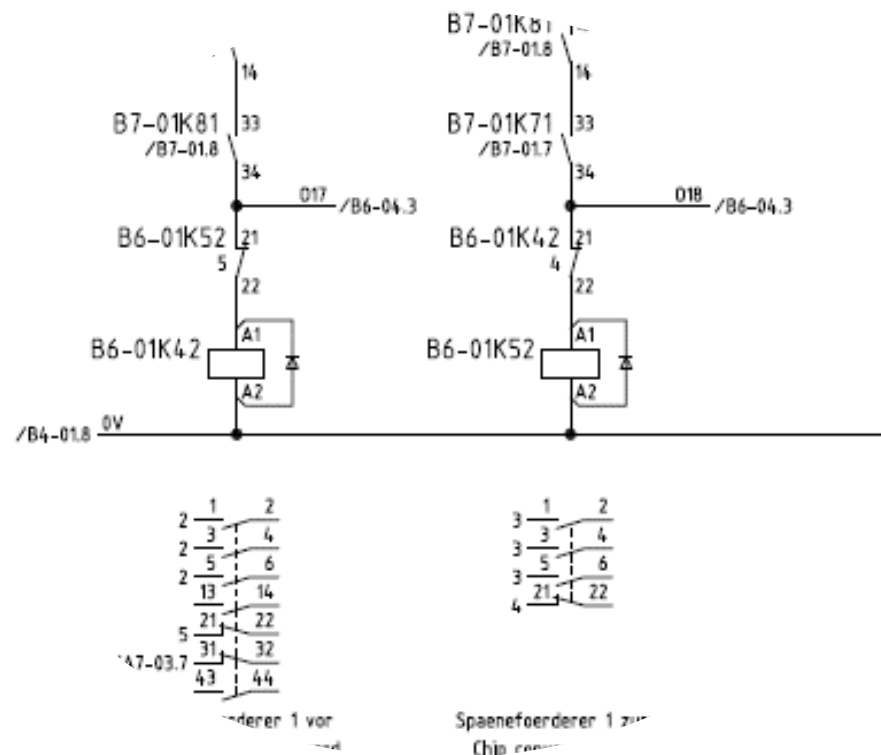


Welcome to our Webinar on Electrical Schematics

Today you will learn How to Read IEC Electrical Schematics

IEC INTERNATIONAL
ELECTROTECHNICAL
COMMISSION



Presenter Marty Redman

The Keys to Reading Drawings

- ✓ Understanding how Electricity Works.
- ✓ The different types of Drawings.
- ✓ Knowing your Symbols and Abbreviations.
- ✓ Understanding how the Devices operate in the circuit.
- ✓ Checking the Title Block.
- ✓ Checking for Key Notes and Updates to the Drawing.
- ✓ Understanding the difference between NEMA and IEC Drawings.



Understanding How Electricity Works.

The 4 things that every circuit must have to work!

1. **Source of energy; we usually get our energy from a breaker or fuse (OCPD) in a distribution panel or disconnect.**
2. **Resistance/Load; this is usually something that does work for us like (motors, heaters, etc.).**
3. **Current (Ampere) is the flow of electrons.**
4. **Complete path; this is created with the conductor (wires) we use to connect the devices together.**



The Different Types of Drawings

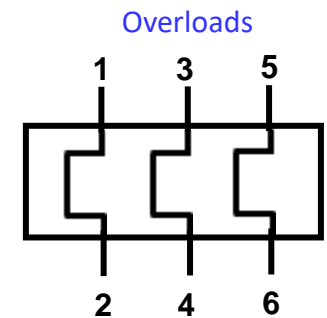
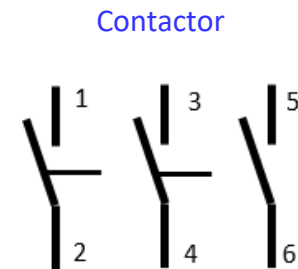
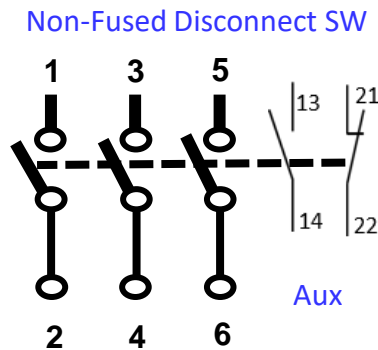
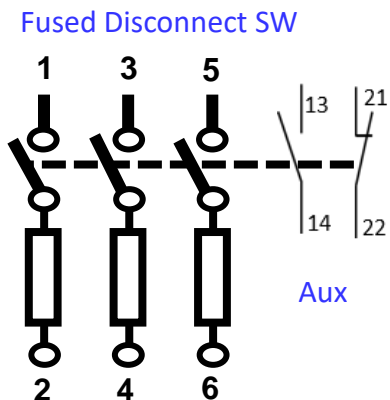
1. **Single-line diagrams** **Distribution flow**
2. **Wiring diagrams** **Location of terminations**
3. **Schematic diagrams** **Electrical operation**
4. **Ladder diagrams** **Control circuits**
5. **Floor plans** **Branch circuit and wiring**
6. **Site plans** **Overview of your facility**



Knowing your Symbols and Abbreviations

- ❖ Each discipline (Arch, Mech, Elec, Plumbing, Civil, Structural, Landscaping) has its own set of symbols and abbreviations.
- ❖ Most drawings will have a Legend Sheet with this information on it.
- ❖ You must know what the symbols mean, or you can't troubleshoot.
- ❖ Two types of Electrical Symbols **Power** and Controls

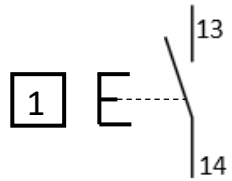
Some Power Symbols



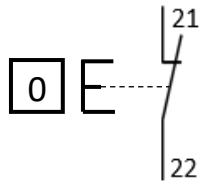
Knowing your Symbols and Abbreviations

❖ Two types of Electrical Symbols Power and **Controls**

Some Control Symbols



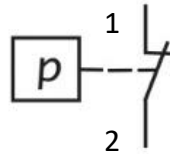
NO Push
Button
Momentary



NC Push
Button
Momentary



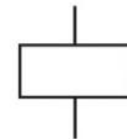
NO Limit
SW



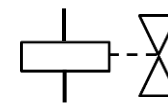
NC Pressure
SW



Pilot light



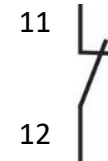
Coil
Could be a
relay or
contactor coil



Solenoid
coil



NO
Relay Contact



NC
Relay Contact

Remember Most drawing are drawn in the de-energized state!

What does this mean?

IEC limit switch



Limit (NC)



Limit (NO)



Limit (NC)
Held Open

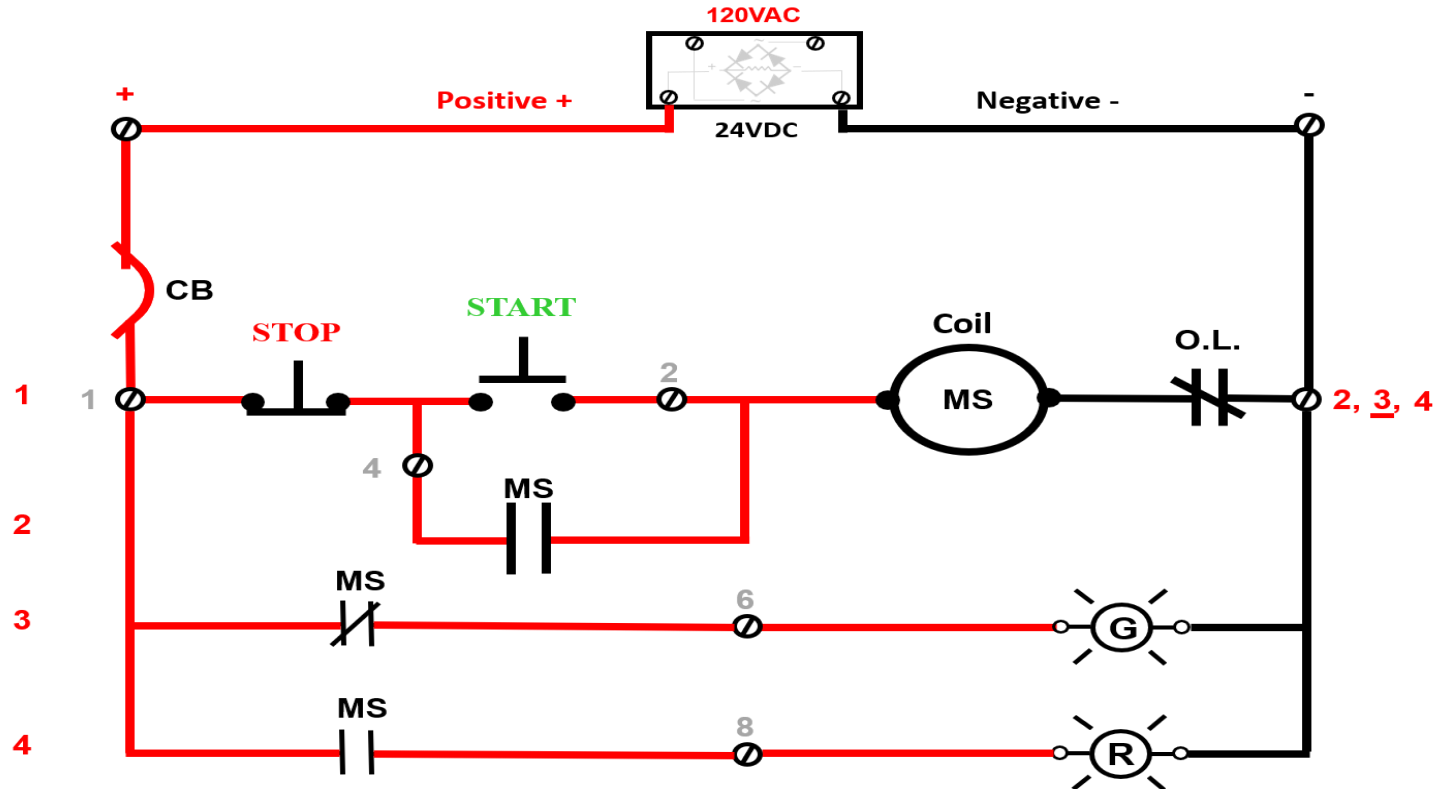


Limit (NO)
Held Closed



NEMA Ladder Diagram

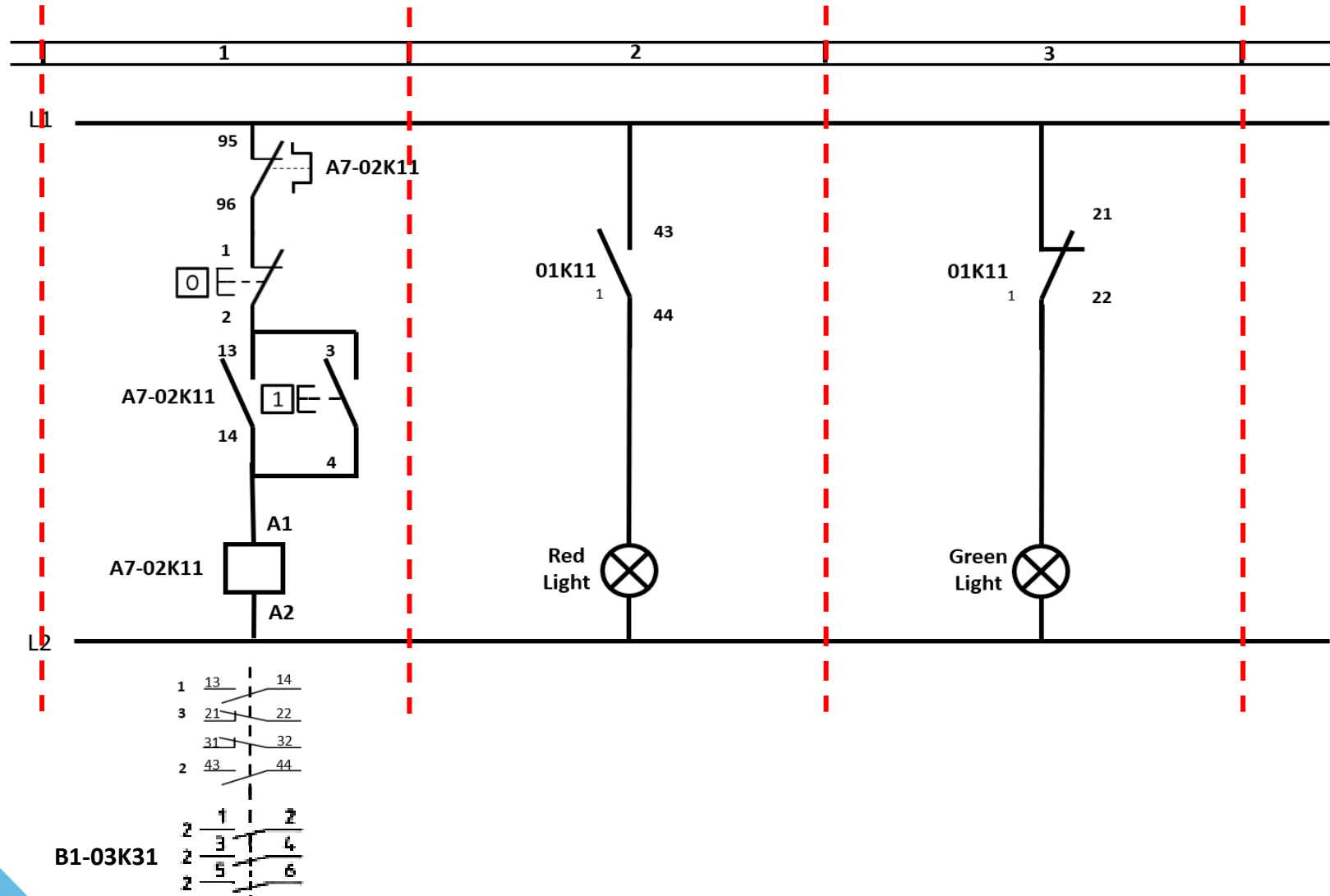
This is a typical NEMA Start/Stop diagram
We read this type top to bottom, left to right



IEC Ladder Diagram

The IEC ladder diagram is showing us just the logic (the path the current takes) and not where any devices are or their ratings. Some may show termination points on the devices as this one does.

IEC Ladder diagrams are read from left to right, and top to bottom.



IEC Prints

What do the numbers all Mean

A7-02K11

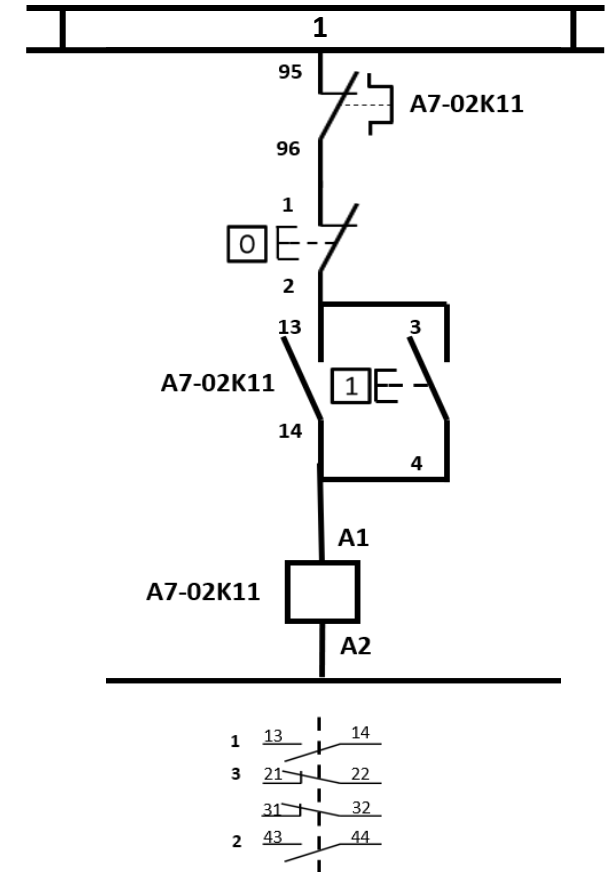
Print Group → **A7-02K11**

Print Page → **A7-02K11**

Type of Device → **A7-02K11** → Relay or contactor

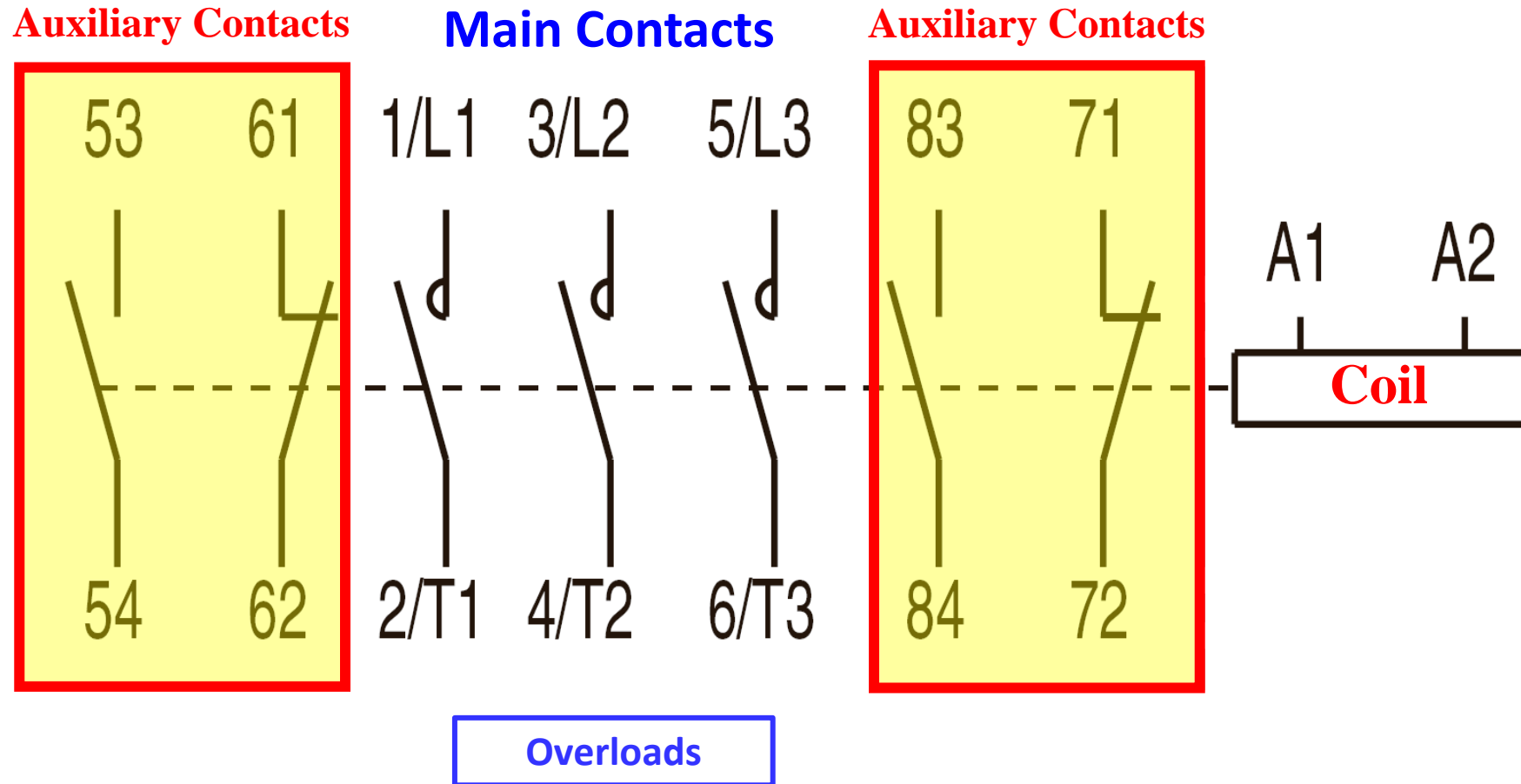
Rung or Space Number → **A7-02K11**

Number of Loads in Space → **A7-02K11**

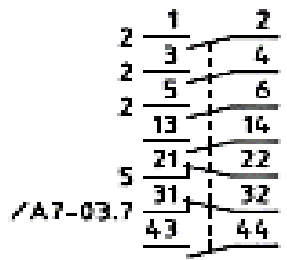
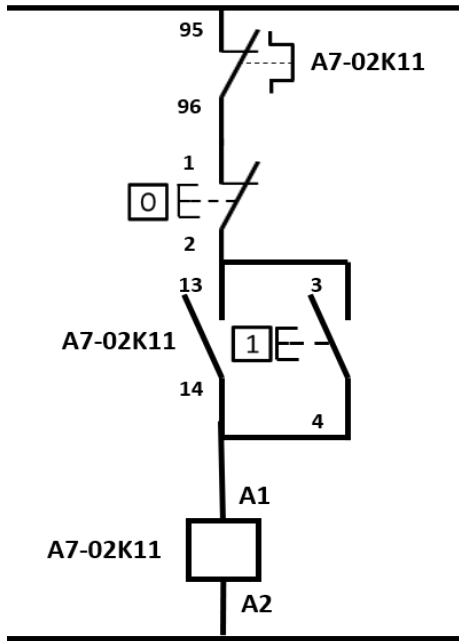


Maschinenbezeichnung		←	A7-01
		+5	→
Serie	Projekt-Nr.	Blatt	A7-02/
04/00	6019655		/79

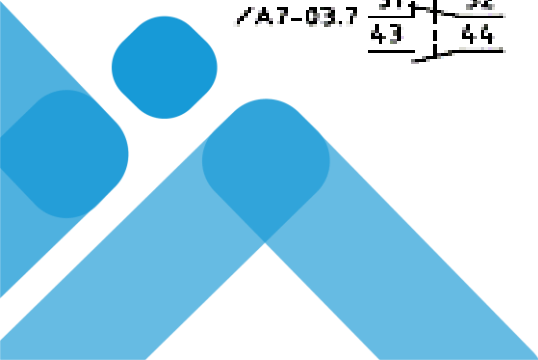
IEC Contactor



IEC Contactor

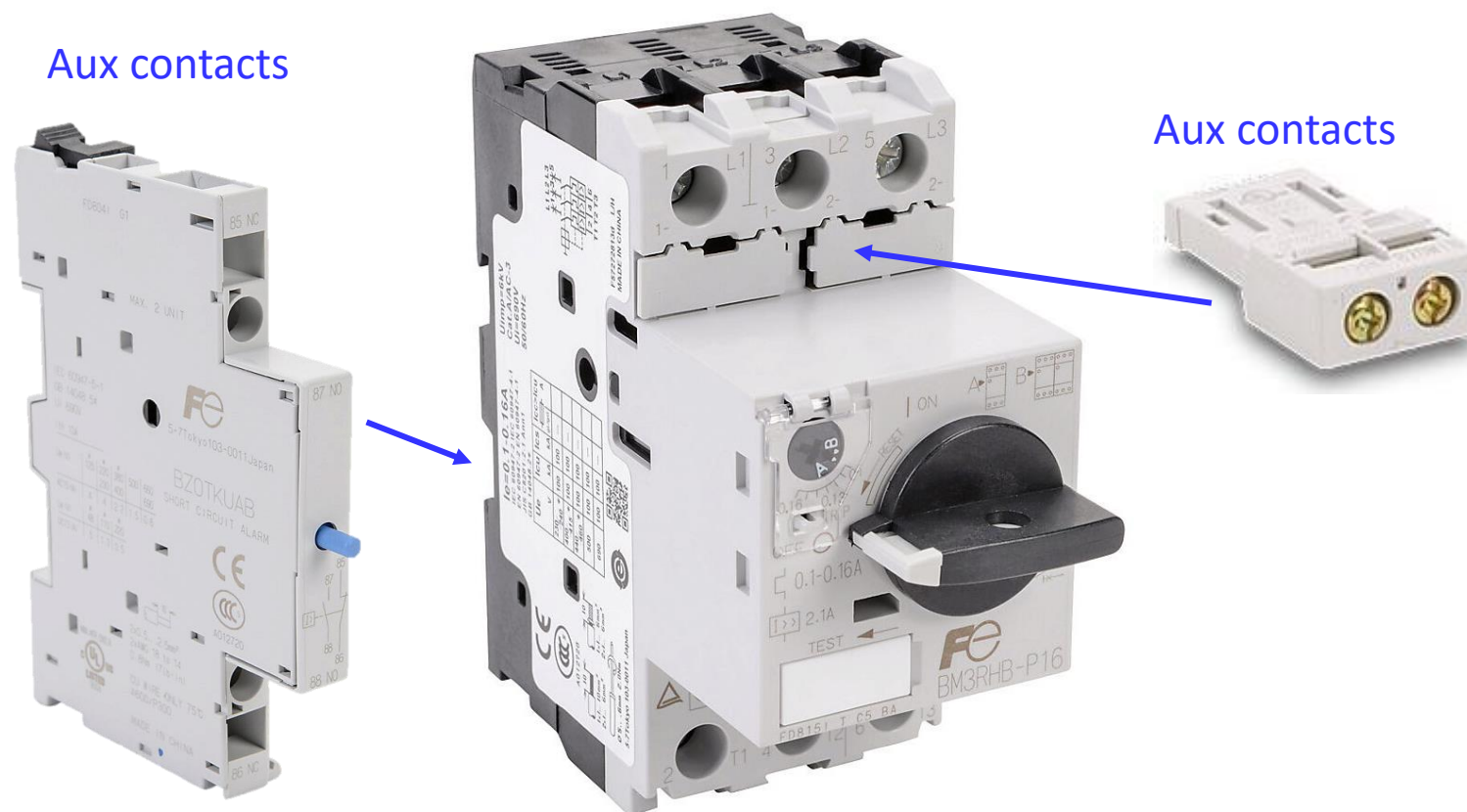


Aux Contacts



IEC Manual Motor Protector

IEC manual motor starters provide high switching capacity while integrating the functions of a molded case circuit breaker (MCCB) and a thermal overload relay. This compact MMS solution offers adjustable thermal-magnetic tripping in all 3 phases.

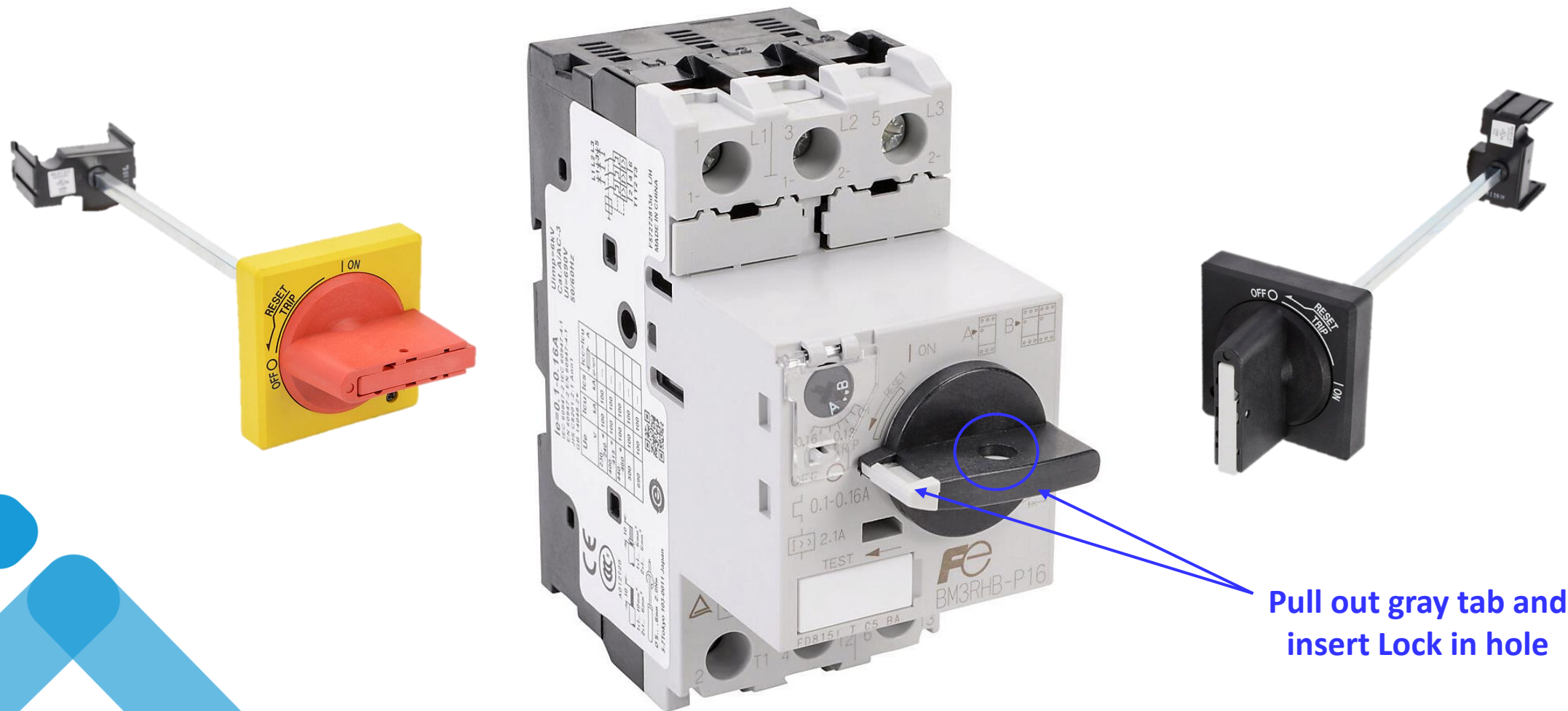


This unit can also be locked out

IEC Manual Motor Protector

This device can also be operated from outside of the cabinet and be Lock and Tagged.

Safety First



Pull out gray tab and insert Lock in hole

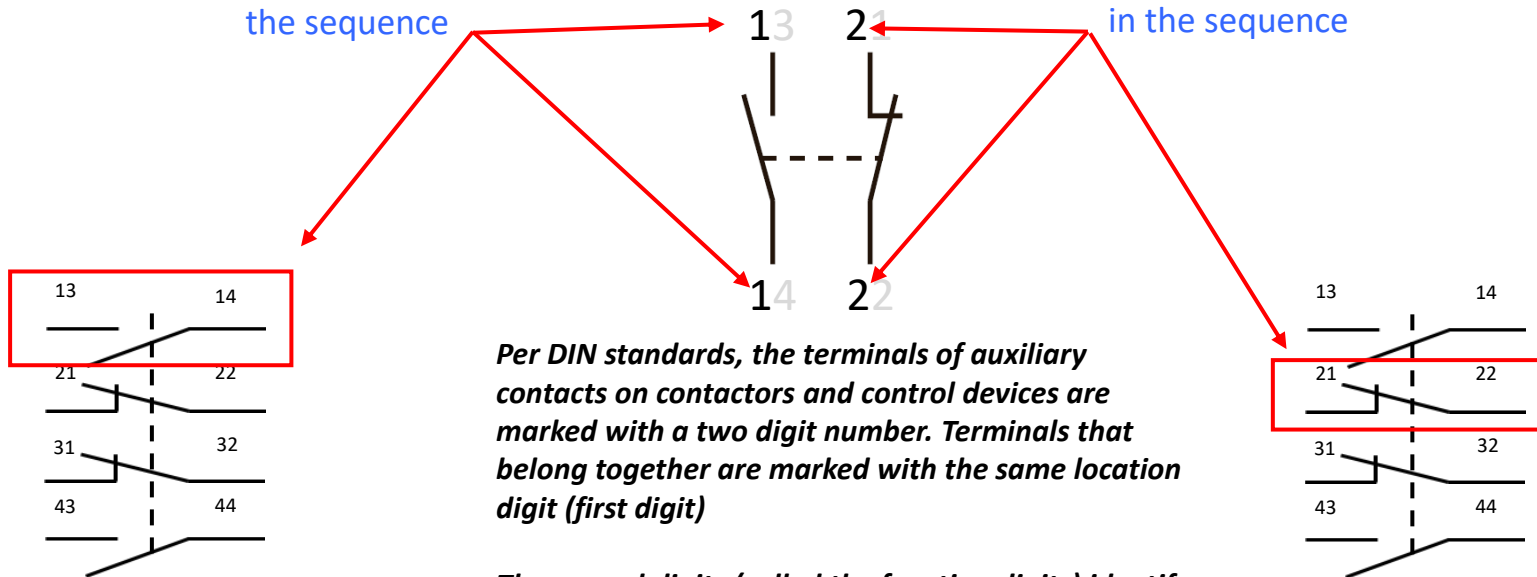
IEC Relay

Type of contact	Function digits
Normally Open	3 and 4
Normally closed	1 and 2
Normally Closed (Special Function)	5 and 6 i.e. Time-Delay or Overload
Normally Open (Special Function)	7 and 8 Overload Contacts



1 identifies first contact in the sequence

2 identifies second contact in the sequence



Per DIN standards, the terminals of auxiliary contacts on contactors and control devices are marked with a two digit number. Terminals that belong together are marked with the same location digit (first digit)

The second digits (called the function digits) identify the function of each contact per the following designation.

IEC Symbols

Type of contact	Function digits
Normally Open	3 and 4
Normally closed	1 and 2

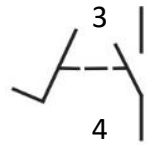
Limit (NC)



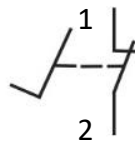
Limit (NO)



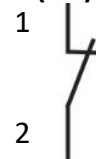
Foot (NO)



Foot (NC)



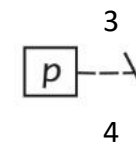
Relay Contact (NC)



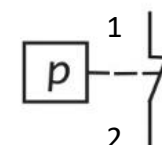
Relay Contact (NO)



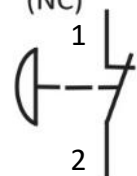
Pressure (NO)



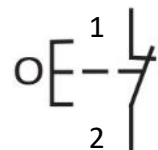
Pressure (NC)



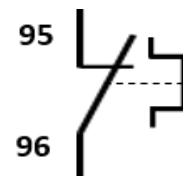
Mushroom Head (NC)



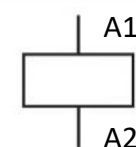
Push Button Momentary (NC)



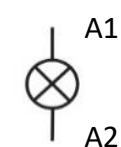
Overload Contact

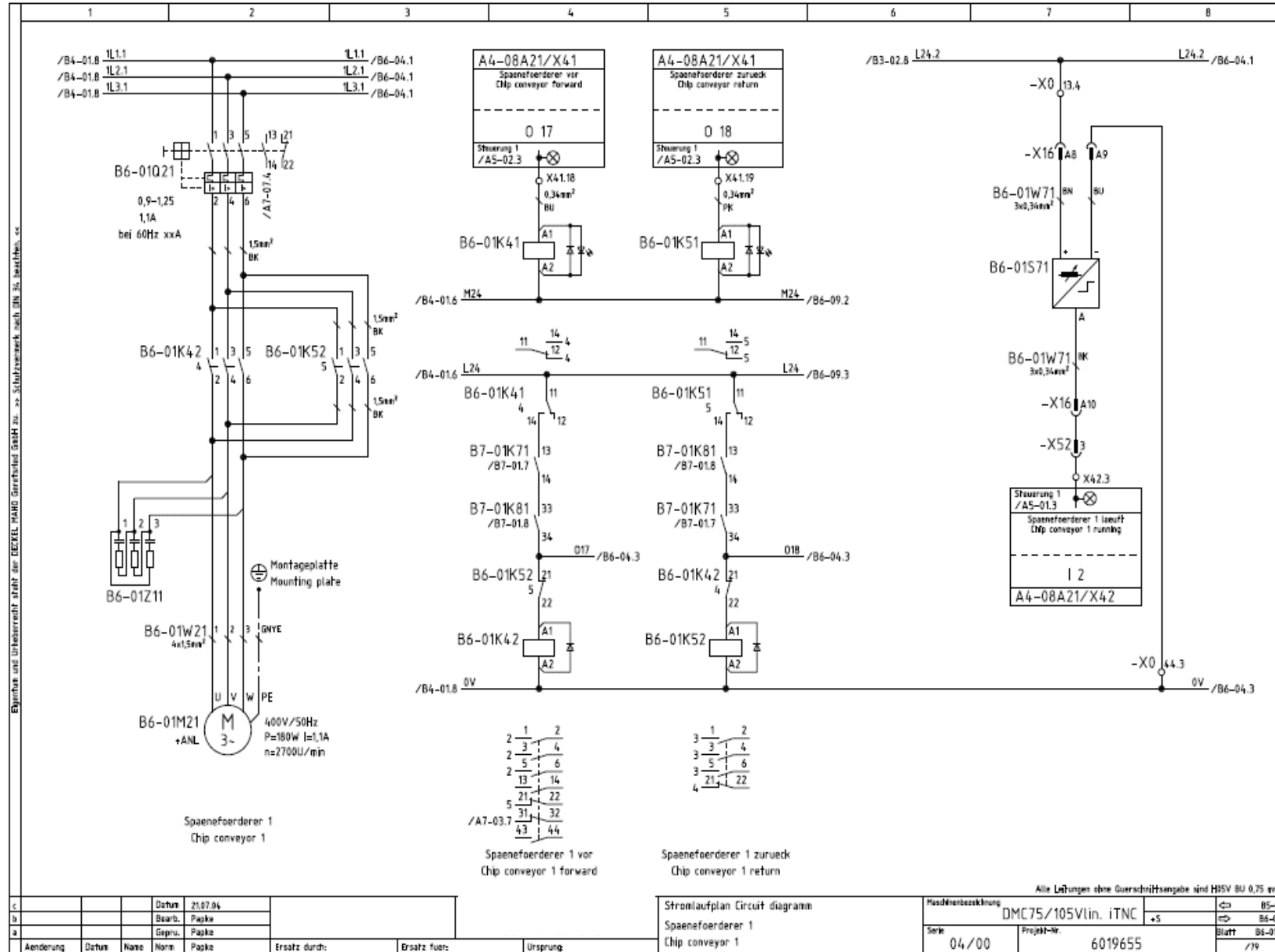


Contactor Coil



Pilot Light

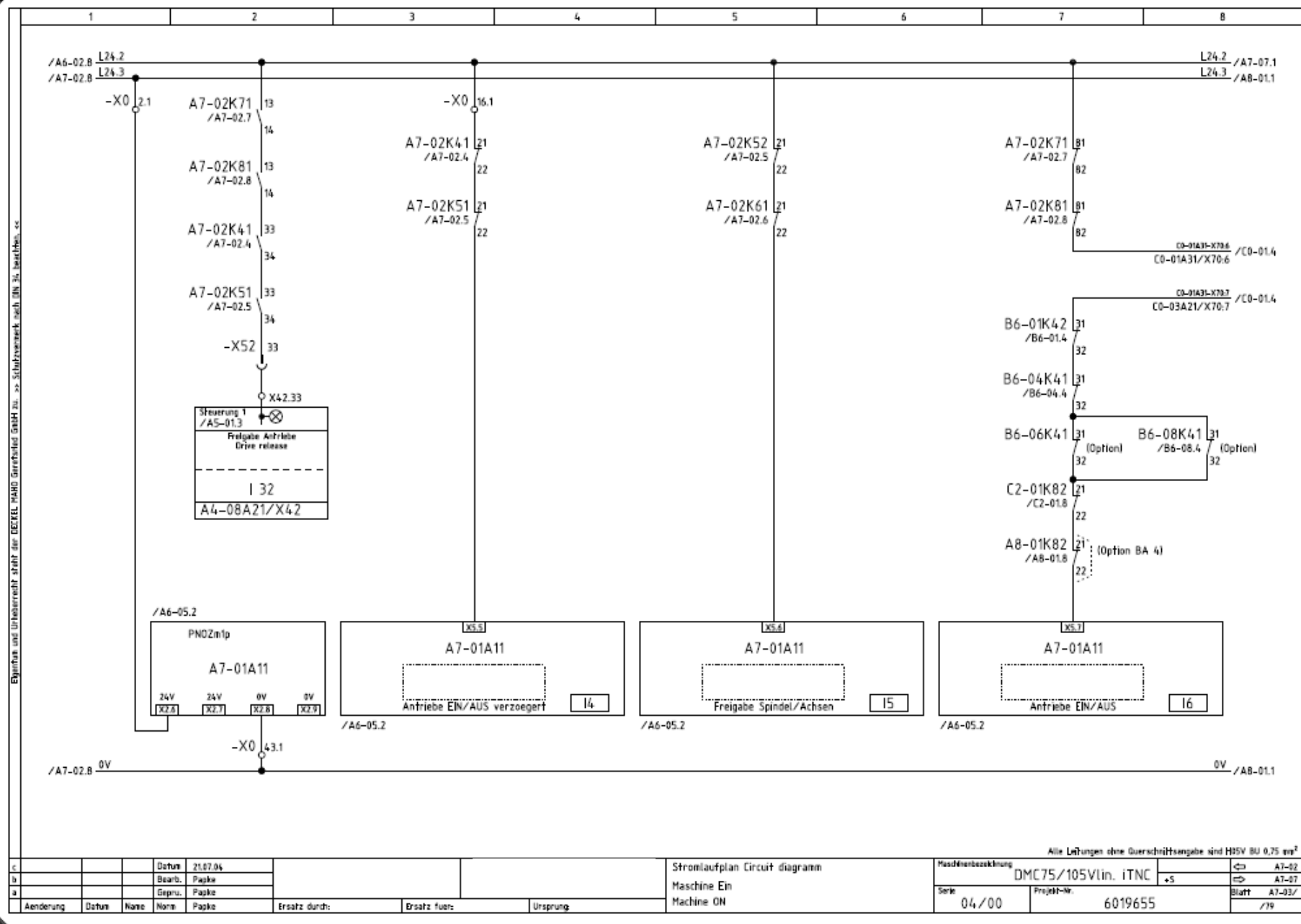




Ergebnis und Unbedenklichkeit steht dem FCKEL HART Gerhardt GmbH zu. -> Schutzanwech nach DIN 34 beachten. cc

c		Datum	21.07.06
b		Bearb.	Flapke
a		Gepru.	Flapke
Änderung	Datum	Name	Name
		Flapke	Flapke
Ersatz durch:	Ersatz fuer:	Ursprung	

Maschinenbezeichnung DMC75/105Vlin. iTNC +S Blatt B6-01/79	Serie 04/00	Projekt-Nr. 6019655	B5-01 B6-04 B6-01/79
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Eigentuem und Urheberrecht steht dem DEVEL HARD Gesellschaft GmbH zu. -> Schutzzeichen nach DIN 34 beachten. <<

Alle Leistungen ohne Querschnittsangaben sind H05V-BU 0,75 mm ²												
c		Datum	21.07.06				Stromlaufplan Circuit diagramm		Modellbezeichnung	DMC75/105Vlin. iTNC	↔	A7-02
b		Bearb.	Paake				Maschine Ein		Serie	04/00	↔	A7-07
a		Gepru.	Paake				Maschine ON		Proj-Nr.	6019655	↔	A7-03/
Aenderung		Datum	Name	Norm	Paake	Ersatz durch:	Ersatz fuer:	Ursprung:			Blatt	/19



Questions?



If you'd like to learn more about electrical schematics,
TPC Training can help!

Email: sales@tpctraining.com

Phone: (847) 808-4000

Remember we should never stop learning!