TEST REPORT

Central Electricity Authority (Technical Standards for Connectivity to the Grid) Regulations, 2007

including Central Electricity Authority (Technical Standards for Connectivity to the Grid) Amendment Regulations, 2013
including Annecure-I: Clarification w.r.t. PART IV of CEA Regulations. Applicability from 2015-09-04
including Central Electricity Authority Notification from 2019-02-06

Report reference number.....:	**20TH0456_CEA_2019_0**
Date of issue.....:.....	2020-10-15
Total number of pages.....:.....	238
Testing laboratory name.....:	**Bureau Veritas Consumer Products Services Germany GmbH**
Address.....:	Businesspark A96, 86842 Türkheim, Germany
Accreditation.....:	ilac-MRA DAkkS Deutsche Akkreditierungsstelle D-PL-12024-03-03
Applicant's name.....:	**Huawei Technologies Co., Ltd.**
Address.....:	Administration Building, Headquarters of Huawei Technologies Co., Ltd., Bantian, Longgang District, Shenzhen, 518129 P.R. China
Test specification	
Standard.....:	Requirements: Central Electricity Authority (Technical Standards for Connectivity to the Grid) Regulations, 2007: GAZETTE OF INDIA: EXTRAORDINRY [Part III – Sec. 4]: MINISTRY OF POWER (Central Electricity Authority) NOTIFICATION from 2007-02-21, No. 12/X/STD(CONN)/GM/CEA. • including Central Electricity Authority (Technical Standards for Connectivity to the Grid) Amendment Regulations, 2013 • including Annecure-I: Clarification w.r.t. PART IV of CEA Regulations. Applicability from 2015-09-04 Central Electricity Authority Notification from 2019-02-06: Central Electricity Authority (Technical Standards for Connectivity to the Grid) (Amendment) Regulations, 2019 Testing: IEC/TS 62910:2015
Test report form number.....:	CEA
Master TRF.....:	Bureau Veritas Consumer Products Services Germany GmbH

Test item description.....:	**Grid connected photovoltaic inverter**
Trademark .....:	HUAWEI
Unit / Type .....:	**SUN2000-215KTL-H0**
MPP DC voltage range [V] .....:	930 - 1300
Input DC voltage range [V] .....:	500 - 1500
Input DC current [A].....:	max. 9x 30
Nominal output AC voltage [V] .....:	800Vac 3~ + PE, 50Hz
Output AC current [A] .....:	max. 155,2
Nominal active output power [kW].....:	200
Max. apparent / active output power [kVA / kW].....:	215
Testing Location .....:	**Huawei Technologies Co., Ltd.**
Address.....:	No.901, Tanglu Road, Pudong, Shanghai, 201206, P.R.China
Dates of testing.....:	2020-08-25 - 2020-09-29
Tested by (name and signature).....:	Weizhao Zheng
Approved by (name and signature).....:	Georg Loritz

Contents

Document History			
Date	**Internal reference**	**Modification / Change / Status**	**Revision**
2020-10-15	Weizhao Zheng	Initial report was written	0

Supplementary information:

The Central Electricity Authority (Technical Standards for Connectivity to the Grid) Regulations does not in every case specify the respective test procedure to the defined requirements. Thus testing was performed according to established test guidelines as documented in detail on pages 13 to 18.

This test report only covers the FRT testing B2 (3).

Copy of marking plate

General remarks

Preface:

The test results presented in this report relate only to the object(**s**) tested.

This report must not be reproduced in part or in full without the written approval of the issuing testing laboratory.

"(see Annex #)" refers to additional information appended to the report.
"(see appended table)" refers to a table appended to the report.

Throughout this report a comma ',' is used as decimal separator and a period '.' as thousands separator.

The following suffixes/indices are used for variables in tables and figures:

- "_+" for positive, "_-" for negative, "_0" for zero sequence system values
- "_RMS" for the RMS values
- "_Lx" for index of phase X

Acronyms:

PGU ..... :	power generating unit
PGS ..... :	power generating system
PCC ..... :	point of common coupling (grid connection point)

Test case verdicts

Test case does not apply to the test object ..... :	N/A
Test item does meet the requirement ..... :	P(ass)
Test item does not meet the requirement ..... :	F(ail)

Description of the vector system to depict test results:

The regarded system of the voltage and current vectors is the load reference system (Figure 1):

- If the inverter feeds to the grid the active power is measured with positive sign.
- If the inverter injects reactive power / current with leading power factor the reactive power / current is marked "leading" (under-excited) or has a negative sign.
- If the inverter injects capacitive reactive power / current with lagging power factor the reactive power / current is marked "lagging" (over-excited) or has a positive sign.

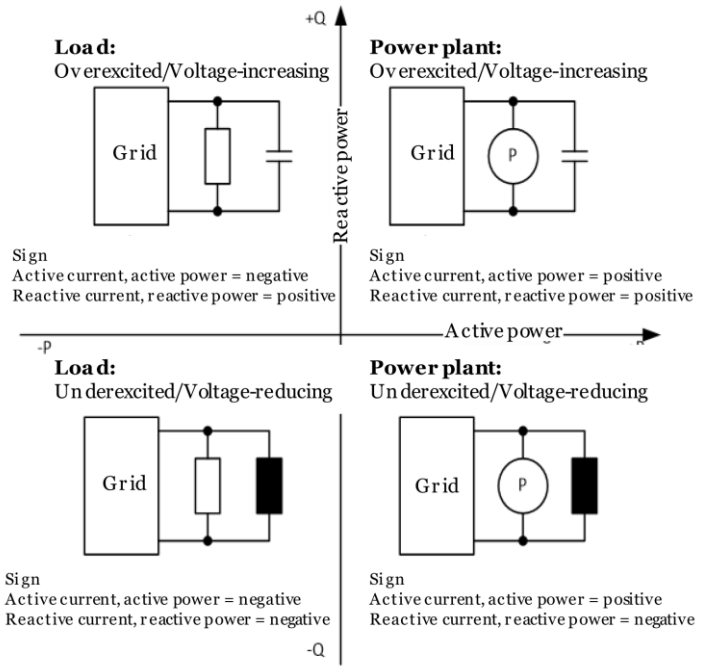


Figure 1 – Generator reference arrow system

General remarks for testing

Test setup:

The PGU is connected on the DC-side to a PV-simulator and on the AC-side to an AC-grid simulator.The AC-grid simulator is operated with nominal conditions of voltage of 800 V (phase-to-phase) and 50 Hz unless stated otherwise by the applied test requirement.

The setup is shown in Figure 2. The specific test and measurement devices are stated in Annex 4.

Note:

* Depending on AC connection terminals provided by the inverter type and the earthing system selected, the neutral conductor of the AC source was not connected for the testing.

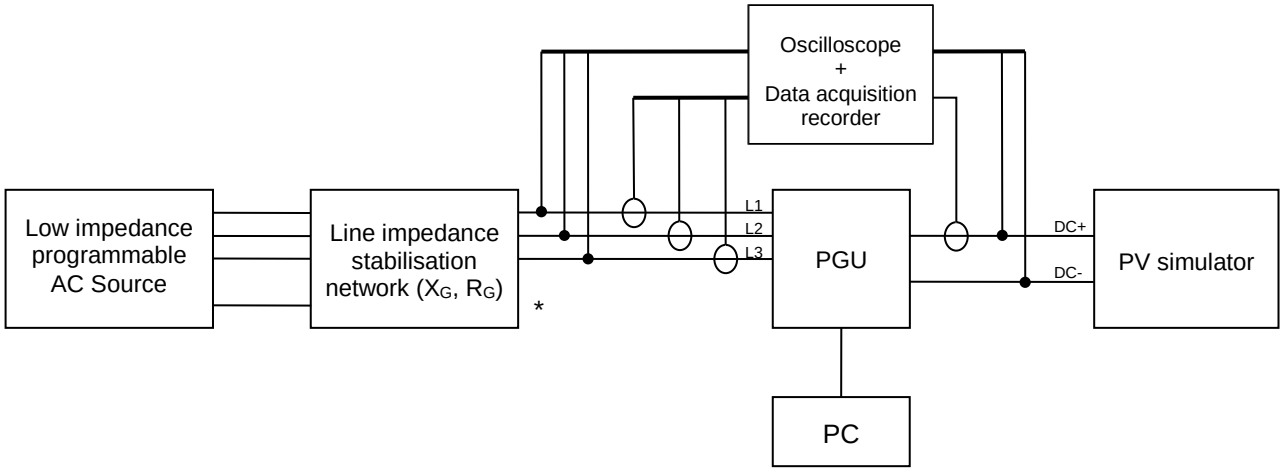


Figure 2 – Test setup scheme

Measurement method:

The requirements, as stated by the applicable standard, for the power quality of the connected grid used for the measurements are fulfilled.

A number of measurements is conducted as stated by the applicable standard's test procedure.

The sample rates and aliasing filters are chosen as required by the applicable standard and according to generally recognised knowledge.

The results are calculated and averaged as stated by the applicable standard.

The measurement uncertainty can be found in Annex 4.

Primary power sources (DC):

Primary power is provided by a PV simulator.

Available power is modified by adapting the short circuit current (I_{sc}) value. Following example shows a PV-curve (I_{sc} = 212,1 A, U_{oc} = 1382,8 V) simulated according to EN50530.

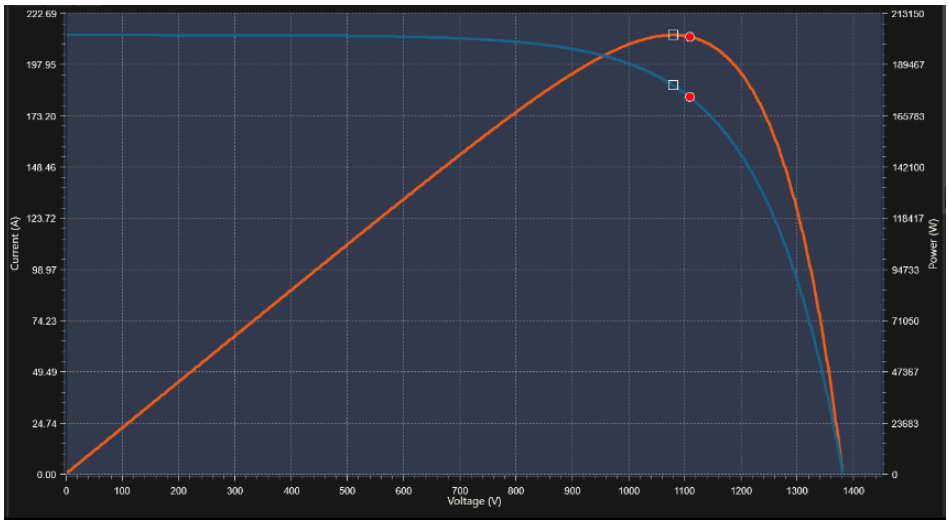


Figure 3 – DC characteristics for testing

General remarks for testing	
Reference values:	
	SUN2000-215KTL-H0 (800 V)
Rated active power, P_n [kW]	200
Max. apparent power, Sma [kVA]	215
Rated voltage (phase-to-phase), Un [V]	800
Rated current, In [A]	144,4
Max. current Imax [A]	155,2

Description of test object(s):
The tests were performed on EUTs *SUN2000-215KTL-H0 (800 V)*
Hardware version:
The product was tested on following HW revisions:
V300R001
Software (FW) version:
The product was tested on:
FW: V300R001

General product information	
General product information: The photovoltaic converter converts DC voltage, generated by photovoltaic modules, into AC voltage. The units are three-phase.	
Equipment mobility .....:	Permanent connection
Operating condition .....:	Continuous
Class of equipment.....:	Class I
Protection against ingress of water ..:	IP66 according to EN 60529
Mass of equipment [kg] .....:	84±1

General product information

Description of the power circuit (Figure 4):

The input and output are protected by SPDs to Earth. The unit is providing EMI filtering at the PV input and output toward mains. The unit does not provide galvanic separation from input to output (transformerless). The output is switched off redundant by the high power switching bridge and a two relays. This assures that the opening of the output circuit can operate in case of one error.

The internal control is redundant built. It consists of Microcontroller master ARM (U101) and slave ARM (U100). The master ARM (U101) which can control the relays by switching signals; measures the voltage, frequency, AC current, DC-injection current, insulation resistance and residual current. In addition it tests the array isolation impedance and the RCMU circuit before each start up.
The slave ARM (U100) is user for detecting grid voltage, grid frequency and residual current, also can open the relay, and communicate with Main ARM (U101) each other.
The unit provides two relays in series on each phase. When single-fault applied to one relay, an error code will appear on display panel, another redundant relay provides basic insulation maintained between the PV array and the mains. All the relays are tested before start up. Both ARM can open the relays.

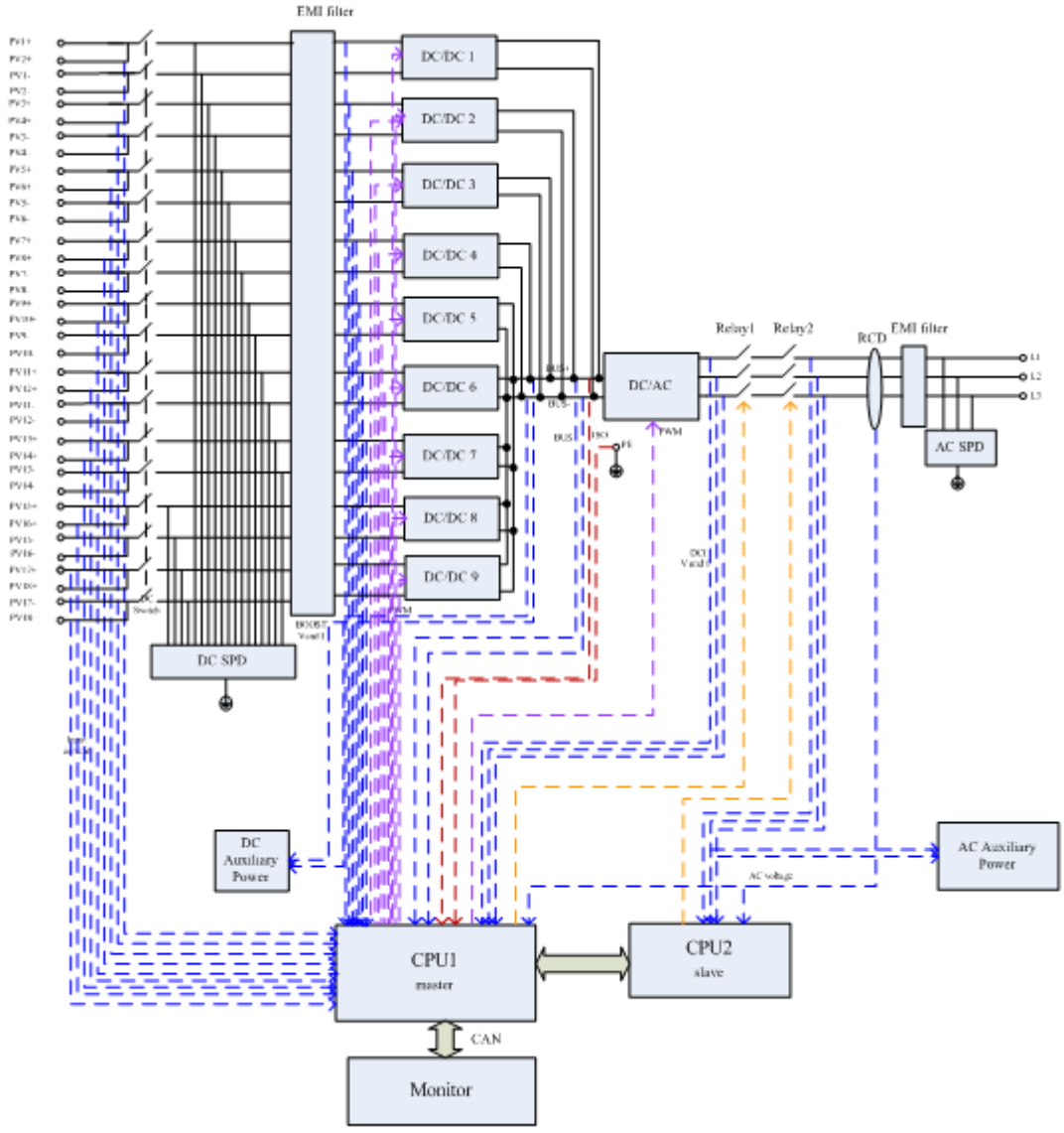


Figure 4 – Block diagram

General product information

Description of the connection to the remote control receiver (Figure 5) *(Manufacturer's data)***:**

A generating station can receive the signal from the State Load Dispatch Centre or Regional Load Dispatch Centre for regulation of the active and reactive power output uisng the Smart Logger (data acquisition device).

The remote control receiver can be connected to the Smart Logger using dry contact for active / reactive power control, which is connected to the inverters via RS485/MBUS.

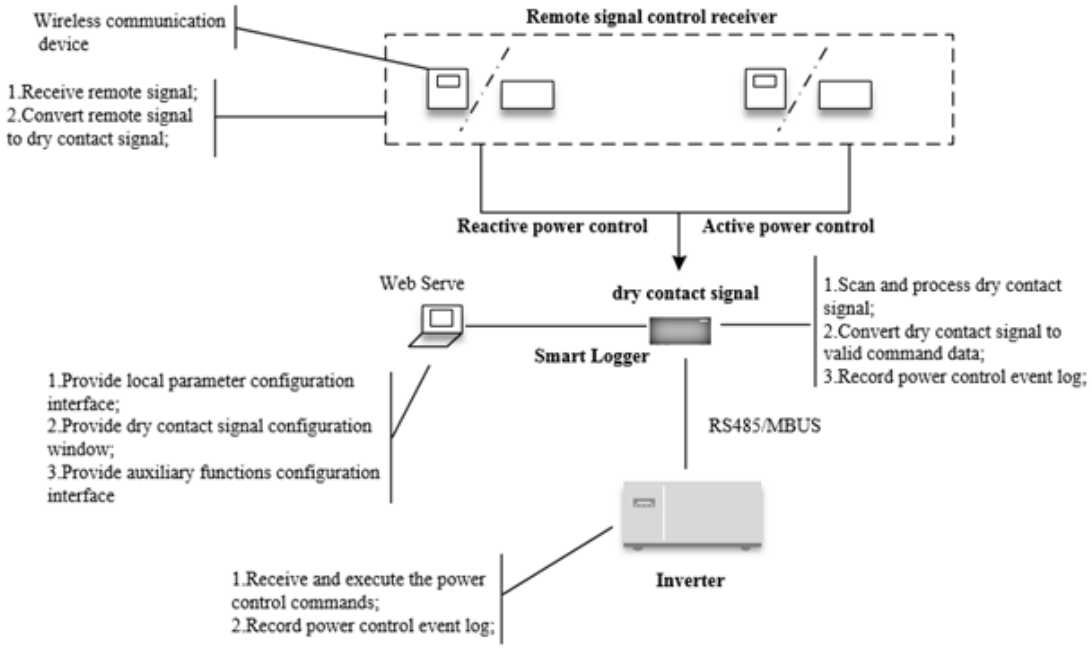


Figure 5 – Connection of the remote control receiver in an installation

Notes on calculations

General remarks:

RMS-Calculations are performed with a moving window, averaging with full sampling rate, losing one full window at the beginning of the time-series, due to the empty filter. The filter is applied twice to all symmetric components with a window length corresponding to one full respectively a half cycle of the measured mean grid frequency.

The average grid frequency over the measured interval is calculated from zero-crossings of the sine function.

Performed Calculation	Used formula	Remarks
Complex unit vectors for angular transformation	$\underline{a} = e^{j\frac{2\pi}{3}} = -\frac{1}{2} + j\frac{\sqrt{3}}{2}$ $\underline{a}^2 = e^{-j\frac{2\pi}{3}} = -\frac{1}{2} - j\frac{\sqrt{3}}{2}$	-
Symmetric component transformation matrix	$\underline{C} = \frac{1}{3}\begin{pmatrix} 1 & \underline{a} & \underline{a}^2 \\ 1 & \underline{a}^2 & \underline{a} \\ 1 & 1 & 1 \end{pmatrix}$ $\underline{U_{120}} = \underline{C} \cdot \underline{U} = \frac{1}{3}\begin{pmatrix} 1 & \underline{a} & \underline{a}^2 \\ 1 & \underline{a}^2 & \underline{a} \\ 1 & 1 & 1 \end{pmatrix}\begin{pmatrix} \underline{U}_{L1} \\ \underline{U}_{L2} \\ \underline{U}_{L3} \end{pmatrix}$	Example of Transformation for vector $\underline{U}$, consisting of 3-phase time-series
Powers	$\underline{S} = \underline{U} \cdot \underline{I}^*$ $P = \lvert\underline{S}\rvert \cdot \cos(\varphi_U - \varphi_I)$ $Q = \lvert\underline{S}\rvert \cdot \sin(\varphi_U - \varphi_I)$	Phase-angle : Angular difference between current and voltage $\varphi = (\varphi_U - \varphi_I)$
Currents: Apparent current, active current, reactive current	$\underline{I}_{120} = \underline{C} \cdot \underline{I} = \begin{pmatrix} \underline{I}_1 = \underline{I}_s \\ \underline{I}_2 \\ \underline{I}_0 \end{pmatrix}$ $I_b = -\lvert\underline{I}_s\rvert \cdot sin(\varphi_{U_1} - \varphi_{I_s})$ $I_w = \lvert\underline{I}_s\rvert \cdot cos(\varphi_{U_1} - \varphi_{I_s})$	The reactive current has reciprocal sign compared to reactive power. This originates from the calculation of reactive power based on multiplication of the complex voltage with the conjugated complex of the current as opposed to the reactive current being calculated by the projection of the complex current phasor to the imaginary axis.
Phase angles for active and reactive decomposition	The difference of the angles of the complex first order fourier coefficients based on nominal grid frequency (50 Hz) calculated from single phase voltage and current and also from positive, negative and zero sequence values constitutes the phase angles.	-
Average active power gradient	The positive sequence active power is integrated from the fault end at t_2 until $t_2 + 5$ s. The gradient is started from t_2 at zero output power until P_{ref} is reached at t_c. So the area made up by the artificial triangle (part of the gradient) and rectangle (part of constant value P_{ref} from t_c through $t_2 + 5$ s) is equal to the integrated measured active power.	-

Central Electricity Authority (Technical Standards for Connectivity to the Grid) Regulations

GAZETTE OF INDIA: EXTRAORDINRY [Part III – Sec. 4]: MINISTRY OF POWER (Central Electricity Authority) NOTIFICATION from 2007-02-21, No. 12/X/STD(CONN)/GM/CEA. including Central Electricity Authority (Technical Standards for Connectivity to the Grid) Amendment Regulations, 2013

B. Connectivity Standards applicable to the Wind generating stations and generating stations using invertersThese generating stations shall comply with the following requirements besides the general connectivity conditionsgiven in the said regulations and Part I of the Schedule

Central Electricity Authority Notification from 2019-02-06

B. Connectivity standards applicable to the wind generating stations, generating stations using inverters, wind - solar photo voltaic hybrid systems and energy storage systems.

The generating stations shall comply with the following requirements in addition to the general connectivity conditions specified under Part 1:

Provided that the energy storage systems shall comply, only with the requirements specified under clause B1 in addition to the general connectivity conditions specified under Part 1.

Clause/§	Requirement	Remark	Verdict
B1	**Requirements with respect to Harmonics, Direct Current (DC) Injection and Flicker**		
B1 (1)	Harmonic current injections from a generating station shall not exceed the limits specified in Institute of Electrical and Electronics Engineers (IEEE) Standard 519.	Testing not covered in this report.	N/A

*From IEEE Standard 519-2014:

Voltage distortion limits depending on voltage level

Table 1—Voltage distortion limits

Bus voltage V at PCC	Individual harmonic (%)	Total harmonic distortion THD (%)
$V \leq 1.0$ kV	5.0	8.0
1 kV < $V \leq 69$ kV	3.0	5.0
69 kV < $V \leq 161$ kV	1.5	2.5
161 kV < V	1.0	1.5[a]

[a]High-voltage systems can have up to 2.0% THD where the cause is an HVDC terminal whose effects will have attenuated at points in the network where future users may be connected.

Current distortion limits depending on short circuit ratio on PCC:

Table 2—Current distortion limits for systems rated 120 V through 69 kV

Maximum harmonic current distortion in percent of I_L						
Individual harmonic order (odd harmonics)[a, b]						
I_{SC}/I_L	$3 \leq h < 11$	$11 \leq h < 17$	$17 \leq h < 23$	$23 \leq h < 35$	$35 \leq h \leq 50$	TDD
< 20[c]	4.0	2.0	1.5	0.6	0.3	5.0
20 < 50	7.0	3.5	2.5	1.0	0.5	8.0
50 < 100	10.0	4.5	4.0	1.5	0.7	12.0
100 < 1000	12.0	5.5	5.0	2.0	1.0	15.0
> 1000	15.0	7.0	6.0	2.5	1.4	20.0

[a]Even harmonics are limited to 25% of the odd harmonic limits above.

[b]Current distortions that result in a dc offset, e.g., half-wave converters, are not allowed.

[c]All power generation equipment is limited to these values of current distortion, regardless of actual I_{sc}/I_L.

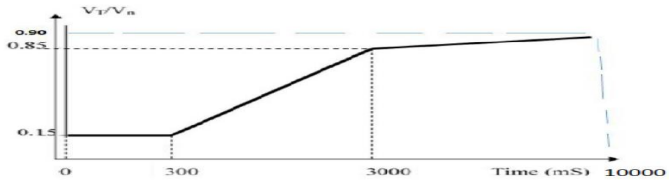
where

I_{sc} = maximum short-circuit current at PCC

I_L = maximum demand load current (fundamental frequency component) at the PCC under normal load operating conditions

B1 (2)	The Generating station shall not inject DC current greater than 0.5 % of the full rated output at the interconnection point.	Testing not covered in this report.	N/A
B1 (3)	The generating station shall not introduce flicker beyond the limits specified in IEC 61000. Provided that the standards for flicker will come into effect from 1st April 2014.	Testing not covered in this report.	N/A

Central Electricity Authority (Technical Standards for Connectivity to the Grid) Regulations			
Clause/§	**Requirement**	**Remark**	**Verdict**
B1 (4)	Measurement of harmonic content, DC injection and flicker shall be done at least once in a year in presence of the parties concerned and the indicative date for the same shall be mentioned in the connection agreement; Provided that in addition to annual measurement, if distribution licensee or transmission licensee or the generating company, as the case may be, desires to measure harmonic content or DC-injection or flicker, it shall inform the other party in writing and the measurement shall be carried out within 5 working days";	Plant level, not relevant for unit testing.	N/A
B2	**For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.**		
B2 (1)	The generating station shall be capable of supplying dynamically varying reactive power support so as to maintain power factor within the limits of 0.95 lagging to 0.95 leading.	Testing not covered in this report.	N/A
B2 (2)	The generating unit shall be capable of operating in the frequency range 47.5 to 52 Hz and be able to deliver rated output in the frequency range of 49.5 Hz to 50.5 Hz: Provided that in the frequency range below 49.90 Hz and above 50.05 Hz, or, as prescribed by the Central Commission, from time to time, it shall be possible to activate the control system to regulate the output of the generating unit as per frequency response requirement as provided in sub-clause (4): Provided further that the generating unit shall be able to maintain its performance contained in this subclause even with voltage variation of up to + 5% subject to availability of commensurate wind speed in case of wind generating stations and solar insolation in case of solar generating stations.	Testing not covered in this report.	N/A

Central Electricity Authority (Technical Standards for Connectivity to the Grid) Regulations			
Clause/§	**Requirement**	**Remark**	**Verdict**
B2 (3)	The generating station connected to the grid, shall remain connected to the grid when voltage at the interconnection point on any or all phases dips up to the level depicted by the thick lines in the following curve, namely: — V_T : Actual Voltage; V_n: Nominal Voltage—  Provided that during the voltage dip, the supply of reactive power has first priority, while the supply of active power has second priority and the active power preferably be maintained during voltage drops, provided, a reduction in active power within the plant's design specifications is acceptable and active power be restored to at least 90% of the pre-fault level within 1 sec of restoration of voltage.	Full LVRT testing was performed on the *SUN2000-215KTL-H0 (800 V)* based on IEC 62910, testing for 3-phase, 2-phase and single pahse voltage faults. Tests have been performed on all 3 phase configurations and showed identical behavior. Thus this report only depicts the configuration for asymmetric dips on L2-L3 (for 2-phase voltage faults) or L1 (for single pahse voltage faults). Note: • The grid fault was simulated at the medium voltage side of the Dy-medium-voltage transformer, the measurement at the low voltage side of the transformer was evaluated. • During a symmetrical grid fault the unit provids reactive current according to Tranmission Code 2007 using a proportional factor (k-factor) of 2 ($\Delta I_{reactive} = k \cdot \Delta u \cdot I_n$), the active current will be limited if needed. In case of asymmetrical faults the control strategy of the acitve and reactive current is the same as in case of symmetrical faults, additionally the reactive current injection is limited to max. 40%I_n. If the active current / power should be maintained at a certain level during a grid fault, this can be achieved by setting a suitable k-factor (setting range: 0~10) to limit the additional reactive current injection. • The activation threshold of the reactive current injection (grid support) was set to 80%U_n as default, paramater is adjustable. • Max. measured settling time of active power after fault clearance (≥ 90% of prefault active power): 1,617 s Note: The tests results show the LVRT capability of the unit, using	see also remark

<table>
<tr><th colspan="4">Central Electricity Authority (Technical Standards for Connectivity to the Grid) Regulations</th></tr>
<tr><td></td><td></td><td>current implementation the requirement of settling time of active power after fault clearance can not be fulfilled.</td><td></td></tr>
<tr><td>B2 (4)</td><td>The generating stations with installed capacity of more than 10 MW connected at voltage level of 33 kV and above –
(i) shall be equipped with the facility to control active power injection in accordance with a set point, capable of being revised based on directions of the State Load Dispatch Centre or Regional Load Dispatch Centre, as the case may be;
(ii) shall have governors or frequency controllers of the units at a droop of 3 to 6% and a dead band not exceeding ±0.03 Hz:
Provided that for frequency deviations in excess of 0.3 Hz, the Generating Station shall have the facility to provide an immediate (within 1 second) real power primary frequency response of at least 10% of the maximum Alternating Current active power capacity;
(iii) shall have the operating range of the frequency response and regulation system from 10% to 100% of the maximum Alternating Current active power capacity, corresponding to solar insolation or wind speed, as the case may be;
(iv) shall be equipped with the facility for controlling the rate of change of power output at a rate not more than ± 10% per minute.</td><td>Testing not covered in this report.</td><td>N/A</td></tr>
<tr><td>B2 (5)</td><td>The generating stations of aggregate capacity of 500 MW and above shall have the provision to receive the signal from the State Load Dispatch Centre or Regional Load Dispatch Centre, as the case may be, for varying active and reactive power output.</td><td>Considered.
See Description of the connection to the remote control receiver (page 11)

B2 (5) part of the regulation does not apply for the unit and will be addressed on plant level.</td><td>N/A</td></tr>
<tr><td>B2 (6)</td><td>The standards in respect of the switchyard associated with the generating stations shall be in accordance with the provisions specified in respect of ‘Sub-stations’ under Part III of these Standards.</td><td>Considered.
B2 (6) part of the regulation does not apply for the unit and will be addressed on plant level.</td><td>N/A</td></tr>
<tr><td>B2 (7)</td><td>The generating station connected to the grid, shall remain connected to the grid when voltage at the interconnection point, on any or all phases (symmetrical or asymmetrical overvoltage conditions) rises above the specified values given below for specified time —
<table>
<tr><th>Over voltage (pu)</th><th>Minimum time to remain connected (Seconds)</th></tr>
<tr><td>1.30 < V</td><td>0 Sec (Instantaneous trip)</td></tr>
<tr><td>1.30 ≥ V > 1.20</td><td>0.2 Sec</td></tr>
<tr><td>1.20 ≥ V >1.10</td><td>2 Sec</td></tr>
<tr><td>V ≤ 1.10</td><td>Continuous</td></tr>
</table></td><td>Testing not covered in this report.</td><td>N/A</td></tr>
</table>

Central Electricity Authority (Technical Standards for Connectivity to the Grid) Regulations			
Clause/§	**Requirement**	**Remark**	**Verdict**
B2 (8)	Short Circuit Ratio at the interconnection point where the generating resource is proposed to be connected shall not be less than 5.	Considered. B2 (8) part of the regulation does not apply for the unit and will be addressed on plant level.	N/A

Central Electricity Authority (Technical Standards for Connectivity to the Grid) Regulations			
Annexure-I **Clarification w.r.t. Part IV of CEA Regulations- applicability (2015-09-04)**			
Clause/§	**Requirement**	**Remark**	**Verdict**
This has reference to the Part IV of the CEA (Technical Standards for Connectivity to the Grid) Regulations, 2007. It is clarified that;		Considered. Test object is not a consumer. This part of the regulation does not apply for the unit and will be addressed on plant level.	N/A
(i)	The condition of voltage and current harmonic as prescribed under Part IV is applicable only to the consumers which are defined as bulk consumers and drawing power at 33KV and above.		
(ii)	For the purpose of bulk consumer means a consumer who avails supply at voltage of 33 KV or above.		
Therefore, Part IV of CEA Regulations is applicable only to consumers drawing power at 33 KV or above and any consumer who is drawing power below 33 KV shall not be covered under Part IV of CEA (Technical Standards for Connectivity of the Grid) Regulations, 2007.			
2019: In Part –IV, for paragraphs 2 and 3, the following paragraphs shall be substituted, namely:-			
(2)	(i) The distribution licensee and bulk consumer shall provide adequate reactive compensation to compensate reactive power requirement in their system so that they do not depend upon the grid for reactive power support. (ii) The power factor for distribution system and bulk consumer shall be within ± 0.95;		
(3)	Voltage and Current Harmonics. - (i) The limits of voltage harmonics by the distribution licensee in its electricity system, the limits of injection of current harmonics by bulk consumers, point of harmonic measurement, i.e., point of common coupling, method of harmonic measurement and other related matters, shall be in accordance with the IEEE 519-2014 standards, as amended from time to time; (ii) Measuring and metering of harmonics shall be a continuous process with meters complying with provisions of IEC 61000-4-30 Class A. (iii) The data measured and metered as mentioned in sub-paragraph (ii) with regard to the harmonics, shall be available with distribution licensee and it shall also be shared with the consumer periodically. (iv) The bulk consumer shall install power quality meter and share the recorded data thereof with the distribution licensee with such periodicity as may be specified by the appropriate Electricity Regulatory Commission: Provided that the existing bulk consumer shall comply with this provision within twelve months from the date of commencement of the Central Electricity Authority (Technical Standards for Connectivity to the Grid) (Amendment) Regulations, 2018. (v) In addition to harmonics, periodic measurement of other power quality parameters such as voltage sag, swell, flicker, disruptions shall be done as per relevant International Electrotechnical Commission Standards by the distribution licensee and the reports thereof shall be shared with the consumer. (vi) The distribution licensee shall install power quality meters in a phased manner within three years from the date of commencement of the Central Electricity Authority (Technical Standards for Connectivity to the Grid) (Amendment) Regulations, 2018 covering at least 33% of the 33 kV substations each year.		

Annex 1 – Test Results

B1 Requirements with respect to Harmonics, Direct Current (DC) Injection and Flicker
B1 (1) Harmonics
Note: Test was not conducted.
B1 (2) Direct Current (DC) Injection
Note: Test was not conducted.
B1 (3) Flicker
Note: Test was not conducted.

B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.
B2 (1) Reactive power support
Note: Test was not conducted.
B2 (2) Operation range of frequency
Note: Test was not conducted.

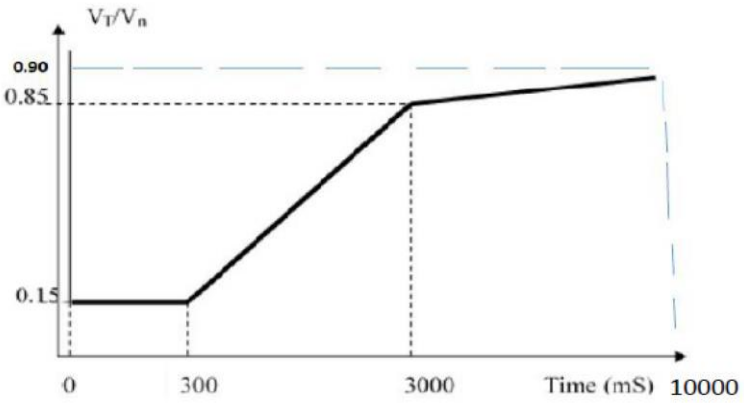
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

B2 (3) Stability during grid voltage dips (LVRT)

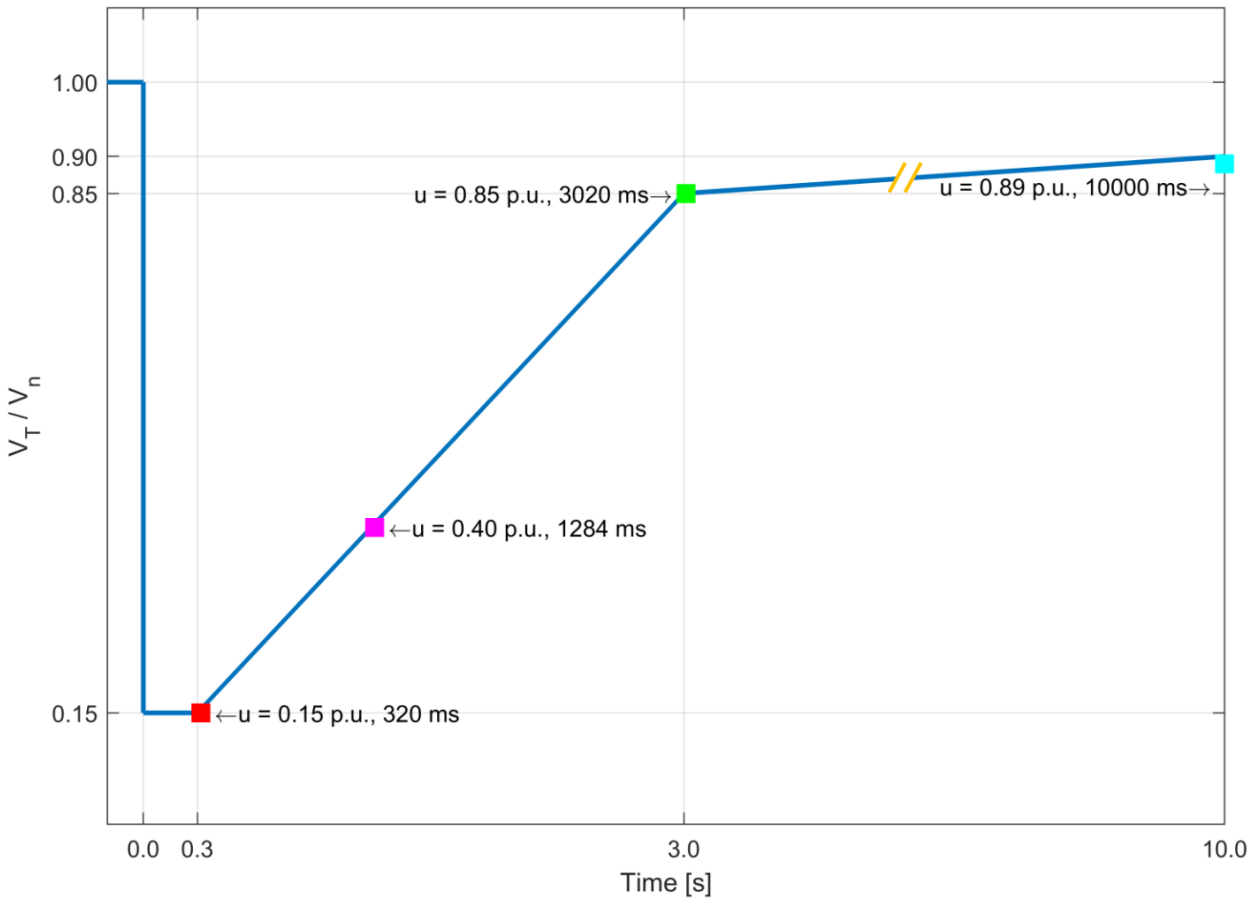
SUN2000-215KTL-H0

Tests based on IEC 62910, testing dips for 3-phase, 2-phase and single phase faults.

Characteristic from guideline:



Verified operating points:



B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Calibration tests without load

(800 V)

Name	Dip depth [p.u.]	Duration [ms]	Type / Phases	Reactive Power before fault [p.u.]	Active Power before fault [p.u.]	Page
CEA_1.1.0	0,15	320	3	0	0	25
CEA_1.2.0	0,15	320	2	0	0	28
CEA_1.3.0	0,15	320	1	0	0	31
CEA_2.1.0	0,40	1284	3	0	0	34
CEA_2.2.0	0,40	1284	2	0	0	37
CEA_2.3.0	0,40	1284	1	0	0	40
CEA_3.1.0	0,85	3020	3	0	0	43
CEA_3.2.0	0,85	3020	2	0	0	46
CEA_3.3.0	0,85	3020	1	0	0	49
CEA_4.1.0	0,89	10000	3	0	0	52
CEA_4.2.0	0,89	10000	2	0	0	55
CEA_4.3.0	0,89	10000	1	0	0	58

Tests with load

SUN2000-215KTL-H0 (800 V)

Name	Dip depth [p.u.]	Duration [ms]	Type / Phases	Reactive Power before fault [p.u.]	Active Power before fault [p.u.]	Page
CEA_1.1.1	0,15	320	3	0	1	61
CEA_1.1.2	0,15	320	3	0	0,2	68
CEA_1.2.1	0,15	320	2	0	1	75
CEA_1.2.2	0,15	320	2	0	0,2	82
CEA_1.3.1	0,15	320	1	0	1	89
CEA_1.3.2	0,15	320	1	0	0,2	96
CEA_2.1.1	0,40	1284	3	0	1	103
CEA_2.1.2	0,40	1284	3	0	0,2	110
CEA_2.2.1	0,40	1284	2	0	1	117
CEA_2.2.2	0,40	1284	2	0	0,2	124
CEA_2.3.1	0,40	1284	1	0	1	131
CEA_2.3.2	0,40	1284	1	0	0,2	138
CEA_3.1.1	0,85	3020	3	0	1	145
CEA_3.1.2	0,85	3020	3	0	0,2	152
CEA_3.2.1	0,85	3020	2	0	1	159
CEA_3.2.2	0,85	3020	2	0	0,2	166
CEA_3.3.1	0,85	3020	1	0	1	173
CEA_3.3.2	0,85	3020	1	0	0,2	180

B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.						
Name	**Dip depth [p.u.]**	**Duration [ms]**	**Type / Phases**	**Reactive Power before fault [p.u.]**	**Active Power before fault [p.u.]**	**Page**
CEA_4.1.1	0,89	10000	3	0	1	187
CEA_4.1.2	0,89	10000	3	0	0,2	194
CEA_4.2.1	0,89	10000	2	0	1	201
CEA_4.2.2	0,89	10000	2	0	0,2	208
CEA_4.3.1	0,89	10000	1	0	1	215
CEA_4.3.2	0,89	10000	1	0	0,2	222

B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

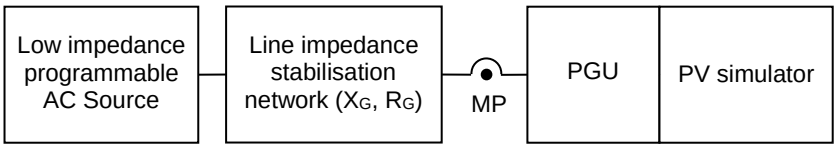
Note:

For every kind of voltage dip a test without load is performed to prove that the test condition is fulfilled (see above).

During a symmetrical grid fault the unit provids reactive current according to Tranmission Code 2007 using a proportional factor (k-factor) of 2 ($\Delta I_{reactive} = k \cdot \Delta u \cdot I_n$), the active current will be limited if needed. In case of asymmetrical faults the control strategy of the acitve and reactive current is the same as in case of symmetrical faults, additionally the reactive current injection is limited to max. 40%I_n.

If the active current / power should be maintained at a certain level during a grid fault, this can be achieved by setting a suitable k-factor (setting range: 0~10) to limit the additional reactive current injection.

The activation threshold of the reactive current injection (grid support) was set to 85%U_n as default, paramater is adjustable.

Test setup	
Schematic of test setup:	
	Note on test setup: Instead of an LVRT test bench a low-voltage AC simulator was used.
Note: Measurement points used at MP. Used sample rate: 10 kHz.	
Grid parameters at MP1	
Nominal voltage PCC // U_G [V]	800 V (P-P)
Nominal apparent power of the test setup // S_n [kVA]	270
Grid impedance R_G [Ω]	1,81
Grid reactance X_G [Ω]	5,56
Test setup	
Grid simulator (grid conditions varied)	☒
Test bench	☐
Identifier of test setup	See Annex 4 – Test equipment list

B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Calibration tests without load

SUN2000-215KTL-H0 (800 V)

CEA_1.1.0

	No.	Parameter	Description / calculation basis	Results		
Gerneral information	1	Test no.	-	CEA_1.1.0-1		
	1	Data file name	-	CEA_1.1.0-1.wdf		
	1	MD5-Checksum	-	dc248ed3786aa03d9c4576362d02bea2		
	2	Date	[yyyy-mm-dd]	2020-09-22		
	3	Time	[hh:mm:ss]	12:51:14		
	4	Fault type	-	Three-phase		
	Phase reference			**A [1)]**	**B [1)]**	**C [1)]**
	5	Voltage drop depth setting	[p.u.]	0.15	0.15	0.15
	6	Set fault duration	[ms]	320.0		
	7	value series impedance X_1	[Ω]	N/A		
	8	value series impedance R_1	[Ω]	N/A		
	9	value short circuit impedance X_2	[Ω]	N/A		
	10	value short circuit impedance R_2	[Ω]	N/A		
	11	Switch event: Connection of series impedance (t_0)	[ms]	N/A		
	12	Switch event: Fault occurrence (t_1)	[ms]	9042.4		
	13	Switch event: Clearance of fault (t_2)	[ms]	9389.7		
	14	Switch event: Short-circuiting of series impedance (t_3)	[ms]	N/A		
	15	Fault duration derived from test	*(from time domain voltage results)* [ms]	347.3		
	16	Measeured value of voltage drop / increase	*(per phase-to-neutral, t_1 + 100ms … t_2 and t_1 - 60s … t_1)* [p.u. U_n]	0.150	0.150	0.151
	16	Measeured value of voltage drop / increase	*(per phase-to-phase, t_1 + 100ms … t_2 and t_1 - 60s … t_1)* [p.u. U_n]	0.151	0.151	0.150
	17	Measeured value of voltage drop / increase	*(positive sequence, phase-to-neutral, t_1 + 100ms … t_2 and t_1 - 60s … t_1)* [p.u. U_n]	0.150		

Note:
[1)] A / B / C indicate the phase-neutral voltages (L1, L2, L3), phase-phase voltages (L12, L23, L31) or the phase currents (L1, L2, L3), for details see Description / calculation basis.

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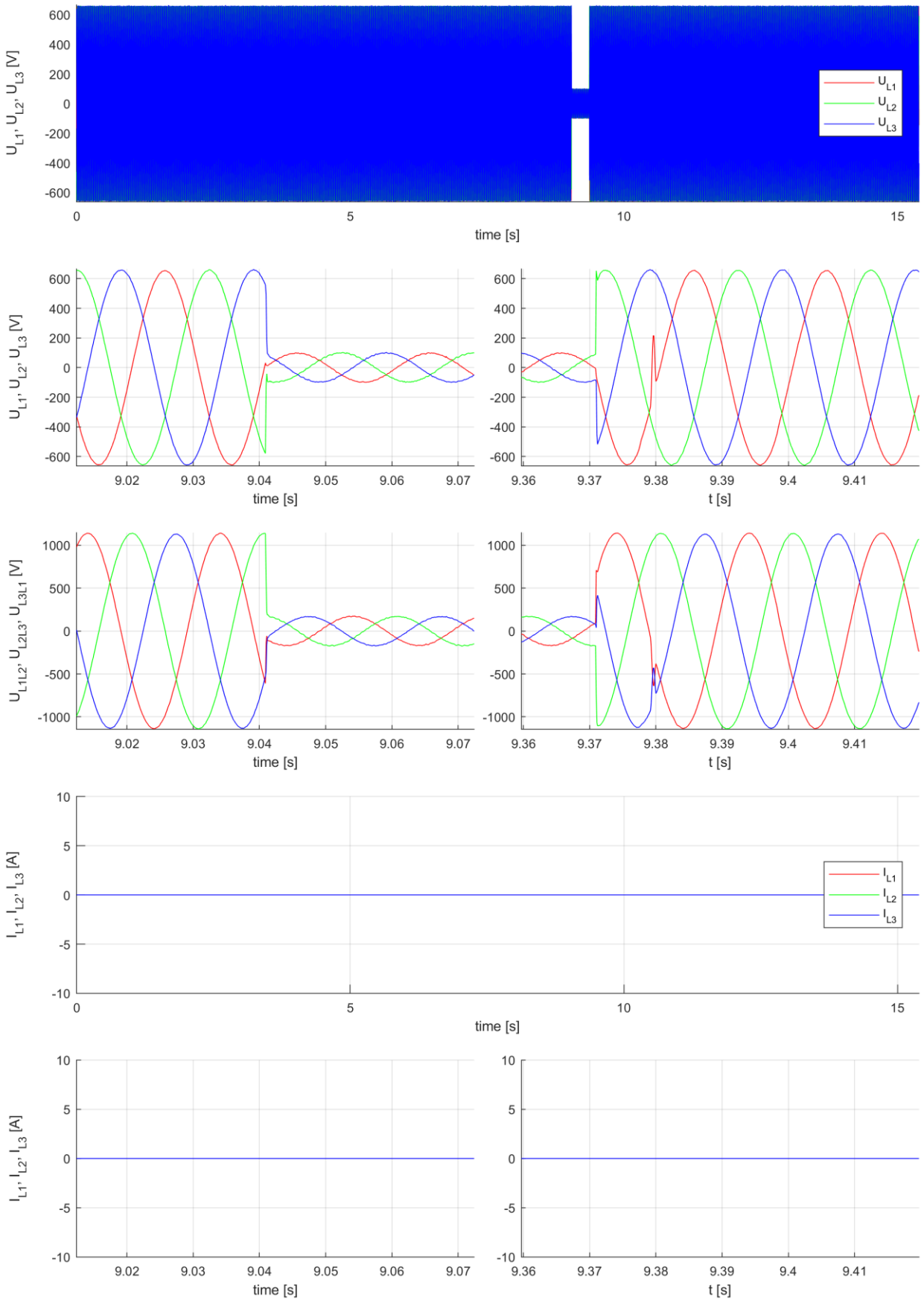

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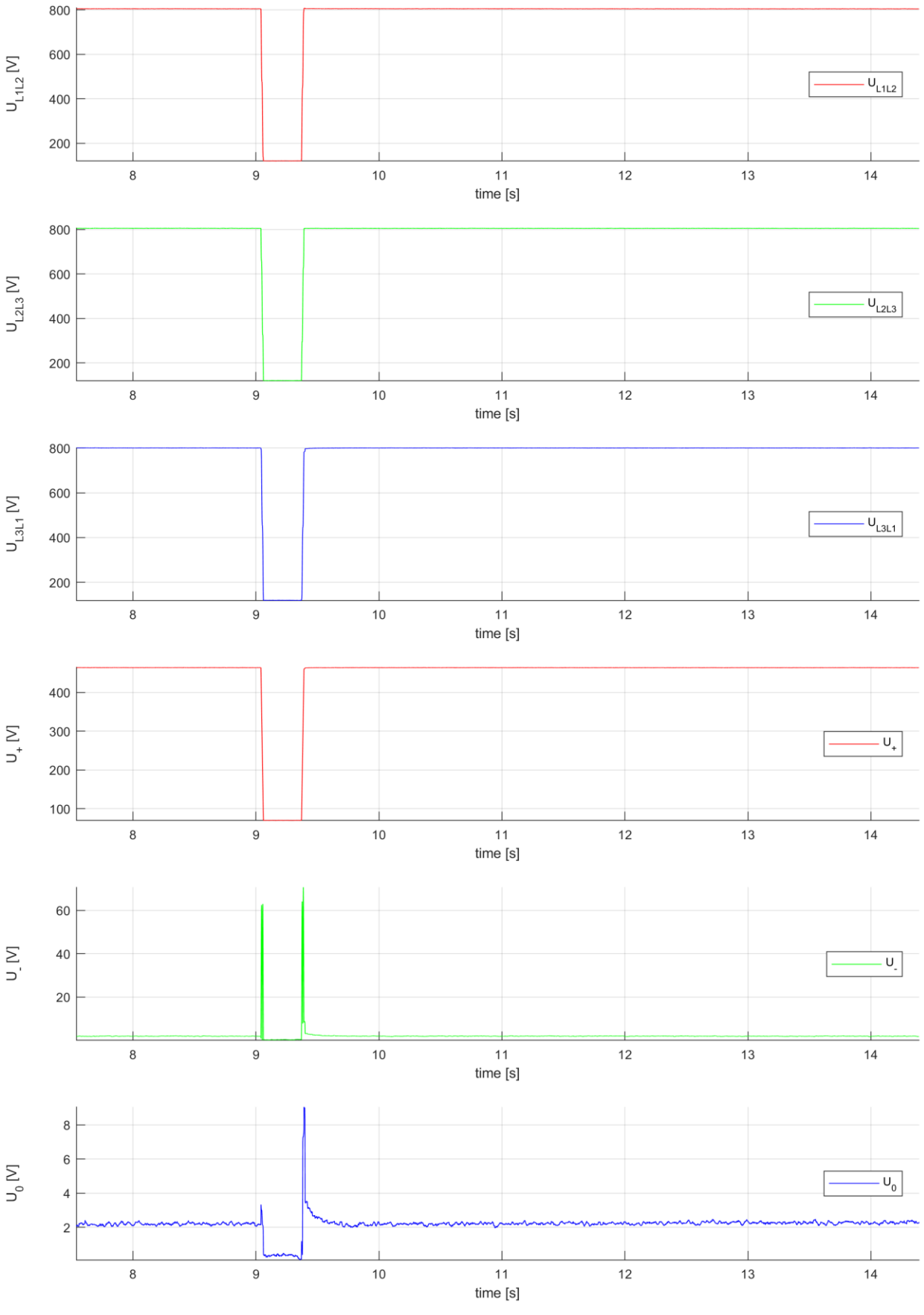

B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

CEA_1.2.0

	No.	Parameter	Description / calculation basis	Results		
Gerneral information	1	Test no.	-	CEA_1.2.0-1		
	1	Data file name	-	CEA_1.2.0-1.wdf		
	1	MD5-Checksum	-	16212e63042276d82360bf66b4abe78c		
	2	Date	[yyyy-mm-dd]	2020-09-22		
	3	Time	[hh:mm:ss]	12:58:00		
	4	Fault type	Fault type D on low-voltage side	Two-phase		
	Phase reference			**A [1)]**	**B [1)]**	**C [1)]**
	5	Voltage drop depth setting	[p.u.]	0.15	0.87	0.87
	6	Set fault duration	[ms]	320.0		
	7	value series impedance X_1	[Ω]	N/A		
	8	value series impedance R_1	[Ω]	N/A		
	9	value short circuit impedance X_2	[Ω]	N/A		
	10	value short circuit impedance R_2	[Ω]	N/A		
	11	Switch event: Connection of series impedance (t_0)	[ms]	N/A		
	12	Switch event: Fault occurrence (t_1)	[ms]	9095.2		
	13	Switch event: Clearance of fault (t_2)	[ms]	9428.5		
	14	Switch event: Short-circuiting of series impedance (t_3)	[ms]	N/A		
	15	Fault duration derived from test	*(from time domain voltage results)* [ms]	333.3		
	16	Measeured value of voltage drop / increase	*(per phase-to-neutral, t_1 + 100ms … t_2 and t_1 - 60s … t_1)* [p.u. U_n]	0.150	0.874	0.876
	16	Measeured value of voltage drop / increase	*(per phase-to-phase, t_1 + 100ms … t_2 and t_1 - 60s … t_1)* [p.u. U_n]	0.523	1.003	0.522
	17	Measeured value of voltage drop / increase	*(positive sequence, phase-to-neutral, t_1 + 100ms … t_2 and t_1 - 60s … t_1)* [p.u. U_n]	0.586		

Note:
[1)] A / B / C indicate the phase-neutral voltages (L1, L2, L3), phase-phase voltages (L12, L23, L31) or the phase currents (L1, L2, L3), for details see Description / calculation basis.

Note:

* The grid fault type C (phase-to-phase fault without grounding) was simulated at the medium voltage side of the Dy-medium-voltage transformer, following diagram shows the measurement at the low voltage side of the transformer – grid fault type D on low voltage side.

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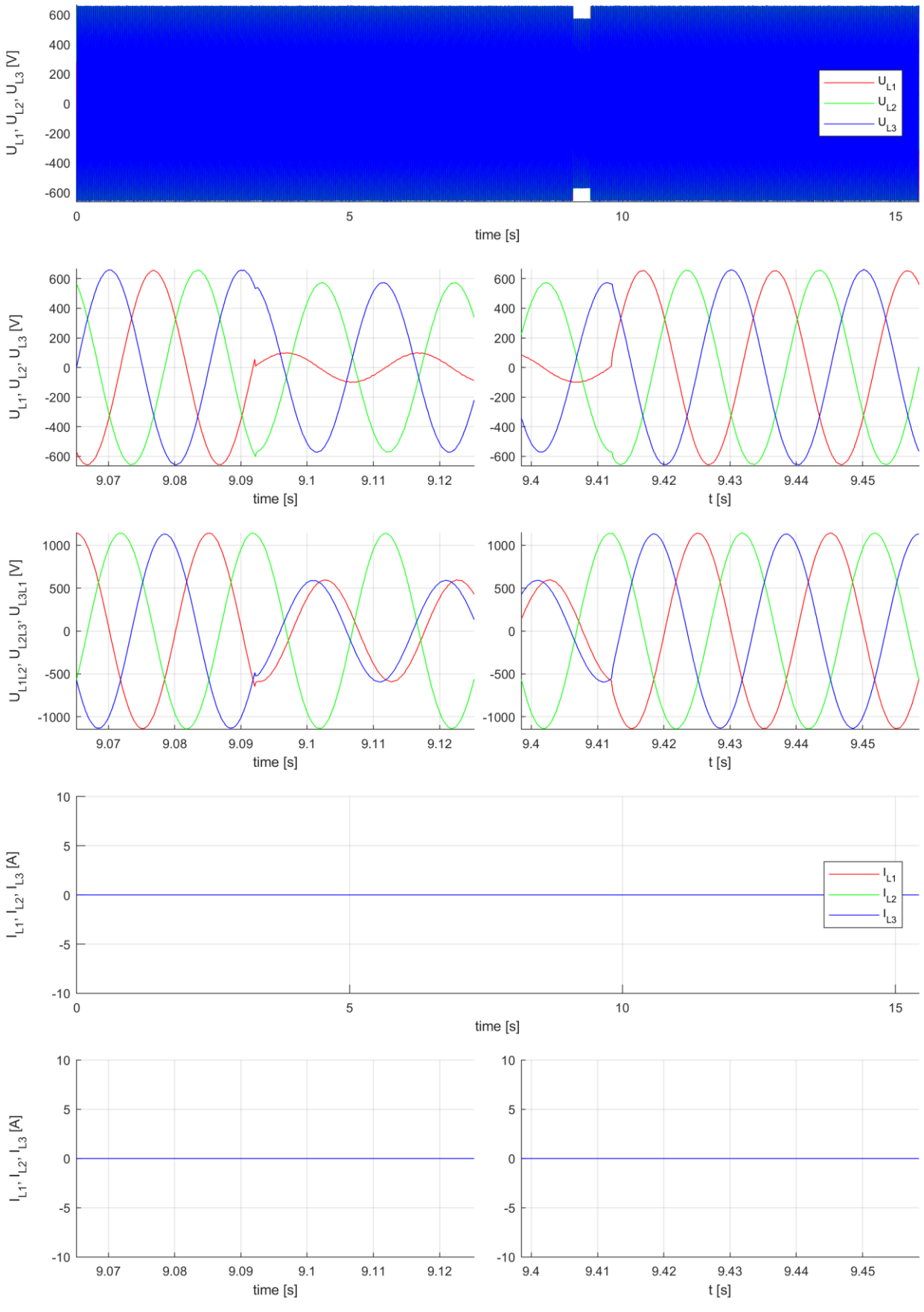
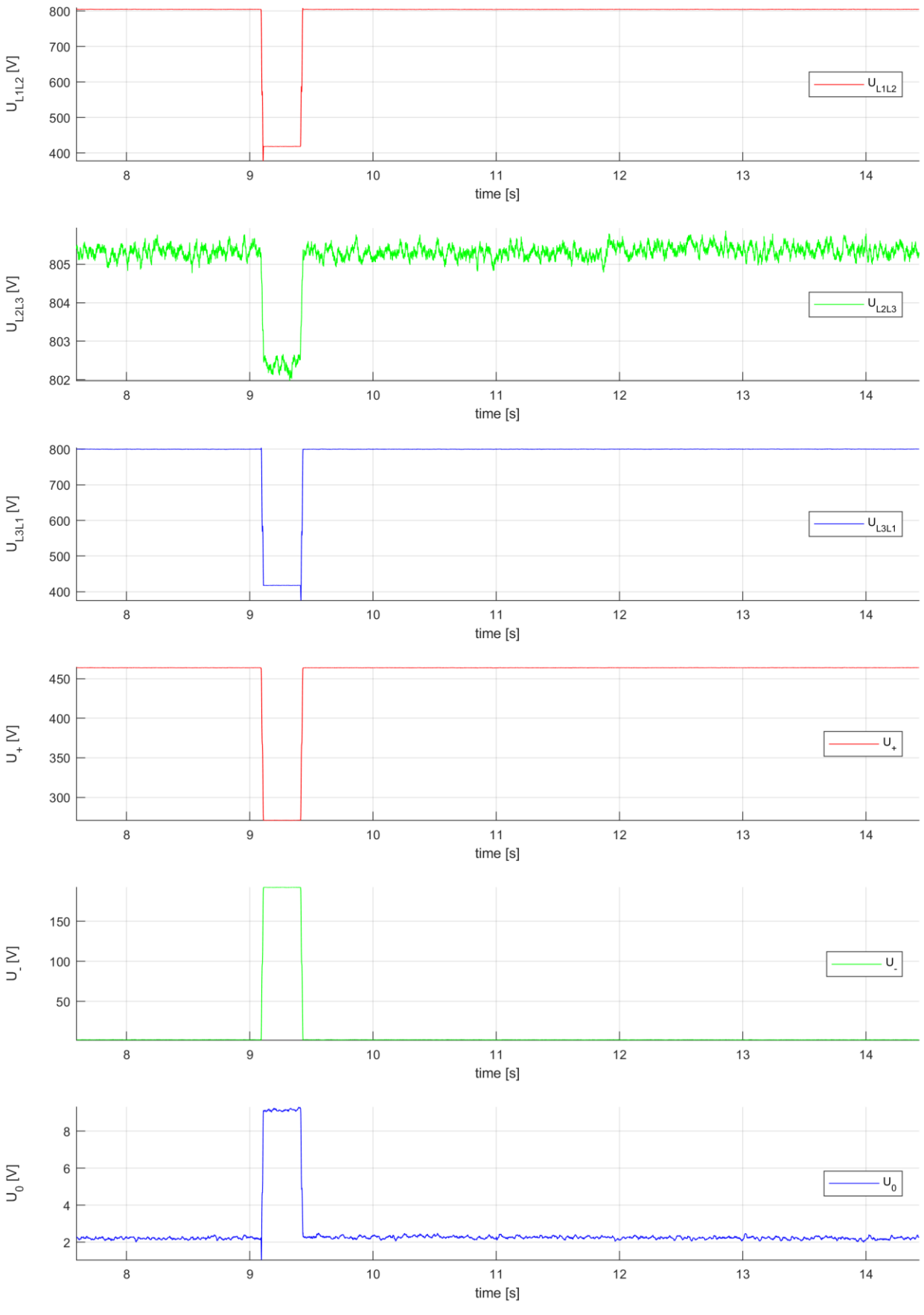


B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.



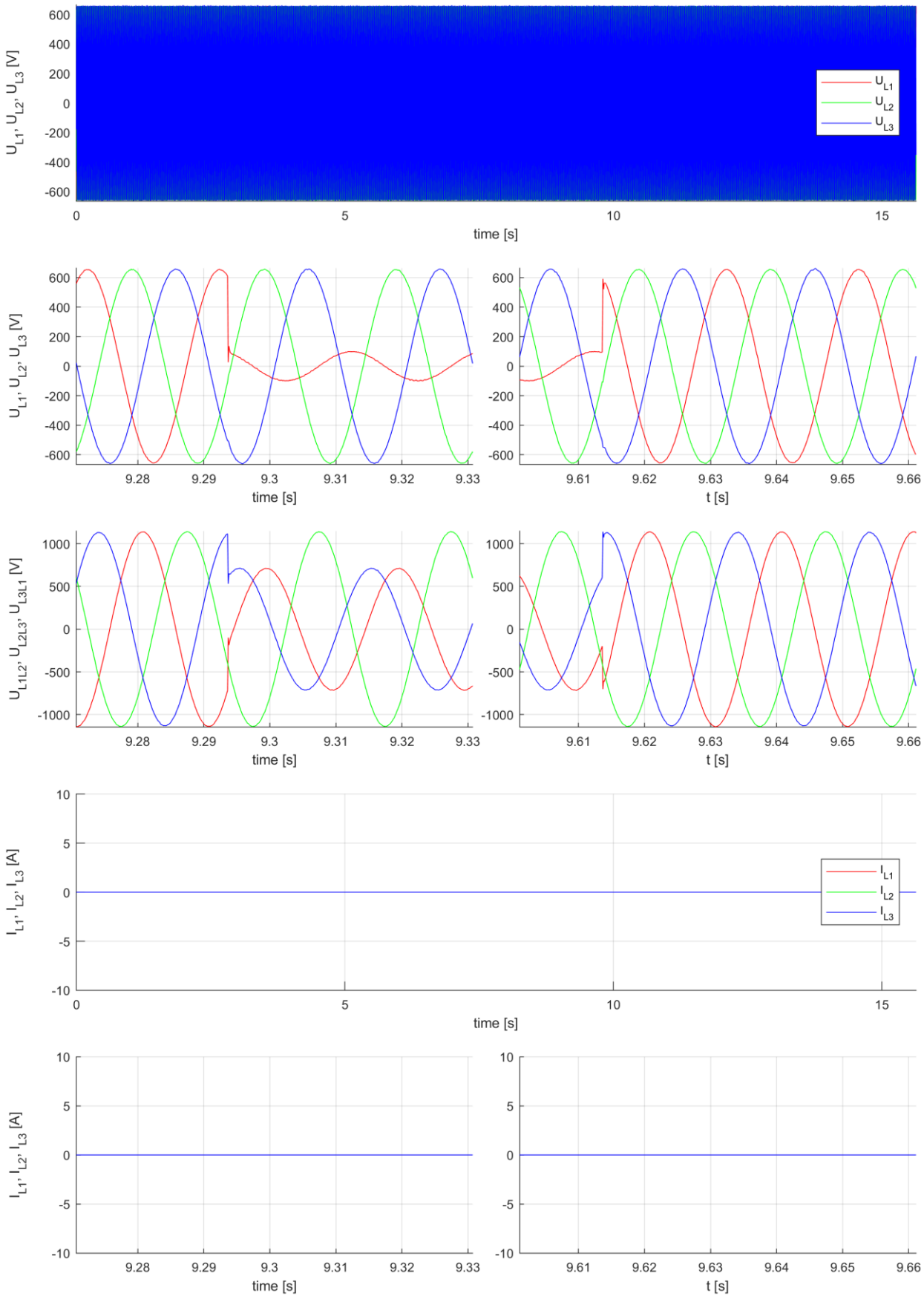
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

CEA_1.3.0

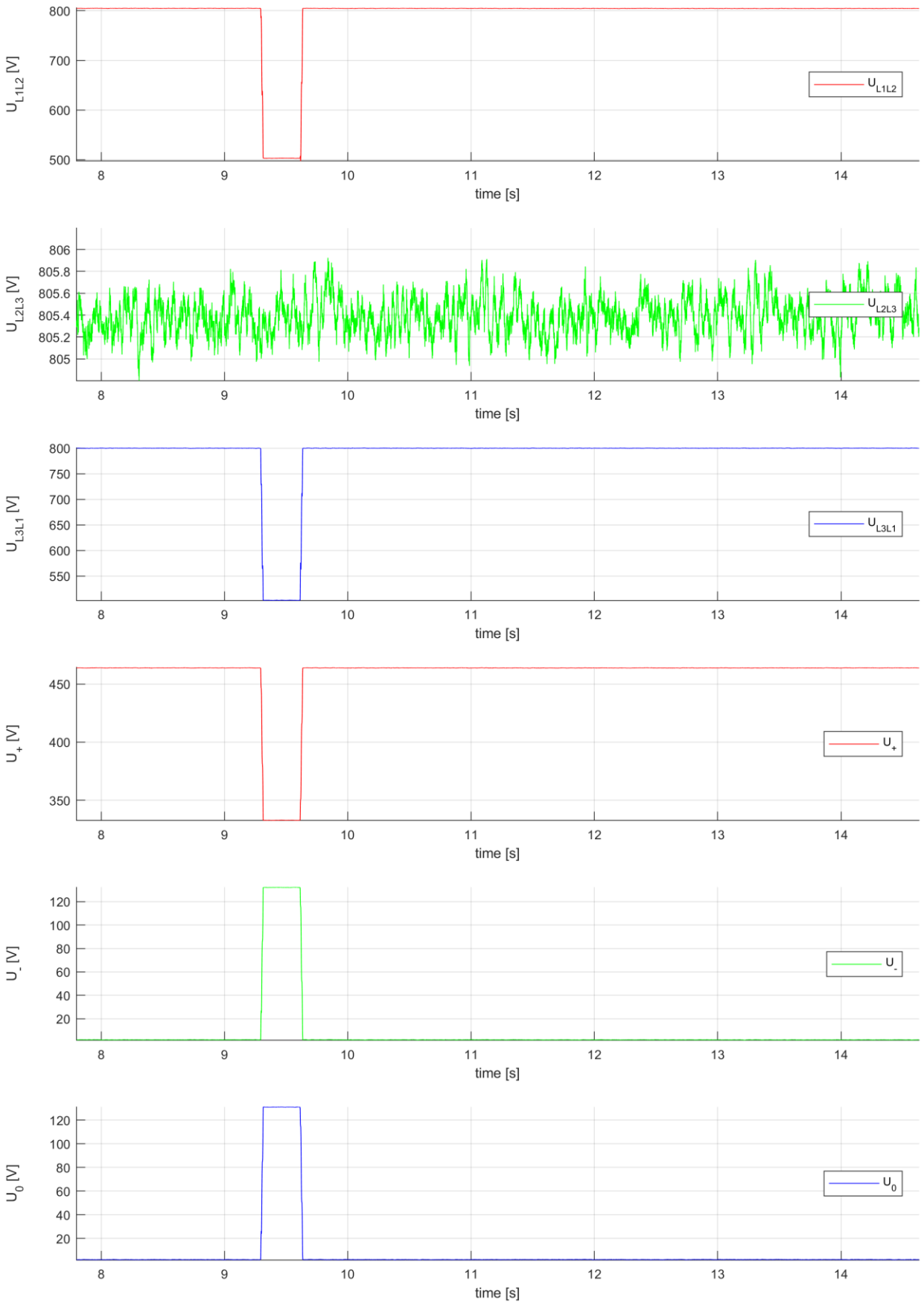
	No.	Parameter	Description / calculation basis	Results		
Gerneral information	1	Test no.	-	CEA_1.3.0-1		
	1	Data file name	-	CEA_1.3.0-1.wdf		
	1	MD5-Checksum	-	9a971d9905e962b4a38c9b4240272460		
	2	Date	[yyyy-mm-dd]	2020-09-12		
	3	Time	[hh:mm:ss]	10:12:06		
	4	Fault type	Fault type B on low-voltage side	One-phase		
	Phase reference			**A [1)]**	**B [1)]**	**C [1)]**
	5	Voltage drop depth setting	[p.u.]	0.15	1.00	1.00
	6	Set fault duration	[ms]	320.0		
	7	value series impedance X_1	[Ω]	N/A		
	8	value series impedance R_1	[Ω]	N/A		
	9	value short circuit impedance X_2	[Ω]	N/A		
	10	value short circuit impedance R_2	[Ω]	N/A		
	11	Switch event: Connection of series impedance (t_0)	[ms]	N/A		
	12	Switch event: Fault occurrence (t_1)	[ms]	9300.7		
	13	Switch event: Clearance of fault (t_2)	[ms]	9631.1		
	14	Switch event: Short-circuiting of series impedance (t_3)	[ms]	N/A		
	15	Fault duration derived from test	*(from time domain voltage results)* [ms]	330.4		
	16	Measeured value of voltage drop / increase	*(per phase-to-neutral, t_1 + 100ms … t_2 and t_1 - 60s … t_1)* [p.u. U_n]	0.151	1.004	1.006
	16	Measeured value of voltage drop / increase	*(per phase-to-phase, t_1 + 100ms … t_2 and t_1 - 60s … t_1)* [p.u. U_n]	0.629	1.007	0.628
	17	Measeured value of voltage drop / increase	*(positive sequence, phase-to-neutral, t_1 + 100ms … t_2 and t_1 - 60s … t_1)* [p.u. U_n]	0.721		

Note:
[1)] A / B / C indicate the phase-neutral voltages (L1, L2, L3), phase-phase voltages (L12, L23, L31) or the phase currents (L1, L2, L3), for details see Description / calculation basis.

B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.



B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.



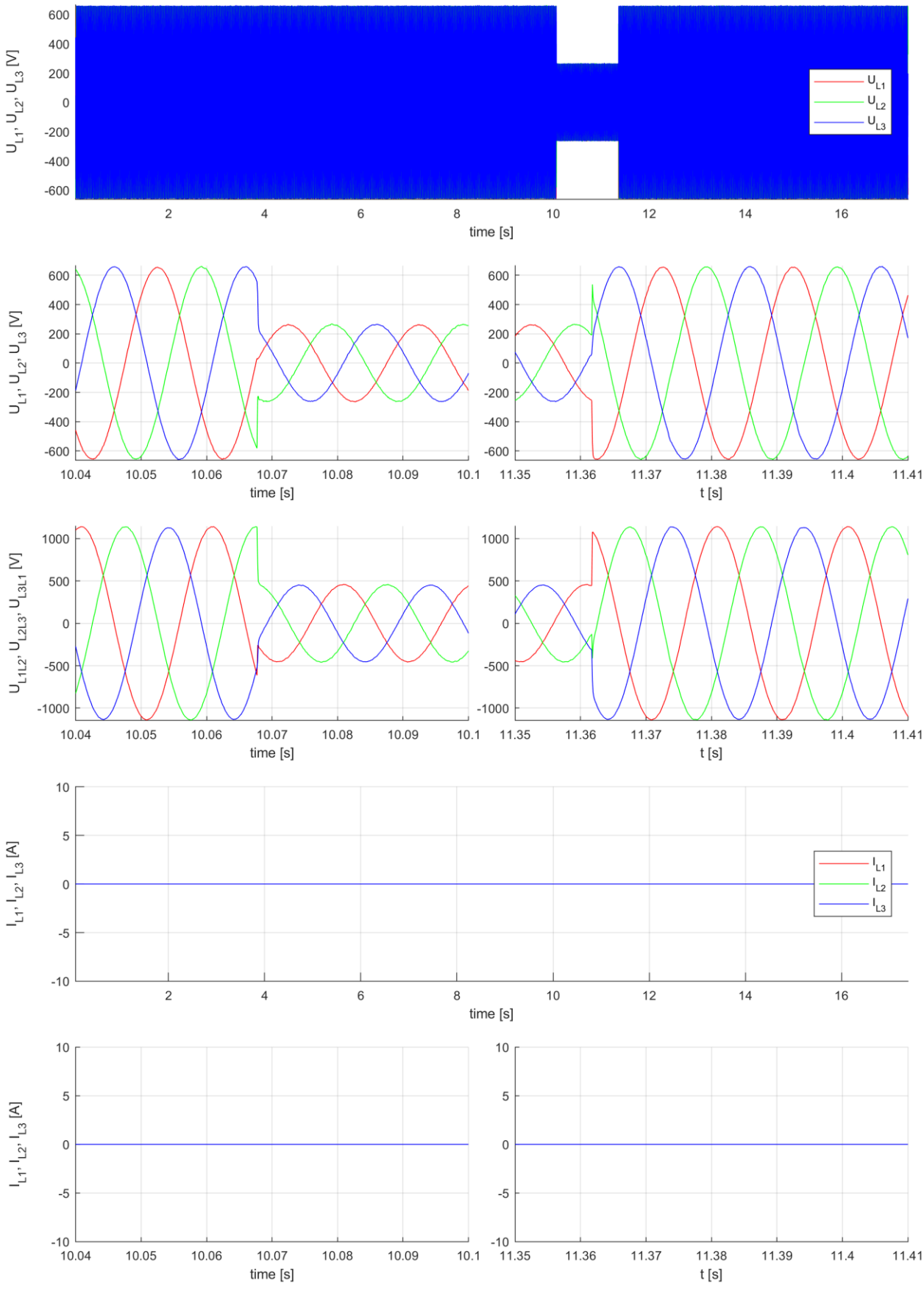
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

CEA_2.1.0

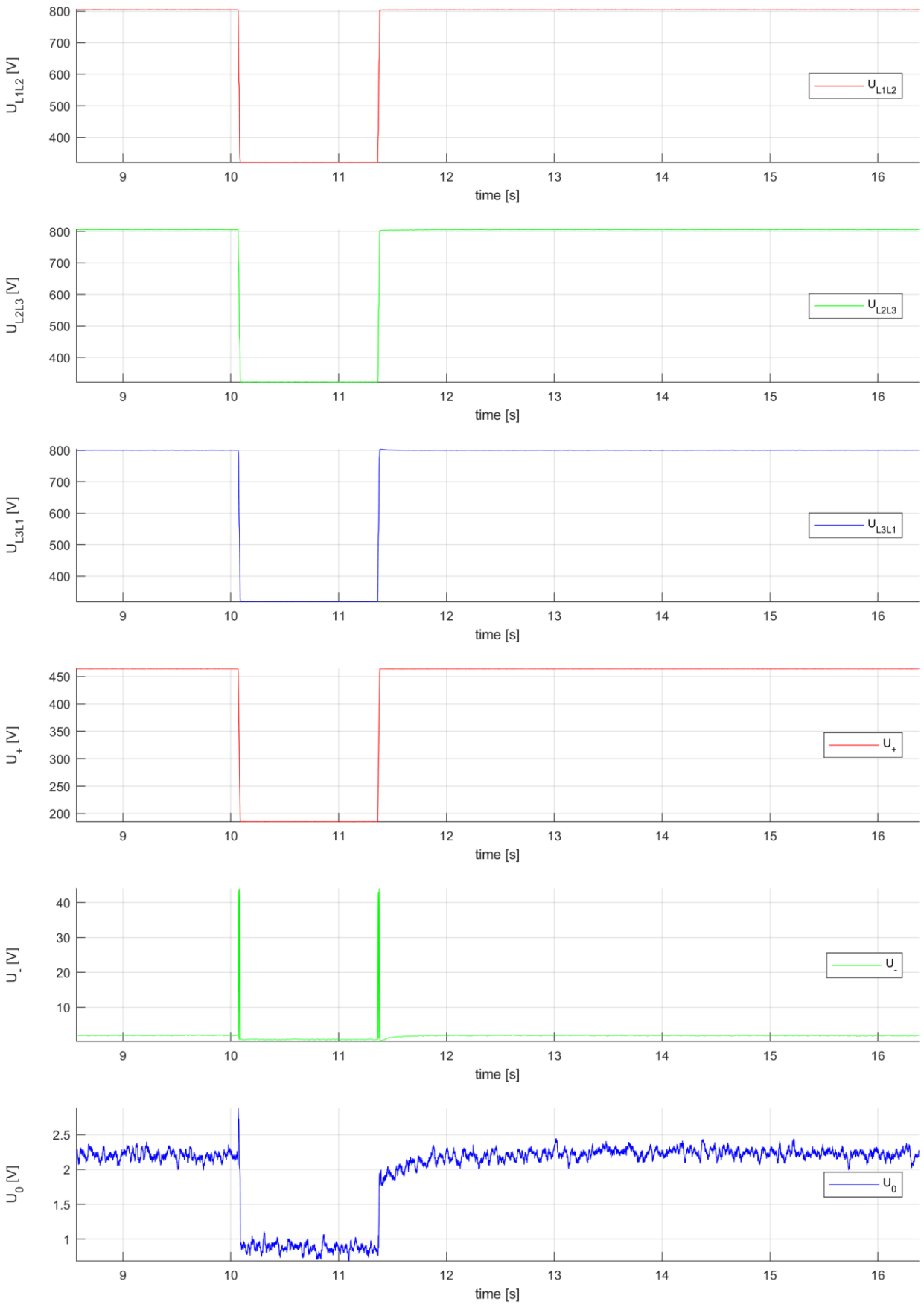
	No.	Parameter	Description / calculation basis	Results		
Gerneral information	1	Test no.	-	CEA_2.1.0-1		
	1	Data file name	-	CEA_2.1.0-1.wdf		
	1	MD5-Checksum	-	92045a5fbe50f1586d4dc801ced19742		
	2	Date	[yyyy-mm-dd]	2020-09-22		
	3	Time	[hh:mm:ss]	12:54:04		
	4	Fault type	-	Three-phase		
	Phase reference			**A** [1)]	**B** [1)]	**C** [1)]
	5	Voltage drop depth setting	[p.u.]	0.40	0.40	0.40
	6	Set fault duration	[ms]	1284.0		
	7	value series impedance X_1	[Ω]	N/A		
	8	value series impedance R_1	[Ω]	N/A		
	9	value short circuit impedance X_2	[Ω]	N/A		
	10	value short circuit impedance R_2	[Ω]	N/A		
	11	Switch event: Connection of series impedance (t_0)	[ms]	N/A		
	12	Switch event: Fault occurrence (t_1)	[ms]	10070.0		
	13	Switch event: Clearance of fault (t_2)	[ms]	11380.0		
	14	Switch event: Short-circuiting of series impedance (t_3)	[ms]	N/A		
	15	Fault duration derived from test	*(from time domain voltage results)* [ms]	1310.0		
	16	Measeured value of voltage drop / increase	*(per phase-to-neutral, t_1 + 100ms … t_2 and t_1 - 60s … t_1)* [p.u. U_n]	0.400	0.401	0.402
	16	Measeured value of voltage drop / increase	*(per phase-to-phase, t_1 + 100ms … t_2 and t_1 - 60s … t_1)* [p.u. U_n]	0.402	0.402	0.400
	17	Measeured value of voltage drop / increase	*(positive sequence, phase-to-neutral, t_1 + 100ms … t_2 and t_1 - 60s … t_1)* [p.u. U_n]	0.401		

Note:
[1)] A / B / C indicate the phase-neutral voltages (L1, L2, L3), phase-phase voltages (L12, L23, L31) or the phase currents (L1, L2, L3), for details see Description / calculation basis.

B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.



B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.



B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

CEA_2.2.0

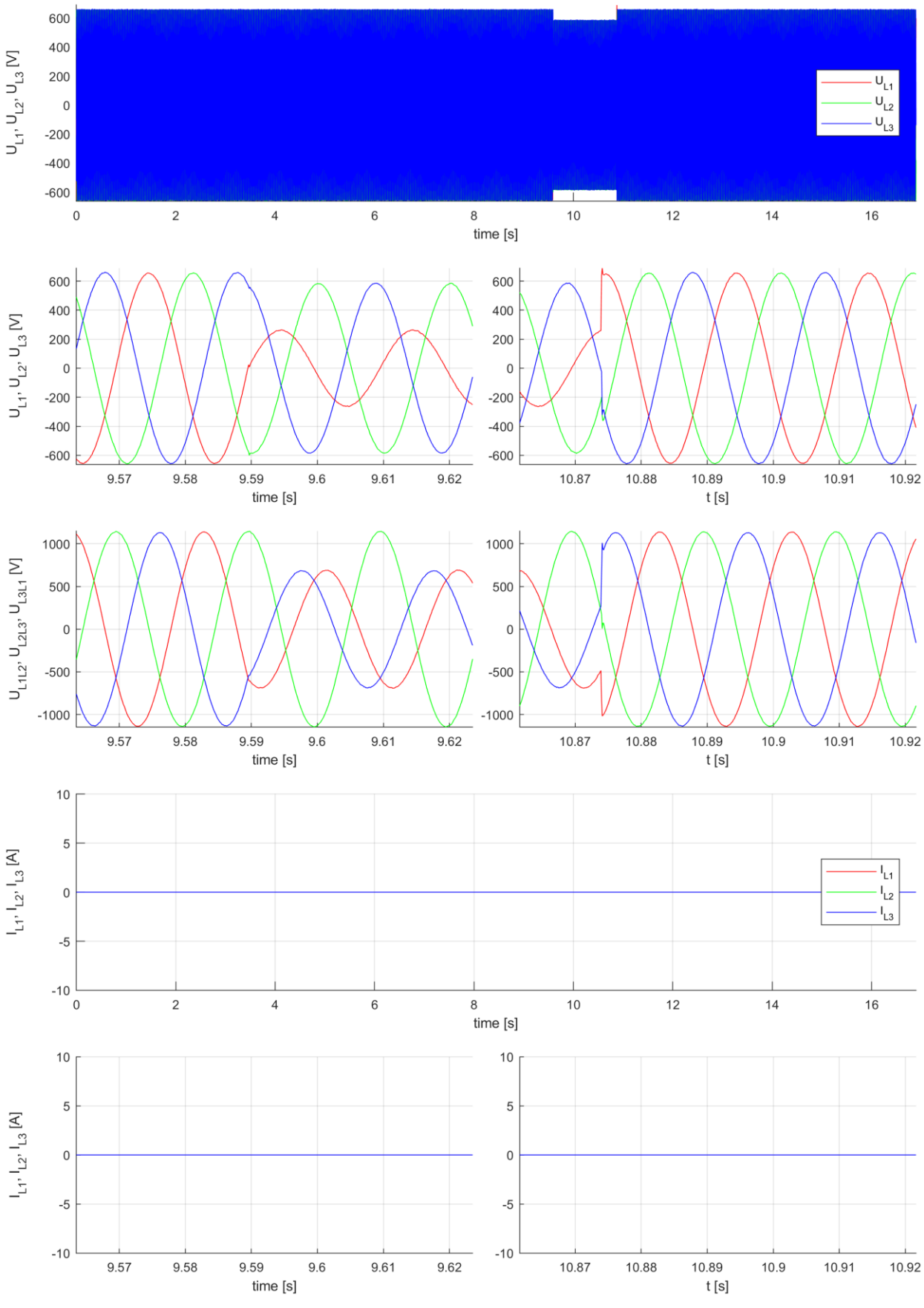
	No.	Parameter	Description / calculation basis	Results		
Gerneral information	1	Test no.	-	CEA_2.2.0-1		
	1	Data file name	-	CEA_2.2.0-1.wdf		
	1	MD5-Checksum	-	c24a9a1e8df4b0dd9d52250683a91c0c		
	2	Date	[yyyy-mm-dd]	2020-09-22		
	3	Time	[hh:mm:ss]	14:44:56		
	4	Fault type	Fault type D on low-voltage side	Two-phase		
	Phase reference			**A [1)]**	**B [1)]**	**C [1)]**
	5	Voltage drop depth setting	[p.u.]	0.40	0.89	0.89
	6	Set fault duration	[ms]	1284.0		
	7	value series impedance X_1	[Ω]	N/A		
	8	value series impedance R_1	[Ω]	N/A		
	9	value short circuit impedance X_2	[Ω]	N/A		
	10	value short circuit impedance R_2	[Ω]	N/A		
	11	Switch event: Connection of series impedance (t_0)	[ms]	N/A		
	12	Switch event: Fault occurrence (t_1)	[ms]	9593.5		
	13	Switch event: Clearance of fault (t_2)	[ms]	10891.6		
	14	Switch event: Short-circuiting of series impedance (t_3)	[ms]	N/A		
	15	Fault duration derived from test	*(from time domain voltage results)* [ms]	1298.1		
	16	Measeured value of voltage drop / increase	*(per phase-to-neutral, t_1 + 100ms … t_2 and t_1 - 60s … t_1)* [p.u. U_n]	0.400	0.893	0.895
	16	Measeured value of voltage drop / increase	*(per phase-to-phase, t_1 + 100ms … t_2 and t_1 - 60s … t_1)* [p.u. U_n]	0.609	1.010	0.606
	17	Measeured value of voltage drop / increase	*(positive sequence, phase-to-neutral, t_1 + 100ms … t_2 and t_1 - 60s … t_1)* [p.u. U_n]	0.700		

Note:
[1)] A / B / C indicate the phase-neutral voltages (L1, L2, L3), phase-phase voltages (L12, L23, L31) or the phase currents (L1, L2, L3), for details see Description / calculation basis.

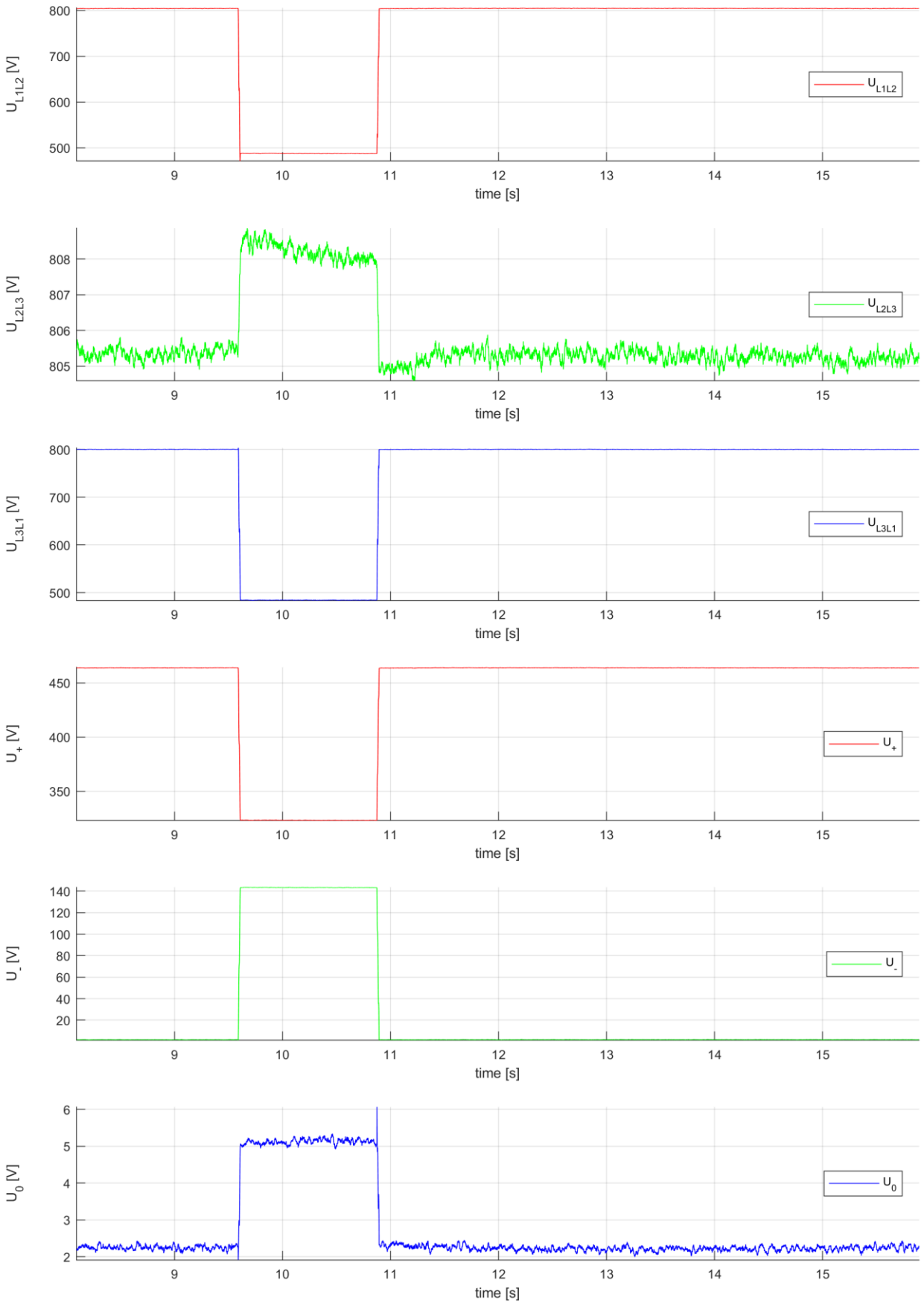
Note:

* The grid fault type C (phase-to-phase fault without grounding) was simulated at the medium voltage side of the Dy-medium-voltage transformer, following diagram shows the measurement at the low voltage side of the transformer – grid fault type D on low voltage side.

B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.



B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.



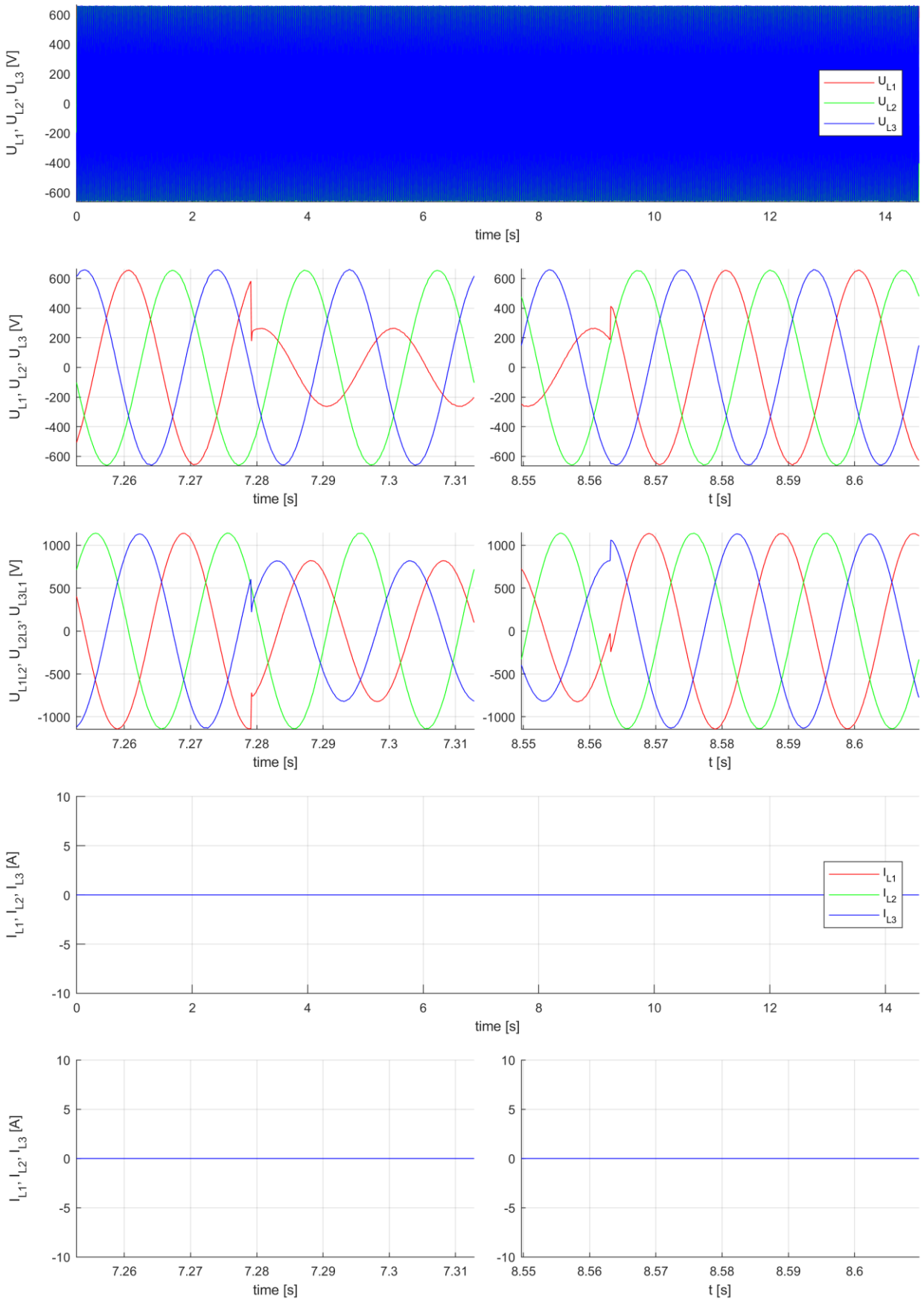
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

CEA_2.3.0

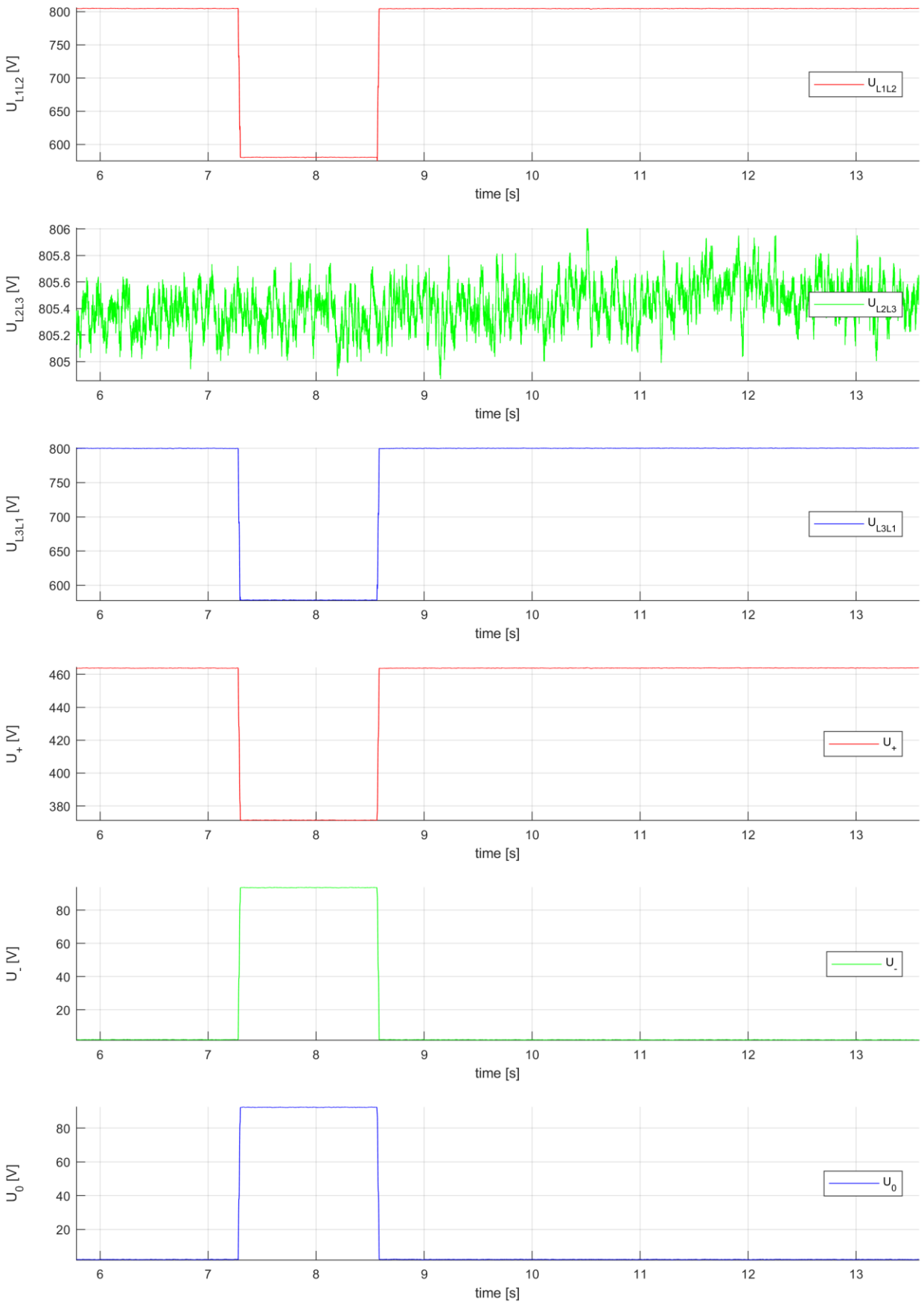
	No.	Parameter	Description / calculation basis	Results		
Gerneral information	1	Test no.	-	CEA_2.3.0-1		
	1	Data file name	-	CEA_2.3.0-1.wdf		
	1	MD5-Checksum	-	06f4d8ac0f3c95cd28080fc08364082e		
	2	Date	[yyyy-mm-dd]	2020-09-12		
	3	Time	[hh:mm:ss]	10:04:34		
	4	Fault type	Fault type B on low-voltage side	One-phase		
	Phase reference			**A [1)]**	**B [1)]**	**C [1)]**
	5	Voltage drop depth setting	[p.u.]	0.40	1.00	1.00
	6	Set fault duration	[ms]	1284.0		
	7	value series impedance X_1	[Ω]	N/A		
	8	value series impedance R_1	[Ω]	N/A		
	9	value short circuit impedance X_2	[Ω]	N/A		
	10	value short circuit impedance R_2	[Ω]	N/A		
	11	Switch event: Connection of series impedance (t_0)	[ms]	N/A		
	12	Switch event: Fault occurrence (t_1)	[ms]	7282.8		
	13	Switch event: Clearance of fault (t_2)	[ms]	8579.7		
	14	Switch event: Short-circuiting of series impedance (t_3)	[ms]	N/A		
	15	Fault duration derived from test	*(from time domain voltage results)* [ms]	1296.9		
	16	Measeured value of voltage drop / increase	*(per phase-to-neutral, t_1 + 100ms … t_2 and t_1 - 60s … t_1)* [p.u. U_n]	0.401	1.004	1.007
	16	Measeured value of voltage drop / increase	*(per phase-to-phase, t_1 + 100ms … t_2 and t_1 - 60s … t_1)* [p.u. U_n]	0.726	1.007	0.723
	17	Measeured value of voltage drop / increase	*(positive sequence, phase-to-neutral, t_1 + 100ms … t_2 and t_1 - 60s … t_1)* [p.u. U_n]	0.804		

Note:
[1)] A / B / C indicate the phase-neutral voltages (L1, L2, L3), phase-phase voltages (L12, L23, L31) or the phase currents (L1, L2, L3), for details see Description / calculation basis.

B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.



B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.



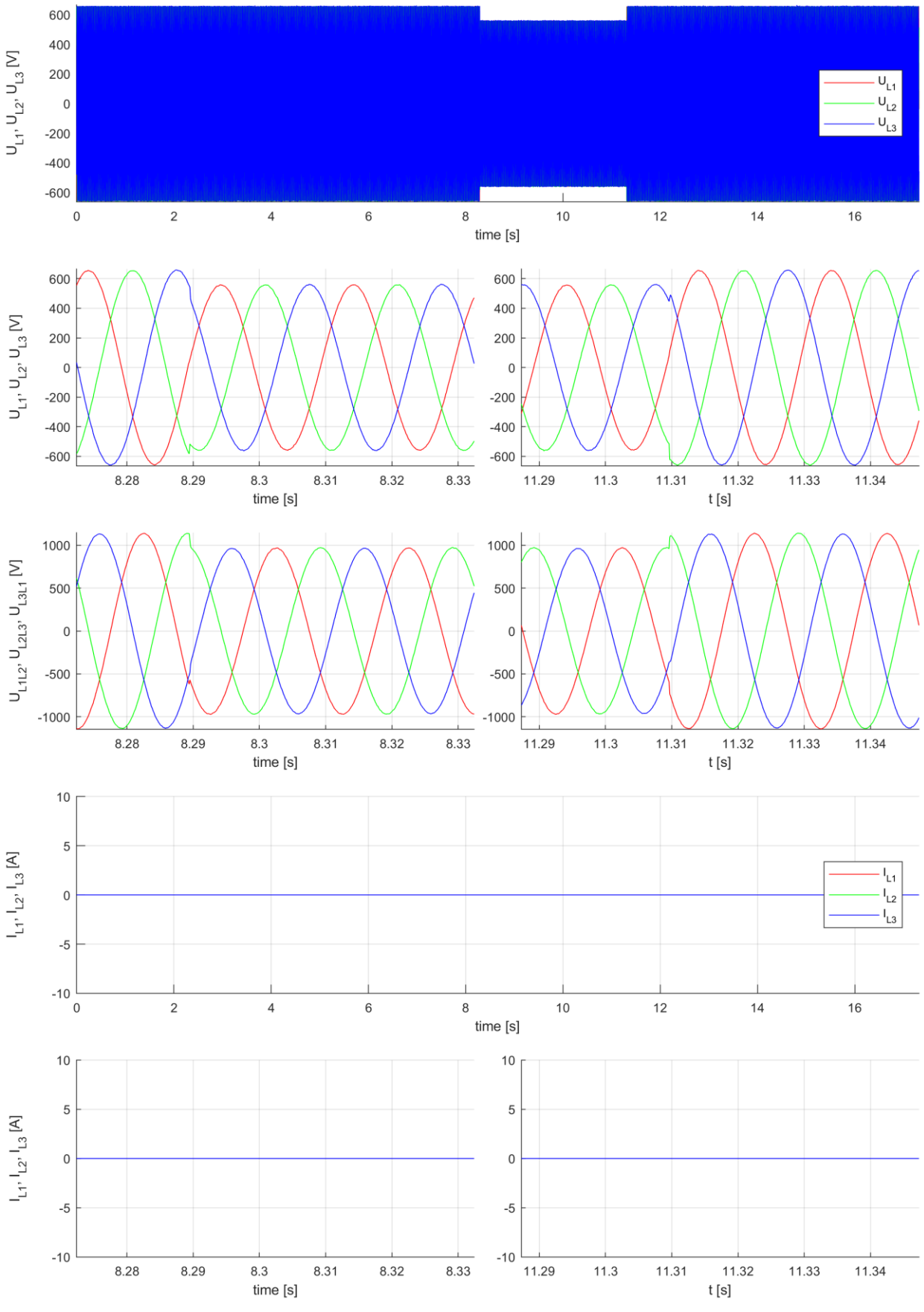
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

CEA_3.1.0

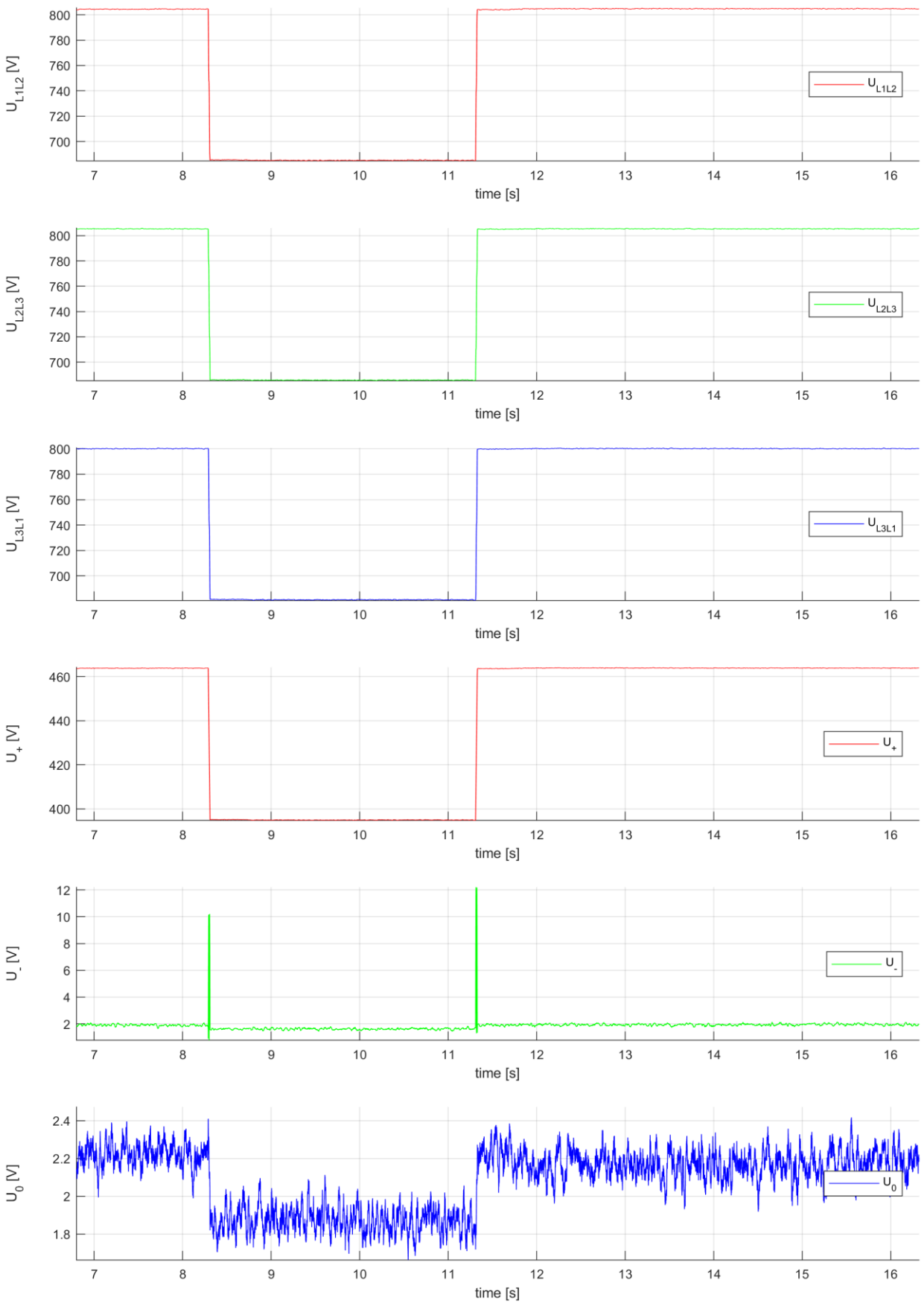
	No.	Parameter	Description / calculation basis	Results		
Gerneral information	1	Test no.	-	CEA_3.1.0-1		
	1	Data file name	-	CEA_3.1.0-1.wdf		
	1	MD5-Checksum	-	9d629ceb7963455f822a54be8134e2d5		
	2	Date	[yyyy-mm-dd]	2020-09-12		
	3	Time	[hh:mm:ss]	10:20:32		
	4	Fault type	-	Three-phase		
	Phase reference			**A** [1)]	**B** [1)]	**C** [1)]
	5	Voltage drop depth setting	[p.u.]	0.85	0.85	0.85
	6	Set fault duration	[ms]	3020.0		
	7	value series impedance X_1	[Ω]	N/A		
	8	value series impedance R_1	[Ω]	N/A		
	9	value short circuit impedance X_2	[Ω]	N/A		
	10	value short circuit impedance R_2	[Ω]	N/A		
	11	Switch event: Connection of series impedance (t_0)	[ms]	N/A		
	12	Switch event: Fault occurrence (t_1)	[ms]	8302.4		
	13	Switch event: Clearance of fault (t_2)	[ms]	11317.3		
	14	Switch event: Short-circuiting of series impedance (t_3)	[ms]	N/A		
	15	Fault duration derived from test	*(from time domain voltage results)* [ms]	3014.9		
	16	Measeured value of voltage drop / increase	*(per phase-to-neutral, t_1 + 100ms … t_2 and t_1 - 60s … t_1)* [p.u. U_n]	0.853	0.855	0.857
	16	Measeured value of voltage drop / increase	*(per phase-to-phase, t_1 + 100ms … t_2 and t_1 - 60s … t_1)* [p.u. U_n]	0.856	0.857	0.852
	17	Measeured value of voltage drop / increase	*(positive sequence, phase-to-neutral, t_1 + 100ms … t_2 and t_1 - 60s … t_1)* [p.u. U_n]	0.855		

Note:
[1)] A / B / C indicate the phase-neutral voltages (L1, L2, L3), phase-phase voltages (L12, L23, L31) or the phase currents (L1, L2, L3), for details see Description / calculation basis.

B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.



B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.



B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

CEA_3.2.0

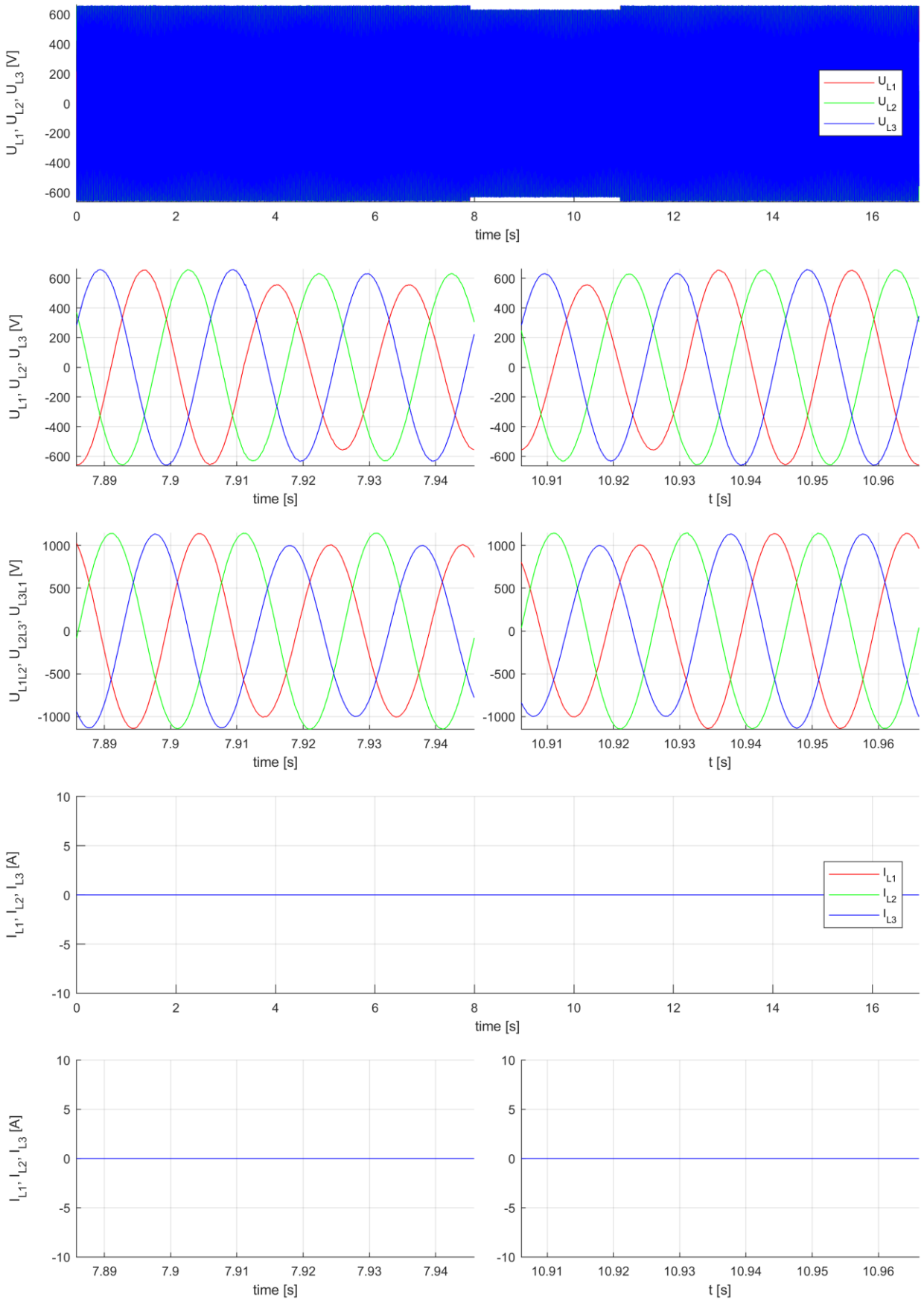
	No.	Parameter	Description / calculation basis	Results		
Gerneral information	1	Test no.	-	CEA_3.2.0-1		
	1	Data file name	-	CEA_3.2.0-1.wdf		
	1	MD5-Checksum	-	a16d483c91d0449ca6b275929c8fbd46		
	2	Date	[yyyy-mm-dd]	2020-09-22		
	3	Time	[hh:mm:ss]	15:01:40		
	4	Fault type	Fault type D on low-voltage side	Two-phase		
	Phase reference			**A [1)]**	**B [1)]**	**C [1)]**
	5	Voltage drop depth setting	[p.u.]	0.85	0.96	0.96
	6	Set fault duration	[ms]	3020.0		
	7	value series impedance X_1	[Ω]	N/A		
	8	value series impedance R_1	[Ω]	N/A		
	9	value short circuit impedance X_2	[Ω]	N/A		
	10	value short circuit impedance R_2	[Ω]	N/A		
	11	Switch event: Connection of series impedance (t_0)	[ms]	N/A		
	12	Switch event: Fault occurrence (t_1)	[ms]	7915.8		
	13	Switch event: Clearance of fault (t_2)	[ms]	10936.1		
	14	Switch event: Short-circuiting of series impedance (t_3)	[ms]	N/A		
	15	Fault duration derived from test	*(from time domain voltage results)* [ms]	3020.3		
	16	Measeured value of voltage drop / increase	*(per phase-to-neutral, t_1 + 100ms … t_2 and t_1 - 60s … t_1)* [p.u. U_n]	0.851	0.964	0.966
	16	Measeured value of voltage drop / increase	*(per phase-to-phase, t_1 + 100ms … t_2 and t_1 - 60s … t_1)* [p.u. U_n]	0.887	1.011	0.882
	17	Measeured value of voltage drop / increase	*(positive sequence, phase-to-neutral, t_1 + 100ms … t_2 and t_1 - 60s … t_1)* [p.u. U_n]	0.924		

Note:
[1)] A / B / C indicate the phase-neutral voltages (L1, L2, L3), phase-phase voltages (L12, L23, L31) or the phase currents (L1, L2, L3), for details see Description / calculation basis.

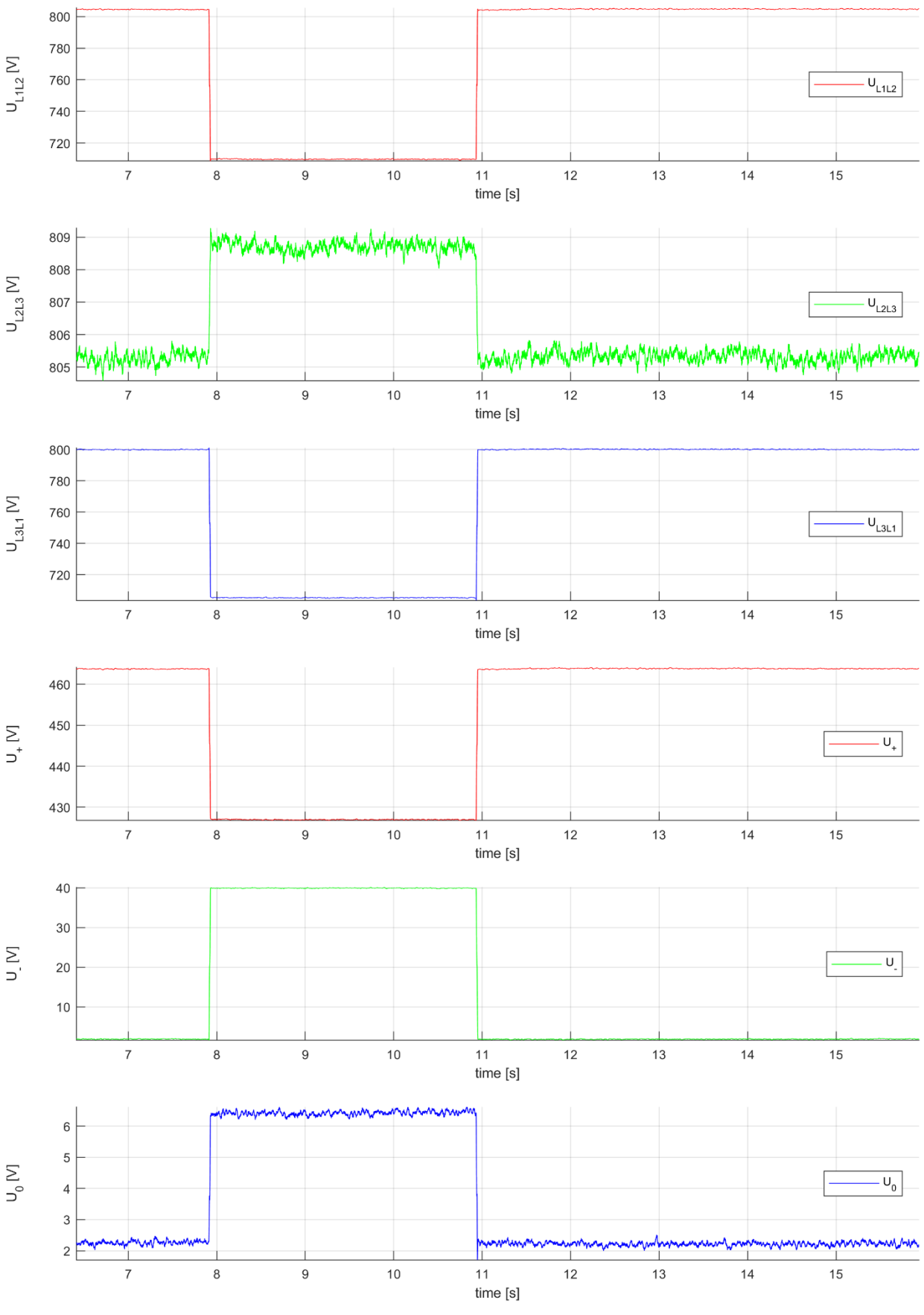
Note:

* The grid fault type C (phase-to-phase fault without grounding) was simulated at the medium voltage side of the Dy-medium-voltage transformer, following diagram shows the measurement at the low voltage side of the transformer – grid fault type D on low voltage side.

B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.



B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.



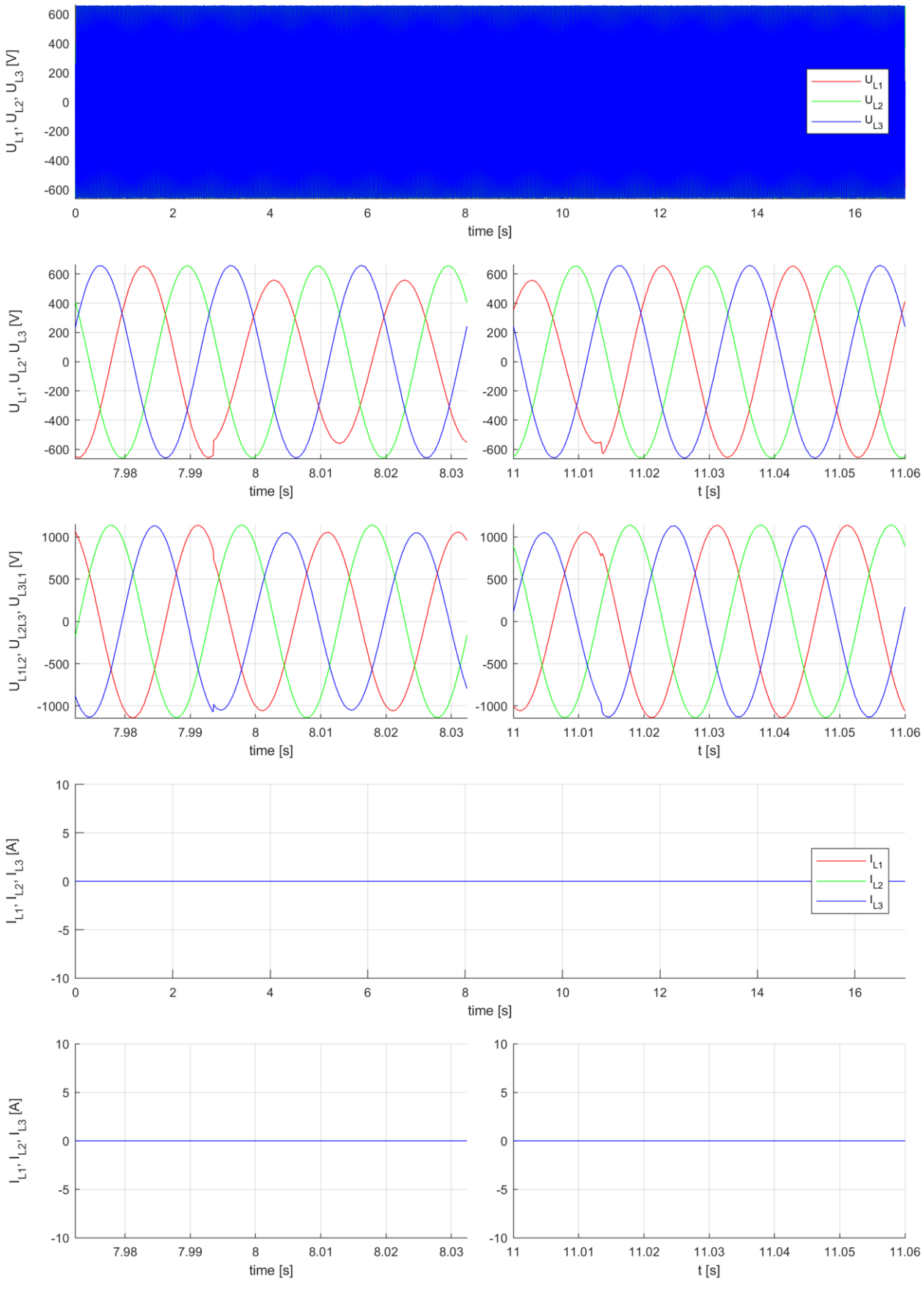
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

CEA_3.3.0

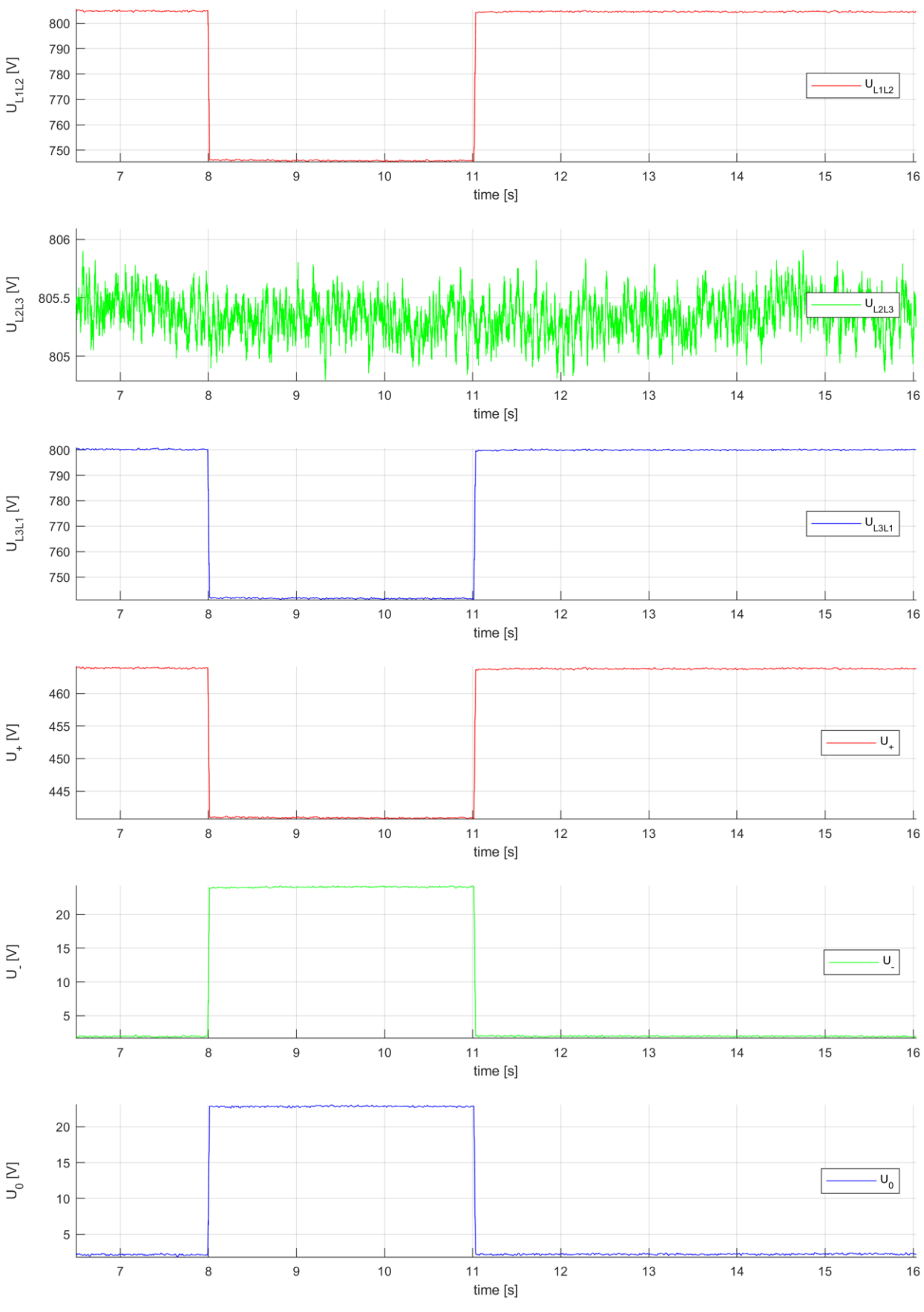
	No.	Parameter	Description / calculation basis	Results		
Gerneral information	1	Test no.	-	CEA_3.3.0-1		
	1	Data file name	-	CEA_3.3.0-1.wvf		
	1	MD5-Checksum	-	969f61f14cb90868666ceb6799467fb5		
	2	Date	[yyyy-mm-dd]	2020-09-23		
	3	Time	[hh:mm:ss]	00:56:26		
	4	Fault type	Fault type B on low-voltage side	One-phase		
	Phase reference			**A [1)]**	**B [1)]**	**C [1)]**
	5	Voltage drop depth setting	[p.u.]	0.85	1.00	1.00
	6	Set fault duration	[ms]	3020.0		
	7	value series impedance X_1	[Ω]	N/A		
	8	value series impedance R_1	[Ω]	N/A		
	9	value short circuit impedance X_2	[Ω]	N/A		
	10	value short circuit impedance R_2	[Ω]	N/A		
	11	Switch event: Connection of series impedance (t_0)	[ms]	N/A		
	12	Switch event: Fault occurrence (t_1)	[ms]	8002.4		
	13	Switch event: Clearance of fault (t_2)	[ms]	11030.0		
	14	Switch event: Short-circuiting of series impedance (t_3)	[ms]	N/A		
	15	Fault duration derived from test	*(from time domain voltage results)* [ms]	3027.6		
	16	Measeured value of voltage drop / increase	*(per phase-to-neutral, t_1 + 100ms … t_2 and t_1 - 60s … t_1)* [p.u. U_n]	0.853	1.004	1.006
	16	Measeured value of voltage drop / increase	*(per phase-to-phase, t_1 + 100ms … t_2 and t_1 - 60s … t_1)* [p.u. U_n]	0.932	1.007	0.927
	17	Measeured value of voltage drop / increase	*(positive sequence, phase-to-neutral, t_1 + 100ms … t_2 and t_1 - 60s … t_1)* [p.u. U_n]	0.955		

Note:
[1)] A / B / C indicate the phase-neutral voltages (L1, L2, L3), phase-phase voltages (L12, L23, L31) or the phase currents (L1, L2, L3), for details see Description / calculation basis.

B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.



B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.



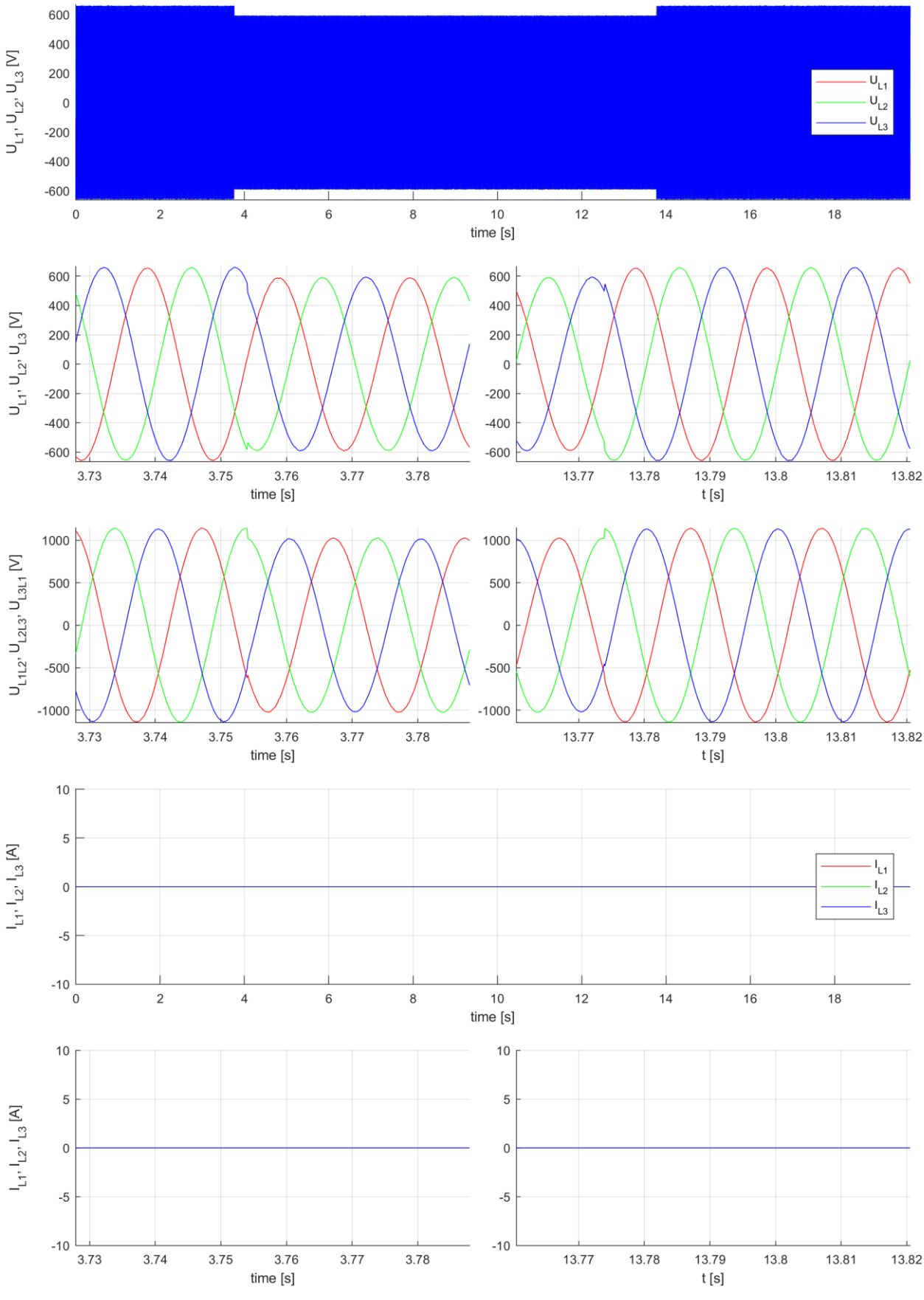
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

CEA_4.1.0

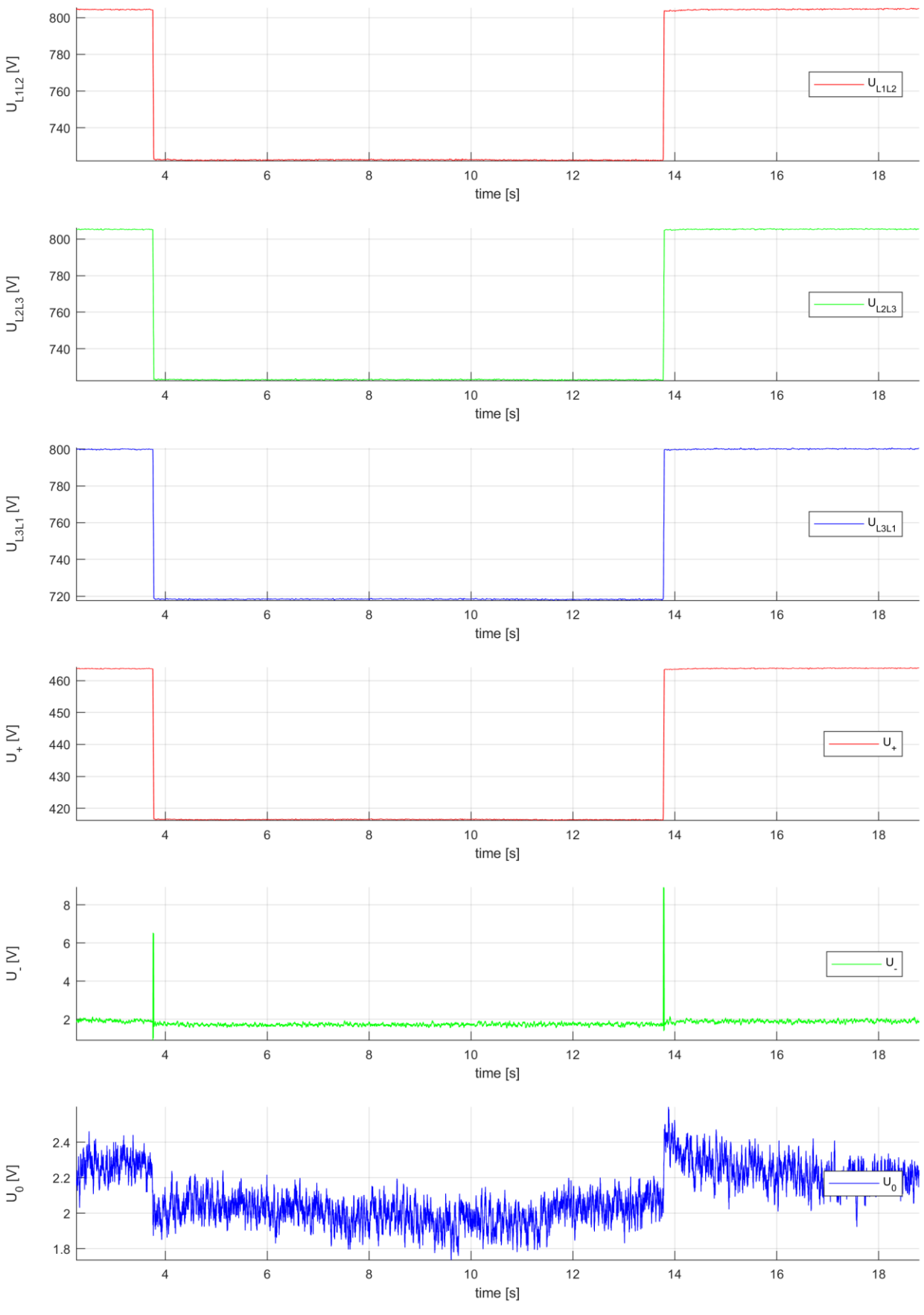
	No.	Parameter	Description / calculation basis	Results		
Gerneral information	1	Test no.	-	CEA_4.1.0-1		
	1	Data file name	-	CEA_4.1.0-1.wdf		
	1	MD5-Checksum	-	86747ce51df904cab05060a611b9c721		
	2	Date	[yyyy-mm-dd]	2020-09-22		
	3	Time	[hh:mm:ss]	13:03:56		
	4	Fault type	-	Three-phase		
	Phase reference			**A [1)]**	**B [1)]**	**C [1)]**
	5	Voltage drop depth setting	[p.u.]	0.89	0.89	0.89
	6	Set fault duration	[ms]	10000.0		
	7	value series impedance X_1	[Ω]	N/A		
	8	value series impedance R_1	[Ω]	N/A		
	9	value short circuit impedance X_2	[Ω]	N/A		
	10	value short circuit impedance R_2	[Ω]	N/A		
	11	Switch event: Connection of series impedance (t_0)	[ms]	N/A		
	12	Switch event: Fault occurrence (t_1)	[ms]	3757.9		
	13	Switch event: Clearance of fault (t_2)	[ms]	13790.5		
	14	Switch event: Short-circuiting of series impedance (t_3)	[ms]	N/A		
	15	Fault duration derived from test	*(from time domain voltage results)* [ms]	10032.6		
	16	Measeured value of voltage drop / increase	*(per phase-to-neutral, t_1 + 100ms … t_2 and t_1 - 60s … t_1)* [p.u. U_n]	0.900	0.902	0.904
	16	Measeured value of voltage drop / increase	*(per phase-to-phase, t_1 + 100ms … t_2 and t_1 - 60s … t_1)* [p.u. U_n]	0.903	0.904	0.898
	17	Measeured value of voltage drop / increase	*(positive sequence, phase-to-neutral, t_1 + 100ms … t_2 and t_1 - 60s … t_1)* [p.u. U_n]	0.902		

Note:
[1)] A / B / C indicate the phase-neutral voltages (L1, L2, L3), phase-phase voltages (L12, L23, L31) or the phase currents (L1, L2, L3), for details see Description / calculation basis.

B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.



B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.



B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

CEA_4.2.0

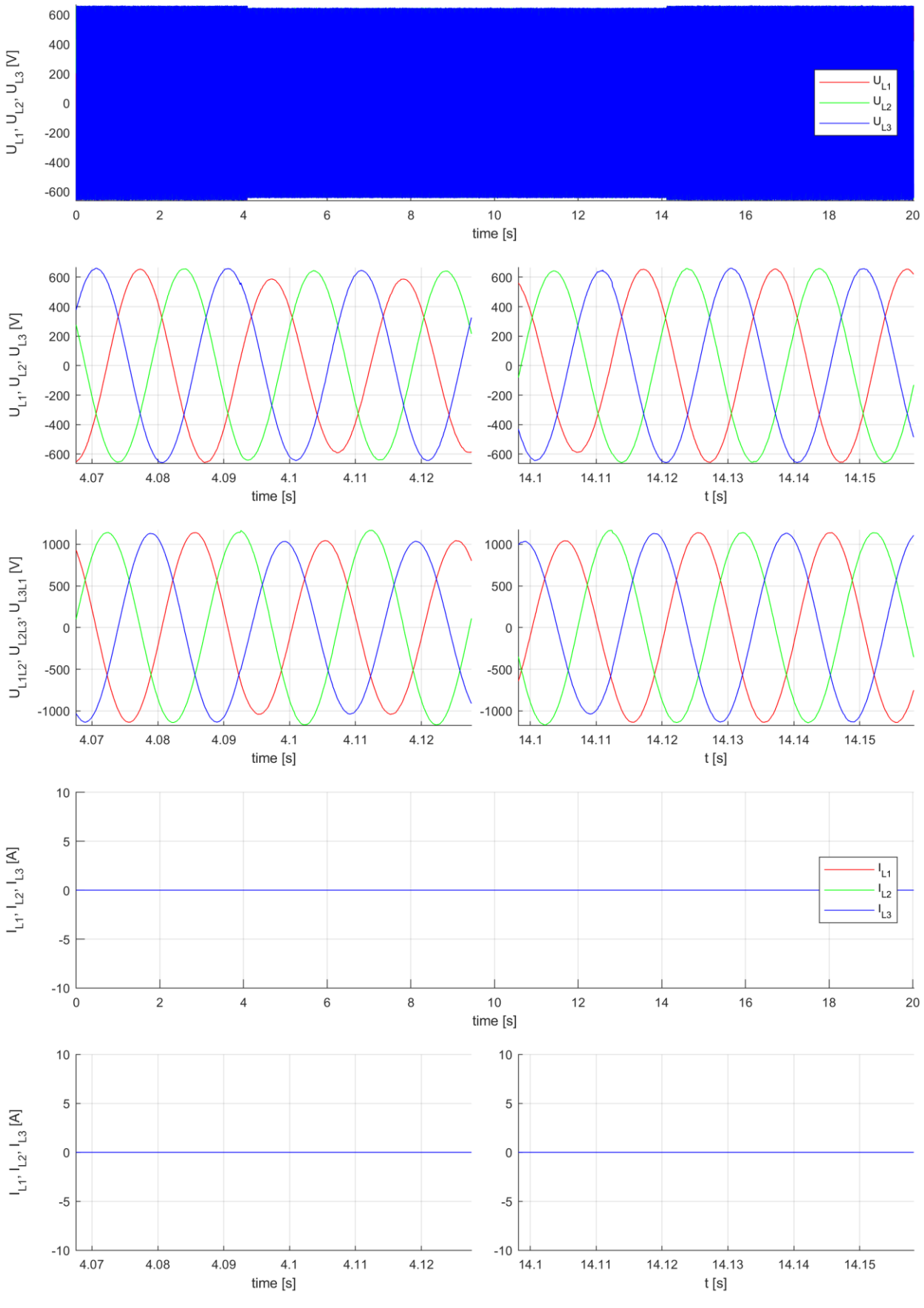
	No.	Parameter	Description / calculation basis	Results		
Gerneral information	1	Test no.	-	CEA_4.2.0-1		
	1	Data file name	-	CEA_4.2.0-1.wdf		
	1	MD5-Checksum	-	fe3e3d092ccfc8d9eeafe9c6964105d9		
	2	Date	[yyyy-mm-dd]	2020-09-22		
	3	Time	[hh:mm:ss]	13:18:40		
	4	Fault type	Fault type D on low-voltage side	Two-phase		
	Phase reference			**A [1)]**	**B [1)]**	**C [1)]**
	5	Voltage drop depth setting	[p.u.]	0.89	0.97	0.97
	6	Set fault duration	[ms]	10000.0		
	7	value series impedance X_1	[Ω]	N/A		
	8	value series impedance R_1	[Ω]	N/A		
	9	value short circuit impedance X_2	[Ω]	N/A		
	10	value short circuit impedance R_2	[Ω]	N/A		
	11	Switch event: Connection of series impedance (t_0)	[ms]	N/A		
	12	Switch event: Fault occurrence (t_1)	[ms]	4097.6		
	13	Switch event: Clearance of fault (t_2)	[ms]	14128.2		
	14	Switch event: Short-circuiting of series impedance (t_3)	[ms]	N/A		
	15	Fault duration derived from test	*(from time domain voltage results)* [ms]	10030.6		
	16	Measeured value of voltage drop / increase	*(per phase-to-neutral, t_1 + 100ms … t_2 and t_1 - 60s … t_1)* [p.u. U_n]	0.900	0.982	0.985
	16	Measeured value of voltage drop / increase	*(per phase-to-phase, t_1 + 100ms … t_2 and t_1 - 60s … t_1)* [p.u. U_n]	0.919	1.030	0.914
	17	Measeured value of voltage drop / increase	*(positive sequence, phase-to-neutral, t_1 + 100ms … t_2 and t_1 - 60s … t_1)* [p.u. U_n]	0.953		

Note:
[1)] A / B / C indicate the phase-neutral voltages (L1, L2, L3), phase-phase voltages (L12, L23, L31) or the phase currents (L1, L2, L3), for details see Description / calculation basis.

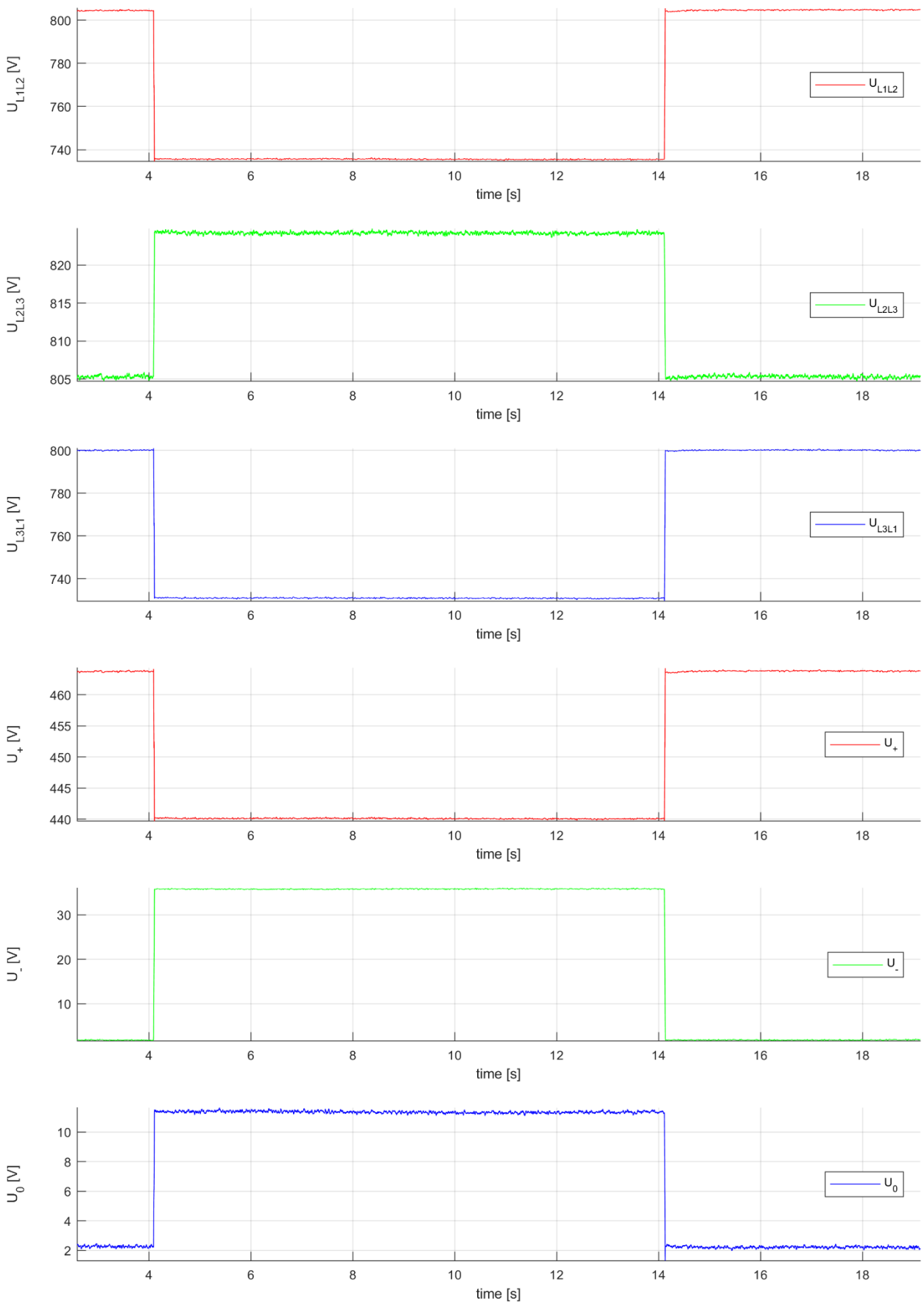
Note:

* The grid fault type C (phase-to-phase fault without grounding) was simulated at the medium voltage side of the Dy-medium-voltage transformer, following diagram shows the measurement at the low voltage side of the transformer – grid fault type D on low voltage side.

B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.



B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.



B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

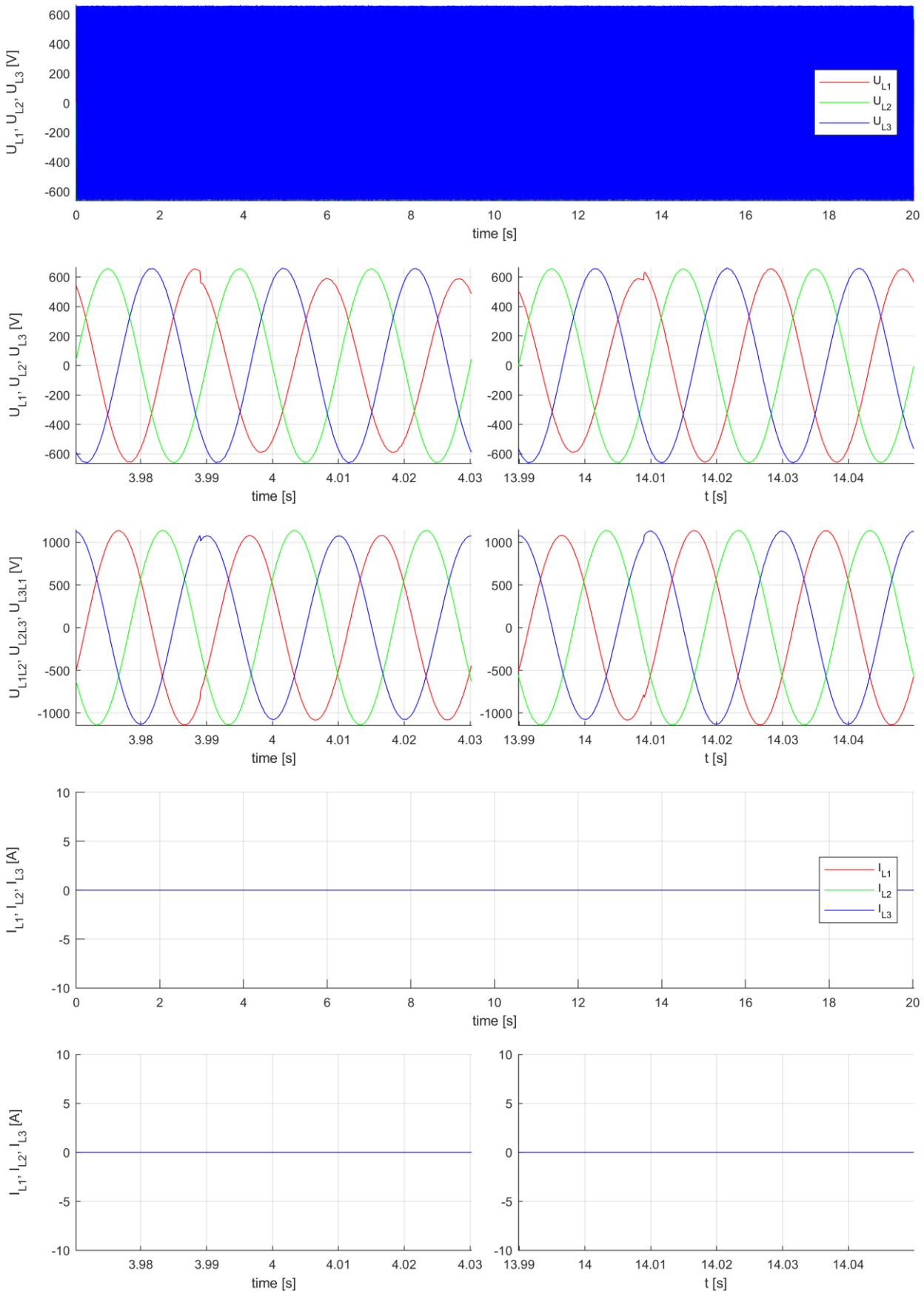
CEA_4.3.0

	No.	Parameter	Description / calculation basis	Results		
General information	1	Test no.	-	CEA_4.3.0-1		
	1	Data file name	-	CEA_4.3.0-1.wdf		
	1	MD5-Checksum	-	484222e8fa249cb59e98da66e2c814ad		
	2	Date	[yyyy-mm-dd]	2020-09-12		
	3	Time	[hh:mm:ss]	10:22:18		
	4	Fault type	Fault type B on low-voltage side	One-phase		
	Phase reference			**A** [1)]	**B** [1)]	**C** [1)]
	5	Voltage drop depth setting	[p.u.]	0.89	1.00	1.00
	6	Set fault duration	[ms]	10000.0		
	7	value series impedance X_1	[Ω]	N/A		
	8	value series impedance R_1	[Ω]	N/A		
	9	value short circuit impedance X_2	[Ω]	N/A		
	10	value short circuit impedance R_2	[Ω]	N/A		
	11	Switch event: Connection of series impedance (t_0)	[ms]	N/A		
	12	Switch event: Fault occurrence (t_1)	[ms]	4000.2		
	13	Switch event: Clearance of fault (t_2)	[ms]	14019.9		
	14	Switch event: Short-circuiting of series impedance (t_3)	[ms]	N/A		
	15	Fault duration derived from test	*(from time domain voltage results)* [ms]	10019.7		
	16	Measeured value of voltage drop / increase	*(per phase-to-neutral, t_1 + 100ms ... t_2 and t_1 - 60s ... t_1)* [p.u. U_n]	0.902	1.004	1.007
	16	Measeured value of voltage drop / increase	*(per phase-to-phase, t_1 + 100ms ... t_2 and t_1 - 60s ... t_1)* [p.u. U_n]	0.956	1.007	0.951
	17	Measeured value of voltage drop / increase	*(positive sequence, phase-to-neutral, t_1 + 100ms ... t_2 and t_1 - 60s ... t_1)* [p.u. U_n]	0.971		

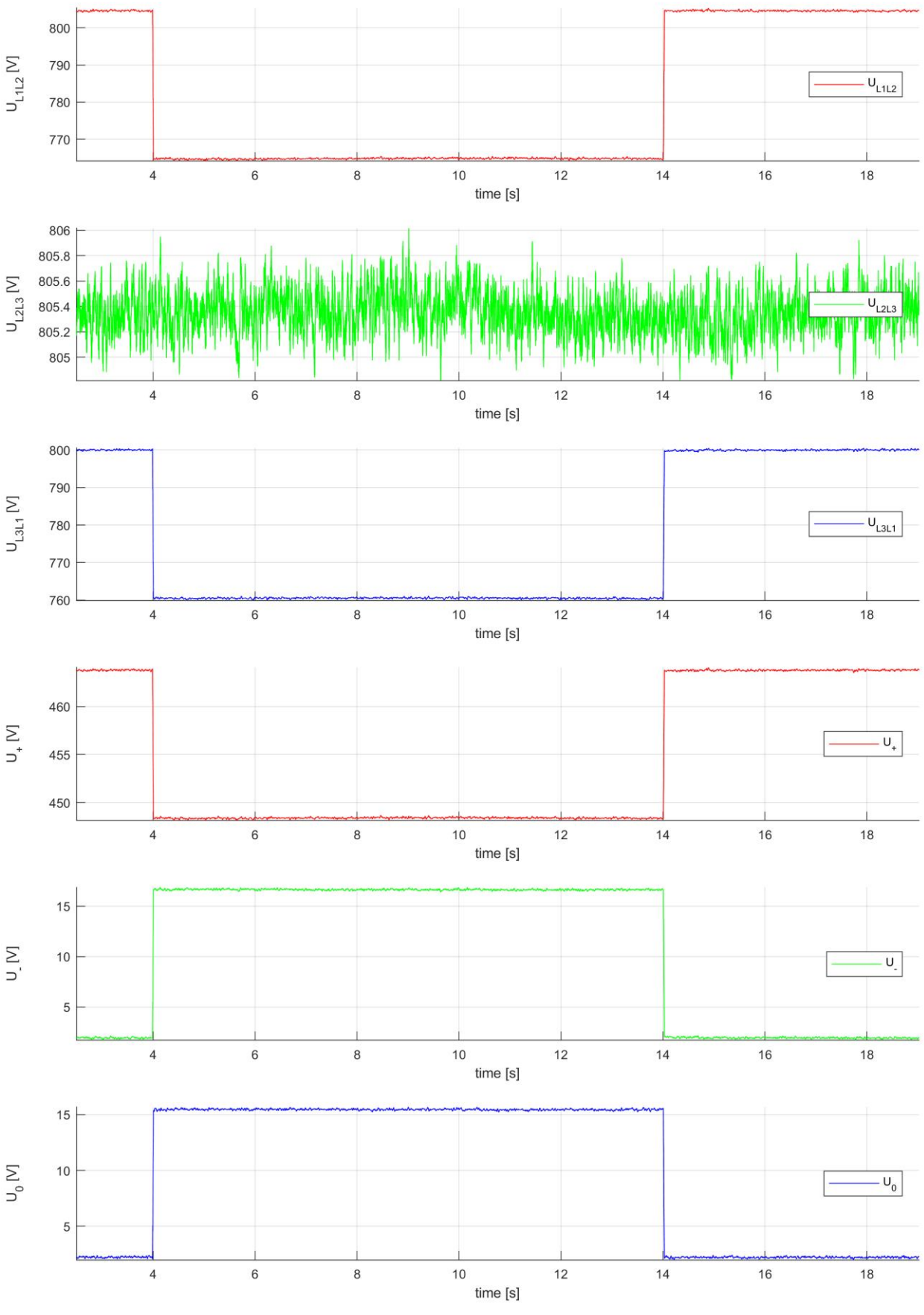
Note:

[1)] A / B / C indicate the phase-neutral voltages (L1, L2, L3), phase-phase voltages (L12, L23, L31) or the phase currents (L1, L2, L3), for details see Description / calculation basis.

B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.



B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.



B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Tests with load

SUN2000-215KTL-H0 (800 V)

CEA_1.1.1

	No.	Parameter	Description / calculation basis	Results		
Gerneral information	1	Test no.	-	CEA_1.1.1-1		
	2	Data file name	-	CEA_1.1.1-1.wdf		
	3	MD5-Checksum	-	e50d2ecc0666f9fb51fffa2446c12592		
	4	Date	[yyyy-mm-dd]	2020-09-23		
	5	Time	[hh:mm:ss]	11:23:48		
	6	Type of fault (number of affected phases)	-	Three-phase		
	Phase reference			**A [1)]**	**B [1)]**	**C [1)]**
	7	Fault occurrence (t_1)	[ms]	10113.7		
	8	Fault clearance (t_2)	[ms]	10461.8		
	9	Fault duration determined from test	*(from time domain voltage results)* [ms]	348.1		
	10	Measeured value of voltage drop / increase	*(per phase-to-neutral, t_1 + 100ms … t_2 and t_1 - 60s ... t_1)* [p.u. U_n]	0.193	0.194	0.194
	11	Measeured value of voltage drop / increase	*(per phase-to-phase, t_1 + 100ms … t_2 and t_1 - 60s ... t_1)* [p.u. U_n]	0.194	0.195	0.193
	12	Measeured value of voltage drop / increase	*(positive sequence, phase-to-neutral, t_1 + 100ms … t_2 and t_1 - 60s ... t_1)* [p.u. U_n]	0.194		
Before grid fault t_1	13	Voltage reference	*(positive sequence, phase-to-neutral averaged over t_1 - 60s … t_1)* [p.u. U_n]	1.005		
	14	Voltage reference	*(negative sequence, phase-to-neutral averaged over t_1 - 60s … t_1)* [p.u. U_n]	0.004		
	15	Reactive current reference [2)]	*(RMS, averaged over t_1 – 10s … t_1)* [p.u. I_n]	-0.002		
	16	Active power reference	*(RMS, averaged over t_1 – 10s … t_1)* [p.u. P_n]	1.005		
	17	Reactive power [2)]	*(RMS, averaged over t_1 – 10s … t_1)* [p.u. P_n]	-0.011		
During Grid fault t1 till t2	18	Reactive current [2)]	*(positive sequence, averaged over t_1 + 100ms … t_2 - 20ms)* [p.u. I_n]	1.003		
	19	Reactive current [2)]	*(negative sequence, averaged over t_1 + 100ms … t_2 - 20ms)* [p.u. I_n]	-0.001		
	20	Apparent current	*(positive sequence, averaged over t_1 + 100ms … t_2 - 20ms)* [p.u. I_n]	1.005		
After fault clearence t2	21	Settling time of active power (from restoration of the voltage ≥ 90% of nominal voltage until the Active Power output restored to ≥ 90% of the pre-fault level)	[s]	1.616		

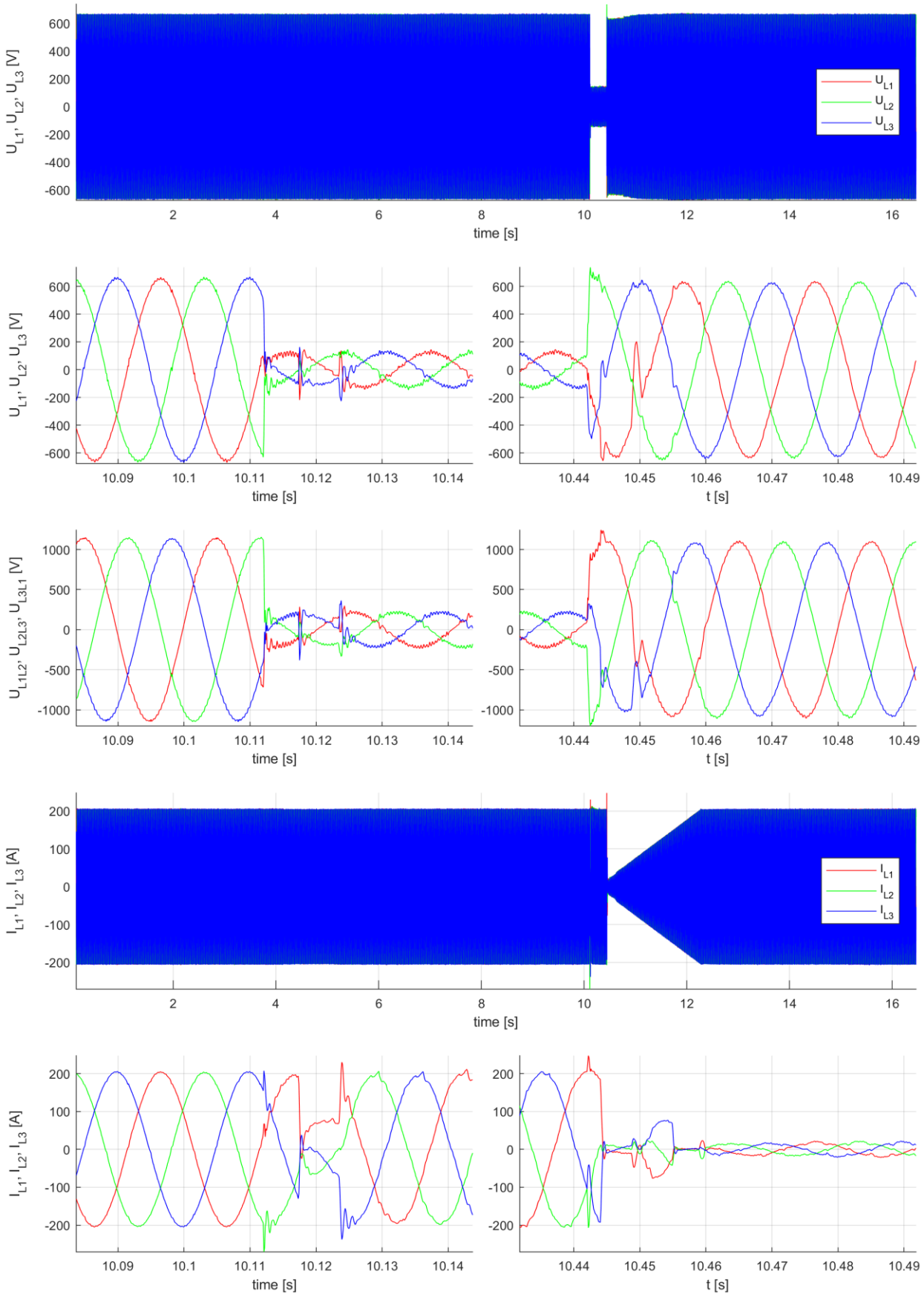
Note:

[1)] A / B / C indicate the phase-neutral voltages (L1, L2, L3), phase-phase voltages (L12, L23, L31) or the phase currents (L1, L2, L3), for details see *Description / calculation basis*.

[2)] Under-excited / inductive reactive current has a negative sign, over-excited / capacitive reactive current has a positive sign, the sign of the reactive power is the same as the reactive current.

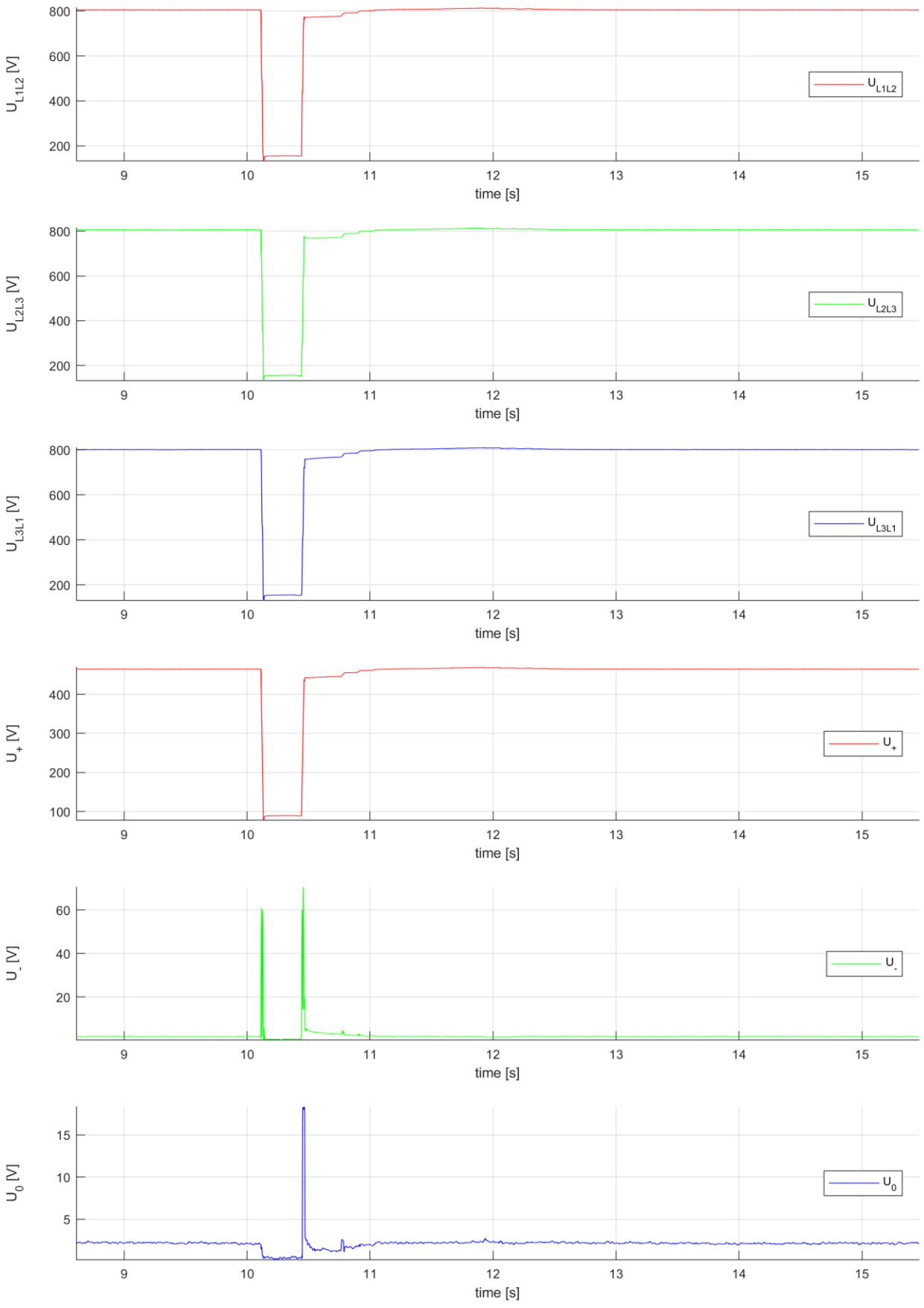
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Timedomain values



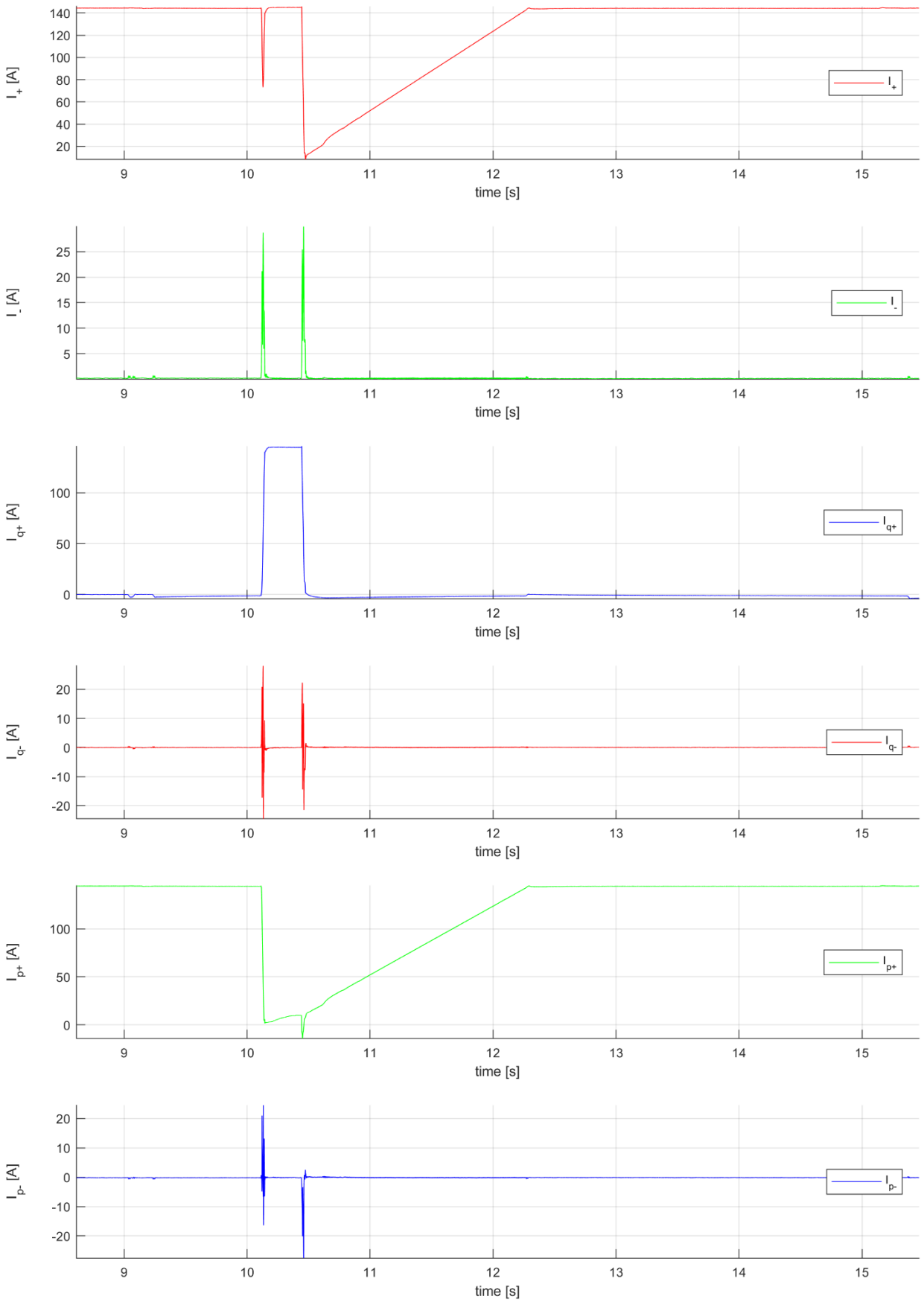
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Positive sequence components and RMS values



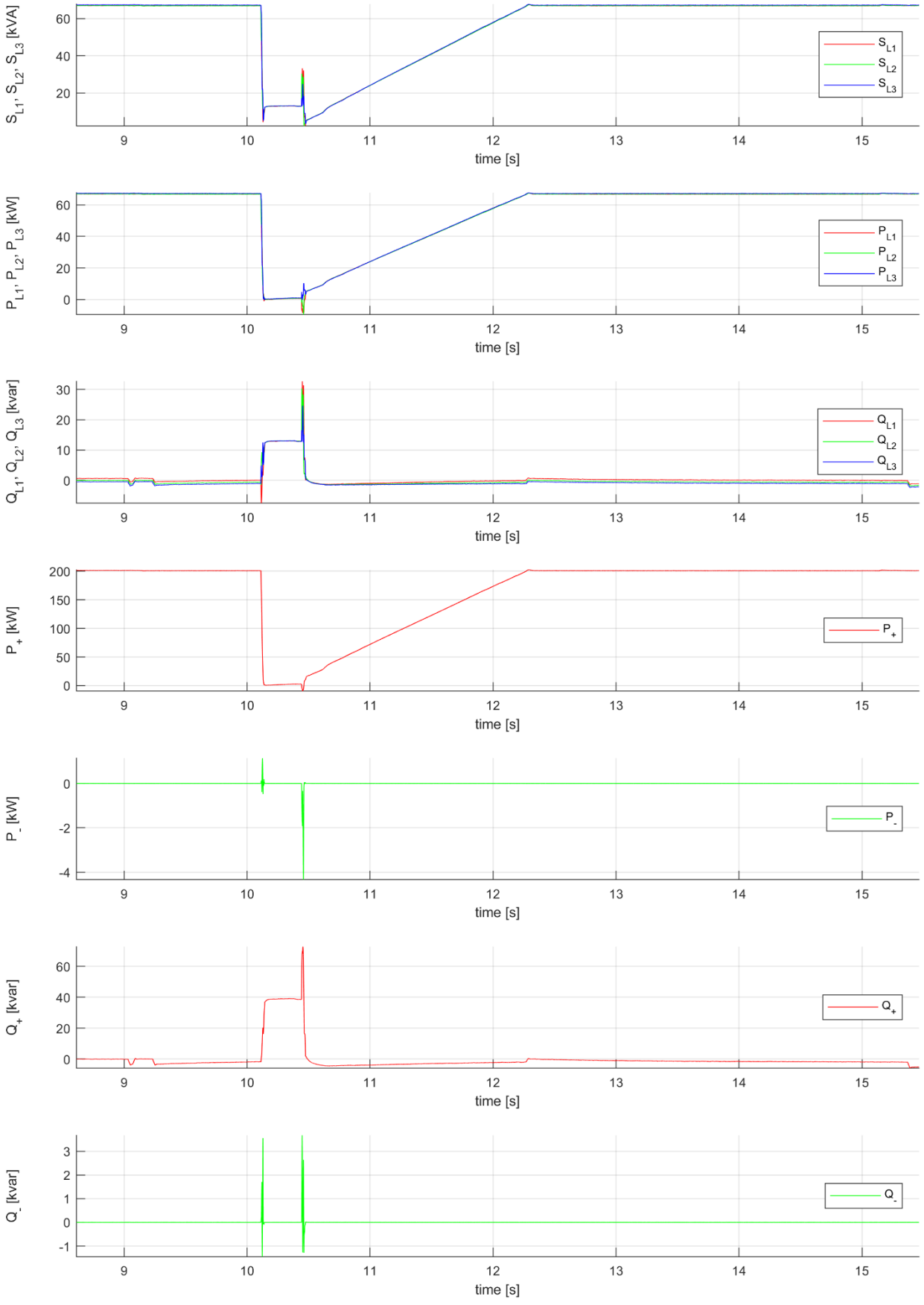
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Positive sequence components and RMS values



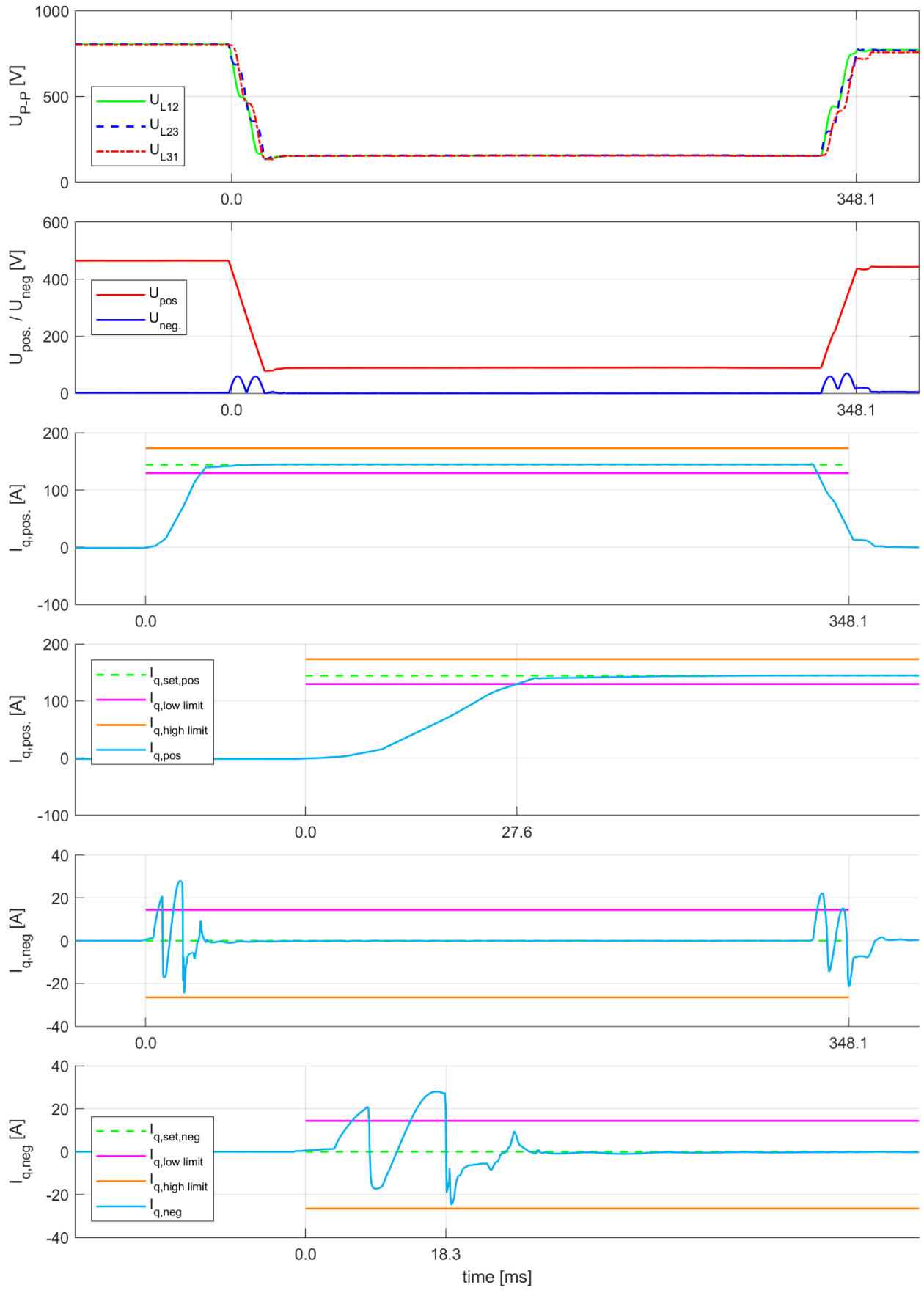
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Positive sequence components and RMS values



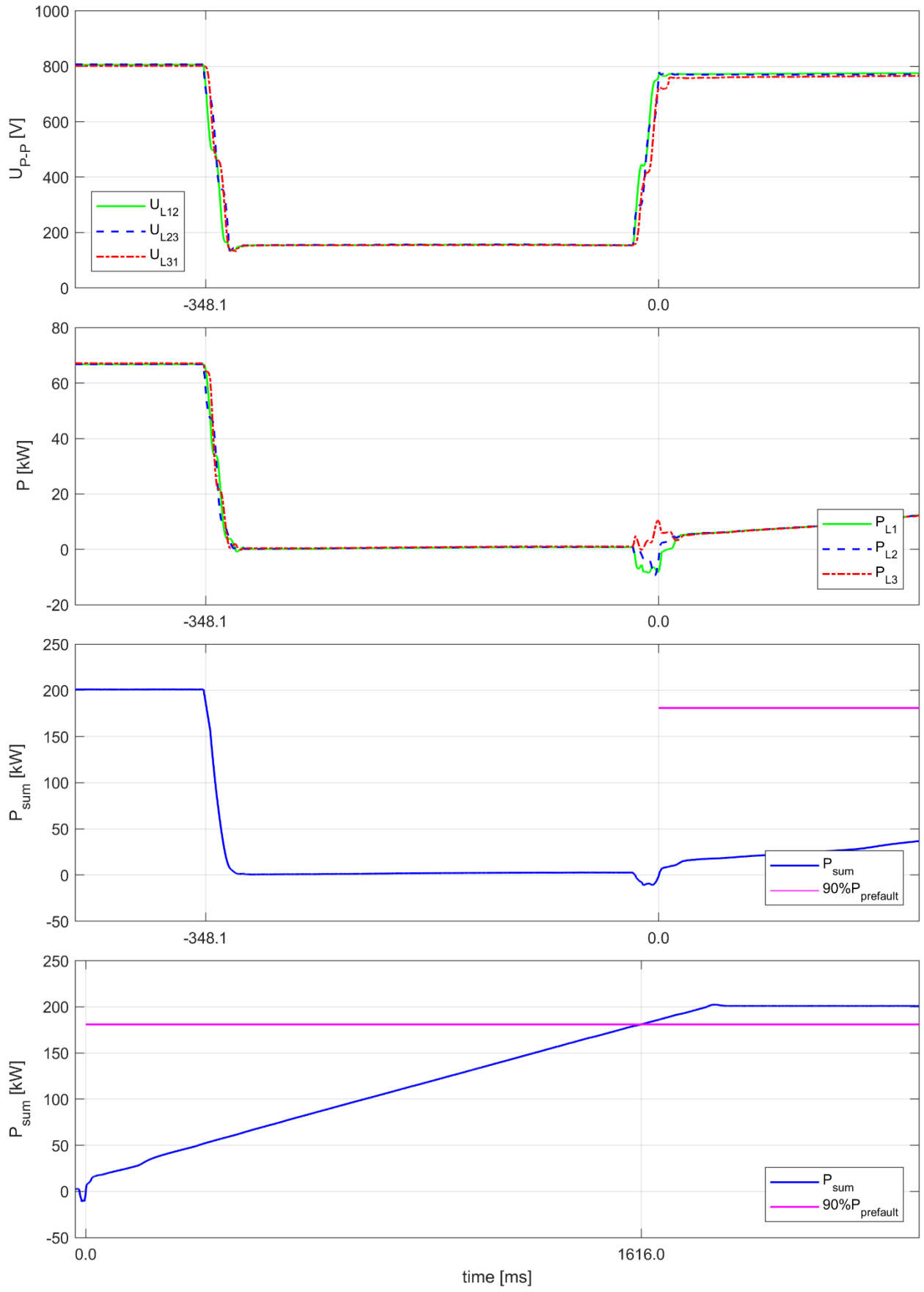
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Positive sequence components and RMS values



B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Positive sequence components and RMS values



B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

CEA_1.1.2

	No.	Parameter	Description / calculation basis	Results		
Gerneral information	1	Test no.	-	CEA_1.1.2-1		
	2	Data file name	-	CEA_1.1.2-1.wdf		
	3	MD5-Checksum	-	2a86347e43ed42a92a16a213537b98ea		
	4	Date	[yyyy-mm-dd]	2020-09-23		
	5	Time	[hh:mm:ss]	11:21:58		
	6	Type of fault (number of affected phases)	-	Three-phase		
	Phase reference			**A [1)]**	**B [1)]**	**C [1)]**
	7	Fault occurrence (t_1)	[ms]	10921.1		
	8	Fault clearance (t_2)	[ms]	11268.9		
	9	Fault duration determined from test	*(from time domain voltage results)* [ms]	347.8		
	10	Measeured value of voltage drop / increase	*(per phase-to-neutral, t_1 + 100ms … t_2 and t_1 - 60s … t_1)* [p.u. U_n]	0.197	0.198	0.198
	11	Measeured value of voltage drop / increase	*(per phase-to-phase, t_1 + 100ms … t_2 and t_1 - 60s … t_1)* [p.u. U_n]	0.198	0.199	0.197
	12	Measeured value of voltage drop / increase	*(positive sequence, phase-to-neutral, t_1 + 100ms … t_2 and t_1 - 60s … t_1)* [p.u. U_n]	0.198		
Before grid fault t_1	13	Voltage reference	*(positive sequence, phase-to-neutral averaged over t_1 - 60s … t_1)* [p.u. U_n]	1.004		
	14	Voltage reference	*(negative sequence, phase-to-neutral averaged over t_1 - 60s … t_1)* [p.u. U_n]	0.004		
	15	Reactive current reference [2)]	*(RMS, averaged over t_1 – 10s … t_1)* [p.u. I_n]	0.000		
	16	Active power reference	*(RMS, averaged over t_1 – 10s … t_1)* [p.u. P_n]	0.202		
	17	Reactive power [2)]	*(RMS, averaged over t_1 – 10s … t_1)* [p.u. P_n]	0.000		
During Grid fault t1 till t2	18	Reactive current [2)]	*(positive sequence, averaged over t_1 + 100ms … t_2 - 20ms)* [p.u. I_n]	1.003		
	19	Reactive current [2)]	*(negative sequence, averaged over t_1 + 100ms … t_2 - 20ms)* [p.u. I_n]	-0.001		
	20	Apparent current	*(positive sequence, averaged over t_1 + 100ms … t_2 - 20ms)* [p.u. I_n]	1.005		
After fault clearence t2	21	Settling time of active power (from restoration of the voltage ≥ 90% of nominal voltage until the Active Power output restored to ≥ 90% of the pre-fault level)	[s]	0.191		

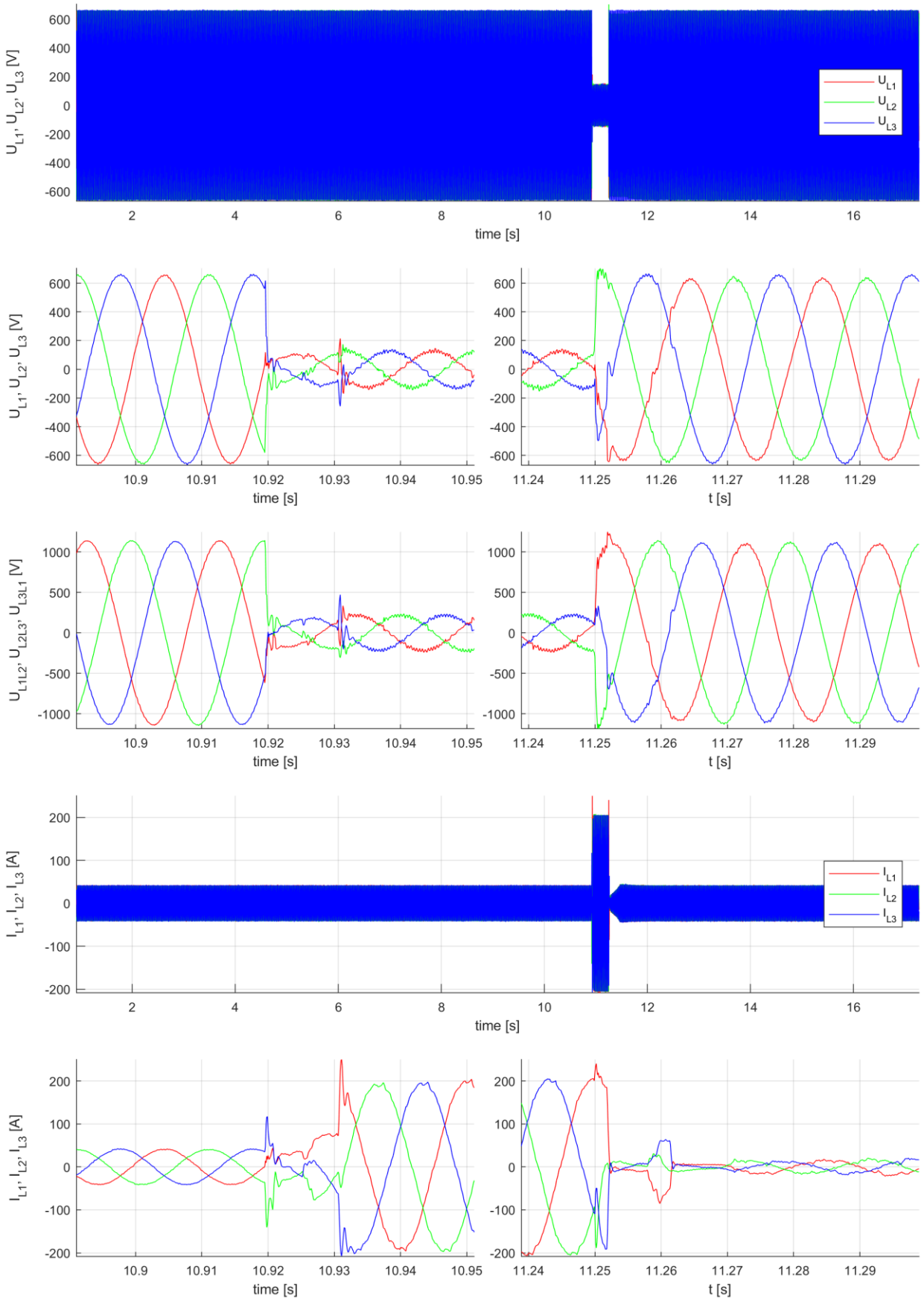
Note:

[1)] A / B / C indicate the phase-neutral voltages (L1, L2, L3), phase-phase voltages (L12, L23, L31) or the phase currents (L1, L2, L3), for details see *Description / calculation basis*.

[2)] Under-excited / inductive reactive current has a negative sign, over-excited / capacitive reactive current has a positive sign, the sign of the reactive power is the same as the reactive current.

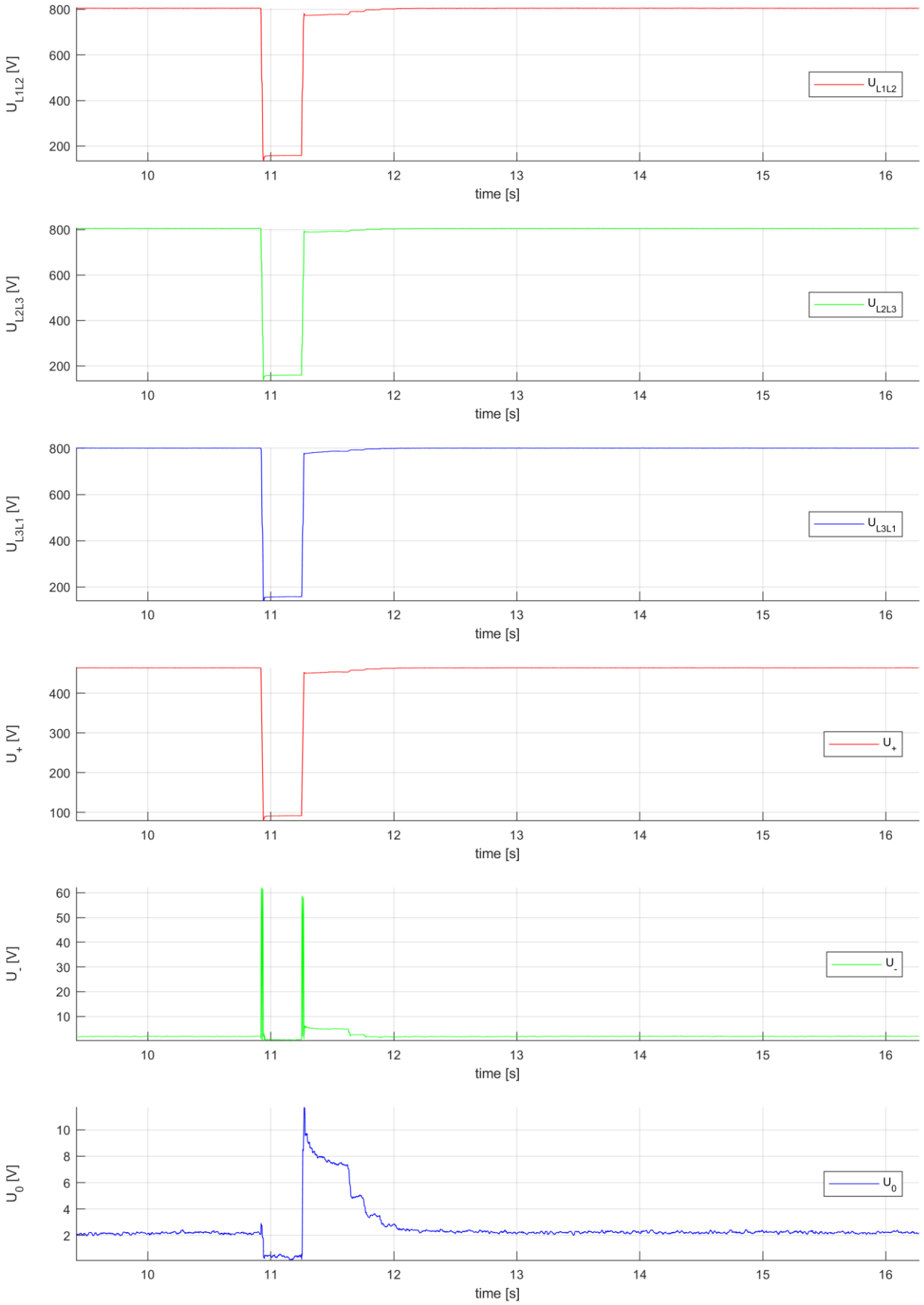
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Timedomain values



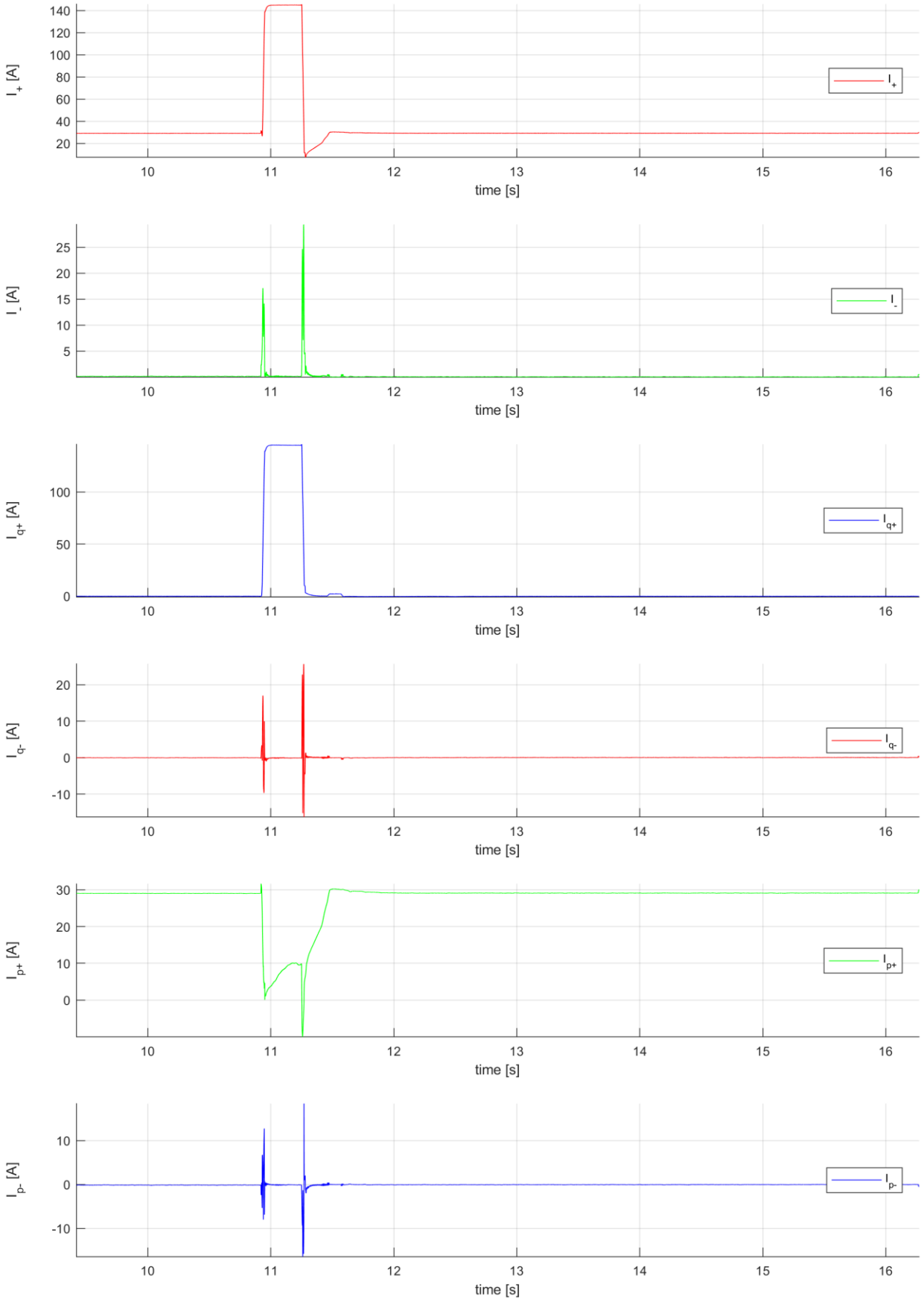
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Positive sequence components and RMS values



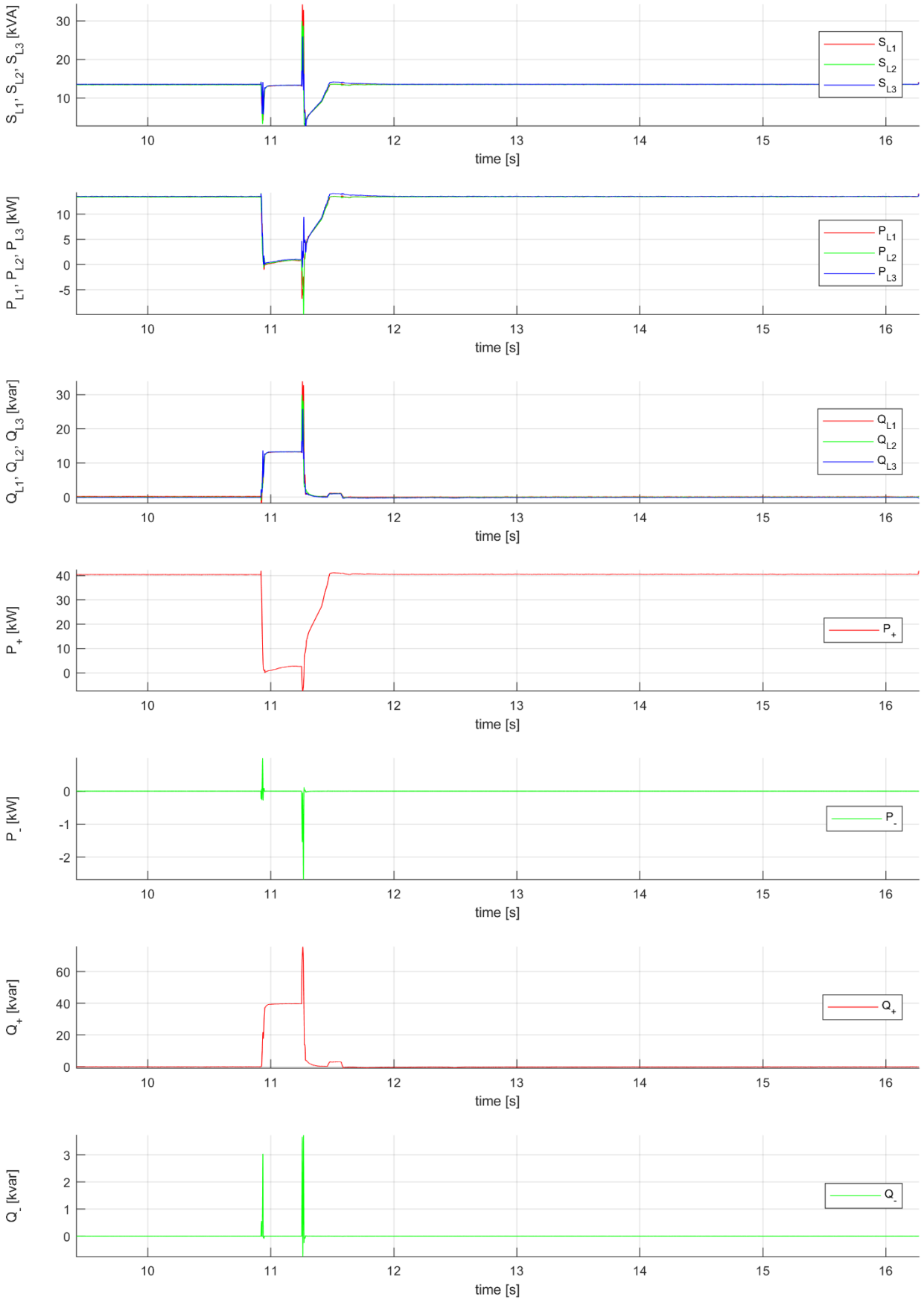
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Positive sequence components and RMS values



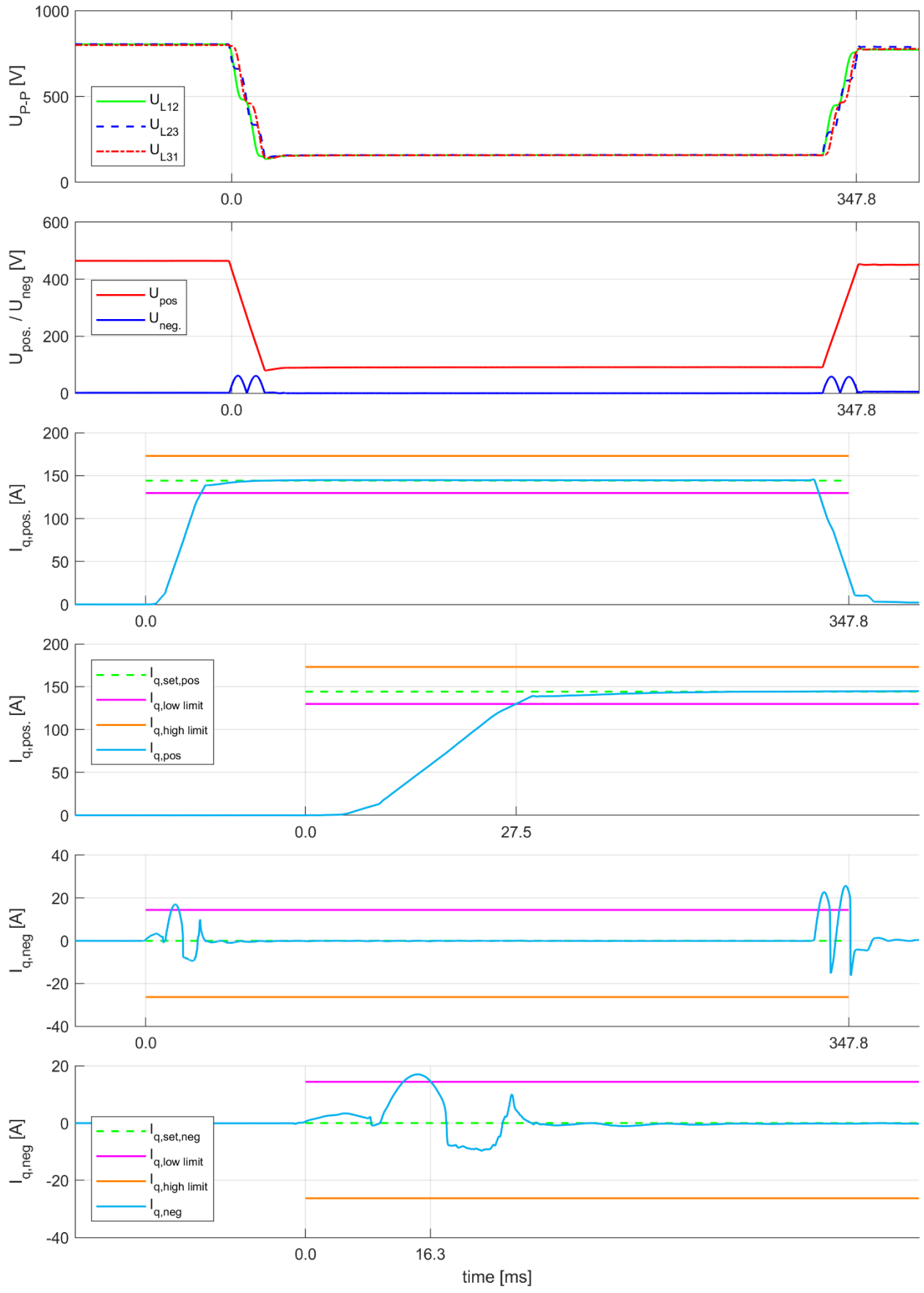
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Positive sequence components and RMS values



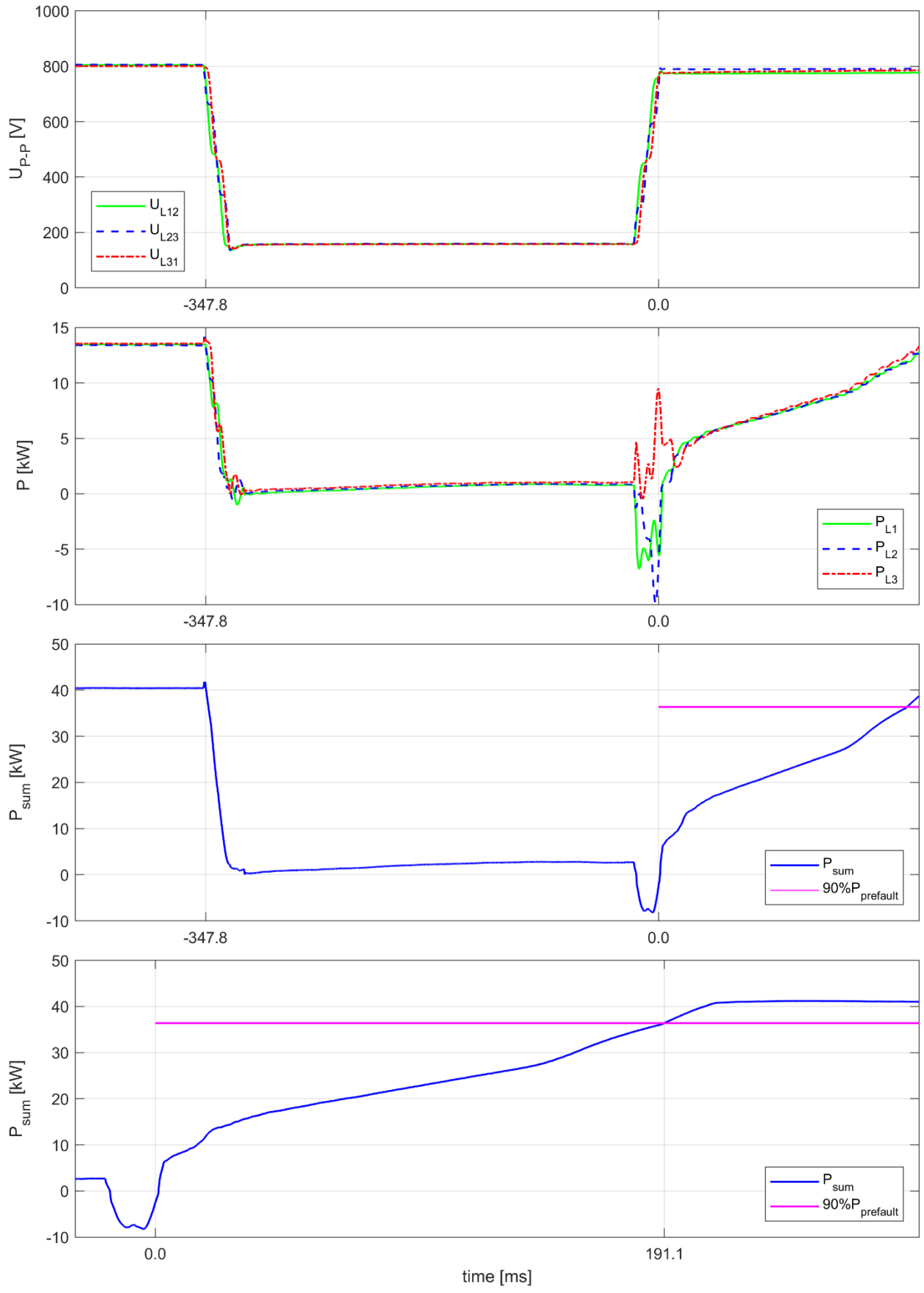
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Positive sequence components and RMS values



B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Positive sequence components and RMS values



B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

CEA_1.2.1

	No.	Parameter	Description / calculation basis	Results		
Gerneral information	1	Test no.	-	CEA_1.2.1-1		
	2	Data file name	-	CEA_1.2.1-1.wdf		
	3	MD5-Checksum	-	fa1e5b0ca0a308188ee648d398a9850a		
	4	Date	[yyyy-mm-dd]	2020-09-23		
	5	Time	[hh:mm:ss]	11:26:40		
	6	Type of fault (number of affected phases)	Fault type D on low-voltage side	Two-phase		
	Phase reference			**A [1)]**	**B [1)]**	**C [1)]**
	7	Fault occurrence (t_1)	[ms]	10285.0		
	8	Fault clearance (t_2)	[ms]	10618.6		
	9	Fault duration determined from test	*(from time domain voltage results)* [ms]	333.6		
	10	Measeured value of voltage drop / increase	*(per phase-to-neutral, t_1 + 100ms … t_2 and t_1 - 60s … t_1)* [p.u. U_n]	0.167	0.869	0.875
	11	Measeured value of voltage drop / increase	*(per phase-to-phase, t_1 + 100ms … t_2 and t_1 - 60s … t_1)* [p.u. U_n]	0.521	0.999	0.528
	12	Measeured value of voltage drop / increase	*(positive sequence, phase-to-neutral, t_1 + 100ms … t_2 and t_1 - 60s … t_1)* [p.u. U_n]	0.592		
Before grid fault t_1	13	Voltage reference	*(positive sequence, phase-to-neutral averaged over t_1 - 60s … t_1)* [p.u. U_n]	1.005		
	14	Voltage reference	*(negative sequence, phase-to-neutral averaged over t_1 - 60s … t_1)* [p.u. U_n]	0.004		
	15	Reactive current reference [2)]	*(RMS, averaged over t_1 – 10s … t_1)* [p.u. I_n]	-0.001		
	16	Active power reference	*(RMS, averaged over t_1 – 10s … t_1)* [p.u. P_n]	0.965		
	17	Reactive power [2)]	*(RMS, averaged over t_1 – 10s … t_1)* [p.u. P_n]	-0.001		
During Grid fault t1 till t2	18	Reactive current [2)]	*(positive sequence, averaged over t_1 + 100ms … t_2 - 20ms)* [p.u. I_n]	0.352		
	19	Reactive current [2)]	*(negative sequence, averaged over t_1 + 100ms … t_2 - 20ms)* [p.u. I_n]	0.004		
	20	Apparent current	*(positive sequence, averaged over t_1 + 100ms … t_2 - 20ms)* [p.u. I_n]	0.360		
After fault clearence t2	21	Settling time of active power (from restoration of the voltage ≥ 90% of nominal voltage until the Active Power output restored to ≥ 90% of the pre-fault level)	[s]	1.583		

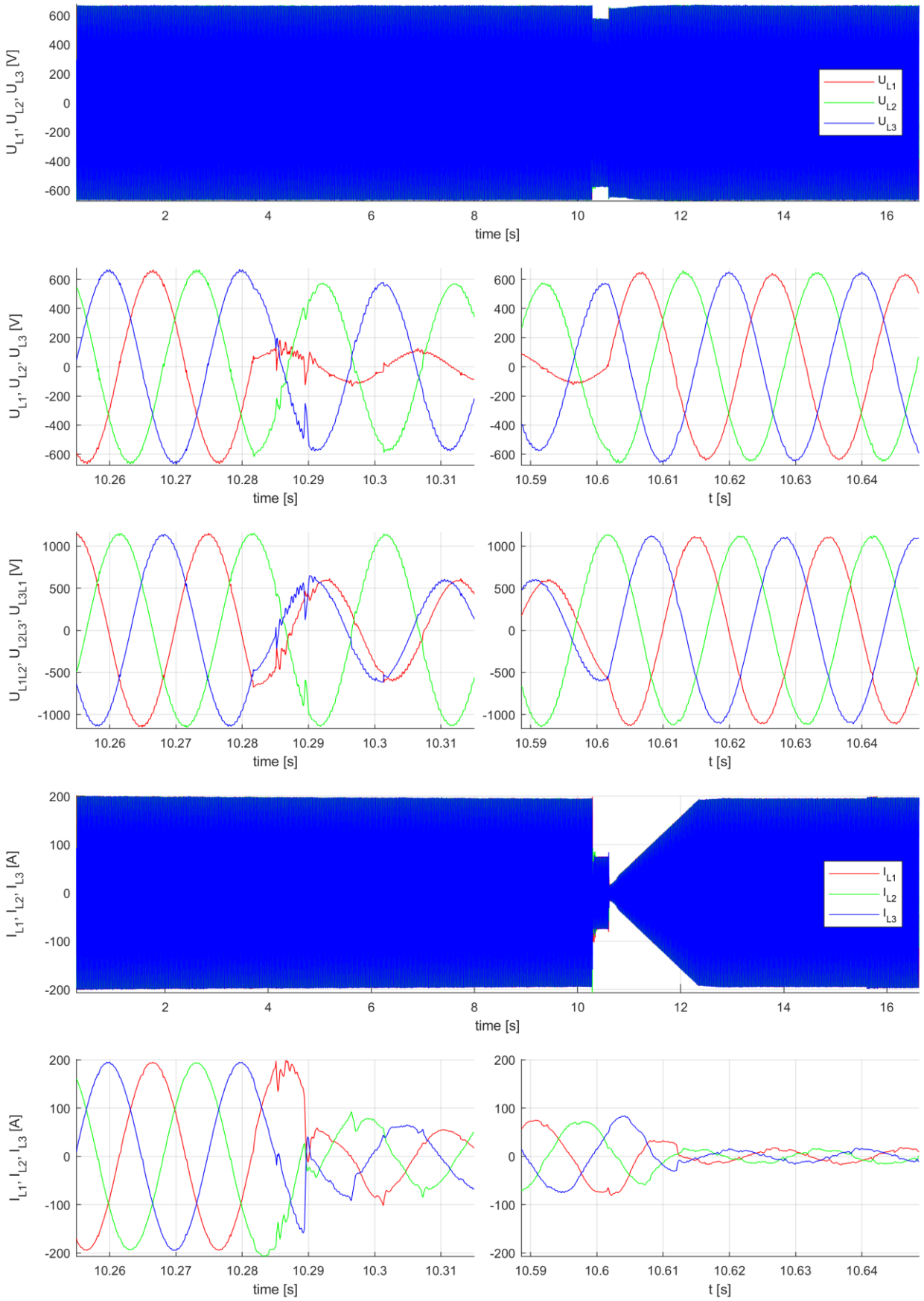
Note:
[1)] A / B / C indicate the phase-neutral voltages (L1, L2, L3), phase-phase voltages (L12, L23, L31) or the phase currents (L1, L2, L3), for details see *Description / calculation basis*.
[2)] Under-excited / inductive reactive current has a negative sign, over-excited / capacitive reactive current has a positive sign, the sign of the reactive power is the same as the reactive current.

Note:

* The grid fault type C (phase-to-phase fault without grounding) was simulated at the medium voltage side of the Dy-medium-voltage transformer, following diagram shows the measurement at the low voltage side of the transformer – grid fault type D on low voltage side.

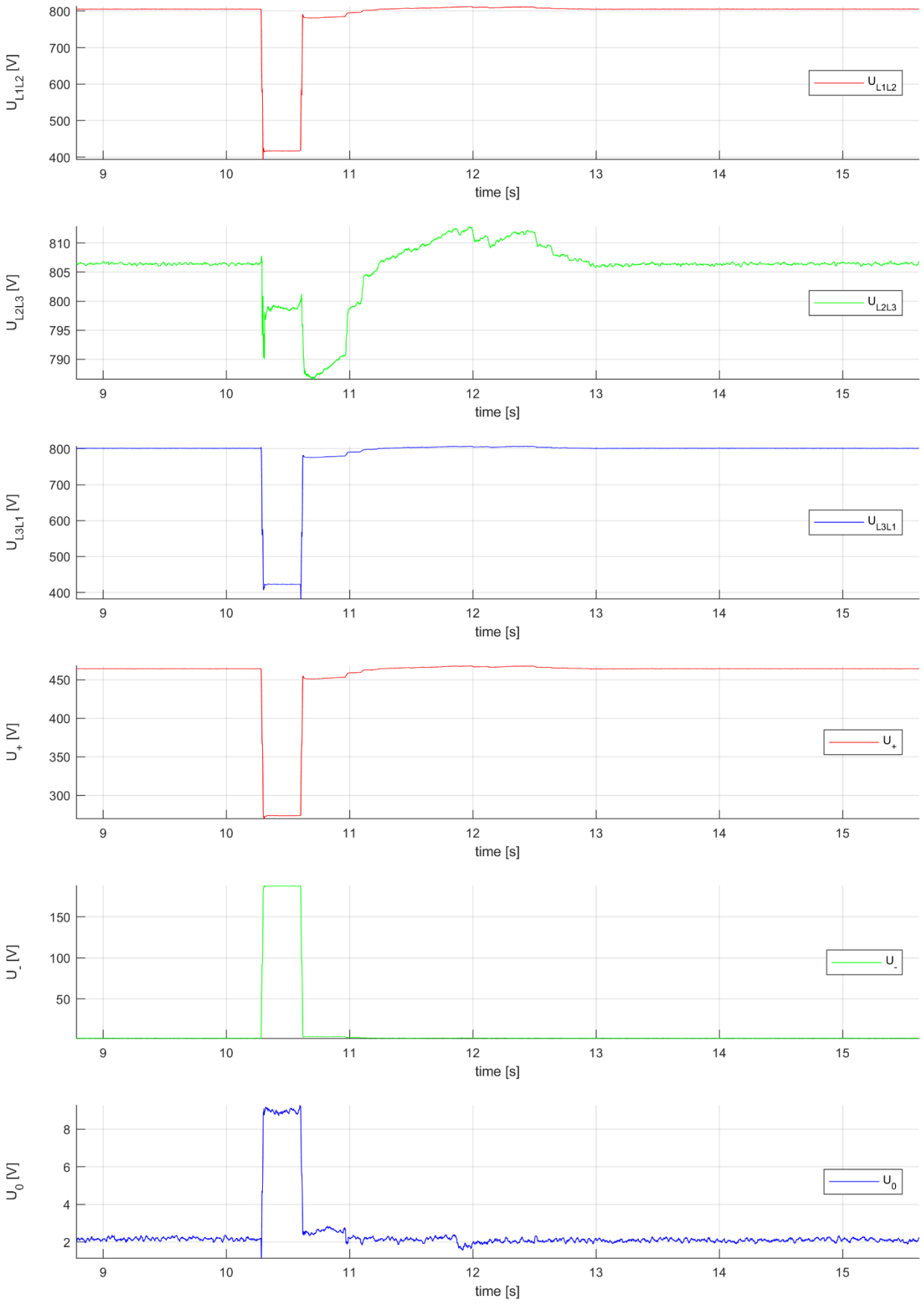
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Timedomain values



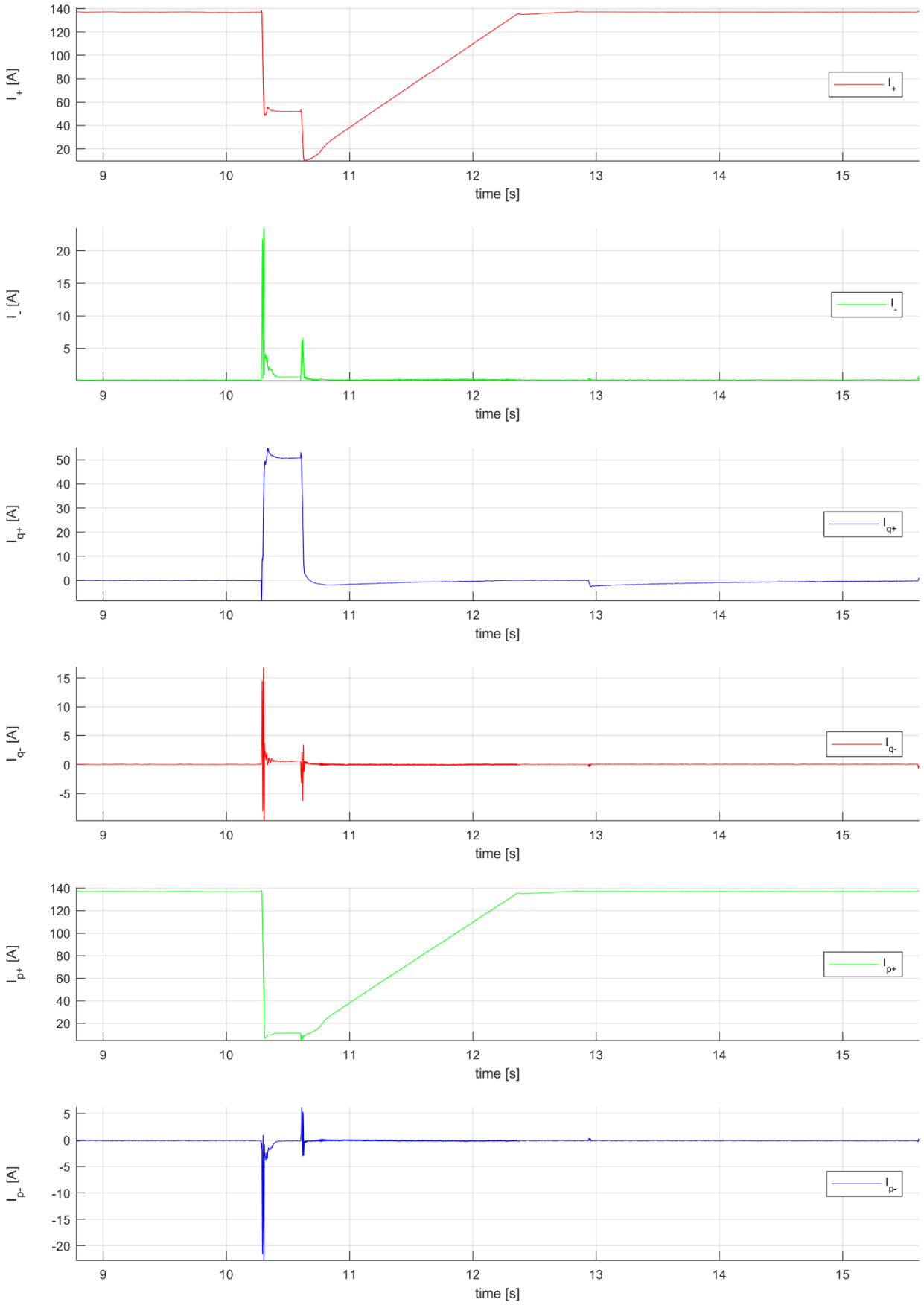
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Positive sequence components and RMS values



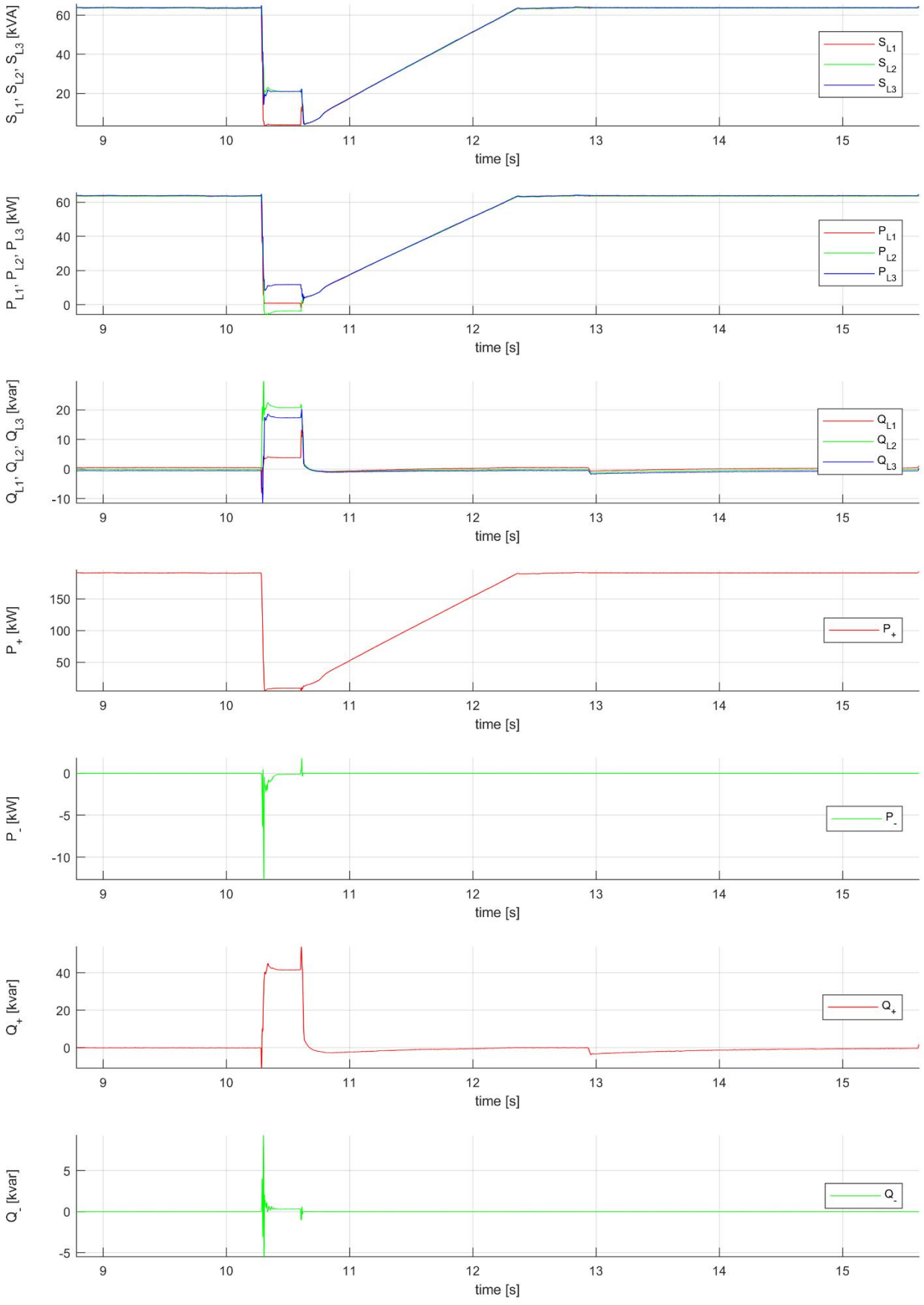
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Positive sequence components and RMS values



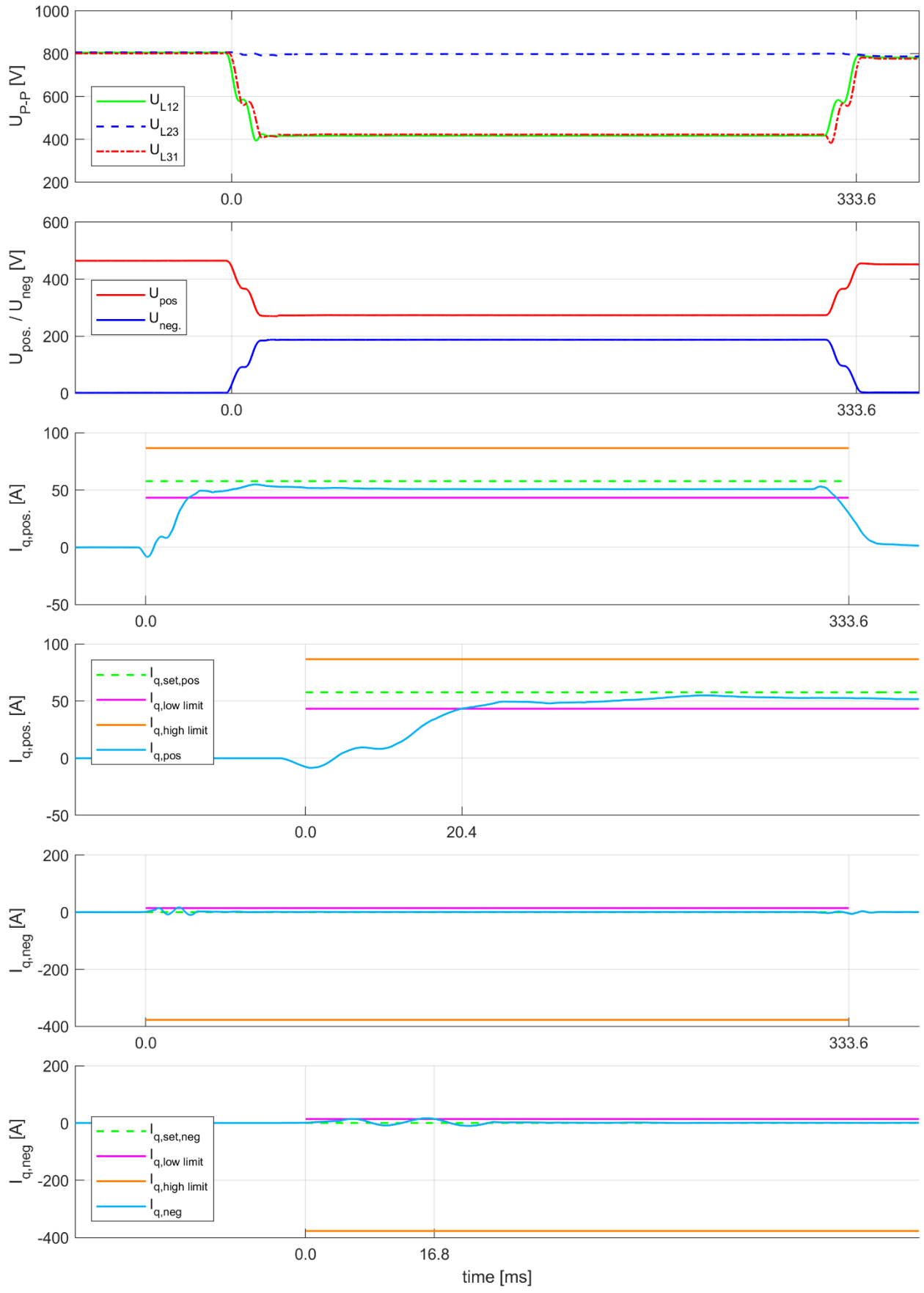
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Positive sequence components and RMS values



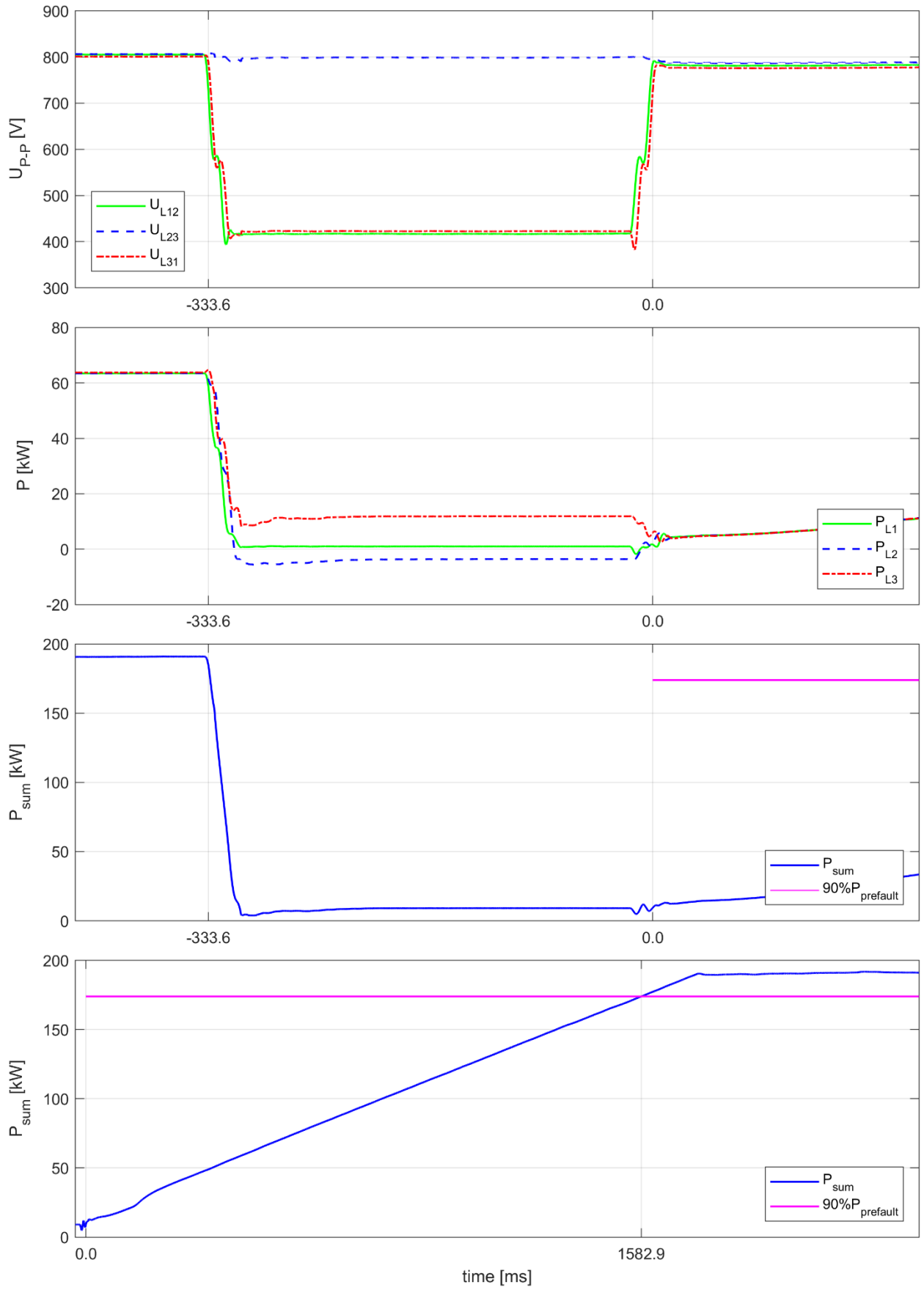
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Positive sequence components and RMS values



B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Positive sequence components and RMS values



B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

CEA_1.2.2

	No.	Parameter	Description / calculation basis	Results		
Gerneral information	1	Test no.	-	CEA_1.2.2-1		
	2	Data file name	-	CEA_1.2.2-1.wdf		
	3	MD5-Checksum	-	c8c0a293d938251d0d7d026e172e5a6f		
	4	Date	[yyyy-mm-dd]	2020-09-23		
	5	Time	[hh:mm:ss]	11:30:12		
	6	Type of fault (number of affected phases)	Fault type D on low-voltage side	Two-phase		
	Phase reference			**A [1)]**	**B [1)]**	**C [1)]**
	7	Fault occurrence (t_1)	[ms]	10762.0		
	8	Fault clearance (t_2)	[ms]	11095.1		
	9	Fault duration determined from test	*(from time domain voltage results)* [ms]	333.1		
	10	Measeured value of voltage drop / increase	*(per phase-to-neutral, t_1 + 100ms … t_2 and t_1 - 60s … t_1)* [p.u. U_n]	0.173	0.889	0.896
	11	Measeured value of voltage drop / increase	*(per phase-to-phase, t_1 + 100ms … t_2 and t_1 - 60s … t_1)* [p.u. U_n]	0.533	1.022	0.542
	12	Measeured value of voltage drop / increase	*(positive sequence, phase-to-neutral, t_1 + 100ms … t_2 and t_1 - 60s … t_1)* [p.u. U_n]	0.607		
Before grid fault t_1	13	Voltage reference	*(positive sequence, phase-to-neutral averaged over t_1 - 60s … t_1)* [p.u. U_n]	1.005		
	14	Voltage reference	*(negative sequence, phase-to-neutral averaged over t_1 - 60s … t_1)* [p.u. U_n]	0.004		
	15	Reactive current reference [2)]	*(RMS, averaged over t_1 – 10s … t_1)* [p.u. I_n]	0.000		
	16	Active power reference	*(RMS, averaged over t_1 – 10s … t_1)* [p.u. P_n]	0.202		
	17	Reactive power [2)]	*(RMS, averaged over t_1 – 10s … t_1)* [p.u. P_n]	0.000		
During Grid fault t1 till t2	18	Reactive current [2)]	*(positive sequence, averaged over t_1 + 100ms … t_2 - 20ms)* [p.u. I_n]	0.409		
	19	Reactive current [2)]	*(negative sequence, averaged over t_1 + 100ms … t_2 - 20ms)* [p.u. I_n]	0.004		
	20	Apparent current	*(positive sequence, averaged over t_1 + 100ms … t_2 - 20ms)* [p.u. I_n]	0.419		
After fault clearence t2	21	Settling time of active power (from restoration of the voltage ≥ 90% of nominal voltage until the Active Power output restored to ≥ 90% of the pre-fault level)	[s]	0.189		

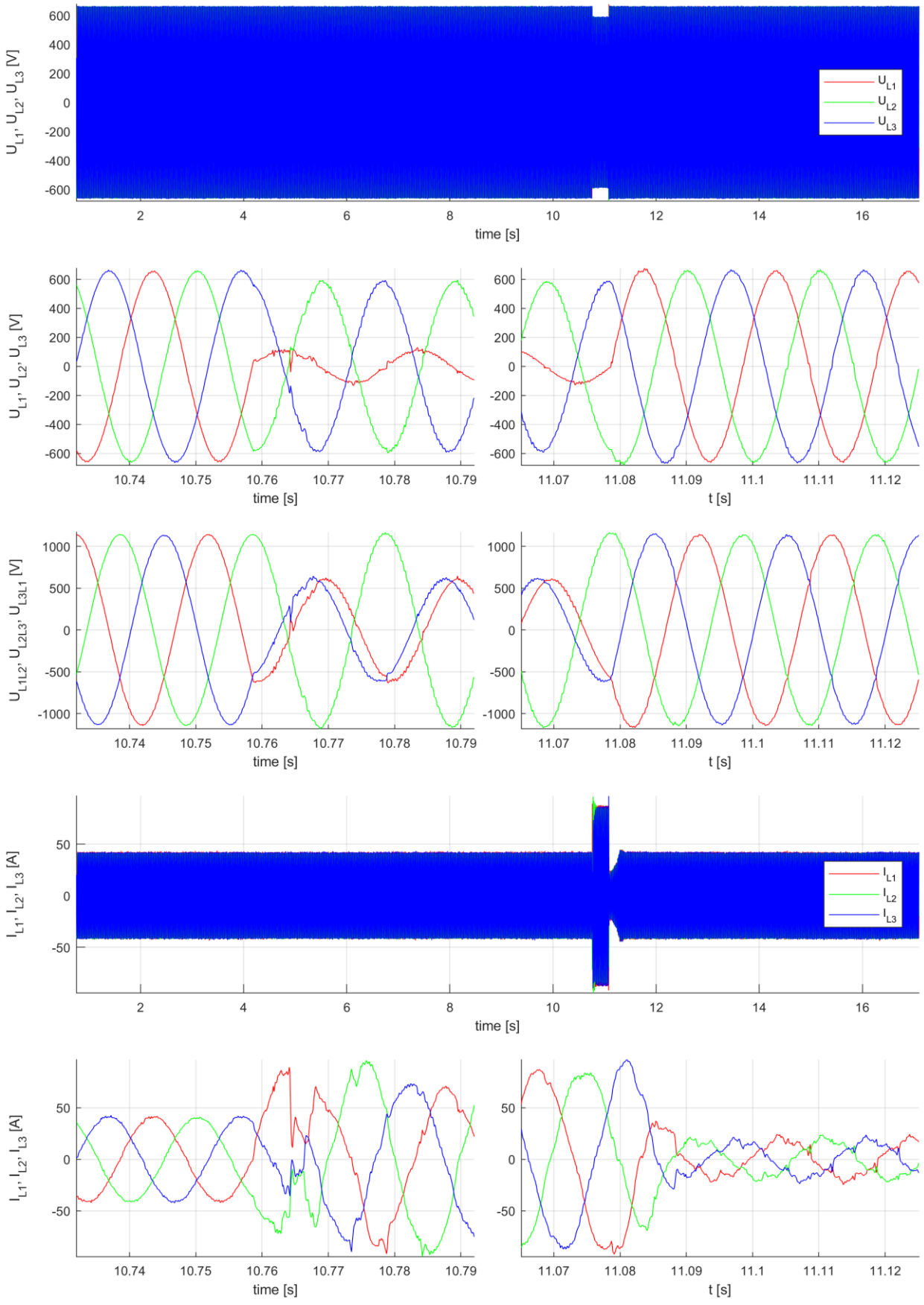
Note:
[1)] A / B / C indicate the phase-neutral voltages (L1, L2, L3), phase-phase voltages (L12, L23, L31) or the phase currents (L1, L2, L3), for details see *Description / calculation basis*.
[2)] Under-excited / inductive reactive current has a negative sign, over-excited / capacitive reactive current has a positive sign, the sign of the reactive power is the same as the reactive current.

Note:

* The grid fault type C (phase-to-phase fault without grounding) was simulated at the medium voltage side of the Dy-medium-voltage transformer, following diagram shows the measurement at the low voltage side of the transformer – grid fault type D on low voltage side.

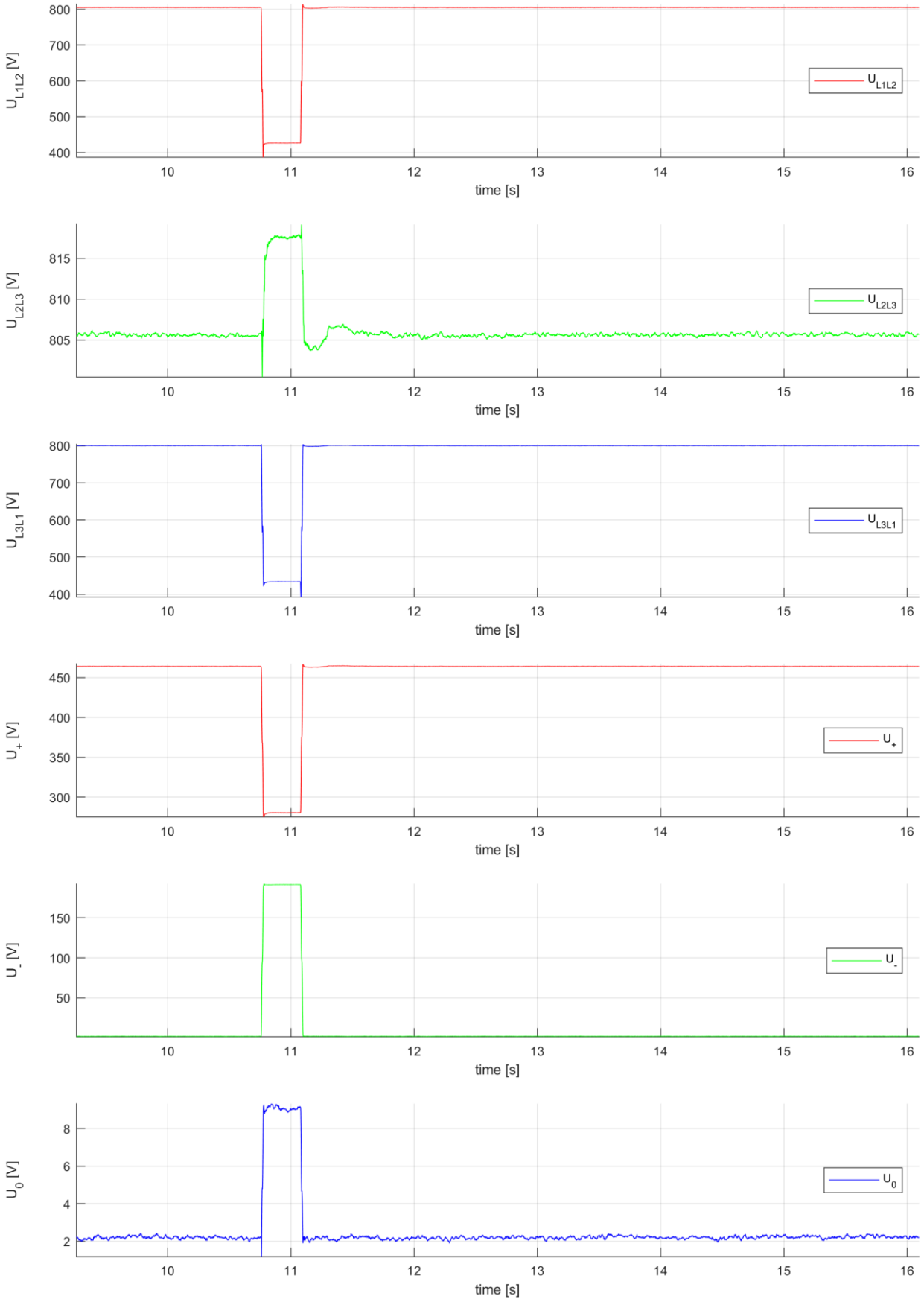
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Timedomain values



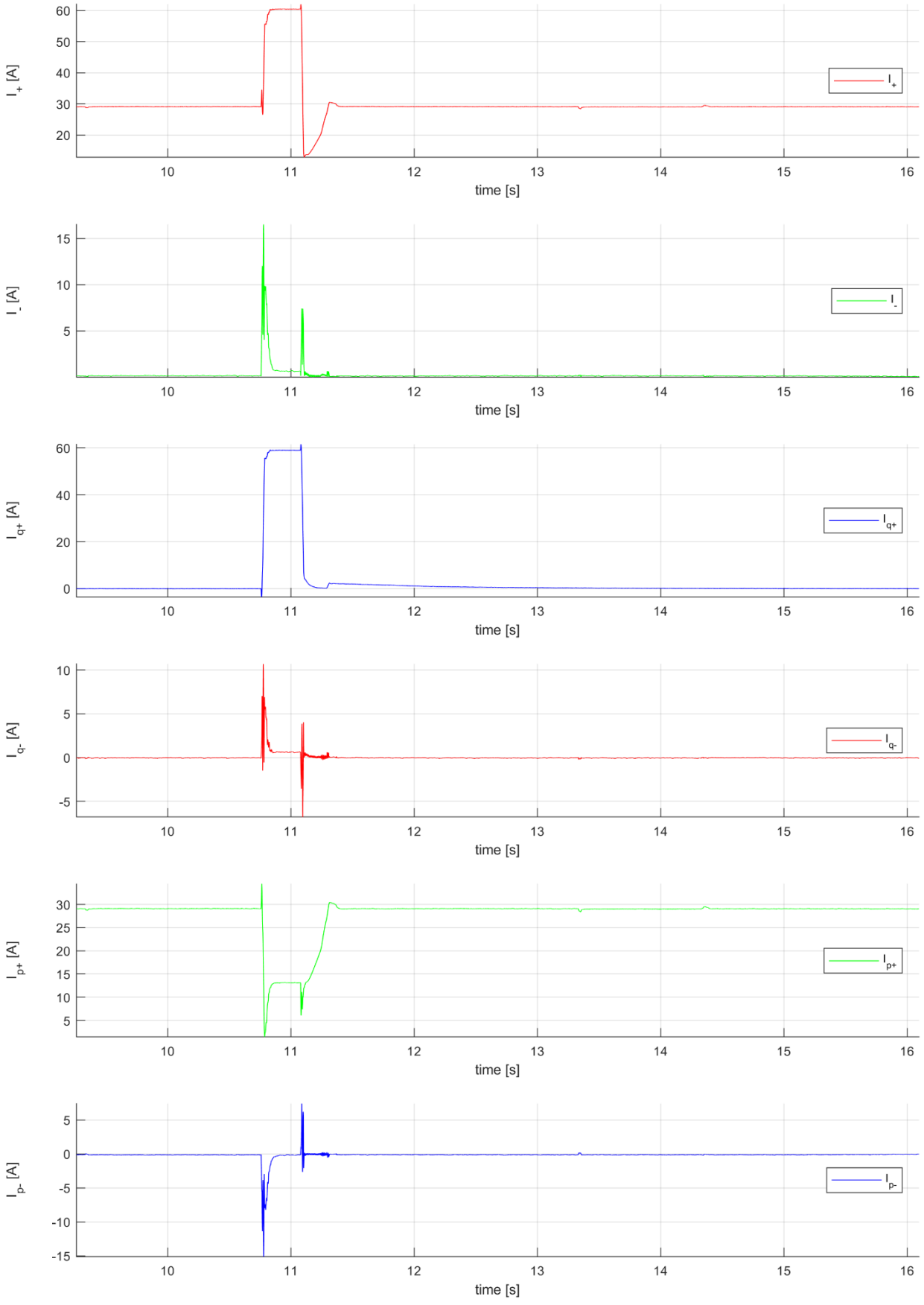
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Positive sequence components and RMS values



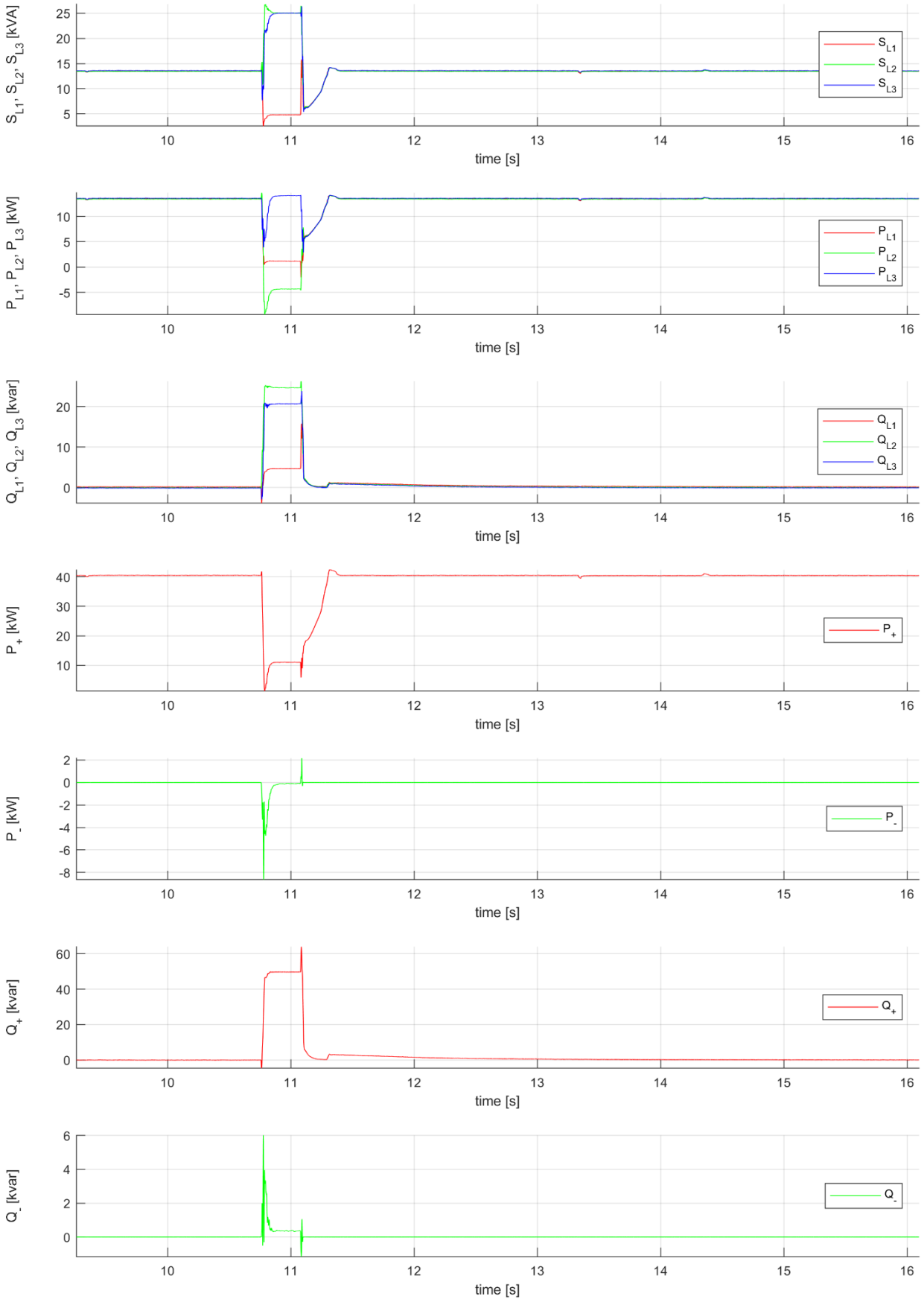
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Positive sequence components and RMS values



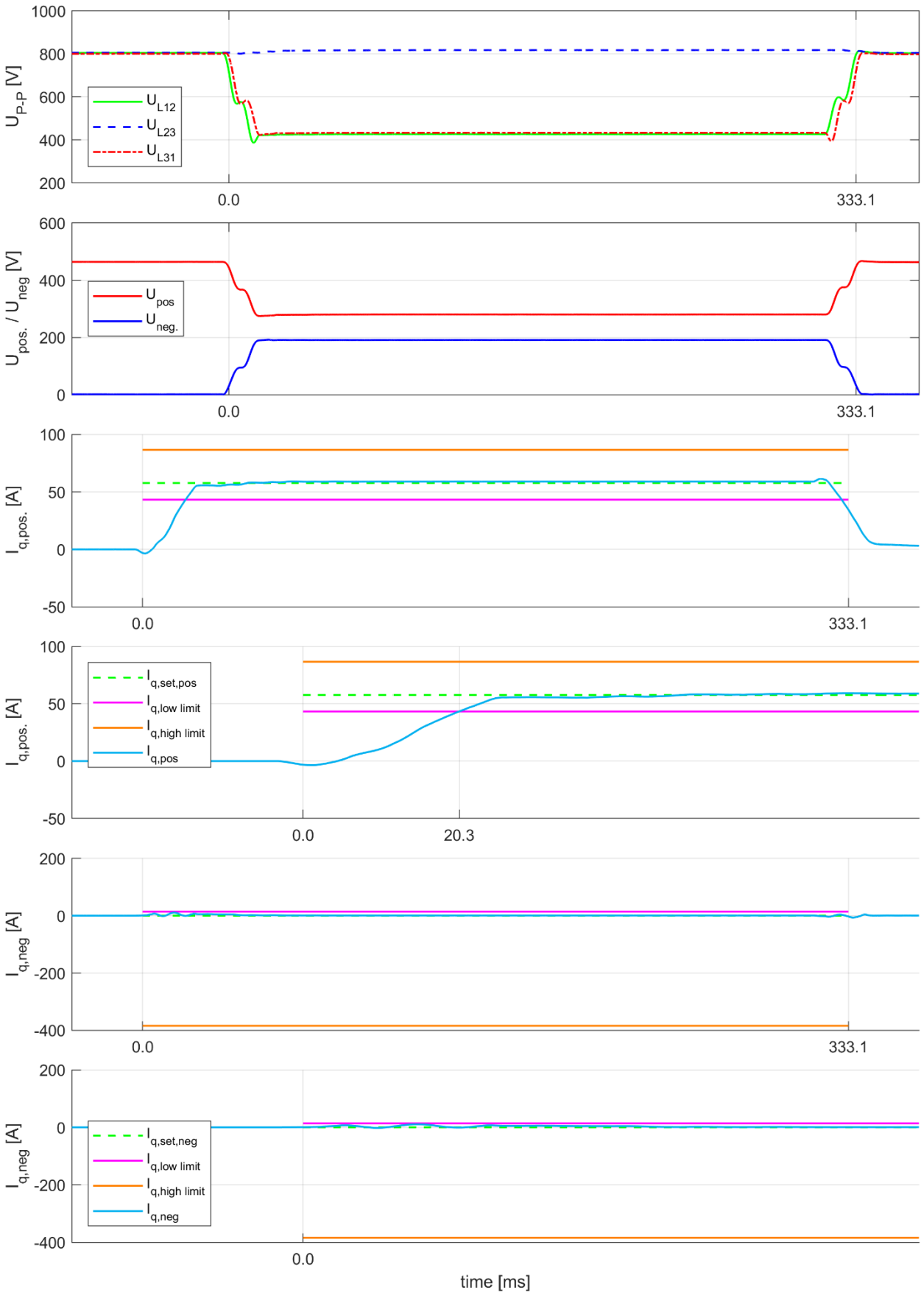
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Positive sequence components and RMS values



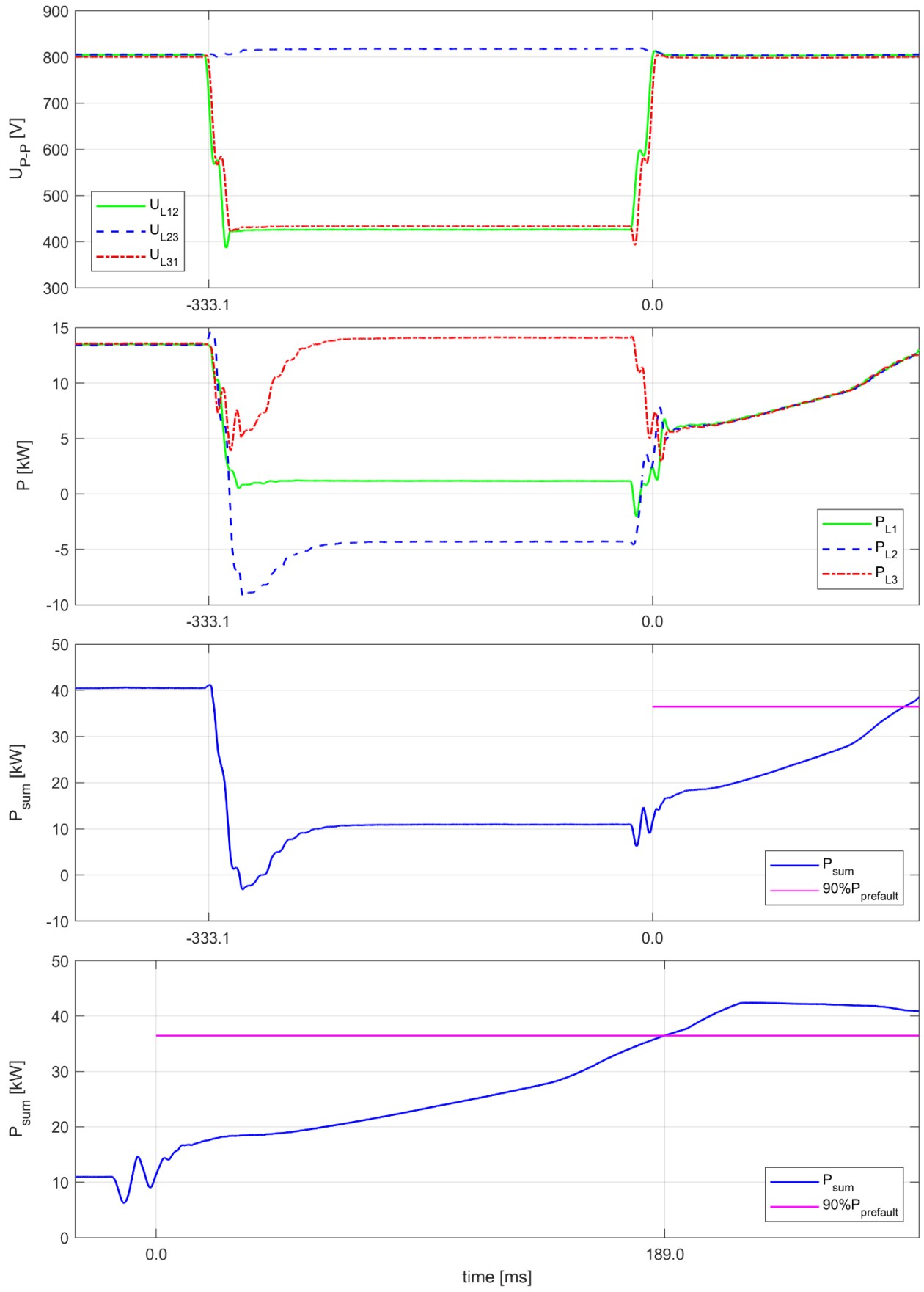
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Positive sequence components and RMS values



B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Positive sequence components and RMS values



B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

CEA_1.3.1

	No.	Parameter	Description / calculation basis	Results		
Gerneral information	1	Test no.	-	CEA_1.3.1-1		
	2	Data file name	-	CEA_1.3.1-1.wdf		
	3	MD5-Checksum	-	36d03160fd66a325471e290311c09990		
	4	Date	[yyyy-mm-dd]	2020-09-29		
	5	Time	[hh:mm:ss]	06:49:48		
	6	Type of fault (number of affected phases)	Fault type B on low-voltage side	One-phase		
	Phase reference			**A [1)]**	**B [1)]**	**C [1)]**
	7	Fault occurrence (t_1)	[ms]	8317.5		
	8	Fault clearance (t_2)	[ms]	8662.1		
	9	Fault duration determined from test	*(from time domain voltage results)* [ms]	344.6		
	10	Measeured value of voltage drop / increase	*(per phase-to-neutral, t_1 + 100ms … t_2 and t_1 - 60s … t_1)* [p.u. U_n]	0.170	1.004	1.005
	11	Measeured value of voltage drop / increase	*(per phase-to-phase, t_1 + 100ms … t_2 and t_1 - 60s … t_1)* [p.u. U_n]	0.632	1.006	0.636
	12	Measeured value of voltage drop / increase	*(positive sequence, phase-to-neutral, t_1 + 100ms … t_2 and t_1 - 60s … t_1)* [p.u. U_n]	0.726		
Before grid fault t_1	13	Voltage reference	*(positive sequence, phase-to-neutral averaged over t_1 - 60s … t_1)* [p.u. U_n]	1.005		
	14	Voltage reference	*(negative sequence, phase-to-neutral averaged over t_1 - 60s … t_1)* [p.u. U_n]	0.004		
	15	Reactive current reference [2)]	*(RMS, averaged over t_1 – 10s … t_1)* [p.u. I_n]	0.001		
	16	Active power reference	*(RMS, averaged over t_1 – 10s … t_1)* [p.u. P_n]	1.003		
	17	Reactive power [2)]	*(RMS, averaged over t_1 – 10s … t_1)* [p.u. P_n]	0.001		
During Grid fault t1 till t2	18	Reactive current [2)]	*(positive sequence, averaged over t_1 + 100ms … t_2 - 20ms)* [p.u. I_n]	0.411		
	19	Reactive current [2)]	*(negative sequence, averaged over t_1 + 100ms … t_2 - 20ms)* [p.u. I_n]	0.003		
	20	Apparent current	*(positive sequence, averaged over t_1 + 100ms … t_2 - 20ms)* [p.u. I_n]	0.420		
After fault clearence t2	21	Settling time of active power (from restoration of the voltage ≥ 90% of nominal voltage until the Active Power output restored to ≥ 90% of the pre-fault level)	[s]	1.613		

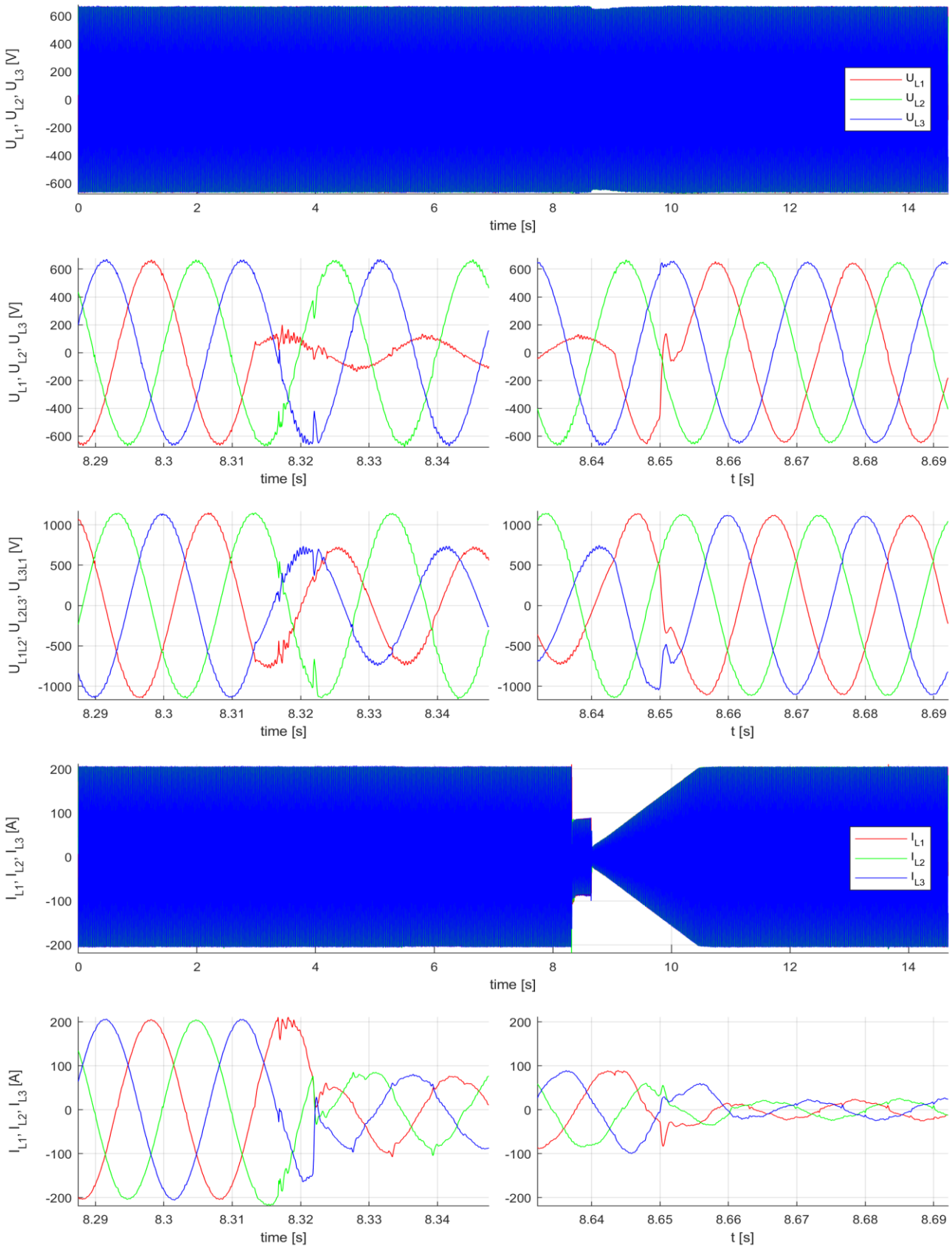
Note:

[1)] A / B / C indicate the phase-neutral voltages (L1, L2, L3), phase-phase voltages (L12, L23, L31) or the phase currents (L1, L2, L3), for details see *Description / calculation basis*.

[2)] Under-excited / inductive reactive current has a negative sign, over-excited / capacitive reactive current has a positive sign, the sign of the reactive power is the same as the reactive current.

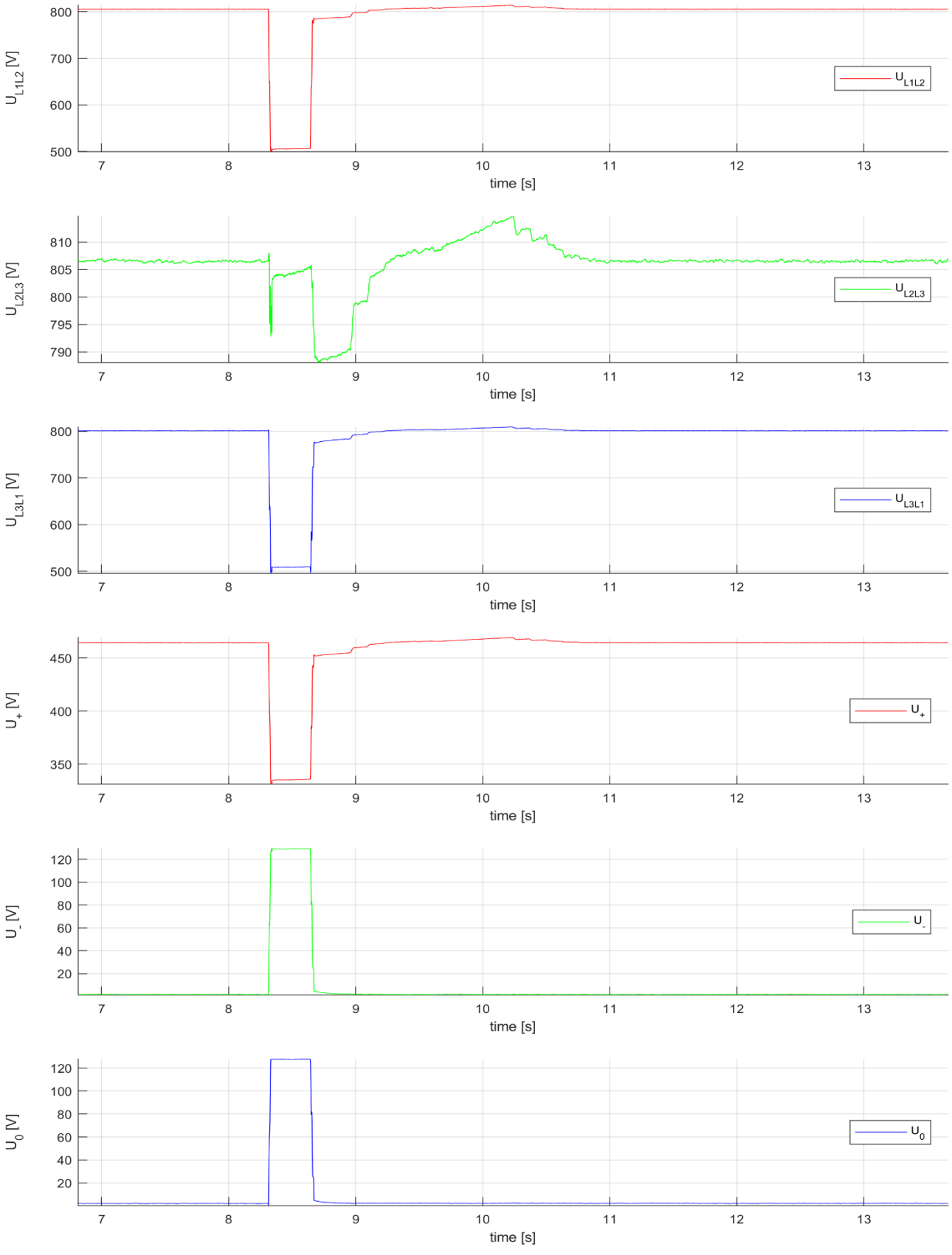
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Timedomain values



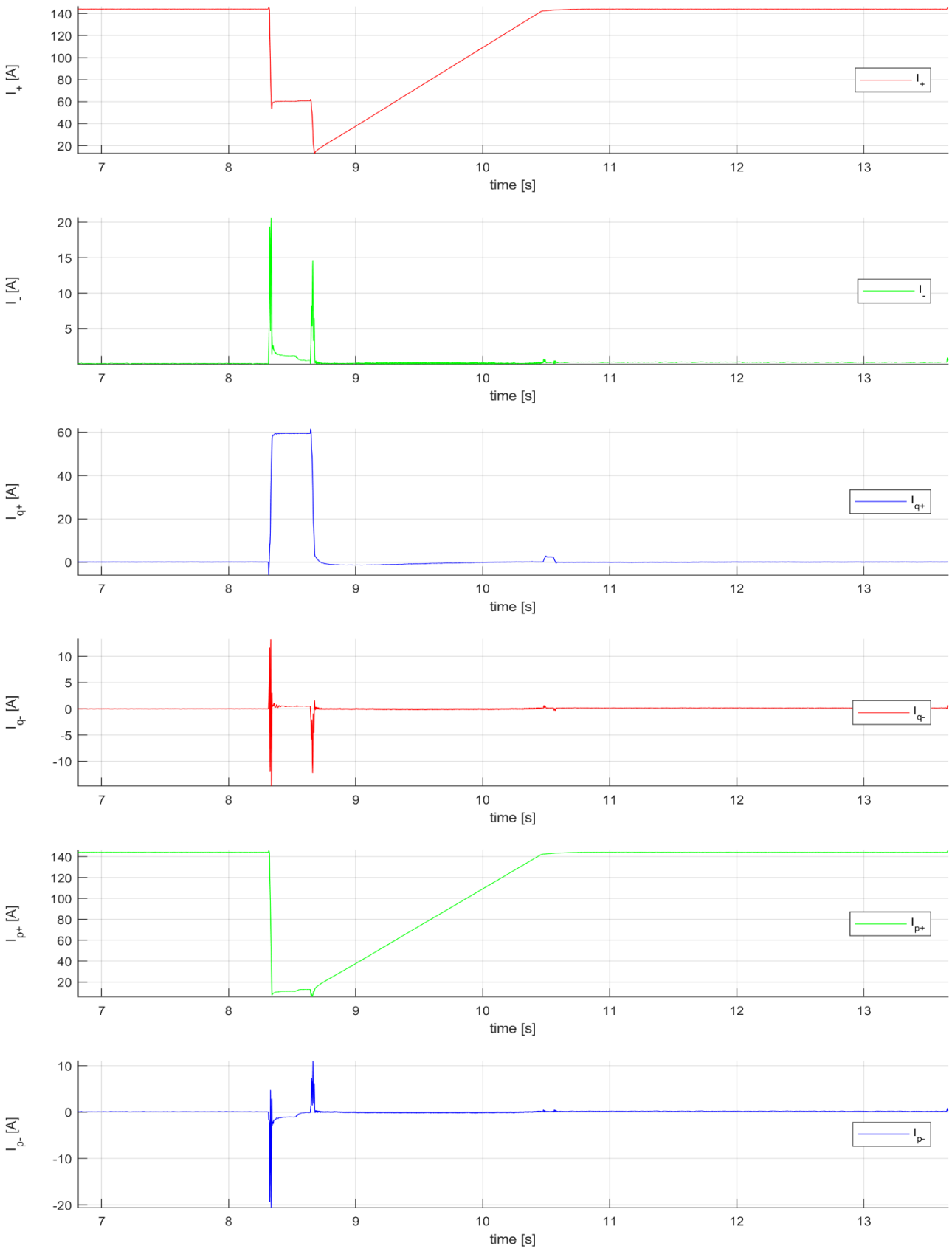
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Positive sequence components and RMS values



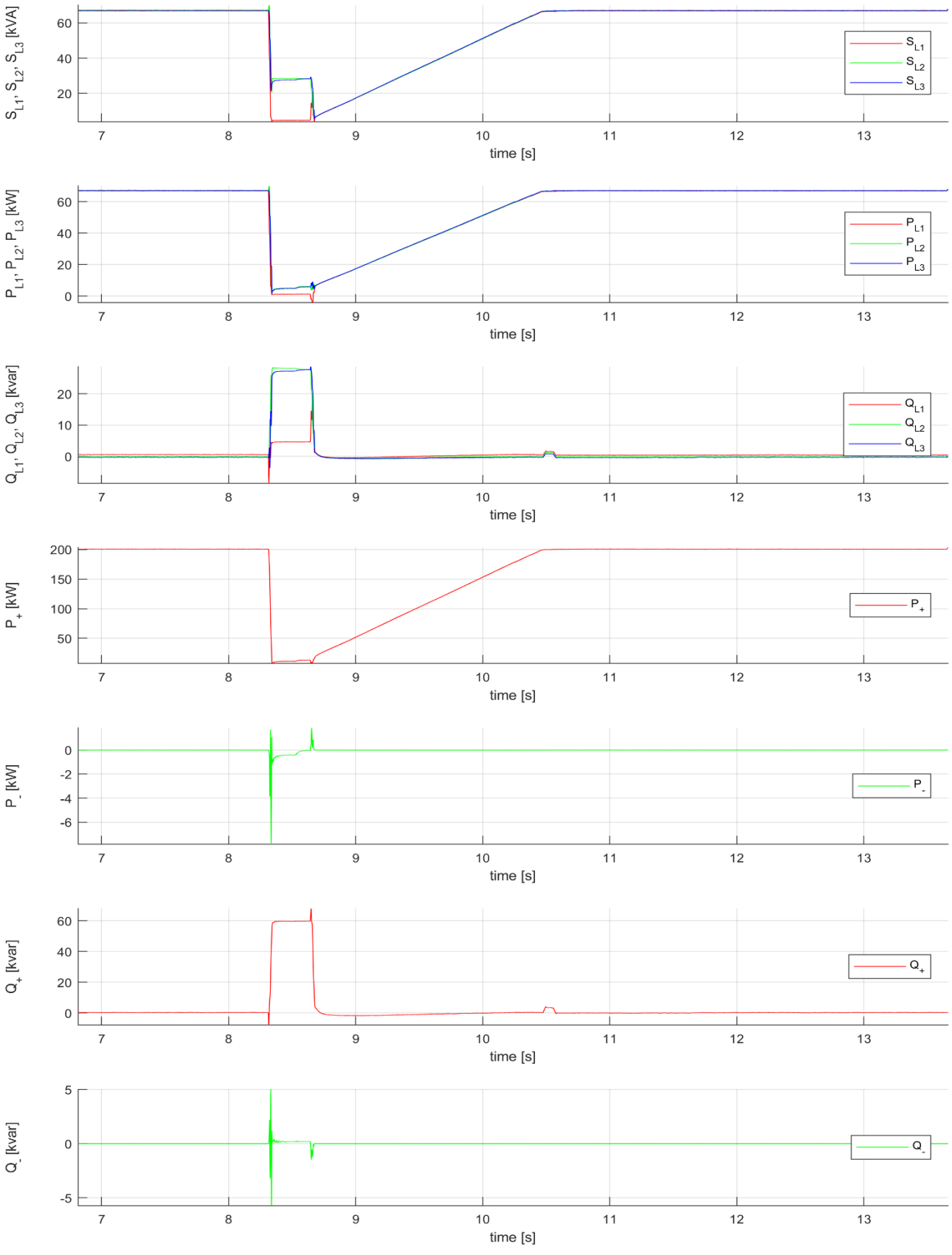
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Positive sequence components and RMS values



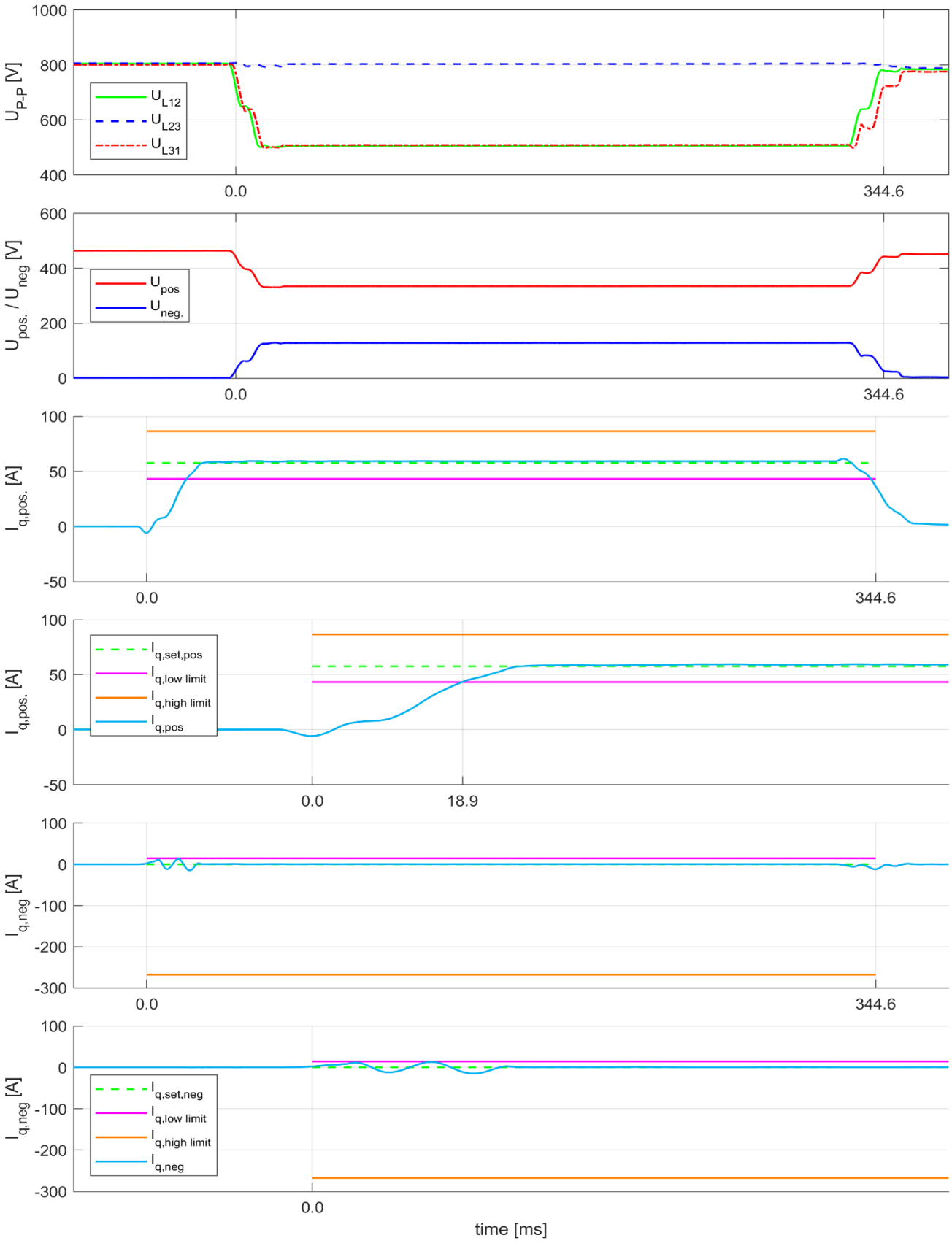
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Positive sequence components and RMS values



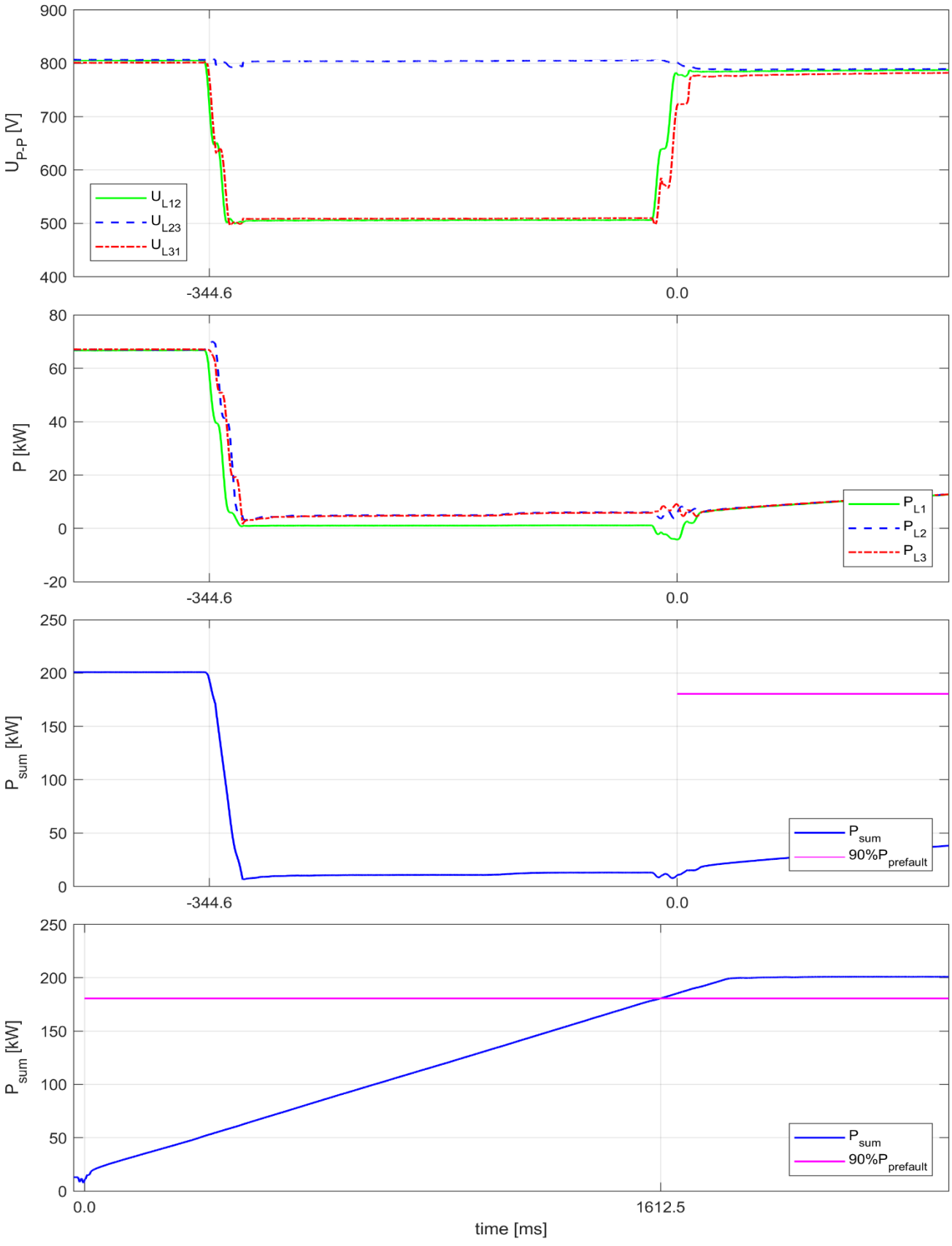
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Positive sequence components and RMS values



B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Positive sequence components and RMS values



B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

CEA_1.3.2

	No.	Parameter	Description / calculation basis	Results		
Gerneral information	1	Test no.	-	CEA_1.3.2-1		
	2	Data file name	-	CEA_1.3.2-1.wdf		
	3	MD5-Checksum	-	a260b34787ba0eaffe908e61041b828b		
	4	Date	[yyyy-mm-dd]	2020-09-29		
	5	Time	[hh:mm:ss]	06:48:20		
	6	Type of fault (number of affected phases)	Fault type B on low-voltage side	One-phase		
	Phase reference			**A [1)]**	**B [1)]**	**C [1)]**
	7	Fault occurrence (t_1)	[ms]	9939.8		
	8	Fault clearance (t_2)	[ms]	10282.4		
	9	Fault duration determined from test	*(from time domain voltage results)* [ms]	342.6		
	10	Measeured value of voltage drop / increase	*(per phase-to-neutral, t_1 + 100ms … t_2 and t_1 - 60s … t_1)* [p.u. U_n]	0.173	1.023	1.025
	11	Measeured value of voltage drop / increase	*(per phase-to-phase, t_1 + 100ms … t_2 and t_1 - 60s … t_1)* [p.u. U_n]	0.645	1.026	0.649
	12	Measeured value of voltage drop / increase	*(positive sequence, phase-to-neutral, t_1 + 100ms … t_2 and t_1 - 60s … t_1)* [p.u. U_n]	0.741		
Before grid fault t_1	13	Voltage reference	*(positive sequence, phase-to-neutral averaged over t_1 - 60s … t_1)* [p.u. U_n]	1.005		
	14	Voltage reference	*(negative sequence, phase-to-neutral averaged over t_1 - 60s … t_1)* [p.u. U_n]	0.004		
	15	Reactive current reference [2)]	*(RMS, averaged over t_1 – 10s … t_1)* [p.u. I_n]	0.000		
	16	Active power reference	*(RMS, averaged over t_1 – 10s … t_1)* [p.u. P_n]	0.202		
	17	Reactive power [2)]	*(RMS, averaged over t_1 – 10s … t_1)* [p.u. P_n]	0.000		
During Grid fault t1 till t2	18	Reactive current [2)]	*(positive sequence, averaged over t_1 + 100ms … t_2 - 20ms)* [p.u. I_n]	0.411		
	19	Reactive current [2)]	*(negative sequence, averaged over t_1 + 100ms … t_2 - 20ms)* [p.u. I_n]	0.004		
	20	Apparent current	*(positive sequence, averaged over t_1 + 100ms … t_2 - 20ms)* [p.u. I_n]	0.421		
After fault clearence t2	21	Settling time of active power (from restoration of the voltage ≥ 90% of nominal voltage until the Active Power output restored to ≥ 90% of the pre-fault level)	[s]	0.175		

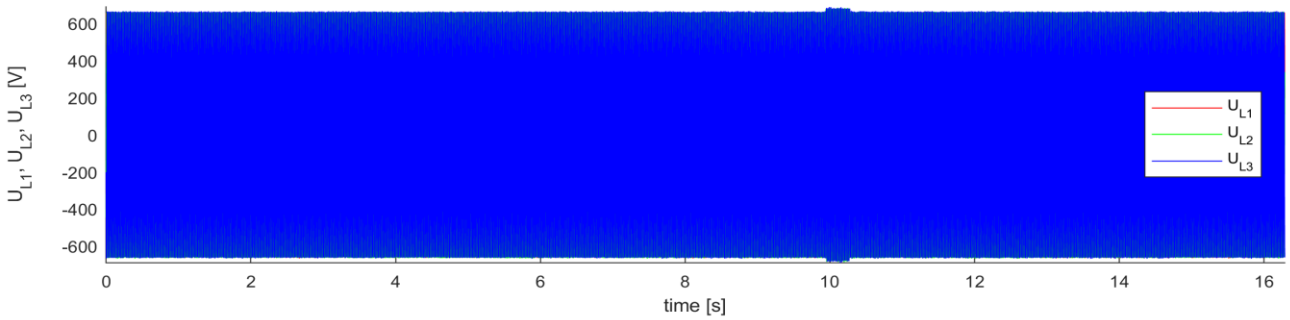
Note:

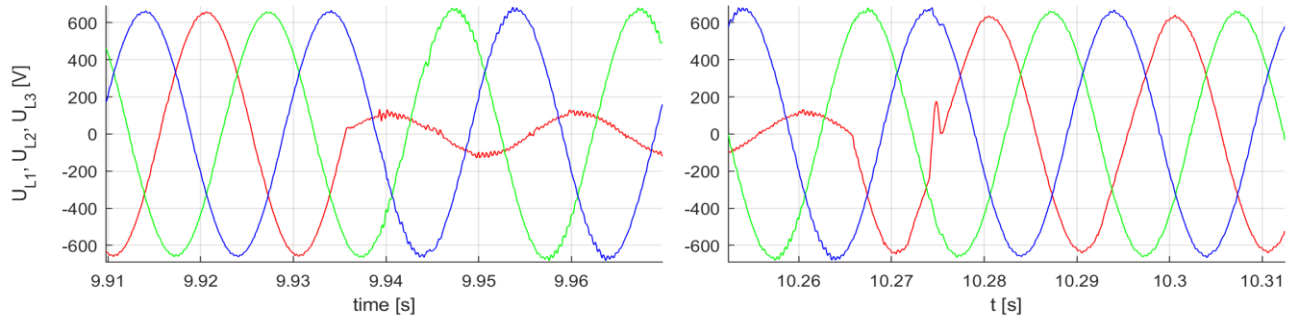
[1)] A / B / C indicate the phase-neutral voltages (L1, L2, L3), phase-phase voltages (L12, L23, L31) or the phase currents (L1, L2, L3), for details see *Description / calculation basis*.

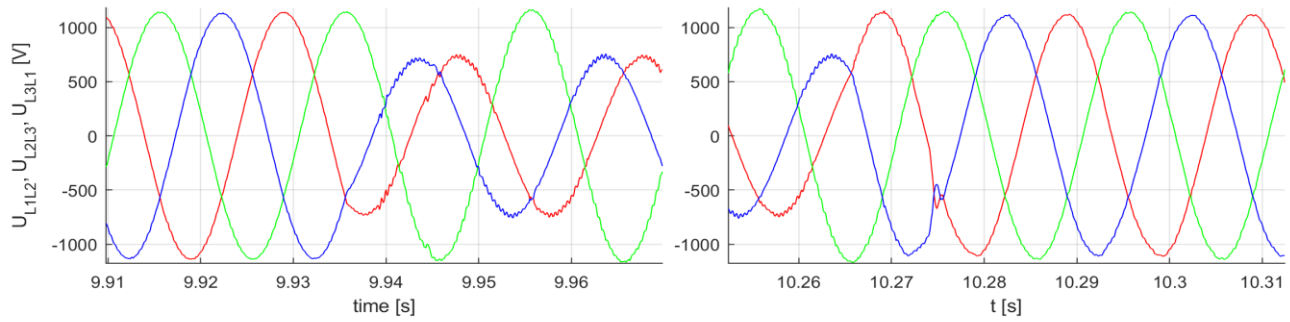
[2)] Under-excited / inductive reactive current has a negative sign, over-excited / capacitive reactive current has a positive sign, the sign of the reactive power is the same as the reactive current.

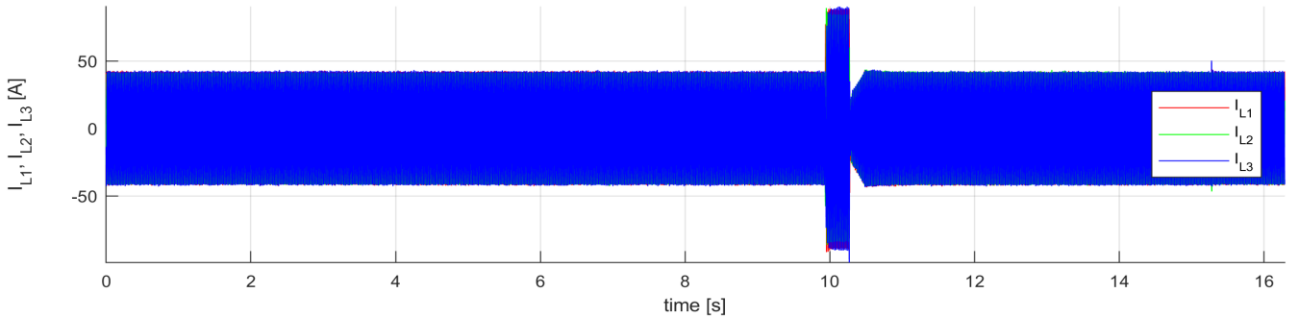
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

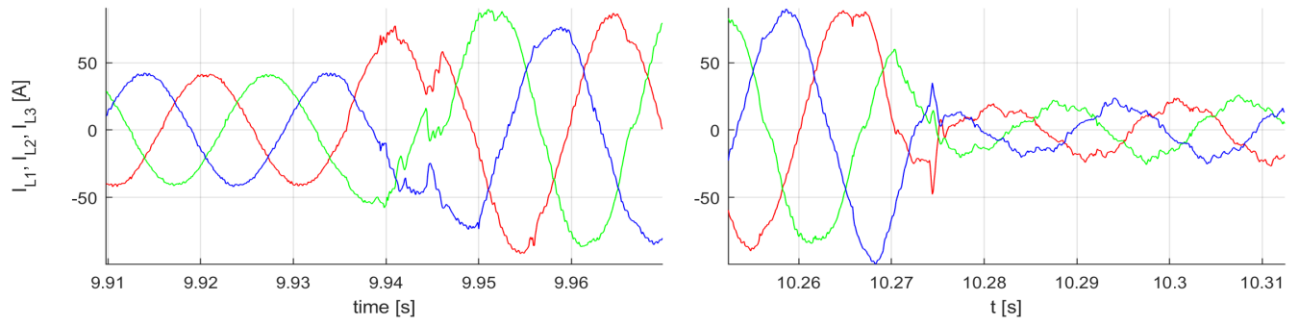
Timedomain values





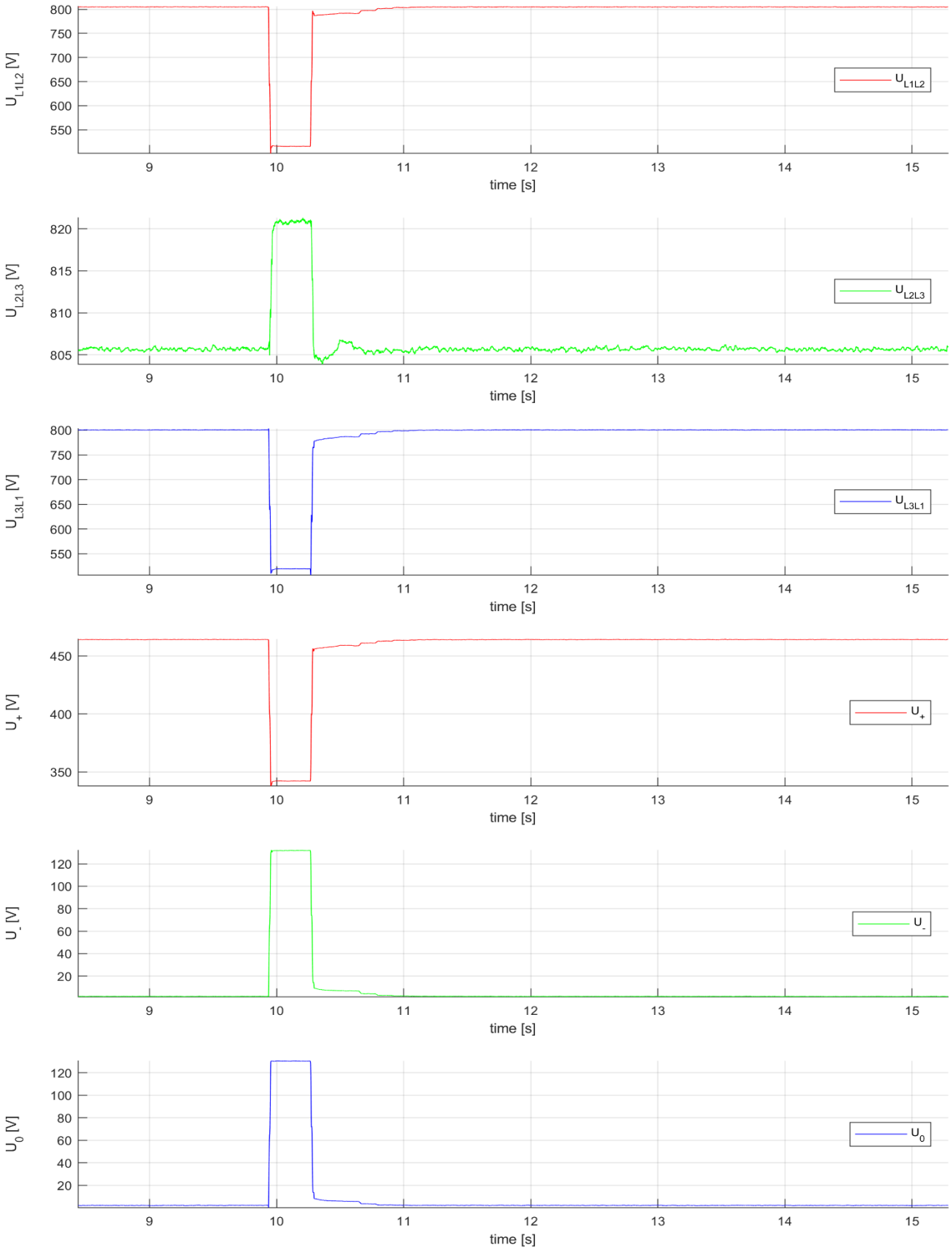






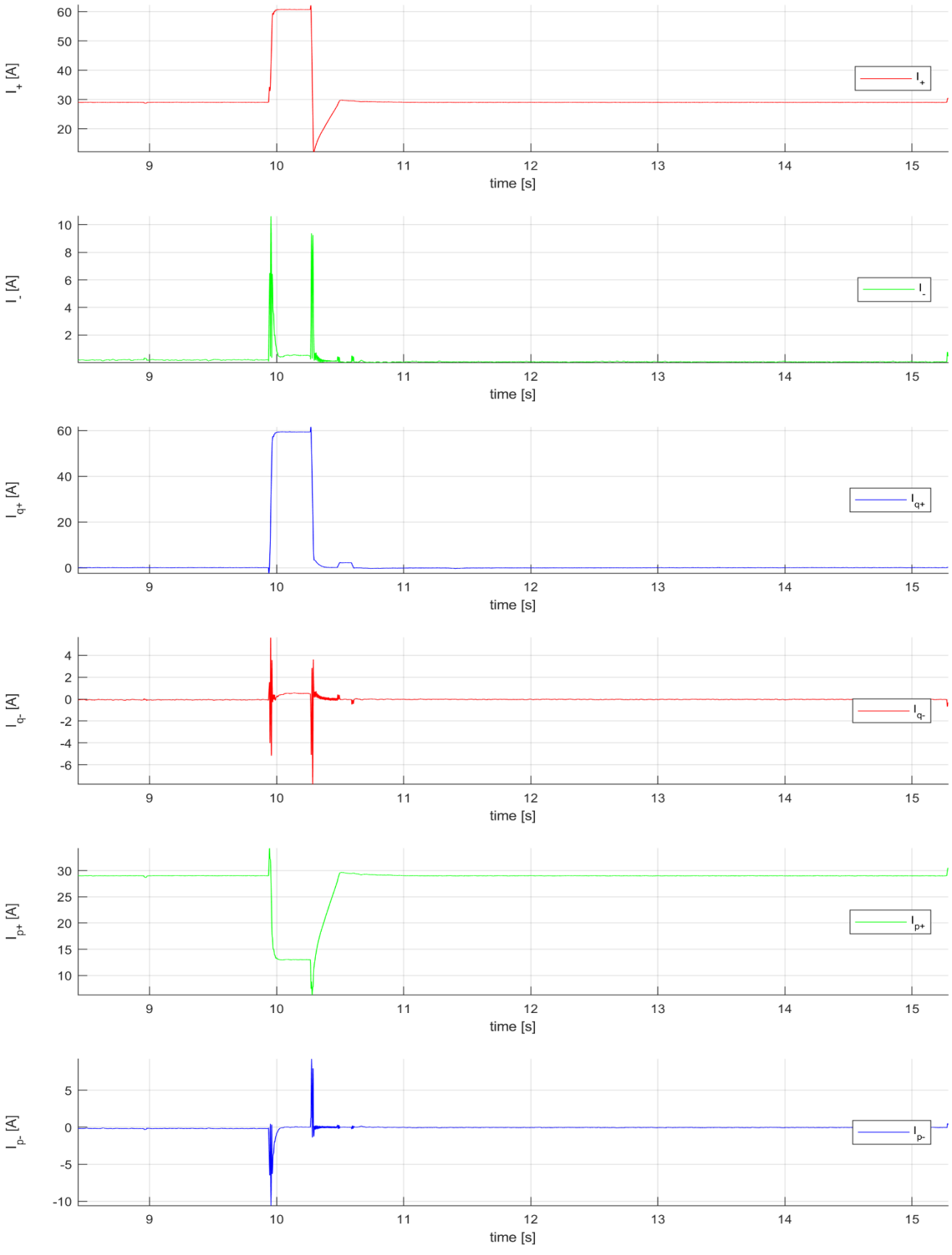
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Positive sequence components and RMS values



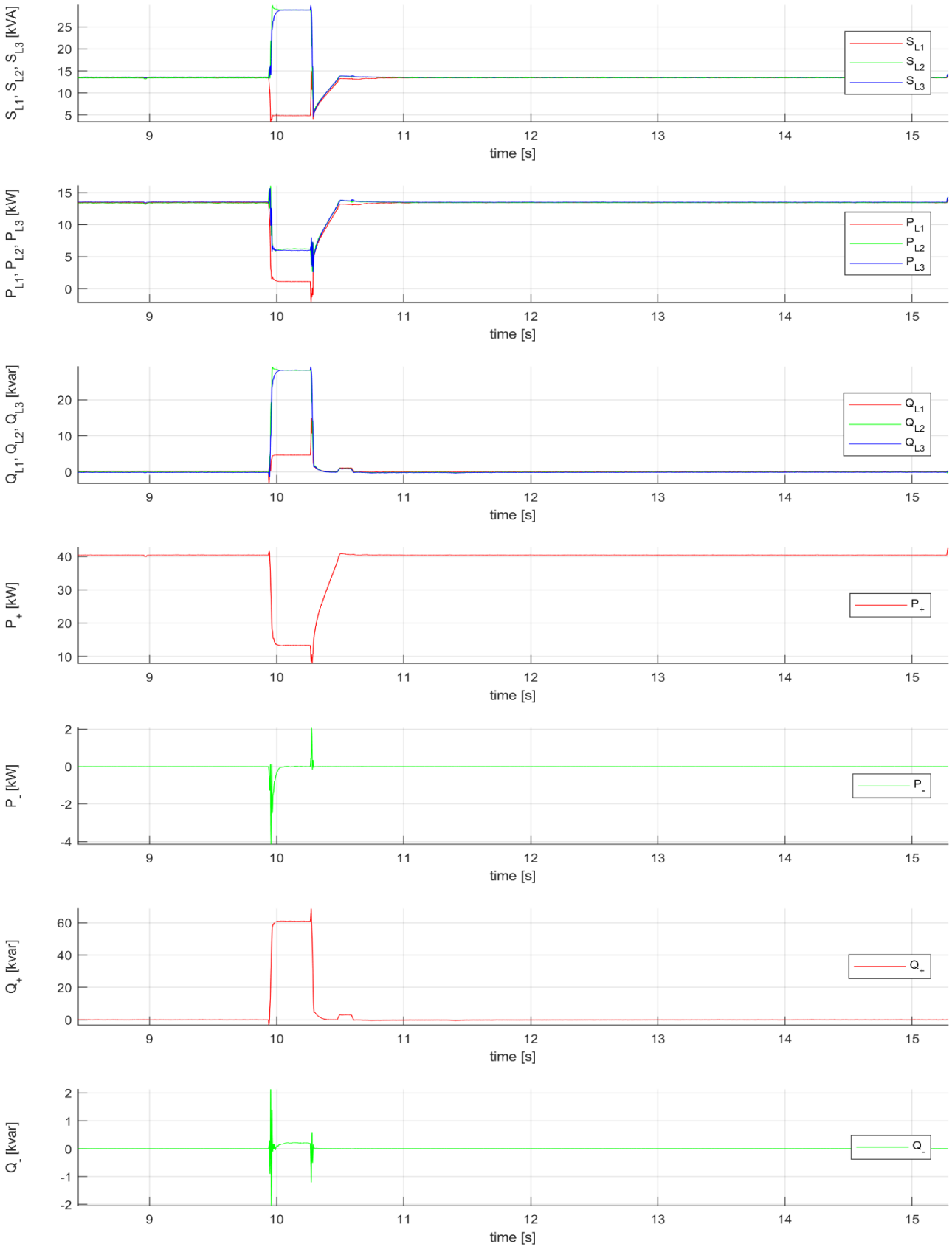
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Positive sequence components and RMS values



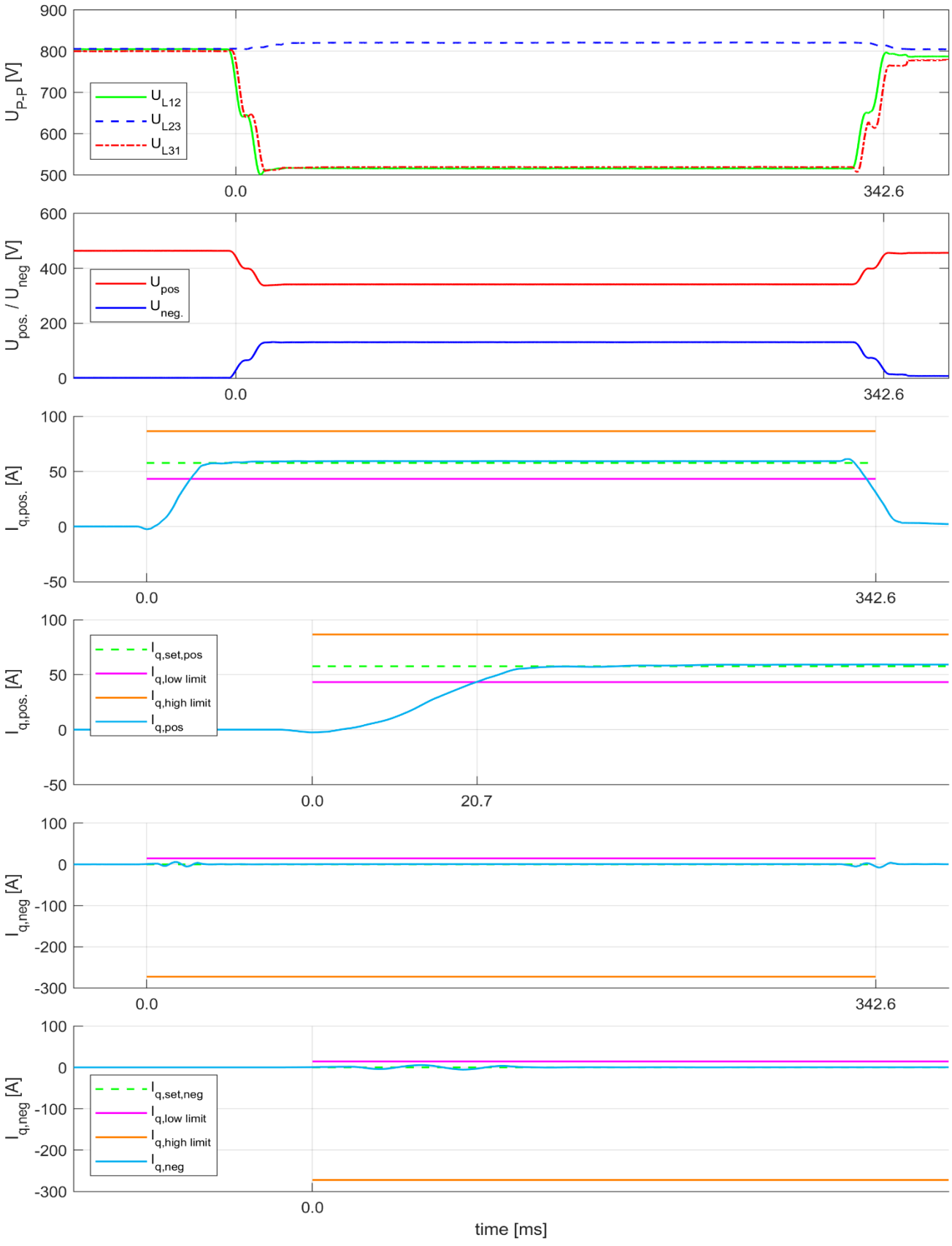
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Positive sequence components and RMS values



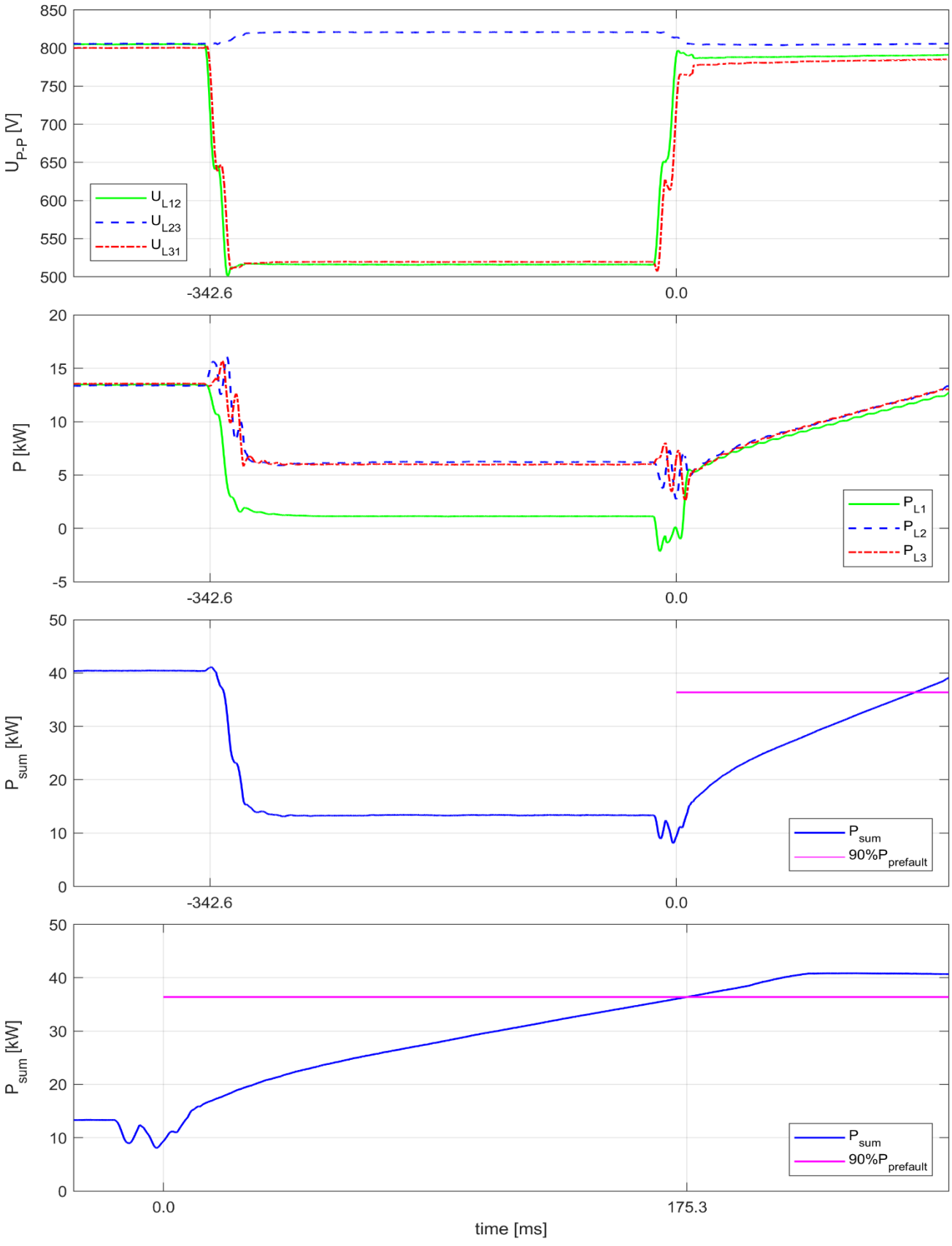
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Positive sequence components and RMS values



B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Positive sequence components and RMS values



B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

CEA_2.1.1

	No.	Parameter	Description / calculation basis	Results		
Gerneral information	1	Test no.	-	CEA_2.1.1-1		
	2	Data file name	-	CEA_2.1.1-1.wdf		
	3	MD5-Checksum	-	f9b10ed173c26e1cf9db37f79dcef76e		
	4	Date	[yyyy-mm-dd]	2020-09-23		
	5	Time	[hh:mm:ss]	11:15:02		
	6	Type of fault (number of affected phases)	-	Three-phase		
	Phase reference			**A** [1)]	**B** [1)]	**C** [1)]
	7	Fault occurrence (t_1)	[ms]	9775.9		
	8	Fault clearance (t_2)	[ms]	11086.3		
	9	Fault duration determined from test	*(from time domain voltage results)* [ms]	1310.4		
	10	Measeured value of voltage drop / increase	*(per phase-to-neutral, t_1 + 100ms … t_2 and t_1 - 60s … t_1)* [p.u. U_n]	0.436	0.437	0.434
	11	Measeured value of voltage drop / increase	*(per phase-to-phase, t_1 + 100ms … t_2 and t_1 - 60s … t_1)* [p.u. U_n]	0.438	0.437	0.433
	12	Measeured value of voltage drop / increase	*(positive sequence, phase-to-neutral, t_1 + 100ms … t_2 and t_1 - 60s … t_1)* [p.u. U_n]	0.436		
Before grid fault t_1	13	Voltage reference	*(positive sequence, phase-to-neutral averaged over t_1 - 60s … t_1)* [p.u. U_n]	1.005		
	14	Voltage reference	*(negative sequence, phase-to-neutral averaged over t_1 - 60s … t_1)* [p.u. U_n]	0.004		
	15	Reactive current reference [2)]	*(RMS, averaged over t_1 – 10s … t_1)* [p.u. I_n]	-0.002		
	16	Active power reference	*(RMS, averaged over t_1 – 10s … t_1)* [p.u. P_n]	1.006		
	17	Reactive power [2)]	*(RMS, averaged over t_1 – 10s … t_1)* [p.u. P_n]	-0.002		
During Grid fault t1 till t2	18	Reactive current [2)]	*(positive sequence, averaged over t_1 + 100ms … t_2 - 20ms)* [p.u. I_n]	1.009		
	19	Reactive current [2)]	*(negative sequence, averaged over t_1 + 100ms … t_2 - 20ms)* [p.u. I_n]	0.000		
	20	Apparent current	*(positive sequence, averaged over t_1 + 100ms … t_2 - 20ms)* [p.u. I_n]	1.012		
After fault clearence t2	21	Settling time of active power (from restoration of the voltage ≥ 90% of nominal voltage until the Active Power output restored to ≥ 90% of the pre-fault level)	[s]	1.607		

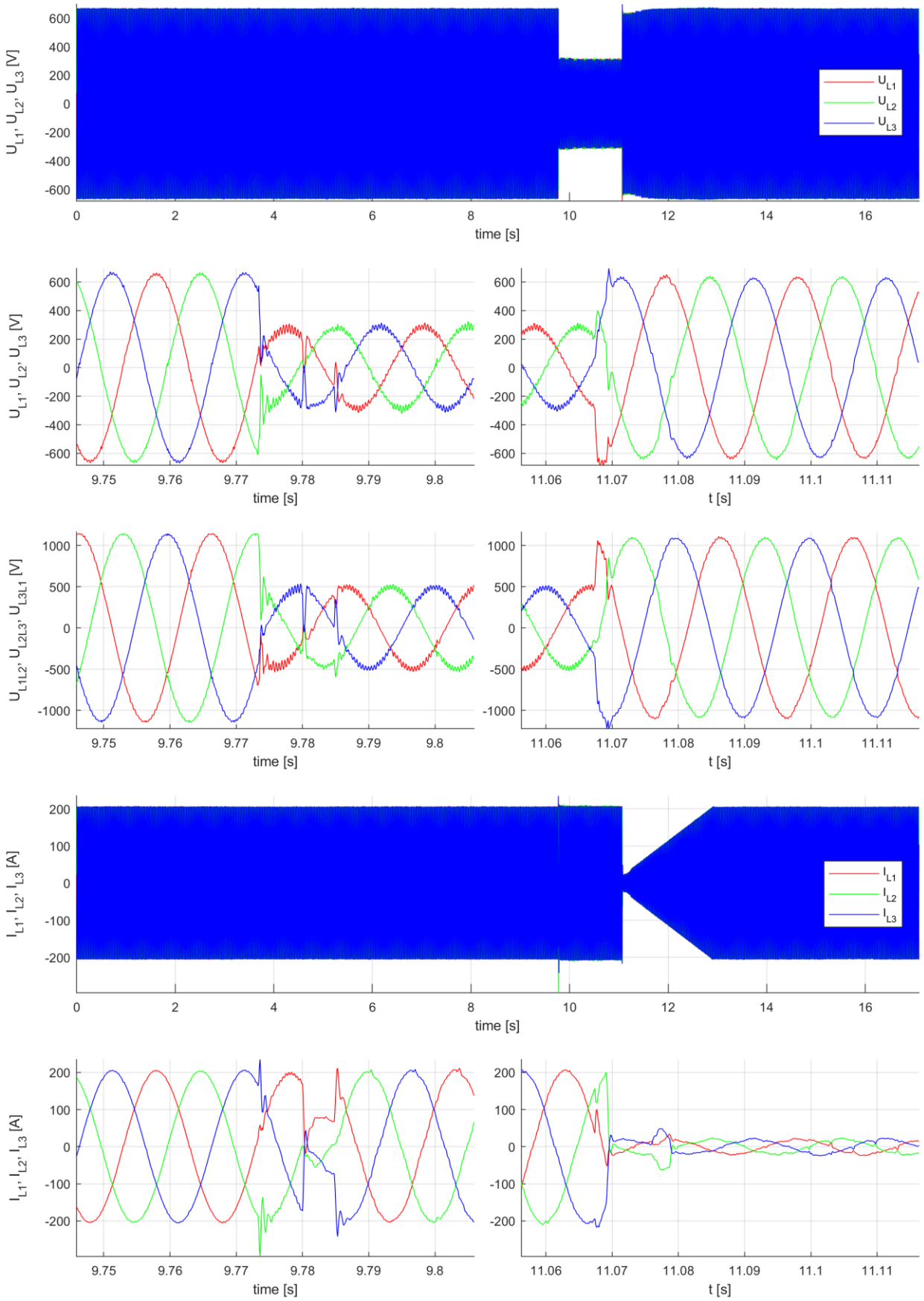
Note:

[1)] A / B / C indicate the phase-neutral voltages (L1, L2, L3), phase-phase voltages (L12, L23, L31) or the phase currents (L1, L2, L3), for details see *Description / calculation basis*.

[2)] Under-excited / inductive reactive current has a negative sign, over-excited / capacitive reactive current has a positive sign, the sign of the reactive power is the same as the reactive current.

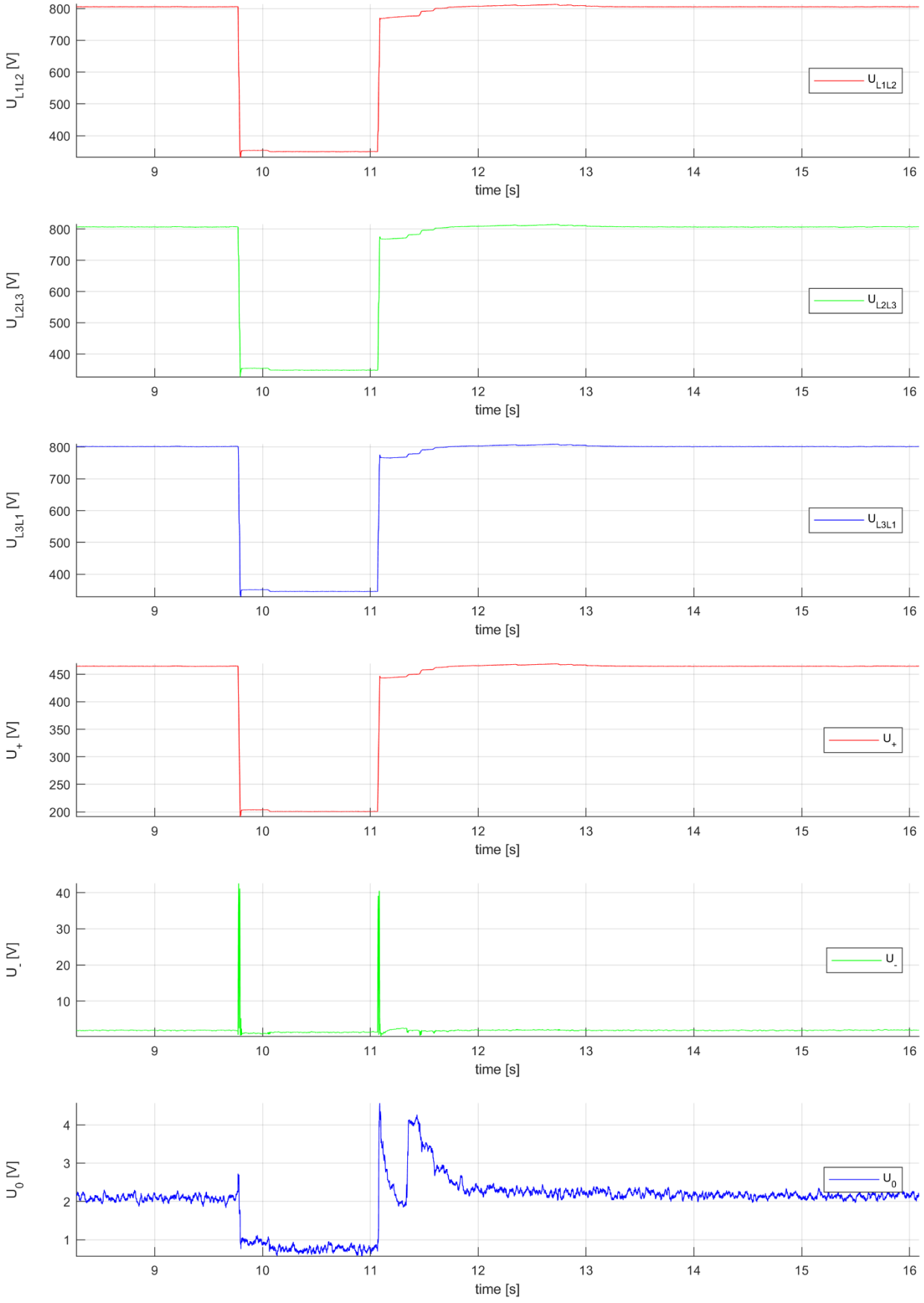
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Timedomain values



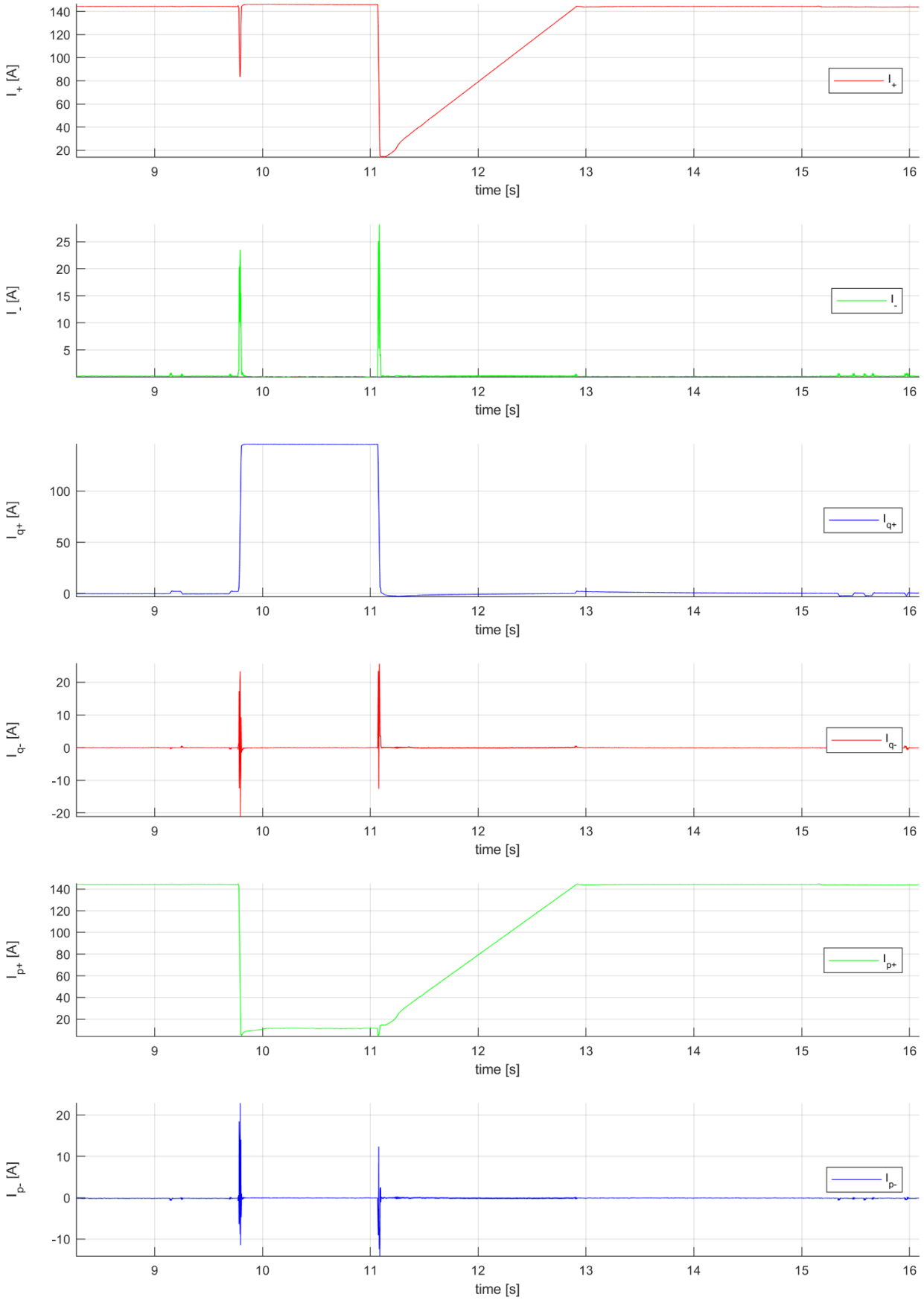
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Positive sequence components and RMS values



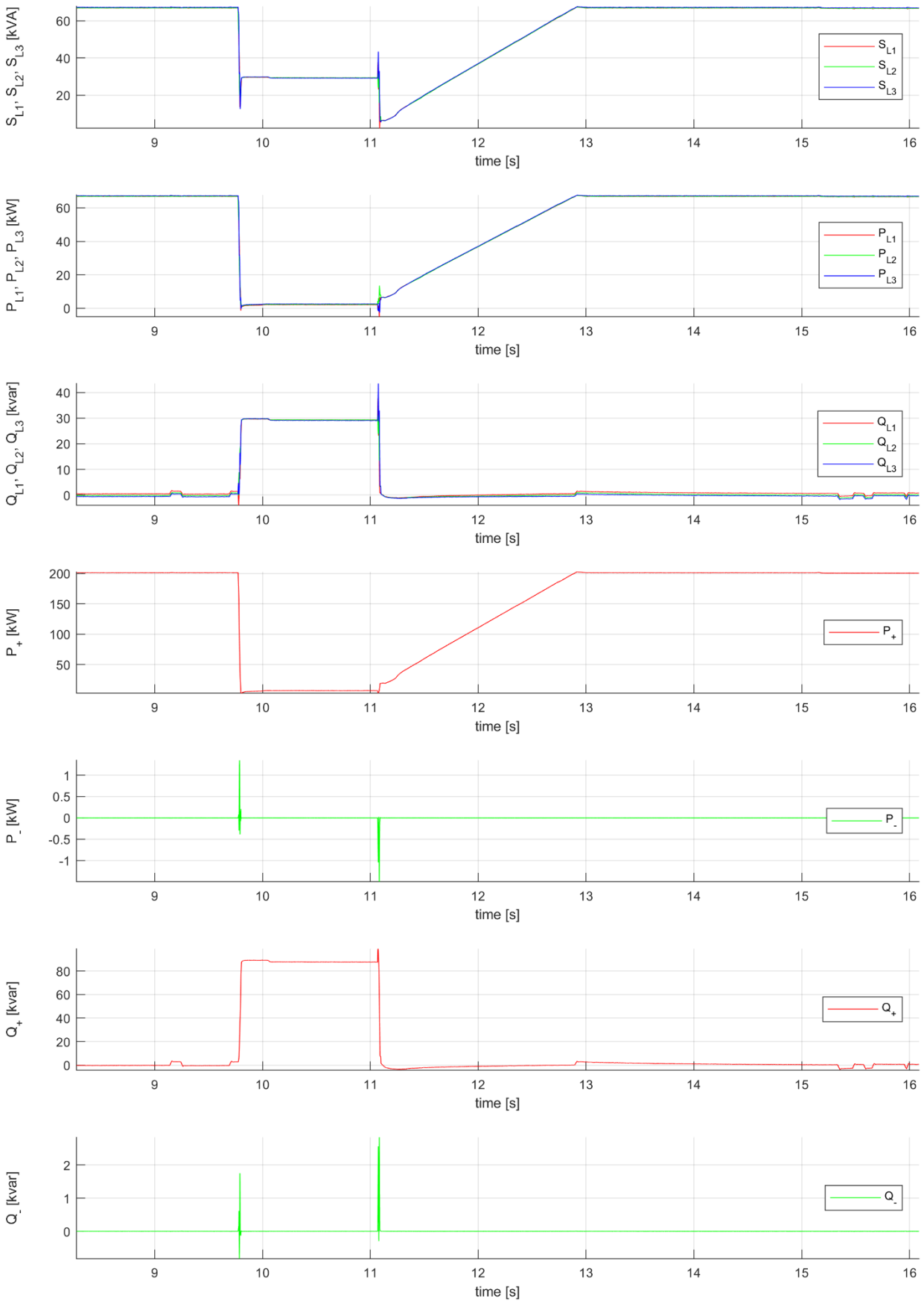
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Positive sequence components and RMS values



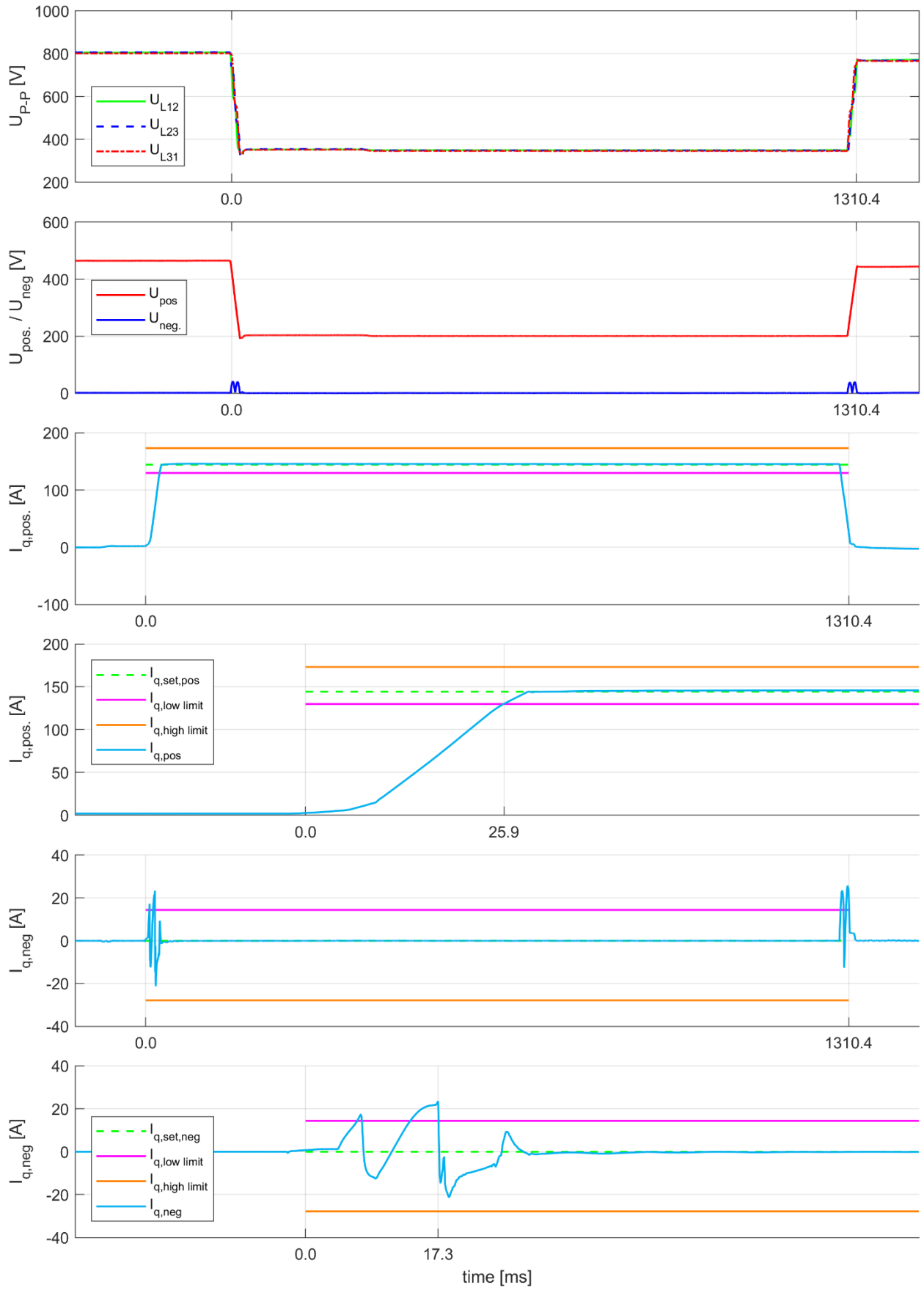
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Positive sequence components and RMS values



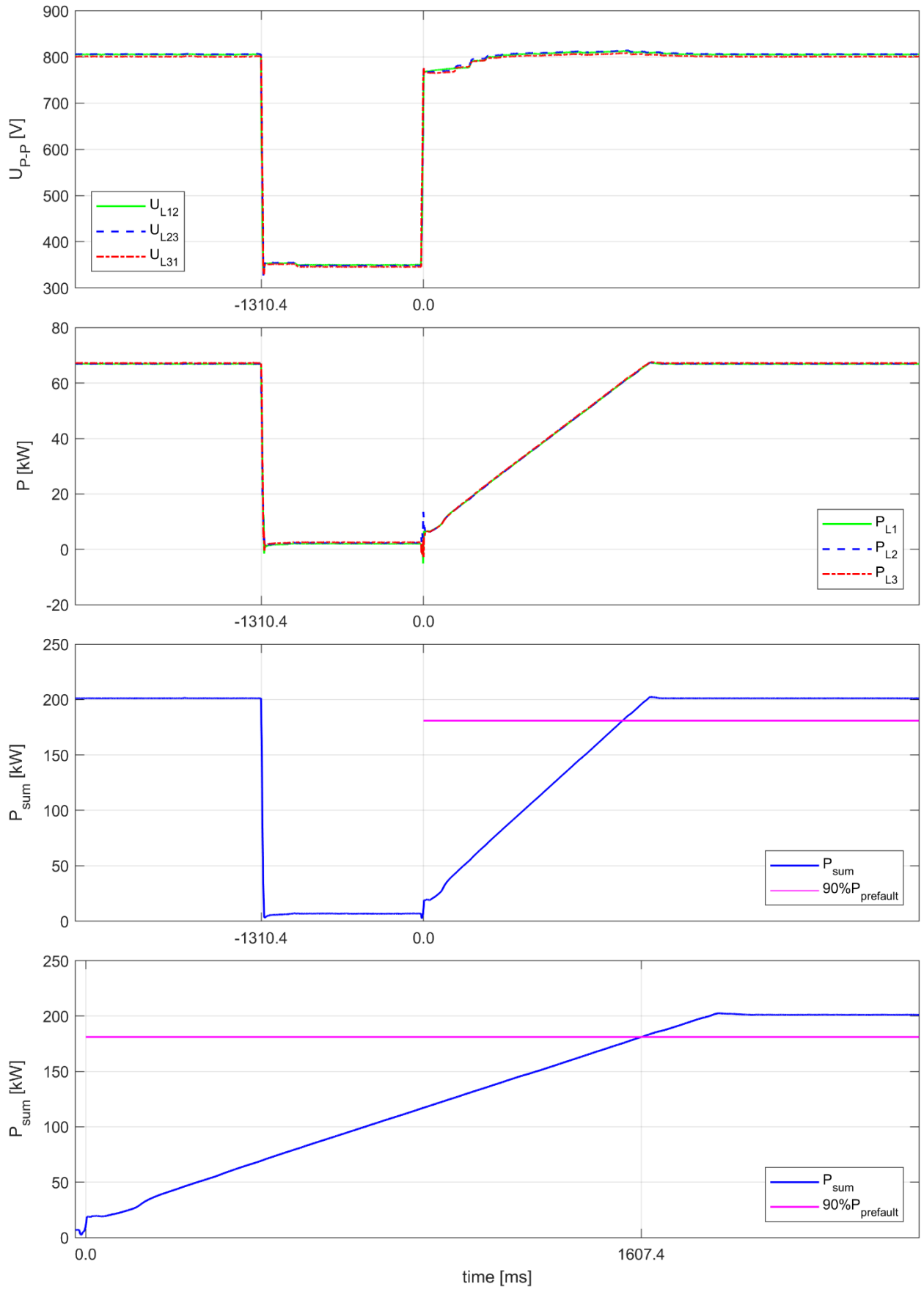
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Positive sequence components and RMS values



B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Positive sequence components and RMS values



B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

CEA_2.1.2

	No.	Parameter	Description / calculation basis	Results		
Gerneral information	1	Test no.	-	CEA_2.1.2-1		
	2	Data file name	-	CEA_2.1.2-1.wdf		
	3	MD5-Checksum	-	74c636493339ec08060b8235d86c66db		
	4	Date	[yyyy-mm-dd]	2020-09-23		
	5	Time	[hh:mm:ss]	11:04:14		
	6	Type of fault (number of affected phases)	-	Three-phase		
	Phase reference			**A [1)]**	**B [1)]**	**C [1)]**
	7	Fault occurrence (t_1)	[ms]	11957.2		
	8	Fault clearance (t_2)	[ms]	13267.2		
	9	Fault duration determined from test	*(from time domain voltage results)* [ms]	1310.0		
	10	Measeured value of voltage drop / increase	*(per phase-to-neutral, t_1 + 100ms … t_2 and t_1 - 60s … t_1)* [p.u. U_n]	0.438	0.439	0.436
	11	Measeured value of voltage drop / increase	*(per phase-to-phase, t_1 + 100ms … t_2 and t_1 - 60s … t_1)* [p.u. U_n]	0.440	0.439	0.435
	12	Measeured value of voltage drop / increase	*(positive sequence, phase-to-neutral, t_1 + 100ms … t_2 and t_1 - 60s … t_1)* [p.u. U_n]	0.438		
Before grid fault t_1	13	Voltage reference	*(positive sequence, phase-to-neutral averaged over t_1 - 60s … t_1)* [p.u. U_n]	1.005		
	14	Voltage reference	*(negative sequence, phase-to-neutral averaged over t_1 - 60s … t_1)* [p.u. U_n]	0.004		
	15	Reactive current reference [2)]	*(RMS, averaged over t_1 – 10s … t_1)* [p.u. I_n]	0.000		
	16	Active power reference	*(RMS, averaged over t_1 – 10s … t_1)* [p.u. P_n]	0.203		
	17	Reactive power [2)]	*(RMS, averaged over t_1 – 10s … t_1)* [p.u. P_n]	0.000		
During Grid fault t1 till t2	18	Reactive current [2)]	*(positive sequence, averaged over t_1 + 100ms … t_2 - 20ms)* [p.u. I_n]	1.009		
	19	Reactive current [2)]	*(negative sequence, averaged over t_1 + 100ms … t_2 - 20ms)* [p.u. I_n]	0.000		
	20	Apparent current	*(positive sequence, averaged over t_1 + 100ms … t_2 - 20ms)* [p.u. I_n]	1.012		
After fault clearence t2	21	Settling time of active power (from restoration of the voltage ≥ 90% of nominal voltage until the Active Power output restored to ≥ 90% of the pre-fault level)	[s]	0.194		

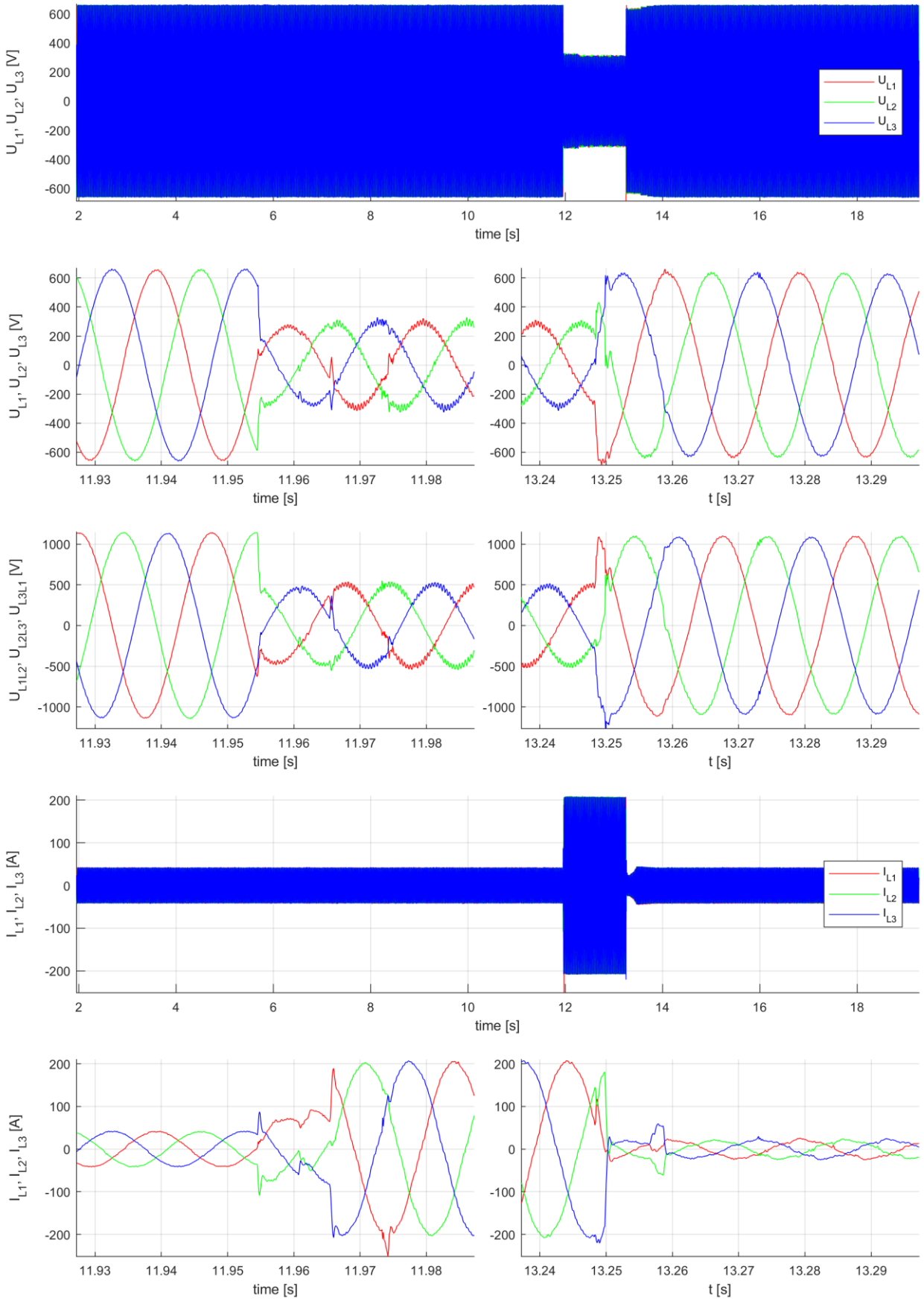
Note:

[1)] A / B / C indicate the phase-neutral voltages (L1, L2, L3), phase-phase voltages (L12, L23, L31) or the phase currents (L1, L2, L3), for details see *Description / calculation basis*.

[2)] Under-excited / inductive reactive current has a negative sign, over-excited / capacitive reactive current has a positive sign, the sign of the reactive power is the same as the reactive current.

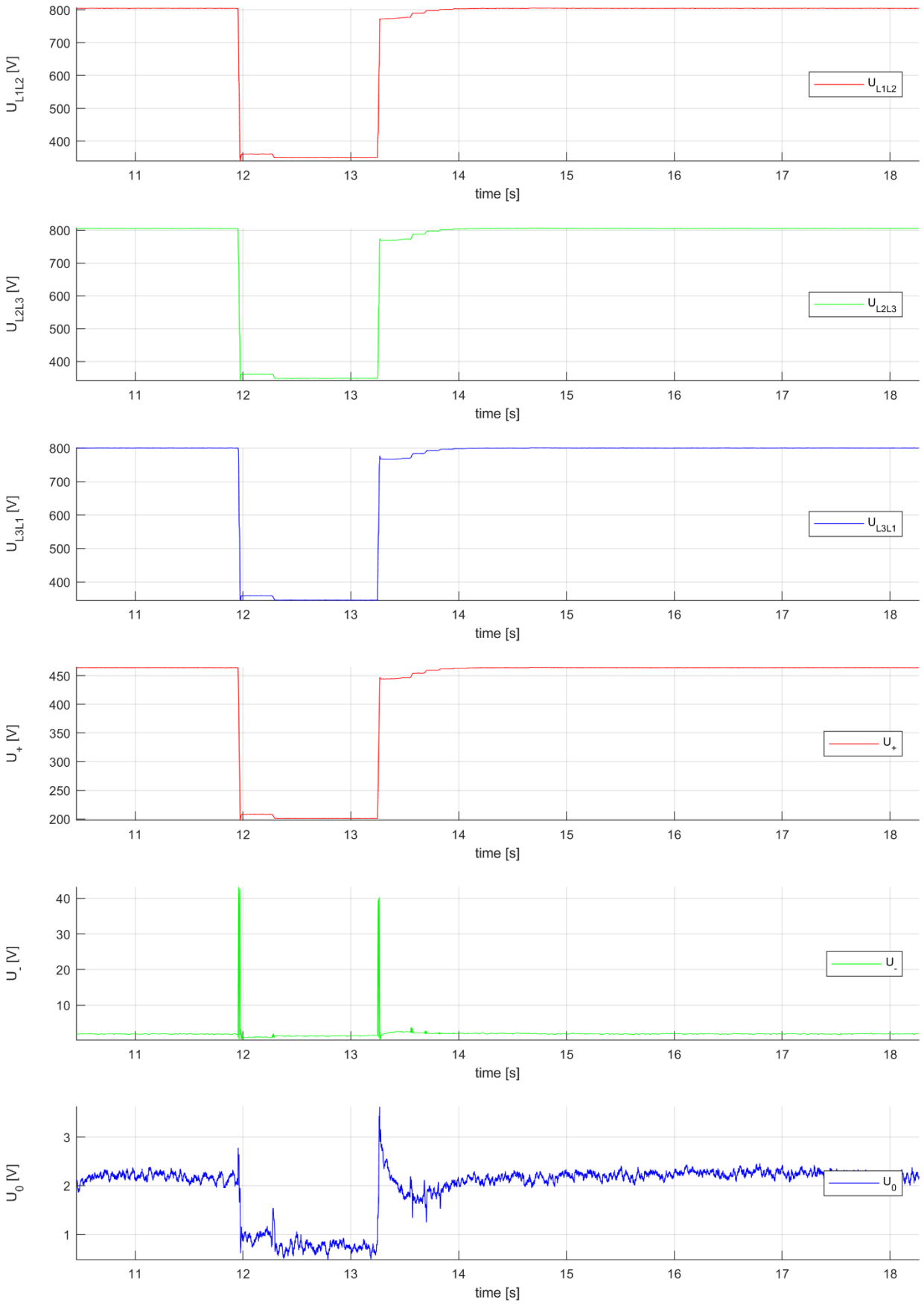
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Timedomain values



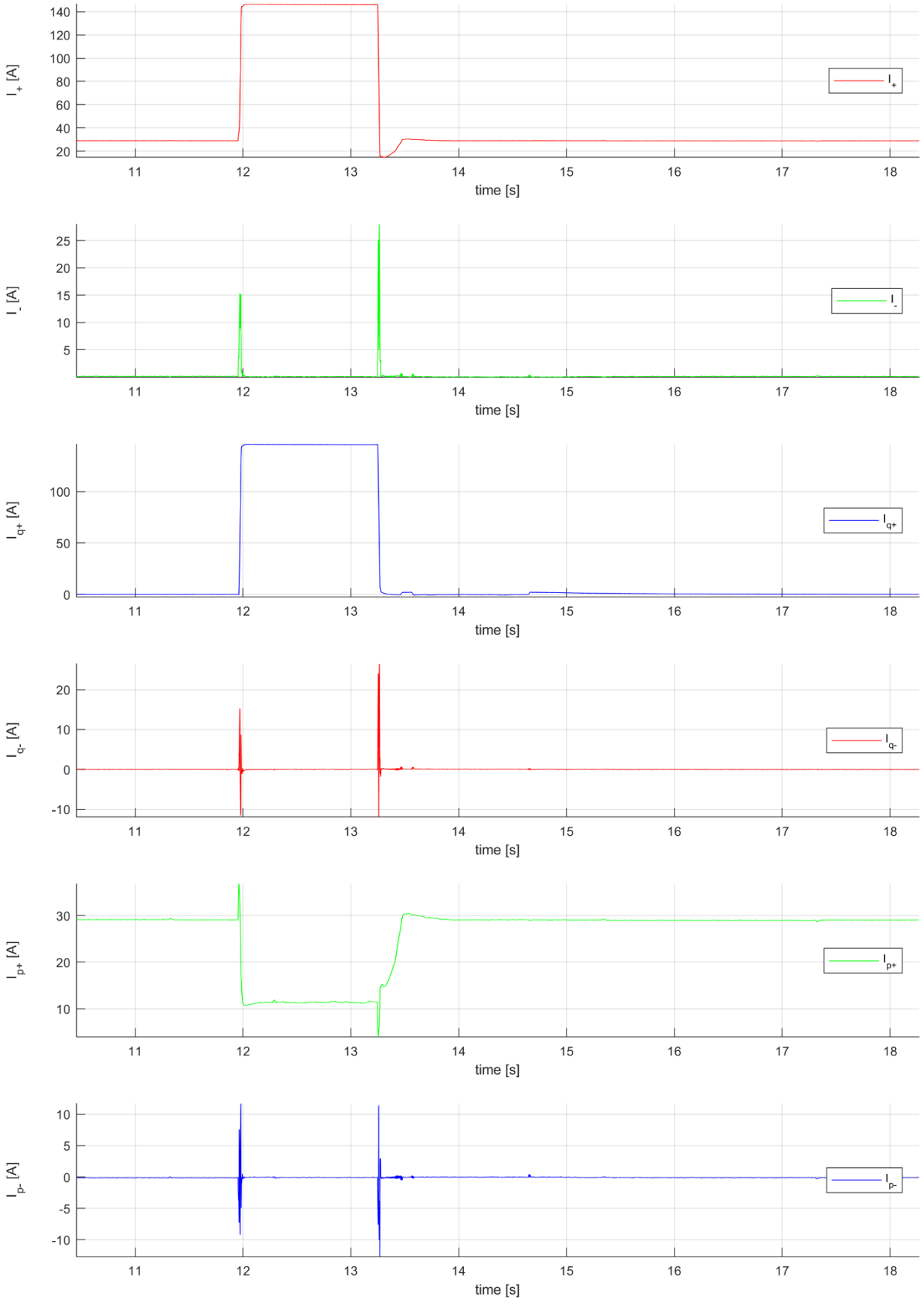
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Positive sequence components and RMS values



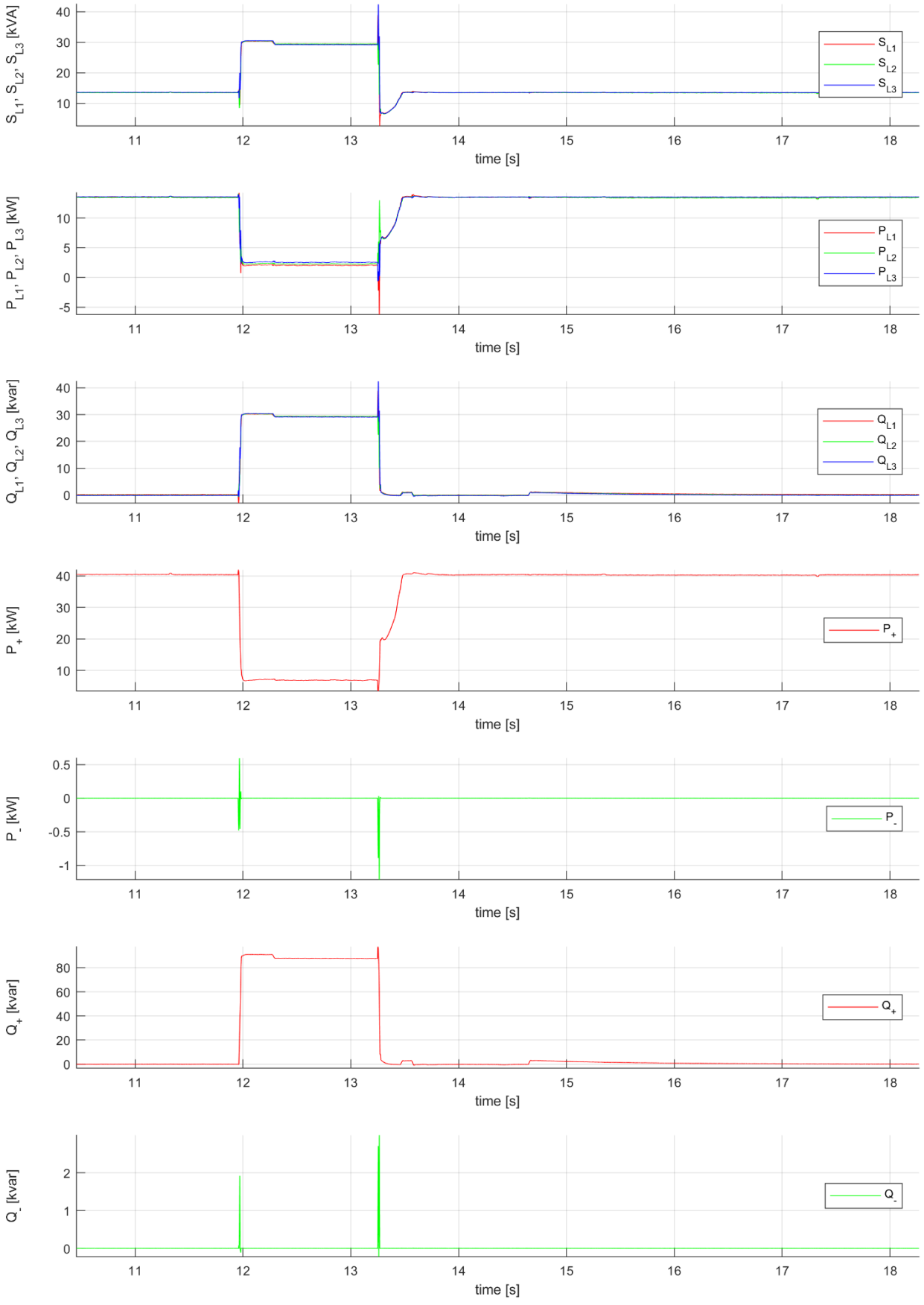
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Positive sequence components and RMS values



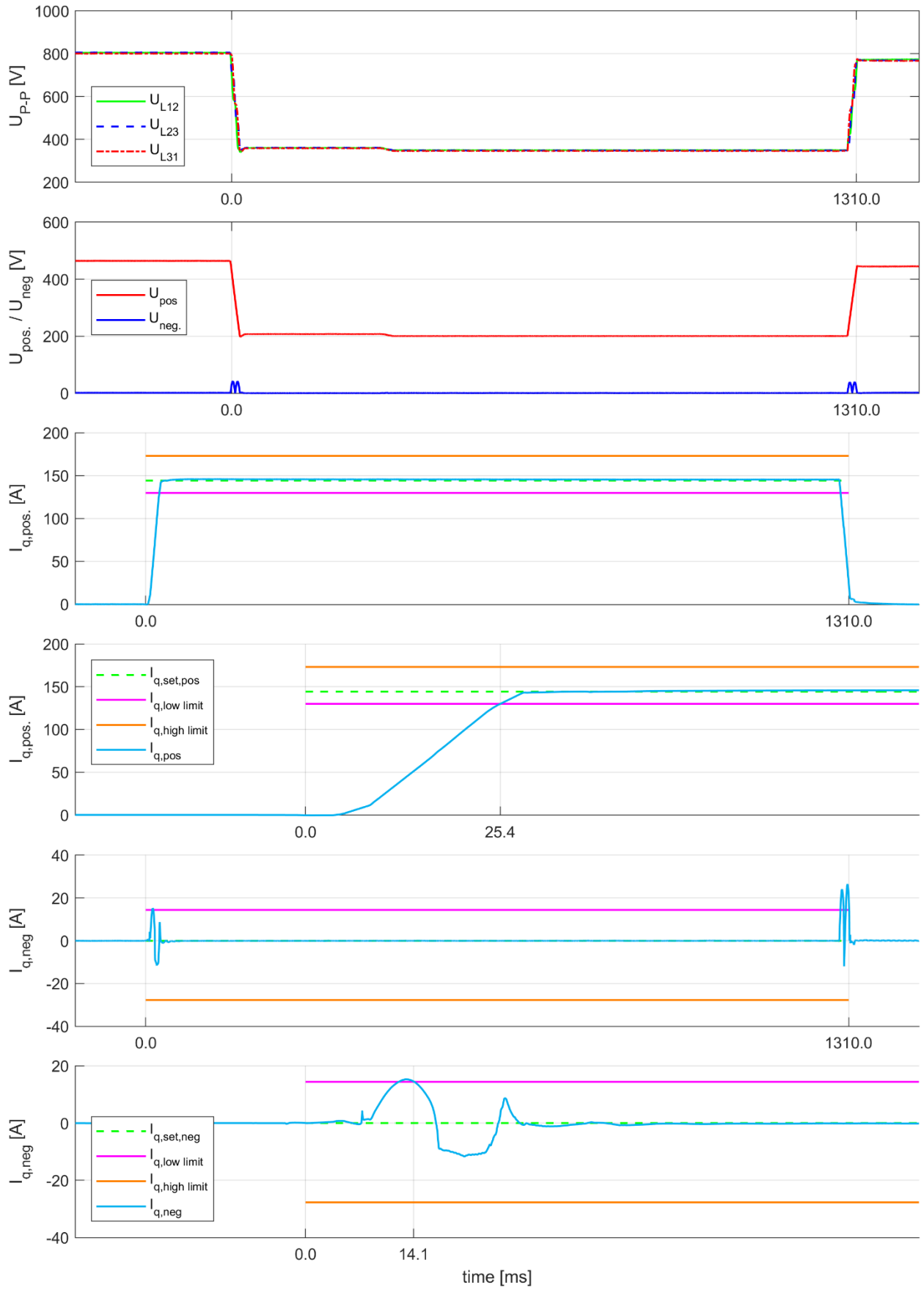
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Positive sequence components and RMS values



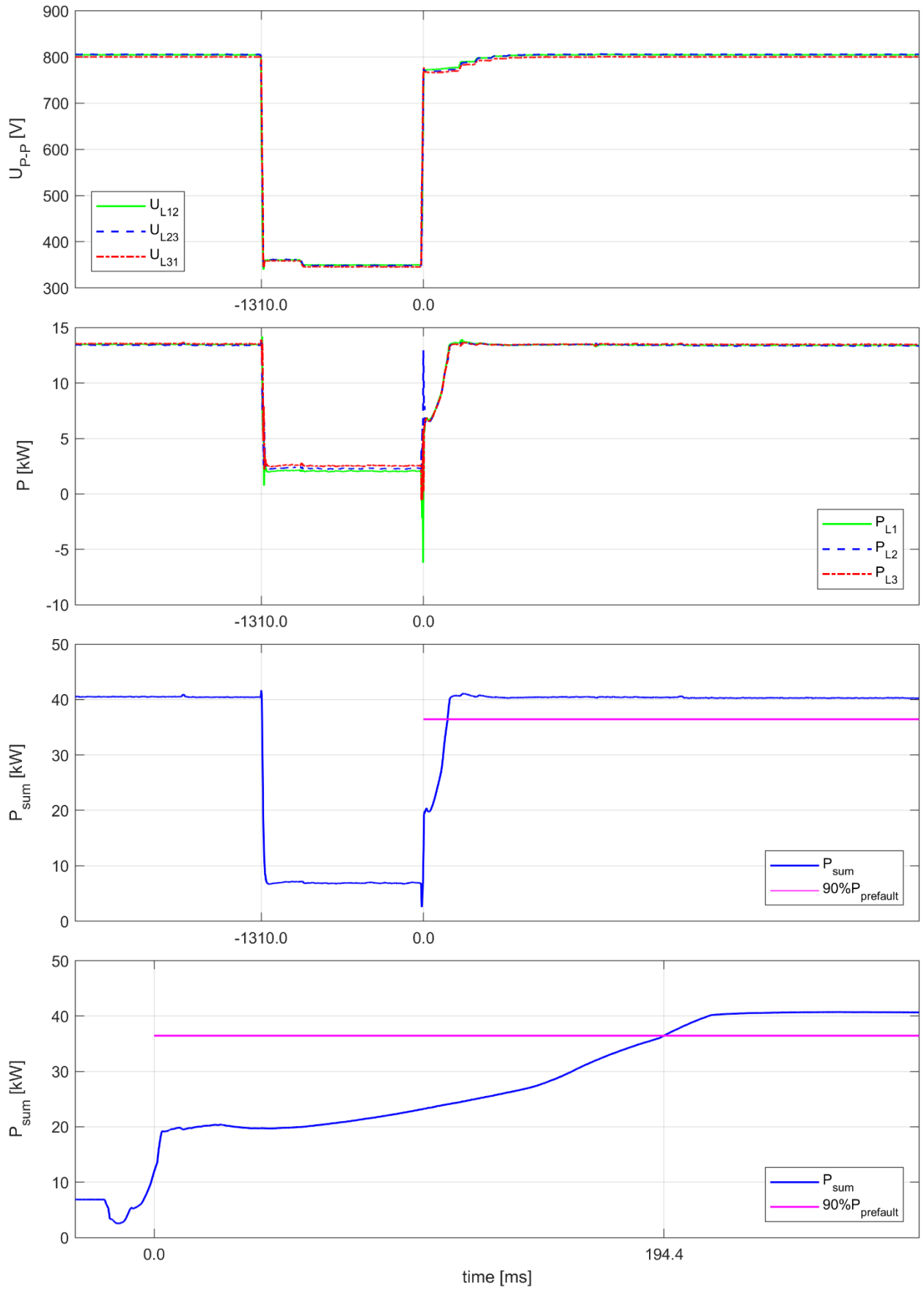
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Positive sequence components and RMS values



B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Positive sequence components and RMS values



B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

CEA_2.2.1

	No.	Parameter	Description / calculation basis	Results		
Gerneral information	1	Test no.	-	CEA_2.2.1-1		
	2	Data file name	-	CEA_2.2.1-1.wdf		
	3	MD5-Checksum	-	7e60e0d5349c28b42e455ebe64612d32		
	4	Date	[yyyy-mm-dd]	2020-09-23		
	5	Time	[hh:mm:ss]	11:17:40		
	6	Type of fault (number of affected phases)	Fault type D on low-voltage side	Two-phase		
	Phase reference			**A [1)]**	**B [1)]**	**C [1)]**
	7	Fault occurrence (t_1)	[ms]	9034.0		
	8	Fault clearance (t_2)	[ms]	10332.9		
	9	Fault duration determined from test	*(from time domain voltage results)* [ms]	1298.9		
	10	Measeured value of voltage drop / increase	*(per phase-to-neutral, t_1 + 100ms … t_2 and t_1 - 60s … t_1)* [p.u. U_n]	0.409	0.892	0.895
	11	Measeured value of voltage drop / increase	*(per phase-to-phase, t_1 + 100ms … t_2 and t_1 - 60s … t_1)* [p.u. U_n]	0.611	1.008	0.612
	12	Measeured value of voltage drop / increase	*(positive sequence, phase-to-neutral, t_1 + 100ms … t_2 and t_1 - 60s … t_1)* [p.u. U_n]	0.704		
Before grid fault t_1	13	Voltage reference	*(positive sequence, phase-to-neutral averaged over t_1 - 60s … t_1)* [p.u. U_n]	1.005		
	14	Voltage reference	*(negative sequence, phase-to-neutral averaged over t_1 - 60s … t_1)* [p.u. U_n]	0.004		
	15	Reactive current reference [2)]	*(RMS, averaged over t_1 – 10s … t_1)* [p.u. I_n]	-0.001		
	16	Active power reference	*(RMS, averaged over t_1 – 10s … t_1)* [p.u. P_n]	1.005		
	17	Reactive power [2)]	*(RMS, averaged over t_1 – 10s … t_1)* [p.u. P_n]	-0.002		
During Grid fault t1 till t2	18	Reactive current [2)]	*(positive sequence, averaged over t_1 + 100ms … t_2 - 20ms)* [p.u. I_n]	0.397		
	19	Reactive current [2)]	*(negative sequence, averaged over t_1 + 100ms … t_2 - 20ms)* [p.u. I_n]	0.003		
	20	Apparent current	*(positive sequence, averaged over t_1 + 100ms … t_2 - 20ms)* [p.u. I_n]	0.407		
After fault clearence t2	21	Settling time of active power (from restoration of the voltage ≥ 90% of nominal voltage until the Active Power output restored to ≥ 90% of the pre-fault level)	[s]	1.617		

Note:

[1)] A / B / C indicate the phase-neutral voltages (L1, L2, L3), phase-phase voltages (L12, L23, L31) or the phase currents (L1, L2, L3), for details see *Description / calculation basis*.

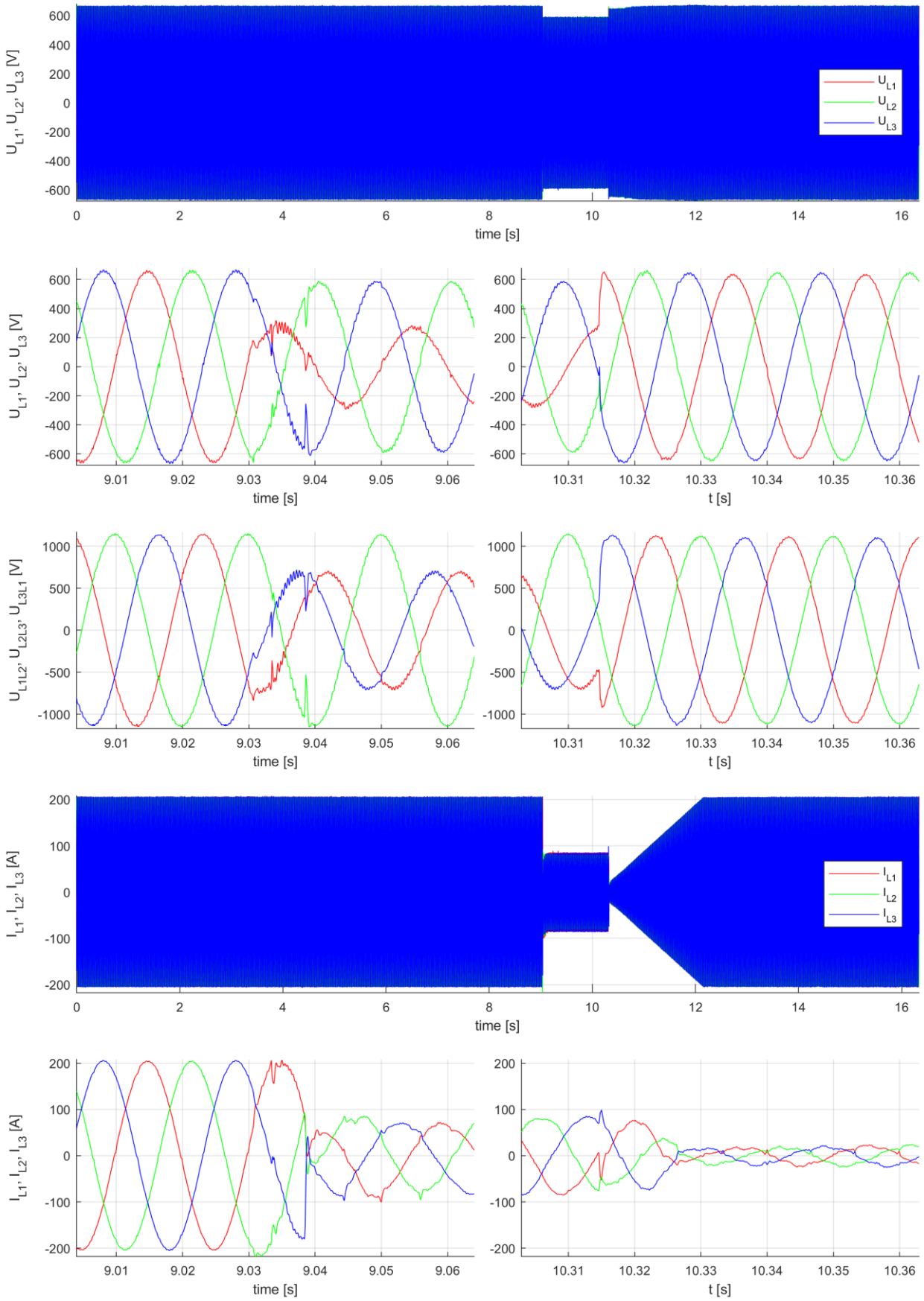
[2)] Under-excited / inductive reactive current has a negative sign, over-excited / capacitive reactive current has a positive sign, the sign of the reactive power is the same as the reactive current.

Note:

* The grid fault type C (phase-to-phase fault without grounding) was simulated at the medium voltage side of the Dy-medium-voltage transformer, following diagram shows the measurement at the low voltage side of the transformer – grid fault type D on low voltage side.

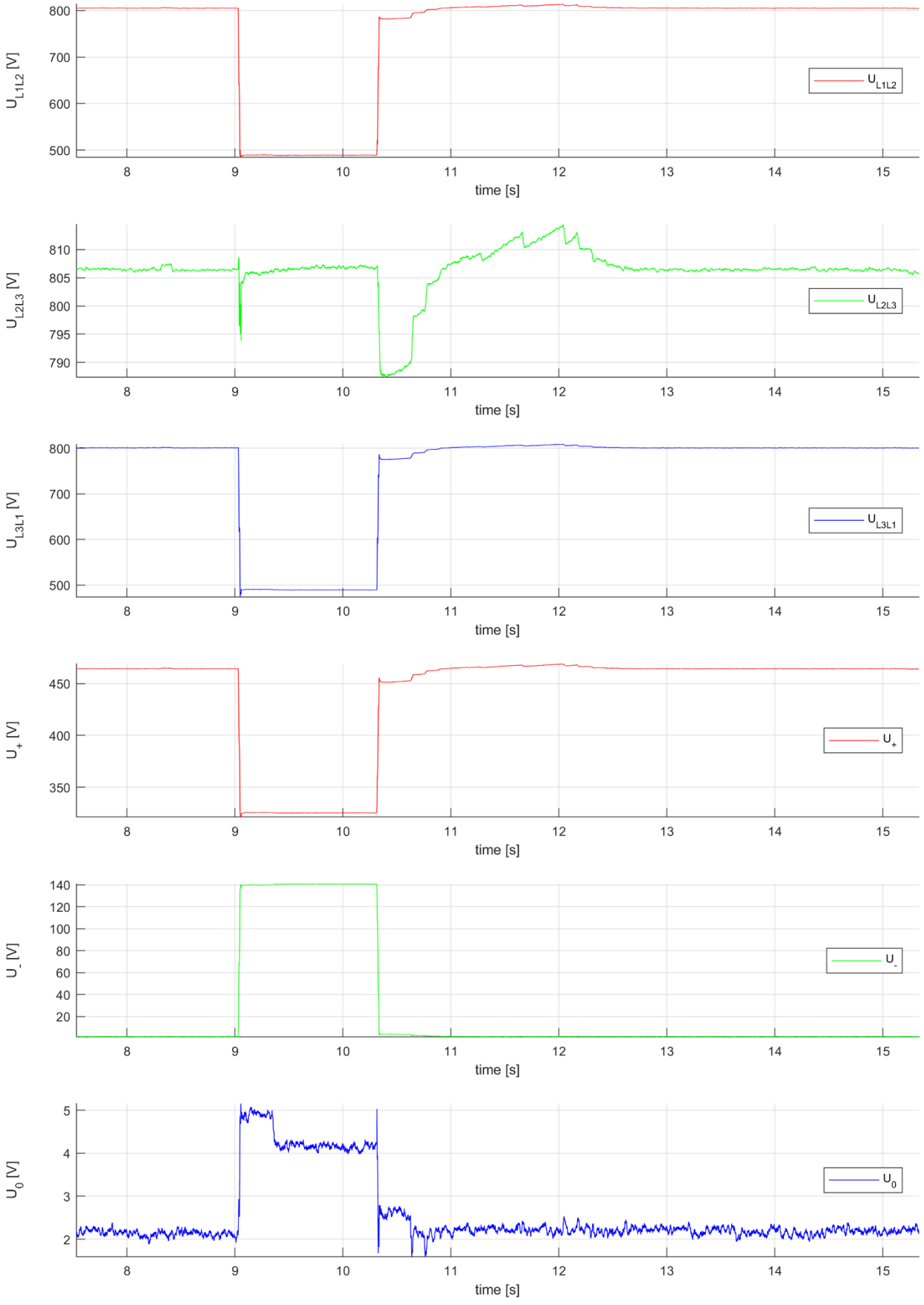
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Timedomain values



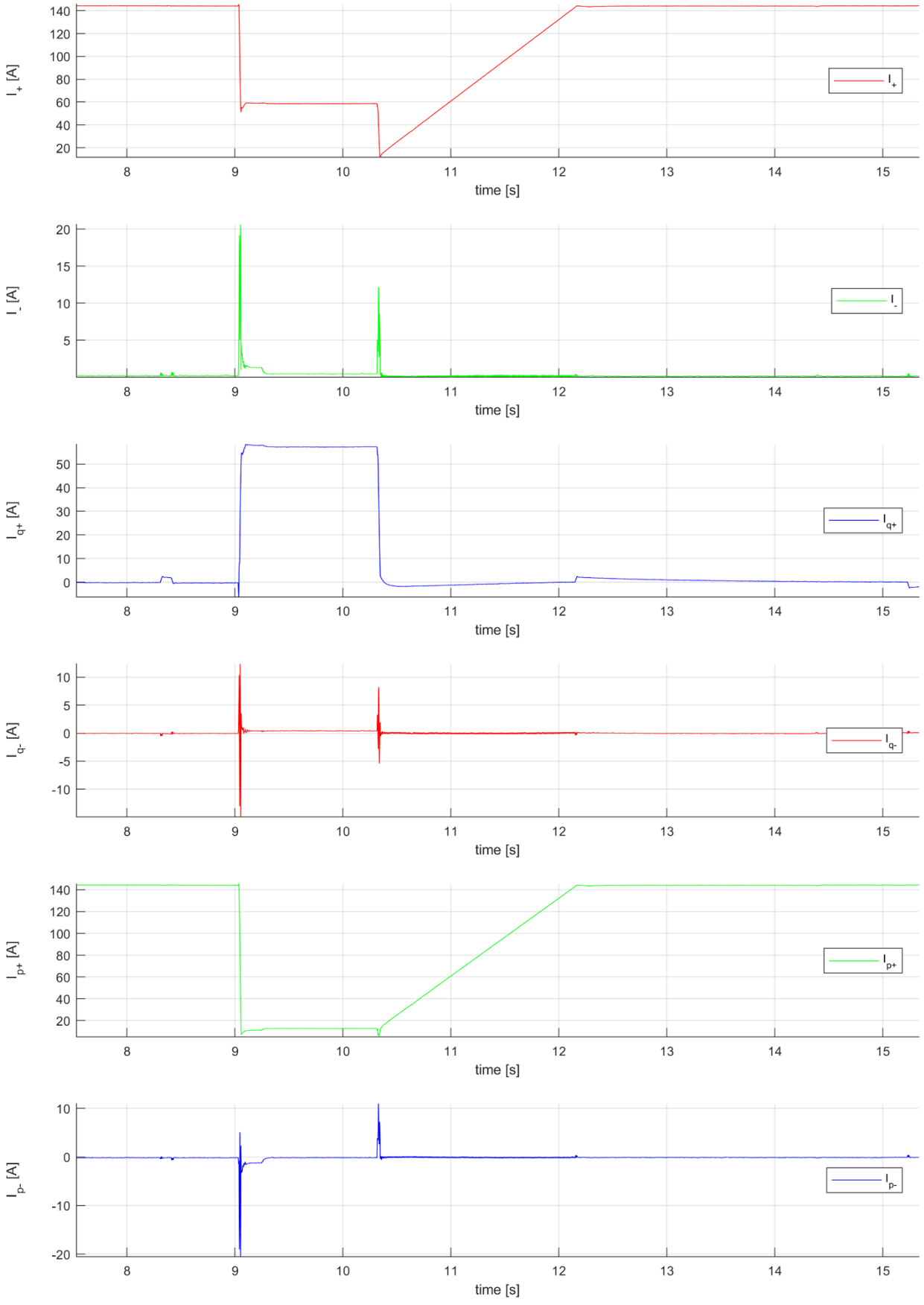
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Positive sequence components and RMS values



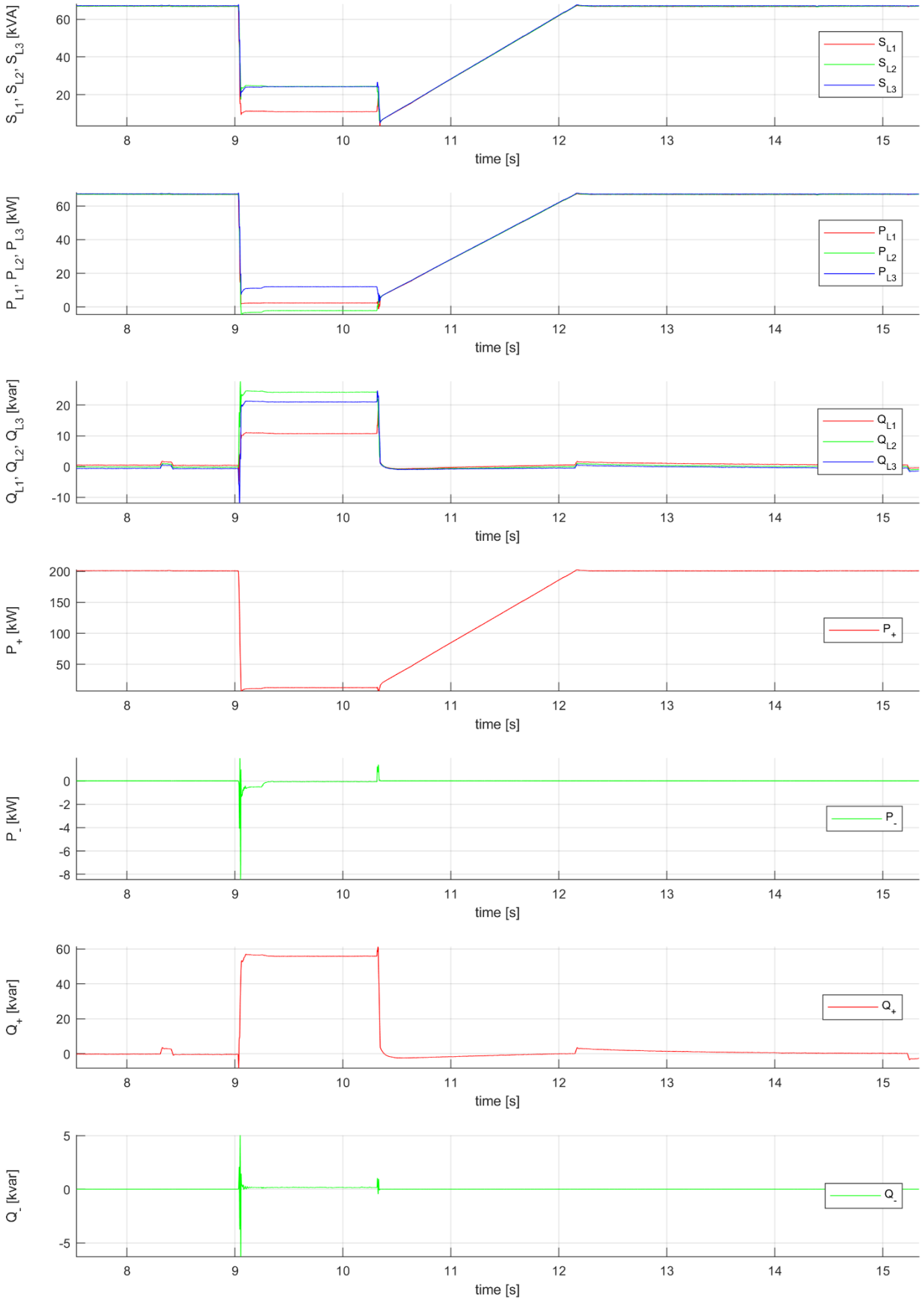
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Positive sequence components and RMS values



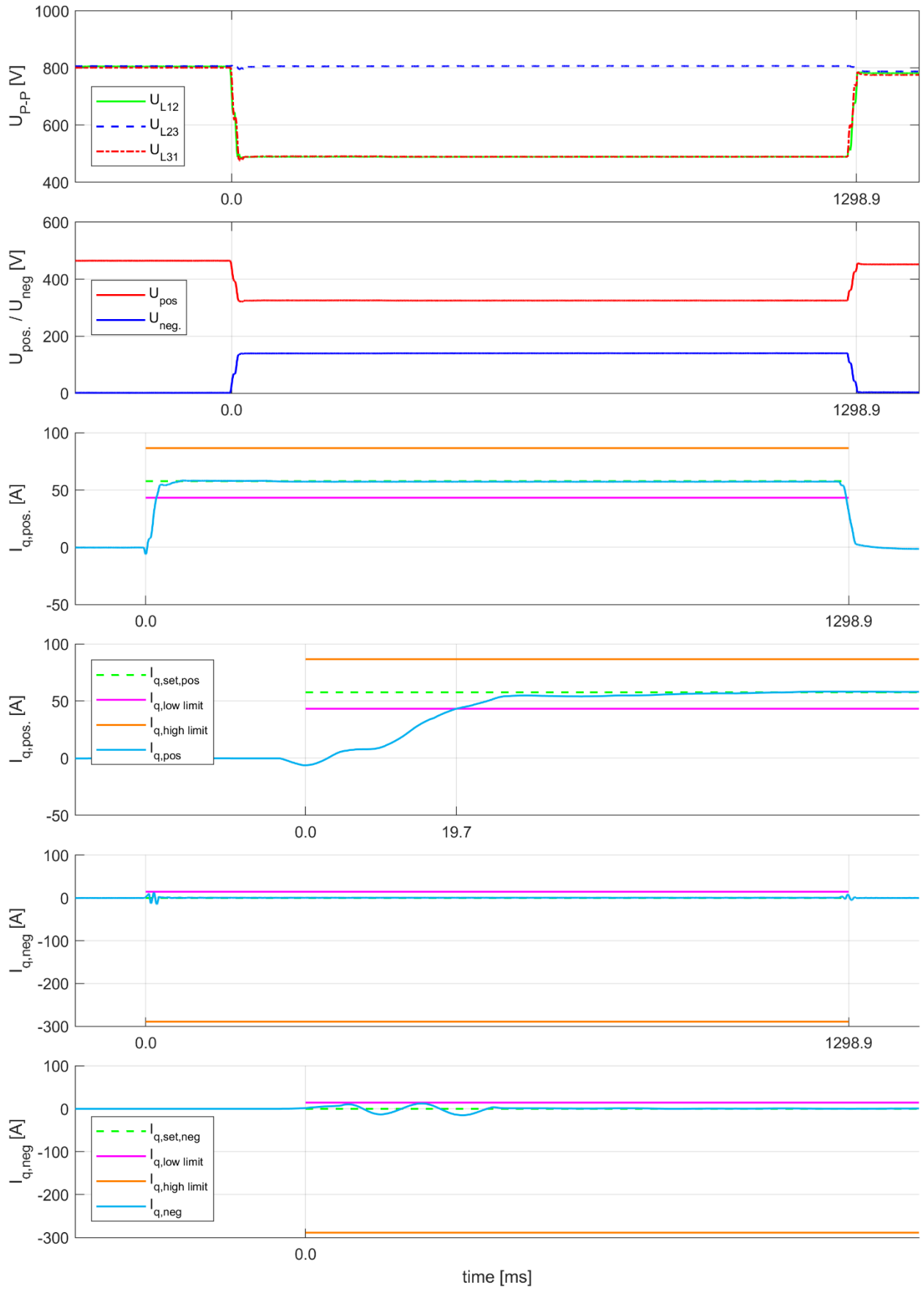
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Positive sequence components and RMS values



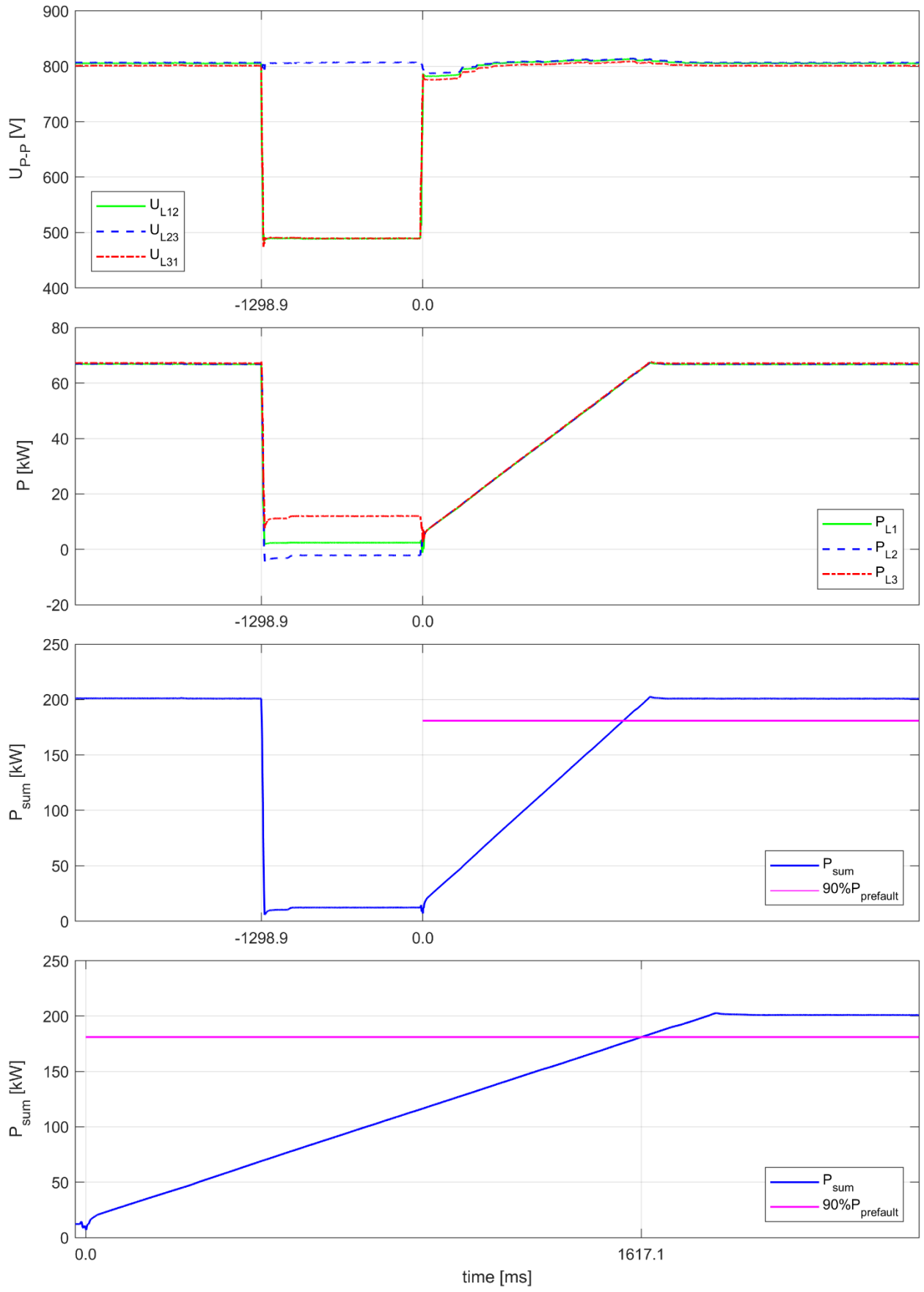
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Positive sequence components and RMS values



B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Positive sequence components and RMS values



B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

CEA_2.2.2

	No.	Parameter	Description / calculation basis	Results		
Gerneral information	1	Test no.	-	CEA_2.2.2-1		
	2	Data file name	-	CEA_2.2.2-1.wdf		
	3	MD5-Checksum	-	880de76b64297f95600026f6fa807e11		
	4	Date	[yyyy-mm-dd]	2020-09-23		
	5	Time	[hh:mm:ss]	11:20:24		
	6	Type of fault (number of affected phases)	Fault type D on low-voltage side	Two-phase		
	Phase reference			**A** [1)]	**B** [1)]	**C** [1)]
	7	Fault occurrence (t_1)	[ms]	10669.2		
	8	Fault clearance (t_2)	[ms]	11961.5		
	9	Fault duration determined from test	*(from time domain voltage results)* [ms]	1292.3		
	10	Measeured value of voltage drop / increase	*(per phase-to-neutral, t_1 + 100ms … t_2 and t_1 - 60s … t_1)* [p.u. U_n]	0.413	0.897	0.900
	11	Measeured value of voltage drop / increase	*(per phase-to-phase, t_1 + 100ms … t_2 and t_1 - 60s … t_1)* [p.u. U_n]	0.615	1.014	0.616
	12	Measeured value of voltage drop / increase	*(positive sequence, phase-to-neutral, t_1 + 100ms … t_2 and t_1 - 60s … t_1)* [p.u. U_n]	0.708		
Before grid fault t_1	13	Voltage reference	*(positive sequence, phase-to-neutral averaged over t_1 - 60s … t_1)* [p.u. U_n]	1.004		
	14	Voltage reference	*(negative sequence, phase-to-neutral averaged over t_1 - 60s … t_1)* [p.u. U_n]	0.004		
	15	Reactive current reference [2)]	*(RMS, averaged over t_1 – 10s … t_1)* [p.u. I_n]	0.000		
	16	Active power reference	*(RMS, averaged over t_1 – 10s … t_1)* [p.u. P_n]	0.202		
	17	Reactive power [2)]	*(RMS, averaged over t_1 – 10s … t_1)* [p.u. P_n]	0.000		
During Grid fault t1 till t2	18	Reactive current [2)]	*(positive sequence, averaged over t_1 + 100ms … t_2 - 20ms)* [p.u. I_n]	0.411		
	19	Reactive current [2)]	*(negative sequence, averaged over t_1 + 100ms … t_2 - 20ms)* [p.u. I_n]	0.003		
	20	Apparent current	*(positive sequence, averaged over t_1 + 100ms … t_2 - 20ms)* [p.u. I_n]	0.421		
After fault clearence t2	21	Settling time of active power (from restoration of the voltage ≥ 90% of nominal voltage until the Active Power output restored to ≥ 90% of the pre-fault level)	[s]	0.185		

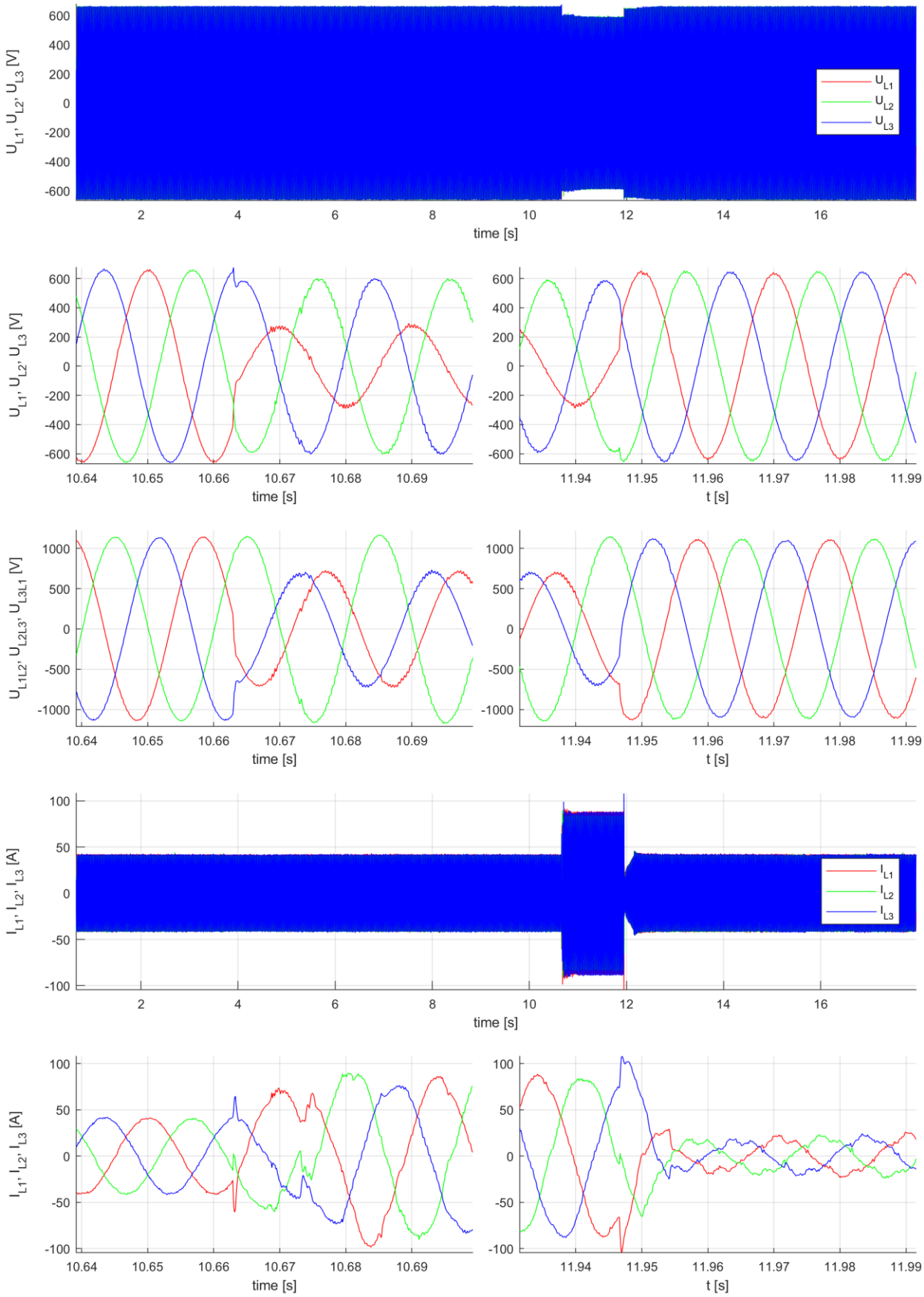
Note:
[1)] A / B / C indicate the phase-neutral voltages (L1, L2, L3), phase-phase voltages (L12, L23, L31) or the phase currents (L1, L2, L3), for details see *Description / calculation basis*.
[2)] Under-excited / inductive reactive current has a negative sign, over-excited / capacitive reactive current has a positive sign, the sign of the reactive power is the same as the reactive current.

Note:

* The grid fault type C (phase-to-phase fault without grounding) was simulated at the medium voltage side of the Dy-medium-voltage transformer, following diagram shows the measurement at the low voltage side of the transformer – grid fault type D on low voltage side.

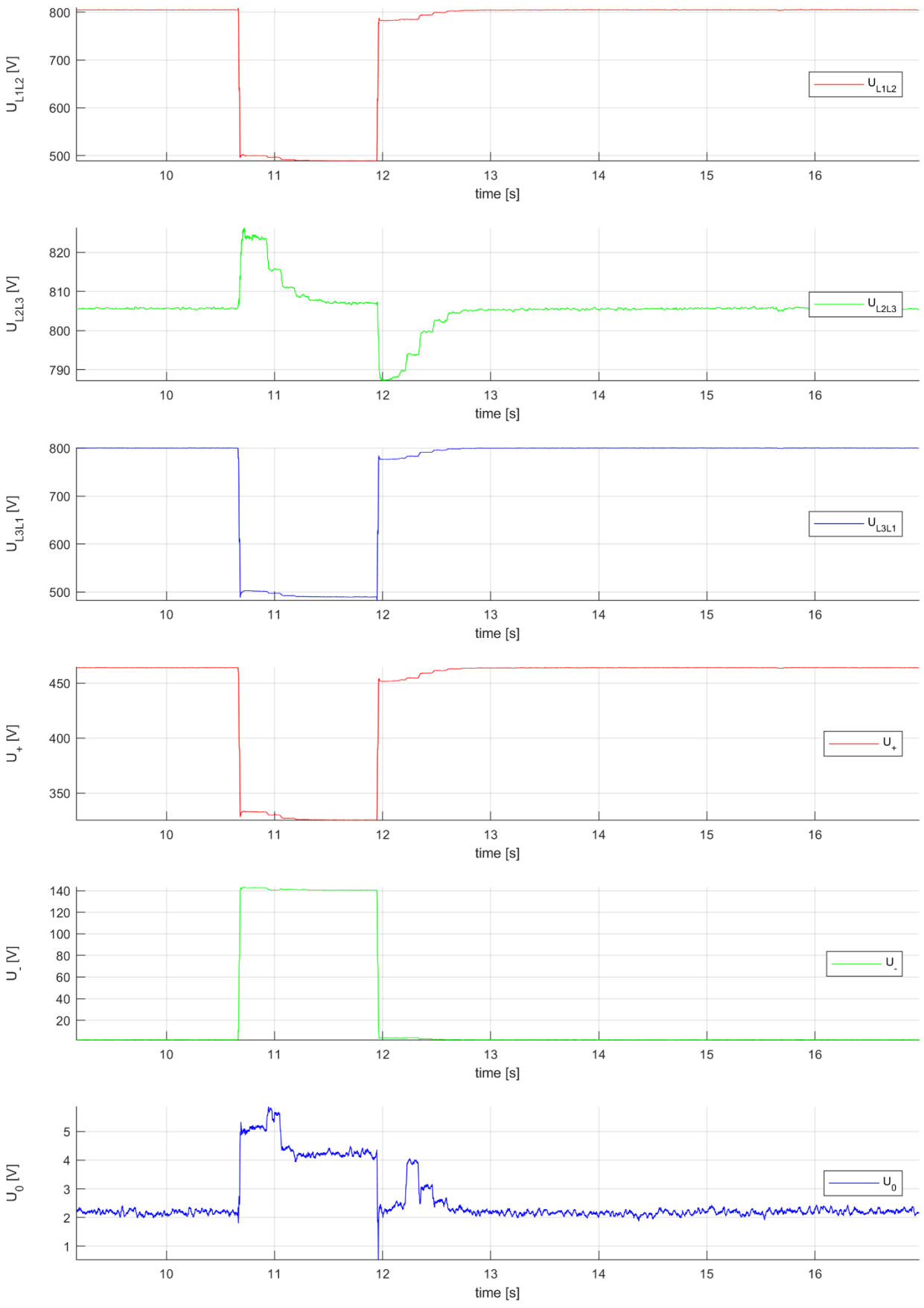
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Timedomain values



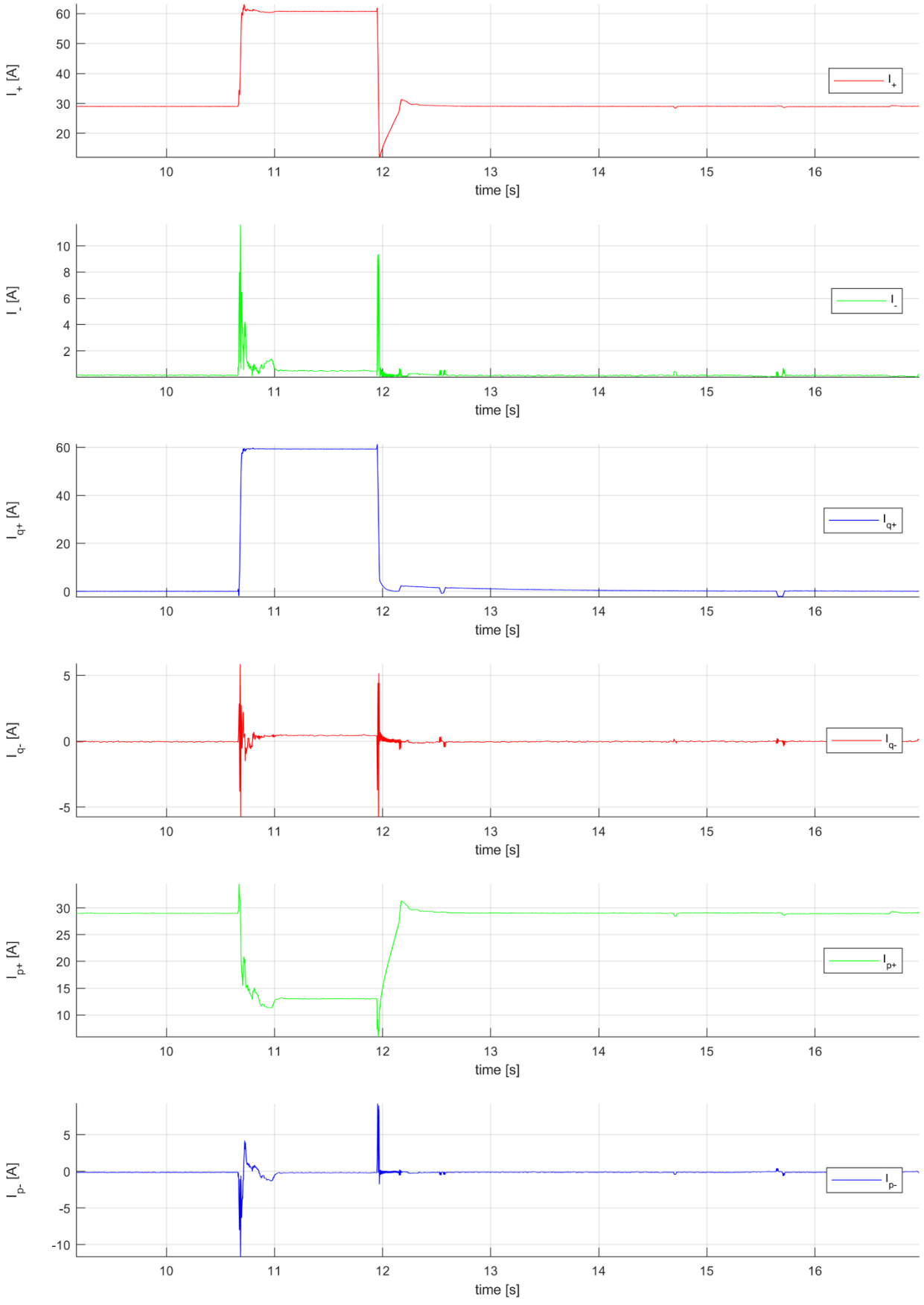
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Positive sequence compnents and RMS values



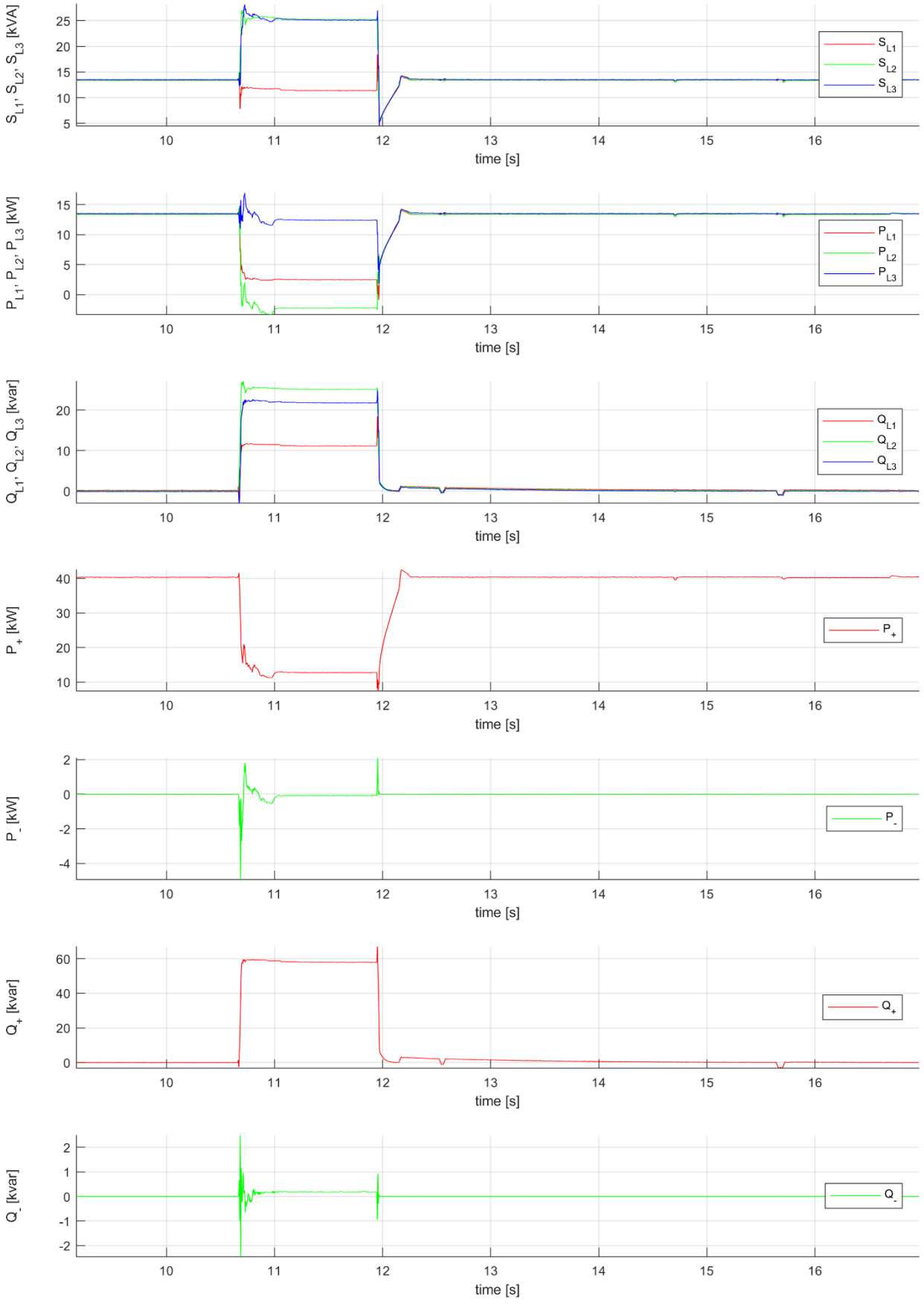
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Positive sequence components and RMS values



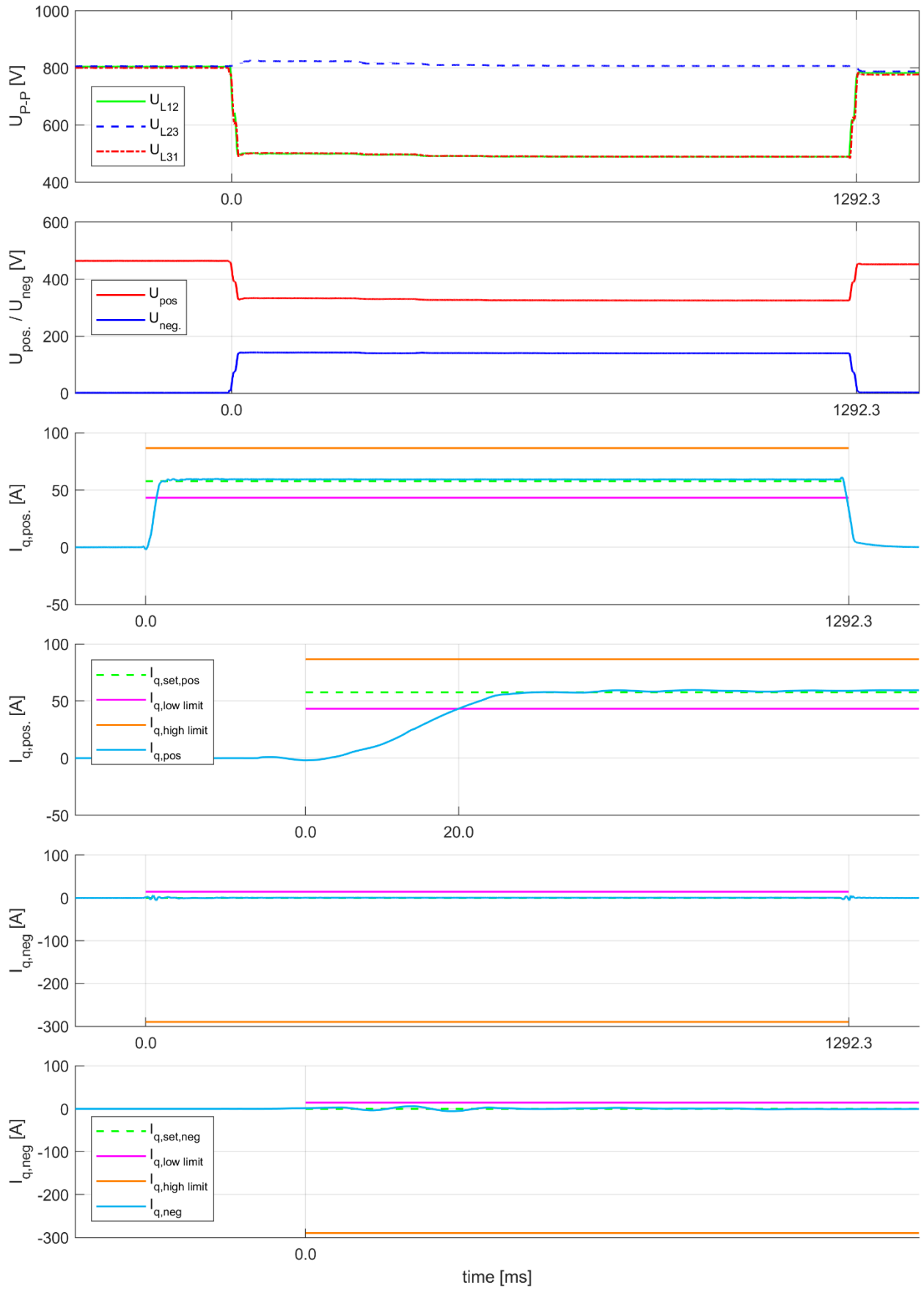
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Positive sequence components and RMS values



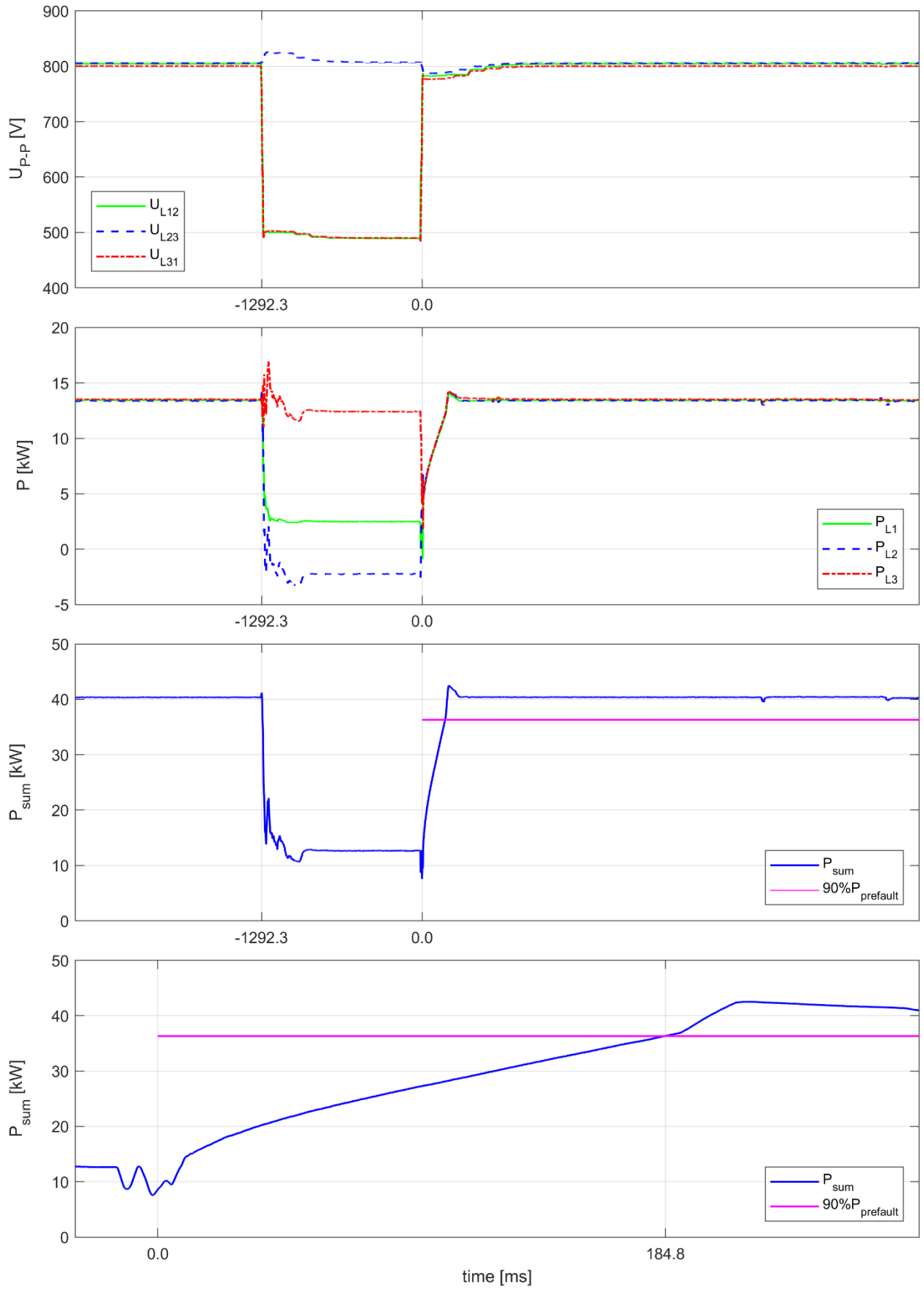
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Positive sequence components and RMS values



B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Positive sequence components and RMS values



B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

CEA_2.3.1

	No.	Parameter	Description / calculation basis	Results		
Gerneral information	1	Test no.	-	CEA_2.3.1-1		
	2	Data file name	-	CEA_2.3.1-1.wdf		
	3	MD5-Checksum	-	f9f9c300d7ce4e346b13fbef9fdc7ee1		
	4	Date	[yyyy-mm-dd]	2020-09-29		
	5	Time	[hh:mm:ss]	06:44:52		
	6	Type of fault (number of affected phases)	Fault type B on low-voltage side	One-phase		
	Phase reference			**A [1)]**	**B [1)]**	**C [1)]**
	7	Fault occurrence (t_1)	[ms]	7539.3		
	8	Fault clearance (t_2)	[ms]	8840.4		
	9	Fault duration determined from test	*(from time domain voltage results)* [ms]	1301.1		
	10	Measeured value of voltage drop / increase	*(per phase-to-neutral, t_1 + 100ms … t_2 and t_1 - 60s … t_1)* [p.u. U_n]	0.409	1.003	1.006
	11	Measeured value of voltage drop / increase	*(per phase-to-phase, t_1 + 100ms … t_2 and t_1 - 60s … t_1)* [p.u. U_n]	0.727	1.006	0.727
	12	Measeured value of voltage drop / increase	*(positive sequence, phase-to-neutral, t_1 + 100ms … t_2 and t_1 - 60s … t_1)* [p.u. U_n]	0.806		
Before grid fault t_1	13	Voltage reference	*(positive sequence, phase-to-neutral averaged over t_1 - 60s … t_1)* [p.u. U_n]	1.005		
	14	Voltage reference	*(negative sequence, phase-to-neutral averaged over t_1 - 60s … t_1)* [p.u. U_n]	0.004		
	15	Reactive current reference [2)]	*(RMS, averaged over t_1 – 10s … t_1)* [p.u. I_n]	0.001		
	16	Active power reference	*(RMS, averaged over t_1 – 10s … t_1)* [p.u. P_n]	1.004		
	17	Reactive power [2)]	*(RMS, averaged over t_1 – 10s … t_1)* [p.u. P_n]	0.001		
During Grid fault t1 till t2	18	Reactive current [2)]	*(positive sequence, averaged over t_1 + 100ms … t_2 - 20ms)* [p.u. I_n]	0.388		
	19	Reactive current [2)]	*(negative sequence, averaged over t_1 + 100ms … t_2 - 20ms)* [p.u. I_n]	0.002		
	20	Apparent current	*(positive sequence, averaged over t_1 + 100ms … t_2 - 20ms)* [p.u. I_n]	0.398		
After fault clearence t2	21	Settling time of active power (from restoration of the voltage ≥ 90% of nominal voltage until the Active Power output restored to ≥ 90% of the pre-fault level)	[s]	1.603		

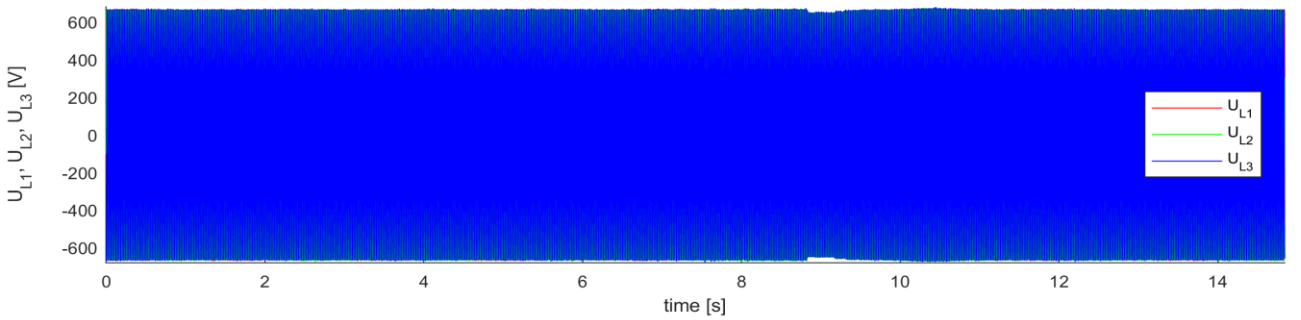
Note:

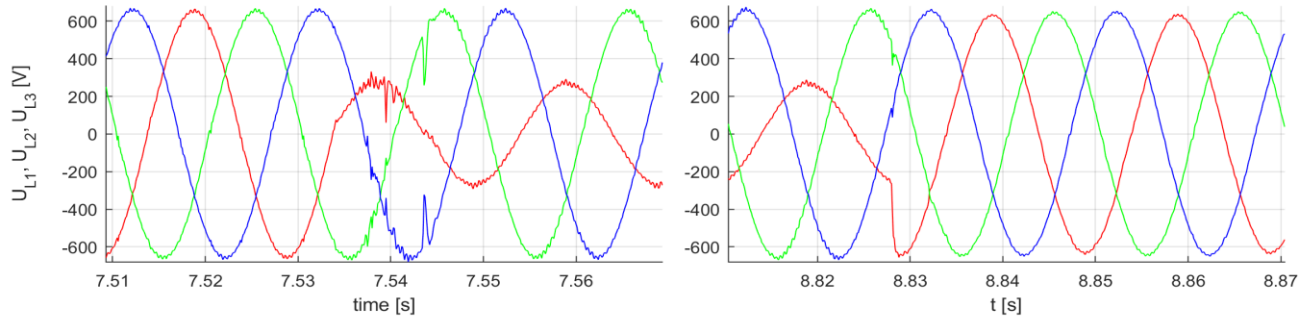
[1)] A / B / C indicate the phase-neutral voltages (L1, L2, L3), phase-phase voltages (L12, L23, L31) or the phase currents (L1, L2, L3), for details see *Description / calculation basis*.

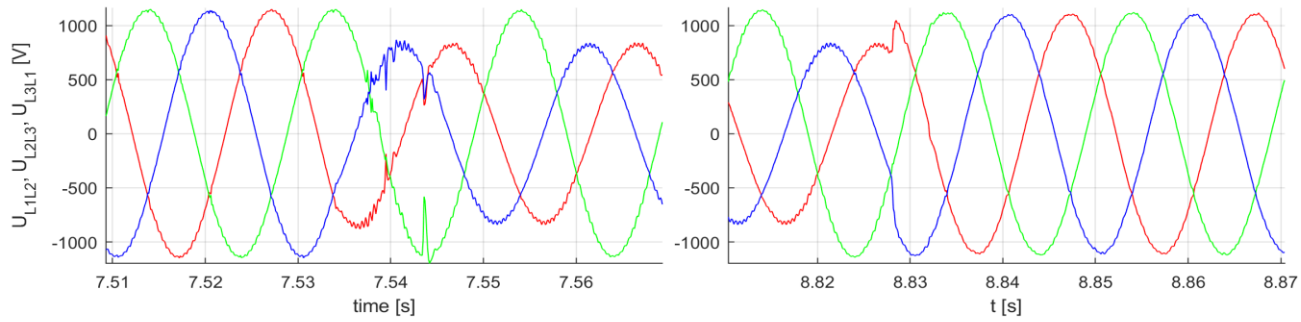
[2)] Under-excited / inductive reactive current has a negative sign, over-excited / capacitive reactive current has a positive sign, the sign of the reactive power is the same as the reactive current.

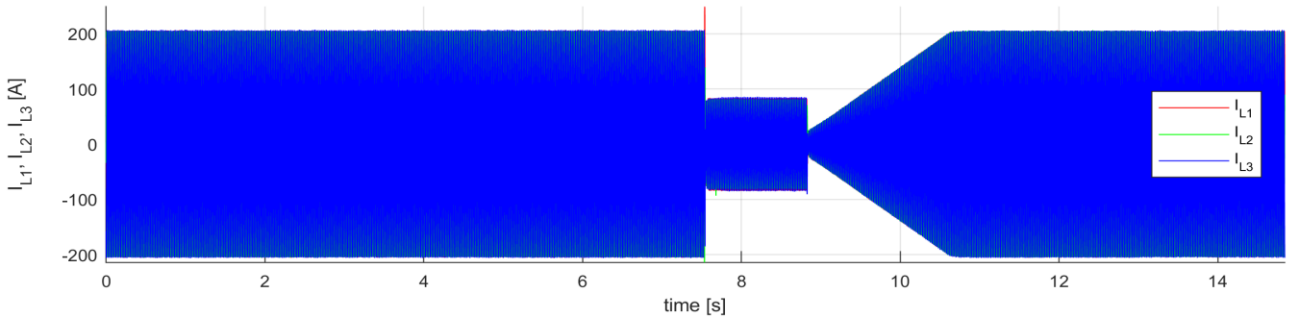
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

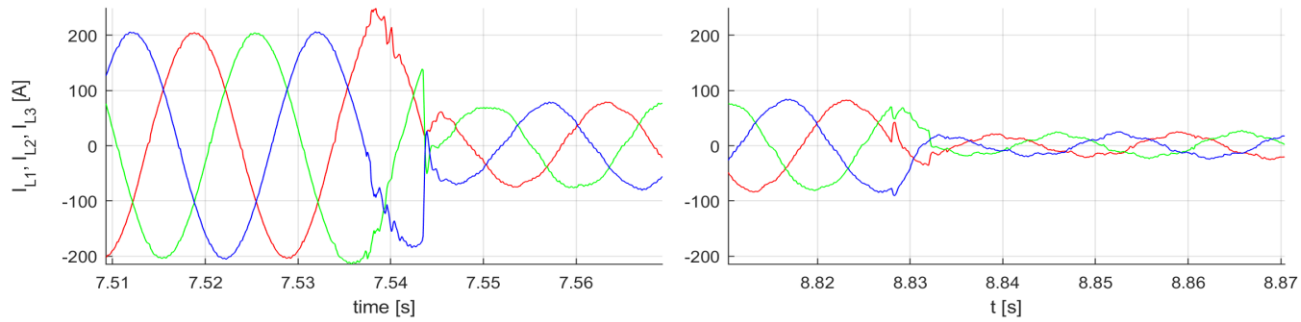
Timedomain values





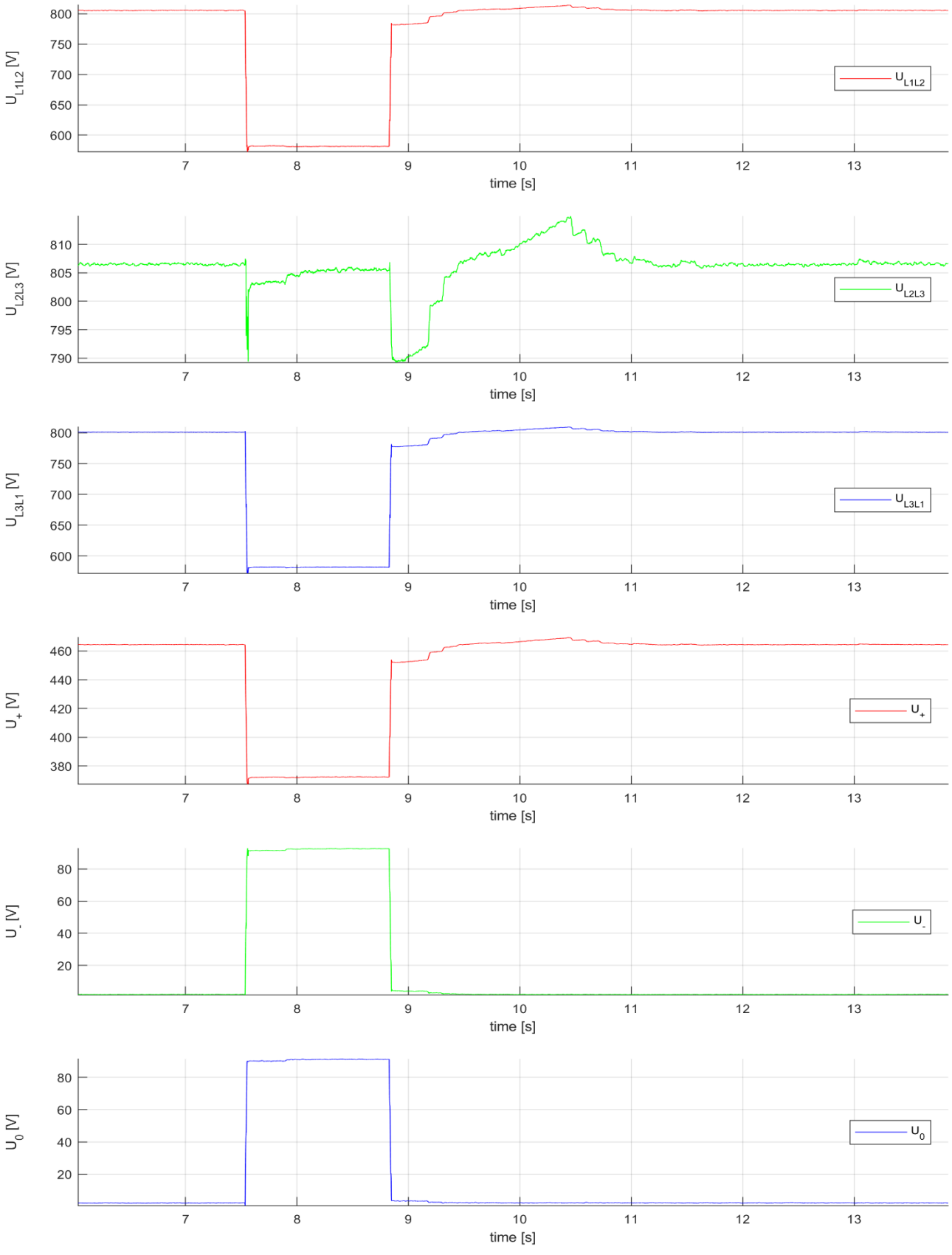






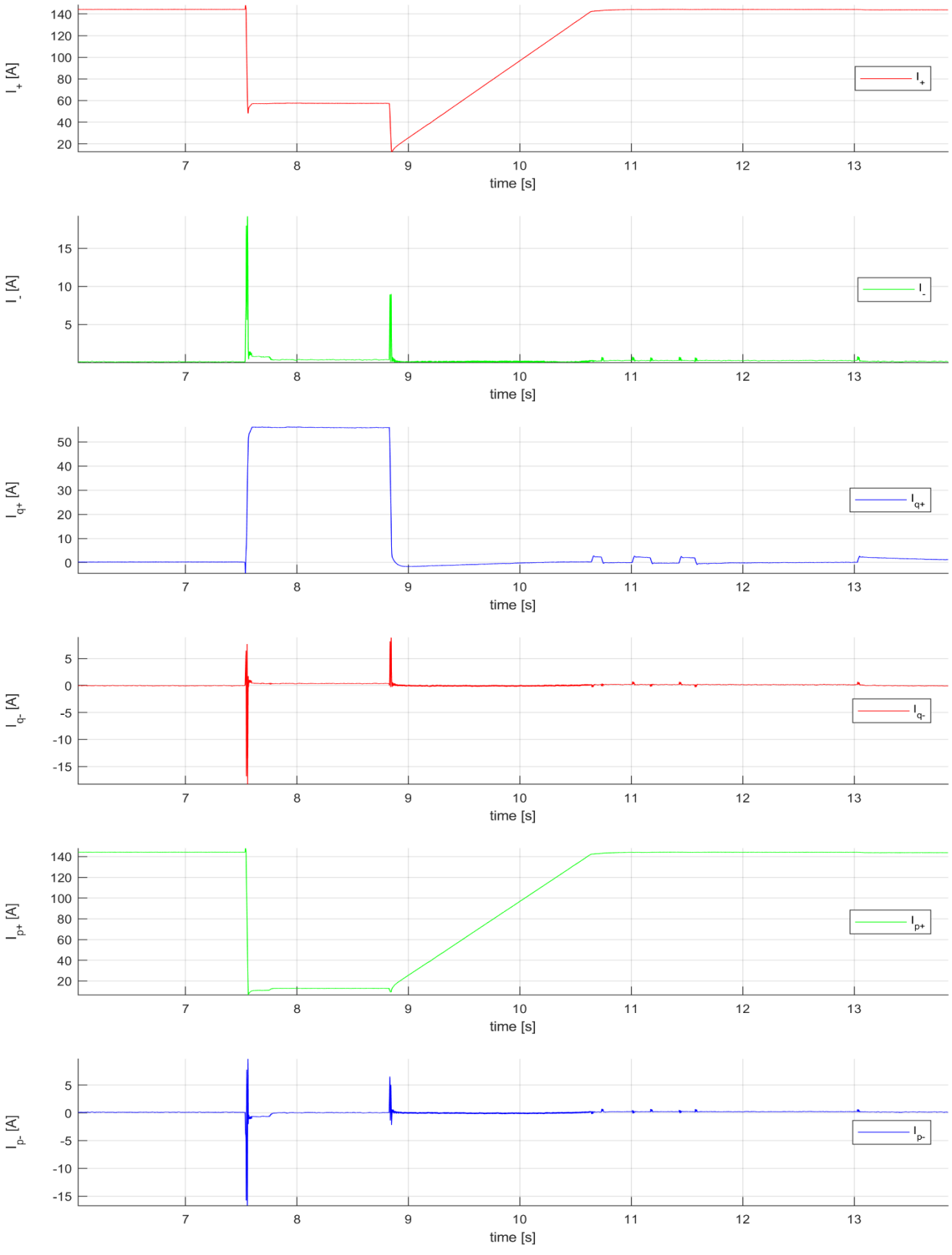
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Positive sequence components and RMS values



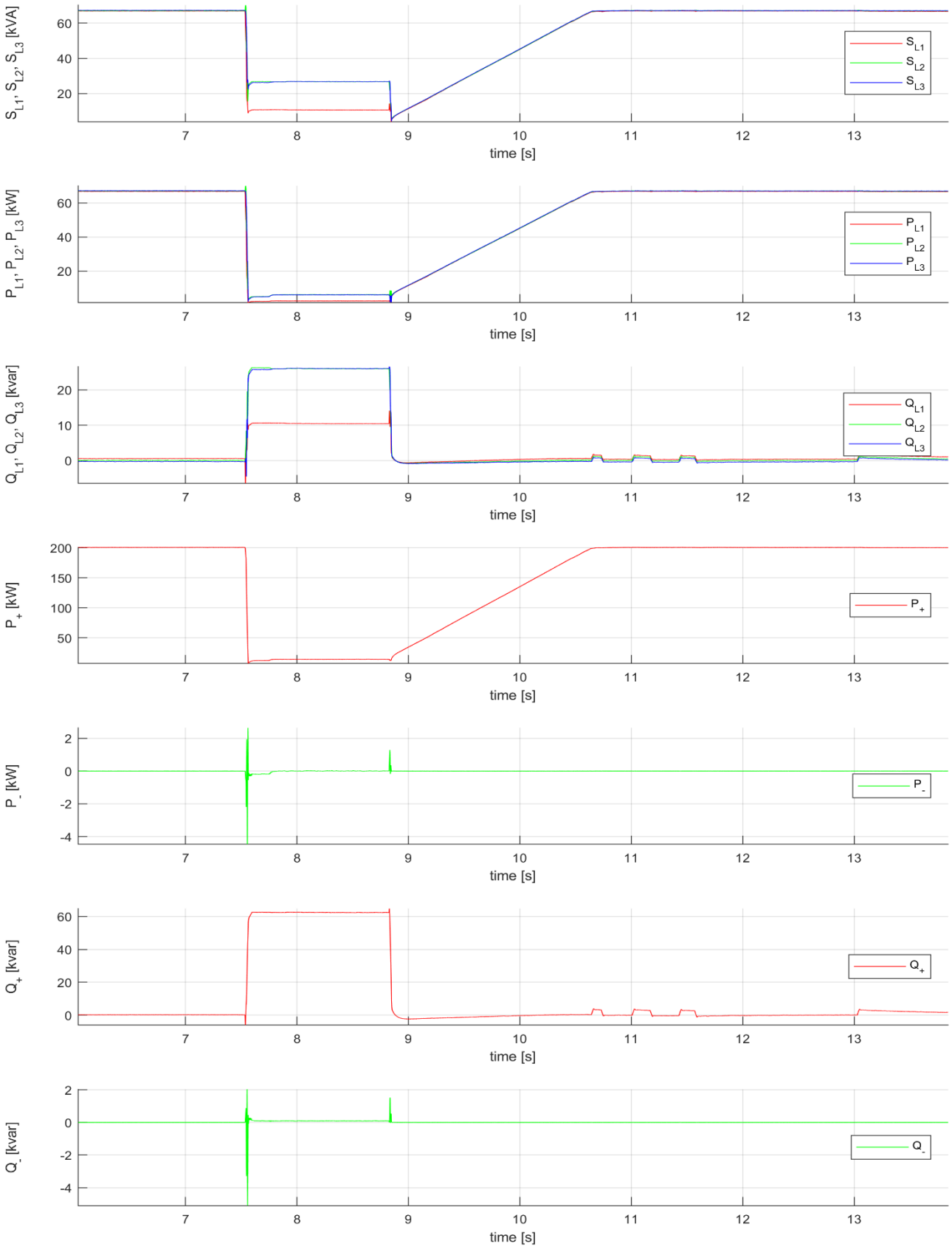
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Positive sequence components and RMS values



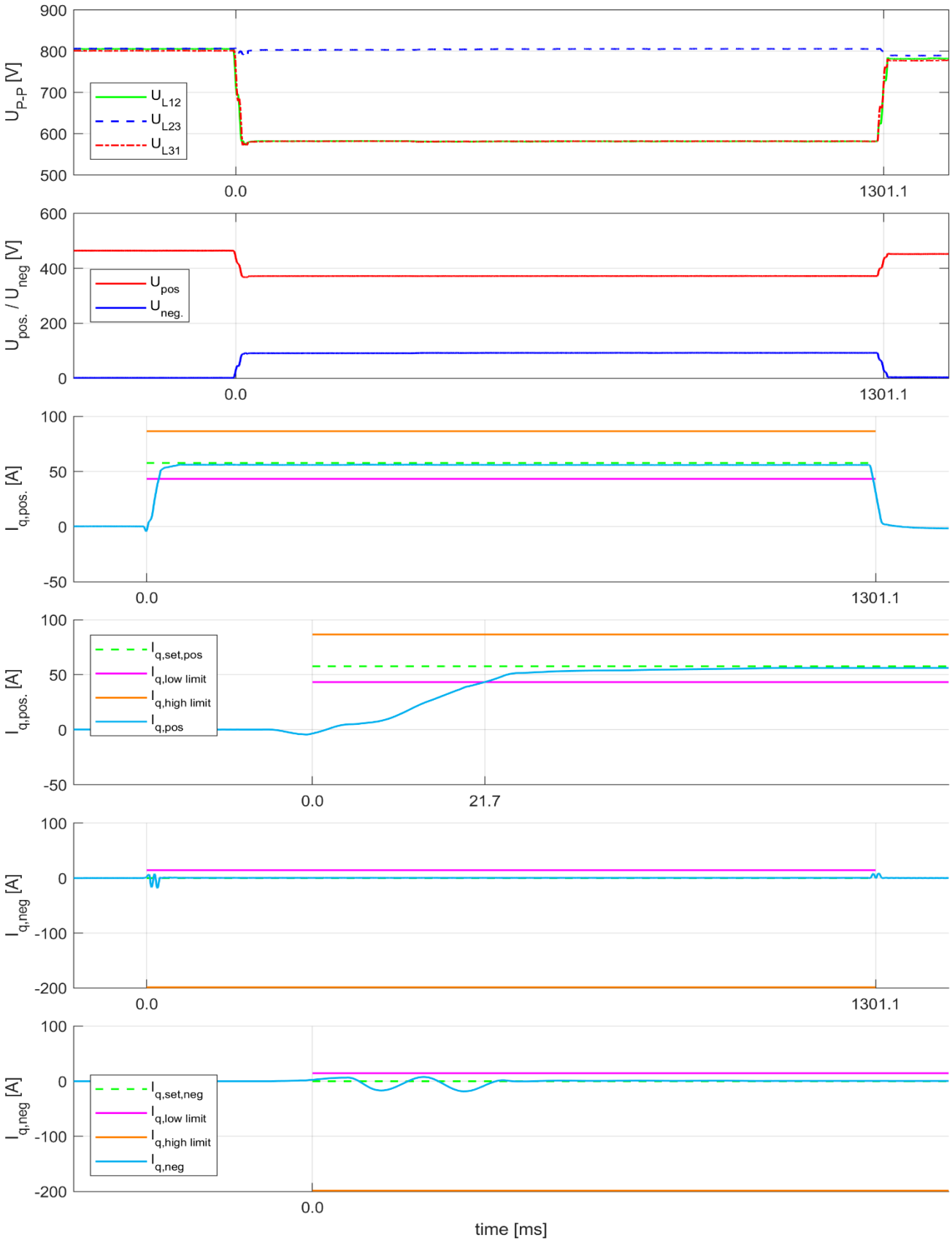
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Positive sequence components and RMS values



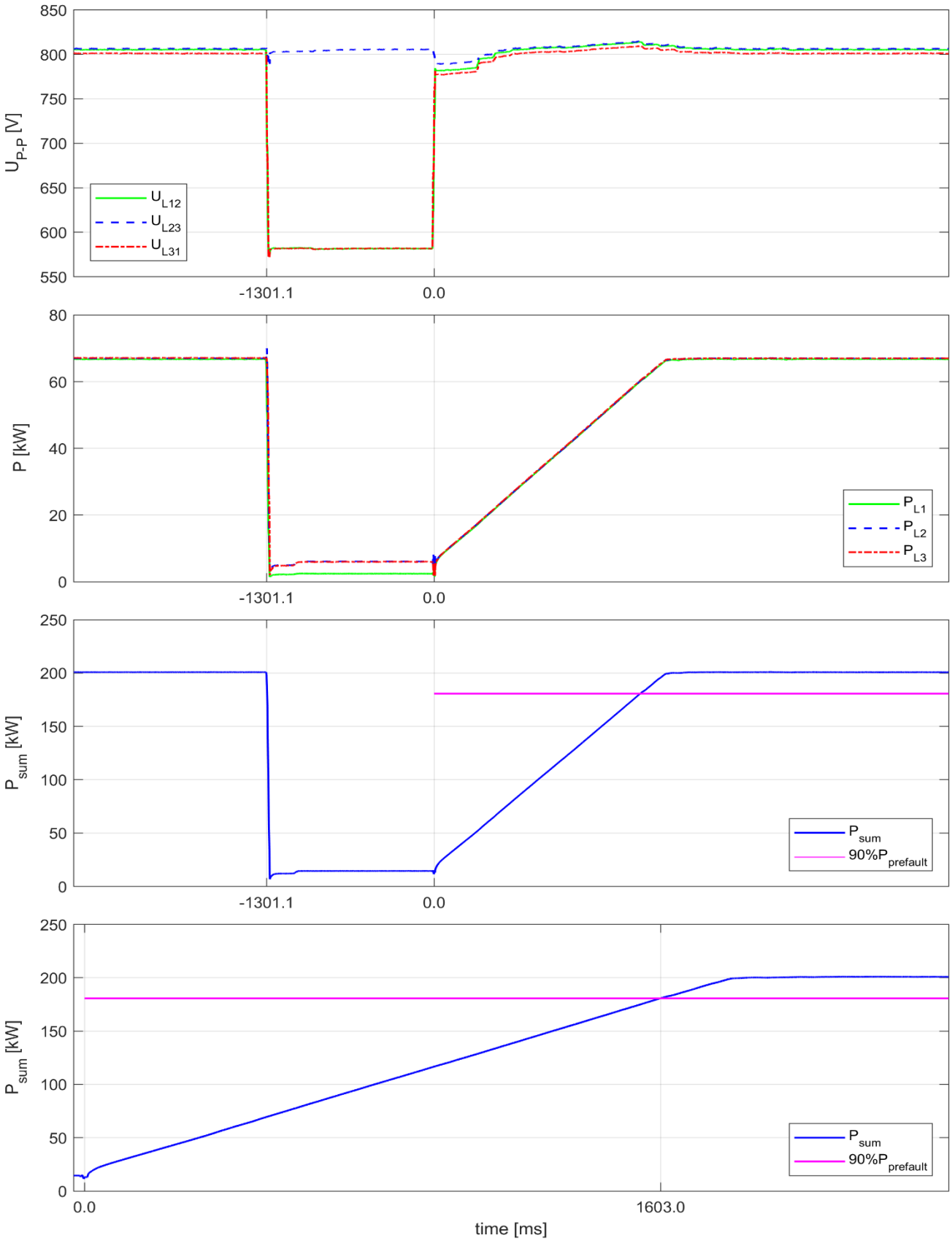
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Positive sequence components and RMS values



B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Positive sequence components and RMS values



B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

CEA_2.3.2

	No.	Parameter	Description / calculation basis	Results		
Gerneral information	1	Test no.	-	CEA_2.3.2-1		
	2	Data file name	-	CEA_2.3.2-1.wdf		
	3	MD5-Checksum	-	f1242e68013b4de865c9b011b08ace89		
	4	Date	[yyyy-mm-dd]	2020-09-29		
	5	Time	[hh:mm:ss]	06:46:24		
	6	Type of fault (number of affected phases)	Fault type B on low-voltage side	One-phase		
	Phase reference			**A [1)]**	**B [1)]**	**C [1)]**
	7	Fault occurrence (t_1)	[ms]	10221.1		
	8	Fault clearance (t_2)	[ms]	11522.2		
	9	Fault duration determined from test	*(from time domain voltage results)* [ms]	1301.1		
	10	Measeured value of voltage drop / increase	*(per phase-to-neutral, t_1 + 100ms … t_2 and t_1 - 60s … t_1)* [p.u. U_n]	0.411	1.010	1.013
	11	Measeured value of voltage drop / increase	*(per phase-to-phase, t_1 + 100ms … t_2 and t_1 - 60s … t_1)* [p.u. U_n]	0.732	1.013	0.732
	12	Measeured value of voltage drop / increase	*(positive sequence, phase-to-neutral, t_1 + 100ms … t_2 and t_1 - 60s … t_1)* [p.u. U_n]	0.811		
Before grid fault t_1	13	Voltage reference	*(positive sequence, phase-to-neutral averaged over t_1 - 60s … t_1)* [p.u. U_n]	1.005		
	14	Voltage reference	*(negative sequence, phase-to-neutral averaged over t_1 - 60s … t_1)* [p.u. U_n]	0.004		
	15	Reactive current reference [2)]	*(RMS, averaged over t_1 – 10s … t_1)* [p.u. I_n]	0.000		
	16	Active power reference	*(RMS, averaged over t_1 – 10s … t_1)* [p.u. P_n]	0.202		
	17	Reactive power [2)]	*(RMS, averaged over t_1 – 10s … t_1)* [p.u. P_n]	0.000		
During Grid fault t1 till t2	18	Reactive current [2)]	*(positive sequence, averaged over t_1 + 100ms … t_2 - 20ms)* [p.u. I_n]	0.383		
	19	Reactive current [2)]	*(negative sequence, averaged over t_1 + 100ms … t_2 - 20ms)* [p.u. I_n]	0.002		
	20	Apparent current	*(positive sequence, averaged over t_1 + 100ms … t_2 - 20ms)* [p.u. I_n]	0.394		
After fault clearence t2	21	Settling time of active power (from restoration of the voltage ≥ 90% of nominal voltage until the Active Power output restored to ≥ 90% of the pre-fault level)	[s]	0.180		

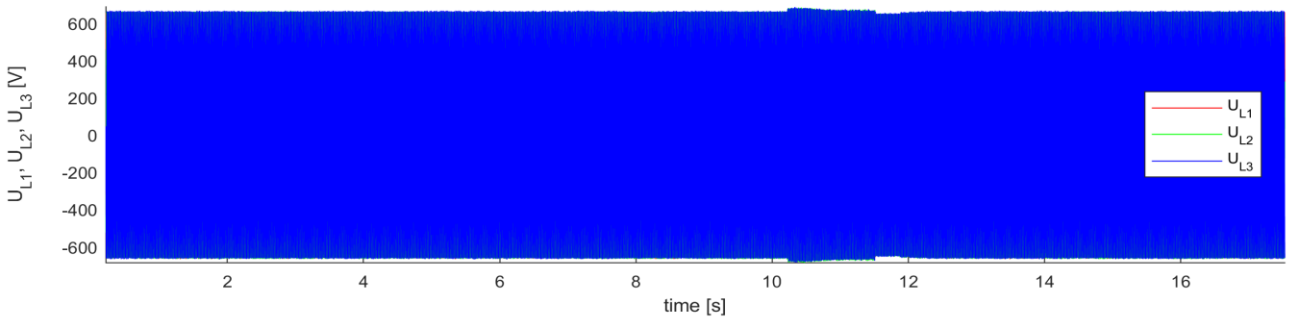
Note:

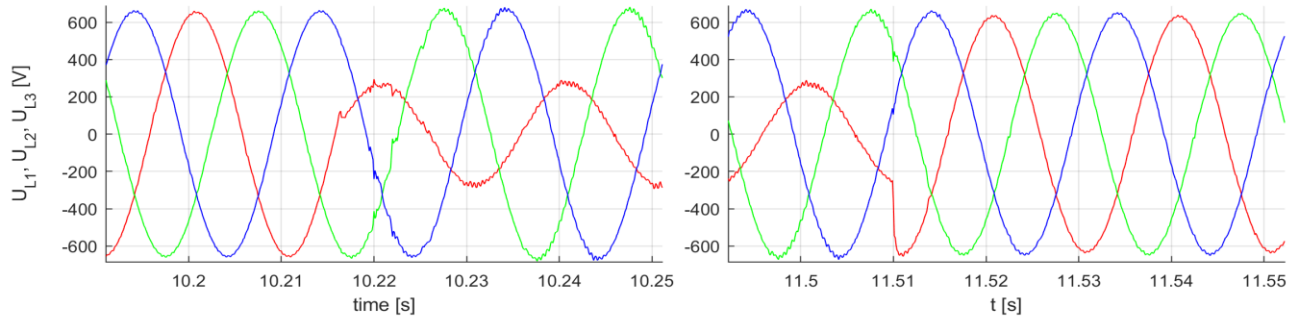
[1)] A / B / C indicate the phase-neutral voltages (L1, L2, L3), phase-phase voltages (L12, L23, L31) or the phase currents (L1, L2, L3), for details see *Description / calculation basis*.

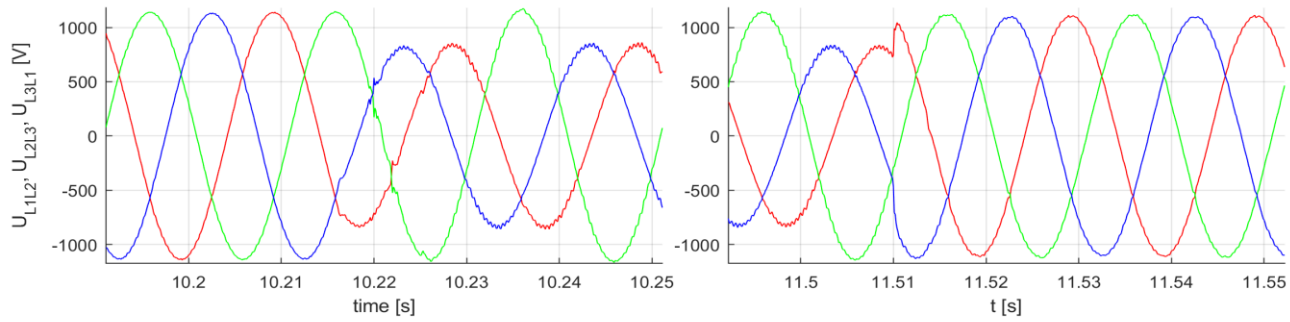
[2)] Under-excited / inductive reactive current has a negative sign, over-excited / capacitive reactive current has a positive sign, the sign of the reactive power is the same as the reactive current.

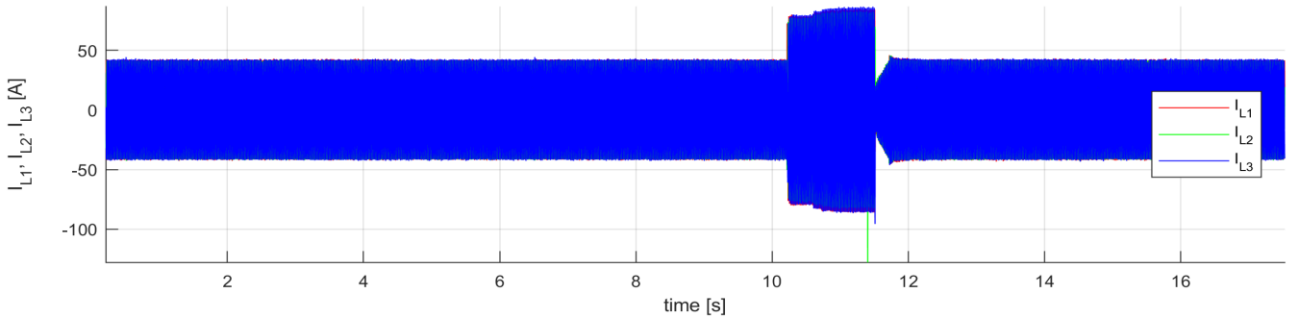
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

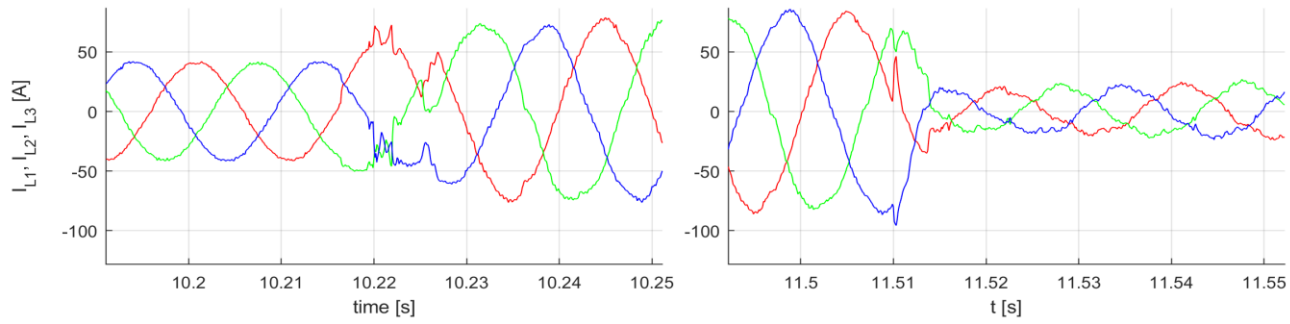
Timedomain values





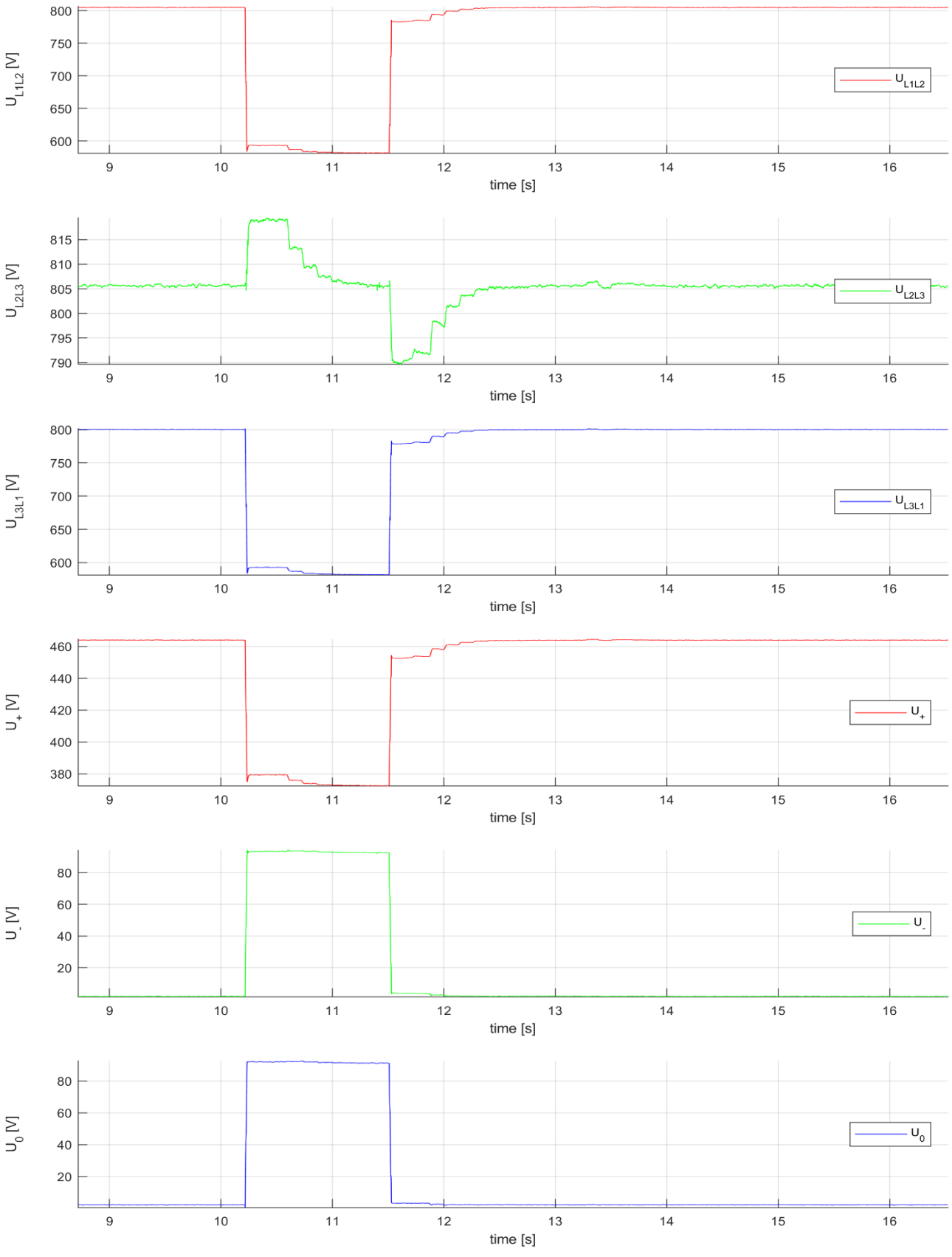






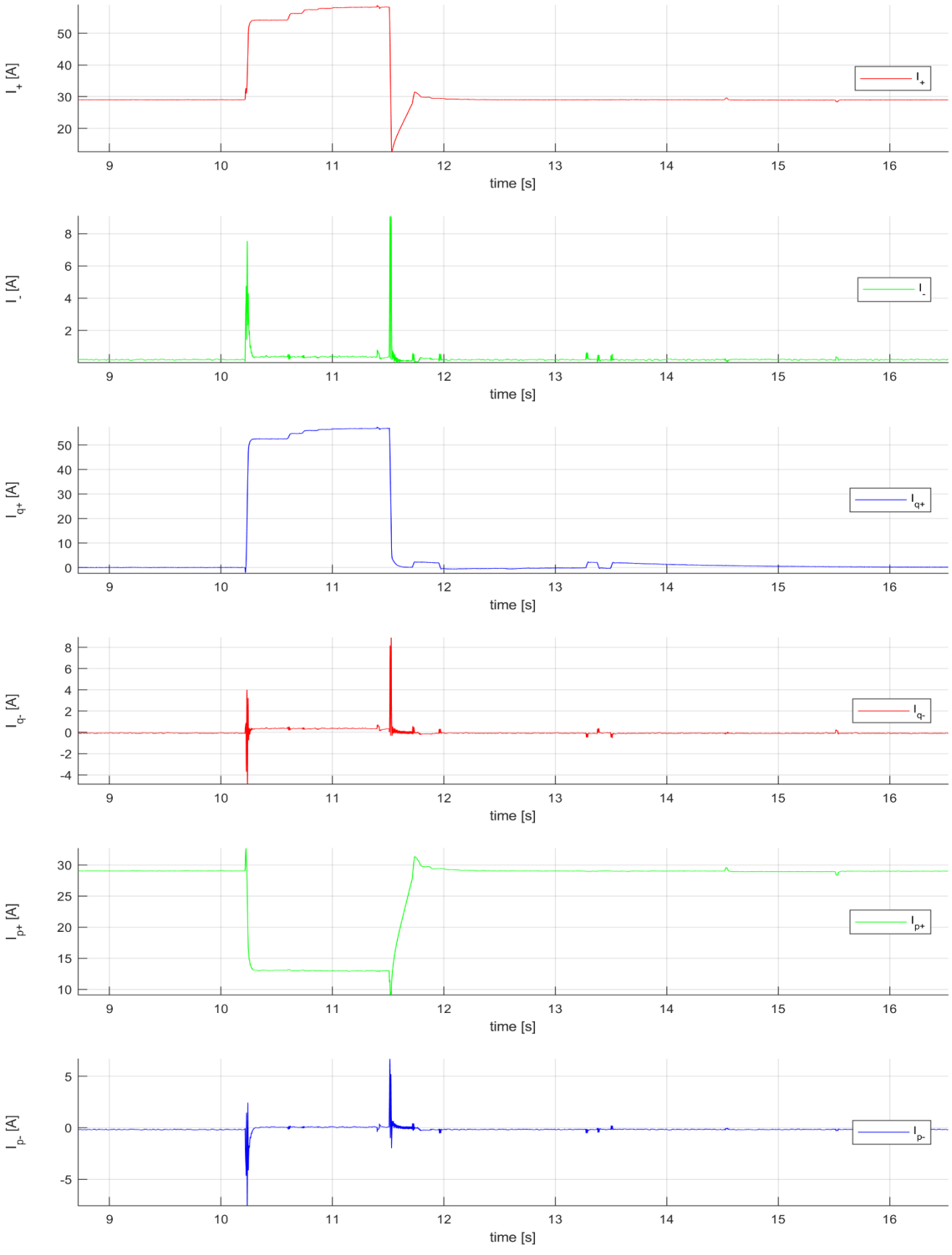
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Positive sequence components and RMS values



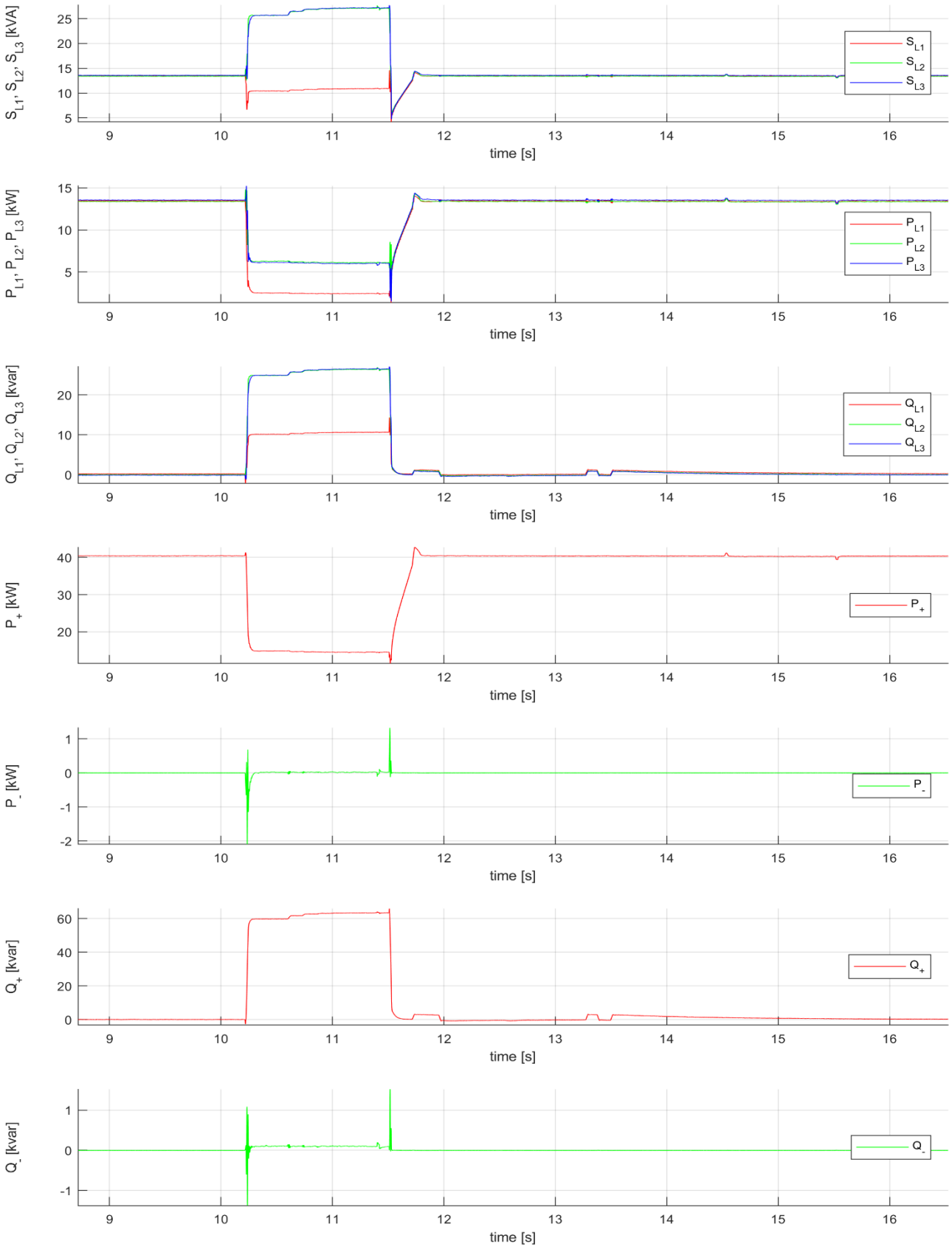
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Positive sequence components and RMS values



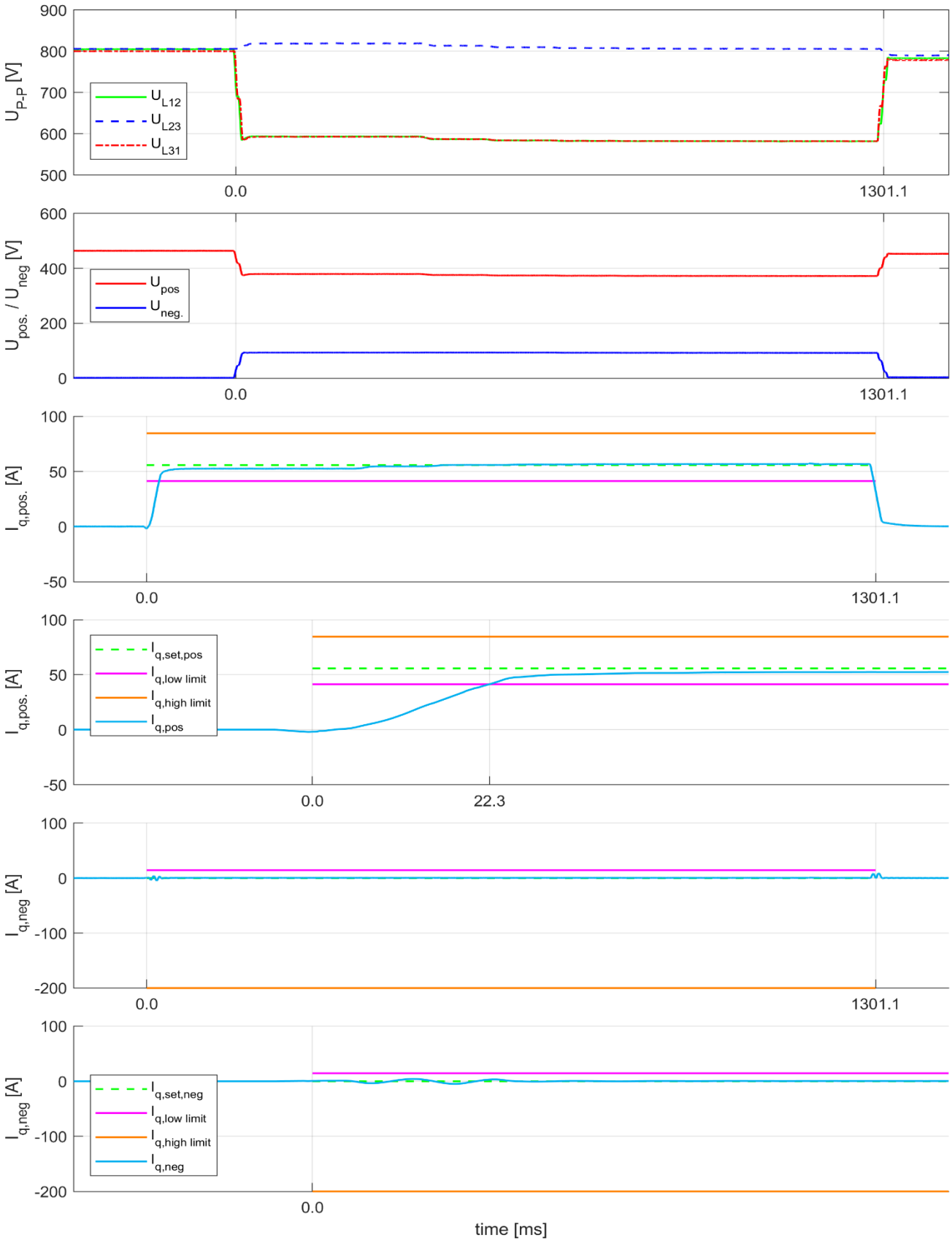
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Positive sequence components and RMS values



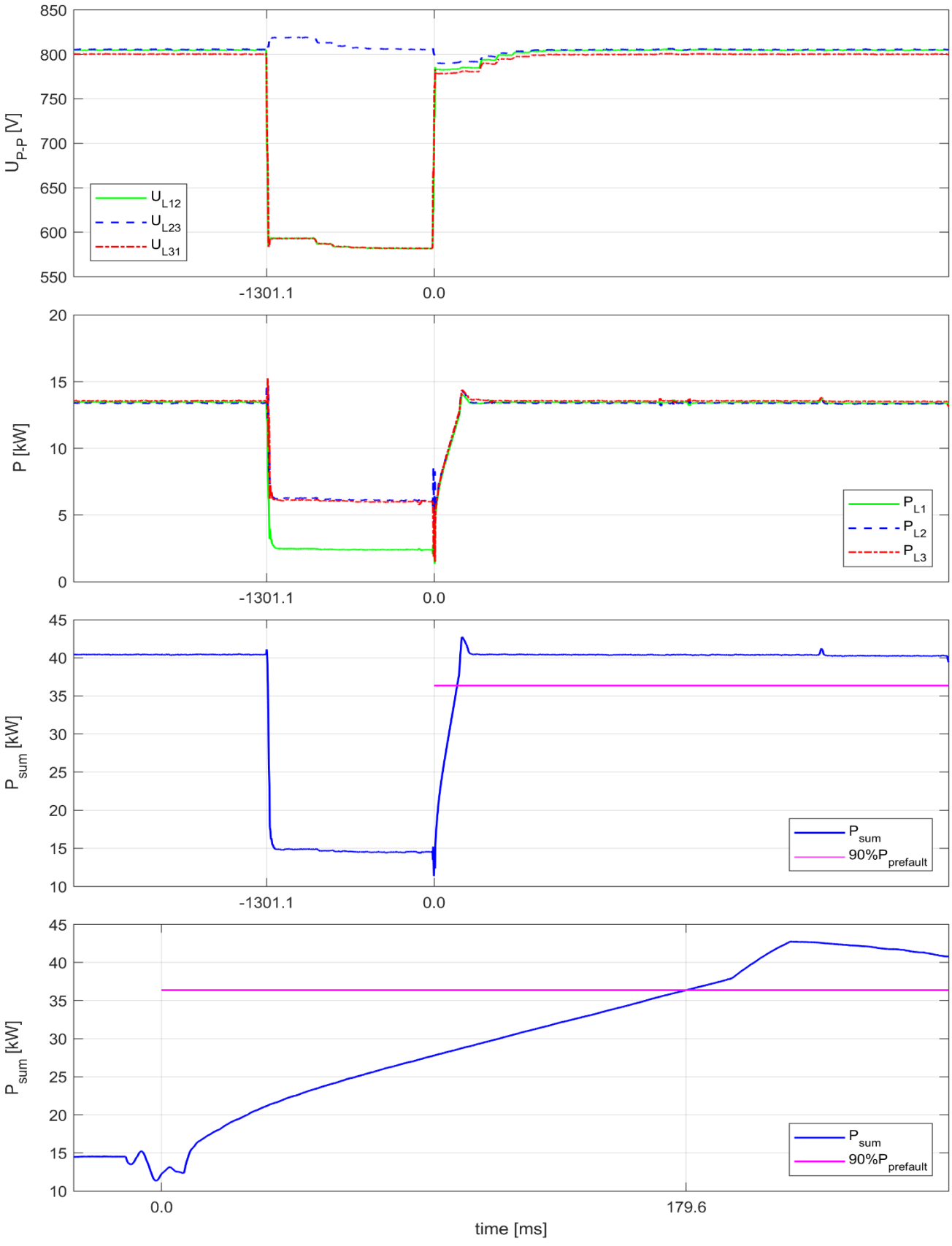
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Positive sequence components and RMS values



B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Positive sequence components and RMS values



B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

CEA_3.1.1

	No.	Parameter	Description / calculation basis	Results		
Gerneral information	1	Test no.	-	CEA_3.1.1-1		
	2	Data file name	-	CEA_3.1.1-1.vvf		
	3	MD5-Checksum	-	0589a9ca9faac3a594b0e309a5b9fd75		
	4	Date	[yyyy-mm-dd]	2020-10-11		
	5	Time	[hh:mm:ss]	03:17:08		
	6	Type of fault (number of affected phases)	-	Three-phase		
	Phase reference			**A [1)]**	**B [1)]**	**C [1)]**
	7	Fault occurrence (t_1)	[ms]	8086.1		
	8	Fault clearance (t_2)	[ms]	11101.1		
	9	Fault duration determined from test	*(from time domain voltage results)* [ms]	3015.0		
	10	Measeured value of voltage drop / increase	*(per phase-to-neutral, t_1 + 100ms … t_2 and t_1 - 60s … t_1)* [p.u. U_n]	0.852	0.853	0.856
	11	Measeured value of voltage drop / increase	*(per phase-to-phase, t_1 + 100ms … t_2 and t_1 - 60s … t_1)* [p.u. U_n]	0.855	0.856	0.850
	12	Measeured value of voltage drop / increase	*(positive sequence, phase-to-neutral, t_1 + 100ms … t_2 and t_1 - 60s … t_1)* [p.u. U_n]	0.854		
Before grid fault t_1	13	Voltage reference	*(positive sequence, phase-to-neutral averaged over t_1 - 60s … t_1)* [p.u. U_n]	1.005		
	14	Voltage reference	*(negative sequence, phase-to-neutral averaged over t_1 - 60s … t_1)* [p.u. U_n]	0.004		
	15	Reactive current reference [2)]	*(RMS, averaged over t_1 – 10s … t_1)* [p.u. I_n]	0.001		
	16	Active power reference	*(RMS, averaged over t_1 – 10s … t_1)* [p.u. P_n]	1.004		
	17	Reactive power [2)]	*(RMS, averaged over t_1 – 10s … t_1)* [p.u. P_n]	0.001		
During Grid fault t1 till t2	18	Reactive current [2)]	*(positive sequence, averaged over t_1 + 100ms … t_2 - 20ms)* [p.u. I_n]	0.006		
	19	Reactive current [2)]	*(negative sequence, averaged over t_1 + 100ms … t_2 - 20ms)* [p.u. I_n]	0.002		
	20	Apparent current	*(positive sequence, averaged over t_1 + 100ms … t_2 - 20ms)* [p.u. I_n]	1.079		
After fault clearence t2	21	Settling time of active power (from restoration of the voltage ≥ 90% of nominal voltage until the Active Power output restored to ≥ 90% of the pre-fault level)	[s]	0.019		

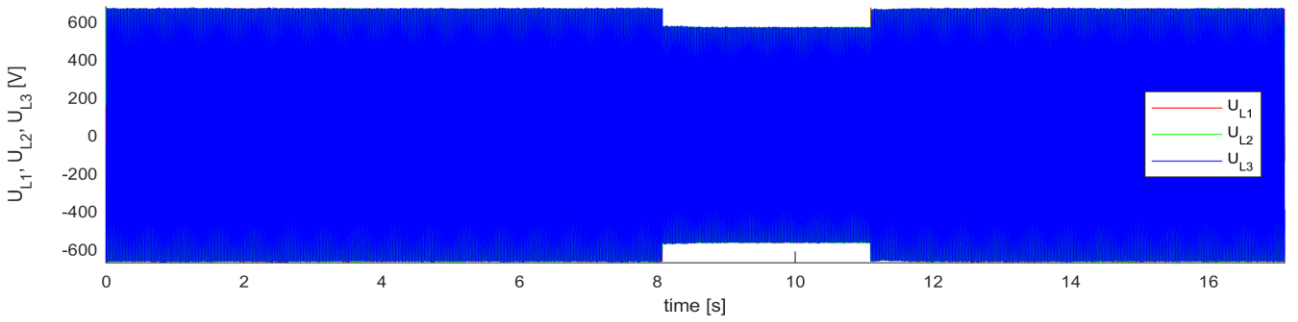
Note:

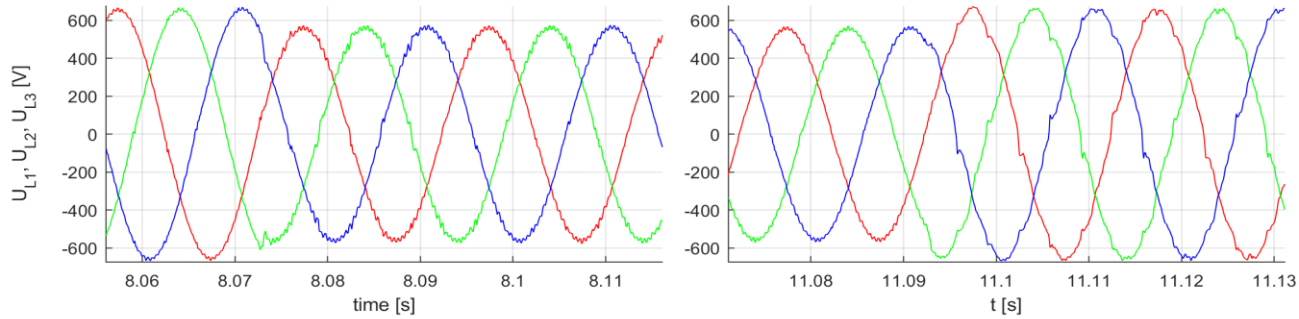
[1)] A / B / C indicate the phase-neutral voltages (L1, L2, L3), phase-phase voltages (L12, L23, L31) or the phase currents (L1, L2, L3), for details see *Description / calculation basis*.

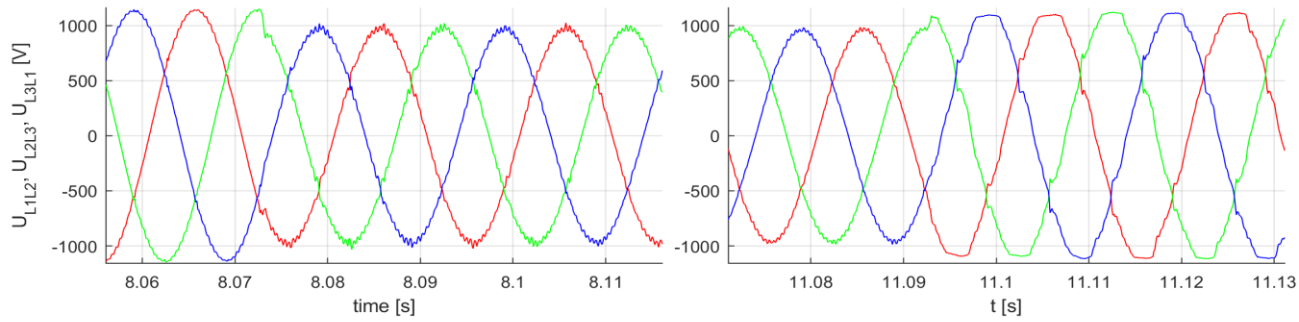
[2)] Under-excited / inductive reactive current has a negative sign, over-excited / capacitive reactive current has a positive sign, the sign of the reactive power is the same as the reactive current.

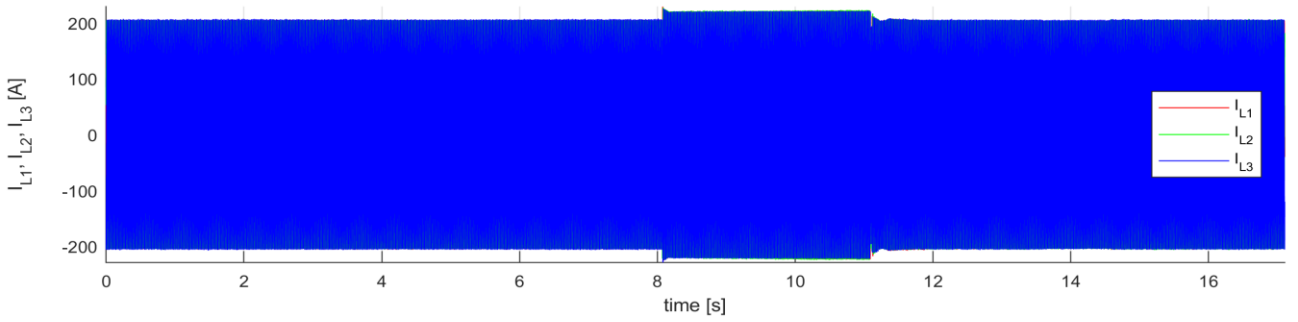
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

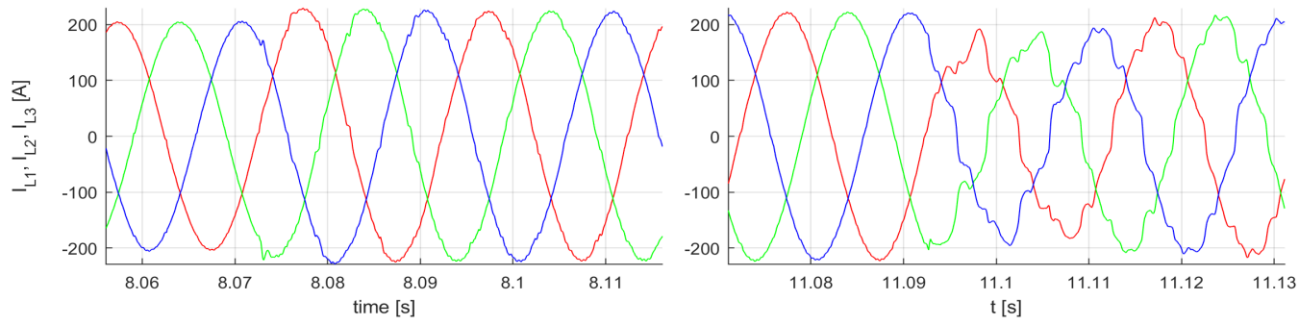
Timedomain values





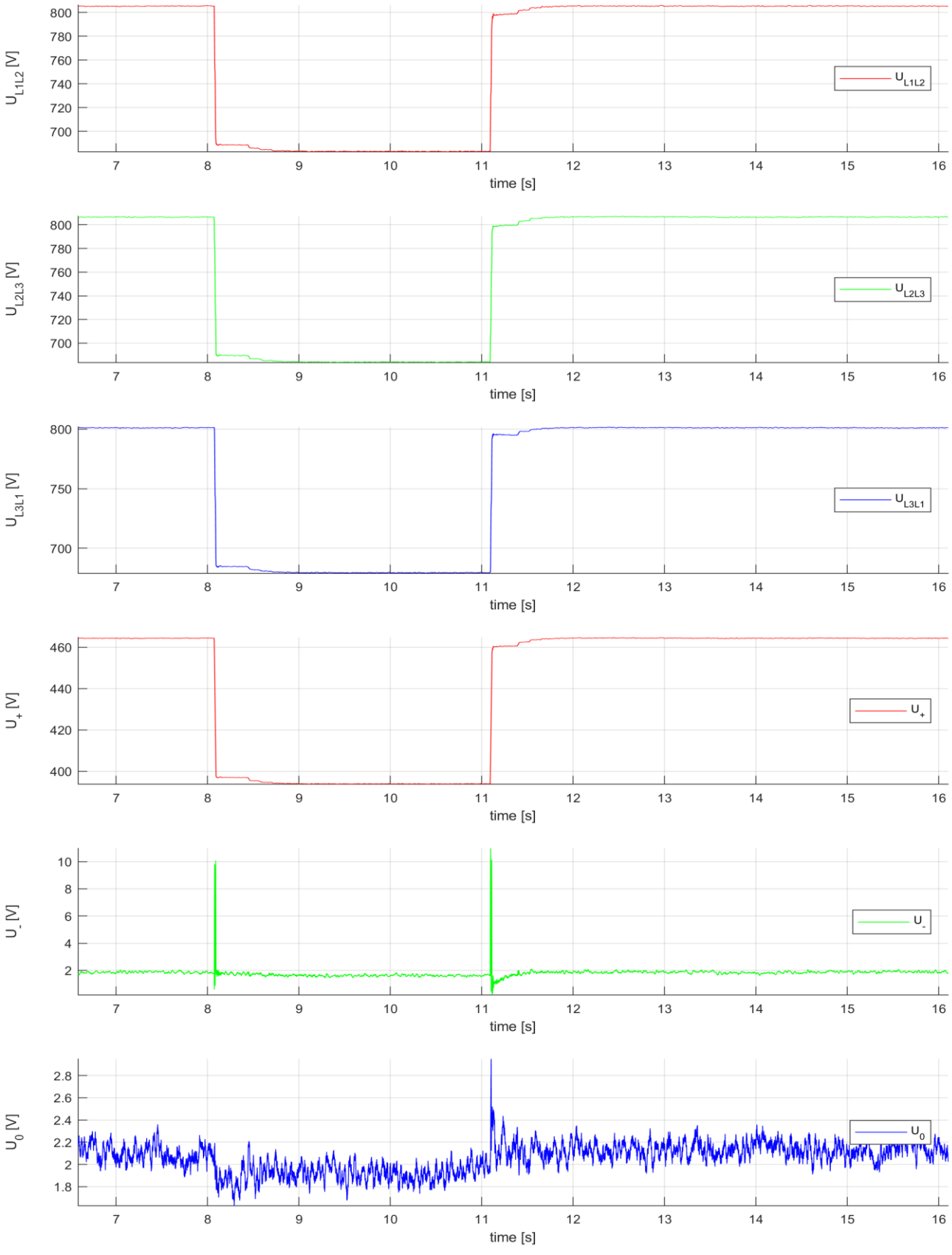






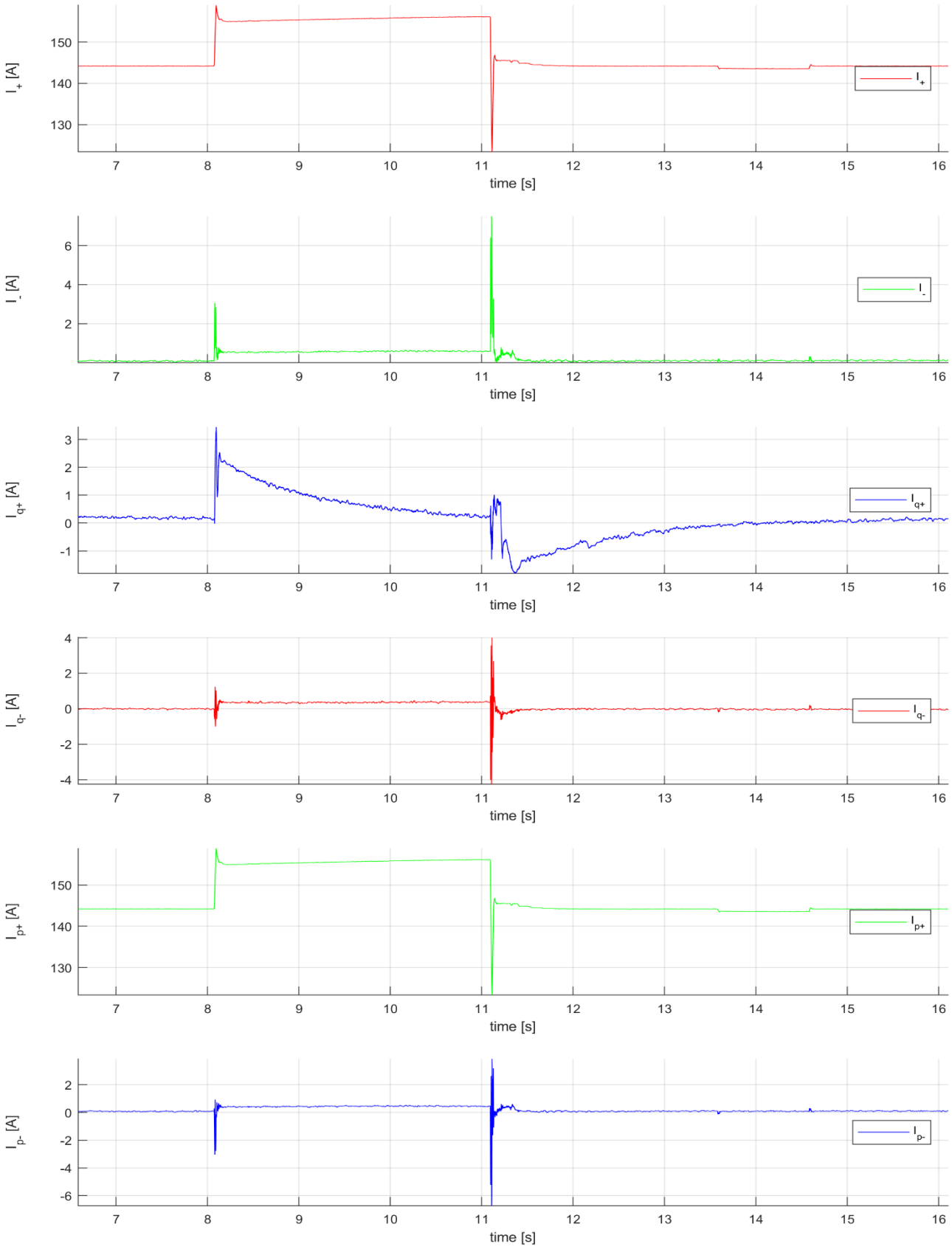
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Positive sequence components and RMS values



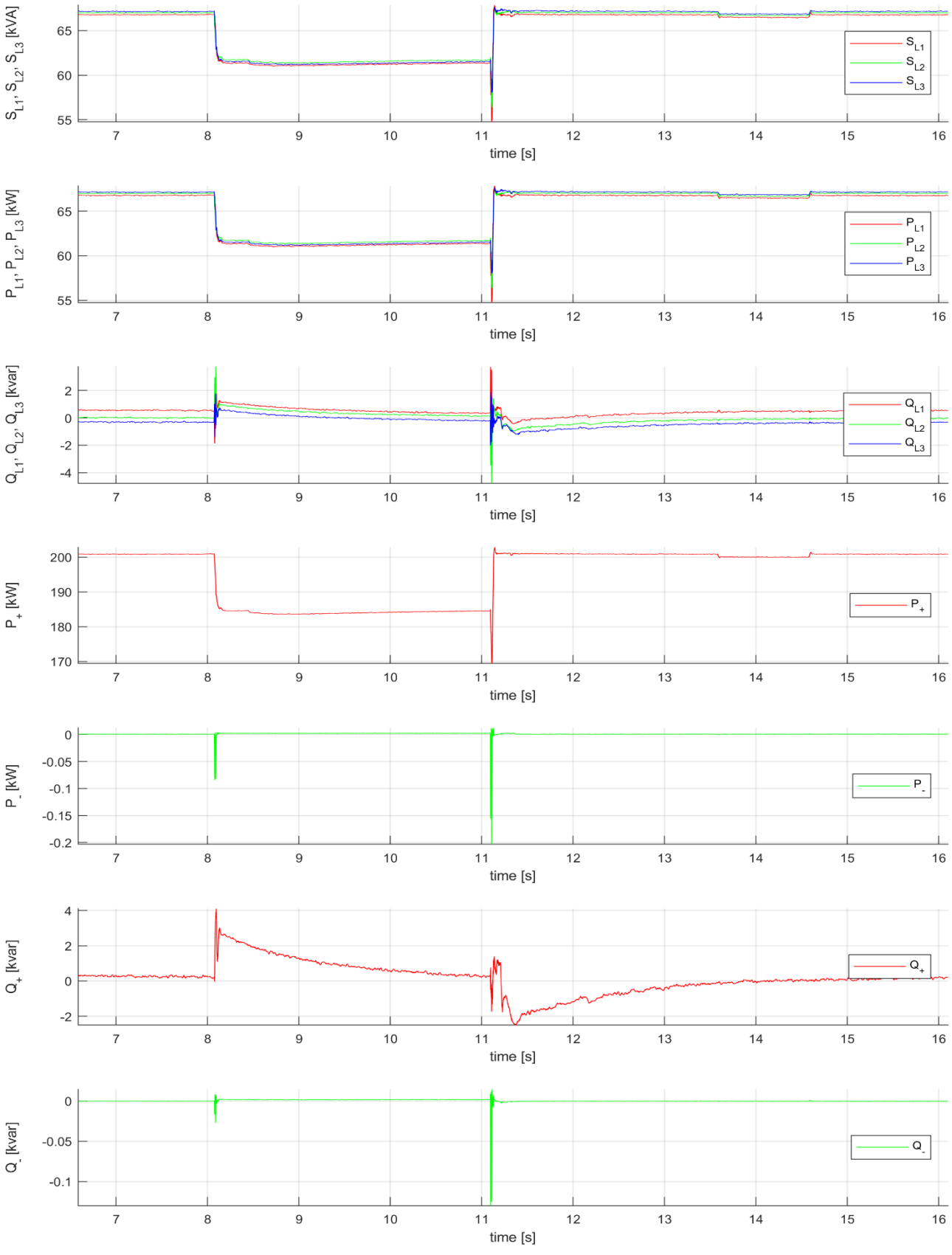
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Positive sequence components and RMS values



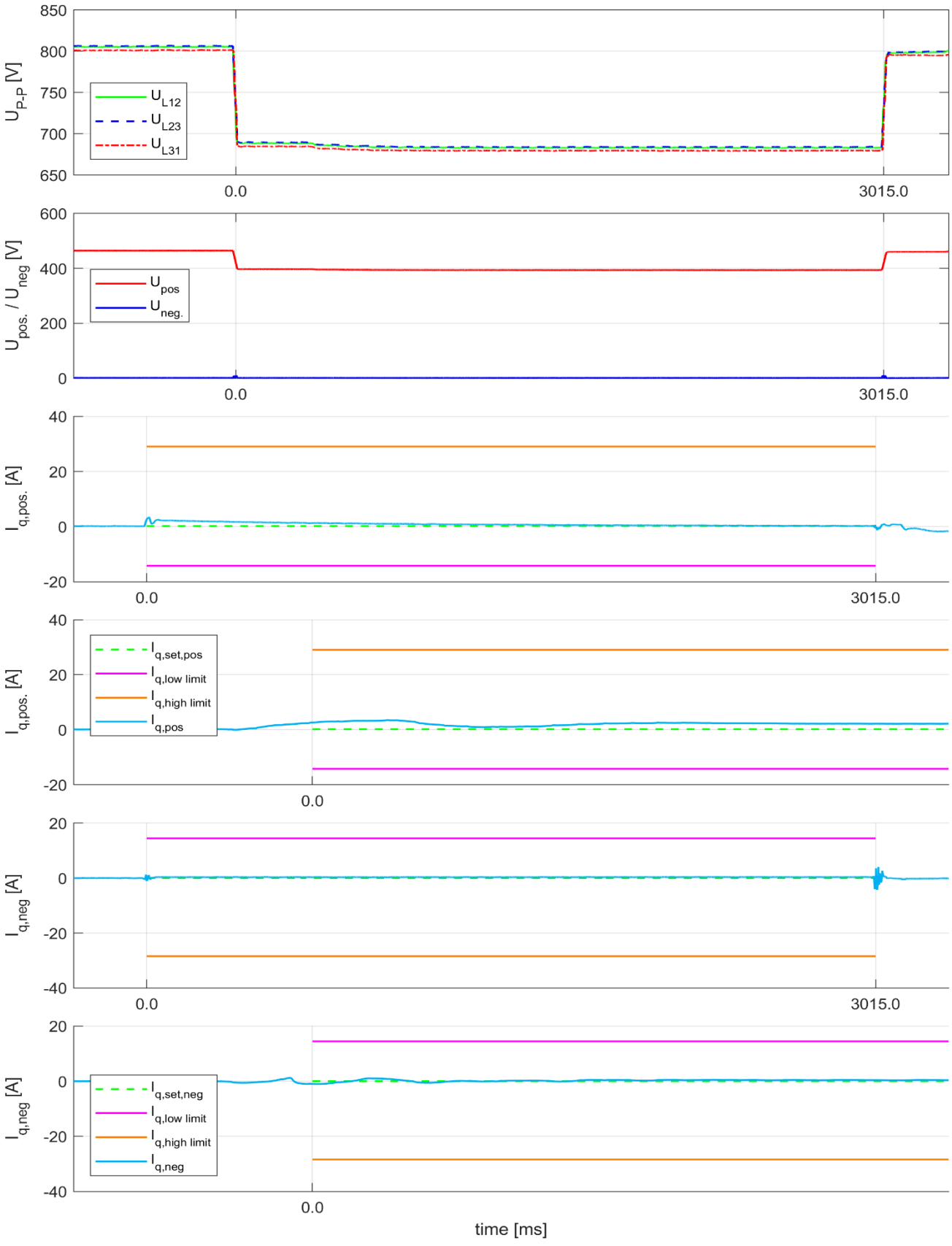
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Positive sequence components and RMS values



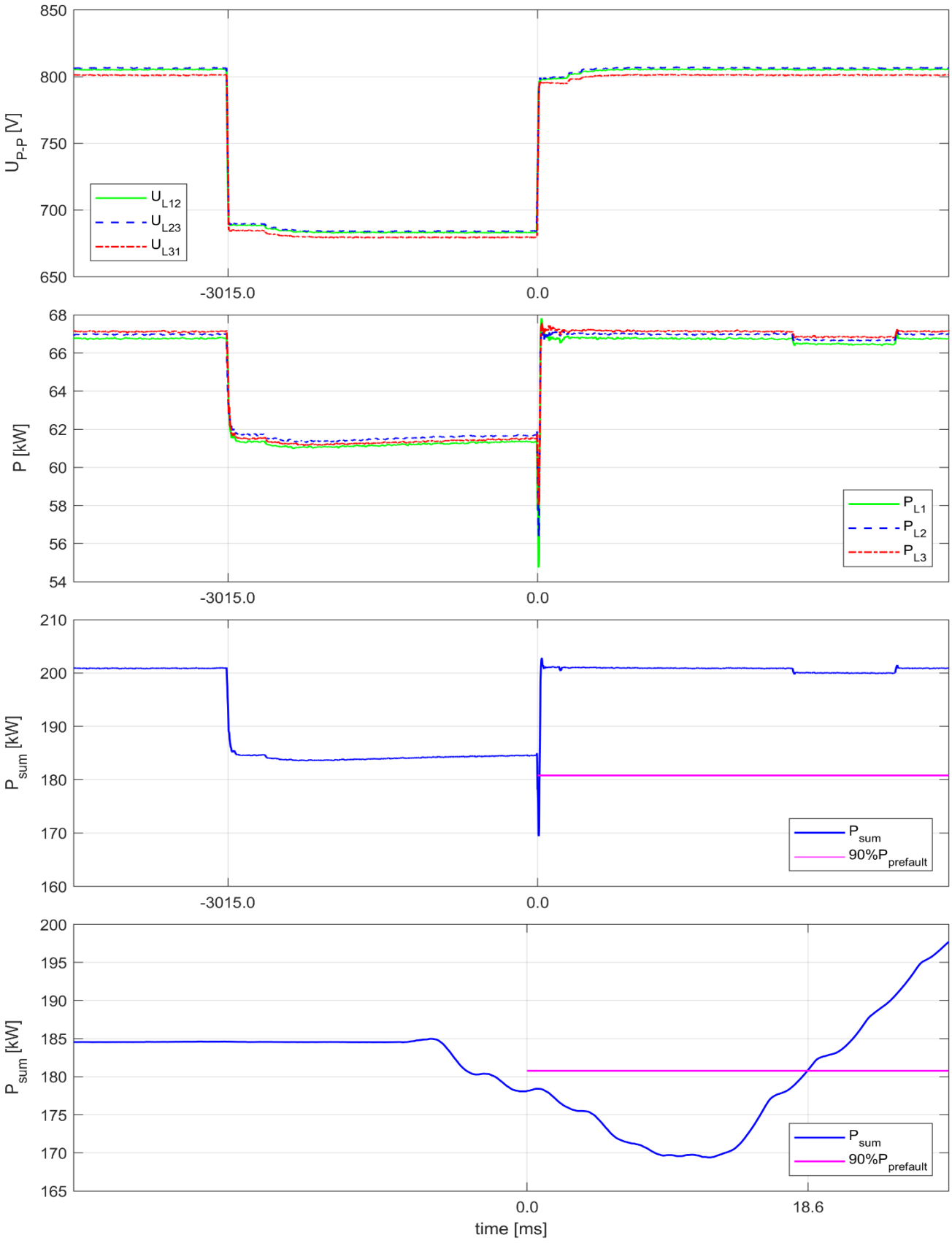
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Positive sequence components and RMS values



B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Positive sequence components and RMS values



B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

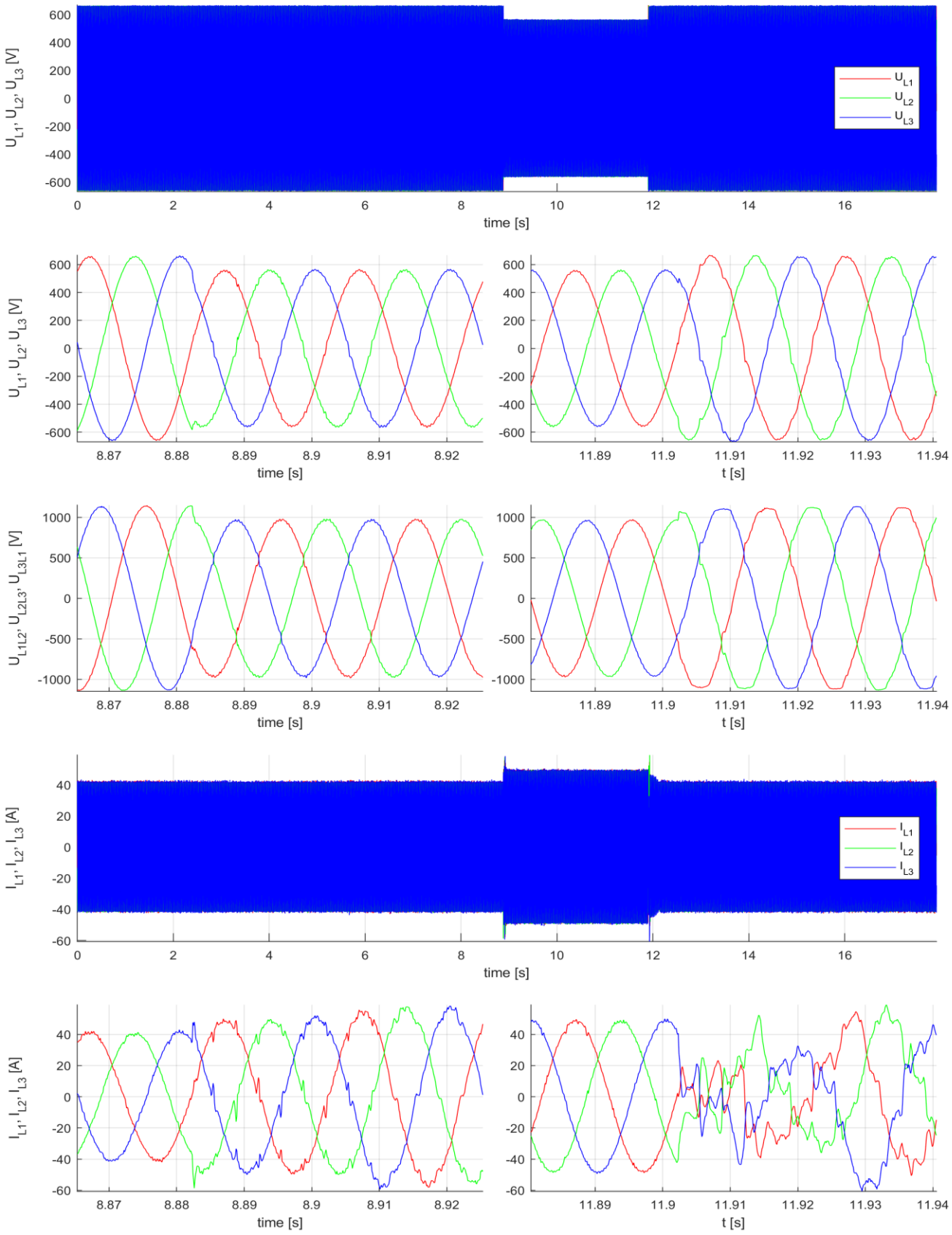
CEA_3.1.2

	No.	Parameter	Description / calculation basis	Results		
Gerneral information	1	Test no.	-	CEA_3.1.2-1		
	2	Data file name	-	CEA_3.1.2-1.wdf		
	3	MD5-Checksum	-	4f366d97380c3e102679869b0fe52bdf		
	4	Date	[yyyy-mm-dd]	2020-09-29		
	5	Time	[hh:mm:ss]	06:34:38		
	6	Type of fault (number of affected phases)	-	Three-phase		
	Phase reference			**A [1)]**	**B [1)]**	**C [1)]**
	7	Fault occurrence (t_1)	[ms]	8895.3		
	8	Fault clearance (t_2)	[ms]	11910.5		
	9	Fault duration determined from test	*(from time domain voltage results)* [ms]	3015.2		
	10	Measeured value of voltage drop / increase	*(per phase-to-neutral, t_1 + 100ms … t_2 and t_1 - 60s … t_1)* [p.u. U_n]	0.850	0.852	0.854
	11	Measeured value of voltage drop / increase	*(per phase-to-phase, t_1 + 100ms … t_2 and t_1 - 60s … t_1)* [p.u. U_n]	0.854	0.854	0.849
	12	Measeured value of voltage drop / increase	*(positive sequence, phase-to-neutral, t_1 + 100ms … t_2 and t_1 - 60s … t_1)* [p.u. U_n]	0.852		
Before grid fault t_1	13	Voltage reference	*(positive sequence, phase-to-neutral averaged over t_1 - 60s … t_1)* [p.u. U_n]	1.004		
	14	Voltage reference	*(negative sequence, phase-to-neutral averaged over t_1 - 60s … t_1)* [p.u. U_n]	0.004		
	15	Reactive current reference [2)]	*(RMS, averaged over t_1 – 10s … t_1)* [p.u. I_n]	0.000		
	16	Active power reference	*(RMS, averaged over t_1 – 10s … t_1)* [p.u. P_n]	0.202		
	17	Reactive power [2)]	*(RMS, averaged over t_1 – 10s … t_1)* [p.u. P_n]	0.000		
During Grid fault t1 till t2	18	Reactive current [2)]	*(positive sequence, averaged over t_1 + 100ms … t_2 - 20ms)* [p.u. I_n]	0.001		
	19	Reactive current [2)]	*(negative sequence, averaged over t_1 + 100ms … t_2 - 20ms)* [p.u. I_n]	0.000		
	20	Apparent current	*(positive sequence, averaged over t_1 + 100ms … t_2 - 20ms)* [p.u. I_n]	0.237		
After fault clearence t2	21	Settling time of active power (from restoration of the voltage ≥ 90% of nominal voltage until the Active Power output restored to ≥ 90% of the pre-fault level)	[s]	0.022		

Note:
[1)] A / B / C indicate the phase-neutral voltages (L1, L2, L3), phase-phase voltages (L12, L23, L31) or the phase currents (L1, L2, L3), for details see *Description / calculation basis*.
[2)] Under-excited / inductive reactive current has a negative sign, over-excited / capacitive reactive current has a positive sign, the sign of the reactive power is the same as the reactive current.

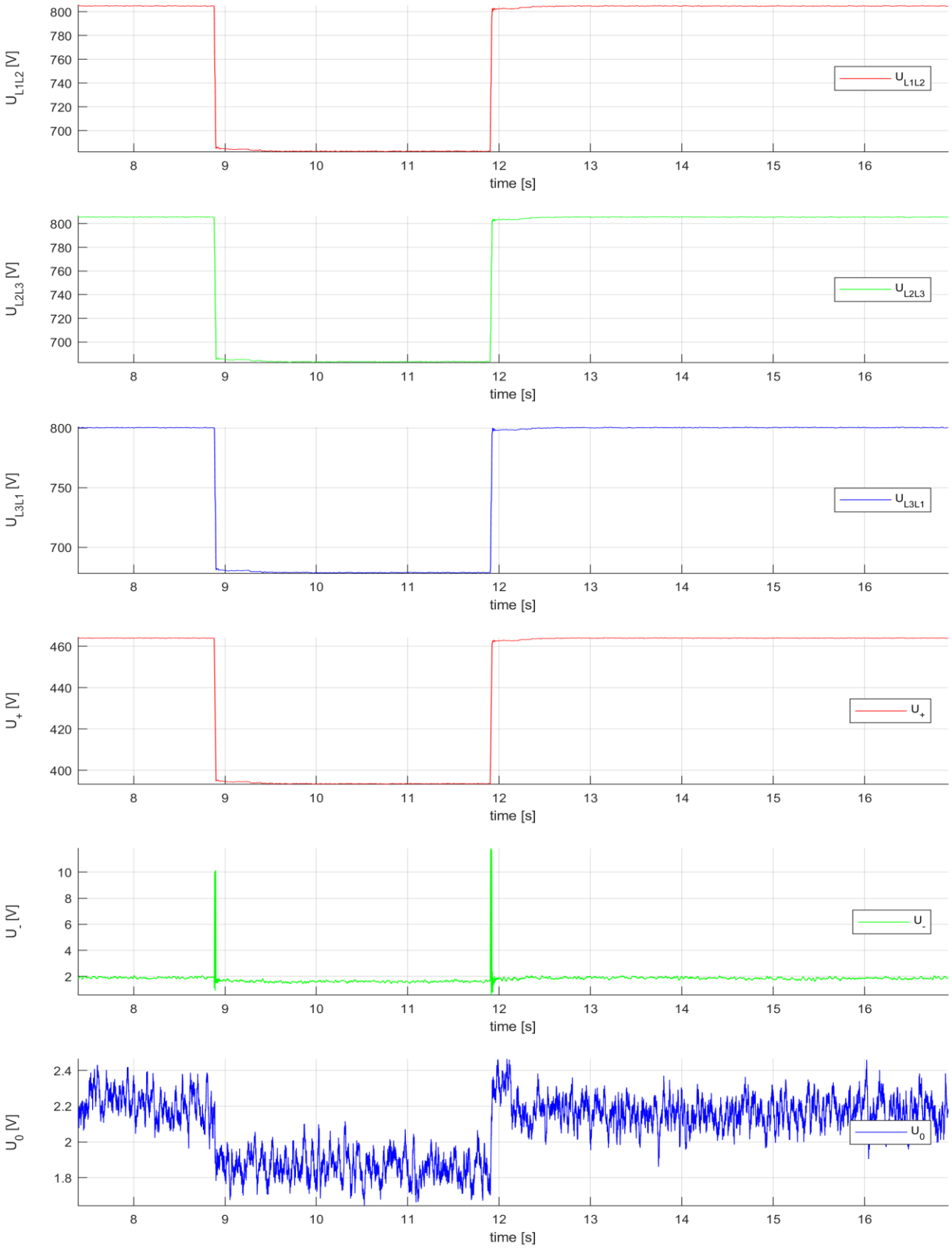
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Timedomain values



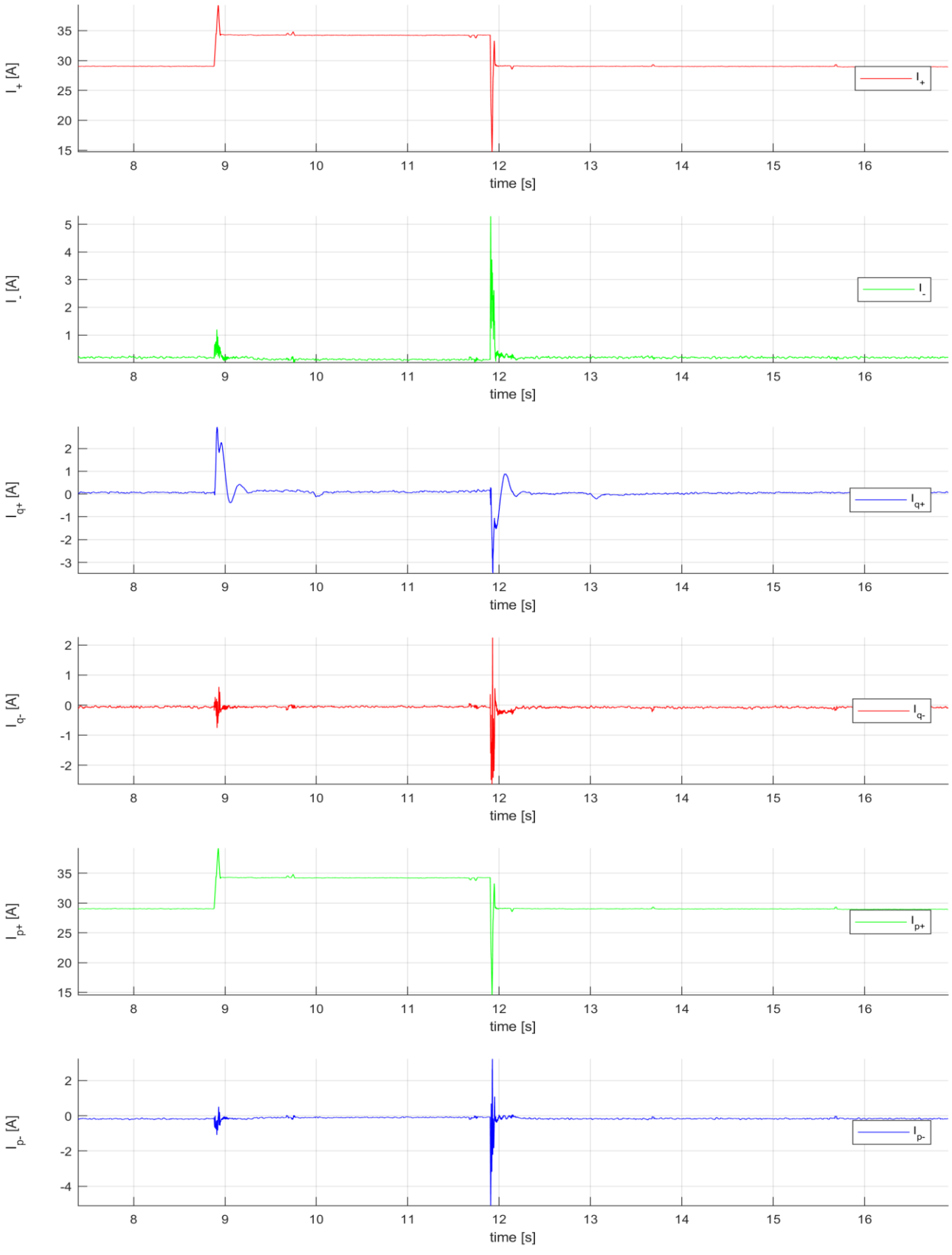
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Positive sequence components and RMS values



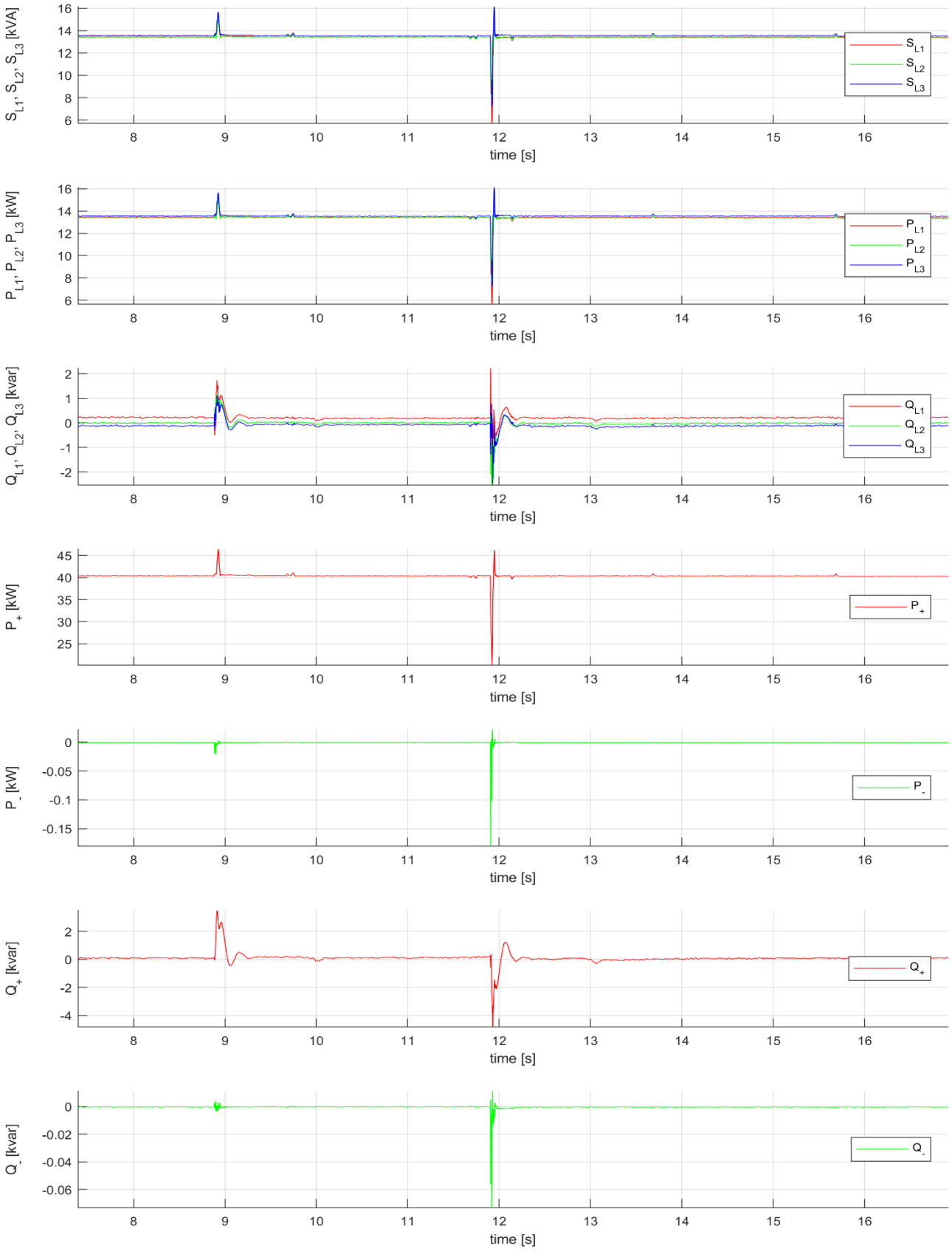
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Positive sequence components and RMS values



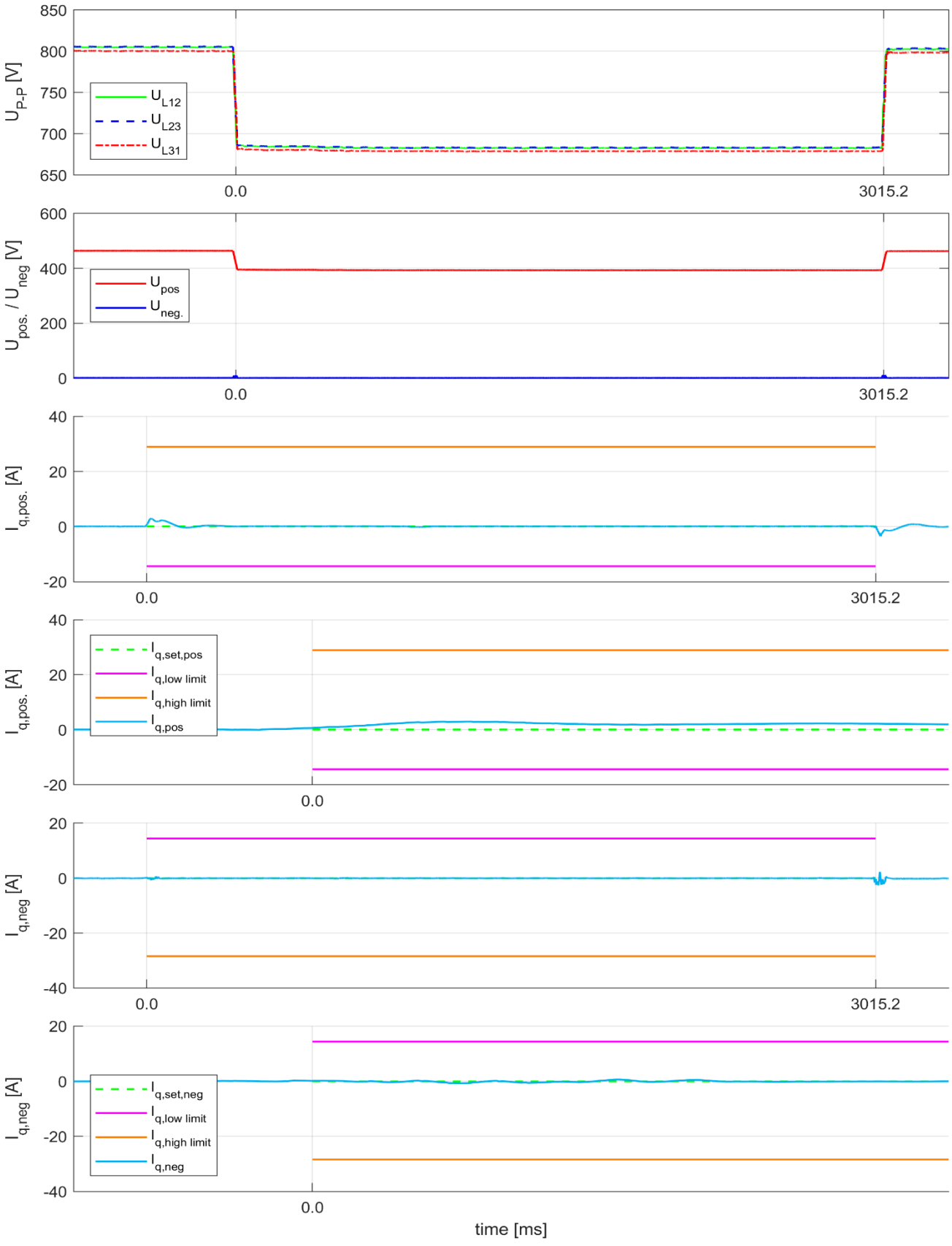
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Positive sequence components and RMS values



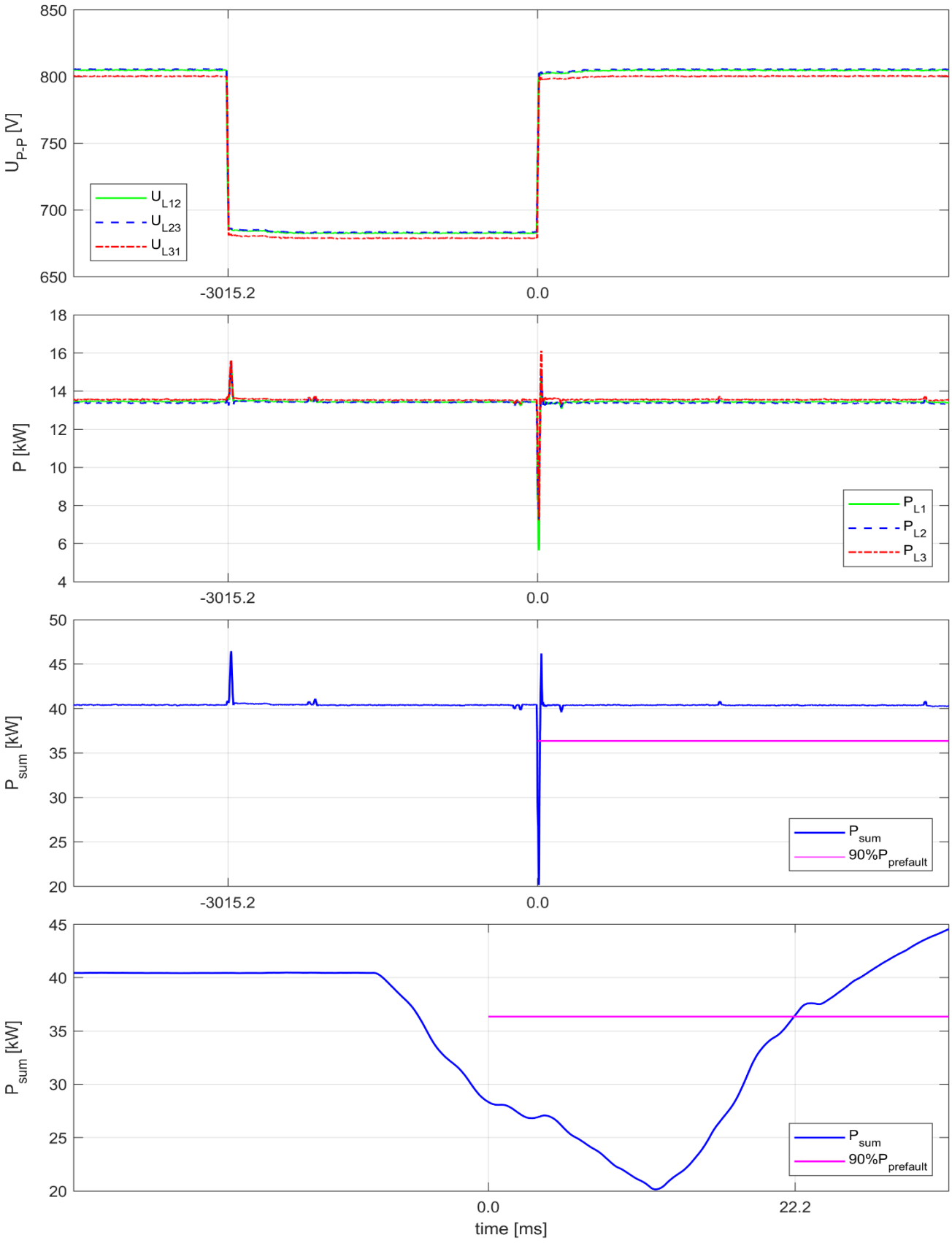
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Positive sequence components and RMS values



B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Positive sequence components and RMS values



B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

CEA_3.2.1

	No.	Parameter	Description / calculation basis	Results		
Gerneral information	1	Test no.	-	CEA_3.2.1-1		
	2	Data file name	-	CEA_3.2.1-1.wdf		
	3	MD5-Checksum	-	50cda7741adb346812770bb5682e8910		
	4	Date	[yyyy-mm-dd]	2020-09-23		
	5	Time	[hh:mm:ss]	11:39:14		
	6	Type of fault (number of affected phases)	Fault type D on low-voltage side	Two-phase		
	Phase reference			**A [1)]**	**B [1)]**	**C [1)]**
	7	Fault occurrence (t_1)	[ms]	9495.4		
	8	Fault clearance (t_2)	[ms]	12515.5		
	9	Fault duration determined from test	*(from time domain voltage results)* [ms]	3020.1		
	10	Measeured value of voltage drop / increase	*(per phase-to-neutral, t_1 + 100ms … t_2 and t_1 - 60s … t_1)* [p.u. U_n]	0.853	0.966	0.967
	11	Measeured value of voltage drop / increase	*(per phase-to-phase, t_1 + 100ms … t_2 and t_1 - 60s … t_1)* [p.u. U_n]	0.892	1.011	0.882
	12	Measeured value of voltage drop / increase	*(positive sequence, phase-to-neutral, t_1 + 100ms … t_2 and t_1 - 60s … t_1)* [p.u. U_n]	0.926		
Before grid fault t_1	13	Voltage reference	*(positive sequence, phase-to-neutral averaged over t_1 - 60s … t_1)* [p.u. U_n]	1.005		
	14	Voltage reference	*(negative sequence, phase-to-neutral averaged over t_1 - 60s … t_1)* [p.u. U_n]	0.004		
	15	Reactive current reference [2)]	*(RMS, averaged over t_1 – 10s … t_1)* [p.u. I_n]	-0.001		
	16	Active power reference	*(RMS, averaged over t_1 – 10s … t_1)* [p.u. P_n]	1.005		
	17	Reactive power [2)]	*(RMS, averaged over t_1 – 10s … t_1)* [p.u. P_n]	-0.001		
During Grid fault t1 till t2	18	Reactive current [2)]	*(positive sequence, averaged over t_1 + 100ms … t_2 - 20ms)* [p.u. I_n]	0.004		
	19	Reactive current [2)]	*(negative sequence, averaged over t_1 + 100ms … t_2 - 20ms)* [p.u. I_n]	0.002		
	20	Apparent current	*(positive sequence, averaged over t_1 + 100ms … t_2 - 20ms)* [p.u. I_n]	1.060		
After fault clearence t2	21	Settling time of active power (from restoration of the voltage ≥ 90% of nominal voltage until the Active Power output restored to ≥ 90% of the pre-fault level)	[s]	0.000		

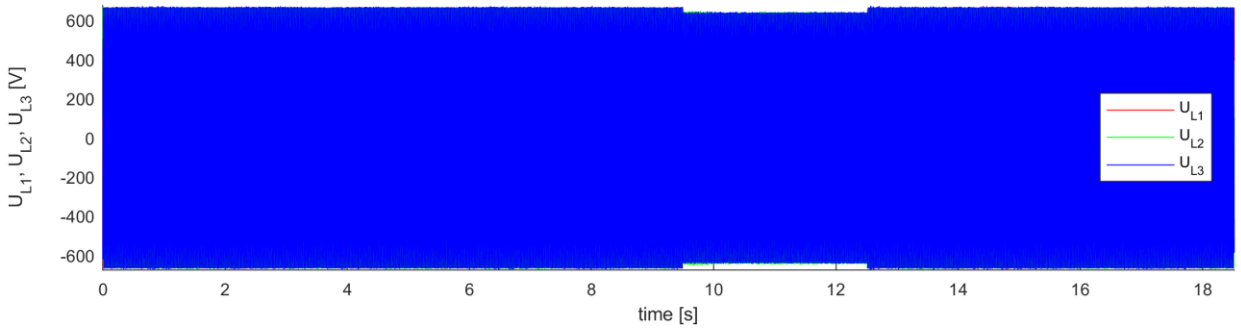
Note:
[1)] A / B / C indicate the phase-neutral voltages (L1, L2, L3), phase-phase voltages (L12, L23, L31) or the phase currents (L1, L2, L3), for details see *Description / calculation basis*.
[2)] Under-excited / inductive reactive current has a negative sign, over-excited / capacitive reactive current has a positive sign, the sign of the reactive power is the same as the reactive current.

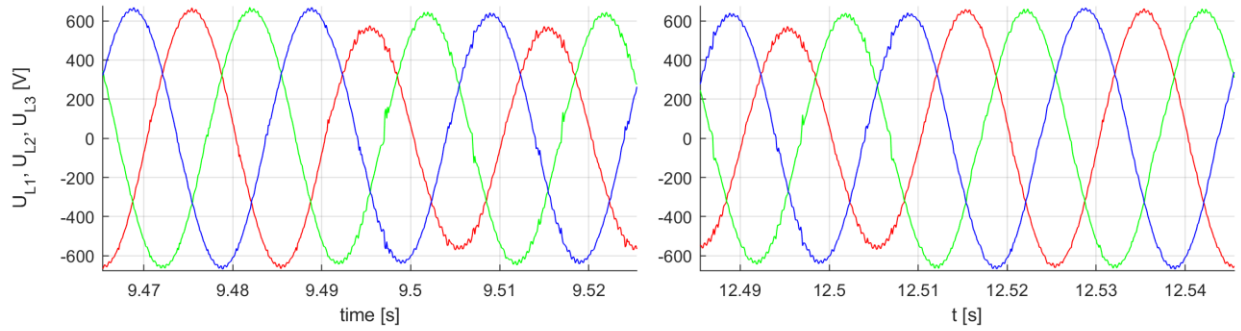
Note:

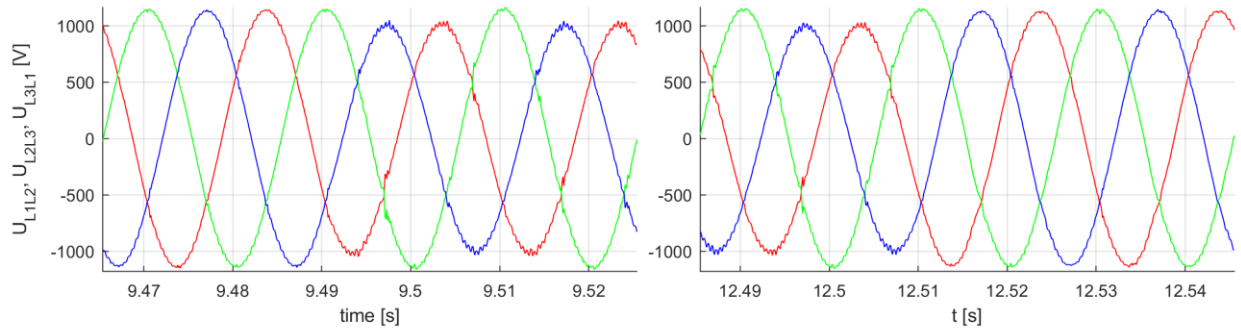
* The grid fault type C (phase-to-phase fault without grounding) was simulated at the medium voltage side of the Dy-medium-voltage transformer, following diagram shows the measurement at the low voltage side of the transformer – grid fault type D on low voltage side.

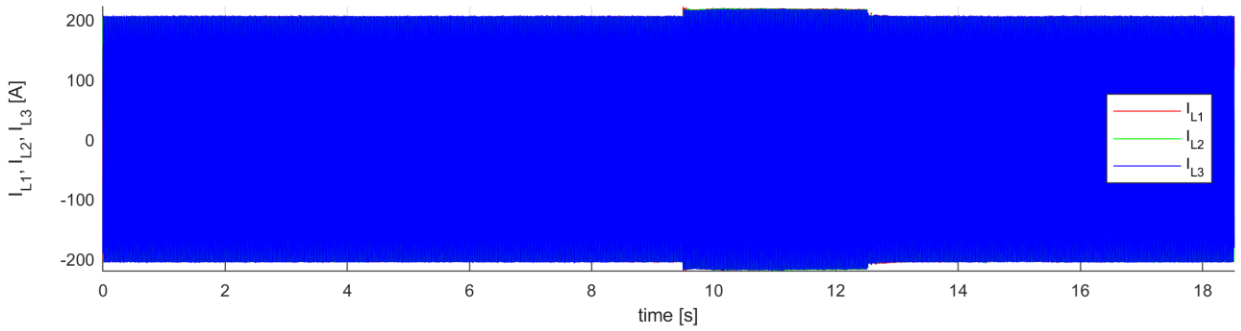
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

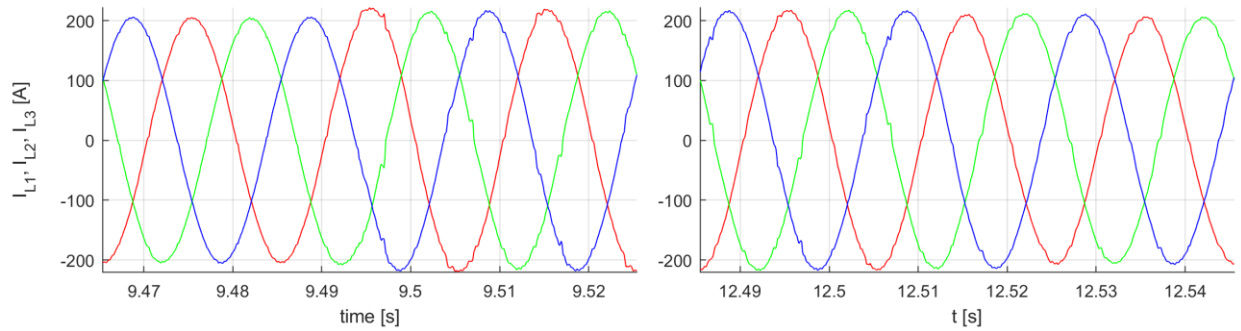
Timedomain values





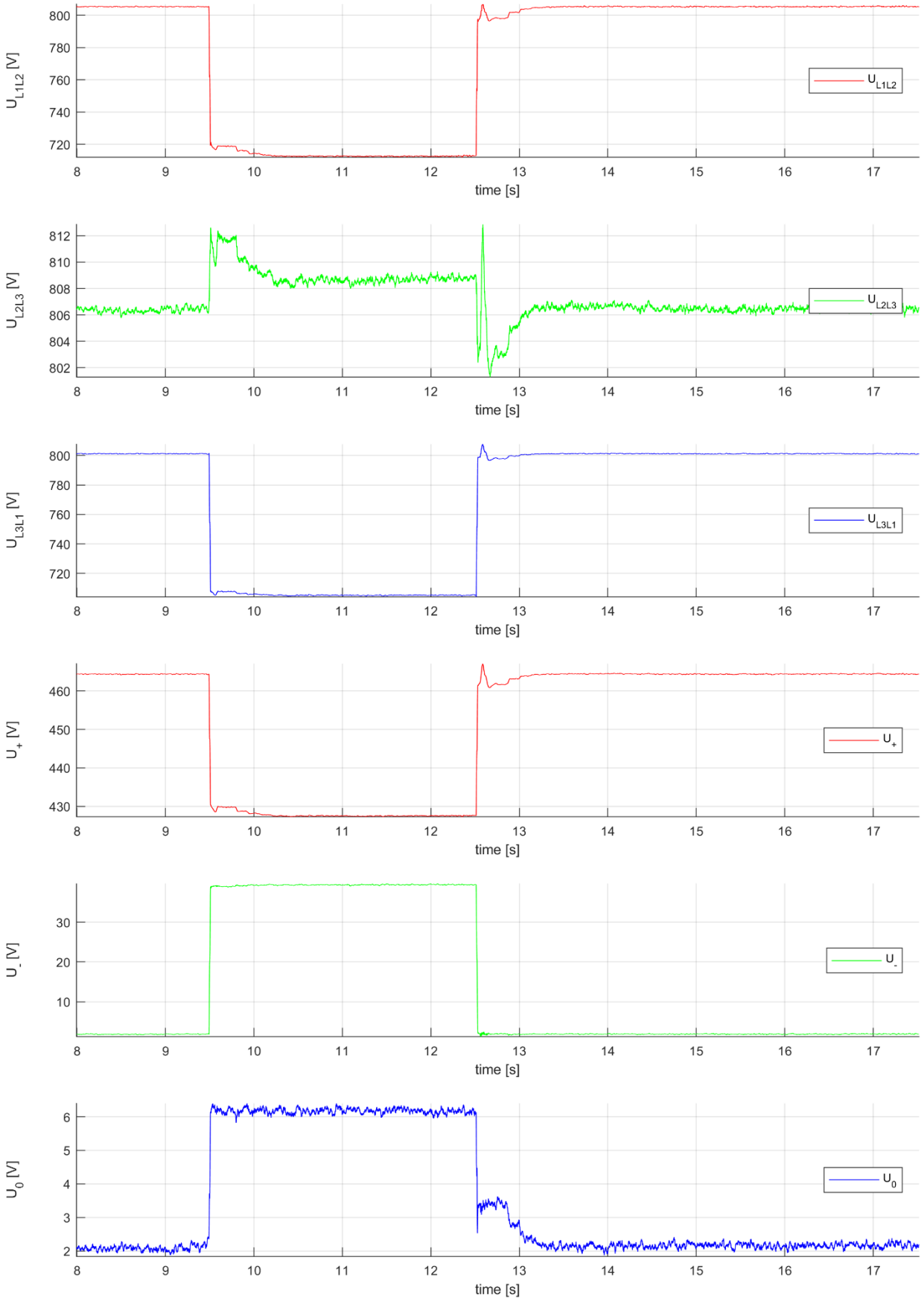






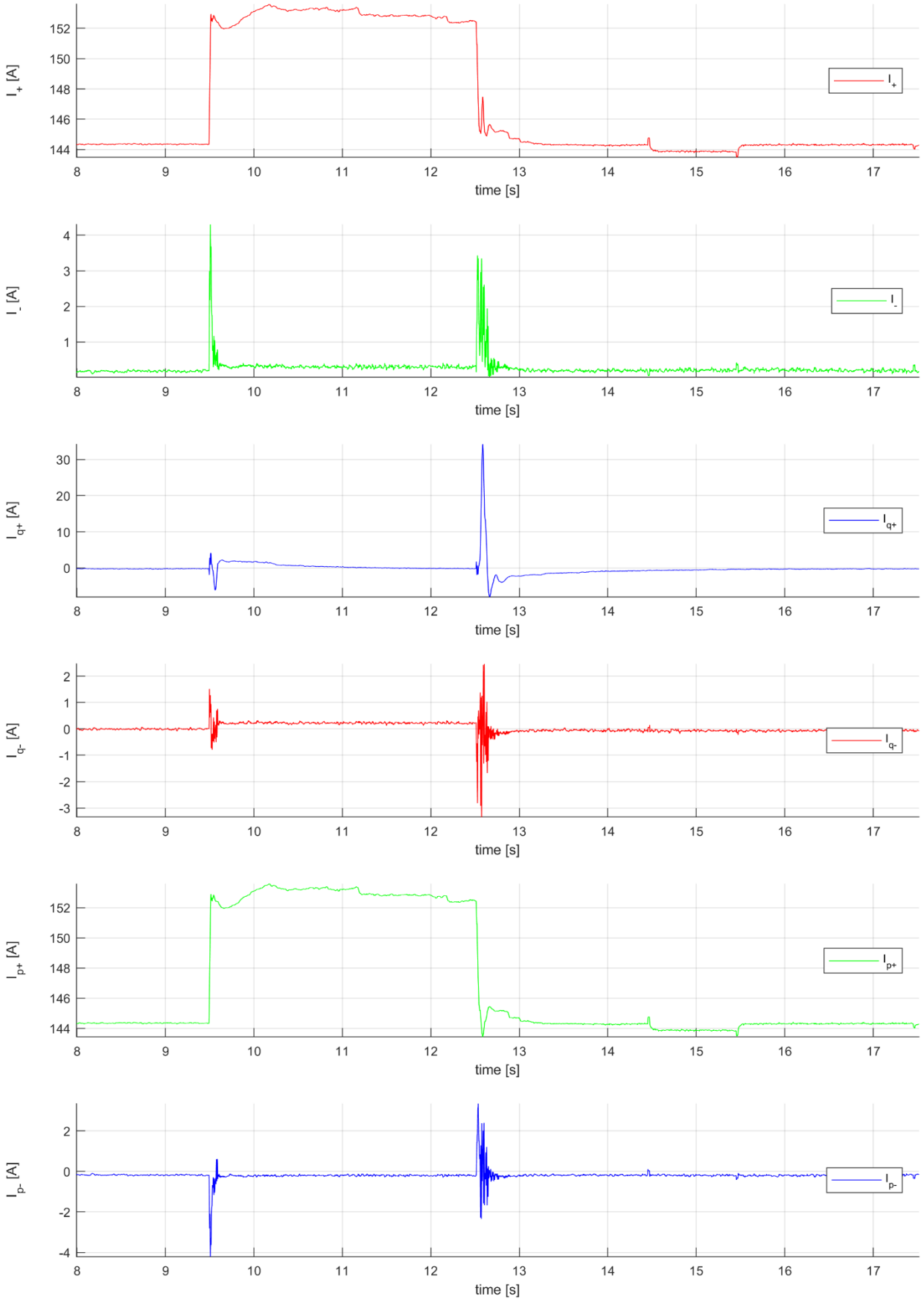
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Positive sequence components and RMS values



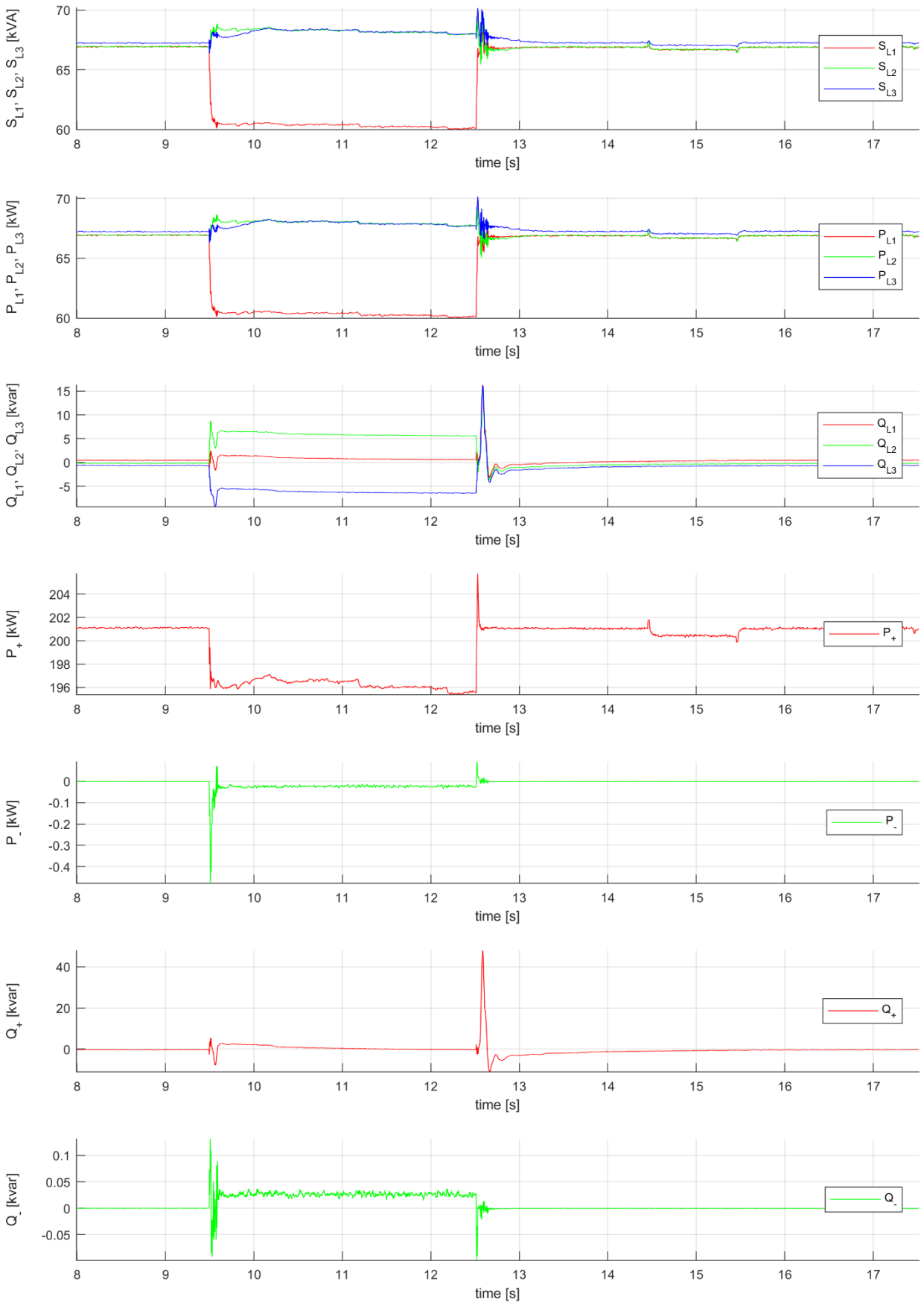
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Positive sequence components and RMS values



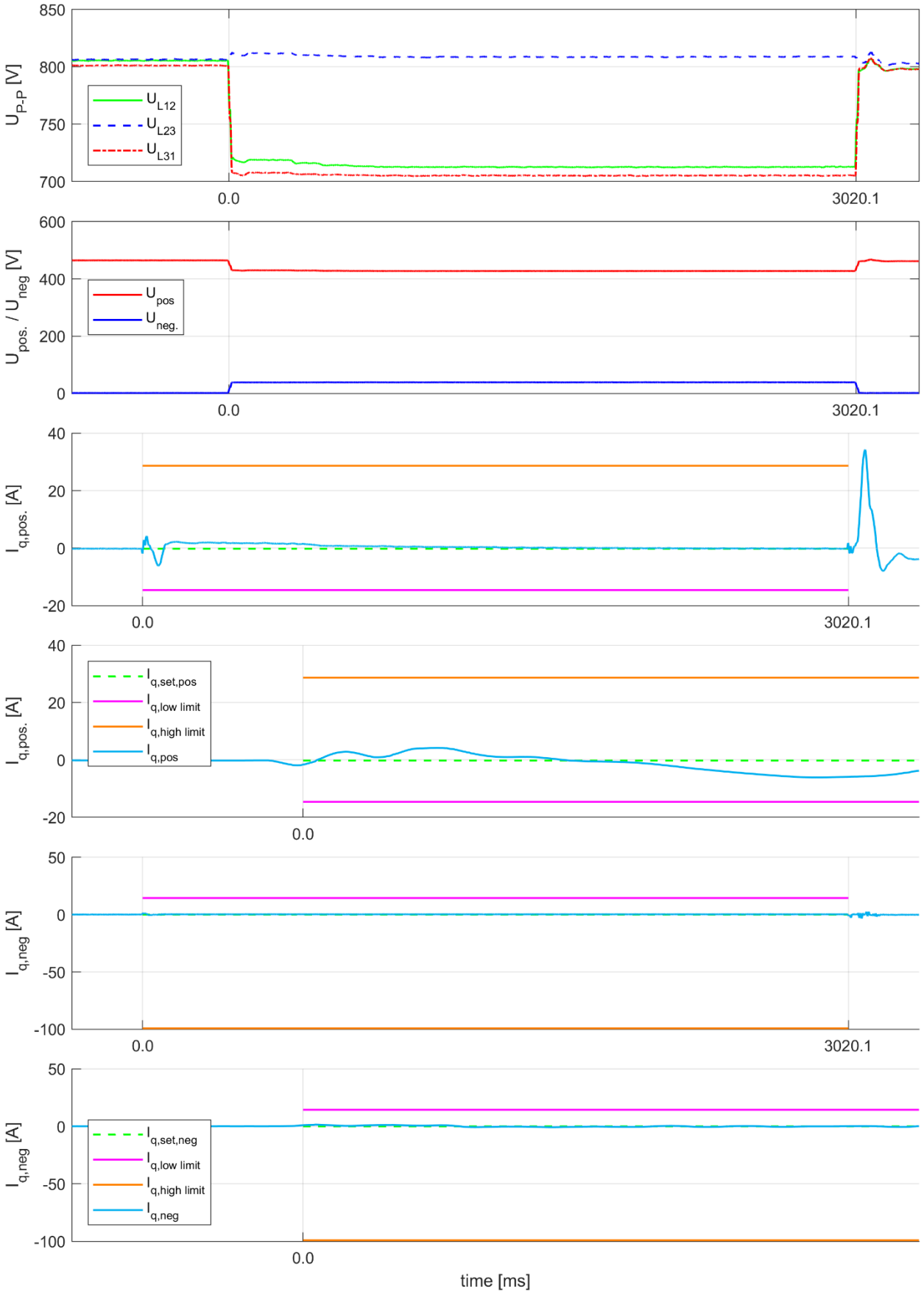
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Positive sequence components and RMS values



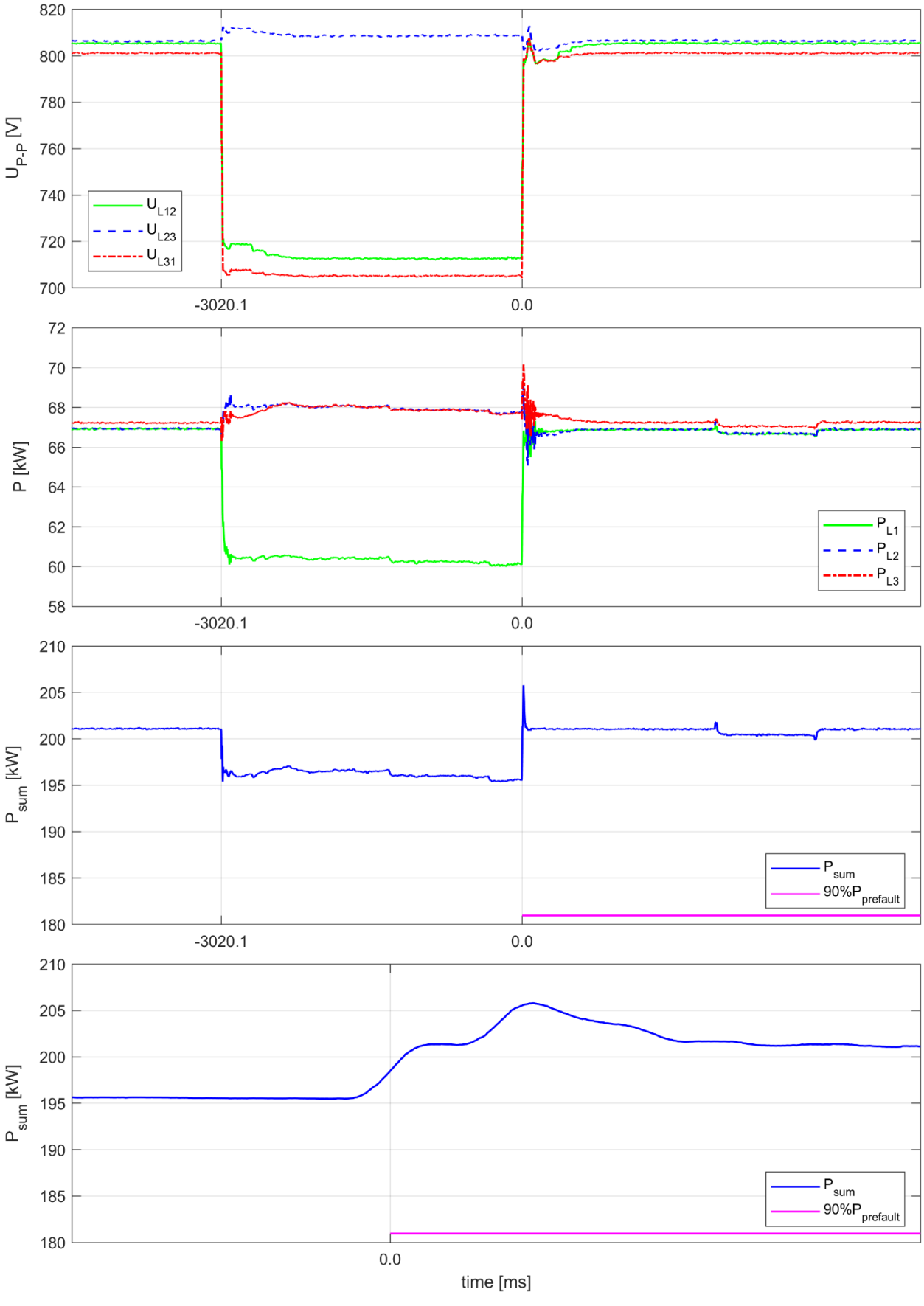
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Positive sequence components and RMS values



B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Positive sequence components and RMS values



B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

CEA_3.2.2

	No.	Parameter	Description / calculation basis	Results		
Gerneral information	1	Test no.	-	CEA_3.2.2-1		
	2	Data file name	-	CEA_3.2.2-1.wdf		
	3	MD5-Checksum	-	87a89edfee3d1f30454594f26e63e4c0		
	4	Date	[yyyy-mm-dd]	2020-09-23		
	5	Time	[hh:mm:ss]	11:40:46		
	6	Type of fault (number of affected phases)	Fault type D on low-voltage side	Two-phase		
	Phase reference			**A** [1)]	**B** [1)]	**C** [1)]
	7	Fault occurrence (t_1)	[ms]	9825.5		
	8	Fault clearance (t_2)	[ms]	12845.7		
	9	Fault duration determined from test	*(from time domain voltage results)* [ms]	3020.2		
	10	Measeured value of voltage drop / increase	*(per phase-to-neutral, t_1 + 100ms … t_2 and t_1 - 60s … t_1)* [p.u. U_n]	0.852	0.964	0.966
	11	Measeured value of voltage drop / increase	*(per phase-to-phase, t_1 + 100ms … t_2 and t_1 - 60s … t_1)* [p.u. U_n]	0.888	1.011	0.882
	12	Measeured value of voltage drop / increase	*(positive sequence, phase-to-neutral, t_1 + 100ms … t_2 and t_1 - 60s … t_1)* [p.u. U_n]	0.925		
Before grid fault t_1	13	Voltage reference	*(positive sequence, phase-to-neutral averaged over t_1 - 60s … t_1)* [p.u. U_n]	1.004		
	14	Voltage reference	*(negative sequence, phase-to-neutral averaged over t_1 - 60s … t_1)* [p.u. U_n]	0.004		
	15	Reactive current reference [2)]	*(RMS, averaged over t_1 – 10s … t_1)* [p.u. I_n]	0.000		
	16	Active power reference	*(RMS, averaged over t_1 – 10s … t_1)* [p.u. P_n]	0.202		
	17	Reactive power [2)]	*(RMS, averaged over t_1 – 10s … t_1)* [p.u. P_n]	0.000		
During Grid fault t1 till t2	18	Reactive current [2)]	*(positive sequence, averaged over t_1 + 100ms … t_2 - 20ms)* [p.u. I_n]	0.000		
	19	Reactive current [2)]	*(negative sequence, averaged over t_1 + 100ms … t_2 - 20ms)* [p.u. I_n]	-0.006		
	20	Apparent current	*(positive sequence, averaged over t_1 + 100ms … t_2 - 20ms)* [p.u. I_n]	0.219		
After fault clearence t2	21	Settling time of active power (from restoration of the voltage ≥ 90% of nominal voltage until the Active Power output restored to ≥ 90% of the pre-fault level)	[s]	0.000		

Note:

[1)] A / B / C indicate the phase-neutral voltages (L1, L2, L3), phase-phase voltages (L12, L23, L31) or the phase currents (L1, L2, L3), for details see *Description / calculation basis*.

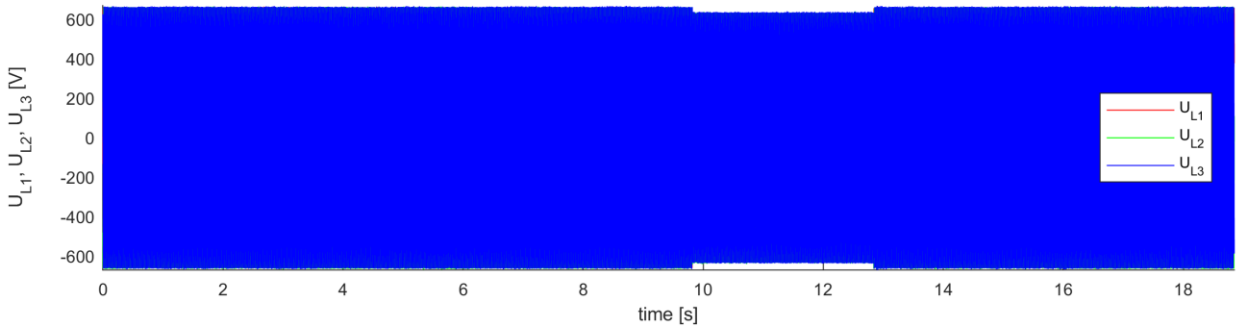
[2)] Under-excited / inductive reactive current has a negative sign, over-excited / capacitive reactive current has a positive sign, the sign of the reactive power is the same as the reactive current.

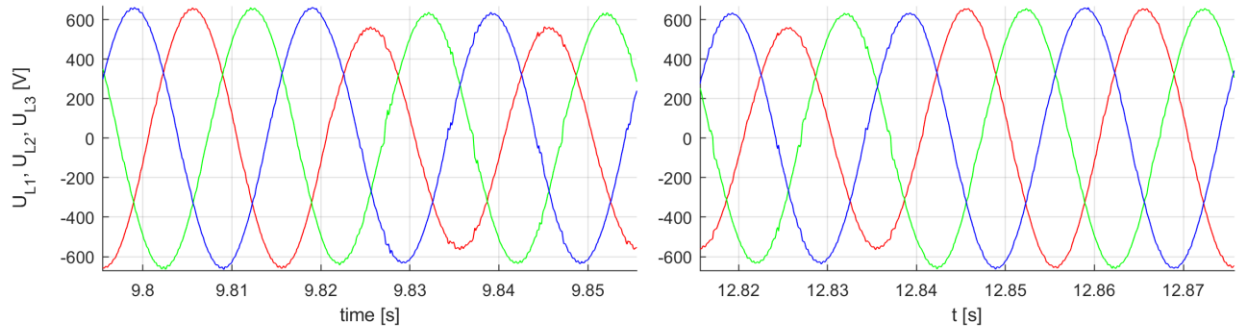
Note:

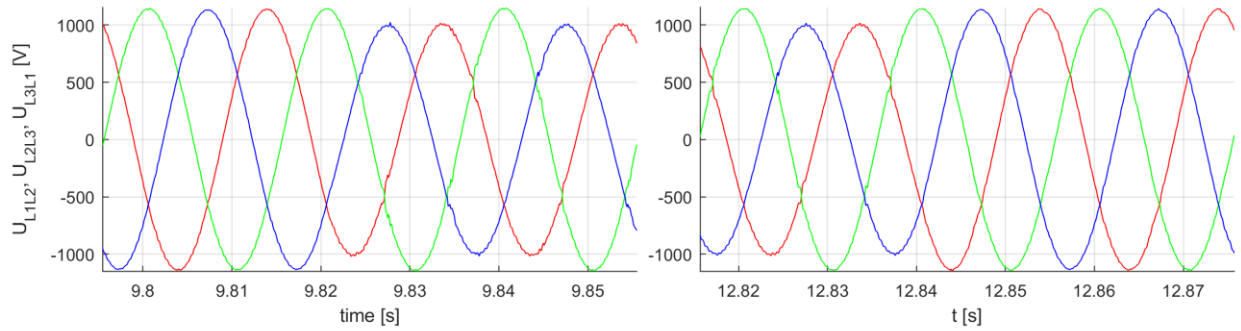
* The grid fault type C (phase-to-phase fault without grounding) was simulated at the medium voltage side of the Dy-medium-voltage transformer, following diagram shows the measurement at the low voltage side of the transformer – grid fault type D on low voltage side.

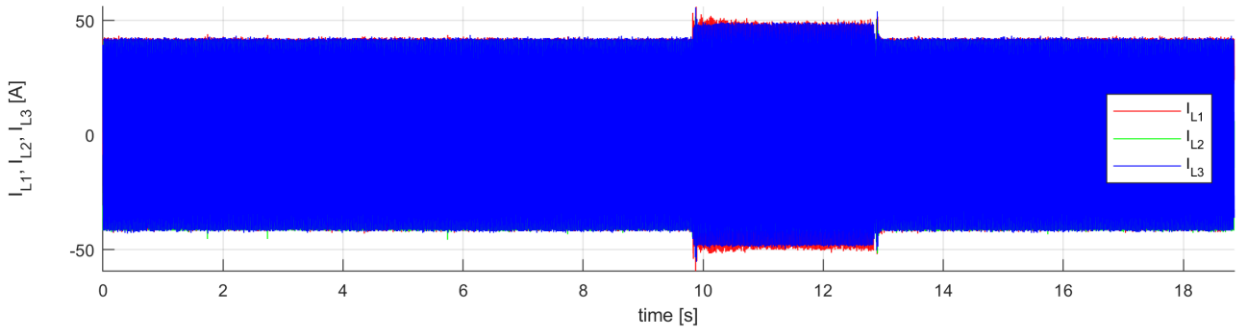
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

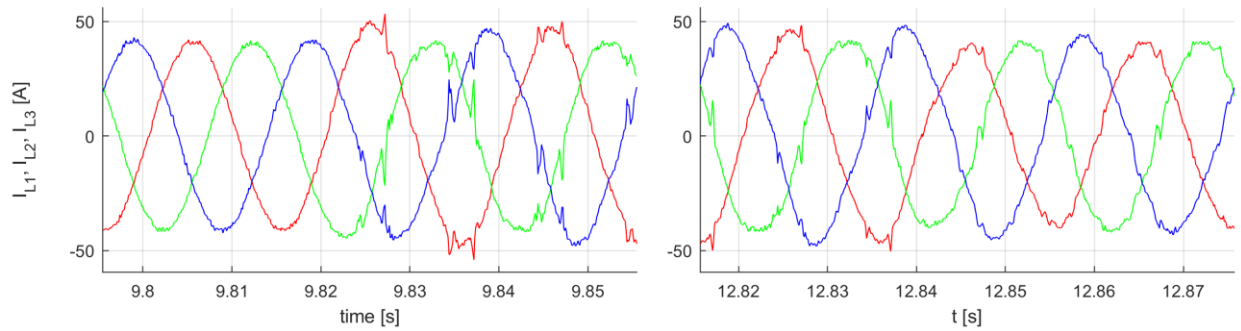
Timedomain values





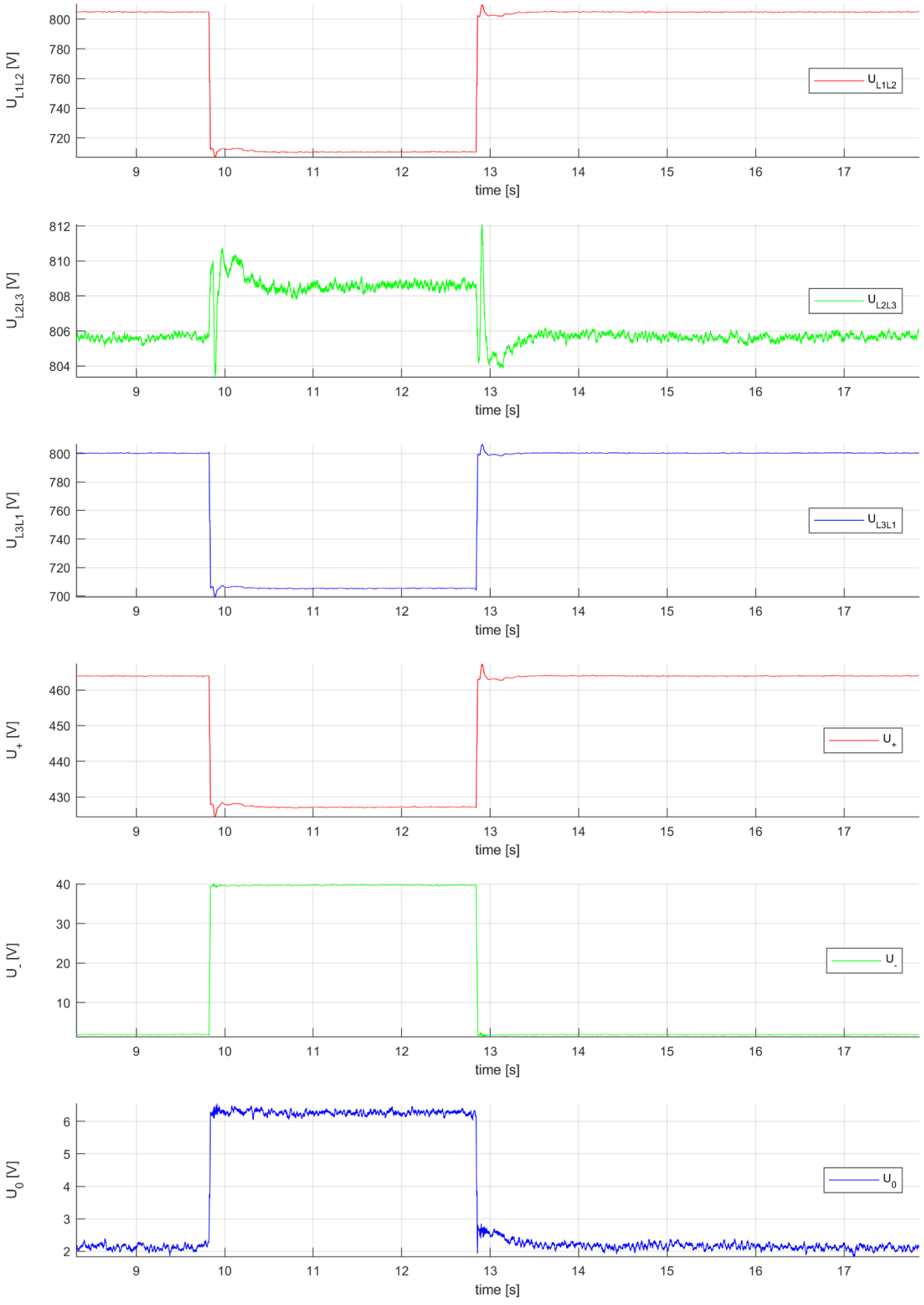






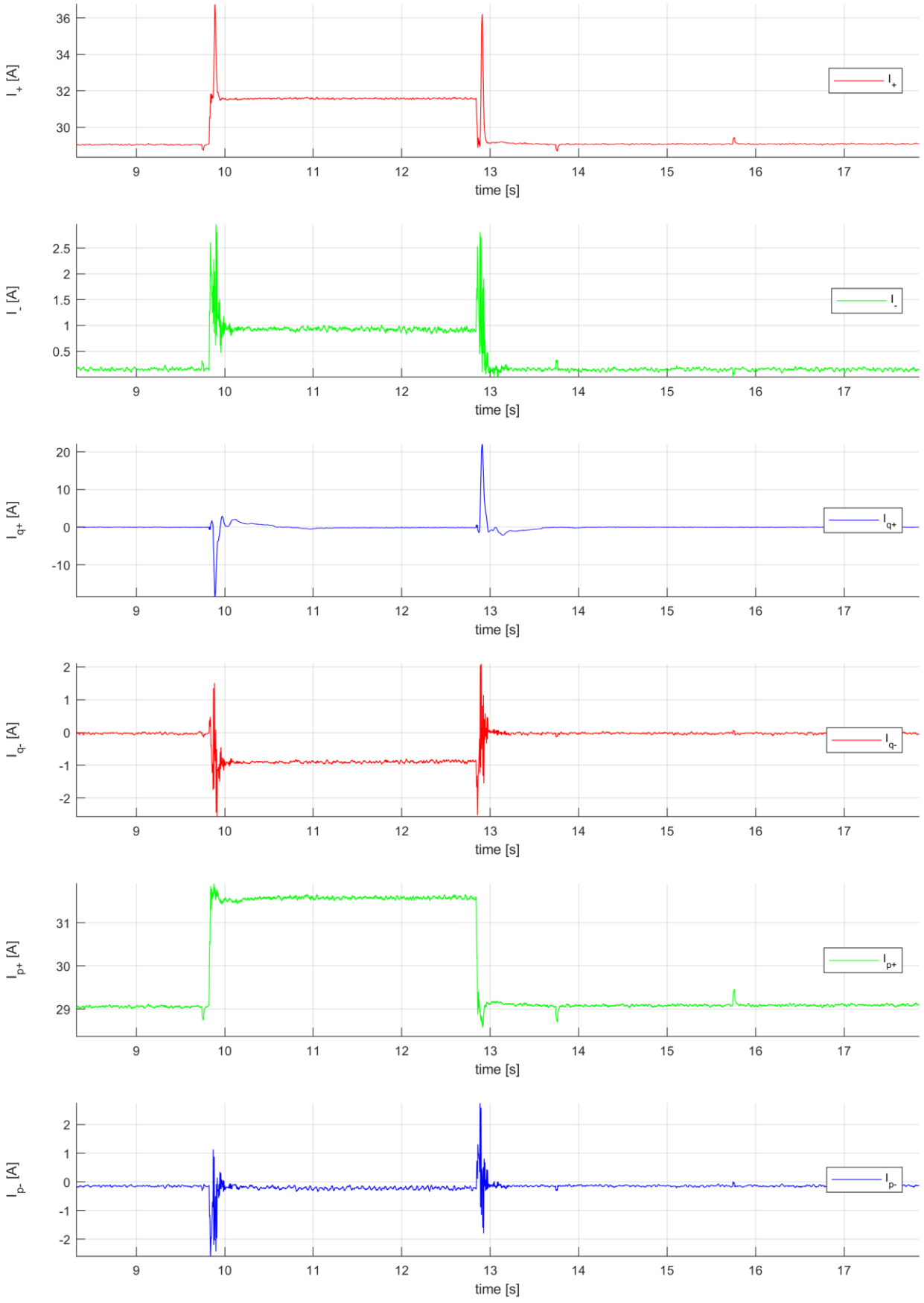
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Positive sequence components and RMS values



B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Positive sequence components and RMS values



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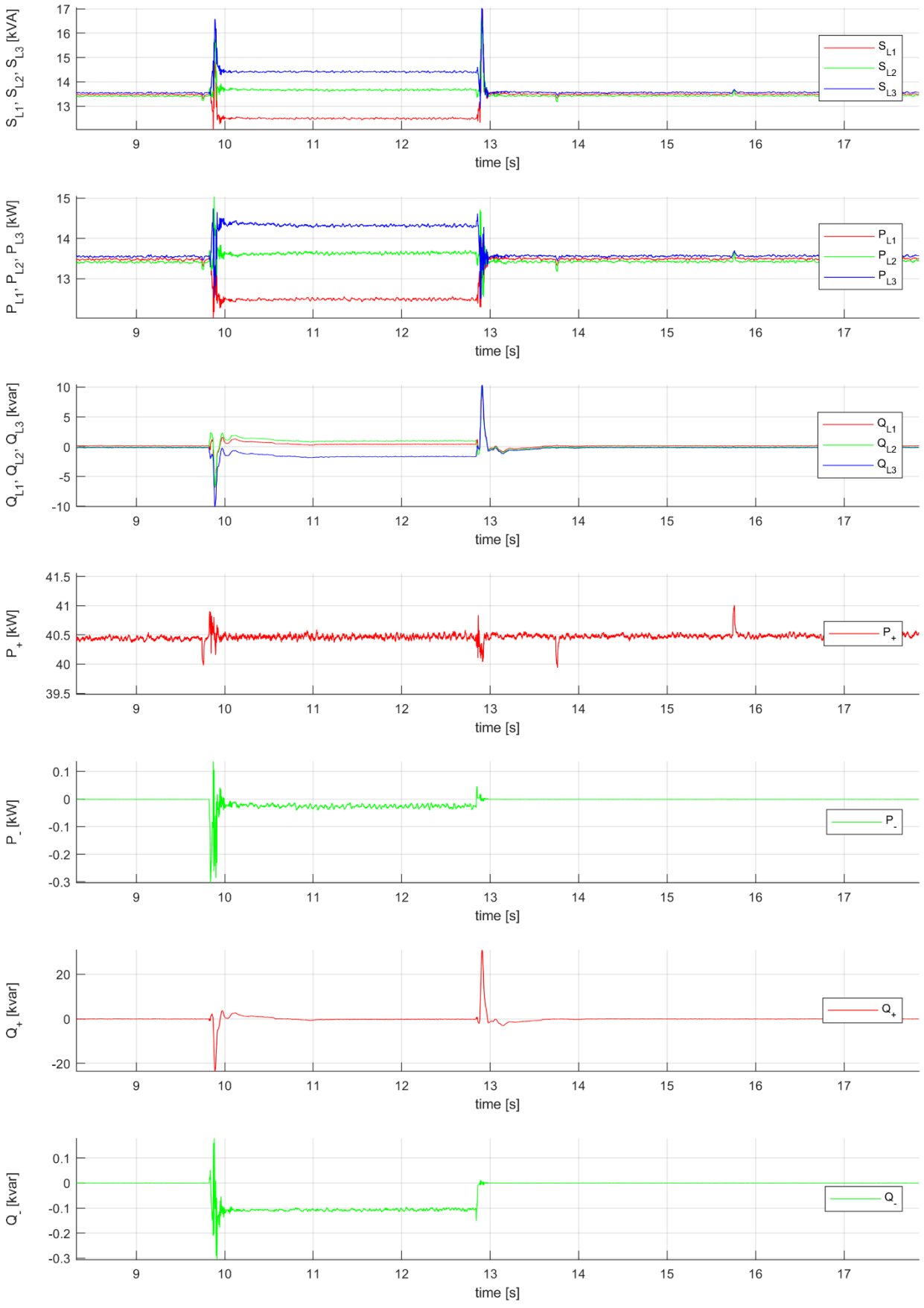
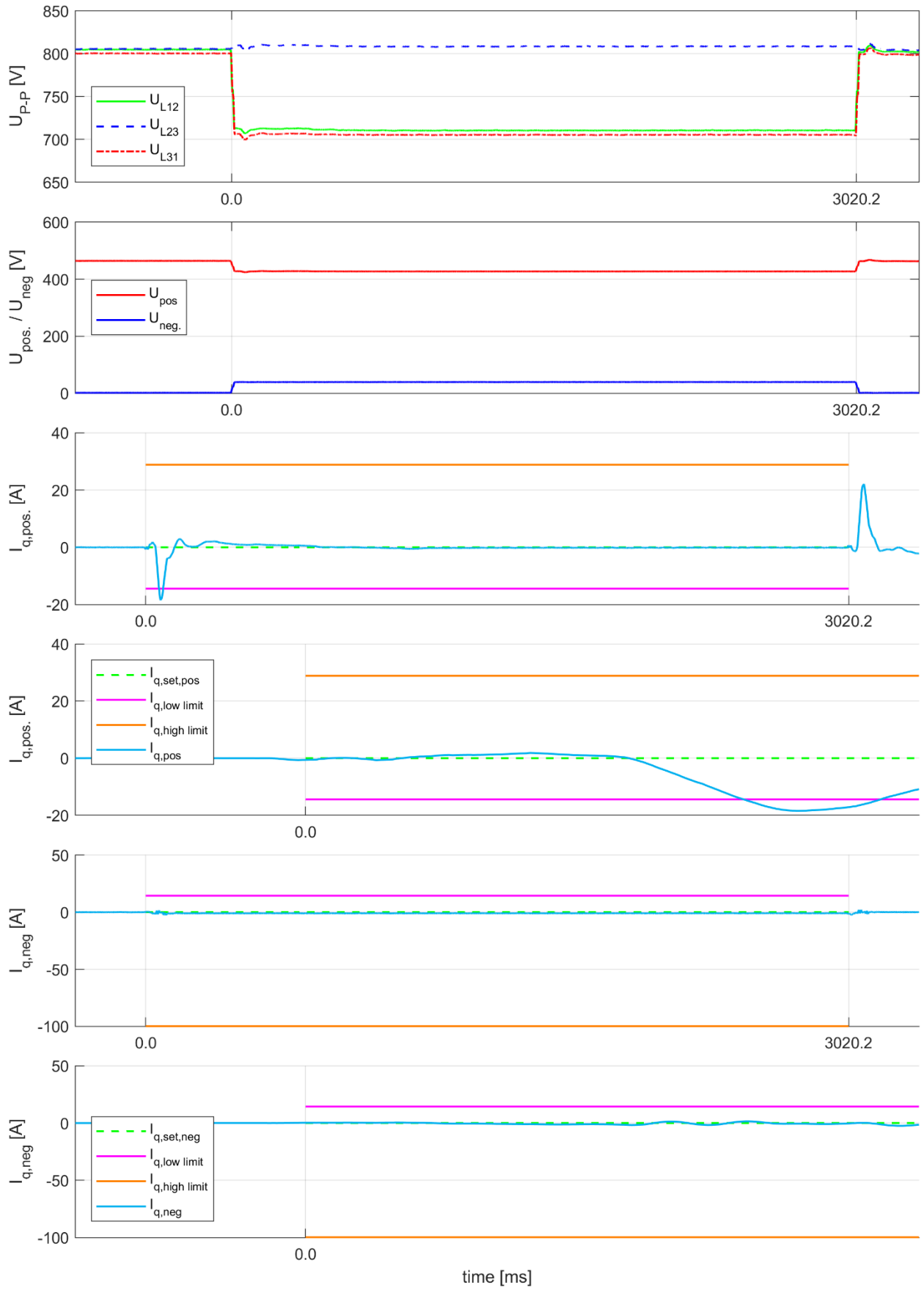
Positive sequence components and RMS values



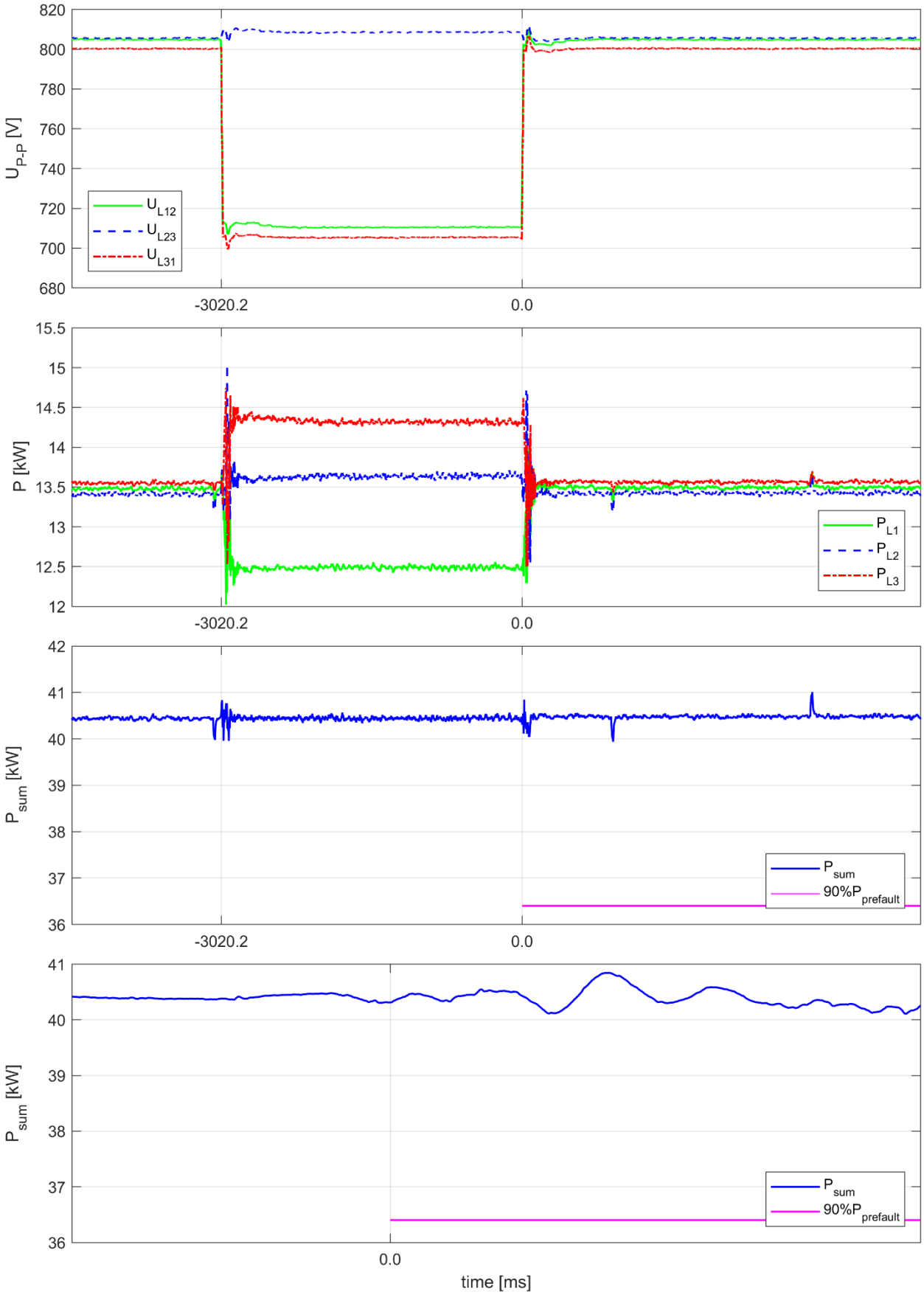
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Positive sequence components and RMS values



B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Positive sequence components and RMS values



B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

CEA_3.3.1

	No.	Parameter	Description / calculation basis	Results		
Gerneral information	1	Test no.	-	CEA_3.3.1-1		
	2	Data file name	-	CEA_3.3.1-1.wdf		
	3	MD5-Checksum	-	cfa76ac8aa93cf3b9d2c61d28da41a6c		
	4	Date	[yyyy-mm-dd]	2020-09-29		
	5	Time	[hh:mm:ss]	06:38:22		
	6	Type of fault (number of affected phases)	Fault type B on low-voltage side	One-phase		
	Phase reference			**A [1)]**	**B [1)]**	**C [1)]**
	7	Fault occurrence (t_1)	[ms]	6548.5		
	8	Fault clearance (t_2)	[ms]	9577.6		
	9	Fault duration determined from test	*(from time domain voltage results)* [ms]	3029.1		
	10	Measeured value of voltage drop / increase	*(per phase-to-neutral, t_1 + 100ms … t_2 and t_1 - 60s … t_1)* [p.u. U_n]	0.852	1.005	1.008
	11	Measeured value of voltage drop / increase	*(per phase-to-phase, t_1 + 100ms … t_2 and t_1 - 60s … t_1)* [p.u. U_n]	0.934	1.008	0.925
	12	Measeured value of voltage drop / increase	*(positive sequence, phase-to-neutral, t_1 + 100ms … t_2 and t_1 - 60s … t_1)* [p.u. U_n]	0.955		
Before grid fault t_1	13	Voltage reference	*(positive sequence, phase-to-neutral averaged over t_1 - 60s … t_1)* [p.u. U_n]	1.005		
	14	Voltage reference	*(negative sequence, phase-to-neutral averaged over t_1 - 60s … t_1)* [p.u. U_n]	0.004		
	15	Reactive current reference [2)]	*(RMS, averaged over t_1 – 10s … t_1)* [p.u. I_n]	0.001		
	16	Active power reference	*(RMS, averaged over t_1 – 10s … t_1)* [p.u. P_n]	1.004		
	17	Reactive power [2)]	*(RMS, averaged over t_1 – 10s … t_1)* [p.u. P_n]	0.001		
During Grid fault t1 till t2	18	Reactive current [2)]	*(positive sequence, averaged over t_1 + 100ms … t_2 - 20ms)* [p.u. I_n]	0.005		
	19	Reactive current [2)]	*(negative sequence, averaged over t_1 + 100ms … t_2 - 20ms)* [p.u. I_n]	-0.012		
	20	Apparent current	*(positive sequence, averaged over t_1 + 100ms … t_2 - 20ms)* [p.u. I_n]	1.051		
After fault clearence t2	21	Settling time of active power (from restoration of the voltage ≥ 90% of nominal voltage until the Active Power output restored to ≥ 90% of the pre-fault level)	[s]	0.000		

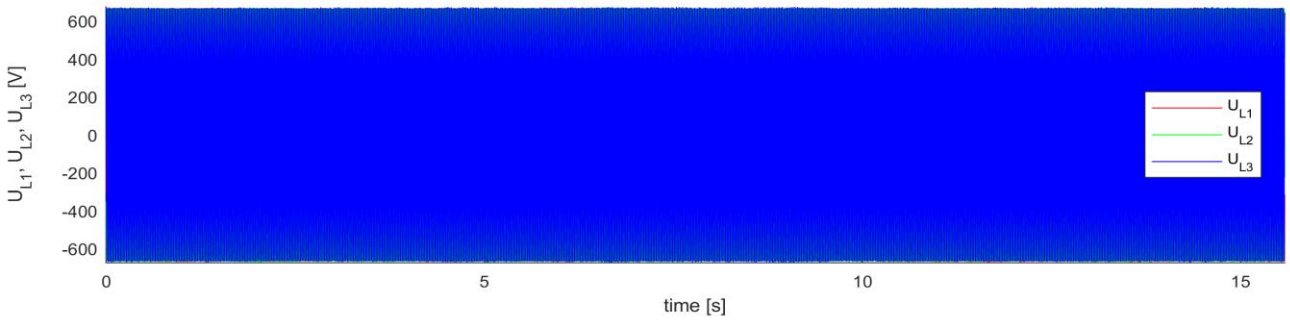
Note:

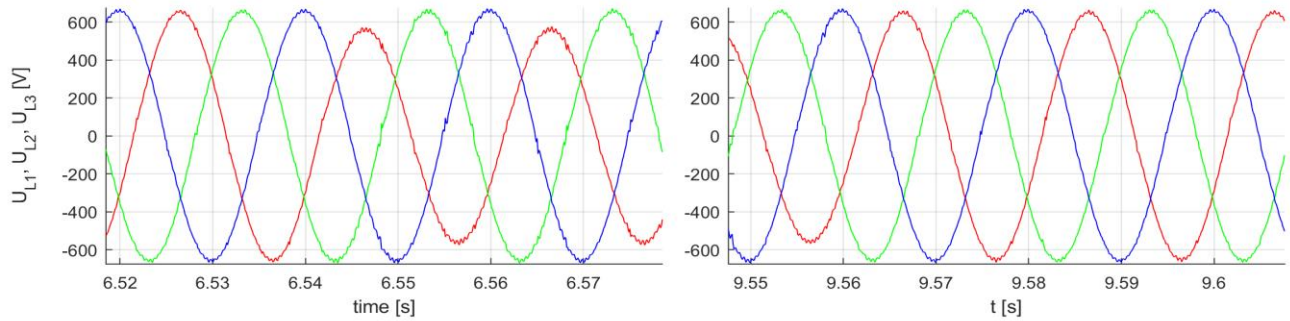
[1)] A / B / C indicate the phase-neutral voltages (L1, L2, L3), phase-phase voltages (L12, L23, L31) or the phase currents (L1, L2, L3), for details see *Description / calculation basis*.

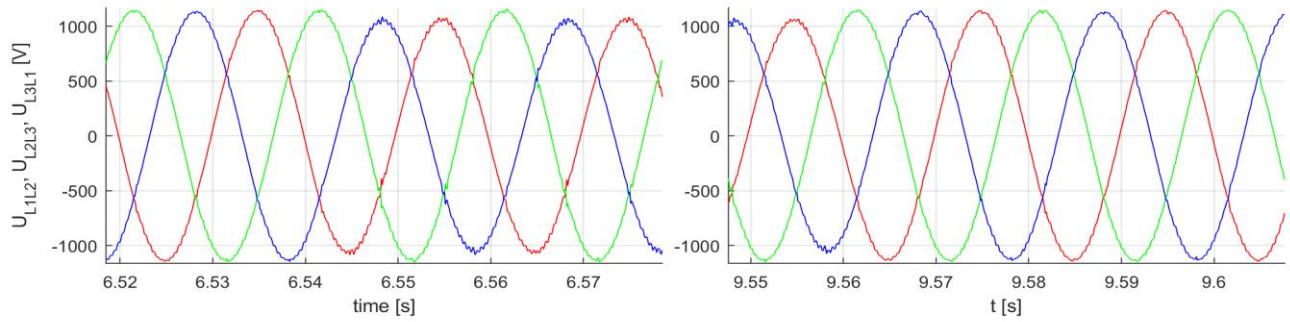
[2)] Under-excited / inductive reactive current has a negative sign, over-excited / capacitive reactive current has a positive sign, the sign of the reactive power is the same as the reactive current.

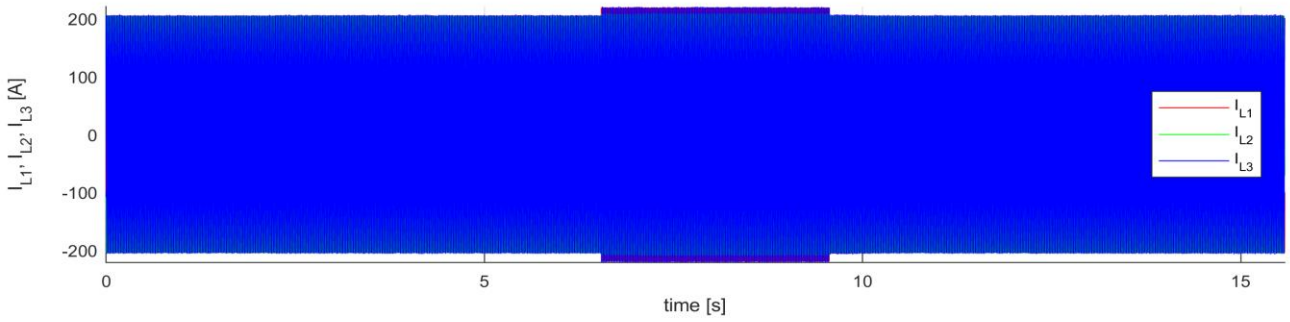
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

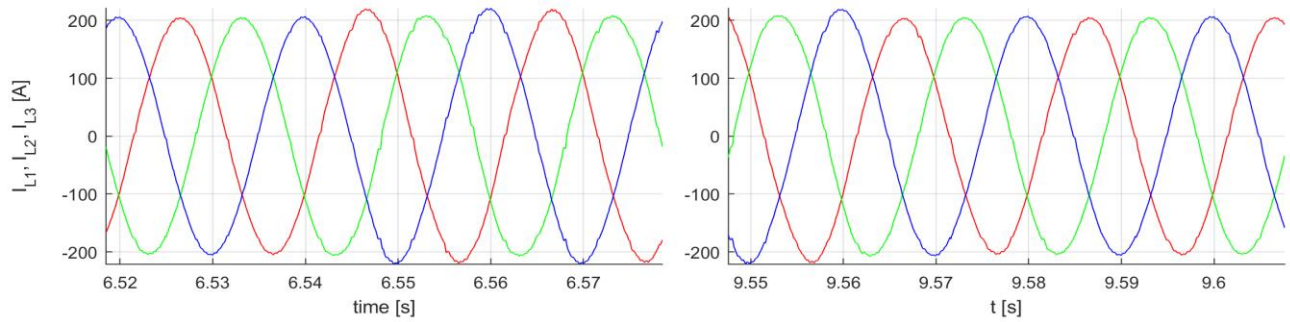
Timedomain values





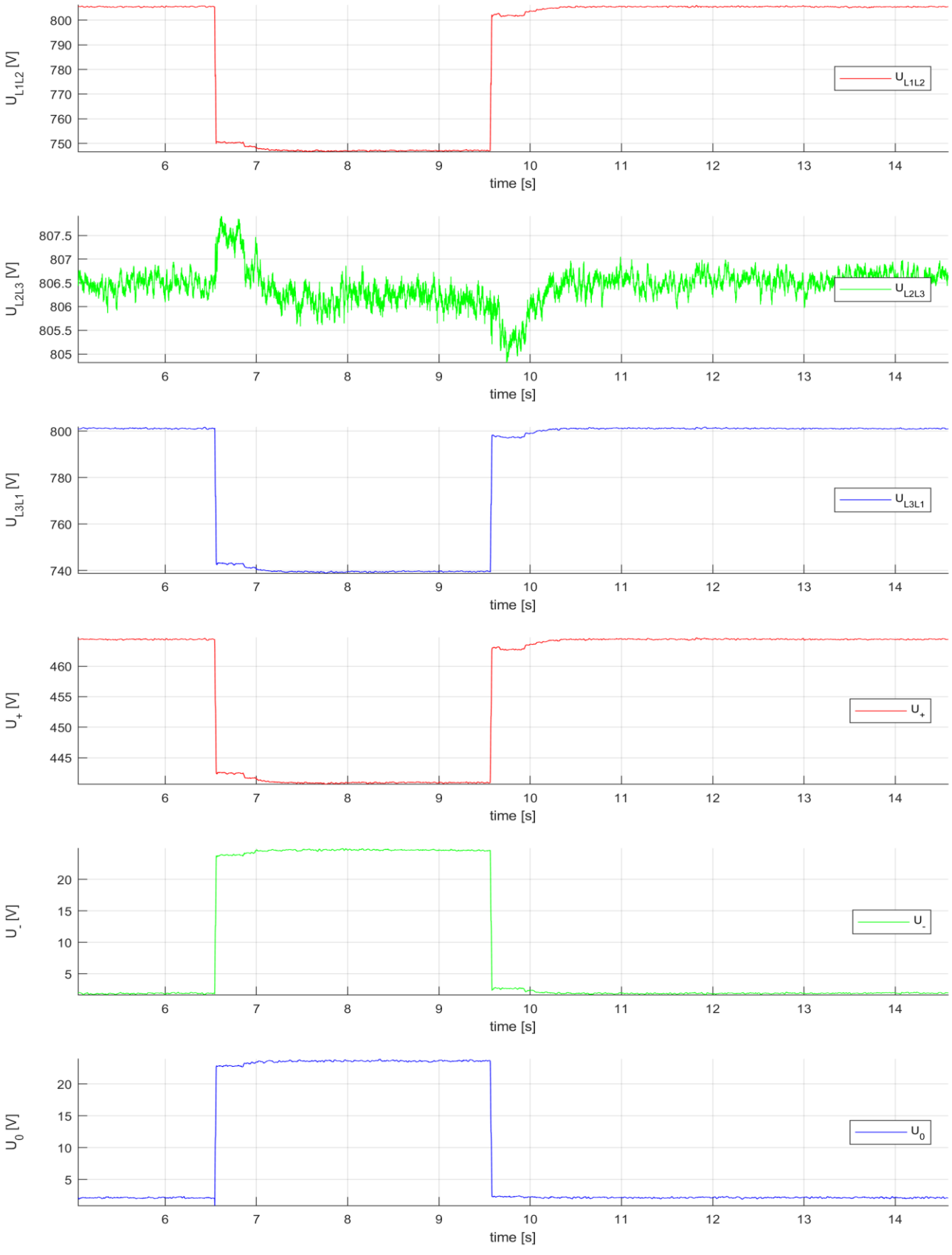






B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Positive sequence components and RMS values



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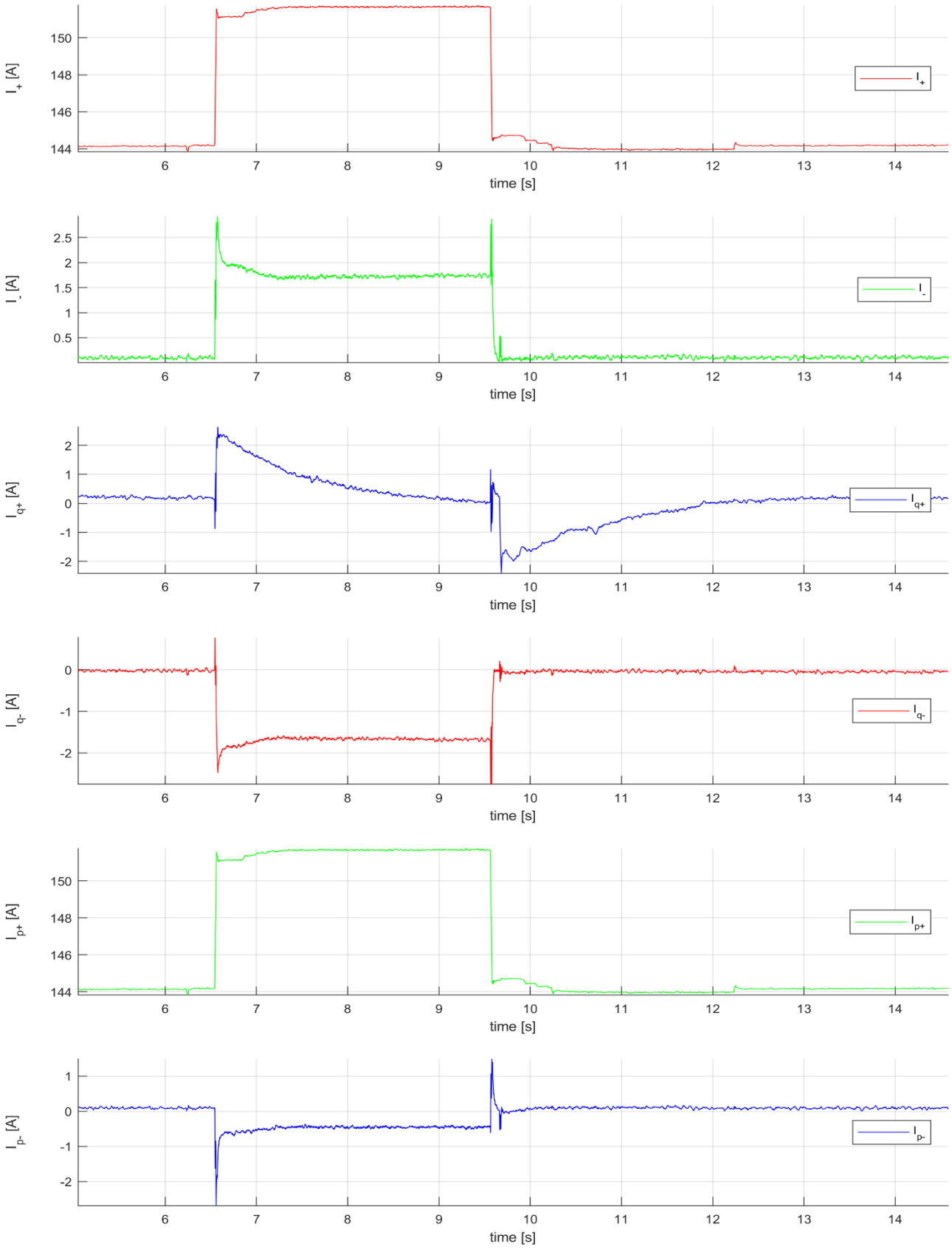
Positive sequence components and RMS values



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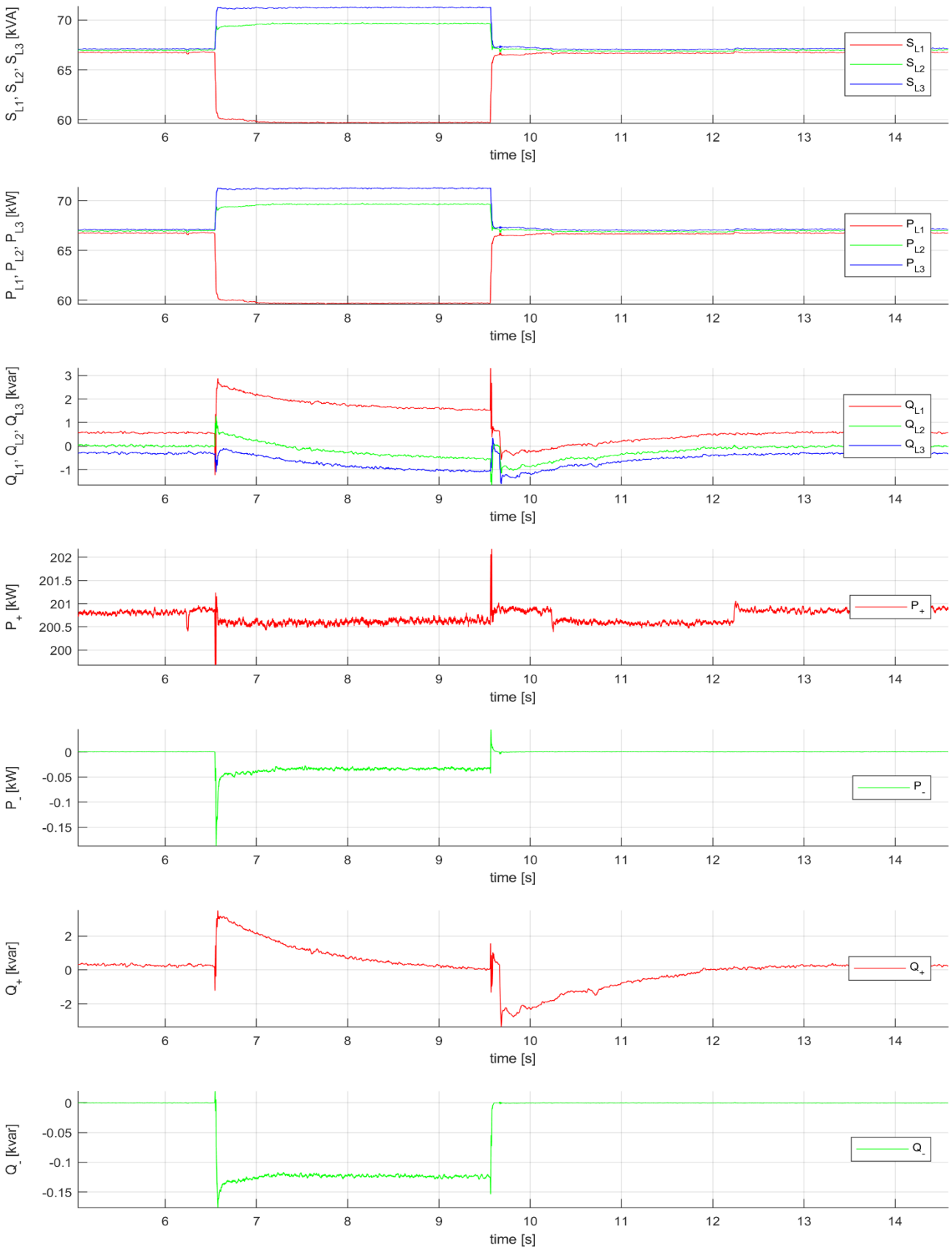
Positive sequence components and RMS values



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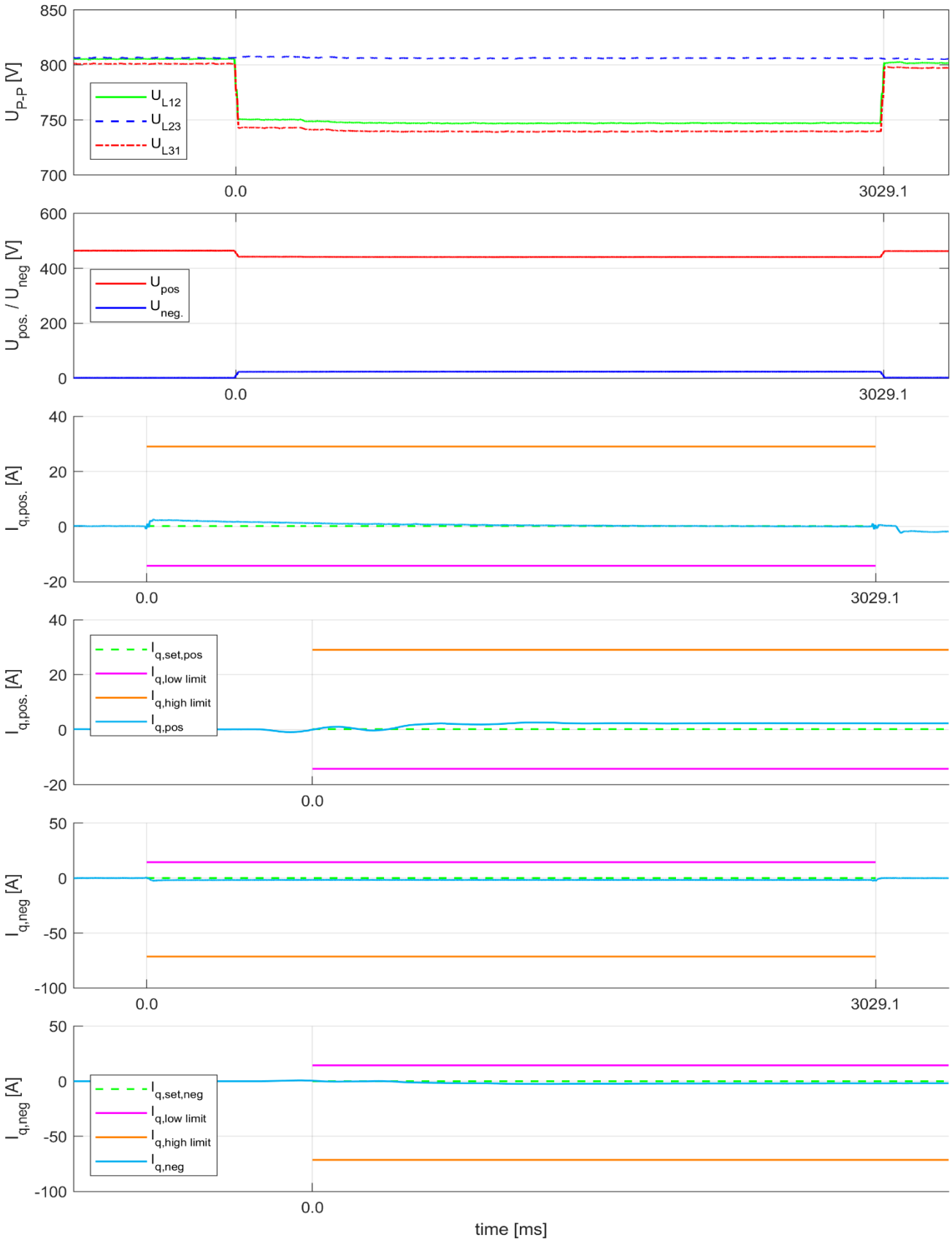
Positive sequence components and RMS values



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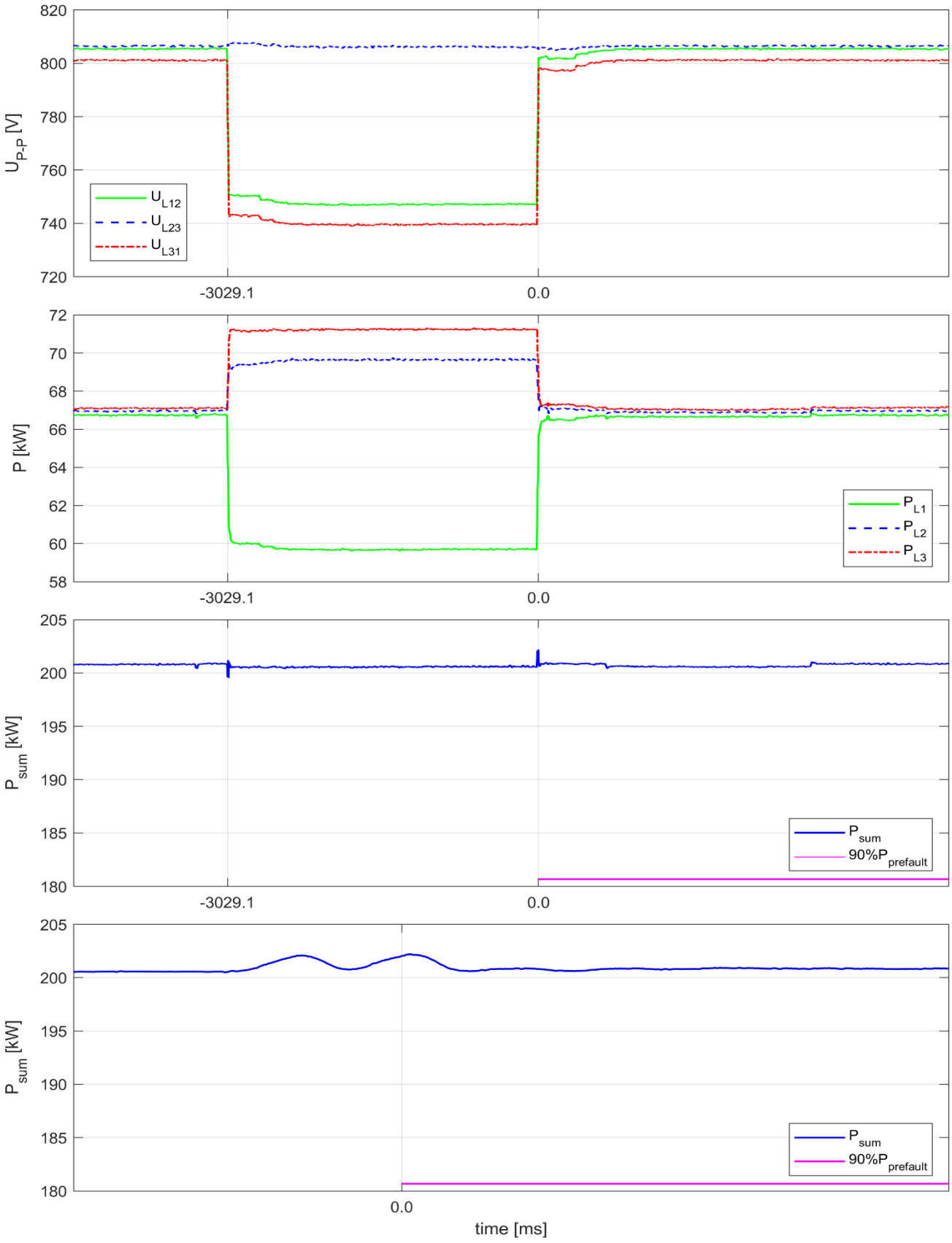
Positive sequence components and RMS values



B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

CEA_3.3.2

	No.	Parameter	Description / calculation basis	Results		
Gerneral information	1	Test no.	-	CEA_3.3.2-1		
	2	Data file name	-	CEA_3.3.2-1.wdf		
	3	MD5-Checksum	-	d31a19e2a7d907e71eb78465efe473bb		
	4	Date	[yyyy-mm-dd]	2020-09-29		
	5	Time	[hh:mm:ss]	06:39:44		
	6	Type of fault (number of affected phases)	Fault type B on low-voltage side	One-phase		
	Phase reference			**A [1)]**	**B [1)]**	**C [1)]**
	7	Fault occurrence (t_1)	[ms]	9643.9		
	8	Fault clearance (t_2)	[ms]	12673.1		
	9	Fault duration determined from test	*(from time domain voltage results)* [ms]	3029.2		
	10	Measeured value of voltage drop / increase	*(per phase-to-neutral, t_1 + 100ms … t_2 and t_1 - 60s … t_1)* [p.u. U_n]	0.850	1.004	1.007
	11	Measeured value of voltage drop / increase	*(per phase-to-phase, t_1 + 100ms … t_2 and t_1 - 60s … t_1)* [p.u. U_n]	0.931	1.007	0.925
	12	Measeured value of voltage drop / increase	*(positive sequence, phase-to-neutral, t_1 + 100ms … t_2 and t_1 - 60s … t_1)* [p.u. U_n]	0.954		
Before grid fault t_1	13	Voltage reference	*(positive sequence, phase-to-neutral averaged over t_1 - 60s … t_1)* [p.u. U_n]	1.004		
	14	Voltage reference	*(negative sequence, phase-to-neutral averaged over t_1 - 60s … t_1)* [p.u. U_n]	0.004		
	15	Reactive current reference [2)]	*(RMS, averaged over t_1 – 10s … t_1)* [p.u. I_n]	0.000		
	16	Active power reference	*(RMS, averaged over t_1 – 10s … t_1)* [p.u. P_n]	0.202		
	17	Reactive power [2)]	*(RMS, averaged over t_1 – 10s … t_1)* [p.u. P_n]	0.000		
During Grid fault t1 till t2	18	Reactive current [2)]	*(positive sequence, averaged over t_1 + 100ms … t_2 - 20ms)* [p.u. I_n]	0.000		
	19	Reactive current [2)]	*(negative sequence, averaged over t_1 + 100ms … t_2 - 20ms)* [p.u. I_n]	-0.005		
	20	Apparent current	*(positive sequence, averaged over t_1 + 100ms … t_2 - 20ms)* [p.u. I_n]	0.212		
After fault clearence t2	21	Settling time of active power (from restoration of the voltage ≥ 90% of nominal voltage until the Active Power output restored to ≥ 90% of the pre-fault level)	[s]	0.000		

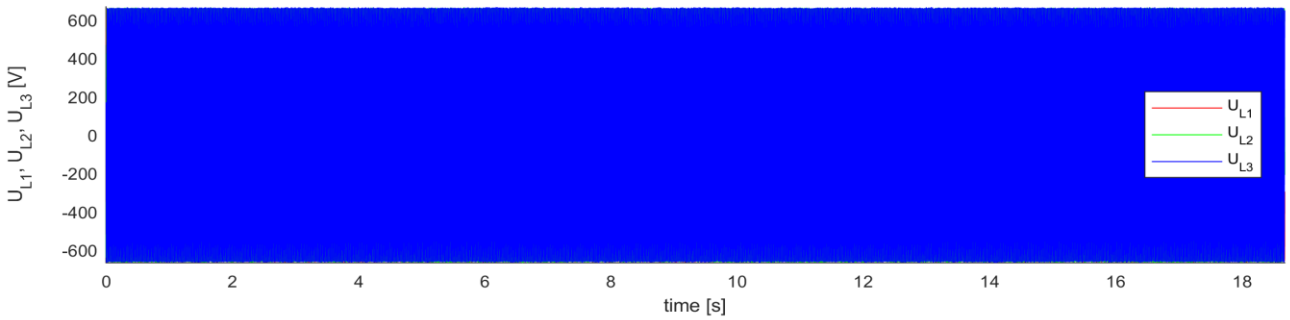
Note:

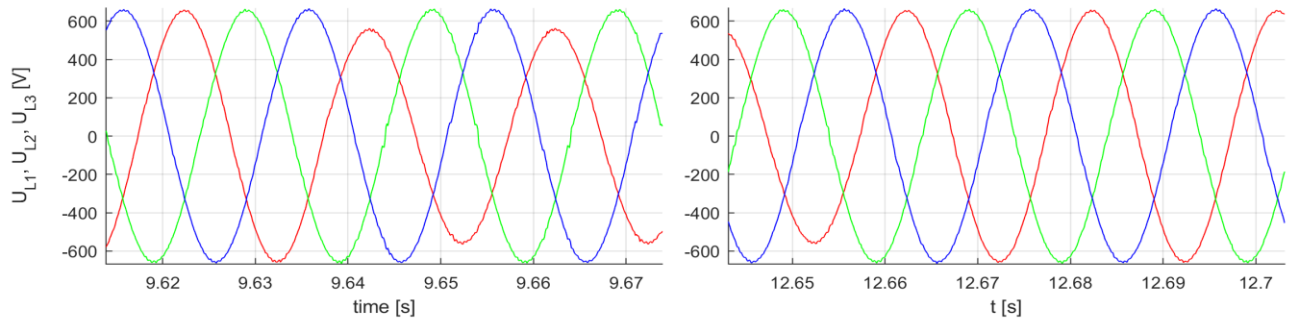
[1)] A / B / C indicate the phase-neutral voltages (L1, L2, L3), phase-phase voltages (L12, L23, L31) or the phase currents (L1, L2, L3), for details see *Description / calculation basis*.

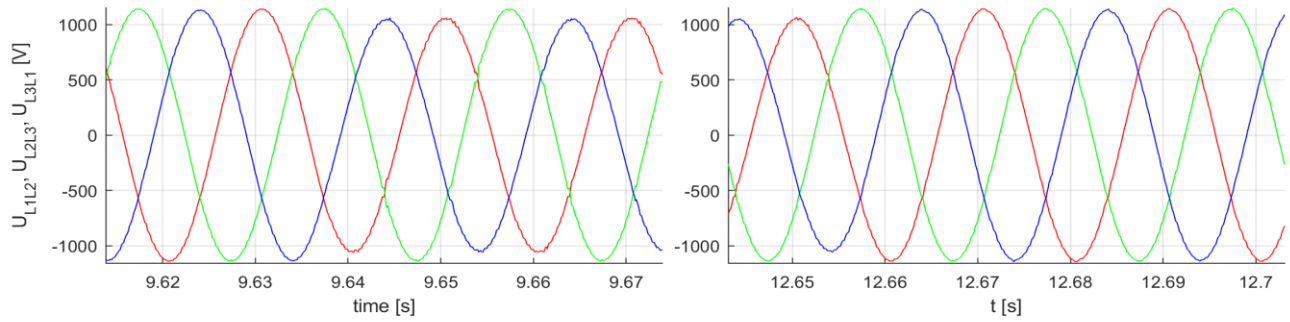
[2)] Under-excited / inductive reactive current has a negative sign, over-excited / capacitive reactive current has a positive sign, the sign of the reactive power is the same as the reactive current.

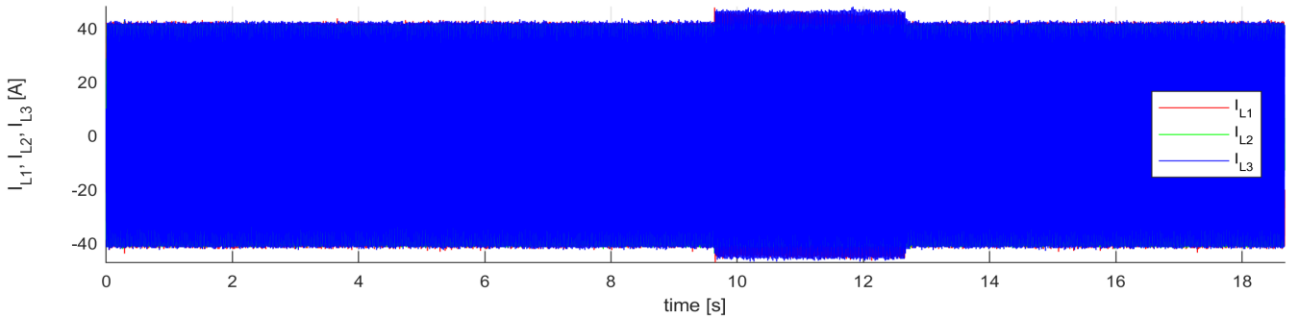
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

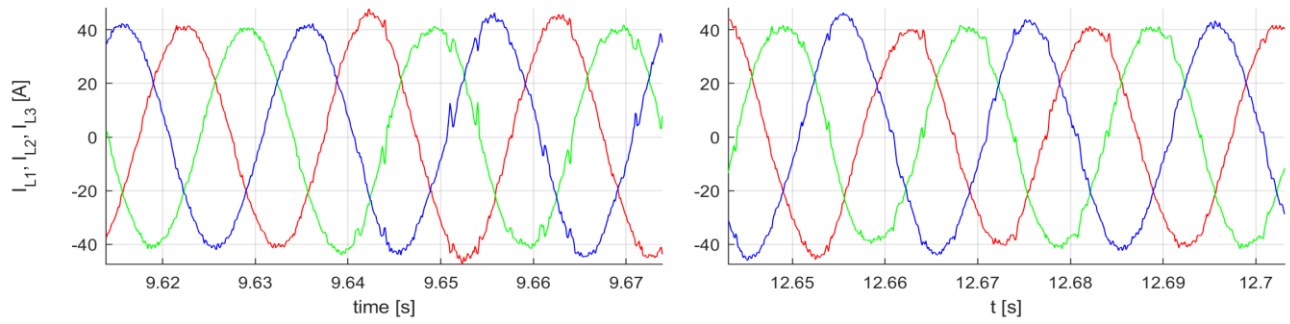
Timedomain values





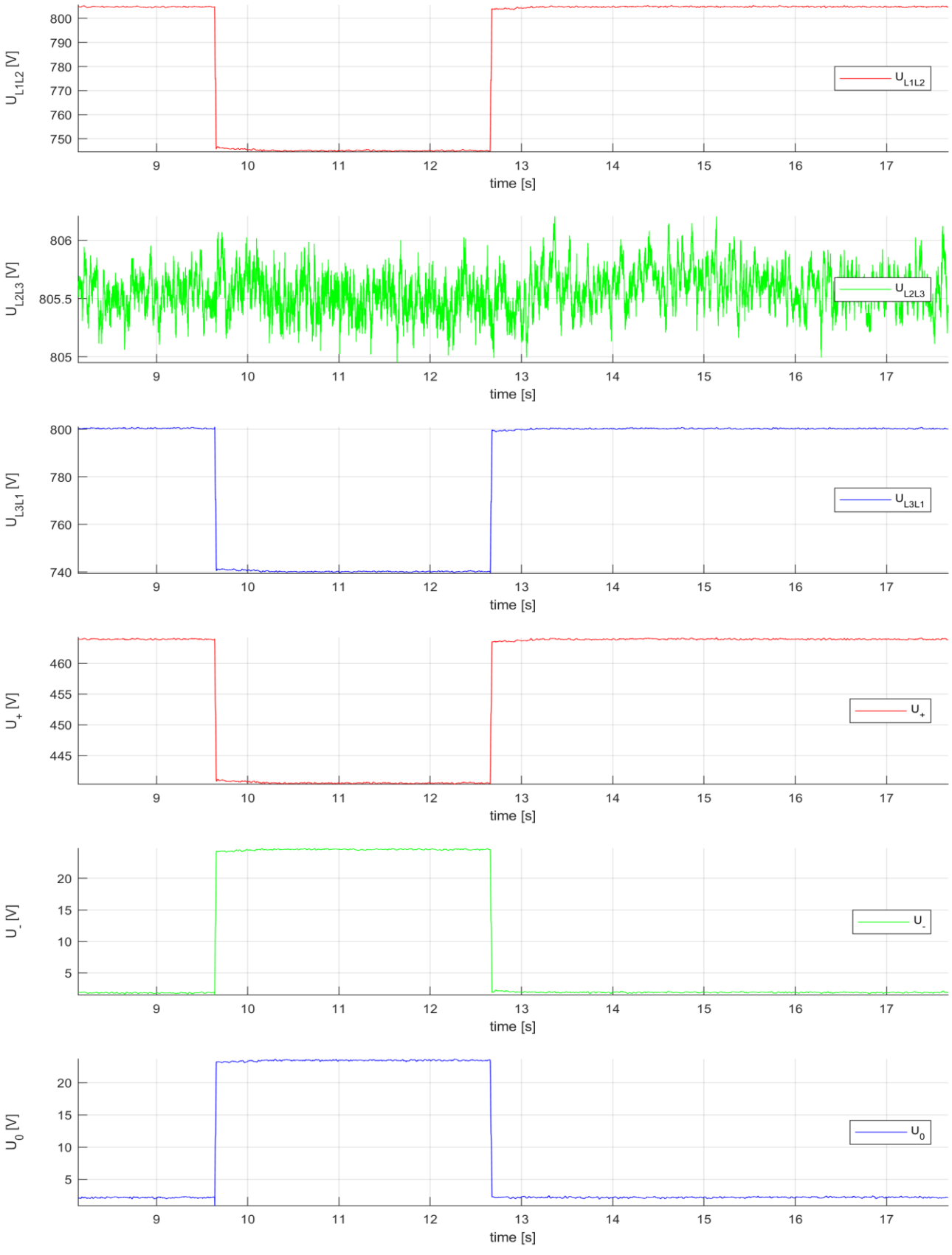






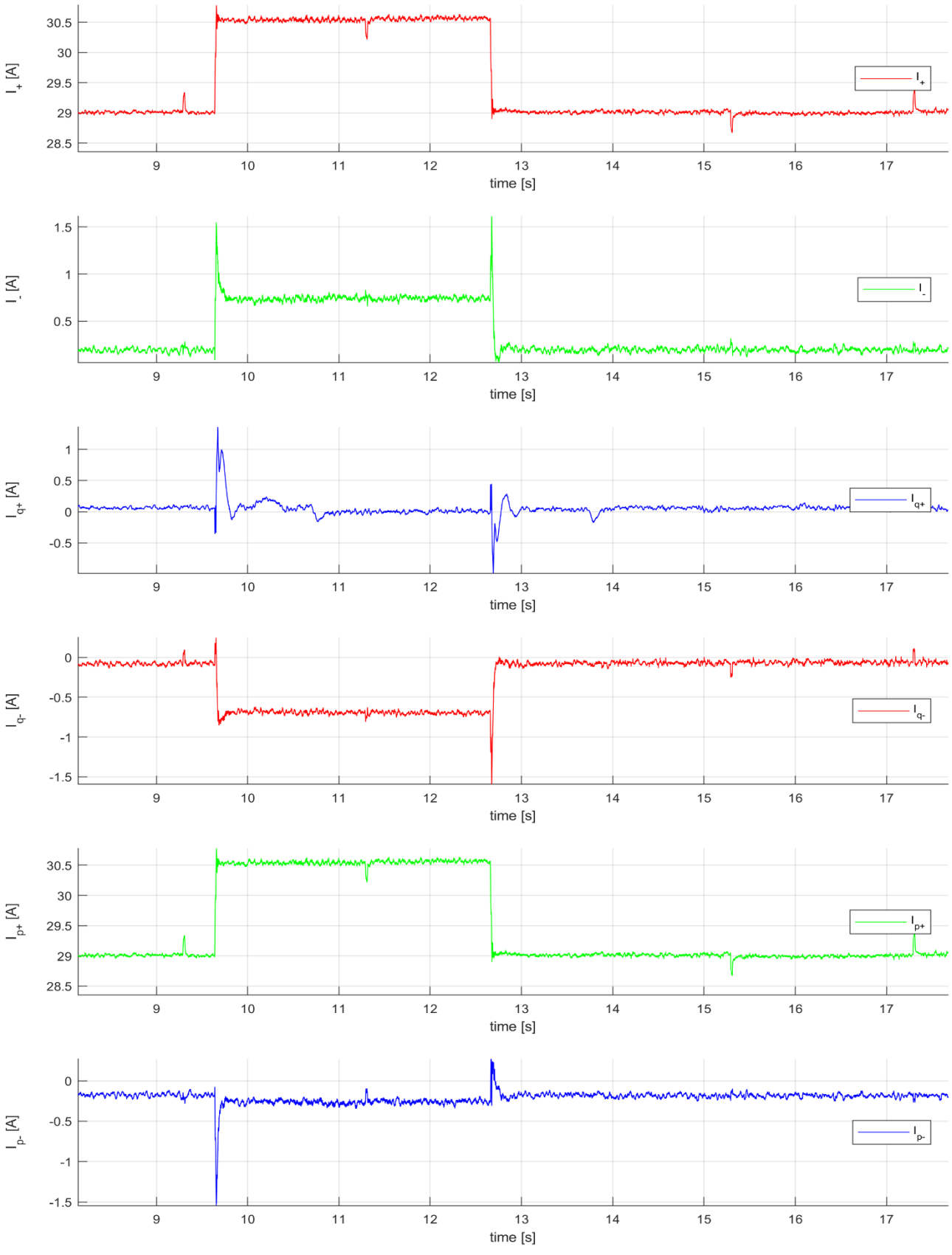
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Positive sequence components and RMS values



B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Positive sequence components and RMS values



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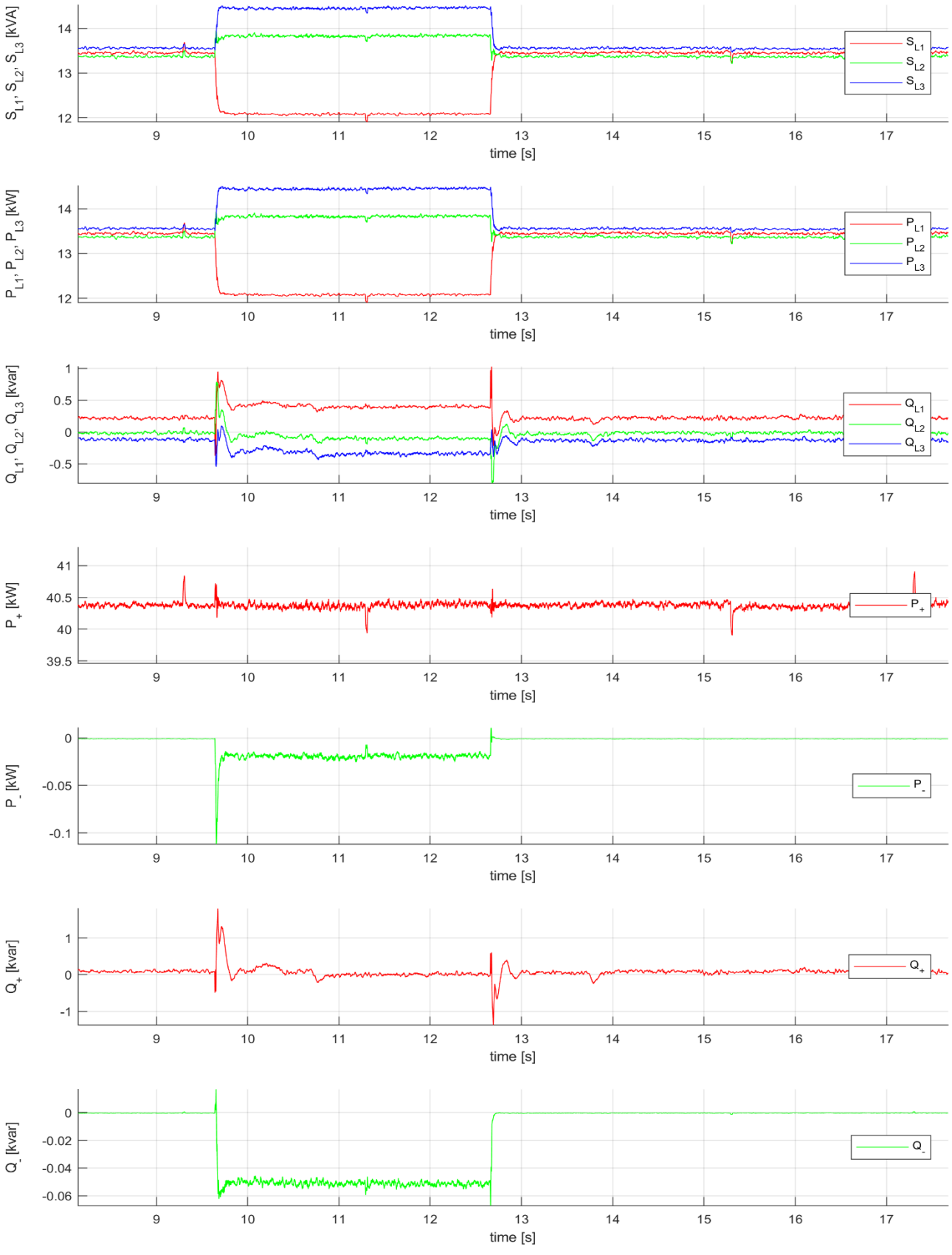
Positive sequence components and RMS values



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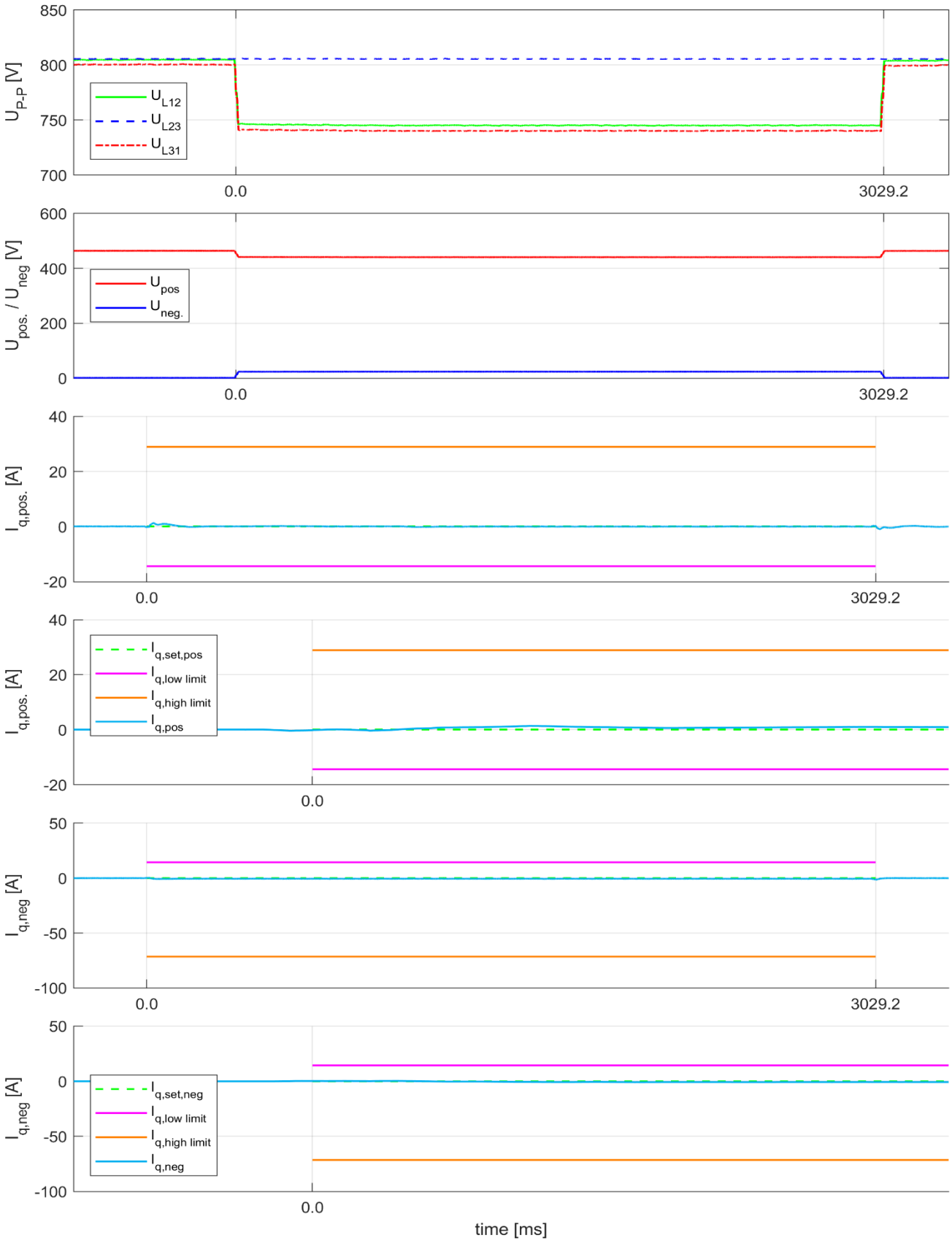
Positive sequence components and RMS values



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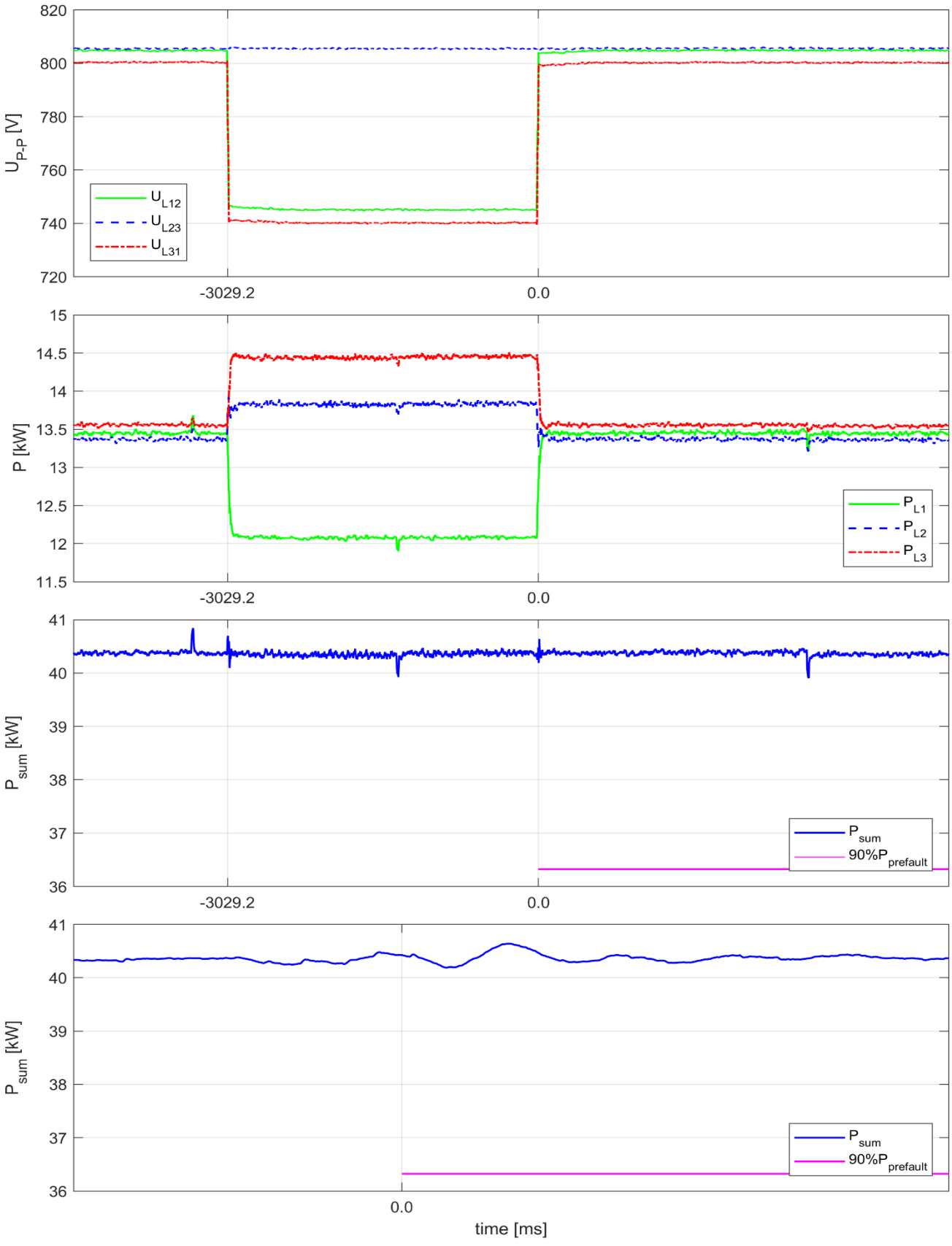
Positive sequence components and RMS values



B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

CEA_4.1.1

	No.	Parameter	Description / calculation basis	Results		
Gerneral information	1	Test no.	-	CEA_4.1.1-1		
	2	Data file name	-	CEA_4.1.1-1.wdf		
	3	MD5-Checksum	-	13cf81c366cbcf58fd69f555cb0228c2		
	4	Date	[yyyy-mm-dd]	2020-09-23		
	5	Time	[hh:mm:ss]	11:47:34		
	6	Type of fault (number of affected phases)	-	Three-phase		
	Phase reference			**A [1)]**	**B [1)]**	**C [1)]**
	7	Fault occurrence (t_1)	[ms]	5975.9		
	8	Fault clearance (t_2)	[ms]	16009.6		
	9	Fault duration determined from test	*(from time domain voltage results)* [ms]	10033.7		
	10	Measeured value of voltage drop / increase	*(per phase-to-neutral, t_1 + 100ms … t_2 and t_1 - 60s … t_1)* [p.u. U_n]	0.901	0.903	0.905
	11	Measeured value of voltage drop / increase	*(per phase-to-phase, t_1 + 100ms … t_2 and t_1 - 60s … t_1)* [p.u. U_n]	0.904	0.906	0.899
	12	Measeured value of voltage drop / increase	*(positive sequence, phase-to-neutral, t_1 + 100ms … t_2 and t_1 - 60s … t_1)* [p.u. U_n]	0.903		
Before grid fault t_1	13	Voltage reference	*(positive sequence, phase-to-neutral averaged over t_1 - 60s … t_1)* [p.u. U_n]	1.005		
	14	Voltage reference	*(negative sequence, phase-to-neutral averaged over t_1 - 60s … t_1)* [p.u. U_n]	0.004		
	15	Reactive current reference [2)]	*(RMS, averaged over t_1 – 10s … t_1)* [p.u. I_n]	-0.001		
	16	Active power reference	*(RMS, averaged over t_1 – 10s … t_1)* [p.u. P_n]	1.005		
	17	Reactive power [2)]	*(RMS, averaged over t_1 – 10s … t_1)* [p.u. P_n]	-0.001		
During Grid fault t1 till t2	18	Reactive current [2)]	*(positive sequence, averaged over t_1 + 100ms … t_2 - 20ms)* [p.u. I_n]	-0.001		
	19	Reactive current [2)]	*(negative sequence, averaged over t_1 + 100ms … t_2 - 20ms)* [p.u. I_n]	0.001		
	20	Apparent current	*(positive sequence, averaged over t_1 + 100ms … t_2 - 20ms)* [p.u. I_n]	1.079		
After fault clearence t2	21	Settling time of active power (from restoration of the voltage ≥ 90% of nominal voltage until the Active Power output restored to ≥ 90% of the pre-fault level)	[s]	0.000		

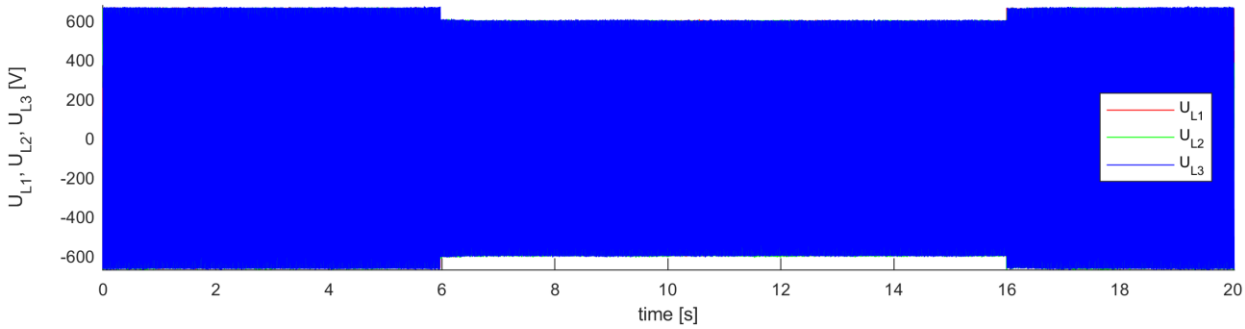
Note:

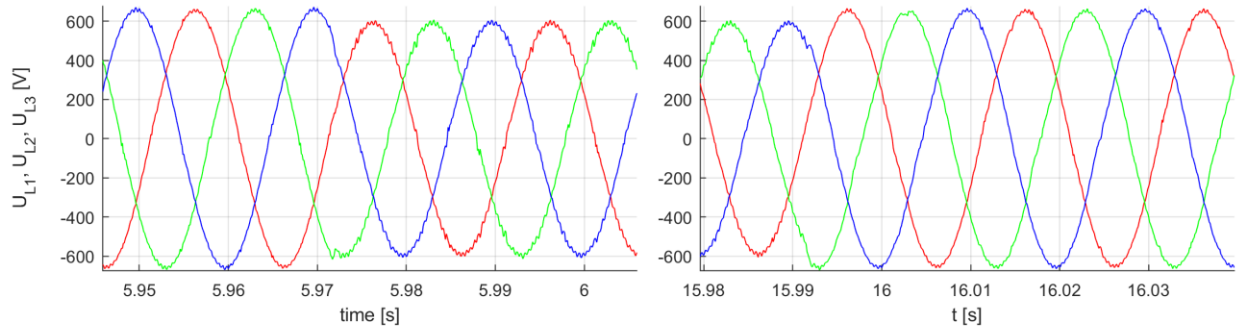
[1)] A / B / C indicate the phase-neutral voltages (L1, L2, L3), phase-phase voltages (L12, L23, L31) or the phase currents (L1, L2, L3), for details see *Description / calculation basis*.

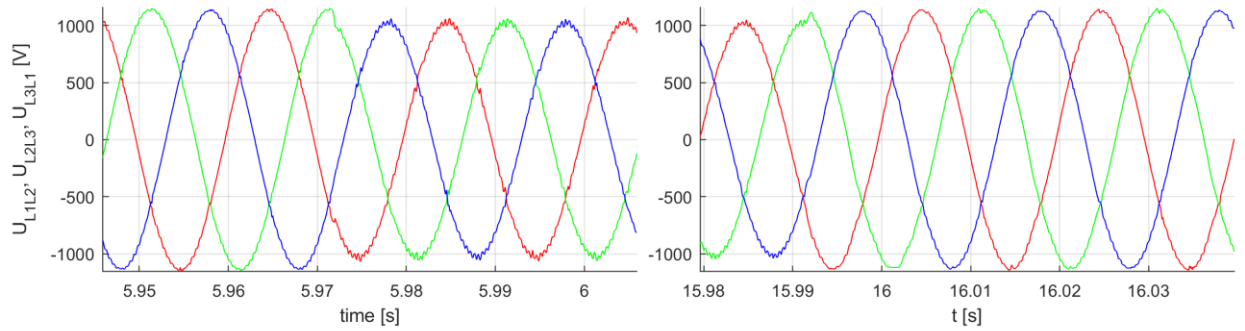
[2)] Under-excited / inductive reactive current has a negative sign, over-excited / capacitive reactive current has a positive sign, the sign of the reactive power is the same as the reactive current.

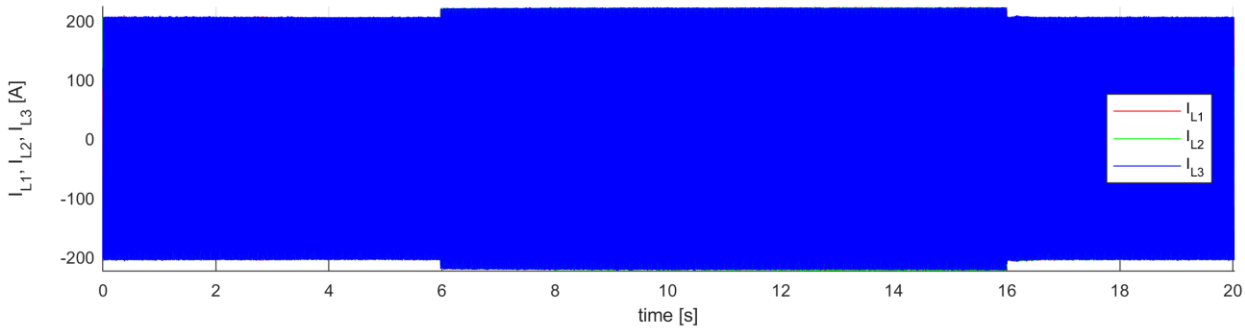
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

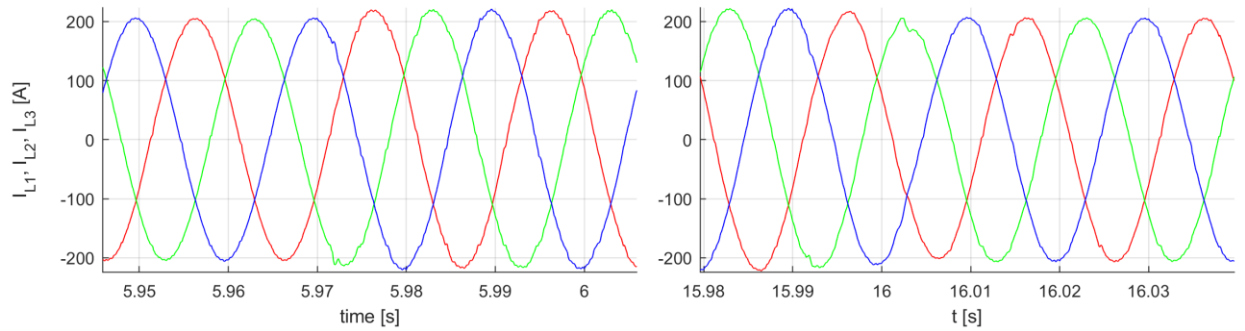
Timedomain values





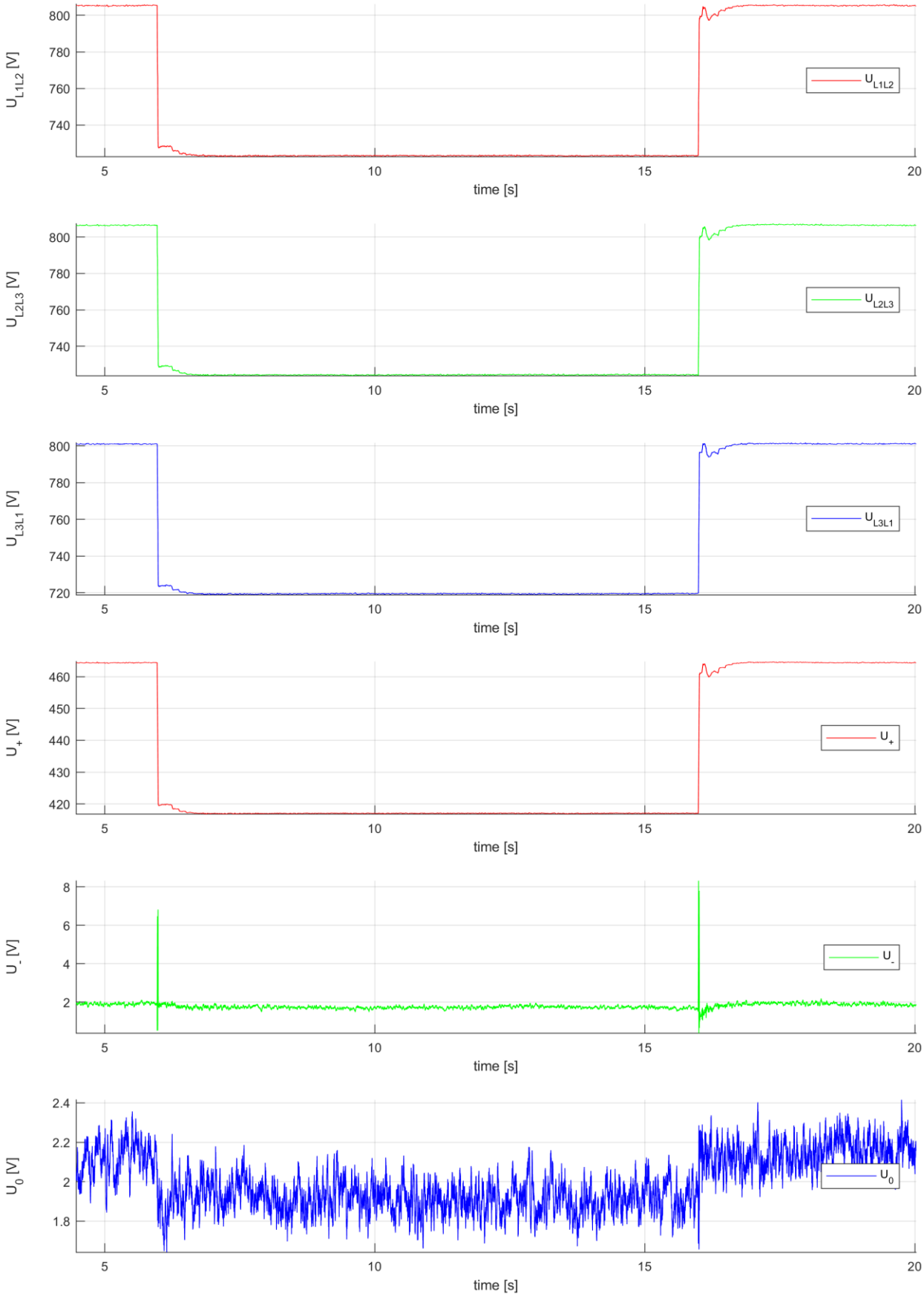






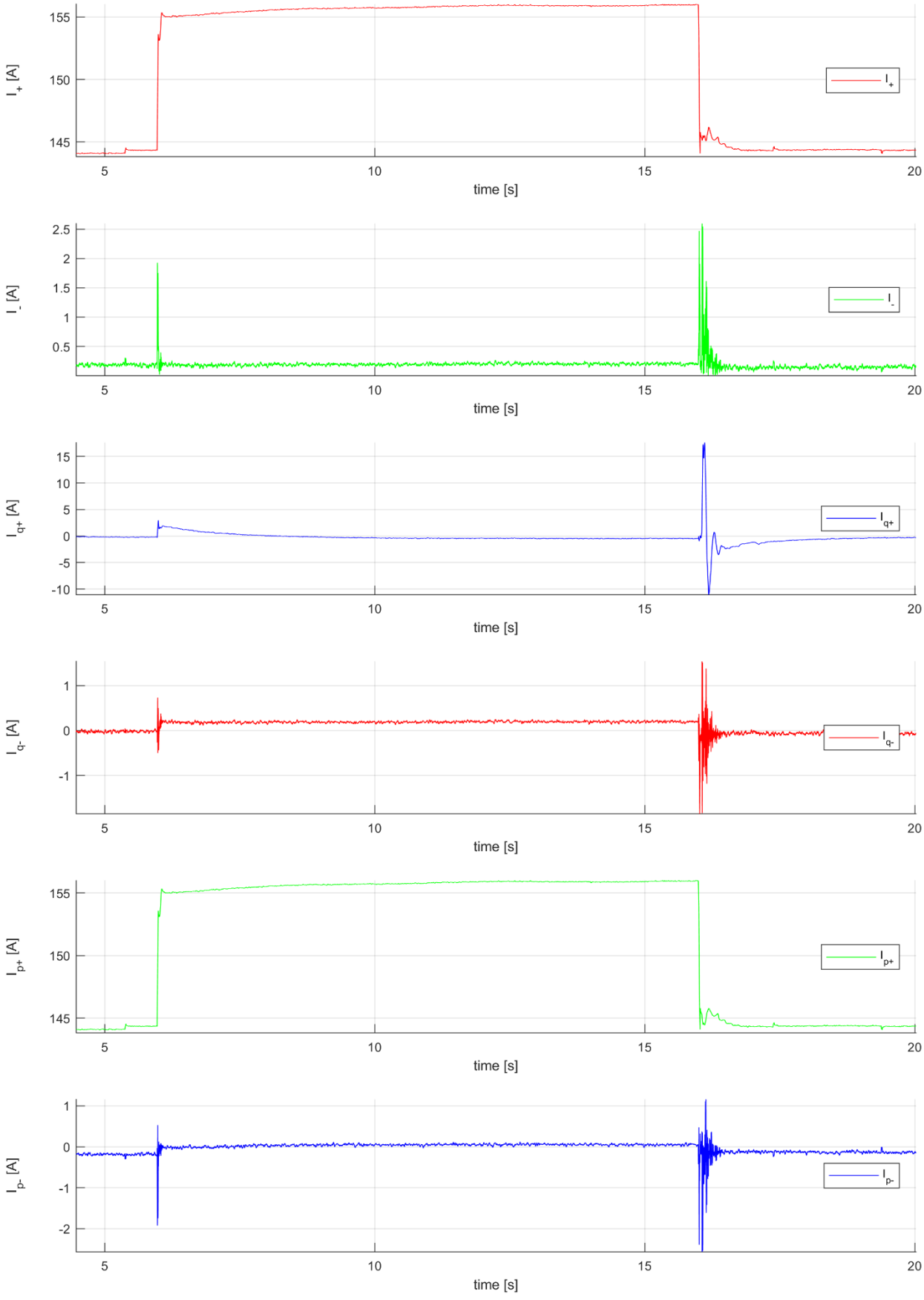
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Positive sequence components and RMS values



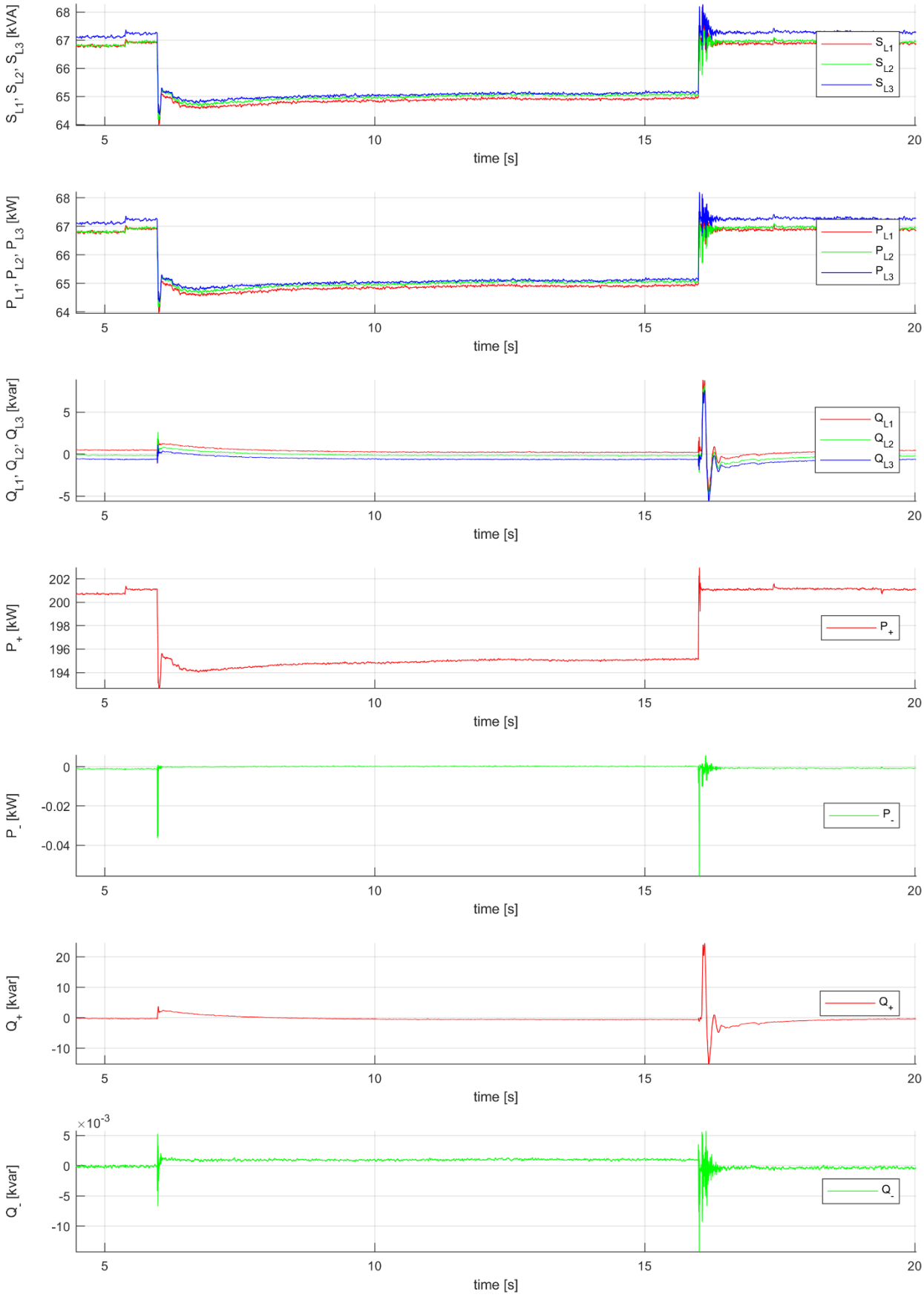
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Positive sequence components and RMS values



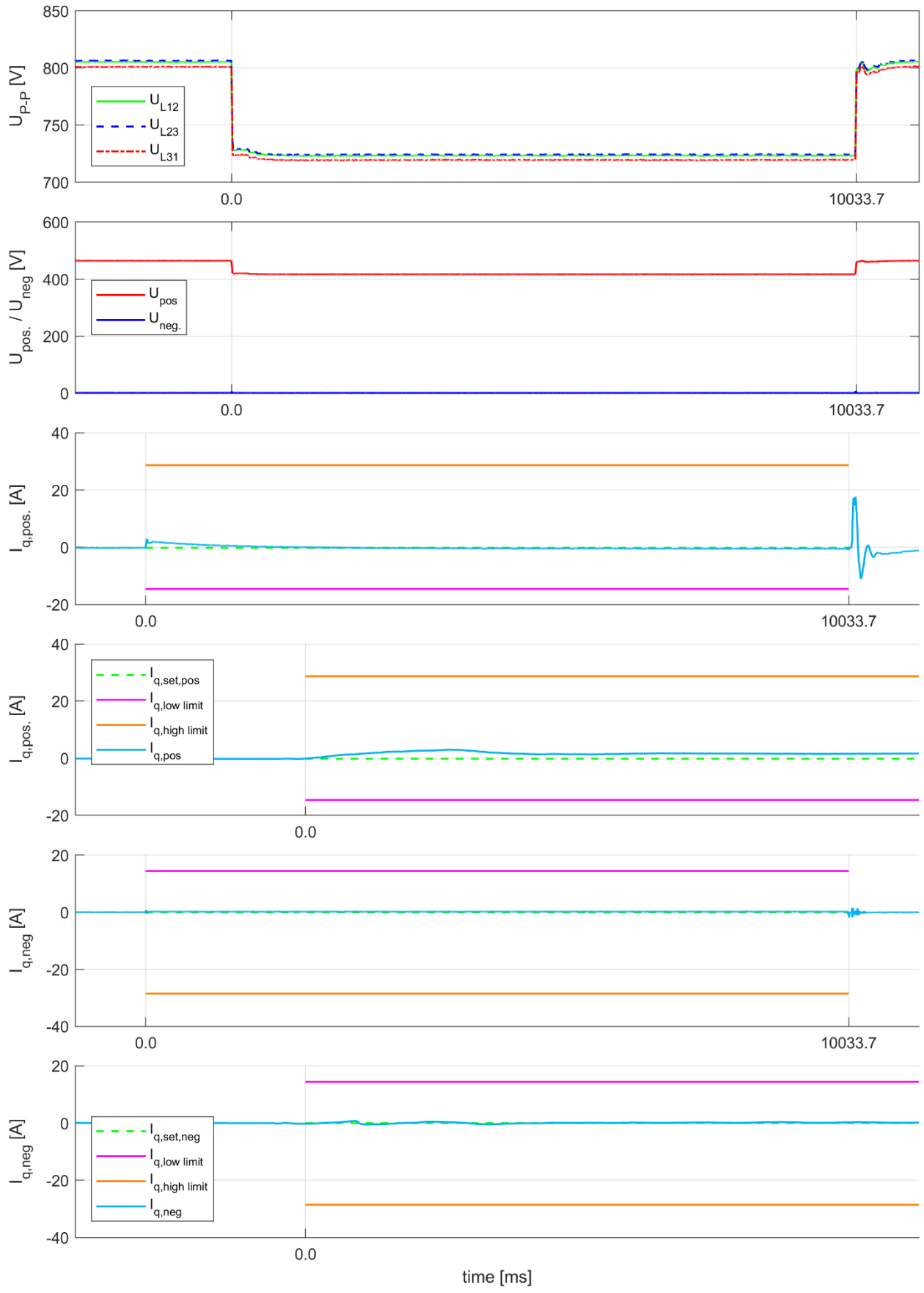
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Positive sequence components and RMS values



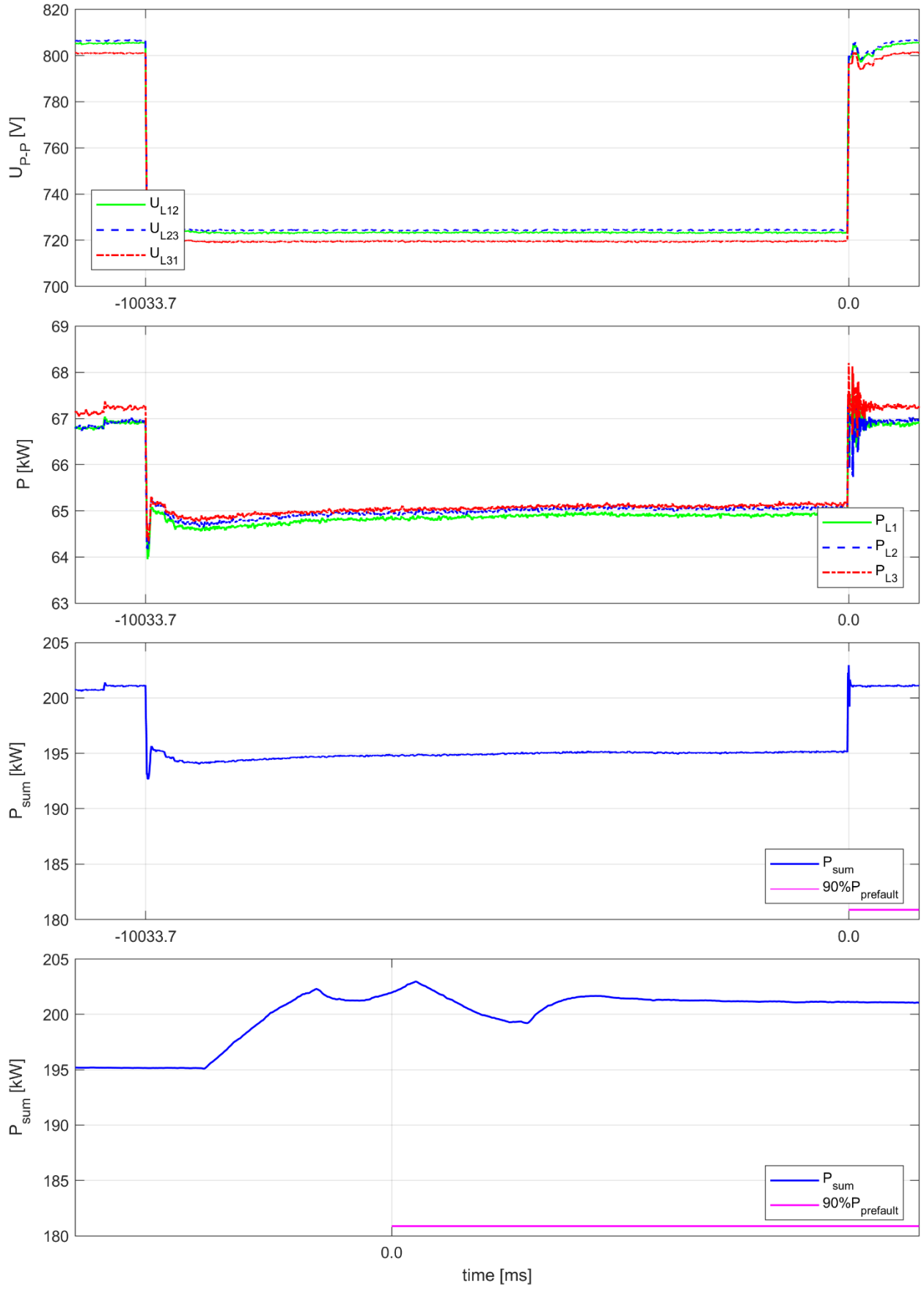
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Positive sequence components and RMS values



B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Positive sequence components and RMS values



B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

CEA_4.1.2

	No.	Parameter	Description / calculation basis	Results		
Gerneral information	1	Test no.	-	CEA_4.1.2-1		
	2	Data file name	-	CEA_4.1.2-1.wdf		
	3	MD5-Checksum	-	8b87d718ec64ff923e1e895461c4c255		
	4	Date	[yyyy-mm-dd]	2020-09-23		
	5	Time	[hh:mm:ss]	11:46:00		
	6	Type of fault (number of affected phases)	-	Three-phase		
	Phase reference			**A [1)]**	**B [1)]**	**C [1)]**
	7	Fault occurrence (t_1)	[ms]	5005.8		
	8	Fault clearance (t_2)	[ms]	15039.2		
	9	Fault duration determined from test	*(from time domain voltage results)* [ms]	10033.4		
	10	Measeured value of voltage drop / increase	*(per phase-to-neutral, t_1 + 100ms … t_2 and t_1 - 60s … t_1)* [p.u. U_n]	0.900	0.902	0.904
	11	Measeured value of voltage drop / increase	*(per phase-to-phase, t_1 + 100ms … t_2 and t_1 - 60s … t_1)* [p.u. U_n]	0.903	0.904	0.898
	12	Measeured value of voltage drop / increase	*(positive sequence, phase-to-neutral, t_1 + 100ms … t_2 and t_1 - 60s … t_1)* [p.u. U_n]	0.902		
Before grid fault t_1	13	Voltage reference	*(positive sequence, phase-to-neutral averaged over t_1 - 60s … t_1)* [p.u. U_n]	1.004		
	14	Voltage reference	*(negative sequence, phase-to-neutral averaged over t_1 - 60s … t_1)* [p.u. U_n]	0.004		
	15	Reactive current reference [2)]	*(RMS, averaged over t_1 – 10s … t_1)* [p.u. I_n]	0.000		
	16	Active power reference	*(RMS, averaged over t_1 – 10s … t_1)* [p.u. P_n]	0.202		
	17	Reactive power [2)]	*(RMS, averaged over t_1 – 10s … t_1)* [p.u. P_n]	0.000		
During Grid fault t1 till t2	18	Reactive current [2)]	*(positive sequence, averaged over t_1 + 100ms … t_2 - 20ms)* [p.u. I_n]	0.000		
	19	Reactive current [2)]	*(negative sequence, averaged over t_1 + 100ms … t_2 - 20ms)* [p.u. I_n]	0.000		
	20	Apparent current	*(positive sequence, averaged over t_1 + 100ms … t_2 - 20ms)* [p.u. I_n]	0.224		
After fault clearence t2	21	Settling time of active power (from restoration of the voltage ≥ 90% of nominal voltage until the Active Power output restored to ≥ 90% of the pre-fault level)	[s]	0.000		

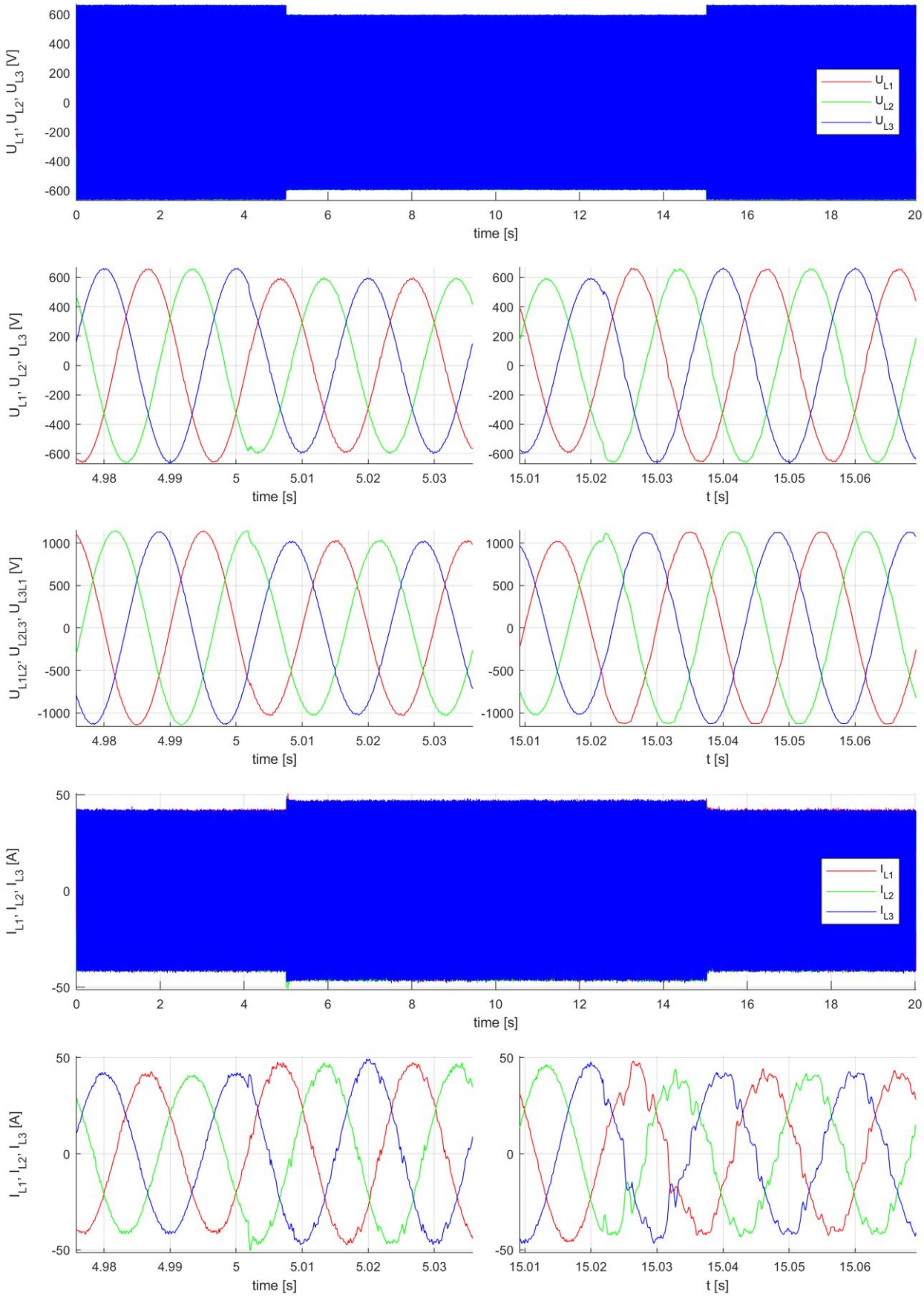
Note:

[1)] A / B / C indicate the phase-neutral voltages (L1, L2, L3), phase-phase voltages (L12, L23, L31) or the phase currents (L1, L2, L3), for details see *Description / calculation basis*.

[2)] Under-excited / inductive reactive current has a negative sign, over-excited / capacitive reactive current has a positive sign, the sign of the reactive power is the same as the reactive current.

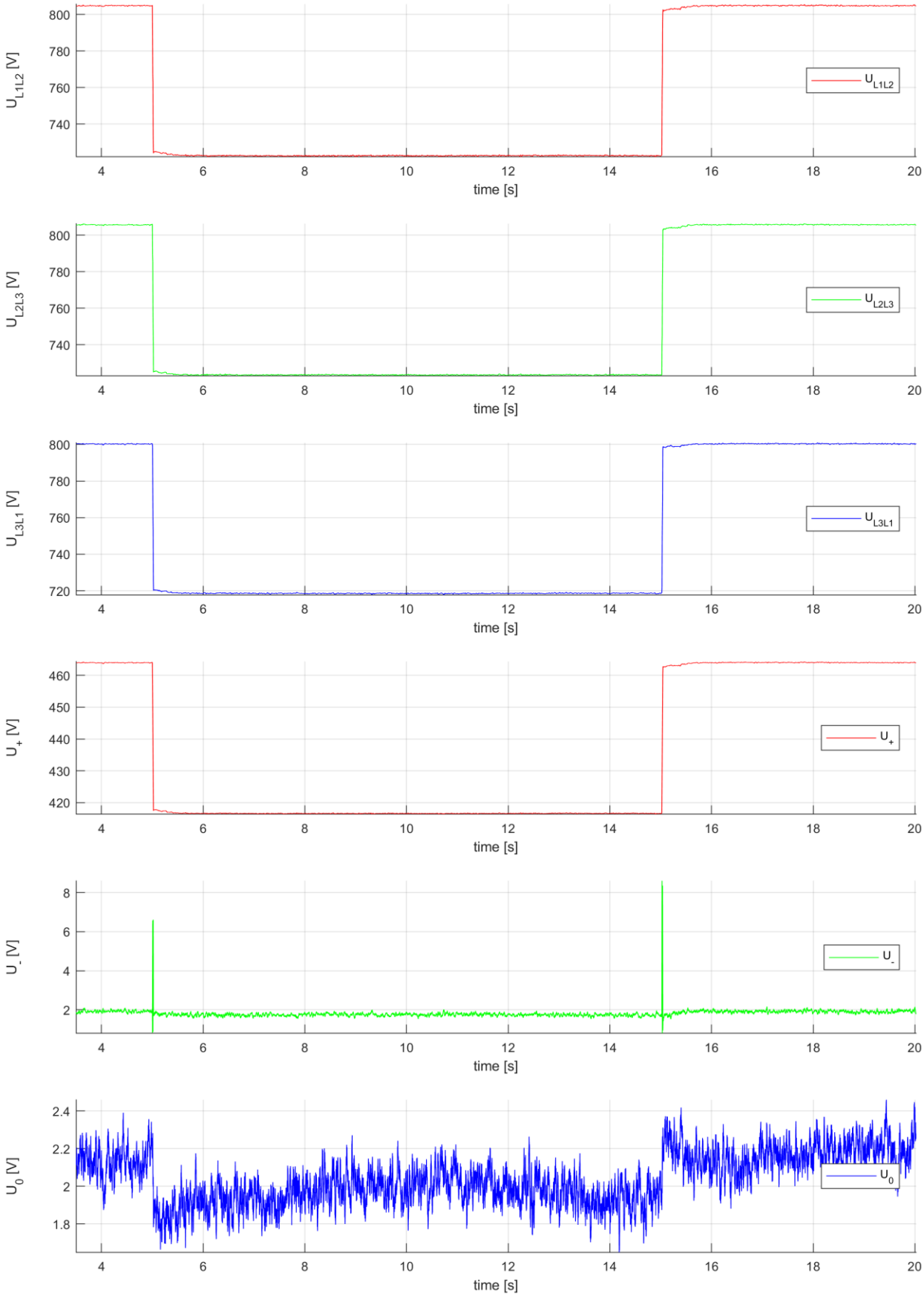
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Timedomain values



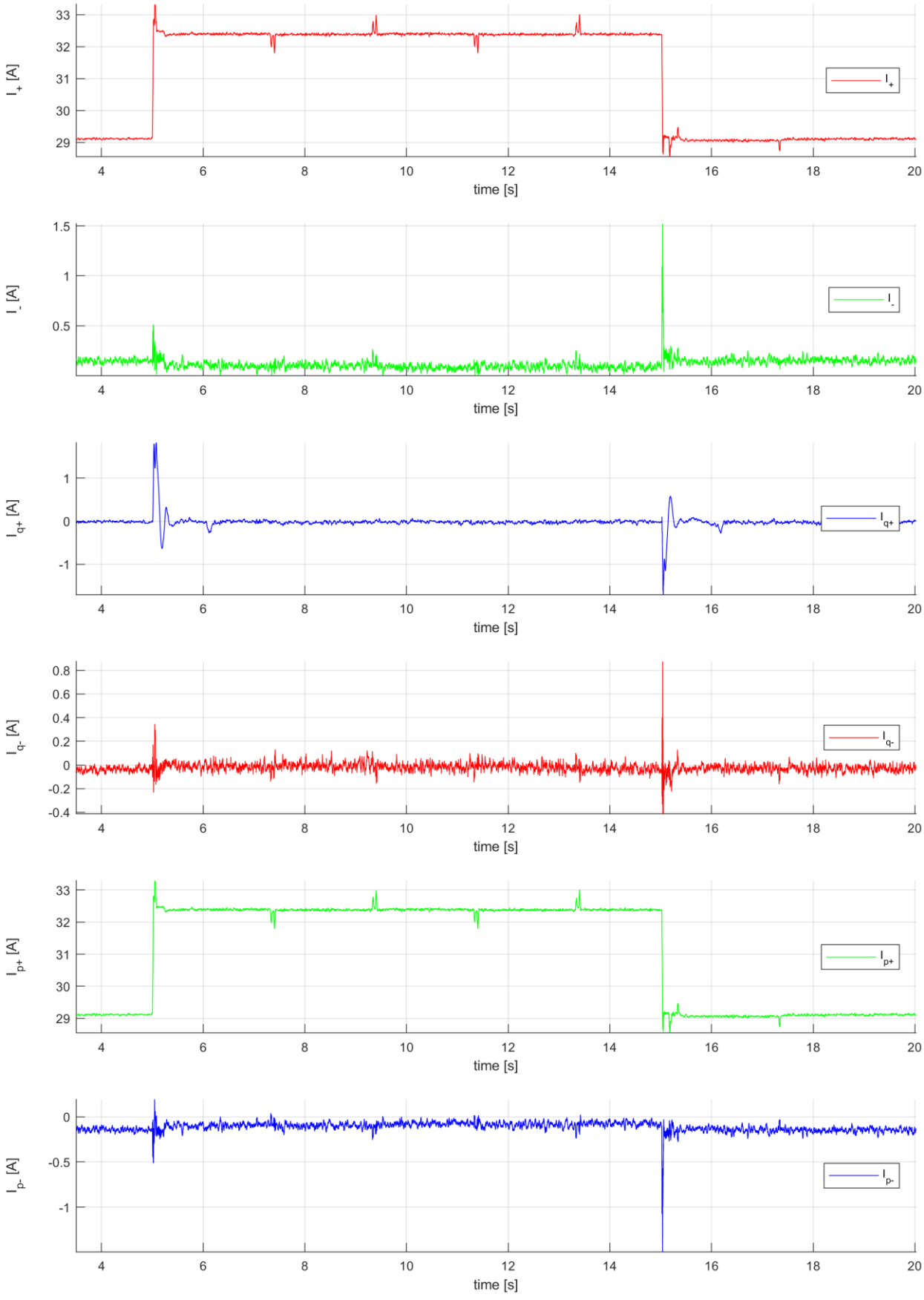
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Positive sequence components and RMS values



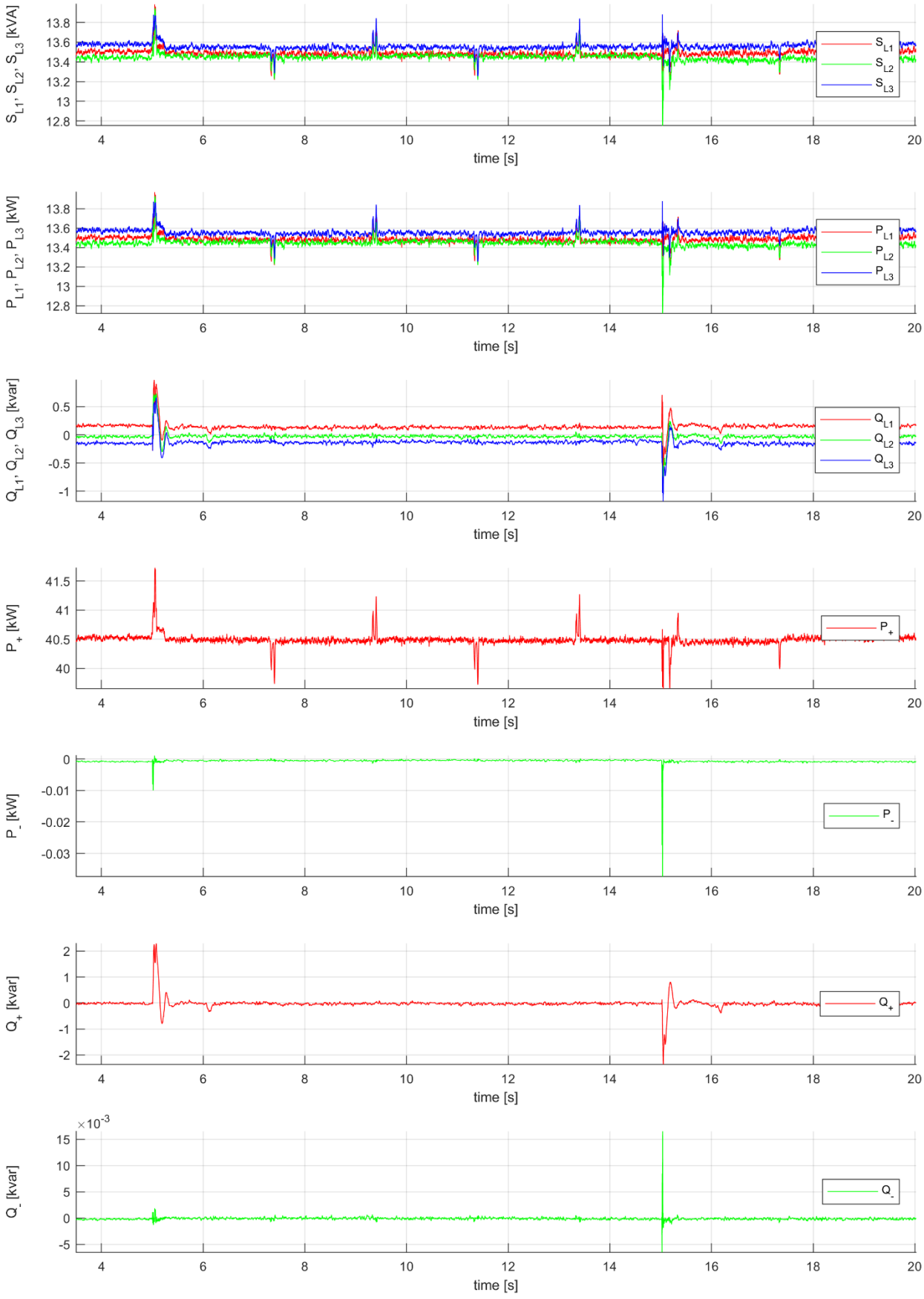
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Positive sequence components and RMS values



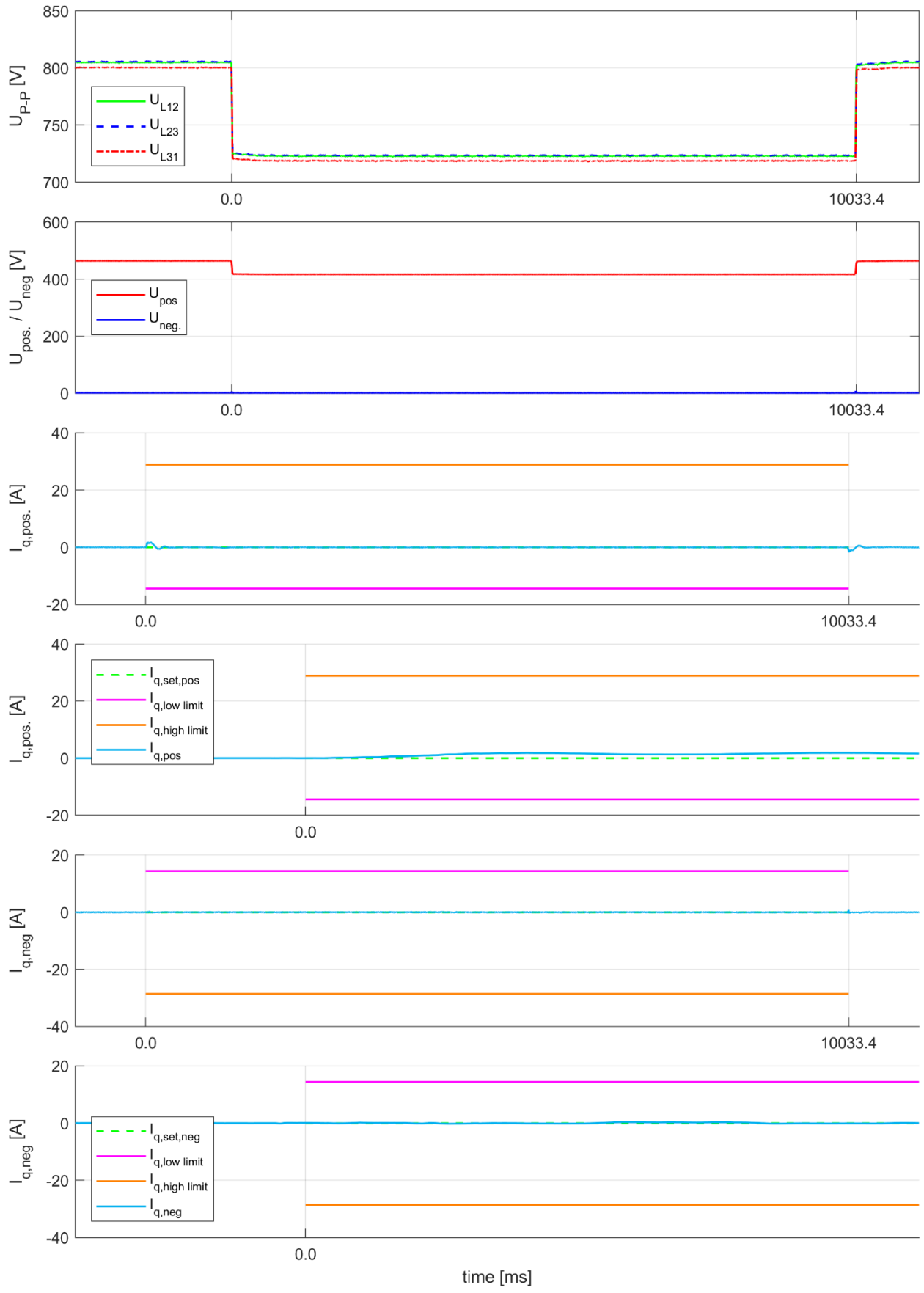
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Positive sequence components and RMS values



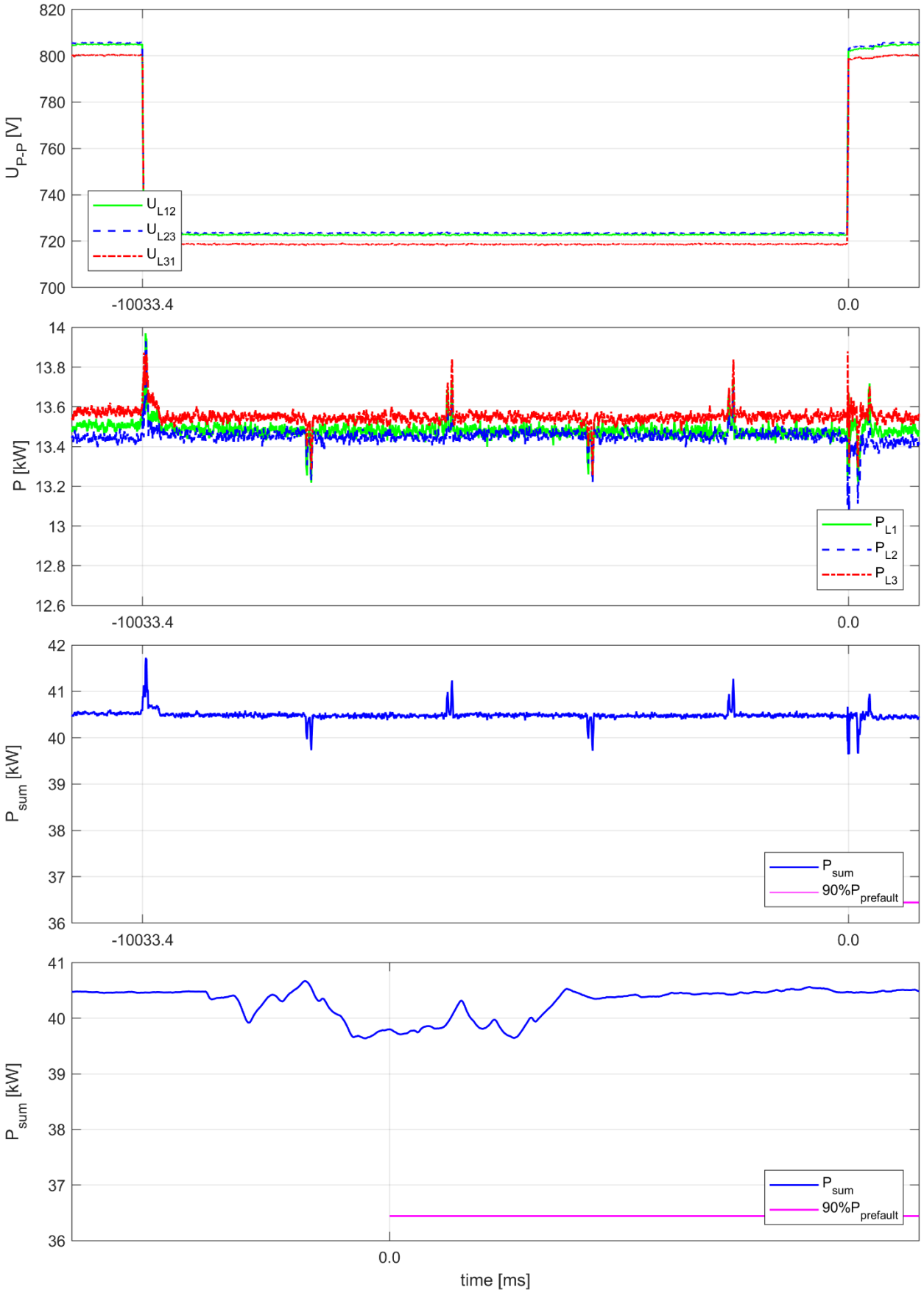
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Positive sequence components and RMS values



B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Positive sequence components and RMS values



B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

CEA_4.2.1

	No.	Parameter	Description / calculation basis	Results		
Gerneral information	1	Test no.	-	CEA_4.2.1-1		
	2	Data file name	-	CEA_4.2.1-1.wdf		
	3	MD5-Checksum	-	a8f93986b8c51bc1eb27dbfcaff18836		
	4	Date	[yyyy-mm-dd]	2020-09-23		
	5	Time	[hh:mm:ss]	11:49:08		
	6	Type of fault (number of affected phases)	Fault type D on low-voltage side	Two-phase		
	Phase reference			**A [1)]**	**B [1)]**	**C [1)]**
	7	Fault occurrence (t_1)	[ms]	6274.4		
	8	Fault clearance (t_2)	[ms]	16304.8		
	9	Fault duration determined from test	*(from time domain voltage results)* [ms]	10030.4		
	10	Measeured value of voltage drop / increase	*(per phase-to-neutral, t_1 + 100ms … t_2 and t_1 - 60s … t_1)* [p.u. U_n]	0.901	0.984	0.986
	11	Measeured value of voltage drop / increase	*(per phase-to-phase, t_1 + 100ms … t_2 and t_1 - 60s … t_1)* [p.u. U_n]	0.923	1.030	0.915
	12	Measeured value of voltage drop / increase	*(positive sequence, phase-to-neutral, t_1 + 100ms … t_2 and t_1 - 60s … t_1)* [p.u. U_n]	0.954		
Before grid fault t_1	13	Voltage reference	*(positive sequence, phase-to-neutral averaged over t_1 - 60s … t_1)* [p.u. U_n]	1.005		
	14	Voltage reference	*(negative sequence, phase-to-neutral averaged over t_1 - 60s … t_1)* [p.u. U_n]	0.004		
	15	Reactive current reference [2)]	*(RMS, averaged over t_1 – 10s … t_1)* [p.u. I_n]	-0.001		
	16	Active power reference	*(RMS, averaged over t_1 – 10s … t_1)* [p.u. P_n]	1.005		
	17	Reactive power [2)]	*(RMS, averaged over t_1 – 10s … t_1)* [p.u. P_n]	-0.001		
During Grid fault t1 till t2	18	Reactive current [2)]	*(positive sequence, averaged over t_1 + 100ms … t_2 - 20ms)* [p.u. I_n]	-0.001		
	19	Reactive current [2)]	*(negative sequence, averaged over t_1 + 100ms … t_2 - 20ms)* [p.u. I_n]	-0.015		
	20	Apparent current	*(positive sequence, averaged over t_1 + 100ms … t_2 - 20ms)* [p.u. I_n]	1.052		
After fault clearence t2	21	Settling time of active power (from restoration of the voltage ≥ 90% of nominal voltage until the Active Power output restored to ≥ 90% of the pre-fault level)	[s]	0.000		

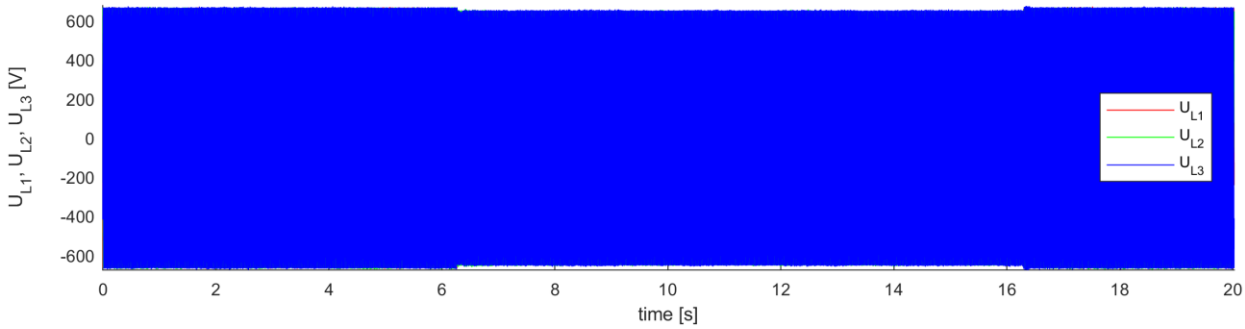
Note:
[1)] A / B / C indicate the phase-neutral voltages (L1, L2, L3), phase-phase voltages (L12, L23, L31) or the phase currents (L1, L2, L3), for details see *Description / calculation basis*.
[2)] Under-excited / inductive reactive current has a negative sign, over-excited / capacitive reactive current has a positive sign, the sign of the reactive power is the same as the reactive current.

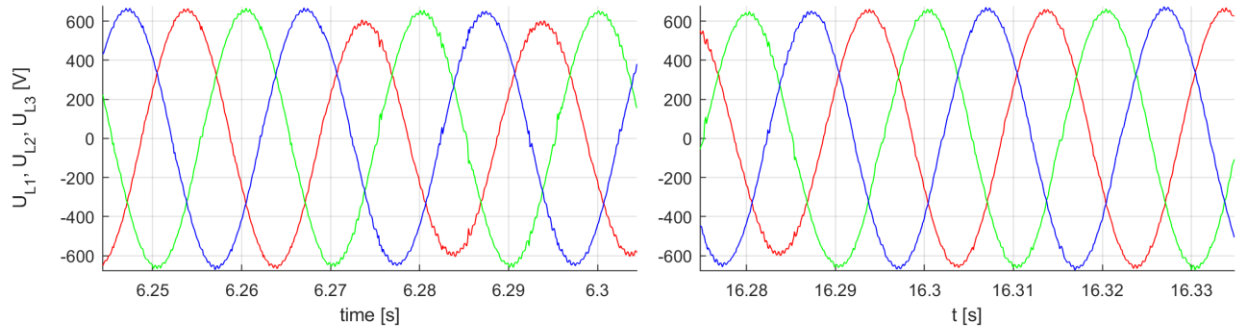
Note:

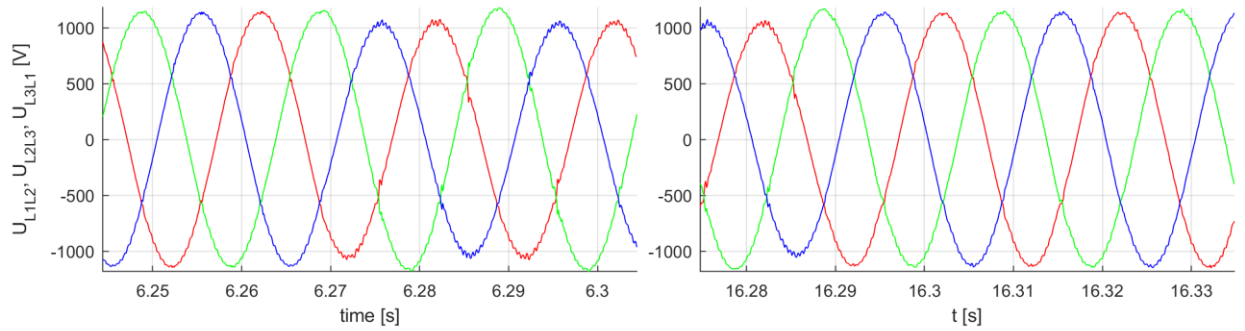
* The grid fault type C (phase-to-phase fault without grounding) was simulated at the medium voltage side of the Dy-medium-voltage transformer, following diagram shows the measurement at the low voltage side of the transformer – grid fault type D on low voltage side.

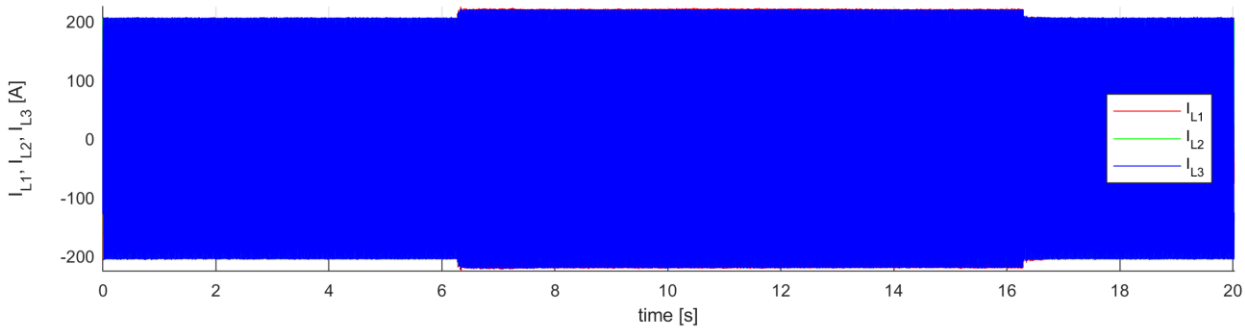
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

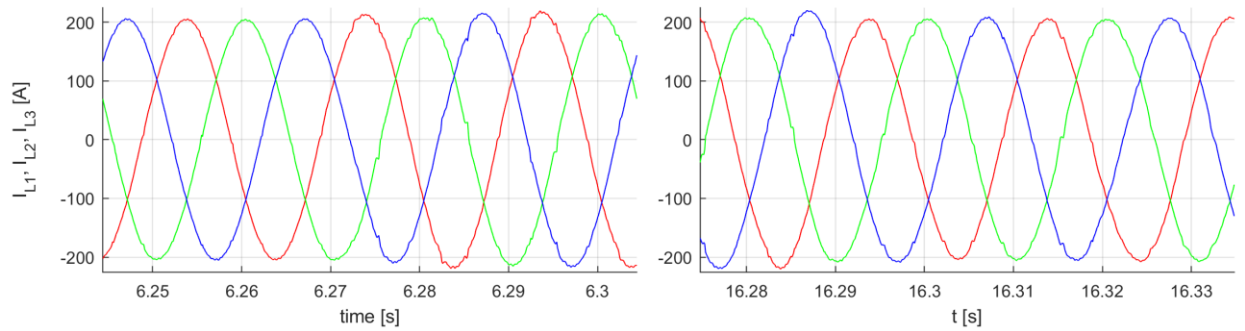
Timedomain values





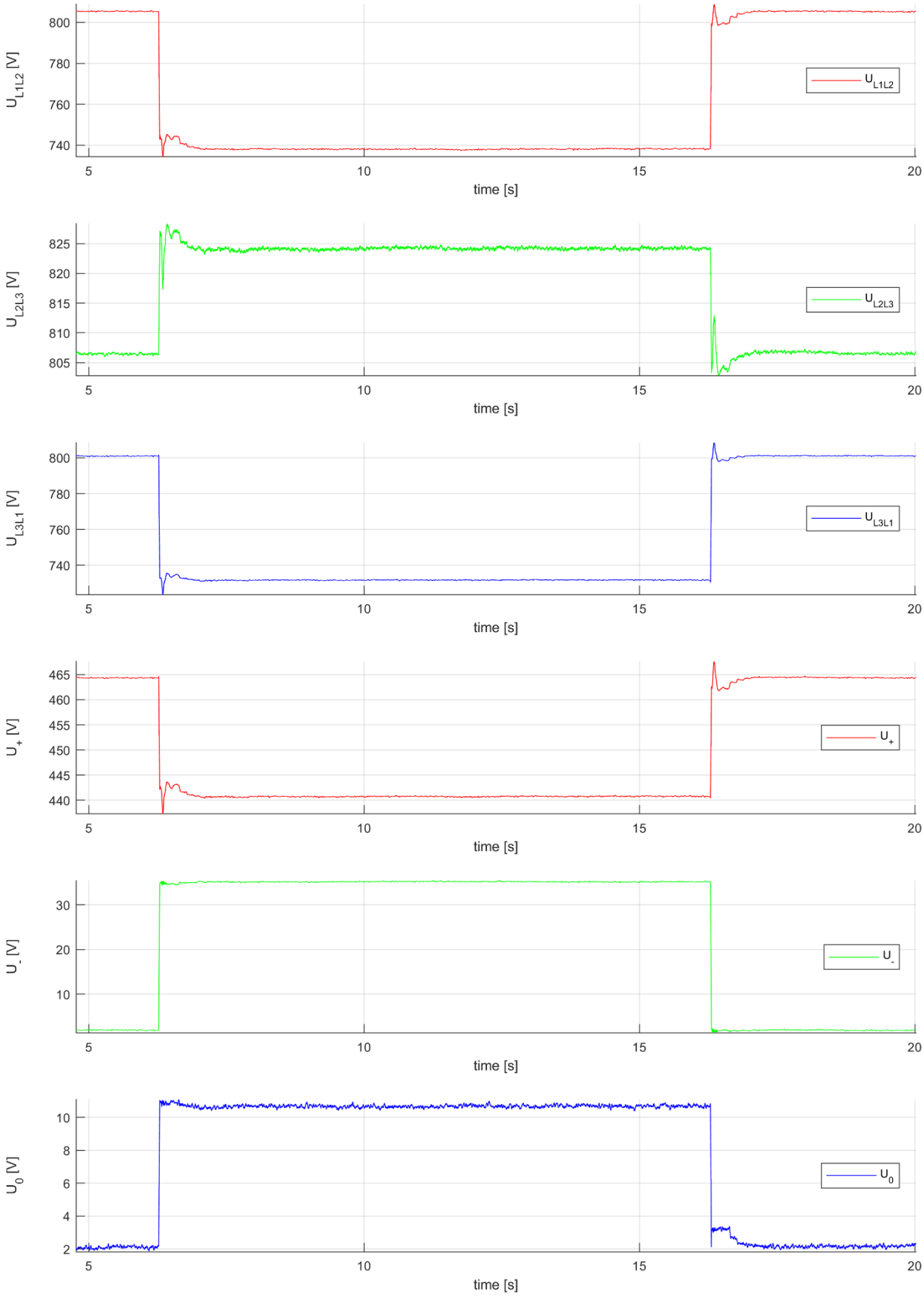






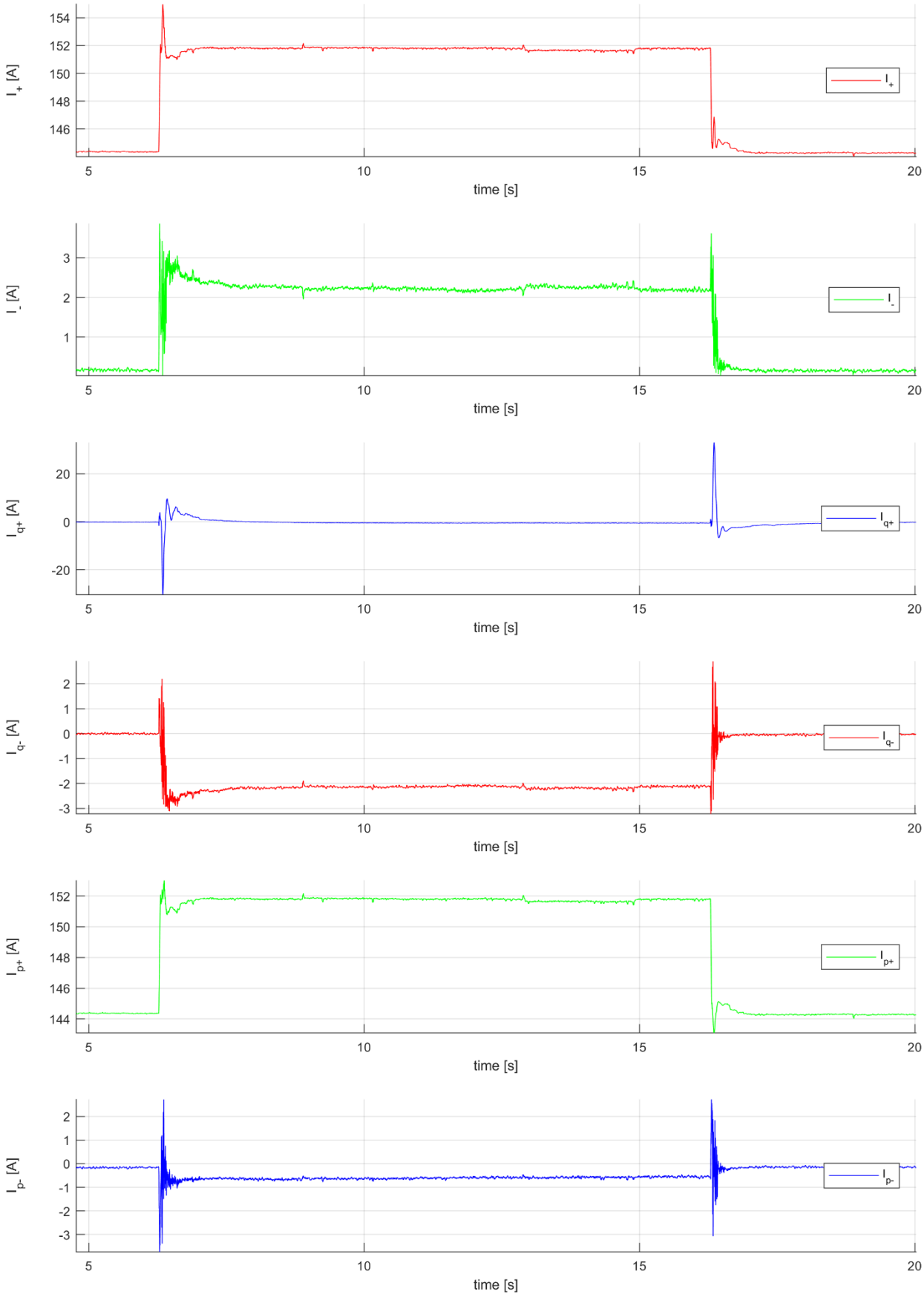
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Positive sequence components and RMS values



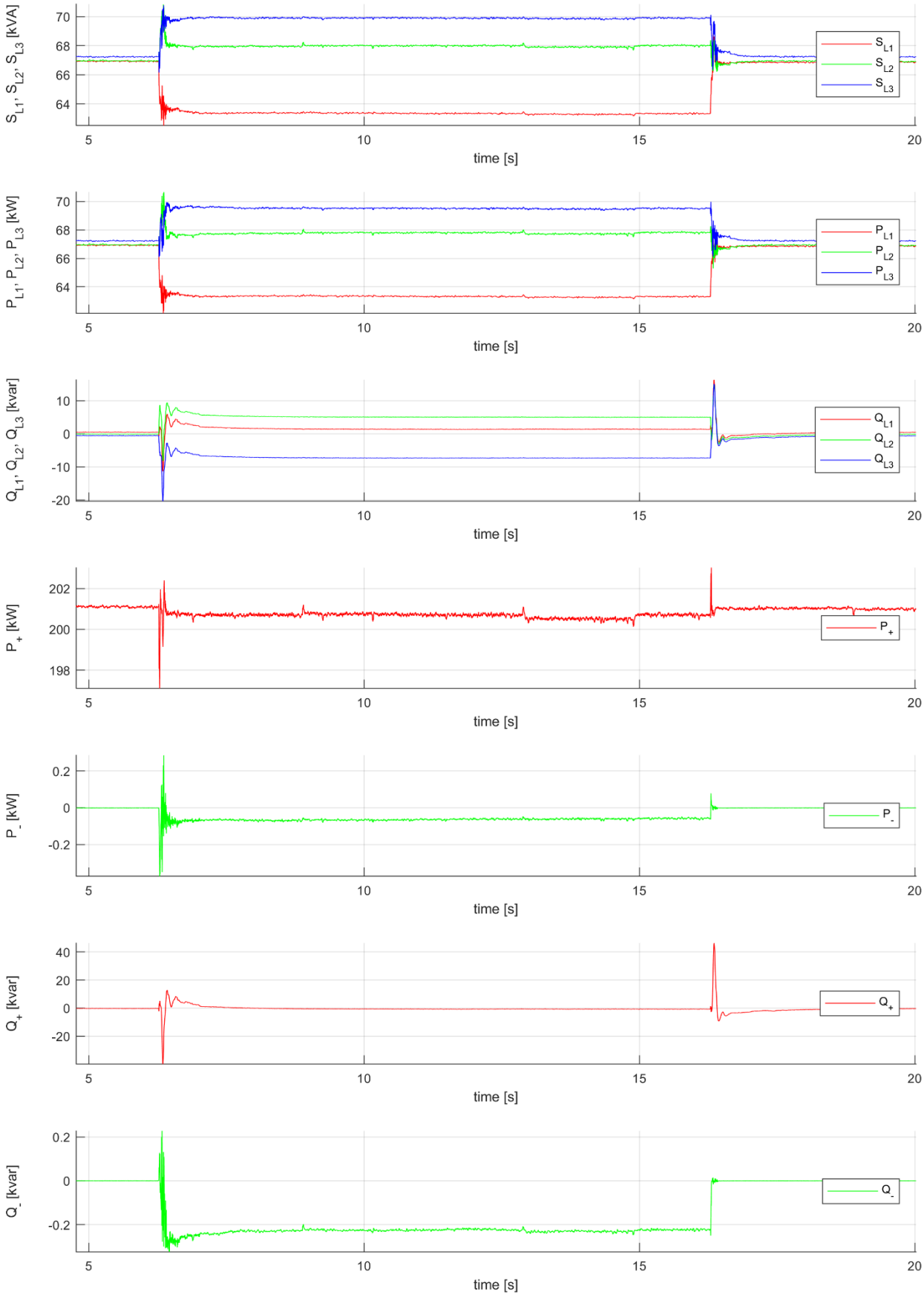
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Positive sequence components and RMS values



B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Positive sequence components and RMS values



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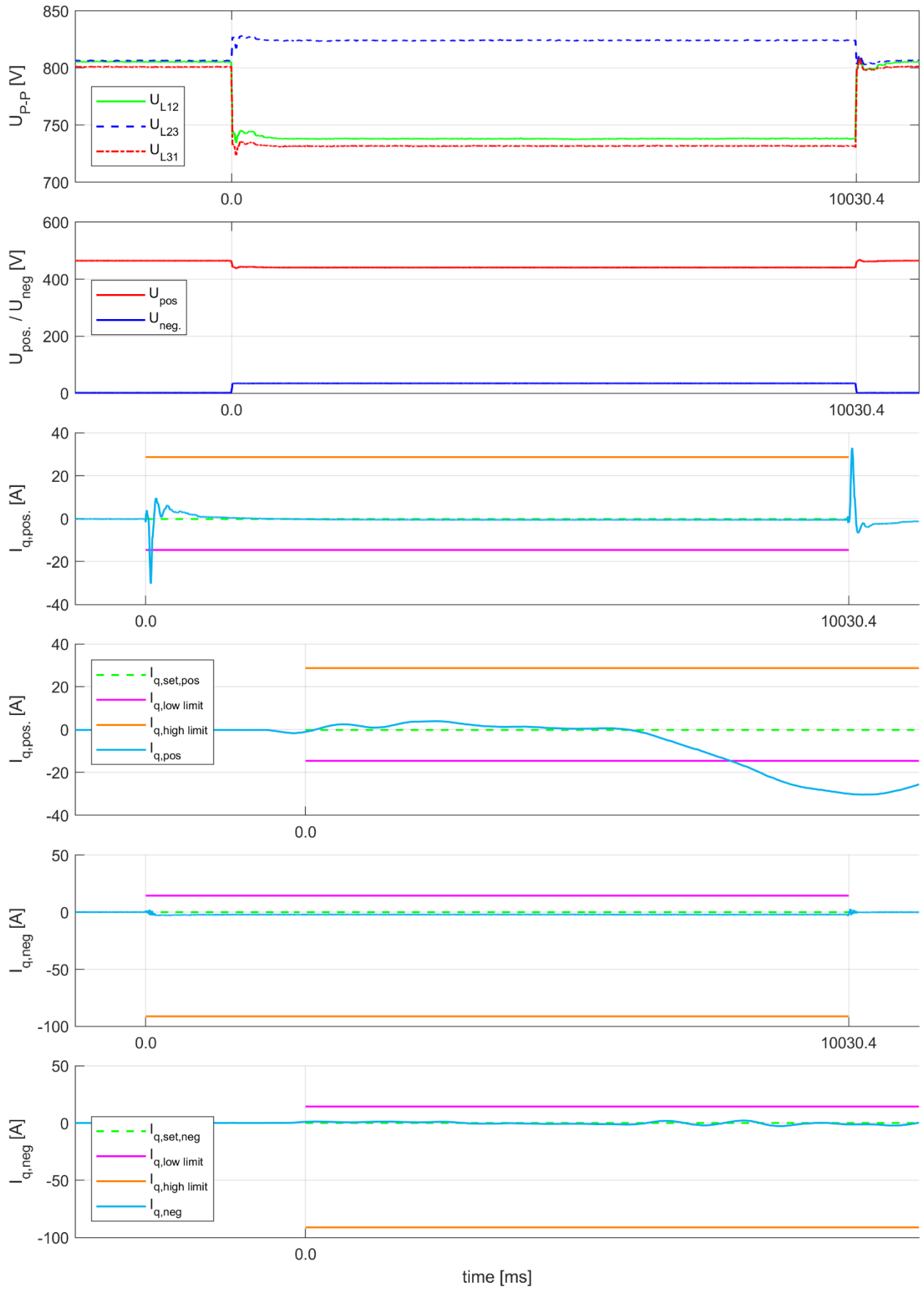
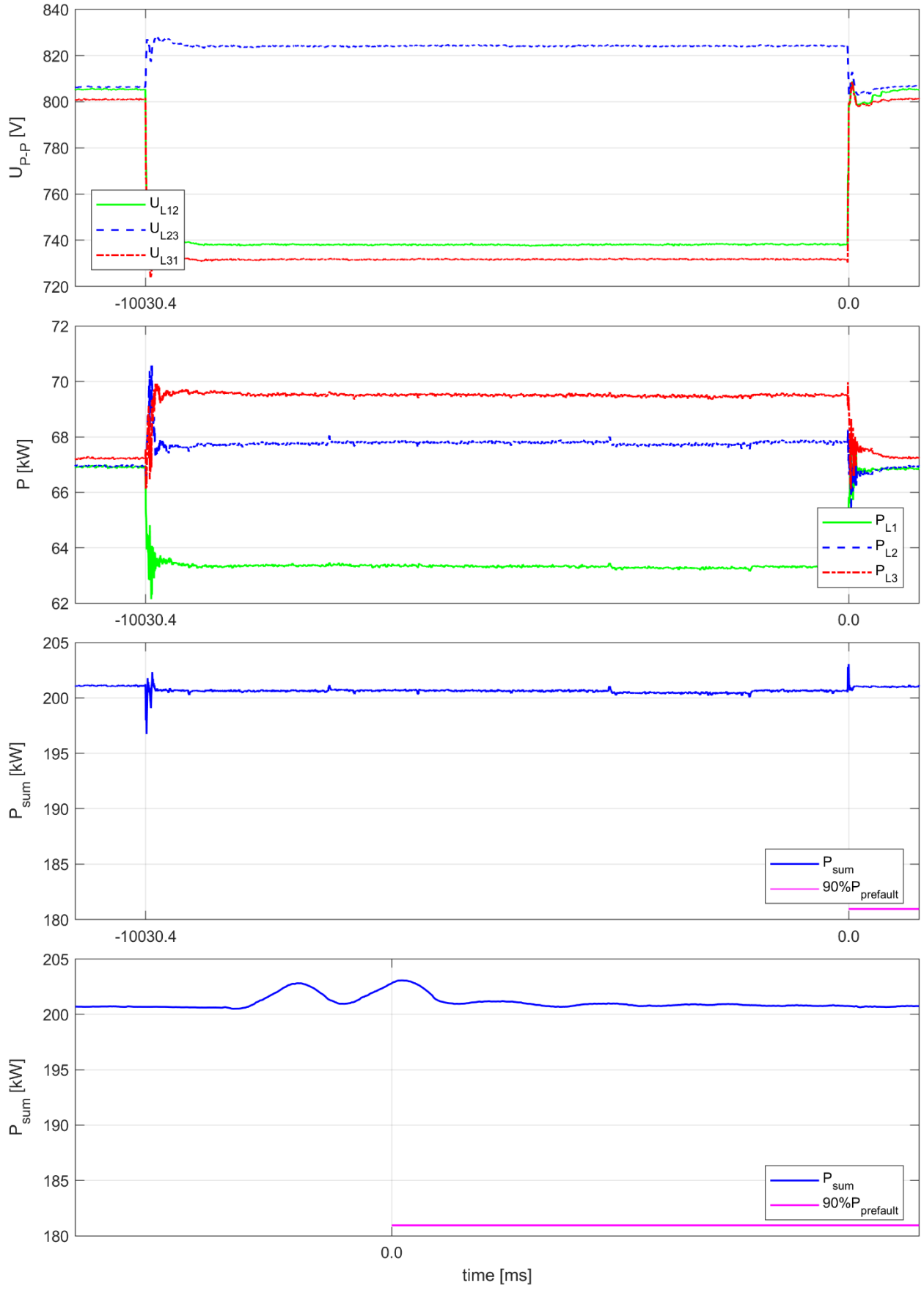
Positive sequence components and RMS values



B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Positive sequence components and RMS values



B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

CEA_4.2.2

	No.	Parameter	Description / calculation basis	Results		
Gerneral information	1	Test no.	-	CEA_4.2.2-1		
	2	Data file name	-	CEA_4.2.2-1.wdf		
	3	MD5-Checksum	-	c3f6899a7839f8818aab8f5cebec0572		
	4	Date	[yyyy-mm-dd]	2020-09-23		
	5	Time	[hh:mm:ss]	11:52:34		
	6	Type of fault (number of affected phases)	Fault type D on low-voltage side	Two-phase		
	Phase reference			**A** [1)]	**B** [1)]	**C** [1)]
	7	Fault occurrence (t_1)	[ms]	5331.3		
	8	Fault clearance (t_2)	[ms]	15361.7		
	9	Fault duration determined from test	*(from time domain voltage results)* [ms]	10030.4		
	10	Measeured value of voltage drop / increase	*(per phase-to-neutral, t_1 + 100ms … t_2 and t_1 - 60s … t_1)* [p.u. U_n]	0.900	0.983	0.985
	11	Measeured value of voltage drop / increase	*(per phase-to-phase, t_1 + 100ms … t_2 and t_1 - 60s … t_1)* [p.u. U_n]	0.920	1.030	0.914
	12	Measeured value of voltage drop / increase	*(positive sequence, phase-to-neutral, t_1 + 100ms … t_2 and t_1 - 60s … t_1)* [p.u. U_n]	0.953		
Before grid fault t_1	13	Voltage reference	*(positive sequence, phase-to-neutral averaged over t_1 - 60s … t_1)* [p.u. U_n]	1.004		
	14	Voltage reference	*(negative sequence, phase-to-neutral averaged over t_1 - 60s … t_1)* [p.u. U_n]	0.004		
	15	Reactive current reference [2)]	*(RMS, averaged over t_1 – 10s … t_1)* [p.u. I_n]	0.000		
	16	Active power reference	*(RMS, averaged over t_1 – 10s … t_1)* [p.u. P_n]	0.203		
	17	Reactive power [2)]	*(RMS, averaged over t_1 – 10s … t_1)* [p.u. P_n]	0.000		
During Grid fault t1 till t2	18	Reactive current [2)]	*(positive sequence, averaged over t_1 + 100ms … t_2 - 20ms)* [p.u. I_n]	-0.001		
	19	Reactive current [2)]	*(negative sequence, averaged over t_1 + 100ms … t_2 - 20ms)* [p.u. I_n]	-0.006		
	20	Apparent current	*(positive sequence, averaged over t_1 + 100ms … t_2 - 20ms)* [p.u. I_n]	0.212		
After fault clearence t2	21	Settling time of active power (from restoration of the voltage ≥ 90% of nominal voltage until the Active Power output restored to ≥ 90% of the pre-fault level)	[s]	0.000		

Note:

[1)] A / B / C indicate the phase-neutral voltages (L1, L2, L3), phase-phase voltages (L12, L23, L31) or the phase currents (L1, L2, L3), for details see *Description / calculation basis*.

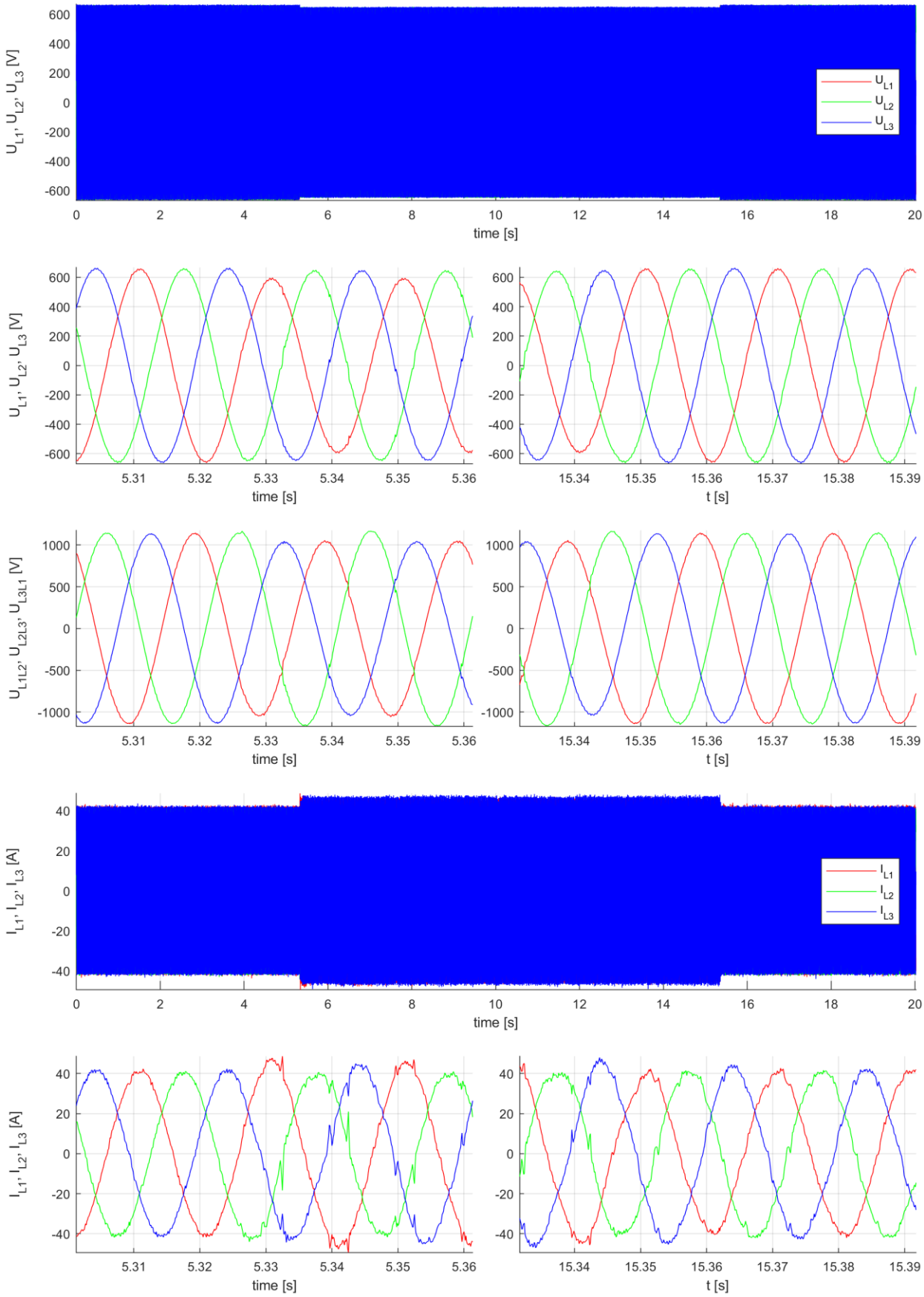
[2)] Under-excited / inductive reactive current has a negative sign, over-excited / capacitive reactive current has a positive sign, the sign of the reactive power is the same as the reactive current.

Note:

* The grid fault type C (phase-to-phase fault without grounding) was simulated at the medium voltage side of the Dy-medium-voltage transformer, following diagram shows the measurement at the low voltage side of the transformer – grid fault type D on low voltage side.

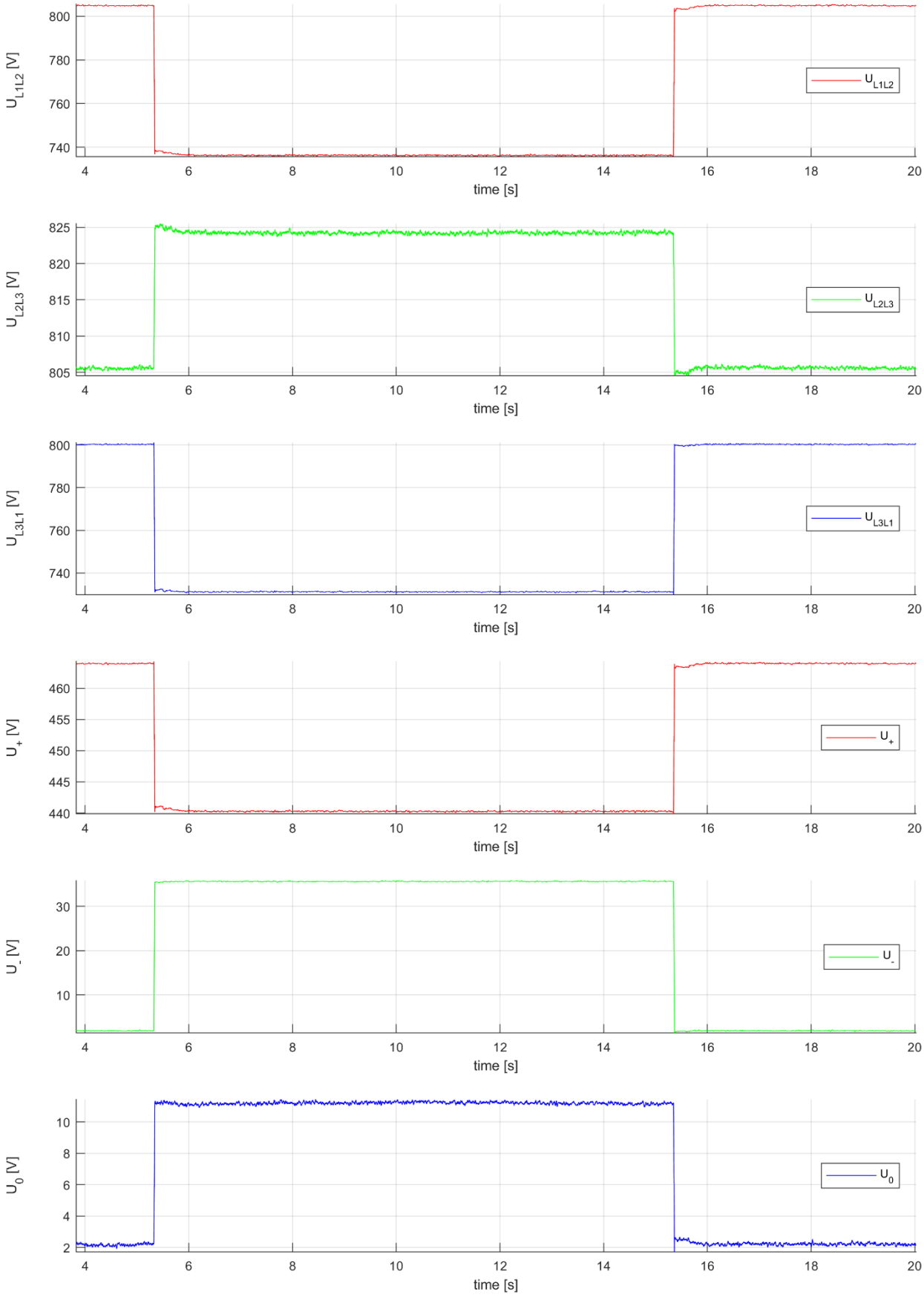
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Timedomain values



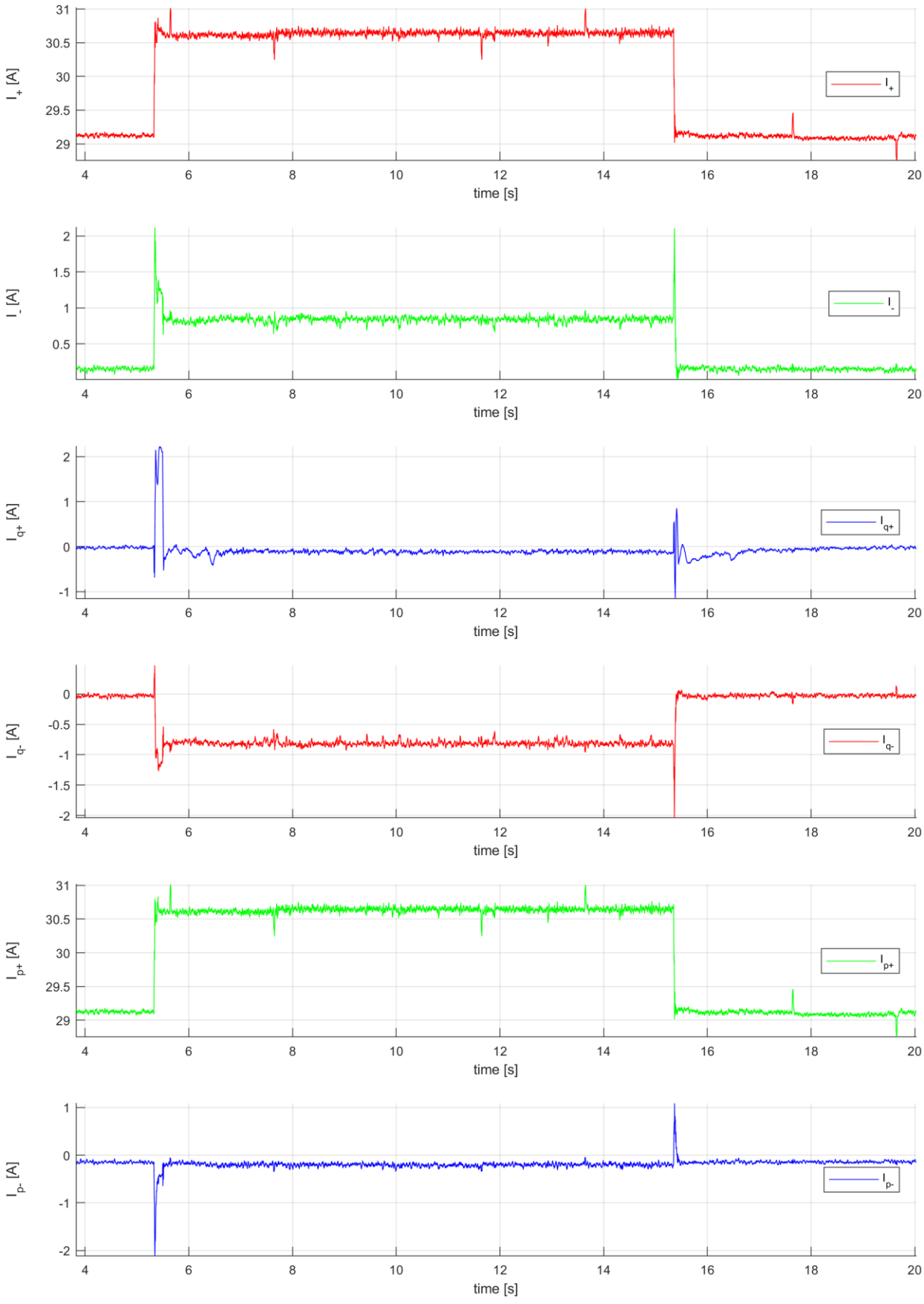
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Positive sequence components and RMS values



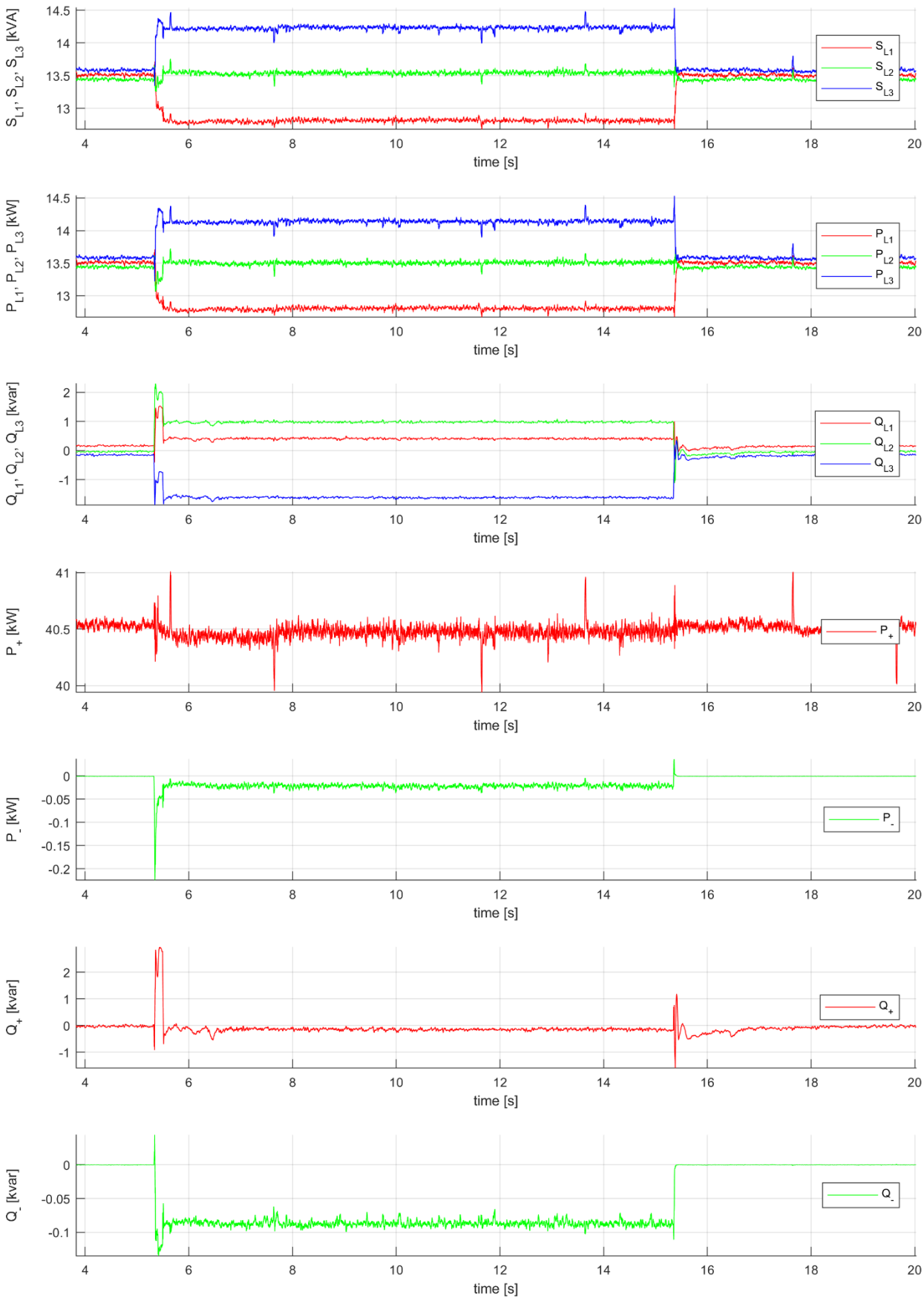
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Positive sequence components and RMS values



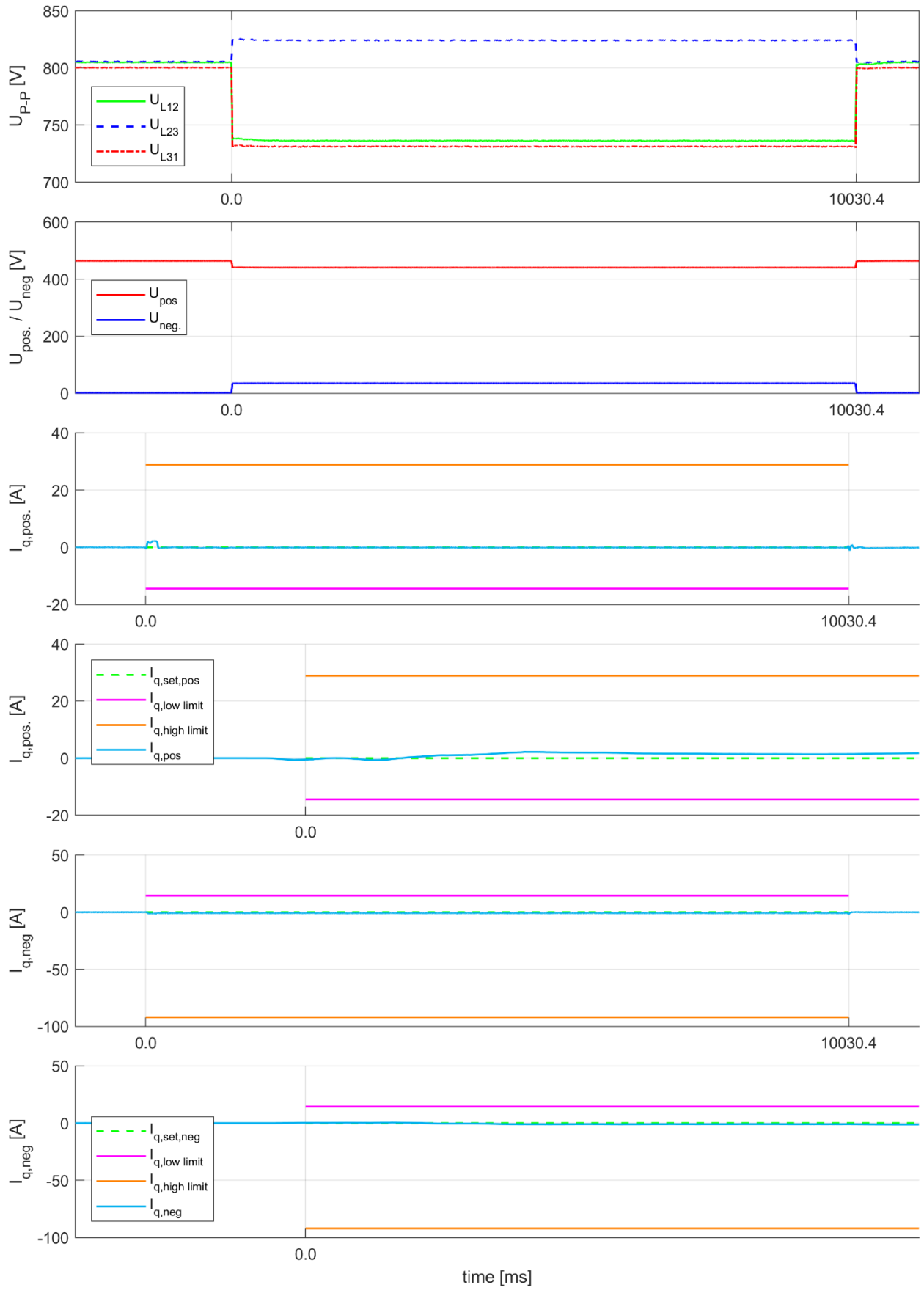
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Positive sequence components and RMS values



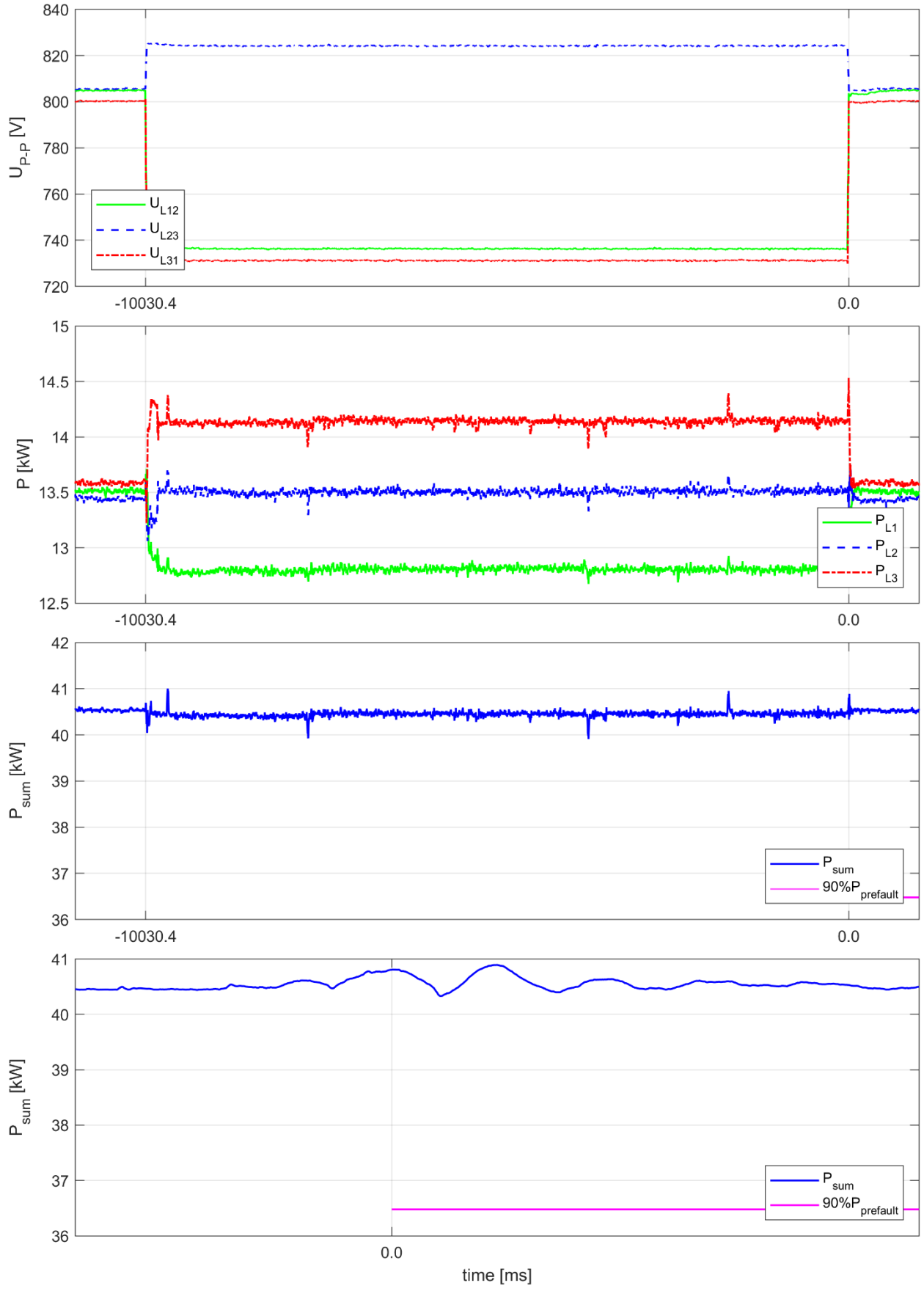
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Positive sequence components and RMS values



B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Positive sequence components and RMS values



B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

CEA_4.3.1

	No.	Parameter	Description / calculation basis	Results		
Gerneral information	1	Test no.	-	CEA_4.3.1-1		
	2	Data file name	-	CEA_4.3.1-1.wdf		
	3	MD5-Checksum	-	370b1466485a39d9716f894d6c123f4d		
	4	Date	[yyyy-mm-dd]	2020-09-29		
	5	Time	[hh:mm:ss]	06:43:36		
	6	Type of fault (number of affected phases)	Fault type B on low-voltage side	One-phase		
	Phase reference			**A [1)]**	**B [1)]**	**C [1)]**
	7	Fault occurrence (t_1)	[ms]	4737.7		
	8	Fault clearance (t_2)	[ms]	14758.5		
	9	Fault duration determined from test	*(from time domain voltage results)* [ms]	10020.8		
	10	Measeured value of voltage drop / increase	*(per phase-to-neutral, t_1 + 100ms … t_2 and t_1 - 60s … t_1)* [p.u. U_n]	0.901	1.005	1.008
	11	Measeured value of voltage drop / increase	*(per phase-to-phase, t_1 + 100ms … t_2 and t_1 - 60s … t_1)* [p.u. U_n]	0.958	1.008	0.950
	12	Measeured value of voltage drop / increase	*(positive sequence, phase-to-neutral, t_1 + 100ms … t_2 and t_1 - 60s … t_1)* [p.u. U_n]	0.971		
Before grid fault t_1	13	Voltage reference	*(positive sequence, phase-to-neutral averaged over t_1 - 60s … t_1)* [p.u. U_n]	1.005		
	14	Voltage reference	*(negative sequence, phase-to-neutral averaged over t_1 - 60s … t_1)* [p.u. U_n]	0.004		
	15	Reactive current reference [2)]	*(RMS, averaged over t_1 – 10s … t_1)* [p.u. I_n]	0.001		
	16	Active power reference	*(RMS, averaged over t_1 – 10s … t_1)* [p.u. P_n]	1.004		
	17	Reactive power [2)]	*(RMS, averaged over t_1 – 10s … t_1)* [p.u. P_n]	0.001		
During Grid fault t1 till t2	18	Reactive current [2)]	*(positive sequence, averaged over t_1 + 100ms … t_2 - 20ms)* [p.u. I_n]	0.000		
	19	Reactive current [2)]	*(negative sequence, averaged over t_1 + 100ms … t_2 - 20ms)* [p.u. I_n]	-0.010		
	20	Apparent current	*(positive sequence, averaged over t_1 + 100ms … t_2 - 20ms)* [p.u. I_n]	1.033		
After fault clearence t2	21	Settling time of active power (from restoration of the voltage ≥ 90% of nominal voltage until the Active Power output restored to ≥ 90% of the pre-fault level)	[s]	0.000		

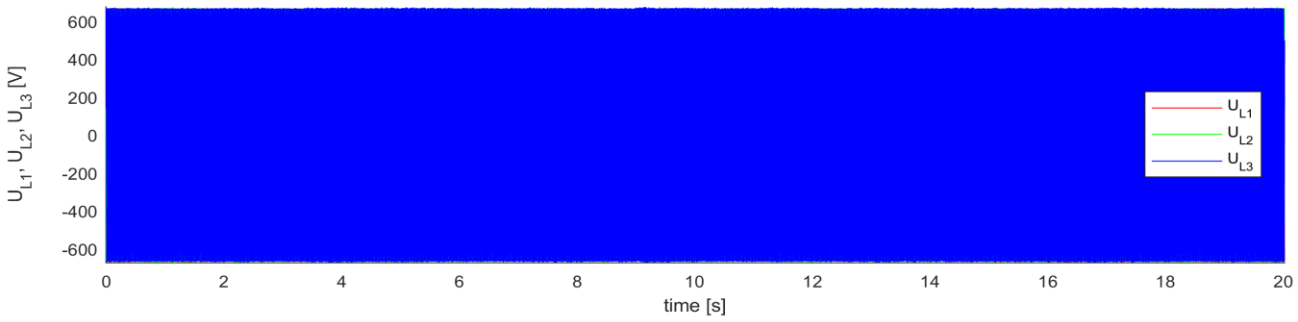
Note:

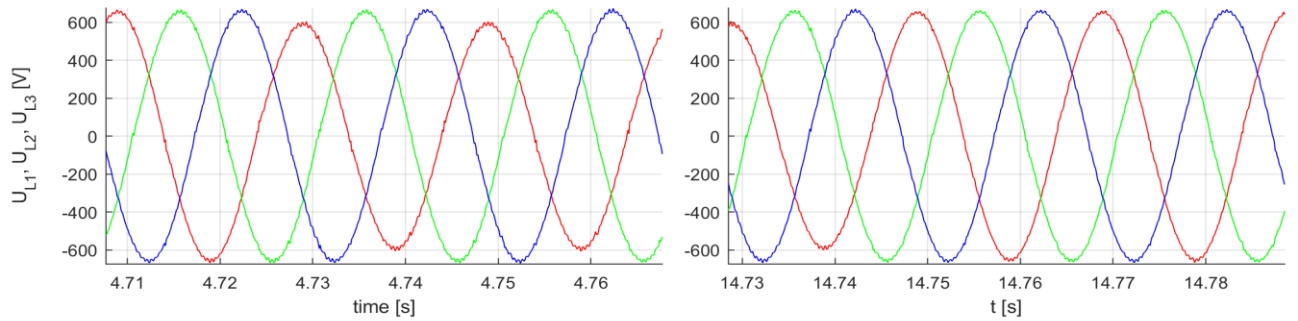
[1)] A / B / C indicate the phase-neutral voltages (L1, L2, L3), phase-phase voltages (L12, L23, L31) or the phase currents (L1, L2, L3), for details see *Description / calculation basis*.

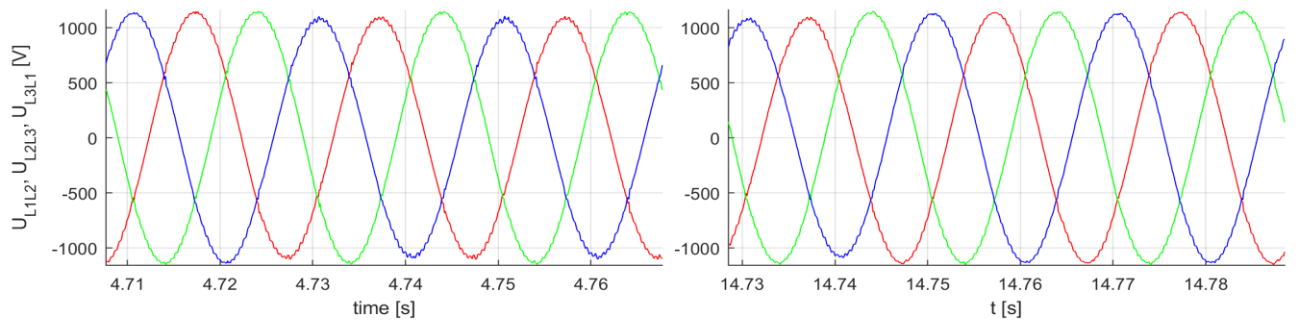
[2)] Under-excited / inductive reactive current has a negative sign, over-excited / capacitive reactive current has a positive sign, the sign of the reactive power is the same as the reactive current.

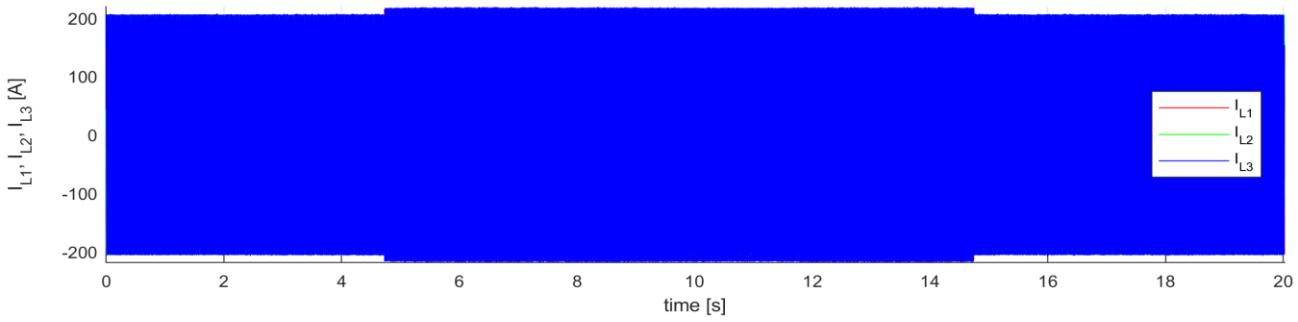
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

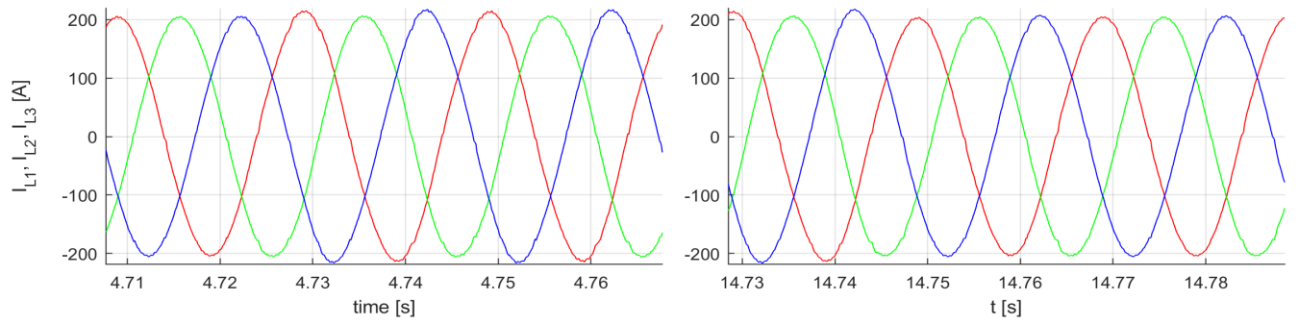
Timedomain values





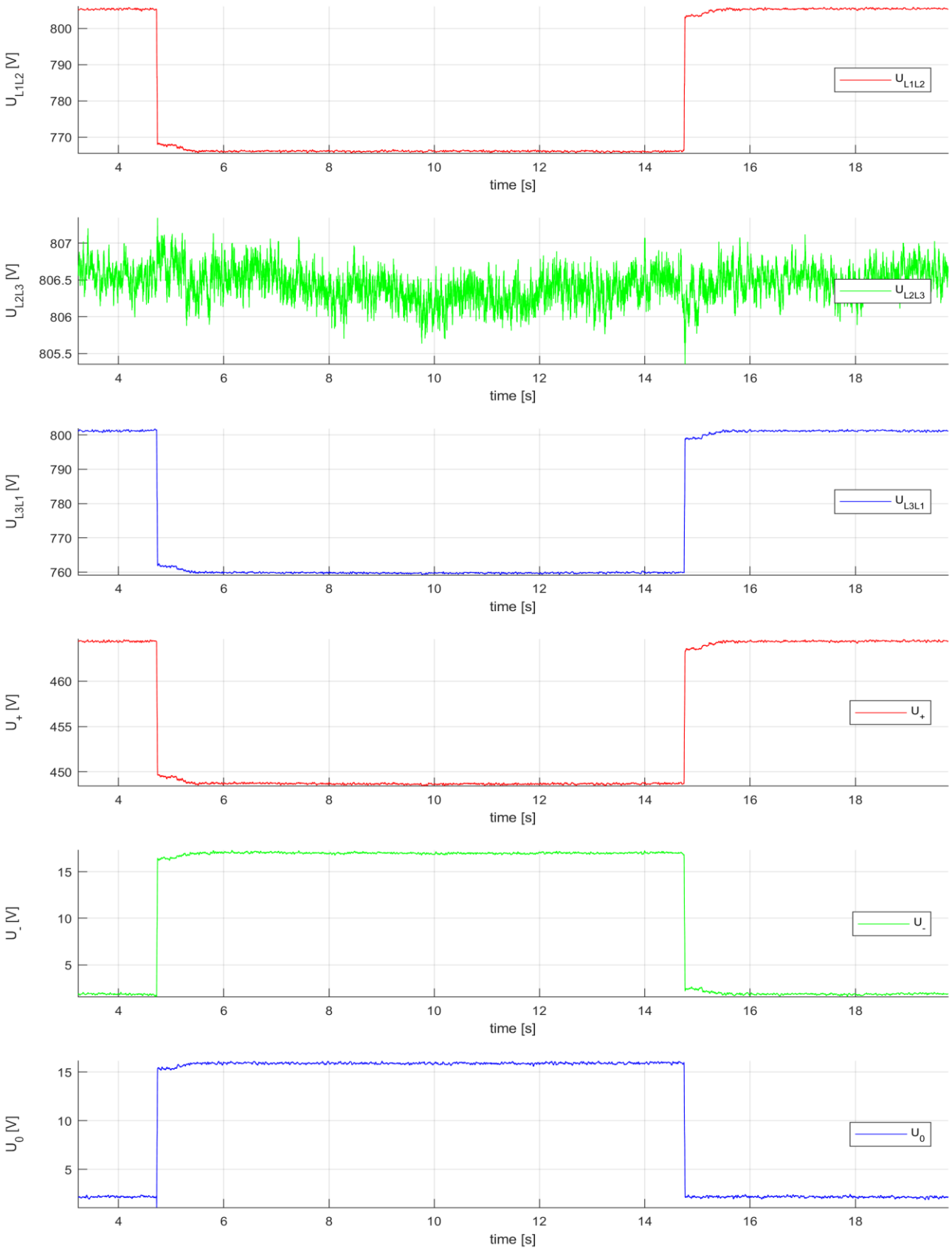






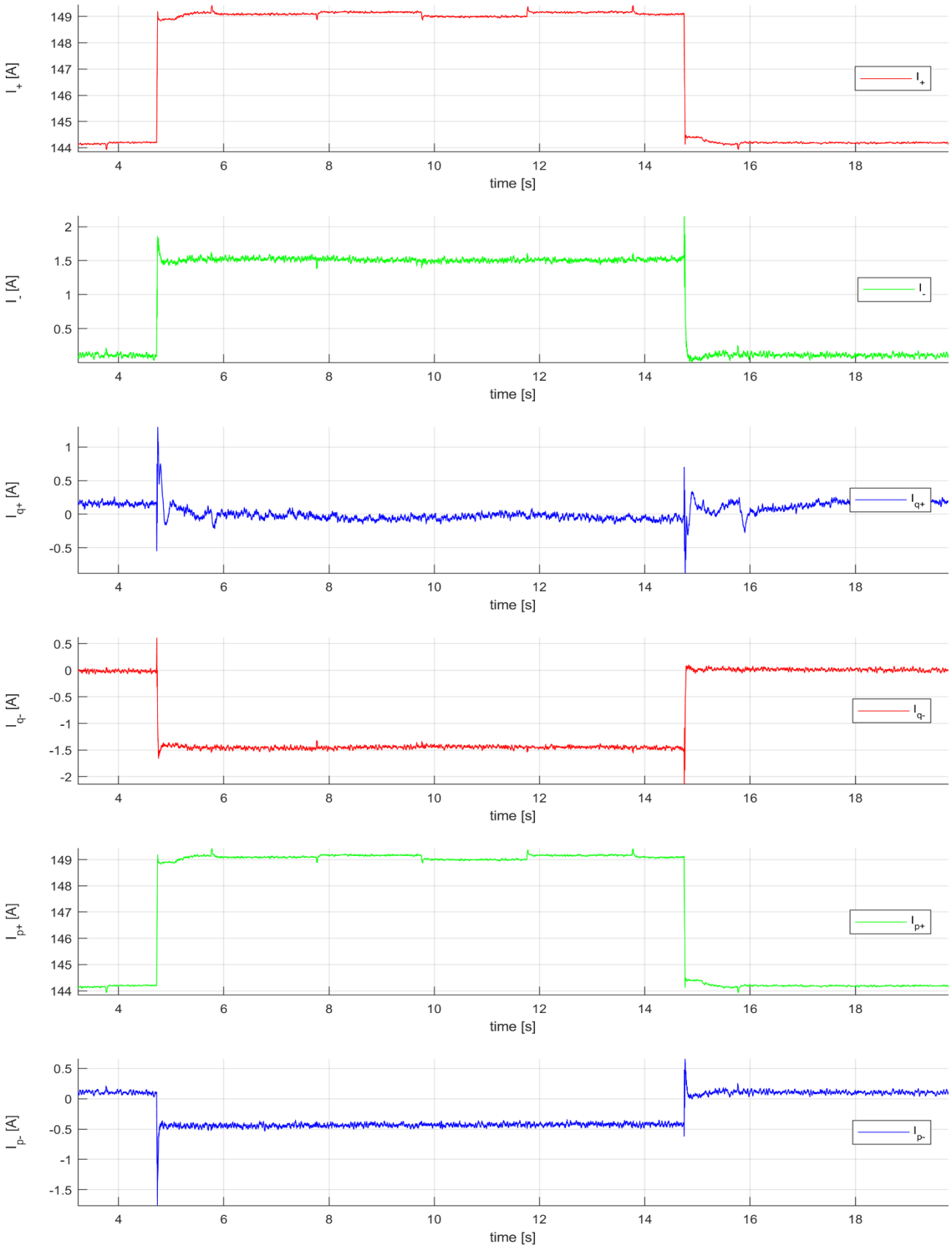
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Positive sequence components and RMS values



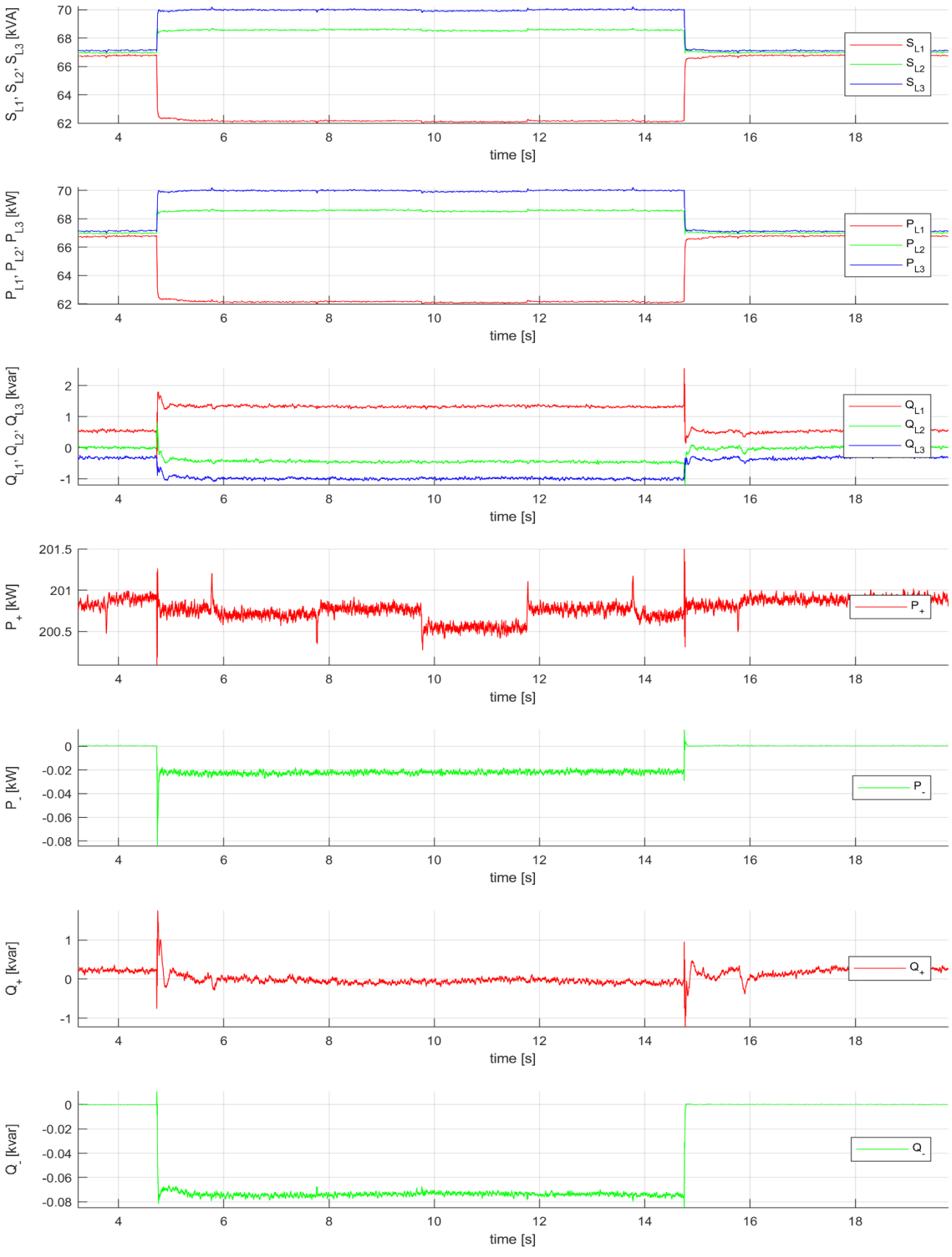
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Positive sequence components and RMS values



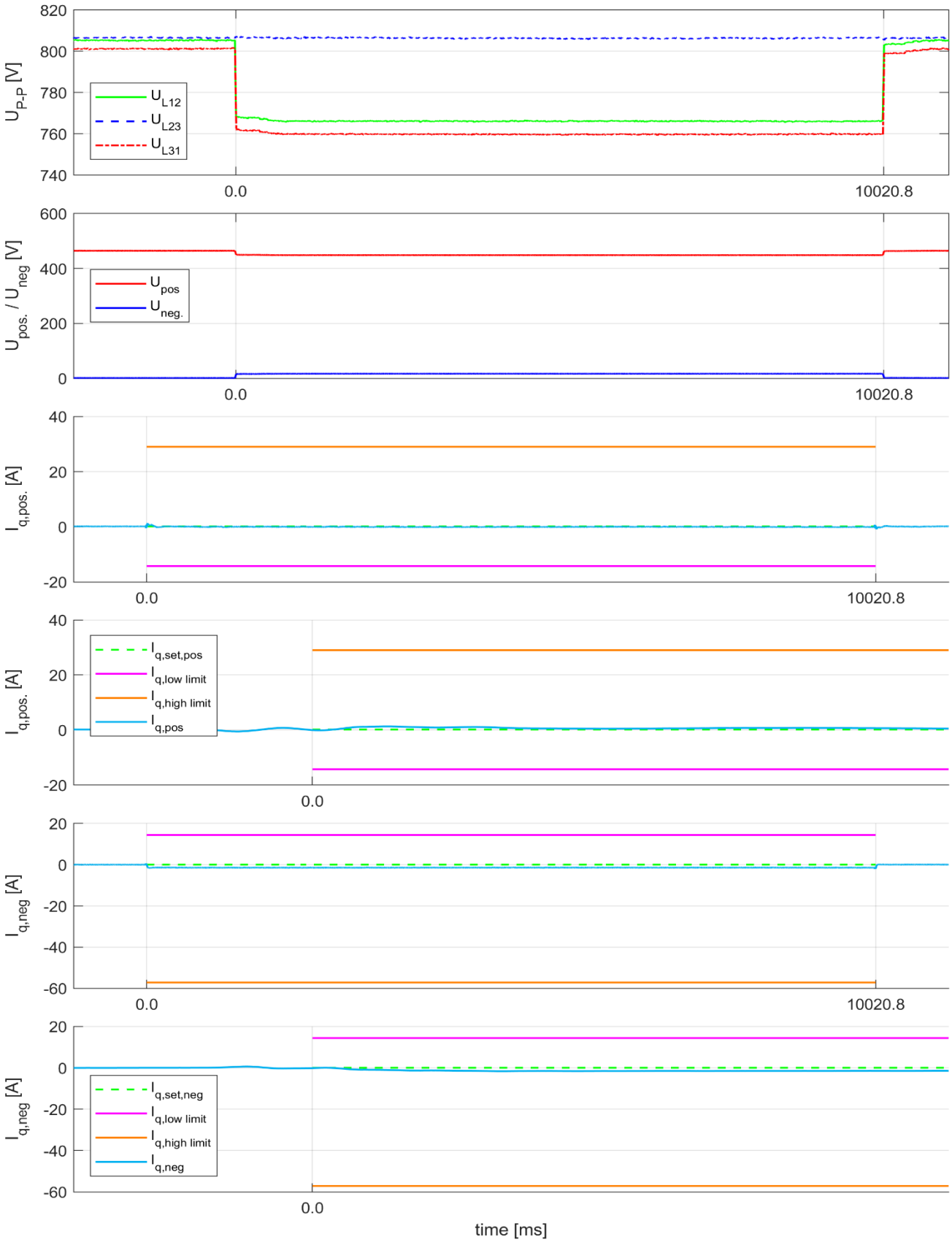
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Positive sequence components and RMS values



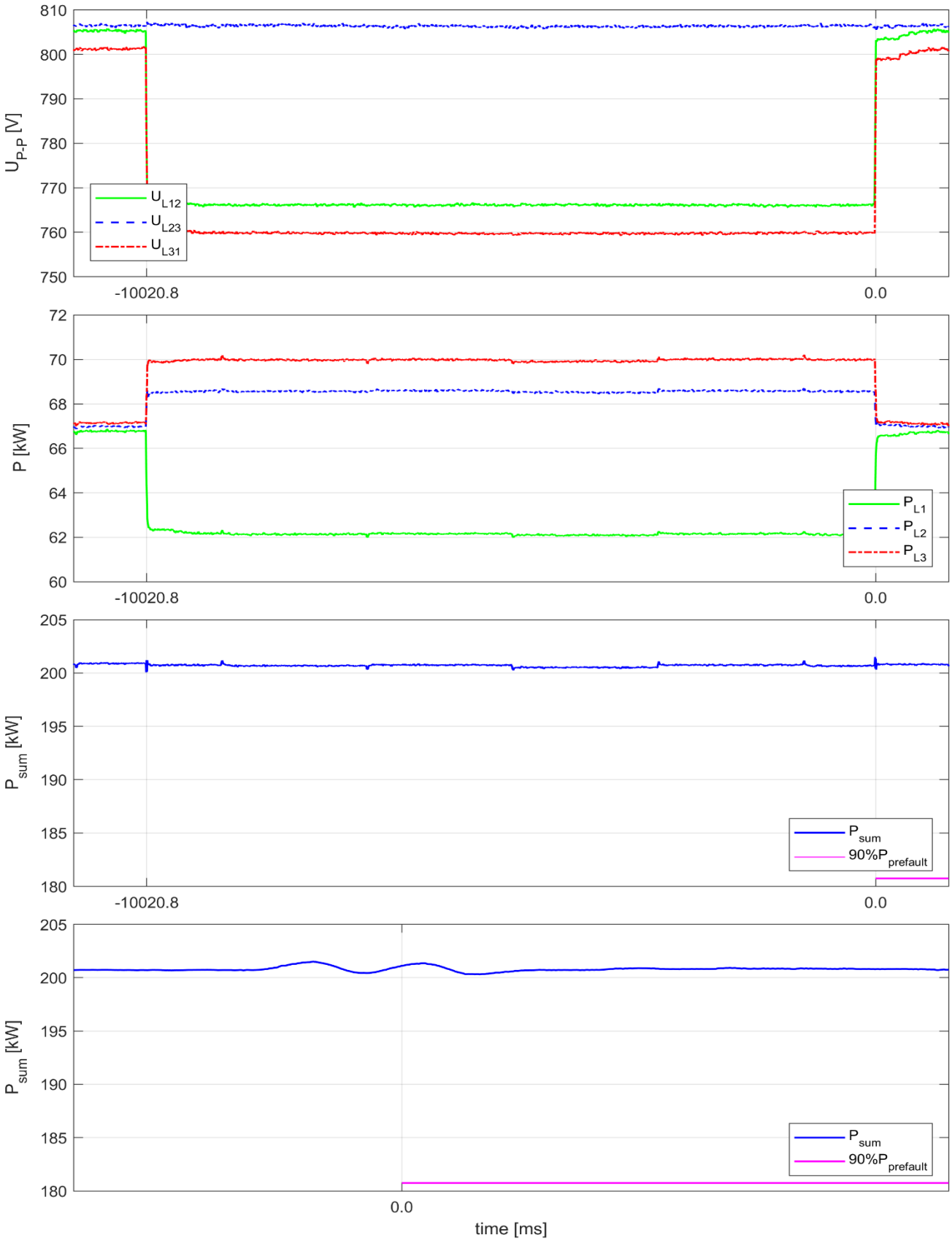
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Positive sequence components and RMS values



B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Positive sequence components and RMS values



B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

CEA_4.3.2

	No.	Parameter	Description / calculation basis	Results		
Gerneral information	1	Test no.	-	CEA_4.3.2-1		
	2	Data file name	-	CEA_4.3.2-1.wdf		
	3	MD5-Checksum	-	d0ca22599a70b2705b0eb17ee3a9318a		
	4	Date	[yyyy-mm-dd]	2020-09-29		
	5	Time	[hh:mm:ss]	06:41:26		
	6	Type of fault (number of affected phases)	Fault type B on low-voltage side	One-phase		
	Phase reference			**A [1)]**	**B [1)]**	**C [1)]**
	7	Fault occurrence (t_1)	[ms]	4930.1		
	8	Fault clearance (t_2)	[ms]	14951.2		
	9	Fault duration determined from test	*(from time domain voltage results)* [ms]	10021.1		
	10	Measeured value of voltage drop / increase	*(per phase-to-neutral, t_1 + 100ms … t_2 and t_1 - 60s … t_1)* [p.u. U_n]	0.900	1.004	1.007
	11	Measeured value of voltage drop / increase	*(per phase-to-phase, t_1 + 100ms … t_2 and t_1 - 60s … t_1)* [p.u. U_n]	0.956	1.007	0.950
	12	Measeured value of voltage drop / increase	*(positive sequence, phase-to-neutral, t_1 + 100ms … t_2 and t_1 - 60s … t_1)* [p.u. U_n]	0.970		
Before grid fault t_1	13	Voltage reference	*(positive sequence, phase-to-neutral averaged over t_1 - 60s … t_1)* [p.u. U_n]	1.004		
	14	Voltage reference	*(negative sequence, phase-to-neutral averaged over t_1 - 60s … t_1)* [p.u. U_n]	0.004		
	15	Reactive current reference [2)]	*(RMS, averaged over t_1 – 10s … t_1)* [p.u. I_n]	0.000		
	16	Active power reference	*(RMS, averaged over t_1 – 10s … t_1)* [p.u. P_n]	0.202		
	17	Reactive power [2)]	*(RMS, averaged over t_1 – 10s … t_1)* [p.u. P_n]	0.000		
During Grid fault t1 till t2	18	Reactive current [2)]	*(positive sequence, averaged over t_1 + 100ms … t_2 - 20ms)* [p.u. I_n]	0.000		
	19	Reactive current [2)]	*(negative sequence, averaged over t_1 + 100ms … t_2 - 20ms)* [p.u. I_n]	-0.004		
	20	Apparent current	*(positive sequence, averaged over t_1 + 100ms … t_2 - 20ms)* [p.u. I_n]	0.208		
After fault clearence t2	21	Settling time of active power (from restoration of the voltage ≥ 90% of nominal voltage until the Active Power output restored to ≥ 90% of the pre-fault level)	[s]	0.000		

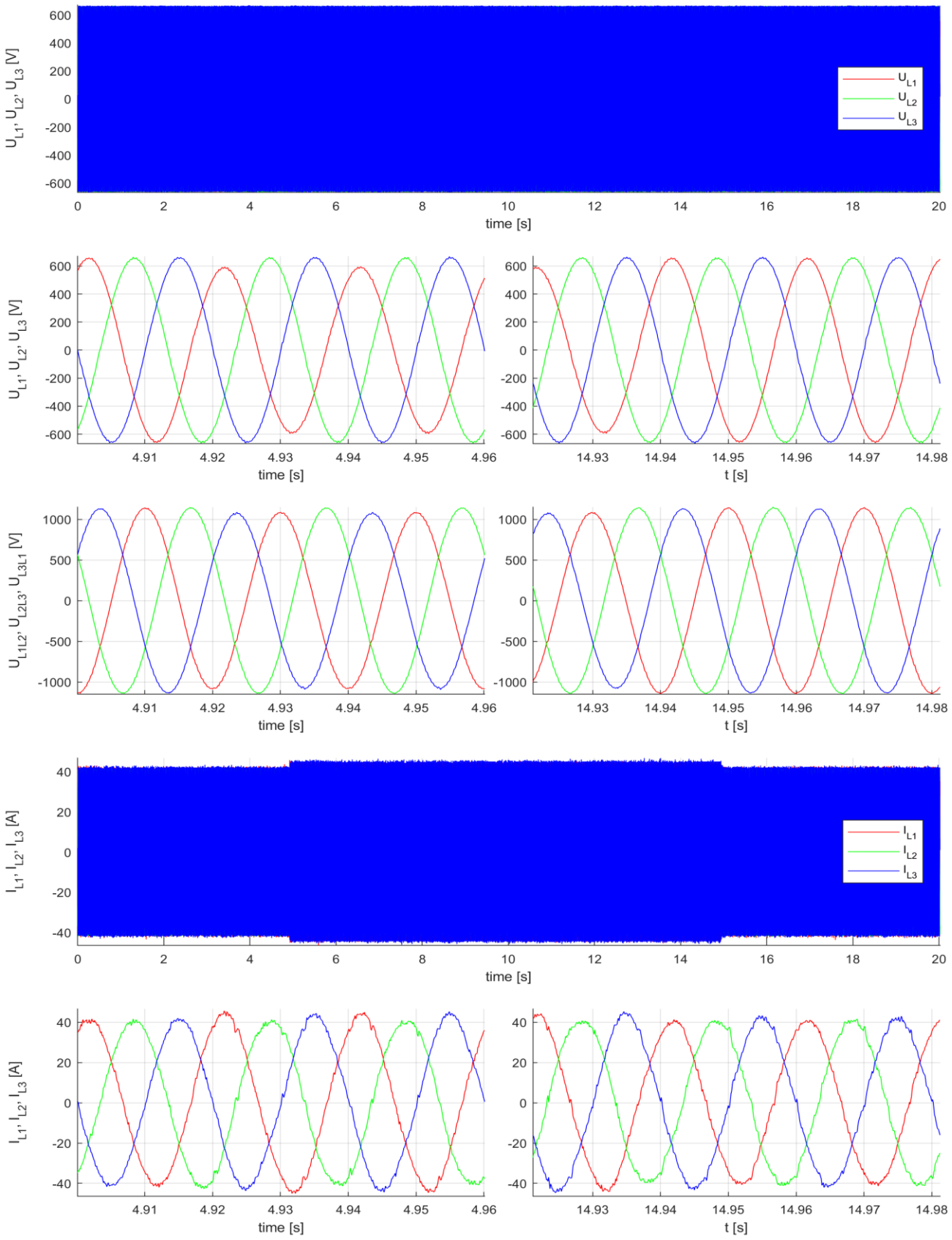
Note:

[1)] A / B / C indicate the phase-neutral voltages (L1, L2, L3), phase-phase voltages (L12, L23, L31) or the phase currents (L1, L2, L3), for details see *Description / calculation basis*.

[2)] Under-excited / inductive reactive current has a negative sign, over-excited / capacitive reactive current has a positive sign, the sign of the reactive power is the same as the reactive current.

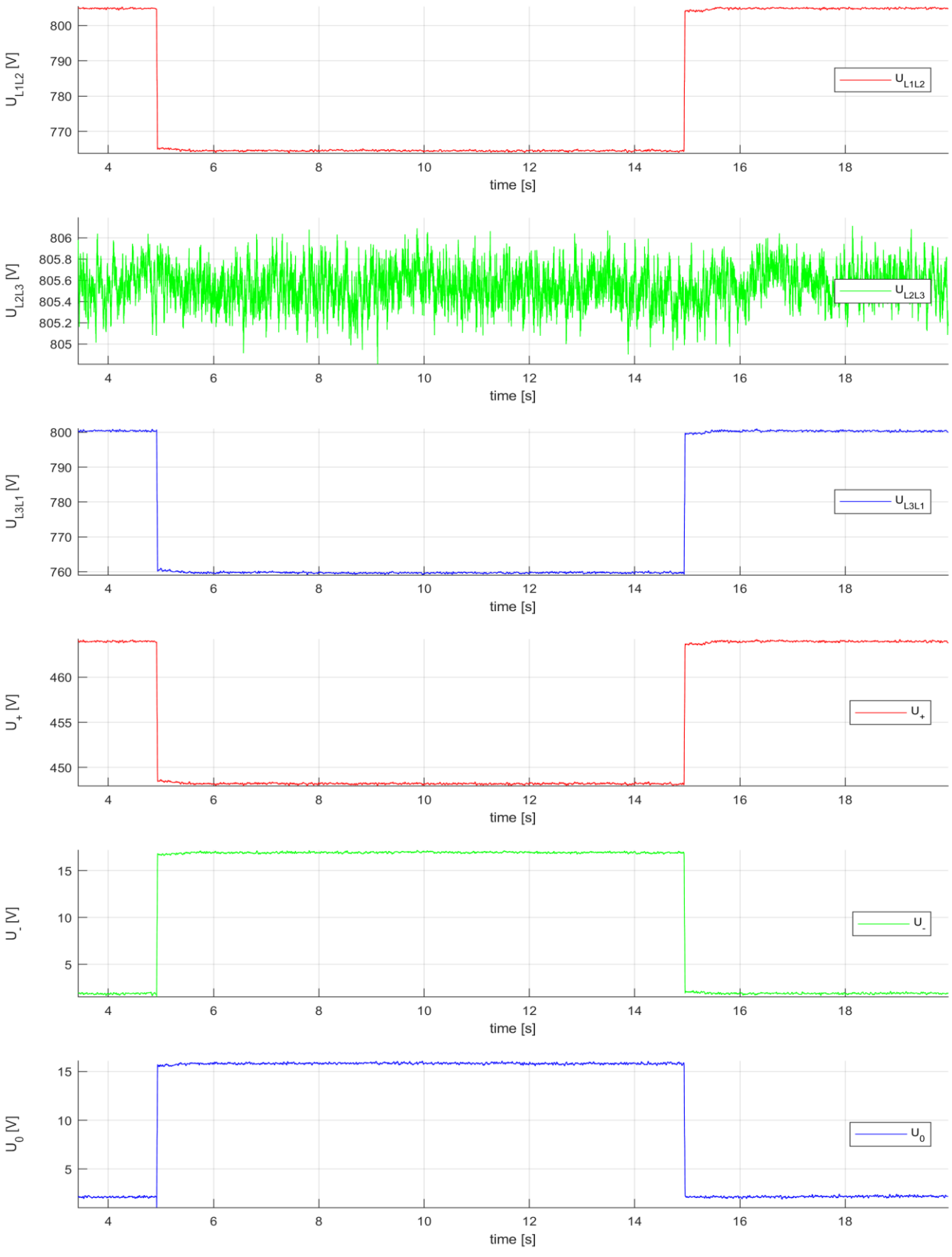
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Timedomain values



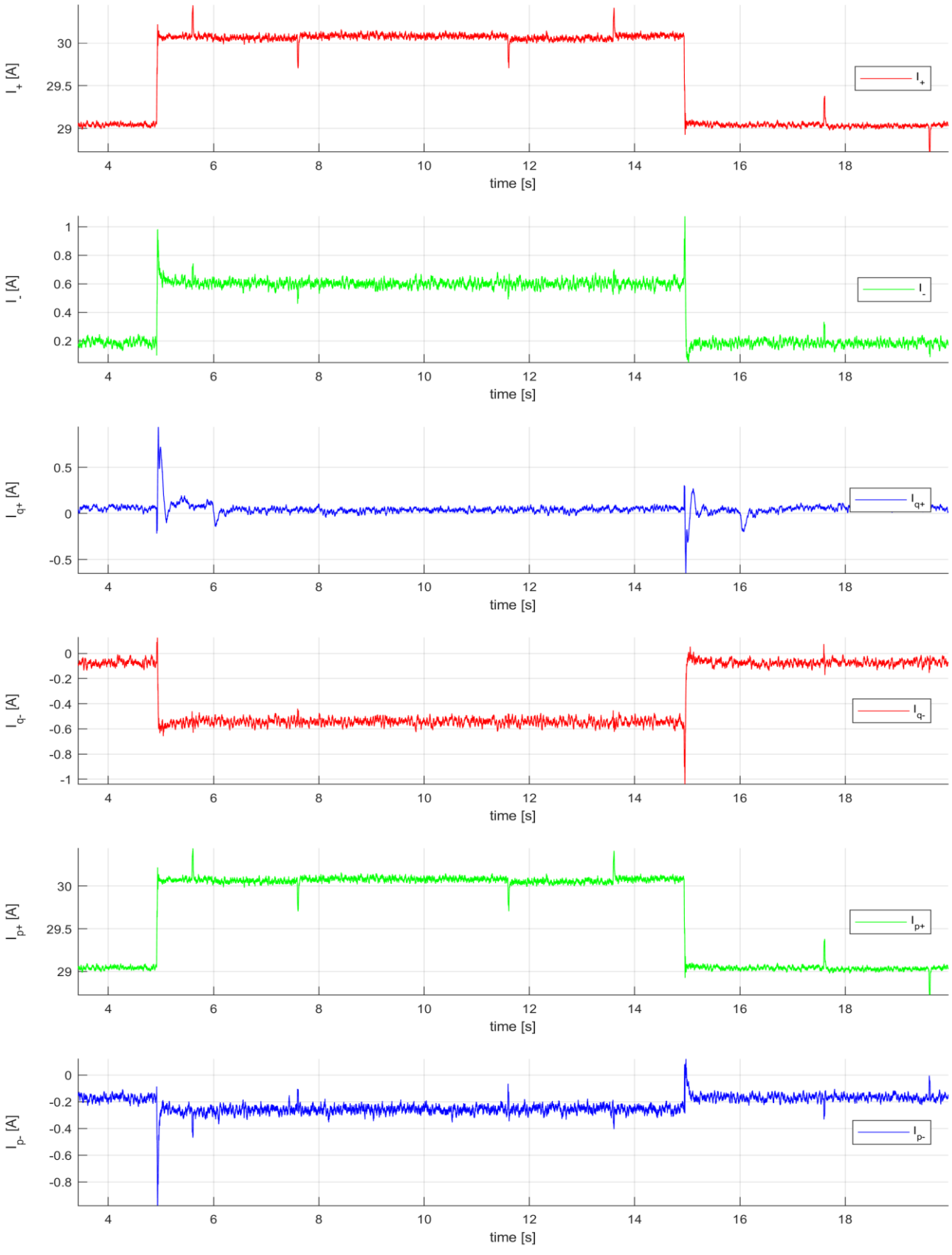
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Positive sequence components and RMS values



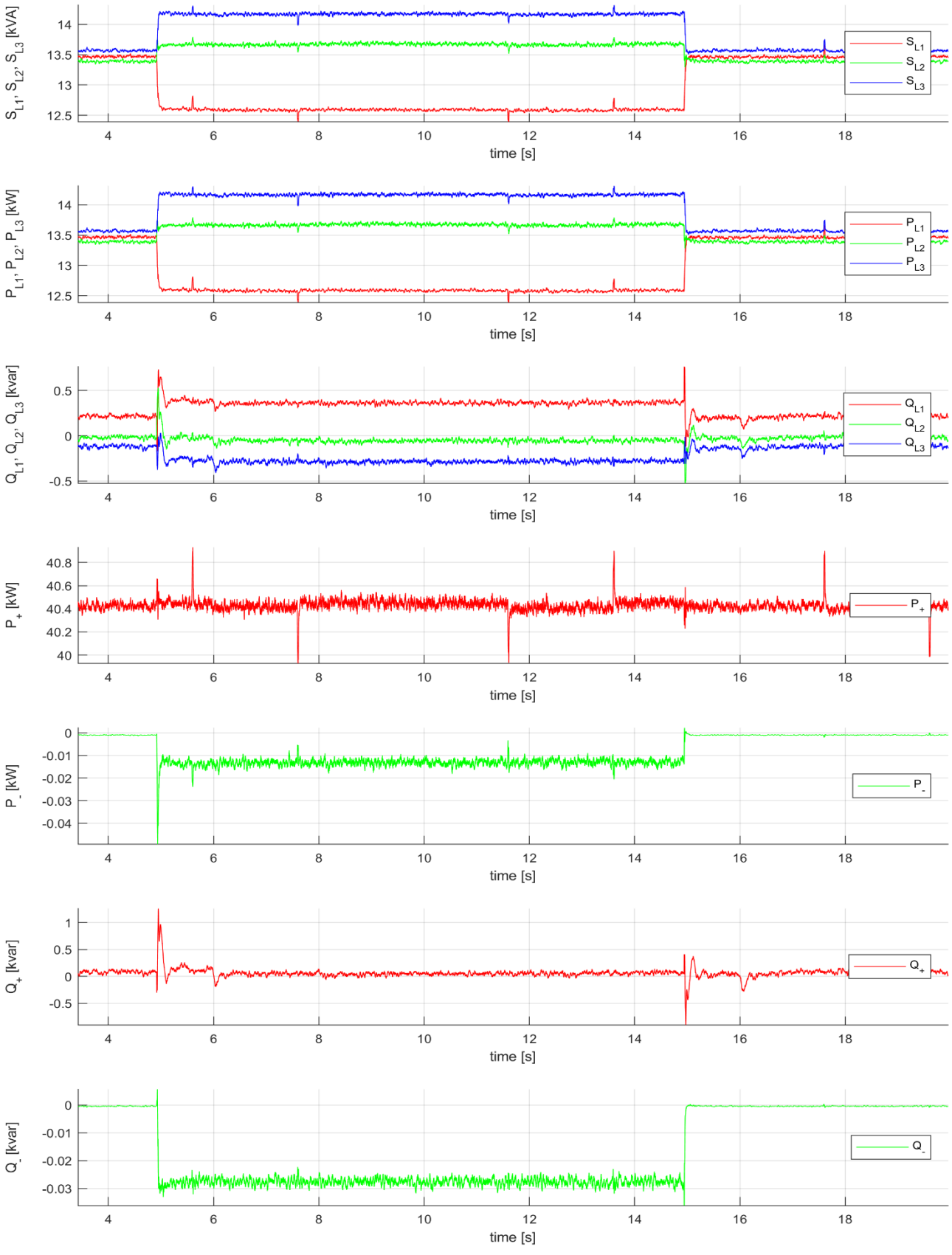
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Positive sequence components and RMS values



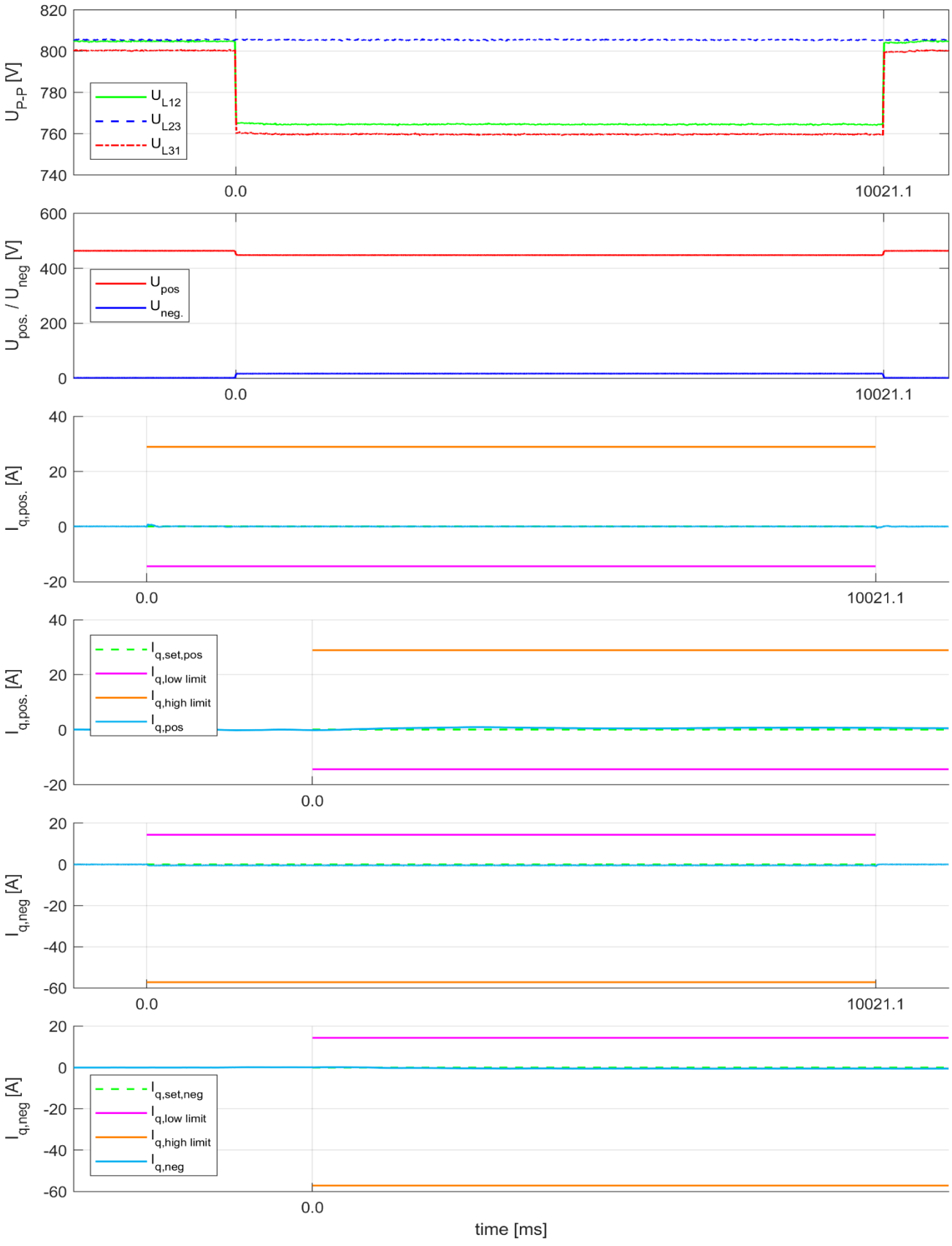
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Positive sequence components and RMS values



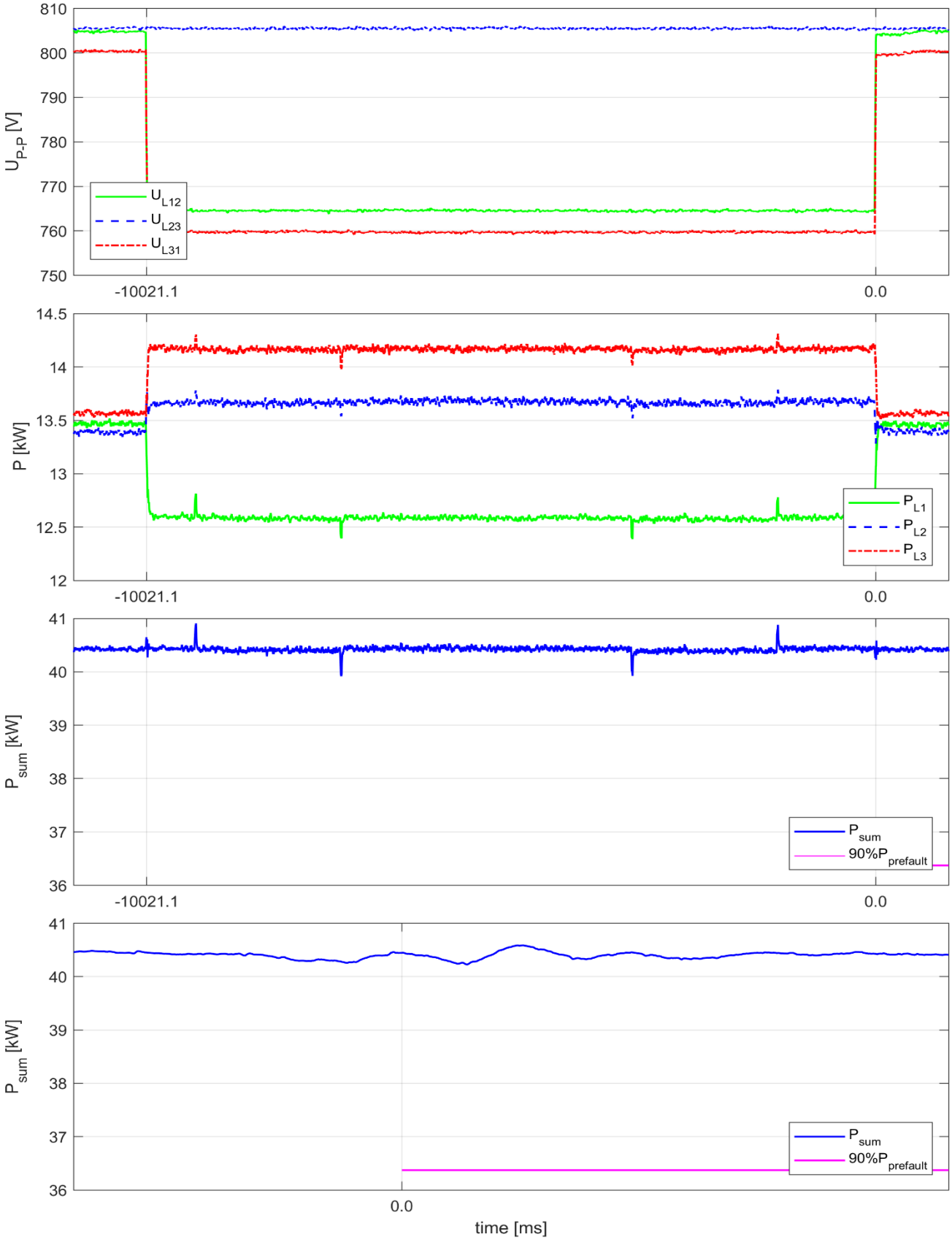
B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Positive sequence components and RMS values



B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.

Positive sequence components and RMS values



B2 For generating station getting connected on or after completion of 6 months from date of publication of these Regulations in the Official Gazette.
B2 (4) Active power control
Note: Test was not conducted.
B2 (7) Operating at overvoltage condition
Note: Test was not conducted.

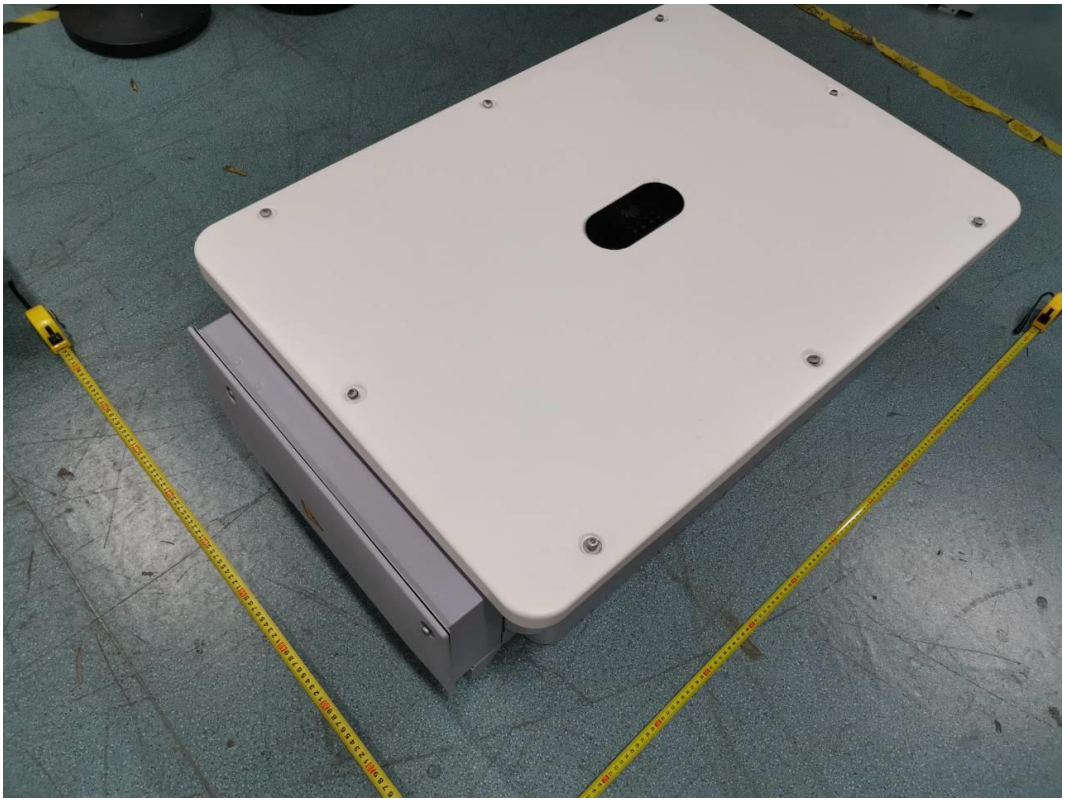
Annex 2 – Pictures of the unit

Enclosure front view

Enclosure side view-1

Enclosure side view-2

Enclosure top view



Enclosure bottom view

Enclosure rear view

Annex 3 – Measurement uncertainty

Measurement category	Expanded uncertainty based on the measurement value
AC Current (50 Hz signal)	±0,33%
DC Current	±1,18%
AC Voltage (50 Hz signal)	±0,36%
DC Voltage	±0,40%
AC Powers	±0,38%
DC Power	±1,21%
Flicker	Flickermeter valid according to class F1 in chapter 6.1 of DIN EN 61000-4-15:2011
Current harmonics up to 9,0 kHz	±1,13%
Voltage harmonics up to 2,5 kHz	±0,67%

Note:

The data and results within this document are accurate. For the uncertainty calculation a confidence level of 95% is assessed.

All stated uncertainties are worst case values due to the definition of uncertainty calculation. The shown uncertainties are equal or lower than the shown values depending on the equipment used for measurements which is stated in this report.

The variability of the components and processes used for manufacturing of devices similar to the tested one can contribute to additional deviation. It is the responsibility of the manufacturer to assure compliance for these devices.

Annex 4 – Test equipment list

Equipment	Internal No.	Manufacturer	Type	Serial No.	Last Calibration
Performance of tests		2020-08-25 - 2020-09-29			
DC power supply	A170322006	KEYSIGHT	N8957APV	DE17052080	October -23-2019
	A170418028	KEYSIGHT	N8957APV	DE17062115	October -23-2019
	A161008717	KEYSIGHT	N8957APV	DE16321631	October -23-2019
	A170322000	KEYSIGHT	N8957APV	DE17032052	October -23-2019
	A161149930	KEYSIGHT	N8957APV	DE16321623	October -23-2019
	A161217057	KEYSIGHT	N8957APV	DE16341673	October -23-2019
	A170322004	KEYSIGHT	N8957APV	DE17022038	October -23-2019
	A161015843	KEYSIGHT	N8957APV	DE16341674	October -23-2019
	A161149930	KEYSIGHT	N8957APV	DE16391780	October -23-2019
	A160814354	KEYSIGHT	N8957APV	DE16231520	October -23-2019
	A170418017	KEYSIGHT	N8957APV	DE17062112	October -23-2019
	A161008705	KEYSIGHT	N8957APV	DE16341669	October -23-2019
	A161008708	KEYSIGHT	N8957APV	DE16341675	October -23-2019
	A160211548	KEYSIGHT	N8957APV	DE15401242	October -23-2019
AC Simulator	A171247305	AMETEK	RS270-3PI	1515A00638	--
Scope	A111171210	YOKOGAWA	DL850E	91LA25621	June-30-2020
	A160610658	Tektronix	DPO7054C	C200928	July-02-2020
Power analyzer	A151233453	HIOKI	PW6001	151209305	October -24-2019
Current sensor	A170420332	HIOKI	CT9555	170333301	December-30-2019
	A170420333	HIOKI	CT9555	170239123	December-27-2019
	A120717854	HIOKI	CT6865	120118228	July-21-2020
	A170420334	HIOKI	CT9555	170234315	December-27-2019

Note:
The AC simulator and DC power supplies are not need to be calibrated, since the voltage and current are measured and determined using the calibrated oscilloscope and power analyser.

End of Test Report