Test Report issued under the responsibility of:

TÜVRheinland®

TEST REPORT
IEC 61010-1
Safety requirements for electrical equipment for measurement, control, and laboratory use
Part 1: General requirements

Report Number.....:	CN231DTM 001
Date of issue.....:	2024-04-24
Total number of pages.....:	386 total (193 (trf) +193 (attachments))
Name of Testing Laboratory preparing the Report.....:	TÜV Rheinland (China) Ltd.
Applicant's name.....:	TDK-Lambda Ltd.
Address.....:	56 Haharoshet St., P.O.B. 500, Karmiel Industrial Zone, 2161401 Karmiel, Israel
Test specification:	
Standard.....:	IEC 61010-1:2010, IEC 61010-1:2010/AMD1:2016
Test procedure.....:	CB Scheme
Non-standard test method.....:	N/A
TRF template used.....:	IECEE OD-2020-F1:2020, Ed.1.3
Test Report Form No.....:	IEC61010_1P
Test Report Form(s) Originator....:	VDE Prüf- und Zertifizierungsinstitut GmbH
Master TRF.....:	2021-04-12

If this Test Report Form is used by non-IECEE members, the IECEE/IEC logo and the reference to the CB Scheme procedure shall be removed.

This report is not valid as a CB Test Report unless signed by an approved IECEE Testing Laboratory and appended to a CB Test Certificate issued by an NCB in accordance with IECEE 02.

General disclaimer:

The test results presented in this report relate only to the object tested.
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Test item description..... :	Programmable AC/DC and AC/AC power supply
Trade Mark ..... :	TDK-Lambda, TDK·Lambda
Manufacturer ..... :	Same as applicant
Model/Type reference..... :	GAC-xxyzuw-mmoppq; GAC-xxyzuw-mmoppq/aaaaaa; GAC-PRO-xxyzuw-mmoppq; GAC-PRO-xxyzuw-mmoppq/aaaaaa Where – x = 0-9; y = A-Z; z = A-Z; u = 0-9; w = A-Z; m = 0-9; o = A-Z; p = 0-9; q = A-Z. a = A-Z, or 0-9, or BLANK. (see "description of model differences" for explanation of model/type reference names)
Ratings..... :	**Input ratings**: 100-240 Va.c., 16 A, 50/60 Hz, for 1-phase 208Vac models with 2kVA output. 100-240 Va.c., 22.5 A, 50/60 Hz, for 1-phase 208Vac models with 3kVA output. 190-240 Va.c., 8.6 A, 50/60 Hz, for 3-phase 208Vac models with 2kVA output. 190-240 Va.c., 12.5 A, 50/60 Hz, for 3-phase 208Vac models with 3kVA models. 380-480 Va.c., 4.5 A, 50/60 Hz, for 3-phase 480Vac models with 2kVA output. 380-480 Va.c., 6.5 A, 50/60 Hz, for 3-phase 480Vac models with 3kVA output. **Output ratings**: AC 0-350 V, 20 A, for 2kVA output (GAC-02 series) AC 0-350 V, 30 A, for 3kVA output (GAC-03 series) AC 0-350 V or DC -500 to +500 V, 20 A for 2kVA output (GAC-PRO-02 series) AC 0-350 V or DC -500 to +500 V, 30 A, for 3kVA output (GAC-PRO-03 series)

Responsible Testing Laboratory (as applicable), testing procedure and testing location(s):			
☐	**CB Testing Laboratory:**		
Testing location/ address..... :			
Tested by (name, function, signature) .... :			
Approved by (name, function, signature) :			
☐	**Testing procedure: CTF Stage 1:**		
Testing location/ address..... :			
Tested by (name, function, signature) .... :			
Approved by (name, function, signature) :			
☐	**Testing procedure: CTF Stage 2:**		

Testing location/ address ..... :			
Tested by (name + signature) ..... :			
Witnessed by (name, function, signature):			
Approved by (name, function, signature) :			
☒	**Testing procedure: CTF Stage 3:**	TDK-Lambda Ltd.	
☐	**Testing procedure: CTF Stage 4:**		
Testing location/ address ..... :		9 HaYotsrim St., P.O.B. 500 Karmiel Industrial Zone Karmiel 2165235, Israel	
Tested by (name, function, signature) .... :		Elias Jiries, PS Group Leader	
Witnessed by (name, function, signature):		Xuhua Liu, PE	
Approved by (name, function, signature) :		Will Zhou, Authorizer	
Supervised by (name, function, signature):		Will Zhou, Authorizer	

List of Attachments (including a total number of pages in each attachment)		
Document No.	Documents included / attached to this report (description)	Page No.
Attachment 1	EU Group Differences	1
Attachment 2	Japan Group Differences	4
Attachment 3	U.S. National Differences	8
Attachment 4	Canada National Differences	16
Attachment 5	Photos	19
Attachment 6	Electrical Schematics	33
Attachment 7	PCB Layouts	77
Attachment 8	Magnetics	10
Attachment 9	Wire Harness	25

Documents referenced by this report (available on request):		
Document Name or No.	Documents description	Page No.

Summary of testing:

CN231DTM 001 – This report is the initial and first report issued.

Refer to the "Tests performed" section in this report for the full list of tests performed for this project.

Different models were selected for different tests to achieve the least favourite condition of that test, and the loading conditions were carefully selected for each specified test after deep Engineering investigation of the product and relevant electrical schematics, and where necessary, after performing multiple preliminary testing to verify the least favourite condition for the specified test. For example, for the working voltage test, multiple loading conditions were tested (e.g. output DC, output AC, output AC with low-frequency vs high-frequency, etc.) and then the least favourite one was noted and tested on a second model (e.g. 1P208 model and 3P208 model).

For the input test, all models with dedicated labels have been tested to verify the input current marked on that label.

Most tests were conducted on tabletop under 25°C (room temperature), except where noted otherwise in temperature rise test where samples were tested in a heating oven. Even for the temperature rise test, the test was also conducted on tabletop before putting the product in the heating oven to compare test results between free convention ventilation and forced convention ventilation (i.e. in a heating oven). The comparison showed no significant differences in most recorded results and thus only the heating oven results were conveyed in this test report.

The test voltage for the voltage test (HiPot) was selected based on the highest calculated required clearance and considering test site altitude. The sub-clause used for the voltage test can be found in the clearance/creepage table in this test report.

Refer to the testing tables throughout this report to learn about the models used and loading conditions relevant for each specific test.

Clause	Comment

Test Report History:
This report may consist of more than one report and is only valid with additional or previous issued reports:

Report Ref. No.	Item
CN231DTM 001	The initial CB test report of this project.

Tests performed (name of test and test clause):	**Testing location:**
CN231DTM 001 4.4 SINGLE-FAULT CONDITIONS 5.1.3 c) Input test (MAINS supply) 5.3 Durability of markings 6.2 Determination of ACCESSIBLE parts 6.3.1 Values in NORMAL CONDITION 6.3.2 Values in SINGLE-FAULT CONDITION (e.g. touch current) 6.5.2 PROTECTIVE CONDUCTOR test (Earthing test) 6.7 Working voltage and Cl/Cr measurements 6.8 Voltage test (Dielectric strength/ Hipot) 6.10.3 Plug discharge test (or capacitive discharge) 8.2 ENCLOSURE rigidity and static test 8.2.2 Ball impact test 8.3 Drop test 9.4 Limited-energy circuit test 10 Temperature test 10.5.2 Resistance to heat of non-metallic ENCLOSURES 10.5.3 Ball-pressure test 4.4.2.7.2 Transformer short test 4.4.2.7.3 Transformer overload test	TDK-Lambda Ltd. 9 HaYotsrim St., P.O.B. 500 Karmiel Industrial Zone, Karmiel 2165235, Israel

Summary of compliance with National Differences (List of countries addressed):

The following national differences were considered to IEC 61010-1:2010 (3rd Edition) + Am 1: 2016: List of countries addressed: EU GROUP DIFFERENCES, CA=Canada, US=United States of America, JP=JAPAN NATIONAL DIFFERENCES

☒ **The product fulfils the requirements of** EN 61010-1:2010+AMD1:2019, UL 61010-1:2012 R6.23, CAN/CSA-C22.2 NO. 61010-1-12 + GI1 + GI2 (R2017) + A1.

Statement concerning the uncertainty of the measurement systems used for the tests
(may be required by the product standard or client)

☐ **Internal procedure used for type testing through which traceability of the measuring uncertainty has been established:**

Procedure number, issue date and title:

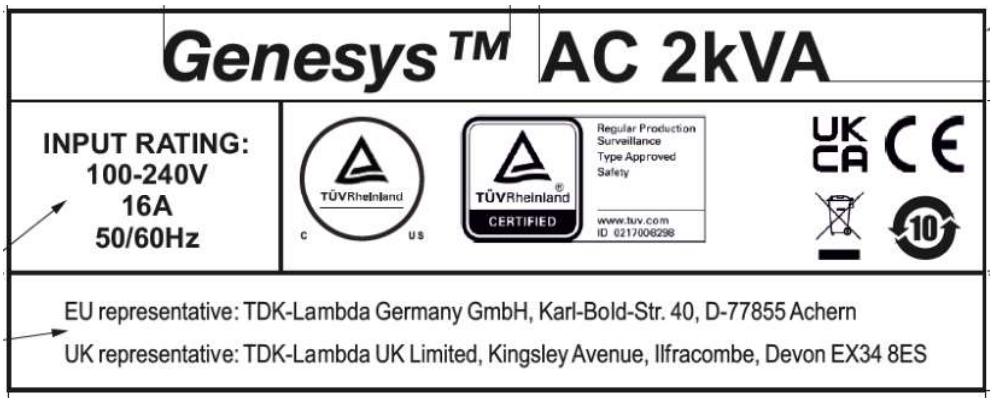
Calculations leading to the reported values are on file with the NCB and testing laboratory that conducted the testing.

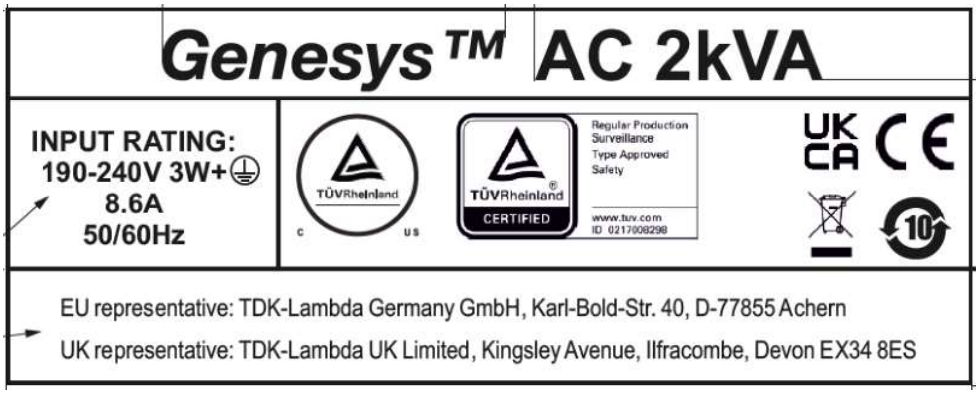
☒ **Statement not required by the standard used for type testing**

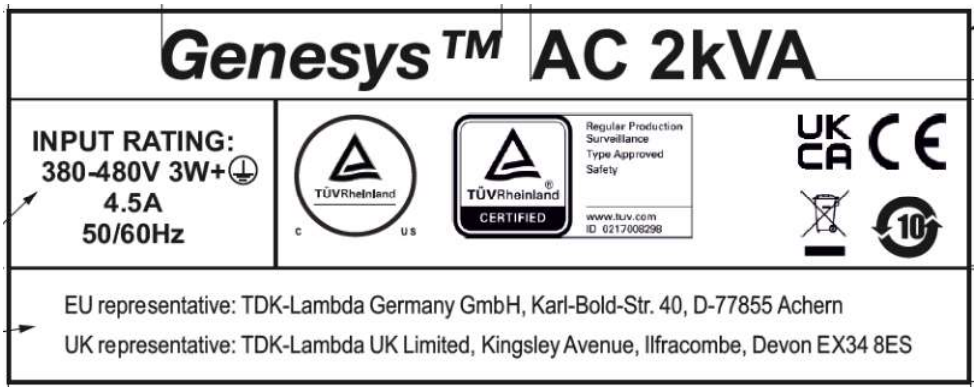
(Note: When IEC or ISO standard requires a statement concerning the uncertainty of the measurement systems used for tests, this should be reported above. The informative text in parenthesis should be delete in both cases after selecting the applicable option)

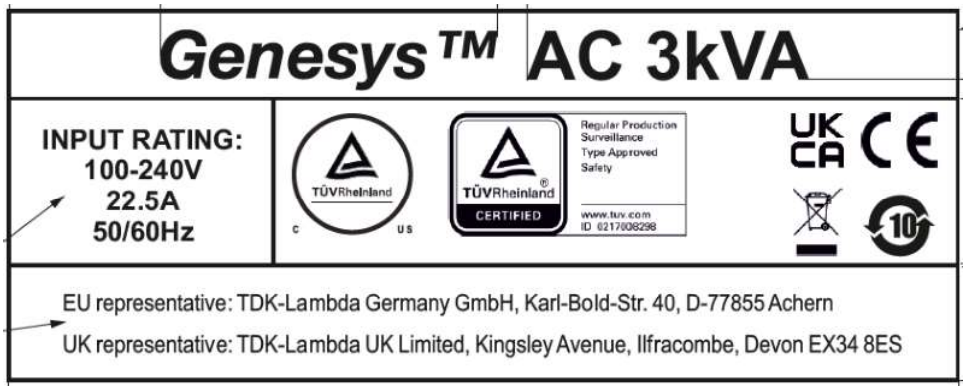
Copy of marking plate:

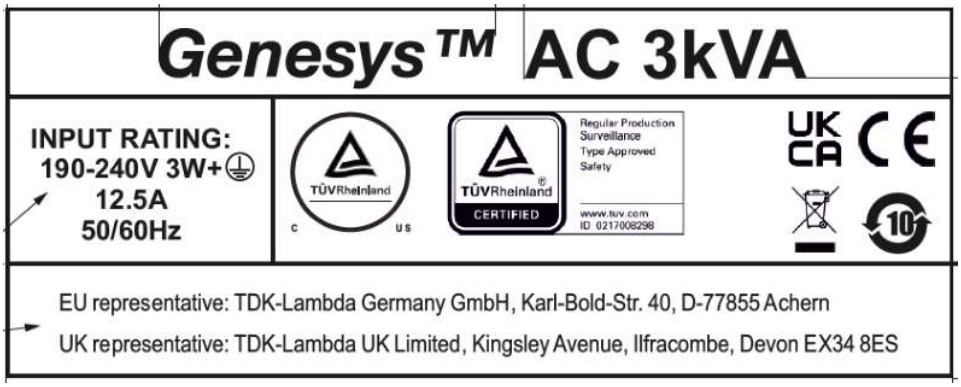
The artwork below may be only a draft. The use of certification marks on a product must be authorized by the respective NCBs that own these marks.










Genesys™ AC 3kVA
INPUT RATING:
190-240V 3W+⏚
12.5A
50/60Hz
TÜVRheinland
c us
TÜVRheinland
CERTIFIED
Regular Production
Surveillance
Type Approved
Safety
www.tuv.com
ID 0217008298
UK CA CE
10
EU representative: TDK-Lambda Germany GmbH, Karl-Bold-Str. 40, D-77855 Achern
UK representative: TDK-Lambda UK Limited, Kingsley Avenue, Ilfracombe, Devon EX34 8ES

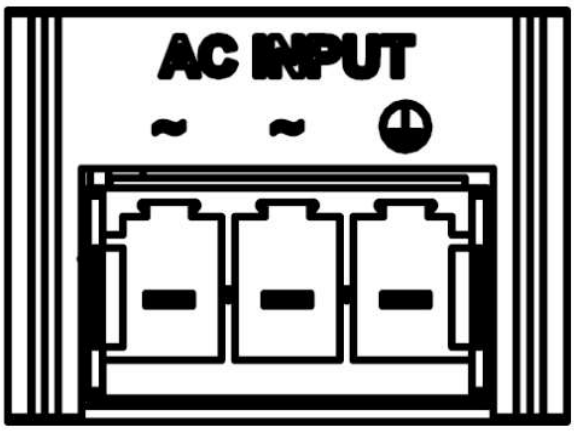

Genesys™ AC 3kVA
INPUT RATING:
380-480V 3W+⏚
6.5A
50/60Hz
TÜVRheinland
c us
TÜVRheinland
CERTIFIED
Regular Production
Surveillance
Type Approved
Safety
www.tuv.com
ID 0217008298
UK CA CE
10
EU representative: TDK-Lambda Germany GmbH, Karl-Bold-Str. 40, D-77855 Achern
UK representative: TDK-Lambda UK Limited, Kingsley Avenue, Ilfracombe, Devon EX34 8ES

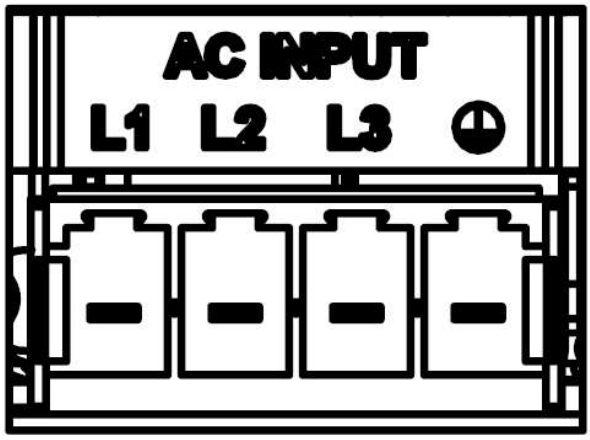

TDK·Lambda
GAC-02
AC Power Source
0-350V/0-20A


TDK·Lambda
GAC-PRO-03
AC+DC Power Source
0-350V/0-30A


TDK·Lambda
GAC-PRO-02
AC+DC Power Source
0-350V/0-20A


TDK·Lambda
GAC-03
AC Power Source
0-350V/0-30A


AC INPUT


AC INPUT
L1 L2 L3

Test item particulars:	
Type of item ..... :	Laboratory
Description of equipment function ..... :	Programmable AC/AC and AC/DC power supply.
Connection to MAINS supply ..... :	Permanent / Detachable cord set / Non detachable cord set (depends on model); NOTE: means of connection to the MAINS depends on the final installation by the customer, and not provided by the manufacturer.
Overvoltage category ..... :	II
POLLUTION DEGREE ..... :	2
Means of protection ..... :	Class I (PE connected)
Environmental conditions ..... :	Normal
For use in wet locations ..... :	No
Equipment mobility ..... :	Fixed
Operating conditions ..... :	Continuous
Overall size of equipment (W x D x H) ..... :	With accessory protection box: 423 x 545 x 44 [mm] Without accessory box: 423 x 641 x 44 [mm]
Mass of equipment (kg) ..... :	8
Marked degree of protection to IEC 60529 ..... :	Considered IPX0 (not marked)
Possible test case verdicts:	
- Test case does not apply to the test object ..... :	N/A (Not Applicable)
- Test object does meet the requirement ..... :	P (Pass)
- Test object does not meet the requirement ..... :	F (Fail)
Testing:	
Date of receipt of test item ..... :	26/March/2023
Date (s) of performance of tests ..... :	26/March/2023 – 21/December/2023

General remarks:

The test results presented in this report relate only to the object tested.
This report shall not be reproduced, except in full, without the written approval of the issuing testing laboratory.
"(see ENCLOSURE #)" refers to additional information appended to the report.
"(see Form A.xx)" refers to a Table appended to the report.
Bottom lines for measurement Tables Forms A.xx are optional if used as record.

Throughout this report a ☐ comma / ☒ point is used as the decimal separator.

Manufacturer's Declaration per sub-clause 4.2.5 of IECEE 02:

The application for obtaining a CB Test Certificate includes more than one factory location and a declaration from the manufacturer stating that the sample(s) submitted for evaluation is (are) representative of the products from each factory has been provided ..... :	☐ **Yes** ☒ **Not applicable**

When differences exist; they shall be identified in the general product information section.

Name and address of factory (ies).....:	TDK-Lambda Ltd. 56 Haharoshet St., P.O.B. 500, Karmiel Industrial Zone, 2161401 Karmiel, Israel

General product information and other remarks:

Description of unit:

The Genesys AC is a power supply that can generate both DC and AC output, while taking AC as a supply source, acting as both AC/AC and AC/DC power supply. It incorporates a digital display with touch capabilities to program the output as desired by the operator, and it can be used as a standalone product on tabletop or be used inside a rack or cabinet. The sinusoidal AC output can be set to have a frequency range between 16 Hz and 5000 Hz.

The Genesys AC incorporates many protection measures, including OCP, OVP, and OTP, and are implemented using multiple means such as pure hardware means using components like input fuse, transformers, passive components (failing safely) etc., and other means such as regulatory networks that trigger safe fail in both normal operation and single-fault conditions, and via software.

The Genesys AC can have a myriad of variants and different models as stated in this document, main differences being input connection method and rating (i.e. 1-phase vs 3-phase, 208Vac vs 480Vac), and output rating (i.e. 2000W vs 3000W, frequency rating), while all models are Class I with a reliable bonding and connection to earth.

The Genesys AC is designed for use in TN/TT power distribution systems, for indoor use only, overvoltage category (OVC) 2 and pollution degree (PD) 2. The product has a temperature rating range of 0 – 40°C, and RH rating of 20% - 90% (no condensation). The product also has a rated altitude of up to 2000 meters and no IP rating (considered as IPX0).

Models indicated or referred to by name as “1-phase 208Vac” or “1P208Vac” or “1P208”, the meaning is models that are 1-phase with a nominal input range between 100-240 Vac (without 10% fluctuations), 90-265 Vac (with 10% fluctuations), and has a derating as reducing output power to 1.5kVA (down from 2kVA or 3kVA, based on model) when working under input voltage 170Vac and below.

Models indicated or referred to by name as “3-phase 208Vac” or “3P208Vac” or “3P208”, the meaning is models that are 3-phase with a nominal input range between 190-240 Vac (without 10% fluctuations), 170-265 Vac (with 10% fluctuations). These models currently have no derating.

Models indicated or referred to by name as “3-phase 480Vac” or “3P480Vac” or “3P480”, the meaning is models that are 3-phase with a nominal input range between 380-480 Vac (without 10% fluctuations), 342-528 Vac (with 10% fluctuations). These models currently have no derating.

Description of model differences:

The Genesys AC series includes several different models.

The models differ from one another by:

- Number of phases (1-phase vs 3-phase)
- Input rating (nominal 208Vac vs nominal 480Vac)
- Output rating (2kW vs 3kW, low-frequency vs high-frequency output)
- Nature of output (AC/AC only power source vs AC/AC and AC/DC power source)
- Other software options. See below details.

Explaining the model/type reference naming convention:

GAC-xxyzuw-mmoppq

GAC-xxyzuw-mmoppq/aaaaaa

GAC-PRO-xxyzuw-mmoppq

GAC-PRO-xxyzuw-mmoppq/aaaaaa

- "GAC" and "GAC-PRO" is the series name, as in Genesys AC (Alternating Current) Source. The difference between GAC and GAC-PRO is in the software and the options given to the customer. For example, the GAC will only have AC Mode, while the GAC-PRO will have AC + DC Mode. Another example is in the output waveforms pertaining to certain avionic standards. This difference is controlled only via software and has no impact or real hardware or structural change on the product itself.
- x= 0-9 | these numbers indicate the output VA power model, for example "02" indicates model 2kVA, "03" indicates 3kVA, etc.
- y= A-Z | this field indicates the type and colour of front panel installed, e.g. full black panel, blank grey panel, etc.
- z= A-Z | these letters indicate input supply type and voltage, where "A" means 85~265Vac single-phase, "B" means 170~265Vac 3-phase, and "C" means 342~528Vac 3-phase (these values include the rated 10% fluctuations).
- u= 0-9 | this field indicates type of communications added with the product. The standard model comes with built-in RS232, RS485, USB, LAN, other variations include IEEE/GPIB type communication feature, etc.
- w= A-Z | these letters indicate output mode options, such as AC mode alone, AC+DC mode combined, 1200Hz vs 5000Hz, etc.
- m= 0-9 | these numbers indicate options for added avionic standards features mostly affecting software and output waveforms, with no or neglectable effect on safety or compliance to this standard. For example, MIL-STD 704, or none at all, etc.
- o= A-Z | these letters indicate added various and IEC standards not related to safety, like compliance to additional EMC or Military-grade standards. For example, a standard model with no additional such standards, or a model with added IEC 61000-4-11 with wave generator and harmonic analysis, etc.
- p= 0-9 | these numbers indicate additional options not affecting or related to safety.
- q= A-Z | these letters describe the type of accessories to be added with the purchased product.
- a= A-Z, or any number 0-9, or BLANK | this field is reserved for sub-models/custom models.

Description of special features:
(HV circuits, high pressure systems etc.)