



CONTROL UNIT OF WHEEL FLANGE LUBRICATION JMO

CENTRAL LUBRICATION / HYDRAULICS

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CONTROL UNIT JMO

APPLICATION

The control units JMO are used as control and checking electronic equipment for spraying lubrication of wheel flanges of locomotives and trams. The control unit JMO is intended mainly for control of lubrication systems OK-01, OK-02 and their type variants. The control units processes the input signals from tachograph of the vehicle or own speed sensor of the vehicle, the curve sensor and from the integrated GPS module, evaluates a speed of the current vehicle, position of it on the track and the operating conditions. Data processed in the automation control software are used to control the operation of the lubrication system according the current vehicle operating conditions, i.e. for applying a lubricant to the wheel flange in the optimized amount on necessary place of the track.

According to the model variants, the control unit is designed for two or four sets of lubricating nozzles (for uni-directional or bi-directional vehicles). The spraying of wheel flanges is controlled independently for the left and right side of the axle with an identification of the direction of travel of the vehicle or together for both sides of axle of the vehicle.

DESCRIPTION

The control unit JMO is electronic equipment consisting of three basic parts; the control module, the GPS module and the display unit.

A key part is the hardware control module containing recorded software and ensuring processing of the input data and control signals for the lubricating system. The control module is placed in a protective case made of aluminium and fitted with connectors, containing individual hardware components according to the type of design of the automatic and the curve sensor. The control module is powered by a 24V DC and contains inputs for connection of the touch screen panel, GPS module, tachograph of the vehicle, respectively information from the master control system of the vehicle or its own speed sensor (speed encoder on the gearbox of driven axle), three-position direction switch (serving also for manual shutdown), switch for manual control of lubrication, low level switch of lubricant in the reservoir of the lubrication pump, pressure sensors in the assembly of compressor and air tank (only for railway vehicles without source of compressed air), sensors of the external climatic conditions (temperature, humidity) and inputs for control of the operation of lubrication system. It also includes outputs for control of the lubrication system, individual spray nozzles. The control module has a built-in Ethernet interface used for the diagnosis, upgrade and management of the control automatic. When the touch screen panel is used, this interface is used for mutual communication between the automatic and touch screen panel.

The GPS module is placed together with the control module in a protective case and this is for type variants of control units, working with the map source. The GPS signal receiver is placed externally as a separate system element. According to the configuration management of the control unit, it is connected with the protective case or control panel by a separate connector.

The display unit, designed as a touch screen panel, is placed via the bracket on the protective case of the control module, or installed separately as an external element located in the cab of the vehicle. The display unit is a control element of the automatic, it is a touch screen panel equipped with a durable colour display of 7" diagonal, displaying in a real-time all necessary information regarding operation of the lubrication system, mainly the selected regime of lubrication, course of lubrication of individual nozzles, amount of the lubricant in the reservoir or reservoirs and the operating conditions of the vehicle concerning the lubrication regime. At the same time it serves for user system set-up, set-up of the basic parameters of

lubrication regimes, track and the vehicle. The external touch screen panel is connected to the control module via a data cable.

For easy visual inspection of the automatics, the LED control lights are placed on protective case. The green LED indicates an operating status and the red one a fault. In case of model variant of the control unit fitted with the display unit, the signals on system status are displayed on the touch panel display.

The control unit is equipped with diagnostics, enabling to protocol the error records and significant events into the cyclic back-upped memory of the control unit, including the time stamp of origination of the error and its description. At the type variant equipped with a touch screen panel, an operative approach towards setting of the user parameters, diagnostic and service information is assured, via this panel in a special display mode (the access may be protected by a security code). In all configurations, the user set-up, diagnostic and service data are also available in service software on computer connected through the Ethernet service interface.

OPERATION

According to the user requirements, one of the chosen type variants of control unit is chosen. The functional properties of the control system then depend on the chosen configuration. The set-up and handling of the control unit is described in detail in the operating manual.

The control unit JMO have defined 5 basic modes of operation.

Switch-of mode

A manual mode, where the lubrication runs only after pressing of the service button (manual lubrication switch), usually installed in the cab of the vehicle driver.

Interval lubrication mode

In this mode runs a cyclic lubrication identically on both sides of the axle of vehicle, at a driving speed higher than the user defined minimum vehicle speed (V_{min}), always after passing a path longer than a user-programmed maximum distance travelled without switch-on of the lubrication cycle (s_{max}). The nominal dose of grease for one lubrication cycle is defined parametrically by setting a maximum time of opening of the valve. The auxiliary interval specifying the minimum time between two openings of the valve then assures that the air tank is not emptied, that would prevent a subsequent lubrication cycle.

This mode is used for all configurations and type variants of the control unit as a backup mode. The control unit chooses it independently as a substitute in case of failure of GPS signal or unavailability of map sources for a given route. Further it is standardly used in a configuration with control of lubrication from the curve sensor for long track sections without bends, for identification of such track section is used the predefined maximum distance without lubrication (s_{max}).

Adaptive mode with the curve sensor

At usage of the type variant of control unit equipped with the curve sensor, the system responds to the gradual entering into the involute curve at a speed greater than the minimum vehicle speed (v_{min}) and after passing the minimum slide distance, it activates the lubrication of wheel flange on the outer side of axle of the vehicle in direction of travel. The lubrication cycle is switched on repeatedly on a base of exceeding of the threshold parameter of angular velocity together with each passing of minimum slide distance (s_{min}). This is determined according to the operational characteristics of the vehicle, respectively of their sets (user settable parameters).

A transfer into the mode of interval lubrication after passing of a longer path than is the user defined maximum distance travelled without a start-up of the lubrication cycle (s_{\max}) is used as a back-up system in case of failure or disconnection of the curve sensor.

Predictive mode with the GPS position of vehicle with map sources

At usage of the type variant of control unit equipped with the GPS module and if for a current track the processed map source is available, an effective lubrication is carried out separately for each side of the axle of vehicle by a predictive way, i.e. ahead of arrival of vehicle into the curve by greater than minimal speed (v_{\min}). During passage of the curve, the cyclical lubrication is done always after passing of the minimum slide distance (s_{\min}), set according to the operating parameters of the vehicle or the set (user settable parameters).

The user defined maximum path travelled without start-up of the lubrication cycle (s_{\max}) works here as the safety parameter, whereas the presence of the GPS signal is also tested. During the signal failure lasting longer than 5 seconds, the mode of interval lubrication is temporarily activated, thus ensuring lubrication even in sections of the track where proper reception of GPS signal is prevented by the terrain character of the track or its build-up (tunnels, indoor stations, etc.). At the same time, the system automatically performs repetitive localization of the active leg of the route so that the predictive mode can be reactivated.

Mode of track record

At usage of the type variant of control unit equipped with the GPS module, the mode of mapping of tracks can be activated. The vehicle may then carry out the ride around the track in the mode of interval lubrication and simultaneously perform mapping of the track into the internal memory of the control unit, the recording capacity is about 4-8 weeks of normal operation (depending on the characteristics of the mapped tracks). Records regarding the tracks are then exported from control unit, software processed and then they can be used to bulk updating of map sources in all control units or vehicles of the user. This way the mapping of requirements of individual tracks for lubrication may be carried out directly by the user during normal operation, without any additional activities or special equipment. Similarly the continuous updating of already mapped routes can be implemented in case of structural modifications of them or changes of driving dispositions.

For software processing of newly mapped tracks and their implementation into the normal operation it is recommended to contact the supplier.

INSTALLATION, SERVICE AND MAINTENANCE

The control module is mounted in any position using the four anchor holes by M5 screws. Configuring equipped with the curve sensor must be installed in a vertical position so that the green light (LED) is located on top of the control module. The automatic is in this case equipped with an arrow indicating direction of the desired assembly.

During placing of control module it is necessary to exclude the possibility of mechanical damage and access of moisture. The control unit is connected according to the applicable norms and wiring diagram. Installation, wiring and commissioning may only be carried out by a person with appropriate qualification. The periodic inspection of function of the control unit and other elements of the system is recommended, including control of wiring, along with the maintenance of wheel flange lubrication.

TYPE VARIANTS

CONTROL UNITS FOR TRAMS

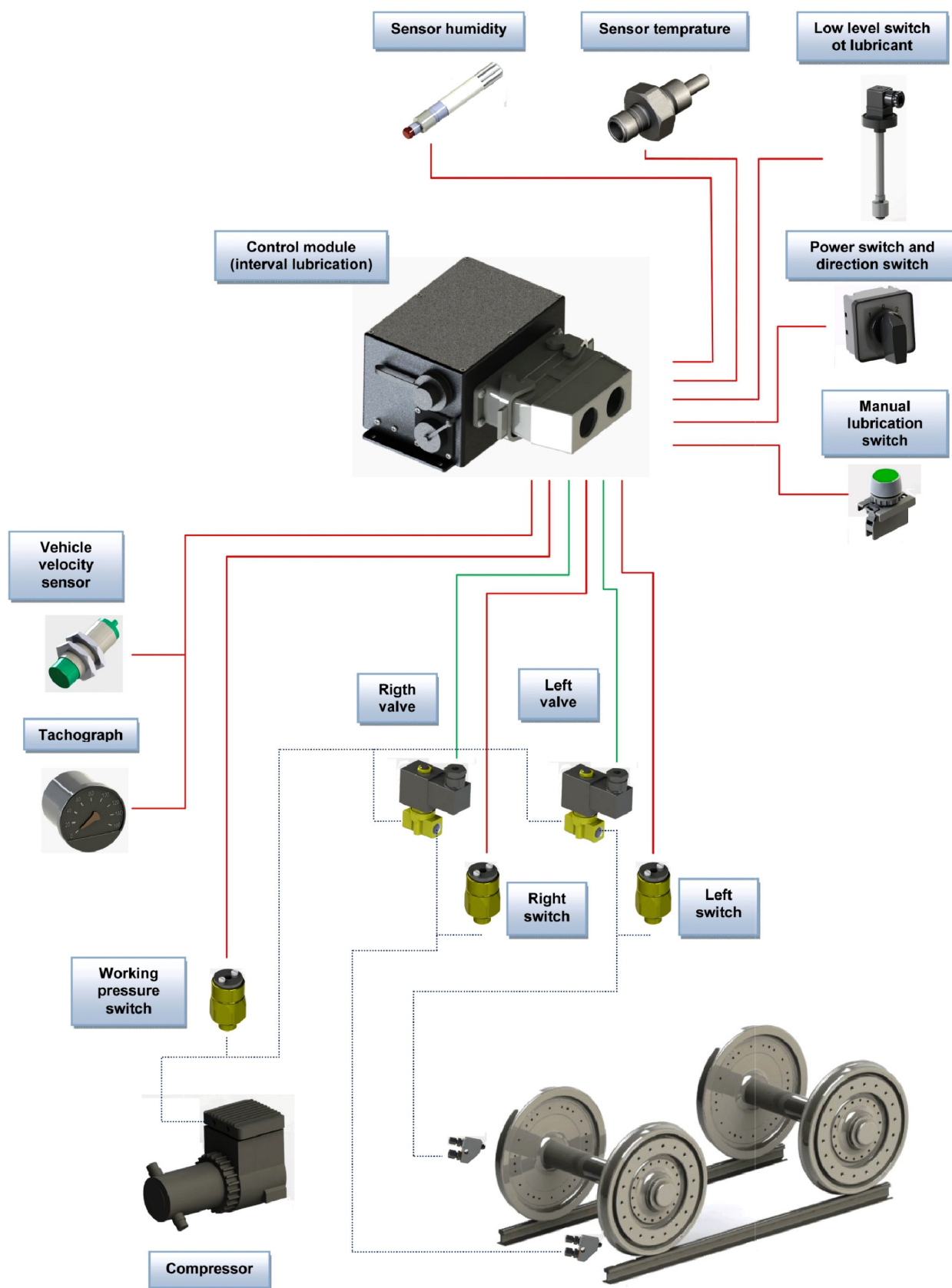
Order No.	Type marking	Curve detection	Display unit	Controlled nozzles	Description
9 55 0732	JMO T-IM2	NO	NO	2	control module (interval lubrication)
9 55 0733	JMO T-IM4			4	
9 55 0734	JMO T-GN2	sensor	NO	2	control module + curve sensor
9 55 0735	JMO T-GN4			4	
9 55 0736	JMO T-GP2	GPS	NO	2	control module + GPS module (map source)
9 55 0737	JMO T-GP4			4	
9 55 0738	JMO T-IM2D	NO	touch screen panel	2	control module (interval lubrication) + display unit
9 55 0739	JMO T-IM2D			4	
9 55 0740	JMO T-GN2D	sensor	touch screen panel	2	control module + curve sensor + display unit
9 55 0741	JMO T-GN4D			4	
9 55 0742	JMO T-GP2D	GPS	touch screen panel	2	control module + GPS module (map source) + display unit
9 55 0743	JMO T-GP4D			4	

CONTROL UNITS FOR LOCOMOTIVES, MOTOR AND ELEKTRIC UNITS

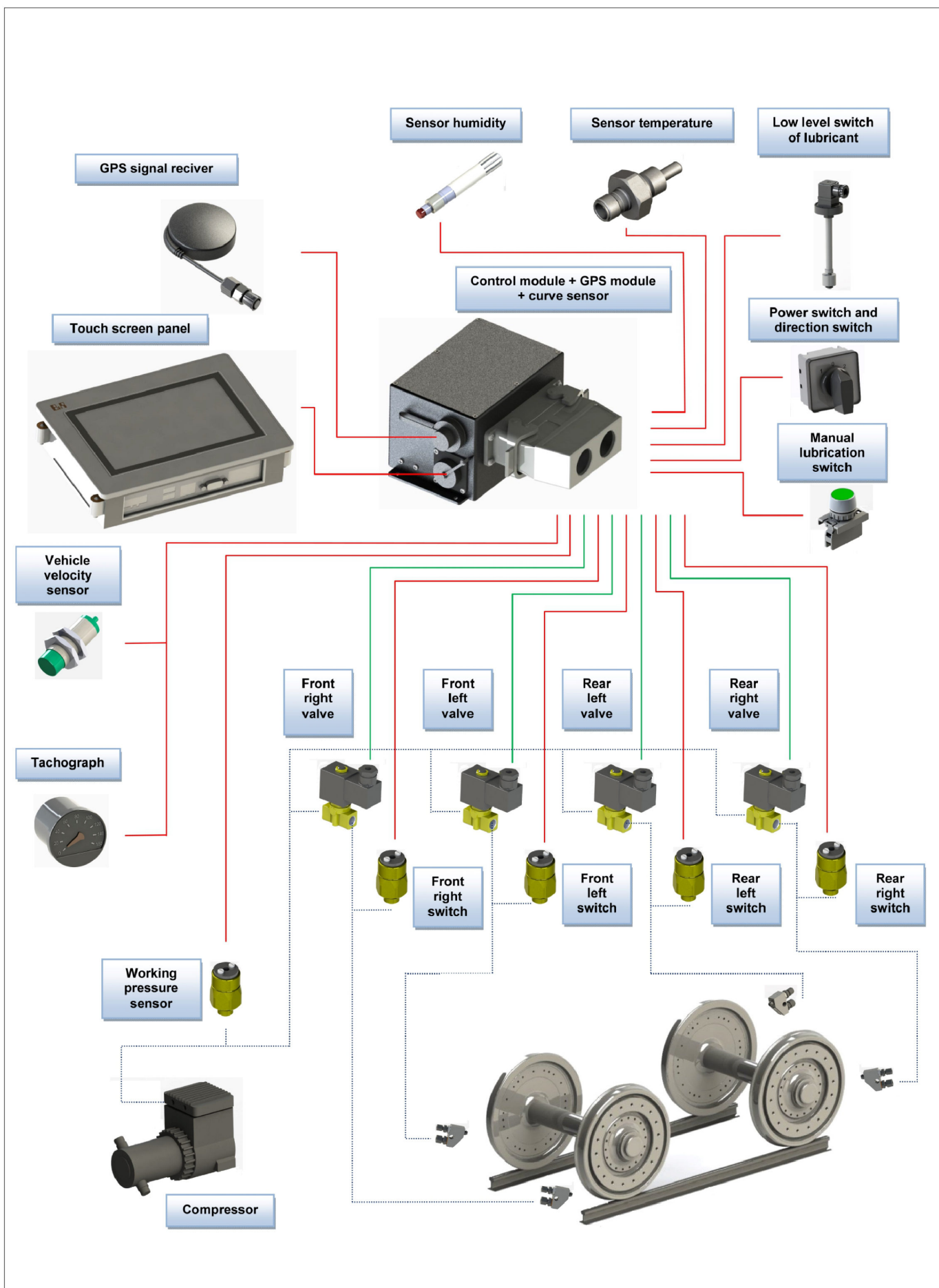
Order No.	Type marking	Curve detection	Display unit	Controlled nozzles	Description
9 55 0750	JMO L-IM2	NO	NO	2	control module (interval lubrication)
9 55 0751	JMO L-IM4			4	
9 55 0752	JMO L-GN2	sensor	NO	2	control module + curve sensor
9 55 0753	JMO L-GN4			4	
9 55 0754	JMO L-GP2	GPS	NO	2	control module + GPS module (map source)
9 55 0755	JMO L-GP4			4	
9 55 0756	JMO L-IM2D	NO	touch screen panel	2	control module (interval lubrication) + display unit
9 55 0757	JMO L-IM2D			4	
9 55 0758	JMO L-GN2D	sensor	touch screen panel	2	control module + curve sensor + display unit
9 55 0759	JMO L-GN4D			4	
9 55 0760	JMO L-GP2D	GPS	touch screen panel	2	control module + GPS module (map source) + display unit
9 55 0761	JMO L-GP4D			4	

TECHNICAL DATA

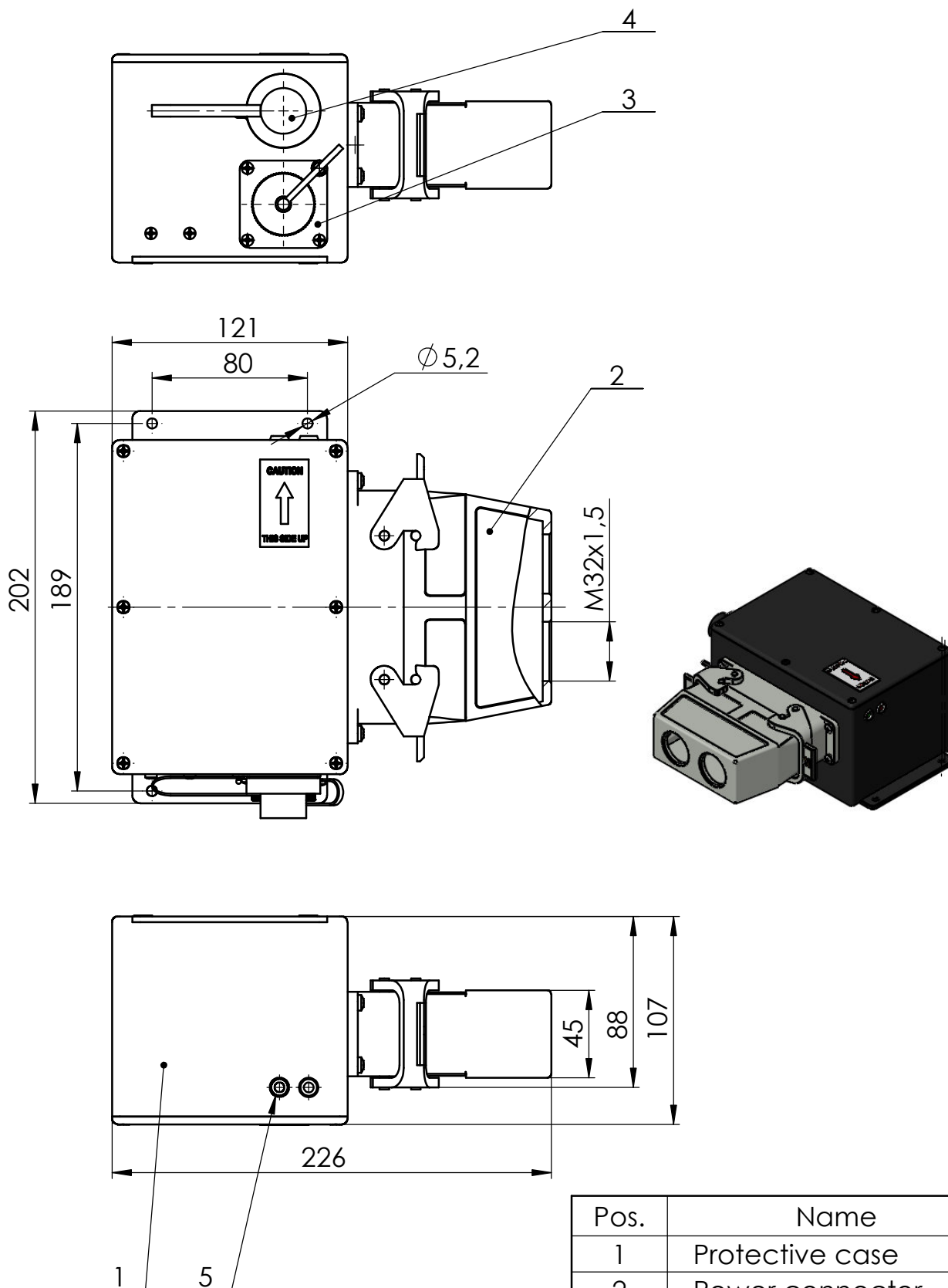
Supply voltage	22 to 26VDC
Idle current	Approx. 30 mA
Protection of control module	IP 67
Current load at input	max. 2A
Class of interruption of supply voltage	S2 (up to 10ms) acc. to EN 50155
Temperature	-40°C to +40°C
Humidity	10% to 90% relative, non-corrosive
Mechanical shocks and vibrations	Category 1 class A acc. to EN 61373
Electromagnetic environment	EN 50121-3 ed. 1 and 2
Supply system	EN 50125-1
Size	Control module - 202 x 226 x 107 mm
	Touch screen panel - 212 x 156 x 52 mm
Assembly position of the control module	Any
	Type variants with curve sensor vertically acc. to description
Weight	Control module – 1.7 kg (acc. to design)
	Touch screen panel – 1.2 kg
	GPS receiver – 0.2 kg



Name	BLOCK SCHEME JMO T-IM2	Tribotec s.r.o. Košuličova 4 Brno www.tribotec.cz +420 543 425 611
Type	CONTROL UNIT JMO	
Code	9 55 0732	



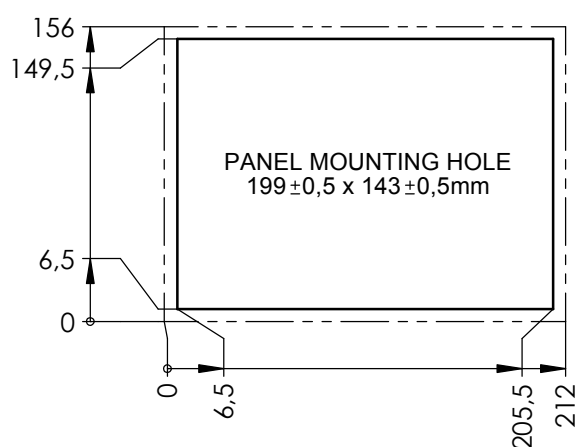
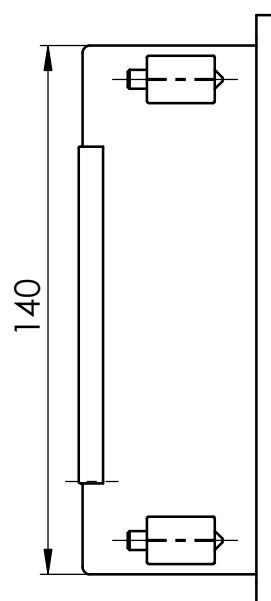
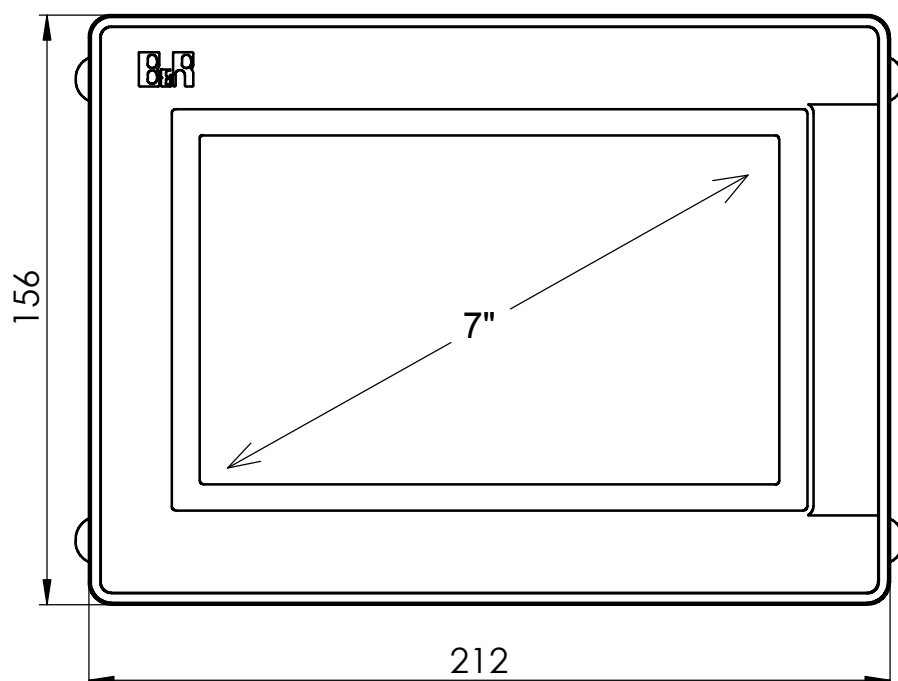
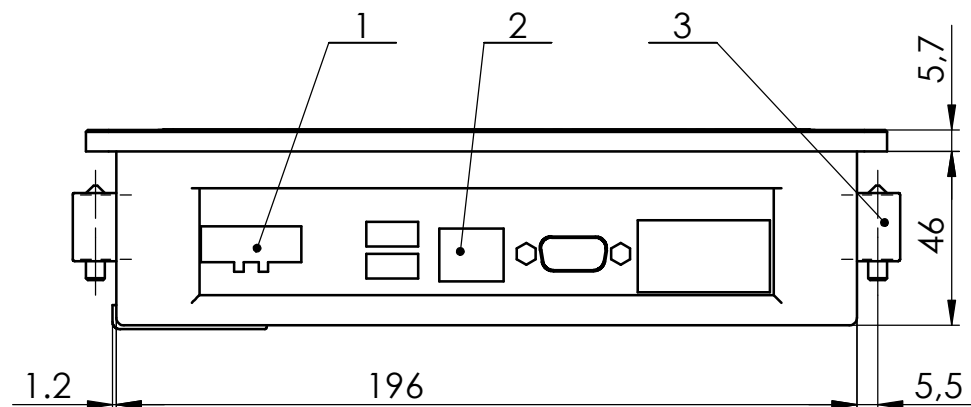
Name	BLOCK SCHEME JMO T-GP4D	Tribotec s.r.o. Košuličova 4 Brno www.tribotec.cz +420 543 425 611
Type	CONTROL UNIT JMO	
Code	9 55 0743	



The type variants with curve sensor have to be mounted vertically according the label.

Pos.	Name
1	Protective case
2	Power connector
3	LAN connector
4	USB connector
5	LED indicators

Name	CONTROL MODULE	Tribotec s.r.o. Košuličova 4 Brno www.tribotec.cz +420 543 425 611
Type	CONTROL UNIT JMO	
Code		



Pos.	Name
1	Power connector
2	LAN connector
3	Anchor screw

Name	TOUCH SCREEN PANEL	TriboTec s.r.o. Košuličova 4 Brno www.tribotec.cz +420 543 425 611
Type	CONTROL UNIT JMO	
Code		