

EDM-M*/30 Digital Card

Start - up manual

Duplomatic MS Spa

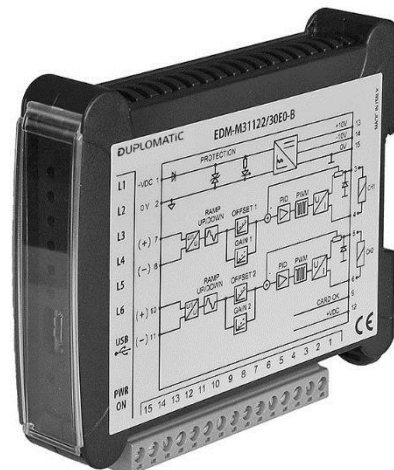


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GENERAL INFO

This manual displays information about the **digital card EDM-M* series 30**, universal amplifier for proportional valves.

Identification codes:

EDM-M1/30E*-A**

EDM-M1/30E*-B**

EDM-M2/30E*-A**

EDM-M2/30E*-B**

EDM-M3**/30E*-A**

EDM-M3**/30E*-B**

by Duplomatic MS S.p.A.

Should you have any questions concerning just the card, please contact Duplomatic MS S.p.A., indicating the description, the code and the serial number written in the label on case side.

Other useful literature about **EDM-M/30** and its start-up can be found in:

Technical catalogue **89251/218 ED**

Software pack **EBC Software v.3.1.0.0 and later**

For installation, start-up, commissioning and maintenance use only skilled workers and materials fit for purpose, as recommended.

Before installation read this file and follow strictly what is indicated.

Duplomatic MS disclaims any liability for damage to person or property resulting from noncompliance of rules and instructions here declared, from misuse or incorrect use or from tampering of provided cards.

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Features

The EDM-M is a digital card suitable for the control of one proportional valve with two solenoids (M2 version) or one/two independent proportional valves, also pressure or throttle, with one solenoid each (M1 and M3 versions).

It is designed for rail mounting type DIN EN 50022.

The card supplies the current to the solenoid according to the reference signal and independently of temperature variations or load impedance.

The card uses micro USB interface, and via software EBC configurator it is possible to set parameters.

- **100% compatible with previous version 20**
- **Micro USB connector:**
 - no serial converter required
 - optionally board supplied by USB for programming (valve use disabled)
- **Separate PWM settings (PWM-Dither) in the 2-channels version EDM-M3**
- **Enable signal** (version A only)
- Parameters programmable via software:
 - Ramps, deadband compensation, scaling of analogue inputs
- Fault recognition (cable breaks, short-circuits, etc.)

Available versions

EDM-M z xx hh /30 Ey - k

The functionalities of the module can be chosen by the proper ordering code, where:

- **Z** is the type of valve / valves to be driven.
 - 1 - single valve with one solenoid
 - 2 - single valve with two solenoids
 - 3 - two valves with one solenoid each, (separate channels, EDM-M3 can manage even two different type of valves)
- **X** indicates the nominal current required.
 - Two digits - XX - appear in M3 version only, because of the separate channels which require entries for each coil.
 - Please note that option 5 is not settable for the 2nd channel, so if you have a coil with this requirement link it with the 1st channel.**
 - 1 – 860 mA
 - 2 – 1200 mA
 - 3 – 1600 mA
 - 4 – 1880 mA
 - 5 – 2600 mA
- **H** indicates the choices for PWM frequency
 - Two digits - HH - appear in M3 version only, because of the different PWM value that each solenoid requires.
 - 1 – 100 Hz
 - 2 – 200 Hz
 - 3 – 300 Hz
 - 4 – 400 Hz
- **Y** indicates the type of reference signal
 - 0 = reference signal in voltage 0...10V or ± 10 V depending on **Z** choice,
 - 1 = reference signal in current 4...20 mA
- **K** indicates PIN12 setting as digital INPUT or digital OUTPUT
 - A = Pin 12 used for external enable (Non-existing configuration in previous series 20)
 - B = Pin 12 used for V aux (internal enable) - Series 20 compatible.

Diagnostic

| Source | Fault | Characteristic |
|----------------------------------------------------------------------|-----------------------------|--------------------------------|
| Command signal PIN 7 / 8, Command signal PIN 10 / 11 4 ÷ 20 mA | Out of range or broken wire | The power stage is deactivated |
| Solenoid A PIN 3 / 4 Solenoid B PIN 5 / 6 | Out of range or broken wire | The power stage is deactivated |
| Supply voltage | Out of range | The power stage is deactivated |
| EEPROM (at switching on) | Data error | The output is deactivated |

Power output

Proper parameters of maximum current, PWM, dither and set the output supplied to solenoids.

Separate parameters are available for each output channel in EDM-M3 card version (two valves with single solenoid)

Moreover, the output value can be compensated using the deadband compensation parameter set.

The maximum current that can be provided to a coil is 120% of the CURRENT parameter.

The upper limit of CURRENT is set by CURRENT_LIM parameter and it can't go over the maximum current of 3600 mA for the output a 2600 mA.

Analog input

Analog inputs type can be selected by SIGNAL_TYPE parameter and signals can be scaled by SIGNAL_OFFSET and SIGNAL_GAIN parameters.

M1 version (for one valve with one coil) require unipolar voltage (0...10 V) or current signal (4...20 mA)

M2 version (for one valve with two coils) generates a proportional current on solenoid A with a positive value of voltage or a current between 12...20 mA and a proportional current on solenoid B with a negative value of voltage or a current between 4...12 mA.

M3 version (for two valves with one coil each), requires that both the analogue inputs must be used.

Led description

The card is equipped with LEDs in the front panel, for a fast check of the card operation.

PWR ON (green led): Power On

OFF: No power supply

ON: Module supplied

L1, L2, L3, L4 (yellow led): Function according with EDM-M model

ON: Associated function consistent

Blinking: Failure as described in the table below

L5, L6 : not used

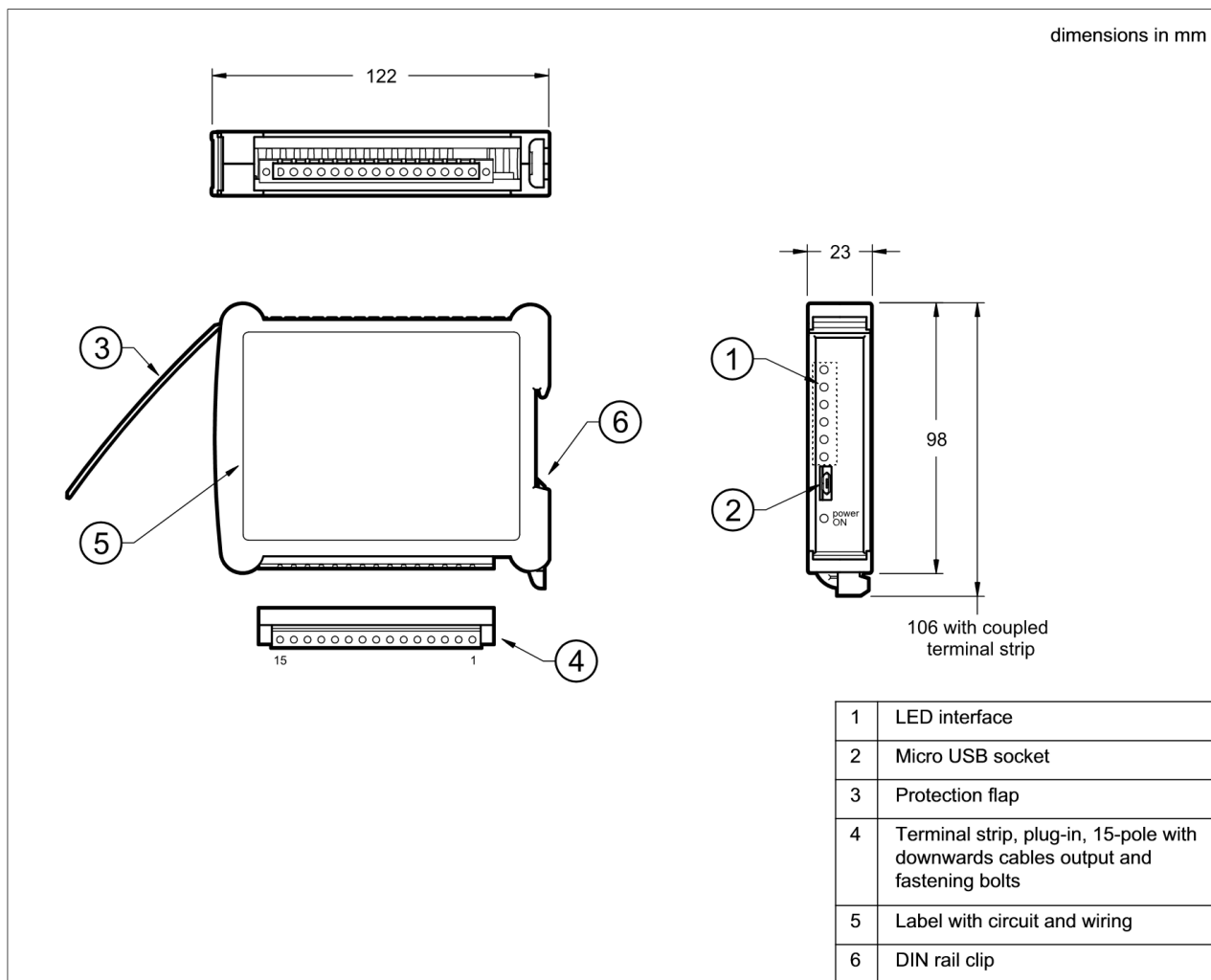
| LED | Card model | Function | Slow Flashing | Fast Flashing |
|------------|------------|--------------|----------------|-----------------------------------------------|
| L1 | M1 | Reference | Signal missing | - |
| | M2 | | | |
| | M3 | Reference 1 | | |
| L2 | M1 | Solenoid | Coil Open | Short circuit |
| | M2 | Solenoid 1 | | |
| | M3 | | | |
| L3 | M2 | Solenoid 2 | Coil Open | Short circuit |
| | M3 | Reference 2 | Signal missing | - |
| L4 | M1 | Ready | Fault | - |
| | M2 | | | |
| | M3 | Solenoid 2 | Coil Open | Short circuit |
| ALL | All | Power supply | - | Missing power voltage (just USB connected) |

NOTE: LEDs blinking all together even when the USB communication is active but the card is not powered.

Technical Characteristics

| | | |
|-------------------------------------------|------|------------------------------------------------------------------------|
| Power supply (U_b) | V DC | 9 ÷ 36 ripple included |
| Fuse, external | A | 6A medium time lag |
| Power consumption | W | Max 60 |
| Output current | A | Max 4.5 |
| Power supply protections | | overload, polarity inversion |
| Output electrical protections | | Short-circuit |
| Digital input | V | Logic 0: <5 |
| | V | Logic 1: >8 |
| Input resistance | kohm | 17 |
| Digital output | V | Logic 0: <2 |
| | V | Logic 1: max U_b |
| Max output current | mA | 50 |
| Analogue input | mA | 4 ÷ 20 ($R_i = 56 \text{ ohm}$) |
| | V | ± 10 differential signal ($R_i = 11 \text{ kohm}$) |
| | V | 0 ÷ 10 ($R_i = 11 \text{ kohm}$) |
| PWM Output current | mA | 200 ÷ 4000 (step less) |
| PWM frequency | Hz | 100-500 |
| Version B only: V aux | V | U_b |
| Max output current | mA | 100 |
| Double aux reference voltages (pin 13/14) | V | +10 |
| | V | -10 |
| Max output current | mA | 50 |
| Control time | ms | 2-10 according with PWM used |
| Interface | | Micro USB-B |
| Electromagnetic compatibility (EMC) | | according to 2014/30/EU |
| Housing material | | ABS |
| Connections | | Plug-in terminal block with tightening screws: 15 poles micro USB-B |
| Operating temperature range | °C | -20 / +70 |
| Protection degree | | IP 20 |

Overall and mounting dimensions



Installation instructions

This module is designed for installation in a shielded EMC housing (control cabinet).

All cables which lead outside must be screened; complete screening is required. It is also necessary to avoid strong electro-magnetic interference sources being installed nearby when using our open and closed loop control modules.

Typical installation location: 24 V control signal area (close to PLC)

The devices must be arranged in the control cabinet so that the power section and the signal section are separate from each other.

Experience shows that the installation place close to the PLC (24 V area) is most suitable. All digital and analogue inputs and outputs are fitted with filters and surge absorbers in the device.

The card must be installed and wired according to the EMC 2014/30/EU directive rules.

If other consumers are operated with the same power supply, a star-shaped ground wiring scheme is recommended.

The following points must be observed when wiring:

- 0V DC of the power supply must be connected to the GND on electrical cabinet.
- The signal cables must be laid separately from power cables.
- Analogue signal cables **must be screened**.
- All other cables must be screened if there are powerful interference sources (frequency converters, power contactors) and cable lengths > 3 m. Inexpensive SMD ferrites can be used with high-frequency radiation.
- The screening should be connected to PE (PE terminal) as close to the module as possible. Local requirements for screening must always be taken into account. The screening should be connected to at both ends. Equipotential bonding must be provided where there are differences between the connected electrical components.
- If having longer lengths of cable (> 30 m), the diameters and screening measures should be checked by specialists and if necessary please consult the manufacturer (e. g. for possible interference, noise sources and voltage drop). However, the sizing must ensure a voltage to the coil of not less than 90% of its nominal voltage.
- **the value of the power supply voltage on the card must not be lower than the rated working voltage of the solenoid to be controlled.**
- Provide a low-resistance connection between PE and the mounting rail. Transient interference is transmitted from the module directly to the mounting rail and from there to the local earth.

It is recommended using a regulated power supply (linear or switching mode) for card supply and for the sensors.



WARNING! Plugs with free-wheeling diodes and LED indicators cannot be used with current controlled power outputs. They interfere with the current control and can destroy the output stage.

Switched inductances (relays and valve coils) which are connected to the same power supply must always be provided with appropriate overvoltage protection directly at the coil.

The 15-poles terminal strip accepts connections of a 1.5 mm² conductor with ferrule. Applications that require larger cross sections require mandatorily a junction box.



WARNING! Engage the terminal block ONLY with the panel switched off.

PIN Tables

EDM-M1

| Connection | Supply |
|------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| PIN 1 | Power supply |
| PIN 2 | 0 V (GND) Power supply (ground). 0 V reference for PIN 9. 0 V reference for PIN 12 in EDM-M version B. |
| Connection | PWM output |
| PIN 3 / 4 | Current controlled PWM output for the solenoid |
| Connection | Analog input |
| PIN 7 | Reference (input) signal, corresponds with 0...10 V or 4...20 mA |
| PIN 8 | 0 V reference for the input signal |
| Connection | IO |
| PIN 9 | Digital output for card status. LOW: power output not enabled HIGH: card ok, power out enabled |
| PIN 12 | VERSION A – Digital input Function depends on parameter ENABLE (INT EXT) EXT = Enable Input. This pin receives ENABLE signal from the PLC. The current output is generated. INT = no associated function. (Enable signal is generated by internal logic) |
| | VERSION B – Aux voltage output It replicates PIN1 value. (0 V ref. PIN2) |
| PIN 13 | Auxiliary voltage output for potentiometer +10 V |
| PIN 14 | Auxiliary voltage output for potentiometer -10 V |
| PIN 15 | 0V reference PIN 13 and PIN 14 |

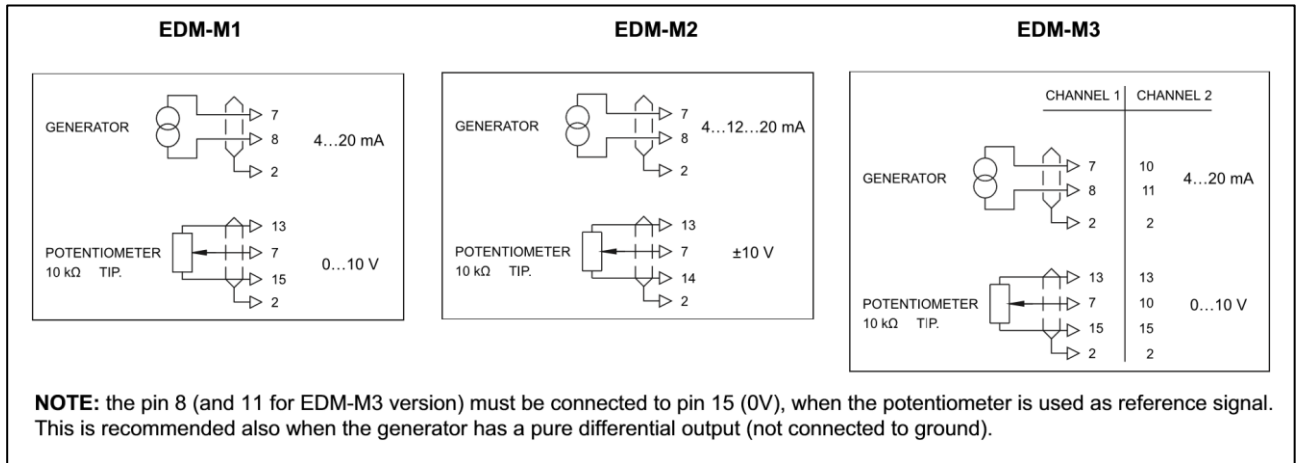
EDM-M2

| Connection | Supply |
|------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| PIN 1 | Power supply |
| PIN 2 | 0 V (GND) Power supply (ground). 0 V reference for PIN 9. 0 V reference for PIN 12 in EDM-M version B. |
| Connection | PWM output |
| PIN 3 / 4 | Current controlled PWM output for the solenoid A |
| PIN 5 / 6 | Current controlled PWM output for the solenoid B |
| Connection | Analog input |
| PIN 7 | Reference (input) signal, corresponds with -10...+10 V or 4...12...20 mA |
| PIN 8 | 0 V reference for the input signal |
| Connection | IO |
| PIN 9 | Digital output for card status. LOW: power output not enabled HIGH: card ok, power out enabled |
| PIN 12 | VERSION A – Digital input Function depends on parameter ENABLE (INT EXT) EXT = Enable Input. This pin receives ENABLE signal from the PLC. The current output is generated. INT = no associated function. (Enable signal is generated by internal logic) |
| | VERSION B - Aux voltage output. It replicates PIN1 value. (0 V ref. PIN2) |
| PIN 13 | Auxiliary voltage output for potentiometer +10 V |
| PIN 14 | Auxiliary voltage output for potentiometer -10 V |
| PIN 15 | 0 V reference for PIN 13 and PIN 14 |

EDM-M3

| Connection | Supply |
|------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| PIN 1 | Power supply |
| PIN 2 | 0 V (GND) Power supply (ground). 0 V reference for PIN 9. 0 V reference for PIN 12 in EDM-M version B. |
| Connection | PWM output |
| PIN 3 / 4 | Channel 1 - current controlled PWM output for the solenoid |
| PIN 5 / 6 | Channel 2 - current controlled PWM output for the solenoid |
| Connection | Analog input |
| PIN 7 | Channel 1 - Reference signal 1, corresponds with 0...10 V or 4...20 mA |
| PIN 8 | 0 V reference for the reference signal in channel 1 |
| PIN 10 | Channel 2 - Reference signal 2, corresponds with 0...10 V or 4...20 mA |
| PIN 11 | 0 V reference for the reference signal in channel 2 |
| Connection | IO |
| PIN 9 | Digital output for card status. LOW: power output not enabled HIGH: card ok, power out enabled |
| PIN 12 | VERSION A – Digital input Function depends on parameter ENABLE (INT EXT) EXT = Enable Input. This pin receives ENABLE signal from the PLC. The current output is generated. INT = no associated function. (Enable signal is generated by internal logic) |
| | VERSION B - Aux voltage output. It replicates PIN1 value. (0 V ref. PIN2) |
| PIN 13 | Auxiliary voltage output for potentiometer +10 V |
| PIN 14 | Auxiliary voltage output for potentiometer -10 V |
| PIN 15 | 0 V reference for PIN 9, PIN 13 and PIN 14 |

Wiring



Card Setup

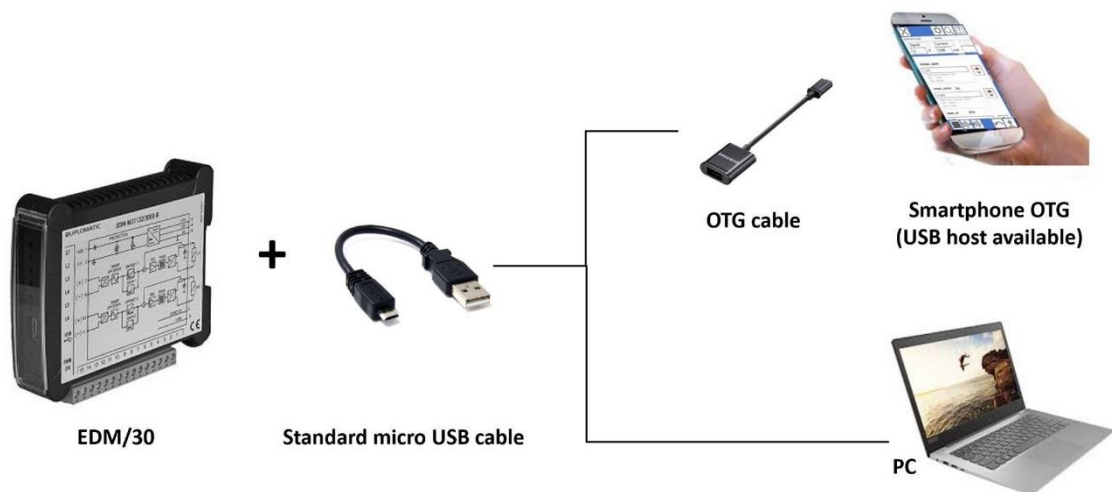
Card configuration occurs only by EBC software from a PC or by EBC app. Anyway, cable connection with the card is always necessary.

All the ancillary equipment is available as separate kit.

EDMPC/30 kit

It includes a USB communication cable (micro USB-B male - USB A male) of 3 meters length, 2 adapter cables for smartphones OTG USB2.0 and OTG USB3.0, in order to cover the widest devices compatibility range, a USB key with EBC software pack for notebook, to be installed.

Ordering code 3898201020.



EBC App

This app has been developed in order to offer immediate diagnostic and configuration activities of USER level parameters of electronic cards even in the field, with a traceability function that makes service operations more efficient.

The app requires Android devices that support OTG function (Usb On-The-Go) and can be downloaded from the Google Play store.

Use the communication cable and the suitable adapter in the EDMPC/30 kit to connect the smartphone to the card.

On-line registration is required at first access. Once registered the app can even work off-line.

The EBC app allows diagnostic and configuration activities of USER level parameters. Password is required to apply parameters changes. See Parameters section.

EBC configurator software

This is the software for EDM-M parameters configuration.

EBC software is a graphical interface for digital communication, diagnostic tasks and parameterization.

In addition to the features available on the app, it offers advanced diagnostic programs and an oscilloscope with measure functions, and allows to save and import parameters sets, as needed for fast card replacement and for the reduction of start-up time of the system.

The software is distributed inside the EDMPC/30 kit and is also available for download at: http://www.duplomatic.com/en_US/download/software-download/

System Requirements & Settings

The EBC software can be installed on every machine equipped with Microsoft OS: Windows 7, 8 and 10, a free USB port to connect the communication cable (standard cable type USB A – micro USB B).

Launch the setup file and follow the guided procedure to install the program and USB drivers. Complete driver setup and restart the machine if requested before connecting the module to the PC.

At the end of installation, a security alert could appear, asking to define permissions for firewall, depending on your OS and notebook configuration.

See software literature (inside software pack) for EBC configuration software.

Please note that for programming purposes, the EDM card can be powered directly through the USB port. Leds blink all together for signalling the USB communication.

If you need to energize the valve simultaneously, you need the power supply to pins 1/2.

Parameters

At software launch, the parameters are displayed in read only mode.

Parameter configuration is structured with different access levels.

To access “User” parameter config in the EBC software you need to log in with the following case-sensitive credentials:

Login: **USR** Pwd: **Dol732**

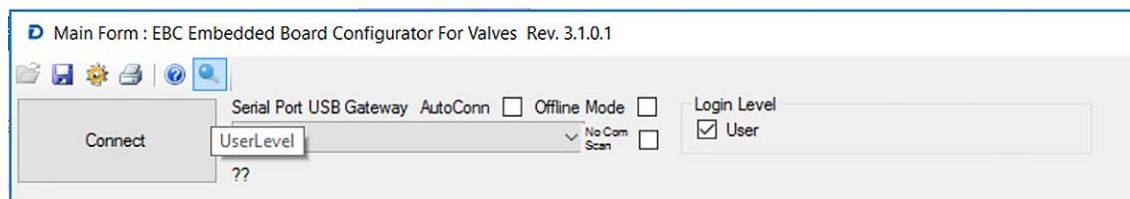


Figure 1 -Password ICON

All displayed but **not changeable** parameters will be marked as **RO (Read Only)**

Summary

| Parameter | Default value | Range | User level | Group |
|--------------------------------------------|------------------------------------------------|------------------------------------------------------------------------|------------|----------------|
| OEM_INFO | Manufacturing date | | RO | |
| BOARD CONFIGURATION | According with ordered code | M1 M2 M3 | RO | |
| DIAGNOSTICS | AUTO (for B version) ENABLE (for A version) | ENABLE DISABLE AUTO | USR | |
| ENABLE | EXT | INT EXT | USR | version A only |
| RESIST | According with ordered code | 0 – 30 Ohm | RO | M1-M2 version |
| RESIST1 RESIST2 | According with ordered code | 0 – 30 Ohm | RO | M3 versions |
| SIGNAL_TYPE | According with ordered code | 0...10V 4...20mA (M1 version) +/-10V 4...12...20mA (M2 version) | RO | M1-M2 versions |
| SIGNAL1_TYPE SIGNAL2_TYPE | According with ordered code | 0...10V 4...20mA | RO | M3 version |

| | | | | |
|----------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------|----------------------------------------------------------------------------|-----|----------------|
| SIGNAL_OFFSET | 0.00 | -3.000...+3.000 V -4.000...+4.000mA Unit according with signal type | USR | M1-M2 versions |
| SIGNAL1_OFFSET SIGNAL2_OFFSET | 0.00 | -3.000...+3.000 V -4.000...+4.000 mA Unit according with signal type | USR | M3 version |
| SIGNAL_GAIN | 1.000 | 0.400...10.000 | USR | M1-M2 versions |
| SIGNAL1_GAIN SIGNAL2_GAIN | 1.000 | 0.400...10.000 | USR | M3 version |
| RAMP_UP RAMP_DOWN | 0 0 | 0 – 20000 ms | USR | M1 version |
| RAMP_UP_A RAMP_DOWN_A RAMP_UP_B RAMP_DOWN_B | 0 0 0 0 | 0 – 20000 ms | USR | M2 version |
| RAMPx_UP RAMPx_DOWN x= 1 2 | 0 0 | 0 – 20000 ms | USR | M3 version |
| CURRENT | According with ordered code | 200 – CURRENT_LIM mA | USR | M1-M2 version |
| CURRENT1 CURRENT2 | According with ordered code | 200 – CURRENT1_LIM 200 – CURRENT2_LIM mA | USR | M3 versions |
| CURRENT_LIM | According with ordered code | 860...3400 mA | RO | M1-M2 version |
| CURRENT1_LIM CURRENT2_LIM | According with ordered code | 860...3400 mA 860...2600 mA | RO | M3 version |
| ADJ_MIN ADJ_MAX ADJ_TRIGGER | According with version 100% 1.5% | 0 – 50% ADJ_MIN – 120% 0 – 20% | USR | M1 version |
| ADJ_MIN_A ADJ_MAX_A ADJ_TRIGGER ADJ_MIN_B ADJ_MAX_B | According with version 100% 1.5% According with version 100% | 0 – 50% ADJ_MIN_A – 120% 0 – 20% ADJ_MIN_B – 120% 0 – 50% | USR | M2 version |

| | | | | |
|-----------------------------------------------------------------------------|-----------------------------|--------------------------------------|-----|----------------|
| ADJx_MIN ADJx_MAX ADJx_TRIGGER x = 1 2 | | 0 – 50% ADJ_MIN – 120% 0 – 20% | USR | M3 version |
| PWM | According with ordered code | 70 – 500 Hz | USR | M1-M2 versions |
| PWM1 PWM2 | According with ordered code | 70 – 500 Hz | USR | M3 version |
| DITHER_AMP DITHER_FREQ | 0% 0Hz | 0 – 15% 0 – PWM/2 Hz | USR | M1-M2 versions |
| DITHERx_AMP DITHERx_FREQ x = 1 2 | 0% 0Hz | 0 – 15% 0 – PWMx/2 Hz | USR | M3 version |

ADJ_MIN, **ADJ_MAX** and **DITHER_AMP**, **DITHER_FREQ** parameters can be displayed in both absolute (mA) and percentage unit. This option can be set by the proper check box in the configuration software.

ADJ_TRIGGER can be displayed in absolute unit only (mA).

Configuration

DIAGNOSTICS (failure monitoring)

| Command | Parameters | Unit | User Level/Group | Default |
|----------------------|--------------------------------|------|------------------|----------------------------------------|
| DIAGNOSTICS x | x = ENABLE DISABLE AUTO | – | USR | ENABLE (A version) AUTO (B version) |

Activation of the monitoring functions of the module.

The monitoring functions should be always active because otherwise no errors are detectable via the READY output. Deactivation is possible mainly for troubleshooting.

ENABLE: All monitoring functions are active. Detected failures can be reset by deactivating the ENABLE input for A version or switching off/on the card for the B version.

AUTO: Auto reset mode. All monitoring functions are active. If the failure does not exist anymore, the module automatically resumes to work.

DISABLE: No monitoring function is active.

ENABLE (to activate external enable of power stage)

| Command | Parameters | Unit | User Level/Group | Default |
|---------|------------|------|------------------|---------|
| ENABLE | INT EXT | – | USR / A version | EXT |

This function enables or disables the use of external enable on pin 12.

With ENABLE = INT, the card enables the output power stage automatically after the power-on (with a delay time of approx. 0.5s).

This parameter is available only for A version of EDM-M card.

Analog input

SIGNAL_OFFSET

| Command | Parameters | Unit | User Level/Group | Default |
|----------------------------------|-------------------------------|---------|------------------|---------|
| SIGNAL_OFFSET | -3.000/+3.000 -4.000/4.000 | V mA | USR / M1-M2 | 0.00 |
| SIGNAL1_OFFSET SIGNAL2_OFFSET | -3.000/+3.000 -4.000/4.000 | V mA | USR / M3 | 1.000 |

SIGNAL_GAIN

| Command | Parameters | Unit | User Level/Group | Default |
|------------------------------|-------------|------|------------------|---------|
| SIGNAL_GAIN | 0.400-10.00 | – | USR / M1-M2 | 0.00 |
| SIGNAL1_GAIN SIGNAL2_GAIN | 0.400-10.00 | – | USR / M3 | 1.000 |

Signal scaling example:

With an EDM-M2**/30E0-* the available signal type is -10...0...+10V.

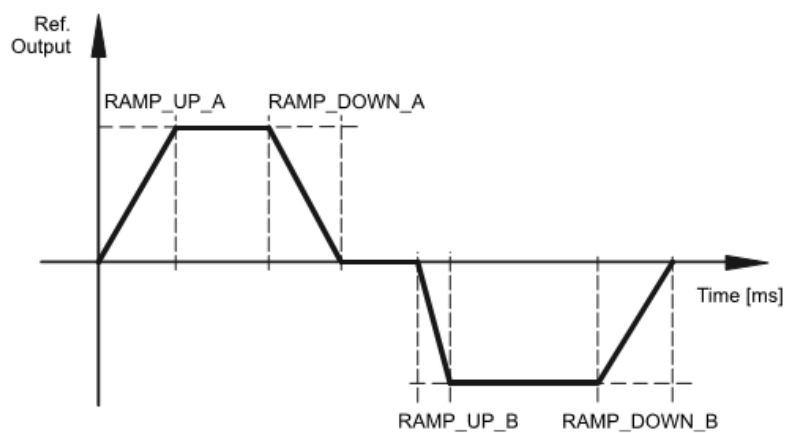
If application signal is 0...2.5...5V this means:

- 0% signal for the valve must be moved from 2.5V (application 0%) to 0V - >
SIGNAL_OFFSET = Standard Offset – Application Offset = 0 - 2.5 = - 2.5 V
- Signal input must be scaled from 2.5V to Standard Full Scale of 10V - >
SIGNAL_GAIN = Standard F.S. / Application F.S. = 10 / 2.5 = 4.0

RAMPS

| Command | Parameters | Unit | User Level/Group | Default |
|------------------------------------------------------|------------|------|------------------|---------|
| RAMP_UP RAMP_DOWN | 0-20000 | ms | USR / M1 | 0 |
| RAMP_UP_A RAMP_DOWN_A RAMP_UP_B RAMP_DOWN_B | 0-20000 | ms | USR / M2 | 0 |
| RAMP1_UP RAMP1_DOWN RAMP2_UP RAMP2_DOWN | 0-20000 | ms | USR / M3 | 0 |

Entered ramp time is related to 100% of signal variation. Different ramps times are available for each quadrant in EDM-M2 card:



Output signals

CURRENT

| Command | Parameters | Unit | User Level/Group | Default |
|------------------------------------|------------------------------------------|------|--------------------|---------------------------------|
| CURRENT | 200 - CURRENT_LIM | mA | USR / M1-M2 | According with the ordered code |
| CURRENT1 CURRENT2 | 200 - CURRENT1_LIM 200 - CURRENT2_LIM | mA | USR / M3 | According with the ordered code |

It set the nominal current of the coil connected. The current can be then adjusted by parameters for “Curve adjustment”.

CURRENT and RESIST values are internally used by the card for an optimum current control loop.

For a correct behavior, EDM-M model must be ordered with the nominal current as close as possible to the nominal current of the coil.

CURRENT_LIM value is a parameter set by the manufacturer according with the model of ordered card.

RESIST

This value returns the nominal resistance of the coil. It is exploited to optimize the control algorithm. RESIST is a read-only parameter, valorised in factory and is dependent on the ordered card version.

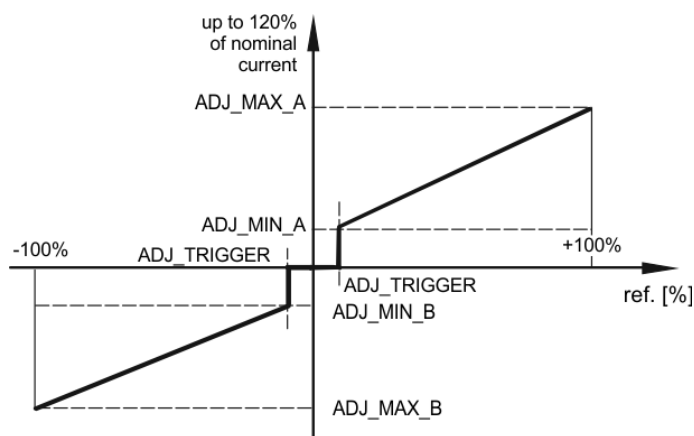
CURVE ADJUSTMENT

| Command | Parameters | Unit | User Level/Group | Default |
|--------------|-----------------|------|------------------|---------|
| ADJ_MIN | 0-50 | | | 0 |
| ADJ_MAX | ADJ_MIN - 120 | % | USR / M1 | 100 |
| ADJ_TRIGGER | 0-20 | | | 1.5 |
| ADJ_MIN_A | 0-50 | | | 0 |
| ADJ_MAX_A | ADJ_MIN_A - 120 | % | USR / M2 | 100 |
| ADJ_TRIGGER | 0-20 | | | 1.5 |
| ADJ_MIN_B | 0-50 | | | 0 |
| ADJ_MAX_B | ADJ_MIN_B - 120 | % | | 100 |
| ADJ1_MIN | 0-50 | | | 0 |
| ADJ1_MAX | ADJ1_MIN - 120 | % | USR / M3 | 100 |
| ADJ1_TRIGGER | 0-20 | | | 1.5 |
| ADJ2_MIN | 0-50 | | | 0 |
| ADJ2_MAX | ADJ2_MIN - 120 | % | | 100 |
| ADJ2_TRIGGER | 0-20 | | | 1.5 |

With these commands, the **output signal is adjusted to the valve characteristics**.

The unit is percentage of nominal current (defined by CURRENT parameter).

The output signal (the maximum valve current) will be defined with the 'MAX' value. The overlap (dead band of the valve) will be compensated with the 'MIN' value. Via the TRIGGER the activation point of the MIN function is set and so a non-sensitive range around the zero-point can be specified.



PWM

| Command | Parameters | Unit | User Level/Group | Default |
|----------------------------|------------|------|--------------------|-----------------------------|
| PWM | 70–500 | Hz | USR / M1-M2 | According with ordered code |
| PWM1 PWM2 | 70–500 | Hz | USR / M3 | According with ordered code |

The frequency can be changed between 70 and 500 Hz step less. The optimum frequency depends on the valve type.

DITHER_AMP, DITHER_FREQ

| Command | Parameters | Unit | User Level/Group | Default |
|----------------------------------------------------------------------------------------|--------------------------------------|--------------------|--------------------|---------|
| DITHER_AMP DITHER_FREQ | 0–15 0–PWM/2 | % Hz | USR / M1-M2 | 0 |
| DITHER1_AMP DITHER1_FREQ DITHER2_AMP DITHER2_FREQ | 0–15 0–PWM1/2 0–15 0–PWM2/2 | % Hz % Hz | USR / M3 | 0 |

The dither can be defined freely with these commands. Different amplitudes or frequencies may be required depending on the valve type. The dither amplitude is defined in % of the nominal current (see: CURRENT command).

The upper limit for Dither frequency is half of PWM frequency selected.

PROCESS DATA (monitoring)

The process data are the variables which can be continuously observed on the monitor or on the oscilloscope.

| Command | Description | Unit |
|----------------------|---------------------------------------------|---------|
| SIGNAL | Command value after input scaling | mA |
| SIGNAL1 | Command1 value after input scaling (M3) | % |
| SIGNAL2 | Command2 value after input scaling (M3) | |
| SIGNAL_PIN | Command value at pin input | V or mA |
| SIGNAL1_PIN | Command value 1 at pin input | |
| SIGNAL2_PIN | Command value 2 at pin input | |
| CURRENT | Output current of solenoid | mA |
| CURRENT_A | Output current of solenoid A (CH1) (M2) | |
| CURRENT_B | Output current of solenoid B (CH2) (M2) | |
| CURRENT1 | Output current of solenoid CH1 (M3) | |
| CURRENT2 | Output current of solenoid CH2 (M3) | |
| CURRENT_ERR | Current error solenoid CH1 | % |
| CURRENT_ERR_A | Current error solenoid A (CH1) (M2) | |
| CURRENT_ERR_B | Current error solenoid B (CH2) (M2) | |
| CURRENT1_ERR | Current error solenoid CH1 (M3) | |
| CURRENT2_ERR | Current error solenoid CH2 (M3) | |
| PWM_DUTY | Percentage of PWM on solenoid CH1 | % |
| PWM_DUTY_A | Percentage of PWM on solenoid CH1 (M2) | |
| PWM_DUTY_B | Percentage of PWM on solenoid CH2 (M2) | |
| PWM1_DUTY | Percentage of PWM on solenoid CH1 (M3) | |
| PWM2_DUTY | Percentage of PWM on solenoid CH2 (M3) | |
| TEMP_BOARD | Temperature of the board | °C |
| TEMP_PWRSTG | Temperature of the power stage of the board | °C |
| V_CTRL | Supply voltage | V |
| V_PWRSTG | Power stage voltage | V |

APPENDIX 1: EDM-M/20 migration

The EDM-M/30 can be used as replacement part of disused EDM-M in series 20 with following adaptations:

Electrical compatibility

The card with the internal enable management, EDM-M*/30E*-B, is 100% wiring compatible with EDM-M in series 20.

Parameters

PI = EDM/20 Parameters Input group

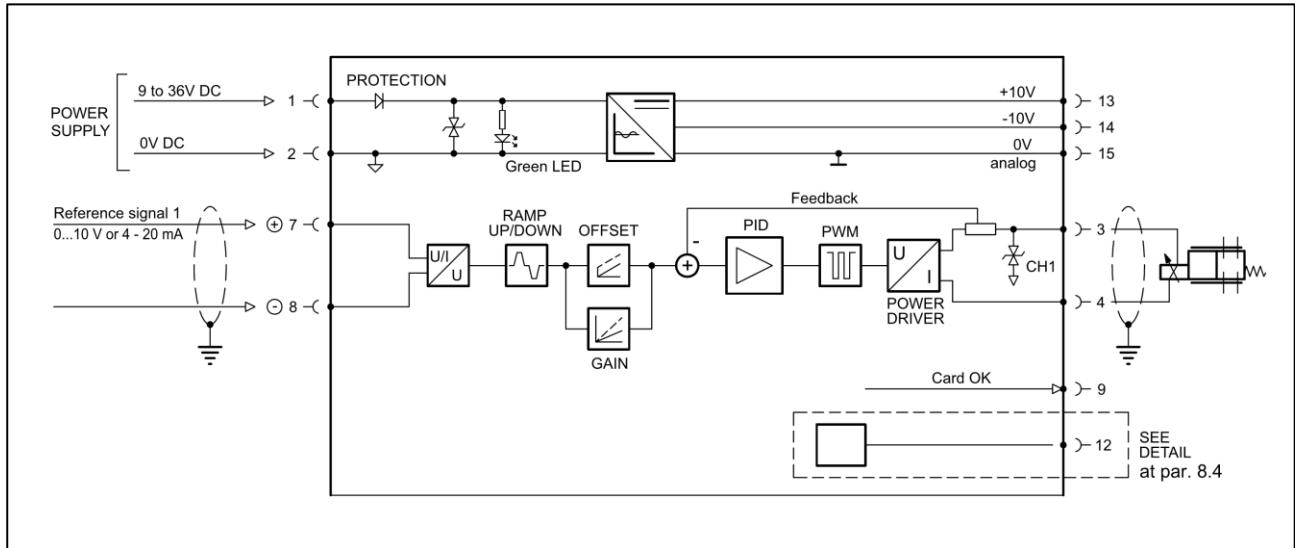
PO = EDM/20 Parameters Output group

| Function | | Series 20 parameter | Series 30 parameter | EDM TYPE | Series 20 values | Series 30 values |
|------------------|------------------|---------------------------|---------------------------------------------------------|----------|-----------------------|---------------------|
| Configuration | Controlled valve | | EDM_TYPE | | 1 Valve Mono | M1 |
| | | | | | 1 Valve Double | M2 |
| | | | | | 2 Valves Mono | M3 |
| | Prod. field | Week | EDM_IDS | | Free string | Free string |
| | | Year | | | | |
| Input parameters | Scaling | Cmd Offset (PI1) | SIGNAL_OFFSET | M1 or M2 | ± 100 | ± 3 [V] ± 4 [mA] |
| | | Cmd Offset (PI1, PI2) | SIGNAL1_OFFSET, SIGNAL2_OFFSET | M3 | | |
| | | V Max (PI1) | SIGNAL_GAIN | M1 or M2 | 0...10000 [1/100V] | 0.4...10 |
| | | V Max (PI1, PI2) | SIGNAL1_GAIN, SIGNAL2_GAIN | M3 | | |
| | Ramps | Max Ramp | - | | 0...20 | - |
| | | Ramp Up, Ramp Dn (PI1) | RAMP_UP, RAMP_DOWN | M1 | 0...99 [%] | 0...20000 [ms] |
| | | Ramp Up, Ramp Dn (PI1) | RAMP_UP_A, RAMP_DOWN_A, RAMP_UP_B, RAMP_DOWN_B | M2 | | |
| | | Ramp Up, Ramp Dn (PI2) | RAMP1_UP, RAMP1_DOWN, RAMP2_UP, RAMP2_DOWN | M3 | | |

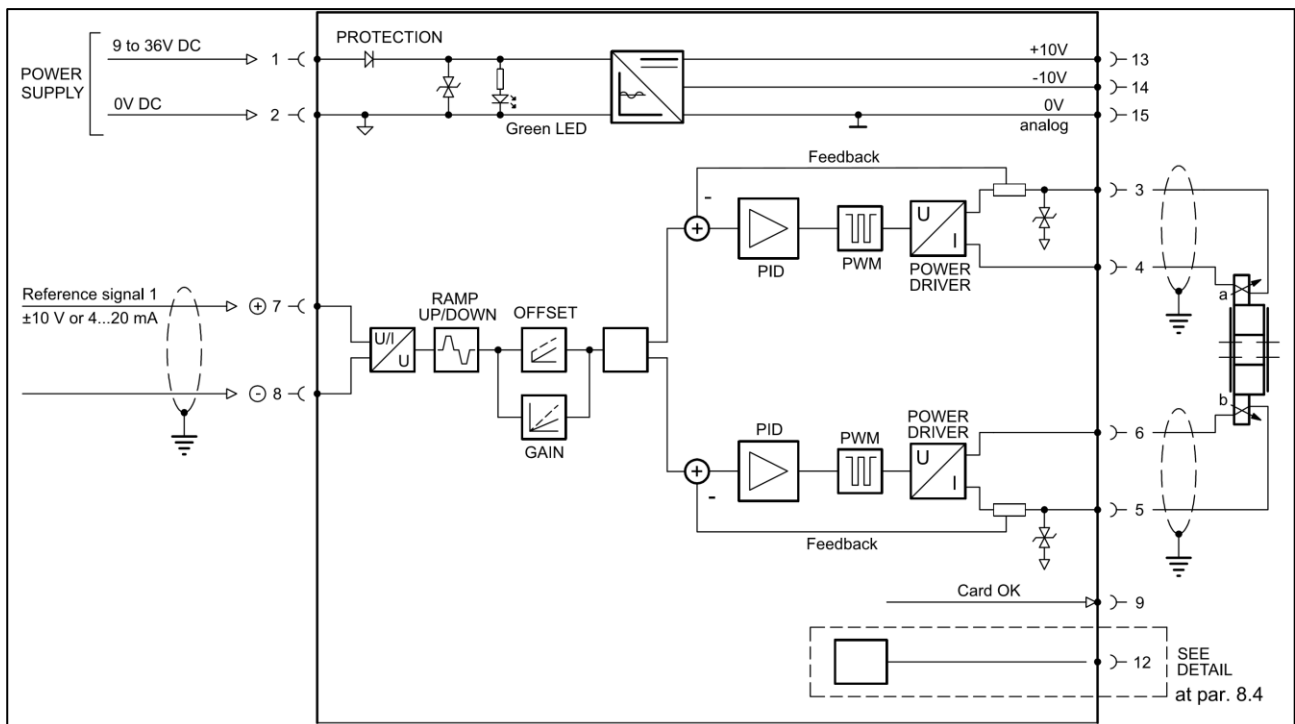
| Function | | Series 20 parameter | Series 30 parameter | EDM TYPE | Series 20 values | Series 30 values |
|-------------------|---------------|----------------------|----------------------------------|----------|-------------------------|----------------------------|
| Output Parameters | Current | Coil Type (PO1) | CURRENT | M1 or M2 | | 200-CURRENT_LIM [mA] |
| | | Coil Type (PO1, PO2) | CURRENT1, CURRENT2 | M3 | | |
| | Adjustment | VT (PI1) | ADJ_TRIGGER | M1 or M2 | 0-200 [1/100V] | 0-20% of scaled reference |
| | | VT (PI1, PI2) | ADJ1_TRIGGER, ADJ2_TRIGGER | M3 | | |
| | | I Min (PO1) | ADJ_MIN | M1 | mA | mA or CURRENT% |
| | | I Min (PO1, PO2) | ADJ_MIN_A, ADJ_MIN_B | M2 | | |
| | | I Min (PO1, PO2) | ADJ1_MIN, ADJ2_MIN | M3 | | |
| | | I Max (PO1) | ADJ_MAX | M1 | mA | mA or CURRENT% |
| | | I Max (PO1, PO2) | ADJ_MAX_A, ADJ_MAX_B | M2 | | |
| | | I Max (PO1, PO2) | ADJ1_MAX, ADJ2_MAX | M3 | | |
| | PWM frequency | PWM Freq | PWM | M1 or M2 | 50...500 [Hz] | 70...500 [Hz] |
| | | | PWM1, PWM2 | M3 | | |
| | Dither | Dither [mA] | DITHER_AMP [%] | M1 or M2 | 0...99 [mA] | mA or 0...15 % of CURRENTx |
| | | | DITHER1_AMP [%], DITHER2_AMP [%] | M3 | | |
| | | Dither Freq [Hz] | DITHER_FREQ [%] | M1 or M2 | 10...PWM/2 if PWM ≤ 198 | 0...PWM/2 |
| | | | DITHER1_FREQ, DITHER2_FREQ [%] | M3 | 10...99 if PWM > 198 | |

APPENDIX 2: Block diagrams

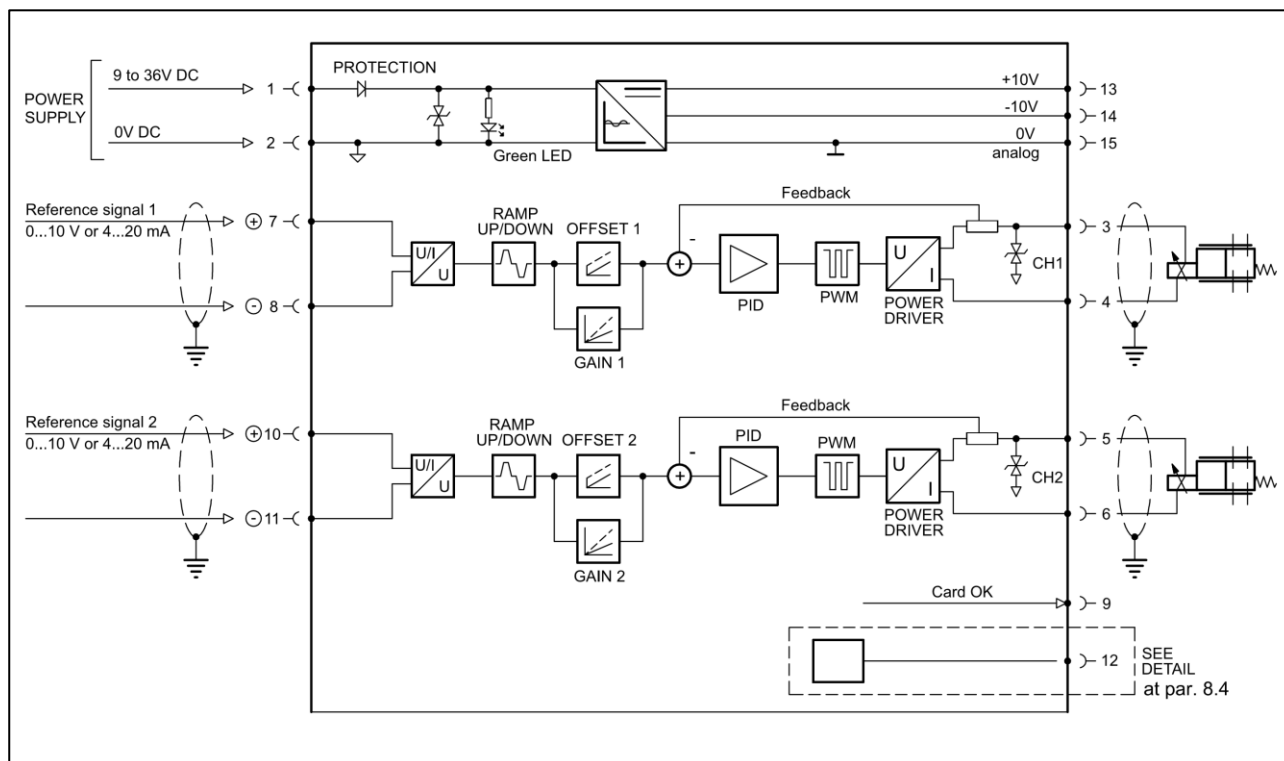
EDM-M1



EDM-M2



EDM-M3



Function of pin 12

