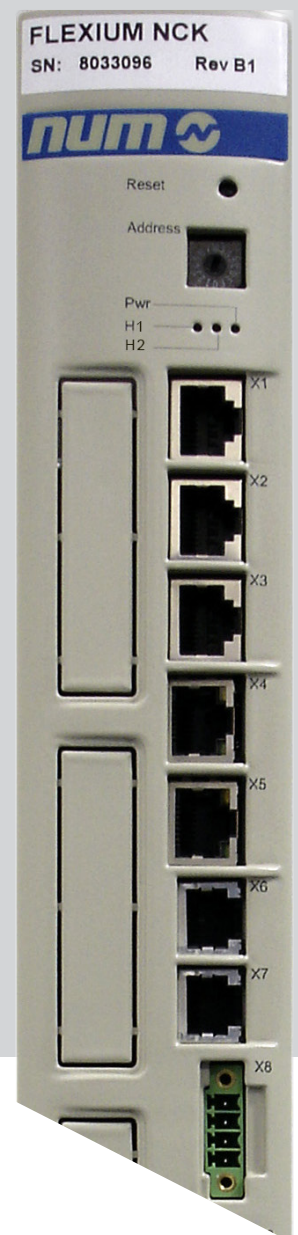


# Flexium systems

## Installation manual

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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 Use of symbols in the manual

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

## 1.3 Document revisions

| Date      | Index | Reason for revision                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | See chapter                                                                                                                                           |
|-----------|-------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| 11 - 2008 | 00    | Document creation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | -                                                                                                                                                     |
| 01 - 2009 | 01    | General update due to internal summary links.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | -                                                                                                                                                     |
| 03 - 2009 | 02    | DPLC, FS152i, FS152 descriptions and connections                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | -                                                                                                                                                     |
| 06 - 2013 | 03    | <p>All-in-one Flexium installation manual creation, moreover this manual introduces the new nPad Mobile Operator Panel, new Industrial Box PC P1 and P2.</p> <p>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.</p> <p>Therefore some manuals as M00011, M00014, M00015 have not to be used anymore.</p> <p>Please also refer to the next page for the main contents of the manual.</p>                                                                                               | -                                                                                                                                                     |
| xx - 2014 | 04    | Internal use revision.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | -                                                                                                                                                     |
| 05 - 2016 | 05    | <p>All-in-one Flexium and Flexium+ installation manual.<br/>Moreover this manual introduces the following sections:</p> <ul style="list-style-type: none"> <li>- New FS122 panel.</li> <li>- New FS153i panel.</li> <li>- New FS153 panel.</li> <li>- New FS192i panel.</li> <li>- New FS192L panel.</li> <li>- New USB QWERTY keyboard (Horizontal and Vertical external keyboard).</li> <li>- New MP05 Panel.</li> <li>- New MP06 panel.</li> <li>- New MP08 panel.</li> <li>- New NUM Industrial Box PC.</li> <li>- New Handwheel connection diagrams.</li> </ul> <p><b>- FS152 and FS152i panels "removed".</b><br/><b>Please refer to Flexium Installation manual M00009EN-04</b></p> | -                                                                                                                                                     |
| 07 - 2017 | 06    | <ul style="list-style-type: none"> <li>- New FS153i, FS154i and FS192i Warning for Machine builder and end user.</li> <li>- New section FS154i panel.</li> <li>- New MP05 (new configurable buttons).</li> <li>- New MP06 / MP08 EtherCAT LEDs RUN and ERROR description.</li> <li>- New MP06 / MP08 Potentiometer Tuning procedure.</li> <li>- New Box PC Warning for Machine builder and end user.</li> <li>- New Box PC P1 G4.</li> <li>- New nPad Wireless Mobile Operator terminal presentation.</li> <li>- New Watchdog diagram.</li> <li>- New CAN LEDs status.</li> <li>- New nPad Wireless Mobile Operator panel connections.</li> <li>- New section NUMSmartBackup.</li> </ul>   | <p>4</p> <p>4.2</p> <p>5.2</p> <p>5.3.6</p> <p>5.3.8</p> <p>6.1</p> <p>6.2</p> <p>8</p> <p>9.4.6</p> <p>9.5.10</p> <p>9.6.7</p> <p>9.18</p> <p>10</p> |

## 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.

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



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## **1.5 NUM Agency**

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

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# Summary

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## 2 Flexium and Flexium<sup>+</sup> CNC Systems

### 2.1 Flexium Systems

Available in three configurations: 6, 8 and 68, Flexium and Flexium<sup>+</sup> 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<sup>+</sup> 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<sup>+</sup> 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.



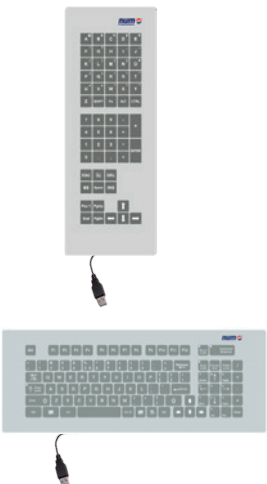
Please refer to NUM Catalog for more detailed information upon the NUM CNC System configurations.

## 2.2 System components

|                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Flexium NCK</b></p>  <p>Please refer to chapter 3 for more detailed information.</p>     | <p><b>Flexium NCK</b> is the heart of a system.</p> <p>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.</p> <p>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.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <p><b>Flexium Panels</b></p>  <p>Please refer to chapter 4 for more detailed information.</p> | <p><b>FS122</b> passive panels (without integrated iPC) are 12" panels designed for use with an external PC or NUM Industrial Box PC P1/P2 or for multi HMI systems.</p> <p>The passive panels FS122 are available with and without touch screen. Both versions have got 22 functional keys.</p> <p><b>FS153i and FS154i</b> PC panels provide both the Man Machine interface (MMI or HMI) and can provide the Flexium PLC function. Different versions of panels are available with or without keyboard, touch screen or not.</p> <p><b>FS153</b> passive panels (without integrated PC) are 15" panels designed for use with an external PC or NUM Industrial Box PC P1/P2 or for multi HMI systems. The passive panels have the same appearance and dimensions as NUM's and FS153i.</p> <p><b>FS192i</b> PC panels provide both the Man Machine interface (MMI or HMI) and can provide the Flexium PLC function. With the latest 19" capacitive touch screen system, NUM has set a new standard for operating panels in the machine tool industry.</p> <p>A compact and scalable panel PC with Intel's i5 allows entry to multi-processor technology with Windows 8 operating system.</p> <p><b>FS192L</b> passive panels (without integrated PC) are 19" panels designed for use with an external PC or NUM Industrial Box PC P1/P2 or for multi HMI systems. The passive panel FS192L is a landscape oriented capacitive touch panel. The touch sensor supports dual-touch gestures.</p> <p>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.</p> |

|                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Machine Panel</b></p>  <p>Please refer to chapter 5 for more detailed information.</p>              | <p><b>MP04</b> panel interfaced on CANOpen is used for control of manual movements, production initiation and intervention during machining and is available with / without handwheel.</p> <p>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.</p> <p><b>MP05</b> 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.</p> <p>MP05 provides E-Stop button, 4 luminous push buttons, USB 2 interface, 2 step key switch, 2 Overrides potentiometers and Handwheel are available.</p> <p><b>MP06 and MP08</b> interfaced on EtherCAT panel are used for control of manual movements, production initiation and intervention during machining.</p> <p>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.</p> <p>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 <sup>(1)</sup>, a three position key-switch and an optional hand-wheel <sup>(1)</sup>.</p> <p>MP06 is designed fit with the FS153 / FS154 family.<br/>MP08 is designed fit with the FS122 family.</p> <p><sup>(1)</sup> Not available on MP08.</p> |
| <p><b>Industrial Box PC</b></p>  <p>Please refer to chapter 6 for more detailed information.</p>        | <p>Industrial box PC are an alternative to FS153i, FS154i / FS192i operator panels. Two performance levels P1 and P2 are available.</p> <p>The required PLC functions are handled by the external Box PC (with dedicated PLC) linked by Ethernet to the external PC.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <p><b>Portable Handwheel HBA-X</b></p>  <p>Please refer to chapter 7 for more detailed information.</p> | <p>The portable handwheel HBA-X for Flexium provides a number of operation function like Axis selection, Hand mode and speed selection, movements forward/backward and speed override.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |



|                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>nPad - Mobile Operator Panel</b></p>  <p>Please refer to chapter 8 for more detailed information.</p> | <p>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.</p> <p>The nPad is equipped with WinCE 6 and CoDeSys HMI runtime environment.</p> <p>nPad Mobile Operator Panel is available with Wireless version maintaining the same functionality.</p>                                                                                     |
| <p><b>USB QWERTY keyboard</b></p>  <p>Please refer to chapter 4 for more detailed information.</p>         | <p>The external USB QWERTY keyboard are adapted to FS153 panels.</p> <p>The keyboard is available for horizontal or vertical mounting.</p>                                                                                                                                                                                                                                                                                                                                                  |
| <p><b>NUM EtherCAT terminal CTMG, CTMT</b></p>                                                            | <p>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.</p> <p>For more detailed informations on the NUM EtherCAT terminals please refer to NUM EtherCAT terminals CTMG and CTMT Operating manual M00032.</p> |
| <p><b>NUMSmartBackup</b></p>  <p>Please refer to chapter 10 for more detailed information.</p>            | <p>The NUMSmartBackup system is an own developed tool to backup or restore all Flexium iPCs.</p>                                                                                                                                                                                                                                                                                                                                                                                            |



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

## 2.3 Flexium 6, Flexium 8 and Flexium 68 systems overview

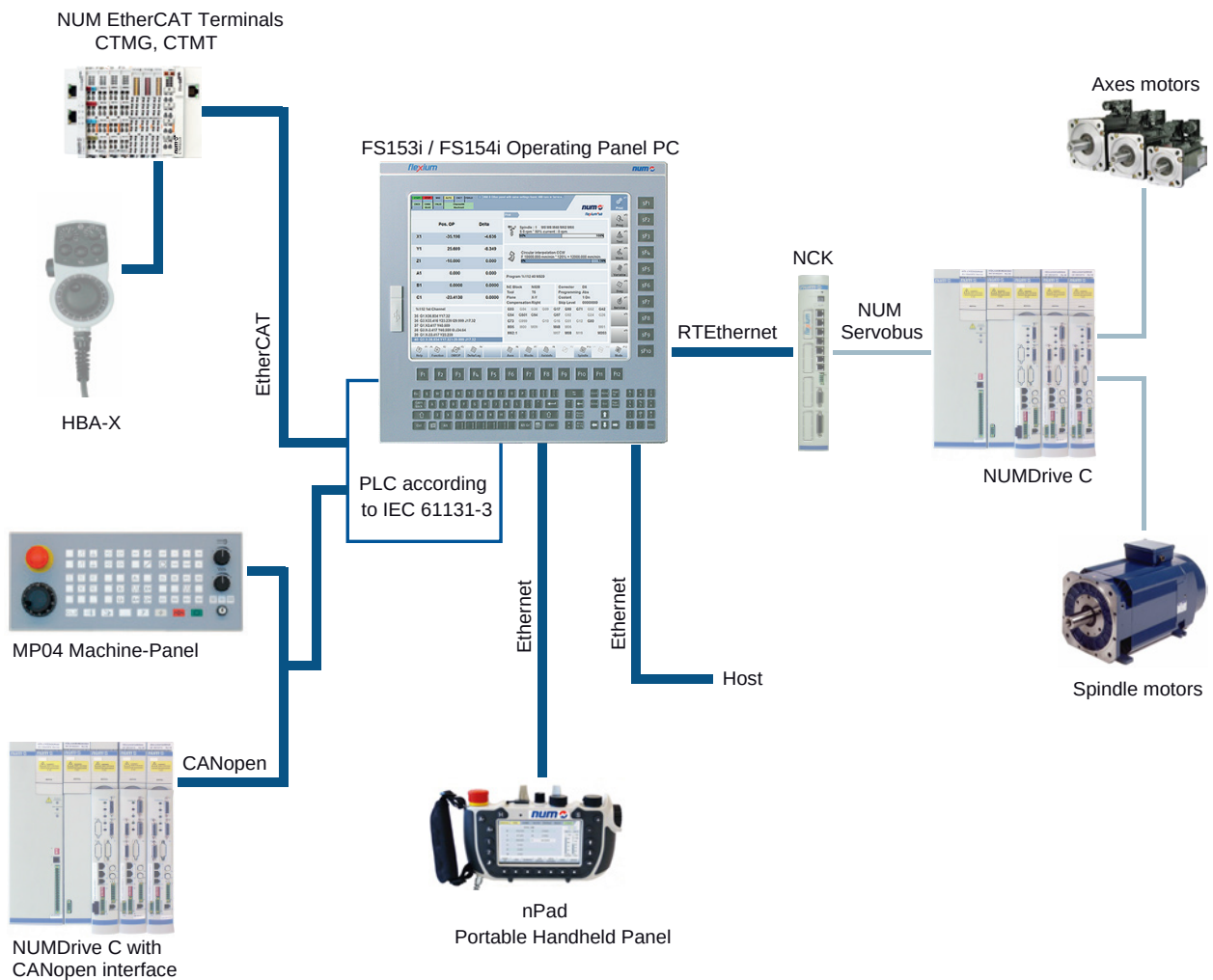
### 2.3.1 Flexium 6

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

### 2.3.2 Flexium 8

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

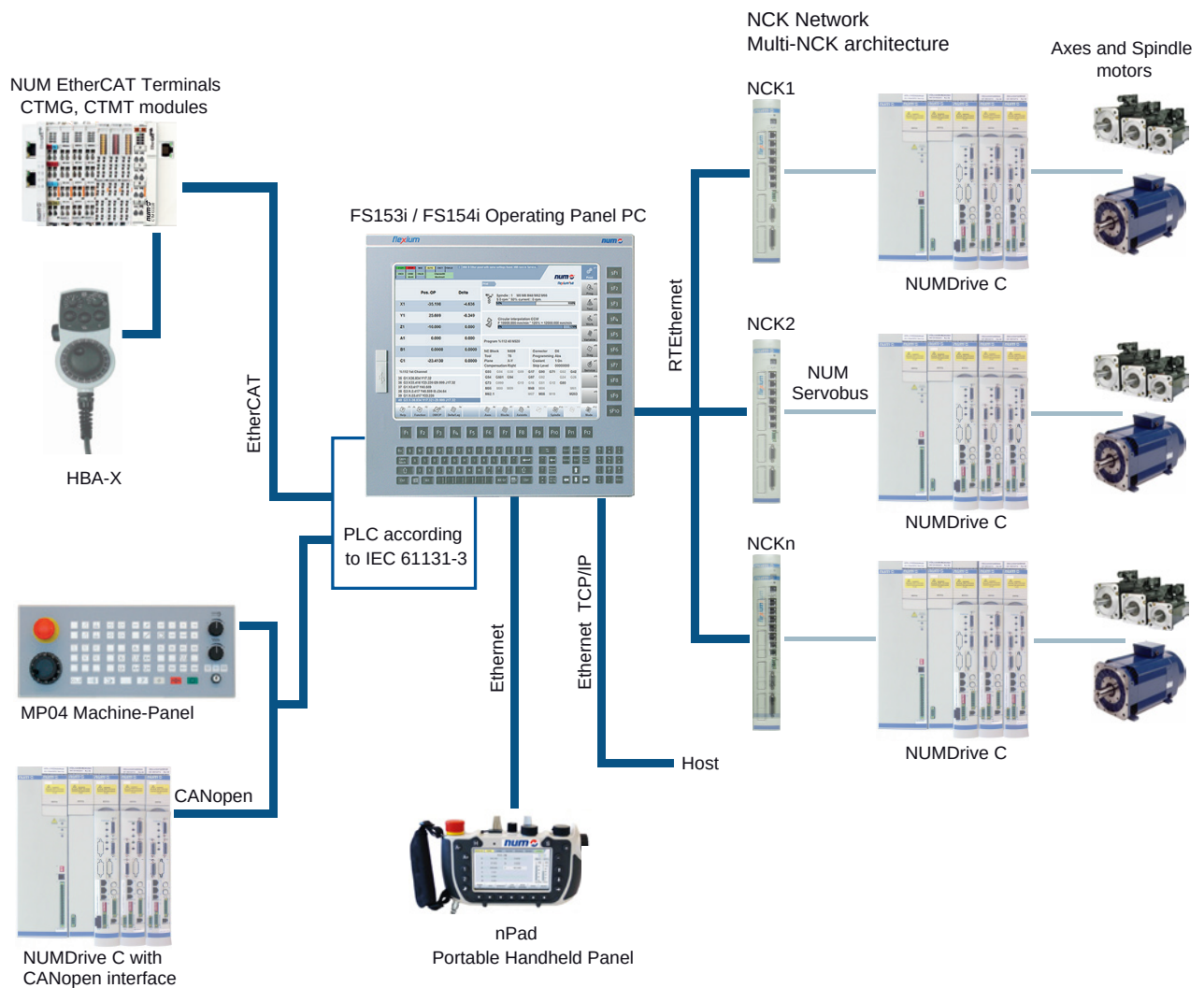
#### Flexium 6 and Flexium 8 systems



### 2.3.3 Flexium 68 fully scalable system

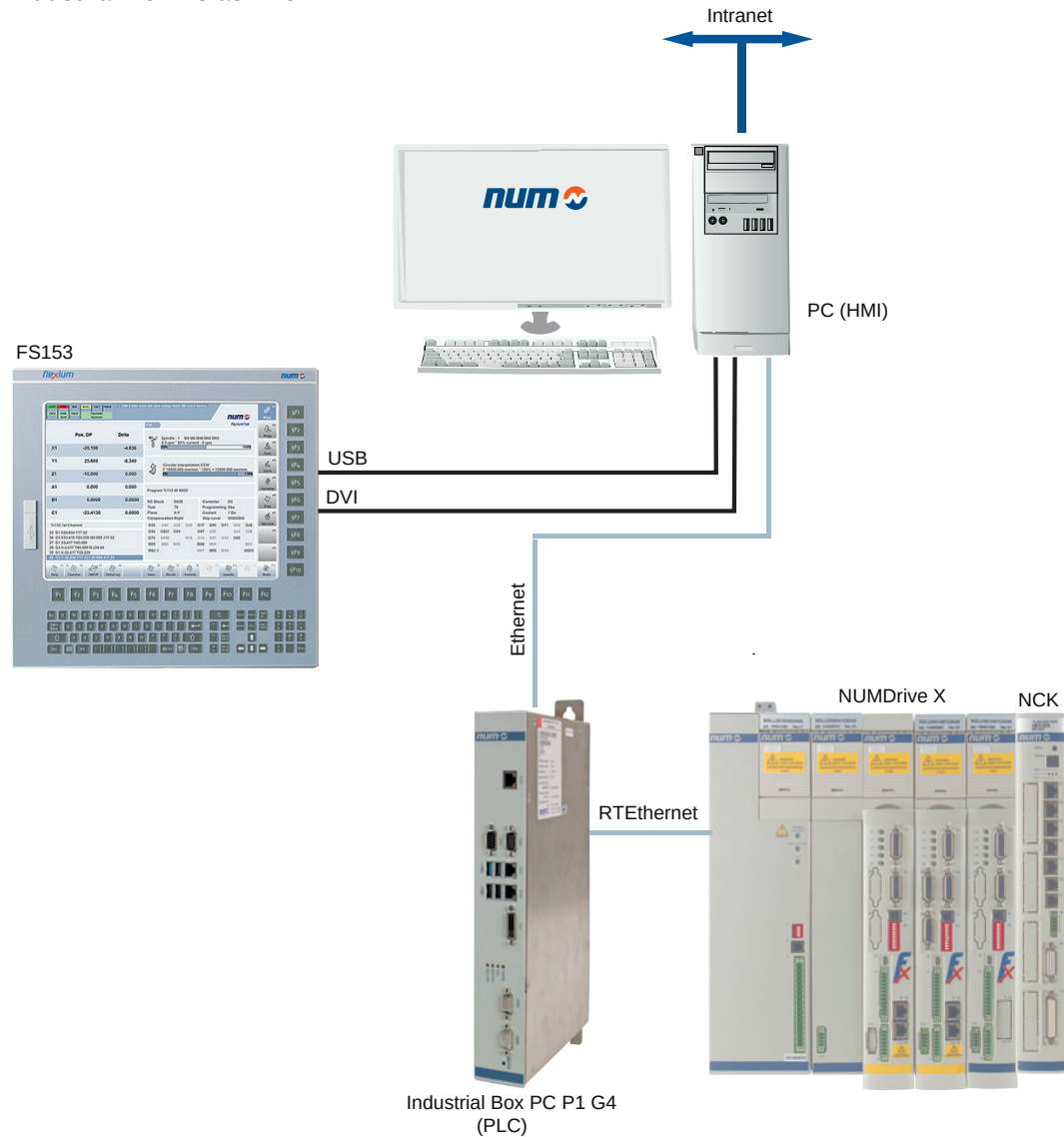
- CNC for 5 axes + spindles in standard version, up to 32 axes/spindles as an option (with a max of two analog).
- Up to 4 spindles may be parameterized.
- One channel is standard, 2, 4, 6 or 8 channels as an option.
- Interpolates 4 axes per channel as standard, up to 9 interpolated axes per channel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

#### Flexium 68 system

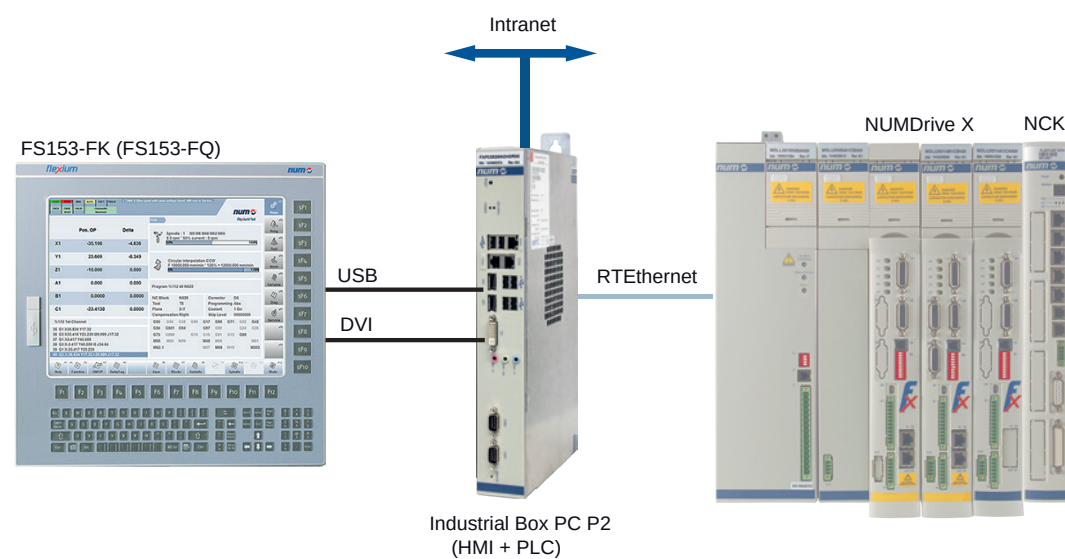


### 2.3.4 Configuration with Industrial PC

#### Industrial Box PC as PLC



#### Industrial Box PC as PC and PLC



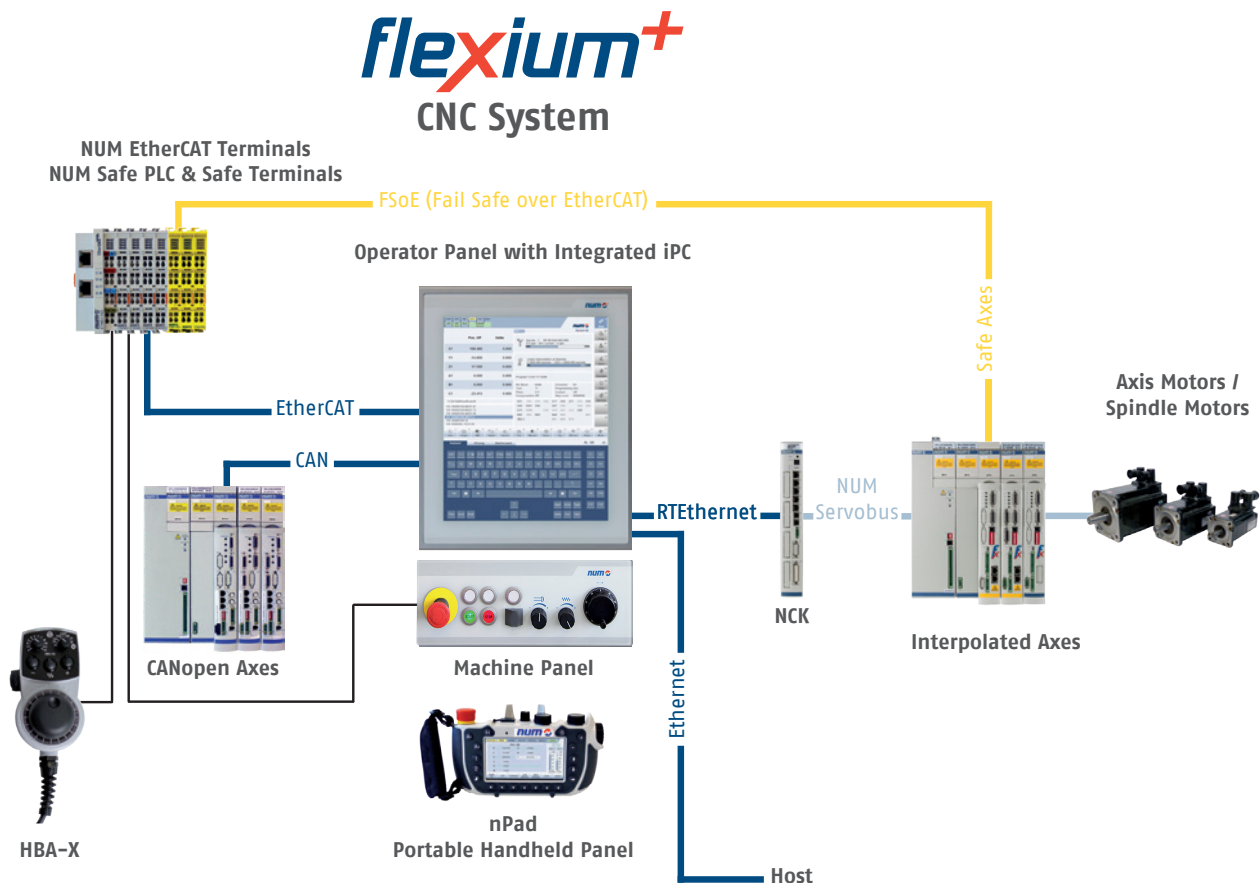
## 2.4 Flexium<sup>+</sup> 6, Flexium<sup>+</sup> 8 and Flexium<sup>+</sup> 68 systems overview

### 2.4.1 Flexium<sup>+</sup> 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<sup>+</sup> 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.



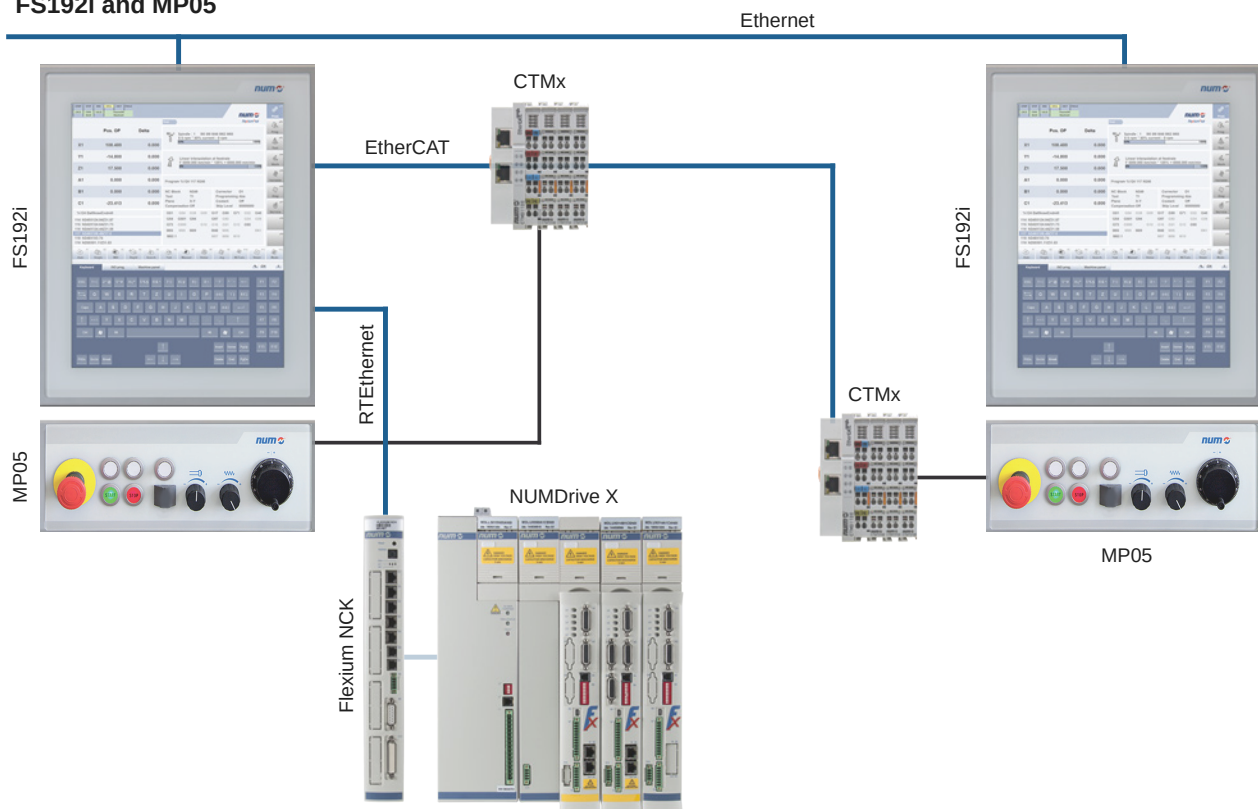
- CNC for 5 axes + spindles in standard version, up to 32 axes/spindles as an option (with a max of two analog).
- One channel is standard, 2, 4, 6 or 8 channels as an option.
- Interpolates 4 axes per channel as standard, up to 9 interpolated axes per channel as an option (more complex interpolations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



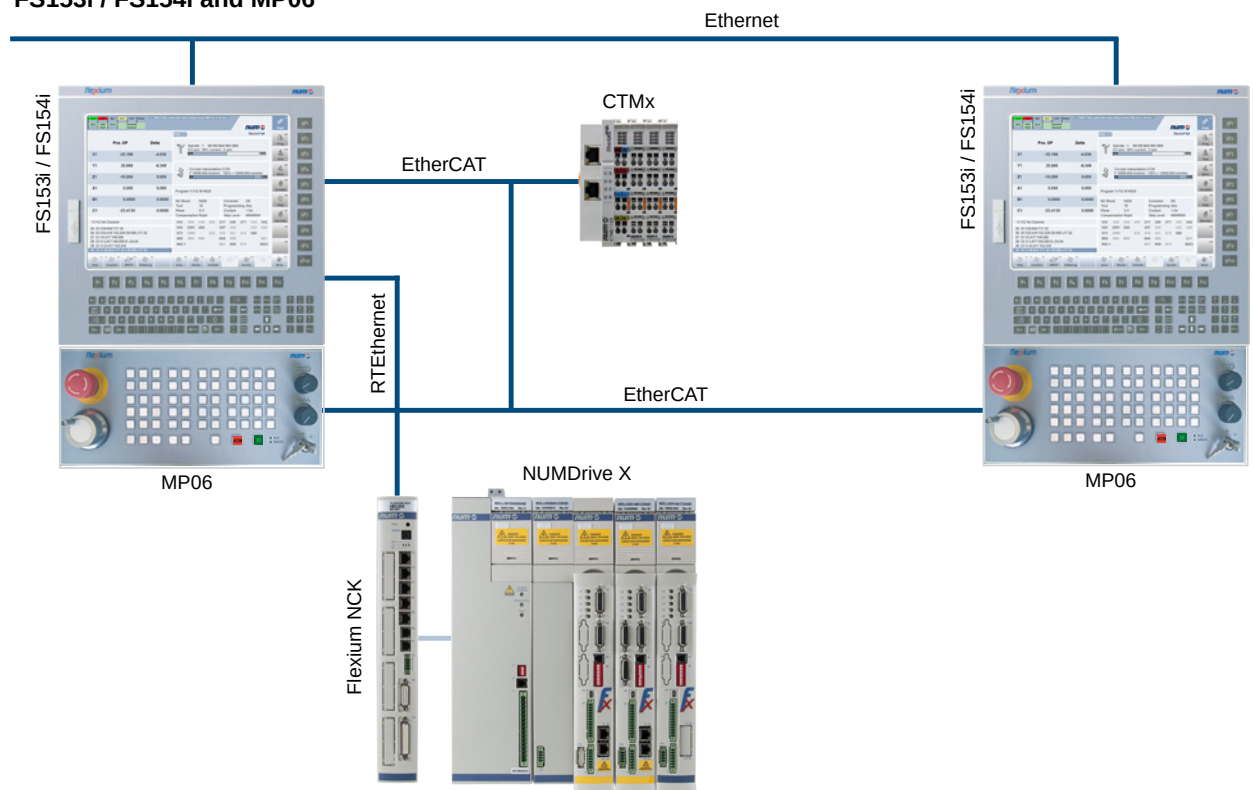


## 2.4.4 Multi Panel configuration

### FS192i and MP05

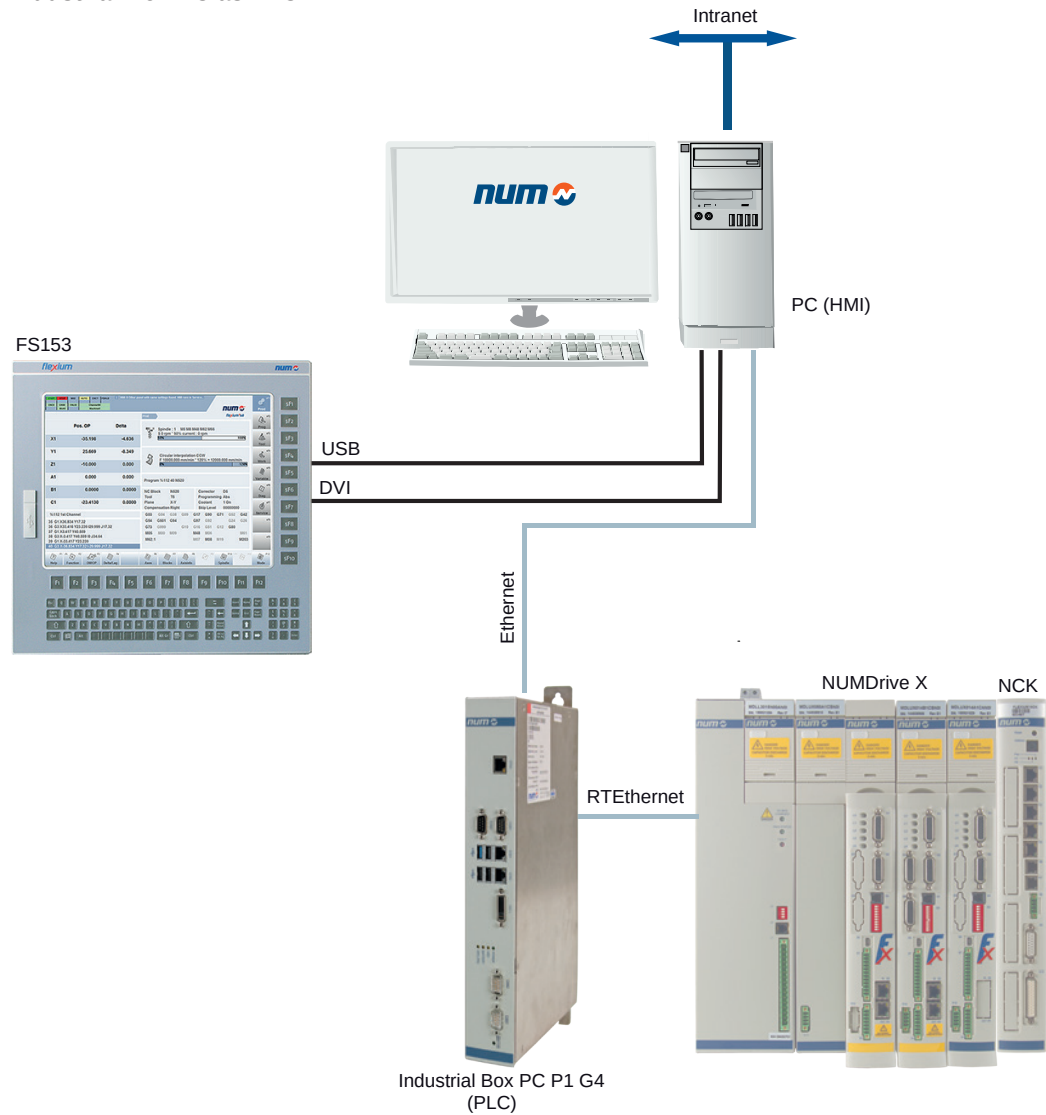


### FS153i / FS154i and MP06

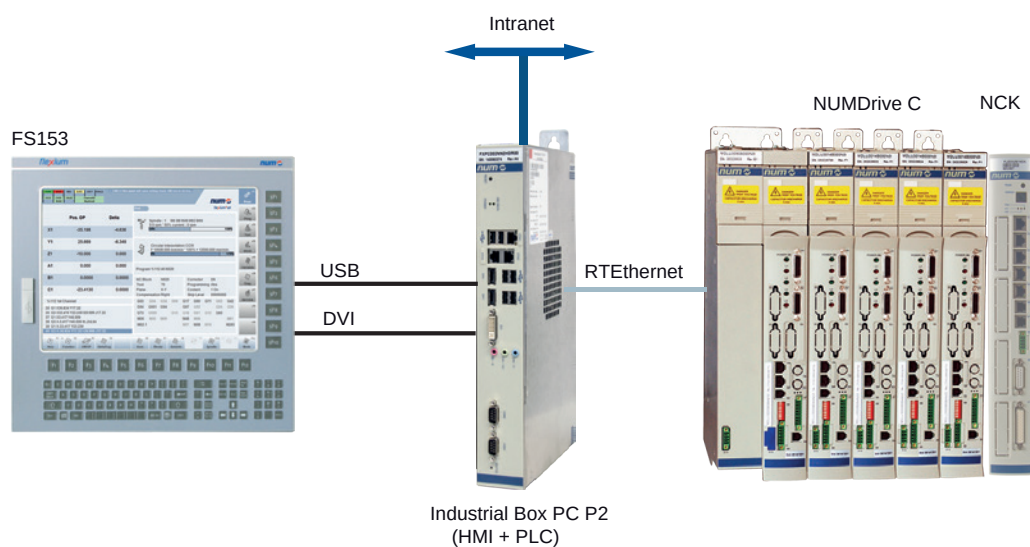


## 2.4.5 Configuration with Industrial PC

### Industrial Box PC as PLC



### Industrial Box PC as PC and PLC





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## 3 Flexium NCK

### 3.1 General

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

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

Flexium NCK is the CNC platform where the CNC software to manage part programs and machining data, to compute paths and speeds and to monitor axis movements is loaded at power up.

CNC units can be linked together in a global configuration, whereby, for example, large transfer systems with more than 200 interpolating axes can be easily implemented.

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

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



NCK front view

NCK Top view



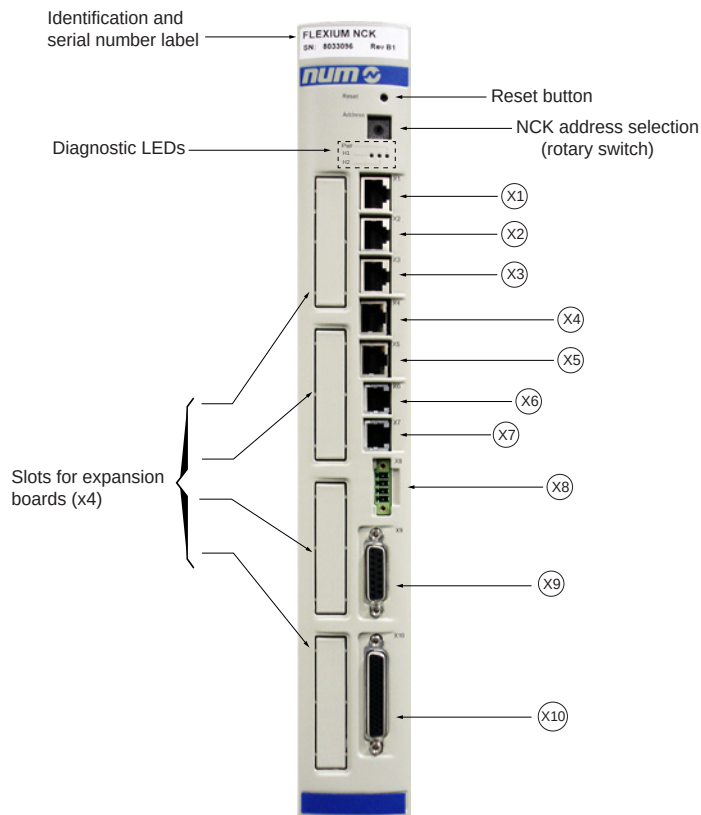
NCK Bottom view



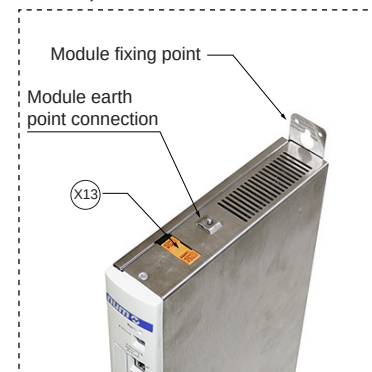
## 3.2 General characteristics

|                                   | Flexium NCK                                                                                          |                                                                                       |
|-----------------------------------|------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| <b>Power supply</b>               | 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. |                                                                                       |
| <b>Analog inputs</b>              | 4 analog input available                                                                             |                                                                                       |
|                                   | Input impedance                                                                                      | 40kΩ                                                                                  |
|                                   | Resolution                                                                                           | 12 bits                                                                               |
|                                   | Input voltage range                                                                                  | 0 / +10V                                                                              |
| <b>Analog outputs</b>             | 2 analog output available                                                                            |                                                                                       |
|                                   | Output voltage range                                                                                 | - 10V / +10V                                                                          |
|                                   | Minimum load                                                                                         | 2kΩ                                                                                   |
|                                   | Resolution                                                                                           | 16 bits                                                                               |
| <b>Digital inputs</b>             | 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)<br>- 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:<br>IEC 62000-4-5, IEC 61000-4-4, IEC 61000-4-6                        |
| <b>Digital outputs</b>            | 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                                                                   |
| <b>Digital inputs for probing</b> | 2 digital inputs available                                                                           |                                                                                       |
|                                   | Maximum operational current                                                                          | 2mA                                                                                   |
|                                   | Minimum current required                                                                             | 1mA                                                                                   |
|                                   | Input on 24V                                                                                         | - Low-level voltage: between 0 and 4.7V.<br>- High-level voltage: between 18 and 27V  |
| <b>Analogue Axes</b>              | Maximum 2. Please refer to chapter 7.9.8 for more detailed informations.                             |                                                                                       |
| <b>Watchdog</b>                   | 2 NO independant contacts                                                                            |                                                                                       |
| <b>Ambient conditions</b>         | Operating temperature range                                                                          | 0°C to 40°C                                                                           |
|                                   | Climatic conditions storage                                                                          | -25°C to 70°C                                                                         |
|                                   | Relative humidity, noncondensing                                                                     | max 75%                                                                               |
| <b>Protection class</b>           | IP 20                                                                                                |                                                                                       |
| <b>Weight</b>                     | ca. 2.2kg                                                                                            |                                                                                       |
| <b>Dimensions</b>                 | W x H x D:                                                                                           | 50 x 355 x 206mm (see also chapter 3.4)                                               |

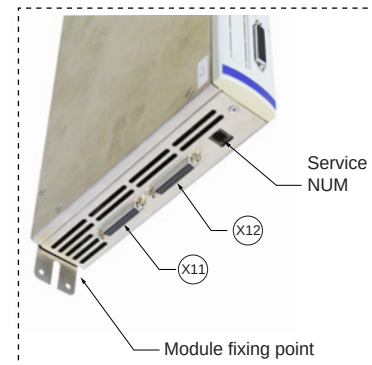
### 3.3 Overall layout and connectors



NCK Top view



NCK Bottom view

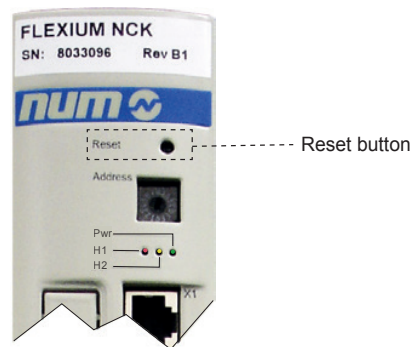


| Connector  | Type             | Description                                                                                                                                                   |
|------------|------------------|-----------------------------------------------------------------------------------------------------------------------------------------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

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### 3.3.1 Reset button

Do not use. Internal NUM use only.



### 3.3.2 Address rotary switch

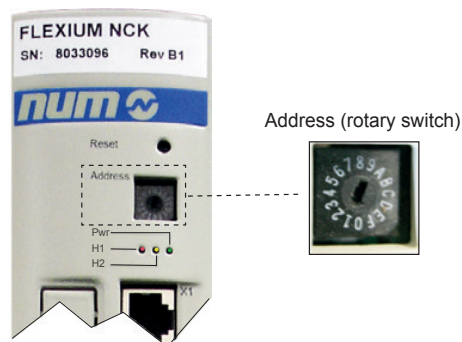
The rotary switch allows to assigning an address to NCK. Each NCK module must receive a unique address. This address is assigned with the aid of the 16-position rotary switch located on the NCK front panel as indicated here under.

Please rotate the switch using an adequate screwdriver.

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

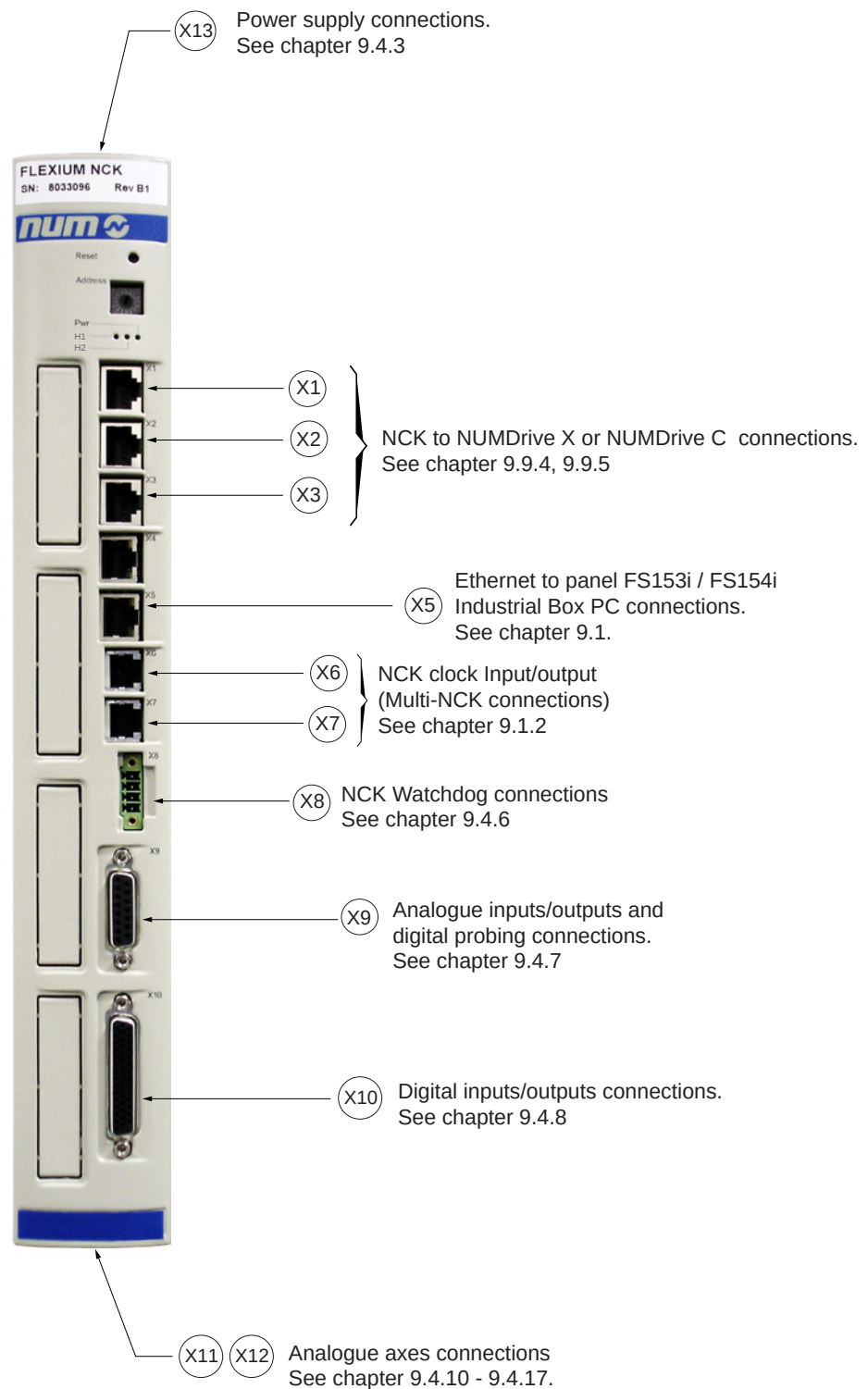
In standard configuration (one NCK module) P99 N1 must correspond to the physical address of the NCK module. In Multi-NCK configurations each module should have its own physical address but its P99 N1 must contain the address of the master NCK module. Default address is 0.

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



### 3.3.3 NCK connectors

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

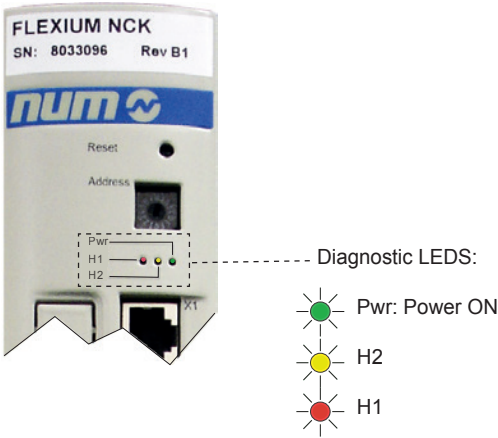




3.3.4 LED status signalling

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

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



3.3.4.1 LED status signalling

| LED status | Meaning                                    | Status timing |
|------------|--------------------------------------------|---------------|
|            | LED ON                                     |               |
|            | Blink 1                                    |               |
|            | Blink 2                                    |               |
|            | Blink 3                                    |               |
|            | Blink 4                                    |               |
|            | Blink 5 :<br>two LEDs alternately blinking |               |
|            | LED OFF                                    |               |

Legend : LED ON  
 LED blink  
 LED OFF

### 3.3.4.2 LED error signalling

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

| Led Status                                                                          |                                                                                     |                                                                                     |                                                                                                                                                                                      |
|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| H1                                                                                  | H2                                                                                  | Pwr                                                                                 | Cause                                                                                                                                                                                |
|    |    |    | Power OFF                                                                                                                                                                            |
|    |    |    | System OK                                                                                                                                                                            |
|    |    |    | <ul style="list-style-type: none"> <li>Waiting for firmware upload.</li> <li>FSxxxxi or Industrial Box PC not fully started</li> </ul>                                               |
|    |    |    | Firmware upload in progress.                                                                                                                                                         |
|    |    |    | Firmware upload aborted.                                                                                                                                                             |
|    |    |    | <ul style="list-style-type: none"> <li>Machine error (e.g. excess following error).</li> <li>CNC_Ready flag will be OFF.</li> <li>RAZ procedure under way, CNC not ready.</li> </ul> |
|    |    |    | <ul style="list-style-type: none"> <li>Communication error between CNC and PLC.</li> <li>CNC_Ready flag and Watchdog will be OFF.</li> </ul>                                         |
|   |    |    | <ul style="list-style-type: none"> <li>Too many DISC NT errors.</li> <li>Wiring – Perturbations or Drive fault.</li> </ul>                                                           |
|  |  |  | <ul style="list-style-type: none"> <li>DISC NT overload.</li> <li>Check the configuration.</li> </ul>                                                                                |
|  |  |  | <ul style="list-style-type: none"> <li>Processor exception.</li> <li>Firmware error – Reboot system.</li> </ul>                                                                      |
|  |  |  | <ul style="list-style-type: none"> <li>Processor in Halt.</li> <li>Hardware error.</li> </ul>                                                                                        |

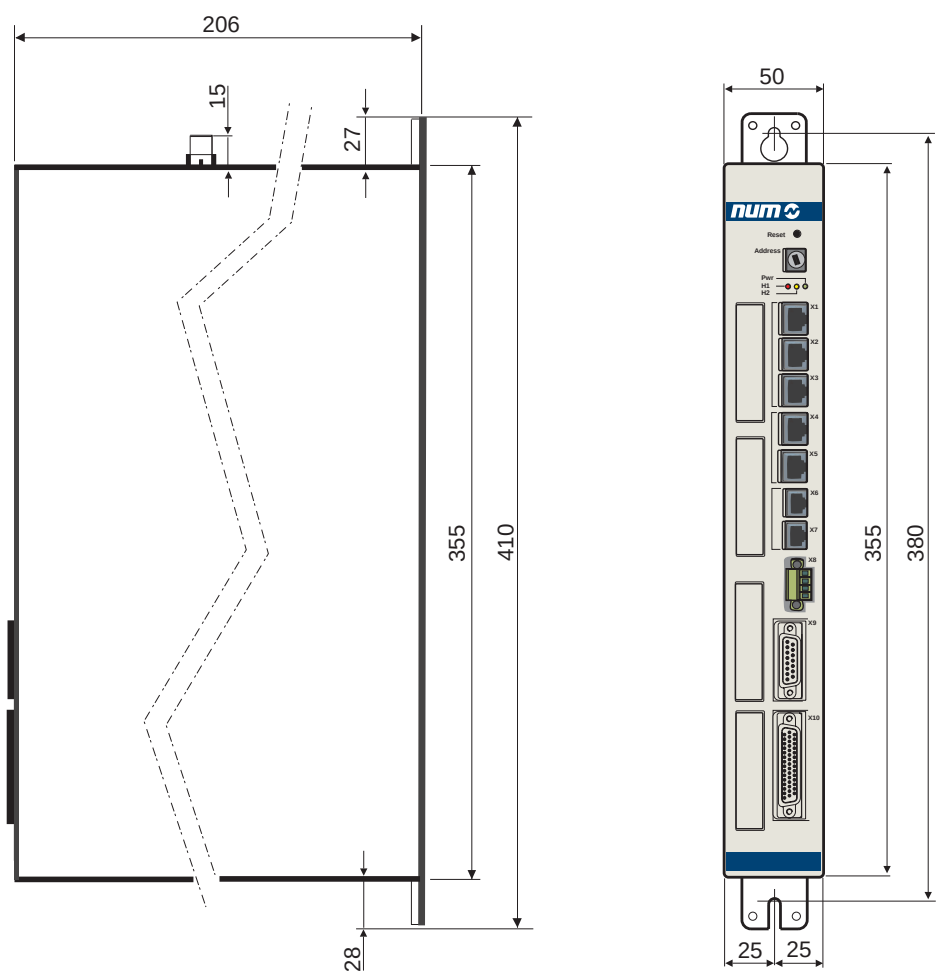
Legend :

-  LED ON
-  LED blink
-  LED OFF

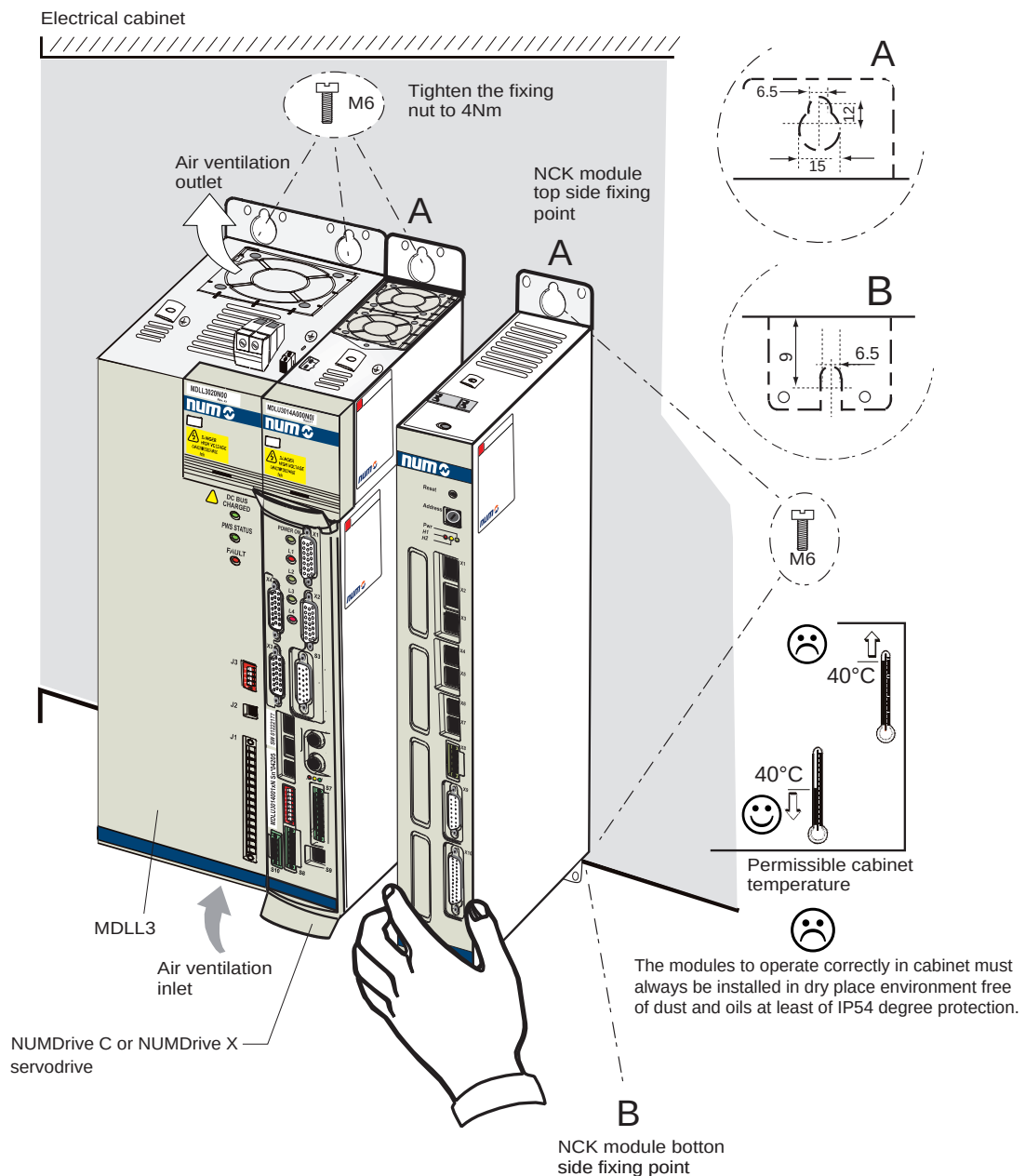


In case of system malfunction, it may be necessary to restart the full system (NCK and PC). Each NCK unit is personalized with an unique identifier. In the unlikely case of failure get in touch with the NUM Service before returning the defective component.

3.4 NCK overall dimensions



### 3.5 Assembly NCK in electrical cabinet



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.

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## 3.6 NCK installation and connections

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

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## 4 Flexium Panels FS - Operators panels

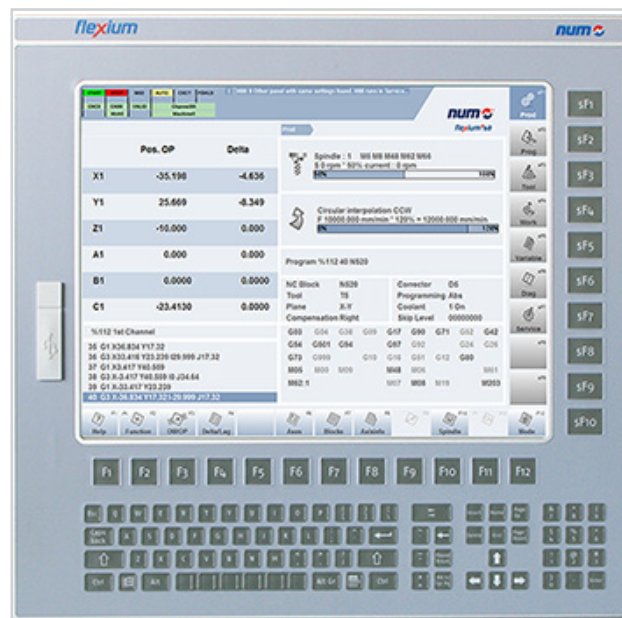
### 4.1 FS153i Operator panels with Integrated iPC

FS153i PC panels provide a powerful and ergonomic platform for Flexium<sup>+</sup> HMI, enabling you to interact with the machine in a simple and logical manner. The integrated PCs use modern dual-core processors. Two performance levels are available: P1 and P2.

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.

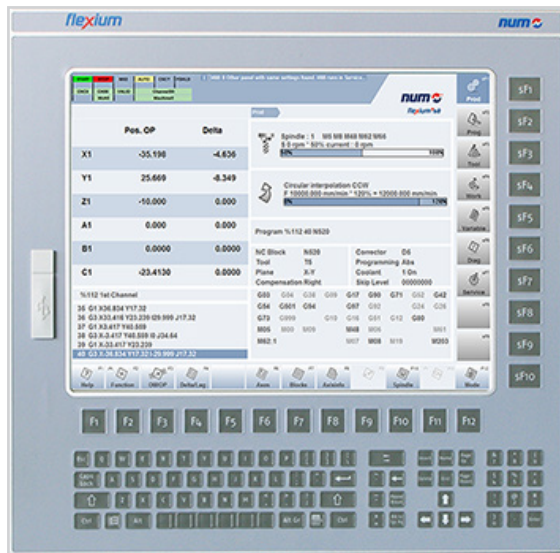
The display quality of their 15.1" screen makes them very legible even in poorly-lit environments. Compact, they are also very rugged and sealed (IP 65) for compatibility with the most severe industrial environments.



#### 4.1.1 FS153i User interface options



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



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

Both configurations are available with touch screen coding "R".

#### 4.1.2 FS153i available versions

| FS153i version                  | Ordering code          | Operating system   |
|---------------------------------|------------------------|--------------------|
| FS153i-FK P2 HD RT              | <b>FXPC153NF2HNR10</b> | WE8.1 Industry Pro |
| FS153i-FQ P2 HD RT              | <b>FXPC153NQ2HNR10</b> | WE8.1 Industry Pro |
| FS153i-FK TS P2 HD RT           | <b>FXPC153RF2HNR10</b> | WE8.1 Industry Pro |
| FS153i-FQ TS P2 HD RT           | <b>FXPC153RQ2HNR10</b> | WE8.1 Industry Pro |
| FS153i-FK P2 HD RT CAN NVRAM    | <b>FXPC153NF2HDR10</b> | WE8.1 Industry Pro |
| FS153i-FQ P2 HD RT CAN NVRAM    | <b>FXPC153NQ2HDR10</b> | WE8.1 Industry Pro |
| FS153i-FK TS P2 HD RT CAN NVRAM | <b>FXPC153RF2HDR10</b> | WE8.1 Industry Pro |
| FS153i-FQ TS P2 HD RT CAN NVRAM | <b>FXPC153RQ2HDR10</b> | WE8.1 Industry Pro |
| FS153i-FK P1 CF RT              | <b>FXPC153NF1CNR00</b> | WES2009            |
| FS153i-FQ P1 CF RT              | <b>FXPC153NQ1CNR00</b> | WES2009            |
| FS153i-FK P1 CF RT CAN NVRAM    | <b>FXPC153NF1CDR00</b> | WES2009            |
| FS153i-FQ P1 CF RT CAN NVRAM    | <b>FXPC153NQ1CDR00</b> | WES2009            |



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### 4.1.3 FS153i ordering code

|                                                                                        |           |          |          |          |          |          |          |          |          |          |
|----------------------------------------------------------------------------------------|-----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|
| <b>FXPC</b>                                                                            | <b>15</b> | <b>3</b> | <b>R</b> | <b>F</b> | <b>2</b> | <b>H</b> | <b>D</b> | <b>R</b> | <b>1</b> | <b>0</b> |
| <b>Display Unit</b><br>• LCD 15"                                                       | 15        |          |          |          |          |          |          |          |          |          |
| <b>Panel/mechanical variant</b><br>• Third generation                                  |           | 3        |          |          |          |          |          |          |          |          |
| <b>Display Sensor</b><br>• Touch Screen resistive (2)<br>• No Touch Sensor             |           |          | R<br>N   |          |          |          |          |          |          |          |
| <b>Keyboard type</b><br>• 22 Function keys<br>• 22 Function keys + QWERTY Keyboard     |           |          |          | F<br>Q   |          |          |          |          |          |          |
| <b>IPC mother board, Processor</b><br>• Performance level P1<br>• Performance level P2 |           |          |          |          | 1<br>2   |          |          |          |          |          |
| <b>Mass memory type</b><br>• Compact Flash (1)<br>• HD (Hard Disk) (2)                 |           |          |          |          |          | C<br>H   |          |          |          |          |
| <b>Option board</b><br>• No fieldbus<br>• CAN + NVRAM                                  |           |          |          |          |          |          | N<br>D   |          |          |          |
| <b>Flexium RTS</b><br>• Real time                                                      |           |          |          |          |          |          |          | R        |          |          |
| <b>Operative System</b><br>• Windows XP kernel (1)<br>• Windows 8 kernel (2)           |           |          |          |          |          |          |          |          | 0<br>1   |          |
| <b>Spare number</b>                                                                    |           |          |          |          |          |          |          |          |          | 0        |

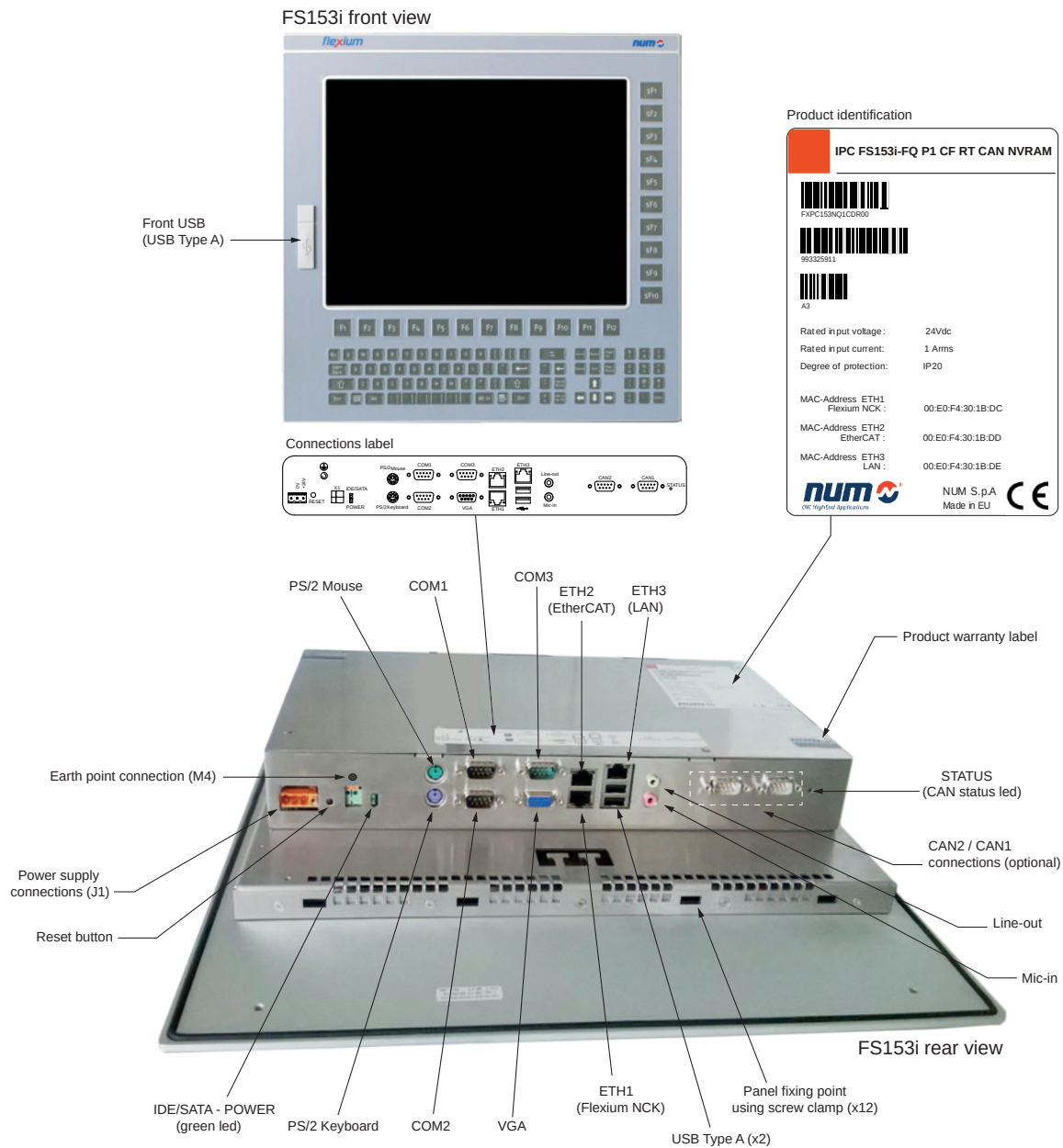
- (1) For P1 performance level  
(2) For P2 performance level

#### 4.1.4 General characteristics

|                                 |                                     | FXPC153NF1Cxxxx<br>FXPC153NQ1Cxxxx                                                                                                                                                                    | FXPC153NF2Hxxxx<br>FXPC153NQ2Hxxxx<br>FXPC153RF2Hxxxx<br>FXPC153RQ2Hxxxx |
|---------------------------------|-------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------|
| <b>Screen</b>                   | User interface options              | Active panel with integrated PC with:<br>- 22 Function Keys,<br>- 22 Function Keys and Qwerty Keyboard,<br>- Touch Screen (resistive)                                                                 |                                                                          |
|                                 | Technology                          | 15" TFT LCD (16.9 million colours)                                                                                                                                                                    |                                                                          |
|                                 | Resolution:                         | 1024 x 768 from 60Hz to 75Hz                                                                                                                                                                          |                                                                          |
|                                 | Size:                               | 304 x 228 mm (12 x 9 inch)                                                                                                                                                                            |                                                                          |
|                                 | Backlight:                          | LED, Contr. 700:1 (Typ)                                                                                                                                                                               |                                                                          |
| <b>Main PC features</b>         | CPU                                 | Atom™ D525 1.8 GHz Dual Core                                                                                                                                                                          | i5-2510E 2.5 GHz Dual Core                                               |
|                                 | RAM                                 | 2GB                                                                                                                                                                                                   | 2GB                                                                      |
|                                 | Mass storage                        | 8 GB SLC Compact Flash                                                                                                                                                                                | 250 GB Hard Disk                                                         |
|                                 | Operating system                    | WES 2009                                                                                                                                                                                              | Win. Embedded 8.1 Industry Pro                                           |
| <b>Communication Interfaces</b> | Ethernet (ETH)                      | 3 x Gigabit LAN / RTE                                                                                                                                                                                 | 3 x Gigabit LAN / RTE                                                    |
|                                 | USB front                           | 1 x Type A V2.0                                                                                                                                                                                       |                                                                          |
|                                 | USB rear                            | 2 x Type A V2.0                                                                                                                                                                                       | 6 x Type A V2.0                                                          |
|                                 | Serial interface                    | 3 x COM                                                                                                                                                                                               | No                                                                       |
|                                 | Dual CAN + NVRAM                    | Optional                                                                                                                                                                                              |                                                                          |
|                                 | DVI-I interface                     | No                                                                                                                                                                                                    | 1                                                                        |
|                                 | VGA interface                       | 1                                                                                                                                                                                                     | No                                                                       |
|                                 | DisplayPort                         | No                                                                                                                                                                                                    | 2                                                                        |
|                                 | Line IN/Line OUT MIC                | Yes                                                                                                                                                                                                   |                                                                          |
| <b>Power supply</b>             | 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. 48W<br><br>As point of reference, the 24V-power supply should be rated for 4A continuous load.                                                                                                    | ca. 68W                                                                  |
| <b>Ambient conditions</b>       | Climatic conditions operation       | 0..45°C, 70% rel. air humidity, non-condensing<br>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         | -40...80°C, 70% rel. air humidity, non-condensing                                                                                                                                                     |                                                                          |
|                                 | Climatic conditions, transport      | Class 2K3 EN50178 (reduced) -20...60°C, 10...90% rel. Air humidity, non-condensing.                                                                                                                   |                                                                          |
| <b>EMC</b>                      | EMC immunity                        | Industry EN 61000-6-2                                                                                                                                                                                 |                                                                          |
|                                 | EMC emission                        | Residential area EN 61000-6-3                                                                                                                                                                         |                                                                          |
| <b>Degree of protection</b>     | Front                               | IP 65                                                                                                                                                                                                 |                                                                          |
|                                 | Rear                                | IP 20                                                                                                                                                                                                 |                                                                          |
|                                 | Pollution degree                    | 2                                                                                                                                                                                                     |                                                                          |
| <b>Weight</b>                   |                                     | ca. 6.1 kg Function Key version, ca. 6.5 kg Full Qwerty version                                                                                                                                       |                                                                          |
| <b>Dimensions</b>               | W x H x D:                          | 410 x 330 (400) x 72.3 mm                                                                                                                                                                             |                                                                          |
| <b>Fan</b>                      | Type                                | Internal with fan                                                                                                                                                                                     |                                                                          |
| <b>Noise</b>                    |                                     | <70dB                                                                                                                                                                                                 |                                                                          |

## 4.1.5 FS153i (with integrated iPC) module description

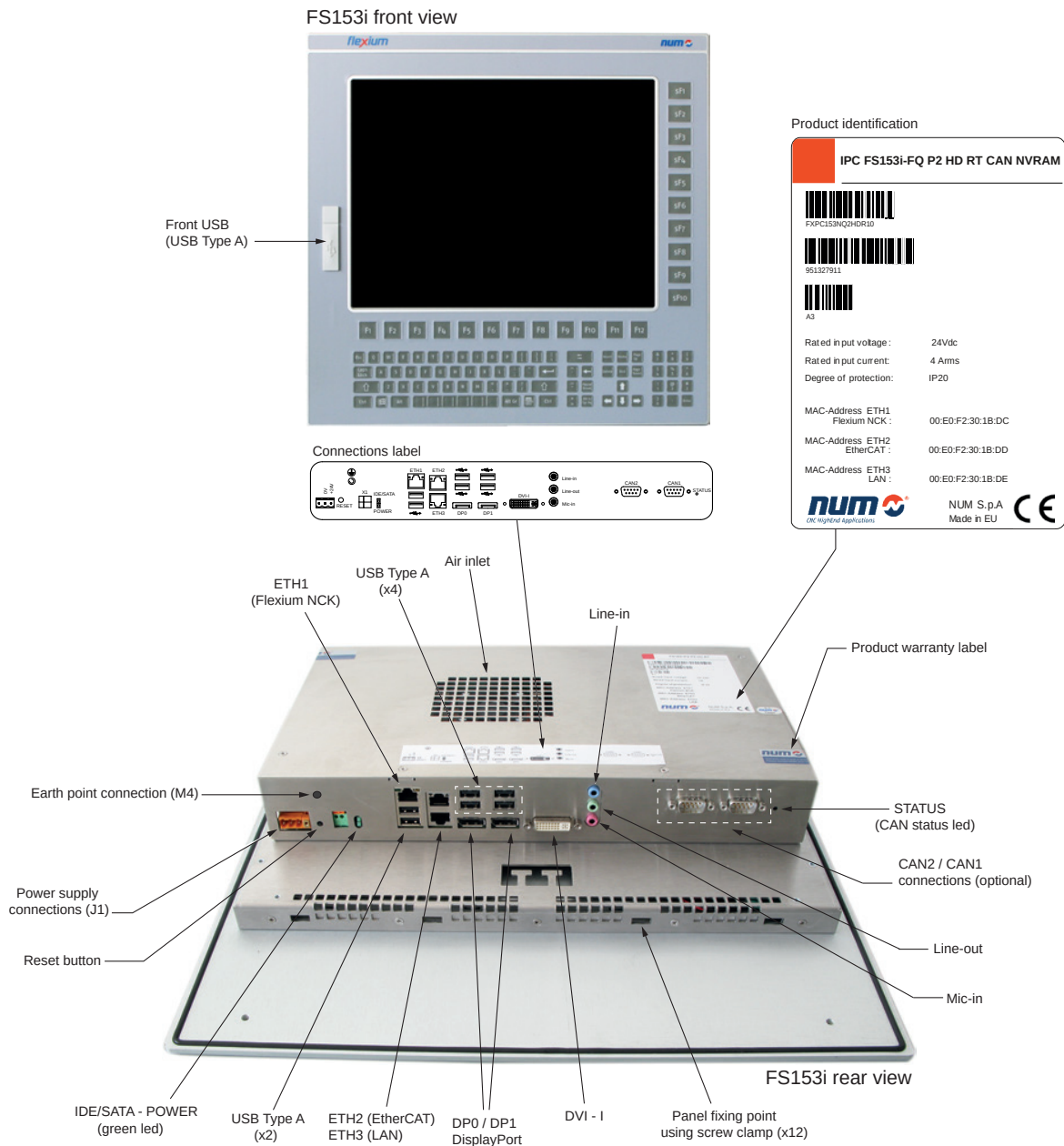
### 4.1.5.1 FS153i-FQ P1 CF RT CAN NVRAM module example



| Connector     | Type                 | Description                                       |
|---------------|----------------------|---------------------------------------------------|
| Power supply  | 3 screws pins F      | FS153i power supply connections                   |
| COM1          | RS232 Sub D 9 pins M | Serial interface. General user purpose            |
| COM2          |                      |                                                   |
| COM3          |                      |                                                   |
| ETH1          | RJ45 (8P/8C)         | Flexium NCK Ethernet connections                  |
| ETH2          | RJ45 (8P/8C)         | EtherCAT port connections                         |
| ETH3          | RJ45 (8P/8C)         | Company LAN                                       |
| CAN1 / CAN2   | Sub D 9 pins M       | Dual CAN + NVRAM interface (optional)             |
| VGA           | Sub D HD 15 pins F   | Video interface PC compatible connection          |
| USB (Front)   | Type A V2.0          | General user purpose. (Mouse and all USB devices) |
| USB x2 (Rear) |                      |                                                   |



#### 4.1.6.1 FS153i-FQ P2 CF RT CAN NVRAM module example

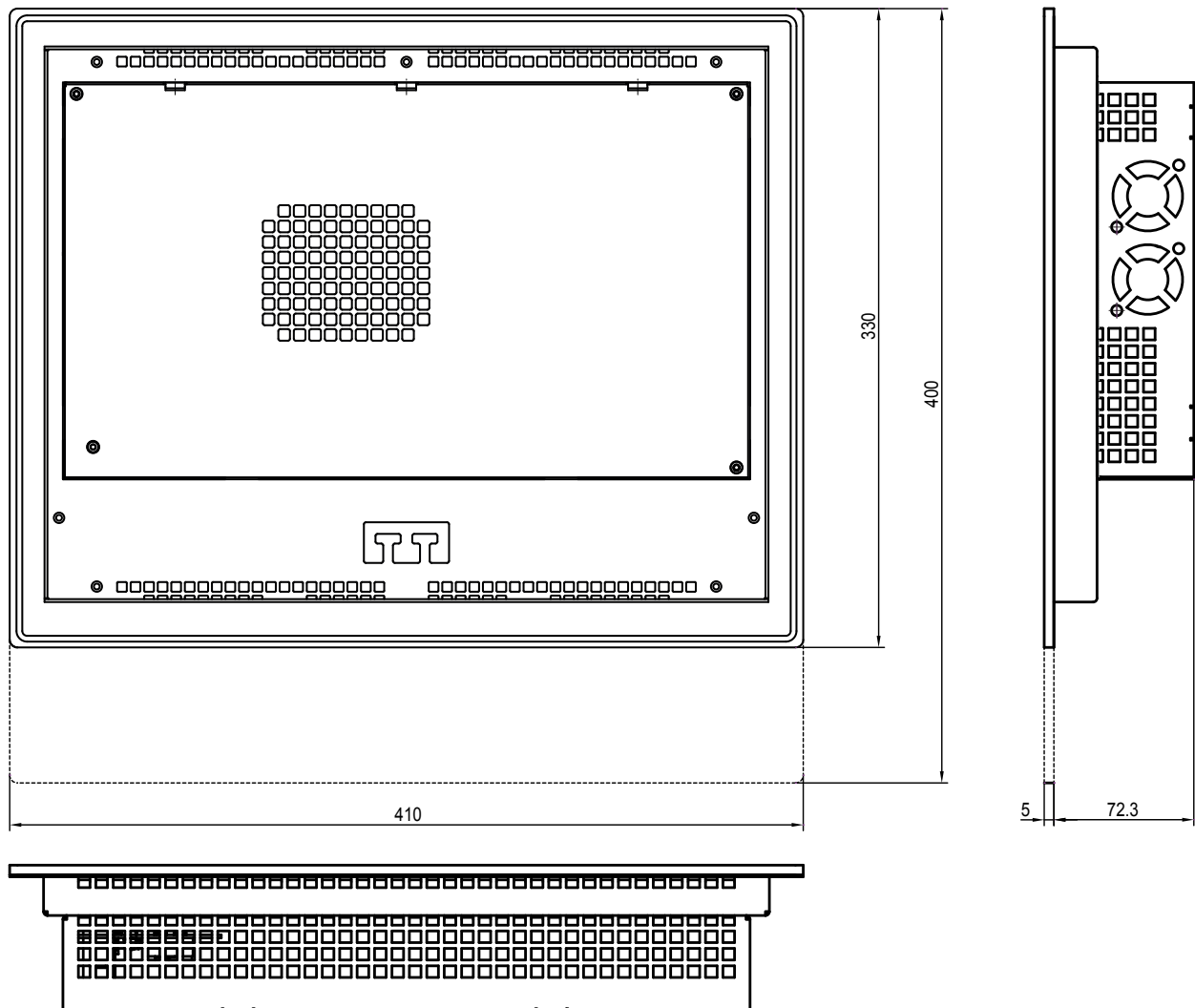


| Connector       | Type            | Description                                       |
|-----------------|-----------------|---------------------------------------------------|
| Power supply    | 3 screws pins F | FS153i power supply connections                   |
| ETH1            | RJ45 (8P/8C)    | Flexium NCK Ethernet connections                  |
| ETH2            | RJ45 (8P/8C)    | EtherCAT port connections                         |
| ETH3            | RJ45 (8P/8C)    | Company LAN                                       |
| CAN1 / CAN2     | Sub D 9 pins M  | Dual CAN + NVRAM interface (optional)             |
| DP0 / DP1       | -               | DisplayPort                                       |
| USB X 1 (Front) | Type A V2.0     | General user purpose. (Mouse and all USB devices) |
| USB x 6 (Rear)  |                 |                                                   |
| DVI-I           | Standard DVI    | Video interface PC compatible connection          |



## 4.1.7 Installation of Panels FS153i

### 4.1.7.1 Detailed dimensions



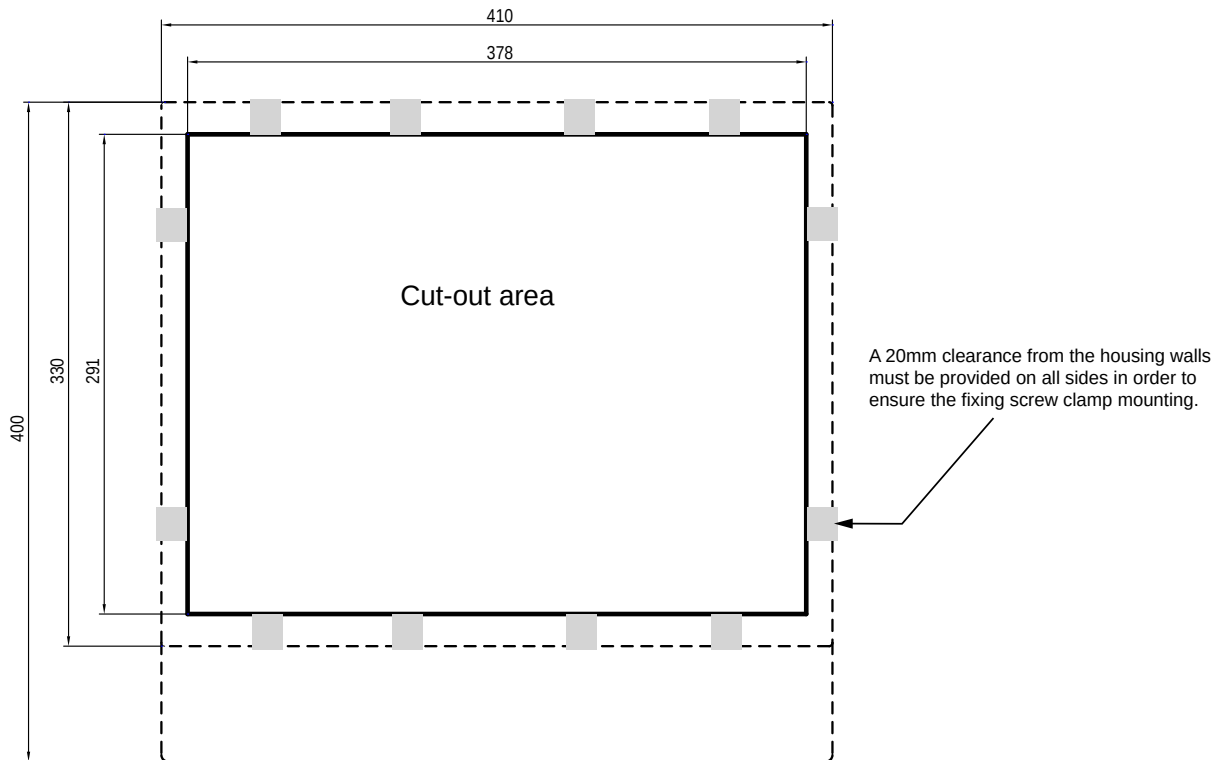
The FS153i can be operated at a maximum ambient temperature of 45°C. The ambient temperature is based on the temperature of the area 5 cm above the panel with the device mounted vertically at a height of 2000 m above sea level.

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

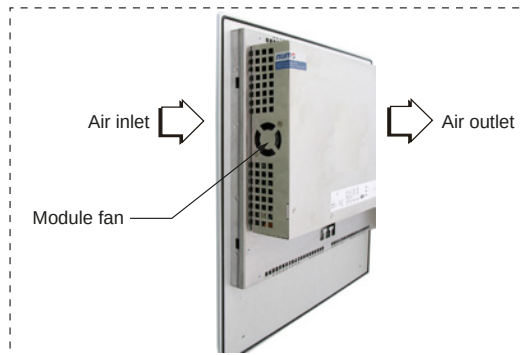
A minimum clearance of 75mm must be provided to active elements such as power supplies, transformers etc.

#### 4.1.7.2 Panel FS153i P1 cut-out, hole pattern and panel mounting

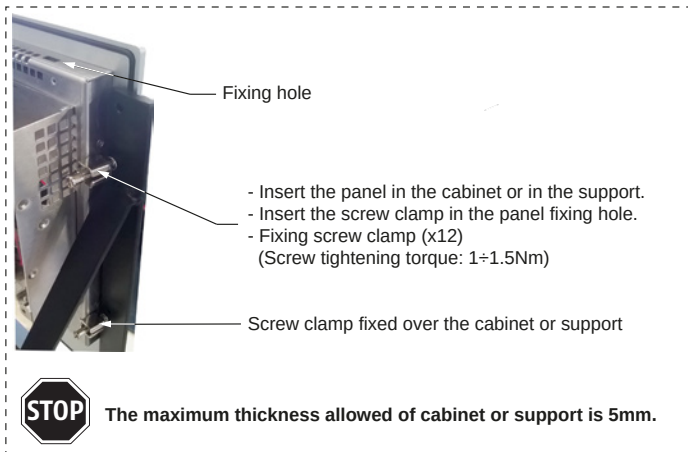
##### Cut-out and hole pattern



##### Panel ventilation

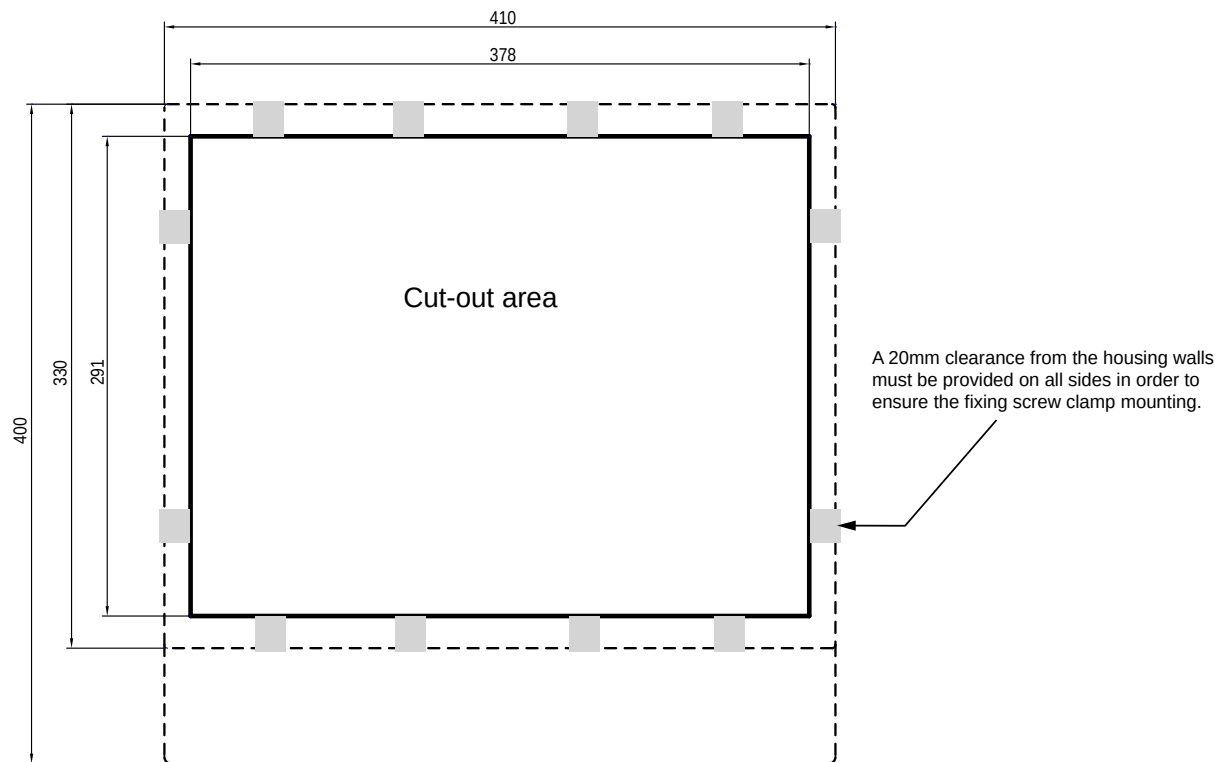


##### Panel mounting and fixing (example with support)

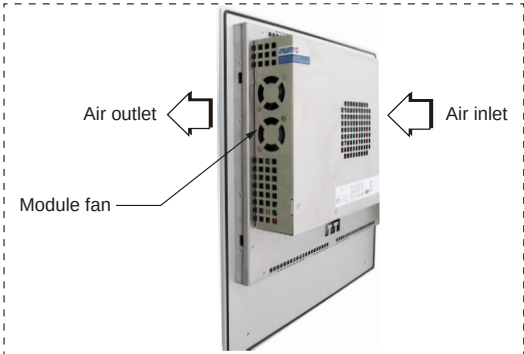


4.1.7.3 Panel FS153i P2 cut-out, hole pattern and panel mounting

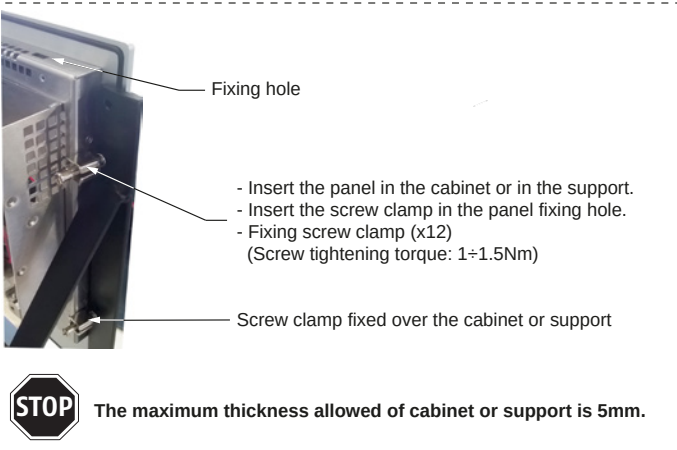
Cut-out and hole pattern



Panel ventilation



Panel mounting and fixing (example with support)



### 4.1.8 Power up and shutdown

FS153i 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 initialized by the PLC program or by windows itself.

### 4.1.9 Diagnostics

| Symptom                                              | Possible cause and remedy                                                                                                                                                                                                                                                                    |
|------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Dark screen during power-up                          | <ul style="list-style-type: none"> <li>- Check power supply.</li> <li>- Loss of setup data.</li> <li>- Connect an external video display for diagnosis.</li> </ul>                                                                                                                           |
| White screen after switch off and re-switch on again | <ul style="list-style-type: none"> <li>- The ATX-power supply doesn't switch on properly because the switch off time was shorter than 20s.</li> </ul>                                                                                                                                        |
| Date/time not correct                                | Replace battery (see next page)                                                                                                                                                                                                                                                              |
| Ethernet connection missing                          | <ul style="list-style-type: none"> <li>- Incorrect Ethernet cable fitted (crossover/direct)</li> <li>- LINK-LED is lit if the connection is correct</li> <li>- ACT LED if the data transfer is correct (flashes during the transfer)</li> <li>- Incorrect/invalid IP address set.</li> </ul> |

### 4.1.10 Disposal

FS153i no longer in use must be properly disposed of or must be returned to the manufacturer for disposal. (Manufacturer address see list of NUM agencies on chapter 1)

#### Special note

The device contains a lithium battery

---

## **4.1.11 Maintenance and Repair**

### **4.1.11.1 Battery**

The battery is used to back up the clock. The battery should be changed every 5 years in order to prevent any date/time loss. Please refer to chapter 9.5.14.



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.

### **4.1.11.2 Transport**

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

### **4.1.11.3 Storage**

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

## **4.1.12 FS153i Panels connections**



Please refer to chapter 9 Flexium connections for more detailed information upon the FS153i Panels connections.

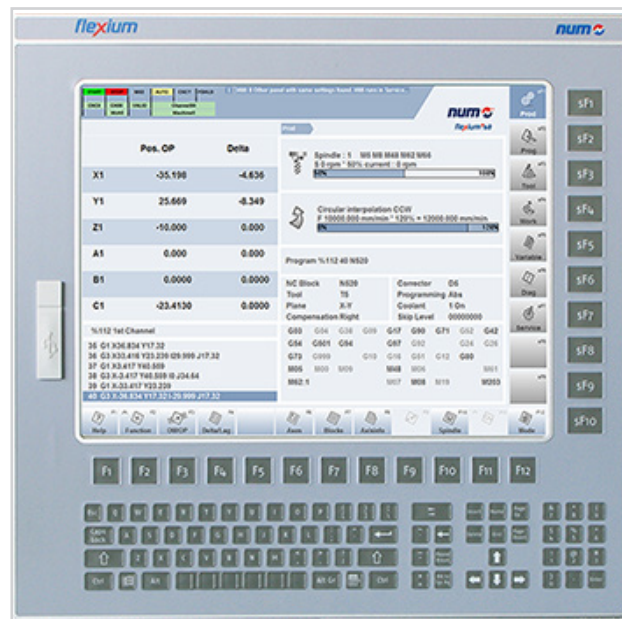
## 4.2 FS154i Operator panels with Integrated iPC

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

Depending on the application, you can choose one of three physical user interfaces:

- With 22 large function keys (keyboard option F)
- With 22 large function keys and an expanded QWERTY keyboard (keyboard option Q).
- With Touch screen available as option.

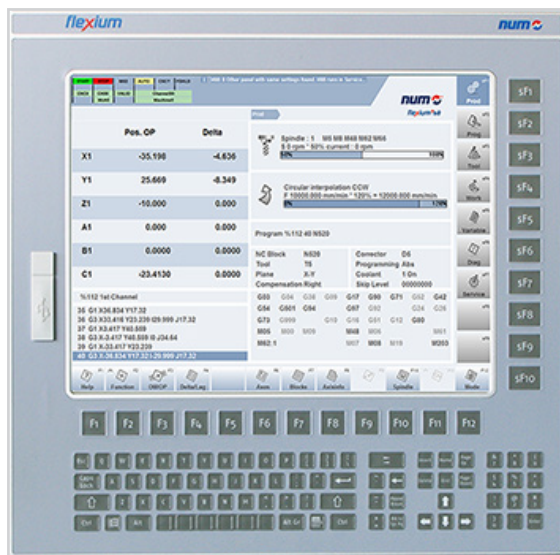
The display quality of their 15.1" screen makes them very legible even in poorly-lit environments. Compact, they are also very rugged and sealed (IP 65) for compatibility with the most severe industrial environments.



## 4.2.1 FS154i User interface options



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



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

Both configurations are available with touch screen coding "R".

### 4.2.2 FS154i available versions

| FS154i version                  | Ordering code          | Operating system   |
|---------------------------------|------------------------|--------------------|
| FS154i-FK P1 HD RT              | <b>FXPC154NF1HNR10</b> | WE8.1 Industry Pro |
| FS154i-FQ P1 HD RT              | <b>FXPC154NQ1HNR10</b> | WE8.1 Industry Pro |
| FS154i-FK P1 HD RT CAN NVRAM    | <b>FXPC154NF1HDR10</b> | WE8.1 Industry Pro |
| FS154i-FQ P1 HD RT CAN NVRAM    | <b>FXPC154NQ1HDR10</b> | WE8.1 Industry Pro |
| FS154i-FK TS P1 HD RT           | <b>FXPC154RF1HNR10</b> | WE8.1 Industry Pro |
| FS154i-FQ TS P1 HD RT           | <b>FXPC154RQ1HNR10</b> | WE8.1 Industry Pro |
| FS154i-FK TS P1 HD RT CAN NVRAM | <b>FXPC154RF1HDR10</b> | WE8.1 Industry Pro |
| FS154i-FQ TS P1 HD RT CAN NVRAM | <b>FXPC154RQ1HDR10</b> | WE8.1 Industry Pro |



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### 4.2.3 FS154i ordering code

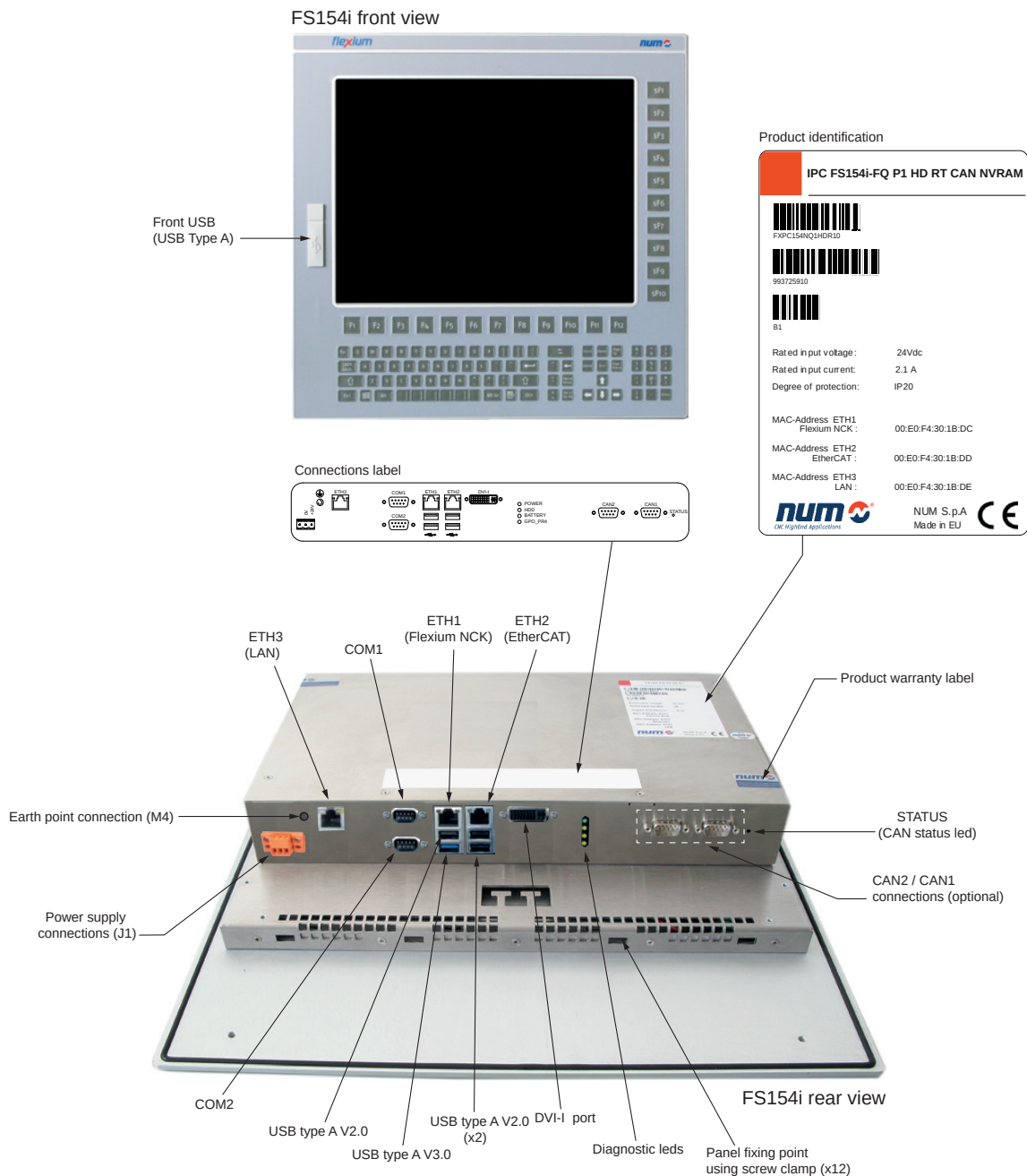
|                                                                                    |           |          |          |          |          |          |          |          |          |          |
|------------------------------------------------------------------------------------|-----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|
| <b>FXPC</b>                                                                        | <b>15</b> | <b>4</b> | <b>R</b> | <b>F</b> | <b>1</b> | <b>H</b> | <b>D</b> | <b>R</b> | <b>1</b> | <b>0</b> |
| <b>Display Unit</b><br>• LCD 15"                                                   | 15        |          |          |          |          |          |          |          |          |          |
| <b>Panel/mechanical variant</b><br>• Fourth generation                             |           | 4        |          |          |          |          |          |          |          |          |
| <b>Display Sensor</b><br>• Touch Screen resistive<br>• No Touch Sensor             |           |          | R<br>N   |          |          |          |          |          |          |          |
| <b>Keyboard type</b><br>• 22 Function keys<br>• 22 Function keys + QWERTY Keyboard |           |          |          | F<br>Q   |          |          |          |          |          |          |
| <b>IPC mother board, Processor</b><br>• Performance level P1                       |           |          |          |          | 1        |          |          |          |          |          |
| <b>Mass memory type</b><br>• HD (Hard Disk)                                        |           |          |          |          |          | H        |          |          |          |          |
| <b>Option board</b><br>• No fieldbus<br>• CAN + NVRAM                              |           |          |          |          |          |          | N<br>D   |          |          |          |
| <b>Flexium RTS</b><br>• Real time                                                  |           |          |          |          |          |          |          | R        |          |          |
| <b>Operative System</b><br>• Windows 8 kernel                                      |           |          |          |          |          |          |          |          | 1        |          |
| <b>Spare number</b>                                                                |           |          |          |          |          |          |          |          |          | 0        |

#### 4.2.4 General characteristics

|                                 |                                     |                                                                                                                                                                                                       |
|---------------------------------|-------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                 |                                     | <b>FXPC154NF1HxR10</b><br><b>FXPC154NQ1HxR10</b><br><b>FXPC154RF1HxR10</b><br><b>FXPC154RQ1HxR10</b>                                                                                                  |
| <b>Screen</b>                   | User interface options              | Active panel with integrated PC with:<br>- 22 Function Keys,<br>- 22 Function Keys and Qwerty Keyboard,<br>- Touch Screen (resistive)                                                                 |
|                                 | Technology                          | 15" TFT LCD (16.9 million colours)                                                                                                                                                                    |
|                                 | Resolution:                         | 1024 x 768 from 60Hz to 75Hz                                                                                                                                                                          |
|                                 | Size:                               | 304 x 228 mm (12 x 9 inch)                                                                                                                                                                            |
|                                 | Backlight:                          | LED, Contr. 700:1 (Typ)                                                                                                                                                                               |
| <b>Main PC features</b>         | CPU                                 | Intel® Celeron™ CPU J1900 @ 2GHz Quad Core                                                                                                                                                            |
|                                 | RAM                                 | 2GB                                                                                                                                                                                                   |
|                                 | Mass storage                        | 250 GB Hard Disk                                                                                                                                                                                      |
|                                 | Operating system                    | Win. Embedded 8.1 Industry Pro                                                                                                                                                                        |
| <b>Communication Interfaces</b> | Ethernet (ETH)                      | 3 x Gigabit LAN / RTE                                                                                                                                                                                 |
|                                 | USB front                           | 1 x Type A V2.0                                                                                                                                                                                       |
|                                 | USB rear                            | 3 x Type A V2.0 + 1 x Type A V3.0                                                                                                                                                                     |
|                                 | Serial interface                    | 2 x COM                                                                                                                                                                                               |
|                                 | Dual CAN + NVRAM                    | Optional                                                                                                                                                                                              |
|                                 | DVI-I interface                     | 1                                                                                                                                                                                                     |
|                                 | VGA interface                       | No                                                                                                                                                                                                    |
|                                 | DisplayPort                         | No                                                                                                                                                                                                    |
|                                 | Line IN/Line OUT MIC                | No                                                                                                                                                                                                    |
| <b>Power supply</b>             | 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                   | typ. 25W max. 50W (2.1A)<br><br>As point of reference, the 24V-power supply should be rated for 4A continuous load.                                                                                   |
| <b>Ambient conditions</b>       | Climatic conditions operation       | 0..45°C, 70% rel. air humidity, non-condensing<br>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         | -40...80°C, 70% rel. air humidity, non-condensing                                                                                                                                                     |
|                                 | Climatic conditions, transport      | Class 2K3 EN50178 (reduced) -20...60°C, 10...90% rel. Air humidity, non-condensing.                                                                                                                   |
| <b>EMC</b>                      | EMC immunity                        | Industry EN 61000-6-2                                                                                                                                                                                 |
|                                 | EMC emission                        | Residential area EN 61000-6-3                                                                                                                                                                         |
| <b>Degree of protection</b>     | Front                               | IP 65                                                                                                                                                                                                 |
|                                 | Rear                                | IP 20                                                                                                                                                                                                 |
|                                 | Pollution degree                    | 2                                                                                                                                                                                                     |
| <b>Weight</b>                   |                                     | ca. 6.1 kg Function Key version, ca. 6.5 kg Full Qwerty version                                                                                                                                       |
| <b>Dimensions</b>               | W x H x D:                          | 410 x 330 (400) x 72.3 mm                                                                                                                                                                             |
| <b>Fan</b>                      | Type                                | Fan-less                                                                                                                                                                                              |
| <b>Noise</b>                    |                                     | <70dB                                                                                                                                                                                                 |

## 4.2.5 FS154i (with integrated iPC) module description

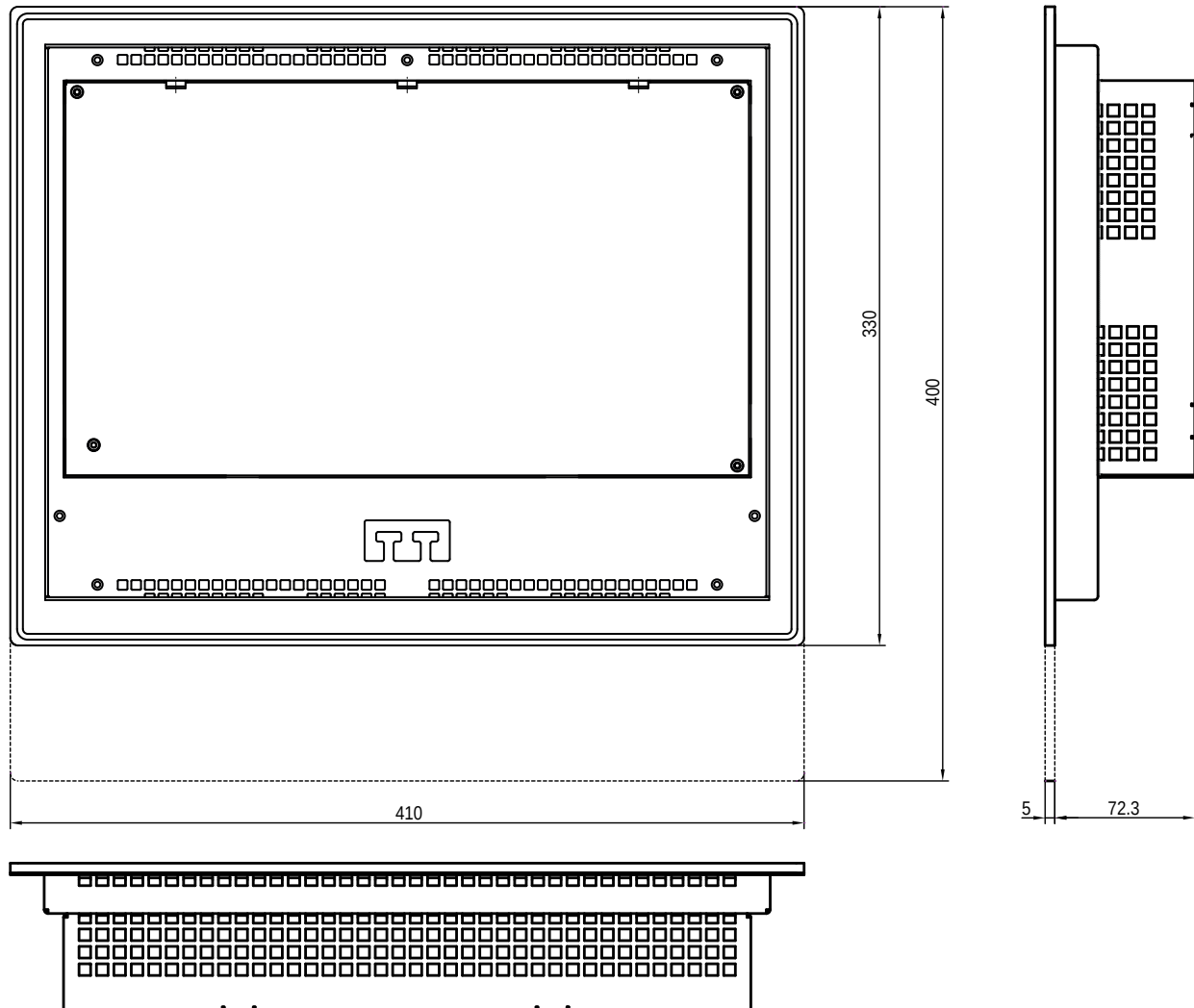
### 4.2.5.1 FS154i-FQ P1 CF RT CAN NVRAM module example



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

## 4.2.6 Installation of Panels FS154i

### 4.2.6.1 Detailed dimensions



Dashed line FS154xQ version only.



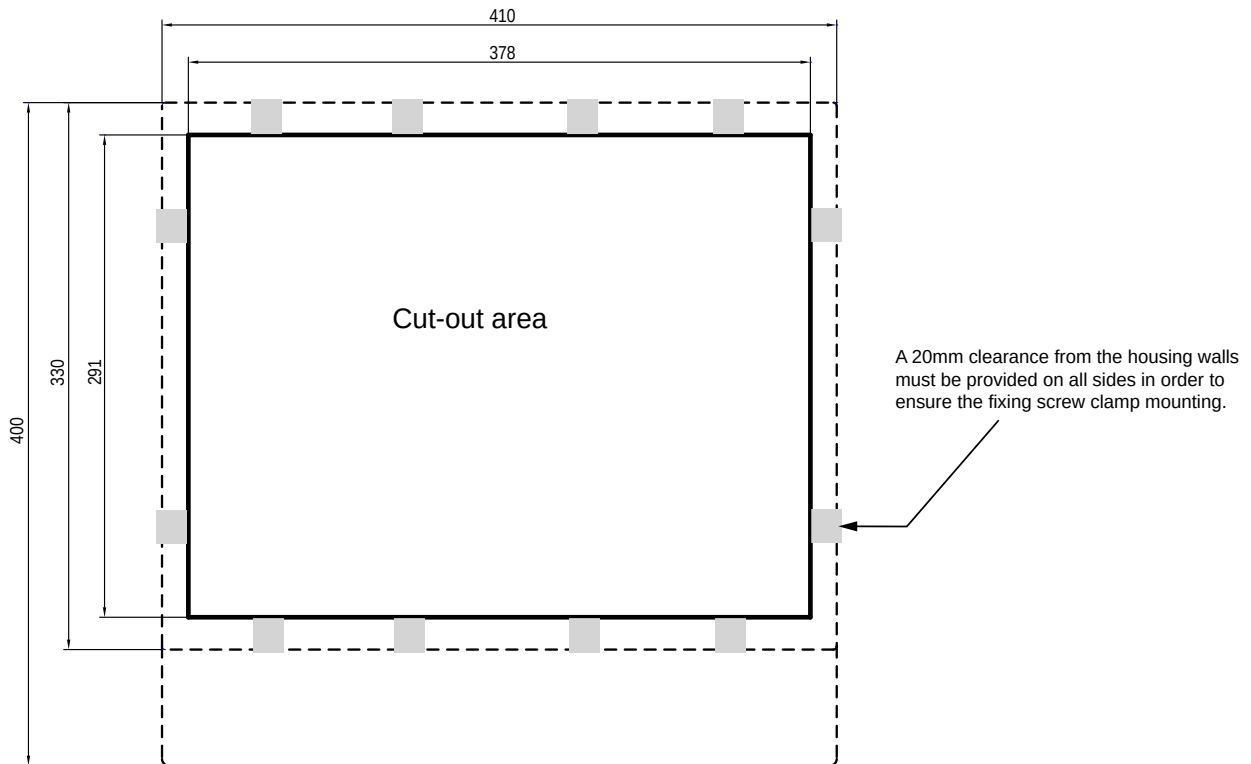
The FS154i can be operated at a maximum ambient temperature of 45°C. The ambient temperature is based on the temperature of the area 5 cm above the panel with the device mounted vertically at a height of 2000 m above sea level.

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

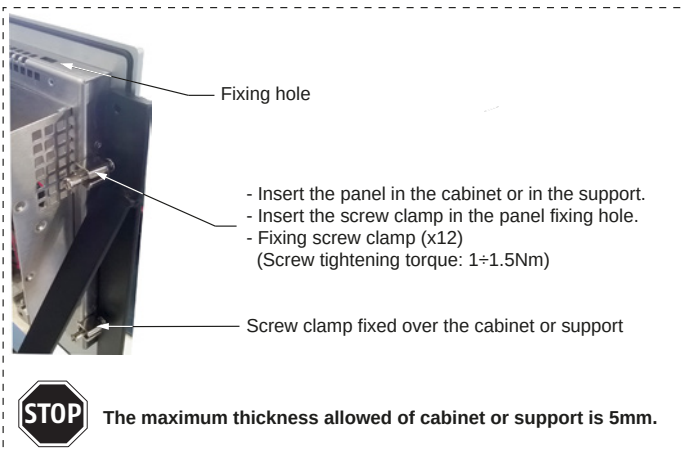
A minimum clearance of 75mm must be provided to active elements such as power supplies, transformers etc.

## 4.2.6.2 Panel FS154i P1 cut-out, hole pattern and panel mounting

### Cut-out and hole pattern



### Panel mounting and fixing (example with support)



### 4.2.7 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. A shutdown can be initialized by the PLC program or by windows itself.

### 4.2.8 Diagnostics

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

| Symptom                                              | Possible cause and remedy                                                                                                                                                                                                                                                                    |
|------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Dark screen during power-up                          | <ul style="list-style-type: none"> <li>- Check power supply.</li> <li>- Loss of setup data.</li> <li>- Connect an external video display for diagnosis.</li> </ul>                                                                                                                           |
| White screen after switch off and re-switch on again | - The ATX-power supply doesn't switch on properly because the switch off time was shorter than 20s.                                                                                                                                                                                          |
| Date/time not correct                                | Replace battery (see next page)                                                                                                                                                                                                                                                              |
| Ethernet connection missing                          | <ul style="list-style-type: none"> <li>- Incorrect Ethernet cable fitted (crossover/direct)</li> <li>- LINK-LED is lit if the connection is correct</li> <li>- ACT LED if the data transfer is correct (flashes during the transfer)</li> <li>- Incorrect/invalid IP address set.</li> </ul> |

### 4.2.9 Disposal

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

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## 4.2.10 Maintenance and Repair

### 4.2.10.1 Battery

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



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



Pay attention to ESD safety protections when changing the battery.

### 4.2.10.2 Transport

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

### 4.2.10.3 Storage

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

## 4.2.11 FS154i Panels connections



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

## 4.3 FS192i Operator panels with integrated iPC

FS192i 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.

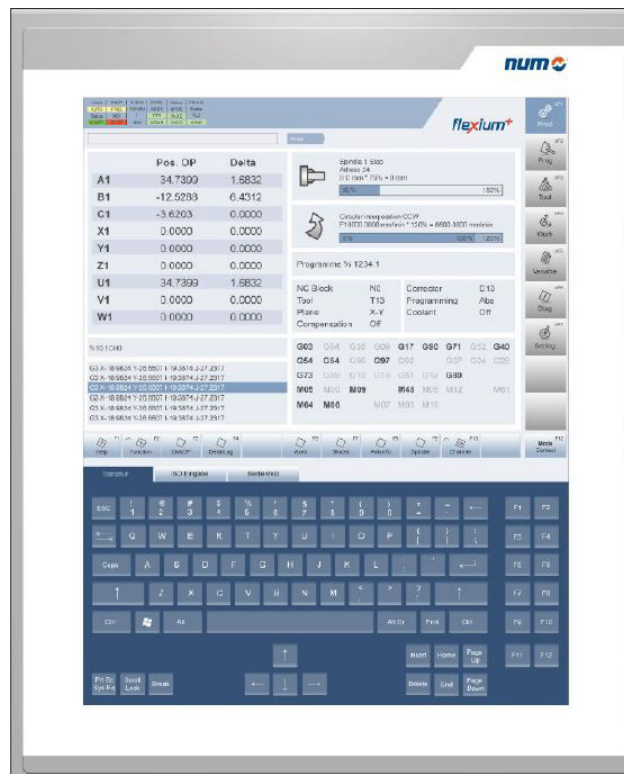
A compact and scalable panel PC with Intel's i5 allows entry to multi-processor technology with Windows 8 operating system.

FS192i function as a powerful platform for the HMI and enable you to operate it simply and logically.

The FS192i 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.





#### 4.3.1 FS192i available versions

| FS192i version               | Ordering code   |
|------------------------------|-----------------|
| FS192i-TS P2 HD NR           | FXPC192CN2HNN00 |
| FS192i-TS P2 HD RT           | FXPC192CN2HNR00 |
| FS192i-TS P2 HD RT CAN       | FXPC192CN2HCR00 |
| FS192i-TS P2 HD RT CAN NVRAM | FXPC192CN2HDR00 |



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.

#### 4.3.2 FS192i ordering code

|                                    | FXPC | 19 | 2 | C | N | 2 | H | D | R | 1 | 0 |
|------------------------------------|------|----|---|---|---|---|---|---|---|---|---|
| <b>Display Unit</b>                |      |    |   |   |   |   |   |   |   |   |   |
| - LCD 19"                          |      | 19 |   |   |   |   |   |   |   |   |   |
| <b>Panel/Mechanical Variant</b>    |      |    |   |   |   |   |   |   |   |   |   |
| - Second generation                |      |    | 2 |   |   |   |   |   |   |   |   |
| <b>Display Sensor</b>              |      |    |   |   |   |   |   |   |   |   |   |
| - Touch screen (proj.) capacitive  |      |    |   | C |   |   |   |   |   |   |   |
| <b>Keyboard Type</b>               |      |    |   |   |   |   |   |   |   |   |   |
| - No keyboard, no function keys    |      |    |   |   | N |   |   |   |   |   |   |
| <b>IPC Mother Board, Processor</b> |      |    |   |   |   |   |   |   |   |   |   |
| - Performance level P2             |      |    |   |   |   | 2 |   |   |   |   |   |
| <b>Mass Memory Type</b>            |      |    |   |   |   |   |   |   |   |   |   |
| - HD (hard disk)                   |      |    |   |   |   |   | H |   |   |   |   |
| <b>Option Board</b>                |      |    |   |   |   |   |   |   |   |   |   |
| - No fieldbus                      |      |    |   |   |   |   |   | N |   |   |   |
| - CAN                              |      |    |   |   |   |   |   | C |   |   |   |
| - CAN + NVRAM                      |      |    |   |   |   |   |   | D |   |   |   |
| <b>Flexium RTS</b>                 |      |    |   |   |   |   |   |   |   |   |   |
| - Real time                        |      |    |   |   |   |   |   |   | R |   |   |
| <b>Operating System</b>            |      |    |   |   |   |   |   |   |   |   |   |
| - Windows 8 Kernel                 |      |    |   |   |   |   |   |   |   | 1 |   |
| <b>Spare Number</b>                |      |    |   |   |   |   |   |   |   |   | 0 |

### 4.3.3 General characteristics

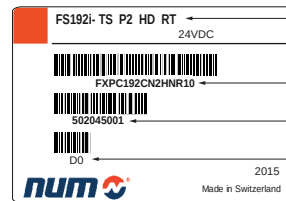
|                                 |                                     | FXPC192CN2Hxx00                                                                                                                                                                                                                                                                                                |
|---------------------------------|-------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Screen</b>                   | User interface options              | Projected capacitive touch screen with hardened glass protection                                                                                                                                                                                                                                               |
|                                 | Technology                          | 19" TFT LCD (16.9 million colours)                                                                                                                                                                                                                                                                             |
|                                 | Resolution:                         | 1024 x 1280 from 60Hz to 75Hz (vertical orientation)                                                                                                                                                                                                                                                           |
|                                 | Size:                               | 304 x 379mm                                                                                                                                                                                                                                                                                                    |
|                                 | Backlight:                          | Contr. 400:1 (Typ)                                                                                                                                                                                                                                                                                             |
| <b>Main PC features</b>         | CPU                                 | i5 M520 2.4GHz Dual Core                                                                                                                                                                                                                                                                                       |
|                                 | RAM                                 | SATA DDR3 2 GB                                                                                                                                                                                                                                                                                                 |
|                                 | Mass storage                        | SATA Hard disk ≥ 260 GB                                                                                                                                                                                                                                                                                        |
|                                 | Operating system                    | Windows Embedded 8.1 Industry Pro                                                                                                                                                                                                                                                                              |
|                                 | Graphic card                        | Intel® HD Graphics                                                                                                                                                                                                                                                                                             |
| <b>Communication Interfaces</b> | Ethernet (ETH)                      | 2 x GbE LAN / RTE, 1 USB to LAN                                                                                                                                                                                                                                                                                |
|                                 | USB rear                            | 4 x Type A V2.0                                                                                                                                                                                                                                                                                                |
|                                 | Serial interface                    | COM1, COM2, (x2), RS232 D-Sub 9 pole male                                                                                                                                                                                                                                                                      |
|                                 | Dual CAN1 / CAN2 (optional)         | max. 500kBaud (isolated); 1MBaud non isolated                                                                                                                                                                                                                                                                  |
|                                 | Dual CAN + NVRAM (optional)         | max. 500kBaud (isolated); 1MBaud non isolated.                                                                                                                                                                                                                                                                 |
|                                 | DVI-I interface                     | 1                                                                                                                                                                                                                                                                                                              |
|                                 | VGA interface                       | 1                                                                                                                                                                                                                                                                                                              |
|                                 | Line IN/Line OUT MIC                | Yes                                                                                                                                                                                                                                                                                                            |
| <b>Power supply</b>             | 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<br>As point of reference, the 24V-power supply should be rated for 4A continuous load.                                                                                                                                                                                                                 |
| <b>Ambient conditions</b>       | Climatic conditions operation       | 5..45 °C with vertical mounting with Hard disk.<br>5..35 °C with mounting up to max. 35° with Hard disk.<br>10...90% rel. air humidity, non-condensing.<br>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.                                                                                                                                                                                                                          |
| <b>EMC</b>                      | EMC immunity                        | Industry EN 61000-6-2                                                                                                                                                                                                                                                                                          |
|                                 | EMC emission                        | Residential area EN 61000-6-3                                                                                                                                                                                                                                                                                  |
| <b>Degree of Protection</b>     | Front                               | IP 65                                                                                                                                                                                                                                                                                                          |
|                                 | Rear                                | IP 20                                                                                                                                                                                                                                                                                                          |
| <b>Weight</b>                   |                                     | 11.2 kg                                                                                                                                                                                                                                                                                                        |
| <b>Dimensions</b>               | W x H x D                           | Please refer to the following pages                                                                                                                                                                                                                                                                            |
| <b>Fan</b>                      | Type                                | The Smart Fan control system supports Thermal® and Speed® cruise.                                                                                                                                                                                                                                              |
| <b>Noise</b>                    |                                     | <70dB                                                                                                                                                                                                                                                                                                          |

#### 4.3.4 FS192i (with integrated PC) module description

FS192i front view



Product identification



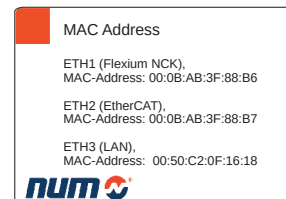
Product type

Product reference code

Serial number

Product revision

MAC Address label

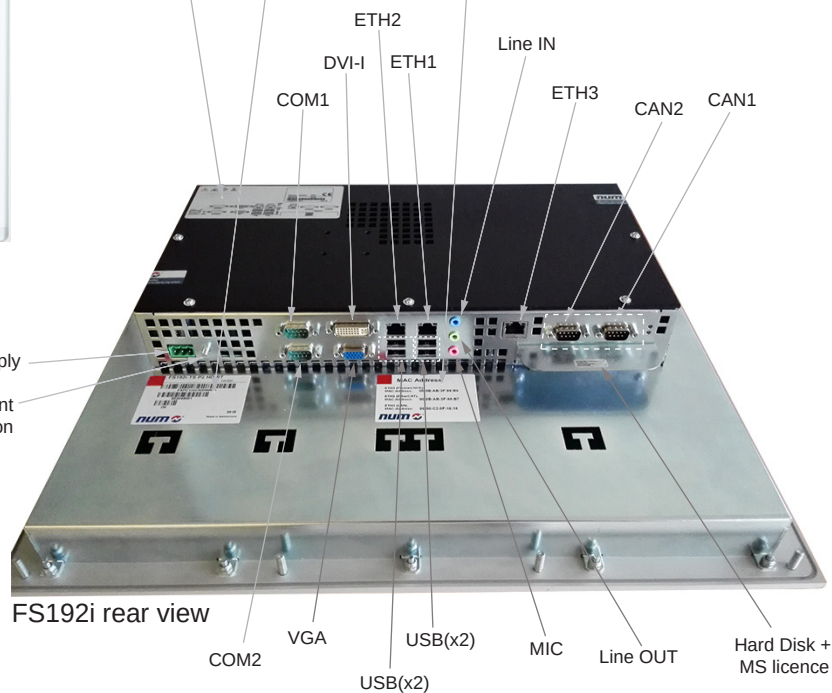


Connection label



Power supply

Earth point connection

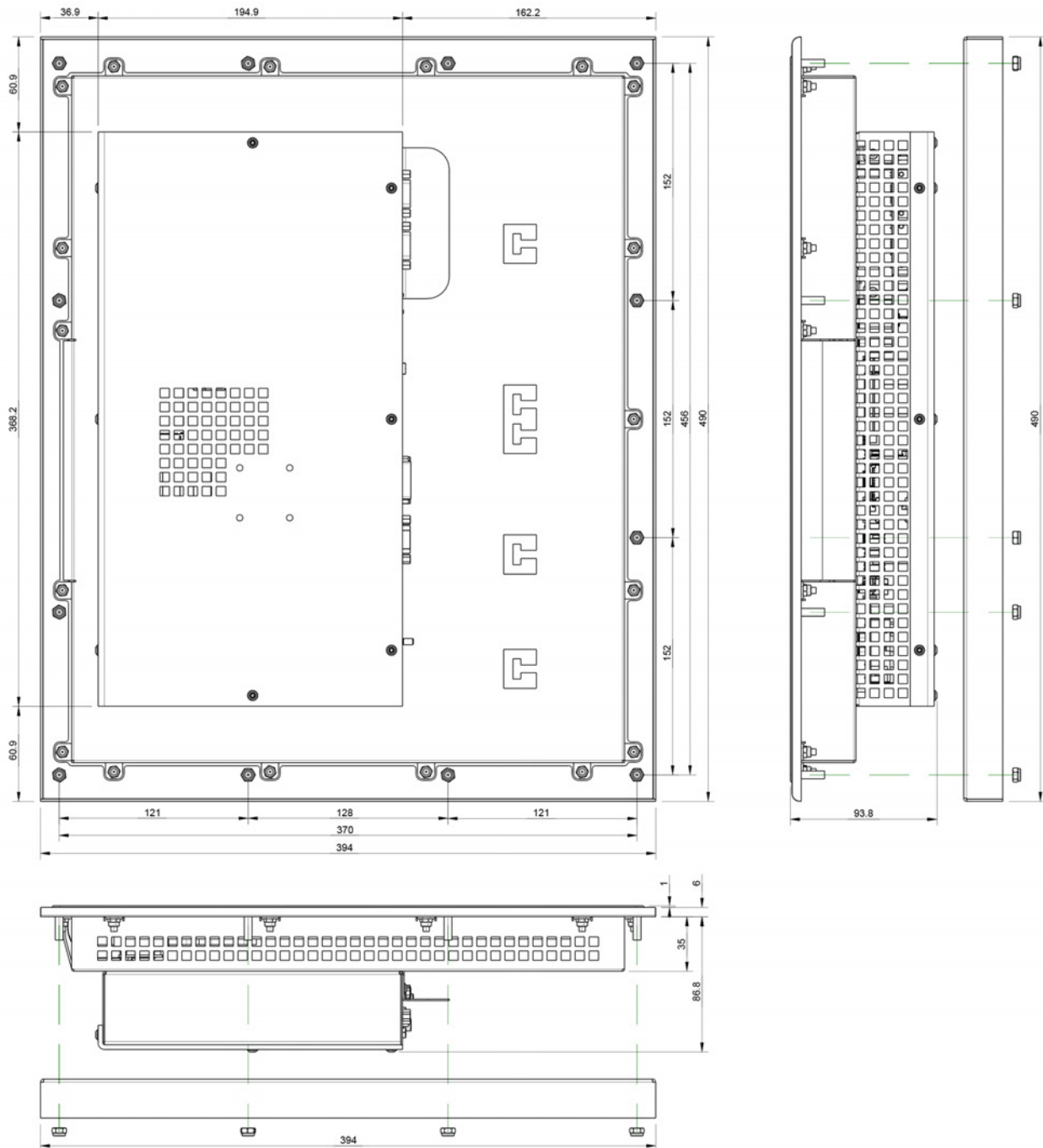


FS192i rear view

| Connector    | Type                 | Description                                       |
|--------------|----------------------|---------------------------------------------------|
| Power supply | 3 screws pins F      | FS192i power supply connections                   |
| COM1         | RS232 Sub D 9 pins M | Serial interface. General user purpose            |
| COM2         |                      |                                                   |
| ETH1         | RJ45 (8P/8C)         | Flexium NCK Ethernet connections                  |
| ETH2         | RJ45 (8P/8C)         | EtherCAT port connections                         |
| ETH3         | RJ45 (8P/8C)         | Company LAN                                       |
| CAN1 /CAN2   | Sub D 9 pins M       | Standard CAN interface (optional)                 |
| USB x4       | Type A V2.0          | General user purpose. (Mouse and all USB devices) |
| VGA          | Sub D HD 15 pins F   | Video interface PC compatible connection          |
| DVI-I        | Standard DVI         | Digital Video interface connection                |

### 4.3.5 Installation of Panels FS192i

#### 4.3.5.1 Detailed dimensions

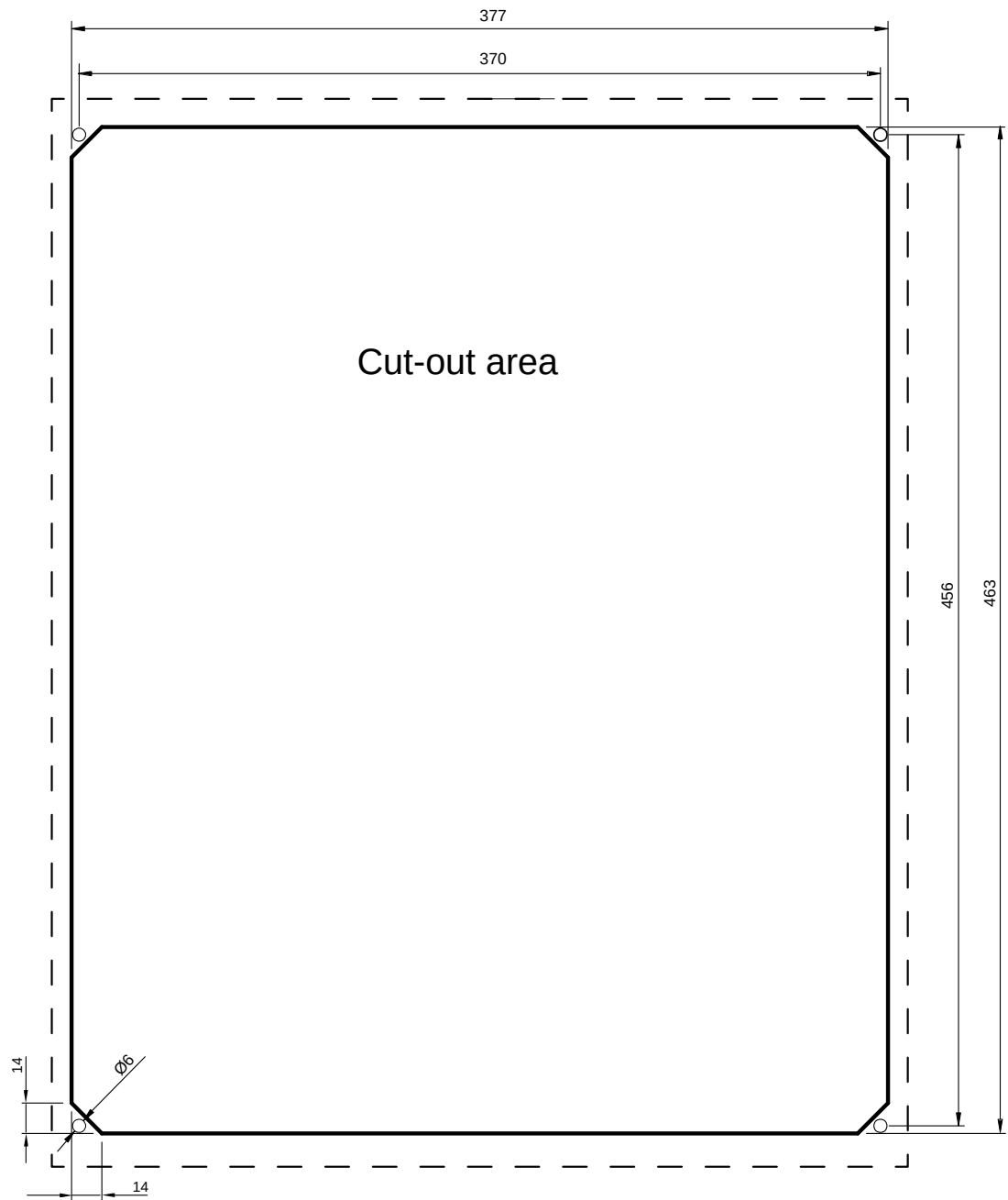


The FS192i can be operated at a maximum ambient temperature of 45°C. The ambient temperature is based on the temperature of the area 5 cm above the panel with the device mounted vertically at a height of 2000 m above sea level.

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

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



**4.3.5.3 Panel FS192i cut-out using Back Side Mounting Plate**

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### 4.3.6 Power up and shutdown

FS192i 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 initialized by the PLC program or by windows itself.

### 4.3.7 Disposal

FS192i no longer in use must be properly disposed of or must be returned to the manufacturer for disposal. (Manufacturer address see list of NUM agencies on chapter 1)

#### 4.3.7.1 Battery

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



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



Pay attention to ESD safety protections when changing the battery.

#### 4.3.7.2 Transport

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

#### 4.3.7.3 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.

### 4.3.8 FS192i Panels connections



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

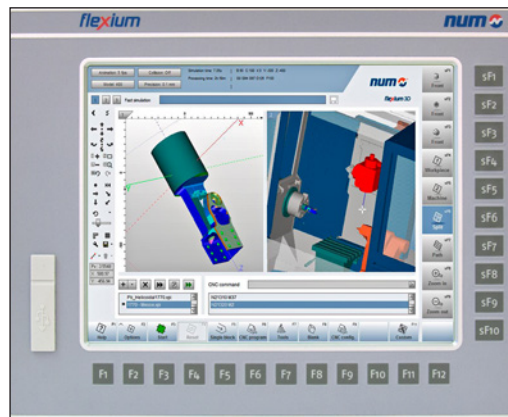
#### 4.4 FS122 Operator Panel (without integrated iPC)

FS122 Operator Panel is a 12-inch passive control panels for Flexium that are designed for use with an external PC or NUM Industrial Box PC P1 / P2.

Please refer to chapter 6 to give more detailed information on Box PC P1 / P2.

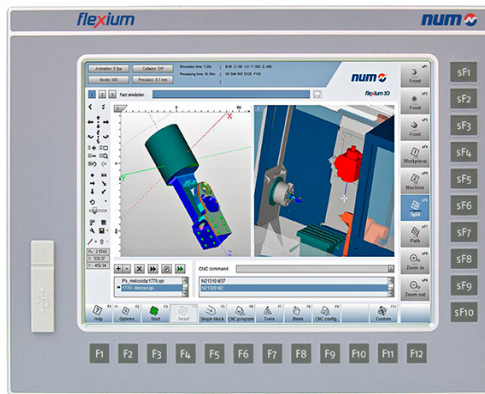
The passive panels FS122 are available with and without touch screen. Both versions have got 22 functional keys.

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

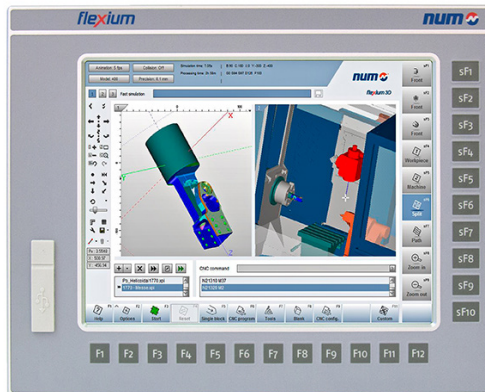




#### 4.4.1 FS122 Panel options



Panel with 22 Function Keys



Panel with 22 Function Keys  
Resistive Touch Screen

#### 4.4.2 FS122 available version

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

#### 4.4.3 FS122 ordering code

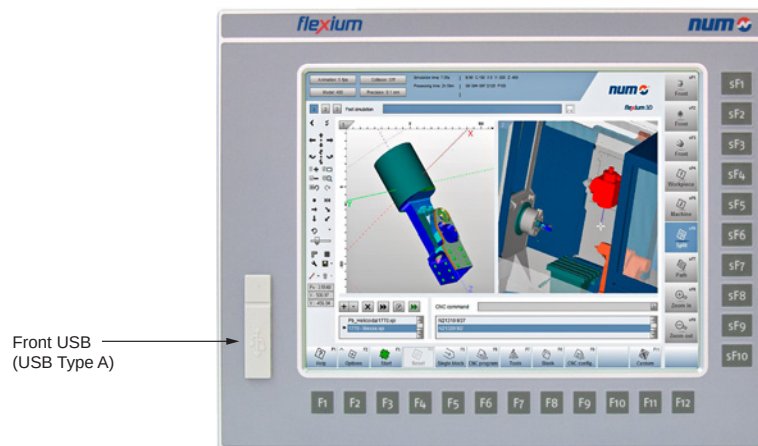
|                                    |      |    |   |   |   |   |   |   |   |   |   |
|------------------------------------|------|----|---|---|---|---|---|---|---|---|---|
|                                    | FXPC | 12 | 2 | R | F | N | N | N | N | 0 | 0 |
| <b>Display Unit</b>                | 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

#### 4.4.4 General characteristics

| FXPC122xFNNNN00                 |                                     |                                                                                                                                                                                                                   |
|---------------------------------|-------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Screen</b>                   | User interface                      | Operator panel without integrated PC:<br>- 22 Function Keys<br>- 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 <sup>2</sup>                                                                                                                                                                                              |
| <b>Main PC features</b>         | CPU                                 | External PC required                                                                                                                                                                                              |
|                                 | RAM                                 |                                                                                                                                                                                                                   |
|                                 | Mass storage                        |                                                                                                                                                                                                                   |
|                                 | Operating system                    |                                                                                                                                                                                                                   |
|                                 | Graphic card                        |                                                                                                                                                                                                                   |
| <b>Communication Interfaces</b> | USB front                           | 1 x Type A V2.0                                                                                                                                                                                                   |
|                                 | USB rear                            | 2 x Type A V2.0 and 1 x Type B V2.0 (USB to PC)                                                                                                                                                                   |
|                                 | DVI-D interface                     | 1                                                                                                                                                                                                                 |
|                                 | VGA interface                       | 1                                                                                                                                                                                                                 |
| <b>Power supply</b>             | 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<br><br>As point of reference, the 24V-power supply should be rated for 4A continuous load.                                                                                                                |
| <b>Ambient conditions</b>       | Climatic conditions operation       | 0..50°C<br>10...90% rel. air humidity, non-condensing.<br><br>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.                                                                                                                               |
| <b>EMC</b>                      | EMC immunity                        | Industry EN 61000-6-2                                                                                                                                                                                             |
|                                 | EMC emission                        | Residential area EN 61000-6-3                                                                                                                                                                                     |
| <b>Degree of protection</b>     | Front                               | IP 65                                                                                                                                                                                                             |
|                                 | Rear                                | IP 20                                                                                                                                                                                                             |
| <b>Weight</b>                   |                                     | ca. 3.45 kg                                                                                                                                                                                                       |
| <b>Dimensions</b>               | W x H x D:                          | 347 x 276 x 63mm                                                                                                                                                                                                  |

#### 4.4.5 FS122 panel description

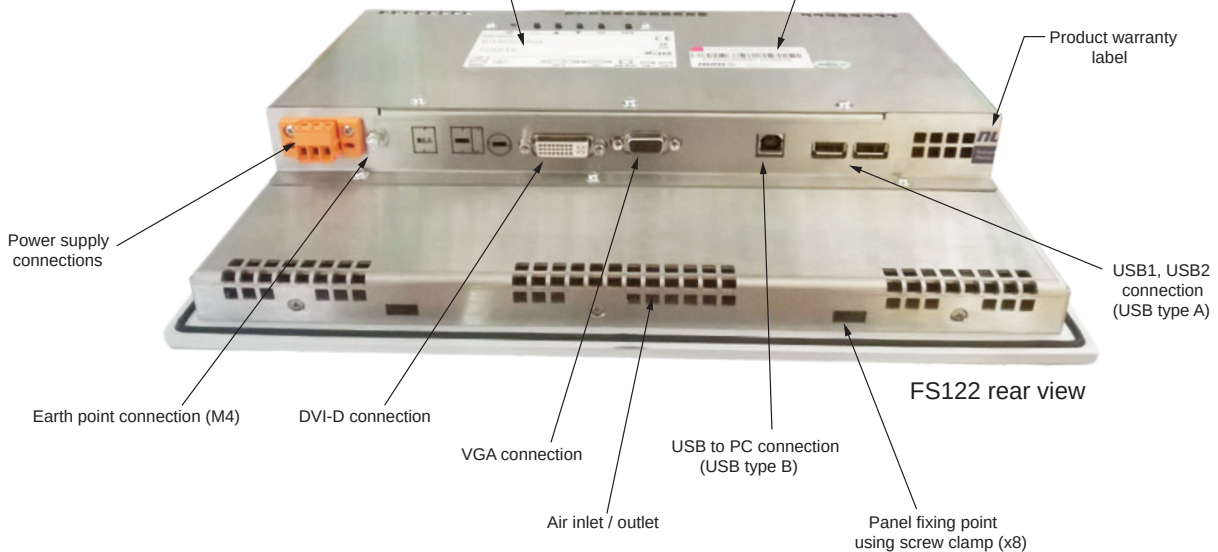
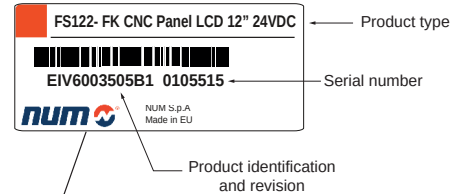
FS122 front view



Connection label



Product identification

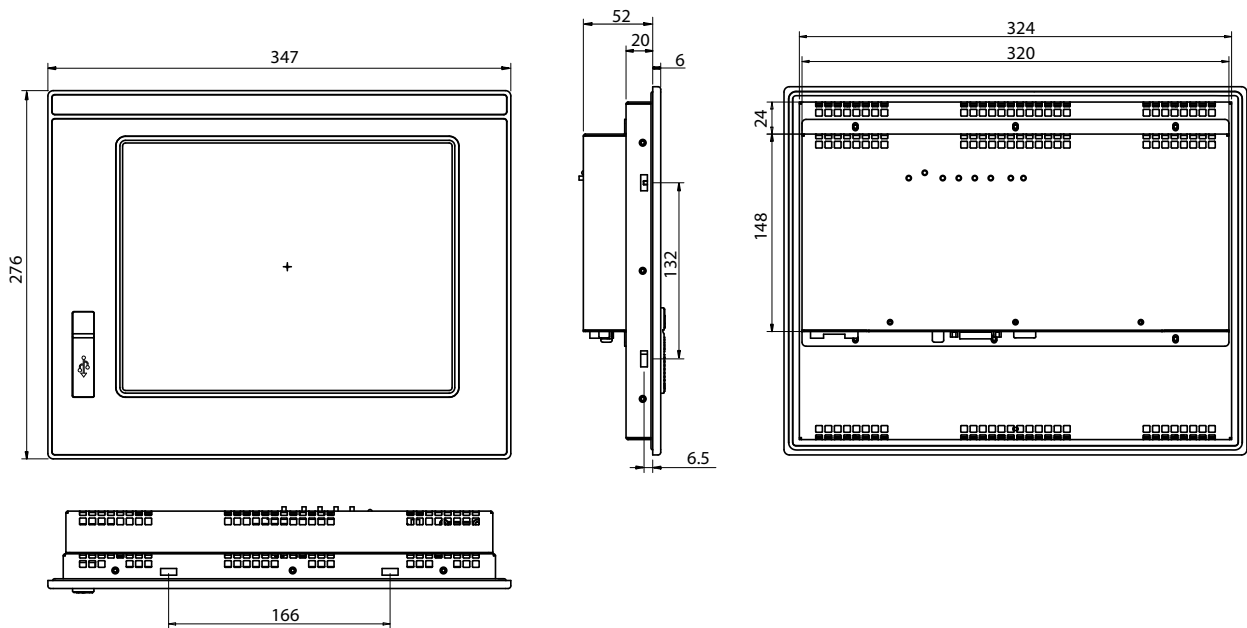


FS122 rear view

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

## 4.4.6 Installation of FS122 Panels

### 4.4.6.1 Detailed dimensions



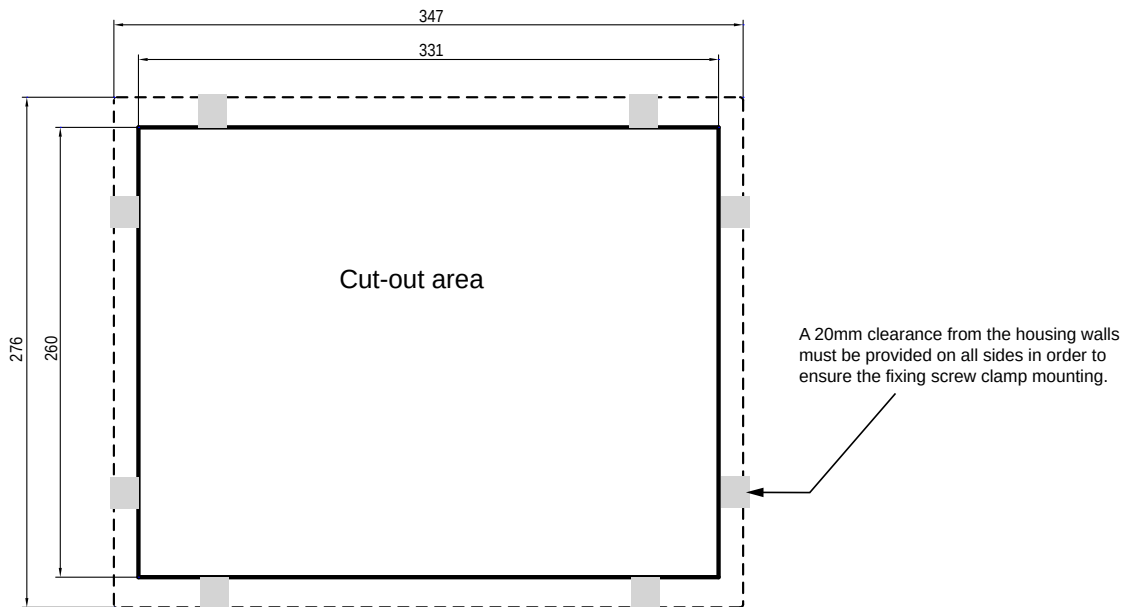
The FS122 can be operated at a maximum ambient temperature of 50°C. The ambient temperature is based on the temperature of the area 5 cm above the panel with the device mounted vertically at a height of 2000 m above sea level.

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

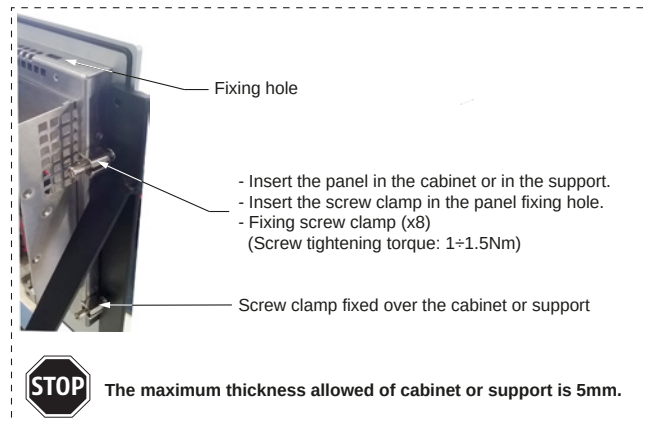
A minimum clearance of 75mm must be provided to active elements such as power supplies, transformers etc.

#### 4.4.6.2 Panel FS122 cut-out, hole pattern and panel mounting

Cut-out and hole pattern



Panel mounting and fixing (example with support)



---

#### **4.4.7 Disposal**

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

##### **4.4.7.1 Transport**

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

##### **4.4.7.2 Storage**

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

#### **4.4.8 FS122 Panels connections**



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

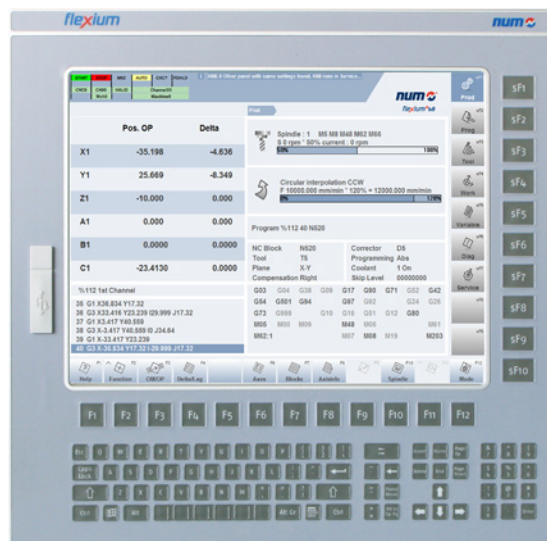
## 4.5 FS153 Operator Panel (without integrated iPC)

FS153 Operator Panel is a 15-inch passive control panels for Flexium that are designed for use with an external PC or NUM Industrial Box PC P1 / P2.

Please refer to chapter 6 to give more detailed information on Box PC P1 / P2.

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

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

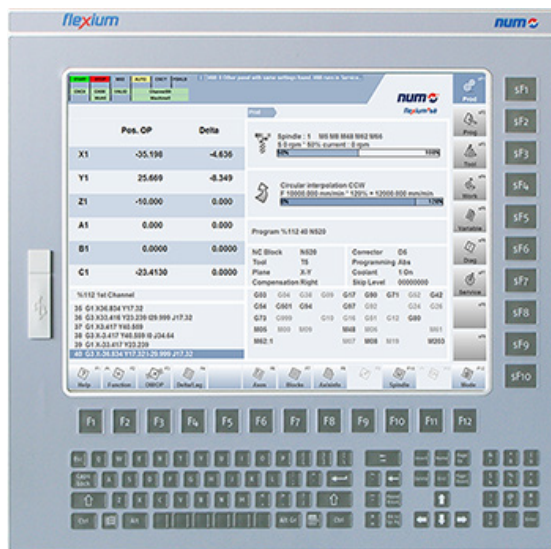




## 4.5.1 FS153 Panel options



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



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

#### 4.5.2 FS153 available version

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

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

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

#### 4.5.3 Ordering code

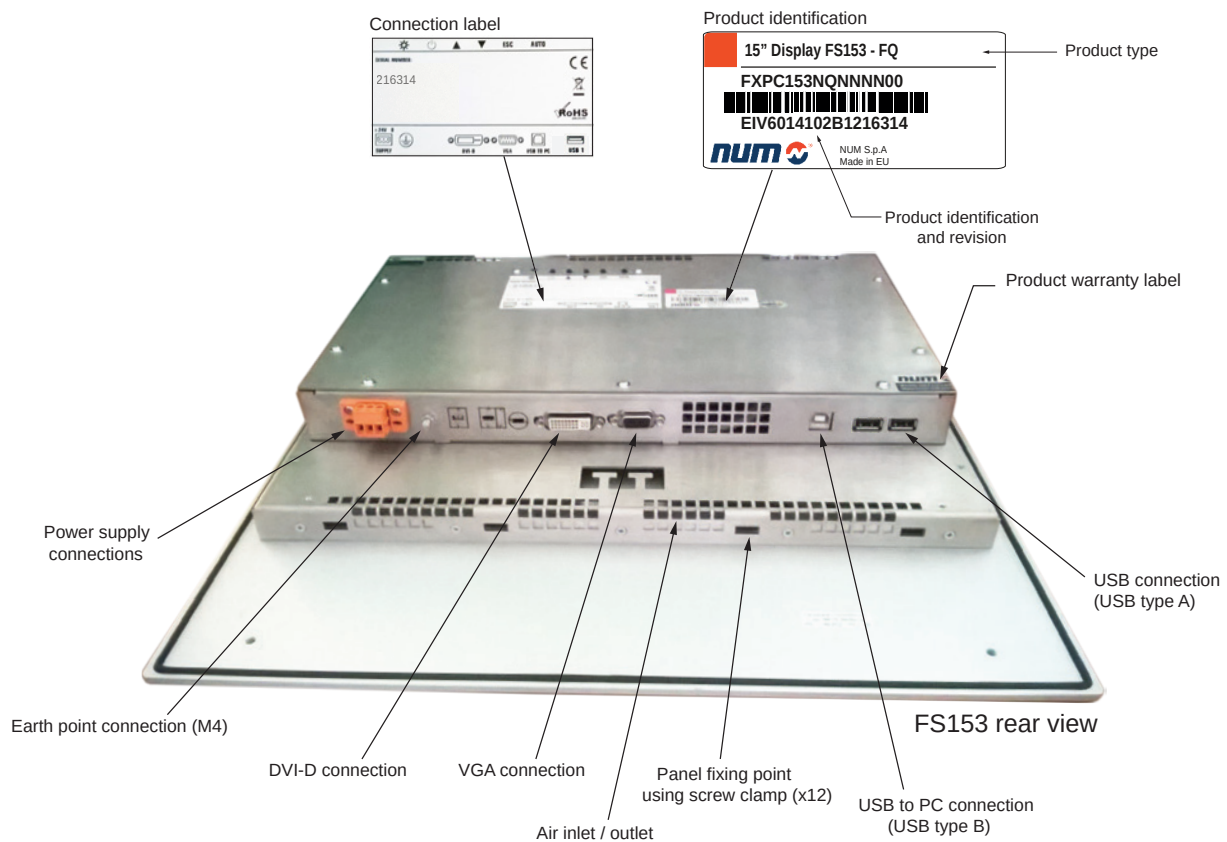
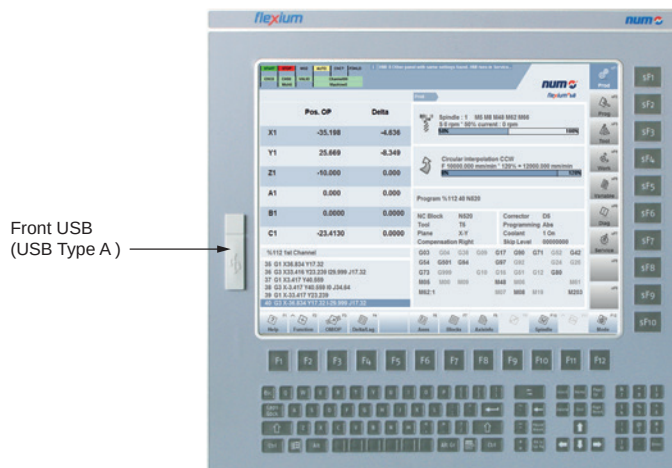
|                                      |      |    |   |   |   |   |   |   |   |   |   |
|--------------------------------------|------|----|---|---|---|---|---|---|---|---|---|
|                                      | FXPC | 15 | 3 | R | F | N | N | N | N | 0 | 0 |
| <b>Display Unit</b>            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

#### 4.5.4 General characteristics

|                                 |                                     | FXPC153NFNNNN00, FXPC153RFNNNN00<br>FXPC153NQNNNN00                                                                                                                                                                                  |
|---------------------------------|-------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Screen</b>                   | User interface                      | Operator panel without integrated PC:<br>- 22 Function Keys ( version FXPC153NFNNNN00)<br>- 22 Function Keys and Qwerty Keyboard (version FXPC153NQNNNN00)<br>- 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)                                                                                                                                                                                                              |
| <b>Main PC features</b>         | CPU                                 | External PC required                                                                                                                                                                                                                 |
|                                 | RAM                                 |                                                                                                                                                                                                                                      |
|                                 | Mass storage                        |                                                                                                                                                                                                                                      |
|                                 | Operating system                    |                                                                                                                                                                                                                                      |
|                                 | Graphic card                        |                                                                                                                                                                                                                                      |
| <b>Communication Interfaces</b> | USB front                           | 1 x Type A V2.0                                                                                                                                                                                                                      |
|                                 | USB rear                            | 2 x Type A V2.0 and 1 xType B V2.0 (USB to PC)<br>(only 1 x Type A V2.0 in case of touch version)                                                                                                                                    |
|                                 | DVI-D interface                     | 1                                                                                                                                                                                                                                    |
|                                 | VGA interface                       | 1                                                                                                                                                                                                                                    |
| <b>Power supply</b>             | 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<br><br>As point of reference, the 24V-power supply should be rated for 4A continuous load.                                                                                                                                   |
| <b>Ambient conditions</b>       | Climatic conditions operation       | 0..50°C<br>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                                                                                                                                                                                |
| <b>EMC</b>                      | EMC immunity                        | Industry EN 61000-6-2                                                                                                                                                                                                                |
|                                 | EMC emission                        | Residential area EN 61000-6-3                                                                                                                                                                                                        |
| <b>Degree of protection</b>     | Front                               | IP 65                                                                                                                                                                                                                                |
|                                 | Rear                                | IP 20                                                                                                                                                                                                                                |
|                                 | Pollution degree                    | 2                                                                                                                                                                                                                                    |
| <b>Weight</b>                   |                                     | ca. 5.3 kg Function Key version<br>ca. 5.7 kg Full Qwerty version                                                                                                                                                                    |
| <b>Dimensions</b>               | W x H x D:                          | 410 x 330 (400) x 52.3 mm                                                                                                                                                                                                            |
| <b>Cooling Type</b>             |                                     | Fanless                                                                                                                                                                                                                              |

#### 4.5.5 FS153 panels description

FS153 front view



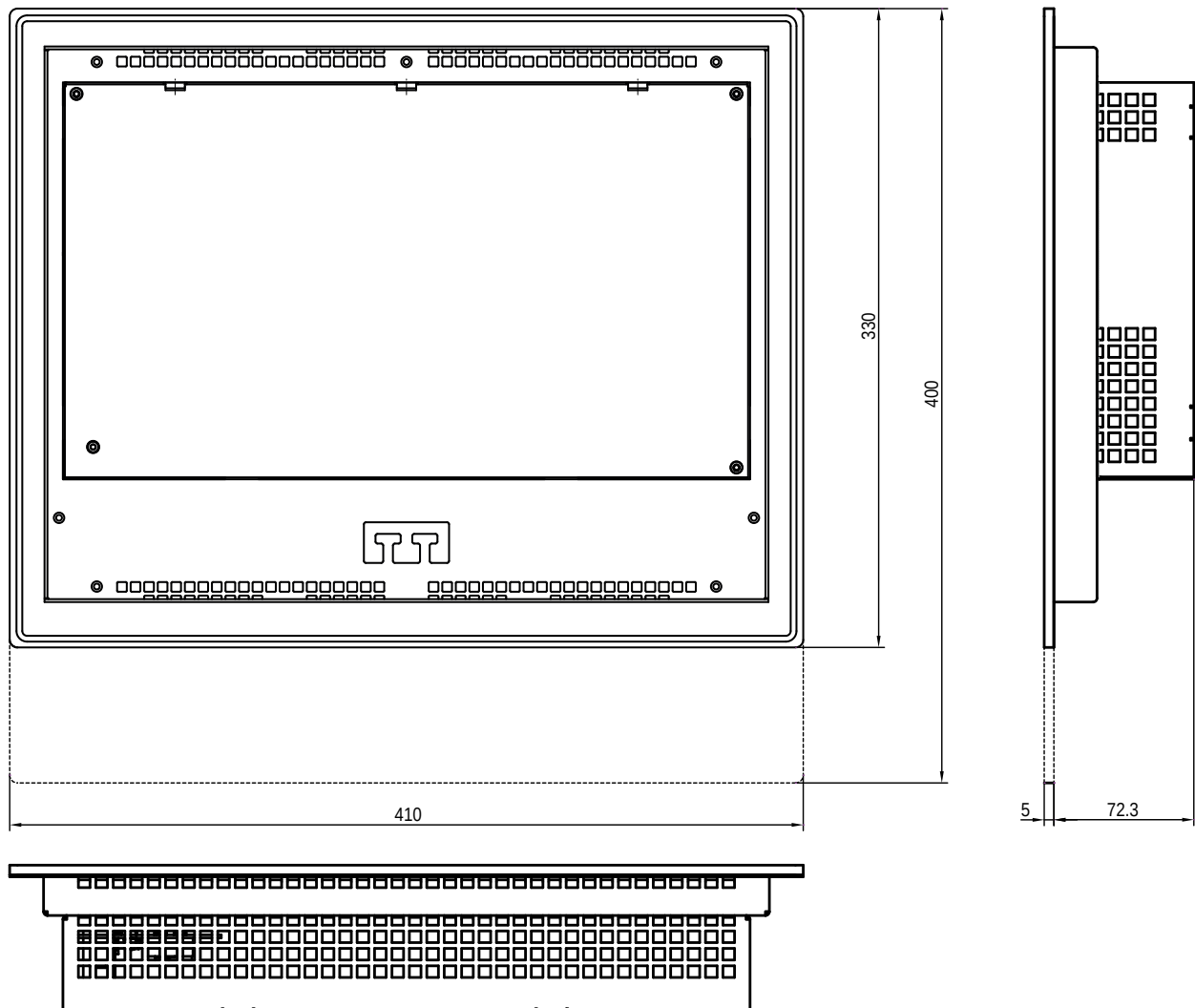
| Connector     | Type            | Description                                                     |
|---------------|-----------------|-----------------------------------------------------------------|
| Power supply  | 3 screws pins F | FS153 power supply connections                              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



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

## 4.5.6 Installation of Panels FS153

### 4.5.6.1 Detailed dimensions



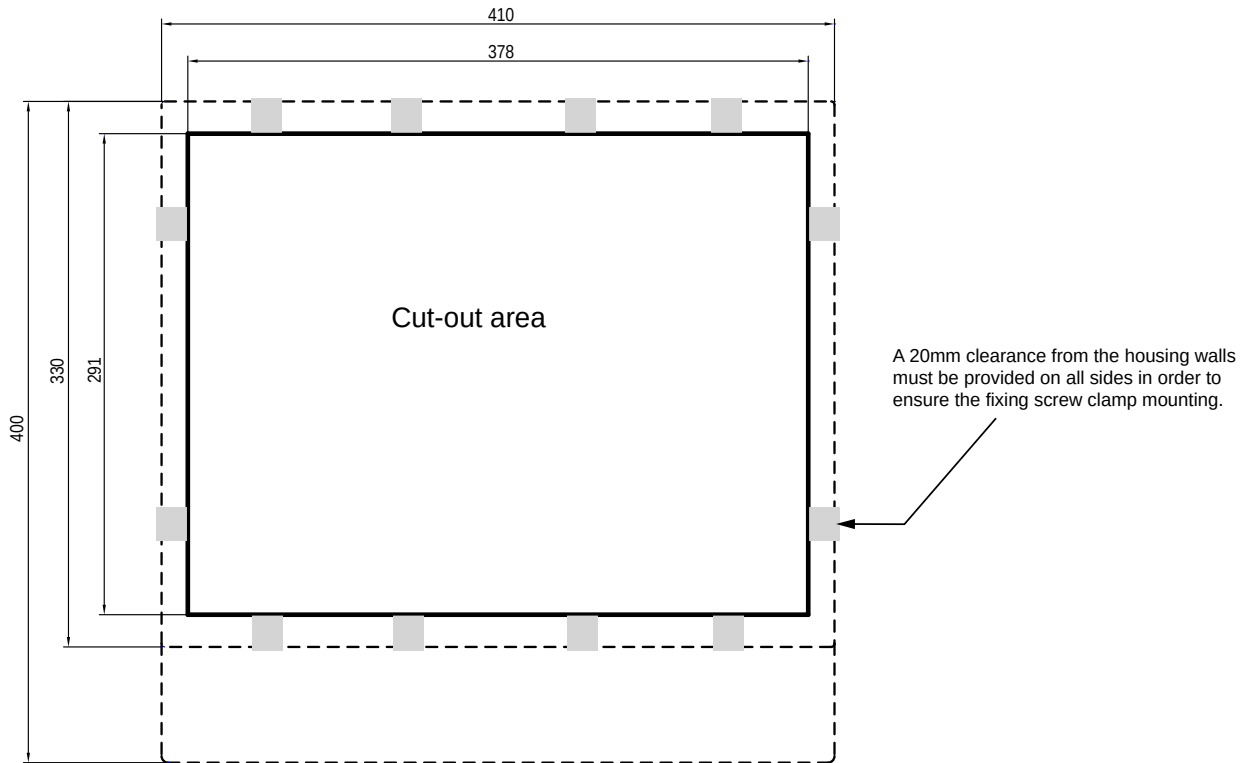
The FS153 can be operated at a maximum ambient temperature of 50°C. The ambient temperature is based on the temperature of the area 5 cm above the panel with the device mounted vertically at a height of 2000 m above sea level.

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

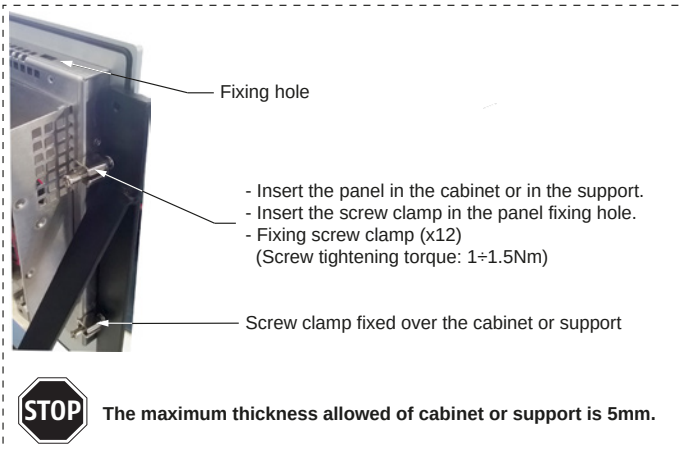
A minimum clearance of 75mm must be provided to active elements such as power supplies, transformers etc.

#### 4.5.6.2 Panels FS153 cut-out, hole pattern and panel mounting

##### Cut-out and hole pattern



##### Panel mounting and fixing (example with support)



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## 4.5.7 Diagnostics

| Symptom                                 | Possible cause and remedy                                                                                                                                                                                    |
|-----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Dark screen during power-up             | <ul style="list-style-type: none"><li>- Check power supply.</li><li>- Check diagnostics LEDs; all three power must be lit.</li><li>- No video data present; the DVI Panel switches to a safe mode.</li></ul> |
| Faults on the screen                    | <ul style="list-style-type: none"><li>- Rotary switch not optimally set for cable length compensation.</li><li>- Check DVI cable.</li></ul>                                                                  |
| Reset of the DVI Panel during operation | <ul style="list-style-type: none"><li>- Voltage drop in the power supply / touch cable too large; feed local 24V.</li></ul>                                                                                  |
| Sticking Image on screen                | <ul style="list-style-type: none"><li>- Use a screen-saver.</li></ul>                                                                                                                                        |

## 4.5.8 Image Sticking

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

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



It is recommended to use a screen-saver.

## 4.5.9 Backlight

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

### 4.5.9.1 Fuse

The device is protected internally by means of a self-healing fuse.

If this fuse is tripped, the FS153 Panel must be disconnected from the power supply, all faults must be rectified and the reset time (approx. 1min) must be allowed to elapse.

#### 4.5.10 Disposal

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

##### 4.5.10.1 Transport

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

##### 4.5.10.2 Storage

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

#### 4.5.11 FS153 Panels connections



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





#### 4.6.1 FS192L ordering code

The FS192L panels are recommended with NUM Industrial BoxPC P1/P2.  
Please refer to chapter 6 for more detailed information.

| FS192L version | Ordering code   |
|----------------|-----------------|
| FXPC192L-TS    | FXPC19LCNNNNN00 |

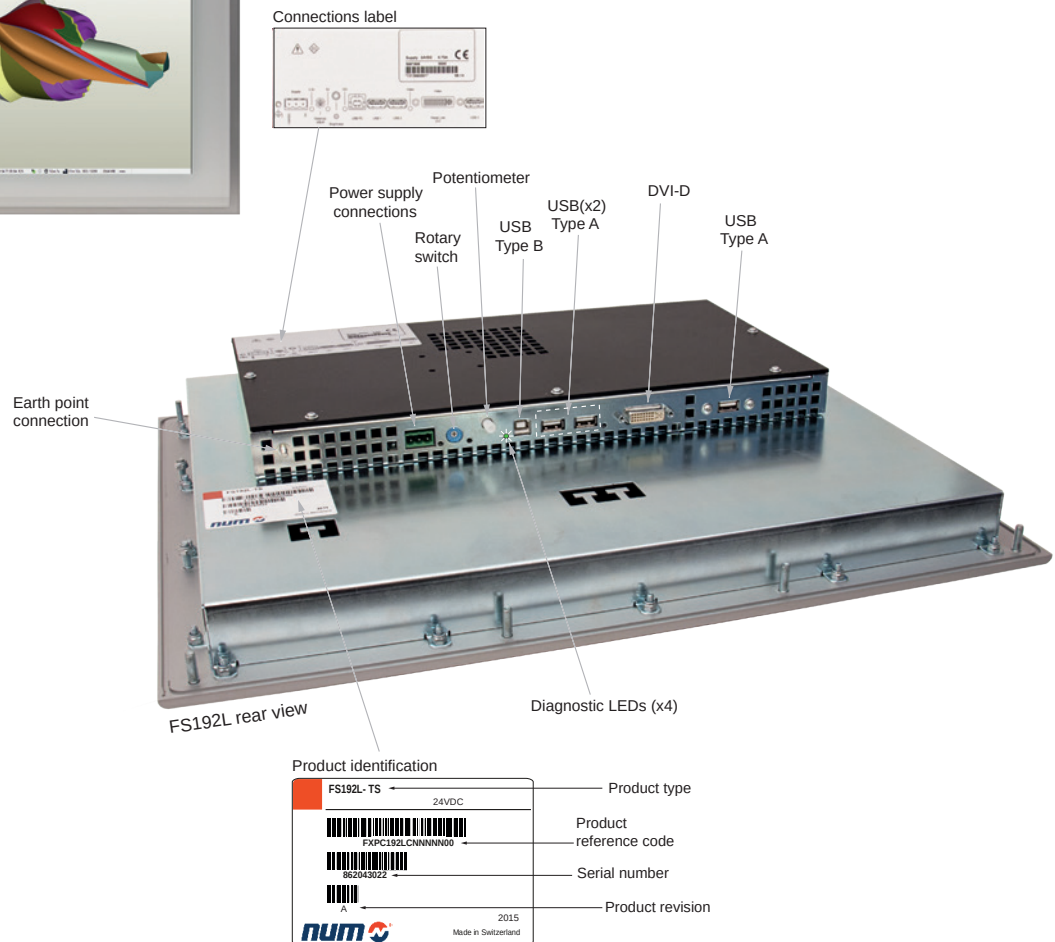
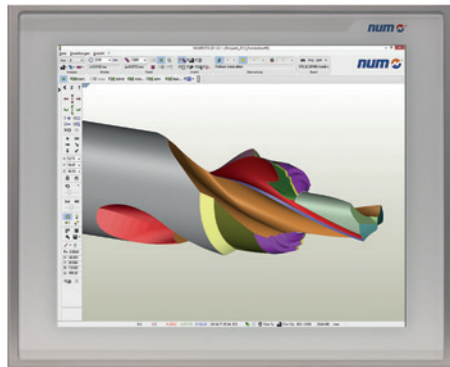
|                                    |      |    |   |   |   |   |   |   |   |   |   |
|------------------------------------|------|----|---|---|---|---|---|---|---|---|---|
|                                    | FXPC | 19 | L | C | N | N | N | N | N | 0 | 0 |
| <b>Display Unit</b>                | 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

## 4.6.2 General characteristics

|                                 |                                     | FXPC19LCNNNNN00                                                                                                                                                                                                                              |
|---------------------------------|-------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Screen</b>                   | 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)                                                                                                                                                                                                                           |
| <b>Main PC features</b>         | CPU                                 | External PC required                                                                                                                                                                                                                         |
|                                 | RAM                                 |                                                                                                                                                                                                                                              |
|                                 | Mass storage                        |                                                                                                                                                                                                                                              |
|                                 | Operating system                    |                                                                                                                                                                                                                                              |
|                                 | Graphic card                        |                                                                                                                                                                                                                                              |
| <b>Communication Interfaces</b> | Ethernet (ETH)                      | 2 x GbE LAN / RTE, 1 USB to LAN                                                                                                                                                                                                              |
|                                 | USB front                           | 1 x Type A V2.0                                                                                                                                                                                                                              |
|                                 | USB rear                            | 3 x Type A V2.0 and 1 x Type B V2.0 (USB to PC)                                                                                                                                                                                              |
|                                 | DVI-D interface                     | 1                                                                                                                                                                                                                                            |
| <b>Power supply</b>             | 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<br>As point of reference, the 24V-power supply should be rated for 4A continuous load.                                                                                                                                               |
| <b>Ambient conditions</b>       | Climatic conditions operation       | 5..45 °C with horizontal mounting.<br>10...90% rel. air humidity, non-condensing.<br><br>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.                                                                                                                                                        |
| <b>EMC</b>                      | EMC immunity                        | Industry EN 61000-6-2                                                                                                                                                                                                                        |
|                                 | EMC emission                        | Residential area EN 61000-6-3                                                                                                                                                                                                                |
| <b>Degree of Protection</b>     | Front                               | IP 65                                                                                                                                                                                                                                        |
|                                 | Rear                                | IP 20                                                                                                                                                                                                                                        |
| <b>Weight</b>                   |                                     | 8.5 kg                                                                                                                                                                                                                                       |
| <b>Dimensions</b>               | W x H x D                           | Please refer to the following pages                                                                                                                                                                                                          |
| <b>Fan</b>                      | Type                                | The Smart Fan control system supports Thermal® and Speed® cruise.                                                                                                                                                                            |
| <b>Noise</b>                    |                                     | <70dB                                                                                                                                                                                                                                        |

### 4.6.3 FS192L (without integrated PC) module description

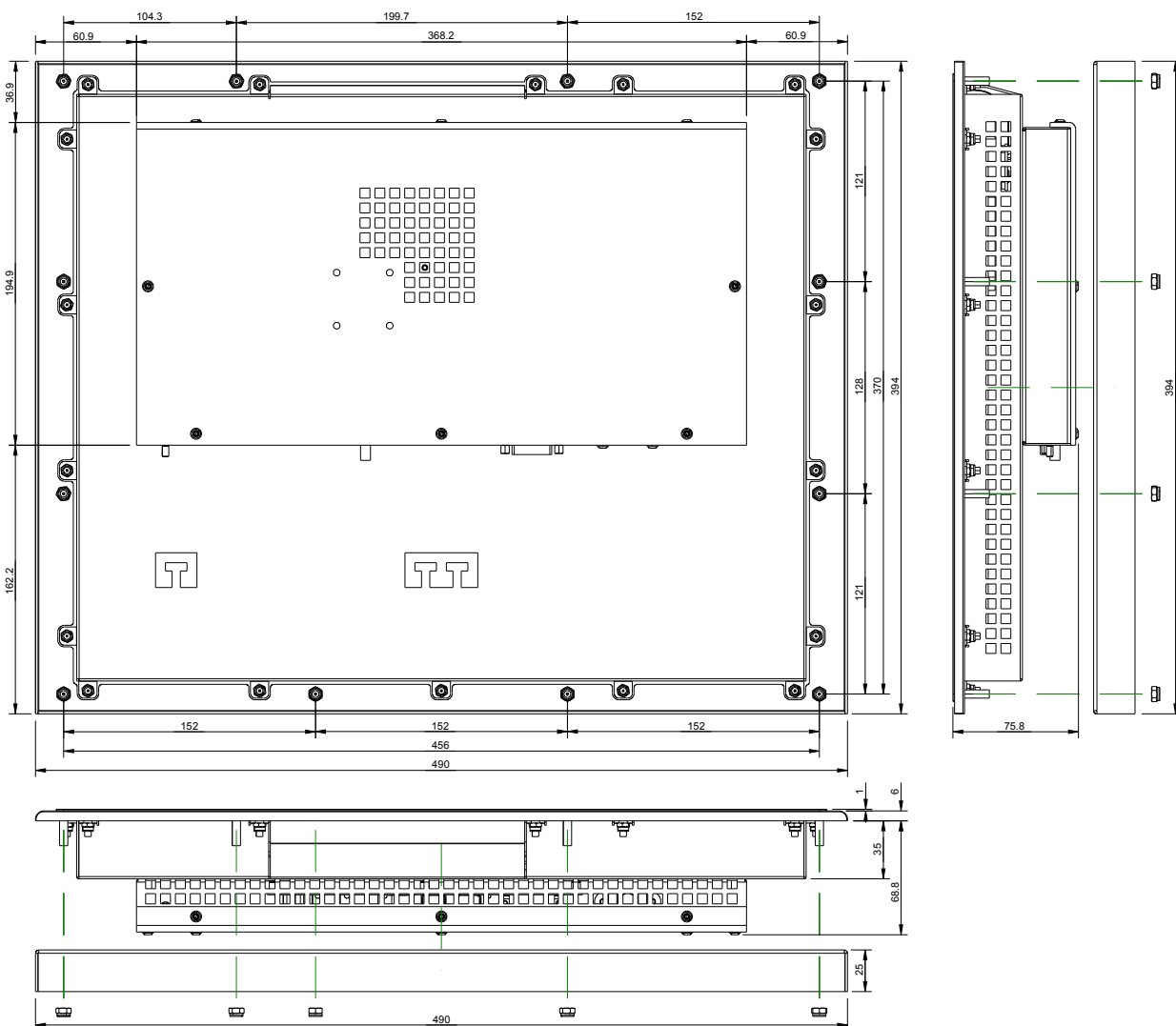
FS192L front view



| Connector     | Type            | Description                                       |
|---------------|-----------------|---------------------------------------------------|
| Power supply  | 3 screws pins F | FS192L power supply connections                   |
| Rotary switch | -               | Rotary switch to adapt DVI cable length           |
| Potentiometer | -               | Potentiometer to adjust the screen brightness     |
| USB (to PC)   | USB port Type B | Interface for FS192L to PC connections            |
| USB x3        | USB port Type A | General user purpose. (Mouse and all USB devices) |
| DVI-D         | Standard DVI    | Digital Video interface connection                |
| LEDs x4       | Green LEDs      | Power supply and DVI signal diagnostics LEDs      |

#### 4.6.4 Installation of Panels FS192L

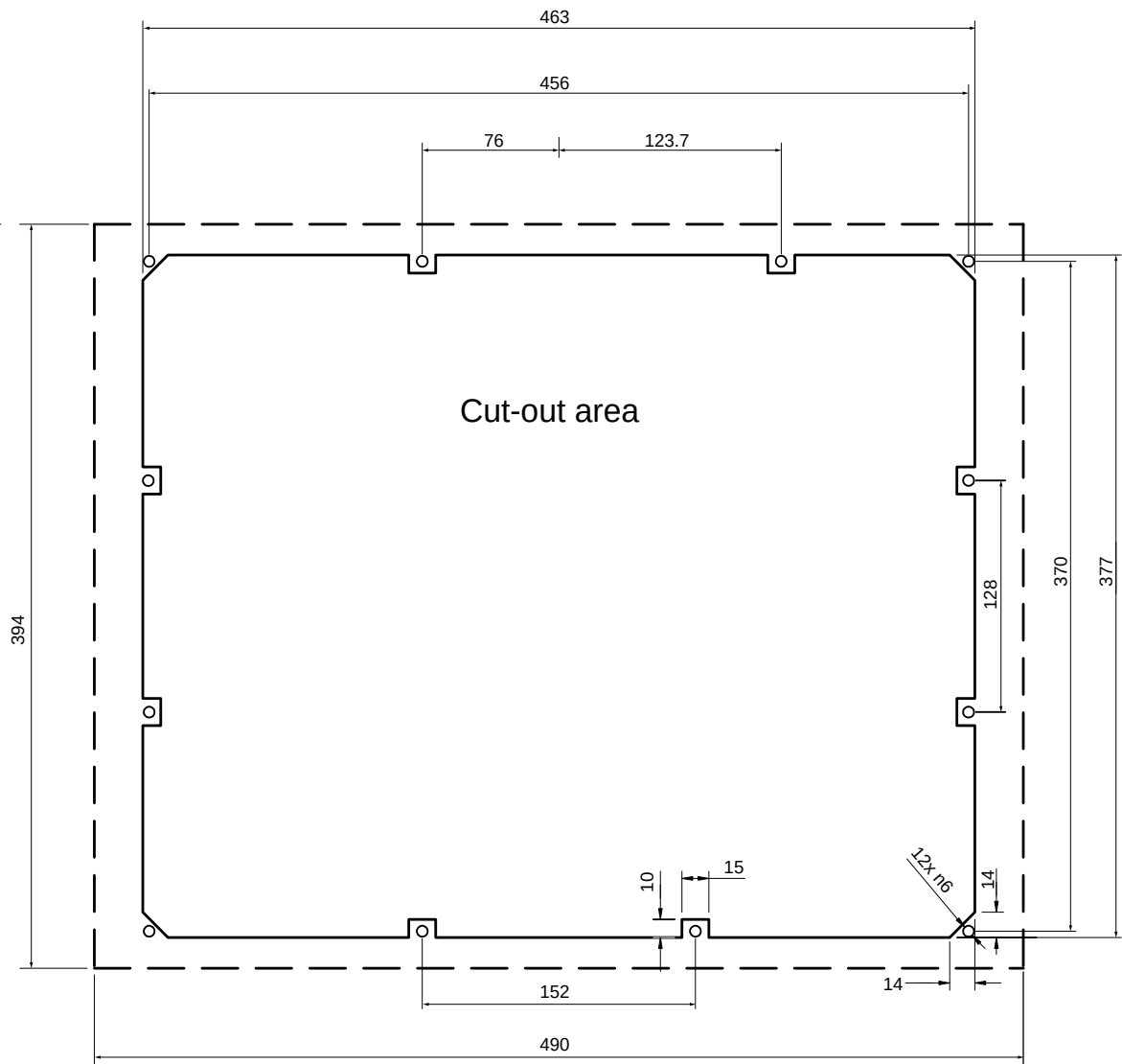
#### 4.6.4.1 Detailed dimensions



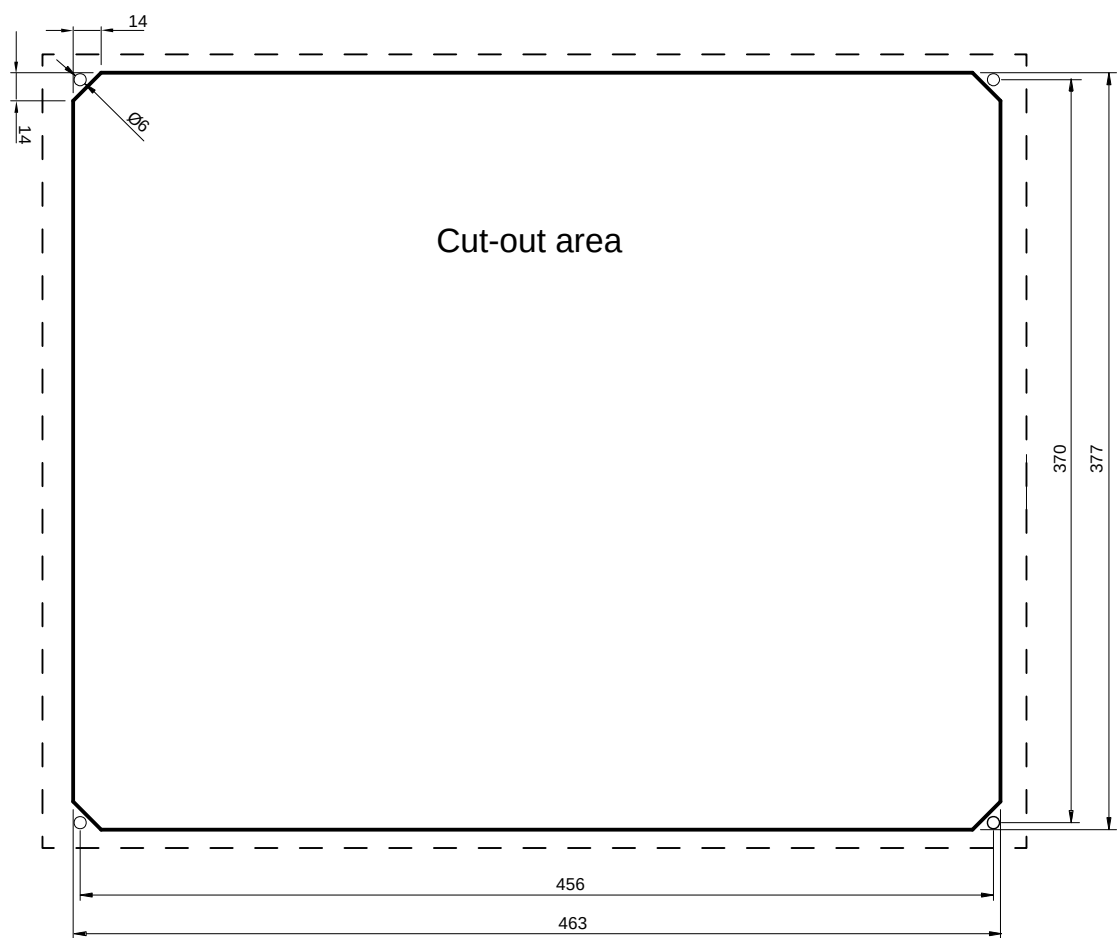
The FS192L can be operated at a maximum ambient temperature of 45°C. The ambient temperature is based on the temperature of the area 5 cm above the panel with the device horizontal mounting at a height of 2000 m above sea level.

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

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

**4.6.4.2 Panel FS192L cut-out and hole pattern**

4.6.4.3 Panel FS192L cut-out using back side mounting plate



#### 4.6.5 Disposal

FS192L no longer in use must be properly disposed of or must be returned to the manufacturer for disposal. (Manufacturer address see list of NUM agencies on chapter 1)

##### 4.6.5.1 Transport

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

##### 4.6.5.2 Storage

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

#### 4.6.6 FS192L Panels connections



Please refer to chapter 9 Flexium connections for more detailed information upon the FS192L Panels connections.



## 4.7 USB QWERTY keyboard (Horizontal and Vertical external keyboard)

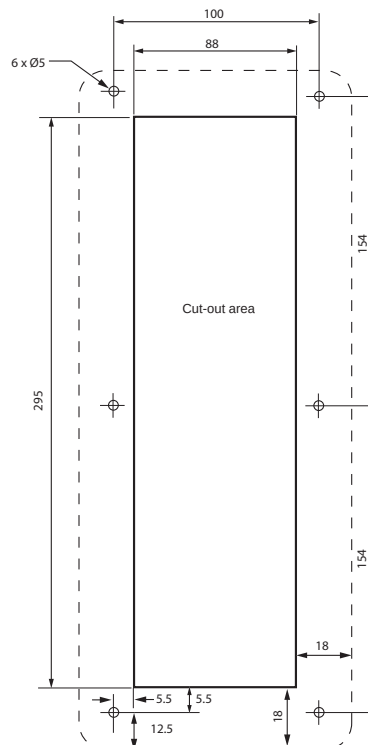
### 4.7.1 General characteristics

|                               | <b>FXHE000248<br/>(Vertical keyboard)</b>                                                                                                                                       | <b>FXHE000249<br/>(Horizontal keyboard)</b>                                                                                 |
|-------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|
| <b>Main keyboard features</b> | 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).<br>See next pages.                                                                             |                                                                                                                             |
|                               |  <p>FS153 Panels</p> <p>USB keyboard</p> <p>Machine panel MP04 or MP06</p> <p>Blind plate</p> |  <p>FS153 Panels</p> <p>USB keyboard</p> |

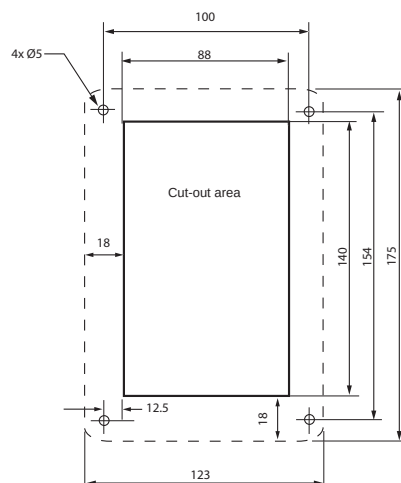
The vertical keyboard is always completed by a blind plate with location for 11 push buttons under membrane.

#### 4.7.2 Installation of the keyboards

#### 4.7.2.1 Vertical keyboard detailed dimensions and cut-out



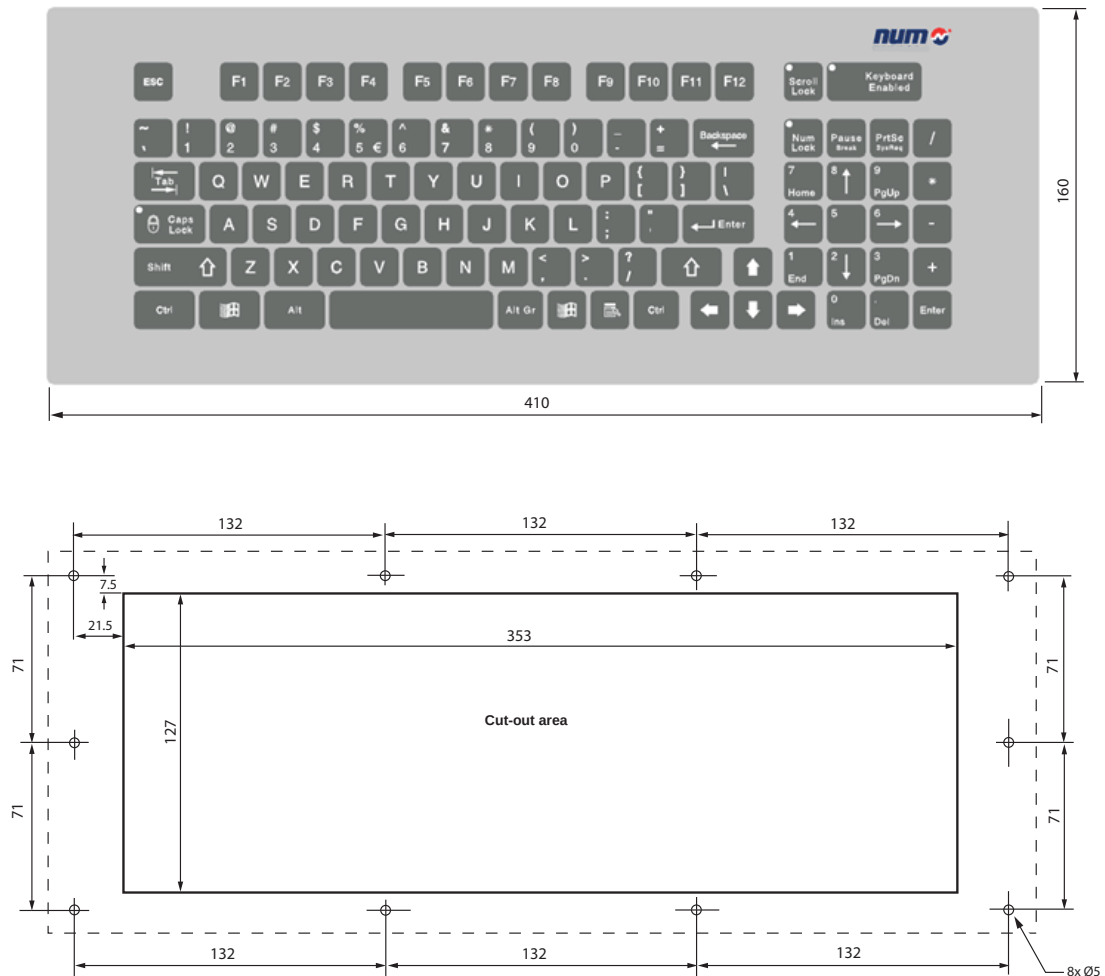
Blind plate (rear view)



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

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

#### 4.7.2.2 Horizontal keyboard detailed dimensions and cut-out



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

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

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

### 4.7.3 Disposal

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

### 4.7.4 USB keyboards connections



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

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## Summary

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## 5 Flexium MP Panels - Machine panel

### 5.1 MP04 Machine panel

#### 5.1.1 General

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

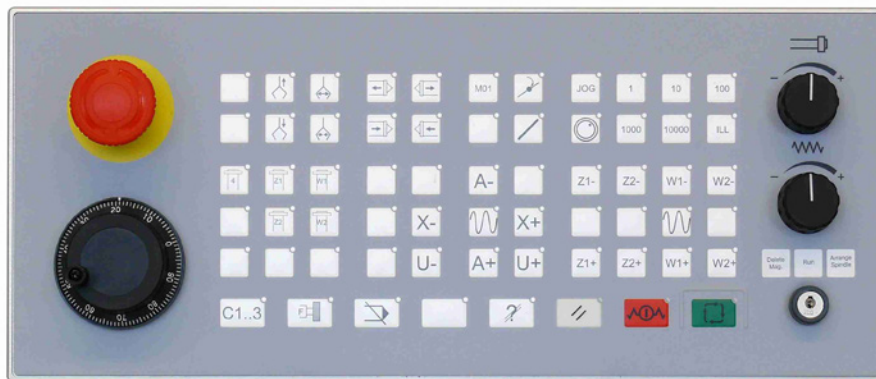
Two versions are available:

- Machine Panel MP04–W, without handwheel (reference FXHE558110)
- Machine Panel MP04–H, with handwheel (reference FXHE558120)

MP04 includes:

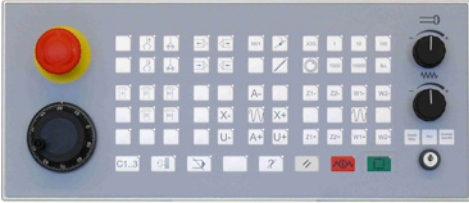
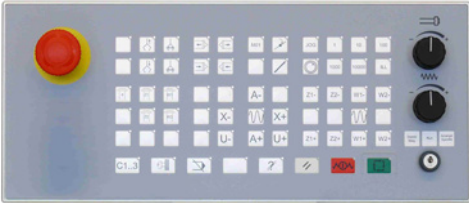
- 55 configurable buttons with LEDs
- 2 Overrides potentiometers for spindle speed and feed rate
- 1 handwheel (FXHE 558 120 only)
- 1 emergency stop button
- 1 three-position key switch
- 3 controls: Cycle start, Cycle stop and Reset
- 5 keys for additional functions with LEDs.

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





### 5.1.2 Machine Panel MP04

| Machine Panels MP04                                                               |                                                                                                                                                                                                                 |
|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <b>Machine Panel MP04-H (with handwheel)</b> <ul style="list-style-type: none"><li>• CAN interface</li><li>• 63 free programmable function buttons</li><li>• Same width as FS153i</li><li>• Handwheel</li></ul> |
|  | <b>Machine Panel MP04-W (without handwheel)</b> <ul style="list-style-type: none"><li>• CAN interface</li><li>• 63 free programmable function buttons</li><li>• Same width as FS153i</li></ul>                  |

### 5.1.3 MP04 available versions and ordering code

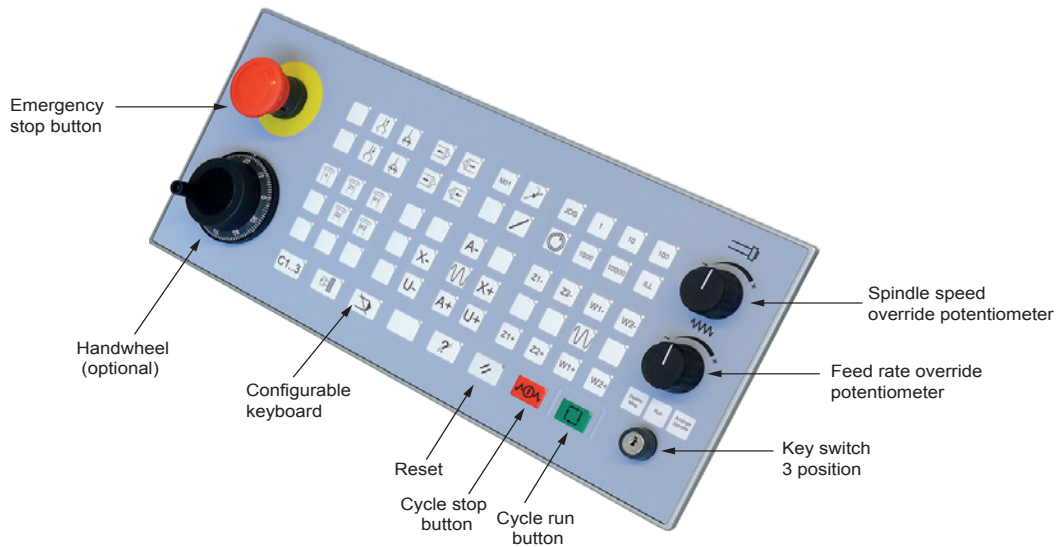
| MP04 version                           | Ordering code     |
|----------------------------------------|-------------------|
| Machine Panel MP04–W without handwheel | <b>FXHE558110</b> |
| Machine Panel MP04–H with handwheel    | <b>FXHE558120</b> |

### 5.1.4 General characteristics

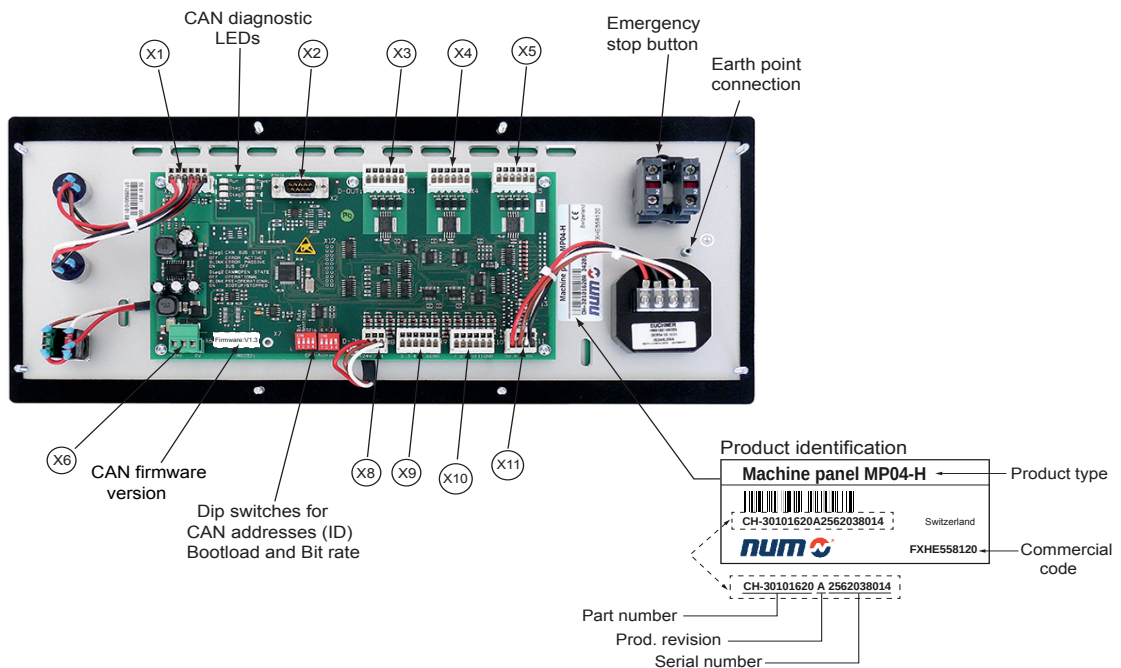
|                             |                                     | FXHE558110                                                                                                                                                                                  | FXHE558120                      |
|-----------------------------|-------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|
| <b>MP04 panel</b>           | User interface                      | 63 free programmable keys                                                                                                                                                                   | 63 free programmable keys       |
|                             | Handwheel                           | Not present                                                                                                                                                                                 | Yes (100 Pulses per revolution) |
|                             | CAN interface                       | Yes (9 Pins Sub-D)                                                                                                                                                                          |                                 |
| <b>On board sensor</b>      | 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                               |
| <b>Press buttons</b>        | 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                                                                                                                                         |                                 |
| <b>Digital inputs</b>       | 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)                                                                                                                                                                     |                                 |
| <b>Digital outputs</b>      | 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)                                                                                                                                         |                                 |
| <b>Power supply</b>         | 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                                                                                                                                                                                     |                                 |
| <b>Ambient conditions</b>   | 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                                                                                                                                           |                                 |
| <b>EMC</b>                  | 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). |                                 |
| <b>Degree of protection</b> | Front                               | IP 65, EN 60068-2-68                                                                                                                                                                        |                                 |
|                             | Rear                                | IP 00                                                                                                                                                                                       |                                 |
| <b>Weight</b>               |                                     | 1.2 kg                                                                                                                                                                                      | 1.3 kg                          |
| <b>Dimensions</b>           | W x H x D:                          | 410 x 175 x 55 mm                                                                                                                                                                           |                                 |

## 5.1.5 MP04 Machine panel description

MP04 Machine Panels front view



MP04 Machine Panels rear view



| 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                    |

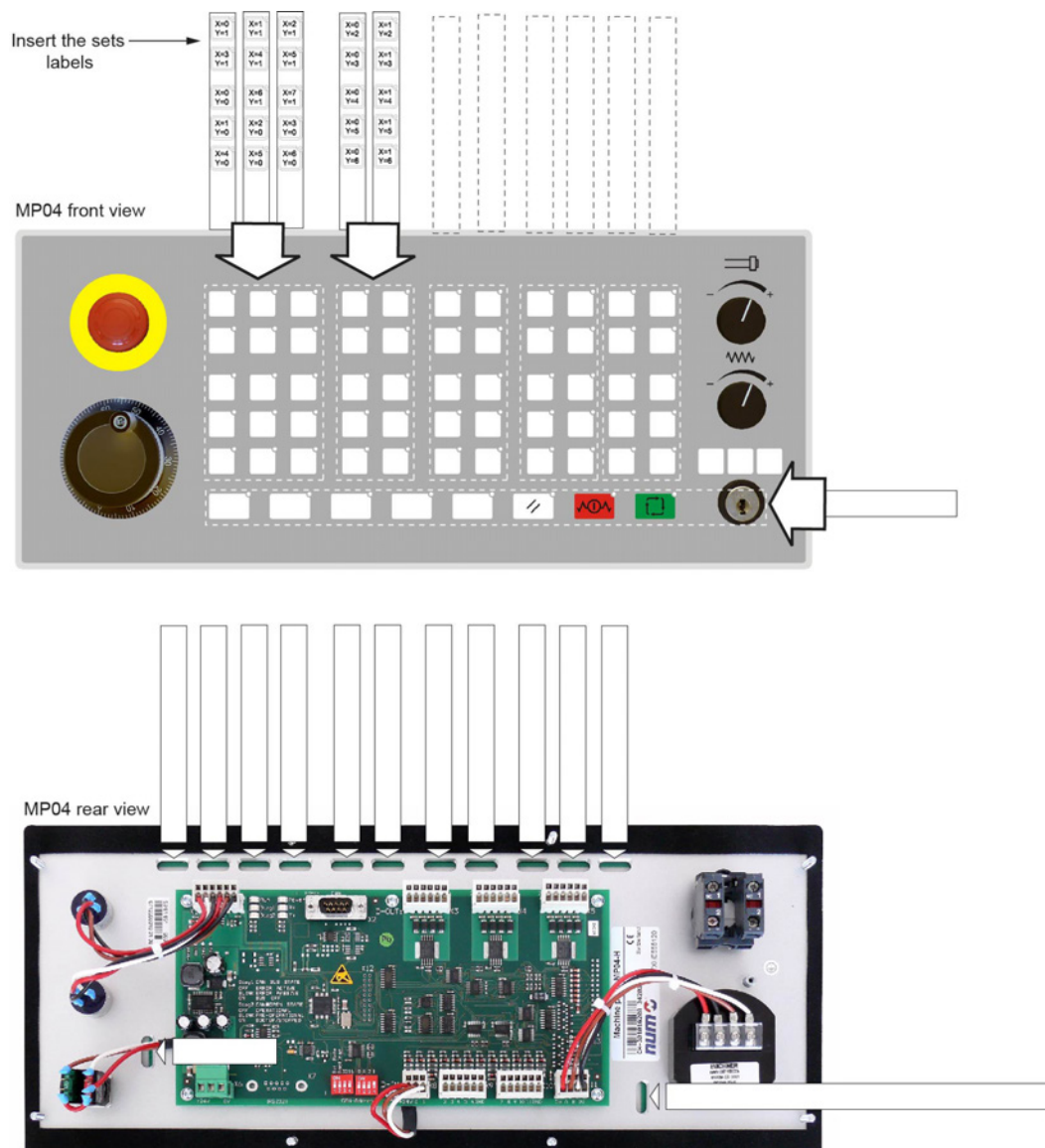
### 5.1.6 Installing the button labels

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

Supplied with the panel:

- a file to define and print the key labels:  
[https://flexium.num.com/folder/01/Examples and Files](https://flexium.num.com/folder/01/Examples%20and%20Files)  
You can get Id and password from your NUM local contact.
- a blank sheet of A4 paper to be printed on a laser printer (Type Folex BG-72 WO width 0.1 mm)

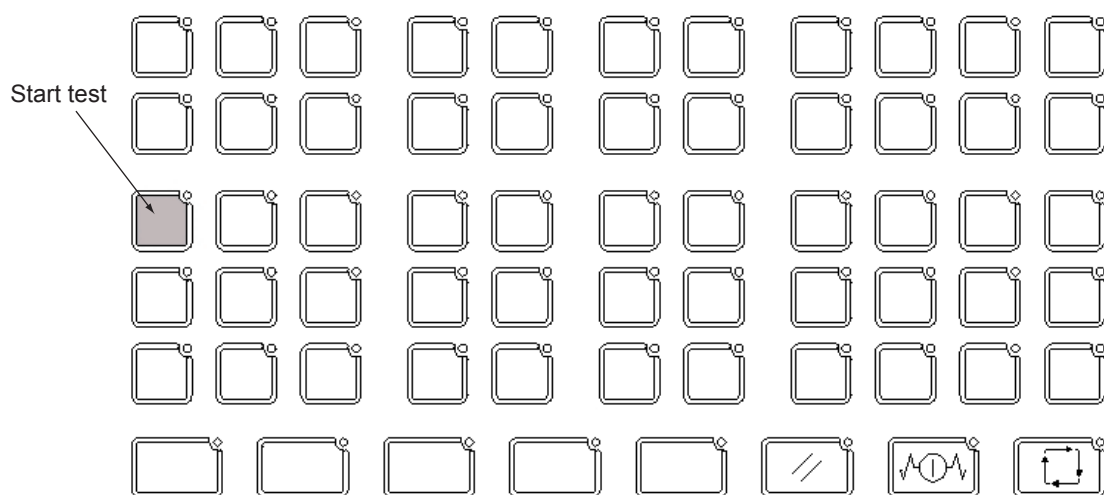
#### 5.1.6.1 Installing the key labels at the rear of the MP04 Machine Panel



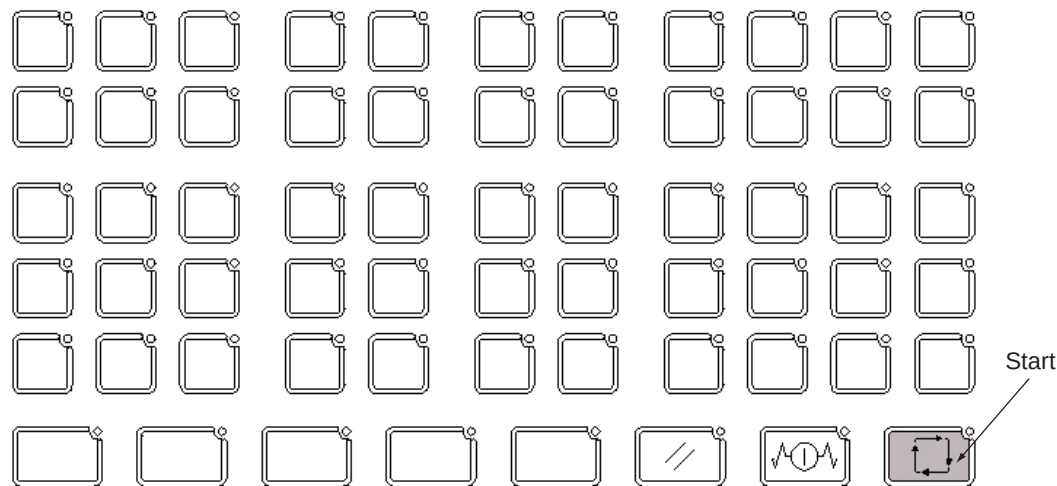
### 5.1.7 Test program

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.

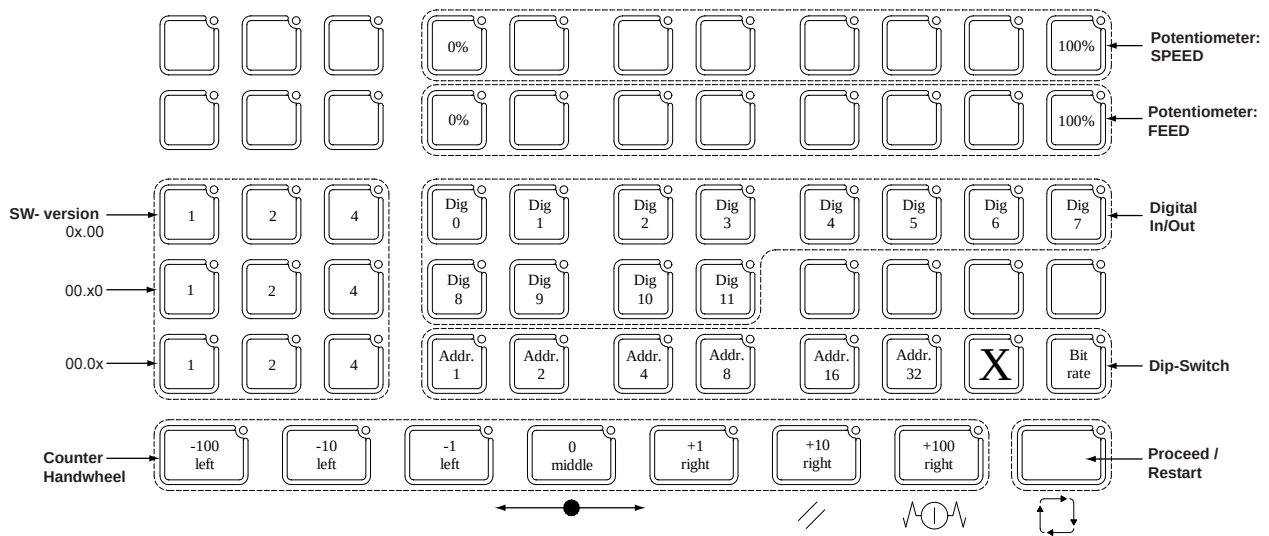


3. All LEDs will light up for 250ms one after another. So the function of the LEDs can be checked.  
After completion of this test, the LED of the “*Start*” button will flash.



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.

---

## 5.1.8 Mounting instructions

### 5.1.8.1 General Mounting instructions

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

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

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



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

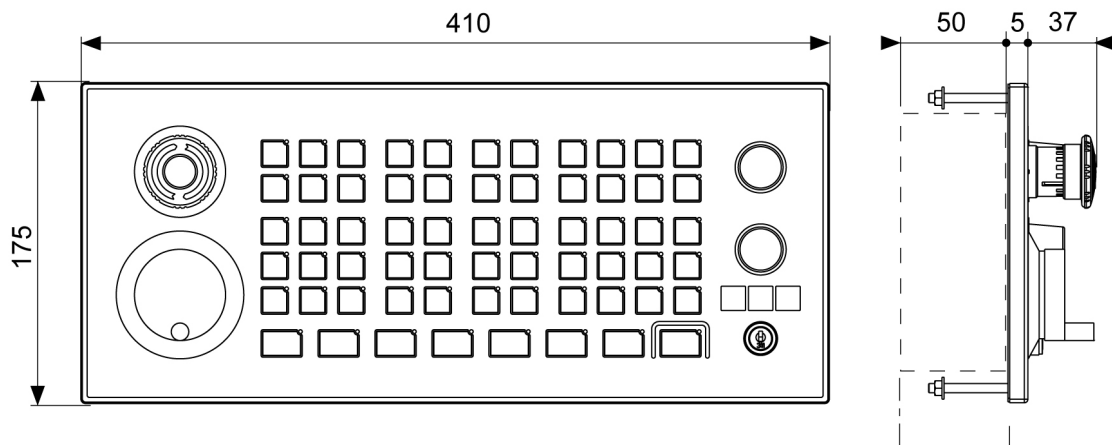
### 5.1.8.2 Flush mounting in front plate

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

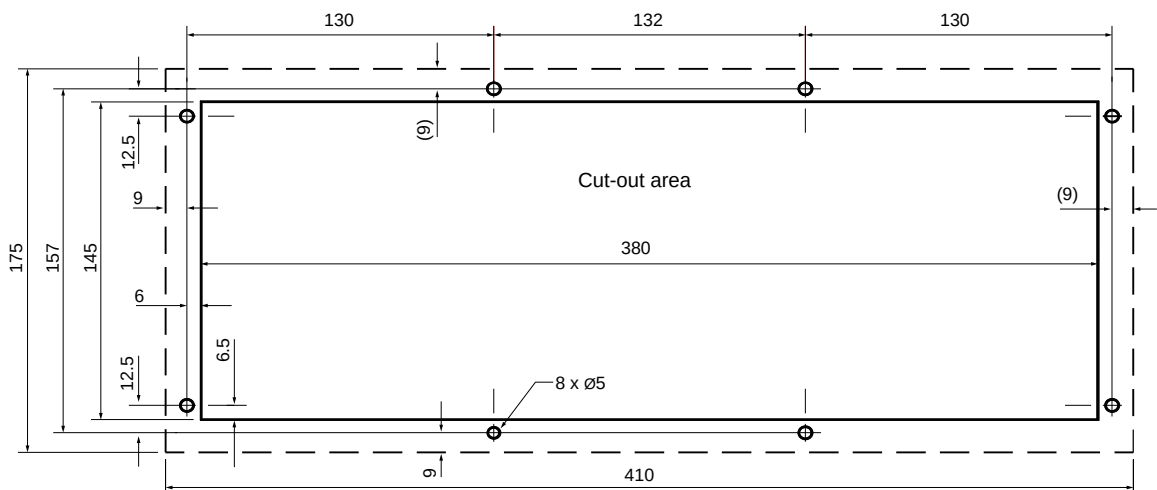


Ensure that the seal is seated correctly on the front panel.  
Avoid torques higher than 0.5Nm, as this may damage the device.  
The thickness of the cabinet must not exceed 7mm.

### 5.1.9 Detailed dimensions of the MP04-W and MP04-H



### 5.1.10 Cut-out and hole pattern



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

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

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

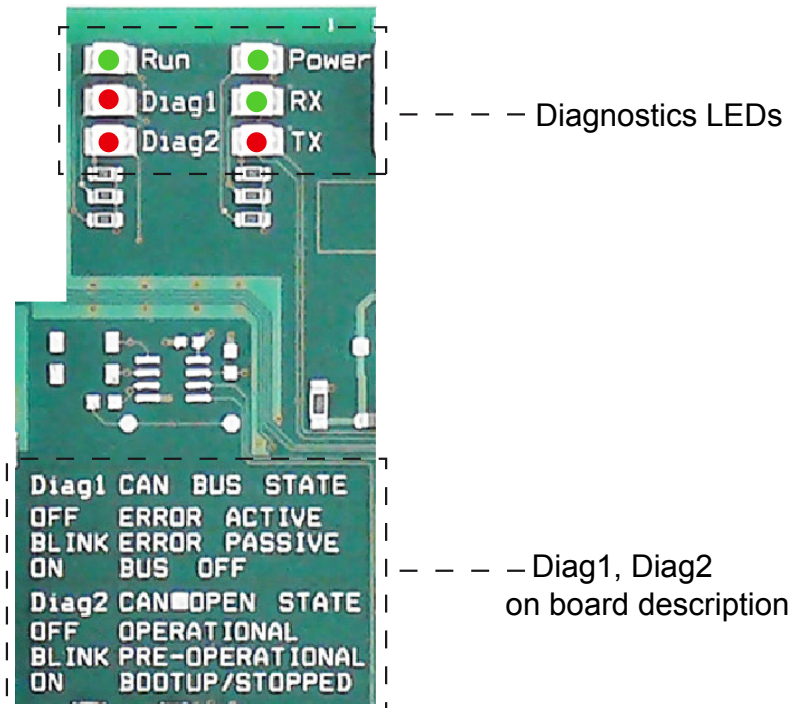


### 5.1.11 Diagnostic LEDs on board

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

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

The two diagnosis LEDs Diag1 and Diag2 are also described on the electronic board as indicated in the picture.



| LED                                                         | Colour | Status   | Possible cause and remedy                                                                                                           |
|-------------------------------------------------------------|--------|----------|-------------------------------------------------------------------------------------------------------------------------------------|
| Run                                                         | Green  | OFF      | <ul style="list-style-type: none"> <li>The module is in bootload state</li> <li>No firmware loaded</li> </ul>                       |
|                                                             |        | Blinking | <ul style="list-style-type: none"> <li>The firmware is working properly</li> </ul>                                                  |
| Diag1                                                       | Red    | OFF      | <ul style="list-style-type: none"> <li>CAN-Bus-State = Error active (error free)</li> </ul>                                         |
|                                                             |        | Blinking | <ul style="list-style-type: none"> <li>CAN-Bus-State = Error passive (disturbed, but working)</li> </ul>                            |
|                                                             |        | ON       | <ul style="list-style-type: none"> <li>CAN-Bus-State = Bus OFF (node disconnected)</li> </ul>                                       |
| Diag2                                                       | Red    | OFF      | <ul style="list-style-type: none"> <li>CAN-Bus-State = operational</li> </ul>                                                       |
|                                                             |        | Blinking | <ul style="list-style-type: none"> <li>CAN-Bus-State = Pre operational</li> </ul>                                                   |
|                                                             |        | ON       | <ul style="list-style-type: none"> <li>CAN-Bus-State = Stopped or during Boot up</li> <li>MP04 is in boot load mode</li> </ul>      |
| Power                                                       | Green  | OFF      | <ul style="list-style-type: none"> <li>The MP04 is switched off</li> <li>The internal +5V power supply is malfunctioning</li> </ul> |
|                                                             |        | ON       | <ul style="list-style-type: none"> <li>The MP04 is switched on and the internal +5V power supply is functioning properly</li> </ul> |
| RX                                                          | Green  |          | <ul style="list-style-type: none"> <li>Receive CAN data <sup>(1)</sup></li> </ul>                                                   |
| TX                                                          | Red    |          | <ul style="list-style-type: none"> <li>Transmit CAN data <sup>(1)</sup></li> </ul>                                                  |
| (1) The light intensity is proportional to the bus traffic. |        |          |                                                                                                                                     |

### 5.1.12 Disposal

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

#### Materials

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

### 5.1.13 Maintenance and Repair

#### 5.1.13.1 Repairs

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

#### 5.1.13.2 Transport

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

#### 5.1.13.3 Storage

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

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#### 5.1.14 MP04 to PLC configuration



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

---

#### 5.1.15 MP04 connections



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

## 5.2 MP05 Machine panel

### 5.2.1 General

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

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

The panel configuration and connections is supplied by the customer.

MP05 includes:

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

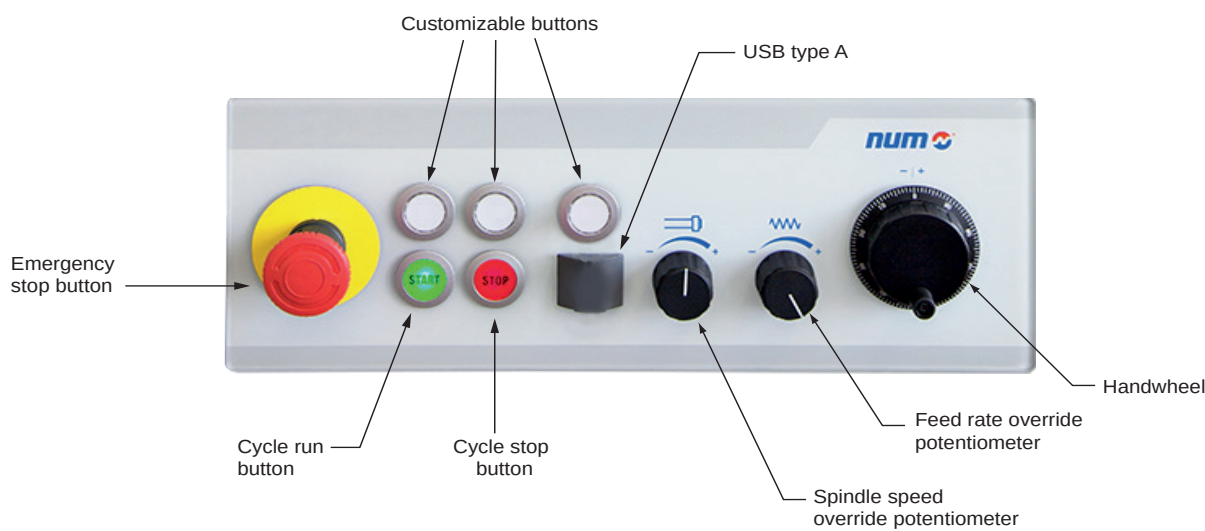


### 5.2.2 MP05 available versions and ordering code

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

5.2.3 MP05 Machine panel description

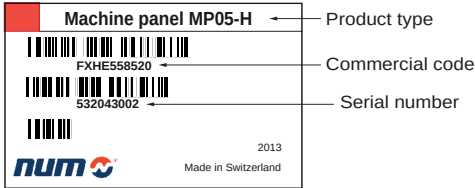
MP05 Machine Panel front view



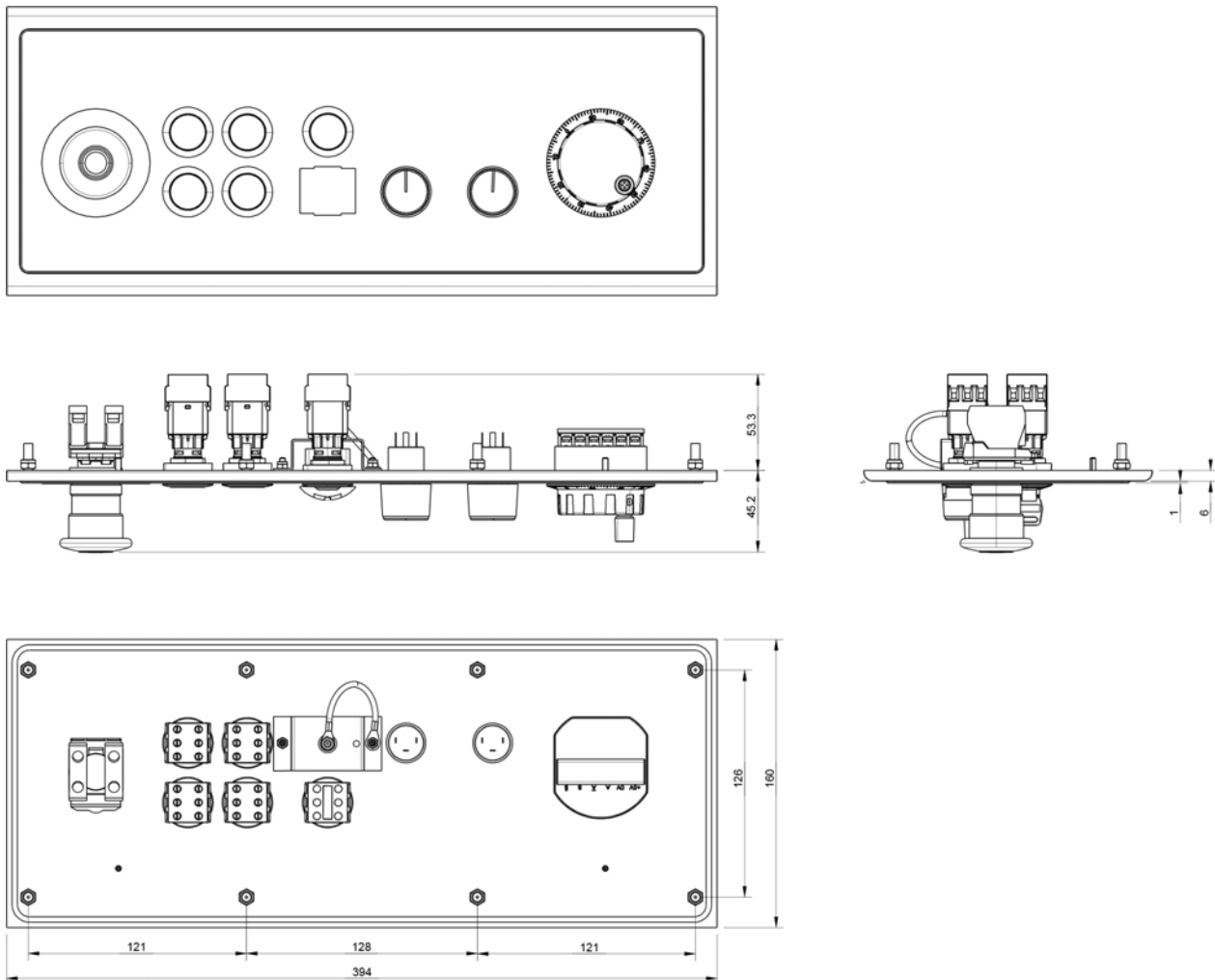
MP05 Machine Panel rear view



Product identification



## 5.2.4 Detailed dimensions

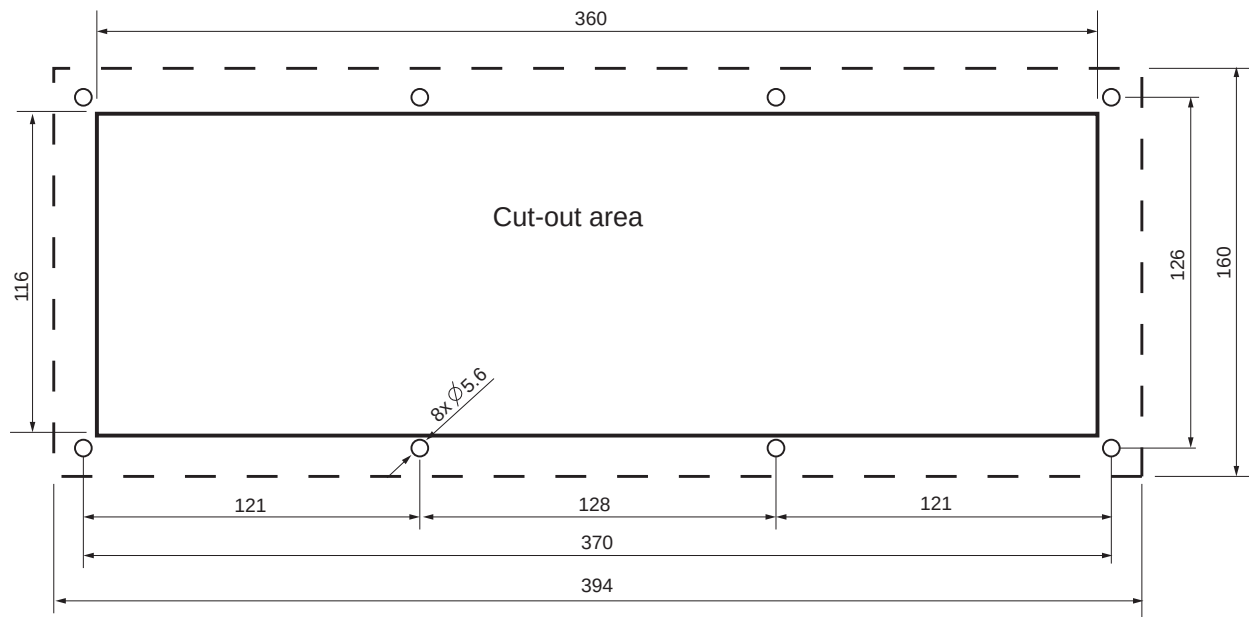


The MP05 can be operated at a maximum ambient temperature of 45°C. The ambient temperature is based on the temperature of the area 5cm above the panel with the device horizontal mounting at a height of 2000m above sea level.

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

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

### 5.2.5 Cut-out and hole pattern



### 5.2.6 Disposal

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

---

## 5.2.7 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)

### 5.2.7.2 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 described for MP04 and MP06 Panels.  
It should be remembered that a high storage temperature reduces the lifespan of the product.  
It is recommended to store the device at room temperature.

## 5.2.8 MP05 connections

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



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## 5.3 MP06 Machine panel

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### 5.3.1 General

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

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

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

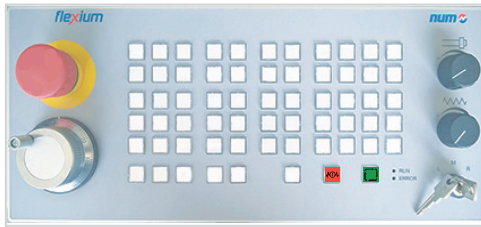
MP06 includes:

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



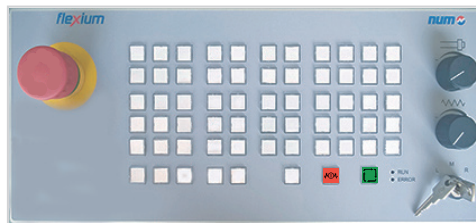
### 5.3.2 Machine Panel MP06

#### MP06 Machine Panels



#### Machine Panel MP06-H (with handwheel)

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



#### Machine Panel MP06-W (without handwheel)

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

### 5.3.3 MP06 available versions and ordering code

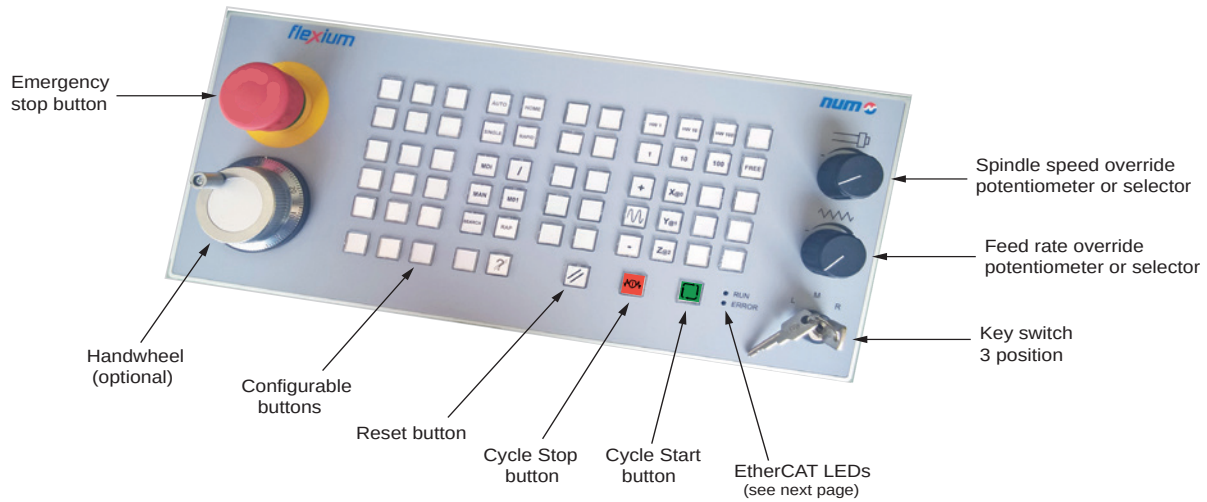
| MP06 version                                              | Ordering code          |
|-----------------------------------------------------------|------------------------|
| Machine Panel MP06–W without handwheel and potentiometers | <b>FXHE02ARE1WE000</b> |
| Machine Panel MP06–H with handwheel and potentiometers    | <b>FXHE02ARE1HE000</b> |
| Machine Panel MP06–W without handwheel and selectors      | <b>FXHE02ARE2WE000</b> |
| Machine Panel MP06–H with handwheel and selectors         | <b>FXHE02ARE2HE000</b> |

### 5.3.4 General characteristics

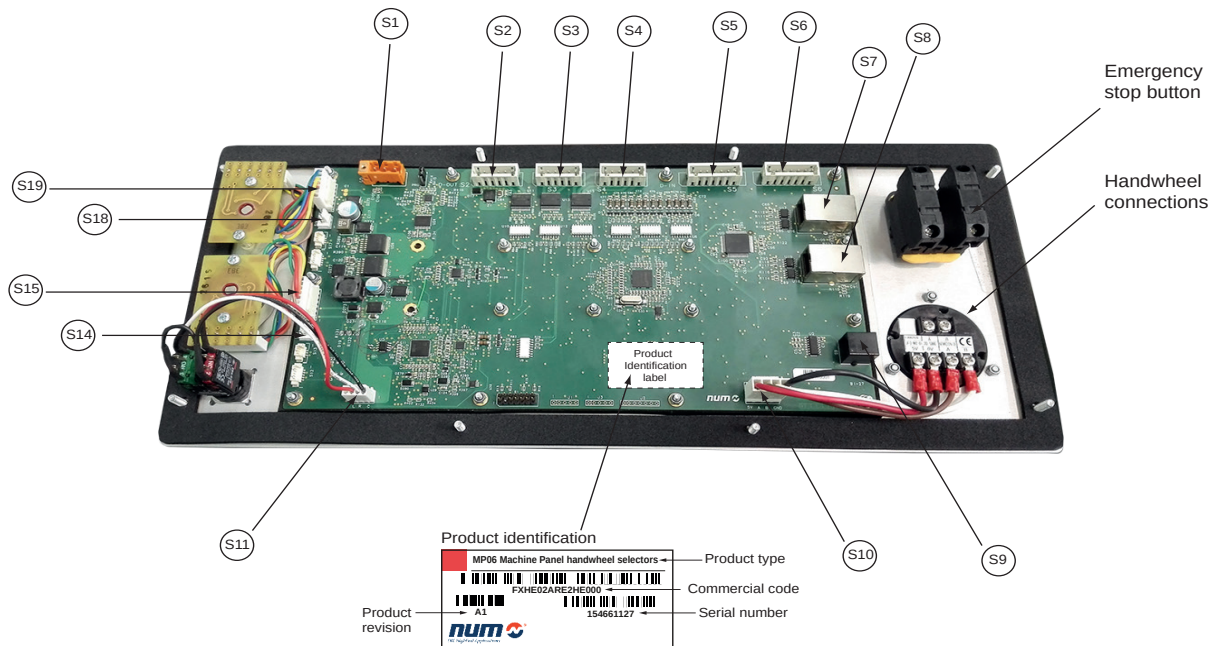
|                      |                                     | FXHE02ARE1WE000                                                                                                                                                                             | FXHE02ARE1HE000          | FXHE02ARE2WE000     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

### 5.3.5 MP06 Machine panel description

MP06 Machine Panels front view



MP06 Machine Panels rear view



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

### 5.3.6 EtherCAT LEDs RUN and ERROR description

#### RUN indicator state

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

#### ERROR indicator state

| Indicator state | ERROR Name                                                  | Description                                                                                                                                                                                   | Example                                                                                                                                                       |
|-----------------|-------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ON              | Application controller failure                              | An critical communication or application controller error has occurred.                                                                                                                       | Application controller is not responding any more (PDI Watchdog Timeout detected by ESC)                                                                      |
| n Flashes       | Reserved                                                    | Reserved for future use                                                                                                                                                                       | -                                                                                                                                                             |
| Triple Flash    | Reserved                                                    | Reserved for future use                                                                                                                                                                       | -                                                                                                                                                             |
| Double Flash    | Processor Data Watchdog Timeout / EtherCAT Watchdog Timeout | An application watchdog timeout has occurred                                                                                                                                                  | Sync Manager Watchdog timeout                                                                                                                                 |
| Single Flash    | Local Error                                                 | Slave device application has changed the EtherCAT state autonomously, due to local error (see ETG.1000 part 6 EtherCAT State Machine). Error indicator bit is set to 1 in AL Status register. | Device changes its EtherCAT state from Op to SafeOpError due to a synchronization error.                                                                      |
| Blinking        | Invalid configuration                                       | General Configuration Error.                                                                                                                                                                  | State change commanded by master is impossible due to register or object settings, or invalid hardware configuration (pin sharing violation detected by ESC). |
| Flickering      | Bootling 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.                                                                                                                             |                                                                                                                                                               |

### 5.3.7 Installing the personalization button labels

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

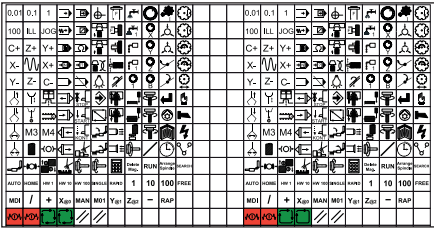
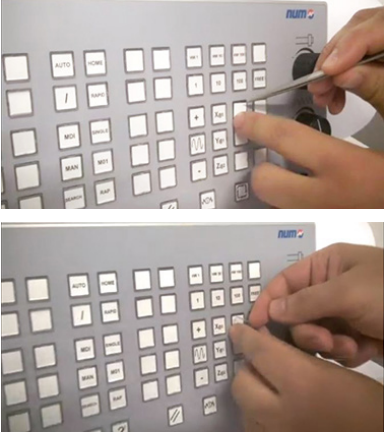
MP06 is supplied with covers button and their assignment is specified by installing a set of personalization label sheet supplied with the machine panel as indicated here under.

If you need printout more own labels please download the label file from:

**<https://flexium.num.com>** (Identifier and password will be provided by your usual num contact)

|      |     |     |  |  |  |  |  |  |  |  |  |  |  |      |     |     |  |  |  |  |  |  |  |  |  |  |  |      |     |     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|------|-----|-----|--|--|--|--|--|--|--|--|--|--|--|------|-----|-----|--|--|--|--|--|--|--|--|--|--|--|------|-----|-----|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| .001 | .01 | .1  |  |  |  |  |  |  |  |  |  |  |  | .001 | .01 | .1  |  |  |  |  |  |  |  |  |  |  |  | .001 | .01 | .1  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 1    | 10  | 100 |  |  |  |  |  |  |  |  |  |  |  | 1    | 10  | 100 |  |  |  |  |  |  |  |  |  |  |  | 1    | 10  | 100 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| C+   | Z+  | Y+  |  |  |  |  |  |  |  |  |  |  |  | C+   | Z+  | Y+  |  |  |  |  |  |  |  |  |  |  |  | C+   | Z+  | Y+  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| X-   |     | X+  |  |  |  |  |  |  |  |  |  |  |  | X-   |     | X+  |  |  |  |  |  |  |  |  |  |  |  | X-   |     | X+  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Y-   | Z-  | C-  |  |  |  |  |  |  |  |  |  |  |  | Y-   | Z-  | C-  |  |  |  |  |  |  |  |  |  |  |  | Y-   | Z-  | C-  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|      |     |     |  |  |  |  |  |  |  |  |  |  |  |      |     |     |  |  |  |  |  |  |  |  |  |  |  |      |     |     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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|      |     |     |  |  |  |  |  |  |  |  |  |  |  |      |     |     |  |  |  |  |  |  |  |  |  |  |  |      |     |     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|      |     |     |  |  |  |  |  |  |  |  |  |  |  |      |     |     |  |  |  |  |  |  |  |  |  |  |  |      |     |     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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|      |     |     |  |  |  |  |  |  |  |  |  |  |  |      |     |     |  |  |  |  |  |  |  |  |  |  |  |      |     |     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|      |     |     |  |  |  |  |  |  |  |  |  |  |  |      |     |     |  |  |  |  |  |  |  |  |  |  |  |      |     |     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|      |     |     |  |  |  |  |  |  |  |  |  |  |  |      |     |     |  |  |  |  |  |  |  |  |  |  |  |      |     |     |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

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

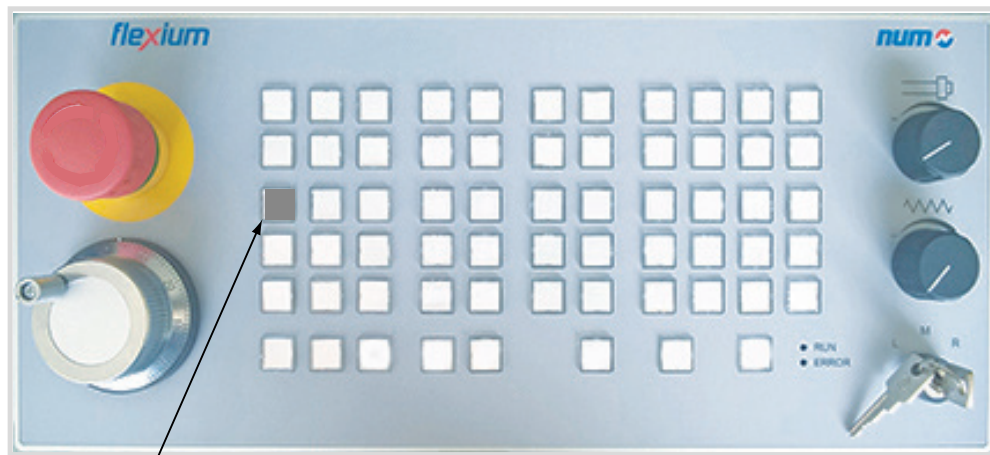
|                                                                                                                                                                                                                            |                                                                                      |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| <p><b>Installing a new key label</b></p> <ul style="list-style-type: none"> <li>- Take your personalization label.</li> <li>- Place the label into the button cavity.</li> <li>- Place the plastic button cover</li> </ul> |    |
| <p><b>Change key label</b></p> <p>Remove the plastic button cover using small pincers or by mean a small screwdriver.</p>                                                                                                  |   |
| <p>Grasp the label.</p>                                                                                                                                                                                                    |  |
| <p>Remove the label.</p>                                                                                                                                                                                                   |  |
| <p>Place the new label.</p>                                                                                                                                                                                                |  |
| <p>Replace the plastic button cover.</p>                                                                                                                                                                                   |  |



### 5.3.8 Test program

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

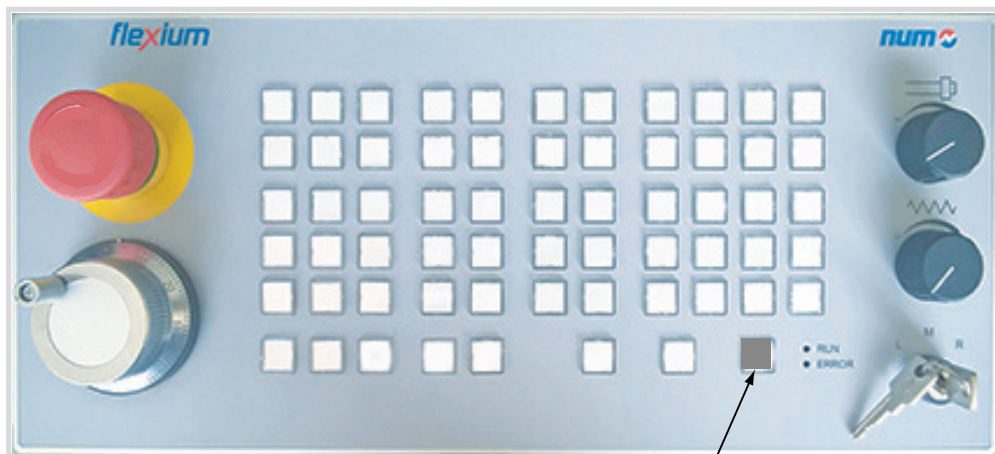
1. Switch off the power of the MP06.
2. Press the button “*Start test*”, hold it depressed and switch power on.  
After 250ms the test procedure starts. The “*Start test*” button may now be released.



Start test button

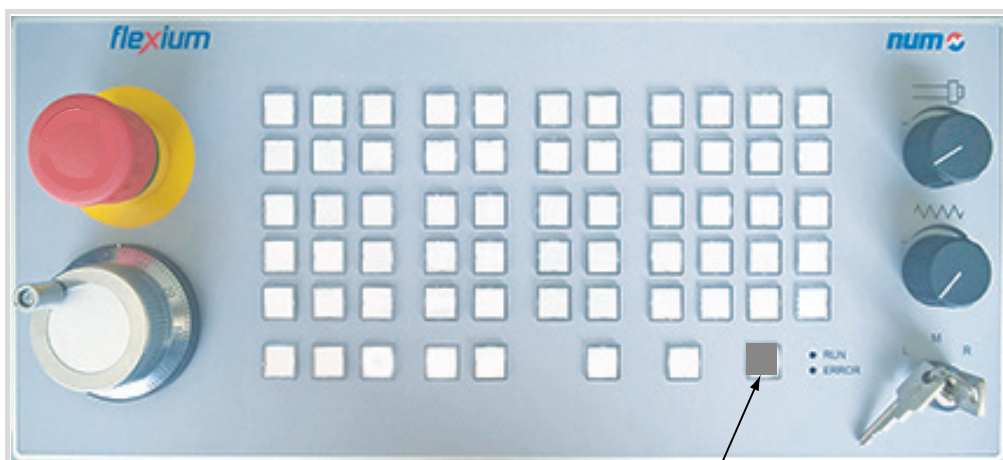


3. All LEDs will light up for 250ms one after another. So the function of the LEDs can be checked. After completion of this test, the LED of the “Start” button will flash.



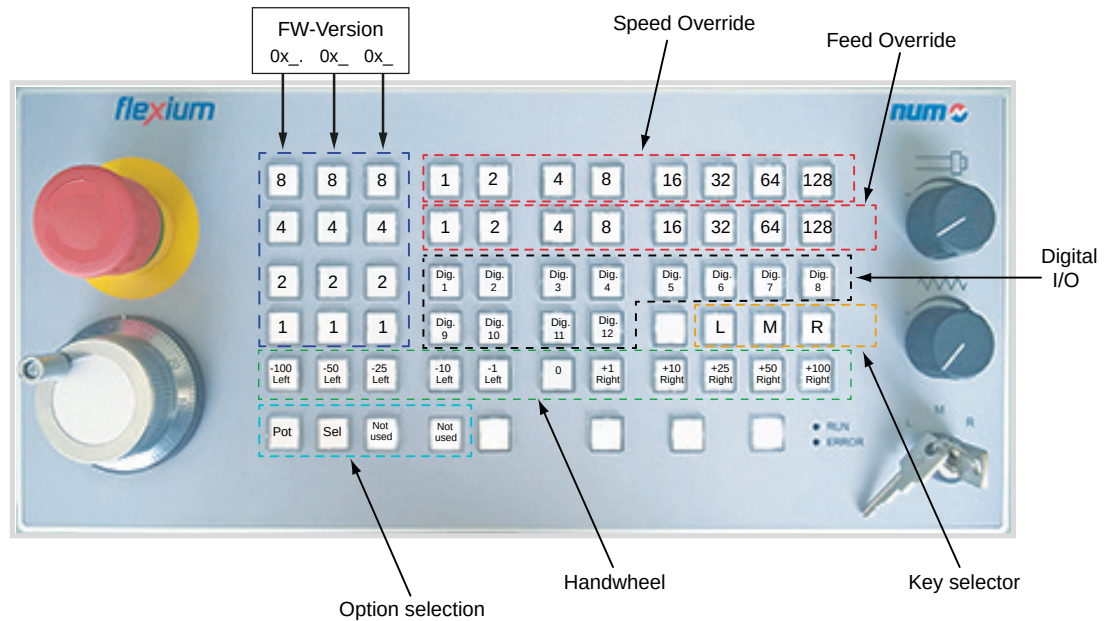
Start button flash

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.



Start button

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



The values displayed are:

|                                                                                                                   |                                                                                                                                                                                                                              |
|-------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>FW-Version (software version)</b><br>(see Blue area)                                                           | Firmware version of the MP06 panel.<br>The version is displayed in Hexadecimal code. (0.00)                                                                                                                                  |
| <b>Handwheel</b><br>(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 )                                                         |
| <b>SPEED Override</b><br><b>FEED Override</b><br>(see Red area)                                                   | By turning the corresponding knob the LEDs will light in binary code:<br>- Potentiometers version: 0 ÷ 255 values displayed.<br>- Selectors version: 0 ÷ 24 values displayed.                                                |
| <b>Digital I/O</b> <sup>(1)</sup><br>(see Black area)                                                             | By pressing a key the relevant digital output will be forced. The LEDs shows the state of the digital inputs.                                                                                                                |
| <b>Key Selector</b> <sup>(1)</sup><br>(see Orange area)                                                           | Shows the 3 switches positions of the key as indicated in the picture above. ( L, M, R key positions)                                                                                                                        |
| <b>Options Selection</b><br>(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). |
| <sup>(1)</sup> This test can be performed just with EtherCAT in OP-state, the RUN led in front panel is light on. |                                                                                                                                                                                                                              |

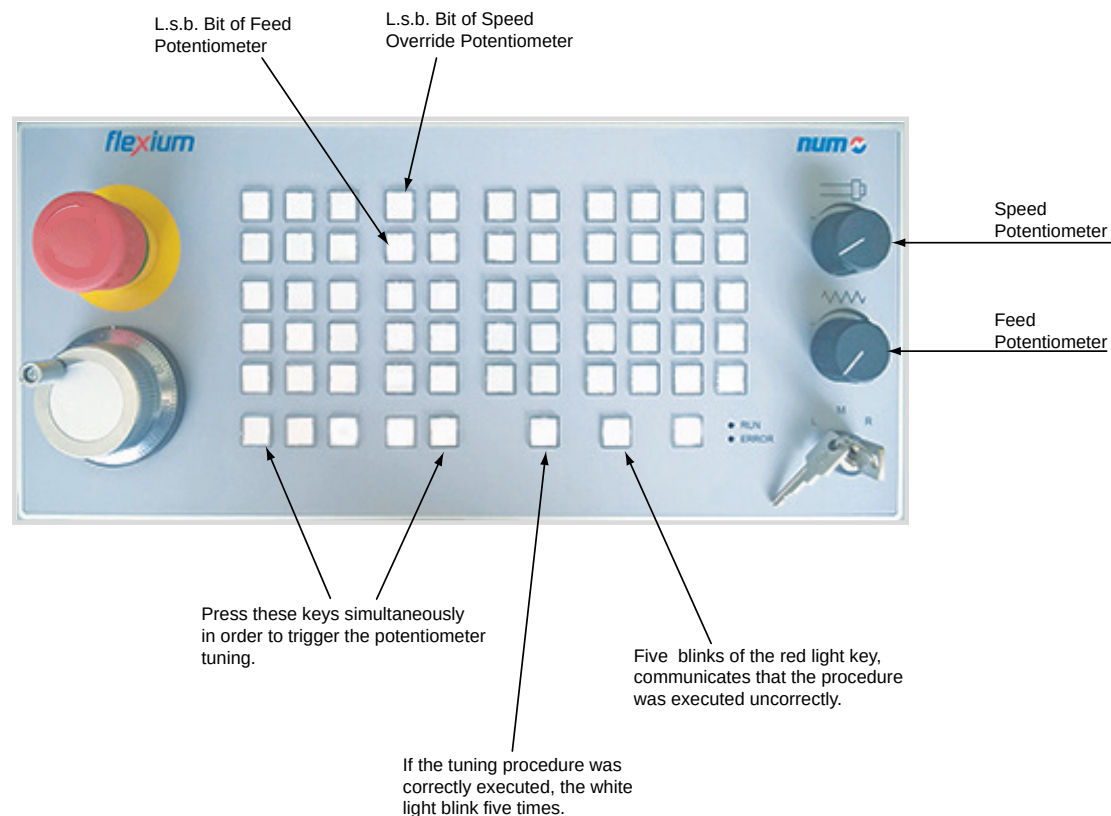
7. To restart the test, press the "Start" button with the flashing LED again.

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

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

Starting from the SW version 3.06 the MP0x offers the feature to set the max value reach by Spindle and Feed potentiometers.

It's possible to set the biggest dynamic of the potentiometers when the MP06 runs in Test Program.



### 9.1 Procedure

1. When the test procedure enter in the step of visualization of Fw version and inputs status (see step 6 of previously paragraph), if the L.s.b keys blink, then the corresponding potentiometer is not tune and the current full scale is set to default value.
2. Set the potentiometers in the position corresponding to the full scale (clockwise end travel).
3. Press simultaneously the fist key and fifth key of last key row.
4. The tuning was execute:
  - a. If the procedure was correct the key with white light blink five times.
  - b. If the value of the potentiometer was too low, then the procedure is deemed not correct and the key with red light, blink five times. After this you can see the lsb of the corresponding knob to blink, in order to signal what potentiometer was uncorrectly positioned.

## 5.3.9 Mounting instructions

### 5.3.9.1 General Mounting instructions

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

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

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



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

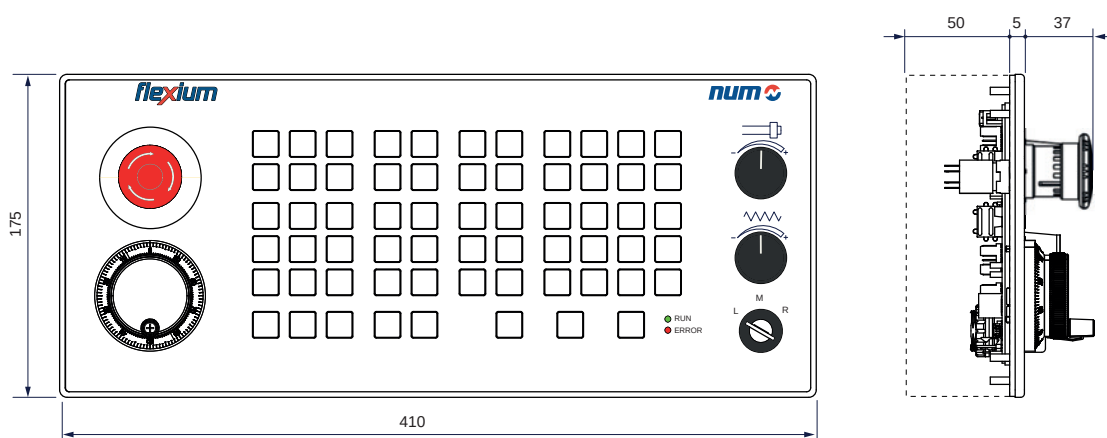
### 5.3.9.2 Flush mounting in front plate

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

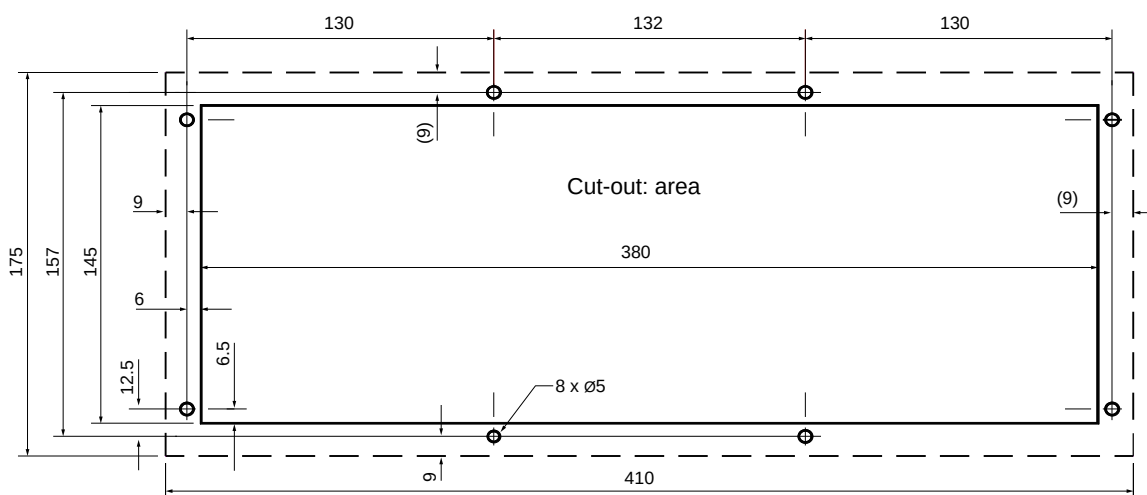


Ensure that the seal is seated correctly on the front panel.  
Avoid torques higher than 0.5Nm, as this may damage the device.  
The thickness of the cabinet must not exceed 7mm.

### 5.3.10 Detailed dimensions



### 5.3.11 Cut-out and hole pattern



MP06 can be operated at a maximum ambient temperature of 45°C.

The ambient temperature is based on the temperature of the area 5cm above the panel with the device horizontal mounting at a height of 2000m above sea level.

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

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

---

### 5.3.12 MP06 to PLC configuration

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For MP06 to PLC configuration please refer to Flexium<sup>+</sup> Commissioning manual M00044.

### 5.3.13 Disposal

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

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## **5.3.14 Maintenance and Repair**

### **5.3.14.1 Repairs**

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

### **5.3.14.2 Transport**

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

### **5.3.14.3 Storage**

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

## **5.3.15 MP06 connections**

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

## 5.4 MP08 Machine panel

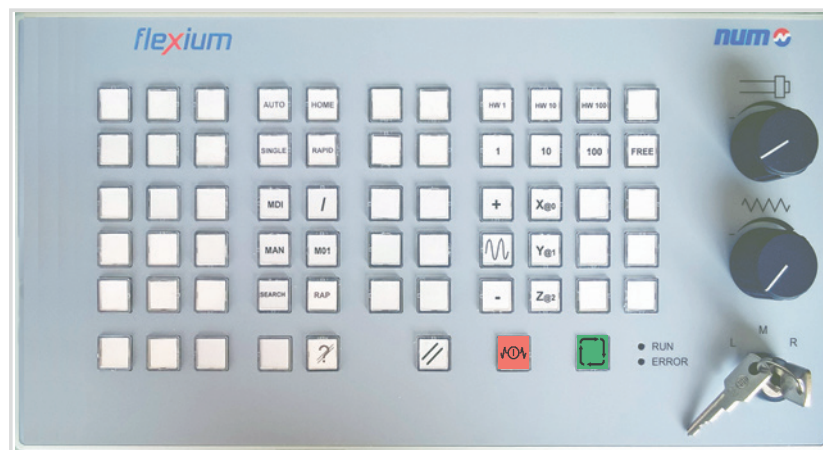
### 5.4.1 General

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

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

MP08 includes:

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



### 5.4.2 MP08 available versions and ordering code

| MP06 version                           | Ordering code          |
|----------------------------------------|------------------------|
| Machine Panel MP08 with potentiometers | <b>FXHE01ARE1WE000</b> |
| Machine Panel MP08 with selectors      | <b>FXHE01ARE2WE000</b> |



---

### 5.4.3 General characteristics



Please refer to MP06 General characteristics on previous pages.  
**(Handwheel and stop pushbutton not available)**

### 5.4.4 MP08 Machine panel description



Please refer to MP06 Machine panel description on previous pages.

### 5.4.5 Installing the personalization button labels



Please refer to MP06 Installing the personalization button label on previous pages.

### 5.4.6 Test program



Please refer to MP06 Test program on previous pages.

## 5.4.7 Mounting instructions

### 5.4.7.1 General Mounting instructions

MP08 are installed from the front, for example, into a control cabinet. They are fixed at the rear with embedded threaded bolts.

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

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



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

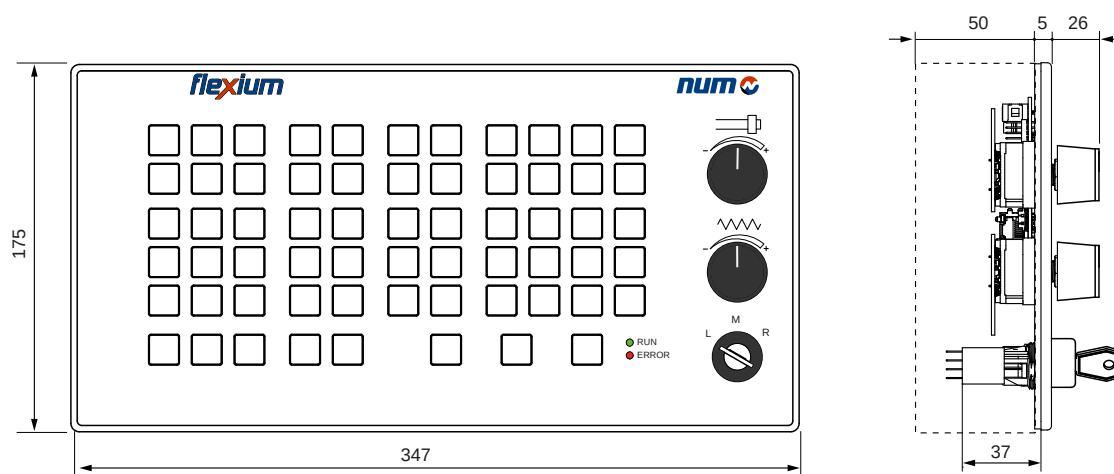
### 5.4.7.2 Flush mounting in front plate

- Insert the MP08 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).

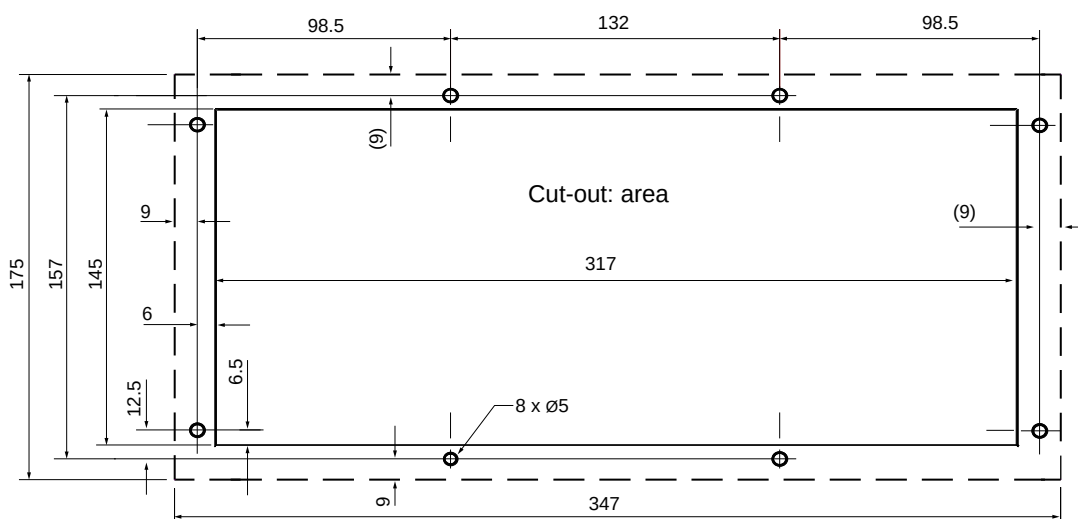


Ensure that the seal is seated correctly on the front panel.  
Avoid torques higher than 0.5Nm, as this may damage the device.  
The thickness of the cabinet must not exceed 7mm.

#### 5.4.8 Detailed dimensions



#### 5.4.9 Cut-out and hole pattern



MP08 can be operated at a maximum ambient temperature of 45°C.

The ambient temperature is based on the temperature of the area 5cm above the panel with the device horizontal mounting at a height of 2000m above sea level.

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

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

#### 5.4.10 MP08 to PLC configuration



For MP08 to PLC configuration please refer to Flexium<sup>+</sup> Commissioning manual M00044 "MP06" configuration.

#### 5.4.11 MP08 connections



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

#### 5.4.12 Disposal

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

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## **5.4.13 Maintenance and Repair**

### **5.4.13.1 Repairs**

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

### **5.4.13.2 Transport**

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

### **5.4.13.3 Storage**

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

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## Summary

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## 6 NUM Industrial Box PC

### 6.1 Industrial Box PC

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

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



Box PC P1 G4

Box PC P2



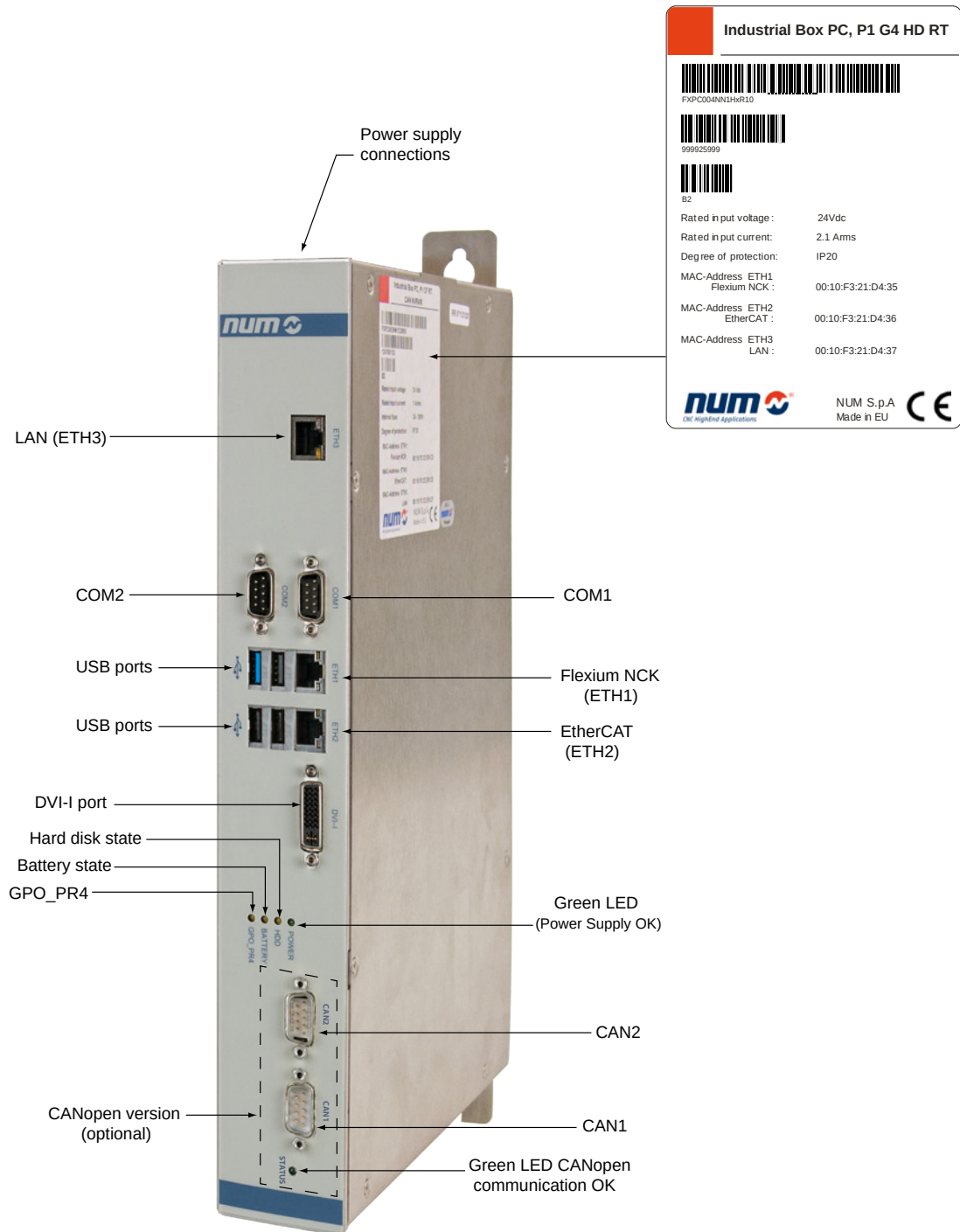
Machine builders and end users are not allowed to install on this NUM industrial PC, software which performs “Desktop Functions” other than through, in support of, and operating as a part of, the Embedded Application. “Desktop Functions” means consumer or business tasks or processes performed by a computer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

### 6.1.1 General characteristics

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

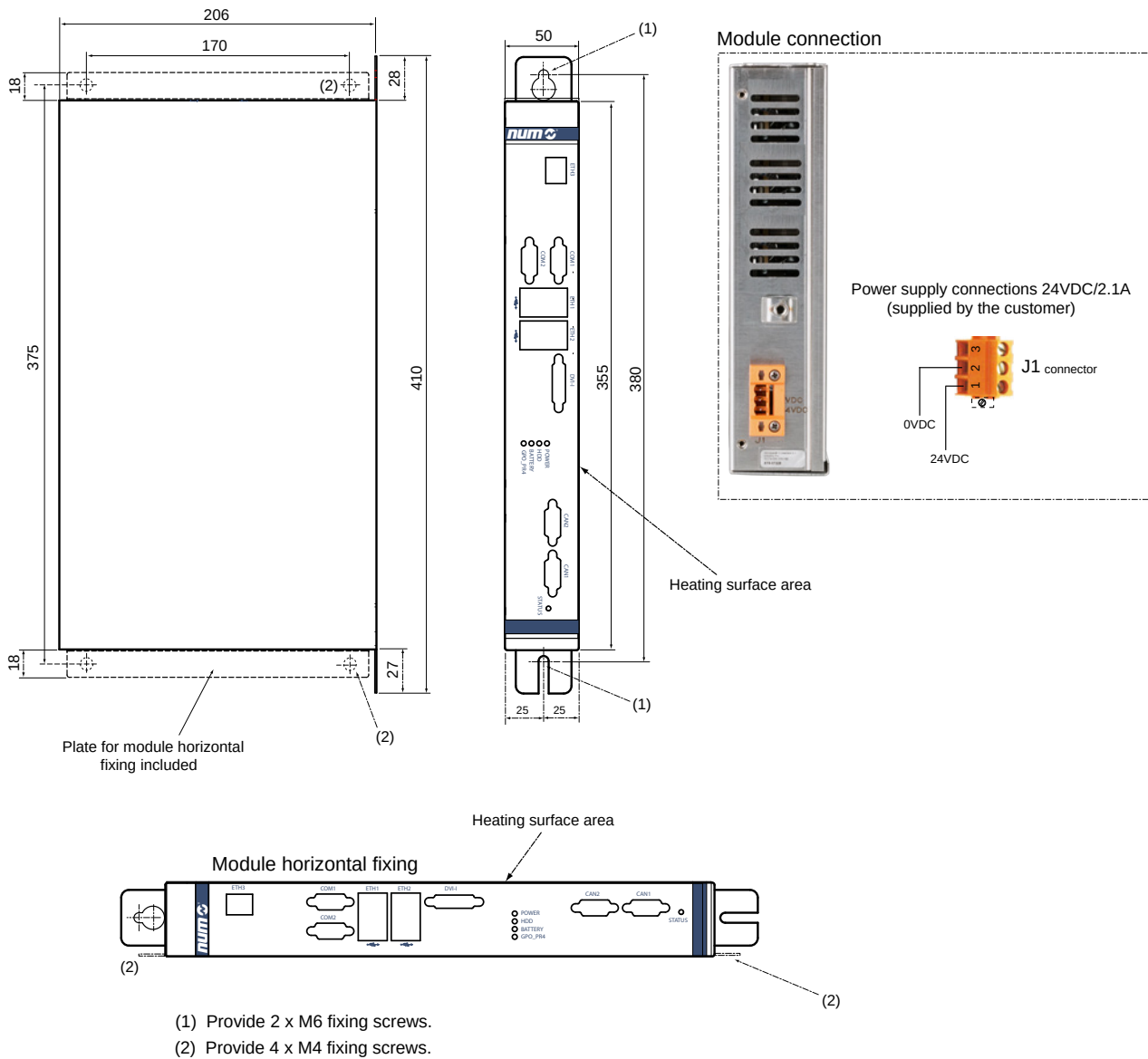
## 6.2 Industrial Box PC P1 G4 (FXPC004NN1HxR00)

### 6.2.1 Box PC P1 G4 layout and connectors



### 6.2.2

Dimensions in mm.



To facilitate sufficient air circulation and so ensure an adequate heat exchange in the system, it is recommended that a minimum ventilation clearance of 100mm is left in the fan area and at top and bottom side when installing the modules in the electrical cabinet.

Do not cover the ventilation grilles with cables or anything else, this may cause the rise temperature inside the drives. Please also refer to the M00027 manual for more detailed information.

### 6.2.3 Power up and shutdown

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

To Power up the system after a shut down it is necessary to switch the power off and on again. Such OFF/ON sequence should be separated by a minimum 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 initialized by the PLC program or by windows itself.

### 6.2.4 Diagnostics

| Symptom                                              | Possible cause and remedy                                                                                                                                                                                                                                                                    |
|------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Dark screen during power-up                          | <ul style="list-style-type: none"> <li>- Check power supply.</li> <li>- Loss of setup data.</li> <li>- Connect an external video display for diagnosis.</li> </ul>                                                                                                                           |
| White screen after switch off and re-switch on again | <ul style="list-style-type: none"> <li>- The ATX-power supply doesn't switch on properly because the switch off time was shorter than 20s.</li> </ul>                                                                                                                                        |
| Date/time not correct                                | Replace battery (see next page)                                                                                                                                                                                                                                                              |
| Ethernet connection missing                          | <ul style="list-style-type: none"> <li>- Incorrect Ethernet cable fitted (crossover/direct)</li> <li>- LINK-LED is lit if the connection is correct</li> <li>- ACT LED if the data transfer is correct (flashes during the transfer)</li> <li>- Incorrect/invalid IP address set.</li> </ul> |

### 6.2.5 Battery replacement

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



Replace only with the same type recommended by NUM.

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



Pay attention to ESD safety protections when changing the battery.

---

## **6.2.6 Maintenance and Repair**

### **6.2.6.1 Repairs**

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

### **6.2.6.2 Transport**

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

### **6.2.6.3 Storage**

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

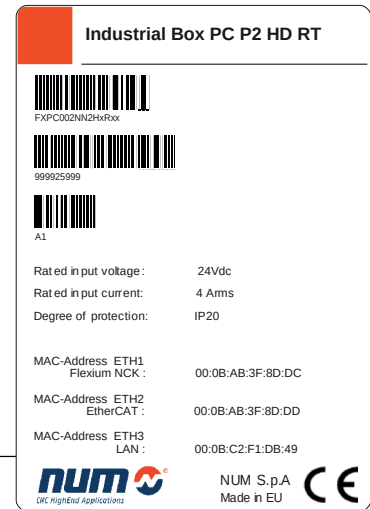
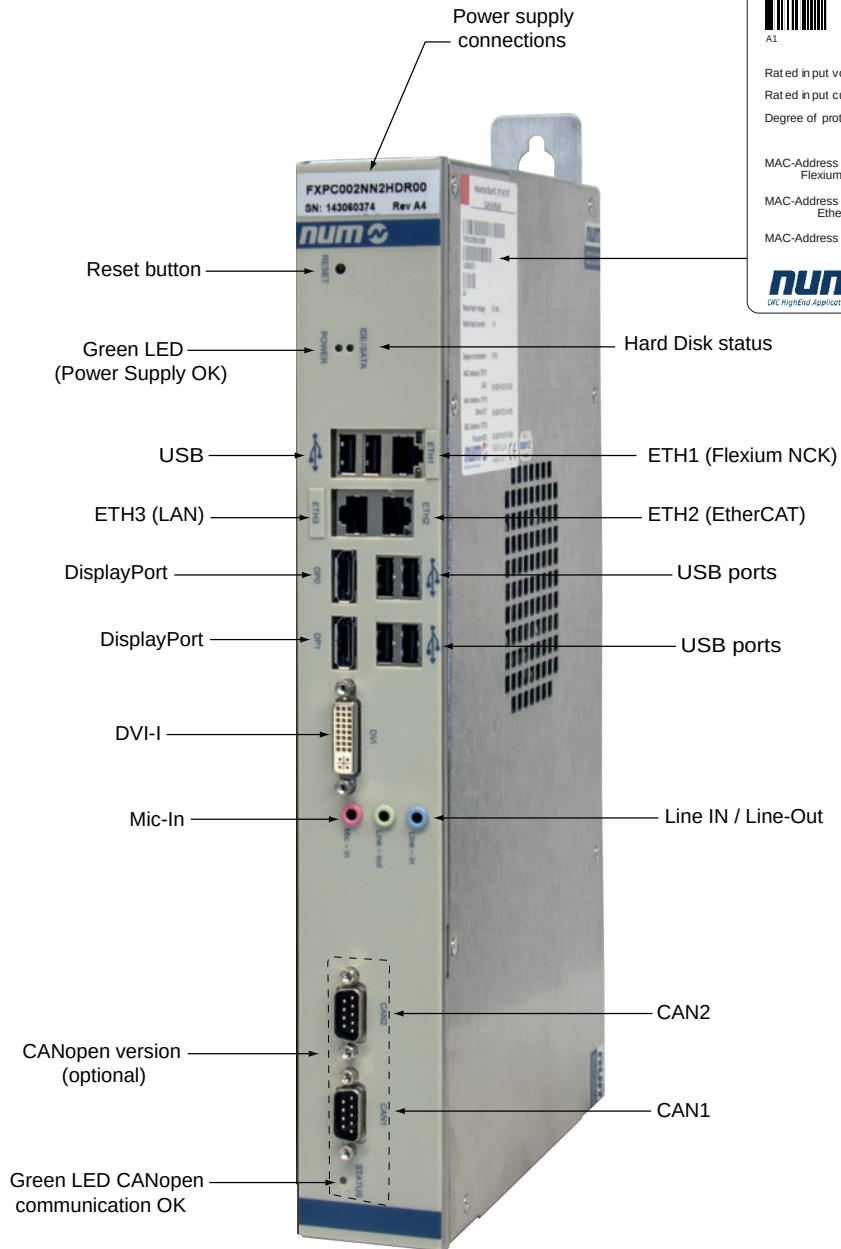
## **6.2.7 Industrial Box PC to NCK general connections**



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

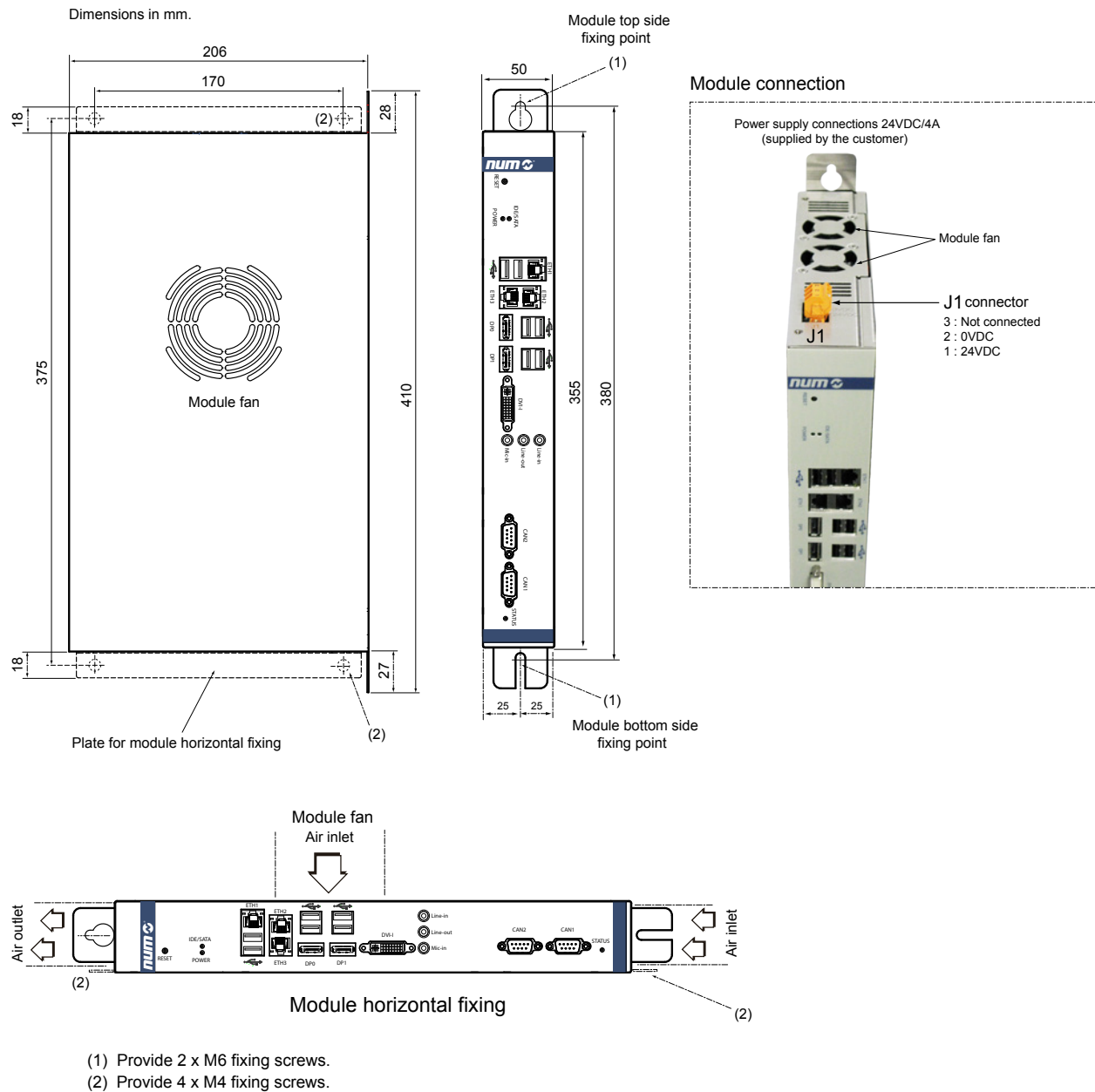
## 6.3 Industrial Box PC P2 (FXPC002NN1HxR00)

### 6.3.1 Box PC P2 layout and connectors





### 6.3.2 Box PC P2 installation and power supply connections



To facilitate sufficient air circulation and so ensure an adequate heat exchange in the system, it is recommended that a minimum ventilation clearance of 100mm is left in the fan area and at top and bottom side when installing the modules in the electrical cabinet.

Do not cover the ventilation grilles with cables or anything else, this may cause the rise temperature inside the drives. Please also refer to the M00027 manual for more detailed information.

### 6.3.3 Power up and shutdown

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

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

### 6.3.4 Diagnostics

| Symptom                                              | Possible cause and remedy                                                                                                                                                                                                                                                                    |
|------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Dark screen during power-up                          | <ul style="list-style-type: none"> <li>- Check power supply.</li> <li>- Loss of setup data.</li> <li>- Connect an external video display for diagnosis.</li> </ul>                                                                                                                           |
| White screen after switch off and re-switch on again | <ul style="list-style-type: none"> <li>- The ATX-power supply doesn't switch on properly because the switch off time was shorter than 20s.</li> </ul>                                                                                                                                        |
| Date/time not correct                                | Replace battery (see next page)                                                                                                                                                                                                                                                              |
| Ethernet connection missing                          | <ul style="list-style-type: none"> <li>- Incorrect Ethernet cable fitted (crossover/direct)</li> <li>- LINK-LED is lit if the connection is correct</li> <li>- ACT LED if the data transfer is correct (flashes during the transfer)</li> <li>- Incorrect/invalid IP address set.</li> </ul> |

### 6.3.5 Battery replacement

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



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

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



Pay attention to ESD safety protections when changing the battery.

---

## **6.3.6 Maintenance and Repair**

### **6.3.6.1 Repairs**

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

### **6.3.6.2 Transport**

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

### **6.3.6.3 Storage**

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

## **6.3.7 Industrial Box PC to NCK general connections**



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

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## Summary

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## 7 Portable Handwheel HBA-X

### 7.1 General

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

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

#### Reference Code

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

#### CAN

Connection to the Flexium / Flexium<sup>+</sup> 68 system can also be made using CAN.

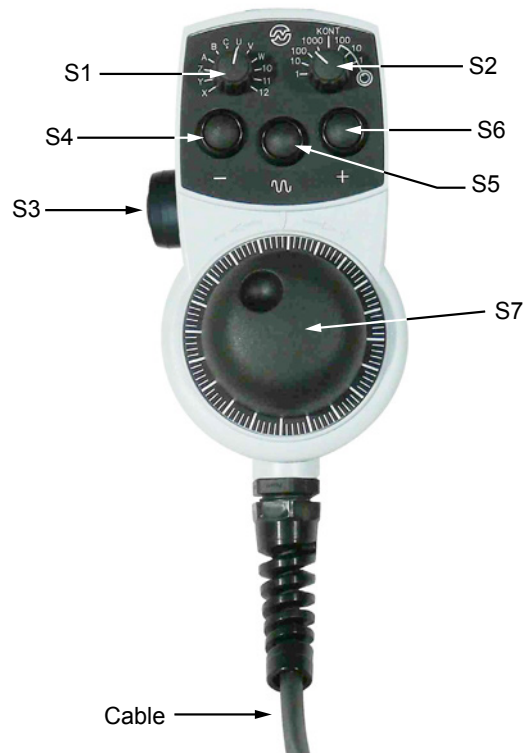
This requires one or more CAN connection devices (including a counter module CTMT as indicated on chapter 9.15) and allows hot-plugging of the HBA-X without affecting the machine.

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





## 7.2 Portable Handwheel HBA-X description



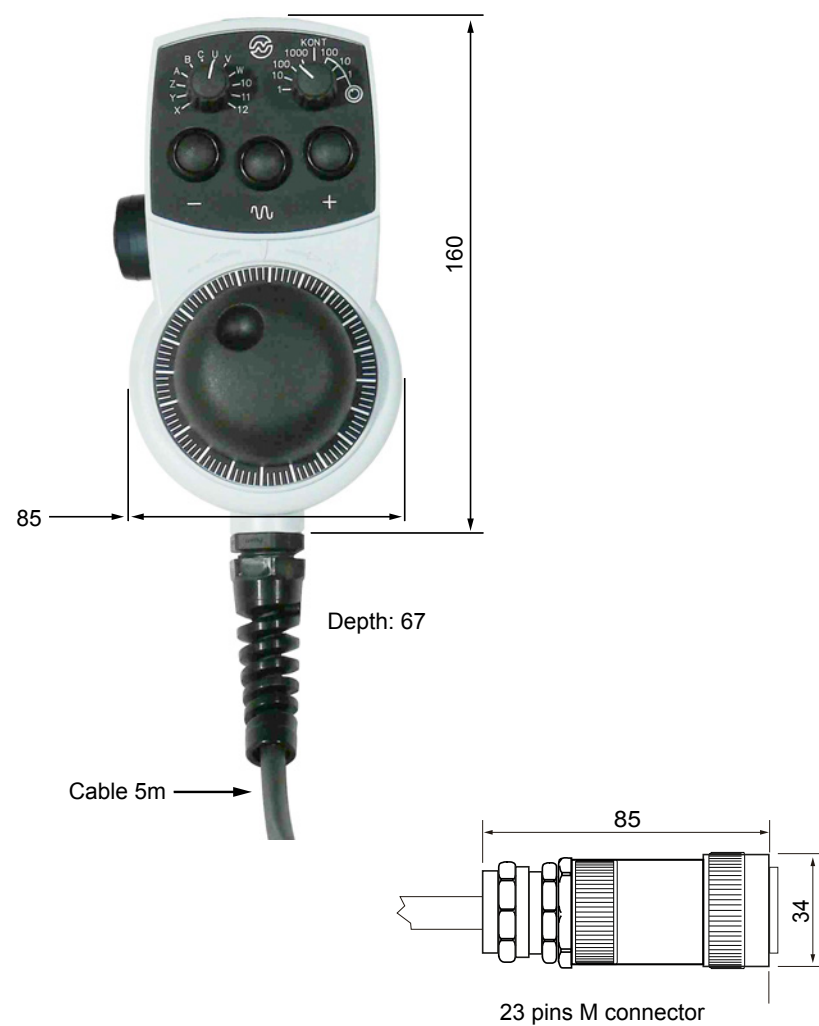
|       |                                                                                      |
|-------|--------------------------------------------------------------------------------------|
| S1    | Selector switch (12 positions axis selection)                                        |
| S2    |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

## 7.3 Technical characteristics

|                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Handwheel</b>                                                                                                                                                                                                                                                                                                                             | <ul style="list-style-type: none"> <li>• Impulse per revolution : 100</li> <li>• Supply voltage : 5VDC <math>\pm</math> 5% for HBA-Xc / 24VDC <math>\pm</math> 5% for HBA-Xd</li> <li>• Output circuit : 5VDC or 24VDC</li> </ul>                              |
| <b>Push Button</b>                                                                                                                                                                                                                                                                                                                           | <ul style="list-style-type: none"> <li>• Control element : 3 single closure</li> <li>• Switching voltage max : 30VDC</li> <li>• Switching current max : 100mA</li> <li>• Switching power max : 1W</li> </ul>                                                   |
| <b>Acknowledge button 3-step</b>                                                                                                                                                                                                                                                                                                             | <ul style="list-style-type: none"> <li>• Control element : 1 double closure</li> <li>• Switching voltage max : 30VDC</li> <li>• Switching current max : 1mA</li> <li>• Switching power max : 0.25W</li> </ul>                                                  |
| <b>Connection</b> <sup>(1) (2)</sup>                                                                                                                                                                                                                                                                                                         | <ul style="list-style-type: none"> <li>• 23-pins connector</li> <li>• Cable 5m</li> </ul>                                                                                                                                                                      |
| <b>Housing</b>                                                                                                                                                                                                                                                                                                                               | <ul style="list-style-type: none"> <li>• Material : Plastic (polycarbonate)</li> <li>• Colour : Grey RAL 7040</li> <li>• Starting current: 250mA @ 24V</li> <li>• Power consumption: 3.12W (typ) = 130mA @ 24V</li> <li>• Electrical insulation: No</li> </ul> |
| <b>Overall dimensions (L, H, W) in mm</b>                                                                                                                                                                                                                                                                                                    | 160 x 85 x 67                                                                                                                                                                                                                                                  |
| <b>Weight</b>                                                                                                                                                                                                                                                                                                                                | Approx. 1.3kg                                                                                                                                                                                                                                                  |
| <b>Temperature</b>                                                                                                                                                                                                                                                                                                                           | <ul style="list-style-type: none"> <li>• Operating temperature: 0 to +50°C</li> <li>• Transport and storage temperature: -20° to +50°C</li> </ul>                                                                                                              |
| <b>Relative humidity</b>                                                                                                                                                                                                                                                                                                                     | <ul style="list-style-type: none"> <li>• Operating: Max 95% non-condensing</li> <li>• Transport: Max 95% non-condensing</li> </ul>                                                                                                                             |
| <b>Operating Altitude</b>                                                                                                                                                                                                                                                                                                                    | Max 3000m                                                                                                                                                                                                                                                      |
| <b>Degree of protection</b>                                                                                                                                                                                                                                                                                                                  | IP 65                                                                                                                                                                                                                                                          |
| <p>(1) For different OEM handwheel places connections it is possible to required an additional socket FXHE181310. Please also refer to chapter 8.</p> <p>(2) Standard cable length is:</p> <ul style="list-style-type: none"> <li>- 5m for straight cable</li> <li>- 2m for spiral cable</li> </ul> <p>Maximum distance from CNC is 40m.</p> |                                                                                                                                                                                                                                                                |

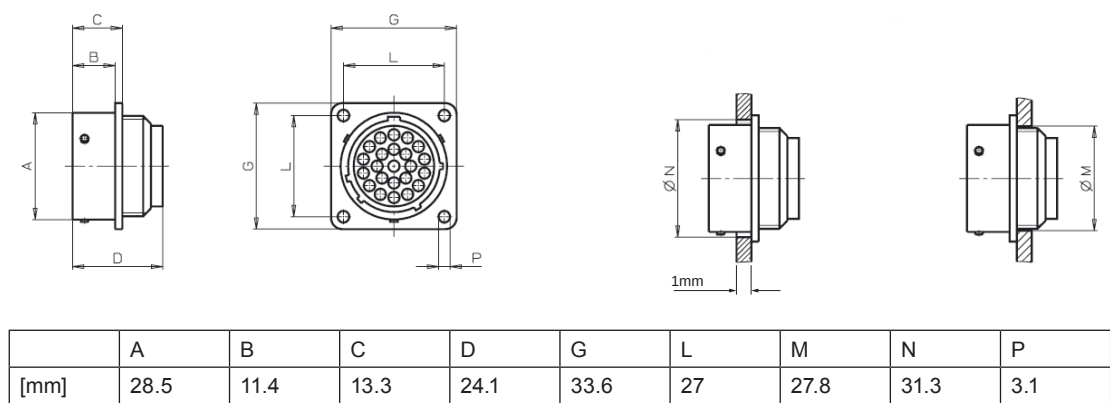
7.4

Overall Dimensions



7.5

Cut out for socket FXHE181310



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## 7.6 Connections

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

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## Summary

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## 8 nPad Mobile Operator Panel

### 8.1 General

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

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

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

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

The safety related devices available on the nPad Mobile Operator Panel are:

- Emergency Stop push-button
- Enabling Device and State Selector.

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

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

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

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

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



## 8.2 Product overview



### 8.3 Technical characteristics

|                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|---------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Emergency Stop Button</b>                | 2 N.C contacts                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Enabling Device</b>                      | 3 positions switches, 2 N.O. contacts                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>State selector</b>                       | 16 state BCD coded                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Handwheel</b>                            | 40 detents per turn                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Override Potentiometer</b>               | 2 linear potentiometers                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>CPU and electronics</b>                  | CPU: <ul style="list-style-type: none"> <li>• 600MHz ARM Cortex-A8 core.</li> <li>• 16kB instruction Cache.</li> <li>• 256kB L2 Cache.</li> <li>• Embedded Graphic engine.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Flash Memory</b>                         | 128MB Flash NOR Solid State Disc (SSD)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>RAM Memory</b>                           | 128MB DDR2 SDRAM                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Ethernet Interface</b>                   | <ul style="list-style-type: none"> <li>• 10/100Mbps Fast Ethernet</li> <li>• Fulfils standards: IEEE 802.3, IEEE 802.3u 100BASE-TX</li> <li>• Supports auto cross-over function (AUTO-MDI)</li> <li>• Connection: 2 shielded twisted pairs</li> </ul>                                                                                                                                                                                                                                                                                                                          |
| <b>USB interface</b>                        | <ul style="list-style-type: none"> <li>• USB 2.0 HOST</li> <li>• max 500mA</li> <li>• USB type-A</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Keyboard</b>                             | The mobile panel has a rubber keypad containing 19 keys: <ul style="list-style-type: none"> <li>• 6 keys are command keys, useful for a direct machine control.</li> <li>• The remaining 13 keys are function keys, useful for navigating and operating through the panels of the software application.</li> <li>• The letter or the symbol printed on the keys reminds the function.</li> </ul>                                                                                                                                                                               |
| <b>Display</b>                              | TFT LCD: <ul style="list-style-type: none"> <li>• Diagonal 5" (12.7cm)</li> <li>• Colours: 16 millions</li> <li>• Resolution: RGB 480x272 pixels</li> <li>• Contrast ratio: 500:1</li> <li>• Viewing angle:               <ul style="list-style-type: none"> <li>- Horizontal: Direction Right / Direction Left = 70°</li> <li>- Vertical: Direction Up = 50° / Direction Down = 70°</li> </ul> </li> <li>• Brightness: 300cd/m<sup>2</sup></li> <li>• Half-brightness time: at least 20000 hours.</li> <li>• Touch screen technology: Resistive sensor technology.</li> </ul> |
| <b>Status LED</b>                           | Bicolor LED: Red / Green. <ul style="list-style-type: none"> <li>• 2 LED's:               <ul style="list-style-type: none"> <li>- RED color: indicates hardware failures,</li> <li>- GREEN color: may be fixed or blinking and is controlled by OS.</li> </ul> </li> <li>• Touch screen TFT LCD Display.</li> </ul>                                                                                                                                                                                                                                                           |
| <b>Power supply</b>                         | <ul style="list-style-type: none"> <li>• Rated voltage : 24VDC +/-25%</li> <li>• Max interruption of the supply : 10ms</li> <li>• Starting current: 250mA @ 24V</li> <li>• Power consumption: 3.12W (typ) = 130mA @ 24V</li> <li>• Electrical insulation: No</li> </ul>                                                                                                                                                                                                                                                                                                        |
| <b>Overall dimensions (L, H, W) in mm</b>   | 220 x 50 x 130                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Weight</b>                               | 730g (without cable with handwheel)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Temperature</b>                          | <ul style="list-style-type: none"> <li>• Operating temperature: +5° to +45°C</li> <li>• Transport and storage temperature: -20° to +70°C</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Relative humidity</b>                    | <ul style="list-style-type: none"> <li>• Operating: Max 95% non-condensing</li> <li>• Transport: Max 95% non-condensing</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Vibration and shock during operation</b> | Fulfils EN 60204/A1:2009 (par. 4.4.8), EN 61131-2:2007 (par. 4.2.2), EN 60068-2-31:2008.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

|                                        |                                                                                                                                                                                                             |
|----------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Operating Altitude</b>              | Max 3000m                                                                                                                                                                                                   |
| <b>Degree of protection</b>            | IP64                                                                                                                                                                                                        |
| <b>Housing and chemical resistance</b> | 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 :<br>nPad has been designed to withstand to aggressive fluids such as:<br>Denatured Ethyl Alcohol, Diesel, Gasoline, Silicon, Acetone and various fluids used for cooling.         |
| <b>Directives</b>                      | Machinery Directive 2006/42/EC.                                                                                                                                                                             |
|                                        | Electromagnetic Compatibility (EMC) Directive 2004/108/EC.                                                                                                                                                  |
| <b>Safety Standards</b>                | EN 60204-1:2006 Safety of Machinery – Electrical Equipment of Machines.<br>Part 1: General Requirements.                                                                                                    |
|                                        | IEC 61000 (1-2-3) Electromagnetic Compatibility (EMC).                                                                                                                                                      |
|                                        | EN 61000-6-2:2005 Electromagnetic Compatibility (EMC)<br>Part 6-2: Generic Standards – Immunity for Industrial Environments.                                                                                |
|                                        | EN 61000-6-4:2007 Electromagnetic Compatibility (EMC)<br>Part 6-4: Generic Standards – Emission Standard for Industrial Environments.                                                                       |
|                                        | EN ISO 13849-1:2008 "Safety of Machinery – Safety related parts of control systems-<br>Part 1: General principles for design" (see detailed information).                                                   |
|                                        | EN 62061:2005 "2008 "Safety of Machinery – Functional safety of safety related electrical,<br>electronic and programmable electronic control systems" (see detailed information).                           |
|                                        | Emergency stop button conforming to standards :<br>IEC 60947-5-5, 6.2 (Safety Lock Mechanism) ; IEC 60947-5-5, 5.2, IEC60947-5-1,<br>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,<br>JIS C8201-5-1, UL508, CSA C22.2 No 14, IEC 60947-5-8 (2006) Low-voltage switchgear<br>and controlgear.                  |

## 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)<br>1A (DC-13 resistive load)                                                                                                                                                         |
| Reliability                                              | <ul style="list-style-type: none"> <li>• Mechanical life: 250000 operation minimum</li> <li>• Electrical life: 250000 operation minimum</li> <li>• Maximum operating frequency: 900 operations/hour</li> </ul> |

#### 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)<br>0.7A (DC-13 resistive load)                                                                                               |
| Reliability: <ul style="list-style-type: none"> <li>• Mechanical life</li> <li>• Electrical life</li> <li>• Maximum operating frequency</li> </ul> | Position 1 → 2: 1000000 operations minimum<br>Position 1 → 2 → 3 → 1: 100000 operations minimum<br>100000 operations minimum<br>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 <sub>d</sub> (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 <sub>d</sub> (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 <sup>-7</sup>     | 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 <sub>op</sub>    | Average number of annual operating days of safety function                    | 240              | 240             | 240            |
| h <sub>op</sub>    | Average number of daily hours of operation of the safety function             | 16               | 16              | 16             |
| t <sub>cycle</sub> | Average elapse time (seconds) between two uses of the safety function         | 1152             | 288             | 19200          |
| n <sub>op</sub>    | Average number of annual operations                                           | 12000            | 4800            | 720            |
| b <sub>10</sub>    | 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 <sub>10d</sub>   | Number of cycles that determines a dangerous failure of 10% of the components | Note 2           | Note 2          | 25000          |
| MTTF <sub>d</sub>  | 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<sub>d</sub>, PFH<sub>d</sub>, SFF and DC were obtained through the assumptions shown in the table here above and are related to each safety function frequency of use. The values for the overall safety functions of the machine depend on how the output safety signals are managed inside the machine controller.

#### Note 2

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

Considering that and referring to paragraph D.5.3 (table D.8) of ISO 13849-2, it is not possible to relate dangerous failures to these components and, so, the values of "b10d", MTTF<sub>d</sub> and PFH<sub>d</sub> for the E-Stop button and Enabling Device does not have any relevance (from a mathematical point of view: "b10d", MTTF<sub>d</sub> = infinite and PFH<sub>d</sub> = 0).

## 8.5 Product code

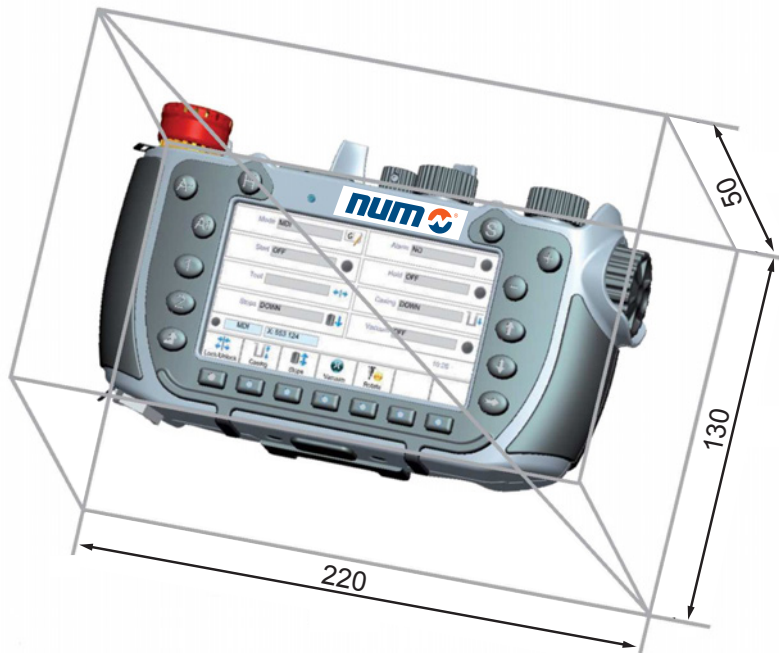
|                                                                                         |           |          |          |          |          |          |          |          |          |          |
|-----------------------------------------------------------------------------------------|-----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|
| <b>NPAD</b>                                                                             | <b>05</b> | <b>2</b> | <b>R</b> | <b>E</b> | <b>1</b> | <b>S</b> | <b>H</b> | <b>0</b> | <b>D</b> | <b>1</b> |
| <b>Display Unit</b><br>LCD 05"                                                          | 05        |          |          |          |          |          |          |          |          |          |
| <b>Panel / mechanical variant</b><br>Variant                                            |           | 2        |          |          |          |          |          |          |          |          |
| <b>Display Sensor</b><br>Tuoch Screen resistive                                         |           |          | R        |          |          |          |          |          |          |          |
| <b>Connection technology</b><br>Wired (Ethernet + wires)<br>Wireless (Wi-Fi +BlueTooth) |           |          |          | E<br>W   |          |          |          |          |          |          |
| <b>Processor performance</b><br>Performance level P1                                    |           |          |          |          | 1        |          |          |          |          |          |
| <b>Safety Functions</b><br>E-Stop, Enabling Device and State selector                   |           |          |          |          |          | S        |          |          |          |          |
| <b>Handwheel</b><br>Handwheel                                                           |           |          |          |          |          |          | H        |          |          |          |
| <b>Options</b><br>Standard                                                              |           |          |          |          |          |          |          | 0        |          |          |
| <b>Cable length</b><br>Wireless version<br>10m cable                                    |           |          |          |          |          |          |          |          | 0<br>D   |          |
| <b>Cable termination</b><br>Wireless version<br>Cable gland and free wires              |           |          |          |          |          |          |          |          |          | 0<br>1   |

Note.

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

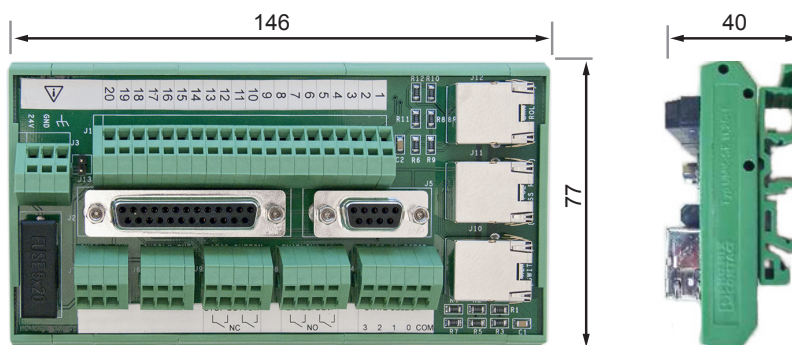
## 8.6 Overall dimensions

nPad Mobile Operator Panel



Approx. weight: 0.73kg (without cable)

nPad terminal connection NPADA001



Approx. weight: 0.2kg

## 8.7 Installation and connections

### 8.7.1 Safety guidelines



- The implementation of the safety related functions must comply with the application safety level determined in a previous risk analysis.

During machine control logic implementation, always take into consideration all conditions related to the machine operations:

- a) checking the Emergency Stop push-button, Enabling Device and State Selector status;
  - b) checking all possible further safety devices available on board of the machine: safety fences, optical barriers and so on.
- User is responsible for considering all further safety and accident prevention guidelines related to the particular working environment in addition and independently from this document.
  - Observe all safety precautions applying to industrial control systems in accordance with national and international regulations.
  - The installation, commissioning and maintenance tasks must be carried out only by qualified personnel. Furthermore it is suggested to follow all national accident prevention guidelines.
  - All safety guidelines, cabling schemes, mechanical and electrical limit values listed in the technical data must be read before installation and commissioning and strictly respected.
  - All instructions contained in this manual ensuring user safety must be taken in consideration. Each non-conformity could cause the safety functions integrated in the handheld terminal not to work properly.



---

### 8.7.2 Installation

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

### 8.7.3 Supply voltage

---



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

#### 8.7.4 Emergency Stop push-button

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

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

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



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

---

### 8.7.5 Enabling Device

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

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

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

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



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

### 8.7.6 Enabling Device positions

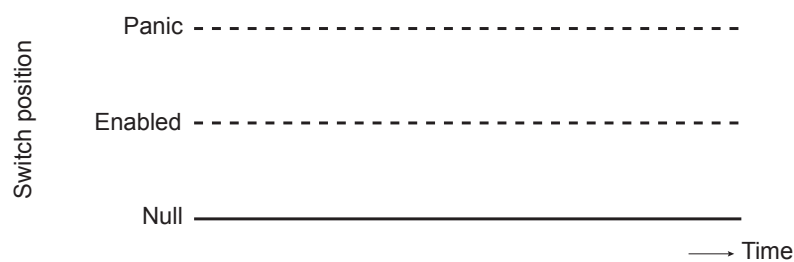
The Enabling Device can have three different positions:

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

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

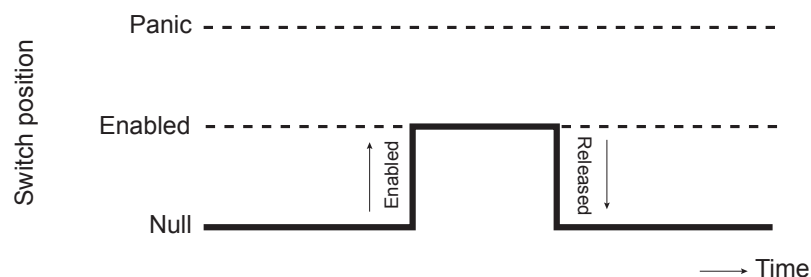
#### Zero position

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



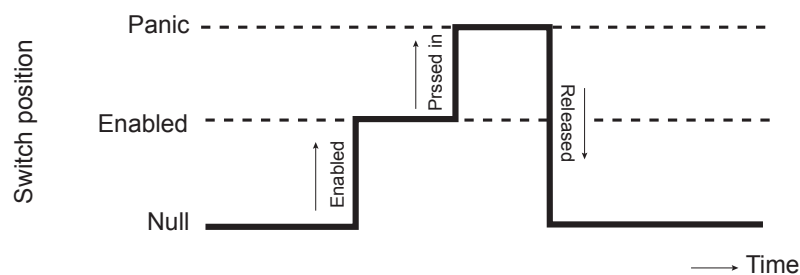
#### Enable position

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



#### Panic position

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



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

---

### 8.7.7 State Selector

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

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

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

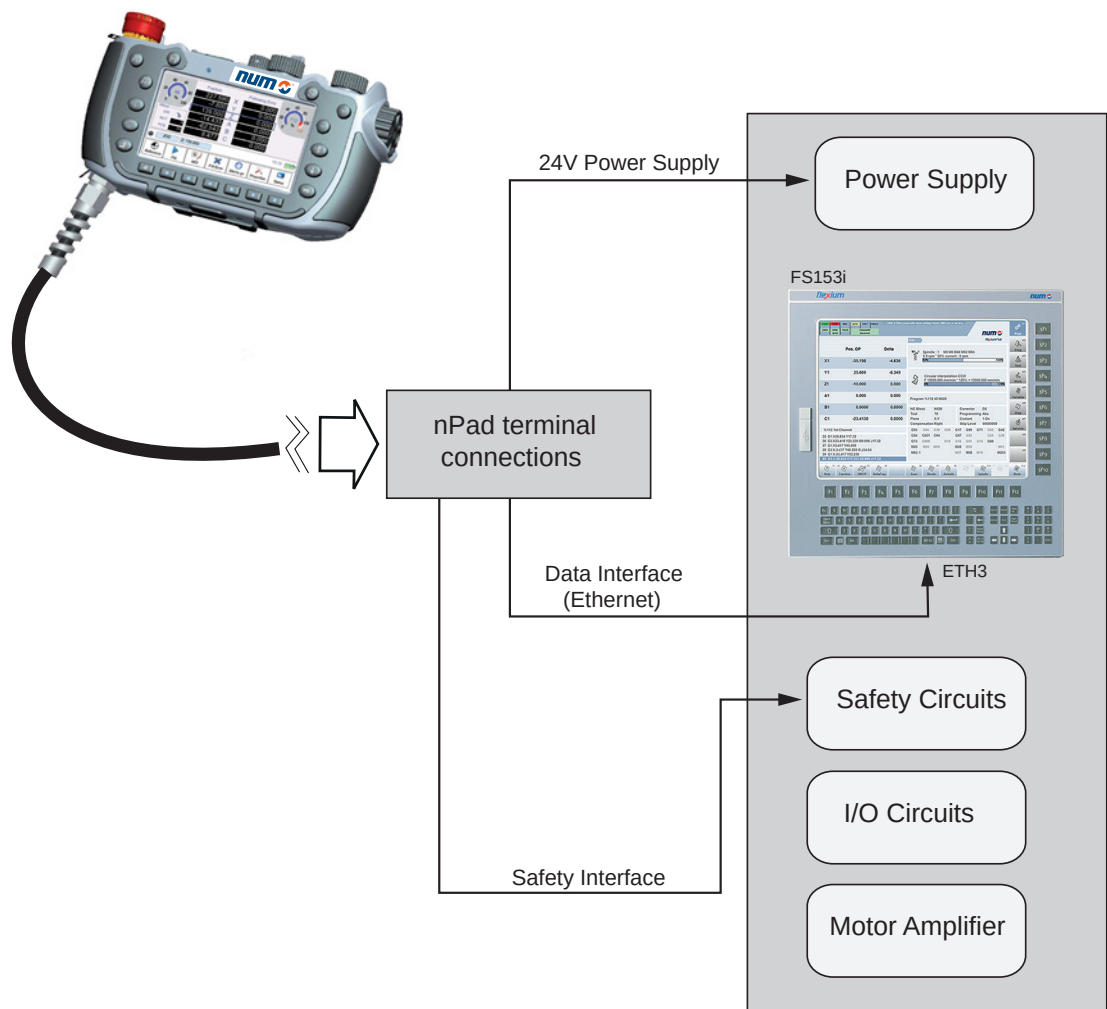


- User is responsible for interfacing the State selector to the machine control logic and implementing the state selecting function according to the safety level determined in a previous risk analysis.
- The State Selector function should be only related to the selection of the various working modes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

## 8.8 Connections

### 8.8.1 Connections overview

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



### 8.8.2 General connections



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



Please refer to Flexium Commissioning manual M00010 or M00044.

---

## 8.10 Maintenance and Repair

---

### 8.10.1 Repairs

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

### 8.10.2 Transport and storage

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

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



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



---

## 8.11 nPad Wireless Mobile Operator Panel

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

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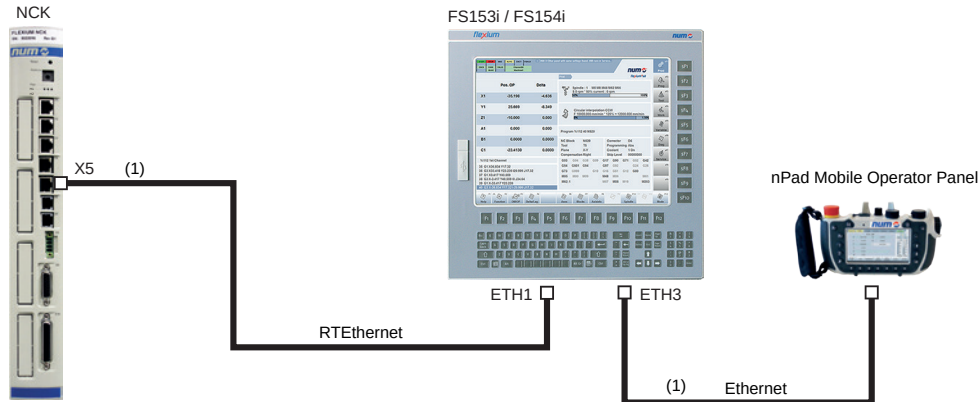
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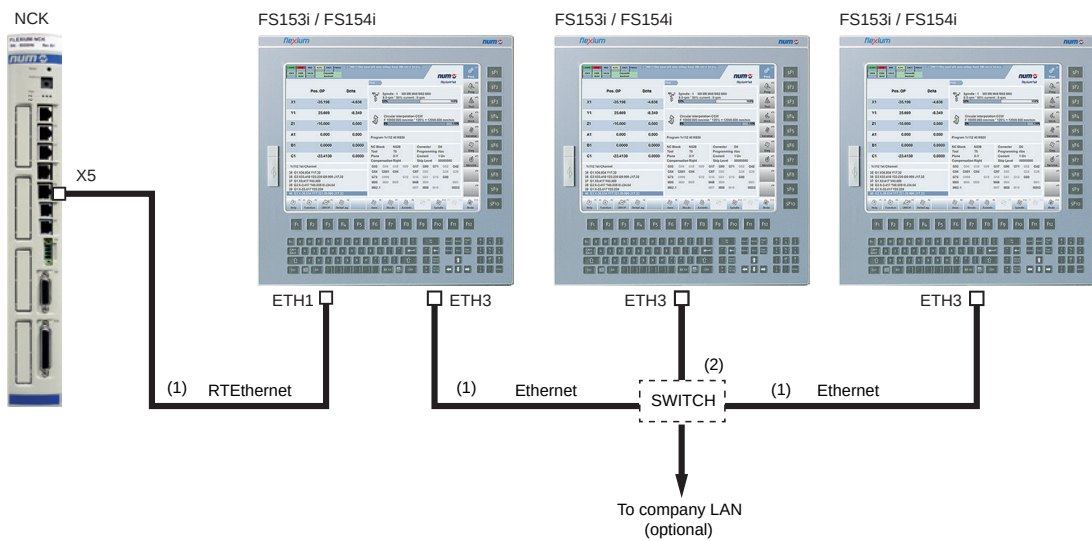
## 9 Flexium connections

### 9.1 NCK general connections

#### 9.1.1 NCK to FS153i / FS154i Panels general connections



#### Multipanel configuration



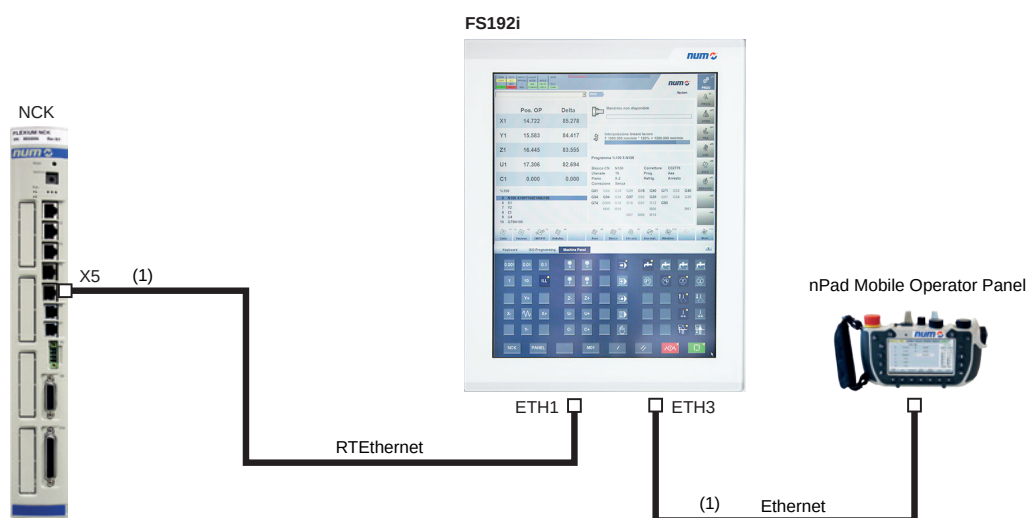
|              |                                                                                                                      |
|--------------|----------------------------------------------------------------------------------------------------------------------|
| 1            | Ethernet cable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



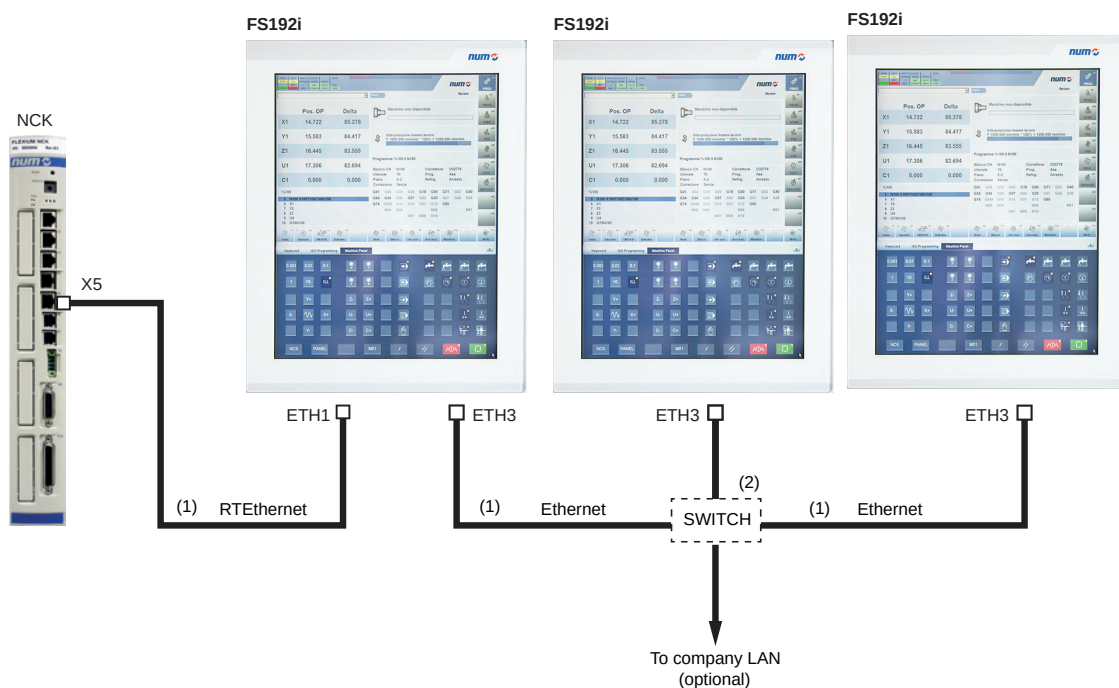
If only two panels are used a Switch module is not necessary. The connection between the two panels can be made with a crossed Ethernet cable.  
The Switch module is not supplied by NUM.



9.1.2 NCK to FS192i Panels general connections



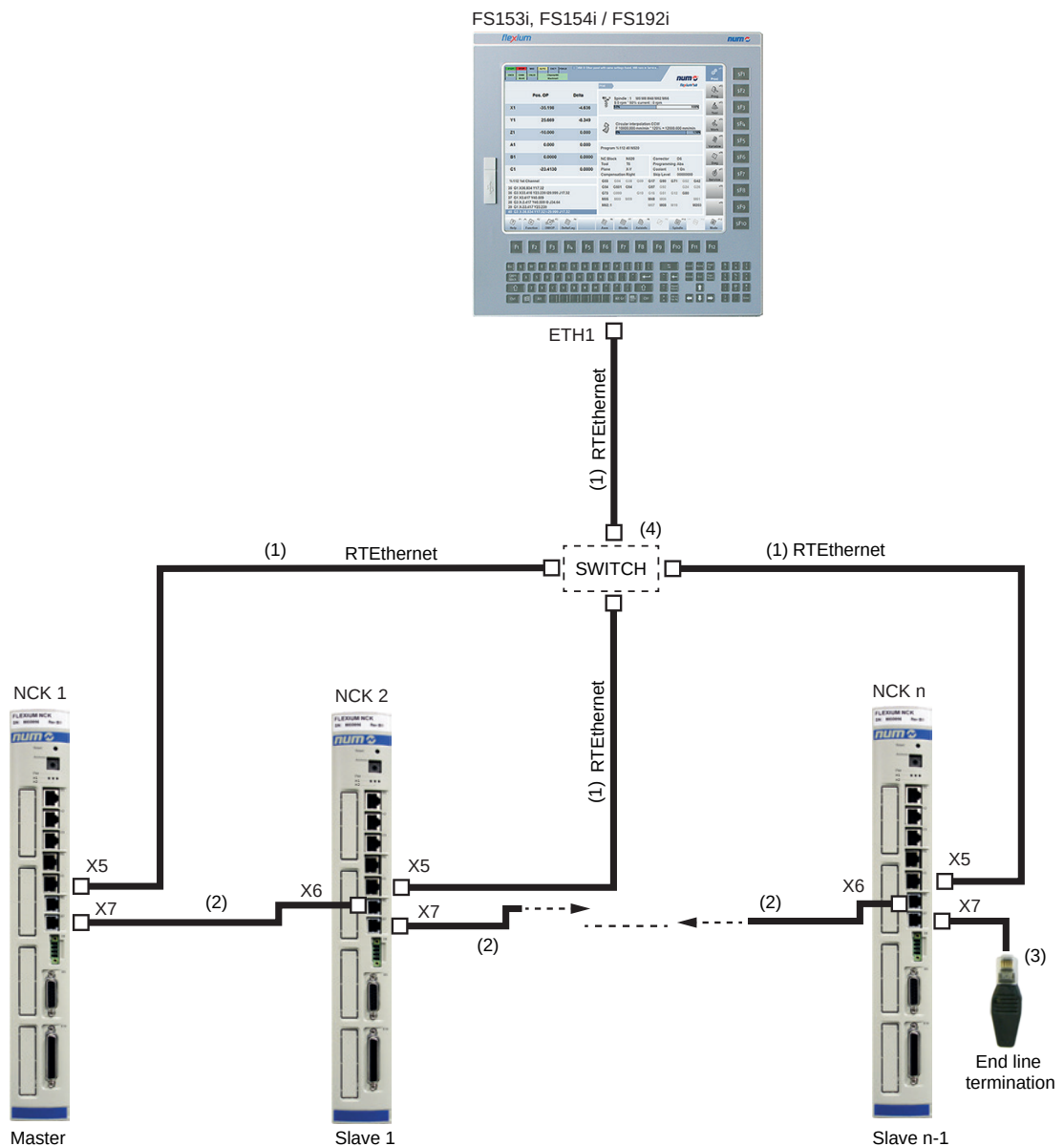
Multipanel configuration



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

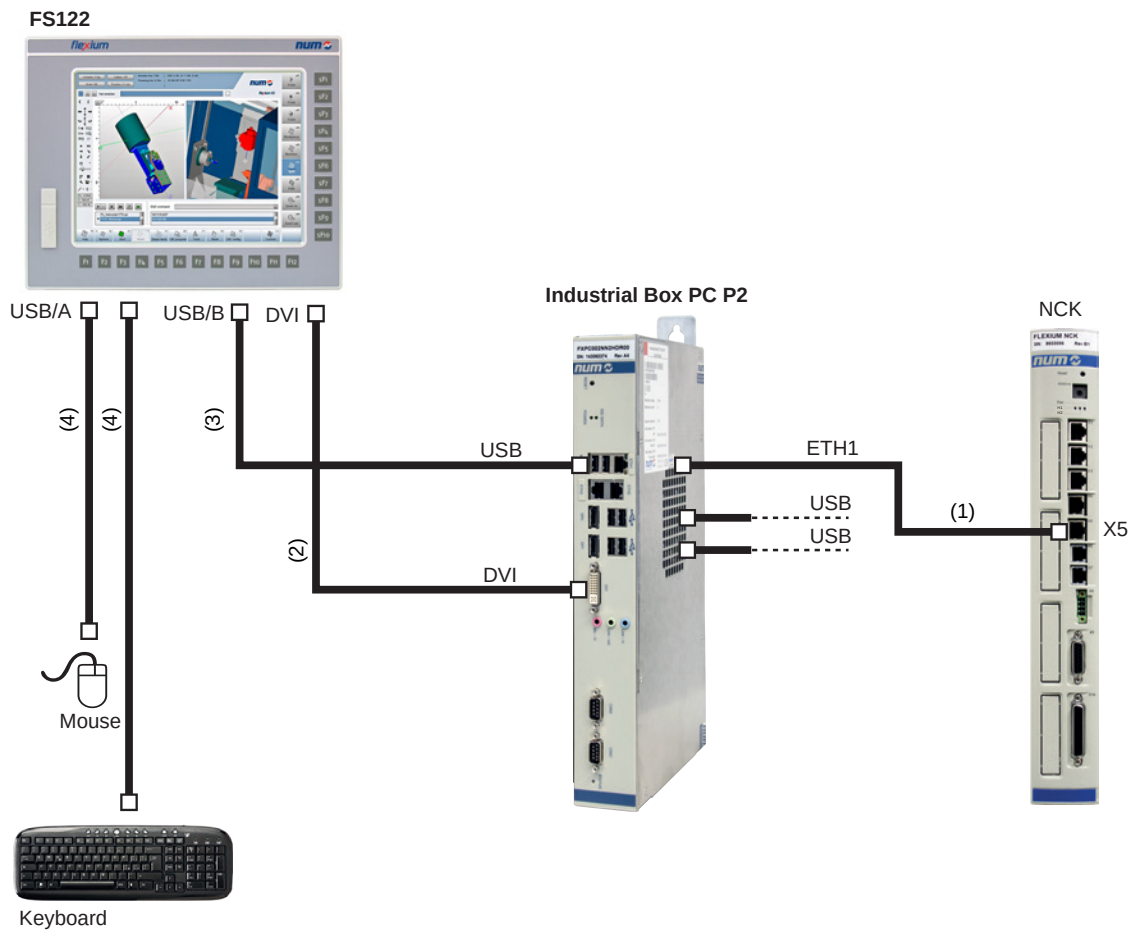
**i** If only two FS192i panels are used a Switch module is not necessary. The connection between the two FS192i can be made with a crossed Ethernet cable. The Switch module is not supplied by NUM.

### 9.1.3 Multi-NCK configuration general connections



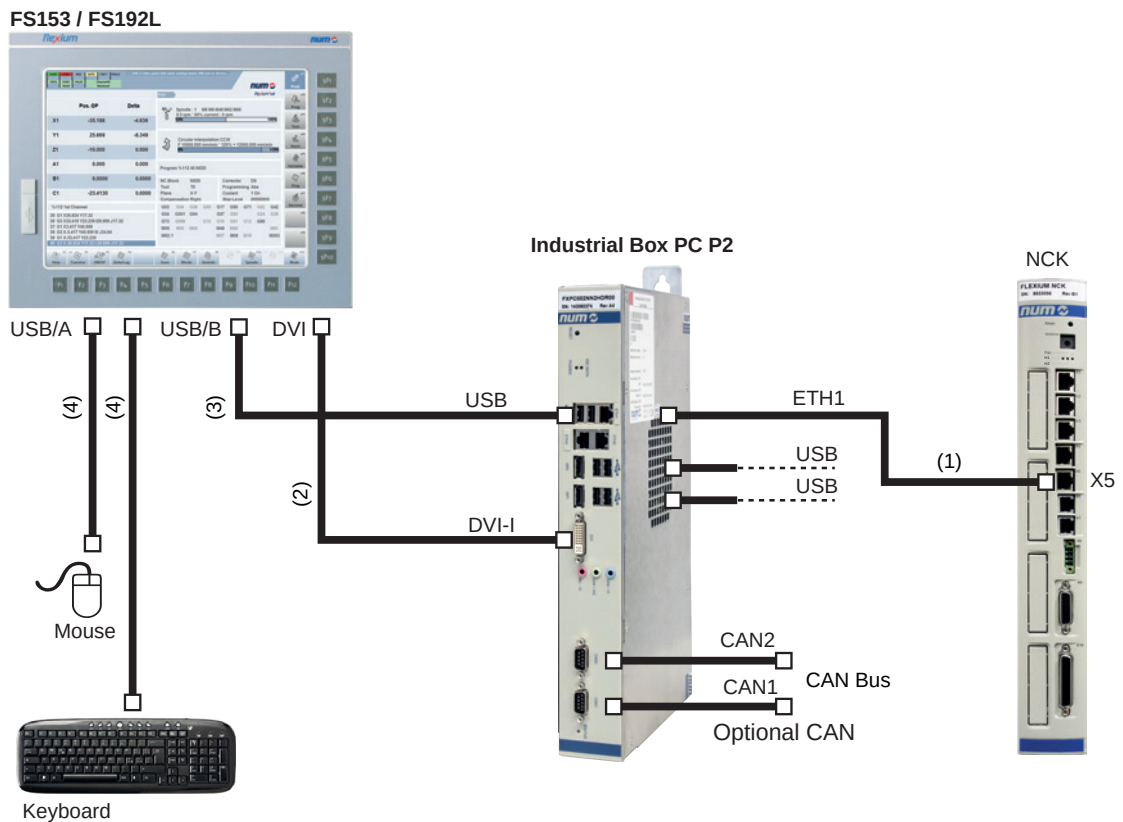
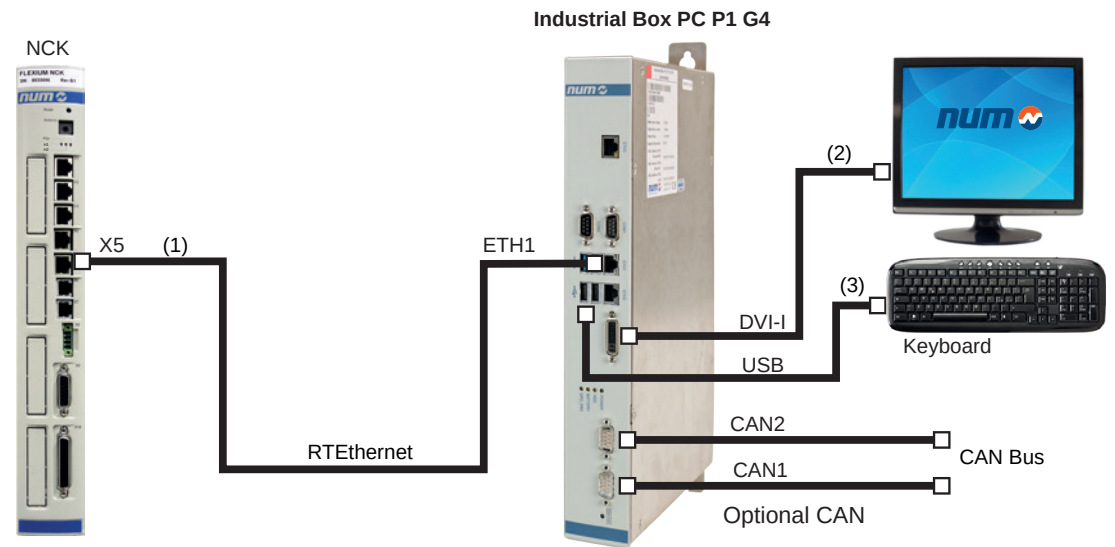
|        |                                                                                                                             |
|--------|-----------------------------------------------------------------------------------------------------------------------------|
| 1      | Ethernet cable connections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

## 9.1.4 NCK to FS122 Panels general connections



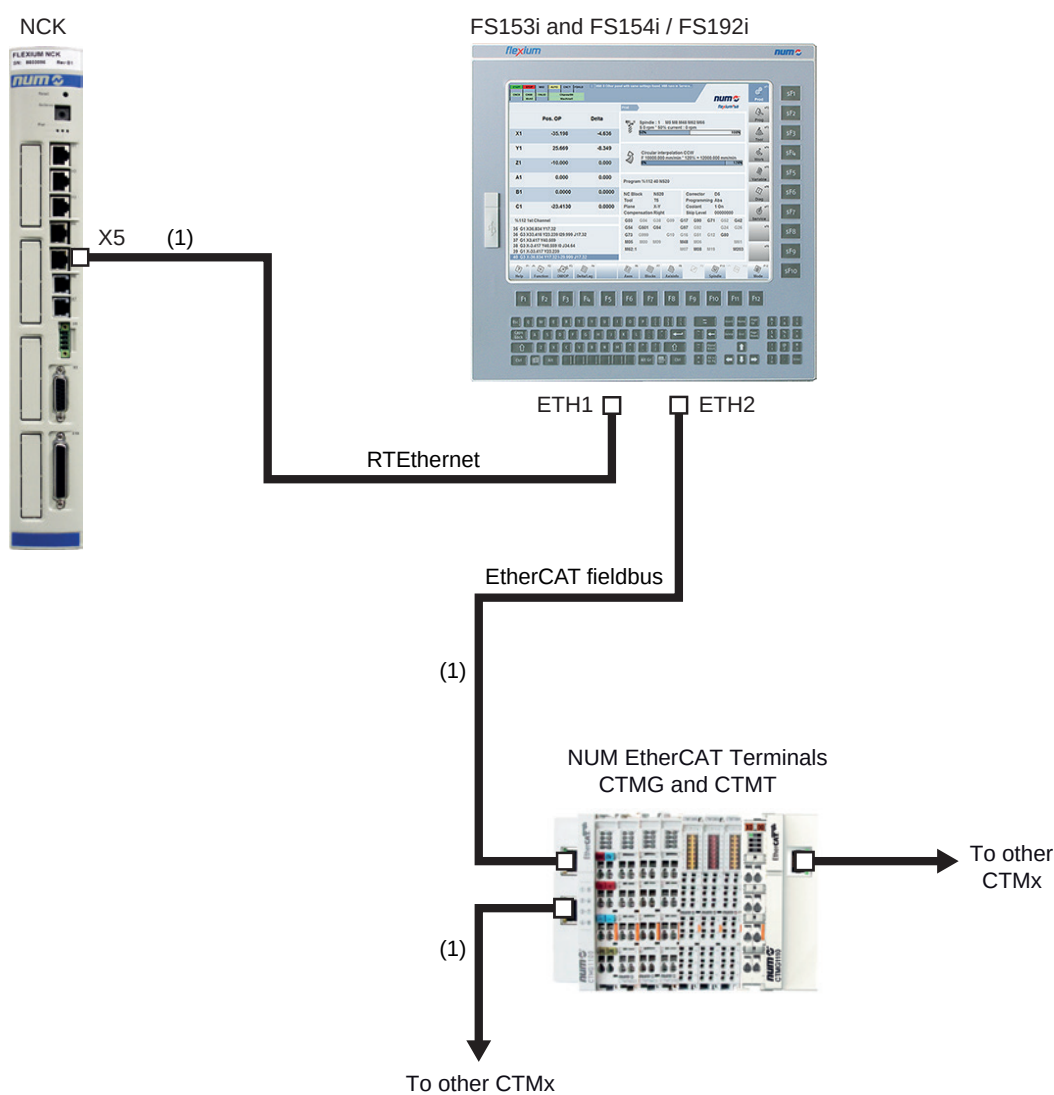
|   |                                                                                                                      |
|---|----------------------------------------------------------------------------------------------------------------------|
| 1 | Ethernet cable connections FXHC18104x. (RJ45,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

### 9.1.5 NCK to Industrial Box PC to FS153, FS192L Passive Panel general connections



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

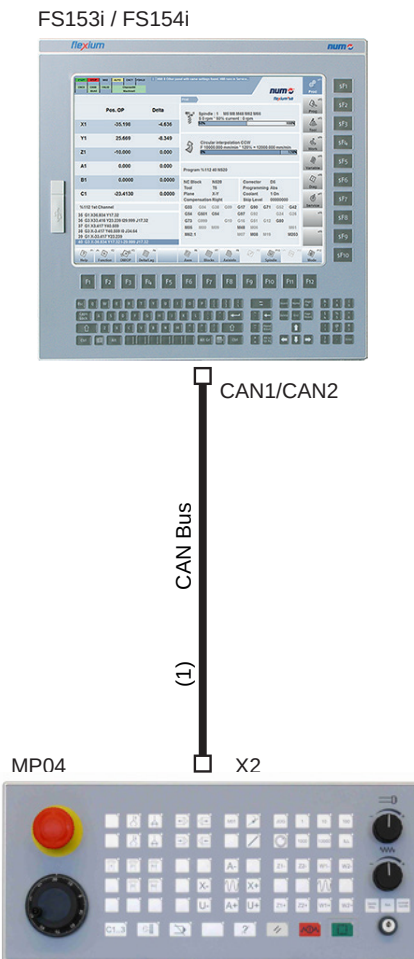
9.1.6 NCK to FS153i / FS154i, FS192i Panel with EtherCAT terminals general connections



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

## 9.2 PLC to Machine panel general connections

### 9.2.1 PLC to MP04 Machine panel general connections



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

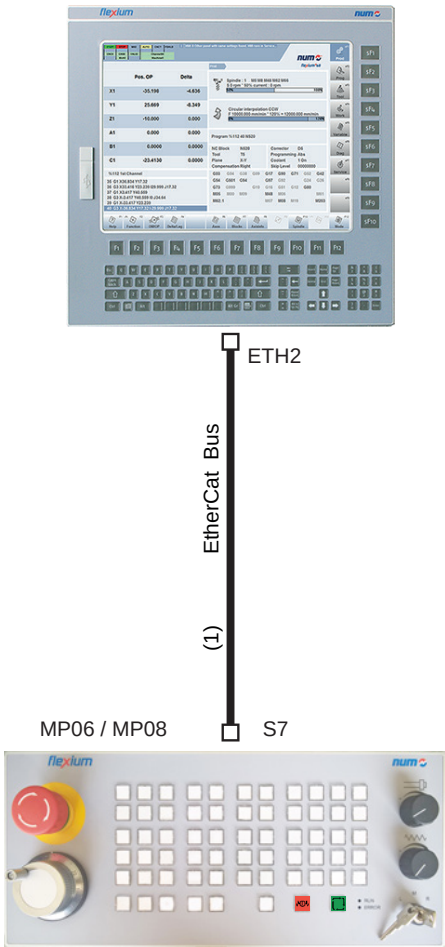
### 9.2.2 PLC to MP05 Machine panel general connections



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

9.2.3 PLC to MP06, MP08 Machine panel general connections

FS153i, FS154i / FS192i

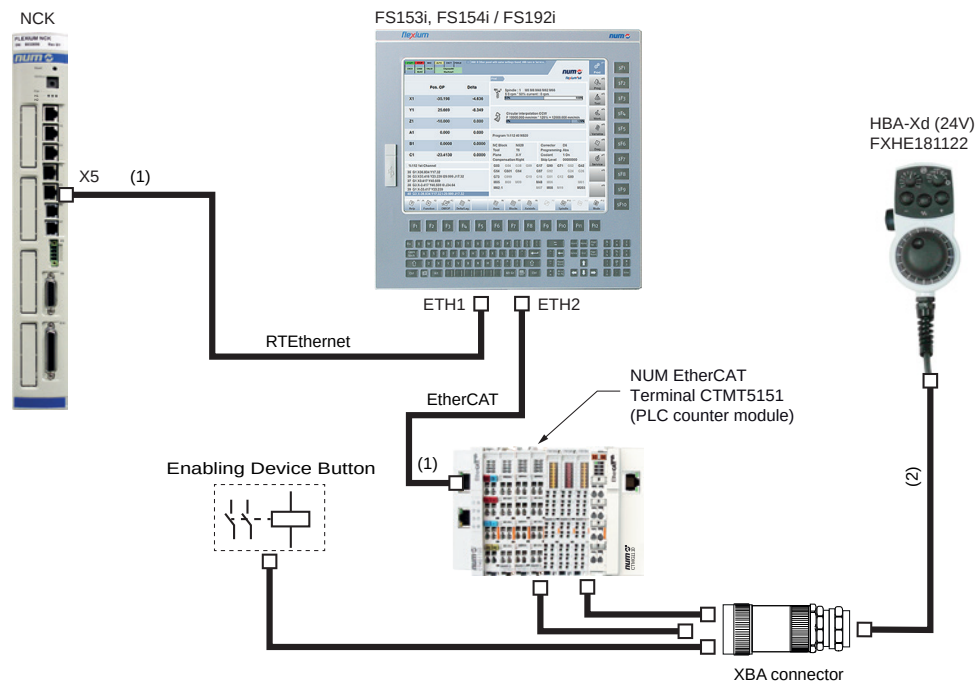


|      |                                                                                                                      |
|------|----------------------------------------------------------------------------------------------------------------------|
| 1    | Ethernet cable connections FXHC18104x.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

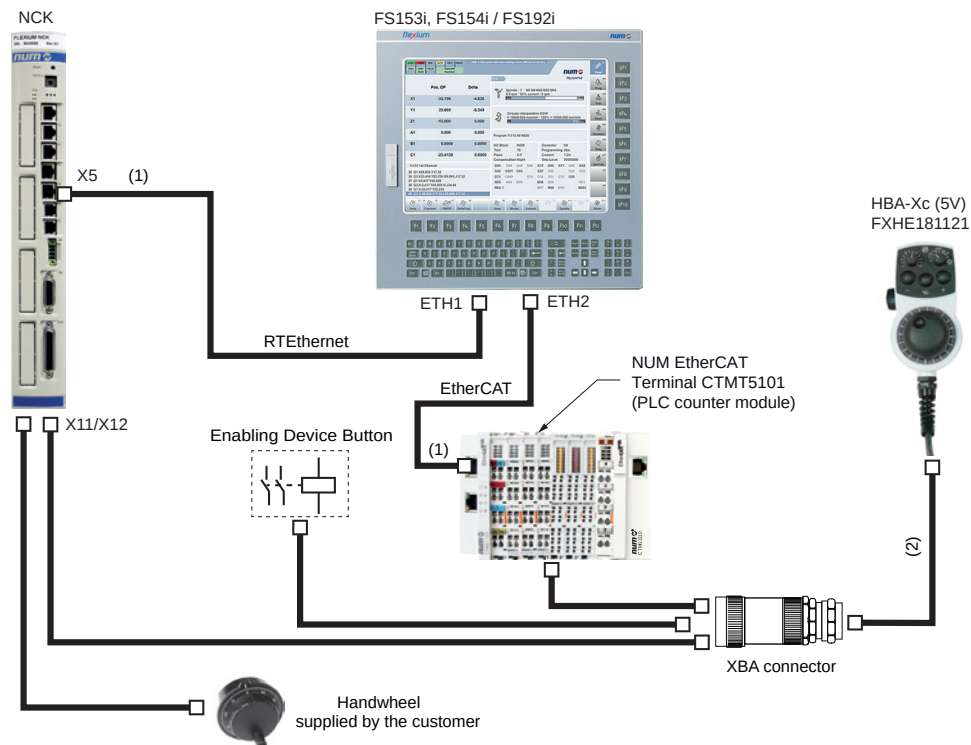


### 9.3 XBA-X Handwheels general connections

FXHE181122 (HBA-Xd 24V) connections



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



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

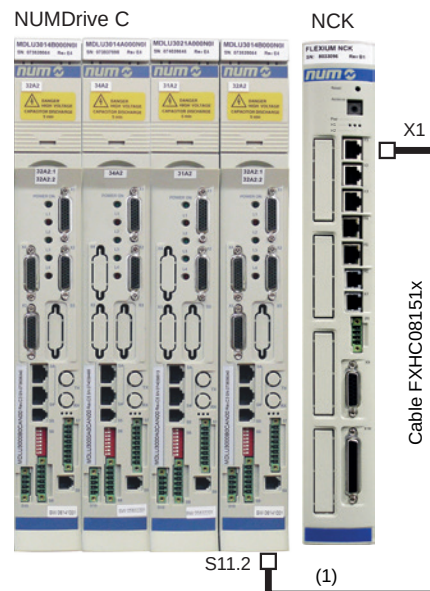
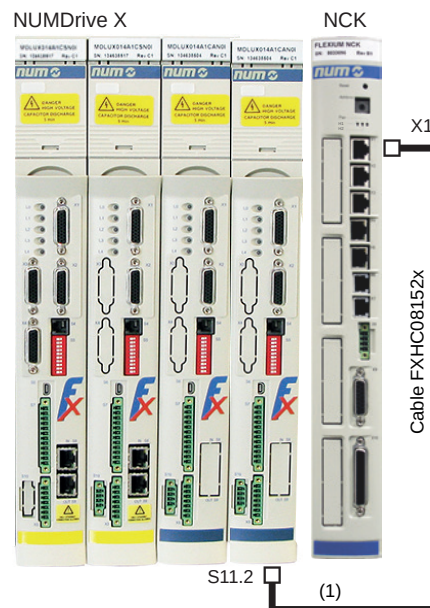


## 9.4 Flexium NCK connections

### 9.4.1 Flexium NCK to NUMDrive X or NUMDrive C general connections

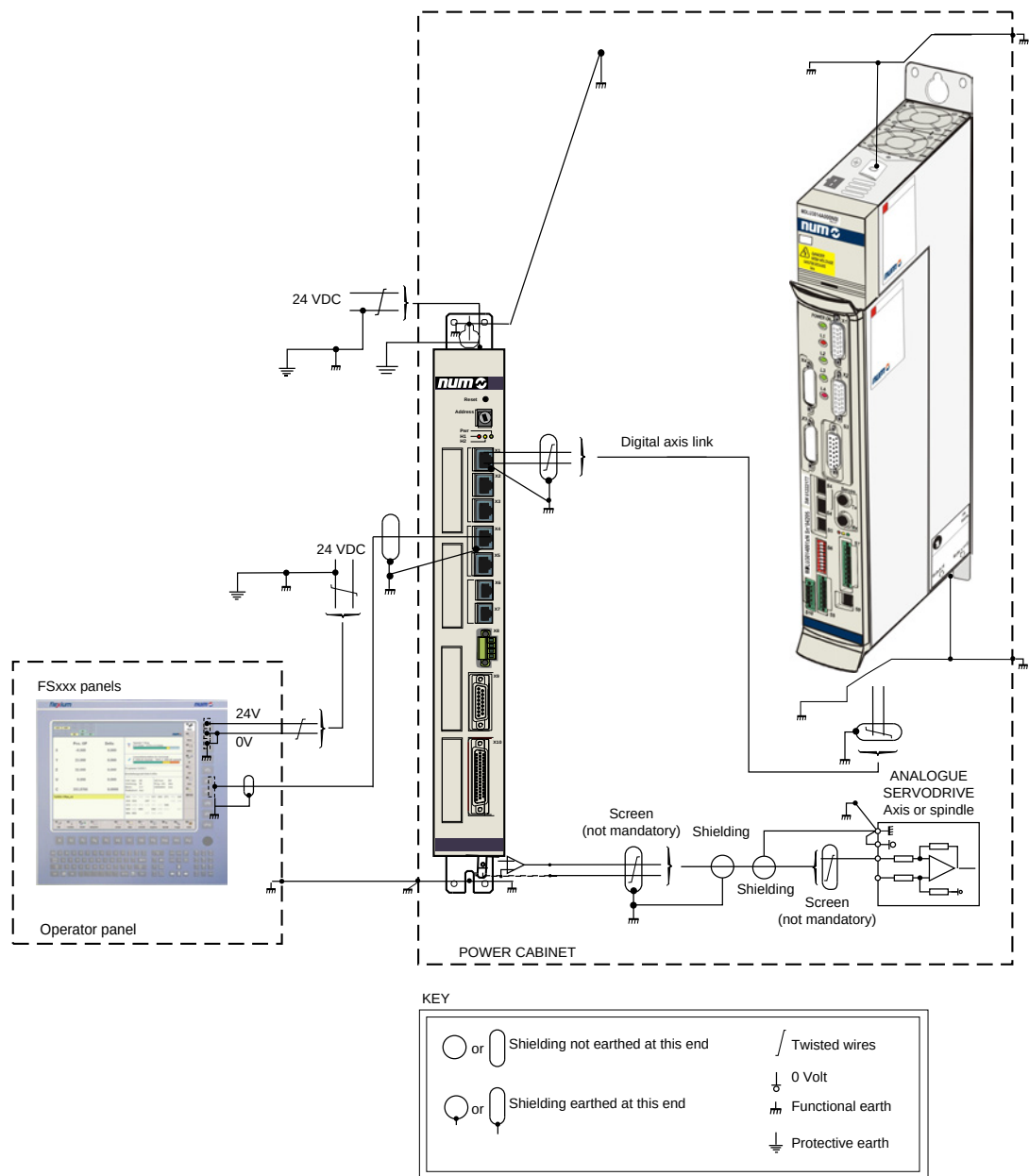
The NCK to NUMDrive X or NUMDrive C connections is possible using the connectors X1, X2, X3 on the front of the NCK panel. The Flexium NCK can control up to 32 digital axes. It is recommended to distribute the axes between these three connectors.

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



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

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



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

### 9.4.3 NCK Power Supply connections

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

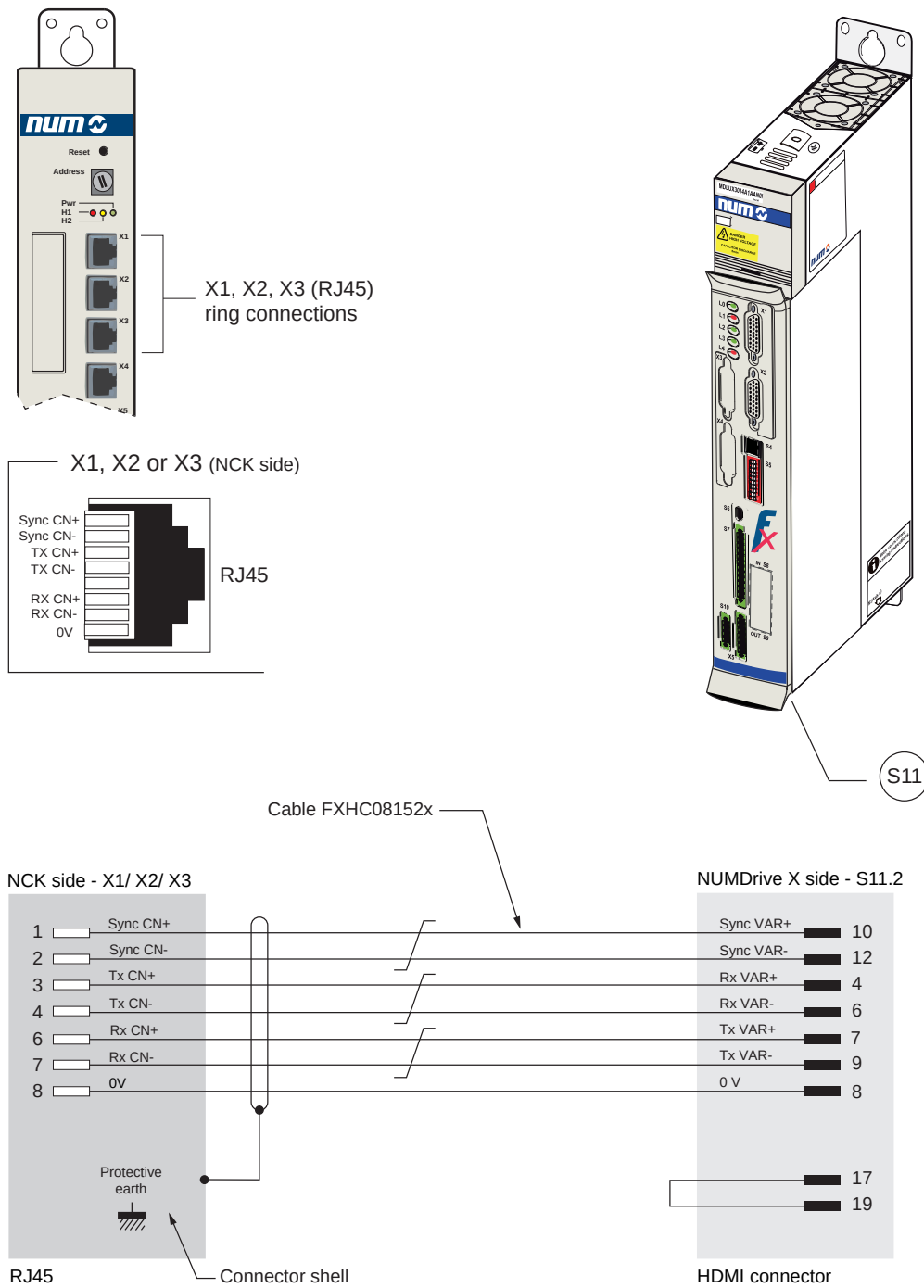
| Power Supply Voltage      | Pin Number       | Description  | Maximum Power |
|---------------------------|------------------|--------------|---------------|
| 24VDC nominal (+20% -15%) | 1 or 3<br>2 or 4 | VIN+<br>VIN- | 48W           |

#### Power supply connector (X13)



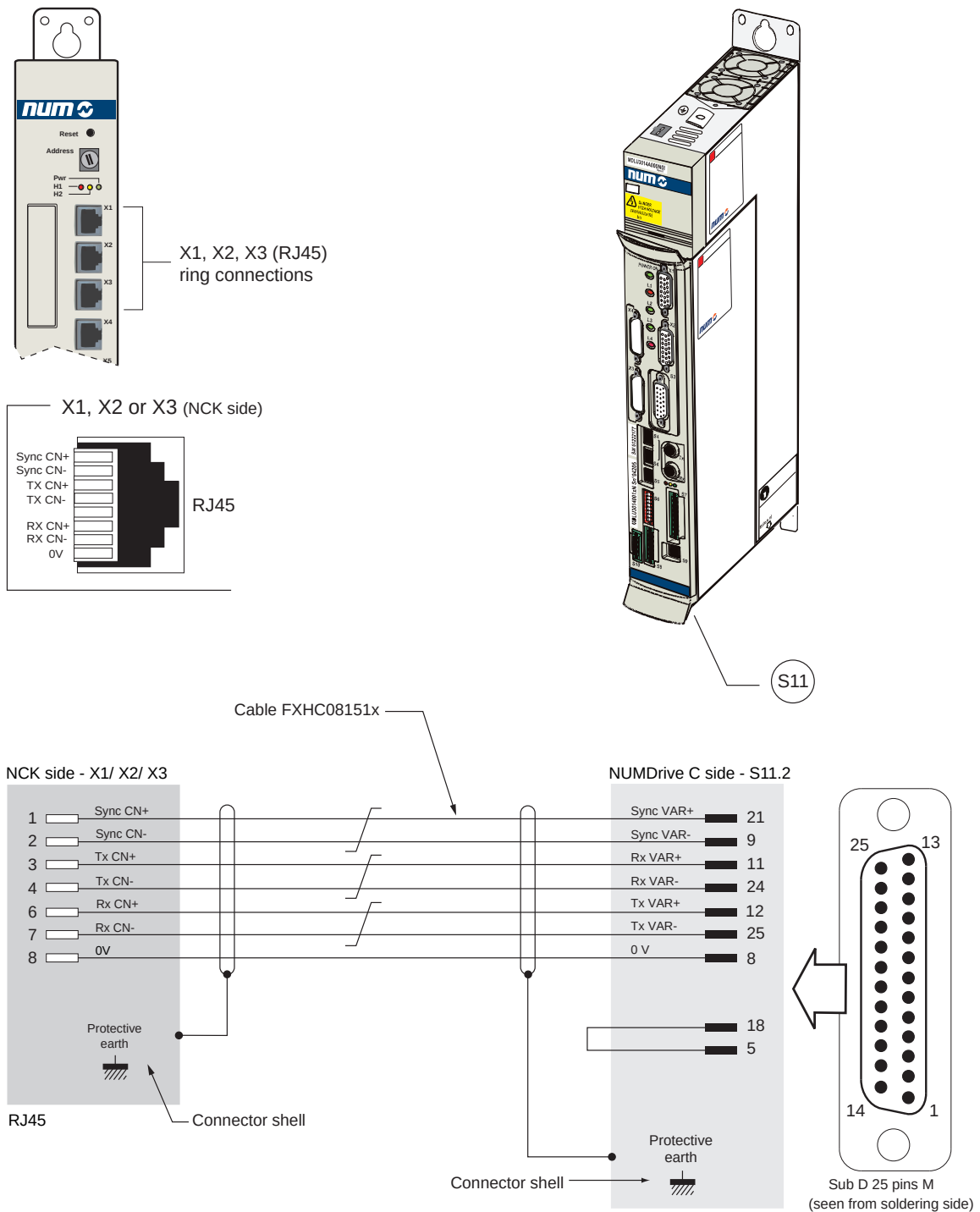
It is absolutely necessary to insert a fast-blow 2A fuse in the NCK powering line.

### 9.4.4 NCK to NUMDrive X connections



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

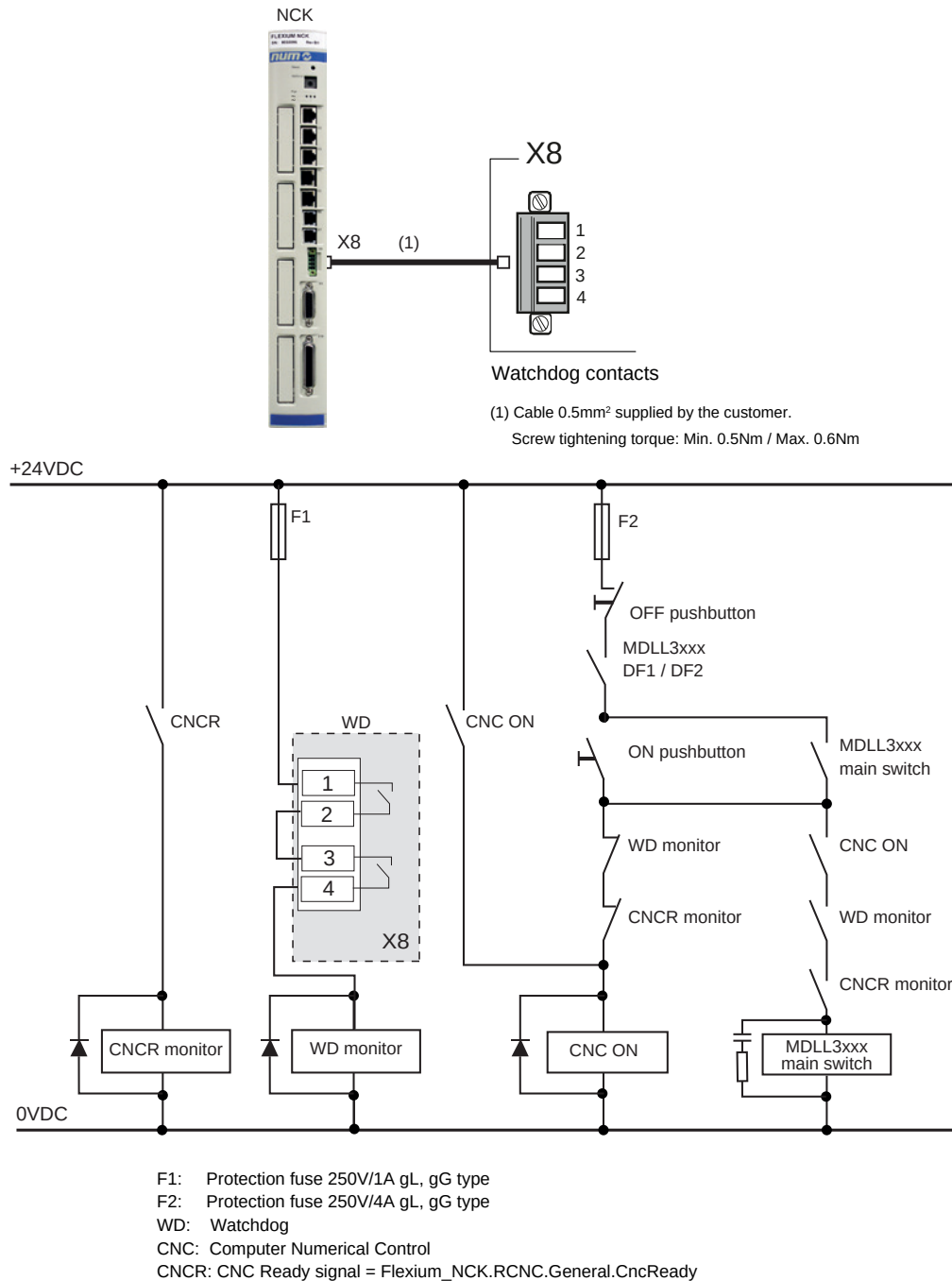
## 9.4.5 NCK to NUMDrive C connections



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

## 9.4.6 NCK Watchdog connections

### Recommended safety daisy chain



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

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



To prevent and avoid overcurrent a protection fuse must be placed in the circuit as indicated in the diagram above.

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

---

#### 9.4.6.1 Wiring of the watchdog - Safety Daisy Chain

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

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



The NCK may continue sending commands to the drives when the WD is open, which could cause problems (collisions, etc.).

The contacts of watchdog relays must therefore be wired in the safety chain so that when the watchdog triggers, power supply to the drives is cut off.

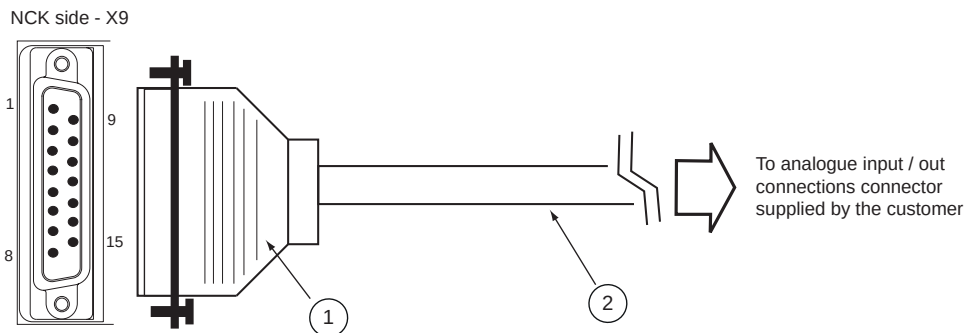
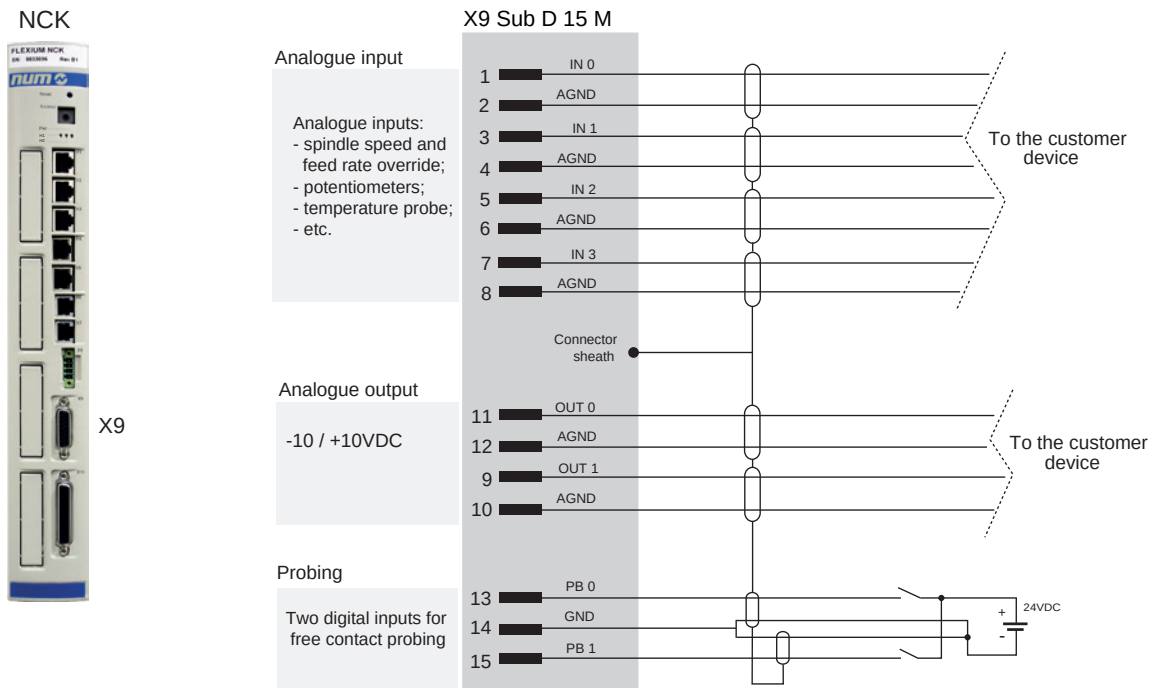
The control system should remain powered to allow troubleshooting and setting of certain logic inputs (which are not the only possible causes of system failure).



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

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

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



|   |                                                                                                                                                                                                                                                                                                                                       |
|---|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | <p>Connector X9 is a part of analog / digital IOs connections kit code FXHE181301. The kit consists of X9, X10 alone connectors NCK side.</p> <ul style="list-style-type: none"> <li>- 1 DB 15 SubD male connector for analogue IOs (X9)</li> </ul> <p>The others user's connections and connectors are supplied by the customer.</p> |
| 2 | <ul style="list-style-type: none"> <li>- Cable for analogue input / output : 1 pair double shielding cable (2 x 0.22 mm<sup>2</sup>)</li> <li>- Cable for probing : 2 wires shielded cable (2 x 0.22 mm<sup>2</sup>)</li> </ul> <p>The cable are supplied by the customer.</p>                                                        |



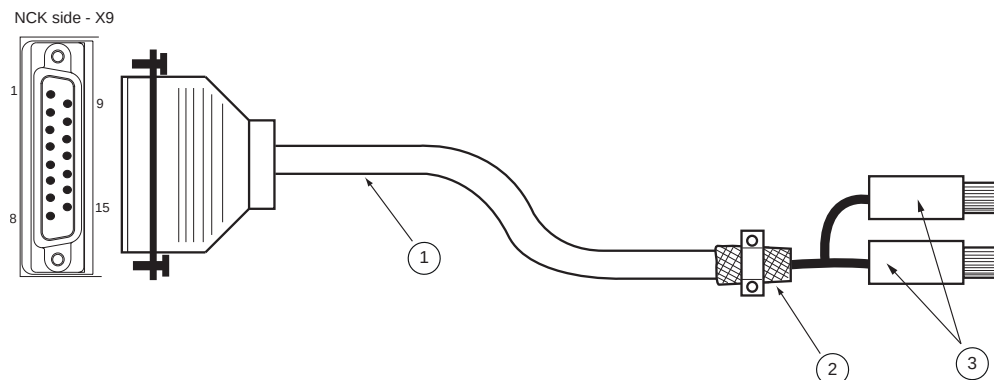
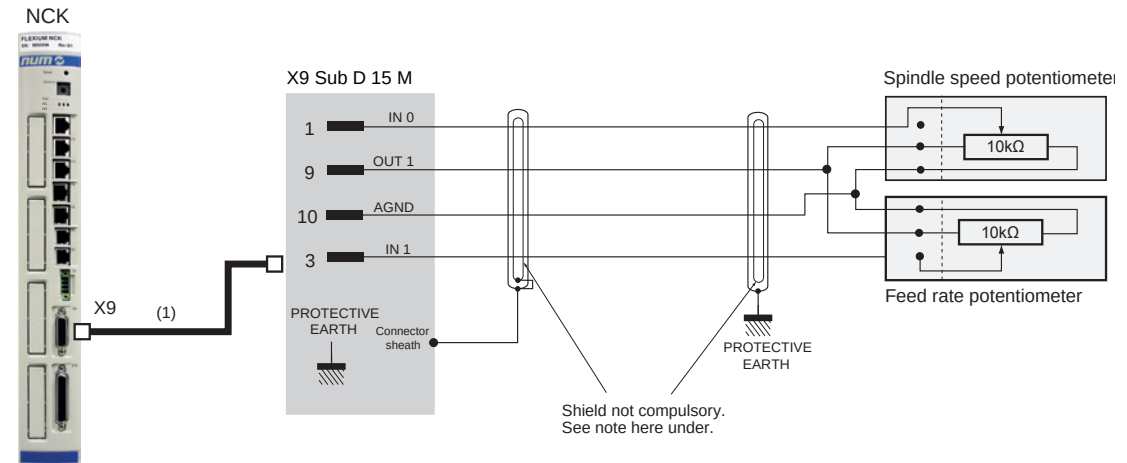
For correct interference suppression in the system, the cable shielding must be earthed in accordance with Cabinet layout and EMC Guide manual M00027.



### 9.4.7.1 Speed and Feed Override potentiometers connections

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

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



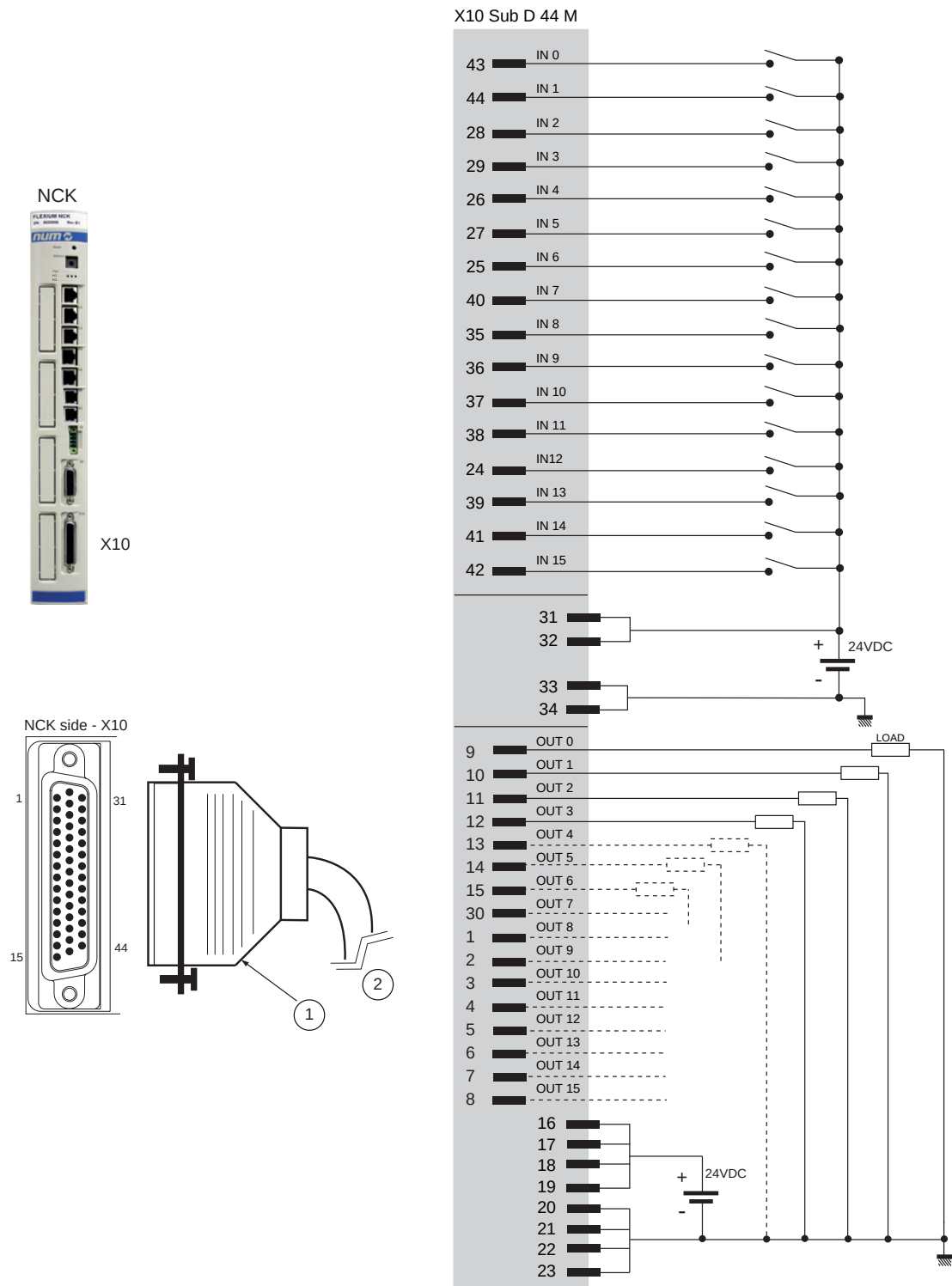
|   |                                                                                           |
|---|-------------------------------------------------------------------------------------------|
| 1 | 4 wires cable with double shielding (4 x 0.22 mm <sup>2</sup> ) supplied by the customer. |
| 2 | Bonding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



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

### 9.4.8 Digital inputs/outputs connections (embedded)

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



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

---

#### 9.4.9 Analogue axes connections

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

The axes measurement system must be an incremental sensor.

##### **Requirements concerning sensors and their Power Supply**

The installation of a sensor is subject to several requirements:

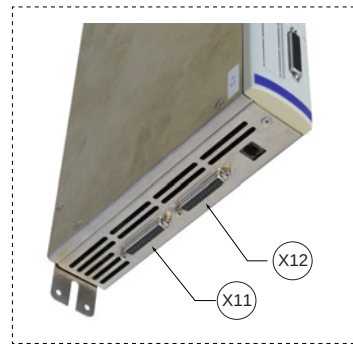
- minimum sensor power supply voltage (see next pages),
- maximum frequency above which the signals provided by the sensor are no longer measured with accuracy by the system (incremental channels, (see next pages),
- maximum available current for the sensor supply (see next pages).

These requirements determine:

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

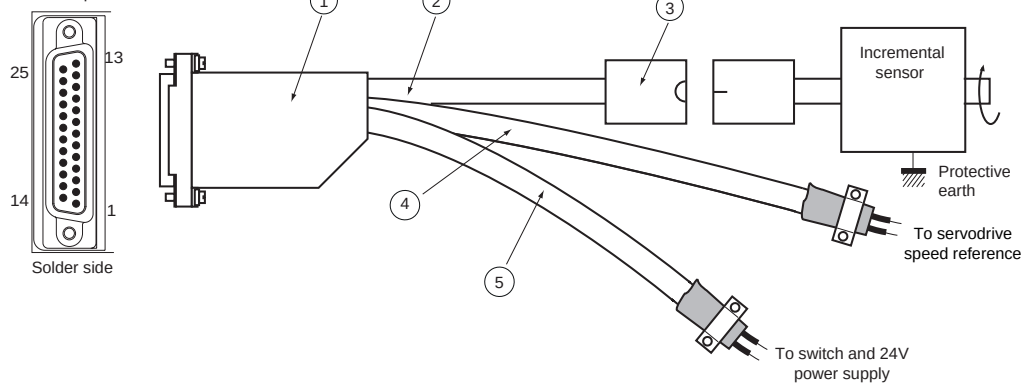
The origin switch must be set after installation.

### 9.4.10 Incremental axis encoder connections cable for Flexium and Flexium<sup>+</sup>

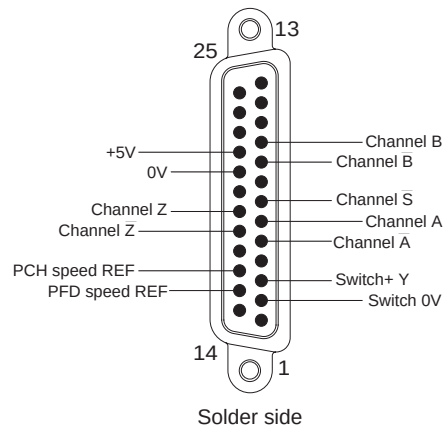


NCK Bottom view

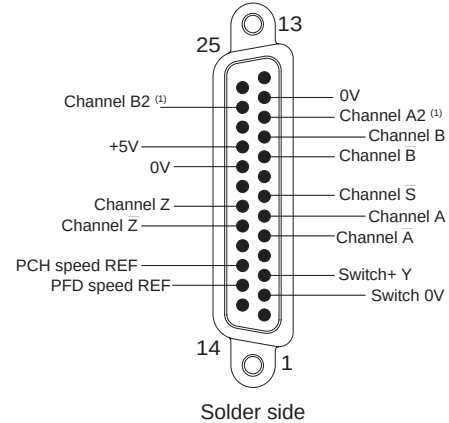
NCK side - X11, X12  
Sub D 25 pins M



#### Flexium



#### Flexium<sup>+</sup>



<sup>(1)</sup> Connections for not differential handwheel (5V signals -TTL single ended)

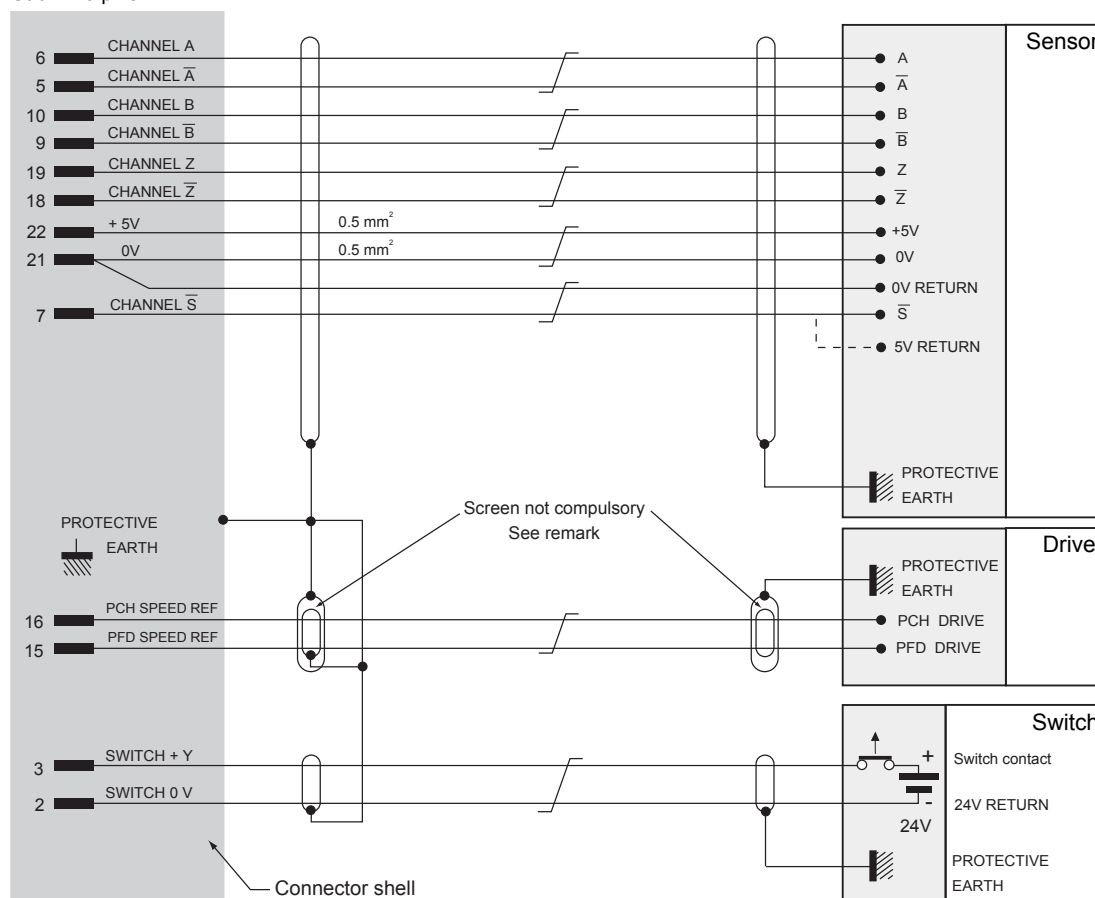
|   |                                                                                                    |
|---|----------------------------------------------------------------------------------------------------|
| 1 | 25-contact male Sub.D connector plug.                                           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



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

## 9.4.11 Incremental TTL encoder connections

NCK side - X11/ X12  
Sub D 25 pins M



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



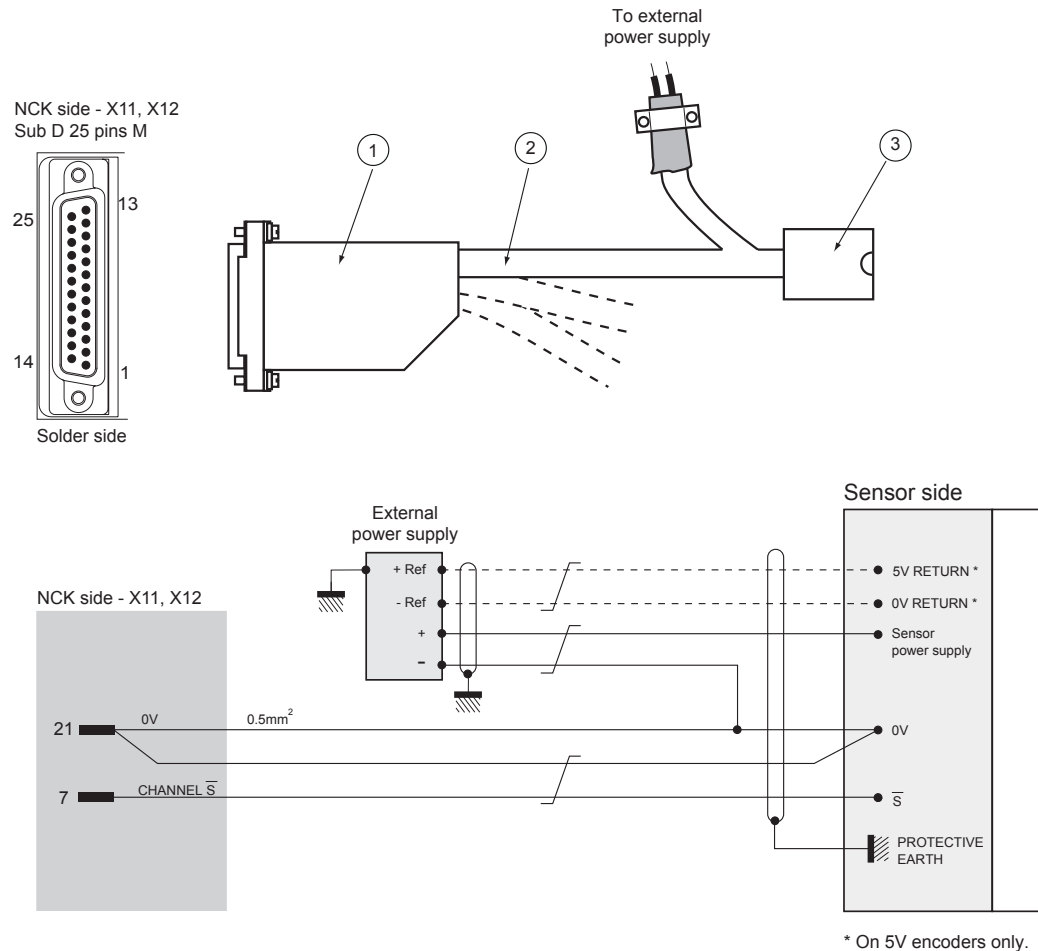
If the interference level is low, the cable with double shielding (servodrive cable) can be replaced by a cable with single shielding connected at both ends to the functional earth.

Contact  $\bar{S}$  is present on sensors with poor signal errors. When the sensor does not include this signal, contact 7 on the NCK side must be connected to the sensor 5V return.

### 9.4.12 Axis with external power supply

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

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



|   |                                                                                                    |
|---|----------------------------------------------------------------------------------------------------|
| 1 | 25-contact male Sub.D connector plug.                                                              |
| 2 | Shielded cable [4 x (2 x 0.14mm <sup>2</sup> ) + 2 x 0.5mm <sup>2</sup> ] 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.

---

### 9.4.13 Voltage across the sensor

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

#### 5VDC Sensors

When the NUM power supply is used, the voltage across the sensor is given by the equation:

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

where:

- $V_s$  (in V) is the voltage across the sensor,
- $L$  (in m) is the cable length (one way only),
- $S$  (in mm<sup>2</sup>) 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 2.624mm<sup>2</sup>. 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 <sup>2</sup>          | 4.753V                    |
| 30m          | 2.624mm <sup>2</sup>         | 4.758V                    |

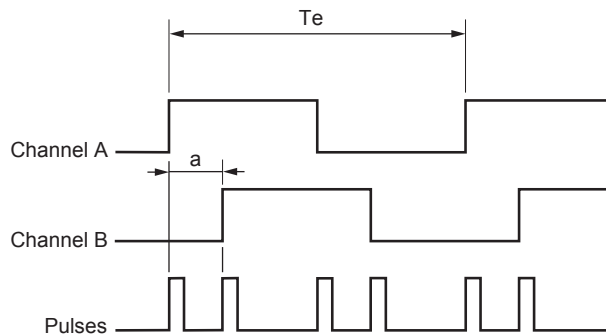
Above 30m, the wire size required would be above 2.624mm<sup>2</sup>. In this case, use an external power supply whose characteristics provide a minimum voltage of 4.75V across the sensor while preserving a reasonable wire size.

#### Sensors requiring a power supply voltage above 5VDC

The use of an external power supply is mandatory.

### 9.4.14 Maximum incremental sensor channel output frequency

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



$T_e$ : signal period on one of the channels

$a$ : time shift between two fronts

The sensor channel output frequency is  $f_e = 1 / T_e$ .

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  $[4 \times (2 \times 0.14 \text{ mm}^2)]$  connecting the sensor to the axis encoder card and using an external power supply:

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

### 9.4.15 Maximum available current per axis

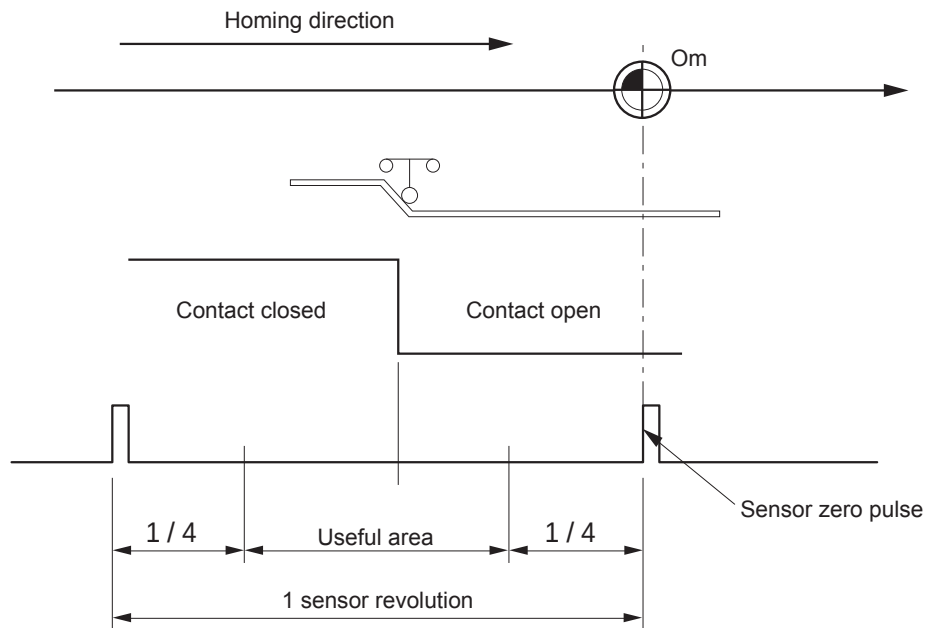
Each axis interface can supply a maximum current of 350mA.

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



#### 9.4.16 Setting the Origin Switch

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

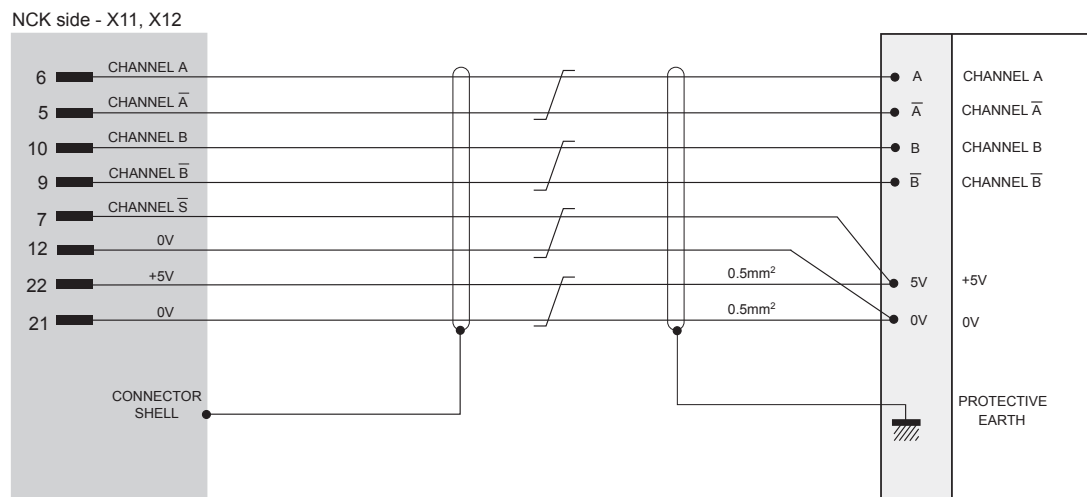
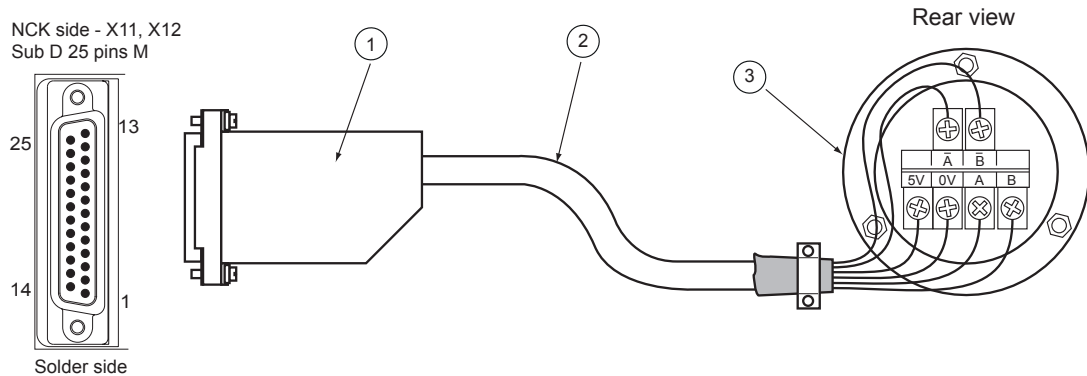


The switch must be set so that the contact opens between one-quarter and three-quarters of the interval separating two zero pulses. This is to avoid coincidence between switch operation and the zero pulse, which could cause a random shift by a distance equal to that separating two zero pulses.

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

## 9.4.17 Handwheels connections

### 9.4.17.1 Handwheels with Differential outputs connections for Flexium



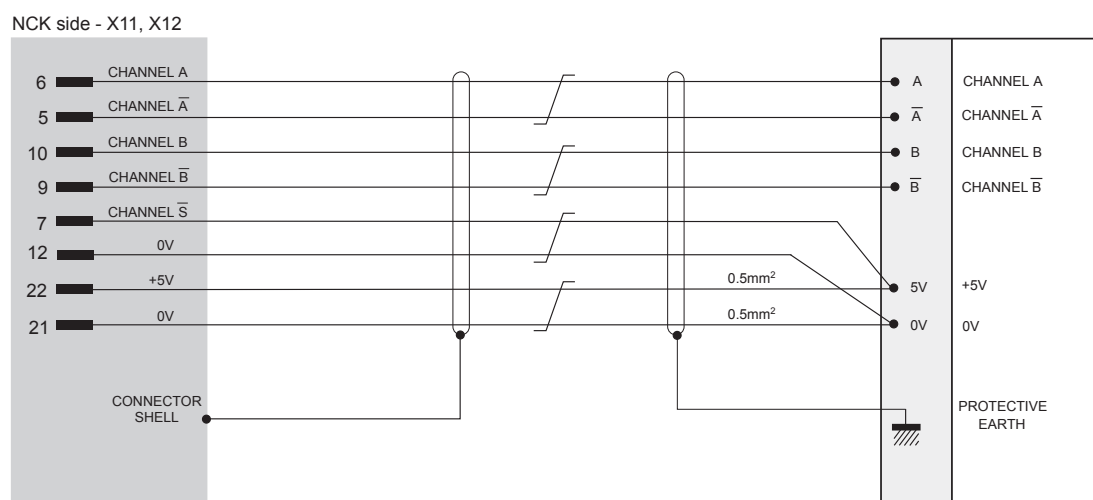
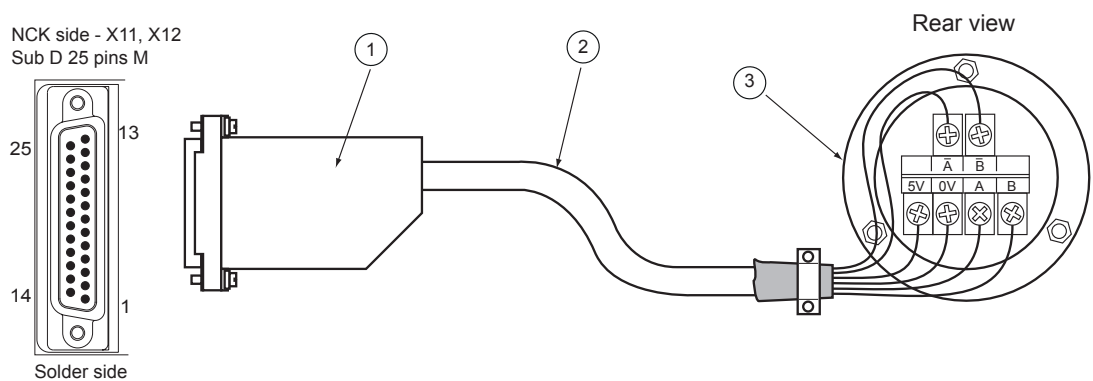
|   |                                                                                                                               |
|---|-------------------------------------------------------------------------------------------------------------------------------|
| 1 | 25-contact male Sub D connector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

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



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

9.4.17.2 Handwheels with Differential outputs connections for Flexium+



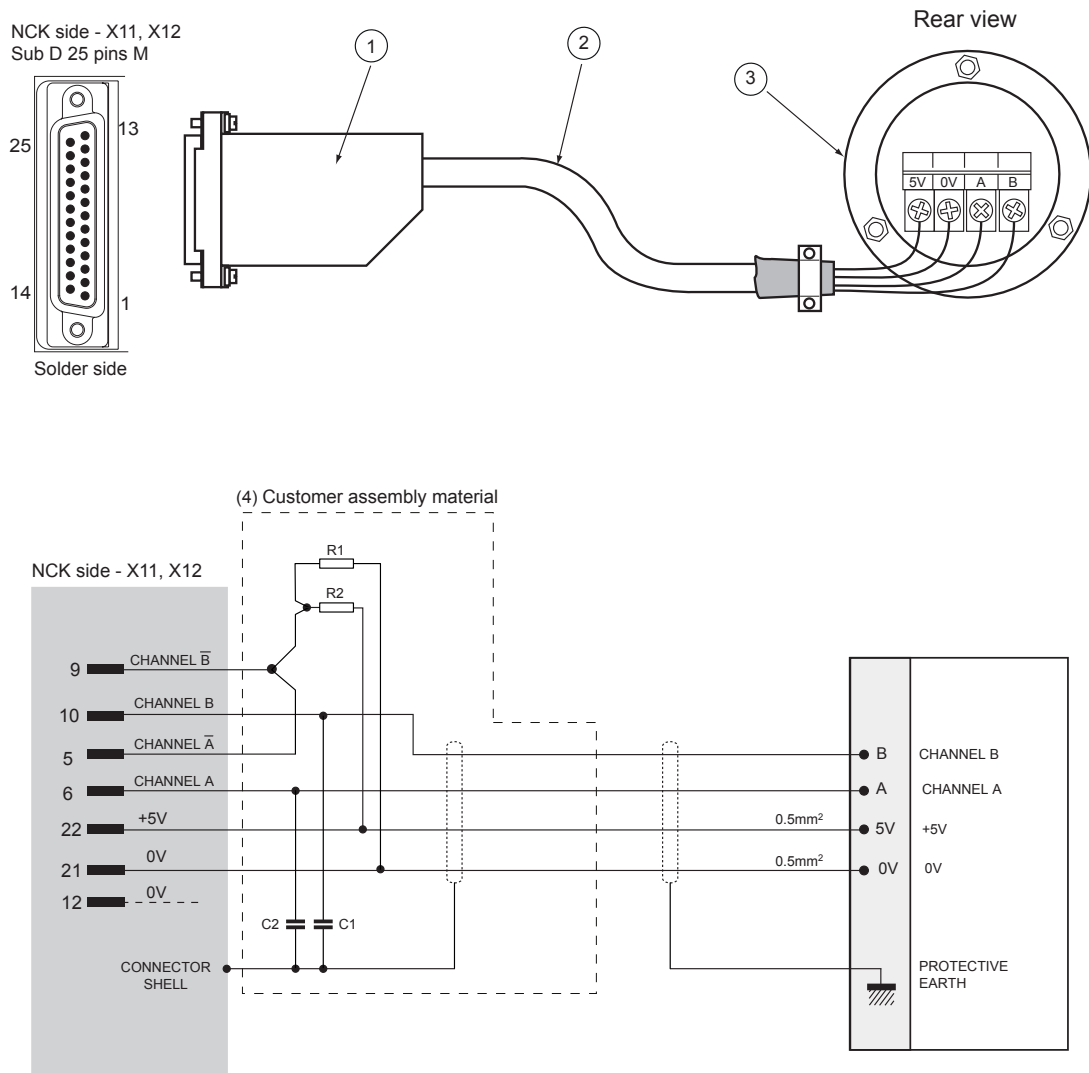
|   |                                                                                                                                                         |
|---|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | 25-contact male Sub D connector plug.                                                                                                                   |
| 2 | Shielded cable with three twisted pairs wrapped around one pair [3 x (2 x 0.14 mm <sup>2</sup> ) + (2 x 0.5 mm <sup>2</sup> )] 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<br>(Axis/Spindle) | Handwheel and analogue axis use the same input, therefore they cannot be connected in the same connector (X11 or X12). |
|                                                                                                          | Yes       | No                              |                                                                                                                        |
|                                                                                                          | No        | Yes                             |                                                                                                                        |
| X12                                                                                                      | Yes       | No                              |                                                                                                                        |
|                                                                                                          | No        | Yes                             |                                                                                                                        |



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

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

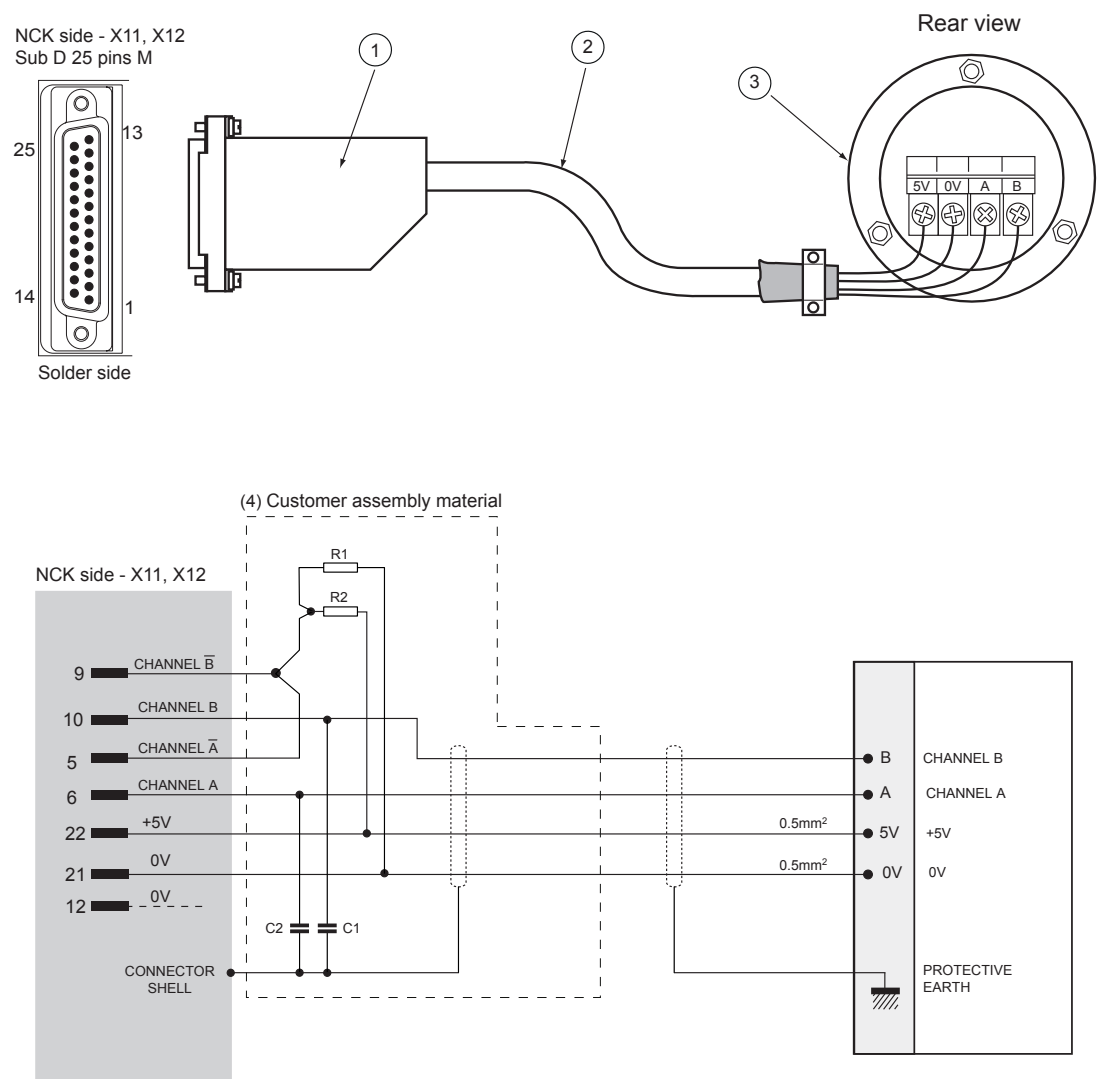


Please also refer to chapter 9.15 for more detailed information of the handwheels connections. For correct interference suppression in the system please refer the advise on previous pages.

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

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

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

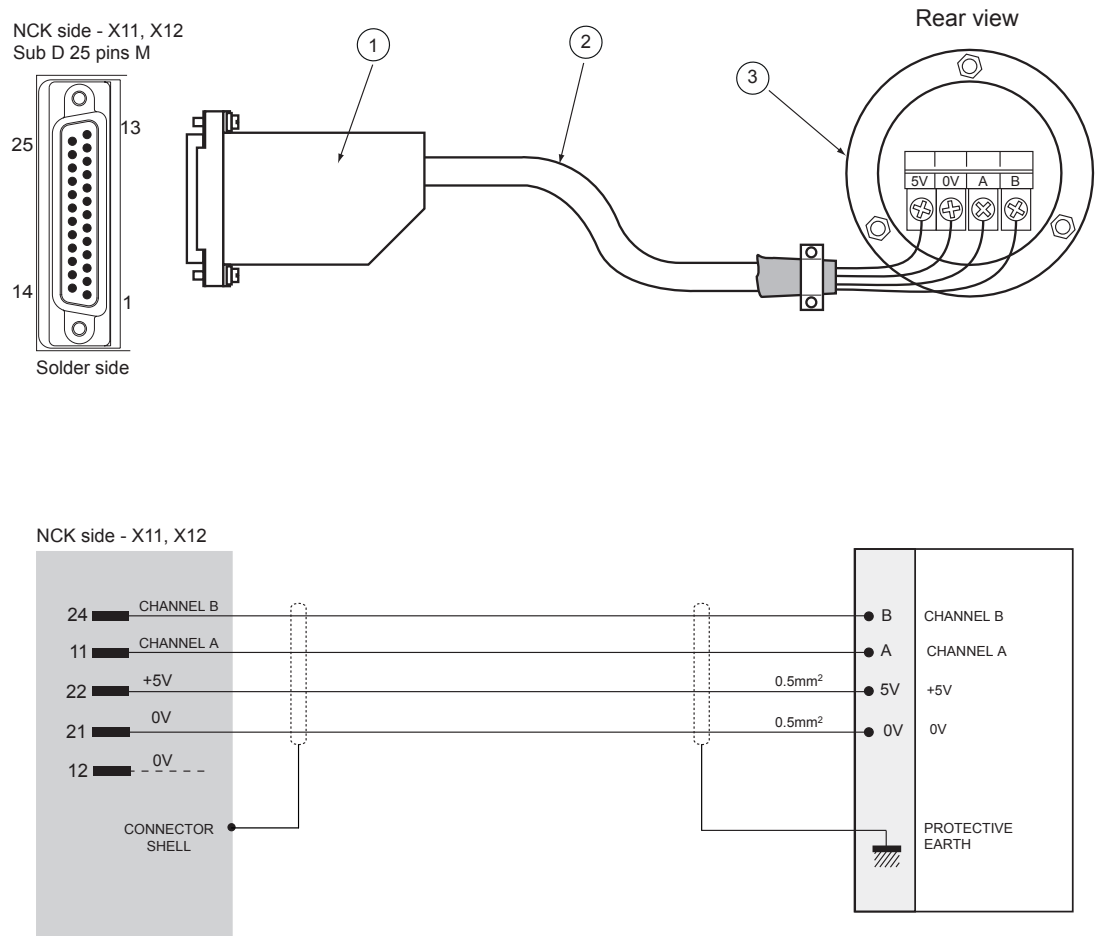


Please also refer to chapter 9.15 for more detailed information of the handwheels connections.  
For correct interference suppression in the system please refer the advise on previous pages.

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

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

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



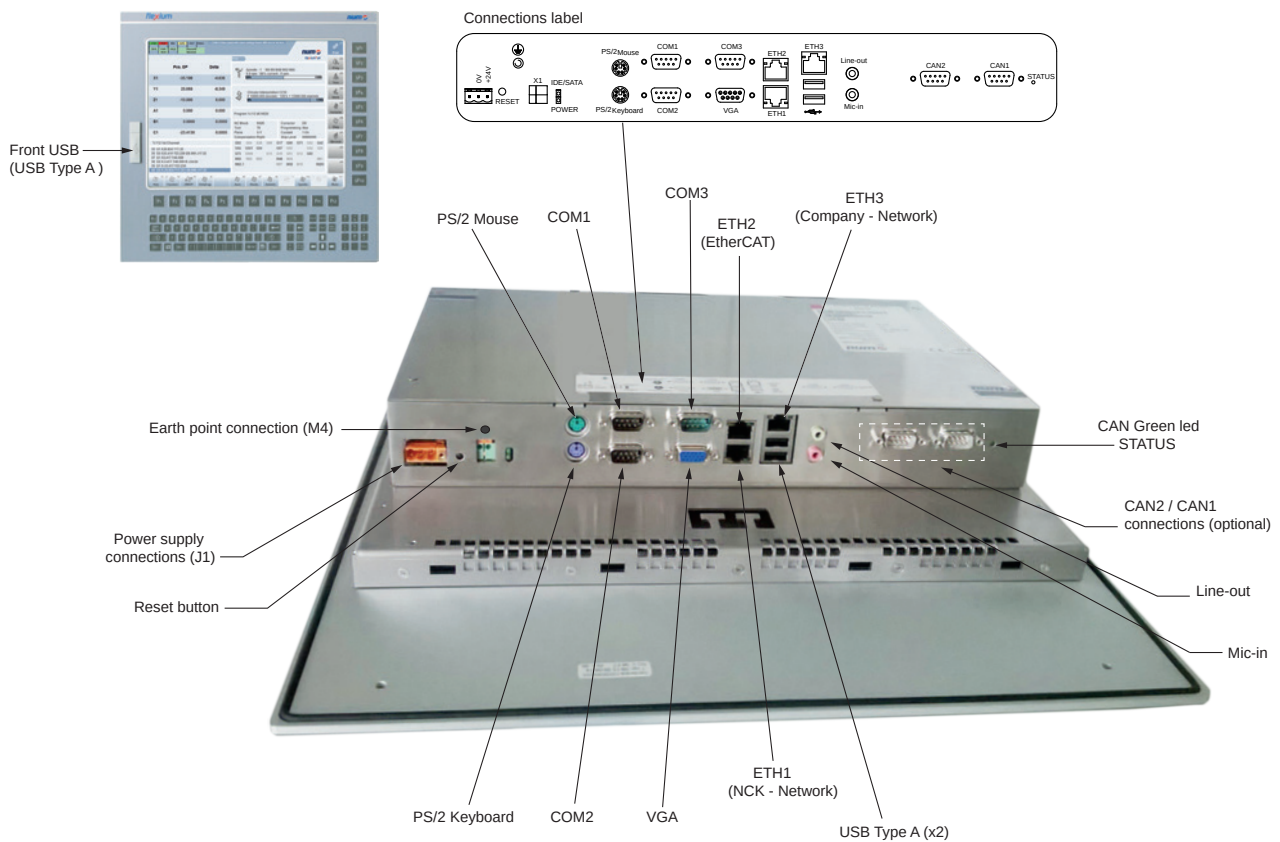
Please also refer to chapter 9.15 for more detailed information of the handwheels connections.

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

| Flexium+ Handwheel connected to reduced coupler input configuration (Max 2 handwheel) |                                |                                 |                                                                                                                                                               |
|---------------------------------------------------------------------------------------|--------------------------------|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|
| X11                                                                                   | Handwheel<br>(Reduced coupler) | Analogue axes<br>(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                             |                                                                                                                                                               |

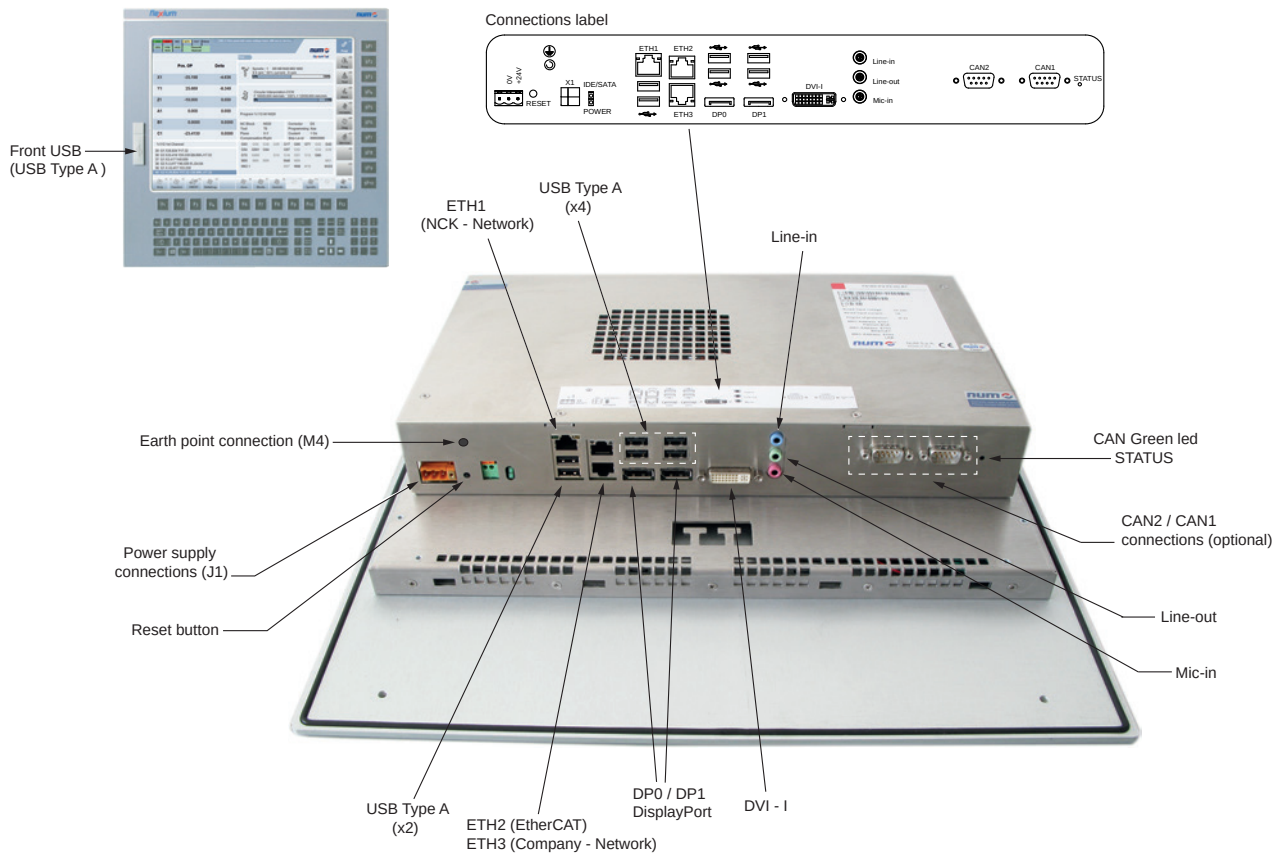
## 9.5 FS153i Panels connections

### 9.5.1 FS153i PC P1 general lay-out connectors



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

## 9.5.2 FS153i PC P2 general lay-out connectors



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



### 9.5.3 Connecting the power supply

The FS153i PC P1 and PC P2 is a device compliant with protection class 3.  
The system must be fed with an SELV 24VDC (safety extra-low voltage) supply by the customer.  
The power supply is not electrically isolated and the 0V terminal is directly connected to the housing potential.

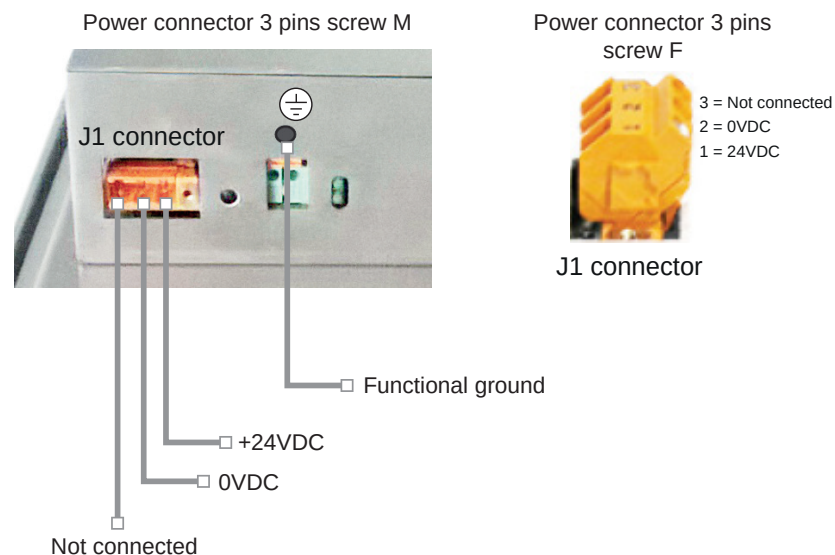
The power supply is protected by a self resettable fuse.  
The relevant national regulations must be observed when connecting the FS153i.

The connection should be made as follows:

- The cross-section of the power supply cable must be between 0.75mm<sup>2</sup> and 1.5mm<sup>2</sup>.
- The current consumption must be taken into account for the power supply (see chapter 4).
- The functional ground is not compulsory for operation. It may help to prevent interference and potential differences.
- The 0V pin is directly connected to the housing potential.
- The two connection cables must be attached to each other close to the plug in order to ensure a safe connection. (see below)

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

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



If the polarity is reversed and a 0V connection is added at the same time, e.g. GND connection of the COM1 interface, the leakage current will flow across this 0V connection.

The two connection cables must be attached to each other close to the plug in order to ensure a safe connection.

### 9.5.4 COM connections

The serial interfaces COM1 to COM3 are PC compatible. The serial interface COM2 is used internally. The serial interfaces COM3 can be lead through on request.

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

| Connector                                                                      | Type                 | Description                            |
|--------------------------------------------------------------------------------|----------------------|----------------------------------------|
| COM1                                                                           | RS232 Sub D 9 pins M | Serial interface. General user purpose |
| COM2                                                                           |                      |                                        |
| COM3                                                                           |                      |                                        |
| Note. It is mandatory to use a shielded cable for interference-free operation. |                      |                                        |



Windows XP embedded devices will not support this interface.

### 9.5.5 VGA Video connection

The video interface is PC compatible.

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

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

### 9.5.6 DVI-I Digital Video connection

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

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

### 9.5.7 DP0 / DP1 DisplayPort

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

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

---

### 9.5.8 ETH1, ETH2 and ETH3 Ethernet connections

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

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

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

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



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

### 9.5.9 USB connections type A

The FS153i provides 2 USB interfaces PC compatible for PC P1 and 6 USB interfaces PC compatible for PC P2 in the rear side of the panel and one more into the front keyboard panel side

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

| Connector                                                                      | Type        | Description                                                     |
|--------------------------------------------------------------------------------|-------------|-----------------------------------------------------------------|
| USB                                                                            | Type A V2.0 | General user purpose.<br>(Mouse, keyboards and all USB devices) |
| Note. It is mandatory to use a shielded cable for interference-free operation. |             |                                                                 |

### 9.5.10 CAN1 and CAN2 connections (optional)

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

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

To activate the second CAN interface (CAN2 connector) the option FXSO000432 "additional 2nd CAN interface for FS153i" 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.

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### 9.5.11 Line-in / Line out / Mic in - Audio connections

The Audio connections are PC compatible.  
Cables connected to the Audio interface must be routed separately from low-voltage cables.

### 9.5.12 PS/2 mouse and PS/2 keyboard

Standard mouse and keyboard PC connections.

### 9.5.13 Reset button

PC reset.

### 9.5.14 Battery replacement

FS153i is provided with a battery-powered real-time clock circuit Exchangeable 3.0V Lithium battery for Real Time Clock CMOS RAM type CR-2032L/BN, CR-2032N/BN or CR2032L/BE.  
There is a danger of explosion if battery is incorrectly replaced.



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

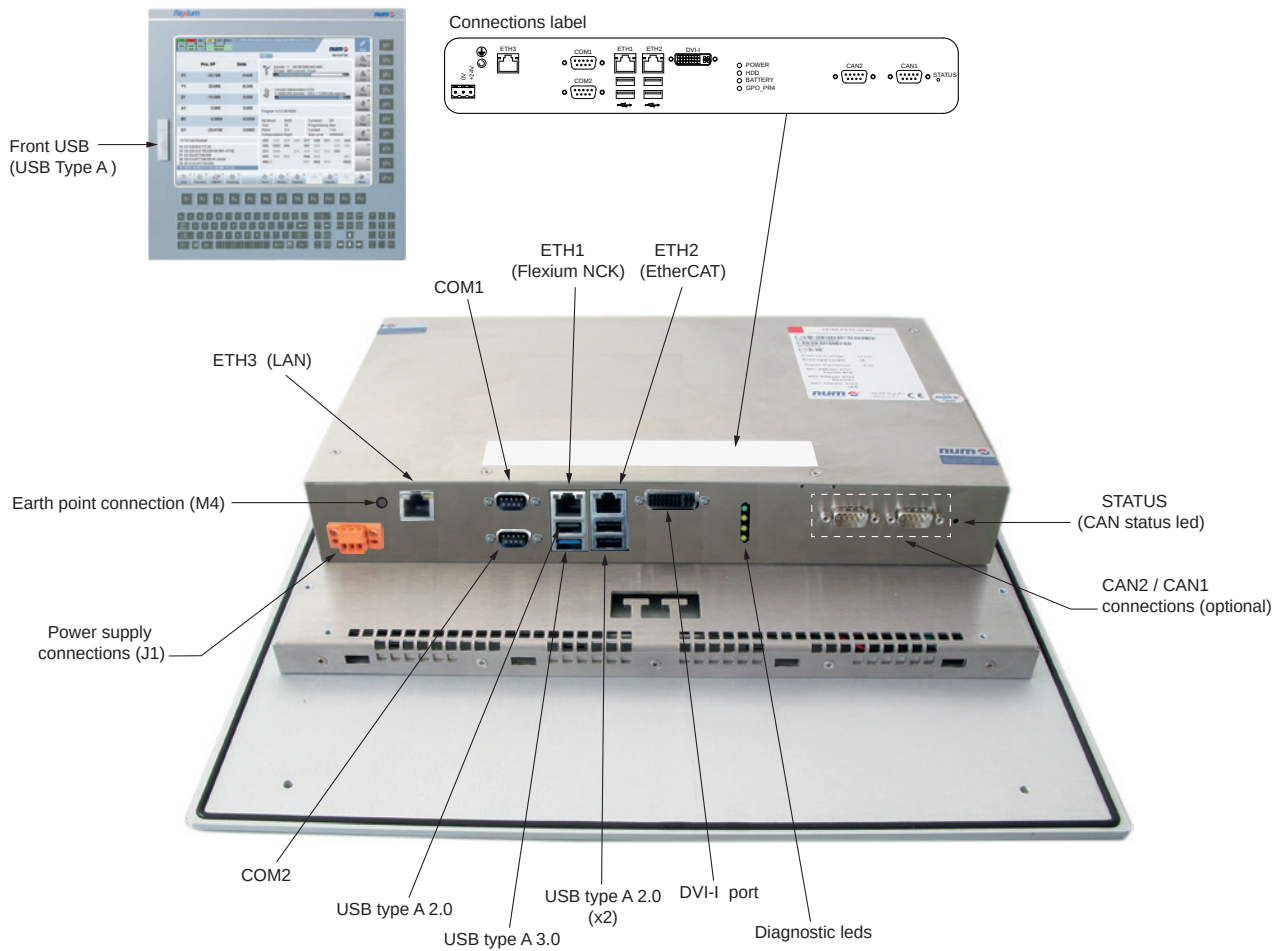
Attention: Opening the back cover or breaking the warranty labels voids the warranty.



Pay attention to ESD safety protections when changing the battery.

## 9.6 FS154i Panels connections

### 9.6.1 FS154i PC P1 G4 general lay-out connectors



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

## 9.6.2 Connecting the power supply

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

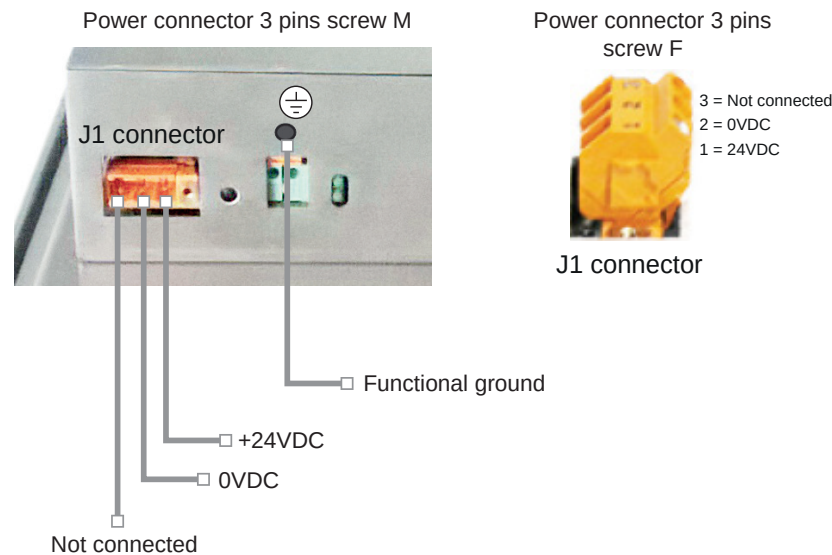
The power supply is protected by a self resettable fuse.  
The relevant national regulations must be observed when connecting the FS154i.

The connection should be made as follows:

- The cross-section of the power supply cable must be between 0.75mm<sup>2</sup> and 1.5mm<sup>2</sup>.
- The current consumption must be taken into account for the power supply (see chapter 4).
- The functional ground is not compulsory for operation. It may help to prevent interference and potential differences.
- The 0V pin is directly connected to the housing potential.
- The two connection cables must be attached to each other close to the plug in order to ensure a safe connection. (see below)

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

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



If the polarity is reversed and a 0V connection is added at the same time, e.g. GND connection of the COM1 interface, the leakage current will flow across this 0V connection.

The two connection cables must be attached to each other close to the plug in order to ensure a safe connection.

### 9.6.3 COM connections

The serial interfaces COM1 to COM2 are PC compatible.

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

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



Windows XP embedded devices will not support this interface.

### 9.6.4 DVI-I Digital Video connection

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

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



### 9.6.5 ETH1, ETH2 and ETH3 Ethernet connections

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

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

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

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



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

### 9.6.6 USB connections type A

The FS154i PC P1 G4 provides 5 USB interfaces PC compatible:

- 3 USB port type A 2.0 on the rear side of the panel
- 1 USB port type A 3.0 on the rear side of the panel
- 1 USB port type A 2.0 into the front keyboard panel.

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

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

### 9.6.7 CAN1 and CAN2 connections (optional)

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

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

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

The green Led "STATUS" indicates:

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

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

The pin assignment is as followed:

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



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

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### 9.6.8 Battery replacement

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



Replace only with the same type recommended by NUM.

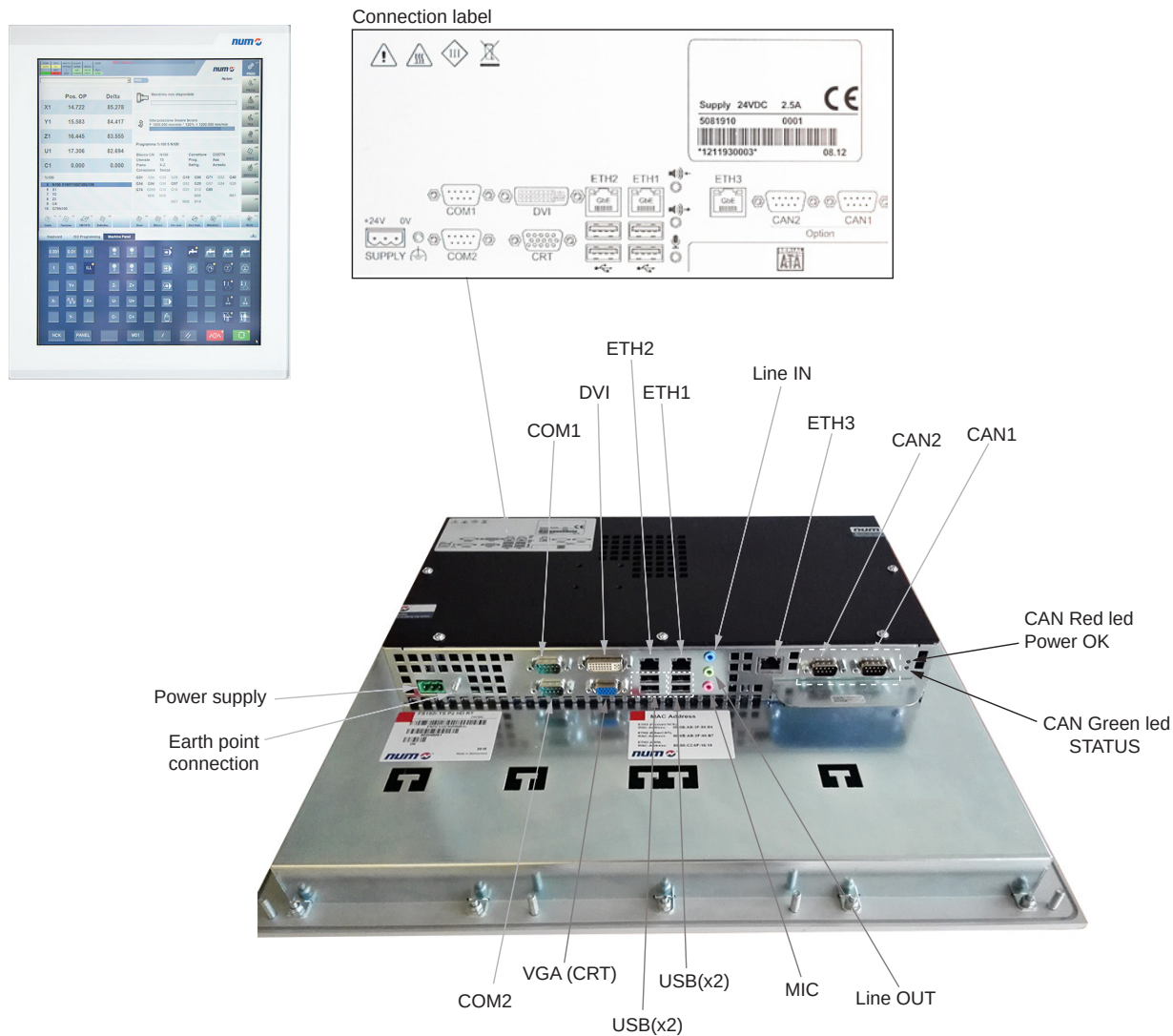
Attention: Opening the back cover or breaking the warranty labels voids the warranty.



Pay attention to ESD safety protections when changing the battery.

## 9.7 FS192i Panels connections

### 9.7.1 FS192i general lay-out connectors



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

## 9.7.2 Connecting the power supply

The FS192i Panel is a device compliant with protection class 3.  
The system must be fed with an SELV 24VDC (safety extra-low voltage) supply by the customer.  
The maximum breaking capacity of the fuse must be observed.

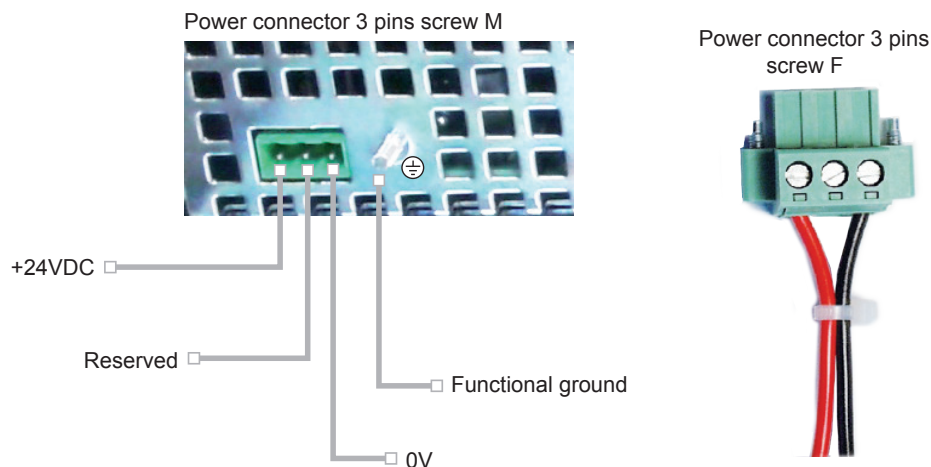
The power supply is not electrically isolated. The 0V terminal is directly connected to the housing potential. The power supply is fuse protected.  
The device is protected against reverse polarity, however, operation is only possible when the device is connected correctly.

The connection should be made as follows:

- The cross-section of the power supply cable must be between 0.75mm<sup>2</sup> and 1.5mm<sup>2</sup>.
- A lead or wire can be used for the connection
- The current consumption must be taken into account for the power supply. (See chapter 4)
- The functional ground is not compulsory for operation. It may help to prevent interference and potential differences.
- The two connection cables must be attached to each other close to the plug in order to ensure a safe connection. (see below)

The plug connector (socket strip with screw terminals) for the terminal is supplied with the device.  
We recommend that the FS192i Panel is grounded in order to prevent interference. This can either be implemented with the shield for the power supply or by using a ground connection on the grounding bolt.

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



If the polarity is reversed and a 0V connection is added at the same time, the leakage current will flow across this 0V connection. The FS192i Panel or external components may be destroyed if the housing is not properly connected to the 0V potential.

The two connection cables must be attached to each other close to the plug in order to ensure a safe connection. The relevant national regulations must be observed when connecting the FS192i Panel.

### 9.7.3 COM connections

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

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

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

### 9.7.4 VGA Video connection

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

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

### 9.7.5 DVI-I Digital Video connection

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

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

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### 9.7.6 ETH1, ETH2 and ETH3 Ethernet connections

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

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

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

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



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

### 9.7.7 USB connections

The FS192i provides 4 USB type A interfaces PC compatible in the rear side of the panel. Cables connected to the USB interface must be routed separately from low-voltage cables.

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

### 9.7.8 CAN1 and CAN2 connections (optional)

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

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

To activate the second CAN interface (CAN2 connector) the option FXSO000432 "additional 2nd CAN interface for FS192i" must be required.

The green Led "STATUS" blinking indicates the CAN communication active.

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

The pin assignment is as followed:

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



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



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### 9.7.9 Battery replacement

FS192i is provided with a battery-powered real-time clock circuit Exchangeable type Panasonic, BR2032. There is a danger of explosion if battery is incorrectly replaced.



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

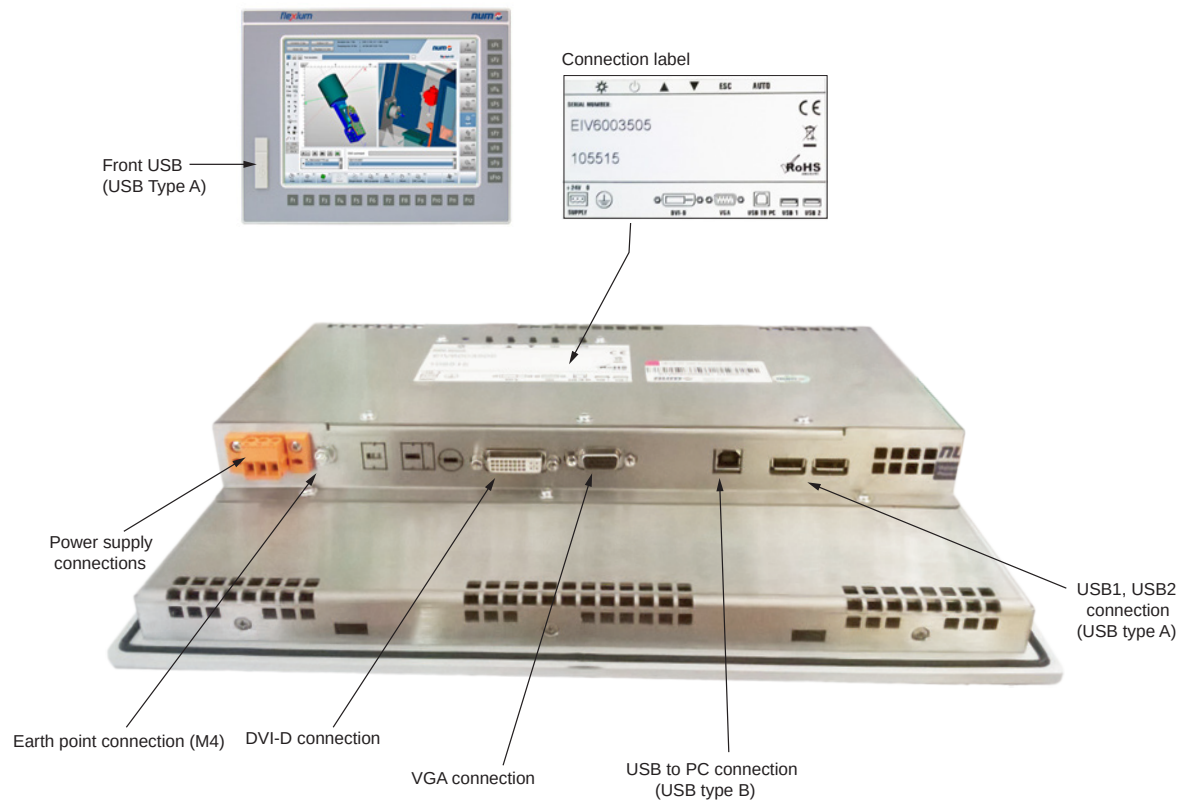
Attention: Opening the back cover or breaking the warranty labels voids the warranty.



Pay attention to ESD safety protections when changing the battery.

## 9.8 FS122 Passive panels connections

### 9.8.1 FS122 general lay-out connectors



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

## 9.8.2 Connecting the power supply

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

The power supply is not electrically isolated. The 0V terminal is directly connected to the housing potential. The power supply is fuseprotected.

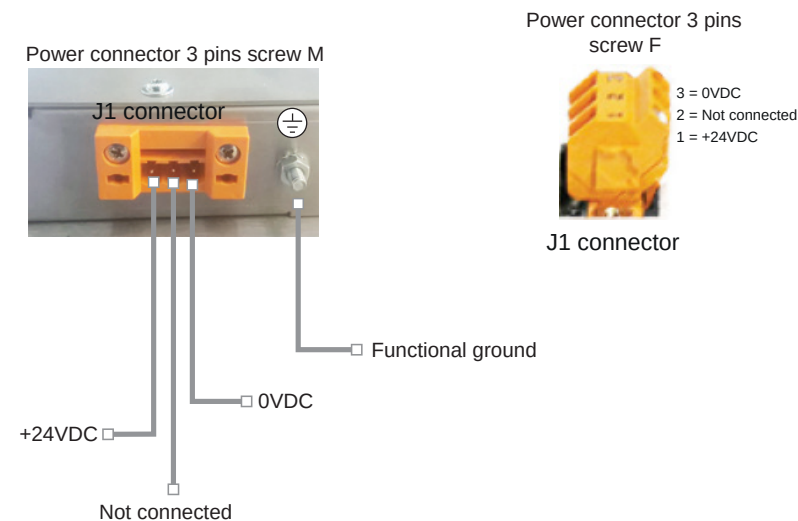
The device is protected against reverse polarity, however, operation is only possible when the device is connected correctly.

The connection should be made as follows:

- The cross-section of the power supply cable must be between 0.75mm<sup>2</sup> and 1.5mm<sup>2</sup>.
- A lead or wire can be used for the connection
- The current consumption must be taken into account for the power supply. (See chapter 4)
- The functional ground is not compulsory for operation. It may help to prevent interference and potential differences.
- The two connection cables must be attached to each other close to the plug in order to ensure a safe connection. (see below)

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

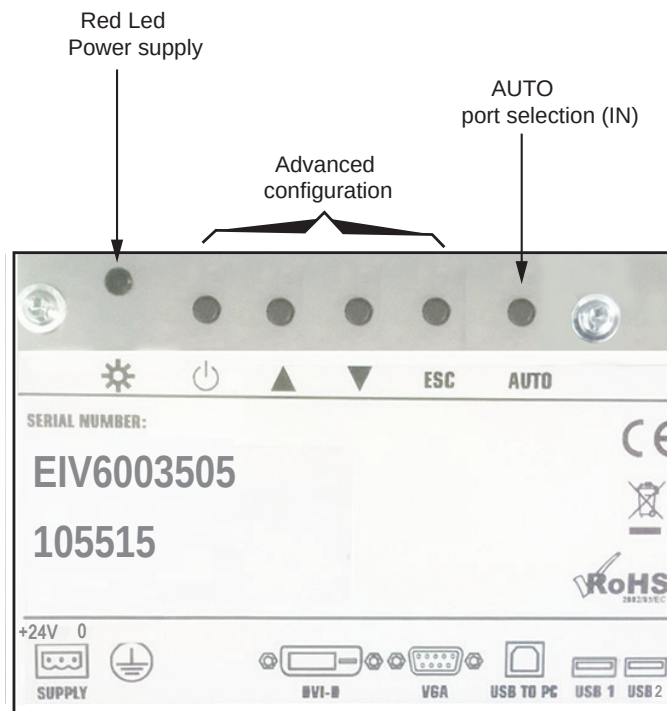
| Designation   | Function                                                         |
|---------------|------------------------------------------------------------------|
| +24VDC        | 24VDC SELV, safety extra low voltage. Protection class III / 4A. |
| -             | Not connected              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



If the polarity is reversed and a 0V connection is added at the same time, the leakage current will flow across this 0V connection. The FS122 Panel or external components may be destroyed if the housing is not properly connected to the 0V potential.

The two connection cables must be attached to each other close to the plug in order to ensure a safe connection. The relevant national regulations must be observed when connecting the FS122 Panel.

### 9.8.3 FS122 configuration



### 9.8.4 USB connections type A

The FS122 provides 3 USB type A interfaces PC compatible two in the rear side of the panel and 1 more into the front keyboard panel side

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

| Connector      | Type     | Description                                                                                                     |
|----------------|----------|-----------------------------------------------------------------------------------------------------------------|
| USB x1 (Front) | USB port | The USB Type A front connection can be used to connect additional peripherie as keyboard, mouse, memystick etc. |
| USB x2 (Rear)  |          | The USB Type A connection are for peripherie (keyboard, mouse Memystick etc.).                                  |

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

### 9.8.5 USB connections type B

The FS122 provides 1 USB tye B interface in the rear side of the panel and one more into the front keyboard panel side and is used to connect the panel to the PC.

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



Take care by elongating the USB connection from the panel to the PC.

The maxiumum permissible cable connection length is 5m.

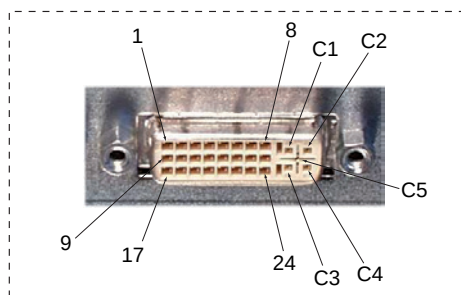
The panel contains a four port USB-Hub (front USB, front keyboard and the two at the rear side. Only a few KVM (Keyboard/Video/Mouse) switch units are able to transfer USB signals from a hub.

### 9.8.6 DVI-D interface connections

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

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

DVI connector

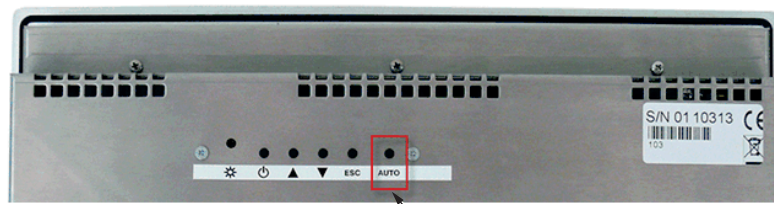


| Pin No | Signal               | Description                                                      |
|--------|----------------------|------------------------------------------------------------------|
| 1, 2   | RX2- / RX2+          | TMDS Data 2- Input / TMDS Data 2+ Input                         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



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

### 9.8.6.1 DVI-D interface configuration



Mode selector.  
Press "Mode" to select  
DVI-D or VGA connection

### 9.8.7 VGA Video connection

The video interface is PC compatible.

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

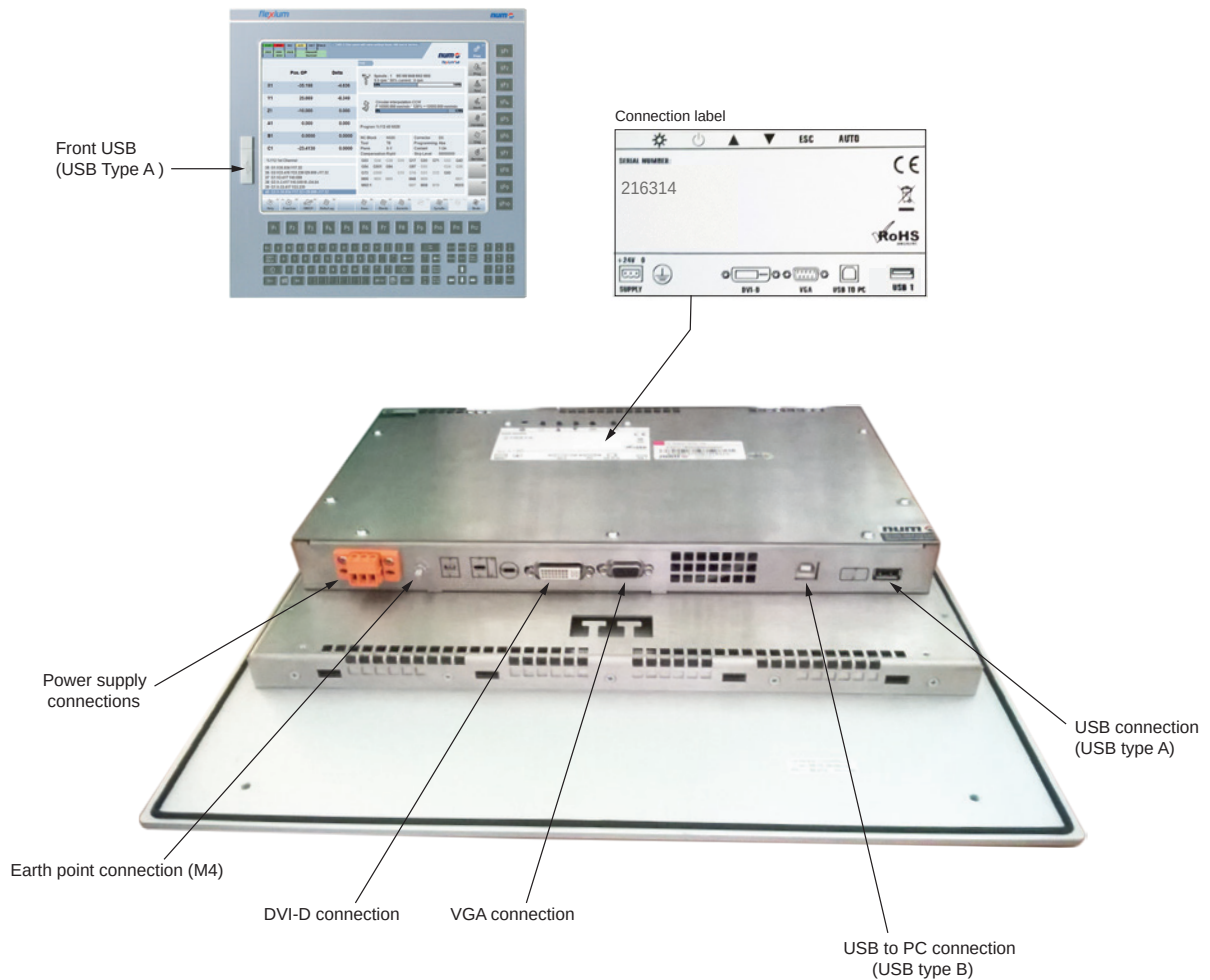
| Connector                                                                      | Type               | Description                   |
|--------------------------------------------------------------------------------|--------------------|-------------------------------|
| VGA                       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

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## 9.9 FS153 Passive panels connections

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### 9.9.1 FS153 general lay-out connectors



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

### 9.9.2 Connecting the power supply

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

The power supply is not electrically isolated. The 0V terminal is directly connected to the housing potential. The power supply is fuse protected.

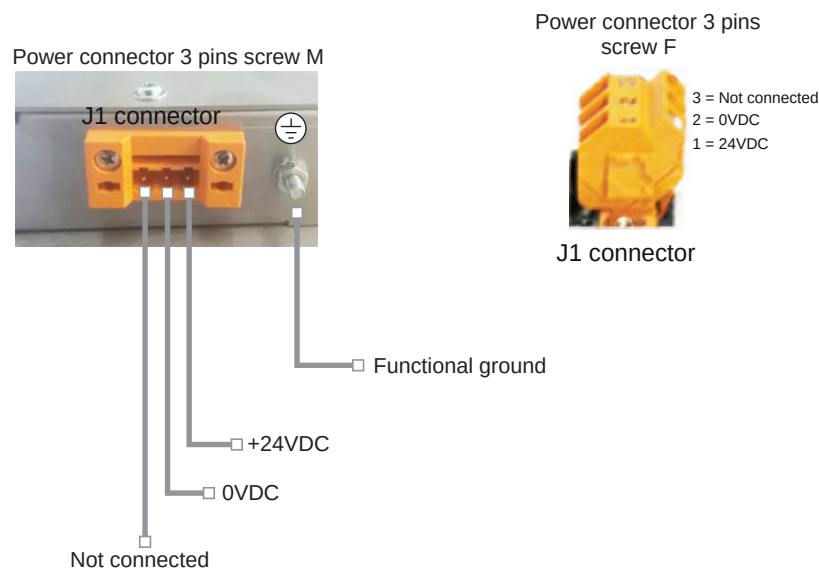
The device is protected against reverse polarity, however, operation is only possible when the device is connected correctly.

The connection should be made as follows:

- The cross-section of the power supply cable must be between 0.75mm<sup>2</sup> and 1.5mm<sup>2</sup>.
- A lead or wire can be used for the connection
- The current consumption must be taken into account for the power supply. (See chapter 4)
- The functional ground is not compulsory for operation. It may help to prevent interference and potential differences.
- The two connection cables must be attached to each other close to the plug in order to ensure a safe connection. (see below)

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

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

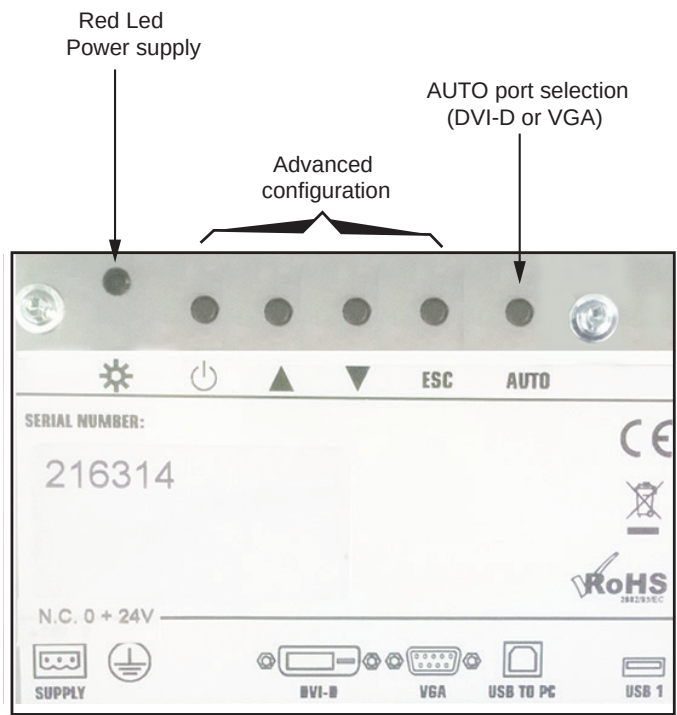


If the polarity is reversed and a 0V connection is added at the same time, the leakage current will flow across this 0V connection. The FS153 Panel or external components may be destroyed if the housing is not properly connected to the 0V potential.

The two connection cables must be attached to each other close to the plug in order to ensure a safe connection. The relevant national regulations must be observed when connecting the FS153 Panel.



9.9.3 FS153 configuration



9.9.4 USB connections type A

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

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

9.9.5 USB connections type B

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



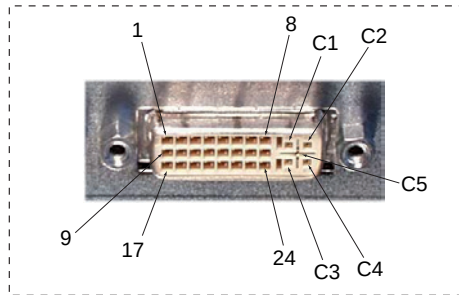
Take care by elongating the USB connection from the panel to the PC. The maxiumum permissible cable connection length is 5m. The panel contains a four port USB-Hub (front USB, front keyboard and the two at the rear side. Only a few KVM (Keyboard/Video/Mouse) switch units are able to transfer USB signals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

### 9.9.6 DVI-D interface connections

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

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

DVI connector



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



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

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### 9.9.7 VGA Video connection

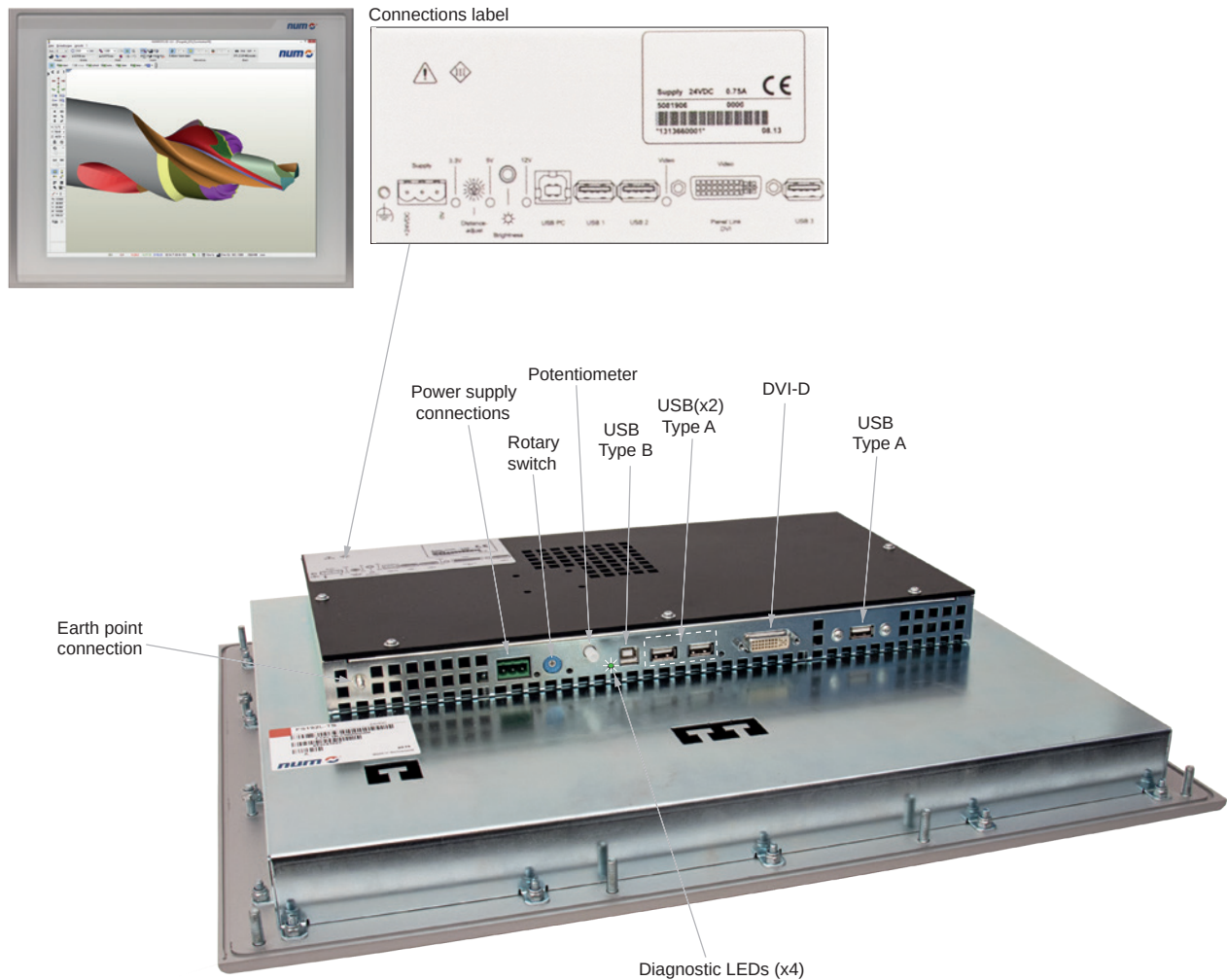
The video interface is PC compatible.

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

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

## 9.10 FS192L Passive panels connections

### 9.10.1 FS192L general lay-out connectors



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

## 9.10.2 Connecting the power supply

The FS192L Panel is a device compliant with protection class 3.  
The system must be fed with an SELV 24VDC (safety extra-low voltage) supply by the customer.  
The maximum breaking capacity of the fuse must be observed.

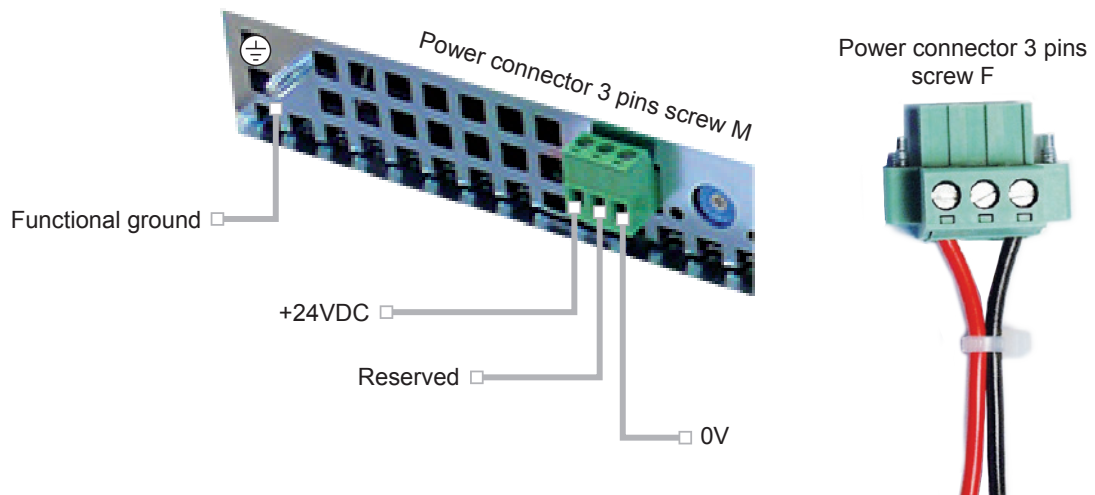
The power supply is not electrically isolated. The 0V terminal is directly connected to the housing potential. The power supply is fuse protected.  
The device is protected against reverse polarity, however, operation is only possible when the device is connected correctly.

The connection should be made as follows:

- The cross-section of the power supply cable must be between 0.75mm<sup>2</sup> and 1.5mm<sup>2</sup>.
- A lead or wire can be used for the connection
- The current consumption must be taken into account for the power supply. (See chapter 4)
- The functional ground is not compulsory for operation. It may help to prevent interference and potential differences.
- The two connection cables must be attached to each other close to the plug in order to ensure a safe connection. (see below)

The plug connector (socket strip with screw terminals) for the terminal is supplied with the device. We recommend that the FS192L Panel is grounded in order to prevent interference. This can either be implemented with the shield for the power supply or by using a ground connection on the grounding bolt.

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



If the polarity is reversed and a 0V connection is added at the same time, the leakage current will flow across this 0V connection. The FS192L Panel or external components may be destroyed if the housing is not properly connected to the 0V potential.

The two connection cables must be attached to each other close to the plug in order to ensure a safe connection. The relevant national regulations must be observed when connecting the FS192L Panel.

### 9.10.3 Rotary switch

The rotary switch can be used to adapt the FS192L Panel for operation with long or short cables in order to prevent quality losses due to the DVI cable being too long or too short.

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

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



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

### 9.10.4 Potentiometer for backlight adjustment

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

### 9.10.5 USB connections type A

The FS192L provides 3 USB interfaces PC compatible.

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

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

### 9.10.6 USB connections type B

The FS192L provides 1 USB tye B interface in the rear side of the panel and it is used to connect the panel to the PC.

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



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

### 9.10.7 Diagnostic LEDs

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

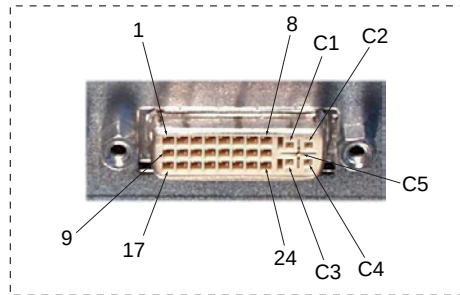
### 9.10.8 DVI-D interface connections

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

The video transfer is carried out differentially in (Transition Minimized Digital Signalling).

The video interface is compliant with the Single Link DVI-D Standard. For practical reasons, a DVI-I connector was fitted, however, the analog inputs do not have any function.

DVI connector



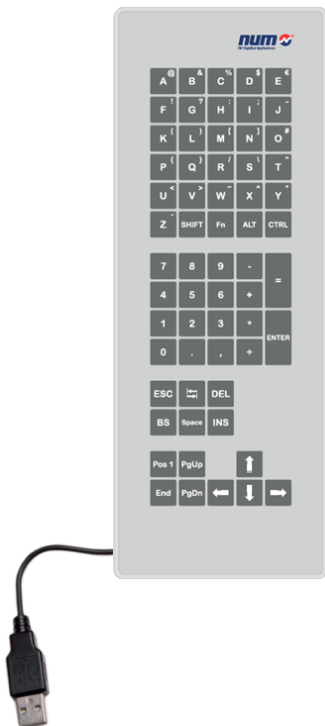
| Pin No | Signal               | Description                                                      |
|--------|----------------------|------------------------------------------------------------------|
| 1, 2   | RX2- / RX2+          | TMDS Data 2- Input / TMDS Data 2+ Input                         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



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

## 9.11 USB QWERTY keyboards connections

Verical USB QWERTY keyboard  
FXHE000248



Connect to USB port type A

Horizontal USB QWERTY keyboard FXHE000249



Connect to USB port type A



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

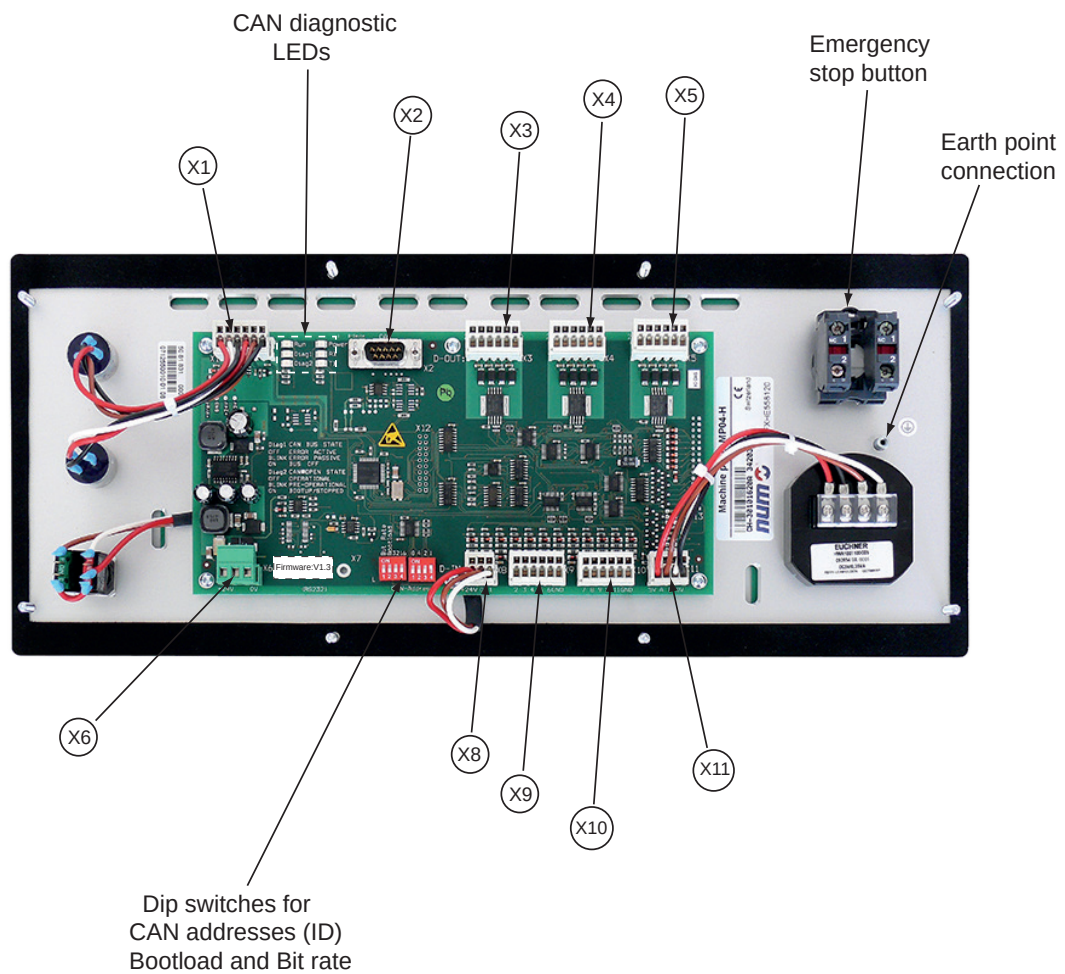


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## 9.12 MP04 Machine panel connections

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### 9.12.1 MP04 general lay-out connectors



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

### 9.12.2 Connecting the power supply (X6)

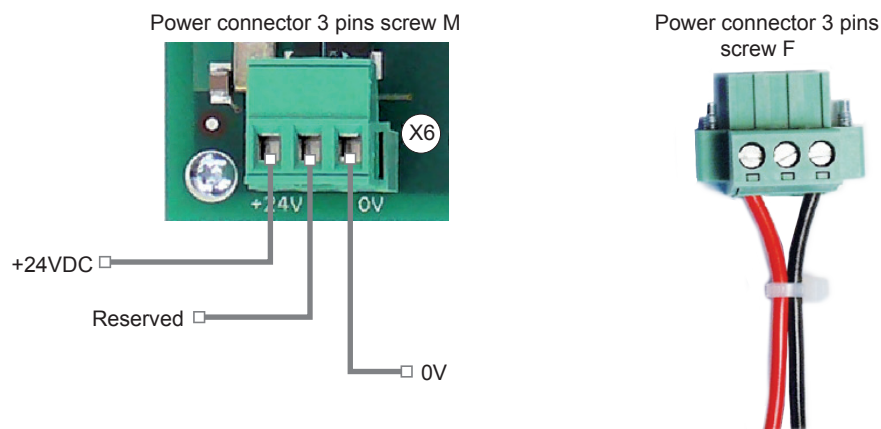
The MP04-W / MP04-H is a device compliant with protection class 3.  
The system must be fed with an SELV 24VDC (safety extra-low voltage) supply.

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

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

The connection should be made as follows:

- The cross-section of the power supply cable must be between 0.75mm<sup>2</sup> and 1.5mm<sup>2</sup>.
- The current consumption must be taken into account for the power supply. (See chapter 5)
- The 0V pin is directly connected to the housing potential.
- The two connection cables must be attached to each other close to the plug in order to ensure a safe connection. (see below)



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

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

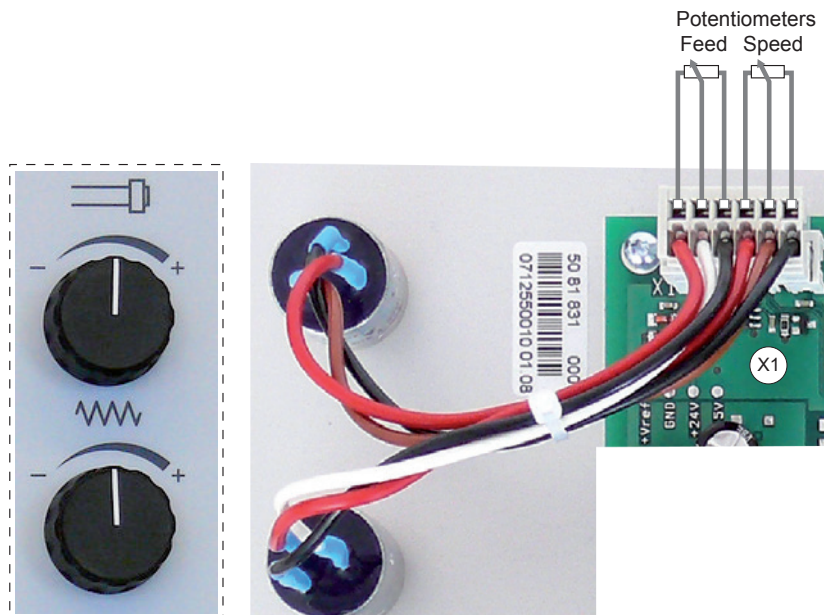


A self-resetting fuse provides short-circuit protection. After waiting a few minutes to cool the fuse, it will be reset and the MP04 is again ready to run.

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

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

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

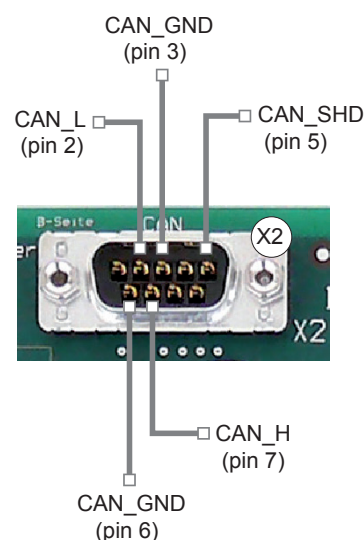


It's not allowed to connect other than 10kOhm potentiometers on this interface. For more detailed information upon the Potentiometers to PLC configuration please refer to Flexium Commissioning manual M00010.

### 9.12.4 CAN interface (X2)

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

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



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

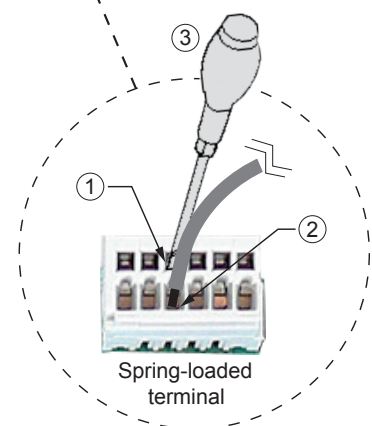
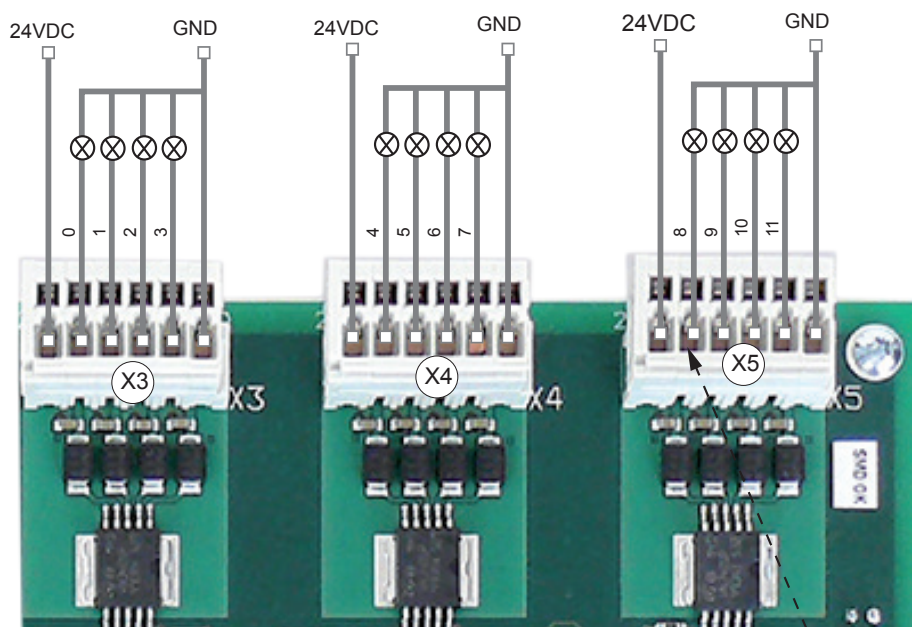
### 9.12.5 Digital outputs connections (X3, X4, X5)

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

#### Cable connection

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

| Cable supplied by the customer |                             |
|--------------------------------|-----------------------------|
| Wire cross section             | 0.08 ... 1.5mm <sup>2</sup> |
| 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.

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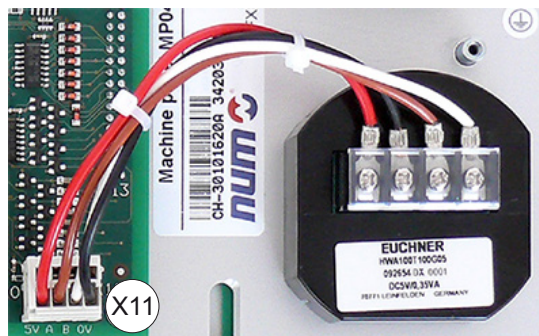
### 9.12.6 Emergency stop button

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



### 9.12.7 Handwheel connections (X11)

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



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



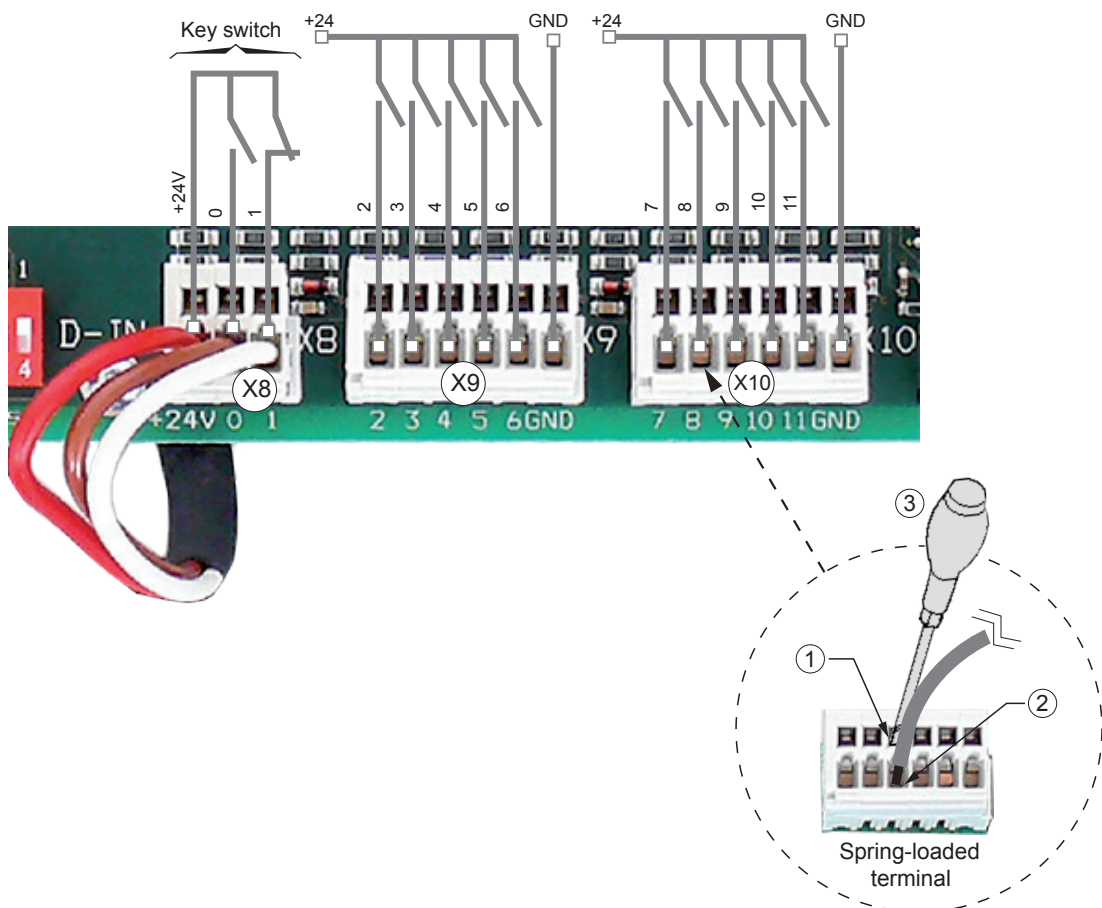
## 9.12.8 Digital inputs connections (X9, X10) and Key switch connections

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

### Cable connection

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

| Cable supplied by the customer |                             |
|--------------------------------|-----------------------------|
| Wire cross section             | 0.08 ... 1.5mm <sup>2</sup> |
| 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.

### 9.12.9 Dip Switches setting (CAN address)

The explanation from the left to the right:

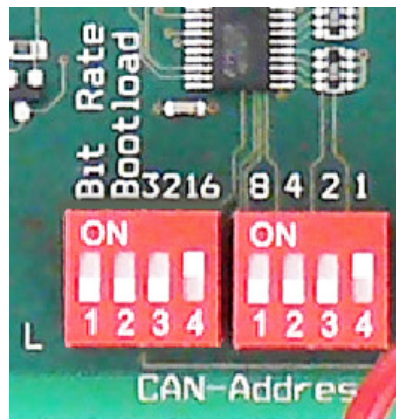
| Block | Description | Position down (OFF) | Position up (ON) |
|-------|-------------|---------------------|------------------|
| Left  | Bit rate    | 125 kBit            | 500 kBit         |
| Left  | Bootload    | OFF                 | ON               |
| Left  | Address 32  | OFF             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

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

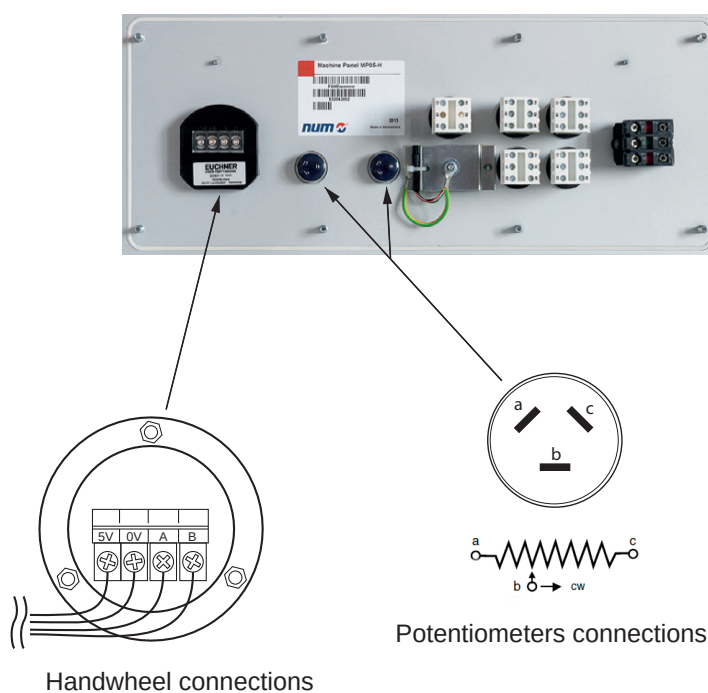
The CAN address can be set between 1 and 64 (Pos 0 = CAN address 64).

#### Example: Bus adresse 36

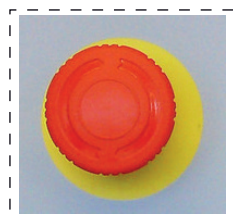
|          |          |    |     |     |    |     |     |
|----------|----------|----|-----|-----|----|-----|-----|
| Bit rate | Bootload | 32 | 16  | 8   | 4  | 2   | 1   |
| X        | OFF      | ON | OFF | OFF | ON | OFF | OFF |



## 9.13 MP05 Machine panel connections



Emergency stop button



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



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

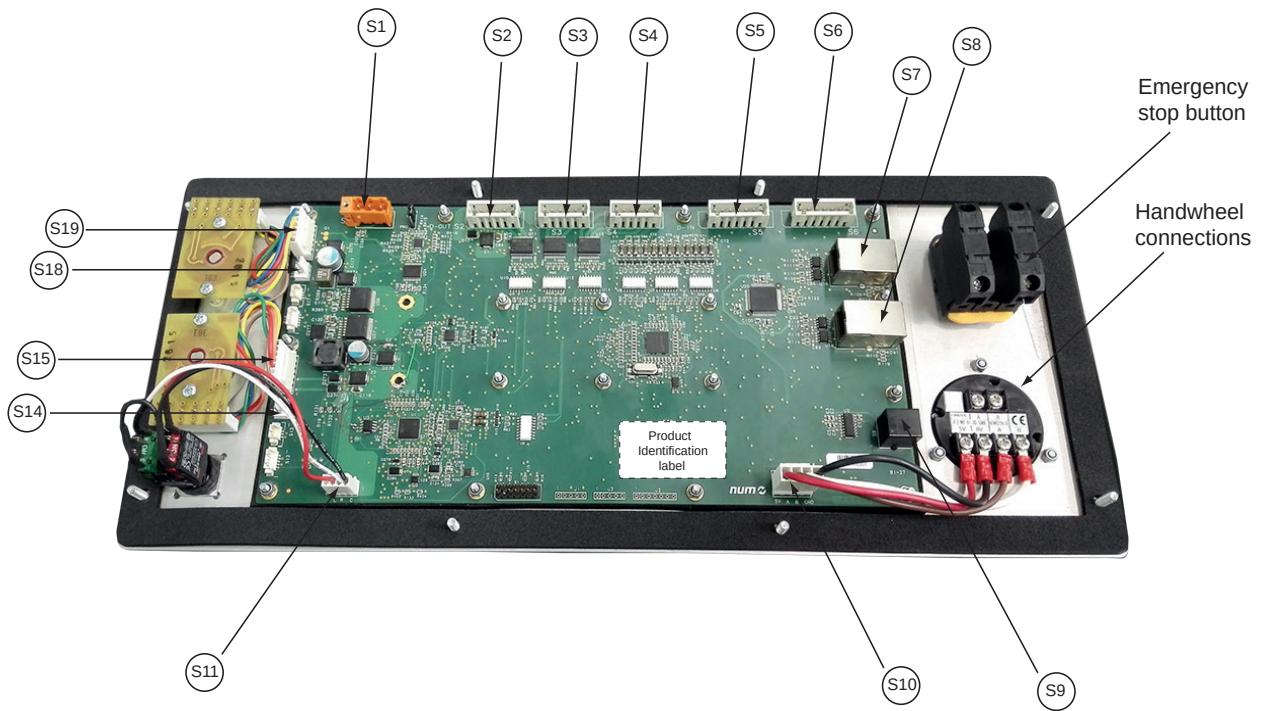


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## 9.14 MP06 Machine panel connections

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### 9.14.1 MP06 general lay-out connectors



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

### 9.14.2 Connecting the power supply (S1)

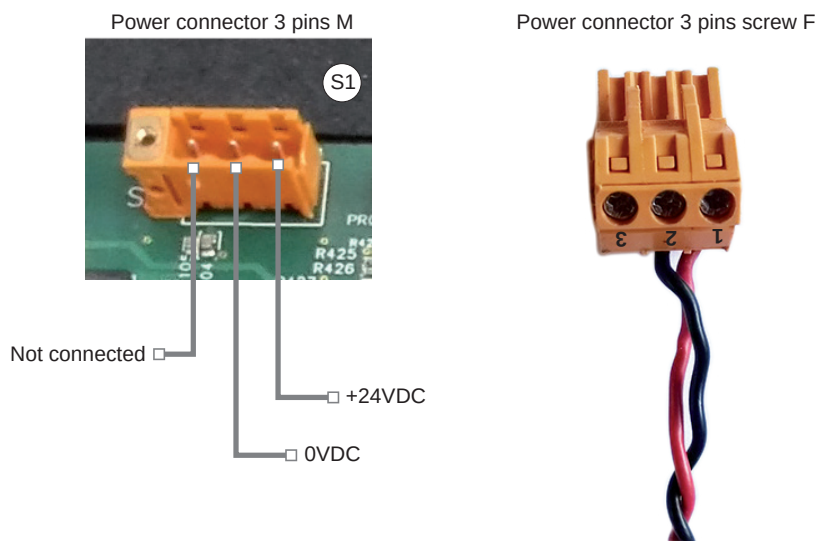
The MP06 is a device compliant with protection class 3.  
The system must be fed with an SELV 24VDC (safety extra-low voltage) supply.

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

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

The connection should be made as follows:

- The cross-section of the power supply cable must be between 0.75mm<sup>2</sup> and 1.5mm<sup>2</sup>.
- The current consumption must be taken into account for the power supply. (See chapter 5)
- The 0V pin is directly connected to the housing potential.
- The two connection cables must be attached to each other close to the plug in order to ensure a safe connection. (see below)



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

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

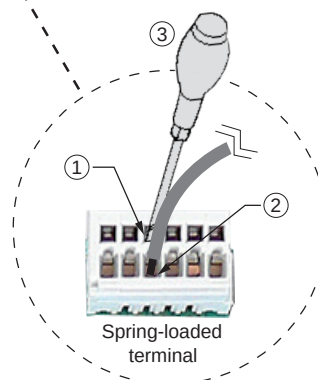
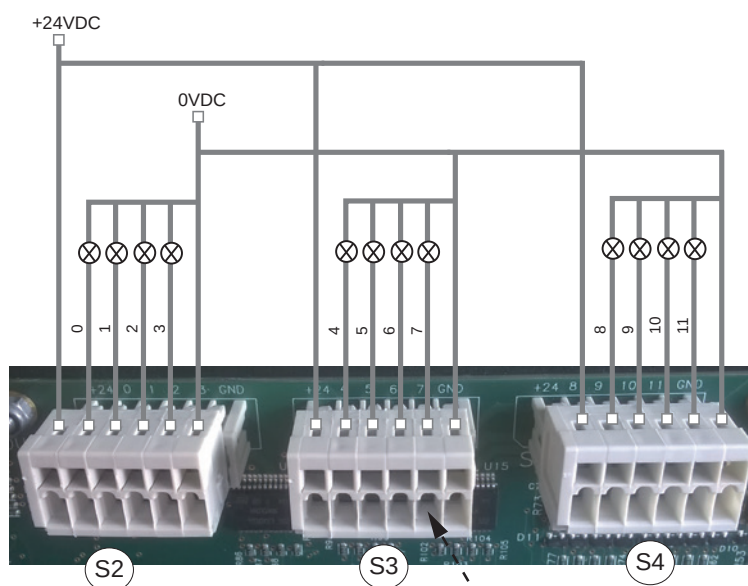
### 9.14.3 Digital outputs connections (S2, S3, S4)

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

#### Cable connection

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

| Cable supplied by the customer |                             |
|--------------------------------|-----------------------------|
| Wire cross section             | 0.08 ... 1.5mm <sup>2</sup> |
| Strip length                   | 8 ... 9mm                   |



Each output cannot provide more than 500mA.

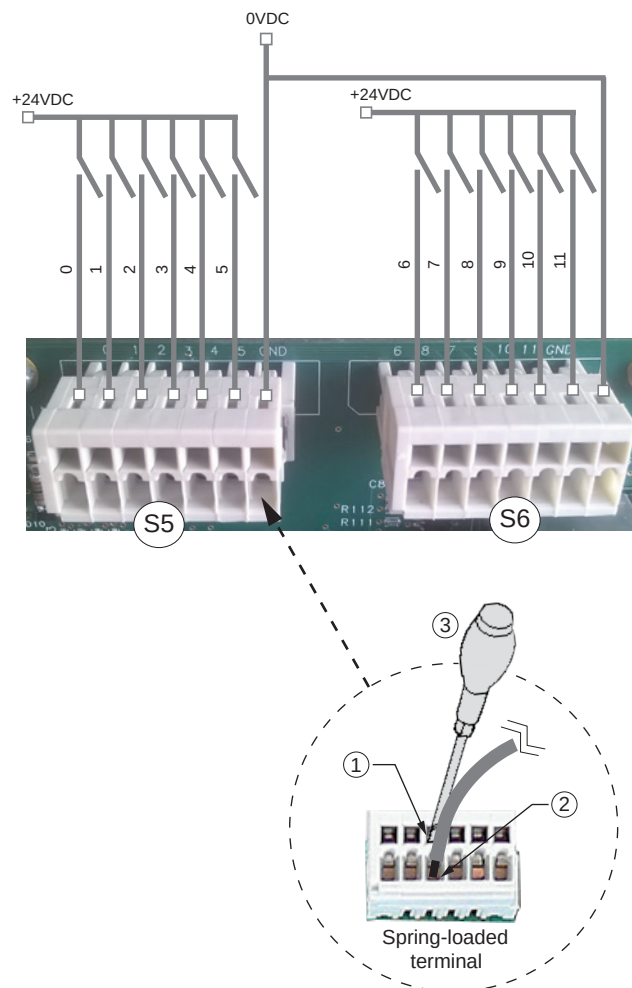
### 9.14.4 Digital inputs connections (S5, S6) connections

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

#### Cable connection

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

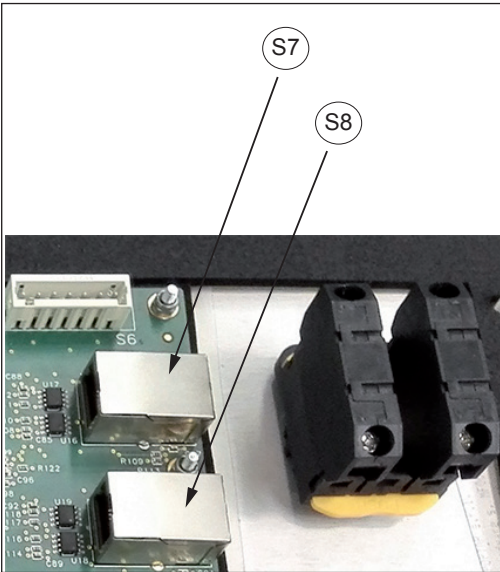
| Cable supplied by the customer |                             |
|--------------------------------|-----------------------------|
| Wire cross section             | 0.08 ... 1.5mm <sup>2</sup> |
| Strip length                   | 8 ... 9mm                   |



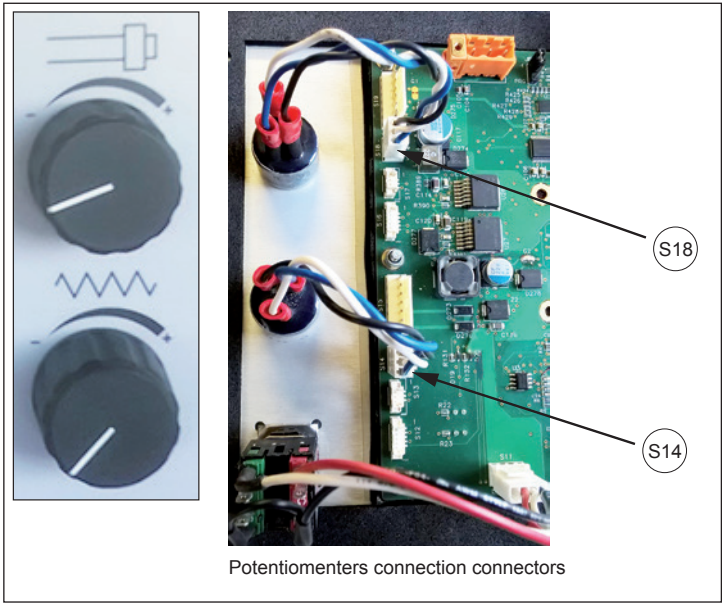
9.14.5 EtherCAT connection (S7 IN / S8 OUT )

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

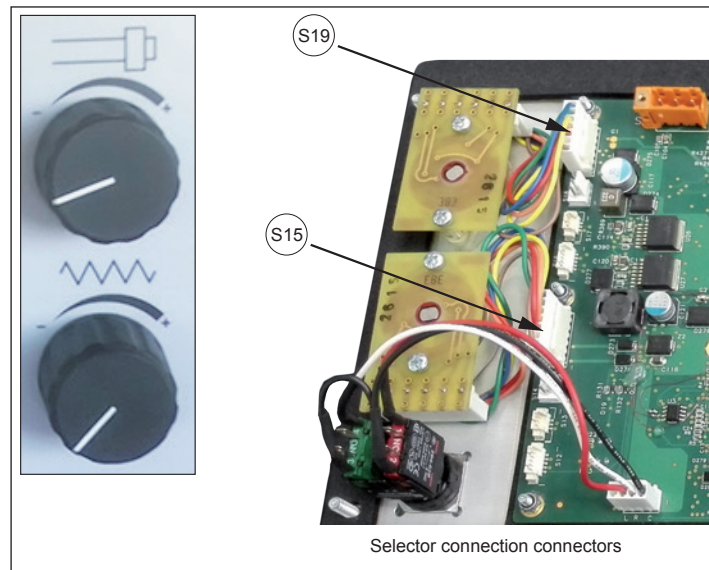
| S7 / S8 Diagnostic LEDs                                                                                                                    |                       |
|--------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|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



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

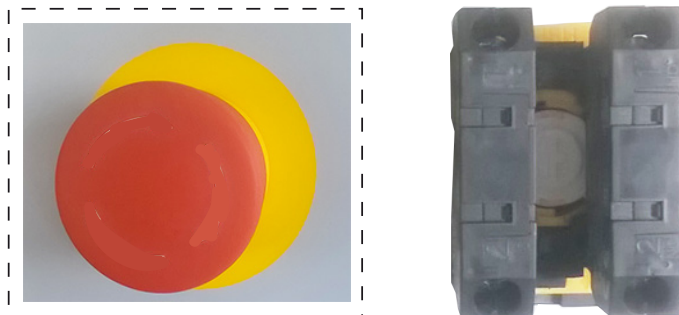


### 9.14.7 Spindle speed and feed rate override selector connections (S15 / S19)

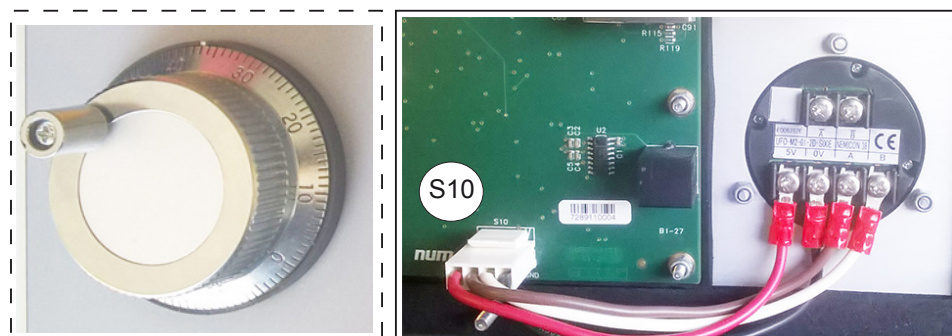


### 9.14.8 Emergency stop button

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



### 9.14.9 Handwheel connections (S10)



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#### 9.14.10 MP06 to PLC configuration



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

#### 9.14.11 Disposal

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



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## 9.15 MP08 Machine panel connections

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Please refer previous pages “MP06 connections” for more detailed information upon the panel connections.  
(Handwheel and Emergency stop button not present in the panel)

1

2

3

4

5

6

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8

9

10

11

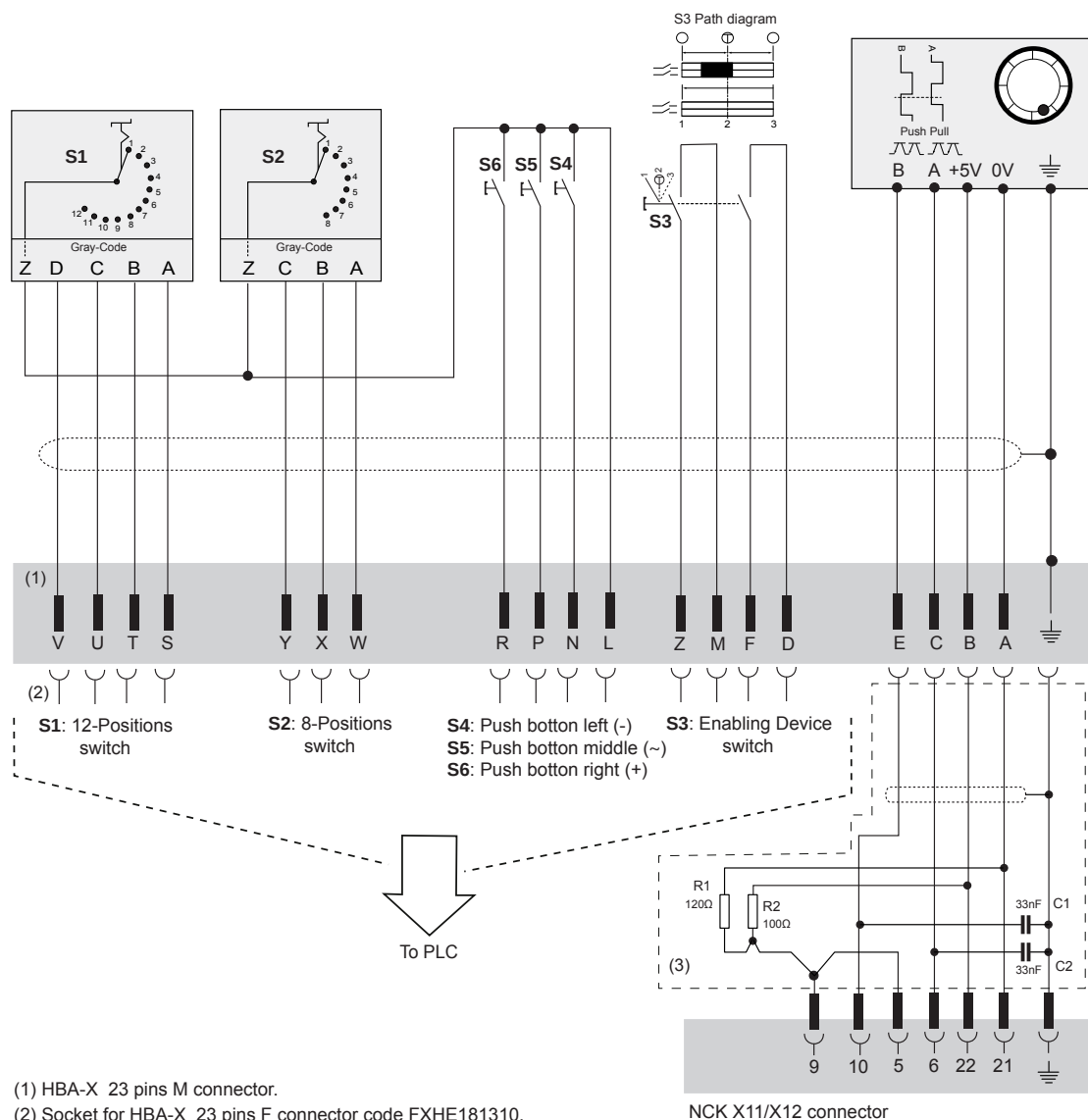


## 9.16 HBA-X handwheel connections

### 9.16.1 HBA-Xc (5V) handwheel connections

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

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



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

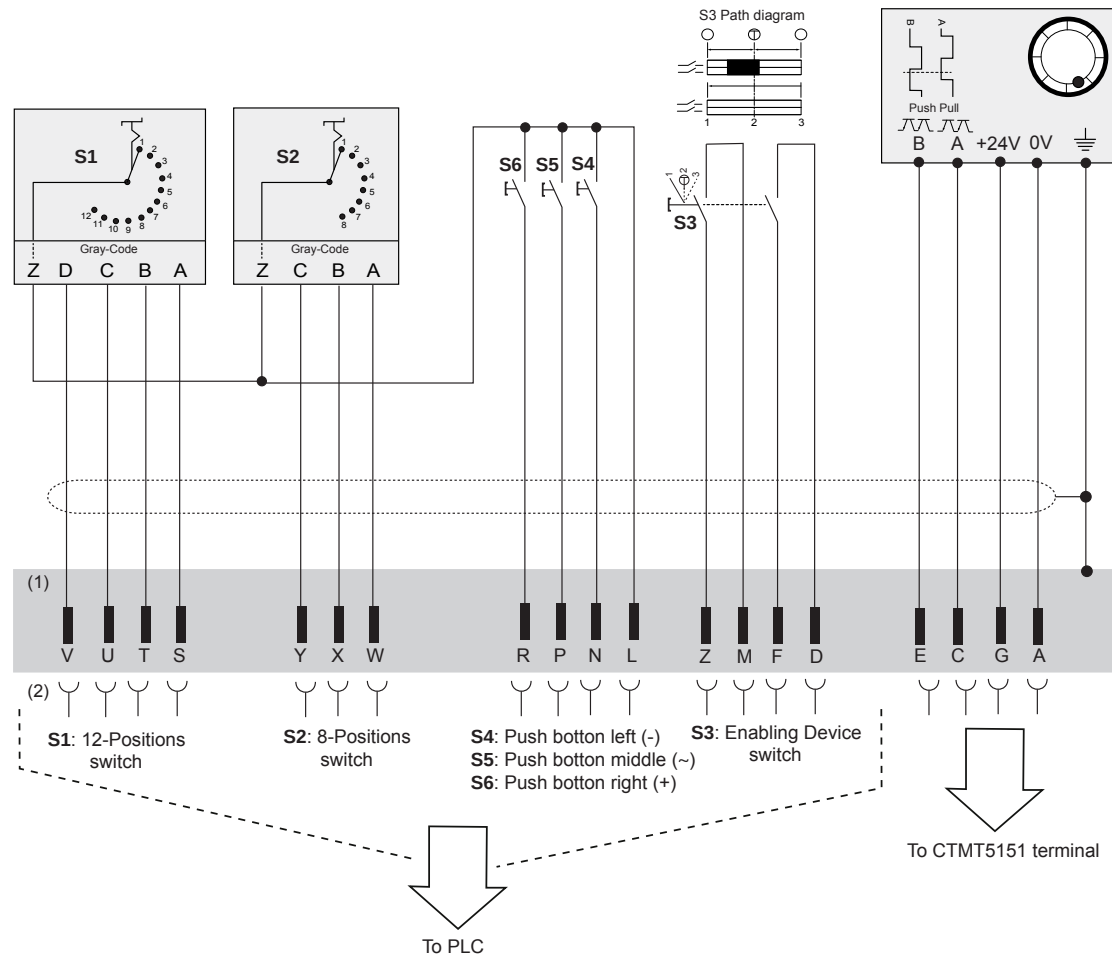
For the second handwheel connection over the NCK X11/X12 connectors see the table here under and also refer to chapter 9.3.

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

### 9.16.2 HBA-Xd (24V) handwheel connections

The HBA-Xd portable handwheel must 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 length supplied with the handwheel. The Enabling Device button has to be wired directly into the security circuit of the manual mode as indicated in the connection diagram on chapter 9.3.



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

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



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

## 9.17 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).

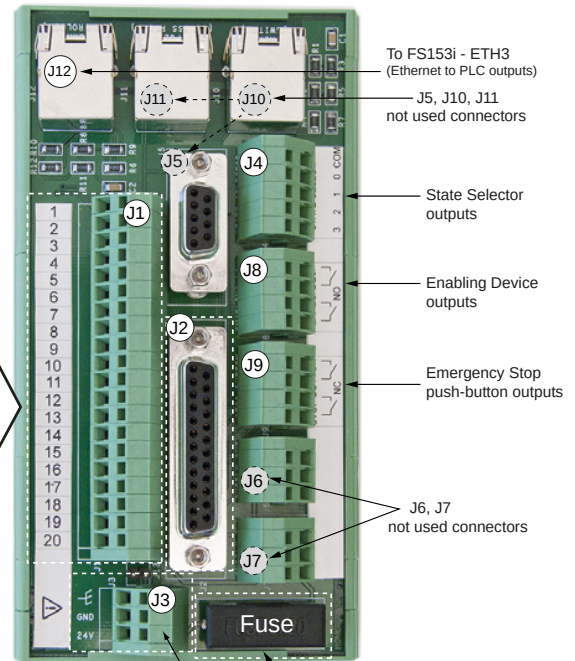
The connector is supplied by the customer.



NPAD052RE1SH0D1

Terminal cable  
(10m length)

nPad terminal connection NPADA001



**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         |

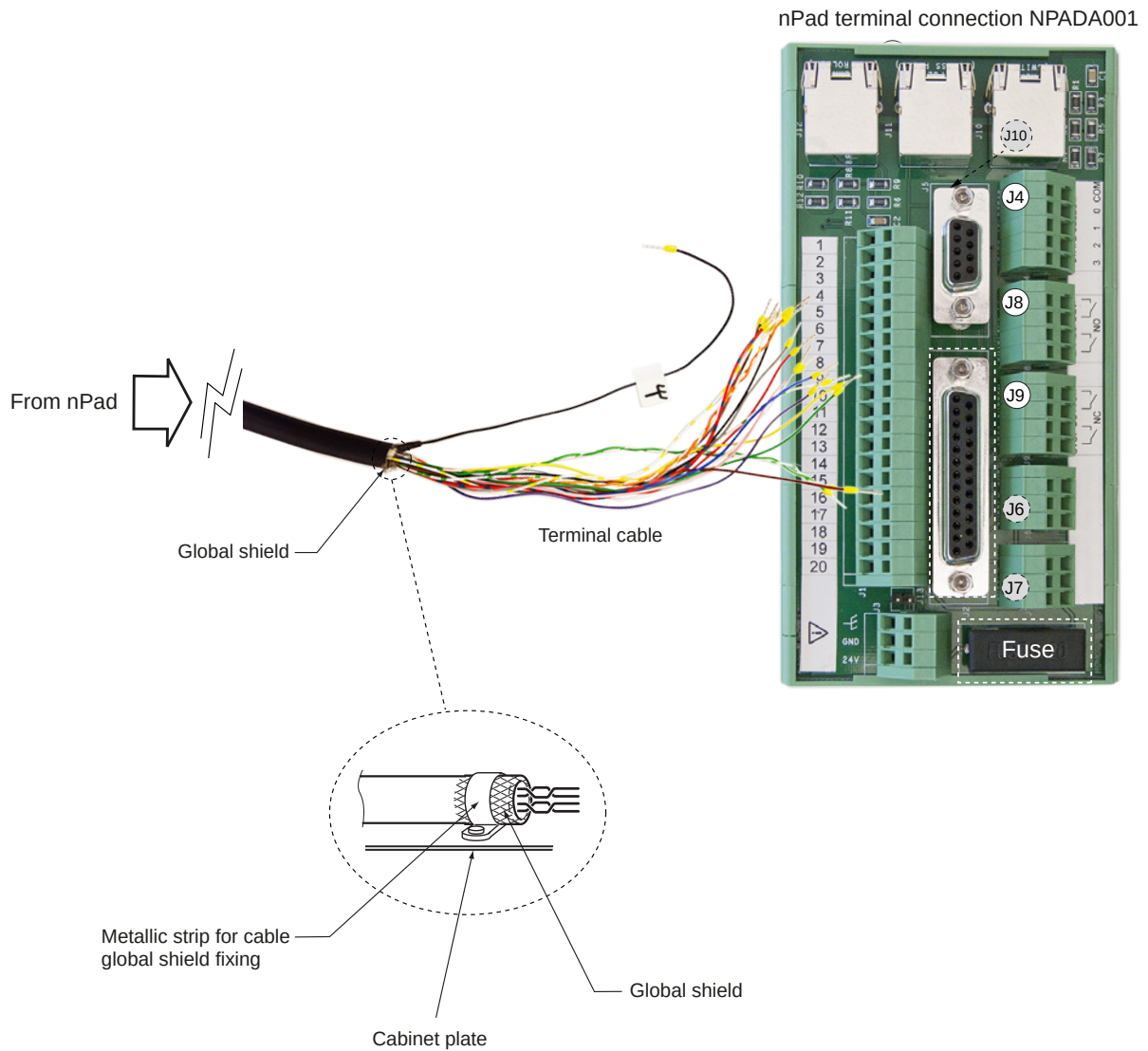
**J3 connector - Power supply connections**

| 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         |

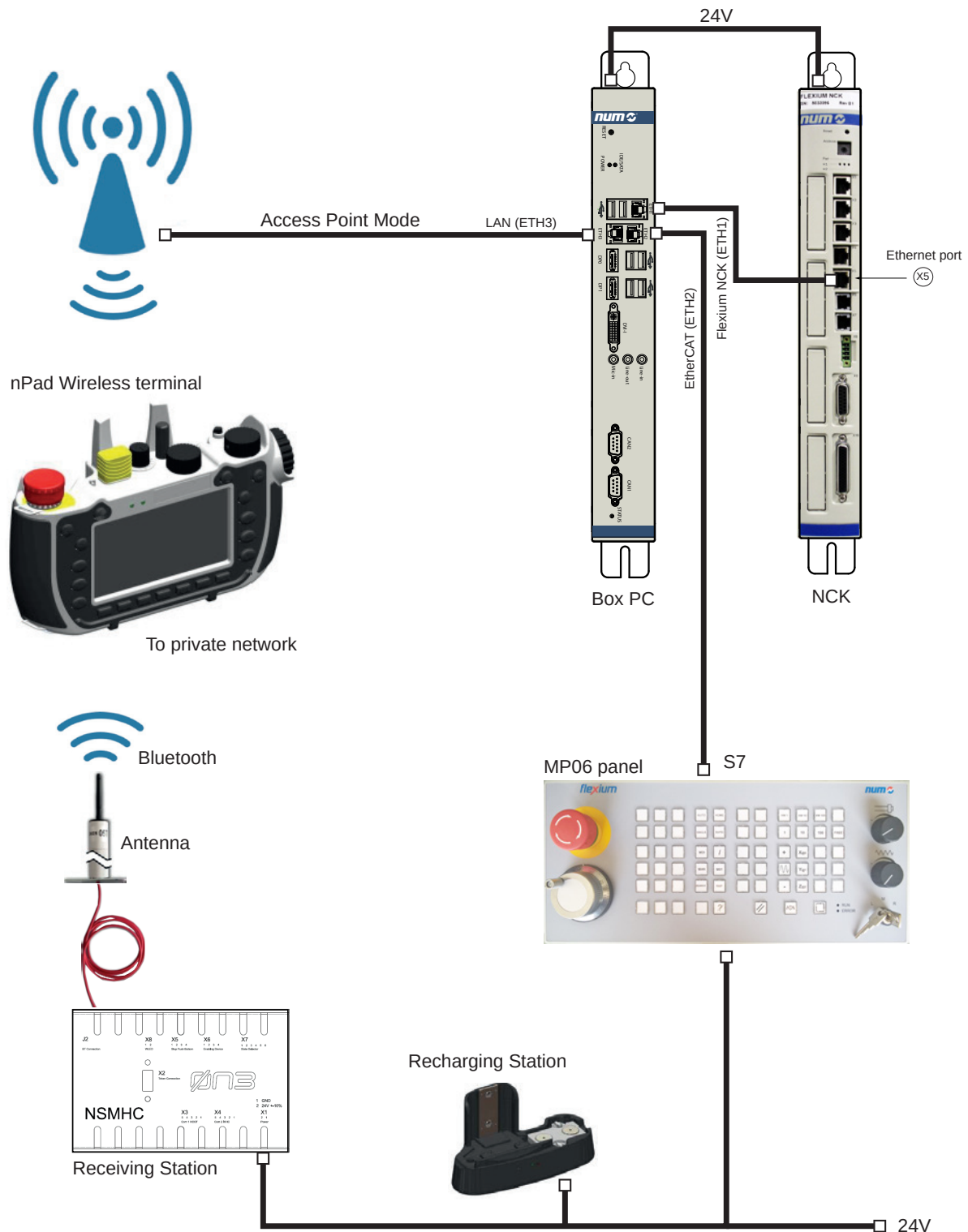
### 9.17.1 Wiring the nPAD terminal cable



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.

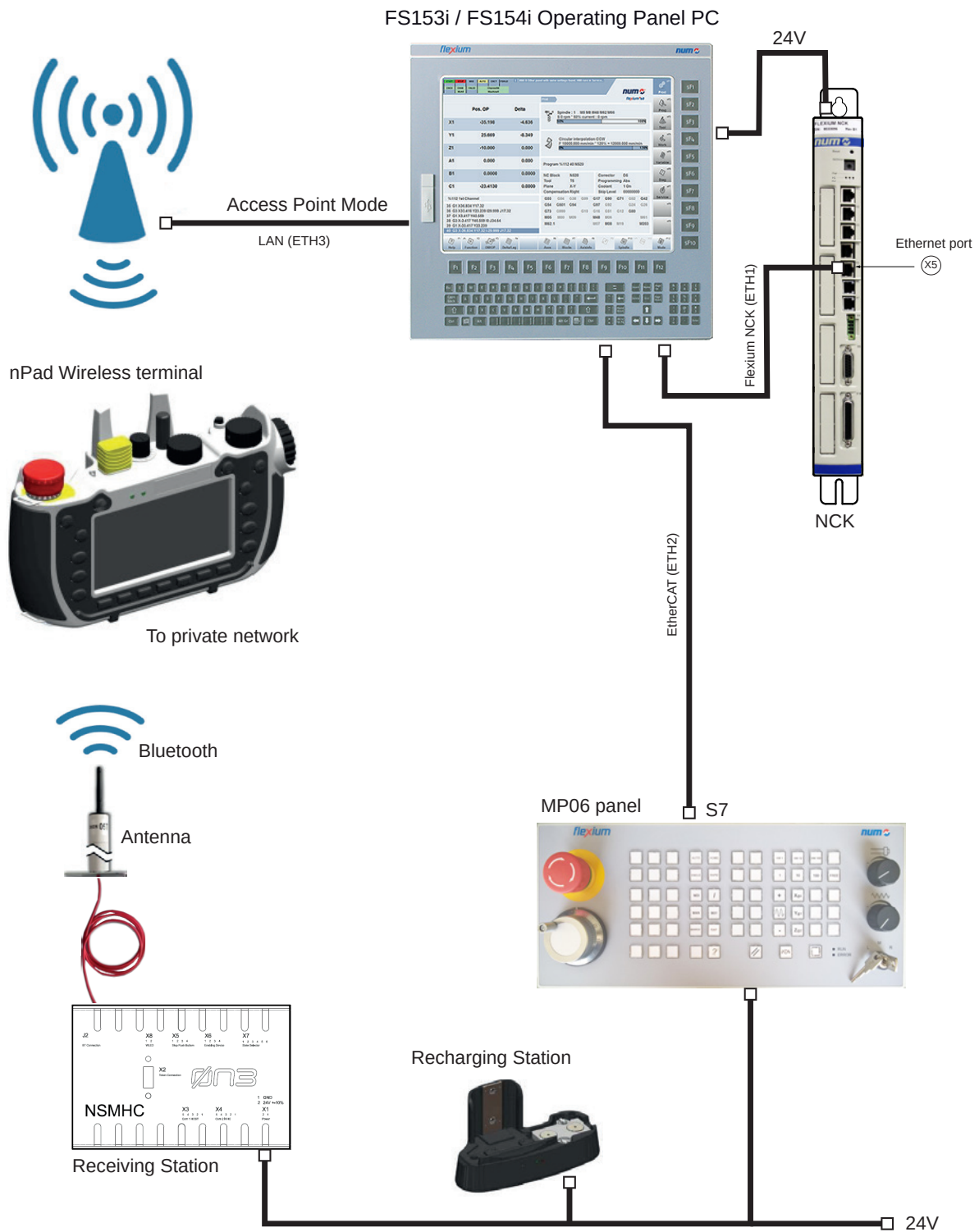
## 9.18 nPad Wireless Mobile Operator Panel connections

### 9.18.1 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.

## 9.18.2 nPad Wireless Mobile Operator Panel with FS 153i or FS154i



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

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# Summary

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## 10 NUMSmartBackup

### 10.1 General

The NUMSmartBackup is a device to backup or restore all Flexium iPCs.

NUMSmartBackup can be used to automatically backup and restore NUM Control Panels. Without any user interaction, it will detect if a backup image is already present on the NUMSmartBackup USB drive and restore the image onto the control panel. Otherwise it will perform a backup.

- Bootable stick for disk imaging and cloning.
- Compatible with NUM iPCs independently of the concrete installed Windows OS:
  - FXPC152xx1xxxxx
  - FXPC152xx2xxxxx
  - FXPC153xx1xxxxx
  - FXPC153xx2xxxxx
  - FXPC154xx1xxxxx
  - FXPC192xx2xxxxx
  - FXPC002xx1xxxxx
  - FXPC002xx2xxxxx
  - FXPC004xx1xxxxx
- 64 GB USB stick (supports USB 2.0 and 3.0)
- Can be used without any monitor, mouse and keyboard (automatically update / restore from stick only for Box PC P1)
- The system is automatically shut down, after a successful Backup or Restore.

#### Reference Code

- FXHE557102



NUM always recommend to OEMs to make a complete backup of your machine configuration after the system configuration and engineering with the new Backup tool.



NUMSmartBackup works correctly if Flexium iPC are in the NUM standard configuration; BIOS changes (different from what explained in the next chapter), creation of hard-disk partitions, installation of 3rd party applications etc. could lead to misfunctionings.

## 10.2 BIOS Configuration

For NUMSmartBackup to be detected by NUM Control Panels, the following options need to be enabled in the BIOS configuration:

1. Connect the NUMSmartBackup and go into *BIOS*.
2. Go to *Advanced -> USB Configuration -> Mass Storage Devices -> General UDisk 5.00* and then select *"Hard Disk"* (refer to figures 1, 2 and 3 ).

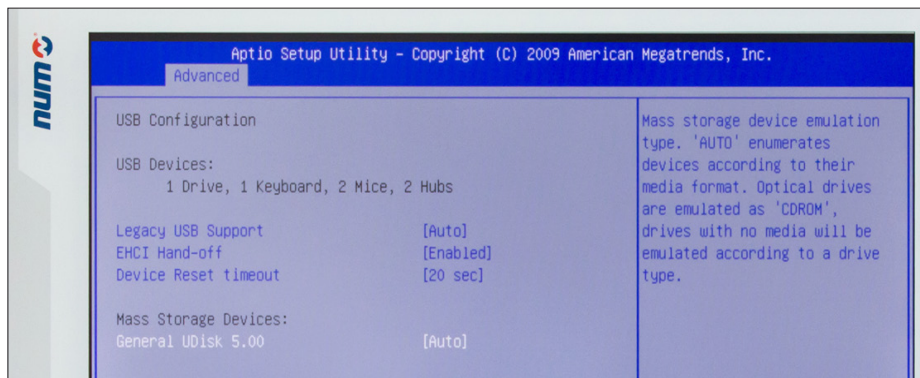


Fig.1

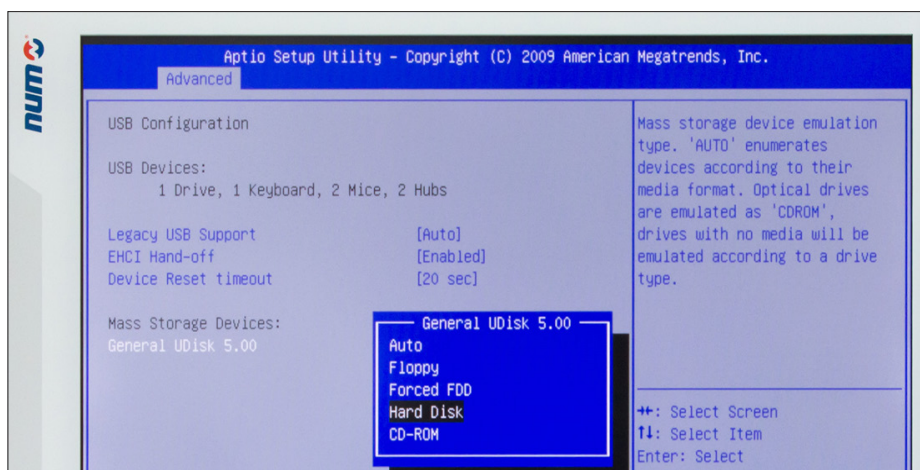


Fig.2

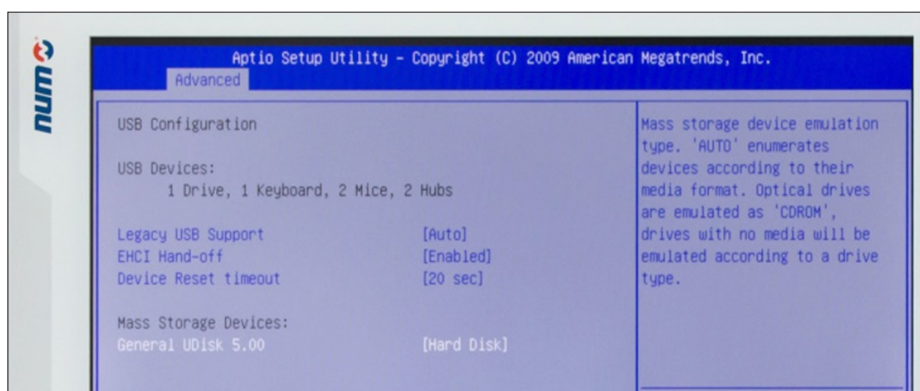
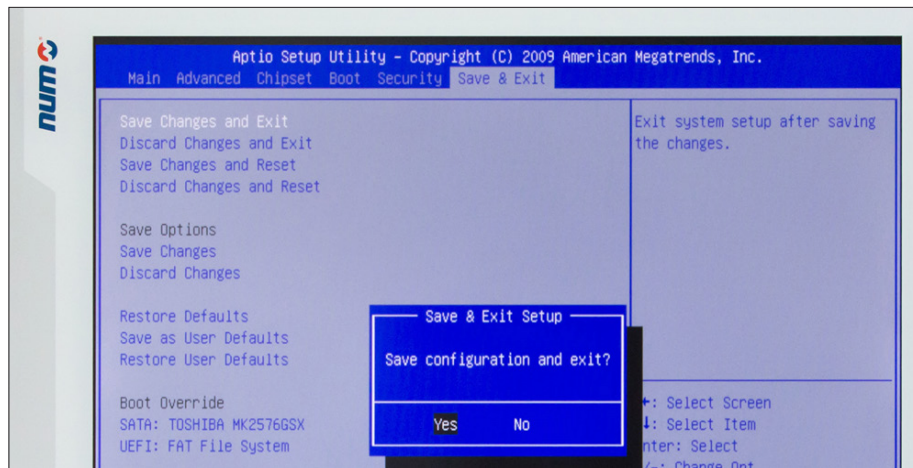
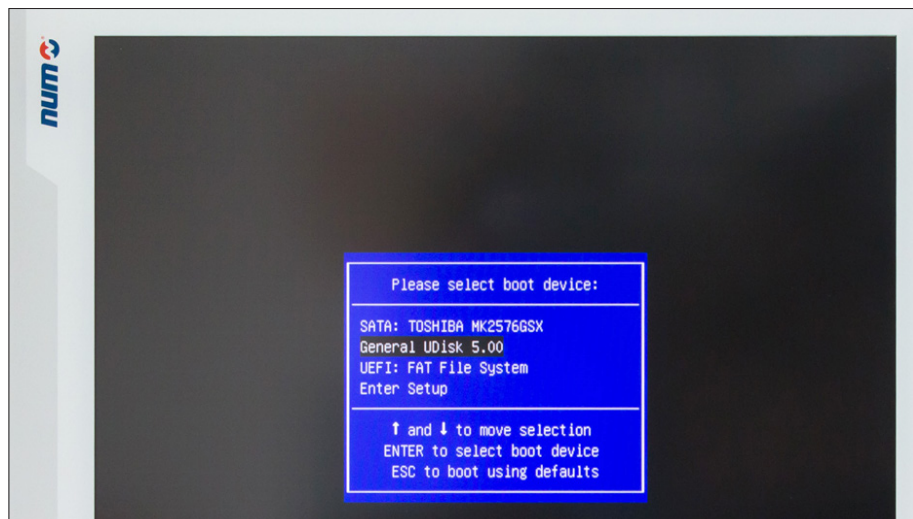


Fig.3

3. Save the changes and restart the system.



4. During the startup push “**F7**” and select *General UDisk 5.00*.

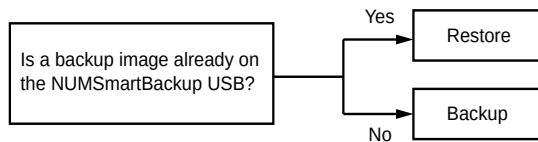


Subsequent runs with NUMSmartBackup may require the user to repeat step 4. However, steps 1-3 need to be executed only once.

## 10.3 Manual operation

NUMSmartBackup was designed to work without any user interaction.

It supports two main procedures, backup and restore, and decides which operation to perform based on the following diagram:



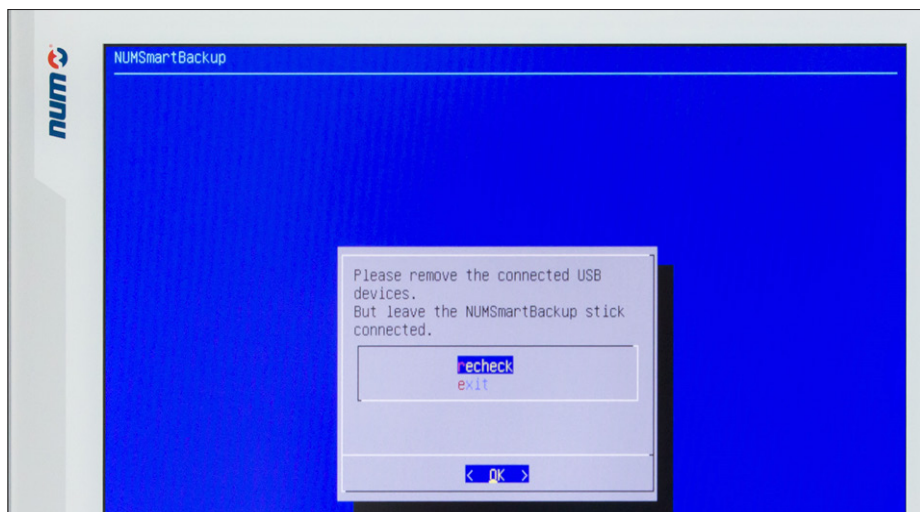
- During the startup NUMSmartBackup will try to load the necessary modules and detect the NUMSmartBackup USB device.



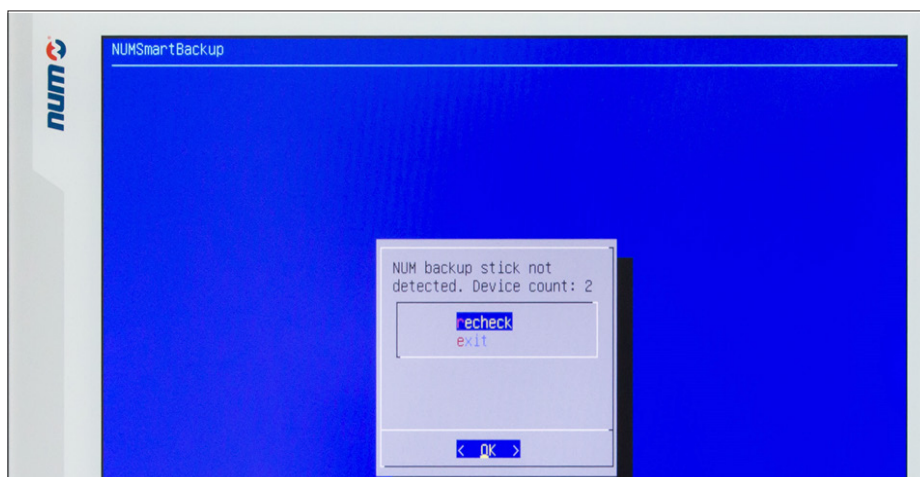
Fig. Initial window



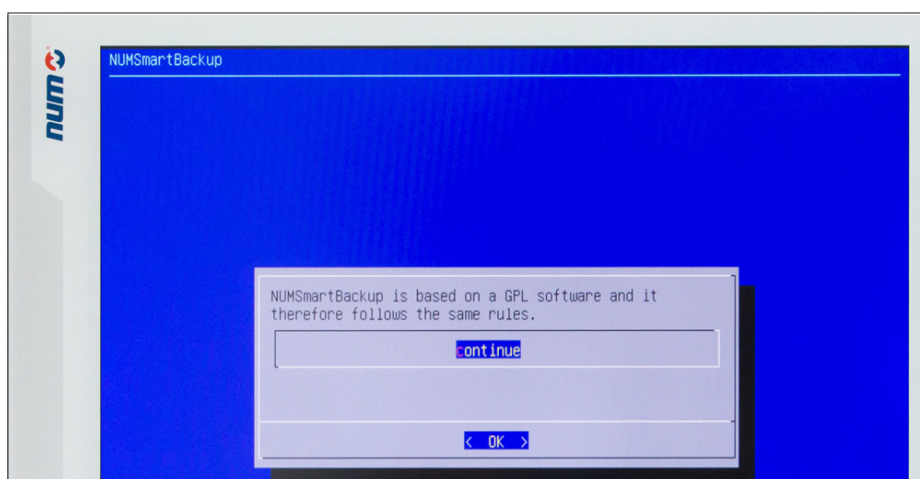
- If multiple USB devices are attached to the system, the program will ask the user to remove the additional USB drives.



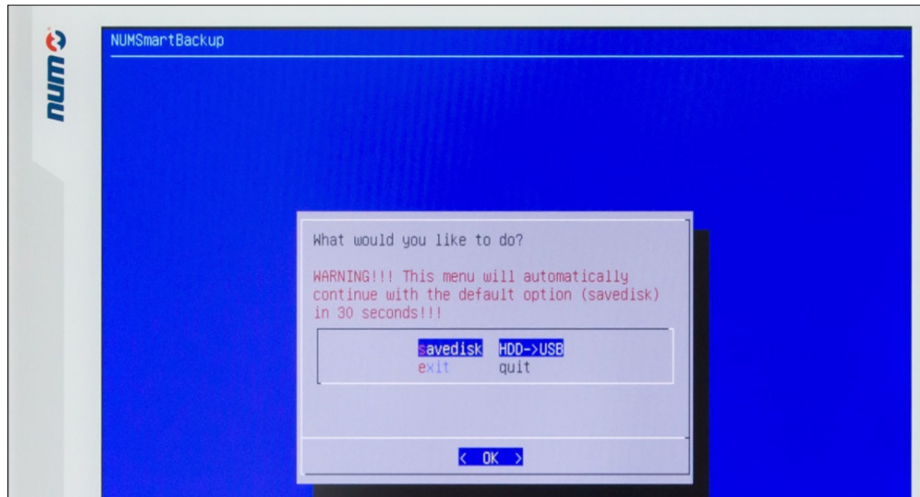
- Removal of the NUMSmartBackup USB after the startup will be detected and the drive will need to be reattached before the program can continue.



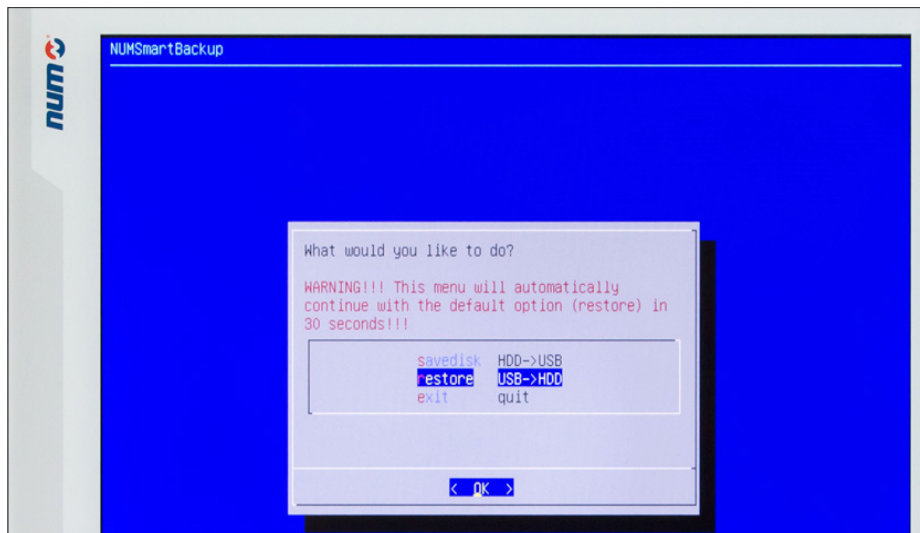
- If the aforementioned requirements are met, then the following message will be shown.



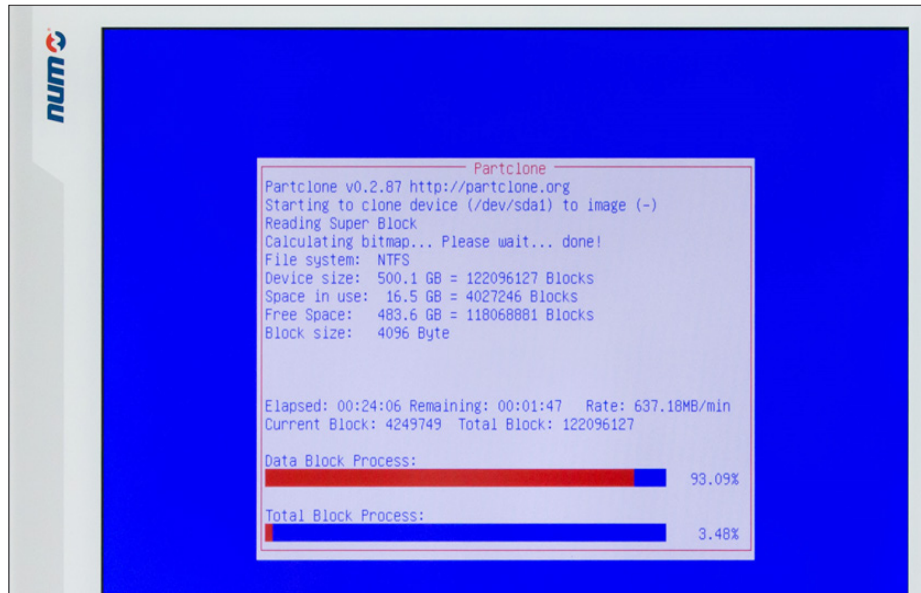
- After a timeout of 10 seconds NUMSmartBackup will proceed with the next dialog.



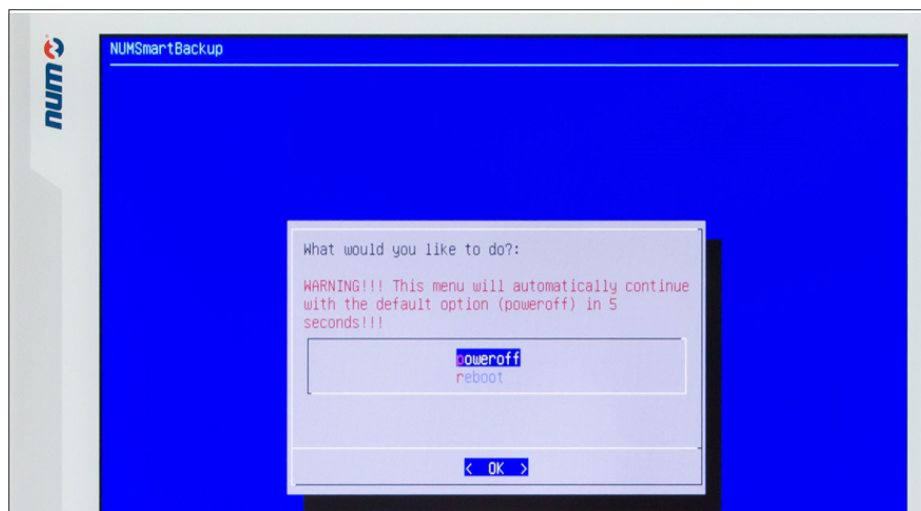
- Please note that if a backup image is already available on the USB drive, then a different dialog will be shown with "restore" as the default option.



- Based on the logic described earlier, NUMSmartBackup will select a default option (backup or restore) and perform that operation after 30 seconds.
- At this point the user may choose a different operation or exit the program altogether.
- The status of the operation as well as an estimate for the remaining time will be displayed (see figure). If there is already a backup image present on the USB and a backup is performed, then the original backup will be overwritten.



- At the end of the procedure, the user may choose to poweroff or restart the system with the default option being “poweroff”. The backup files can be found in the “*numBackupImage*” folder.





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## Summary

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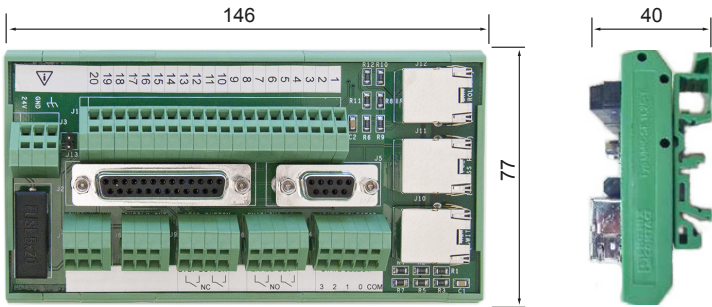
## 11 Available accessories

### 11.1 Flexium accessories list

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

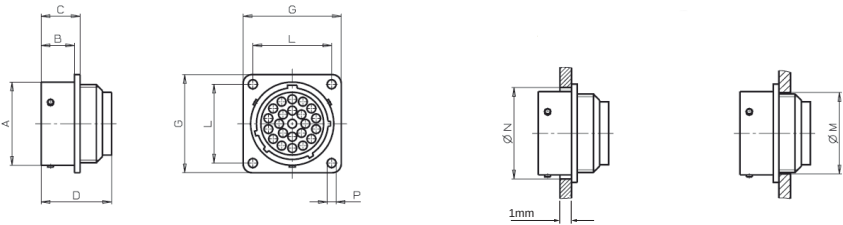
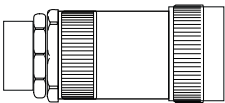
| Accessories                                                                        | Order code        | Description                                                              |                                                                                      |
|------------------------------------------------------------------------------------|---------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

| Accessories         | Order code | Description                                                         |
|---------------------|------------|---------------------------------------------------------------------|
| Terminal connection | NPADA001   | Terminal connectionc for nPad Mobile Operator Panel.<br>See figure. |



Approx. weigth: 0.2kg

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



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## 11.2 CAN Cable and CAN connectors connection

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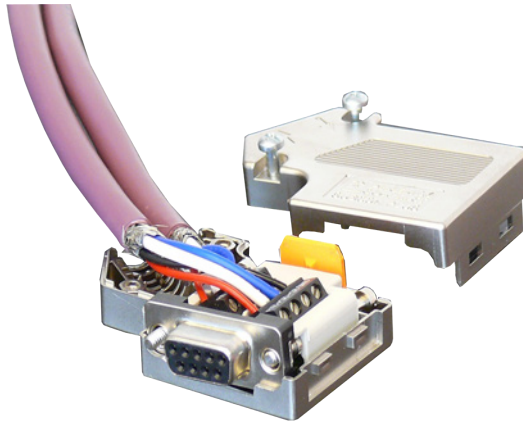
### 11.2.1 CAN cable FXHC181060



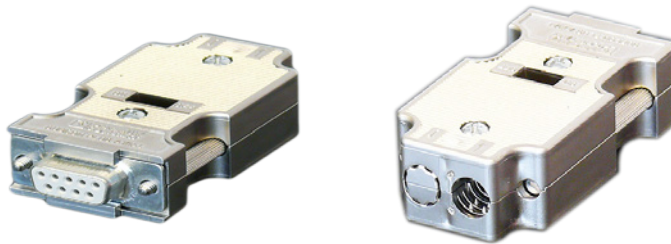
| Wire colour | CAN connections |
|-------------|-----------------|
| Blank       | Shield          |
| Red         | V+              |
| Black       | V-              |
| White       | CAN-H           |
| Blue        | CAN-L           |

### 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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