Introduction

To determine the size of a DPI for an application it is necessary to have data on the load to be supported. The accuracy of the data collected will depend on the technical expertise and measuring instruments that are available on site.

Load parameters

The most accurate result will be obtained when the first three parameters listed are measured on site. The up-time value will depend on the application requirements.It generally falls in the range 0.35 to 3 seconds and is user adjustable from 0.1 to 3.1 seconds in 0.1 second steps. The factory default for this parameter is 1 second.

1. Load voltage (V_{supply})
2. Load current (I_{load})
3. Load power factor ($\cos\Phi$)
4. Up-time (t) Factory default setting 1 second

Methods to determine the electrical parameters

1. Measure the values

The best method to determine the load parameters is to measure them on site. Use a true rms multimeter with a current probe that can measure power factor for the measurements (eg Fluke 39). See Fig 1 for measurement points.

2. Load based estimate

The *continuous* load (VA) or current (A) rating of the devices to be supported should be added together. This information can be found on a schematic diagram of the control circuit in the motor control center (MCC) or switchboard, or from the device manufacturer. Add up the *holding* VA of each contactor *coil* to obtain the total load VA and note the coil/control voltage. The contactor energizing or inrush current need not be considered. Load current is equal to the load VA divided by the load voltage. The load power factor must be estimated. If the load is all contactors and relays use a power factor of 0.2. Check for resistive loads such as PLC power supplies signal lamps or other electronic devices and if these are present use a power factor of 0.75.

3. Control transformer rating

The size of the control transformer(s) can be found on the transformer rating label. Make a note of the VA rating and the secondary voltage (control voltage). The control voltage will normally be 120, 208 or 230Vac. Load current is equal to the transformer VA rating divided by the transformer secondary voltage. The load power factor must be estimated. If the load is all contactors and relays use a power factor of 0.2. Check for resistive loads such as PLC power supplies signal lamps or other electronic devices and if these are present use a power factor of 0.75.

Up-time value

The factory default setting of 1 second will work well with most applications. There are situations where it is necessary to reduce the up-time and others where it is beneficial to increase it. The optimum up-time depends on the application.

1. Low inertia loads require shorter up-times

Large compressors and pumps slow down very rapidly when power is removed and it is considered unsafe to hold the controls in for longer than 350ms. See *User Manual*

p10, Adjustments - DSW2, set DSW2 to Noise Immune & Two Level.

2. High inertia loads use longer up-times

Conveyers and fans are high inertia loads and can run for seconds after the power has been removed. Up-times of 2 to 3 seconds can be used for these applications.

3. Non rotating loads use longer up-times

Boiler and gas oven controls can be held in for longer times and can use up-time settings from 2 to 3 seconds or longer.

Select a DPI based on application data

1. Use the DPI Selector

The easiest and most accurate way to select a DPI is to use the DPI Selector software that is available free of charge from your DPI supplier or download it from our web site. EXCEL must be installed on the computer where the DPI Selector is to be used. Run the DPI Selector and enter the figures for Load current, Load voltage and Load power factor. The up-time for each model is displayed based on the figures entered. Select the model with the up-time closest to the value chosen for the application.

Example:

Application data: t = 1 second / V_{supply} = 120V / I_{load} = 15A cos Φ = 0.2

Enter these figures in the DPI Selector.

DPI54S/54L Selector v1.1

Actual Load Current [A]	Actual Input Voltage [Vrms]	Actual Power Factor [cosΦ]
15	120	0.2

⇧

Enter the values for 120V models above.

Supply voltage value. Enter the measured supply voltage.

Enter the values for 230V models below.

⇩

10	220	0.02

If Power Factor is not known check the load:
Power supplies, resistors, lamps - cosΦ = 1
Contactors & relays only - cosΦ = 0.2
Mixed loads estimate or use - cosΦ = 0.75
Measure cosΦ for best accuracy, this is important!
Check how cosΦ influences Up- time.

Notes:
No - Load current exceeds the unit full load rating.
120 volt models
230 volt models

MODEL	Up-time [sec]	Possible choice?
DPI54S6.6mF120V6A	0.12	No
DPI54S13.2mF120V6A	0.24	No
DPI54S19.8mF120V6A	0.35	No
DPI54S39.6mF120V8A	0.71	No
DPI54L33mF120V25A	0.59	Yes
DPI54L66mF120V25A	1.18	Yes
DPI54L99mF120V25A	1.77	Yes
DPI54L198mF120V25A	3.54	Yes
DPI54L297mF120V25A	5.31	Yes
DPI54L396mF120V25A	7.08	Yes
DPI54L495mF120V25A	8.85	Yes
DPI54L594mF120V25A	10.62	Yes
DPI54L693mF120V25A	12.39	Yes
DPI54S2.04mF230V6A	0.58	No
DPI54S4.08mF230V6A	1.17	No
DPI54S6.12mF230V6A	1.75	No
DPI54S12.24mF230V8A	3.50	No
DPI54L15mF230V25A	4.28	Yes
DPI54L30mF230V25A	8.57	Yes
DPI54L45mF230V25A	12.85	Yes
DPI54L90mF230V25A	25.71	Yes
DPI54L135mF230V25A	38.56	Yes
DPI54L180mF230V25A	51.42	Yes
DPI54L225mF230V25A	64.27	Yes
DPI54L270mF230V25A	77.13	Yes
DPI54L315mF230V25A	89.98	Yes

Select the DPI54L66mF120V25A with up-time of 1.18 seconds.

2. Use the Minimum up-time formulae

Refer to the *Specifications* section in the user manual, look for the formulae under the heading *Inverter,* sub heading *Minimum up-time as a function of the load*.

Minimum up-time as function of the load: $t = (\eta * C_{cap} * V_{supply}) \div (I_{load} * \cos \Phi)$

Minimum up-time = t	use default (1 sec) or choose a value.
Value of storage capacitor(s) = C_{cap}	see specification for model selected.
Stored energy factor = η	see specification for model selected.
Load voltage = V_{supply}	measure or estimate value.
Load current = I_{load}	measure or estimate value.
Load power factor = cos Φ	measure or estimate value.

Pick a DPI with a current rating equal or higher the application load current then enter the capacitor value and stored energy figures from the DPI specification sheet together with the load data. Compare the Minimum up-time result with the required up-time for the application. If the up-time is too low recalculate using the next largest DPI with the next largest storage capacitor.

Example

Application data:

$t = 1$ second / $V_{supply} = 120V$ / $I_{load} = 15A$ / $\cos\Phi = 0.2$

Load Current = 15A try a DPI54L33mF120V25A

DPI data from specifications: $C_{cap} = 0.033$ / $\eta = 0.47$

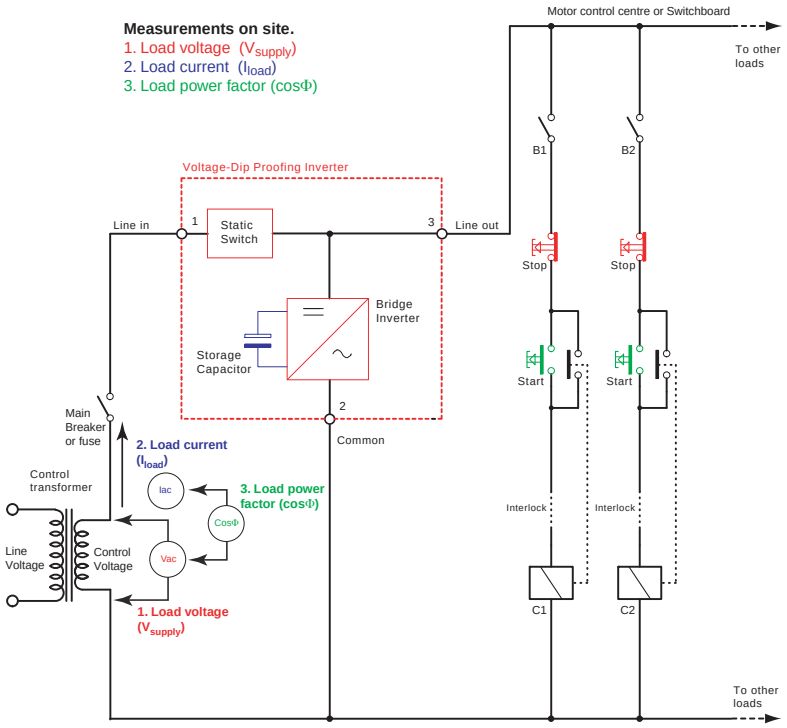
Minimum up-time = $(0.47*0.033*120) \div (15*0.2) = 0.62$ seconds - too low!

Try DPI54L66mF120V25A

DPI data from specifications: $C_{cap} = 0.066$ / $\eta = 0.47$

Minimum up-time = $(0.47*0.066*120) \div (15*0.2) = 1.24$ seconds - OK!

Select the DPI54L66mF120V25A for the application.



A typical DPI connection diagram

Fig 1

On site measurement of load parameters