LOR general cable list description

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|  | Name | Signature | Date |

**Authors**

|  |  |
| --- | --- |
| **Name** | **Affiliation** |
| Tommaso Lapucci | INAF-Arcetri |
| Marco Bonaglia | INAF-Arcetri |
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# Introduction

## Purpose

This technical has the purpose to give a short description of the cables needed for the LOR WFS.

## Scope

## Definitions, Acronyms and Abbreviations

AO Adaptive Optics

ELT Extreme Large Telescope

ESO European Southern Observatory

FoV                 Field of View

IFW                 Instrument Control Framework

HW                 Hardware

INAF               Istituto Nazionale di Astro Fisica

INS                 Instrumentation Software

LGS           Laser Guide Stars

LOR           Low Order and Reference

MCAO            Multi Conjugate Adaptive Optics

MICADO        Multi-AO Imaging Camera for Deep Observations

MORFEO       Multiconjugate adaptive Optics Relay For ELT Observations

NGS           Natural Guide Star

NGSA/CA       Natural Guide Star Acquisition/Collision Avoidance

OPC/UA         Open Platform Communications/Unified Architecture

PLC                Programmable Logic Controller

SW                 Software

TBD               To Be Defined

WFS               WaveFront Sensor

WDM Water Distribution MORFEO

# Related Documents

## Applicable Documents

The following applicable documents form a part of the present document to the extent specified herein. In the event of conflict between applicable documents and the content of the present document, the content of the present document shall be taken as superseding.

AD1 ESO-262825\_1 E-ELT Electrical and Electronic Design Requirements

## Reference Documents

The following documents, of the exact version shown herein, are listed as background references only. They are not to be construed as a binding complement to the present document.

# Introduction

The LOR Electronics is hosted in two of the co-rotating cabinets placed on the co-rotating platform of MICADO: ICS04 (where it shall not exceed a volume equivalent to 25U) and ICS03 (where it shall not exceed a volume equivalent to 6U). The block diagram of figure 1 gives an overview of all the connections between these cabinets and the LOR devices.

Immagine che contiene testo, diagramma, Piano, Parallelo

Descrizione generata automaticamente

Figure 1 LOR electronics block scheme

The aim is to address the encumbrance of the cables that will be installed in the MCIADO volume and the routing of the connectors passing through the MICADO central flange .

Immagine che contiene cartone animato, schermata, clipart

Descrizione generata automaticamente

Figure 2 Cable path from cabinets to GD envelope where the LOR devices are installed.

All the cables selected for the LOR WFS are following the fire properties EN60332-1/3 according to the electronic standard mentioned in AD1.

In what follows we will make use of the MICADO location identifier legend ( shown in figure 2).

Immagine che contiene testo, diagramma, calligrafia

Descrizione generata automaticamente

Figure 3 LOR section of the MICADO location identifier

# Cable list between +ICS03/+ICS04 and +LOR

This chapter describes the routing between the three connectors panels placed on the LOR support structure and the subracks placed in ICS03 and ICS04 cabinets.

Immagine che contiene mappa

Descrizione generata automaticamente

Figure 4 3D view of a LOR with the connector panel pointed by the arrow

Most of the cables will have a sectioning of at the connector panel while a few will go directly from the cabinets to the LOR devices.

Immagine che contiene testo, diagramma, schermata, schizzo

Descrizione generata automaticamente

Figure 5 2D view of the connector panel

Immagine che contiene testo, diagramma, cerchio, linea

Descrizione generata automaticamente

Figure 6 MICADO Central flange

# Destination : +WFS01 and +UB1

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Device/function** | **ID** | **Type of signals** | **Number of wires x wire diameter [mm2]** | **Cable PN/ section/ bending radius** | **SOURCE** | **DESTINATION** |
| AcqStages |  | Ctrl out  To motor phases | 5 | Kollmorgen DE-87792  ∅ 11 mm  10 x outer diameter | +UC105 | +WFS01 |
|  | Feedback on motor + hall | 17 | Kollmorgen DE-107915  ∅ 10 mm  10 x outer diameter | +UC105 | +WFS01 |
|  | Limit + lin. Encoder | 18x0.14mm^2 | LAPP Unitronic LiYCY 0034318  ∅ 7,3 mm  15 x outer diameter | +UC105 | +WFS01 |
| Interlock Park switches X and Y |  | 24V contacts | 8 x0.25mm^2 | LAPP Unitronic LiYCY 0034408  ∅ 7,1 mm  15 x outer diameter | +UC101 | +WFS01 |
| Focus Comp. |  | DC motor,  Encoder,  Limit switches | 16 x0.34mm^2 | LAPP Unitronic LiYCY 0034515  ∅ 9,4 mm  15 x outer diameter | +UC102 | +UB1 |
| Pupil St. Mirror |  | HV & strain gauges | 30x0.34mm^2 | LAPP Unitronic LiYCY 0034530  ∅ 12,3 mm  15 x outer diameter | +UC102 | +UB1 |
| ADC  rotary stage 1 |  | DC motor,  Encoder,  Limit switches | 16 x0.34mm^2 | LAPP Unitronic LiYCY 0034515  ∅ 9,4 mm  15 x outer diameter | +UC102 | +UB1 |
| ADC  rotary stage 2 |  | DC motor,  Encoder,  Limit switches | 16 x0.34mm^2 | LAPP Unitronic LiYCY 0034515  ∅ 9,4 mm  15 x outer diameter | +UC102 | +UB1 |
| Sensors box |  | T, RH, leak (on board) | 40x0.14mm^2 | LAPP Unitronic LiYCY 0034340  ∅ 10,4 mm  15 x outer diameter | +UC101 | TBD |
| Env. sensors (outside the sensor box) |  | PT100 4 wires | 6x0.14mm^2 | LAPP Unitronic LiYCY 0034306  ∅ 6,1 mm  15 x outer diameter | +UC101 | TBD |
| FREDA |  | Fibers (RTC, control & PTP) | 4 | Neutrik opticalCON QUAD Advance  ∅ 5.8 mm  10 x outer diameter | TBD | +UB1 |
|  | Power | 4x 1mm^2 | LAPP  ÖLFLEX® CLASSIC 110 CH  10035058  ∅ 8.9 mm  15 x outer diameter | +UC114 | +UB1 |
|  | HW Alarm and enable | 4x 0.14mm^2 | LAPP Unitronic LiYCY 0034304  ∅ 4,3 mm  15 x outer diameter | +UC114 | +UB1 |
|  | AVC | TBD | TBD |  |  |
|  | Cooling |  | Reichelt Chemietechnik n. 14067 (ID: 8 mm, OD: 14.7 mm, bending R: 45 mm) |  |  |
| ALICE |  | Fibers (RTC, control & PTP) | 4 | Neutrik opticalCON QUAD Advance  ∅ 5.8 mm  10 x outer diameter |  |  |
|  | Power | 4x 1mm^2  7x 1.5mm^2 | LAPP  ÖLFLEX® CLASSIC 110 CH  10035058  ∅ 8.9 mm  15 x outer diameter | +UC114 | +UB1 |
|  | HW Alarm and enable | 4x 0.14mm^2 | LAPP Unitronic LiYCY 0034304  ∅ 4,3 mm  15 x outer diameter | +UC114 | +UB1 |
|  | Cooling |  | Reichelt Chemietechnik n. 14067 (ID: 8 mm, OD: 14.7 mm, bending R: 45 mm) |  |  |
| Anti collision System  TBC |  | Signal from the sensor to the control unit | 4x 0.25mm^2 | LAPP Unitronic LiYCY 0034404  ∅ 5 mm  15 x outer diameter | TBC | TBC |

# Destination : +WFS02 and +UB2

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Device/function** | **ID** | **Type of signals** | **Number of wires x wire diameter [mm2]** | **Cable PN/ section/ bending radius** | **SOURCE** | **DESTINATION** |
| AcqStages |  | Ctrl out  To motor phases | 5 | Kollmorgen DE-87792  ∅ 11 mm  10 x outer diameter | +UC105 | +WFS02 |
|  | Feedback on motor + hall | 17 | Kollmorgen DE-107915  ∅ 10 mm  10 x outer diameter | +UC105 | +WFS02 |
|  | Limit + lin. Encoder | 18x0.14mm^2 | LAPP Unitronic LiYCY 0034318  ∅ 7,3 mm  15 x outer diameter | +UC105 | +WFS02 |
| Interlock Park switches X and Y |  | 24V contacts | 8 x0.25mm^2 | LAPP Unitronic LiYCY 0034408  ∅ 7,1 mm  15 x outer diameter | +UC101 | +WFS02 |
| Focus Comp. |  | DC motor,  Encoder,  Limit switches | 16 x0.34mm^2 | LAPP Unitronic LiYCY 0034515  ∅ 9,4 mm  15 x outer diameter | +UC103 | +UB2 |
| Pupil St. Mirror |  | HV & strain gauges | 30x0.34mm^2 | LAPP Unitronic LiYCY 0034530  ∅ 12,3 mm  15 x outer diameter | +UC103 | +UB2 |
| ADC  rotary stage 1 |  | DC motor,  Encoder,  Limit switches | 16 x0.34mm^2 | LAPP Unitronic LiYCY 0034515  ∅ 9,4 mm  15 x outer diameter | +UC103 | +UB2 |
| ADC  rotary stage 2 |  | DC motor,  Encoder,  Limit switches | 16 x0.34mm^2 | LAPP Unitronic LiYCY 0034515  ∅ 9,4 mm  15 x outer diameter | +UC103 | +UB2 |
| Sensors box |  | T, RH, leak (on board) | 40x0.14mm^2 | LAPP Unitronic LiYCY 0034340  ∅ 10,4 mm  15 x outer diameter | +UC101 | TBD |
| Env. sensors (outside the sensor box) |  | PT100 4 wires | 6x0.14mm^2 | LAPP Unitronic LiYCY 0034306  ∅ 6,1 mm  15 x outer diameter | +UC101 | TBD |
| FREDA |  | Fibers (RTC, control & PTP) | 4 | Neutrik opticalCON QUAD Advance  ∅ 5.8 mm  10 x outer diameter | TBD | +UB2 |
|  | Power | 4x 1mm^2 | LAPP  ÖLFLEX® CLASSIC 110 CH  10035058  ∅ 8.9 mm  15 x outer diameter | +UC114 | +UB2 |
|  | HW Alarm and enable | 4x 0.14mm^2 | LAPP Unitronic LiYCY 0034304  ∅ 4,3 mm  15 x outer diameter | +UC114 | +UB2 |
|  | AVC | TBD | TBD |  |  |
|  | Cooling |  | Reichelt Chemietechnik n. 14067 (ID: 8 mm, OD: 14.7 mm, bending R: 45 mm) |  |  |
| ALICE |  | Fibers (RTC, control & PTP) | 4 | Neutrik opticalCON QUAD Advance  ∅ 5.8 mm  10 x outer diameter |  |  |
|  | Power | 4x 1mm^2  7x 1.5mm^2 | LAPP  ÖLFLEX® CLASSIC 110 CH  10035058  ∅ 8.9 mm  15 x outer diameter | +UC114 | +UB2 |
|  | HW Alarm and enable | 4x 0.14mm^2 | LAPP Unitronic LiYCY 0034304  ∅ 4,3 mm  15 x outer diameter | +UC114 | +UB1 |
|  | Cooling |  | Reichelt Chemietechnik n. 14067 (ID: 8 mm, OD: 14.7 mm, bending R: 45 mm) |  |  |
| Anti collision System  TBC |  | Signal from the sensor to the control unit | 4x 0.25mm^2 | LAPP Unitronic LiYCY 0034404  ∅ 5 mm  15 x outer diameter |  |  |

# Destination : +WFS03 and +UB3

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Device/function** | **ID** | **Type of signals** | **Number of wires x wire diameter [mm2]** | **Cable PN/ section/ bending radius** | **SOURCE** | **DESTINATION** |
| AcqStages |  | Ctrl out  To motor phases | 5 | Kollmorgen DE-87792  ∅ 11 mm  10 x outer diameter | +UC105 | +WFS03 |
|  | Feedback on motor + hall | 17 | Kollmorgen DE-107915  ∅ 10 mm  10 x outer diameter | +UC105 | +WFS03 |
|  | Limit + lin. Encoder | 18x0.14mm^2 | LAPP Unitronic LiYCY 0034318  ∅ 7,3 mm  15 x outer diameter | +UC105 | +WFS03 |
| Interlock Park switches X and Y |  | 24V contacts | 8 x0.25mm^2 | LAPP Unitronic LiYCY 0034408  ∅ 7,1 mm  15 x outer diameter | +UC101 | +WFS03 |
| Focus Comp. |  | DC motor,  Encoder,  Limit switches | 16 x0.34mm^2 | LAPP Unitronic LiYCY 0034515  ∅ 9,4 mm  15 x outer diameter | +UC104 | +UB3 |
| Pupil St. Mirror |  | HV & strain gauges | 30x0.34mm^2 | LAPP Unitronic LiYCY 0034530  ∅ 12,3 mm  15 x outer diameter | +UC104 | +UB3 |
| ADC  rotary stage 1 |  | DC motor,  Encoder,  Limit switches | 16 x0.34mm^2 | LAPP Unitronic LiYCY 0034515  ∅ 9,4 mm  15 x outer diameter | +UC104 | +UB3 |
| ADC  rotary stage 2 |  | DC motor,  Encoder,  Limit switches | 16 x0.34mm^2 | LAPP Unitronic LiYCY 0034515  ∅ 9,4 mm  15 x outer diameter | +UC104 | +UB3 |
| Sensors box |  | T, RH, leak (on board) | 40x0.14mm^2 | LAPP Unitronic LiYCY 0034340  ∅ 10,4 mm  15 x outer diameter | +UC101 | TBD |
| Env. sensors (outside the sensor box) |  | PT100 4 wires | 6x0.14mm^2 | LAPP Unitronic LiYCY 0034306  ∅ 6,1 mm  15 x outer diameter | +UC101 | TBD |
| FREDA |  | Fibers (RTC, control & PTP) | 4 | Neutrik opticalCON QUAD Advance  ∅ 5.8 mm  10 x outer diameter | TBD | +UB3 |
|  | Power | 4x 1mm^2 | LAPP  ÖLFLEX® CLASSIC 110 CH  10035058  ∅ 8.9 mm  15 x outer diameter | +UC114 | +UB3 |
|  | HW Alarm and enable | 4x 0.14mm^2 | LAPP Unitronic LiYCY 0034304  ∅ 4,3 mm  15 x outer diameter | +UC114 | +UB3 |
|  | AVC | TBD | TBD |  |  |
|  | Cooling |  | Reichelt Chemietechnik n. 14067 (ID: 8 mm, OD: 14.7 mm, bending R: 45 mm) |  |  |
| ALICE |  | Fibers (RTC, control & PTP) | 4 | Neutrik opticalCON QUAD Advance  ∅ 5.8 mm  10 x outer diameter |  |  |
|  | Power | 4x 1mm^2  7x 1.5mm^2 | LAPP  ÖLFLEX® CLASSIC 110 CH  10035058  ∅ 8.9 mm  15 x outer diameter | +UC114 | +UB3 |
|  | HW Alarm and enable | 4x 0.14mm^2 | LAPP Unitronic LiYCY 0034304  ∅ 4,3 mm  15 x outer diameter | +UC114 | +UB3 |
|  | Cooling |  | Reichelt Chemietechnik n. 14067 (ID: 8 mm, OD: 14.7 mm, bending R: 45 mm) |  |  |
| Anti collision System  TBC |  | Signal from the sensor to the control unit | 4x 0.25mm^2 | LAPP Unitronic LiYCY 0034404  ∅ 5 mm  15 x outer diameter |  |  |

# LOR cable list through the cable wrap

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Device/function** | **ID** | **Type of signals** | **Number of wires x wire diameter [mm2]** | **Cable PN/ section/ bending radius** | **SOURCE** | **DESTINATION** |
| EtherCAT |  | Copper ETherCAT | 4 x 2 x AWG24 | ETHERLINE® Cat.6A P FD FC  2170952  ∅ 8,8 mm  15 x outer diameter | +ICS05 | MAORY PLC |
| Interlock |  | 24V contacts | 8x0.34mm^2 | LAPP Unitronic LiYCY 0034508  ∅ 7,8 mm  15 x outer diameter | +UC111 | +ICS112 |
| Camera fiber bundle |  | Optical | 48x SM 9/125µm OS2 |  | TBD | TBD |

# LOR cable list between cabinets

There will be the need to route some cables from the following cabinets:

1. From ICS04 to ICS05
2. From ICS04 to ICS03

# LOR cable list between cabinets ICS04 and ICS05

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Device/function** | **ID** | **Type of signals** | **Number of wires x wire diameter [mm2]** | **Cable PN/ section/ bending radius** | **SOURCE** | **DESTINATION** |
| EtherCAT |  | Copper ETherCAT | 4 x 2 x AWG24 | ETHERLINE® Cat.6A P FD FC  2170952  ∅ 8,8 mm  15 x outer diameter | +UC105 | +ICS05 |

# LOR cable list between cabinets ICS04 and ICS03

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Device/function** | **ID** | **Type of signals** | **Number of wires x wire diameter [mm2]** | **Cable PN/ section/ bending radius** | **SOURCE** | **DESTINATION** |
| EtherCAT |  | Copper ETherCAT | 4 x 2 x AWG24 | ETHERLINE® Cat.6A P FD FC  2170952  ∅ 8,8 mm  15 x outer diameter | +UC100 | +UC114 |

# LOR cable list from ICS04 to WDM

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Device/function** | **ID** | **Type of signals** | **Number of wires x wire diameter [mm2]** | **Cable PN/ section/ bending radius** | **SOURCE** | **DESTINATION** |
| Burkert 6213 |  | 24 power and signal | 12x1mm^2 | LAPP Unitronic LiYCY 0034812  ∅ 11,4 mm  15 x outer diameter | +UC101 | +WDM |
| SSP61 |  | 24 power and signal | 12x0.5mm^2 | LAPP Unitronic LiYCY 0034612  ∅ 9,6 mm  15 x outer diameter | +UC101 | +WDM |
| PT100s |  | signals | 4x0..34mm^2 | LAPP Unitronic LiYCY 0034504  ∅ 5,7 mm  15 x outer diameter | +UC101 | +WDM |
| SM6000 |  | Power and signals | 18x0.5mm^2  only 16 wires used | LAPP Unitronic LiYCY 0034618  ∅ 11,8 mm  15 x outer diameter | +UC101 | +WDM |

**\*\*\* End of document \*\*\***