IONPURE®

SERVICE BULLETIN 2017-02

Title Isolation Transformer Selection for DCR power controllers

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Scope This bulletin applies to Ionpure power controllers, models IP-DCR600V15A-R2 (W2T 827 122), and IP-DCR600V15A-M (W2T 827 123).

Purpose An isolation transformer is required upstream of the Digital Communication Rectifier (DCR) to provide electrical isolation between the AC input and the DC output, and to ensure that the CEDI module cathode is at zero volts. But the selection of the transformer voltage can affect the DCR's reliability, waveform and power factor (efficiency), as well as the CEDI module performance. This bulletin gives recommendations on transformer selection.

Design Considerations

Primary (input) AC voltage: can be single or three-phase, selected to match the power available at the site. **NOTE: *the three phase primary should be Delta, not Wye.***

> Voltage Taps, Primary: voltage taps in the primary are recommended by most transformer manufacturers, to ensure that the transformer provides the desired output voltage. A common tap arrangement is two 2.5% taps above and four 2.5% taps below nominal voltage. Transformers are shipped with the taps connected for nominal voltage. The installing electrician must change the taps if the supply voltage differs from the nominal voltage rating.

Secondary (output) AC voltage: must be single-phase. The voltage can be from 220 to 660 VAC but must be at least 1.1 times higher than the maximum DC voltage required by the CEDI module.

> Voltage Taps, Secondary: ***voltage taps in the secondary are recommended in order to optimize the efficiency (power factor) and reliability of the DCR as well as the salt removal performance of the CEDI module.*** Suggested taps are given in column 4 of Table 1, below. The maximum DC output voltage of the DCR will be about 90% of the selected tap (input) voltage.

Number of Secondary Windings: a single secondary winding can feed multiple DCRs, which would normally be the least expensive transformer option. Another possible configuration is a dedicated secondary winding for each power controller, which can provide the benefit of preventing failures in one winding from affecting others.

Frequency: 50 or 60 Hz.

Duty Cycle: 100%

Isolation transformer rating (KVA): this is determined by multiplying the (maximum DC voltage) by the (maximum DC current) by the safety factor 1.3. See Table 1.

Temperature Rise and Insulation Class: transformers with 130 or 150 °C temperature rise with an insulation class of 220 °C are commonly available. Transformers with lower temperature rise are more efficient and have longer service life, but are priced higher. Selection is left up to the user. IEC standards specify the maximum temperature rise of transformers in relation to the insulating material used.

Construction: use open frame transformers with copper windings. Copper-wound transformers are usually more efficient and smaller than aluminum-wound units.

Thermal Switch: it is recommended to have a thermal switch embedded in the secondary winding to shut off the AC supply to the transformer if the temperature exceeds a set value, below the insulation class maximum temperature.

Table 1: Isolation Transformer Sizing for IONPURE CEDI Modules (single power controller)

Module Type (CEDI)	Maximum Required DC Volts	Maximum Required DC Amps	Recommended Input Voltage to DCR (VAC taps)	Minimum Transformer KVA Rating*	Fuse Size for Secondary (Amps)
LX04 X&Z	53	6	**20/40/60**	0.6	4
LX10 X&Z	133	6	**50/100/150**	1.2	7
LX18 X&Z	240	6	**90/180/270**	2.2	9
LX24 X&Z	320	6	**120/240/360**	3.0	8
LX30 X&Z	400	6	**150/290/440**	3.5	10
LX45 X&Z	600	6	**220/440/660**	5.6	11
LX04HI	50	10	**20/40/60**	0.8	5
LX10HI	125	10	**45/95/145**	1.7	10
LX18HI	225	10	**80/170/250**	2.5	9
LX24HI	300	10	**110/220/330**	3.5	13
LX30HI	375	10	**140/280/420**	4.7	14
LX45HI	600	10	**220/440/660**	9	16
VNX 25-2, 28-2	600	6.6	**220/440/660**	5.6	11
VNX 25EP-2, 28EP-2	600	6.6	**220/440/660**	5.6	11
VNX 50-1, 50-2	600	13.2	**220/440/660**	10.5	20
VNX 50-3, 55-2	600	13.2	**220/440/660**	10.5	20
VNX 50-E, 55-E	600	13.2	**220/440/660**	10.5	20
VNX 50-EP, 55-EP	600	13.2	**220/440/660**	10.5	20
VNX 50-EX, 55-EX	600	13.2	**220/440/660**	10.5	20
VNX15CDIT-2	600	6.6	**220/440/660**	5.6	11
VNX30CDIT-2	600	13.2	**220/440/660**	10.5	20
VNX50-HH	600	10	**220/440/660**	9	16
VNX55HH-2	600	10	**220/440/660**	9	16
MX30	27	2.5	**10/20/30**	0.2	1
MX60	53	2.5	**20/40/60**	0.3	2
MX125	106	2.5	**40/80/120**	0.5	3
MX250	213	2.5	**80/160/240**	0.9	4
MX500	426	2.5	**160/315/470**	1.7	4