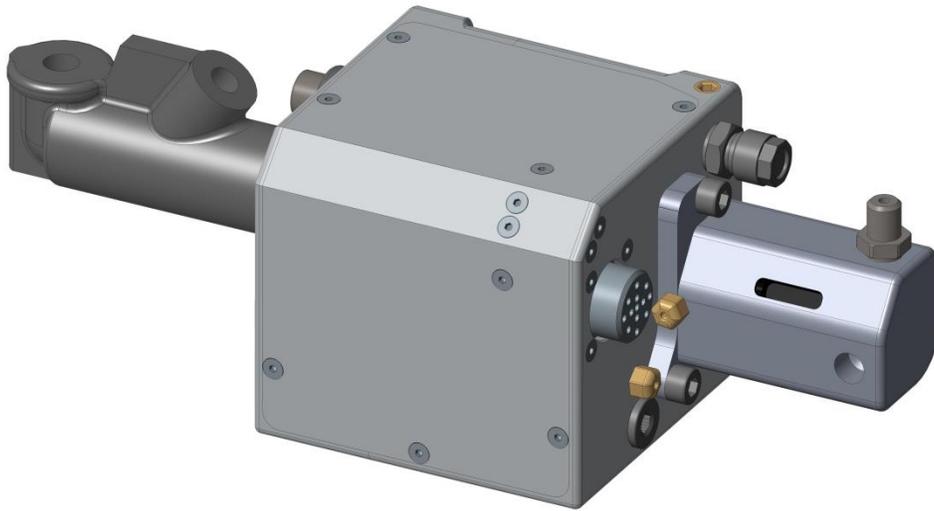


Clutch Actuator With Master Cylinder



Features

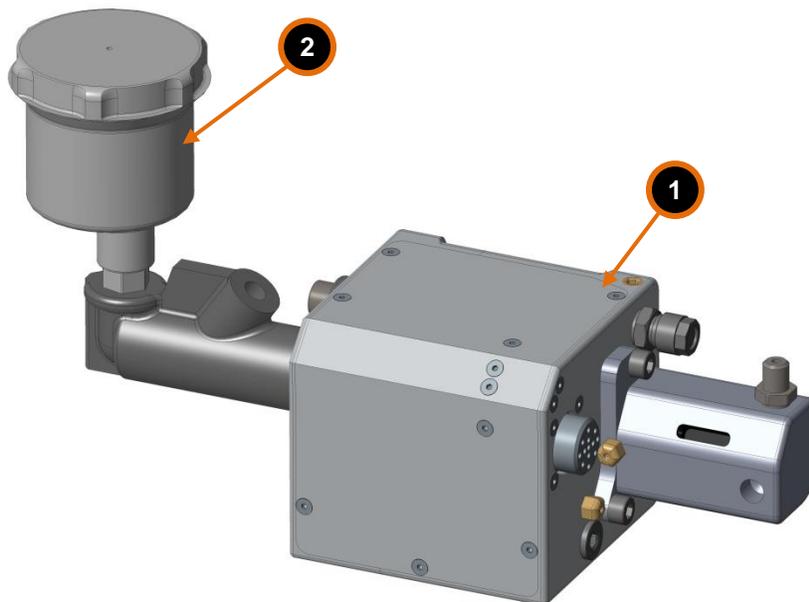
- Pneumatically operated clutch actuator
- Valves integrated in the actuator
- No need for extra valve block
- Inline connection to existing clutch line
- Integrated position sensor
- No need for stroke adjustment
- Very light (only weights 1900 g)

Technical specifications

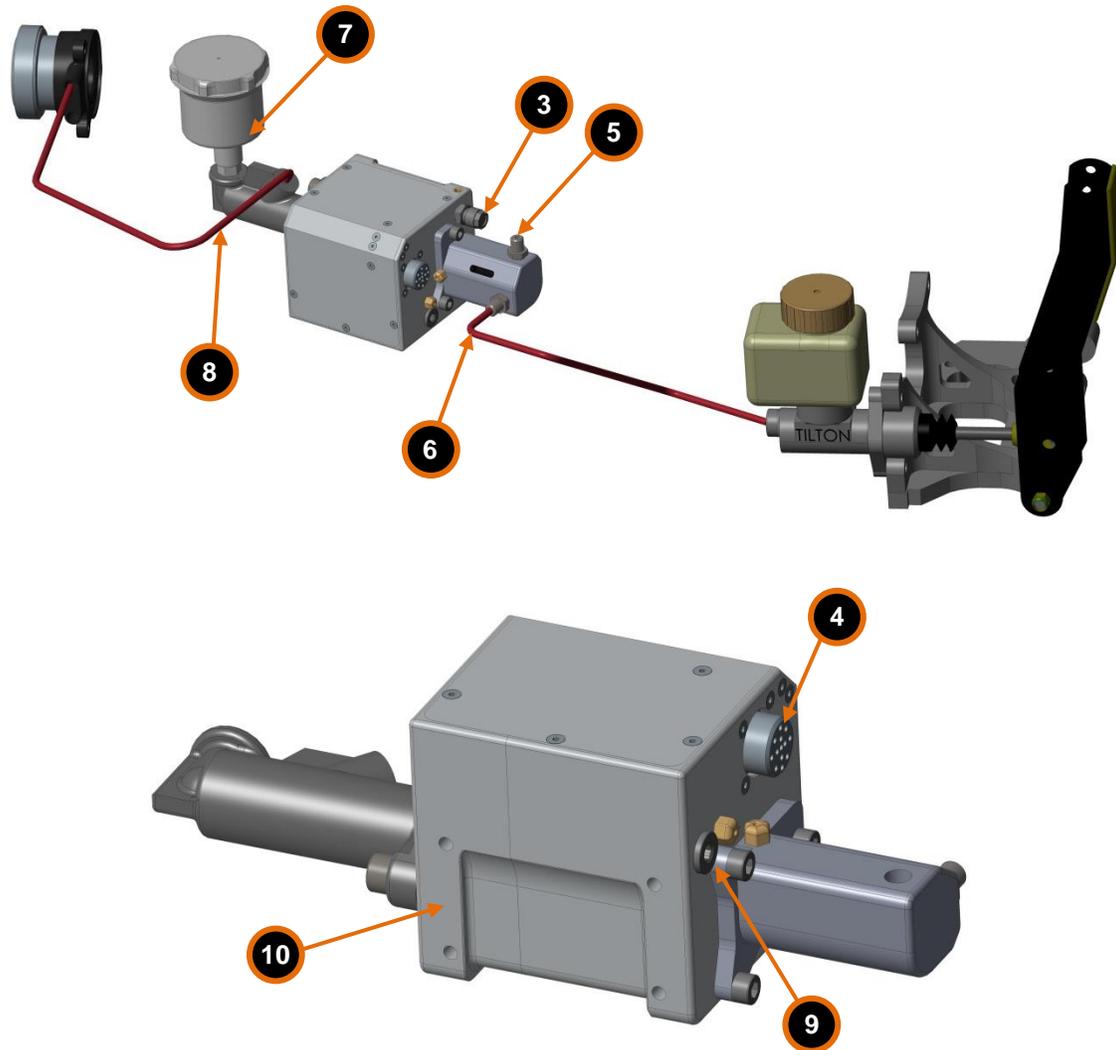
Dimensions L x W x H	270 x 95 x 87 mm	
Weight	1900 g	
Operating temperature	-20 ... 80°C	
Operating pressure	6 ... 9 Bar	
Stroke	32 mm	
Operating force [8 Bar]	Push	1600 N
Pneumatic fitting	Pneumatic tube 8/6 mm	

Included in the kit

- ① Pneumatic clutch actuator
- ② Reservoir
Connector



Connection Diagram



- ③ Air supply (Ø 8 mm pneumatic pipe).
- ④ Electrical connector
- ⑤ Bleeding screw M10x1 (included)
- ⑥ Hydraulic line to foot pedal M10x1 (fitting not included)
- ⑦ Clutch reservoir 7/16-20 (included). Can be mounted separately from actuator
- ⑧ Hydraulic line to clutch slave cylinder 3/8-24 (fitting not included)
- ⑨ Pneumatic plug for clutch bleeding. **Replace with G1/8 silencer if unit is not powered.**
- ⑩ Mounting surface with holes for mounting (see technical drawing).

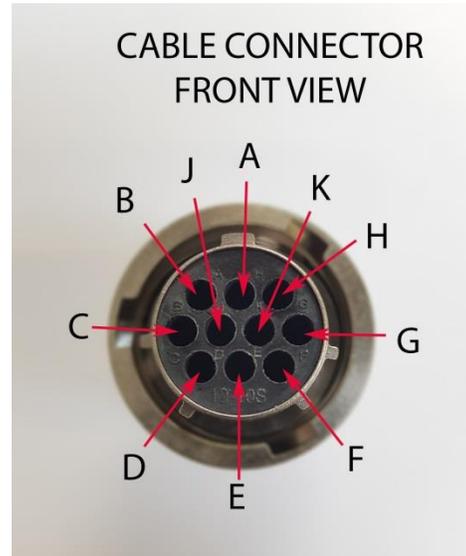
Electrical diagram

Connector pinout:

A	Free
B	CAN-
C	CAN+
D	GND
E	12V
F	SETPOINT 5V
G	SETPOINT GND
H	SETPOINT SIG (0-5V)
J	BLIP (active low switch)
K	FREE

CP-01 Clutch Paddle Connection:

- Brown wire - SETPOINT 5V (F)
- Blue – SETPOINT GND (G)
- Black – SETPOINT SIG (H)



Included CAN connector should be connected like this:



General operation

When actuator is connected and powered it can take commands:

- via foot pedal using original hydraulic pedal - highest priority
- analog paddle via pin H - medium priority
- with CAN commands on pins C (CAN+) and B (CAN-) - lowest priority

If clutch is pressed with a foot, analog paddle gets ignored until the foot clutch is released.

If paddle has already been pressed, foot clutch doesn't override the control until foot clutch is pressed more than the paddle. When foot goes over the paddle it must return to zero before paddle control is enabled again.

Both foot clutch & analog paddles have higher priority than CAN commands so CAN commands get "on hold" if either of them are pressed. If you send CAN command and foot or analog is pressed and both of them are released, CAN command that was previously sent takes effect.

Bleeding the clutch

1. Unscrew pneumatic exhaust for clutch bleeding ⑨.
2. Use bleeding screw ⑤ to first bleed from foot pedal to clutch actuator. It's possible that foot pedal will not return automatically back to position – in this case, move the pedal back to position manually while bleeding. If you do not have a foot clutch, this step can be ignored.
3. Bleed the clutch from clutch actuator to slave cylinder on your car. Use bleeding screw on your car's clutch slave cylinder. If you don't have a foot clutch, you can bleed it using the software using the override slider.

Quick setup

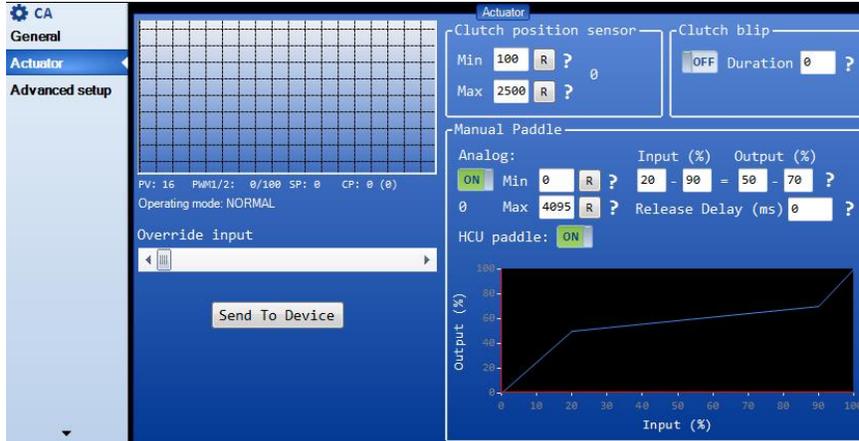
1. Download latest MME Configuration software from the <http://www.mme-motorsport.com/en/download>
2. Plug USB CAN cable and make sure the CAN+ and CAN- are properly connected and wires properly terminated (using 120 ohm resistors in parallel)
3. Open MME Configuration and select Clutch Actuator from the detected devices list.
4. First, you need to set maximum travel for the clutch actuator. Number that defines what the maximum travel is can be found under Clutch position sensor, parameter Max.
 - Put the car in 1st gear (engine not running)
 - Move **Override input** slider to zero
 - Adjust Max value to 4000. Press **Send To Device** to save the value.
 - Slowly slide the slider to the right. Clutch should slowly extract. While doing this, jerk the car so you can see if clutch is pressed enough or not. Once you reach the point where car starts to move freely, go a little bit further to the right and click **R** next to the Max window.
 - Move the slider to zero (completely to the left)
 - Press **Send To Device** to save the settings.
 - Verify that moving the slider completely to the right, extends the clutch to safe max position
5. If you use clutch **Analog paddle** (CP-01 or any other 0-5V device), you first need to enable it (by clicking the OFF/ON button). While paddle is released, click **R** next to the Min window. Press the paddle fully and while holding it fully pressed, click **R** next to the Max window. Press **Send To Device** to save the settings.
6. By setting **Input / Output and Input2 / Output2** you can change the mapping of the input command in regard to output. Input 10%, Output 50% means that when you press the paddle 10%, it's already 50% open, then you have the next 90% of the paddle for the 50 – 100% output.
7. **Release Delay** is how fast does the paddle release react when you release it. Bigger delay will cause clutch paddle to be slower on release to prevent sudden release (by mistake) which is undesirable.

SEE BELOW FOR MORE DETAILED SOFTWARE DESCRIPTION

Actuator software setup

YOU NEED TO PRESS F5 OR SEND TO DEVICE FOR THE CHANGES TO TAKE EFFECT

Actuator window:



Graph shows current set point (SP - red line) vs clutch position (CP – green line). PWM1/2 shows how much are internal valves opened. PV shows the current PID position error (SP-CP)

Override input allows you override the position within the software.

Clutch position sensor:

Min defines position where clutch is completely released. Usually this number is left at 100. If system is noisy, 100 is a good number.

Max defines how far the clutch will go when fully pressed. Number next to the boxes show the internal clutch actuator position (4095 is fully extracted).

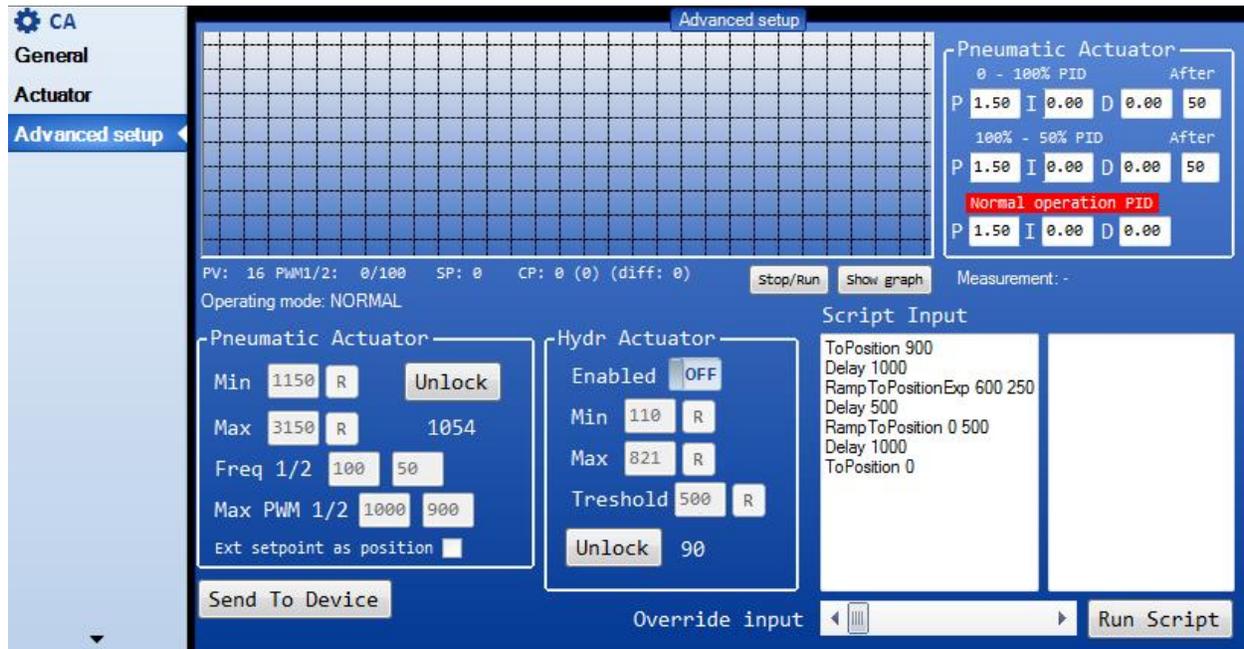
Manual paddle:

If **Analog** is ON this means that we get command via pin H (SETPOINT SIG). This is a 0-5V analog voltage input. Values below Analog show the current raw analog reading (0 = 0V, 4095 = 5V). **Min** defines the value when paddle is fully released. By clicking the R next to the window, current raw value is transferred to the window. **Max** defines raw value when paddle is completely pressed. In noisy system add/remove 50 to both **Min/Max** to get rid of the analog noise.

Clutches usually need more precise control around the bite point and don't need much above or below that point. With **Input/Output** mapping you can precisely set how analog paddle is mapped. For example, it makes sense to utilize 20-80% of the paddle travel to that 40-50% (or whatever your ideal bite point is) so you can control that area more easily. Everything above 50% or below 40% can normally be ignored. Example: 20-80/40-50 will utilize that paddle input from 20-80% will precisely control the 40-50% output region.

Release Delay (ms) adds delay when paddle is released. Example: if paddle is completely released when fully open and delay is 1000ms input will drop to 0 in 1000ms. If it were pressed 50% it would take 500ms to go to zero.

Advanced window:



Pneumatic actuator:

Min and **Max** numbers define the internal pneumatic actuator and should not be changed unless you know what you're doing.

Freq 1/2 define max frequency for Valve1 (pushing the actuator out) and Valve2 (letting the air out = actuator retracting). 100/50 is a good start.

Max PWM 1/2 defines maximum PWM duty cycle for each valve (Resolution is 0.1% so 1000 means 100%)

Ext setpoint as position changes operating mode of the actuator to have the closed loop position feedback according to the analog input, instead of internal position. This should normally be unchecked.

Hydr Actuator:

If **Enabled**, clutch actuator is aware of the foot clutch actuator and responds to the foot commands.

Min/Max values define fully closed and fully extracted internal cylinder and should not be changed unless you know what you're doing.

Treshold is the raw number after which foot clutch gets detected as a clutch press and should be tuned to your car.

Pneumatic actuator PID:

There are 3 PID parameters sets that are used depending on the movement. P/I/D define how PWMs are calculated. There are 3 sets available:

0-100% movement (when going from fully closed to fully opened), 100% - 50% (when going from fully opened to the bitepoint) and normal operation.

0-100% and 100-50% movements are only used when commands are sent via CAN BUS. If analog paddle is used, only normal operation is used.

After number defines how many milliseconds after the command, valve is fully opened, before going into PWM mode.

P:1.5, I:0, D:0 is a good starting point.

Script Input:

Script input is simulation tool to test the responsiveness of the setup. Commands get executed from top to bottom. Currently supported:

ToPosition [position] – jumps to [position]

Delay [milliseconds] – waits for [milliseconds] before continuing

RampToPositionExp [position] [milliseconds] – ramps to [position] exponentially in [milliseconds]

RampToPosition [position] [milliseconds] - ramps to [position] linearly in [milliseconds]

CAN BUS info

CAN speed = automatic detection

CAN Broadcasting data set

ID	B0	B1	B2	B3	B4	B5	B6	B7
0x6CA	cp.H	cp.L	free	free	setp.H	setp.L	status	crc
0x6CB	status2	ap.H	ap.L	apr.H	apr.L	paddr.H	paddr.L	crc
0x6CC	free	pwm1	pwm2	pidpv	hap.H	hap.L	hap.p	crc

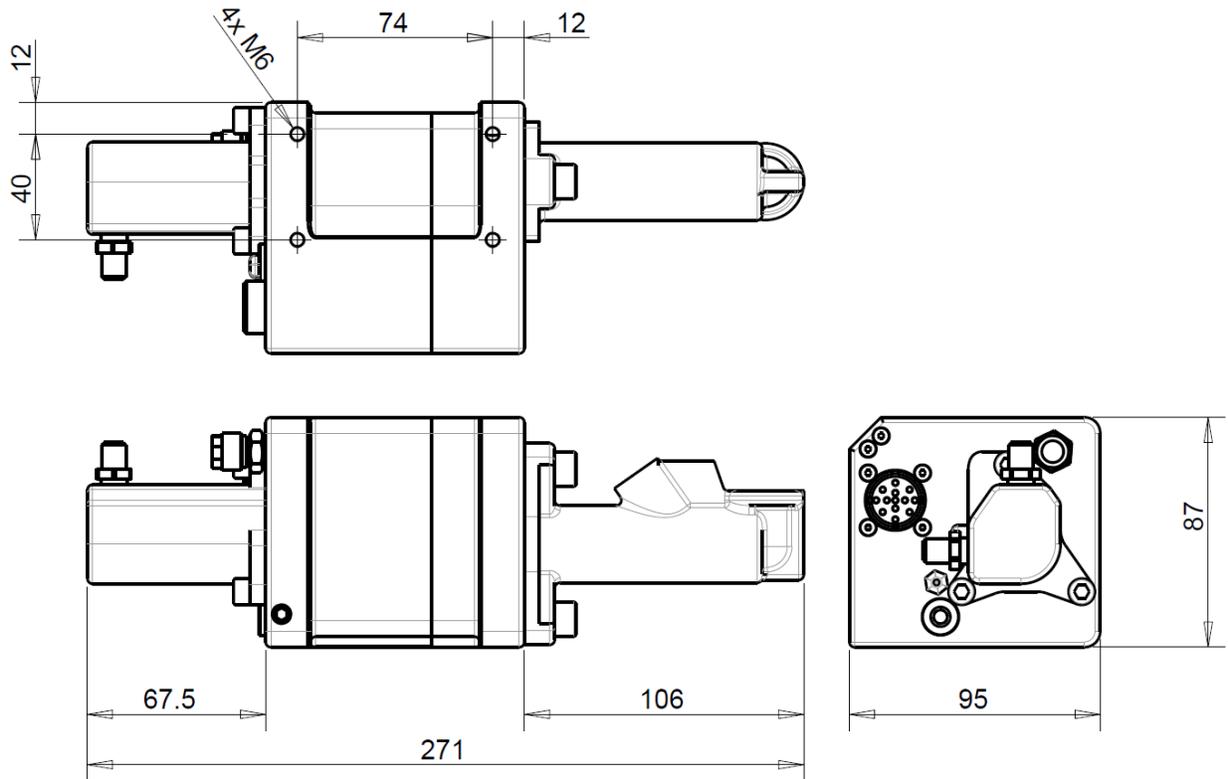
cp.H+L	Current clutch position (0-1024)
setp.H+L	Current setpoint (H*256+L)
status	Status bits: B0 – manual override by foot B1 – manual override by paddle B2 – clutch blip active B3 – ramping B4-B7 - free
status2	Status bits: B0 – PID 0-100 active B1 – PID 100-50 active B2-B7 - free
crc	crc checksum. Formula used: 1 + B0 + B1 + B2 + B3 + B4 + B5 + B6
ap.H+L	Pneumatic actuator position (H*256+L)
apr.H+L	Raw pneumatic actuator position (H*256+L)
padd.H+L	Manual paddle raw position (H*256+L)
pwm1	PWM of valve 1 (PWM = 4.0*X)
pwm2	PWM of valve 2 (PWM = 4.0*X)
pidPV	PID PV (PV=4.0*X)
hap.H+L	Hydraulic actuator position (H*256+L)

CAN Commands

ID	B0	B1	B2	B3	B4	B5	B6	B7
0x6CD	command	p1	p2	p3	p4	free	free	crc

command	
0x98	Start broadcasting
0x99	Send version. Reply (3 bytes): 0x6CF [ver_major] [ver_minor] [signature]
0x30	Set clutch set point p1- set point MSB p2 - set point LSB Values from 0 – 1024
0x40	Set clutch set point with ramp. p1: set point MSB p2: set point LSB p3: duration (ms) MSB p4: duration (ms) MSB p5: 1 = exponential, 0 = linear

Technical drawing



Servicing

Once a year replace two M5 pneumatic silencers on the actuator with new one.

Check for fluid leaking.

WARRANTY

12 Month Limited Warranty

MME Motorsport warrants to the consumer that all MME Motorsport products will be free from defects in material and workmanship for a period of twelve months from the date of the original purchase. Products that fail within this 12-month warranty period will be repaired or replaced when determined by us that the product failed due to defects in material or workmanship. This warranty is limited to the repair or replacement of the MME Motorsport part. This warranty applies only to the original purchaser of the product and is non-transferable. All implied warranties shall be limited in duration to the said 12-month warranty period. Improper use or installation, accident, abuse, unauthorized repairs, opening the casing or alterations performed by the user on any MME Motorsport product voids this warranty.

In no event shall this warranty exceed the original purchase price of the MME Motorsport part nor shall MME Motorsport be responsible for special, incidental or consequential damages or cost incurred due to the failure of this product.

MME Motorsport disclaims any liability for consequential damages due to breach of any written or implied warranty on all of its products.

Warranty returns will only be accepted by MME Motorsport after email confirmation is given to return the product. The product must be received by MME Motorsport within 30 days of the dated email and shipping is at the consumer's expense. Once your package is received by our warranty and repairs department you will be notified and provided with updates.

In the case of Void warranty claims the consumer will be responsible for all shipping, duty and repair costs. The consumer will be notified of a void warranty claim before any repair work is undertaken.

INTENDED USE AND SAFETY INFORMATION

- All input pressure lines **MUST** be fitted with an air filter of at least 5 microns.
- Air supply must be in accordance with ISO 8573-1:2010 (7:4:4) and not exceed 10 bar.
- Temperature of the internal valve block should not exceed 70C/158F
- The unit should be protected against water spray.
- **Unit is not street legal and it should not be used on public roads or anywhere where failure could cause damage or injuries. Using the unit is entirely at the risk of the consumer and great consideration should be given to ensure the adequate back up systems are in place to ensure safe operation of the vehicle.**