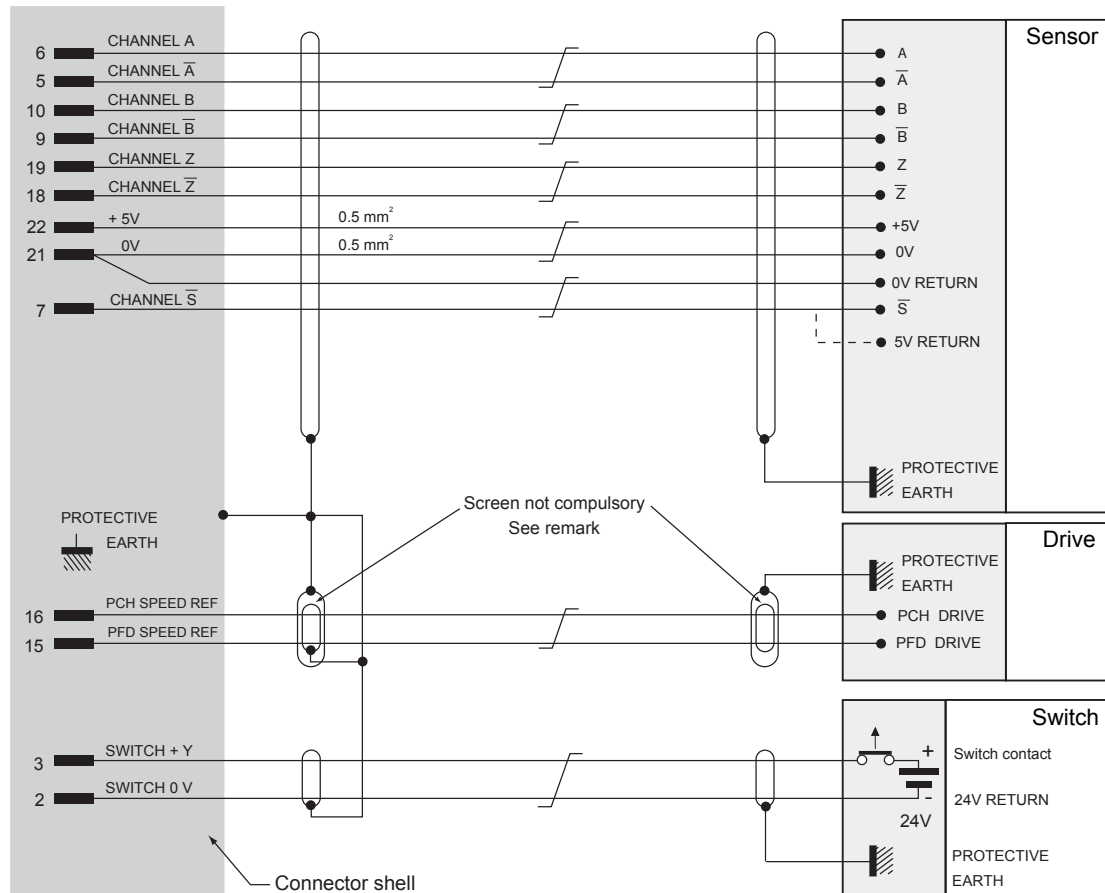
9.3.9.1 Incremental axis encoder connections cable for Flexium and Flexium+



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

9.3.9.2 Incremental TTL encoder connections

NCK side - X11/ X12
Sub D 25 pins M



The wiring of channels A, $\bar{A}$, B, $\bar{B}$, Z, $\bar{Z}$ 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).



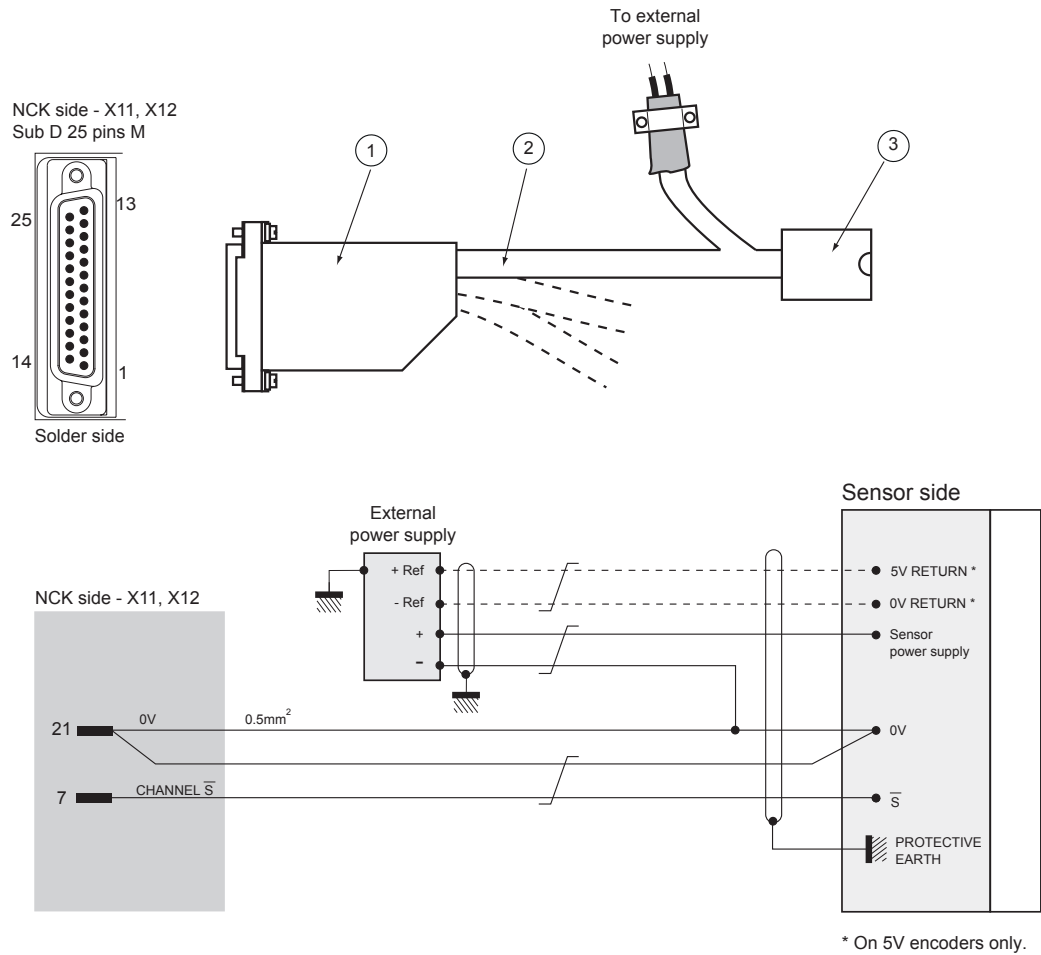
If the interference level is low, the cable with double shielding (servodrive cable) can be replaced by a cable with single shielding connected at both ends to the functional earth.

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.

9.3.9.3 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 0.14mm ²) + 2 x 0.5mm ²] supplied by the customer
3	Connector



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

9.3.9.4 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:

$$V_s = 4.95 - (0.45 + 36.8 \times 10^{-3} \times L/S) \times I$$

where:

- V_s (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 (V_s) 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	1.65mm ²	4.753V
30m	2.624mm ²	4.758V

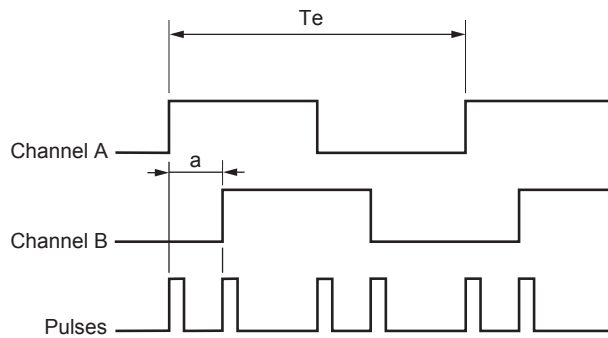
Above 30m, the wire size required would be above 2.624mm². In this case, use an external power supply whose characteristics provide a minimum voltage of 4.75V across the sensor while preserving a reasonable wire size.

Sensors requiring a power supply voltage above 5VDC

The use of an external power supply is mandatory.

9.3.9.5 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 $f_e = 1 / T_e$.

Extreme values allowing correct signal detection by the system:

- Maximum frequency: $f_{e \text{ max}} = 1.8\text{MHz}$
- Minimum time shift between two fronts: $a_{\text{min}} = 138\text{ns}$.

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

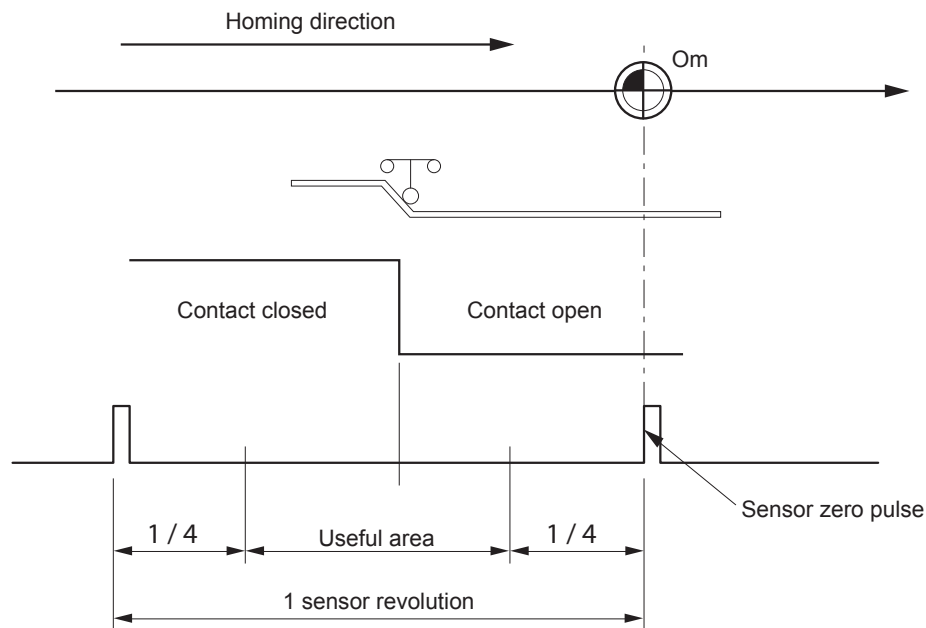
9.3.9.6 Maximum available current per axis

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.

9.3.9.7 Setting the Origin Switch

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

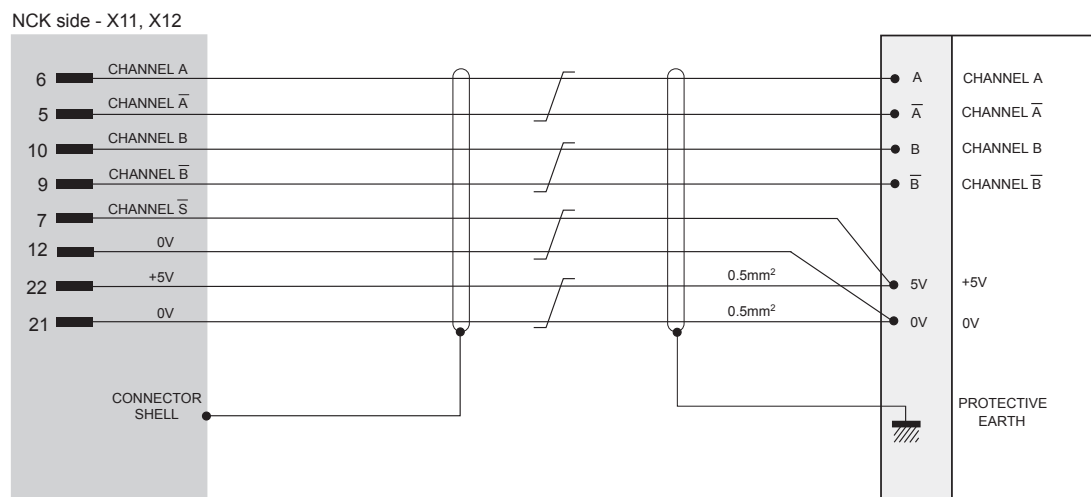
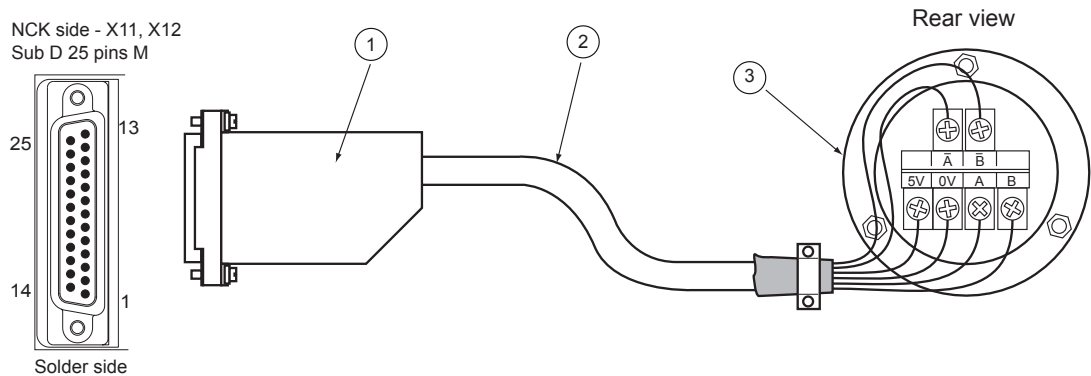


The switch must be set so that the contact opens between one-quarter and three-quarters of the interval separating two zero pulses. This is to avoid coincidence between switch operation and the zero pulse, which could cause a random shift by a distance equal to that separating two zero pulses.

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.

9.3.10 Handwheels connections

9.3.10.1 Handwheels with Differential outputs connections for Flexium

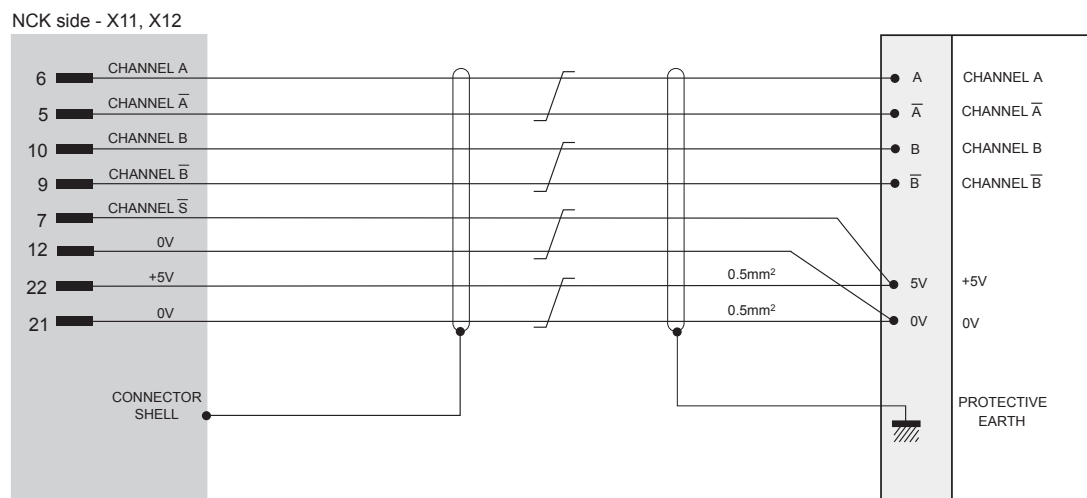
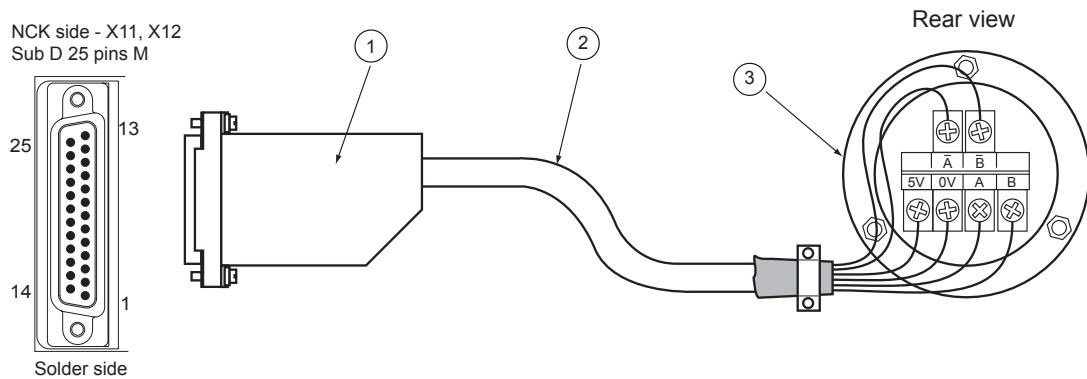


1	25-contact male Sub D connector plug.
2	Shielded cable with three twisted pairs wrapped around one pair [3 x (2 x 0.14 mm ²) + (2 x 0.5 mm ²)] supplied by the customer
3	Handwheel with differential outputs

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 be 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 analogue 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.

9.3.10.2 Handwheels with Differential outputs connections for Flexium⁺

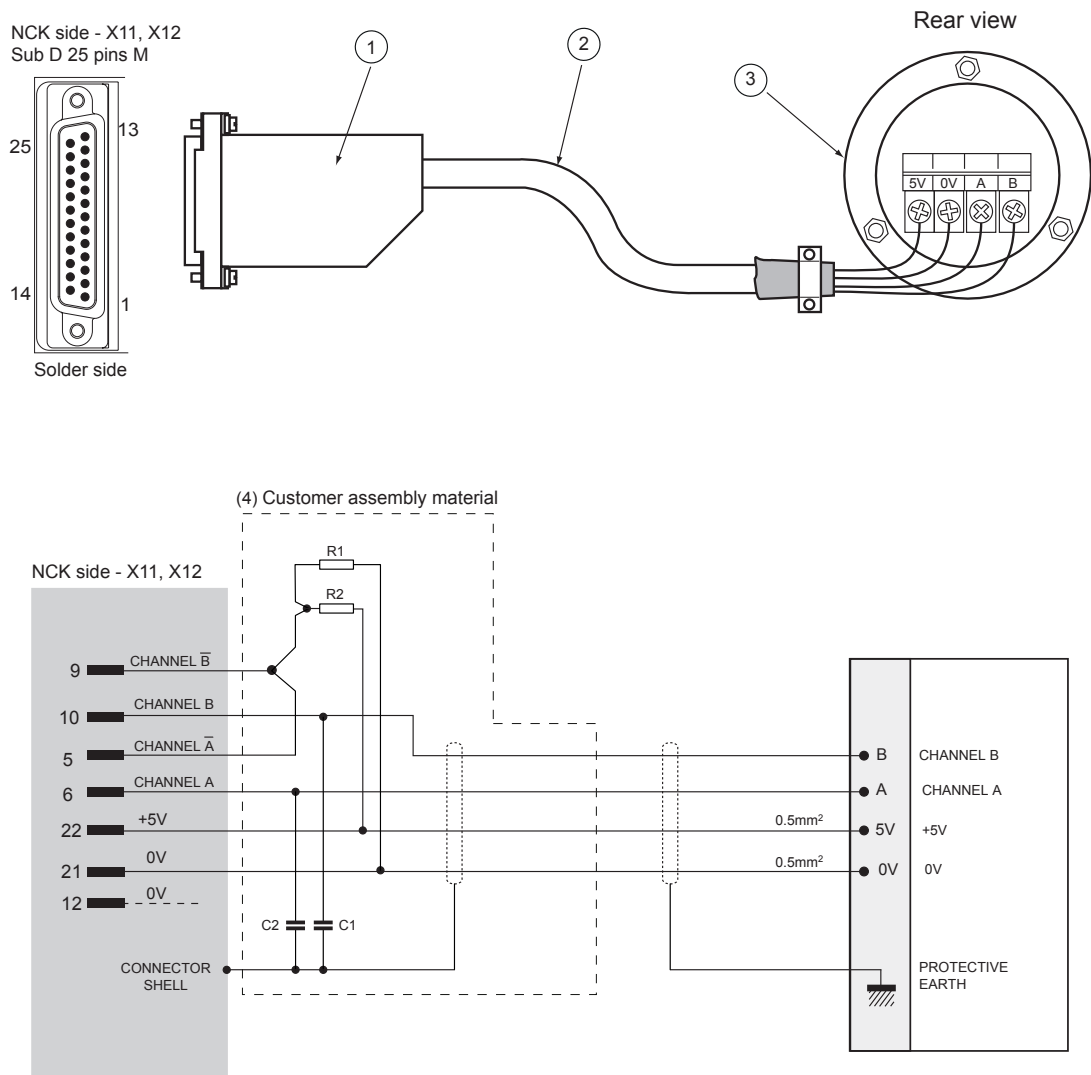
1	25-contact male Sub D connector plug.
2	Shielded cable with three twisted pairs wrapped around one pair [3 x (2 x 0.14 mm ²) + (2 x 0.5 mm ²)] supplied by the customer
3	Handwheel with differential outputs

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 be connected in the same connector (X11 or X12).
	Yes	No	
X12	No	Yes	
	Yes	No	
X12	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.

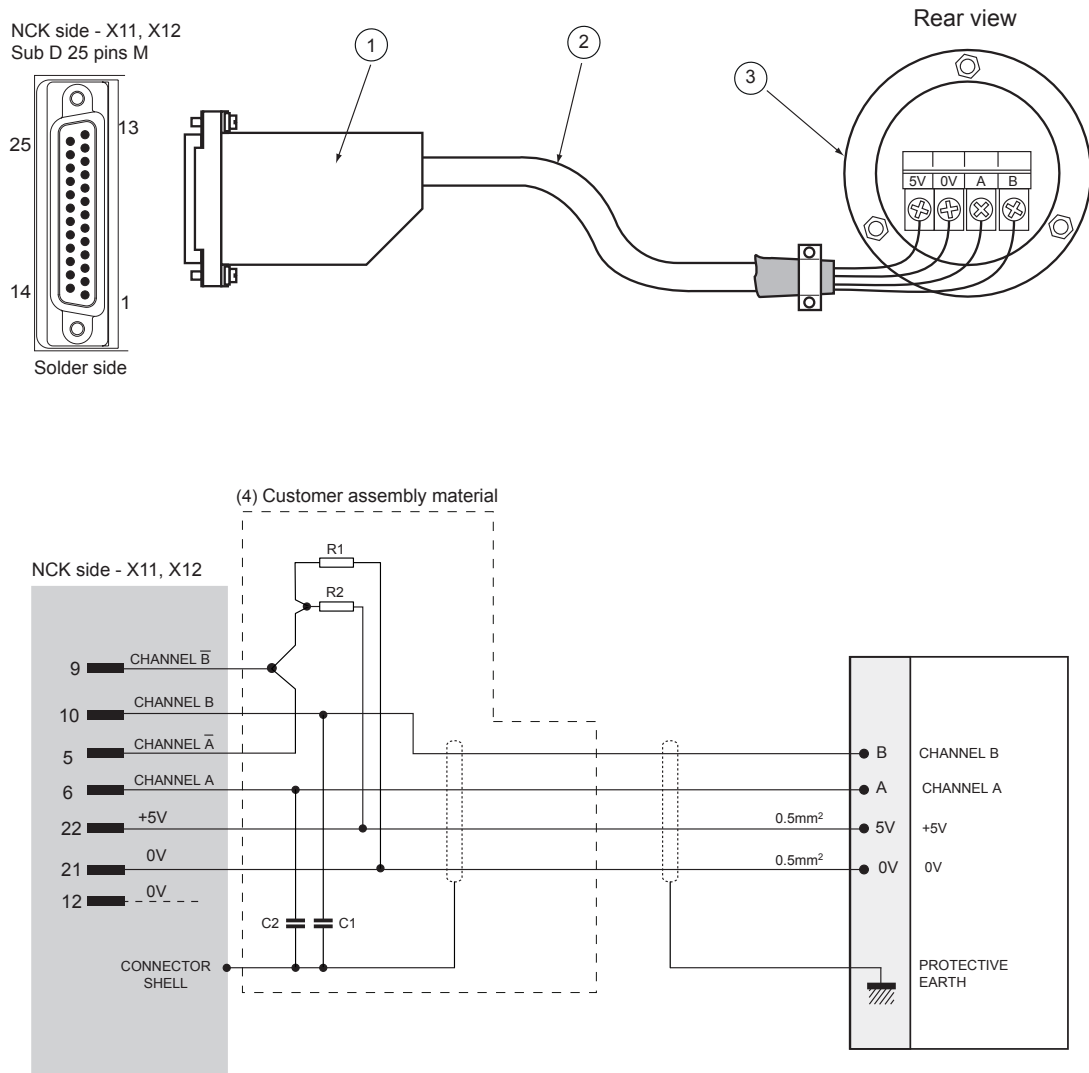
9.3.10.3 Handwheels with Non-Differential outputs connected to full coupler of Flexium



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 mm ²) + (2 x 0.5 mm ²)] 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 analogue axis @1 it is not possible to declare an handwheel with @1.
	Yes	No	
	No	Yes	
X12	Yes	No	
	No	Yes	

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

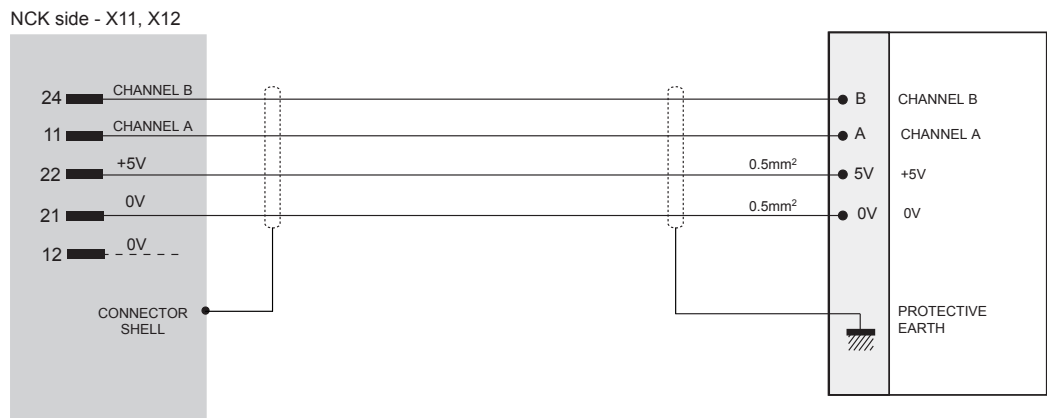
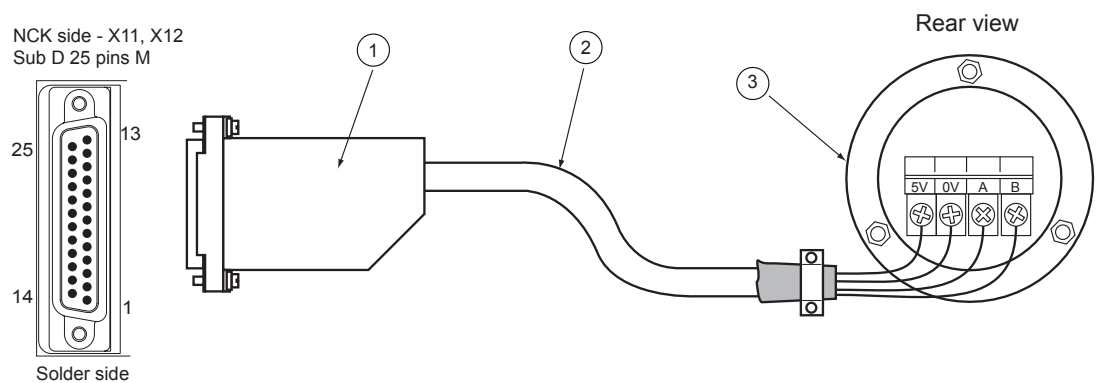
For correct interference suppression in the system please refer the advise on previous pages.

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 be connected in the same connector (X11 or X12).
	Yes	No	
X12	No	Yes	
	Yes	No	
X12	Yes	No	
	No	Yes	

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



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 Analogue axes over the same X11 or X12 connector.
	Yes	Yes	
X12	Yes	Yes	

9.4 Operator panels connections

9.4.1 Connecting the power supply J1

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 operator panel.

The connection should be made as follows:

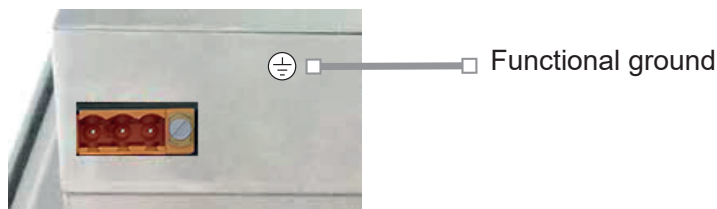
- The cross-section of the power supply cable must be between 0.75mm² and 1.5mm².
- The current consumption must be taken into account for the power supply (see chapter 4).
- The functional ground is not compulsory for operation. It may help to prevent interference and potential differences.
- The 0V pin is directly connected to the housing potential.

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

Pin	Designation	Function
1	+24VDC	24VDC SELV, safety extra low voltage. Protection class III / 4A.
2	0V	0V power supply
3	-	Not connected

J1 Power connector

3 pins M



J1 Power connector 3 pins screw F



9.4.2 FS122 J1 power supply

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 operator panel.

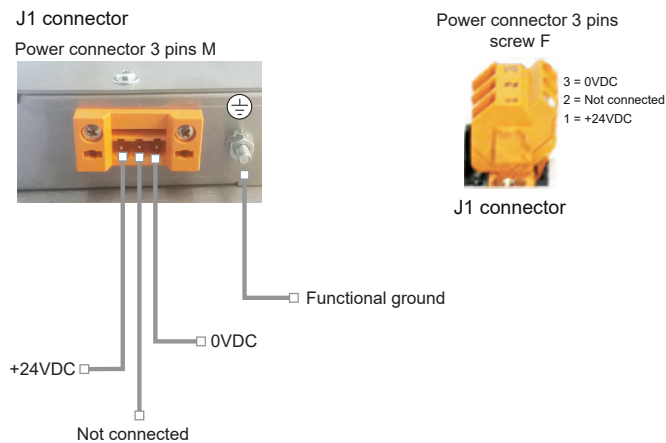
The connection should be made as follows:

- 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 4.5.2).
- 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 plug connector (socket strip with screw terminals) for the terminal is supplied with the device.

Pin	Designation	Function
1	+24VDC	24VDC SELV, safety extra low voltage. Protection class III / 4A.
2	-	Not connected
3	0V	0V power supply

FS122 SUPPLY connector



9.4.3 COM1 and COM2 connections

The serial interfaces COM1 and COM2 are PC compatible.

Cables connected to the RS232 interface must be routed separately from low-voltage cables. It is mandatory to use a shielded cable for interference-free operation.

Connector	Type	Description
COM1	RS232 Sub D 9 pins M	Serial interface. General user purpose
COM2		

Pin	Designation	Function
1	CD	Carrier Detect (MODEM detects remote MODEM response)
2	RXD	Receive Data (Data received by the device)
3	TXD	Transmit Data (Data sent by the device)
4	DTR	Data Terminal Ready (PC signals readiness to connect)
5	GND	Ground (Reference for voltage signals)
6	DSR	Data Set Ready (MODEM signals readiness to communicate)
7	RTS	Request To Send (PC requests permission to send data)
8	CTS	Clear To Send (MODEM grants permission to send data)
9	RI	Ring Indicator (MODEM detects an incoming call)

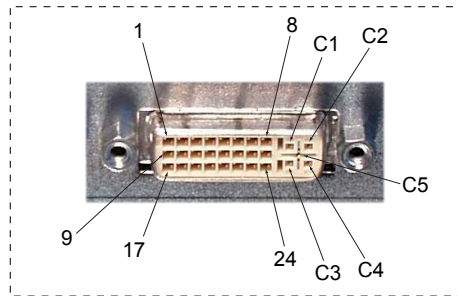
9.4.4 DVI-I and DVI-D Digital Video connection

These digital video connection could be used for connecting a supplementary video.

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

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

DVI connector

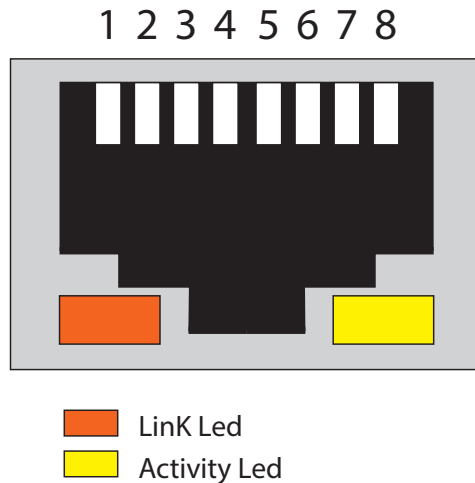


Pin No	Signal	Description
1, 2	RX2- / RX2+	TMDS Data 2- Input / TMDS Data 2+ Input
3	RX2/RX4 shield	TMDS shield for Data 2 & 4
4, 5	RX4- / RX4+	Not connected internally
6, 7	DDC Clock / DDC Data	Digital Data Channel Clock Input / Digital Data Channel Data I/O
8	Analog Vsync	Not connected internally
9, 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	Available only DVI-I connector
C2	Analog Green	
C3	Analog Blue	
C4	Analog Hsync	
C5	Analog Ground	

9.4.5 ETH1, ETH2 and ETH3 Ethernet connections

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

- LINK (Connection to HUB or other device)
- ACTIVITY (Send or Receive)



Activity Led	
Status	Activity
Light OFF	No connection
Light ON fixed	Connected without data transmission
Light ON flashing	Connected with data transmission

Link Led	
Status	Description
Light OFF	10Mbps connection
Light ON orange	100Mbps connection
Light ON green	1Gbps connection

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

9.4.6 USB type A connection

USB interfaces PC compatible to be used Connect general purpose USB devices (Mouse, keyboards):

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

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

9.4.7 USB type B connection

USB type B interface 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 maximum permissible cable connection length is 5m.

9.4.8 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 [11.2](#)

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:

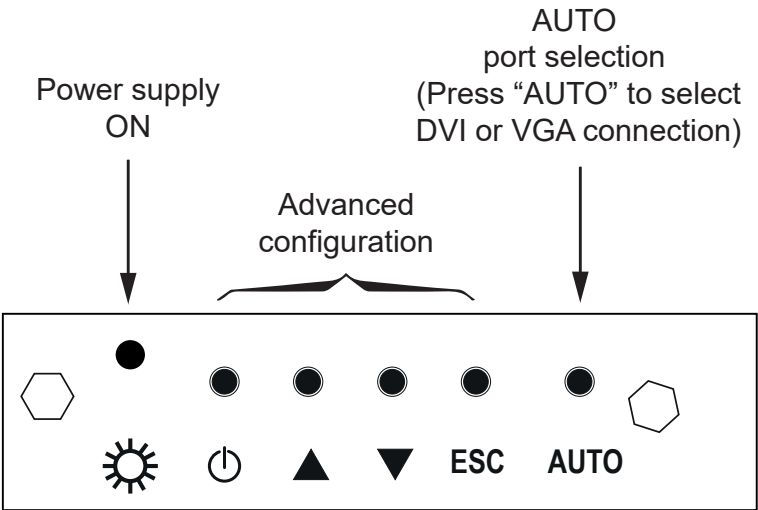
Pin	Description
1	-
2	CAN_L (Low)
3	CAN_GND
4	-
5	SHIELD
6	CAN_GND
7	CAN_H (High)
8	-
9	-



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 [11.1](#)

9.5 Operator panel (without integrated PC)

9.5.1 Panel configuration



9.6 USB QWERTY keyboards connections



Verical USB QWERTY keyboard
FXHE000248



Connect to USB port type A



Horizontal USB QWERTY keyboard
FXHE000249



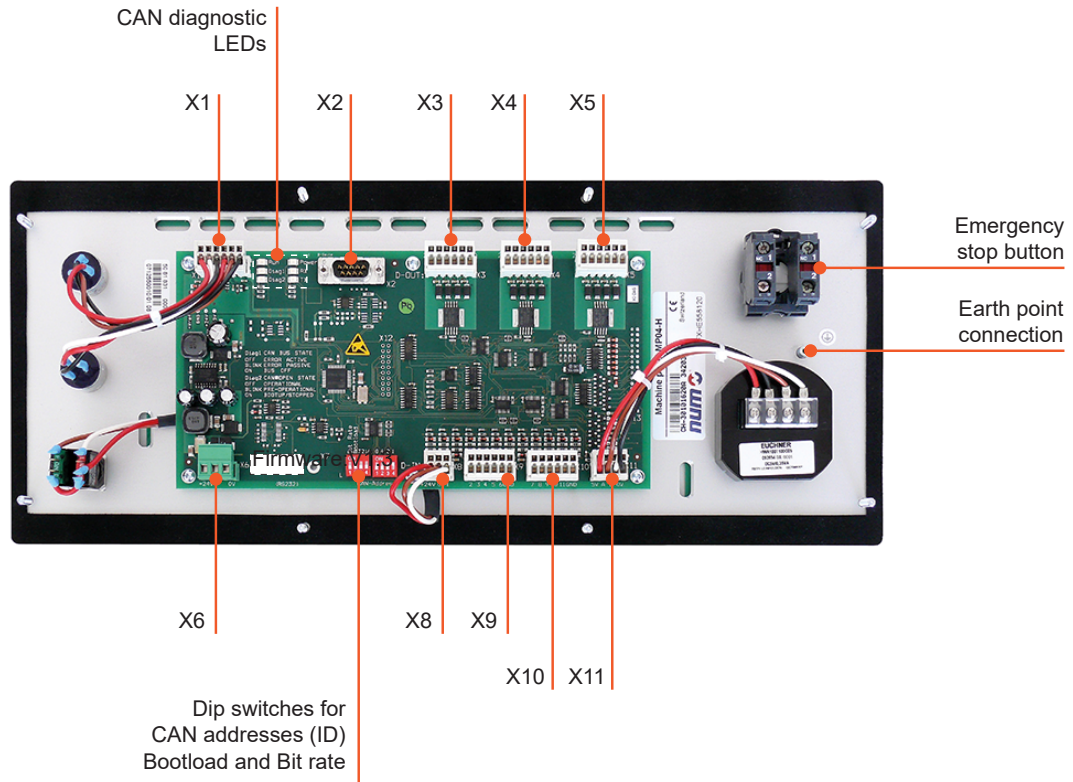
Connect to USB port type A



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

9.7 MP04 Machine panel connections

9.7.1 Connectors lay-out



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

9.7.2 Connecting the power supply (X6)

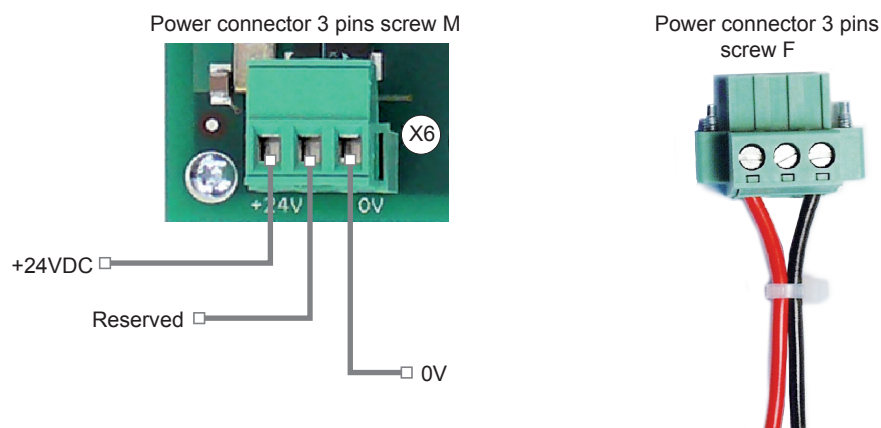
The MP04-W / MP04-H is a device compliant with protection class 3.
The system must be fed with an SELV 24VDC (safety extra-low voltage) supply.

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 5.1.3)
- 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. 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.

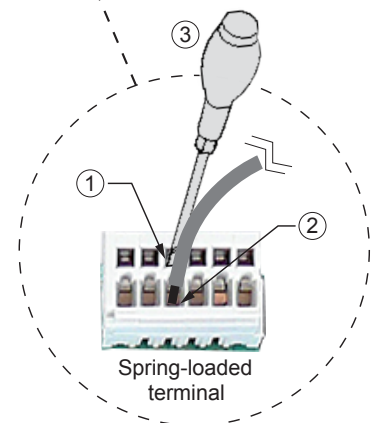
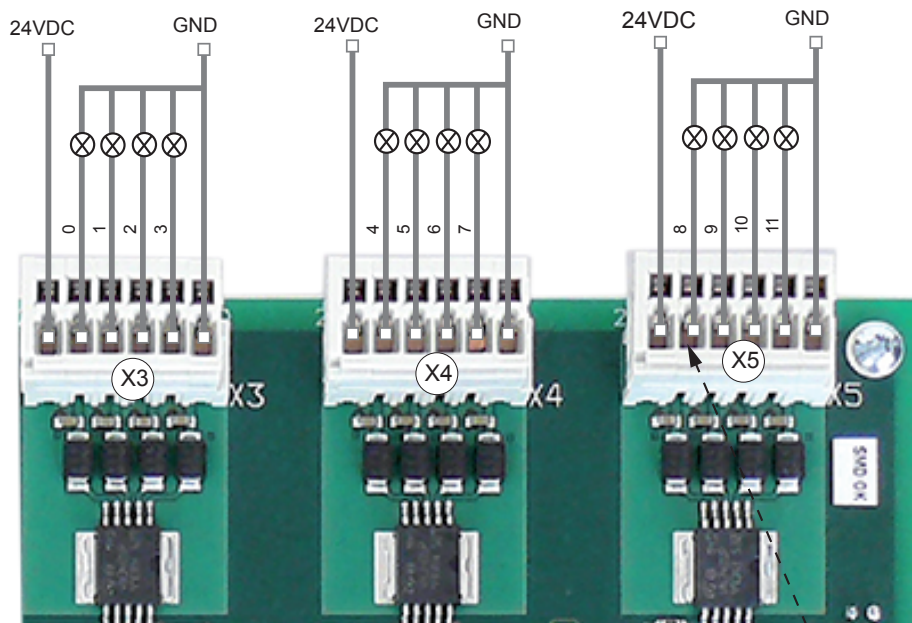
9.7.3 Digital outputs connections (X3, X4, X5)

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 ... 1.5mm ²
Strip length	8 ...9mm



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.

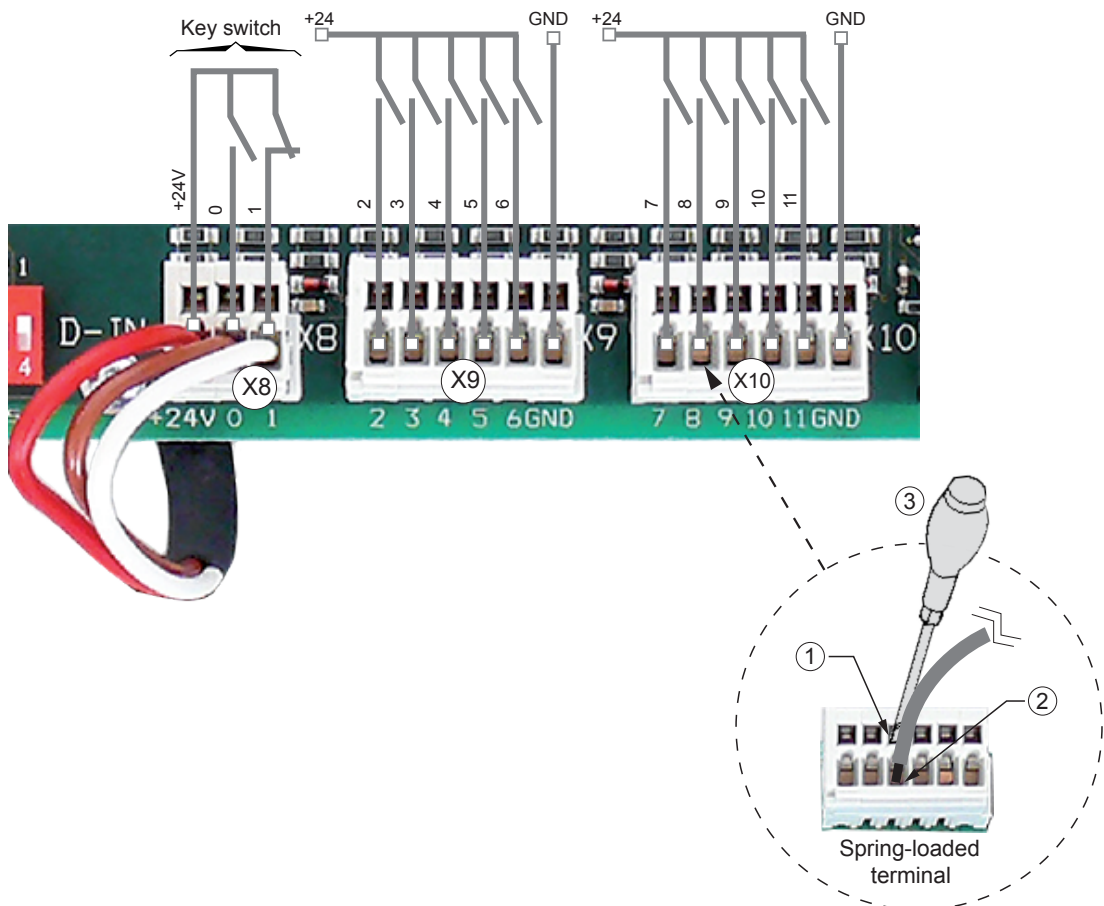
9.7.4 Digital inputs connections (X9, X10) and Key switch connections (X8)

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 ... 1.5mm ²
Strip length	8 ... 9mm

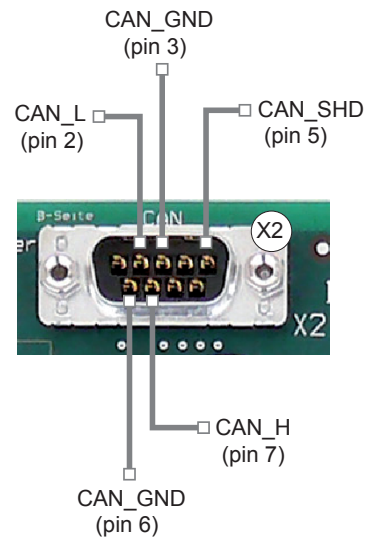


The inputs DI0 and DI1 are reserved for the key switch.
For more detailed information upon the Digital input to PLC configuration please refer to Flexium Commissioning manual M00010.

9.7.5 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	-



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.

9.7.6 CAN address (Dip Switches setting)

The explanation from the left to the right:

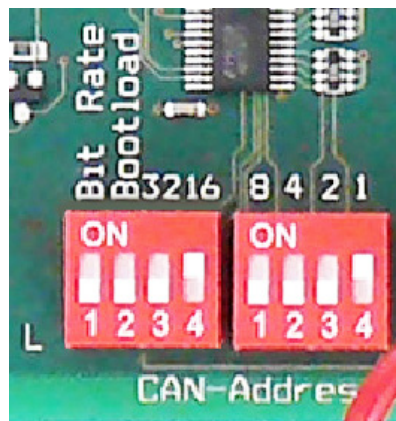
Block	Description	Position down (OFF)	Position up (ON)
Left	Bit rate	125 kBit	500 kBit
Left	Bootload	OFF	ON
Left	Address 32	OFF	ON
Left	Address 16	OFF	ON
Right	Address 8	OFF	ON
Right	Address 4	OFF	ON
Right	Address 2	OFF	ON
Right	Address 1	OFF	ON

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).

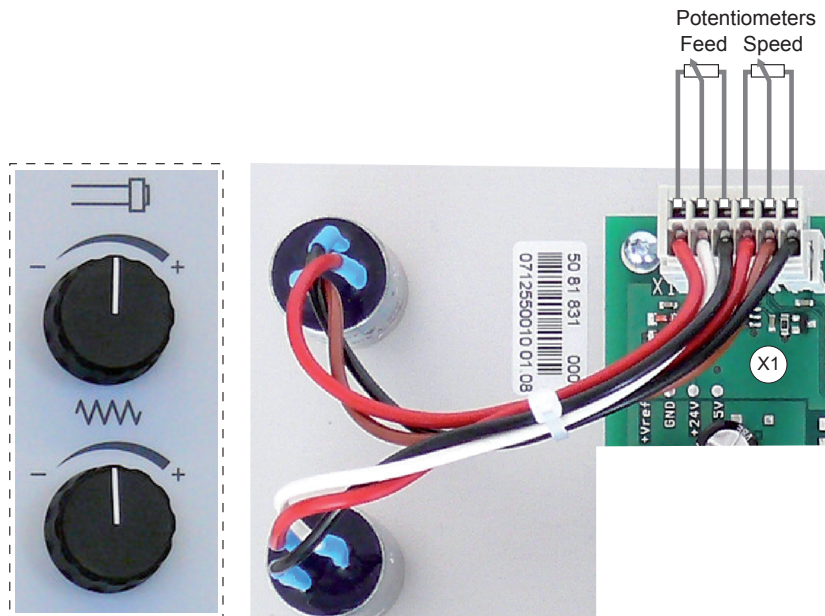
Example: Bus adresse 36

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



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

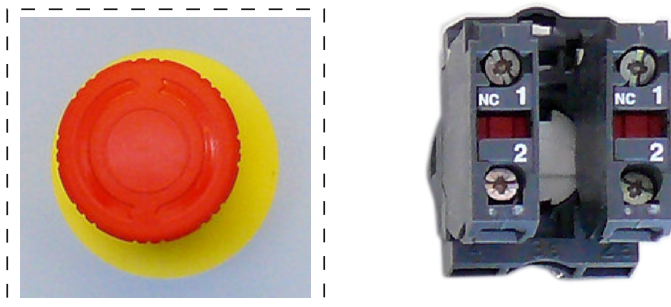
This interface is for 10kOhm potentiometers. The voltage is 2.5VDC, the resolution 10Bit.



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.

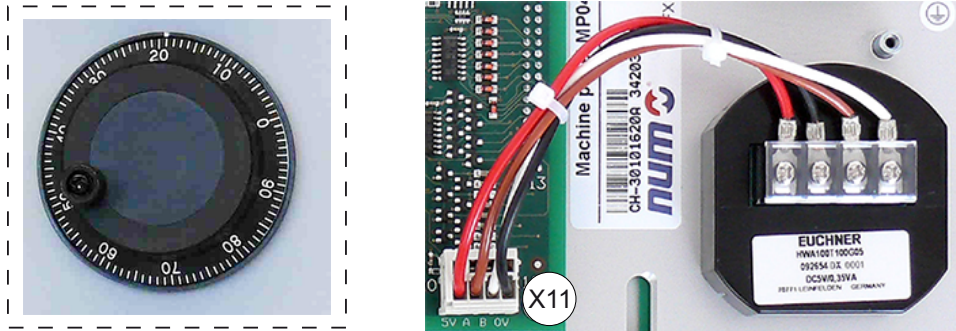
9.7.8 Emergency stop button

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



9.7.9 Handwheel connections (X11)

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



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.

9.8 MP05 Machine panel connections

9.8.1 MP05-H G1



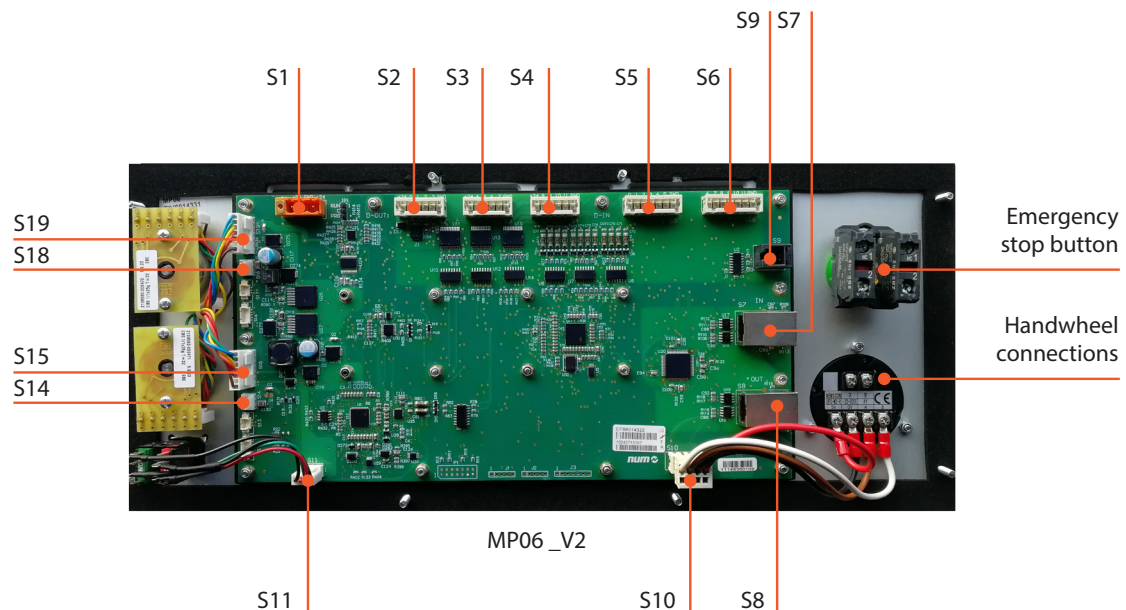
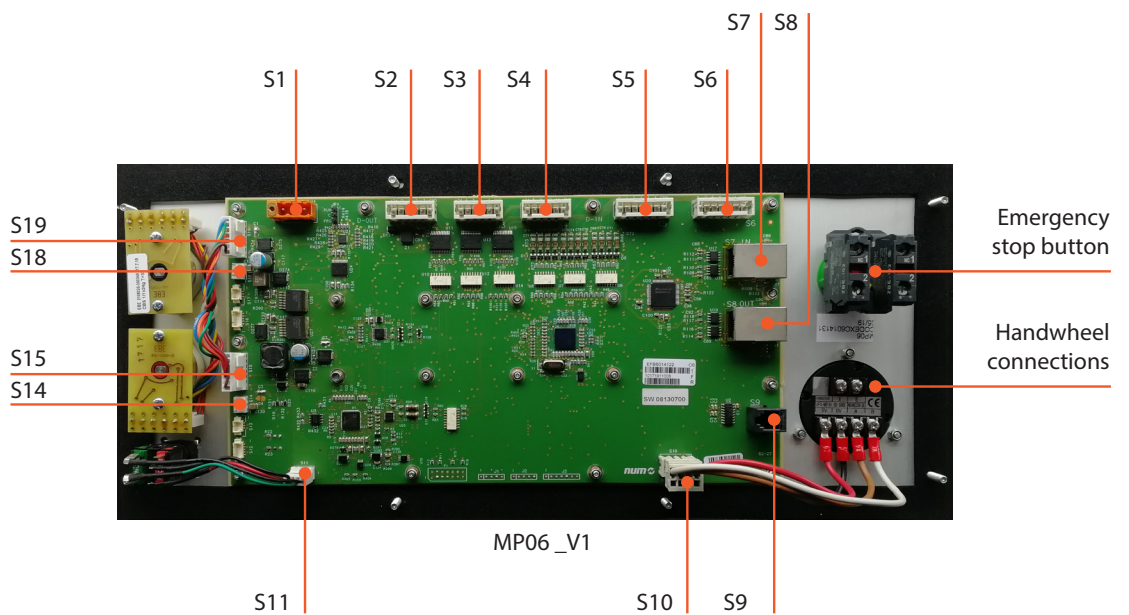
9.8.2 MP05-H G2



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

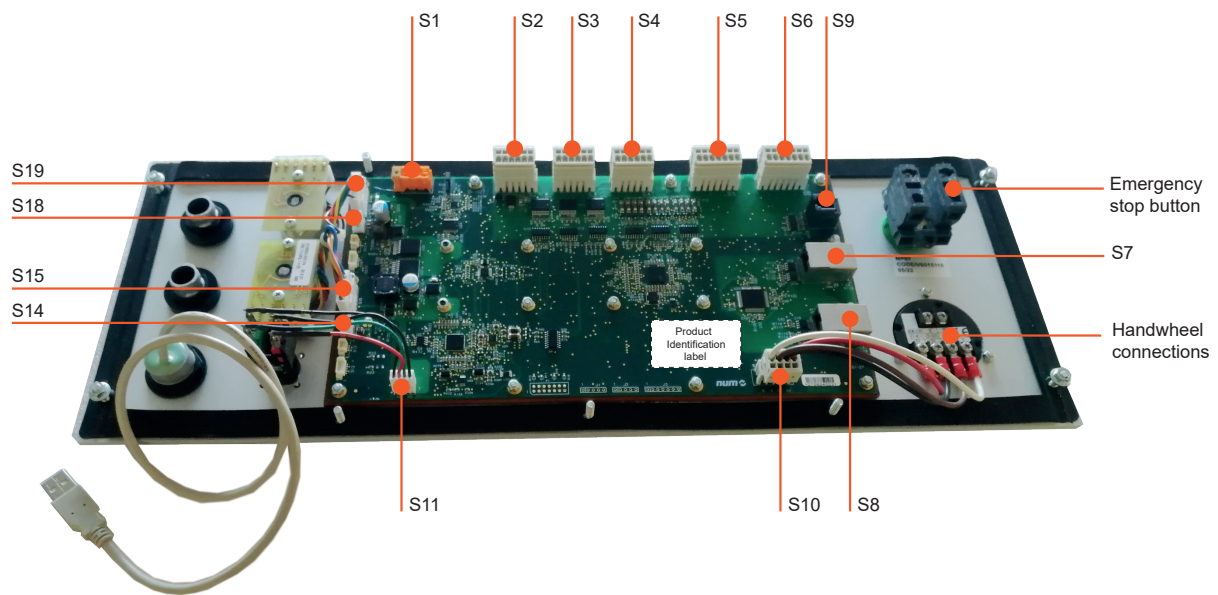
9.9 MP06 MP06_M Machine panel connections

9.9.1 Connectors lay-out



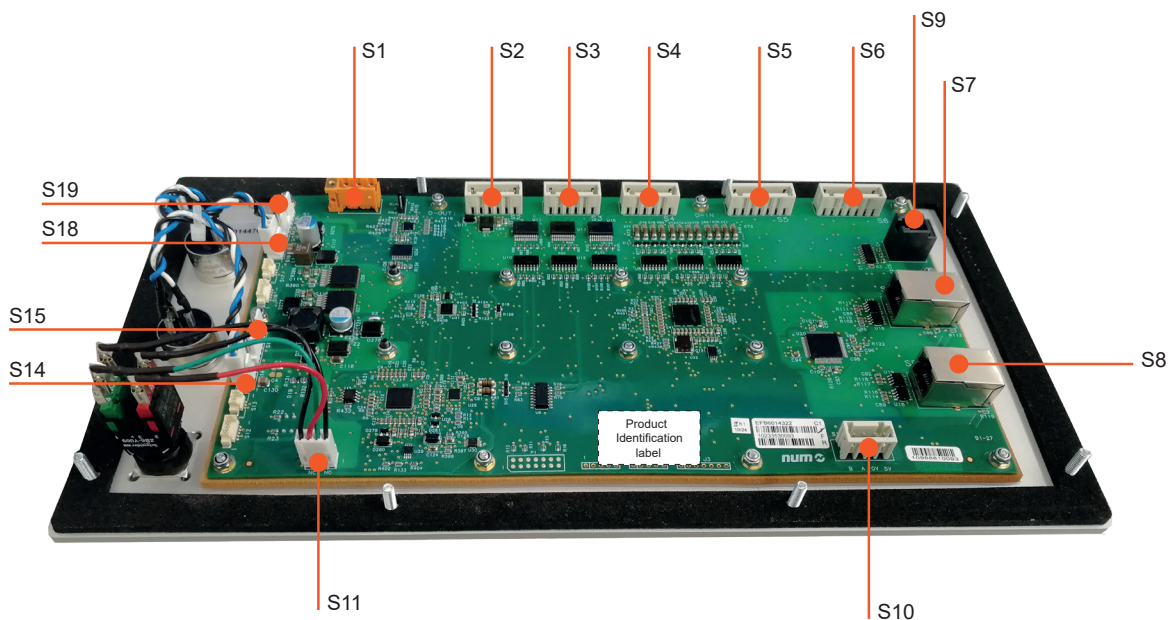
The panel connections are available as indicated in the following pages.

9.9.2 MP07 connectors lay-out



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

9.9.3 MP08 connectors lay-out



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

9.9.4 Connecting the power supply (S1)

The MP06 is a device compliant with protection class 3.

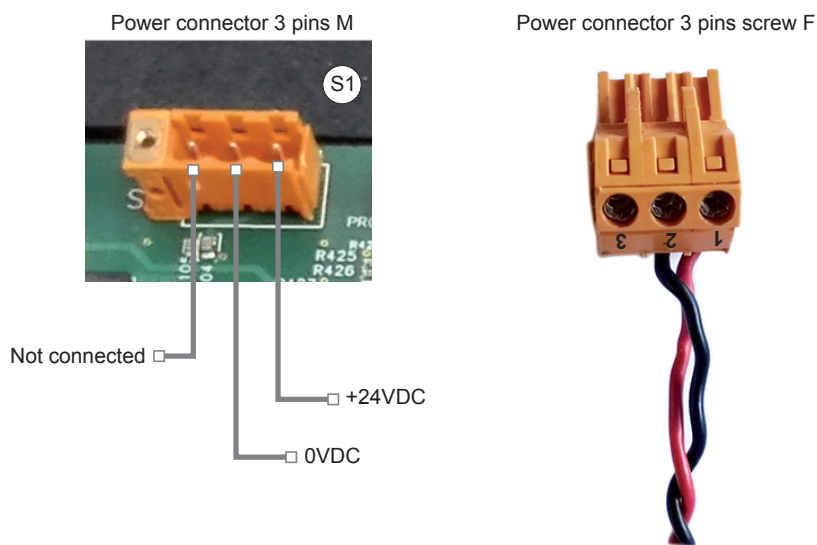
The system must be fed with an SELV 24VDC (safety extra-low voltage) supply.

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 5.3.5)
- 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)



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.

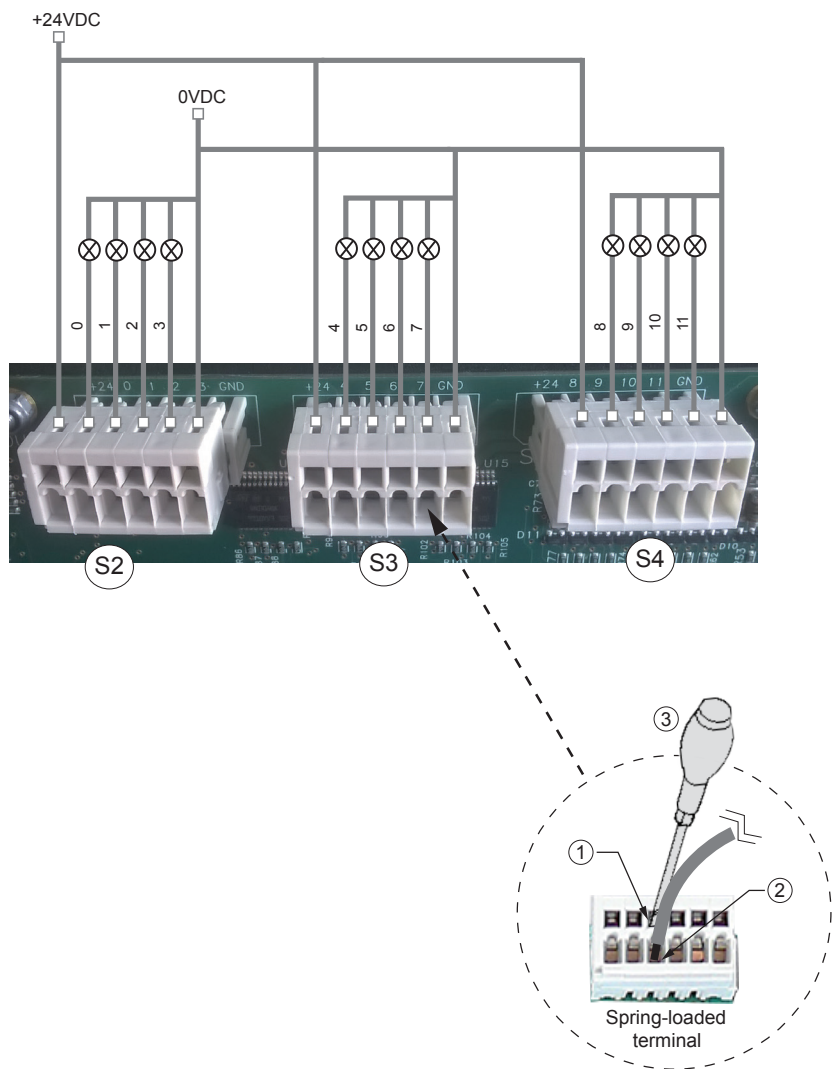
9.9.5 Digital outputs connections (S2, S3, S4)

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 ... 1.5mm ²
Strip length	8 ...9mm



Each output cannot provide more than 500mA.

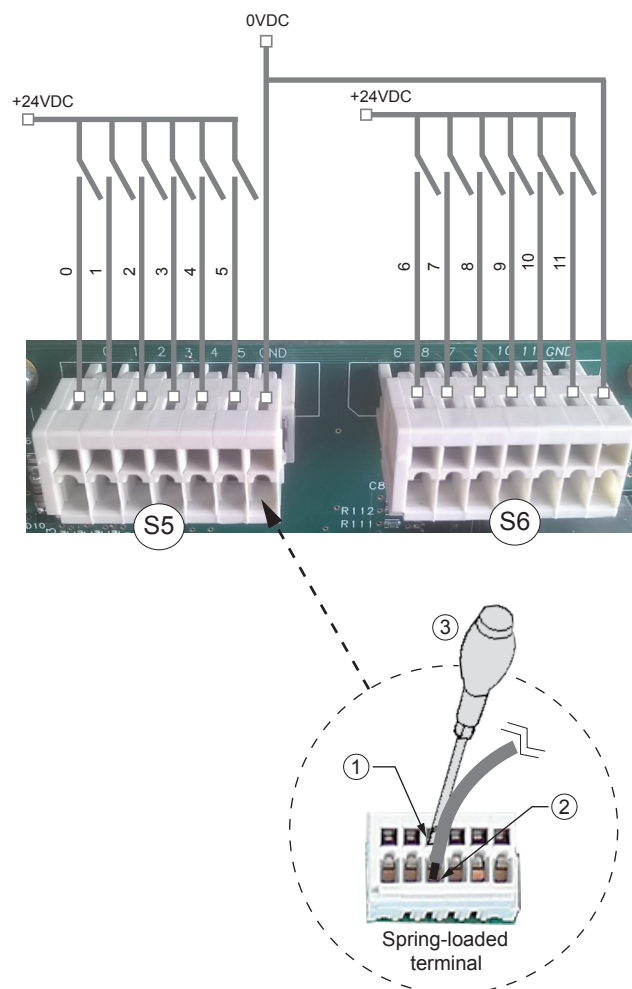
9.9.6 Digital inputs connections (S5, S6)

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

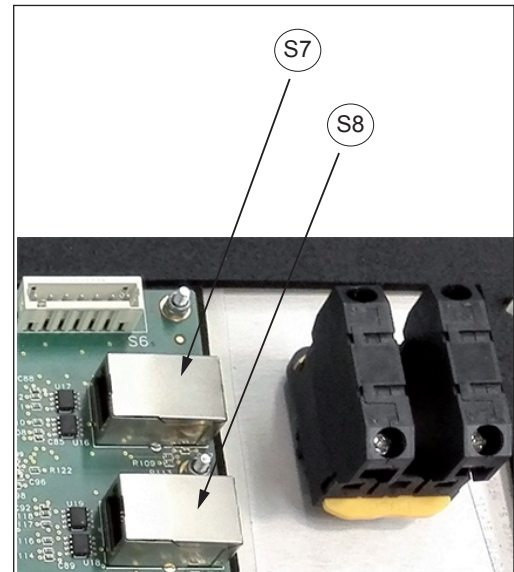


9.9.7 EtherCAT connection (S7 IN / S8 OUT)

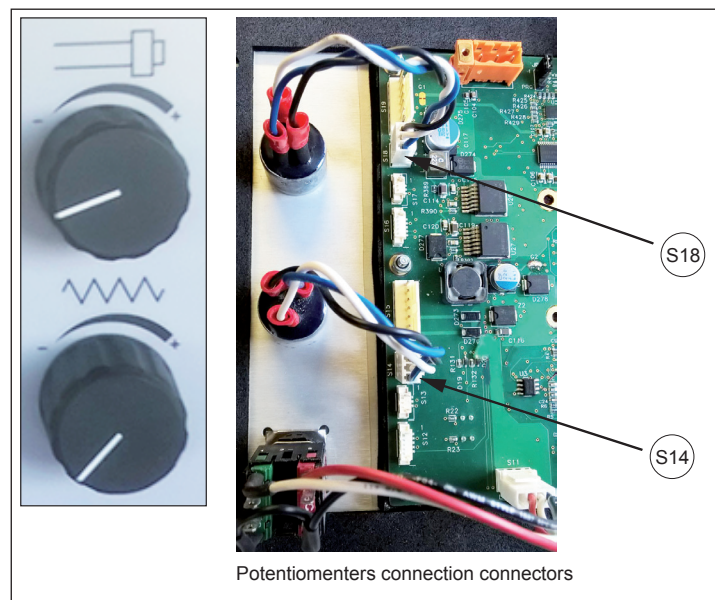
This is a standard EtherCAT interface.

To connect the EtherCAT cable it is mandatory to use the NUM cable AEOFU018Mxxxx .

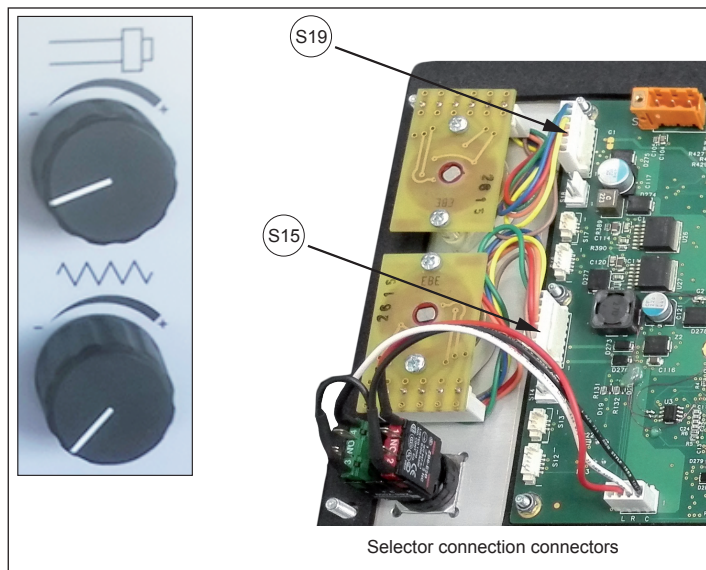
S7 / S8 Diagnostic LEDs	
Green LED: LinkAct Led	
OFF	No link
Blinking	Link and activity
ON	Link without activity
Orange LED PERR(x) port error	
Port receive error indicators PERR(x), displays physical layer RX errors. The PERR(x) LEDs flash once if a physical layer RX error occurs.	



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



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

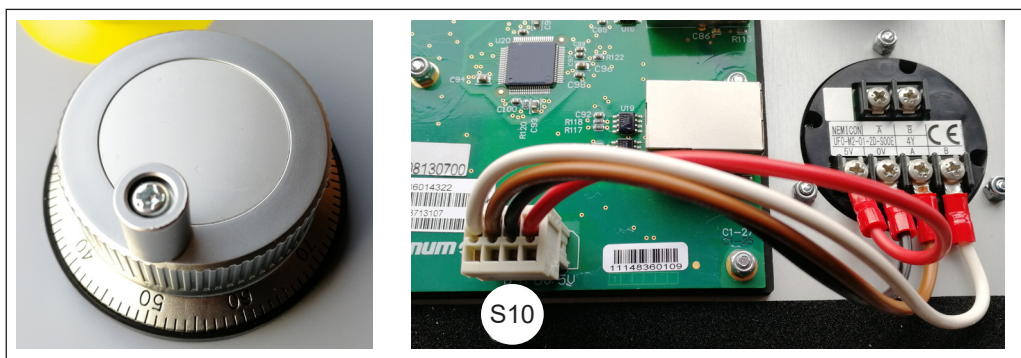


9.9.10 Emergency stop button

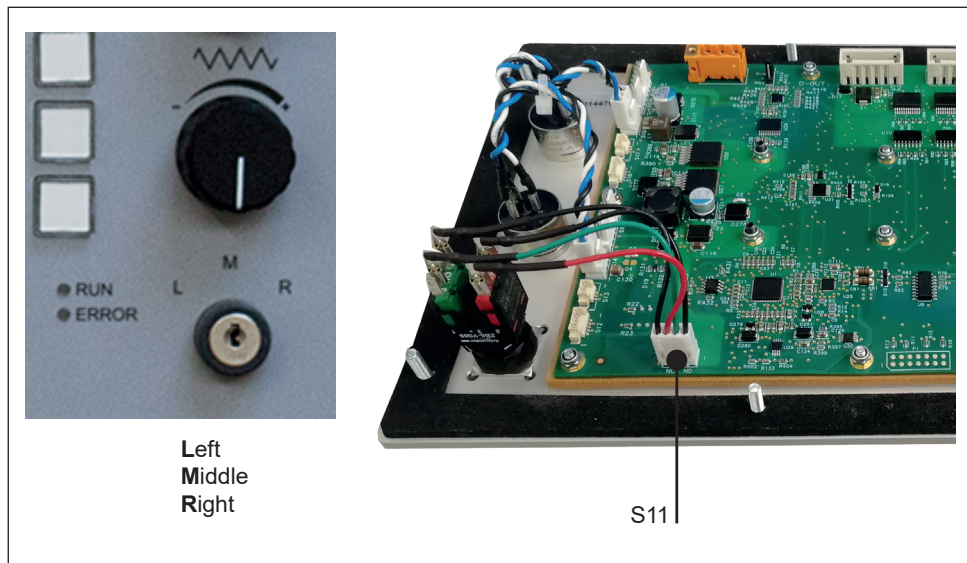
You need to connect the emergency stop directly into the two channel emergency circuit. The two contacts are normally closed. (24V/8A resistive load or 24V/4A inductive load)



9.9.11 Handwheel connections (S10)



9.9.12 Three - position Key switch (S11)



9.9.13 MP Machine Panel to PLC configuration

Please refer to M00010 Flexium Commissioning manual or M00044 Flexium+ Commissioning manual.

9.10 MP07 Panel connections

MP07 connections are identical to those of MP06. The dimensions are adapted to the FS184i operator's panel. Please refer to "MP06 Machine panel connections" chapter 9.9 for detailed information upon the panel connections.

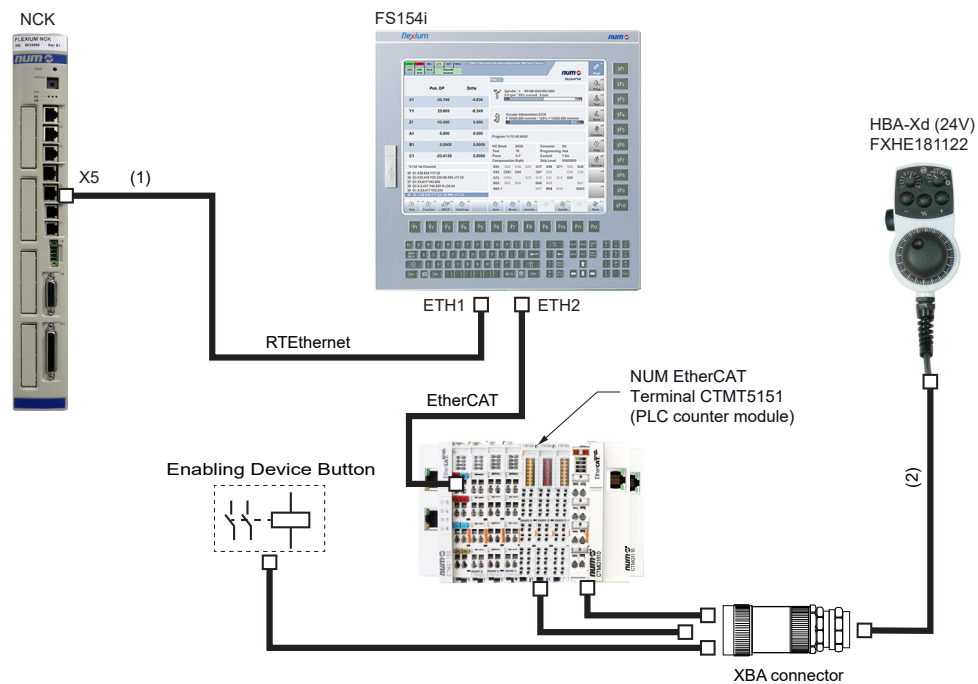
MP07 provides an USB extender plug and two cap mounted homes where standard pushbuttons can be fitted

9.11 MP08 Machine panel connections

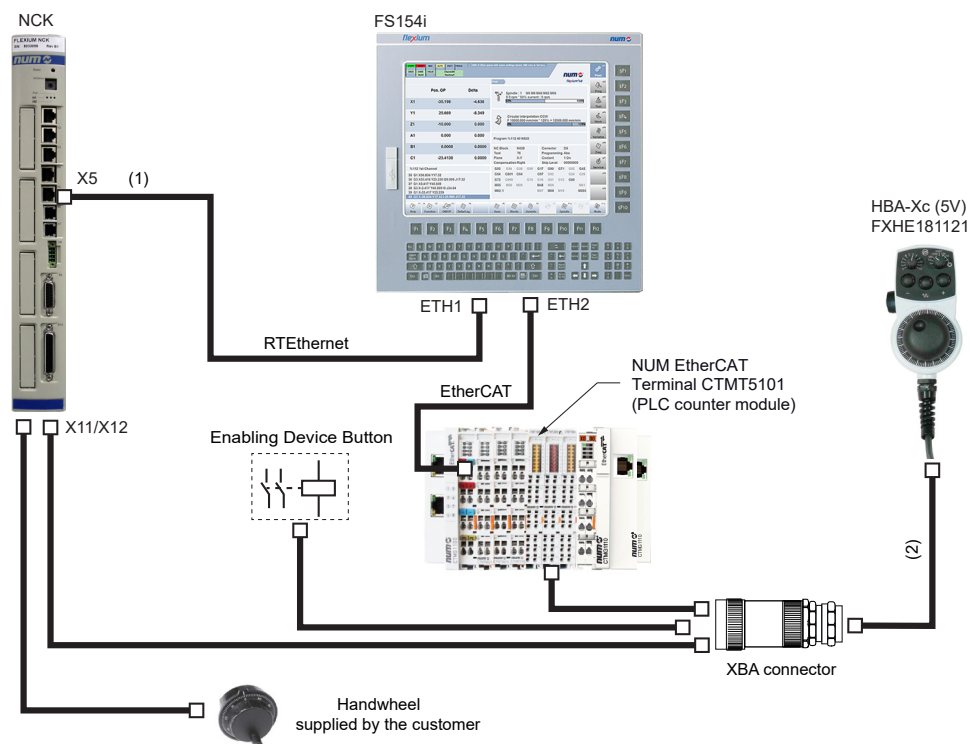
MP08 and MP06 connections are identical except that MP08 does not feature Handwheel nor Emergency stop buttons. Please refer to "MP06 Machine panel connections" chapter 9.9 for detailed information upon the panel connections.

9.12 HBA-X Handwheel connections

FXHE181122 (HBA-Xd 24V) connections



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

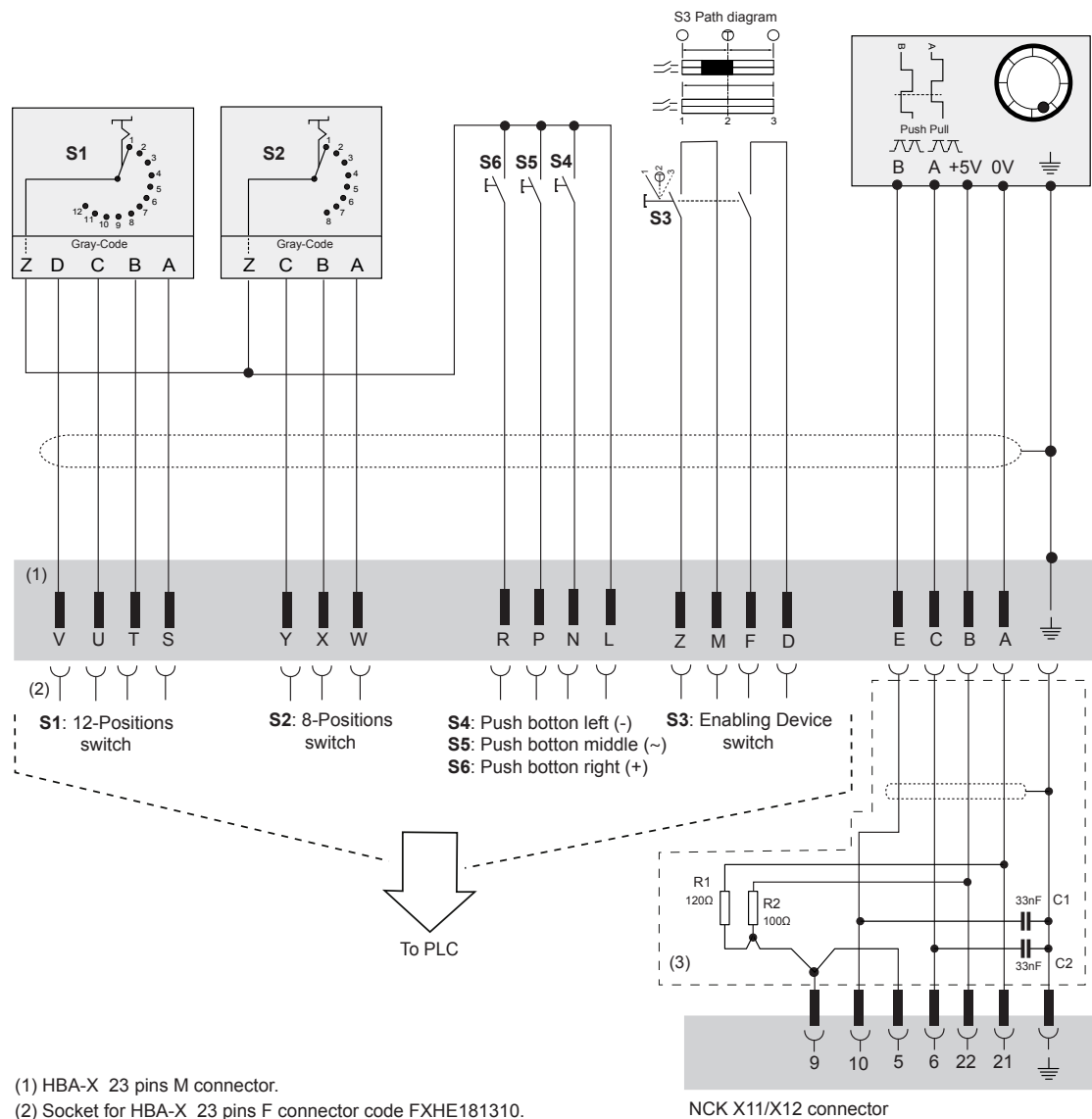


1	Ethernet cable connections AEOFRU018Mxxx (RJ45, Cat.5E) For the cable length please refer to the chapter 11.1
2	XBA-X connections cable see chapter 9.12
ETH1 / ETH2	Please refer to chapter 9.4.5
X5	Please refer to chapter 3.5

9.12.1 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.



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

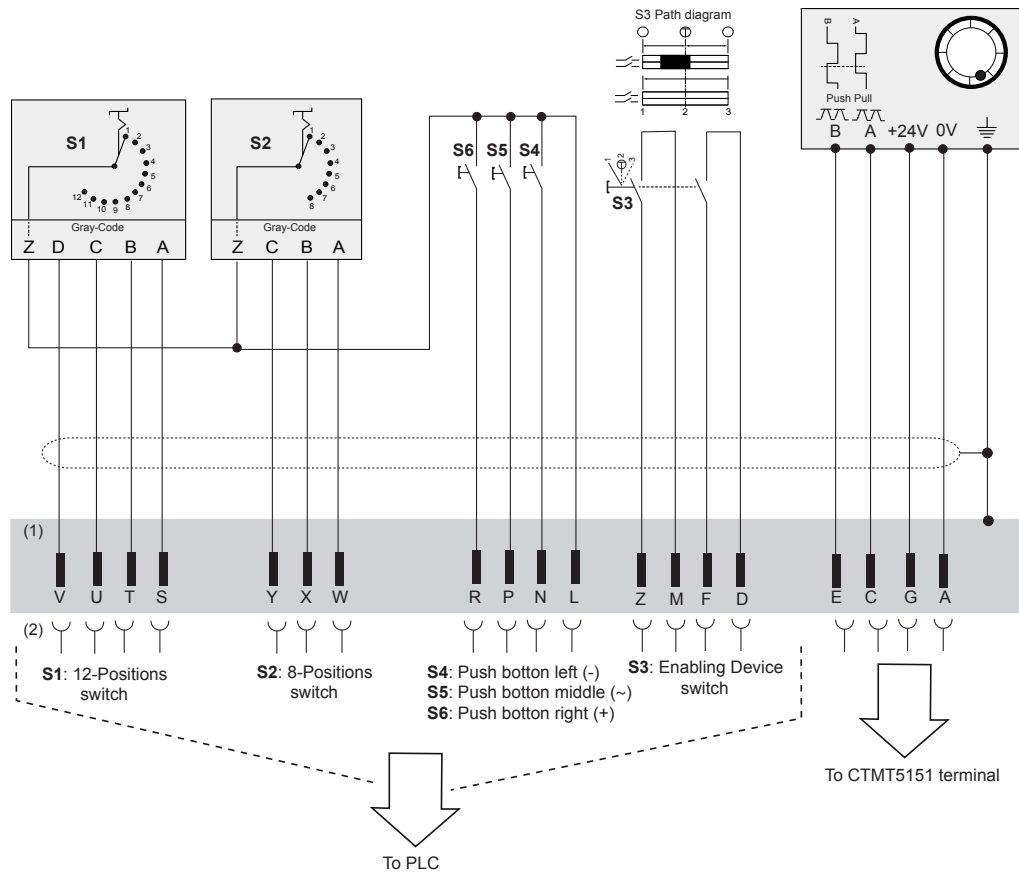
For the second handwheel connection over the NCK X11/X12 connectors see the table here under and also refer to chapter [9.3.9](#)

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

9.12.2 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.

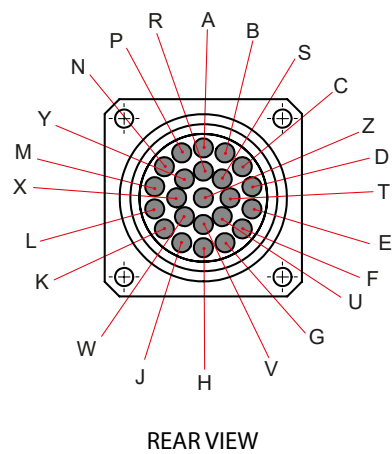
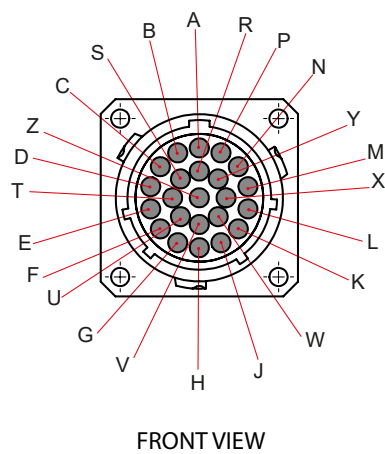


Gray-Code table				
Position	D	C	B	A
1	0	0	0	0
2	0	0	0	1
3	0	0	1	1
4	0	0	1	0
5	0	1	1	0
6	0	1	1	1
7	0	1	0	1
8	0	1	0	0
9	1	1	0	0
10	1	1	0	1
11	1	1	1	1
12	1	1	1	0



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

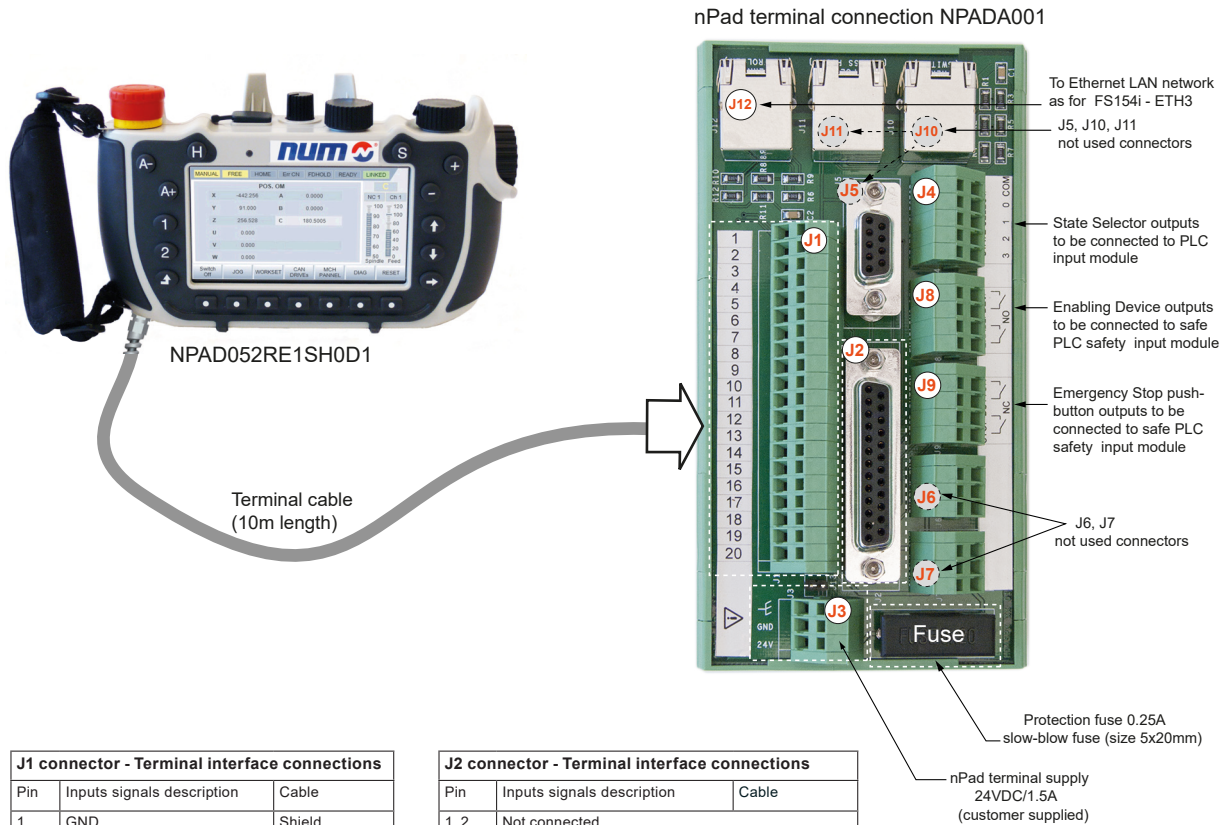
9.12.3 **Socket for HBA-X 23 pins F connector FXHE181310 pin-out**



9.13 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

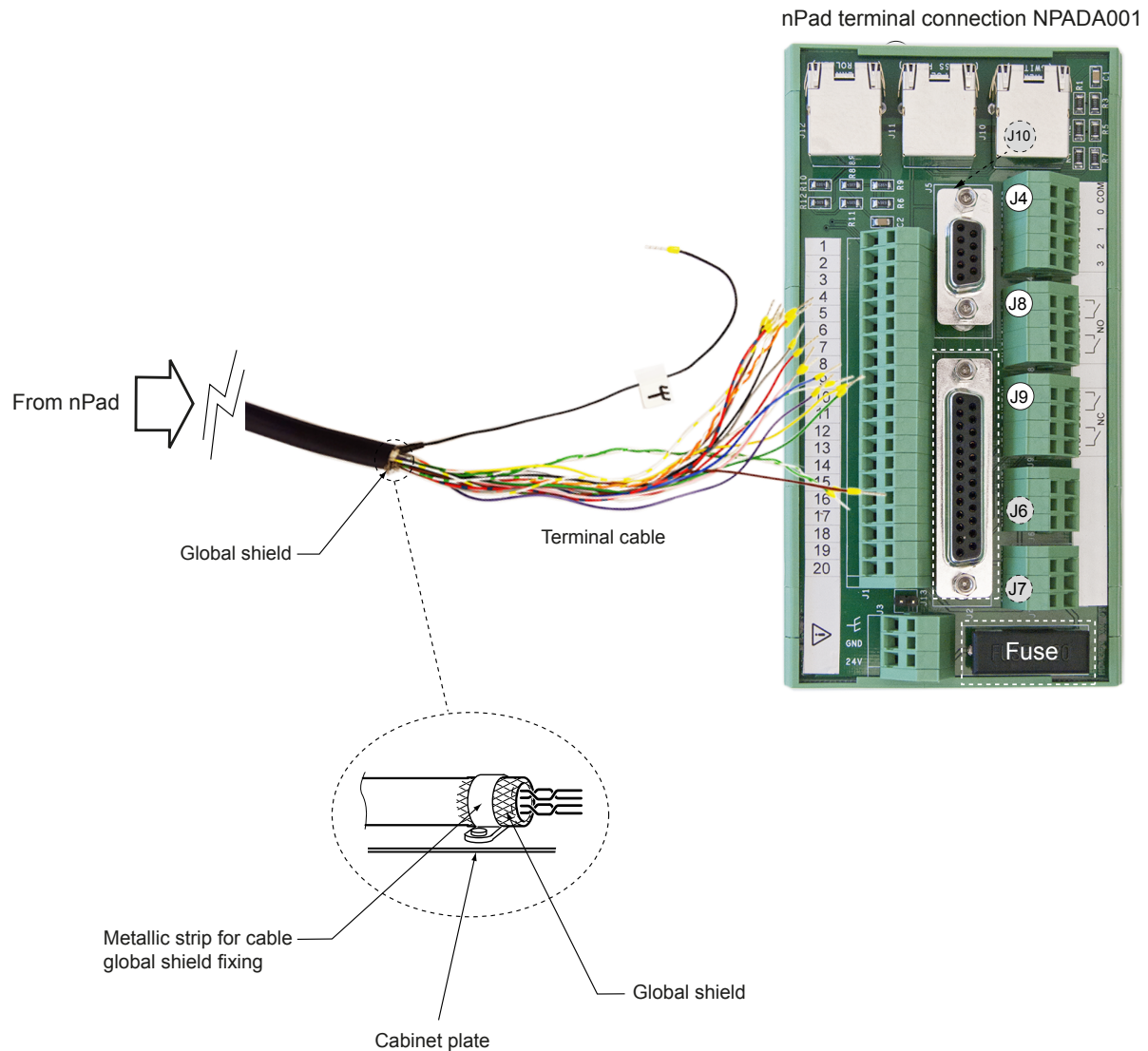
J3 connector - Power supply connections

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

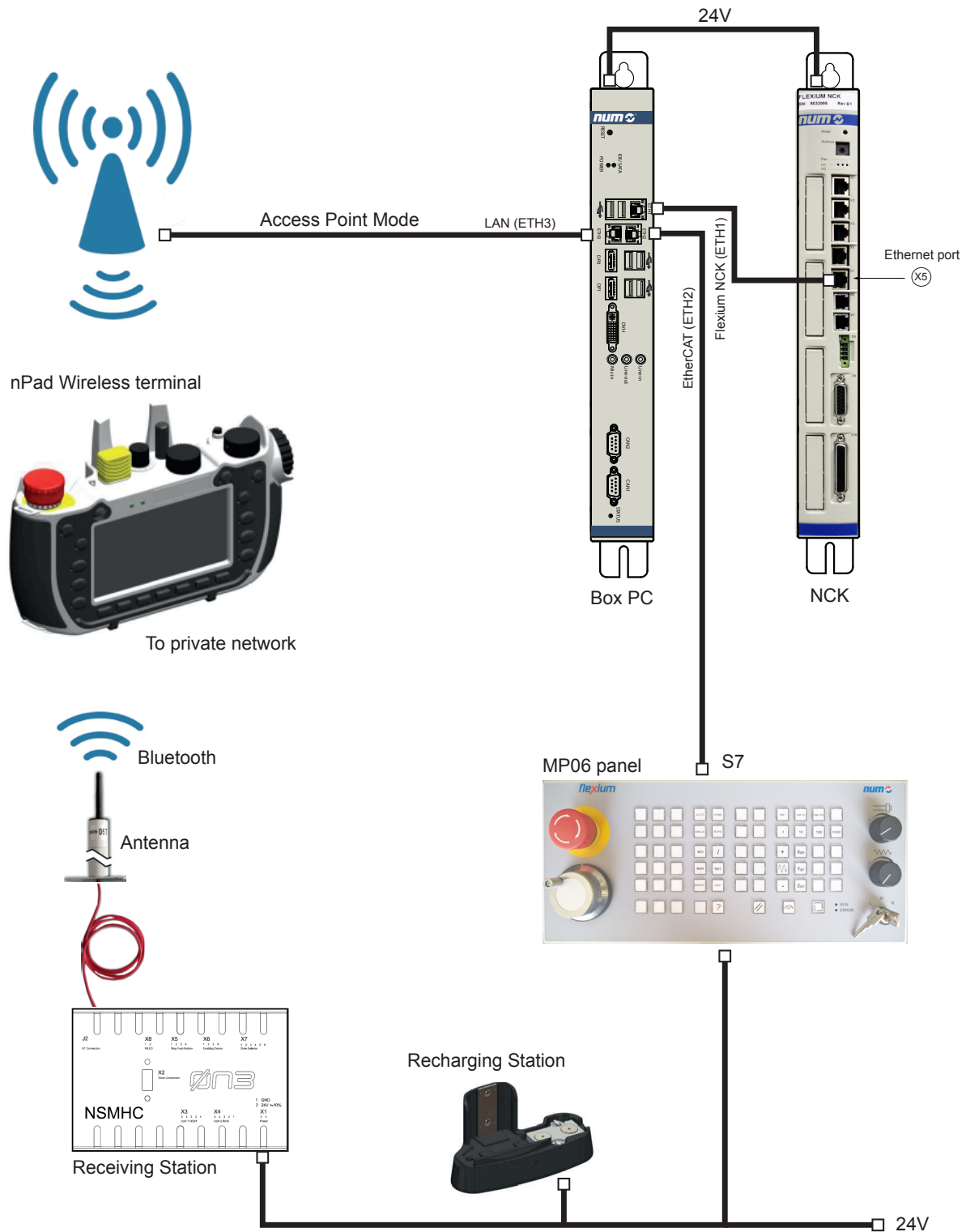
9.13.1 Wiring the nPAD terminal cable



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 disturbance on nPad terminal. For more detailed information please refer to Cabinet layout and EMC Guide M00027.

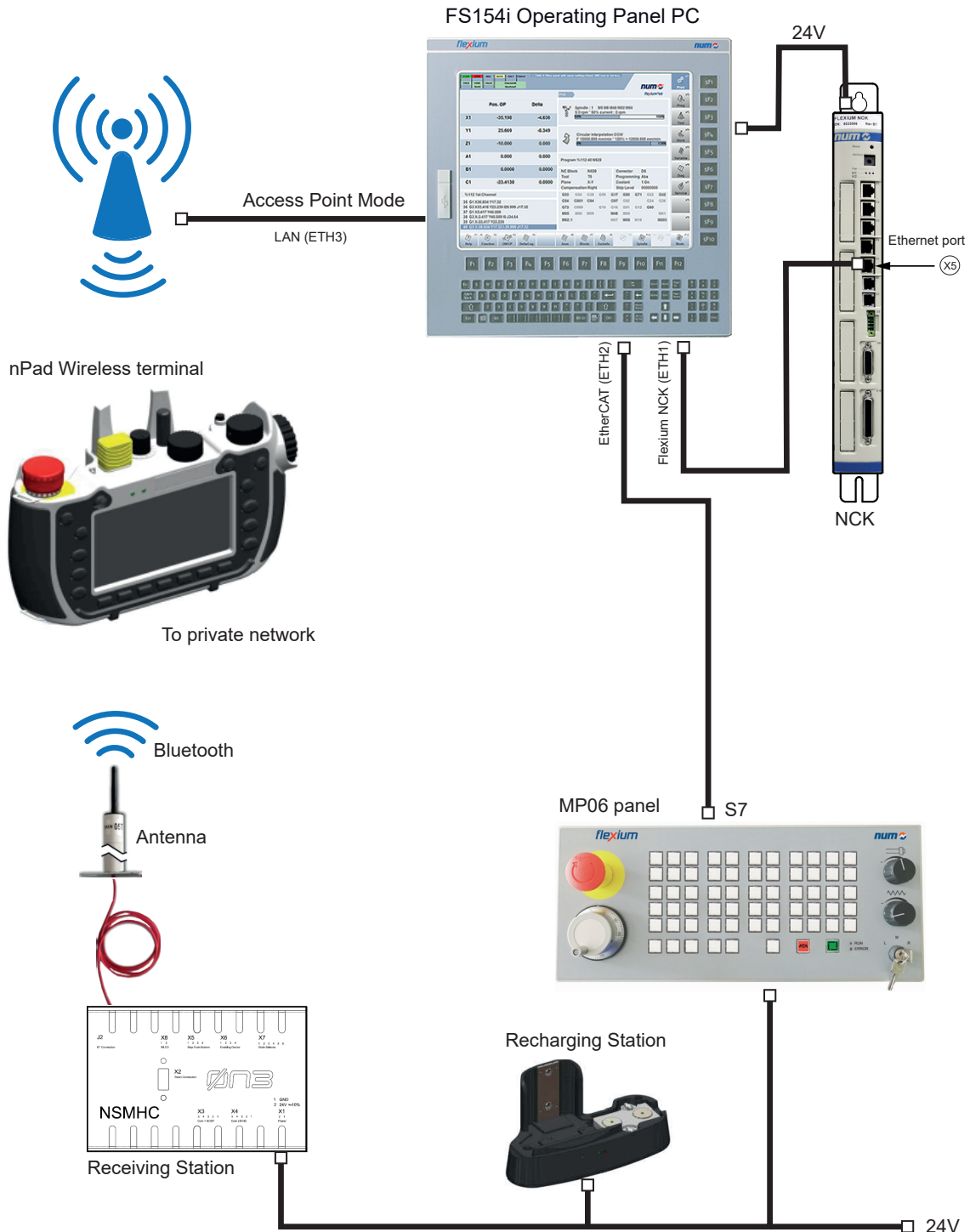
9.14 nPad Wireless Mobile Operator Panel connections

9.14.1 nPad Wireless Mobile Operator Panel with Box PC



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

9.14.2 nPad Wireless Mobile Operator Panel with 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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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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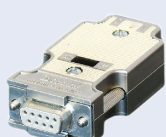
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11 Available accessories

11.1 Flexium / Flexium+ accessories list

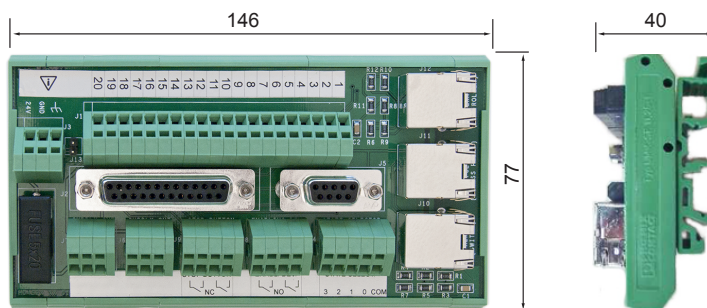
Accessories	Order code	Description	
NCK to NUMDrive X cable	FXHC081520 FXHC081521 FXHC081522 FXHC081523 FXHC081524	0.6m length 1m length 2.5m length 5m length 10m length	
NCK to NUMDrive C cable	FXHC081510 FXHC081511 FXHC081512 FXHC081513 FXHC081514	0.6m length 1m length 2.5m length 5m length 10m length	
MDLL3 / MDLUX	AEOF011M0002 AEOF011M0003 AEOF011M0004	MDLUX size 1 - 2 MDLUX size 3 MDLUX size 4 - 6	
EtherCAT Cable (yellow RJ45) for NUM-SAMX Connections	AEOF012M0001 AEOF012M0002 AEOF012M00A2 AEOF012M0003 AEOF012M0004 AEOF012M0015 AEOF012M0020 AEOF012M0030	MDLUF size 1 MDLUF size 2 MDLUF size 3 MDLUF size 4 MDLUF size 6 Cable length 1.5 m Cable length 2 m Cable length 3m	
Cable for Tandem: • Anti-Backlash • Torque Duplication • Winding Duplication	AEOF013M0001 AEOF013M0002 AEOF013M00A2 AEOF013M0003 AEOF013M0004	MDLUF size 1 MDLUF size 2 MDLUF size 3 MDLUF size 4 MDLUF size 6	
MDLUX DISC NT+ Cable for MDLUX Digital Bus Interconnections	AEOF015M0001 AEOF015M0002 AEOF015M00A2 AEOF015M0003 AEOF015M0004	MDLUX size 1 MDLUX size 2 MDLUX size 3 MDLUX size 4 MDLUX size 6	

Accessories	Order code	Description	
Ethernet cable (RJ45) for: • FS154i or FS184i or FS244i or BoxPC to NCK, • FS154i or FS184i or FS244i or BoxPC to EtherCAT Gateway, • NUM-STOX to NUM-STOX, • EtherCAT Gateway interconnection	AEOFRU018M0001 AEOFRU018M0002 AEOFRU018M00A2 AEOFRU018M0003 AEOFRU018M0004 AEOFRU018M0005 AEOFRU018M0010 AEOFRU018M0020 AEOFRU018M0025 AEOFRU018M0050 AEOFRU018M0100 AEOFRU018M0200 AEOFRU018M0300	MDLUX size 1 MDLUX size 2 MDLUX size 3 MDLUX size 4 MDLUX size 6 Cable length 0.5 m Cable length 1 m Cable length 2 m Cable length 2.5 m Cable length 5 m Cable length 10 m Cable length 20 m Cable length 30 m	
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	
NUMSmartBackup 64GB	FXHE557102	The NUMSmartBackup system is an own developed tool to backup or restore all Flexium iPCs.	
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	

Accessories	Order code	Description	
CAN connector	FXHE181201	CAN Female connector 90°	
CAN connector	FXHE181202	CAN Male / Female connector 90° with prog. unit	
Socket for portable HBA-X	FXHE181310	HBA-X connector. The socket FXHE181310 is an OEM additional 23 pins F connector to connected the handwheel on different places on the machine. See chapter 7.5	

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

Dimensions in mm



Approx. weight: 0.2kg

11.2 CAN Cable and CAN connectors connection

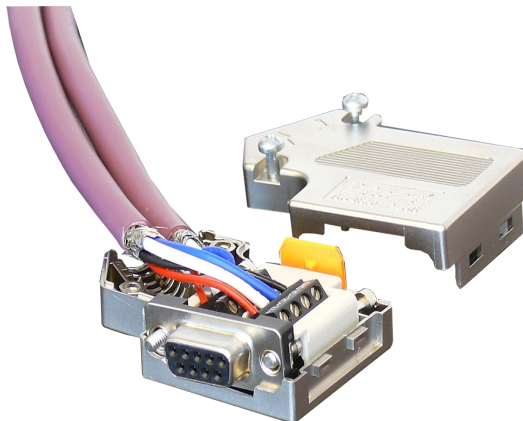
11.2.1 CAN cable FXHC181060



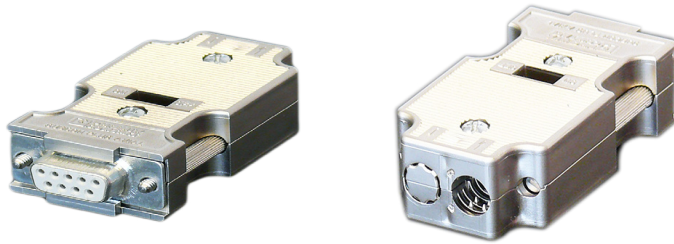
Wire colour	CAN connections
Blank	Shield
Red	V+
Black	V-
White	CAN-H
Blue	CAN-L

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

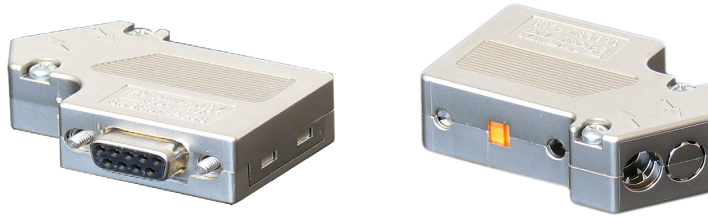


Wire colour	BUS IN connections	BUS OUT connections
Blank	Shield	Shield
Black	GND	GND
White	1C+	2C+
Blue	1C-	2C-

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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