

# Digital electronic drives for SSP servopumps

fieldbus, smart start-up, smart maintenance



## D-MP

Electronic drive exploits the modern technology of servo drives to accurately control pressure and flow in hydraulic systems through Smart Servopumps (SSP).

Atos PC software allows to customize the SSP configuration and via the Smart Start-up function guides the user step by step during the commissioning phases.

Multiple axis function allows to manage customized settings for up to 4 axes.

Smart Maintenance provides information on health condition of SSP and allows to plan in advance the replacement of worn components, maximizing productivity and minimizing maintenance costs.

For more info please refer to AS050.

## General Features:

- DB9 serial port RS485 always present
- Fast plug-in connectors input/output for CANopen
- DB9 connector for PROFIBUS DP
- RJ45 connectors input/output for EtherCAT, PROFINET IO RT/IRT
- DB15 connector for servomotor resolver always present
- Fast plug-in connector for STO always present
- Ambient temperature range: -10 ÷ +50 °C
- IP20 protection degree
- CE and UL marking

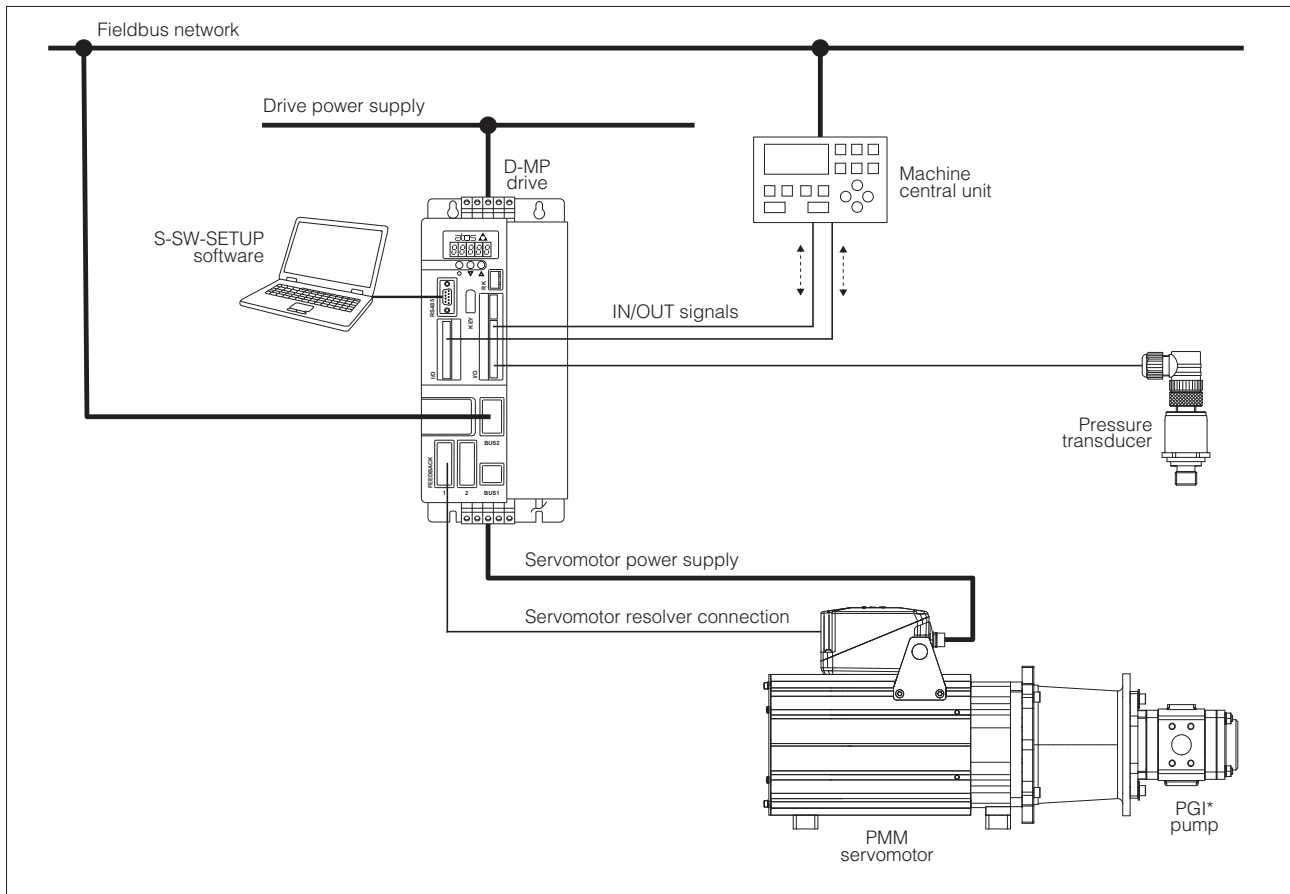
## Software Features:

- Intuitive graphic interface
- Smart Maintenance
- Smart Start-up
- Multiple axis
- Smart tuning
- Setting of SSP functional parameters
- Complete diagnostics
- Internal oscilloscope function

## 1 MODEL CODE

| D-MP  | - | T-SP                | - | BC                 | - | 022 | / | K | *             |
|---|---|---------------------|---|--------------------|---|-----|---|---|---------------|
| Electronic drive<br>in wall mounting format   |   |                     |   |                    |   |     |   |   | Series number |
| <b>Control mode:</b><br><b>T-SP</b> = high performances p/Q control   |   |                     |   |                    |   |     |   |   |               |
| <b>Fieldbus interface</b> , serial port RS485 always present:<br><b>NP</b> = not present<br><b>BC</b> = CANopen<br><b>BP</b> = PROFIBUS DP<br><b>EH</b> = EtherCAT<br><b>EP</b> = PROFINET RT/IRT |   |                     |   |                    |   |     |   |   |               |
| <b>STO function</b> , see section 12 :<br><b>K</b> = Safe Torque Off (STO) - always present   |   |                     |   |                    |   |     |   |   |               |
| <b>Rated current [Arms]</b> , see section 6 :   |   |                     |   |                    |   |     |   |   |               |
| <b>022</b> = 22 A   |   | <b>060</b> = 57,5 A |   | <b>140</b> = 140 A |   |     |   |   |               |
| <b>032</b> = 32 A   |   | <b>090</b> = 87 A   |   | <b>165</b> = 165 A |   |     |   |   |               |
| <b>046</b> = 46 A   |   | <b>100</b> = 100 A  |   | <b>210</b> = 210 A |   |     |   |   |               |

## 2 BLOCK DIAGRAM EXAMPLE



## 3 DRIVE SETTINGS AND PROGRAMMING TOOLS - see tech. table AS800

Drive functional parameters and configurations, can be easily set and optimized using Atos S-SW-SETUP programming software connected via serial port RS485 to the drive. For fieldbus versions, the software permits drive parameterization through serial port RS485 also if the drive is connected to the central machine unit via fieldbus.

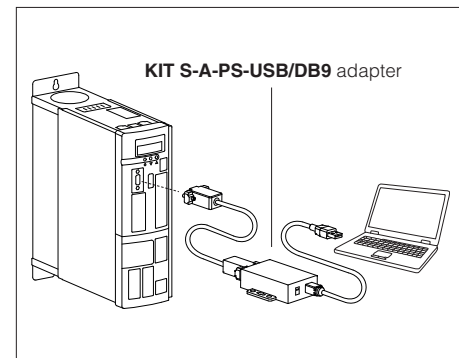
S-SW-SETUP permits to have many features so as Smart Start-up, Multiple axis and Smart tuning for an easy and rapid commissioning. For detailed info refer to **AS050**.

**S-SW-SETUP** support:

|                  |               |
|------------------|---------------|
| NP (Serial)      |               |
| BC (CANopen)     | EH (EtherCAT) |
| BP (PROFIBUS DP) | EP (PROFINET) |

**Note:** for detailed descriptions of settings, wirings and installation procedures, please refer to the user manuals included in the S-SW-SETUP

### Serial port RS485 connection



## 4 FIELDBUS - see tech. table GS510

Fieldbus allows drive direct communication with machine control unit for digital reference, drive diagnostics and settings. These execution allow to operate the drive through fieldbus or analog signals available on the connectors.

## 5 GENERAL CHARACTERISTICS

|                           |  |
|---------------------------|--|
| Assembly position         | Wall mounting  |
| Ambient temperature range | -10 ÷ 50°C ; the maximum ambient temperature of D-MP is 50°C ; a derating is necessary   |
| Altitude                  | 0 ÷ 1000 m ; current derating for higher altitudes   |
| Humidity                  | 5÷ 85%   |
| Vibration                 | 1g (57 Hz ≤ frequency ≤ 150Hz)   |
| Cooling                   | Fan  |
| Compliance                | CE according to Low Voltage Directive (LVD) 2014/35/EU and to EMC directive 2014/30/EU<br>UL marking attesting that the device complies with the essential requirements of the UL 61800-5-1<br>RoHS Directive 2011/65/EU as last update by 2015/863/EU |

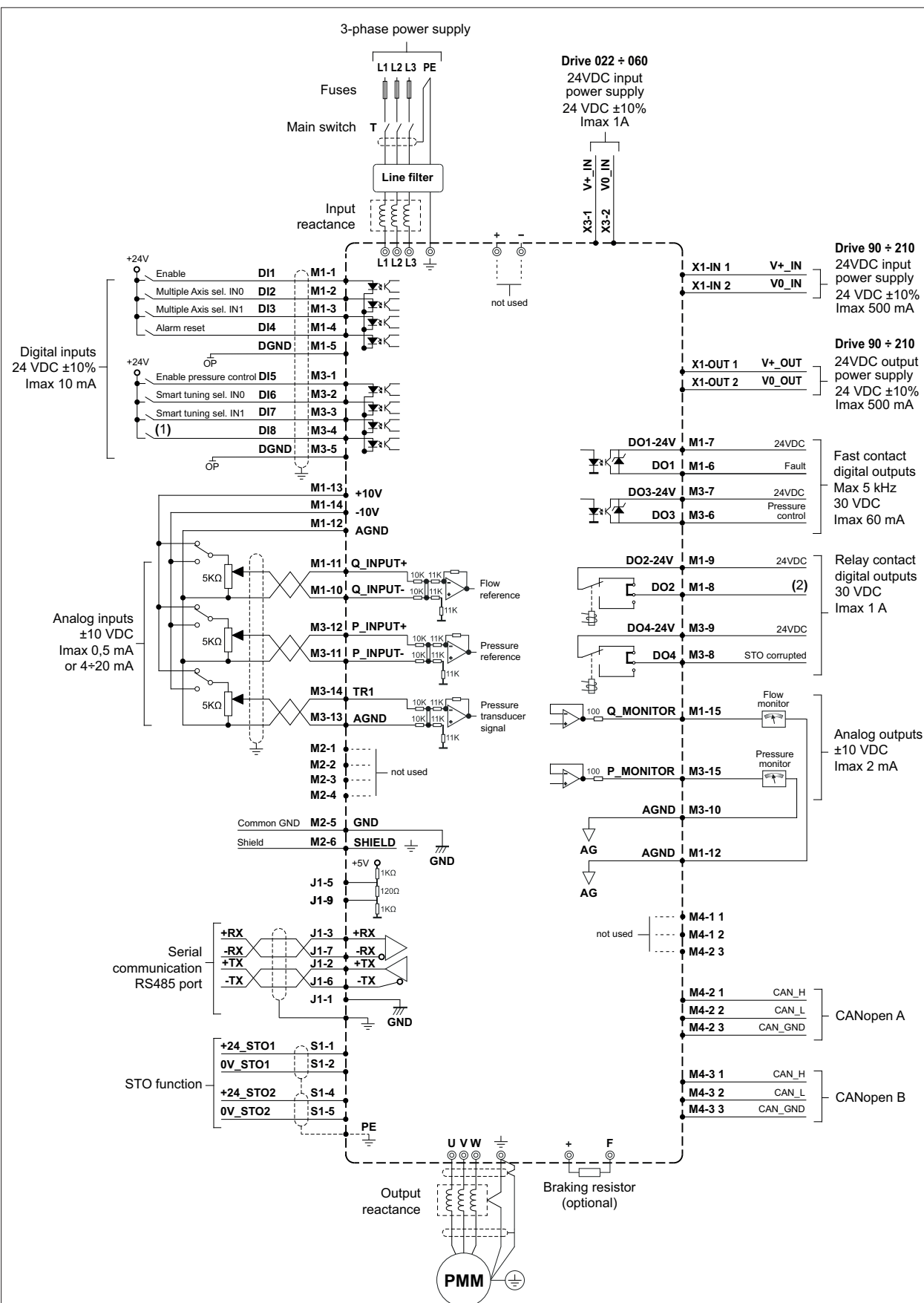
## 6 ELECTRICAL CHARACTERISTICS

| Drive type   |       | 022   | 032                               | 046                               | 060  | 090                                  | 100  | 140 | 165    | 210 |
|--|-------|---|-----------------------------------|-----------------------------------|------|--------------------------------------|--|-----|--------|-----|
| Rated current  | [A]   | 22  | 32                                | 46                                | 57.5 | 87                                   | 100  | 140 | 165    | 210 |
| Overload current <b>(1)</b>                                    | [A]   | 44  | 64                                | 92                                | 115  | 174                                  | 200  | 280 | 330    | 420 |
| Rated power  | [kW]  | 11  | 15                                | 22                                | 30   | 45                                   | 55   | 75  | 90     | 110 |
| Rated IN voltage   | [V]   | 200 V -10% ÷ 480 V +10% @ 45 ÷ 65 Hz  |                                   |                                   |      | 400 V -10% ÷ 480 V +10% @ 45 ÷ 65 Hz |  |     |        |     |
| PWM frequency <b>(2)</b>                                       | [kHz] | 1 ÷ 15  |                                   |                                   |      |                                      |  |     | 1 ÷ 10 |     |
| Network type   |       | Grounded (TT, TN) corner earthed or not earthed, ungrounded (IT)  |                                   |                                   |      |                                      |  |     |        |     |
| Max shorts circuit current                                     | [A]   | 5000  |                                   |                                   |      | 10000                                |  |     |        |     |
| Overvoltage category   |       | 3   |                                   |                                   |      |                                      |  |     |        |     |
| Protective class   |       | I   |                                   |                                   |      |                                      |  |     |        |     |
| Thermal braking current  | [A]   | 15  | 25                                | 45                                | 45   | 89                                   | 109  | 149 | 179    | 219 |
| Peak current   | [A]   | 30  | 50                                | 85                                | 85   | 138                                  | 138  | 188 | 225    | 275 |
| Braking voltage  | [V]   | 780   |                                   |                                   |      |                                      |  |     |        |     |
| 24VDC input power supply                                       |       | 24 Vdc ±10% @ max 1,0 A for drives type 022, 090, 100, 140, 165, 210<br>24 Vdc ±10% @ max 1,3 A for drives type 032<br>24 Vdc ±10% @ max 1,8 A for drives type 046, 060   |                                   |                                   |      |                                      |  |     |        |     |
| 24VDC output power supply                                      |       | 24 Vdc ±10% @ max 500 mA - only for drives type 090, 100, 140, 165, 210   |                                   |                                   |      |                                      |  |     |        |     |
| Digital inputs   |       | 24 Vdc ±10% @ max 10 mA   |                                   |                                   |      |                                      |  |     |        |     |
| Digital outputs - fast contact                                 |       | 30 Vdc @ max 60 mA (max 5 kHz)  |                                   |                                   |      |                                      |  |     |        |     |
| Digital outputs - relay contact                                |       | 30 Vdc @ max 1 A  |                                   |                                   |      |                                      |  |     |        |     |
| Analog inputs  |       | ±10 V @ max 0,5 mA or 4 ÷ 20 mA (settable with specific dip-switch - see S-MAN-HW manual)   |                                   |                                   |      |                                      |  |     |        |     |
| Analog outputs   |       | ±10 V @ max 2 mA  |                                   |                                   |      |                                      |  |     |        |     |
| Pressure transducer power supply                               |       | +24 Vdc @ max 100 mA (E-ATR-8 see tech table <b>GS465</b> )   |                                   |                                   |      |                                      |  |     |        |     |
| Protection degree to DIN EN60529                               |       | IP20  |                                   |                                   |      |                                      |  |     |        |     |
| Analog reference resolution                                    |       | 12 bit  |                                   |                                   |      |                                      |  |     |        |     |
| Speed control mode   |       | Field-Oriented Control  |                                   |                                   |      |                                      |  |     |        |     |
| Braking resistance   |       | External (see tech table <b>AS810</b> )   |                                   |                                   |      |                                      |  |     |        |     |
| Filter   |       | External (see tech table <b>AS810</b> )   |                                   |                                   |      |                                      |  |     |        |     |
| Reactance  |       | External - recommended for high power (> 45kW) (see tech table <b>AS810</b> )   |                                   |                                   |      |                                      |  |     |        |     |
| Communication interface  |       | Serial<br>Atos ASCII coding   | CANopen<br>EN50325-4 + DS408      | PROFIBUS DP<br>EN50170-2/IEC61158 |      |                                      | EtherCAT, PROFINET IO RT / IRT<br>EC 61158 |     |        |     |
| Communication physical layer                                   |       | insulated<br>RS485  | optical insulated<br>CAN ISO11898 | optical insulated<br>RS485        |      |                                      | Fast Ethernet, insulated<br>100 Base TX    |     |        |     |
| Recommended wiring cable for logic and 24Vdc power supply      |       | LiYCY shielded cables - max conductor size: 1,5 mm²<br>1,5 mm² max 30 m for 24 Vdc power supply - 0,5 mm² max 30 m for logic<br>Notes: for pressure transducer wiring cable please consult the transducer datasheet |                                   |                                   |      |                                      |  |     |        |     |
| Recommended wiring cable for drive and servomotor power supply |       | see section <b>13</b>   |                                   |                                   |      |                                      |  |     |        |     |

**(1)** 200% overload for maximum 3s and 155% for 30s

**(2)** Default is 5 kHz

## 7 WIRING BLOCK DIAGRAM



(1) The behavior of DI8 vary depending on the SSP execution:

- 1: Not used - (SSP with single pump)
- 2: Single pump activation - (SSP with double pump)

(2) The behavior of DO2 vary depending on the SSP execution:

- 1: STO test suggested - (SSP with single pump, without /D option)
- 2: Smart cooling active - (SSP with single pump, with /D option)
- 3: Single pump mode active - (SSP with double pump)



PROFIBUS DP (BP)

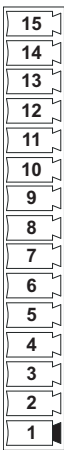
Ethernet (EH, EP)



## BUS2

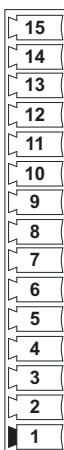
**BUS2**AS500

## 8.1 M1 connector - IN/OUT digital and analog signals

| CONNECTOR  | PIN | SIGNAL           | TECHNICAL SPECIFICATIONS  | NOTES   |
|--|-----|------------------|---|---|
| <b>M1</b><br> | 1   | <b>DI1</b>       | Enable (24 Vdc) or disable (0 Vdc), referred to DGND  | Input - on/off signal                                 |
|  | 2   | <b>DI2</b>       | Multiple axis selection IN0, referred to DGND   | Input - on/off signal                                 |
|  | 3   | <b>DI3</b>       | Multiple axis selection IN1, referred to DGND   | Input - on/off signal                                 |
|  | 4   | <b>DI4</b>       | Alarm reset   | Input - on/off signal                                 |
|  | 5   | <b>DGND</b>      | Common gnd for digital input  | Common gnd  |
|  | 6   | <b>DO1 (1)</b>   | Fault (0 Vdc) or normal working (24 Vdc), referred to DO1-24V   | Output - on/off signal<br><b>Software selectable</b>  |
|  | 7   | <b>DO1-24V</b>   | DO1 power supply 24 Vdc   | Input - power supply                                  |
|  | 8   | <b>DO2 (2)</b>   | For SSP with single pump execution, without /D option:<br>STO test suggested (24 Vdc) or not suggested (0 Vdc), referred to DO2-24V                       | Output - on/off signal<br><b>Software selectable</b>  |
|  |     |                  | For SSP with single pump execution, with /D option:<br>Smart cooling active (24 Vdc) or not active (0 Vdc), referred to DO2-24V                           |   |
|  |     |                  | For SSP with double pump execution:<br>Single pump ON active (24 Vdc) or not active (0 Vdc), referred to DO2-24V  |   |
|  | 9   | <b>DO2-24V</b>   | DO2 power supply 24 Vdc   | Input - power supply                                  |
|  | 10  | <b>Q_INPUT-</b>  | Negative flow reference input signal for Q_INPUT+   | Input - analog signal                                 |
|  | 11  | <b>Q_INPUT+</b>  | Flow reference input signal: $\pm 10 \text{ Vdc} / 4 \div 20 \text{ mA}$ maximum range<br>Default is $0 \div 10 \text{ Vdc}$                              | Input - analog signal<br><b>Dip-switch selectable</b> |
|  | 12  | <b>AGND</b>      | Common gnd for Q_MONITOR and stabilized power supply  | Common gnd  |
|  | 13  | <b>+10V</b>      | Stabilized power supply +10V - Current: max 10 mA   | Output power supply                                   |
|  | 14  | <b>-10V</b>      | Stabilized power supply -10V - Current: max 10 mA   | Output power supply                                   |
|  | 15  | <b>Q_MONITOR</b> | Flow monitor output signal: $\pm 10 \text{ Vdc}$ maximum range, referred to AGND Default is $0 \div 10 \text{ Vdc}$ ( $10\text{V} = 3276,7 \text{ rpm}$ ) | Output - analog signal<br><b>Software selectable</b>  |

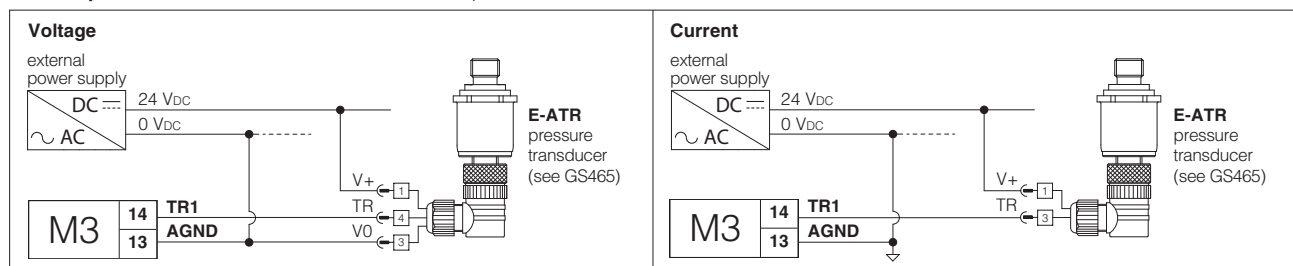
(1) Digital output with fast contact    (2) Digital output with relay contact

## 8.2 M3 connector - IN/OUT digital and analog signals - p/Q control connections


| CONNECTOR  | PIN | SIGNAL           | TECHNICAL SPECIFICATIONS  | NOTES   |
|--|-----|------------------|---|---|
| <b>M3</b><br> | 1   | <b>DI5</b>       | Enable (24 Vdc) or disable (0 Vdc) p/Q control, referred to DGND  | Input - on/off signal                                 |
|  | 2   | <b>DI6</b>       | Pressure smart tuning selection IN0, referred to DGND   | Input - on/off signal                                 |
|  | 3   | <b>DI7</b>       | Pressure smart tuning selection IN1, referred to DGND   | Input - on/off signal                                 |
|  | 4   | <b>DI8</b>       | For SSP with single pump execution:<br>(not used)   | Input - on/off signal                                 |
|  |     |                  | For SSP with double pump execution:<br>Enable (24 Vdc) or disable (0 Vdc) single pump, referred to DGND   |   |
|  | 5   | <b>DGND</b>      | Common gnd for digital input  | Common gnd  |
|  | 6   | <b>DO3 (1)</b>   | Smart maintenance alert (24 Vdc) or not alert (0 Vdc), referred to DO3-24V  | Output - on/off signal<br><b>Software selectable</b>  |
|  | 7   | <b>DO3-24V</b>   | DO3 power supply 24 Vdc   | Input - power supply                                  |
|  | 8   | <b>DO4 (2)</b>   | STO corrupted (24 Vdc) or not corrupted (0 Vdc), referred to DO4-24V  | Output - on/off signal<br><b>Software selectable</b>  |
|  | 9   | <b>DO4-24V</b>   | DO4 power supply 24 Vdc   | Input - power supply                                  |
|  | 10  | <b>AGND</b>      | Common gnd for P_MONITOR  | Common gnd  |
|  | 11  | <b>P_INPUT-</b>  | Negative pressure reference input signal for P_INPUT+   | Input - analog signal                                 |
|  | 12  | <b>P_INPUT+</b>  | Pressure reference input signal: $\pm 10 \text{ Vdc} / 4 \div 20 \text{ mA}$ maximum range<br>Default is $0 \div 10 \text{ Vdc}$                                | Input - analog signal<br><b>Dip-switch selectable</b> |
|  | 13  | <b>AGND</b>      | Common gnd for transducer signal  | Common gnd  |
|  | 14  | <b>TR1</b>       | Signal pressure transducer: $\pm 10 \text{ Vdc} / 4 \div 20 \text{ mA}$ maximum range<br>Default is $4 \div 20 \text{ mA}$                                      | Input - analog signal<br><b>Dip-switch selectable</b> |
|  | 15  | <b>P_MONITOR</b> | Pressure monitor output signal: $\pm 10 \text{ Vdc}$ maximum range, referred to AGND<br>Default is $0 \div 10 \text{ Vdc}$ ( $10\text{V} = 819,2 \text{ bar}$ ) | Output - analog signal<br><b>Software selectable</b>  |

(1) Digital output with fast contact    (2) Digital output with relay contact


## Remote pressure transducer connections - examples




### 8.3 M2 connector - not used - available only for common GND and SHIELD connection

| CONNECTOR  | PIN | SIGNAL | TECHNICAL SPECIFICATIONS | NOTES          |
|--|-----|--------|--------------------------|----------------|
| <b>M2</b><br> | 1   | NC     | -                        | Do not connect |
|  | 2   | NC     | -                        | Do not connect |
|  | 3   | NC     | -                        | Do not connect |
|  | 4   | NC     | -                        | Do not connect |
|  | 5   | GND    | Common gnd               |                |
|  | 6   | SHIELD | Shield                   |                |


### 8.4 X3 connector - 24VDC input power supply - only for drives type 022 ÷ 060

| CONNECTOR  | PIN | SIGNAL | TECHNICAL SPECIFICATIONS | NOTES                |
|--|-----|--------|--------------------------|----------------------|
| <b>X3</b><br> | 1   | V+_IN  | Power supply 24 Vdc      | Input - power supply |
|  | 2   | V0_IN  | Power supply 0 Vdc       | Gnd - power supply   |

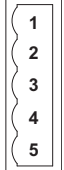
### 8.5 X1-IN connector - 24VDC Input power supply - only for drives type 090 ÷ 210

| CONNECTOR  | PIN | SIGNAL | TECHNICAL SPECIFICATIONS | NOTES                |
|--|-----|--------|--------------------------|----------------------|
| <b>X1-IN</b><br> | 1   | V+_IN  | Power supply 24 Vdc      | Input - power supply |
|  | 2   | V0_IN  | Power supply 0 Vdc       | Gnd - power supply   |

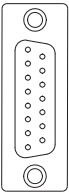
### 8.6 X1-OUT connector - 24VDC output power supply - only for drives type 090 ÷ 210

| CONNECTOR  | PIN | SIGNAL | TECHNICAL SPECIFICATIONS | NOTES                 |
|--|-----|--------|--------------------------|-----------------------|
| <b>X1-OUT</b><br> | 1   | V+_OUT | Power supply 24 Vdc      | Output - power supply |
|  | 2   | V0_OUT | Power supply 0 Vdc       | Gnd - power supply    |

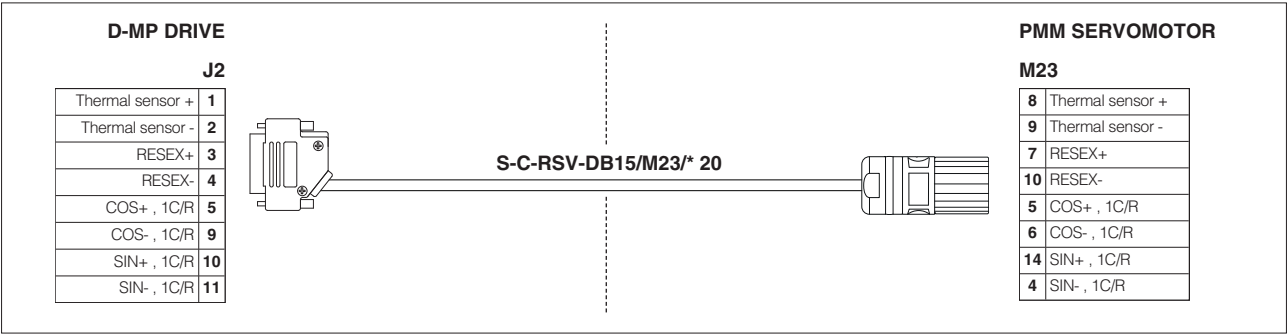
### 8.7 S1 connector - Safe Torque Off (STO)

| CONNECTOR  | PIN | SIGNAL    | TECHNICAL SPECIFICATIONS  | NOTES                |
|--|-----|-----------|---|----------------------|
| <b>S1</b><br> | 1   | +24V_STO1 | Power supply for STO1 - first safety system channel<br>Voltage: +24 Vdc ±10 % - Current: max 10 mA  | Input - power supply |
|  | 2   | 0V_STO1   |   | Gnd - power supply   |
|  | 3   | NC        | -   | Do not connect       |
|  | 4   | +24V_STO2 | Power supply for STO2 - second safety system channel<br>Voltage: +24 Vdc ±10 % - Current: max 10 mA | Input - power supply |
|  | 5   | 0V_STO2   |   | Gnd - power supply   |

8.8 J2 connector - Servomotor resolver - DB15 - 15 pin

| CONNECTOR  | PIN | SIGNAL           | TECHNICAL SPECIFICATIONS                               | NOTES                 |
|--|-----|------------------|--|-----------------------|
| <div><div>J2</div><div></div><div>female<br/>(drive view)</div></div> | 1   | Thermal sensor + | Servomotor thermal sensor - positive input (KTY or PT) | Input - analog signal |
|  | 2   | Thermal sensor + | Servomotor thermal sensor - negative input (KTY or PT) | Input - analog signal |
|  | 3   | RESEX+           | -  |                       |
|  | 4   | RESEX-           | -  |                       |
|  | 5   | COS+ , 1C/R      | -  |                       |
|  | 6   | NC               | -  | Do not connect        |
|  | 7   | NC               | -  | Do not connect        |
|  | 8   | NC               | -  | Do not connect        |
|  | 9   | COS- , 1C/R      | -  |                       |
|  | 10  | SIN+ , 1C/R      | -  |                       |
|  | 11  | SIN- , 1C/R      | -  |                       |
|  | 12  | NC               | -  | Do not connect        |
|  | 13  | NC               | -  | Do not connect        |
|  | 14  | NC               | -  | Do not connect        |
|  | 15  | NC               | -  | Do not connect        |

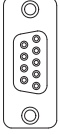
Servomotor resolver cable connection - example - see tech table AS810




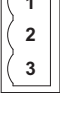
**Note:** for more information about PMM servomotor, please refer tech table AS400.



### 8.9 J1 connector - Serial RS485 communication port - DB9 - 9 pin

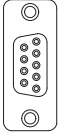
| CONNECTOR  | PIN | SIGNAL | TECHNICAL SPECIFICATIONS | NOTES          |
|--|-----|--------|--------------------------|----------------|
| <b>J1</b><br><br>female<br>(drive view) | 1   | NC     | -                        | Do not connect |
|  | 2   | TX+    | Transmitter              |                |
|  | 3   | RX+    | Receiver                 |                |
|  | 4   | NC     | -                        | Do not connect |
|  | 5   | NC     | -                        | Do not connect |
|  | 6   | TX-    | Transmitter              |                |
|  | 7   | RX-    | Receiver                 |                |
|  | 8   | NC     | -                        | Do not connect |
|  | 9   | NC     | -                        | Do not connect |

### 8.10 M4-2 and M4-3 connectors - CANopen (BC) - always present (not use for NP, BP, EH, EP)

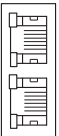
| CONNECTOR  | PIN | SIGNAL  | TECHNICAL SPECIFICATIONS | NOTES |
|--|-----|---------|--------------------------|-------|
| <b>M4-2</b><br><br>main | 1   | CAN_HA  | Bus line (high)          |       |
|  | 2   | CAN_LA  | Bus line (low)           |       |
|  | 3   | CAN_GND | Signal zero data line    |       |
| <b>M4-3</b><br><br>main | 1   | CAN_HB  | Bus line (high)          |       |
|  | 2   | CAN_LB  | Bus line (low)           |       |
|  | 3   | CAN_GND | Signal zero data line    |       |

**Note:** inside the control board is present a dip-switch to terminate the fieldbus network. For more information, please refer S-MAN-HW manual.

### 8.11 BUS2 connector - PROFIBUS DP (BP)

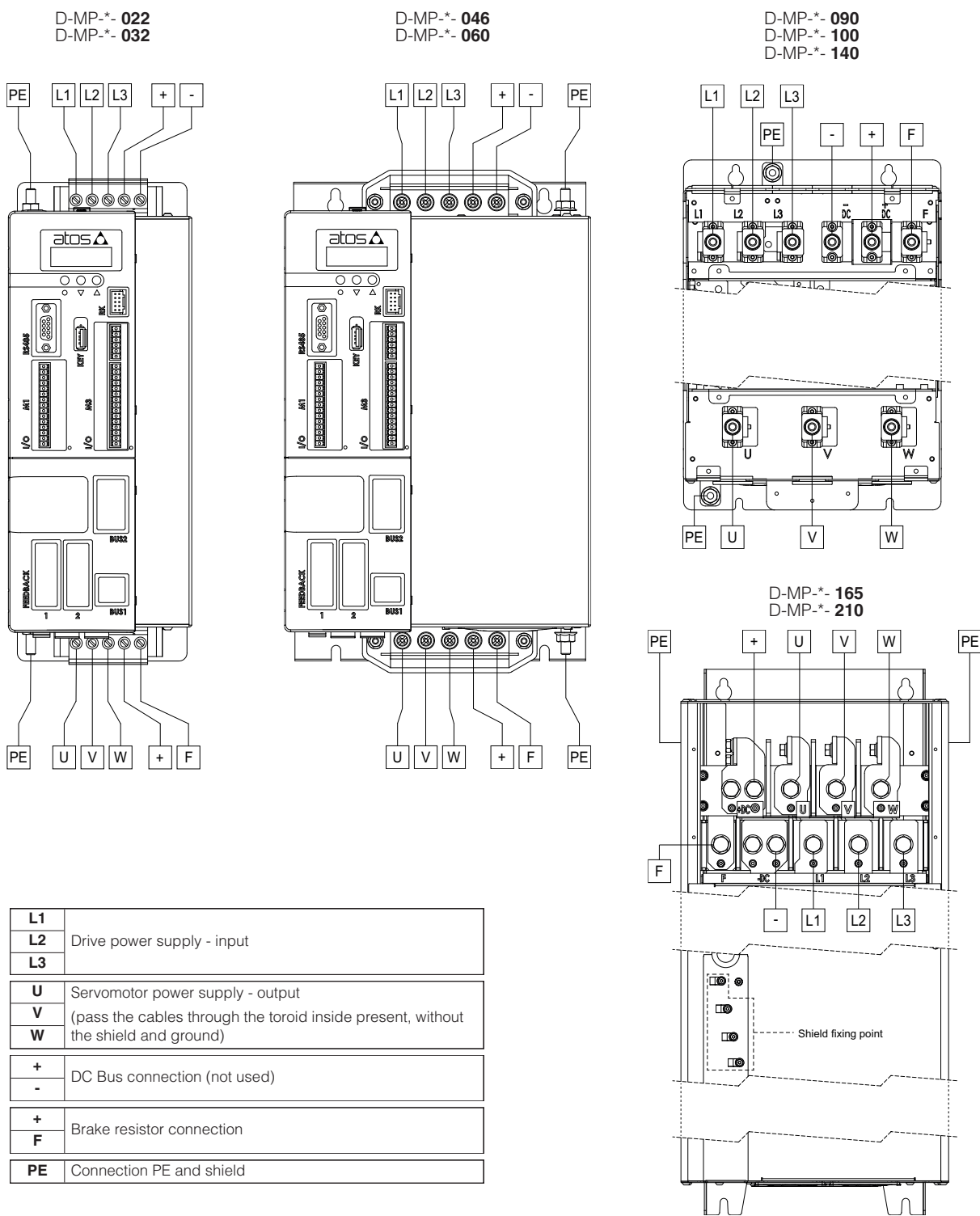
| CONNECTOR  | PIN | SIGNAL | TECHNICAL SPECIFICATIONS              | NOTES          |
|--|-----|--------|---------------------------------------|----------------|
| <b>BUS2</b><br> | 1   | SHIELD | Shield                                |                |
|  | 2   | NC     | -                                     | Do not connect |
|  | 3   | LINE_B | Bus line (B)                          |                |
|  | 4   | DE     | Control's signal for repeater         |                |
|  | 5   | DGND   | Data line and termination signal zero |                |
|  | 6   | +5V    | Termination supply signal             |                |
|  | 7   | NC     | -                                     | Do not connect |
|  | 8   | LINE_A | Bus line (A)                          |                |
|  | 9   | NC     | -                                     | Do not connect |

### 8.12 BUS2 connectors IN/OUT - Ethernet (EH, EP)

| CONNECTOR  | PIN | SIGNAL | TECHNICAL SPECIFICATIONS   | NOTES          |
|--|-----|--------|----------------------------|----------------|
| <b>BUS2</b><br> | 1   | TX+    | Transmitter (white/orange) |                |
|  | 2   | RX+    | Receiver (orange)          |                |
|  | 3   | TX-    | Transmitter (white/green)  |                |
|  | 4   | NC     | -                          | Do not connect |
|  | 5   | NC     | -                          | Do not connect |
|  | 6   | RX-    | Receiver (green)           |                |
|  | 7   | NC     | -                          | Do not connect |
|  | 8   | NC     | -                          | Do not connect |

**Note:** perform the cables connection following the IN and OUT indications.

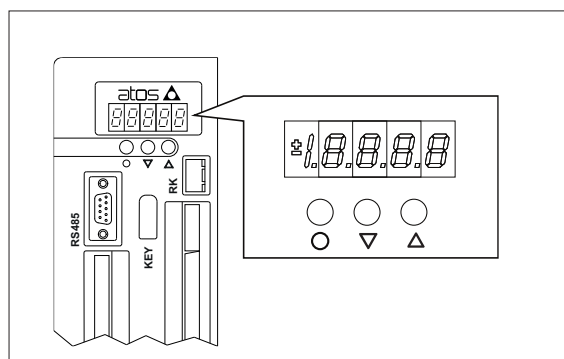
## 9 DRIVE AND SERVOMOTOR POWER CONNECTIONS



## 10 DISPLAY

On the drive front panel is available a numeric display to view the drive status and/or alarms condition. For more information, please refer S-MAN-SW manual.

**Note:** the 3 keys, ● (S selection), ▼ (- decrease), ▲ (+ increase) are not used



## 11 POWER SUPPLY AND SIGNALS SPECIFICATIONS

Atos digital drives are CE marked according to the applicable directives (e.g. Immunity and Emission EMC Directive).

Installation, wirings and start-up procedures must be performed according to the general prescriptions shown in tech table **AS050** and in the user manuals included in the S-SW-SETUP programming software.

Generic electrical output signals of the drive (e.g. fault or monitor signals) must not be directly used to activate safety functions, like to switch-ON/OFF the machine's safety components, as prescribed by the European standards (Safety requirements of fluid technology systems and components-hydraulics, ISO 4413).

### 11.1 Drive power supply (L1, L2, L3)

The drive must be connected to the main power supply through terminals L1, L2, L3 and with the ground cable connected to the PE stud (see section [9](#)).

When connecting drives type 022 ÷ 060A to 3-phase supply mains we recommend using a 3-phase reactance (see tech table **AS810**).

**For drives type 090 ÷ 210 the 3-phase input reactance is mandatory.** The 3-phase reactance is used to reduce the current peaks on the diode bridge DB and the effective value of the current through the capacitors. It is also used to reduce interference from the supply line to the drive and from the drive to the line.

The drive must be wired steadily through appropriately sized cables (see section [13](#)).

**Notes:** drives type 022 ÷ 060 feature a soft-start function built in the drive;  
the reactance can be omitted only for particular cases (in this case contact Atos technical office)



A correct installation to the main power supply is required according to IEC 61800-5-1



Ultra-fast fuses must be installed between the main power supply and the drive (see section [14](#))

### 11.2 Servomotor power supply (U, V, W)

The servomotor must be connected to terminals U, V, W and with the ground cable connected to the PE stud (see section [9](#)).

For drives type 090 ÷ 140 pass the servomotor 3-phase through the present toroid inside, without shield and ground. Connect the servomotor by means of shielded or armored cables only and ground the shield on the converter side as well as on servomotor side. If shielded cables cannot be used, the servomotor cables should be placed in a metallic raceway connected to ground.

Atos recommends to use a 3-phase reactance between the drive and the servomotor; with cables longer than 50 meters, the reactance is mandatory (for more information please consult Atos technical office).

Any short circuit between U, V, W will cause the drive to shut down. If the interruption between the servomotor and the drive is obtained by means of electromagnetic switches (such as contactors, thermal relays and the like) ensure that the drive is disabled before cutting off the connection between the servomotor and the drive (in order not to damage the contactors).

The servomotor must be wired steadily through appropriately sized cables (see section [13](#)).

### 11.3 24VDC input power supply (V+<sub>IN</sub> and V0<sub>IN</sub>)

Through the pins 1 and 2 of the X3 connector (for drives type 022 ÷ 060 see 8.4) or X1-IN connector (for drives type 090 ÷ 210 see 8.5) is possible to power the drive logic and servomotor sensor (mandatory for drives type 022 ÷ 060 no self powered).

The drives type 090 ÷ 210 generates internally a 24 V<sub>DC</sub> auxiliary supply through the main power supply; the drive logic can be supply through X1-IN connector with an external 24 V<sub>DC</sub> without produce conflict between the internally generated voltage and the auxiliary power supplied externally (is used the source with higher voltage level). This feature allows to configure the drive without main power supply and keep the drive logic switched on even in the absence of the drive main power supply.

### 11.4 24VDC output power supply (V+<sub>OUT</sub> and V0<sub>OUT</sub>)

Only for drives type 090 ÷ 210 the 24V<sub>DC</sub> output power supply is available on pins 1 and 2 of the X1-OUT connector (see 8.6).

This voltage can be used only to provide an auxiliary supply for digital I/O to the drive and provides an auxiliary supply for STO channels function (the auxiliary supply must be interrupted by suitable safety contacts). The output current is internally limited to a 500mA; protection against external over-current and short-circuit.

### 11.5 Flow reference input signals (Q<sub>INPUT</sub>+) )

The drive is designed to receive an analog reference input signal (pin 11 on M1) for the servomotor rotation speed.

Flow reference input signal is factory preset, default is 0 ÷ 10 V<sub>DC</sub>.

Drive with fieldbus interface can be software set to receive reference signal directly from the machine control unit (fieldbus reference).



Input signal can be reconfigured between voltage and current within a maximum range of  $\pm 10$  V<sub>DC</sub> or 4 ÷ 20 mA, using specific dip-switch present on the drive. Set the dip-switch with the drive powered off and before making the electrical connections as it would not be possible to remove the cover with connectors wired (see S-MAN-HW installation manual).

### 11.6 Pressure reference input signal (P<sub>INPUT</sub>+) )

The drive is designed to receive an analog reference input signal (pin 12 on M3) for the system pressure.

Pressure reference input signal is factory preset, default is 0 ÷ 10 V<sub>DC</sub>.

Drive with fieldbus interface can be software set to receive reference signal directly from the machine control unit (fieldbus reference).



Input signal can be reconfigured between voltage and current within a maximum range of  $\pm 10$  V<sub>DC</sub> or 4 ÷ 20 mA, using specific dip-switch present on the drive. Set the dip-switch with the drive powered off and before making the electrical connections as it would not be possible to remove the cover with connectors wired (see S-MAN-HW installation manual).

### 11.7 Flow monitor output signal (Q<sub>MONITOR</sub>)

The drive generates an analog output signal (pin 15 on M1) for servomotor actual rotation speed.

The monitor output signal can be software set to show other signals available in the drive.

Default is 0 ÷ 10 V<sub>DC</sub> (10V = 3276,7 rpm). For more information please refer S-MAN-SW programming software manual.

### 11.8 Pressure monitor output signal (P<sub>MONITOR</sub>)

The drive generates an analog output signal (pin 15 on M3) to the system actual pressure.

The monitor output signal can be software set to show other signals available in the drive.

Default is 0 ÷ 10 V<sub>DC</sub> (10V = 819,2 bar). For more information please refer S-MAN-SW programming software manual.

### 11.9 Enable input signal (DI1)

To enable the servomotor control, supply a 24 V<sub>DC</sub> on pin 1 of the M1: Enable input signal allows to enable/disable servomotor control, without removing the electrical power supply to the drive; it is used to keep active the communication and the other driver functions when the drive must be disabled for safety reasons. This condition **does not comply** with norms IEC 61508 and ISO 13849.

Input is optoisolated from the internal regulation (24 V<sub>DC</sub>  $\pm$  10% @ I<sub>max</sub> 10 mA).

### 11.10 Multiple axis selection input signal (DI2 and DI3)

Two on-off input signals are available on pin 2 and pin 3 of the M1 connector to select one of the four axis parameters setting, stored into the drive.

Switching the active setting of axis during the machine cycle allows to optimize the system dynamic response in different hydraulic working conditions (volume, flow, etc.).

Supply a 24 V<sub>DC</sub> or a 0 V<sub>DC</sub> on pin 2 and/or pin 3 of the M1, to select one of the PID settings as indicated by binary code table at side.

Input is optoisolated from the internal regulation (24 V<sub>DC</sub>  $\pm$  10% @ I<sub>max</sub> 10 mA).

| PIN  | AXIS SELECTION |                    |                    |                    |
|------|----------------|--------------------|--------------------|--------------------|
|      | SET 1          | SET 2              | SET 3              | SET 4              |
| M1-2 | 0              | 24 V <sub>DC</sub> | 0                  | 24 V <sub>DC</sub> |
| M1-3 | 0              | 0                  | 24 V <sub>DC</sub> | 24 V <sub>DC</sub> |

### 11.11 Alarm reset input signal (DI4)

Alarm reset input signal allows to clear all alarms present into the drive: to reset the drive alarms, supply 24 V<sub>DC</sub> on pin 4 of the M1.

Input is optoisolated from the internal regulation (24 V<sub>DC</sub>  $\pm$  10% @ I<sub>max</sub> 10 mA).

### 11.12 Fault output signal (DO1)

This output signal (pin 6 on M1) indicates fault conditions of the drive (reference or transducer signal cable broken, maximum error exceeded, etc.). Fault presence corresponds to 0 Vdc, normal working corresponds to 24 Vdc. Fault status is not affected by the status of the Enable input signal.

This output signal can be used as digital output by software selection.

**Notes:** when STO function is enabled the fault output signal is set to 0 Vdc (see section 12); digital output with fast contact (max 5 kHz)

### 11.13 STO test suggested output signal (DO2) - for SSP with single pump execution, without /D option

This output signal (pin 8 on M1) indicates that the STO test is suggested (see section 12).

STO test suggested corresponds to 24 Vdc, while not suggested corresponds to 0 Vdc.

STO test suggested logical output signal is not intended as a fault condition.

This output signal can be used as digital output by software selection.

**Note:** digital output with relay contact

### 11.14 Smart cooling active output signal (DO2) - for SSP with single pump execution, with /D option

This output signal (pin 8 on M1) indicates the working conditions to which the internal gear pump (PGI\*) is subject to rapid overheating. For /D option (see AS100) this digital output condition can be used to manage (using an external relay) the JO-DL cartridge installed on the manifold block.

Smart cooling active corresponds to 24 Vdc, while not active corresponds to 0 Vdc.

Smart cooling active logical output signal is not intended as a fault condition.

This output signal can be used as digital output by software selection.

Note: digital output with relay contact

### 11.15 Single pump mode ON active output signal (DO2) - for SSP with double pump execution

For the double pump execution, a venting valve must be energized to vent the first pump.

This output signal (pin 8 on M1) can be used to energize the venting valve (see AS100).

Single pump active corresponds to 24 Vdc (exclusion of the first pump), while not active corresponds to 0 Vdc.

This output signal can be used as a digital output via software selection.

Note: digital output with relay contact

### 11.16 Enable p/Q control input signal (DI5)

By default, the p/Q control is always active.

Through S-SW-SETUP software, it's possible to modify the configuration of the drive so that the p/Q control can be enabled/disabled via this digital input:

- when digital input is set to 0Vdc, p/Q control is disabled and the drive performs just flow control
- when digital input is set to 24Vdc, p/Q control is enabled and the drive performs flow and pressure control

Input is optoisolated from the internal regulation (24 Vdc  $\pm$  10% @ Imax 10 mA).

### 11.17 Pressure smart tuning selection input signals (DI6 and DI7)

Pressure smart tuning selection can be switched from Dynamic (default) to Balanced or Smooth via software, fieldbus or using DI6 and DI7 digital inputs (pin 2 and 3 on M3), as shown at side; if requested, performances can be further customized directly tuning each single PID control parameter.

Inputs are optoisolated from the internal regulation (24 Vdc  $\pm$  10% @ Imax 10 mA).

| PIN  | SMART TUNING SELECTION |          |        |
|------|------------------------|----------|--------|
|      | DYNAMIC                | BALANCED | SMOOTH |
| M3-2 | 0                      | 24 Vdc   | 0      |
| M3-3 | 0                      | 0        | 24 Vdc |

### 11.18 Single pump mode activation input signals (DI8) - for SSP with double pump execution

By default, the system operates with automatic single pump mode activation enabled. In this mode, the drive automatically excludes the first pump and uses only the second pump when necessary.

Through S-SW-SETUP software, the drive can be configured to control the single pump activation via a digital input signal. This allows manual activation or deactivation of the single pump mode according to the digital input status:

- when digital input is set to 0 Vdc, the single pump is not activated and the system works with both pumps
- when digital input is set to 24 Vdc, single pump is activated and the drive excludes the first pump and works in single pump mode, operating only the second pump

To enable the single pump mode activation, supply a 24 Vdc on pin 4 of the M3: this signal allows to enable/disable the single pump activation.

Input is optoisolated from the internal regulation (24 Vdc  $\pm$  10% @ Imax 10 mA).

### 11.19 Smart maintenance alert output signal (DO3)

This output signal (pin 6 on M3) indicates that smart maintenance must be performed.

Smart maintenance alert corresponds to 24 Vdc, while not alert corresponds to 0 Vdc.

This output signal can be used as digital output by software selection.

**Note:** digital output with fast contact (max 5 kHz)

### 11.20 STO corrupted output signal (DO4)

This output signal (pin 8 on M3) indicates the presence of fault conditions or the need for specific actions for the STO function.

The STO corrupted corresponds to 24 Vdc, while not corrupted corresponds to 0 Vdc.

This output signal can be used as digital output by software selection.

**Note:** digital output with relay contact

### 11.21 Remote pressure transducer input signals (TR1)

Analog remote pressure transducers can be directly connected to the drive.

Analog input signal (pin 14 on M3) is factory preset, default is 4  $\div$  20 mA.

Refer to pressure transducer characteristics to select the transducer type according to specific application requirements.



Input signal can be reconfigured between voltage and current within a maximum range of  $\pm$ 10 Vdc or 4  $\div$  20 mA, using specific dip-switch present on the drive. Set the dip-switch with the drive powered off and before making the electrical connections as it would not be possible to remove the cover with connectors wired (see S-MAN-HW installation manual).

## 12 STO FUNCTION - /K always present

The drive implements the Safe Torque Off (STO) function as a prevention of unexpected starts according to 2006/42/EC Machinery Directive (MD) - standard EN 61800-5-2.

This function is enabled setting 0 Vdc on both +24V\_STO1 and +24V\_STO2 channels. It prevents the generation of a rotating magnetic field removing the power semiconductor control voltage allowing short-term operations (such as cleaning and / or maintenance work on parts of non-electrical devices of the machine) without disconnecting drive power supply or the connection between the drive and the servomotor.

For detailed descriptions, please refer to the S-MAN-HW installation manual.



The STO function must be tested periodically as indicated in the S-MAN-HW manual to avoid the servomotor control is automatically disabled.



If the STO function is not used, both channels +24V\_STO1 and +24V\_STO2 must be permanently connected to the 24V voltage.



Even if the STO function is not used, it is still necessary to periodically test the STO function.

## 13 POWER AND PROTECTION CABLES SIZE

### 13.1 IEC specifications

| Drive type | Servomotor type (1) | Drive power cables | Servomotor power cables | Drive, servomotor power cables and braking cables tightening torque | Protection cables | Protection cables tightening torque | Power cables max length   |
|------------|---------------------|--------------------|-------------------------|---|-------------------|-------------------------------------|---------------------------|
|            |                     | [mm²]              | [mm²]                   | [Nm]  | [mm²]             | [Nm]                                | [m]                       |
|            |                     | L1 , L2 , L3       | U , V , W               | L1 , L2 , L3<br>U , V , W<br>+ , F                                  | PE                | PE                                  | L1 , L2 , L3<br>U , V , W |
| D-MP-*-022 | PMM-*-1009          | 6                  | 6                       | 1,7   | 6                 | 8,5                                 | 50 <b>(2)</b>             |
| D-MP-*-032 | PMM-*-1015          | 10                 | 10                      | 1,7   | 10                |                                     |                           |
| D-MP-*-046 | PMM-*-1024          | 16                 | 16                      | 3,8   | 16                |                                     |                           |
| D-MP-*-060 | PMM-*-1032          | 25                 | 25                      | 3,8   | 16                |                                     |                           |
| D-MP-*-090 | PMM-*-2042          | 50                 | 50                      | 15 - 20   | 35                | 15 - 20                             |                           |
| D-MP-*-100 | PMM-*-2055          | 70                 | 70                      | 15- 20  | 35                |                                     |                           |
| D-MP-*-140 |                     | 70                 | 70                      | 15 - 20   | 50                |                                     |                           |
| D-MP-*-165 | PMM-*-2080          | 95                 | 95                      | 25 - 30   | 70                | 25 - 30                             |                           |
| D-MP-*-210 | PMM-*-2100          | 95                 | 95                      | 25 - 30   | 70                |                                     |                           |

(1) For more information about PMM servomotor, please refer tech table **AS400**

(2) With cables longer than 50 meters, 3-phase reactance between the drive and the servomotor is mandatory  
For more information please consult Atos technical office

### 13.2 UL specifications

| Drive type | Servomotor type (1) | Drive power cables | Servomotor power cables | Drive, servomotor power cables and braking cables tightening torque | Protection cables |              | Protection cables tightening torque | Power cables max length   |
|------------|---------------------|--------------------|-------------------------|---|-------------------|--------------|-------------------------------------|---------------------------|
|            |                     | [AWG / kcmil]      | [AWG / kcmil]           | [Lbin-in]   | [AWG]             |              | [Lbin-in]                           | [ft]                      |
|            |                     | L1 , L2 , L3       | U , V , W               | L1 , L2 , L3<br>U , V , W<br>+ , F                                  | PE [UL] (2)       | PE [CSA] (3) | PE                                  | L1 , L2 , L3<br>U , V , W |
| D-MP-*-022 | PMM-*-1009          | AWG 8              | AWG 8                   | 15  | 10                | 10           | 75                                  | 164 (4)                   |
| D-MP-*-032 | PMM-*-1015          | AWG 6              | AWG 6                   | 15  | 8                 | 10           |                                     |                           |
| D-MP-*-046 | PMM-*-1024          | AWG 3              | AWG 4                   | 40  | 8                 | 8            |                                     |                           |
| D-MP-*-060 | PMM-*-1032          | AWG 2              | AWG 3                   | 40  | 8                 | 8            |                                     |                           |
| D-MP-*-090 | PMM-*-2042          | AWG 1              | AWG 1                   | 132.3-177   | 6                 | 6            | 133-177                             |                           |
| D-MP-*-100 | PMM-*-2055          | AWG 1/0            | AWG 1/0                 | 132.3-177   | 4                 | 4            |                                     |                           |
| D-MP-*-140 |                     | AWG 4/0            | AWG 4/0                 | 132.3-177   | 4                 | 4            |                                     |                           |
| D-MP-*-165 | PMM-*-2080          | 250 Kcmil          | 250 Kcmil               | 221.3-265.5   | 3                 | 3            |                                     |                           |
| D-MP-*-210 | PMM-*-2100          | 350 Kcmil          | 350 Kcmil               | 221.3-265.5   | 3                 | 3            |                                     |                           |

(1) For more information about PMM servomotor, please refer tech table **AS400**

(2) Article 250.122 - Table 250.122 of the NEC (UL)

(3) CSA C22.2 No. 274, Table 9 (CSA)

(4) With cables longer than 164 ft, 3-phase reactance between the drive and the servomotor is mandatory  
For more information please consult Atos technical office

## 14 FUSES

| Drive type | Min. short circuit current<br>[A] | Input current without input reactance<br>[A] | Input current with input reactance<br>[A] | Rated current<br>[A] | I <sup>2</sup> t clearing @660V, 20°C<br>[A²s] | Rated voltage<br>[V] | Manufacturer<br>(1) | Type             | Size    |
|------------|-----------------------------------|--|---|----------------------|--|----------------------|---------------------|------------------|---------|
| D-MP-*-022 | 280                               | 31,3   | 26,0                                      | 50                   | 770  | 700                  | BUSSMANN            | 170M1414         | 000 (3) |
| D-MP-*-032 | 380                               | 42,2   | 38  | 63                   | 1450   | 700                  | BUSSMANN            | 170M1415         | 000 (3) |
| D-MP-*-046 | 500                               | 58,5   | 54,5                                      | 80                   | 2550   | 700                  | BUSSMANN            | 170M1416         | 000 (3) |
| D-MP-*-060 | 650                               | 71,5   | 68,1                                      | 100                  | 4650   | 700                  | BUSSMANN            | 170M1417         | 000 (3) |
| D-MP-*-090 | 1400                              | 10000  | 103                                       | 200                  | 15169  | 690                  | Littelfuse          | PSR030xx0200 (2) | 030     |
| D-MP-*-100 | 1400                              |  | 118                                       | 200                  | 15169  | 690                  | Littelfuse          | PSR030xx0200 (2) | 030     |
| D-MP-*-140 | 2100                              |  | 166                                       | 315                  | 61830  | 690                  | Littelfuse          | PSR030xx0315 (2) | 030     |
| D-MP-*-165 | 2100                              |  | 195                                       | 315                  | 61830  | 690                  | Littelfuse          | PSR030xx0315 (2) | 030     |
| D-MP-*-210 | 3800                              |  | 249                                       | 450                  | 160110   | 690                  | Littelfuse          | PSR030xx0450 (2) | 030     |

**Notes:** fuses with higher current rating than the recommended ones must not be used; fuses with lower current rating can be used.

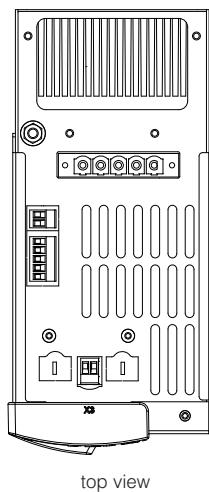
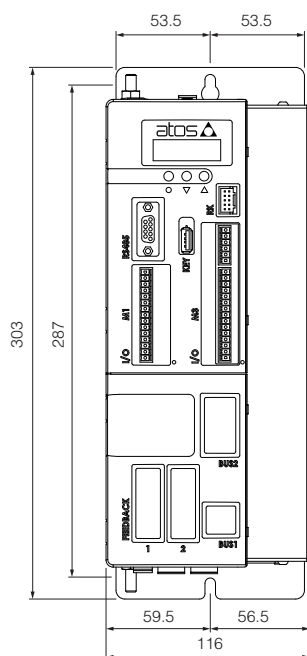
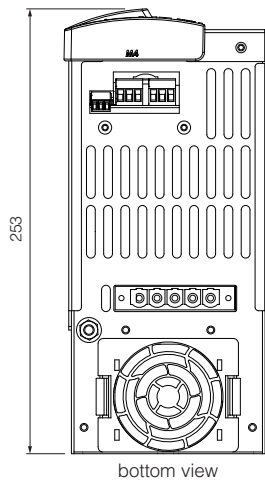
(1) Fuses from other manufacturers can be used if they meet the ratings and the melting curve of the fuse mentioned in the table

(2) "xx" defines the termination type that can be: US/UL/DS/DL/FS/FL

(3) According to IEC 60269

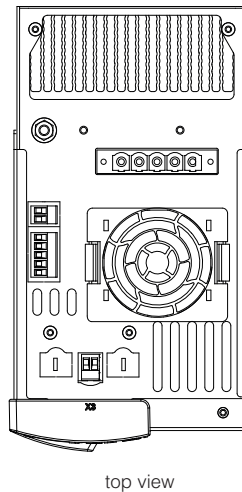
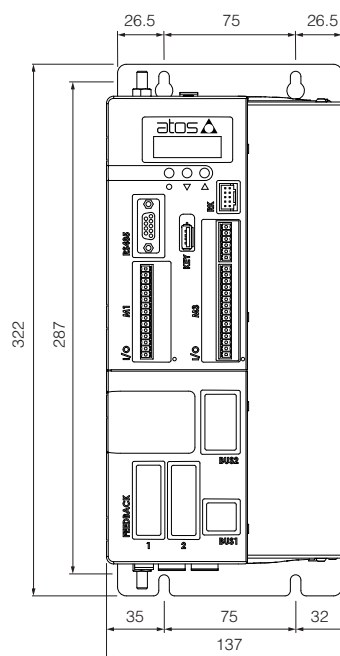
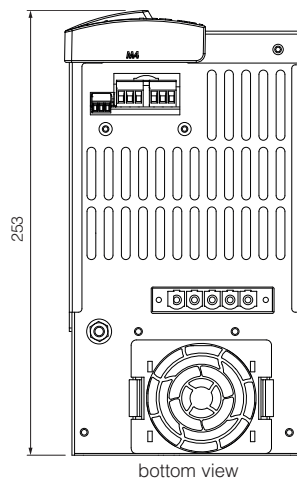
## D-MP-\*-022

Fixing screws = M4



## D-MP-\*-032

Fixing screws = M4

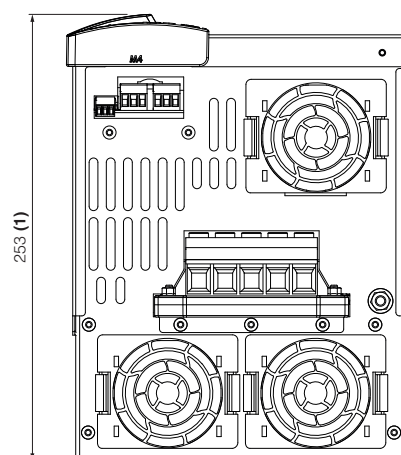


### Mass [kg]

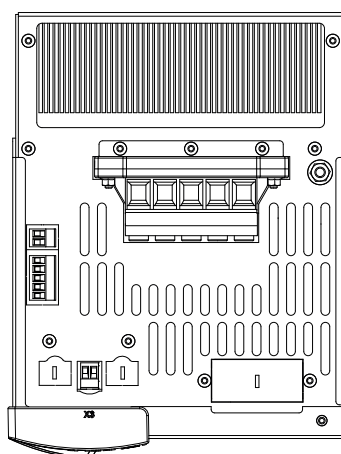
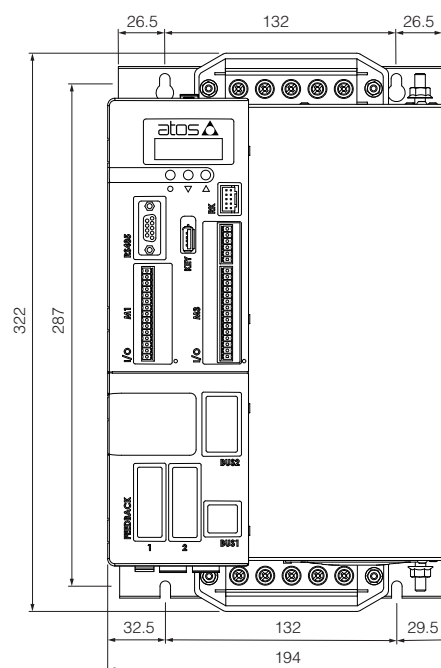
|            |     |
|------------|-----|
| D-MP-*-022 | 5.2 |
| D-MP-*-032 | 5.7 |

# **D-MP-\*-046** **D-MP-\*-060** Fixing screws = M4

| Mass [kg]  |     |
|------------|-----|
| D-MP-*-046 | 9.6 |
| D-MP-*-060 |     |



bottom view



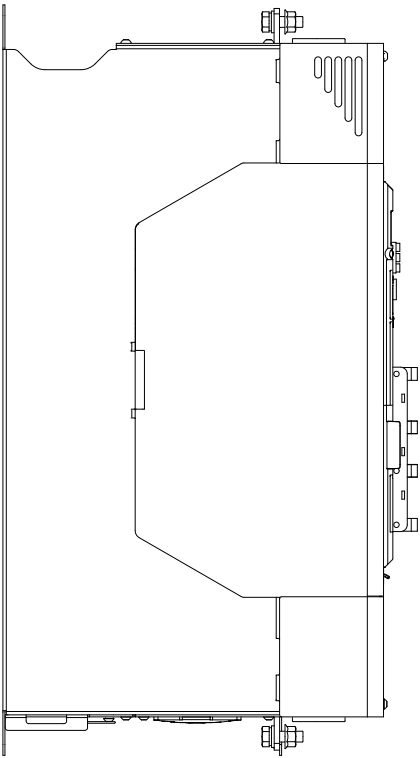
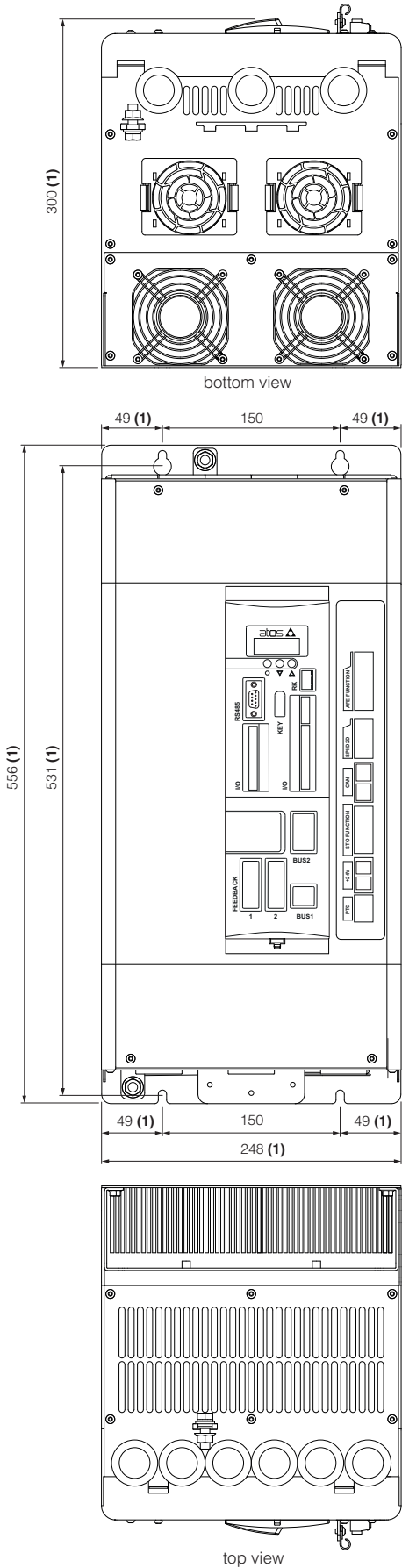
top view

(1) This measure differs from previous D-MP series 10

D-MP-\*-090  
D-MP-\*-100  
D-MP-\*-140

Fixing screws = M6

| Mass [kg]  |    |
|------------|----|
| D-MP-*-090 | 25 |
| D-MP-*-100 |    |
| D-MP-*-140 |    |



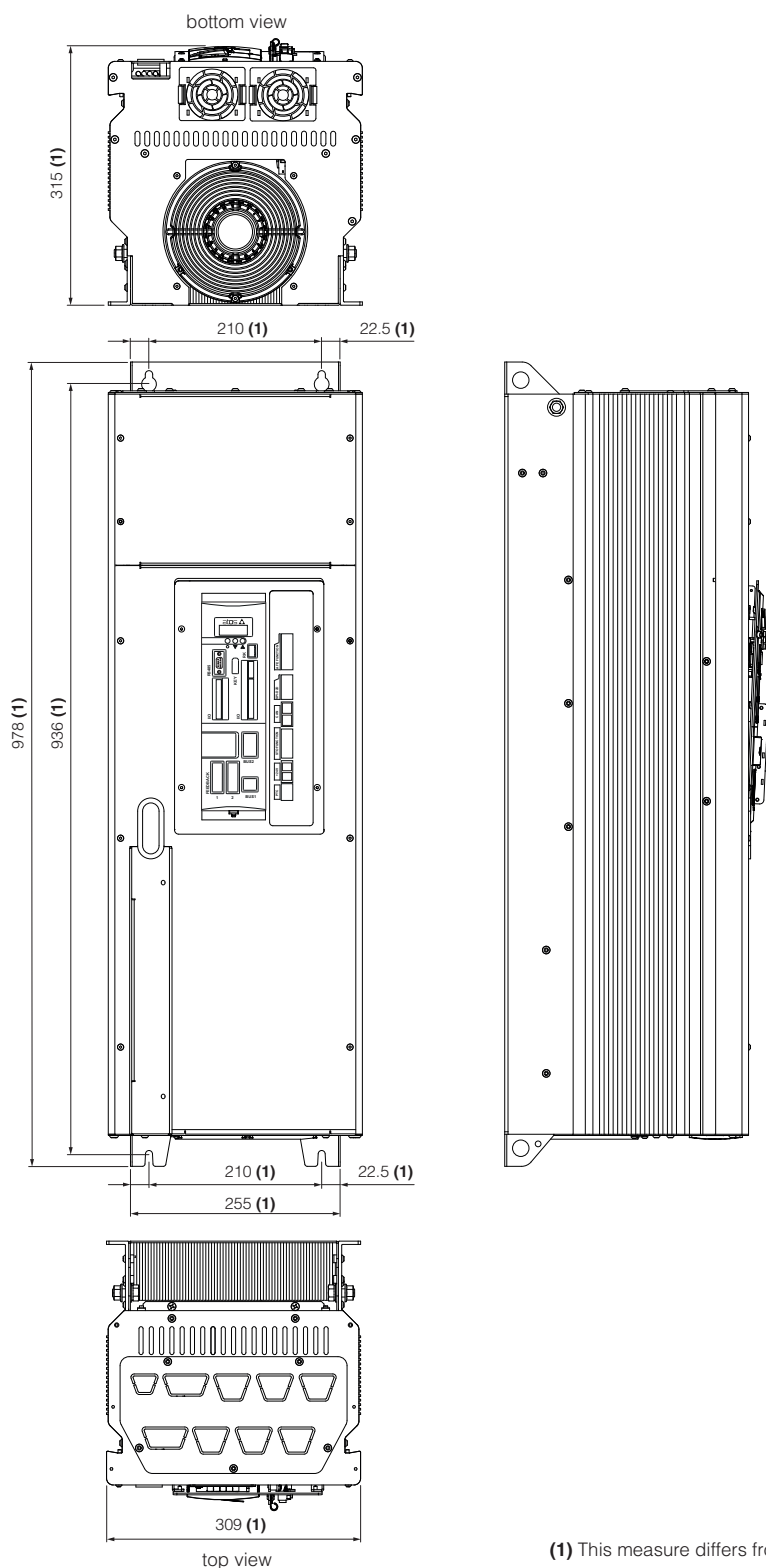
(1) This measure differs from previous D-MP series 10



# **D-MP-\*-165** **D-MP-\*-210**

Fixing screws = M8

| Mass [kg]  |    |
|------------|----|
| D-MP-*-165 | 50 |
| D-MP-*-210 |    |



## **16 RELATED DOCUMENTATION**

|              |  |                 |  |
|--------------|--|-----------------|--|
| <b>AS050</b> | Basics for Smart Servopumps - SSP                | <b>AS800</b>    | Programming tools for pumps & servopumps             |
| <b>AS100</b> | SSP Smart Servopumps                             | <b>AS810</b>    | Accessories for servopumps                           |
| <b>AS200</b> | Sizing criteria for servopumps                   | <b>AS910</b>    | Operating and maintenance information for servopumps |
| <b>AS300</b> | PGI cast iron internal gear pumps, high pressure | <b>GS510</b>    | Fieldbus   |
| <b>AS320</b> | PGIX2 cast iron double internal gear pumps       | <b>QA100</b>    | Quickstart for SSP servopumps commissioning          |
| <b>AS350</b> | PGIL aluminium internal gear pumps               | <b>S-MAN-HW</b> | Servopumps installation manual                       |
| <b>AS400</b> | PMM high performance synchronous servomotors     | <b>S-MAN-SW</b> | Servopumps programming software manual               |