

FEATURED PRODUCTS
OF **JETCAT**



JetCat
The Next Generation

PRO Engines

March 2017 Edition

OUR HISTORY & VISION

The engineering office at CAT M. Zipperer GmbH has been developing tailor-made, individual laboratory solutions for the medical industry since 1976. The products range from high-precision micro-dosing pumps to magnetic stirrers, shaking devices, dispersing devices, cell counters and robots for laboratory automation. In a departure from our traditional offerings, CAT began the development and manufacturing of micro turbines for remote control (RC) jet models in 1998, at which time "JetCat" was born! The fascination for jets has never ended for us; and today, turbines are not only used in the hobby industry, but also in commercial applications such as drones and manned flight; and are also being used in stationary applications by universities, colleges and government entities. Our steadily grown workforce of approximately 90 employees ensures that we can continue to provide comprehensive solutions that meet the unique individual requirements of both our private and industrial customers. We place great importance on maintaining high quality standards for all of our products and services as well as our processes. We are proud to say that our quality control system is ISO9000 certified. All JetCat engines are fully designed and verified by 3D CAD systems. In addition to tool making, the company's fleet of CNC machines allows for flexible production in the milling and machining of parts of every kind imaginable. The plastic parts are produced with our own plastic

injection molding machines, while the precise welding and cutting of thin-walled metal parts such as combustion chambers is carried out on our on-site laser welding and cutting systems. The "short distance" from engineering to production allows for a very close cooperation between the engineers, machinists and production specialists with minimum delays. This makes us particularly strong at taking new ideas and customer wishes from concept to completion, which can be quickly implemented and field-tested. Unlike other engine manufacturers, all software and electronics are developed and manufactured in house!

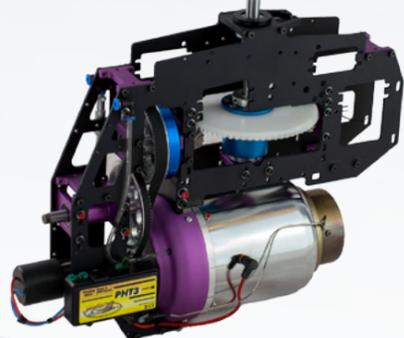
All engines are subjected to test runs before delivery to the end user. For this purpose, we have a specially equipped test cell in which thrust is measured; and for shaft drives, torque/power is measured. In addition, the individual rotating assembly of the engine is dynamically balanced, then a final balance is completed in the fully assembled state. This is all accomplished in our laboratory with various precision balancing machines.

Markus Zipperer
CEO, Ingenieurbüro CAT, M. Zipperer GmbH

INNOVATION AND COOPERATION
Innovation and cooperation for the mutual benefit of customers, employees and companies



JetCat
P80
1997



JetCat
PHT3
2001



JetCat
P160
2003



JetCat
P200
2003



JetCat
P20-SE
2010



JetCat
P550 PRO-GL
2016



JetCat
P180-NX
2016



JetCat
P220-RXi
2015

- PHT3
- PHT3-3
- PHT4
- SPT5
- SPT5-H
- PHT2
- SPH5
- SPM5
- SPT15
- SPT15-RX
- SPT15-RX-H
- SPT10-RX
- SPT10-RX-H

- P20-SE
- P60
- P70
- P80
- P90-RX
- P100-RX
- P120
- P140-RX
- P160
- P180
- P180-RX
- P180-NX
- P200
- P220-RXi
- P300-RX
- P300-PRO
- P400-RX
- P400-PRO
- P550-PRO-GL

- P20-SX
- P60-SE
- P80-SE
- P90-RXi
- P90-RXi-B
- P120-SE
- P140-RXi
- P160-SE
- P180-RXi
- P180-RXi-B
- P200-SX
- P200-RX
- P300-RX-G
- P300-PRO-GL
- P400-RX-G
- P400-PRO-GL
- P400-PRO-GH
- P550-PRO-GH

JetCat PRO Engines

- Highest Level Of Integration For Professional/ Industrial Use

JetCat PRO engines provide the highest level of integration and maximum ease of installation. All peripheral systems necessary for the engine's operation are fully integrated under the engine's front cowling. Besides the supply battery, fuel tank and some external control signals, there are no further external subsystems required! The control signals are fed out on a pigtail cable terminated with a 15-pin SUB-D connector (other connector types available on request). The power supply is made via a second pigtail cable with a XT60 connector for direct battery connection.

JetCat-PRO engine features:

Integrated Engine Components:

- ECU (electronic control unit)
- Brushless fuel pump
- Fuel & Kerosene-start Solenoids
- Fuel filter
- Direct kerosene startup
- Barometric altitude / pressure sensor
- 4-pin Molex expansion connector (e.g. for smoke pumps / fuel transfer pumps)
- Bleed-air port with integrated one way valve (e.g. for pressurization of fuel system)

Power supply:

Via 3-cell LiPo battery / XT60 Power connector / capacity 3000mAh or higher

Data Connector (Section)

Via 15pin SUB-D (male) this provides for the following control options:

- 1x PowerOn control signal
 - 2x PWM input channels (e.g. for RC remote control; THR/AUX)
 - 2x independent RS232 interfaces for computer remote control and/or interconnection of multiple engines
 - 1x analog voltage control / sensor input
 - 1x JetCat Bus interface, e.g. for connection of GSU and/or other JetCat accessories (LCU / flow sensor/ BMS system etc.)
- CAN-Bus interface for control and data reporting

Standard version:

The standard P300/P400-PRO engine has a "normal" starter motor, with no generator (to save cost e.g. for hobby applications). By using our "JetCat-PRO" interface, the engines can easily be used for RC-model applications. The PRO-Interface also has full functionality of our telemetry adapter already integrated!

Generator version PRO-GL:

This versions consist of a brushless and contactless operating starter/generator system. The generator is "soft" coupled, meaning it will spin at a lower RPM than the engine shaft itself (patent pending). An engine mounted and integrated DC/DC power converter with additional charge control circuitry allows for the buffering/re-charging of the engine supply battery. The charging system is capable of supplying charge power to the engine battery even at engine idle (although not recommended, the engine battery could even be removed once the engine has been started up). The electrical power of this charging system is approx. 85W. Due to the "soft" coupling of the alternator, there is no option for higher electrical power output or 3-phase AC output.

Generator version PRO-GH:

This version consists of a brushless and contactless operating starter/generator system. The generator is "hard" coupled to the engine shaft (but there is still no mechanical contact), meaning it will spin at the same RPM as the engine shaft. This configuration allows for a much higher power output of the generator (900W!). This version is also supplied with an unregulated 3-phase AC power output. The 3-phase voltage will vary proportionally with engine RPM. Typically, the measured DC voltage at idle will be around 12V/7,5A (33000 1/min) and 35V/22A (100000 1/min) when loaded with an 1,50hm resistor behind a rectifier network (6x high power Shottky diodes).

As with the previous generator option, an engine mounted and integrated DC/DC power converter with additional charge control circuitry allows for the buffering/re-charging of the engine supply battery. The charging system is capable of supplying charge power to the engine battery even at engine idle (the engine battery could even be removed once the engine has been started up). The electrical power of this charging system is approx. 85W.

Generator version PRO-GH:

For P550-PRO engines only available in PRO-GL or PRO-GH versions!



JetCat P400 PRO

**JetCat
P300 PRO**



**JetCat
P400 PRO**



**JetCat
P550 PRO**



Basic Specifications	P550-PRO	P400-PRO	P300-PRO
Idle rpm (1/min)	26000	30000	35000
Max rpm (1/min)	83000	98000	106000
Thrust at idle (N)	28	14	14
Thrust @ maxRpm (N)	550	397	300
EGT range (°C)	480-750	480-750	480-750
Pressure ration	3,8	3,8	3,55
Mass flow (kg/s)	0,93	0,67	0,5
Exhaust gas velocity (km/h)	2129	2122	2160
Exhaust gas power output (kW)	162,6	116,4	90
Fuel consumption @ maxRpm (ml/min)	1650	1300	980
Fuel consumption idle (ml/min)	300	200	179
Fuel consumption idle (kg/min)	0,240	0,16	0,143
Fuel consumption @ maxRpm (kg/min)	1,320	1,040	0,784
SFC @ maxRpm (kg/Nh)	0,144	0,158	0,157
Weight (g)	4900	3650	2730
Diameter (mm)	178,6	148,4	132
Lenght (mm) incl. starter	426	353	380,5
Operating conditions			
Maximum startup altitude	2600m (@STP)		
Maximum operating altitude	10000m / 32800ft		
Fuel	Jet-A1 with 5% oil		
Max axial (forward) acceleration	25G	25G	25G

All data at STP +/- 3% ; STP. Standart temperature and pressure: 15°C, 1013mbar



JetCat P300 PRO

P300 PRO Art No.: 71153-70
 P300 PRO-GL Art No.: 71153-71
 P300 PRO-GH Art No.: 71153-72



JetCat P400 PRO

P400 PRO Art No.: 71154-70
 P400 PRO-GL Art No.: 71154-71
 P400 PRO-GH Art No.: 71154-72



JetCat P550 PRO

P550 PRO-GL Art No.: 71155-70
 P550 PRO-GH Art No.: 71155-72

JetCat PRO-Interface



JetCat PRO-Interface

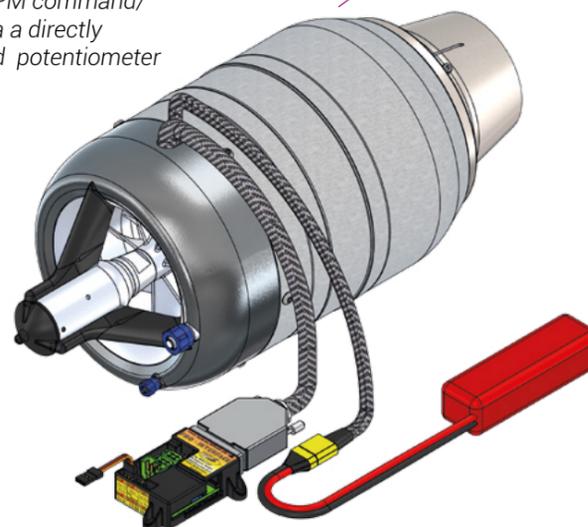
By using the "JetCat-PRO" interface, not only can all PRO engines easily be used in RC-model applications, it provides a ready-made solution, and easy interface point for educational and industrial applications. It also provides full functionality of our JetCat Telemetry-Adapter if desired! Furthermore, the PRO Adapter allows for an easy access point to connect other accessories such as:

- One or two channel RC control (from receiver)
- Telemetry output for: Jeti, Graupner Hott, Multiplex M-BUS and Futaba SBUS-2
- RJ12 jack for connection of GSU
- Air Speed sensor header
- 6 and 8 pin ERNI flat cable connectors (e.g. for connection of LCU / Mini GSU)
- RS232 header for computer control
- CAN-Bus header
- Header to JetCat BMS (Battery Management System)

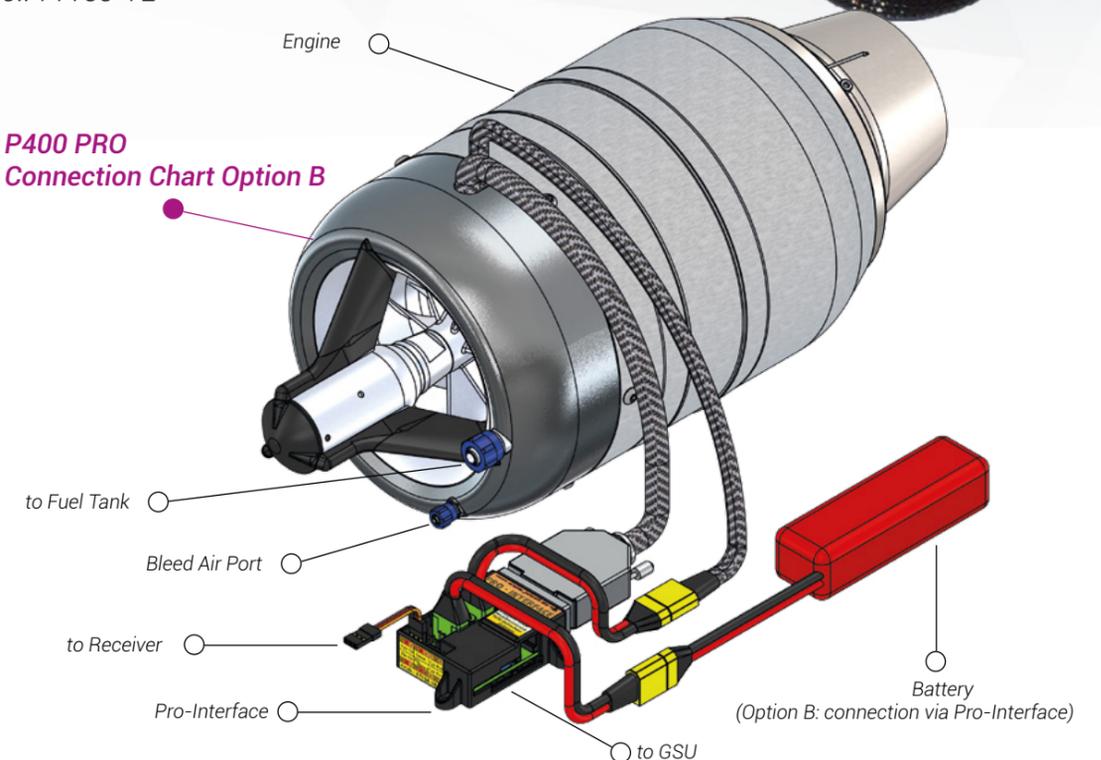
PRO-Interface Art No.: 61168-10

- Cross check communication port (for interconnecting / synchronizing two engines).
- 3x Status LEDs
- Analog and digital inputs for:
 - Power On/Off
 - Engine On/Off Control
 - Engine RPM command/control via a directly connected potentiometer

P400 PRO Connection Chart Option A



P400 PRO Connection Chart Option B



JetCat Engines

The next Generation:

JetCat P180-NX

JetCat P220-RXi

JetCat BMS-System

The next Generation:

The newly developed JetCat P180-NX and JetCat P220-RXi, not only have fully encapsulated & integrated brushless fuel pumps internally mounted, they also feature a brushless starter / generator system! Since the rotor of the brushless fuel pump is running in the fuel, the need for shaft seals is no longer required, making fuel leaks a thing of the past. The starter / generator utilizes magnetic "coupling" between the starter and engine rotor which produces a contact free system to the engine's shaft! This contact-less system is resistant to wear and dirt which removes the possibility of slippage of the starter clutch caused by oil/dirt, or a worn O-ring.

The specially developed non-contact clutch system also ensures that the brushless generator can operate independently of the engine's shaft, which allows the generator to run at very low speeds. This ensures very high reliability, as well as longevity of the entire starter / generator system. Furthermore, the JetCat P220-RXi has been optimized to achieve a minimum system weight. The laser-welded housing is made of thin-walled stainless steel, bringing the entire engine's weight,

including integrated brushless pump, valves, fuel filter, and generator / charging system to only 1850g. The engine also features an integrated full-metal fuel distribution system with fuel filter and electromagnetic shut-off valves. The fuel distribution system is milled from solid aluminum and eliminates potentially faulty hose connections / fittings etc.

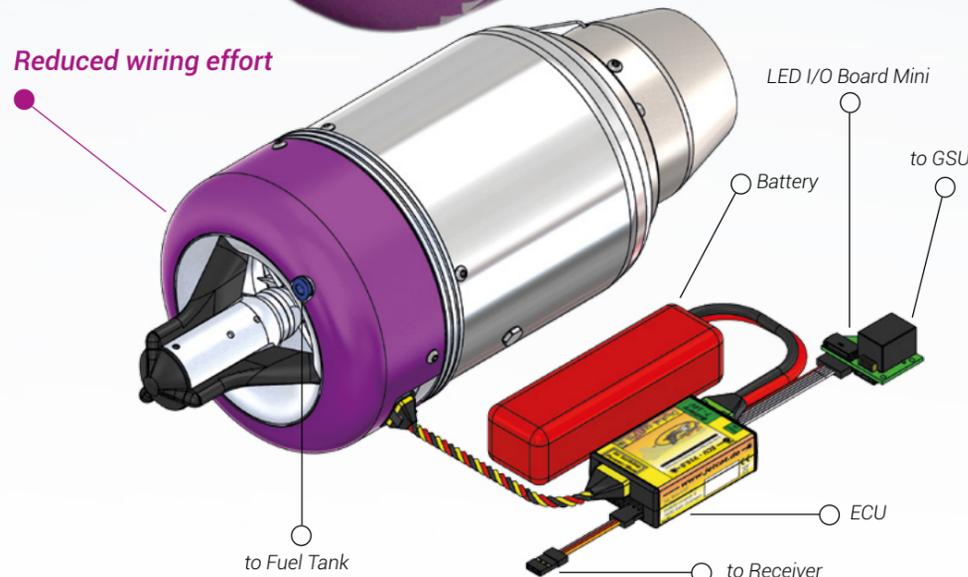
Never charge batteries again, the FUTURE is here! After the engine starts, the ECU battery is charged by the generator with high power charge current which is fully automatic along with the voltage. Initially, the engine's battery must be charged in the no-load state. Using the optional JetCat BMS System, suitable receiver batteries can also be charged. This entire engine and charging system is ideal for large models that must comply with size and weight requirements since smaller and inherently lighter receiver batteries may now be used because the batteries are constantly recharged in flight by the BMS System.



JetCat P180-NX
175 N

Typ	P180-NX	P220-RXi
Idle rpm (1/min)	32000	35000
Max rpm (1/min)	126000	117000
Thrust at idle (N)	7	9
Thrust @ maxRpm (N)	175	220
EGT range (°C)	520-750	480-750
Pressure ration	3,5	3,9
Mass flow (kg/s)	0,38	0,45
Exhaust gas velocity (km/h)	1658	1760
Exhaust gas power output (kW)	40,3	53,8
Fuel consumption @ maxRpm (ml/min)	585	725
Fuel consumption idle (ml/min)	120	130
Fuel consumption idle (kg/min)	0,096	0,104
Fuel consumption @ maxRpm (kg/min)	0,468	0,580
SFC @ maxRpm (kg/Nh)	0,160	0,158
Weight (g)	1710 ⁻⁵	1850
Diameter (mm)	112	116,8
Lenght (mm) incl. starter	283	309

Reduced wiring effort



JetCat P220-RXi
220 N

JetCat Battery Management System - (BMS)

BMS-System V 1.0 description:

The JetCat BMS (Battery Management System) solves several necessities when charging the engine and receiver batteries from an engine powered generator system:

- 1) Precise measurement of the cell voltages of the engine battery, and forwarding of this information to the ECU and generator charging system.
- 2) Balancing of the engine battery cells.
- 3) Output control and current measurement of the two charging outputs to the RX batteries.
- 4) Reporting of all charge currents / voltages and charged capacities to the ECU.

Principal of Operation:

The integrated starter/generator is used to charge the engine / ECU battery once the engine is running. The charge current into the battery depends on the type of engine battery used (i.e. 3cell LiFe or 2 cell LiPo) and the actual RPM setting of the engine. The charge current provided (generator current) is used for all connected devices like ECU, fuel pumps, valves etc., as well as for charging of the engine and receiver batteries, if connected. The charge current into the supply battery can reach up to approximately 6.5A; this is necessary to replace the energy used during startup and cooling within a short period of time.

Once the engine battery has reached its "full charge", the charge current is automatically reduced to stay within the allowable margins of the engine's battery. To replace the battery energy used up during engine start and cooling, about two minutes of engine run time above 45,000 rpms are typically required. This time will increase depending on how much energy is needed for buffering/ recharging of the optional connected receiver batteries or other equipment (i.e. smoke pump).



The receiver's batteries are fully recharged automatically even after power down of the model! (Powerbox Systems receiver batteries required)
Can be used with V10 ECU's
(*may require ECU software update, www.jetcat.de)

BMS-System Art No.: 61108-60

JetCat Telemetry Adapter



Works with V6 and V10 ECU's
(*may require ECU software update, www.jetcat.de)

JetCat Telemetry Adapter

The JetCat Telemetry Adapter allows ECU data to be transmitted to the telemetry systems of different radios.

Telemetry types currently supported:

- Multiplex Sensor Bus (MSB v2, M-Link Telemetry)
- HoTTv4
- Futaba S.Bus
- Jeti Telemetry

Principle of Operation:

The JetCat Telemetry Adapter is connected directly to the ECU data bus. The output of the Telemetry Adapter typically goes directly to the receiver (or telemetry input of the receiver). The sensor has two parallel switched outputs which allows the second output to be connected to another device or sensor. The telemetry type (Multiplex MSB, Graupner/SJ HoTTv4, Futaba SBUS2) must be set in the engine's ECU via the Limits menu using the GSU. The telemetry data transmitted to the receiver will depend on the specific telemetry type selected or used.

Telemetry Adapter Art No.: 61108-70

Jeti Telemetry



Futaba S.Bus

Telemetrie		JetCat Test	
Empfänger	Extern	1. JetCat V10(Pumpe)	1. JetCat V10(Rest Kr...)
7.3V	0.0V	5.03V	3922ml
1. JetCat V10(Drehzahl)	1. JetCat V10(Turbine...)	1. JetCat V10(Kraftsto...)	
123300rpm	125000rpm	702ml/min	
1. JetCat V10(Temper...)	1. JetCat V10(Schub)	1. JetCat V10(Höhe)	
666°C	181.2N	0m	

MSB v2



HoTTv4



JetCat Mini-GSU



JetCat Mini-GSU

The (Mini) Ground Support Unit (MGSU) is an option for those who do not want to carry the standard GSU. The Mini-GSU is so small that it can simply remain in the model if desired. The 2-line, backlit alphanumeric LCD display and 10 function buttons offer the same operations as the "large" GSU.

The connection to V6 and lower ECU(s) is done via an 8-pin ribbon cable and connector directly to the LED I/O interface. The connection to V10 & up ECU(s) is made either directly to the ECU or the std. LED I/O board via a 6-pin ribbon cable and connector to the JetCat I/O interface with charging input.

Mini-GSU

Art No.: 61161-00

JetCat LCU-PRO-USB



Direct connection of the LCU to the ECU via the LED-IO interface.
(Power supply and data)

JetCat Scale model lighting

Automated lighting control for your model. The JetCat-LCU can automatically control your model lighting depending on the engines operation condition.

Via the additional 3x RC inputs individual lights can also be directly RC controlled (e.g. for landing lights)

- Easy programming with only 2 buttons
- LCU automatically switches ON/OFF with RC power, no additional switch necessary
- Fully opto-isolated RC inputs
- USB port for parameter setting / programming via PC / laptop
- Can be powered from engine battery.
- 3x independent RC inputs / outputs (V-cable function on board)
- Input for control and power supply of the LCU via JetCat-ECU (8-pin flat cable)
- 14x outputs:
11x multifunction, 2x afterburner, 1x switching output
- 22x 1W - emitters connectable (each multifunction output can drive up to 2 LEDs)
- 2x afterburner rings directly connectable (output regulated to 6.6V)
- Afterburner lights are automatically triggered from ECU at full throttle and engine running.
- Each output has a dedicated control LED
- Status LED (green/ yellow/ red) for programming aid and voltage monitor
- Battery connection via MPX plug (or from ECU)
- Each output function (LED) can be freely assigned to an RC input or be automatically controlled from ECU.
- Extensive adjustments and combinations possible
Anodised aluminum upper shell

Examples of automatic lighting control via engines state:

Engine state	Jet-model	Helicopter model
Engine OFF, no cooling	All lights OFF	
Engine start	Flash lights= ON Position lights= OFF	
Engine Ignition detected	Position lights for 4 secs ON then OFF again	Position lights and ACL (=anti-collision light) for 4 secs ON then OFF again
Engine started up and idle rpm reached	Flash lights= ON Position lights= ON	
Engine at max/full rpm	Afterburner lights ON when engine RPM >90% and full RPM commanded	Max Rpm reached and stable ACL =0
Engine OFF, cooling	Flash lights=ON, all other lights=OFF	Flash lights=ON, all other lights=OFF
Battery low	All lights OFF	All lights OFF
FailSafe condition detected	Position lights and afterburner lights flash rapidly	Position lights and ACL flash rapidly
Fuel low	Position lamps flashing in 4-second interval	Position lamps flashing in 4-second interval

LCU-PRO-USB Art No.: 61162-30



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