MODULAR PROCESS AND QUALITY CONTROL SYSTEM FOR MACHINE TOOLS

MARPOSS

System description

MODULAR, DISTRIBUTED CONTROL SYSTEM FOR MACHINE TOOLS

BLÚ is the innovative modular, distributed system for process control and monitoring on machine tools. The solution is the result of over 60 years of experience in managing and optimising machining processes.

Connecting the sensors to their respective Function Nodes directly on the machine optimises the measurement system topography, reducing the number of connections drastically and hence minimising installation time and costs.

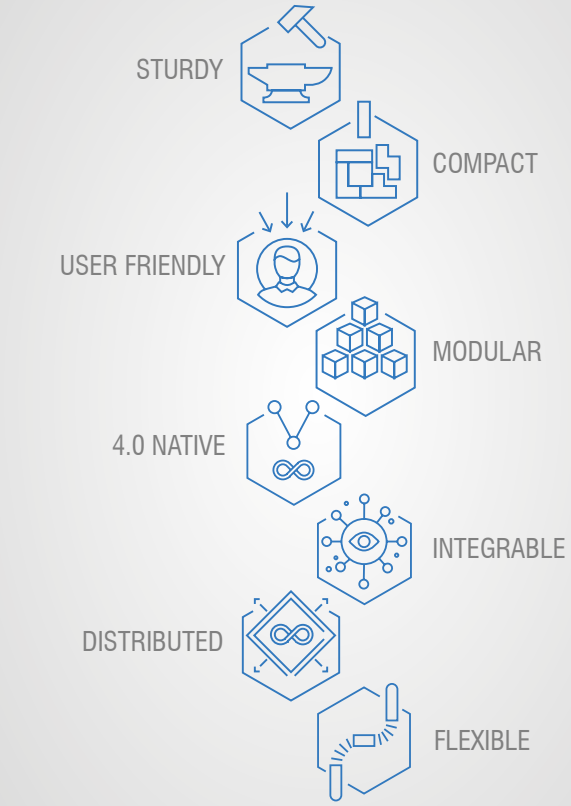
Thanks to MMSB, the proprietary MARPOSS measurement bus, the signals acquired by the sensors are transmitted in totally digital form, thus guaranteeing robust, reliable communications.

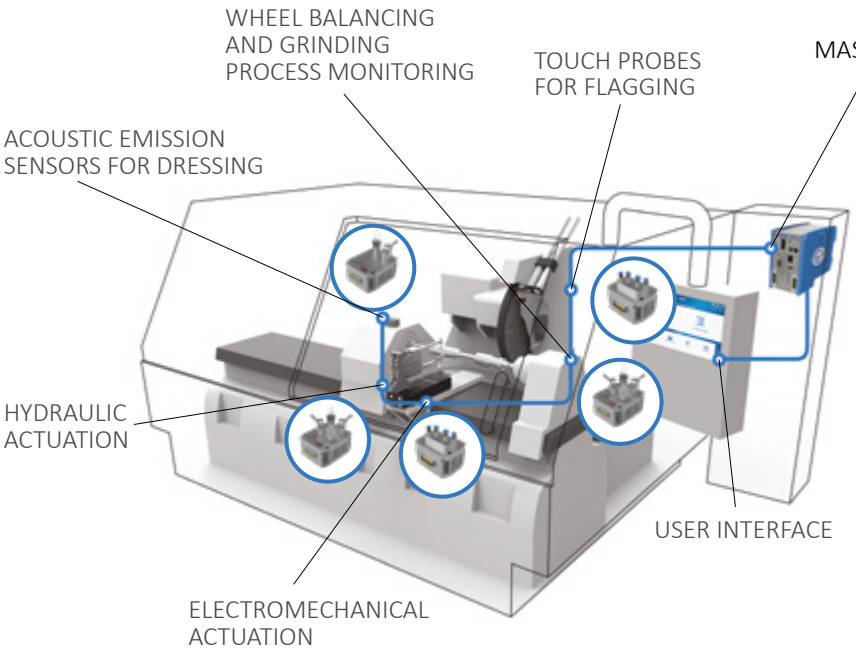
The Master Unit has been designed to guarantee the maximum level of integration between the measurement system and the machine and the company network, in addition to the operator.

The interface software, BLÚ HMI, has been designed to render the system effective and easy to use.

BLÚ is the ideal solution for all applications featuring a high level of complexity.

Benefits





MMSB for connection of all sensors

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Nodes layout examples

Example of node layout inside a cabinet (DRY area) using the frontal, “Bridge” type connection.

DIN guide for rear mounting is present.

Examples of node layout in working area (Wet area).

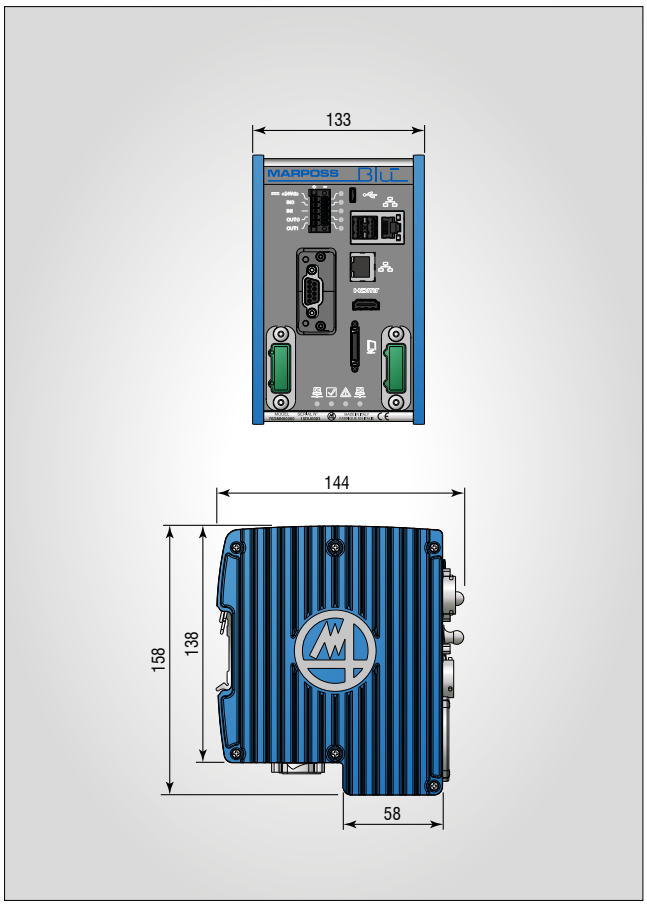
1. Two function nodes
2. Function node and auxiliary node

To guarantee the connection between the various nodes, use the accessories supplied with them (clamps, brackets, connectors). The nodes may be secured to the structure using just 4 screws.

The nodes convert the analogue signals from the individual transducers to digital signals. In this way it is possible to transfer the values to the system Master via the MMSB (Marposs Measure Sensor Bus) in digital format, thus avoiding the Signal to Noise ratio issues that affect analogue signals, and which are the result of the length of traditional cables.
The Measurement Nodes can be connected together using the dedicated accessories or, depending on the topology of the network managed by the MMSB, by using the special cables, which have been designed, together with their connectors, to withstand the typical conditions inside the machine working area.
Relevant sensors can be connected to the master unit using sturdy, reliable extensions, with quick-release connectors, designed by Marposs to withstand harsh machine conditions.

Master Node

This is the heart and mind of the BLÚ system; it has been designed to be housed inside the machine cabinet (DRY area). It is extremely compact and very easy to install, which means that it will fit into very small spaces.
The Master contains the basic system SW and the application part for each single configuration; it manages data storing and the Human Interface for the entire system.
This is where the MMSB (Marposs Measure Sensor Bus), which connects all the function nodes present on the network together, originates. The MMSB is used to transmit all the information regarding the management of the various processes elaborated by the single function nodes. The system uses connectors that do not require any additional wiring, and this, together with the simplicity of the software reconfiguration process, means that the modules can be connected rapidly, enabling the user to adapt the network to the specific requirements of each machine tool in real time.
One of the frontally accessible slots contains the fieldbus interface suitable for connection with the machine master. The BLÚ system modules for use in both the cabinet and the working area are connected via the connectors located laterally on the bottom of the front panel.



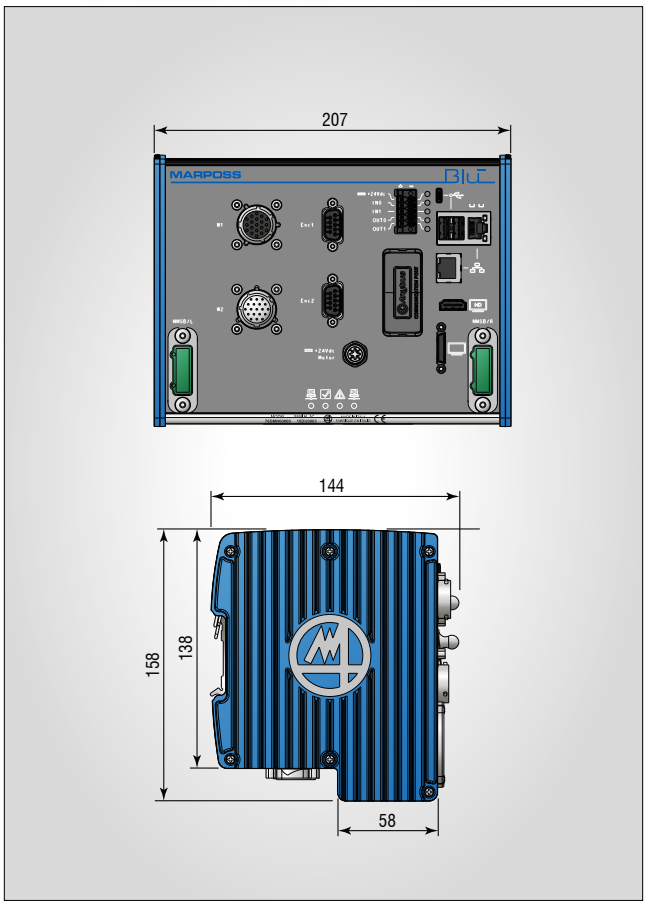
POWER SUPPLY	24 VDC SELV (EN 60950-1) -15 +20%
CURRENT CONSUMPTION	6 A max Max. conductor cross section 1,5 mm² (AWG 16) Overload protection: replaceable quick-blow fuse
REAR MECHANICAL MOUNTING	35 x 7.5 mm EN 50022 DIN guide
PROTECTION RATING *(IEC 60259)*	IP40
WORKING TEMPERATURE	5/45 °C
STORAGE TEMPERATURE	-20/70 °C
RELATIVE HUMIDITY	5-80% (non-condensing)
PERMISSIBLE VIBRATION	2g sinusoidal on three axes
OPERATING ALTITUDE	2000 m max

Available interfaces

Ethernet HOST via RJ45 connector	10/100/1000 Mbps
Ethernet AUX via RJ45 connector	10/100 Mbps
HDMI for connection to a display	Version 2.0 Type A connector Connection distance 7 m (typical) Full HD monitor (with HDMI input)
Connector for Marposs remote panel	Panel formats available: 16:9 , 7" TFT, capacitive touch RESOLUTION 800X 480, 256 K colours protection rating IP54
USB HOST	2 x PORTS, type A connector, version 2.0 HS, Imax 500 mA, Speed 480 Mbit/s, max. connection distance 4.5 m
FAST I/O for hard-wiring using 16/24 AWG cables	2 OUT, 24VDC isolated, Sink/Source, Iout =100 mA Short circuit protected Commutation time <1 ms 2 IN in accordance with the specification IEN 61101-2 type 1/3
FIELDBUS	PROFIBUS DP V1 PROFINET SERCOS III ETHERNET IP ETHERCAT OTHERS ON REQUEST
Connectors for MMSB (Marposs Measuring Sensor Bus)	Max length single section 30 m Total network length 100 m

Protomar Master Node

A Master node version integrating specific node to connect and manage Protomar wide range absolute measuring gauge is available.
Protomar is an absolute wide range measurement gauge. It's capable of measuring any diameter within the measurement range with no need of any manual retooling or dedicated zeroing when the diameter to be inspected changes.



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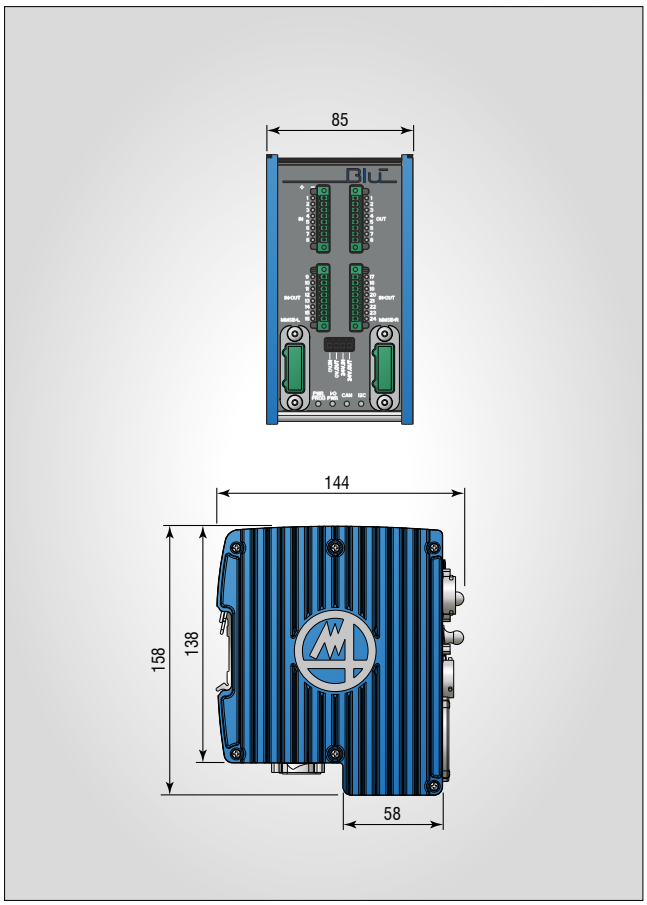
Digital I/O Node

The digital I/O node can be used to connect inputs and physical outputs (for example, push-buttons, cycle management boxes, relays, actuators, lamps, PLC/CNC, etc.) All inputs and outputs may be either SINK or SOURCE type, according to the requirements of the specific configuration.
Each module is capable of handling up to 32 24 VDC signals, divided as follows: 8 Inputs, 8 Outputs and 16 configurable Inputs or Outputs, depending on the specific configuration.
There are 4 connectors on the front panel, and each connector has 8 pins, which are assigned the indicated function.



INPUTS OUTPUTS POWER SUPPLY	24 VDC SELV (EN 60950-1) -15 +20%
PROTECTION RATING *(IEC 60259)*	IP40
WORKING TEMPERATURE	5/45 °C
STORAGE TEMPERATURE	-20/70 °C
RELATIVE HUMIDITY	5-80% (non-condensing)
PERMISSIBLE VIBRATION	2g sinusoidal on three axes
OPERATING ALTITUDE	2000 m max

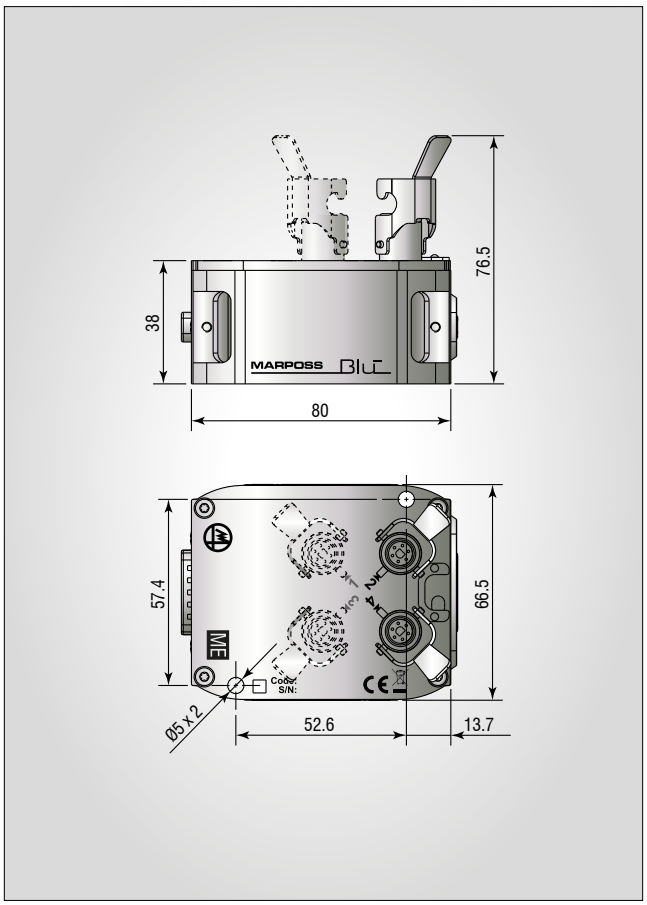
Available functions

N° 8 inputs	Inputs. Green LED = Input Active Cable cross section 0.5 - 1.5 mm2. 24VDC SELV (as defined by EN 60950-1) -15 + 20 %, Sink/Source, (Sink in accordance with IEC 61131-2). Short circuit protection. Switching time < 5 ms.
N° 8 Outputs	Outputs. Green LED = output active. Red LED = output active but in short circuit. Cable cross section 0.5 - 1.5 mm2. 24VDC SELV (as defined by EN 60950-1) -15 + 20 %, Sink/Source, (Sink in accordance with IEC 61131-2), Imax = 250 mA. Short circuit protection Switching time < 1 ms.
N° 16 configurable Inputs/Outputs	Inputs/Outputs. Cable cross section 0.5 - 1.5 mm2. 16 IN/OUT configurable individually. Imax = 100mA. in accordance with IEC 61131-2. • Inputs. Green LED = Input Active • Outputs. Green LED = output active. Red LED = output active but in short circuit

ME Node

Node for monitoring measurement signals (ME - Measurement).
There is a measuring node in both the version for 4 LVDT transducers and the version for two LVDT/HBT transducers.
The sensors can be selected, according to the application, from the vast range of Marposs solutions:

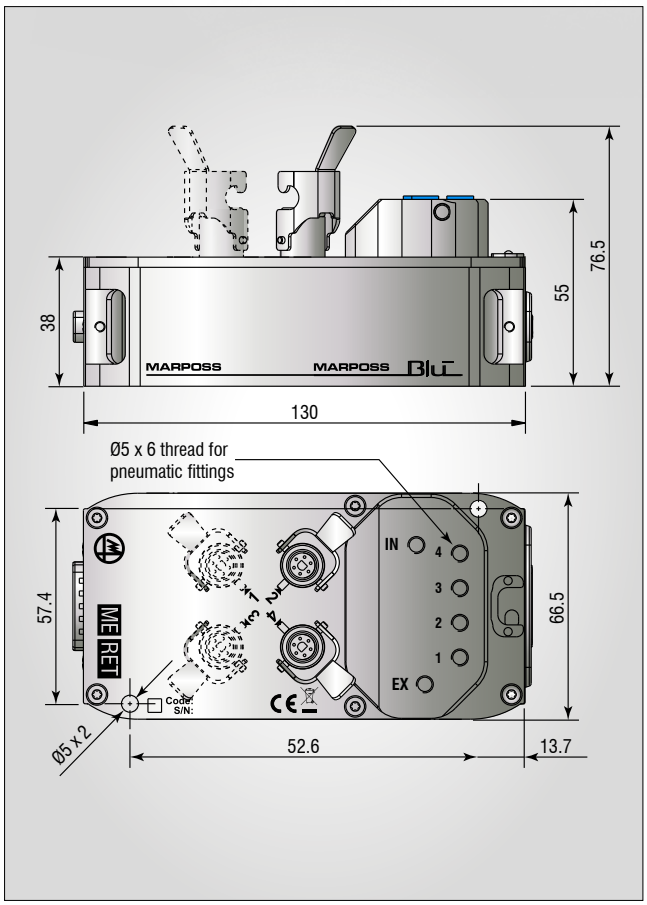
- Unimar and NanoUnimar universal heads
- Internal measuring heads
- External measuring heads



PROTECTION RATING *(IEC 60259)*	IP66, IP67
DISTANCE FROM THE SINGLE MEASUREMENT HEAD	9m MAX for 4LVDT node 30m MAX for 2LVDT/2HBT node
OPERATING TEMPERATURE RANGE	5/55 °C
STORAGE TEMPERATURE RANGE	-20/70 °C

Nodo ME RET

When RETRACTION (measure armsets opening and closing, in order to avoid collisions with measured parts) is needed to be managed, ME Nodes with retraction versions are available, in which circuital part manages armsets opening/closing air flow by electro-valves.
Each Node can manage retraction of max 4 output (8 heads) in a independent way. Retraction Nodes have been designed to be placed in machine working area (Wet area). They have to be placed near measuring heads, in order to use small legth pneumatic pipes (typically 3 m) for a retraction activation/deactivating time optimization ,



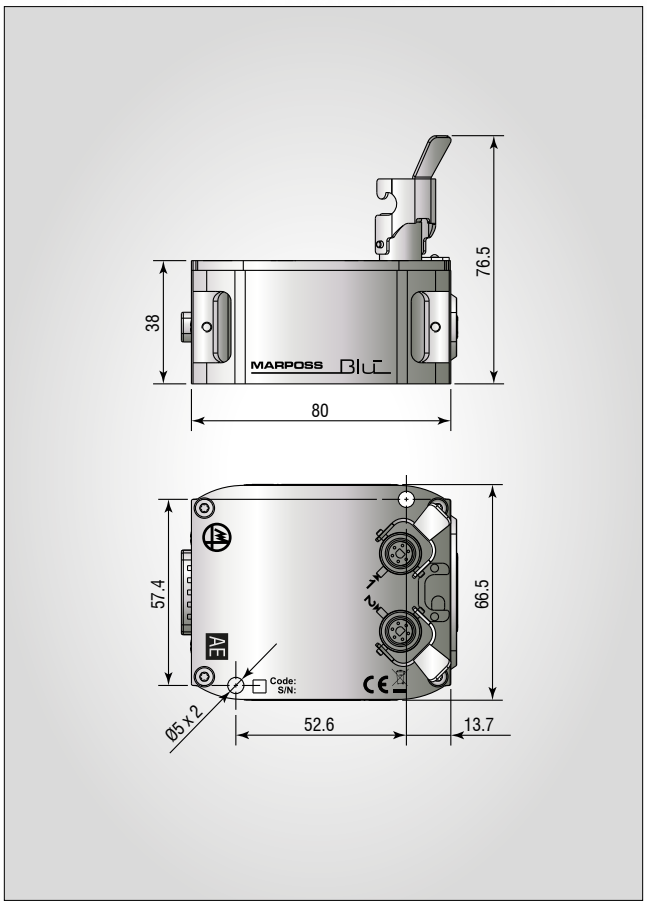
PROTECTION RATING *(IEC 60259)*		IP66, IP67
NUMER OF OUTPUTS		4 max
AIR SPECIFICATIONS		Dry filtered < 5 µm
RESPONSE TIMES RANGE	Pressure 3 bar	ACTIVATION TIMES 600/750 ms with 1/4 transducers DEACTIVATION TIMES 240/250 ms with 1/4 transducers
	Pressure 6 bar	ACTIVATION TIMES 310/340 ms with 1/4 transducers DEACTIVATION TIMES 420/450 ms with 1/4 transducers
OPERATING TEMPERATURE RANGE		5/55 °C
STORAGE TEMPERATURE RANGE		-20/70 °C

(*) = Type of hoses used: L = 3 m / Ø2 mm and 1/4 heads connected

AE Node

Node for monitoring acoustic signals and ultrasounds (AE - Acoustic Emission).
The node can handle up to two sensors which can be selected according to the application, within the vast range of Marposs/ Dittel solutions:

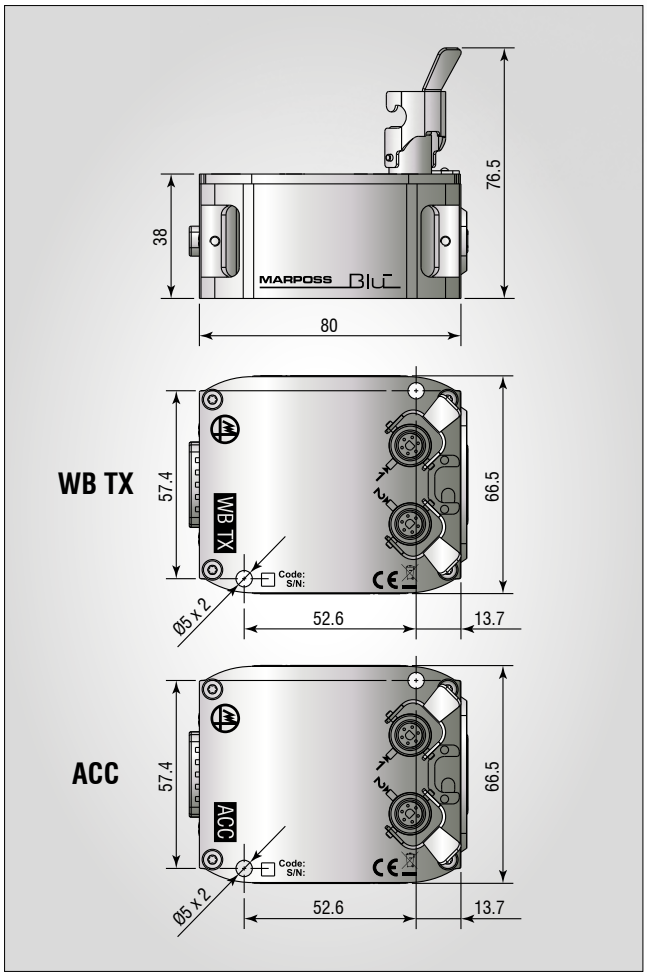
- Fixed sensor
- Rotating sensor
- Ring sensor
- Liquid sensor
- Internal spindle sensor



PROTECTION RATING *(IEC 60259)*	IP66, IP67
DISTANCE FROM SINGLE SENSOR	30 m max
OPERATING TEMPERATURE RANGE	5/55 °C
STORAGE TEMPERATURE RANGE	-20/70 °C

WB and ACC Nodes

ACC is node for monitoring vibration signals (ACC - Acceleration) that can handle up to two accelerometers.
The sensors can be selected according to the application, within the vast range of Marposs/Dittel solutions.
WB TX is node to pilot balancing systems which compensate the vibrations triggered by the rotation of the grinding wheels.
The node can handle up to two balancing heads selected, according to the application, from the vast range of Marposs/Dittel solutions (spindle type heads and flange type heads).

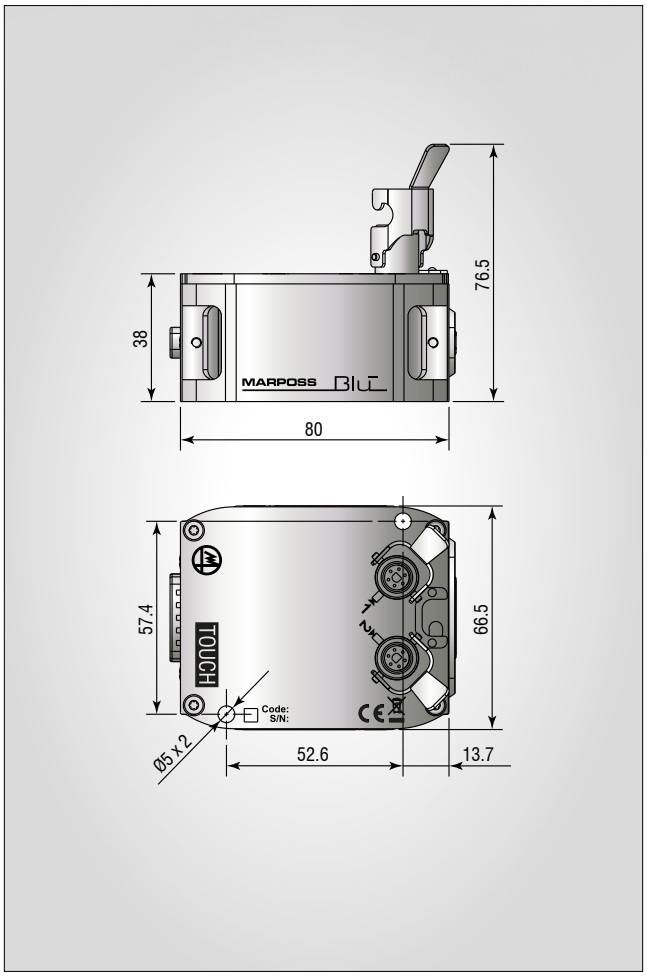


PROTECTION RATING *(IEC 60259)*	IP66, IP67
DISTANCE FROM SINGLE SENSOR	30 m max
OPERATING TEMPERATURE RANGE	5/55 °C
STORAGE TEMPERATURE RANGE	-20/70 °C

TOUCH Node

Node for detecting the switch signal given by a digital TOUCH type probe.
The node can handle up to two probes with a view to detecting references, positions or taking measurements.
The sensors can be selected according to the application, within the vast range of Marposs MIDA solutions:

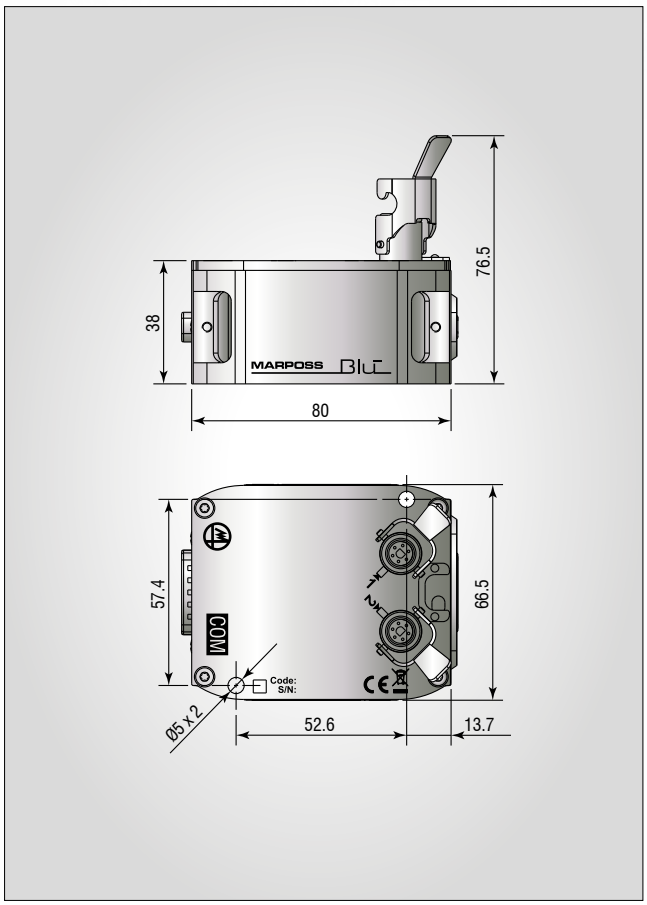
- T25
- TT25
- T25P



PROTECTION RATING *(IEC 60259)*	IP66, IP67
DISTANCE FROM THE SINGLE PROBE	30 m max
OPERATING TEMPERATURE RANGE	5/55 °C
STORAGE TEMPERATURE RANGE	-20/70 °C

COM Node

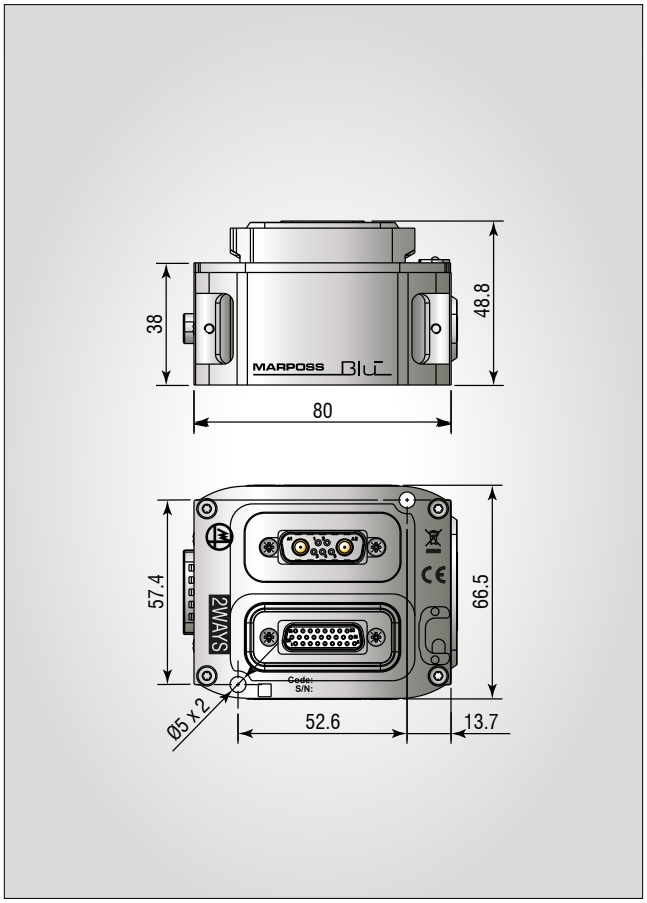
COM Node is designed to drive and control electro-mechanical devices as eFenar and eSlide movements.
Machine communicates with Master Node, which in turn set how and when to drive each device in order to achieve programmed cycles, by moving electric actuators instead of traditional pneumatic or hydraulic ones.
COM Node is designed to be placed near each managed actuator: movement, postion and diagnostics.



PROTECTION RATING *(IEC 60259)*	IP66, IP67
OPERATING TEMPERATURE RANGE	5/55 °C
STORAGE TEMPERATURE RANGE	-20/70 °C

2WAYS Node

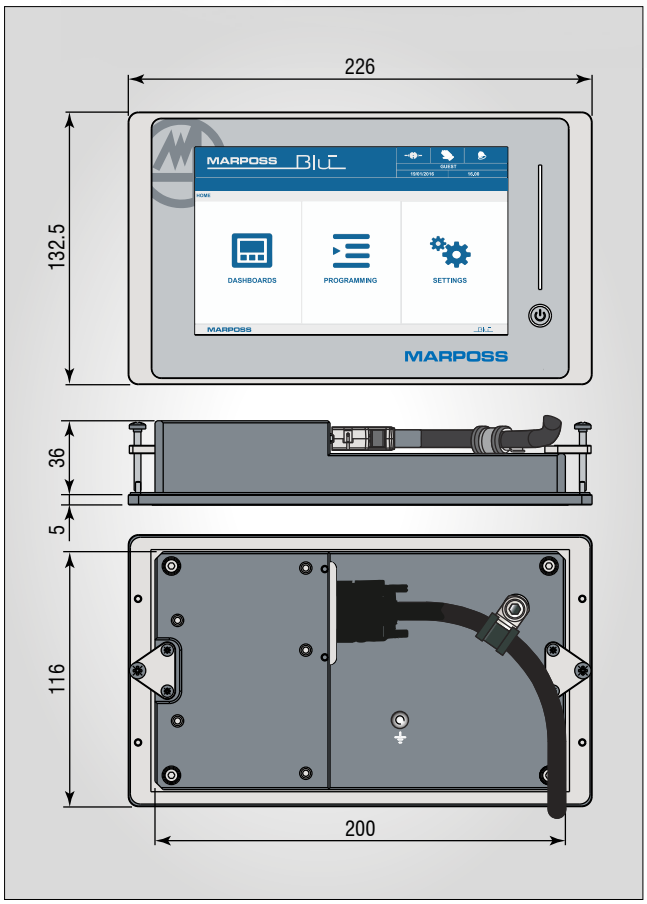
The 2WAYS Node extends the flexibility of the MMSB network further by performing switch, repeater and power boost functions. It allows splitting of the bus to support particularly complicated machine topologies and reconditioning of the same to adapt to large-scale plants.
Both the MMSB network cables and auxiliary 24 V cables, which allow power boosting on the bus, are connected to the node via quick-release connectors.
The node is manufactured in stainless steel and is designed to be positioned inside the machine working area (Wet Area).



PROTECTION RATING *(IEC 60259)*	IP66, IP67
OPERATING TEMPERATURE RANGE	5/55 °C
STORAGE TEMPERATURE RANGE	-20/70 °C

Operator Panel

7" 16:9 colour display with capacitive touch screen with which the BLU system functions can easily be programmed and displayed.
Operator Panel has been specifically designed to be used under severe machining conditions.



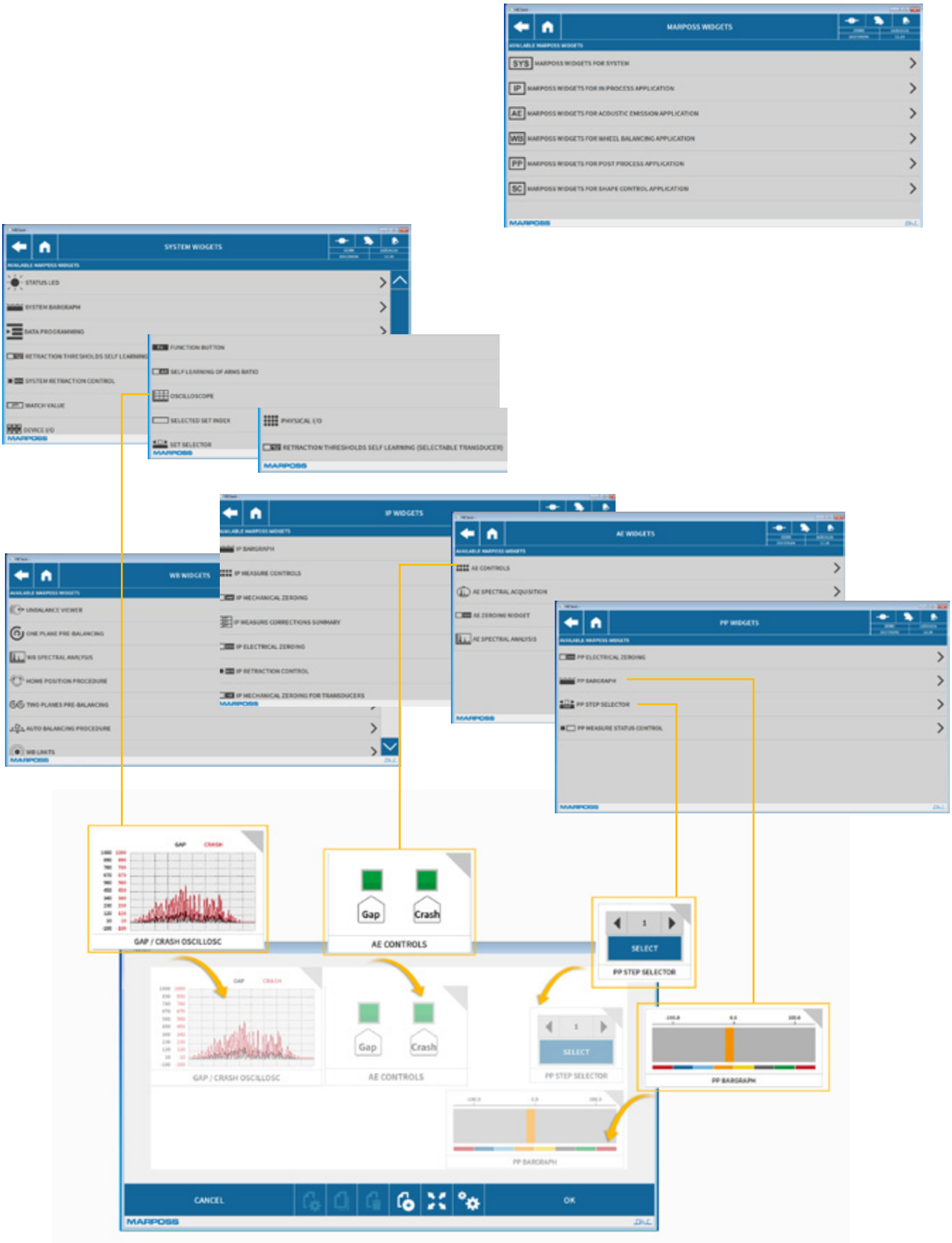
PROTECTION RATING *(IEC 60259)*	IP54
OPERATING TEMPERATURE RANGE	5/50 °C (dry area)
MAXIMUM CABLE LENGTH	30 m

BLÚ HMI

BLÚ HMI is the interface specifically designed for communication between the operator and the BLÚ control system.
BLÚ HMI has different dashboards which can be easily re-dimensioned and ensure easy integration on BLÚ range devices (i.e. the operator panel) or on external devices such as machine PCs.
Properly enabled users can autonomously create new dashboards or alter existing ones.
BLÚ HMI provides all the functions demanded by the Smart Factory where production flexibility is required and is easy to use.

Widgets

All the dashboards are created with the basic widgets available in the library of the software version being used.



Software Cycles

Generate the signals and information necessary for checking and optimising working cycles in the machine.
Production and machine conditions are monitored.
Intuitive programming allows effective management of the parameters necessary for the main functions which are MEASUREMENT, ACOUSTIC EMISSION and GRINDING WHEEL BALANCING.

MEASUREMENT (ME)

Part dimension check, which can be performed either during (in-process) or before/after (pre /post-process) working.
Various in process cycles are available for measuring:

- positions (in “active/continuous” or “passive/one-shot” mode)
- internal and external diameters
- lengths

particular parts such as: cams, cam diameters, three-lobed parts

The measurements are usually taken by comparing with the reference master, but it is possible to manage “absolute measurement” heads which do not require the presence of a reference master
All of the cycles can be performed both on parts with continuous and interrupted surfaces.
Processing is possible for checking taper, ovality and adaptive cycles which indicate, at programmable intervals, the quantity of material removed.
There are also cycles for post-process and pre-process measurement such as T.I.R. and correction, compensation, coupling measurements.

ACOUSTIC EMISSION (AE)

A check run using ultrasound sensors for monitoring working cycles and machine conditions.
Cycles available:

- “Gap” - for determining contact between the grinding wheel and part, or grinding wheel and dressing wheel.
- “Crash” - for an immediate stop of moving parts in the event of a collision.
- “Monitoring” - for continuously checking working/dressing cycles.

GRINDING WHEEL BALANCING (WB)

Necessary both to guarantee the quality of parts produced and protection of machine parts.
Cycles available:

- Manual balancing/Pre-Balancing in single and double plane
- Automatic balancing in single and double plane

Manual balancing is performed using weights placed by the operator during interaction with the machine cycle.
Automatic balancing uses electro-actuated heads controlled by the system to automatically compensate for imbalances generated by rotating parts, without any interruption of productivity.
The new “deterministic balancing” cycles guarantee unparalleled performance.

Accessories

MMSB (Marposs Measure Sensor Bus) Cable

Master/node or node/node MMSB connection bus
Area:
DRY/WET (master/node connection)
WET (node/node connection)

Master side connector, protection rating: IP40 (IEC 60259)
NODE side connector, protection rating: IP66, IP67 (IEC 60259)
Maximum total network length: 100 m
Maximum length of single stretch: 30

Clamping Bracket

Device use to secure the two function nodes
Area: WET

Guarantees the mechanical connection between two nodes.
Two brackets per connection

Function Node Termination (Wet)

Used to terminate the last node on the network
Area: WET

Closes the MMSB BUS connection and protects it.
Protection rating: IP66, IP67 (IEC 60259)

Function Node Termination (Dry)

Used to terminate the last node on the network
Area: DRY

Closes the MMSB BUS connection and protects it.
Protection rating: IP40 (IEC 60259)

Bridge Connector

Connector for connecting two cabinet modules
Area: DRY

Transfers the MMSB BUS when the modules are installed close together in a cabinet
One connector per connection
Protection rating: IP40 (IEC 60259)

Bulkhead for 24 V and for MMSB Cable

Bulkhead connector for 24 V power supply cable
Area: WET/DRY
Protection rating: IP66, IP67 (IEC 60259)

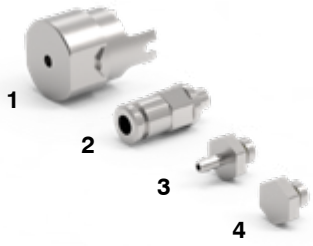
Bulkhead connector for MMSB Bus cable
Area: WET/DRY
Protection rating: IP66, IP67 (IEC 60259)

Coupling Clamp and Spring Connector

Device used to secure the MMSB cable to the function node
Area: Wet
One clamp per connection

Connector for connecting two stretches of MMSB together
Area: Wet
Used for MMSB connections in cases where no Nodes are present (permits future expansion after installation in the machine)
Used to secure the 24 V connector cover cap to the 2WAYS "T" Node.

Fittings and closing plugs



For all nodes:
1. Closing plug for not used node connector

For RET Node only:
2. Air quick fitting
3. Air barbed fitting
4. Closing plug for not used retraction connectors

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For a full list of address locations, please consult the Marposs official website

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Marposs has an integrated system for Company quality, environmental and safety management, with ISO 9001, ISO 14001 and OHSAS 18001 certification.

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