

Memorandum

From:

Date: 13th September, 1984

To:

Further to a recent communication with _____, we
enclose the following documents for your consideration :

1. Technical details of the 400Hz power distribution cable, type PZ 1161 (manufactured to BS 6346).
2. Wire Diagram - 3-400Hz M.G. sets (Kato R.S.). Drawing number D. 10650001 Rev. C.
3. Kato M/G housing 50Hz. Drawing number 608-00001-74.
4. Anton Piller control cabinet. Drawing number 4652050052 including description.
5. Anton Piller brushless frequency converter. Drawing number 33.5.351.4005.
6. Anton Piller drawing number 42.5.661.0977.
7. Anton Piller drawing number 42.8.091.3047.
8. Anton Piller drawing number 42.2.539.0036.
9. Extract from Anton Piller specification for frequency converter type FUA 35.4.2-5/40A.

On the subject of exhaust air ductwork, both Anton Piller and Kato confirmed that the exhaust air path through the motor generator, could be routed such that the outlet would appear at the left hand end of the control cubicle (when viewed from the front).

The Kato quietised M/G set is designed to be delivered in one piece, however the design could be changed to overcome site access problems. We would appreciate more details on the accessibility and capacity of your lift, prior to instructing Kato to carry out design changes.

We trust that the enclosed information meets with your approval, and should you require any further assistance or discussion, please do not hesitate to contact us.

Regards,

encl:

400Hz POWER DISTRIBUTION CABLE.1. INTRODUCTION

This specification refers to the supply and delivery of cable suitable for a 400Hz Motor Generator sets and feeds directly to a computer system. The maximum output of each generator is 150kw. The system voltage is 225 volts line to line.

2. CABLE DETAILS

The cable shall be constructed as a seven core concentric cable with two cores per phase and one core for the neutral. The cable shall be laid up with the neutral core in the centre and the two conductors per phase diametrically opposite around it. The cable will be insulated with P.V.C. (or equal) and have P.V.C. bedding, steel wire armour and P.V.C. sheath (or equal).

Details of a similar cable previously used are:

Conductors	Stranded copper
Cross Section	7 x 32mm ²
Maximum permitted temperature	70°C
Operational min. installation temp:	5°C
Diameter:	45mm
Rated voltage:	1000V
Maximum permitted voltage	1150V
Test voltage:	4000V
Resistance per phase at 400Hz:	0.317 Ohm/km (70°C)
Resistance per neutral at 400Hz:	0.630 Ohm/km (70°C)
Inductance per phase:	0.113 mH/km
Inductance per neutral	0.199 mH/km
Reactance/phase at 400Hz:	0.284 Ohm/km
Reactance/neutral at 400Hz:	0.500 Ohm/km
Capacitance phase/phase:	0.132 microF/km
Capacitance phase/neutral:	0.070 microF/km
Overall capacitance:	0.460 microF/km
Max. current capacity in air:	220 AMPS

The cable shall have a maximum volt drop of 2% of 225V on a 50m length.

3. CABLE INSTALLATION.

The cable will be installed in free air on cable tray in a dry cool atmosphere. No chemical or operating hazards exist.

DIMENSIONS

Please refer to enclosed drawing 4652050052

The Frequency Converter and associated control equipment would be contained within a single sheet steel enclosure requiring access from the front only.

The cubicle and Frequency Converter have been designed in sections to enable easier access/off-loading and transportation.

The three sections are:-

1. BASE/CONVERTER SECTION.

Contains the Frequency Converter and sound proofing baffles. A cable entry area is provided for cables.

DIMENSIONS

Length = 2350mm, Depth = 1100mm, Height = 900mm,
Weight = 250Kg (approx). *(cabinet only)*

2. UPPER CONTROL AND SWITCH PANEL.

Contains the control circuitry and instrumentation. Two hinged doors and a lift off centre panel provide access.

DIMENSIONS

Length = 2350mm, Depth = 850mm, Height = 1110mm,
Weight = 500Kg (approx).

3. UPPER BACK SILENCING SECTION.

Contains the air ducts and silencing baffles.

DIMENSIONS

Length = 2350mm, Depth = 250mm, Height = 1110mm,
Weight = 130Kg (approx).

TOTAL DIMENSIONS.

Length = 2350mm, Depth = 1100mm, Height = 2060mm,
Weight = 880Kg
Weight = 167kVA Unit - 3000kg (approx) *relays machine 2120KG*

NB: Items 2 and 3 may be delivered as one piece if preferred.

DIMENSIONS

Length = 2350mm, Depth = 1100mm, Height = 1110mm,
Weight = 630 kg (approx).

TECHNICAL SPECIFICATION

Frequency Converter, Type FUA 35.4.2-5/40A

The converter and associated control equipment would all be contained within a silenced enclosure requiring front access. The converter would be compliant with Cray Research Specification 02251300 A.5 issued 9/13/83, E.C.O. number 3173.

Motor - Single shaft monoblock design with brushless, squirrel cage motor.

Input - Voltage 380-415 volts $\pm 10\%$
Frequency 50Hz ± 3 Hz
Running Current 300 amps at 380 volts, 275 amps at 415V
Starting Current 100 amps at 415V
Starting Time 60 seconds
Speed 1485 rpm
Power factor 0.9

Generator- Single shaft monoblock design with brushless rotating exciter.

Output - Voltage 225 volts AC nominal
Steady State $\pm 1\%$ no load to full load
Transient $\pm 15\%$ maximum, 100% load change (pf = 0.9)
Regulation $\pm 1\%$ for input voltage variation of $\pm 10\%$
Recovery 0.4 sec to within $\pm 1\%$ of nominal (no load to full load).
Modulation 0.5% maximum
Balance 1% line to line with balanced 3 phase load.
Adjustment $\pm 10\%$ of nominal voltage
Harmonic distortion 0.6% rms total, line to line for balanced linear loads - no load to full load
Voltage build up 60 seconds at application of control voltage
Overshoot 1% maximum of nominal

Cont/...

TECHNICAL SPECIFICATION

Frequency Converter, Type FUA 35.4.2-5/40A

Inertial isolation	for input power outages of 0.5 seconds the voltage output would not fall below 95% of nominal
Rating	167 or 200kVA at load power factor 0.9
Output Current	427 amps/phase at 0.9 power factor or 514 amps/phase at 0.9 power factor
Temperature	0°C to 40°C ambient
Relative Humidity	0-95%
Noise Level dB(A)	65 when measured at 1m from any surface.

167/200kVA, 50/400Hz Frequency Converter

Ventilation and Air Flow

- a) Air Outlet of Frequency Converter - 600mm x 200mm
- b) Air Flow - 70 cubic metres/minute
- c) Disposable Air Pressure - 10mm WC

If an air duct arrangement is being considered, then the duct should be 600 x 500mm minimum with one bend only of 90° and a total length of 5000mm. Additional fans would not be required.

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400 HZ M-G Set cabling

Reference:

A Subject: CONTROL CABLES AND CONDUITS

1 FROM PDU TO ROOM SCREEN

(a) ON/OFF CONTROL:

3 x 14 AWG (= 2 mm²) min, 240 V rated twisted wires.

Screening or conduit optional. Will pass through filters at screen.

(b) MANUAL VOLTAGE REGULATION:

Belden
8720?2 x shielded twisted pair, each wire 14 AWG (2 mm²) min in 1/2" screwed conduit, PVC insulated. Ground conduit at screen only. To pass through filters IF POSSIBLE.2 FROM ^{400 HZ} DB#1 TO ROOM SCREEN:

(a) VOLTAGE SENSING

3 x Twisted 14 AWG (2 mm²) wires, ^{240V rated} in 1/2" screwed conduit, PVC insulated. Ground conduit at screen only. To pass through filters if possible.

3 FROM 400 HZ DB#2 TO ROOM SCREEN.1

(a) As for 2(a) above, in a separate conduit.

4 FROM ROOM SCREEN TO M-G CONTROL CABINET #1:

(a) ON-OFF CONTROL:

3 x 14 AWG (2 mm²) minimum, 240 V rated twisted wires.Filtered at room screen. Screening or ^{screwed} conduit (1/2" wid) optional but if used must be insulated & grounded at room/screen only.

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(b) Manual Voltage REGULATION:Belson
4720

2 x shielded twisted pair, each wire 14 AWG (2 mm^2) minimum in one run of $\frac{1}{2}$ " screwed conduit, PVC insulated. Conduit grounded at room screen only. IF FILTERS CANNOT BE USED, CONDUIT TO SCREW INTO SPECIAL ENTRY BOX AT SCREENED ROOM WALL.

(c) VOLTAGE SENSE #1:

3 x twisted 14 AWG (2 mm^2) wires (240V rated) in $\frac{1}{2}$ " screwed conduit, PVC insulated. Conduit grounded at room screen only. IF FILTERS CANNOT BE USED, CONDUIT TO SCREW INTO SPECIAL ENTRY BOX AT SCREENED ROOM WALL.

5 FROM ROOM SCREEN TO MG CONTROL CABINET #2:

As for 4(c) above in an additional $\frac{1}{2}$ " conduit - same conditions.

6 CONTROL CABINET #1 TO CONTROL CABINET #2

(a) 5 x twisted 14 AWG (2 mm^2) minimum ^{wires,} 240 V-rated, in $\frac{1}{2}$ " steel conduit, grounded at one cabinet only (either cabinet). Insulated conduit preferable

(b) 2 x shielded twisted pair, each wire 14 AWG (2 mm^2) minimum in ^{separate} $\frac{1}{2}$ " steel conduit, grounded at one

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cabinet only. (either cabinet). Insulated conduit preferable. For grounding consistency, suggest grounding at Cabinet # 2.

] CONTROL CABINET # 2 TO CONTROL CABINET # 3

NOT NOW REQUIRED

8 REMOTE TEMP RISE ALARM INDICATION ?

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B. POWER CABLING.1. 50 HZ POWER TO EACH CONTROL CABINET

500 MCM (240 mm²) min per phase
1/0 (50 mm²) neutral.

2. CONTROL CABINET TO MACHINE

Already supplied in case of quietised sets.

NB. Factory installed connection in each cabinet between incoming 50 Hz neutral and neutral terminal of Alternator to be removed. Alternator neutral to be grounded only at screened room earth stud by neutral conductor(s) of 400 Hz cable in 3 below.

3. 400 HZ POWER FROM EACH CONTROL CABINET

Via parallel runs of special 7-conductor low loss 400 Hz cable to be nominated. Cable will have 70°C rating, be steel wire armoured & will require aluminium only cable ladders. Number of parallel runs to be advised. Probable need for design/fabrication of special termination boxes at control cabinets and screened room filters to combine paralleled runs. Minimum

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bending radius and cable spacing to be advised.